

SECTION 4

HAZARD IDENTIFICATION

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

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

44 CFR Requirement

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

4.1 OVERVIEW

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

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

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

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

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

Next, **Table 4.3** documents the evaluation process used for determining which of the initially identified hazards are considered significant enough to warrant further evaluation in the risk assessment. For each hazard considered, the table indicates whether or not the hazard was identified as a significant hazard to be further assessed, how this determination was made, and why this determination was made. The table works to summarize not only those hazards that *were* identified (and why) but also those that *were not* identified (and why not). Hazard events not identified for inclusion at this time may be addressed during future evaluations and updates of the risk assessment if deemed necessary by the Regional Hazard Mitigation Planning Committee during the plan update process.

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

4.2 DESCRIPTION OF FULL RANGE OF HAZARDS

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

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

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<p>Hurricane and Tropical Storm</p>	<p>Hurricanes and tropical storms are classified as cyclones and defined as any closed circulation developing around a low-pressure center in which the winds rotate counter-clockwise in the Northern Hemisphere (or clockwise in the Southern Hemisphere) and with a diameter averaging 10 to 30 miles across. When maximum sustained winds reach or exceed 39 miles per hour, the system is designated a tropical storm, given a name, and is closely monitored by the National Hurricane Center. When sustained winds reach or exceed 74 miles per hour the storm is deemed a hurricane. The primary damaging forces associated with these storms are high-level sustained winds, heavy precipitation and tornadoes. Coastal areas are also vulnerable to the additional forces of storm surge, wind-driven waves and tidal flooding which can be more destructive than cyclone wind. The majority of hurricanes and tropical storms form in the Atlantic Ocean, Caribbean Sea and Gulf of Mexico during the official Atlantic hurricane season, which extends from June through November.</p>
<p>Lightning</p>	<p>Lightning is a discharge of electrical energy resulting from the buildup of positive and negative charges within a thunderstorm, creating a “bolt” when the buildup of charges becomes strong enough. This flash of light usually occurs within the clouds or between the clouds and the ground. A bolt of lightning can reach temperatures approaching 50,000 degrees Fahrenheit. Lightning rapidly heats the sky as it flashes, but the surrounding air cools following the bolt. This rapid heating and cooling of the surrounding air causes thunder. On average, 73 people are killed each year by lightning strikes in the United States.</p>
<p>Nor’easter</p>	<p>Similar to hurricanes, nor’easters are ocean storms capable of causing substantial damage to coastal areas in the Eastern United States due to their associated strong winds and heavy surf. Nor’easters are named for the winds that blow in from the northeast and drive the storm up the East Coast along the Gulf Stream, a band of warm water that lies off the Atlantic coast. They are caused by the interaction of the jet stream with horizontal temperature gradients and generally occur during the fall and winter months when moisture and cold air are plentiful. Nor’easters are known for dumping heavy amounts of rain and snow, producing hurricane-force winds, and creating high surf that causes severe beach erosion and coastal flooding.</p>
<p>Tornado</p>	<p>A tornado is a violently rotating column of air that has contact with the ground and is often visible as a funnel cloud. Its vortex rotates cyclonically with wind speeds ranging from as low as 40 mph to as high as 300 mph. Tornadoes are most often generated by thunderstorm activity when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The destruction caused by tornadoes ranges from light to catastrophic depending on the intensity, size and duration of the storm.</p>
<p>Severe Thunderstorm</p>	<p>Thunderstorms are caused by air masses of varying temperatures meeting in the atmosphere. Rapidly rising warm moist air fuels the formation of thunderstorms. Thunderstorms may occur singularly, in lines, or in clusters. They can move through an area very quickly or linger for several hours. Thunderstorms may result in hail, tornadoes, or straight-line winds. Windstorms pose a threat to lives, property, and vital utilities primarily due to the effects of flying debris and can down trees and power lines.</p>

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

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

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<p>Storm Surge</p>	<p>A storm surge is a large dome of water often 50 to 100 miles wide and rising anywhere from four to five feet in a Category 1 hurricane up to more than 30 feet in a Category 5 storm. Storm surge heights and associated waves are also dependent upon the shape of the offshore continental shelf (narrow or wide) and the depth of the ocean bottom (bathymetry). A narrow shelf, or one that drops steeply from the shoreline and subsequently produces deep water close to the shoreline, tends to produce a lower surge but higher and more powerful storm waves. Storm surge arrives ahead of a storm’s actual landfall and the more intense the hurricane is, the sooner the surge arrives. Storm surge can be devastating to coastal regions, causing severe beach erosion and property damage along the immediate coast. Further, water rise caused by storm surge can be very rapid, posing a serious threat to those who have not yet evacuated flood-prone areas.</p>
<p>OTHER HAZARDS</p>	
<p>Hazardous Materials Incident</p>	<p>Hazardous material (HAZMAT) incidents can apply to fixed facilities as well as mobile, transportation-related accidents in the air, by rail, on the nation’s highways and on the water. HAZMAT incidents consist of solid, liquid and/or gaseous contaminants that are released from fixed or mobile containers, whether by accident or by design as with an intentional terrorist attack. A HAZMAT incident can last hours to days, while some chemicals can be corrosive or otherwise damaging over longer periods of time. In addition to the primary release, explosions and/or fires can result from a release, and contaminants can be extended beyond the initial area by persons, vehicles, water, wind and possibly wildlife as well.</p>
<p>Terror Threat</p>	<p>Terrorism is defined by FEMA as, “the use of force or violence against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion, or ransom.” Terrorist acts may include assassinations, kidnappings, hijackings, bomb scares and bombings, cyber attacks (computer-based), and the use of chemical, biological, nuclear and radiological weapons.</p>
<p>Wildfire</p>	<p>An uncontrolled fire burning in an area of vegetative fuels such as grasslands, brush, or woodlands. Heavier fuels with high continuity, steep slopes, high temperatures, low humidity, low rainfall, and high winds all work to increase risk for people and property located within wildfire hazard areas or along the urban/wildland interface. Wildfires are part of the natural management of forest ecosystems, but most are caused by human factors. Over 80 percent of forest fires are started by negligent human behavior such as smoking in wooded areas or improperly extinguishing campfires. The second most common cause for wildfire is lightning.</p>

4.3 DISASTER DECLARATIONS

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

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

TABLE 4.2: SMOKY MOUNTAIN REGION DISASTER DECLARATIONS

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

4.4 HAZARD EVALUATION

TABLE 4.3: DOCUMENTATION OF THE HAZARD EVALUATION PROCESS

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
ATMOSPHERIC HAZARDS			
Avalanche	NO	<ul style="list-style-type: none"> • Review of US Forest Service National Avalanche Center web site • Review of the NC State Hazard Mitigation Plan • Review of FEMA's Multi-Hazard Identification and Risk Assessment 	<ul style="list-style-type: none"> • There is no risk of avalanche events in North Carolina. The United States avalanche hazard is limited to mountainous western states including Alaska, as well as some areas of low risk in New England. • Avalanche hazard was removed from the North Carolina State Hazard Mitigation Plan after determining the mountain elevation in Western North Carolina did have enough snow not produce this hazard.
Drought	YES	<ul style="list-style-type: none"> • Review of the NC State Hazard Mitigation Plan • Review of the North Carolina Drought Monitor website 	<ul style="list-style-type: none"> • Droughts are discussed in NC State Hazard Mitigation Plan as a lesser hazard. • There are reports of drought conditions in sixteen out of the last seventeen years in the Smoky Mountain Region, according to the North Carolina Drought Monitor.
Hailstorm	YES	<ul style="list-style-type: none"> • Review of NC State Hazard Mitigation Plan • Review of NOAA NCEI Storm Events Database 	<ul style="list-style-type: none"> • Hailstorm events are discussed in the state plan under the Severe Thunderstorm hazard as a lesser hazard. • NCEI reports 217 hailstorm events (0.75 inch size hail to 2.5 inches) for the Smoky Mountain Region between 1970 and 2016. For these events, there were \$1.9 million (2017 dollars) in property damages.

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

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

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

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

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Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
GEOLOGIC HAZARDS			
Earthquake	YES	<ul style="list-style-type: none"> • Review of NC State Hazard Mitigation Plan • Review of previous county and tribal hazard mitigation plans in the Smoky Mountain Region • USGS Earthquake Hazards Program web site • Review of the National Geophysical Data Center 	<ul style="list-style-type: none"> • Earthquake events are discussed in the state plan and all of the participating counties in the Smoky Mountain Region are considered to be at moderate risk to an earthquake event (no counties are high risk). • Earthquakes have occurred in and around the State of North Carolina in the past. The state is affected by the Charleston and the New Madrid (near Missouri) Fault lines which have generated a magnitude 8.0 earthquake in the last 200 years. • 82 events are known to have occurred in the region according to the National Geophysical Data Center. The greatest MMI reported was a 7. • According to USGS seismic hazard maps, the peak ground acceleration (PGA) with a 10% probability of exceedance in 50 years for the Smoky Mountain Region is approximately 6%g. FEMA recommends that earthquakes be further evaluated for mitigation purposes in areas with a PGA of 3%g or more.
Expansive Soils	NO	<ul style="list-style-type: none"> • Review of NC State Hazard Mitigation Plan • Review of USDA Soil Conservation Service’s Soil Survey 	<ul style="list-style-type: none"> • Expansive soils are identified in the state plan; however Mountain Region 1 does not identify expansive soils as a top hazard. • According to FEMA and USDA sources, the Smoky Mountain Region is located in an area that has a “little to no” clay swelling potential.

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

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Tsunami	NO	<ul style="list-style-type: none"> • Review of NC State Hazard Mitigation Plan • Review of FEMA guidance 	<ul style="list-style-type: none"> • Tsunamis are discussed in the state plan and described as a “greater” hazard for the state. However, the Mountain Region scored a zero for tsunami hazard risk. • Only one of the previous plans in the Smoky Mountain Region addresses tsunami and it is identified as being highly unlikely to occur. • No record exists of a catastrophic Atlantic basin tsunami impacting the mid-Atlantic coast of the United States. • Tsunami inundation zone maps are not available for communities located along the U.S. East Coast. • FEMA mitigation planning guidance suggests that locations along the U.S. East Coast have a relatively low tsunami risk and need not conduct a tsunami risk assessment at this time.
Volcano	NO	<ul style="list-style-type: none"> • Review of NC State Hazard Mitigation Plan • Review of USGS Volcano Hazards Program web site 	<ul style="list-style-type: none"> • There are no active volcanoes in North Carolina. • There has not been a volcanic eruption in North Carolina in over 1 million years. • No volcanoes are located near the Smoky Mountain Region.

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

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

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

4.5 HAZARD IDENTIFICATION RESULTS

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

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

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