Annex M
Wake County

This annex includes jurisdiction-specific information for Wake County. It consists of the following five subsections:

- M.1 Wake County Community Profile
- M.2 Wake County Risk Assessment
- M.3 Wake County Vulnerability Assessment
- M.4 Wake County Capability Assessment
- M.5 Wake County Mitigation Strategy

M.1 WAKE COUNTY COMMUNITY PROFILE

M.1.1 Geography and the Environment

Wake County is best known as being home of the capital of North Carolina, Raleigh, and is home to a number of government agencies and functions. Many state agencies are located in Wake County as are many federal agencies.

Wake County is also known as one of three counties that comprise the Research Triangle metropolitan region, so named for the Research Triangle Park (RTP) which encompasses the three major metropolitan areas of Chapel-Hill, Durham, and Raleigh. Each of these metropolitan areas is home to a major research university (UNC-Chapel Hill, Duke, and NC State University, respectively) and RTP draws on these universities for its workforce. The Research Triangle Park is a hub of high-tech and biotech research and is a defining feature of the economy in Wake County.

Summer temperatures generally venture into the 90s for highs and cool off to the 70s at night. Winter temperatures in can drop to below freezing but generally highs are in the 50s. Rainfall is most common in the summer months but occurs consistently throughout the year.

M.1.2 Population and Demographics

According to the 2010 Census, Wake County has a population of 900,993 people. The county has seen exceptional growth between 2000 and 2010, and the population density is almost 1,100 people per square mile. Population counts from the US Census Bureau for 1990, 2000, and 2010 are presented in **Table M.1**.

TABLE M.1: POPULATION COUNTS FOR WAKE COUNTY

Jurisdiction	1990 Census Population	2000 Census Population	2010 Census Population	% Change 2000-2010
WAKE COUNTY	**423,380**	**627,846**	**900,993**	**43.51%**

Source: US Census Bureau

The racial characteristics of the county are presented in **Table M.2**. Whites make up the majority of the population in the county, accounting for over 65 percent of the population.

TABLE M.2: DEMOGRAPHICS OF WAKE COUNTY

Jurisdiction	White Persons, Percent (2010)	Black Persons, Percent (2010)	American Indian or Alaska Native, Percent (2010)	Other Race, Percent (2010)	Persons of Hispanic Origin, Percent (2010)*
WAKE COUNTY	**66.3%**	**20.7%**	**0.5%**	**12.5%**	**9.1%**

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

M.1.3 Housing

According to the 2010 US Census, there are 371,836 housing units in Wake County, the majority of which are single family homes or mobile homes. Housing information for the county is presented in **Table M.3**.

TABLE M.3: HOUSING CHARACTERISTICS

Jurisdiction	Housing Units (2000)	Housing Units (2010)	Seasonal Units, Percent (2010)	Median Home Value (2007-2011)
WAKE COUNTY	**258,953**	**371,836**	**7.0%**	**$230,400**

Source: US Census Bureau

M.1.4 Infrastructure

Transportation

There are several major roadways that cross Wake County. The most prominent is Interstate 40 which runs through the county on an east-west track. It has two spurs that more or less encompass the city of Raleigh and provide access to many of the outlying municipalities. In conjunction with I-40, I-440 makes up the "Beltline" that encircles most of central Raleigh. Meanwhile, I-540/NC-540 is a partly completed loop that is outside the beltline that currently connects many of the northern and western municipalities. In addition to the Interstate, there are many major highways that traverse the county. Federal highways of note are US-1, US-64, US-264, US-70, and US-401, while state highways in the county include NC-39, NC-42, NC-50, NC-54, NC-55, NC-96, NC-98, and NC-231.

In terms of other transportation services, Raleigh-Durham International Airport (RDU) is one of the largest airports in the state and serves more than 35 international and domestic locations and over 9 million passengers a year. Wake County is also home to two Amtrak railway facilities, located in Raleigh and Cary. The Triangle Transit authority operates a bus system that connects Raleigh, Durham, and Chapel-Hill and there are also several intra-county bus lines that provide service between Wake County municipalities.

Utilities

Electrical power in Wake County is provided by two entities and Duke Energy and Wake Electric Membership Corporation with Duke Energy providing service to a majority of the county. Water and

sewer service is provided by two main entities as well: The City of Raleigh Public Utilities and Western Wake Partners. Natural gas is provided by PSNC Energy.

Community Facilities

There are a number of public buildings and community facilities located throughout Wake County. According to the data collected for the vulnerability assessment (Section 6.4.1), there are 81 fire stations, 38 police stations, and 158 public schools located within the study area.

Three major hospitals are located in Wake County: Rex Hospital, WakeMed, and Duke Raleigh. WakeMed also operates several satellite locations throughout the county.

Wake County is also home to several parks, including three state parks: Falls Lake State Recreation Area, William B. Umstead State Park, and Jordan Lake State Recreation Area. There are also a number of county and municipal parks located throughout the jurisdictions, including the American Tobacco Trail which is a rails to trails project that is open to a wide variety of non-motorized uses.

M.1.5 Land Use

Much of Wake County is developed and relatively urbanized. However, there are some areas that are more sparsely developed, sometimes due to the conservation of land. As shown in **Figure 3.1** above, there are many incorporated municipalities located throughout the study area, and these areas are where the region's population is generally concentrated. The incorporated areas are also where many businesses, commercial uses, and institutional uses are located. Land uses in the balance of the study area consist of a variety of types of residential, commercial, industrial, government, and recreational uses. Local land use and associated regulations are further discussed in *Section 7: Capability Assessment.*

M.1.6 Employment and Industry

According to the North Carolina Employment Security Commission, in 2012 (the last full year with data available), Wake County had an average annual employment of 453,415 workers. The Retail Trade industry employed 11.4% of the County's workforce followed by Health Care and Social Assistance (10.5%); Professional and Technical Services (9.3%); and Accommodation and Food Services (9.2%). In 2012, the projected median household income was $60,412 compared to $42,941 for the state of North Carolina in 2011 (2012 numbers were not available).

M.2 WAKE COUNTY RISK ASSESSMENT

This subsection includes hazard profiles for each of the significant hazards identified in Section 4: *Hazard Identification* as they pertain to Wake County. Where possible data has been included only for the unincorporated area of Wake County. Each hazard profile includes a description of the hazard's location and extent, notable historical occurrences, and the probability of future occurrences. Additional information can be found in Section 5: *Hazard Profiles*.

M.2.1 Drought

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, Wake County has a relatively low risk for drought hazard. However, local areas may experience much more severe and/or frequent drought events than what is represented on the Palmer Drought Severity Index map. Furthermore, it is assumed that the county would be uniformly exposed to drought, making the spatial extent potentially widespread. It is also notable that drought conditions typically do not cause significant damage to the built environment.

Historical Occurrences

According to the North Carolina Drought Monitor, Wake County has had drought occurrences all of the last fourteen years (2000-2013). **Table M.4** shows the most severe drought classification for each year, according to North Carolina Drought Monitor classifications.

TABLE M.4: HISTORICAL DROUGHT OCCURRENCES IN WAKE COUNTY

Abnormally Dry | **Moderate Drought** | **Severe Drought** | **Extreme Drought** | **Exceptional Drought**

	Wake County
2000	MODERATE
2001	SEVERE
2002	**EXCEPTIONAL**
2003	ABNORMAL
2004	ABNORMAL
2005	SEVERE
2006	SEVERE
2007	**EXCEPTIONAL**
2008	**EXCEPTIONAL**
2009	MODERATE
2010	SEVERE
2011	SEVERE
2012	MODERATE
2013	MODERATE

Source: North Carolina Drought Monitor

Probability of Future Occurrences

Based on historical occurrence information, it is assumed that Wake County has a probability level of likely (10-100 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. However, historical information also indicates that there is a much lower probability for extreme, long-lasting drought conditions.

M.2.2 Extreme Heat

Location and Spatial Extent

Excessive heat typically impacts a large area and cannot be confined to any geographic or political boundaries. All of Wake County is susceptible to extreme heat conditions.

Historical Occurrences

Data from the National Climatic Data Center was used to determine historical extreme heat and heat wave events in Wake County. There were two events reported:

July 22, 1998 – *Excessive Heat* - Excessive heat plagued central North Carolina during July 22 through July 23. Maximum temperatures reached the 98 to 103 degree range combined with dew points in the 78 to 80 degree range with little wind to give heat index values of around 110 degrees.

August 22, 2007 – *Heat* - An athlete from Enloe High School running track collapsed from heat exhaustion and was sent to the hospital in critical condition. The student remained in the hospital in critical condition for several days.

In addition, information from the State Climate Office of North Carolina was reviewed to obtain historical temperature records in the region. Temperature information has been reported since 1898. The recorded maximum for Wake County was 107 degrees Fahrenheit in Raleigh at North Carolina State University in 2011.

The State Climate Office also reports average maximum temperatures in various locations in the county. The most centralized location is in Raleigh at North Carolina State University. **Table M.5** shows the average maximum temperatures from 1971 to 2000 at the North Carolina State University observation station which can be used as a general comparison for the region.

Table M.5: AVERAGE MAXIMUM TEMPERATURE IN RALEIGH, WAKE COUNTY

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Avg. Max (°F)	48.8	53.0	61.2	70.6	77.5	84.4	87.9	85.9	80.0	69.8	61.3	52.1

Source: State Climate Office of North Carolina

Probability of Future Occurrences

Based on historical occurrence information, it is assumed that all of Wake County has a probability level of likely (10 to 100 percent annual probability) for future extreme heat events to impact the region.

M.2.3 Hailstorm

Location and Spatial Extent

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

Historical Occurrences

According to the National Climatic Data Center, 102 recorded hailstorm events have affected unincorporated Wake County since 1993.[1] **Table M.6** is a summary of the hail events in unincorporated Wake County. **Table M.7** provides detailed information about each event that occurred. In all, hail occurrences resulted in $0 (2013 dollars) in property damages. Hail ranged in diameter from 0.75 inches to 3.00 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.

[1] These hail events are only inclusive of those reported by the National Climatic Data Center (NCDC). It is likely that additional hail events have affected Wake County. In addition to NCDC, the North Carolina Department of Insurance office was contacted for information. As additional local data becomes available, this hazard profile will be amended.

TABLE M.6: SUMMARY OF HAIL OCCURRENCES IN WAKE COUNTY

Location	Number of Occurrences	Property Damage (2013)
Unincorporated Wake County	102	$0

Source: National Climatic Data Center

TABLE M.7: HISTORICAL HAIL OCCURRENCES IN WAKE COUNTY

	Date	Magnitude	Deaths/Injuries	Property Damage*
Wake County				
Wake County	8/15/1958	1 in.	0/0	$0
Wake County	3/19/1966	1 in.	0/0	$0
Wake County	3/19/1966	1 in.	0/0	$0
Wake County	2/9/1970	0.75 in.	0/0	$0
Wake County	5/23/1973	0.75 in.	0/0	$0
Wake County	5/28/1973	1.75 in.	0/0	$0
Wake County	4/8/1976	1.5 in.	0/0	$0
Wake County	4/19/1978	1.25 in.	0/0	$0
Wake County	4/19/1978	1 in.	0/0	$0
Wake County	6/22/1978	1 in.	0/0	$0
Wake County	4/27/1980	1.75 in.	0/0	$0
Wake County	4/27/1980	0.75 in.	0/0	$0
Wake County	4/27/1980	0.75 in.	0/0	$0
Wake County	4/30/1981	0.75 in.	0/0	$0
Wake County	6/3/1982	1 in.	0/0	$0
Wake County	6/3/1982	1.75 in.	0/0	$0
Wake County	6/3/1982	2 in.	0/0	$0
Wake County	6/16/1982	2 in.	0/0	$0
Wake County	5/26/1983	0.75 in.	0/0	$0
Wake County	4/16/1985	0.75 in.	0/0	$0
Wake County	6/24/1986	1.75 in.	0/0	$0
Wake County	6/24/1986	1.75 in.	0/0	$0
Wake County	8/2/1986	0.75 in.	0/0	$0
Wake County	7/13/1987	1.5 in.	0/0	$0
Wake County	8/21/1987	1.75 in.	0/0	$0
Wake County	10/6/1987	1 in.	0/0	$0
Wake County	5/17/1988	1.75 in.	0/0	$0
Wake County	5/19/1988	1 in.	0/0	$0
Wake County	5/19/1988	1 in.	0/0	$0
Wake County	6/2/1988	2 in.	0/0	$0
Wake County	6/2/1988	0.75 in.	0/0	$0
Wake County	6/17/1988	1 in.	0/0	$0
Wake County	7/19/1988	0.75 in.	0/0	$0
Wake County	7/31/1988	1 in.	0/0	$0
Wake County	9/24/1988	2.5 in.	0/0	$0
Wake County	4/25/1989	1.75 in.	0/0	$0
Wake County	6/15/1989	0.88 in.	0/0	$0
Wake County	6/16/1989	3 in.	0/0	$0

	Date	Magnitude	Deaths/Injuries	Property Damage*
Wake County	4/2/1990	1 in.	0/0	$0
Wake County	5/4/1990	1.5 in.	0/0	$0
Wake County	6/3/1990	1 in.	0/0	$0
Wake County	7/1/1990	2.5 in.	0/0	$0
Wake County	8/29/1990	1.75 in.	0/0	$0
Wake County	8/29/1990	0.75 in.	0/0	$0
Wake County	6/26/1992	0.75 in.	0/0	$0
Wake County	6/26/1992	1 in.	0/0	$0
Wake County	7/26/1992	1 in.	0/0	$0
Wake County	9/4/1992	1.5 in.	0/0	$0
New Hill	3/27/1993	0.75 in.	0/0	$0
New Hill	5/19/1993	1.75 in.	0/0	$0
Wake County	5/1/1994	0.75 in.	0/0	$0
Wake County	5/26/1995	1.75 in.	0/0	$0
FALLS LAKE	5/11/1996	0.75 in.	0/0	$0
CARPENTER	3/21/1999	1 in.	0/0	$0
SHOTWELL	8/13/2000	0.88 in.	0/0	$0
NEW HILL	5/14/2006	0.75 in.	0/0	$0
FALLS	5/20/2006	0.75 in.	0/0	$0
BAYLEAF	5/9/2008	0.75 in.	0/0	$0
WAKE XRDS	5/9/2008	0.75 in.	0/0	$0
WILLOW SPGS	5/9/2008	0.88 in.	0/0	$0
NEWHILL	5/20/2008	1.75 in.	0/0	$0
WILLOW	5/20/2008	0.88 in.	0/0	$0
MACEDONIA	5/20/2008	0.75 in.	0/0	$0
WILLOW SPGS	5/20/2008	1 in.	0/0	$0
MACEDONIA	7/6/2008	0.75 in.	0/0	$0
MILLBROOK	7/22/2008	0.75 in.	0/0	$0
FAWLERS XRDS	5/5/2009	0.88 in.	0/0	$0
WILLOW SPGS	7/1/2009	0.75 in.	0/0	$0
FALLS	7/27/2009	1 in.	0/0	$0
LEESVILLE	7/28/2009	0.88 in.	0/0	$0
WILLIAMS XRDS	8/5/2009	0.88 in.	0/0	$0
ROYAL MILLS	2/28/2011	1 in.	0/0	$0
SIX FORKS	8/29/2011	1.25 in.	0/0	$0
ECHO HGTS	3/31/2012	0.75 in.	0/0	$0
AUBURN	3/31/2012	1.25 in.	0/0	$0
PET XRDS	5/4/2012	1 in.	0/0	$0
AUBURN	5/17/2012	1.25 in.	0/0	$0
AUBURN	5/23/2012	1.25 in.	0/0	$0
FORESTVILLE	5/23/2012	1 in.	0/0	$0
STARMOUNT	5/23/2012	1 in.	0/0	$0
STARMOUNT	5/23/2012	1 in.	0/0	$0
STARMOUNT	5/23/2012	1 in.	0/0	$0
BAYLEAF	7/1/2012	1 in.	0/0	$0
BAYLEAF	7/1/2012	1.75 in.	0/0	$0
UPCHURCH	7/1/2012	1 in.	0/0	$0

	Date	Magnitude	Deaths/Injuries	Property Damage*
FAWLERS XRDS	7/1/2012	1 in.	0/0	$0
FAWLERS XRDS	7/1/2012	1.5 in.	0/0	$0
BAYLEAF	7/1/2012	1.75 in.	0/0	$0
FALLS	7/1/2012	1 in.	0/0	$0
UPCHURCH	7/1/2012	1.75 in.	0/0	$0
SIX FORKS	7/1/2012	1 in.	0/0	$0
AUBURN	7/1/2012	1 in.	0/0	$0
FALLS	7/6/2012	1 in.	0/0	$0
STARMOUNT	7/6/2012	1.75 in.	0/0	$0

*Property damage is reported in 2013 dollars; All damage may not have been reported.
Source: National Climatic Data Center

Probability of Future Occurrences

Based on historical occurrence information, it is assumed that the probability of future hail occurrences is likely (10 – 100 percent annual probability). Since hail is an atmospheric hazard (coinciding with thunderstorms), it is assumed that Wake County has equal exposure to this hazard. It can be expected that future hail events will continue to cause minor damage to property and vehicles throughout the county.

M.2.4 Hurricane and Tropical Storm

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 Wake County. The entire jurisdiction is equally susceptible to hurricane and tropical storms.

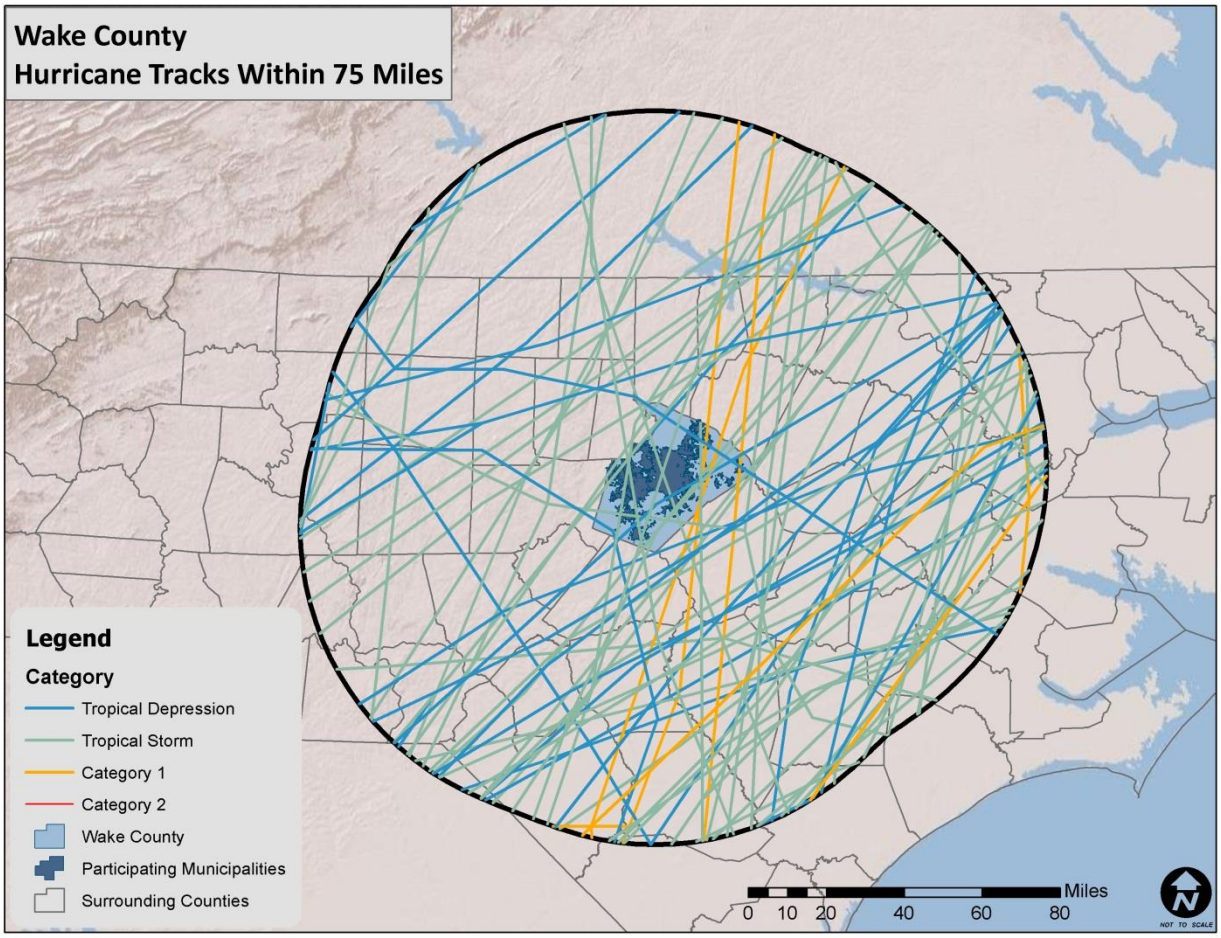
Historical Occurrences

According to the National Hurricane Center's historical storm track records, 87 hurricane or tropical storm tracks have passed within 75 miles of Wake County since 1850.[2] This includes eight hurricanes, fifty-five tropical storms, and twenty-four tropical depressions.

Of the recorded storm events, twenty-one storms have traversed directly through Wake County as shown in **Figure M.1**. **Table M.8** provides for each event the date of occurrence, name (if applicable), maximum wind speed (as recorded within 75 miles of Wake County) and Category of the storm based on the Saffir-Simpson Scale.

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

FIGURE M.1: HISTORICAL HURRICANE STORM TRACKS WITHIN 75 MILES OF WAKE COUNTY



Source: National Oceanic and Atmospheric Administration; National Hurricane Center

TABLE M.8: HISTORICAL STORM TRACKS WITHIN 75 MILES OF WAKE COUNTY (1850–2013)

Date of Occurrence	Storm Name	Maximum Wind Speed (miles per hour)	Storm Category
1851	NOT NAMED	35	Tropical Storm
1853	NOT NAMED	62	Tropical Storm
1854	NOT NAMED	57	Tropical Storm
1859	NOT NAMED	53	Tropical Storm
1859	NOT NAMED	35	Tropical Storm
1867	NOT NAMED	35	Tropical Storm
1873	XXXX873144	44	Tropical Storm
1873	NOT NAMED	44	Tropical Storm
1876	NOT NAMED	62	Tropical Storm
1877	NOT NAMED	48	Tropical Storm
1878	NOT NAMED	44	Tropical Storm
1878	NOT NAMED	79	Category 1
1882	NOT NAMED	53	Tropical Storm

Date of Occurrence	Storm Name	Maximum Wind Speed (miles per hour)	Storm Category
1883	NOT NAMED	44	Tropical Storm
1885	NOT NAMED	35	Tropical Storm
1886	NOT NAMED	31	Tropical Depression
1886	NOT NAMED	35	Tropical Storm
1886	NOT NAMED	53	Tropical Storm
1887	NOT NAMED	31	Tropical Depression
1888	NOT NAMED	31	Tropical Depression
1889	NOT NAMED	35	Tropical Storm
1891	NOT NAMED	35	Tropical Storm
1893	NOT NAMED	44	Tropical Storm
1893	NOT NAMED	70	Category 1
1893	NOT NAMED	31	Tropical Depression
1896	NOT NAMED	62	Tropical Storm
1899	NOT NAMED	66	Category 1
1902	NOT NAMED	35	Tropical Storm
1902	NOT NAMED	31	Tropical Depression
1904	NOT NAMED	48	Tropical Storm
1907	NOT NAMED	53	Tropical Storm
1911	NOT NAMED	22	Tropical Depression
1912	NOT NAMED	53	Tropical Storm
1913	NOT NAMED	57	Tropical Storm
1913	NOT NAMED	66	Category 1
1915	NOT NAMED	35	Tropical Storm
1916	NOT NAMED	31	Tropical Depression
1916	NOT NAMED	31	Tropical Depression
1920	NOT NAMED	31	Tropical Depression
1924	NOT NAMED	53	Tropical Storm
1927	NOT NAMED	44	Tropical Storm
1928	NOT NAMED	35	Tropical Storm
1928	NOT NAMED	40	Tropical Storm
1929	NOT NAMED	35	Tropical Storm
1935	NOT NAMED	53	Tropical Storm
1940	NOT NAMED	62	Tropical Storm
1944	NOT NAMED	48	Tropical Storm
1944	NOT NAMED	31	Tropical Depression
1945	NOT NAMED	35	Tropical Storm
1946	NOT NAMED	22	Tropical Depression
1947	NOT NAMED	22	Tropical Depression
1954	HAZEL	70	Category 1
1955	DIANE	53	Tropical Storm
1956	IVY	35	Tropical Storm
1959	CINDY	26	Tropical Depression

Date of Occurrence	Storm Name	Maximum Wind Speed (miles per hour)	Storm Category
1960	BRENDA	44	Tropical Storm
1961	UNNAMED	44	Tropical Storm
1964	CLEO	26	Tropical Depression
1965	UNNAMED	26	Tropical Depression
1968	CELESTE	31	Tropical Depression
1970	ALMA	22	Tropical Depression
1971	UNNAMED	40	Tropical Storm
1971	HEIDI	40	Tropical Storm
1972	AGNES	35	Tropical Storm
1976	SUBTROP:SUBTROP 3	35	Tropical Storm
1979	DAVID	35	Tropical Storm
1984	DIANA	40	Tropical Storm
1985	ONE-C	31	Tropical Depression
1985	BOB	26	Tropical Depression
1987	UNNAMED	53	Tropical Storm
1996	JOSEPHINE	44	Tropical Storm
1996	BERTHA	57	Tropical Storm
1996	FRAN	57	Tropical Storm
1997	DANNY	31	Tropical Depression
1998	EARL	66	Category 1
1999	DENNIS	31	Tropical Depression
1999	FLOYD*	66	Category 1
2000	GORDON	35	Tropical Storm
2000	HELENE	35	Tropical Storm
2003	NOT NAMED	57	Tropical Storm
2004	CHARLEY	79	Category 1
2004	GASTON	35	Tropical Storm
2004	JEANNE	31	Tropical Depression
2006	ALBERTO	35	Tropical Storm
2008	OMAR	26	Tropical Depression
2008	SIXTEEN	26	Tropical Depression
2008	HANNA	40	Tropical Storm

Source: National Hurricane Center

The National Climatic Data Center reported seven events associated with a hurricane or tropical storm in Wake County between 1950 and 2013. These storms are listed in **Table M.9** and are generally representative of storms with the greatest impact on the county over the time period.

TABLE M.9: HISTORICAL HURRICANE/TROPICAL STORM OCCURRENCES IN WAKE COUNTY

Date of Occurrence	Storm Name	Deaths/Injuries	Property Damage*
7/12/1996	Hurricane Bertha	0/0	$0
9/5/1996	Hurricane Fran	7/2	$0
8/27/1998	Hurricane Bonnie	0/0	$0

Date of Occurrence	Storm Name	Deaths/Injuries	Property Damage*
9/4/1999	Hurricane Dennis	0/0	$0
9/15/1999	Hurricane Floyd	0/0	$179,765,471
9/18/2003	Hurricane Isabel	1/0	$776,235
9/1/2006	Tropical Storm Ernesto	0/0	$0

*Property damage is reported in 2013 dollars; All damage may not have been reported.

Federal records also indicate that three disaster declarations were made in 1996 (Hurricane Fran), 1999 (Hurricane Floyd), and 2003 (Hurricane Isabel) for the county.[3]

Flooding and high winds are both hazards of concern with hurricane and tropical storm events in Wake County as evidenced by the difference in impacts caused by Hurricanes Fran and Floyd. Whereas Floyd's effects were primarily due to flooding, Fran's high winds caused damage throughout the county in conjunction with flooding impacts. Some anecdotal information is available for the major storms that have impacted the area as found below:

Hurricane Fran – September 5-6, 1996
After being saturated with rain just a few weeks earlier by Hurricane Bertha, Wake County was impacted by the one of the most devastating storms to ever make landfall along the Atlantic Coast. Fran dropped more than 10 inches of rain in many areas and had sustained winds of around 115 miles per hour as it hit the coast and began its path along the I-40 corridor towards Wake County. In the end, over 900 million dollars in damages to residential and commercial property and at least 1 death were reported in Wake County alone. Damages to infrastructure and agriculture added to the overall toll and more than 1.7 million people in the state were left without power.

Hurricane Floyd – September 16-17, 1999
Much like Hurricane Fran, Hurricane Floyd hit the North Carolina coast just 10 days after Tropical Storm Dennis dropped more than 10 inches of rain in many areas of the state. As a result, the ground was heavily saturated when Floyd dumped an additional 15 to 20 inches in some areas. Although much of the heavy damage from the storm was found further east, Wake County suffered significant damage from the storm. Across the state more than 6 billion dollars in property damage was recorded and agricultural impacts were extremely high.

Probability of Future Occurrences

Given the inland location of the jurisdiction, it is less likely to be affected by a hurricane or tropical storm system than counties closer to the coast. However, given its location in the eastern part of the state, hurricanes and tropical storms still remain a real threat to Wake County. Based on historical evidence, the probability level of future occurrence is likely (annual probability between 10 and 100 percent). Given the regional nature of the hazard, all areas are equally exposed to this hazard. When the jurisdiction is impacted, the damage could be catastrophic, threatening lives and property throughout the planning area.

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

M.2.5 Lightning

Location and Spatial Extent

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

Historical Occurrences

According to the National Climatic Data Center, there have been twelve recorded lightning events in unincorporated Wake County since 1950, as listed in summary **Table M.10** and detailed in **Table M.11**.[4] However, it is certain that more lightning events have in fact impacted the jurisdiction. Many of the reported events are those that caused damage, and it should be expected that damages are likely much higher for this hazard than what is reported.

TABLE M.10: SUMMARY OF LIGHTNING OCCURRENCES IN WAKE COUNTY

Location	Number of Occurrences	Deaths/Injuries	Property Damage (2013)
Unincorporated Wake County	12	1/0	$294,407

Source: National Climatic Data Center

TABLE M.11: HISTORICAL LIGHTNING OCCURRENCES IN WAKE COUNTY

	Date	Deaths/Injuries	Property Damage*	Details
Wake County				
FALLS	7/24/1999	1/0	$0	A man was stepping from his boat onto the dock when he was hit by lightning. He never regained consciousness and died the next day.
MACEDONIA	7/16/2010	0/0	$11,255	A broken line of showers and thunderstorms developed across western North Carolina during the afternoon and then moved east across central and eastern North Carolina during the evening hours
FALLS	7/20/2010	0/0	$11,255	An upper level disturbance combined with strong afternoon heating to produce scattered strong to severe storms. Additional storms then developed along the numerous outflow boundaries.

[4] These lightning events are only inclusive of those reported by the National Climatic Data Center (NCDC). It is certain that additional lightning events have occurred in Wake County. The State Fire Marshall's office was also contacted for additional information but none could be provided. As additional local data becomes available, this hazard profile will be amended.

	Date	Deaths/Injuries	Property Damage*	Details
WILDERS GROVE	7/17/2010	0/0	$11,255	Thunderstorms developed across Virginia and central North Carolina as a small long lived MCS crossed the central and southern Appalachians. Widespread wind damage was reported across northern and central portions of central North Carolina.
SIX FORKS	7/29/2010	0/0	$2,251	A line of strong to severe storms formed as a cold front moved into a very moist and moderately unstable air mass..
LEESVILLE	7/20/2010	0/0	$16,883	An upper level disturbance combined with strong afternoon heating to produce scattered strong to severe storms. Additional storms then developed along the numerous outflow boundaries.
FORESTVILLE	7/1/2009	0/0	$5,796	A strong upper level disturbance and attendant surface cold front combined to produce scattered showers and thunderstorms across the eastern half of central North Carolina. The unseasonably dry low levels of the atmosphere across central North Carolina created a favorable environment for any thunderstorms that developed to produce damaging winds. Many of the thunderstorms that developed became severe and produced damaging winds across the eastern half of central North Carolina
UPCHURCH	6/15/2010	0/0	$56,275	A broken line of thunderstorms, some which were severe, tracked east across the Northwest and Eastern Piedmont. The storms were associated with a weak upper level

	Date	Deaths/Injuries	Property Damage*	Details
				disturbance which combined with afternoon heating.
UPCHURCH	6/22/2010	0/0	$140,689	Strong insolation underneath an oppressive upper level heat ridge resulted in isolated pulse severe convection.
WILLOW	6/2/2010	0/0	$28,138	Strong to severe slow moving storms and merging storms resulted in severe damaging winds and flash flooding across portions of Central North Carolina. Frequent to excessive lightning resulted in property damage across the area to homes and businesses.
WYATT	5/9/2012	0/0	$5,305	A cold front moved into central North Carolina and interacted with an unstable air mass to produce scattered showers and thunderstorms. Some of these storms became strong to severe across portions of the Piedmont and Coastal Plain of central North Carolina.
UPCHURCH	7/6/2012	0/0	$5,305	An upper level disturbance moved across central North Carolina and interacted with moderate to strong instability to trigger scattered showers and thunderstorms. Several of these storms became severe and produced damaging winds and a few isolated severe hail reports.

*Property damage is reported in 2013 dollars; All damage may not have been reported.
Source: National Climatic Data Center

Probability of Future Occurrences

Although there were not a high number of historical lightning events reported in Wake County 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®), Wake County is located in an area of the country that experienced an average of 4 to 5 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 jurisdiction.

M.2.6 Severe Thunderstorm/High Wind

Location and Spatial Extent

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

Historical Occurrences

Severe storms were at least partially responsible for three disaster declarations in Wake County in 1988, 1998, and 2011.[5] According to NCDC, there have been 186 reported thunderstorm/high wind events since 1994 for high wind and since 1950 for thunderstorms.[6] These events caused over $300,000 (2013 dollars) in damages. **Table M.12** summarizes this information. **Table M.13** presents detailed high wind and thunderstorm wind event reports including date, magnitude, and associated damages for each event.[7]

TABLE M. 12: SUMMARY OF THUNDERSTORM/HIGH WIND OCCURRENCES IN WAKE COUNTY

Location	Number of Occurrences	Deaths/Injuries	Property Damage (2013 dollars)
Unincorporated Wake County	186	1/2	$323,146

Source: National Climatic Data Center

TABLE M.13: HISTORICAL THUNDERSTORM/HIGH WIND OCCURRENCES IN WAKE COUNTY

Location	Date	Type	Magnitude	Deaths/ Injuries	Property Damage*
Wake County					
Wake County	6/15/1958	TSTM WIND	0 kts.	0/0	$0
Wake County	6/15/1958	TSTM WIND	0 kts.	0/0	$0
Wake County	6/21/1964	TSTM WIND	50 kts.	0/0	$0
Wake County	10/7/1965	TSTM WIND	0 kts.	0/0	$0
Wake County	7/14/1966	TSTM WIND	0 kts.	0/0	$0
Wake County	7/20/1970	TSTM WIND	0 kts.	0/0	$0
Wake County	8/3/1970	TSTM WIND	0 kts.	0/0	$0
Wake County	5/17/1973	TSTM WIND	0 kts.	0/0	$0
Wake County	5/28/1973	TSTM WIND	0 kts.	0/0	$0

[5] A complete listing of historical disaster declarations can be found in Section 4: *Hazard Profiles*.
[6] These thunderstorm events are only inclusive of those reported by the National Climatic Data Center (NCDC). It is certain that additional thunderstorm events have occurred in Wake County. As additional local data becomes available, this hazard profile will be amended.
[7] The dollar amount of damages provided by NCDC is divided by the number of affected counties to reflect a damage estimate for the county.

Location	Date	Type	Magnitude	Deaths/ Injuries	Property Damage*
Wake County	8/12/1973	TSTM WIND	0 kts.	0/0	$0
Wake County	8/12/1973	TSTM WIND	0 kts.	0/0	$0
Wake County	6/23/1974	TSTM WIND	0 kts.	0/0	$0
Wake County	3/24/1975	TSTM WIND	0 kts.	0/0	$0
Wake County	3/24/1975	TSTM WIND	0 kts.	0/0	$0
Wake County	3/24/1975	TSTM WIND	0 kts.	0/0	$0
Wake County	10/9/1976	TSTM WIND	0 kts.	0/0	$0
Wake County	7/13/1977	TSTM WIND	0 kts.	0/0	$0
Wake County	2/11/1981	TSTM WIND	0 kts.	0/0	$0
Wake County	6/16/1982	TSTM WIND	0 kts.	0/0	$0
Wake County	7/3/1982	TSTM WIND	0 kts.	0/0	$0
Wake County	7/4/1982	TSTM WIND	0 kts.	0/0	$0
Wake County	8/23/1983	TSTM WIND	0 kts.	0/0	$0
Wake County	3/20/1984	TSTM WIND	52 kts.	0/0	$0
Wake County	3/20/1984	TSTM WIND	0 kts.	0/0	$0
Wake County	3/21/1984	TSTM WIND	0 kts.	0/0	$0
Wake County	3/21/1984	TSTM WIND	0 kts.	0/0	$0
Wake County	4/4/1984	TSTM WIND	0 kts.	0/0	$0
Wake County	5/8/1984	TSTM WIND	0 kts.	0/0	$0
Wake County	5/8/1984	TSTM WIND	52 kts.	0/0	$0
Wake County	5/8/1984	TSTM WIND	0 kts.	0/0	$0
Wake County	5/8/1984	TSTM WIND	0 kts.	0/0	$0
Wake County	4/16/1985	TSTM WIND	0 kts.	0/0	$0
Wake County	5/22/1985	TSTM WIND	0 kts.	0/0	$0
Wake County	6/5/1985	TSTM WIND	0 kts.	0/0	$0
Wake County	6/5/1985	TSTM WIND	0 kts.	0/0	$0
Wake County	2/6/1986	TSTM WIND	0 kts.	0/0	$0
Wake County	2/6/1986	TSTM WIND	0 kts.	0/0	$0
Wake County	3/13/1986	TSTM WIND	0 kts.	0/0	$0
Wake County	7/22/1986	TSTM WIND	0 kts.	0/0	$0
Wake County	7/26/1986	TSTM WIND	0 kts.	0/0	$0
Wake County	7/26/1986	TSTM WIND	0 kts.	0/0	$0
Wake County	7/29/1986	TSTM WIND	0 kts.	0/0	$0
Wake County	8/2/1986	TSTM WIND	53 kts.	0/0	$0
Wake County	8/2/1986	TSTM WIND	0 kts.	0/0	$0
Wake County	8/10/1986	TSTM WIND	0 kts.	0/0	$0
Wake County	8/11/1986	TSTM WIND	0 kts.	0/0	$0
Wake County	4/12/1987	TSTM WIND	50 kts.	0/0	$0
Wake County	4/12/1987	TSTM WIND	0 kts.	0/0	$0
Wake County	4/12/1987	TSTM WIND	0 kts.	0/0	$0
Wake County	6/1/1987	TSTM WIND	0 kts.	0/0	$0
Wake County	6/3/1987	TSTM WIND	0 kts.	0/0	$0
Wake County	6/23/1987	TSTM WIND	0 kts.	0/0	$0
Wake County	7/3/1987	TSTM WIND	0 kts.	0/0	$0
Wake County	7/12/1987	TSTM WIND	0 kts.	0/0	$0
Wake County	7/26/1987	TSTM WIND	0 kts.	0/0	$0

Location	Date	Type	Magnitude	Deaths/ Injuries	Property Damage*
Wake County	8/4/1987	TSTM WIND	0 kts.	0/0	$0
Wake County	8/21/1987	TSTM WIND	0 kts.	0/0	$0
Wake County	5/23/1988	TSTM WIND	0 kts.	0/0	$0
Wake County	6/17/1988	TSTM WIND	0 kts.	0/0	$0
Wake County	6/20/1988	TSTM WIND	0 kts.	0/0	$0
Wake County	6/20/1988	TSTM WIND	0 kts.	0/0	$0
Wake County	6/20/1988	TSTM WIND	0 kts.	0/0	$0
Wake County	7/31/1988	TSTM WIND	0 kts.	0/0	$0
Wake County	2/21/1989	TSTM WIND	0 kts.	0/0	$0
Wake County	2/21/1989	TSTM WIND	0 kts.	0/0	$0
Wake County	3/18/1989	TSTM WIND	0 kts.	0/0	$0
Wake County	4/25/1989	TSTM WIND	0 kts.	0/0	$0
Wake County	4/27/1989	TSTM WIND	0 kts.	0/0	$0
Wake County	5/5/1989	TSTM WIND	0 kts.	0/0	$0
Wake County	5/6/1989	TSTM WIND	0 kts.	0/0	$0
Wake County	5/1/1990	TSTM WIND	0 kts.	0/0	$0
Wake County	6/22/1990	TSTM WIND	0 kts.	0/0	$0
Wake County	6/22/1990	TSTM WIND	0 kts.	0/0	$0
Wake County	6/22/1990	TSTM WIND	0 kts.	0/0	$0
Wake County	8/16/1990	TSTM WIND	0 kts.	0/0	$0
Wake County	4/8/1991	TSTM WIND	0 kts.	0/0	$0
Wake County	3/10/1992	TSTM WIND	0 kts.	0/0	$0
Wake County	3/10/1992	TSTM WIND	0 kts.	0/0	$0
Wake County	4/24/1992	TSTM WIND	0 kts.	0/0	$0
Wake County	8/12/1992	TSTM WIND	0 kts.	0/0	$0
Wake County	8/5/1994	THUNDERSTORM WINDS	0 kts.	0/0	$0
Wake County	5/19/1995	THUNDERSTORM WINDS	0 kts.	0/0	$68,275
Wake County	6/11/1995	THUNDERSTORM WINDS	60 kts.	0/0	$0
COUNTYWIDE	1/19/1996	TSTM WIND	0 kts.	0/0	$0
NEW HILL	4/15/1996	TSTM WIND	0 kts.	0/0	$16,574
SRN HALF	7/2/1996	TSTM WIND	0 kts.	0/0	$0
Wake County	4/1/1997	HIGH WIND	50 kts.	1/1	$0
Wake County	7/24/1997	HIGH WIND	50 kts.	0/0	$0
Wake County	2/3/1998	HIGH WIND	35 kts.	0/0	$0
Wake County	2/16/1998	HIGH WIND	52 kts.	0/0	$0
PURNELL	5/20/2000	TSTM WIND	50 kts.	0/0	$0
FALLS	8/10/2000	TSTM WIND	50 kts.	0/0	$0
FUQUAY SPGS	7/5/2002	TSTM WIND	50 kts.	0/0	$0
Wake County	3/7/2004	TSTM WIND	65 kts.	0/0	$7,030
Wake County	11/22/2006	HIGH WIND	38 kts.	0/0	$12,668
Wake County	4/16/2007	TSTM WIND	42 kts.	0/0	$0
Wake County	2/10/2008	TSTM WIND	43 kts.	0/0	$229
WILLIAMS XRDS	3/4/2008	TSTM WIND	61 kts.	0/0	$0
BAYLEAF	6/1/2008	TSTM WIND	50 kts.	0/0	$0

Location	Date	Type	Magnitude	Deaths/ Injuries	Property Damage*
BAYLEAF	6/1/2008	TSTM WIND	50 kts.	0/0	$0
MILLBROOK	6/27/2008	TSTM WIND	50 kts.	0/0	$0
PURNELL	6/29/2008	TSTM WIND	50 kts.	0/0	$0
PURNELL	6/29/2008	TSTM WIND	50 kts.	0/0	$0
CARPENTER	7/4/2008	TSTM WIND	50 kts.	0/0	$0
PET XRDS	7/22/2008	STRONG WIND	50 kts.	0/0	$0
BAYLEAF	8/15/2008	THUNDERSTORM WIND	50 kts.	0/0	$17,911
BRENTWOOD	8/20/2008	STRONG WIND	50 kts.	0/0	$0
Wake County	9/6/2008	THUNDERSTORM WIND	50 kts.	0/0	$14,926
Wake County	9/6/2008	STRONG WIND	39 kts.	0/0	$7,463
Wake County	1/7/2009	THUNDERSTORM WIND	55 kts.	0/0	$115,927
UPCHURCH	5/5/2009	THUNDERSTORM WIND	50 kts.	0/0	$0
BROOKHAVEN	5/9/2009	THUNDERSTORM WIND	50 kts.	0/0	$0
COLLEGE VIEW	5/9/2009	THUNDERSTORM WIND	50 kts.	0/0	$0
LEESVILLE	5/9/2009	THUNDERSTORM WIND	50 kts.	0/0	$0
ROYAL MILLS	5/9/2009	THUNDERSTORM WIND	50 kts.	0/0	$0
SIX FORKS	5/9/2009	THUNDERSTORM WIND	50 kts.	0/0	$0
PURNELL	6/17/2009	THUNDERSTORM WIND	50 kts.	0/0	$0
WILDERS GROVE	7/1/2009	THUNDERSTORM WIND	50 kts.	0/0	$2,319
WILLOW SPGS	7/27/2009	THUNDERSTORM WIND	60 kts.	0/0	$0
WILLOW SPGS	7/27/2009	HIGH WIND	50 kts.	0/0	$0
BAYLEAF	8/11/2009	STRONG WIND	50 kts.	0/0	$0
WESTOVER	8/17/2009	HIGH WIND	50 kts.	0/0	$0
PURNELL	9/28/2009	THUNDERSTORM WIND	50 kts.	0/0	$0
ROCKTON	6/13/2010	THUNDERSTORM WIND	50 kts.	0/0	$0
LEESVILLE	7/20/2010	THUNDERSTORM WIND	57 kts.	0/0	$0
SIX FORKS	7/20/2010	THUNDERSTORM WIND	50 kts.	0/0	$0
MILLBROOK	7/29/2010	THUNDERSTORM WIND	50 kts.	0/0	$1,126
CARALEIGH	8/5/2010	THUNDERSTORM WIND	50 kts.	0/0	$0
WILDERS GROVE	8/5/2010	THUNDERSTORM WIND	50 kts.	0/0	$0

Location	Date	Type	Magnitude	Deaths/ Injuries	Property Damage*
PURNELL	8/23/2010	THUNDERSTORM WIND	50 kts.	0/0	$0
FRIENDSHIP	11/16/2010	THUNDERSTORM WIND	50 kts.	0/0	$0
AUBURN	11/17/2010	THUNDERSTORM WIND	50 kts.	0/0	$0
BARHAM	11/17/2010	THUNDERSTORM WIND	50 kts.	0/0	$0
COLLEGE VIEW	11/17/2010	THUNDERSTORM WIND	50 kts.	0/0	$0
KENNEBEC	11/17/2010	THUNDERSTORM WIND	50 kts.	0/0	$0
ROCKTON	11/17/2010	THUNDERSTORM WIND	50 kts.	0/0	$0
WAKE XRDS	11/17/2010	THUNDERSTORM WIND	50 kts.	0/0	$0
WILDERS GROVE	11/17/2010	THUNDERSTORM WIND	50 kts.	0/0	$0
WILDERS GROVE	11/17/2010	THUNDERSTORM WIND	50 kts.	0/0	$0
ROYAL MILLS	3/23/2011	THUNDERSTORM WIND	50 kts.	0/0	$21,855
BAYLEAF	6/10/2011	THUNDERSTORM WIND	50 kts.	0/0	$0
ASBURY	6/20/2011	THUNDERSTORM WIND	50 kts.	0/0	$0
BURT	6/21/2011	THUNDERSTORM WIND	50 kts.	0/0	$0
MC CULLERS	6/27/2011	THUNDERSTORM WIND	54 kts.	0/0	$0
BONSAL	6/28/2011	THUNDERSTORM WIND	50 kts.	0/0	$0
GREEN LEVEL	7/24/2011	THUNDERSTORM WIND	50 kts.	0/0	$0
WILLIAMS XRDS	7/25/2011	THUNDERSTORM WIND	50 kts.	0/0	$0
BROOKHAVEN	8/29/2011	THUNDERSTORM WIND	50 kts.	0/0	$0
WESTOVER	2/24/2012	THUNDERSTORM WIND	50 kts.	0/0	$0
ASBURY	5/9/2012	THUNDERSTORM WIND	50 kts.	0/0	$0
ASBURY	5/9/2012	THUNDERSTORM WIND	50 kts.	0/0	$2,122
MC CULLERS	5/9/2012	THUNDERSTORM WIND	50 kts.	0/0	$0
ROYAL MILLS	5/23/2012	THUNDERSTORM WIND	50 kts.	0/0	$0
WYATT	5/23/2012	THUNDERSTORM WIND	50 kts.	0/0	$0

Location	Date	Type	Magnitude	Deaths/ Injuries	Property Damage*
WAKE XRDS	6/1/2012	THUNDERSTORM WIND	50 kts.	0/0	$0
PURNELL	6/29/2012	THUNDERSTORM WIND	50 kts.	0/0	$5,305
BARHAM	7/1/2012	THUNDERSTORM WIND	50 kts.	0/0	$1,061
BANKS	7/3/2012	THUNDERSTORM WIND	50 kts.	0/0	$2,122
CAMP POLK	7/3/2012	THUNDERSTORM WIND	50 kts.	0/0	$0
MILLBROOK	7/3/2012	THUNDERSTORM WIND	50 kts.	0/0	$2,122
WILDERS GROVE	7/3/2012	THUNDERSTORM WIND	50 kts.	0/0	$0
COLLEGE VIEW	7/4/2012	THUNDERSTORM WIND	50 kts.	0/0	$5,305
MILLBROOK	7/4/2012	THUNDERSTORM WIND	50 kts.	0/0	$0
SIX FORKS	7/4/2012	THUNDERSTORM WIND	50 kts.	0/0	$0
EAGLE ROCK	7/5/2012	THUNDERSTORM WIND	50 kts.	0/0	$3,183
MACEDONIA	7/5/2012	THUNDERSTORM WIND	50 kts.	0/0	$2,122
MILLBROOK	7/5/2012	THUNDERSTORM WIND	50 kts.	0/0	$0
WILDERS GROVE	7/5/2012	THUNDERSTORM WIND	50 kts.	0/0	$3,183
MILLBROOK	7/6/2012	THUNDERSTORM WIND	50 kts.	0/0	$0
ROCKTON	7/6/2012	THUNDERSTORM WIND	50 kts.	0/0	$0
STARMOUNT	7/6/2012	THUNDERSTORM WIND	50 kts.	0/0	$0
UPCHURCH	7/6/2012	THUNDERSTORM WIND	50 kts.	0/0	$0
AUBURN	7/24/2012	THUNDERSTORM WIND	50 kts.	0/0	$2,122
CAMP POLK	7/24/2012	THUNDERSTORM WIND	50 kts.	0/0	$0
CAMP POLK	7/24/2012	THUNDERSTORM WIND	50 kts.	0/0	$0
ECHO HGTS	7/24/2012	THUNDERSTORM WIND	50 kts.	0/0	$2,122
LEESVILLE	7/24/2012	THUNDERSTORM WIND	50 kts.	0/0	$0
METHOD	7/24/2012	THUNDERSTORM WIND	50 kts.	0/0	$5,305
WILBON	7/24/2012	THUNDERSTORM WIND	50 kts.	0/0	$0

Location	Date	Type	Magnitude	Deaths/ Injuries	Property Damage*
CAMP POLK	7/28/2012	THUNDERSTORM WIND	50 kts.	0/0	$0
FAWLERS XRDS	7/28/2012	THUNDERSTORM WIND	50 kts.	0/0	$0
LEESVILLE	7/28/2012	THUNDERSTORM WIND	50 kts.	0/0	$0
BAYLEAF	8/1/2012	THUNDERSTORM WIND	50 kts.	0/0	$0
LASSITER	8/1/2012	THUNDERSTORM WIND	50 kts.	0/0	$0
BAYLEAF	8/8/2012	THUNDERSTORM WIND	50 kts.	0/0	$769
ROCKTON	9/18/2012	THUNDERSTORM WIND	50 kts.	0/0	$0

*Property damage is reported in 2013 dollars; All damage may not have been reported.
Source: National Climatic Data Center

Probability of Future Occurrences

Given the high number of previous events, it is certain that wind events, including straight-line wind and thunderstorm wind, will occur in the future. This results in a probability level of highly likely (100 percent annual probability) for future wind events for the entire jurisdiction.

M.2.7 Tornado

Location and Spatial Extent

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

Historical Occurrences

Tornadoes are becoming a more and more common occurrence in central and eastern North Carolina as demonstrated by a recent outbreak of tornadoes in the spring of 2011. According to the National Climatic Data Center, there have been twenty-one recorded tornado events in unincorporated Wake County since 1956 (**Table M.14**), resulting in over $700 million (2013 dollars) in property damages.[8] Detailed information on these events can be found in **Table M.15**. The largest magnitude of these tornadoes was a F4 in intensity, although an F5 event is possible. It is important to note that only tornadoes that have been reported are factored into this risk assessment. It is likely that a high number of occurrences have gone unreported over the past 50 years.

[8] These tornado events are only inclusive of those reported by the National Climatic Data Center (NCDC). It is likely that additional tornadoes have occurred in Wake County. As additional local data becomes available, this hazard profile will be amended.

TABLE M.14: SUMMARY OF TORNADO OCCURRENCES IN WAKE COUNTY

Location	Number of Occurrences	Deaths/Injuries	Property Damage (2013)
Unincorporated Wake County	21	7/184	$700,021,569

Source: National Climatic Data Center

TABLE M.15: HISTORICAL TORNADO IMPACTS IN WAKE COUNTY

	Date	Magnitude	Deaths/ Injuries	Property Damage*	Details
Wake County					
Wake County	5/12/1950	F0	0/0	$0	
Wake County	5/12/1950	F1	0/0	$0	
Wake County	4/5/1952	F2	0/0	$245,175	
Wake County	3/18/1956	F1	0/1	$239,506	
Wake County	3/18/1956	F2	0/0	$23,951	
Wake County	11/2/1966	F2	0/9	$2,011,388	
Wake County	5/14/1967	F0	0/0	$0	
Wake County	7/11/1967	F1	0/0	$194,529	
Wake County	5/28/1973	F1	0/0	$146,412	
Wake County	5/29/1973	F0	0/0	$146,412	
Wake County	12/31/1975	F1	0/0	$12,080	
Wake County	5/7/1977	F0	0/0	$10,734	
Wake County	2/11/1981	F2	0/2	$715,623	
Wake County	6/13/1982	F1	1/0	$67,373	
Wake County	6/16/1982	F2	0/0	$673,733	
Wake County	3/14/1986	F1	0/0	$59,362	
Wake County	3/26/1988	F0	2/105		
Wake County	11/28/1988	F4	0/0	$569,530,309	
Wake County	10/23/1990	F1	0/0	$0	
ROCKTON	4/25/2010	F0	0/0	$281,377	EPISODE NARRATIVE: An isolated cell formed over Moore County in advance of a strong surface cold front in a high shear and moderate CAPE environment. The lone storm strengthened into a super cell over central Wake County before it produced a weak EF0 tornado near Zebulon in eastern Wake County.
BURT	4/16/2011	F3	4/67	$125,663,605	EPISODE NARRATIVE: A strong storm system that had a history of producing deadly tornadoes across Oklahoma and the deep south on the 14th and 15th weakened as it crossed the southern Appalachians during the early morning hours of the 16th. A squall line descended the Blue Ridge by the late morning hours, and rapidly intensified |as it moved east into the central Piedmont of North Carolina, with four long live tornadic

	Date	Magnitude	Deaths/ Injuries	Property Damage*	Details
					supercells evolving from the linear convective segment. These tornadic supercells went on to produce 9 tornadoes in the Raleigh CWA, including 2 EF3s, and 4 EF2s. The tornadoes left 6 dead with approximately 275 injuries

*Property Damage is reported in 2013 dollars.
Source: NCDC

2011 Tornadoes- April 16, 2011
In 2011, the county and all of its jurisdictions were impacted by one of the worst tornado-related events in the county's recorded history. A squall line descended the Blue Ridge by the late morning hours, and rapidly intensified |as it moved east into the central Piedmont of North Carolina, with four long live tornadic supercells evolving from the linear convective segment. These tornadic supercells went on to produce 9 tornadoes in the Raleigh CWA, including 2 EF3s, and 4 EF2s. The tornadoes left 6 dead with approximately 275 injuries.

Probability of Future Occurrences
According to historical information, tornado events are not an annual occurrence for the jurisdiction. However, tornadoes are a somewhat common occurrence in the county as it is located in an area of relatively flat topography in the southeastern United States. While the majority of the reported tornado events are small in terms of size, intensity, and duration, they do pose a significant threat should Wake County experience a direct tornado strike. The probability of future tornado occurrences affecting Wake County is likely (10-100 percent annual probability).

M.2.8 Winter Storm and Freeze

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. Wake County is accustomed to smaller scale severe winter weather conditions and often receives severe winter weather during the winter months. Given the atmospheric nature of the hazard, the entire jurisdiction has uniform exposure to a winter storm.

Historical Occurrences
Severe winter weather has resulted in six disaster declarations in Wake County. This includes ice storms in 1968 and 2002, snow storms in 1977, 1993, and 1996, and a severe winter storm in 2000. [9] According to the National Climatic Data Center, there have been 30 recorded winter storm events in Wake County since 1993 (**Table M.16**).[10] These events resulted in over $900,000 (2013 dollars) in damages.

[9] A complete listing of historical disaster declarations can be found in Section 4: *Hazard Profiles*.
[10] These ice and winter storm events are only inclusive of those reported by the National Climatic Data Center (NCDC). It is certain that additional winter storm conditions have affected Wake County.

TABLE M.16: SUMMARY OF WINTER STORM EVENTS IN WAKE COUNTY

Location	Number of Occurrences	Deaths/Injuries	Property Damage (2013)
Unincorporated Wake County	30	2/10*	$900,752

Source: National Climatic Data Center

There have been several severe winter weather events to impact Wake County. The text below describes one of the major events and associated impacts on the county. Similar impacted can be expected with severe winter weather.

1996 Winter Storm
This storm left two feet of snow and several thousand citizens without power for up to nine days. Although shelters were opened, some roads were impassible for up to four days. This event caused considerable disruption to business, industry, schools, and government services.

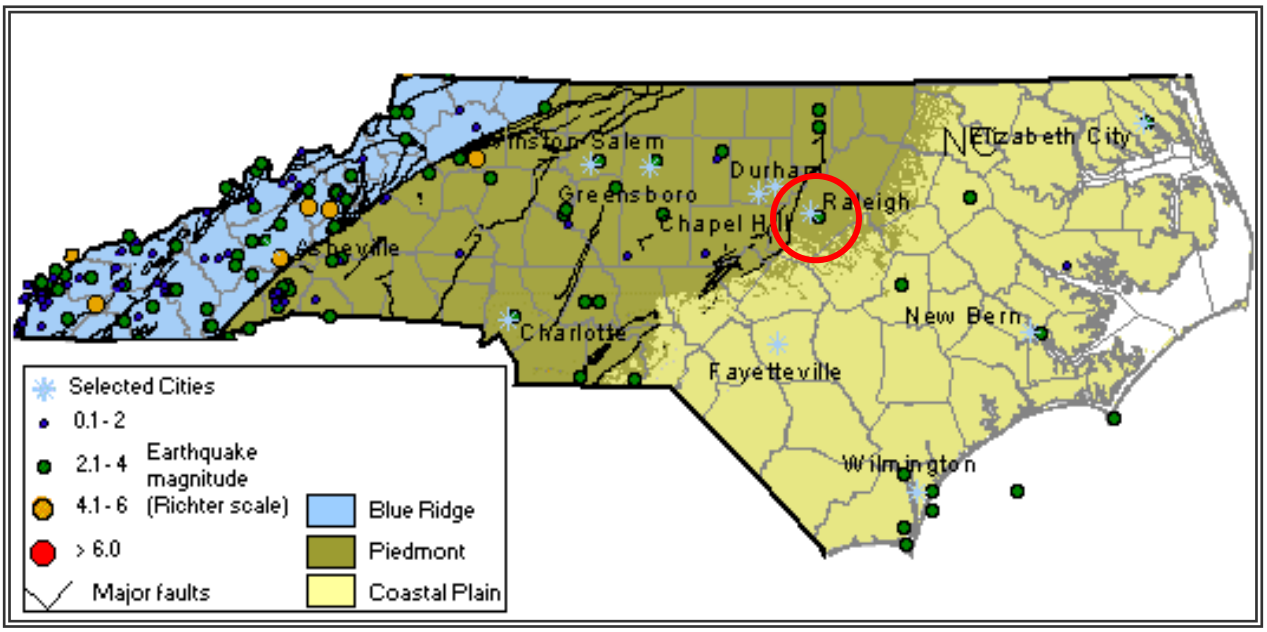
Winter storms throughout the planning area have several negative externalities including hypothermia, cost of snow and debris cleanup, business and government service interruption, traffic accidents, and power outages. Furthermore, citizens may resort to using inappropriate heating devices that could to fire or an accumulation of toxic fumes.

Probability of Future Occurrences
Winter storm events will remain a somewhat regular occurrence in Wake County due to location and latitude. According to historical information, Wake County experiences an average of 1-2 winter storm events each year. Therefore, the annual probability is likely (10-100 percent).

M.2.9 Earthquake

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 M.2** is a map showing geological and seismic information for North Carolina.

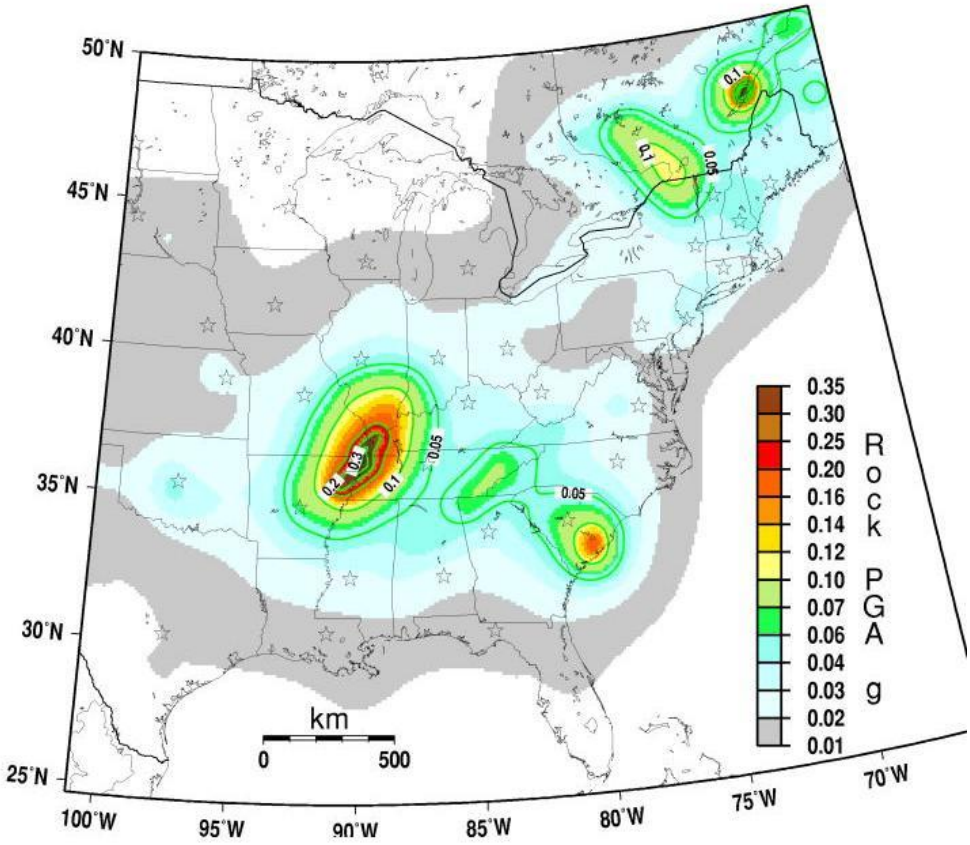
FIGURE M.2: GEOLOGICAL AND SEISMIC INFORMATION FOR NORTH CAROLINA



Source: North Carolina Geological Survey

Figure M.3 shows the intensity level associated with Wake County, based on the national USGS map of peak acceleration with 10 percent probability of exceedance in 50 years. It is the probability that ground motion will reach a certain level during an earthquake. The data show peak horizontal ground acceleration (the fastest measured change in speed, for a particle at ground level that is moving horizontally due to an earthquake) with a 10 percent probability of exceedance in 50 years. The map was compiled by the U.S. Geological Survey (USGS) Geologic Hazards Team, which conducts global investigations of earthquake, geomagnetic, and landslide hazards. According to this map, Wake County lies within an approximate zone of level "2" to "3" ground acceleration. This indicates that the county exists within an area of moderate seismic risk.

FIGURE M.3: PEAK ACCELERATION WITH 10 PERCENT PROBABILITY OF EXCEEDANCE IN 50 YEARS



Source: USGS, 2008

Historical Occurrences

Although no earthquakes are known to have occurred in unincorporated Wake County since 1874, several have occurred within the incorporated areas of county boundary. The strongest of these measured a VIII on the Modified Mercalli Intensity (MMI) scale. **Table M.17** provides a summary of earthquake events reported by the National Geophysical Data Center between 1638 and 1985. **Table M.18** presents a detailed occurrence of each event including the date, distance for the epicenter, and Modified Mercalli Intensity (if known). [11]

TABLE M.17: SUMMARY OF SEISMIC ACTIVITY IN WAKE COUNTY

Location	Number of Occurrences	Greatest MMI Reported	Richter Scale Equivalent
Unincorporated Wake County	--	--	--

Source: National Geophysical Data Center

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

TABLE M.18: SIGNIFICANT SEISMIC EVENTS IN WAKE COUNTY (1638 -1985)

Location	Date	Epicentral Distance (km)	Magnitude	MMI (magnitude)
Wake County				
None reported				

Source: National Geophysical Data Center

In addition to those earthquakes specifically affecting Wake County, a list of earthquakes that have caused damage throughout North Carolina is presented below in **Table M.19.**

TABLE M.19: EARTHQUAKES WHICH HAVE CAUSED DAMAGE IN NORTH CAROLINA

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

*This event is accounted for in the Wake County occurrences.

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

Source: This information compiled by Dr. Kenneth B. Taylor and provided by Tiawana Ramsey of NCEM. Information was compiled from the National Earthquake Center, Earthquakes of the US by Carl von Hake (1983), and a compilation of newspaper reports in the Eastern Tennessee Seismic Zone compiled by Arch Johnston, CERI, Memphis State University (1983).

Probability of Future Occurrences

The probability of significant, damaging earthquake events affecting Wake County is unlikely. However, it is possible that future earthquakes resulting in light to moderate perceived shaking and damages ranging from none to very light will affect the county. The annual probability level for the county is estimated between 1 and 10 percent (possible).

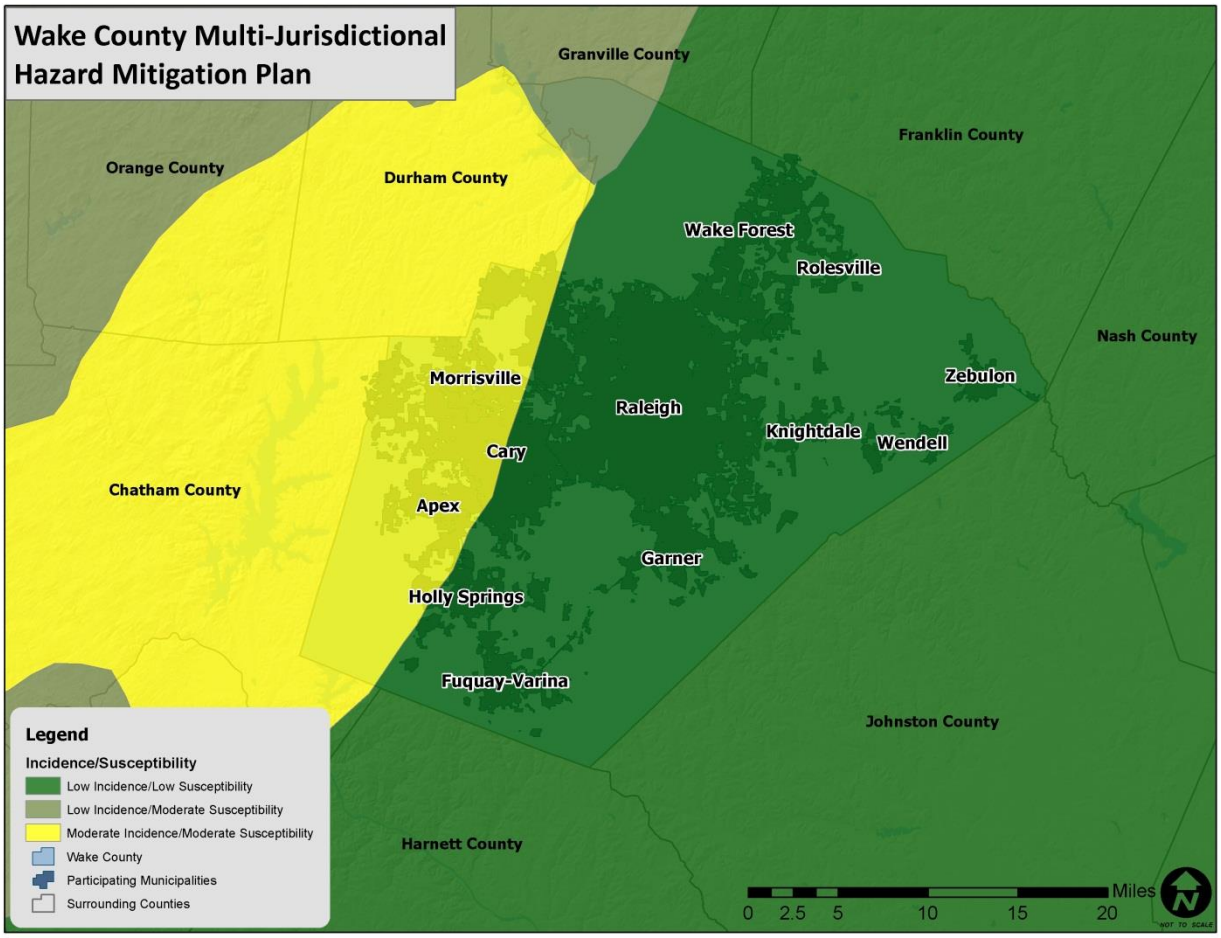
M.2.10 Landslide

Location and Spatial Extent

Landslides occur along steep slopes when the pull of gravity can no longer be resisted (often due to heavy rain). Human development can also exacerbate risk by building on previously undevelopable steep slopes and constructing roads by cutting through hills or mountains. Landslides are possible throughout Wake County, although the overall risk is relatively low.

According to **Figure M.4** below, the majority of the county has low landslide activity. However there is a small area along the western border of the county that has a moderate incidence and moderate susceptibility. In all other areas, there is low susceptibility.

FIGURE M.4: LANDSLIDE SUSCEPTIBILITY AND INCIDENCE MAP OF WAKE COUNTY



Source: USGS

Historical Occurrences

Steeper topography in some areas of Wake County make 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 M.20** presents a summary of the landslide occurrence

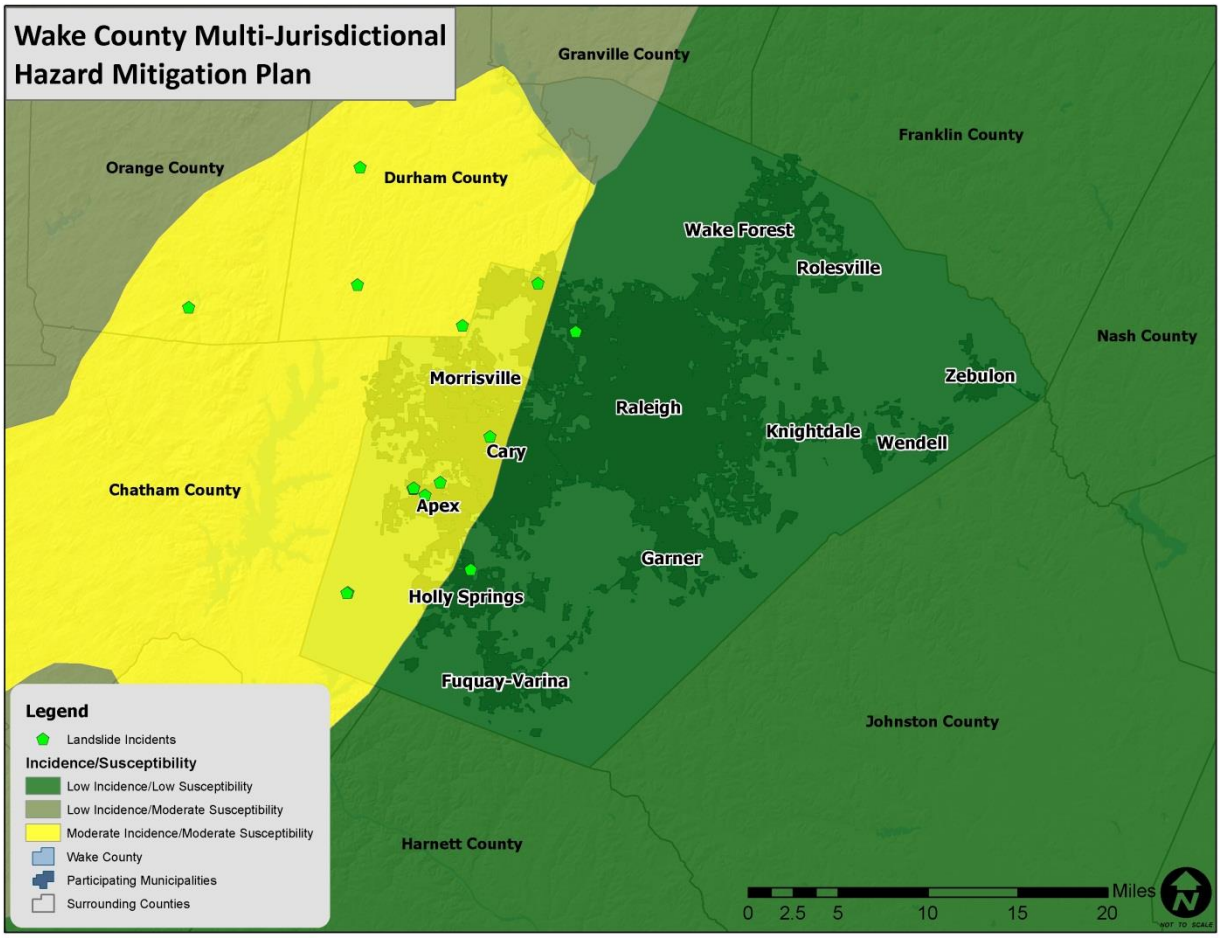
events as provided by the North Carolina Geological Survey[12]. The georeferenced locations of the landslide events presented in the aforementioned tables are presented in **Figure M.5**. Some incidence mapping has also been completed throughout the western portion of North Carolina though none has been done in this area of the state. Therefore, it should be noted that more incidents than what is reported may have occurred in Wake County.

TABLE M.20: SUMMARY OF LANDSLIDE ACTIVITY IN WAKE COUNTY

Location	Number of Occurrences
Unincorporated Wake County	4

Source: North Carolina Geological Survey

FIGURE M.5: LOCATION OF PREVIOUS LANDSLIDE OCCURRENCES IN WAKE COUNTY



Source: North Carolina Geological Survey

Probability of Future Occurrences

Based on historical information and the USGS susceptibility index, the probability of future landslide events is possible (1 to 10 percent probability). Local conditions may become more favorable for

[12] 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.

landslides due to heavy rain, for example. This would increase the likelihood of occurrence. It should also be noted that some areas in Wake County have greater risk than others given factors such as steepness on slope and modification of slopes.

M.2.11 Dam and Levee Failure

Location and Spatial Extent

The North Carolina Division of Land Resources provides information on dams, including a hazard potential classification. There are three hazard classifications—high, intermediate, and low—that correspond to qualitative descriptions and quantitative guidelines. **Table M.21** explains these classifications.

TABLE M.21: NORTH CAROLINA DAM HAZARD CLASSIFICATIONS

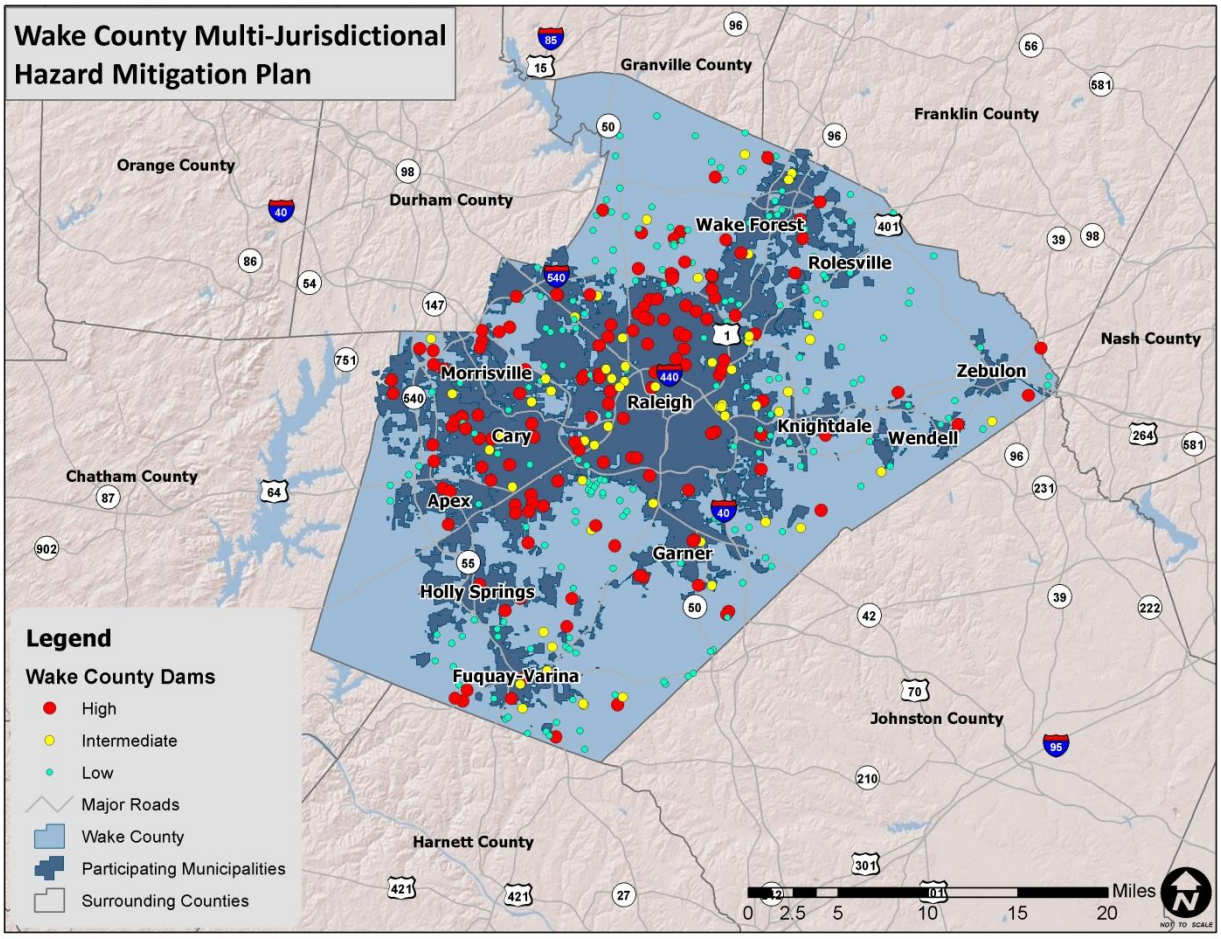
Hazard Classification	Description	Quantitative Guidelines
Low	Interruption of road service, low volume roads	Less than 25 vehicles per day
	Economic damage	Less than $30,000
Intermediate	Damage to highways, Interruption of service	25 to less than 250 vehicles per day
	Economic damage	$30,000 to less than $200,000
High	Loss of human life*	Probable loss of 1 or more human lives
	Economic damage	More than $200,000
	*Probable loss of human life due to breached roadway or bridge on or below the dam.	250 or more vehicles per day

Source: North Carolina Division of Land Resources

According to the North Carolina Division of Land Management there are 220 dams in unincorporated Wake County.[13] **Figure M.6** shows the dam location and the corresponding hazard ranking for each. Of these dams, 44 are classified as high hazard potential. These high hazard dams are listed in **Table M.22**.

[13] 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 M.6: WAKE COUNTY DAM LOCATION AND HAZARD RANKING



Source: North Carolina Division of Land Resources, 2012

TABLE M.22: WAKE COUNTY HIGH HAZARD DAMS

Dam Name	Hazard Potential	Surface Area (acres)	Max Capacity (Ac-ft)	Owner Type
Wake County				
Falls Of The Neuse Dam	High	0	1128100	Federal
Lake Benson Dam	High	463	7200	Local Gov
Crabtree Dam 20-A	High	0	2500	Local Gov
Crabtree Creek Dam 5-A	High	0	3010	Local Gov
Garner Ww Lagoon #1	High	25	394	Local Gov
Garner Ww Lagoon #2	High	25	306	Local Gov
Neuse River Waste Water Treatment Plant Equalization Basin	High	7.5	114	Local Gov
Bunn Lake Dam	High	120	975	Private
Johnson Pond Dam	High	9	95	Private
Crossgate Lake Dam #1	High	13.1	207	Private
Crossgate Dam #2	High	0	40	Private

Dam Name	Hazard Potential	Surface Area (acres)	Max Capacity (Ac-ft)	Owner Type
Holding Lake Dam	High	11	145	Private
Panther Lake Dam	High	82	253	Private
Sunset Lake Dam	High	98.1	750	Private
Robertson'S Pond	High	25	259	Private
Rdu Wastewater Dam	High	1.6	22.5	Private
Rtp South Dam	High	77	708	Private
Crooked Creek	High	0	40	Private
Pendleton Lake	High	0	10	Private
Johnson Pond Dam	High	0	5	Private
Coachman Trail Lake Dam Lower	High	2	93	Private
Stonebridge Lake Dam	High	0	45	Private
Herndon Pond Dam	High	0	22	Private
Springdale Estates Upper Dam	High	0	75	Private
Coachman Trail Lake Dam Upper	High	0	180	Private
Byrd Dam	High	1	10	Private
Fuller Lake Dam	High	0	70	Private
Bailey Dam	High	6	76	Private
Marshall Pond #2	High	4	59	Private
Howell Dam	High	3	36	Private
Manchester Dam	High	0	88	Private
Crossgate Dam #3	High	0	12	Private
Chateau Lapointe Dam H	High	0	90	Private
Cozart Pond Dam	High	2	0	Private
Underwood Pond Dam	High	4	27	Private
Betts Pond Dam	High	5	40	Private
Breckenridge Recreation Center Dam	High	3	38	Private
Hasentree Golf Communtiy Dam	High	0	139	Private
RTP W-5 Dam	High	47	700	Private
State Fair H & L Dam	High	6	78	State
Lake Wheeler Dam	High	560	10800	Utility
Burnside Drive Dam	High	3	12	
Seymour Farms Pond Dam	High	0.7	7	
Rosewood Subdivision Dam	High	1	6	

Source: North Carolina Division of Land Resources, 2012

It should also be noted that the North Carolina dam classification regulations were recently updated. As a result of the change, more dams are generally classified as high hazard.

Historical Occurrences

Four dam breaches were reported in unincorporated Wake County but none have been significant**.** **Table M.23** displays the classification of each dam at time of failure and the main cause of the damage.

TABLE 5.23: HISTORICAL DAM FAILURES IN WAKE COUNTY

Name	Location	Class at Time of Failure	Current Class	Cause of Failure
Cedar Hills*	Wake County	Intermediate	High	Heavy rain (mid 1970s)
Coachman's Trail Lower	Wake County	High	High	Heavy rain (late 1970s)
Beaman's Lake***	Wake County	Intermediate	Intermediate	Heavy rain (late 1980s)
Yates Mill Pond	Wake County	Intermediate	Intermediate	Hurricane Fran (1996)

*High due to downstream development
**High due to increased traffic on downstream road
***Exempt due to dam height

Probability of Future Occurrences

Given the current dam inventory and historic data, a dam breach is unlikely (less than 1 percent annual probability) in the future. However, as has been demonstrated in the past, regular monitoring is necessary to prevent these events.

M.2.12 Erosion

Location and Spatial Extent

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

Historical Occurrences

Several sources were vetted to identify areas of erosion in Wake County. This includes searching local newspapers, interviewing local officials, and reviewing the previous hazard mitigation plan. Little information could be found and erosion was not addressed in the previous Wake County hazard mitigation plan.

Probability of Future Occurrences

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

M.2.13 Flood

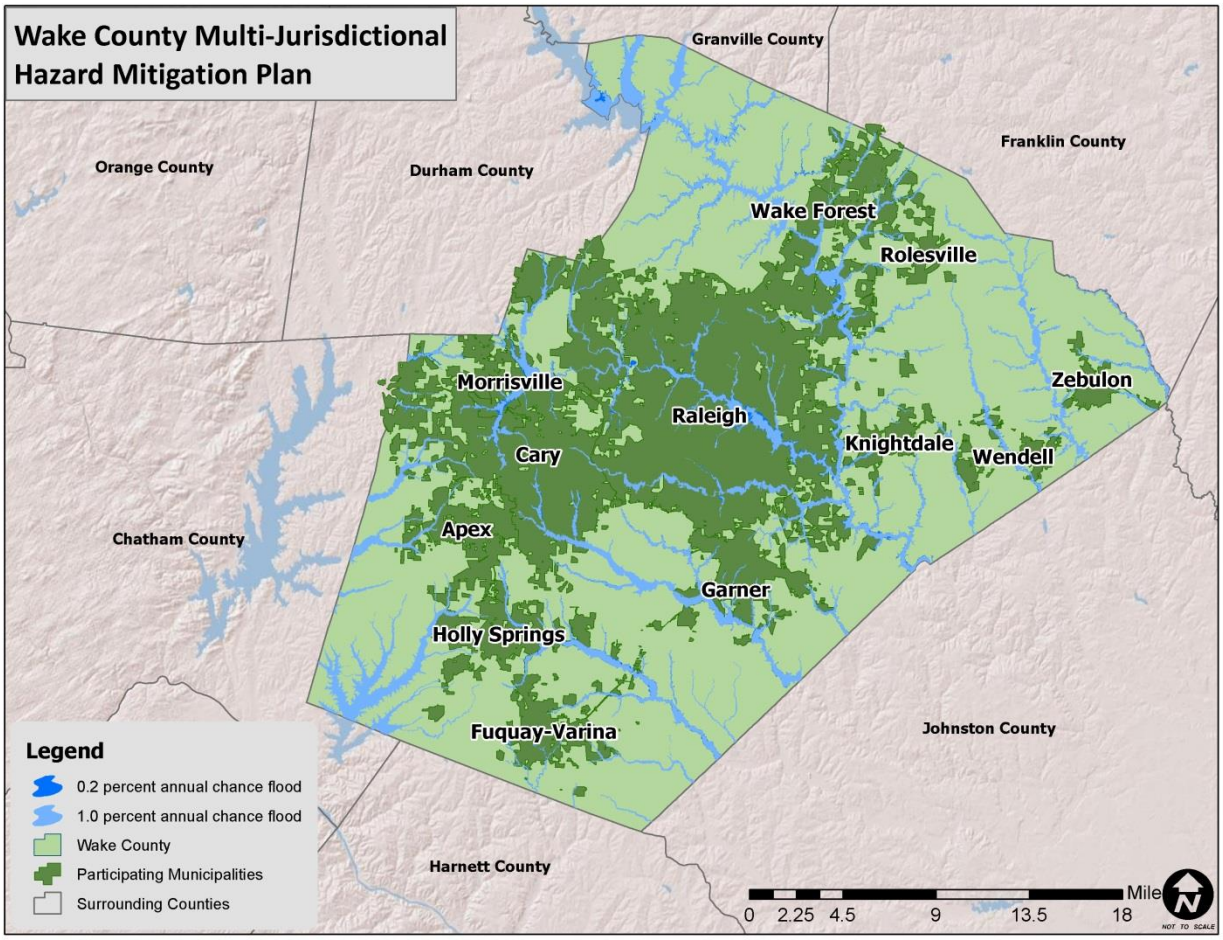
Location and Spatial Extent

There are areas in Wake County that are susceptible to flood events. Special flood hazard areas in the jurisdiction were mapped using Geographic Information System (GIS) and FEMA Digital Flood Insurance Rate Maps (DFIRM).[14] This includes Zone A (1-percent annual chance floodplain), Zone AE (1-percent annual chance floodplain with elevation), Zone X500 (0.2-percent annual chance floodplain). According to GIS analysis, in unincorporated Wake County, there are 55 square miles of land in zones A and AE (1-percent annual chance floodplain/100-year floodplain).

[14] The county-level DFIRM data used for Wake County were updated in 2010.

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 M.7** illustrates the location and extent of currently mapped special flood hazard areas for Wake County based on best available FEMA Digital Flood Insurance Rate Map (DFIRM) data.

FIGURE M.7: SPECIAL FLOOD HAZARD AREAS IN WAKE COUNTY



Source: Federal Emergency Management Agency

Historical Occurrences

Information from the National Climatic Data Center was used to ascertain historical flood events. The National Climatic Data Center reported a total of 43 events in unincorporated Wake County since 1993.[15] A summary of these events is presented in **Table M.24**. These events accounted for over $200,000 (2013 dollars) in property damage in the unincorporated county.[16] Specific information on flood events, including date, type of flooding, and deaths and injuries, can be found in **Table M.25**.

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

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

TABLE M.24: SUMMARY OF FLOOD OCCURRENCES IN WAKE COUNTY

Location	Number of Occurrences	Deaths/Injuries	Property Damage (2013)
Unincorporated Wake County	43	0/0	$220,101

Source: National Climatic Data Center

TABLE M.25: HISTORICAL FLOOD EVENTS IN WAKE COUNTY

	Date	Type	Deaths/ Injuries	Property Damage*
Wake County				
SRN	10/5/1995	FLASH FLOOD	0/0	$0
Northern	6/24/1995	FLASH FLOOD	0/0	$85,344
COUNTYWIDE	7/24/1997	FLASH FLOOD	0/0	$0
COUNTYWIDE	9/27/1999	FLASH FLOOD	0/0	$0
COUNTYWIDE	9/15/1999	FLASH FLOOD	0/0	$0
COUNTYWIDE	9/5/1999	FLASH FLOOD	0/0	$0
COUNTYWIDE	9/28/1999	FLASH FLOOD	0/0	$0
COUNTYWIDE	6/16/2001	FLASH FLOOD	0/0	$0
SOUTH PORTION	7/9/2001	FLASH FLOOD	0/0	$0
SOUTH PORTION	7/4/2001	FLASH FLOOD	0/0	$0
EAST PORTION	8/1/2003	FLASH FLOOD	0/0	$0
CENTRAL PORTION	8/8/2003	FLASH FLOOD	0/0	$0
CENTRAL PORTION	8/8/2003	FLASH FLOOD	0/0	$0
COUNTYWIDE	8/12/2004	FLASH FLOOD	0/0	$0
COUNTYWIDE	6/14/2006	FLASH FLOOD	0/0	$0
BRENTWOOD	4/27/2008	FLASH FLOOD	0/0	$0
MILLBROOK	4/27/2008	FLASH FLOOD	0/0	$0
MILLBROOK	9/6/2008	FLASH FLOOD	0/0	$119,405
ECHO HGTS	8/30/2008	FLASH FLOOD	0/0	$0
CARIO	8/28/2008	FLASH FLOOD	0/0	$0
ASBURY	5/5/2009	FLOOD	0/0	$0
MILLBROOK	5/5/2009	FLASH FLOOD	0/0	$0
BRENTWOOD	5/5/2009	FLASH FLOOD	0/0	$0
COLLEGE VIEW	12/2/2009	FLASH FLOOD	0/0	$0
CAMP POLK	12/2/2009	FLASH FLOOD	0/0	$0
WESTOVER	12/2/2009	FLASH FLOOD	0/0	$0
CARALEIGH	1/25/2010	FLASH FLOOD	0/0	$0
WESTOVER	6/16/2009	FLASH FLOOD	0/0	$0
WILLOW	9/22/2009	FLASH FLOOD	0/0	$0
CARALEIGH	8/24/2010	FLASH FLOOD	0/0	$0
LEESVILLE	8/5/2010	FLASH FLOOD	0/0	$0
ASBURY	6/1/2010	FLASH FLOOD	0/0	$0
WILLIAMS XRDS	9/30/2010	FLASH FLOOD	0/0	$0
STARMOUNT	8/6/2011	FLASH FLOOD	0/0	$0
COLLEGE VIEW	9/21/2011	FLASH FLOOD	0/0	$5,464
MILLBROOK	7/30/2012	FLASH FLOOD	0/0	$0
MILLBROOK	9/6/2012	FLASH FLOOD	0/0	$0

	Date	Type	Deaths/ Injuries	Property Damage*
MILLBROOK	9/18/2012	FLASH FLOOD	0/0	$0
MILLBROOK	9/8/2012	FLASH FLOOD	0/0	$9,888
COLLEGE VIEW	9/8/2012	FLASH FLOOD	0/0	$0

Source: National Climatic Data Center

Historical Summary of Insured Flood Losses

According to FEMA flood insurance policy records as of December 2013, there have been 62 flood losses reported in unincorporated Wake County through the National Flood Insurance Program (NFIP) since 1978. A summary of these figures for the jurisdiction is provided in **Table M.26**. 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 additional instances of flood loss in Wake County were either uninsured, denied claims payment, or not reported.

TABLE M.26: SUMMARY OF INSURED FLOOD LOSSES IN WAKE COUNTY

Location	Flood Losses	Claims Payments
Unincorporated Wake County	62	$787,324

Source: FEMA, NFIP

Repetitive Loss Properties

FEMA defines a repetitive loss property as any insurable building for which two or more claims of more than $1,000 were paid by the NFIP within any rolling 10-year period, since 1978. A repetitive loss property may or may not be currently insured by the NFIP. Currently there are over 140,000 repetitive loss properties nationwide.

As of July 2013, there are 5 non-mitigated repetitive loss properties located in unincoporated Wake County, which accounted for 17 losses and $316,761 in claims payments under the NFIP. Without mitigation, repetitive loss properties will likely continue to experience flood losses. **Table M.27** presents detailed information on repetitive loss properties and NFIP claims and policies for Wake County.

TABLE M.27: SUMMARY OF REPETITIVE LOSS PROPERTIES IN WAKE COUNTY

Location	Number of Properties	Types of Properties	Number of Losses	Building Payments	Content Payments	Total Payments	Average Payment
Unincorporated Wake County	5	4 single family, 1 multi-family residential	17	$260,683	$56,078	$316,761	$18,633

Source: National Flood Insurance Program

Probability of Future Occurrences

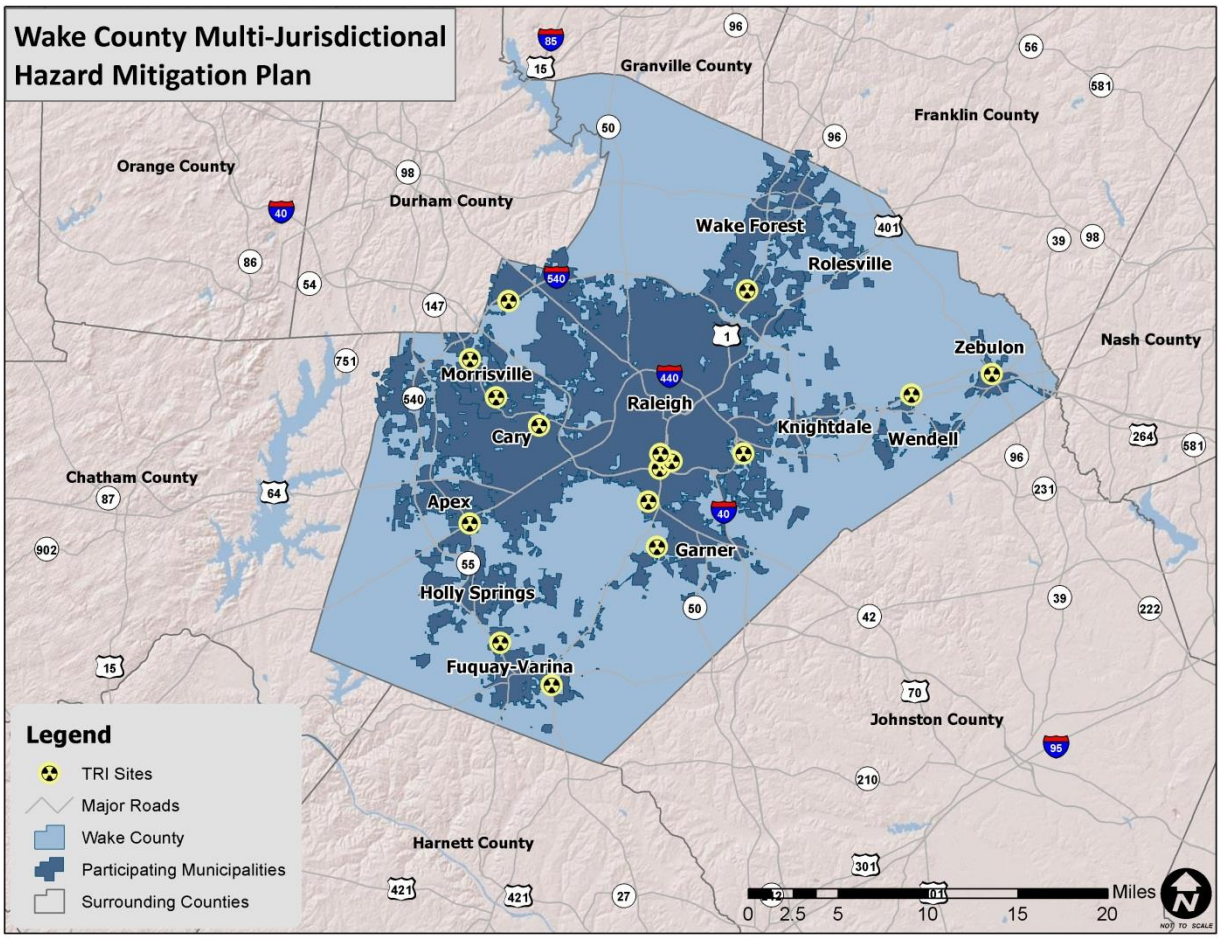
Flood events will remain a threat in areas prone to flooding in Wake County, and the probability of future occurrences will remain likely (between 10 and 100 percent annual probability) The probability of future flood events based on magnitude and according to best available data is illustrated in the 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).

M.2.14 Hazardous Materials Incidents

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 agents. This information is then reported in the Toxic Release Inventory (TRI). TRI sites indicate where such activity is occurring. Unincorporated Wake County has ten TRI site. These sites are shown in **Figure M.8.**

FIGURE M.8: TOXIC RELEASE INVENTORY (TRI) SITES IN WAKE COUNTY



Source: EPA

In addition to "fixed" hazardous materials locations, hazardous materials may also impact the jurisdiction via roadways and rail. All roads that permit hazardous material transport are considered potentially at risk to an incident.

Historical Occurrences

The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) lists historical occurrences throughout the nation. A "serious incident" is a hazardous materials incident that involves:

- a fatality or major injury caused by the release of a hazardous material,
- the evacuation of 25 or more persons as a result of release of a hazardous material or exposure to fire,
- a release or exposure to fire which results in the closure of a major transportation artery,
- the alteration of an aircraft flight plan or operation,
- the release of radioactive materials from Type B packaging,
- the release of over 11.9 galls or 88.2 pounds of a severe marine pollutant, or
- the release of a bulk quantity (over 199 gallons or 882 pounds) of a hazardous material.

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

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

Table M.28 presents detailed information on historic HAZMAT incidents reported in Wake County.

TABLE M.28: SUMMARY OF HAZMAT INCIDENTS IN WAKE COUNTY

Report Number	Date	City	Mode	Serious Incident?	Fatalities/ Injuries	Damages ($)	Quantity Released
Wake County							
None reported							

Source: USDOT PHMSA

Probability of Future Occurrences

Given the location of ten toxic release inventory sites in Wake County and several roadways and rails that transport hazardous materials, it is possible that a hazardous material incident may occur in the jurisdiction (between 1 percent and 10 percent annual probability). Local 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.

M.2.15 Wildfire

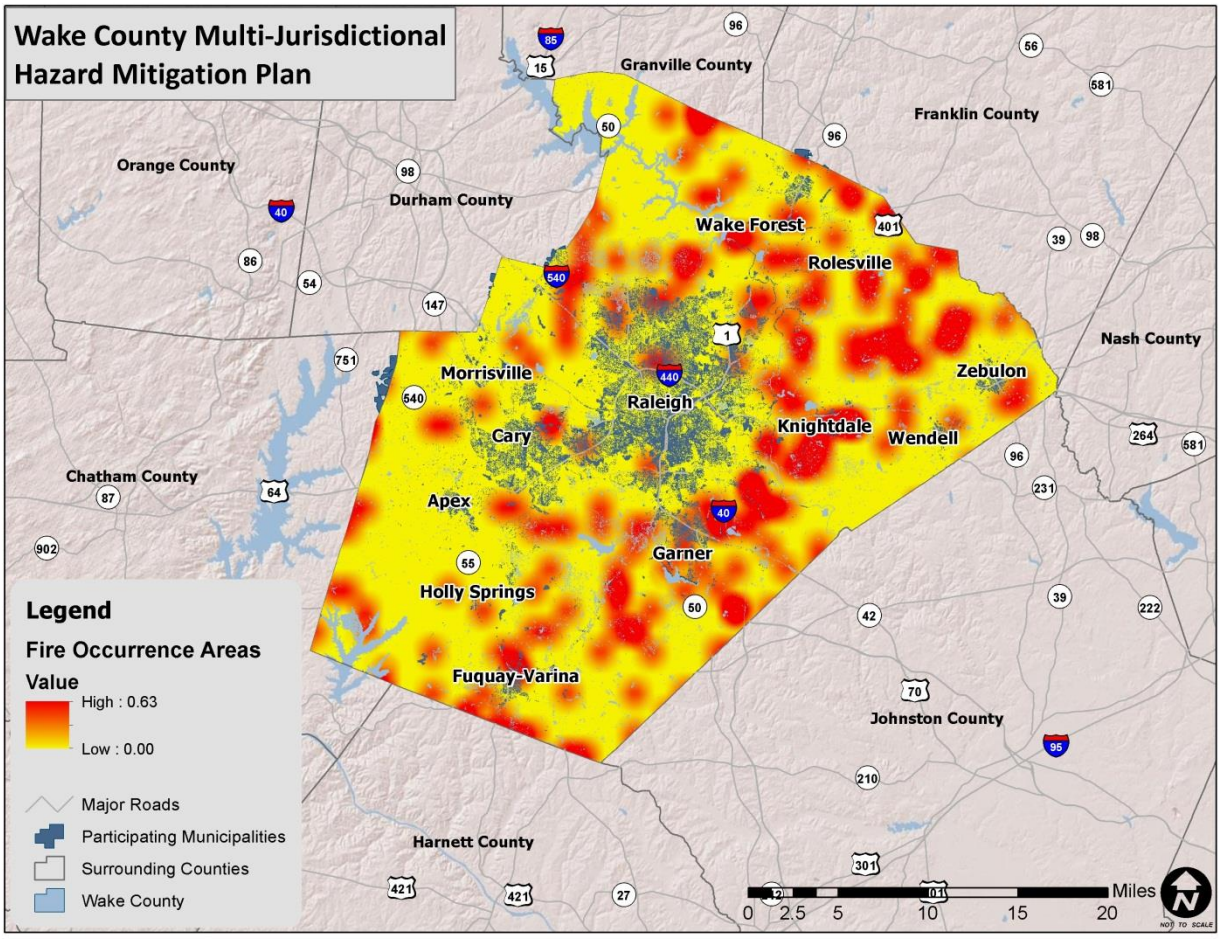
Location and Spatial Extent

The entire jurisdiction is at some 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.

Historical Occurrences

Figure M.9 shows the Fire Occurrence Areas (FOA) in Wake County based on data from the Southern Wildfire Risk Assessment. This data is based on historical fire ignitions and is reported as the number of fires that occur per 1,000 acres each year. Therefore, even areas classified as at relatively high risk within the county are a relatively low risk compared to other areas of the state.

FIGURE M.9: HISTORIC WILDFIRE EVENTS IN WAKE COUNTY



Source: Southern Wildfire Risk Assessment

Based on data from the North Carolina Division of Forest Resources from 2003 to 2012, Wake County experiences an average of 16 wildfires annually which burn an average of 98 acres per year. The data indicates that most of these fires are small, averaging six acres per fire. **Table M.29** lists the number of reported wildfire occurrences in the county between the years 2003 and 2012.

TABLE M.29: HISTORICAL WILDFIRE OCCURRENCES IN WAKE COUNTY

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Wake County										
Number of Fires	8	13	18	23	28	12	2	21	17	13
Number of Acres	52.3	28.7	65.0	167.4	120.9	74.6	17.3	130.2	225.0	101.0

Source: North Carolina Division of Forest Resources

Probability of Future Occurrences

Wildfire events will be an ongoing occurrence in Wake County. The likelihood of wildfires increases during drought cycles and abnormally dry conditions. Fires are likely to stay small in size but could increase due local climate and ground conditions. Dry, windy conditions with an accumulation of forest

floor fuel (potentially due to ice storms or lack of fire) could create conditions for a large fire that spreads quickly. It should also be noted that some areas do vary somewhat in risk. For example, highly developed areas are less susceptible unless they are located near the urban-wildland boundary. The risk will also vary due to assets. Areas in the urban-wildland interface will have much more property at risk, resulting in increased vulnerability and need to mitigate compared to rural, mainly forested areas. The probability assigned to Wake County for future wildfire events is possible (a 1 and 10 percent annual probability).

M.2.16 Nuclear Accident

Location and Spatial Extent

The entire county is at risk to a nuclear incident. However, areas in the southwest part of the region are more susceptible due to their proximity to the Shearon Harris Nuclear Station.

Historical Occurrences

Although there have been no major nuclear events at the Shearon Harris 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. In May of 2013, there was an unplanned shutdown of the plant which resulted from the discovery of a ¼ inch crack in the Reactor Pressure Vessel Head.

Shearon Harris has declared 2 "Alerts" and 28 "Notice of Unusual Events" since 1986, which are shown in **Table M.30**. There have also been 338 additional incidents reported to the NRC since 1986, but they did not necessitate an emergency declaration and therefore were not included in this analysis.

Table M.30: SHEARON HARRIS EMERGENCY DECLARATION HISTORY

Emergency Declaration	Date	Description
Alert	08/12/1988	Loss of greater than 50% of main control board (MCB) alarms due to electrical problems; normal power supply to annunciator panel failed and did not transfer to its backup inverter.
Alert	10/09/1988	Fire on "B" Main Electrical Transformer; release of flammable gas in the Protected Area.
Unusual Event	11/28/1986	Loss of ERFIS computer system to display Safety Parameter Display System (SPDS) (55 lapsed minutes).
Unusual Event	11/29/1986	Loss of ERFIS computer system to display SPDS (58 lapsed minutes).
Unusual Event	11/30/1986	Loss of ERFIS computer system to display SPDS (48 lapsed minutes).
Unusual Event	12/03/1986	Loss of ERFIS computer system to display SPDS (27 lapsed minutes).
Unusual Event	12/11/1986	Safety Injection (an Emergency Core Cooling System) actuated while testing electronic circuitry.
Unusual Event	01/27/1987	Loss of ERFIS computer system to display SPDS (23 lapsed minutes).
Unusual Event	07/11/1987	Loss of ERFIS computer system to display SPDS (22 lapsed minutes).
Unusual Event	07/24/1987	Loss of ERFIS computer system to display SPDS (32 lapsed minutes).
Unusual Event	07/25/1987	Loss of ERFIS computer system to display SPDS (28 lapsed minute).
Unusual Event	02/04/1988	Fire within the Protected Area greater than 10 minutes; smoke observed coming from the motor for the reactor auxiliary building supply fan.
Unusual Event	10/06/1988	RCS leakage in excess of Tech Specs (unidentified leakage > 1.0 gpm).
Unusual Event	10/20/1988	RCS leakage in excess of Tech Specs; pressure operated relief valve opened and admitted RCS inventory to the pressurized relief tank (PRT).
Unusual Event	11/17/1988	Loss of ERFIS computer system to display SPDS for > 60 minutes.
Unusual Event	12/01/1988	Reactor coolant system (RCS) leakage in excess of Tech Specs (unidentified leakage > 1.0 gpm).

Emergency Declaration	Date	Description
Unusual Event	12/16/1988	High level alarm on radiological effluent release monitor the (Treated Laundry and Hot Shower high level alarm was set just above background).
Unusual Event	03/13/1989	Loss of ERFIS computer system to display SPDS for > 60 minutes.
Unusual Event	01/24/1991	Plant shutdown required by Technical Specifications. Excessive leakage of a containment penetration; leakage discovered during surveillance testing.
Unusual Event	02/15/1991	Loss of ERFIS computer system to display SPDS for > 4 hours.
Unusual Event	03/05/1991	Plant shutdown required by Technical Specifications (testing of "A" Reactor Coolant Pump (RCP) electrical protection function).
Unusual Event	04/14/1992	Loss of ERFIS computer system to display SPDS for > 4 hours.
Unusual Event	02/06/1993	Loss of ERFIS computer system to display SPDS for > 4 hours.
Unusual Event	02/17/1994	Loss of ERFIS computer system to display SPDS for > 4 hours.
Unusual Event	07/22/1994	Loss of both emergency diesel generators - "B" diesel generator was being worked on; in accordance with test procedures, "A" diesel generator is required to be tested within 24 hours following having redundant diesel out-of-service; did not pass test.
Unusual Event	11/05/1995	Unplanned emergency core cooling system (ECCS) discharge to the reactor vessel; reactor trip and safety injection (SI) occurred during the performance of testing.
Unusual Event	12/14/1995	Train derailment on site - while removing empty cask car from the Protected Area, the rail cars were moved onto the Engine Spur to allow passage of the CSX engine on adjacent Plant Spur; cask car shifted; 4 wheels of the car left the rails.
Unusual Event	01/22/1997	Security Event - while working Work Request and Authorization (WR&A), I&C Tech investigation found cut wire in a Turbine Building radiation monitor. Later determined to not be vandalism (i.e., not a security threat).
Unusual Event	04/02/2000	Loss of Emergency Response Facility Information System (ERFIS) computer system to display Safety Parameter Display System (SPDS) for more than 4 hours.
Unusual Event	08/23/2011	Seismic activity at the site due to a magnitude 5.8 earthquake near Mineral, VA.

The PULSTAR Nuclear Research Reactor has one reported "Notice of Unusual Events" since 1986, which is shown in **Table M.31**. This event occurred on August 23, 2011, and was due to seismic activity from the magnitude 5.8 earthquake near Mineral, Virginia. There were two additional known events in which an emergency declaration was not made and assistance was not required from the City of Raleigh or Wake County. One event occurred on July 2, 2011, and resulted in a shutdown of the reactor due to a 10-gallon-per-hour leak. The second event was reported on December 13, 2010, when a radiography technician walked in front of a 30 rem per hour beam of radiation for 60 seconds due to a shutter being left open.

Table M.31: PULSTAR Nuclear Research Reactor Incident History

Emergency Declaration	Date	Description
None	12/13/2010	A radiography technician walked in front of a 30 REM per hour beam of radiation for 60 seconds due to a shutter being left open. This incident was reported to the Nuclear Regulatory Commission (NRC), but no assistance was required from the City of Raleigh or Wake County.
None	07/02/2011	PULSTAR shut down due to a 10 gallon per hour leak. No emergency was declared (less than 350 gallons per hour reporting threshold), and no action was required from the City of Raleigh or Wake County.
Unusual Event	08/23/2011	Seismic activity at the site due to a magnitude 5.8 earthquake near Mineral, VA.

Probability of Future Occurrences

A major 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).

M.2.17 Terror Threat

Location and Spatial Extent

A terror threat could potentially occur at any location in the county. However, the very definition of a terrorist event indicates that it is most likely to be targeted at a critical or symbolic resource/location. Ensuring and protecting the continuity of critical infrastructure and key resources (CIKR) of the United States is essential to the Nation's security, public health and safety, economic vitality, and way of life. CIKR includes physical and/or virtual systems or assets that, if damaged, would have a detrimental impact on national security, including large-scale human casualties, property destruction, economic disruption, and significant damage to morale and public confidence. **Table M.32** shows the U.S. Department of Homeland Security's (DHS) identified main critical infrastructure sectors.

TABLE M.32 U.S. DEPARTMENT OF HOMELAND SECURITY CRITICAL INFRASTRUCTURE SECTORS

- Agriculture and Food
- Banking and Finance
- Chemical
- Commercial Facilities
- Communications
- Critical Manufacturing
- Dams
- Defense Industrial Base
- Emergency Services
- Energy
- Government Facilities
- Healthcare and Public Health
- Information Technology
- National Monuments and Icons
- Nuclear Reactors, Materials, and Waste
- Postal and Shipping
- Transportation Systems
- Water

Historical Occurrences

Although there have been no major terror events in Wake County, there is some possibility that one could occur as there have been incidents in the past in the United States and the county is a population center that is home to the capital of North Carolina and has potential targets.

Probability of Future Occurrences

Wake County has had no recorded terrorist events. Due to no recorded incidents against Wake County, the probability of future occurrences of a terrorist attack is rated as unlikely with less than 1 percent annual probability of an incident occurring.

M.2.18 Conclusions on Hazard Risk

The hazard profiles presented above were developed using best available data and result in what may be considered principally a qualitative assessment as recommended by FEMA in its "How-to" guidance document titled *Understanding Your Risks: Identifying Hazards and Estimating Losses* (FEMA Publication 386-2). It relies heavily on historical and anecdotal data, stakeholder input, and professional and

experienced judgment regarding observed and/or anticipated hazard impacts. It also carefully considers the findings in other relevant plans, studies, and technical reports.

Hazard Extent

Table M.33 describes the extent of each natural hazard identified for Wake County. The extent of a hazard is defined as its severity or magnitude, as it relates to the planning area.

TABLE M.33 EXTENT OF WAKE COUNTY HAZARDS

Atmospheric 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 M:4). According to the North Carolina Drought Monitor Classifications, the most severe drought condition is Exceptional. Wake County has received this ranking three times over the fourteen year reporting period.
Extreme Heat	The extent of extreme heat can be defined by the maximum temperature reached. The highest temperature recorded in Wake County is 107 degrees Fahrenheit in Raleigh in 1898.
Hailstorm	Hail extent can be defined by the size of the hail stone. The largest hail stone reported in Wake County was 3.00 inches. It should be noted that future events may exceed this.
Hurricane and Tropical Storm	Hurricane extent is defined by the Saffir-Simpson Scale which classifies hurricanes into Category 1 through Category 5 (Table 5.10). The highest magnitude hurricanes to traverse directly through Wake County were two storms which carried tropical force winds of 70 knots upon arrival in Wake County. Both an Unnamed Storm in 1893 and Hurricane Hazel in 1954 carried this maximum sustained wind speed. It should also be noted that Hurricane Fran, which struck more recently, attained maximum sustained winds of 57 knots.
Lightning	According to the NOAA flash density map (Figure 5.5), Wake County is located in an area that experiences 4 to 5 lightning flashes per square kilometer per year. It should be noted that future lightning occurrences may exceed these figures.
Thunderstorm Wind/High Wind	Thunderstorm extent is defined by the number of thunderstorm events and wind speeds reported. According to a 60-year history from the National Climatic Data Center, the strongest recorded wind event in Wake County was reported at 65 knots (approximately 75 mph). It should be noted that future events may exceed these historical occurrences.
Tornado	Tornado hazard extent is measured by tornado occurrences in the US provided by FEMA (Figure 5.6) as well as the Fujita/Enhanced Fujita Scale (Tables 5.18 and 5.19). The greatest magnitude reported was an F4 (reported on November 28, 1988).
Winter Storm and Freeze	The extent of winter storms can be measured by the amount of snowfall received (in inches). The greatest snowfall reported in Wake County was 20-24 inches during the Blizzard of 1996. Due to variations in storm systems, extent totals vary for each participating jurisdiction and reliable data on snowfall totals is not available.

Geologic Hazards	
Earthquake	Earthquake extent can be measured by the Richter Scale (Table 5.24) and the Modified Mercalli Intensity (MMI) scale (Table 5.25) and the distance of the epicenter from Wake County. According to data provided by the National Geophysical Data Center, the greatest MMI to impact the county was reported in Raleigh with a MMI of VIII (destructive) with a correlating Richter Scale measurement of approximately 7.2.
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 between low and moderate in Wake County. There is also moderate susceptibility in some areas.
Hydrologic Hazards	
Dam Failure	Dam failure extent is defined using the North Carolina Division of Land Resources criteria (Table 5.30). Of the 5 dams in Wake County, 44 are classified as high-hazard.
Erosion	The extent of erosion can be defined by the measurable rate of erosion that occurs. There are no erosion rate records located in Wake County.
Flood	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 55 square miles of the total land area in Wake County. Flood depth and velocity are recorded via United States Geological Survey stream gages throughout the region. While a gage does not exist for each participating jurisdiction, there is one at or near many areas. The greatest peak discharge recorded for the area was at Crabtree Creek at Ebenezer Church Road (Raleigh) in 1973. Water reached a discharge of 117,007 cubic feet per second.
Other Hazards	
Hazardous Materials Incident	According to USDOT PHMSA, the largest hazardous materials incident reported in the county is 75 LGA released on the highway in Raleigh. It should be noted that larger events are possible.
Wildfire	Wildfire data was provided by the North Carolina Division of Forest Resources and is reported annually by county from 2003-2012. Analyzing the data indicates the following wildfire hazard extent. The greatest number of fires to occur in any year was 28 in 2007. The greatest number of acres to burn in a single year occurred in 2011 when 225 acres were burned. Although this data lists the extent that has occurred, larger and more frequent wildfires are possible throughout the region.
Nuclear Accident	Although there is not any historic precedent for a nuclear accident in Wake County, it is possible that a serious to major accident could occur. This would result in severe exposure to radiation for southwest Wake County (in the 10 mile buffer) and much of the rest of the county would also be impacted (50 mile buffer).

Terror Threat	There is no history of terror threats in Wake County however; it is possible that one of these events could occur. If this were to take place, the magnitude of the event could range on the scale of catastrophic with many fatalities and injuries to the population.

Priority Risk Index Results

In order to draw some meaningful planning conclusions on hazard risk for Wake County, the results of the hazard profiling process were used to generate countywide hazard classifications according to a "Priority Risk Index" (PRI). More information on the PRI and how it was calculated can be found in Section 5.20.2.

Table M.34 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 Work Groups and Coordinating Committee. The results were then used in calculating PRI values and making final determinations for the risk assessment.

TABLE M.34: SUMMARY OF PRI RESULTS FOR WAKE COUNTY

Hazard	Category/Degree of Risk					
	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Atmospheric Hazards						
Drought	Likely	Minor	Large	More than 24 hours	More than 1 week	**2.5**
Extreme Heat	Likely	Minor	Large	More than 24 hours	Less than 1 week	**2.4**
Hailstorm	Highly Likely	Minor	Moderate	6 to 12 hours	Less than 6 hours	**2.5**
Hurricane and Tropical Storm	Likely	Critical	Large	More than 24 hours	Less than 24 hours	**2.9**
Lightning	Highly Likely	Minor	Negligible	6 to 12 hours	Less than 6 hours	**2.1**
Thunderstorm/High Wind	Highly Likely	Critical	Moderate	6 to 12 hours	Less than 6 hours	**3.1**
Tornado	Likely	Critical	Small	Less than 6 hours	Less than 6 hours	**2.7**
Winter Storm and Freeze	Likely	Limited	Moderate	More than 24 hours	Less than 1 week	**2.5**
Geologic Hazards						
Earthquake	Possible	Minor	Moderate	Less than 6 hours	Less than 6 hours	**2**
Landslide	Possible	Minor	Small	Less than 6 hours	Less than 6 hours	**1.8**
Hydrologic Hazards						
Dam and Levee Failure	Unlikely	Critical	Small	Less than 6 hours	Less than 6 hours	**2.1**
Erosion	Possible	Minor	Small	More than 24 hours	More than 1 week	**1.8**
Flood	Likely	Critical	Small	6 to 12 hours	Less than 1 week	**2.8**
Other Hazards						
Hazardous Materials Incident	Likely	Limited	Small	Less than 6 hours	Less than 24 hours	**2.5**
Wildfire	Possible	Minor	Small	Less than 6 hours	Less than 1 week	**2**
Nuclear Accident	Unlikely	Critical	Large	6 to 12 hours	Less than 1 week	**2.6**
Terror Threat	Unlikely	Critical	Moderate	Less than 6 hours	Less than 24 hours	**2.4**

M.2.16 Final Determinations on Hazard Risk

The conclusions drawn from the hazard profiling process for Wake County, including the PRI results and input from the Regional Work Groups and Coordinating Committee, resulted in the classification of risk for each identified hazard according to three categories: High Risk, Moderate Risk, and Low Risk (**Table M.35**). 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 Wake County. A more quantitative analysis to estimate potential dollar losses for each hazard has been performed separately, and is described in Section 6: *Vulnerability Assessment* and below in Section M.3. 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 M.35: CONCLUSIONS ON HAZARD RISK FOR WAKE COUNTY

HIGH RISK	Severe Thunderstorm/High Wind Hurricane/Tropical Storm Tornado Flood
MODERATE RISK	Drought Extreme Heat Hailstorm Winter Storm and Freeze Hazardous Materials Incident Nuclear Accident Terror Threat
LOW RISK	Lightning Earthquake Landslide Dam and Levee Failure Erosion Wildfire

M.3 WAKE COUNTY VULNERABILITY ASSESSMENT

This subsection identifies and quantifies the vulnerability of Wake County to the significant hazards previously identified. This includes identifying and characterizing an inventory of assets in the county and assessing the potential impact and expected amount of damages caused to these assets by each identified hazard event. More information on the methodology and data sources used to conduct this assessment can be found in Section 6: *Vulnerability Assessment*.

M.3.1 Asset Inventory

Table M.36 lists the number of parcels, total value of parcels, total number of parcels with improvements, and the total assessed value of improvements for unincorporated Wake County (study area of vulnerability assessment).[17]

TABLE M.36: IMPROVED PROPERTY IN WAKE COUNTY

Location	Number of Parcels	Total Assessed Value of Parcels	Estimated Number of Buildings	Total Assessed Value of Improvements
Unincorporated Wake County	92,500	$36,869,910,205	88,745	$20,154,896,961

Table M.37 lists the fire stations, police stations, EMS stations, medical care facilities, schools, and other critical facilities located in unincorporated Wake County. These facilities were identified as primary critical facilities in that they are necessary to maintain government functions and protect the life, health, safety, and welfare of citizens. These primary facilities were geospatially mapped and used as the basis for further geographic analysis of the hazards that could potentially affect critical facilities.

All critical facility information was provided by local governments and their GIS departments. Much of the information for both the county and jurisdictions was provided by Wake County GIS. In addition, **Figure M.10** shows the locations of the primary critical facilities in Wake County. **Table M.48**, near the end of this section, shows a complete list of the critical facilities by name, as well as the hazards that affect each facility. As noted previously, this list is not all-inclusive and only includes information provided by the local government.

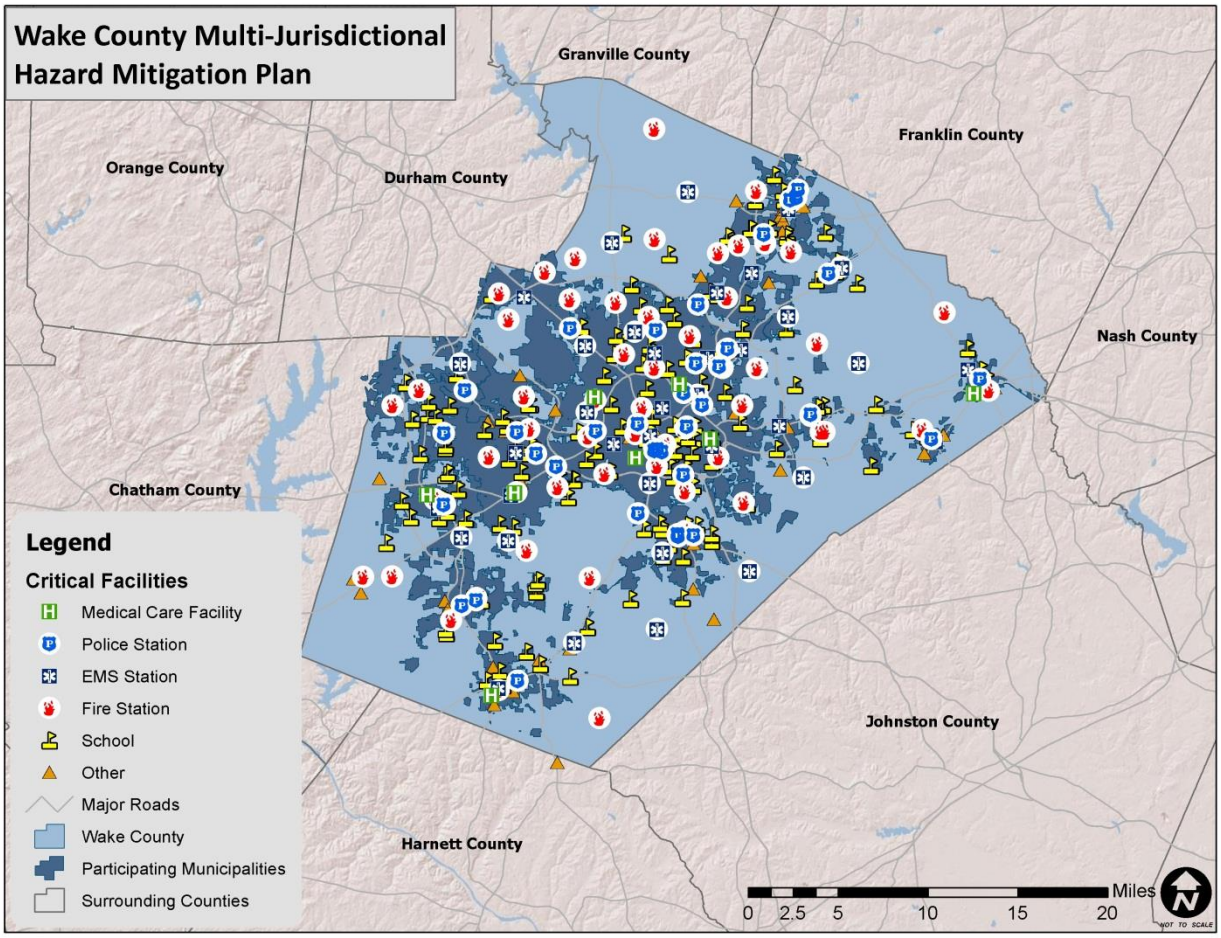
TABLE M.37: CRITICAL FACILITY INVENTORY IN WAKE COUNTY

Location	Fire Stations	Police Stations	EMS Stations	Medical Care Facilities	Schools	Other
Unincorporated Wake County	21	0	11	0	12	4

Source: Local Governments

[17] 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.

FIGURE M.10: CRITICAL FACILITY LOCATIONS IN WAKE COUNTY



Source: Local Governments

M.3.2 Social Vulnerability

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

Table M.38 lists the population by jurisdiction according to U.S. Census 2010 population estimates. Unfortunately, estimates were not available at the census block level, limited the results to county-wide estimates. The total population in unincorporated Wake County according to Census data is 181,890 persons. Additional population estimates are presented above in Section M.1.

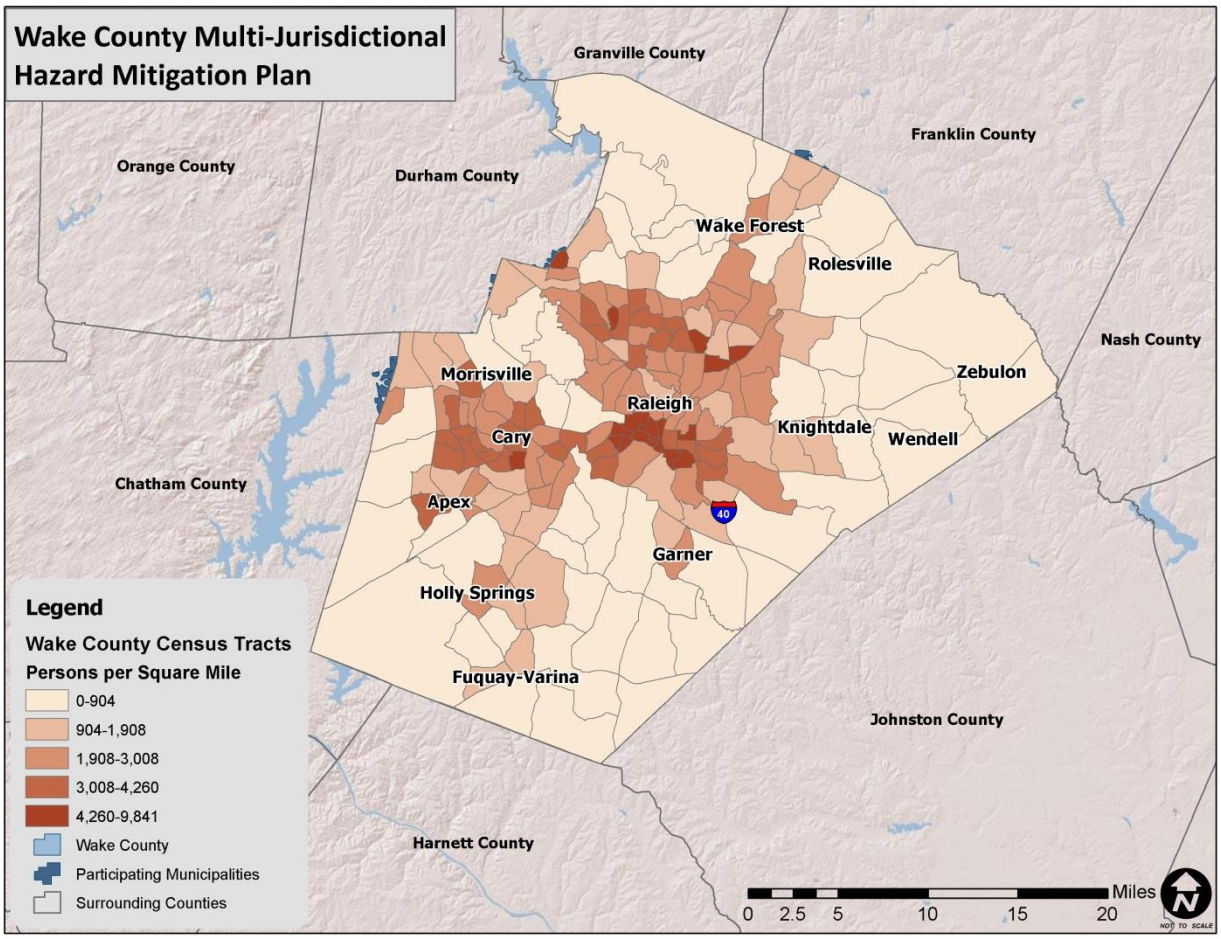
TABLE M.38: TOTAL POPULATION IN WAKE COUNTY

Location	Total 2010 Population
Unincorporated Wake County	181,890

Source: U.S. Census 2010

In addition, **Figure M.11** illustrates the population density by census tract as it was reported by the U.S. Census Bureau in 2010.[18]

FIGURE M.11: POPULATION DENSITY IN WAKE COUNTY



Source: U.S. Census Bureau, 2010

M.3.3 Vulnerability Assessment Results

As noted in Section 6: *Vulnerability Assessment*, only hazards with a specific geographic boundary, modeling tool, or sufficient historical data allow for further analysis. Those results, specific to Wake County, are presented here. All other hazards are assumed to impact the entire planning region (drought, extreme heat, hailstorm, lightning, thunderstorm/high wind, tornado, and winter storm and freeze) or, due to lack of data, analysis would not lead to credible results (erosion, dam and levee failure, terror threat). The total county exposure, and thus risk, was presented in **Table M.35**.

The annualized loss estimate for all hazards is presented at the end of this section in **Table M.47.**

The hazards presented in this section include: hurricane and tropical storm winds, earthquake, landslide, flood, hazardous materials incident, wildfire, and nuclear accident.

[18] Population by census block was not available at the time this plan was completed.

Hurricane and Tropical Storm

Historical evidence indicates that Wake County has a significant risk to the hurricane and tropical storm hazard. Several tracks have come near or traversed through the county, as shown and discussed in Section M.2.4.

Hurricanes and tropical storms can cause damage through numerous additional hazards such as flooding, erosion, tornadoes, and high winds and precipitation, thus it is difficult to estimate total potential losses from these cumulative effects. The current Hazus-MH hurricane model only analyzes hurricane winds and is not capable of modeling and estimating cumulative losses from all hazards associated with hurricanes; therefore only hurricane winds are analyzed in this section. It can be assumed that all existing and future buildings and populations are at risk to the hurricane and tropical storm hazard. Hazus-MH 2.1 was used to determine annualized losses for the county as shown below in **Table M.39.** Only losses to buildings are reported, in order to best match annualized losses reported for other hazards. Hazus-MH reports losses at the U.S. Census tract level, so determining participating jurisdiction losses was not possible.

TABLE M.39: ANNUALIZED LOSS ESTIMATIONS FOR HURRICANE WIND HAZARD

Location	Building Loss	Contents Loss	Inventory Loss	Total Annualized Loss
Wake County	**$9,936,000**	**$3,892,000**	**$28,000**	**$13,856,000**

Source: Hazus-MH 2.1

In addition, probable peak wind speeds were calculated in Hazus. These are shown below in **Table M.40.**

TABLE M.40: PROBABLE PEAK HURRICANE/TROPICAL STORM WIND SPEEDS (MPH)

Location	50-year event	100-year event	500-year event	1,000-year event
Wake County	76.6	85.7	104.6	111.2

Source: Hazus-MH 2.1

Social Vulnerability

Given equal susceptibility across the county, it is assumed that the total population is at risk to the hurricane and tropical storm hazard.

Critical Facilities

Given equal vulnerability across Wake County, all critical facilities are considered to be at risk. Some buildings may perform better than others in the face of such an event due to construction and age, among other factors. Determining individual building response is beyond the scope of this plan. However, this plan will consider mitigation actions for vulnerable structures, including critical facilities, to reduce the impacts of the hurricane wind hazard. A list of specific critical facilities and their associated risk can be found in **Table M.48** at the end of this section.

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

Earthquake

For the earthquake hazard vulnerability assessment, a probabilistic scenario was created to estimate the annualized loss for the county. The results of the analysis reported at the U.S. Census tract level do not make it feasible to estimate losses at the jurisdiction level. Since the scenario is annualized, no building counts are provided. Losses reported included losses due to building damage (structural and non-structural), contents, and inventory. However, like the analysis for hurricanes, the comparative annualized loss figures at the end of this chapter only utilize building losses in order to provide consistency with other hazards. **Table M.41** summarizes the findings.

TABLE M.41: ANNUALIZED LOSS ESTIMATIONS FOR EARTHQUAKE HAZARD

Location	Structural Building Loss	Non Structural Building Loss	Contents Loss	Inventory Loss	Total Annualized Loss
Wake County	**$119,000**	**$314,000**	**$88,000**	**$3,000**	**$524,000**

Source: Hazus-MH 2.1

Social Vulnerability

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

Critical Facilities

The Hazus probabilistic analysis indicated that no critical facilities would sustain measurable damage in an earthquake event. However, all critical facilities should be considered at-risk to minor damage, should an event occur. A list of individual critical facilities and their risk can be found in **Table M.48**.

In conclusion, an earthquake has the potential to impact all existing and future buildings, facilities, and populations in Wake County. Minor earthquakes may rattle dishes and cause minimal damage while stronger earthquakes will result in structural damage as indicated in the Hazus scenario above. Impacts of earthquakes include debris clean-up, service disruption and, in severe cases, fatalities due to building collapse. Specific vulnerabilities for assets will be greatly dependent on their individual design and the mitigation measures in place, where appropriate. Such site-specific vulnerability determinations are outside the scope of this assessment but will be considered during future plan updates if data becomes available. Furthermore, mitigation actions to address earthquake vulnerability will be considered.

Landslide

In order to complete the vulnerability assessment for landslides in Wake County, GIS analysis was used. The potential dollar value of exposed land and property total can be determined using the USGS Landslide Susceptibility Index (detailed in Section M.2.10), tax parcel and building footprint data, and GIS analysis. **Table M.42** presents the potential at-risk property where available. All areas of Wake County are identified as low or moderate incidence areas by the USGS landslide data. Some areas are also of moderate landslide susceptibility. Since there were no high incidence levels in the county, the moderate incidence level was used to identify different areas of concern for the analysis below.

TABLE M. 42: TOTAL POTENTIAL AT-RISK PARCELS FOR THE LANDSLIDE HAZARD

Location	Number of Parcels At Risk	Number of Improvements At Risk	Total Value of Improvements At Risk ($)
Incidence Level	**Moderate**		
Unincorporated Wake County	6,673	5,396	$3,145,211,453

Source: USGS

Social Vulnerability

Given low susceptibility across most of Wake County, it is assumed that much of the total population is at a very low risk to landslides. However, Wake County is probably at somewhat higher risk than other jurisdictions.

Critical Facilities

Six critical facilities are located in a moderate susceptibility area. This includes 1 EMS station, 4 fire stations, and 1 other. A list of specific critical facilities and their associated risk can be found in **Table M.48** at the end of this section.

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

Flood

Historical evidence indicates that Wake County is susceptible to flood events. A total of 46 flood events have been reported by the National Climatic Data Center resulting in $220,101 in damages. On an annualized level, these damages amounted to $12,228 for Wake County.

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 the county. The determination of assessed value at-risk (exposure) was calculated using GIS analysis by summing the total assessed building values for only those improved properties that were confirmed to be located within an identified floodplain. **Table M.43** presents the potential at-risk property. Both the number of parcels and the approximate value are presented.

TABLE M.43: ESTIMATED EXPOSURE OF PARCELS TO THE FLOOD HAZARD

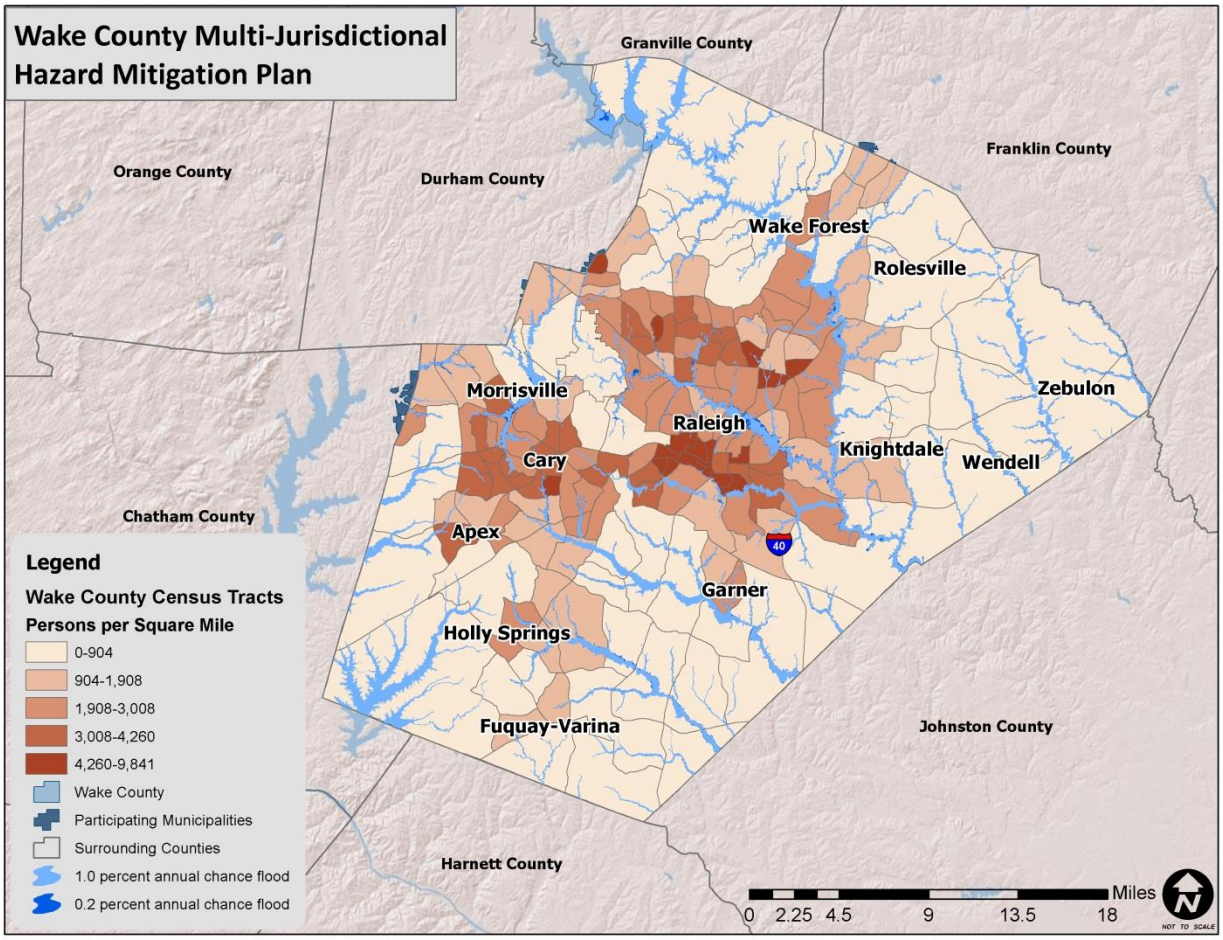
Location	1.0-percent ACF			0.2-percent ACF		
	Approx. Number of Parcels	Approx. Number Improved Buildings	Approx. Improved Value of Buildings	Approx. Number of Parcels	Approx. Number Improved Buildings	Approx. Improved Value of Buildings
Unincorporated Wake County	6,093	373	$2,834,713,327	467	192	$237,670,063

Source: FEMA DFIRM

Social Vulnerability

Since 2010 population was available at the tract level, it was difficult to determine a reliable figure on population at-risk to flood due to tract level population data. **Figure M.12** is presented to gain a better understanding of at risk population.

FIGURE M.12 : POPULATION DENSITY NEAR FLOODPLAINS



Source: FEMA DFIRM, U.S. Census 2010

Critical Facilities

The critical facility analysis revealed that there are a no critical facilities located in the Wake County 1.0-percent annual chance floodplain and 0.2-percent annual chance floodplain based on FEMA DFIRM boundaries and GIS analysis. A list of specific critical facilities and their associated risk can be found in **Table M.48** at the end of this section.

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

Hazardous Materials Incident

Although historical evidence and existing Toxic Release Inventory sites indicate that Wake County is susceptible to hazardous materials events, there are few reports of damage. Therefore, it is difficult to

calculate a reliable annualized loss figure. It is assumed that while one major event could result in significant losses, annualizing structural losses over a long period of time would most likely yield a negligible annualized loss estimate for Wake County.

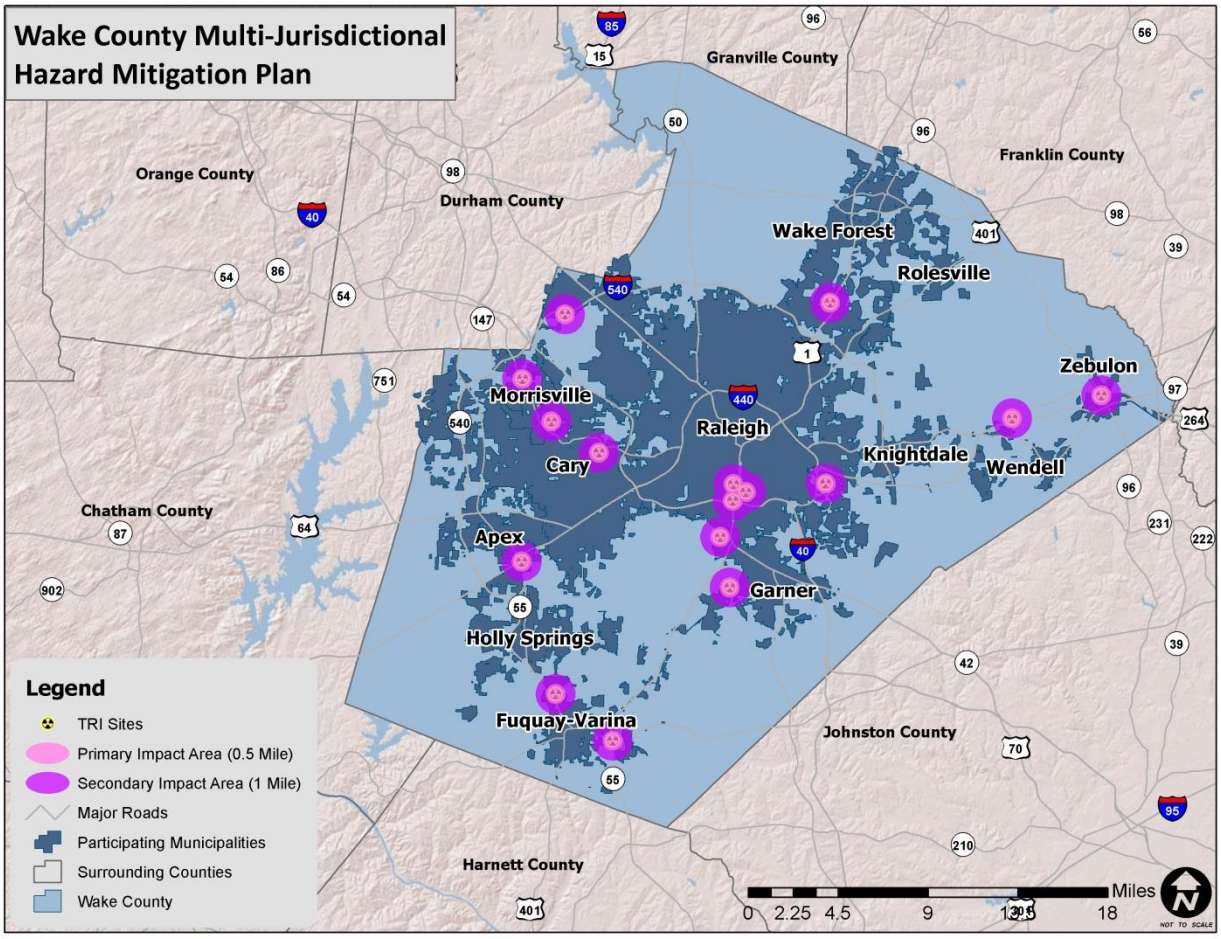
One significant hazardous materials event to impact Wake County occurred on October 2, 2006 when the EQ Industrial Services (a hazardous waste handling company) exploded. The event displaced 17,000 citizens and lasted for three days.

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

In order to conduct the vulnerability assessment for this hazard, GIS intersection analysis was used for fixed and mobile areas and parcels.[19] In both scenarios, two sizes of buffers—0.5-mile and 1.0-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 the PHMSA Emergency Response Guidebook. For the fixed site analysis, geo-referenced TRI listed toxic sites in Wake County, along with buffers, were used for analysis as shown in **Figure M.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 M.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 M.44** (fixed sites), **Table M.45** (mobile road sites) and **Table M.46** (mobile railroad sites).[20]

[19] This type of analysis will likely yield inflated results (generally higher than what is actually reported after an event).
[20] Note that parcels included in the 1.0-mile analysis are also included in the 0.5-mile analysis.

FIGURE M.13 : TRI SITES WITH BUFFERS IN WAKE COUNTY



Source: EPA

TABLE M.44: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS (FIXED SITES)

Location	0.5-mile buffer			1.0-mile buffer		
	Approx. Number of Parcels	Approx. Number Improved	Approx. Improved Value	Approx. Number of Parcels	Approx. Number Improved	Approx. Improved Value
Unincorporated Wake County	750	452	$884,583,035	3,345	2,599	$1,474,039,219

FIGURE M.14 : MOBILE HAZMAT BUFFERS IN WAKE COUNTY

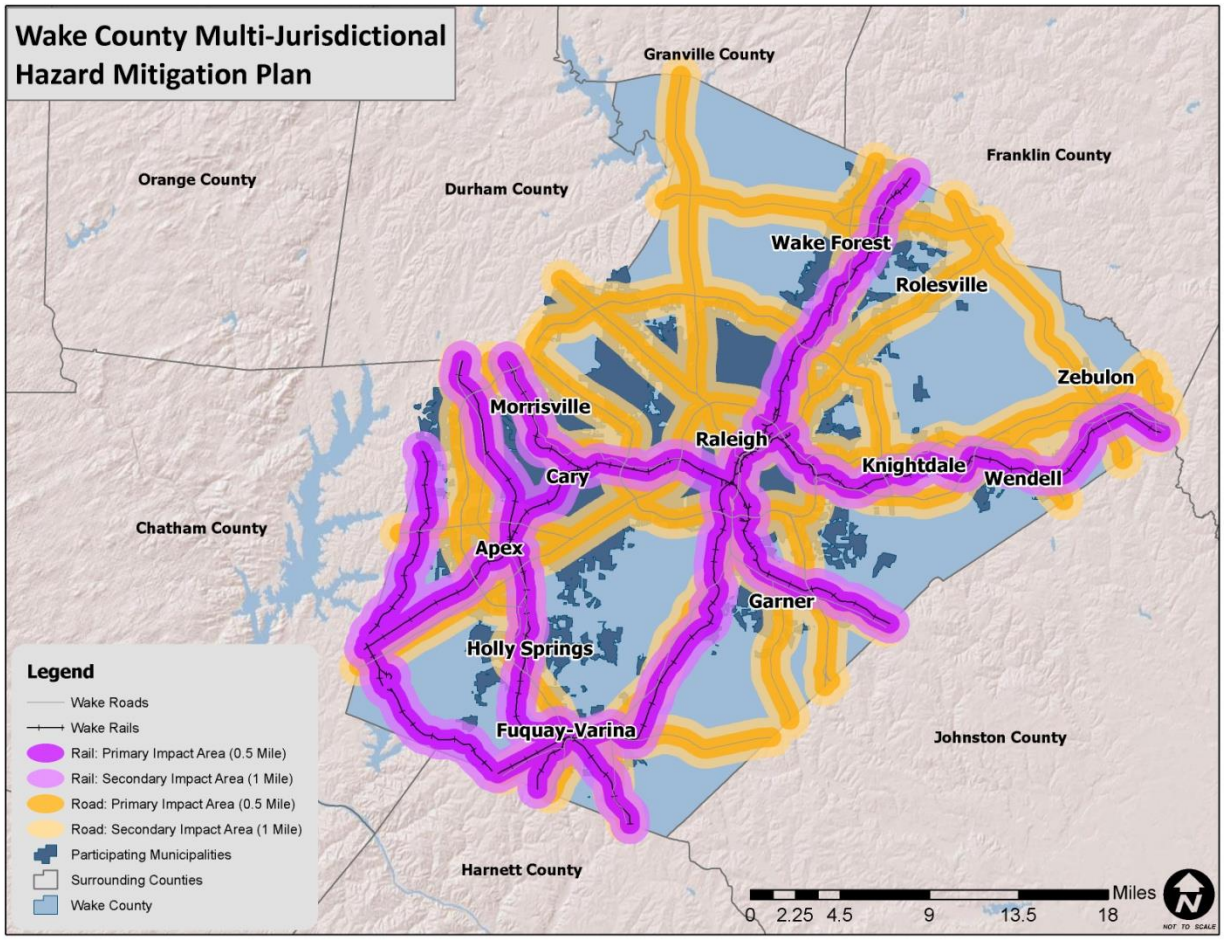


TABLE M.45: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS SPILL (MOBILE ANALYSIS - ROAD)

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
Unincorporated Wake County	29,836	26,417	$8,095,982,143	51,171	47,032	$12,306,306,740

TABLE M.46: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS SPILL (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
Unincorporated Wake County	11,758	10,547	$2,979,477,839	21,718	20,060	$5,352,080,287

Social Vulnerability
Given high susceptibility across the jurisdiction, it is assumed that the total population is at risk to a hazardous materials incident. It should be noted that areas of population concentration may be at an elevated risk due to a greater burden to evacuate population quickly.

Critical Facilities
Fixed Site Analysis:
The critical facility analysis for fixed TRI sites revealed that 1 critical facility is located in a HAZMAT risk zone. The primary impact zone does not include any facilities. A list of specific critical facilities and their associated risk can be found in **Table M.48** at the end of this section.

Mobile Analysis:
The critical facility analysis for road transportation corridors in Wake County revealed that there are 31 critical facilities are located in a HAZMAT risk zone. The primary impact zone includes 23 facilities. The remaining facilities are in the secondary, 1.0-mile zone. The railroad buffer areas include 10 facilities with 5 in the primary impact zone. It should be noted that many of the facilities located in the buffer areas for railroad are also located in the buffer areas for road and/or the fixed site analysis. A list of specific critical facilities and their associated risk can be found in **Table M.48** 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 Wake County. Those areas in a primary buffer are at the highest risk, though all areas carry some vulnerability due to variations in conditions that could alter the impact area such direction and speed of wind, volume of release, etc. Further, incidents from neighboring jurisdictions could also have an impact.

Wildfire
Although historical evidence indicates that Wake County is susceptible to wildfire events, there are few reports of damage. Upon conversion of the wildfire risk data (see Section 6: *Vulnerability Assessment*) and completion of the wildfire analysis, it was determined that less than 4,000 square feet in the entire county registered at over 1 on the Level of Concern scale for wildfire. This indicates that the relative risk of wildfire is extremely low compared to other counties in the state, which resulted in zero or near zero counts of buildings and facilities located in the wildfire risk zones. Therefore, no tables or figures are included and the overall risk for the jurisdiction should be assumed to be very low. As such, it is difficult to calculate a reliable annualized loss figure. Annualized loss is considered negligible though it should be noted that a single event could result in significant damages throughout the county.

Social Vulnerability
All areas have relatively equal vulnerability and there is low susceptibility across the entire county.
It is assumed that the total population is at low risk to the wildfire hazard.

Critical Facilities
The critical facility analysis revealed that there are no critical facilities located in wildfire areas of concern. It should be noted, however, that several factors could impact the spread of a wildfire putting all facilities at risk. A list of specific critical facilities and their associated risk can be found in **Table M.48** at the end of this section.

In conclusion, a wildfire event has the potential to impact some existing and future buildings, critical facilities, and populations in Wake County.

Nuclear Accident

The location of Shearon Harris Nuclear Station in southwest Wake County demonstrates that the county is at risk to the effects of a nuclear accident. Although there have not been any major events at this plant in the past, there have been major events at other nuclear stations around the country. Additionally, smaller scale incidents at Shearon-Harris Nuclear Station have occurred.

In order to assess nuclear risk, a GIS-based analysis was used to estimate exposure during a nuclear event within each of the risk zones described in *Section 5: Hazard Profiles*. 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 one of the risk zones. All areas of Wake County are located within one of the risk zones. **Table M.47** present the potential at-risk property. Both the number of parcels/buildings and the approximate value are presented.

TABLE A.47: ESTIMATED EXPOSURE OF PARCELS/BUILDINGS TO A NUCLEAR ACCIDENT

Location	10-mile buffer			50-mile buffer		
	Approx. Number of Parcels	Approx. Number Improved Buildings	Approx. Improved Value of Buildings[21]	Approx. Number of Parcels	Approx. Number Improved Buildings	Approx. Improved Value of Buildings[22]
Unincorporated Wake County	10,274	8,993	$2,050,839,254	92,500	88,745	$20,154,896,961

Social Vulnerability

Since all areas of the county are within at least the 50-mile buffer area, the total population is considered to be at risk to a nuclear accident. However, populations in the southwest part of the county are considered to be at an elevated risk.

Critical Facilities

The critical facility analysis revealed that there are a total of six critical facilities located in the 10-mile nuclear buffer area including 1 EMS stations, 4 fire stations, and 1 other in Wake County.

In conclusion, a nuclear accident has the potential to impact many existing and future buildings, facilities, and populations in Wake County, though areas closer to the power plant are at a higher risk than others. All structures are at some risk given that they are all located within at least the 50-mile buffer area.

Conclusions on Hazard Vulnerability

Table M.48 presents a summary of annualized loss for each hazard in Wake County. 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, although an annualized loss was determined

[21] Improved value of buildings is estimated based on the building value associated with parcels that have been identified as being located in the 10-mile buffer, since building footprints were not associated with dollar value data.
[22] Improved value of buildings is estimated based on the building value associated with parcels that have been identified as being located in the 50-mile buffer, since building footprints were not associated with dollar value data.

through the damage reported through historical occurrences at the municipal level, it is likely that the county-wide estimate (found in Section 6: *Vulnerability Assessment*) is potentially a better estimate. These values should be used as an additional planning tool or measure risk for determining hazard mitigation strategies.

TABLE M.48: ANNUALIZED LOSS FOR WAKE COUNTY*

Event	Wake County
Dam Failure	Negligible
Drought	Negligible
Erosion	Negligible
Extreme Heat	Negligible
Hail	Negligible
Hurricane & Tropical Storm	Negligible
Landslide	Negligible
Lightning	$21,029
Thunderstorm Wind/High Wind[23]	$5,875
Tornado	$11,111,453
Winter Storm & Freeze	$47,408
Flood	$12,228
Earthquake	Negligible
HAZMAT Incident	Negligible
Wildfire	Negligible
Nuclear Accident	Negligible
Terror Threat	Negligible

*In this table, the term "Negligible" is used to indicate that no records 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 kept.

As noted previously, all existing and future buildings and populations (including critical facilities) are vulnerable to atmospheric hazards including drought, hailstorm, hurricane and tropical storm, lightning, thunderstorm wind, tornado, and winter storm and freeze. Some buildings may be more vulnerable to these hazards based on locations, construction, and building type. **Table M.49** shows the critical facilities vulnerable to additional hazards analyzed in this section. The table lists those assets that are determined to be exposed to each of the identified hazards (marked with an "**X**").

[23] The annualized losses for these hazards were combined.

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TABLE M.49: AT-RISK CRITICAL FACILITIES IN WAKE COUNTY

		ATMOSPHERIC								GEOLOGIC			HYDROLOGIC		OTHER										
FACILITY NAME	FACILITY TYPE	Drought	Extreme Heat	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Incidence	Landslide- Mod. Incidence	Flood – 100 yr	Flood – 500 yr	Fixed HAZMAT 0.5 mile	Fixed HAZMAT 1.0 mile	Mobile HZMT 0.5 mile (road)	Mobile HZMT 1.0 mile (road)	Mobile HZMT 0.5 mile (rail)	Mobile HZMT 1.0 mile (rail)	Wildfire	Nuclear Accident 10 mile	Nuclear Accident 50 mile	Terror Threat
WAKE COUNTY																									
HOLLY SPRINGS	EMS STATION	X	X	X	X	X	X	X	X	X								X		X		X	X	X
WAKE CROSSROADS	EMS STATION	X	X	X	X	X	X	X	X	X						X	X	X					X	X
STONY HILL	EMS STATION	X	X	X	X	X	X	X	X	X							X	X					X	X
HILLTOP	EMS STATION	X	X	X	X	X	X	X	X	X							X	X	X	X			X	X
BETHANY CHURCH	EMS STATION	X	X	X	X	X	X	X	X	X													X	X
SIX FORKS NORTH	EMS STATION	X	X	X	X	X	X	X	X	X							X	X					X	X
RDU AIRPORT	EMS STATION	X	X	X	X	X	X	X	X	X		X					X	X					X	X
GARNER SOUTH	EMS STATION	X	X	X	X	X	X	X	X	X													X	X
KNIGHTDALE SOUTH	EMS STATION	X	X	X	X	X	X	X	X	X								X					X	X
KNIGHTDALE WEST	EMS STATION	X	X	X	X	X	X	X	X	X							X	X		X			X	X
MINICITY	EMS STATION	X	X	X	X	X	X	X	X	X							X	X					X	X
APEX #2	FIRE STATION	X	X	X	X	X	X	X	X	X		X					X	X	X	X		X	X	X
FUQUAY-VARINA #2	FIRE STATION	X	X	X	X	X	X	X	X	X							X	X	X	X			X	X

		ATMOSPHERIC								GEOLOGIC			HYDROLOGIC		OTHER										
FACILITY NAME	FACILITY TYPE	Drought	Extreme Heat	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Incidence	Landslide- Mod. Incidence	Flood – 100 yr	Flood – 500 yr	Fixed HAZMAT 0.5 mile	Fixed HAZMAT 1.0 mile	Mobile HZMT 0.5 mile (road)	Mobile HZMT 1.0 mile (road)	Mobile HZMT 0.5 mile (rail)	Mobile HZMT 1.0 mile (rail)	Wildfire	Nuclear Accident 10 mile	Nuclear Accident 50 mile	Terror Threat
GARNER #2	FIRE STATION	X	X	X	X	X	X	X	X	X													X	X
FAIRVIEW #2	FIRE STATION	X	X	X	X	X	X	X	X	X								X					X	X
FAIRVIEW #1	FIRE STATION	X	X	X	X	X	X	X	X	X													X	X
RDU CFR	FIRE STATION	X	X	X	X	X	X	X	X	X		X											X	X
EASTERN WAKE #1	FIRE STATION	X	X	X	X	X	X	X	X	X													X	X
HOPKINS	FIRE STATION	X	X	X	X	X	X	X	X	X								X					X	X
WENDELL #2	FIRE STATION	X	X	X	X	X	X	X	X	X													X	X
WAKE-NEW HOPE #2	FIRE STATION	X	X	X	X	X	X	X	X	X													X	X
FALLS	FIRE STATION	X	X	X	X	X	X	X	X	X													X	X
BAY LEAF #1	FIRE STATION	X	X	X	X	X	X	X	X	X													X	X
STONY HILL #1	FIRE STATION	X	X	X	X	X	X	X	X	X							X	X					X	X
STONY HILL #2	FIRE STATION	X	X	X	X	X	X	X	X	X													X	X
BAY LEAF #2	FIRE STATION	X	X	X	X	X	X	X	X	X							X	X					X	X
DURHAM HIGHWAY #1	FIRE STATION	X	X	X	X	X	X	X	X	X													X	X
FUQUAY-VARINA #3	FIRE	X	X	X	X	X	X	X	X	X													X	X

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC								GEOLOGIC			HYDROLOGIC		OTHER									
		Drought	Extreme Heat	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Incidence	Landslide- Mod. Incidence	Flood – 100 yr	Flood – 500 yr	Fixed HAZMAT 0.5 mile	Fixed HAZMAT 1.0 mile	Mobile HZMT 0.5 mile (road)	Mobile HZMT 1.0 mile (road)	Mobile HZMT 0.5 mile (rail)	Mobile HZMT 1.0 mile (rail)	Wildfire	Nuclear Accident 10 mile	Nuclear Accident 50 mile	Terror Threat
	STATION																							
HOLLY SPRINGS #1	FIRE STATION	X	X	X	X	X	X	X	X	X								X		X		X	X	X
HOLLY SPRINGS #2	FIRE STATION	X	X	X	X	X	X	X	X	X							X	X	X	X		X	X	X
HOLLY SPRINGS #3	FIRE STATION	X	X	X	X	X	X	X	X	X		X					X	X				X	X	X
RFD #29	FIRE STATION	X	X	X	X	X	X	X	X	X		X						X					X	X
JAMES REST HOME	OTHER	X	X	X	X	X	X	X	X	X		X					X	X				X	X	X
SPRING ARBOR ADULT CARE OF EAST RALEIGH	OTHER	X	X	X	X	X	X	X	X	X							X	X					X	X
WALTONWOOD CARY PARKWAY ADULT CARE	OTHER	X	X	X	X	X	X	X	X	X							X	X					X	X
HOSPICE OF WAKE COUNTY	OTHER	X	X	X	X	X	X	X	X	X							X	X					X	X
SWIFT CREEK ES	SCHOOL	X	X	X	X	X	X	X	X	X								X					X	X
BRASSFIELD ES	SCHOOL	X	X	X	X	X	X	X	X	X													X	X
PLEASANT UNION ES	SCHOOL	X	X	X	X	X	X	X	X	X								X					X	X
EAST WAKE HS	SCHOOL	X	X	X	X	X	X	X	X	X							X	X					X	X
CARVER ES	SCHOOL	X	X	X	X	X	X	X	X	X							X	X	X	X			X	X
YATES MILL ES	SCHOOL	X	X	X	X	X	X	X	X	X													X	X
JONES DAIRY ES	SCHOOL	X	X	X	X	X	X	X	X	X													X	X
EAST WAKE SCHOOL OF HEALTH SCIENCE	SCHOOL	X	X	X	X	X	X	X	X	X							X	X					X	X
SMITH ES	SCHOOL	X	X	X	X	X	X	X	X	X							X	X		X			X	X

		ATMOSPHERIC								GEOLOGIC			HYDROLOGIC		OTHER										
FACILITY NAME	FACILITY TYPE	Drought	Extreme Heat	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Incidence	Landslide- Mod. Incidence	Flood – 100 yr	Flood – 500 yr	Fixed HAZMAT 0.5 mile	Fixed HAZMAT 1.0 mile	Mobile HZMT 0.5 mile (road)	Mobile HZMT 1.0 mile (road)	Mobile HZMT 0.5 mile (rail)	Mobile HZMT 1.0 mile (rail)	Wildfire	Nuclear Accident 10 mile	Nuclear Accident 50 mile	Terror Threat
EAST WAKE SCHOOL OF INTEGRATED TECHNOLOGY	SCHOOL	X	X	X	X	X	X	X	X	X							X	X					X	X
FRED A. SMITH ES	SCHOOL	X	X	X	X	X	X	X	X	X							X	X		X			X	X
VANCE ES	SCHOOL	X	X	X	X	X	X	X	X	X													X	X

M.4 WAKE COUNTY CAPABILITY ASSESSMENT

This subsection discusses the capability of the Wake County to implement hazard mitigation activities. More information on the purpose and methodology used to conduct the assessment can be found in Section 7: *Capability Assessment*.

M.4.1 Planning and Regulatory Capability

Table M.50 provides a summary of the relevant local plans, ordinances, and programs already in place or under development for the Wake County. A checkmark (✓) indicates that the given item is currently in place and being implemented. An asterisk (*) indicates that the given item is currently being developed for future implementation. Each of these local plans, ordinances, and programs should be considered available mechanisms for incorporating the requirements of the Wake County Hazard Mitigation Plan.

TABLE M.50: RELEVANT PLANS, ORDINANCES, AND PROGRAMS

Planning Tool/Regulatory Tool	Hazard Mitigation Plan	Comprehensive Land Use Plan	Floodplain Management Plan	Open Space Management Plan (Parks & Rec/Greenway Plan	Stormwater Management Plan/Ordinance	Natural Resource Protection Plan	Flood Response Plan	Emergency Operations Plan	Continuity of Operations Plan	Evacuation Plan	Disaster Recovery Plan	Capital Improvements Plan	Economic Development Plan	Historic Preservation Plan	Flood Damage Prevention Ordinance	Zoning Ordinance	Subdivision Ordinance	Unified Development Ordinance	Post-Disaster Redevelopment Ordinance	Building Code	Fire Code	National Flood Insurance Program (NFIP)	NFIP Community Rating System
Wake County	✓	✓	✓	✓	✓		✓	✓	✓			✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	

A more detailed discussion on the county's planning and regulatory capabilities follows.

Emergency Management

Hazard Mitigation Plan
Wake County has previously adopted a hazard mitigation plan.

Emergency Operations Plan
Wake County has adopted the Wake County Emergency Operations Plan. The county also maintains a municipal-level emergency operations plan.

General Planning

Comprehensive Land Use Plan
Wake County has adopted a Land Use Plan as well as a growth management plan.

Capital Improvements Plan
Wake County has a long-range capital improvement program plan in place.

Zoning Ordinance
Wake County includes zoning regulations as part of the local unified development ordinance.

Subdivision Ordinance
Wake County also includes subdivision regulations as part of the local unified development ordinance.

Building Codes, Permitting, and Inspections
North Carolina has a state compulsory building code which applies throughout the state. The building code is enforced within the county's planning jurisdiction by the Wake County Building Inspections and Permits Department.

Floodplain Management

Table M.51 provides NFIP policy and claim information for the Wake County.

TABLE M.51: NFIP POLICY AND CLAIM INFORMATION

Jurisdiction	Date Joined NFIP	Current Effective Map Date	NFIP Policies in Force	Insurance in Force	Closed Claims	Total Payments to Date
Wake County	11/15/78	04/16/13	405	$108,769,300	62	$787,324

Source: NFIP Community Status information as of 3/20/14; NFIP claims and policy information as of 12/31/13

Flood Damage Prevention Ordinance
All communities participating in the NFIP are required to adopt a local flood damage prevention ordinance. Wake County participates in the NFIP and has adopted flood damage prevention regulations.

Open Space Management Plan
Wake County has adopted an open space master plan that is administered by Parks and Recreation.

Stormwater Management Plan
Wake County has not adopted a stormwater management plan; however, the county includes stormwater management regulations as part of the local unified development ordinance.

M.4.2 Administrative and Technical Capability

Table M.52 provides a summary of the capability assessment results for Wake County with regard to relevant staff and personnel resources. A checkmark (✓) indicates the presence of a staff member(s) in the county with the specified knowledge or skill.

TABLE M.52: RELEVANT STAFF / PERSONNEL RESOURCES

Staff / Personnel Resource	Planners with knowledge of land development/land management practices	Engineers or professionals trained in construction practices related to buildings and/or infrastructure	Planners or engineers with an understanding of natural and/or human-caused hazards	Emergency Manager	Floodplain Manager	Land Surveyors	Scientists familiar with the hazards of the community	Staff with education or expertise to assess the community's vulnerability to hazards	Personnel skilled in GIS and/or Hazus	Resource development staff or grant writers
Wake County	✓	✓	✓	✓	✓		✓	✓	✓	✓

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.

M.4.3 Fiscal Capability

Table M.53 provides a summary of the results for Wake County 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 hazard mitigation plan.

TABLE M.53: RELEVANT FISCAL RESOURCES

Fiscal Tool / Resource	Capital Improvement Programming	Community Development Block Grants (CDBG)	Special Purpose Taxes (or taxing districts)	Gas/Electric Utility Fees	Water/Sewer Fees	Stormwater Utility Fees	Development Impact Fees	General Obligation, Revenue, and/or Special Tax Bonds	Partnering Arrangements or Intergovernmental Agreements	Other: PDM, FMAP, HMGP, PA, other Federal and state funding sources, etc.
Wake County	✓	✓	✓	✓	✓		✓	✓	✓	✓

M.4.4 Political Capability

The previous hazard mitigation plan indicates that the citizens, property owners, business owners, and elected officials of Wake County are committed to improving the community through hazard mitigation. The County Manager along with the Board of Commissioners continually strive to make Wake County a safer community in which to live and work. These officials see the hazard mitigation plan as a key component in helping to achieve that goal.

M.4.5 Conclusions on Local Capability

Table M.54 shows the results of the capability assessment using the designed scoring methodology described in Section 7: *Capability Assessment*. The capability score is based solely on the information found in the existing hazard mitigation plan and readily available on the county's government website. According to the assessment, the local capability score for the county is 49, which falls into the high capability ranking.

TABLE M.54: CAPABILITY ASSESSMENT RESULTS

Jurisdiction	Overall Capability Score	Overall Capability Rating
Wake County	49	High

M.5 WAKE COUNTY MITIGATION STRATEGY

This subsection provides the blueprint for Wake County to follow in order to become less vulnerable to its identified hazards. It is based on general consensus of the Regional Work Groups and the findings and conclusions of the capability assessment and risk assessment. Additional Information can be found in Section 8: *Mitigation Strategy* and Section 9: *Mitigation Action Plan*.

M.5.1 Mitigation Goals

Wake County developed seven mitigation goals in coordination with other participating jurisdictions. The county-wide mitigation goals are presented in **Table M.55**.

TABLE M.55: WAKE COUNTY MITIGATION GOALS

	Goal
Goal #1	Protect public health, life, safety, and welfare by increasing public awareness and education of hazards and by encouraging collective and individual responsibility for mitigating hazard risks.
Goal #2	Improve technical capability to respond to hazards and to improve the effectiveness of hazard mitigation actions
Goal #3	Enhance existing or create new policies and ordinances that will help reduce the damaging effects of natural hazards.
Goal #4	Minimize threats to life and property by protecting the most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation actions.
Goal #5	Generally reduce the impact of all natural hazards
Goal #6	Ensure that hazard mitigation is considered when redevelopment occurs after a natural disaster.
Goal #7	Ensure that disaster response and recovery personnel have the necessary equipment and supplies available in order to serve the public in the event of a disaster

M.5.2 Mitigation Action Plan

The mitigation actions proposed by Wake County are listed in the following Mitigation Action Plan.

Wake County Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2014)
Prevention							
P-1	Continue to prohibit the placement of any new residential or commercial structures or the introduction of fill in the floodway or floodway fringe.	Flood	High	Wake Planning and Environmental Services	Local	Complete	This action was completed and will be removed from the next plan update.
P-2	Initiate hydrologic and hydraulic modeling of the stormwater system to provide a representation of watersheds and predict the water quantity response of streams and rivers to land use conditions and storm events.	Flood, Drought, Riverine Erosion	High	Wake Environmental Services	Local	Complete	This action was completed and will be removed from the next plan update.
P-3	Apply 100-foot buffers to perennial streams in water supply watersheds, and study the possibility of increasing the protection of other watercourses and drainageways in Wake County.	Flood	Moderate	Wake Planning and Environmental Services	Local	Complete	This action was completed and will be removed from the next plan update.
P-4	Apply 100-foot wide undisturbed stream buffers to the lower Swift Creek and study it for Little River watershed.	Flood	Moderate	Wake Planning and Environmental Services	Local	Complete	This action was completed and will be removed from the next plan update.
P-5	Study the possibility of establishing either a stormwater utility or some other permanent dedicated funding source for stormwater and floodplain programs.	Flood, Drought, Riverine Erosion	High	N/A	Local	Deleted	Stormwater Management Task Force did not recommend this action. Board of Commissioners agreed.
P-6	Initiate NPDES Phase II Stormwater Program as required.	Flood, Drought, Riverine Erosion	High	Wake Environmental Services	Local	Deleted	Wake County does not have an MS4 System therefore a permit is not required.
P-7	Collaborate on NPDES Phase II minimum measures where local governments on a voluntary basis can request that Wake County provide staff and resources related to any and all functions required by Phase II stormwater rules.	Flood, Drought, Riverine Erosion	High	Wake Environmental Services	Local	Complete	This action was completed and will be removed from the next plan update.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2014)
P-8	Create development regulations to encourage use of low impact development site planning principles to help control stormwater volume impacts.	Flood, Drought, Riverine Erosion, High Winds	Moderate	Wake Planning and Environmental Services	Local	Complete	This action was completed and will be removed from the next plan update.
P-9	Study the possibility of revising the zoning ordinance to include impervious surface standards that help minimize impervious surface coverage in priority and healthy watersheds. Wake County opted for use of NRCS Curve Number approach, which is superior to impervious surface standards.	Flood, Drought, Riverine Erosion	Moderate	Wake Environmental Services	Local	Complete	This action was completed and will be removed from the next plan update.
P-10	Implement post-construction stormwater runoff controls to address additional runoff volume from new development and issues related to flooding created from higher peak runoff rates.	Flood, Drought, Riverine Erosion	Moderate	Wake Environmental Services	Local	Complete	This action was completed and will be removed from the next plan update.
P-11	Study the possibility of charging offset fees for development that exceeds set impervious surface ratios in priority watersheds.	Flood, Drought, Riverine Erosion	Moderate	N/A	Local	Deleted	Stormwater Management Task Force did not recommend this action. Board of Commissioners agreed.
P-12	Ensure sensitive site design through reviewing development plans, meeting with customers, and site inspections.	Flood, Drought, Riverine Erosion	High	Wake Environmental Services	Local	Complete	This action was completed and will be removed from the next plan update.
P-13	Update the design manual for erosion control to include the newest, most effective site design technologies. Train staff on new techniques.	Flood, Drought, Riverine Erosion	High	Wake Environmental Services	Local	Complete	This action was completed and will be removed from the next plan update.
P-14	Enhance erosion and sedimentation control programs, primarily through enhanced enforcement.	Flood, Drought, Riverine Erosion	High	Wake Environmental Services	Local	Complete	This action was completed and will be removed from the next plan update.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2014)
P-15	Continue the stream monitoring program and seek to maximize efforts through coordination with other organizations.	Flood, Drought, Riverine Erosion	High	Wake Planning, Environmental Services, Municipalities, DENR-WQ, USGS, Ecosystems Enhancement Program	Local, Regional, State, Federal	Complete	This action was completed and will be removed from the next plan update.
P-16	Develop an Environmental Monitoring Program to evaluate current water quality conditions and monitor impacts of growth and development on the health and condition of water resources in the future.	Flood, Drought, Riverine Erosion	High	Wake Planning, Environmental Services, Municipalities, DENR-WQ, USGS, Ecosystems Enhancement Program	Local, Regional, State, Federal	2017-2019	In progress. Wake County is partnering with UNRBA to do ongoing stream monitoring in the Falls Lake watershed for the next 3-5 years.
P-17	Maintain an open space prioritization and acquisition program to ensure maximum success with limited funds.	Flood, Drought	High	Wake Land Acquisition Review Committee, Open Space and Parks Advisory Committee, Contractors, Municipalities, TJCOG, Trust for Public Lands, and Triangle Land Conservancy	Local, Regional, State, Federal	Complete	This action was completed and will be removed from the next plan update.
P-18	Partner with other governmental units and other interested parties to jointly identify and acquire 30,000 acres of open space lands.	Flood, Drought	High	Municipalities, State of NC, NC State University, Trust for Public Lands, and Triangle Land Conservancy	Local, Private, State, Federal	2019, with long term goal of Approx. 25-30 years	The County has purchased approximately 5,000 acres since the program's inception. It will take several decades as indicated to complete.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2014)
P-19	Oversee completion of planned reclaimed water projects per the County's approved Community Improvement Program (CIP).	Drought	Moderate	Raleigh, Wake County	Local	2019-2021	Completed several reclaimed water projects in RTP and others directly related to County facilities. More projects are in the works going forward.
P-20	Perform demonstration projects for rainwater harvesting, nutrient reductions and runoff reductions and water conservation.	Drought	Moderate	Wake Soil and Water Conservation	Local	Complete	This action was completed and will be removed from the next plan update.
P-21	Develop enhanced information about water saving devices.	Drought	Moderate	Wake Soil and Water Conservation	Local	Complete	This action was completed and will be removed from the next plan update.
Property Protection							
PP-1	Continue to utilize Federal and State grants to address structures in floodplains: acquire and remove from the floodplain; or renovate, retrofit and/or elevate structures flooded after a President or State declared disaster.	Flood	Moderate	Wake Environmental Services, Finance-Risk Management, and General Services Administration	Federal, State, Local	Delete	The County is not actively seeking grants to address floodplain structures. The County will pursue it if an when the circumstances arise.
PP-2	Continue to provide service to inform and advise citizens of the actions they may take to improve drainage, halt erosion, and to relocate, renovate or retrofit structures being flooded.	Flood, Drought, Riverine Erosion	Moderate	Wake Environmental Services	Local, Private	Complete	This action was completed and will be removed from the next plan update.
Natural Resource Protection							
NRP-1	Continue local program to enforce Erosion and Sedimentation Control Standards. Cross train ES employees in other disciplines to improve efficiency.	Flood, Drought, Riverine Erosion	High	Wake Environmental Services	Local	Complete	This action was completed and will be removed from the next plan update.
NRP-2	Employ a variety of regulated Best Management Practices (BMPs) in the Stormwater Program to reduce peak flows, provide groundwater recharge, etc. One-year and (sometimes) 10-year storm event design required. 100-year spillway capacity always required.	Flood, Drought, Riverine Erosion	Moderate	Wake Environmental Services	Local	Complete	This action was completed and will be removed from the next plan update.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2014)
NRP-3	Consider regulations to regulate clear-cutting to help control erosion from construction sites.	Flood, Drought, Riverine Erosion	Moderate	Wake Environmental Services, Planning, and Community Services	Local	Complete	This action was completed and will be removed from the next plan update.
NRP-4	Maintain the County's cluster and open space subdivision regulations and recreation land dedication ordinance to enhance conservation efforts.	All	High	Wake Environmental Services, Planning, and Community Services	Local	Complete	This action was completed and will be removed from the next plan update.
NRP-5	Study the possibility of developing a conservation subdivision, or open space subdivision, ordinance to help preserve significant natural features.	All	Moderate	Wake Environmental Services, Planning, and Community Services	Local	Complete	This action was completed and will be removed from the next plan update.
Structural Projects							
SP-1	Inspection and maintenance of Crabtree Creek flood control structures.	Flood	High	Wake General Services Administration	Local	Complete	This action was completed and will be removed from the next plan update.
SP-2	Channel Maintenance - Possibility of private property owner assistance program to be investigated as part of stormwater utility feasibility study.	Flood, Riverine Erosion	High	Wake Environmental Services	Local	Delete	Stormwater Management Task Force did not recommend this action. Board of Commissioners agreed.
SP-3	Pursue stream restoration projects and will look for ways to expand the program through partnerships with various entities.	Flood, Riverine Erosion	High	Wake Environmental Services , Community Services, DENR-WQ Ecosystems Enhancement Program, USACE	Local, Regional, State, Federal	Complete	This action was completed and will be removed from the next plan update.
Emergency Services							
ES-1	Identify priority County facilities and provide access to one main entrance. Restore life safety and building systems as needed.	All	High	Wake General Services Administration	Local, FEMA	Complete	This action was completed and will be removed from the next plan update.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2014)
ES-2	Develop a Business Continuity Plan, the primary document housing all disaster related plans and procedures.	All	High	Wake Emergency Management	Local	Complete	This action was completed and will be removed from the next plan update.
ES-3	Oversee completion of planned equipment replacements/upgrades for 800 MGHZ emergency communications systems, EMS facilities, and fire/rescue facilities per the approved capital improvement program.	All	High	Wake Facilities Design and Construction	Local	December 2018	In progress. The 800 MGHZ replacements are underway and scheduled for completion in 2018.
Public Education and Awareness							
PEA-1	Provide monitoring and enforcement of Wake County flood hazard regulations.	Flood	Moderate	Wake Environmental Services	Local	Complete	This action was completed and will be removed from the next plan update.
PEA-2	Provide flood zone information through call-in or e-mail program to any inquirer. County requires showing flood zone information on all plats recorded in County planning jurisdiction.	Flood	High	Wake Environmental Services	Local	Complete	This action was completed and will be removed from the next plan update.
PEA-3	Maintain a web site to answer citizen questions about flood hazards, flood safety, availability of flood insurance, stormwater regulations, and other information.	Flood	Moderate	Wake Environmental Services	Local	Complete	This action was completed and will be removed from the next plan update.
PEA-4	Partner with Raleigh to use the "Communicator" application that will use GIS to develop automated call lists to warn residents of impending floods	Flood	High	Emergency Management & GIS	Local	Complete	This action was completed and will be removed from the next plan update.
PEA-5	Maintain Environmental Network Call Center. Citizens may report flooding problems, pollution issues, erosion problems, infrastructure damage, littering, etc.	All	Moderate	Wake Environmental Services	Local	2019	This call center is in place, but a review and update of the system will be likely in the coming years.
PEA-6	Adopt updates to floodplain maps. Staff will review maps and identify all structures in floodplains and notify property owners of the risks and availability of flood insurance. List forwarded to Emergency Management.	Flood	High	Wake Environmental Services	Local	Complete	This action was completed and will be removed from the next plan update.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2014)
PEA-7	Maintain flood elevation certificates.	Flood	Moderate	Wake Environmental Services and Community Services	Local	Complete	This action was completed and will be removed from the next plan update.
PEA-8	Update flood hazard maps to reflect new subdivisions, changes in corporate limits, and any new DFIRM data.	Flood	Moderate	Wake GIS	Local	Complete	This action was completed and will be removed from the next plan update.
PEA-9	Continue to use the State's Residential Property Disclosure Statement that includes check off on whether or not the property being offered for sale is within a Federally-designated floodplain.	Flood	Moderate	State of NC, Realtors	State	Delete	The county is not responsible for this action, but the state and realtors are ensuring that this is taking place.
PEA-10	Continue to make flood protection educational materials available.	Flood	Moderate	Wake Environmental Services	Local	Complete	This action was completed and will be removed from the next plan update.
PEA-11	Provide environmental education classes for development community and residents using Clearwater Contractor Education Program as model.	Flood	High	Wake Environmental Services, Community Services, and Municipalities	Local, State	Delete	Insufficient staff resources to accomplish this action.
PEA-12	Consider a countywide stormwater call center to improve response time to customers, provide an educational component, and allow stormwater staff to devote more time to solving problems	Flood	High	Wake Environmental Services, Community Services, and Municipalities	Local, State	Delete	Insufficient staff resources to accomplish this action.
PEA-13	Develop common public education materials and programs to inform the public on stormwater issues and convince them to change their behaviors accordingly.	Flood, Drought, Riverine Erosion	Moderate	Wake County Soil and Water Conservation	Local, State	Complete	This action was completed and will be removed from the next plan update.