Buncombe Madison

Regional Hazard Mitigation Plan

FINAL - April 2021

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SECTION 1
INTRODUCTION

This section provides a general introduction to the Buncombe Madison 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 Buncombe Madison Region is located in the western part of North Carolina and includes the two counties and the municipalities within the counties. 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, such as hazardous substances. These hazards threaten the life and safety of residents in the Buncombe Madison 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 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.

Buncombe and Madison Counties first joined together in 2013 to develop the initial version of this regional plan. Prior to that, each County was operating under individual County-level hazard mitigation plans. The plan development process for the 2021 update of the plan is detailed in Section 2: Planning Process.

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

1.1.1 The Disaster Mitigation Act and the Flood Insurance Reform Act

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

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

The Buncombe Madison 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. Additionally, the plan was developed in accordance with updated FEMA Region IV Review Standards that were provided in February of 2020.

1.2 PURPOSE

The purpose of the Buncombe Madison Regional Hazard Mitigation Plan is to:

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

1.3 SCOPE

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

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

TABLE 1.1: PARTICIPATING JURISDICTIONS

Buncombe County	
Asheville	Montreat
Biltmore Forest	Weaverville
Black Mountain	Woodfin
Madison County	
Hot Springs	Mars Hill
Marshall	

1.4 AUTHORITY

The Buncombe Madison Regional Hazard Mitigation Plan has been developed in accordance with current state and federal rules and regulations governing local hazard mitigation plans and has been adopted by each participating county, local jurisdiction in accordance with standard local procedures. Copies of the adoption resolutions for each participating jurisdiction are provided in Appendix A. The

Plan shall be routinely monitored and revised to maintain compliance with the following provisions, rules, and legislation:

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

1.5 SUMMARY OF PLAN CONTENTS

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

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

The ***Community Profile***, located in Section 3, provides a general overview of the Buncombe Madison Region, including prevalent geographic, demographic, and economic characteristics. In addition, building characteristics and land use patterns are discussed. This baseline information provides a snapshot of the planning area and helps local officials recognize those social, environmental, and economic factors that ultimately play a role in determining the region's vulnerability to hazards.

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

The Risk Assessment begins by identifying hazards that threaten the Buncombe Madison Region. Next, detailed profiles are established for each hazard, building on available historical data from past hazard occurrences, spatial extent, and probability of future occurrence. This section culminates in a hazard risk ranking based on conclusions regarding the frequency of occurrence, spatial extent, and potential impact highlighted in each of the hazard profiles. In the vulnerability assessment, NCEM's Risk Management Section's loss estimation methodology is used to evaluate known hazard risks by their relative long-term cost in expected damages. In essence, the information generated through the risk assessment serves a critical function as the participating jurisdictions in the Buncombe Madison 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 Buncombe Madison 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 detailed survey questionnaire and an inventory and analysis of existing plans, ordinances, and relevant documents. The

purpose of this assessment is to identify any existing gaps, weaknesses, or conflicts in programs or activities that may hinder mitigation efforts and to identify those activities that should be built upon in establishing a successful and sustainable local hazard mitigation program.

The *Community Profile*, *Risk Assessment,* and *Capability Assessment* collectively serve as a basis for determining the goals for the Buncombe Madison 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 Buncombe Madison Regional Hazard Mitigation Plan to consider in reducing hazard vulnerabilities. The strategy provides the foundation for a detailed ***Mitigation Action Plan***, found in Section 9, which links specific mitigation actions for each county and municipal department or agency to locally-assigned implementation mechanisms and target completion dates. Together, these sections are designed to make the Plan both strategic, through the identification of long-term goals, and functional, through the identification of immediate and short-term actions that will guide day-to-day decision-making and project implementation.

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

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

SECTION 2
PLANNING PROCESS

This section describes the planning process undertaken to develop the Buncombe Madison 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 Buncombe Madison Region
- 2.3 Preparing the 2021 Plan
- 2.4 The Buncombe Madison Regional Hazard Mitigation Planning Team
- 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 BUNCOMBE MADISON REGION

Prior to the development of the Buncombe Madison Regional Hazard Mitigation Plan in 2016, both of the counties participating in this Plan had previously adopted separate county-level hazard mitigation plans. The FEMA approval dates for each of these plans, along with a list of the participating municipalities for each plan, are listed below:

- *Buncombe County – County-Wide All Hazards Mitigation Plan* (September 2011)
  - City of Asheville
  - Town of Biltmore Forest
  - Town of Black Mountain
  - Town of Montreat
  - Town of Weaverville
  - Town of Woodfin
- *Hazard Mitigation Plan for Madison County, North Carolina and the Municipalities of Hot Springs, Marshall and Mars Hill* (June 2013)
  - Town of Hot Springs
  - Town of Mars Hill
  - Town of Marshall

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

For the development of the 2016 plan, all of the aforementioned jurisdictions joined to develop a regional plan. No new jurisdictions joined the process and all of the jurisdictions that participated in previous planning efforts participated in the development of the 2016 regional plan. The regional plan was developed in order to simplify planning efforts for the jurisdictions in the Buncombe Madison Region and allowed resources to be shared amongst the participating jurisdiction to ease the administrative duties of all of the participants by combining the two existing County-level plans into one multi-jurisdictional plan. The 2016 plan was important and successful first start for regional hazard mitigation planning efforts and that success has carried over into the 2021 update of the plan.

2.3 PREPARING THE 2021 PLAN

Hazard mitigation plans are required to be updated every five years to remain eligible for federal mitigation funding. To simplify planning efforts, the jurisdictions in the Buncombe Madison Region decided to join together to create the *Buncombe Madison Regional Hazard Mitigation Plan*. This allows resources to be shared amongst the participating jurisdictions and eases the administrative duties of all of the participants by combining the existing county plans into one multi-jurisdictional plan.

FEMA requires that hazard mitigation plans be updated every five years to remain eligible for federal mitigation and public assistance funding. To prepare the 2021 *Buncombe Madison Regional Hazard Mitigation Plan*, ESP Associates, Inc. was hired by North Carolina Emergency Management to provide professional mitigation planning services. Per the contractual scope of work, the consultant team followed the mitigation planning process recommended by FEMA (Publication Series 386 and Local Mitigation Plan Review Guide) and recommendations provided by North Carolina Emergency Management (NCEM) mitigation planning staff[1]. Additionally, for the 2020 update, FEMA Community Rating System (CRS) and Community Wildfire Protection Plan (CWPP) requirements were integrated into the plan update.

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

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

FEMA Disaster Mitigation Act Requirement	CRS Activity 510 Planning Requirement
Phase I – Planning Process	
§201.6(c)(1)	Step 1: Organize to Prepare the Plan
§201.6(b)(1)	Step 2: Involve the Public
§201.6(b)(2) & (3)	Step 3: Coordinate
Phase II – Risk Assessment	
§201.6(c)(2)(i)	Step 4: Assess the Hazard
§201.6(c)(2)(ii) & (iii)	Step 5: Assess the Problem
Phase III – Mitigation Strategy	
§201.6(c)(3)(i)	Step 6: Set Goals
§201.6(c)(3)(ii)	Step 7: Review Possible Activities
§201.6(c)(3)(iii)	Step 8: Draft an Action Plan
Phase IV – Plan Maintenance	
§201.6(c)(5)	Step 9: Adopt the Plan
§201.6(c)(4)	Step 10: Implement, Evaluate and Revise the Plan

TABLE 2.2 COMMUNITY WILDFIRE PROTECTION PLAN PROCESS INTEGRATION REFERENCE TABLE

CWPP Process	Hazard Mitigation Plan Integration Reference
Step 1: Convene Decisionmakers	Section 2: Planning Process
Step 2: Involve Federal Agencies	Section 2: Planning Process

[1] A copy of the negotiated contractual scope of work between NCEM and ESP is available through NCEM upon request.

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

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

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

The process used to prepare this Plan included twelve major steps that were completed over the course of approximately nine months beginning in August 2019. Each of these planning steps (illustrated in **Figure 2.1**) resulted in critical work products and outcomes that collectively make up the Plan. Specific plan sections are further described in Section 1: *Introduction*.

FIGURE 2.1: MITIGATION PLANNING PROCESS FOR THE BUNCOMBE MADISON REGION

2.4 THE BUNCOMBE MADISON REGIONAL HAZARD MITIGATION PLANNING TEAM

In order to guide the development of this Plan, the Buncombe Madison jurisdictions created the Buncombe Madison Regional Hazard Mitigation Planning Team (Regional Hazard Mitigation Planning Team or Regional Planning Team). The Regional Hazard Mitigation Planning Team represents a community-based planning team made up of representatives from various county and municipal departments, and other key stakeholders identified to serve as critical partners in the planning process. Beginning in August 2019, the Regional Hazard Mitigation Planning Team 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, team members routinely communicated and were kept informed through an e-mail distribution list.

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

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

- help update existing mitigation actions and design and propose any appropriate new mitigation actions for their department/agency for incorporation into the Mitigation Action Plan
- review and provide timely comments on all study findings and draft plan deliverables
- support the adoption of the 2021 *Buncombe Madison Regional Hazard Mitigation Plan*

Table 2.3 lists the members of the Regional Hazard Mitigation Planning Team who were responsible for participating in the development of the Plan. Team members are listed in alphabetical order by last name.

TABLE 2.3: MEMBERS OF THE BUNCOMBE MADISON REGIONAL HAZARD MITIGATION PLANNING TEAM

NAME	POSITION	DEPARTMENT / AGENCY
Buncombe County		
Pennington, Nathan	Planning Director	Buncombe County Planning Department
Ledford, Angela*	Planner	Buncombe County Emergency Services
Fox-Clark, Cynthia	Floodplain Manager	Buncombe County Planning Department
Buncombe County Municipalities		
Asheville		
Hensley, Lee	Watershed Supervisor	City of Asheville
Watford, Nancy	Stormwater Supervisor	City of Asheville
Burnette, Scott	Fire Chief	City of Asheville Fire Department
Biltmore Forest		
Kanipe, Jonathan	Town Manager	Town of Biltmore Forest
Black Mountain		
Trotman, Jessica	Planning Director	Black Mountain Planning Department
Wilson, John V.	Deputy Fire Chief	Black Mountain Fire Department
Montreat		
Carmichael, Alex	Town Administrator	Town of Montreat
Weaverville		
Williams, Ted	Fire Chief	Weaverville Fire Department
Woodfin		
Angel, Jeffrey D	Fire Chief	Town of Woodfin Fire Department
Saunders, Michael	Town Planner	Town of Woodfin
Madison County		
Dispenza, Caleb*	Emergency Management Director	Madison County Emergency Management
Roberts, Edward	Emergency Management Coordinator	Madison County Emergency Management
Metcalf, Shelia	Lab Director	Madison County Health Department

NAME	POSITION	DEPARTMENT / AGENCY
Sprinkle, Renee	Communicable Disease Specialist	Madison County Health Department
Hot Springs		
Marshall		
Allen, Nancy G	Town Administrator	Town of Marshall
Mars Hill		
Bennett, Nathan	Town Manager	Town of Mars Hill
Waldrup, Nathan	Interim Fire Chief	Town of Mar Hill Fire Department
Other Stakeholders		
Cole, Ryan	Chief	Skyland Fire Department
Lance, Trevor	Division Chief	Skyland Fire Department

* Served as the County's main Point of Contact

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

TABLE 2.4: MEMBERS DESIGNATING REPRESENTATIVES TO BUNCOMBE MADISON REGIONAL HAZARD MITIGATION PLANNING TEAM

NAME	POSITION	DEPARTMENT / AGENCY
Norton, Abby	Mayor	Town of Hot Springs

2.4.1 Multi-Jurisdictional Participation

The Buncombe Madison Regional Multi-Jurisdictional Hazard Mitigation Plan includes two counties and nine incorporated municipalities. To satisfy multi-jurisdictional participation requirements, each county and its participating jurisdictions were required to perform the following tasks:

- Participate in mitigation planning workshops;
- Identify completed mitigation projects, if applicable; 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. Each jurisdiction will adopt their Mitigation Action Plan separately. This provides the means for jurisdictions to monitor and update their Plan on a regular basis.

2.5 COMMUNITY MEETINGS AND WORKSHOPS

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

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

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

The following meetings were held during the development of this plan. Copies of agendas, sign-in sheets, minutes, and handout materials for all meetings and workshops can be found in Appendix D.

August 26, 2019
Internal Project Kickoff Meeting
Following issuance of a notice to proceed from NCEM, ESP Associates reached out by email to County Emergency Management and Planning Department leads from Henderson, Polk, Rutherford, and Transylvania Counties, NCEM Area 15 Coordinator and the Western Branch Manager to introduce themselves, explain the plan update process in general and schedule a time to hold an informal internal kickoff conference call/Skype meeting.

On August 26, 2019, Nathan Slaughter, Hazard Mitigation Department Manager from ESP Associates, Inc. and Project Manager for the update of the Buncombe Madison Regional Hazard Mitigation Plan conducted a conference call/Skype meeting with the internal lead stakeholders previously mentioned above. He presented important project information about the plan update, gave a brief refresher on hazard mitigation and a reminder about the importance of the plan, provided a project overview to include key objectives, project tasks, schedule and staff, and then defined roles and responsibilities of the project consultant and the participating jurisdictions.

Following the presentation, he discussed with these stakeholders the need to set up a date, time and location for the official project kickoff meeting with the regional hazard mitigation planning committee. The lead internal stakeholders discussed potential meeting dates and locations and decided that September 24, 2019 would be the date of the meeting at a location to be determined later. The details of the official kickoff meeting were then determined through later conversations with Buncombe County Emergency Management staff.

September 24, 2019
First Regional Hazard Mitigation Planning Team
Meeting – Project Kickoff Meeting -
Buncombe County Public Safety Training Center
Nathan Slaughter, Department Manager from ESP Associates, Inc. and Project Manager for the update of the Buncombe Madison Regional Hazard Mitigation Plan, began the meeting by welcoming the attendees and giving a brief overview of the project and the purpose of the meeting.

Mr. Slaughter led the meeting of the Regional Hazard Mitigation Planning Team and began by having attendees introduce themselves. The attendees included representatives from various departments and

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

local jurisdictions within each of the counties participating in the plan update. Mr. Slaughter then provided an overview of the items to be discussed at the meeting and briefly reviewed the agenda and presentation slide handouts. He then defined mitigation and gave a review of the Disaster Mitigation Act of 2000 and NC Senate Bill 300.

To continue, Mr. Slaughter provided detailed information about the project. He mentioned that the project is funded by a FEMA HMGP grant, and that NCEM was managing the project this time around and had assigned ESP Associates to serve as the project manager because of their prior experience working in the region. For this update, there was no local match requirement.

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

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

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

- Coordinate between the two participating counties to update the regional plan
- Update the plan to demonstrate progress and reflect current conditions
- Complete the update before the existing plan expires on July 6, 2021
- Increase public awareness and education
- Maintain grant eligibility for participating jurisdictions
- Update the plan in accordance with Community Rating System (CRS) requirements, and
- Maintain compliance with State and Federal requirements

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

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

GIS data required for the analysis. He also reviewed the list of identified hazards and the committee agreed to maintain the previous list of hazards for the two counties.

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

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

Mr. Slaughter then reviewed the roles and responsibilities of ESP Associates, Inc, the County leads, and the participating jurisdictions. The presentation concluded with a discussion of the next steps to be taken in the project development. He encouraged meeting participants to distribute the Public Participation Survey and shared the public web link. The next HMPT meeting was scheduled for some time in early 2020 to discuss the findings of the risk and capability assessments and to begin updating existing mitigation actions and identify new goals.

August 11, 2020
Second Regional Hazard Mitigation Planning Team Meeting – Mitigation Strategy Meeting - Online Meeting

This meeting was held online because of the COVID-19 pandemic.

Nathan Slaughter, Project Manager from ESP Associates, began the meeting by welcoming the attendees and thanking them for their time and joining the online meeting. Mr. Slaughter gave an overview of the meeting agenda and asked meeting attendees to introduce themselves. He then gave a refresher on mitigation, why we plan, and the key objectives of the project. He reviewed the participating jurisdictions, project tasks and project schedule. He stated that a draft of the updated Regional Hazard Mitigation Plan would be presented in September 2020.

Mr. Slaughter then presented the findings of the risk assessment. He shared the list of all hazards that are addressed in the regional plan, and reviewed the list of hazards addressed in the North Carolina State Hazard Mitigation Plan. He discussed how the hazards in the regional plan would be revised to align with the hazards in the State Plan. This would include the addition of manmade hazards and technological hazards. He discussed a couple of caveats for the risk assessment and indicated that best available data was used. While that information is helpful, events are often under-reported, so it is important to keep the end goal in sight. The purpose of the risk assessment was shared: to compare hazards and determine which should be the focus of the mitigation actions. Finally, he mentioned to the stakeholders that it ultimately is their risk assessment, so their recommendations for adjustment are welcomed and encouraged.

Mr. Slaughter stated that since the last plan was updated, there have been three Presidential disaster declarations that have impacted the region, which helped emphasize the need to continue updating the mitigation plan.

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

- FLOOD: There have also been 454 reported NFIP losses since 1978 and approximately $19 million in claims. There are 31 repetitive loss properties, and future occurrences are highly likely.
- HURRICANE AND COASTAL HAZARDS: 24 storm tracks have come within 75 miles of the region since 1850. 2 of those were classified as tropical storms. Future occurrences are likely.
- SEVERE WINTER WEATHER: 352 winter weather events have been reported for the region between 1996-2018. Future occurrences are highly likely.
- EXCESSIVE HEAT: There have been 13 excessive heat events reported in the region between 1996-2019. Future occurrences are likely.
- WILDFIRE: Wildfire is a hazard of concern for the region, which is one of the most at risk areas in the State. Future occurrences are likely.
- DAM FAILURE: Of the 113 dams in the region, 63 are considered high hazard dams. Future occurrences are unlikely.
- DROUGHT: There were 7 regional drought events between 2000 and 2018, and future occurrences are likely.
- TORNADOES: There have been 7 recorded events since 1950, causing $2.7 million in property damage. Future occurrences are likely.
- SEVERE THUNDERSTORMS: 279 severe thunderstorm events have been recorded since 1950. These events resulted 3 deaths and 17 injuries and $5.5 million in property damages. Future occurrences are highly likely.
- LANDSLIDES: There have been 213 landslide occurrences recorded in the region. Future occurrences are highly likely.
- HAILSTORM: There have been 256 recorded events since 1950. Future occurrences are likely.
- LIGHTNING: Since 1996, there have been 17 reported occurrences, which resulted in 2 deaths, 7 injuries and nearly $700 thousand in property damage. Future occurrences are highly likely.
- EARTHQUAKE: Earthquake events have taken place in the region. The strongest earthquake to impact NC was in 1916 in Skyland. Future occurrences are possible.
- INFECTIOUS DISEASE: The COVID-19 pandemic is an example of an infectious disease outbreak and future occurrences are possible.
- HAZARDOUS MATERIALS INCIDENTS: 13 serious HAZMAT events have been reported since 1970 through the PHMSA. There are 24 TRI Facilities in the region. Future occurrences are possible.
- NUCLEAR EMERGENCY: There is 1 nuclear facility within 50 miles of the region. No major historical occurrences were found, and future occurrences are unlikely.
- TERRORISM: Although there are a number of potential targets for terrorist in the region, future occurrences are unlikely.
- CYBER: Cyber is an emerging hazard for the region. Future occurrences are possible.
- ELECTROMAGNETIC PULSE: EMP is a low- probability hazard for the region.

In concluding the review of Hazard Profiles, Mr. Slaughter stated if anyone had additional information for the hazard profiles. Planning committee members offered the following comments:

- Future occurrences of wildfire should be considered highly likely.

After the open discussion, Mr. Slaughter asked the planning committee members to call or email him with their concerns or additional comments on the risk assessment.

The results of the hazard identification process were used to generate a Priority Risk Index (PRI), which categorizes and prioritizes potential hazards as high, moderate or low risk based on probability, impact, spatial extent, warning time, and duration. The highest PRI was assigned to Severe Winter Weather, Tornadoes/Severe Thunderstorms, Flooding, Landslides and Cyber.

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

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

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

Mr. Slaughter gave Mary Roderick from the Land of Sky Council of Governments and Jim Fox from the National Environmental Modeling and Analysis Center (NEMAC) an opportunity to talk about the Regional Resilience Assessment project and the AccelAdapt tool that can be used for mapping vulnerability and envisioning resilience solutions. These represent two additional examples of enhanced capabilities in the region.

Mr. Slaughter then transitioned to the Mitigation Strategy portion of the presentation. He began by reviewing some of the major concepts of mitigation and then gave the results of the icebreaker exercise from the first Regional Hazard Mitigation Planning Committee meeting, where attendees were given "money" to spend on various hazard mitigation techniques. The results were as follows:

- Prevention $154
- Emergency Services $86
- Property Protection $65
- Natural Resource Protection $55
- Public Education and Awareness $39
- Structural Projects $30

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

Mr. Slaughter then indicated that each participating jurisdiction would need to provide a status update for their existing mitigation actions (completed, deleted, or deferred) by August 31, 2020. Mr. Slaughter also discussed the Mitigation Action Worksheets to be completed for any new mitigation actions and requested that all worksheets be returned by August 31, 2020. Mr. Slaughter then presented sample mitigation actions for the committee members to consider to include in their plan update.

Mr. Slaughter then discussed the results of the public participation survey that was posted on several of the participating counties' and jurisdictions' websites. As of the meeting date, 92 responses had been received. Based on the preliminary results, respondents felt that flooding and severe winter weather posed the greatest threats to their neighborhood. Most did not live in a floodplain or have flood insurance, but 67% of all respondents did not know who to contact regarding reducing their risks to hazards.

Finally, Mr. Slaughter discussed the next steps in the planning process. These included returning mitigation action updates and delivery of a draft plan in September 2020. He again 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 involved public participation. Individual citizen and community-based input provides the entire planning team with a greater understanding of local concerns and increases the likelihood of successfully implementing mitigation actions by developing community "buy-in" from those directly affected by the decisions of public officials. As citizens become more involved in decisions that affect their safety, they are more likely to gain a greater appreciation of the hazards present in their community and take the steps necessary to reduce their impact. Public awareness is a key component of any community's overall mitigation strategy aimed at making a home, neighborhood, school, business or entire city safer from the potential effects of hazards.

Public involvement in the development of the *Buncombe Madison Regional Hazard Mitigation Plan* was sought using three distinct methods: (1) physical public meeting, (2) public survey instruments were made available in hard copy and online; and (2) copies of the draft plan deliverables were made available for public review on county and municipal websites and at government offices. The public was provided two opportunities to be involved in the development of the regional plan at two distinct periods during the planning process: (1) during the drafting stage of the Plan; and (2) upon completion

of a final draft Plan, but prior to official plan approval and adoption. In addition, a public participation survey (discussed in greater detail in Section 2.6.1) was made available during the planning process at various locations throughout the region and on county and municipal websites.

Additionally, 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 Team 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 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 Team to be made available for residents to complete at local public offices. A link to an electronic version of the survey was also posted on each county's website. A total of 92 survey responses were received, which provided valuable input for the Regional Hazard Mitigation Planning Team to consider in the development of the plan update. Selected survey results are presented below.

- Approximately 51 percent of survey respondents had been impacted by a disaster, mainly flooding, and winter storms.
- Respondents ranked Flooding and Severe Winter Weather as the highest threats to their neighborhood (22 percent each), followed by Wildfire (15 percent) and Severe Thunderstorm/High Wind (14 percent).
- Approximately 53 percent of respondents have taken actions to make their homes more resistant to hazards and 90 percent are interested in making their homes more resistant to hazards.
- 67 percent of respondents do not know what office to contact regarding reducing their risks to hazards.
- Natural Resource Protection, Prevention, and Emergency Services 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.

2.7 INVOLVING THE STAKEHOLDERS

44 CFR Requirement

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

At the beginning of the planning process for the development of this plan, the project consultant worked with both of the County Emergency Management leads to initiate outreach to stakeholders to be involved in the planning process. The project consultant sent out a list of recommended stakeholders provided from FEMA Publication 386-1 titled **Getting Started: Building Support for Mitigation Planning**. The list of recommended stakeholders is found in Appendix C of that publication (Worksheet #1: Build

the Planning Team) and has been included in **Appendix D** of this plan to demonstrate the wide range of stakeholders that were considered to participate in the development of this plan. Each of the County Emergency Management leads used that list for reference as they invited stakeholders from their counties to participate in the planning process.

In addition to participation from a wide variety of County-level departments, additional stakeholders that were involved in the process of developing this plan included: North Carolina Department of Transportation, Land of Sky Council of Governments, NEMAC and the US Forest Service.

In addition to the efforts described above, the regional Hazard Mitigation Planning Team encouraged more open and widespread participation in the mitigation planning process by designing and distributing the *Public Participation Survey*. These opportunities were provided for local officials, residents, businesses, academia, and other private interests in the region to be involved and offer input throughout the local mitigation planning process.

2.8 DOCUMENTATION OF PLAN PROGRESS

Progress in hazard mitigation planning for the participating jurisdictions in the Buncombe Madison Region is documented in this plan update. Since hazard mitigation planning efforts officially began in the participating counties with the development of the initial Hazard Mitigation Plans in the late 1990s and early 2000s, many mitigation actions have been completed and implemented in the participating jurisdictions. These actions will help reduce the overall risk to natural hazards for the people and property in the Buncombe Madison 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 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 Team 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 Buncombe Madison 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 Buncombe Madison Region is located in Western North Carolina in the Blue Ridge Mountain portion of the Appalachian Mountains. For the purposes of this plan, the Buncombe Madison Region includes the two counties of Buncombe and Madison and their participating municipalities. An orientation map is provided as **Figure 3.1**.

The Buncombe Madison Region includes many natural attractions. Located in the Blue Ridge Mountains, the area draws tourists and outdoor enthusiasts alike to the Pisgah National Forest. The Pisgah National Forest covers over 500,000 acres, has some of the highest mountains in the eastern United States, and includes over 60 miles of Appalachian Trail. A portion of the scenic Blue Ridge Parkway also traverses the region.

Fall is considered the region's "peak season" due to the colorful foliage; however, tourists visit the area year-round to see the diverse wildlife and waterfalls, hike, bike, fish, picnic, and camp. Other natural attractions include the French Broad River and Hot Springs. In addition, the Biltmore Estate, America's largest privately-owned house, is also located in the region.

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

TABLE 3.1: TOTAL LAND AREAS OF PARTICIPATING COUNTIES

County	Total Land Area
Buncombe County	657 square miles
Madison County	450 square miles

Source: United States Census Bureau

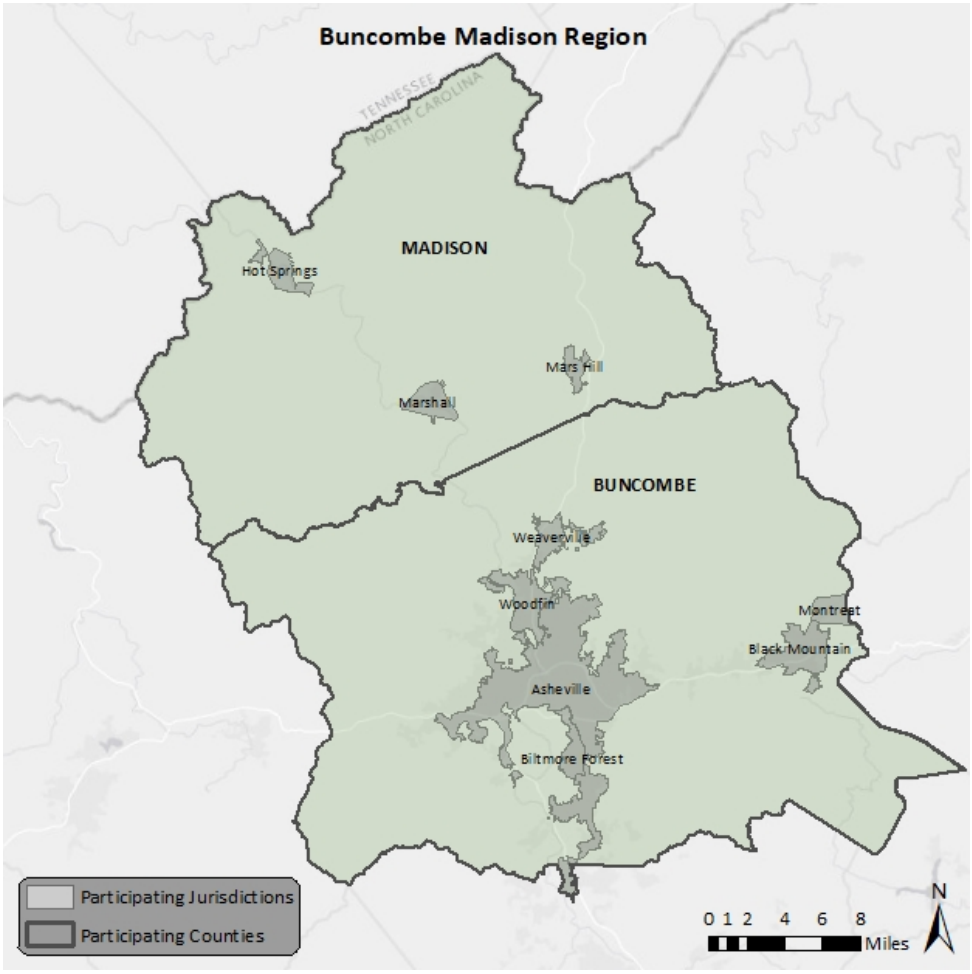
The Buncombe Madison Region enjoys a moderate climate that is characterized by mild winter and warm summers; however, variation in elevation and topography can drastically affect local weather. In general, the spring months are marked by unpredictable weather and changes can occur rapidly with sunny skies yielding to snow in just a few hours. From March through May, temperatures in the lower elevations typically range from 45˚F to 67˚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 80s 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 during September but drop to the 50s and 60s by early November. The first frost often occurs in late October and the lows are near freezing towards November. During these autumn months, there are only occasional rain showers making it the driest period of the year.

Winter in the Buncombe Madison 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. 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 infrequently; however, in the higher mountains, snow falls more frequently and up to two feet can fall at one time.

FIGURE 3.1: BUNCOMBE MADISON REGION ORIENTATION MAP



3.2 POPULATION AND DEMOGRAPHICS

Buncombe County is the largest of the two counties by area and it also has the largest population. Between 2010 and 2018, the majority of participating jurisdictions experienced population growth, with the exception of Biltmore Forest and Hot Springs which saw declines. In total, Buncombe County experienced growth of 8.7% whereas Madison County experienced a 4.7% increase. Population counts from the US Census Bureau for 2000, 2010, and estimates for 2018 for the two participating counties are presented in **Table 3.2**.

TABLE 3.2: POPULATION COUNTS FOR PARTICIPATING COUNTIES

Jurisdiction	2000 Census Population	2010 Census Population	2018 Census Population estimate	% Change 2010-2018
Buncombe County	206,330	238,318	259,103	8.7%
Madison County	19,635	20,764	21,763	4.7%

Source: United States Census Bureau

Based on the 2018 Census, the median age of residents of the participating counties ranges from 42 to 44 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 89 and 96 percent of the population in Buncombe and Madison Counties, respectively.

TABLE 3.3: DEMOGRAPHICS OF PARTICIPATING COUNTIES

Jurisdiction	White, Percent (2018)	Black or African American, Percent (2018)	American Indian or Alaska Native, Percent (2018)	Asian, Percent (2018)	Native Hawaiian or Other Pacific Islander, Percent (2018)	Other Race, Percent (2018)	Two or More Races, percent (2018)	Persons of Hispanic Origin, Percent (2018)*
Buncombe County	89.5%	6.4%	0.5%	1.4%	0.2%	2.6%	2.1%	6.6%
Madison County	96%	1.6%	0.5%	0.5%	0.1%	0.5%	1.3%	2.7%

*Hispanics may be of any race, so also are included in applicable race categories
Source: United States Census Bureau

3.3 HOUSING, INFRASTRUCTURE, AND LAND USE

3.3.1 Housing

According to the 2010 US Census, there were 137,605 housing units in the Buncombe Madison Region, the majority of which are single family homes or mobile homes. Housing information for the two participating counties is presented in **Table 3.4**. As shown in the table, Buncombe County has a lower percentage of seasonal housing units compared to the Madison County.

TABLE 3.4: HOUSING CHARACTERISTICS OF PARTICIPATING COUNTIES

Jurisdiction	Housing Units (2010)	Housing Units (2018)	Seasonal Units, percent (2018)	Median Home Value (2013-2017)
Buncombe County	113,365	126,567	1.6%	209,800
Madison County	10,608	11,038	3.1%	172,200

Source: United States Census Bureau

3.3.2 Infrastructure

Transportation

The Buncombe Madison Region contains some of North Carolina's most recognized scenic roadways. The most popular among tourists is the Blue Ridge Parkway. This National Parkway runs 469 miles through 29 Virginia and North Carolina Counties, including Buncombe County. Built to connect Shenandoah National Park to the Great Smoky Mountain National park, the Parkway has been the most visited unit of the National Park System every year since 1946 with the exception of 1949.

Another scenic highway unique to the region is the I-26 Scenic Byway. The nine-mile segment of I-26 that runs through Madison County is the only interstate in the state to be selected as a scenic byway. Running east to west, the stretch begins at Exit 9 north of Asheville (traveling on I-26 West) and offers spectacular views from some of the highest elevations on any interstate in North Carolina.

Other scenic highways in the region, also rich in history, include the French Broad Overview and the Appalachian Medley. The French Broad Overview consists of multiple roadways passing through Buncombe and Madison Counties for 17 miles following the French Broad River. The route begins at the 1-26 Weaverville Exit (Exit 29) and continues towards Marshall, including routes SR 1727, NC 251, and US 25B/70B. The Appalachian Medley byway begins its 45-mile stretch at I-40 Exit 24 on NC 209 just south of the region and travels north along NC 209 through Madison County. From NC 29, the route follows US 25/70 and ends in Walnut.

In addition to the designated scenic routes, three interstates (I-26, I-40, and I-240), five U.S. highways (US Highways 19, 23, 25, 70, and 74), and fifteen North Carolina state routes (NC Routes 9, 63, 81, 112, 146, 151, 191, 197, 208, 209, 212, 213, 251, 280, and 694) complete the region's highway system. The primary mode of transportation is personal vehicle with the City of Asheville being the only jurisdiction to provide public transit service in the region.

The Asheville Regional Airport is the largest airport in the mountains serving 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 125 miles from Asheville. Other major nearby airports include the Hartsfield-Jackson Atlanta International Airport and the Nashville Metropolitan Airport.

Utilities

Electrical power in the Buncombe Madison Region is provided by Duke Progress Energy and French Broad Electric Membership Corporation (EMC). Water and sewer services are provided by the City of Asheville, Metropolitan Water District, and Woodfin Water District. Since municipal water systems are

extremely limited in the mountains, private or shared wells and septic systems are considered the norm in this region.

Community Facilities
There are a number of public buildings and community facilities located throughout the Buncombe Madison Region. According to the data collected for the vulnerability assessment (Section 6.4.1), there are 2 emergency operations centers, 101 fire/EMS stations, 26 police stations, 267 medical care facilities, and 61 public schools located within the study area.

The medical facilities located in the region are concentrated in the Asheville area; including Mission Hospital and Asheville Surgery Center, a 744-bed general medical and surgical provider; Asheville Specialty Hospital, a 34-bed facility offering long-term acute care; and CarePartners Rehabilitation Hospital, an 80-bed rehabilitation facility. Additionally, Asheville is home to the Charles George VA Medical Center which provides care for veterans. Other medical facilities in the study area include: Mountain Area Health Education Center (MAHEC) in Asheville which provides health care education and services, and The Sisters of Mercy Urgent Care with facilities in West Asheville, South Asheville, and Weaverville.

In addition to Pisgah National Forest, the Buncombe Madison Region contains numerous local, state, and national parks and recreation areas. These include the Blue Ridge Parkway, French Broad River, Lake Julian, and the privately-owned Biltmore Estate. These facilities offer recreational opportunities to area residents and millions of visitors each year.

3.3.3 Land Use

Aside from the municipal areas in the region (some of which are rapidly growing), there still remain many areas of the Buncombe Madison Region that 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 smaller incorporated municipalities located throughout the study area comprising a large number of the region's population. 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 Buncombe Madison 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 Buncombe Madison Region have focused recent economic development efforts on cultural and natural heritage tourism.

According to the North Carolina Department of Commerce Labor & Economic Analysis, in 2018, Buncombe County had a labor force of 143,757 workers. The top 5 employers in Buncombe County were Memorial Mission Hospital, the Board of Education, Ingles Markets, Biltmore Workforce Management, and the Veterans Administration. The unemployment rate was 2.7 compared to the State rate of 3.7.

Madison County had a labor force consisting of 10,461 workers. In 2018, the top 5 employers in

Madison County were Madison County Schools, Mars Hill University, Madison County, Ingles Markets, and PrintPack Medical. The county unemployment rate was 3.2 while the State rate was 3.7.

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

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44 CFR Requirement

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

4.1 OVERVIEW

The Buncombe Madison 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 Buncombe Madison Region has included a comprehensive assessment of both types of hazards.

Upon a review of the full range of natural hazards suggested under FEMA planning guidance, the participating counties in the Buncombe Madison Region (Buncombe County and Madison County) have identified a number of hazards that are to be addressed in its Regional Hazard Mitigation Plan. These hazards were identified through an extensive process that utilized input from the Buncombe Madison Regional Hazard Mitigation Planning Team members, research of past disaster declarations in the participating counties[1], and review of the North Carolina State Hazard Mitigation Plan (2018). Therefore, since the development of the previous version of this plan, the hazards identified and included in the plan have changed. A list of all previous hazards covered in the 2014 Buncombe-Madison Regional Hazard Mitigation Plan is viewable in **Table 4.1**, along with a summary of the hazards assessed in this 2020 update. Readily available information from reputable sources (such as federal and state agencies) was also evaluated to supplement information from these key sources.

[1] A complete list of disaster declarations for the Buncombe Madison Region can be found below in Section 4.3.

TABLE 4.1: 2020 BUNCOMBE MADISON HAZARDS UPDATE

2016 Buncombe Madison Identified Hazards		2021 Buncombe Madison Identified Hazards		Sub hazards covered in 2021 Plan and Explanations
Atmospheric Hazards	Drought	Drought	Natural Hazards	Agricultural Drought, Hydrological Drought
	Hailstorms			Assessed under "Tornadoes/Thunderstorms"
	Heat Wave/Extreme Heat			
	Lightning			Assessed under "Tornadoes/Thunderstorms"
	Thunderstorm Wind/High Wind	Severe Thunderstorms		Assessed under "Tornadoes/Thunderstorms"
	Hurricane and Tropical Storm	Hurricane and Coastal Hazards		Storm Surge associated with Hurricanes and Nor'easters, High Wind associated with Hurricanes and Nor'easters, Torrential Rain, Tornadoes Associates with Hurricanes, Severe Winter Weather associated with Nor'easters
	Tornadoes	Tornadoes/Thunderstorms		Hailstorm, Torrential Rain associated with Severe Thunderstorms, Thunderstorm Wind, Lightning, Waterspout, High Wind
	Winter Storms and Freezes	Severe Winter Weather		Freezing Rain, Snowstorms, Blizzards, Wind Chill, Extreme Cold
	Erosion			Assessed under "Geological"
Hydrologic Hazards	Flooding	Flooding		
	Dam/Levee Failure	Dam Failures		
	Earthquakes	Earthquakes		
Geologic Hazards	Landslides	Geological		Landslides, Sinkholes, Erosion
Other Hazards	Wildfires	Wildfires		
		Infectious Disease	Other Hazards	
Other Hazards		Terrorism	Technological Hazards	Chemical, Biological, Radiological, Nuclear, Explosive
		Radiological Emergency – Fixed Nuclear Facilities		
		Cyber		
		Electromagnetic Pulse		

	Hazardous Materials Incidents	Hazardous Substances		Hazardous Materials, Hazardous Chemicals, Oil Spill

4.2 DISASTER DECLARATIONS

Disaster declarations provide initial insight into the hazards that may impact the Buncombe Madison Regional planning area. Since 1973, fourteen presidential disaster declarations have been reported in the Buncombe Madison Region, which can be seen in **Table 4.2** below. This includes four declarations related to severe storms and flooding, three storms related to winter storm events, and four storms related to hurricane or tropical storm. The most recent declaration was a result of the global pandemic caused by COVID-19.

TABLE 4.2: BUNCOMBE MADISON REGION DISASTER DECLARATIONS

Year	Disaster Number	Description	Buncombe County	Madison County
1973	394	SEVERE STORMS & FLOODING	X	
1977	542	SEVERE STORMS & FLOODING	X	X
1995	1073	SEVERE STORMS, FLOODING, HIGH WINDS		X
1996	1087	BLIZZARD OF 96	X	X
1996	1103	WINTER STORM		X
1996	1134	HURRICANE FRAN	X	
1998	1200	SEVERE STORMS AND FLOODING		X
2004	1546	TROPICAL STORM FRANCES	X	X
2004	1553	HURRICANE IVAN	X	X
2010	1871	SEVERE WINTER STORMS AND FLOODING	X	X
2013	4146	SEVERE STORMS, FLOODING, LANDSLIDES AND MUDSLIDES	X	X
2018	4393	HURRICANE FLORENCE		X
2020	4487	COVID -19 PANDEMIC	X	X
2020	4553	SEVERE STORMS, TORNADOES AND FLOODING		X

4.3 SUMMARY OF HAZARD IMPACTS SINCE PREVIOUS PLAN

Since the approval date of the previous Buncombe Madison Regional Hazard Mitigation Plan in 2016, there have been (99) hazard events recorded for the region in the National Centers for Environmental Information Storm Events Database. It is important to take note of those hazard events and consider them in the Hazard Identification section to help ensure that the appropriate hazards are being considered in the risk assessment sections and in the Mitigation Strategy. **Table 4.3** documents the hazard events recorded. Details for some of these events are discussed in further detail in the *Hazard Profiles* section.

TABLE 4.3: SUMMARY OF HAZARD EVENTS SINCE PREVIOUS PLAN

Hazard Type*	Number of Reported Events in Buncombe County	Number of Reported Events in Madison County
Cold/Wind Chill	6	5
Flash Flood	9	2
Flood	4	0
Hail	11	1
Heavy Snow	3	3
High Wind	4	0
Lightning	0	0
Strong Wind	1	0
Thunderstorm Wind	0	0
Tornado	0	0
Tropical Storm	0	0
Winter Storm	3	3
Winter Weather	22	22
TOTAL NUMBER OF REPORTED EVENTS	**63**	**36**

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

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

4.4 HAZARD EVALUATION

Table 4.4 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 Council during the plan update process.

TABLE 4.3: DOCUMENTATION OF THE HAZARD EVALUATION PROCESS

Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
NATURAL HAZARDS			
Avalanche	**NO**	• Review of the NC State Hazard Mitigation Plan • Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of the previous Buncombe Madison Regional Hazard Mitigation Plan • Review of the US Forest Service National Avalanche Center web site	• 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 is not included in the previous Buncombe Madison Regional Hazard Mitigation Plan.
Drought	**YES**	• Review of the NC State Hazard Mitigation Plan • Review of the North Carolina Drought Monitor website • Review of the previous Buncombe Madison Regional Hazard Mitigation Plan	• There are reports of drought conditions in all of the last 14 years in the Buncombe Madison Region, according to the North Carolina Drought Monitor. • Droughts are discussed in NC State Hazard Mitigation Plan • Drought is included in the previous Buncombe Madison Regional Hazard Mitigation Plan.
Hailstorm	**YES (Assessed under Tornadoes/ Thunderstorms)**	• Review of NC State Hazard Mitigation Plan • Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of NOAA NCEI Storm Events Database • Review of the previous Buncombe Madison Regional Hazard Mitigation Plan	• Hailstorm events are discussed in the state plan under the Tornadoes/ Thunderstorm hazard. • NCEI reports 256 hailstorm events (3/4 inch size hail to 4.0 inches) for the Buncombe Madison Region between 1962 and 2018. For these events there was $36,000 (2019 dollars) in property damages. • Hailstorm are addressed as an individual hazard in the previous Buncombe Madison Regional Hazard

Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
			Mitigation Plan. Given the frequency of the event, individual analysis is warranted.
Excessive Heat	**NO**	• Review of NOAA NCEI Storm Events Database • Review of the North Carolina State Hazard Mitigation Plan • Review of the previous Buncombe Madison Regional Hazard Mitigation Plan	• NCEI does not report any excessive heat event for the Buncombe Madison counties • The NC State Hazard Mitigation Plan includes Excessive Heat as an identified hazard for North Carolina • Excessive Heat was listed as Extreme Heat in the previous Buncombe Madison Regional Hazard Mitigation Plan
Hurricane and Coastal Hazards	**YES**	• Review of NC State Hazard Mitigation Plan • Analysis of NOAA historical tropical cyclone tracks and National Hurricane Center Website • Review of NOAA NCEI Storm Events Database • Review of historical presidential disaster declarations • Review of the previous Buncombe Madison Regional Hazard Mitigation Plan	• Hurricane and coastal hazard events are discussed in the state plan • NOAA historical records indicate 24 hurricane or tropical storms/depressions have come within 75 miles of the Buncombe Madison Region between 1896 and 2019. • Three out of fourteen disaster declarations in the Buncombe Madison Region are directly related to hurricane and tropical storm events. • Hurricane and coastal hazards were addressed as Hurricanes and Tropical Storms in the previous Buncombe Madison Regional Hazard Mitigation Plan.
Lightning	**YES (Assessed under Tornadoes/ Thunderstorms)**	• Review of NC State Hazard Mitigation Plan • Review of FEMA's Multi-Hazard Identification and Risk Assessment	• Lightning events are discussed in the state plan as part of the Tornadoes/Thunderstorm hazard. • NCEI reports 17 lightning events for the Buncombe Madison Region since

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?
		• Review of NOAA NCEI Storm Events Database, NOAA lightning statistics • Review of the previous Buncombe Madison Regional Hazard Mitigation Plan	1996. These events have resulted in a recorded 7 injuries and 2 deaths and nearly $705,400 (2019 dollars) in property damage. • Lightning is addressed as an individual hazard in the previous Buncombe Madison Regional Hazard Mitigation Plan
Nor'easter	**NO**	• Review of NC State Hazard Mitigation Plan • Review of NOAA NCEI Storm Events Database • Review of the previous Buncombe Madison Regional Hazard Mitigation Plan	• NCEI does not report any nor'easter activity for the Buncombe Madison Region. However, nor'easters may have affected the region as severe winter storms. In this case, the activity would be reported under winter storm events. • Nor'easters were not addressed in the previous Buncombe Madison hazard mitigation plan
Tornadoes	**YES**	• 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 the previous Buncombe Madison Regional Hazard Mitigation Plan	• Tornado events are discussed in the NC State Hazard Mitigation Plan. • NCEI reports 11 tornado events in Buncombe Madison Region counties since 1950. These events have resulted in 5 injuries and over $6 million (2019 dollars) in property damage with the most severe being an F2. • Tornadoes were addressed as a hazard in the previous Buncombe Madison Regional Hazard Mitigation Plan.
Severe Thunderstorm	**YES (Assessed under Tornadoes/ Thunderstorms)**	• Review of NC State Hazard Mitigation Plan • Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of NOAA NCEI Storm Events Database	• Severe thunderstorm events are discussed in the NC State Hazard Mitigation Plan. • NCEI reports 279 thunderstorm wind events in the Buncombe Madison Region counties between since 1950. These events have resulted in 3

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?
		• Review of the previous Buncombe Madison Regional Hazard Mitigation Plan	deaths and 17 injuries and over $5.8 million (2018 dollars) in property damage. • Severe thunderstorm events were listed as Thunderstorm Wind/High Wind in the previous Buncombe Madison plans.
Severe Winter Weather	**YES**	• 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 • Review of the previous Buncombe Madison Regional Hazard Mitigation Plan	• Severe winter weather, including snow storms and ice storms, are discussed in the state plan. • NCEI reports that the Buncombe Madison counties have been affected by three hundred and fifty-two (352) snow and ice events since 1996. These events resulted in three hundred and forty-two ($342) in property damages and did not cause any deaths or injuries. • Three of the region's fourteen disaster declarations were directly related to severe winter weather events. • Severe winter weather events were listed as Winter Storm and Freeze in the previous Buncombe Madison Hazard Mitigation plan.
Earthquakes	**YES**	• Review of NC State Hazard Mitigation Plan • Review of the previous Buncombe Madison Regional Hazard Mitigation Plan • USGS Earthquake Hazards Program web site • Review of the National Geophysical Data Center • Review of FEMA's Multi-Hazard Identification and Risk Assessment	• Earthquake events are discussed in the state plan and both Buncombe and Madison counties are considered to be at moderate risk to an earthquake event (no counties are high risk). • Earthquakes are addressed in the previous Buncombe Madison Hazard Mitigation Plan • Earthquakes have occurred in and around the State of North Carolina in the past. The state is affected by the

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?
			Charleston and the New Madrid (near Missouri) Fault lines which have generated a magnitude 8.0 earthquake in the last 200 years. • 54 events are known to have occurred in the region according to the National Center for Environmental Information. The greatest MMI reported was a VII. • According to USGS seismic hazard maps, the peak ground acceleration (PGA) with a 10% probability of exceedance in 50 years for the Buncombe Madison Region is approximately 5-9%g. FEMA recommends that earthquakes be further evaluated for mitigation purposes in areas with a PGA of 3%g or more.
Expansive Soils	**NO**	• Review of NC State Hazard Mitigation Plan • Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of USDA Soil Conservation Service's Soil Survey • Review of the previous Buncombe Madison Regional Hazard Mitigation Plan	• Expansive soils are identified in the state plan • According to FEMA and USDA sources, the Buncombe Madison Region is located in an area that has a "little to no" clay swelling potential. • The previous Buncombe Madison hazard mitigation plan does not identify expansive soils as a potential hazard.
Geological (Landslides, Sinkholes, Erosion)	**YES**	• 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	• Landslide/rock fall events are discussed in the state plan, and ranked as a hazard in the Buncombe Madison counties. • USGS landslide hazard maps indicate "high landslide incidence" (more than 15% of the area is involved in landslides) is found in all counties. All

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?
		• Review of the previous Buncombe Madison Regional Hazard Mitigation Plan	counties also have areas of moderate incident with high susceptibility. • The previous Buncombe Madison hazard mitigation plan addresses landslides.
Tsunami	**NO**	• Review of NC State Hazard Mitigation Plan • Review of the previous Buncombe Madison Regional Hazard Mitigation Plan • Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of FEMA "How-to" mitigation planning guidance (Publication 386-2, "Understanding Your Risks – Identifying Hazards and Estimating Losses).	• Tsunamis are discussed in the state plan. However, the Mountain Region scored a zero for tsunami hazard risk. • The previous plans in the Buncombe Madison Region do not address tsunami as a hazard. • No record exists of a catastrophic Atlantic basin tsunami impacting the mid-Atlantic coast of the United States. • Tsunami inundation zone maps are not available for communities located along the U.S. East Coast. • FEMA mitigation planning guidance suggests that locations along the U.S. East Coast have a relatively low tsunami risk and need not conduct a tsunami risk assessment at this time.
Volcano	**NO**	• Review of NC State Hazard Mitigation Plan • Review of USGS Volcano Hazards Program web site	• 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 Buncombe Madison Region.
Dam Failure	**YES**	• Review of NC State Hazard Mitigation Plan • Review of North Carolina Dam Safety Program's NC Dam Inventory as of 03/25/2020 • Review of the U.S. Army Corps	• Dam failure is discussed in the state plan as a hazard of concern for the Buncombe Madison Region. • Per the NC Dam Inventory, there are 63 high hazard dams in the planning region. (High hazard is defined as

Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
		of Engineers National Inventory of Dams database • Review of the previous Buncombe Madison Regional Hazard Mitigation Plan	"where failure will likely cause loss of life or serious damage to homes, industrial and commercial buildings, important public utilities, primary highways, or major railroads.") • The previous Buncombe Madison hazard mitigation plan identified dam failure as a hazard.
Erosion	**YES (Referenced in Geological Hazards)**	• Review of NC State Hazard Mitigation Plan • Review of the previous Buncombe Madison Regional Hazard Mitigation Plan	• Riverine erosion has the potential to occur due to the existence of several rivers in the region • Coastal erosion is discussed in the state plan but is only applicable for coastal areas.
Flooding	**YES**	• Review of NC State Hazard Mitigation Plan • Review of historical disaster declarations • Review of NOAA NCEI Storm Events Database • Review of FEMA's NFIP Community Status Book and Community Rating System (CRS) • Review of the previous Buncombe Madison Regional Hazard Mitigation Plan	• The flood hazard is thoroughly discussed in the state plan. • Three of fourteen Presidential Disaster Declarations were flood-related and/or caused by hurricane or tropical storm related events. • NCEI reports that Buncombe Madison Region counties have been affected by 84 flood events since 1996. These events in total caused two deaths and one injury, and did cause an estimated $102 million (2020 dollars) in property damages and over $13 million in crop damages (2020 dollars) • Both of the counties and all of the Municipalities participate in the NFIP. • The previous Buncombe Madison hazard mitigation plan addresses flooding as a hazard.
Storm Surge	**NO**	• Review of NC State Hazard Mitigation Plan	• Given the inland location of the Buncombe Madison Region, Storm

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?
		• Review of the previous Buncombe Madison Regional Hazard Mitigation Plan • Review of NOAA NCEI Storm Events Database	Surge will not affect the area. • Storm surge is discussed in the state plan under the hurricane hazard and indicates that the mountain region has zero vulnerability to storm surge. • No historical events were reported by NCEI • The previous Buncombe Madison Hazard Mitigation Plan does not address storm surge as a hazard.
OTHER HAZARDS			
Wildfires	**YES**	• Review of NC State Hazard Mitigation Plan • Review of the previous Buncombe Madison Regional Hazard Mitigation Plan • Review of Southern Wildfire Risk Assessment (SWRA) Data • Review of the NC Division of Forest Resources website	• Wildfires are identified as a hazard in the state plan • The previous plan in the Buncombe Madison Region addressed wildfire. • A review of SWRA data indicates that there are areas of elevated concern in the Buncombe Madison Region. • According to the North Carolina Division of Forest Resources, the Buncombe Madison Region experiences an average of 182 fires each year which burn a combined average of 154 acres each year. • Wildfire hazard risks will increase as low-density development along the urban/wildland interface increases.
Hazardous Substances	**YES**	• Review of the previous Buncombe Madison Regional Hazard Mitigation Plan • Review of the NC State Hazard Mitigation Plan	• Hazardous Substances are identified as a hazard in the state plan. • The previous Buncombe Madison hazard mitigation plan address Hazardous Substances as Hazardous Materials Incident • This update assesses hazardous materials, hazardous chemicals, and oil spills under this hazard.
Infectious	**YES**		

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?
Disease		• Review of the previous Buncombe Madison Hazard Mitigation Plan	• Infectious Disease is identified as a hazard in the state plan • Although none of the previous hazard mitigation plans for the region included infectious diseases as a hazard, it is assessed in this update to maintain consistency with the NC State Hazard Mitigation Plan. • Infectious Disease has caused one of the fourteen disaster declarations in the Buncombe Madison Region.
TECHNOLOGICAL HAZARDS			
Terrorism	**YES**	• Review of the NC State Hazard Mitigation Plan • Review of the previous Buncombe Madison Regional Hazard Mitigation Plan • Review of local Official knowledge	• The previous Buncombe Madison Hazard Mitigation Plan does not identify terror threat as a hazard. To maintain consistency with the NC State Hazard Mitigation plan, terrorism is included in the update. • The NC State Hazard Mitigation Plan identifies terrorism as a hazard • This hazard will assess chemical, biological, radiological, nuclear, and explosive terrorism events.
Radiological Emergency – Fixed Nuclear Facilities	**YES**	• Review of the previous Buncombe Madison Regional Hazard Mitigation Plan • Review of IAEA list of fixed nuclear power stations in the United States • Discussion with local officials about location of nuclear power stations	• The Oconee Nuclear Station is located closest to the Buncombe Madison region near Seneca, South Carolina and could impact the region. • Nuclear events can sometimes be caused by natural hazards and deserve some attention in this plan due to some areas of the region being located in the 50-Mile evacuation zone for the Oconee Nuclear Station.
Cyber	**YES**		

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?
		• Review of NC State Hazard Mitigation Plan	• Changing future conditions encourage the assessment of the possibility of a cyberattack with the increase in global technology
Electromagnetic Pulse	**YES**	• Review of NC State Hazard Mitigation Plan	• Changing future conditions encourage the assessment of the possibility of an electromagnetic pulse with the increase in global technology

4.5 HAZARD IDENTIFICATION RESULTS

Table 4.5 provides a summary of the hazard identification and evaluation process noting which of the 27 initially identified hazards are considered significant enough for further evaluation through this Plan's risk assessment (marked with "☑").

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

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

☑ = Hazard considered significant enough for further evaluation in the Buncombe Madison Region hazard risk assessment.
** = Hazard is assessed as a sub hazard under the Tornadoes/Thunderstorms hazard.

SECTION 5
HAZARD PROFILES

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

- 5.1 Overview
- 5.2 Study Area
- 5.3 Drought
- 5.4 Hurricane and Coastal Hazards
- 5.5 Tornadoes/Thunderstorms
- 5.6 Winter storm and Freeze
- 5.7 Earthquake
- 5.8 Geological (Landslide)
- 5.9 Dam Failure
- 5.10 Flooding
- 5.11 Wildfire
- 5.12 Infectious Disease
- 5.13 Hazardous Substances
- 5.14 Radiological Emergency – Fixed Nuclear Facilities
- 5.15 Terrorism
- 5.16 Cyber
- 5.17 Electromagnetic Pulse
- 5.18 Conclusions on Hazard Risk
- 5.19 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 Buncombe Madison regional hazard risk assessment by creating a hazard profile. Each hazard profile includes a general description of the hazard, its location and extent, notable historical occurrences, and the probability of future occurrences. Each profile also includes specific items noted by members of the Buncombe Madison Regional Hazard Mitigation Planning Committee as it relates to unique historical or anecdotal hazard information for Buncombe and Madison counties, or a participating municipality within them.

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

The following hazards were identified:

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

5.2 STUDY AREA

The Buncombe Madison Region includes two counties: Buncombe and Madison Counties. **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 Buncombe Madison Region.

TABLE 5.1: PARTICIPATING JURISDICTIONS IN THE BUNCOMBE MADISON REGIONAL HAZARD MITIGATION PLAN

Buncombe County	
Asheville	Montreat
Biltmore Village	Weaverville
Black Mountain	Woodfin
Madison County	
Hot Springs	Mars Hill
Marshall	

FIGURE 5.1: BUNCOMBE MADISON REGION BASE MAP

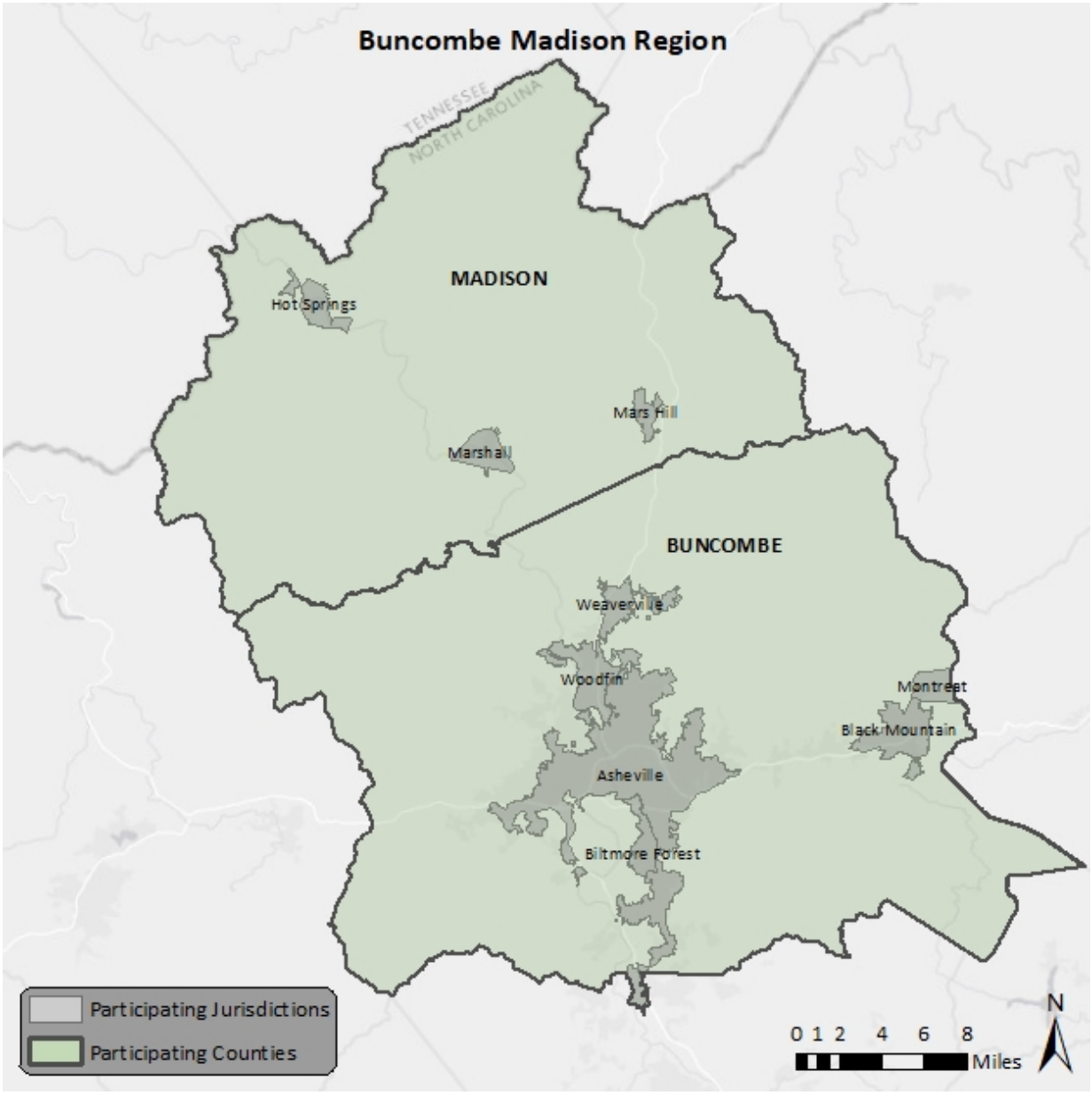


Table 5.2 lists each significant hazard for the Buncombe Madison Region and identifies whether or not it has been determined to be a specific hazard of concern for the nine municipal jurisdictions and each of the two county's unincorporated areas. This is the based on the best available data and information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

TABLE 5.2 SUMMARY OF IDENTIFIED HAZARD EVENTS IN THE BUNCOMBE MADISON REGION

Jurisdiction	Atmospheric								Geologic		Hydrologic			Other	
	Drought	Extreme Heat	Hailstorm	Hurricane and	Lightning	Thunderstorm	Tornado	Winter Storm	Earthquake	Landslide	Dam and Levee	Erosion	Flood	HAZMAT	Wildfire
Buncombe County															
Asheville	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Biltmore Forest	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Black Mountain	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Montreat	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Weaverville	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Woodfin	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Unincorporated Area	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Madison County															
Hot Springs	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Marshall	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Mars Hill	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Unincorporated Area	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Natural 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 of time, usually a season or more in length. High temperatures, high winds, and low humidity can exacerbate drought conditions. In addition, human actions and demands for water resources can hasten drought-related impacts. Drought categories are based on streamflow, groundwater levels, the amount of water stored in reservoirs, soil moisture, the time of year and other relevant factors for assessing the extent and severity of dry conditions.

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

TABLE 5.3 DROUGHT CLASSIFICATION DEFINITIONS

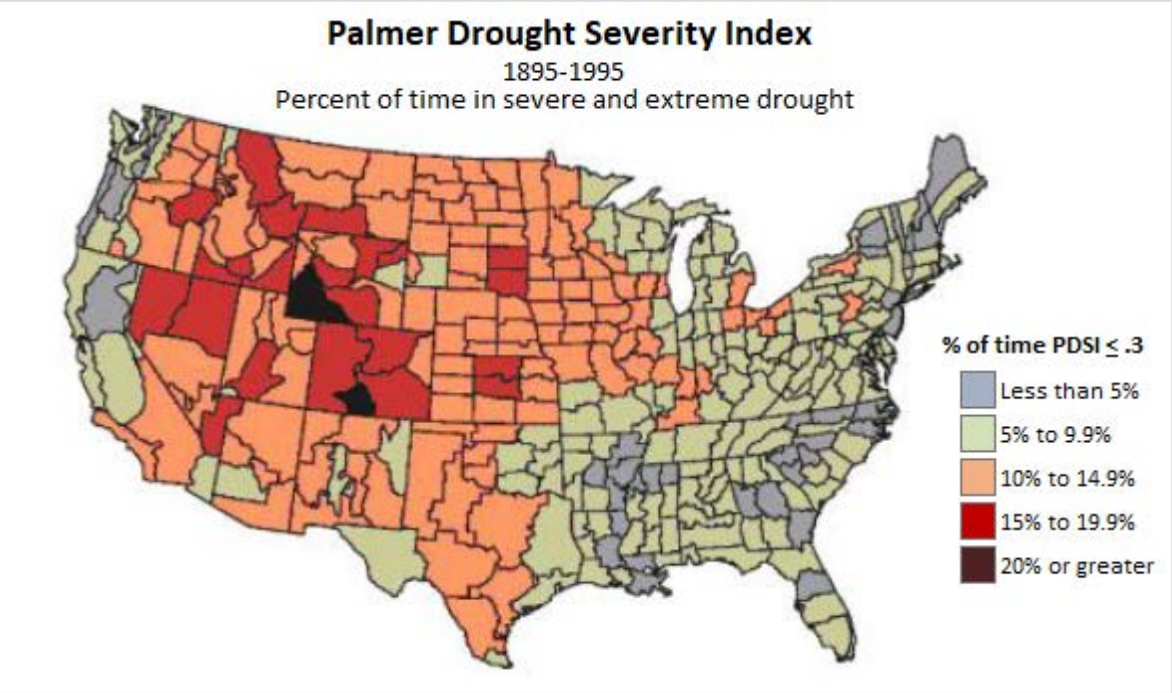
Meteorological Drought	The degree of dryness or departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.
Hydrologic Drought	The effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels.
Agricultural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

Source: Multi-Hazard Identification and Risk Assessment: A Cornerstone of the National Mitigation Strategy, Federal Emergency Management Agency

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

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

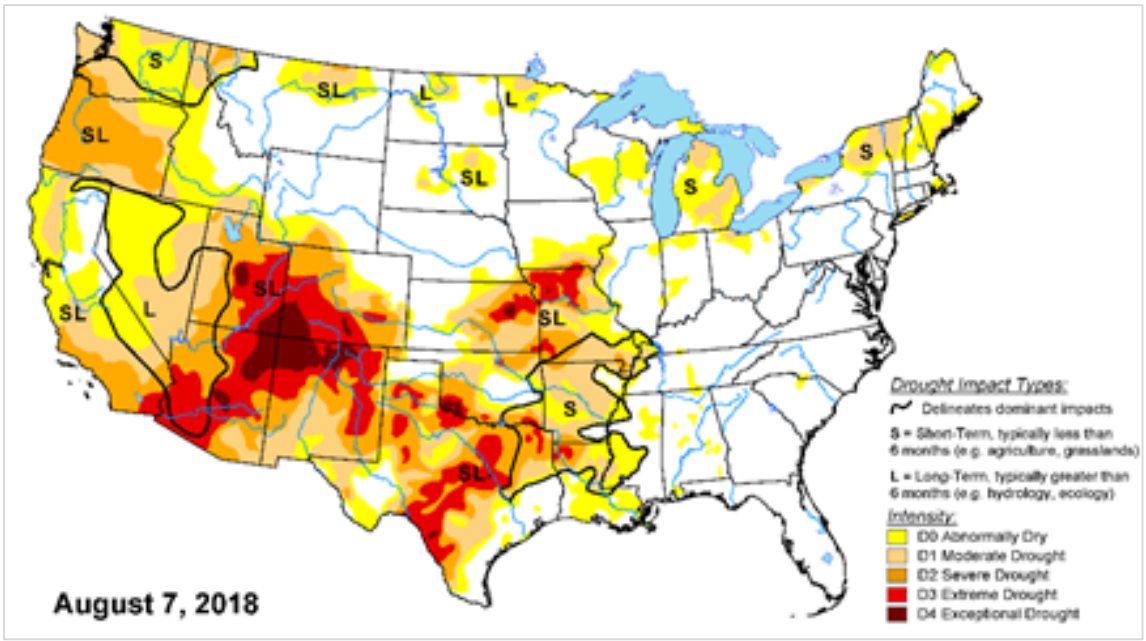
FIGURE 5.2: PALMER DROUGHT SEVERITY INDEX SUMMARY



Source: National Drought Mitigation Center

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

FIGURE 5.3: US DROUGHT MONITOR



Source: US Drought Monitor

5.3.2 Location and Spatial Extent

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

5.3.3 Historical Occurrences

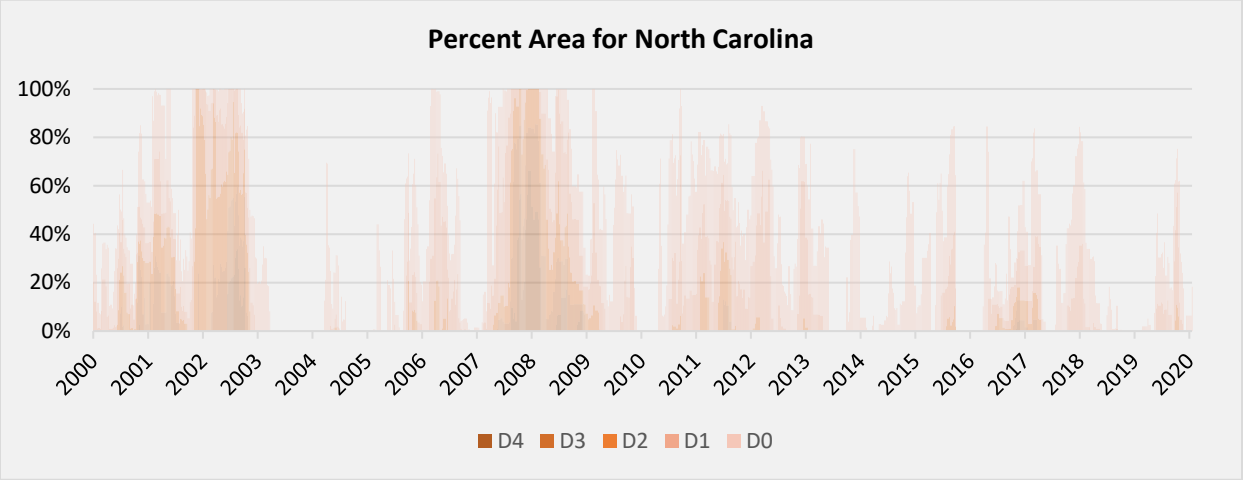
The North Carolina Drought Management Advisory Council also reports data on North Carolina drought conditions from 2000 to 2018 through the North Carolina Drought Monitor. It classifies drought conditions using the scale set by the US Drought Monitor, which classifies conditions on a scale of D0 to D4.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

TABLE 5.4: USDM DROUGHT CLASSIFICATIONS

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

Data from the North Carolina Drought Management Advisory Council and National Centers for Environmental Information (NCEI) were used to ascertain historical drought events in the Buncombe Madison Region. Since 2000, the longest duration of drought (D1-D4) in North Carolina lasted 155 weeks beginning on January 4, 2000 and ending on December 17, 2002. The most intense period of drought occurred the week of December 11, 2007 where D4 affected 66.2% of North Carolina land. **Figure 5.4** shows the percent area of North Carolina that has experiencing drought conditions from 2000 to 2018.

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



Source: NIDIS, Drought.gov, US Drought Portal

According to the North Carolina Drought Monitor, all of the counties in the Buncombe Madison Region had drought occurrences (including abnormally dry) in all of the last 14 years (2005-2019) (**Table 5.5**). It should be noted that the North Carolina Drought Monitor also estimates what percentage of the county is in each classification of drought severity. For example, the most severe classification reported may be exceptional, but a majority of the county may actually be in a less severe condition.

TABLE 5.5: SUMMARY OF DROUGHT OCCURRENCES

	Buncombe County		Madison County	
	Scale	Description	Scale	Description
2019	D1	Moderate Drought	D2	Severe Drought
2018	D0	Abnormally Dry	D0	Abnormally Dry
2017	D3	Extreme Drought	D2	Severe Drought
2016	D2	Severe Drought	D3	Extreme Drought
2015	D2	Severe Drought	D1	Moderate Drought
2014	D0	Abnormally Dry	D0	Abnormally Dry
2013	D0	Abnormally Dry	D0	Abnormally Dry
2012	D1	Moderate Drought	D0	Abnormally Dry
2011	D1	Moderate Drought	D0	Abnormally Dry
2010	D1	Moderate Drought	D1	Moderate Drought
2009	D2	Severe Drought	D1	Moderate Drought
2008	D4	Exceptional Drought	D4	Exceptional Drought
2007	D4	Exceptional Drought	D4	Exceptional Drought
2006	D2	Severe Drought	D1	Moderate Drought
2005	D0	Abnormally Dry	D1	Moderate Drought

Source: North Carolina Drought Monitor

According to the North Carolina Drought Management Advisory Council, the year 2007 was recorded as the driest year by the National Weather Service in more than 100 years in North Carolina and was #1 in the 2007 statewide temperature ranks. Records were set in many areas for number of days of low

humidity and number of days with temperatures above 90 F[1].

The Buncombe Madison region in the 2007 – 2008 season, experienced the highest number of acres burned by wildfire in the last 18 years. According to the National Park Service Fire and Aviation Management, wildfires burned 1,809.8 acres in 2007 – 2008 in the Buncombe Madison Region. This was due in part to lack of rainfall which left pine straw and other vegetation crispy and dry and fueled far more wildfires than average. Across the rest of North Carolina, the 7,200 wildfires in 2007 burned more acreage than had burned in any year during the last two decades.

As a response to the consistent level of drought in the state, the North Carolina Department of Environmental Quality engaged in rule revisions that provided even greater uses for reclaimed water for residents.

5.3.4 Probability of Future Occurrences

Based on historical occurrence information, it is assumed that all of the Buncombe Madison Region has a probability level of likely (10 to 100 percent annual probability) for future drought events. This hazard may vary slightly by location but each area has an equal probability of experiencing a drought. While reports indicate that there is a much lower probability for extreme, long-lasting drought conditions, NOAA also predicts that central North Carolina to have areas of persistent drought and further drought development[2].

[1] North Carolina Drought Management Advisory Council Activities Report - 2008

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

5.4 HURRICANE AND COASTAL HAZARDS

5.4.1 Background

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

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

As an incipient hurricane develops, barometric pressure (measured in millibars or inches) at its center falls and winds increase. If the atmospheric and oceanic conditions are favorable, it can intensify into a tropical depression. When maximum sustained winds reach or exceed 39 miles per hour, the system is designated a tropical storm, given a name, and is closely monitored by the National Hurricane Center in Miami, Florida. When sustained winds reach or exceed 74 miles per hour the storm is deemed a hurricane. Hurricane intensity is further classified by the Saffir-Simpson Scale (**Table 5.9**), which rates hurricane intensity on a scale of 1 to 5, with 5 being the most intense.

TABLE 5.9: SAFFIR-SIMPSON SCALE

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

Source: National Hurricane Center (2018)

The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds and barometric pressure, which are combined to estimate potential damage. Categories 3, 4, and 5 are classified as "major" hurricanes and, while hurricanes within this range comprise only 20 percent of total tropical cyclone landfalls, they account for over 70 percent of the damage in the United States. **Table 5.10** 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 5.10: HURRICANE DAMAGE CLASSIFICATIONS

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

Source: National Hurricane Center; Federal Emergency Management Agency

5.4.2 Location and Spatial Extent

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 Buncombe Madison Region. All areas in the Buncombe Madison Region are equally susceptible to hurricane and tropical storms.

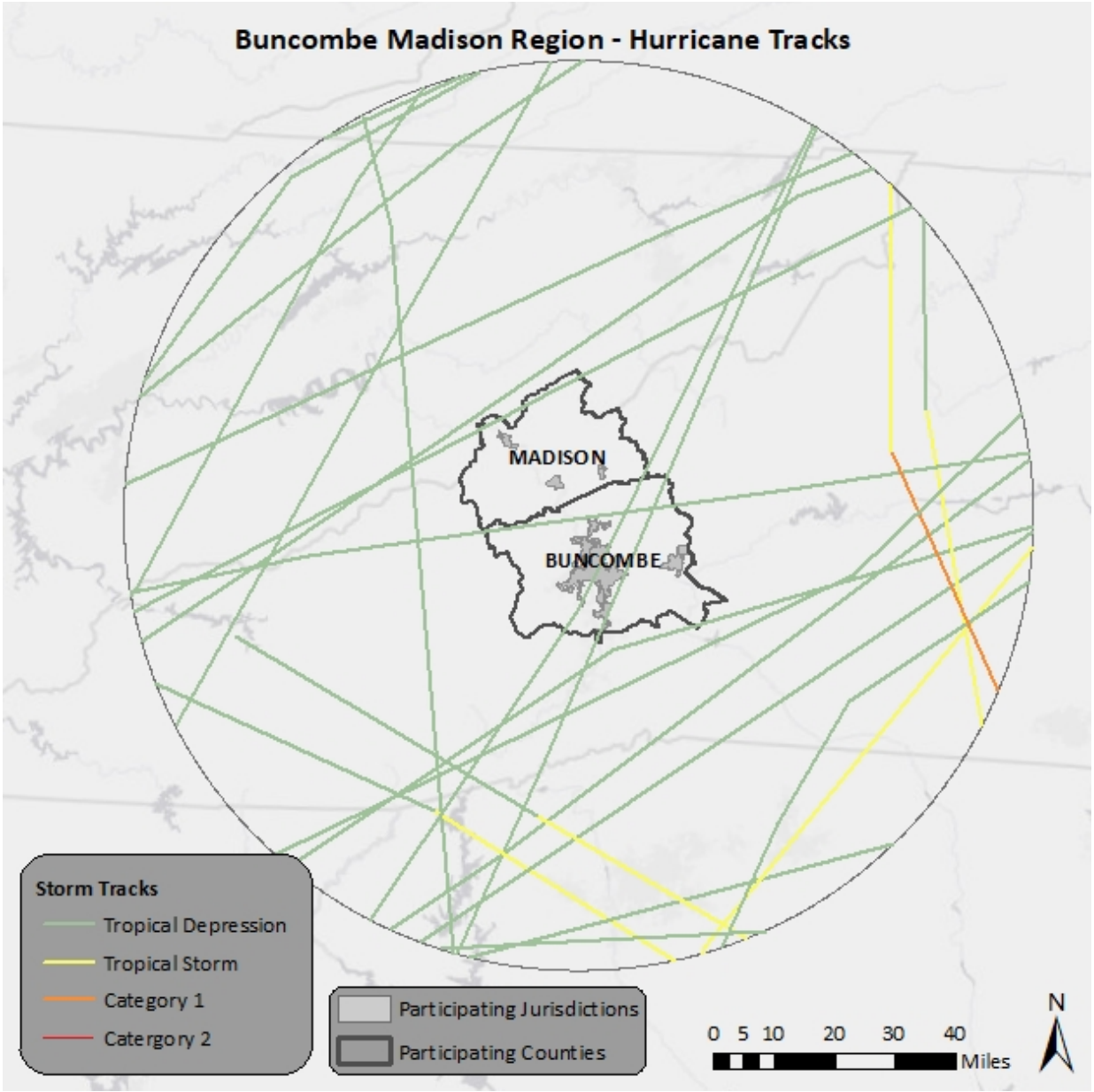
5.4.3 Historical Occurrences

According to the National Hurricane Center's historical storm track records, 24 tropical storm tracks have passed within 75 miles of the Buncombe Madison Region since 1896.[3] This includes 2 tropical storms and 22 tropical depressions.

Of the recorded storm events, five tropical depressions traversed directly through the Buncombe Madison Region as shown in **Figure 5.4**. **Table 5.11** provides the date of occurrence, name (if applicable), maximum wind speed (as recorded within 75 miles of the Buncombe Madison Region) and Category of the storm based on the Saffir-Simpson Scale for each event.

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

FIGURE 5.4: HISTORICAL HURRICANE STORM TRACKS WITHIN 75 MILES



Source: National Oceanic and Atmospheric Administration; National Hurricane Center

TABLE 5.11: HISTORICAL STORM TRACKS WITHIN 75 MILES OF THE BUNCOMBE MADISON REGION (1850–2013)

Date of Occurrence	Storm Name	Maximum Wind Speed (knots)	Storm Category
7/17/1896	NOT NAMED	26.4	Tropical Depression
9/28/1901	NOT NAMED	30.8	Tropical Depression
10/7/1902	NOT NAMED	30.8	Tropical Depression
10/5/1905	NOT NAMED	22	Tropical Depression
9/3/1906	NOT NAMED	26.4	Tropical Depression

Date of Occurrence	Storm Name	Maximum Wind Speed (knots)	Storm Category
9/21/1907	NOT NAMED	30.8	Tropical Depression
8/26/1911	NOT NAMED	22	Tropical Depression
8/30/1913	NOT NAMED	22	Tropical Depression
8/4/1916	NOT NAMED	30.8	Tropical Depression
8/7/1928	NOT NAMED	26.4	Tropical Depression
10/7/1932	NOT NAMED	13.2	Tropical Depression
5/27/1934	NOT NAMED	22	Tropical Depression
8/23/1949	NOT NAMED	--	Tropical Depression
9/20/1959	GRACIE	39.6	Tropical Storm
7/18/1968	CELESTE	22	Tropical Depression
9/14/1975	ELOISE	17.6	Tropical Depression
9/3/1977	BABE	22	Tropical Depression
8/20/1985	ONE-C	22	Tropical Depression
9/22/1989	HUGO	48.4	Tropical Storm
8/14/1994	BERYL	13.2	Tropical Depression
7/6/2003	DOLORES	17.6	Tropical Depression
9/5/2004	FRANCES	22	Tropical Depression
9/6/2004	IVAN	17.6	Tropical Depression
7/3/2005	CINDY	17.6	Tropical Depression
9/12/2018	FLORENCE	69.5	Category 1

Source: National Hurricane Center

The National Climatic Data Center did not report any events associated with a hurricane or tropical storm in the Buncombe Madison Region between 1950 and 2013.

Federal records indicate that three disaster declarations were made in 1996 (Hurricane Fran), 2004 (Tropical Storm Frances), and 2004 (Hurricane Ivan) for the region.[4]

Flooding is generally the greatest hazard of concern with hurricane and tropical storm events in the Buncombe Madison Region. Most events do not carry winds that are above that of the winter storms and straight-line winds received by the Buncombe Madison counties. 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.

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

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.

Hurricane Florence – September 12 – 15, 2018
Hurricane Florence was a long-lived Cape Verde hurricane and the wettest tropical cyclone on record in the Carolinas. As the storm moved over North Carolina, it caused record breaking storm surge of 9 to 13 feet and rainfall across the state of 20 to 30 inches, which produced catastrophic and life-threatening flooding. North Carolina reported 42 fatalities due to the hurricane and preliminary damage estimates of $16.7 billion.

5.4.4 Probability of Future Occurrences

Given 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 still remains a real threat to the Buncombe Madison Region due to induced events like flooding and landslides. Based on historical evidence, the probability level of future occurrence is possible (between 1 and 10 percent annual probability). Given the regional nature of the hazard, all areas are equally exposed to this hazard. However, when the region is impacted, the damage could be catastrophic, threatening lives and property throughout the planning area.

5.5 TORNADOES/THUNDERSTORMS

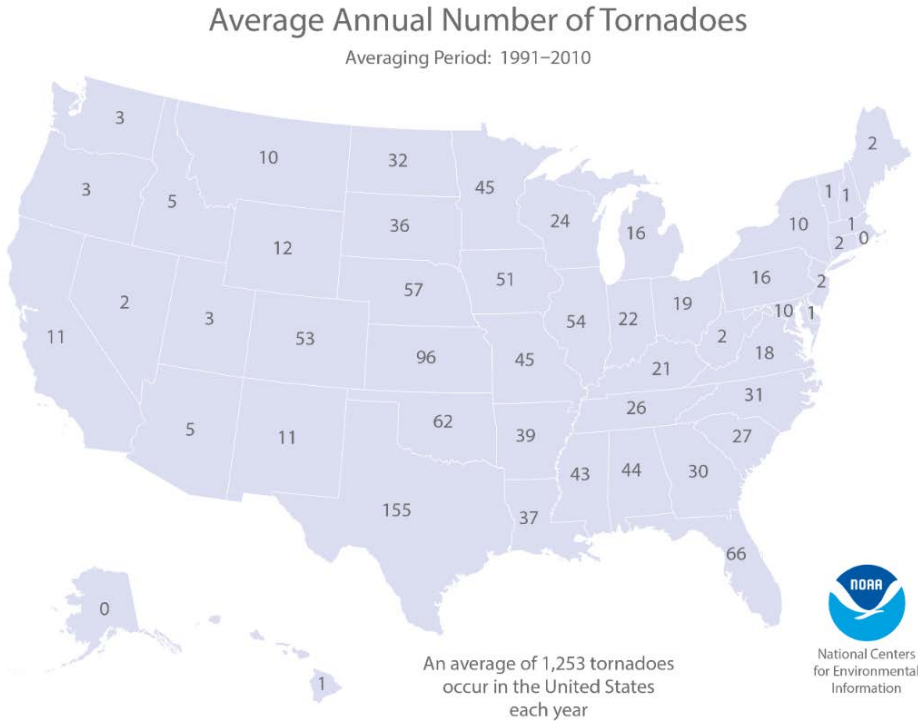
For the purposes of maintaining consistency with the State of State of North Carolina Hazard Mitigation Plan, this section will assess tornadoes and thunderstorms, which also include high winds, hailstorms and lightning.

5.5.1 Background and Description

Tornadoes

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground. Tornadoes are most often generated by thunderstorm activity (but sometimes result from hurricanes and other tropical storms) when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The damage caused by a tornado is a result of the high wind velocity and wind-blown debris, also accompanied by lightning or large hail. According to the National Weather Service, tornado wind speeds normally range from 40 miles per hour to more than 300 miles per hour. The most violent tornadoes have rotating winds of 250 miles per hour or more and are capable of causing extreme destruction and turning normally harmless objects into deadly missiles. Each year, an average of over 1,200 tornadoes is reported nationwide, resulting in an average of 56 deaths and 1,500 injuries[5]. According to the NOAA Storm Prediction Center (SPC), the highest concentration of tornadoes in the United States has been in Oklahoma, Texas, Kansas, and Florida respectively. Although the Great Plains region of the Central United States does favor the development of the largest and most dangerous tornadoes (earning the designation of "tornado alley"), Florida experiences the greatest number of tornadoes per square mile of all U.S. states (SPC, 2002). **Figure 5.6** shows tornado activity in the United States based on the number of recorded tornadoes per 10,000 square miles.

FIGURE 5.6: TORNADO ACTIVITY IN THE UNITED STATES



Tornadoes are more likely to occur during the months of March through May and are most likely to form

[5] NOAA, 2013.

in the late afternoon and early evening. Most tornadoes are a few dozen yards wide and touch down briefly, but even small short-lived tornadoes can inflict tremendous damage. Highly destructive tornadoes may carve out a path over a mile wide and several miles long.

The destruction caused by tornadoes ranges from light to inconceivable depending on the intensity, size, and duration of the storm. Typically, tornadoes cause the greatest damage to structures of light construction, including residential dwellings (particularly mobile homes). Tornadic magnitude is reported according to the Fujita and Enhanced Fujita Scales. Tornado magnitudes prior to 2005 were determined using the traditional version of the Fujita Scale (**Table 5.12**). Tornado magnitudes that were determined in 2005 and later were determined using the Enhanced Fujita Scale (**Table 5.13**).

TABLE 5.12: THE FUJITA SCALE (EFFECTIVE PRIOR TO 2005)

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

Source: National Weather Service

TABLE 5.13 THE ENHANCED FUJITA SCALE (EFFECTIVE 2005 AND LATER)

EF-Scale Number	Intensity Phrase	3 Second Gust (MPH)	Type of Damage Done
0	Gale	65-85	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards.
1	Moderate	86-110	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
2	Significant	111-135	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
3	Severe	136-165	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
4	Devastating	166-200	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
5	Incredible	Over 200	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel re-enforced concrete structures badly damaged.

Source: National Weather Service

Thunderstorms

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

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

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

Thunderstorm events have the capability of producing straight-line winds that can cause severe destruction to communities and threaten the safety of a population. Such wind events, sometimes

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

separate from a thunderstorm event, are common throughout the Buncombe Madison Region. Therefore, high winds are also reported in this section.

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

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

Hailstorms

Hailstorms are a potentially damaging outgrowth of severe thunderstorms. Early in the developmental stages of a hailstorm, ice crystals form within a low-pressure front due to the rapid rising of warm air into the upper atmosphere and the subsequent cooling of the air mass. Frozen droplets gradually accumulate on the ice crystals until they develop to a sufficient weight and fall as precipitation. Hail typically takes the form of spheres or irregularly-shaped masses greater than 0.75 inches in diameter. The size of hailstones is a direct function of the size and severity of the storm. High velocity updraft winds are required to keep hail in suspension in thunderclouds. The strength of the updraft is a function of the intensity of heating at the Earth's surface. Higher temperature gradients relative to elevation above the surface result in increased suspension time and hailstone size. **Table 5.14** shows the TORRO Hailstorm Intensity Scale which is a way of measuring hail severity.

TABLE 5.14: TORRO HAILSTORM INTENSITY SCALE

	Intensity Category	Typical Hail Diameter (mm)*	Probable Kinetic Energy, J-m^2	mm to inch conversion (inches)	Typical Damage Impacts
H0	Hard Hail	5	0-20	0 – 0.2	No damage
H1	Potentially Damaging	5-**15**	>20	0.2 – 0.6	Slight general damage to plants, crops
H2	Significant	10-**20**	>100	0.4 – 0.8	Significant damage to fruit, crops, vegetation
H3	Severe	20-**30**	>300	0.8 – 1.2	Severe damage to crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	25-**40**	>500	1.0 – 1.6	Widespread glass damage, vehicle bodywork damage
H5	Destructive	30-**50**	>800	1.2 – 2.0	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	40-**60**		1.6 – 2.4	Bodywork of grounded aircraft dented; brick walls pitted
H7	Destructive	50-**75**		2.0 – 3.0	Severe roof damage, risk of serious injuries

	Intensity Category	Typical Hail Diameter (mm)*	Probable Kinetic Energy, J-m^2	mm to inch conversion (inches)	Typical Damage Impacts
H8	Destructive	60-**90**		1.6 – 3.5	(Severest recorded in the British Isles) Severe damage to aircraft bodywork
H9	Super Hailstorms	75-**100**		3.0 – 3.9	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorms	>100			Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

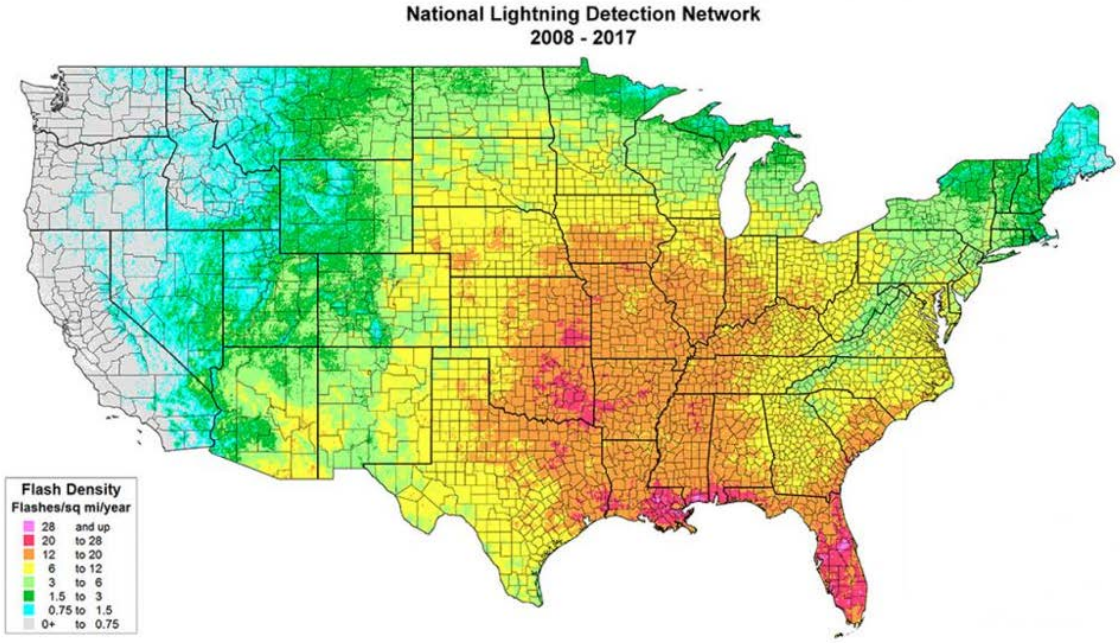
Source: http://www.torro.org.uk/site/hscale.php

Lightning

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

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

FIGURE 5.7: LIGHTNING FLASH DENSITY IN THE UNITED STATES



Source: Vaisala U.S. National Lightning Detection Network

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

responsible for igniting wildfires that can result in widespread damages to property.

5.5.2 Location and Spatial Extent

Tornadoes

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

Thunderstorms

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

Hailstorms

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

Lightning

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

5.5.3 Historical Occurrences

Lightning

According to the National Climatic Data Center, there have been a total of 17 recorded lightning events in the Buncombe Madison Region since 1993.[7] These events resulted in 2 deaths, 7 injuries, and over $700,000 (2020 dollars) in damages, as listed in summary **Table 5.12**. Detailed information on historical lightning events can be found in Appendix H.

TABLE 5.12: SUMMARY OF LIGHTNING OCCURRENCES

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2020 dollars)
Buncombe County	**14**	**1/7**	**$391,000**
Asheville	4	0/6	$80,500
Biltmore Forest	0	0/0	$0

[7] These lightning events are only inclusive of those reported by the National Centers for Environmental Information (NCEI). It is certain that additional lightning events have occurred in the Buncombe-Madison Region. The State Fire Marshal's office was also contacted for the additional information but none could be provided. As additional local data becomes available, this hazard profile will be amended.

Black Mountain	1	0/0	$0
Montreat	0	0/0	$0
Weaverville	1	0/1	$0
Woodfin	0	0/0	$0
Unincorporated Area	8	1/0	$310,500
Madison County	**3**	**1/0**	**$314,400**
Hot Springs	0	0/0	$0
Marshall	1	0/0	$14,400
Mars Hill	1	0/0	$300,000
Unincorporated Area	1	1/0	$0
BUNCOMBE MADISON REGION TOTAL	**17**	**2/7**	**$705,400**

Source: National Center for Environmental Information

It is certain that more than 17 events have impacted the region. Many of the reported events are those that caused damage. Therefore, it should be expected that damages are likely much higher for this hazard than what is reported.

Hailstorm

According to the National Climatic Data Center, 256 recorded hailstorm events have affected the Buncombe Madison Region since 1962.[8] **Table 5.8** is a summary of the hail events in the Buncombe Madison Region. Detailed information about each event that occurred in the region is provided in Appendix H. In all, hail occurrences resulted in over $36,000 (2020 dollars) in property damages, most of which were reported in Madison County. Hail ranged in diameter from 0.25 inches to 2.0 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 Climatic Data Center. Therefore, it is likely that damages are greater than the reported value. Additionally, a single storm event may have affected multiple counties.

TABLE 5.8: SUMMARY OF HAIL OCCURRENCES

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2019)
Buncombe County	**188**	0/0	**$7,200**
Asheville	34	0/0	$7,200
Biltmore Forest	1	0/0	$0
Black Mountain	10	0/0	$0
Montreat	3	0/0	$0
Weaverville	21	0/0	$0
Woodfin	0	0/0	$0
Unincorporated Area	119	0/0	$0
Madison County	**68**	0/0	**$28,800**
Hot Springs	3	0/0	$0
Marshall	21	0/0	$28,800
Mars Hill	11	0/0	$0
Unincorporated Area	33	0/0	$0

[8] These hail events are only inclusive of those reported by the National Centers for Environmental Information (NCEI). It is likely that additional hail events have affected the Buncombe-Madison Region. In addition to NCEI, the North Carolina Department of Insurance office was contacted for information. As additional local data becomes available, this hazard profile will be amended.

BUNCOMBE MADISON REGION TOTAL	**256**	**0/0**	**$36,000**

Source: National Climatic Data Center

Tornadoes

Tornadoes are a fairly rare occurrence in mountainous areas. However, they have and do occur in the Buncombe Madison Region. Tornadoes have not resulted in any disaster declarations in the Buncombe Madison Region.[9] According to the National Climatic Data Center, there have been a total of 10 recorded tornado events in the Buncombe Madison Region since 1976 (**Table 5.16**), resulting in over $6 million (2020 dollars) in property damages.[10] In addition, five injuries were reported. The magnitude of these tornadoes ranges from F0 to F1 in intensity, although an F2 through 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 years. Detailed information on historical tornado events can be found in Appendix H.

TABLE 5.16: SUMMARY OF TORNADO OCCURRENCES

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2019)
Buncombe County	8	0/0	$3,773,750
Asheville	2	0/0	$387,500
Biltmore Forest	0	0/0	$0
Black Mountain	0	0/0	$0
Montreat	0	0/0	$0
Weaverville	0	0/0	$0
Woodfin	0	0/0	$0
Unincorporated Area	6	0/0	$3,386,250
Madison County	3	0/5	$2,241,750
Hot Springs	0	0/0	$0
Marshall	0	0/0	$0
Mars Hill	0	0/0	$0
Unincorporated Area	3	0/5	$2,241,750
BUNCOMBE MADISON REGION TOTAL	**11**	**0/5**	**$6,015,500**

Source: National Climatic Data Center

Thunderstorms

Severe storms resulted in four disaster declarations in the Buncombe Madison Region in 1973, 1977, 1995, and 1998.[11] According to NCEI, there have been 279 reported thunderstorm and high wind events since 1959 in the Buncombe Madison Region.[12] These events caused over $5.8 million (2013 dollars) in damages. There were reports of 17 injuries and 3 fatalities. **Table 5.13** summarizes this information.

[9] A complete list of historical disaster declarations cane be found in Section 4: *Hazard Identification*.

[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 the Buncombe-Madison Region. As additional local data becomes available, this hazard profile will be amended.

[11] A complete list of historical disaster declarations can ne found in Section 4: *Hazard Identification*.

[12] These thunderstorm events are only inclusive of those reported by the National Centers for Environmental Information (NCEI). It is likely that additional thunderstorm events have occurred in the Buncombe-Madison Region. As additional local data becomes available, this hazard profile will be amended.

TABLE 5.13: SUMMARY OF THUNDERSTORM / HIGH WIND OCCURRENCES

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2020 dollars)
Buncombe County	**180**	**2/12**	**$3,882,319**
Asheville	26	0/1	$196,286
Biltmore Forest	0	0/0	$0
Black Mountain	4	0/0	$1,384
Montreat	1	0/0	$0
Weaverville	11	0/1	$5,376
Woodfin	4	0/1	$0
Unincorporated Area	134	2/7	$3,679,273
Madison County	**99**	**1/5**	**$1,978,329**
Hot Springs	12	0/0	$0
Marshall	17	0/0	$24,597
Mars Hill	8	0/0	$2,610
Unincorporated Area	62	1/5	$1,951,122
BUNCOMBE MADISON REGION TOTAL	**279**	**3/17**	**$5,860,648**

Source: National Climatic Data Center

5.5.4 Probability of Future Occurrences

Lightning

Although there were not a high number of historical lightning events reported throughout the Buncombe Madison Region via NCDC 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 Buncombe Madison Region is located in an area of the country that experienced an average of 2 to 4 lightning flashes per square kilometer per year between 1997 and 2010. Therefore, the probability of future events is highly likely (100 percent annual probability). It can be expected that future lightning events will continue to threaten life and cause minor property damages throughout the region.

Hailstorms

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

Tornadoes

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

Thunderstorms

A thunderstorm/wind event is an atmospheric hazard, and thus has no geographic boundaries. It is typically a widespread event that can occur in all regions of the United States. However, thunderstorms are most common in the central and southern states because atmospheric conditions in those regions

are favorable for generating these powerful storms. Also, the Buncombe Madison Region typically experiences several straight-line wind events each year. These wind events can and have caused significant damage. It is assumed that the Buncombe Madison Region has uniform exposure to a thunderstorm/wind event and the spatial extent of an impact could be large.

5.6 WINTER STORM AND FREEZE

5.6.1 Background

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 winter storm events have the potential to present dangerous conditions to the affected area. Larger snowfalls pose a greater risk, reducing visibility due to blowing snow and making driving conditions treacherous. A heavy snow event is defined by the National Weather Service as an accumulation of 4 of more inches in 12 hours or less. A blizzard is the most severe form of winter storm. It combines low temperatures, heavy snow, and winds of 35 miles per hour or more, which reduces visibility to a quarter mile or less for at least 3 hours. Winter storms are often accompanied by sleet, freezing rain, or an ice storm. Such freeze events are particularly hazardous as they create treacherous surfaces.

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

5.6.2 Location and Spatial Extent

Nearly the entire continental United States is susceptible to winter storm and freeze events. Some ice and winter storms may be large enough to affect several states, while others might affect limited, localized areas. The degree of exposure typically depends on the normal expected severity of local winter weather. The Buncombe Madison 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.

5.6.3 Historical Occurrences

Winter weather has resulted in three disaster declarations in the Buncombe Madison Region. This includes the Blizzard of 1996, one subsequent 1996 winter storm, and a severe winter storm in 2010.[13] According to the National Climatic Data Center, there have been a total of 352 recorded winter storm

[13] 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 Profiles*.

events in the Buncombe Madison Region since 1996 (**Table 5.17**).[14] These events resulted in $342 (2020 dollars) in damages.[15] Detailed information on the recorded winter storm events can be found in Appendix H.

TABLE 5.17: SUMMARY OF WINTER STORM EVENTS

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2020 dollars)
Buncombe County	**175**	**0/0**	**$342**
Asheville	0	0/0	$0
Biltmore Forest	0	0/0	$0
Black Mountain	0	0/0	$0
Montreat	0	0/0	$0
Weaverville	0	0/0	$0
Woodfin	0	0/0	$0
Unincorporated Area	175	0/0	$342
Madison County	**177**	**0/0**	**$0**
Hot Springs	0	0/0	$0
Marshall	0	0/0	$0
Mars Hill	0	0/0	$0
Unincorporated Area	177	0/0	$0
BUNCOMBE MADISON REGION TOTAL	**352**	**0/0**	**$342**

Source: National Climatic Data Center

There have been several severe winter weather events in the Buncombe Madison 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.

2010 Winter Storm
The storm came in two different parts: the first part of the storm produced between 3 and 7 inches of snow across the western and northern portions of the central North Carolina Piedmont during the afternoon and evening of December 25th; the latter part generally produced between 4 and 12 inches of snow. North Carolina was one of the six US States where a state of emergency was declared due to the storm.

[14] These ice and winter storm events are only inclusive of those reported by the National Centers for Environmental Information (NCEI). It is likely that additional winter storm conditions have affected the Buncombe-Madison Region. In addition, the 351 are reported by county, so many of these storms likely affected all of the counties.
[15] The dollar amount of damages provided by NCEI is divided by the number of affected counties to reflect a damage estimate for the county.

5.6.4 Probability of Future Occurrences

Winter storm events will remain a regular occurrence in the Buncombe Madison Region due to location and elevation. According to historical information, the Buncombe Madison Region experiences multiple winter storm events each year. Therefore, the annual probability is highly likely (100 percent).

5.7 EARTHQUAKE

5.7.1 Background and Description

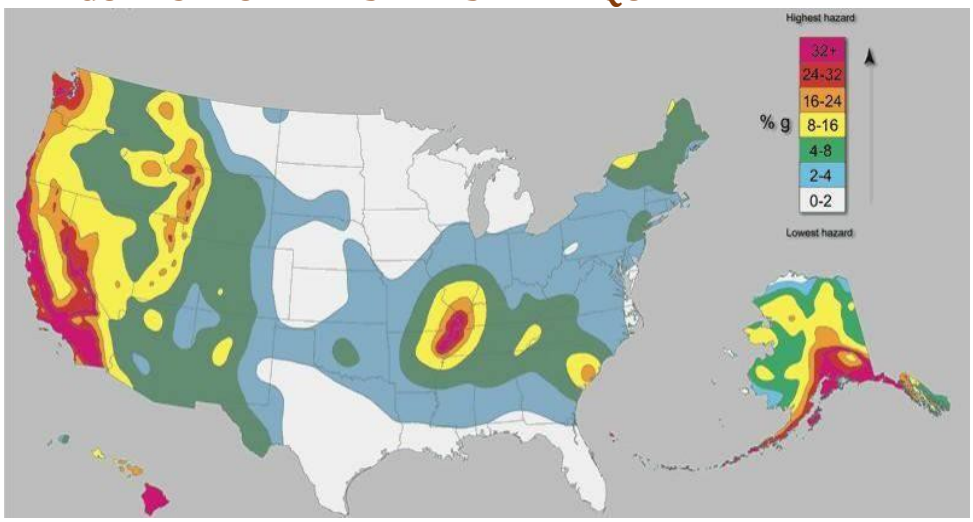
An earthquake is movement or trembling of the ground produced by sudden displacement of rock in the Earth's crust. Earthquakes result from crustal strain, volcanism, landslides, or the collapse of caverns. Earthquakes can affect hundreds of thousands of square miles, cause damage to property measured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

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

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

The greatest earthquake threat in the United States is along tectonic plate boundaries and seismic fault lines located in the central and western states; however, the Eastern United State does face moderate risk to less frequent, less intense earthquake events. **Figure 5.7** shows relative seismic risk for the United States.

FIGURE 5.7: UNITED STATES EARTHQUAKE HAZARD MAP



Source: United States Geological Survey

Earthquakes are measured in terms of their magnitude and intensity. Magnitude is measured using the

Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake through a measure of shock wave amplitude (**Table 5.18**). Each unit increase in magnitude on the Richter Scale corresponds to a 10-fold increase in wave amplitude, or a 32-fold increase in energy. Intensity is most commonly measured using the Modified Mercalli Intensity (MMI) Scale based on direct and indirect measurements of seismic effects. The scale levels are typically described using roman numerals, ranging from "I" corresponding to imperceptible (instrumental) events to "XII" for catastrophic (total destruction). A detailed description of the Modified Mercalli Intensity Scale of earthquake intensity and its correspondence to the Richter Scale is given in **Table 5.19**.

TABLE 5.18: 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 5.19: MODIFIED MERCALLI INTENSITY SCALE FOR EARTHQUAKES

SCALE	INTENSITY	DESCRIPTION OF EFFECTS	CORRESPONDING RICHTER SCALE MAGNITUDE
I	Not felt	Not felt except by a very few under especially favorable conditions.	
II	Weak	Felt only by a few persons at rest, especially on upper floors of buildings.	< 4.2
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.	
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.	
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.	< 4.8
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.	< 5.4
VII	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.	< 6.1
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory	

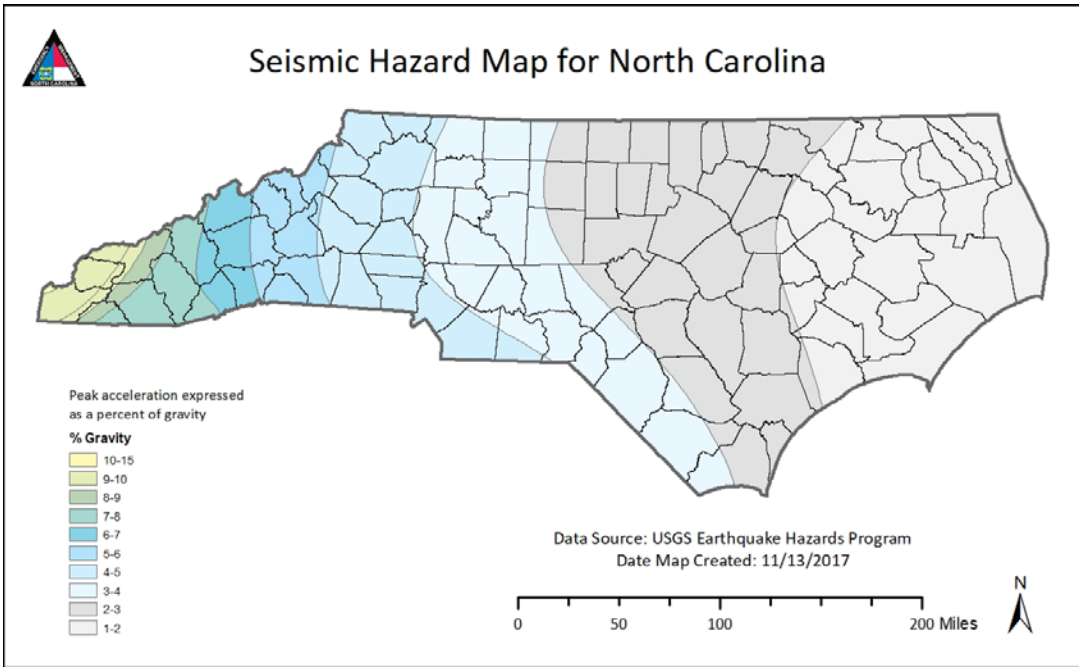
SCALE	INTENSITY	DESCRIPTION OF EFFECTS	CORRESPONDING RICHTER SCALE MAGNITUDE
		stacks, columns, monuments, walls. Heavy furniture overturned.	
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.	< 6.9
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.	< 7.3

Source: Federal Emergency Management Agency

5.7.2 Location and Spatial Extent

Approximately two-thirds of North Carolina is subject to earthquakes, with the western and southeast region most vulnerable to a very damaging earthquake. The state is affected by both the Charleston Fault in South Carolina and New Madrid Fault in Tennessee. Both of these faults have generated earthquakes measuring greater than 8 on the Richter Scale during the last 200 years. In addition, there are several smaller fault lines throughout North Carolina. **Figure 5.8** is a map showing geological and seismic information for North Carolina.

FIGURE 5.10: GEOLOGICAL AND SEISMIC INFORMATION FOR NORTH CAROLINA

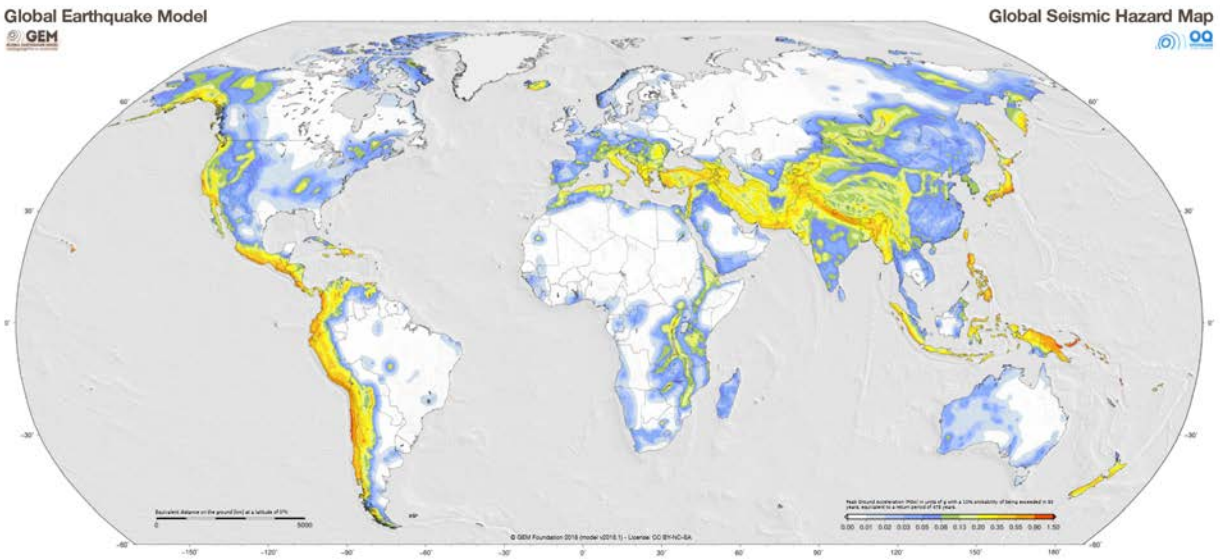


Source: North Carolina Geological Survey

Figure 5.11 shows the intensity level associated with the Buncombe, Madison Region, 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, most of

the Buncombe, Madison Region lies within an approximate zone of level "5-6-" ground acceleration with a small portion being located in the "4-5" zone. This indicates that the region as a whole exists within an area of moderate seismic risk.

FIGURE 5.11: PEAK ACCELERATION WITH 10 PERCENT PROBABILITY OF EXCEEDANCE IN 50 YEARS



Source: Global Earthquake Model, 2018

5.7.3 Historical Occurrences

At least 54 earthquakes are known to have occurred in the Buncombe Madison Region since 1960. The strongest of these measured a VII on the Modified Mercalli Intensity (MMI) scale. **Table 5.20** provides a summary of earthquake events reported by the United States Geological Survey between 1638 and 1985.

TABLE 5.20: SUMMARY OF SEISMIC ACTIVITY IN THE BUNCOMBE MADISON REGION

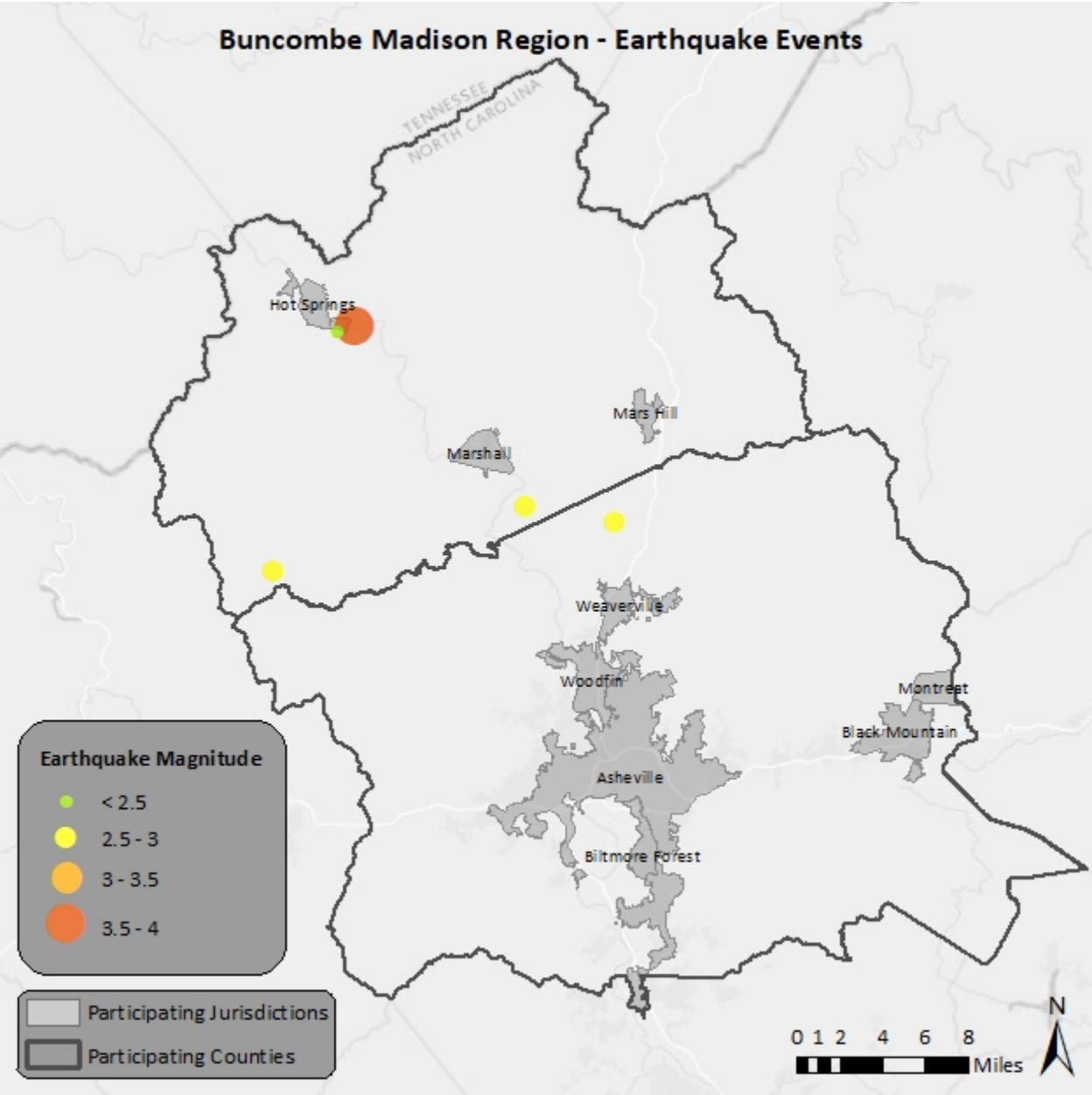
Location	Number of Occurrences	Greatest MMI Reported	Richter Scale Equivalent
Buncombe County	**37**	**VII**	**< 6.1**
Asheville	27	VII	< 6.1
Biltmore Forest	-	-	-
Black Mountain	3	II	< 4.2
Montreat	5	V	< 4.8
Weaverville	2	VI	< 5.4
Woodfin	0	-	-
Unincorporated Area	0	-	-
Madison County	**17**	**VI**	**< 5.4**
Hot Springs	4	IV	< 4.8
Marshall	8	VI	< 5.4
Mars Hill	5	V	< 4.8
Unincorporated Area	0	-	-
BUNCOMBE MADISON REGION TOTAL	**54**	**VII**	**< 6.1**

Source: USGS, NCEI

Note: No further details about these events could be located. Future updates of the plan will attempt to provide more context to previously reported earthquake events.

Figure 5.10 below shows the historical data for where earthquakes have occurred throughout the Buncombe Madison region.

FIGURE 5.10: HISTORIC EARTHQUAKE EVENTS (1960-2019)



Source: USGS

The most recent earthquake event to directly affect North Carolina was the 2020 Sparta earthquake. A narrative discussion about this earthquake can be found below.

Sparta Earthquake (August 9, 2020)

According to the National Weather Service, the 5.2 magnitude earthquake was the second strongest earthquake to occur in North Carolina since 1900. There were no immediate reports of injuries from this earthquake. Before the 5.1 earthquake, five other minor earthquakes were measured in the area. Although there were no reports of injuries or deaths associated with the earthquake, there was extensive property damage reported across in Sparta and across Alleghany County. Over 525 damage reports were filed with Alleghany County officials. People felt the effects of the earthquake across the Carolinas, in Virginia, Georgia and Tennessee.

In addition to those earthquakes specifically affecting the Buncombe Madison Region, a list of earthquakes that have caused damage throughout North Carolina is presented below in **Table 5.21.**

TABLE 5.21: EARTHQUAKES WHICH HAVE CAUSED DAMAGE IN N.C.

Date	Location	Richter Scale (Magnitude)	MMI (Intensity)	MMI in North Carolina
12/16/1811 - 1	NE Arkansas	8.5	XI	VI
12/16/1811 - 2	NE Arkansas	8.0	X	VI
12/18/1811 - 3	NE Arkansas	8.0	X	VI
01/23/1812	New Madrid, MO	8.4	XI	VI
02/071812	New Madrid, MO	8.7	XII	VI
04/29/1852	Wytheville, VA	5.0	VI	VI
08/31/1861	Wilkesboro, NC	5.1	VII	VII
12/23/1875	Central Virginia	5.0	VII	VI
08/31/1886	Charleston, SC	7.3	X	VII
05/31/1897	Giles County, VA	5.8	VIII	VI
01/01/1913	Union County, SC	4.8	VII	VI
02/21/1916*	Asheville, NC	5.5	VII	VII
07/08/1926	Mitchell County, NC	5.2	VII	VII
11/03/1928*	Newport, TN	4.5	VI	VI
05/13/1957	McDowell County, NC	4.1	VI	VI
07/02/1957*	Buncombe County, NC	3.7	VI	VI
11/24/1957*	Jackson County, NC	4.0	VI	VI
10/27/1959 **	Chesterfield, SC	4.0	VI	VI
07/13/1971	Newry, SC	3.8	VI	VI
11/30/1973*	Alcoa, TN	4.6	VI	VI
11/13/1976	Southwest Virginia	4.1	VI	VI
05/05/1981	Henderson County, NC	3.5	VI	VI
08/09/2020	Sparta, NC	5.1	VII	VII

*This event is accounted for in the Buncombe Madison 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).

5.7.4 Probability of Future Occurrences

The probability of significant, damaging earthquake events affecting the Buncombe Madison Region 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 region. The annual probability level for the region is estimated between 10 and 100 percent (likely). The USGS also uses historical data to predict the probability of a major earthquake within the next 50 years by county. Those results follow: Buncombe County – 3.42% and Madison County – 4.11%.

5.8 GEOLOGICAL

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

5.8.1 Background and Description

Landslide

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

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

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

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

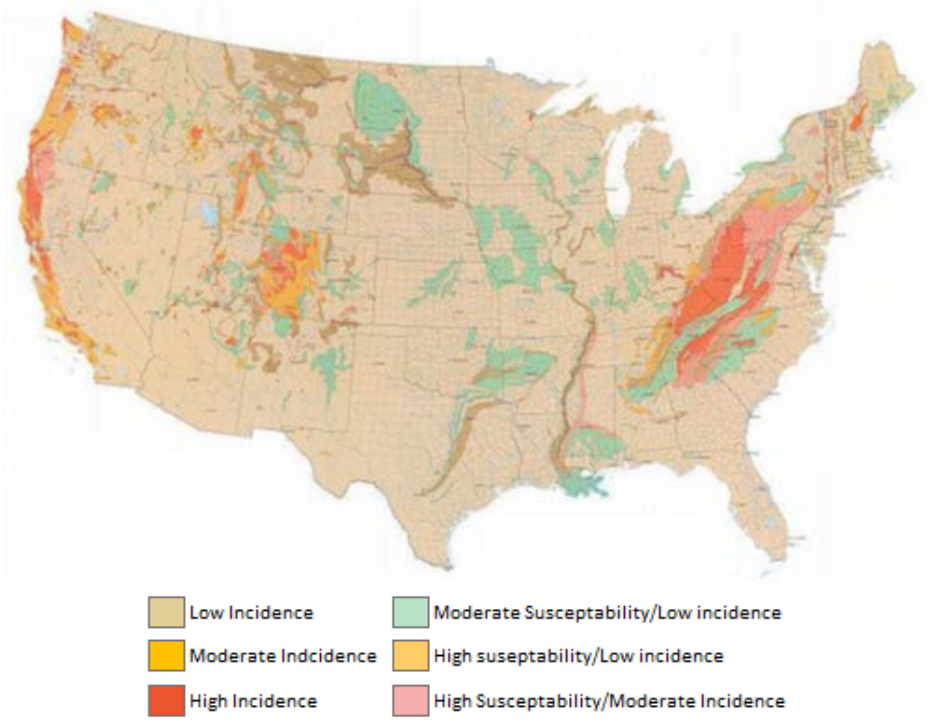
Areas that are generally prone to landslide hazards include previous landslide areas, the bases of steep slopes, the bases of drainage channels, and developed hillsides where leach-field septic systems are used. Areas that are typically considered safe from landslides include areas that have not moved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

According to the United States Geological Survey, each year landslides cause $5.1 billion (2009 dollars) in damage and between 25 and 50 deaths in the United States.[16] **Figure 5.10** delineates areas where

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

large numbers of landslides have occurred and areas that are susceptible to landslides in the conterminous United States.[17]

FIGURE 5.10: LANDSLIDE OVERVIEW MAP



Source: United States Geological Survey

Sinkholes

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

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

FIGURE 5.12: SINKHOLE IN NORTH CAROLINA

[17] This map 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.

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

Source: NCEM

Erosion

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

There are two types of soil erosion: wind erosion and water erosion. Wind erosion can cause significant soil loss. Winds blowing across sparsely vegetated or disturbed land can pick up soil particles can 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 as hurricanes in coastal areas, may cause significant erosion by combining high winds with heavy surf and storm surge to significantly impact the shoreline.

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

Climate can affect the amount of runoff, especially the frequency, intensity, and duration of rainfall and storms. When rainstorms are frequent, intense, or of long duration, erosion risks are high. Seasonal changes in temperature and rainfall amounts define the period of highest erosion risk of the year.
During the past 20 years, the importance of erosion control has gained the increased attention of the public. Implementation of erosion control measures consistent with sound agricultural and construction

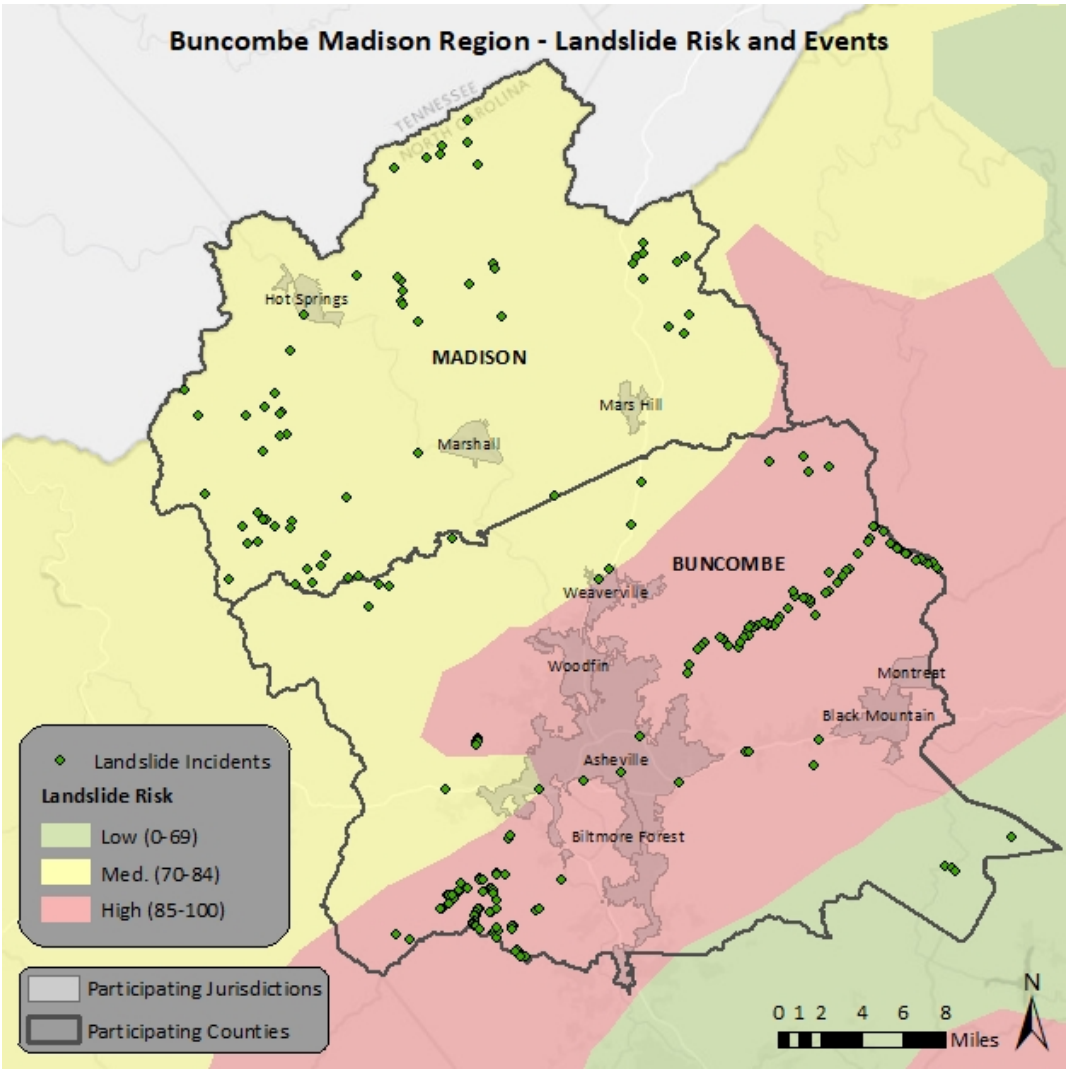
operations is needed to minimize the adverse effects associated with harmful chemicals run-off due to wind or water events. The increase in government regulatory programs and public concern has resulted in a wide range or erosion control products, techniques, and analytical methodologies in the United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

5.8.2 Location and Spatial Extent

Landslides

Landslides are possible throughout the Buncombe Madison Region. However, some areas may experience more landslide activities than others. According to **Figure 5.11** below, the central portion of Buncombe County has the greatest landslide activity. A majority of the northern portion of the region has a moderate incidence occurrence rate; and the southern-most portion of the region has a low incidence record.

FIGURE 5.11: LANDSLIDE SUSCEPTIBILITY AND INCIDENCE MAP



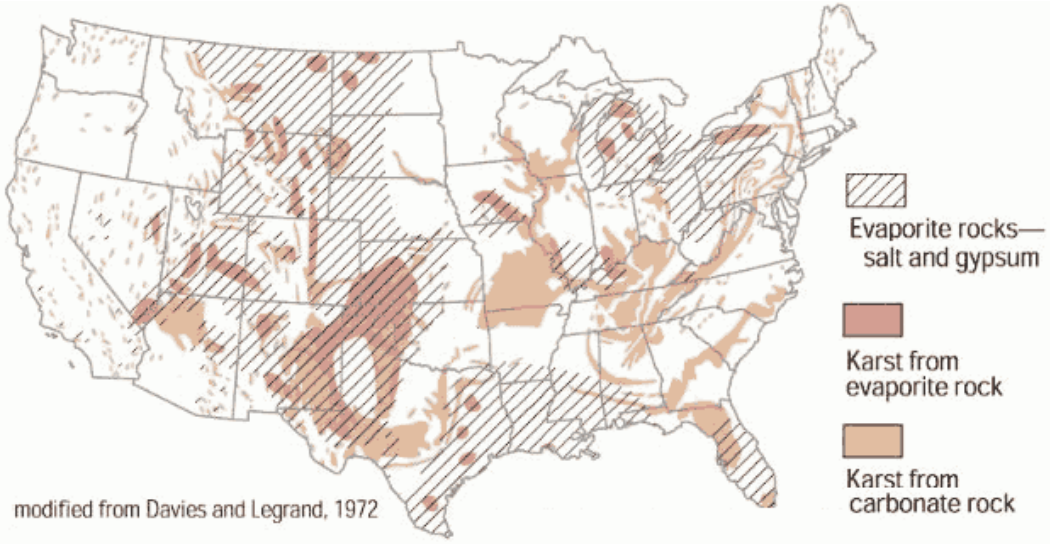
Source: United States Geological Survey

Sinkholes

Figure 5.12 below shows areas of the United States where certain rock types that are susceptible to

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

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



Erosion

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

5.8.3 Historical Occurrences

Landslides

Steep topography throughout the Buncombe Madison Region makes the planning area susceptible to landslides. Most landslides are caused by heavy rainfall in the area. Building on steep slopes that was not previously possible also contributes to risk. **Table 5.22** presents a summary of the landslide occurrence events as provided by the North Carolina Geological Survey[19]. The locations of the landslide events presented in the aforementioned tables are presented in **Figure 5.12**. 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 both counties.

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

TABLE 5.22: SUMMARY OF LANDSLIDE ACTIVITY

Location	Number of Occurrences
Buncombe County	**152**
Asheville	3
Biltmore Forest	0
Black Mountain	0
Montreat	0
Weaverville	1
Woodfin	0
Unincorporated Area	148
Madison County	**61**
Hot Springs	1
Marshall	0
Mars Hill	0
Unincorporated Area	60
BUNCOMBE MADISON REGION TOTAL	**213**

Source: North Carolina Geological Survey

The National Climatic Data center also reported three landslide events that took place in the Buncombe Madison Region.

Buncombe County — September 8, 2004
Flooding began during the late afternoon across the county and gradually worsened during the evening and overnight hours, with near-record flooding observed along the Swannaoa and French Broad Rivers. Most valley communities across the county were affected by severe flooding along the rivers, or along smaller streams. Flooding along the Swannanoa devastated Asheville's Biltmore area, as well as the Black Mountain and Swannanoa communities. Numerous businesses and residences were damaged or destroyed by flood waters. Widespread damage to roads and bridges also occurred, either due to flooding or landslides. Resulting landslides caused $13,047,732 (2013 dollars) of property damage in Buncombe County.

Buncombe County — September 17, 2004
After many hours of moderate to heavy rainfall, gradual rises on creeks and streams resulted in the second devastating flood across the county in just 9 days. Flooding first began around Candler, but eventually affected every valley community in the county. Flooding was actually more widespread than during the Frances flood, but was not quite as severe. Virtually every stream in the county flooded, including the French Broad River. Two males, ages 32 and 28, died in Leicester when they attempted to cross a flooded area in a pickup truck. Hundreds of roads were flooded and the bridge over highway 197 in Barnardsville was washed out. The French Broad flooded the studios and other businesses in the River District in downtown Asheville. At Enka, a motel was flooded, which necessitated the rescue of 40 people. Numerous homes were destroyed or severely damaged by flood water or landslides. There was a total of $13,047,732 (2013 dollars) of property damage.

Buncombe County — July 7, 2005
Part of a hillside gave way, damaging the Broad River VFDs building. There was a total of $63,339 (2013 dollars) of property damage.

The information below identifies additional historical information reported in the previous hazard

mitigation plans.

Buncombe County
In September 2004, intense rainfall from the remnants of Hurricanes Frances and Ivan triggered at least 400 landslides throughout western North Carolina. Following these events, the NC Department of Environment and Natural Resources (NCDENR) conducted a field study to document the number, location, and extent of previous landslides in Buncombe, Haywood, Henderson, Jackson, Macon, and Watauga Counties. This study revealed 1,253 landslide features throughout Buncombe County (314 landslides and 938 landslide deposit areas). According to a North Carolina Landslide Fact Sheet produced after this study, "…landslide deposits are where significant volumes of unconsolidated soil and rock fragments have accumulated over time from several processes such as debris flows, debris slides, and rock falls. Most mapped deposits are likely prehistoric, but have yet to be verified by modern age- dating techniques."

According to NCDENR data, most recent landslide events include: a storm event in November of 1977 that triggered over 60 debris flows in the Bent Creek area; a debris flow in the Starnes Cove community triggered by the remnants of Hurricane Ivan in September of 2004 that destroyed one home, damaged two vehicles, destroyed the garage of another home, and damaged the road; and a rockslide that caused significant damage to the Broad River Fire Department in July of 2005 during the remnants of Tropical Storm Cindy. The debris deposit volume from the 2004 Starnes Cove event was estimated to be 7,500 to 10,000 cubic yards of earthen material. The volume estimate did not include debris from the damaged and destroyed structures. Volume estimates were not available for the 1977 and 2005 events.

Madison County
Madison County is susceptible to large landslides and the most recent occurrence was the Good Friday event of 2019. Heavy rains fell on already saturated soil causing several slides including one that damaged of three structures. Other small landslides (10 to 40 cubic yards) have been occasional during times of higher than normal precipitation.

5.8.4 Probability of Future Occurrences

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

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

Erosion
Erosion remains a natural, dynamic, and continuous process for the Buncombe Madison Region, and it will continue to occur. The annual probability level assigned for erosion is possible (between 1 and 33.3 percent annual probability). 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*.

5.9 DAM AND LEVEE FAILURE

5.9.1 Background and Description

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

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

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

5.9.2 Location and Spatial Extent

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

TABLE 5.23: NORTH CAROLINA DAM HAZARD CLASSIFICATIONS

Hazard Classification	Description	Quantitative Guidelines
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

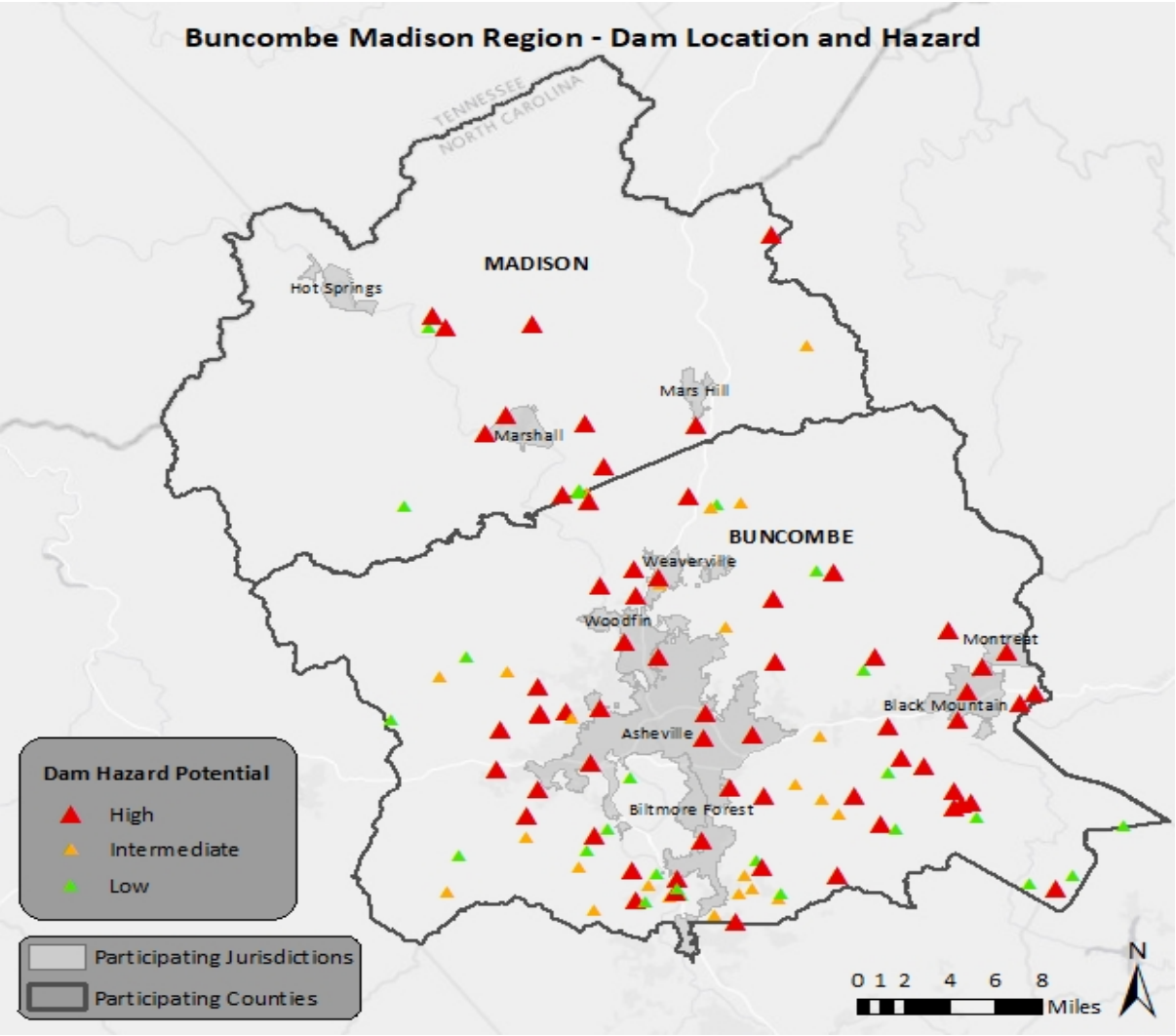
According to the North Carolina Division of Energy, Mineral, and Land Resources, there are 112 dams in the Buncombe Madison Region with 96 in Buncombe County and only 16 in Madison County.[20] **Figure 5.13** shows the dam location and the corresponding hazard ranking for each. Of these dams, 59 are classified as high hazard potential. These high hazard dams are summarized by county in **Table 5.24.** .

TABLE 5.24: SUMMARY OF HIGH HAZARD DAMS

Location	Number High Hazard Dams
Buncombe County	53
Madison County	10
BUNCOMBE MADISON REGION TOTAL	**63**

[20] 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 5.13: DAM LOCATION AND HAZARD RANKING



Source: North Carolina Division of Land Resources, 2012

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

(Taken from previous Buncombe County hazard mitigation plan.) The highest level of risk [of a dam failure] is along the Swannanoa River below the Bee Tree and North Fork Dams. This area extends along US 70 Highway from Swannanoa to Biltmore. In a breech involving the ¾ Probable Maximum Precipitation the maximum flood depth within the inundation area would be 58.5 feet. These dams have the greatest impoundment and, therefore, larger inundation areas. It is possible that a dam failure having limited impact over a small area could occur.

5.9.3 Historical Occurrences

The only dam failure to cause significant damage occurred when Bear Wallow Dam along Newfound Creek in Buncombe County failed on February 22, 1976. The private earthen dam broke, destroying one home and killing a family of four. There is no record of additional significant dam failures in the region; however, several breach scenarios in the area could be catastrophic.

5.9.4 Probability of Future Occurrence

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

5.10 FLOODING

5.10.1 Background

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

Floods generally result from excessive precipitation and can be classified under two categories: general floods, precipitation over a given river basin for a long period of time along with storm-induced wave action, and flash floods, the product of heavy localized precipitation in a short time period over a given location. The severity of a flooding event is typically determined by a combination of several major factors, including stream and river basin topography and physiography, precipitation and weather patterns, recent soil moisture conditions, and the degree of vegetative clearing and impervious surface.

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

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

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

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

Location and Spatial Extent

There are areas in the Buncombe Madison Region that are susceptible to flood events. Special flood

hazard areas in the Buncombe Madison Region were mapped using Geographic Information System (GIS) and FEMA Digital Flood Insurance Rate Maps (DFIRM).[21] This includes Zone A (1-percent annual chance floodplain), Zone AE (1-percent annual chance floodplain with elevation), and Zone X 500 (0.2-percent annual chance floodplain). According to GIS analysis, of the 1,111 square miles that make up the Buncombe Madison Region, there are 31.3 square miles of land in zones A and AE (1-percent annual chance floodplain/100-year floodplain) and 3.0 square miles of land in zone X 500 (0.2-percent annual chance floodplain/500-year floodplain). The county totals are presented below in **Table 5.25**.

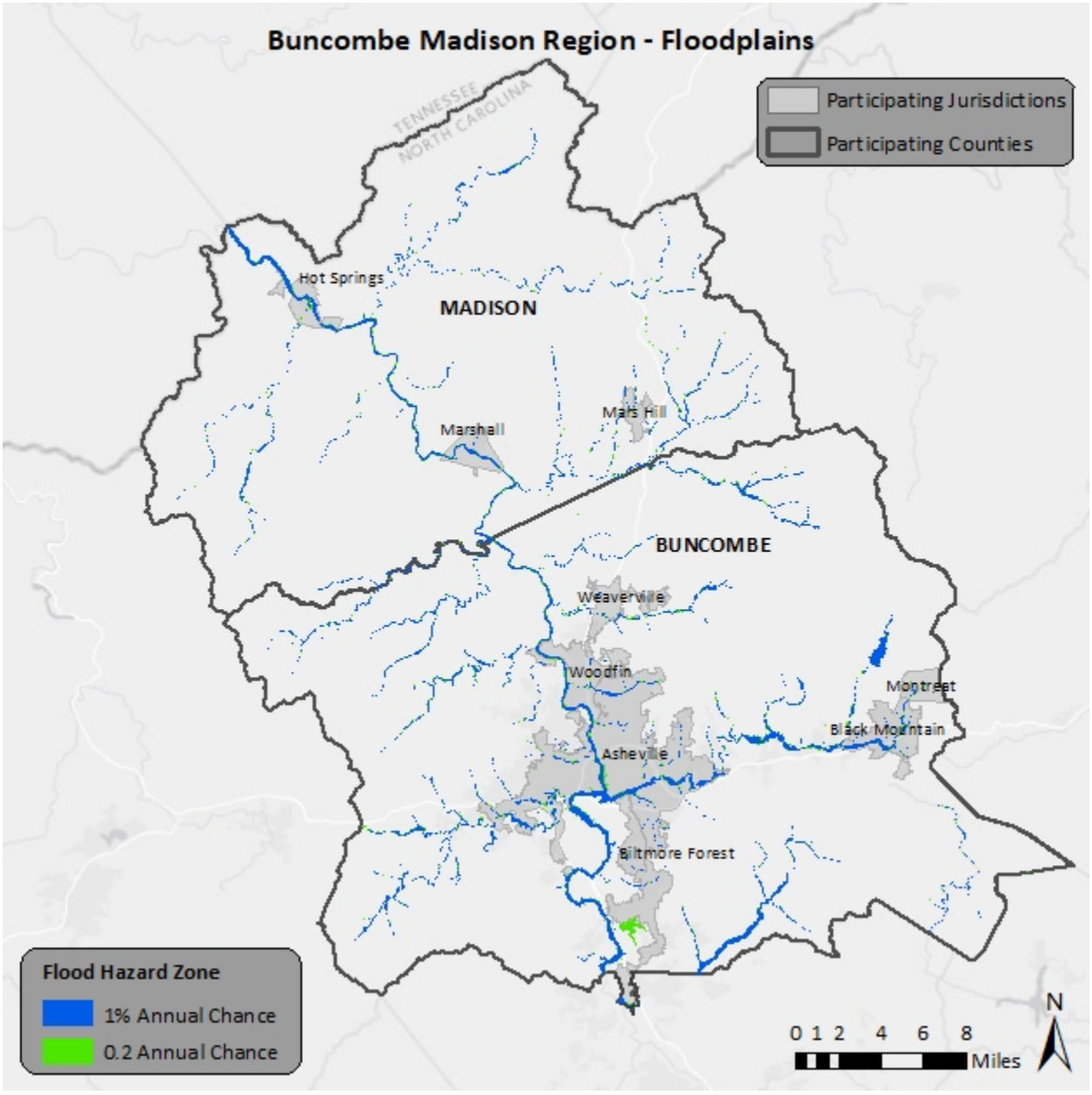
TABLE 5.25: SUMMARY OF FLOODPLAIN AREAS

Location	100-year area (square miles)	500-year area (square miles)
Buncombe County	22.21	2.16
Madison County	9.11	0.84
BUNCOMBE MADISON REGION TOTAL	**31.32**	**3.00**

These flood zone values account for 3.1 percent of the total land area in the Buncombe Madison 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 5.14** illustrates the location and extent of currently mapped special flood hazard areas for the Buncombe Madison Region based on best available FEMA DFIRM data. Additional, more detailed county-level and jurisdiction-level maps can be found in Appendices F and H.

[21] The county-level DFIRM data used for both Buncombe County and Madison County was updated in 2011.

FIGURE 5.14: SPECIAL FLOOD HAZARD AREAS



Source: Federal Emergency Management Agency

5.10.2 Historical Occurrences

Flooding has resulted in five disaster declarations in the Buncombe Madison Region.[22] Information from the National Center for Environmental Information was used to ascertain additional historical flood events. The National Center for Environmental Information reported a total of 84 events throughout the Buncombe Madison Region since 1996.[23] A summary of these events is presented in **Table 5.26**. These

[22] 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 Profiles*.

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

events accounted for over $122 million (2020 dollars) in property damage throughout the region.[24] Specific information on flood events for each county, including date, type of flooding, and deaths and injuries, can be found in Appendix H.

TABLE 5.26: SUMMARY OF FLOOD OCCURRENCES IN BUNCOMBE MADISON REGION

Location	Number of Occurrences	Injuries	Deaths	Property Damage	Crop Damage
Buncombe County	**44**	**0**	**2**	**$85,038,004**	**$1,000,000**
Asheville	4	0	0	$10,000	$0
Biltmore Forest	0	0	0	$0	$0
Black Mountain	3	0	0	$4	$0
Montreat	1	0	0	$500	$0
Weaverville	4	0	0	$40,000	$0
Woodfin	1	0	0	$2,500,000	$0
Unincorporated Area	13	0	2	$82,487,500	$1,000,000
Madison County	**40**	**1**	**1**	**$17,507,000**	**$12,170,000**
Hot Springs	1	0	0	$2,500,000	$0
Marshall	14	0	0	$2,835,000	$7,500,000
Mars Hill	2	0	0	$0	$0
Unincorporated Area	23	1	1	$12,172,000	$4,670,000
BUNCOMBE MADISON REGION TOTAL	**84**	**1**	**3**	**$102,545,004**	**$13,170,000**

Source: National Center for Environmental Information

Table 5.27 shows significant flooding events in the Buncombe Madison communities in the last 20 years (2000 – 2020).

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

TABLE 5.27: MAJOR FLOOD OCCURRENCES IN THE BUNCOMBE MADISON REGION

Area	Date	Type	Property Damage	Crop Damage	Information
Asheville	5-Jun-02	Flood	$10,000	$0	Some street flooding occurred, and water entered a few homes.
Weaverville	21-May-12	Flash Flood	$20,000	$0	The Eden Glenn Mobile Home Park was flooded by Flat Creek after around 3 inches of rain fell in an hour. Approximately 30 people were evacuated from about 2 dozen mobile homes between 7 pm and midnight. One utility building floated away and there was underpinning damage to a few trailers. County officials reported that this same area flooded around 17 years ago. After a lull in rainfall during the morning hours, numerous showers and thunderstorms with heavy rain again developed over parts of the North Carolina Mountains and foothills during the afternoon hours. A few areas of flash flooding developed as a result. There were also a few severe storms over the North Carolina foothills and piedmont.
Woodfin	4-Jul-13	Flash Flood	$2,500,000	$0	Several streets were flooded from the Biltmore Forest area northward to Asheville. Numerous roads were closed by flooding, landslides and fallen trees. Around 9 pm EDT a large debris flow took out part of Vance Gap Road, isolating several homes. Around a dozen residences had to be evacuated as a result of the slide. After a lull in rainfall during the morning hours, numerous showers and thunderstorms with heavy rain again developed over parts of the North Carolina Mountains and foothills during the afternoon hours. A few areas of flash flooding developed as a result. There were

					also a few severe storms over the North Carolina foothills and piedmont.
Weaverville	22-Aug-15	Flash Flood	$20,000	$0	County comms and FD reported localized flash flooding developed in the Weaverville area after 2 to 4 inches of rain fell in a short period of time. Several small creeks overflowed their banks and flooded roads as well as the basements of some homes on Woodland Hills Dr, Hamburg Mountain Rd, and Lakeshore Dr. In addition, water from a stream along Merrimon Rd resulted in stalling of a vehicle, with the driver requiring rescue. At least one small mudslide also occurred in the area. Isolated thunderstorms developed across the mountains during the evening. One slow-moving storm developed over the Weaverville area and produced flash flooding in the Weaverville area while another produced brief damaging winds in east Asheville.
Marshall	27-Jun-01	Flash Flood	$0	$500,000	Walnut Creek and other smaller creeks flooded. Five county roads were closed. 150 people were evacuated. 3 homes and 1 business damaged. People were trapped in their homes by the flood water.

Marshall	29-Jun-01	Flash Flood	$1,000,000	$2,500,000	A significant flash flood occurred in Madison County on the 29th, the fourth major flash flood to affect Madison County in six weeks. Numerous roads were flooded, closing major commuter highways 208 and 212. Many private bridges were washed away. Damage to the tobacco crop alone was estimated at $400,000. Flooding began after nearly four hours of moderate to heavy rain trained over the rugged, hilly terrain of northern Madison County. The first report was of a mudslide between Marshall and Mars Hill, then Laurel Creek, especially susceptible to flooding during the summer of 2001, overflowed its banks once again, taking 7 or 8 bridges with it and washing a mobile home away. Big Laurel and Shelton Laurel creeks also flooded, stranding 9 families for a couple of days once the roads connecting them to the main highway were washed out.
Marshall	29-Jun-01	Flash Flood	$100,000	$2,500,000	Another round of heavy rain brought Big Laurel creek out of its banks again. A house trailer was damaged this time, and parts of highways 19 and 23 leading into Yancey County were washed away or closed because of water, sand and debris. Bridges and roads were still closed in many of these same areas from flooding the day before. The Jarrett Cove bridge, which crosses Big Laurel, washed away between 430 AM EST and 515 AM EST.

Marshall	4-Aug-01	Flash Flood	$1,700,000	$2,000,000	The most severe of the recent flash floods to affect Madison County during the summer season developed rapidly Saturday morning. Flooding was swift and extensive, destroying highway bridges, private bridges and sweeping away structures and causing a large amount of property and crop damage. A state of emergency was declared for Madison County as a result of the flash flooding, the sixth major flash flood in Madison County in two months. Flooding lingered into the afternoon, damaging or destroying businesses, churches, homes and outside wells. Abundant tropical moisture, with a direct trajectory off the Atlantic Ocean, was lifted up the higher terrain of Northwest Madison County, resulting in potent precipitation-producing showers and thunderstorms that became anchored because of a light mean wind flow aloft. Rain gauges in the flood area recorded upwards of 4 inches of rain in just a couple of hours.
Madison (Countywide	3-Jul-13	Flash Flood	$2,500,000	$0	Numerous roads were reportedly closed across the county due to flooding, including Highway 70/25. Some roads were heavily damaged by flooding and landslides. A very moist airmass and southeast, upscale flow helped to support localized very heavy rain over parts of the North Carolina mountains.

Source: National Centers for Environmental Information

5.10.3 Historical Summary of Insured Flood Losses

According to FEMA flood insurance policy records as of March 2020, there have been 454 flood losses reported in the Buncombe Madison Region through the National Flood Insurance Program (NFIP) since

1978, totaling more than $19.1 million in claims payments. A summary of these figures for each Buncombe Madison county is provided in **Table 5.27**. It should be emphasized that these numbers include only those losses to structures that were insured through the NFIP policies, and for losses in which claims were sought and received. It is likely that many additional instances of flood loss in the Buncombe Madison Region were either uninsured, denied claims payment, or not reported.

TABLE 5.27: SUMMARY OF INSURED FLOOD LOSSES

Location	Number of Policies	Flood Losses	Claims Payments
Buncombe County	982	406	$18,190,992
Asheville	495	250	$14,527,234
Biltmore Forest	0	0	$0
Black Mountain	61	12	$35,989
Montreat	11	0	$0
Weaverville	26	0	$0
Woodfin	0	0	$41,307
Unincorporated Area	389	144	$3,586,462
Madison County	91	48	$936,445
Hot Springs	4	1	$2,361
Marshall	30	36	$517,815
Mars Hill	6	0	$0
Unincorporated Area	51	11	$416,269
BUNCOMBE MADISON REGION TOTAL	**1,073**	**454**	**$19,127,437**

Source: Federal Emergency Management Agency, National Flood Insurance Program

5.10.4 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.

There are 31 non-mitigated repetitive loss properties located in the Buncombe Madison Region, which accounted for 78 losses and more than $4.5 million in claims payments under the NFIP. The average claim amount for these properties is $58,402. Twenty-four of the thirty-one properties are commercial, 4 are institutional, and 4 multi-family residential. Without mitigation these properties will likely continue to experience flood losses. **Table 5.28** presents a summary of these figures for the Buncombe Madison Region.

TABLE 5.28: SUMMARY OF REPETITIVE LOSS PROPERTIES

Location	Number of Properties	Number of Losses	Total Payments
Buncombe County	**27**	**64**	**$4,432,655**
Asheville	27	64	$4,432,655
Biltmore Forest	0	0	$0
Black Mountain	0	0	$0
Montreat	0	0	$0
Weaverville	0	0	$0
Woodfin	0	0	$0
Unincorporated Area	0	0	$0

Madison County	**4**	**14**	**$122,726**
Hot Springs	0	0	$0
Marshall	4	14	$122,726
Mars Hill	0	0	$0
Unincorporated Areas	0	0	$0
BUNCOMBE MADISON REGION TOTAL	**31**	**78**	**$4,555,381**

Source: National Flood Insurance Program

5.10.5 Probability of Future Occurrences

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

Other Hazards

5.11 WILDFIRES

5.11.1 Background and Description

A wildfire is any outdoor fire (i.e. grassland, forest, brush land) that is not under control, supervised, or prescribed.[25] Wildfires are part of the natural management of forest ecosystems, but may also be caused by human factors.

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

There are three classes of wildland fires: surface fire, ground fire, and crown fire. A surface fire is the most common of these three classes and burns along the floor of a forest, moving slowly and killing or damaging trees. A ground fire (muck fire) is usually started by lightning of 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 wilds 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. Additional, more detailed county-level and jurisdiction-level maps can be found in Appendix G.

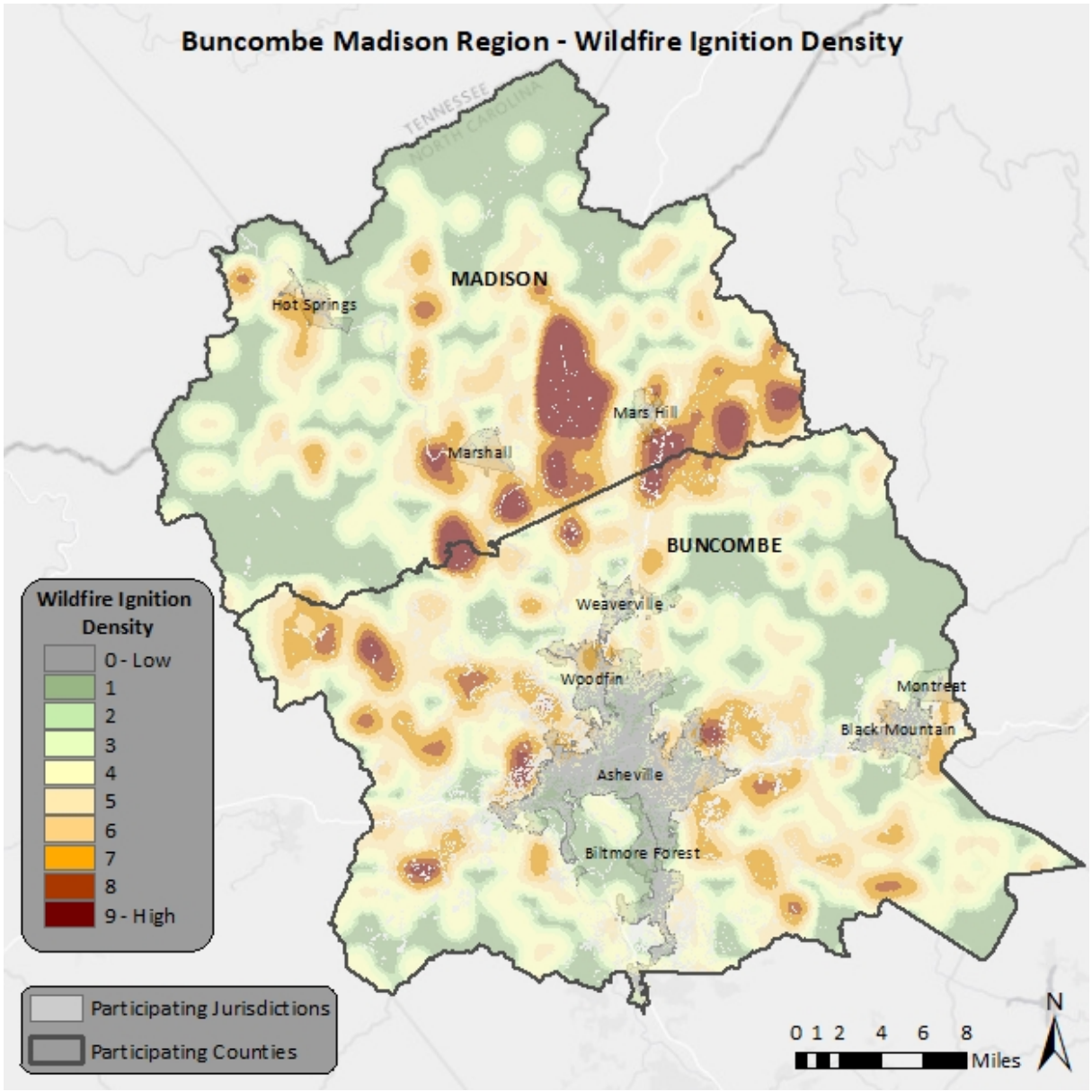
[25] Prescription burning, or "controlled burn," undertaken by land management agencies is the process of igniting fires under selected conditions, in accordance with strict parameters.

5.11.2 Location and Spatial Extent

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

Figures 5.16 shows the Wildfire Ignition Density for the Buncombe Madison Region based on data from the Southern Wildfire Risk Assessment. This data represents the likelihood of wildfire igniting in the area, which is derived from historical wildfire occurrences to create an average ignition rate map.

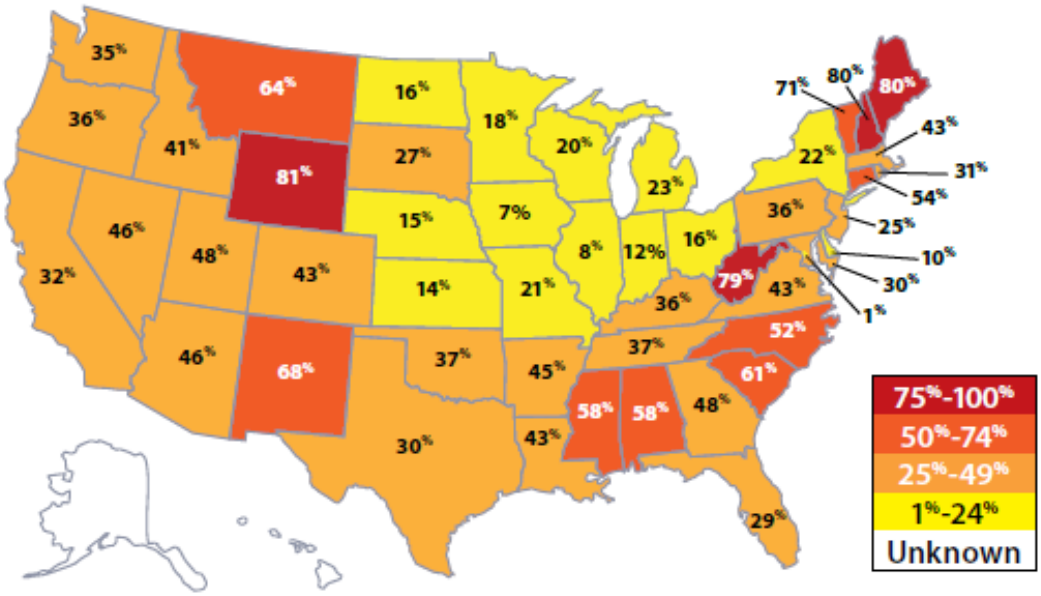
FIGURE 5.16: WILDFIRE IGNITION DENSITY



Source: Southern Wildfire Risk Assessment

Every state also has a Wildland Urban Interface (WUI), which is the rating of potential impact of wildfires on people and their homes. The WUI is not a fixed geographical location, but rather a combination of human development and vegetation where wildfires have the greatest potential to result in negative impacts. Nationally, one-third of all homes lie in the WUI, which is a growing danger. Below, **Figure 5.17** shows a map of each state's WUI. Based on the data from the US Department of Agriculture, 52% of homes in North Carolina lie within the WUI.

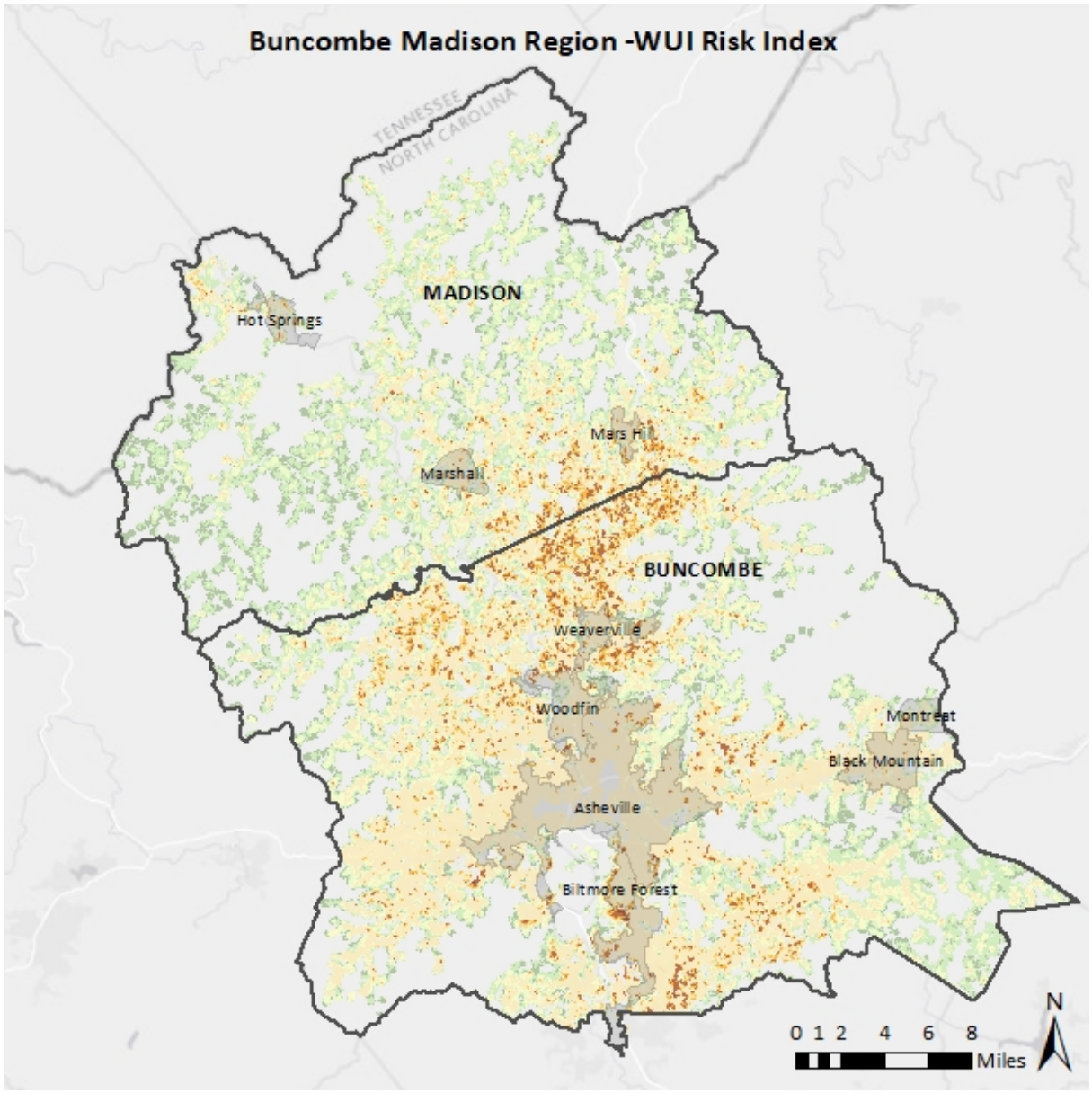
FIGURE 5.17: PERCENT OF TOTAL HOMES IN THE WILDLAND URBAN INTERFACE



Source: US Department of Agriculture

Below, **Figures 5.18** display the WUI Risk Index for the Buncombe Madison Region.

FIGURE 5.18: WUI RISK INDEX



Source: Southern Wildfire Risk Assessment

5.11.3 Historical Occurrences

Information from the National Association of State Foresters was used to ascertain historical wildfire events. The National Association of State Foresters reported that a total of 767 events that impacted an area greater than 1 acre have occurred throughout the Buncombe Madison Region since 2001[26]. A summary of these events is presented in **Table 5.19** and a map of them is shown in **Figure 5.19**. The largest of these events was the Larman Fire which occurred north of Hot Springs in 2001 and impacted 2,716 acres.

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

TABLE 5.29: SUMMARY OF WILDFIRE INCIDENTS (2001-2018)

Location	Number of Wildfires	Total Acres Burned
Buncombe County	**340**	**3,749**
Asheville	6	12.9
Biltmore Forest	0	0
Black Mountain	1	1
Montreat	0	0
Weaverville	2	4
Woodfin	1	54
Unincorporated Area	330	3,677
Madison County	**427**	**7,197.0**
Hot Springs	2	5.4
Marhsall	1	5.1
Mars Hill	3	3.6
Unincorporated Areas	421	7182.9
BUNCOMBE MADISON REGION TOTAL	**767**	**10,946**

Source: NASF

TABLE 5.30: WILDFIRE INCIDENTS IN THE BUNCOMBE MADISON REGION (2001-2018)

Fire #	County	Acres	Reported On
NCST-011-20010005	Buncombe	3.00	02/02/2001
NCST-011-20010008	Buncombe	1.00	02/03/2001
NCST-011-20010009	Buncombe	2.00	02/05/2001
NCST-011-20010010	Buncombe	2.00	02/06/2001
NCST-011-20010011	Buncombe	18.00	02/07/2001
NCST-011-20010012	Buncombe	3.00	02/08/2001
NCST-011-20010013	Buncombe	4.00	02/09/2001
NCST-011-20010015	Buncombe	5.00	02/11/2001
NCST-011-20010017	Buncombe	3.50	02/24/2001
NCST-011-20010018	Buncombe	2.00	02/24/2001
NCST-011-20010022	Buncombe	3.70	03/10/2001
NCST-011-20010024	Buncombe	15.00	03/11/2001
NCST-011-20010028	Buncombe	1.00	03/17/2001
NCST-011-20010029	Buncombe	2.00	03/24/2001
NCST-011-20010030	Buncombe	11.00	03/25/2001
NCST-011-20010036	Buncombe	4.00	04/07/2001
NCST-011-20010038	Buncombe	5.50	04/12/2001
NCST-011-20010047	Buncombe	8.00	04/26/2001
NCST-011-20010050	Buncombe	10.00	04/27/2001
NCST-011-20010053	Buncombe	5.00	05/04/2001
NCST-011-20010061	Buncombe	6.00	05/15/2001
NCST-011-20010062	Buncombe	10.00	10/19/2001

Fire #	County	Acres	Reported On
NCST-011-20010066	Buncombe	35.00	10/26/2001
NCST-011-20010065	Buncombe	7.00	10/26/2001
NCST-011-20010072	Buncombe	1.00	10/28/2001
NCST-011-20010075	Buncombe	1.50	10/30/2001
NCST-011-20010080	Buncombe	3.00	11/02/2001
NCST-011-20010085	Buncombe	3.50	11/06/2001
NCST-011-20010089	Buncombe	1.00	11/07/2001
NCST-011-20010092	Buncombe	5.00	11/11/2001
NCST-011-20010094	Buncombe	2.00	11/12/2001
NCST-011-20010100	Buncombe	2.00	11/15/2001
NCST-011-20010101	Buncombe	2.00	11/16/2001
NCST-011-20010103	Buncombe	1.50	11/17/2001
NCST-011-20010110	Buncombe	14.00	12/03/2001
NCST-011-20010112	Buncombe	5.00	12/06/2001
NCST-011-20010115	Buncombe	62.00	12/30/2001
NCST-011-20020002	Buncombe	1.00	01/15/2002
NCST-011-20020004	Buncombe	5.50	01/30/2002
NCST-011-20020006	Buncombe	5.00	02/04/2002
NCST-011-20020009	Buncombe	1.50	02/16/2002
NCST-011-20020012	Buncombe	6.50	02/18/2002
NCST-011-20020015	Buncombe	4.00	02/23/2002
NCST-011-20020017	Buncombe	1.00	03/01/2002
NCST-011-20020018	Buncombe	1.00	03/01/2002
NCST-011-20020020	Buncombe	3.30	03/07/2002
NCST-011-20020022	Buncombe	3.00	03/08/2002
NCST-011-20020030	Buncombe	55.00	03/11/2002
NCST-011-20020029	Buncombe	10.00	03/11/2002
NCST-011-20020031	Buncombe	2.50	03/11/2002
NCST-011-20020027	Buncombe	1.00	03/11/2002
NCST-011-20020034	Buncombe	3.00	04/06/2002
NCST-011-20020036	Buncombe	30.00	04/07/2002
NCST-011-20020037	Buncombe	7.00	04/17/2002
NCST-011-20020038	Buncombe	4.00	04/18/2002
NCST-011-20020047	Buncombe	3.00	05/01/2002
NCST-011-20020051	Buncombe	5.00	08/13/2002
NCST-011-20020056	Buncombe	1.00	12/01/2002
NCST-011-20020057	Buncombe	15.00	12/22/2002
NCST-011-20030007	Buncombe	1.50	03/24/2003
NCST-011-20030012	Buncombe	3.00	04/02/2003

Fire #	County	Acres	Reported On
NCST-011-20030013	Buncombe	2.00	04/04/2003
NCST-011-20030017	Buncombe	1.00	04/15/2003
NCST-011-20030019	Buncombe	20.00	04/29/2003
NCST-011-20040003	Buncombe	3.30	01/22/2004
NCST-011-20040006	Buncombe	3.00	02/01/2004
NCST-011-20040010	Buncombe	4.00	02/29/2004
NCST-011-20040018	Buncombe	14.00	03/13/2004
NCST-011-20040019	Buncombe	2.00	03/13/2004
NCST-011-20040015	Buncombe	2.00	03/13/2004
NCST-011-20040027	Buncombe	20.00	03/14/2004
NCST-011-20040028	Buncombe	12.80	03/14/2004
NCST-011-20040023	Buncombe	2.00	03/14/2004
NCST-011-20040031	Buncombe	50.30	03/24/2004
NCST-011-20040033	Buncombe	20.00	03/25/2004
NCST-011-20040035	Buncombe	1.00	03/27/2004
NCST-011-20040042	Buncombe	8.00	04/17/2004
NCST-011-20040043	Buncombe	1.00	04/17/2004
NCST-011-20040045	Buncombe	25.00	04/18/2004
NCST-011-20040046	Buncombe	10.00	04/18/2004
NCST-011-20040044	Buncombe	2.00	04/18/2004
NCST-011-20040047	Buncombe	1.00	04/21/2004
NCST-011-20040048	Buncombe	4.70	04/23/2004
NCST-011-20040050	Buncombe	2.00	05/11/2004
NCST-011-20040053	Buncombe	10.00	11/29/2004
NCST-011-20050002	Buncombe	4.50	01/04/2005
NCST-011-20050012	Buncombe	5.00	03/07/2005
NCST-011-20050014	Buncombe	2.00	03/10/2005
NCST-011-20050017	Buncombe	7.00	03/13/2005
NCST-011-20050018	Buncombe	1.00	03/15/2005
NCST-011-20050021	Buncombe	1.30	03/30/2005
NCST-011-20050022	Buncombe	3.00	04/03/2005
NCST-011-20050023	Buncombe	1.00	04/17/2005
NCST-011-20050024	Buncombe	4.60	04/19/2005
NCST-011-20050027	Buncombe	4.00	05/09/2005
NCST-011-20050029	Buncombe	2.50	09/15/2005
NCST-011-20050041	Buncombe	14.20	11/12/2005
NCST-011-20050040	Buncombe	3.40	11/12/2005
NCST-011-20050043	Buncombe	5.10	11/19/2005
NCST-011-20050047	Buncombe	5.00	11/26/2005

Fire #	County	Acres	Reported On
NCST-011-20060004	Buncombe	1.70	01/24/2006
NCST-011-20060006	Buncombe	3.20	01/28/2006
NCST-011-20060009	Buncombe	7.20	02/02/2006
NCST-011-20060010	Buncombe	5.10	02/03/2006
NCST-011-20060013	Buncombe	5.00	02/26/2006
NCST-011-20060018	Buncombe	3.00	03/02/2006
NCST-011-20060023	Buncombe	10.00	03/04/2006
NCST-011-20060021	Buncombe	4.00	03/04/2006
NCST-011-20060022	Buncombe	2.00	03/04/2006
NCST-011-20060025	Buncombe	1.00	03/05/2006
NCST-011-20060032	Buncombe	9.00	03/11/2006
NCST-011-20060036	Buncombe	1.20	03/13/2006
NCST-011-20060038	Buncombe	1.00	03/15/2006
NCST-011-20060039	Buncombe	1.00	03/15/2006
NCST-011-20060042	Buncombe	2.10	03/16/2006
NCST-011-20060059	Buncombe	1.00	04/02/2006
NCST-011-20060061	Buncombe	16.40	04/05/2006
NCST-011-20060060	Buncombe	5.00	04/05/2006
NCST-011-20060063	Buncombe	8.60	04/07/2006
NCST-011-20060077	Buncombe	54.00	12/06/2006
NCST-011-20060081	Buncombe	5.30	12/13/2006
NCST-011-20060082	Buncombe	2.00	12/17/2006
NCST-011-20070006	Buncombe	3.00	02/10/2007
NCST-011-20070010	Buncombe	5.00	02/19/2007
NCST-011-20070012	Buncombe	4.00	02/22/2007
NCST-011-20070015	Buncombe	3.20	02/24/2007
NCST-011-20070024	Buncombe	19.00	03/03/2007
NCST-011-20070026	Buncombe	112.50	03/09/2007
NCST-011-20070029	Buncombe	20.60	03/11/2007
NCST-011-20070030	Buncombe	1.40	03/11/2007
NCST-011-20070034	Buncombe	2.50	03/19/2007
NCST-011-20070037	Buncombe	1.50	03/24/2007
NCST-011-20070038	Buncombe	1.00	03/25/2007
NCST-011-20070045	Buncombe	5.00	04/05/2007
NCST-011-20070049	Buncombe	187.00	04/16/2007
NCST-011-20070051	Buncombe	4.00	04/18/2007
NCST-011-20070053	Buncombe	3.20	04/22/2007
NCST-011-20070058	Buncombe	1.10	04/30/2007
NCST-011-20070059	Buncombe	2.00	05/01/2007

Fire #	County	Acres	Reported On
NCST-011-20070066	Buncombe	3.00	06/12/2007
NCST-011-20070068	Buncombe	3.00	07/23/2007
NCST-011-20080002	Buncombe	3.10	01/26/2008
NCST-011-20080001	Buncombe	1.90	01/26/2008
NCST-011-20080006	Buncombe	2.80	02/02/2008
NCST-011-20080009	Buncombe	29.20	03/02/2008
NCST-011-20080014	Buncombe	4.00	03/22/2008
NCST-011-20080024	Buncombe	1.50	04/17/2008
NCST-011-20090003	Buncombe	1.00	01/25/2009
NCST-011-20090001	Buncombe	20.00	02/01/2009
NCST-011-20090004	Buncombe	5.40	02/13/2009
NCST-011-20090018	Buncombe	1.00	02/21/2009
NCST-011-20090019	Buncombe	1.00	02/23/2009
NCST-011-20090002	Buncombe	8.00	02/26/2009
NCST-011-20090006	Buncombe	7.00	03/05/2009
NCST-011-20090007	Buncombe	16.50	03/08/2009
NCST-011-20090017	Buncombe	3.00	03/09/2009
NCST-011-20090013	Buncombe	1.90	03/10/2009
NCST-011-20090012	Buncombe	1.00	03/22/2009
NCST-011-20100006	Buncombe	5.10	03/20/2010
NCST-011-20100007	Buncombe	2.00	03/27/2010
NCST-011-20100021	Buncombe	34.00	04/03/2010
NCST-011-20100024	Buncombe	2.50	04/08/2010
NCST-011-20100028	Buncombe	1.00	09/14/2010
NCST-011-20100035	Buncombe	1.50	10/24/2010
NCST-011-20100036	Buncombe	2.00	10/30/2010
NCST-011-20100046	Buncombe	1.50	11/25/2010
NCST-011-20110003	Buncombe	2.00	12/11/2010
NCST-011-20110001	Buncombe	1.10	12/11/2010
NCST-011-20110028	Buncombe	1.00	02/23/2011
NCST-011-20110032	Buncombe	5.30	03/08/2011
NCST-011-20110031	Buncombe	9.20	03/20/2011
NCST-011-20110053	Buncombe	3.30	04/09/2011
NCST-011-20110056	Buncombe	1.80	05/01/2011
NCST-011-20110069	Buncombe	2.00	10/05/2011
NCST-011-20110068	Buncombe	2.50	10/15/2011
NCST-011-20110078	Buncombe	8.20	11/03/2011
NCST-011-20110080	Buncombe	7.00	11/13/2011
NCST-011-20110075	Buncombe	1.00	11/18/2011

Fire #	County	Acres	Reported On
NCST-011-20110082	Buncombe	1.80	12/19/2011
NCST-011-20120030	Buncombe	17.00	01/02/2012
NCST-011-20120025	Buncombe	3.00	01/29/2012
NCST-011-20120011	Buncombe	1.00	02/17/2012
NCST-011-20120029	Buncombe	1.80	02/18/2012
NCST-011-20120016	Buncombe	1.00	02/22/2012
NCST-011-20120017	Buncombe	2.00	02/23/2012
NCST-011-20120033	Buncombe	1.10	03/10/2012
NCST-011-20120040	Buncombe	7.00	03/16/2012
NCST-011-20120044	Buncombe	1.00	03/30/2012
NCST-011-20120055	Buncombe	2.20	04/04/2012
NCST-011-20120048	Buncombe	1.00	04/09/2012
NCST-011-20120065	Buncombe	20.00	07/01/2012
NCST-011-20120064	Buncombe	5.00	10/28/2012
NCST-011-20120072	Buncombe	15.00	11/10/2012
NCST-011-20120024	Buncombe	1.80	12/19/2012
NCST-011-20130002	Buncombe	2.00	01/24/2013
NCST-011-20130015	Buncombe	1.50	03/10/2013
NCST-011-20130039	Buncombe	1.00	03/15/2013
NCST-011-20130020	Buncombe	18.00	03/16/2013
NCST-011-20130033	Buncombe	1.00	04/07/2013
NCST-011-20130041	Buncombe	2.00	04/10/2013
NCST-011-20130044	Buncombe	1.50	04/14/2013
NCST-011-20130052	Buncombe	2.00	11/10/2013
NCST-011-20140002	Buncombe	1.00	02/01/2014
NCST-011-20140006	Buncombe	5.00	02/08/2014
NCST-011-20140054	Buncombe	3.00	02/24/2014
NCST-011-20140051	Buncombe	30.00	02/27/2014
NCST-011-20140022	Buncombe	25.00	02/27/2014
NCST-011-20140017	Buncombe	1.00	02/27/2014
NCST-011-20140018	Buncombe	2.00	02/28/2014
NCST-011-20140024	Buncombe	2.00	03/08/2014
NCST-011-20140025	Buncombe	1.00	03/08/2014
NCST-011-20140058	Buncombe	2.00	03/10/2014
NCST-011-20140032	Buncombe	2.00	03/10/2014
NCST-011-20140036	Buncombe	13.80	03/14/2014
NCST-011-20140039	Buncombe	11.20	03/20/2014
NCST-011-20140089	Buncombe	1.00	03/29/2014
NCST-011-20140053	Buncombe	103.00	04/02/2014

Fire #	County	Acres	Reported On
NCST-011-20140078	Buncombe	1.00	04/10/2014
NCST-011-20140079	Buncombe	2.80	04/11/2014
NCST-011-20140071	Buncombe	35.00	04/26/2014
NCST-011-20140086	Buncombe	12.50	04/27/2014
NCST-011-20140072	Buncombe	3.00	04/27/2014
NCST-011-20140087	Buncombe	2.00	04/27/2014
NCST-011-20140091	Buncombe	17.00	05/09/2014
NCST-011-20150003	Buncombe	1.00	01/18/2015
NCST-011-20150041	Buncombe	738.00	04/01/2015
NCST-011-20150043	Buncombe	46.00	04/01/2015
NCST-011-20150040	Buncombe	22.00	04/05/2015
NCST-011-FY2016-0006	Buncombe	70.87	11/14/2015
NCST-011-FY2016-0010	Buncombe	2.38	11/14/2015
NCST-011-FY2016-0030	Buncombe	5.16	03/23/2016
NCST-011-FY2016-0030	Buncombe	5.16	03/23/2016
NCST-011-FY2016-0051	Buncombe	29.33	03/30/2016
NCST-011-FY2016-0052	Buncombe	7.33	04/03/2016
NCST-011-FY2016-0052	Buncombe	7.33	04/03/2016
NCST-011-FY2016-0053	Buncombe	4.33	04/08/2016
NCST-011-FY2016-0040	Buncombe	3.03	04/09/2016
NCST-011-FY2016-0040	Buncombe	3.03	04/09/2016
NCST-011-FY2016-0041	Buncombe	2.31	04/15/2016
NCST-011-FY2016-0041	Buncombe	2.31	04/15/2016
NCST-011-FY2016-0049	Buncombe	96.18	04/17/2016
NCST-011-FY2016-0049	Buncombe	96.18	04/17/2016
NCST-011-FY2016-0044	Buncombe	3.18	04/17/2016
NCST-011-FY2016-0044	Buncombe	3.18	04/17/2016
NCST-011-FY2017-0017	Buncombe	11.05	11/07/2016
NCST-011-FY2017-0020	Buncombe	1.35	11/10/2016
NCST-011-FY2017-0020	Buncombe	1.35	11/10/2016
NCST-011-FY2017-0055	Buncombe	3.71	02/06/2017
NCST-011-FY2017-0056	Buncombe	8.17	02/10/2017
NCST-011-FY2017-0058	Buncombe	1.07	02/16/2017
NCST-011-FY2017-0061	Buncombe	3.18	02/25/2017
NCST-011-FY2017-0062	Buncombe	1.03	03/03/2017
NCST-011-FY2017-0065	Buncombe	5.89	03/08/2017
NCST-011-FY2017-0066	Buncombe	3.36	03/09/2017
NCST-011-FY2017-0074	Buncombe	1.09	03/25/2017
NCST-011-FY2018-0026	Buncombe	14.50	02/20/2018

Fire #	County	Acres	Reported On
NCST-011-FY2018-0030	Buncombe	2.76	02/23/2018
NCST-011-FY2018-0050	Buncombe	1.01	04/12/2018
NCST-011-FY2018-0048	Buncombe	1.42	04/13/2018
NCST-011-FY2018-0061	Buncombe	54.81	04/21/2018
NCST-011-FY2018-0062	Buncombe	14.23	04/30/2018
NCST-057-20010003	Madison	2.10	01/26/2001
NCST-057-20010004	Madison	2.00	01/29/2001
NCST-057-20010007	Madison	6.50	02/01/2001
NCST-057-20010009	Madison	1.90	02/04/2001
NCST-057-20010010	Madison	4.00	02/06/2001
NCST-057-20010011	Madison	2.10	02/06/2001
NCST-057-20010012	Madison	2.00	02/06/2001
NCST-057-20010013	Madison	3.00	02/07/2001
NCST-057-20010014	Madison	1.20	02/08/2001
NCST-057-20010017	Madison	2.00	02/27/2001
NCST-057-20010019	Madison	1.50	03/10/2001
NCST-057-20010023	Madison	1.60	03/11/2001
NCST-057-20010020	Madison	1.10	03/11/2001
NCST-057-20010030	Madison	7.90	03/19/2001
NCST-057-20010035	Madison	24.00	03/26/2001
NCST-057-20010036	Madison	4.70	04/09/2001
NCST-057-20010042	Madison	2.00	04/13/2001
NCST-057-20010043	Madison	3.00	04/14/2001
NCST-057-20010044	Madison	4.00	04/20/2001
NCST-057-20010046	Madison	3.00	04/22/2001
NCST-057-20010054	Madison	2.50	04/28/2001
NCST-057-20010056	Madison	1.40	05/14/2001
NCST-057-20010057	Madison	1.50	05/16/2001
NCST-057-20010060	Madison	14.40	10/18/2001
NCST-057-20010072	Madison	3.20	11/10/2001
NCST-057-20010074	Madison	184.00	11/12/2001
NCST-057-20010082	Madison	1.50	12/25/2001
NCST-057-20020002	Madison	8.80	01/05/2002
NCST-057-20020001	Madison	3.00	01/05/2002
NCST-057-20020003	Madison	2.30	01/06/2002
NCST-057-20020005	Madison	2.40	01/13/2002
NCST-057-20020007	Madison	2.00	02/09/2002
NCST-057-20020009	Madison	1.00	02/15/2002
NCST-057-20020013	Madison	6.00	02/16/2002

Fire #	County	Acres	Reported On
NCST-057-20020012	Madison	3.00	02/16/2002
NCST-057-20020010	Madison	2.10	02/16/2002
NCST-057-20020020	Madison	4.80	02/23/2002
NCST-057-20020022	Madison	2.00	02/24/2002
NCST-057-20020023	Madison	1.40	02/25/2002
NCST-057-20020028	Madison	2.50	03/05/2002
NCST-057-20020030	Madison	5.10	03/06/2002
NCST-057-20020031	Madison	2.40	03/06/2002
NCST-057-20020032	Madison	2.20	03/06/2002
NCST-057-20020033	Madison	27.10	03/07/2002
NCST-057-20020037	Madison	4.60	03/08/2002
NCST-057-20020034	Madison	3.20	03/08/2002
NCST-057-20020035	Madison	2.10	03/08/2002
NCST-057-20020036	Madison	1.50	03/08/2002
NCST-057-20020041	Madison	30.20	03/11/2002
NCST-057-20020045	Madison	30.00	03/24/2002
NCST-057-20020047	Madison	31.20	03/25/2002
NCST-057-20020051	Madison	1.00	04/20/2002
NCST-057-20020052	Madison	1.50	04/23/2002
NCST-057-20020053	Madison	18.00	04/26/2002
NCST-057-20020054	Madison	2.00	05/09/2002
NCST-057-20020057	Madison	4.00	12/22/2002
NCST-057-20030004	Madison	5.00	01/19/2003
NCST-057-20030003	Madison	4.00	02/05/2003
NCST-057-20030008	Madison	2.60	03/09/2003
NCST-057-20030009	Madison	5.20	03/10/2003
NCST-057-20030012	Madison	2.00	03/24/2003
NCST-057-20030014	Madison	5.00	03/27/2003
NCST-057-20030015	Madison	1.20	04/02/2003
NCST-057-20030016	Madison	3.30	04/13/2003
NCST-057-20030017	Madison	1.60	04/14/2003
NCST-057-20030018	Madison	12.30	04/16/2003
NCST-057-20030019	Madison	32.30	04/24/2003
NCST-057-20030023	Madison	1.00	10/24/2003
NCST-057-20040003	Madison	2.20	01/03/2004
NCST-057-20040002	Madison	1.80	01/03/2004
NCST-057-20040004	Madison	4.20	01/14/2004
NCST-057-20040007	Madison	1.50	01/31/2004
NCST-057-20040012	Madison	1.00	02/21/2004

Fire #	County	Acres	Reported On
NCST-057-20040014	Madison	1.30	02/22/2004
NCST-057-20040017	Madison	3.50	02/28/2004
NCST-057-20040018	Madison	4.30	02/29/2004
NCST-057-20040025	Madison	4.00	03/11/2004
NCST-057-20040032	Madison	8.80	03/24/2004
NCST-057-20040034	Madison	4.10	03/25/2004
NCST-057-20040033	Madison	2.00	03/25/2004
NCST-057-20040037	Madison	11.00	03/27/2004
NCST-057-20040039	Madison	1.50	03/27/2004
NCST-057-20040044	Madison	7.30	03/29/2004
NCST-057-20040040	Madison	1.00	03/29/2004
NCST-057-20040045	Madison	1.30	04/05/2004
NCST-057-20040048	Madison	5.50	04/09/2004
NCST-057-20040050	Madison	11.10	04/10/2004
NCST-057-20040054	Madison	3.30	04/16/2004
NCST-057-20040055	Madison	11.50	04/17/2004
NCST-057-20040058	Madison	2.10	04/18/2004
NCST-057-20040060	Madison	29.00	04/20/2004
NCST-057-20040061	Madison	7.00	04/22/2004
NCST-057-20040062	Madison	65.80	04/25/2004
NCST-057-20040066	Madison	1.80	12/05/2004
NCST-057-20040067	Madison	3.30	12/31/2004
NCST-057-20050001	Madison	1.90	01/01/2005
NCST-057-20050003	Madison	44.00	01/04/2005
NCST-057-20050005	Madison	1.50	01/12/2005
NCST-057-20050009	Madison	17.10	02/05/2005
NCST-057-20050008	Madison	4.10	02/05/2005
NCST-057-20050014	Madison	1.10	02/19/2005
NCST-057-20050021	Madison	1.00	03/24/2005
NCST-057-20050025	Madison	75.20	03/26/2005
NCST-057-20050024	Madison	4.60	03/26/2005
NCST-057-20050026	Madison	4.30	03/30/2005
NCST-057-20050028	Madison	5.10	04/04/2005
NCST-057-20050029	Madison	3.10	04/06/2005
NCST-057-20050031	Madison	4.10	04/16/2005
NCST-057-20050035	Madison	1.00	11/07/2005
NCST-057-20060001	Madison	1.30	01/01/2006
NCST-057-20060002	Madison	15.70	01/10/2006
NCST-057-20060004	Madison	1.00	01/25/2006

Fire #	County	Acres	Reported On
NCST-057-20060010	Madison	38.70	01/29/2006
NCST-057-20060015	Madison	7.00	02/16/2006
NCST-057-20060034	Madison	5.00	03/04/2006
NCST-057-20060027	Madison	2.00	03/04/2006
NCST-057-20060029	Madison	1.10	03/04/2006
NCST-057-20060042	Madison	14.00	03/09/2006
NCST-057-20060041	Madison	1.50	03/09/2006
NCST-057-20060046	Madison	16.10	03/13/2006
NCST-057-20060047	Madison	6.10	03/14/2006
NCST-057-20060048	Madison	8.00	03/15/2006
NCST-057-20060050	Madison	6.10	03/15/2006
NCST-057-20060051	Madison	2.00	03/15/2006
NCST-057-20060055	Madison	4.00	04/06/2006
NCST-057-20060056	Madison	38.60	04/07/2006
NCST-057-20060057	Madison	15.30	04/12/2006
NCST-057-20060058	Madison	2.50	04/14/2006
NCST-057-20060060	Madison	2.80	04/16/2006
NCST-057-20060064	Madison	3.50	10/31/2006
NCST-057-20060074	Madison	8.10	12/04/2006
NCST-057-20060077	Madison	1.90	12/11/2006
NCST-057-20070001	Madison	1.00	01/27/2007
NCST-057-20070005	Madison	4.00	01/31/2007
NCST-057-20070003	Madison	1.00	01/31/2007
NCST-057-20070004	Madison	1.00	01/31/2007
NCST-057-20070008	Madison	2.50	02/10/2007
NCST-057-20070011	Madison	1.00	02/24/2007
NCST-057-20070012	Madison	5.00	02/28/2007
NCST-057-20070015	Madison	1.10	03/03/2007
NCST-057-20070017	Madison	6.00	03/05/2007
NCST-057-20070019	Madison	102.00	03/07/2007
NCST-057-20070018	Madison	1.00	03/07/2007
NCST-057-20070021	Madison	2.70	03/11/2007
NCST-057-20070022	Madison	5.00	03/12/2007
NCST-057-20070023	Madison	2.20	03/12/2007
NCST-057-20070025	Madison	77.00	03/13/2007
NCST-057-20070028	Madison	25.00	03/14/2007
NCST-057-20070031	Madison	20.00	03/19/2007
NCST-057-20070033	Madison	10.90	03/23/2007
NCST-057-20070034	Madison	3.20	03/23/2007

Fire #	County	Acres	Reported On
NCST-057-20070035	Madison	1.70	03/23/2007
NCST-057-20070036	Madison	324.00	03/25/2007
NCST-057-20070037	Madison	10.40	03/25/2007
NCST-057-20070039	Madison	19.90	03/28/2007
NCST-057-20070042	Madison	18.10	04/14/2007
NCST-057-20070046	Madison	20.00	04/23/2007
NCST-057-20070047	Madison	20.00	04/23/2007
NCST-057-20070054	Madison	1.40	05/07/2007
NCST-057-20070056	Madison	2.80	05/24/2007
NCST-057-20070058	Madison	24.50	05/28/2007
NCST-057-20070060	Madison	3.50	06/10/2007
NCST-057-20070069	Madison	1.10	09/23/2007
NCST-057-20070071	Madison	1.00	10/03/2007
NCST-057-20070077	Madison	1.90	10/27/2007
NCST-057-20070083	Madison	1.10	11/09/2007
NCST-057-20070085	Madison	6.60	12/01/2007
NCST-057-20080003	Madison	1.20	01/08/2008
NCST-057-20080009	Madison	1.20	02/03/2008
NCST-057-20080010	Madison	15.30	02/09/2008
NCST-057-20080012	Madison	21.00	02/10/2008
NCST-057-20080011	Madison	4.10	02/10/2008
NCST-057-20080014	Madison	32.20	03/13/2008
NCST-057-20080015	Madison	3.90	03/13/2008
NCST-057-20080018	Madison	16.90	03/22/2008
NCST-057-20080017	Madison	1.10	03/22/2008
NCST-057-20080020	Madison	125.20	03/26/2008
NCST-057-20080021	Madison	4.40	03/26/2008
NCST-057-20080022	Madison	7.80	04/16/2008
NCST-057-20080023	Madison	3.80	04/16/2008
NCST-057-20080026	Madison	3.30	04/17/2008
NCST-057-20080027	Madison	360.20	04/18/2008
NCST-057-20080029	Madison	20.80	04/24/2008
NCST-057-20080030	Madison	10.20	04/24/2008
NCST-057-20080041	Madison	1.40	11/06/2008
NCST-057-20080043	Madison	21.30	11/11/2008
NCST-057-20090002	Madison	3.10	01/17/2009
NCST-057-20090005	Madison	10.30	02/01/2009
NCST-057-20090007	Madison	1.70	02/02/2009
NCST-057-20090013	Madison	2.30	02/23/2009

Fire #	County	Acres	Reported On
NCST-057-20090014	Madison	1.20	02/25/2009
NCST-057-20090017	Madison	1.30	02/26/2009
NCST-057-20090020	Madison	1.20	03/07/2009
NCST-057-20090021	Madison	4.90	03/08/2009
NCST-057-20090023	Madison	1.20	03/09/2009
NCST-057-20090024	Madison	3.20	03/11/2009
NCST-057-20090025	Madison	6.00	03/13/2009
NCST-057-20090029	Madison	3.00	03/17/2009
NCST-057-20090028	Madison	3.00	03/17/2009
NCST-057-20090035	Madison	6.80	03/22/2009
NCST-057-20090038	Madison	5.00	03/23/2009
NCST-057-20090037	Madison	5.00	03/23/2009
NCST-057-20090039	Madison	5.00	04/04/2009
NCST-057-20090041	Madison	11.80	04/05/2009
NCST-057-20090042	Madison	5.10	04/09/2009
NCST-057-20090019	Madison	5.30	04/18/2009
NCST-057-20090012	Madison	4.40	04/19/2009
NCST-057-20090046	Madison	2.70	04/24/2009
NCST-057-20090047	Madison	10.70	10/30/2009
NCST-057-20100012	Madison	19.10	04/02/2010
NCST-057-20100008	Madison	7.00	04/02/2010
NCST-057-20100016	Madison	1.50	04/07/2010
NCST-057-20100017	Madison	14.20	04/10/2010
NCST-057-20100018	Madison	10.10	04/18/2010
NCST-057-20110001	Madison	1.00	01/29/2011
NCST-057-20110003	Madison	1.00	02/09/2011
NCST-057-20110005	Madison	10.30	02/14/2011
NCST-057-20110004	Madison	1.00	02/14/2011
NCST-057-20110007	Madison	21.30	02/17/2011
NCST-057-20110010	Madison	1.20	02/21/2011
NCST-057-20110013	Madison	1.10	02/23/2011
NCST-057-20110015	Madison	1.50	03/04/2011
NCST-057-20110018	Madison	1.10	03/05/2011
NCST-057-20110022	Madison	1.10	03/18/2011
NCST-057-20110024	Madison	3.00	03/19/2011
NCST-057-20110026	Madison	12.20	03/22/2011
NCST-057-20110029	Madison	4.50	04/03/2011
NCST-057-20110035	Madison	1.70	04/26/2011
NCST-057-20110042	Madison	4.00	05/02/2011

Fire #	County	Acres	Reported On
NCST-057-20110060	Madison	1.20	12/26/2011
NCST-057-20120001	Madison	1.00	12/30/2011
NCST-057-20120002	Madison	30.00	01/05/2012
NCST-057-20120003	Madison	8.10	01/07/2012
NCST-057-20120004	Madison	3.30	01/17/2012
NCST-057-20120009	Madison	1.00	03/06/2012
NCST-057-20120016	Madison	1.50	04/09/2012
NCST-057-20120015	Madison	1.00	04/09/2012
NCST-057-20120017	Madison	12.00	04/10/2012
NCST-057-20120018	Madison	2.00	04/11/2012
NCST-057-20120020	Madison	1.00	04/14/2012
NCST-057-20120024	Madison	2.00	04/20/2012
NCST-057-20120028	Madison	1.00	07/05/2012
NCST-057-20120033	Madison	15.10	11/16/2012
NCST-057-20130004	Madison	3.50	01/11/2013
NCST-057-20130008	Madison	1.00	02/14/2013
NCST-057-20130011	Madison	4.20	03/10/2013
NCST-057-20130014	Madison	5.00	03/15/2013
NCST-057-20130015	Madison	17.00	03/16/2013
NCST-057-20130017	Madison	12.00	03/29/2013
NCST-057-20130021	Madison	1.00	04/09/2013
NCST-057-20130023	Madison	1.00	04/10/2013
NCST-057-20130024	Madison	1.10	04/11/2013
NCST-057-20130027	Madison	5.50	04/16/2013
NCST-057-20130032	Madison	12.70	04/30/2013
NCST-057-20130036	Madison	1.00	10/10/2013
NCST-057-20130040	Madison	1.00	11/01/2013
NCST-057-20130041	Madison	3.20	11/11/2013
NCST-057-20140001	Madison	1.00	01/04/2014
NCST-057-20140006	Madison	37.70	02/01/2014
NCST-057-20140005	Madison	13.70	02/01/2014
NCST-057-20140004	Madison	1.90	02/01/2014
NCST-057-20140014	Madison	2.50	02/12/2014
NCST-057-20140017	Madison	3.00	02/22/2014
NCST-057-20140020	Madison	11.20	02/23/2014
NCST-057-20140022	Madison	6.00	02/25/2014
NCST-057-20140028	Madison	1.10	03/08/2014
NCST-057-20140029	Madison	6.10	03/10/2014
NCST-057-20140030	Madison	1.30	03/10/2014

Fire #	County	Acres	Reported On
NCST-057-20140032	Madison	15.50	03/11/2014
NCST-057-20140034	Madison	3.20	03/21/2014
NCST-057-20140019	Madison	1.00	03/23/2014
NCST-057-20140042	Madison	5.50	03/31/2014
NCST-057-20140044	Madison	1.40	04/01/2014
NCST-057-20140043	Madison	1.10	04/01/2014
NCST-057-20140045	Madison	75.00	04/02/2014
NCST-057-20140046	Madison	1.00	04/02/2014
NCST-057-20140048	Madison	1.00	04/05/2014
NCST-057-20140052	Madison	12.20	04/14/2014
NCST-057-20140057	Madison	1.50	04/21/2014
NCST-057-20140064	Madison	2.30	04/23/2014
NCST-057-20140071	Madison	2.00	05/06/2014
NCST-057-20140072	Madison	1.10	05/08/2014
NCST-057-20140078	Madison	1.00	05/28/2014
NCST-057-20140083	Madison	1.00	11/10/2014
NCST-057-20140084	Madison	7.00	11/15/2014
NCST-057-20140090	Madison	3.00	12/19/2014
NCST-057-20150004	Madison	5.50	01/21/2015
NCST-057-20150010	Madison	32.20	03/08/2015
NCST-057-20150012	Madison	1.10	03/21/2015
NCST-057-20150014	Madison	4.30	03/31/2015
NCST-057-20150020	Madison	3.80	04/03/2015
NCST-057-20150018	Madison	3.10	04/03/2015
NCST-057-20150016	Madison	3.90	04/04/2015
NCST-057-20150025	Madison	3.20	04/11/2015
NCST-057-20150028	Madison	27.00	05/05/2015
NCST-057-FY2016-0023	Madison	8.02	01/30/2016
NCST-057-FY2016-0023	Madison	8.02	01/30/2016
NCST-057-FY2016-0025	Madison	5.19	02/29/2016
NCST-057-FY2016-0025	Madison	5.19	02/29/2016
NCST-057-FY2016-0028	Madison	3.20	03/06/2016
NCST-057-FY2016-0028	Madison	3.20	03/06/2016
NCST-057-FY2016-0032	Madison	8.36	03/14/2016
NCST-057-FY2016-0035	Madison	7.24	03/18/2016
NCST-057-FY2016-0035	Madison	7.24	03/18/2016
NCST-057-FY2016-0040	Madison	1.47	03/23/2016
NCST-057-FY2016-0042	Madison	19.78	03/24/2016
NCST-057-FY2016-0042	Madison	19.78	03/24/2016

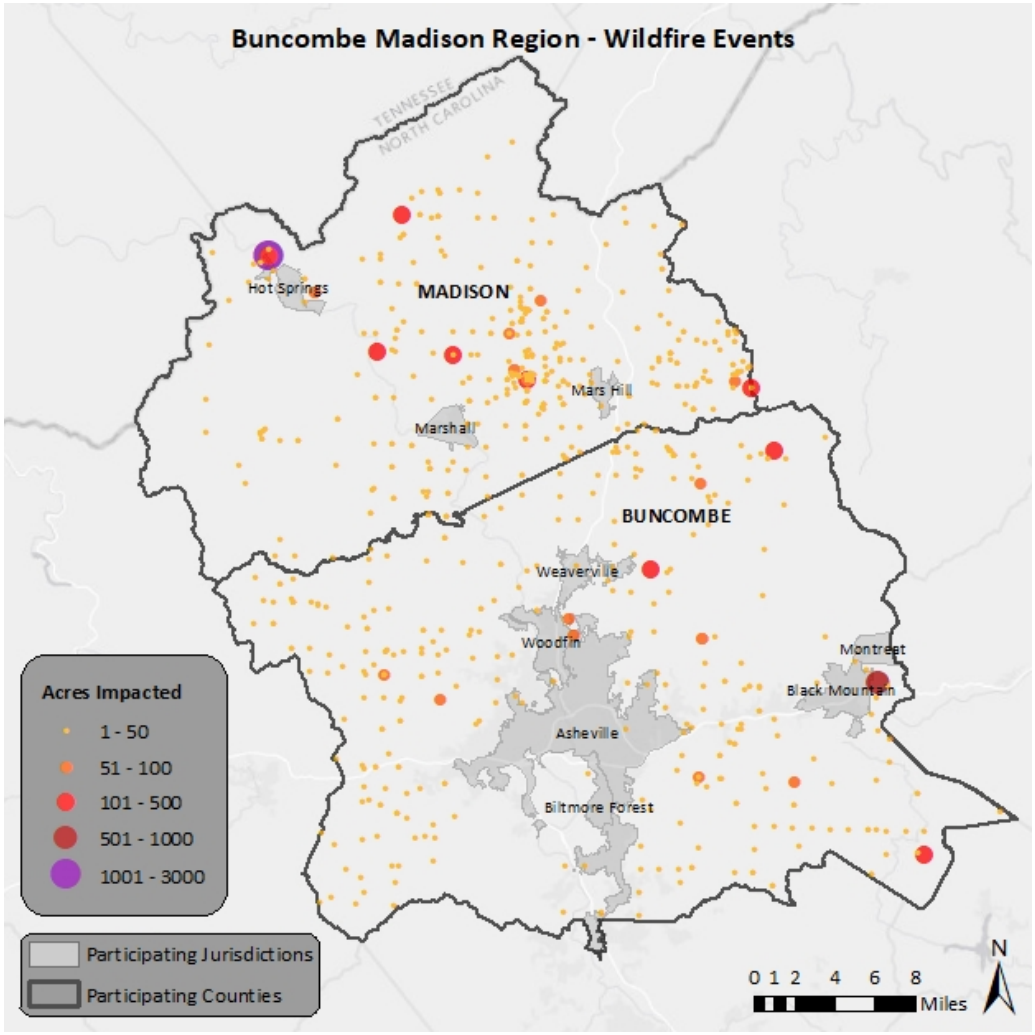
Fire #	County	Acres	Reported On
NCST-057-FY2016-0041	Madison	6.17	03/24/2016
NCST-057-FY2016-0045	Madison	5.78	03/28/2016
NCST-057-FY2016-0049	Madison	16.04	03/29/2016
NCST-057-FY2016-0049	Madison	16.04	03/29/2016
NCST-057-FY2016-0048	Madison	14.47	03/29/2016
NCST-057-FY2016-0051	Madison	29.47	04/08/2016
NCST-057-FY2016-0051	Madison	29.47	04/08/2016
NCST-057-FY2016-0054	Madison	6.40	04/17/2016
NCST-057-FY2016-0054	Madison	6.40	04/17/2016
NCST-057-FY2016-0053	Madison	75.88	04/20/2016
NCST-057-FY2016-0053	Madison	75.88	04/20/2016
NCST-057-FY2016-0057	Madison	64.13	04/22/2016
NCST-057-FY2016-0057	Madison	64.13	04/22/2016
NCST-057-FY2017-0025	Madison	1.28	11/01/2016
NCST-057-FY2017-0025	Madison	1.28	11/01/2016
NCST-057-FY2017-0046	Madison	3.02	11/08/2016
NCST-057-FY2017-0056	Madison	3.87	12/22/2016
NCST-057-FY2018-0010	Madison	7.84	09/20/2017
NCST-057-FY2018-0027	Madison	30.02	12/16/2017
NCST-057-FY2018-0041	Madison	3.05	02/20/2018
NCST-057-FY2018-0039	Madison	2.07	02/20/2018
NCST-057-FY2018-0040	Madison	1.21	02/20/2018
NCST-057-FY2018-0047	Madison	3.47	03/04/2018
NCST-057-FY2018-0048	Madison	3.61	03/05/2018
NCST-057-FY2018-0054	Madison	1.00	03/19/2018
NCST-057-FY2018-0060	Madison	1.55	04/02/2018
NCST-057-FY2018-0066	Madison	21.48	04/13/2018
NCST-057-FY2018-0067	Madison	2.06	04/18/2018
NCST-057-FY2018-0071	Madison	6.67	04/29/2018
NCST-057-FY2018-0074	Madison	2.38	05/12/2018
NCST-057-FY2018-0075	Madison	1.46	05/15/2018

Source: NASF

Over the last 17 years, the Buncombe Madison region have experienced a number of wildfires. In **Figure 5.19** below, the greatest cluster of wildfires to occur were near the town of Hot Springs. The town is located directly off the Appalachian Trail and is subject to an increased risk of wildfires due to its proximity to the forest. In September 2019, an 11-acre wildfire broke out near the town, and in April 2016 a 2,500-acre wildfire was believed to have started from high temperatures and dry conditions approximately 1 mile east of the town on Highway 25/70. Another wildfire happened in May 2018 scorched about 50 acres a closed a 7.2-mile section from Garenflo Gap to Hot Springs. All of these events coincide with years where there were consistent high levels of drought severity according to the

DCMA.

FIGURE 5.19: HISTORIC WILDFIRE EVENTS



There is no narrative information on historical wildfires to impact the Buncombe Madison region found in the NCEI database, the NC State Hazard Mitigation Plan, the North Carolina Forest Service or provided by local emergency managers.

5.11.4 Probability of Future Occurrence

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

5.12 INFECTIOUS DISEASES

For the purposes of this plan, this section will assess infectious diseases and vector-borne diseases within the Buncombe-Madison region.

5.12.1 Background and Description

Infectious Disease

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

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

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

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

Of note, a vaccine for influenza is produced every year and, according to the CDC, is highly effective in preventing the disease.

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

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

Vector-Borne Diseases

Bacterial, viral and parasitic diseases that are transmitted by mosquitoes, ticks and fleas are collectively called "vector-borne diseases" (the insects and arthropods are the "vectors" that carry the diseases). Although the term "vector" can also apply to other carriers of disease — such as mammals that can transmit rabies or rodents that can transmit hantavirus — those diseases are generally called zoonotic (animal-borne) diseases.

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

5.12.2 Location and Spatial Extent

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

5.12.3 Historical Occurrences

Infectious Disease

Information from the North Carolina Department of Health and Human services was used to monitor and track cases of the infectious disease COVID-19. A COVID – 19 Pandemic disaster declaration was declared for North Carolina on March 24, 2020. **Table 5.33** provides a summary of confirmed cases of COVID–19 in the Clay Macon Region.

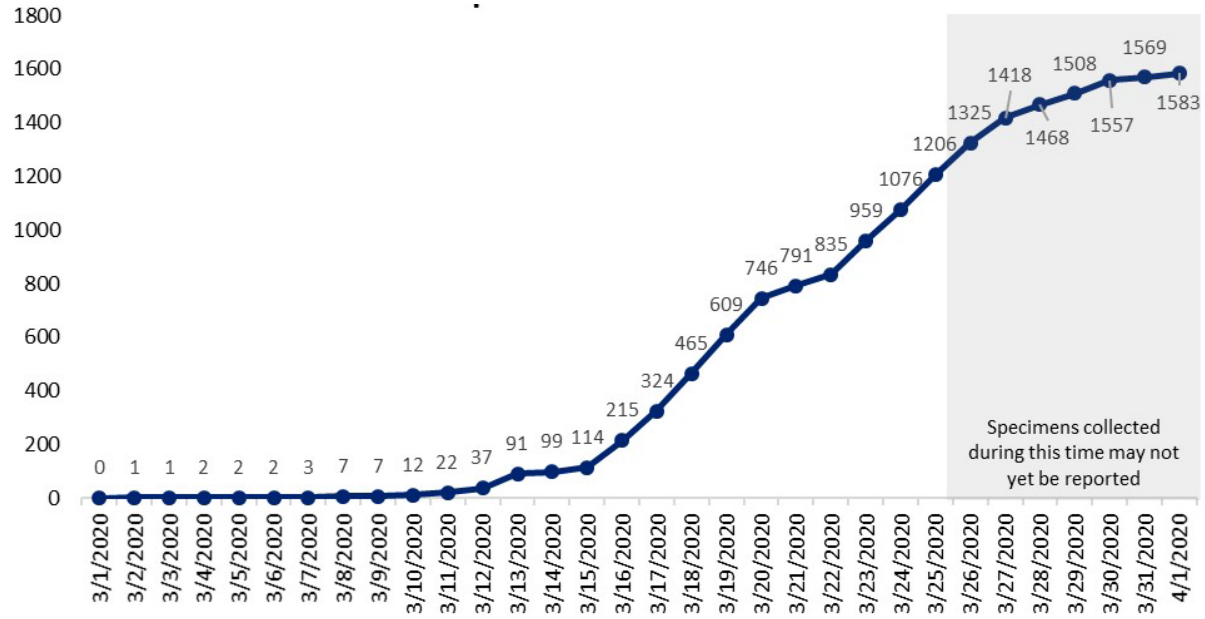
TABLE 5.33: SUMMARY OF CONFIMRED COVID – 19 CASES IN THE BUNCOMBE MADISON REGION

Location	Number of Cases	Number of Deaths*
Buncombe County	36	2
Madison County	0	0
Buncombe Madison Region Total	36	2

Source: North Carolina Department of Health and Human Services
** Deaths reflect deaths in persons with laboratory-confirmed COVID-19 reported by local health departments to the NC Department of Health and Human Services*

As of April 2, 2020, NC DHHS reported there were 1,857 cases of COVID – 19 in North Carolina[27]. These cases reflect cases that were tested and returned positive, including the NC State Laboratory of Public Health and reporting hospital and commercial labs. **Figure 5.22** below provides an overview of the total number of COVID-19 cases by date of specimen collection for North Carolina.

FIGURE 5.22: CUMULATIVE NUMBER OF COVID-19 CASES BY DATE OF SPECIMIN COLLECTION*



*15 cases are missing specimen collection datez

Source: North Carolina Department of Health and Human Services
** All data are preliminary and might change as cases are investigated. Numbers may not sum to 100% due to rounding.*

Vector-Borne Diseases

In 2016, North Carolina state health officials encouraged citizens to take preventative measures against mosquito bites to avoid contracting the Zika virus. $477,500 dollars was allocated from the Governor's yearly budget to develop an infrastructure to detect, prevent, control, and respond to the Zika virus and

[27] https://www.ncdhhs.gov/covid-19-case-count-nc#by-counties

other vector-borne illnesses[28].

5.12.4 Probability of Future Occurrence

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

[28] https://www.ncdhhs.gov/news/press-releases/nc-prepared-zika-virus-risk-local-virus-carrying-mosquitoes-low

Technological Hazards

5.13 HAZARDOUS SUBSTANCES

5.13.1 Background and Description

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

Hazardous material (HAZMAT) incidents can apply to fixed facilities as well as mobile, transportation related accidents in the air, by rail, on the nation's highways, and on the water. Approximately 6,774 HAZMAT events occur each year, 5,517 of which are highway incidents, 991 are railroad incidents, and 266 are due to other causes[29]. In essence, HAZMAT incidents consist of solid, liquid, and/or gaseous contaminants that are released from fixed or mobile containers, whether by accident or by design as with an intentional terrorist attack. A HAZMAT incident can last hours to days, while some chemicals can be corrosive or otherwise damaging over longer periods of time. In addition to the primary release, explosions and/or fires can result from a release, and contaminants can be extended beyond the initial area by persons, vehicles, water, wind, and possibly wildlife as well.

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

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

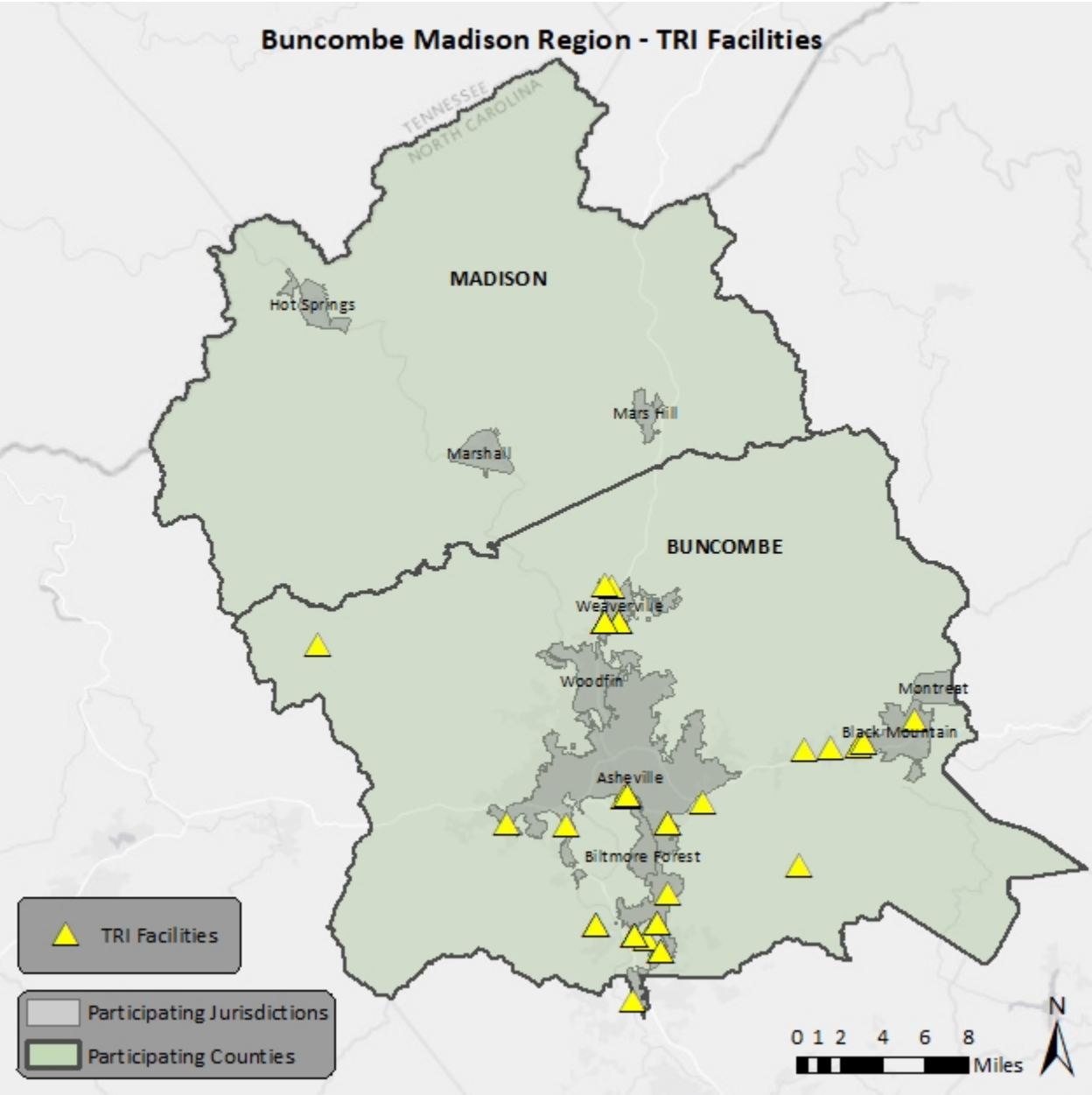
5.13.2 Location and Spatial Extent

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

[29] FEMA, 1997.

agents. This information is then reported in the Toxic Release Inventory (TRI). TRI sites indicate where such activity is occurring. The Buncombe Madison Region has 25 TRI sites. These sites are shown in **Figure 5.15.**

FIGURE 5.15: TOXIC RELEASE INVENTORY (TRI) SITES IN THE BUNCOMBE MADISON REGION



Source: Environmental Protection Agency

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.

5.13.2 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 5.37** 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 material "serious incident" was defined as follows:

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

Table 5.29 summarizes the HAZMAT incidents reported in the Buncombe Madison Region. Detailed information on these events is presented in Appendix H.

TABLE 5.29: SUMMARY OF HAZMAT INCIDENTS IN THE BUNCOMBE MADISON REGION

Location	Incidents Reported	Injuries	Fatalities	Type	Costs
Buncombe County	**12**	**0**	**0**		**$1,364,100**
Asheville	12	0	0	Highway	$1,004,531
Biltmore Forest	0	0	0	n/a	$0
Black Mountain	0	0	0	n/a	$0
Montreat	0	0	0	n/a	$0
Weaverville	0	0	0	n/a	$0
Woodfin	0	0	0	n/a	$0
Unincorporated Area	7	0	0	n/a	$359,569
Madison County	**1**	**0**	**0**		**$28,800**
Hot Springs	0	0	0	n/a	$0
Marshall	0	0	0	n/a	$28,800
Mars Hill	1	0	0	Highway	$0
Unincorporated Area	0	0	0	n/a	$0

BUNCOMBE MADISON REGION TOTAL	13	0	0		$1,392,900

Source: United States Department of Transportation Pipeline and Hazardous Materials Safety Administration

5.13.3 Probability of Future Occurrences

Given the location of 25 toxic release inventory sites in the Buncombe Madison Region and several serious roadway incidents, it is possible that a hazardous material incident may occur in the region (between 1 and 10 percent annual probability). County and municipal officials are mindful of this possibility and take precautions to prevent such an event from occurring. Furthermore, there are detailed plans in place to respond to an occurrence.

5.14 RADIOLOGICAL EMERGENCY – FIXED NUCLEAR FACILITIES

5.14.1 Background and Description

Although not referenced in the previous Buncombe Madison Hazard Mitigation Plan, radiological emergencies will be assessed in this update.

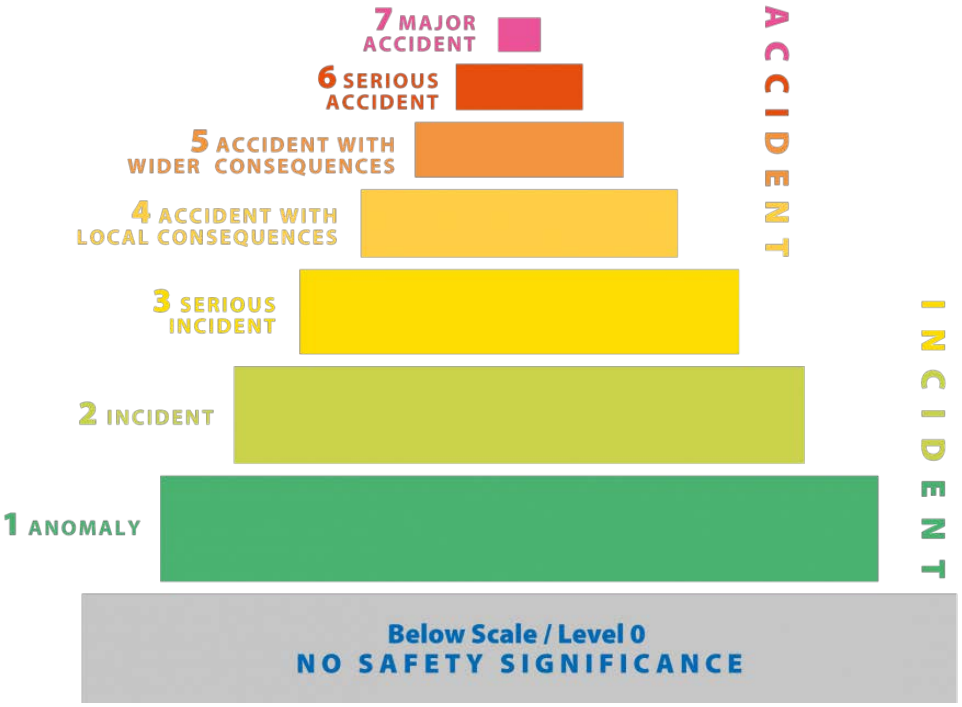
A nuclear and radiation accident is defined by the International Atomic Energy Agency as "an event that has led to significant consequences to people, the environment or the facility. Often, this type of incident results from damage to the reactor core of a nuclear power plant which can release radioactivity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

The Oconee Nuclear Station is located near Seneca, South Carolina. It began operation in 1973 and is currently operating under a renewed license until 2033. With three nuclear stations, it is one of the nation's largest nuclear plants.

5.14.2 Location and Spatial Extent

Buncombe County is at risk to a nuclear incident. The bottom of Buncombe County falls within the 50-mile radius from the Oconee Nuclear Plant. The International Atomic Energy Association has developed a scale called the International Nuclear and Radiological Event Scale (INES) which provides a quantitative means of assessing the extent of a nuclear event. This scale, like the MMI used for earthquakes, is logarithmic which means that each increasing level on the scale represents an event 10 times more severe than the previous level (**Figure 5.x**).

FIGURE 5.32: INTERNATIONAL NUCLEAR EVENT SCALE

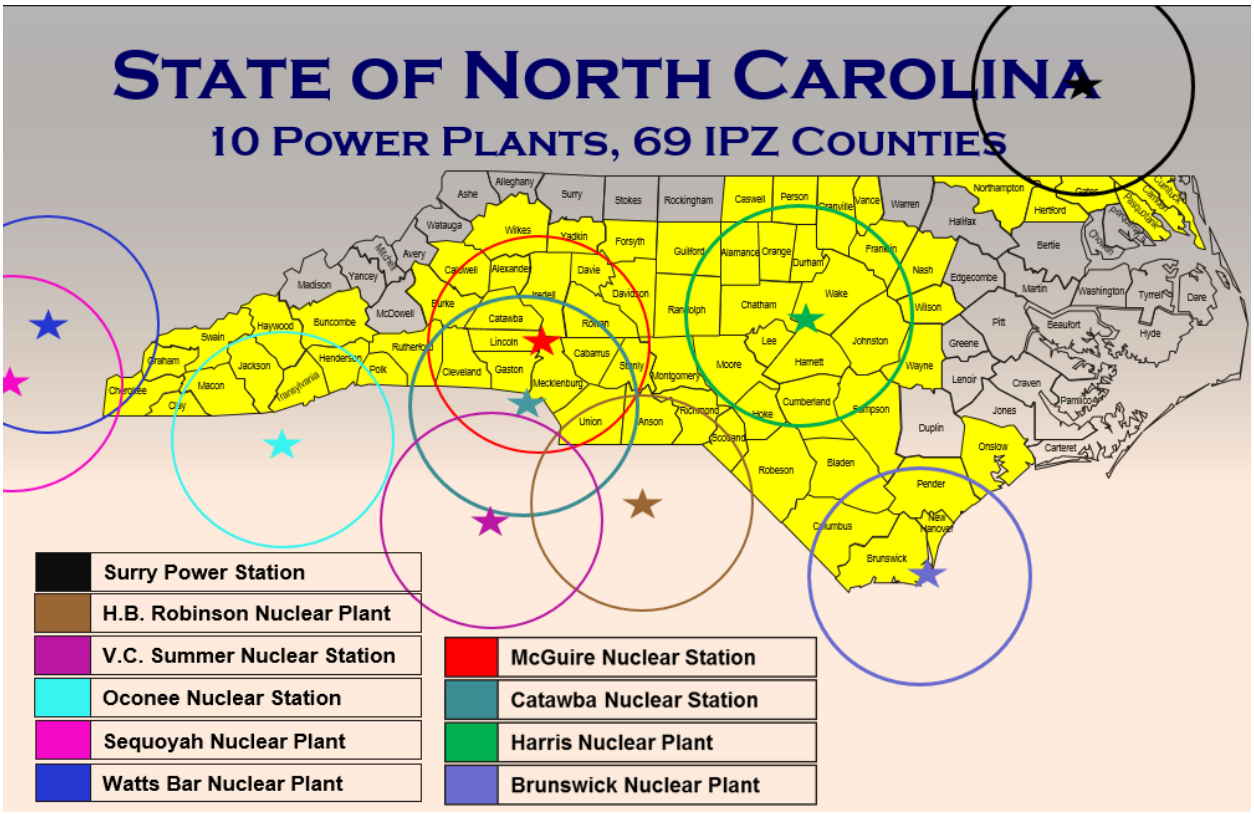


Source: International Atomic Energy Agency

The Nuclear Regulatory Commission defines two emergency planning zones around nuclear plants. Areas located within 10 miles of the station are considered to be within the zone of highest risk to a nuclear incident and this radius is the designated evacuation radius recommended by the Nuclear Regulatory Commission. Within the 10-mile zone, the primary concern is exposure to and inhalation of radioactive contamination. The most concerning effects in the secondary 50-mile zone are related to ingestion of food and liquids that may have been contaminated. Only the bottom section of Buncombe County falls within the 50-mile radius, so it is considered to be at risk from a nuclear incident.

Although the Oconee Nuclear Station is located far outside the Buncombe Madison region, one of the counties falls within the 50-mile buffer zone, as seen in **Figure 5.xx** below.

FIGURE 5.XX: NORTH CAROLINA NUCLEAR POWER STATIONS AND INCIDENT HAZARD ZONES



Source: International Atomic Energy Agency

5.14.3 Historical Occurrences

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

5.14.4 Probability of Future Occurrences

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

5.15 TERRORISM

5.15.1 Background and Description

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

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

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

Explosive

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

Chemical

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

Radiological

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

Biological

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

Nuclear

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

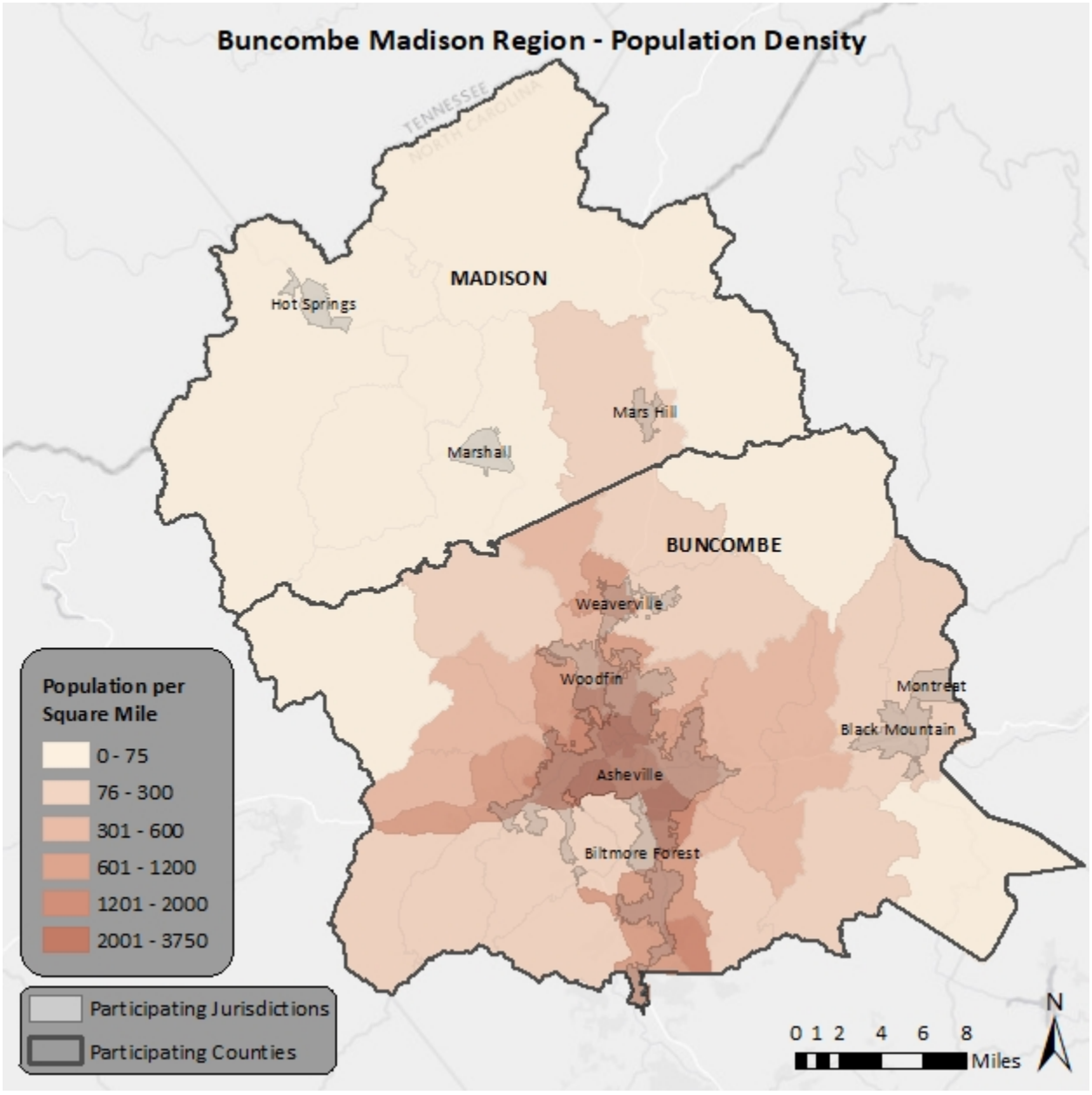
OTHER

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

5.15.2 Location and Spatial Extent

All parts of North Carolina are vulnerable to a terror event; however, terrorism tends to target more densely populated areas. The map in **Figure 5.33, Figure 5.34,** and **Figure 5.35** display the population density in each county in the Buncombe-Madison Region using census tract levels.

FIGURE 5.33: POPULATION DENSITY IN BUNCOMBE MADISON REGION



Source: US Census Bureau

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

TABLE 5.31: 2018 POPULATION ESTIMATES

Location	2018 Population Estimate
Buncombe County	261,191
Asheville	92,452
Biltmore Forest	1,403
Black Mountain	8,148
Montreat	836
Weaverville	3,974
Woodfin	6,582
Unincorporated Area	147,796
Madison County	21,763
Hot Springs	576
Marshall	907
Mars Hill	2,032
Unincorporated Area	18,248
BUNCOMBE MADISON REGION TOTAL	**239,428**

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

5.15.3 Historical Occurrences

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

5.15.4 Probability of Future Occurrences

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

5.16 CYBER

5.16.1 Background and Description

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

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

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

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

- Web App Attacks: Incidents in which web applications were attacked, which can include exploiting code-level vulnerabilities in the application.
- Point-of-Sale Intrusions: Remote attacks against environments where card-present retail transactions are conducted.
- Insider and Privilege Misuse: Unapproved or malicious use of organizational resources.
- Miscellaneous Errors: Incidents in which unintentional actions directly compromise an attribute of a security asset.
- Physical Theft and Loss: Incidents where an information asset went missing.
- Crimeware: Instances involving malware that do not fit into a more specific pattern.
- Payment Card Skimmers: Incidents involving skimming devices physically implanted on an asset that reads magnetic stripe data from payment cards.
- Cyber-espionage: Unauthorized network or system access linked to state-affiliated actors.
- Denial-of-Service Attacks: Any attack intended to compromise the availability of networks and systems that are designed to overwhelm systems, resulting in performance degradation or interruption of service.

Figure 5.36 below displays nationwide cyberattack incident patterns from the 2018 Verizon Data Breach Investigations Report.

FIGURE 5.36: PERCENTAGE AND COUNTS OF INCIDENTS PER PATTERN

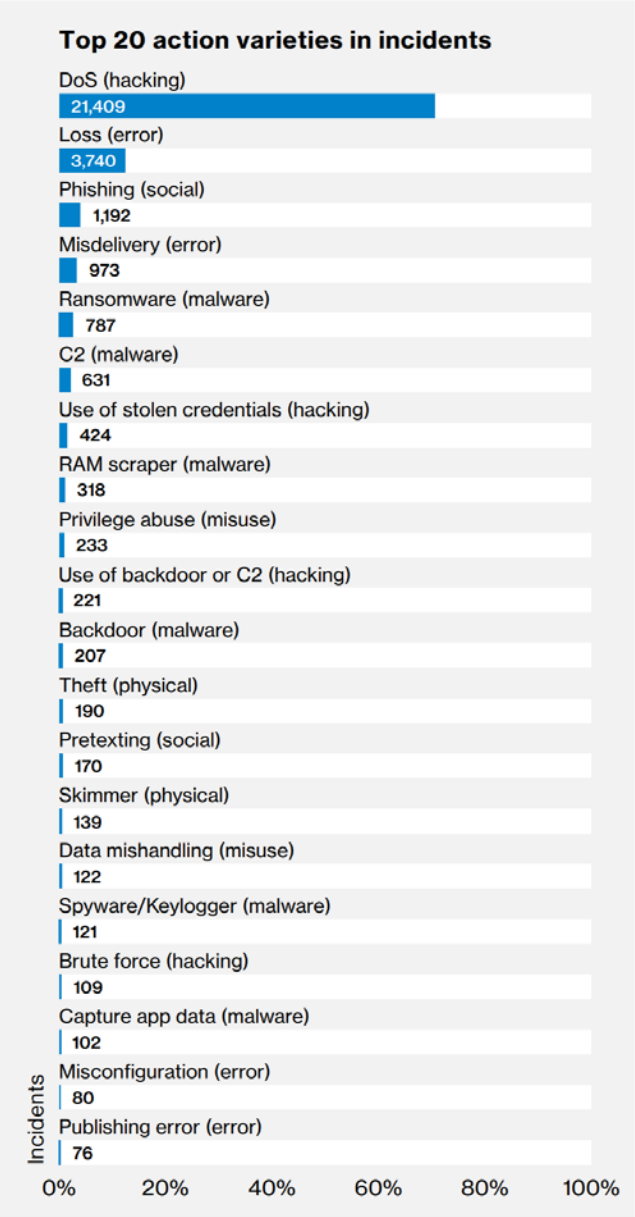


Figure 4. Top 20 threat action varieties (incidents) (n=30,362)

Source: 2018 Verizon Data Breach Investigations Report

5.16.2 Location and Spatial Extent

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

5.16.3 Historical Occurrences

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

In 2016, North Carolina reported the highest number of cybercrimes in the "non-payment/non-delivery" sector, which can be seen in **Table 5.35** below.

TABLE 5.35: NORTH CAROLINA CYBERCRIMES AND VICTIM COUNTS IN 2016

Crime Type by Victim Count

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

Source: FBI Internet Crime Complaint Center, 2016

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

5.16.4 Probability of Future Occurrences

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

5.17 ELECTROMAGNETIC PULSE

5.17.1 Background and Description

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

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

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

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

5.17.2 Location and Spatial Extent

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

5.17.3 Historical Occurrences

There have been no reports of EMP occurrences in the Buncombe Madison region.

5.17.4 Probability of Future Occurrences

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

5.18 CONCLUSIONS ON HAZARD RISK

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

5.18.1 Hazard Extent

Table 5.31 describes the extent of each natural hazard identified for the Buncombe Madison Region. The extent of a hazard is defined as its severity or magnitude, as it relates to the planning area.

TABLE 5.31: EXTENT OF BUNCOMBE MADISON REGION HAZARDS

Natural Hazards	
Drought	Drought extent is defined by the North Carolina Drought Monitor Classifications which include Abnormally Dry, Moderate Drought, Severe Drought, Extreme Drought, and Exceptional Drought (page #). According to the North Carolina Drought Monitor Classifications, the most severe drought condition is Exceptional. The Buncombe Madison region experienced drought conditions every year of the last 14 years (2005 - 2019).
Hurricane and Tropical Storm Hazards	Hurricane extent is defined by the Saffir-Simpson Scale which classifies hurricanes into Category 1 through Category 5 (Table #). Only one hurricane has traversed directly through the region. The greatest classification to directly impact the region was Hurricane Florence in 2018 which reached a maximum wind speed of ~69.5 knots.

Tornadoes / Thunderstorms	Tornadoes: Tornado hazard extent is measured by tornado occurrences in the US provided by FEMA (Figure #) as well as the Fujita/Enhanced Scale (Tables #). The greatest magnitude reported as an F1, which occurred on several occasions in the region. *Buncombe County*: F1 *Madison County*: F1 Thunderstorms: Thunderstorm extent is defined by the number of thunder events and wind speed reported. According to a 63-year history from the National Centers for Environmental Information, the strongest recorded wind speed event in the Buncombe Madison region was reported on May 3, 2009 at 75 knots (approximately 85 mph). It should be noted that future events may exceed these historical occurrences. *Buncombe County*: 75 knots *Madison County*: 65 knots Lightning: According to the Vaisala flash density map (Figure #), a majority of the Buncombe Madison region is located in an area that experiences 1.5 to 3 per square kilometer per year. It should be noted that future lightning occurrences may exceed these figures. Hailstorms: Hail extent can be defined by the size of the hail stone. The largest hail stone reported in the Buncombe Madison region was 2.00 inches (reported on April 16, 1998). It should be noted that future lighting occurrences may exceed these figures. *Buncombe County*: 2.00 inches *Madison County*: 2.00 inches
Severe Winter Weather	The extent of winter storms can be measured by the amount of snowfall received (in inches). The greatest 24-hour snowfall reported in the region was 22 inches on March 14, 1993. Due to extreme variations in elevation throughout the region, extent totals will vary for each participating jurisdiction and reliable data on snowfall totals is not available. *Buncombe County*: 20 inches *Madison County*: 22 inches
Earthquakes	Earthquake extent can be measured by the Richter Scale (Table #) and the Modified Mercalli Intensity (MMI) Scale (Table #) and the distance of the epicenter from the Buncombe Madison region. According to data provided by the National Geophysical Data Center, the greatest MMI to impact the region was reported on February 21, 1916 with an MMI of VII (Very Strong) with a correlating Richter Scale measurement of approximately 5.5. *Buncombe County*: VII *Madison County*: VI

<table>
<tr><td>Geological</td><td>Landslide: As noted above in the landslide profile, the landslide data provided by the North Carolina Geological Survey is incomplete. This provides a challenge when trying to determine an accurate extent for the landslide hazard. However, when using the USGS landslide susceptibility index, extent can be measured with incidence, which is high for a majority of the Buncombe Madison region. There is also a high susceptibility throughout the region.

Sinkhole: The Buncombe Madison region has a relatively low risk for sinkholes. The region has no historical information related to sinkholes. Even though there is no historical information from the North Carolina Geological Survey or the National Centers for Environmental Information, there is a possibility of unreported occurrences.

Erosion: The extent of erosion can be defined by the measurable rate of erosion that occurs. There are no erosion rate records available for the Buncombe Madison region.</td></tr>
<tr><td>Dam Failure</td><td>Dam failure extent is defined using the North Carolina Division of Land Resources criteria (Table #). Of the 112 dams in the Buncombe Madison region, 63 dams are considered High Hazard.
Buncombe County: 53
Madison County: 10</td></tr>
<tr><td>Flooding</td><td>Flood extent can be measured by the amount of land and property in the floodplain as well as flood height and velocity. The amount of land in the floodplain accounts for 3.1 percent of the total land area in the Buncombe Madison region. Flood depth and velocity are recorded via the United States Geological Survey stream gauges throughout the region. While a gauge does not exist for each of the participating jurisdiction, there is one at or near many areas. The greatest peak discharge recorded for the region was reported on July 16, 1916. Water reached a discharge of 115,000 cubic feet per second and the stream gauge height was recorded at 22 feet. Additional peak discharge readings and gauge heights are in the table below.

<table>
<tr><th>Location/ Jurisdiction</th><th>Date</th><th>Peak Discharge (cfs)</th><th>Gage Height (ft)</th></tr>
<tr><td colspan="4">Buncombe County</td></tr>
<tr><td>French Broad River at Asheville</td><td>7/16/1916</td><td>110,000</td><td>23.1</td></tr>
<tr><td colspan="4">Madison County</td></tr>
</table>
</td></tr>
</table>

	<table><tr><td>French Broad River at Marshall</td><td>7/16/1916</td><td>115,000</td><td>22</td></tr></table> Depth of flooding inside structures across the region during a maximum flood event ranges from 1-3 feet and varies based on the structure's location in the floodplain and the elevation of the structure.
Other Hazards	
Wildfires	Wildfire data was provided by the North Carolina Division of Forest Resources and is reported annually by county. Analyzing the data by count indicates the following wildfire hazard extent for each county. ***Buncombe County*** The greatest number of fires to occur in any year was 37 in 2001. The greatest number of acres burned in any single year occurred in 2015 when 738 acres burned. ***Madison County*** The greatest number of fires to occur in any year was 35 in 2007. The greatest number of acres burned in any single year occurred in 2008 when 360.2 acres burned. Although this data lists the extent that has occurred, larger and more frequent wildfires are possible throughout the region.
Infectious Disease	There is no available method for determining dollar losses due to infectious diseases at this time; however, $477,500 dollars was allocated from the Governor's yearly budget in 2016 for the preventative measures regarding Zika virus. The entire Buncombe Madison is susceptible to infectious diseases such as the flu, which kills hundreds of people annually.
Technological Hazard	
Hazardous Materials Incident	According to the USDOT PHMSA, the largest hazardous materials incident reported in the region was 12,000 SLB on October 3, 1997 in Asheville. It should be noted that larger events are possible.
Terrorism	Although no severe terrorism attacks have been reported in Buncombe Madison region, the entire area is still at risk to a future event. Densely populated areas, such as cities, are considered more susceptible. Terror events have the potential to affect the human population, buildings and infrastructure, and the economy in the region.
Cyber	No cyber-attacks have been historically reported in the Buncombe Madison region. Technology usage, however, is increasing. A cyber-attack could potentially devastate the region's economy and could have lasting negative impacts.

Electromagnetic Pulse	Electromagnetic Pulse (EMP) occurrences have not taken place in the Buncombe Madison region, but the risk still exists. If an EMP were to occur, the effects would negatively impact first responders and communication efforts and may cause panic within the area.

5.18.2 Priority Risk Index

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

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

The application of the PRI results in numerical values that allow identified hazards to be ranked against one another (the higher the PRI value, the greater the hazard risk). PRI values are obtained by assigning varying degrees of risk to five categories for each hazard (probability, impact, spatial extent, warning time, and duration). Each degree of risk has been assigned a value (1 to 4) and an agreed upon weighting factor[30], as summarized in **Table 5.32**. To calculate the PRI value for a given hazard, the assigned risk value for each category is multiplied by the weighting factor. The sum of all five categories equals the final PRI value, as demonstrated in the example equation below:

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

According to the weighting scheme and point system applied, the highest possible value for any hazard is 4.0. When the scheme is applied for the Buncombe Madison 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 Team.

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

TABLE 5.32: PRIORITY RISK INDEX FOR THE BUNCOMBE MADISON REGION

PRI Category	Degree of Risk			Assigned Weighting Factor
	Level	Criteria	Index Value	
Probability	Unlikely	Less than 1% annual probability	1	30%
	Possible	Between 1 and 10% annual probability	2	
	Likely	Between 10 and 100% annual probability	3	
	Highly Likely	100% annual probability	4	
Impact	Minor	Very few injuries, if any. Only minor property damage and minimal disruption on quality of life. Temporary shutdown of critical facilities.	1	30%
	Limited	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one day.	2	
	Critical	Multiple deaths/injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one week.	3	
	Catastrophic	High number of deaths/injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for 30 days or more.	4	
Spatial Extent	Negligible	Less than 1% of area affected	1	20%
	Small	Between 1 and 10% of area affected	2	
	Moderate	Between 10 and 50% of area affected	3	
	Large	Between 50 and 100% of area affected	4	
Warning Time	More than 24 hours	Self-explanatory	1	10%
	12 to 24 hours	Self-explanatory	2	
	6 to 12 hours	Self-explanatory	3	
	Less than 6 hours	Self-explanatory	4	
Duration	Less than 6 hours	Self-explanatory	1	10%
	Less than 24 hours	Self-explanatory	2	
	Less than one week	Self-explanatory	3	
	More than one week	Self-explanatory	4	

5.18.3 Priority Risk Index Results

Table 5.33 summarizes the degree of risk assigned to each category for all initially identified hazards based on the application of the PRI. Assigned risk levels were based on the detailed hazard profiles developed for this section, as well as input from the Regional Hazard Mitigation Planning Team. The results were then used in calculating PRI values and making final determinations for the risk assessment.

TABLE 5.33: SUMMARY OF PRI RESULTS FOR THE BUNCOMBE MADISON REGION

Hazard	Sub hazard(s) Assessed	Category/Degree of Risk					
		Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Natural Hazards							
Drought		Likely	Minor	Large	More than 24 hours	More than 1 week	2.5
Hurricane and Coastal Hazards		Possible	Critical	Large	More than 24 hours	Less than 24 hours	2
Tornadoes/ Thunderstorms	Hailstorm, Lightning	Highly Likely	Limited	Moderate	6 to 12 hours	Less than 6 hours	3.2
Severe Winter Weather		Highly Likely	Critical	Large	More than 24 hours	Less than 1 week	3.3
Earthquakes		Possible	Minor	Moderate	Less than 6 hours	Less than 6 hours	2.3
Geological	Landslide, Sinkholes, Erosion	Highly Likely	Critical	Small	Less than 6 hours	Less than 6 hours	2.8
Dam Failure		Unlikely	Critical	Moderate	More than 24 hours	Less than 6 hours	2
Flooding		Highly Likely	Limited	Moderate	6 to 12 hours	Less than 24 hours	2.9
Other Hazards							
Wildfires		Likely	Minor	Small	Less than 6 hours	Less than 1 week	2.2
Infectious Disease		Possible	Critical	Small	More than 24 hours	More than 1 week	2.4
Technological Hazards							
Hazardous Substances		Possible	Limited	Small	Less than 6 hours	Less than 24 hours	2.2
Radiological Emergency	Fixed Nuclear Facilities	Unlikely	Critical	Small	6 to 12 hours	Less than 1 week	2.2
Terrorism		Unlikely	Critical	Small	Less than 6 hours	Less than 6 hours	2.1
Cyber		Possible	Critical	Large	Less than 6 hours	Less than 1 week	3
Electromagnetic Pulse		Unlikely	Minor	Large	12 to 24 hours	Less than 6 hours	1.7

5.19 FINAL DETERMINATIONS

The conclusions drawn from the hazard profiling process for the Buncombe Madison Region, including the PRI results and input from the Regional Hazard Mitigation Planning Team, resulted in the classification of risk for each identified hazard according to three categories: High Risk, Moderate Risk, and Low Risk (**Table 5.34**). 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 Buncombe Madison 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 is still possible in some cases and their assigned classification will continue to be evaluated during future plan updates.

TABLE 5.34: CONCLUSIONS ON HAZARD RISK FOR THE BUNCOMBE MADISON REGION

HIGH RISK	Severe Winter Weather Tornadoes / Thunderstorms Flood Geological Hazards (Landslide) Cyber
MODERATE RISK	Drought Wildfire Hazardous Substances Hurricane /Coastal Hazards Earthquake Dam Failure Infectious Disease
LOW RISK	Terrorism Radiological Emergencies EMP

SECTION 6
VULNERABILITY ASSESSMENT

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

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

44 CFR Requirement

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

6.1 OVERVIEW

This section builds upon the information provided in Section 4: Hazard Identification and Section 5: Hazard Profiles by identifying and characterizing an inventory of assets in the Buncombe Madison Region. Additionally, an assessment is conducted for each identified hazard, including the potential impact and expected amount of damages it may cause. The primary objective of the vulnerability assessment is to quantify exposure and the potential loss estimates for each hazard. In doing so, each county and their participating jurisdictions may better understand their unique risks to identified hazards and be better prepared to evaluate and prioritize specific hazard mitigation actions. This section begins with an explanation of the methodology applied to complete the vulnerability assessment, followed by a summary description of the asset inventory as compiled for jurisdictions in the Buncombe Madison Region. The remainder of this section focuses on the results of the assessment conducted.

6.2 METHODOLOGY

This vulnerability assessment was conducted using three distinct methodologies: (1) A stochastic risk assessment; (2) a geographic information system (GIS)-based analysis; and (3) a risk modeling software analysis. Each approach provides estimates for the potential impact of hazards by using a common, systematic framework for evaluation, including historical occurrence information provided in the *Hazard*

Identification and *Hazard Profiles* sections. A brief description of the three different approaches is provided on the following pages.

6.2.1 Stochastic Risk Assessment

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

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

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

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

The results for these hazards are found at the end of this section in **Table 6.26**.

6.2.2 GIS-Based Analysis

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

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

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

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

6.2.3 Risk Management Tool

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

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

Finally, the Risk Management Tool also assesses vulnerable populations, such as children and elderly persons. Data used to assess these populations is from the US 2010 Census. According to the US Census Bureau, those defined as “elderly,” are 65 years old or older, while those defined as “children” are 5 years old or younger. It is important to note that the numbers assessed are from the most recent Census in 2010.

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

The RMT was originally developed as part of the Integrated Hazard Risk Management (IHRM) pilot project which included Durham, Edgecombe, Macon and New Hanover counties. The pilot was successful and it

was determined that there is a need and interest in a system designed to be used statewide and potentially nationwide in the future. The RMT used in this update was the second version created by NCEM.

A list of the hazards assessed by the RMT follows:

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

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

Hazard Prioritization

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

6.3 EXPLANATION OF DATA SOURCES

Hurricane and Coastal Hazards

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

Tornadoes/Thunderstorms

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

Earthquakes

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

Geological (Landslide)

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

Flooding

FEMA Digital Flood Insurance Rate Maps (DFIRMs) were used to determine flood vulnerability. DFIRM data can be used in ArcGIS for mapping purposes and, they identify several features including floodplain boundaries and base flood elevations. Identified areas on the DFIRM represent some features of a Flood Insurance Rate Maps including the 100-year flood areas (1.0-percent annual chance flood), and the 500-year flood areas (0.2-percent annual chance flood). For the vulnerability assessment, local parcel data and critical facilities were overlaid on the 100-year floodplain areas and 500-year floodplain areas. This data was also supplemented with the NCEM RMT data, which assessed structure type and vulnerable populations within the floodplain areas. It should be noted that such an analysis does account for building elevation.

Wildfires

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

RMT, which assessed vulnerable buildings, potential dollar losses of those buildings, and susceptible populations.

Hazardous Substances

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

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

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

6.4 ASSET INVENTORY

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

6.4.1 Physical and Improved Assets

The two categories of physical assets consist of:

1. Improved Property: Includes all improved properties in the Buncombe Madison Region according to local parcel data provided by the counties. The information has been expressed in terms of the number

[2] While potentially not all-inclusive for the jurisdictions in the Buncombe Madison 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.

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. Each county provided data from their respective critical facilities that were used in this section. Identified critical facilities are fire stations, police stations, medical care facilities, schools, government facilities, emergency operation centers, or other important buildings. It should be noted that this listing is not all-inclusive for assets located in the region, but it is anticipated that it will be expanded during future plan updates as more geo-referenced data becomes available for use in GIS analysis.

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

Table 6.1 lists the number of parcels, total value of parcels, total number of parcels with improvements, and the total assessed value of improvements for participating areas of the Buncombe Madison Region (study area of vulnerability assessment)[3].

TABLE 6.1: IMPROVED PROPERTY IN THE BUNCOMBE MADISON REGION

Location[4]	Number of Parcels	Total Assessed Value of Parcels	Estimated Number of Buildings	Total Assessed Value of Improvements
Buncombe County	**100,417**	**$8,212,795,805**	**76,066**	**$20,633,535,101**
Asheville	37,096	$3,499,685,000	29,784	$9,366,979,944
Biltmore Forest	722	$244,565,600	631	$466,595,600
Black Mountain	4,621	$284,348,100	3,378	$739,693,250
Montreat	903	$83,142,600	615	$211,181,300
Weaverville	2,362	$154,077,180	1,844	$466,582,300
Woodfin	2,680	$166,370,400	1,729	$394,408,327
Unincorporated Area	52,033	$3,780,606,925	38,085	$8,988,094,380
Madison County	**21,390**	**$1,451,273,921**	**9,812**	**$951,221,065**
Hot Springs	458	$29,240,320	277	$19,705,487
Marshall	589	$20,083,823	355	$28,864,257
Mars Hill	590	$18,473,229	442	$67,431,133
Unincorporated Area	19,753	$1,383,476,549	8,738	$835,220,188
Buncombe Madison Regional Total	**121,807**	**$9,664,069,726**	**85,878**	**$21,584,756,166**

Source: Local governments

The following table lists the fire stations, police stations, emergency operations centers (EOCs), medical care facilities, schools, and other critical facilities located in the Buncombe Madison Region. Local governments at the county level provided a majority of the data for this analysis. In addition, **Figure 6.1** shows the locations of essential facilities in the Buncombe Madison Region. **Table 6.26**, at the end of this section, shows a complete list of the critical facilities by name, as well as the hazards that affect each

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

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

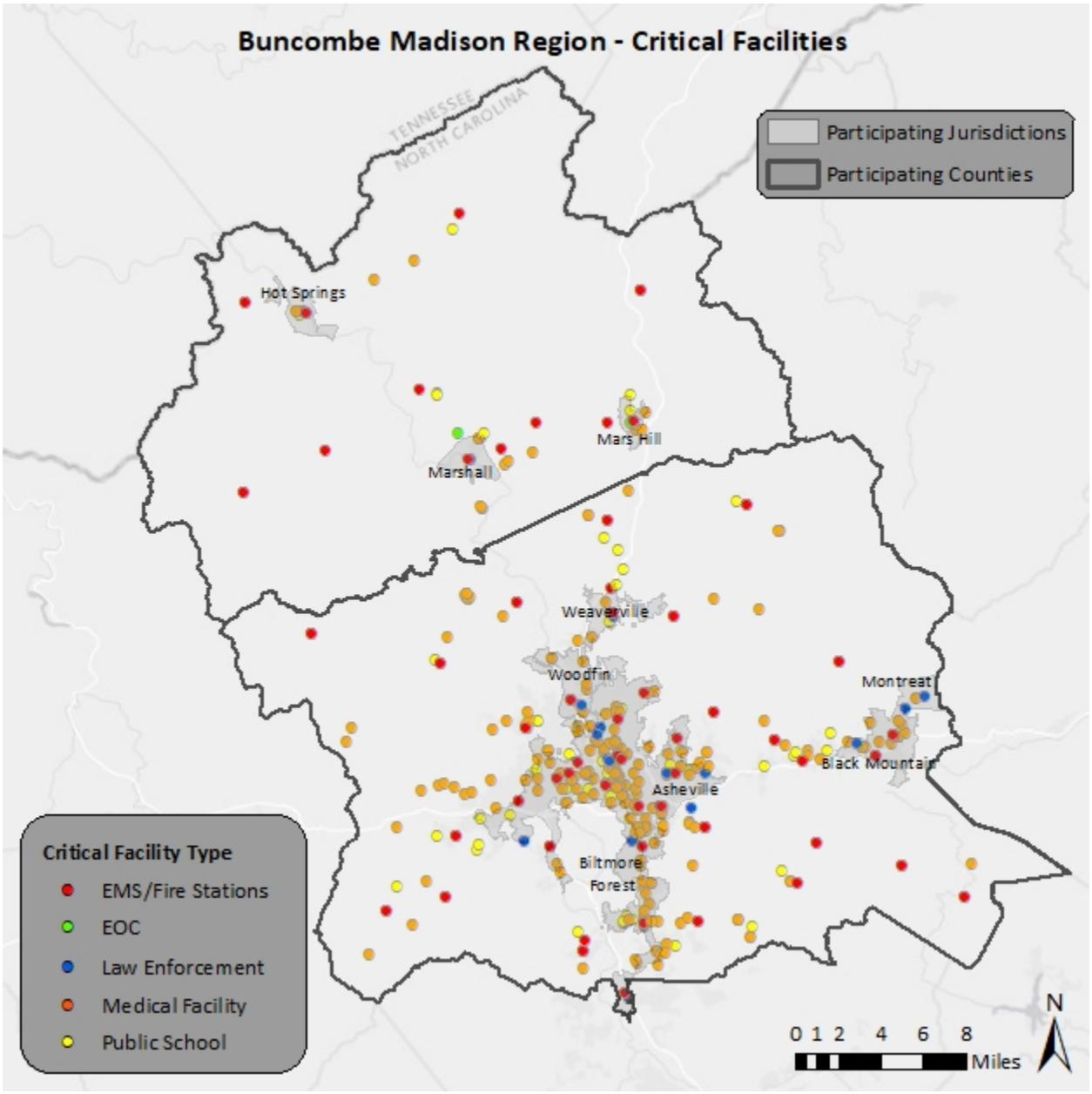
facility. As noted previously, this list is not all inclusive and only includes information provided by the counties.

TABLE 6.2: CRITICAL FACILITY INVENTORY

Location	Fire/EMS Stations	Police Stations	Medical Care Facilities	Schools	Other
Buncombe County	**84**	**22**	**249**	**54**	**1**
Asheville	32	14	133	22	1
Biltmore Forest	0	1	4	0	0
Black Mountain	4	2	14	2	0
Montreat	0	1	1	0	0
Weaverville	3	1	2	2	0
Woodfin	2	1	10	1	0
Unincorporated Area	43	2	85	27	0
Madison County	**17**	**4**	**18**	**7**	**2**
Hot Springs	2	1	4	1	0
Marshall	1	2	2	0	0
Mars Hill	2	1	3	1	1
Unincorporated Area	12	0	9	5	1
Buncombe Madison Regional Total	**101**	**26**	**267**	**61**	**3**

Source: Local governments

FIGURE 6.1: CRITICAL FACILITIES IN THE BUNCOMBE MADISON REGION



Source: Local governments

6.4.2 Social Vulnerability

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

Table 6.3 lists the population by county according to U.S. Census 2010 population estimates. The population estimates are updated using the most recent vintage tables dated July 1, 2018. The total population in the Buncombe Madison Region according to Census data is 280,866.

TABLE 6.3: TOTAL POPULATION IN THE BUNCOMBE MADISON REGION

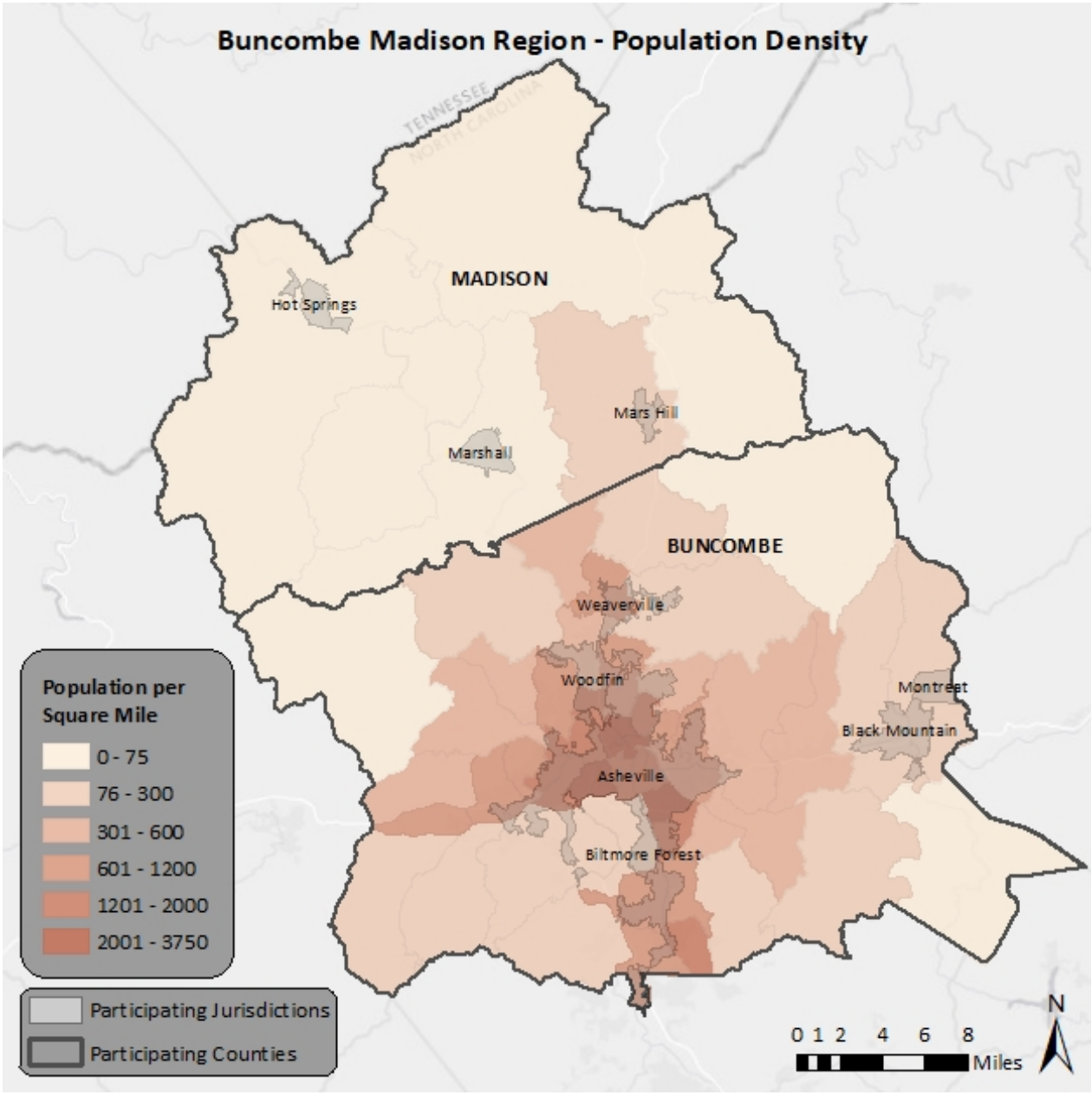
Location	2018 Population Estimates
Buncombe County	259,103
Madison County	21,763
Buncombe Madison Regional Total	**280,866**

Source: US Census Bureau

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

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

FIGURE 6.2: POPULATION DENSITY IN THE BUNCOMBE MADISON REGION



6.4.3. Development Trends and Changes in Vulnerability

Since the previous regional hazard mitigation plan was approved (in 2015), the Buncombe Madison Region has experienced strong growth and development. **Table 6.4** shows the number of building units constructed since 2010 according to the US Census American Community Survey.

TABLE 6.4: BUILDING COUNTS FOR THE BUNCOMBE MADISON REGION

Location	Total Housing Units (2017)	Units Built 2010 or Later	% Building Stock Built Post-2010
Buncombe County	**119,412**	**5709**	**4.8%**
Asheville	43,856	2062	4.7%
Biltmore Forest	695	4	0.6%

Location	Total Housing Units (2017)	Units Built 2010 or Later	% Building Stock Built Post-2010
Black Mountain	4,296	199	4.6%
Montreat	601	0	0.0%
Weaverville	1,808	50	2.8%
Woodfin	2,732	270	9.9%
Unincorporated Area	65,424	3,124	4.8%
Madison County	**10,860**	**418**	**3.8%**
Hot Springs	370	11	3.0%
Marshall	501	10	2.0%
Mars Hill	780	31	4.0%
Unincorporated Area	9,209	366	4.0%
Buncombe Madison Regional Total	**130,272**	**6,127**	**4.7%**

Source: US Census Bureau

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

TABLE 6.5: POPULATION GROWTH FOR THE BUNCOMBE MADISON REGION

Location	2010	2012	2014	2016	2018	% Change 2010-2018
Buncombe County	**238,737**	**243,657**	**249,122**	**254,988**	**249,103**	**4.3%**
Asheville	83,471	85,329	87,855	91,145	92,452	10.8%
Biltmore Forest	1,345	1,369	1,392	1,408	1,403	4.3%
Black Mountain	7,843	7,924	8,082	8,145	8,148	3.9%
Montreat	722	684	714	797	836	15.8%
Weaverville	3,676	3,763	3,820	3,869	3,974	8.1%
Woodfin	6,178	6,286	6,384	6,472	6,582	6.5%
Unincorporated Area	135,502	138,302	140,875	143,152	135,708	0.2%
Madison County	**20,779**	**20,884**	**21,189**	**21,359**	**21,763**	**4.7%**
Hot Springs	557	555	561	565	576	3.4%
Marshall	875	870	878	889	907	3.7%
Mars Hill	1,869	2,036	2,148	2,058	2,032	8.7%
Unincorporated Area	17,478	17,423	17,602	17,847	18,248	4.4%
Buncombe Madison Regional Total	**259,516**	**264,541**	**270,311**	**276,347**	**270,866**	**4.4%**

Source: US Census Bureau

Based on the above data, the rate of residential development and population growth in the region since 2010 has increased, especially in Asheville and Montreat. The overall population increased slightly in Buncombe and Madison County, too, and across all participating jurisdictions. Changes in development do impact the region's vulnerability since the last update. The greater the population, the greater the risk is that persons are impacted by hazards. It should be noted that if future development occurs in vulnerable areas, populations and infrastructure will be exposed to potential hazards.

6.5 VULNERABILITY ASSESSMENT RESULTS

As noted earlier, only hazards with a specific geographic boundary, modeling tool, or sufficient historical data allow for further analysis. Those results are presented here. All other hazards are assumed to impact the entire planning region (drought, excessive heat, hailstorm, lightning, and severe winter weather) or, due to lack of data, analysis would not lead to credible results (sinkholes, erosion, dam failure, infectious disease, terrorism, cyber, EMP). The total region exposure for critical facilities is presented in **Table 6.26**.

The annualized loss estimate for all hazards is presented at the end of this section in **Table 6.25.**

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

6.5.1. Hurricane and Coastal Hazards

Historical evidence indicates that the Buncombe Madison Region has a significant risk to the hurricane and tropical storm hazard, mostly due to the location of the state of North Carolina as a coastal state. Many more storm tracks have come near or traversed through the region, as shown and discussed in Section 5: *Hazard Profiles.*

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

NCEM's Risk Management Tool analyzes hurricane winds and no other hazards often associated with hurricanes; therefore, only hurricane winds are analyzed in this section. Building and population vulnerabilities to hurricane winds in a 100-year frequency event (return period) are reported in the following **Table 6.6** and **Table 6.7**.

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

TABLE 6.6: BUILDING VULNERABILITIES TO HURRICANE WINDS

Location	Pre-Firm Buildings at Risk	Residential Buildings at Risk		Commercial Buildings at Risk		Public Buildings at Risk		Total Buildings at Risk	
		Number	Damages	Number	Damages	Number	Damages	Number	Damages
Buncombe County	**72,793**	**101,186**	**32,339,992**	**9,873**	**9,065,435**	**1,705**	**5,371,568**	**112,764**	**46,776,995**
Asheville	33,778	33,144	10,806,819	3,694	4,730,943	750	2,293,192	37,588	17,830,954
Biltmore Forest	725	686	468,379	31	19,955	8	4,156	725	492,489
Black Mountain	4,016	3,585	999,663	342	644,078	88	90,759	4,015	1,734,500
Montreat	629	598	202,971	5	4,101	26	17,575	629	224,647
Weaverville	1,903	4,627	1,862,037	300	450,863	60	193,964	4,987	2,506,865
Woodfin	2,589	2,243	606,425	238	277,168	105	134,548	2,586	1,018,141
Unincorporated Area	29,153	56,303	17,393,698	5,263	2,938,327	668	2,637,374	62,234	22,969,399
Madison County	**17,311**	**16,335**	**3,435,773**	**775**	**814,425**	**330**	**268,520**	**17,440**	**4,518,718**
Hot Springs	449	394	80,208	30	24,611	25	3,781	449	108,600
Marshall	1,410	1,220	339,295	111	80,649	76	68,770	1,407	488,714
Mars Hill	409	436	73,098	85	59,026	22	13,866	543	145,990

Location	Pre-Firm Buildings at Risk	Residential Buildings at Risk		Commercial Buildings at Risk		Public Buildings at Risk		Total Buildings at Risk	
		Number	Damages	Number	Damages	Number	Damages	Number	Damages
Unincorporated Area	15,043	14,285	2,943,172	549	650,139	207	182,103	15,041	3,775,414
Buncombe Madison Regional Total	**90,104**	**117,521**	**35,775,765**	**10,648**	**9,879,860**	**2,035**	**5,640,088**	**130,204**	**51,295,713**

Source: NCEM Risk Management Tool

TABLE 6.7: POPULATION VULNERABILITIES TO HURRICANE WINDS

Location	Elderly at Risk	Children at Risk	Total at Risk
Buncombe County	**38,096**	**13,475**	**238,268**
Asheville	15,141	5,356	94,698
Biltmore Forest	216	76	1,349
Black Mountain	1,247	441	7,798
Montreat	115	41	722
Weaverville	1,468	519	9,181
Woodfin	984	348	6,155
Unincorporated Area	18,925	6,694	118,365
Madison County	**3,662**	**938**	**20,786**
Hot Springs	97	25	550
Marshall	155	40	880
Mars Hill	519	133	2,949
Unincorporated Area	2,891	740	16,407
Buncombe Madison Regional Total	**41,758**	**14,413**	**259,054**

Source: NCEM Risk Management Tool

SOCIAL VULNERABILITY

Given the equal susceptibility across the entire Buncombe Madison Region, it can be assumed that the entire population is at risk to the hurricane and tropical storm hazard.

CRITICAL FACILITIES

Given equal vulnerability across the Buncombe Madison Region, all critical facilities are considered to be at risk. Although some buildings may perform better than others in the face of such an event due to construction, age, and other factors, determining individual building response is beyond the scope of this plan. However, this plan will consider mitigation actions for vulnerable structures, including critical facilities, to reduce the impacts of the hurricane wind hazard. A list of specific critical facilities and their associated risk can be found in **Table 6.26** at the end of this section.

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

6.5.2 Tornadoes/Thunderstorms

Tornadoes

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

TABLE 6.8: BUILDING VULNERABILITY TO THE TORNADOES HAZARD

Location	Pre-Firm Buildings at Risk	Residential Buildings at Risk		Commercial Buildings at Risk		Public Buildings at Risk		Total Buildings at Risk	
		Number	Damages	Number	Damages	Number	Damages	Number	Damages
Buncombe County	**72,793**	**101,186**	**$12,138,941,109**	**9,873**	**$6,127,617,876**	**1,705**	**$1,959,700,623**	**112,764**	**$20,226,259,606**
Asheville	33,778	33,144	$4,061,769,761	3,694	$3,579,769,695	750	$904,950,438	37,588	$8,546,489,894
Biltmore Forest	725	686	$161,580,643	31	$23,453,221	8	$8,162,858	725	$193,196,722
Black Mountain	4,016	3,585	$400,252,716	342	$355,275,987	88	$62,101,586	4,015	$817,630,289
Montreat	629	598	$91,399,802	5	$4,961,400	26	$19,560,262	629	$115,921,464
Weaverville	1,903	4,627	$670,395,593	300	$303,850,381	60	$86,635,621	4,987	$1,060,881,594
Woodfin	2,589	2,243	$230,338,431	238	$169,757,905	105	$69,054,374	2,586	$469,150,709
Unincorporated Area	29,153	56,303	$6,523,204,163	5,263	$1,690,549,287	668	$809,235,484	62,234	$9,022,988,934
Madison County	**17,332**	**16,356**	**$1,509,522,354**	**775**	**$422,174,893**	**330**	**$185,128,628**	**17,461**	**$2,116,825,874**
Hot Springs	449	394	$30,822,519	30	$14,560,237	25	$7,436,170	449	$52,818,926
Marshall	409	436	$35,433,223	85	$40,305,637	22	$16,181,888	543	$91,920,748
Mars Hill	1,410	1,220	$135,525,429	111	$69,928,031	76	$57,889,046	1,407	$263,342,505
Unincorporated Area	15,064	14,306	$1,307,741,183	549	$297,380,988	207	$103,621,524	15,062	$1,708,743,695
Buncombe Madison Regional Total	**90,125**	**117,542**	**$13,648,463,463**	**10,648**	**$6,549,792,769**	**2,035**	**$2,144,829,251**	**130,225**	**$22,343,085,480**

Source: NCEM Risk Management Tool

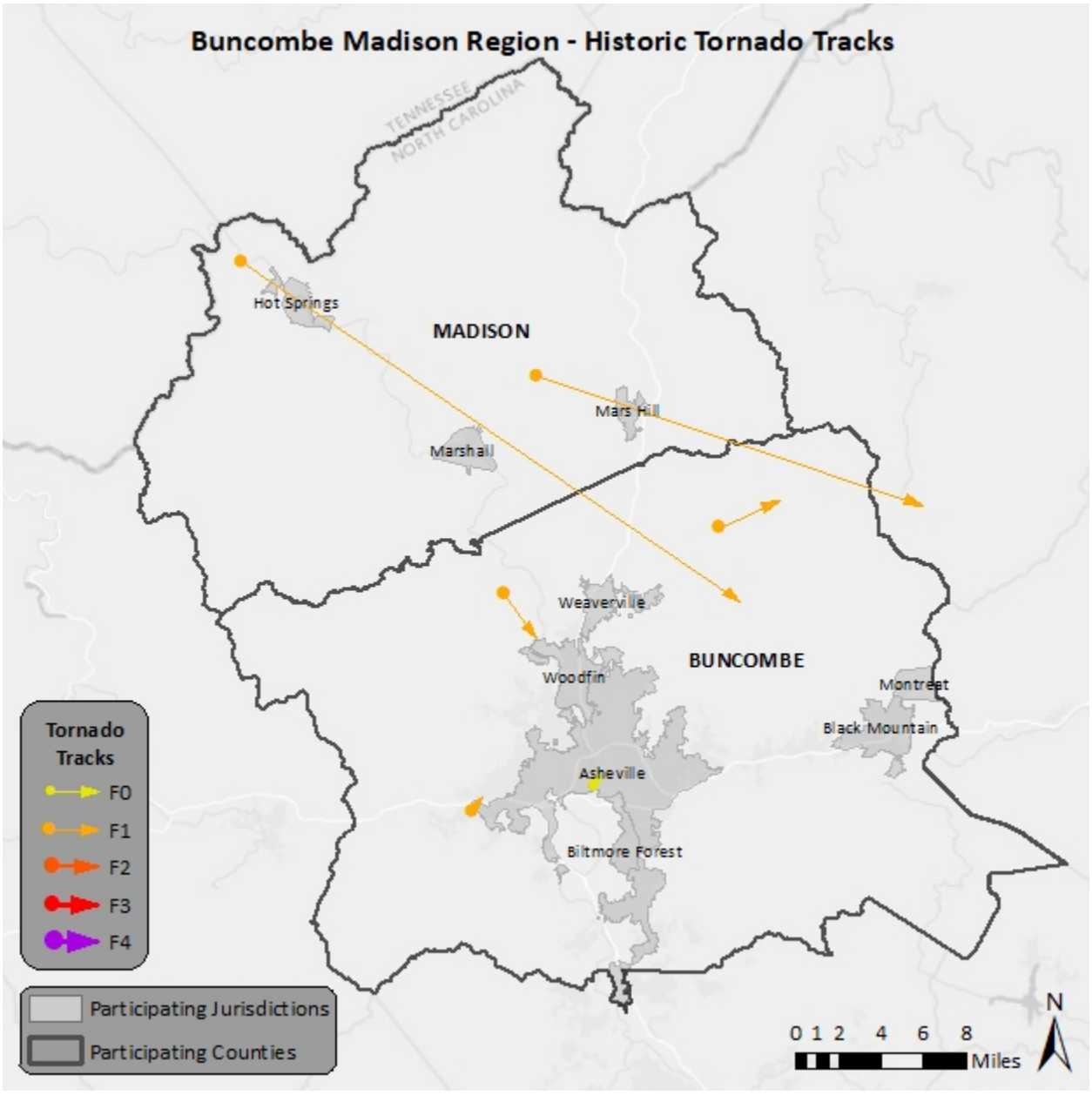
TABLE 6.9: POPULATION VULNERABILITY TO THE TORNADOES HAZARD

Location	Elderly at Risk	Children at Risk	Total at Risk
Buncombe County	**38,096**	**13,475**	**238,268**
Asheville	15,141	5,356	94,698
Biltmore Forest	216	76	1,349
Black Mountain	1,247	441	7,798
Montreat	115	41	722
Weaverville	1,468	519	9,181
Woodfin	984	348	6,155
Unincorporated Area	18,925	6,694	118,365
Madison County	**3666**	**939**	**20810**
Hot Springs	97	25	550
Marshall	155	40	880
Mars Hill	519	133	2,949
Unincorporated Area	2,895	741	16,431
Buncombe Madison Regional Total	**41,762**	**14,414**	**259,078**

Source: NCEM Risk Management Tool

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

FIGURE 6.3: HISTORICAL TORNADO TRACKS



Source: NOAA

Thunderstorms

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

TABLE 6.10: BUILDING VULNERABILITY TO THUNDERSTORM WINDS

Location	Pre-Firm Buildings at Risk	Residential Buildings at Risk		Commercial Buildings at Risk		Public Buildings at Risk		Total Buildings at Risk	
		Number	Damages	Number	Damages	Number	Damages	Number	Damages
Buncombe County	**72,793**	**101,186**	**$32,339,992**	**9,873**	**$9,065,435**	**1,705**	**$5,371,568**	**112,764**	**$46,776,995**
Asheville	33,778	33,144	$10,806,819	3,694	$4,730,943	750	$2,293,192	37,588	$17,830,954
Biltmore Forest	725	686	$468,379	31	$19,955	8	$4,156	725	$492,489
Black Mountain	4,016	3,585	$999,663	342	$644,078	88	$90,759	4,015	$1,734,500
Montreat	629	598	$202,971	5	$4,101	26	$17,575	629	$224,647
Weaverville	1,903	4,627	$1,862,037	300	$450,863	60	$193,964	4,987	$2,506,865
Woodfin	2,589	2,243	$606,425	238	$277,168	105	$134,548	2,586	$1,018,141
Unincorporated Area	29,153	56,303	$17,393,698	5,263	$2,938,327	668	$2,637,374	62,234	$22,969,399
Madison County	**17,311**	**16,335**	**$3,435,773**	**775**	**$814,425**	**330**	**$268,520**	**17,440**	**$4,518,718**
Hot Springs	449	394	$80,208	30	$24,611	25	$3,781	449	$108,600
Marshall	409	436	$73,098	85	$59,026	22	$13,866	543	$145,990
Mars Hill	1,410	1,220	$339,295	111	$80,649	76	$68,770	1,407	$488,714
Unincorporated Area	15,043	14,285	$2,943,172	549	$650,139	207	$182,103	15,041	$3,775,414
Buncombe Madison Regional Total	**90,104**	**117,521**	**$35,775,765**	**10,648**	**$9,879,860**	**2,035**	**$5,640,088**	**130,204**	**$51,295,713**

Source: NCEM Risk Management Tool

TABLE 6.11: POPULATION VULNERABILITY TO THUNDERSTORM WINDS

Location	Elderly at Risk	Children at Risk	Total at Risk
Buncombe County	**38,096**	**13,475**	**238,268**
Asheville	15,141	5,356	94,698
Biltmore Forest	216	76	1,349
Black Mountain	1,247	441	7,798
Montreat	115	41	722
Weaverville	1,468	519	9,181
Woodfin	984	348	6,155
Unincorporated Area	18,925	6,694	118,365
Madison County	**3,662**	**938**	**20,786**
Hot Springs	97	25	550
Marshall	155	40	880
Mars Hill	519	133	2,949
Unincorporated Area	2,891	740	16,407
Buncombe Madison Regional Total	**41,758**	**14,413**	**259,054**

Source: NCEM Risk Management Tool

SOCIAL VULNERABILITY

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

CRITICAL FACILITIES

All critical facilities should still be considered at-risk to damage should an event occur. A list of all individual critical facilities in the region can be found in **Table 6.26**.

6.5.3. Earthquakes

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

TABLE 6.12: BUILDING VULNERABILITY TO THE EARTHQUAKE HAZARD

Location	Pre-Firm Buildings at Risk	Residential Buildings at Risk		Commercial Buildings at Risk		Public Buildings at Risk		Total Buildings at Risk	
		Number	Damages	Number	Damages	Number	Damages	Number	Damages
Buncombe County	**72,793**	**101,186**	**$30,253,039**	**9,873**	**$30,947,496**	**1,705**	**$10,111,017**	**112,764**	**$71,311,552**
Asheville	33,778	33,144	$11,113,702	3,694	$19,181,005	750	$4,759,686	37,588	$35,054,394
Biltmore Forest	725	686	$363,791	31	$116,145	8	$48,883	725	$528,819
Black Mountain	4,016	3,585	$884,315	342	$1,517,905	88	$369,167	4,015	$2,771,387
Montreat	629	598	$182,732	5	$16,346	26	$89,296	629	$288,374
Weaverville	1,903	4,627	$1,607,089	300	$1,528,585	60	$458,841	4,987	$3,594,514
Woodfin	2,589	2,243	$647,666	238	$940,001	105	$408,318	2,586	$1,995,985
Unincorporated Area	29,153	56,303	$15,453,744	5,263	$7,647,509	668	$3,976,826	62,234	$27,078,079
Madison County	**17332**	**16,356**	**$4,310,343**	**775**	**$2,138,204**	**330**	**$1,032,861**	**17,461**	**$7,481,407**
Hot Springs	449	394	$114,589	30	$75,619	25	$41,310	449	$231,518
Marshall	409	436	$133,042	85	$237,308	22	$113,493	543	$483,843
Mars Hill	1,410	1,220	$462,905	111	$391,467	76	$302,742	1,407	$1,157,113
Unincorporated Area	15,064	14,306	$3,599,807	549	$1,433,810	207	$575,316	15,062	$5,608,933
Buncombe Madison Regional Total	**90,125**	**117,542**	**$34,563,382**	**10,648**	**$33,085,700**	**2,035**	**$11,143,878**	**130,225**	**$78,792,959**

Source: NCEM Risk Management Tool

TABLE 6.13: POPULATION VULNERABILITY TO THE EARTHQUAKE HAZARD

Location	Elderly at Risk	Children at Risk	Total at Risk
Buncombe County	**37,148**	**13,116**	**232,194**
Asheville	15,141	5,356	94,698
Biltmore Forest	1,468	519	9,181
Black Mountain	1,247	441	7,798
Montreat	155	40	880
Weaverville	115	41	722
Woodfin	97	25	550
Unincorporated Area	18,925	6,694	118,365
Madison County	**4,614**	**1,298**	**26,884**
Hot Springs	984	348	6,155
Marshall	216	76	1,349
Mars Hill	519	133	2,949
Unincorporated Area	2,895	741	16,431
Buncombe Madison Regional Total	**41,762**	**14,414**	**259,078**

Source: NCEM Risk Management Tool

SOCIAL VULNERABILITY

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

CRITICAL FACILITIES

All critical facilities should still be considered at-risk to minor damage should an event occur. A list of all individual critical facilities in the region can be found in **Table 6.26**.

In conclusion, an earthquake could potentially impact all existing and future buildings, facilities, and populations in the Buncombe Madison region. Though minor earthquakes are often recorded but not felt, they may rattle breakables and cause minimal damage. Furthermore, major earthquakes have potential to damage structures. Severe impacts of earthquakes may result in debris clean-up, service disruption, building collapse, and fatalities. Specific vulnerabilities for assets will be greatly dependent on their individual design and the mitigation measures in place, where appropriate. Such site-specific vulnerability determinations are outside the scope of this assessment but will be considered during future plan updates if data becomes available. Furthermore, mitigation actions to address earthquake vulnerability will be considered.

6.5.4. Geological (Landslide)

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

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

Location	Number of Parcels at Risk		Number of Improvements at Risk		Total Value of Improvements at Risk ($)	
Incidence Level	Moderate	High	Moderate	High	Moderate	High
Buncombe County	**123,898**	**99,387**	**92,502**	**74,421**	**$23,709,595,751**	**$20,596,509,951**
Asheville	37,095	35,687	29,784	28,617	$9,366,979,944	$9,130,405,444
Biltmore Forest	722	722	631	631	$466,595,600	$466,595,600
Black Mountain	4,621	4,621	3,378	3,378	$739,693,250	$739,693,250
Montreat	903	903	615	615	$211,181,300	$211,181,300
Weaverville	2,362	2,336	1,844	1,828	$466,582,300	$452,502,200
Woodfin	2,680	2,680	1,729	1,729	$394,408,327	$394,408,327
Unincorporated Area	75,515	52,438	54,521	37,623	$12,064,155,030	$9,201,723,830
Madison County	**21,380**	**97**	**9,810**	**40**	**$950,987,969**	**$4,031,573**
Hot Springs	458	-	277	-	$19,705,487	$0
Marshall	589	-	355	-	$28,864,257	$0
Mars Hill	590	-	442	-	$67,431,133	$0
Unincorporated Area	19,743	97	8,736	40	$834,987,092	$4,031,573
Buncombe Madison Regional Total	**145,278**	**99,484**	**102,312**	**74,461**	**$24,660,583,720**	**$20,600,541,524**

Source: United States Geological Survey, Local governments

SOCIAL VULNERABILITY

Given moderate to high susceptibility across the entire Buncombe Madison Region, it is assumed that a moderate amount of population is at risk.

CRITICAL FACILITIES

There are 349 critical facilities located in a high susceptibility area, including the following: 1 EOC, 216 Medical facilities, 67 fire/EMS stations, 22 police stations, and 43 public schools. The remaining critical facilities are located in low incidence areas. A list of specific critical facilities and their associated risk can be found in **Table 6.26** at the end of this section.

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

6.5.5 Flooding

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 Buncombe Madison counties. The determination of assessed value at-risk (exposure) was calculated using GIS analysis by summing the total assessed building values for only those improved properties that were confirmed to be located within an identified floodplain. **Table 6.15** presents the potential at-risk property. Both the number of parcels and the approximate value are presented.

TABLE 6.15: ESTIMATED EXPOSURE OF PARCELS TO THE FLOODING HAZARD

Location	1% Annual Chance of Flooding (100-year)			0.2% Annual Chance of Flooding (500-year)		
	Approx. # of Parcels	Approx. # of Improved Buildings	Approx. Improved Value of Buildings	Approx. # of Parcels	Approx. # of Improved Buildings	Approx. Improved Value of Buildings
Buncombe County	**8,032**	**5,536**	**$2,277,237,100**	**8,989**	**6,279**	**$2,438,832,200**
Asheville	2,357	1,748	$832,942,600	2,839	2,134	$925,139,700
Biltmore Forest	11	8	$9,339,500	11	8	$9,339,500
Black Mountain	431	283	$142,834,900	488	328	$151,433,600
Montreat	49	33	$43,800,500	59	42	$49,634,500
Weaverville	48	32	$7,821,700	60	44	$10,320,500
Woodfin	126	84	$19,173,200	158	103	$22,434,400
Unincorporated Area	5,010	3,348	$1,221,324,700	5,374	3,620	$1,270,530,000
Madison County	**2,951**	**1,441**	**$128,178,642**	**3,134**	**1,538**	**$135,483,744**
Hot Springs	126	58	$5,131,789	158	85	$6,941,024
Marshall	256	169	$15,585,708	276	176	$16,030,974
Mars Hill	45	29	$4,850,662	46	30	$5,006,712
Unincorporated Area	2,524	1,185	$102,610,483	2,654	1,247	$107,505,034
Buncombe Madison Regional Total	**10,983**	**6,977**	**$2,405,415,742**	**12,123**	**7,817**	**$2,574,315,944**

Source: FEMA DFIRM

To assess flood risk, the NCEM Risk Management Tool (RMT) analyzed buildings located in the 1 percent chance of annual floodplains. The buildings are assessed by the type of building (commercial, residential, or public) and also assesses Pre-Firm buildings, or structures built before flood code regulations were installed. This data is shown by jurisdiction in **Table 6.16**.

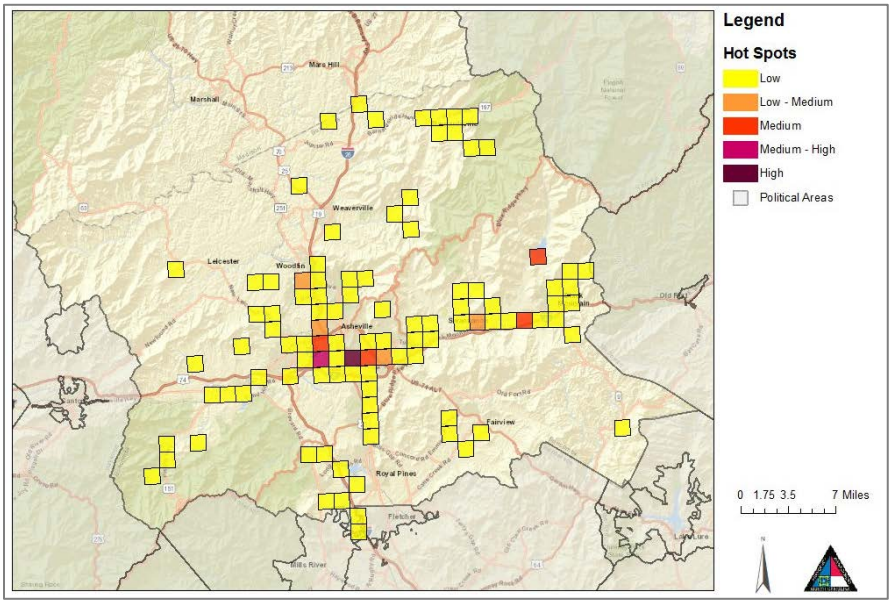
TABLE 6.16: BUILDING VULNERABILITY FOR THE 100-YEAR FLOODPLAINS

Location	Pre-Firm Buildings at Risk	Residential Buildings at Risk		Commercial Buildings at Risk		Public Buildings at Risk		Total Buildings at Risk	
		Number	Damages	Number	Damages	Number	Damages	Number	Damages
Buncombe County	**2,010**	**1,809**	**$20,295,563**	**554**	**$54,100,557**	**46**	**$7,968,667**	**2,409**	**$82,364,786**
Asheville	650	336	$5,987,915	396	$41,534,992	12	$1,074,104	744	$48,597,010
Biltmore Forest	1	0	$0	1	$43,928	0	$0	1	$43,928
Black Mountain	254	220	$1,880,021	30	$6,874,585	4	$34,256	254	$8,788,862
Montreat	18	14	$810,056	0	$0	4	$210,672	18	$1,020,728
Weaverville	28	37	$216,293	2	$30,467	0	$0	39	$246,760
Woodfin	98	54	$617,724	36	$3,382,327	8	$3,159,689	98	$7,159,740
Unincorporated Area	961	1,148	$10,783,554	89	$2,234,258	18	$3,489,946	1,255	$16,507,758
Madison County	**536**	**474**	**$4,357,726**	**40**	**$915,269**	**20**	**$727,783**	**534**	**$6,000,778**
Hot Springs	34	15	$288,909	11	$115,832	8	$307,678	34	$712,420
Marshall	14	12	$194,968	2	$26,621	0	$0	14	$221,589
Mars Hill	14	10	$72,412	2	$148,996	1	$63,517	13	$284,924
Unincorporated Area	474	437	$3,801,437	25	$623,820	11	$356,588	473	$4,781,845
Buncombe Madison Regional Total	**2,546**	**2,283**	**$24,653,289**	**594**	**$55,015,826**	**66**	**$8,696,450**	**2,943**	**$88,365,564**

Source: NCEM Risk Management Tool

Figure 6.4 below displays visual hotspots of potential dollar losses for the flood hazard in Buncombe County. Based on the photo, most hot spots are in an area with low vulnerability.

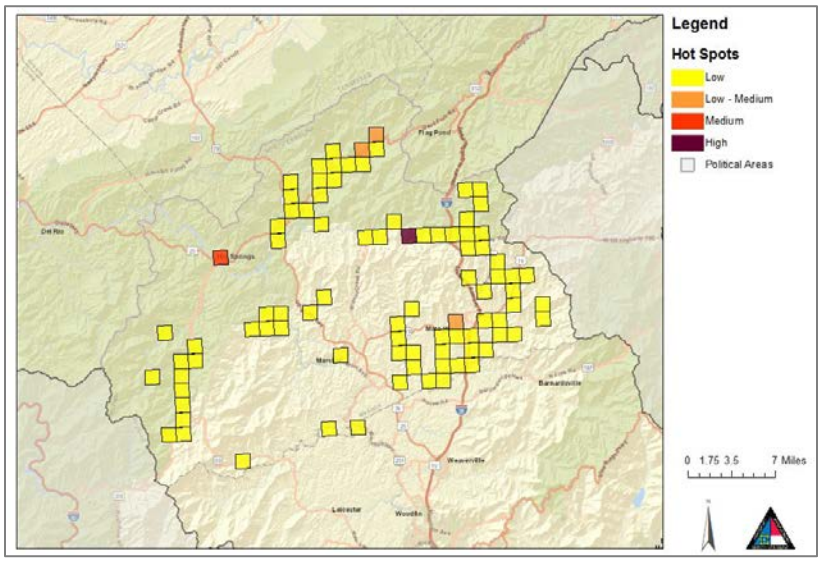
FIGURE 6.4: POTENTIAL DOLLAR LOSSES FOR FLOODING BUNCOMBE COUNTY



Source: NCEM Risk Management Tool

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

FIGURE 6.6: POTENTIAL DOLLAR LOSSES FOR FLOODING IN MADISON COUNTY



Source: NCEM Risk Management Tool

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

TABLE 6.17: POPULATION VULNERABILITY FOR 100-YEAR FLOODPLAINS

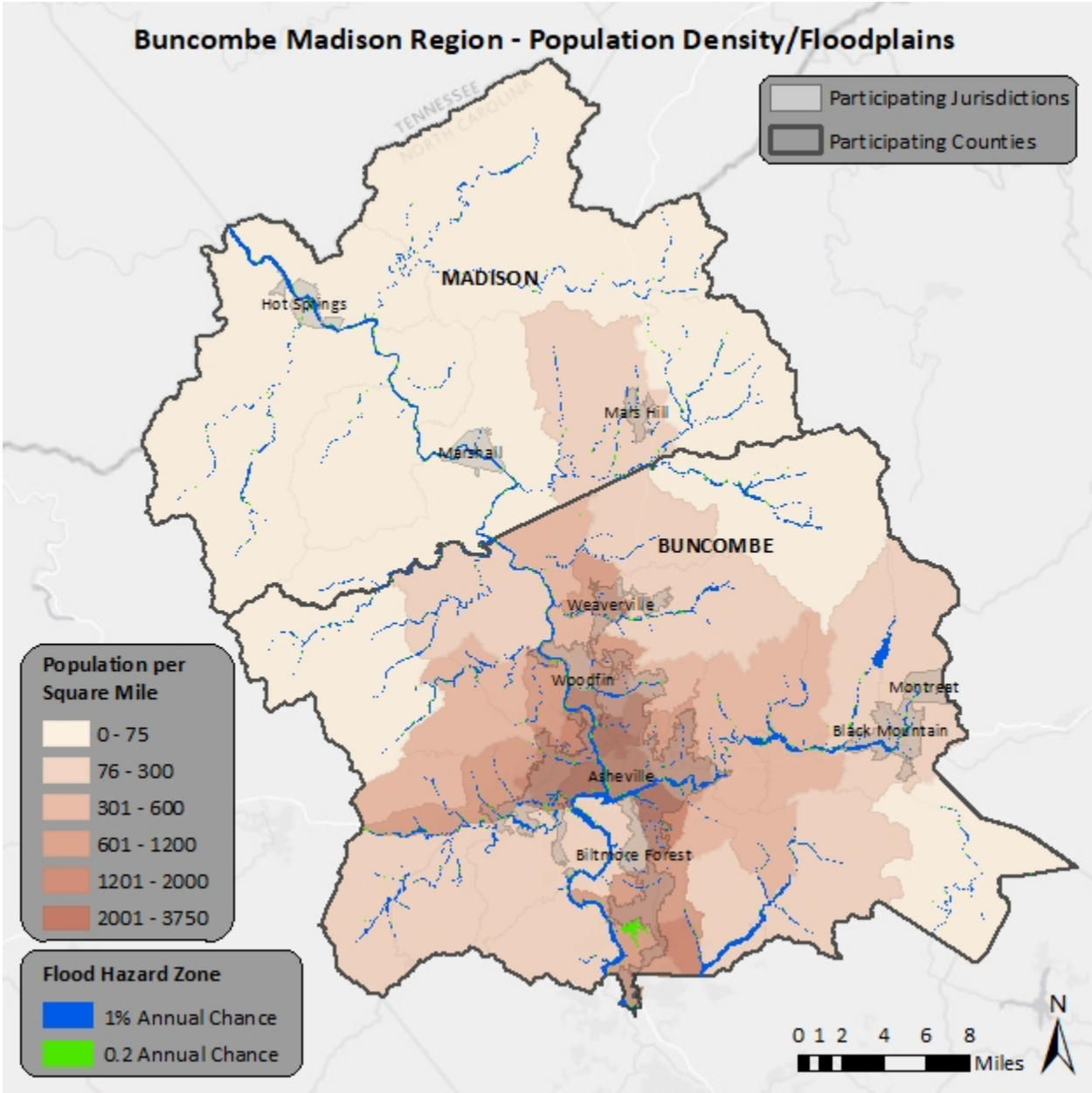
Incidence Level	Elderly at Risk	Children at Risk	Total at Risk
Buncombe County	**657**	**231**	**4,105**
Asheville	156	55	973
Biltmore Forest	0	0	0
Black Mountain	77	27	484
Montreat	3	1	17
Weaverville	12	4	73
Woodfin	24	8	148
Unincorporated Area	385	136	2,410
Madison County	**100**	**26**	**570**
Hot Springs	4	1	21
Marshall	4	1	24
Mars Hill	4	1	24
Unincorporated Area	88	23	501
Buncombe Madison Regional Total	**757**	**257**	**4,675**

Source: NCEM Risk Management Tool

SOCIAL VULNERABILITY

A national Census has not been conducted since 2010; therefore, 2010 Census tract level population counts are outdated for this update. However, population estimates from the US Census Bureau as of July 1, 2017 were available at a jurisdictional level. This data was analyzed to present at-risk populations to the flooding hazard in the Buncombe Madison region and can be seen below in **Figure 6.11**.

FIGURE 6.11: POPULATION DENSITY NEAR FLOODPLAINS



Source: FEMA DFIRM, US Census Bureau

CRITICAL FACILITIES

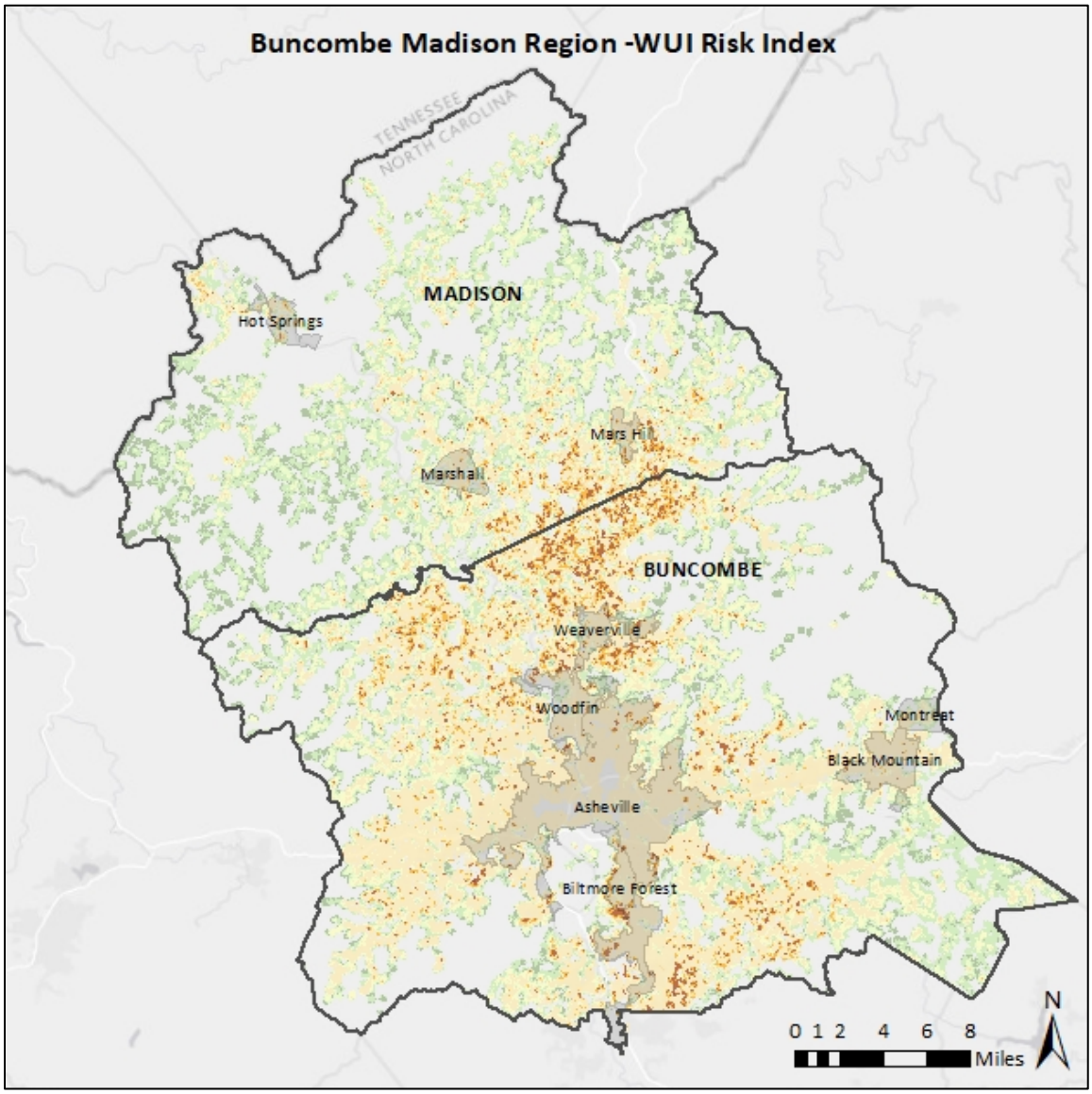
The critical facility analysis revealed that there are 29 critical facilities located in the Buncombe Madison Region's 1.0-percent and 2.0-percent annual chance floodplain based on FEMA DFIRM boundaries and GIS analysis. (As previously noted, this analysis does not consider building elevation, which may negate risk.) These facilities include 2 public schools, 8 Fire/EMS Stations, 3 Law Enforcement facilities, and 16 medical facilities. A list of specific critical facilities and their associated risk can be found in **Table 6.26** at the end of this section.

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

6.5.6 Wildfires

Historical evidence indicates that the Buncombe Madison Region is susceptible to wildfire events. To estimate exposure to wildfire, the Wildland Urban Interface (WUI) Risk Index for the region was obtained from the Southern Wildfire Risk Assessment. The WUI uses a Response Function modeling approach and rates the potential impact of a wildfire on people and their homes. The index ranges from -1 to -9, with -9 being the most negative impact. For example, an area with high housing density and high flame lengths are rated -9, while an area with low housing density and low flame lengths are rated -1. At-risk areas fall within the range of -7 to -9. This index was layered with parcel data using GIS analysis. **Figure 6.12** shows the WUI Risk Index for the region below.

FIGURE 6.12: WILDLAND URBAN INTERFACE RISK INDEX



Source: Southern Wildfire Risk Assessment

The region contains some lands where the value falls into the at-risk category. Overall, there is a high-to-medium wildfire ignition density risk index in the region which is somewhat than other areas in North Carolina.

SOCIAL VULNERABILITY

Even though not all areas have equal vulnerability, there is some susceptibility across the entire Buncombe Madison 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

Few of the Buncombe Madison Region critical facilities are in the at-risk area (-7 or higher) for wildfires. Buncombe County had the most with 18 facilities, while Madison County had 2. **Table 6.19** shows the results of the GIS analysis.

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

Location	Number of At-Risk Critical Facilities
Buncombe County	18
Madison County	2
Buncombe Madison Regional Total	**20**

Source: Southern Wildfire Risk Assessment, Local governments

Additional information was provided through the NCEM Risk Management Tool (RMT). This data can be seen in below in **Table 6.20** and **Table 6.21**.

TABLE 6.20: BUILDING VULNERABILITY TO WILDFIRE HAZARDS IN THE BUNCOMBE MADISON REGION

Location	Pre-Firm Buildings at Risk	Residential Buildings at Risk		Commercial Buildings at Risk		Public Buildings at Risk		Total Buildings at Risk	
		Number	Damages	Number	Damages	Number	Damages	Number	Damages
Buncombe County	**40,882**	**67,131**	**$9,622,837,964**	**5,737**	**$4,308,918,710**	**927**	**$2,182,616,137**	**73,795**	**$16,114,372,813**
Asheville	12,516	13,045	$2,102,789,725	889	$1,808,782,048	209	$644,338,354	14,143	$4,555,910,127
Biltmore Forest	3	3	$631,561	-	$0	-	$0	3	$631,561
Black Mountain	2,399	2,223	$318,037,457	127	$314,327,230	48	$56,236,881	2,398	$688,601,569
Montreat	323	297	$50,131,180	4	$5,920,309	22	$25,613,238	323	$81,664,727
Weaverville	1,591	3,992	$702,638,095	249	$352,657,346	47	$132,082,383	4,288	$1,187,377,824
Woodfin	1,687	1,482	$198,262,203	139	$155,343,228	64	$93,206,259	1,685	$446,811,690
Unincorporated Area	22,363	46,089	$6,250,347,743	4,329	$1,671,888,549	537	$1,231,139,022	50,955	$9,153,375,315
Madison County	**14,643**	**13,861**	**$1,619,718,657**	**648**	**$453,164,772**	**265**	**$265,666,792**	**14,774**	**$2,338,550,221**
Hot Springs	331	301	$34,314,734	19	$14,720,758	11	$8,559,387	331	$57,594,879
Marshall	409	435	$49,388,081	85	$57,017,287	22	$26,949,330	542	$133,354,698
Mars Hill	1,273	1,122	$179,654,684	99	$82,181,726	52	$75,136,171	1,273	$336,972,581
Unincorporated Area	12,630	12,003	$1,356,361,158	445	$299,245,001	180	$155,021,904	12,628	$1,810,628,063
Buncombe Madison Regional Total	**55,525**	**80,992**	**$11,242,556,621**	**6,385**	**$4,762,083,482**	**1,192**	**$2,448,282,929**	**88,569**	**$18,452,923,034**

Source: NCEM Risk Management Tool

TABLE 6.21: POPULATION VULNERABILITY TO WILDFIRE HAZARD

Incidence Level	Elderly at Risk	Children at Risk	Total at Risk
Buncombe County	**24,189**	**8,556**	**151,296**
Asheville	5,951	2,105	37,219
Biltmore Forest	1	-	6
Black Mountain	773	273	4,835
Montreat	57	20	360
Weaverville	1,266	448	7,918
Woodfin	649	230	4,062
Unincorporated Area	15,492	5,480	96,896

Incidence Level	Elderly at Risk	Children at Risk	Total at Risk
Madison County	**3,134**	**803**	**17,793**
Hot Springs	74	19	422
Marshall	155	40	878
Mars Hill	477	122	2,711
Unincorporated Area	2,428	622	13,782
Buncombe Madison Regional Total	**27,323**	**9,359**	**169,089**

Source: NCEM Risk Management Tool

6.5.7 Hazardous Substances

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

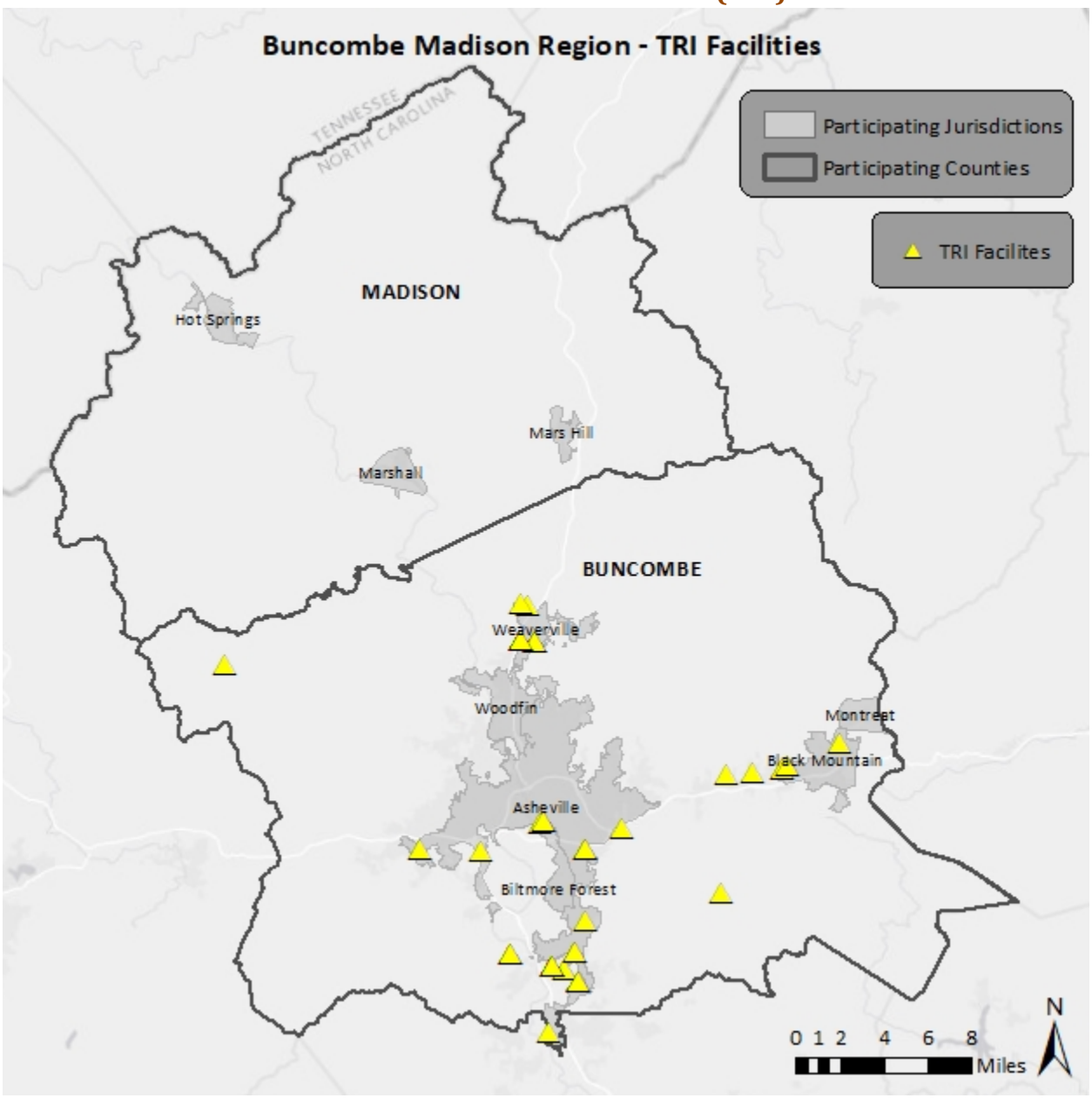
Most hazardous substance incidents that occur are contained and suppressed before destroying any property or threatening lives. However, they can have a significant negative impact. Such events can cause multiple deaths, completely shut down facilities for 30 days or more, and cause more than 50 percent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

In order to conduct the vulnerability assessment for this hazard, GIS intersection analysis was used for fixed and mobile areas and parcels[5]. In both scenarios, two sizes of buffers—0.5 mile and 1 mile—were used. These areas are assumed to respect the different levels of effect: immediate (primary) and secondary. Primary and secondary impact sites were selected based on guidance from FEMA 426, Reference Manual to Mitigate Potential Terrorist Attacks against Buildings and engineering judgment. For the fixed site analysis, geo-referenced TRI listed toxic sites in the Buncombe Madison Region, along with buffers, were used for analysis as shown in **Figure 6.13.** 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 6.14** shows the areas used for mobile toxic release buffer analysis. The results indicate the approximate number of parcels, improved value, as shown in **Table 6.22** (fixed sites), **Table 6.23** (mobile road sites) and **Table 6.24** (mobile railroad sites)[6].

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

[6] Note that parcels included in the 1-mile analysis are also included in the 0.5-mile analysis.

FIGURE 6.13: TOXIC RELEASE INVENTORY (TRI) FACILITIES



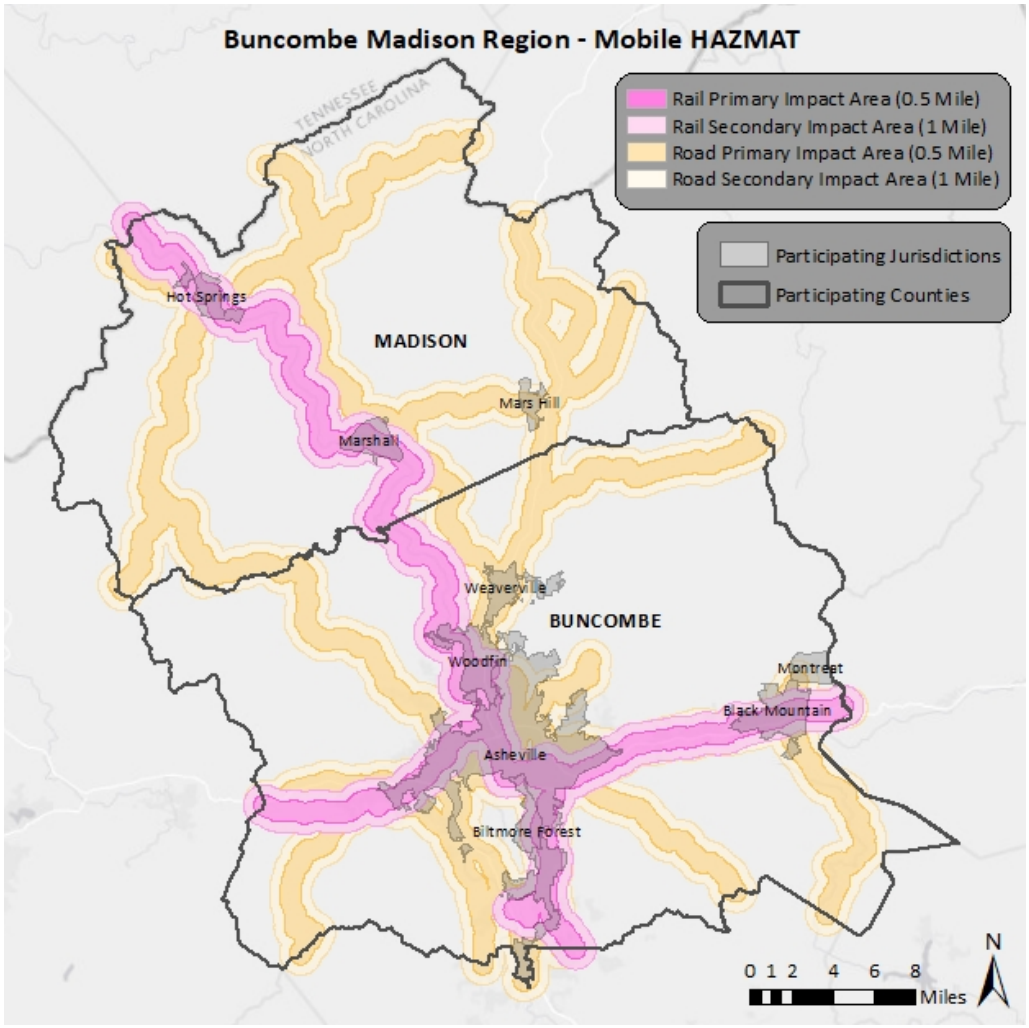
Source: EPA

TABLE 6.22: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS SUBSTANCES (FIXED SITES) IN THE BUNCOMBE MADISON REGION

Location	0.5 Mile Buffer			1.0 Mile Buffer		
	Approx. Number of Parcels	Approx. Number Improved	Approx. Improved Value	Approx. Number of Parcels	Approx. Number Improved	Approx. Improved Value
Buncombe County	**6,972**	**5,503**	**$1,921,998,100**	**25,531**	**20,272**	**$5,976,791,314**
Asheville	1,940	1,520	$583,872,100	8,049	6,520	$2,247,582,184
Biltmore Forest	0	0	$-	55	50	$29,428,400
Black Mountain	1,106	917	$221,957,100	2,779	2,222	$461,098,200
Montreat	0	0	$-	6	5	$1,484,900
Weaverville	581	461	$113,388,900	1,804	1,449	$329,388,900
Woodfin	0	0	$-	4	4	$3,138,800
Unincorporated Area	3,345	2,605	1,002,780,000	12,834	10,022	$2,904,669,930
Madison County	**0**	**0**	**$-**	**0**	**0**	**$-**
Hot Springs	0	0	$-	0	0	$-
Marshall	0	0	$-	0	0	$-
Mars Hill	0	0	$-	0	0	$-
Unincorporated Area	0	0	$-	0	0	$-
Buncombe Madison Regional Total	**6,972**	**5,503**	**$1,921,998,100**	**25,531**	**20,272**	**$5,976,791,314**

Source: EPA, Local governments

FIGURE 6.14: MOBILE HAZMAT BUFFERS IN THE BUNCOMBE MADISON REGION



Source: NC Department of Transportation

TABLE 6.23: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS SUBSTANCES (MOBILE ANALYSIS – ROAD)

Location	0.5 Mile Buffer			1.0 Mile Buffer		
	Approx. Number of Parcels	Approx. Number Improved	Approx. Improved Value	Approx. Number of Parcels	Approx. Number Improved	Approx. Improved Value
Buncombe County	**73,062**	**56,393**	**$15,745,097,401**	**97,002**	**74,202**	**$19,799,782,001**
Asheville	32,050	25,809	$8,293,529,844	36,286	29,104	$9,164,691,544
Biltmore Forest	498	453	$306,895,100	693	611	$436,415,800
Black Mountain	3,951	2,886	$638,774,900	4,535	3,324	$723,501,800
Montreat	296	229	$69,800,200	546	424	$159,418,000
Weaverville	1,825	1,461	$335,313,500	1,847	1,471	$338,560,700
Woodfin	2,426	1,670	$353,014,327	2,607	1,715	$385,919,627
Unincorporated Area	32,016	23,885	$5,747,769,530	50,488	37,553	$8,591,274,530
Madison County	**8,588**	**4,226**	**$416,124,168**	**11,945**	**5,903**	**$568,764,297**
Hot Springs	439	265	$19,281,922	458	277	$19,705,487

Location	0.5 Mile Buffer			1.0 Mile Buffer		
	Approx. Number of Parcels	Approx. Number Improved	Approx. Improved Value	Approx. Number of Parcels	Approx. Number Improved	Approx. Improved Value
Marshall	561	342	$28,001,088	587	353	$28,762,668
Mars Hill	377	279	$48,251,856	576	431	$65,454,737
Unincorporated Area	7,211	3,340	$320,589,302	10,324	4,842	$454,841,405
Buncombe Madison Regional Total	**81,650**	**60,619**	**$16,161,221,569**	**108,947**	**80,105**	**$20,368,546,298**

Source: NC Department of Transportation, Local Governments

TABLE 6.24: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS SUBSTANCES (MOBILE ANALYSIS – RAILROAD)

Location	0.5 Mile Buffer			1.0 Mile Buffer		
	Approx. Number of Parcels	Approx. Number Improved	Approx. Improved Value	Approx. Number of Parcels	Approx. Number Improved	Approx. Improved Value
Buncombe County	**28,552**	**22,115**	**$5,693,252,677**	**53,408**	**41,567**	**$11,040,976,365**
Asheville	14,438	11,471	$3,075,499,550	25,438	20,256	$5,904,231,408
Biltmore Forest	280	249	$185,119,800	656	586	$412,957,100
Black Mountain	2,043	1,591	$373,340,900	3,766	2,905	$624,543,000
Montreat	-	-	$0	-	-	$0
Weaverville	-	-	$0	-	-	$0
Woodfin	1,598	1,099	$220,242,327	2,265	1,487	$329,909,027
Unincorporated Area	10,193	7,705	$1,839,050,100	21,283	16,333	$3,769,335,830
Madison County	**2,009**	**1,020**	**$83,571,268**	**3,357**	**1,719**	**$140,418,748**
Hot Springs	424	264	$19,004,419	458	277	$19,705,487
Marshall	498	293	$22,838,000	579	352	$28,351,186
Mars Hill	-	-	$0	-	-	$0
Unincorporated Area	1,087	463	$41,728,849	2,320	1,090	$92,362,075
Buncombe Madison Regional Total	**30,561**	**23,135**	**$5,776,823,945**	**56,765**	**43,286**	**$11,181,395,113**

Source: NC Department of Transportation, Local Governments

SOCIAL VULNERABILITY

Given high susceptibility across the entire Buncombe Madison Region, it is assumed that the total population is at risk to hazardous materials incidents. It should be noted that areas of population concentration may be at an elevated risk due to a greater burden to evacuate population quickly.

CRITICAL FACILITIES

Fixed Site Analysis:

The critical facility analysis for fixed TRI sites revealed that there are 133 facilities located in a HAZMAT risk zone. The primary impact zone (0.5-mile buffer) includes 44 facilities throughout the region. All of the facilities in the primary impact zone are located Buncombe County. A list of specific critical facilities and their associated risk can be found in **Table 6.26** at the end of this section.

Mobile Analysis:

The critical facility analysis for road and railroad transportation corridors revealed that there are 353 critical facilities located in the primary (0.5 mile) mobile HAZMAT buffer areas for roads and railroads throughout the region. Although this is a worst-case scenario model, it indicates that most of the critical facilities in the Buncombe Madison region are vulnerable to a potential mobile HAZMAT incident. Additionally, there are 386 critical facilities located in the secondary (1 mile) buffer area of both roads and railroads, accounting for approximately 84 percent of the total number of critical facilities in the region. This may be the result of many critical facilities being located near major roadways for ease of access, but it is nonetheless important to recognize what a large percentage of critical facilities in the region are located in the smaller buffer area. A list of specific critical facilities and their associated risk can be found in **Table 6.26** at the end of this section.

In conclusion, a hazardous material incident has the potential to impact many existing and future buildings, critical facilities, and populations in the Buncombe Madison Region. Those areas in a primary buffer are at the highest risk, though all areas carry some vulnerability due to variations in conditions that could alter the impact area such direction and speed of wind, volume of release, etc.

6.6 CONCLUSIONS ON HAZARD VULNERABILITY

The results of this vulnerability assessment are useful in at least three ways:

- Improving our understanding of the risk associated with the natural hazards in the Buncombe Madison 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 Buncombe Madison 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 Buncombe Madison 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 Buncombe and Madison 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).

Table 6.25 presents a summary of potential annualized loss estimates for each hazard in the Buncombe Madison Region. Due to the reporting of hazard damages primarily at the county level, it was difficult to determine an accurate annualized loss estimate for each municipality. Therefore, an annualized loss was determined through the damage reported through historical occurrences at the county level. If no historical occurrences were reported, an accurate annualized loss estimate could not be obtained. These values should be used as an additional planning tool or measure risk for determining hazard mitigation strategies throughout the region.

TABLE 6.25: POTENTIAL ANNUALIZED LOSSES

Hazard	Buncombe County	Madison County	Total
Drought	-	-	-
Excessive Heat	Negligible	Negligible	Negligible
Hurricane and Coastal Hazards	$8,087,911	$1,432,115	$9,520,026
Tornadoes/ Thunderstorms	$822,765	$584,682	$1,407,447
Severe Winter Weather	$571,384	$178,628	$750,012
Earthquakes	$1,264,156	$249,098	$1,513,254
Geological	Negligible	Negligible	Negligible
Dam Failure	Negligible	Negligible	Negligible
Flooding	$14,314,247	$160,960	$14,475,207
Wildfires	Negligible	Negligible	Negligible
Infectious Disease	Negligible	Negligible	Negligible
Hazardous Substances	Negligible	Negligible	Negligible
Radiological Emergency	Negligible	Negligible	Negligible
Terrorism	Negligible	Negligible	Negligible
Cyber	Negligible	Negligible	Negligible
Electromagnetic Pulse	Negligible	Negligible	Negligible

**In this table, the term "Negligible" is used to indicate that no records of dollar losses for the particular hazard were recorded. This could be the case either because there were no events that caused dollar damage or because documentation of that particular type of event is not well kept.*

As noted previously, all existing and future buildings and populations (including critical facilities) are vulnerable to natural hazards including drought, hurricane and coastal hazards, tornadoes/ thunderstorms, and severe winter weather. Some buildings may be more vulnerable to these hazards based on locations, construction, and building type. **Table 6.25** shows the critical facilities vulnerable to additional hazards analyzed in this section. The table lists those assets that are determined to be exposed to each of the identified hazards (marked with an "**X**")

Facility Name	Facility Type	Natural								Geological		Other						
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)
Buncombe County Emergency Management	EOC	X	X	X	X	X	X			X	X				X	X		
Asheville Fire and Rescue Station 1	Fire/EMS Stations	X	X	X	X	X	X			X	X				X	X		
Asheville Fire and Rescue Station 2	Fire/EMS Stations	X	X	X	X	X	X			X	X			X	X	X	X	X
Asheville Fire and Rescue Station 3 / Buncombe County EMS Station 3	Fire/EMS Stations	X	X	X	X	X	X			X	X				X	X		X
Asheville Fire and Rescue Station 4	Fire/EMS Stations	X	X	X	X	X	X			X	X		X	X	X	X	X	X
Asheville Fire and Rescue Station 5	Fire/EMS Stations	X	X	X	X	X	X			X	X			X	X	X	X	X
Asheville Fire and Rescue Station 6	Fire/EMS Stations	X	X	X	X	X	X			X	X				X	X		X
Asheville Fire and Rescue Station 7	Fire/EMS Stations	X	X	X	X	X	X			X	X				X	X		
Asheville Fire and Rescue Station 8	Fire/EMS Stations	X	X	X	X	X	X			X	X				X	X		
Asheville Fire and Rescue Station 9	Fire/EMS Stations	X	X	X	X	X	X			X	X				X	X	X	X
Asheville Fire and Rescue Station 10	Fire/EMS Stations	X	X	X	X	X	X				X				X	X	X	X
Asheville Fire and Rescue Station 11	Fire/EMS Stations	X	X	X	X	X	X			X	X			X	X	X		
Asheville Regional Airport Department of Public Safety	Fire/EMS Stations	X	X	X	X	X	X			X	X			X	X	X		
Barnardsville Volunteer Fire Department	Fire/EMS Stations	X	X	X	X	X	X	X	X	X	X				X	X		
Beaverdam Volunteer Fire Department Incorporated	Fire/EMS Stations	X	X	X	X	X	X		X	X	X							
Black Mountain Fire Department - Main Station	Fire/EMS Stations	X	X	X	X	X	X			X	X		X	X	X	X	X	X
Black Mountain Fire Department Station 2	Fire/EMS Stations	X	X	X	X	X	X			X	X				X	X	X	X
Black Mountain Fire Department Station 3	Fire/EMS Stations	X	X	X	X	X	X			X	X							
Broad River Volunteer Fire and Rescue Department	Fire/EMS Stations	X	X	X	X	X	X								X	X		
Broad River Volunteer Fire and Rescue Dept.	Fire/EMS Stations	X	X	X	X	X	X								X	X		
Buncombe County Emergency Medical Services Station 2 And 12	Fire/EMS Stations	X	X	X	X	X	X			X	X				X	X		

Facility Name	Facility Type	Natural								Geological		Other						
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)
Buncombe County Emergency Medical Services Station 3	Fire/EMS Stations	X	X	X	X	X	X				X			X	X	X		
Buncombe County Rescue Squad	Fire/EMS Stations	X	X	X	X	X	X			X	X	X			X	X	X	X
Enka Candler Fire and Rescue / Buncombe County EMS Station 7	Fire/EMS Stations	X	X	X	X	X	X				X				X	X	X	X
Fairview Volunteer Fire Department - Main Station	Fire/EMS Stations	X	X	X	X	X	X			X	X			X	X	X		
Fairview Volunteer Fire Department - Substation	Fire/EMS Stations	X	X	X	X	X	X			X	X							
French Broad Volunteer Fire and Rescue	Fire/EMS Stations	X	X	X	X	X	X				X							
Garren Creek Volunteer Fire Department	Fire/EMS Stations	X	X	X	X	X	X											
Haw Creek Fire and Rescue	Fire/EMS Stations	X	X	X	X	X	X			X	X					X		
Jupiter Volunteer Fire Department Incorporated	Fire/EMS Stations	X	X	X	X	X	X				X	X						
Leicester Volunteer Fire Department	Fire/EMS Stations	X	X	X	X	X	X				X				X	X		
Leicester Volunteer Fire Department Station 2	Fire/EMS Stations	X	X	X	X	X	X				X			X				
Medical Emergency Ambulance Incorporated	Fire/EMS Stations	X	X	X	X	X	X			X	X			X	X	X		
Reems Creek Fire Department	Fire/EMS Stations	X	X	X	X	X	X			X	X							
Regional Transport Services	Fire/EMS Stations	X	X	X	X	X	X			X	X				X	X	X	X
Reynolds Volunteer Fire Department/Buncombe County EMS Station 9	Fire/EMS Stations	X	X	X	X	X	X			X	X				X	X		
Riceville Volunteer Fire Department	Fire/EMS Stations	X	X	X	X	X	X			X	X							
Skyland Fire and Rescue District 1/ Buncombe County EMS Station 5	Fire/EMS Stations	X	X	X	X	X	X			X	X		X	X	X	X	X	X
Skyland Fire and Rescue District 2	Fire/EMS Stations	X	X	X	X	X	X			X	X				X	X		
Skyland Fire and Rescue District 3	Fire/EMS Stations	X	X	X	X	X	X			X	X							
Swannanoa Fire and Rescue Department	Fire/EMS Stations	X	X	X	X	X	X			X	X			X	X	X	X	X

Facility Name	Facility Type	Natural								Geological		Other						
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)
Swannanoa Fire and Rescue Department - Bee Tree Station	Fire/EMS Stations	X	X	X	X	X	X			X	X							
Town of Weaversville Fire Department	Fire/EMS Stations	X	X	X	X	X	X			X	X			X	X	X		
Upper Hominy Volunteer Fire and Rescue Dept	Fire/EMS Stations	X	X	X	X	X	X			X	X				X	X		
Upper Hominy Volunteer Fire and Rescue Dept - Substation	Fire/EMS Stations	X	X	X	X	X	X			X	X							
Upper Hominy Volunteer Fire and Rescue Dept.	Fire/EMS Stations	X	X	X	X	X	X			X	X				X	X		
US Forest Service - Arden Ranger Station	Fire/EMS Stations	X	X	X	X	X	X			X	X				X	X		
West Buncombe Volunteer Fire and Rescue / Buncombe County EMS Station 6	Fire/EMS Stations	X	X	X	X	X	X			X	X				X	X		
Woodfin Volunteer Fire Department	Fire/EMS Stations	X	X	X	X	X	X			X	X				X	X	X	X
Asheville Airport Police Department	Law Enforcement	X	X	X	X	X	X			X	X			X	X	X		
Biltmore Forest Police Department	Law Enforcement	X	X	X	X	X	X			X	X				X	X		X
Buncombe County Sheriff's Department	Law Enforcement	X	X	X	X	X	X			X	X				X	X		X
Bureau of Alcohol Tobacco Firearms and Explosives - Asheville Satellite Office	Law Enforcement	X	X	X	X	X	X			X	X				X	X		X
City of Asheville Police Department	Law Enforcement	X	X	X	X	X	X			X	X				X	X		
City of Asheville Police Department - East Asheville Oakley Resource Center	Law Enforcement	X	X	X	X	X	X			X	X				X	X	X	X
City of Asheville Police Department - West Asheville Resource Center	Law Enforcement	X	X	X	X	X	X			X	X				X	X		X
City of Black Mountain Police Department	Law Enforcement	X	X	X	X	X	X			X	X			X	X	X	X	X
City of Montreat Police Department	Law Enforcement	X	X	X	X	X	X			X	X			X	X	X		
Dep't of Health And Human Services Police Department	Law Enforcement	X	X	X	X	X	X			X	X		X	X	X	X	X	X

Facility Name	Facility Type	Natural								Geological		Other						
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)
Montreat College - Montreat Campus Police Department	Law Enforcement	X	X	X	X	X	X			X	X							
National Park Service - Blue Ridge Parkway Ranger Station	Law Enforcement	X	X	X	X	X	X			X	X		X	X	X	X	X	X
NC Division of Forest Resources - Region Three	Law Enforcement	X	X	X	X	X	X			X	X				X	X		
NC State Highway Patrol - Western Criminal Interdiction Team	Law Enforcement	X	X	X	X	X	X			X	X				X	X		
NC State Highway Patrol Troop G HQ	Law Enforcement	X	X	X	X	X	X			X	X				X	X		
NPS - Blue Ridge Parkway Oteen Ranger Station	Law Enforcement	X	X	X	X	X	X			X	X	X			X	X		X
Town of Weaverville Police Department	Law Enforcement	X	X	X	X	X	X			X	X			X	X	X		
UNC-A Campus Police	Law Enforcement	X	X	X	X	X	X			X	X				X	X	X	X
US Fish And Wildlife Service - Office of Law Enforcement - Asheville	Law Enforcement	X	X	X	X	X	X			X	X				X	X	X	X
US IRS Criminal Investigation Division - Asheville	Law Enforcement	X	X	X	X	X	X			X	X				X	X		X
US Marshals Service - Asheville	Law Enforcement	X	X	X	X	X	X			X	X				X	X		X
Woodfin Police Department	Law Enforcement	X	X	X	X	X	X			X	X				X	X	X	X
35 Dogwood	Medical Facility	X	X	X	X	X	X			X	X							
54 Tipperary	Medical Facility	X	X	X	X	X	X			X	X					X		
Adams Family Care Home	Medical Facility	X	X	X	X	X	X			X	X							
Addiction Recovery Institute	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Advanced Home Care	Medical Facility	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X
Advantage Home Care, Inc.	Medical Facility	X	X	X	X	X	X	X	X	X	X				X	X	X	X
Alterra Clare Bridge of Asheville	Medical Facility	X	X	X	X	X	X			X	X		X	X	X	X	X	X
Americas Addiction Trtmnt-1796 Hendersonville Rd	Medical Facility	X	X	X	X	X	X			X	X		X	X	X	X	X	X
Arbor Terrace of Asheville	Medical Facility	X	X	X	X	X	X			X	X			X	X	X	X	X

Facility Name	Facility Type	Natural								Geological		Other						
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)
Arcadia Health Care	Medical Facility	X	X	X	X	X	X			X	X			X	X	X		X
Arden Family Care Home #2	Medical Facility	X	X	X	X	X	X			X	X			X	X	X		X
Arden's Family Care Home #1	Medical Facility	X	X	X	X	X	X			X	X			X		X		X
Ardenwoods	Medical Facility	X	X	X	X	X	X	X	X	X	X				X	X		
ARP/Phoenix/Orange Street	Medical Facility	X	X	X	X	X	X			X	X				X	X		
Asheville Alzheimer's Care Center	Medical Facility	X	X	X	X	X	X			X	X			X	X	X		X
Asheville Health Care Center	Medical Facility	X	X	X	X	X	X		X	X	X		X	X	X	X	X	X
Asheville Institute, Inc.	Medical Facility	X	X	X	X	X	X			X	X				X	X		
Asheville Manor	Medical Facility	X	X	X	X	X	X			X	X			X	X	X		X
Aston Park Health Care Center, Inc.	Medical Facility	X	X	X	X	X	X			X	X				X	X		
Avondale Dda #1	Medical Facility	X	X	X	X	X	X			X	X			X	X	X		
Avondale Dda #2	Medical Facility	X	X	X	X	X	X			X	X			X	X	X		
Banaltrum Private Duty Caregivers, Ltd.	Medical Facility	X	X	X	X	X	X			X	X				X	X		
Bayada Nurses, Inc.	Medical Facility	X	X	X	X	X	X			X	X		X	X	X	X	X	X
Beaverdam Family Care Home	Medical Facility	X	X	X	X	X	X	X	X	X	X							
Becky's Rest Home #1	Medical Facility	X	X	X	X	X	X			X	X							
Becky's Rest Home #2	Medical Facility	X	X	X	X	X	X			X	X							
Belleaire	Medical Facility	X	X	X	X	X	X			X	X				X	X	X	X
Beth Powell Home	Medical Facility	X	X	X	X	X	X			X	X		X	X	X	X		X
Betty Jo Norton Home	Medical Facility	X	X	X	X	X	X			X	X				X	X	X	X
Beverly Health Care - Asheville	Medical Facility	X	X	X	X	X	X			X	X							
Beverly Lyda Home	Medical Facility	X	X	X	X	X	X			X	X		X	X		X	X	X
Biltmore Family Care Home #1	Medical Facility	X	X	X	X	X	X			X	X			X	X	X		X
Biltmore Family Care Home #2	Medical Facility	X	X	X	X	X	X			X	X			X	X	X		X
Biltmore Family Care Home #3	Medical Facility	X	X	X	X	X	X			X	X			X	X	X		X

Facility Name	Facility Type	Natural								Geological		Other						
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)
Biltmore Family Care Home #4	Medical Facility	X	X	X	X	X	X			X	X			X	X	X		X
Biltmore Forest Family Care Center	Medical Facility	X	X	X	X	X	X			X	X			X	X	X	X	X
Blue Ridge Area Foundation/Vocational Services	Medical Facility	X	X	X	X	X	X		X	X	X				X	X	X	X
Blue Ridge Center-283	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Blue Ridge Center-356	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Blue Ridge Home Care	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Blue Ridge Homes	Medical Facility	X	X	X	X	X	X			X	X		X	X	X	X	X	X
Blue Ridge Rehabilitation And Healthcare Center	Medical Facility	X	X	X	X	X	X			X	X			X	X	X		X
Brian Center Health & Rehabilitation/Weaverville	Medical Facility	X	X	X	X	X	X			X	X			X	X	X		
Brooks-Howell Home	Medical Facility	X	X	X	X	X	X			X	X				X	X		
Carolina Mtn. Dda Group Home	Medical Facility	X	X	X	X	X	X				X					X		
Carolyn Propst Home	Medical Facility	X	X	X	X	X	X			X	X			X	X	X	X	X
Child And Family Center of Arden	Medical Facility	X	X	X	X	X	X			X	X		X	X	X	X	X	X
Chiles Avenue Group Home	Medical Facility	X	X	X	X	X	X			X	X				X	X	X	X
Clearview Terrace	Medical Facility	X	X	X	X	X	X			X	X				X	X		
CNC/Access	Medical Facility	X	X	X	X	X	X			X	X				X	X		
Coram Alternate Site Services, Inc.	Medical Facility	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
Counseling And Recovery Center	Medical Facility	X	X	X	X	X	X			X	X				X	X		
Counterpoint	Medical Facility	X	X	X	X	X	X			X	X				X	X		
Country Time Village #10	Medical Facility	X	X	X	X	X	X				X							
Country Time Village #11	Medical Facility	X	X	X	X	X	X				X							
Country Time Village #12	Medical Facility	X	X	X	X	X	X				X							
Country Time Village #13	Medical Facility	X	X	X	X	X	X				X							
Country Time Village #3	Medical Facility	X	X	X	X	X	X				X							
Country Time Village #4	Medical Facility	X	X	X	X	X	X				X							

Facility Name	Facility Type	Natural								Geological		Other						
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)
Country Time Village #5	Medical Facility	X	X	X	X	X	X				X							
Country Time Village #6	Medical Facility	X	X	X	X	X	X				X							
Country Time Village #7	Medical Facility	X	X	X	X	X	X				X							
Country Time Village #8	Medical Facility	X	X	X	X	X	X				X	X						
Country Time Village #9	Medical Facility	X	X	X	X	X	X				X							
Country Time Village I	Medical Facility	X	X	X	X	X	X				X							
Country Time Village II	Medical Facility	X	X	X	X	X	X				X							
Creative Clay, Inc.	Medical Facility	X	X	X	X	X	X	X	X	X	X				X	X	X	X
Creekside Home	Medical Facility	X	X	X	X	X	X			X	X					X		X
Crescent View	Medical Facility	X	X	X	X	X	X			X	X			X	X	X	X	X
Crossroads Day Treatment Center	Medical Facility	X	X	X	X	X	X			X	X				X	X		
Cummings, Reuter, Lions And Reynolds Cottages	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Davidson Home	Medical Facility	X	X	X	X	X	X			X	X			X		X		X
Deerfield Episcopal Retirement Community, Inc.	Medical Facility	X	X	X	X	X	X			X	X			X	X	X	X	X
Dillingham Family Care Home	Medical Facility	X	X	X	X	X	X			X	X							
Dogwood Court Home	Medical Facility	X	X	X	X	X	X			X	X							
Eliada Homes/ Donald And Carolyn Andrick	Medical Facility	X	X	X	X	X	X			X	X				X	X		
Eliada Homes/Bob & Teresa Mcminn	Medical Facility	X	X	X	X	X	X				X					X		
Eliada Homes/James And Wanda Mccurry	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Eliada Homes/Martha Gardenhight	Medical Facility	X	X	X	X	X	X			X	X			X	X	X	X	X
Eliada Homes/Otis And Alice Ware	Medical Facility	X	X	X	X	X	X			X	X				X	X	X	X
Ellenwood	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Emerald Ridge Rehabilitation And Care Center	Medical Facility	X	X	X	X	X	X			X	X				X	X	X	X
Erwin Hills Family Care Home	Medical Facility	X	X	X	X	X	X			X	X				X	X		
Fairview Family Care Home #1	Medical Facility	X	X	X	X	X	X			X	X							

Facility Name	Facility Type	Natural								Geological		Other						
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)
Fairview Family Care Home #2	Medical Facility	X	X	X	X	X	X			X	X							
Fairview Family Care Home #3	Medical Facility	X	X	X	X	X	X			X	X							
Fairview Family Care Home #4	Medical Facility	X	X	X	X	X	X			X	X							
Farm School Road Home	Medical Facility	X	X	X	X	X	X			X	X					X		
Femcare, Inc.	Medical Facility	X	X	X	X	X	X			X	X				X	X		
Ferndale Home	Medical Facility	X	X	X	X	X	X								X	X		
First Step Farm-Men	Medical Facility	X	X	X	X	X	X			X	X							
First Step Farm-Women	Medical Facility	X	X	X	X	X	X				X							
Flesher's Fairview Health Care Center, Inc.	Medical Facility	X	X	X	X	X	X			X	X			X	X	X		
Flesher's Fairview Rest Home, Inc.	Medical Facility	X	X	X	X	X	X			X	X			X	X	X		
Flynn Christian Fellowship Home	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Foundation Psychological Services, P.A.	Medical Facility	X	X	X	X	X	X	X	X	X	X							
French Broad Family Care	Medical Facility	X	X	X	X	X	X				X	X						
Gaddy Home	Medical Facility	X	X	X	X	X	X			X	X				X	X	X	X
Georgetown Family Care Home	Medical Facility	X	X	X	X	X	X			X	X				X	X		
Givens Estates United Methodist Retirement Communit	Medical Facility	X	X	X	X	X	X			X	X			X	X	X	X	X
Givens Health Center	Medical Facility	X	X	X	X	X	X			X	X			X	X	X	X	X
Goodwill Ind. of NW NC, Inc./Asheville Employment & Training	Medical Facility	X	X	X	X	X	X			X	X				X	X	X	X
Grace Manor	Medical Facility	X	X	X	X	X	X				X							
Grandfather Home For Children-Asheville	Medical Facility	X	X	X	X	X	X			X	X					X		
Hall Street Home	Medical Facility	X	X	X	X	X	X			X	X				X	X		
Haywood Heights	Medical Facility	X	X	X	X	X	X			X	X					X	X	X
Heart Path Cardiac Rehabilitation Program	Medical Facility	X	X	X	X	X	X			X	X				X	X		X

Facility Name	Facility Type	Natural								Geological		Other						
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)
Heather Court	Medical Facility	X	X	X	X	X	X			X	X	X	X	X	X	X		
Henry Home	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Highland Farms, Inc.	Medical Facility	X	X	X	X	X	X			X	X			X	X	X	X	X
Highland Farms, Inc.	Medical Facility	X	X	X	X	X	X			X	X			X	X	X	X	X
Hillside Group Home	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Holmes Family Care Home	Medical Facility	X	X	X	X	X	X			X	X		X	X	X	X	X	X
Holmes Home	Medical Facility	X	X	X	X	X	X			X	X		X	X	X	X		X
Hope House	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Horizon Recovery	Medical Facility	X	X	X	X	X	X			X	X				X	X		
Interim Healthcare	Medical Facility	X	X	X	X	X	X			X	X			X	X	X		X
Irene Wortham Residential Center-Azalea	Medical Facility	X	X	X	X	X	X			X	X			X	X	X	X	X
Johnson Drive Home	Medical Facility	X	X	X	X	X	X			X	X				X	X		
Kathy's Place	Medical Facility	X	X	X	X	X	X			X	X							
Kelly Home Care Services, Inc.	Medical Facility	X	X	X	X	X	X			X	X				X	X		
Ken & Lynn's Place	Medical Facility	X	X	X	X	X	X			X	X			X	X	X	X	X
Kennilworth Family Care Home	Medical Facility	X	X	X	X	X	X			X	X				X	X		
Kim Andrick Home	Medical Facility	X	X	X	X	X	X			X	X							
Knob Hill Family Care Home	Medical Facility	X	X	X	X	X	X			X	X				X	X		
Lee's Ridge Family Care Home	Medical Facility	X	X	X	X	X	X			X	X					X		
Leicester Heights Family Care	Medical Facility	X	X	X	X	X	X				X					X		X
Liberty Corner Enterprises	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Liberty House	Medical Facility	X	X	X	X	X	X			X	X			X	X	X	X	X
Liberty Oaks #1	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Liberty Oaks #2	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Lincare, Inc.	Medical Facility	X	X	X	X	X	X			X	X				X	X		

Facility Name	Facility Type	Natural								Geological		Other						
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)
Loftis Oxygen & Medical Euipment, Inc.	Medical Facility	X	X	X	X	X	X			X	X		X	X	X	X	X	X
LWC-Rose Street Home	Medical Facility	X	X	X	X	X	X			X	X			X	X	X		X
LWRC-Dogwood	Medical Facility	X	X	X	X	X	X			X	X			X	X	X		X
Maggie's Place	Medical Facility	X	X	X	X	X	X				X				X	X		X
Magnolia Health Care Center	Medical Facility	X	X	X	X	X	X			X	X		X	X	X	X	X	X
Mahec Women's Health Center	Medical Facility	X	X	X	X	X	X			X	X			X	X	X		X
Marjorie Mccune Memorial Center	Medical Facility	X	X	X	X	X	X			X	X	X	X	X		X	X	X
Marshall	Medical Facility	X	X	X	X	X	X			X	X				X	X		
Marty's Place	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Mary Benson House	Medical Facility	X	X	X	X	X	X			X	X				X	X	X	X
Maxim Healthcare Services, Inc.	Medical Facility	X	X	X	X	X	X			X	X				X	X	X	X
Maxim Healthcare Services, Inc.	Medical Facility	X	X	X	X	X	X			X	X				X	X	X	X
Mayflower House	Medical Facility	X	X	X	X	X	X			X	X							
Mcdaniel's Family Care Home	Medical Facility	X	X	X	X	X	X			X	X				X	X	X	X
Meadowbrook Family Care Home	Medical Facility	X	X	X	X	X	X				X							
Memorial Mission Hospital and Mission Surgicare Center	Medical Facility	X	X	X	X	X	X			X	X			X	X	X		X
Millbrook Family Care	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Mitchell Heights Family Care #3	Medical Facility	X	X	X	X	X	X			X	X				X	X	X	X
Mitchell Heights Family Care Home 1	Medical Facility	X	X	X	X	X	X			X	X				X	X	X	X
Mitchell Heights Family Care Home 2	Medical Facility	X	X	X	X	X	X			X	X				X	X	X	X
Mitchell Heights Family Care Home 4	Medical Facility	X	X	X	X	X	X			X	X				X	X	X	X
Mitchell Heights Family Care Home 5	Medical Facility	X	X	X	X	X	X			X	X				X	X	X	X
Moody Home	Medical Facility	X	X	X	X	X	X				X							
Mountain Area Hospice	Medical Facility	X	X	X	X	X	X			X	X				X	X	X	X

Facility Name	Facility Type	Natural								Geological		Other						
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)
Mountain Brook Long Term Care	Medical Facility	X	X	X	X	X	X			X	X					X		
Mountain House	Medical Facility	X	X	X	X	X	X			X	X				X	X		
Mountain Ridge Wellness Center, Llc	Medical Facility	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
Mountain Treatment Center	Medical Facility	X	X	X	X	X	X			X	X				X	X		
Mountain Valley Retirement Home	Medical Facility	X	X	X	X	X	X			X	X							
Mt. Pisgah Family Care Home	Medical Facility	X	X	X	X	X	X			X	X					X		
Neil Dobbins Center	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
New Stock Road Group Home	Medical Facility	X	X	X	X	X	X			X	X			X	X	X		
Oakley Home	Medical Facility	X	X	X	X	X	X			X	X				X	X	X	X
Onas's Place	Medical Facility	X	X	X	X	X	X			X	X				X	X		
Orthopaedic Surgery Center of Asheville	Medical Facility	X	X	X	X	X	X			X	X			X	X	X		X
Penley Boarding Home #1	Medical Facility	X	X	X	X	X	X			X	X			X	X	X		
Pisgah Group Home	Medical Facility	X	X	X	X	X	X			X	X			X	X	X	X	X
Pisgah Manor Health Care Center	Medical Facility	X	X	X	X	X	X	X	X		X					X		
Pleasant Cove	Medical Facility	X	X	X	X	X	X				X							
Plemmons Family Care Home #1	Medical Facility	X	X	X	X	X	X				X					X		X
Plemmons Family Care Home #2	Medical Facility	X	X	X	X	X	X				X			X	X	X		X
Pro Temps Medical Staffing	Medical Facility	X	X	X	X	X	X			X	X				X	X	X	X
Psa Healthcare	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Richard A. Wood, Jr. Assisted Living Center	Medical Facility	X	X	X	X	X	X			X	X			X	X	X	X	X
Richmond Hill Rest Home #1	Medical Facility	X	X	X	X	X	X			X	X					X	X	X
Richmond Hill Rest Home #2	Medical Facility	X	X	X	X	X	X			X	X					X	X	X
Richmond Hill Rest Home #3	Medical Facility	X	X	X	X	X	X			X	X					X	X	X
Richmond Hill Rest Home #4	Medical Facility	X	X	X	X	X	X			X	X					X	X	X
Richmond Hill Rest Home #5	Medical Facility	X	X	X	X	X	X			X	X					X	X	X

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Rickman Nursing Care Center	Medical Facility	X	X	X	X	X	X			X	X					X	X	X
Rivendell Woods A	Medical Facility	X	X	X	X	X	X			X	X	X				X	X	X
Rivendell Woods B	Medical Facility	X	X	X	X	X	X			X	X	X				X	X	X
Rivendell Woods East Unit L	Medical Facility	X	X	X	X	X	X			X	X		X	X	X	X	X	X
Rivendell Woods East Unit M	Medical Facility	X	X	X	X	X	X			X	X		X	X	X	X	X	X
Rivendell Woods East Unit N	Medical Facility	X	X	X	X	X	X			X	X		X	X	X	X	X	X
Rivendell Woods G	Medical Facility	X	X	X	X	X	X			X	X	X				X	X	X
Rivendell Woods North Unit C	Medical Facility	X	X	X	X	X	X			X	X	X				X	X	X
Rivendell Woods North Unit D	Medical Facility	X	X	X	X	X	X			X	X	X				X	X	X
Rivendell Woods North Unit F	Medical Facility	X	X	X	X	X	X			X	X	X				X	X	X
Rivendell Woods Unit E	Medical Facility	X	X	X	X	X	X			X	X	X				X	X	X
Rivendell Woods Unit K	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Rivendell Woods West Unit H	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Rivendell Woods West Unit I	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Rivendell Woods West Unit J	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Rivendell Woods, Inc. Unit O	Medical Facility	X	X	X	X	X	X			X	X		X	X	X	X	X	X
Riverview Group Home	Medical Facility	X	X	X	X	X	X			X	X			X		X	X	X
Robert S. Swain Recovery Center	Medical Facility	X	X	X	X	X	X			X	X			X	X	X	X	X
Rock Hill Family Care Home	Medical Facility	X	X	X	X	X	X			X	X			X	X	X	X	X
Roff's Family Care Home	Medical Facility	X	X	X	X	X	X			X	X			X	X	X		X
Rogers/Uldricks Home	Medical Facility	X	X	X	X	X	X			X	X			X	X	X		
Samaritan Place Assisted Living	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Shady Brook Assisted Living	Medical Facility	X	X	X	X	X	X			X	X					X		
Shangri-La Family Care Home #1	Medical Facility	X	X	X	X	X	X				X							
Shangri-La Family Care Home #2	Medical Facility	X	X	X	X	X	X				X							

Facility Name	Facility Type	Natural								Geological		Other						
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)
Solution Therapy Associates	Medical Facility	X	X	X	X	X	X			X	X			X	X	X	X	X
Sonrise	Medical Facility	X	X	X	X	X	X			X	X							
South Asheville Family Care Home	Medical Facility	X	X	X	X	X	X			X	X		X	X	X	X	X	X
St. Dunstan Manor Group Home	Medical Facility	X	X	X	X	X	X			X	X		X	X	X	X	X	X
St. Joseph's Hospital	Medical Facility	X	X	X	X	X	X			X	X			X	X	X		X
Stapleton Home	Medical Facility	X	X	X	X	X	X				X							
Stat Nursing Service, Inc.	Medical Facility	X	X	X	X	X	X			X	X				X	X	X	X
Summersgill Home	Medical Facility	X	X	X	X	X	X			X	X							
Susan Little Home	Medical Facility	X	X	X	X	X	X			X	X			X	X	X	X	X
Tar Heel Home Health	Medical Facility	X	X	X	X	X	X			X	X			X	X	X	X	X
Temperance House	Medical Facility	X	X	X	X	X	X			X	X			X	X	X	X	X
The Baker Home	Medical Facility	X	X	X	X	X	X			X	X			X	X	X	X	X
The Endoscopy Center	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
The Laurels of Greentree Ridge	Medical Facility	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X
The Laurels of Summit Ridge	Medical Facility	X	X	X	X	X	X			X	X				X	X		
The Lighthouse Recovery Center	Medical Facility	X	X	X	X	X	X			X	X				X	X		
The Oaks At Sweeten Creek	Medical Facility	X	X	X	X	X	X			X	X		X	X	X	X	X	X
The Ray Home	Medical Facility	X	X	X	X	X	X				X							
The Relationship Center	Medical Facility	X	X	X	X	X	X			X	X				X	X	X	X
The Riddle Institute/Studio Xi	Medical Facility	X	X	X	X	X	X			X	X				X	X		
The Village Inn	Medical Facility	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
The Window Box	Medical Facility	X	X	X	X	X	X			X	X		X	X	X	X	X	X
The Women At Risk Program	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Thoms Rehabilitation Hospital	Medical Facility	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X
Turning Point Services/ Teresa Warren Home	Medical Facility	X	X	X	X	X	X				X				X	X		

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Umar-Givens Estates	Medical Facility	X	X	X	X	X	X			X	X			X	X	X	X	X
Umar-Haw Creek	Medical Facility	X	X	X	X	X	X			X	X					X		
Unique Care Incorporated	Medical Facility	X	X	X	X	X	X			X	X				X	X		
United Medical, Inc.	Medical Facility	X	X	X	X	X	X	X	X	X	X				X	X	X	X
USA Staffing	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Visiting Health Professionals	Medical Facility	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X
Visiting Health Professionals, Inc.	Medical Facility	X	X	X	X	X	X			X	X				X	X	X	X
Wentworth Home	Medical Facility	X	X	X	X	X	X			X	X			X	X	X	X	X
Westwood Assisted Living - A	Medical Facility	X	X	X	X	X	X			X	X				X	X	X	X
Westwood Assisted Living - B	Medical Facility	X	X	X	X	X	X			X	X				X	X	X	X
White Fawn Family Care Home	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Windwood Rest Home	Medical Facility	X	X	X	X	X	X				X					X		
WNC Group Home - Kenmore	Medical Facility	X	X	X	X	X	X			X	X			X	X	X	X	X
WNC Group Home - Ora	Medical Facility	X	X	X	X	X	X			X	X			X	X	X	X	X
WNC Group Home - Pine Spring	Medical Facility	X	X	X	X	X	X			X	X				X	X		
WNC Group Home-Montford	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Worley Place	Medical Facility	X	X	X	X	X	X			X	X				X	X		X
Yale Avenue Home	Medical Facility	X	X	X	X	X	X			X	X				X	X		
Artspace Charter	Public School	X	X	X	X	X	X			X	X				X	X	X	X
Asheville High	Public School	X	X	X	X	X	X			X	X		X	X	X	X	X	X
Asheville Middle	Public School	X	X	X	X	X	X			X	X				X	X	X	X
Avery's Creek Elementary	Public School	X	X	X	X	X	X			X	X		X	X	X	X		
Barnardsville Elementary	Public School	X	X	X	X	X	X			X	X				X	X		
Bell Elementary	Public School	X	X	X	X	X	X			X	X				X	X		
Black Mountain Elementary	Public School	X	X	X	X	X	X			X	X		X	X	X	X	X	X

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		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)
Black Mountain Primary	Public School	X	X	X	X	X	X			X	X		X	X	X	X	X	X
Buncombe County Early College	Public School	X	X	X	X	X	X			X	X		X	X	X	X	X	X
Buncombe County Middle College	Public School	X	X	X	X	X	X			X	X		X	X	X	X	X	X
Buncombe Regional Detention	Public School	X	X	X	X	X	X			X	X				X	X		
Candler Elementary	Public School	X	X	X	X	X	X				X				X	X	X	X
Cane Creek Middle	Public School	X	X	X	X	X	X			X	X							
Claxton Elementary	Public School	X	X	X	X	X	X			X	X				X	X		
Community High School	Public School	X	X	X	X	X	X			X	X		X	X	X	X	X	X
Eblen Intermediate	Public School	X	X	X	X	X	X			X	X					X		
Emma Elementary	Public School	X	X	X	X	X	X			X	X					X	X	X
Enka High	Public School	X	X	X	X	X	X				X					X		X
Enka Middle	Public School	X	X	X	X	X	X				X			X	X	X	X	X
Erwin High	Public School	X	X	X	X	X	X			X	X					X		
Erwin Middle	Public School	X	X	X	X	X	X			X	X				X	X		
Estes Elementary	Public School	X	X	X	X	X	X			X	X	X		X	X	X		X
Evergreen Community Charter	Public School	X	X	X	X	X	X			X	X					X		
Fairview Elementary	Public School	X	X	X	X	X	X			X	X		X	X	X	X		
Francine Delany New School	Public School	X	X	X	X	X	X			X	X				X	X		
Glen Arden Elementary	Public School	X	X	X	X	X	X			X	X					X		
Hall Fletcher Elementary	Public School	X	X	X	X	X	X			X	X				X	X		X
Haw Creek Elementary	Public School	X	X	X	X	X	X			X	X				X	X		
Hominy Valley Elementary	Public School	X	X	X	X	X	X				X					X		X
Ira B Jones Elementary	Public School	X	X	X	X	X	X			X	X	X			X	X		
Isaac Dickson Elementary	Public School	X	X	X	X	X	X			X	X				X	X	X	X
Johnston Elementary	Public School	X	X	X	X	X	X			X	X				X	X		X

Facility Name	Facility Type	Natural								Geological		Other						
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)
Koontz Intermediate	Public School	X	X	X	X	X	X			X	X			X	X	X		X
Leicester Elementary	Public School	X	X	X	X	X	X				X				X	X		
North Buncombe Elementary	Public School	X	X	X	X	X	X				X	X						
North Buncombe High	Public School	X	X	X	X	X	X				X					X		
North Buncombe Middle	Public School	X	X	X	X	X	X				X			X	X	X		
North Windy Ridge Intermediate	Public School	X	X	X	X	X	X				X				X	X		
Oakley Elementary	Public School	X	X	X	X	X	X			X	X				X	X	X	X
Owen High	Public School	X	X	X	X	X	X			X	X							X
Owen Middle	Public School	X	X	X	X	X	X			X	X			X		X		X
Pisgah Elementary	Public School	X	X	X	X	X	X				X				X	X		
Reynolds High	Public School	X	X	X	X	X	X	X	X	X	X				X	X		
Reynolds Middle	Public School	X	X	X	X	X	X			X	X				X	X		
Roberson High	Public School	X	X	X	X	X	X			X	X			X	X	X		X
Sand Hillvenable Elem	Public School	X	X	X	X	X	X				X			X	X	X	X	X
School of Inquiry And Life Sciences	Public School	X	X	X	X	X	X			X	X		X	X	X	X	X	X
Valley Springs Middle	Public School	X	X	X	X	X	X			X	X			X	X	X		X
Vance Elementary	Public School	X	X	X	X	X	X			X	X				X	X		X
Weaverville Elementary	Public School	X	X	X	X	X	X			X	X		X	X	X	X		
Weaverville Primary	Public School	X	X	X	X	X	X			X	X			X	X	X		
West Buncombe Elementary	Public School	X	X	X	X	X	X			X	X					X		
Williams Elementary	Public School	X	X	X	X	X	X			X	X		X	X	X	X		X
Woodfin Elementary	Public School	X	X	X	X	X	X			X	X				X	X	X	X
Madison County Emergency Operations Center	Emergency Operation Center	X	X	X	X	X	X				X				X	X		X

Facility Name	Facility Type	Natural								Geological		Other						
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)
Madison County Emergency Operations Center-Alternate	Emergency Operation Center	X	X	X	X	X	X				X				X	X		
Big Pine Volunteer Fire Department Incorporated	Fire/EMS Stations	X	X	X	X	X	X				X							
Ebbs Chapel Volunteer Fire Department Incorporated	Fire/EMS Stations	X	X	X	X	X	X	X	X		X					X		
Ebbs Chapel Volunteer Fire Department Incorporated	Fire/EMS Stations	X	X	X	X	X	X	X	X		X					X		
Hot Springs Fire Department	Fire/EMS Stations	X	X	X	X	X	X	X	X		X				X	X	X	X
Laurel Volunteer Fire Department Incorporated	Fire/EMS Stations	X	X	X	X	X	X				X				X	X		
Madison County Ambulance Service	Fire/EMS Stations	X	X	X	X	X	X				X				X	X		
Madison County Ambulance Service 6	Fire/EMS Stations	X	X	X	X	X	X				X				X	X		
Madison County Ambulance Service 7	Fire/EMS Stations	X	X	X	X	X	X	X	X		X				X	X	X	X
Mars Hill Volunteer Fire Department	Fire/EMS Stations	X	X	X	X	X	X				X				X	X		
Mars Hill Volunteer Fire Department	Fire/EMS Stations	X	X	X	X	X	X				X				X	X		
Marshall Community Volunteer Fire Department	Fire/EMS Stations	X	X	X	X	X	X	X	X		X				X	X	X	X
NC Division of Forest Resources District 1 - Madison County	Fire/EMS Stations	X	X	X	X	X	X				X				X	X		
Spring Creek Volunteer Fire Department Incorporated	Fire/EMS Stations	X	X	X	X	X	X				X				X	X		
Spring Creek Volunteer Fire Department Incorporated	Fire/EMS Stations	X	X	X	X	X	X				X				X	X		
The Country Volunteer Fire Department Incorporated	Fire/EMS Stations	X	X	X	X	X	X				X				X	X		
The Country Volunteer Fire Department Incorporated	Fire/EMS Stations	X	X	X	X	X	X				X				X	X		

Facility Name	Facility Type	Natural								Geological		Other						
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)
Walnut Community Volunteer Fire Department	Fire/EMS Stations	X	X	X	X	X	X				X				X	X		
Hot Springs Police Department	Law Enforcement	X	X	X	X	X	X	X	X		X				X	X	X	X
Madison County Sheriffs Department / Jail	Law Enforcement	X	X	X	X	X	X	X	X		X				X	X	X	X
Mars Hill Police Department	Law Enforcement	X	X	X	X	X	X				X				X	X		
Marshall Police Department	Law Enforcement	X	X	X	X	X	X	X	X		X				X	X	X	X
Asheville Institute, Inc.	Medical Facility	X	X	X	X	X	X				X				X	X		
Blue Ridge Center-Madison County Program	Medical Facility	X	X	X	X	X	X				X				X	X		
Elderberry Health Care	Medical Facility	X	X	X	X	X	X				X				X	X		X
Hot Springs Family Care Home #1	Medical Facility	X	X	X	X	X	X				X				X	X	X	X
Hot Springs Family Care Home #2	Medical Facility	X	X	X	X	X	X				X				X	X	X	X
Hot Springs Family Care Home #3	Medical Facility	X	X	X	X	X	X				X				X	X	X	X
Madison County Department of Community Services	Medical Facility	X	X	X	X	X	X				X							
Madison County Group Home	Medical Facility	X	X	X	X	X	X				X				X	X	X	X
Madison Home Care & Hospice	Medical Facility	X	X	X	X	X	X				X				X	X		
Madison Manor Nursing Center	Medical Facility	X	X	X	X	X	X				X					X		
Mars Hill Retirement Community	Medical Facility	X	X	X	X	X	X				X				X	X		
Mintz Family Care Home #1	Medical Facility	X	X	X	X	X	X				X				X	X	X	X
Mintz Family Care Home #2	Medical Facility	X	X	X	X	X	X				X				X	X	X	X
Mintz Family Care Home #3	Medical Facility	X	X	X	X	X	X				X				X	X	X	X
Mintz Family Care Home #4	Medical Facility	X	X	X	X	X	X				X	X			X	X		
Mintz Family Care Home #5	Medical Facility	X	X	X	X	X	X				X	X			X	X		
Mountain Opportunity Center-Madison	Medical Facility	X	X	X	X	X	X				X				X	X		X
Unaka Center	Medical Facility	X	X	X	X	X	X				X				X	X		
Brush Creek Elementary	Public School	X	X	X	X	X	X				X				X	X		
Hot Springs Elementary	Public School	X	X	X	X	X	X				X				X	X	X	X

Facility Name	Facility Type	Natural								Geological		Other						
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)
Laurel Elementary	Public School	X	X	X	X	X	X	X	X		X				X	X		
Madison Early College High	Public School	X	X	X	X	X	X				X							
Madison High	Public School	X	X	X	X	X	X				X				X	X		
Madison Middle	Public School	X	X	X	X	X	X				X				X	X		
Mars Hill Elementary	Public School	X	X	X	X	X	X				X					X		

SECTION 7
CAPABILITY ASSESSMENT

This section of the Plan discusses the capability of the communities in the Buncombe Madison Region to implement hazard mitigation activities. It consists of the following four subsections:

- 7.1 What is a Capability Assessment?
- 7.2 Conducting the Capability Assessment
- 7.3 Capability Assessment Findings
- 7.4 Conclusions on Local Capability

7.1 WHAT IS A CAPABILITY ASSESSMENT?

The purpose of conducting a capability assessment is to determine the ability of a local jurisdiction to implement a comprehensive mitigation strategy and to identify potential opportunities for establishing or enhancing specific mitigation policies, programs, or projects.[1] As in any planning process, it is important to try to establish which goals, objectives, and/or actions are feasible based on an understanding of the organizational capacity of those agencies or departments tasked with their implementation. A capability assessment helps to determine which mitigation actions are practical, and likely to be implemented over time, given a local government's planning and regulatory framework, level of administrative and technical support, amount of fiscal resources, and current political climate.

A capability assessment has two primary components: 1) an inventory of a local jurisdiction's relevant plans, ordinances, or programs already in place and 2) an analysis of its capacity to carry them out. Careful examination of local capabilities will detect any existing gaps, shortfalls, or weaknesses with ongoing government activities that could hinder proposed mitigation activities and possibly exacerbate community hazard vulnerability. A capability assessment also highlights the positive mitigation measures already in place or being implemented at the local government level, which should continue to be supported and enhanced through future mitigation efforts.

The capability assessment completed for the Buncombe Madison 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

In order to facilitate the inventory and analysis of local government capabilities within the Buncombe Madison counties, a detailed Capability Assessment Survey was completed for each of the participating jurisdictions based on the information found in existing hazard mitigation plans and local government websites. The survey questionnaire compiled information on a variety of "capability indicators" such as existing local plans, policies, programs, or ordinances that contribute to and/or hinder the region's ability to implement hazard mitigation actions. Other indicators included information related to the communities' fiscal, administrative, and technical capabilities, such as access to local budgetary and personnel resources for mitigation purposes. The current political climate, an important consideration for any local planning or decision making process, was also evaluated with respect to hazard mitigation.

At a minimum, survey results provide an extensive inventory of existing local plans, ordinances, programs, and resources that are in place or under development in addition to their overall effect on hazard loss reduction. However, the survey instrument can also serve to identify gaps, weaknesses, or conflicts that counties and local jurisdictions can recast as opportunities for specific actions to be proposed as part of the hazard mitigation strategy.

The information collected in the survey questionnaire was incorporated into a database for further analysis. A general scoring methodology was then applied to quantify each jurisdiction's overall capability.[2] According to the scoring system, each capability indicator was assigned a point value based on its relevance to hazard mitigation.

Using this scoring methodology, a total score and an overall capability rating of "high," "moderate," or "limited" could be determined according to the total number of points received. These classifications are designed to provide nothing more than a general assessment of local government capability. The results of this capability assessment provide critical information for developing an effective and meaningful mitigation strategy.

7.3 CAPABILITY ASSESSMENT FINDINGS

The findings of the capability assessment are summarized in this Plan to provide insight into the relevant capacity of the jurisdictions in the Buncombe Madison 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 Buncombe Madison Regional Hazard Mitigation Planning Team.

7.3.1 Planning and Regulatory Capability

Planning and regulatory capability is based on the implementation of plans, ordinances, and programs that demonstrate a local jurisdiction's commitment to guiding and managing growth, development, and redevelopment in a responsible manner while maintaining the general welfare of the community. It includes emergency response and mitigation planning, comprehensive land use planning, and transportation planning; the enforcement of zoning or subdivision ordinances and building codes that

[2] The scoring methodology used to quantify and rank the region's capability can be found in Appendix B.

regulate how land is developed and structures are built; as well as protecting environmental, historic, and cultural resources in the community. Although some conflicts can arise, these planning initiatives generally present significant opportunities to integrate hazard mitigation principles and practices into the local decision making process.

This assessment is designed to provide a general overview of the key planning and regulatory tools and programs that are in place or under development for the jurisdictions in the Buncombe Madison 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 Buncombe Madison Region. A checkmark (✓) indicates that the given item is currently in place and being implemented. An asterisk (*) indicates that the given item is currently being developed for future implementation. Each of these local plans, ordinances, and programs should be considered available mechanisms for incorporating the requirements of the Buncombe Madison Regional Hazard Mitigation Plan.

TABLE 7.1: RELEVANT PLANS, ORDINANCES, AND PROGRAMS

Planning / Regulatory Tool	BUNCOMBE COUNTY	Asheville	Biltmore Forest	Black Mountain	Montreat	Weaverville	Woodfin	MADISON COUNTY	Hot Springs	Marshall	Mars Hill
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	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Planning / Regulatory Tool	BUNCOMBE COUNTY	Asheville	Biltmore Forest	Black Mountain	Montreat	Weaverville	Woodfin	MADISON COUNTY	Hot Springs	Marshall	Mars Hill
Zoning Ordinance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Subdivision Ordinance	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Unified Development Ordinance		✓		✓		*				✓	
Post-Disaster Redevelopment Ordinance											
Building Code	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Fire Code	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
National Flood Insurance Program (NFIP)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
NFIP Community Rating System		*									

A more detailed discussion on the region's planning and regulatory capability follows.

7.3.1.1 Emergency Management

Hazard mitigation is widely recognized as one of the four primary phases of emergency management. The three other phases include preparedness, response, and recovery. In reality, each phase is interconnected with hazard mitigation, as **Figure 7.1** suggests. Opportunities to reduce potential losses through mitigation practices are most often implemented before disaster strikes, such as the elevation of flood prone structures or the continuous enforcement of policies that prevent and regulate development that is vulnerable to hazards due to its location, design, or other characteristics. Mitigation opportunities will also be presented during immediate preparedness or response activities, such as installing storm shutters in advance of a hurricane, and certainly during the long-term recovery and redevelopment process following a hazard event.

FIGURE 7.1: THE FOUR PHASES OF EMERGENCY MANAGEMENT

Planning for each phase is a critical part of a comprehensive emergency management program and a key to the successful implementation of hazard mitigation actions. As a result, the Capability Assessment Survey asked several questions across a range of emergency management plans in order to assess the Buncombe Madison 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.

- Both of the counties participating in this multi-jurisdictional plan have previously adopted hazard mitigation plans. Each participating jurisdiction was included in their respective county's plan.

Disaster Recovery Plan: A disaster recovery plan serves to guide the physical, social, environmental, and economic recovery and reconstruction process following a disaster. In many instances, hazard mitigation principles and practices are incorporated into local disaster recovery plans with the intent of capitalizing on opportunities to break the cycle of repetitive disaster losses. Disaster recovery plans can also lead to the preparation of disaster redevelopment policies and ordinances to be enacted following a hazard event.

- None of the counties or municipalities 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.

- Buncombe County and Madison County each maintain emergency operations plans through their respective Emergency Management Departments.
- All of the municipalities in Buncombe County have entered into a Civil Preparedness Agreement to implement the county emergency operations plan.

- ✧ Madison County's emergency operations plan addresses hazards which threaten the county and municipalities.

Continuity of Operations Plan: A continuity of operations plan establishes a chain of command, line of succession, and plans for backup or alternate emergency facilities in case of an extreme emergency or disaster event.

- ✧ Buncombe County has a Continuity of Operations Plan.

Flood Response Plan: A flood response plan establishes procedures for responding to a flood emergency including coordinating and facilitating resources to minimize the impacts of flood.

- ✧ The City of Asheville is the only jurisdiction that has adopted a flood response plan.

7.3.1.2. 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 Buncombe Madison 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.

- ✧ Buncombe County has adopted a comprehensive land use plan that includes all of its municipalities as well as the unincorporated county. The City of Asheville, the Town of Black Mountain, and the Town of Weaverville each have municipal comprehensive land use plans in place.
- ✧ Madison County, the Town of Hot Springs, the Town of Marshall, and the Town of Mars Hill have each adopted a comprehensive plan.

Capital Improvements Plan: A capital improvements plan guides the scheduling of spending on public improvements. A capital improvements plan can serve as an important mechanism for guiding future development away from identified hazard areas. Limiting public spending in hazardous areas is one of the most effective long-term mitigation actions available to local governments.

- ✧ Buncombe County and all of its municipalities, except the Town of Biltmore Forest and the Town of Woodfin, have capital improvements plans.
- ✧ Madison County does not have a capital improvements plan in place. However, the Town

of Marshall and the Town of Mars Hill do have capital improvements programs.

Historic Preservation Plan: A historic preservation plan is intended to preserve historic structures or districts within a community. An often overlooked aspect of the historic preservation plan is the assessment of buildings and sites located in areas subject to natural hazards and the identification of ways to reduce future damages. This may involve retrofitting or relocation techniques that account for the need to protect buildings that do not meet current building standards or are within a historic district that cannot easily be relocated out of harm's way.

- ✧ None of the counties or municipalities participating in this multi-jurisdictional plan have a historic preservation plan.

Zoning Ordinance: Zoning represents the primary means by which land use is controlled by local governments. As part of a community's police power, zoning is used to protect the public health, safety, and welfare of those in a given jurisdiction that maintains zoning authority. A zoning ordinance is the mechanism through which zoning is typically implemented. Since zoning regulations enable municipal governments to limit the type and density of development, a zoning ordinance can serve as a powerful tool when applied in identified hazard areas.

- ✧ All of the counties and municipalities participating in this plan have adopted zoning ordinances. The City of Asheville, the Town of Black Mountain, the Town of Weaverville, and the Town of Marshall include zoning regulations as part of their local unified development ordinance. The remaining municipalities and two counties have adopted stand-alone zoning ordinances.

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.

- ✧ All of the counties and municipalities participating in this plan have adopted subdivision regulations, except the Town of Hot Springs. Again, the City of Asheville, the Town of Black Mountain, the Town of Weaverville, and the Town of Marshall include these regulations as part of their local unified development ordinance. The other municipalities and two counties with subdivision regulations have adopted stand-alone ordinances.

Building Codes, Permitting, and Inspections: Building codes regulate construction standards. In many communities, permits and inspections are required for new construction. Decisions regarding the adoption of building codes (that account for hazard risk), the type of permitting process required both before and after a disaster, and the enforcement of inspection protocols all affect the level of hazard risk faced by a community.

- ✧ North Carolina has a state compulsory building code, which applies throughout the state; however, jurisdictions may adopt codes if approved as providing adequate minimum standards. All of the participating counties and municipalities have adopted a building code. The building code is enforced by each county's building inspector.
- ✧ In Buncombe County, the City of Asheville, the Town of Black Mountain, and the Town of

Montreat 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).[3] In North Carolina, the North Carolina Department of Insurance assesses the building codes in effect in a particular community and how the community enforces its building codes *with special emphasis on mitigation of losses from natural hazards*. The results of BCEGS assessments are routinely provided to ISO's member private insurance companies, which in turn may offer ratings credits for new buildings constructed in communities with strong BCEGS classifications. The concept is that communities with well-enforced, up-to-date codes should experience fewer disaster-related losses and, as a result, should have lower insurance rates.

In conducting the assessment, ISO collects information related to personnel qualification and continuing education as well as the number of inspections performed per day. This type of information combined with local building codes is used to determine a grade for that jurisdiction. The grades range from 1 to

[3] Participation in BCEGS is voluntary and may be declined by local governments if they do not wish to have their local building codes evaluated.

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.

Other relevant plans

There have been other planning efforts and processes conducted in the Buncombe Madison Region that contribute to enhanced hazard mitigation community capability and capacity for the participating jurisdictions. A few examples of these efforts include the following:

- City of Asheville Flood Damage Reduction Task Force
  https://nemac.unca.edu/flood-damage-reduction-task-force
- Buncombe County Multi-Hazard Risk Tool
  https://nemac.unca.edu/buncombe-county-multi-hazard-risk-tool
- City of Asheville's Climate Resilience Assessment
  https://www.ashevillenc.gov/department/sustainability/sustainability-initiatives/climate-resilience/
- Swannanoa Flood Risk Management Project
  https://nemac.unca.edu/swannanoa-flood-risk-management-project
- Land of Sky Regional Resilience Risk Assessment and NEMAC/FernLeaf AccelAdapt Tool
  http://www.landofsky.org/pdf/LGS/LOS_Resilience_Exposure_Phase1_Report.pdf

7.3.1.2 Floodplain Management

Flooding represents the greatest natural hazard facing the nation. At the same time, the tools available to reduce the impacts associated with flooding are among the most developed when compared to other hazard-specific mitigation techniques. In addition to approaches that cut across hazards such as education, outreach, and the training of local officials, the *National Flood Insurance Program* (NFIP) contains specific regulatory measures that enable government officials to determine where and how growth occurs relative to flood hazards. Participation in the NFIP is voluntary for local governments; however, program participation is strongly encouraged by FEMA as a first step for implementing and sustaining an effective hazard mitigation program. It is therefore used as part of this assessment as a key indicator for measuring local capability.

In order for a county or municipality to participate in the NFIP, they must adopt a local flood damage prevention ordinance that requires jurisdictions to follow established minimum building standards in the floodplain. These standards require that all new buildings and substantial improvements to existing buildings will be protected from damage by a 100-year flood event and that new development in the floodplain will not exacerbate existing flood problems or increase damage to other properties.

A key service provided by the NFIP is the mapping of identified flood hazard areas. Once completed, the Flood Insurance Rate Maps (FIRMs) are used to assess flood hazard risk, regulate construction practices, and set flood insurance rates. FIRMs are an important source of information to educate residents,

government officials, and the private sector about the likelihood of flooding in their community.

Table 7.2 provides NFIP policy and claim information for each participating jurisdiction in the Buncombe Madison Region.

TABLE 7.2: NFIP POLICY AND CLAIM INFORMATION

Jurisdiction	Date Joined NFIP	Current Effective Map Date	NFIP Policies in Force	Insurance in Force	Total Losses	Total Payments to Date
BUNCOMBE COUNTY†	08/01/80	04/03/12	404	$110,385,300	235	$4,013,326
Asheville	07/16/80	01/06/10	528	$169,660,900	344	$15,058,870
Biltmore Forest	03/26/10	01/06/10	12	$4,816,300	1	$539
Black Mountain	04/15/80	01/06/10	60	$15,805,100	29	$135,058
Montreat	09/19/05	01/06/10	14	$4,590,100	2	$4,947
Weaverville	05/06/97	01/06/10	35	$11,197,800	1	$5,799
Woodfin	02/01/80	01/06/10	28	$11,772,300	5	$41,308
MADISON COUNTY†	09/02/82	01/06/10	52	$13,939,700	21	$416,269
Hot Springs	07/05/82	01/06/10	5	$1,098,000	1	$2,361
Marshall	05/15/78	01/06/10	31	$7,281,300	47	$517,815
Mars Hill	08/19/87	01/06/10	5	$1,095,600	1	$0

†Includes unincorporated areas of county only
Source: NFIP Community Status information as of 11/19/19; NFIP claims and policy information as of 7/31/19

Community Rating System: An additional indicator of floodplain management capability is the active participation of local jurisdictions in the Community Rating System (CRS). The CRS is an incentive-based program that encourages counties and municipalities to undertake defined flood mitigation activities that go beyond the minimum requirements of the NFIP by adding extra local measures to provide protection from flooding. All of the 18 creditable CRS mitigation activities are assigned a range of point values. As points are accumulated and reach identified thresholds, communities can apply for an improved CRS class rating. Class ratings, which range from 10 to 1, are tied to flood insurance premium reductions as shown in **Table 7.3**. As class rating improves (the lower the number the better), the percent reduction in flood insurance premiums for NFIP policyholders in that community increases.

TABLE 7.3: CRS PREMIUM DISCOUNTS, BY CLASS

CRS Class	Premium 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.

- The City of Asheville participates in the CRS as a Class 8 community. Participation in the CRS program should be considered as a mitigation action by each of the counties and the other municipalities. The program would be most beneficial to Buncombe County, which has 429 NFIP policies.

Flood Damage Prevention Ordinance: A flood damage prevention ordinance establishes minimum building standards in the floodplain with the intent to minimize public and private losses due to flood conditions.

- All communities participating in the NFIP are required to adopt a local flood damage prevention ordinance. All counties and municipalities participating in this hazard mitigation plan also participate in the NFIP and they all have adopted flood damage prevention regulations.

Floodplain Management Plan: A floodplain management plan (or a flood mitigation plan) provides a framework for action regarding corrective and preventative measures to reduce flood-related impacts.

- None of the counties or municipalities participating in this multi-jurisdictional plan have adopted floodplain management plans.

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.

- Buncombe County has adopted the Buncombe County Greenways and Trails Master Plan which also includes all of its municipalities. The City of Asheville, the Town of Black Mountain, and the Town of Montreat have each adopted a municipal-level parks or greenways master plan.
- Neither Madison County nor its municipalities have adopted an open space management plan.

Stormwater Management Plan: A stormwater management plan is designed to address flooding associated with stormwater runoff. The stormwater management plan is typically focused on design and construction measures that are intended to reduce the impact of more frequently occurring minor urban flooding.

- The Town of Black Mountain is the only jurisdiction with a stormwater management plan in place. However, several jurisdictions have stormwater management ordinances in place.
- Buncombe County has adopted a stormwater management ordinance that is administered by the county throughout the unincorporated area as well as within the municipal boundaries of the following towns: Biltmore Forest, Montreat, Weaverville, and Woodfin, through interlocal agreement. The City of Asheville, the Town of Black Mountain, and the Town of Montreat administer their own stormwater management ordinances.
- The Town of Marshall is the only Madison County jurisdiction that has adopted stormwater regulations. These regulations are included in the town's unified development ordinance.

7.3.2 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 Buncombe Madison Region with regard to relevant staff and personnel resources. A checkmark (✓) indicates the presence of a staff member(s) in that jurisdiction with the specified knowledge or skill.

TABLE 7.4: RELEVANT STAFF / PERSONNEL RESOURCES

Staff / Personnel Resource	BUNCOMBE COUNTY	Asheville	Biltmore Forest	Black Mountain	Montreat	Weaverville	Woodfin	MADISON COUNTY	Hot Springs	Marshall	Mars Hill
Planners with knowledge of land development / land management practices	✓	✓		✓		✓					
Engineers or professionals trained in construction practices related to buildings and/or infrastructure	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Planners or engineers with an understanding of natural and/or human-caused hazards	✓			✓							
Emergency Manager	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Floodplain Manager	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Land Surveyors											
Scientists familiar with the hazards of the community	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Staff with education or expertise to assess the community's vulnerability to hazards	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Personnel skilled in GIS and/or Hazus	✓	✓	✓	✓	✓	✓	✓	✓			
Resource development staff or grant writers											

Credit for having a floodplain manager was given to those jurisdictions that have a flood damage prevention ordinance, and therefore an appointed floodplain administrator, regardless of whether the appointee was dedicated solely to floodplain management. Credit was given for having a scientist familiar with the hazards of the community if a jurisdiction has a Cooperative Extension Service or Soil and Water Conservation Department. Credit was also given for having staff with education or expertise to assess the community's vulnerability to hazards if a staff member from the jurisdiction was a participant on the existing hazard mitigation plan's planning committee.

7.3.3 Fiscal Capability

The ability of a local government to take action is often closely associated with the amount of money available to implement policies and projects. This may take the form of outside grant funding awards or locally-based revenue and financing. The costs associated with mitigation policy and project implementation vary widely. In some cases, policies are tied primarily to staff time or administrative costs associated with the creation and monitoring of a given program. In other cases, direct expenses are linked to an actual project, such as the acquisition of flood-prone homes, which can require a substantial commitment from local, state, and federal funding sources.

The Capability Assessment Survey was used to capture information on the region's fiscal capability through the identification of locally available financial resources.

Table 7.5 provides a summary of the results for the Buncombe Madison Region with regard to relevant fiscal resources. A checkmark (✓) indicates that the given fiscal resource is locally available for hazard mitigation purposes (including match funds for state and federal mitigation grant funds) according to the previous county hazard mitigation plans.

TABLE 7.5: RELEVANT FISCAL RESOURCES

Fiscal Tool / Resource	BUNCOMBE COUNTY	Asheville	Biltmore Forest	Black Mountain	Montreat	Weaverville	Woodfin	MADISON COUNTY	Hot Springs	Marshall	Mars Hill
Capital Improvement Programming	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Community Development Block Grants (CDBG)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Special Purpose Taxes (or taxing districts)								✓	✓	✓	✓
Gas / Electric Utility Fees											
Water / Sewer Fees											
Stormwater Utility Fees		✓									

Fiscal Tool / Resource	BUNCOMBE COUNTY	Asheville	Biltmore Forest	Black Mountain	Montreat	Weaverville	Woodfin	MADISON COUNTY	Hot Springs	Marshall	Mars Hill
Development Impact Fees											
General Obligation, Revenue, and/or Special Tax Bonds											
Partnering Arrangements or Intergovernmental Agreements	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Other: HMGP, FMAP, other Federal and state funding sources, etc.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

7.3.4 Political Capability

One of the most difficult capabilities to evaluate involves the political will of a jurisdiction to enact meaningful policies and projects designed to reduce the impact of future hazard events. Hazard mitigation may not be a local priority or may conflict with or be seen as an impediment to other goals of the community, such as growth and economic development. Therefore, the local political climate must be considered in designing mitigation strategies as it could be the most difficult hurdle to overcome in accomplishing their adoption and implementation.

The Capability Assessment Survey was used to capture information on political capability of the Buncombe Madison 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, stormwater management, erosion and sedimentation control, steep slope development, zoning, and subdivision.
- Buncombe County is currently a participant in the NFIP and has adopted the required ordinances related to Flood Damage Prevention, Soil Erosion and Sedimentation Control, Watershed Protection, and Stormwater Management. This demonstrates to some extent both favorable political support and a willingness to adopt hazard mitigation efforts in an active manner.
- In Madison County, as with many municipalities, major changes will likely be met with resistance. However, incremental changes stand a better chance of success over the long term. In terms of changes to hazard mitigation, there are numerous opportunities for Madison County, however, public education and progressive steps are essential for the success of any new initiatives. If the public is supportive of proposed changes, the elected officials who are responsible for adopting them are more likely to show their support. Building a disaster- resistance community depends primarily on involving the public and achieving participation. As required by FEMA for the local hazard mitigation plan, public participation is a must and to make it true, the political climate ought to be suitable.

7.4 CONCLUSIONS ON LOCAL CAPABILITY

In order to form meaningful conclusions on the assessment of local capability, a quantitative scoring methodology was designed and applied to results of the Capability Assessment Survey. This methodology, further described in Appendix B, attempts to assess the overall level of capability of the Buncombe Madison Region to implement hazard mitigation actions.

The overall capability to implement hazard mitigation actions varies little among the participating jurisdictions. For planning and regulatory capability, the majority of the jurisdictions are in the moderate range with a few falling in the limited range. There is also some variation in the administrative and

technical capability among the jurisdictions with larger jurisdictions generally having greater staff and technical resources. All of jurisdictions are in the limited to moderate range for fiscal capability.

Table 7.6 shows the results of the capability assessment using the designed scoring methodology. The capability score is based solely on the information found in existing hazard mitigation plans and readily available on the jurisdictions' government websites. According to the assessment, the average local capability score for all jurisdictions is 35.0, which falls into the moderate capability ranking.

TABLE 7.6: CAPABILITY ASSESSMENT RESULTS

Jurisdiction	Overall Capability Score	Overall Capability Rating
BUNCOMBE COUNTY	42	High
Asheville	45	High
Biltmore Forest	33	Moderate
Black Mountain	39	Moderate
Montreat	34	Moderate
Weaverville	37	Moderate
Woodfin	33	Moderate
MADISON COUNTY	31	Moderate
Hot Springs	28	Moderate
Marshall	33	Moderate
Mars Hill	30	Moderate

As previously discussed, one of the reasons for conducting a Capability Assessment is to examine local capabilities to detect any existing gaps or weaknesses within ongoing government activities that could hinder proposed mitigation activities and possibly exacerbate community hazard vulnerability. These gaps or weaknesses have been identified for each jurisdiction in the tables found throughout this section. The participating jurisdictions used the Capability Assessment as part of the basis for the Mitigation Actions that are identified in Section 9; therefore, each jurisdiction addresses their ability to expand on and improve their existing capabilities through the identification of their Mitigation Actions.

7.4.2 Linking the Capability Assessment with the Risk Assessment and the Mitigation Strategy

The conclusions of the Risk Assessment and Capability Assessment serve as the foundation for the development of a meaningful hazard mitigation strategy. During the process of identifying specific mitigation actions to pursue, the regional planning committee 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 Buncombe Madison Region to follow in order to become less vulnerable to its identified hazards. It is based on general consensus of the Buncombe Madison 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 Buncombe Madison Region
- 8.5 Plan Update Requirement

8.1 INTRODUCTION

The intent of the Mitigation Strategy is to provide the Buncombe Madison 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 Buncombe Madison Region (provided separately in Section 9: *Mitigation Action Plan*). Each county and participating jurisdiction has its own Mitigation Action Plan (MAP) that reflects the needs and concerns of that jurisdiction. The MAP represents an unambiguous and functional plan for action and is considered to be the most essential outcome of the mitigation planning process.

The MAP includes a prioritized listing of proposed hazard mitigation actions (policies and projects) for the participating jurisdictions 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 Buncombe Madison 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

All existing mitigation actions found in the Mitigation Action Plan were previously prioritized by the participating jurisdictions. For the 2021 update of the plan the members of the Regional Hazard Mitigation Planning Committee were asked, as part of the process of providing a status update for each action, to make sure that the assigned priority for each action was still appropriate. Prioritization of the proposed mitigation actions was based on the following strategies:

1. High Priority – Highly cost-effective, administratively feasible and politically feasible strategies that should be implemented in fiscal years 2020/2021 and 2021/2022 and be continued.
2. Medium Priority – Strategies that have at least two of the following characteristics (but not all three) and should be implemented in fiscal years 2021/2022 to 2022/2023:
    a. Highly cost-effective; or
    b. Administratively feasible, given current levels of staffing and resources; or
    c. Are politically popular and supportable given the current environment.
3. Low Priority – Strategies that have at least one of the following characteristics (but not two or three) and should be implemented in the next five (5) years (by the end of 2025/2026):
    d. Highly cost-effective; or
    e. Administratively feasible, given current levels of staffing and resources; or
    f. Are politically popular and supportable given the current environment.

The point of contact for each county helped coordinate the prioritization process by reviewing each action and working with the lead agency/department responsible to determine a priority for each action using the factors listed above.

Using these criteria, actions were classified as high, moderate, or low priority by the participating jurisdiction officials.

8.2 MITIGATION GOALS

44 CFR Requirement
44 CFR Part 201.6(c)(3)(i): The mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

The primary goal of all local governments is to promote the public health, safety, and welfare of its citizens. In keeping with this standard, the Buncombe Madison counties and the participating municipalities have developed eleven goal statements for local hazard mitigation planning in the region. In developing these goals, the previous county hazard mitigation plans were reviewed to determine areas of consistency. The project consultant reviewed the goals from each of the existing plans that were combined to form this regional plan. Many of the goals were similar and regional goals were formulated based on commonalities found between the goals in each plan. These proposed regional goals and their corresponding goals or objectives from the previous plans are presented in **Table 8.1**.

The proposed regional goals were presented, reviewed, voted on, and accepted by the Planning Committee at the second Regional Hazard Mitigation Planning Committee meeting. This process of combining goals from the previous plans served to highlight the planning process that had occurred in both counties prior to joining this regional planning effort. Each goal, purposefully broad in nature, serves to establish parameters that were used in developing more mitigation actions. The Buncombe Madison Regional Mitigation Goals are presented in **Table 8.2**. Consistent implementation of actions over time will ensure that community goals are achieved.

TABLE 8.1: PROPOSED MITIGATION GOALS

	Proposed Goal	Former Plan Reference	
		Buncombe County	Madison County
Goal #1	Incorporate hazard mitigation into the planning process of each jurisdiction and continue to carry out hazard mitigation by seeking funding when available.	Goal 1, Goal 7	
Goal #2	Evaluate, strengthen, and enforce ordinances.	Goal 2, Goal 3	
Goal #3	Increase and enhance public education and awareness regarding disasters and hazard mitigation.	Goal 4	Goal 7
Goal #4	Address stormwater management and impervious surface issues.	Goal 5	
Goal #5	Continue participation in the National Flood Insurance Program and investigate participation in the NFIP's Community Rating System.	Goal 6	
Goal #6	Conduct future development (including infrastructure) in a way that protects human life and property through management of natural features such as floodplains and wetlands and avoids development in known hazard areas. This will also reduce the risk to emergency workers.		Goal 1, Goal 2, Goal 4, Goal 5
Goal #7	Ensure that population growth does not exceed the capacity of evacuation routes.		Goal 3
Goal #8	Protect existing structures through retrofitting or other means.		Goal 6
Goal #9	Enhance the community's capability through the use of mutual aid agreements and sharing of resources at the county and regional level.		Goal 8
Goal #10	Ensure that community officials are well-educated and aware of existing resources, regulations, and procedures related to disasters.		Goal 9
Goal #11	Maintain and monitor the current plan and renew and revise as necessary.		Goal 10

TABLE 8.2: BUNCOMBE MADISON REGIONAL MITIGATION GOALS

	Goal
Goal #1	Incorporate hazard mitigation into the planning process of each jurisdiction and continue to carry out hazard mitigation by seeking funding when available.
Goal #2	Evaluate, strengthen, and enforce ordinances.
Goal #3	Increase and enhance public education and awareness regarding disasters and hazard mitigation.
Goal #4	Address stormwater management and impervious surface issues.
Goal #5	Continue participation in the National Flood Insurance Program and investigate participation in the NFIP's Community Rating System.
Goal #6	Conduct future development (including infrastructure) in a way that protects human life and property through management of natural features such as floodplains and wetlands and avoids development in known hazard areas. This will also reduce the risk to emergency workers.
Goal #7	Ensure that population growth does not exceed the capacity of evacuation routes.
Goal #8	Protect existing structures through retrofitting or other means.
Goal #9	Enhance the community's capability through the use of mutual aid agreements and sharing of resources at the county and regional level.
Goal #10	Ensure that community officials are well-educated and aware of existing resources, regulations, and procedures related to disasters.
Goal #11	Maintain and monitor the current plan and renew and revise as necessary.

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 Buncombe Madison 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 Buncombe Madison 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

Each of the prevention mitigation techniques is described in more detail in the Capability Assessment section (Section 7).

8.3.2 Property Protection

Property protection measures involve the modification of a site or the modification of existing buildings and structures to help them keep the hazard away or better withstand the forces of a hazard, or removal of the structures from hazardous locations. Examples include:

- Modification of the site to keep the hazard from reaching the building

  - Flood Barriers
  - Relocation
  - Building Elevation
  - Demolition
  - Demo/Rebuild
- Modify the building (retrofit) so it can withstand impacts of the hazard
  - Windproofing
  - Dry Floodproofing
  - Wet Floodproofing
  - Seismic design techniques
- Critical facilities protection
- Safe rooms, shutters, shatter-resistant glass
- Insurance (private property and public property)

Site Modification

Flood Barriers

A flood protection barrier can be built of dirt or soil (a "berm") or concrete or steel (a "floodwall"). Careful design is needed to ensure that it does not create additional flooding or drainage problems on neighboring properties. Depending on how well the ground drains, if floodwaters will stay up for more than an hour or two, the design needs to account for leaks, seepage of water underneath, and rainwater that will fall inside the perimeter. This is usually done with a sump or French drain to collect the internal groundwater and surface water and a pump and pipe to pump the internal drainage over the barrier. However, barriers can only be built so high and they can be overtopped by a flood higher than expected. Barriers made of earth are susceptible to erosion from rain and floodwaters if not properly sloped, covered with grass, and properly maintained.

Relocation

Moving a flood-prone building to higher ground is the surest and safest way to protect it from flooding. While almost any building can be moved, the cost increases for heavier structures, such as those with exterior brick and stone walls, and for large or irregularly shaped buildings. Relocation is also preferred for large lots that include buildable areas outside the floodplain or where the owner has a new location available outside of the hazard zone.

Building Elevation

Elevating a building above the flood level can be almost as effective as moving it out of the floodplain. Once the building is raised, water is allowed to flow under and around the building, causing little or no damage to the structure or its contents. Raising a building above the flood level is cheaper than moving it and can be less disruptive to a neighborhood. Elevation has proven to be an acceptable and reasonable means of complying with floodplain regulations that require new, substantially improved, and substantially damaged buildings to be elevated above the base flood elevation. Building elevation protects the physical building but does not eliminate life safety or rescue needs during a flood event.

Demolition

Some buildings, especially heavily damaged or repetitively flooded ones, may not be the expense to protect them from future damages. In some cases, it is cheaper to demolish them and either replace

them with new, flood protected structures, or relocate the occupants to a safer site. Demolition is also appropriate for buildings that are difficult to move – such as larger, slab foundation or masonry structures – and for dilapidated structures that are not cost-beneficial to protect.

Demolition/Rebuild

If a building is not in good shape, elevating it may not be feasible or it may even be dangerous. An alternative is to demolish the structure and build a new one on the site that meets or exceeds all flood protection codes. However, it can be difficult to qualify for the FEMA funding to implement this technique and it is not a regularly funded option. Certain rules must be followed to qualify for federal funds for pilot reconstruction.

Site Modification (Retrofitting)

Dry Floodproofing

Dry floodproofing is a mitigation practice whereby one makes all areas of a structure below the flood protection level watertight. Dry floodproofing can be achieved by coating wall with waterproofing compounds or plastic sheeting. Additionally, openings, such as doors, windows and vents, are closed, either permanently, with removable shields, or with sandbags. Dry floodproofing of new and existing nonresidential buildings in the regulatory floodplain is permitted under state, FEMA and local regulations. Dry floodproofing of existing residential buildings in the floodplain is also permitted as long as the building is not substantially damaged or being substantially improved. There are no restrictions for dry floodproofing buildings located outside the regulatory floodplain.

Dry floodproofing is only effective for areas of shallow flooding, such as areas with repetitive drainage problems. It does not protect from the deep flooding along lakes and larger rivers caused by hurricanes or other storms or velocity flooding where floodwaters move swiftly and can damage the dry floodproofing materials.

Wet Floodproofing

The alternative to dry floodproofing is wet floodproofing: water is let into the structure and everything that could be damaged by a flood is removed or elevated above the flood level. Structural components below the flood level are replaced with materials that are not subject to water damage. For example, concrete block walls are used instead of wooden studs and gypsum wallboard. Mechanical fixtures such as the furnace, water heater and laundry facilities are permanently relocated to a higher floor. Where the flooding is not deep, these appliances can be raised on blocks or platforms.

Insurance

Private Property

Although most homeowner's insurance policies do not cover a property for flood damage, an owner can insure a building for damage by surface flooding through the National Flood Insurance Program. Flood insurance coverage is provided for buildings and their contents damaged by a "general condition of surface flooding" in the area. Most people purchase flood insurance because it is required by the bank when they get a mortgage or home improvement loan. Usually these policies just cover the building's structure and not the contents. Contents coverage can be purchased separately. Renters can buy contents coverage, even if the owner does not buy structural coverage on the building. Most people don't realize that there is a 30-day waiting period to purchase a flood insurance policy and there are limits on coverage.

Public Property

Governments can purchase commercial insurance policies. Larger local governments often self-insure and absorb the cost of damage to one facility, but if many properties are exposed to damage, self-insurance can drain the government's budget. Communities cannot expect federal disaster assistance to make up the difference after a flood.

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:

- Wetland protection
- Erosion and sediment control
- Watershed management
- Stream/River Restoration
- Best Management Practices
- Dumping Regulations
- Farmland Protection
- Forest and vegetation management (e.g., fire resistant landscaping, fuel breaks, etc.)
- Habitat preservations
- Slope stabilization

Wetland Protection

Wetlands are often synonymous with floodplains and topographically depressed areas of a watershed. Many wetlands receive and store floodwaters, thus slowing and reducing downstream flows. They also serve as a natural filter and helps improve water quality, and they provide habitat for many species of fish, wildlife and plants.

Erosion and Sedimentation Control

Farmlands and construction sites typically contain large areas of bare exposed soil. Surface water runoff can erode soil from these sites, sending sediment into downstream waterways. Erosion also occurs along stream banks and shorelines as the volume and velocity of flow or wave action destabilize and wash away the soil. Sediment suspended in the water tends to settle out where flowing water slows down. This sediment can clog storm drains, drain tiles, culverts and ditches and reduce the water transport and storage capacity of river and stream channels, lakes and wetlands.

There are two principal strategies to address these problems: minimize erosion and control sedimentation. Techniques to minimize erosion include phased construction, minimal land clearing, and stabilizing bare ground as soon as possible with vegetation and other soil stabilizing practices. Many of the participating jurisdictions in the Buncombe Madison Region have adopted Erosion and Sedimentation Control Ordinances and/or Stormwater Management Ordinances that address some of these issues.

Stream/River Restoration

There is a growing movement that has several names, such as "stream conservation," "bioengineering," or "riparian corridor restoration." The objective of these approaches is to return streams, stream banks and adjacent land to a more natural condition, including the natural meanders. Another term is "ecological restoration," which restores native indigenous plants and animals to an area.
A key component of these efforts is to use appropriate native plantings along the banks that resist erosion. This may involve retrofitting the shoreline with willow cuttings, wetland plants, or rolls of landscape material covered with a natural fabric that decomposes after the banks are stabilized with plant roots.

In all, restoring the right vegetation to a stream has the following advantages:

- Reduces the amount of sediment and pollutants entering the water
- Enhances aquatic habitat by cooling water temperature
- Provides food and shelter for both aquatic and terrestrial wildlife
- Can reduce flood damage by slowing the velocity of water
- Increases the beauty of the land and its property value
- Prevents property loss due to erosion
- Provides recreational opportunities, such as hunting, fishing and bird watching
- Reduces long-term maintenance costs

Best Management Practices

Point source pollutants come from pipes such as the outfall of a municipal wastewater treatment plant. They are regulated by the US EPA. Nonpoint source pollutants come from non-specific locations and harder to regulate. Examples of nonpoint source pollutants are lawn fertilizers, pesticides, other chemicals, animal wastes, oils from street surfaces and industrial areas, and sediment from agriculture, construction, mining and forestry. These pollutants are washed off the ground's surface by stormwater and flushed into receiving storm sewers, ditches and streams.

The term "best management practices" (BMPs) refers to design, construction and maintenance practices and criteria that minimize the impact of stormwater runoff rates and volumes, prevent erosion, protect natural resources and capture nonpoint source pollutants (including sediment). They can prevent increases in downstream flooding by attenuating runoff and enhancing infiltration of stormwater. They also minimize water quality degradation, preserve beneficial natural features onsite, maintain natural base flows, minimize habitat loss, and provide multiple usages of drainage and storage facilities.
Many of the Stormwater Management Ordinances that are in place in the Buncombe Madison Region contain regulations for stormwater BMPs.

Dumping Regulations

BMPs usually address pollutants that are liquids or are suspended in water that are washed into a lake or stream. Dumping regulations address solid matter, such as shopping carts, appliances and landscape waste that can be accidentally or intentionally thrown into channels or wetlands. Such materials may not pollute the water, but they can obstruct even low flows and reduce the channels' and wetlands' abilities to convey or clean stormwater.

Many cities have nuisance ordinances that prohibit dumping garbage or other "objectionable waste" on public or private property. Waterway dumping regulations need to also apply to "non-objectionable" materials, such as grass clippings or tree branches, which can kill ground cover or cause obstructions in channels. Regular inspections to catch violations should be scheduled.

In addition, many people do not realize the consequences of their actions. They may, for example, fill in the ditch in their front yard without realizing that is needed to drain street runoff. They may not understand how regrading their yard, filling a wetland, or discarding leaves or branches in a watercourse can cause a problem to themselves and others. Therefore, a dumping enforcement program should include public information materials that explain the reasons for the rules as well as the penalties.

Farmland Protection

Farmland protection is an important piece of comprehensive planning and zoning throughout the United States. The purpose of farmland protection is to provide mechanisms for prime, unique, or important agricultural land to remain as such, and to be protected from conversion to nonagricultural uses.

Frequently, farm owners sell their land to residential or commercial developers and the property is converted to non-agricultural land uses. With development comes more buildings, roads and other infrastructure. Urban sprawl occurs, which can lead to additional stormwater runoff and emergency management difficulties.

Farms on the edge of cities are often appraised based on the price they could be sold for to urban developers. This may drive farmers to sell to developers because their marginal farm operations cannot afford to be taxed as urban land. The Farmland Protection Program in the United States Department of Agriculture's 2002 Farm Bill (Part 519) allows for funds to go to state, tribal, and local governments as well as nonprofit organizations to help purchase easements on agricultural land to protect against the development of the land.

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

Levees and Floodwalls

Probably the best-known flood control measure is a barrier of earth (levee) or concrete (floodwall) erected between the watercourse and the property to be protected. Levees and floodwalls confine water to the stream channel by raising its banks. However, they must be well designed to account for large floods, underground seepage, pumping of internal drainage, and erosion and scour.

Reservoirs and Detention

Reservoirs reduce flooding by temporarily storing flood waters behind dams or in storage or detention basins. Reservoirs lower flood heights by holding back, or detaining, runoff before it can flow downstream. Flood waters are detained until the flood has subsided, and then the water in the reservoir or detention basin is released or pumped out slowly at a rate that the river can accommodate downstream.

Reservoirs can be dry and remain idle until a large rain event occurs. Or they may be designed so that a lake or pond is created. The lake may provide recreational benefits or water supply (which could also help mitigate a drought).

Flood control reservoirs are most commonly built for one of two purposes. Large reservoirs are constructed to protect property from existing flood problems. Smaller reservoirs, or detention basins, are built to protect property from the stormwater runoff impacts of new development.

Diversion

A diversion is a new channel that sends floodwaters to a different location, thereby reducing flooding along an existing watercourse. Diversions can be surface channels, overflow weirs, or tunnels. During normal flows, the water stays in the old channel. During floods, the floodwaters spill over to the diversion channel or tunnel, which carries the excess water to a receiving lake or river.

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

Threat Recognition

The first step in responding to a flood is to know when weather conditions are such that an event could occur. With a proper and timely threat recognition system, adequate warnings can be disseminated. The National Weather Service (NWS) is the prime agency for detecting meteorological threats. Severe weather warnings are transmitted through NOAA's Weather Radio System. Local emergency managers can then provide more site-specific and timely recognition after the Weather Service issues a watch or a warning. A flood threat recognition system predicts the time and height of a flood crest. This can be done by measuring rainfall, soil moisture, and stream flows upstream of the community and calculating the subsequent flood levels.

On smaller rivers and streams, locally established rainfall and river gauges are needed to establish a flood threat recognition system. The NWS may issue a "flash flood watch." This is issued to indicate current or developing hydrologic conditions that are favorable for flash flooding in and close to the watch area, but the occurrence is neither certain nor imminent. These events are so localized and so

rapid that a "flash flood warning" may not be issued, especially if no remote threat recognition equipment is available. In the absence of a gauging system on small streams, the best threat recognition system is to have local personnel monitor rainfall and stream conditions. While specific flood crests and times will not be predicted, this approach will provide advance notice of potential local or flash flooding.

Warning

The next step in emergency response following threat recognition is to notify the public and staff of other agencies and critical facilities. More people can implement protection measures if warnings are early and include specific detail.

The NWS issues notices to the public using two levels of notification:

- Watch: conditions are right for flooding, thunderstorms, tornadoes or winter storms.
- Warning: a flood, tornado, etc., has started or been observed.

A more specific warning may be disseminated by the community in a variety of ways. The following are the more common methods:

- CodeRED countywide mass telephone emergency communication system
- Commercial or public radio or TV stations
- The Weather Channel
- Cable TV emergency news inserts
- Telephone trees/mass telephone notification
- NOAA Weather Radio
- Tone activated receivers in key facilities
- Outdoor warning sirens
- Sirens on public safety vehicles
- Door-to-door contact
- Mobile public address systems
- Email notifications

Just as important as issuing a warning is telling people what to do in case of an emergency. A warning program should include a public information component.

StormReady

The National Weather Service (NWS) established the StormReady program to help local governments improve the timeliness and effectiveness of hazardous weather related warnings for the public. To be officially StormReady, a community must:

- Establish a 24-hour warning point and emergency operations center
- Have more than one way to receive severe weather warnings and forecasts and to alert the public
- Create a system that monitors weather conditions locally
- Promote the importance of public readiness through community seminars

- Develop a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises

Being designated a NWS StormReady community is a good measure of a community's emergency warning program for weather hazards. As documented in the Capability Assessment section of this plan, Buncombe County and the Biltmore Company are designated as StormReady.

Response

The protection of life and property is the most important task of emergency responders. Concurrent with threat recognition and issuing warnings, a community should respond with actions that can prevent or reduce damage and injuries. Typical actions and responding parties include the following:

- Activating the emergency operations center (emergency preparedness)
- Closing streets or bridges (police or public works)
- Shutting off power to threatened areas (utility company)
- Passing out sand and sandbags (public works)
- Holding children at school or releasing children from school (school superintendent)
- Opening evacuation shelters (the American Red Cross)
- Monitoring water levels (public works)
- Establishing security and other protection measures (police)

An emergency action plan ensures that all bases are covered and that the response activities are appropriate for the expected threat. These plans are developed in coordination with the agencies or offices that are given various responsibilities.

Emergency response plans should be updated annually to keep contact names and telephone numbers current and to ensure that supplies and equipment that will be needed are still available. They should be critiqued and revised after disasters and exercises to take advantage of the lessons learned and of changing conditions. The end result is a coordinated effort implemented by people who have experience working together so that available resources will be used in the most efficient manner possible.

Evacuation and Shelter

There are six key components to a successful evacuation:

- Adequate warning
- Adequate routes
- Proper timing to ensure the routes are clear
- Traffic control
- Knowledgeable travelers
- Care for special populations (e.g., disabled persons, prisoners, hospital patients, schoolchildren)

Those who cannot get out of harm's way need shelter. Typically, the American Red Cross will staff shelters and ensure that there is adequate food, bedding, and wash facilities. Shelter management is a specialized skill. Managers must deal with problems like scared children, families that want to bring in their pets, and the potential for an overcrowded facility.

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

Outreach Projects

Outreach projects are the first step in the process of orienting property owners to the hazards they face and to the concept of property protection. They are designed to encourage people to seek out more information in order to take steps to protect themselves and their properties. Awareness of the hazard is not enough; people need to be told what they can do about the hazard.

Thus, projects should include information on safety, health and property protection measures. Research has shown that a properly run local information program is more effective than national advertising or publicity campaigns. Therefore, outreach projects should be locally designed and tailored to meet local conditions.

Community newsletters/direct mailings: The most effective types of outreach projects are mailed or distributed to everyone in the community. In the case of floods, they can be sent only to floodplain property owners.

News media: Local newspapers can be strong allies in efforts to inform the public. Local radio stations and cable TV channels can also help. These media offer interview formats and cable TV may be willing to broadcast videos on the hazards.

Libraries and Websites

The two previous activities tell people that they are exposed to a hazard. The next step is to provide information to those who want to know more. The community library and local websites are obvious places for residents to seek information on hazards, hazard protection, and protecting natural resources. Books and pamphlets on hazard mitigation can be given to libraries, and many of these can be obtained for free from state and federal agencies. Libraries also have their own public information campaigns with displays, lectures and other projects, which can augment the activities of the local government.

Today, websites are commonly used as research tools. They provide fast access to a wealth of public and private sites for information. Through links to other websites, there is almost no limit to the amount of up to date information that can be accessed on the Internet. Some examples of resources that can be found online include, but are not limited to, floodplain maps, information for homeowners on how to retrofit for floods and flood information for children.

Technical Assistance

Hazard Information

Residents and business owners that are aware of the potential hazards can take steps to avoid problems or reduce their exposure to flooding. Communities can easily provide map information from FEMA's FIRMs and Flood Insurance Studies. They may also assist residents in submitting requests for map amendments and revisions when they are needed to show that a building is located outside the mapped floodplain.

Some communities supplement what is shown on the FIRM with information on additional hazards, flooding outside mapped areas and zoning. When the map information is provided, community staff can explain insurance, property protection measures and mitigation options that are available to property owners. They should also remind inquirers that being outside the mapped floodplain is no guarantee that a property will never flood.

Property Protection Assistance

While general information provided by outreach projects or the library is beneficial, most property owners do not feel ready to retrofit their buildings without more specific guidance. Local building department staffs are experts in construction. They can provide free advice, not necessarily to design a protection measure, but to steer the owner onto the right track. Building or public works department staffs can provide the following types of assistance:

- Visit properties and offer protection suggestions,
- Recommend or identify qualified or licensed contractors,
- Inspect homes for anchoring of roofing and the home to the foundation, and
- Explain when building permits are needed for home improvements.

Public Information Program

A Program for Public Information (PPI) is a document that receives CRS credit. It is a review of local conditions, local public information needs, and a recommended plan of activities. A PPI consists of the following parts, which are incorporated into this plan:

- Description of the local flood hazard,
- The property protection measures appropriate for the flood hazard,
- Flood safety measures appropriate for the local situation,
- The public information activities currently being implemented within the community, including those being carried out by non-government agencies,
- Goals for the community's public information program,
- The outreach projects that will be done each year to reach the goals, and
- The process that will be followed to monitor and evaluate the projects.

8.4 SELECTION OF MITIGATION TECHNIQUES FOR THE BUNCOMBE MADISON REGION

In order to determine the most appropriate mitigation techniques for the communities in the Buncombe Madison 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 Buncombe Madison Region county plans were evaluated to determine their 2021 implementation status. Updates on the implementation status of each action are provided. Any changes to relative priority of the action are noted as well. The mitigation actions provided in Section 9: *Mitigation Action Plan* include the mitigation actions from the previous plans as well as any new mitigation actions proposed through the 2021 planning process. Actions identified as completed in the 2016 version of the plan have been moved to Appendix E.

SECTION 9
MITIGATION ACTION PLAN

This section includes the listing of the mitigation actions proposed by participating jurisdictions in the Buncombe Madison Region. It consists of the following two subsections:

- 9.1 Overview
- 9.2 Mitigation Action Plans

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44 CFR Requirement
44 CFR Part 201.6(c)(3)(iii): The mitigation strategy shall include an action plan describing how the actions identified in paragraph (c)(2)(ii) of this section will be prioritized, implemented, and administered by the local jurisdiction.

9.1 OVERVIEW

As described in the previous section, the Mitigation Action Plan, or MAP, provides a functional plan of action for each jurisdiction. It is designed to achieve the mitigation goals established in Section 8: *Mitigation Strategy* and will be maintained on a regular basis according to the plan maintenance procedures established in Section 10: *Plan Maintenance*.

Each proposed mitigation action has been identified as an effective measure (policy or project) to reduce hazard risk in Buncombe and Madison counties. Each action is listed in the MAP in conjunction with background information such as hazard(s) addressed and relative priority. Other information provided in the MAP includes potential funding sources to implement the action should funding be required (not all proposed actions are contingent upon funding). Most importantly, implementation mechanisms are provided for each action, including the designation of a lead agency or department responsible for carrying the action out as well as a timeframe for its completion. These implementation mechanisms ensure that the Buncombe Madison Regional Hazard Mitigation Plan remains a functional document that can be monitored for progress over time. The proposed actions are not listed in priority order, though each has been assigned a priority level of "high," "moderate," or "low" as described below and in Section 8 (page 8.2).

The Mitigation Action Plan is organized by mitigation strategy category (Prevention, Property Protection, Natural Resource Protection, Structural Projects, Emergency Services, or Public Education and Awareness). The following are the key elements described in the Mitigation Action Plan:

- Hazard(s) Addressed—Hazard which the action addresses.
- Relative Priority—High, moderate, or low priority as assigned by the jurisdiction.
- Lead Agency/Department—Department responsible for undertaking the action.
- Potential Funding Sources—Local, State, or Federal sources of funds are noted here, where applicable.

- Implementation Schedule—Date by which the action the action should be completed. More information is provided when possible.

- Implementation Status (2021)—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 11 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
Buncombe County	**9:3**	**14**
Asheville	9:14	11
Biltmore Forest	9:19	5
Black Mountain	9:21	11
Montreat	9:24	13
Weaverville	9:27	7
Woodfin	9:29	6
Madison County	**9:32**	**25**
Hot Springs	9:42	5
Marshall	9:45	5
Mars Hill	9:48	5

Buncombe County Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
Prevention							
P-1	Incorporate hazard mitigation into the planning process of each jurisdiction.	All	Moderate	Local	County EM	2025, Annual review	In May 2012, Buncombe County adopted the Sustainability Plan. The Plan outlined a five year plan for the County and its residents to make improvements in our community, environment and economy. One of the fourteen goal areas in the Plan is Resistance to Natural and Manmade Hazards". The two objectives under this goal are to: 1) locate critical facilities outside high hazard areas; and 2) Ensure local preparedness for emergencies (floods, fuel shortages, climate change, fire, droughts, earthquakes, food shortages, landslides, hazardous materials incidents, medical epidemics, etc.). In each year's Plan update, current indicators are tracked and strategies for looking forward are shown.
P-2	Continue to carry out the hazard mitigation planning process and seek funding for emerging needs.	All	Moderate	Local	County EM	2025, Annual review	On-going currently as evidenced by update of existing actions and continued participation in the regional hazard mitigation plan.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
P-3	Evaluate participation in the National Flood Insurance Program Community Rating System (CRS)	Flooding	Moderate	Local	Planning Dept.	2025	New Action for 2021 update. A high percentage of Buncombe County's land area is located within flood-prone areas. As developable land continues to diminish, the County will experience increased development pressure upon flood-prone land. As described on the CRS website, "*As a part of the National Flood Insurance Program (NFIP), the Community Rating System is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum program requirements.* *As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the Community Rating System:* 1. *Reduce flood damage to insurable property* 2. *Strengthen and support the insurance aspects of the National Flood Insurance Program* 3. *Encourage a comprehensive approach to floodplain management*" Citizens of participating CRS communities are eligible for reduced flood insurance rates. In exchange, participating local governments commit to implementing programs to educate the community about flood risks, and to the adoption of higher standards for floodplain development. Buncombe County will evaluate participation in CRS. Constraints: • Program participation would require additional staff and capital resources within the Planning & Development, Emergency Management, and Communications departments, and expose the County to period program reviews by the International Organization for Standards (ISO). • Enhanced floodplain development standards will reduce the land area that is available for development as well as increase the cost of land development in these areas. This will be mitigated, to some extent, by improving options for cluster development.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
P-4	Adopt new standards to limit the loss of life and damage to property in flood-prone areas.	Flooding	Moderate	Local	Planning Dept.	2025	New action for the 2021 update. A high percentage of Buncombe County's land area is located within flood-prone areas. As developable land continues to diminish, the County will experience increased development pressure upon flood-prone land. Development in these areas reduce the County's supply of prime farmland, and increases the community's susceptibility to loss of life and property damage due to flooding. The County's current floodplain development regulations meet the minimum, Federal and State requirements for participation in the National Flood Insurance Program (NFIP). However, they do facilitate continued development in floodplains. Buncombe County will: • Modify current floodplain development procedures and standards to require more extensive engineering analysis for new developments in flood-prone areas, to ensure that fill and other modifications to the floodplain do not elevate the risk of loss of life and property damage upon nearby properties. • Modify current floodplain development procedures and standards to limit the size and/or density of new developments within the floodplain. • Promote greater utilization of development processes that allow for the conservation of flood-prone land and the clustering of home sites outside of the floodplain. Retain existing processes, but reorganize, consolidate, and expand conservation and cluster development options across the Zoning and Subdivision ordinances. • The aforementioned policies may be implemented as part of, or separate from, potential participation in CRS. Constraints: • Enhanced floodplain development standards will reduce the land area that is available for development increase the cost of land development in these areas. This will be mitigated, to some extent, by improving options for cluster development.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
P-5	Improve access to large land development projects.	Flooding, Wildfire, Landslide	Moderate	Local	Planning Dept.	2025	New action for the 2021 update. Current land development regulations for minor and major subdivisions require one improved entrance into new residential developments. No defined access requirements exist for large multi-family, commercial, and mixed use development projects. A majority of developments, which have occurred since the advent of Buncombe County's current land development regulations, have employed only a single point of access; these projects have created thousands of dwelling units. Developments – particularly residential developments – with a single point of access, can be severely impacted by hazards such as fires, floods, and landslides. Disruptions to access roads can trap residents, impair the ability of first responders to gain access to impacted neighborhoods, and can limit the speed with which essential services are restored. Buncombe County will: • Require that developments that exceed a defined set of thresholds (square feet of commercial space, number of dwellings, or similar), provide more than one point of access. • Require that larger residential developments include at least one primary street that is designed and constructed to North Carolina Department of Transportation (NCDOT) standards, and dedicated to NCDOT as a public street. • Require that a minimum number of streets within new developments, including a public street as referenced above, be designed to connect to adjacent properties for which future development potential is high, and / or to adjacent, existing developments. Constraints: The following considerations will limit the ability and / or willingness of developers to meet these goals: • Topographical features such as ridgelines, wetlands, and water bodies. • The size, configuration, ownership, and the timing of future development of adjacent properties. • The cost of infrastructure.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
P-6	Retain and improve Buncombe County's regulations that guide development on steep slopes.	Landslide	Moderate	Local	Planning Dept.	2025	New action for the 2021 update. A high percentage of Buncombe County's land area contains steeply sloping terrain. Home sites in these areas are in high demand, as new residents seek spectacular views in a rural setting. Development upon steep terrain can destabilize slopes and increase the risks to life and property due to landslides. Steep slope development can lead to elevated impacts from stormwater and erosion. Development upon steep slopes is at greater risk due to ice storms, wildfires, and landslides. Dispersed development in comparatively remote areas with steep road inclines increases the costs and response time for emergency services. As developable land continues to diminish, the County will experience increased development pressure in these areas. The County's current land development standards limit development density on steep slopes, and require a higher degree of engineering and design for new dwellings therein. However, these standards are spread across four, separate sections of the Subdivision and Zoning ordinances. Buncombe County will: • Retain, but reorganize and consolidate Buncombe County's existing standards for land development upon steep slopes. • Enhance current slope and soil evaluation requirements for lots containing steep slopes, to limit slope disturbance and avoid landslide-prone soils. • Promote greater utilization of development processes that allow for the conservation of steeply sloping land and the clustering of home sites. Retain existing processes, but reorganize, consolidate, and expand conservation and cluster development options across the Zoning and Subdivision ordinances. Constraints: • Enhanced steep slope development standards will increase the cost of land development in these areas and will reduce the land area that is available for development. This will be mitigated, to some extent, by improving options for cluster development.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
Property Protection							
PP-2	Consider strengthening the requirements for road construction for special subdivision through the Subdivision Ordinance	All	Moderate	Local	Planning Dept.	2025	In recent years, Buncombe County has made revisions to its Subdivision Ordinance. The changes to the Subdivision Ordinance included strengthening the requirements for road construction and turn-around specifications to help provide adequate access for emergency vehicles. These changes apply to minor and major subdivisions, and do not apply to subdivisions proposed with three lots or fewer (special subdivisions), or to family subdivisions. Prior to any subdivision being recorded, the Fire Marshal is required to approve the subdivision for emergency services access if the lot is not accessed off a state maintained road. In 2005 requirements were added to require geotechnical reports, soils maps, and compaction testing for roads. Hillside developments on 25% or greater slope were restricted within the 2006 changes. Density is decreased and lot sizes are increased within these areas. Limitations on maximum impervious and disturbed surfaces was added which apply to individual lots with 25% or greater slope within hillside subdivisions. In 2007 changes were made which require that builders on lots subject to the maximum impervious and disturbed areas submit a scaled site plan showing the areas of disturbance and impervious cover. Provisions were included to allow and encourage cluster development in hillside subdivisions. In 2010, additional revisions were made to the Subdivision Ordinance. Pre-application conferences for major subdivisions became a requirement prior to submission of plans. Slope analysis maps became a requirement for all major subdivisions and any subdivision subject to Hillside Development standards. Requirements for minor and major subdivisions during the preliminary plan review to submit proof of permission for waste system and water system were instituted. Also through the 2010 revisions, subdivision roads designated public or private became subject to final approval by the Buncombe County Fire Marshal; the minimum minor subdivision road right-of-way width was increased from 15 feet to 20 feet; and access roads standards to both major and minor subdivisions became eight-inch minimum aggregated base course No. 7 stone. with a minimum of 16 feet, subject to Buncombe County Fire Prevention Ordinance and approval by the Buncombe County Fire Marshal. The horizontal centerline design standards for both minor and major subdivisions T-turnaround became a minimum required length of perpendicular cord of 60 feet. Major subdivision road standards minimum pavement width became 18 feet, with two feet of additional drivable surface required capable of supporting the imposed load of fire apparatus weighing at least 75,000 pounds. Any request for variance for road width is now required to be accompanied by a letter from the Fire Marshal approving the alternate method. For minor subdivision roads, and any features such as cul-de-sacs and T-turnarounds, standards for roads less than or equal to ten percent grade began to be

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
							required to have an eight-inch minimum aggregated base course. All roads exceeding ten percent grade became required to meet major subdivision road construction standards. Final plan approval is now contingent upon the requirement than an engineer certify compliance with these standards. Within the Hillside Development Standards section of the Subdivision Ordinance (Sec. 70-68), changes were made to the density table for disturbance and minimum lot size. Changes were added to disturbed and impervious surfaces for communal infrastructure. Vegetation removal and re-vegetation requirements were included. Cluster development provisions became one of the types of development within the new Alternative Path Hillside Development standards, which allows for the additional design flexibility and preservation of environmentally sensitive features. The alternative path also recognizes Building and Grading Envelope Conservation development. The alternative path is encouraged in order to limit disturbed areas and preserve ridge tops, woodlands, open spaces, floodplains, moderate and high risk landslide hazard areas and other environmentally sensitive areas. Since the 2010 changes were implemented, road requirements and standards are now being considered for special and family subdivisions. Consideration could be given for a minimum required road width and right-of-way width; road grade and required minimum distance for pull outs for emergency vehicles; requirements for T-turnarounds or cul-de sacs; private driveway standards; and minimum access road width standards.
PP-3	Continue to implement the recommendations of the Comprehensive Land Use Plan	All	Moderate	Local	Planning Dept./Board of Commissioners	2025	The latest Comprehensive Land Use Plan Update was adopted in September 2013. The Update provides a current assessment of the County while also providing an outlook for future land use patterns and potential strategies to address the County's needs. There is a section in the Comprehensive Land Use Plan Update dedicated to Hazards and the Hazard Mitigation Plan (pages 55-57). The hazards and risks within the County are listed from the Hazard Mitigation Plan. The main regulations identified that the County employs to mitigate these hazards and risks are identified as the zoning overlays, including the Steep Slope/High Elevation Overlay District and the Protected Ridge Overlay District within the Zoning Ordinance, and the Flood Damage Prevention Ordinance. Specific recommendations from the Comprehensive Land Use Plan Update include the following: -Commercial districts should allow a specific height by right, while requests for additional height would be regulated as a Planned Unit Development/Conditional Use Permit. Heights which require a Planned Unit Development/Conditional Use Permit should be subject to specific conditions which protect

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
							residential properties, viewsheds, transportation corridors, and project's review; -Partner with regional planning initiatives in order to understand efficiencies in service delivery and ensuring citizens needs are met. The Comprehensive Land Use Plan Update addresses the general direction of the County's growth and development; identifies other planning efforts; directs the County's growth and development while considering topographic constraints; and addresses objectives through the specific recommendations which can be made within standing land use policies and regulations. The County will soon begin the process of updating Comprehensive Plan and will take this opportunity to integrate hazard mitigation and resiliency elements into the plan.
PP-5	Continue to evaluate and revise the stormwater management ordinance in accordance with changes as mandated by state law.	FL	Moderate	Local	Planning Dept.	2025, Annually	Buncombe County adopted the Stormwater Management Ordinance on September 27, 2006. It was adopted to establish minimum requirements for the control of adverse impacts due to stormwater runoff associated with new development. Managing stormwater runoff protects property, lessens stream channel erosion, prevents increased flooding and provides additional protection of floodplains, wetlands and water resources, riparian and aquatic ecosystems. The Ordinance requires permits for residential development activity disturbing one acre or more. Commercial activity requires permits for activities that are on tracts one acre or larger. The Ordinance requires developers to install permanent measures to control the rate of runoff to that which existed prior to development for the 1 year 24-hour storm events.
PP-6	Ensure enforcement of ordinances.	All	Moderate	Local	Planning Dir., Fire Marshal, Erosion Control Officer, Storm Water engineer, Building Permits and Inspections Dir., Floodplain Ordinance Administrator, Subdivision	2025, Annual review	Each Ordinance is enforced through an individual department. However, the permitting software system Accela can link cases and approvals based on parcel number. There is an order for approval for development activities. The Accela software controls the order for approval of cases and prevents permits from being issued until approvals from other relevant Ordinance administrators is provided. Through this system, for example, building permits are not issued until subdivision approval has been provided, or a building permit for a structure in the floodplain is not issued until floodplain approval has been provided. Another way that Ordinance administrators remain connected is through the Technical Review Committee. The Technical Review Committee consists of representatives from the Fire Marshal's office, Building Permits and Inspections, Planning (Zoning, Subdivision, Floodplain, Stormwater, Erosion Control), and Environmental Health. The Committee meets on a regular basis to review plans before they are presented to the Planning Board, and to discuss changes that are occurring within each of their departments related to Ordinance enforcement.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
					Ordinance Administrator, Zoning Staff		
PP-7	Address the issues of storm water management and impervious surfaces.	FL/ER	Moderate	Local	Stormwater Ordinance Administrator	Action deleted.	This will be addressed through implementation of PP-5. Action to be removed from future updates.
PP-8	Continue participation in the National Flood Insurance Program and investigate participation in the NFIP's Community Ratings System.	FL	High	Local	Floodplain Ordinance Administrator	2025, Annual review	The County's Flood Damage Prevention Ordinance regulates development within the 100-year floodplain. The County first adopted the Ordinance in August of 1980 when the County agreed to participate in the National Flood Insurance Program (NFIP). By the joining the NFIP, flood insurance and federal assistance became available to the County and its residents. The Ordinance regulates development within the 100-year floodplain with the purpose of promoting public health, safety, and general welfare and to minimize public and private losses due to flood conditions within flood prone areas. As a condition of continued eligibility in the NFIP, the County must maintain floodplain management regulations that meet the standards of the NFIP regulations. In conjunction with adopting the revised floodplain maps that became effective in January 2010, the County adopted revisions to the Ordinance aimed at improving safety of residents and businesses within and surrounding the 100-year floodplain. Revisions included requiring an additional foot of freeboard (i.e., requiring elevations 2 feet above the base flood elevation) for new structures and utilities within the 100-year floodplain; prohibiting new habitable structures within the floodway; and requiring submission of an elevation certificate for new structures constructed in the 100-year floodplain. Procedurally, when the new maps and revised ordinance were adopted, the Planning Board and subsequently the Board of Commissioners found that these revisions and updates were reasonable, in the public interest, and consistent with the Comprehensive Land Use Plan because they furthered the principles of managing sensitive environmental areas and conservation of critical environmental

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
							resources by restricting activities within the 100-year floodplain. It is anticipated that within this Hazard Mitigation Plan Update period, the floodplain maps for Buncombe County will again be updated, and our Ordinance reviewed for compliance with the NFIP requirements and compared with the State's model ordinance for floodplain management standards. With each new remapping, opportunities become available for communicating risk to persons whose property borders rivers and streams. Through public meetings and established communication channels (television, web, Twitter, e-zines, newspaper, etc.), many residents can be reached. For those properties within the 100-year floodplain, and especially for those properties that will be newly placed in the 100-year floodplain through the remapping effort, direct mail notices will be sent, informing residents of the new maps and proposed changes. The continued goals for floodplain management in the County include the following: -Effectively communicate risk for persons who are considering buying or building on properties within the 100-year floodplain; -Locate critical facilities and large scale development outside the 100-year floodplain; -Protect water resources and ecological systems/wildlife through the enforcement of the Flood Damage Prevention Ordinance; -Restore the natural resources and function of floodplains by promoting and working in collaboration with stream restoration and hazard mitigation grant programs; and -Educate the public to help them reduce their environmental footprints by locating businesses and residences outside the 100-year floodplain when possible. New action P-3 included in this update to specifically address CRS. Future updates of this plan will remove reference to CRS as it is now covered under that action.
Emergency Services							
ES-1	E-911 addressing reform is needed.	All Hazards	Moderate	Local	County EM and Planning Dept.	2025	New action for 2021 update. A current and conflict-free, road naming and property addressing system is necessary in order to provide timely and effective responses to emergencies of all scales. Effective addressing is also critical to County departments and agencies such as the Tax Department and the Board of Elections, as well as non-County entities such as utilities and mail delivery providers. Buncombe County's Emergency 911 (E-911) addressing program was established in 1993 with the adoption of Chapter 66, Article II.-Street Names and Street Addresses, of Buncombe County Code. At the present time, the Planning & Development Department administers this Ordinance. The ordinance has not been updated since its adoption; technology and processes for managing road names and addressing have changed considerably since its adoption, and the ordinance needs to be modernized to account for

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
							NextGen addressing and other changes to technology and processes. Furthermore, while Buncombe County provides road naming and addressing services for all unincorporated areas and most municipalities within its boundaries, the City of Asheville maintains a separate road naming and addressing program. Having two, separate systems has limited the ability of both jurisdictions to resolve addressing and road name conflicts. Finally, Buncombe County's addressing program is fully administered by a single, Addressing Coordinator position. Such staffing will be evaluated for additional needs as the county continues to urbanize. Buncombe County will: • Develop and adopt a modern road naming and addressing ordinance. • Evaluate staffing levels within the E-911 program. • Collaborate with the City of Asheville to evaluate consolidation of their separate road naming and addressing programs. Constraints: Staffing analyses and consolidation efforts may result in increased staffing and other program costs to Buncombe County.
Public Education and Awareness							
PEA-1	Educate the public regarding hazard mitigation.	All	High	Local	County EM	2025, Annual review and update	Public education is a continuous effort. Information is provided during key time periods such as severe weather awareness week, winter storm season, and severe storm/hurricane season as well as throughout the year as requested by various community groups. Information is provided via brochures and information on the county website regarding grant programs and preparedness efforts individual citizens can take to be ready when a hazard impacts the community.

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City of Asheville Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2015 Action Implementation Status	2021 Action Implementation Status
Prevention								
P-1	Incorporate hazard mitigation into the planning process.	All	Moderate	Local	Stormwater Services Manager/ Assistant Fire Chief/ Development Services Department	2026, Annual review	Ordinances are developed to address stormwater and flood for new developments, city staff is working with the Army Corps of Engineers in the Swannanoa River Valley to potentially identify and address flood mitigation projects.	On-going project. Ordinance is being maintained and is updated as needed. The City participated in the Swannanoa River Flood Assessment which identified a number of potential flood mitigation projects in the region. More recently the City conducted a Climate Resilience Assessment, which was adopted as part of the City's Comprehensive plan.
P-2	Continue to carry out the hazard mitigation planning process and seek funding for emerging needs.	All	Moderate	Local	Public Works Director/Fire Chief/Planning Director/Chief Code Enforcement Officer	2026	City Staff is working with the Corps of Engineers in identifying future flood mitigation projects and seeking funding for these projects will continue. The city has not received any funding from mitigation programs in the last 5 years.	Within the Swannanoa Risk Assessment, 2 projects were identified in the City, the Lake Craig project was completed in 2015, providing additional floodplain area, removing fill. Due to remediation of the dam structure, flood attenuation resulted in larger areas of land to purchase reducing the benefit cost ratio needed to move forward. The Biltmore Ave bridge project was also identified, and is currently under evaluation.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2015 Action Implementation Status	2021 Action Implementation Status
Property Protection								
PP-1	Ensure enforcement of ordinances.	All	Moderate	Local	Planning, Fire Marshal, Erosion Control Officer, Stormwater Engineer, Building Permits and Inspections, Floodplain Ordinance Administrator Zoning Staff	2026, Annual review	City Staff actively pursues enforcement issues and maintains records & metrics and will continue to do so going forward.	On-going program. Continue all elements, records and metrics.
PP-2	Address the issues of storm water management and impervious surfaces.	FL/ER	Moderate	Local	Director Public Works and staff	2026, Annually	City Staff has an active stormwater program to identify projects and maintain current public infrastructure. Many improvements have been made to the stormwater system in the past 5 years including drain upgrades, pipe replacements, etc. The city will continue to implement that program going forward.	On-going program. Updated Stormwater Management plan in 2020. City has implemented a number of stormwater improvement projects, this includes upgrades and maintenance to the existing system and installation of new infrastructure.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2015 Action Implementation Status	2021 Action Implementation Status
PP-3	Continue participation in the National Flood Insurance Program and investigate participation in the NFIP's Community Ratings System.	FL	High	Local	Public Relations Staff/Public Works Staff/ Development Services Staff	2026, Annual review	Participation in NFIP is on-going. CRS Application filed (score pending). Once achieved, the city will work to enhance rating where possible.	On-going program. The City continues to participate in the Nation Flood Insurance Program. The City was accepted in the Community Rating System program on October 1, 2014, at a class 8. On May 1, 2020 we received our verification and recertification maintaining a class 8. The CIty's Comprehensive plan has a goal to improve to in class in a minimum of 7, by the next verification cycle, 2024.
PP-4	Revise the flood hazard ordinance.	FL	High	Local	Chief Code Enforcement Officer/Public Works Staff/ Development Services Staff	Completed 1/6/2010	Enforce the current ordinance (no revisions planned at this time)	Completed, the current ordinance was adopted in 2010. We are planning on revising this flood hazard ordinance section in the next 5 years. We continue to enforce the existing ordinance.
PP-5	Administer & enforce International Building Codes and Fire Codes for new construction.	All	Moderate	City's General Fund	Chief Code Enforcement Officer	Completed NC State Building Code was adopted in 2017; The International Building Code was adopted in 2009	The city has adopted the NC State Building Code and International Building Code. This action is complete.	On-going program. The City has continued to adopt the most recent NC Building code, currently adopted code is 2018

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2015 Action Implementation Status	2021 Action Implementation Status
Emergency Management and Prevention								
EM-1	Develop a comprehensive flood (hazard) warning and response plan. This would incorporate a flood (hazard) threat recognition system (FIMAN and CONTRAIL), methods/standards to warn the public through AVLAlert or other service providers, incorporate the existing and expand the plan for coordinated flood (hazard) response, and critical facilities coordination. Provide public outreach and information on the plan, annually.	All Hazard	High	Local	Fire Department (Emergency Management) Development Services, Public Works	2026	NA	New action for the 2021 plan update.
Public Education and Awareness								
PEA-1	Educate the public regarding hazard mitigation.	All Hazards	High	Local staff	City Public Information Staff	2026, Annually review program	The city has made many efforts to reach out to and educate the public and will continue to do so going forward. Information is provided via brochures and information on the city website regarding grant programs and preparedness efforts individual citizens can take to be ready when a hazard impacts the community.	Ongoing. The city continues to make efforts to reach out to and educate the public. Over the past 5 years, information has been provided via brochures and information on the city website regarding grant programs and preparedness efforts individual citizens can take to be ready when a hazard impacts the community. The City will continue to identify other opportunities to make hazard mitigation information available to the public.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2015 Action Implementation Status	2021 Action Implementation Status
PEA-2	Manually disperse and have a website plus social media posting which provides information about relevant emergency response and preparedness actions the public can take.	All	High	Local staff	City and Fire Public Information Officer	2025, Annual review and update	New Action	On-going. The City has a number of outreach and public engagement platforms which provide information about relevant emergency response and preparedness actions, from our website, social media posts, YouTube channel, and hardcopy distribution of pamphlets. We also participate in each of the FEMA hazard awareness weeks.
PEA-3	Manually disperse and have a website plus social media posting which provides information about Buncombe County's Hazard Mitigation Plan and relevant mitigation measures the public can take.	All	High	Local staff	City and Fire Public Information Officer	2025, Annual review and update	New Action	On-going. The City has a number of outreach platforms which provide information about Buncombe County's Hazard mitigation plan, from our website, social media posts, and hardcopy distribution of pamphlets.

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Town of Biltmore Forest Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2015 Action Implementation Status	2021 Action Implementation Status
Prevention								
P-1	Incorporate hazard mitigation into the planning process.	All	Moderate	Local	Town Manager	2025, Annual review	In May 2012, Buncombe County adopted the Sustainability Plan. The Plan outlined a five year plan for the County and its residents to make improvements in our community, environment and economy. One of the fourteen goal areas in the Plan is Resistance to Natural and Manmade Hazards". The two objectives under this goal are to: 1) locate critical facilities outside high hazard areas; and 2) Ensure local preparedness for emergencies (floods, fuel shortages, climate change, fire, droughts, earthquakes, food shortages, landslides, hazardous materials incidents, medical epidemics, etc.). In each year's Plan update, current indicators are tracked and strategies for looking forward are shown.	The Town has started taking a more robust and active role in planning review. As part of this, we are actively considering stormwater conditions as a voluntary comment when reviewing new development. Our existing planning processes for residential renovations also focus on mitigation of hazards.
P-2	Continue to carry out the hazard mitigation planning process and seek funding for emerging needs.	All	Moderate	Local	Director of Public Works	2025, Annual review	This is happening currently as evidenced by update of existing actions and move toward regional plan. The town was a part of applying for funding for this regional plan.	This is an ongoing process involving updates to the hazard mitigation plan. The Town has also participated in regional resiliency workshops to ensure adequate preparedness and reaction to hazards.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2015 Action Implementation Status	2021 Action Implementation Status
Property Protection								
PP-1	Ensure enforcement of ordinances.	All	Moderate	Local	Zoning Administrator	2025	Town Staff actively pursues enforcement issues and maintains records & metrics and will continue to do so going forward.	The Town continues to perform code enforcement. In the event code issues may impact the public (such as dangerous trees leaning over the roadway) the town is being proactive and removing these hazards after allowing time for the property owner to perform this work.
PP-2	Address the issues of storm water management and impervious surfaces.	FL/ER	Moderate	Local	Director Public Works	2025	Town Staff has an active stormwater program to identify projects and maintain current public infrastructure. The town will continue to implement that program going forward.	Stormwater management has been a focal point of the Town since 2015. During this time, the Town has contracted with a consultant to develop a stormwater master plan for the Town and is beginning the process this year of making repairs to the ten (10) highest risk areas. This work will be ongoing for at least the next ten years. Preventative maintenance and design review has also been stepped up to ensure appropriate construction is performed on new infrastructure.
Public Education and Awareness Activities								
PEA-1	Educate the public regarding hazard mitigation.	All	High	Local	Town Manager	2025, annually review program	The town has made many efforts to reach out to and educate the public and will continue to do so going forward. Information is provided via brochures and information on the county/town websites regarding grant programs and preparedness efforts individual citizens can take to be ready when a hazard impacts the community.	This process is ongoing, and the Town has taken a broader approach in the past few years to incorporate citizen comment in stormwater design, park re-design (including stream restoration in an easily flooded area), and working with residents and corporate entities to perform adequate power line maintenance and reduce the chances of wildfires.

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Town of Black Mountain Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
Prevention							
P-1	Incorporate hazard mitigation into the Black Mountain planning process by continuing to Integrate HM planning into development plan review processes within the Planning and Development Department.	All	Moderate	Local	Building & Zoning Dept/Planning & Development Dept	2025, Annual review	This is done as the projects develop. For instance, if a developer wants to build in an area that is prone to flooding, the P&D Department will work with the developer to look at different options for construction such as relocating or elevating. The town will continue to work to incorporate hazard mitigation into the overall planning process.
P-2	Update the Land Use Ordinances (including building regulations, subdivision ordinances and zoning regulations) to be consistent with the 2005 NCGS updates to authorizing statutes and to better incorporate HM and public safety needs into land use policies.	All	Moderate	Local	Building & Zoning Dept/Planning & Development Dept	2025, Annual review	Our land use code was updated in 2010. We will continue to incorporate HM planning into development process.
P-3	Establish/Continue to implement Best Management Practices and Measurable Goals for each of the six required components for the Black Mountain Stormwater Plan.	FL	Moderate	Local	Stormwater Manager	2025, Annual review	The town has made great strides towards implementing best practices and continues to work on this. Any new projects are subject to our storm water ordinance. Among other requirements, this ordinance requires larger development projects to include a plan for retaining the first inch of rainwater runoff.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
P-4	Participate in regional work to mitigate flooding through Senate Bill 7 funding.	FL	Moderate	Local	Building & Zoning Dept/Planning & Development Dept	2025	Thus far, the town has not participated in regional work to mitigate flooding due to lack of staff time. This will continue to be a goal going forward.
p-6	Develop a database that identifies each property that has received damage due to hazards identified within this mitigation plan. The database should also include a tax identification number of the property, a description of the property damage, the value of the damage, and links to photographs of the damage. Developing this database will allow the Town to easily identify properties at high risk of damage from certain hazards as well as properties, which receive repetitive damage from multiple hazards.	All	Moderate	Local	Building & Zoning Dept/Planning & Development Dept	2025	So far, this activity hasn't been completed. This action will remain in the plan going forward.
Property Protection							
PP-1	Ensure consistency in zoning and building inspections enforcement and continue to enforce the International Building Code. Involve local emergency staff and HM principles in development and permitting review.	All	Moderate	Local	Building & Zoning Dept/Planning & Development Dept	2025, Annual review	This is done on a daily basis and as projects develop. The town will continue to ensure consistency in zoning and building inspections in the future.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
PP-2	Investigate participation in the National Flood Insurance Programs Community Ratings System.	FL	Moderate	Local	County Project Impact Coord./EM Planner/Town Floodplain Administrator	2025	The town does not currently participate in the CRS but it will continue to evaluate the viability of participating in the future. There has not been sufficient staff availability to pursue this action.
Public Education and Awareness Activities							
PEA-1	Educate contractors, developers and designers on code changes and new development issues.	All	High	Local	Building & Zoning Dept/Planning & Development Dept	2025	Our building inspector does a good job with this with in-office interactions and by making information available online. He will continue to do so as part of his job duties. The town will continue to outreach to contractors/developers.
PEA-2	Provide new homebuilders with information on quality redevelopment and safe housing development.	All	High	Local	Building Inspections Dept.	2025	We do provide builders with information via our website as well as in office materials. The town will continue to outreach to its citizens.
PEA-3	Manually disperse and have a website posting which provides information about relevant emergency response and preparedness actions the public can take.	All	High	Local	Fire Prevention Officer	2025	This has been done to some extent w/Code Red. Code Red is the town's emergency notification system. The town will continue to outreach to its citizens.
PEA-4	Manually disperse and have a website posting which provides information about Buncombe County's Project Impact and the County's Hazard Mitigation Plan and relevant mitigation measures the public can take.	All	High	Local	Town Manager/Fire Chief/Police Chief	2025	This hasn't been done due to lack of staff time, but we do provide a link to Buncombe County's on our website. The town will continue to outreach to its citizens.

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Town of Montreat Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
Prevention							
P-1	Appoint a representative to the Hazard Mitigation Plan Evaluation and Revision Committee. Continue to meet as needed.	All	High	Local	Town Administrator /Public Works Director	2025, Annual review	The town has appointed a representative to the Hazard Mitigation Plan Committee and that representative participated in the plan update process. The town will continue to provide a representative to HMP Committee going forward.
P-2	Review resources discussing hazard mitigation concepts.	All	High	Local	Town Administrator	2025, Annual review	The town has annually reviewed all resources discussing hazard mitigation concepts. The town will continue to review these resources and integrate new resources as necessary.
P-4	Develop a checklist in our zoning and building inspections department to ensure consistency in zoning enforcement and to prevent omissions in the evaluation of projects.	All	High	Local	Building Inspector/ Code Administrator	2025, Annual review	The town has developed a building/zoning checklist to ensure consistency in zoning enforcement. This checklist will need to be reviewed and updated annually to ensure applicability of checklist.
P-6	Report results of inspection/enforcement measures to the Project Impact Coordinator/Emergency Management Planner on a semi-annual basis.	All	High	Local	Town Administrator	2025, Semi-Annual review	On a semi-annual basis, the town has reported the results of inspection/enforcement measures to the PIC or EM Planner. In the future, this reporting process will continue to take place semi-annually.
P-8	Continue to update the Town of Montreat Emergency Response Ordinance on an annual basis including relevant positions and contact information changes.	All	High	Local	Building Inspector/ Code Administrator	2025, Annual review	The town has worked on updating its ERO an annual basis and will continue to make updates and changes to the ordinance during an annual review period.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
P-14	Purchase a complete GPS setup and provide training on said setup to all pertinent town personnel.	All	High	General Fund Revenue/ Grants	Town	2025	Although some GPS technology is available, the town would like to look into additional components. The town will continue to work to train all pertinent town staff in the latest updates in GPS technology.
Property Protection							
PP-1	Update the zoning ordinance to reflect mitigation planning and safety factors.	All	High	Local	Town Administrator	2025	The zoning ordinance has been updated in many ways to reflect mitigation planning, however there are additional measures that could be added to improve mitigation so the town will work to include those going forward.
PP-5	Investigate participation in the National Flood Insurance Programs Community Ratings System.	FL	High	Local	Town	2025	The town has not joined the CRS, but it will continue to look into the program and work towards developing the necessary programs to join. There has not been sufficient staff availability to pursue this action.
PP-7	Develop a database that identifies each property that has received damage due to hazards identified within this mitigation plan. The database should also include a tax identification number of the property, a description of the property damage, the value of the damage, and links to photographs of the damage.	All	High	Local	Town	2025	The town has not fully developed a database that identifies properties that have been damaged by past events, in large part because there have not been enough historic events to gain a full perspective of risk. The town will work to continue to develop this database over the next several years.
Public Education and Awareness Activities							
PEA-1	Educate contractors, developers and designers on code changes and new development issues.	All	High	Local	Planning and Inspections Department	2025, Annually	The town has worked to ensure developers and contractors are well- educated on code changes (by providing in-office information and by making information available online) and will continue to keep these interests up to date as new information is developed.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
PEA-2	Provide new homebuilders with information on quality redevelopment and safe housing development.	All	High	Local	Planning and Inspections Department	2025, Annual review	The town has provided information on quality redevelopment and safe housing to homebuilders over the past several years (through both in-office education and online resources) and will continue to provide this information. Updates to information will be integrated as well.
PEA-3	Manually disperse and have a website posting which provides information about relevant emergency response and preparedness actions the public can take.	All	High	Local	Planning and Inspections Department	2025, Annual review and update	The town has developed a number or resources for the public to utilize to help with preparedness and these have been dispersed both manually and through the website. The town will work to reach out in new ways going forward, such as through social media, and will also maintain current outreach strategies.
PEA-4	Manually disperse and have a website posting which provides information on Buncombe County's Project Impact and the County's HMP and relevant mitigation measures the public can take.	All	High	Local	Planning and Inspections Department	2025, Annual review and update	The town has developed a number or resources for the public to utilize to help with understanding Project Impact and mitigation and these have been dispersed both manually and through the website. The town will work to reach out in new ways going forward, such as through social media, and will also maintain current outreach strategies.

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Town of Weaverville Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
Prevention							
P-1	Incorporate hazard mitigation into the planning process.	All	High	Local	Town Manager	2025, Annual review	Ongoing project. One example of how the Town is integrating hazard mitigation into the day-to-day planning process is by enforcing the Flood Damage Prevention Ordinance. The Town will continue to do this and attempt to identify other ways to integrate hazard mitigation into planning.
P-2	Identify storm water management best practices, develop a storm water management program, and adopt a stormwater ordinance.	FL	High	Local	Town Manager	Completed	The town has developed a stormwater management program and ordinance and enforces on a regular basis, so this action will be removed from the next update as a capability.
P-3	Refine the Stormwater Management Program and enforce the regulations.	FL	High	Local	Town Manager	2025, Annual review	The town is always working to enforce the regulations of the Stormwater Management Program and will look at refining the program on an annual basis. No major refinements have been made over the past 5 years.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
P-4	Continue to carry out the hazard mitigation planning process and seek funding for emerging needs.	All	High	Local	Town Manager	2025	This is happening currently as evidenced by update of existing actions. The Town has not applied for hazard mitigation funding in the past 5 years but will continue to monitor our Mitigation Action Plan and work to implement actions.
Property Protection							
PP-1	Evaluate and strengthen existing ordinances as needed.	All	High	Local	Town Manager	2025, Annual review	The town has attempted to provide strong ordinances to reduce risk and will continue to look at how it can integrate more mitigation-oriented practices going forward. No major changes to ordinances were made during the past 5 years.
PP-2	Ensure enforcement of ordinances.	All	High	Local	Town Manager	2025, Annual review	Town Staff actively pursues enforcement issues and maintains records & metrics and will continue to do so going forward.
Public Education and Awareness Activities							
PEA-1	Educate the public regarding hazard mitigation using newsletters and special alerts, etc.	All	High	Local	Town Manager	2025, Annually review program	The town has made many efforts to reach out to and educate the public and will continue to do so going forward. Information is provided via brochures and information on the county/town websites regarding grant programs and preparedness efforts individual citizens can take to be ready when a hazard impacts the community.
FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures EQ = Earthquake LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees TS = Thunderstorms EM = Buncombe County Emergency Management Town = Town of Weaverville							

Town of Woodfin Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
Prevention							
P-1	Incorporate hazard mitigation into the planning process.	All	High	Local	Town Administrator/ Board of Aldermen	2025, Annual review	Ongoing project. One example of how the Town is integrating hazard mitigation into the day-to-day planning process is by enforcing the Flood Damage Prevention Ordinance. The Town will continue to do this and attempt to identify other ways to integrate hazard mitigation into planning.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
P-3	Refine the Stormwater Management Program and enforce the regulations.	FL	High	Local	Town Administrator/ Board of Aldermen	2025, Annual review	The town is always working to enforce the regulations of the Stormwater Management Program and will look at refining the program on an annual basis. No major changes to stormwater management were made over the past 5 years.
P-4	Continue to carry out the hazard mitigation planning process and seek funding for emerging needs.	All	High	Local	Town Administrator/ Board of Aldermen	2025	This is happening currently as evidenced by update of existing actions. The Town has not applied for hazard mitigation funding in the past 5 years but will continue to monitor our Mitigation Action Plan and work to implement actions.
Property Protection							
PP-1	Evaluate and strengthen existing ordinances as needed.	All	High	Local	Town Administrator/ Board of Aldermen	2025, Annual review	The town has attempted to provide strong ordinances to reduce risk and will continue to look at how it can integrate more mitigation-oriented practices going forward.
PP-2	Ensure enforcement of ordinances.	All	High	Local	Town Administrator/ Board of Aldermen	2025, Annual review	Town Staff actively pursues enforcement issues and maintains records & metrics and will continue to do so going forward.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
Public Education and Awareness Activities							
PEA-1	Educate the public regarding hazard mitigation. Woodfin should have readily available information on floodplain location, flood insurance, soil conditions, zoning, and long range planning available at Town Hall. The Town can refer citizens to the County's web site which includes information on hazard mitigation. Buncombe County has also supplied hazard mitigation information for airing on its Government Access cable television channel.	All	High	Local	Town Administrator/ Board of Aldermen	2025 Annually review program	The town has made many efforts to reach out to and educate the public and will continue to do so going forward. Information is provided via brochures and information on the county/town websites regarding grant programs and preparedness efforts individual citizens can take to be ready when a hazard impacts the community.

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Madison County Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
Prevention							
P-1	Continue participation in the National Flood Insurance Program without suspension.	FL	High	Local	EM	2025, Annual review	The county is currently a participant in the NFIP and will continue to work to maintain compliance going forward.
P-2	Inventory of residential and commercial properties in the 100 year floodplain to mitigate the hazards of flooding– In addition to clearing debris in County creeks and the work now being considered by the US Army Corps of Engineers in the French Broad River in the vicinity of Marshall to reduce future flood impacts, it is recommended that an inventory of those public and private structures located in the floodplain be conducted and list of priority properties be identified for acquisition and relocation, or if appropriate, elevation of structures.	FL	Moderate	Local	EM	2025, Annual review	During this plan update, the inventory of properties in the 100 year floodplain was updates. However, this list will need to be updated when future map updates occur and as mitigation actions are taken.
P-3	Inventory of dams in the County to mitigate the hazards of dam failure and flooding. – Conduct a full inventory of all publicly and privately maintained dams in the County. The information collected will identify problem areas and opportunities for rehabilitation or removal of decaying dams.	D/FL	Moderate	Local	EM	2025, Annual review	During this plan update, the inventory of dams was updated. However, this list does not include all privately owned smaller dams and the list will need to be updated periodically so there is still some work to be completed on this action.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
P-4	Terrorism assessment and public health survey to mitigate the hazards of terrorism– By all accounts, the risk of a terrorist attack occurring in Madison County is small but it cannot be totally ignored. It is recommended that the County conduct a full assessment of its terrorist risk and of the capabilities of the public health system. Included in the appendices to this report is a community terrorism assessment. Public health system terrorism assessment tools are currently under development. The results of these two surveys should identify opportunities to reduce the impact of both a terrorist incident but also natural hazards such as floods, hurricanes, tornadoes, etc.	TR	Moderate	Local	EM	2025	The county will need to carry out a full assessment of its risk to a terrorist attack and the threats to the public health system.
P-6	Link County, municipal and other computer systems and networks for use in mitigation and response efforts – It is recommended that County officials explore linking existing County computer systems to collect and process hazard data in order to provide information on hazard mitigation opportunities and to assist in disaster response and recovery efforts. There are numerous computer software products on the market or in development that could be used to integrate multiple data sources and assess the data collected.	All	Moderate	Local	IT/EM	2025	The county has looked into ways to integrate its computer systems and has done so in many ways to support productivity including having a countywide GIS layer of critical facilities. Although some of these initiatives have supported mitigation activities, additional integration is needed to fully support mitigation efforts.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
P-7	Establish a local funding source for mitigation projects – Consideration should be given to establishing a local funding source designed to provide incentives to developers to build disaster resistant homes and subdivisions. Funds from this account could also be used to provide loans and/or grants to homeowners and businesses for hazard mitigation projects. Funding mechanisms to be considered should include but not be limited to: sales tax increase, real estate tax, bond issue, utility charge and others.	All	Moderate	Local	EM	2025	The county has not yet established a local funding source to incentivize builders to develop disaster-resistant homes and businesses because it was not economically feasible. The county will look to establish this going forward.
P-8	Creative initiatives already under consideration to take advantage of tourist revenues should continue and other opportunities explored. Opportunities represented by the increase in market of second/vacation homes need to be explored.	All	Moderate	Local	County Board	2025	Thus far, the county has not yet looked into utilizing additional funding from tourist revenues to support mitigation initiatives to any great degree because those funds were needed for other projects/initiatives. The county will investigate whether this would be a viable option going forward.
P-9	Staffing for first responders – Staffing levels at some of the County fire installations. Priority should be given to finding ways to attract additional staff and resources.	All	Moderate	Local	EM	2025	The county has worked hard to ensure adequate staffing at its first responder facilities, but more staff is needed to have a sufficient coverage for all response needs.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
P-10	Ambulance Shortfall – Severe concerns were raised over the lack of ambulance capacity within the County. The distances within the County and potential for multiple incidents, in addition to the more routine medical emergencies requires the County to explore means to increase the number of ambulances available to serve the County, even in non-disaster circumstances.	All	Moderate	Local	EM	2025	The county has worked hard to ensure adequate ambulances, but this capacity remains an issue and additional funding will need to be pursued.
P-11	Application for emergency funds from the US Department of Transportation for impacts in I-26 corridor – County officials should approach the US Department of Transportation (DOT) to inquire if DOT emergency funds may be available to address flooding issues in the new I-26 corridor.	FL	Moderate	Federal	EM	2025	Many of the flooding issues in the new I-26 corridor remain and so the county will continue to pursue funding and efforts to try to address these issues. This type of funding has been discussed over the past 5 years, but there has been minimal advancement in terms of applying those funds to I-26.
Property Protection							
PP-1	Remove debris from streams across County.	FL	High	Grants	EM	2025, After events	The county has worked to remove debris from streams and ensure adequate flow of water. The county will continue to address any debris issues in streams and will seek funding to do so, especially in the wake of a disaster event.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021Action Implementation Status
PP-2	Update and enforce Land Use Ordinances and Building Codes to mitigate the hazards of structure fires, flooding, and landslides. Critical segments of this ordinance are the requirements for transportation ingress and egress to subdivisions and the grade of subdivision roadways. These requirements must be properly enforced to ensure that emergency vehicles will have adequate access to hazards in subdivisions and that floodplain restrictions are met.	WF/FL/LS	Moderate	Local	Planning and Zoning	2025, Annual review	The county has enforced its land use ordinances and building codes and will continue to update these codes as necessary to improve the county's resilience and mitigate the impacts of hazards.
PP-3	Clear fire fuel from forest floor in Wolf Laurel and other targeted areas in the County to mitigate the hazards of wildfire– The recent drought and the southern pine beetle epidemic has resulted in significant levels of additional fuel on the forest floor in several areas in the County. Removing this fuel should be a priority for fire prevention efforts in the County in the coming months.	WF	Moderate	Local	EM	2025, Annual process	The county has worked with staff at NC Forestry to clear fire fuel from the forest floor and reduce the potential impacts from wildfire. This will continue to be a priority going forward, especially in dry times when wildfires are more likely.
PP-4	Actively buyout targeted residential and commercial properties in the 100-year floodplain – Based on the priorities established as part of the countywide inventory, begin the acquisition, relocation or elevation of structures. This is a voluntary involvement project. It is further noted that the Town of Marshall is opposed to the demolition of any historical buildings in the Downtown area.	FL	Low	FEMA/Federal Grants	EM	2025	In recent years, the county has not acquired or elevated many homes due to a combination of factors including lack of funding and lack of interest, but it would like to look at implementing more voluntary buyouts and elevations in the future to reduce flood risk. The County is currently working to obtain funding for a landslide buy-out.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
Emergency Services							
ES-1	Assess the need and seek funds to acquire warning systems – It is recommended that the County assess the need for various warning systems to address the hazards in the County. These systems would include a siren based system to alert residents to wildfire activities and threats, a series of stream gauges to alert residents and public officials to flood threats and conditions in the creeks in the County and in the French Broad River and a reverse 911 systems capability for use by County officials in alerting residents to threats and evacuation orders.	All	Moderate	Local	EM	2025	The county has installed some warning system capability, but in many ways it is not sufficient in terms of its total coverage due to some populations not being reached. The county would like to work to continue expanding its warning system capability.
ES-2	It is also recommended that the County sponsor Community Emergency Response Training (CERT) for individuals and business owners.	All	Moderate	Local	EM	2025	The county has not had as much success as it would like in developing a CERT team so it will continue to work to improve this resource in the future by training more individuals.
ES-3	Training for first responders – County police, fire, EMS and public health officers require additional training in responding to hazardous materials transportation incidents and biological and chemical incidents.	HM	Moderate	Local	EM	2025	Although first responders have been well trained in the county, there are always new strategies for improving this capability so additional training will be pursued.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
ES-4	Improved operations and communications- It is recommended that County officials regularly exercise their response plan to natural and manmade disasters in order to maintain and refine coordination and communications among first responders. The County should hold at least one full exercise annually followed by a full debriefing of participants. Consideration should also be given to conducting 1-2 tabletop exercises annually including at least one tabletop exercise with a terrorism scenario.	All	Moderate	Local	EM	2025, Annual exercise	The county has held an annual exercise to practice and train for major disaster events. It will continue to hold an exercise at least annually going forward.
ES-5	Seek agreements with hospitals outside of the County on mass casualty requirements – County officials should approach hospitals located outside the County, including Tennessee, to establish mutual aid agreements concerning protocols if a mass casualty event occurs in the County. It is recommended that these new agreements build on existing agreements and expand to new facilities in order to achieve a reasonable capacity for mass casualties should an event occur in Madison County.	All	Moderate	Local	EM	2025	The county has worked to expand its capability in terms of hospitals and medical care with regard to mass casualty events. The county will continue to work on maintaining existing resources while expanding to new resources.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
ES-6	Seek agreements with rail carriers in the County on notification requirements for HZM transported in and through the County – County officials should contact the Norfolk Southern railway concerning the shipment of hazardous materials on the rail line in the County and to determine roles and responsibilities of notification and response requirements for incidents involving a rail incident involving hazardous materials in the County.	HM	Moderate	Local	County Officials/EM	2025	The county has worked with rail carriers on notification requirements for materials passing through the county, but increased coordination is likely going to be necessary to maintain and improve the system of coordination and ensure safety.
ES-7	Acquire HZM equipment for fire, police and EMS – Each of the volunteer fire departments in the County consider the acquisition of additional hazardous materials response equipment a top priority. This equipment will provide needed protection to County first responders and improve their response capabilities. As a result, threat of injury and death to first responders and accident victims in hazardous materials incidents will be reduced which also result in reduced insurance costs and improved public safety.	All	Low	Federal and Private Grants	EM	2025	The county has provided adequate equipment and resources for responders, but this capability could be improved with additional resources.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
ES-8	Establish a second HazMat response team – Based on a needs assessment and the increased traffic in hazardous materials expected in the County in the future when the I-26 corridor is completed requires that the County consider establishing a second HazMat response team. Establishing this new team will require additional training for fire, police and EMS personnel, additional HazMat equipment for first responders and revisions to existing response protocols among volunteer fire departments. Consideration must also be given to where to locate this new team.	HM	Low	Federal and Private Grants	EM	2025	The county has not established a second HazMat team due to lack of funding, but it will look into funding for one in the future.
ES-9	Acquire fire equipment – Each of the volunteer fire departments in the County has fire equipment needs including fire vehicles, turnout gear, breathing apparatus and other equipment.	WF	Low	FEMA/Federal Grants	EM	2025	Although fire equipment has been provided, staff are always in need of the latest resources that can be acquired to respond to wildfire events.
Structural Projects							
SP-1	Construct County Emergency Operations Center (EOC) – The County should consider building an Emergency Operations Center (EOC) that would allow centralization of communications equipment, consolidation on command and control functions and a mitigation and preparedness planning and education center.	All	Low	FEMA/Federal Grants	EM	2025	The county has not established a specific building to act as an EOC, but it will continue to look into funding and constructing this facility.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
Public Education and Awareness							
PEA-1	Citizen Program – Design and implement a public education campaign designed to inform County residents about hazard and terrorism mitigation efforts. This campaign would also outline County response capabilities and plans and identify the role individual citizens can play in a disaster incident.	All	Moderate	Local	EM	2025	The county is constantly reaching out to citizens to inform them of best practices in hazard mitigation and preparedness for emergency events. However, as new ways of communicating become available (such as social media), the county will expand its practices to attempt to reach as many citizens as possible. Information is provided via brochures and information on the county website regarding grant programs and preparedness efforts individual citizens can take to be ready when a hazard impacts the community.
FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures EQ = Earthquake LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees TS = Thunderstorms EM = Madison County Emergency Management							

Town of Hot Springs Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
Prevention							
P-1	Continue participation in the National Flood Insurance Program without suspension.	FL	High	Local	Town Admin	2025, Annual review	The town is currently a participant in the NFIP and will continue to work to maintain compliance going forward.
Property Protection							
PP-2	Floodproof commercial buildings on Main Street.	FL	High	PDM/HMGP Grants	EM	2025	The town has encouraged local business owners to floodproof their structures but this action is not complete as the town is looking into ways that it could help commercial property owners with this process.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
PP-3	Clear creeks of debris to mitigate the hazards of flooding – Creek flooding is an issue in several areas in the County and one potential strategy for reducing creek flooding is removing debris directly from the creeks that reduces water flows in the creeks. This is not the only solution to creek flooding and will likely need to be repeated in the future. However, if done properly, clearing the debris can reduce flooding impacts in the future and provide additional protection to the County's natural resources. In order to reduce flooding problems in Madison County, debris will be regularly removed from the French Broad River in Hot Springs.	FL	High	Local	Public Works Dept.	2025, After events	The county/town have worked to remove debris from creeks and ensure adequate flow of water. The county/town will continue to address any debris issues in creeks and will seek funding to do so, especially in the wake of a disaster event.
Structural Projects							
SP-1	Support construction of a new County Emergency Operations Center (EOC) – the Town supports the County as they consider building an Emergency Operations Center (EOC) that would allow centralization of communications equipment, consolidation on command and control functions and a mitigation and preparedness planning and education center. This would be a great benefit for the Town.	All	Low	FEMA/Federal Grants	County EM Town of Hot Springs	2025	The county has not yet established a specific building to act as an EOC, but it will continue to look into funding and constructing this facility. The Town continues to support this effort and will continue to do so until it is completed.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
Public Education and Awareness Activities							
PEA-1	Citizen Program – Assist County EM with design and implement a public education campaign designed to inform Town residents about hazard and terrorism mitigation efforts. This campaign would also outline County EM and Town response capabilities and plans and identify the role individual citizens can play in a disaster incident.	All	Moderate	Local	County EM and Town of Hot Springs	2025	With support from County EM, the Town is constantly reaching out to citizens to inform them of best practices in hazard mitigation and preparedness for emergency events. However, as new ways of communicating become available (such as social media), the Town, with support from County EM, will expand its practices to attempt to reach as many citizens as possible. Information is provided via brochures and information on the County website regarding grant programs and preparedness efforts individual citizens can take to be ready when a hazard impacts the community. The Town directs residents (through in-person interactions and online messaging) to the County site for information.

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Town of Marshall Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
Prevention							
P-1	Continue participation in the National Flood Insurance Program without suspension.	FL	High	Local	EM	2025, Annual review	The town is currently a participant in the NFIP and will continue to work to maintain compliance going forward.
Property Protection							
PP-2	Flood proof commercial buildings on Main Street.	FL	High	PDM/HMGP Grants	EM	2025	The town has encouraged local business owners to flood proof their structures but this action is not complete as the town is looking into ways that it could help commercial property owners with this process.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
PP-3	Clear creeks of debris to mitigate the hazards of flooding – Creek flooding is an issue in several areas in the County and one potential strategy for reducing creek flooding is removing debris directly from the creeks that reduces water flows in the creeks. This is not the only solution to creek flooding and will likely need to be repeated in the future. However, if done properly, clearing the debris can reduce flooding impacts in the future and provide additional protection to the County's natural resources. In order to reduce flooding problems in Madison County, debris will be regularly removed from the French Broad River in Marshall.	FL	High	Local	Public Works Dept.	2025, After events	The county/town has worked to remove debris from creeks and ensure adequate flow of water. The county/town will continue to address any debris issues in creeks and will seek funding to do so, especially in the wake of a disaster event.
Structural Projects							
SP-1	Support construction of a new County Emergency Operations Center (EOC) – the Town supports the County as they consider building an Emergency Operations Center (EOC) that would allow centralization of communications equipment, consolidation on command and control functions and a mitigation and preparedness planning and education center. This would be a great benefit for the Town.	All	Low	FEMA/Federal Grants	County EM and Town of Marshall	2025	The county has not yet established a specific building to act as an EOC, but it will continue to look into funding and constructing this facility. The Town continues to support this effort and will continue to do so until it is completed.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
Public Education and Awareness Activities							
PEA-1	Citizen Program – Assist County EM with design and implement a public education campaign designed to inform Town residents about hazard and terrorism mitigation efforts. This campaign would also outline County EM and Town response capabilities and plans and identify the role individual citizens can play in a disaster incident.	All	Moderate	Local	County EM and Town of Marshall	2025	With support from County EM, the Town is constantly reaching out to citizens to inform them of best practices in hazard mitigation and preparedness for emergency events. However, as new ways of communicating become available (such as social media), the Town, with support from County EM, will expand its practices to attempt to reach as many citizens as possible. Information is provided via brochures and information on the County website regarding grant programs and preparedness efforts individual citizens can take to be ready when a hazard impacts the community. The Town directs residents (through in-person interactions and online messaging) to the County site for information.
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Town of Mars Hill Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
Prevention							
P-1	Continue participation in the National Flood Insurance Program without suspension.	FL	High	Local	Town Admin	2025, Annual review	The town is currently a participant in the NFIP and will continue to work to maintain compliance going forward.
P-2	Staffing for first responders – Staffing levels at some of the County fire installations, such as Mars Hill are considered inadequate. Priority should be given to finding ways to attract additional staff and resources.	All	Moderate	Local	EM	2025	The county has worked hard to ensure adequate staffing at its first responder facilities, but more staff is needed to have a sufficient coverage for all response needs.
Property Protection							

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
PP-2	Clear creeks of debris to mitigate the hazards of flooding – Creek flooding is an issue in several areas in the County and one potential strategy for reducing creek flooding is removing debris directly from the creeks that reduces water flows in the creeks. This is not the only solution to creek flooding and will likely need to be repeated in the future. However, if done properly, clearing the debris can reduce flooding impacts in the future and provide additional protection to the County's natural resources. In order to reduce flooding problems in Madison County, debris will be regularly removed from the Ivy River in Mars Hill.	FL	High	Local	Public Works Dept.	2025, After events	The county/town have worked to remove debris from creeks and ensure adequate flow of water. The county/town will continue to address any debris issues in creeks and will seek funding to do so, especially in the wake of a disaster event.
Structural Projects							
SP-1	Support construction of a new County Emergency Operations Center (EOC) – the Town supports the County as they consider building an Emergency Operations Center (EOC) that would allow centralization of communications equipment, consolidation on command and control functions and a mitigation and preparedness planning and education center. This would be a great benefit for the Town.	All	Low	FEMA/Federal Grants	County EM and Town of Mars Hill	2025	The county has not yet established a specific building to act as an EOC, but it will continue to look into funding and constructing this facility. The Town continues to support this effort and will continue to do so until it is completed.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2021 Action Implementation Status
Public Education and Awareness Activities							
PEA-1	Citizen Program – Assist County EM with design and implement a public education campaign designed to inform Town residents about hazard and terrorism mitigation efforts. This campaign would also outline County EM and Town response capabilities and plans and identify the role individual citizens can play in a disaster incident.	All	Moderate	Local	County EM and Town of Mars Hill	2025	With support from County EM, the Town is constantly reaching out to citizens to inform them of best practices in hazard mitigation and preparedness for emergency events. However, as new ways of communicating become available (such as social media), the Town, with support from County EM, will expand its practices to attempt to reach as many citizens as possible. Information is provided via brochures and information on the County website regarding grant programs and preparedness efforts individual citizens can take to be ready when a hazard impacts the community. The Town directs residents (through in-person interactions and online messaging) to the County site for information.

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SECTION 10
PLAN MAINTENANCE

This section discusses how the Buncombe Madison Regional Mitigation Strategy and Mitigation Action Plan will be implemented and how the Regional Hazard Mitigation Plan will be evaluated and enhanced over time. This section also discusses how the public will continue to be involved in a sustained hazard mitigation planning process. It consists of the following four subsections:

- 10.1 Implementation and Integration
- 10.2 Monitoring, Evaluation, and Enhancement
- 10.3 Continued Public Involvement
- 10.4 Evaluation of Monitoring, Evaluation and Update Process

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44 CFR Requirement

44 CFR Part201.6(c)(4)(i):
The plan shall include a plan maintenance process that includes a section describing the method and schedule of monitoring, evaluating and updating the mitigation plan within a five-year cycle.

44 CFR Part 201.6(c)(4)(ii):
The plan maintenance process shall include a process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

10.1 IMPLEMENTATION AND INTEGRATION

Each agency, department or other partner participating under the Buncombe Madison 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 Buncombe Madison Region will seek outside funding sources to implement mitigation projects in both the pre-disaster and post-disaster environments. When applicable, potential funding sources have been identified for proposed actions listed in the Mitigation Action Plan.

The participating jurisdictions will integrate this Hazard Mitigation Plan into relevant City and County government decision-making processes or mechanisms, where feasible. This includes integrating the requirements of the Hazard Mitigation Plan into other local planning documents, processes or mechanisms, such as comprehensive or capital improvement plans, when appropriate. The members of the Buncombe Madison Regional Hazard Mitigation Planning Committee will remain charged with

ensuring that the goals and mitigation actions of new and updated local planning documents for their agencies or departments are consistent, or do not conflict with, the goals and actions of the Hazard Mitigation Plan, and will not contribute to increased hazard vulnerability in the Buncombe Madison Region.

Since the initial regional plan was adopted in 2016 and with each County-specific plan prior to that, each County and participating jurisdiction has worked to integrate the hazard mitigation plan into other planning mechanisms where applicable/feasible. Examples of how this integration has occurred have been documented in the Implementation Status discussion provided for each of the mitigation actions found in Section 9. Specific examples of how integration has occurred include:

- Integrating the mitigation plan into reviews and updates of floodplain management ordinances
- Integrating the mitigation plan into reviews and updates of County emergency operations plans
- Integrating the mitigation plan into review and updates of building codes
- Integrating the mitigation plan into the capital improvements plan through identification of mitigation actions that require local funding.

Opportunities to further integrate the requirements of this Plan into other local planning mechanisms shall continue to be identified through future meetings of the Regional Hazard Mitigation Planning Committee, individual county meetings, and the annual review process described herein. Although it is recognized that there are many possible benefits to integrating components of this Plan into other local planning mechanisms, the development and maintenance of this stand-alone Regional Hazard Mitigation Plan is deemed by the Buncombe Madison Regional Hazard Mitigation Planning Committee to be the most effective and appropriate method to implement local hazard mitigation actions at this time.

10.2 MONITORING, EVALUATION AND ENHANCEMENT

Periodic revisions and updates of the Hazard Mitigation Plan are required to ensure that the goals of the Plan are kept current, taking into account potential changes in hazard vulnerability and mitigation priorities. In addition, revisions may be necessary to ensure that the Plan is in full compliance with applicable federal and state regulations. Periodic evaluation of the Plan will also ensure that specific mitigation actions are being reviewed and carried out according to the Mitigation Action Plan.

When determined necessary, the Buncombe Madison Regional Hazard Mitigation Planning Committee shall meet in March of every year to evaluate and monitor the progress attained and to revise, where needed, the activities set forth in the Plan. The findings and recommendations of the Regional Hazard Mitigation Planning Committee shall be documented in the form of a report that can be shared with interested City and County Council members. The Regional Hazard Mitigation Planning Committee will also meet following any disaster events warranting a reexamination of the mitigation actions being implemented or proposed for future implementation. This will ensure that the Plan is continuously updated to reflect changing conditions and needs within the Buncombe Madison Region. For future updates of the plan, North Carolina Emergency Management's Hazard Mitigation Planning section will help coordinate the reconvening the Regional Hazard Mitigation Planning Committee for these reviews through coordination with each County's Emergency Management Departments. The Emergency Management Director from Buncombe and Madison Counties will maintain ultimate responsibility for their respective County's plan implementation and monitoring, evaluation and update.

Five (5) Year Plan Review

The Plan will be thoroughly reviewed by the Regional Hazard Mitigation Planning Committee every five years to determine whether there have been any significant changes in the Buncombe Madison Region that may, in turn, necessitate changes in the types of mitigation actions proposed. New development in identified hazard areas, an increased exposure to hazards, an increase or decrease in capability to address hazards, and changes to federal or state legislation are examples of factors that may affect the necessary content of the Plan.

The plan review provides participating jurisdiction officials with an opportunity to evaluate those actions that have been successful and to explore the possibility of documenting potential losses avoided due to the implementation of specific mitigation measures. The plan review also provides the opportunity to address mitigation actions that may not have been successfully implemented as assigned. North Carolina Emergency Management's Hazard Mitigation Planning section will help coordinate the reconvening the Regional Hazard Mitigation Planning Committee and conducting the five-year review through coordination with each County's Emergency Management Departments.

During the five-year plan review process, the following questions will be considered as criteria for assessing the effectiveness and appropriateness of the Plan:

- Do the goals address current and expected conditions?
- Has the nature or magnitude of risks changed?
- Are the current resources appropriate for implementing the Plan?
- Are there implementation problems, such as technical, political, legal or coordination issues with other agencies?
- Have the outcomes occurred as expected?
- Did County departments participate in the plan implementation process as assigned?

Following the five-year review, any revisions deemed necessary will be summarized and implemented according to the reporting procedures and plan amendment process outlined herein. Upon completion of the review and update/amendment process, the Buncombe Madison Regional Hazard Mitigation Plan will be submitted to the State Hazard Mitigation Officer at the North Carolina Division of Emergency Management (NCEM) for final review and approval in coordination with the Federal Emergency Management Agency (FEMA).

Disaster Declaration

Following a disaster declaration, the Buncombe Madison Regional Hazard Mitigation Plan will be revised as necessary to reflect lessons learned, or to address specific issues and circumstances arising from the event. It will be the responsibility North Carolina Emergency Management's Hazard Mitigation Planning section to coordinate the reconvening of the Regional Hazard Mitigation Planning Committee, through coordination with each County's Emergency Management Department, and ensure the appropriate stakeholders are invited to participate in the plan revision and update process following declared disaster events.

Reporting Procedures

The results of the five-year review will be summarized by the Regional Hazard Mitigation Planning Committee in a report that will include an evaluation of the effectiveness of the Plan and any required or recommended changes or amendments. The report will also include an evaluation of

implementation progress for each of the proposed mitigation actions, identifying reasons for delays or obstacles to their completion along with recommended strategies to overcome them.

Plan Amendment Process

Upon the initiation of the amendment process, representatives from the Buncombe Madison counties will forward information on the proposed change(s) to all interested parties including, but not limited to, all directly affected County departments, residents, and businesses. Information will also be forwarded to the North Carolina Division of Emergency Management. This information will be disseminated in order to seek input on the proposed amendment(s) for no less than a 45-day review and comment period.

At the end of the 45-day review and comment period, the proposed amendment(s) and all comments will be forwarded to the Regional Hazard Mitigation Planning Committee for final consideration. The Planning Committee will review the proposed amendment along with the comments received from other parties, and if acceptable, the committee will submit a recommendation for the approval and adoption of changes to the Plan.

In determining whether to recommend approval or denial of a Plan amendment request, the following factors will be considered by the Regional Hazard Mitigation Planning Committee:

- There are errors, inaccuracies or omissions made in the identification of issues or needs in the Plan
- New issues or needs have been identified which are not adequately addressed in the Plan
- There has been a change in information, data, or assumptions from those on which the Plan is based

Upon receiving the recommendation from the Regional Hazard Mitigation Planning Committee and prior to adoption of the Plan, the participating jurisdictions will hold a public hearing, if deemed necessary. The governing bodies of each participating jurisdiction will review the recommendation from the Regional Hazard Mitigation Planning Committee (including the factors listed above) and any oral or written comments received at the public hearing. Following that review, the governing bodies will take one of the following actions:

- Adopt the proposed amendments as presented
- Adopt the proposed amendments with modifications
- Refer the amendments request back to the Regional Hazard Mitigation Planning Committee for further revision, or
- Defer the amendment request back to the Regional Hazard Mitigation Planning Committee for further consideration and/or additional hearings

10.3 CONTINUED PUBLIC INVOLVEMENT

44 CFR Requirement
44 CFR Part 201.6(c)(4)(iii): The plan maintenance process shall include a discussion on how the community will continue public participation in the plan maintenance process

Public participation is an integral component to the mitigation planning process and will continue to be essential as this Plan evolves over time. As described above, significant changes or amendments to the Plan shall require a public hearing prior to any adoption procedures.

Other efforts to involve the public in the maintenance, evaluation and revision process will be made as necessary. These efforts may include:

- Advertising meetings of the Regional Hazard Mitigation Planning Committee in local newspapers, public bulletin boards and/or County office buildings
- Designating willing and voluntary citizens and private sector representatives as official members of the Regional Hazard Mitigation Planning Committee
- Utilizing local media to update the public on any maintenance and/or periodic review activities taking place
- Utilizing the county websites to advertise any maintenance and/or periodic review activities taking place, and
- Keeping copies of the Plan in public libraries.

10.4 EVALUATION OF MONITORING, EVALUATION AND UPDATE PROCESS

Over the past five years, the participating jurisdictions have been independently implementing, monitoring and evaluating their own mitigation action plans. Progress made in implementing actions has been documented in Section 9: Mitigation Action Plan where each action contains a narrative about the implementation status of the action as of 2021. That said, the jurisdiction did waiver slightly from the monitoring and evaluation process defined in the original version of the plan, but still made significant process in implementing their mitigation action plans. During the 2021 update of this plan, the Regional Hazard Mitigation Planning Committee determined that the procedures for the upcoming five-year monitoring and evaluation process will remain as defined above, with minor revisions as noted, and will be re-evaluated during the next plan update process.

The five-year comprehensive update process began as early as 2018 when North Carolina Emergency Management made the decision to set aside HMGP funding from Hurricane Matthew to fund the Buncombe Madison Regional Hazard Mitigation Plan update. To facilitate this effort, NCEM assigned the plan update to their pre-qualified hazard mitigation planning consultants ESP Associates. Representatives from ESP Associates first reached out to Buncombe-Madison representatives in September to initiate the plan update process. More details about the plan update process are provided in Section 2, Planning Process. For the next update of this plan, NCEM's Hazard Mitigation Planning section will continue take the lead on organizing and initiating the 5-year update of the plan.

Appendix A
Plan Adoption

This appendix includes the local adoption resolutions for each of the participating jurisdictions.

Appendix B
Planning Tools

This appendix includes the following:

1. Blank Public Participation Survey
2. Blank Capability Assessment
3. Scoring Criteria for Capability Assessment
4. Blank Mitigation Action Worksheet

PUBLIC SURVEY
FOR HAZARD MITIGATION PLANNING

We need your help!

Buncombe and Madison are currently engaged in a planning process to become less vulnerable to natural disasters, and your participation is important to us!

These two counties, 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 and returning it to:

Nathan Slaughter, ESP Associates, Inc.
2200 Gateway Centre Blvd – Suite 216
Morrisville, NC 27560

Surveys can also be emailed to nslaughter@espassociates.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 *Buncombe Madison Regional Hazard Mitigation Plan*, please contact ESP Associates, Inc, planning consultant for the project. You may reach Nathan Slaughter at 919.415.2726 or at the email address above.

This survey is also available online at:
https://s.surveyplanet.com/uSiT4nell

1. Where do you live?

- ❑ Unincorporated Buncombe County
- ❑ Unincorporated Madison County
- ❑ Asheville
- ❑ Biltmore Forest
- ❑ Black Mountain
- ❑ Montreat
- ❑ Weaverville
- ❑ Woodfin
- ❑ Hot Springs
- ❑ Marshall
- ❑ Mars Hill

Have you ever experienced or been impacted by a disaster?

- ❑ Yes
- ❑ No

a. If "Yes," please explain:

2. How concerned are you about the possibility of our community being impacted by a disaster?

- ❑ Extremely concerned
- ❑ Somewhat concerned
- ❑ Not concerned

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

- ❑ Cyber Attack
- ❑ Drought
- ❑ Electromagnetic Pulse (EMP)
- ❑ Excessive Heat
- ❑ Hazardous Substances
- ❑ Infectious Disease
- ❑ Lightning
- ❑ Severe Thunderstorms/High Wind
- ❑ Earthquakes
- ❑ Erosion
- ❑ Flooding
- ❑ Hurricane and Coastal Hazards
- ❑ Landslides
- ❑ Radiological Emergency
- ❑ Severe Winter Weather
- ❑ Terrorism
- ❑ Tornadoes
- ❑ Dam Failure
- ❑ Wildfire

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

- ❑ Cyber Attack
- ❑ Drought
- ❑ Electromagnetic Pulse (EMP)
- ❑ Excessive Heat
- ❑ Hazardous Substances
- ❑ Infectious Disease
- ❑ Lightning
- ❑ Severe Thunderstorms/High Wind
- ❑ Earthquakes
- ❑ Erosion
- ❑ Flooding
- ❑ Hurricane and Coastal Hazards
- ❑ Landslides
- ❑ Radiological Emergency
- ❑ Severe Winter Weather
- ❑ Terrorism
- ❑ Tornadoes
- ❑ Dam Failure
- ❑ Wildfire

5. **Is there another hazard not listed above that you think is a wide-scale threat to your neighborhood?**

   - ❑ Yes (please explain): _____
   - ❑ No

6. **Is your home located in a floodplain?**
   - ❑ Yes
   - ❑ No
   - ❑ I'm not sure

7. **Do you have flood insurance?**

   - ❑ Yes
   - ❑ No
   - ❑ I'm not sure

   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): _____

8. **Have you taken any actions to make your home or neighborhood more resistant to hazards?**

   - ❑ Yes
   - ❑ No

   b. **If "Yes," please explain:**

9. **Are you interested in making your home or neighborhood more resistant to hazards?**

   - ❑ Yes
   - ❑ No

10. Do you know what office to contact regarding reducing your risks to hazards in your area?

- ❑ Yes
- ❑ No

11. 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
- ❑ Mail
- ❑ Public workshops/meetings
- ❑ School meetings
- ❑ Other (please explain): _____

12. 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?

13. 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?

14. 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
1. Prevention Administrative or regulatory actions that influence the way land is developed and buildings are built. Examples include planning and zoning, building codes, open space preservation, and floodplain regulations.	❑	❑	❑
2. Property Protection Actions that involve 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.	❑	❑	❑
3. Natural Resource Protection Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems. Examples include: floodplain protection, habitat preservation, slope stabilization, riparian buffers, and forest management.	❑	❑	❑
4. Structural Projects Actions intended to lessen the impact of a hazard by modifying the natural progression of the hazard. Examples include dams, levees, detention/retention basins, channel modification, retaining walls and storm sewers.	❑	❑	❑
5. Emergency Services Actions that protect people and property during and immediately after a hazard event. Examples include warning systems, evacuation planning, emergency response training, and protection of critical emergency facilities or systems.	❑	❑	❑
6. Public Education and Awareness Actions to inform citizens about hazards and the techniques they can use to protect themselves and their property. Examples include outreach projects, school education programs, library materials and demonstration events.	❑	❑	❑

THANK YOU FOR YOUR PARTICIPATION!

This survey may be submitted anonymously; however, if you provide us with your name and contact information below we will have the ability to follow up with you to learn more about your ideas or concerns (optional):

Name: _____

Address: _____

_____

Phone: _____ **E-Mail:** _____

Local Capability Assessment Survey

Jurisdiction/Agency: _____ **Phone:** _____

Point of Contact: _____ **E-mail:** _____

1. PLANNING AND REGULATORY CAPABILITY - Please indicate whether the following planning or regulatory tools (plans, ordinances, codes or programs) are currently in place or under development for your jurisdiction by placing an "**X**" in the appropriate box. Then, for each particular item in place, identify the department or agency responsible for its implementation and indicate its estimated or anticipated effect on hazard loss reduction (Strongly Supports, Helps Facilitate or Hinders) with another "**X**". Finally, please provide additional comments or explanations in the space provided or with attachments.

Planning / Regulatory Tool	In Place	Under Development	Department / Agency Responsible	Effect on Loss Reduction			Comments
				Strongly Supports	Helps Facilitate	Hinders	
Hazard Mitigation Plan							
Comprehensive Land Use Plan (or General, Master or Growth Mgt. Plan)							
Floodplain Management Plan							
Open Space Management Plan (or Parks & Rec./ Greenways Plan)							
Stormwater Management Plan / Ordinance							
Natural Resource Protection Plan							
Flood Response Plan							
Emergency Operations Plan							
Continuity of Operations Plan							
Evacuation Plan							
Other Plans (please explain under Comments)							

Local Capability Assessment Survey

Planning / Regulatory Tool	In Place	Under Development	Department / Agency Responsible	Effect on Loss Reduction			Comments
				Strongly Supports	Facilitates	Hinders	
Disaster Recovery Plan							
Capital Improvements Plan							
Economic Development Plan							
Historic Preservation Plan							
Floodplain Ordinance (or Flood Damage Prevention Ordinance)							
Zoning Ordinance							
Subdivision Ordinance							
Unified Development Ordinance							
Post-disaster Redevelopment / Reconstruction Ordinance							
Building Code							
Fire Code							
National Flood Insurance Program (NFIP)							
NFIP Community Rating System (CRS Program)							

Local Capability Assessment Survey

2. ADMINISTRATIVE AND TECHNICAL CAPABILITY - Please indicate whether your jurisdiction maintains the following staff members within its current personnel resources by placing an "**X**" in the appropriate box . Then, if YES, please identify the department or agency they work under and provide any other comments you may have in the space provided or with attachments.

Staff / Personnel Resources	Yes	No	Department / Agency	Comments
Planners with knowledge of land development and land management practices				
Engineers or professionals trained in construction practices related to buildings and/or infrastructure				
Planners or engineers with an understanding of natural and/or human-caused hazards				
Emergency manager				
Floodplain manager				
Land surveyors				
Scientist familiar with the hazards of the community				
Staff with education or expertise to assess the community's vulnerability to hazards				
Personnel skilled in Geographic Information Systems (GIS) and/or FEMA's HAZUS program				
Resource development staff or grant writers				

Local Capability Assessment Survey

3. FISCAL CAPABILITY - Please indicate whether your jurisdiction has access to or is eligible to use the following local financial resources ***for hazard mitigation purposes*** (including as match funds for State of Federal mitigation grant funds). Then, identify the primary department or agency responsible for its administration or allocation and provide any other comments you may have in the space provided or with attachments.

Financial Resources	Yes	No	Department / Agency	Comments
Capital Improvement Programming				
Community Development Block Grants (CDBG)				
Special Purpose Taxes (or taxing districts)				
Gas / Electric Utility Fees				
Water / Sewer Fees				
Stormwater Utility Fees				
Development Impact Fees				
General Obligation, Revenue and/or Special Tax Bonds				
Partnering arrangements or intergovernmental agreements				
Other: _____				

Local Capability Assessment Survey

4. POLITICAL CAPABILITY - Political capability can be generally measured by the degree to which local political leadership is willing to enact policies and programs that reduce hazard vulnerabilities in your community, even if met with some opposition. Examples may include guiding development away from identified hazard areas, restricting public investments or capital improvements within hazard areas, or enforcing local development standards that go beyond minimum State or Federal requirements (e.g., building codes, floodplain management, etc.). Please identify some general examples of these efforts if available and/or reference where more documentation can be found.

Local Capability Assessment Survey

5. SELF-ASSESSMENT OF CAPABILITY - Please provide an approximate measure of your jurisdiction's capability to effectively implement hazard mitigation strategies to reduce hazard vulnerabilities. Using the following table, please place an "**X**" in the box marking the most appropriate degree of capability (Limited, Moderate or High) based upon best available information and the responses provided in Sections 1-4 of this survey.

	DEGREE OF CAPABILITY		
	LIMITED	**MODERATE**	**HIGH**
Planning and Regulatory Capability			
Administrative and Technical Capability			
Fiscal Capability			
Political Capability			
OVERALL CAPABILITY			

Points System for Capability Ranking

0-19 points = Limited overall capability
20-39 points = Moderate overall capability
40-68 points = High overall capability

I. Planning and Regulatory Capability
(Up to 43 points)

Yes = 3 points
Under Development = 1 point
Included under County plan/code/ordinance/program = 1 point
No = 0 points

- Hazard Mitigation Plan
- Comprehensive Land Use Plan
- Floodplain Management Plan
- National Flood Insurance Program
- NFIP Community Rating System

Yes = 2 points
Under Development = 1 point
Included under County plan/code/ordinance/program = 1 point
No = 0 points

- Open Space Management Plan / Parks & Recreation Plan
- Stormwater Management Plan
- Natural Resource Protection Plan
- Flood Response Plan
- Emergency Operations Plan
- Continuity of Operations Plan
- Evacuation Plan
- Disaster Recovery Plan
- Flood Damage Prevention Ordinance
- Post-disaster Redevelopment / Reconstruction Ordinance

Yes = 1 point
No = 0 points

- Capital Improvements Plan
- Economic Development Plan
- Historic Preservation Plan
- Zoning Ordinance
- Subdivision Ordinance
- Unified Development Ordinance
- Building Code
- Fire Code

II. Administrative and Technical Capability
(Up to 15 points)

Yes = 2 points
Service provided by County = 1 point
No = 0 points

- Planners with knowledge of land development and land management practices
- Engineers or professionals trained in construction practices related to buildings and/or infrastructure
- Planners or engineers with an understanding of natural and/or human-caused hazards
- Emergency manager
- Floodplain manager

Yes = 1 point
No = 0 points

- Land surveyors
- Scientist familiar with the hazards of the community
- Staff with education or expertise to assess the community's vulnerability to hazards
- Personnel skilled in Geographical Information Systems (GIS) and/or Hazus
- Resource development staff or grant writers

III. Fiscal Capability
(Up to 10 points)

Yes = 1 point
No = 0 points

- Capital Improvement Programming
- Community Development Block Grants (CDBG)
- Special Purpose Taxes (or tax districts)
- Gas / Electric Utility Fees
- Water / Sewer Fees
- Stormwater Utility Fees
- Development Impact Fees
- General Obligation / Revenue / Special Tax Bonds
- Partnering arrangements or intergovernmental agreements
- Other

MITIGATION ACTION WORKSHEETS

Mitigation Action Worksheets are used to identify potential hazard mitigation actions that participating jurisdictions in the Buncombe Madison Region will consider to reduce the negative effects of identified hazards. The worksheets provide a simple yet effective method of organizing potential actions in a user-friendly manner that can easily be incorporated into the Region's Hazard Mitigation Plan.

The worksheets are to be used as part of a strategic planning process and are designed to be:

a.) completed electronically (worksheets and instructions will be e-mailed to members of the Hazard Mitigation Planning Team following the Mitigation Strategy Workshop);
b.) reviewed with your department/organization for further consideration; and
c.) returned according to the contact information provided below.

Electronic copies may be e-mailed to: nslaughter@espassociates.com
Hard copies can be mailed to:
Nathan Slaughter
2200 Gateway Centre Blvd, Suite 216
Morrisville, NC 27560

INSTRUCTIONS

Each mitigation action should be considered to be a separate local project, policy or program and each individual action should be entered into a separate worksheet. By identifying the implementation requirements for each action, the worksheets will help lay the framework for engaging in distinct actions that will help reduce the community's overall vulnerability and risk. Detailed explanations on how to complete the worksheet are provided below.

Proposed Action: Identify a specific action that, if accomplished, will reduce vulnerability and risk in the impact area. Actions may be in the form of local policies (i.e., regulatory or incentive-based measures), programs or structural mitigation projects and should be consistent with any pre-identified mitigation goals and objectives.

Site and Location: Provide details with regard to the physical location or geographic extent of the proposed action, such as the location of a specific structure to be mitigated, whether a program will be citywide, countywide or regional, etc.

History of Damages: Provide a brief history of any known damages as it relates to the proposed action and the hazard(s) being addressed. For example, the proposed elevation of a repetitive loss property should include an overview of the number of times the structure has flooded, total dollar amount of damages if available, etc.

Hazard(s) Addressed: List the hazard(s) the proposed action is designed to mitigate against.

Category: Indicate the most appropriate category for the proposed action as discussed during the Mitigation Strategy Workshop (Prevention; Property Protection; Natural Resource Protection; Structural Projects; Emergency Services; Public Education and Awareness).

Priority: Indicate whether the action is a "high" priority, "moderate" priority or "low" priority based generally on the following criteria:

1. Effect on overall risk to life and property
2. Ease of implementation / technical feasibility
3. Project costs versus benefits
4. Political and community support
5. Funding availability

Estimated Cost: If applicable, indicate what the total cost will be to accomplish this action. This amount will be an estimate until actual final dollar amounts can be determined. Some actions (such as ordinance revisions) may only cost "local staff time" and should be noted so.

Potential Funding Sources: If applicable, indicate how the cost to complete the action will be funded. For example, funds may be provided from existing operating budgets or general funds, a previously established contingency fund, a cost-sharing federal or state grant program, etc.

Lead Agency/Department Responsible: Identify the local agency, department or organization that is best suited to implement the proposed action.

Implementation Schedule: Indicate when the action will begin and when the action is expected to be completed. Remember that some actions will require only a minimal amount of time, while others may require a long-term or continuous effort.

Comments: This space is provided for any additional information or details that may not be captured under the previous headings.

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

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

COMMENTS

Appendix C
Local Mitigation Plan Review Tool

LOCAL MITIGATION PLAN REVIEW TOOL

The *Local Mitigation Plan Review Tool* demonstrates how the Local Mitigation Plan meets the regulation in 44 CFR §201.6 and offers States and FEMA Mitigation Planners an opportunity to provide feedback to the community.

- The Regulation Checklist provides a summary of FEMA's evaluation of whether the Plan has addressed all requirements.
- The Plan Assessment identifies the plan's strengths as well as documents areas for future improvement.
- The Multi-jurisdiction Summary Sheet is an optional worksheet that can be used to document how each jurisdiction met the requirements of each Element of the Plan (Planning Process; Hazard Identification and Risk Assessment; Mitigation Strategy; Plan Review, Evaluation, and Implementation; and Plan Adoption).

The FEMA Mitigation Planner must reference this *Local Mitigation Plan Review Guide* when completing the *Local Mitigation Plan Review Tool*.

Jurisdiction: Buncombe County	**Title of Plan:** Buncombe Madison Regional Hazard Mitigation Plan – 2021 Update	**Date of Plan:** DRAFT – September 2020
Local Point of Contact: Nathan Slaughter	**Address:** 2200 Gateway Centre Blvd., Suite 216 Morrisville, NC 27560	
Title: Hazard Mitigation Department Manager		
Agency: ESP Associates		
Phone Number: 919-264-9582	**E-Mail:** nslaughter@espassociates.com	

State Reviewer:	**Title:**	**Date:**

FEMA Reviewer:	**Title:**	**Date:**
Date Received in FEMA Region ***(insert #)***		
Plan Not Approved		
Plan Approvable Pending Adoption		
Plan Approved		

SECTION 1:
REGULATION CHECKLIST

INSTRUCTIONS: The Regulation Checklist must be completed by FEMA. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been 'Met' or 'Not Met.' The 'Required Revisions' summary at the bottom of each Element must be completed by FEMA to provide a clear explanation of the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is 'Not Met.' Sub-elements should be referenced in each summary by using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each Element and sub-element are described in detail in this *Plan Review Guide* in Section 4, Regulation Checklist.

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	**Location in Plan** (section and/or page number)	**Met**	**Not Met**
ELEMENT A. PLANNING PROCESS			
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))	Section 1.3, Section 2.3, 2.4, 2.4.1, 2.5, 2.6, 2.6.1, 2.7; App. D		
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))	Section 2.4, 2.4.1, Section 2.7; App. D		
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))	Section 2.6, 2.6.1; App. D		
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))	Section 7 7-3, 7-4 and related subsections		
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))	Section 10.3 10-4		
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))	Section 10.2		
ELEMENT A: REQUIRED REVISIONS			
ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT			
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))	Section 4; Section 5 and all subsections		

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))	Section 5 and all relevant subsections; Appendix H		
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))	Section 5; Section 6 and relevant subsections		
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))	Section 5.10.4		
ELEMENT B: REQUIRED REVISIONS			
ELEMENT C. MITIGATION STRATEGY			
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))	Section 7 and all relevant subsections		
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))	Section 5.10.3 Section 7.3.1.2		
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))	Section 8.2		
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))	Section 8.3-8.4; Section 9.2		
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))	Section 8.1.1; Section 9.2		
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))	Section 10.1		
ELEMENT C: REQUIRED REVISIONS			
ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (applicable to plan updates only)			
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))	Section 3.3.3		

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))	Section 9, Appendix E		
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	Section 8.5		
ELEMENT D: REQUIRED REVISIONS			
ELEMENT E. PLAN ADOPTION			
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))	Pending NCEM and FEMA review and APA status.		
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))	Pending NCEM and FEMA review and APA status.		
ELEMENT E: REQUIRED REVISIONS			
ELEMENT F. ADDITIONAL STATE REQUIREMENTS (OPTIONAL FOR STATE REVIEWERS ONLY; NOT TO BE COMPLETED BY FEMA)			
F1.			
F2.			
ELEMENT F: REQUIRED REVISIONS			

SECTION 2:
PLAN ASSESSMENT

INSTRUCTIONS: The purpose of the Plan Assessment is to offer the local community more comprehensive feedback to the community on the quality and utility of the plan in a narrative format. The audience for the Plan Assessment is not only the plan developer/local community planner, but also elected officials, local departments and agencies, and others involved in implementing the Local Mitigation Plan. The Plan Assessment must be completed by FEMA. The Assessment is an opportunity for FEMA to provide feedback and information to the community on: 1) suggested improvements to the Plan; 2) specific sections in the Plan where the community has gone above and beyond minimum requirements; 3) recommendations for plan implementation; and 4) ongoing partnership(s) and information on other FEMA programs, specifically RiskMAP and Hazard Mitigation Assistance programs. The Plan Assessment is divided into two sections:

1. Plan Strengths and Opportunities for Improvement
2. Resources for Implementing Your Approved Plan

Plan Strengths and Opportunities for Improvement is organized according to the plan Elements listed in the Regulation Checklist. Each Element includes a series of italicized bulleted items that are suggested topics for consideration while evaluating plans, but it is not intended to be a comprehensive list. FEMA Mitigation Planners are not required to answer each bullet item, and should use them as a guide to paraphrase their own written assessment (2-3 sentences) of each Element.

The Plan Assessment must not reiterate the required revisions from the Regulation Checklist or be regulatory in nature, and should be open-ended and to provide the community with suggestions for improvements or recommended revisions. The recommended revisions are suggestions for improvement and are not required to be made for the Plan to meet Federal regulatory requirements. The italicized text should be deleted once FEMA has added comments regarding strengths of the plan and potential improvements for future plan revisions. It is recommended that the Plan Assessment be a short synopsis of the overall strengths and weaknesses of the Plan (no longer than two pages), rather than a complete recap section by section.

Resources for Implementing Your Approved Plan provides a place for FEMA to offer information, data sources and general suggestions on the overall plan implementation and maintenance process. Information on other possible sources of assistance including, but not limited to, existing publications, grant funding or training opportunities, can be provided. States may add state and local resources, if available.

A. Plan Strengths and Opportunities for Improvement

This section provides a discussion of the strengths of the plan document and identifies areas where these could be improved beyond minimum requirements.

Element A: Planning Process

How does the Plan go above and beyond minimum requirements to document the planning process with respect to:

- *Involvement of stakeholders (elected officials/decision makers, plan implementers, business owners, academic institutions, utility companies, water/sanitation districts, etc.);*
- *Involvement of Planning, Emergency Management, Public Works Departments or other planning agencies (i.e., regional planning councils);*
- *Diverse methods of participation (meetings, surveys, online, etc.); and*
- *Reflective of an open and inclusive public involvement process.*

Element B: Hazard Identification and Risk Assessment

In addition to the requirements listed in the Regulation Checklist, 44 CFR 201.6 Local Mitigation Plans identifies additional elements that should be included as part of a plan's risk assessment. The plan should describe vulnerability in terms of:

1) *A general description of land uses and future development trends within the community so that mitigation options can be considered in future land use decisions;*
2) *The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas; and*
3) *A description of potential dollar losses to vulnerable structures, and a description of the methodology used to prepare the estimate.*

How does the Plan go above and beyond minimum requirements to document the Hazard Identification and Risk Assessment with respect to:

- *Use of best available data (flood maps, HAZUS, flood studies) to describe significant hazards;*
- *Communication of risk on people, property, and infrastructure to the public (through tables, charts, maps, photos, etc.);*
- *Incorporation of techniques and methodologies to estimate dollar losses to vulnerable structures;*
- *Incorporation of Risk MAP products (i.e., depth grids, Flood Risk Report, Changes Since Last FIRM, Areas of Mitigation Interest, etc.); and*
- *Identification of any data gaps that can be filled as new data became available.*

Element C: Mitigation Strategy

How does the Plan go above and beyond minimum requirements to document the Mitigation Strategy with respect to:

- *Key problems identified in, and linkages to, the vulnerability assessment;*
- *Serving as a blueprint for reducing potential losses identified in the Hazard Identification and Risk Assessment;*
- *Plan content flow from the risk assessment (problem identification) to goal setting to mitigation action development;*
- *An understanding of mitigation principles (diversity of actions that include structural projects, preventative measures, outreach activities, property protection measures, post-disaster actions, etc);*
- *Specific mitigation actions for each participating jurisdictions that reflects their unique risks and capabilities;*
- *Integration of mitigation actions with existing local authorities, policies, programs, and resources; and*
- *Discussion of existing programs (including the NFIP), plans, and policies that could be used to implement mitigation, as well as document past projects.*

Element D: Plan Update, Evaluation, and Implementation (*Plan Updates Only*)

How does the Plan go above and beyond minimum requirements to document the 5-year Evaluation and Implementation measures with respect to:

- *Status of previously recommended mitigation actions;*
- *Identification of barriers or obstacles to successful implementation or completion of mitigation actions, along with possible solutions for overcoming risk;*
- *Documentation of annual reviews and committee involvement;*
- *Identification of a lead person to take ownership of, and champion the Plan;*
- *Reducing risks from natural hazards and serving as a guide for decisions makers as they commit resources to reducing the effects of natural hazards;*
- *An approach to evaluating future conditions (i.e. socio-economic, environmental, demographic, change in built environment etc.);*
- *Discussion of how changing conditions and opportunities could impact community resilience in the long term; and*
- *Discussion of how the mitigation goals and actions support the long-term community vision for increased resilience.*

B. Resources for Implementing Your Approved Plan

Ideas may be offered on moving the mitigation plan forward and continuing the relationship with key mitigation stakeholders such as the following:

- *What FEMA assistance (funding) programs are available (for example, Hazard Mitigation Assistance (HMA)) to the jurisdiction(s) to assist with implementing the mitigation actions?*
- *What other Federal programs (National Flood Insurance Program (NFIP), Community Rating System (CRS), Risk MAP, etc.) may provide assistance for mitigation activities?*
- *What publications, technical guidance or other resources are available to the jurisdiction(s) relevant to the identified mitigation actions?*
- *Are there upcoming trainings/workshops (Benefit-Cost Analysis (BCA), HMA, etc.) to assist the jurisdictions(s)?*
- *What mitigation actions can be funded by other Federal agencies (for example, U.S. Forest Service, National Oceanic and Atmospheric Administration (NOAA), Environmental Protection Agency (EPA) Smart Growth, Housing and Urban Development (HUD) Sustainable Communities, etc.) and/or state and local agencies?*

SECTION 3:
MULTI-JURISDICTION SUMMARY SHEET (OPTIONAL)

INSTRUCTIONS: For multi-jurisdictional plans, a Multi-jurisdiction Summary Spreadsheet may be completed by listing each participating jurisdiction, which required Elements for each jurisdiction were 'Met' or 'Not Met,' and when the adoption resolutions were received. This Summary Sheet does not imply that a mini-plan be developed for each jurisdiction; it should be used as an optional worksheet to ensure that each jurisdiction participating in the Plan has been documented and has met the requirements for those Elements (A through E).

MULTI-JURISDICTION SUMMARY SHEET													
#	Jurisdiction Name	Jurisdiction Type (city/borough/ township/ village, etc.)	Plan POC	Mailing Address	Email	Phone	Requirements Met (Y/N)					
							A. Planning Process	B. Hazard Identification & Risk Assessment	C. Mitigation Strategy	D. Plan Review, Evaluation & Implementation	E. Plan Adoption	F. State Require-ments
1	Buncombe County	County										
2	Asheville	City										
3	Biltmore Forest	Town										
4	Black Mountain	Town										
5	Montreat	Town										
6	Weaverville	Town										
7	Woodfin	Town										
8	Madison County	County										
9	Hot Springs	Town										

MULTI-JURISDICTION SUMMARY SHEET													
#	Jurisdiction Name	Jurisdiction Type (city/borough/ township/ village, etc.)	Plan POC	Mailing Address	Email	Phone	Requirements Met (Y/N)					
							A. Planning Process	B. Hazard Identification & Risk Assessment	C. Mitigation Strategy	D. Plan Review, Evaluation & Implementation	E. Plan Adoption	F. State Require-ments
10	Marshall	Town										
11	Mars Hill	Town										

Appendix D
Planning Process Documentation

This appendix includes:

1. Meeting Agendas
2. Meeting Sign-In Sheets
3. Neighboring Jurisdiction Outreach Documentation
4. Public Survey Summary Results

AGENDA

Buncombe-Madison Regional Hazard Mitigation Plan Update
Project Kickoff Meeting
September 24, 2019
10:00 AM – Noon

1) **Introductions**

2) **Mitigation Refresher**

3) **Icebreaker Exercise**

4) **Project Overview**
   a) Key Objectives
   b) Project Tasks
   c) Project Schedule

5) **Roles & Responsibilities**
   a) ESP Associates
   b) County Leads
   c) Participating Jurisdictions

6) **Next Steps**
   a) Initiate data collection efforts
   b) Begin public outreach
   c) Discuss next Hazard Mitigation Planning Team meeting

7) **Questions, Issues or Concerns**

AGENDA

Buncombe Madison Regional Hazard Mitigation Plan
Mitigation Strategy Workshop
August 11, 2020
10:00AM - Noon

1) Introductions

2) Mitigation Recap

3) Project Schedule

4) Risk Assessment Findings

a) **Hazard Identification**
b) **Hazard Profiles**
c) **Hazard Vulnerability Assessment**

5) Capability Assessment Findings

6) Mitigation Strategy

7) Summary of Public Involvement

8) Plan Maintenance

9) Next Steps

Buncombe-Madison Regional Hazard Mitigation Plan Update
Project Kickoff Meeting

September 24, 2019

10:00 AM - Noon

Name	Agency	City	Phone Number	E-mail Address
Jonathan Kanipe	Town of Biltmore Forest	Biltmore Forest, NC	828-274-0824	jkanipe@biltmoreforest.org
Alex Carmichael	Town of Montreat	Montreat	669-8002	acarmichael@townofmontreat.org
Lee Hensley	City of Asheville	Asheville	777-0283	lhensley@cityofashevillenc.gov
Nathan Pennington	Buncombe County	Asheville	250-4856	nathan.pennington@buncombecounty.org
Nancy Watford	City of Asheville	Asheville	259-5404	NWatford@ashevillenc.gov

Buncombe-Madison Regional Hazard Mitigation Plan Update
Project Kickoff Meeting

September 24, 2019

10:00 AM - Noon

Name	Agency	City	Phone Number	E-mail Address
Jessica Trotman	Town of Black Mountain		828-284-9374	jessica.trotman@townofblackmountain.org
Michael Saunders	Town of Woodfin		828.253.4887	michaelsaunders@woodfin-nc.gov
Nathan Waldrup	Town of Mars Hill FD		828-206-2956	nwaldrup@townofmarshill.org
Nathan Bennett	Town of MARS HILL Town Manager	Mars Hill	828-689-2301	NBennett@townofmarshill.org
Nancy G. Allen	Town of Marshall Town Administrator	Marshall	828-649-3031	nallen@townofmarshall.org

Buncombe-Madison Regional Hazard Mitigation Plan Update
Project Kickoff Meeting

September 24, 2019

10:00 AM - Noon

Name	Agency	City	Phone Number	E-mail Address
JOHN V. WILSON	BLK. MTN. FIRE	BLACK MTN	828-419-9320	john.wilson@townofblackmountain.gov
Jeffrey D Angel	Woodfin Fire	Woodfin	828-713-7546	Ja2011WFD@AOL.COM
Ryan Cole	SKYLAND FD	SKYLAND	626-674-6986	RCOLE@SKYLANDFIRE.com
Trevor Lance	Skyland FD	Skyland	828-606-8990	Tlance@Skylandfire.com

Buncombe-Madison Regional Hazard Mitigation Plan Update
Project Kickoff Meeting

September 24, 2019

10:00 AM - Noon

Name	Agency	City	Phone Number	E-mail Address
Angie Ledford	Bun Co EM		(828) 250-6605	angela.ledford@buncombecounty.org
Cynthia Fox-Clark	Bun Co Planning		250-4836	cynthia.fox-clark@buncombecounty.org
Ted Williams	Weaverville FD	Weaverville	828-545-2823	twilliams@weavervillefd.org
Scott Burnette	City of Asheville Fire Dept.	Asheville	828-552-1468	stburnette@ashevillenc.gov

Buncombe-Madison Regional Hazard Mitigation Plan Update
Project Kickoff Meeting

September 24, 2019

10:00 AM - Noon

Name	Agency	City	Phone Number	E-mail Address
Renee Sprinkle, RN (Communicable Disease)	Madison County Health Dept. (Public Health)	Marshall	828-380-6898 (cell) 828-649-3531 Ext. 255	rsprinkle@madisoncountync.gov
Shelia Metcalf	Madison County Health Department	Marshall	828-649-3531 ext. 235 828-380-0924	smetcalf@madisoncountync.gov
Caleb Dispenza	Madison County Emergency Services	Marshall	828-649-3602	E911@madisoncountync.gov
Edward Roberts	Madison County Emergency Management	Marshall	828-649-3602	lroberts@madisoncountync.gov

Buncombe Madison Regional HMP -
8/11/20- Mitigation Strategy Meeting Attendance List

Full Name	User Action	Timestamp
Nathan Slaughter	Joined	8/11/2020, 9:49:34 AM
Scott Burnette (Guest)	Joined	8/11/2020, 9:50:20 AM
Angela Ledford	Joined	8/11/2020, 9:52:38 AM
Angela Ledford	Left	8/11/2020, 11:20:30 AM
Jonathan Kanipe	Joined	8/11/2020, 9:54:24 AM
Jim Fox (Guest)	Joined	8/11/2020, 9:57:00 AM
Ted Williams	Joined	8/11/2020, 9:58:26 AM
Caleb Dispenza - Madison County (Guest)	Joined	8/11/2020, 9:59:31 AM
Louis Roberts (Guest)	Joined	8/11/2020, 10:01:45 AM
Mary Roderick	Joined	8/11/2020, 10:02:42 AM
+1 828-206-3155	Joined	8/11/2020, 10:03:25 AM
Nancy Watford (Guest)	Joined	8/11/2020, 10:03:29 AM
Aashka Patel (Guest)	Joined	8/11/2020, 10:03:40 AM
Nathan L. Pennington (Guest)	Joined	8/11/2020, 10:05:12 AM
Nathan L. Pennington (Guest)	Left	8/11/2020, 11:13:22 AM
jessica (Guest)	Joined	8/11/2020, 10:07:28 AM
jessica (Guest)	Left	8/11/2020, 10:07:45 AM
jessica (Guest)	Joined	8/11/2020, 10:07:45 AM
jessica (Guest)	Left	8/11/2020, 11:12:21 AM

Neighboring Jurisdictions for the Buncombe Madison Region

Jurisdiction	Name	Title	Email
Haywood County	Greg Shuping	EM Director	greg.shuping@haywoodcountync.gov
	Jodie Ferguson	Planner	jodie.ferguson@haywoodcountync.gov
Yancey County	Jeff Howell	EM Director	jeff.howell@yanceycountync.gov
McDowell County	William Kehler	EM Director	william.kehler@mcdowellgov.com
	Ron Harmon	Planner	rharmon@mcdowellgov.com
Rutherford County	Frankie Hamrick	EM Director	frankie.hamrick@rutherfordcountync.gov
	Danny Searcy	Planner	danny.searcy@rutherfordcountync.gov
Henderson County	Jimmy Brissie	EM Director	jbrissie@hendersoncountync.gov
	Autumn Radcliff	Planner	autumnr@hendersoncountync.org
Transylvania County	Kevin Shook	EM Director	kevin.shook@transylvaniacounty.org
		Planner	planning@transylvaniacounty.org
Cocke County	Joseph Esway	EM Director	emadirector@cockecountytn.gov
Greene County	Kevin Morrison	Mayor	MayorKevinMorrison@greenecountytngov.com
Unicoi County			unicoiema@unicoicountytn.gov

Nathan Slaughter

From: Nathan Slaughter
Sent: Friday, September 18, 2020 3:07 PM
To: 'greg.shuping@haywoodcountync.gov'; 'jodie.ferguson@haywoodcountync.gov'; 'jeff.howell@yanceycountync.gov'; 'william.kehler@mcdowellgov.com'; 'rharmon@mcdowellgov.com'; 'frankie.hamrick@rutherfordcountync.gov'; 'danny.searcy@rutherfordcountync.gov'; 'jbrissie@hendersoncountync.gov'; 'autumnr@hendersoncountync.org'; 'kevin.shook@transylvaniacounty.org'; 'planning@transylvaniacounty.org'; 'emadirector@cockecountytn.gov'; 'MayorKevinMorrison@greenecountytngov.com'; 'unicoiema@unicoicountytn.gov'
Subject: NOTIFICATION: Buncombe Madison Regional Hazard Mitigation Plan

Importance: Low

Good afternoon

You are receiving this email because a neighboring County (Buncombe and Madison County NC), along with the municipalities within those counties and other participating partners, are now working to update the region's multi-jurisdictional *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 hazard risks and determine strategies for how to best minimize or manage those risks. Upon completion, the plan will represent a comprehensive multi-jurisdictional *Hazard Mitigation Plan* for the two-county region.

You are being notified of this planning process for two purposes:

1. FEMA requires that neighboring jurisdictions be provided an opportunity to be involved in the planning process.

2. You may want to contribute information to these jurisdictions to consider as they update their hazard mitigation plan.

I serve as the Project Manager for the update of the plan. Please let me know if you would like to contribute information, be invited to any upcoming meetings in the development of the plan or if you would like to receive a copy of the draft plan.

Should you have any questions about the *Buncombe Madison Regional Hazard Mitigation Plan*, please do not hesitate to contact me. Thank you for your time!

Nathan Slaughter, AICP, CFM
Department Manager – Hazard Mitigation
ESP Associates, Inc.
2200 Gateway Centre Boulevard – Suite 216
Morrisville, NC 27560
www.espassociates.com

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

Fire Marshal
Homeland Security
Honor Guard
Road Mapping & Addressing

Buncombe Madison Regional Hazard Mitigation Plan Update - Public Meeting

From Emergency Services

Buncombe and Madison counties are working together to update their regional Hazard Mitigation Plan. Natural disasters in our area are inevitably going to occur; however, the purpose of this plan is to assess our community's natural hazard risks and determine how to lessen our vulnerability when disaster strikes.

Your input is needed.

Public input and support are essential parts of this plan. In order to develop the most effective and beneficial plan possible, your input is needed. A public meeting will be held on Tuesday, Sept. 24 from 6-7 p.m. in the auditorium of Asheville-Buncombe Technical Community College's Public Safety Training Center location in Woodfin.

All interested residents from the counties and participating jurisdictions are invited to attend the meeting. By applying a collective approach to hazard mitigation plan development, we will contribute to a more resilient community. We look forward to seeing you on Tuesday, Sept. 24.

An online public survey is available.

Buncombe County Gov @buncombeGov · Sep 23

Public input and support are essential parts of this plan. A public meeting will be held on Tuesday, Sept. 24 from 6-7 p.m. in the auditorium of A-B Tech Public Safety Training Center location in Woodfin.

buncombecounty.org/Governing/Dept...

Madison County, North Carolina

County Manger Office: 828-649-2854

Madison-Buncombe Regional Hazard Mitigation Plan – Public Meeting on September 24, 2019

Marshall DMV Reopening Notice

Announcements

An online public survey is available.

If you can't make this public meeting please leave your comments on our public input survey at this link.

What: Buncombe Madison Regional Hazard Mitigation Plan Update – Public Meeting

When: Tuesday, Sept. 24, 2019
6-7 p.m.

Where: Asheville-Buncombe Technical Community College Building - Auditorium

Public Safety Training Center

20 Canoe Ln., Woodfin, NC 28804

Buncombe-Madison Regional Hazard Mitigation Plan Update
Public Meeting

September 24, 2019

6:00 PM - 7:00 PM

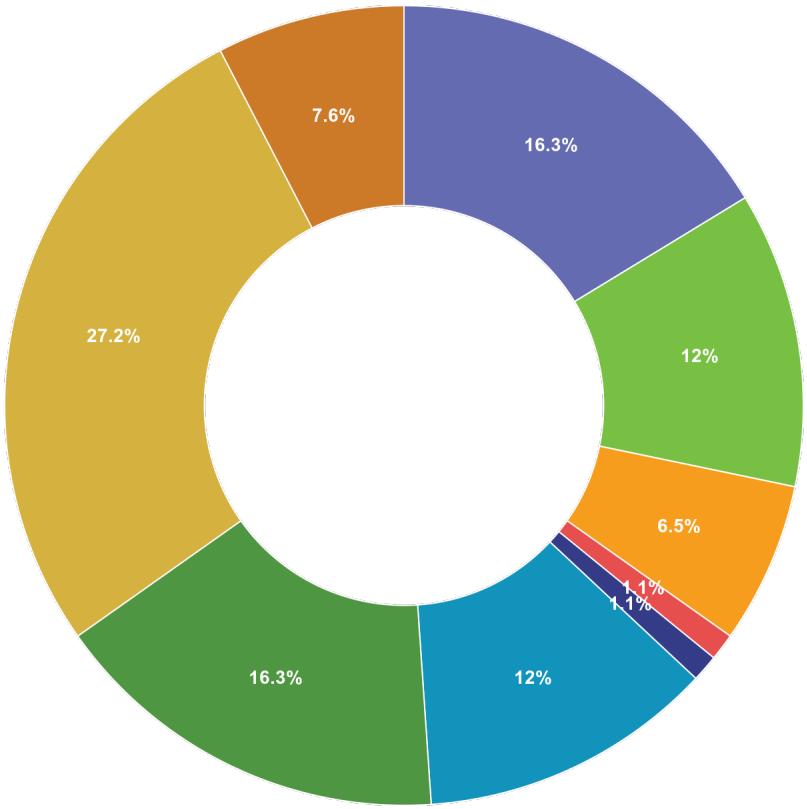
Name	Agency	City	Phone Number	E-mail Address
Cynthia Kessler	representing Wolf Laurel developm	Mars Hill	(423) 323-3518	Kessler properties @ charter.net

surveyplanet

Buncombe Madison Regional Hazard Mitigation Plan - Public Survey

We need your help!

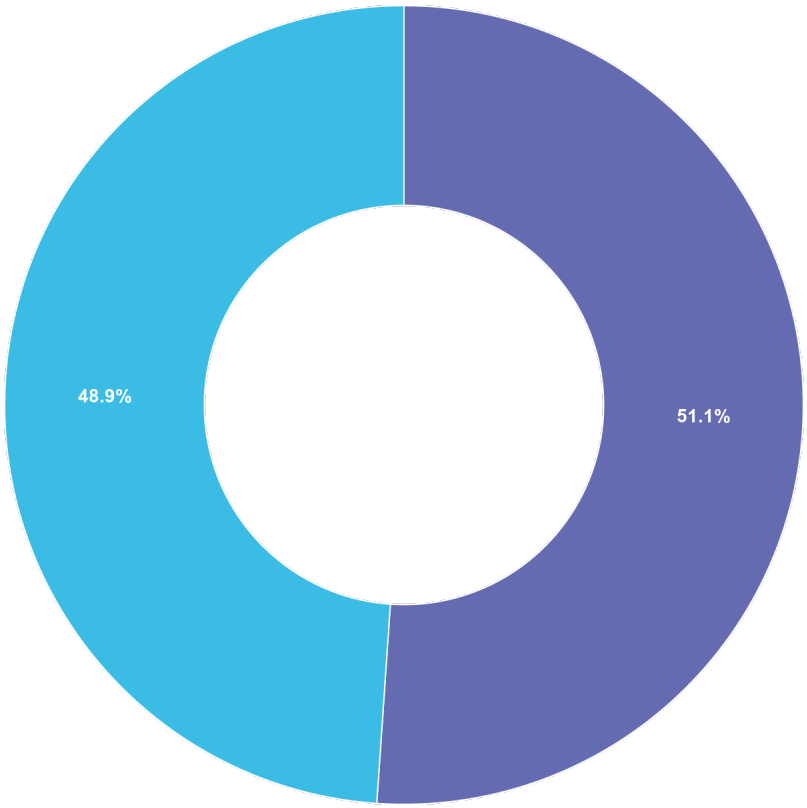
Q1 1\. Where do you live?*



Answered: 92 **Unanswered:** 0

Choice	Total
Asheville	15
Biltmore Forest	0
Black Mountain	11
Montreat	0
Weaverville	6
Woodfin	1
Hot Springs	1
Marshall	11
Mars Hill	15
Unincorporated Buncombe County	25
Unincorporated Madison County	7

Q2 2\. Have you ever experienced or been impacted by a disaster in Buncombe or Madison County?*



Answered: 92 **Unanswered:** 0

Choice	Total
Yes	47
No	45

Q3 3\. If “Yes,” please explain.

Saturday, November 30, 2019, 2:17 PM UTC

Flooding that largely washed out our driveway and made the local road hard to use.

Saturday, November 30, 2019, 2:14 PM UTC

The flooding from hurricanes in 2004 flooded the river arts district where I had a studio at the time.

Sunday, November 24, 2019, 1:55 AM UTC

Earthquake

Sunday, November 24, 2019, 12:06 AM UTC

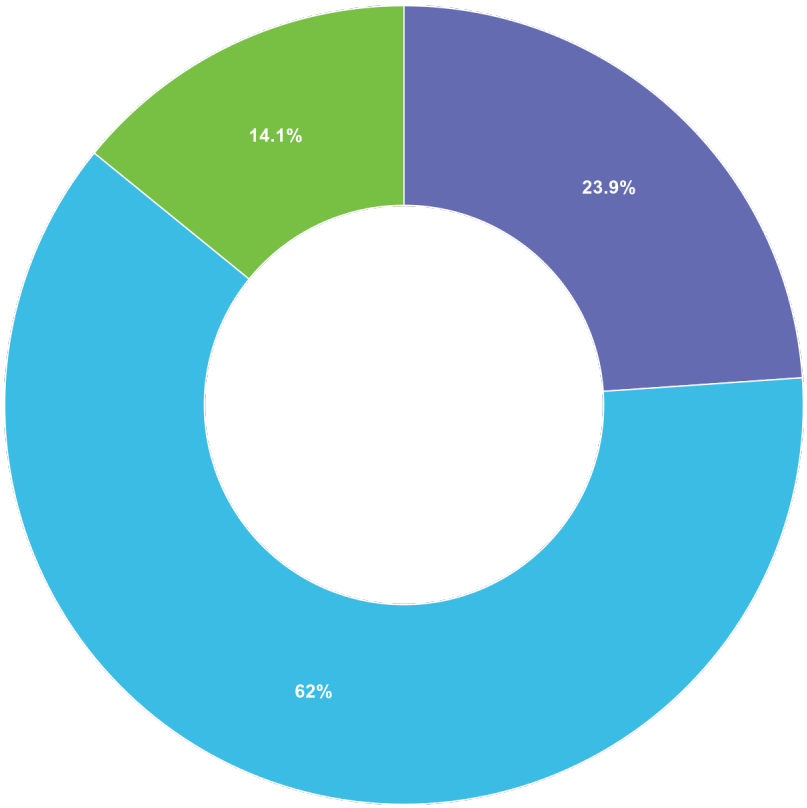
2004 back to back rain events and loss of water

Saturday, November 23, 2019, 8:55 PM UTC

Severe winter weather blizzard of 1993.

Answered: 47 **Unanswered:** 45

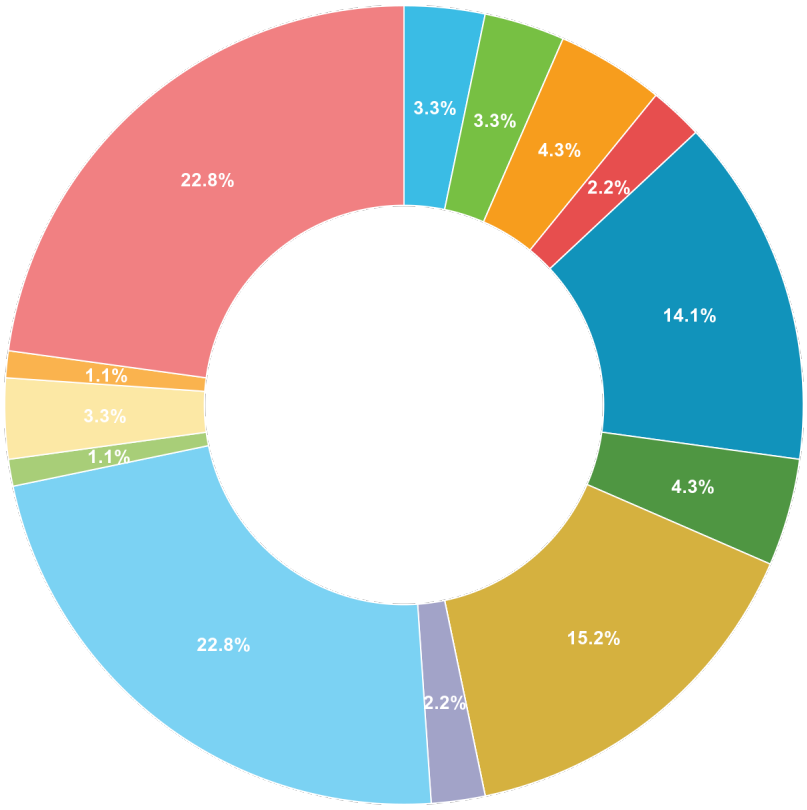
Q4 4\. How concerned are you about the possibility of your community being impacted by a disaster?*



Answered: 92 **Unanswered:** 0

	Choice	Total
	Extemely concerned	22
	Somewhat concerned	57
	Not concerned	13

Q5 5\. Please select the **one** hazard you think is the highest threat to your neighborhood:*

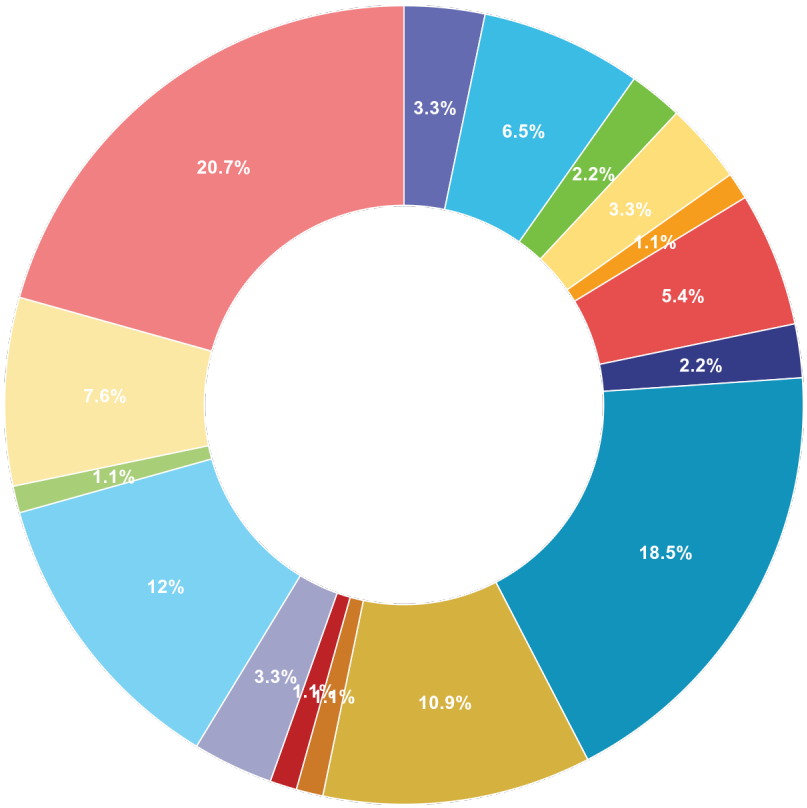


Answered: 92 **Unanswered:** 0

Choice	Total
Cyber Attack	0
Drought	3
Electromagnetic Pulse (EMP)	3
Excessive Heat	0
Hazardous Substances	4
Infectious Disease	2
Lightning	0
Severe Thunderstorms/High Winds	13
Terrorism	4
Wildfire	14

Choice	Total
Dam Failure	0
Earthquakes	0
Erosion	2
Flooding	21
Hurricane and Coasta; Hazards	1
Landslides	3
Radiological Emergency	1
Severe Winter Weather	21
Tornadoes	0

Q6 6\. Please select the **one** hazard you think is the second highest threat to your neighborhood:*



Answered: 92 **Unanswered:** 0

	Choice	Total
	Cyber Attack	3
	Drought	6
	Electromagnetic Pulse (EMP)	2
	Excessive Heat	3
	Hazardous Substances	1
	Infectious Disease	5
	Lightning	2
	Severe Thunderstorms/High Wind	17
	Terrorism	0
	Wildfire	10

Choice	Total
Dam Failure	1
Earthquake	1
Erosion	3
Flooding	11
Hurricane and Coastal Hazards	1
Landslides	7
Radiological Emergency	0
Severe Winter Weather	19
Tornado	0

Q7 7\. Are there any other hazards that you feel pose a wide-scale threat to your community? If so, please explain:

Sunday, December 1, 2019, 4:41 PM UTC

Climate change will be causing great threats to water quality and threaten water safety

---

Saturday, November 30, 2019, 2:14 PM UTC

I do think cyber terrorism is a possibility, and our systems aren't up to the challenge.

Saturday, November 30, 2019, 1:11 PM UTC

After living in Florida for most of 30 years, hurricanes and their effects are high on my list of concerns. I'd imagine mountains would mitigate some of these, yet winds, storms and flooding could still affect this area and our neighbors. Being without power is a scary proposition for anyone, but for older people can become even more concerning.

Sunday, November 24, 2019, 1:55 AM UTC

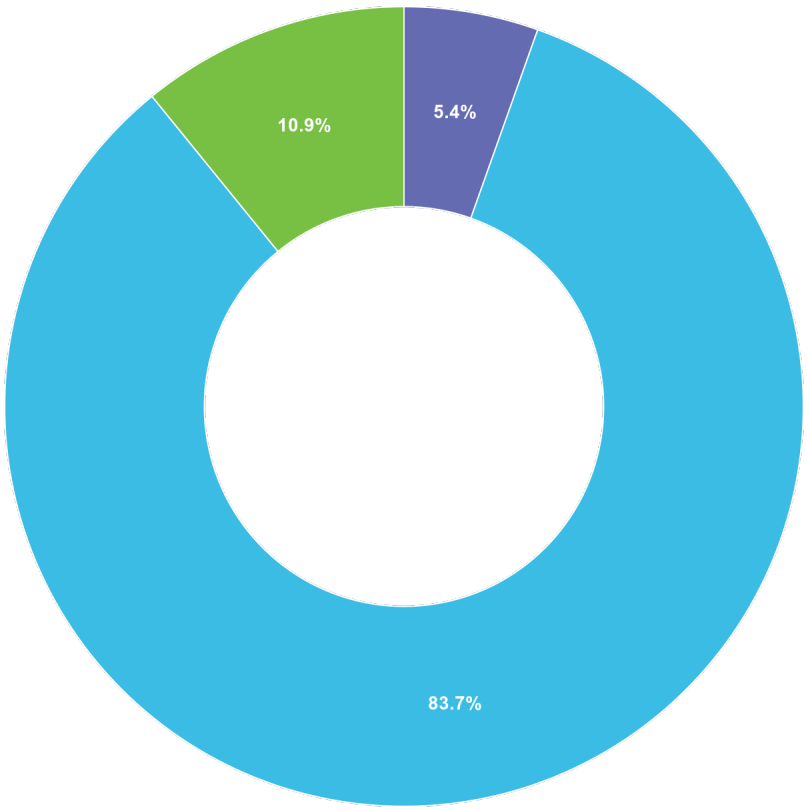
This survey is stupid. EMP in buncombe county? You're crazy

Sunday, November 24, 2019, 12:06 AM UTC

Cyber threat

Answered: 39 **Unanswered:** 53

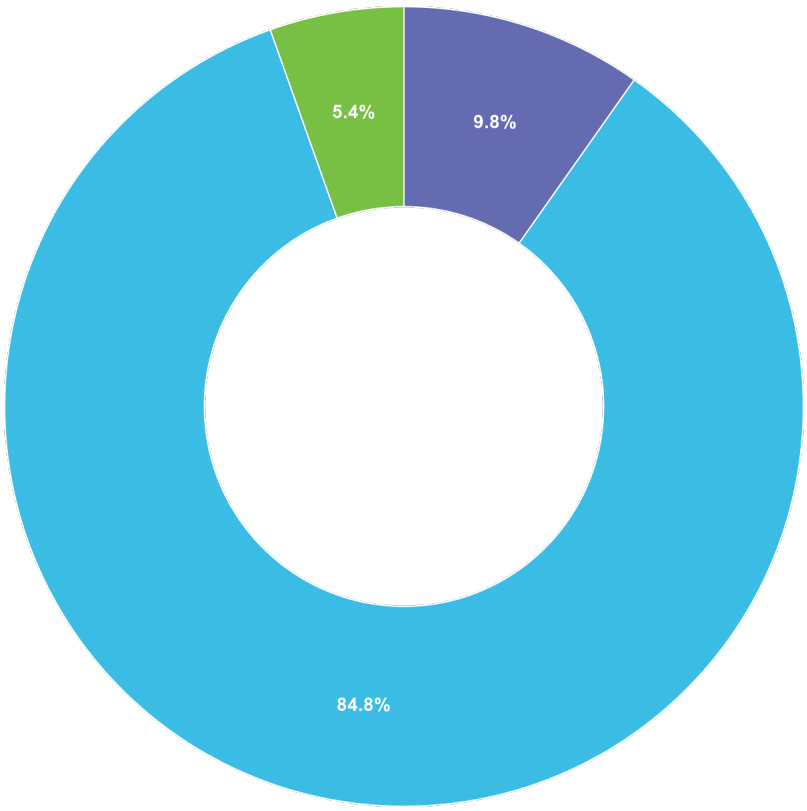
Q8 8\. Is your home located in a floodplain?*



Answered: 92 **Unanswered:** 0

Choice	Total
Yes	5
No	77
I'm not sure	10

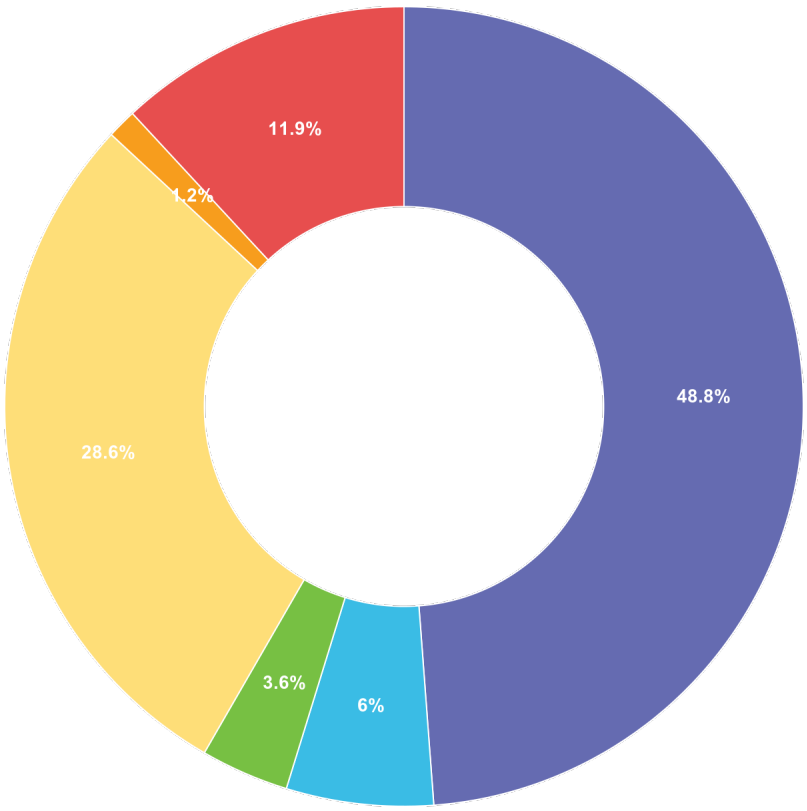
Q9 9\. Do you have flood insurance?*



Answered: 92 **Unanswered:** 0

Choice	Total
Yes	9
No	78
I'm not sure	5

Q10 10\. If you do not have flood insurance, why not?



Answered: 84 **Unanswered:** 8

Choice	Total
Not located in floodplain	41
Too expensive	5
Not necessary because it never floods	3
Not necessary because I am elevated or otherwise protected	24
Never really considered it	1
Other	10

Q11 11\. If "Other," please explain:

Sunday, December 1, 2019, 11:41 AM UTC

renter

Sunday, November 24, 2019, 1:55 AM UTC

This survey is stupid

Thursday, November 7, 2019, 11:42 PM UTC

Flood insurance not available because we are in a flood plain

Thursday, November 7, 2019, 10:59 PM UTC

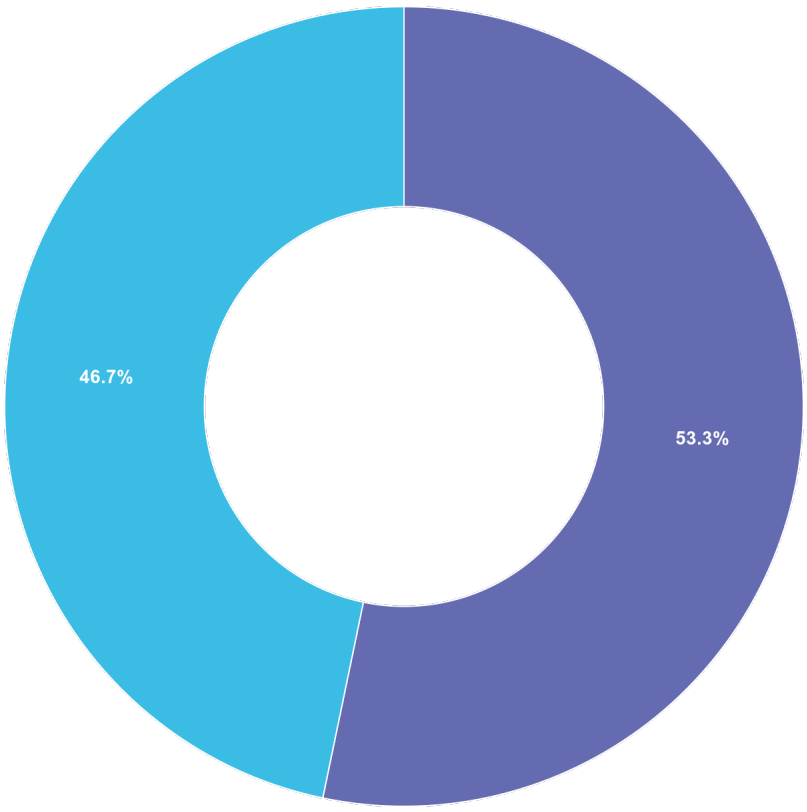
I don't own and we're up on top off Kenilworth Rd. But Swannanoa River Rd is one of the 34 ways out of this neighborhood and it floods.

Sunday, November 3, 2019, 6:14 PM UTC

rental

Answered: 10 **Unanswered:** 82

Q12 12\. Have you taken any steps to make your home or neighborhood more resistant to hazards?*



Answered: 92 **Unanswered:** 0

Choice	Total
Yes	49
No	43

Q13 13\. If "Yes," please explain:

Sunday, December 1, 2019, 12:13 PM UTC

erosion mitigation on local stream

Saturday, November 30, 2019, 2:17 PM UTC

I have been systematically cutting back trees in the vicinity of our house (wildfires) and have taken steps to divert water from our road (flooding).

Saturday, November 30, 2019, 1:11 PM UTC

Went to a "Firewise" presentation, and examined the area around our home. Unfortunately, we still have many plants within 10' of our home. I have brought in an arborist several times to examine the health of our trees, removed 2 (sadly) which were sick, and cabled another for safety. I try to keep our property watered and healthy to remove the immediate threat fires could cause. I've had tree limbs removed that were close to our home. Water runoff/flooding might not be a problem, but I have flood insurance currently. I think I will cancel it next year, as it's gotten much more restrictive in what it covers, than in past year.

Sunday, November 24, 2019, 1:55 AM UTC

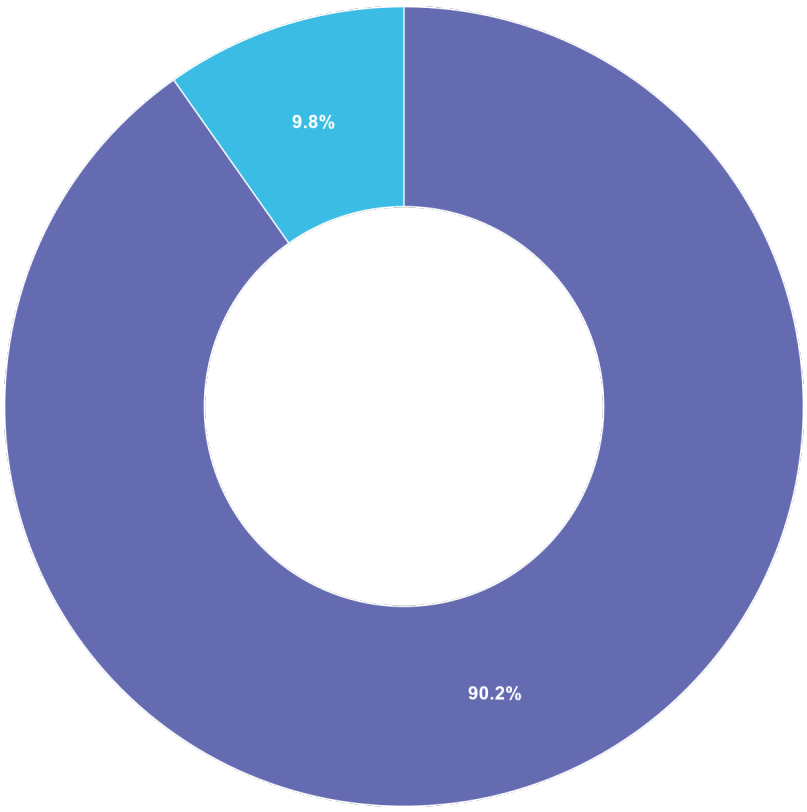
This survey is stupid. I built a 20' wall around my house to keep the government out

Sunday, November 24, 2019, 12:06 AM UTC

Do not have excess brush around the house, hardy siding

Answered: 39 **Unanswered:** 53

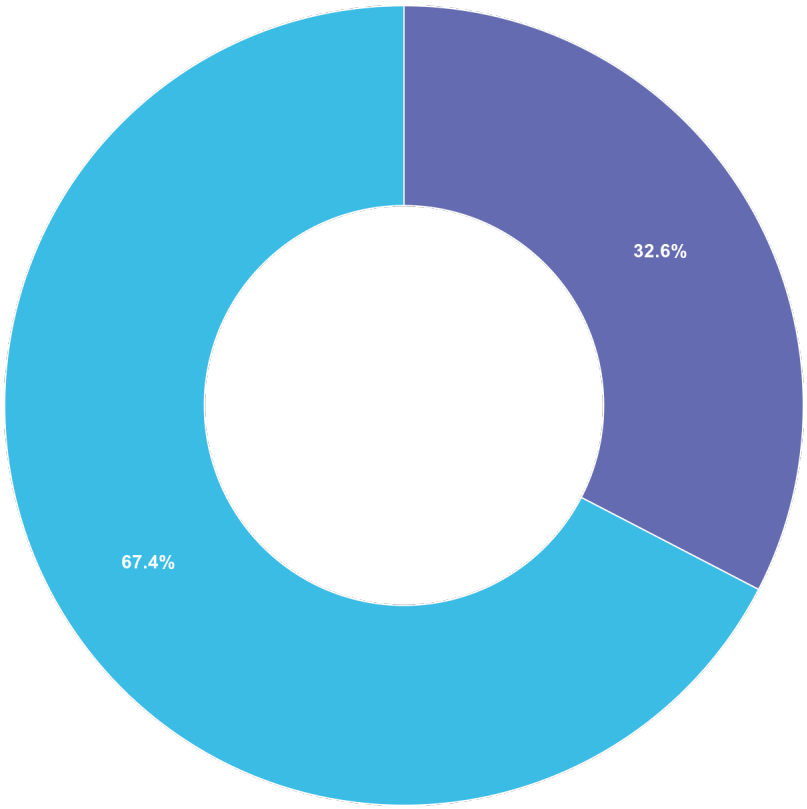
Q14 14\. Are you interested in making your home or neighborhood more resistant to hazards?*



Answered: 92 **Unanswered:** 0

Choice	Total
Yes	83
No	9

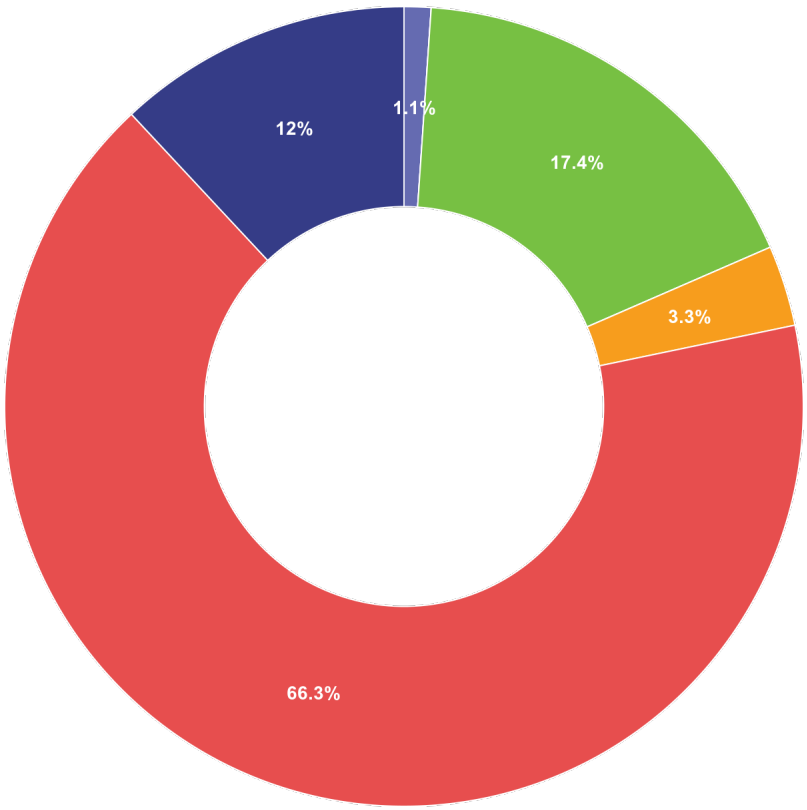
Q15 15\. Do you know what office to contact to find out more information about how to reduce your risks to hazards in your area?*



Answered: 92 **Unanswered:** 0

Choice	Total
Yes	30
No	62

Q16 16\. What is the most effective way for you to receive information about how to make your home and neighborhood more resistant to hazards?*



Answered: 92 **Unanswered:** 0

Choice	Total
Newspaper	1
Radio	0
Mail	16
School Meetings	0
Television	3
Internet (including social media)	61
Public Wokshops/Meetings	11

Q17 17\. Are there any other ways you prefer to receive information? If so, please explain:

Sunday, December 1, 2019, 4:41 PM UTC

Email or text

Sunday, December 1, 2019, 12:13 PM UTC

US Mail, workshops. Mail can include a lot of useful stuff that doesn't include screen time, and workshops allow for Q & A and free interchange between presenter and participant.

Sunday, December 1, 2019, 3:27 AM UTC

E-Mail

Saturday, November 30, 2019, 2:17 PM UTC

Public workshops and Internet are both useful. I appreciate especially asynchronous information that can be accessed at any time (Internet and mail).

Saturday, November 30, 2019, 2:14 PM UTC

Public radio

Answered: 27 **Unanswered:** 65

Q18 18\. 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?

Sunday, December 1, 2019, 4:41 PM UTC

Hold community meetings, work with churches, education for people about how they can work to avoid the hazard happening instead of reacting to it

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Sunday, December 1, 2019, 12:13 PM UTC

Awareness of shelters and evac routes,

Saturday, November 30, 2019, 2:17 PM UTC

Regarding flooding, better road drainage and support walls would help. Regarding wildfires, information resources about how to take steps to prevent wildfires and mitigate the impact of wildfires would help.

Saturday, November 30, 2019, 1:11 PM UTC

More education of our neighbors in the risks would be valuable. I think some folks need to hear things multiple times before they take in the dangers.

Sunday, November 24, 2019, 11:40 AM UTC

Better communication of impending issues

Answered: 49 **Unanswered:** 43

Q19 19\. 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? If so, please explain:

Sunday, December 1, 2019, 4:41 PM UTC

Education

Saturday, November 30, 2019, 2:17 PM UTC

Landslides are the only other issue that seems relevant to our situation. That is usually an issue in the context of very heavy rainfall. This seems like a zoning issue to me.

Sunday, November 24, 2019, 1:55 AM UTC

Yes. Wanda greene is the biggest hazard to this county. Stop wasting money

---

Sunday, November 24, 2019, 12:06 AM UTC

Inform residents about how to protect their property

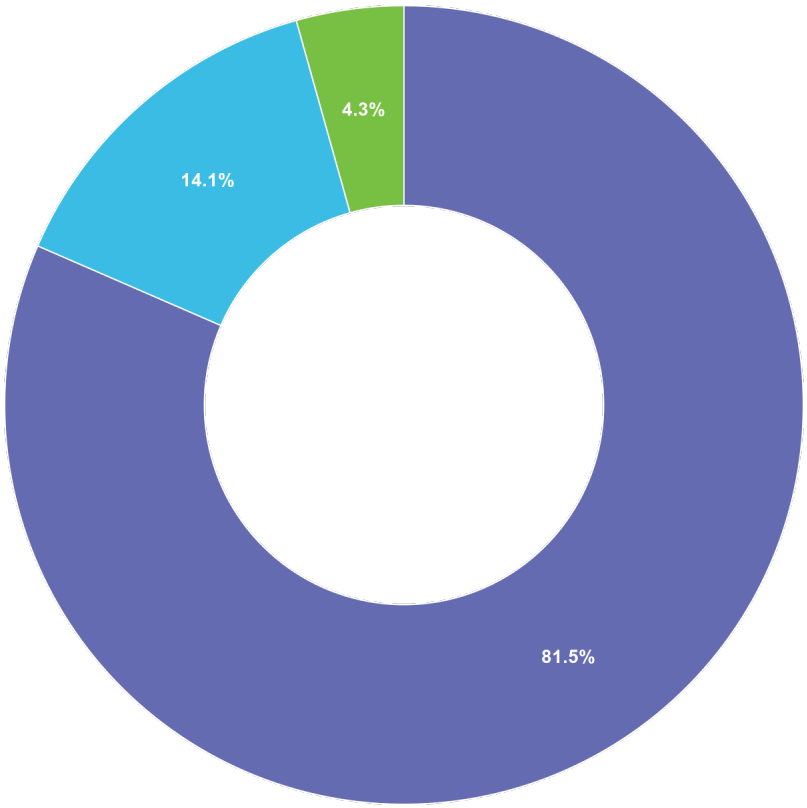
Saturday, November 23, 2019, 8:55 PM UTC

Traffic routes plans

Answered: 18 **Unanswered:** 74

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. In the next six questions, please tell us how important you think each one is for your community to consider pursuing.

20\. **Prevention** - Administrative or regulatory actions that influence the way land is developed and buildings are built. Examples include planning and zoning, building codes, open space preservation, and floodplain regulations.*



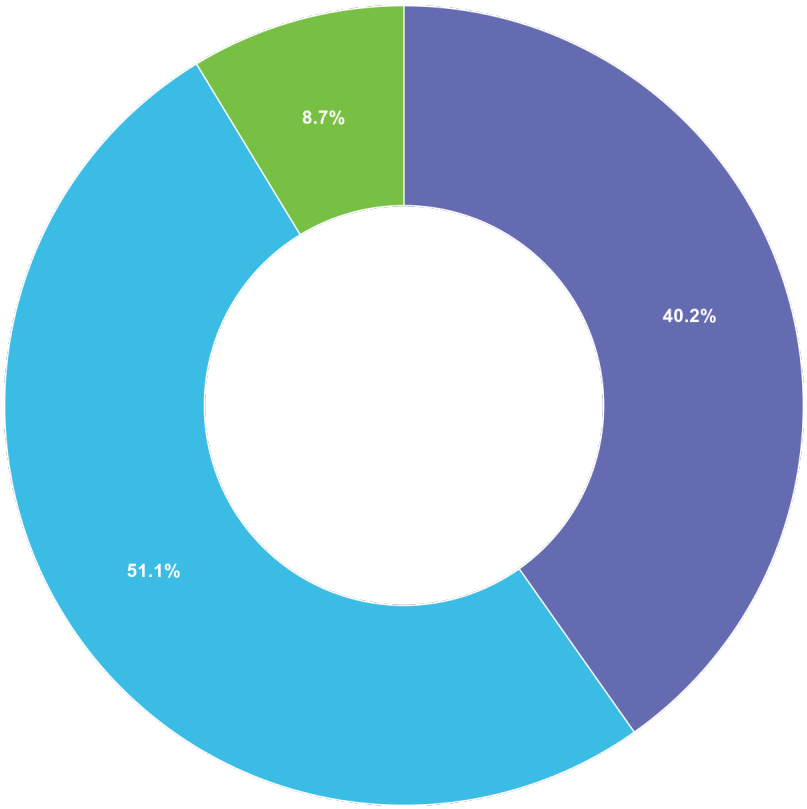
Answered: 92 **Unanswered:** 0

	Choice	Total
●	Very important	75
●	Somewhat important	13
●	Not important	4

Q21 21\. **Property Protection** - 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

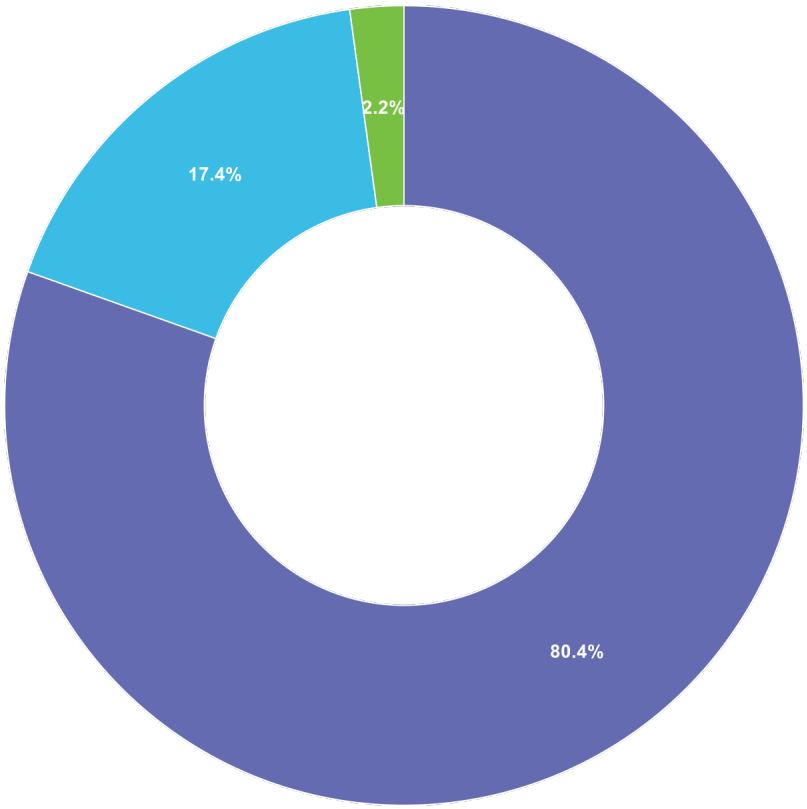
shutters.)*



Answered: 92 **Unanswered:** 0

Choice	Total
Very important	37
Somewhat important	47
Not important	8

Q22 22\. **Natural Resource Protection** - Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems. (Examples include: floodplain protection, habitat preservation, slope stabilization, riparian buffers, and forest management.)*

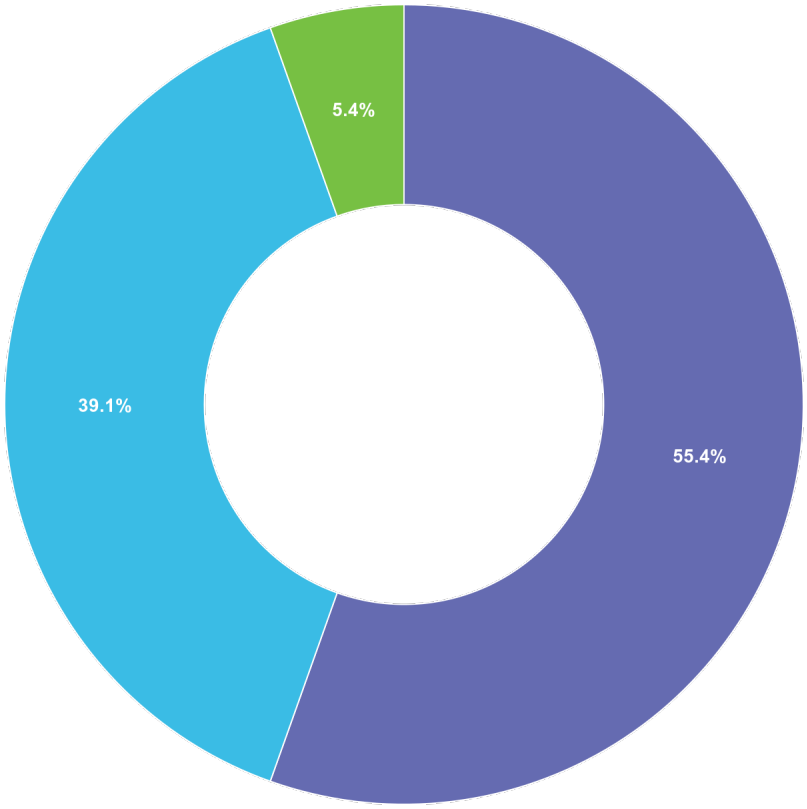


Answered: 92 **Unanswered:** 0

Choice	Total
Very important	74
Somewhat important	16
Not important	2

Q23 23\. **Structural Projects** - Actions intended to lessen the impact of a hazard by modifying the natural progression of the hazard.

(Examples include dams, levees, detention/retention basins, channel modification, retaining walls and storm sewers.)*



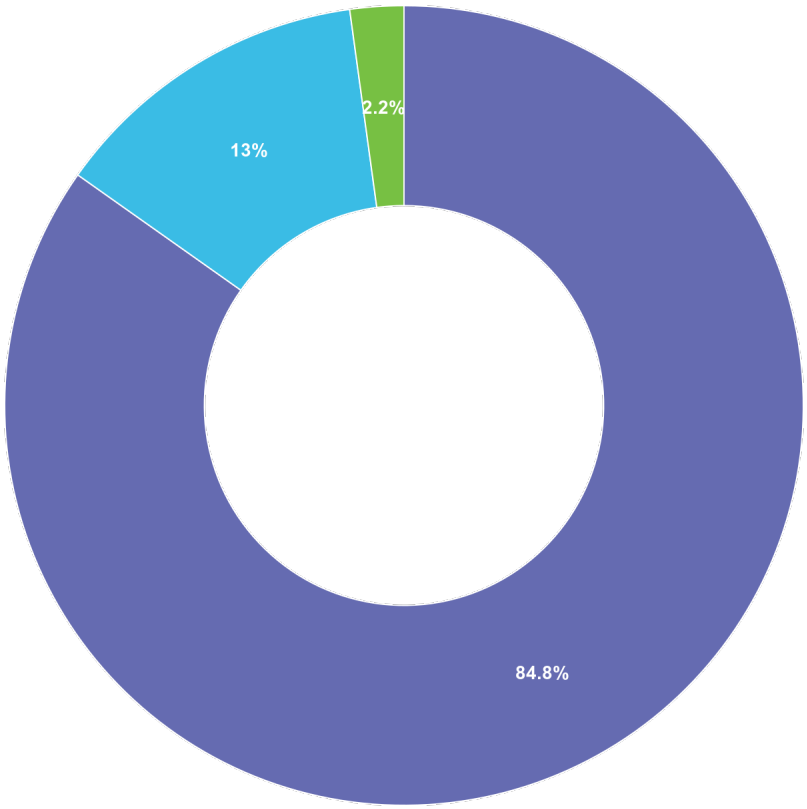
Answered: 92 **Unanswered:** 0

Choice	Total
Very important	51
Somewhat important	36

Choice	Total
Not important	5

Q24 24\. **Emergency Services** - Actions that protect people and property during and immediately after a hazard event.

(Examples include warning systems, evacuation planning, emergency response training, and protection of critical emergency facilities or systems.)*

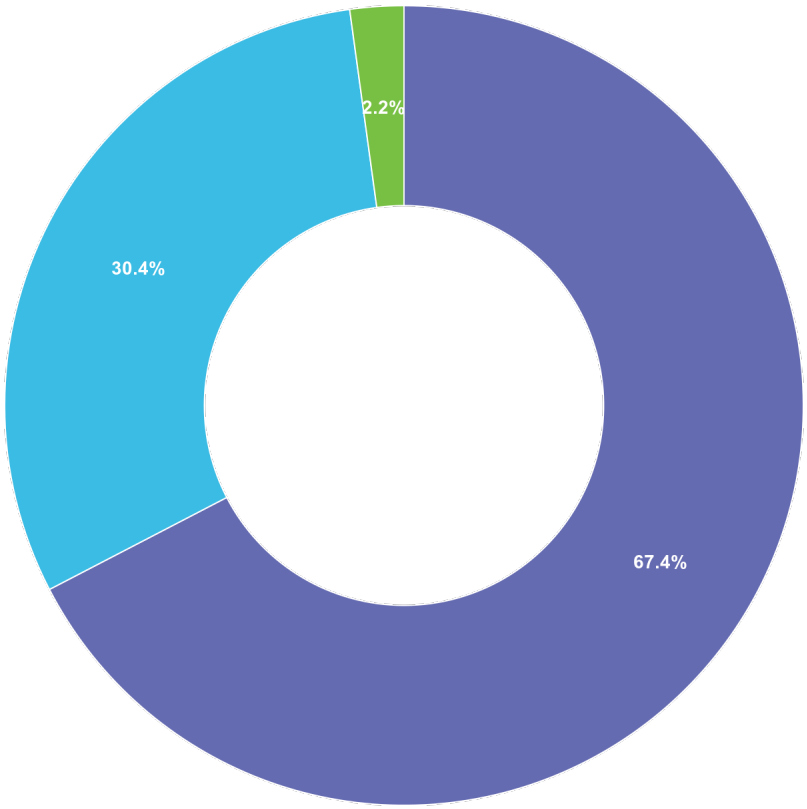


Answered: 92 **Unanswered:** 0

Choice	Total
Very important	78
Somewhat important	12
Not important	2

Q25 25\. **Public Education and Awareness** - Actions to inform citizens about hazards and the techniques they can use to protect themselves and their property.

(Examples include outreach projects, school education programs, library materials and demonstration events.)*



Answered: 92 **Unanswered:** 0

Choice	Total
Very important	62
Somewhat important	28
Not important	2

Q26 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)

Sunday, December 1, 2019, 4:41 PM UTC
Megan Jamison
Mewilliams400@gmail.com

Sunday, December 1, 2019, 3:27 AM UTC
Claudio Ruben
14 Elk Mountain Rdg.
Asheville, NC 28804

Saturday, November 30, 2019, 2:17 PM UTC
Bruce Larson
349 Clarks Branch Road
Leicester, NC 28748
828-545-5459
brucedeanlarson@gmail.com

Saturday, November 30, 2019, 1:11 PM UTC

Erika Heumann

ilatte6@gmail.com

Sunday, November 24, 2019, 1:55 AM UTC

Wanda Greene, the biggest threat to the county

Answered: 14 **Unanswered:** 78

Appendix E
Completed Mitigation Actions

Buncombe County Completed Mitigation Actions

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2014 Action Implementation Status
Prevention							
PP-1	Strengthen the road design and construction as it pertains to the Manufactured Home Park Ordinance.	All	Moderate	Local	County EM/Planning Dept.	Completed	Buncombe County adopted the Manufactured Home Park Ordinance in April 1996. The purpose of the Ordinance is to protect the health, safety and general welfare of citizens of the County, particularly those who are residents of manufactured home parks. New parks and expansions of current parks are required to apply for a manufactured home park permit for construction. Plans are required to contain title block information; project data including the number of lots and acreage disturbed; road and utility information; location of natural features affecting the site, including the location of the 100-year floodplain and floodway; and other information specified in Section 46-65.5 in the Buncombe County Code of Ordinances. In 2006, the

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2014 Action Implementation Status
							requirement was added that all plans or requests must comply with the Buncombe County Fire Prevention Ordinance, and that the County fire marshal provide approval prior to a permit being issued. There are specific street construction standards required in the Ordinance, including a minimum drive width of 16', with all weather surface. Other street considerations include road intersection standards; minimum number of parking spaces per unit; minimum recorded access road right-of-way width; required turnarounds for street lengths over 500'; and road standards determined by road grade. Manufactured home spaces are required to have certain square footage depending on whether the park is served by sewer or septic systems. Each new home space must be located on ground not susceptible to flooding and graded so as to prevent any water from ponding. Each home shall be located at least 20' from any other home, at least 15' from the manufactured home park boundary, and at least 10' from the edge of any interior street. The Ordinance has requirements for all manufactured home parks, related to the provision of solid waste receptacles; the maintenance and safety of the park; adequate potable water supply; and responsibility for ensuring that each home be equipped with anchored steps or stairs from at least two exits. Finally, the Ordinance has penalties for violation and procedures for enforcement. At this time, there is no plan for further amending the road design standards in this Ordinance.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2014 Action Implementation Status
PP-4	Revise the Erosion Control Ordinance.	FL	Moderate	Local	Planning Dept.	Completed	The County's Soil Erosion and Sedimentation Control Ordinance has been in existence since 1993, and was adopted pursuant to the authority granted in the North Carolina Sedimentation Pollution Control Act of 1973. The purpose of the Ordinance is to regulate certain land disturbing activity to control accelerated erosion and sedimentation in order to prevent the pollution of water and other damage to lakes, watercourses, and other public and private property. The general requirements of the Ordinance include requiring a plan for any land disturbing activity which uncovers one or more acres on a tract of land. In addition, a plan is required for any residential land disturbing activity which uncovers one-quarter acre or more on a lot, parcel, or tract with an average slope of 25% or greater in its natural state, or any residential land disturbing activity which uncovers one-half acre or more on a lot, parcel or tract with an average slope of 15-25% in its natural state, and applies to the Subdivision Ordinance, section 70-68. An additional requirement is that all persons conducting land-disturbing activity shall take all reasonable measures to protect all public and private property from damage caused by such activities. Plans are required to identify critical areas; limit time of exposure; limit exposed areas; control surface water; control sedimentation; and manage stormwater runoff. A notarized statement of financial responsibility and ownership is also required. Maintenance of ground cover following development is required. Civil penalties can be assessed for various violations, with a daily charge, and injunctive relief procedures are outlined. The Ordinance was revised in 2006, and the fee schedule changed in 2011. There are no plans to further revise this Ordinance.

FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures EQ = Earthquake LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees TS = Thunderstorms EM = Buncombe County Emergency Management

City of Asheville Completed Mitigation Actions

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2014 Action Implementation Status
Property Protection							
PP-4	Revise the flood hazard ordinance.	FL	High	Local	Chief Code Enforcement Officer/Public Works Staff/ Development Services Staff	Completed 1/6/2010	Enforce the current ordinance (no revisions planned at this time)
PP-5	Administer & enforce International Building Codes and Fire Codes for new construction.	All	Moderate	City's General Fund	Chief Code Enforcement Officer	Completed NC State Building Code was adopted in 2012; The International Building Code was adopted in 2009	The city has adopted the NC State Building Code and International Building Code. This action is complete.

Town of Biltmore Forest Completed Mitigation Actions

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2014 Action Implementation Status
Property Protection							
PP-3	Adopt the Stormwater Management Ordinance.	FL	High	Local	Board of Commissioners	Completed	The town has adopted a Stormwater Management Ordinance.
PP-4	Adopt the Flood Damage Prevention Ordinance.	FL	High	Local	Board of Commissioners	Completed	The town has adopted a Flood Damage Prevention Ordinance.

FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures EQ = Earthquake LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees TS = ThunderstormsEM = Buncombe County Emergency Management Town = Town of Biltmore Forest

Town of Black Mountain Completed Mitigation Actions

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2014 Action Implementation Status
Prevention							
P-5	Record and maintain all tax parcel information and floodplain locations in a GIS system in order to build the Town's capability to identify areas needing future mitigation.	FL	Moderate	Local	GIS	Completed	This has been done and is in our on-site GIS.

FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures EQ = Earthquake LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees TS = Thunderstorms EM = Buncombe County Emergency Management Town = Town of Black Mountain

Town of Montreat Completed Mitigation Actions

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2014 Action Implementation Status
Prevention							
P-3	Develop a mechanism that will ensure review of appropriate policies and procedures following a natural disaster event.	All	High	Local	Town Administrator	Completed	The town has developed a mechanism in conjunction with the county to ensure appropriate policies and procedures are followed in the wake of a disaster event. In the future, the town will continue to follow these policies. This action will be removed from the next update as a capability.
P-5	Develop a tracking system in the building inspections department to record the number of plans accepted and rejected and the number of warning and citation issued.	All	High	Local	Building Inspector/ Code Administrator	Completed	The town has developed a tracking system for building inspections to record plans that were accepted/rejected. Since this system is in place, this action will be removed from the next update as a capability.
P-7	Continue to enforce the International Building Code.	All	High	Local	Building Inspector/ Code Administrator	Completed	The International Building Code has been adopted and will continue to be enforced. This action will be removed from the next update as a capability.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2014 Action Implementation Status
P-9	Create a storm sewer system map that identifies and locates stormwater drainage components that include outfalls and receiving streams.	FL	High	Local	Town	Completed	The stormwater sewer system map has been created, so this action will be removed from the next update as a capability.
P-10	Establish a system for inspecting illicit discharges, which shall include employee cross-training for town staff on detecting and reporting illicit discharges.	FL	High	Local	Town	Completed	A system for inspecting illicit discharges has been established, so this action will be removed from the next update as a capability.
P-11	Establish a reporting mechanism for the public to report illicit discharges.	FL	High	Local	Town	Completed	A mechanism has been established for the public to report illicit discharges, so this action will be removed from the next update as a capability.
P-12	Provide a reporting mechanism for the public to notify the appropriate authorities of observed erosion and sedimentation problems.	ER	High	Local	Town	Completed	A reporting mechanism for the public to report erosion/sedimentation problems has been put in place, so this action will be removed from the next update as a capability.
P-13	Conduct annual review and update plans for permitted facilities as needed for the Stormwater Management Plan.	FL	High	Local	Town	Completed	The town has developed a list of facilities that need to have plans updated for the Stormwater Management Plan, so this action will be removed from the next update as a capability.
Property Protection							
PP-2	Develop, implement and enforce an Illicit Discharge Ordinance.	FL	High	Local	Town	Completed	An Illicit Discharge Ordinance has been implemented, so this action will be removed from the next update as a capability.
PP-3	Develop an ordinance to implement and enforce post-construction runoff controls for new development and redevelopment.	FL	High	Local	Town	Completed	An ordinance has been developed to regulate post-construction runoff, so this action will be removed from the next update as a capability.
PP-4	Inspect all facilities and operations with the potential for generating polluted stormwater runoff. Document deficiencies and corrective actions.	FL	High	Local	Town	Completed	A system is in place to have regular inspections for stormwater runoff, so this action will be removed from the next update as a capability.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2014 Action Implementation Status
PP-6	Maintain all tax parcel information and floodplain locations in a GIS system in order to build the Towns capability to identify areas needing future mitigation.	All	High	Local	Town	Completed	All tax parcel information is maintained in GIS, so this action will be removed from the next update as a capability.
Natural Resource Protection							
NRP-1	Develop post-construction runoff control measures for protecting Trout Waters in accordance with 15A NCAC .0126	FL	High	Local	Town	Completed	An ordinance has been developed to regulate post-construction runoff, so this action will be removed from the next update as a capability
Public Education and Awareness Activities							
PEA-5	Prepare a public education program for the Stormwater Management Plan.	FL	High	Local	Regional Stormwater Planning Committee	Completed	The town has implemented the public education program for the Stormwater Management Plan, so this action will be removed from the next update as a capability
PEA-6	Develop and maintain a web site that will offer information on water quality, stormwater projects and activities and ways to contact stormwater program staff.	FL	High	Local	Regional Stormwater Planning Committee	Completed	The town has developed a website on water quality and stormwater projects, so this action will be removed from the next update as a capability
PEA-7	Develop general stormwater educational material targeting school children, homeowners and business.	FL	High	Local	Regional Stormwater Planning Committee	Completed	Educational information on stormwater has been developed, so this action will be removed from the next update as a capability
PEA-8	Distribute written material on stormwater management through utility mail outs and at special events.	FL	High	Local	Regional Stormwater Planning Committee	Completed	Material on stormwater has been distributed through a number of ways, so this action will be removed from the next update as a capability
PEA-9	Conduct at least one public meeting during the application process to explain the Phase II program. Allow the public an opportunity to review and comment on the stormwater management program.	FL	High	Local	Regional Stormwater Planning Committee	Completed	Public meetings were held during the application process for Phase II to allow review and comment, so this action will be removed from the next update as a capability
PEA-10	Develop educational materials for local developers explaining the local post-construction approval process for stormwater management.	FL	High	Local	Town	Completed	Educational materials have been developed for local developers, so this action will be removed from the next update as a capability

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2014 Action Implementation Status
PEA-11	Conduct training on pollution prevention and good housekeeping procedures for the Stormwater Management Plan.	L	High	Local	Town	Completed	Training on pollution prevention and housekeeping procedures for the Stormwater Management Plan have taken place, so this action will be removed from the next update as a capability
FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures EQ = Earthquake LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees TS = Thunderstorms EM = Buncombe County Emergency Management Town = Town of Montreat							

Town of Weaverville Completed Mitigation Actions

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2014 Action Implementation Status
Prevention							
P-2	Identify storm water management best practices, develop a storm water management program, and adopt a stormwater ordinance.	FL	High	Local	Town Manager	Completed	The town has developed a stormwater management program and ordinance and enforces on a regular basis, so this action will be removed from the next update as a capability.
FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures EQ = Earthquake LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees TS = Thunderstorms EM = Buncombe County Emergency Management Town = Town of Weaverville							

Town of Woodfin Completed Mitigation Actions

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2014 Action Implementation Status
Prevention							
P-2	Identify storm water management best practices will be and develop a storm water management program and adopt a stormwater ordinance.	FL	High	Local	Town Administrator/ Board of Aldermen	Completed	The town has developed a stormwater management program and ordinance and enforces on a regular basis, so this action will be removed from the next update as a capability.

FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures EQ = Earthquake
LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees TS = Thunderstorms EM = Buncombe County Emergency Management Town = Town of Woodfin

Madison County Completed Mitigation Actions

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2014 Action Implementation Status
Prevention							
P-5	Prepare a needs assessment for a second hazmat team to mitigate the hazards of hazmat.	HZ	Moderate	Local	EM	Completed	The county has developed a needs assessment and will look at investing in a second HazMat team. See ES-8

FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures EQ = Earthquake
LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees TS = Thunderstorms EM = Madison County Emergency Management

Town of Hot Springs Completed Mitigation Actions

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2014 Action Implementation Status
PP-1	Remove debris from streams across County.	FL	High	Grants	EM	Deleted	This action was deleted because it is more or less the same as Action PP-3.

FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures EQ = Earthquake
LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees TS = Thunderstorms EM = Madison County Emergency Management Town = Town of Hot Springs

Town of Marshall Completed Mitigation Actions

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2014 Action Implementation Status
Property Protection							
PP-1	Remove debris from streams across County.	FL	High	Grants	EM	Deleted	This action was deleted because it is more or less the same as Action PP-3.

FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures EQ = Earthquake
LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees EM = Madison County Emergency Management Town = Town of Marshall

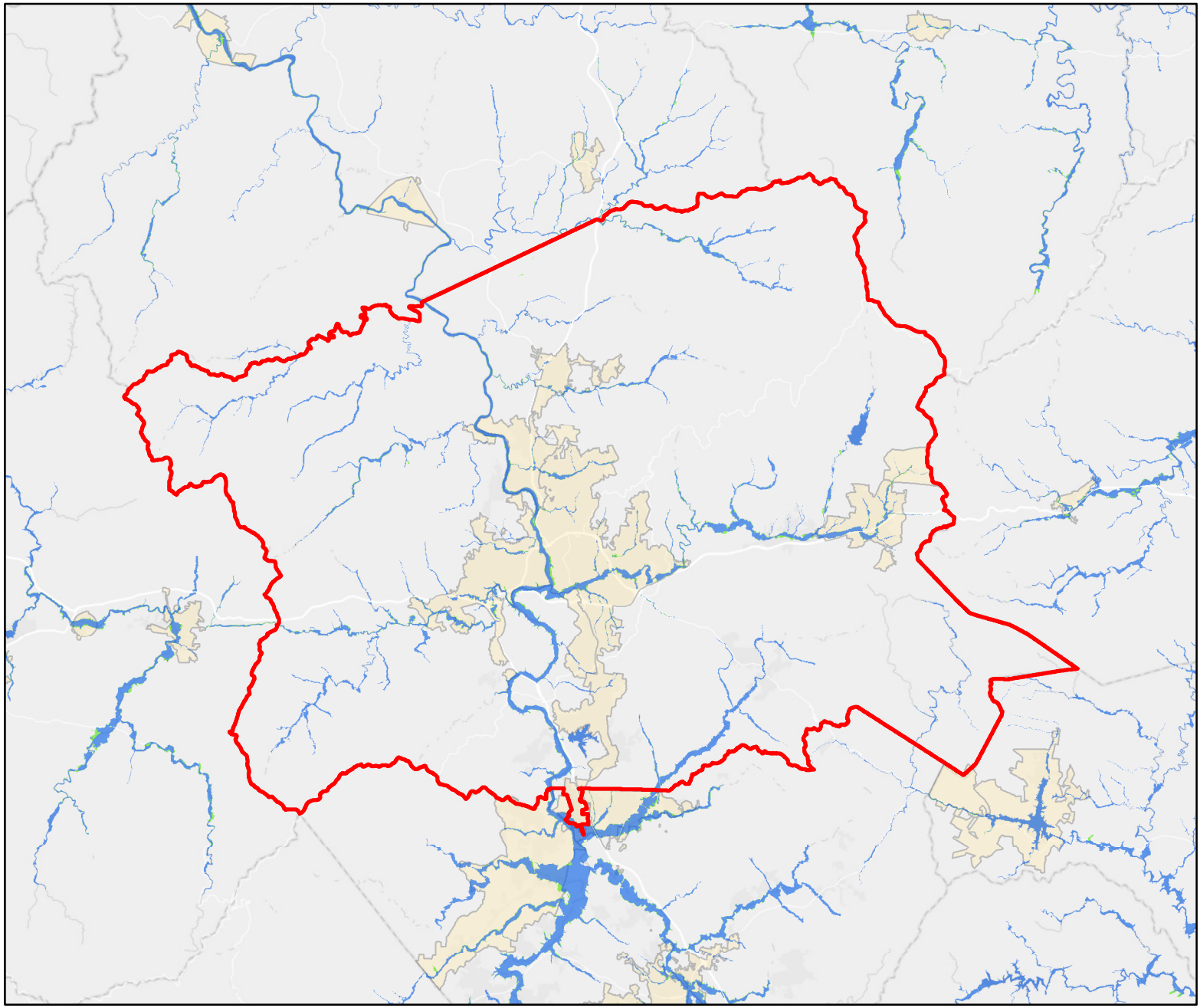
Town of Mars Hill Completed Mitigation Actions

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2014 Action Implementation Status
Property Protection							
PP-1	Remove debris from streams across County.	FL	High	Grants	EM	Deleted	This action was deleted because it is more or less the same as Action PP-2.

FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures EQ = Earthquake
LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees TS = Thunderstorms EM = Madison County Emergency Management Town = Town of Mars Hill

Appendix F
Flood Hazard Maps

Buncombe County - Flood Hazard Areas



Legend

- County Boundary
- Municipal Boundary
- Major Roads

Flood Zone

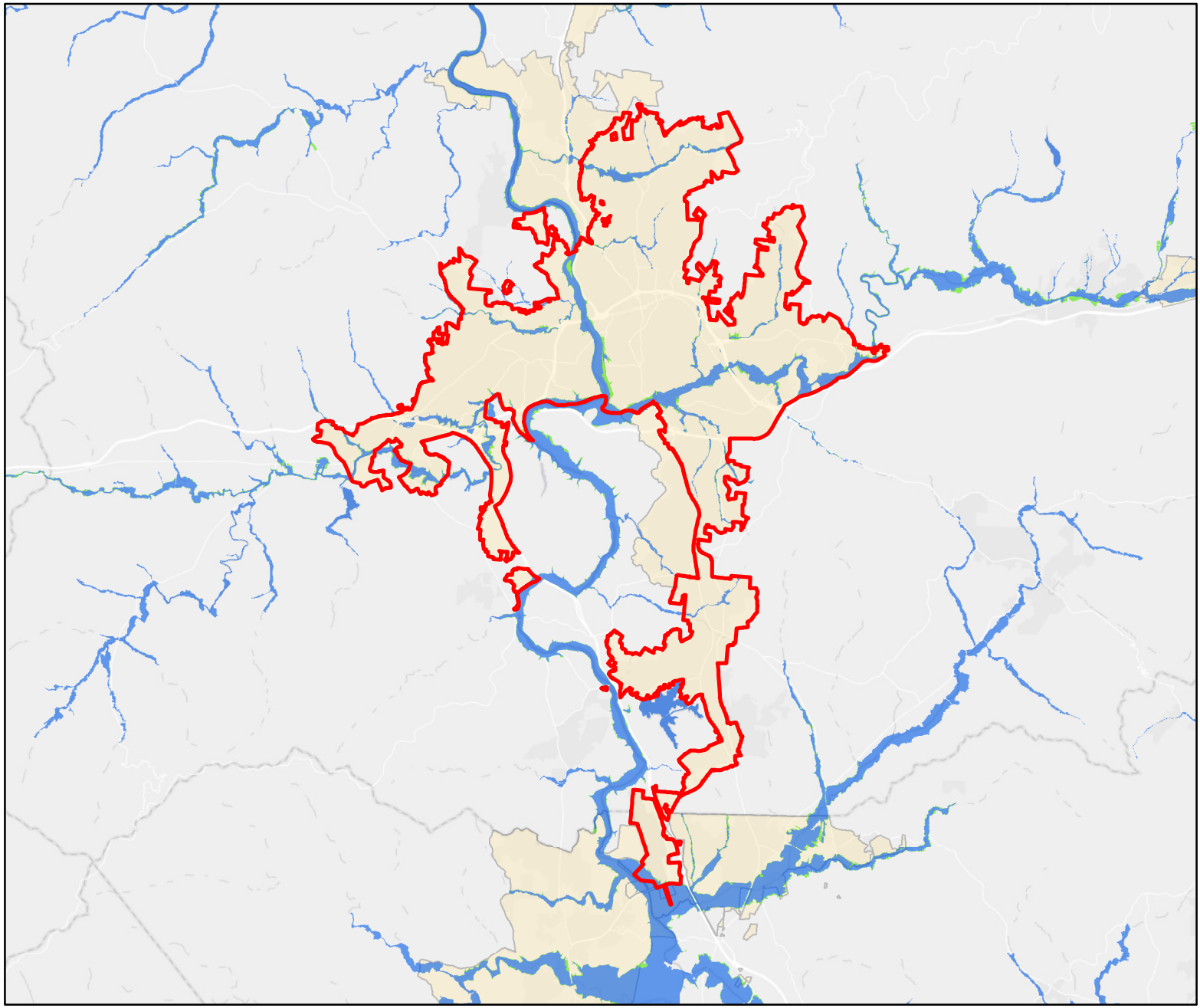
- 100 Year Flood Zone
- 500 Year Flood Zone
- Coastal Flood Zone

Data Source: North Carolina Floodplain Mapping Program

0 3.75 7.5 15 Miles

N

Asheville - Flood Hazard Areas



Legend

- County Boundary
- Municipal Boundary
- Major Roads

Flood Zone

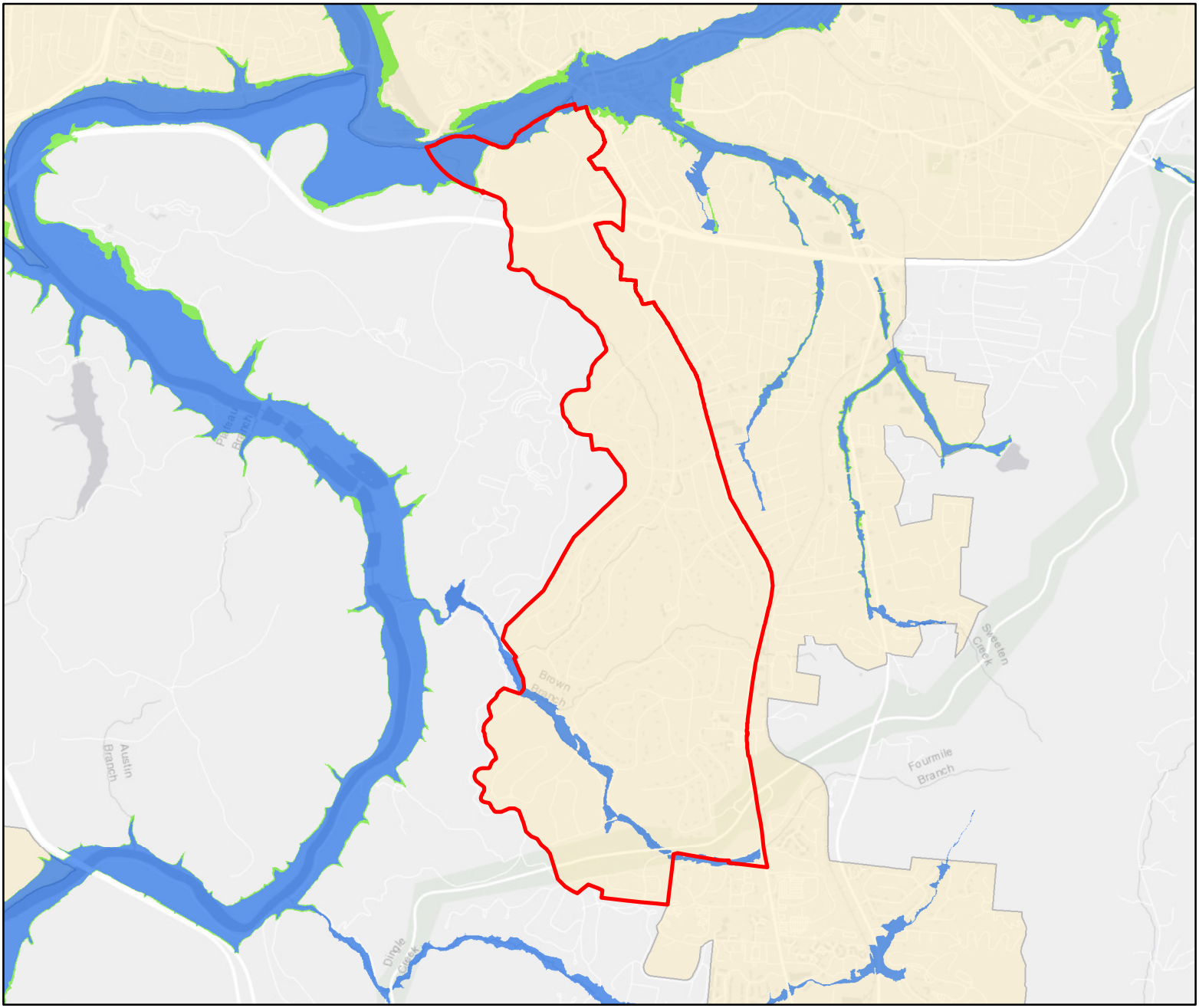
- 100 Year Flood Zone
- 500 Year Flood Zone
- Coastal Flood Zone

Data Source: North Carolina Floodplain Mapping Program

0 1.75 3.5 7 Miles

N

Biltmore Forest - Flood Hazard Areas



Legend

- County Boundary
- Municipal Boundary
- Major Roads

Flood Zone

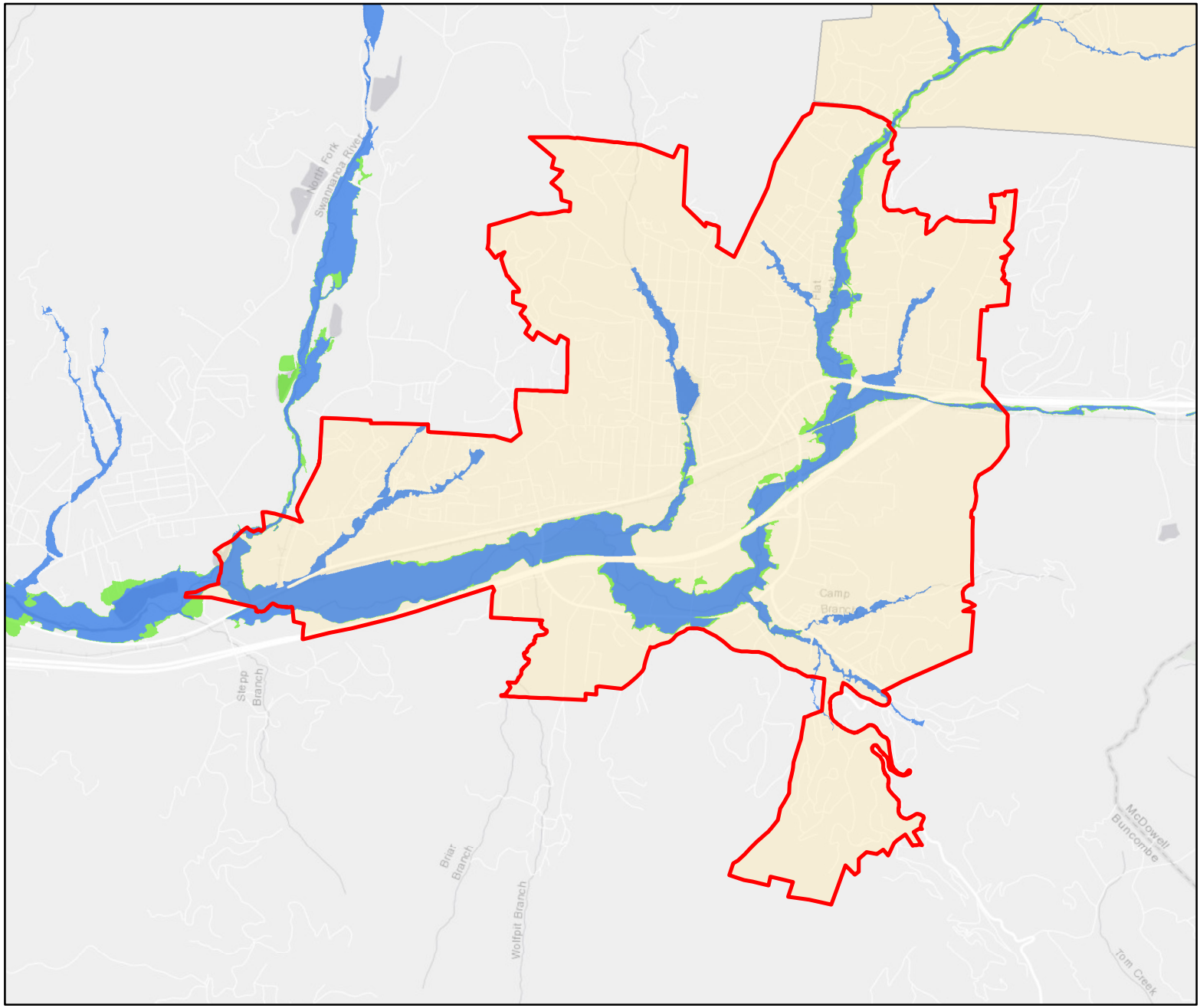
- 100 Year Flood Zone
- 500 Year Flood Zone
- Coastal Flood Zone

Data Source: North Carolina Floodplain Mapping Program

0 0.4 0.8 1.6 Miles

N

Black Mountain - Flood Hazard Areas



Legend

- County Boundary
- Municipal Boundary
- Major Roads

Flood Zone

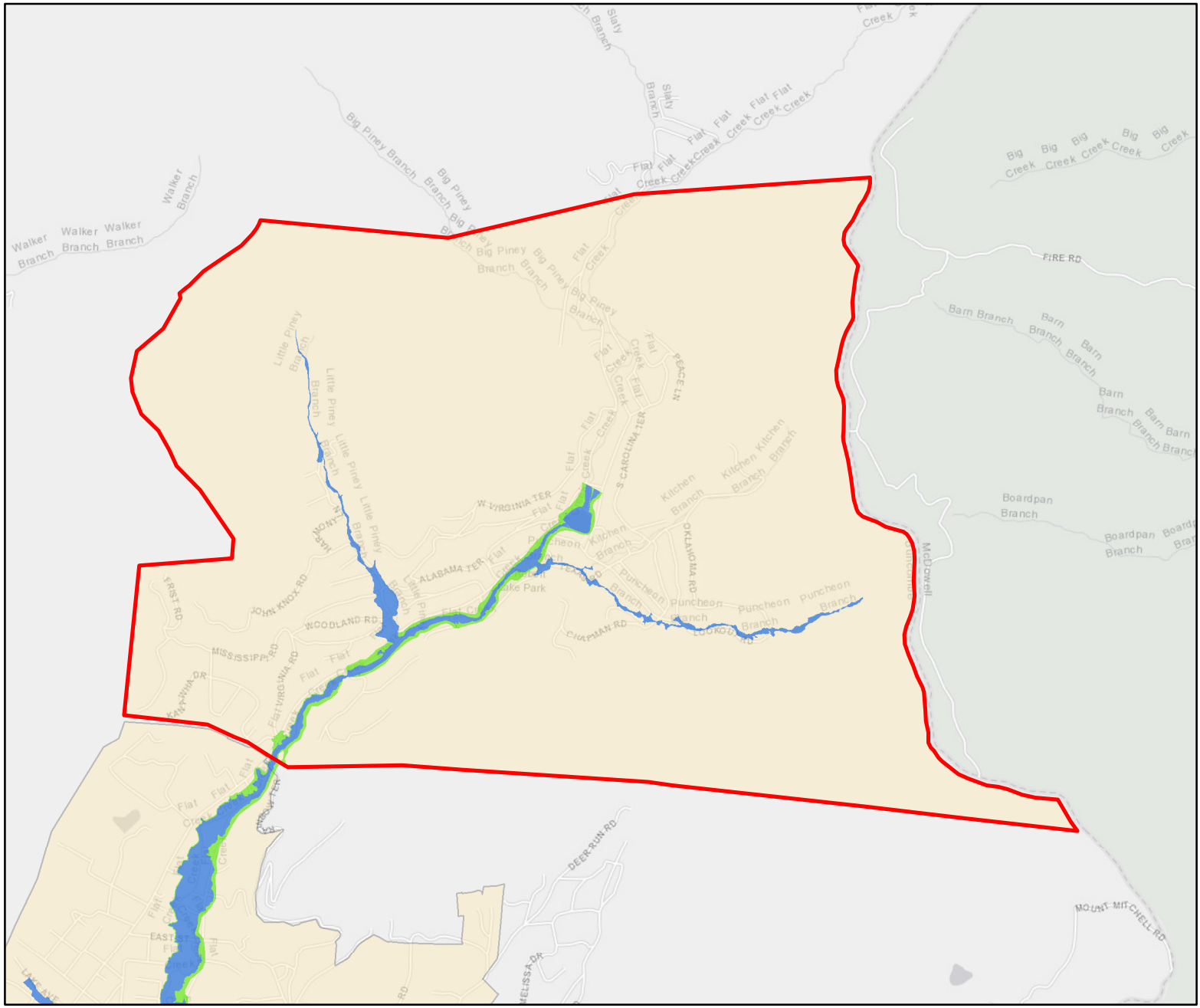
- 100 Year Flood Zone
- 500 Year Flood Zone
- Coastal Flood Zone

Data Source: North Carolina Floodplain Mapping Program

0 0.425 0.85 1.7 Miles

N

Montreat - Flood Hazard Areas



Legend

- County Boundary
- Municipal Boundary
- Major Roads

Flood Zone

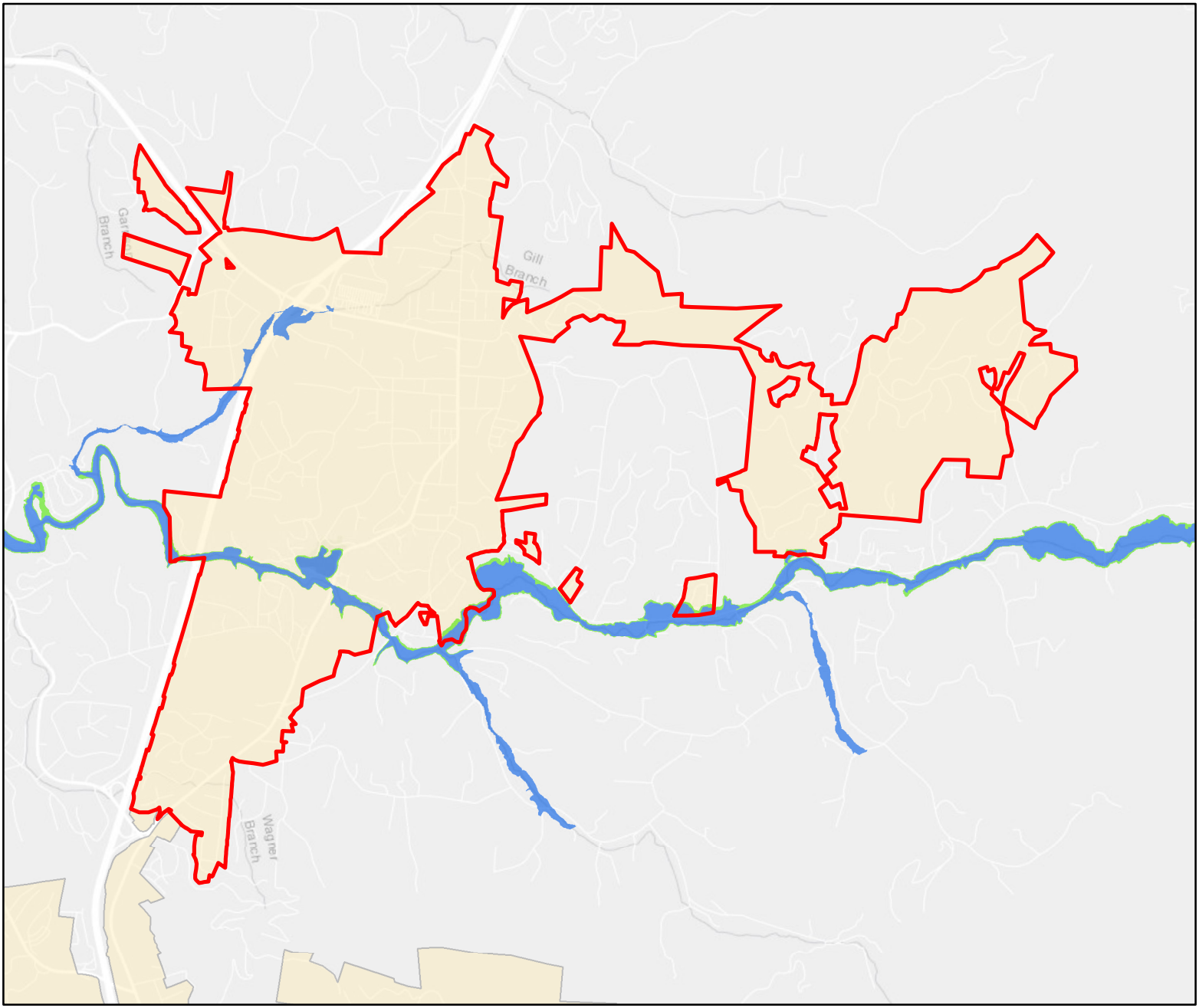
- 100 Year Flood Zone
- 500 Year Flood Zone
- Coastal Flood Zone

Data Source: North Carolina Floodplain Mapping Program

0 0.225 0.45 0.9 Miles

N

Weaverville - Flood Hazard Areas



Legend

- County Boundary
- Municipal Boundary
- Major Roads

Flood Zone

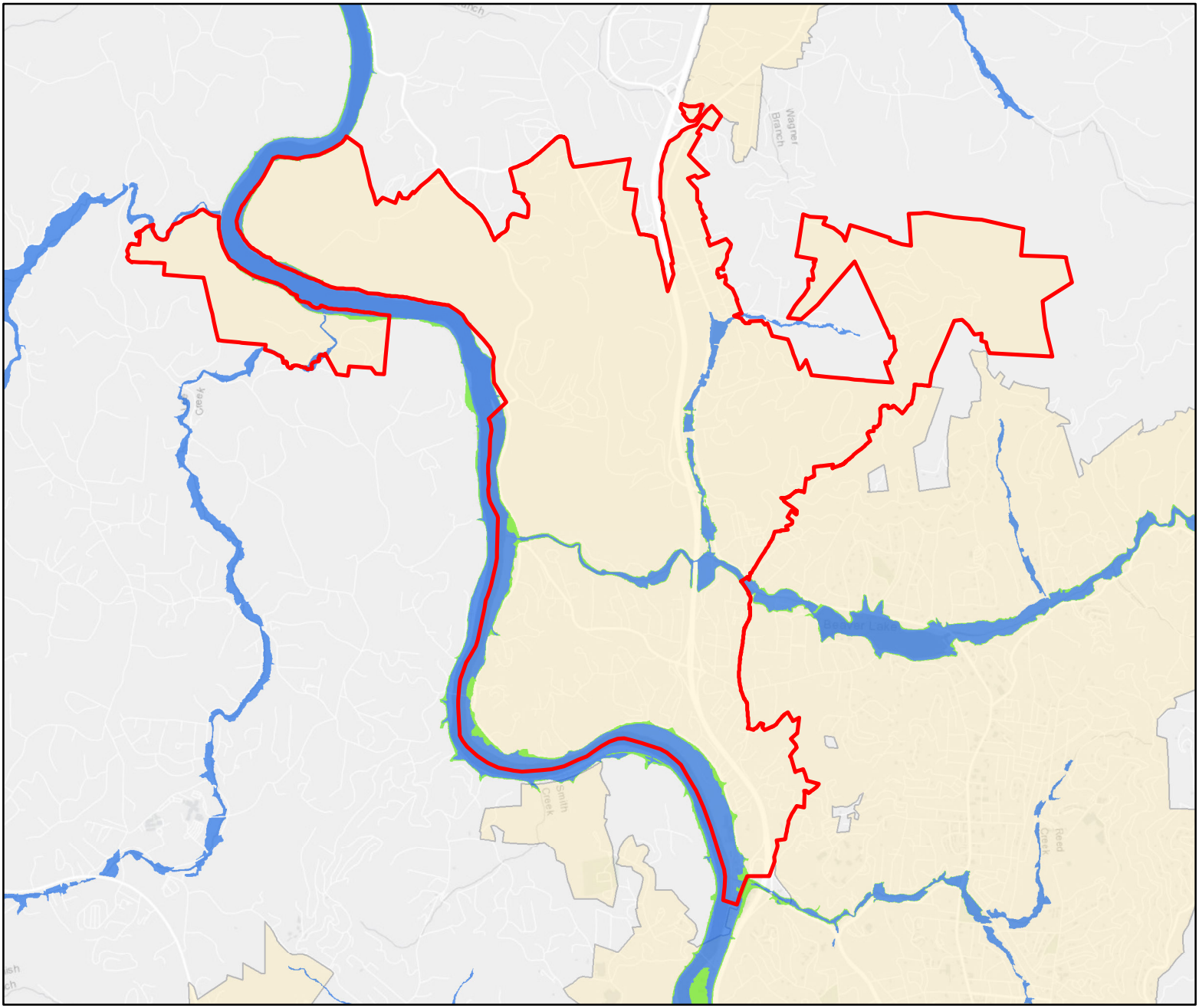
- 100 Year Flood Zone
- 500 Year Flood Zone
- Coastal Flood Zone

Data Source: North Carolina Floodplain Mapping Program

0 0.35 0.7 1.4 Miles

N

Woodfin - Flood Hazard Areas



Legend

- County Boundary
- Municipal Boundary
- Major Roads

Flood Zone

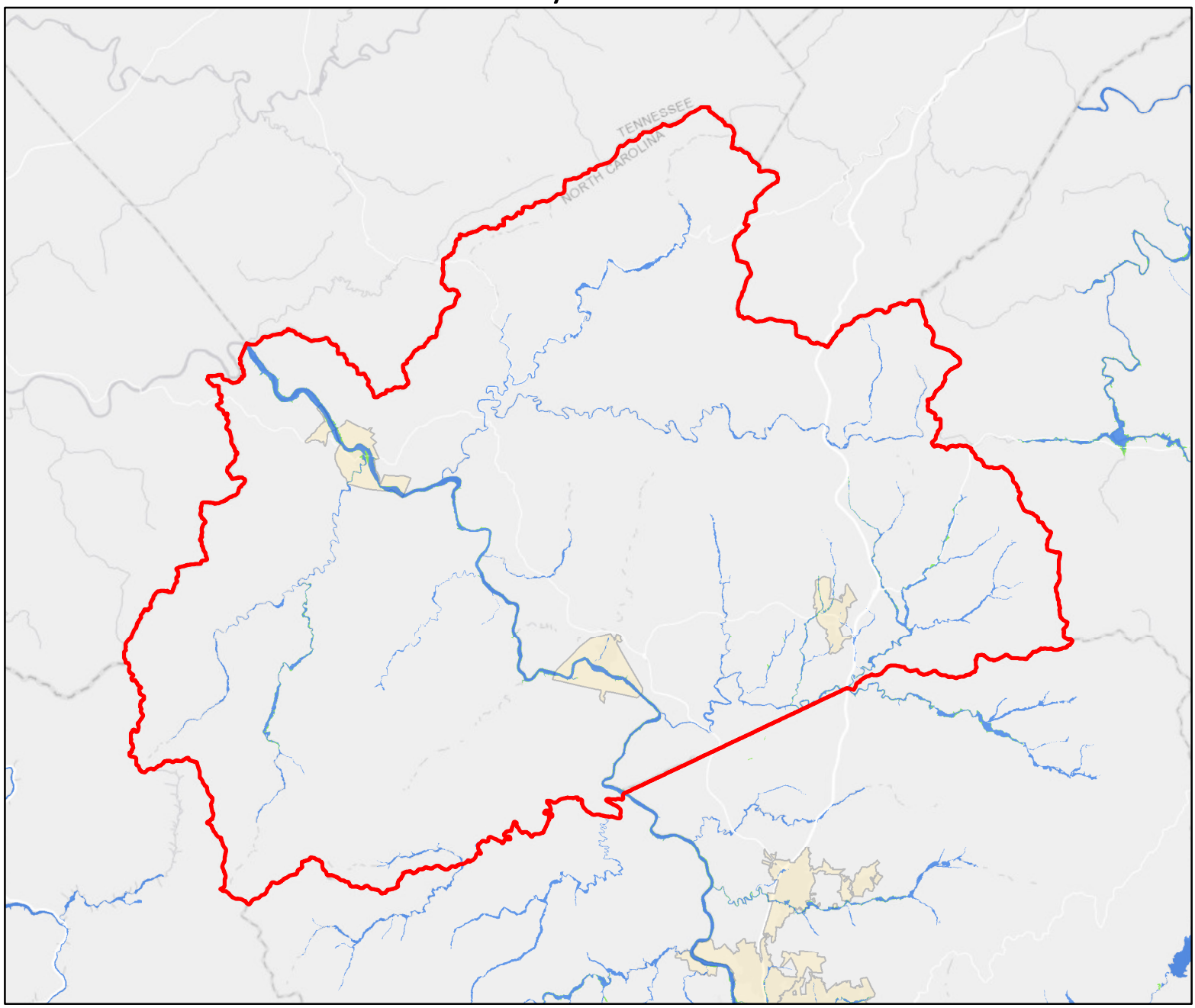
- 100 Year Flood Zone
- 500 Year Flood Zone
- Coastal Flood Zone

Data Source: North Carolina Floodplain Mapping Program

0 0.45 0.9 1.8 Miles

N

Madison County - Flood Hazard Areas



Legend

- County Boundary
- Municipal Boundary
- Major Roads

Flood Zone

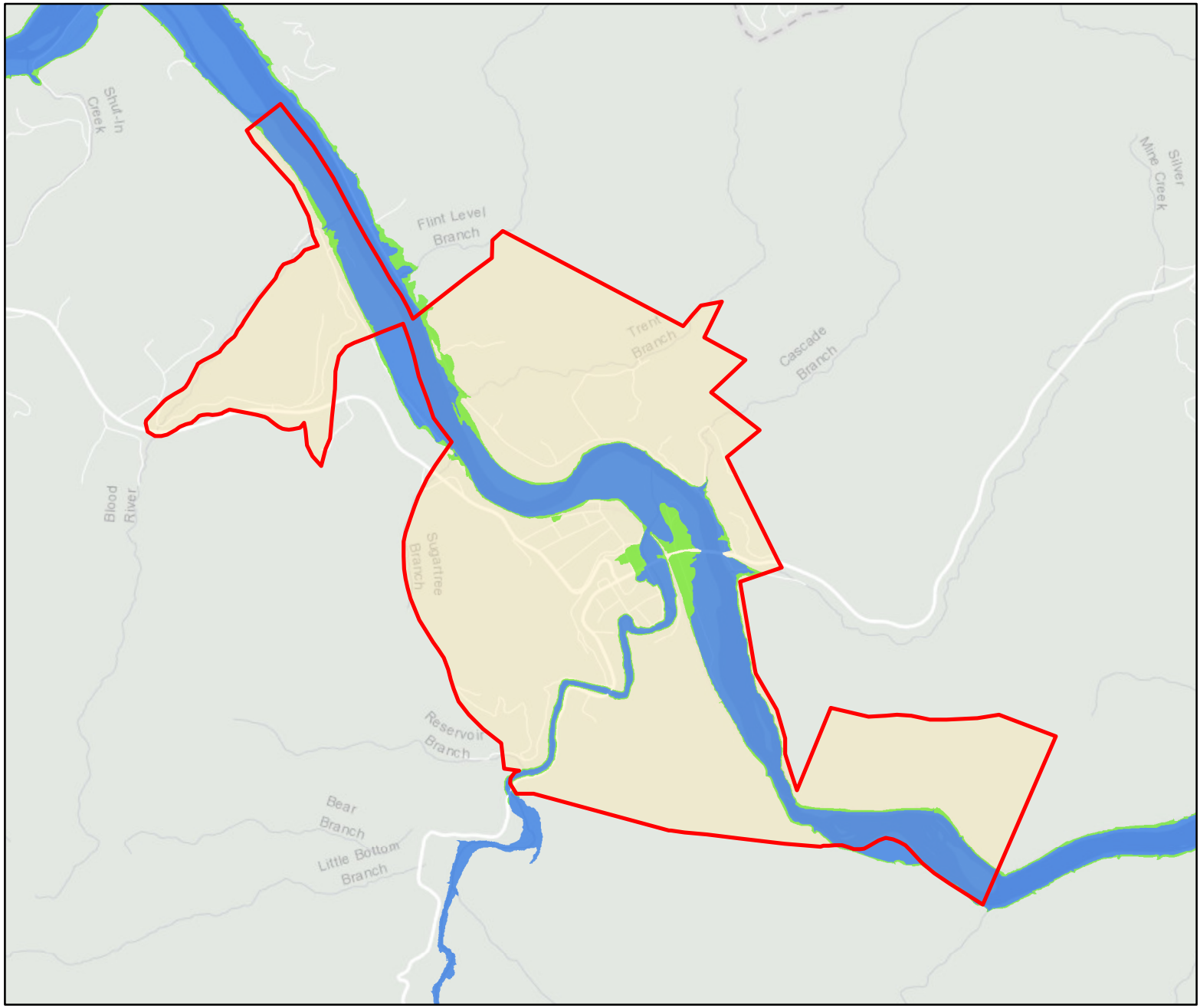
- 100 Year Flood Zone
- 500 Year Flood Zone
- Coastal Flood Zone

Data Source: North Carolina Floodplain Mapping Program

0 2.75 5.5 11 Miles

N

Hot Springs - Flood Hazard Areas



Legend

- County Boundary
- Municipal Boundary
- Major Roads

Flood Zone

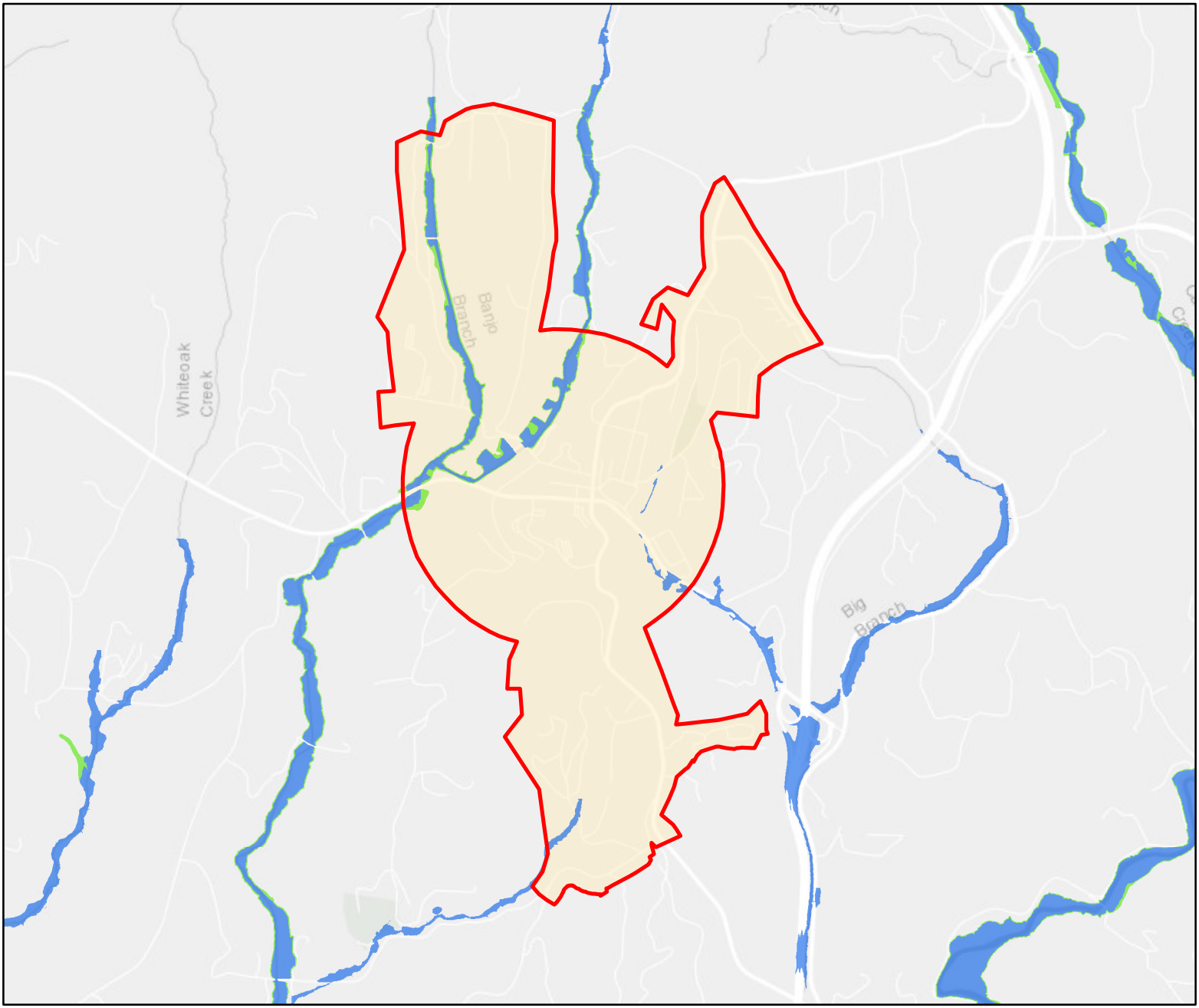
- 100 Year Flood Zone
- 500 Year Flood Zone
- Coastal Flood Zone

Data Source: North Carolina Floodplain Mapping Program

0 0.325 0.65 1.3 Miles

N

Mars Hill - Flood Hazard Areas



Legend

- County Boundary
- Municipal Boundary
- Major Roads

Flood Zone

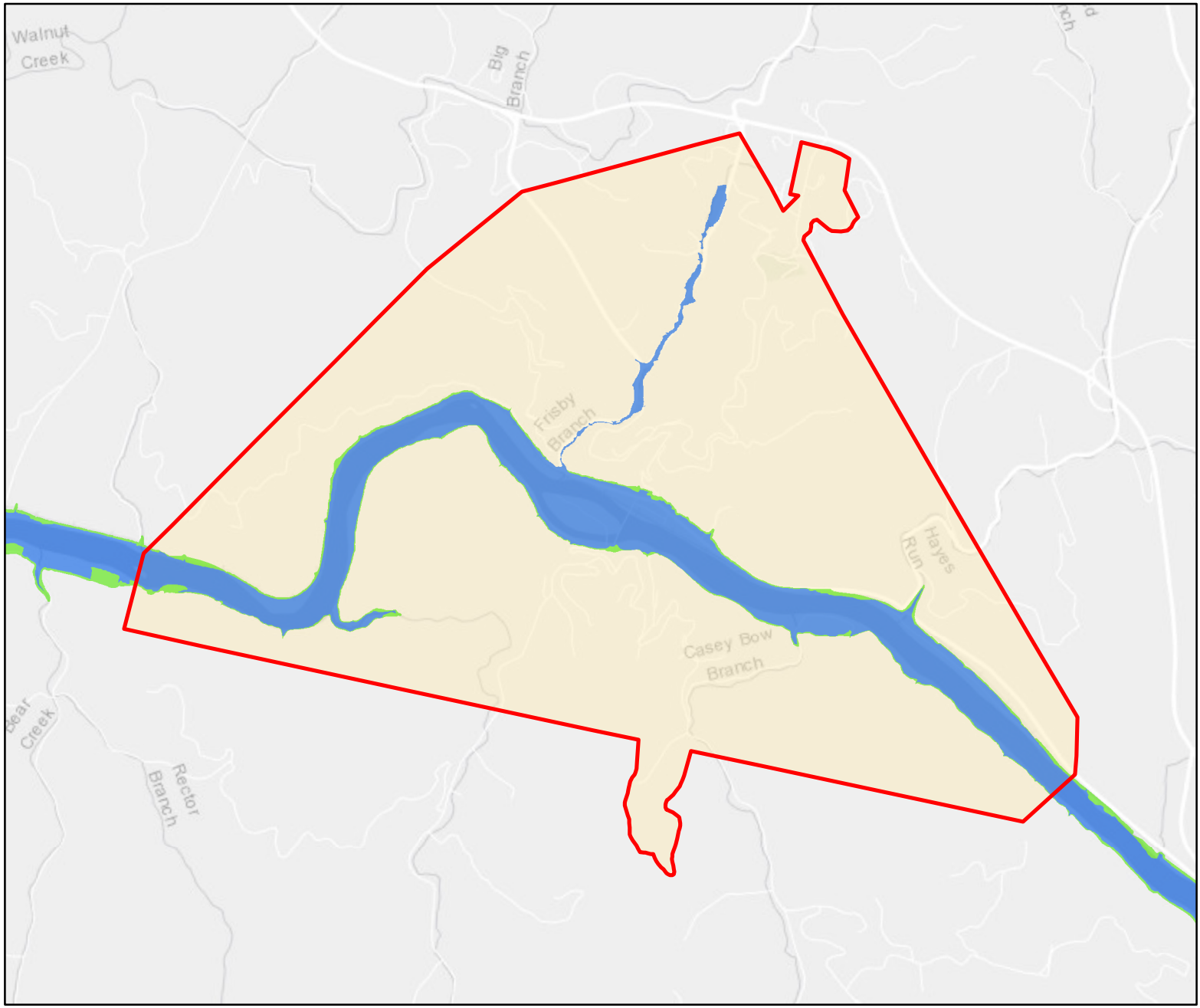
- 100 Year Flood Zone
- 500 Year Flood Zone
- Coastal Flood Zone

Data Source: North Carolina Floodplain Mapping Program

0 0.275 0.55 1.1 Miles

N

Marshall - Flood Hazard Areas



Legend

- County Boundary
- Municipal Boundary
- Major Roads

Flood Zone

- 100 Year Flood Zone
- 500 Year Flood Zone
- Coastal Flood Zone

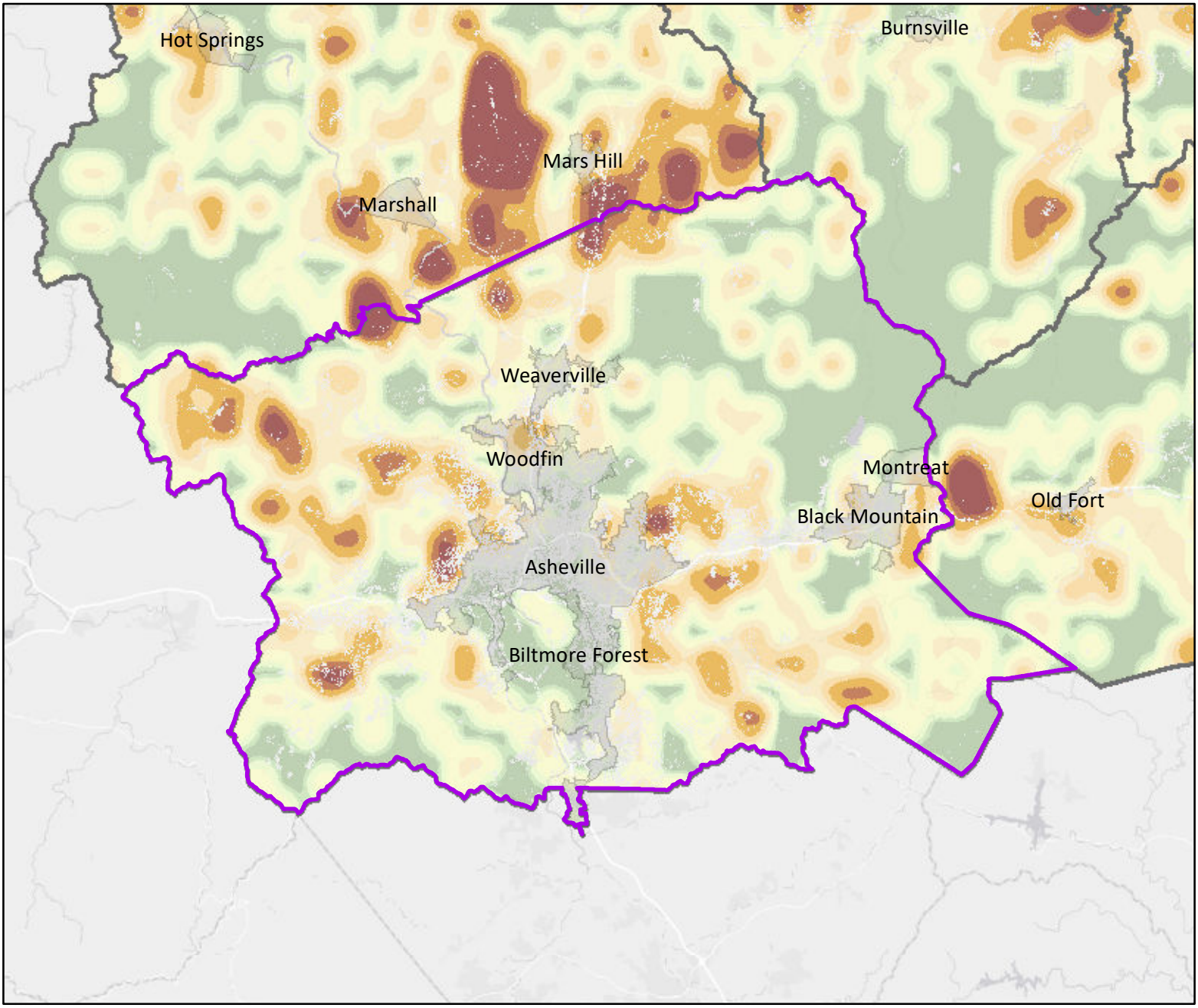
Data Source: North Carolina Floodplain Mapping Program

0 0.275 0.55 1.1 Miles

N

Appendix G
Wildfire Hazard Maps

Buncombe County - Wildfire Ignition Density



Legend

Municipal Boundary

County Boundary

Wildfire Ignition Density Index

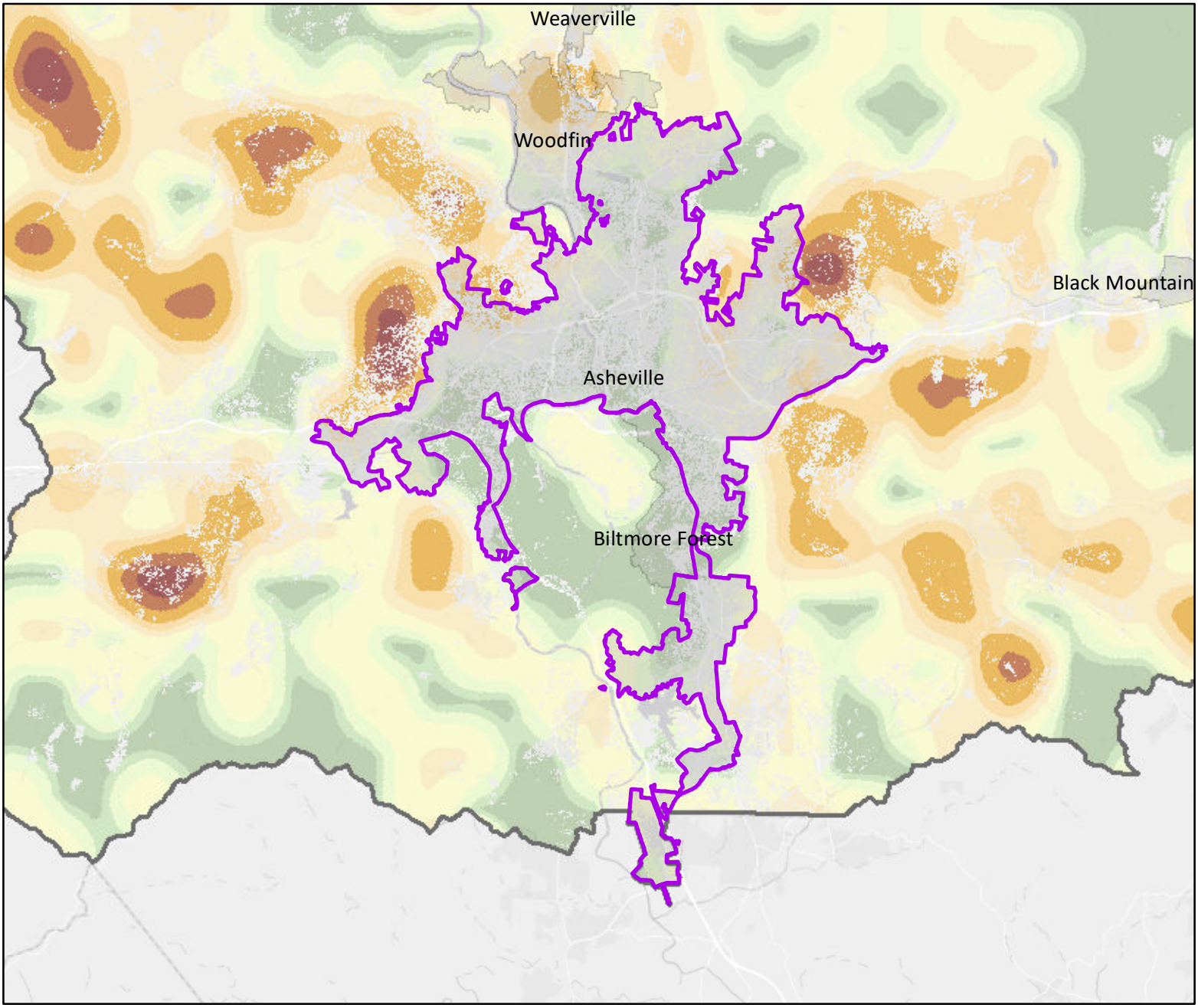
0 1 2 3 4 5 6 7 8 9

Data Source:SOUTHERN GROUP OF STATE FORESTERS
WILDFIRE RISK ASSESSMENT PORTAL

0 3.75 7.5 15 Miles

N

Asheville - Wildfire Ignition Density



Legend

Municipal Boundary

County Boundary

Wildfire Ignition Density Index

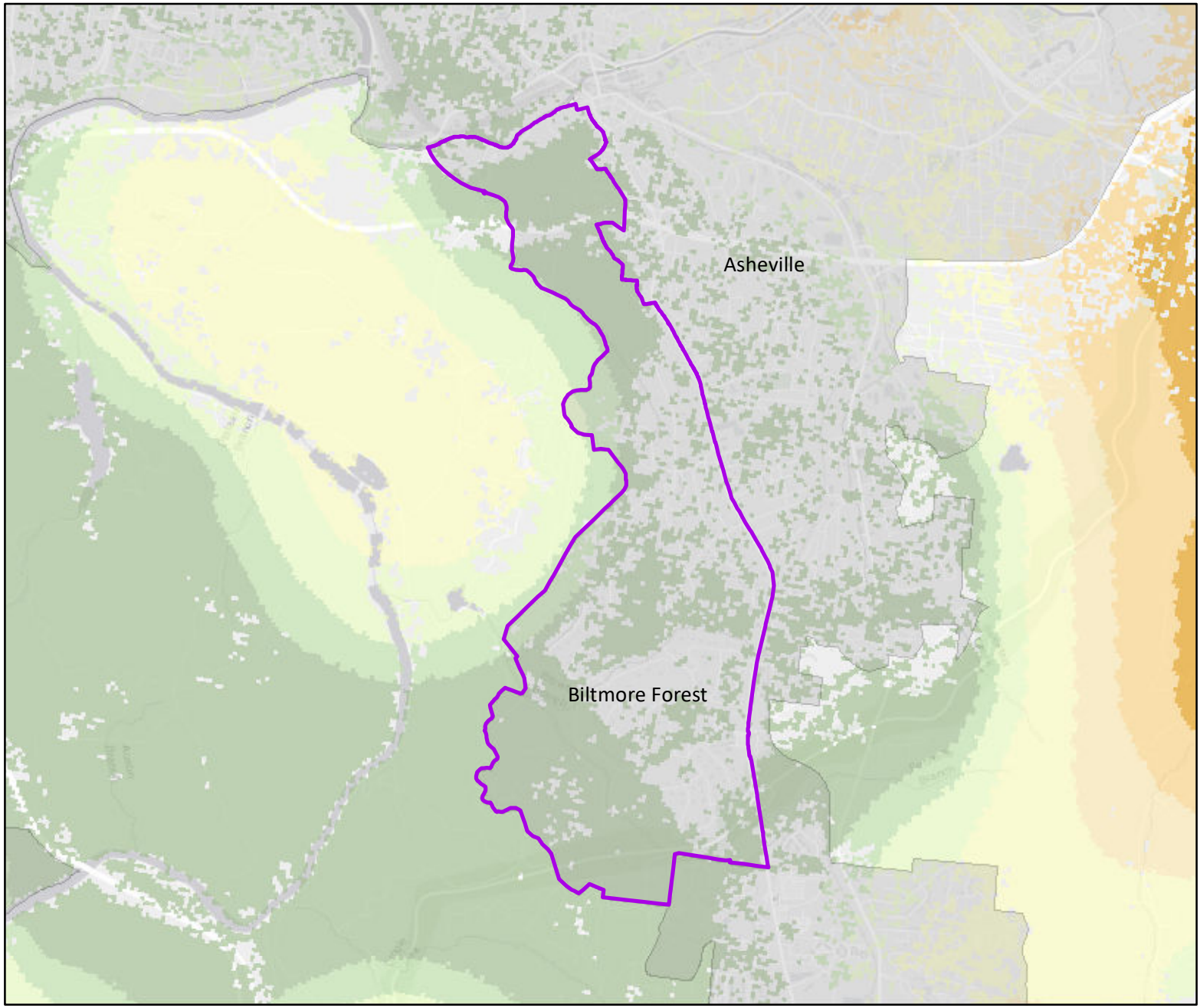
0 1 2 3 4 5 6 7 8 9

Data Source:SOUTHERN GROUP OF STATE FORESTERS WILDFIRE RISK ASSESSMENT PORTAL

0 1.75 3.5 7 Miles

N

Biltmore Forest - Wildfire Ignition Density



Legend

Municipal Boundary

County Boundary

Wildfire Ignition Density Index

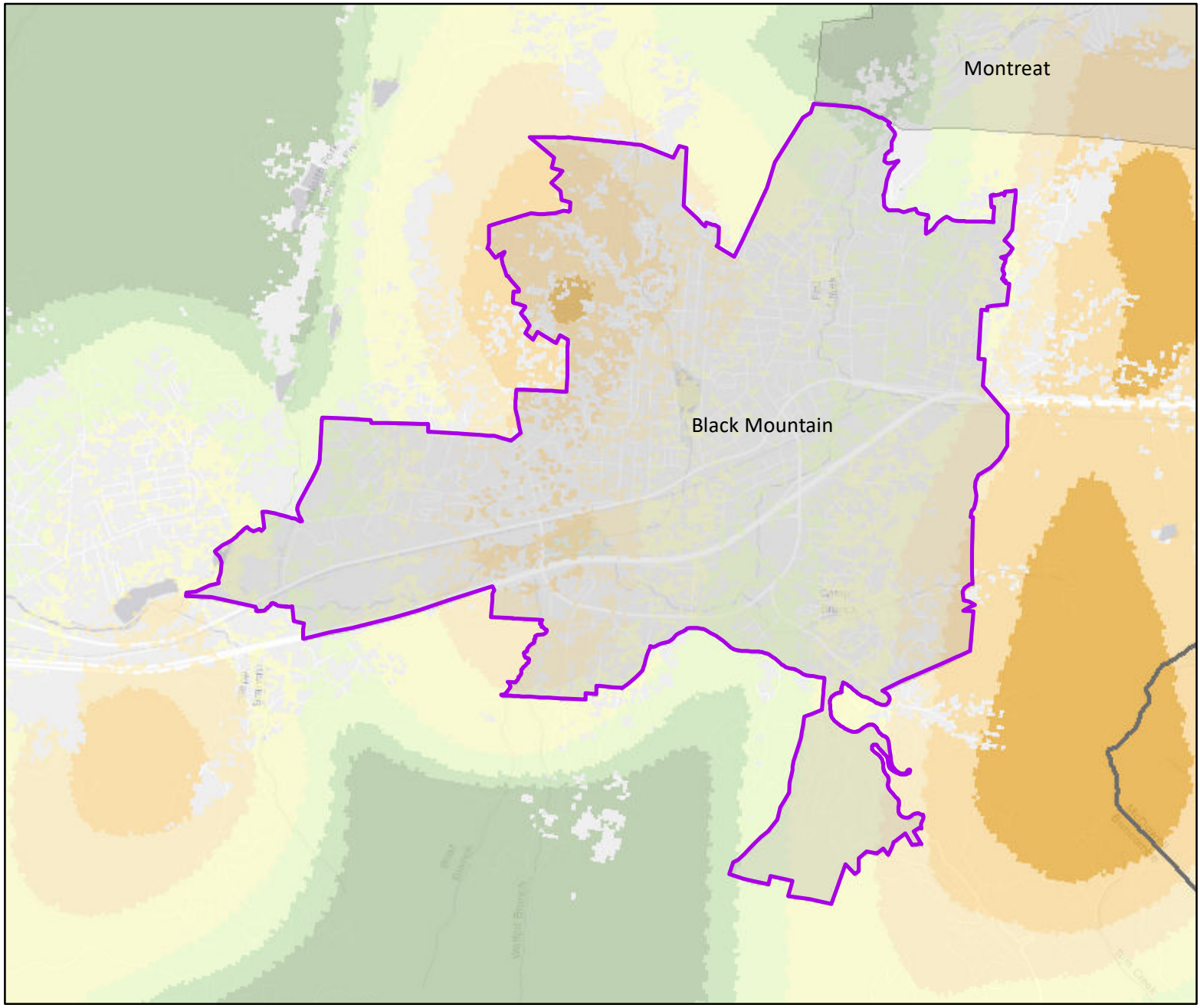
0 1 2 3 4 5 6 7 8 9

Data Source:SOUTHERN GROUP OF STATE FORESTERS WILDFIRE RISK ASSESSMENT PORTAL

0 0.4 0.8 1.6 Miles

N

Black Mountain - Wildfire Ignition Density



Legend

Municipal Boundary

County Boundary

Wildfire Ignition Density Index

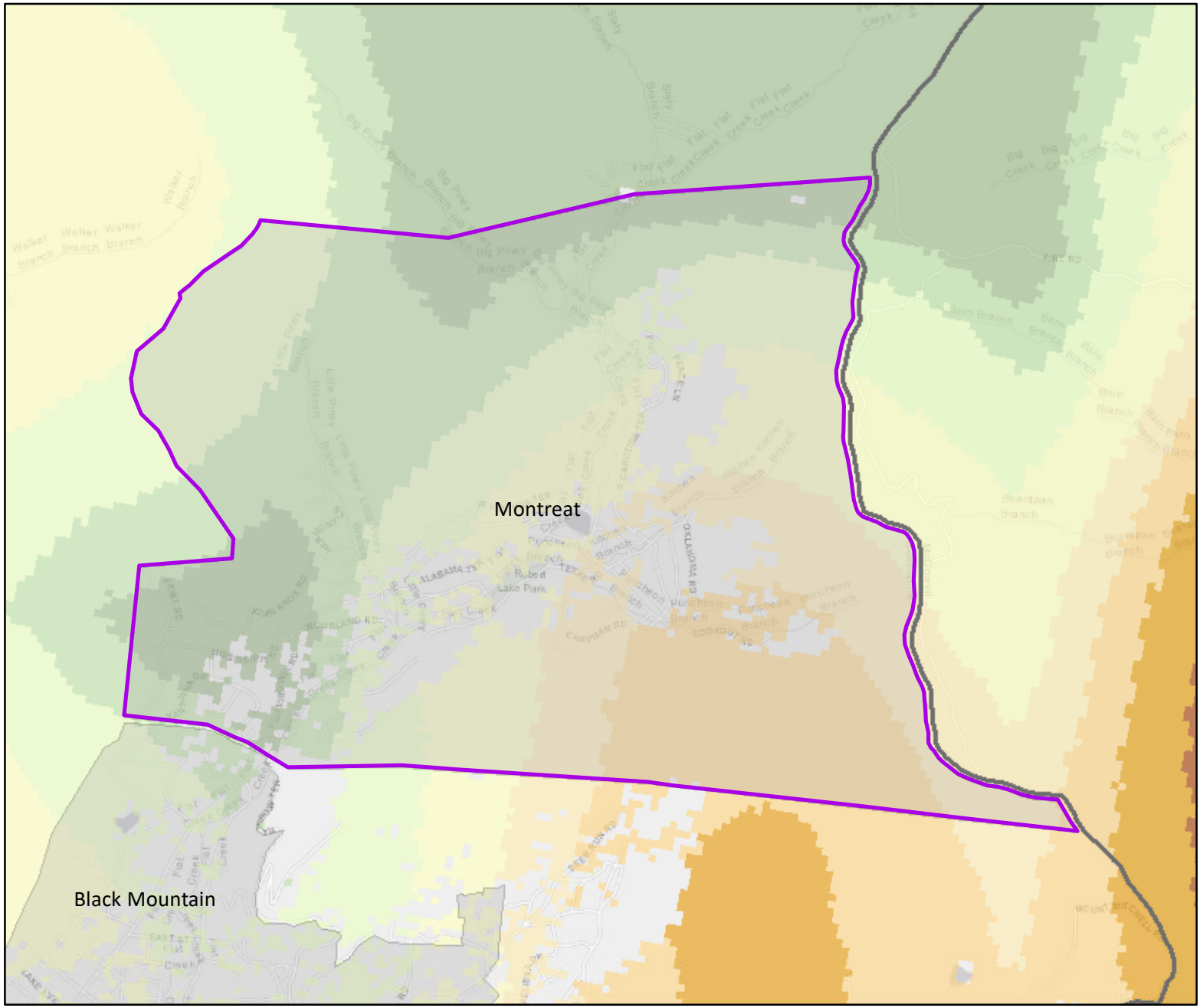
0 1 2 3 4 5 6 7 8 9

Data Source:SOUTHERN GROUP OF STATE FORESTERS
WILDFIRE RISK ASSESSMENT PORTAL

0 0.425 0.85 1.7 Miles

N

Montreat - Wildfire Ignition Density



Legend

Municipal Boundary

County Boundary

Wildfire Ignition Density Index

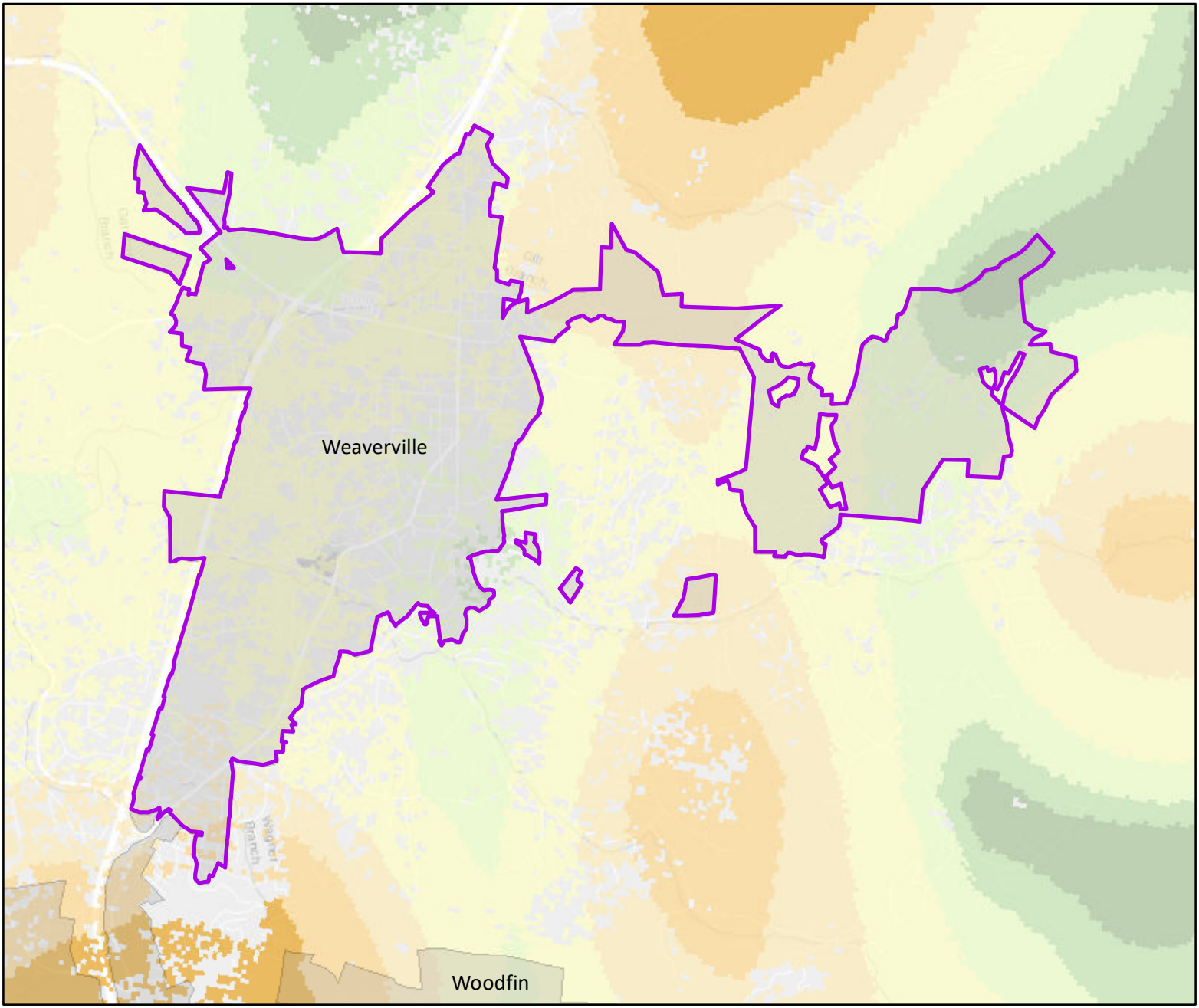
0 1 2 3 4 5 6 7 8 9

Data Source:SOUTHERN GROUP OF STATE FORESTERS WILDFIRE RISK ASSESSMENT PORTAL

0 0.225 0.45 0.9 Miles

N

Weaverville - Wildfire Ignition Density



Legend

Municipal Boundary

County Boundary

Wildfire Ignition Density Index

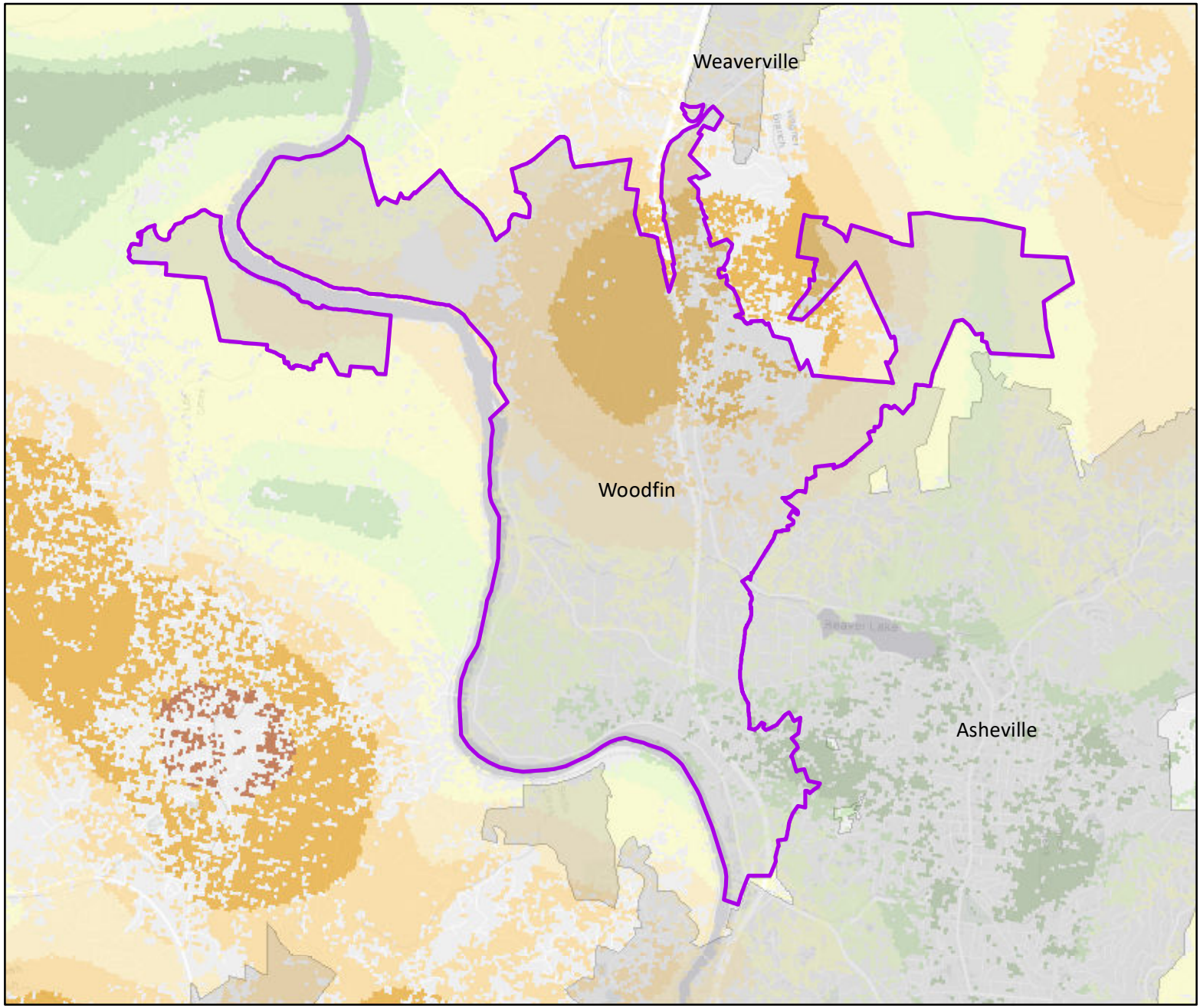
0 1 2 3 4 5 6 7 8 9

Data Source:SOUTHERN GROUP OF STATE FORESTERS WILDFIRE RISK ASSESSMENT PORTAL

0 0.35 0.7 1.4 Miles

N

Woodfin - Wildfire Ignition Density



Legend

Municipal Boundary

County Boundary

Wildfire Ignition Density Index

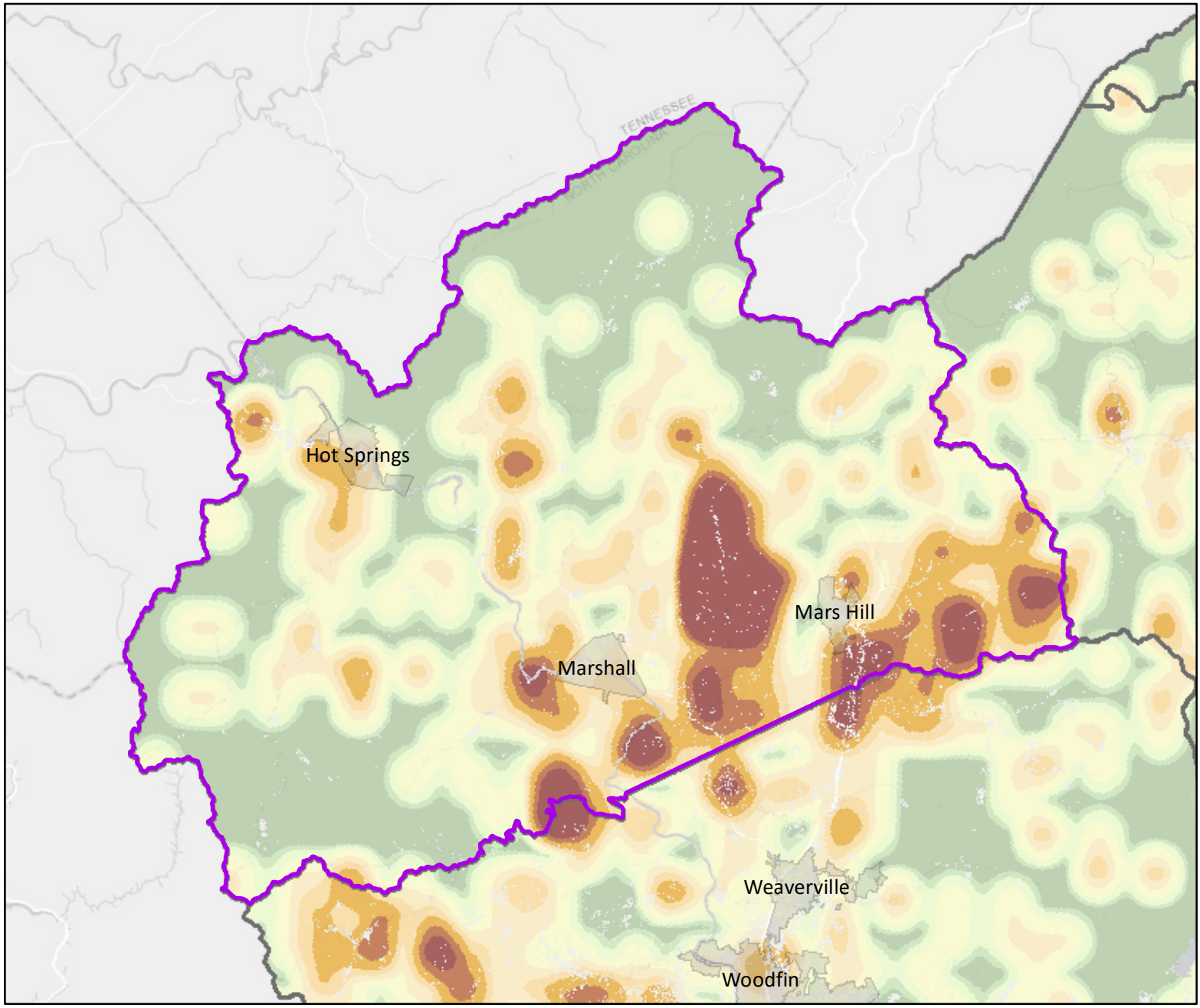
0 1 2 3 4 5 6 7 8 9

Data Source:SOUTHERN GROUP OF STATE FORESTERS
WILDFIRE RISK ASSESSMENT PORTAL

0 0.45 0.9 1.8 Miles

N

Madison County - Wildfire Ignition Density



Legend

Municipal Boundary

County Boundary

Wildfire Ignition Density Index

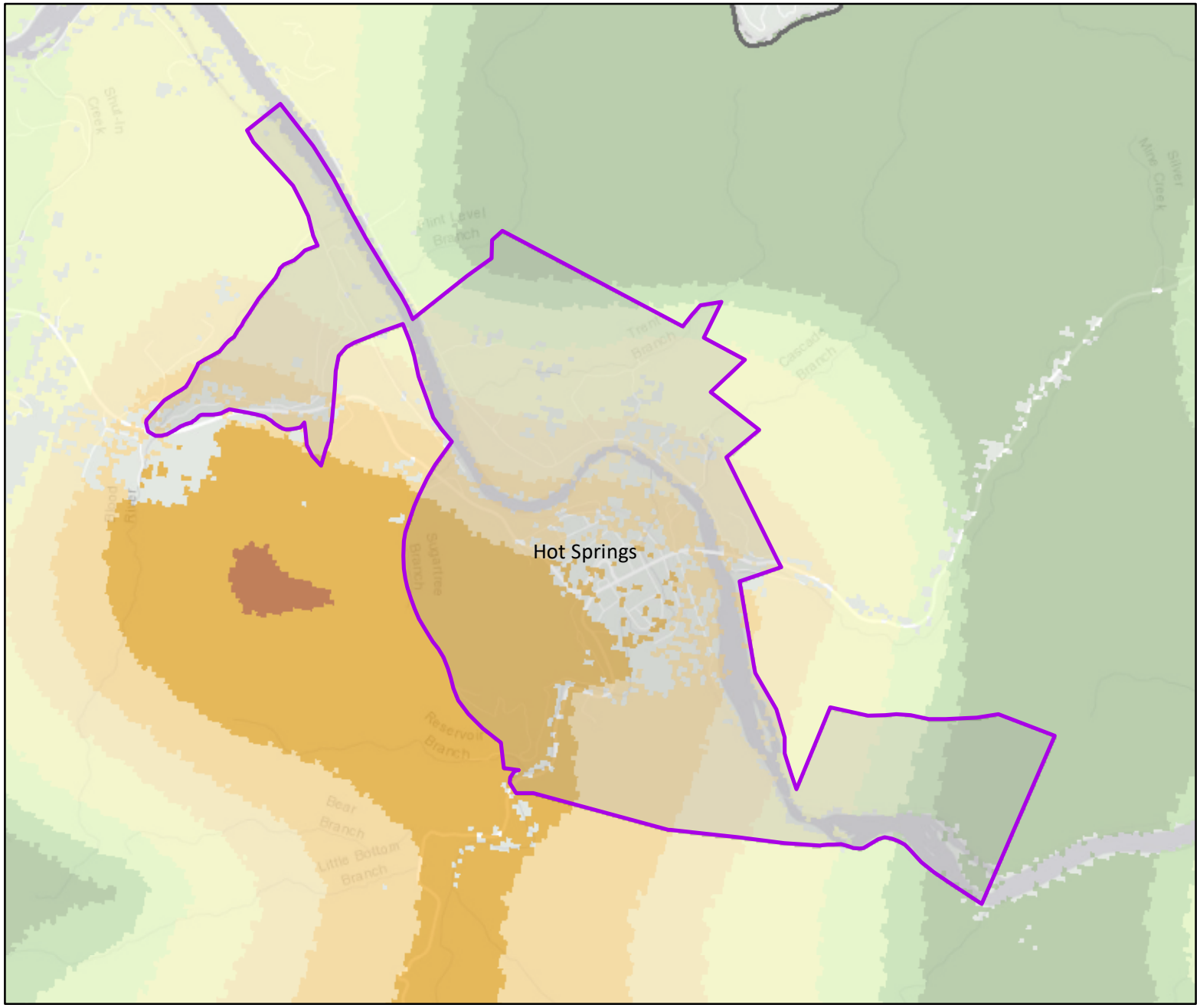
0 1 2 3 4 5 6 7 8 9

Data Source:SOUTHERN GROUP OF STATE FORESTERS
WILDFIRE RISK ASSESSMENT PORTAL

0 2.75 5.5 11 Miles

N

Hot Springs - Wildfire Ignition Density



Legend

Municipal Boundary

County Boundary

Wildfire Ignition Density Index

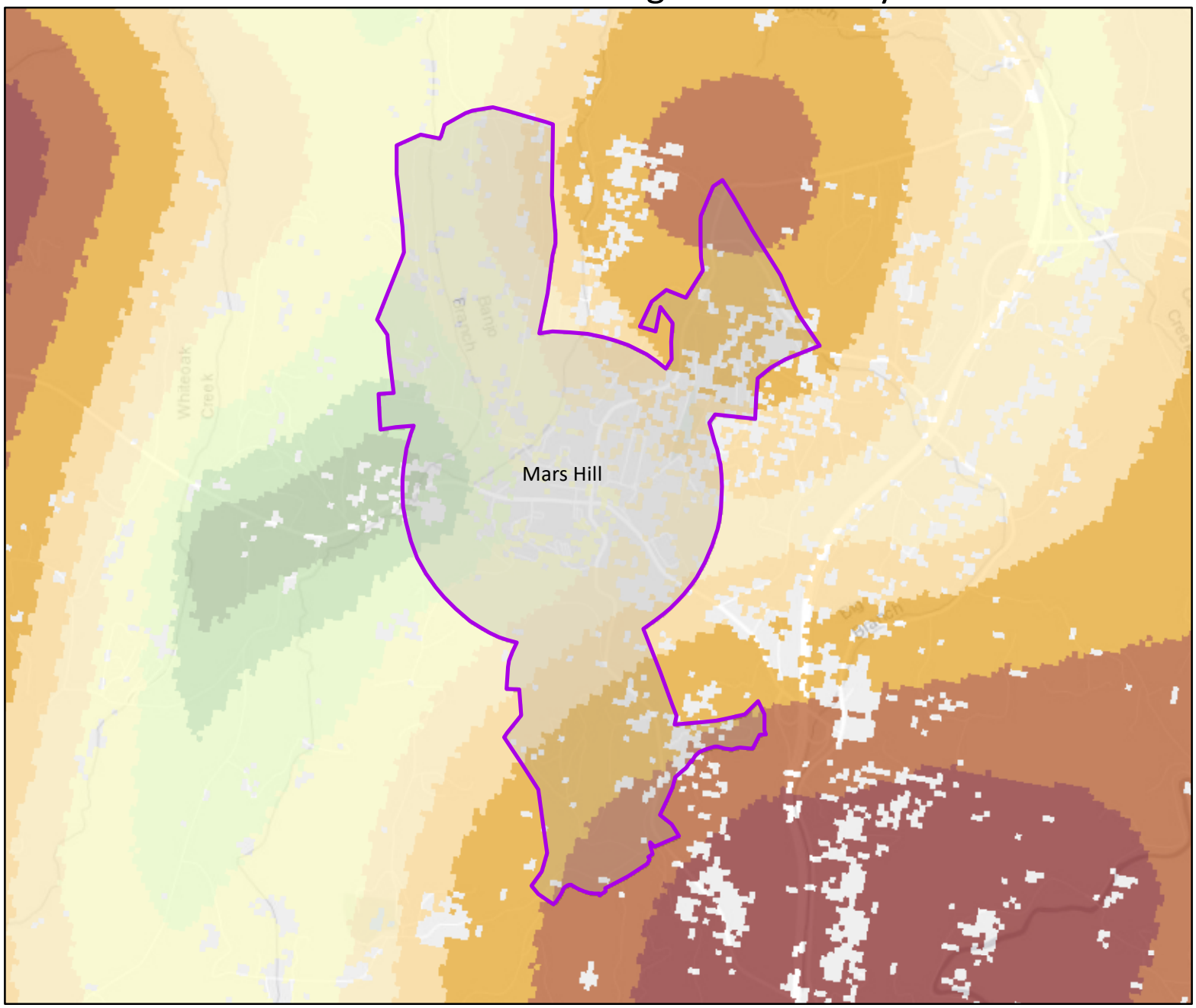
0 1 2 3 4 5 6 7 8 9

Data Source:SOUTHERN GROUP OF STATE FORESTERS
WILDFIRE RISK ASSESSMENT PORTAL

0 0.325 0.65 1.3 Miles

N

Mars Hill - Wildfire Ignition Density



Legend

Municipal Boundary

County Boundary

Wildfire Ignition Density Index

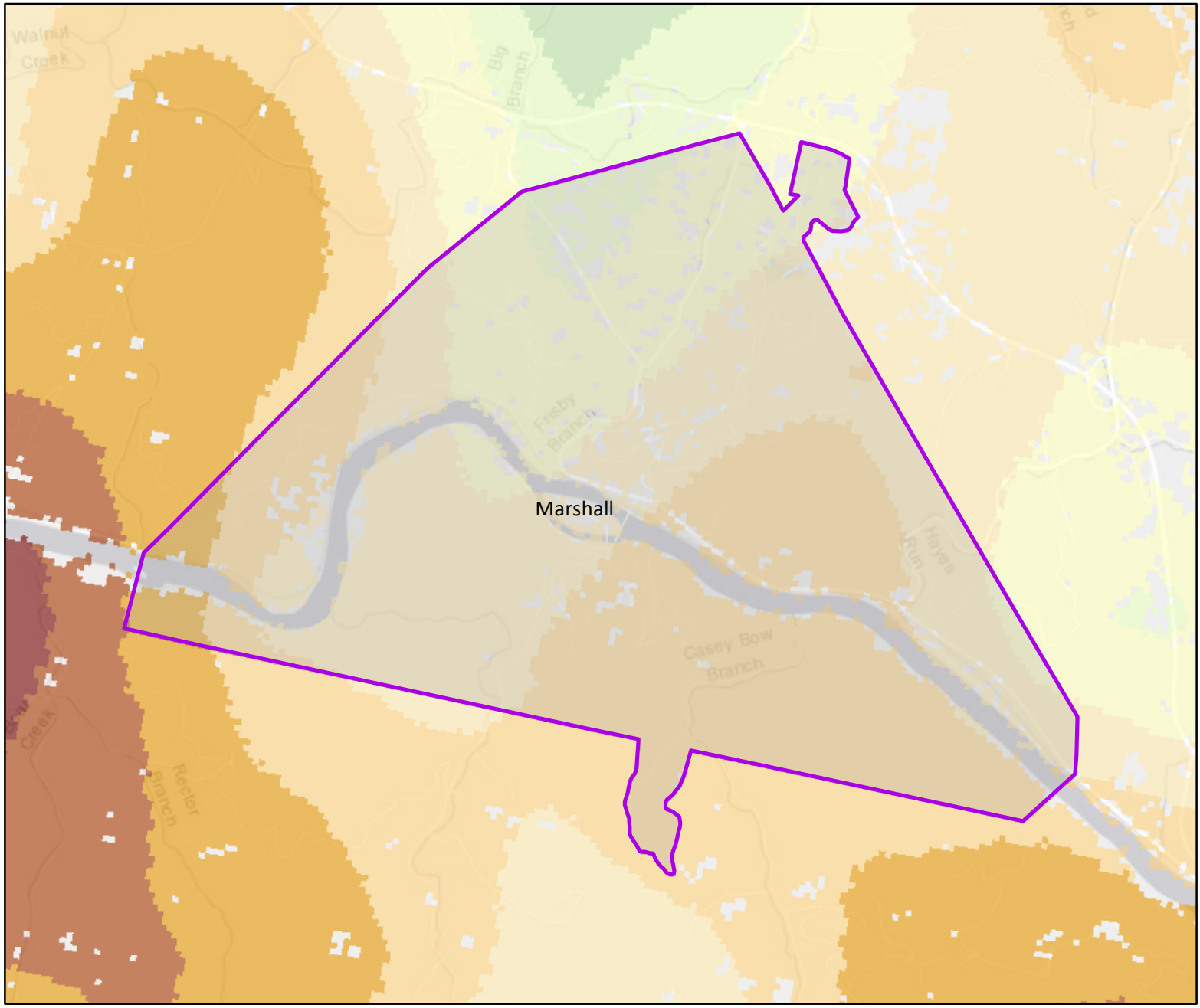
0 1 2 3 4 5 6 7 8 9

Data Source:SOUTHERN GROUP OF STATE FORESTERS WILDFIRE RISK ASSESSMENT PORTAL

0 0.275 0.55 1.1 Miles

N

Marshall - Wildfire Ignition Density



Legend

Municipal Boundary

County Boundary

Wildfire Ignition Density Index

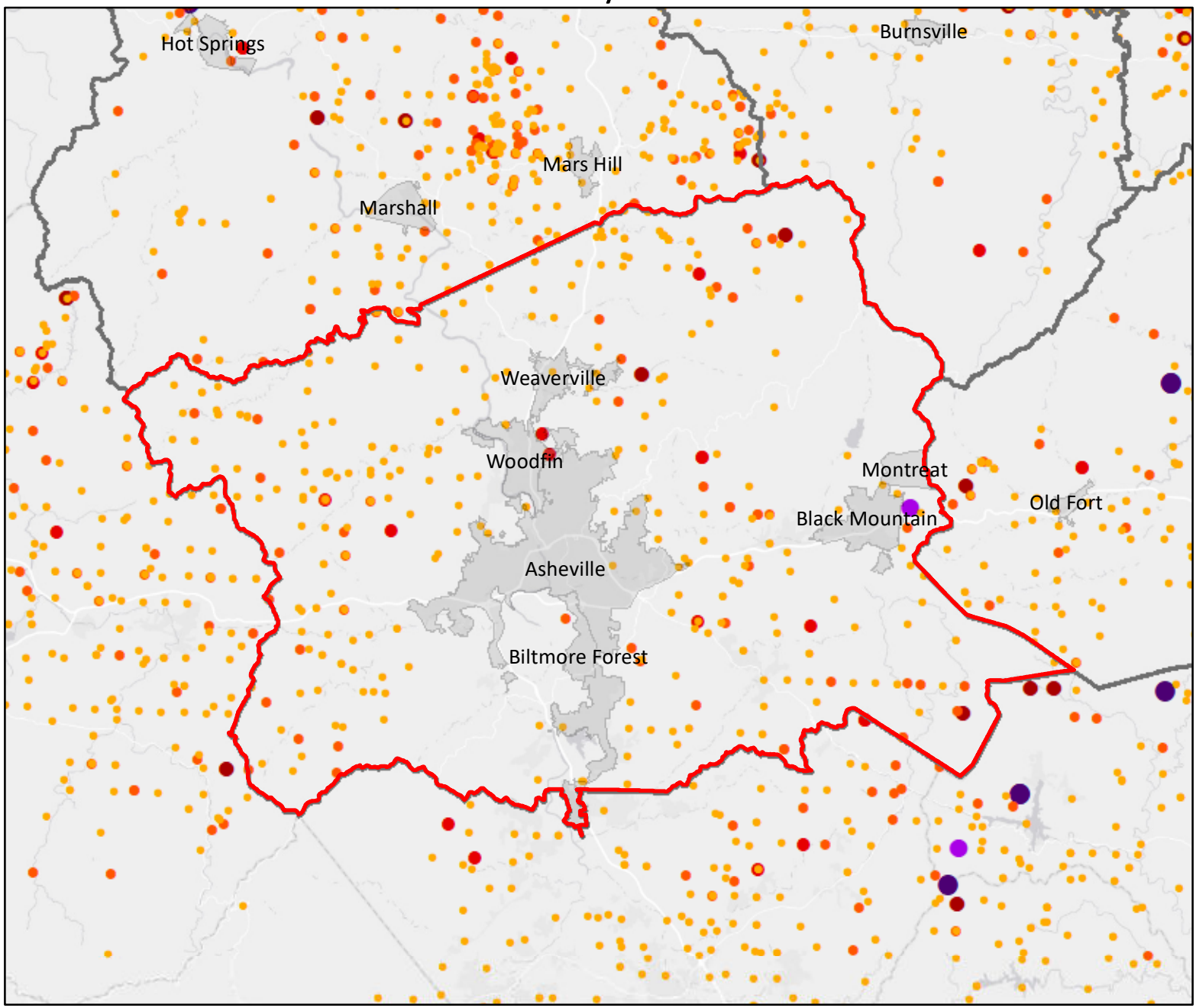
0 1 2 3 4 5 6 7 8 9

Data Source:SOUTHERN GROUP OF STATE FORESTERS
WILDFIRE RISK ASSESSMENT PORTAL

0 0.275 0.55 1.1 Miles

N

Buncombe County - Wildfire Events



Legend

- Municipal Boundary
- County Boundary

Acres Impacted

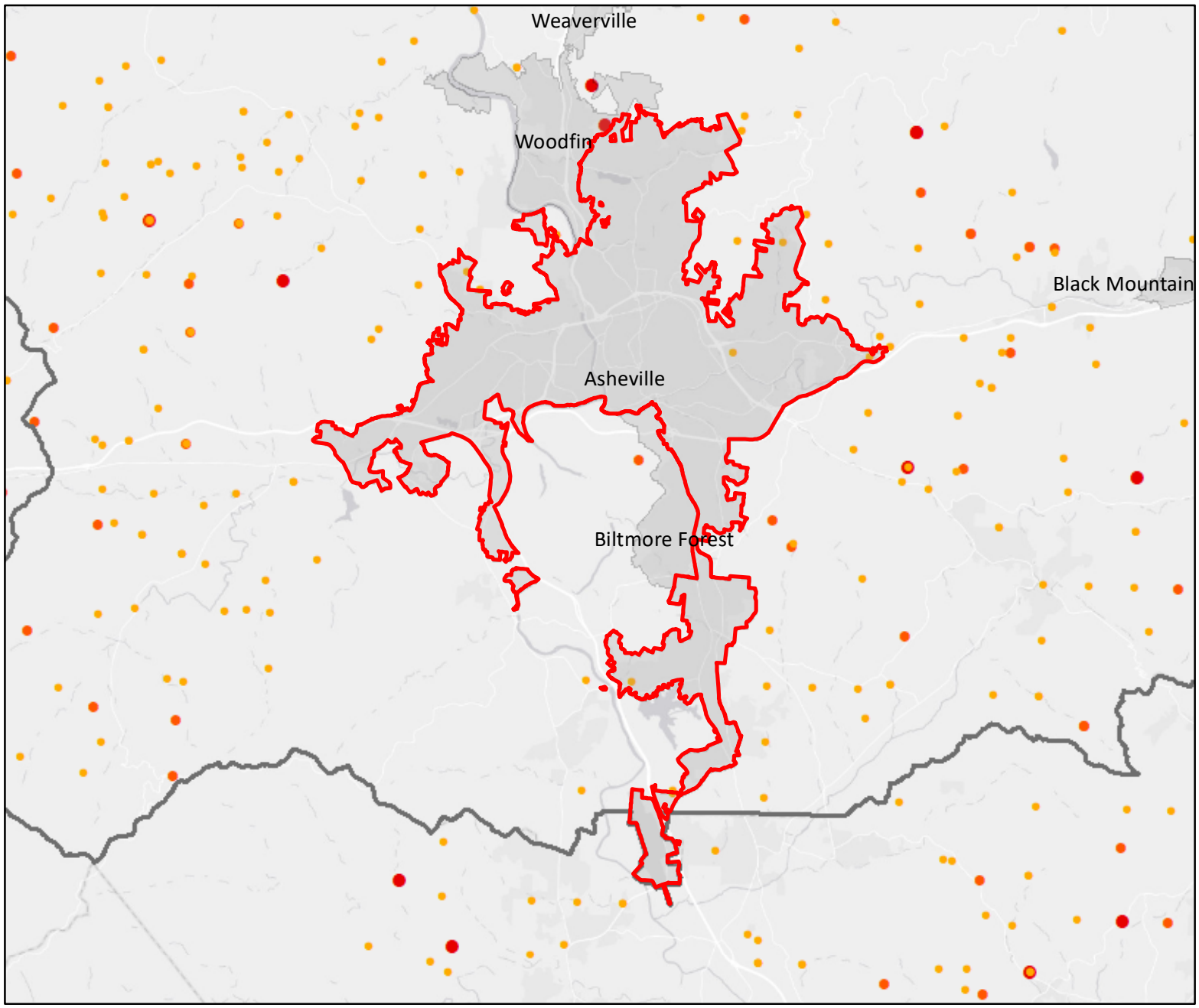
- 1 - 10
- 11 - 50
- 51 - 100
- 101 - 500
- 501 - 1000
- >1000

Data Source:SOUTHERN GROUP OF STATE FORESTERS
WILDFIRE RISK ASSESSMENT PORTAL

0 3.75 7.5 15 Miles

N

Asheville - Wildfire Events



Legend

- Municipal Boundary
- County Boundary

Acres Impacted

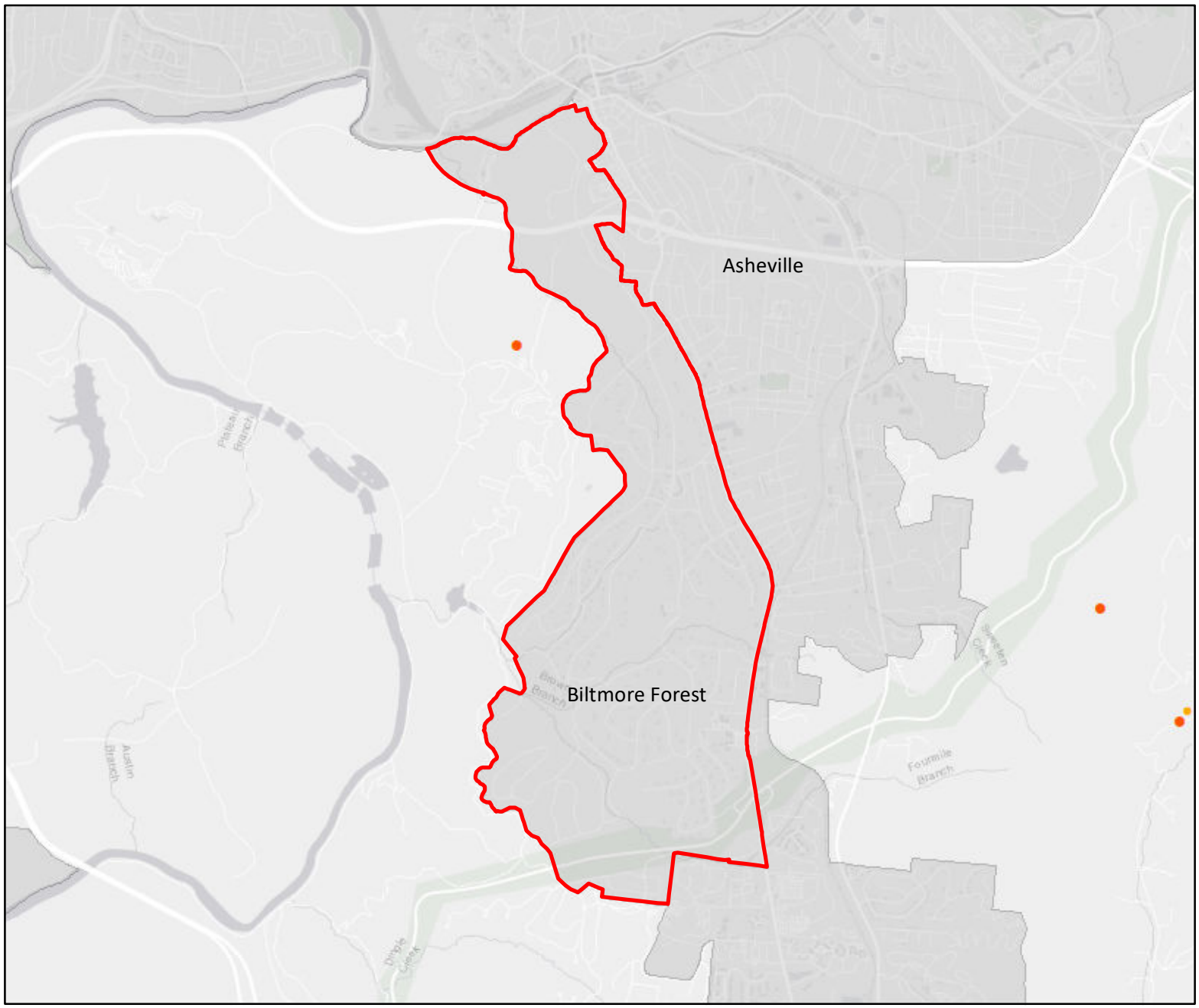
- 1 - 10
- 11 - 50
- 51 - 100
- 101 - 500
- 501 - 1000
- >1000

Data Source:SOUTHERN GROUP OF STATE FORESTERS
WILDFIRE RISK ASSESSMENT PORTAL

0 1.75 3.5 7 Miles

N

Biltmore Forest - Wildfire Events



Legend

- Municipal Boundary
- County Boundary

Acres Impacted

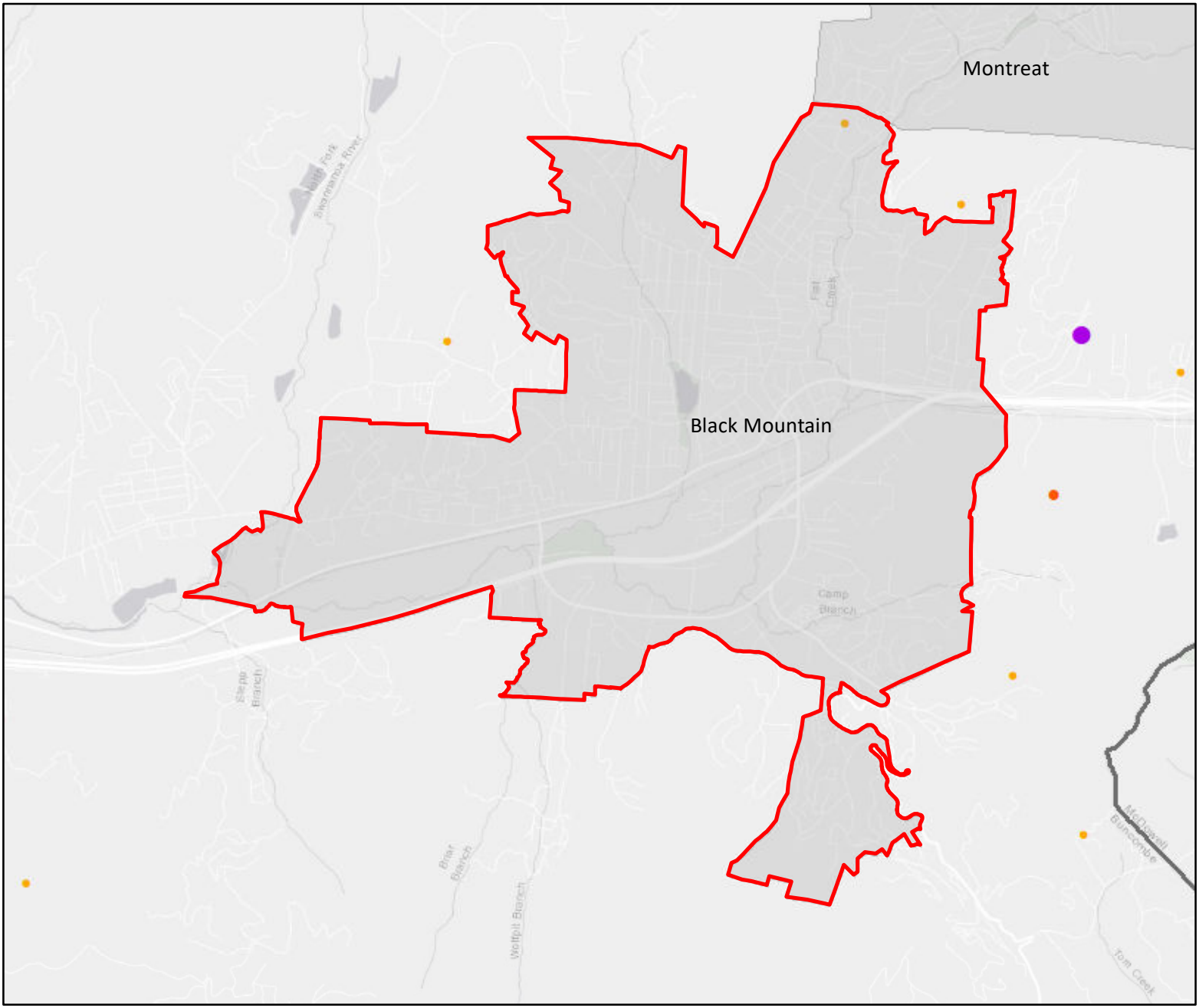
- 1 - 10
- 11 - 50
- 51 - 100
- 101 - 500
- 501 - 1000
- >1000

Data Source:SOUTHERN GROUP OF STATE FORESTERS
WILDFIRE RISK ASSESSMENT PORTAL

0 0.4 0.8 1.6 Miles

N

Black Mountain - Wildfire Events



Legend

- Municipal Boundary
- County Boundary

Acres Impacted

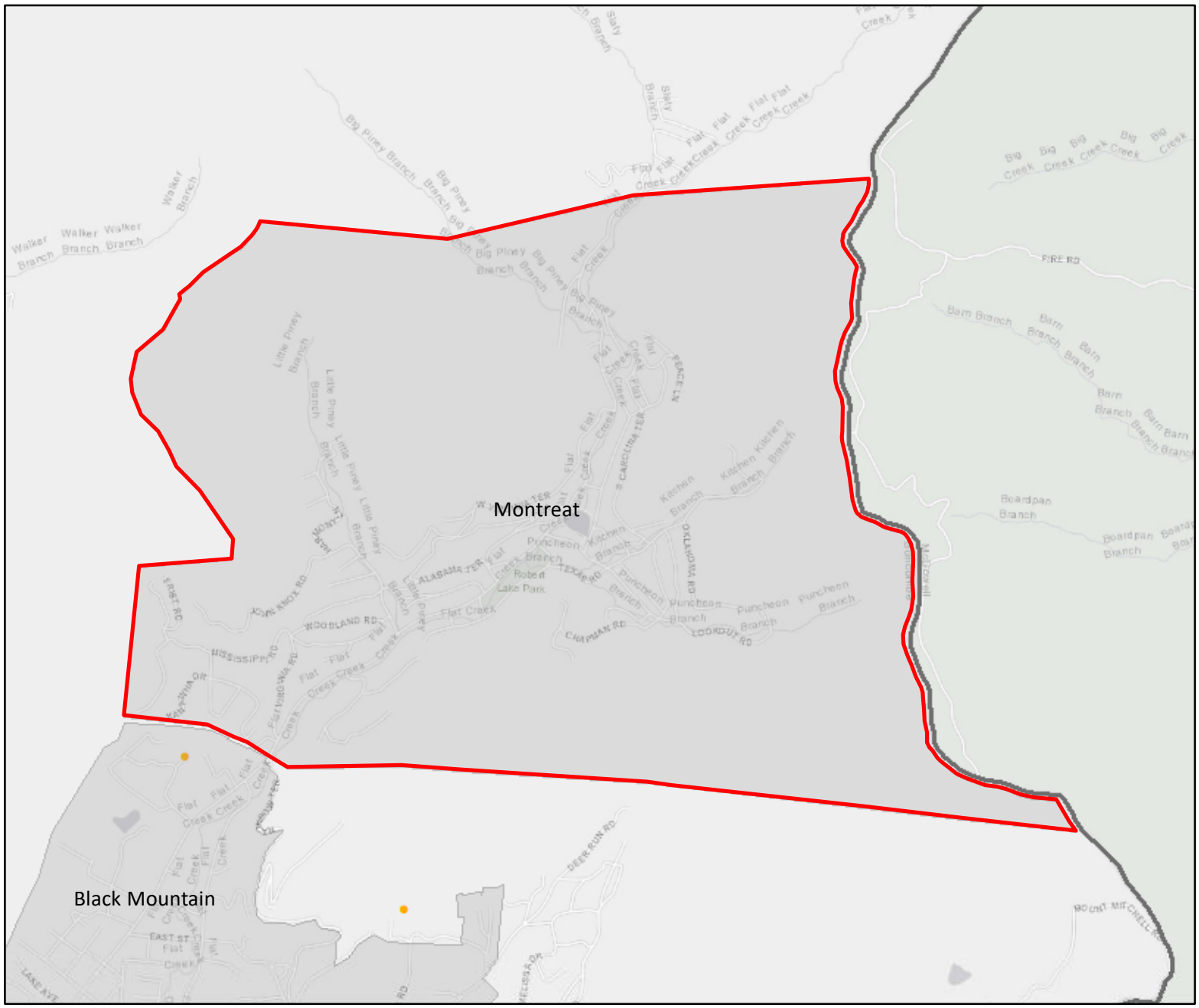
- 1 - 10
- 11 - 50
- 51 - 100
- 101 - 500
- 501 - 1000
- >1000

Data Source:SOUTHERN GROUP OF STATE FORESTERS
WILDFIRE RISK ASSESSMENT PORTAL

0 0.425 0.85 1.7 Miles

N

Montreat - Wildfire Events



Legend

- Municipal Boundary
- County Boundary

Acres Impacted

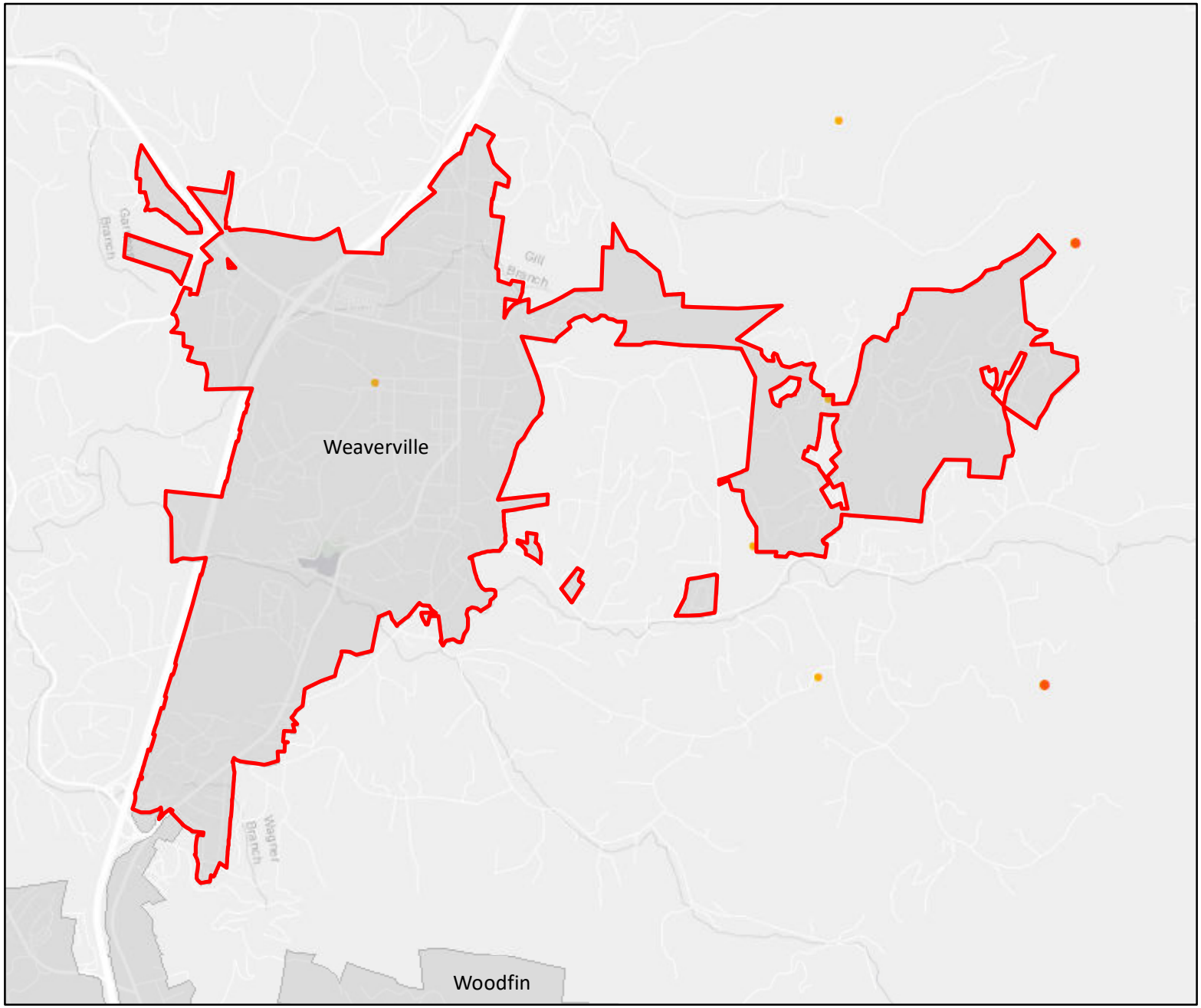
- 1 - 10
- 11 - 50
- 51 - 100
- 101 - 500
- 501 - 1000
- >1000

Data Source:SOUTHERN GROUP OF STATE FORESTERS
WILDFIRE RISK ASSESSMENT PORTAL

0 0.225 0.45 0.9 Miles

N

Weaverville - Wildfire Events



Legend

- Municipal Boundary
- County Boundary

Acres Impacted

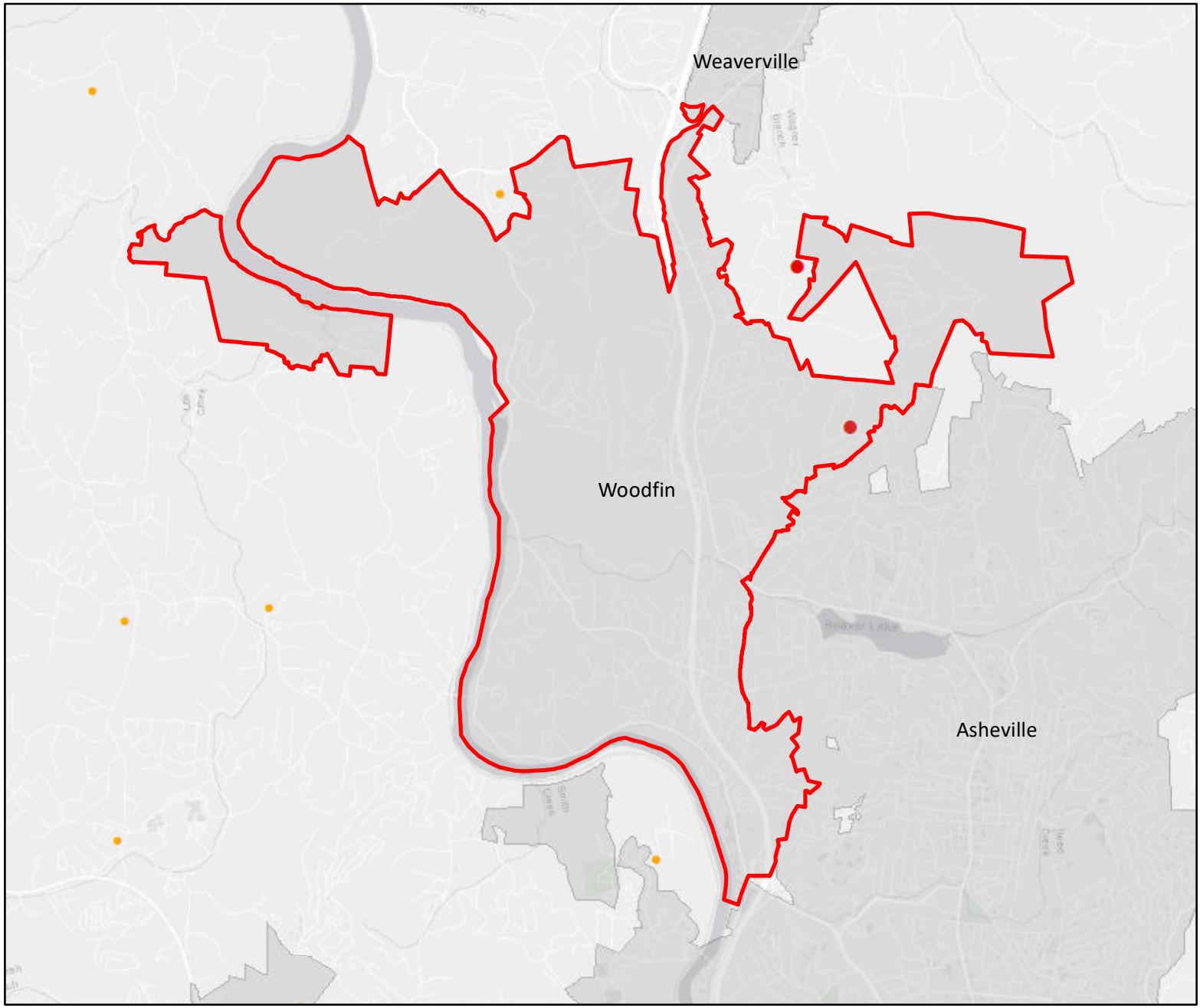
- 1 - 10
- 11 - 50
- 51 - 100
- 101 - 500
- 501 - 1000
- >1000

Data Source:SOUTHERN GROUP OF STATE FORESTERS
WILDFIRE RISK ASSESSMENT PORTAL

0 0.35 0.7 1.4 Miles

N

Woodfin - Wildfire Events



Legend

- Municipal Boundary
- County Boundary

Acres Impacted

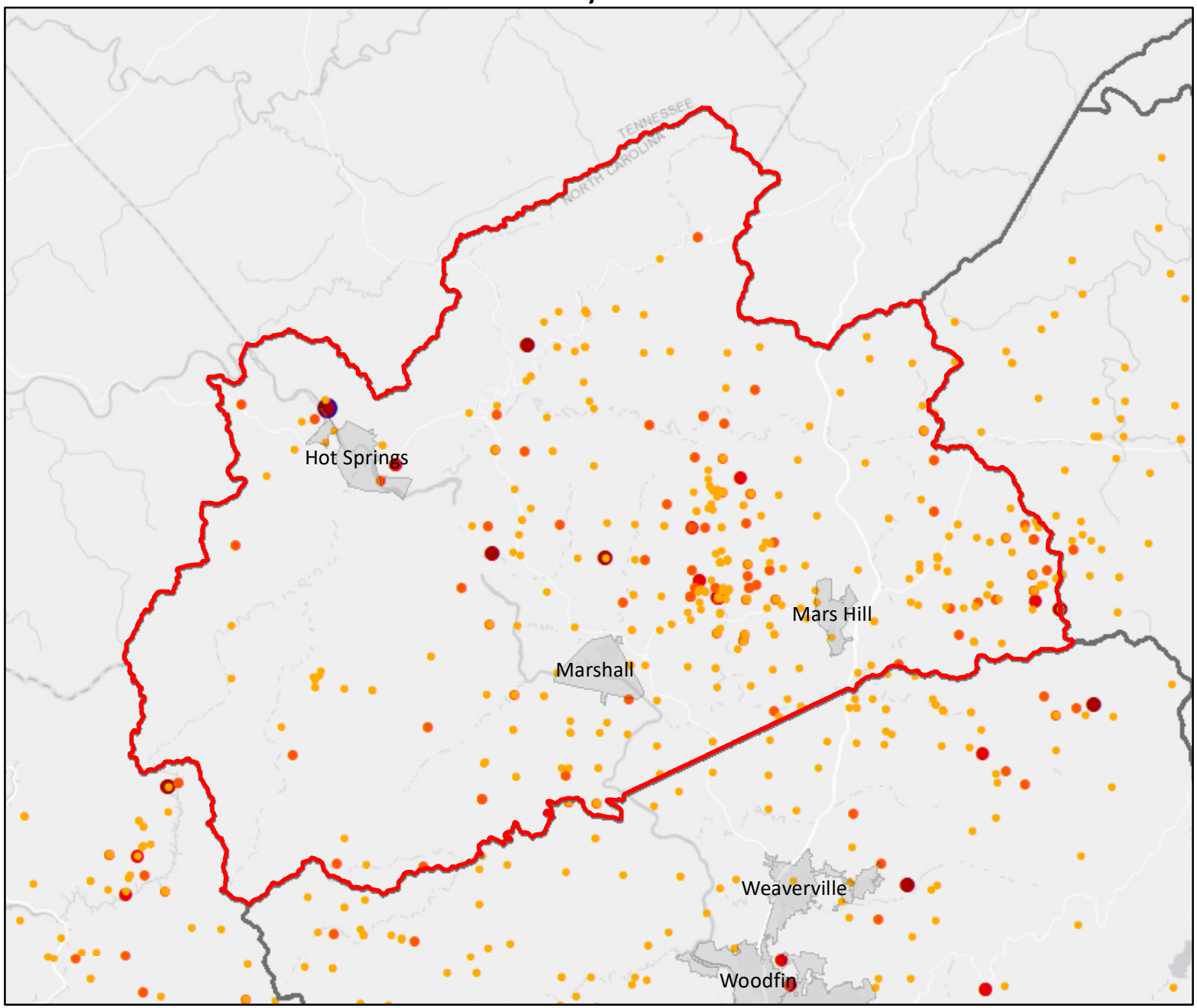
- 1 - 10
- 11 - 50
- 51 - 100
- 101 - 500
- 501 - 1000
- >1000

Data Source:SOUTHERN GROUP OF STATE FORESTERS
WILDFIRE RISK ASSESSMENT PORTAL

0 0.45 0.9 1.8 Miles

N

Madison County - Wildfire Events



Legend

- Municipal Boundary
- County Boundary

Acres Impacted

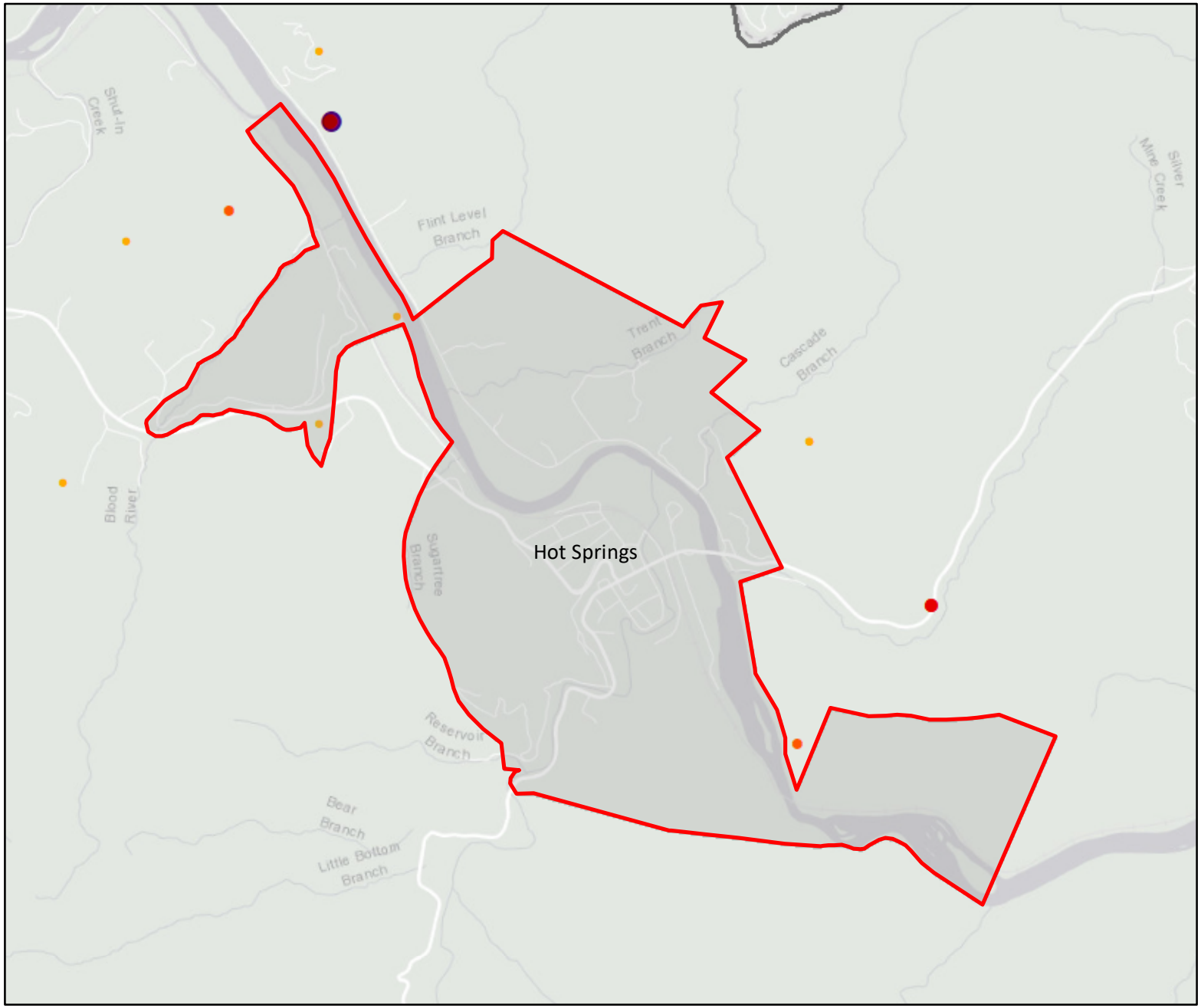
- 1 - 10
- 11 - 50
- 51 - 100
- 101 - 500
- 501 - 1000
- >1000

Data Source:SOUTHERN GROUP OF STATE FORESTERS
WILDFIRE RISK ASSESSMENT PORTAL

0 2.75 5.5 11 Miles

N

Hot Springs - Wildfire Events



Legend

- Municipal Boundary
- County Boundary

Acres Impacted

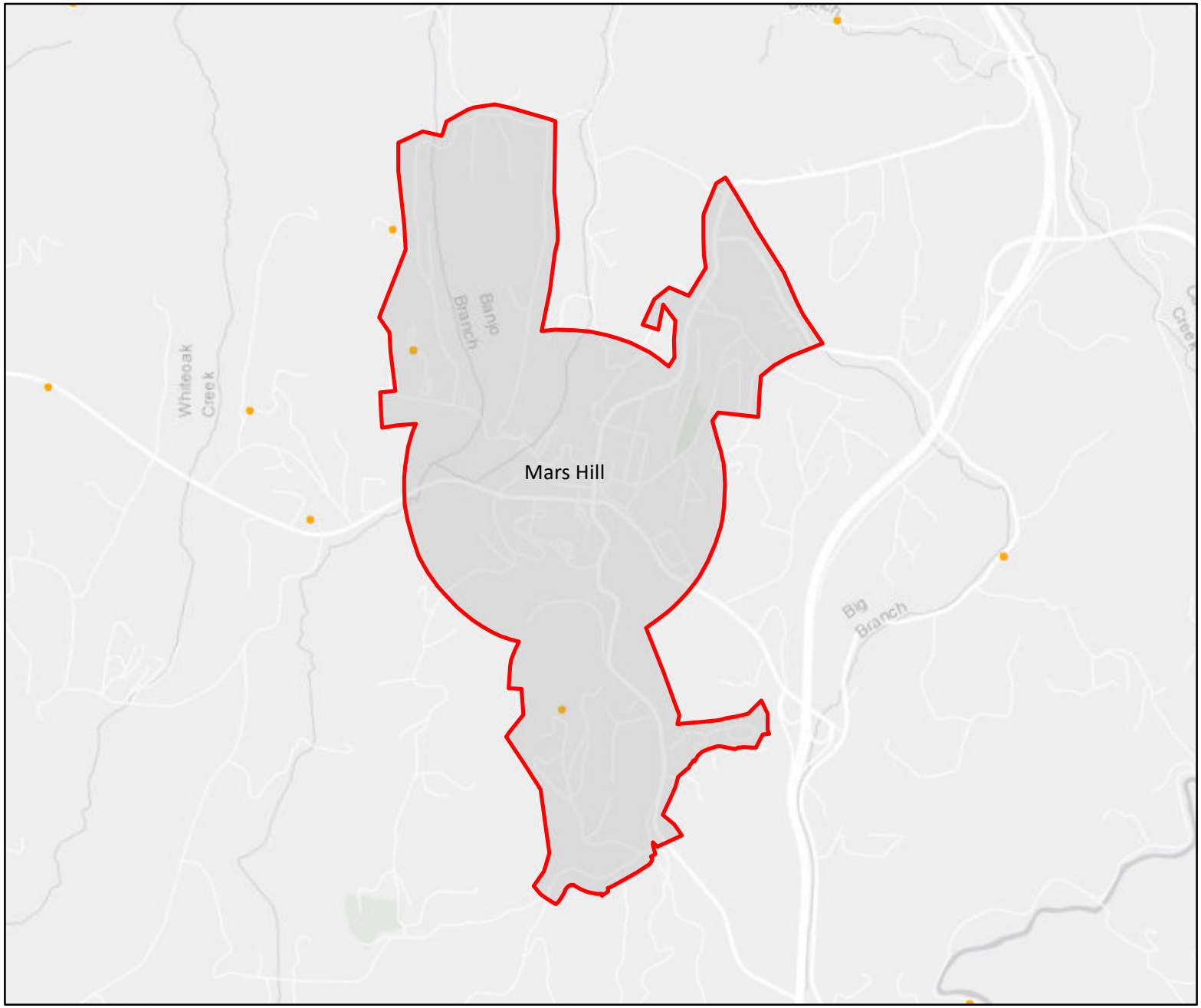
- 1 - 10
- 11 - 50
- 51 - 100
- 101 - 500
- 501 - 1000
- >1000

Data Source:SOUTHERN GROUP OF STATE FORESTERS WILDFIRE RISK ASSESSMENT PORTAL

0 0.325 0.65 1.3 Miles

N

Mars Hill - Wildfire Events



Legend

- Municipal Boundary
- County Boundary

Acres Impacted

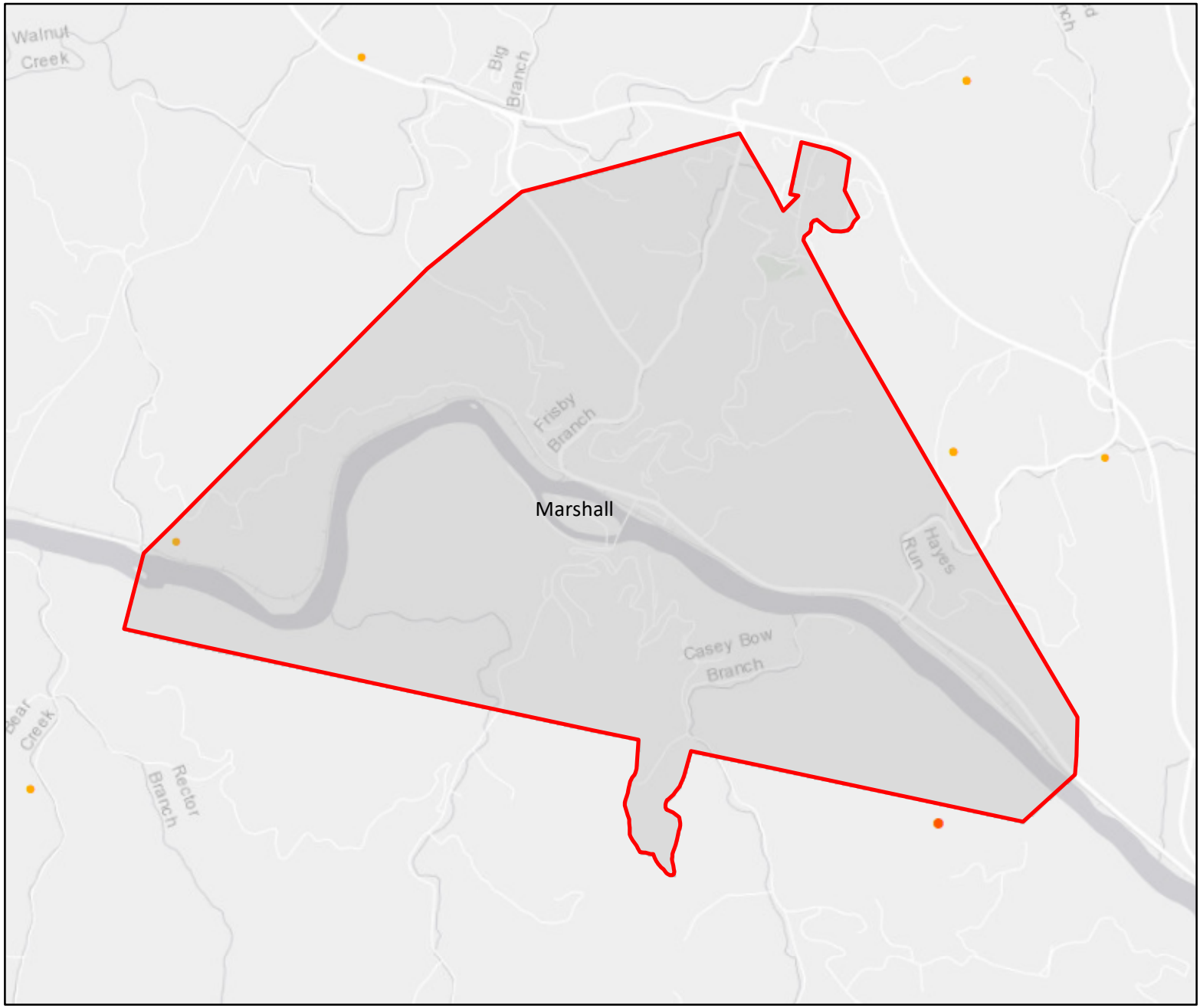
- 1 - 10
- 11 - 50
- 51 - 100
- 101 - 500
- 501 - 1000
- >1000

Data Source:SOUTHERN GROUP OF STATE FORESTERS WILDFIRE RISK ASSESSMENT PORTAL

0 0.275 0.55 1.1 Miles

N

Marshall - Wildfire Events



Legend

- Municipal Boundary
- County Boundary

Acres Impacted

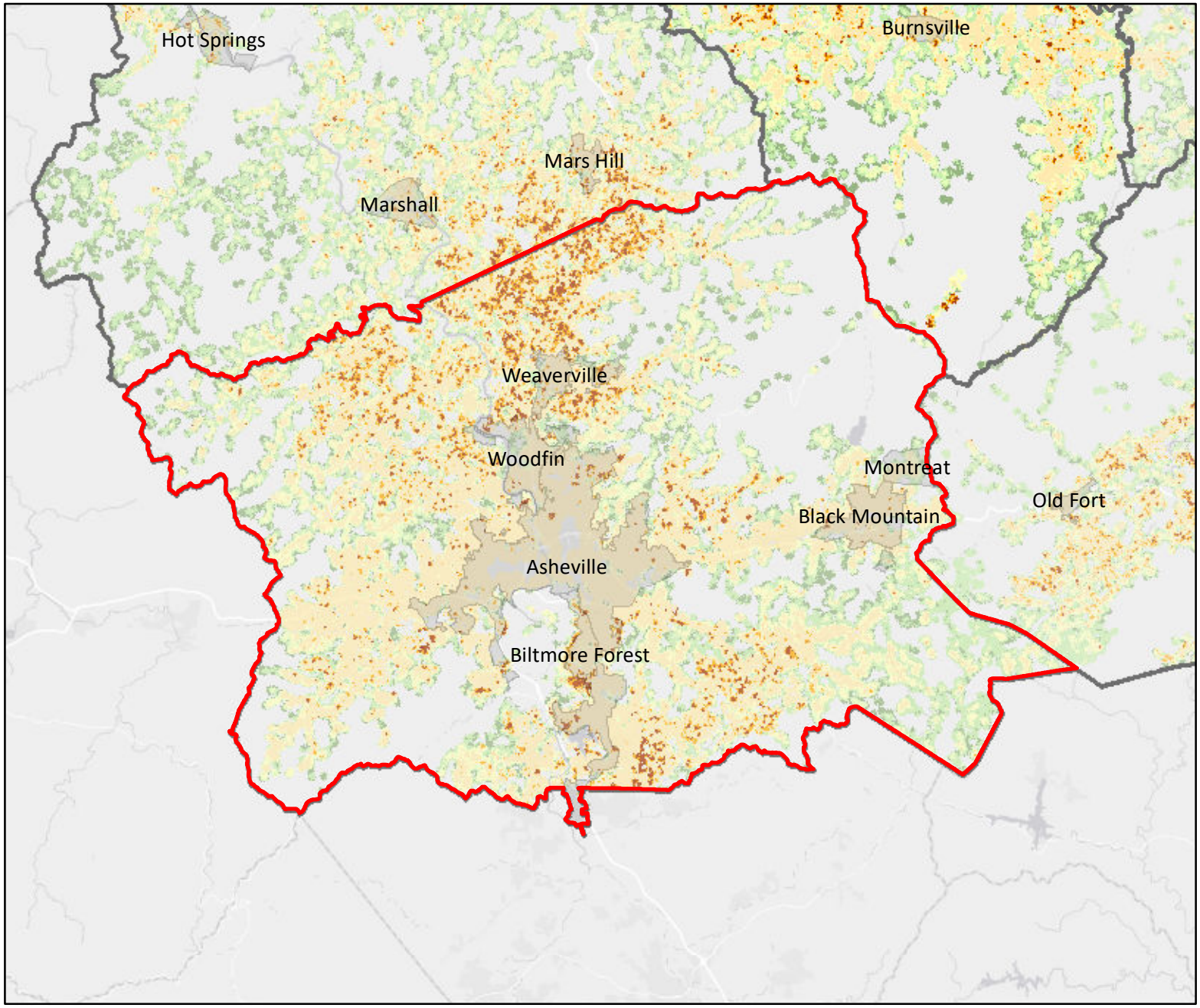
- 1 - 10
- 11 - 50
- 51 - 100
- 101 - 500
- 501 - 1000
- >1000

Data Source:SOUTHERN GROUP OF STATE FORESTERS WILDFIRE RISK ASSESSMENT PORTAL

0 0.275 0.55 1.1 Miles

N

Buncombe County - Wildland Urban Interface Risk Index



Legend

Municipal Boundary

County Boundary

WUI Risk Index

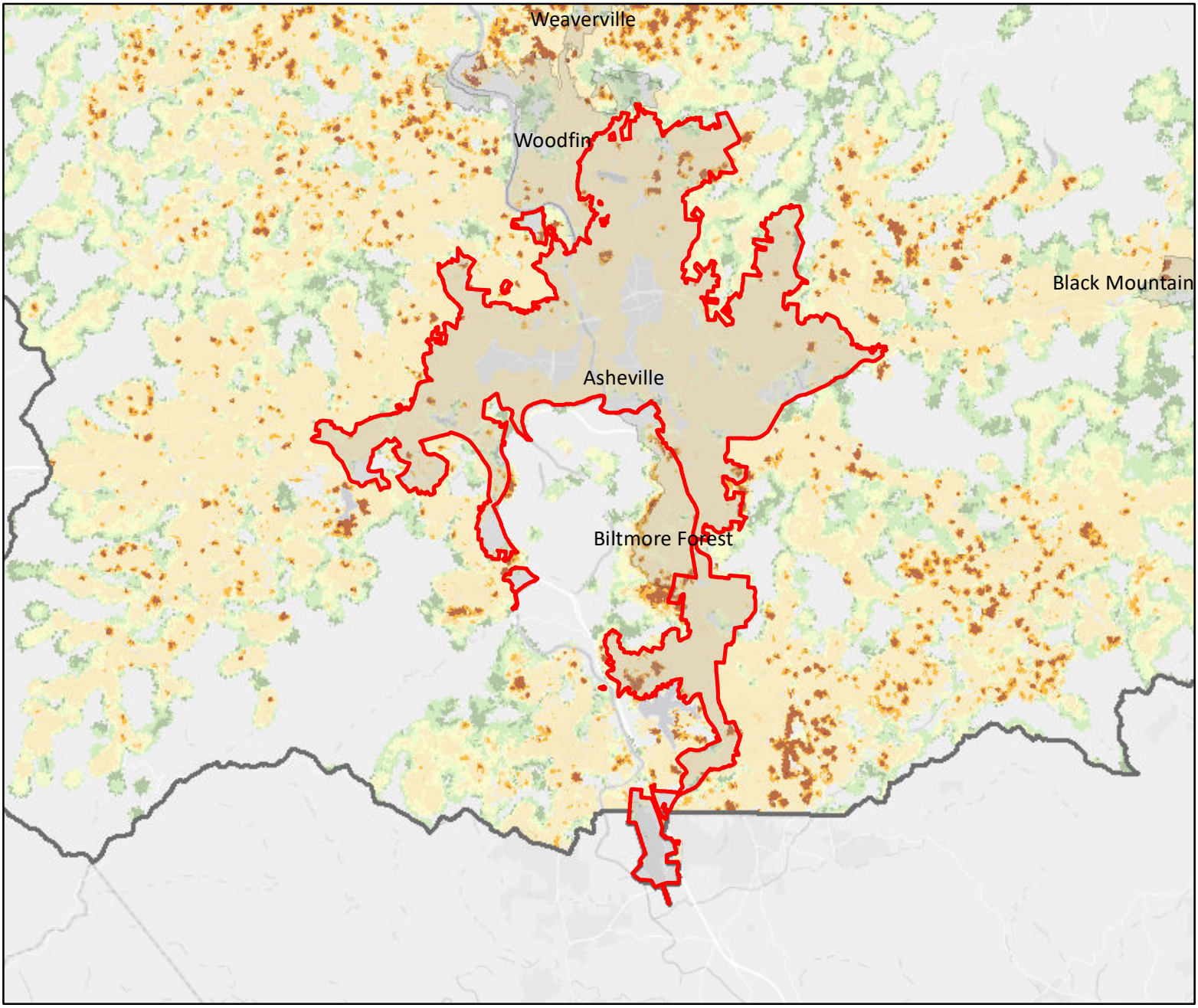
0 Low -3 -6 -9 High

Data Source:SOUTHERN GROUP OF STATE FORESTERS
WILDFIRE RISK ASSESSMENT PORTAL

0 3.75 7.5 15 Miles

N

Asheville - Wildland Urban Interface Risk Index



Legend

Municipal Boundary

County Boundary

WUI Risk Index

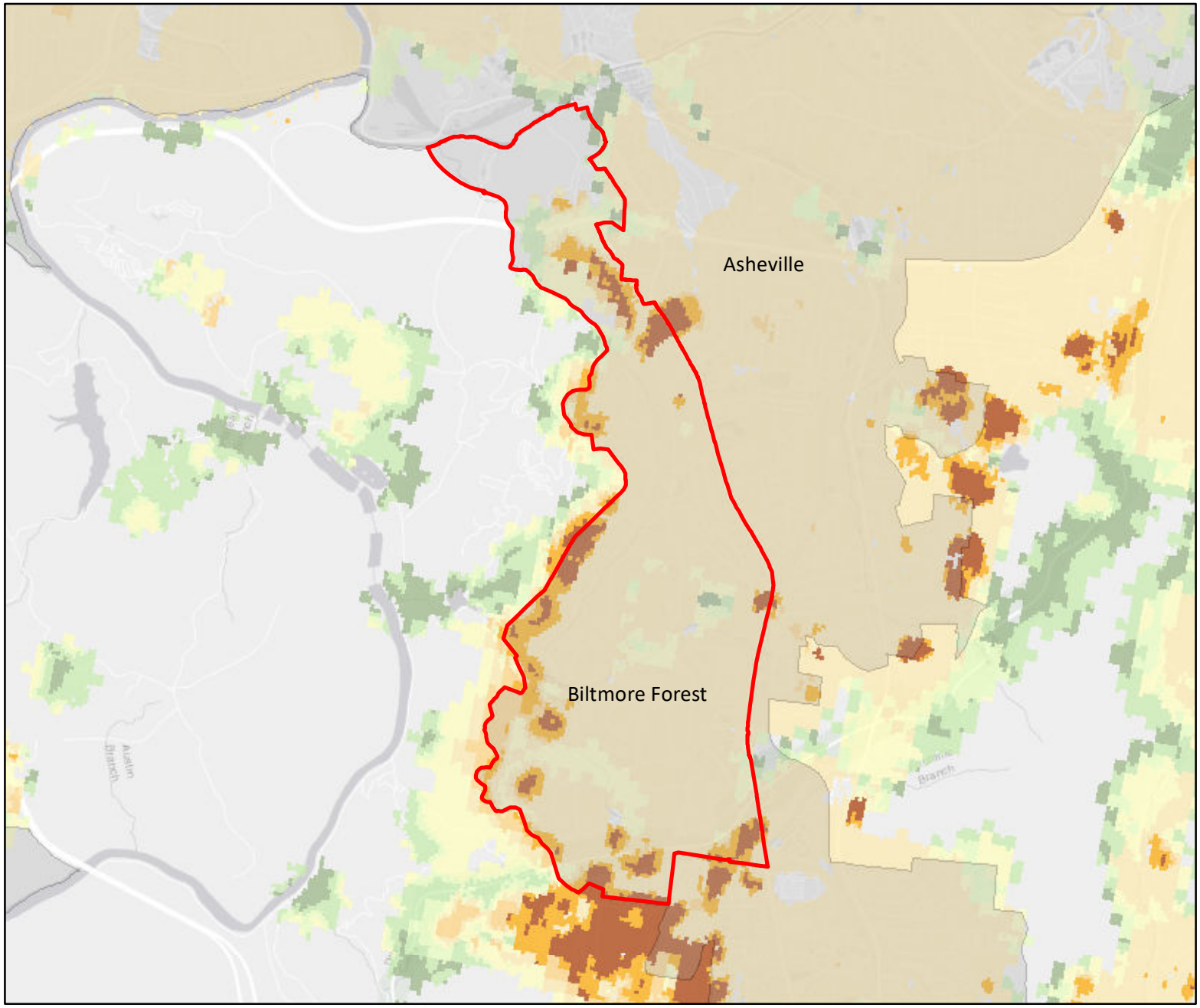
0 Low -3 -6 -9 High

Data Source:SOUTHERN GROUP OF STATE FORESTERS WILDFIRE RISK ASSESSMENT PORTAL

0 1.75 3.5 7 Miles

N

Biltmore Forest - Wildland Urban Interface Risk Index



Legend

Municipal Boundary

County Boundary

WUI Risk Index

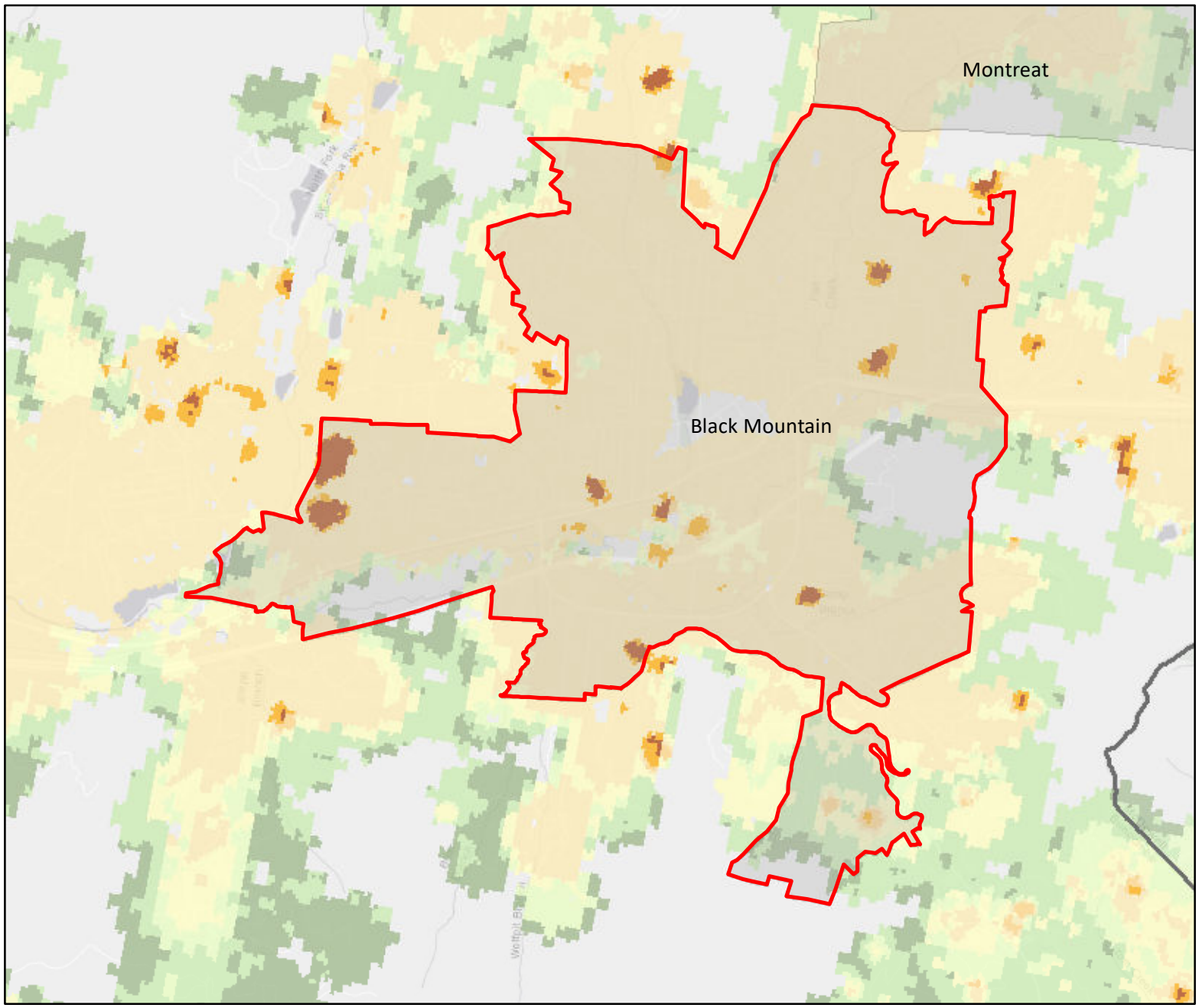
0 Low -3 -6 -9 High

Data Source:SOUTHERN GROUP OF STATE FORESTERS
WILDFIRE RISK ASSESSMENT PORTAL

0 0.4 0.8 1.6 Miles

N

Black Mountain - Wildland Urban Interface Risk Index



Legend

Municipal Boundary

County Boundary

WUI Risk Index

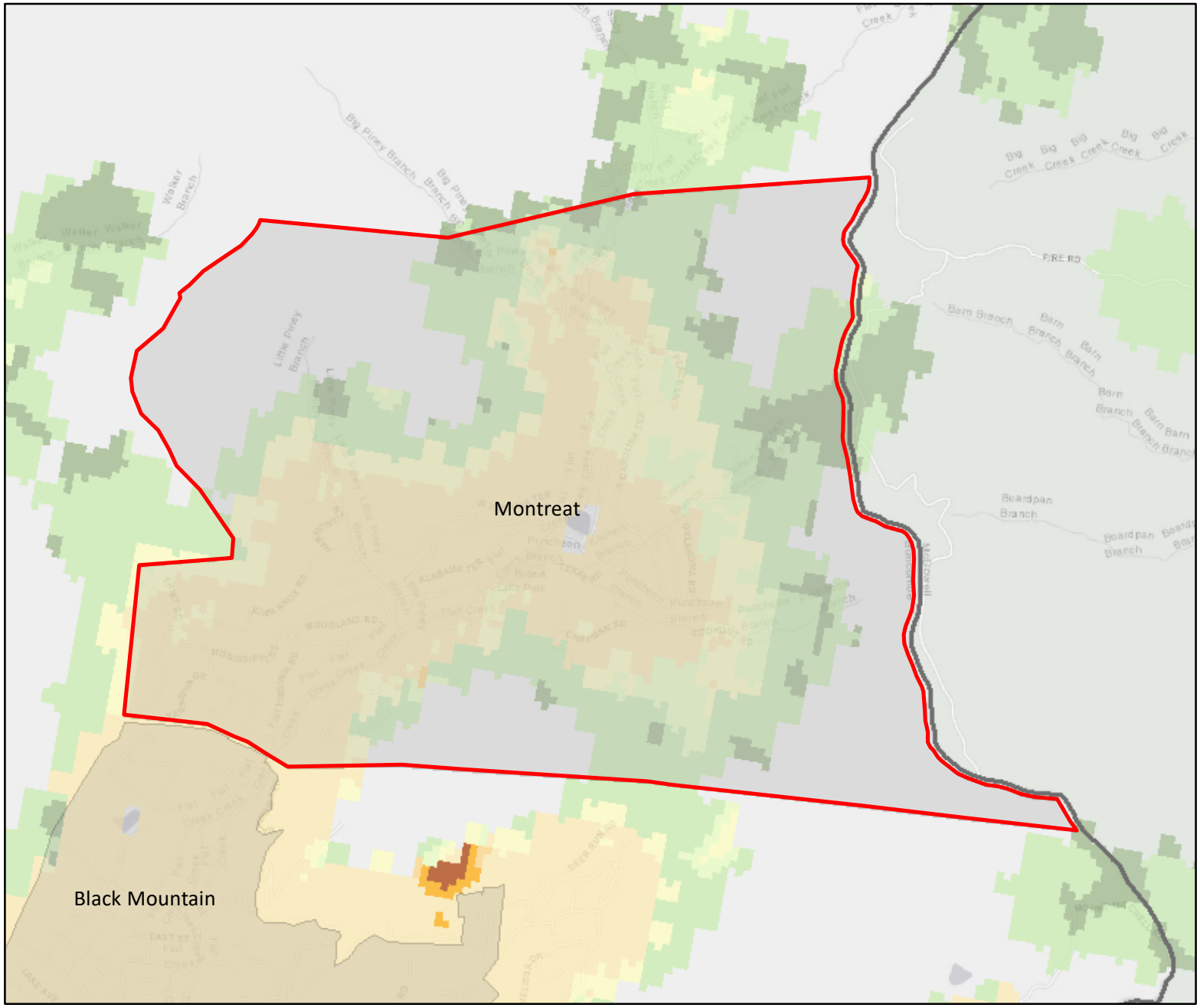
0 Low -3 -6 -9 High

Data Source:SOUTHERN GROUP OF STATE FORESTERS
WILDFIRE RISK ASSESSMENT PORTAL

0 0.425 0.85 1.7 Miles

N

Montreat - Wildland Urban Interface Risk Index



Legend

Municipal Boundary

County Boundary

WUI Risk Index

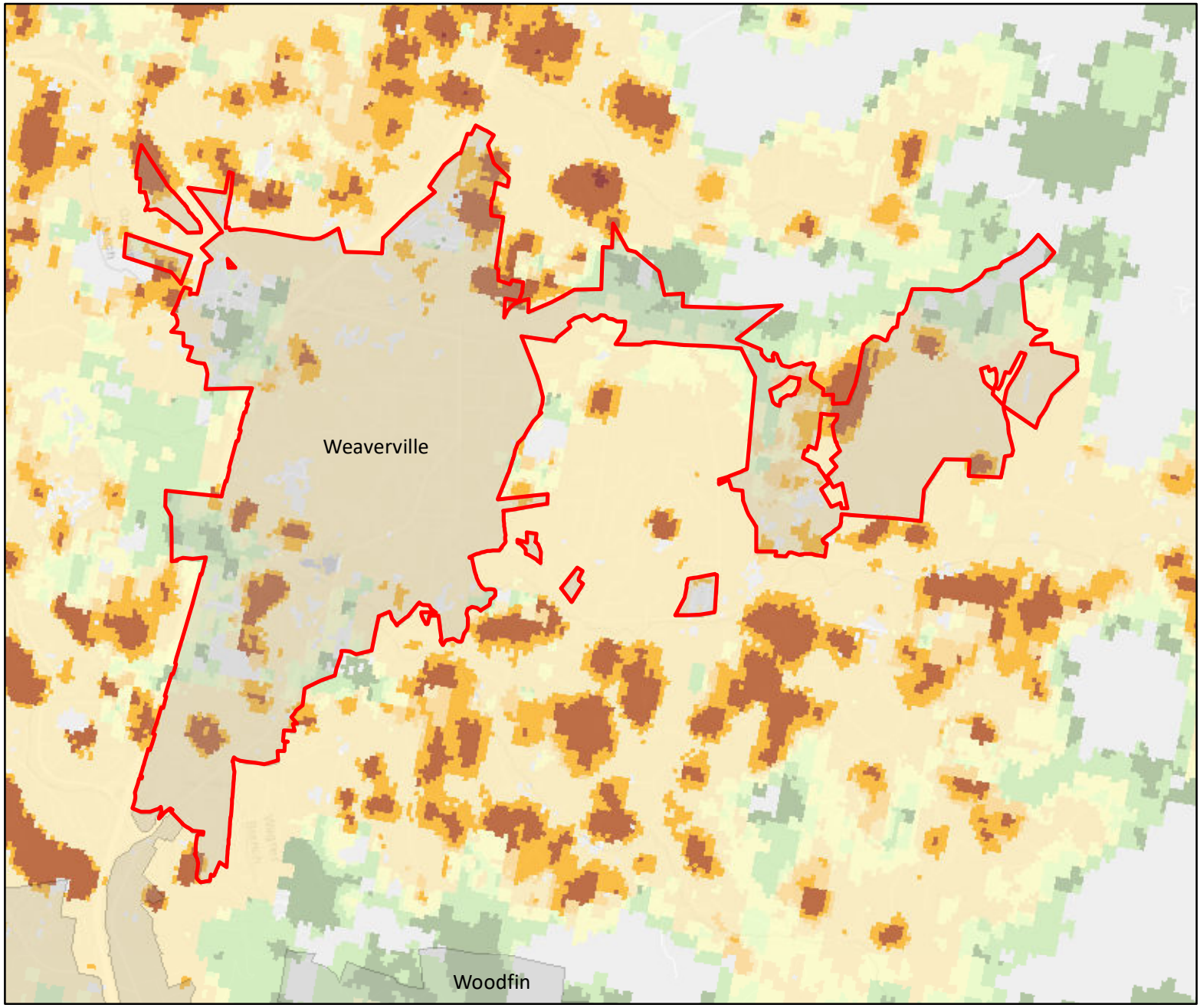
0 Low -3 -6 -9 High

Data Source:SOUTHERN GROUP OF STATE FORESTERS WILDFIRE RISK ASSESSMENT PORTAL

0 0.225 0.45 0.9 Miles

N

Weaverville - Wildland Urban Interface Risk Index



Legend

Municipal Boundary

County Boundary

WUI Risk Index

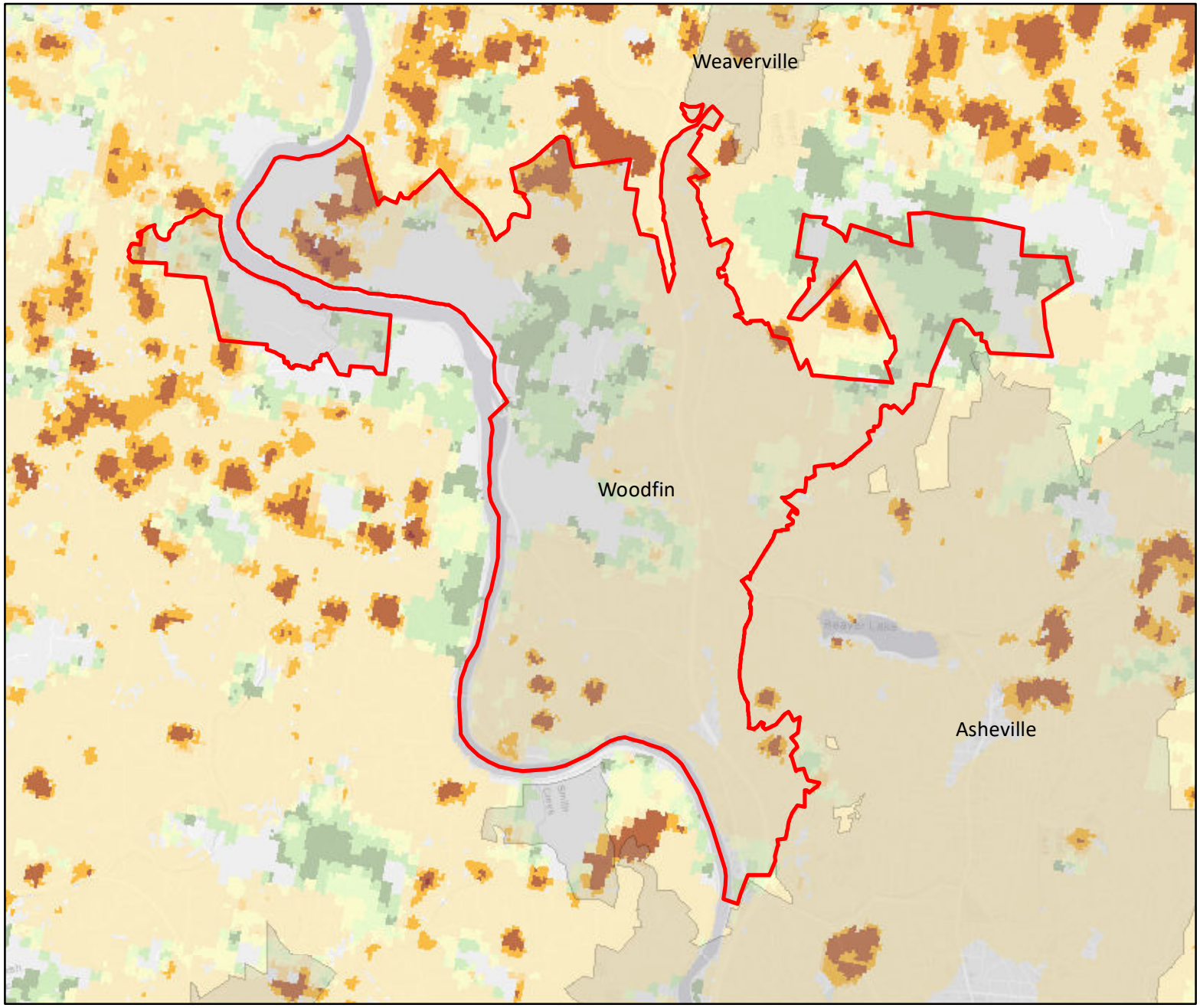
0 Low -3 -6 -9 High

Data Source:SOUTHERN GROUP OF STATE FORESTERS
WILDFIRE RISK ASSESSMENT PORTAL

0 0.35 0.7 1.4 Miles

N

Woodfin - Wildland Urban Interface Risk Index



Legend

Municipal Boundary

County Boundary

WUI Risk Index

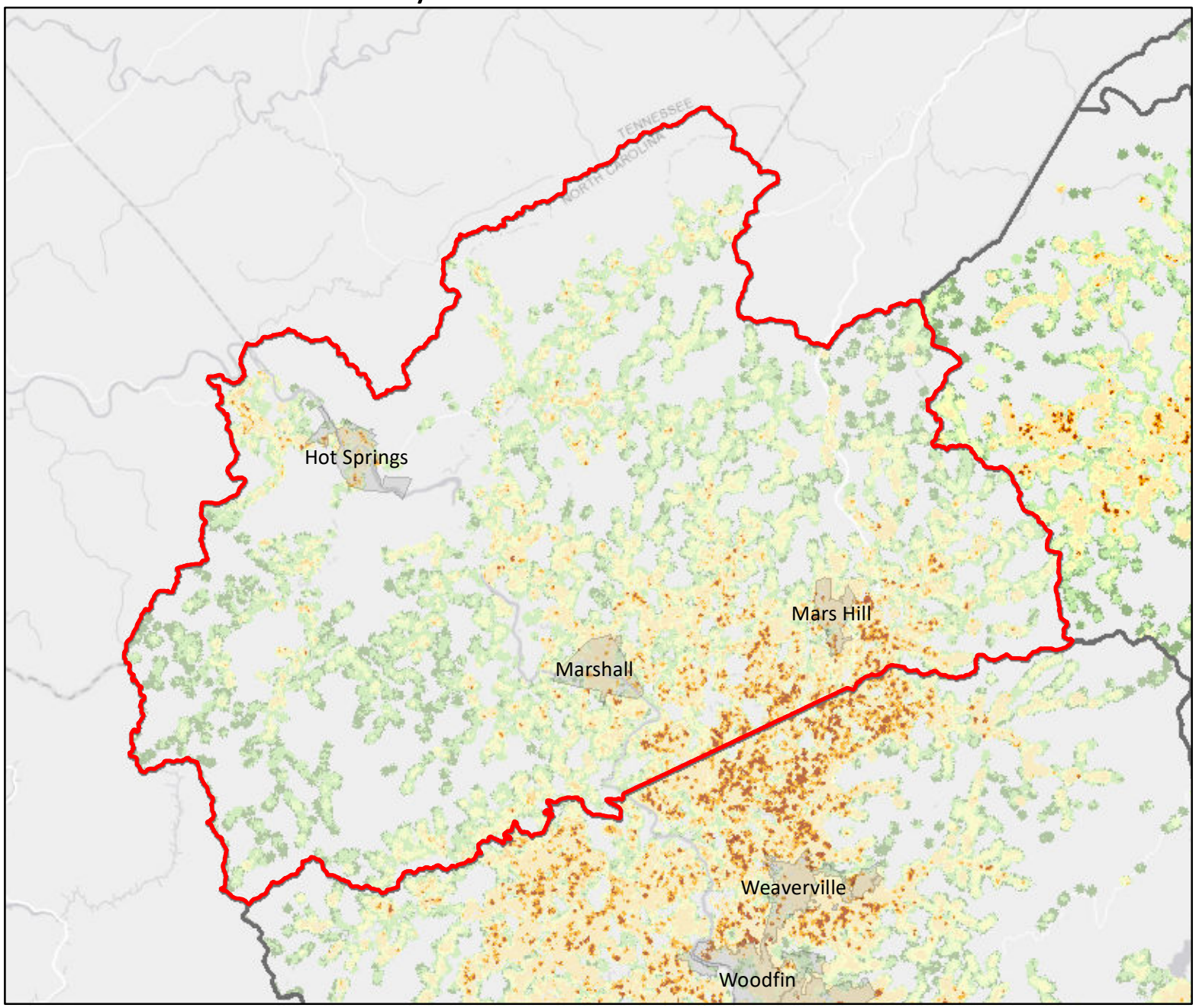
0 Low -3 -6 -9 High

Data Source:SOUTHERN GROUP OF STATE FORESTERS
WILDFIRE RISK ASSESSMENT PORTAL

0 0.45 0.9 1.8 Miles

N

Madison County - Wildland Urban Interface Risk Index



Legend

Municipal Boundary

County Boundary

WUI Risk Index

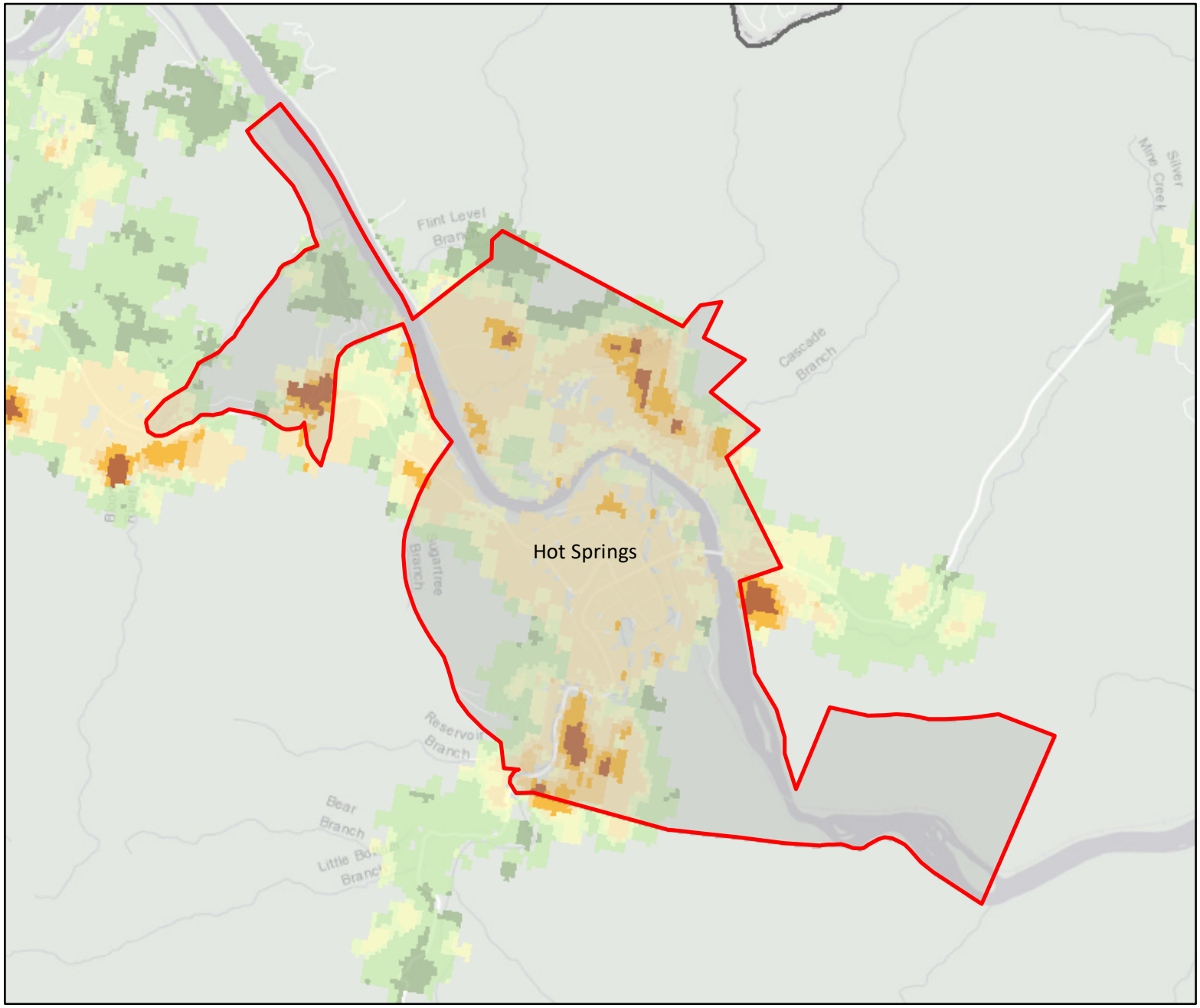
0 Low -3 -6 -9 High

Data Source:SOUTHERN GROUP OF STATE FORESTERS WILDFIRE RISK ASSESSMENT PORTAL

0 2.75 5.5 11 Miles

N

Hot Springs - Wildland Urban Interface Risk Index



Legend

Municipal Boundary

County Boundary

WUI Risk Index

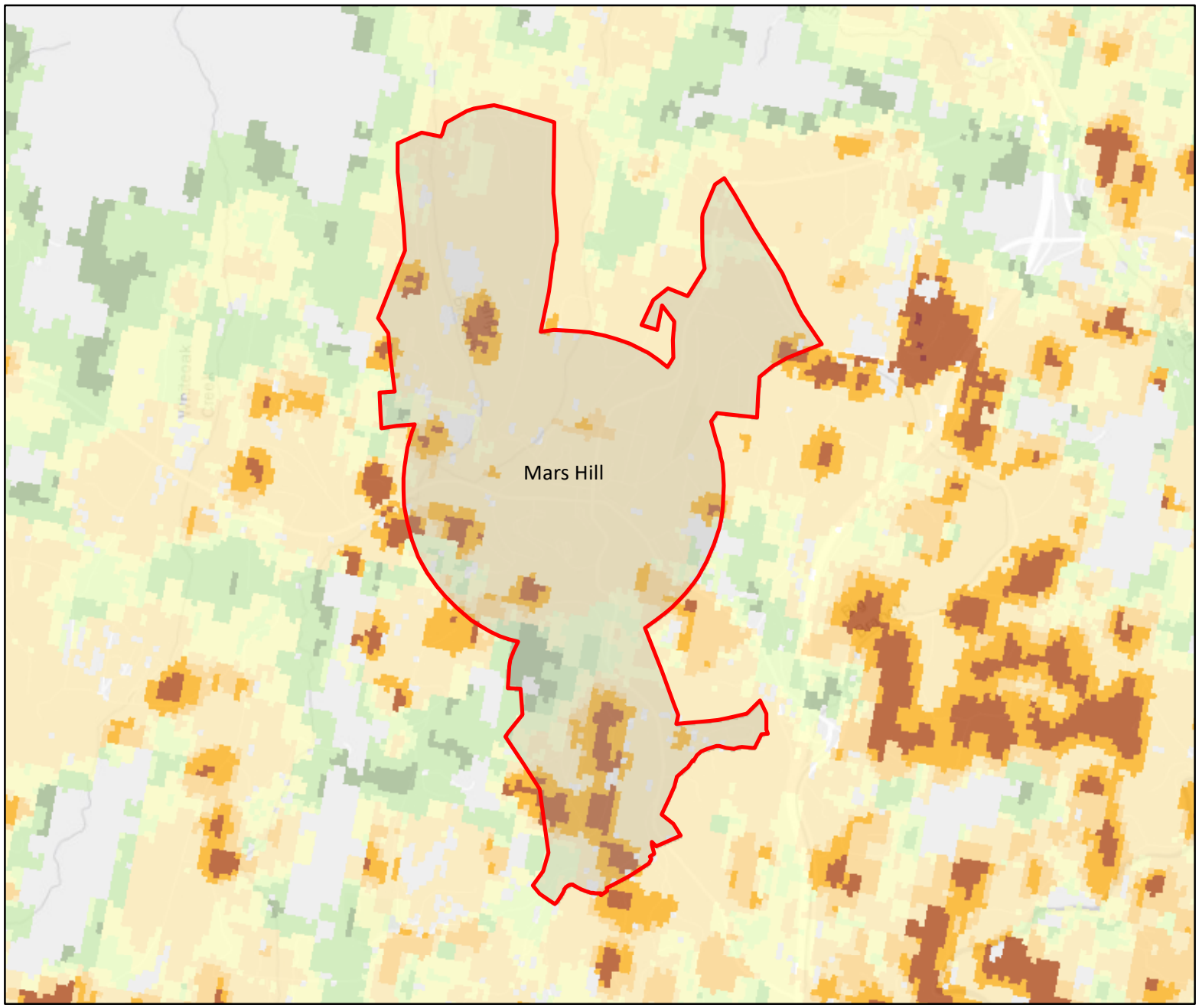
0 Low -3 -6 -9 High

Data Source:SOUTHERN GROUP OF STATE FORESTERS
WILDFIRE RISK ASSESSMENT PORTAL

0 0.325 0.65 1.3 Miles

N

Mars Hill - Wildland Urban Interface Risk Index



Legend

Municipal Boundary

County Boundary

WUI Risk Index

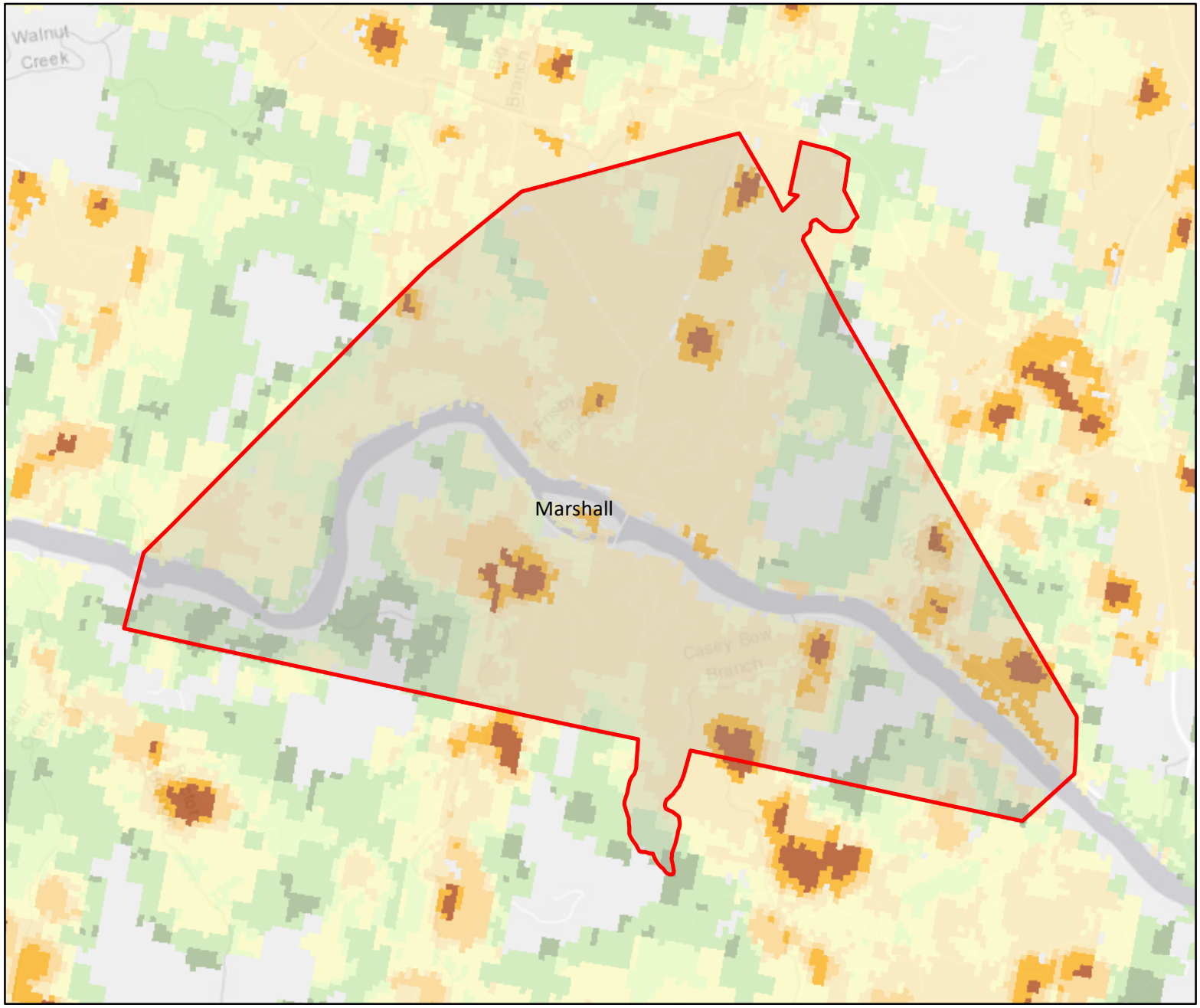
0 Low -3 -6 -9 High

Data Source:SOUTHERN GROUP OF STATE FORESTERS
WILDFIRE RISK ASSESSMENT PORTAL

0 0.275 0.55 1.1 Miles

N

Marshall - Wildland Urban Interface Risk Index



Legend

Municipal Boundary

County Boundary

WUI Risk Index

0 Low -3 -6 -9 High

Data Source:SOUTHERN GROUP OF STATE FORESTERS WILDFIRE RISK ASSESSMENT PORTAL

0 0.275 0.55 1.1 Miles

N

Appendix H:
NCEI Storm Event Data

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

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

TABLE H.1: DROUGHT EVENTS (2000-2019)

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

Date	Description
5/1/2001	Unprecedented drought conditions continued. Some rivers and lakes reached record-low levels. Well-drilling companies in the North Carolina piedmont were recording twice as much business as usual.
8/1/2001	The effects of the long-term drought became more severe, especially in the North Carolina piedmont. Critical water conditions were beginning to concern officials and residents of Charlotte.
11/1/2001	
12/1/2001	Very little active weather during December signaled that the drought was still present - and becoming critically important to more and more people. The Charlotte area recorded an all-time record dry calendar year with just 26.23 inches of rainfall during 2001. Records have been kept in the area since 1878. Many communities initiated either mandatory or voluntary water restrictions. At Kings Mountain, NC - a new pump was required at Lake Moss because the water level dropped below 2 of the 3 existing pumps. Record low ground water supplies, lake levels, and stream flows were reported across all of Western North Carolina.
8/1/2002	The water supply situation reached crisis levels in some communities, as the effects of the long term drought continued to plague western North Carolina. Particularly hard hit were several Piedmont communities along the Interstate 77 corridor. The city of Shelby was forced to buy water from surrounding communities and even from private companies and citizens. In Statesville, emergency construction of wells and a dam was necessary to prevent the city from running out of water, as the South Yadkin River reached historically low levels. Water levels on area lakes were as much as 10 feet below full pond. Most of the larger towns and cities along the I-77 corridor had imposed mandatory water restrictions by the end of the month, including the Charlotte metro area.
5/1/2007	The effects of an extended period of dry weather were exacerbated by an abnormally dry May, with many locations reporting one of the driest Mays in recorded history. By the end of May, many climatological stations were reporting yearly rainfall deficits as high as 10 inches. The result was severe to extreme drought conditions across much of western North Carolina by the end of the month. Water restrictions were implemented in some counties across extreme western North Carolina. The very dry conditions added to agriculture hardships caused by a hard freeze and widespread damaging winds in April.
6/1/2007	Despite an increase in thunderstorm activity, drought conditions persisted across much of western North Carolina. The persistent drought continued to cause hardships to agricultural interests that were still recuperating from the April freeze. Dollar values for the drought damage should be included in either the August or September Storm Data for this region.
8/1/2007	Severe to extreme drought conditions persisted across much of western North Carolina during August. By the end of the month, voluntary water restrictions continued in almost all North Carolina counties along and west of I-77. Stream flows and groundwater levels approached record low levels. Water levels on some reservoirs decreased by as much as 1 foot every 10 days. Agricultural interests continued to be especially hard hit, and the North Carolina governor requested federal disaster aid by the end of the month. Dollar values for the drought should be included in either the September or October Storm Data for this region.
9/1/2007	Extreme drought conditions persisted across western North Carolina through September, as the region experienced another month of well-below normal precipitation. By the end of the month, most locations were running a yearly rainfall deficit of 11-17 inches. Stream flows and groundwater levels were near record low levels, with many streams running at 5 percent or less of normal flow. Water levels on area reservoirs were some of the lowest in recorded history. Agricultural interests continued to be especially hard hit. Farmers continued to struggle to feed livestock due to a lack of hay and poor pasture conditions, forcing many cattle to be sold or slaughtered. Agricultural and other losses attributed to the drought are estimated to be in the hundreds of millions of dollars. County-based losses for the growing season will be included in next month's Storm Data.
10/1/2007	Unusually dry weather continued across western North Carolina through October. Although a soaking rain near the end of the month resulted in near-normal monthly precipitation for the mountains, the piedmont saw another month of well-below normal rainfall. Most areas were on pace to break yearly rainfall deficit records. By the end of the month, exceptional drought conditions were reported across the majority of the area. Water flow on area streams continued at 3 to 6 percent of normal, while lake levels remained at near-

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

Date	Description
	to exceptional drought conditions across the North Carolina mountains and foothills. Voluntary water restrictions remained widespread during the month. A few communities held onto mandatory restrictions early in the month, but many of these were lifted by the end of the month. Well water remained near record low levels in many areas, while lake levels persisted well below normal stages. Rainfall from Fay resulted in some improvement in streamflows, although most rivers and major streams remained at less than 25 percent of normal, with many still running at less than 10 percent of normal. By the end of the month, government officials had requested a federal disaster declaration for most of the counties in the area, due to crop damages.
10/1/2008	Another abnormally dry month resulted in a persistence of severe to exceptional drought conditions over much of the mountains and foothills of North Carolina. Some slight improvement was observed in well water levels, but they remained near record lows. Most rivers and major streams continued to flow at less than 10 percent of normal. Voluntary water restrictions continued in most areas, with a few areas continuing to institute mandatory restrictions. Meanwhile, severe crop losses resulted in a federal disaster declaration for much of the larger agricultural communities across the area.
11/1/2008	Another month of below normal rainfall resulted in a persistence of severe to exceptional drought conditions over much of western North Carolina through November. In fact, drought conditions actually worsened in some areas, with portions of the central North Carolina mountains deteriorating to exceptional drought conditions late in the month. Slight improvements in well water levels continued across the area. Most rivers and major streams continued to flow at less than 10 percent of normal. Voluntary water restrictions continued in most areas, with a few areas continuing to institute mandatory restrictions.
11/1/2016	Abnormally dry weather that began early in 2016 and continued through the spring, summer, and early fall resulted in establishment of extreme to exceptional drought conditions across the across the southern and central mountains and southern foothills of North Carolina by November. Total rainfall deficits for the period from July until the end of November were as much as 18 inches below normal, while annual rainfall deficits were two feet or more below normal. The drought conditions worsened farther to the southwest across the state. Drought conditions were exacerbated by an unusually warm late summer and early fall, when it is not unusual to see temperatures 10 to 15 degrees above normal. Stream flows and reservoir levels were well below normal across the area, while the very dry vegetation resulted in volatile wildfire conditions. A strong cold front brought much needed rainfall to the area during the last couple of days of the month, spelling the start of a wetter period that brought an end to the more extreme drought conditions.
Madison County	
7/1/1998	Dry weather continued through much of the month of July, affecting crops during the critical part of the growing season. Corn and other vegetables sustained the most damage, but a dollar amount was not available at the time of this writing.
10/1/1998	The drought which began during the summer continued through October. The only significant rainfall during the month occurred on the 7-8th. Cities and counties began to restrict water usage and streamflows for several mountain locations were reduced to the lowest seen in 50 years.
11/1/1998	Dry weather persisted into the late fall with rainfall deficits between 5 and 10 inches. This affected late season crops and caused water shortages. Water usage restrictions were initiated in many communities.
8/1/1999	The drought worsened during the month of August as high evaporation rates and little rainfall occurred. The most severe conditions by the end of the month had developed in the foothills and piedmont. Water restrictions began in several communities, and for some, the first time in memory. Hay and late crops dried up in many counties. Ponds and wells began to dry up as well, affecting homeowners, farmers, and businesses such as nurseries. In addition, boaters were running aground on recreational lakes due to low water levels.
9/1/1999	Rainfall continued to be scarce across much of western North Carolina through the month of September, prolonging the drought conditions which existed all summer. However, some areas in the piedmont picked up some rain from the remnants of Hurricane Dennis early in the month and from Hurricane Floyd itself

Date	Description
	two weeks later. Although this rain brought some relief, more wells ran dry and many more areas began mandatory water restrictions.
10/1/1999	The return of some rainfall as well as lower evaporation rates due to the change of seasons, resulted in the drought easing somewhat. Drought classifications were lowered in some cases, and some places lifted water restrictions. However, the drought had not ended by the end of the month.
8/1/2000	The 2 year drought was reaching a critical stage by late summer. Many 80 to 100 foot wells were going dry. Area lakes were at record low levels causing property damage to docks, boats, etc.
9/1/2000	Overall, drought conditions continued across western North Carolina despite some locations receiving near their month's average rainfall. Low stream flow and municipal water supply remained the largest issues with many towns and cities enacting water restrictions. Citizens were quoted as saying this is the driest they have ever seen it. Despite the drought conditions, impact on crops seemed to be minimal.
10/1/2000	Effects of the drought intensified as many areas received absolutely no rain during the month, setting records for the longest stretch without measurable rainfall in several locations. Wells and mountain streams continued to dry up and lake levels continued to drop. Many communities were forced to start more stringent water conservation measures.
11/1/2000	The long-term drought continued to affect the region. Rainfall during the month was near or slightly above normal, but this had little effect on the ground water levels. Numerous wells dried up during the fall, and well borers and drillers could not keep up with the demand. Large lakes reported record low levels and some communities continued or initiated water control measures.
2/1/2001	The long term drought's impact became more severe, even during the winter, as water levels in lakes dropped and stream flow on rivers reached the lowest in memory. More and more communities began water restrictions and started preparing for a busy fire weather season.
3/1/2001	Despite beneficial rain during March, the drought continued to grip most of the area. Severe water restrictions were implemented in parts of the North Carolina piedmont, where reservoir had dropped to all-time low levels. In Concord, food establishments were asked to use paper and plastic products to conserve water.
4/1/2001	Some relief to the long-term drought occurred at mid-month, but for the most part, the rainfall deficit for the three-year period actually grew larger by the end of April. Mandatory water restrictions continued at a few mountain locations, with voluntary water restrictions urged at many others. Numerous wells went dry during April.
5/1/2001	Unprecedented drought conditions continued. Some rivers and lakes reached record-low levels. Well-drilling companies in the North Carolina piedmont were recording twice as much business as usual.
11/1/2001	
12/1/2001	Very little active weather during December signaled that the drought was still present - and becoming critically important to more and more people. The Charlotte area recorded an all-time record dry calendar year with just 26.23 inches of rainfall during 2001. Records have been kept in the area since 1878. Many communities initiated either mandatory or voluntary water restrictions. At Kings Mountain, NC - a new pump was required at Lake Moss because the water level dropped below 2 of the 3 existing pumps. Record low ground water supplies, lake levels, and stream flows were reported across all of Western North Carolina.
8/1/2002	The water supply situation reached crisis levels in some communities, as the effects of the long term drought continued to plague western North Carolina. Particularly hard hit were several Piedmont communities along the Interstate 77 corridor. The city of Shelby was forced to buy water from surrounding communities and even from private companies and citizens. In Statesville, emergency construction of wells and a dam was necessary to prevent the city from running out of water, as the South Yadkin River reached historically low levels. Water levels on area lakes were as much as 10 feet below full pond. Most of the larger towns and cities along the I-77 corridor had imposed mandatory water restrictions by the end of the month, including the Charlotte metro area.
5/1/2007	The effects of an extended period of dry weather were exacerbated by an abnormally dry May, with many locations reporting one of the driest Mays in recorded history. By the end of May, many climatological

Date	Description
	stations were reporting yearly rainfall deficits as high as 10 inches. The result was severe to extreme drought conditions across much of western North Carolina by the end of the month. Water restrictions were implemented in some counties across extreme western North Carolina. The very dry conditions added to agriculture hardships caused by a hard freeze and widespread damaging winds in April.
6/1/2007	Despite an increase in thunderstorm activity, drought conditions persisted across much of western North Carolina. The persistent drought continued to cause hardships to agricultural interests that were still recuperating from the April freeze. Dollar values for the drought damage should be included in either the August or September Storm Data for this region.
7/1/2007	Drought conditions persisted across much of western North Carolina during July. By the end of July, voluntary water restrictions were instituted in almost all North Carolina counties along and west of I-77. Some mandatory restrictions were introduced in Union County, NC. Agricultural interests continued to be especially hard hit. The absence of rain negatively affected the hay crop, creating concern for the loss of livestock. Dollar values for the drought damage should be included in either the August or September Storm Data for this region.
8/1/2007	Severe to extreme drought conditions persisted across much of western North Carolina during August. By the end of the month, voluntary water restrictions continued in almost all North Carolina counties along and west of I-77. Stream flows and groundwater levels approached record low levels. Water levels on some reservoirs decreased by as much as 1 foot every 10 days. Agricultural interests continued to be especially hard hit, and the North Carolina governor requested federal disaster aid by the end of the month. Dollar values for the drought should be included in either the September or October Storm Data for this region.
9/1/2007	Extreme drought conditions persisted across western North Carolina through September, as the region experienced another month of well-below normal precipitation. By the end of the month, most locations were running a yearly rainfall deficit of 11-17 inches. Stream flows and groundwater levels were near record low levels, with many streams running at 5 percent or less of normal flow. Water levels on area reservoirs were some of the lowest in recorded history. Agricultural interests continued to be especially hard hit. Farmers continued to struggle to feed livestock due to a lack of hay and poor pasture conditions, forcing many cattle to be sold or slaughtered. Agricultural and other losses attributed to the drought are estimated to be in the hundreds of millions of dollars. County-based losses for the growing season will be included in next month's Storm Data.
10/1/2007	Unusually dry weather continued across western North Carolina through October. Although a soaking rain near the end of the month resulted in near-normal monthly precipitation for the mountains, the piedmont saw another month of well-below normal rainfall. Most areas were on pace to break yearly rainfall deficit records. By the end of the month, exceptional drought conditions were reported across the majority of the area. Water flow on area streams continued at 3 to 6 percent of normal, while lake levels remained at near-record lows. Although most cities and towns were requesting voluntary water restrictions be observed, mandatory restrictions were ordered in quite a few communities. In some areas, the water situation was becoming dire, with Monroe, NC officials reporting that water supplies would be exhausted by early 2008 if significant rain did not occur. Also, private wells were beginning to dry up in many areas. Agriculture continued to be severely impacted by the drought. As of this writing, county by county dollar estimates of drought damage have not been made available.
11/1/2007	November provided no relief from the effects of the long term drought. In fact, another month of well-below normal rainfall made an already dire situation even worse. Many locations remained on pace to set annual records for rainfall deficit. By the end of the month, the vast majority of the region was experiencing exceptional drought conditions. Streamflow on area rivers remained extremely low, generally less than 10 percent of normal. Meanwhile, lakes continued to gradually fall toward record low levels.
12/1/2007	The latter half of December saw a transition to a wetter pattern across the southeast. Most observing stations in western North Carolina|reported above normal monthly rainfall for the first time since January 2007. However, this was not enough to put much of a dent in the long-term drought as extreme to exceptional drought conditions persisted into the New Year. Although the increase in rainfall did allow for some recharge of area streams, many were still running at less than 25 percent of normal flow at the end of the month.

Date	Description
1/1/2008	January saw a return to dry weather across western North Carolina.|Most observing stations across the region reported a rainfall deficit of 1 to 2 inches during the month, resulting in another month of exceptional drought conditions across most of the area. Water levels on area lakes remained within a foot or two of record low stages. However, rivers and streams remained somewhat recharged from the December rains, with streamflow on most waterways running 25 to 75 percent of normal.
6/1/2008	Although near normal rainfall was observed across much of the area during the late winter and early spring, another period of abnormally dry weather in May and June exacerbated severe to extreme drought conditions over the western Carolinas and northeast Georgia. Much of the area saw less than 2 inches of rain during this period of time. By the end of the month, much of the mountains and foothills of western North Carolina were running 10 inches below normal annual rainfall. Total rainfall deficits since the beginning of 2007 were around 20 inches or more in the hardest hit areas. By the end of the month, flow on almost all major streams was running less than 10 percent of normal. Many area crops suffered.
7/1/2008	Unusually dry weather continued through the month of July, with severe to extreme drought conditions persisting across the area. Afternoon and evening thunderstorms provided some degree of relief across portions of the North Carolina piedmont, but locations across Upstate South Carolina and extreme western North Carolina reported annual rainfall deficits of nearly 11 inches by the end of the month. Mandatory water restrictions were instituted across much of the North Carolina foothills. Water well levels began to descend below record low levels, most of which were recorded during the 1999-2002 drought. The vast majority of major streams across the area continued to run 1-10 percent of normal flow. Agriculture continued to be hard hit, with some areas reporting a 100 percent loss of the corn crop.
8/1/2008	Dry weather persisted across much of the area for most of August, although portions of the North Carolina Piedmont began to see relief from the dry conditions early in the month, due to an increase in daily thunderstorm activity. Elsewhere, exceptional drought conditions persisted and even expanded slightly westward to cover more of far western North Carolina and northeast Georgia. During the early part of the month, flows on most of the major streams across the area were running at record low levels, with the French Broad River setting a minimum flow record that had stood for almost 100 years. Only a handful of streams were running at more than 1 to 7 percent of normal. Groundwater levels were 2-5 feet below normal. Significant agricultural impacts persisted, with losses to summer crops, including hay, estimated at 30%. The dry weather also affected the livestock industry, due to shortages of pasture crops necessary for feeding.||By the end of the month, Tropical Storm Fay had dropped up to 11 inches of rainfall across the area, providing some relief from the drought conditions, especially across the North Carolina Piedmont.
9/1/2008	The heavy rain brought by Tropical Storm Fay in late August provided some relief to the drought conditions across the area. This was particularly true across the North Carolina piedmont, where improving conditions were aided by normal September rainfall. However, another dry month resulted in a persistence of extreme to exceptional drought conditions across the North Carolina mountains and foothills. Voluntary water restrictions remained widespread during the month. A few communities held onto mandatory restrictions early in the month, but many of these were lifted by the end of the month. Well water remained near record low levels in many areas, while lake levels persisted well below normal stages. Rainfall from Fay resulted in some improvement in streamflows, although most rivers and major streams remained at less than 25 percent of normal, with many still running at less than 10 percent of normal. By the end of the month, government officials had requested a federal disaster declaration for most of the counties in the area, due to crop damages.
10/1/2008	Another abnormally dry month resulted in a persistence of severe to exceptional drought conditions over much of the mountains and foothills of North Carolina. Some slight improvement was observed in well water levels, but they remained near record lows. Most rivers and major streams continued to flow at less than 10 percent of normal. Voluntary water restrictions continued in most areas, with a few areas continuing to institute mandatory restrictions. Meanwhile, severe crop losses resulted in a federal disaster declaration for much of the larger agricultural communities across the area.
11/1/2008	Another month of below normal rainfall resulted in a persistence of severe to exceptional drought conditions over much of western North Carolina through November. In fact, drought conditions actually worsened in some areas, with portions of the central North Carolina mountains deteriorating to exceptional

Date	Description
	drought conditions late in the month. Slight improvements in well water levels continued across the area. Most rivers and major streams continued to flow at less than 10 percent of normal. Voluntary water restrictions continued in most areas, with a few areas continuing to institute mandatory restrictions.

TABLE H.2: EXTREME COLD/WIND CHILL (2000-2019)

Date	Description
	Buncombe County
12/1/2000	December, 2000 will long be remembered for the brutal hold that cold weather had on the region. Temperatures ran 6 to 8 degrees below normal for the entire month. At Charlotte, it was the coldest month in 83 years.
1/6/2014	An arctic cold front blasted through the mountains during the morning hours of the 6th, bringing strong gusty winds and the coldest air mass to have affected the region since 1994. By the evening hours, air temperatures within the mountain valleys had fallen to the single digits, while the high elevations were below zero. Winds that continued in the 20 to 30 mph range with higher gusts yielded life-threatening wind-chill values through the overnight of the 6th and the morning of the 7th. Low temperatures on the 7th ranged from 0 to -5 in the lowest valleys, to -15 to -25 above 5000 feet. Meanwhile, winds remained gusty through the morning hours of the 7th. Minimum wind chills of -20 to -30 were common in the valleys early on the 7th, while wind chills reached as low as -50 at the highest peaks. Although the winds diminished enough to bring wind chills above -15 in the valleys by early afternoon, high temperatures on the 7th did not warm out of the teens in many locations.
1/7/2015	An arctic cold front moved through Western North Carolina during the morning and afternoon of the 7th, bringing strong winds and bitterly cold air to the region. By mid-evening, sustained winds of 15 to 30 mph combined with air temperatures in the single digits and teens to yield wind chill values in the -5 to -15 range in the northern and central valleys. By daybreak on the 8th, while the gusty winds continued, air temperatures ranged from 0 to 10 above in the valleys, and as low as -15 on the high peaks and ridge tops of the northern mountains. Wind chill values during this time ranged from -10 to -20 in the valleys, while the high elevations likely saw values as low as -50, if not lower. The dangerous wind chills abated throughout the 8th, as temperatures warmed and winds diminished. However, air temperatures remained below freezing throughout the 8th.
2/18/2015	A strong arctic cold front blasted through Western North Carolina during the afternoon and evening of the 18th, bringing strong winds and bitterly cold air to the region. By mid-evening, sustained winds of 15 to 30 mph combined with air temperatures in the single digits and teens to yield wind chill values in the -5 to -15 range in the valleys. By daybreak on the 19th, while the gusty winds continued, air temperatures ranged from 5 below to 5 above in the valleys, and as low as -20 on the high peaks and ridge tops of the northern mountains. Wind chill values during this time ranged from -15 to -20 in the valleys, while the high elevations likely saw values as low as -50, if not lower. The dangerous wind chills continued throughout the 19th, as air temperatures failed to warm above the teens in even the lowest valleys and the high elevations remained below 0, while most areas remained in the single digits. Wind chills remained no higher than 0 across most of the area until late morning on the 20th. Record lows were recorded at the Asheville Regional Airport on the 18th and the 19th.
	Madison County
12/1/2000	December, 2000 will long be remembered for the brutal hold that cold weather had on the region. Temperatures ran 6 to 8 degrees below normal for the entire month. At Charlotte, it was the coldest month in 83 years.
1/6/2014	An arctic cold front blasted through the mountains during the morning hours of the 6th, bringing strong gusty winds and the coldest air mass to have affected the region since 1994. By the evening hours, air temperatures within the mountain valleys had fallen to the single digits, while the high elevations were below zero. Winds that continued in the 20 to 30 mph range with higher gusts yielded life threatening wind chill values through the overnight of the 6th and the morning of the 7th. Low temperatures on the 7th ranged from 0 to -5 in the lowest valleys, to -15 to -25 above 5000 feet. Meanwhile, winds remained gusty

Date	Description
	through the morning hours of the 7th. Minimum wind chills of -20 to -30 were common in the valleys early on the 7th, while wind chills reached as low as -50 at the highest peaks. Although the winds diminished enough to bring wind chills above -15 in the valleys by early afternoon, high temperatures on the 7th did not warm out of the teens in many locations.
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TABLE H.3: FLOOD EVENTS (2000-2019)

Location	Date	Description
Buncombe County		
ASHEVILLE	6/5/2002	Some street flooding occurred, and water entered a few homes.
Unincorporated Area	2/6/2004	Flooding along the French Broad continued downstream to affect lowland areas in Henderson County to just south of Asheville.
Unincorporated Area	9/7/2004	Flooding began during the late afternoon across the county and gradually worsened during the evening and overnight hours, with near-record flooding observed along the Swannaoa and French Broad Rivers. Most valley communities across the county were affected by severe flooding along the rivers, or along smaller streams. Flooding along the Swannanoa devastated Asheville's Biltmore area, as well as the Black Mountain and Swannanoa communities. Numerous businesses and residences were damaged or destroyed by flood waters. Widespread damage to roads and bridges also occurred, either due to flooding or landslides.
Unincorporated Area	9/16/2004	After many hours of moderate to heavy rainfall, gradual rises on creeks and streams resulted in the second devastating flood across the county in just 9 days. Flooding first began around Candler, but eventually affected every valley community in the county. Flooding was actually more widespread than during the Frances flood, but was not quite as severe. Virtually every stream in the county flooded, including the French Broad River. Two males, ages 32 and 28, died in Leicester when they attempted to cross a flooded area in a pickup truck. Hundreds of roads were flooded and the bridge over highway 197 in Barnardsville was washed out. The French Broad flooded the studios and other businesses in the River District in downtown Asheville. At Enka, a motel was flooded, which necessitated the rescue of 40 people. Numerous homes were destroyed or severely damaged by flood water or landslides.

Location	Date	Description
ELK MTN	5/5/2013	A mix of river and stream flooding affected the county after several inches of rain fell, mainly on the 5th. A few streams went out of their banks during the evening hours of the 5th. Charlotte Street was flooded by Flat Creak during this time. Starting during the early morning hours of the 6th, much of the French Broad and Swannanoa River systems went above flood stage. Several roads were affected around Asheville where the French Broad was above flood stage from 115 AM EDT on the 6th until 630 PM EDT that day. Flooded roads included Amboy Road, Swannanoa River Road, Riverside Drive from Craven Street to the I-26 on-ramp, Lyman Street and Azalea Road among others. Several rock and mud slides affected the county as well, particularly the south and east parts.
KENNWORTH	10/23/2017	Media and stream gauges reported flooding developed across southeastern sections of Buncombe County after widespread rainfall of 3 to 4 inches, with roughly half of that occurring over a period of just a couple of hours. Severe urban flooding and stream flooding along Sweeten Creek developed in the Biltmore Village area. Biltmore Ave and Sweeten Creek Rd were both largely impassable in spots due to deep water. Water also entered several businesses along Brook St and Sweeten Creek Rd. Minor stream flooding was also reported along Cane Creek in the Fairview area, where at least one road was flooded and impassable, and near the headwaters of the Swannanoa River, which flooded Veterans Park in Black Mountain.
GROVEMONT	5/29/2018	Stream gauge on county comms reported flooding along the Swannanoa River basin. Backwater effects near the town of Swannanoa caused a tributary to flood Azalea Road. The river was also reported to be flooding low-lying areas in the Oteen community. Thr river crested just below moderate flood stage in Biltmore Village, sending water over portions of Swannanoa River Rd and flooding businesses between the river and the railroad tracks in the village. While only around 2 inches of rain fell in the Asheville area from the 29th through the 30th, the bulk of the flood water originated from the headwaters near Black Mountain, where as much as 10 inches fell during this time.
GROVESTONE	12/28/2018	Stream gauges along the Swannanoa River in Buncombe County exceeded their established flood stages after 3 to 4 inches of rain fell throughout the basin in about 24 hours. Low spots on the campus of Warren Wilson College were inundated. The primary impacts were in Biltmore Village in Asheville. The river, along with backwater effects into smaller tributaries flooded and closed multiple streets, including Garfield St, Decatur St, Caledonia Rd, Glendale Ave, Swannanoa River Rd, and Thompson St. Water entered the lower levels of a couple of businesses on Decatur St and Garfield St.
BLACK MTN	6/9/2019	Stream gauges on the Swannanoa River at Black Mountain and downstream at Warren Wilson exceeded their established flood stages after 4 to 5 inches of rain fell in the headwaters over a period of several hours. Veterans Park was flooded in Black Mountain, while several campus roads and low-lying areas at Warren Wilson College also flooded.
Madison County		
Unincorporated Area	5/6/2003	While flash flooding was ongoing across the northwest part of the county, the French Broad River began to respond to the persistent heavy rainfall, and flooded in several locations across the county. Water covered portions of highway 63.
Unincorporated Area	11/19/2003	Little Laurel Creek overflowed its banks and flooded several roads and highways, some of which required closing. The French Broad rose to flood stage at Hot Springs.
Unincorporated Area	9/7/2004	Although rainfall over Madison County was much less than what occurred to the east and south, major flooding developed along the French Broad River, as runoff from the extremely heavy rainfall near the headwaters worked its way downstream. The river reached its highest level in over 25 years, resulting in significant damage to roads, bridges, and some private property.
Unincorporated Area	9/16/2004	After hours of heavy rain, gradual rises along creeks and streams culminated in flooding across the county by midnight. The first streams to flood were Spring Creek in Hot Springs and Big Pine Creek west of Marshall. By sunrise on the 17th, virtually every stream in the

Location	Date	Description
		county had flooded. Flooding was quite severe, as most stream levels exceeded those of recent memory. Southwest of Marshall, 4 feet of water from Sandymush Creek entered the basement of a home located 100 feet north and 10 feet above the upper banks of the creek. Long-time residents described the flooding as the worst in at least 25 years.

TABLE H.4: HAIL EVENTS (2000-2019)

Location	Date	MPH	Description
Buncombe County			
FAIRVIEW	5/13/2000	1	Thunderstorms developed in the mountains in the early afternoon with several becoming severe a few hours later. Other severe thunderstorms moved into or developed in the foothills and piedmont during the early evening. Hail up to the size of walnuts and some wind damage occurred in the mountains and foothills. Several trees were blown down near Fairview.
CANDLER	8/10/2000	0.75	A strong mesoscale convective system which originated in the Ohio River Valley was able to sustain itself while moving through the central and southern Appalachians. This intense squall line moved north to south through western North Carolina during the wee hours of the morning on the 10th. Wind damage was reported from just about every county in western North Carolina and a few occurrences of hail up to quarter size were reported as well. Wind damage was mainly limited to downed trees and power lines although some light structural damage did occur too.
ASHEVILLE	9/4/2000	0.75	An isolated severe thunderstorm produced dime size hail on the Blue Ridge Parkway and Hwy 25.
ASHEVILLE	10/25/2000	0.25	Abundant pea size hail fell from a few showers and thunderstorms in northeast Buncombe county during the afternoon. Traffic accidents occurred on the Blue Ridge Parkway near Craggy Gardens at an elevation of 4900 feet due to the icy road.
ASHEVILLE	6/22/2001	1.75	
LEICESTER	6/25/2001	1	Quarter-sized hail observed by police officer.
ASHEVILLE	6/4/2002	1.25	
SANDYMUSH	6/4/2002	1	
ASHEVILLE	6/4/2002	0.75	
ASHEVILLE	6/4/2002	0.75	
LEICESTER	6/4/2002	1.75	
WEAVERVILLE	6/4/2002	1.75	
MONTREAT	6/4/2002	0.75	
LEICESTER	6/20/2002	0.75	
SWANNANOA	7/1/2002	0.88	
ENKA	7/2/2002	0.75	
FAIRVIEW	5/15/2003	1.75	Hail covered the ground.
ASHEVILLE	5/15/2003	1.75	Hail fell on Flat Top Mountain.
WEAVERVILLE	5/15/2003	1.75	
ASHEVILLE	5/15/2003	1	
ASHEVILLE	5/15/2003	1	
WEAVERVILLE	5/15/2003	0.75	
SWANNANOA	7/12/2003	0.75	
ASHEVILLE	7/21/2003	0.75	Hail fell at Asheville Regional Airport.

Location	Date	MPH	Description
WEAVERVILLE	8/4/2003	0.75	Several trees were blown down. Widespread power outages were reported across much of the northern portion of the county. Hail up to the size of pennies also covered the ground in portions of Weaverville.
ENKA	8/4/2003	1.75	
BLACK MTN	5/9/2004	0.88	
ASHEVILLE	6/5/2005	0.88	Spotter in the Beaucatcher Mountain area reported mostly pea size hail, with a few stones up to nickel size.
ASHEVILLE	6/5/2005	0.88	Spotter in the Beaucatcher Mountain area reported mostly pea size hail, with a few stones up to nickel size.
AVERY CREEK	7/27/2005	0.75	
ASHEVILLE	7/27/2005	0.88	
AVERY CREEK	7/27/2005	0.75	
ASHEVILLE	7/27/2005	0.88	
LEICESTER	8/4/2005	0.75	
LEICESTER	8/4/2005	0.75	
ALEXANDER	4/3/2006	1	
WEAVERVILLE	4/3/2006	0.88	
ASHEVILLE	4/3/2006	0.75	
BLACK MTN	4/3/2006	0.75	
ASHEVILLE AIRPARK AR	4/19/2006	0.75	
BLACK MTN	5/13/2006	0.75	
ASHEVILLE	6/11/2006	0.75	Penny size hail on Flat Top Mountain.
ASHEVILLE	6/11/2006	0.88	
BLACK MTN	7/20/2006	0.75	Penny size hail reported near the McDowell County line.
CANDLER	8/10/2006	1	
WEAVERVILLE	8/10/2006	0.75	Numerous trees blown down near the Madison County line. Also, penny size hail in Weaverville around this time.
WEAVERVILLE	3/28/2007	0.75	An isolated severe thunderstorm produced large hail in Buncombe County.
BLACK MTN	4/19/2007	1	Hail covered the ground.
FAIRVIEW	6/8/2007	1.75	Reported on Shumont Rd.
ASHEVILLE	6/12/2007	1.75	Golfball size hail at exit 37 on I-40. Also, quarter to golfball size hail in the Candler area.
WEAVERVILLE	6/12/2007	1	Hail covered the ground in many areas.
ASHEVILLE	6/12/2007	0.88	Scattered severe storms developed over western North Carolina for a second day in a row. The storms mainly produced large hail.
WEAVERVILLE	6/15/2007	0.88	Hail covered the ground in some areas.
ASHEVILLE	6/15/2007	1	Hail reported along I-240.
BARNARDSVILLE	6/15/2007	0.75	Severe storms produced multiple instances of large hail and wind damage over Buncombe County in the mountains of North Carolina during the late afternoon hours.
CANDLER	6/24/2007	1.5	Numerous severe storms affected western North Carolina beginning in the early afternoon and lasting well into the night.
CANDLER	6/24/2007	0.88	Numerous severe storms affected western North Carolina beginning in the early afternoon and lasting well into the night.
FAIRVIEW	6/24/2007	0.88	Numerous severe storms affected western North Carolina beginning in the early afternoon and lasting well into the night.
BARNARDSVILLE	6/27/2007	0.75	Several severe storms affected western North Carolina during the afternoon and evening hours.

Location	Date	MPH	Description
WEAVERVILLE	7/10/2007	0.75	Scattered severe storms affected western North Carolina during the afternoon and evening hours.
SKYLAND	7/19/2007	0.75	A few severe storms affected the western Foothills and mountains of North Carolina during the afternoon and evening hours.
ASHEVILLE	8/24/2007	0.88	Several severe storms affected western North Carolina during the afternoon hours.
BLACK MTN	6/7/2008	0.75	Reported along I-40 near exit 59.
ASHEVILLE	6/10/2008	0.75	Scattered severe storms affected western North Carolina during the afternoon and evening hours.
CANDLER	6/10/2008	1	Scattered severe storms affected western North Carolina during the afternoon and evening hours.
CANDLER	6/10/2008	0.75	Scattered severe storms affected western North Carolina during the afternoon and evening hours.
WEAVERVILLE	6/26/2008	0.88	Scattered severe storms affected parts of western North Carolina during the afternoon hours.
ROYAL PINES	9/30/2008	0.75	Hail was reported on Four Oaks Dr.
MIDWAY	4/24/2009	0.75	Hail was reported on highway 25.
SHUMON	5/9/2009	0.75	Hail was reported on Shumont Rd.
JUPITER	5/28/2009	0.75	Hail was reported on Palmer Ford Rd.
GROVEMONT	6/2/2009	0.75	Hail reported in the Grovemont community.
FAIRVIEW	6/2/2009	1.25	NCDC employee reported hail up to 1.25 inches in diameter along highway 74 just south of town. A spotter reported penny size hail in the same area.
FAIRVIEW	6/8/2009	1	Nickel to quarter size hail was reported on Sugar Hollow Rd.
BLACK MTN	6/9/2009	0.75	Widely scattered multicell storms produced a few areas of wind damage and large hail over western North Carolina.
MIDWAY	6/10/2009	1	Several clusters of thunderstorms produced areas of severe weather over parts of western North Carolina during the afternoon and evening hours. Some flash flooding was also observed over the region.
ASHEVILLE AIRPARK AR	6/18/2009	0.88	A fast-moving line of thunderstorms produced wind damage as it crossed the mountains and foothills of North Carolina.
WEAVERVILLE	7/20/2009	0.75	Hail covered the ground.
PAINT FORK	7/20/2009	0.88	Scattered severe storms affected the mountains and foothills of North Carolina, as well as the Piedmont east of Charlotte, during the early evening hours.
ARDEN, STOCKSVILLE	8/5/2009	0.75	A cold front triggered thunderstorm over the North Carolina Mountains starting in the early afternoon hours. The storms organized into a slow-moving mesoscale convective system as they moved across the foothills and western piedmont. Quite a bit of wind damage, and some large hail, was produced.
MURPHY JCT	9/9/2009	0.75	Hail was reported on Patton Ave on the southwest side of Asheville.
WEAVERVILLE	9/9/2009	0.75	A persistent upper low triggered thunderstorm over the North Carolina mountains and foothills during the early morning hours of the 9th. A few of the storms produced large hail. Thunderstorms redeveloped in this same area early in the afternoon and more severe weather was reported.
BEVERLY HILLS	5/14/2010	0.75	Dime size hail was reported on Tunnel Rd.
BEVERLY HILLS	5/14/2010	0.75	Dime size hail was reported on Tunnel Rd.
FAIRVIEW	5/14/2010	1	Quarter size hail was reported near Old Fort Rd.
FAIRVIEW	5/14/2010	1	Quarter size hail was reported near Old Fort Rd.
DILLINGHAM	5/14/2010	1	A cold front stalled over eastern Tennessee. Storms developed ahead of the front over the North Carolina Mountains. Some of the storms produced large hail as they moved off of the high terrain.

Location	Date	MPH	Description
WEST ASHEVILLE	5/14/2010	1	A cold front stalled over eastern Tennessee. Storms developed ahead of the front over the North Carolina Mountains. Some of the storms produced large hail as they moved off of the high terrain.
FAIRVIEW	5/14/2010	0.75	A cold front stalled over eastern Tennessee. Storms developed ahead of the front over the North Carolina Mountains. Some of the storms produced large hail as they moved off of the high terrain.
GROVEMONT	5/14/2010	1	A cold front stalled over eastern Tennessee. Storms developed ahead of the front over the North Carolina Mountains. Some of the storms produced large hail as they moved off of the high terrain.
DILLINGHAM	5/14/2010	1	A cold front stalled over eastern Tennessee. Storms developed ahead of the front over the North Carolina Mountains. Some of the storms produced large hail as they moved off of the high terrain.
WEST ASHEVILLE	5/14/2010	1	A cold front stalled over eastern Tennessee. Storms developed ahead of the front over the North Carolina Mountains. Some of the storms produced large hail as they moved off of the high terrain.
FAIRVIEW	5/14/2010	0.75	A cold front stalled over eastern Tennessee. Storms developed ahead of the front over the North Carolina Mountains. Some of the storms produced large hail as they moved off of the high terrain.
GROVEMONT	5/14/2010	1	A cold front stalled over eastern Tennessee. Storms developed ahead of the front over the North Carolina Mountains. Some of the storms produced large hail as they moved off of the high terrain.
DUNSMORE	7/26/2010	1	Numerous showers and thunderstorms developed over the western Carolinas ahead of a cold front. Most of the severe weather affected South Carolina and Georgia, but a fair number of pulse severe storms also affected the mountains and foothills of North Carolina.
DUNSMORE	7/26/2010	1	Numerous showers and thunderstorms developed over the western Carolinas ahead of a cold front. Most of the severe weather affected South Carolina and Georgia, but a fair number of pulse severe storms also affected the mountains and foothills of North Carolina.
WEAVERVILLE	4/9/2011	1	Hail up to quarter size was reported by an NCDC employee.
RIDGECREST	4/9/2011	0.88	Nickel size hail fell on I-40 near the Ridgecrest community.
WEAVERVILLE	4/9/2011	0.88	Nickel size hail was reported in Weaverville.
BARNARDSVILLE	4/9/2011	0.75	Thunderstorms initiated over the mountains of North Carolina during the afternoon hours. As the afternoon progressed, several supercell thunderstorms developed which tracked southeast across the foothills and piedmont along a slow-moving surface cold front. With unusually steep lapse rates over the region, several of the storms produced large hail. Fortunately, the supercells were a little elevated in nature, and only one, brief, weak tornado developed. Still, hail ranging up to the size of a softballs did quite a bit of damage over the region.
WALKERTOWN	4/9/2011	0.88	Thunderstorms initiated over the mountains of North Carolina during the afternoon hours. As the afternoon progressed, several supercell thunderstorms developed which tracked southeast across the foothills and piedmont along a slow-moving surface cold front. With unusually steep lapse rates over the region, several of the storms produced large hail. Fortunately, the supercells were a little elevated in nature, and only one, brief, weak tornado developed. Still, hail ranging up to the size of a softballs did quite a bit of damage over the region.
BLACK MTN	5/3/2011	0.75	Clusters of fast-moving thunderstorms developed ahead of a strong cold front. Some of the storms produced damaging winds as they tapped strong gradient winds over the western Carolinas.
AVERY CREEK	5/12/2011	0.75	Numerous reports of penny size hail were received along Avery Creek Rd.

Location	Date	MPH	Description
ASHEVILLE	5/13/2011	1	Quarter size hail was reported on Patton Ave on on the west side of Asheville.
FAIRVIEW	5/13/2011	1	An approaching upper low helped trigger numerous thunderstorms over western North Carolina during the afternoon hours and into the overnight. Some of the storms produced large hail and damaging winds.
STONY FORK	6/2/2011	1	Quarter size hail fell at the Mt Pisgah Campground.
CANDLER	6/8/2011	0.75	Numerous thunderstorms developed over the North Carolina mountains as an unseasonably hot airmass persisted across the region. The storms produced both large hail and damaging winds.
SAND HILL	6/8/2011	1	Numerous thunderstorms developed over the North Carolina mountains as an unseasonably hot airmass persisted across the region. The storms produced both large hail and damaging winds.
BOSWELL	6/8/2011	1	Numerous thunderstorms developed over the North Carolina mountains as an unseasonably hot airmass persisted across the region. The storms produced both large hail and damaging winds.
BEVERLY HILLS	6/9/2011	1	Quarter size hail fell at Tunnel Rd and I-240.
FLAT CREEK	6/10/2011	0.75	Scattered thunderstorms developed over the mountains as a hot, humid airmass remained over the region. A few of the storms produced damaging winds and large hail.
BILTMORE	6/15/2011	1.75	Half dollar to golf ball size hail fell in the Biltmore Forest area.
AVERY CREEK	6/21/2011	1.25	NCDC employee reported up to half dollar size hail in the Bent Creek community.
BOSWELL	6/21/2011	1	Quarter size hail was reported at the intersection of Brevard Rd and I-40.
ASHEVILLE	4/5/2012	1	Several reports of hail up to the size of quarters were received from the north side of Asheville.
WILSON	4/5/2012	1	Thunderstorms developed over the mountains during the afternoon hours. A couple of the storms produced hail up to the size of quarters.
ASHEVILLE	4/17/2012	0.88	A long lived multicell severe storm developed over the central mountains of North Carolina during the afternoon hours and moved into the foothills before dissipating.
BILTMORE	4/26/2012	1.75	Multiple reports of quarter to golf ball size hail were received from the west side of Asheville, across the south side of town and across the Fairview area.
SWANNANOA, BLACK MOUNTAIN	4/26/2012	0.88	A well organized MCS moved into the North Carolina Mountains around 8 a.m. EDT. The line weakened as it crossed the mountains, though it still downed a number of trees and produced small hail. The line did not produce any additional severe weather after emerging into the foothills, though it did hold together as it moved across the foothills and western piedmont and even produced periodic small hail.
CANDLER	4/26/2012	1	Thunderstorms developed during the afternoon along an outflow boundary from an MCS that crossed the region earlier in the day. The afternoon and evening storms produced large hail and some straight-line wind damage.
SKYLAND	4/26/2012	0.88	Thunderstorms developed during the afternoon along an outflow boundary from an MCS that crossed the region earlier in the day. The afternoon and evening storms produced large hail and some straight-line wind damage.
STOCKSVILLE	4/30/2012	0.75	Penny size hail fell along Forest Knoll Court, about a mile east of Weaverville.
LEICESTER	4/30/2012	1	Quarter to half dollar size hail fell from Leicester to New Stock Rd about 2 miles west of Weaverville.
WEAVERVILLE	4/30/2012	1	Scattered thunderstorms developed over the North Carolina Mountains during the late afternoon and evening hours. Some of the storms produced large hail.
WEAVERVILLE, ASHEVILLE	5/17/2012	1	An isolated thunderstorm produced a little large hail over the central French Broad Valley.
MIDWAY	5/19/2012	1	Quarter size hail was reported at the Asheville Regional Airport.

Location	Date	MPH	Description
WEAVERVILLE	5/21/2012	0.75	Slow moving thunderstorms produced around 3 inches of rain in an hour to the north of Asheville causing a small area of flash flooding.
BILTMORE FOREST	6/22/2012	0.88	Nickel size hail was reported in the Biltmore Forest area.
BLACK MTN	6/22/2012	1	Scattered thunderstorms developed over the Blue Ridge Mountains starting in the late morning hours. The storms caused scattered wind damage and produced a few reports of large hail as they moved out into the foothills and Piedmont.
SHUMON	7/3/2012	1	Scattered, pulse-type thunderstorms developed over western North Carolina during the afternoon hours. With a very unstable airmass in place over the region, several of the storms produced large hail and wind damage.
SHUMON	7/3/2012	1	Scattered, pulse-type thunderstorms developed over western North Carolina during the afternoon hours. With a very unstable airmass in place over the region, several of the storms produced large hail and wind damage.
MONTREAT	8/10/2012	0.88	A cold front crossed the mountains during the late evening hours, triggering scattered thunderstorms. The wind shear was a little stronger than normal for the summer months, and a couple of the storms reached severe limits causing wind damage.
FAIRVIEW	5/21/2013	0.88	A few minutes of dime to nickel size hail were reported just north of Fairview.
FAIRVIEW	5/21/2013	1	Quarter size hail was reported on Wrights Cove Road.
AVERY CREEK	5/22/2013	0.88	Nickel size hail fell near Lake Powhatan.
WALKERTOWN	6/16/2014	1	Public reported lots of hail up to quarter size at the North Fork Dam.
LEICESTER	6/18/2014	1	Public reported quarter size hail near Leicester.
WEAVERVILLE	6/19/2014	0.75	Multiple public reports of dime to penny size hail were received from the Weaverville area.
WEAVERVILLE	7/2/2014	1	Public reported dime to quarter size hail in the Weaverville area.
NEW BRIDGE	7/2/2014	1	Public reported nickel to quarter size hail.
WEST HAVEN	6/18/2015	1.75	Cocorahs observer reported golf ball size hail 1 NE Avery Creek. Public reported golf ball size hail in Biltmore Park.
WILSON	6/19/2015	0.75	Public reported 3/4-inch hail at Warren Wilson College.
MONTREAT	5/1/2016	1.5	Public and CoCoRahs observer reported quarter to ping pong ball size hail in the Montreat area. The hail accumulated an inch or more in some areas.
DILLINGHAM	5/1/2016	1	Public reported quarter size hail via Social Media.
BLUE RIDGE	5/2/2016	0.75	Spotter reported 3/4 inch hail.
JUPITER	5/12/2016	0.75	Public reported 3/4 inch hail along Eller Ford Rd.
GROVESTONE	7/8/2016	1.75	Media, spotters, and NWS Employee reported quarter to golf ball size hail across the Black Mountain area.
GROVESTONE	7/8/2016	0.75	Spotter reported 3/4-inch hail.
SHILOH	7/14/2017	0.75	Public reported 3/4-inch hail.
GROVEMONT	5/5/2018	0.75	Public reported 3/4-inch hail.
SKYLAND	8/19/2019	0.88	Up to nickel size hail covered the ground at Lake Julian Park.
Madison County			
MARSHALL	6/4/2002	1.25	A long duration hailstorm resulted in roof damage to a few homes at Meadow Forks.
SPRING CREEK	6/4/2002	1	Hail accumulated to depths of 2 inches.
MARSHALL	6/4/2002	1	
SPRING CREEK	7/2/2002	0.75	
MARS HILL	7/3/2002	1.75	
MARS HILL	7/22/2002	1.25	
MARSHALL	5/15/2003	1.75	

Location	Date	MPH	Description
MARSHALL	5/15/2003	0.75	
MARSHALL	4/22/2005	0.75	
MARSHALL	4/22/2005	0.75	
MARSHALL	8/3/2005	0.75	
MARSHALL	8/3/2005	0.75	
MARSHALL	8/5/2005	0.75	
MARSHALL	8/5/2005	0.75	
HOT SPGS	3/14/2006	0.88	
MARSHALL	4/3/2006	0.75	
MARSHALL	5/3/2007	1	Isolated severe thunderstorms affected the French Broad Valley during the afternoon hours.
MARSHALL	6/12/2007	0.75	Scattered severe storms developed over western North Carolina for a second day in a row. The storms mainly produced large hail.
MARS HILL	6/27/2007	0.75	Several severe storms affected western North Carolina during the afternoon and evening hours.
MARSHALL	5/20/2008	0.75	Several clusters of severe thunderstorms developed over western North Carolina during the afternoon and evening hours ahead of a cold front.
MARSHALL	6/9/2008	0.75	Several severe storms developed over western North Carolina during the afternoon and evening hours ahead of a cold front.
MARS HILL	6/27/2008	0.75	Scattered severe storms affected western North Carolina during the afternoon and evening hours.
(HSS)HOT SPGS	5/8/2009	0.75	Scattered severe storms produced large hail and damaging winds over the North Carolina mountains.
PETERSBURG	6/3/2009	0.75	Hail reported on Cody Rd.
BARNARD	6/3/2009	0.75	Scattered severe storms developed over western North Carolina ahead of a cold front. There was also an isolated instance of flash flooding.
MARS HILL	7/20/2009	0.75	Scattered severe storms affected the mountains and foothills of North Carolina, as well as the Piedmont east of Charlotte, during the early evening hours.
BELVA	9/9/2009	0.75	This storm produced quite a bit of hail over the north central part of the county, including near the intersection of highways 208 and 12 where hail was reported to be 3 inches deep.
WORLEY	5/15/2010	1	Hail up to quarter size fell on Big Pine Rd. Also, a tree was blown down in this area.
WORLEY	5/15/2010	1	Hail up to quarter size fell on Big Pine Rd. Also, a tree was blown down in this area.
BARNARD	4/9/2011	1.5	Hail 1.5 inches in diameter was reported in the Walnut area.
HALLS STORE	4/9/2011	1.75	Quarter to golf ball size hail fell to the north of Mars Hill.
PAINT FORK	4/9/2011	1	Thunderstorms initiated over the mountains of North Carolina during the afternoon hours. As the afternoon progressed, several supercell thunderstorms developed which tracked southeast across the foothills and piedmont along a slow-moving surface cold front. With unusually steep lapse rates over the region, several of the storms produced large hail. Fortunately, the supercells were a little elevated in nature, and only one, brief, weak tornado developed. Still, hail ranging up to the size of a softballs did quite a bit of damage over the region.
WALNUT	4/9/2011	1.75	Thunderstorms initiated over the mountains of North Carolina during the afternoon hours. As the afternoon progressed, several supercell thunderstorms developed which tracked southeast across the foothills and piedmont along a slow-moving surface cold front. With unusually steep lapse rates over the region, several of the storms produced large hail. Fortunately the supercells were a little

Location	Date	MPH	Description
			elevated in nature, and only one, brief, weak tornado developed. Still, hail ranging up to the size of a softballs did quite a bit of damage over the region.
MARS HILL	5/22/2011	1.75	A second consecutive severe thunderstorm affected the Mars Hill area with hail up to the size of golf balls.
WALNUT	5/22/2011	1.75	Hail up to the size of golf balls was reported from the north side of Marshall to the Mars Hill area.
WALNUT	5/22/2011	0.75	Penny size hail was reported on the highway 25 bypass.
MARSHALL	5/22/2011	1	Quarter size hail was reported in downtown Marshall.
BETHEL	5/22/2011	2	Two-inch diameter hail was reported along highway 19.
BARNARD	6/5/2011	1	Quarter size hail fell in the Walnut community.
MARS HILL	6/8/2011	0.75	Numerous thunderstorms developed over the North Carolina mountains as an unseasonably hot airmass persisted across the region. The storms produced both large hail and damaging winds.
MARSHALL	6/9/2011	1	Quarter size hail was reported on the northeast side of Marshall.
WALNUT	6/21/2011	1	Quarter size hail fell in Marshall.
WALNUT	8/14/2011	1	Hail up to quarter size fell at the 911 center.
BETHEL	3/2/2012	1	Quarter size hail was reported near the Yancey County line.
GRAPEVINE	3/2/2012	1.25	Two supercell thunderstorms entered the North Carolina mountains during the evening hours. One of the storms produced a strong tornado in the town of Murphy in Cherokee County. The supercell remained surprisingly strong as it crossed the southern mountains, producing large hail and eventually another weak tornado in Jackson County. Later at night, storms organized into a broken line across Upstate South Carolina. The northern part of the line crossed the southern North Carolina piedmont where it produced a strong, brief tornado on the northeast side of Charlotte. The storm did not exhibit supercell characteristics, and the tornado spun up quite quickly as the line intersected a low-level boundary.
MARS HILL	3/15/2012	1	Numerous reports of up to quarter size hail were received northeast of Mars Hail, generally on and near Interstate 26.
IVY	3/15/2012	0.75	A warm, unstable airmass supported the development of scattered thunderstorms over the North Carolina mountains. A couple of the storms produced large hail.
BIG LAUREL	5/19/2013	1	Quarter size hail fell along Chapel Hill Rd.
MARSHALL	4/3/2014	0.75	Public reported 3/4-inch hail near Marshall.
(HSS)HOT SPGS	5/11/2015	0.88	Spotter reported nickel size hail.

TABLE H.5: HEAVY RAIN EVENTS (2000-2019)

Location	Date	Description
Buncombe County		
ARDEN	8/7/2001	Heavy rain caused the roof of a school to partially collapse, ruining new carpet and furniture. Water also entered through some of the doors.
COUNTYWIDE	12/19/2002	Heavy rain caused a few North Carolina mountain streams to rise to near bank-full. In addition, the wet soil combined with gusty winds to cause some drought weakened trees to fall across the area.
BARNARDSVILLE	2/22/2003	Mudslides resulting from heavy rainfall blocked some roads near Barnardsville.
ARDEN	6/15/2004	A stopped-up storm drain caused flooding to develop at an apartment complex during a heavy thunderstorm.
FAIRVIEW	8/26/2008	A combination of gusty winds and wet ground resulting from very heavy rainfall caused a tree to fall on a house, destroying a screen porch.

WEST HAVEN	5/27/2009	A combination of heavy rain and a damaged culvert caused the dirt beneath a section of Brevard Rd to wash away, collapsing the road.
WEAVERVILLE	5/21/2012	Heavy rain resulted in some urban flooding in Weaverville, closing Main St for a brief period of time.
WOODFIN	4/29/2014	Fire Department reported that a little over 2 inches of rain that fell in around an hour combined with a blocked culvert to cause a small tributary of Beaverdam Creek to flood 6 homes to a depth of around 5 feet in the Brookdale Dr/Woodfin Ave area. Up to 30 people required rescue. The homes were heavily damaged by the flooding. Local COCORAHS reports showed storm total rainfall of 4 to 5 inches in this area, most of which fell in a fairly short period of time.
Madison County		
MARSHALL	6/4/2002	3.5 inches of rain fell in one-and-a-half hours at Meadow Forks.
COUNTYWIDE	12/19/2002	Heavy rain caused a few North Carolina mountain streams to rise to near bankfull. In addition, the wet soil combined with gusty winds to cause some drought weakened trees to fall across the area.
MARS HILL	7/25/2004	California Creek overflowed its banks.
MARSHALL	8/3/2005	Report of 1.75 inches of rain in 20 minutes, with Bull Creek beginning to come out of its banks.
MARSHALL	8/3/2005	Report of 1.75 inches of rain in 20 minutes, with Bull Creek beginning to come out of its banks.
ROLLINS	5/16/2009	High water on Sandymush Creek washed out a private bridge and eroded the soil beneath a section of Sandymush Creek Rd.
PAINT ROCK	6/5/2013	Parts of Upper Shut-In road were further damaged by high stream levels after very heavy rain. An earlier flood had significantly under-cut parts of the road. Water was also reported over parts of River Road in this same area. Several small landslides also affected River Road and Upper Shut-In road in this same area.

TABLE H.6: HEAVY SNOW EVENTS (2000-2019)

Date	Description
Buncombe County	
1/8/2001	Another round of light snow occurred, adding another inch or two accumulation. In Buncombe and Madison Counties, neither episode yielded much accumulation, but there was enough to cause slick roads until 10 am.
1/20/2000	A cold front crossed the mountains overnight, and low pressure formed along the front in the foothills by morning. Cold air was already in place across the region, so precipitation fell in the form of snow. By noon on the 20th, 3 to 6 inches of snow had fallen from Madison to Avery counties. Elsewhere across the central mountains, northern foothills and northwest piedmont, 1 to 3 inches of snow fell. There were isolated reports of 4 inches from the highest peaks in Swain and Haywood counties. The combination of snow and wind in the wake of the front caused some trees to fall, especially in Caldwell county. One tree fell across a mobile home and caused $24K in damage. Several other trees fell across roads.
1/22/2000	A cold dome of arctic high pressure centered over the Mid-Atlantic States provided very cold and dry air to western North Carolina. Meanwhile, weak low pressure moved east along a frontal boundary stalled across the Gulf Coast States to the Georgia coast. Abundant moisture flowed north into the sub-freezing air over western North Carolina, resulting in light snow as early as the afternoon on the 22nd. Snow became heavy by mid-afternoon across the mountains and by evening across the foothills and piedmont. A general 4 to 7 inch snowfall occurred in the mountains with as much as 10 inches reported in Jackson county. Generally 4 to 6 inches of snow fell across the foothills and piedmont, with a local maximum of 7 inches in western Lincoln county. Rowan county failed to meet heavy snow criteria with accumulations of up to 3 inches. Freezing rain and sleet mixed with the snow for a short time before the precipitation ended, and for the most part, caused little additional problems. The one exception was across southern Union county where freezing rain lasted all night and through much of the morning on the 23rd. Ice accumulations reached

Date	Description
	damaging levels there around 3 am, causing a large number of trees and power lines to fall throughout the morning. This in turn, resulted in widespread power outages.
1/26/2000	An upper level disturbance and northwest flow combined to produce varying amounts of snow across the mountains from early evening on the 25th through noon on the 26th. One to three inches of snow fell from Macon county to Buncombe and Yancey counties. Heavy snow accumulated 4 to 6 inches across most of the Tennessee border counties from Graham to Avery.
2/4/2000	A cold and moist northwest flow produced snow showers for about 24 hours across mainly the Tennessee border counties. Snow accumulations of 1 to 3 inches occurred as far east as northern Buncombe county. Four inches of snow fell across the northern part of Mitchell county.
4/8/2000	A cold and moist northwest flow behind a cold front produced light snow across the mountains. Accumulations were generally a dusting to one inch, but the highest mountains north of Asheville received 2 to 3 inches.
11/19/2000	Light to moderate snow started in the mountains and spread southeast, lasting through the day. Generally 1 to 3 inches of snow fell, but some higher elevations of the central and southern mountains reported more than 4 inches.
12/3/2000	A developing surface cyclone off the Carolina Coast spread abundant moisture into western North Carolina, which was still mired in a cold, winter-like temperature regime. The result was another widespread snowfall. Accumulations ranged from a dusting in the northern foothills to more than 6 inches in western Macon County and 5 inches in Henderson County. Most accumulations were in the 1 to 3 inch range.
12/17/2000	A dynamic system affected western North Carolina during the 16th and 17th, bringing a variety of weather to the region, from freezing rain in mountain valleys to large hail and damaging winds across much of the region. A number of meteorological factors came together to produce such interesting atmospheric phenomena: a very strong cold front that would eventually usher in the coldest air in nearly two years into the state, strong mid-level and upper-level jets, a potent upper level disturbance, a temporary surge of warm, moist air into the region and the antecedent cold air trapped in lower valleys of the higher terrain in the mountains. Heavy rain, with embedded thunderstorms, crossed the region from late morning through the afternoon on the 16th. Cold air trapped in some valleys of the northern mountains never completely scoured out, resulting in a light glaze south and west of Newland. Just as surface temperatures rose above freezing in the northern mountains, thunderstorms pushed out ahead of the strong front, with numerous small hail reports. Nickel-sized hail was reported 8 miles north of Sylva in Jackson County. As the front, and attendant pressure gradient, pushed its way into western North Carolina, winds increased into the 50 to 60 mph range, resulting in numerous downed trees and power lines. Nearly every county in the mountains reported some wind damage. The high winds eventually affected the foothills and piedmont. In Charlotte, numerous trees were downed and furniture was blown off porches. An unsturdy building in Spencer collapsed. In the wake of the frontal passage, much colder air invaded the region, and as another shortwave affected the region on the 17th, a wide swath of 1 to 3 inch snow blanketed the higher terrain. Flurries were reported as far east as Hickory and Gastonia.
12/19/2000	The latest in a sprightly succession of Arctic cold fronts crossed the region on the 18th and 19th. Abundant low level moisture and an upper level disturbance riding over the new surge of cold air provided the ingredients for the latest round of snow. The heaviest snow accumulations, in general, were north and west of Asheville, especially near the Tennessee border. The northern half of Mitchell County recorded 5 to 6 inches of new snow...as did the higher-terrain Highlands/Cashiers area of southern Jackson and Transylvania counties in the southern mountains. Buncombe, Transylvania and Macon counties each reported numerous 4 inch accumulations, with most other mountain locations reporting between 1 and 3 inches. Foothill

Date	Description
	locations, especially those closest to the mountains, racked up some impressive totals as well, with Marion and Morganton each reporting 2 to 3 inches. Farther east, in the northwest piedmont, accumulations were limited to less than 2 inches. More than 200 traffic accidents were reported from the region due to the wintry weather.
1/1/2001	A powerful upper level disturbance interacted with left-over cold air and abundant low level moisture to wring out snow showers across the North Carolina mountains from midday New Years Day through the early morning hours on the 2nd. Highest accumulations were in Haywood County, with several reports of 3 inch accumulations.
1/8/2001	A weak upper level disturbance crossed the mountains early on the 8th, producing a light blanket of fresh snow.
1/20/2001	
3/6/2001	
3/15/2001	A cold front, accompanied by abundant low level moisture, crossed the region early on the 15th, resulting in a light blanket of fresh snow.
3/20/2001	Low pressure developed off the South Carolina coast and steadily strengthened as it moved northward across the coastal waters of North Carolina, the Virginia tidewater and eventually out to sea. Rapid strengthening occurred as a strong upper level disturbance rotated around an upper low that was crossing the southeast states. As the cyclone strengthened, abundant moisture was wrapped around the storm and thrown back against the higher terrain of the Carolinas, resulting in high winds and very heavy snow. The heaviest snow accumulations were in far western North Carolina. The highest accumulations were 24 to 30 inches at Sugar Mountain, Beech Mountain and Newland in Avery County, at Mount Mitchell in southern Yancey County and in a narrow swath along the border between Madison and Haywood counties. However, accumulations of over a foot were reported from most mountain counties, including Buncombe, Haywood, Jackson, Macon, Mitchell, and Transylvania. Accumulations of over a foot also extended into the extreme western foothills, where Jonas Ridge and Little Switzerland each recorded between 12 and 16 inches of snow. East of the higher terrain, snowfall amounts ranged from 2 to 5 inches from northern Caldwell county southward to Morganton, Marion, Lake Lure and Tryon. Isolated 2 inch amounts came from as far east as Casar in northern Cleveland County. Wind damage was far more widespread than the heavy snow, for most foothill and piedmont areas experienced numerous downed trees and power lines, although damage appeared to take on a more scattered character as one moved east away from the higher terrain. The highest wind gust was an estimated 80 knots from a cooperative observer at Flat Top Mountain in southeast Buncombe County.
4/1/2001	A potent upper level disturbance rotating across the southeast states behind a strong cold front that crossed the area late in March interacted with cold, moist air remaining over the mountains to produce a light blanket of snow early on the 1st.
12/4/2002	Snow began falling around sunrise across the mountains of North Carolina, and had accumulated to 3 to 6 inches by evening.
1/16/2003	Light snow began across the mountains of North Carolina during the afternoon of the 16th, and gradually intensified with time. By early morning of the 17th, 4 to 8 inches of snow had accumulated. As much as a foot was reported on some of the highest peaks.
1/23/2003	Snow began at around midnight across the mountains of North Carolina, and intensified as it spread into the foothills and the western piedmont. The hardest hit area was the foothills, where 8 to 12 inches of snow had fallen by mid morning. Otherwise, snow accumulations were generally in the 3 to 6 inch range.

Date	Description
2/6/2003	Light snow began falling across the western mountains of North Carolina during the afternoon of the 6th, and gradually increased in intensity and coverage during the evening and overnight hours. General snowfall amounts of 4 to 5 inches were reported in the major valleys. However, accumulations of up to 8 inches occurred in the highest elevations along the Tennessee border.
3/30/2003	Snow intensified across the southern and central mountains during the pre-dawn hours, and by sunrise, heavy snow accumulations were realized. Valley locations received anywhere from a trace to 6 inches, while up to 8 inches accumulated in the highest elevations. The heavy, wet snow caused widespread power outages, especially in Haywood County. Three hikers required rescue in Haywood County, and one was hospitilazed with hypothermia.
4/10/2003	Light snow began across the North Carolina mountains during the early morning hours of the 10th, but due to a warm ground, accumulations were confined to the highest elevations through 8 AM. However, the snow intensified dramatically during the middle and late part of the morning, and by early afternoon, 2-4 inches had accumulated in valley locations near the Blue Ridge. In the higher elevations, 4 to 6 inch totals were common, while 8 to 12 inches accumulated on some of the highest peaks along the Tennessee border. The heavy, wet snow caused numerous trees and power lines to fall, and power outages were widespread.
12/18/2003	A prolonged period of snow produced heavy accumulations over a 2-day period across much of the North Carolina mountains. Most valley locations received total accumulations of 6 inches or less. However, most of the high elevation areas along the Tennessee border received between 1 and 2 feet. Northwest winds of 20 to 30 mph caused blowing and drifting snow.
1/25/2004	Light snow developed early in the morning across the mountains, foothills, and northern piedmont of North Carolina. The snow intensified throughout the morning and afternoon, and by early evening 3 to 5 inches had accumulated across much of the area. Accumulations as high as 8 inches occurred in mountainous areas along the Tennessee border.
2/12/2004	Snow began during the late evening hours across the northern and central mountains, and continued overnight. By sunrise on the 12th, accumulations of 3 to 6 inches were common. The heaviest amounts occurred in the highest elevations along the Tennessee border.
2/26/2004	Snow intensity increased during the late morning across the North Carolina mountains, and continued through the afternoon. Total accumulations of 3 to 5 inches occurred, but much of it melted rapidly.
12/11/2004	Heavy snow fell across the mountains and accumulated in the high elevations to 3 to 6 inches. The heavy snow level in most locations was 4000 feet, but dropped off to as low as 3000 feet in the southwest mountains. Elevations between 2500 feet and 3500 feet generally had and inch or two.
12/19/2004	Heavy snow fell for about 7 hours, along with wind gusts to near 50 mph. The highest accumulations were along the Tennessee border, especially in Graham County where some drifts reached a reported 2 feet. The snow and wind was accompanied by very cold weather. The Asheville Regional Airport reached a record low of 7 degrees the morning of the 20th. Buncombe County had heavy snowfall in the western and northern part of the county, although areas from Asheville south to the Henderson County line only had a trace to an inch. The temperature fell to below zero overnight in parts of the northern mountains, even the valleys, with single digits common elsewhere.
2/28/2005	The wet snow became heavier across the mountains and northern foothills during the early morning hours on the 28th. Most locations below 3000 feet changed back to rain before the precipitation ended. A quick 3 to 7 inches of snow accumulated across much of this area. Isolated heavier totals up to 13 inches occurred along the Blue Ridge, north of I-40, while the lower elevations of the foothills generally received only 1 to 3 inches.
2/28/2005	The wet snow became heavier across the mountains and northern foothills during the early morning hours on the 28th. Most locations below 3000 feet changed back to rain before the precipitation ended. A quick 3 to 7 inches of snow accumulated across much of this area. Isolated heavier totals up to 13 inches occurred along the Blue Ridge, north of I-40, while the lower elevations of the foothills generally received only 1 to 3 inches.
2/11/2006	Northwest flow, a very cold airmass, and upper air disturbances combined to produce an unusually strong upslope snow event across the far western counties of North Carolina. Widespread, heavy snow showers began to develop during the early evening of the 11th, and by late evening, heavy snowfall accumulations

Date	Description
	were common across the area. The snow lasted for a very long period, continuing through the 12th and the early morning hours of the 13th before finally tapering off. Combined with the light snow that fell across the area on the morning of the 11th, storm total accumulations of 5 to 10 inches occurred within the valleys near the Tennessee border. Meanwhile, accumulations were generally in the 1-2 foot range across the higher elevations. There were unofficial reports of as much as 4 feet in the Smoky Mountains. This event was unusual in that heavy snowfall extended as far east as the higher elevations of eastern Buncombe county, while the valleys of northern Buncombe received 3 to 6 inches.
1/16/2008	Light snow began during the early evening hours across the southern mountains and foothills of the western Carolinas and northeast Georgia. Snowfall intensity began to increase during the mid and late evening.|Snow continued to fall across the central and northern mountains, and much of the foothills of North Carolina, during the early morning hours. Total accumulations of 2-5 inches were reached across the area during the pre-dawn hours. Some amounts as high as 8 inches were reported in the higher elevations. Snow changed briefly to sleet and freezing rain before ending across the foothills.
1/29/2010	Low pressure tracked across southern Georgia during the night of the 29th, and then off the Southeast cost on the 30th. As the low passed so far south of the region, most of the precipitation fell as snow, though other precipitation types mixed in toward the end. ||Snow, heavy at times began across the southern and central mountains during the late afternoon, and began to quickly accumulate. By early evening, some areas had picked up 4 inches of snowfall. Heavy snow continued most of the night. The precipitation changed over to sleet and freezing rain before ending, but only trace amounts of ice occurred. Total accumulations ranged from 4-8 inches across the Tennessee border counties, to more than a foot in the upper French Broad Valley. The heavy wet snow caused numerous trees to fall, especially in the interior and southwest valleys, resulting in fairly widespread power outages.
3/2/2010	Snow began to fall during the pre-dawn across the mountains of the western Carolinas. After sunrise, snow became moderate to heavy at times, resulting in accumulations of 1 to 4 inches across most of the area by late morning. Snow, heavy at times, continued into the afternoon across the mountains, with heavy accumulations realized in most areas by early afternoon. By early evening, total snowfall ranged from 4 to 8 inches across the area, with localized amounts as high as 10 inches, especially in the higher elevations.
12/12/2010	Moderate to heavy snow developed ahead of a cold front over the central and southern mountains during the late evening and early morning hours. The snow continued through the morning hours with many areas seeing accumulations of 3 to 6 inches. Although snow generally ended in most areas by late morning of the 12th, snow showers developing within northwest flow behind the front resulted in additional accumulations across the higher elevations along the Tennessee border. By the time these snow showers tapered off on the morning of the 14th, some of these areas had more than a foot of snow. Very gusty winds and cold temperatures resulted in wind chill values below 0 in many areas during the overnight and early morning hours.
12/25/2010	A developing coastal storm system brought light to moderate snow, with occasional heavy bursts to the mountains beginning around sunrise on Christmas, and continuing through the morning. Snow, heavy at times, continued through the afternoon across the central and southern mountains. By Christmas evening, most locations had 6 to 10 inches of fresh snowpack. Although snow ended in most areas during the evening of the 25th, a strong northwest flow resulted in development of numerous snow showers along the Tennessee border on the 26th through the 27th. Many of these snow showers managed to add to snowfall totals, mainly in the higher elevations of the Nantahala Mountains and the Balsams, where total accumulations of more than a foot became common. Very gusty winds and cold temperatures resulted in wind chill values less than 0 and considerable blowing and drifting of snow, mainly in the high elevations.
1/29/2010	Low pressure tracked across southern Georgia during the night of the 29th, and then off the Southeast cost on the 30th. As the low passed so far south of the region, most of the precipitation fell as snow, though other precipitation types mixed in toward the end. ||Snow, heavy at times began across the southern and central mountains during the late afternoon, and began to quickly accumulate. By early evening, some areas had picked up 4 inches of snowfall. Heavy snow continued most of the night. The precipitation changed over to sleet and freezing rain before ending, but only trace amounts of ice occurred. Total accumulations ranged from 4-8 inches across the Tennessee border counties, to more than a foot in the upper French Broad Valley.

Date	Description
	The heavy wet snow caused numerous trees to fall, especially in the interior and southwest valleys, resulting in fairly widespread power outages.
3/2/2010	Snow began to fall during the pre-dawn across the mountains of the western Carolinas. After sunrise, snow became moderate to heavy at times, resulting in accumulations of 1 to 4 inches across most of the area by late morning. Snow, heavy at times, continued into the afternoon across the mountains, with heavy accumulations realized in most areas by early afternoon. By early evening, total snowfall ranged from 4 to 8 inches across the area, with localized amounts as high as 10 inches, especially in the higher elevations.
12/12/2010	Moderate to heavy snow developed ahead of a cold front over the central and southern mountains during the late evening and early morning hours. The snow continued through the morning hours with many areas seeing accumulations of 3 to 6 inches. Although snow generally ended in most areas by late morning of the 12th, snow showers developing within northwest flow behind the front resulted in additional accumulations across the higher elevations along the Tennessee border. By the time these snow showers tapered off on the morning of the 14th, some of these areas had more than a foot of snow. Very gusty winds and cold temperatures resulted in wind chill values below 0 in many areas during the overnight and early morning hours.
12/25/2010	A developing coastal storm system brought light to moderate snow, with occasional heavy bursts to the mountains beginning around sunrise on Christmas, and continuing through the morning. Snow, heavy at times, continued through the afternoon across the central and southern mountains. By Christmas evening, most locations had 6 to 10 inches of fresh snowpack. Although snow ended in most areas during the evening of the 25th, a strong northwest flow resulted in development of numerous snow showers along the Tennessee border on the 26th through the 27th. Many of these snow showers managed to add to snowfall totals, mainly in the higher elevations of the Nantahala Mountains and the Balsams, where total accumulations of more than a foot became common. Very gusty winds and cold temperatures resulted in wind chill values less than 0 and considerable blowing and drifting of snow, mainly in the high elevations.
1/10/2011	Moderate to heavy snow associated with a Gulf Coast storm system spread from south to north across the mountains of western North Carolina during the nighttime hours. Heavy snow accumulations of up to 4 inches were reported over the southern mountains by as early as 4 am. Heavy snow accumulations were not reported over the northern mountains until mid-morning. The snow became lighter around sunrise, but continued to accumulate through the morning. By early afternoon, snowfall totals ranged from 7 to 10 inches over the southern and central mountains and 3 to 6 inches over the northern mountains. During early afternoon, precipitation changed to light freezing rain and continued into the evening hours. This added as much as a tenth of an inch of ice to the heavy snowfall totals. Persistent cold temperatures ensured that many roads remained snow-packed or ice covered for several days. Some schools and businesses remained closed for as much as 5 days.
1/22/2016	An area of low pressure spread light snow into the mountains and foothills of North Carolina by around midnight on the 22nd. The snow continued through the early morning hours, gradually increasing in intensity. By mid-morning, amounts ranged from 2-4 inches across the foothills to 3-5 inches across the mountains, with locally higher amounts, especially in the high elevations near the Blue Ridge. Road conditions deteriorated quickly around sunrise, resulting in many traffic accidents. Moderate to heavy snow continued into the afternoon, gradually tapering off during the evening. The snow briefly changed to sleet before ending across the foothills. By the time the snow tapered off, accumulations ranged from 4-8 inches across the low elevations of the foothills, to 8-14 inches across the mountains. Locally higher amounts occurred, especially on the high peaks near the Blue Ridge, where several feet were reported.
1/6/2017	As an area of surface low pressure moved northeast along the Gulf and Southeast coasts, moisture overspread the southern Appalachians throughout the 6th. Although the precip may have started as rain in the lower valleys, it primarily fell as snow. It was initially light in most areas, but became heavy during mid-to-late evening, continuing into the overnight. By the time the heavier snowfall rates tapered off around sunrise, total accumulations ranged from 5 to 7 inches. Locally higher amounts of as much as 10 were observed across the higher elevations of the foothills counties.
12/8/2018	A mixture of rain and snow developed across the mountains and southern foothills of North Carolina during the afternoon and evening of the 8th, transitioning to all snow in most areas by early evening. The snow

Date	Description
	became heavy at times during the evening into the overnight. By the time the snow tapered off during the morning of the 9th, total accumulations ranged from 6 to 10 inches across much of the area. Locally higher occurred closer to the higher elevations.
	Madison County
1/18/2000	Low pressure moved east across Tennessee and weakened as it ran into a surface high pressure ridge along the East Coast. Nevertheless, enough moisture was available to cause heavy snow to fall from Avery county, east across the northern foothills and northwest piedmont. Precipitation began as light rain in the mid-evening hours on the 17th, but quickly turned to snow as the atmosphere cooled to below freezing. Snowfall ranged between 3 and 6 inches across the area by noon on the 18th, with a narrow band of 1 to 3 inch accumulation of snow and sleet to the immediate south.
1/20/2000	A cold front crossed the mountains overnight, and low pressure formed along the front in the foothills by morning. Cold air was already in place across the region, so precipitation fell in the form of snow. By noon on the 20th, 3 to 6 inches of snow had fallen from Madison to Avery counties. Elsewhere across the central mountains, northern foothills and northwest piedmont, 1 to 3 inches of snow fell. There were isolated reports of 4 inches from the highest peaks in Swain and Haywood counties. The combination of snow and wind in the wake of the front caused some trees to fall, especially in Caldwell county. One tree fell across a mobile home and caused $24K in damage. Several other trees fell across roads.
1/22/2000	A cold dome of arctic high pressure centered over the Mid-Atlantic States provided very cold and dry air to western North Carolina. Meanwhile, weak low pressure moved east along a frontal boundary stalled across the Gulf Coast States to the Georgia coast. Abundant moisture flowed north into the sub-freezing air over western North Carolina, resulting in light snow as early as the afternoon on the 22nd. Snow became heavy by mid-afternoon across the mountains and by evening across the foothills and piedmont. A general 4 to 7 inch snowfall occurred in the mountains with as much as 10 inches reported in Jackson county. Generally 4 to 6 inches of snow fell across the foothills and piedmont, with a local maximum of 7 inches in western Lincoln county. Rowan county failed to meet heavy snow criteria with accumulations of up to 3 inches. Freezing rain and sleet mixed with the snow for a short time before the precipitation ended, and for the most part, caused little additional problems. The one exception was across southern Union county where freezing rain lasted all night and through much of the morning on the 23rd. Ice accumulations reached damaging levels there around 3 am, causing a large number of trees and power lines to fall throughout the morning. This in turn, resulted in widespread power outages.
1/26/2000	An upper level disturbance and northwest flow combined to produce varying amounts of snow across the mountains from early evening on the 25th through noon on the 26th. One to three inches of snow fell from Macon county to Buncombe and Yancey counties. Heavy snow accumulated 4 to 6 inches across most of the Tennessee border counties from Graham to Avery.
1/31/2000	Northwest flow produced a light snowfall of 1 to 3 inches.
2/4/2000	A cold and moist northwest flow produced snow showers for about 24 hours across mainly the Tennessee border counties. Snow accumulations of 1 to 3 inches occurred as far east as northern Buncombe county. Four inches of snow fell across the northern part of Mitchell county.
4/8/2000	A cold and moist northwest flow behind a cold front produced light snow across the mountains. Accumulations were generally a dusting to one inch, but the highest mountains north of Asheville received 2 to 3 inches.
11/19/2000	Light to moderate snow started in the mountains and spread southeast, lasting through the day. Generally 1 to 3 inches of snow fell, but some higher elevations of the central and southern mountains reported more than 4 inches.
12/3/2000	A developing surface cyclone off the Carolina Coast spread abundant moisture into western North Carolina, which was still mired in a cold, winter-like temperature regime. The result was another widespread snowfall. Accumulations ranged from a dusting in the northern foothills to more than 6 inches in western Macon County and 5 inches in Henderson County. Most accumulations were in the 1 to 3 inch range.
12/17/2000	A dynamic system affected western North Carolina during the 16th and 17th, bringing a variety of weather to the region, from freezing rain in mountain valleys to large hail and damaging winds across much of the region. A number of meteorological factors came together to produce such interesting atmospheric

Date	Description
	phenomena: a very strong cold front that would eventually usher in the coldest air in nearly two years into the state, strong mid-level and upper-level jets, a potent upper level disturbance, a temporary surge of warm, moist air into the region and the antecedent cold air trapped in lower valleys of the higher terrain in the mountains. Heavy rain, with embedded thunderstorms, crossed the region from late morning through the afternoon on the 16th. Cold air trapped in some valleys of the northern mountains never completely scoured out, resulting in a light glaze south and west of Newland. Just as surface temperatures rose above freezing in the northern mountains, thunderstorms pushed out ahead of the strong front, with numerous small hail reports. Nickel-sized hail was reported 8 miles north of Sylva in Jackson County. As the front, and attendant pressure gradient, pushed its way into western North Carolina, winds increased into the 50 to 60 mph range, resulting in numerous downed trees and power lines. Nearly every county in the mountains reported some wind damage. The high winds eventually affected the foothills and piedmont. In Charlotte, numerous trees were downed and furniture was blown off porches. An unsturdy building in Spencer collapsed. In the wake of the frontal passage, much colder air invaded the region, and as another shortwave affected the region on the 17th, a wide swath of 1 to 3 inch snow blanketed the higher terrain. Flurries were reported as far east as Hickory and Gastonia.
12/19/2000	
12/30/2000	A strong northwest flow into the western facing slopes of the North Carolina mountains produced heavy snow in Graham and Madison counties. Accumulations ranged from 3 to 5 inches with most of the heavy snowfall reported in the extreme western halves of both counties. There was one unverified report of 8 inches along the Skyway in Graham County, with drifts as high as 3 feet reported there.
1/1/2001	A powerful upper level disturbance interacted with left-over cold air and abundant low level moisture to wring out snow showers across the North Carolina mountains from midday New Years Day through the early morning hours on the 2nd. Highest accumulations were in Haywood County, with several reports of 3 inch accumulations.
1/8/2001	A weak upper level disturbance crossed the mountains early on the 8th, producing a light blanket of fresh snow.
1/8/2001	Another fast-moving upper level disturbance produced more light snow, mostly in areas near the Tennessee border.
1/20/2001	Strong, northwest winds on the backside of a developing surface cylcone along the Carolina coast advected much colder air into the North Carolina mountains on the 20th, resulting in heavy snow along the slopes with a western exposure. Highest accumulations were in Avery and Mitchell counties, with Poplar reporting 5 to 6 inches, and Elk Park 5 to 8 inches.
1/25/2001	A cold front crossed the mountains early on the 25th, producing additional light snow accumulations in the northern North Carolina mountains.
3/20/2001	
3/20/2001	Low pressure developed off the South Carolina coast and steadily strengthened as it moved northward across the coastal waters of North Carolina, the Virginia tidewater and eventually out to sea. Rapid strengthening occurred as a strong upper level disturbance rotated around an upper low that was crossing the southeast states. As the cyclone strengthened, abundant moisture was wrapped around the storm and thrown back against the higher terrain of the Carolinas, resulting in high winds and very heavy snow. The heaviest snow accumulations were in far western North Carolina. The highest accumulations were 24 to

Date	Description
	30 inches at Sugar Mountain, Beech Mountain and Newland in Avery County, at Mount Mitchell in southern Yancey County and in a narrow swath along the border between Madison and Haywood counties. However, accumulations of over a foot were reported from most mountain counties, including Buncombe, Haywood, Jackson, Macon, Mitchell, and Transylvania. Accumulations of over a foot also extended into the extreme western foothills, where Jonas Ridge and Little Switzerland each recorded between 12 and 16 inches of snow. East of the higher terrain, snowfall amounts ranged from 2 to 5 inches from northern Caldwell county southward to Morganton, Marion, Lake Lure and Tryon. Isolated 2 inch amounts came from as far east as Casar in northern Cleveland County. Wind damage was far more widespread than the heavy snow, for most foothill and piedmont areas experienced numerous downed trees and power lines, although damage appeared to take on a more scattered character as one moved east away from the higher terrain. The highest wind gust was an estimated 80 knots from a cooperative observer at Flat Top Mountain in southeast Buncombe County.
4/1/2001	A potent upper level disturbance rotating across the southeast states behind a strong cold front that crossed the area late in March interacted with cold, moist air remaining over the mountains to produce a light blanket of snow early on the 1st.
1/6/2002	Snow began in the early morning, reaching accumulations of 4 to 8 inches by 3 pm. The highest accumulations were in the high elevations. Some sleet was mixed in with the snow.
2/3/2002	Light snow fell from late afternoon into late evening, resulting in 1 to 2.5 inches accumulations in some areas, and a few slick roads.
2/26/2002	Snow fell overnight into the morning hours, as an upper level storm system moved across the area, and was followed by strong northwest winds. Most of the snow fell immediately along the Tennessee border, but extended east of there in some cases. Some of the higher elevations of Graham, Madison, and Avery Counties received as much as 5 inches of snow. In addition to the snow, wind chill values fell to zero and below in some locations.
11/17/2002	The first snow of the season brought an inch or two of accumulation to the higher elevations of the North Carolina mountains. Winds also gusted to 45 mph in some loactions.
11/22/2002	Snow accumulated to as much as 5 inches on the highest peaks along the Tennessee border. Also, wind gusts resulted in scattered tree damage across the area.
12/4/2002	Snow began falling around sunrise across the mountains of North Carolina, and had accumulated to 3 to 6 inches by evening.
1/16/2003	Light snow began across the mountains of North Carolina during the afternoon of the 16th, and gradually intensified with time. By early morning of the 17th, 4 to 8 inches of snow had accumulated. As much as a foot was reported on some of the highest peaks.
1/23/2003	Snow began at around midnight across the mountains of North Carolina, and intensified as it spread into the foothills and the western piedmont. The hardest hit area was the foothills, where 8 to 12 inches of snow had fallen by mid morning. Otherwise, snow accumulations were generally in the 3 to 6 inch range.
2/6/2003	Light snow began falling across the western mountains of North Carolina during the afternoon of the 6th, and gradually increased in intensity and coverage during the evening and overnight hours. General snowfall amounts of 4 to 5 inches were reported in the major valleys. However, accumulations of up to 8 inches occurred in the highest elevations along the Tennessee border.
3/30/2003	Snow intensified across the southern and central mountains during the pre-dawn hours, and by sunrise, heavy snow accumulations were realized. Valley locations received anywhere from a trace to 6 inches, while up to 8 inches accumulated in the highest elevations. The heavy, wet snow caused widespread power outages, especially in Haywood County. Three hikers required rescue in Haywood County, and one was hospitilazed with hypothermia.

Date	Description
4/10/2003	Light snow began across the North Carolina mountains during the early morning hours of the 10th, but due to a warm ground, accumulations were confined to the highest elevations through 8 AM. However, the snow intensified dramatically during the middle and late part of the morning, and by early afternoon, 2-4 inches had accumulated in valley locations near the Blue Ridge. In the higher elevations, 4 to 6 inch totals were common, while 8 to 12 inches accumulated on some of the highest peaks along the Tennessee border. The heavy, wet snow caused numerous trees and power lines to fall, and power outages were widespread.
12/18/2003	A prolonged period of snow produced heavy accumulations over a 2-day period across much of the North Carolina mountains. Most valley locations received total accumulations of 6 inches or less. However, most of the high elevation areas along the Tennessee border received between 1 and 2 feet. Northwest winds of 20 to 30 mph caused blowing and drifting snow.
1/25/2004	Light snow developed early in the morning across the mountains, foothills, and northern piedmont of North Carolina. The snow intensified throughout the morning and afternoon, and by early evening 3 to 5 inches had accumulated across much of the area. Accumulations as high as 8 inches occurred in mountainous areas along the Tennessee border.
2/12/2004	Snow began during the late evening hours across the northern and central mountains, and continued overnight. By sunrise on the 12th, accumulations of 3 to 6 inches were common. The heaviest amounts occurred in the highest elevations along the Tennessee border.
2/26/2004	Snow intensity increased during the late morning across the North Carolina mountains, and continued through the afternoon. Total accumulations of 3 to 5 inches occurred, but much of it melted rapidly.
12/11/2004	Heavy snow fell across the mountains and accumulated in the high elevations to 3 to 6 inches. The heavy snow level in most locations was 4000 feet, but dropped off to as low as 3000 feet in the southwest mountains. Elevations between 2500 feet and 3500 feet generally had and inch or two.
12/19/2004	Heavy snow fell for about 7 hours, along with wind gusts to near 50 mph. The highest accumulations were along the Tennessee border, especially in Graham County where some drifts reached a reported 2 feet. The snow and wind was accompanied by very cold weather. The Asheville Regional Airport reached a record low of 7 degrees the morning of the 20th. Buncombe County had heavy snowfall in the western and northern part of the county, although areas from Asheville south to the Henderson County line only had a trace to an inch. The temperature fell to below zero overnight in parts of the northern mountains, even the valleys, with single digits common elsewhere.
3/1/2005	Snow developed during the evening across the northern mountains, as strong northwest winds developed in the wake of a cold front. 2 to 4 inches of snow accumulated in addition to that which fell across the area on the morning of the 28th.
3/1/2005	Snow developed during the evening across the northern mountains, as strong northwest winds developed in the wake of a cold front. 2 to 4 inches of snow accumulated in addition to that which fell across the area on the morning of the 28th.
1/14/2006	As snow showers continued across the western mountains, accumulations reached 2-5 inches across the area by early afternoon. There were locally heavier amounts in the higher elevations.
2/11/2006	Northwest flow, a very cold airmass, and upper air disturbances combined to produce an unusually strong upslope snow event across the far western counties of North Carolina. Widespread, heavy snow showers began to develop during the early evening of the 11th, and by late evening, heavy snowfall accumulations were common across the area. The snow lasted for a very long period, continuing through the 12th and the early morning hours of the 13th before finally tapering off. Combined with the light snow that fell across the area on the morning of the 11th, storm total accumulations of 5 to 10 inches occurred within the valleys near the Tennessee border. Meanwhile, accumulations were generally in the 1-2 foot range across the higher elevations. There were unofficial reports of as much as 4 feet in the Smoky Mountains. This event was unusual in that heavy snowfall extended as far east as the higher elevations of eastern Buncombe county, while the valleys of northern Buncombe received 3 to 6 inches.
3/25/2006	An extended period of upslope flow and an unstable airmass resulted in numerous snow showers across the western mountains of North Carolina. The snow showers began on the evening of the 24th and continued through the evening of the 25th. Snowfall accumulated to 4 to 8 inches in the higher elevations along the Tennessee border. Although snowfall totals in the valleys were lower, 2 to 3 incehs did accumulate at the

Date	Description
	lower end of the French Broad valley, and in the Pigeon River gorge. In many cases, heavy bursts of snow would cause a quick inch or so to accumulate in the valleys before melting rapidly under the influence of warm temperatures. Therefore, actual snowfall in the valleys was probably higher than reported.
12/26/2006	Snow showers developed during the afternoon hours across the western North Carolina mountains. They became more widespread and heavy during the evening hours, with a few locations experiencing heavy snowfall, mainly in areas above 3000 feet. Two to 4 inch totals were common along the higher elevations of the Cherohala Skyway in Graham County and in the higher elevations of Madison County. The valleys generally received less than an inch.
1/9/2007	An upper level disturbance brought fairly uniform 1 to 4 inch snowfall amounts across the mountains during the late morning. The snow was quite heavy in spots and accumulated rapidly. Roads became slick and hazardous, especially in the higher elevations. Quite a few traffic accidents occurred in Madison County, including 1 fatal accident. Highway 441 was closed through the Smoky Mountains. Once the upper disturbance moved east of the area, scattered to numerous snow showers continued to affect the mountains through much of the afternoon and evening. Most areas along the Tennessee border began to see heavy snowfall accumulations by early evening. Total accumulations in the higher elevations were fairly uniform in the 3 to 5-inch range, although some locations right along the Tennessee border saw up to 7 inches, particularly along the Cherohala Skyway in Graham County, and across the northern mountains. The valleys saw less snow, with generally 1 to 2 inches observed south of the French Broad River, and 1 to 4 inches observed from the French Broad north.
1/9/2007	An upper level disturbance brought fairly uniform 1 to 4-inch snowfall amounts across the mountains during the late morning. The snow was quite heavy in spots and accumulated rapidly. Roads became slick and hazardous, especially in the higher elevations. Quite a few traffic accidents occurred in Madison County, including 1 fatal accident. Highway 441 was closed through the Smoky Mountains. Once the upper disturbance moved east of the area, scattered to numerous snow showers continued to affect the mountains through much of the afternoon and evening. Most areas along the Tennessee border began to see heavy snowfall accumulations by early evening. Total accumulations in the higher elevations were fairly uniform in the 3 to 5-inch range, although some locations right along the Tennessee border saw up to 7 inches, particularly along the Cherohala Skyway in Graham County, and across the northern mountains. The valleys saw less snow, with generally 1 to 2 inches observed south of the French Broad River, and 1 to 4 inches observed from the French Broad north.
2/17/2007	Light to moderate snow developed in areas from the Smokies to the lower French Broad valley during the early evening and continued into the early morning hours. By 3 AM, snowfall amounts of 1-3 inches were fairly uniform across the area. Snow continued through the pre-dawn hours in areas from the northern Smokies, through the Piegeon River gorge, to the lower French Broad valley and surrounding areas. By the time the snow tapered off to flurries during mid-morning, snowfall totals ranged from 2-4 inches in the valleys, including Waynesville, Marshall, and Mars Hill, to 4-6 inches across the higher elevations near the Tennessee border. Snow showers continued to produce sporadic light accumulations in the higher elevations through much of the day.
4/6/2007	A record-setting cold airmass, northwest flow, and a strong upper air disturbance resulted in a late season snow shower event across the North Carolina mountains. By 3 am, snow had accumulated to as much as 2 inches in the valleys, with as much as 6 inches reported in the higher elevations. Snow showers continued through the morning hours, with heavy snowfall totals reported during the pre-dawn hours. Snowfall was highly variable across the region, with generally only 2-3 inches accumulating in the lower elevations. However, some of the higher elevations of the northern mountains saw as much as 10 inches.
4/15/2007	As a strong cold front moved across the mountains and snow levels dropped rapidly, rain showers changed to snow showers and caused rapid accumulation of heavy snow, mainly in the higher elevations along the Tennessee border. Total accumulations generally ranged from 2-5 inches, mainly in areas above 3500 feet, while the valleys saw amounts ranging from a trace up to an inch.
1/1/2008	Snow showers developed New Yearï¿½ï¿½ï¿½s Evening across the western slopes of the Appalachians. As snow showers, heavy at times, continued across the western Mountains of North Carolina, accumulations began to pile up during the pre-dawn hours of the 2nd. Many locations reported 2-4 inches of accumulation

Date	Description
	by sunrise. By the time the snow tapered off to flurries (during late morning), total accumulations ranged from a couple of inches in the valleys away from the Tennessee border, to 4-6 inches in areas along the state line. Although accumulating snow tapered off during mid-morning, flurries continued for much of the day, while very windy conditions resulted in blowing and drifting snow.
2/26/2008	Snow showers developed across the western mountains during the late evening. The snow showers increased in coverage and intensity through the early morning hours of the 27th, resulting in heavy snow accumulations across much of the western mountains before sunrise. Snow continued through the day and evening hours and did not begin tapering off until the early morning hours on the 28th. Total accumulations were highly variable across the area. While locations such as Bryson City and Waynesville saw less than 2 inches, areas along the Tennessee border received as much as a foot. Even the valley floors near the state line received as much as 8 inches.
12/1/2008	Snow showers developed during the early morning hours and continued through much of the day across the Tennessee border counties. Snow showers, heavy at times, continued near the Tennessee border, with heavy snowfall accumulations reported by early evening. The snow tapered off to flurries during the early morning hours. Total snowfall amounts ranged from an inch or 2 along the Blue Ridge, to as much as 6-7 inches in the higher elevations near the state line.
1/8/2009	Snow showers developed across the Tennessee border counties around sunrise, and persisted until the late afternoon hours. Snowfall amounts ranged from 2-5 inches, mainly in elevations above 3000 feet or so. Some locally higher amounts were reported on the higher peaks.
1/18/2009	Snow showers developed over the western mountains during the late evening of the 18th, and continued off and on through the evening hours of the 20th. Snowfall totals ranged from 4 to 6 inches at the higher elevations of the southwest and central mountains, to 1 to 3 inches in the valleys. Over the northern mountains totals ranged from 4 to 7 inches, with 1 to 3 inches along the eastern slopes of the Blue Ridge.
3/1/2009	Rain changed to snow across portions of the southern and central mountains, generally in locations from the Balsams to areas north and east, and continued through the afternoon. The snow became heavy at times, and quickly accumulated to 1-4 inches by early evening. Locally higher amounts were reported in the higher elevations of the Balsams and Newfound Mountains. Snow, heavy at times continued into the evening hours. By the time the snow tapered off, accumulations of 2-5 inches were common across the area. However, locally higher amounts occurred, especially in the higher elevations, where up to 10 inches were reported. The heavy wet snow, combined with gusty winds, caused some trees to fall and isolated power outages.
4/7/2009	After an extended period of snow showers, heavy snowfall accumulations were reached across the higher elevations of the southern and central mountains near the Tennessee border. Total accumulations in areas above 3500 feet generally ranged from 3-6 inches, although some of the higher elevations of the Smokies, the Newfound Mountains, and along the Cherohala Skyway received amounts of 10 inches or more.
1/7/2010	A very cold and moist northwest flow resulted in development of scattered to numerous snow showers across the western mountains during the evening of the 7th. The snow showers continued across much of the Tennessee border counties through the day on the 8th, with heavy accumulations reached in some areas by late morning. Total accumulations ranged from 1-3 inches over the lower French Broad Valley, to 3-6 inches across the northern mountains. Over the southwest mountains, total snowfall accumulations ranged from trace amounts in the valleys beneath the Smokies, to 2-4 inches in the higher elevations along the Tennessee border.
1/29/2010	Low pressure tracked across southern Georgia during the night of the 29th, and then off the southeast cost on the 30th. As the low passed well south of the region, most of the precipitation fell as snow, though other precipitation types mixed in toward the end. ||Snow became heavy during the evening, and quickly accumulated to yield heavy snowfall totals. Total accumulations ranged from 5-9 inches across much of the northern mountains, foothills and western piedmont of North Carolina, as well as in a small part of the South Carolina mountains. A 55-year-old man died of exposure after falling in the snow in Gastonia (indirect). The precipitation changed to freezing rain and sleet near the end of the event, resulting in light accumulations of ice.

Date	Description
2/15/2010	Northwest flow snow showers developed over the northern mountains during the evening and persisted over the next 24 hours. By the evening of the 16th, accumulations of 5-6 inches were common near the Tennessee border, while only an inch or so had fallen in areas closer to the Blue Ridge. The snow continued off and on for almost two more days, before finally tapering off during the morning of the 18th. Accumulations along the Tennessee border totaled a foot or more in some areas. Meanwhile, locations closer to the Blue Ridge only saw a couple of inches. Over Avery County, total accumulations were higher, with 1-2 feet near the Tennessee border.
2/24/2010	Northwest flow snow showers developed during the evening across the northern mountains, and continued along the Tennessee border through much of the 25th, with heavy snowfall accumulations reached across much of the area shortly after sunrise. Total accumulations ranged from only a couple of inches along the Blue Ridge, to 7 inches in the lower valleys along the Tennessee border. Meanwhile, some of the higher elevations received a foot or more of snowfall.
3/2/2010	Snow began to fall around sunrise across the North Carolina mountains along the Blue Ridge escarpment. Snow became moderate to heavy at times during the late morning and early afternoon, resulting in accumulations of 1 to 4 inches across most of the area. Snow, heavy at times, continued into the afternoon across the Blue Ridge, with heavy accumulations realized in most areas by mid-afternoon. By early evening, total snowfall ranged from 3 to 6 inches. Localized snowfall amounts as high as 10 inches occurred, especially in the higher elevations along the escarpment.
11/5/2010	Moist northwest flow resulted in widespread snow showers near the Tennessee line, beginning around mid-morning on the 5th. Snow showers continued off and on across the higher elevations of the Smokies, Newfound Mountains and surrounding areas through the day. By early afternoon, 3 to 5 inches had accumulated above 3500 feet. By the morning of the 6th, some areas had as much as 8 inches. While periods of snow showers, flurries, and rain mixed with snow were reported in the valleys, little or no accumulation occurred below 3500 feet.
12/12/2010	Light snow began falling over the northern mountains and Madison County during the early morning hours of the 12th. By mid-morning, accumulations of 1 to 3 inches were observed across the area. After a strong cold front swept through the mountains, northwest winds resulted in development of numerous snow showers by early afternoon. By mid-evening, snowfall totals ranged from 1 to 5 inches across the area.||As snow showers continued in the northwest flow, snow continued to gradually accumulate in the higher elevations along the Tennessee border. By the time the snow tapered off early on the 14th, accumulations generally ranged from 4 to 8 inches in the higher elevations, generally above 3500 feet, although some areas saw as much as 20 inches. The lower elevations saw considerably lower amounts, generally in the 2-5 inch range. Very windy conditions and very cold temperatures resulted in wind chill values below 0 in many areas during the overnight and early morning hours.
12/25/2010	A developing coastal storm system brought light to moderate snow, with occasional heavy bursts to the northern mountains beginning shortly after sunrise on Christmas. Snow, heavy at times, continued through the afternoon across the northern mountains and surrounding areas. By Christmas evening, most locations had 3 to 6 inches of fresh snowpack. A brief lull in snowfall occurred overnight. However, snowfall began to increase again during the morning of the 26th, as strong northwest flow resulted in development of numerous snow showers along the Tennessee border. The snow showers continued until the afternoon of the 27th. This resulted in additional accumulations that ranged from 2 to 6 inches in the valleys to a foot or more in the higher elevations. Very gusty winds and cold temperatures resulted in wind chill values less than 0 and considerable blowing and drifting of snow, especially in the high elevations.
1/7/2010	A very cold and moist northwest flow resulted in development of scattered to numerous snow showers across the western mountains during the evening of the 7th. The snow showers continued across much of the Tennessee border counties through the day on the 8th, with heavy accumulations reached in some areas by late morning. Total accumulations ranged from 1-3 inches over the lower French Broad Valley, to 3-6 inches across the northern mountains. Over the southwest mountains, total snowfall accumulations ranged from trace amounts in the valleys beneath the Smokies, to 2-4 inches in the higher elevations along the Tennessee border.

Date	Description
1/29/2010	Low pressure tracked across southern Georgia during the night of the 29th, and then off the southeast cost on the 30th. As the low passed well south of the region, most of the precipitation fell as snow, though other precipitation types mixed in toward the end. ||Snow became heavy during the evening, and quickly accumulated to yield heavy snowfall totals. Total accumulations ranged from 5-9 inches across much of the northern mountains, foothills and western piedmont of North Carolina, as well as in a small part of the South Carolina mountains. A 55-year-old man died of exposure after falling in the snow in Gastonia (indirect). The precipitation changed to freezing rain and sleet near the end of the event, resulting in light accumulations of ice.
2/15/2010	Northwest flow snow showers developed over the northern mountains during the evening and persisted over the next 24 hours. By the evening of the 16th, accumulations of 5-6 inches were common near the Tennessee border, while only an inch or so had fallen in areas closer to the Blue Ridge. The snow continued off and on for almost two more days, before finally tapering off during the morning of the 18th. Accumulations along the Tennessee border totaled a foot or more in some areas. Meanwhile, locations closer to the Blue Ridge only saw a couple of inches. Over Avery County, total accumulations were higher, with 1-2 feet near the Tennessee border.
2/24/2010	Northwest flow snow showers developed during the evening across the northern mountains, and continued along the Tennessee border through much of the 25th, with heavy snowfall accumulations reached across much of the area shortly after sunrise. Total accumulations ranged from only a couple of inches along the Blue Ridge, to 7 inches in the lower valleys along the Tennessee border. Meanwhile, some of the higher elevations received a foot or more of snowfall.
3/2/2010	Snow began to fall around sunrise across the North Carolina mountains along the Blue Ridge escarpment. Snow became moderate to heavy at times during the late morning and early afternoon, resulting in accumulations of 1 to 4 inches across most of the area. Snow, heavy at times, continued into the afternoon across the Blue Ridge, with heavy accumulations realized in most areas by mid-afternoon. By early evening, total snowfall ranged from 3 to 6 inches. Localized snowfall amounts as high as 10 inches occurred, especially in the higher elevations along the escarpment.
11/5/2010	Moist northwest flow resulted in widespread snow showers near the Tennessee line, beginning around mid-morning on the 5th. Snow showers continued off and on across the higher elevations of the Smokies, Newfound Mountains and surrounding areas through the day. By early afternoon, 3 to 5 inches had accumulated above 3500 feet. By the morning of the 6th, some areas had as much as 8 inches. While periods of snow showers, flurries, and rain mixed with snow were reported in the valleys, little or no accumulation occurred below 3500 feet.
12/12/2010	Light snow began falling over the northern mountains and Madison County during the early morning hours of the 12th. By mid-morning, accumulations of 1 to 3 inches were observed across the area. After a strong cold front swept through the mountains, northwest winds resulted in development of numerous snow showers by early afternoon. By mid-evening, snowfall totals ranged from 1 to 5 inches across the area.||As snow showers continued in the northwest flow, snow continued to gradually accumulate in the higher elevations along the Tennessee border. By the time the snow tapered off early on the 14th, accumulations generally ranged from 4 to 8 inches in the higher elevations, generally above 3500 feet, although some areas saw as much as 20 inches. The lower elevations saw considerably lower amounts, generally in the 2-5 inch range. Very windy conditions and very cold temperatures resulted in wind chill values below 0 in many areas during the overnight and early morning hours.
12/25/2010	A developing coastal storm system brought light to moderate snow, with occasional heavy bursts to the northern mountains beginning shortly after sunrise on Christmas. Snow, heavy at times, continued through the afternoon across the northern mountains and surrounding areas. By Christmas evening, most locations had 3 to 6 inches of fresh snowpack. A brief lull in snowfall occurred overnight. However, snowfall began to increase again during the morning of the 26th, as strong northwest flow resulted in development of numerous snow showers along the Tennessee border. The snow showers continued until the afternoon of the 27th. This resulted in additional accumulations that ranged from 2 to 6 inches in the valleys to a foot or more in the higher elevations. Very gusty winds and cold temperatures resulted in wind chill values less than 0 and considerable blowing and drifting of snow, especially in the high elevations.

Date	Description
1/7/2011	Light to moderate snow developed ahead of a cold front across the western mountains of North Carolina around noon, and continued through the afternoon. After the cold front passed during the early evening, snow showers, some of which were heavy developed within a moist northwest flow, adding to accumulations across the Tennesse border counties. Snow showers continued into the overnight and through much of the 8th before tapering off during the evening and the early morning hours of the 9th. Total accumulations were highly variable across the area and depended largely upon terrain. Storm total amounts ranged from 3 to 5 inches in the southwest mountain valleys, to 4 to 8 inches in the lower French Broad Valley and the northern mountain valleys. The high elevations along the state line received as much as 2 feet.
1/10/2011	Moderate to heavy snow associated with a Gulf Coast storm system spread from south to north across the mountains of western North Carolina during the nighttime hours. Heavy snow accumulations of up to 4 inches were reported over the southern mountains by as early as 4 am. Heavy snow accumulations were not reported over the northern mountains until mid-morning. The snow became lighter around sunrise, but continued to accumulate through the morning. By early afternoon, snowfall totals ranged from 7 to 10 inches over the southern and central mountains and 3 to 6 inches over the northern mountains. During early afternoon, precipitation changed to light freezing rain and continued into the evening hours. This added as much as a tenth of an inch of ice to the heavy snowfall totals. Persistent cold temperatures ensured that many roads remained snow-packed or ice covered for several days. Some schools and businesses remained closed for as much as 5 days.
2/11/2012	Snow showers developed over much of the North Carolina mountains during the early morning hours, and continued throughout the day. Snow showers continued off and on across the Tennessee border counties during the evening and early part of the overnight. Total accumulations ranged from a couple of inches in the lower valleys, to as much as 8 inches in the higher elevations of the Newfound Mountains and northern mountains.
10/29/2012	As ï¿½ï¿½ï¿½Superstorm Sandyï¿½ï¿½ï¿½ï¿½ moved across New England and stalled over the northern Mid-Atlantic region, abundant moisture was transported into the mountains. The first snow showers of the season developed within this moist northwest flow across the northern mountains of North Carolina during the pre-dawn hours of the 29th. Snow showers, some heavy continued through the day and overnight, and by the pre-dawn hours of the 30th, heavy snowfall accumulations were observed, mainly across the higher elevations of the northern mountains and Madison County. By the time the snow showers tapered off during the early morning hours of the 31st, 1 to 3 feet of snow was reported in the high elevations (above 4000 feet or so), with the heaviest amounts occurring at the peaks along the Tennessee border. Meanwhile, the lower valleys saw storm totals of only a few inches.
2/2/2013	Snow developed across Madison and Yancey counties during the early evening and continued off and on through the morning of the 3rd. By the late morning, heavy snowfall accumulations were reported in many locations. Snow showers, heavy at times continued through much of the 3rd before tapering off by during the evening. Total accumulations ranged from 3-5 inches in most valley locations to as much as a foot in the higher elevations.
11/26/2013	As cold air spilled into the North Carolina mountains in the wake of an arctic cold front, rain quickly changed to snow after midnight. Periods of moderate and briefly heavy snow were reported. Northwest flow snow showers continued across the higher elevations of the Newfound Mountains and northern Smokies through the day. While most lower valley areas saw total accumulations of less than a couple of inches, 3-6 inches fell above about 3500 feet. However, accurate accumulations were difficult to report owing to wind gusts up to 50 mph causing considerable blowing and drifting snow.
1/21/2014	Widespread snow showers developed along the Tennessee border along and immediately behind a cold front during the late morning and continued through the evening hours across the Tennessee border counties. Heavy snowfall accumulations were realized in the favored northwest flow locations by late evening. Total accumulations ranged from 3 to 6 inches across much of the area, although the valleys southwest of the French Broad generally saw less. Locally higher amounts up to 10 inches were observed in the high elevations of the northern mountains.

Date	Description
11/1/2014	Precipitation associated with a strong upper level disturbance and associated strong cold front changed to snow at the highest peaks and ridge tops by early evening Halloween evening, with snow levels dropping rapidly to the valley floors by the end of the evening as an arctic air mass infiltrated the region behind the front. By the pre-dawn hours of the 1st, snow accumulation ranged from a dusting to a couple of inches on the valley floors, to a foot or more in the high elevations along the Tennessee border. Snow became more showery and sporadic in nature during the morning of the 1st, especially across the valleys, but not before heavy snowfall totals were reached within much of the Tennessee border counties. 2-6 inches of snowfall accumulated across many valley areas by daybreak. Meanwhile, snow showers, heavy at times continued across the high elevations into early afternoon. Total accumulations of 1-2 feet were reported in locations above 4000 feet along the state line, mainly across the Smokies and the Newfound Mountains.
1/22/2016	An area of low pressure spread light snow into the mountains and foothills of North Carolina by around midnight on the 22nd. The snow continued through the early morning hours, gradually increasing in intensity. By mid-morning, amounts ranged from 2-4 inches across the foothills to 3-5 inches across the mountains, with locally higher amounts, especially in the high elevations near the Blue Ridge. Road conditions deteriorated quickly around sunrise, resulting in many traffic accidents. Moderate to heavy snow continued into the afternoon, gradually tapering off during the evening. The snow briefly changed to sleet before ending across the foothills. By the time the snow tapered off, accumulations ranged from 4-8 inches across the low elevations of the foothills, to 8-14 inches across the mountains. Locally higher amounts occurred, especially on the high peaks near the Blue Ridge, where several feet were reported.
1/6/2017	As an area of surface low pressure moved northeast along the Gulf and Southeast coasts, moisture overspread the southern Appalachians throughout the 6th. Although the precip may have started as rain in the lower valleys, it primarily fell as snow. It was initially light in most areas, but became heavy during mid-to-late evening, continuing into the overnight. By the time the heavier snowfall rates tapered off around sunrise, total accumulations ranged from 5 to 7 inches. Locally higher amounts of as much as 10 were observed across the higher elevations of the foothills counties.
12/8/2018	Snow developed across northwest North Carolina around midnight the morning of the 9th, and began accumulating quickly. Moderate to heavy snow continued through the morning of the 9th before tapering off during the early afternoon. Storm total accumulations were generally in the 10 to 15-inch range, with slightly lower amounts south of I-40, and locally higher amounts across the mountains, particularly the high peaks along the Blue Ridge, where more than two feet fell. Travel was paralyzed across this area for a couple of days.

TABLE H.7: HIGH WIND EVENTS (2000-2019)

Date	MPH	Description
Buncombe County		
1/13/2000	52	Strong and damaging northwest winds behind a strong cold front, gusted to 60 mph or more. Many trees and power lines were blown down which resulted in power outages for some mountain residents. The highest winds in the foothills occurred near the Blue Ridge Parkway.
3/19/2000	55	High gradient winds blowing from the south knocked down numerous trees and power lines across the mountains. Only light structural damage occurred, except in Avery county. Roofs were blown off several houses around Banner Elk, Beech Mountain police reported the door of their office was nearly blown off, and there was an unofficial measurement of a 135-mph wind gust on Beech Mountain. The highest winds occurred between 11 pm and 4 am.
3/28/2000	50	High winds following a cold front caused a number of problems during the afternoon. Numerous trees and power lines were downed and some light structural damage occurred. Several thousand people were without power for a while too. A man was injured when a wall toppled over onto him in Concord. Streets were blocked by the downed trees and power lines in Charlotte.
4/8/2000	50	High winds following a cold front blew down a number of trees and power lines. Scattered power outages occurred as well.
12/16/2000	55	

Date	MPH	Description
3/6/2001	55	
3/20/2001	55	
7/4/2001	40	Mesoscale high wind event developed behind a line of strong to severe thunderstorms. Numerous trees were blown down countywide during a time of persistent 30 to 40 mph winds. Later, an off-duty weather observer estimated wind gusts of between 40 and 50 mph.
10/13/2001	50	A strong pressure gradient developed across the mountains as a cold front crossed the region, followed by strong cold advection into the mountains. A 50-knot low level jet contributed to the high winds, the effects of which were enhanced by valley channeling.
11/24/2001	50	A marginal high wind event developed, with most mountain counties reporting winds below damaging levels., However, in these 4 zones, winds gusted to a high enough level to cause scattered trees to be downed, with some power outages resulting.
11/29/2001	50	
2/4/2002	50	High winds starting picking up during the late morning, and by noon reached damaging levels in some areas. Scattered to numerous trees and power lines were blown down, depending on the county. Some structural damage resulted - mostly from trees falling on vehicles and buildings. After a brief respite around sunset, the wind picked up again to damaging levels during mid and late evening.
9/27/2002	50	Winds associated with Isidore increased in the early morning hours across the North Carolina mountains, resulting in more widespread damage to trees and power lines. Widespread power outages were reported. Numerous roads were blocked by fallen trees, and a church tent was blown down and destroyed in Brevard.
11/6/2002	50	High winds behind a cold front caused numerous trees to fall across portions of the mountains and foothills of North Carolina.
11/30/2002	50	Numerous trees and large tree limbs were blown down. Power outages were also reported.
12/13/2002	65	Damaging winds were caused by a gravity wave as it propagated out of upstate South Carolina, and across the southern mountains and foothills of North Carolina. Numerous trees and power lines were blown down, and roads and highways were blocked in Asheville and Hendersonville. Power outages lasted for much of the day across portions of Buncombe County.
12/25/2002	50	Very strong winds developed during the late morning across the mountains and foothills. Wind gusts reached an estimated 60 to 75 mph across the higher elevations. Damage to trees and power lines was widespread, and power outages were numerous. Some trees fell on vehicles and structures.
1/23/2003	60	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.
2/23/2003	50	A number of trees were blown down, especially in Asheville.
10/14/2003	50	High winds developed just ahead of and behind a cold front across the mountains and foothills of North Carolina. Numerous trees and power lines were blown down.
11/13/2003	50	High winds developed behind a cold front across the mountains and foothills of North Carolina. Sustained winds of 40 mph developed during the pre-dawn hours, and persisted for much of the day, especially in the highest elevations. Numerous trees were blown down. Along the Blue Ridge Parkway in Buncombe County, the Craggy Gardens visitors' center was heavily damaged.
11/18/2003	50	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 occured in these counties.
3/7/2004	50	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.

Date	MPH	Description
7/5/2004	55	A small area of high winds developed across the mountains and the higher terrain of the foothills in the wake of a thunderstorm complex. Numerous trees and power lines were blown down.
9/16/2004	55	High winds developed across the mountains, as the remants of Hurricane Ivan moved just west of the area. Locations near the southern exposure of the Blue Ridge were the hardest hit, with major damage occurring in and around Highlands, Cashiers, Brevard, and southern Henderson County. Thousands of trees were blown down, including 90,000 apple trees in Henderson County. Numerous trees fell on structures and vehicles. A 55-year-old man was killed shortly after midnight near Hendersonville, when a tree fell through his house. Hundreds of structures in Henderson County were damaged by fallen trees and debris. A woman in Highlands was injured when a tree limb hit her in the head.
9/17/2004	50	As the remnants of Ivan retreated toward the mid-Atlantic region, high pressure building in behind the circulation caused a resurgence of strong winds across the mountains and foothills. This resulted in additional tree and power line damage.
1/22/2005	60	High winds developed across the mountains behind a strong cold front that swept through the region during the evening. Numerous trees were blown down. There were scattered power outages throughout the mountains.
1/22/2005	60	High winds developed across the mountains behind a strong cold front that swept through the region during the evening. Numerous trees were blown down. There were scattered power outages throughout the mountains.
3/8/2005	60	High winds developed across portions of the mountains during the morning, mainly from the French Broad Valley north. Trees and power lines were blown down, resulting in some power outages. Several gusts were measured in the 60-70 mph range by home weather equipment. The most significant winds/damage occurred around Black Mountain.
3/8/2005	60	High winds developed across portions of the mountains during the morning, mainly from the French Broad Valley north. Trees and power lines were blown down, resulting in some power outages. Several gusts were measured in the 60-70 mph range by home weather equipment. The most significant winds/damage occurred around Black Mountain.
4/2/2005	60	High winds developed across the mountains and foothills during the evening, and continued through the overnight hours before subsiding during the late morning of the 3rd. Numerous trees, power poles, and power lines were blown down, resulting in fairly widespread power outages. The northern foothill counties appeared to the the hardest hit. In McDowell County, several homes and vehicles were damaged by falling trees. In Caldwell County, the roof of the County office building was damaged in Lenoir, and at least two homes were damaged by falling trees in the northern part of the county.
1/14/2006	60	Strong winds developed behind a cold front across the mountains and foothills of North Carolina during the late morning, and continued through the remainder of the day. There was widespread damage to trees and power lines, with quite a few power outages. The hardest hit areas were along and near the Blue Ridge south of I-40. There were tens of thousands of power outages, 14,000 in Henderson County alone. The area around Lake Lure was especially hard hit, with numerous trees and lines down.
1/25/2006	55	High winds developed across the mountains and the foothills during the overnight hours, and continued through about mid-morning. The hardest hit areas were locations along and near the Blue Ridge from I-40 north, and Jackson county in North Carolina. In Avery County, a steeple was blown off of a church. Scattered to widespread tree damage occurred, with quite a few power outages, mainly concentrated along the I-40 corridor from Black Mountain to Old Fort.
11/15/2006	50	Strong southerly winds developed ahead of a cold front, blowing down numerous trees and power lines across portions of the central and southern mountains during the evening and overnight hours on the 15th and 16th.
4/15/2007	70	Very strong winds developed in areas along and near the Blue Ridge during the early evening of the 15th, and continued through the early morning hours of the 16th. A 66-mph gust was recorded at Asheville Regional Airport during the evening. However, winds likely gusted to 70-80 mph at times in

Date	MPH	Description
		other areas. Widespread damage occurred to trees and power lines, with widespread power outages reported. Some trees fell on homes, vehicles, and roads. Three injuries occurred in the Hendersonville area due to the wind: a tree fell on a mobile home in Hendersonville, injuring two occupants. Also, a utility worker was injured when high winds knocked him from the power pole he was working on.
4/16/2007	65	After abating somewhat in the early morning hours, there was a resurgence in damaging winds across the Blue Ridge Mountains and surrounding areas during the daylight hours. Thousands of trees and numerous power lines fell across the area, with many trees falling on roads and damaging homes and vehicles. A 59-year-old man was killed when the vehicle he was driving on Turnpike Rd near Mills River was crushed by a fallen tree. In Saluda, a 75-year-old man was critically injured when a tree fell on his car. He died several days later. A utility worker was also seriously injured in in the Hickory Grove area of Polk County, when a falling tree pinned him to his vehicle. At the height of the event, about 30,000 customers were without power in Henderson County alone, with power outages numbering in the hundreds of thousands across the area as a whole. Some customers remained without power until the 19th.
2/10/2008	55	As the polar vortex dropped into New England, an unusually tight gradient developed over the western Carolinas and Northeast Georgia. This gradient, combined with afternoon heating, helped to mix down areas of strong winds. Areas along and east of the Blue Ridge were hardest hit, with numerous trees reported down, some across roads and on homes. The gusty winds combined with ongoing drought conditions to produce numerous brush fires across the area during the afternoon.
5/11/2008	60	Strong winds developed behind a cold front over the North Carolina mountains. Numerous trees and power lines were blown down across the region. Several structures were damaged by fallen trees. Twenty-two homes were damaged by fallen trees in the town of Lake Lure in Rutherford County alone.
12/31/2008	50	High winds developed near the Blue Ridge around sunrise, peaking in the mid to late morning, before tapering off during the afternoon. Numerous trees and power lines were blown down, with some scattered power outages.
12/9/2009	55	After a period of heavy rain that left the ground saturated, strong winds developed behind a cold front during the late morning hours over the North Carolina mountains. The combination of very windy conditions and wet ground resulted in numerous fallen trees, which brought down power lines and damaged homes and cars.
10/29/2012	50	As superstorm Sandy approached the northeast coast, strong northwest winds developed across the North Carolina mountains during the early morning of the 29th and continued throughout the day. The strongest winds developed across the upper French Broad Valley and the Green River Gorge area, where numerous trees fell during the day.
12/21/2012	55	Although gusty northwest winds were observed across much of the mountains beginning during the evening of the 20th, with a few trees blown down through the morning of the 21st, stronger winds developed during the afternoon of the 21st. A scattering of downed trees occurred through the afternoon, with a few power outages reported. However, the strongest winds occurred during the overnight hours. Numerous trees were blown down on the night of the 21st and early on the 22nd, with most of the damage occurring within a few miles of the Blue Ridge escarpment. Multiple trees fell on structures, especially in Buncombe and Henderson counties. Trees falling on power lines also resulted in quite a few power outages.
1/30/2013	50	Strong winds over the mountains became damaging near the eastern Blue Ridge during the afternoon, as a line of weakening rain showers moved across the area. Multiple trees and large limbs were blown down in a short period of time.
3/29/2014	56	Strong northwest winds developed across the mountains and portions of the foothills behind a cold front late on the 29th, with the strongest winds affecting locations along and near the eastern escarpment of the Blue Ridge. The winds gusted to over 60 mph at times (a peak gust of 62 mph was measured by the ASOS at the Asheville Regional Airport at around 730 AM). Gusts in excess of 80 mph likely occurred across the higher elevations. Numerous trees were blown down in these areas.

Date	MPH	Description
		Sporadic minor damage was reported to roofs across the area and a downed power lines resulted in scattered power outages, especially across the mid/upper French Broad Valley and surrounding locations. A few trees fell on homes as well. The strong winds continued through much of the 30th before tapering off by mid-evening.
4/2/2016	50	Strong northwest winds developed across the mountains and northern foothills in the wake of an arctic cold front around midnight and continued through the overnight hours. Numerous trees were blown down across the area, along with some power lines. One tree fell on a camping trailer in Steele Creek Park in northwest Burke County, resulting in injury to an occupant. Another tree fell on a car in the Lake Lure area of Rutherford County.
9/11/2017	50	As Tropical Storm Irma moved north/northwest across the Florida Panhandle and southwest Georgia, strong winds developed over the mountains of southwest North Carolina. Although gusts only occasionally exceeded 50 mph in most locations, the prolonged nature of the event, combined with saturated soils resulting from heavy rainfall resulted in many trees falling on roads, power lines, vehicles, and structures. Many were without power for a day or more. While the most significant damage was confined to these areas, there were also reports of significant tree damage across much of the remainder of the North Carolina mountains above 4000 feet or so, where winds likely gusted in excess of 60 mph fairly frequently.
3/2/2018	50	As low pressure strengthened rapidly off the Mid-Atlantic and Northeast coast, strong northwest winds developed across the North Carolina mountains early on the 2nd, with the most intense winds observed from around sunrise into the early afternoon. Numerous trees were blown down across the area, with quite a few power outages reported. Some sporadic structural damage occurred, mainly due to falling trees and large limbs.
1/20/2019	50	Northwest winds in the wake of a strong cold front increased after sunrise and became damaging across the middle French Broad Valley and across the higher elevations of Rutherford and McDowell counties. Numerous trees and power lines were blown down in this area, with some minor structural damage also reported. The winds began to diminish during the afternoon.
Madison County		
3/19/2000	55	High gradient winds blowing from the south knocked down numerous trees and power lines across the mountains. Only light structural damage occurred, except in Avery county. Roofs were blown off several houses around Banner Elk, Beech Mountain police reported the door of their office was nearly blown off, and there was an unofficial measurement of a 135 mph wind gust on Beech Mountain. The highest winds occurred between 11 pm and 4 am.
12/16/2000	55	
3/6/2001	55	
10/13/2001	50	The wind began blowing hard around midnight, causing numerous trees to fall. Widespread power outages occurred in some cases.
11/29/2001	50	
2/4/2002	50	High winds starting picking up during the late morning, and by noon reached damaging levels in some areas. Scattered to numerous trees and power lines were blown down, depending on the county. Some structural damage resulted - mostly from trees falling on vehicles and buildings. After a brief respite around sunset, the wind picked up again to damaging levels during mid and late evening.
9/27/2002	50	Winds associated with Isidore increased in the early morning hours across the North Carolina mountains, resulting in more widespread damage to trees and power lines. Widespread power outages were reported. Numerous roads were blocked by fallen trees, and a church tent was blown down and destroyed in Brevard.
11/30/2002	50	Numerous trees and large tree limbs were blown down. Power outages were also reported.
12/25/2002	50	Very strong winds developed during the late morning across the mountains and foothills. Wind gusts reached an estimated 60 to 75 mph across the higher elevations. Damage to trees and power lines was widespread, and power outages were numerous. Some trees fell on vehicles and structures.

Date	MPH	Description
1/23/2003	60	High winds resulted in numerous trees and power lines being blown down across the mountains and foothills. In Mars Hill, the roof of a store was badly damaged. In Columbus, store signs were blown out.
10/14/2003	50	High winds developed just ahead of and behind a cold front across the mountains and foothills of North Carolina. Numerous trees and power lines were blown down.
11/13/2003	50	High winds developed behind a cold front across the mountains and foothills of North Carolina. Sustained winds of 40 mph developed during the pre-dawn hours, and persisted for much of the day, especially in the highest elevations. Numerous trees were blown down. Along the Blue Ridge Parkway in Buncombe County, the Craggy Gardens visitors' center was heavily damaged.
11/18/2003	50	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.
3/7/2004	50	Strong winds developed across the mountains just ahead of and along a strong cold front. Numerous trees and power lines were blown down. Weak thunderstorms may have contributed to the high winds across the northern mountains, but damage extended to areas far away from those affected by the storms.
7/5/2004	55	A small area of high winds developed across the mountains and the higher terrain of the foothills in the wake of a thunderstorm complex. Numerous trees and power lines were blown down.
9/16/2004	55	High winds developed across the mountains, as the remnants of Hurricane Ivan moved just west of the area. Locations near the southern exposure of the Blue Ridge were the hardest hit, with major damage occurring in and around Highlands, Cashiers, Brevard, and southern Henderson County. Thousands of trees were blown down, including 90,000 apple trees in Henderson County. Numerous trees fell on structures and vehicles. A 55-year-old man was killed shortly after midnight near Hendersonville, when a tree fell through his house. Hundreds of structures in Henderson County were damaged by fallen trees and debris. A woman in Highlands was injured when a tree limb hit her in the head.
9/17/2004	50	As the remnants of Ivan retreated toward the mid-Atlantic region, high pressure building in behind the circulation caused a resurgence of strong winds across the mountains and foothills. This resulted in additional tree and power line damage.
12/1/2004	50	The counties reported damage from high winds, mainly trees and power lines, with some structural damage possible, mainly from falling trees.
12/23/2004	50	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.
1/22/2005	60	High winds developed across the mountains behind a strong cold front that swept through the region during the evening. Numerous trees were blown down. There were scattered power outages throughout the mountains.
1/22/2005	60	High winds developed across the mountains behind a strong cold front that swept through the region during the evening. Numerous trees were blown down. There were scattered power outages throughout the mountains.
3/8/2005	60	High winds developed across portions of the mountains during the morning, mainly from the French Broad Valley north. Trees and power lines were blown down, resulting in some power outages. Several gusts were measured in the 60-70 mph range by home weather equipment. The most significant winds/damage occurred around Black Mountain.
3/8/2005	60	High winds developed across portions of the mountains during the morning, mainly from the French Broad Valley north. Trees and power lines were blown down, resulting in some power outages. Several gusts were measured in the 60-70 mph range by home weather equipment. The most significant winds/damage occurred around Black Mountain.
2/7/2007	55	A brief period of high wind gusts knocked down trees and power lines in the Marshall area. Wind equipment in the 7 Mile Ridge area measured a peak wind gust of 63 mph.

Date	MPH	Description
4/15/2007	55	Strong winds developed behind a cold front during the evening hours of the 15th. Numerous trees and power lines were blown down across the area. However, damage was much more widespread toward the Blue Ridge.
4/16/2007	60	After an intense, but relatively brief high wind event affected the mountains and foothills on the evening of the 15th, another widespread damaging high wind event developed during the day of the 16th. However, this particular event included much of the piedmont. Thousands of trees fell across the area, resulting in widespread power outages. Numerous trees fell on roads, homes, and vehicles. The Blue Ridge mountains and the foothills received the brunt of the strongest winds. In Highlands, NC, two homes were heavily damaged by fallen trees, while approximately 100 homes received minor to moderate damage. A tree fell on and severely damaged a home in Otto, NC. Two businesses received significant roof damage in Cashiers, NC. Three construction workers were injured in Mount Holly when an inflatable structure collapsed at a constructions site. Five homes were damaged by fallen trees in Lincoln County, NC alone. Three homes were damaged in Iredell County and in In Catawba County, a 30-foot brick wall on top of a building in Newton was blown down, while sections of a metal roof were torn off a business in Viewmont.
2/10/2008	55	As the polar vortex dropped into New England, an unusually tight gradient developed over the western Carolinas and Northeast Georgia. This gradient, combined with afternoon heating, helped to mix down areas of strong winds. Areas along and east of the Blue Ridge were hardest hit, with numerous trees reported down, some across roads and on homes. The gusty winds combined with ongoing drought conditions to produce numerous brush fires across the area during the afternoon.
5/11/2008	60	Strong winds developed behind a cold front over the North Carolina mountains. Numerous trees and power lines were blown down across the region. Several structures were damaged by fallen trees. Twenty-two homes were damaged by fallen trees in the town of Lake Lure in Rutherford County alone.
12/9/2009	55	After a period of heavy rain that left the ground saturated, strong winds developed behind a cold front during the late morning hours over the North Carolina mountains. The combination of very windy conditions and wet ground resulted in numerous fallen trees, which brought down power lines and damaged homes and cars.
1/30/2013	50	Strong winds over the mountains became damaging near the eastern Blue Ridge during the afternoon, as a line of weakening rain showers moved across the area. Multiple trees and large limbs were blown down in a short period of time.

TABLE H.8: ICE STORM EVENTS (2000-2019)

Date	Description
	Buncombe County
1/29/2000	Weakening low pressure in the Ohio River Valley, developing low pressure along the Gulf Coast and cold, arctic air in place across the Carolinas resulted in a wintry mess across western North Carolina. This was the last in a series of 5 winter storms that wreaked havoc on western North Carolina in an 11 day span. The ice storm in the mountains consisted mainly of a couple inches of sleet. However, the combined accumulation of the mixture of sleet and snow was generally 2 to 3 inches. Some freezing rain mixed in during the morning of the 30th. Across the foothills and piedmont, precipitation which briefly began as some light sleet and snow, turned quickly to freezing rain. The freezing rain was heavy enough across the southern piedmont, including the Charlotte area, to result in a 1/4 to 1/2 inch glaze. Scattered power outages resulted, with Gaston county reporting 2500 people without power. The entire Duke Power system reported 77,000 people without power.
12/15/2005	Ice accretion began to cause damage across the southern mountains and foothills of North Carolina just prior to sunrise. By late morning, the ice storm had become quite serious, as thousands of trees fell across the area, and power outages were widespread. Numerous trees and large limbs fell on and damaged homes and vehicles. It was estimated that three-quarters of Henderson County residents lost power. Most who lost power were without it for at least 24 hours. In some areas, it took as much as 5 days to restore electricity.

Date	Description
	Despite the devastation, road problems were few and far between, as temperatures hovered right around freezing for most of the event. Duke Power estimated costs for overtime and line repair at 72 million dollars for the event, though these costs are not reflected in the property damage values for the event above. In Henderson County, 2 deaths (indirect) occurred as a result of the ice storm. A woman died of carbon monoxide poisoning after running a generator in a garage. A man died of carbon monoxide poisoning due to a malfunctioning gas stove.
12/15/2005	Ice accretion began to cause damage across the southern mountains and foothills of North Carolina just prior to sunrise. By late morning, the ice storm had become quite serious, as thousands of trees fell across the area, and power outages were widespread. Numerous trees and large limbs fell on and damaged homes and vehicles. It was estimated that three-quarters of Henderson County residents lost power. Most who lost power were without it for at least 24 hours. In some areas, it took as much as 5 days to restore electricity. Despite the devastation, road problems were few and far between, as temperatures hovered right around freezing for most of the event. Duke Power estimated costs for overtime and line repair at 72 million dollars for the event, though these costs are not reflected in the property damage values for the event above. In Henderson County, 2 deaths (indirect) occurred as a result of the ice storm. A woman died of carbon monoxide poisoning after running a generator in a garage. A man died of carbon monoxide poisoning due to a malfunctioning gas stove.
2/1/2008	Freezing rain continued through the early morning hours of the 1st in areas along the Blue Ridge. Ice accumulations of up to 1/2 inch occurred, resulting to significant damage to trees and power lines. Power outages were widespread from Brevard to Hendersonville. Sleet mixed in with the freezing rain, resulting in up to 2 inches of sleet accumulation in the Northern Mountains. Precipitation actually began during the evening of January 31st, but ice storm criteria were not met until the early morning hours of February 1st.
12/24/2009	Light freezing rain developed late on Christmas Eve and continued throughout the overnight before becoming heavier shortly before sunrise. Light ice accretion occurred, mainly on elevated surfaces during this time. Quite a few slick spots also developed, mainly on bridges and overpasses. Freezing rain continued through the morning hours along the eastern escarpment of the Blue Ridge, and became heavy at times by mid-morning. By the time the precipitation tapered off, ice accretion ranged from .25 to .5 inch across much of the area. The combination of ice and wind gusts up to 60 mph (with gusts up to 80 mph in the higher elevations) caused numerous trees and power lines to fall. The resultant widespread power outages exacerbated the problems for areas that had yet to recover from the December 18th snowstorm.
2/26/2013	Rain and freezing rain began across the southern mountains shortly after midnight and continued through the pre-dawn hours. Many locations saw mainly rain. However, cold air locked in near the escarpment resulted in an all-freezing rain event there. By the time temperatures warmed above freezing during late morning, up to a half inch of ice had accumulated within a few miles of the continental divide. Meanwhile, locations farther away from the Blue Ridge saw only trace amounts of ice. There were scattered downed trees and power lines, resulting in quite a number of power outages, especially in McDowell and Henderson counties.
1/12/2019	Moist air flowing over a wedge of cold air banked against the eastern slopes of the Appalachians resulted in precipitation development across the Blue Ridge and surrounding areas beginning during the evening of the 12th. The atmosphere quickly cooled to or below freezing near the escarpment and out across the lower elevations of the foothills and far northwest Piedmont. This resulted in much of the precipitation falling as freezing rain in these areas. The freezing rain continued through the overnight across the Blue Ridge and surrounding areas before tapering off around daybreak on the 13th. Total ice accretion of one quarter to one half inch was reported, with the heaviest amounts being across the foothills and immediately along the Blue Ridge escarpment. Scattered downed trees and power outages were reported throughout the area.
Madison County	
1/29/2000	Weakening low pressure in the Ohio River Valley, developing low pressure along the Gulf Coast and cold, arctic air in place across the Carolinas resulted in a wintry mess across western North Carolina. This was the last in a series of 5 winter storms that wreaked havoc on western North Carolina in an 11-day span. The ice storm in the mountains consisted mainly of a couple inches of sleet. However, the combined accumulation of the mixture of sleet and snow was generally 2 to 3 inches. Some freezing rain mixed in during the morning

Date	Description
	of the 30th. Across the foothills and piedmont, precipitation which briefly began as some light sleet and snow, turned quickly to freezing rain. The freezing rain was heavy enough across the southern piedmont, including the Charlotte area, to result in a 1/4 to 1/2-inch glaze. Scattered power outages resulted, with Gaston county reporting 2500 people without power. The entire Duke Power system reported 77,000 people without power.

TABLE H.9: LIGHTNING EVENTS (2000-2019)

Location	Date	Description
Buncombe County		
ENKA	8/18/2000	Lightning struck a nearby tree, ran into a house, and ignited a fire which burned the house and its contents.
ASHEVILLE	6/20/2001	Lightning struck an unoccupied house, causing a fire that resulted in serious damage.
SKYLAND	7/3/2001	Lightning started a fire at a power transformer, destroying the building which was located at a power plant and a car belonging to one of the power plant employees.
BLACK MTN	6/3/2002	Lightning struck the Public Safety building, City Hall, the Fire Station, and 4 residences. One residence suffered a major fire and considerable damage.
WEAVERVILLE	7/12/2003	A man was seriously injured when he was struck by lightning while standing next to a tree at Reems Creek.
ASHEVILLE	7/14/2006	Four people, 3 adults and 1 child, received minor injuries from a lightning strike at the Biltmore Estate.
FAIRVIEW	6/8/2009	A 65-year-old man was struck and killed by lightning on highway 74E just south of Fairview.
AVERY CREEK	2/28/2011	Lightning struck a home on Owenby Lane, igniting a fire.
Madison County		
MARS HILL	7/14/2000	A cluster of severe thunderstorms produced damaging wind and hail close to midnight. Numerous downed trees and power lines were reported along with the usual associated power outages. A lot of hail fell in Weaverville but the size was unknown. Lightning struck a home in Mars Hill, destroying the home and its contents.
MARSHALL	7/2/2002	Lightning ignited a housefire.
JOE	6/4/2010	A 25-year-old woman was struck and killed by lightning while hiking on Max Patch.
JOE	6/4/2010	A 25-year-old woman was struck and killed by lightning while hiking on Max Patch.

TABLE H.10: THUNDERSTORM EVENTS (2000-2019)

Location	Date	MPH	Description
Buncombe County			
FAIRVIEW	5/13/2000	52	Thunderstorms developed in the mountains in the early afternoon with several becoming severe a few hours later. Other severe thunderstorms moved into or developed in the foothills and piedmont during the early evening. Hail up to the size of walnuts and some wind damage occurred in the mountains and foothills. Several trees were blown down near Fairview.
CANDLER	5/25/2000	70	A mesoscale convective system crossed western North Carolina during the morning. Thunderstorms along the leading edge produced winds reported as high as 94 mph in Candler. These winds picked up and a vacant mobile home and blew it into an occupied mobile home, destroying both. There were no injuries. Trees were also blown down. More than an hour later the thunderstorms intensified and became severe over the foothills and western piedmont.
CANDLER	6/3/2000	50	A severe thunderstorm produced damaging winds which blew down power lines and one tree in Candler. Another severe storm produced a considerable amount of dime size hail in the Greenlee community outside of Marion.

Location	Date	MPH	Description
ASHEVILLE, WEAVERVILLE, BLACK MOUNTAIN	6/25/2000	50	Strong to severe thunderstorms developed in the mountains during the early afternoon and rumbled east across the foothills and into the western piedmont by early evening. All of the damage was produced by straight-line winds estimated almost as high as 70 mph that downed trees and power lines. In the Asheville, Biltmore, and Skyland areas 3300 people were left without power. A couple of houses were damaged by falling trees in Weaverville and Barnardsville. Fifteen to twenty trees were downed in Black Mountain - with some on cars. In Union county, sections of a church roof blew off, doors blew out, nails were pulled out the wall, and shingles were blown away. Gusty winds between 40 and 45 mph blew down one tree which landed on and flattened a car near Stony Point. Lightning struck a tree in a picnic area on top of Roan Mountain. A family was shocked as the lightning spread through the adjacent ground and pavement. One man fell back and hit his head on the pavement. He died five days later from a blood clot in his brain. The other five people suffered minor burns, cuts, and bruises.
WEAVERVILLE	7/14/2000	50	A cluster of severe thunderstorms produced damaging wind and hail close to midnight. Numerous downed trees and power lines were reported along with the usual associated power outages. A lot of hail fell in Weaverville but the size was unknown. Lightning struck a home in Mars Hill, destroying the home and its contents.
CANDLER	8/10/2000	60	Numerous trees were blown down across Hwys 19 and 23, as well as on other side roads. A utility building was blown over and a couple of sheriff's department cars were blown off the road.
JUPITER	4/1/2001	55	The first reported wind damage in the episode came from northern Buncombe County. Most of the roof of a house was blown off into the road. The residents reported that all was calm, then rain and wind hit suddenly. The wind flow may have been increased by a funnelling effect through a narrow mountain pass.
CANDLER	5/19/2001	50	Spotter reported two trees blown down in Candler.
SKYLAND	5/19/2001	50	The Emergency Operations Center relayed reports of trees blown across roads at both Skyland and Fairview.
FAIRVIEW	5/19/2001	50	
ASHEVILLE	6/22/2001	55	Numerous reports of quarter-sized to golfball-sized hail in southern Buncombe County, along with several downed trees and power lines. Very heavy rainfall was also associated with this batch of storms, eventually resulting in a classic flash flood at Skyland.
ASHEVILLE	7/3/2001	50	Trees down in the Bent Creek area, blocking Brevard Road for a short time.
SKYLAND	7/8/2001	55	10 trees down between Skyland and the Henderson County line.
ASHEVILLE	7/8/2001	70	Cooperative observer at Flat Top Mountain reported a measured wind gust to 81 mph.
WEAVERVILLE	7/8/2001	50	Numerous trees and power lines blown over.
ASHEVILLE	7/8/2001	65	Power poles were snapped in half and numerous roads were blocked by downed trees. Widespread power outages reported.
LEICESTER	7/8/2001	60	Trees blown down across Interstate 40, six miles west of Asheville. One tree was blown onto a house, and several fell on cars and roofs. Damage was far greater in the western half of Buncombe County than in the eastern half.
LEICESTER	10/25/2001	50	Trees and power lines blown over in the Leicester area, resulting in about 400 power outages.
ASHEVILLE	3/17/2002	50	A few trees were reported blown down.
ASHEVILLE	5/2/2002	51	Measured by ASOS at the Asheville Regional Airport.
SKYLAND	5/2/2002	55	Numerous trees were blown down.

Location	Date	MPH	Description
JUPITER	5/2/2002	55	Several trees were blown down.
COUNTYWIDE	5/13/2002	50	Trees and powerlines were blown down.
LEICESTER	6/4/2002	50	A few trees were blown down.
ASHEVILLE	6/5/2002	50	A few trees were blown down. One tree fell on an automobile, trapping the occupants.
BLACK MTN	6/13/2002	50	Some trees and powerlines were blown down.
ASHEVILLE	7/2/2002	50	Trees were blown down near the intersection of Interstates 26 and 40.
WEAVERVILLE	7/4/2002	50	Several trees were blown down, and one injury resulted from a falling tree.
ASHEVILLE	5/2/2003	50	Numerous trees and power lines were blown down, many of which fell on cars and homes.
LEICESTER	5/2/2003	50	Numerous trees and power lines were blown down.
BLACK MTN	5/2/2003	50	Numerous trees and power lines were blown down.
ARDEN	6/8/2003	50	Several trees were blown down.
WEAVERVILLE	6/15/2003	50	A tree, several large tree limbs, and power lines were blown down
FAIRVIEW	7/12/2003	60	Numerous trees and power lines were blown down.
LEICESTER	7/13/2003	50	
BARNARDSVILLE	7/22/2003	50	Trees were blown down.
ARDEN	8/1/2003	50	Several trees were blown down. One tree fell on a mobile home.
ENKA	8/4/2003	60	Numerous trees and power lines were blown down. Part of the tin roof was blown off of an auto shop. Part of the roof was blown off of a warehouse, causing a wall to collapse. Numerous power outages were reported in areas from Asheville to Black Mountain.
WEAVERVILLE	8/4/2003	50	Several trees were blown down. Widespread power outages were reported across much of the northern portion of the county. Hail up to the size of pennies also covered the ground in portions of Weaverville.
CANDLER	5/22/2004	50	A large tree was blown down onto an automobile, crushing the vehicle.
LEICESTER	5/31/2004	50	Some trees were blown down.
LEICESTER	6/12/2004	60	Numerous trees were blown down in the Sandymush area. The roof was blown off a mobile home.
LEICESTER	7/5/2004	50	Several trees were blown down.
ASHEVILLE	8/11/2004	52	
COUNTYWIDE	5/20/2005	50	Wind blew down 3 trees at scattered locations across the county.
COUNTYWIDE	5/20/2005	50	Wind blew down 3 trees at scattered locations across the county.
ASHEVILLE	7/27/2005	50	Several trees down in town.
ASHEVILLE	7/27/2005	50	Several trees down in town.
ENKA	5/20/2006	50	Several trees blown down in the Enka area.
CANDLER	5/30/2006	50	Several trees blown down.
ASHEVILLE	6/11/2006	55	Numerous trees down southeast of Asheville.
ASHEVILLE	6/11/2006	50	Part of a fallen tree fell on a house southwest of Asheville, while another tree leaned into power lines southeast of Asheville.
CANDLER	7/4/2006	50	Trees down in the Beaverdam community.
ASHEVILLE	8/10/2006	60	Numerous trees blown down near the Madison County line. Also, penny size hail in Weaverville around this time.
ASHEVILLE	6/15/2007	50	A tree fell on power lines in south Asheville, causing widespread power outages in the Kenilworth Rd area.
BLACK MTN	6/26/2007	50	Three large tree limbs blown down.
ASHEVILLE	6/28/2007	50	Several trees blown down near the intersection of North Bear Creek Rd and Old Country Home Rd.

Location	Date	MPH	Description
SKYLAND	7/19/2007	50	Three trees blown down.
ASHEVILLE	7/27/2007	50	Four trees blown down.
WOODFIN	8/21/2007	50	A couple of trees blown down.
LEICESTER	1/30/2008	50	A few trees were blown down between Leicester and Enka.
ASHEVILLE	3/4/2008	50	Quite a few trees blown down around the county, with a few blocking roads.
OAKLEY	5/3/2009	75	Numerous trees were blown down on the east side of Asheville and some buildings suffered roof damage. Damage was most concentrated in the area around Glendale Ave and Swannanoa River Rd. These roads and several side streets were closed due to falling trees. In addition, large tree limbs were blown down on I-240 near Fairview Rd and on Tunnel Rd.
FAIRVIEW	6/8/2009	50	Two trees were blown down near the intersection of Upper Brush Creek Rd and highway 74.
LEICESTER	6/11/2009	50	A few trees were blown down from Leicester to Woodfin to the west side of Asheville.
FORKS OF IVY	6/16/2009	50	Large trees were blown down on Locust Grove Rd.
LEICESTER	6/17/2009	50	Trees were blown down on Bear Creek Rd and Newfound Rd.
ASHEVILLE AIRPARK AR	6/18/2009	55	Numerous trees were blown down across West Asheville. A tree fell on a home on State St. Other affected streets included Louisiana Ave and Frances St.
ROYAL PINES	7/28/2009	50	Trees were blown down in the Concord Mountain area.
ROYAL PINES	7/28/2009	50	Trees were blown down on Mills Gap road a little east of Skyland.
ROCKVIEW	8/5/2009	50	Several large tree limbs and at least one tree were blown down.
FAIRVIEW	8/5/2009	50	Three trees were blown down around Fairview.
BEVERLY HILLS	6/21/2010	55	Trees and power lines were blown down across the city.
BEVERLY HILLS	6/21/2010	55	Trees and power lines were blown down across the city.
JUGTOWN	7/20/2010	50	Several large tree limbs were blown down.
JUGTOWN	7/20/2010	50	Several large tree limbs were blown down.
ROYAL PINES	7/25/2010	50	Several trees were blown down in the Skyland area.
ROYAL PINES	7/25/2010	50	Several trees were blown down in the Skyland area.
MIDWAY	8/5/2010	50	Large tree limbs were blown down on Christ School Rd.
MIDWAY	8/5/2010	50	Large tree limbs were blown down on Christ School Rd.
BINGHAM HGTS	8/5/2010	55	Multiple trees were blown down on Adams Hill Rd, on the northwest side of Asheville. Some trees fell on vehicles.
BINGHAM HGTS	8/5/2010	55	Multiple trees were blown down on Adams Hill Rd, on the northwest side of Asheville. Some trees fell on vehicles.
MURPHY JCT	4/4/2011	50	Two trees were blown down near the intersection of I-26 and I-240. Other trees were blown down in the Asheville area, including on Wanoca Ave on the southeast side of town.
SWANNANOA	5/3/2011	60	Numerous trees and large limbs were blown down in the Swannanoa area and around Black Mountain. Some trees fell on and blocked roads in Black Mountain. Two people received minor injuries near Black Mountain due to falling trees, one on Goldmont Rd and the other on Old Toll Rd. A couple of small structures also received damage due to falling trees.
BOSWELL	6/8/2011	50	Large tree limbs were blown down on the west side of Asheville.
BEVERLY HILLS	6/9/2011	50	A few trees were blown down on the east side of Asheville, with one tree causing minor damage to a home.
FLAT CREEK	6/10/2011	50	At least two trees were blown down about 3 miles north of Weaverville.
SKYLAND	6/12/2011	50	Multiple trees were blown down in the Skyland area.
CANTO	6/18/2011	50	A couple of trees were blown down in the Weaverville and Leicester area with other trees blown down in the Riceville and Swannanoa areas. Also, part of the

Location	Date	MPH	Description
			roof was reportedly blown off a building on Majestic Mountain Dr. A couple of trees were blown down along the Blue Ridge Parkway east of Asheville, causing the Parkway to be closed for a while. Several trees were also blown down in the Black Mountain area.
WEAVERVILLE	7/4/2011	50	A tree was blown down on Clarks Chapel Rd. Large limbs were also blown down in the same area.
BILTMORE	9/2/2011	50	Trees were down in the Biltmore Forest area, including along Vanderbilt Rd.
JUPITER	4/1/2012	55	Trees and power lines were blown down along Indian Camp Rd and long Monticello Rd about two miles west of Weaverville.
ASHEVILLE	4/26/2012	50	Trees were blown down from about 2 miles northwest of Asheville, across the city, down to the Fairview area. Trees reportedly fell on homes on Future Dr., Reddick Rd and Mountain View Rd.
WOODFIN	6/22/2012	55	Multiple trees and power lines were blown down from Weaverville Road on the north side of the city, across the west side, down to the Biltmore Forest and Arden areas. Some affected roads included Vanderbilt Rd, Sweeten Creek Rd, and Overlook Rd. A tree fell on a home on Lancelot Lane.
SHUMON	7/3/2012	55	Multiple trees were snapped by the downburst winds.
LEICESTER	7/5/2012	50	A couple trees were blown down in the Leicester area.
VOLGA	7/6/2012	50	A few trees were blown down along Bear Creek Rd about 3 miles north of Leicester.
WOODFIN	7/6/2012	50	A tree and power lines were blown down on a mobile home on Powers Rd, with one person trapped inside. Multiple trees were also down on Gorman Bridge Rd with another tree down on Wolf Park Circle. All of these events were very close together.
WEAVERVILLE	7/6/2012	50	Trees were blown down on several roads northwest of Weaverville, including New Stock Rd, Greenridge Rd, Monticello Rd and Gill Branch Rd.
BARNARDSVILLE	8/10/2012	50	Multiple trees and large limbs were blown down along highway 197 near the Barnardsville community.
AVERY CREEK	5/22/2013	50	A former NWS employee estimated winds gusting to 60 mph. Also, a large tree limb was blown down nearby on Ledbetter Rd.
FAIRVIEW	6/9/2013	50	A few trees were blown down near Fairview.
BARNARDSVILLE	7/9/2013	55	Numerous trees were blown down in the Barnardsville area.
ASHEVILLE	5/23/2014	55	Media reported multiple trees blown down in the Riceville Community (4 E Asheville), with some trees on homes and one tree falling on a moving vehicle on Lower Grassy Branch Rd. Spotter also reported numerous trees down west of Black Mountain. The wind damage was the result of outflow from a dissipating line of thunderstorms.
WEAVERVILLE	7/2/2014	50	Public reported multiple trees and large limbs were blown down in and around Weaverville.
OTEEN	7/27/2014	50	County comms reported multiple trees blown down across East Asheville and trees down on Wilson Ave in Swannanoa.
WEAVERVILLE	7/27/2014	50	County comms reported trees blown down just northwest of Weaverville.
BINGHAM HGTS	7/27/2014	55	NWS employee estimated up to 70 mph winds near downtown Asheville. Fire Dept reported multiple trees blown down from the city of Asheville south toward the Arden area.
NEW BRIDGE	9/1/2014	50	County comms reported multiple trees and power lines blown down on I-26 near mile marker 21.
MIDWAY	6/21/2015	50	County comms reported trees and power lines blown down on Fair Oaks Rd.
OAK FOREST	7/14/2015	50	Media reported multiple trees blown down on Sweeten Creek Rd near Biltmore Forest. FD reported multiple trees and power lines down in the Fairview area.

Location	Date	MPH	Description
KENNWORTH	7/20/2015	50	Newspaper reported multiple trees and some power lines were blown down in west Asheville, particularly along Riverview Dr, Grandview Dr, and Lamb Ave.
SAND HILL	8/14/2015	50	HAM radio operator reported multiple trees and large limbs blown down along Pond Rd, with one tree down on an unoccupied vehicle.
BEVERLY HILLS	8/22/2015	50	County comms reported multiple trees and power lines blown down on Chunns Cove Rd near Tunnel Rd.
JUPITER	6/4/2016	60	Public reported multiple trees uprooted or snapped centered in the area around Jupiter Rd and Lower Flat Creek Rd.
NEW BRIDGE	7/5/2016	50	Public reported (via Social Media) multiple trees blown down and power outages along Riverside Dr.
FAIRVIEW	7/6/2016	50	County comms reported multiple trees and power lines blown down near Highway 74 and Old Fort Rd.
LEICESTER	7/6/2016	50	County comms reported numerous trees blown down across the county from north through east of Asheville.
LEICESTER	7/7/2016	50	Public and spotters reported multiple trees and power lines blown down throughout the county. One tree fell on a home on Middlemont Ave in Asheville.
WEAVERVILLE	7/14/2016	40	Public reported (via Social Media) a tree fell on a vehicle.
CANDLER HGTS	4/3/2017	60	County comms reported roof damage to a building and damage to an adjacent building on Smoky Park Highway.
JUGTOWN	5/27/2017	50	County comms and public reported multiple trees blown down across the western part of the county.
WEST ASHEVILLE	7/5/2017	50	Public reported a few trees and large limbs blown down west of Asheville.
FAIRVIEW	7/14/2017	50	County comms reported several trees blown down along Emmas Grove Rd near Old Gap Creek Rd.
BOSWELL	7/14/2017	50	Media reported two trees blown down on Talmadge St near Talmadge Ct.
SHILOH	7/14/2017	50	Public reported multiple trees, large limbs, and power lines blown down. Highway 74A was closed for a while due to debris over the road.
CANDLER	5/31/2018	55	County comms reported numerous trees and some power lines blown down between Candler and Enka.
OTEEN	6/24/2018	50	NWS volunteer student relayed report of multiple trees blown down along the Swannanoa River in East Asheville.
LEICESTER	6/25/2018	50	County comms reported a couple trees blown down in the Leicester area.
LEICESTER	6/26/2018	50	County comms reported numerous trees blown down along Leicester Highway near Leicester and numerous trees and power lines down in the Candler area. One tree fell on a home in Candler.
ROCKVIEW	8/8/2018	50	Public reported multiple large tree limbs blown down along North Fork Road.
SANDYMUSH	6/21/2019	50	County comms reported scattered trees blown down across the county.
SKYLAND	8/19/2019	55	Up to 20 trees were blown down and some boats damaged to in the marina at Lake Julian Park.
SANDYMUSH	8/22/2019	50	Public reported trees blown down on Hemlock Ridge.
Madison County			
HOT SPGS	7/6/2000	50	A severe thunderstorm produced damaging winds which downed trees and power lines.
MARS HILL	7/14/2000	50	A cluster of severe thunderstorms produced damaging wind and hail close to midnight. Numerous downed trees and power lines were reported along with the usual associated power outages. A lot of hail fell in Weaverville but the size was unknown. Lightning struck a home in Mars Hill, destroying the home and its contents.

Location	Date	MPH	Description
MARSHALL	8/10/2000	50	Numerous trees were blown down across the northern part of the county. Crews were out all night cleaning up.
HOT SPGS	7/8/2001	60	Numerous trees and power lines down in northern, and eastern, Madison County. A tree was blown onto a house at Hot Springs.
MARSHALL	7/8/2001	60	Numerous trees and power lines down. A roof blown off a barn at Mars Hill. Some trees fell onto structures.
SPRING CREEK	7/9/2001	55	Gas station personnel reported numerous trees and power lines down across roads overnight.
MARSHALL	1/24/2002	50	A few trees were blown down.
MARS HILL	1/24/2002	50	A few trees were blown down.
COUNTYWIDE	5/2/2002	60	Numerous trees were blown down, and a tin roof was blown off of a home.
MARS HILL	7/2/2002	50	Several trees were blown down.
MARSHALL	7/2/2002	50	Several trees were blown down.
MARSHALL	7/4/2002	50	Several trees were blown down at the intersection of Highway 19 and Main St.
ENGLISH	5/2/2003	50	Trees and power lines were blown down at Wolf Laurel.
HOT SPGS	5/26/2004	50	Some trees were blown down.
MARSHALL	5/26/2004	50	Trees were blown down.
SPRING CREEK	6/12/2004	50	Some trees were blown down.
SPRING CREEK	7/5/2004	50	Trees were blown down.
MARS HILL	7/25/2004	55	Several trees were blown down and the roof was blown off a barn.
MARSHALL	8/2/2004	55	Numerous trees were blown down along highway 208 in the Shelton Laurel area.
HOT SPGS	5/10/2005	50	Report of 3 trees blown down in the Luck area.
HOT SPGS	5/10/2005	50	Report of 3 trees blown down in the Luck area.
BIG LAUREL	5/20/2005	50	Trees down along highway 64.
BIG LAUREL	5/20/2005	50	Trees down along highway 64.
MARSHALL	4/2/2006	55	Numerous trees downed, mainly across the eastern part of the county. One tree fell on a house and another fell on and totaled an automobile.
SPRING CREEK	4/19/2006	50	Several trees down.
MARSHALL	5/18/2006	50	Five trees down from the Spring Creek area to the Doggett Mountain area.
MARS HILL	5/20/2006	50	A tree down on highway 212, and another on highway 23, both along the Tennessee border.
MARS HILL	5/31/2006	50	Several trees blown down and pea size hail covering the ground.
MARSHALL	8/10/2006	50	Two trees blown down.
MARSHALL	9/28/2006	55	Part of the roof blown off a barn.
MARSHALL	4/3/2007	50	Trees blown down on Worley Cove Rd.
HOT SPGS	1/30/2008	50	A few trees were blown down between Hot Springs and Marshall.
HOT SPGS	6/9/2008	50	Two trees blown down.
MARSHALL	6/26/2008	50	Two large trees were blown down along Rector Corner Rd.
HOT SPGS	6/28/2008	50	Scattered trees were blown down throughout the county.
(HSS)HOT SPGS	7/21/2008	50	A tree was blown down on Frisbee Court in Hot Springs and another blown down on highway 209 just west of Hot Springs.
ALLENSTAND	2/11/2009	55	Numerous trees blown down throughout the county.
BARNARD	6/18/2009	55	Multiple trees were blown down in and around Marshall.
BARNARD	6/18/2009	50	Several trees were blown down along highway 25/70 between Walnut and Marshall, and another tree blown down on Skyway Dr in Marshall.
BARNARD	8/4/2009	50	Three trees were blown down.
REVERE	8/11/2009	50	Two small trees were snapped off on Revere Rd in the northeast part of the county.

Location	Date	MPH	Description
ALLEGHENY	8/4/2010	55	Several trees were blown down along highway 212, about 13 miles north of Marshall.
ALLEGHENY	8/4/2010	55	Several trees were blown down along highway 212, about 13 miles north of Marshall.
BIG LAUREL	8/5/2010	50	A tree was blown down on Big Laurel Rd.
BIG LAUREL	8/5/2010	50	A tree was blown down on Big Laurel Rd.
PETERSBURG	8/5/2010	50	A tree was blown down on Petersburg Rd, about 4 miles northeast of Marshall.
PETERSBURG	8/5/2010	50	A tree was blown down on Petersburg Rd, about 4 miles northeast of Marshall.
ANTIOCH	10/25/2010	55	Numerous trees were blown down across the northern portion of the county.
ANTIOCH	10/25/2010	55	Numerous trees were blown down across the northern portion of the county.
ANTIOCH	4/27/2011	65	NWS storm survey found that a tornadic thunderstorm over Greene County, TN produced an area of downburst damage just across the state line from the Grassy Creek Rd area to U.S. Highway 25/70 in far western Madison County. Numerous trees were blown down. The roof of one home on Azalea Lane was damaged by a falling tree. Another home had part of its roof removed. A couple of outbuildings were also destroyed.
FAUST	5/10/2011	50	Two trees were blown down on Puncheon Fork Rd, about 5 miles north of Mars Hill.
WALNUT	5/22/2011	50	Several trees were blown down between Marshall and Mars Hill, with a tree on a house in the Mars Hill area. Additional trees were blown down on highway 19 east of Mars Hill.
REDMON	6/5/2011	50	Several small trees and some large limbs were blown down on Riddle Farm Rd.
LONE RIDGE	6/8/2011	50	Several trees and large limbs were blown down on Bull Creek Rd.
(HSS)HOT SPGS	4/1/2012	60	Numerous trees were blown down across the county. A 300 foot radio antenna was blown down in Marshall.
LUCK	7/1/2012	50	Several large tree limbs were blown down in the Canto community.
FAUST	7/5/2012	50	Multiple trees and power lines were blown down in the Wolf Laurel area. The damaging winds were associated with an outflow boundary from thunderstorms over East Tennessee.
BELVA	9/2/2012	60	Numerous trees were blown down in the Shelton and Laurel communities in the northeast part of the county. Tobacco, cane and corn crops were flattened in this area as well. The winds caused a barn to collapse along highway 212.
ALLEGHENY	6/13/2013	50	At least two trees were blown down in the Laurel community, with one tree down on Cutshall Town Rd.
PAINT ROCK	6/27/2013	50	Several trees were blown down on Paint Rock Rd.
ENGLISH	2/19/2014	50	Multiple trees were blown down in the Wolf Ridge area.
MARS HILL	5/23/2014	50	Spotter reported a large tree and mutliple large limbs down in the Mars Hill area. Other spotters estimated 60 mph winds in the area.
BLUFF	7/27/2014	50	County comms reported multiple trees blown down across the county, primarily in the Spring Creek area.
ALLEGHENY	5/11/2015	50	Public reported damage to a porch and several tin tiles removed from a home.
ROLLINS	5/27/2015	50	FD and county comms reported multiple trees blown down just south of Marshall.
ROLLINS	7/13/2015	50	County comms reported multiple trees blown down southeast of Marshall.
PAINT ROCK	7/13/2015	50	Spotter reported multiple trees blown down near the Tennessee border.
MARSHALL	8/10/2015	50	County comms reported multiple trees blown down, with about a half dozen blocking roads from near Marshall to I-26 between Mars Hill and the Tennessee border.
MARS HILL	7/6/2016	50	County comms reported multiple trees blown down near Mars Hill.

Location	Date	MPH	Description
BLUFF	7/6/2016	50	Spotter reported multiple trees blown down between Hot Springs and the Spring Creek community.
SANDY BOTTOM	7/8/2016	50	County comms reported multiple trees blown down off Highway 25.
GRAPEVINE	7/27/2016	50	County comms reported multiple trees blown down on Grapevine Rd.
PETERSBURG	7/27/2016	50	County comms reported trees blown down on Silvers Mill Rd and on Wind Swept Bridge Rd.
PETERSBURG	8/27/2016	50	County comms reported multiple trees blown down between Marshall and Mars Hill.
EBBS MILL	5/27/2017	50	County comms reported numerous trees and power lines blown down throughout Madison County.
ANTIOCH	5/31/2018	55	County comms reported numerous trees blown down, with the damage roughly paralleling the French Broad River.
BARNARD	6/17/2018	50	County comms reported a few trees blown down in the Walnut area.
(HSS)HOT SPGS	6/24/2018	50	County comms reported multiple power lines blown down in the Hot Springs area.
(HSS)HOT SPGS	7/20/2018	50	Public reported (via Social Media) a few trees blown down between Hot Springs and Jupiter.
EBBS MILL	6/21/2019	50	County comms reported scattered trees blown down across the county.

TABLE H.11: TORNADO EVENTS (2000-2019)

County	Location	Date	Scale	Description
Madison County	ANTIOCH	4/27/2011	EF0	A short path of tornado damage was found embedded within a larger area of downburst wind damage. However, the damage associated with this path was no more severe than the damage associated with the downburst. Multiple large trees were blown down, a shed was destroyed and another tossed, and the roof was peeled from an outbuilding. One fallen tree clipped a home in this area as well.

TABLE H.12: WINTER STORM EVENTS (2000-2019)

Date	Description
	Buncombe County
2/16/2003	A light freezing rain developed along the Blue Ridge during the morning hours, and began to intensify during the afternoon. By mid-afternoon, a quarter of an inch of glaze had accumulated across much of the area. The precipitation transitioned to mainly sleet during the late afternoon, and by mid-evening, around an inch of sleet had accumulated on top of the glaze of ice. Numerous traffic accidents and road closures resulted from the precipitation.
12/4/2003	Heavy snow and sleet began during the early morning hours across the North Carolina mountains, and by late afternoon had accumulated to 3 to 4 inches across much of the area. Some slopes with an eastern exposure had up to 5 inches.
3/1/2009	Rain changed to snow across portions of the southern and central mountains, generally in locations from the Balsams to areas north and east, and continued through the afternoon. The snow became heavy at times, and quickly accumulated to 1-4 inches by early evening. Locally higher amounts were reported in the higher elevations of the Balsams and Newfound Mountains. Snow, heavy at times continued into the evening hours. By the time the snow tapered off, accumulations of 2-5 inches were common across the area. However, locally higher amounts occurred, especially in the higher elevations, where up to 10 inches were reported. The heavy wet snow, combined with gusty winds, caused some trees to fall and isolated power outages.

Date	Description
12/18/2009	A strengthening area of low pressure moved out of the Gulf of Mexico, across southern Georgia, and then up the southeast coast. As the low passed south of the region, snow became heavy across the southern and central mountains, as well as the Smokies and surrounding valleys late in the morning. Heavy snow developed a little later over the northern mountains. The heavy snow continued throughout the afternoon. Snowfall rates of 1-2 inches per hour became common across the area during the afternoon. Meanwhile, warming temperatures allowed the snow to mix with and eventually change to rain and sleet in the southwest mountain valleys. The heavy, wet snow combined with gusty winds to cause numerous trees and power lines to fall across the area during the afternoon. Widespread power outages resulted, and some customers were without power for as much as a week. Even longer outages affected parts of the northern mountains. ||The snow ended over the Blue Ridge and the central mountains on the evening of the 18th. However, wrap around snow showers developed along the Tennessee line, resulting in additional snow accumulations overnight and into the morning hours of the 19th.||Total accumulations ranged from 12-18 inches across the lower northern mountain valleys, to 2-3 feet in the higher elevations along the Tennessee border, and in areas along the eastern escarpment. Over the southern and central mountains, total accumulations ranged from 6-10 inches in the lower elevations near the southern escarpment, to as much as 2 feet in the higher elevations. While the southwest mountain valleys generally saw only 3-5 inches, 2-3 feet of total snowfall was reported in the higher elevations of the Smokies and along the Cherohala Skyway in Graham County.||Hundreds of traffic accidents were reported during the storm, and continued for several days thereafter, as continuous melting and refreezing of ice and snow resulted in treacherous road conditions during the late night and morning hours. Hospitals reported 100s of cases and slips and falls during this time as well.
2/4/2010	As low pressure moved across the deep south, snow, mixed with sleet, developed over the southern mountains during the late afternoon hours. The precipitation fell heavily at times, and up to 4 inches of snow accumulated across the area by early evening. Snow continued to fall overnight, but became mixed with or changed to sleet around midnight. Total sleet and snow accumulations of 2 to 5 inches occurred across the area by sunrise. By mid-morning of the 5th, precipitation changed to freezing rain, with damaging ice accumulations occurring. Total ice accretion in excess of 1/2 inch occurred along the Blue Ridge, resulting in widespread damage to trees and power lines, and widespread power outages along the southeastern escarpment. Ice accretion diminished rapidly north and west of the Blue Ridge.
2/4/2010	As low pressure moved across the deep south, snow, mixed with sleet, developed over the southern mountains during the late afternoon hours. The precipitation fell heavily at times, and up to 4 inches of snow accumulated across the area by early evening. Snow continued to fall overnight, but became mixed with or changed to sleet around midnight. Total sleet and snow accumulations of 2 to 5 inches occurred across the area by sunrise. By mid-morning of the 5th, precipitation changed to freezing rain, with damaging ice accumulations occurring. Total ice accretion in excess of 1/2 inch occurred along the Blue Ridge, resulting in widespread damage to trees and power lines, and widespread power outages along the southeastern escarpment. Ice accretion diminished rapidly north and west of the Blue Ridge.
2/12/2014	A Miller type-A low pressure system moved up along the South Carolina coast bringing widespread heavy snow to the mountains of western North Carolina. Total accumulations generally ranged from 5-9 inches across the area, although locations above 4000 feet or so saw 1-1.5 feet.
2/16/2015	Sleet and snow overspread the mountains and foothills of North Carolina during the afternoon and began to accumulate. Precipitation changed quickly to sleet in most areas, before mixing with freezing rain from southwest to northeast during the late afternoon and early evening. Sleet and freezing caused deteriorating road conditions by early evening, when heavy accumulations of sleet and/or freezing rain were reported across much of the area. Most locations saw around a half inch to an inch of sleet, along with around a tenth of an inch of ice accretion. The valleys of southwest North Carolina saw more freezing rain than sleet, with about one quarter inch of ice reported. Scattered power outages were therefore more concentrated there. Meanwhile, the northern foothills saw mostly sleet, with many areas reporting 2 to 3 inches of accumulation. Roads became very treacherous and impassable in many areas until melting began on the afternoon of the 17th.

Date	Description
2/25/2015	After the significant snowfall that fell across portions of the North Carolina mountains on the morning of the 24th, an area of low pressure moving along the Gulf Coast spread yet another round of snow across the southern Appalachians and adjacent foothills during the evening of the 25th. The snow was heavy at times, and quickly accumulated, with occasional mixed rain undercutting the totals a bit across the southern foothills. Many areas reported heavy accumulations by late evening. By the time the snow tapered off during the early morning of the 26th, total accumulations ranged from 4 to 6 inches, with locally higher amounts across the mountains. Across the foothills, where snow occasionally mixed with or changed to rain along the Highway 74 corridor, accumulations ranged from 2 to 5 inches.
12/8/2017	As moisture associated with developing and strengthening low pressure over the northeast Gulf of Mexico overspread western North Carolina, snow developed across the central and northern mountains around sunrise on the 8th and quickly accumulated. By noon, heavy snowfall accumulations were reported across much of the Blue Ridge area, while moderate to occasionally heavy snow continued to fall throughout the afternoon into the evening. By the time the snow tapered off to flurries and light snow showers during the early morning hours of the 9th, total accumulations ranged from 9-12 inches across the area, with locally higher amounts reported. While occasional flurries and light snow showers produced locally light additional accumulations into the early daylight hours of the 9th, the accumulating snow ended in most areas shortly after midnight.
Madison County	
12/4/2003	Heavy snow and sleet began during the early morning hours across the North Carolina mountains, and by late afternoon had accumulated to 3 to 4 inches across much of the area. Some slopes with an eastern exposure had up to 5 inches.
2/2/2009	Snow showers developed during the evening of the 2nd along the Tennessee border and continued off and on through the overnight hours and through much of the 3rd. One to four inches had accumulated in many areas by the evening of the 3rd. Numerous traffic accidents were reported on I-40 through the Pigeon River gorge in Haywood County. Snow showers increased in coverage and intensity during the late evening, then continued for much of the overnight hours. Snow persisted off and on through much of the 4th. Total accumulations ranged from 1 to 4 inches in the lower valleys, to as much as 8 inches in the higher elevations along the Tennessee border.
12/18/2009	A strengthening area of low pressure moved out of the Gulf of Mexico, across southern Georgia, and then up the southeast coast. As the low passed south of the region, snow became heavy across the southern and central mountains, as well as the Smokies and surrounding valleys late in the morning. Heavy snow developed a little later over the northern mountains. The heavy snow continued throughout the afternoon. Snowfall rates of 1-2 inches per hour became common across the area during the afternoon. Meanwhile, warming temperatures allowed the snow to mix with and eventually change to rain and sleet in the southwest mountain valleys. The heavy, wet snow combined with gusty winds to cause numerous trees and power lines to fall across the area during the afternoon. Widespread power outages resulted, and some customers were without power for as much as a week. Even longer outages affected parts of the northern mountains. ||The snow ended over the Blue Ridge and the central mountains on the evening of the 18th. However, wrap around snow showers developed along the Tennessee line, resulting in additional snow accumulations overnight and into the morning hours of the 19th.||Total accumulations ranged from 12-18 inches across the lower northern mountain valleys, to 2-3 feet in the higher elevations along the Tennessee border, and in areas along the eastern escarpment. Over the southern and central mountains, total accumulations ranged from 6-10 inches in the lower elevations near the southern escarpment, to as much as 2 feet in the higher elevations. While the southwest mountain valleys generally saw only 3-5 inches, 2-3 feet of total snowfall was reported in the higher elevations of the Smokies and along the Cherohala Skyway in Graham County.||Hundreds of traffic accidents were reported during the storm, and continued for several days thereafter, as continuous melting and refreezing of ice and snow resulted in treacherous road conditions during the late night and morning hours. Hospitals reported 100s of cases and slips and falls during this time as well.
3/5/2013	Snow showers developed across the mountains during the evening of the 5th and continued through the morning of the 6th. By the time the snow tapered off during early evening, total snowfall ranged from an

Date	Description
	inch or two in southern Madison County to as much as 8 inches in the higher elevations along the Tennessee border. Very gusty winds also resulted in considerable blowing and drifting of the snow.
3/25/2013	Snow showers developed during the early morning hours of the 25th and continued off and on throughout the day. Synoptically enhanced northwest flow snow showers became heavy overnight across the western mountains, and by the afternoon hours of the 26th storm total snowfall amounts of 4 to 8 inches were common across the area. Snow showers continued through the early morning hours of the 27th across the higher elevations near the Tennessee border, where totals of a foot or more were prevalent. Heavy snowfall was mainly confined to areas above 3000 feet or so in the southern and central mountains, but was a little more widespread in the northern mountains.
1/2/2014	After a strong cold front introduced much colder air to the mountains, snow showers developed near the Tennessee border during mid-evening. The snow showers lasted through the pre-dawn hours, resulting in heavy accumulations across mainly the higher elevations of the northern and central mountains. Total accumulations were generally in the 3-5 inch range above 3500 feet near the Tennessee border. Locally higher amounts were observed on the high peaks and ridge tops, while most lower valley areas saw anywhere from a dusting to less than two inches. Very strong northwest winds resulted in considerable blowing and drifting snow.
2/12/2014	A Miller type-A low pressure system moved up along the South Carolina coast bringing widespread heavy snow to the mountains of western North Carolina. Total accumulations generally ranged from 5-9 inches across the area, although locations above 4000 feet or so saw 1-1.5 feet.
2/16/2015	Sleet and snow overspread the mountains and foothills of North Carolina during the afternoon and began to accumulate. Precipitation changed quickly to sleet in most areas, before mixing with freezing rain from southwest to northeast during the late afternoon and early evening. Sleet and freezing caused deteriorating road conditions by early evening, when heavy accumulations of sleet and/or freezing rain were reported across much of the area. Most locations saw around a half inch to an inch of sleet, along with around a tenth of an inch of ice accretion. The valleys of southwest North Carolina saw more freezing rain than sleet, with about one quarter inch of ice reported. Scattered power outages were therefore more concentrated there. Meanwhile, the northern foothills saw mostly sleet, with many areas reporting 2 to 3 inches of accumulation. Roads became very treacherous and impassable in many areas until melting began on the afternoon of the 17th.
2/25/2015	After the significant snowfall that fell across portions of the North Carolina mountains on the morning of the 24th, an area of low pressure moving along the Gulf Coast spread yet another round of snow across the southern Appalachians and adjacent foothills during the evening of the 25th. The snow was heavy at times, and quickly accumulated, with occasional mixed rain undercutting the totals a bit across the southern foothills. Many areas reported heavy accumulations by late evening. By the time the snow tapered off during the early morning of the 26th, total accumulations ranged from 4 to 6 inches, with locally higher amounts across the mountains. Across the foothills, where snow occasionally mixed with or changed to rain along the Highway 74 corridor, accumulations ranged from 2 to 5 inches.
12/8/2017	As moisture associated with developing and strengthening low pressure over the northeast Gulf of Mexico overspread western North Carolina, snow developed across the central and northern mountains around sunrise on the 8th and quickly accumulated. By noon, heavy snowfall accumulations were reported across much of the Blue Ridge area, while moderate to occasionally heavy snow continued to fall throughout the afternoon into the evening. By the time the snow tapered off to flurries and light snow showers during the early morning hours of the 9th, total accumulations ranged from 9-12 inches across the area, with locally higher amounts reported. While occasional flurries and light snow showers produced locally light additional accumulations into the early daylight hours of the 9th, the accumulating snow ended in most areas shortly after midnight.

Appendix I
Community Rating System

This section of the Plan provides a summary of mitigation measures that were considered by the participating jurisdictions in the Buncombe Madison 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 communities that participate in the Buncombe Madison 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

I.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 that have been 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, 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.

I.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 I.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 I.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 that the participating jurisdictions can use to reduce future flood losses since many communities have 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**
City of Asheville	UDO, Chapter 7, Article XII: Flood Protection.	The City of Asheville's Flood Protection Ordinance requires a number of items be submitted with new applications for new development or redevelopment. Among other items, these include a boundary of the special flood hazard area be delineated on the plot plan and that the elevation of the proposed development be included.	• The city should continue to implement its higher freeboard requirements for properties located in the floodplain • The city should continue to implement its "no-rise" in base flood elevation clause.	• The city considered prohibiting any fill in floodplain areas, but it was determined to not be technically, politically, or economically feasible.

I.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 CRS portion of 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 I.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 I.2: COMPREHENSIVE/LAND USE PLANNING ACTIVITIES

Preventative Activities				
Comprehensive/Land Use Plan— A comprehensive or 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 that the participating jurisdictions can use to reduce future flood losses since most communities already have a comprehensive plan in place.				
Jurisdiction	**Current Standards/ Regulations**	**Local Implementation**	**Recommendations for Future Implementation**	**Changes Considered but Discounted as Not Feasible**
City of Asheville	Asheville City Development Plan 2025	The Asheville City Development Plan 2025 includes several policies which are related to reducing flood risk through watershed protection. Specific policies include encouraging the protection of riparian zones and reducing impervious surface area, both of which can serve to reduce stormwater runoff, thereby reducing flood risk.	• The city is willing to consider possibly increasing the amount of its land area classified as open space.	• The city considered classifying all areas delineated as floodplain as open space but it was determined to be not socially, legally, technically, politically, or economically feasible. • The city considered preventing infrastructure expansion in areas exposed to flood hazards, but it was determined to not be legally, technically, politically, or economically feasible.

I.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

CRS portion of the Hazard Mitigation Planning process considered several activities that attempt to reduce flood risk through some form of zoning.

As described in **Table I.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 I.3: ZONING ACTIVITIES

Preventative Activities				
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, zoning can help reduce future flood risk by prohibiting or limiting future construction in the 100-year floodplain or by limiting the density of development in the floodplain. Zoning is an appropriate activity that the participating jurisdictions can use to reduce future flood losses since most communities have some degree of zoning in place.				
Jurisdiction	**Current Standards/ Regulations**	**Local Implementation**	**Recommendations for Future Implementation**	**Changes Considered but Discounted as Not Feasible**
City of Asheville	UDO, Chapter 7, Article VIII: General Use Districts. The city maintains several zoning districts, which include potential hazards from fire, flooding, and diseases as one of the evaluation criteria for zoning.	The City of Asheville's Unified Development Ordinance evaluates zoning district classifications based on the potential a given area has to flood. A specific example of how this criterion was put into action involves the River District. The zoning ordinance identifies the River District and explains that a goal of this district is to minimize stormwater runoff, soil erosion, river bank destabilization, grading, and flood damage to development located in this district.	• The city is willing to possibly consider requiring a higher ration than is currently in place of permeable to impermeable surface area in new commercial construction.	• The city considered prohibiting or limiting future construction in the floodplain, but it was determined to not be socially, legally, technically, politically, or economically feasible • The city considered limiting the density of development in the floodplain, but it was determined to not be socially, politically, or economically feasible.

I.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 CRS portion of the Hazard Mitigation

Planning process considered several activities that attempt to reduce flood risk through subdivision ordinances.

As described in **Table I.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 I.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 the participating 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**
City of Asheville	UDO, Chapter 7, Article XV Subdivisions. The city has established subdivision regulations to promote orderly growth and development of the community.	The City of Asheville Subdivision Ordinance includes requirements that encourage the adequate design of stormwater systems within new subdivisions and that utilities and drainage be designed to minimize flood damage. These requirements recognize the importance of reducing the impacts to new development by ensuring it is protected from flooding.	• The city is willing to consider possibly incentivizing the use of rain barrels or rain gardens. • The city should continue to require more trees be preserved and planted in landscape designs to reduce stormwater runoff. • The city should continue to require a drainage study with new development.	• The city 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.

I.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 I.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. In general, communities were either already implementing stormwater 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 I.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 that the participating jurisdictions can use to reduce future flood losses since most communities are working to develop or already have a form of stormwater management in place.				
Jurisdiction	**Current Standards/ Regulations**	**Local Implementation**	**Recommendations for Future Implementation**	**Changes Considered but Discounted as Not Feasible**
City of Asheville	UDO, Chapter 7, Article XII Stormwater, Soil Erosion and Sedimentation Control, Illicit Discharge and Connection. The city has established stormwater regulations to comply with federal and state law regarding stormwater discharge and control the potential adverse effects of increased stormwater runoff associated with future and existing development.	The City of Asheville Stormwater Management ordinance recognizes that stormwater runoff can have an adverse impact on the health, safety, and general welfare of its citizens. Therefore, as one of its primary tenets, it requires that new development and redevelopment maintain the pre-development hydrologic response as nearly as practicable to reduce flooding and erosion.	• The city should continue to set compensatory water storage requirements for new construction. • The city should continue to regulate development in upland areas in order to reduce stormwater runoff. • The city should continue to link flood hazard mitigation objectives with EPA Stormwater Phase II initiatives.	• The city has considered a number of options regarding stormwater management as is evident in previous columns. It is at least considering implementation of all options that were considered.

I.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 I.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 I.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
City of Asheville	Adopted 2012 North Carolina State Building Code	Appendix G of 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 by designed and constructed with methods, practices, and materials that minimize flood damage.	• The city should continue adopting future updates to the North Carolina State Building Code and enforcing it throughout the jurisdiction. • The city should continue to enforce higher building codes such as the International Building Code or International Residential Code • The city should continue to implement 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	• The city considered a number of options regarding building codes as is evident in previous columns. It is at least considering implementation of all options that were considered.


Madison County
Buncombe County
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