

Hazard Identification and Analysis

Hazard identification and Analysis is the first step of the Hazard Mitigation Planning process. By identifying and analyzing the hazards facing their jurisdiction the community is able to determine which specific hazards it should focus its attention and resources on. In conducting the hazard identification and analysis phase of the Hazard Mitigation Plan, Buncombe County utilized the criteria set forth by the North Carolina Division of Emergency Management in *Keeping Natural Hazards from Becoming Disasters: A Basic Workbook for Local Governments* (October 2000):

- **Type** – Different hazards call for different mitigation measures. The preferred approach is to consider all the hazards that threaten the community and focus on those that pose the greatest risk.
- **Likelihood of Occurrence** – Estimate the likelihood of each type of hazard occurring in your area. This estimate should be based on local historical evidence.
 - ◆ *Highly Likely*: near 100% probability in the next year.
 - ◆ *Likely*: between 10% and 100% probability in the next year, or at least one chance in the next 10 years.
 - ◆ *Possible*: between 1% and 10% probability in the next year, or at least one chance in the next 100 years.
 - ◆ *Unlikely*: less than 1% probability in the next year, or less than one chance in the next 100 years.
- **Location** – Certain areas, such as floodplains and steep slopes, are more prone to hazards than others. Many of these areas are readily identifiable on maps. Identify the areas that are most vulnerable to each natural hazard and mark whether they cover a small, medium, or large proportion of the community.

- **Impact** – Each community should determine the likely impact from each hazard threat. Impact is a combination of the severity of the event, its magnitude, and the density of human activity in that area affected.

	Magnitude	Severity
Catastrophic	More than 50%	Multiple deaths. Complete shutdown of facilities for 30 days or more. More than 50 percent of property is severely damaged.
Critical	25 to 50%	Multiple severe injuries. Complete shutdown of critical facilities for at least 2 weeks. More than 25 percent of property is severely damaged.
Limited	10 to 25%	Some injuries. Complete shutdown of critical facilities for more than one week. More than 10 percent of property is severely damaged.
Negligible	Less than 10%	Minor injuries. Minimal quality-of-life impact. Shutdown of critical facilities and services for 24 hours or less. Less than 10 percent of property is severely damaged.

- **Hazard Index** – Some natural hazards have extraordinary impacts, but occur infrequently (for example, severe earthquakes). Other hazards occur annually or several times a decade, but cause less damage (for example, floods). This last column identifies which type of risk each hazard poses for the community. Likelihood is ranked from 1 to 4 with unlikely being a “1” and highly likely being a “4”. Location is ranked from 1 to 3 with small location receiving a “1” and large location receiving a “3”. Impact is ranked from 1 to 4 with negligible events equating to “1” and catastrophic events equating to “4”. High likelihood, high impact hazards should rank as primary objectives.

Table 2 “Hazard Identification and Analysis for Buncombe County” summarizes this process for our community.

**Table 2
Hazard Identification and Analysis for Buncombe County**

Hazard	<u>Likelihood of Occurrence</u> (i.e., highly-4, likely-3, possible-2, unlikely-1)	Location (i.e., large-3, medium-2, small-1)	<u>Impacts</u> (i.e., catastrophic-4, critical-3, limited-2, negligible-1)	<u>Hazard Index</u> (i.e., rank by combining how much impact & how frequently this hazard affects your community)
Severe Winter Storm	Highly (4)	Large (3)	Critical (3)	10
Utility Failure	Likely (3)	Medium (2)	Critical (3)	8
Flooding	Highly (4)	Small (1)	Limited (2)	7
Drought	Possible (2)	Medium (2)	Limited (1)	6
Hazardous Materials	Highly (4)	Small (1)	Negligible (1)	6
Landslide	Highly (4)	Small (1)	Negligible (1)	6
Dam Failure	Possible (2)	Small (1)	Limited (2)	5
Earthquake	Likely (3)	Small (1)	Negligible (1)	5
Wildfire	Likely (3)	Small (1)	Negligible (1)	5
Tornado	Possible (2)	Small (1)	Negligible (1)	4

Buncombe County identified several hazards that threaten our jurisdiction to varying degrees. These hazards were identified through an extensive process that utilized input from Risk Assessment Sub-committee members, State and local data of past events, and the National Climatic Data Center's Storm Events Database. This analysis revealed that the municipal jurisdictions within Buncombe County face the same hazards as the unincorporated areas of the County with the exception that there is no identified 100-year floodplain in the towns of Montreat and Biltmore Forest. Hazard maps are included for the 100-year flood plain, areas above 3,000 feet in elevation (increased vulnerability to winter storms), and historic tornado touchdown areas. Those are the only hazard areas that we are capable of mapping at this time. As we add additional and/or improved data layers to our GIS database we may be capable of producing additional hazard maps in future additions of this document.

Earthquake

An earthquake is a sudden, rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. The forces of plate tectonics have shaped the earth over millions of years as the huge plates that form the earth's surface move slowly over, under, and past each other. Generally this movement is gradual but, at other times, the plates are locked together, unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free causing the ground to shake. Ground shaking from earthquakes can collapse buildings and bridges; disrupt gas, electric, and phone service; and sometimes trigger landslides, avalanches, flash floods, fires, and huge, destructive ocean waves (tsunamis). Earthquakes strike suddenly, without warning. Earthquakes can occur at any time of the year and at any time of the day or night. (www.fema.gov/diz01/eqquakes.htm).

Earthquakes have occurred that were centered in Buncombe County in 1916 (Mag. 5.5, MMI VII) and 1957 (Mag. 3.7, MMI VI). Earthquakes have occurred that were centered in surrounding counties in 1957 (McDowell County – Mag. 4.1, MMI VI), 1957 (Jackson County – Mag. 4.0, MMI VI), and 1981 (Henderson County – Mag. 3.5, MMI VI). See Appendix for explanation of Mag. (Richter Magnitude) and MMI (Maximum Modified Mercalli Intensity). Buncombe County lies within the Eastern Tennessee Seismic Aone which extends from Charleston, SC northwest into eastern Tennessee the curves northeast to central Virginia. This region has the potential to produce an earthquake of significant intensity in the future (NCDEM: Local Hazard Mitigation Planning Manual, November 1998). Based on past incidents and NCDEM classification, an earthquake having a negligible impact on a small area for Buncombe County is likely to occur. Therefore, earthquake is assigned a hazard index of 5 out of a possible 11.

Tornado

A tornado occurs when a rapidly rotating funnel-shaped cloud extending downward from the base of a severe thunderstorm comes into contact with the ground or any objects on the ground. (NOAA Definitions and Preparedness Page – www.nws.noaa.gov/er/okx/Preparedness.html). Since tornadoes strike with little or no warning, once a tornado watch or warning is issued, it is too late to protect your home and belongings (www.fema.gov/projectimpact). Because the mountainous areas of Western North Carolina disrupt the inflow of air near the surface of squall lines and individual thunderstorms, organized thunderstorm activity, and , consequently, tornadic activity, is less in this region than in the eastern part of the state (NCDEM: Local Hazard Mitigation Planning Manual, November 1998).

Minor tornadoes occurred in Buncombe County in 1976, 1977, 1993 and 1999. Based on past incidents and NCDEM classification, a tornado having a negligible impact on a small area of Buncombe County is a possible occurrence. Therefore, tornadoes are assigned a hazard index of 4 out of a possible 11. A map identifying previous tornado touchdown areas is included in Appendix B.

Flood

A flood is the inundation of a normally dry area caused by high flow, or overflow of water in an established watercourse, such as a river, stream, or drainage ditch; or ponding of water at or near the point where the rain fell. This is a duration type event with a slower onset than flash flooding, normally greater than 6 hours. “Flash Flooding” is flooding which follows within a few hours (usually less than 6 hours) of heavy or excessive rainfall, dam or levee failure, or the sudden release of water impounded by an ice jam. (NOAA *Glossary of Hydrologic Terms*).

Buncombe County experienced major flooding in 1976, 1977, and 1982. Minor flooding events have occurred almost annually. Based on past events and NCDEM classification, a flood having a limited impact on a small area of Buncombe County is highly likely to occur. Therefore, flooding is assigned a hazard index of 7 out of a possible 11. A map of the 100-year flood plain is included in the section entitled “Vulnerability Analysis”.

Severe Winter Storm

Severe Winter Storms can include various combinations of the following factors: snow, sleet, ice, or freezing rain; strong winds; and extreme cold. Accumulations of snow and ice can collapse buildings, bring down power lines, and make travel treacherous. Strong winds can knock down trees and utility poles. Sustained winds of 35 miles per hour combined with snowfall produce blizzard conditions with low visibility (1/4 mile or less), severe drifting, and dangerous wind chills. Prolonged exposure to the extreme cold of winter storms can lead to frostbite or hypothermia and become life-threatening. (NOAA *Winter Storms: The Deceptive Killers – A Guide to Survival*, November 1991).

Severe Winter Storms occurred in 1977, 1993, and 1998. Minor events causing problems in isolated areas of the County occur almost every year. Snow accumulation tends to be greater in areas above 3,000 feet in elevation. Based on past events and NCDEM classification, a severe winter storm having a critical impact over a large portion of Buncombe County is highly likely to occur. Therefore, severe winter storms are assigned a hazard index of 10 out of a possible 11. A map indicating areas above 3,000 feet in elevation is included in the section entitled “Vulnerability Analysis”.

Landslide

A Landslide is the descent of a mass of earth and rock down a slope. A Landslide may be caused when water from rain and melting snow sinks into the earth on the top of a slope, seeps through cracks and pores in underlying sandstone, and then encounters a layer of slippery material, such as shale or clay, inclined toward the valley. If the support is sufficiently weakened, a mass of earth and rock slides down along the well-lubricated layer. Landslides may also be triggered by earthquakes (encarta.msn.com). The steep slopes and fragile soils of Western North Carolina place Buncombe County at high risk of a landslide.

Based on NCDEM classification, a landslide having a negligible impact on a small area of Buncombe County is highly likely to occur. Therefore, landslides are assigned a hazard index of 6 out of a possible 11.

Wildfire

A wildfire is the uncontrolled burning of woodlands, brush, or grasslands. The potential for the threat of wildfire is dependent upon surface fuel characteristics, recent climate conditions, current meteorological conditions and fire behavior. Fall is a particularly dangerous time for wildfire because of the dry vegetation produced by hot dry summers (NCDEM: Local Hazard Mitigation Planning Manual, November 1998). Ignition can be caused by a discarded cigarette butt, improperly extinguished campfire, stray spark, lightning, etc. Once a wildfire threatens a community, it’s often too late to protect homes and belongings. In areas that have been burned by wildfires, some houses remain while the neighboring houses are destroyed. These houses are misnamed “miracle houses”. These houses often survive, not because of a miracle, but because of specific steps the owner has taken, in regard to landscaping and location of trees and bushes, for the purpose of creating “defensible space” should a wildfire occur (www.fema.gov/projectimpact).

Wildfires occurred in Buncombe County in 1986 (25 acres) and in 1999 (500 acres). Based on past incidents and NCDEM classification, a wildfire having a negligible impact on a small area of Buncombe County is likely to occur. Therefore, wildfire is assigned a hazard index of 5 out of a possible 11.

Hazardous Materials

Two major Interstate Highways, I-26 and I-40, pass through Buncombe County. Tanker trucks carrying hazardous materials travel these highways on a continual basis, bringing with them the chance of a hazardous materials incident such as a spill. Many industries in the area also maintain quantities of hazardous materials on hand for use in their daily business. Such use also carries with it the risk of a spill.

A review of events since 1983 reveals multiple hazardous material incidents each year. However, the majority of these events were minor incidents of limited consequence. Based on past events, a hazardous materials incident having a negligible impact on a small area of Buncombe County is highly likely to occur. Therefore, hazardous materials incidents are assigned a hazard index of 6 out of a possible 11.

Utility Failure

Utility failure is an interruption in electrical, telephone, water, or sewer service. Failure of utilities can occur as a consequence of many of the hazard events previously discussed. Utility failure can also happen as a “stand-alone” event due to technical problems within the utility company itself. Outages may be confined to small areas within the County, but there is the potential for widespread utility failure which would constitute a disaster in and of itself.

In 1990 the City of Asheville experienced a total loss of telephone service due to technical problems. This incident left over 45,000 customers without telephone service. Based on past incidents a utility failure having a critical impact over a medium sized area of Buncombe County is likely to occur. Therefore, utility failure is assigned a hazard index of 8 out of a possible 11.

Drought/Heat Wave

A drought may be defined as a condition where and when the water supply is deficient enough for a long enough period of time to damage the growth of vegetation, industrial production, or domestic activities. The National Drought Mitigation Center states that “In the most general sense, drought originates from a deficiency of precipitation over an extended period of time, resulting in a water shortage for some activity, group, or environmental sector.” Drought may or may not be accompanied by intense heat. This heat not only exacerbates the drought condition by increasing evaporation, it may also lead to health-related illness such as heat exhaustion or heat stroke or aggravate certain medical conditions.

Buncombe County experienced significant drought conditions three times in the past 70 years. The droughts occurred in the mid-1930s, 1998, and 2002 (NOAA). Based on previous occurrences there is a four to five percent chance that our area will experience a drought in any given year. There is the possible occurrence of a drought having a limited impact over a medium sized area of Buncombe County. Therefore, drought is assigned a hazard index of 6 out of a possible 11.

Dam Failure

A dam failure occurs when the structure retaining the water fails to function in the manner for which it was designed and constructed. The failure may vary in time from a prolonged deterioration of the structure to an almost instantaneous failure in which the dam gives away completely and without warning. Dam failure may be caused by: overtopping, structure failure (or damage), or seepage. There are many dams in the County that are too small to come under the jurisdiction of the State Dam Safety Law. A dam must be fifteen feet high and be capable of impounding at least ten acre-feet, or be classified as high hazard potential to be regulated. High hazard potential means that human life could be lost if the dam were to fail, major infrastructure would be lost, or significant property damage would be done. This designation in no way implies that the dam is deficient or likely to fail (NCDENR).

Buncombe County has 32 dams classified as high hazard potential. It is possible that a dam failure having limited impact over a small area could occur. Therefore, dam failure is assigned a hazard index of 5 out of a possible 11.

NOTE: Because Buncombe County's risk of Tsunamis is extremely slight, they are not analyzed in this document.

Table 2 "Hazard Identification and Analysis" ranks the events described above by assigning each one a Hazard Index number. The Hazard index number is based on combining the Likelihood of Occurrence, Location, and Potential Impact. The Hazard Index indicates that Buncombe County's major threats come from Severe Winter Storms, Utility Failure, and Flooding. The remainder of this document will concentrate on these three hazards. An integral part of the hazard mitigation planning process includes the continual evaluation and update of the plan. Additional hazards may be taken into consideration at some point in the future.