ANNEX D
WARREN COUNTY

This annex includes jurisdiction-specific information for Warren County and its participating municipalities. It consists of the following five subsections:

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

D.1 WARREN COUNTY COMMUNITY PROFILE

D.1.1 Geography and the Environment

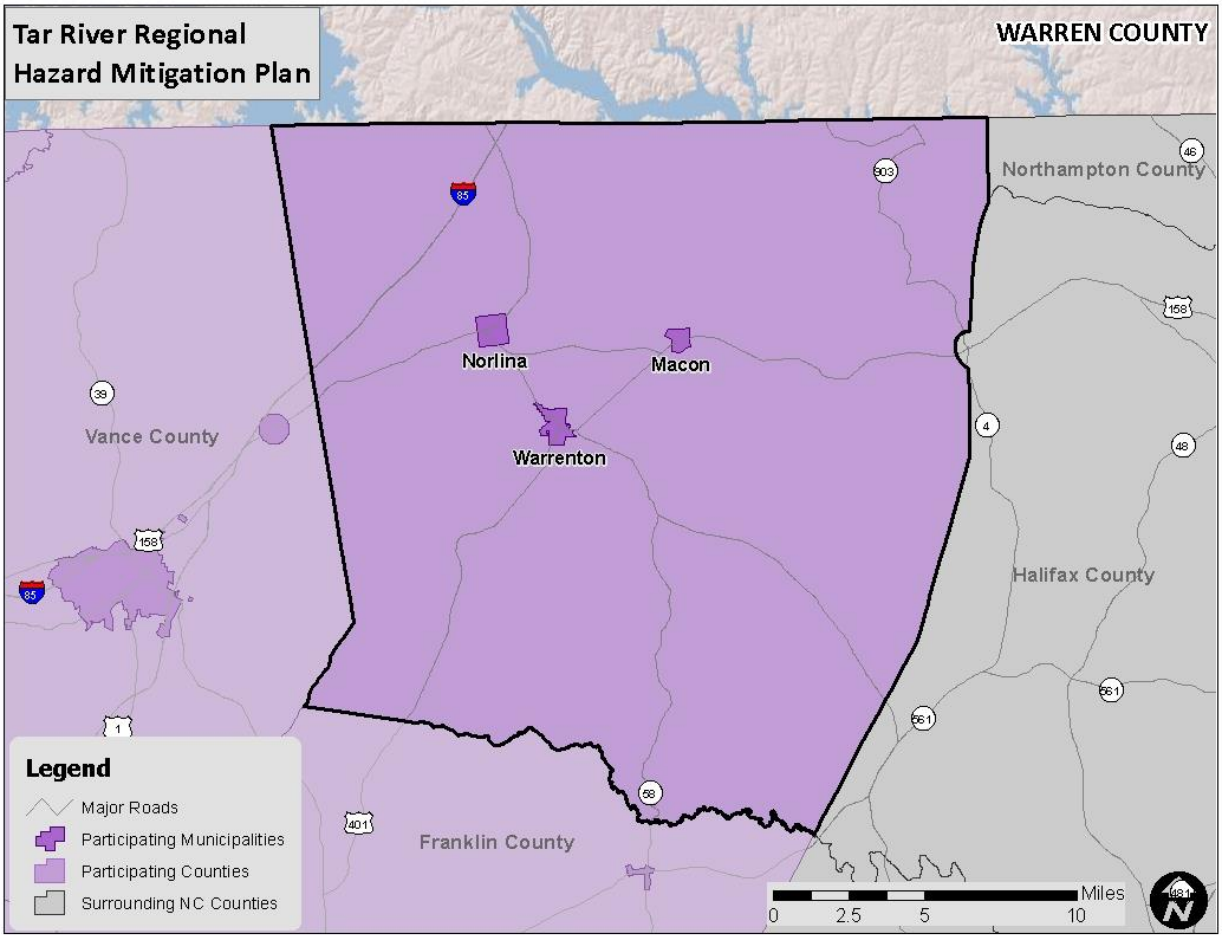
Warren County is located on the northern border of North Carolina in the central portion of the state. There are three municipalities in the county, the Towns of Macon, Norlina, and Warrenton, as well as numerous unincorporated areas. An orientation map is provided as **Figure D.1**.

The county was originally part of Bute County until it became its own county in 1779 and was named for Joseph Warren of Massachusetts who was a physician and general in the American Revolutionary War. The total area of the county is 444 square miles, 16 square miles of which is water area.

From January through March, temperatures range from an average high in the lower 60s to an average low in the mid 20s. Typically, the weather is milder by late April and warm in May. June through September has highs usually in the 90s with lows in the 60s. October is still warm but starts to cool down, and by November, the high temperatures are in the 60s but drop to the 40s in December with potential lows running in the 30s.

The average precipitation each month is around four inches. The wettest month is August, typically having almost five inches of rain, and the driest month is December, with a little over three inches of rain. The annual snowfall is low. The most snowfall to occur at one time within the county was 15 inches in 1948.

FIGURE D.1: WARREN COUNTY ORIENTATION MAP



D.1.2 Population and Demographics

According to the 2010 Census, Warren County has a population of 20,972 people. The county has seen 5 percent growth between 2000 and 2010, and the average population density is 47 people per square mile. Population counts from the U.S. Census Bureau for 1990, 2000, and 2010 for the county and all of its participating municipalities are presented in **Table D.1**.

TABLE D.1: POPULATION COUNTS FOR WARREN COUNTY

Jurisdiction	1990 Census Population	2000 Census Population	2010 Census Population	% Change 2000-2010
Warren County	**17,265**	**19,972**	**20,972**	**5.0%**
Town of Macon	--	115	119	3.5%
Town of Norlina	--	1,107	1,118	1.0%
Town of Warrenton	--	811	862	6.3%

Source: United States Census Bureau

Based on the 2010 Census, the median age of residents of Warren County is 44.9 years. The racial characteristics of the county are presented in **Table D.2**. Blacks or African Americans make up the majority of the population in the county, accounting for around 52 percent of the population.

TABLE D.2: DEMOGRAPHICS OF WARREN COUNTY

Jurisdiction	White, Percent (2010)	Black or African American, Percent (2010)	American Indian or Alaska Native, Percent (2010)	Asian, Percent (2010)	Native Hawaiian or Other Pacific Islander, Percent (2010)	Other Race, Percent (2010)	Two or More Races, percent (2010)	Persons of Hispanic Origin, Percent (2010)*
Warren County	**38.8%**	**52.3%**	**5.0%**	**0.2%**	**0.0%**	**2.0%**	**1.6%**	**3.3%**
Town of Macon	84.9%	13.4%	0.8%	0.0%	0.0%	0.0%	0.8%	0.0%
Town of Norlina	48.5%	42.2%	0.2%	0.4%	0.0%	3.8%	2.1%	6.3%
Town of Warrenton	54.6%	40.8%	0.8%	0.2%	0.0%	2.1%	1.4%	3.4%

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

D.1.3 Housing

According to the 2010 U.S. Census, there are 11,806 housing units in Warren County, the majority of which are single family homes or mobile homes. Housing information for the county and municipalities is presented in **Table D.3**. As shown in the table, the county has a significantly higher percentage of seasonal units compared to the towns.

TABLE D.3: HOUSING CHARACTERISTICS OF WARREN COUNTY

Jurisdiction	Housing Units (2000)	Housing Units (2010)	Seasonal Units, Percent (2010)	Median Home Value (2010-2014)
Warren County	**10,548**	**11,806**	**18.4%**	**$97,400**
Town of Macon	63	63	1.6%	$76,200
Town of Norlina	534	567	0.9%	$78,000
Town of Warrenton	472	528	1.9%	$135,600

Source: United States Census Bureau

D.1.4 Infrastructure

Transportation

There are several major highways that cross through Warren County. The county is connected to the other counties in the region by an interstate and various US Highways. Interstate 85 is the second longest interstate in the state, running across the county from north to south into Virginia and South Carolina. US Route 1 travels north-south from South Carolina to Virginia, connecting various counties within the Research Triangle region. US Route 158 runs east-west through the northern portion of North Carolina and provides business access through the Town of Macon to the Town of Warrenton. US Route 401 north-south is a spur of Route 1 connecting North Carolina to various states along the U.S. east coast.

The Tar River Region is served by Raleigh-Durham International Airport (RDU) which is located in Raleigh. The airport currently offers direct flights on 13 airlines to cities around the country and the world. This airport served over 9 million passengers in 2011. Warren County Airport, located in the Town of Warrenton, is a smaller airport with limited aircraft access.

Utilities

Electrical power in Warren County is provided by Progress Energy and Halifax Electric Membership.

The Warren County Water System provides water and sewer services throughout the county. The Town of Warrenton provides water and sewer services to additional residents within the county. There are also parts of the county that utilize wells and septic systems.

Community Facilities

There are a number of buildings and community facilities located throughout Warren County. According to the data collected for the vulnerability assessment (Section 6.4.1), there are 14 fire stations, 3 police stations, and 12 public schools located within the county.

There are multiple parks throughout Warren County that include playground equipment, walking tracks, various sports fields and courts, swimming pool, and picnic areas. Kimball Point and County Line Campgrounds are part of the Kerr Lake State Recreation Area and provide campsites with various amenities. Water and motorsports opportunities are available within Warren County. There are also accessible golf courses for both residents and visitors in the county. Lakeland Theatre Company and Ridgway Opry House provide various arts and entertainment opportunities. Throughout the county, there are museums and historic elements available to residents and tourists.

D.1.5 Land Use

There are three incorporated municipalities in Warren County as well as unincorporated communities located throughout the county. Warren County has various land uses varying from primarily rural-agrarian to lakeside residential and urban/suburban development. Developed land within the unincorporated areas is primarily made up of larger parcels designated for agricultural activities. Smaller residential lots are associated with the two large lakes, Kerr and Gaston, located in the northern portion of the county. The incorporated areas are where many businesses, commercial uses, and institutional uses are located.

Warren County is experiencing, and is projected to continue experiencing, moderate growth. To protect environmental resources and to promote the health, safety, and general welfare of the residents, Warren County does employ a zoning ordinance for various land use classifications.

D.1.6 Employment and Industry

According to the American Community Survey (ACS) 5-year estimates, in 2014, Warren County had an annual average employment of 7,920 workers and average unemployment rate of 4.5 percent (compared to 6.6 percent for the state). In 2014, the top employment industry was Educational Services, and Health Care and Social Assistance, making up 27.9 percent of total employment. Other major industries were Manufacturing (15.2%); Retail Trade (11.5%); and Public Administration (7.8%). In 2014,

the county's average annual median household income was $34,953 compared to $46,693 for the state of North Carolina.

D.2 WARREN COUNTY RISK ASSESSMENT

This subsection includes hazard profiles for each of the significant hazards identified in Section 4: *Hazard Identification* as they pertain to Warren 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*.

D.2.1 Drought

Location and Spatial Extent

Drought typically covers a large area and cannot be confined to any geographic or political boundaries. 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 United States Drought Monitor, Warren County has had drought occurrences in 14 of the last 16 years (2000-2015). **Table D.4** shows the most severe drought classification for each year according to United States Drought Monitor classifications. It should be noted that the United States Drought Monitor also estimates what percentage of the county is in each classification of drought severity. For example, the most severe classification reported may be exceptional but a majority of the county may actually be in a less severe condition.

TABLE D.4: HISTORICAL DROUGHT OCCURRENCES IN WARREN COUNTY

Abnormally Dry (D0) Moderate Drought (D1) Severe Drought (D2) Extreme Drought (D3) Exceptional Drought (D4)

Year	Warren County
2000	D0
2001	D2
2002	D4
2003	None
2004	D0
2005	D1
2006	D2
2007	D4
2008	D4
2009	D1
2010	D2
2011	D2
2012	D1
2013	D1
2014	None
2015	D1

Source: United States Drought Monitor

According to the North Carolina State Climate Office, Warren County has experienced at least moderate drought in 8 of the last 14 years. The county's highest level of drought each year according to the Palmer Drought Severity Index can be found in **Table 5.5.**

TABLE 5.5: HISTORICAL DROUGHT OCCURRENCES IN WARREN COUNTY

Year	Warren County	
2000	-1.40	Mid-range
2001	-3.25	Severe
2002	-4.48	Extreme
2003	-0.36	Mid-range
2004	-2.01	Moderate
2005	-1.77	Mid-range
2006	-2.07	Moderate
2007	-4.06	Extreme
2008	-3.97	Severe
2009	-1.15	Mid-range
2010	-1.86	Mid-range
2011	-2.86	Moderate
2012	-2.19	Moderate
2013	0.25	Mid-range

Source: North Carolina State Climate Office

Probability of Future Occurrences

Based on historical occurrence information, it is assumed that Warren County has a probability level of likely (between 10 and 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.

D.2.2 Extreme Heat/Heat Wave

Location and Spatial Extent

Excessive heat typically impacts a large area and cannot be confined to any geographic or political boundaries. All of Warren 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 Warren County. One event was reported:

July 22, 1998 – *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 for several hours each

afternoon. To make matters worse, the minimum temperatures did not fall below 80 at several locations and those that did achieved that feat for only an hour or two. Strong thunderstorms ended the 2 day excessive heat ordeal on the evening of the 23 when rain cooled the environment enough to send temperatures into the lower 70s at most locations.

In addition, information from the State Climate Office of North Carolina was reviewed to obtain historical temperature records in the county. Temperature information has been reported since 1930. The recorded maximum for Warren County can be found below in **Table D.6**.

TABLE D.6: HIGHEST RECORDED TEMPERATURE IN WARREN COUNTY

Location	Date	Temperature (°F)
Arcola	6/19/1944	104
WARREN COUNTY MAXIMUM	--	**104**

Source: State Climate Office of North Carolina

The State Climate Office also reports average maximum temperatures in various locations in the region. There is one observation station located in Warren County. **Table D.7** shows the average maximum temperatures from 1971 to 2000 at the Arcola observation station which can be used as a general comparison for the county.

TABLE D.7: AVERAGE MAXIMUM TEMPERATURE IN WARREN COUNTY

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Avg. Max (°F)	51.9	55.2	63.6	73.1	79.9	87.1	90.8	89.5	84.4	74.7	66.4	56.1

Source: State Climate Office of North Carolina

Probability of Future Occurrences

Based on historical occurrence information, it is assumed that all of Warren County has a probability level of possible (between 1 and 10 percent annual probability) for future extreme heat events to impact the county.

D.2.3 Hailstorm

Location and Spatial Extent

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

Historical Occurrences

According to the National Climatic Data Center, 31 recorded hailstorm events have affected Warren County since 1974.[1] **Table D.8** is a summary of the hail events in Warren County. **Table D.9** provides detailed information about each event that occurred in the county. In all, hail occurrences resulted in

[1] These hail events are only inclusive of those reported by the National Climatic Data Center (NCDC) from 1955 through July 2015. It is likely that additional hail events have affected Warren 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.

over $71,000 (2015 dollars) in property damages.[2] Hail ranged in diameter from 0.75 inches to 2.0 inches. It should be noted that hail is notorious for causing substantial damage to cars, roofs, and other areas of the built environment that may not be reported to the National Climatic Data Center. Therefore, it is likely that damages are greater than the reported value.

TABLE D.8: SUMMARY OF HAIL OCCURRENCES IN WARREN COUNTY

Location	Number of Occurrences	Deaths/Injuries	Property Damage (2015)	Annualized Property Loss
Macon	0	0/0	$0	$0
Norlina	3	0/0	$0	$0
Warrenton	7	0/0	$0	$0
Unincorporated Area	21	0/0	$71,380	$1,741
WARREN COUNTY TOTAL	**31**	**0/0**	**$71,380**	**$1,741**

Source: National Climatic Data Center

TABLE D.9: HISTORICAL HAIL OCCURRENCES IN WARREN COUNTY

	Date	Magnitude	Deaths/Injuries	Property Damage*
Macon				
None Reported	--	--	--	--
Norlina				
NORLINA	5/8/1998	0.75 in.	0/0	$0
NORLINA	5/14/2006	0.88 in.	0/0	$0
NORLINA	5/14/2006	0.75 in.	0/0	$0
Warrenton				
Warrenton	7/1/1994	0.75 in.	0/0	$0
WARRENTON	11/8/1996	1.00 in.	0/0	$0
WARRENTON	5/8/1998	0.75 in.	0/0	$0
WARRENTON	7/3/2002	1.00 in.	0/0	$0
WARRENTON	6/23/2004	0.75 in.	0/0	$0
WARRENTON	6/7/2005	0.75 in.	0/0	$0
WARRENTON	7/27/2009	0.88 in.	0/0	$0
Unincorporated Area				
WARREN CO.	6/23/1974	0.75 in.	0/0	$0
WARREN CO.	8/17/1982	0.75 in.	0/0	$0
WARREN CO.	4/14/1984	1.00 in.	0/0	$0
WARREN CO.	6/24/1985	1.00 in.	0/0	$0
WARREN CO.	7/10/1985	0.75 in.	0/0	$0
WARREN CO.	5/10/1988	0.75 in.	0/0	$0
WARREN CO.	5/24/1988	0.75 in.	0/0	$0
WARREN CO.	3/15/1989	0.75 in.	0/0	$0
WARREN CO.	6/24/1992	1.75 in.	0/0	$0
INEZ	8/5/1997	1.75 in.	0/0	$0
ELBERON	5/8/1998	0.75 in.	0/0	$0

[2] Adjusted dollar values were calculated based on the average Consumer Price Index for a given calendar year. This index value has been calculated every year since 1913. For 2015, the November 2015 monthly index was used.

	Date	Magnitude	Deaths/Injuries	Property Damage*
OAKVILLE	6/3/1998	1.00 in.	0/0	$0
ARCOLA	4/15/1999	2.00 in.	0/0	$71,380
RIDGEWAY	5/19/2001	0.88 in.	0/0	$0
DREWRY	5/10/2003	0.75 in.	0/0	$0
LITTLETON	7/19/2006	0.88 in.	0/0	$0
AFTON	7/27/2008	1.75 in.	0/0	$0
PASCHALL	4/20/2009	1.00 in.	0/0	$0
CHURCHILL	4/20/2009	0.75 in.	0/0	$0
INEZ	7/1/2012	1.00 in.	0/0	$0
ARCOLA	4/20/2015	1.00 in.	0/0	$0

*Property damage is reported in 2015 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 highly likely (100 percent annual probability). Since hail is an atmospheric hazard (coinciding with thunderstorms), it is assumed that all of Warren 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.

D.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 Warren County. The entire county is equally susceptible to hurricane and tropical storms.

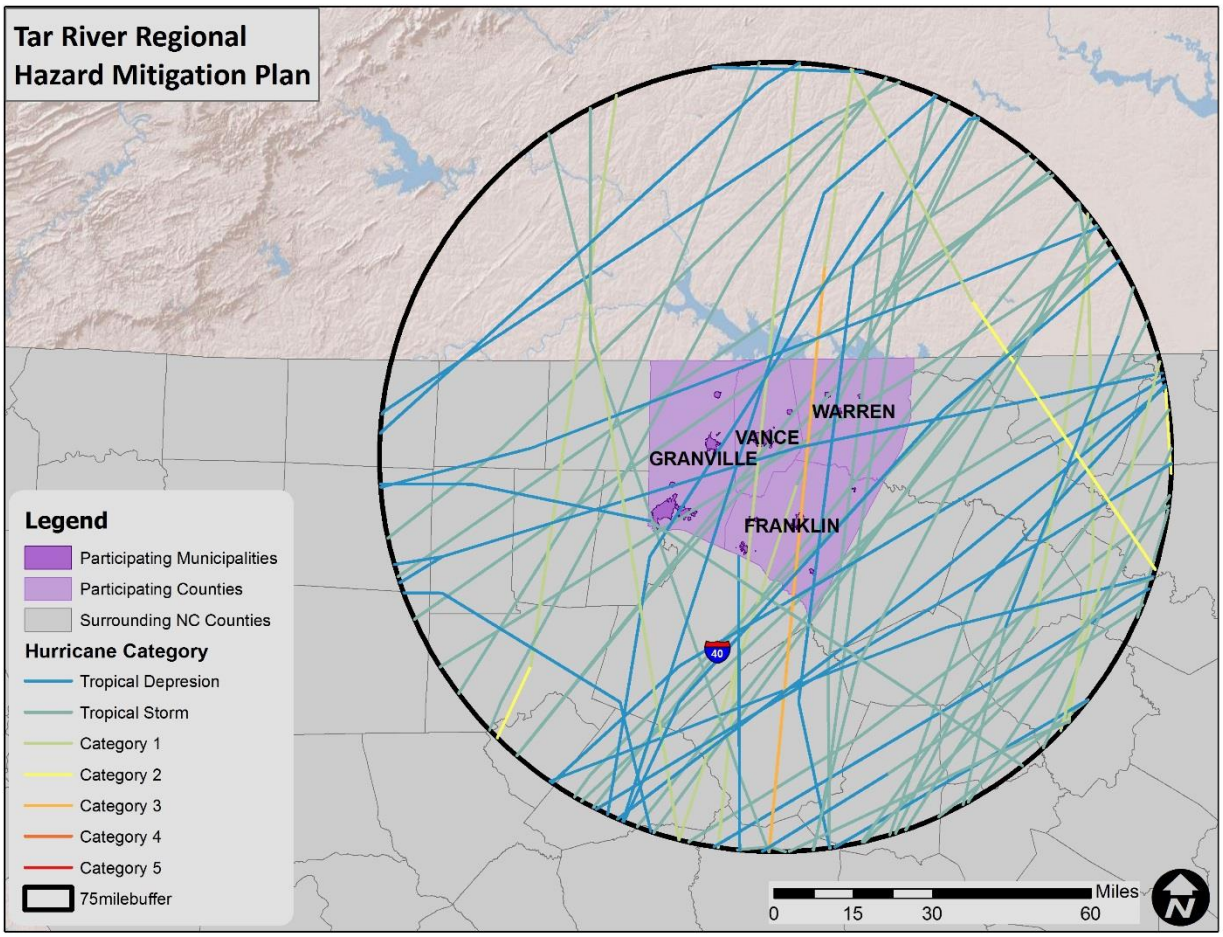
Historical Occurrences

According to the National Hurricane Center's historical storm track records, 61 hurricane or tropical storm tracks have passed within 75 miles of the Tar River Region since 1851.[3] This includes 11 hurricanes, 34 tropical storms, and 16 tropical depressions.

Of the recorded storm events, 31 have traversed directly through the Tar River Region as shown in **Figure D.2**. **Table D.10** provides for each event the date of occurrence, name (if applicable), maximum wind speed (as recorded within 75 miles of the Tar River Region), and Category of the storm based on the wind speed within the 75 mile buffer according to the Saffir-Simpson Scale.

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

FIGURE D.2: HISTORICAL HURRICANE STORM TRACKS WITHIN 75 MILES OF THE TAR RIVER REGION



Source: National Oceanic and Atmospheric Administration; National Hurricane Center

TABLE D.10: HISTORICAL STORM TRACKS WITHIN 75 MILES OF THE TAR RIVER REGION (1850–2014)

Date of Occurrence	Storm Name	Maximum Wind Speed (knots)	Storm Category
8/25/1851	UNNAMED	40	Tropical Storm
9/9/1854	UNNAMED	50	Tropical Storm
9/17/1859	UNNAMED	50	Tropical Storm
6/23/1867	UNNAMED	40	Tropical Storm
10/25/1872	UNNAMED	40	Tropical Storm
9/29/1874	UNNAMED	60	Tropical Storm
9/17/1876	UNNAMED	80	Category 1
10/4/1877	UNNAMED	50	Tropical Storm
10/23/1878	UNNAMED	90	Category 2
9/12/1883	UNNAMED	50	Tropical Storm
10/13/1885	UNNAMED	40	Tropical Storm
6/22/1886	UNNAMED	35	Tropical Storm

Date of Occurrence	Storm Name	Maximum Wind Speed (knots)	Storm Category
7/2/1886	UNNAMED	40	Tropical Storm
10/20/1887	UNNAMED	30	Tropical Depression
9/10/1888	UNNAMED	35	Tropical Storm
9/24/1889	UNNAMED	45	Tropical Storm
10/13/1893	UNNAMED	80	Category 1
9/29/1896	UNNAMED	85	Category 2
10/31/1899	UNNAMED	75	Category 1
6/16/1902	UNNAMED	40	Tropical Storm
9/14/1904	UNNAMED	60	Tropical Storm
8/31/1911	UNNAMED	25	Tropical Depression
9/3/1913	UNNAMED	55	Tropical Storm
5/16/1916	UNNAMED	35	Tropical Storm
9/6/1916	UNNAMED	35	Tropical Storm
9/30/1924	UNNAMED	60	Tropical Storm
8/12/1928	UNNAMED	35	Tropical Storm
9/19/1928	UNNAMED	70	Category 1
10/2/1929	UNNAMED	50	Tropical Storm
9/6/1935	UNNAMED	50	Tropical Storm
8/2/1944	UNNAMED	60	Tropical Storm
10/20/1944	UNNAMED	50	Tropical Storm
9/18/1945	UNNAMED	50	Tropical Storm
10/9/1946	UNNAMED	25	Tropical Depression
9/25/1947	UNNAMED	25	Tropical Depression
10/15/1954	HAZEL	110	Category 3
8/17/1955	DIANE	60	Tropical Storm
7/10/1959	CINDY	30	Tropical Depression
9/14/1961	UNNAMED	35	Tropical Storm
8/31/1964	CLEO	30	Tropical Depression
6/9/1968	ABBY	25	Tropical Depression
8/20/1969	CAMILLE	25	Tropical Depression
5/26/1970	ALMA	25	Tropical Depression
10/1/1971	GINGER	45	Tropical Storm
9/16/1976	SUBTROP:UNNAMED	30	Tropical Depression
8/18/1985	DANNY	25	Tropical Depression
9/8/1987	UNNAMED	0	Tropical Depression
7/13/1996	BERTHA	65	Category 1
9/6/1996	FRAN	65	Category 1
7/24/1997	DANNY	30	Tropical Depression
9/4/1998	EARL	50	Tropical Storm
9/5/1999	DENNIS	50	Tropical Storm
9/16/1999	FLOYD*	90	Category 2
9/19/2000	GORDON	20	Tropical Depression
9/23/2000	HELENE	35	Tropical Storm
9/18/2003	ISABEL	85	Category 2
8/30/2004	GASTON	30	Tropical Depression
9/28/2004	JEANNE	25	Tropical Depression

Date of Occurrence	Storm Name	Maximum Wind Speed (knots)	Storm Category
6/14/2006	ALBERTO	35	Tropical Storm
9/1/2006	ERNESTO	50	Tropical Storm
9/6/2008	HANNA	60	Tropical Storm

*Although storm track was outside of the 75 mile buffer, this event was considered significant enough to include.
Source: National Hurricane Center

The National Climatic Data Center reported five events associated with a hurricane or tropical storm in Warren County since 1996. Additionally, Federal records indicate that four disaster declarations were made in 1996 (Hurricane Fran), 1999 (Hurricane Floyd), 2003 (Hurricane Isabel), and 2011 (Hurricane Irene) for the county.[4]

Flooding is generally the greatest hazard of concern with hurricane and tropical storm events in Warren County though some events do carry winds that can have significant impacts on the county. 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 hit just a few weeks earlier by Hurricane Bertha, North Carolina 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 central North Carolina. In the end, over 3 billion dollars in damages were reported in the state. 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, 1999
Hurricane Floyd, combined with the weather conditions before and immediately after this hurricane, resulted in the most severe flooding and devastation in North Carolina history. In North Carolina, the storm resulted in 35 fatalities, over $3 billion in damages, 7,000 destroyed homes, 56,000 damaged homes, 1,500 people rescued from flooded areas, and more than 500,000 customers without electricity. Additionally, the flooding caused an estimated $813 million in agricultural losses affecting 32,000 farmers. There was also significant loss of livestock, including 2,860,827 poultry, 28,000 swine, and 619 cattle.

Probability of Future Occurrences
Given the inland location of the county, it is more likely to be affected by remnants of hurricane and tropical storm systems (as opposed to a major hurricane) which may result in flooding or high winds. However, as was the case during Hurricane Fran, there is potential for large storms to have severe impacts on the county. The probability of being impacted is less than coastal areas, but still remains a real threat to Warren County due to induced events like flooding. Based on historical evidence, the probability level of future occurrence is likely (between 10 and 100 percent annual probability). Given the regional nature of the hazard, all areas in the county are equally exposed to this hazard. When the county is impacted, the damage could be widespread, threatening lives and property throughout the planning area.

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

D.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 Warren County is uniformly exposed to lightning.

Historical Occurrences

According to the National Climatic Data Center, there have been two recorded lightning events in Warren County since 2012 as listed in summary **Table D.11**.[5] These events resulted in over $1,000 (2015 dollars) in damages.[6] Furthermore, lighting caused one injury in the county. A complete listing of those events can be found in **Table D.12**.

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

TABLE D.11: SUMMARY OF LIGHTNING OCCURRENCES IN WARREN COUNTY

Location	Number of Occurrences	Deaths/Injuries	Property Damage (2015)	Annualized Property Loss
Macon	0	0/0	$0	$0
Norlina	0	0/0	$0	$0
Warrenton	0	0/0	$0	$0
Unincorporated Area	2	0/1	$1,036	$345
WARREN COUNTY TOTAL	**2**	**0/1**	**$1,036**	**$345**

Source: National Climatic Data Center

TABLE D.12: HISTORIC LIGHTNING OCCURRENCES IN WARREN COUNTY

	Date	Deaths/Injuries	Property Damage*	Details
Macon				
None Reported	--	--	--	--
Norlina				
None Reported	--	--	--	--
Warrenton				
None Reported	--	--	--	--
Unincorporated Area				
ENTERPRISE	6/29/2012	0/0	$1,036	Lightning struck three trees that started a subsequent brush fire several miles north of Littleton.

[5] These lightning events are only inclusive of those reported by the National Climatic Data Center (NCDC) from 1996 through July 2015. It is certain that additional lightning events have occurred in Warren 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.

[6] Adjusted dollar values were calculated based on the average Consumer Price Index for a given calendar year. This index value has been calculated every year since 1913. For 2015, the November 2015 monthly index was used.

	Date	Deaths/Injuries	Property Damage*	Details
ENTERPRISE	6/29/2012	0/1	$0	Lightning struck two people just north of Littleton. One person was transported to the hospital.

*Property Damage is reported in 2015 dollars; all damage may not have been reported.
Source: National Climatic Data Center

Probability of Future Occurrences

Although there was not a high number of historical lightning events reported in Warren County via NCDC data, it is considered a regular occurrence, especially 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®), Warren County is located in an area of the country that experienced an average of 2 to 8 lightning flashes per square kilometer per year between 2005 and 2014. 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 county.

D.2.6 Nor'easter

Location and Spatial Extent

Nor'easters affect the entire east coast of the United States and thus are a threat to North Carolina. However, since Warren County is not located directly on the coast, the county is not susceptible to many of the potential impacts from a nor'easter such as high surf and beach erosion. The county is equally susceptible to many of the other impacts from a nor'easter including heavy snowfall and high winds. Therefore, the county has uniform risk to the nor'easter hazard.

Historical Occurrences

There were no reports of nor'easter events in Warren County according to NCDC data; however, it is possible that nor'easter activity was reported as winter weather events. Instead, information on past occurrences was obtained from NOAA's Storm Surge and Coastal Inundation event history.[7] Anecdotal information for two major nor'easters that have impacted the county is found below:

October 1991 Halloween Nor'easter or the "Perfect Storm"

Although it didn't make landfall, the Halloween Nor'easter of 1991 (also known as the "Perfect Storm") caused destruction from New England to North Carolina and even caused some damage in southern Florida and Puerto Rico on October 31. North Carolina saw waves 10-15 feet high, and Ocean City, MD, saw record high tide of 7.8 feet. This nor'easter was responsible for 12 deaths and 1998 dollar value damage estimates approached $1 billion.

March 1993 Superstorm

The *Superstorm of March '93* was named for its large area of impact, all the way from Florida and Alabama north through New England. Unlike most nor'easters that move up the coast, this storm took a more inland track across Southeast Virginia and the central Chesapeake Bay. The *Superstorm* was a

[7] Historic information on nor'easters was pulled from NOAA data describing nor'easters at http://www.stormsurge.noaa.gov/event_history.html

major severe weather event in the southeast, causing flooding and snow in the Mid-Atlantic states and blizzard conditions in the northeast.

Probability of Future Occurrences

The potential damage of a nor'easter is similar to a hurricane or tropical storm system with the added risk of hail and snow, thereby threatening property and life with severe winds and flooding. The probability of a nor'easter impacting the county is possible (between 1 and 10 percent annual probability).

D.2.7 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, Warren County typically experiences several straight-line wind events each year. These wind events can and have caused significant damage. It is assumed that Warren County has uniform exposure to a thunderstorm/wind event and the spatial extent of an impact could be large.

Historical Occurrences

Severe storms were not responsible for any disaster declarations in Warren County.[8] According to NCDC, there have been 99 reported thunderstorm wind and high wind events since 1981 in Warren County.[9] These events caused almost $413,000 (2015 dollars) in damages.[10] **Table D.13** summarizes this information. **Table D.14** presents detailed thunderstorm wind and high wind event reports including date, magnitude, and associated damages for each event.

TABLE D.13: SUMMARY OF THUNDERSTORM/HIGH WIND OCCURRENCES IN WARREN COUNTY

Location	Number of Occurrences	Deaths/Injuries	Property Damage (2015)	Annualized Property Loss
Macon	3	0/0	$0	$0
Norlina	1	0/0	$0	$0
Warrenton	22	0/0	$12,401	$653
Unincorporated Area	73	0/0	$400,205	$11,771
WARREN COUNTY TOTAL	**99**	**0/0**	**$412,606**	**$12,423**

Source: National Climatic Data Center

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

[9] These thunderstorm events are only inclusive of those reported by the National Climatic Data Center (NCDC) from 1955 through July 2015 and these high wind events are only inclusive of those reported by NCDC from 1996 through July 2015. It is likely that additional thunderstorm and high wind events have occurred in Warren County. As additional local data becomes available, this hazard profile will be amended.

[10] Adjusted dollar values were calculated based on the average Consumer Price Index for a given calendar year. This index value has been calculated every year since 1913. For 2015, the November 2015 monthly index was used.

TABLE D.14: HISTORICAL THUNDERSTORM / HIGH WIND OCCURRENCES IN WARREN COUNTY

	Date	Type	Magnitude	Deaths/Injuries	Property Damage*
Macon					
MACON	6/7/2005	Thunderstorm Wind	50 kts. EG	0/0	$0
MACON	7/9/2012	Thunderstorm Wind	50 kts. EG	0/0	$0
MACON	6/26/2015	Thunderstorm Wind	50 kts. EG	0/0	$0
Norlina					
NORLINA	6/30/2015	Thunderstorm Wind	50 kts. EG	0/0	$0
Warrenton					
WARRENTON	11/8/1996	Thunderstorm Wind	50 kts.	0/0	$0
WARRENTON	3/5/1997	Thunderstorm Wind	50 kts.	0/0	$0
WARRENTON	6/16/1998	Thunderstorm Wind	50 kts.	0/0	$0
WARRENTON	4/15/1999	Thunderstorm Wind	50 kts.	0/0	$0
WARRENTON	4/8/2000	Thunderstorm Wind	50 kts. E	0/0	$0
WARRENTON	9/20/2005	Thunderstorm Wind	50 kts. EG	0/0	$0
WARRENTON	4/3/2006	Thunderstorm Wind	50 kts. EG	0/0	$0
WARRENTON	4/22/2006	Thunderstorm Wind	50 kts. EG	0/0	$0
WARRENTON	7/13/2006	Thunderstorm Wind	50 kts. EG	0/0	$0
WARRENTON	7/19/2006	Thunderstorm Wind	50 kts. EG	0/0	$0
WARRENTON	7/27/2006	Thunderstorm Wind	50 kts. EG	0/0	$0
WARRENTON	7/27/2007	Thunderstorm Wind	50 kts. EG	0/0	$0
WARRENTON	6/14/2008	Thunderstorm Wind	50 kts. EG	0/0	$0
WARRENTON	7/23/2008	Thunderstorm Wind	50 kts. EG	0/0	$0
WARRENTON	7/17/2009	Thunderstorm Wind	50 kts. EG	0/0	$0
WARRENTON	5/27/2010	Thunderstorm Wind	50 kts. EG	0/0	$0
WARRENTON	7/20/2010	Thunderstorm Wind	50 kts. EG	0/0	$0
WARRENTON	8/21/2011	Thunderstorm Wind	50 kts. EG	0/0	$0
WARRENTON	6/1/2012	Thunderstorm Wind	50 kts. EG	0/0	$0
WARRENTON	6/29/2012	Thunderstorm Wind	50 kts. EG	0/0	$10,359
WARRENTON	7/28/2012	Thunderstorm Wind	50 kts. EG	0/0	$0
WARRENTON	6/13/2013	Thunderstorm Wind	50 kts. EG	0/0	$2,042
Unincorporated Area					
WARREN CO.	2/11/1981	Thunderstorm Wind	0 kts.	0/0	$0
WARREN CO.	8/17/1982	Thunderstorm Wind	0 kts.	0/0	$0
WARREN CO.	8/17/1982	Thunderstorm Wind	0 kts.	0/0	$0
WARREN CO.	8/17/1982	Thunderstorm Wind	0 kts.	0/0	$0
WARREN CO.	3/21/1984	Thunderstorm Wind	0 kts.	0/0	$0
WARREN CO.	5/8/1984	Thunderstorm Wind	0 kts.	0/0	$0
WARREN CO.	5/8/1984	Thunderstorm Wind	0 kts.	0/0	$0
WARREN CO.	10/15/1985	Thunderstorm Wind	0 kts.	0/0	$0
WARREN CO.	10/15/1985	Thunderstorm Wind	0 kts.	0/0	$0
WARREN CO.	11/3/1985	Thunderstorm Wind	0 kts.	0/0	$0
WARREN CO.	7/20/1986	Thunderstorm Wind	0 kts.	0/0	$0
WARREN CO.	7/20/1986	Thunderstorm Wind	0 kts.	0/0	$0
WARREN CO.	7/26/1986	Thunderstorm Wind	0 kts.	0/0	$0
WARREN CO.	8/2/1986	Thunderstorm Wind	0 kts.	0/0	$0

	Date	Type	Magnitude	Deaths/Injuries	Property Damage*
WARREN CO.	8/28/1987	Thunderstorm Wind	0 kts.	0/0	$0
WARREN CO.	9/11/1987	Thunderstorm Wind	0 kts.	0/0	$0
WARREN CO.	12/10/1987	Thunderstorm Wind	0 kts.	0/0	$0
WARREN CO.	8/19/1988	Thunderstorm Wind	0 kts.	0/0	$0
WARREN CO.	4/27/1989	Thunderstorm Wind	0 kts.	0/0	$0
WARREN CO.	6/16/1989	Thunderstorm Wind	0 kts.	0/0	$0
WARREN CO.	6/23/1989	Thunderstorm Wind	0 kts.	0/0	$0
WARREN CO.	7/12/1989	Thunderstorm Wind	0 kts.	0/0	$0
WARREN CO.	7/12/1989	Thunderstorm Wind	0 kts.	0/0	$0
WARREN CO.	7/20/1991	Thunderstorm Wind	0 kts.	0/0	$0
Warren Plaza	11/11/1995	Thunderstorm Wind	0 kts.	0/0	$0
LITTLETON	5/11/1996	Thunderstorm Wind	0 kts.	0/0	$113,689
INEZ	8/5/1997	Thunderstorm Wind	50 kts.	0/0	$74,093
WISE	8/20/1997	Thunderstorm Wind	50 kts.	0/0	$0
WARREN (ZONE)	2/16/1998	High Wind	45 kts.	0/0	$0
COUNTYWIDE	3/3/1999	Thunderstorm Wind	50 kts.	0/0	$0
COUNTYWIDE	8/14/1999	Thunderstorm Wind	--	0/0	$0
INEZ	8/26/1999	Thunderstorm Wind	--	0/0	$0
ELAMS	5/2/2002	Thunderstorm Wind	50 kts. E	0/0	$0
LITTLETON	2/22/2003	Thunderstorm Wind	50 kts. EG	0/0	$0
WARREN (ZONE)	3/7/2004	High Wind	55 kts. EG	0/0	$0
CHURCHILL	6/11/2004	Thunderstorm Wind	50 kts. EG	0/0	$0
ARCOLA	5/26/2006	Thunderstorm Wind	50 kts. EG	0/0	$0
VAUGHAN	6/23/2006	Thunderstorm Wind	50 kts. EG	0/0	$0
OINE	9/24/2006	Thunderstorm Wind	50 kts. EG	0/0	$0
LITTLETON	4/15/2007	Thunderstorm Wind	50 kts. EG	0/0	$0
WARREN (ZONE)	4/16/2007	Strong Wind	41 kts. EG	0/0	$0
OINE	6/27/2007	Thunderstorm Wind	50 kts. EG	0/0	$0
EMBRO	8/21/2007	Thunderstorm Wind	50 kts. EG	0/0	$0
WARREN (ZONE)	2/10/2008	Strong Wind	43 kts. EG	0/0	$5,523
WARRENTON WRRN CO AR	4/28/2008	Thunderstorm Wind	50 kts. EG	0/0	$0
WARREN PLAINS	7/23/2008	Thunderstorm Wind	50 kts. EG	0/0	$0
AFTON	7/31/2008	Thunderstorm Wind	50 kts. EG	0/0	$0
WARREN (ZONE)	1/7/2009	Strong Wind	43 kts. MG	0/0	$5,543
ELAMS	1/7/2009	Thunderstorm Wind	52 kts. EG	0/0	$55,431
MANSON	7/17/2009	Thunderstorm Wind	50 kts. EG	0/0	$55,431
WARREN (ZONE)	11/11/2009	Strong Wind	35 kts. EG	0/0	$1,109
WARREN (ZONE)	12/9/2009	Strong Wind	40 kts. EG	0/0	$1,109
WARREN (ZONE)	2/10/2010	High Wind	50 kts. EG	0/0	$1,091
ENTERPRISE	7/8/2010	Thunderstorm Wind	50 kts. EG	0/0	$0
VICKSBORO	7/17/2010	Thunderstorm Wind	50 kts. EG	0/0	$0
PASCHALL	10/27/2010	Thunderstorm Wind	50 kts. EG	0/0	$16,361
ARCOLA	3/6/2011	Thunderstorm Wind	50 kts. EG	0/0	$0
OAKVILLE	4/5/2011	Thunderstorm Wind	50 kts. EG	0/0	$0
ARCOLA	7/4/2011	Thunderstorm Wind	50 kts. EG	0/0	$0

	Date	Type	Magnitude	Deaths/Injuries	Property Damage*
WARREN (ZONE)	8/27/2011	Strong Wind	43 kts. MG	0/0	$52,867
INEZ	12/7/2011	Thunderstorm Wind	50 kts. EG	0/0	$0
MACON NOCARVA FLD AR	2/24/2012	Thunderstorm Wind	50 kts. EG	0/0	$0
OINE	5/1/2012	Thunderstorm Wind	50 kts. EG	0/0	$0
PASCHALL	5/1/2012	Thunderstorm Wind	50 kts. EG	0/0	$2,072
ELAMS	5/1/2012	Thunderstorm Wind	50 kts. EG	0/0	$10,359
AFTON	6/1/2012	Thunderstorm Wind	50 kts. EG	0/0	$0
AFTON	7/8/2012	Thunderstorm Wind	50 kts. EG	0/0	$0
ELBERON	7/9/2012	Thunderstorm Wind	50 kts. EG	0/0	$0
GROVE HILL	7/28/2012	Thunderstorm Wind	50 kts. EG	0/0	$0
WARREN (ZONE)	1/30/2013	Strong Wind	40 kts. EG	0/0	$510
ENTERPRISE	4/19/2013	Thunderstorm Wind	50 kts. EG	0/0	$510
MANSON	6/11/2014	Thunderstorm Wind	50 kts. EG	0/0	$1,507
WARREN PLAINS	6/20/2015	Thunderstorm Wind	50 kts. EG	0/0	$3,000

*Property damage is reported in 2015 dollars; All damage may not have been reported.
Source: National Climatic Data Center

Probability of Future Occurrences

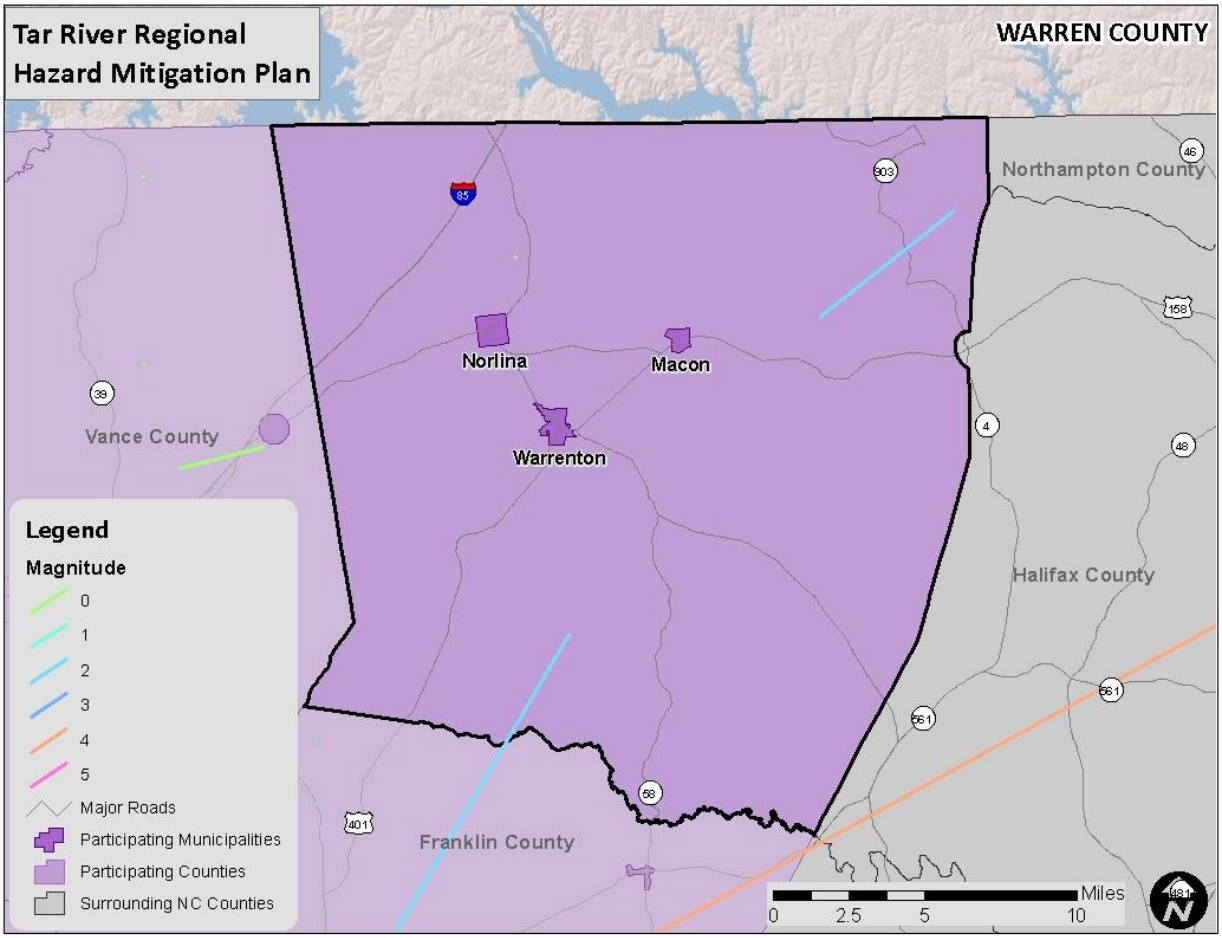
Given the high number of previous events, it is certain that wind events, including straight-line wind and thunderstorm wind, will occur in the future. This results in a probability level of highly likely (100 percent annual probability) for future wind events for the entire county.

D.2.8 Tornado

Location and Spatial Extent

Tornadoes occur throughout the state of North Carolina and thus in Warren 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 Warren County is uniformly exposed to this hazard. With that in mind, **Figure D.3** shows tornado track data for many of the major tornado events that have impacted the county. While no definitive pattern emerges from this data, some areas that have been impacted in the past may be potentially more susceptible in the future.

FIGURE D.3: HISTORICAL TORNADO TRACKS IN WARREN COUNTY



Source: National Weather Service Storm Prediction Center

Historical Occurrences

Tornadoes were not responsible for any disaster declarations in Warren County.[11] According to the National Climatic Data Center, there have been a total of five recorded tornado events in Warren County since 1966 (**Table D.15**), resulting in nearly $3.5 million (2015 dollars) in property damages.[12] [13] The magnitude of these tornadoes ranged from F0 to F2 in intensity although an EF5 event is possible (**Table D.16**). 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 65 years.

TABLE D.15: SUMMARY OF TORNADO OCCURRENCES IN WARREN COUNTY

Location	Number of Occurrences	Deaths/Injuries	Property Damage (2015)	Annualized Property Loss
Macon	0	0/0	$0	$0

[11] A complete listing of historical disaster declarations can be found in Section 4: *Hazard Profiles*.
[12] These tornado events are only inclusive of those reported by the National Climatic Data Center (NCDC) from 1950 through July 2015. It is likely that additional tornadoes have occurred in Warren County. As additional local data becomes available, this hazard profile will be amended.
[13] Adjusted dollar values were calculated based on the average Consumer Price Index for a given calendar year. This index value has been calculated every year since 1913. For 2015, the November 2015 monthly index was used.

Location	Number of Occurrences	Deaths/Injuries	Property Damage (2015)	Annualized Property Loss
Norlina	0	0/0	$0	$0
Warrenton	0	0/0	$0	$0
Unincorporated Area	5	0/0	$3,470,926	$70,835
WARREN COUNTY TOTAL	**5**	**0/0**	**$3,470,926**	**$70,835**

Source: National Climatic Data Center

TABLE D.16: HISTORICAL TORNADO IMPACTS IN WARREN COUNTY

	Date	Magnitude	Deaths/ Injuries	Property Damage*	Details
Macon					
None Reported	--	--	--	--	--
Norlina					
None Reported	--	--	--	--	--
Warrenton					
None Reported	--	--	--	--	--
Unincorporated Area					
WARREN CO.	11/2/1966	F2	0/0	$1,835,170	Moved northeastward in a skipping path from Angier across eastern Raleigh, near Louisburg and into Warren County. In the area east and south of Raleigh two homes and five house trailers were destroyed, three trailers and six homes severely damaged; minor damage to about twenty other homes and business buildings. Trees twisted off, power poles broken. In Louisburg a manufacturing plan was damaged. Most of the injured were in the house trailers. One person reported seeing a funnel cloud, several others observed quantities of debris moving spirally through the air; many heard a roaring sound. Heavy rain accompanied the storm.
WARREN CO.	10/2/1969	F2	0/0	$1,620,150	--
Wise	10/27/1995	F0	0/0	$15,606	A steeple was blown off a church in the Wise community. Numerous trees were damaged and twisted within a few blocks of the church.
RIDGEWAY	5/19/2001	F0	0/0	$0	The roof of a chicken house was damaged, and numerous trees were blown down in the same area.
AFTON	5/9/2003	F0	0/0	$0	Trees were blown down and twisted, and a mobile home was destroyed.

*Property damage is reported in 2015 dollars; All damage may not have been reported.
Source: National Climatic Data Center

Probability of Future Occurrences

According to historical information, tornado events are not an annual occurrence for the county. However, given the county's location in the southeastern United States and history of tornadoes, an occurrence is possible every few years. While the majority of the reported tornado events are small in terms of size, intensity, and duration, they do pose a significant threat should Warren County experience a direct tornado strike. The probability of future tornado occurrences affecting Warren County is likely (between 10 to 100 percent annual probability).

D.2.9 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. Warren County is accustomed to severe winter weather conditions and often receives winter weather during the winter months. Given the atmospheric nature of the hazard, the entire county has uniform exposure to a winter storm.

Historical Occurrences

Winter weather has resulted in four disaster declarations in Warren County. This includes the Blizzard of 1996, one subsequent 1996 winter storm, a severe winter storm in 2000, and a severe ice storm in 2002.[14] According to the National Climatic Data Center, there have been a total of 43 recorded winter storm events in Warren County since 1996 (**Table D.17**).[15] These events resulted in almost $763,000 (2015 dollars) in damages.[16] Detailed information on the recorded winter storm events can be found in **Table D.18**.

TABLE D.17: SUMMARY OF WINTER STORM EVENTS IN WARREN COUNTY

Location	Number of Occurrences	Deaths/Injuries	Property Damage (2015)	Annualized Property Loss
Warren County	43	0/0	$762,635	$40,139

Source: National Climatic Data Center

TABLE D.18: HISTORICAL WINTER STORM IMPACTS IN WARREN COUNTY

	Date	Type of Storm	Deaths/Injuries	Property Damage*
Macon				
None Reported	--	--	--	--
Norlina				
None Reported	--	--	--	--
Warrenton				
None Reported	--	--	--	--

[14] A complete listing of historical disaster declarations can be found in Section 4: *Hazard Profiles*.
[15] These ice and winter storm events are only inclusive of those reported by the National Climatic Data Center (NCDC) from 1996 through July 2015. It is likely that additional winter storm conditions have affected Warren County.
[16] Adjusted dollar values were calculated based on the average Consumer Price Index for a given calendar year. This index value has been calculated every year since 1913. For 2015, the November 2015 monthly index was used.

	Date	Type of Storm	Deaths/Injuries	Property Damage*
Unincorporated Area				
WARREN (ZONE)	1/6/1996	Winter Storm	0/0	$0
WARREN (ZONE)	1/11/1996	Ice Storm	0/0	$0
WARREN (ZONE)	2/2/1996	Ice Storm	0/0	$0
WARREN (ZONE)	2/16/1996	Heavy Snow	0/0	$0
WARREN (ZONE)	12/23/1998	Ice Storm	0/0	$0
WARREN (ZONE)	1/18/2000	Winter Storm	0/0	$0
WARREN (ZONE)	1/20/2000	Winter Storm	0/0	$0
WARREN (ZONE)	1/22/2000	Winter Storm	0/0	$0
WARREN (ZONE)	1/24/2000	Winter Storm	0/0	$0
WARREN (ZONE)	1/28/2000	Winter Storm	0/0	$0
WARREN (ZONE)	11/19/2000	Heavy Snow	0/0	$0
WARREN (ZONE)	12/3/2000	Winter Storm	0/0	$0
WARREN (ZONE)	1/3/2002	Winter Storm	0/0	$0
WARREN (ZONE)	12/4/2002	Winter Storm	0/0	$0
WARREN (ZONE)	2/16/2003	Winter Storm	0/0	$0
WARREN (ZONE)	1/26/2004	Winter Storm	0/0	$0
WARREN (ZONE)	2/15/2004	Winter Storm	0/0	$0
WARREN (ZONE)	1/18/2007	Winter Weather	0/0	$0
WARREN (ZONE)	1/21/2007	Winter Weather	0/0	$0
WARREN (ZONE)	12/7/2007	Winter Weather	0/0	$11,471
WARREN (ZONE)	1/19/2008	Winter Weather	0/0	$0
WARREN (ZONE)	1/20/2009	Winter Storm	0/0	$0
WARREN (ZONE)	3/2/2009	Winter Storm	0/0	$0
WARREN (ZONE)	12/18/2009	Winter Weather	0/0	$0
WARREN (ZONE)	1/29/2010	Winter Storm	0/0	$0
WARREN (ZONE)	2/5/2010	Winter Weather	0/0	$0
WARREN (ZONE)	2/12/2010	Winter Weather	0/0	$0
WARREN (ZONE)	12/4/2010	Winter Weather	0/0	$0
WARREN (ZONE)	12/16/2010	Winter Weather	0/0	$0
WARREN (ZONE)	12/25/2010	Winter Storm	0/0	$0
WARREN (ZONE)	1/7/2011	Winter Weather	0/0	$0
WARREN (ZONE)	1/10/2011	Winter Weather	0/0	$0
WARREN (ZONE)	1/21/2014	Winter Weather	0/0	$0
WARREN (ZONE)	1/28/2014	Winter Storm	0/0	$0
WARREN (ZONE)	2/12/2014	Winter Storm	0/0	$0
WARREN (ZONE)	3/3/2014	Winter Weather	0/0	$0
WARREN (ZONE)	3/6/2014	Ice Storm	0/0	$251,164
WARREN (ZONE)	3/17/2014	Winter Weather	0/0	$0
WARREN (ZONE)	1/13/2015	Winter Weather	0/0	$0
WARREN (ZONE)	1/27/2015	Winter Weather	0/0	$0
WARREN (ZONE)	2/16/2015	Winter Storm	0/0	$0
WARREN (ZONE)	2/24/2015	Winter Weather	0/0	$0
WARREN (ZONE)	2/25/2015	Winter Storm	0/0	$500,000

*Property damage is reported in 2015 dollars; All damage may not have been reported.
Source: National Climatic Data Center

There have been several severe winter weather events in Warren County. The text below describes two of the major events and associated impacts on the county. Similar impacts can be expected with severe winter weather.

1996 Winter Storm – January 6-8, 1996
This storm left two feet of snow in some areas and several thousand citizens without power for up to nine days. Although shelters were opened, some roads were impassible for many days. This event caused considerable disruption to business, industry, schools, and government services.

2002 Ice Storm – December 4-5, 2002
An ice storm produced up to an inch of freezing rain in central North Carolina impacting 40 counties. A total of 24 people were killed, and as many as 1.8 million people were left without electricity. Additionally, property damage was estimated at almost $100 million. New records were also set for traffic accidents and school closing durations. The scale of destruction was comparable to that of hurricanes that have impacted the state, such as Hurricane Fran in 1996. The storm cost the state $97.2 million in response and recovery.

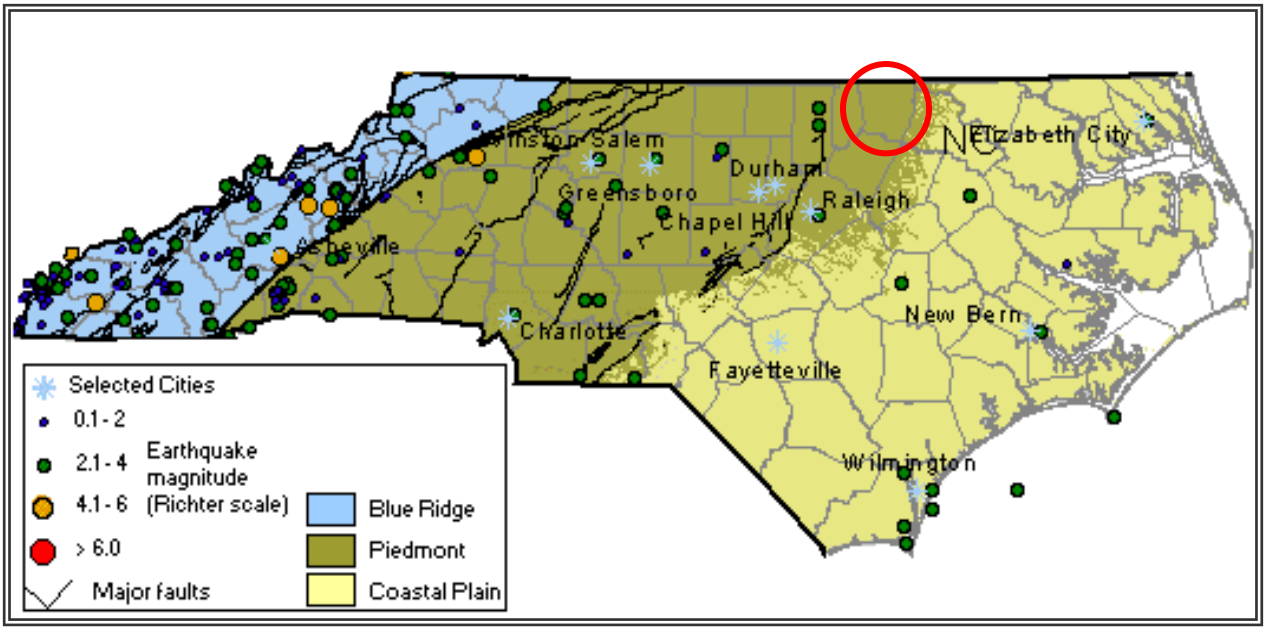
Winter storms throughout the planning area have several negative externalities including hypothermia, cost of snow and debris cleanup, business and government service interruption, traffic accidents, and power outages. Furthermore, citizens may resort to using inappropriate heating devices that could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

Probability of Future Occurrences
Winter storm events will remain a regular occurrence in Warren County due to its location in the northern part of the state. According to historical information, Warren County generally experiences several winter storm events each year. Therefore, the probability of future occurrence is highly likely (100 percent annual probability).

D.2.10 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. In terms of major faults, the state is primarily affected by 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 and neighboring states such as the Eastern Tennessee and Virginia seismic zones. These zones have produced smaller earthquakes but are more likely to have an impact on Warren County. **Figure D.4** is a map showing geological and seismic information for North Carolina including some fault lines and historic event epicenters.

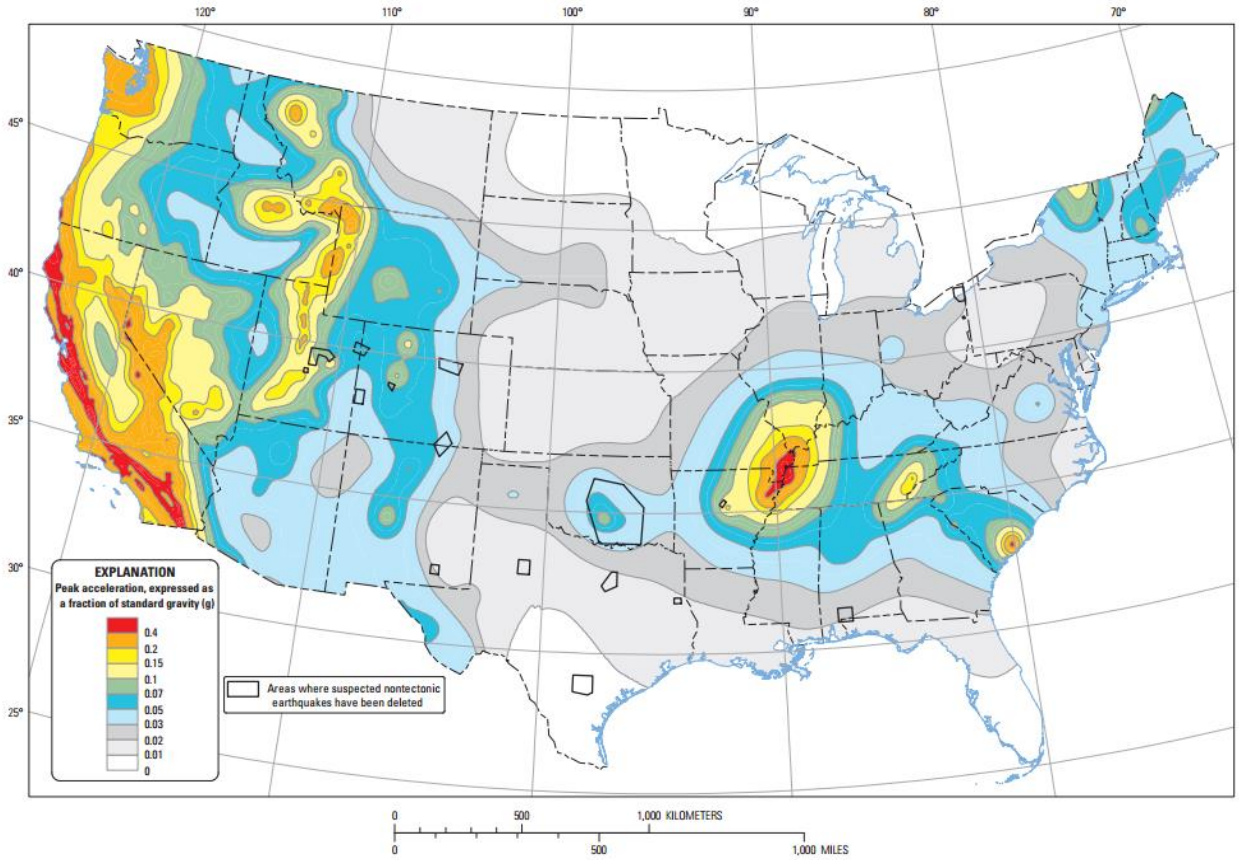
FIGURE D.4: GEOLOGICAL AND SEISMIC INFORMATION FOR NORTH CAROLINA



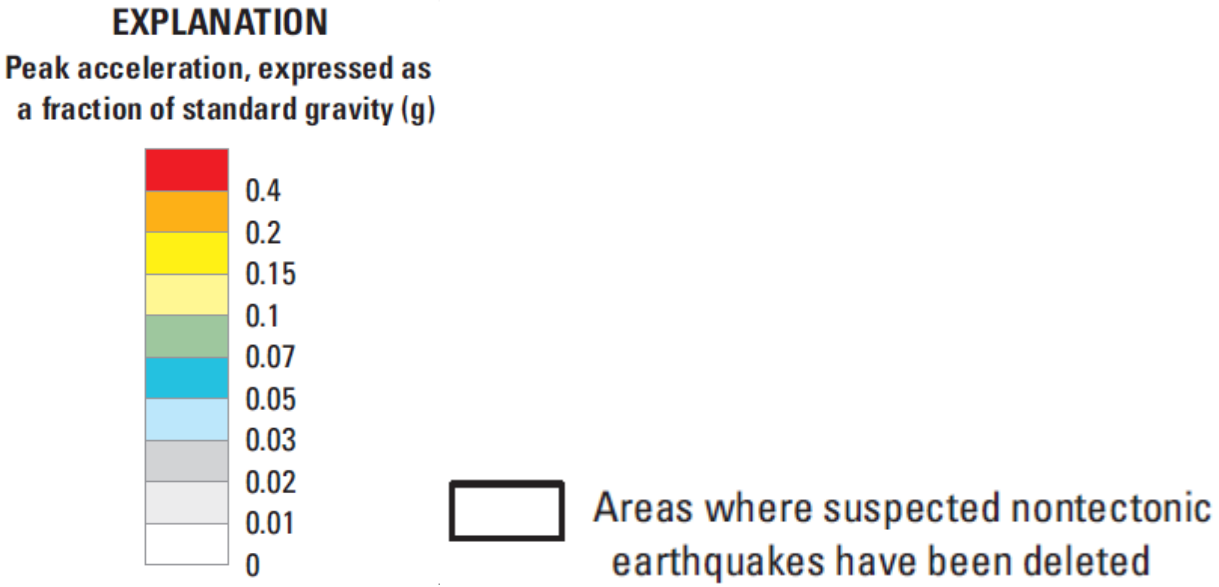
Source: North Carolina Geological Survey

Figure D.5 shows the intensity level associated with Warren 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, Warren County lies within an approximate zone of level "2" to "3" ground acceleration. This indicates that the county exists within an area of low to moderate seismic risk.

FIGURE D.5: PEAK ACCELERATION WITH 10 PERCENT PROBABILITY OF EXCEEDANCE IN 50 YEARS



Ten-percent probability of exceedance in 50 years map of peak ground acceleration



Source: United States Geological Survey, 2014

Historical Occurrences

At least one earthquake is known to have affected Warren County since 1969. This measured a V on the Modified Mercalli Intensity (MMI) scale. **Table D.19** provides a summary of earthquake events reported by the National Geophysical Data Center between 1638 and 1985. **Table D.20** presents a detailed report including the date, distance from the epicenter, magnitude, and Modified Mercalli Intensity (if known) for each event. [17]

TABLE D.19: SUMMARY OF SEISMIC ACTIVITY IN WARREN COUNTY

Location	Number of Occurrences	Greatest MMI Reported	Richter Scale Equivalent
Macon	0	--	--
Norlina	0	--	--
Warrenton	1	V	< 4.8
Unincorporated Area	0	--	--
WARREN COUNTY TOTAL	**1**	**V**	**< 4.8**

Source: National Geophysical Data Center

TABLE D.20: SIGNIFICANT SEISMIC EVENTS IN WARREN COUNTY (1638 -1985)

Location	Date	Epicentral Distance	Magnitude	MMI
Macon				
None Reported	--	--	--	--
Norlina				
None Reported	--	--	--	--
Warrenton				
WARRENTON	11/20/1969	275.0 km	4.3	V
Unincorporated Area				
None Reported	--	--	--	--

Source: National Geophysical Data Center

Probability of Future Occurrences

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

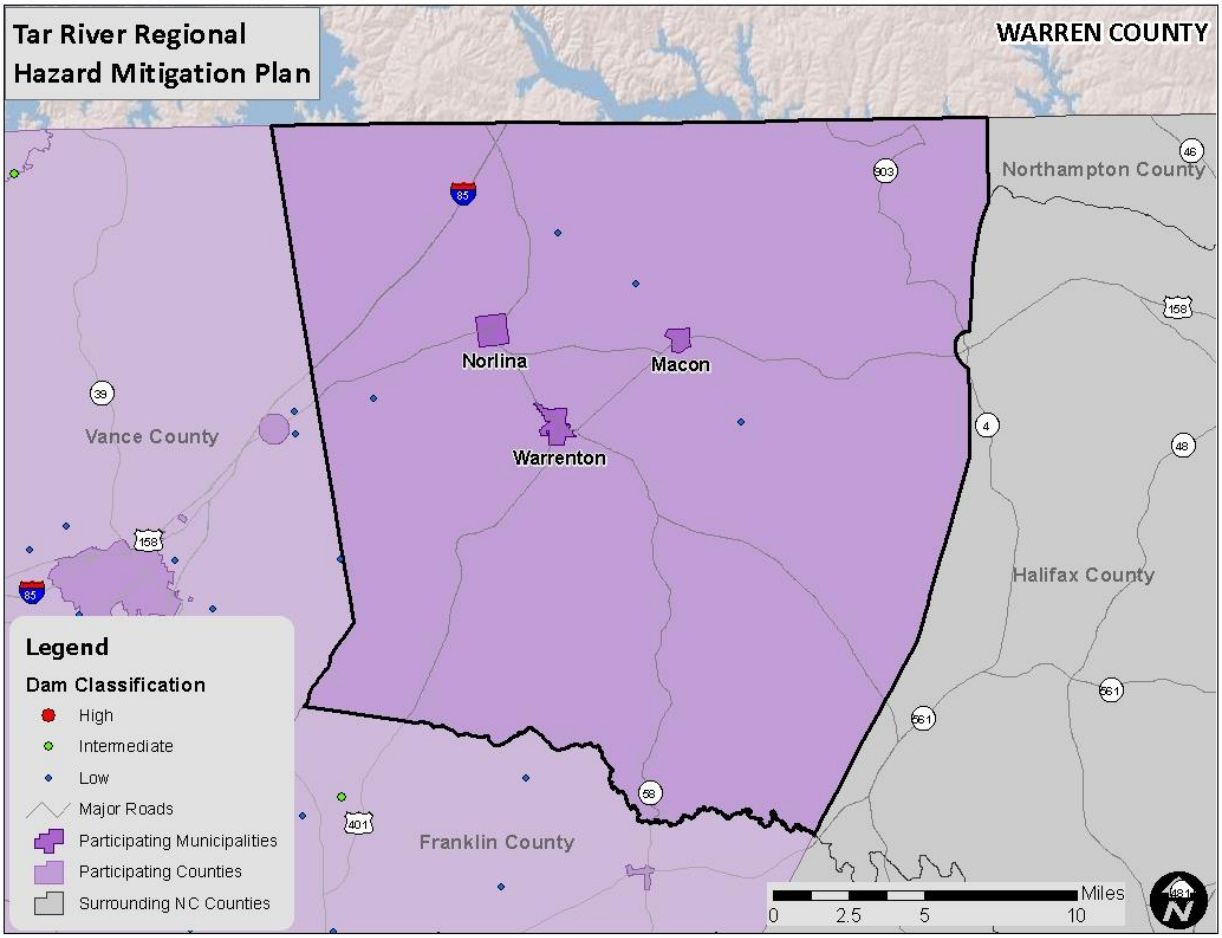
D.2.11 Dam and Levee Failure

Location and Spatial Extent

According to the North Carolina Division of Energy, Mineral, and Land Resources, there are four dams in Warren County.[18] **Figure D.6** shows the dam location and the corresponding hazard ranking for each. Of these dams, none are classified as high hazard potential (**Table D.21)**.

[17] 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.
[18] The October 7, 2015 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 D.6: WARREN COUNTY DAM LOCATION AND HAZARD RANKING



Source: North Carolina Division of Energy, Mineral, and Land Resources, 2015

TABLE D.21: WARREN COUNTY HIGH HAZARD DAMS

Dam Name	Hazard Potential	Surface Area (acres)	Max Capacity (Ac-ft)	Owner Type
Warren County				
None Reported	--	--	--	--

Source: North Carolina Division of Energy, Mineral, and Land Resources, 2015

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.

The information below identifies additional information reported in the previous hazard mitigation plan on dam locations.

Warren County

John H. Kerr Dam is located in Virginia about 10 miles upstream north and west of Warren County. It is rated "high hazard" meaning that if a failure were to occur there is a probable loss of one or more

human lives and property damage would probably exceed $200,000. The dam is maintained by the Army Corps of Engineers and would affect the Roanoke River and Lake Gaston, which are located near and along the northern edge of the county.

Historical Occurrences

There have been no dam breaches reported in Warren County according to the State of North Carolina Hazard Mitigation Plan and local officials/records.

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.

D.2.12 Flood

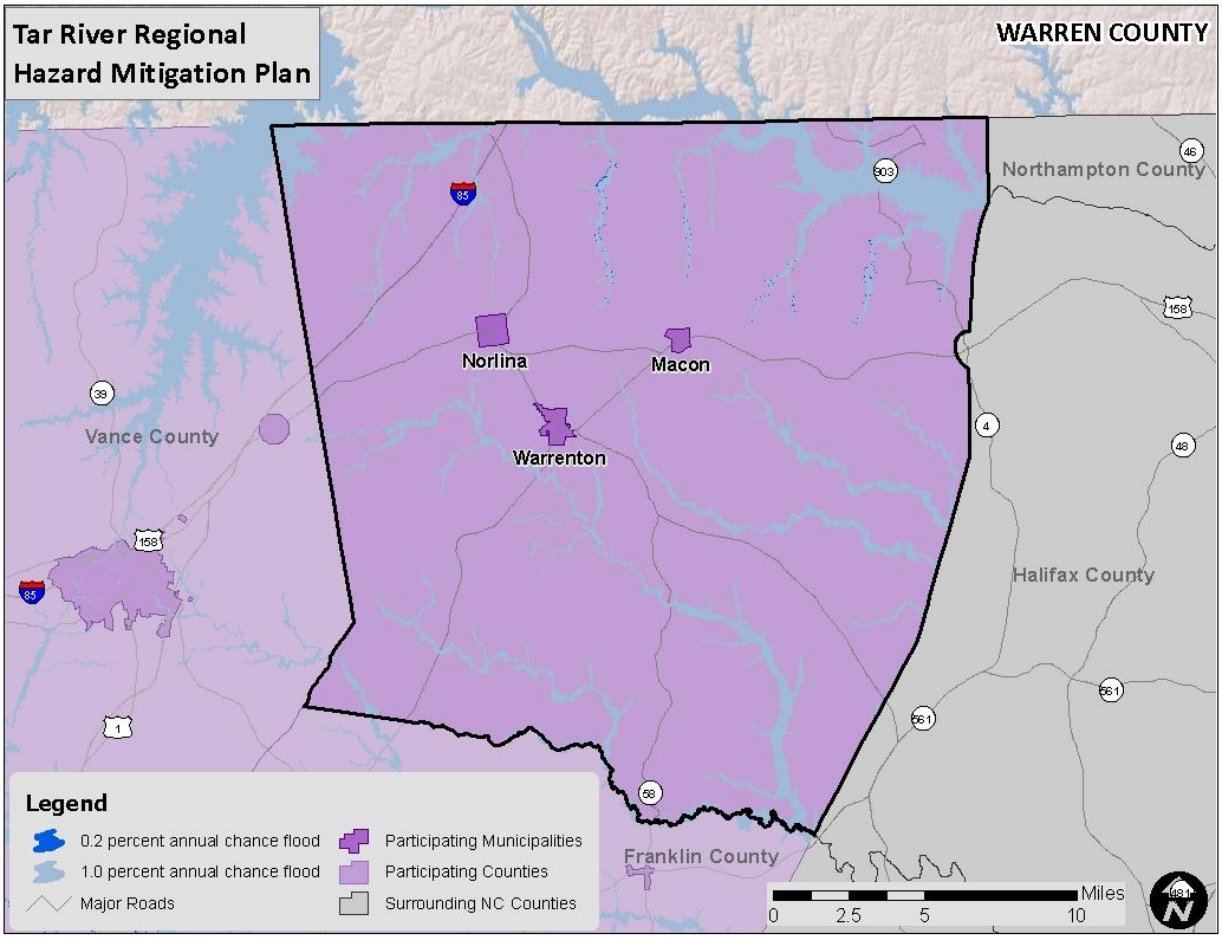
Location and Spatial Extent

There are areas in Warren County that are susceptible to flood events. Special flood hazard areas in the county were mapped using Geographic Information System (GIS) and FEMA Digital Flood Insurance Rate Maps (DFIRM).[19] This includes Zone AE (1-percent annual chance floodplain with elevation) and Zone X500 (0.2-percent annual chance floodplain). According to GIS analysis, of the 444 square miles that make up Warren County, there are 39.5 square miles of land in Zone AE (1-percent annual chance floodplain/100-year floodplain) and 0.2 square miles of land in Zone X500 (0.2-percent annual chance floodplain/500-year floodplain).

These flood zone values account for 8.9 percent of the total land area in Warren County. It is important to note that while FEMA digital flood data is recognized as best available data for planning purposes, it does not always reflect the most accurate and up-to-date flood risk. Flooding and flood-related losses often do occur outside of delineated special flood hazard areas. **Figure D.7**, **Figure D.8**, **Figure D.9**, and **Figure D.10** illustrate the location and extent of currently mapped special flood hazard areas for Warren County and its municipalities based on best available FEMA Digital Flood Insurance Rate Map (DFIRM) data.

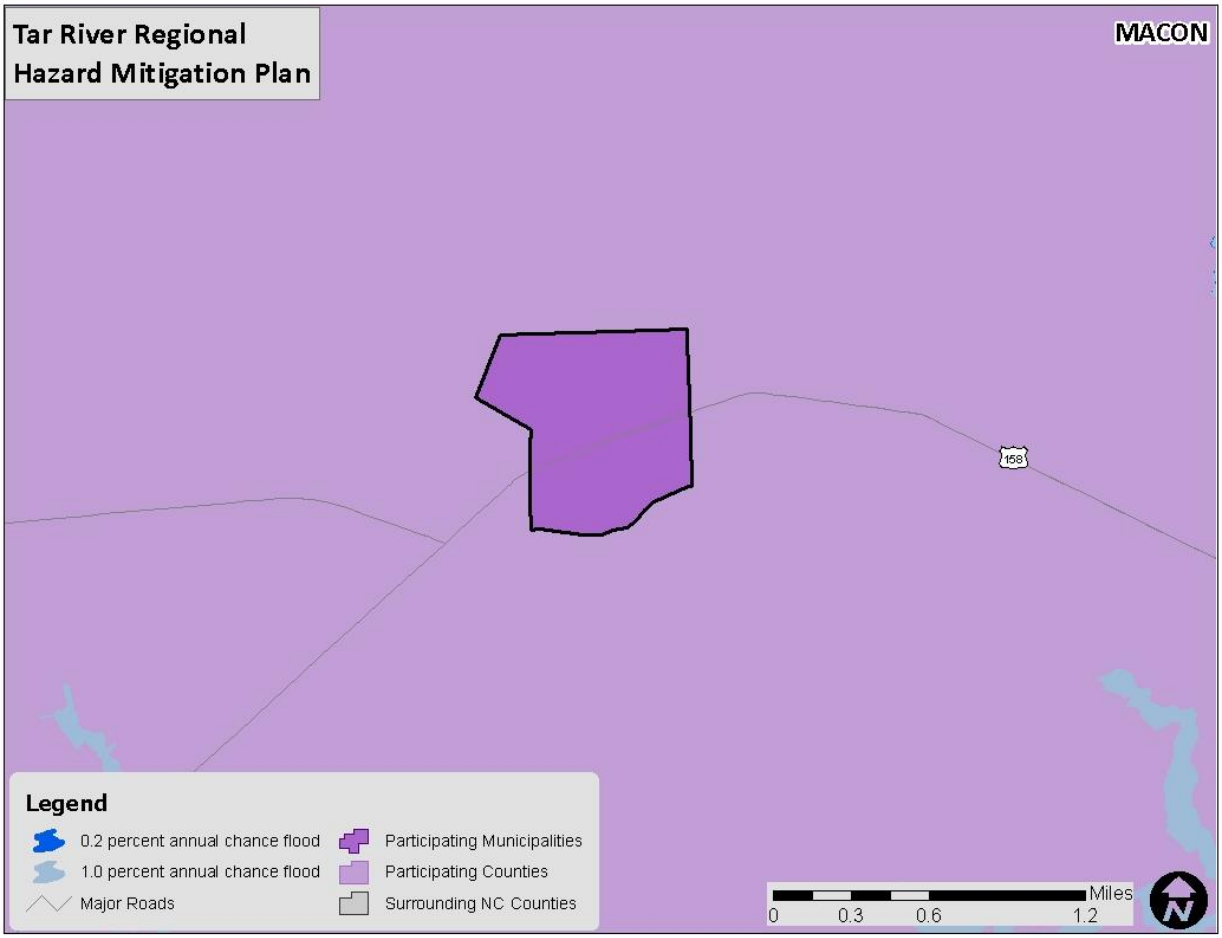
[19] The county-level DFIRM used for Warren County was updated in 2008.

FIGURE D.7: SPECIAL FLOOD HAZARD AREAS IN WARREN COUNTY



Source: Federal Emergency Management Agency

FIGURE D.8: SPECIAL FLOOD HAZARD AREAS IN MACON

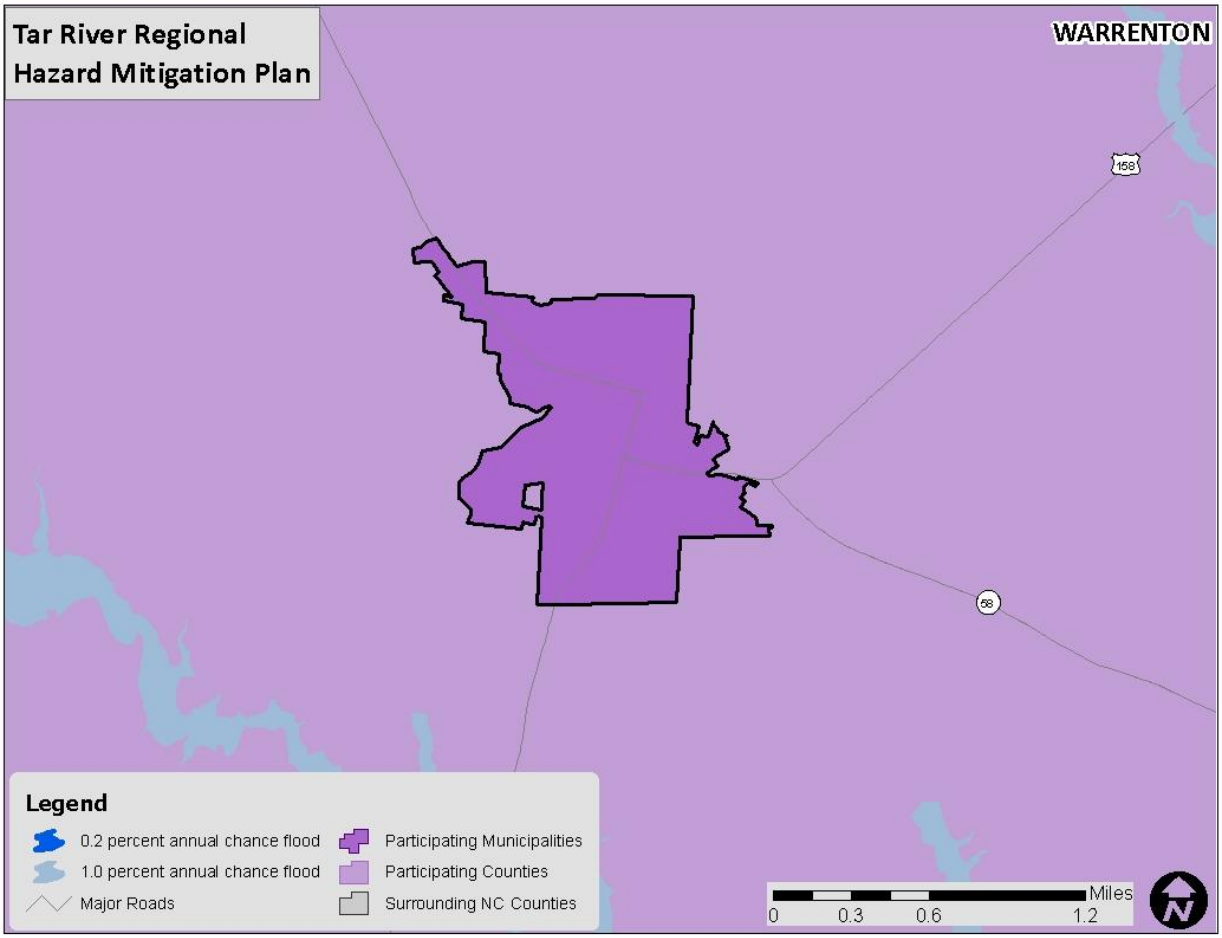


Source: Federal Emergency Management Agency

FIGURE D.9: SPECIAL FLOOD HAZARD AREAS IN NORLINA

Source: Federal Emergency Management Agency

FIGURE D.10: SPECIAL FLOOD HAZARD AREAS IN WARRENTON



Source: Federal Emergency Management Agency

Historical Occurrences

The National Climatic Data Center reported a total of 16 events in Warren County since 1996.[20] A summary of these events is presented in **Table D.22**. These events did not account for any property damage in the county.[21] However, there were two fatalities and two injuries reported for these events. Specific information on flood events, including date, type of flooding, and deaths and injuries, can be found in **Table D.23**.

TABLE D.22: SUMMARY OF FLOOD OCCURRENCES IN WARREN COUNTY

Location	Number of Occurrences	Deaths/Injuries	Property Damage (2015)	Annualized Property Loss
Macon	0	0/0	$0	$0
Norlina	2	0/0	$0	$0
Warrenton	3	0/0	$0	$0

[20] These flood events are only inclusive of those reported by the National Climatic Data Center (NCDC) from 1996 through July 2015. It is likely that additional occurrences have occurred and have gone unreported in Warren County.
[21] Adjusted dollar values were calculated based on the average Consumer Price Index for a given calendar year. This index value has been calculated every year since 1913. For 2015, the November 2015 monthly index was used.

Location	Number of Occurrences	Deaths/Injuries	Property Damage (2015)	Annualized Property Loss
Unincorporated Area	11	2/2	$0	$0
WARREN COUNTY TOTAL	**16**	**2/2**	**$0**	**$0**

Source: National Climatic Data Center

TABLE D.23: HISTORICAL FLOOD EVENTS IN WARREN COUNTY

	Date	Type	Deaths/Injuries	Property Damage*
Macon				
None Reported	--	--	--	--
Norlina				
NORLINA	8/18/2001	Flash Flood	0/0	$0
NORLINA	7/11/2004	Flash Flood	0/0	$0
Warrenton				
WARRENTON	3/19/1998	Flash Flood	0/0	$0
WARRENTON	6/23/2006	Flash Flood	0/0	$0
WARRENTON	4/25/2014	Flash Flood	0/0	$0
Unincorporated Area				
SRN PART	9/10/1996	Flash Flood	0/0	$0
COUNTYWIDE	7/24/1997	Flash Flood	0/0	$0
COUNTYWIDE	9/16/1999	Flash Flood	2/0	$0
COUNTYWIDE	7/24/2000	Flash Flood	0/0	$0
SOUTH PORTION	9/3/2000	Flash Flood	0/0	$0
COUNTYWIDE	9/18/2003	Flash Flood	0/0	$0
SOUTHEAST PORTION	6/14/2006	Flash Flood	0/0	$0
ENTERPRISE	7/21/2012	Flash Flood	0/0	$0
AFTON	6/7/2013	Flash Flood	0/0	$0
WARRENTON WRRN CO AR	9/8/2014	Flash Flood	0/2	$0
GROVE HILL	9/8/2014	Flash Flood	0/0	$0

*Property damage is reported in 2015 dollars; All damage may not have been reported.
Source: National Climatic Data Center

Historical Summary of Insured Flood Losses

According to FEMA flood insurance policy records as of November 2015, there have been no flood losses reported in Warren County through the National Flood Insurance Program (NFIP) since 1978. A summary of these figures for the county is provided in **Table D.24**. It should be emphasized that these numbers include only those losses to structures that were insured through the NFIP policies and for losses in which claims were sought and received. It is likely that many additional instances of flood loss in Warren County were either uninsured, denied claims payment, or not reported.

TABLE D.24: SUMMARY OF INSURED FLOOD LOSSES IN WARREN COUNTY

Location	Flood Losses	Claims Payments
Macon*	--	--
Norlina*	--	--
Warrenton	0	$0

Location	Flood Losses	Claims Payments
Unincorporated Area	0	$0
WARREN COUNTY TOTAL	**0**	**$0**

*This community does not participate in the National Flood Insurance Program. Therefore, no values are reported.
Source: Federal Emergency Management Agency, National Flood Insurance Program

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 2015, there are no non-mitigated repetitive loss properties located in Warren County. **Table D.25** presents detailed information on repetitive loss properties and NFIP claims and policies for Warren County.

TABLE D.25: REPETITIVE LOSS PROPERTIES IN WARREN COUNTY

Location	Number of Properties	Types of Properties	Number of Losses	Building Payments	Content Payments	Total Payments	Average Payment
Macon*	--	--	--	--	--	--	--
Norlina*	--	--	--	--	--	--	--
Warrenton	0	--	0	$0	$0	$0	$0
Unincorporated Area	0	--	0	$0	$0	$0	$0
WARREN COUNTY TOTAL	**0**		**0**	**$0**	**$0**	**$0**	**$0**

* These communities do not participate in the National Flood Insurance Program. Therefore, no values are reported.
Source: National Flood Insurance Program

Probability of Future Occurrences

Flood events will remain a threat in Warren County, and the probability of future occurrences will remain highly likely (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 indicate those areas susceptible to the 1-percent annual chance flood (100-year floodplain) and the 0.2-percent annual chance flood (500-year floodplain).

It can be inferred from the floodplain location maps, previous occurrences, and repetitive loss properties that risk varies throughout the county and participating municipalities. For example, the municipalities have less floodplain and thus a lower risk of flood than the unincorporated area of the county.

D.2.13 Wildfire

Location and Spatial Extent

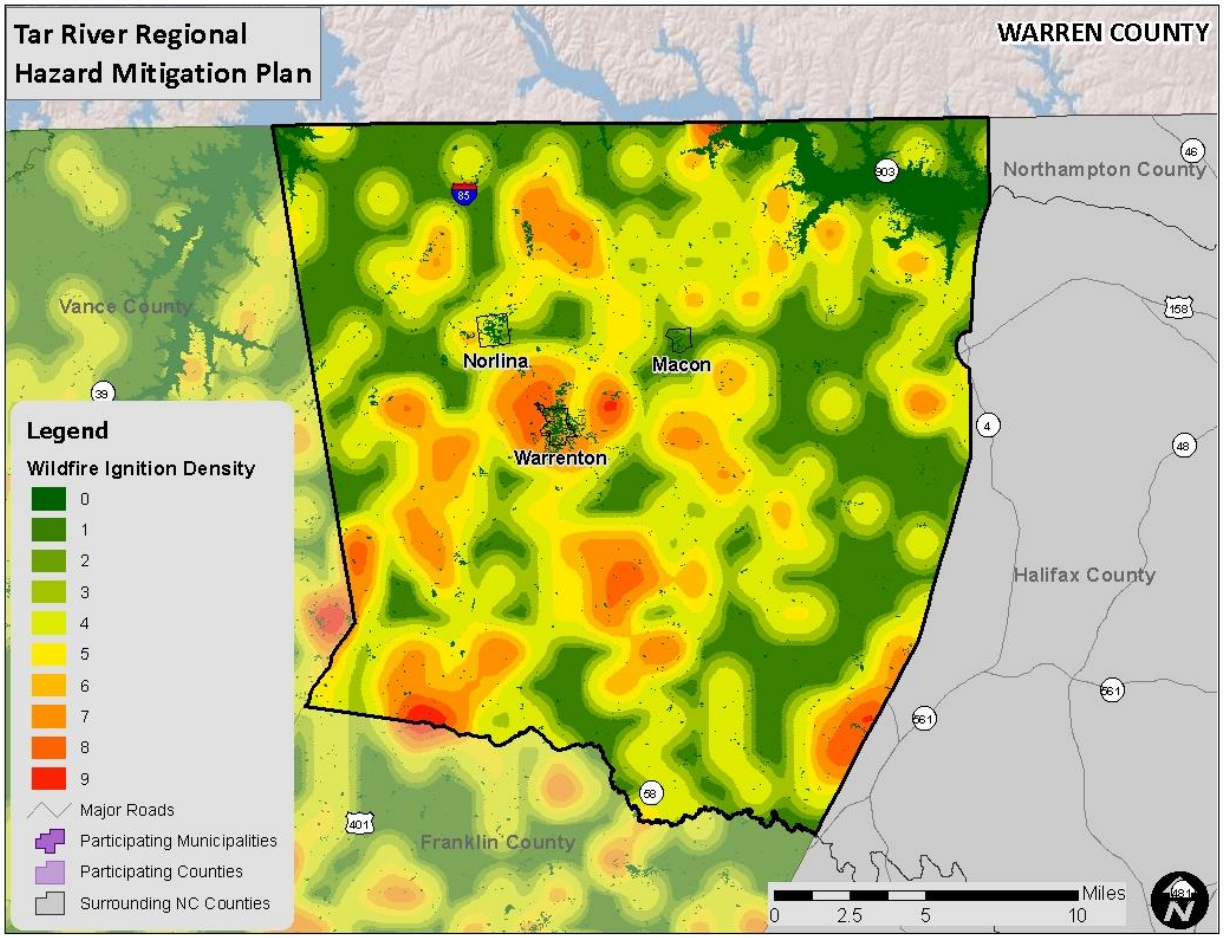
The entire county is at risk to a wildfire occurrence. However, several factors such as drought conditions or high levels of fuel on the forest floor may make a wildfire more likely. Furthermore, areas in the urban-wildland interface are particularly susceptible to fire hazard as populations abut formerly

undeveloped areas. The Wildfire Ignition Density data shown in the figure below give an indication of historic location in the county.

Historical Occurrences

Figure D.11 shows the Wildfire Ignition Density in Warren County based on data from the Southern Wildfire Risk Assessment. This data is based on historical fire ignitions and the likelihood of a wildfire igniting in an area. Occurrence is derived by modeling historic wildfire ignition locations to create an average ignition rate map. This is measured in the number of fires per year per 1,000 acres.[22]

FIGURE D.11: WILDFIRE IGNITION DENSITY IN WARREN COUNTY



Source: Southern Wildfire Risk Assessment

Based on data from the North Carolina Division of Forest Resources from 2005 to 2014, Warren County experienced an average of 31 wildfires annually which burn a combined 267 acres per year. The data indicate that most of these fires are small, averaging nine acres per fire. **Table D.26** lists the number of reported wildfire occurrences in the county between the years 2005 and 2014.

[22] Southern Wildfire Risk Assessment, 2014.

TABLE D.26: HISTORICAL WILDFIRE OCCURRENCES IN WARREN COUNTY

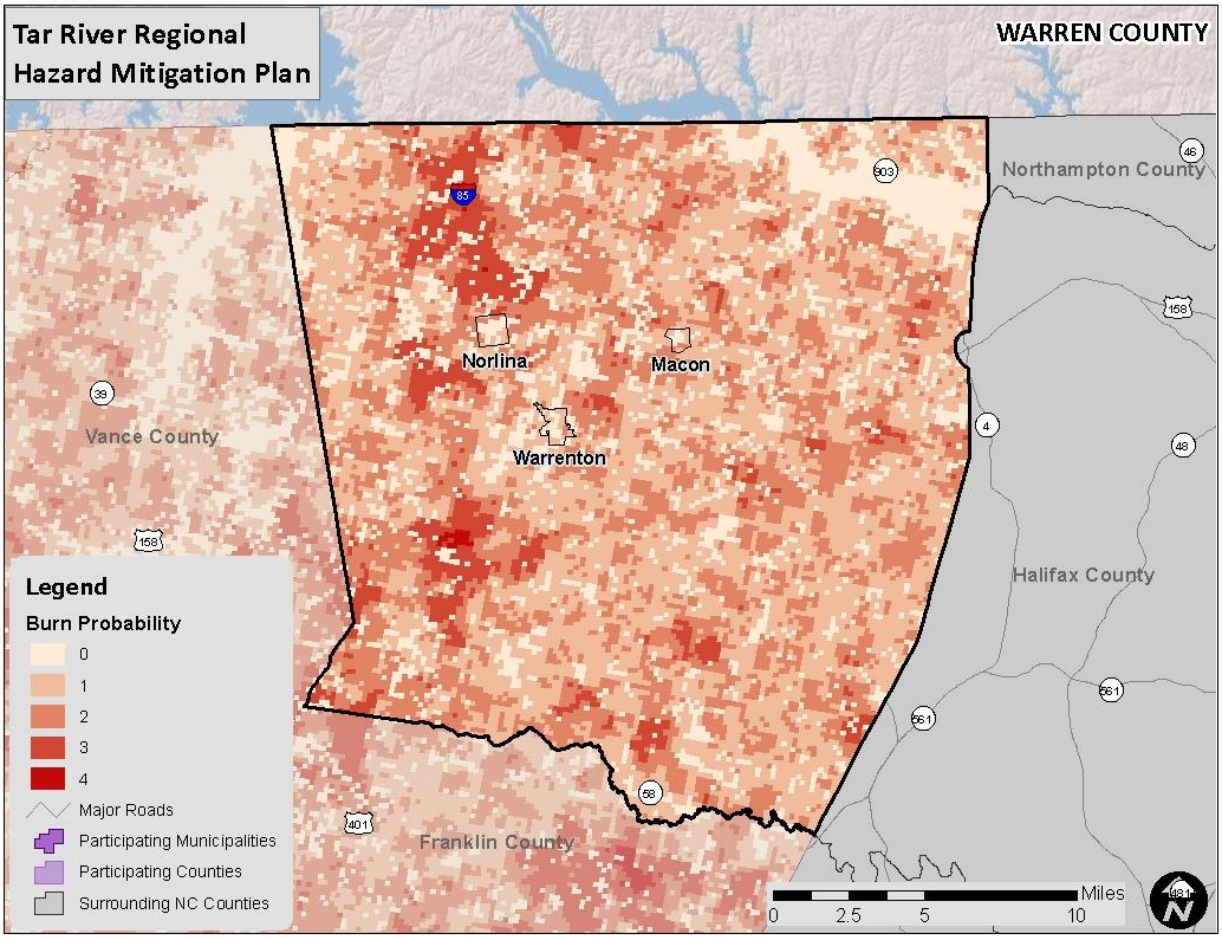
Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Warren County										
Number of Fires	31	39	50	27	33	30	30	41	16	16
Number of Acres	133.6	81.7	73.8	98.7	64.2	36.0	2,094.0	58.2	16.3	16.2

Source: North Carolina Division of Forest Resources

Probability of Future Occurrences

Wildfire events will be an ongoing occurrence in Warren County. **Figure D.12** shows that there is some probability a wildfire will occur throughout the county. However, 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 Warren County for future wildfire events is highly likely (100 percent annual probability).

FIGURE D.12: BURN PROBABILITY IN WARREN COUNTY



Source: Southern Wildfire Risk Assessment

D.2.14 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 D.27 describes the extent of each natural hazard identified for Warren County. The extent of a hazard is defined as its severity or magnitude as it relates to the planning area.

TABLE D.27 EXTENT OF WARREN COUNTY HAZARDS

Atmospheric Hazards	
Drought	Drought extent is defined by the United States Drought Monitor Classifications which include Abnormally Dry, Moderate Drought, Severe Drought, Extreme Drought, and Exceptional Drought. According to the United States Drought Monitor Classifications, the most severe drought condition is Exceptional. Warren County has received this ranking 3 times over the 16-year reporting period.
Extreme Heat/Heat Wave	The extent of extreme heat can be defined by the maximum temperature reached. The highest temperature recorded in Warren County is 104 degrees Fahrenheit (reported on June 19, 1944).
Hailstorm	Hail extent can be defined by the size of the hail stone. The largest hail stone reported in Warren County was 2.0 inches (reported on April 15, 1999). 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. The greatest classification of hurricane to traverse within 75 miles of the Tar River Region was Hurricane Hazel in 1954, which reached a maximum wind speed of 110 knots (Category 3) in the region. Although the county is much more likely to be impacted by the remnants of a hurricane or tropical storm, it is possible that a storm can impact the county directly.
Lightning	According to the Vaisala flash density map, Warren County is located in an area that experiences 2 to 8 lightning flashes per square kilometer per year. It should be noted that future lightning occurrences may exceed these figures.
Nor'easter	Major occurrences of a nor'easter tend to happen rarely in Warren County, but there are several events that give some indication of the potential winds and precipitation that might impact the county. Based on these past events, it is likely that wind speeds of 70 mph could be reached and snowfall of around 2 feet could be left on the ground.
Severe Thunderstorm/ High Wind	Thunderstorm extent is defined by the number of thunder events and wind speeds reported. According to a 60-year history from the National Climatic Data Center, the strongest recorded wind event in Warren County was reported on March 7, 2004 at 55 knots (approximately 63 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 as well as the Fujita/Enhanced Fujita Scale. The greatest magnitude reported in the county was an F2 (last reported on October 2, 1969). It should be noted that an EF5 tornado is possible.
Winter Storm and Freeze	The extent of winter storms can be measured by the amount of snowfall received (in inches). The greatest 24-hour snowfall reported in Warren County was 15.0 inches on February 1, 1948. Due to unpredictable variations in snowfall throughout the county, extent totals will vary for each participating jurisdiction and reliable data on snowfall totals is not abundantly available.
Geologic Hazards	
Earthquake	Earthquake extent can be measured by the Richter Scale, the Modified Mercalli Intensity (MMI) scale, and the distance of the epicenter from Warren County. According to data provided by the National Geophysical Data Center, the greatest earthquake to impact the county had a MMI of V (slightly strong) and a Richter Scale magnitude of 4.3 (reported on November 20, 1969). The epicenter of this earthquake was located 275.0 km away.

Hydrologic Hazards	
Dam and Levee Failure	Dam failure extent is defined using the North Carolina Division of Energy, Mineral, and Land Resources criteria. Of the four dams in Warren County, none are classified as high-hazard.
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 8.9 percent of the total land area in Warren County. It should also be noted that local officials recall flooding depths of at least 3-5 feet in some historic events and this is loosely corroborated by NCDC narrative records. Flood depth and velocity are recorded via United States Geological Survey stream gages throughout the county. The greatest peak discharge recorded for the county was reported in January 1954. Water reached a discharge of 5,300 cubic feet per second and the stream crest height was recorded at 23.17 feet.
Other Hazards	
Wildfire	Wildfire data was provided by the North Carolina Division of Forest Resources and is reported annually by county from 2005-2014. The greatest number of fires to occur in Warren County in any year was 75 in 2001. The greatest number of acres to burn in the county in a single year occurred in 2011 when 2,094.0 acres were burned. Although this data lists the extent that has occurred, larger and more frequent wildfires are possible throughout the county.

Priority Risk Index Results

In order to draw some meaningful planning conclusions on hazard risk for Warren 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 5.16.2.

Table D.28 summarizes the degree of risk assigned to each category for all initially identified hazards based on the application of the PRI. Assigned risk levels were based on the detailed hazard profiles developed for this subsection as well as input from the Regional Hazard Mitigation Planning Team. The results were then used in calculating PRI values and making final determinations for the risk assessment.

TABLE D.28: SUMMARY OF PRI RESULTS FOR WARREN 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/Heat Wave	Possible	Minor	Large	More than 24 hours	Less than 1 week	**2.1**
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	Limited	Negligible	6 to 12 hours	Less than 6 hours	**2.4**
Nor'easter	Possible	Limited	Large	More than 24 hours	Less than 24 hours	**2.3**
Severe Thunderstorm/High Wind	Highly Likely	Critical	Moderate	6 to 12 hours	Less than 6 hours	**3.1**

Hazard	Category/Degree of Risk					
	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Tornado	Likely	Critical	Small	Less than 6 hours	Less than 6 hours	**2.7**
Winter Storm and Freeze	Highly Likely	Limited	Moderate	More than 24 hours	Less than 1 week	**2.8**
Geologic Hazards						
Earthquake	Possible	Minor	Moderate	Less than 6 hours	Less than 6 hours	**2.0**
Hydrologic Hazards						
Dam and Levee Failure	Unlikely	Critical	Small	Less than 6 hours	Less than 6 hours	**2.1**
Flood	Highly Likely	Limited	Small	6 to 12 hours	Less than 1 week	**2.8**
Other Hazards						
Wildfire	Highly Likely	Minor	Moderate	Less than 6 hours	Less than 1 week	**2.8**

D.2.15 Final Determinations on Hazard Risk

The conclusions drawn from the hazard profiling process for Warren County, including the PRI results and input from the Regional Hazard Mitigation Planning Team, resulted in the classification of risk for each identified hazard according to three categories: High Risk, Moderate Risk, and Low Risk (**Table D.29**). For purposes of these classifications, risk is expressed in relative terms according to the estimated impact that a hazard will have on human life and property throughout all of Warren County. A more quantitative analysis to estimate potential dollar losses for each hazard has been performed separately and is described in Section 6: *Vulnerability Assessment* and below in Section D.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 D.29: CONCLUSIONS ON HAZARD RISK FOR WARREN COUNTY

HIGH RISK	Severe Thunderstorm/High Wind Hurricane and Tropical Storm Winter Storm and Freeze Wildfire Flood Tornado
MODERATE RISK	Drought Hailstorm Lightning Nor'easter
LOW RISK	Extreme Heat/Heat Wave Dam and Levee Failure Earthquake

D.3 WARREN COUNTY VULNERABILITY ASSESSMENT

This subsection identifies and quantifies the vulnerability of Warren 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*.

D.3.1 Asset Inventory

Table D.30 lists the number of parcels, estimated number of structures, and the total assessed value of improvements for Warren County and its participating jurisdictions (study area of vulnerability assessment).[23]

TABLE D.30: IMPROVED PROPERTY IN WARREN COUNTY

Location	Number of Parcels	Estimated Number of Structures	Total Assessed Value of Improvements
Macon	112	112	$5,409,844
Norlina	644	793	$30,596,484

[23] 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.

Location	Number of Parcels	Estimated Number of Structures	Total Assessed Value of Improvements
Warrenton	680	808	$89,326,323
Unincorporated Area	22,260	19,324	$1,102,062,318
WARREN COUNTY TOTAL	**23,696**	**21,037**	**$1,227,394,969**

Table D.31 summarizes the critical facilities located in Warren County by type. The county government provided the data for this analysis. It should be noted that while some jurisdictions may not have any facilities of a particular type identified, this does not imply that these types of facilities do not exist within that jurisdiction. It simply means that those facilities have not been identified as critical facilities. Communities are encouraged to focus on their most vital critical facilities in this analysis and, as such, different counties and communities often vary in terms of what is classified as a critical facility.

In addition, **Figure D.13** shows the locations of these critical facilities in Warren County. **Table D.51**, at the end of this subsection, shows a complete list of the critical facilities by name as well as the hazards that affect each facility. As noted previously, this list is not all-inclusive and only includes information provided by the county.

TABLE D.31: CRITICAL FACILITY INVENTORY IN WARREN COUNTY

Location	Airports	EMS/Rescue Stations	Emergency Operations Centers	Fire Stations	Government Administration Facilities
Macon	0	0	0	1	0
Norlina	0	0	0	1	0
Warrenton	0	0	0	1	2
Unincorporated Area	0	3	1	11	6
WARREN COUNTY TOTAL	**0**	**3**	**1**	**14**	**8**

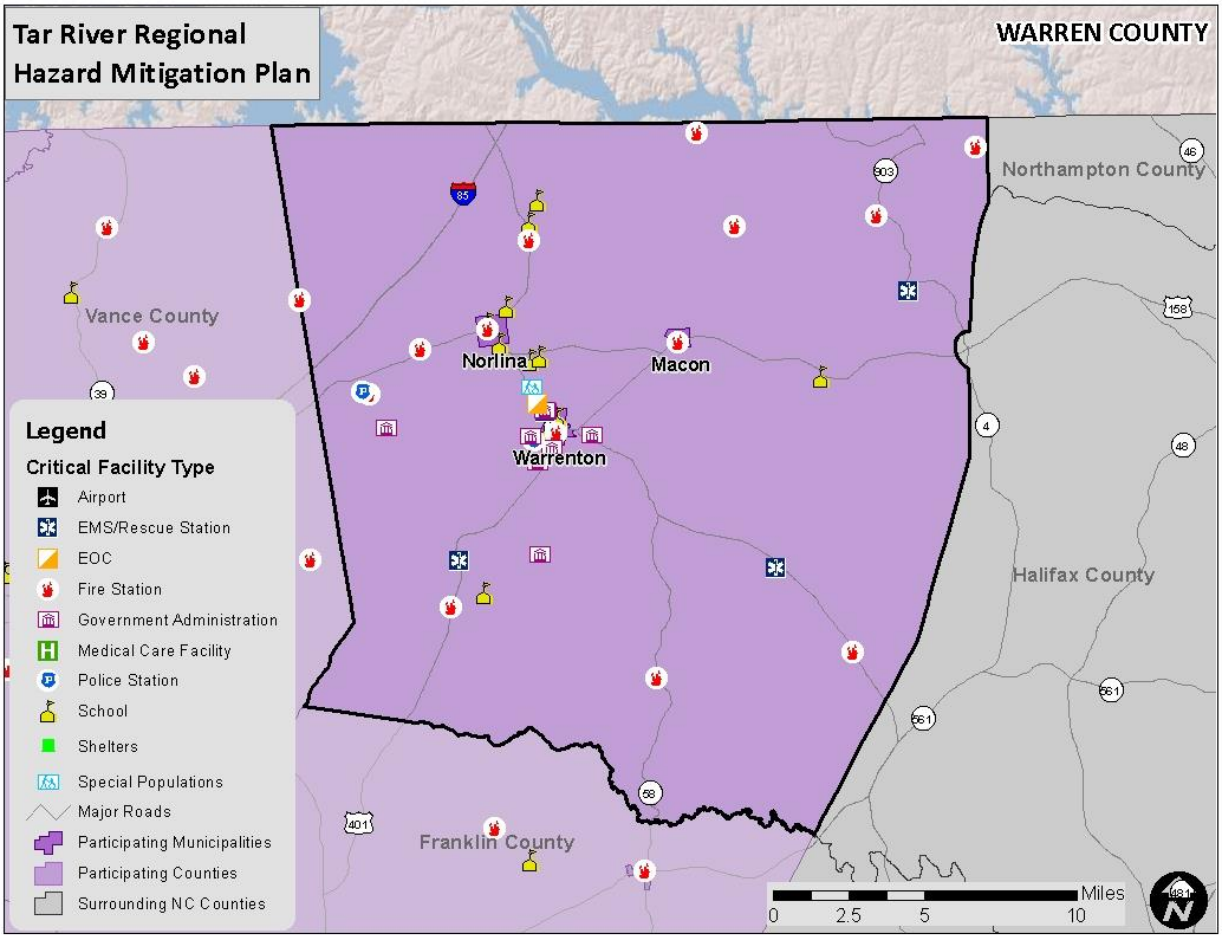
Source: Local Governments

TABLE D.31: CRITICAL FACILITY INVENTORY IN WARREN COUNTY (CONT.)

Location	Medical Care Facilities	Police Stations	Schools	Shelters	Special Populations
Macon	0	0	0	0	0
Norlina	0	0	2	0	0
Warrenton	0	1	3	0	0
Unincorporated Area	0	2	7	0	1
WARREN COUNTY TOTAL	**0**	**3**	**12**	**0**	**1**

Source: Local Governments

FIGURE D.13: CRITICAL FACILITY LOCATIONS IN WARREN COUNTY



Source: Local Governments

D.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 Warren County that are potentially at risk to these hazards.

Table D.32 lists the population by jurisdiction according to the 2010 U.S. Census. The total population in Warren County according to Census data is 20,972 persons. Additional population estimates are presented above in Section D.1.

TABLE D.32: TOTAL POPULATION IN WARREN COUNTY

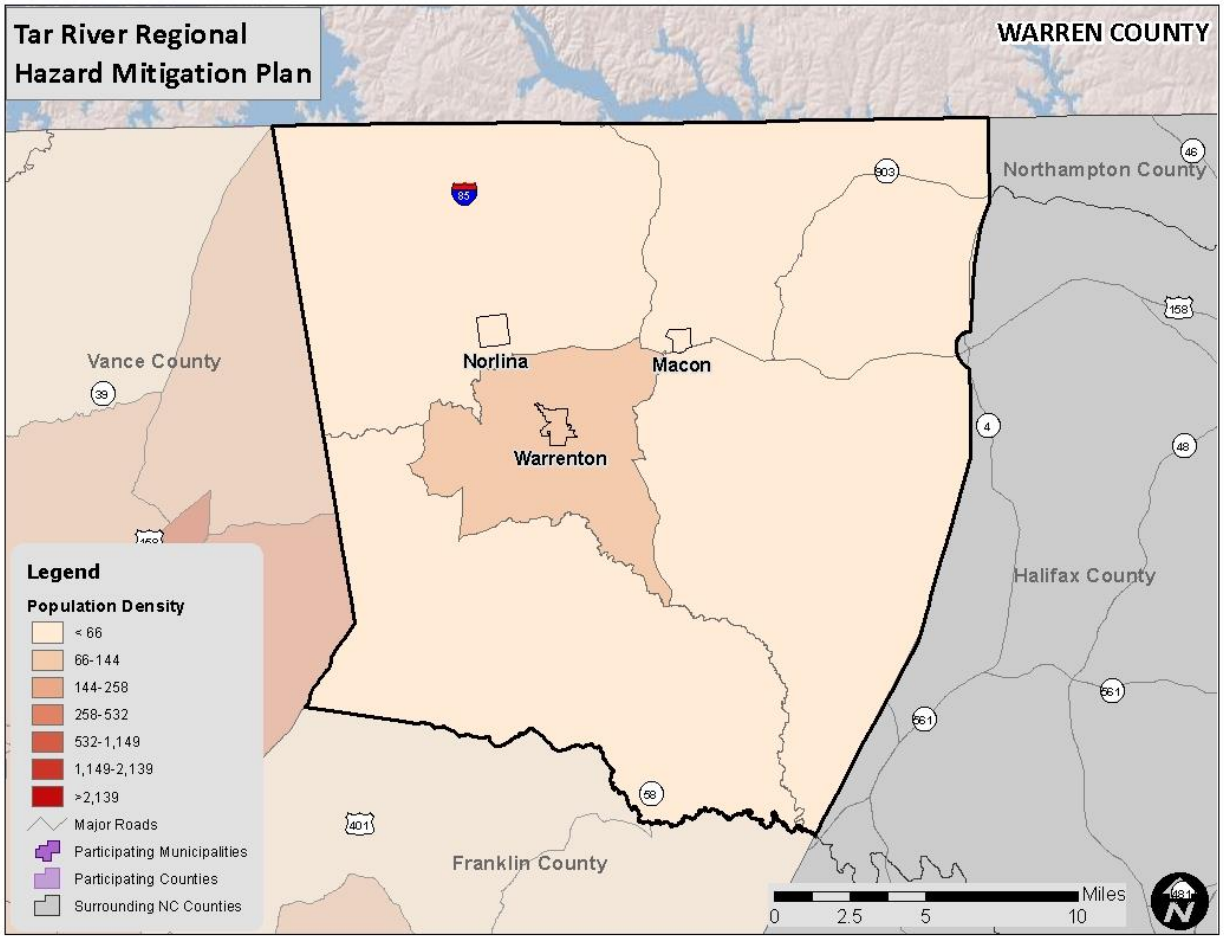
Jurisdiction	Total Population (2010)
Warren County	**20,972**
Town of Macon	119
Town of Norlina	1,118

Jurisdiction	Total Population (2010)
Town of Warrenton	862

Source: United States Census Bureau, 2010 Census

In addition, **Figure D.14** illustrates the population density by census tract as it was reported by the 2010 U.S. Census.

FIGURE D.14: POPULATION DENSITY IN WARREN COUNTY



Source: United States Census Bureau, 2010 Census

D.3.3 Development Trends and Changes in Vulnerability

Since the previous county hazard mitigation plan was approved (in 2012), Warren County has experienced limited growth and development. **Table D.33** shows the number of building units constructed since 2010 according to the U.S. Census American Community Survey (ACS).

TABLE D.33: BUILDING COUNTS FOR WARREN COUNTY

Jurisdiction	Total Housing Units (2014)	Units Built 2010 or later	% Building Stock Built Post-2010
Macon	70	0	0.0%
Norlina	570	0	0.0%
Warrenton	595	3	0.5%
Unincorporated Area	10,532	136	1.3%
WARREN COUNTY TOTAL	**11,767**	**139**	**1.2%**

Source: United States Census Bureau, 2010-2014 American Community Survey 5-Year Estimates

Table D.34 shows population growth estimates for the county from 2010 to 2014 based on the ACS 5-year estimates.

TABLE D.34: POPULATION GROWTH FOR WARREN COUNTY

Jurisdiction	Population Estimates					% Change 2010-2014
	2010	2011	2012	2013	2014	
Macon	564	165	199	164	118	-79.1%
Norlina	999	1,113	873	958	968	-3.1%
Warrenton	1,093	1,206	1,354	1,241	883	-19.2%
Unincorporated Area	18,154	18,398	18,434	18,429	18,659	2.8%
WARREN COUNTY TOTAL	**20,810**	**20,882**	**20,860**	**20,792**	**20,628**	**-0.9%**

Source: United States Census Bureau, 2005-2010, 2006-2011, 2007-2012, 2008-2013, 2009-2013, and 2010-2014 American Community Survey 5-Year Estimates

Based on the data above, there has been a relatively low rate of residential development and population growth in the county since 2010, and several municipalities have actually experienced population declines. However, the unincorporated area has experienced a higher rate of development compared to the rest of the county, resulting in an increased number of structures that are vulnerable to the potential impacts of the identified hazards. Additionally, there was a slightly higher rate of population growth in the unincorporated area. Since the population has increased in this jurisdiction, there are now greater numbers of people exposed to the identified hazards. Therefore, development and population growth have impacted the county's vulnerability since the previous local hazard mitigation plan was approved and there has been a slight increase in the overall vulnerability.

It is also important to note that as development increases in the future, greater populations and more structures and infrastructure will be exposed to potential hazards if development occurs in the floodplains, high wildfire risk areas, or any other known hazard areas.

D.3.4 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 Warren County, are presented here. All other hazards are assumed to impact the entire planning region (drought, extreme heat, hailstorm, lightning, nor'easter, and winter storm/freeze) or, due to lack of data, analysis would not lead to credible results (dam and levee failure). The total county exposure, and thus risk, was presented in **Table D.30**.

The annualized loss estimate for all hazards is presented near the end of this subsection in **Table D.50.**

The hazards presented in this subsection include: earthquake, flood, hurricane and tropical storm winds, severe thunderstorm/high wind, tornado, and wildfire.

Earthquake

Historical evidence indicates that any earthquake activity in the county is likely to inflict minor damage to the planning area. At least one earthquake is known to have affected Warren County since 1969 as discussed in Section D.2.10.

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 municipal 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, in the comparative annualized losses for the county presented near the end of this section in **Table D.50**, only losses to buildings are reported in order to best match annualized losses reported for the other hazards. **Table D.35** summarizes the findings.

TABLE D.35: HAZUS ANNUALIZED LOSS ESTIMATIONS FOR EARTHQUAKE HAZARD

Location	Structural Damage	Non-Structural Damage	Contents Damage	Inventory Loss	Total Annualized Loss
Warren County	$1,000	$3,000	$1,000	$0	$5,000

Source: Hazus-MH 2.2

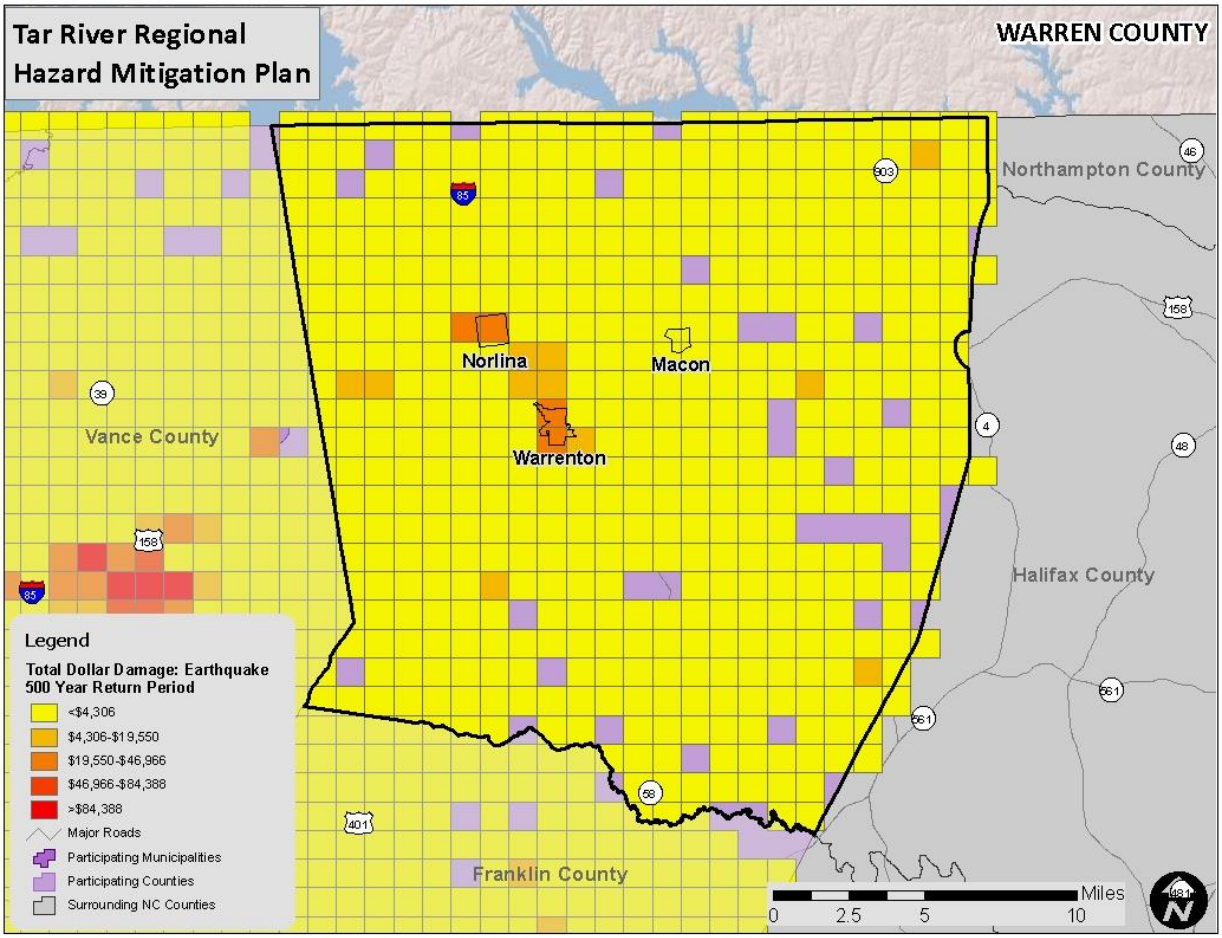
Additionally, data from the IHRM tool was included in the plan to compare to the Hazus analysis results and to provide a multi-faceted approach to potential risk loss estimates. For the earthquake hazard, the IHRM tool includes data on three different return period events: 500-year, 1,000-year, and 2,500-year events. For this plan, it was determined that the 500-year analysis provided the most useful estimates and the results of this analysis are provided below in **Table D.36** and shown in **Figure D.15**

TABLE D.36: IHRM/I-RISK 500-YEAR RETURN PERIOD LOSS ESTIMATIONS FOR EARTHQUAKE HAZARD

Jurisdiction	Potential Dollar Losses
Warren County	$427,728

Source: North Carolina Division of Emergency Management, Integrated Hazard Risk Management Tool

FIGURE D.15: TOTAL DOLLAR DAMAGE FROM 500-YEAR RETURN PERIOD EARTHQUAKE



Source: North Carolina Division of Emergency Management, Integrated Hazard Risk Management Tool

Social Vulnerability

It can be assumed that all existing future populations are at risk to the earthquake hazard though it should be noted that since damage is more damage is likely to occur in urbanized areas, there may be a higher potential for social impacts in these areas as well.

Critical Facilities

The Hazus probabilistic analysis indicated that no critical facilities would sustain measurable damage in an earthquake event. However, all critical facilities should be considered at-risk to minor damage should an event occur. A list of individual critical facilities and their risk can be found in **Table D.51** at the end of this subsection.

In conclusion, an earthquake has the potential to impact all existing and future buildings, facilities, and populations in Warren County. Minor earthquakes may rattle dishes and cause minimal damage while stronger earthquakes could possibly result in some 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. Although such site-specific vulnerability determinations are outside the scope of this assessment, the IHRM data contains useful information on

where the impacts and dollar losses from an earthquake event will likely be concentrated. Site specific analysis will be considered during future plan updates if data becomes available.

Flood

Historical evidence indicates that Warren County is susceptible to flood events. A total of 16 flood events have been reported by the National Climatic Data Center, but no claims have been made through the National Flood Insurance Program since its inception in 1978.

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 and state-level building footprint data for Warren County. The determination of assessed value at-risk (exposure) was calculated using GIS analysis by summing the total assessed building values for only those improved properties that were confirmed to be located within an identified floodplain. **Table D.37** presents the potential at-risk property. The number of parcels, structures, and the approximate improved value are presented.

TABLE D.37: ESTIMATED EXPOSURE OF PARCELS TO THE FLOOD HAZARD

Location	1.0-percent ACF			0.2-percent ACF		
	Approx. Number of Parcels	Approx. Number Structures	Approx. Improved Value of Structures	Approx. Number of Parcels	Approx. Number Structures	Approx. Improved Value of Structures
Macon	0	0	$0	0	0	$0
Norlina	0	0	$0	0	0	$0
Warrenton	0	0	$0	0	0	$0
Unincorporated Area	56	71	$6,529,532	1	1	$109,504
Macon	0	0	$0	0	0	$0
Norlina	0	0	$0	0	0	$0
WARREN COUNTY TOTAL	**56**	**71**	**$6,529,532**	**1**	**1**	**$109,504**

Source: Federal Emergency Management Agency DFIRM

Additionally, data from the IHRM tool was included in the plan to compare to the floodplain analysis results and to provide a multi-faceted approach to potential risk loss estimates. For the flood hazard, the IHRM tool includes data on five different return period events: 10-year, 25-year, 50-year, 100-year, and 500-year events. However, it should be noted that several of the return period events (i.e., 10-year, 25-year, 50-year, and 500-year) do not yet have data available for every county. Therefore, for this plan, it was determined that the 100-year analysis provided the most useful estimates, and the results of this analysis are provided below in **Table D.38** and shown in **Figure D.16**.

TABLE D.38: IHRM/I-RISK 100-YEAR RETURN PERIOD LOSS ESTIMATIONS FOR FLOOD HAZARD

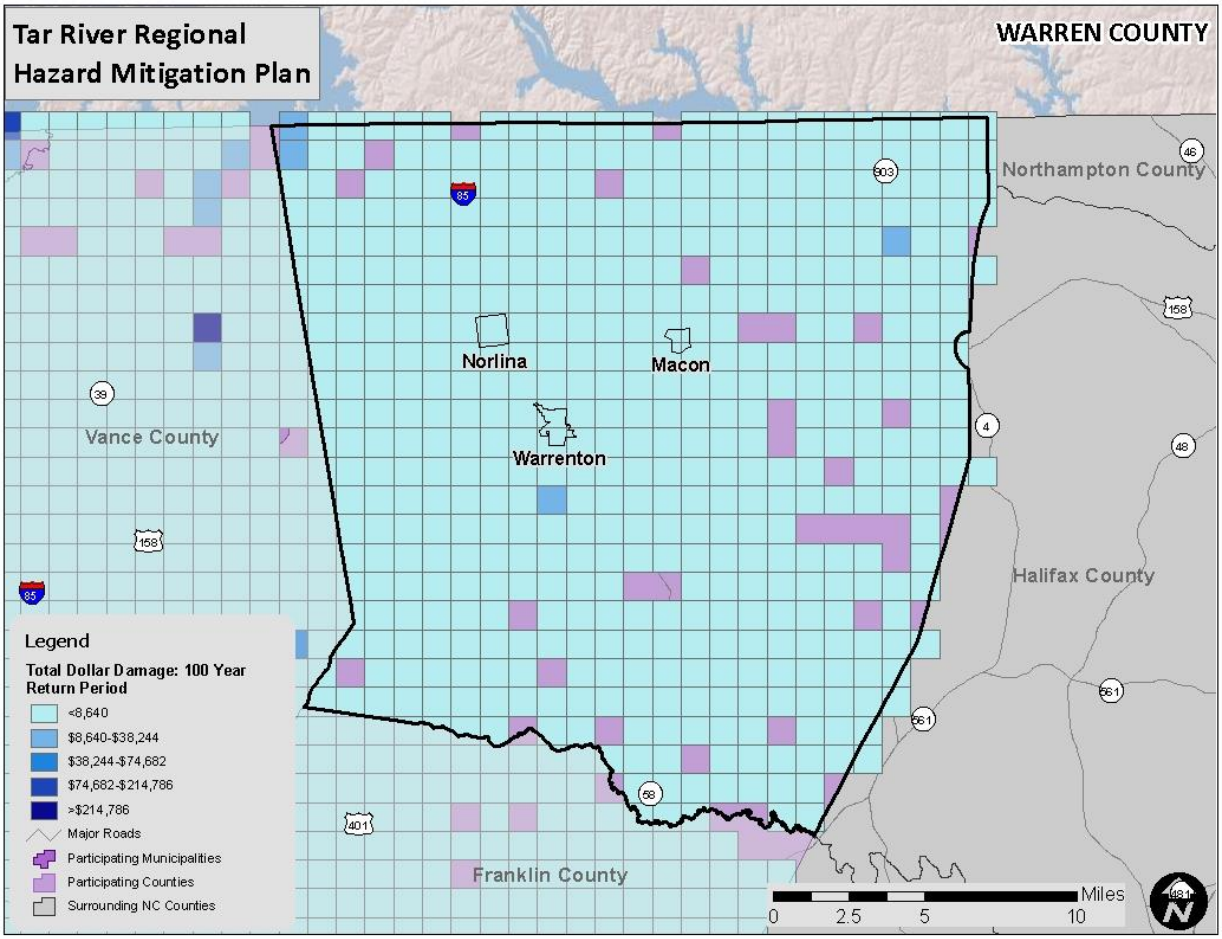
Jurisdiction	Potential Dollar Losses
Warren County	$112,721

Source: North Carolina Division of Emergency Management, Integrated Hazard

Jurisdiction	Potential Dollar Losses

Risk Management Tool

FIGURE D.16: TOTAL DOLLAR DAMAGE FROM 100-YEAR RETURN PERIOD FLOOD

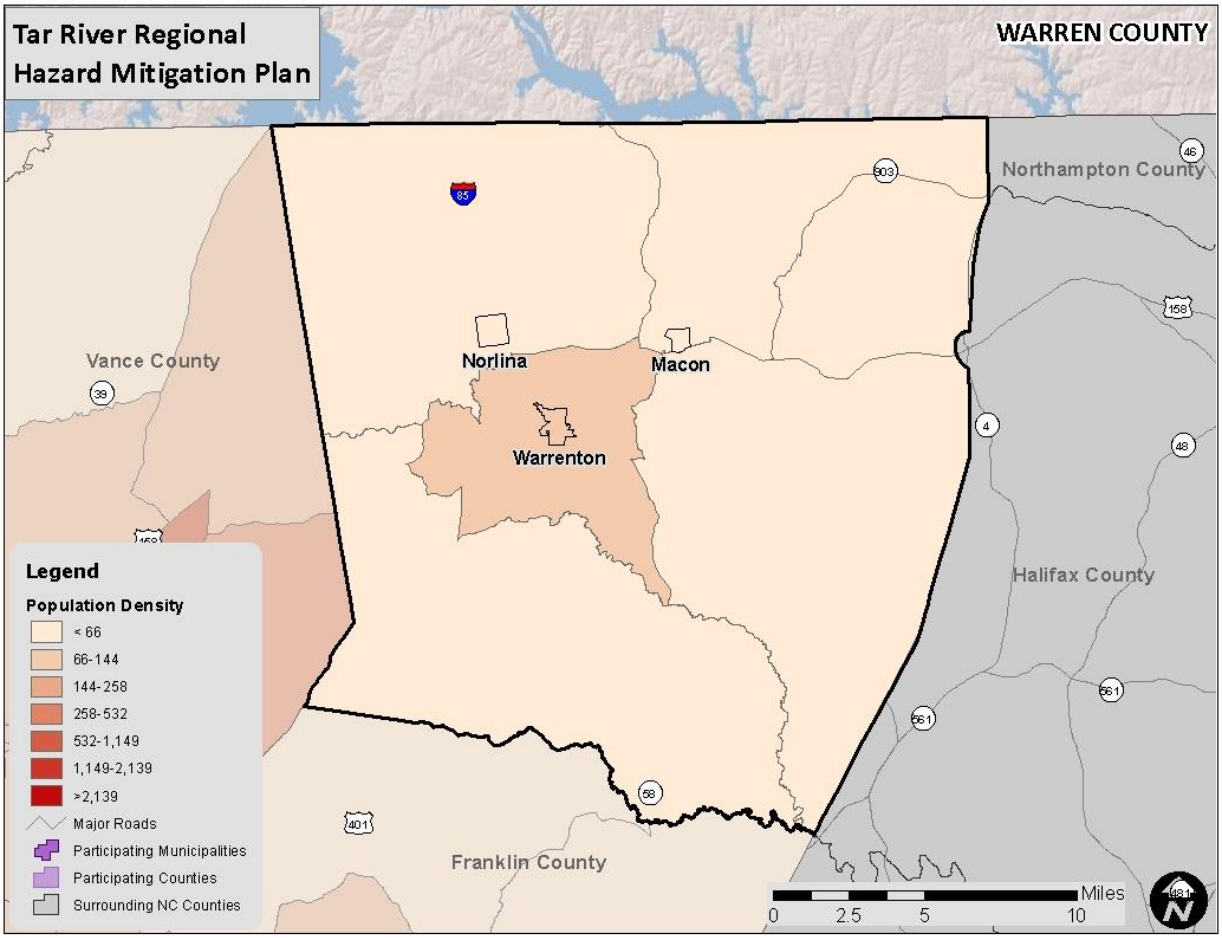


Source: North Carolina Division of Emergency Management, Integrated Hazard Risk Management Tool

Social Vulnerability

Population data from the 2010 Census was utilized at the tract level and overlaid with the flood hazard data to give an estimate of the potentially vulnerable population to flooding. **Figure D.17** is presented to gain a better understanding of at risk population.

FIGURE D.17: POPULATION DENSITY NEAR FLOODPLAINS



Source: Federal Emergency Management Agency DFIRM; United States Census Bureau, 2010 Census

Critical Facilities

The critical facility analysis revealed that there are no critical facilities located in the Warren 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 **Table D.51** at the end of this subsection.

In conclusion, a flood has the potential to impact many existing and future buildings, facilities, and populations in Warren 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.

Hurricane and Tropical Storm

Historical evidence indicates that Warren County has a significant risk to the hurricane and tropical storm hazard. There have been four disaster declarations due to hurricanes (Hurricane Fran, Hurricane

Floyd, Hurricane Isabel, and Hurricane Irene) in the county. Several tracks have come near or traversed through Warren County as shown and discussed in Section D.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 piece of the analysis. It can be assumed that all existing and future buildings and populations are at risk to the hurricane and tropical storm hazard.

Hazus-MH 2.2 was used to determine annualized losses for the county as shown below in **Table D.39.** Hazus-MH reports losses at the U.S. Census tract level, so determining losses at the municipal level was not possible. Losses reported include losses to building, contents, and inventory. However, like the analysis for tornadoes, the comparative annualized loss figures presented near the end of this section in **Table D.50** only utilize building losses in order to provide consistency with the other hazards.

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

Location	Building Damage	Contents Damage	Inventory Loss	Total Annualized Loss
Warren County	$189,000	$75,000	$0	$264,000

Source: Hazus-MH 2.2

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

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

Location	50-year event	100-year event	500-year event	1,000-year event
Macon	69.9	78.4	93.5	99.7
Norlina	67.5	75.3	91.1	97.4
Warrenton	68.6	76.7	92.0	98.2
Unincorporated Area	69.9	78.4	93.5	99.7
MAXIMUM WIND SPEED REPORTED	**69.9**	**78.4**	**93.5**	**99.7**

Source: Hazus-MH 2.2

In addition to Hazus analysis, data from the IHRM tool was included in the plan to compare results and to provide a multi-faceted approach to potential risk loss estimates. For the hurricane/tropical storm hazard, the IHRM tool includes data on five different return period events: 25-year, 50-year, 100-year, 300-year, and 700-year. For this plan, it was determined that the 25-year and 100-year analysis provided the most useful estimates. The results of this analysis are provided below in **Table D.41** and **Table D.42** and shown in **Figure D.18**.

TABLE D.41: IHRM/I-RISK 25-YEAR RETURN PERIOD LOSS ESTIMATIONS FOR HURRICANE/TROPICAL STORM HAZARD

Jurisdiction	Potential Dollar Losses
Warren County	$1,332,722

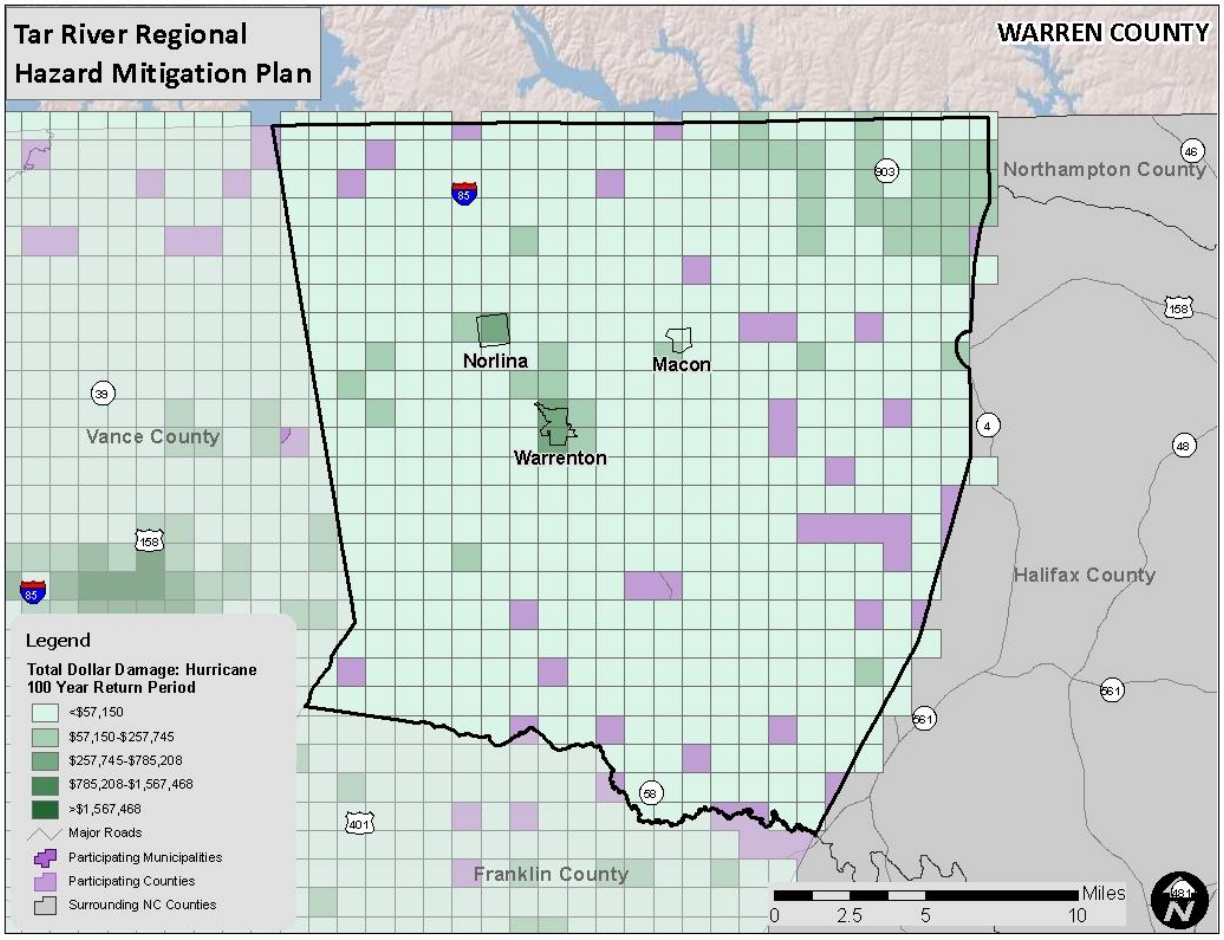
Source: North Carolina Division of Emergency Management, Integrated Hazard Risk Management Tool

TABLE D.42: IHRM/I-RISK 100-YEAR RETURN PERIOD LOSS ESTIMATIONS FOR HURRICANE/TROPICAL STORM HAZARD

Jurisdiction	Potential Dollar Losses
Warren County	$10,784,495

Source: North Carolina Division of Emergency Management, Integrated Hazard Risk Management Tool

FIGURE D.18: TOTAL DOLLAR DAMAGE FROM 100-YEAR RETURN PERIOD HURRICANE/TROPICAL STORM



Source: North Carolina Division of Emergency Management, Integrated Hazard Risk Management Tool

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

Critical Facilities
Given equal vulnerability across Warren County, all critical facilities are considered to be at risk. Some buildings may perform better than others in the face of such an event due to construction and age among other factors. Determining individual building response is beyond the scope of this plan. However, this plan will consider mitigation actions for vulnerable structures, including critical facilities, to reduce the impacts of the hurricane wind hazard. A list of specific critical facilities and their associated risk can be found in **Table D.51** at the end of this subsection.

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

Severe Thunderstorm/High Wind
Due to the pervasive and unpredictable nature of thunderstorms, it can be difficult to estimate potential losses that result from this hazard. Nevertheless, there have been substantial damages caused by thunderstorms in Warren County, so there is unquestionably a significant risk to these events.

Using the IHRM tool, the planning team was able to get a rough estimate of potential dollar damages from a number of return period events. During the plan development process, it was determined that the impacts from a 25-year, 50-year, and 100-year return period event would provide useful results for the planning team to make decisions about potential risk and mitigation strategies to reduce that risk. These potential damages are outlined in **Table D.43**, **Table D.44**, and **Table D.45**. Additionally, **Figure D.19** shows the geographic breakdown of where these damages are most likely to occur from a 100-year return period event.

TABLE D.43: IHRM/I-RISK 25-YEAR RETURN PERIOD LOSS ESTIMATIONS FOR THUNDERSTORM HAZARD

Jurisdiction	Potential Dollar Losses
Warren County	$4,701,812

Source: North Carolina Division of Emergency Management, Integrated Hazard Risk Management Tool

TABLE D.44: IHRM/I-RISK 50-YEAR RETURN PERIOD LOSS ESTIMATIONS FOR THUNDERSTORM HAZARD

Jurisdiction	Potential Dollar Losses
Warren County	$7,556,623

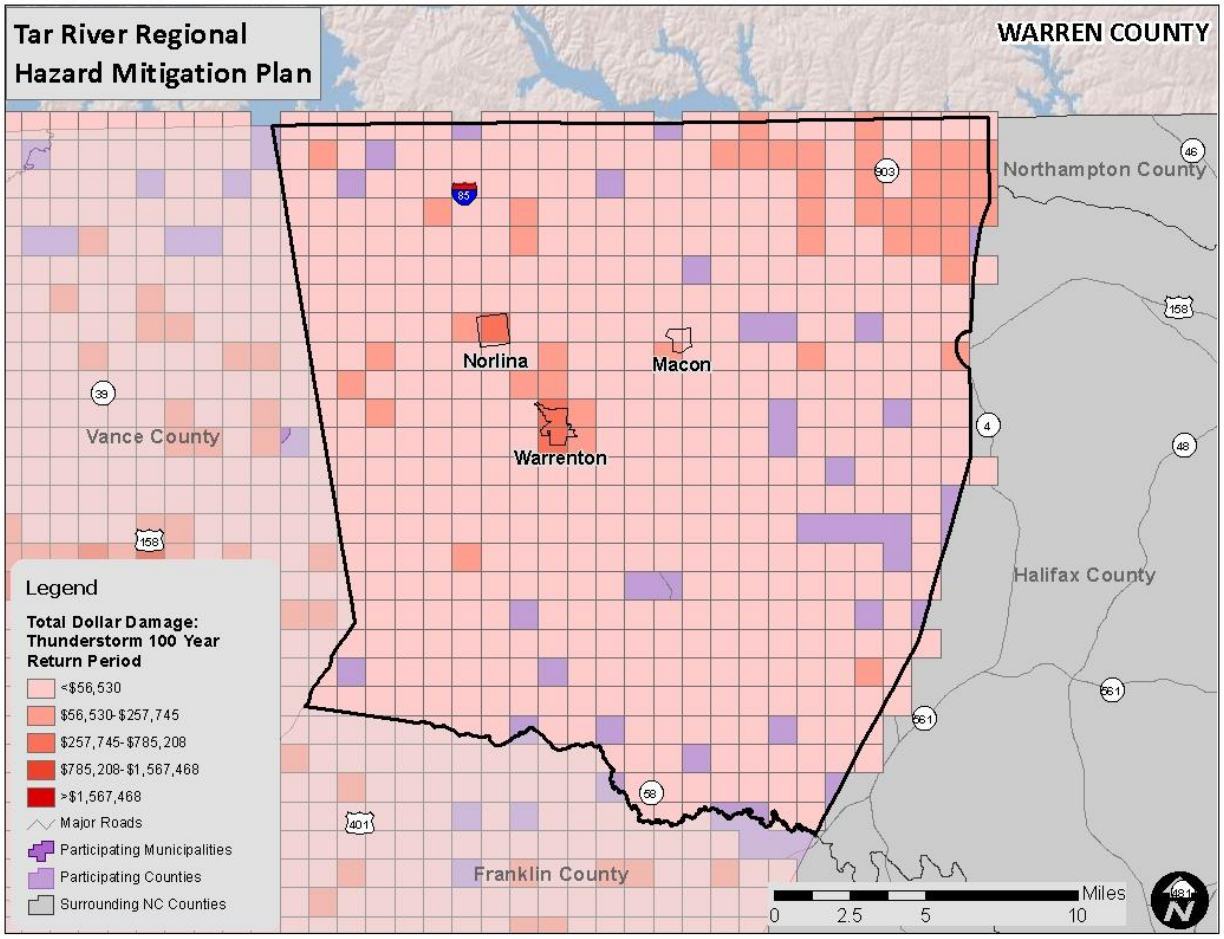
Source: North Carolina Division of Emergency Management, Integrated Hazard Risk Management Tool

TABLE D.45: IHRM/I-RISK 100-YEAR RETURN PERIOD LOSS ESTIMATIONS FOR THUNDERSTORM HAZARD

Jurisdiction	Potential Dollar Losses
Warren County	$11,578,297

Source: North Carolina Division of Emergency Management, Integrated Hazard Risk Management Tool

FIGURE D.19: TOTAL DOLLAR DAMAGE FROM 100-YEAR RETURN PERIOD THUNDERSTORM



Source: North Carolina Division of Emergency Management, Integrated Hazard Risk Management Tool

Social Vulnerability

Given equal susceptibility across the entire county, it is assumed that the total population is at risk to the severe thunderstorm/high wind hazard.

Critical Facilities

All facilities are potentially at risk to hazards such as thunderstorm that have widespread and unpredictable locational impacts. A list of specific critical facilities and their associated risk can be found in **Table D.51** at the end of this subsection.

In conclusion, a severe thunderstorm/high wind event has the potential to impact many existing and future buildings, critical facilities, and populations in Warren County.

Tornado

Tornadoes are extremely unpredictable events that can occur just about anywhere, but they tend to occur in areas with flat terrain and open spaces. Given the unpredictability of this type of event, it is often difficult to estimate potential losses.

Nevertheless, using data from the IHRM tool, it is possible to make an estimation of potential losses from this type of event due to a number of different categories of tornado based on the Enhanced Fujita scale (discussed in Section 5). The tool estimates losses for each of the six categories of tornado (EF0 to EF5) that might impact the county. In this plan, it was determined that it would be useful to include potential losses from an EF1 and EF3 tornado. The results of this analysis can be found below in **Table D.46**, **Table D.47**, and **Figure D.20**.

TABLE D.46: IHRM/I-RISK EF1 LOSS ESTIMATIONS FOR TORNADO HAZARD

Jurisdiction	Potential Dollar Losses
Warren County	$1,080,007,984

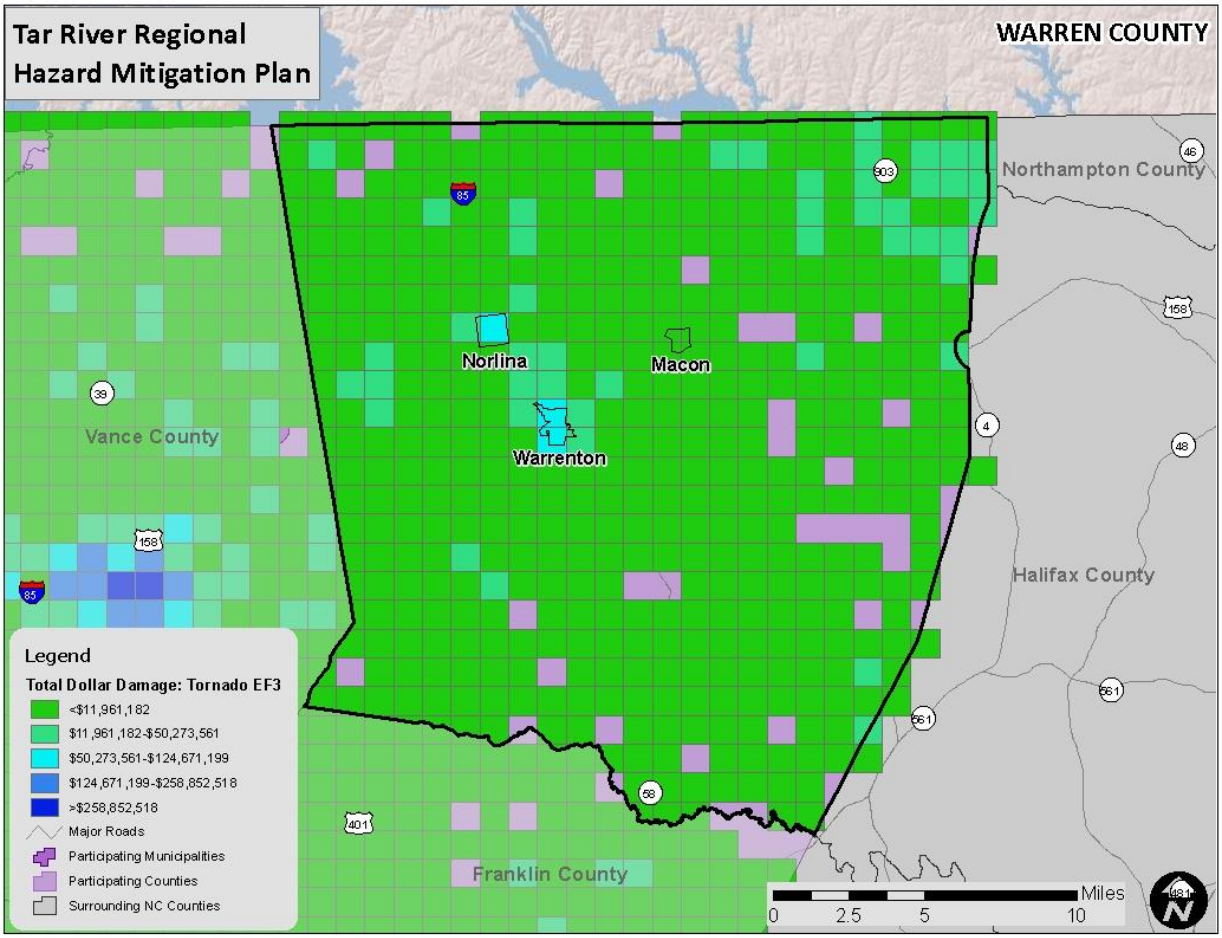
Source: North Carolina Division of Emergency Management, Integrated Hazard Risk Management Tool

TABLE D.47: IHRM/I-RISK EF3 LOSS ESTIMATIONS FOR TORNADO HAZARD

Jurisdiction	Potential Dollar Losses
Warren County	$2,554,812,027

Source: North Carolina Division of Emergency Management, Integrated Hazard Risk Management Tool

FIGURE D.20: TOTAL DOLLAR DAMAGE FROM AN EF3 TORNADO



Source: North Carolina Division of Emergency Management, Integrated Hazard Risk Management Tool

Social Vulnerability

Given equal susceptibility across the entire county, it is assumed that the total population is at risk to the tornado hazard.

Critical Facilities

All facilities are potentially at risk to hazards such as tornadoes that have unpredictable locational impacts. A list of specific critical facilities and their associated risk can be found in **Table D.51** at the end of this subsection.

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

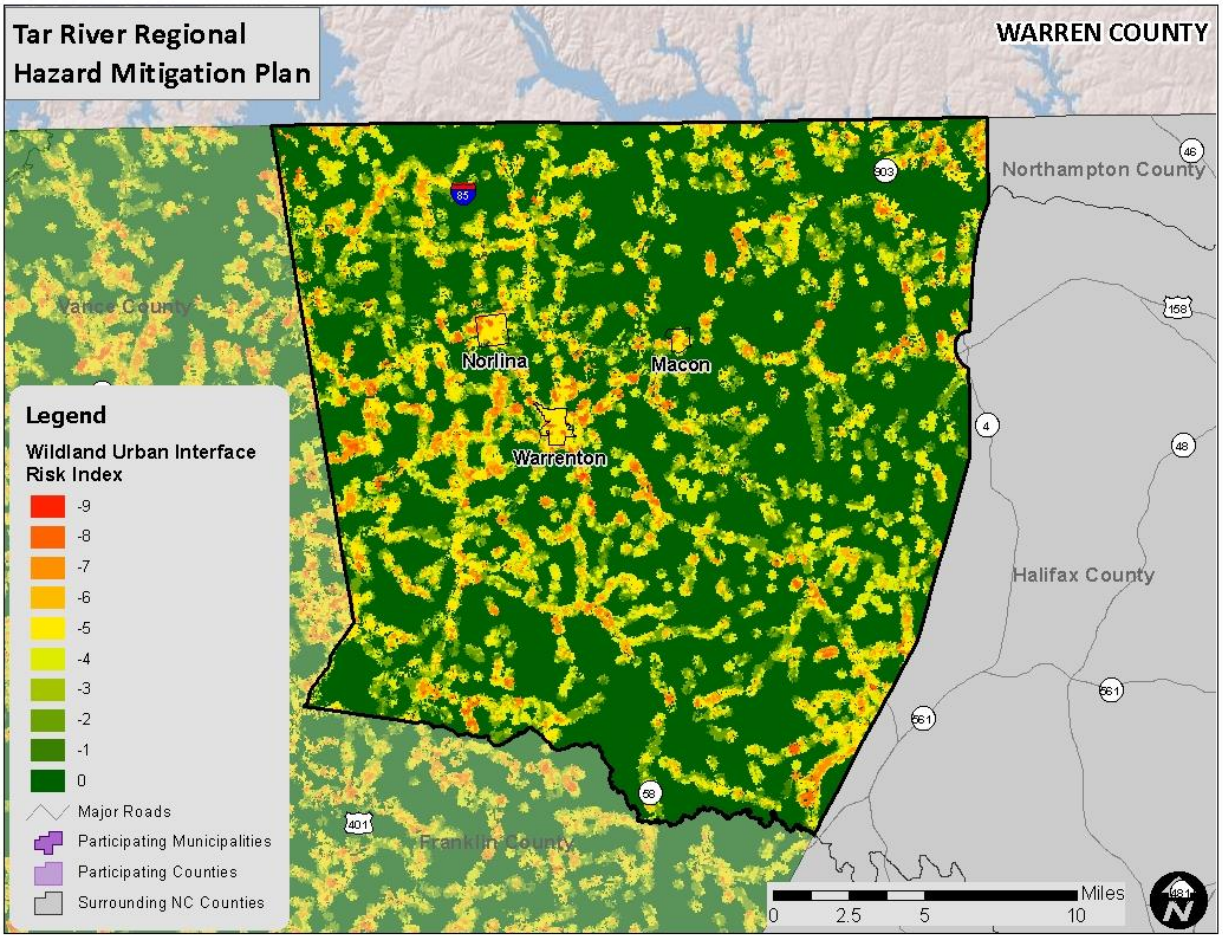
Wildfire

Although historical evidence indicates that Warren County is susceptible to wildfire events, there are few reports of damage. Therefore, it is difficult to calculate a reliable annualized loss figure. Annualized loss is considered negligible though it should be noted that a single event could result in significant damages throughout the county.

To estimate exposure to wildfire, the approximate number of parcels and their associated improved value was determined using GIS analysis. For the critical facility analysis, areas of risk were intersected with critical facility locations. **Figure D.21** shows the Wildland Urban Interface Risk Index (WUIRI) data, which is a data layer that shows a rating of the potential impact of a wildfire on people and their homes. The key input, Wildland Urban Interface (WUI), reflects housing density (houses per acre) consistent with Federal Register National standards. The location of people living in the WUI and rural areas is key information for defining potential wildfire impacts to people and homes. Initially provided as raster data, it was converted to a polygon to allow for analysis. The Wildland Urban Interface Risk Index data ranges from 0 to -9 with lower values being most severe (as noted previously, this is only a measure of relative risk). **Figure D.22** shows the areas of analysis where any grid cell is less than -5. Areas with a value below -5 were chosen to be displayed as areas of risk because this showed the upper echelon of the scale and the areas at highest risk.

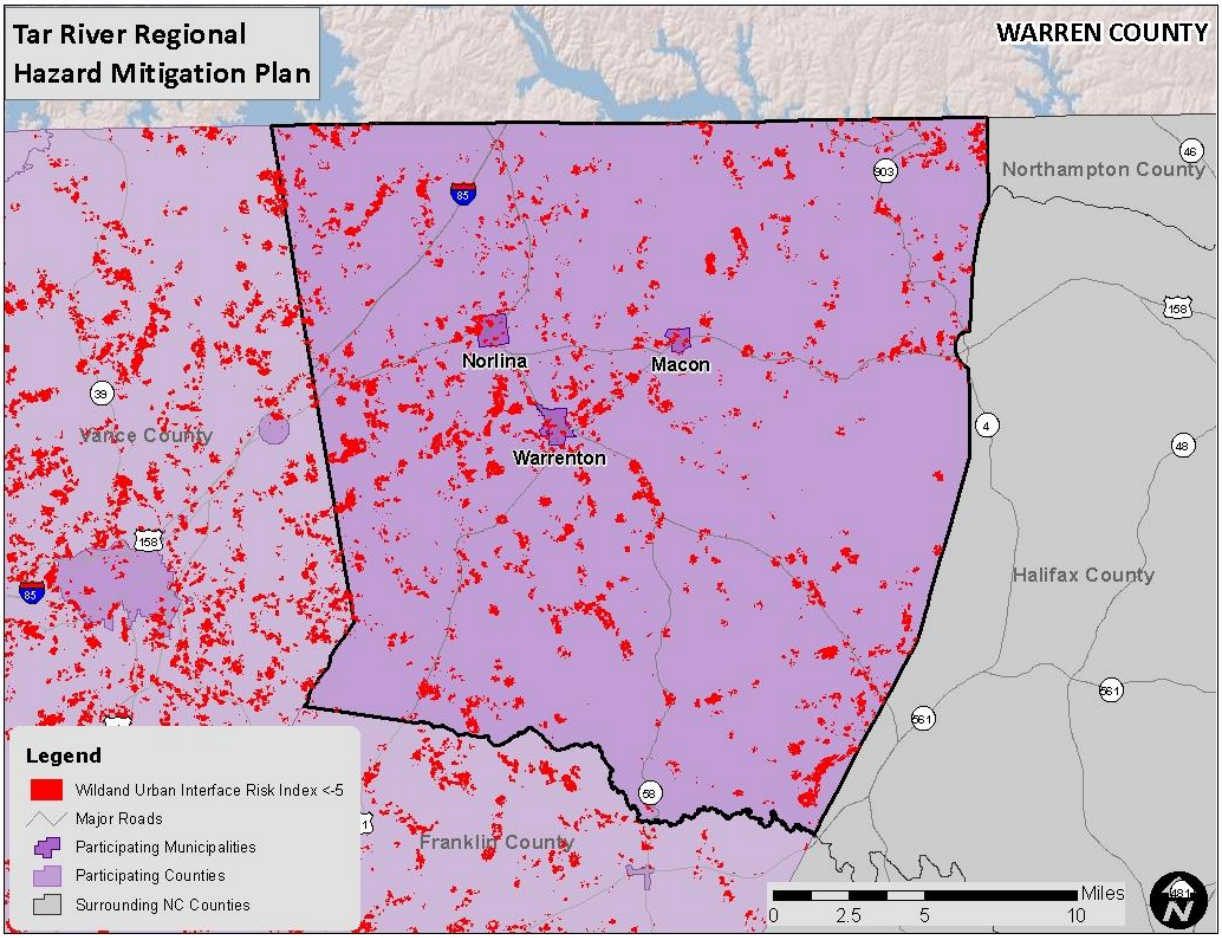
Table D.48 shows the results of the analysis.

FIGURE D.21: WUI RISK INDEX AREAS IN WARREN COUNTY



Source: Southern Wildfire Risk Assessment Data

FIGURE D.22: WILDFIRE RISK AREAS IN WARREN COUNTY



Source: Southern Wildfire Risk Assessment Data

TABLE D.48: EXPOSURE OF IMPROVED PROPERTY TO WILDFIRE AREAS OF CONCERN

Location	High Wildfire Risk Area		
	Approx. Number of Parcels	Approx. Number Structures	Approx. Improved Value of Structures
Macon	22	27	$787,779
Norlina	126	182	$12,022,608
Warrenton	70	92	$15,604,556
Unincorporated Area	2,098	3,070	$179,415,648
WARREN COUNTY TOTAL	**2,316**	**3,371**	**$207,830,591**

Source: Southern Wildfire Risk Assessment Data

Wildfires can occur anywhere but are generally most threatening when they occur near personal property and infrastructure. Since wildfires typically begin in non-urbanized areas and become a threat when they migrate towards urbanized areas where people work and live, the wildland urban interface is often the area that is most threatened by wildfire and is the area that is normally impacted most in

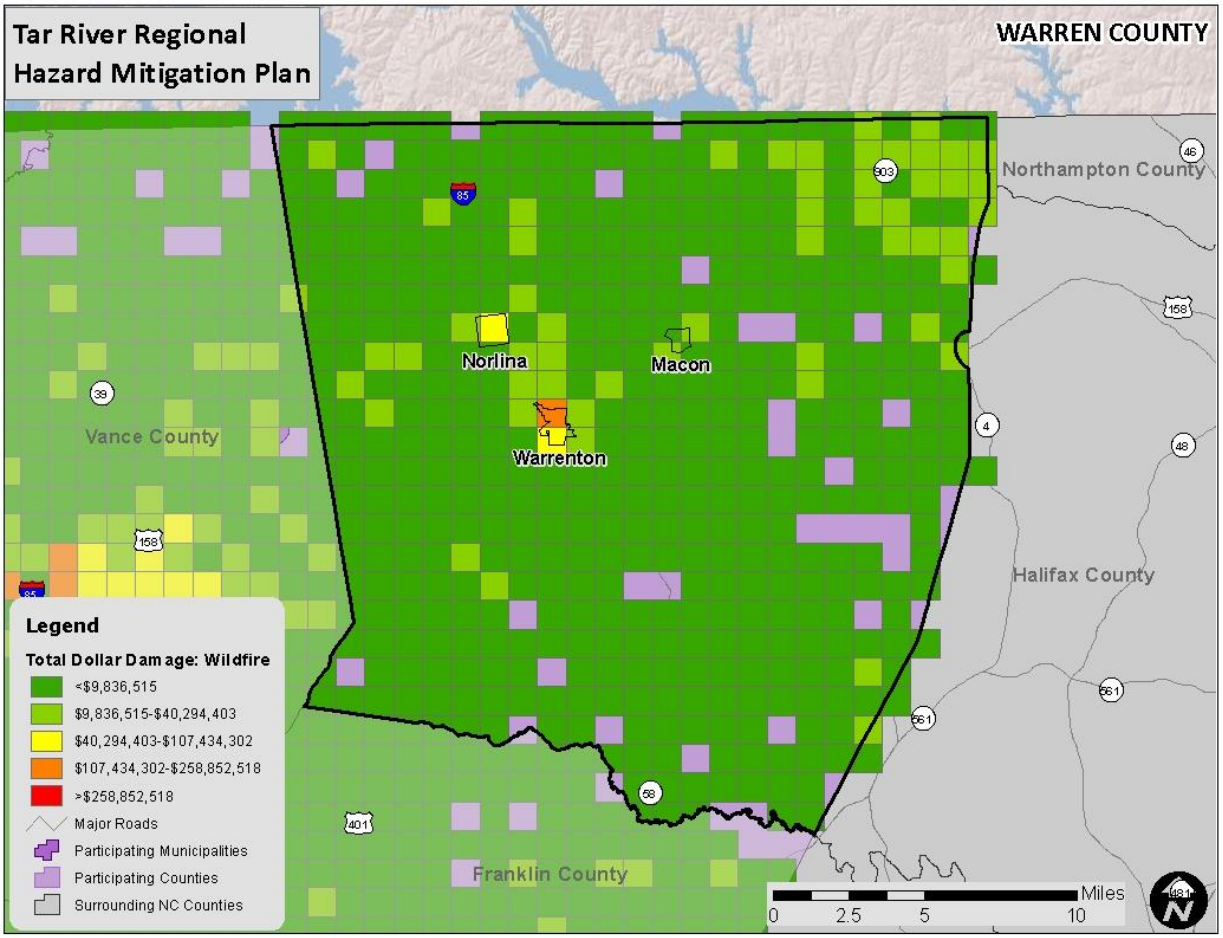
terms of dollar damages. Using data from the IHRM tool, it is possible to make an estimation of potential losses from this type of event. The tool estimates potential losses for a significant wildfire event that takes place within the county, and the results of this analysis can be found below in **Table D.49** and **Figure D.23**.

TABLE D.49: IHRM/I-RISK LOSS ESTIMATIONS FOR SIGNIFICANT WILDFIRE

Jurisdiction	Potential Dollar Losses
Warren County	$2,440,392,959

Source: North Carolina Division of Emergency Management, Integrated Hazard Risk Management Tool

FIGURE D.23: TOTAL DOLLAR DAMAGE FROM SIGNIFICANT WILDFIRE



Source: North Carolina Division of Emergency Management, Integrated Hazard Risk Management Tool

Social Vulnerability

Although not all areas have equal vulnerability, there is some susceptibility across the entire county. It is assumed that the total population is at risk to the wildfire hazard. Determining the exact number of people in certain wildfire zones is difficult with existing data and could be misleading.

Critical Facilities

The critical facility analysis revealed that there are nine critical facilities located in wildfire areas of concern. This includes one EMS/rescue station, one EOC, two fire stations, three government administration buildings, and two schools. It should be noted, however, that several factors could impact the spread of a wildfire putting all facilities at risk. A list of specific critical facilities and their associated risk can be found in **Table D.51** at the end of this subsection.

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

Conclusions on Hazard Vulnerability

Table D.50 presents a summary of annualized loss for each hazard in Warren 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, an annualized loss was determined through the damage reported through historical occurrences at the county level. These values should be used as an additional planning tool or measure risk for determining hazard mitigation strategies throughout the region.

TABLE D.50: ANNUALIZED LOSS FOR WARREN COUNTY

Event	Warren County
Atmospheric Hazards	
Drought	Negligible
Extreme Heat/Heat Wave	Negligible
Hailstorm	$1,741
Hurricane and Tropical Storm†	$189,000
Lightning	$345
Nor'easter	Negligible
Severe Thunderstorm/ High Wind	$12,423
Tornado	$70,835
Winter Storm and Freeze	$40,139
Geologic Hazards	
Earthquake†	$1,000
Hydrologic Hazards	
Dam and Levee Failure	Negligible
Flood††	$1,127
Other Hazards	
Wildfire	Negligible

*In this table, the term "Negligible" is used to indicate that no records of dollar losses for the particular hazard were recorded. This could be the case either because there were no events that caused dollar damage or because documentation of that particular type of event is not well kept.
†Annualized loss estimate for buildings only from Hazus.
†† Estimated using the IHRM Tool data for the 100-year return

Event	Warren County

period event.

As noted previously, all existing and future buildings and populations (including critical facilities) are vulnerable to atmospheric hazards including drought, extreme heat/heat wave, hailstorm, hurricane and tropical storm, lightning, nor'easter, severe thunderstorm/high wind, tornado, and winter storm and freeze. Some buildings may be more vulnerable to these hazards based on locations, construction, and building type, and additional data is provided where available from the IHRM Tool. **Table D.51** shows the critical facilities vulnerable to additional hazards analyzed in this section. The table lists those assets that are determined to be exposed to each of the identified hazards (marked with an "**X**").

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TABLE D.51: AT-RISK CRITICAL FACILITIES IN WARREN COUNTY

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC									GEO	HYDROLOGIC			OTH
		Drought	Extreme Heat/Heat Wave	Hailstorm	Hurricane and Tropical Storm	Lightning	Nor'easter	Severe Thunderstorm/ High Wind	Tornado	Winter Storm and Freeze	Earthquake	Dam and Levee Failure	Flood – 100 yr	Flood – 500 yr	Wildfire
Warren County															
Warren County EMS	EMS/Rescue Station	X	X	X	X	X	X	X	X	X	X	X			
Warren County EMS Station 3	EMS/Rescue Station	X	X	X	X	X	X	X	X	X	X	X			X
Warren County Rescue Squad	EMS/Rescue Station	X	X	X	X	X	X	X	X	X	X	X			
Warren County EOC	EOC	X	X	X	X	X	X	X	X	X	X	X			X
Aflon-Elberson Fire Dept	Fire Station	X	X	X	X	X	X	X	X	X	X	X			
Arcola VFD	Fire Station	X	X	X	X	X	X	X	X	X	X	X			
Churchill Five Fork VFD	Fire Station	X	X	X	X	X	X	X	X	X	X	X			
Churchill Five Forks Fire Department	Fire Station	X	X	X	X	X	X	X	X	X	X	X			
Drewery Volunteer Fire Dept	Fire Station	X	X	X	X	X	X	X	X	X	X	X			X
Hawtree Fire Dept	Fire Station	X	X	X	X	X	X	X	X	X	X	X			
Inez Fire Department	Fire Station	X	X	X	X	X	X	X	X	X	X	X			
Long Bridge VFD	Fire Station	X	X	X	X	X	X	X	X	X	X	X			
Ridgeway Volunteer Fire Dept	Fire Station	X	X	X	X	X	X	X	X	X	X	X			
Roanoke Wildwood Volutneer Fire Dept	Fire Station	X	X	X	X	X	X	X	X	X	X	X			
Soul City Fire Dept	Fire Station	X	X	X	X	X	X	X	X	X	X	X			X
Animal Shelter	Government Administration	X	X	X	X	X	X	X	X	X	X	X			X

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC									GEO	HYDROLOGIC			OTH
		Drought	Extreme Heat/Heat Wave	Hailstorm	Hurricane and Tropical Storm	Lightning	Nor'easter	Severe Thunderstorm/ High Wind	Tornado	Winter Storm and Freeze	Earthquake	Dam and Levee Failure	Flood – 100 yr	Flood – 500 yr	Wildfire
Warren County Maintenance	Government Administration	X	X	X	X	X	X	X	X	X	X	X			
Warren County PCB Landfill Detoxification Prj	Government Administration	X	X	X	X	X	X	X	X	X	X	X			
Warren County Plant	Government Administration	X	X	X	X	X	X	X	X	X	X	X			
Warren County Pumping Station	Government Administration	X	X	X	X	X	X	X	X	X	X	X			X
Water Treatment Plant	Government Administration	X	X	X	X	X	X	X	X	X	X	X			X
Department Of Corrections	Police Station	X	X	X	X	X	X	X	X	X	X	X			
Warren County Correctional Institution	Police Station	X	X	X	X	X	X	X	X	X	X	X			
North Warren School	School	X	X	X	X	X	X	X	X	X	X	X			
Northside Elem	School	X	X	X	X	X	X	X	X	X	X	X			
Old Wise School Bldg	School	X	X	X	X	X	X	X	X	X	X	X			
South Warren Elementary School	School	X	X	X	X	X	X	X	X	X	X	X			
Vaghan Elementary	School	X	X	X	X	X	X	X	X	X	X	X			
Warren County High School	School	X	X	X	X	X	X	X	X	X	X	X			
Warren County Middle School	School	X	X	X	X	X	X	X	X	X	X	X			
Warren Hill Retirement	Special Populations	X	X	X	X	X	X	X	X	X	X	X			
Macon Fire Dept	Fire Station	X	X	X	X	X	X	X	X	X	X	X			
Norlina Fire Department	Fire Station	X	X	X	X	X	X	X	X	X	X	X			

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC									GEO	HYDROLOGIC			OTH
		Drought	Extreme Heat/Heat Wave	Hailstorm	Hurricane and Tropical Storm	Lightning	Nor'easter	Severe Thunderstorm/ High Wind	Tornado	Winter Storm and Freeze	Earthquake	Dam and Levee Failure	Flood – 100 yr	Flood – 500 yr	Wildfire
Norlina Christian School	School	X	X	X	X	X	X	X	X	X	X	X			
Norlina Elementary Christian School	School	X	X	X	X	X	X	X	X	X	X	X			X
Warren County EMS Station 1	EMS/Rescue Station	X	X	X	X	X	X	X	X	X	X	X			
Warrenton Rural Volunteer Fire Department	Fire Station	X	X	X	X	X	X	X	X	X	X	X			
Warren County Business Loaves And Fishes	Government Administration	X	X	X	X	X	X	X	X	X	X	X			
Warren County Health Department	Government Administration	X	X	X	X	X	X	X	X	X	X	X			
Sheriff	Police Station	X	X	X	X	X	X	X	X	X	X	X			
Hawkins Educational Center	School	X	X	X	X	X	X	X	X	X	X	X			
Mariam Boyd School	School	X	X	X	X	X	X	X	X	X	X	X			X
UGCC Warren County Campus	School	X	X	X	X	X	X	X	X	X	X	X			

D.4 WARREN COUNTY CAPABILITY ASSESSMENT

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

D.4.1 Planning and Regulatory Capability

Table D.52 provides a summary of the relevant local plans, ordinances, and programs already in place or under development for Warren 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 Tar River Regional Hazard Mitigation Plan.

TABLE D.52: 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
WARREN COUNTY	✓	✓		✓				✓				✓		✓	✓	✓	✓			✓	✓	✓	
Macon	✓							✓								✓				✓	✓		
Norlina	✓							✓								✓				✓	✓		
Warrenton	✓							✓							✓	✓				✓	✓	✓	

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

Emergency Management

Hazard Mitigation Plan
Warren County has previously adopted a hazard mitigation plan. All of the participating municipalities were also included in this plan.

Emergency Operations Plan
Warren County maintains an emergency operations plan through its Emergency Management Department. Each participating municipality is included in the county's emergency operations plan.

General Planning

Comprehensive Land Use Plan
Warren County has adopted a comprehensive development plan. However, none of the municipalities have municipal-level land use plans in place.

Capital Improvements Plan
Warren County has a capital improvement plan in place. However, none of the municipalities have municipal-level capital improvement plans in place.

Historic Preservation Plan
Warren County has a historic preservation plan in place. The county has also adopted a historic preservation ordinance and developed historic preservation design guidelines.

Zoning Ordinance
Warren County and all of the participating municipalities have adopted zoning ordinances.

Subdivision Ordinance
Warren County has adopted subdivision regulations. However, none of the municipalities have adopted subdivision ordinances for their jurisdictions.

Building Codes, Permitting, and Inspections
North Carolina has a state compulsory building code which applies throughout the state. Warren County provides building code enforcement not only for the unincorporated areas of the county but also for all of its municipalities under inter-local agreement.

Floodplain Management

Table D.53 provides NFIP policy and claim information for each participating jurisdiction in Warren County.

TABLE D.53: 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
WARREN COUNTY†	02/01/87	02/04/09	30	$9,014,300	0	$0
Macon*	--	--	--	--	--	--
Norlina*	--	02/04/09	--	--	--	--

Jurisdiction	Date Joined NFIP	Current Effective Map Date	NFIP Policies in Force	Insurance in Force	Closed Claims	Total Payments to Date
Warrenton	04/16/07	(NSFHA)	0	$0	0	$0

†Includes unincorporated areas of county only
*Community does not participate in the NFIP
(NSFHA) – No Special Flood Hazard Area – All Zone C
Source: NFIP Community Status information as of 02/03/2016; NFIP claims and policy information as of 11/30/2015

All jurisdictions listed above that are participants in the NFIP will continue to comply with all required provisions of the program and will work to adequately comply in the future utilizing a number of strategies. For example, the jurisdictions will coordinate with NCEM and FEMA to develop maps and regulations related to special flood hazard areas within their jurisdictional boundaries and, through a consistent monitoring process, will design and improve their floodplain management program in a way that reduces the risk of flooding to people and property.

The Town of Macon does not participate in the NFIP because it currently does not have any identified flood hazard areas within its jurisdictions. The Town of Norlina also does not participate in the NFIP due to lack of available funding and/or political support.

Flood Damage Prevention Ordinance
All communities participating in the NFIP are required to adopt a local flood damage prevention ordinance. Warren County and Warrenton both participate in the NFIP and have adopted flood damage prevention regulations.

Open Space Management Plan
Warren County has developed a parks and recreation master plan.

Stormwater Management Plan
Although Warren County and its municipalities do not have stormwater management plans or ordinances in place, the county has adopted some stormwater regulations through the local subdivision regulations.

D.4.2 Administrative and Technical Capability

Table D.54 provides a summary of the capability assessment results for Warren County with regard to relevant staff and personnel resources. A checkmark (✓) indicates the presence of a staff member(s) in that jurisdiction with the specified knowledge or skill.

TABLE D.54: 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
WARREN COUNTY	✓	✓	✓	✓	✓		✓	✓	✓	
Macon	✓	✓	✓	✓			✓	✓	✓	
Norlina	✓	✓	✓	✓			✓	✓	✓	
Warrenton	✓	✓	✓	✓	✓		✓	✓	✓	

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 team.

D.4.3 Fiscal Capability

Table D.55 provides a summary of the results for Warren 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 county hazard mitigation plan.

TABLE D.55: 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: HMGP, DPIG, FMAP, PA, SBA, other federal and state programs, etc.
WARREN COUNTY	✓	✓	✓					✓	✓	✓
Macon	✓	✓	✓					✓	✓	✓
Norlina	✓	✓	✓					✓	✓	✓
Warrenton	✓	✓	✓					✓	✓	✓

D.4.4 Political Capability

The previous hazard mitigation plan indicates that Warren County has experienced the devastating effects of natural hazards (i.e., recent hurricanes and ice storms). The citizens, property owners, business owners, and elected officials of the county are committed to implementing a hazard mitigation plan in order to reduce community vulnerability. The Warren County Board of Commissioners, the professional staff, and the citizens of the county are continually striving to make Warren County a safer community in which to live, work, and play. The county recognizes that implementation of a hazard mitigation plan is an essential component in helping to achieve these goals.

D.4.5 Conclusions on Local Capability

Table D.56 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 existing hazard mitigation plans and readily available on the jurisdictions' government websites. According to the assessment, the average local capability score for the county and its municipalities is 25.3, which falls into the moderate capability ranking.

TABLE D.56: CAPABILITY ASSESSMENT RESULTS

Jurisdiction	Overall Capability Score	Overall Capability Rating
WARREN COUNTY	40	High

Jurisdiction	Overall Capability Score	Overall Capability Rating
Macon	18	Limited
Norlina	18	Limited
Warrenton	25	Moderate

D.5 WARREN COUNTY MITIGATION STRATEGY

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

D.5.1 Mitigation Goals

Warren County developed nine mitigation goals in coordination with the other participating Tar River Region jurisdictions. The regional mitigation goals are presented in **Table D.57**.

TABLE D.57: TAR RIVER REGIONAL MITIGATION GOALS

	Goal
Goal #1	**Reduce the risk of loss of life and personal injury** from natural hazards.
Goal #2	Reduce the risk and impact of future natural disasters by **regulating development in known high hazard areas and enhancing existing or creating new policies and ordinances** that will help reduce the damaging effects of natural hazards and prevent vulnerability from increasing.
Goal #3	**Pursue funds to reduce the risk of natural hazards to existing developments** where such hazards are clearly identified and the mitigation efforts are cost effective.
Goal #4	**Ensure that hazard mitigation is considered when redevelopment occurs** after a natural disaster and **expedite post-disaster reconstruction**.
Goal #5	**Protect the public health, safety, and welfare by increasing public awareness** of hazards, **providing education** on protection from hazards, and encouraging collective and individual responsibility for mitigating hazard risks.
Goal #6	**Protect the fragile natural and scenic areas** of the region, particularly those areas that protect drinking water supplies.
Goal #7	**Protect the most vulnerable populations, buildings, infrastructure, and critical facilities** through the implementation of cost-effective and technically feasible mitigation actions.
Goal #8	**Enhance emergency response** during times of disaster.
Goal #9	Improve technical capability to respond to hazards **and to improve the effectiveness of hazard mitigation actions.**

D.5.2 Mitigation Action Plan

The mitigation actions proposed by Warren County, the Town of Macon, the Town of Norlina, and the Town of Warrenton are listed in the following individual Mitigation Action Plans.

Warren County Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2016)
Prevention							
P-1	Building Inspections – Flood Damaged Structures. All portions of buildings that have been submerged for any length of time will be inspected for flood related damage as well as other conditions that may be dangerous to life, health or other property. Plan for Damaged Structures: 1. Overall damage assessment/data collection (visual inspection from roadways). 2. Data compiled and geographical areas assigned to teams. 3. Second detailed assessment by area teams. 4. Portions of walls, floors, ceilings, etc. that have been exposed to water will be opened for evaluation. 5. All construction that is repaired, replaced, dried, or sealed will be inspected before covered. 6. Structure inspected for certificate of compliance.	Flood	High	Warren County Code Enforcement, Town of Warrenton, Town of Norlina, Town of Macon	Local	2021	(Action P-6 from 2012 plan) The county has carried out building inspections after flood events have damaged structures following the process outlined. The county will continue to perform these inspections post-flood event and is dedicated to improving its inspection process to ensure buildings are efficiently inspected. Therefore this action will remain in the plan going forward.
P-2	Policy and procedures related to storm damage and disconnected utility services: 1) inform public via television, radio and newspaper of the necessary steps to have utilities restored; 2) restrict travel as necessary while collecting damage assessment data; conduct inspections on first come, first serve basis; 4) work overtime to expedite utility reconnections.	All	High	Warren County Code Enforcement and Emergency Services	Local	2021	(Action P-7 from 2012 plan) The county has implemented its policies and procedures related to storm damage and utilities, but would like to evaluate this process going forward to ensure it is adequate. This action will be carried over in the plan.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2016)
Property Protection							
PP-1	Create and maintain a list of repetitive flood loss properties.	Flood	Moderate	Warren County Planning and Zoning	Local	2021	(Action PP-1 from 2012 plan) The county is in the process of pulling together a list of repetitive loss properties, but will need to periodically update this list so the action will remain in place
PP-2	Continue to enforce state and local building codes and fire codes.	All	Moderate	Warren County Planning and Zoning	Local	2021	(Action PP-2 from 2012 plan) The county has enforced the state and local building/fire codes over the past 5 years. Going forward, the county will continue to review its enforcement procedures and make improvements where necessary to ensure construction is carried out in accordance with codes.
PP-3	Construct new EOC to withstand tornado/hurricane/thunderstorm force winds	Tornado, Hurricane, Thunderstorm, Winter Storm	High	Warren County Emergency Services	Federal, State, Local	2018	New Action
PP-4	Address previous flooding issues at critical facilities (e.g. wastewater treatment plant) via retrofitting, better drainage, other mitigation protection projects.	Flood	High	Warren County Emergency Services	Federal, State, Local	2020	New Action

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2016)
PP-5	For any interested homeowners located in floodplain areas, the county will consider applying for mitigation grant funding to acquire or elevate the homes on a strictly voluntary basis for the homeowner.	Flood	Moderate	Warren County Emergency	FEMA, NCEM	2021	New Action
Natural Resource Protection							
NRP-1							
Structural Projects							
SP-1							
Emergency Services							
ES-1	Ensure adequate evacuation warning in case of major hazard event.	All	High	Warren County Emergency Services	Local	2021	(Action ES-1 from 2012 plan) The county has worked with a number of resources to ensure adequate evacuation warning for residents. However, there are many improvements to information sharing that may be implemented and the county would like to evaluate ways to improve its warning system.
ES-2	Improve shelter capacities with alternate power/heat sources.	Winter Storm	High	Warren County Emergency Services, Town of Norlina	Local	2020	(Action ES-2 from 2012 plan) The county has made little progress in terms of improving shelter power/heat capacities due to lack of funding, but would like this to be a focus going forward so it will remain an action.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2016)
ES-3	Identify alternate detour routes from major arteries in the county.	All	High	Warren County Emergency Services	Local	2019	(Action ES-5 from 2012 plan) Alternate detour routes from major arteries have been identified in some cases, but there is not a comprehensive plan in place so the county would like to continue to pursue this action going forward.
ES-4	Develop grant application(s) to install generators at critical facility locations throughout the county.	All	High	Warren County Emergency Services	FEMA, NCEM, Local	2021	New Action
Public Education and Awareness							
PEA-1	Place flood protection and other hazard education materials in all branches of the Warren County public library system.	All	High	Warren County Planning and Zoning, Town of Warrenton	Local	2021	(Action PI-1 from 2012 plan) Some materials have been placed in public libraries, but the county would like to improve these materials and get the information out through additional venues so the action will remain in place.
PEA-2	Create outreach website for public designed to display risk information developed during the Hazard Mitigation Plan process.	All	High	Tar River Region, Warren County	Local	2016	New Action
Previously Completed Actions							
	At next Land Use Plan Update, review and include hazard mitigation objectives.	All	Moderate	Warren County Planning and Zoning	Local		Completed. (Action P-1 from 2012 plan)
	Develop a policy to minimize public services to proposed new structures that will be located in 100-year floodplain areas.	Flood	Moderate	Warren County Planning and Zoning, Town of Warrenton	Local		Completed. (Action P-2 from 2012 plan)

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2016)
	Update the Floodplain Ordinance to raise the minimum flood protection level.	Flood	Moderate	Warren County Planning and Zoning	Local		Completed. (Action P-3 from 2012 plan)
	Update the Subdivision Ordinance by reviewing and incorporating hazard mitigation objectives. Will address Fire wise Community issues to address wildfire hazards.	All (Wild-fire)	Moderate	Warren County Planning and Zoning	Local		Completed. (Action P-4 from 2012 plan)
	Revise and update the regulatory floodplain maps.	Flood	High	Warren County Planning and Zoning	Federal State		Completed. (Action P-5 from 2012 plan)
	Create a zoning map (digital) that can be easily reproduced/updated for staff and public use.	All	High	Warren County Planning and Zoning	Local		Completed. (Action P-8 from 2012 plan)
	Establish program to maintain continuity of government operations.	All	High	Warren County Emergency Services	Local		Completed. (Action ES-3 from 2012 plan)
	Identify alternate Emergency Operations Center locations.	All	High	Warren County Emergency Services	Local		Completed. (Action ES-4 from 2012 plan)

Town of Macon Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2016)
Prevention							
P-1	Seek to join NFIP.	Flood	High	Town of Macon	Local	2021	(Action P-1 from 2012 plan) The town has not joined the NFIP due to lack of staff time and resources to implement the program. The town will continue to pursue this action going forward.
P-2	Building Inspections – Flood Damaged Structures. All portions of buildings that have been submerged for any length of time will be inspected for flood related damage as well as other conditions that may be dangerous to life, health or other property. Plan for Damaged Structures: 1. Overall damage assessment/data collection (visual inspection from roadways). 2. Data compiled and geographical areas assigned to teams. 3. Second detailed assessment by area teams. 4. Portions of walls, floors, ceilings, etc. that have been exposed to water will be opened for evaluation. 5. All construction that is repaired, replaced, dried, or sealed will be inspected before covered. 6. Structure inspected for certificate of compliance.	Flood	High	Warren County Code Enforcement, Town of Macon	Local	2021	(Action P-6 from 2012 plan) The county, in coordination with the town, has carried out building inspections after flood events have damaged structures following the process outlined. The county will continue to perform these inspections post-flood event and is dedicated to improving its inspection process to ensure buildings are efficiently inspected. Therefore this action will remain in the plan going forward.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2016)
Property Protection							
PP-1	For any interested homeowners located in floodplain areas, the county will consider applying for mitigation grant funding to acquire or elevate the homes on a strictly voluntary basis for the homeowner.	Flood	Moderate	Warren County Emergency Services, Town of Macon	FEMA, NCEM	2021	New Action
Natural Resource Protection							
NRP-1							
Structural Projects							
SP-1							
Emergency Services							
ES-1							
Public Education and Awareness							
PEA-1	Create outreach website for public designed to display risk information developed during the Hazard Mitigation Plan process.	All	High	Tar River Region, Warren County, Town of Macon	Local	2016	New Action

Town of Norlina Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2016)
Prevention							
P-1	Seek to join the NFIP	Flood	High	Town of Norlina	Local	2021	(Action P-1 from 2012 plan) The town has not joined the NFIP due to lack of staff time and resources to implement the program. The town will continue to pursue this action going forward.
P-2	Investigate joining the Fire wise Communities Program	Wildfire	Moderate	Town of Norlina	Local	2021	(Action P-3 from 2012 plan) The town has not joined the Firewise program due to lack of staff time, but this is still something the town would like to pursue, so it will remain in the plan.
P-3	Trim trees to reduce effects of wind storms and ice storms	Wind and Winter storms	Moderate	Town of Norlina	Local	2021	(Action P-4 from 2012 plan) The town has worked to trim trees ahead of storm events in the past, but there are some improvements to the program that could be implemented and the town will evaluate the program in the future.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2016)
P-4	Building Inspections – Flood Damaged Structures. All portions of buildings that have been submerged for any length of time will be inspected for flood related damage as well as other conditions that may be dangerous to life, health or other property. Plan for Damaged Structures: 1. Overall damage assessment/data collection (visual inspection from roadways). 2. Data compiled and geographical areas assigned to teams. 3. Second detailed assessment by area teams. 4. Portions of walls, floors, ceilings, etc. that have been exposed to water will be opened for evaluation. 5. All construction that is repaired, replaced, dried, or sealed will be inspected before covered. 6. Structure inspected for certificate of compliance.	Flood	High	Warren County Code Enforcement, Town of Norlina,	Local	2021	(Action P-6 from 2012 plan) The county, in coordination with the town, has carried out building inspections after flood events have damaged structures following the process outlined. The county will continue to perform these inspections post-flood event and is dedicated to improving its inspection process to ensure buildings are efficiently inspected. Therefore this action will remain in the plan going forward.
Property Protection							
PP-1	Building a storm water sewer system to help control run-off and reduce shallow flooding.	Flood	Moderate	Town of Norlina	Local	ON-GOING	(Action P-2 from 2012 plan) The town has not built a complete stormwater sewer system to reduce shallow flooding due to lack of funding. The town will continue to pursue this action in the future.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2016)
PP-2	For any interested homeowners located in floodplain areas, the county will consider applying for mitigation grant funding to acquire or elevate the homes on a strictly voluntary basis for the homeowner.	Flood	Moderate	Warren County Emergency Services, Town of Norlina	FEMA, NCEM	2021	New Action
Natural Resource Protection							
NRP-1							
Structural Projects							
SP-1							
Emergency Services							
ES-1	Improve shelter capacities with alternate power/heat sources.	Winter Storm	High	Warren County Emergency Services, Town of Norlina	Local	2020	(Action ES-2 from 2012 plan) The county has made little progress in terms of improving shelter power/heat capacities due to lack of funding, but would like this to be a focus going forward so it will remain an action.
Public Education and Awareness							
PEA-1	Create outreach website for public designed to display risk information developed during the Hazard Mitigation Plan process.	All	High	Tar River Region, Warren County, Town of Norlina	Local	2016	New Action

Town of Warrenton Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2016)
Prevention							
P-1	Investigate joining the Fire wise Communities Program	Wildfire	Moderate	Town of Warrenton	Local	2021	(Action P-2 from 2012 plan) The town has not joined the Firewise program due to lack of staff time, but this is still something the town would like to pursue, so it will remain in the plan.
P-2	Trim trees to reduce effects of wind storms and Ice storms	Wind and winter storms	Moderate	Town of Warrenton	Local	2021	(Action P-3 from 2012 plan) The town has worked to trim trees ahead of storm events in the past, but there are some improvements to the program that could be implemented and the town will evaluate the program in the future.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2016)
P-3	Building Inspections – Flood Damaged Structures. All portions of buildings that have been submerged for any length of time will be inspected for flood related damage as well as other conditions that may be dangerous to life, health or other property. Plan for Damaged Structures: 1. Overall damage assessment/data collection (visual inspection from roadways). 2. Data compiled and geographical areas assigned to teams. 3. Second detailed assessment by area teams. 4. Portions of walls, floors, ceilings, etc. that have been exposed to water will be opened for evaluation. 5. All construction that is repaired, replaced, dried, or sealed will be inspected before covered. 6. Structure inspected for certificate of compliance.	Flood	High	Warren County Code Enforcement, Town of Warrenton	Local	2021	(Action P-6 from 2012 plan) The county, in coordination with the town, has carried out building inspections after flood events have damaged structures following the process outlined. The county will continue to perform these inspections post-flood event and is dedicated to improving its inspection process to ensure buildings are efficiently inspected. Therefore this action will remain in the plan going forward.
Property Protection							
PP-1	For any interested homeowners located in floodplain areas, the county will consider applying for mitigation grant funding to acquire or elevate the homes on a strictly voluntary basis for the homeowner.	Flood	Moderate	Warren County Emergency Services, Town of Warrenton	FEMA, NCEM	2021	New Action
Natural Resource Protection							
NRP-1							
Structural Projects							
SP-1							
Emergency Services							
ES-1							

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2016)
Public Education and Awareness							
PEA-1	Place flood protection and other hazard education materials in all branches of the Warren County public library system.	All	High	Warren County Planning and Zoning, Town of Warrenton	Local	2021	(Action PI-1 from 2012 plan) Some materials have been placed in public libraries, but the county would like to improve these materials and get the information out through additional venues so the action will remain in place.
PEA-2	Create outreach website for public designed to display risk information developed during the Hazard Mitigation Plan process.	All	High	Tar River Region, Warren County, Town of Warrenton	Local	2016	New Action
Previously Completed Actions							
	Continue to enforce floodplain ordinance as a member of the NFIP	Flood	Moderate	Town of Warrenton	Local		Completed. (Action P-1 from 2012 plan)
	Develop a policy to minimize public services to proposed new structures that will be located in 100-year floodplain areas.	Flood	Moderate	Warren County Planning and Zoning, Town of Warrenton	Local		Completed. (Action P-2 from 2012 plan)

APPENDIX A
PLAN ADOPTION

This appendix includes the local adoption resolutions for each of the participating jurisdictions.

APPENDIX B
PLANNING TOOLS

This appendix includes the following:

1. List of Recommended Stakeholders
2. Blank Public Participation Survey
3. GIS Data Inventory Sheet
4. Scoring Criteria for Capability Assessment
5. Blank Mitigation Action Worksheet

In establishing a planning team, you want to ensure that you have a broad range of backgrounds and experiences represented. Below are some suggestions for agencies to include in a planning team. There are many organizations, both governmental and community-based, that should be included when creating a local team. In addition, state organizations can be included on local teams, when appropriate, to serve as a source of information and to provide guidance and coordination.

Use the checklist as a starting point for forming your team. Check the boxes beside any individuals or organizations that you have in your community/state that you believe should be included on your planning team so you can follow up with them.

Task A. Create the planning team – *Suggestions for team members.* Date:_____

Local/Tribal

- ☐ Administrator/Manager's Office
- ☐ Budget/Finance Office
- ☐ Building Code Enforcement Office
- ☐ City/County Attorney's Office
- ☐ Economic Development Office
- ☐ Emergency Preparedness Office
- ☐ Fire and Rescue Department
- ☐ Hospital Management
- ☐ Local Emergency Planning Committee
- ☐ Planning and Zoning Office
- ☐ Police/Sheriff's Department
- ☐ Public Works Department
- ☐ Sanitation Department
- ☐ School Board
- ☐ Transportation Department
- ☐ Tribal Leaders

Special Districts and Authorities

- ☐ Airport and Seaport Authorities
- ☐ Business Improvement District(s)
- ☐ Fire Control District
- ☐ Flood Control District
- ☐ Redevelopment Agencies
- ☐ Regional/Metropolitan Planning Organization(s)
- ☐ School District(s)
- ☐ Transit/Transportation Agencies

Others

- ☐ Architectural/Engineering/Planning Firms
- ☐ Citizen Corps
- ☐ Colleges/Universities
- ☐ Land Developers
- ☐ Major Employers/Businesses
- ☐ Professional Associations
- ☐ Retired Professionals

State

- ☐ Adjutant General's Office (National Guard)
- ☐ Board of Education
- ☐ Building Code Office
- ☐ Climatologist
- ☐ Earthquake Program Manager
- ☐ Economic Development Office
- ☐ Emergency Management Office/State Hazard Mitigation Officer
- ☐ Environmental Protection Office
- ☐ Fire Marshal's Office
- ☐ Geologist
- ☐ Homeland Security Coordinator's Office
- ☐ Housing Office
- ☐ Hurricane Program Manager
- ☐ Insurance Commissioner's Office
- ☐ National Flood Insurance Program Coordinator
- ☐ Natural Resources Office
- ☐ Planning Agencies
- ☐ Police
- ☐ Public Health Office
- ☐ Public Information Office
- ☐ Tourism Department

Non-Governmental Organizations (NGOs)

- ☐ American Red Cross
- ☐ Chamber of Commerce
- ☐ Community/Faith-Based Organizations
- ☐ Environmental Organizations
- ☐ Homeowners Associations
- ☐ Neighborhood Organizations
- ☐ Private Development Agencies
- ☐ Utility Companies
- ☐ Other Appropriate NGOs

PUBLIC PARTICIPATION SURVEY
FOR HAZARD MITIGATION PLANNING

We need your help!

The Counties of Franklin, Granville, Vance, and Warren are currently engaged in a planning process to become less vulnerable to natural disasters, and your participation is important to us!

The Counties, along with participating local jurisdictions and other participating partners, are now working to prepare a multi-jurisdictional *Hazard Mitigation Plan*. The purpose of this Plan is to identify and assess our community's hazard risks and determine how to best minimize or manage those risks. Upon completion, the Plan will represent a comprehensive multi-jurisdictional *Hazard Mitigation Plan* for the four-county region.

This survey questionnaire provides an opportunity for you to share your opinions and participate in the mitigation planning process. The information you provide will help us better understand your hazard concerns and can lead to mitigation activities that should help lessen the impact of future hazard events.

Please help us by completing this survey by December 31, 2015 and returning it to:

Ryan Wiedenman, Atkins
1616 E Millbrook Road, Suite 310
Raleigh, NC 27609

Surveys can also be faxed to: (919) 876-6848 or emailed to ryan.wiedenman@atkinsglobal.com

If you have any questions regarding this survey or would like to learn about more ways you can participate in the development of the *Tar River Regional Hazard Mitigation Plan*, please contact Atkins, planning consultant for the project. You may reach Ryan Wiedenman (Atkins) at 919-431-5295 or by email at ryan.wiedenman@atkinsglobal.com.

1. Where do you live?

- ❑ Unincorporated Franklin County
- ❑ Unincorporated Granville County
- ❑ Unincorporated Vance County
- ❑ Unincorporated Warren County
- ❑ Bunn
- ❑ Butner
- ❑ Centerville
- ❑ Creedmoor
- ❑ Franklinton
- ❑ Henderson
- ❑ Hollister (Warren County)
- ❑ Kittrell
- ❑ Littleton (Warren County)
- ❑ Louisburg
- ❑ Macon
- ❑ Middleburg
- ❑ Norlina
- ❑ Oxford
- ❑ Stem
- ❑ Stovall
- ❑ Warrenton
- ❑ Youngsville
- ❑ Other: _____

2. **Have you ever experienced or been impacted by a disaster?**

   - ❑ Yes
   - ❑ No

   a. **If "Yes," please explain:**

3. **How concerned are you about the possibility of our community being impacted by a disaster?**

   - ❑ Extremely concerned
   - ❑ Somewhat concerned
   - ❑ Not concerned

4. **Please select the <u>one</u> hazard you think is the *highest threat* to your neighborhood:**

   - ❑ Dam / Levee Failure
   - ❑ Drought
   - ❑ Extreme Heat
   - ❑ Earthquake
   - ❑ Erosion
   - ❑ Flood
   - ❑ Hailstorm
   - ❑ Hurricane / Tropical Storm
   - ❑ Land Subsidence / Sink Hole
   - ❑ Landslide
   - ❑ Lightning
   - ❑ Nor'easter
   - ❑ Severe Winter Storm / Freeze
   - ❑ Severe Thunderstorm / High Wind
   - ❑ Tornado
   - ❑ Wildfire

5. **Please select the <u>one</u> hazard you think is the *second highest threat* to your neighborhood:**

   - ❑ Dam / Levee Failure
   - ❑ Drought
   - ❑ Extreme Heat
   - ❑ Earthquake
   - ❑ Erosion
   - ❑ Flood
   - ❑ Hailstorm
   - ❑ Hurricane / Tropical Storm
   - ❑ Land Subsidence / Sink Hole
   - ❑ Landslide
   - ❑ Lightning
   - ❑ Nor'easter
   - ❑ Severe Winter Storm / Freeze
   - ❑ Severe Thunderstorm / High Wind
   - ❑ Tornado
   - ❑ Wildfire

6. **Is there another hazard not listed above that you think is a wide-scale threat to your neighborhood?**

   - ❑ Yes (please explain): _____
   - ❑ No

7. Is your home located in a floodplain?

- ❑ Yes
- ❑ No
- ❑ I don't know

8. Do you have flood insurance?

- ❑ Yes
- ❑ No
- ❑ I don't know

a. If "No," why not?

- ❑ Not located in floodplain
- ❑ Too expensive
- ❑ Not necessary because it never floods
- ❑ Not necessary because I'm elevated or otherwise protected
- ❑ Never really considered it
- ❑ Other (please explain): _____

9. Have you taken any actions to make your home or neighborhood more resistant to hazards?

- ❑ Yes
- ❑ No

a. If "Yes," please explain:

10. Are you interested in making your home or neighborhood more resistant to hazards?

- ❑ Yes
- ❑ No

11. Do you know what office to contact regarding reducing your risks to hazards in your area?

- ❑ Yes
- ❑ No

12. What is the most effective way for you to receive information about how to make your home and neighborhood more resistant to hazards?

- ❑ Newspaper
- ❑ Television
- ❑ Radio
- ❑ Internet
- ❑ Mail
- ❑ Public workshops/meetings
- ❑ School meetings
- ❑ Other (please explain): _____

13. In your opinion, what are some steps your local government could take to reduce or eliminate the risk of future hazard damages in your neighborhood?

14. Are there any other issues regarding the reduction of risk and loss associated with hazards or disasters in the community that you think are important?

15. A number of community-wide activities can reduce our risk from hazards. In general, these activities fall into one of the following six broad categories. Please tell us how important you think each one is for your community to consider pursuing.

Category	Very Important	Somewhat Important	Not Important
1. Prevention Administrative or regulatory actions that influence the way land is developed and buildings are built. Examples include planning and zoning, building codes, open space preservation, and floodplain regulations.	❑	❑	❑
2. Property Protection Actions that involve the modification of existing buildings to protect them from a hazard or removal from the hazard area. Examples include acquisition, relocation, elevation, structural retrofits, and storm shutters.	❑	❑	❑
3. Natural Resource Protection Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems. Examples include: floodplain protection, habitat preservation, slope stabilization, riparian buffers, and forest management.	❑	❑	❑
4. Structural Projects Actions intended to lessen the impact of a hazard by modifying the natural progression of the hazard. Examples include dams, levees, detention/retention basins, channel modification, retaining walls, and storm sewers.	❑	❑	❑
5. Emergency Services Actions that protect people and property during and immediately after a hazard event. Examples include warning systems, evacuation planning, emergency response training, and protection of critical emergency facilities or systems.	❑	❑	❑
6. Public Education and Awareness Actions to inform citizens about hazards and the techniques they can use to protect themselves and their property. Examples include outreach projects, school education programs, library materials, and demonstration events.	❑	❑	❑

THANK YOU FOR YOUR PARTICIPATION!

This survey may be submitted anonymously; however, if you provide us with your name and contact information below we will have the ability to follow up with you to learn more about your ideas or concerns (optional):

Name: _____

Address: _____

_____

Phone: _____ **E-Mail:** _____

GIS Data Request Sheet
Tar River Regional Hazard Mitigation Plan

Data requested	Available?	Received?	Potential Sources
Tax Parcel Data			Tax Assessor
including replacement value			
Building Footprints			Tax Assessor/GIS office
Critical Facilities (in GIS or list form with addresses)			Tax Assessor/GIS office
examples include:			
government buildings			
hospitals			
senior care			
police/fire/EMS/EOC			
locally significant buildings			
schools			
Local hazard studies			public works, natural resources, planning
examples include:			
Flood Studies (HEC-RAS, Risk MAP)			
Local Hazard History Articles			
Areas of Concern Studies			

If you have any questions, please contact:

Ryan Wiedenman
ryan.wiedenman@gmail.com
919-431-5295

Points System for Capability Ranking

0-19 points = Limited overall capability
20-39 points = Moderate overall capability
40-68 points = High overall capability

I. Planning and Regulatory Capability
(Up to 43 points)

Yes = 3 points
Under Development = 1 point
Included under County plan/code/ordinance/program = 1 point
No = 0 points

- Hazard Mitigation Plan
- Comprehensive Land Use Plan
- Floodplain Management Plan
- National Flood Insurance Program
- NFIP Community Rating System

Yes = 2 points
Under Development = 1 point
Included under County plan/code/ordinance/program = 1 point
No = 0 points

- Open Space Management Plan / Parks & Recreation Plan
- Stormwater Management Plan
- Natural Resource Protection Plan
- Flood Response Plan
- Emergency Operations Plan
- Continuity of Operations Plan
- Evacuation Plan
- Disaster Recovery Plan
- Flood Damage Prevention Ordinance
- Post-disaster Redevelopment / Reconstruction Ordinance

Yes = 1 point
No = 0 points

- Capital Improvements Plan
- Economic Development Plan
- Historic Preservation Plan
- Zoning Ordinance
- Subdivision Ordinance
- Unified Development Ordinance
- Building Code
- Fire Code

II. Administrative and Technical Capability
(Up to 15 points)

Yes = 2 points
Service provided by County = 1 point
No = 0 points

- Planners with knowledge of land development and land management practices
- Engineers or professionals trained in construction practices related to buildings and/or infrastructure
- Planners or engineers with an understanding of natural and/or human-caused hazards
- Emergency manager
- Floodplain manager

Yes = 1 point
No = 0 points

- Land surveyors
- Scientist familiar with the hazards of the community
- Staff with education or expertise to assess the community's vulnerability to hazards
- Personnel skilled in Geographical Information Systems (GIS) and/or Hazus
- Resource development staff or grant writers

III. Fiscal Capability
(Up to 10 points)

Yes = 1 point
No = 0 points

- Capital Improvement Programming
- Community Development Block Grants (CDBG)
- Special Purpose Taxes (or tax districts)
- Gas / Electric Utility Fees
- Water / Sewer Fees
- Stormwater Utility Fees
- Development Impact Fees
- General Obligation / Revenue / Special Tax Bonds
- Partnering arrangements or intergovernmental agreements
- Other

MITIGATION ACTION WORKSHEETS

Mitigation Action Worksheets are used to identify potential hazard mitigation actions that participating jurisdictions in the Tar River Region will consider to reduce the negative effects of identified hazards. The worksheets provide a simple yet effective method of organizing potential actions in a user-friendly manner that can easily be incorporated into the Regional Hazard Mitigation Plan.

The worksheets are to be used as part of a strategic planning process and are designed to be:

a.) completed electronically (worksheets and instructions will be e-mailed to members of the Hazard Mitigation Planning Team following the Mitigation Strategy Workshop);
b.) reviewed with your department/organization for further consideration; and
c.) returned according to the contact information provided below.

Please return all completed worksheets no later than February 19, 2016 to:

Ryan Wiedenman, Project Manager Atkins
Electronic copies may be e-mailed to: ryan.wiedenman@atkinsglobal.com
Hard copies may be faxed to: 919-876-6848 (Attn: Ryan Wiedenman)

INSTRUCTIONS

Each mitigation action should be considered to be a separate local project, policy or program and each individual action should be entered into a separate worksheet. By identifying the implementation requirements for each action, the worksheets will help lay the framework for engaging in distinct actions that will help reduce the community's overall vulnerability and risk. Detailed explanations on how to complete the worksheet are provided below.

Proposed Action: Identify a specific action that, if accomplished, will reduce vulnerability and risk in the impact area. Actions may be in the form of local policies (i.e., regulatory or incentive-based measures), programs or structural mitigation projects and should be consistent with any pre-identified mitigation goals and objectives.

Site and Location: Provide details with regard to the physical location or geographic extent of the proposed action, such as the location of a specific structure to be mitigated, whether a program will be citywide, countywide or regional, etc.

History of Damages: Provide a brief history of any known damages as it relates to the proposed action and the hazard(s) being addressed. For example, the proposed elevation of a repetitive loss property should include an overview of the number of times the structure has flooded, total dollar amount of damages if available, etc.

Hazard(s) Addressed: List the hazard(s) the proposed action is designed to mitigate against.

Category: Indicate the most appropriate category for the proposed action as discussed during the Mitigation Strategy Workshop (Prevention; Property Protection; Natural Resource Protection; Structural Projects; Emergency Services; Public Education and Awareness).

Priority: Indicate whether the action is a "high" priority, "moderate" priority or "low" priority based generally on the following criteria:

1. Effect on overall risk to life and property
2. Ease of implementation / technical feasibility
3. Project costs versus benefits
4. Political and community support
5. Funding availability

Estimated Cost: If applicable, indicate what the total cost will be to accomplish this action. This amount will be an estimate until actual final dollar amounts can be determined. Some actions (such as ordinance revisions) may only cost "local staff time" and should be noted so.

Potential Funding Sources: If applicable, indicate how the cost to complete the action will be funded. For example, funds may be provided from existing operating budgets or general funds, a previously established contingency fund, a cost-sharing federal or state grant program, etc.

Lead Agency/Department Responsible: Identify the local agency, department or organization that is best suited to implement the proposed action.

Implementation Schedule: Indicate when the action will begin and when the action is expected to be completed. Remember that some actions will require only a minimal amount of time, while others may require a long-term or continuous effort.

Comments: This space is provided for any additional information or details that may not be captured under the previous headings.

MITIGATION ACTION	
Proposed Action:	
BACKGROUND INFORMATION	
Site and Location:	
History of Damages:	

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	
Category:	
Priority (High, Moderate, Low):	
Estimated Cost:	
Potential Funding Sources:	
Lead Agency/Department Responsible:	
Implementation Schedule:	

COMMENTS

APPENDIX C
LOCAL MITIGATION PLAN REVIEW TOOL

LOCAL MITIGATION PLAN REVIEW TOOL

The *Local Mitigation Plan Review Tool* demonstrates how the Local Mitigation Plan meets the regulation in 44 CFR §201.6 and offers States and FEMA Mitigation Planners an opportunity to provide feedback to the community.

- The Regulation Checklist provides a summary of FEMA's evaluation of whether the Plan has addressed all requirements.
- The Plan Assessment identifies the plan's strengths as well as documents areas for future improvement.
- The Multi-jurisdiction Summary Sheet is an optional worksheet that can be used to document how each jurisdiction met the requirements of the each Element of the Plan (Planning Process; Hazard Identification and Risk Assessment; Mitigation Strategy; Plan Review, Evaluation, and Implementation; and Plan Adoption).

The FEMA Mitigation Planner must reference this *Local Mitigation Plan Review Guide* when completing the *Local Mitigation Plan Review Tool*.

Jurisdiction: Tar River Region (Franklin, Granville, Vance, and Warren Counties)	**Title of Plan:** Tar River Regional Hazard Mitigation Plan	**Date of Plan:** March 2016
Local Point of Contact: Jeff Lewis **Title: Emergency Management Director** **Agency: Franklin County Emergency Management**	**Address:** **8146 NC 56 Highway** **Louisburg, NC 27549**	
Phone Number: 919-496-5005	**E-Mail: jlewis@franklincountync.us**	

State Reviewer:	**Title:**	**Date:**

FEMA Reviewer:	**Title:**	**Date:**
Date Received in FEMA Region ***(insert #)***		
Plan Not Approved		
Plan Approvable Pending Adoption		
Plan Approved		

SECTION 1:
REGULATION CHECKLIST

INSTRUCTIONS: The Regulation Checklist must be completed by FEMA. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been 'Met' or 'Not Met.' The 'Required Revisions' summary at the bottom of each Element must be completed by FEMA to provide a clear explanation of the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is 'Not Met.' Sub-elements should be referenced in each summary by using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each Element and sub-element are described in detail in this *Plan Review Guide* in Section 4, Regulation Checklist.

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	**Location in Plan (section and/or page number)**	**Met**	**Not Met**
ELEMENT A. PLANNING PROCESS			
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))	Section 2; App. D		
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))	Section 2.4-2.7; App. D		
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))	Section 2.6-2.7; App. B; App. D		
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))	Section 7.3; Jurisdiction-specific annexes (Section X.4)		
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))	Section 10.4		
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))	Section 10.3		
ELEMENT A: REQUIRED REVISIONS			
ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT			
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))	Section 4; Section 5; Jurisdiction-specific annexes (Section X.2)		

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))	Section 5; Jurisdiction-specific annexes (Section X.2)		
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))	Section 5; Section 6; Jurisdiction-specific annexes (Section X.2 and X.3)		
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))	Section 5.14.5 (Table 5.29); Jurisdiction-specific annexes (Section X.2.12; Table X.25)		
ELEMENT B: REQUIRED REVISIONS			
ELEMENT C. MITIGATION STRATEGY			
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))	Section 7; Jurisdiction-specific annexes (Section X.4)		
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))	Section 5.14.4 (Table 5.28); Section 7.3.4 (Table 7.2); Jurisdiction-specific annexes (Section X.2.12 and X.4.1; Table X.24 and X.53)		
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))	Section 8.2; Jurisdiction-specific annexes (Section X.5.1)		
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))	Section 8.3-8.4; Section 9.2; Jurisdiction-specific annexes (Section X.5.2)		
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))	Section 8.1.1; Section 9.2; Jurisdiction-specific annexes (Section X.5.2)		

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))	Section 7.3.1 (Table 7.1); Section 10.1-10.2; Jurisdiction-specific annexes (Section X.4.1; Table X.52)		
ELEMENT C: REQUIRED REVISIONS			
ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (applicable to plan updates only)			
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))	Section 6.4.3; Jurisdiction-specific annexes (Section X.3.3)		
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))	Section 2.8; Section 8.5; Section 9.2; Jurisdiction-specific annexes (Section X.5.2)		
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	Section 5.17 (Table 5.34); Section 9.2; Jurisdiction-specific annexes (Section X.2.15 and X.5.2; Table X.29)		
ELEMENT D: REQUIRED REVISIONS			
ELEMENT E. PLAN ADOPTION			
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))	App. A		
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))	App. A		
ELEMENT E: REQUIRED REVISIONS			
ELEMENT F. ADDITIONAL STATE REQUIREMENTS (OPTIONAL FOR STATE REVIEWERS ONLY; NOT TO BE COMPLETED BY FEMA)			
F1.			
F2.			

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
ELEMENT F: REQUIRED REVISIONS			

SECTION 2:
PLAN ASSESSMENT

INSTRUCTIONS: The purpose of the Plan Assessment is to offer the local community more comprehensive feedback to the community on the quality and utility of the plan in a narrative format. The audience for the Plan Assessment is not only the plan developer/local community planner, but also elected officials, local departments and agencies, and others involved in implementing the Local Mitigation Plan. The Plan Assessment must be completed by FEMA. The Assessment is an opportunity for FEMA to provide feedback and information to the community on: 1) suggested improvements to the Plan; 2) specific sections in the Plan where the community has gone above and beyond minimum requirements; 3) recommendations for plan implementation; and 4) ongoing partnership(s) and information on other FEMA programs, specifically RiskMAP and Hazard Mitigation Assistance programs. The Plan Assessment is divided into two sections:

1. Plan Strengths and Opportunities for Improvement
2. Resources for Implementing Your Approved Plan

Plan Strengths and Opportunities for Improvement is organized according to the plan Elements listed in the Regulation Checklist. Each Element includes a series of italicized bulleted items that are suggested topics for consideration while evaluating plans, but it is not intended to be a comprehensive list. FEMA Mitigation Planners are not required to answer each bullet item, and should use them as a guide to paraphrase their own written assessment (2-3 sentences) of each Element.

The Plan Assessment must not reiterate the required revisions from the Regulation Checklist or be regulatory in nature, and should be open-ended and to provide the community with suggestions for improvements or recommended revisions. The recommended revisions are suggestions for improvement and are not required to be made for the Plan to meet Federal regulatory requirements. The italicized text should be deleted once FEMA has added comments regarding strengths of the plan and potential improvements for future plan revisions. It is recommended that the Plan Assessment be a short synopsis of the overall strengths and weaknesses of the Plan (no longer than two pages), rather than a complete recap section by section.

Resources for Implementing Your Approved Plan provides a place for FEMA to offer information, data sources and general suggestions on the overall plan implementation and maintenance process. Information on other possible sources of assistance including, but not limited to, existing publications, grant funding or training opportunities, can be provided. States may add state and local resources, if available.

A. Plan Strengths and Opportunities for Improvement

This section provides a discussion of the strengths of the plan document and identifies areas where these could be improved beyond minimum requirements.

Element A: Planning Process

How does the Plan go above and beyond minimum requirements to document the planning process with respect to:

- *Involvement of stakeholders (elected officials/decision makers, plan implementers, business owners, academic institutions, utility companies, water/sanitation districts, etc.);*
- *Involvement of Planning, Emergency Management, Public Works Departments or other planning agencies (i.e., regional planning councils);*
- *Diverse methods of participation (meetings, surveys, online, etc.); and*
- *Reflective of an open and inclusive public involvement process.*

Element B: Hazard Identification and Risk Assessment

In addition to the requirements listed in the Regulation Checklist, 44 CFR 201.6 Local Mitigation Plans identifies additional elements that should be included as part of a plan's risk assessment. The plan should describe vulnerability in terms of:

1) *A general description of land uses and future development trends within the community so that mitigation options can be considered in future land use decisions;*
2) *The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas; and*
3) *A description of potential dollar losses to vulnerable structures, and a description of the methodology used to prepare the estimate.*

How does the Plan go above and beyond minimum requirements to document the Hazard Identification and Risk Assessment with respect to:

- *Use of best available data (flood maps, HAZUS, flood studies) to describe significant hazards;*
- *Communication of risk on people, property, and infrastructure to the public (through tables, charts, maps, photos, etc.);*
- *Incorporation of techniques and methodologies to estimate dollar losses to vulnerable structures;*
- *Incorporation of Risk MAP products (i.e., depth grids, Flood Risk Report, Changes Since Last FIRM, Areas of Mitigation Interest, etc.); and*
- *Identification of any data gaps that can be filled as new data became available.*