Cumberland-Hoke Regional Hazard Mitigation Plan

Cumberland and Hoke Counties, NC

Participating Jurisdictions:

Cumberland County
Hoke County
City of Fayetteville
City of Raeford
Town of Eastover
Town of Falcon
Town of Godwin
Town of Hope Mills
Town of Linden
Town of Spring Lake
Town of Stedman
Town of Wade

FEMA

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Table of Contents

1 INTRODUCTION 1
1.1 Background 1
1.2 Purpose and Need 1
1.3 Scope 2
1.4 Authority 2
1.5 Plan Update 2
1.5.1 What's New in the Plan 3
1.5.2 Past Goals Update 4
1.5.3 Past Mitigation Actions Update 5
1.6 Organization of the Plan 6
2 PLANNING PROCESS 7
2.1 Local Government Participation 7
2.2 The 10-Step Planning Process 11
2.2.1 Phase 1 – Planning Process 12
2.2.2 Phase II – Risk Assessment 16
2.2.3 Phase III – Mitigation Strategy 16
2.2.4 Phase IV – Plan Maintenance 17
3 COMMUNITY PROFILE 18
3.1 Geography and Climate 18
3.2 Cultural, Historic and Natural Resources 19
3.3 Economy 24
3.4 Land Use 26
3.5 Population and Demographics 29
3.6 Growth and Development Trends 30
4 HAZARD IDENTIFICATION 32
5 HAZARD PROFILES 35
5.1 Dam/Levee Failure 40
5.1.1 Hazard Description 40
5.1.2 Location and Spatial Extent 42

5.1.3 Past Occurrences 46
5.1.4 Probability of Future Occurrence 49
5.1.5 Consequence Analysis 49
5.2 Drought 50
5.2.1 Hazard Description 50
5.2.2 Location and Spatial Extent 51
5.2.3 Past Occurrences 52
5.2.4 Probability of Future Occurrence 53
5.2.5 Consequence Analysis 53
5.3 Earthquake 54
5.3.1 Hazard Description 54
5.3.2 Location and Spatial Extent 55
5.3.3 Past Occurrences 55
5.3.4 Probability of Future Occurrence 56
5.3.5 Consequence Analysis 57
5.4 Erosion 57
5.4.1 Hazard Description 57
5.4.2 Location and Spatial Extent 59
5.4.3 Past Occurrences 59
5.4.4 Probability of Future Occurrence 59
5.4.5 Consequence Analysis 59
5.5 Extreme Heat 60
5.5.1 Hazard Description 60
5.5.2 Location and Spatial Extent 61
5.5.3 Past Occurrences 61
5.5.4 Probability of Future Occurrence 61
5.5.5 Consequence Analysis 61
5.6 Hurricane/Tropical Storm 62
5.6.1 Hazard Description 62
5.6.2 Location and Spatial Extent 65
5.6.3 Past Occurrences 66

5.6.4 Probability of Future Occurrences 67
5.6.5 Consequence Analysis 68
5.7 Inland Flooding: 100-/500-year 69
5.7.1 Hazard Description 69
5.7.2 Location and Spatial Extent 70
5.7.3 Past Occurrences 73
5.7.4 Probability of Future Occurrences 74
5.7.5 Consequence Analysis 74
5.8 Severe Weather (Thunderstorm Wind, Lightning & Hail) 75
5.8.1 Hazard Description 75
5.8.2 Location and Spatial Extent 76
5.8.3 Past Occurrences 77
5.8.4 Probability of Future Occurrences 78
5.8.5 Consequence Analysis 78
5.9 Sinkhole 79
5.9.1 Hazard Description 79
5.9.2 Location and Spatial Extent 81
5.9.3 Past Occurrences 81
5.9.4 Probability of Future Occurrences 82
5.9.5 Consequence Analysis 82
5.10 Tornado 83
5.10.1 Hazard Description 83
5.10.2 Location and Spatial Extent 85
5.10.3 Past Occurrences 86
5.10.4 Probability of Future Occurrences 87
5.10.5 Consequence Analysis 87
5.11 Wildfire 88
5.11.1 Hazard Description 88
5.11.2 Location and Spatial Extent 89
5.11.3 Past Occurrences 92
5.11.4 Probability of Future Occurrences 92

5.11.5 Consequence Analysis 93
5.12 Winter Storm 94
5.12.1 Hazard Description 94
5.12.2 Location and Spatial Extent 95
5.12.3 Past Occurrences 95
5.12.4 Probability of Future Occurrences 97
5.12.5 Consequence Analysis 98
5.13 Hazard Profile Summary 99
6 VULNERABILITY ASSESSMENT 100
6.1 Methodology 100
6.2 Asset Inventory 101
6.2.1 Properties at Risk 101
6.2.2 Critical Facilities at Risk 102
6.3 Vulnerability Assessment Results 105
6.3.1 Dam/Levee Failure 105
6.3.2 Drought 109
6.3.3 Earthquake 109
6.3.4 Extreme Heat 111
6.3.5 Hurricane/Tropical Storm 112
6.3.6 Inland Flooding: 100-/500-year 113
6.3.7 Severe Weather (Thunderstorm, Lightning, & Hail) 121
6.3.8 Tornado 122
6.3.9 Wildfire 125
6.3.10 Winter Storm 134
6.4 Priority Risk Index 134
6.4.1 Priority Risk Index Results 136
6.4.2 Final Risk Classifications 136
7 CAPABILITY ASSESSMENT 137
7.1 Overview of Capability Assessment 137
7.2 Planning and Regulatory Capability 137
7.3 Floodplain Management 140

7.4 Administrative and Technical Capability 141
7.5 Fiscal Capability 142
8 MITIGATION STRATEGY 144
8.1 Mitigation Strategy: Overview 144
8.1.1 Continued Compliance with the NFIP 144
8.2 Goals 145
8.2.1 Coordination with Other Planning Efforts 145
8.2.2 Goal Setting Exercise 145
8.2.3 Resulting Goals 148
8.3 Identification and Analysis of Mitigation Actions 149
8.3.1 Prioritization Process 149
9 MITIGATION ACTION PLAN 151
10 PLAN ADOPTION 159
11 PLAN MAINTENANCE 160
11.1 Integration into Local Planning Mechanisms 160
11.2 Monitoring, Evaluating, and Updating 161
11.3 Continued Public Involvement 162
ANNEX A - CUMBERLAND COUNTY UNINCORPORATED AREAS 163
ANNEX B – CITY OF FAYETTEVILLE 192
ANNEX C – TOWN OF EASTOVER 225
ANNEX D – TOWN OF FALCON 247
ANNEX E – TOWN OF GODWIN 269
ANNEX F – TOWN OF HOPE MILLS 289
ANNEX G – TOWN OF LINDEN 313
ANNEX H – TOWN OF SPRING LAKE 333
ANNEX I – TOWN OF STEDMAN 354
ANNEX J – TOWN OF WADE 375
ANNEX K – HOKE COUNTY UNINCORPORATED AREAS 396
ANNEX L – CITY OF RAEFORD 424
APPENDIX A – LOCAL MITIGATION PLAN REVIEW TOOL 445
APPENDIX B – PLANNING PROCESS DOCUMENTATION 455

APPENDIX C – MITIGATION STRATEGY 500

APPENDIX D - REFERENCES 512

List of Tables

Table 1.1 - Comparison of Hazards for Plan Update 3
Table 1.2 – Summary of Updates to Existing Goals 4
Table 2.1 - HMPC Meeting Attendance Record 9
Table 2.2 - Staff Capability with Six Mitigation Categories 11
Table 2.3 - Mitigation Planning and CRS 10-Step Process Reference Table 11
Table 2.4 – Summary of HMPC Meeting Dates 12
Table 2.5 - Summary of Public Meeting Dates 13
Table 2.6 - Public Outreach Efforts 14
Table 3.1 - Total Land Area of Participating Jurisdictions 18
Table 3.2 – Cumberland County Summary of Flood Zone Acreage 21
Table 3.3 – Threatened and Endangered Species in Cumberland County 22
Table 3.4 – Hoke County Summary of Flood Zone Acreage 23
Table 3.5 – Threatened and Endangered Species in Hoke County 24
Table 3.6- Employment and Occupation Statistics for Cumberland County 25
Table 3.7 - Top Five Employers in Cumberland County 25
Table 3.8- Employment and Occupation Statistics for Hoke County 25
Table 3.9 - Top Five Employers in Hoke County 26
Table 3.10 - Population Counts for Participating Jurisdictions 29
Table 3.11 - Demographics of Participating Jurisdictions 30
Table 3.12 – Historic and Projected Population Growth (1990 – 2035) 30
Table 4.1 - Major Disaster Declarations in Cumberland County (1953 - 2015) 33
Table 4.2 - Major Disaster Declarations in Hoke County (1953 - 2015) 33
Table 4.3 – Hazard Evaluation 33
Table 5.1 - Participating Jurisdictions 36
Table 5.2 - NCEI Severe Weather Reports (January 1950 – May 2015) 37
Table 5.3- Dam Hazard Classifications 41
Table 5.4 - North Carolina Dam Inventory for Cumberland and Hoke Counties 42
Table 5.5 - Known Dam Failures in Cumberland and Hoke Counties 46
Table 5.6 - Drought Classifications 50
Table 5.7 - Historical Drought Occurrences 52
Table 5.8 - Richter Scale 54
Table 5.9 - Earthquakes Affecting North Carolina 56
Table 5.10 – Saffir-Simpson Hurricane Wind Scale, 2012 63
Table 5.11 - NCEI Hurricane and Tropical Storm Events for Cumberland and Hoke Counties 66
Table 5.12 - Mapped Flood Insurance Zones within Cumberland and Hoke Counties 70
Table 5.13 - Summary of Flood Zone Acreage 73
Table 5.14 - NCEI Flooding Events in Cumberland and Hoke Counties 73

Table 5.15 - NCEI Severe Weather Events in Cumberland and Hoke Counties 77
Table 5.16 - Enhanced Fujita (EF) Scale 84
Table 5.17 - NCEI Records for Tornadoes in Cumberland and Hoke Counties (1950-2015) 86
Table 5.18 - Records for Wildfire in Cumberland and Hoke Counties 92
Table 5.19 - NCEI Records for Winter Storm Events in Cumberland and Hoke Counties (1996-2015) 95
Table 5.20 - Summary of Hazard Profile Results 99
Table 6.1 - Properties at Risk in Cumberland and Hoke Counties 101
Table 6.2 - Critical Facilities at Risk in Cumberland and Hoke Counties 102
Table 6.3 - Properties Potentially at Risk to Dam Failure 106
Table 6.4 - Estimated Building Damage and Content Loss – Earthquake 500-yr Return Period 110
Table 6.5 - Estimated Building Damage and Content Loss – Earthquake 1,000-yr Return Period 110
Table 6.6 - Estimated Building Damage and Content Loss – Earthquake 2,500-yr Return Period 111
Table 6.7 – Regional Population at Risk to Earthquake 111
Table 6.8 - Estimated Building Damage and Content Loss – Hurricane Wind 100-yr Return Period 113
Table 6.9 – Regional Population at Risk to Hurricane Wind 113
Table 6.10 - Flood Loss Damage Factors 116
Table 6.11 - Content Replacement Factors 117
Table 6.12 - Estimated Building Damage and Content Loss - Flood 100-yr Return Period 117
Table 6.13 – Regional Population at Risk to Flood 118
Table 6.14 - Estimated Building Damage and Content Loss – Thunderstorm Wind 100-yr Return Period 121
Table 6.15 – Regional Population at Risk to Thunderstorm Wind 121
Table 6.16 - Estimated Building Damage and Content Loss – F0 Tornado 122
Table 6.17 - Estimated Building Damage and Content Loss – F1 Tornado 123
Table 6.18 - Estimated Building Damage and Content Loss – F2 Tornado 123
Table 6.19 - Estimated Building Damage and Content Loss – F3 Tornado 124
Table 6.20 - Estimated Building Damage and Content Loss – F4 Tornado 124
Table 6.21 - Priority Risk Index for Cumberland and Hoke County Region 135
Table 6.22 - Summary of PRI Results 136
Table 6.23 - Summary of Hazard Risk Classification 136
Table 7.1 - Planning and Regulatory Capability by Jurisdiction 137
Table 7.2 - NFIP Policy and Claim Information by Jurisdiction 141
Table 7.3 - Administrative and Technical Capability by Jurisdiction 141
Table 7.4 – Fiscal Resources by Jurisdiction 142
Table 9.1 - Mitigation Action Plan by Jurisdiction 152

List of Figures

Figure 3.1 - Cumberland and Hoke County River Basins 19
Figure 3.2 - Cumberland County Existing Land Use 27
Figure 3.3 - Cumberland County 2030 Growth Strategy Map 28
Figure 3.4 - Hoke County Existing Land Use 29

Figure 3.5 - Cumberland County Population Change 31
Figure 5.1 - Cumberland and Hoke County Base Map 37
Figure 5.2 - Components of a Typical Levee 42
Figure 5.3- High Hazard Dam Locations 46
Figure 5.4- Palmer Drought Severity Index 51
Figure 5.5 - Standardized Precipitation Index 52
Figure 5.6 - Seismic Hazard Information for North Carolina 55
Figure 5.7- Stream Meanders 58
Figure 5.8 - National Weather Service Heat Wave Brochure 61
Figure 5.9 - Life Cycle of a Hurricane 63
Figure 5.10- NOAA Historical Hurricane Tracks 67
Figure 5.11 - Characteristics of a Floodplain 70
Figure 5.12 - Mapped Flood Insurance Zones for Cumberland and Hoke Counties 72
Figure 5.13 - Rock Formations in the United States 79
Figure 5.14 - North Carolina Areas Prone to Sinkholes 80
Figure 5.15 - Sinkhole Hazard Scores by County 81
Figure 5.16 - Tornado Activity in the United States 85
Figure 5.17 - 1984 Tornado Outbreak 87
Figure 5.18 - Wildfire Probability Map 89
Figure 5.19 - Cumberland County Wildland Urban Interface 90
Figure 5.20 - Cumberland County Wildland Urban Interface 91
Figure 5.21 - Fire Weather Forecasting, NWS Raleigh http://www.weather.gov/rah/fire 92
Figure 5.22 – NWS Wind Chill Temperature Index 94
Figure 5.23 - Probability of Heavy Snowfall 97
Figure 6.1 - Critical Facilities in Cumberland County 103
Figure 6.2- Critical Facilities in Hoke County 104
Figure 6.3 - Cumberland County Dam Failure Impact 107
Figure 6.4 - Hoke County Dam Failure Impact 108
Figure 6.5 - Cumberland County Flood Depth Grid (100-yr) 114
Figure 6.6 - Hoke County Flood Depth Grid (100-yr) 115
Figure 6.7 - Cumberland County Critical Facilities and FEMA Flood Zones 119
Figure 6.8 - Hoke County Critical Facilities and FEMA Flood Zones 120
Figure 6.9 - Cumberland County Wildland Urban Interface Risk Index 126
Figure 6.10 - Hoke County Wildland Urban Interface Risk Index 127
Figure 6.11 - Cumberland County Burn Probability 129
Figure 6.12 - Hoke County Burn Probability 130
Figure 6.13 - Cumberland County Rate of Spread 132
Figure 6.14 - Hoke County Rate of Spread 133
Figure 8.1 - Goals Exercise - Part 1 146
Figure 8.2 - Goals Exercise - Part 2 147

1 INTRODUCTION

Chapter 1 provides an introduction to the Cumberland-Hoke Regional Hazard Mitigation Plan. It consists of the following subsections:

- 1.1 Background
- 1.2 Purpose and Need
- 1.3 Scope
- 1.4 Authority
- 1.5 Plan Update
- 1.6 Organization of the Plan

1.1 Background

Each year in the United States, natural disasters take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. These monies only partially reflect the true cost of disasters, because additional expenses incurred by insurance companies and non-governmental organizations are not reimbursed by tax dollars. Many natural disasters are predictable, and much of the damage caused by these events can be reduced or even eliminated.

In an effort to reduce the Nation's mounting natural disaster losses, the U.S. Congress passed the Disaster Mitigation Act of 2000 (DMA 2000) to invoke new and revitalized approaches to mitigation planning. Section 322 of DMA 2000 emphasizes the need for state and local government entities to closely coordinate on mitigation planning activities, and makes the development of a hazard mitigation plan a specific eligibility requirement for any local government applying for federal mitigation grant funds. These funds include the Hazard Mitigation Grant Program (HMGP), the Pre-Disaster Mitigation (PDM) program, and the Flood Mitigation Assistance (FMA) Program, all of which are administered by the Federal Emergency Management Agency (FEMA) under the Department of Homeland Security. Communities with an adopted and federally approved hazard mitigation plan thereby become pre-positioned and more apt to receive available mitigation funds before and after the next disaster strikes.

This Plan was prepared in coordination with FEMA Region IV and the North Carolina Division of Emergency Management (NCEM) to ensure that it meets all applicable DMA 2000 planning requirements. A Local Mitigation Plan Crosswalk, found in Appendix A, provides a summary of FEMA's current minimum standards of acceptability and notes the location within the Plan where each planning requirement is met.

1.2 Purpose and Need

As defined by FEMA, "hazard mitigation" means any sustained action taken to reduce or eliminate the long-term risk to life and property from a hazard event. Hazard mitigation planning is the process through which hazards are identified, likely impacts determined, mitigation goals set, and appropriate mitigation strategies determined, prioritized, and implemented.

The purpose of this plan is to identify, assess and mitigate risk in order to better protect the people and property of Cumberland and Hoke Counties from the effects of natural and man-made hazards. This plan documents the hazard mitigation planning process and identifies relevant hazards and strategies the participating communities will use to decrease vulnerability and increase resiliency and sustainability. This

plan demonstrates the participating communities' commitment to reducing risks from identified hazards and serves as a tool to help decision-makers direct mitigation activities and resources. This Plan will ensure the involved communities' continued eligibility for federal disaster assistance, including the HMGP, PDM and FMA programs.

1.3 Scope

This document comprises a Regional Hazard Mitigation Plan for Cumberland and Hoke Counties in North Carolina. The previous Cumberland County Multi-Jurisdictional Plan dated April 2011 and the Hoke County Multi-Jurisdictional Plan dated March 2010 have been combined into one Regional Plan for this update.

The jurisdictions participating in this Plan are the Unincorporated Areas of Cumberland County; the City of Fayetteville; the Towns of Eastover, Falcon, Godwin, Hope Mills, Linden, Spring Lake, Stedman, and Wade; the Unincorporated Areas of Hoke County; and the City of Raeford. Even though portions of Fort Bragg and Pope Air Force Base are part of the City of Fayetteville and the Town of Spring Lake, these portions of the jurisdictions have been omitted from this Plan update.

1.4 Authority

This Hazard Mitigation Plan Update has been adopted by Cumberland and Hoke Counties in accordance with the authority and police powers granted to counties as defined by the State of North Carolina (N.C.G.S., Chapter 153A). This Hazard Mitigation Plan has also been adopted by the participating municipalities under the authority granted to cities and towns as defined by the State of North Carolina (N.C.G.S., Chapter 160A). Copies of all local resolutions to adopt the Plan are included in Chapter 10.

This Plan was developed in accordance with current state and federal rules and regulations governing local hazard mitigation plans. The Plan shall be monitored and updated on a routine basis to maintain compliance with the following legislation:

- Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as enacted by Section 104 of the Disaster Mitigation Act of 2000 (P.L. 106-390) and by FEMA's Interim Final Rule published in the Federal Register on February 26, 2002, at 44 CFR Part 201;
- National Flood Insurance Act of 1968, as amended 42 U.S.C. 4001 et seq; and
- North Carolina General Statutes, Chapter 166A: North Carolina Emergency Management Act, as amended by Senate Bill 300: An Act to Amend the Laws Regarding Emergency Management as Recommended by the Legislative Disaster Response and Recovery Commission (2001).

1.5 Plan Update

CFR Subchapter D §201.6(d)(3): A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for mitigation project grant funding.

Both the 2011 Cumberland County and 2010 Hoke County Multi-jurisdictional Hazard Mitigation Plans contained a risk assessment of identified hazards for the Counties and participating municipalities and a mitigation strategy to address the risk and vulnerability from these hazards. Since that time, progress has been made by both Counties and all participating municipalities on implementation of the mitigation

strategy. This section includes an overview of the approach to updating and combining the plans and identifies new analyses and information included in this plan update.

1.5.1 What's New in the Plan

The creation of the regional HMP update involved a comprehensive review and update of each section of the existing plans and an assessment of the success of the Counties and participating municipalities in evaluating, monitoring and implementing the mitigation strategy outlined in their existing plans. Only the information and data still valid from the existing plans was carried forward as applicable into this regional HMP. The following requirements were addressed during the development of this regional plan:

- Consider changes in vulnerability due to action implementation;
- Document success stories where mitigation efforts have proven effective;
- Document areas where mitigation actions were not effective;
- Document any new hazards that may arise or were previously overlooked;
- Incorporate new data or studies on hazards and risks;
- Incorporate new capabilities or changes in capabilities;
- Incorporate growth and development-related changes to inventories; and
- Incorporate new action recommendations or changes in action prioritization.

Table 1.1 provides a comparison of the hazards addressed in the 2013 State of North Carolina HMP as well as the existing plans for both Counties. A final decision was made by the HMPC as to which hazards should be included in the combined 2016 Regional Plan as noted in the table below.

Table 1.1 - Comparison of Hazards for Plan Update

Hazards Included in Previous Plans			Final HMPC Decision – Include in 2016 Regional Plan?
State of North Carolina 2013 HMP	Cumberland County 2011 HMP	Hoke County 2010 HMP	
Flooding	N/A	Flood	Yes
Earthquake	Earthquake	Earthquake	Yes
Hurricanes and Coastal	Hurricane	Hurricane/Tropical Storm/Nor'easter	Yes
Severe Winter Weather	Severe Winter Storms	Winter Storm	Yes
Wildfire	Wildfire	Wildfire	Yes
Dam Failure	N/A	Dam/Levee Failure	Yes
Drought	Drought	Drought	Yes
Geological	N/A	Landslide/Sinkhole	Yes
Severe Thunderstorm	Thunderstorms	Severe Thunderstorm	Yes
Tornado	Tornadoes	Tornado	Yes
N/A	Extreme Heat	Extreme Heat	Yes
N/A	N/A	Erosion	Yes

In addition to the specific changes in hazard analyses identified above, the following items were also addressed in the 2015 plan update:

- GIS was used, to the extent data allowed, to analyze the priority hazards as part of the vulnerability assessment. This involved utilizing mapped hazard data combined with local parcel data.

- Assets at risk to identified hazards were identified by property type and values of properties based on tax assessment data from Cumberland and Hoke Counties.
- A discussion on climate change and its projected effect on specific hazards was included in Chapter 5 Hazard Profiles.
- The discussion on growth and development trends was enhanced utilizing 2010 Census data.
- Enhanced public outreach and agency coordination efforts were conducted throughout the plan update process in order to meet the more rigorous requirements of the 2013 CRS Coordinator's Manual, in addition to DMA requirements.

1.5.2 Past Goals Update

Table 1.2 provides a summary of updates to the goals from the 2011 Cumberland County and 2010 Hoke County Multi-jurisdictional Hazard Mitigation Plans as decided by the HMPC. The revised goals for the 2016 Plan Update can be found in Chapter 8 – Mitigation Strategy.

Table 1.2 – Summary of Updates to Existing Goals

EXISTING GOALS	DEFER	REVISE	DELETE	PLAN UPDATE NOTES
2011 Cumberland County, NC HMP				
Goal 1 Reduce vulnerability of Cumberland County and its municipalities to all natural hazards for existing development, future development, redevelopment and infrastructure.		X		Replaced with revised Goal #2
Goal 2 Identify and protect all properties/natural resources that are at risk of damage due to a hazard and to undertake cost-effective mitigation measures to minimize losses.		X		Replaced with revised Goal #1
Goal 3 Improve public awareness, education and outreach programs for the natural hazards that Cumberland County and its municipalities are most likely to experience.		X		Replaced with revised Goal #3
2010 Hoke County, NC HMP				
Goal 1 Establish or participate in local, state and federal mitigation-oriented and disaster-based programs and planning efforts that seek to lessen the damaging effects of natural hazards and protect lives and property.		X		Replaced with revised Goal #4
Goal 2 Implement as needed mitigation-oriented projects that lessen the damaging effects of natural hazards and protect lives and property.			X	

EXISTING GOALS	DEFER	REVISE	DELETE	PLAN UPDATE NOTES
Goal 3 Identify and seek funding for necessary equipment needed to enhance emergency services currently offered to the citizens of Hoke County and the residents of the City of Raeford.			X	
Goal 4 Investigate and seek funding for unspecified special projects that are intended to have a positive effect on reducing the damaging impact of natural hazards on Hoke County and the City of Raeford.			X	

1.5.3 Past Mitigation Actions Update

A status update of the mitigation actions assigned to each participating jurisdiction in the previous 2011 Cumberland County and 2010 Hoke County Multi-jurisdictional Hazard Mitigation Plans is provided in the Annex for each participating jurisdiction.

Details on mitigation projects carried forward from the existing County plans into the new Regional Plan as well as new projects can be found in Chapter 9 - Mitigation Action Plan and the Annex for each participating jurisdiction.

1.6 Organization of the Plan

The Cumberland-Hoke Regional Hazard Mitigation Plan is organized as follows:

- Chapter 1 - Introduction
- Chapter 2 – Planning Process
- Chapter 3 – Community Profile
- Chapter 4 – Hazard Identification
- Chapter 5 – Hazard Profiles
- Chapter 6 – Vulnerability Assessment
- Chapter 7 – Capability Assessment
- Chapter 8 – Mitigation Strategy
- Chapter 9 – Mitigation Action Plan
- Chapter 10 – Plan Adoption
- Chapter 11 – Plan Maintenance
- Community Annexes
    - Annex A – Cumberland County Unincorporated Areas
    - Annex B – City of Fayetteville
    - Annex C – Town of Eastover
    - Annex D – Town of Falcon
    - Annex E – Town of Godwin
    - Annex F– Town of Hope Mills
    - Annex G – Town of Linden
    - Annex H – Town of Spring Lake
    - Annex I – Town of Stedman
    - Annex J – Town of Wade
    - Annex K – Hoke County Unincorporated Areas
    - Annex L – City of Raeford
- Appendix A – Local Mitigation Plan Review Tool
- Appendix B – Planning Process Documentation
- Appendix C – Mitigation Strategy
- Appendix D – References

2 PLANNING PROCESS

Chapter 2 provides an overview of the planning process used to develop the Cumberland-Hoke Regional Hazard Mitigation Plan. It consists of the following subsections:

- 2.1 Local Government Participation
- 2.2 The 10-Step Planning Process

Requirement §201.6(b): An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:
1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process; and
3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.
Requirement §201.6(c)(1): The plan shall include the following:
1) Documentation of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

This Regional Hazard Mitigation Plan was developed under the guidance of a Hazard Mitigation Planning Committee (HMPC). Information in this plan will be used to help guide and coordinate mitigation activities and decisions for local land use policy in the future. Proactive mitigation planning will help reduce the cost of disaster response and recovery to communities and their residents by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruptions. This plan identifies activities that can be undertaken by both the public and the private sectors to reduce safety hazards, health hazards, and property damage caused by floods.

2.1 Local Government Participation

The DMA planning regulations and guidance stress that each local government seeking FEMA approval of their mitigation plan must participate in the planning effort in the following ways:

- Participate in the process as part of the HMPC;
- Detail where within the planning area the risk differs from that facing the entire area;
- Identify potential mitigation actions; and
- Formally adopt the plan.

For the Cumberland-Hoke Regional HMPC, “participation” meant the following:

- Providing facilities for meetings;
- Attending and participating in the HMPC meetings;
- Completing and returning the Amec Foster Wheeler Data Collection Guide;
- Collecting and providing other requested data (as available);

- Managing administrative details;
- Making decisions on plan process and content;
- Identifying mitigation actions for the plan;
- Reviewing and providing comments on plan drafts;
- Informing the public, local officials, and other interested parties about the planning process and providing opportunity for them to comment on the plan;
- Coordinating, and participating in the public input process; and
- Coordinating the formal adoption of the plan by the local governing body.

The HMPC met all of the above participation requirements. The Committee's representatives included representatives of County, City and Town Departments; citizens and other stakeholders. A signed resolution for Cumberland County forming the HMPC is included in Appendix B – Planning Process Documentation. The participants comprising the Cumberland-Hoke HMPC included the following:

- Three-at-Large Citizens of Cumberland County: Ora Bethea, Alexia Fields and Barrett Lowe
- One-at-Large Citizen of Hoke County: Johnny Joseph
- City of Fayetteville Fire/Emergency Management Department: Scott Bullard, Emergency Manager
- City of Fayetteville Planning and Code Enforcement Services Department: David Nash, Senior Planner
- Cumberland County Department of Emergency Services: Randy Beeman, Director
- Cumberland County Department of Emergency Services: Tim Mitchell, Deputy Director
- Cumberland County Department of Emergency Services: Gene Booth, Emergency Management Program Coordinator
- Cumberland County Department of Emergency Services: Melvin Lewis, Planner
- Cumberland County Department of Engineering, Infrastructure and Landscaping: Wayne Dudley, Engineer Technician
- Cumberland County Management: Tracy Jackson, Assistant County Manager
- Cumberland County Planning and Inspections Department: Denise Sykes, Senior Planner
- Cumberland County Planning and Inspections Department: Will Linville, Planner
- Town of Eastover: Kim Nazarchyk, Town Manager
- Town of Falcon: Belinda D. White, Town Clerk
- Town of Godwin: Willie J. Burnette, Mayor
- Town of Hope Mills: John W. Ellis III, Town Manager
- Town of Linden: Ruby Hendges, Town Clerk
- Town of Spring Lake: Paul Hoover, Public Works Department
- Town of Stedman: Billy Horne, Mayor
- Town of Wade: Cindy Burchett, Town Clerk
- American Red Cross – Highland Chapter: Bobby Currie, Disaster Program Specialist
- Sustainable Sandhills: Alba Polonkey, Sustainability Program Manager
- United Way of Cumberland County: Robert Hines, Executive Director
- Hoke County Tax Assessor: Lisa Beal, GIS Coordinator
- Hoke County Administration: Letitia Edens, County Manager
- Hoke County Planning Department: Robert Farrell, Director
- Hoke County EMS: Robert Godwin, Director
- Hoke County Emergency Management: Freddy Johnson Sr., Director
- Hoke County Building Code Enforcement: Scotty Locklear, Code Enforcement Officer

- Hoke County Fire Code Enforcement: Robin Lorenzen, Code Enforcement Officer
- Hoke County Parks & Recreation Director: Kendric Maynor, Director
- Hoke County Utilities: Leonard McBryde III, Director
- Hoke County Sherriff's Office: Hubert Peterkin, Sheriff
- Hoke County Local Emergency Planning Committee (LEPC): Wanda Richardson, President
- Hoke County Emergency Communications: Jimmy Stewart, Director
- Hoke County Board of Commissioners: Robert Wright, Fire Commissioner
- City of Raeford Fire Department: Terry Tap, Fire Marshal
- City of Raeford Council: Mary Neil King, Council Member
- City of Raeford Police Department: Kemp Crumpler, Chief
- City of Raeford Administration: Dennis Baxley, City Manager
- Raeford News Journal: Ken McDonald, Editor

Table 2.1 details the HMPC meeting dates and the HMPC members in attendance. A more detailed summary of HMPC meeting dates including topics discussed and meeting locations follows in Table 2.4. During the planning process, the HMPC members communicated through face-to-face meetings, email and telephone conversations. Draft documents were posted on the Cumberland County, Hoke County and City of Fayetteville websites so that the HMPC members could easily access and review them. Although all HMPC members could not be present at every meeting, coordination was ongoing throughout the entire planning process. In particular, the communities of Falcon, Godwin, Stedman and Wade participated in the planning process through emails and phone conversations and in direct contact with the Cumberland County Planning Department. Also, these jurisdictions were provided planning process materials during the planning process.

Table 2.1 - HMPC Meeting Attendance Record

Member Name	Affiliation	Meeting Date					
		6/12/15	6/16/15	9/30/15	11/12/15	12/14/15	1/6/16
Ora Bethea	Citizen				X	X	
Alexia Fields	Citizen				X		
Barrett Lowe	Citizen				X		X
Scott Bullard	City of Fayetteville Fire/Emergency Mgmt		X		X	X	X
David Nash	City of Fayetteville Planning and Code Enforcement Services Department		X		X	X	X
Randy Beeman	Cumberland County Emergency Services		X	X	X	X	
Tim Mitchell	Cumberland County Emergency Services		X	X	X	X	X
Gene Booth	Cumberland County Emergency Services			X	X	X	X
Melvin Lewis	Cumberland County Emergency Services		X		X	X	X
Wayne Dudley	Cumberland County Dept of Engineering		X				
Tracy Jackson	Cumberland County Management		X				
Denise Sykes	Cumberland County Planning Dept		X	X	X		X

Member Name	Affiliation	Meeting Date					
		6/12/15	6/16/15	9/30/15	11/12/15	12/14/15	1/6/16
Will Linville	Cumberland County Planning Dept		X	X	X		
Kim Nazarchyk	Town of Eastover, Town Manager				X		
Belinda White	Town of Falcon, Town Clerk						
Willie Burnette	Town of Godwin, Mayor						
John Ellis	Town of Hope Mills, Town Manager						
Ruby Hendges	Town of Linden, Town Clerk						
Paul Hoover	Town of Spring Lake Public Works						
Billy Horne	Town of Stedman, Mayor						
Cindy Burchett	Town of Wade, Town Clerk						
Bobby Currie	American Red Cross			X	X	X	X
Alba Polonkey	Sustainable Sandhills		X		X	X	X
Robert Hines	United Way of Cumberland County						
Dennis Baxley	City of Raeford Manager						
Lisa Beal	Hoke County GIS/Mapping	X					
Kemp Crumpler	City of Raeford Police Department	X		X			
Letitia Edens	Hoke County Manager	X					
Robert Farrell	Hoke County Planning Director	X	X	X	X	X	X
Robert Godwin	Hoke EMS Director	X					
Freddy Johnson Sr.	Hoke County EM Director	X		X			
Johnny Joseph	Public at Large	X					
Mary Neil King	City of Raeford, Council Member						
Scotty Locklear	Hoke County Building Code Enforcement						
Robin Lorenzen	Hoke County Fire Code Enforcement	X		X	X		X
Kendric Maynor	Hoke County Parks & Recreation Director	X					
Leonard McBryde III	Hoke County Utilities Director	X					
Ken McDonald	Raeford News Journal - Editor	X		X			
Hubert Peterkin	Hoke County Sheriff	X					
Wanda Richardson	President Hoke County LEPC	X					
Jimmy Stewart	Hoke County Emergency Communications	X					
Terry Tapp	City of Raeford Fire Marshal	X		X			
Robert Wright	Hoke County Board of Commissioners						

Based on the area of expertise of each representative participating on the HMPC, Table 2.2 demonstrates each member's expertise in the six mitigation categories (Prevention, Property Protection, Natural Resource Protection, Emergency Services, Structural Flood Control Projects and Public Information). The Cumberland County Planning & Inspections Department is responsible for community land use and comprehensive planning and was an active participant on the HMPC and provided data and information to support development of the plan.

Table 2.2 - Staff Capability with Six Mitigation Categories

Community Department/Office	Prevention	Property Protection	Natural Resource Protection	Emergency Services	Structural Flood Control Projects	Public Information
Emergency Management	X			X		X
Planning	X	X				X
Engineering		X			X	
Building Inspections	X	X			X	
Parks and Recreation			X			X

Appendix B provides additional documentation of the planning process that was implemented during the development of this Regional HMP.

2.2 The 10-Step Planning Process

The planning process for preparing the Cumberland-Hoke Regional Hazard Mitigation Plan was based on DMA planning requirements and FEMA's associated guidance. This guidance is structured around a four-phase process:

1) Planning Process;
2) Risk Assessment;
3) Mitigation Strategy; and
4) Plan Maintenance.

Into this process, the participating jurisdictions integrated a more detailed 10-step planning process used for FEMA's Community Rating System (CRS) and Flood Mitigation Assistance programs. Thus, the modified 10-step process used for this plan meets the requirements of six major programs: FEMA's Hazard Mitigation Grant Program; Pre-Disaster Mitigation Program; Community Rating System; Flood Mitigation Assistance Program; Severe Repetitive Loss Program; and new flood control projects authorized by the U.S. Army Corps of Engineers.

Table 2.3 shows how the 10-step CRS planning process aligns with the four phases of hazard mitigation planning pursuant to the Disaster Mitigation Act of 2000.

Table 2.3 - Mitigation Planning and CRS 10-Step Process Reference Table

DMA Process	CRS Process
Phase I – Planning Process	
§201.6(c)(1)	Step 1. Organize to Prepare the Plan
§201.6(b)(1)	Step 2. Involve the Public
§201.6(b)(2) & (3)	Step 3. Coordinate
Phase II – Risk Assessment	
§201.6(c)(2)(i)	Step 4. Assess the Hazard

DMA Process	CRS Process
§201.6(c)(2)(ii) & (iii)	Step 5. Assess the Problem
Phase III – Mitigation Strategy	
§201.6(c)(3)(i)	Step 6. Set Goals
§201.6(c)(3)(ii)	Step 7. Review Possible Activities
§201.6(c)(3)(iii)	Step 8. Draft an Action Plan
Phase IV – Plan Maintenance	
§201.6(c)(5)	Step 9. Adopt the Plan
§201.6(c)(4)	Step 10. Implement, Evaluate and Revise the Plan

2.2.1 Phase 1 – Planning Process

Planning Step 1: Organize to Prepare the Plan

In alignment with the commitment to participate in the DMA planning process and the CRS, community officials worked to establish the framework and organization for development of the plan. An initial meeting was held with key community representatives to discuss the organizational aspects of the plan development process. At the beginning of this planning process, Cumberland County passed a resolution establishing the planning process and the HMPC. A signed resolution forming the HMPC is included in Appendix B – Planning Process Documentation.

The formal HMPC meetings followed the 10 CRS Planning Steps. Meeting agendas, minutes and sign-in sheets for the HMPC meetings are included in Appendix B – Planning Process Documentation. The meeting dates and topics discussed are summarized below in Table 2.4. All HMPC meetings were open to the public.

Table 2.4 – Summary of HMPC Meeting Dates

Meeting Type	Meeting Topic	Meeting Date/ Time	Meeting Location
HMPC #1 (Hoke Co Kick-off)	1) Introduction to DMA and CRS planning process 2) Organize resources: the role of the HMPC, planning for public involvement, and coordinating with other agencies and stakeholders	June 12, 2015 10:00am – Noon	227 N. Main Street, Raeford, NC 28376
HMPC #2 (Cumberland Co Kick-off)	1) Introduction to DMA, CRS and the planning process 2) Organize resources: the role of the HMPC, planning for public involvement, and coordinating with other agencies and stakeholders	June 16, 2015 2:00pm – 3:30pm	131 Dick Street, Fayetteville, NC 28301
HMPC #3	1) Review/discussion of Flood Risk Assessment (Assess the Hazard) 2) Review/discussion of Vulnerability Assessment (Assess the Problem)	September 30, 2015 10:00am – Noon	116 W Prospect St Raeford, NC 28376
HMPC #4	1) Review goals in existing Cumberland and Hoke Plans	November 12, 2015 1:30pm -3:30pm	

Meeting Type	Meeting Topic	Meeting Date/ Time	Meeting Location
	2) Revise existing goals and create new goals for Regional Plan		1347 Rim Road, Fayetteville NC 28314
HMPC #5	1) Review mitigation actions in existing Cumberland and Hoke Plans 2) Create new actions for Regional Plan	December 14, 2015 2:00pm – 4:00 pm	1347 Rim Road, Fayetteville NC 28314
HMPC #6	1) Review "Draft" Hazard Mitigation Plan 2) Solicit comments and feedback from the HMPC	January 6, 2016 2:00pm – 4:00 pm	1347 Rim Road, Fayetteville NC 28314

Planning Step 2: Involve the Public

The first public meeting to provide an introduction to the planning process was held on June 16, 2015 at 6:30PM. A second and final public meeting to review the entire Draft Plan was held on January 6, 2016 at 6:30PM. As documented in Appendix B, a public notice was posted in the local newspaper, The Fayetteville Observer, prior to both public meetings inviting members of the public to attend. The public meeting dates and topics discussed are summarized below in Table 2.5.

Table 2.5 - Summary of Public Meeting Dates

Meeting Type	Meeting Topic	Meeting Date/Time	Meeting Locations
Public Meeting #1	1) Introduction to DMA, CRS and the planning process 2) Introduction to hazard identification	June 16, 2015 6:30-8:00PM	Smith Recreation Center, 1520 Slater Ave, Fayetteville, NC 28301
Public Meeting #2	1) Review "Draft" Hazard Mitigation Plan 2) Solicit comments and feedback from the public	January 6, 2016 6:30-8:00PM	E.E. Miller Recreation Center, 1347 Rim Road, Fayetteville, NC 28314

Involving the Public beyond Attending Public Meetings

Early discussions with the HMPC established the initial plan for public involvement. The HMPC agreed to an approach using established public information mechanisms and resources within the communities. Public involvement activities for this plan update included press releases, stakeholder and public meetings, and the collection of public and stakeholder comments on the draft plan.

The HMPC found seven different ways to involve the public beyond attending public meetings. Documentation to support the additional public outreach efforts can be found in Appendix B – Planning Process Documentation. The public outreach activities beyond the formal public meetings are summarized below in Table 2.6.

Table 2.6 - Public Outreach Efforts

Location		Event/Message	Date
1	Cumberland County website	Digital copy of Draft Risk Assessment posted on County website with request for public review/comment	October 2015
2	City of Fayetteville website	Digital copy of Draft Risk Assessment posted on City website with request for public review/comment	October 2015
3	Cumberland County Emergency Management Office	Hard copy of Draft Risk Assessment made available for public review/comment	October 2015
4	Cumberland County website; Hoke County website	Digital copy of complete Draft Plan posted on County website with request for public review/comment	January 2016
5	City of Fayetteville website	Digital copy of complete Draft Plan posted on City website with request for public review/comment	January 2016
6	Cumberland and Hoke County Emergency Management Offices	Hard copy of complete Draft Plan made available for public review/comment	January 2016
7	Media Release	Public Comments Sought for Hazard Mitigation Plan	January 2016
8	The Fayetteville Observer	Newspaper Article Seeking Public Input	January 2016

Planning Step 3: Coordinate

Early in the planning process, the HMPC determined that the risk assessment, mitigation strategy development, and plan approval would be greatly enhanced by inviting other local, state and federal agencies and organizations to participate in the process. Coordination involved sending these stakeholders coordination emails asking for their assistance and input and telling them how to become involved in the plan development process. The list of stakeholders and an example coordination email is provided in Appendix B – Planning Process Documentation. The HMPC contacted the following agencies and organizations with specific data requests and a request for their input into the planning process:

- NCEM
  - Natural Hazards Risk Data
  - Repetitive Loss Data
- ISO/FEMA
  - Repetitive Loss Data
  - BCEGS Classifications
- NC Forestry Service
  - Cumberland County Fire Reports (2005-2015)
  - Hoke County Fire Reports (2005-2015)
- NC Dam Safety
  - Dam Inventory
- NC Natural Heritage Program
  - Inventory of Significant Natural Areas of Cumberland County
  - Inventory of Significant Natural Areas of Hoke County
- Sustainable Sandhills
  - Cumberland County Climate Resiliency Plan

Coordination with Other Community Planning Efforts and Hazard Mitigation Activities

Coordination with other community planning efforts is also paramount to the success of this plan. Mitigation planning involves identifying existing policies, tools, and actions that will reduce a community's risk and vulnerability to hazards. Integrating existing planning efforts and mitigation policies and action strategies into this plan establishes a credible and comprehensive plan that ties into and supports other community programs. The development of this plan incorporated information from the following existing plans, studies, reports, and initiatives as well as other relevant data from neighboring communities and other jurisdictions.

- Cumberland County Land Use Plan, 2010; Hoke County Land Use Plan, 2005
  - Used to identify growth and development trends and to develop the consequence analysis for each hazard.
- Cumberland County 2030 Growth Vision Plan
  - Used to identify growth and development trends and to develop the consequence analysis for each hazard.
- Cumberland and Hoke County Ordinances
  - The following ordinances were used to develop the capability assessment and the mitigation strategy for Cumberland and Hoke County Unincorporated Areas:
    - Zoning Ordinance
    - Subdivision Ordinance
    - Flood Damage Prevention Ordinance
- City of Fayetteville Unified Development Ordinance, 2011
  - Used to develop the capability assessment and the mitigation strategy for the City of Fayetteville.
- City of Raeford Unified Development Ordinance, 2009
  - Used to develop the capability assessment and the mitigation strategy for the City of Fayetteville.
- City of Fayetteville Capital Improvement Plan, 2016-2020
  - Used to develop the capability assessment and the mitigation strategy for the City of Fayetteville.
- Cumberland County Emergency Operations Plan, 2006
  - Used to develop the capability assessment and the mitigation strategy for the City of Fayetteville.
- Cumberland County, NC and Incorporated Areas Flood Insurance Study, Revised 2007; Hoke County, NC and Incorporated Areas Flood Insurance Study, Revised 2014
  - Used to identify flooding sources and SFHAs within Cumberland and Hoke Counties. The SFHAs were used to prepare the inland flooding vulnerability assessment.
- Cumberland County Multi-Jurisdictional Hazard Mitigation Plan, April 2011; Hoke County Multi-Jurisdictional Hazard Mitigation Plan, March 2010
  - Used to identify previously profiled hazards and to capture relevant information to be carried forward in the plan update. Also used to identify existing mitigation actions and to prepare a status update for existing actions.
- Cumberland County Climate Resiliency Plan, 2015
  - Used to assess the potential for climate change to affect the probability of future occurrence for each hazard profiled in the plan update.
- Fayetteville-Cumberland Parks & Recreation Master Plan, 2006

- Used to identify open space within Cumberland County. Also used to develop the capability assessment and the mitigation strategy for the County.

These and other documents were reviewed and considered, as appropriate, during the collection of data to support Planning Steps 4 and 5, which include the hazard identification, vulnerability assessment, and capability assessment. Data from these plans and ordinances were incorporated into the risk assessment and hazard vulnerability sections of the plan as appropriate. The data was also used in determining the capability of the community in being able to implement certain mitigation strategies. The Capability Assessment can be found in Chapter 7 – Capability Assessment.

2.2.2 Phase II – Risk Assessment

Planning Steps 4 and 5: Identify/Assess the Hazard and Assess the Problem

The HMPC completed a comprehensive effort to identify, document, and profile all hazards that have, or could have, an impact on the planning area. Data collection worksheets were developed and used in this effort to aid in determining hazards and vulnerabilities and where the risk varies across the planning area. Geographic information systems (GIS) were used to display, analyze, and quantify hazards and vulnerabilities. A draft of the risk and vulnerability assessment was posted on the Cumberland County website and the City of Fayetteville website for HMPC and public review and comment.

The HMPC also conducted a capability assessment to review and document the planning area's current capabilities to mitigate risk from and vulnerability to hazards. By collecting information about existing government programs, policies, regulations, ordinances, and emergency plans, the HMPC could assess those activities and measures already in place that contribute to mitigating some of the risks and vulnerabilities identified. A more detailed description of the risk assessment process and the results are included in Chapter 4 – Hazard Identification, Chapter 5 – Hazard Profiles, and Chapter 6 – Vulnerability Assessment.

2.2.3 Phase III – Mitigation Strategy

Planning Steps 6 and 7: Set Goals and Review Possible Activities

Amec Foster Wheeler facilitated brainstorming and discussion sessions with the HMPC that described the purpose and process of developing planning goals, a comprehensive range of mitigation alternatives, and a method of selecting and defending recommended mitigation actions using a series of selection criteria. This information is included in Chapter 8 - Mitigation Strategy.

Planning Step 8: Draft an Action Plan

A complete first draft of the plan was prepared based on input from the HMPC regarding the draft risk assessment and the goals and activities identified in Planning Steps 6 and 7. This complete draft was posted for HMPC and public review and comment on the Cumberland County website and the City of Fayetteville website. Other agencies were invited to comment on this draft as well. HMPC, public and agency comments were integrated into the final draft for the NCEM and FEMA Region IV to review and approve, contingent upon final adoption by the governing body of each participating jurisdiction.

2.2.4 Phase IV – Plan Maintenance

Planning Step 9: Adopt the Plan

In order to secure buy-in and officially implement the plan, the plan was reviewed and adopted by the governing body of each participating jurisdiction on the dates included in the corresponding resolutions included in Chapter 10 - Plan Adoption.

Planning Step 10: Implement, Evaluate and Revise the Plan

Implementation and maintenance of the plan is critical to the overall success of hazard mitigation planning. Up to this point in the planning process, all of the HMPC's efforts have been directed at researching data, coordinating input from participating entities, and developing appropriate mitigation actions. Chapter 11 - Plan Maintenance provides an overview of the overall strategy for plan implementation and maintenance and outlines the method and schedule for monitoring, updating, and evaluating the plan. Chapter 11 also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

3 COMMUNITY PROFILE

Chapter 3 provides a general overview of Cumberland and Hoke Counties and their participating municipalities. It consists of the following subsections:

- 3.1 Geography and Climate
- 3.2 Cultural, Historic and Natural Resources
- 3.3 Economy
- 3.4 Land Use
- 3.5 Population and Demographics
- 3.6 Growth and Development Trends

A more detailed profile for each participating jurisdiction is provided within each community's Annex.

3.1 Geography and Climate

Cumberland and Hoke Counties are located in the Upper Coastal Plains section of North Carolina, distinctively known as the "Sandhills". The Counties are bordered by Moore and Harnett Counties to the north, Sampson County to the east, Robeson and Bladen Counties to the south, and Scotland County to the west. The total land area for each participating jurisdiction is presented in Table 3.1

Table 3.1 - Total Land Area of Participating Jurisdictions

Jurisdiction	Total Area (square miles)	Land Area (square miles)	Water Area (square miles)
Cumberland County	658.1	652.0	6.1
City of Fayetteville	147.8	145.9	1.9
Town of Eastover	11.4	11.4	0.01
Town of Falcon	1.2	1.2	0.0
Town of Godwin	0.5	0.5	0.0
Town of Hope Mills	7.0	6.9	0.1
Town of Linden	0.5	0.5	0.0
Town of Spring Lake	23.3	23.1	0.2
Town of Stedman	2.1	2.1	0.0
Town of Wade	1.8	1.8	0.0
Hoke County	392.6	391.0	1.6
City of Raeford	3.8	3.8	0.0

Source: 2010 U.S. Census

The land in Cumberland County slopes generally from northwest to southeast. The northwestern section of Cumberland County, within Fort Bragg, has elevations of over 400 feet. Elevations in the southeastern section of Cumberland County tend to be at 100 feet or less. The Cape Fear River runs through Cumberland County, from north to south. The elevation of the river is approximately 35 feet above sea level. Land on the western side of the river is dissected by several systems of streams that flow into the Cape Fear River. There are nine municipalities within the County: the City of Fayetteville and the Towns of Hope Mills, Spring Lake, Eastover, Stedman, Wade, Falcon, Godwin, and Linden.

The topography in Hoke County is gently rolling with land elevations ranging from the lowest point on Rockfish Creek (36 feet above sea level) in the southeastern portion of the County to the highest point

(550 feet above sea level) in the northwestern portion of the County near the McCain area. Hoke County is located in two river basins – the Cape Fear River Basin to the north and east, and the Lumber River Basin to the south and west, with the Lumber River forming the southwestern boundary of the County. There is one municipality within the County: the City of Raeford. Figure 3.1 shows the municipalities and river basins within Cumberland and Hoke Counties.

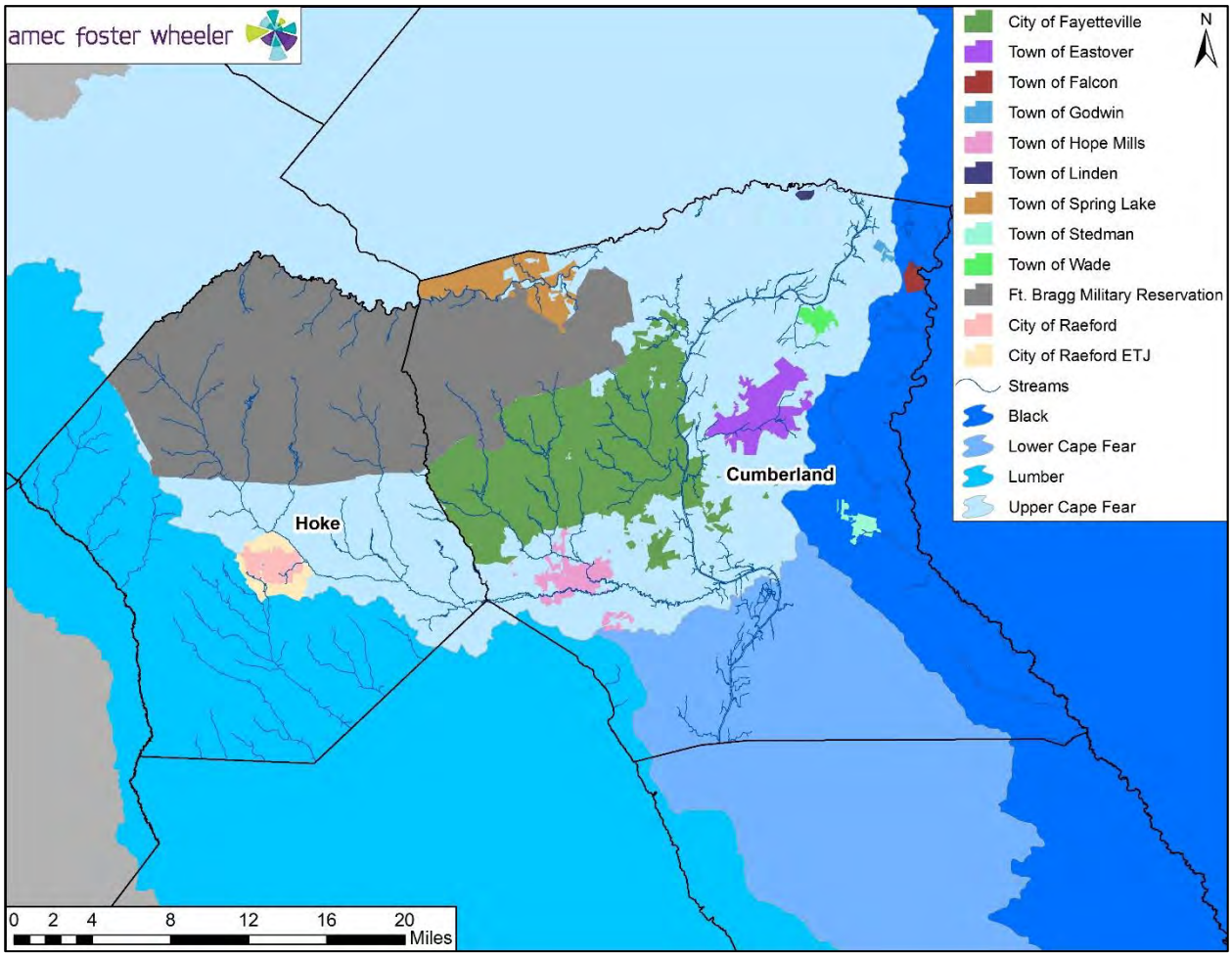


Figure 3.1 - Cumberland and Hoke County River Basins

The Cumberland and Hoke County region has a mild climate, with a mean daily high temperature range from nearly 55 degrees in January to nearly 90 degrees in July. The annual precipitation for the region is approximately 46 inches per year.

3.2 Cultural, Historic and Natural Resources

Cumberland County

Archaeology

Archaeological surveys, including a 1985 county-wide effort, have resulted in over 850 prehistoric and historic archaeological sites being recorded with the North Carolina State Historic Preservation Office. Excavations at the Fayetteville Arsenal along Hay Street and at Cool Springs are notable projects in Fayetteville.

National Register of Historic Places

There are sixty-one Cumberland County listings in the National Register of Historic Places. They include rail stations, churches (Big Rockfish Presbyterian, Cape Fear Baptist, Evans Metropolitan AME Zion, Falcon Tabernacle), Civil War sites (Confederate Breastworks, Arsenal), early taverns (Barge's, Cool Spring), public buildings (Frances B. Stein Library), Cross Creek Cemetery No. 1 in Fayetteville, and several historic districts such as Haymount and Pope Air Force Base. The Market House in Fayetteville has been recognized as a National Historic Landmark.

Natural Features and Resources

Parks, Preserve and Conservation

The State of North Carolina owns and operates Carvers Creek State Park in northern Cumberland County. The park is over 4,000 acres and includes a 100 acre millpond. The park includes meadows of native grasses and wildflowers, longleaf pine forest and mixed pine and hardwood forests.

According to the Fayetteville-Cumberland Parks and Recreation Master Plan and the Fayetteville-Cumberland Parks & Recreation Department, over 1,200 acres of public park land in over 100 park sites exist within the City and County. The park and recreation facilities include: Arnett Park, Lake Rim Park and Recreation Center, County Mini Parks, Cashwell School Park, Seabrook School Park, Sunnyside School Park and Beaver Dam School Park; County Neighborhood Parks, Stoney Point School Park, Eastover Central Park, Grays Creek Park, South Hope Mills Park, East Hope Mills Park, East Fayetteville Park and Southeast Cumberland Park; County Community Parks, North Cumberland Park, East Cumberland Park and South Cumberland Park; the Cape Fear River Trail; City Mini Parks, College Lakes Park, College Lakes Elementary School Park, 71st Middle/Lloyd Auman School Park, Crystal Springs Park, Montclair Elementary School Park and Brentwood School Park; City Neighborhood Parks, Massey Hill Park, Nick Jeralds School Park, Cliffdale School Park, Bailey Lake Road Park, Gilmore Park and Southgate Park; City Community Parks, Northwest Fayetteville Park and Southwest Fayetteville Park.

The Town of Eastover manages: Talley Woodland Park with a wooded area and benches; Eastover Ball Park with baseball/softball fields, playgrounds, concessions, softball field, walking trail and sheltered picnic areas; and Eastover Recreation Center – indoor basketball gym, cardio exercise room, 2 large activity rooms.

The Town of Falcon has one recreation facility, the J.O. Humphries Memorial Park. This 4.08 acre facility includes tennis courts, an open play area, a play apparatus, a physical fitness area, a natural area, a pavilion and picnicking facilities.

The Town of Godwin manages 12 acres of parks including playground equipment, a walking trail, picnic shelters and a volleyball court.

The Town of Hope Mills manages the Hope Mills Municipal Park which includes a ballfield, playground and walking trail. Additionally, a private man-made lake named Fantasy Lake Water Park is located nearby and includes water slides, swings, pedal boats, arcade, volleyball courts and picnic area.

The Town of Stedman manages the 2.23 acre Ernest Freeman Town Park with amenities including playground equipment, benches, swings, grills, and a large picnic shelter.

The Town of Wade manages Wade Community Park.

No information for parks was readily available for the Towns of Linden and Spring Lake.

Water Bodies and Floodplains

Cumberland County is located in the Cape Fear Basin, with only a small portion of the southern county boundary along Cold Camp Creek draining to the Lumber River Basin. There are thirty dams forming lakes or ponds within the County, ranging from under an acre up to 210 acres in size. Glenville Lake serves as a water supply to the City of Fayetteville. The dam on Hope Mills Lake, a 68 acre lake used for recreation located in Hope Mills, has been breached.

Within Cumberland County, there are Water Supply Watershed Protection areas on Little Cross Creek (protected area and critical area, WS-IV), Cross Creek (protected area and critical area, WS-IV), two areas on the Cape Fear River (protected area and critical area, WS-IV), and two areas on the Little River (protected area and critical area, WS-III).

Almost 75,000 acres of the land within the County is located within a 100-yr or 500-yr special flood hazard area. A summary of acreage by flood zone is as follows: Zone A (128 acres), Zone AE (36,126 acres); Zone X 500-yr (38,368 acres); and Zone X Unshaded (346,274 acres).

Table 3.2 – Cumberland County Summary of Flood Zone Acreage

Community	Zone A (acres)	Zone AE (acres)	Shaded Zone X (acres)	Unshaded Zone X (acres)	Total
Cumberland County Unincorporated Areas	119	29,485	32,356	275,115	**337,075**
Town of Eastover	0	693	1,406	5,189	**7,288**
Town of Falcon	0	128	0	681	**809**
City of Fayetteville	9	4,761	4,327	51,152	**60,249**
Town of Godwin	0	0	0	337	**337**
Town of Hope Mills	0	354	93	3,979	**4,426**
Town of Linden	0	0	76	173	**249**
Town Spring Lake	0	632	81	7,572	**8,285**
Town of Stedman	0	67	0	1,001	**1,068**
Town of Wade	0	6	29	1,075	**1,110**
Total	**128**	**36,126**	**38,368**	**346,274**	**420,896**

There are three distinct physical areas on the western side of the Cape Fear River: the lower terrace, the second terrace, and the uplands area. The lower terrace is a low, flat area adjacent to the Cape Fear River. On the western side of the river, the lower terrace extends from Longview Drive Extension on the north to Rockfish Creek on the south. On average, the lower terrace is about a mile wide. This area has historically served as a flood plain for the Cape Fear River; the larger floods of the Cape Fear River have inundated this area in the past. The lower terrace is poorly drained, because it is flat and because it has soils that tend to be plastic and impervious. Campbellton, one of the earliest settlements in the Fayetteville/Cumberland County area, was established on the lower terrace in 1762, due to its proximity to the Cape Fear River. Poor drainage and the threat of flooding from the Cape Fear River caused development to shift west from the lower terrace to the second terrace. The second terrace is located on higher ground, west of the lower terrace. The dividing line on the east between the second terrace and the lower terrace is a noticeable rise in elevation that can be seen along Person Street (near Liberty Point) and along Grove Street (just east of Green Street) in downtown Fayetteville. Drainage on the second terrace tends to be more favorable than in the lower terrace. The higher elevation of the second terrace has made it less vulnerable to flooding from the Cape Fear River. However, the second terrace is still vulnerable to flooding from Cross Creek and Blounts Creek.

Natural and Beneficial Floodplain Functions: Under natural conditions, a flood causes little or no damage in floodplains. Nature ensures that floodplain flora and fauna can survive the more frequent inundations, and the vegetation stabilizes soils during flooding. Floodplains reduce flood damage by allowing flood waters to spread over a large area. This reduces flood velocities and provides flood storage to reduce peak flows downstream.

Threatened and Endangered Species

The U.S. Fish and Wildlife Service maintains a regular listing of threatened species, endangered species, species of concern, and candidate species for counties across the United States. Last updated in December 2012, Cumberland County has 36 species that are listed with the U.S. Fish and Wildlife Services. Table 3.3 below shows the species identified as threatened, endangered, or other classification in Cumberland County.

Table 3.3 – Threatened and Endangered Species in Cumberland County

Common Name	Scientific Name	Federal Status
American Alligator	*Alligator mississippiensis*	Threatened
American Eel	*Anguilla rostrata*	Species of Concern
Bachman's Sparrow	*Aimophila aestivalis*	Species of Concern
Black-throated green warbler	*Dendroica virens waynei*	Species of Concern
Broadtail Madtom	*Noturus sp. cf. leptacanthus*	Species of Concern
Carolina Gopher Frog	*Rana capito*	Species of Concern
Northern Pine Snake	*Pituophis melanoleucus*	Species of Concern
Red-cockaded Woodpecker	*Picoides borealis*	Endangered
Sandhills Chub	*Semotilus lumbee*	Species of Concern
Southern Hognose Snake	*Heterodon simus*	Species of Concern
Atlantic Pigtoe	*Fusconaia masoni*	Species of Concern
Saint Francis' Satyr Butterfly	*Neonympha mitchellii francisci*	Endangered
Yellow Lampmussel	*Lampsilis cariosa*	Species of Concern
American Chaffseed	*Schwalbea americana*	Endangered
Awned Meadowberry	*Rhexia aristosa*	Species of Concern
Bog Oatgrass	*Danthonia epilis*	Species of Concern
Bog Spicebush	*Lindera subcoriacea*	Species of Concern
Boykin's Lobelia	*Lobelia boykinii*	Species of Concern
Carolina Grass-of-parnassus	*Parnassia caroliniana*	Species of Concern
Cuthbert Turtlehead	*Chelone cuthbertii*	Species of Concern
False Coco	*Pteroglossaspis ecristata*	Species of Concern
Georgia Lead-plant	*Amorpha georgiana var. georgiana*	Species of Concern
Loose Watermilfoil	*Myriophyllum laxum*	Species of Concern
Michaux's Sumac	*Rhus michauxii*	Endangered
Pickering's Dawnflower	*Stylisma pickeringii var. pickeringii*	Species of Concern
Pondberry	*Lindera melissifolia*	Endangered
Pondspice	*Litsea aestivalis*	Species of Concern
Rough-leaved Loosestrife	*Lysimachia asperulaefolia*	Endangered
Roughleaf Yellow-eyed Grass	*Xyris scabrifolia*	Species of Concern
Sandhills Bog Lily	*Lilium pyrophilum*	Species of Concern
Sandhills Milk-vetch	*Astragalus michauxii*	Species of Concern
Small-leaved Meadow-rue	*Thalictrum macrostylum*	Species of Concern
Spring-flowering Goldenrod	*Solidago verna*	Species of Concern
Venus' Fly-trap	*Dionaea muscipula*	Species of Concern
Well's Sandhill Prixie-moss	*Pyxidanthera barbulata var. brevifolia*	Species of Concern

Common Name	Scientific Name	Federal Status
Savanna Campylopus	*Campylopus carolinae*	Species of Concern

Source: U.S. Fish & Wildlife Service (http://www.fws.gov/raleigh/species/cntylist/cumberland.html)

Hoke County

National Register of Historic Places

Hoke County contains four National Register listings including two plantation houses (Mill Prong and Puppy Creek Plantation), a major antebellum Presbyterian Church (Long Street), and the Hoke County Courthouse. The Raeford Historic District was more recently listed on the National Register of Historic Places in 2006. Raeford is significant as a typical railroad town in the Sandhills of North Carolina displaying characteristic commercial and residential growth along a grid pattern parallel and perpendicular to the rail line.

Natural Features and Resources

Parks, Preserve and Conservation

According to the 2005 Hoke County Land Use Plan, Hoke County has three soccer fields, 3 picnic shelters, seven baseball/softball fields, three playgrounds, two multi-use trails and three basketball courts. The City of Raeford has four public recreational facilities, 211 Sports Complex, Armory Park, Burlington Park and Rockfish Park, which include a ball field, two playgrounds, two tennis courts and walking trails.

Water Bodies and Floodplains

Hoke County is located in the Cape Fear Basin and the Lumber River Basin in the southern and western areas of the County. There are thirty dams forming lakes or ponds within the County, ranging from 1.6 acres to 85 acres in size.

Within Hoke County, there are Water Supply Watershed Protection areas on the Lumber River (protected area critical area, WS-IV) and on the Little River (protected area, WS-III).

Almost 350 acres of the land within the City of Raeford are located within the 100-yr special flood hazard area. A summary of acreage by flood zone is as follows: Zone AE (342 acres); Zone X 500-yr (58 acres); and Zone X Unshaded (5,547 acres).

Almost 19,000 acres of the land within Hoke County are located within the 100-yr special flood hazard area. A summary of acreage by flood zone is as follows: Zone A (2,420 acres); Zone AE (16,222 acres); Zone X 500-yr (513 acres); and Zone X Unshaded (225,493 acres).

Table 3.4 – Hoke County Summary of Flood Zone Acreage

Community	Zone A (acres)	Zone AE (acres)	Shaded Zone X (acres)	Unshaded Zone X (acres)	Total
Hoke County Unincorporated Areas	2,420	16,222	513	225,493	**244,648**
City of Raeford	0	342	58	5,547	**5,947**
Total	**2,420**	**16,564**	**571**	**231,040**	**250,595**

Natural and Beneficial Floodplain Functions: Under natural conditions, a flood causes little or no damage in floodplains. Nature ensures that floodplain flora and fauna can survive the more frequent inundations, and the vegetation stabilizes soils during flooding. Floodplains reduce flood damage by allowing flood waters to spread over a large area. This reduces flood velocities and provides flood storage to reduce peak flows downstream.

Threatened and Endangered Species

The U.S. Fish and Wildlife Service maintains a regular listing of threatened species, endangered species, species of concern, and candidate species for counties across the United States. Last updated in December 2012, Hoke County has 31 species that are listed with the U.S. Fish and Wildlife Services. Table 3.5 below shows the species identified as threatened, endangered, or other classification in Hoke County.

Table 3.5 – Threatened and Endangered Species in Hoke County

Common Name	Scientific Name	Federal Status
American Alligator	*Alligator mississippiensis*	Threatened
American Eel	*Anguilla rostrata*	Species of Concern
Bachman's Sparrow	*Aimophila aestivalis*	Species of Concern
Carolina Gopher Frog	*Rana capito capito*	Species of Concern
Northern Pine Snake	*Pituophis melanoleucus melanoleucus*	Species of Concern
Pinwoods Darter	*Etheostoma mariae*	Species of Concern
Rafinesque's Big-eared Bat	*Corynorhinus rafinesquii*	Species of Concern
Red-cockaded Woodpecker	*Picoides borealis*	Endangered
Sandhills Chub	*Semotilus lumbee*	Species of Concern
Southeastern Myotis	*Myotis austroriparius*	Species of Concern
Southern Hognose Snake	*Heterodon simus*	Species of Concern
Saint Francis' Satyr Butterfly	*Neonympha mitchellii francisci*	Endangered
American Chaffseed	*Schwalbea americana*	Endangered
Awned Meadowberry	*Rhexia aristosa*	Species of Concern
Bog Spicebush	*Lindera subcoriacea*	Species of Concern
Boykin's Lobelia	*Lobelia boykinii*	Species of Concern
Carolina Grass-of-parnassus	*Parnassia caroliniana*	Species of Concern
False Coco	*Pteroglossaspis ecristata*	Species of Concern
Georgia Lead-plant	*Amorpha georgiana var. georgiana*	Species of Concern
Hairy-peduncled Beakrush	*Rhynchospora crinipes*	Species of Concern
Loose Watermilfoil	*Myriophyllum laxum*	Species of Concern
Michaux's Sumac	*Rhus michauxii*	Endangered
Pickering's Dawnflower	*Stylisma pickeringii var. pickeringii*	Species of Concern
Pondspice	*Litsea aestivalis*	Species of Concern
Rough-leaved Loosestrife	*Lysimachia asperulaefolia*	Endangered
Roughleaf Yellow-eyed Grass	*Xyris scabrifolia*	Species of Concern
Sandhills Bog Lily	*Lilium pyrophilum*	Species of Concern
Sandhills Milk-vetch	*Astragalus michauxii*	Species of Concern
Spring-flowering Goldenrod	*Solidago verna*	Species of Concern
Venus' Fly-trap	*Dionaea muscipula*	Species of Concern
Well's Sandhill Prixie-moss	*Pyxidanthera barbulata var. brevifolia*	Species of Concern

Source: U.S. Fish & Wildlife Service (http://www.fws.gov/raleigh/species/cntylist/hoke.html)

3.3 Economy

Both Cumberland and Hoke Counties sustain a diversified economy. In Cumberland County, most private sector employment is concentrated in educational services, health care and social assistance (28%). The

top three employment industries in Cumberland County in 2013 were educational services, health care and social assistance (28%), retail trade (14%), and arts, entertainment, recreation, and food services (11%). Table 3.6 provides an overview of employment and occupation statistics for Cumberland County. Table 3.7 provides the top five employers in Cumberland County.

Table 3.6- Employment and Occupation Statistics for Cumberland County

Employment Status	Percentage
In labor force	66.3
Employed	47.4
Unemployed	7.3
Armed Forces	11.6
Not in labor force	33.7
Occupation	
Management, business, science and arts	33.0
Service	20.3
Sales and office	25.9
Natural resources, construction and maintenance	8.8
Production, transportation and material moving	12.0

Source: U.S. Census Bureau 2009-2013 American Community Survey 5-Year Estimates

Table 3.7 - Top Five Employers in Cumberland County

Rank	Company	Industry	Number of Employees
1	Defense Ex-Army, Navy & Air Force	Public Administration	1,000+
2	Cumberland County Board of Education	Education & Health Services	1,000+
3	Cape Fear Valley Health Systems	Education & Health Services	1,000+
4	Wal-Mart Associates, Inc.	Trade, Transportation & Utilities	1,000+
5	Cumberland County	Public Administration	1,000+

Source: NC Department of Commerce, 2015

In Hoke County, most private sector employment is concentrated in educational services, health care and social assistance (27%). The top three employment industries in Hoke County in 2013 were educational services, health care and social assistance (27%), manufacturing (14%), and retail trade (12%). Table 3.8 provides an overview of employment and occupation statistics for Hoke County. Table 3.9 provides the top five employers in Hoke County.

Table 3.8- Employment and Occupation Statistics for Hoke County

Employment Status	Percentage
In labor force	64.1
Employed	47.4
Unemployed	8.1
Armed Forces	8.6
Not in labor force	35.9
Occupation	
Management, business, science and arts	28.9
Service	22.0
Sales and office	23.6
Natural resources, construction and maintenance	10.4
Production, transportation and material moving	15.1

Source: U.S. Census Bureau 2009-2013 American Community Survey 5-Year Estimates

Table 3.9 - Top Five Employers in Hoke County

Rank	Company	Industry	Number of Employees
1	Hoke County Board of Education	Education & Health Services	1,000+
2	Hoke County	Public Administration	250-499
3	Conopco Inc.	Manufacturing	250-499
4	The Staffing Alliance LLC	Professional & Business Services	250-499
5	Burlington Industries LLC	Manufacturing	250-499

Source: NC Department of Commerce, 2015

Fort Bragg, one of the largest military installations in the world in terms of personnel, is located in Cumberland and Hoke Counties. Currently, more than 50,000 active duty personnel call Fort Bragg home. As the area's single largest employer, Fort Bragg (and Pope Army Airfield) has a huge impact on area growth and economic conditions. As stated in the Cumberland County 2030 Joint Growth Vision Plan - Growth Factory Analysis, Dr. Sid Gautam of the Center for Entrepreneurship at Methodist College, in May 2000, conducted an Analysis of the Economic Impact of Ft. Bragg and Pope Air Force Base (now Pope Army Airfield which is part of Fort Bragg). Among his conclusions were the following:

- Ten classes of payroll dollars contribute $1.2 billion in wages for 50,000 jobs and result in an economic impact of $3.48 billion annually.
- Ft. Bragg and Pope Army Airfield represent no less than 35% of the economies of Cumberland and Hoke Counties--on the order of fifteen times the impact of the area's largest manufacturing facility.
- By itself, Bragg-Pope would be North Carolina's eighth largest metropolitan economy.
- A very significant part of military payrolls go to long-term residents. On average, a Bragg-Pope dollar circulates 2.64 times through the economy in a year.
- Fort Bragg outweighs Pope Army Airfield in economic impact by about 8:1, but Pope contributes nearly $400 million to the economy.

3.4 Land Use

The existing land use for Cumberland County is shown in Figure 3.2 on the following page. Interstate 95, which bisects the County, serves as a major north-south route on the eastern seaboard. Most of the urban development is located west of the Interstate, while land located east of Interstate 95 is generally rural. The proposed land use for the Cumberland County area is shown in Figure 3.3 – 2030 Growth Strategy Map. According to the 2030 Growth Vision Plan, 149,248 acres is designated as rural area; 47,897 acres as conservation area; 44,974 acres as urban fringe; 105,585 acres as urban area; and 26,558 acres as community growth area.

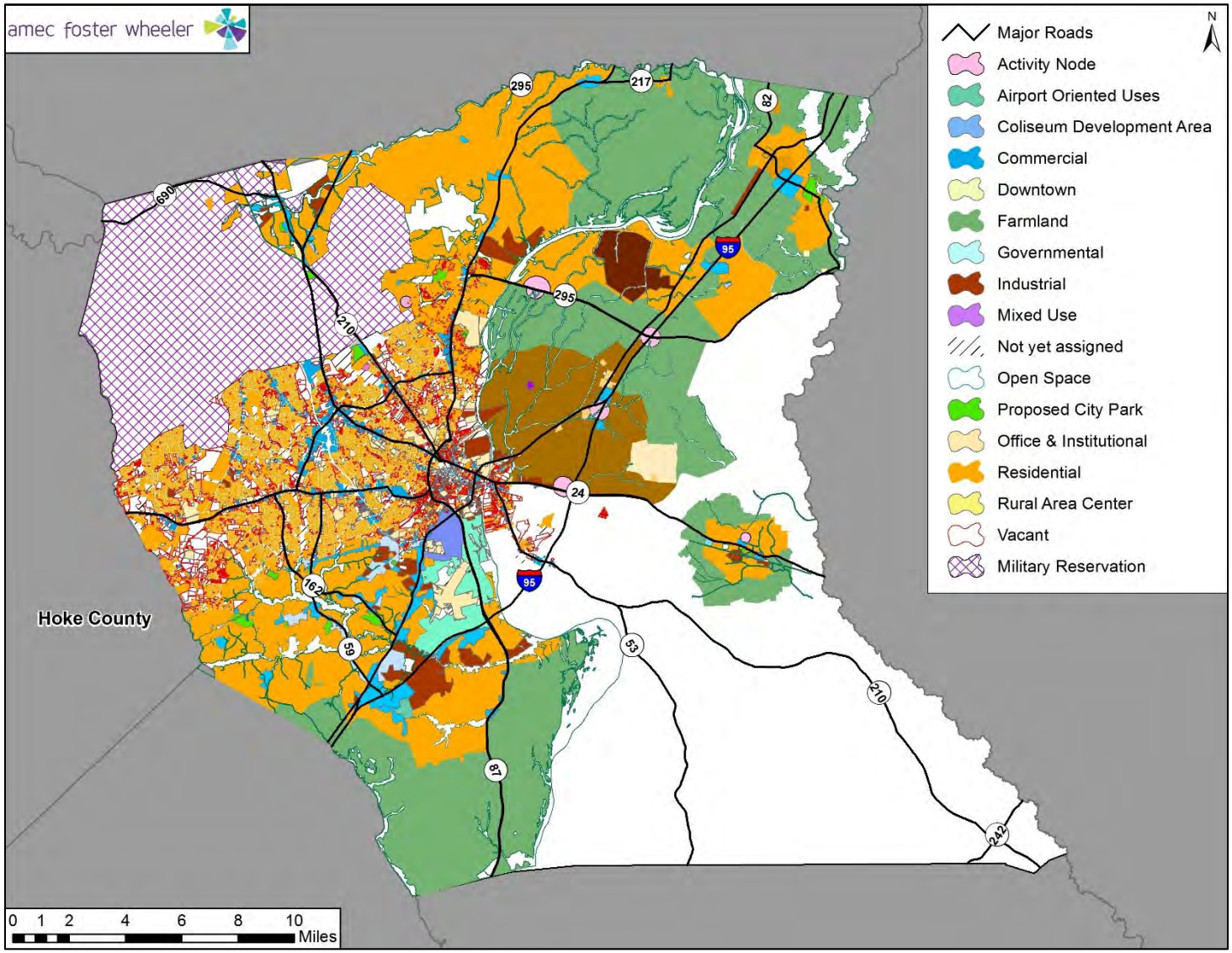


Figure 3.2 - Cumberland County Existing Land Use

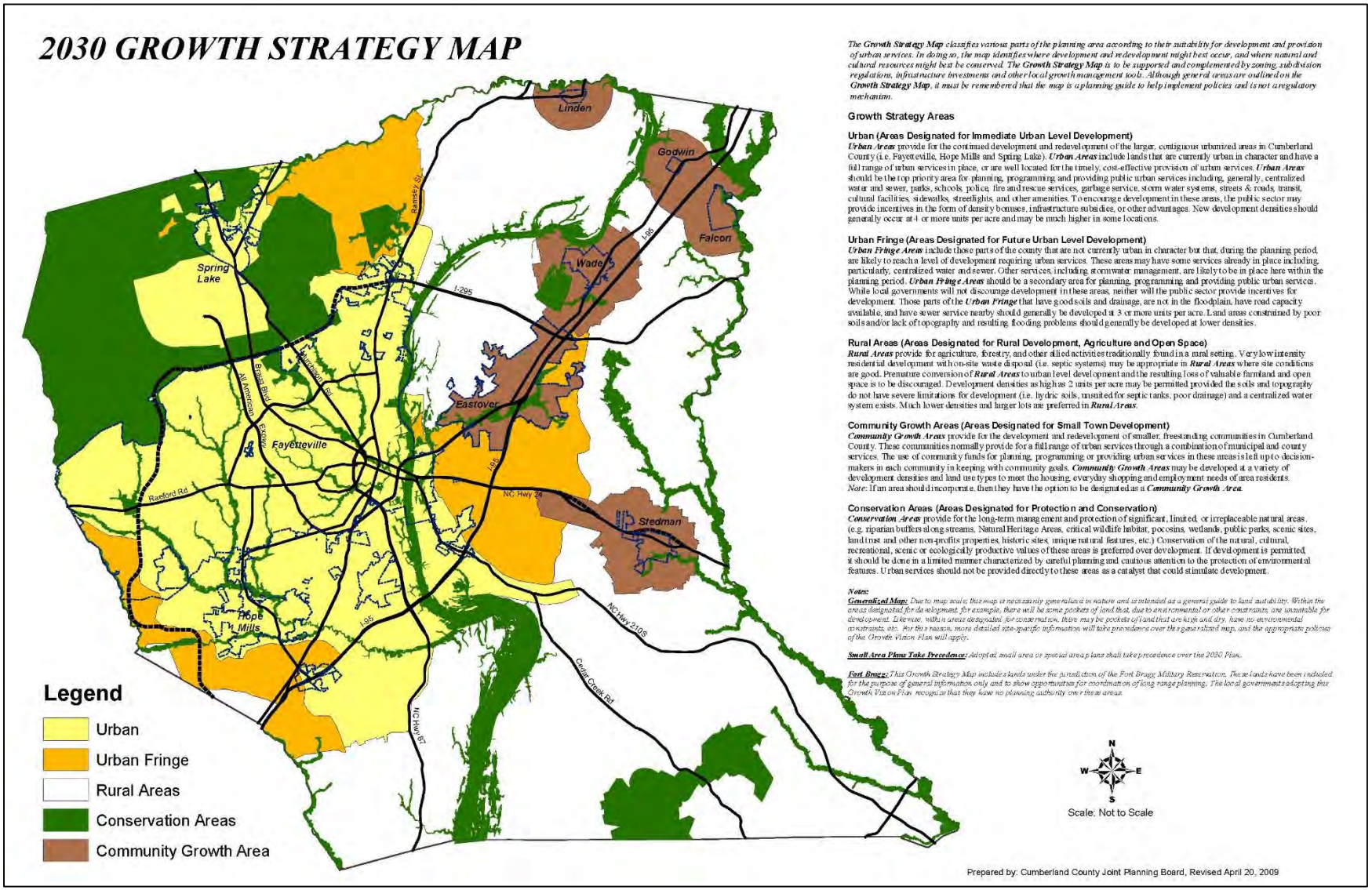


Figure 3.3 - Cumberland County 2030 Growth Strategy Map

The existing land use for Hoke County is shown in Figure 3.4. According to the Hoke County 2005 Land Use Plan, approximately 97% of the County is zoned as Residential-Agricultural-20 which requires a minimum lot size area of 0.5 acre. Fort Bragg occupies approximately 36% of the total County acreage. Future land use data is not available for Hoke County.

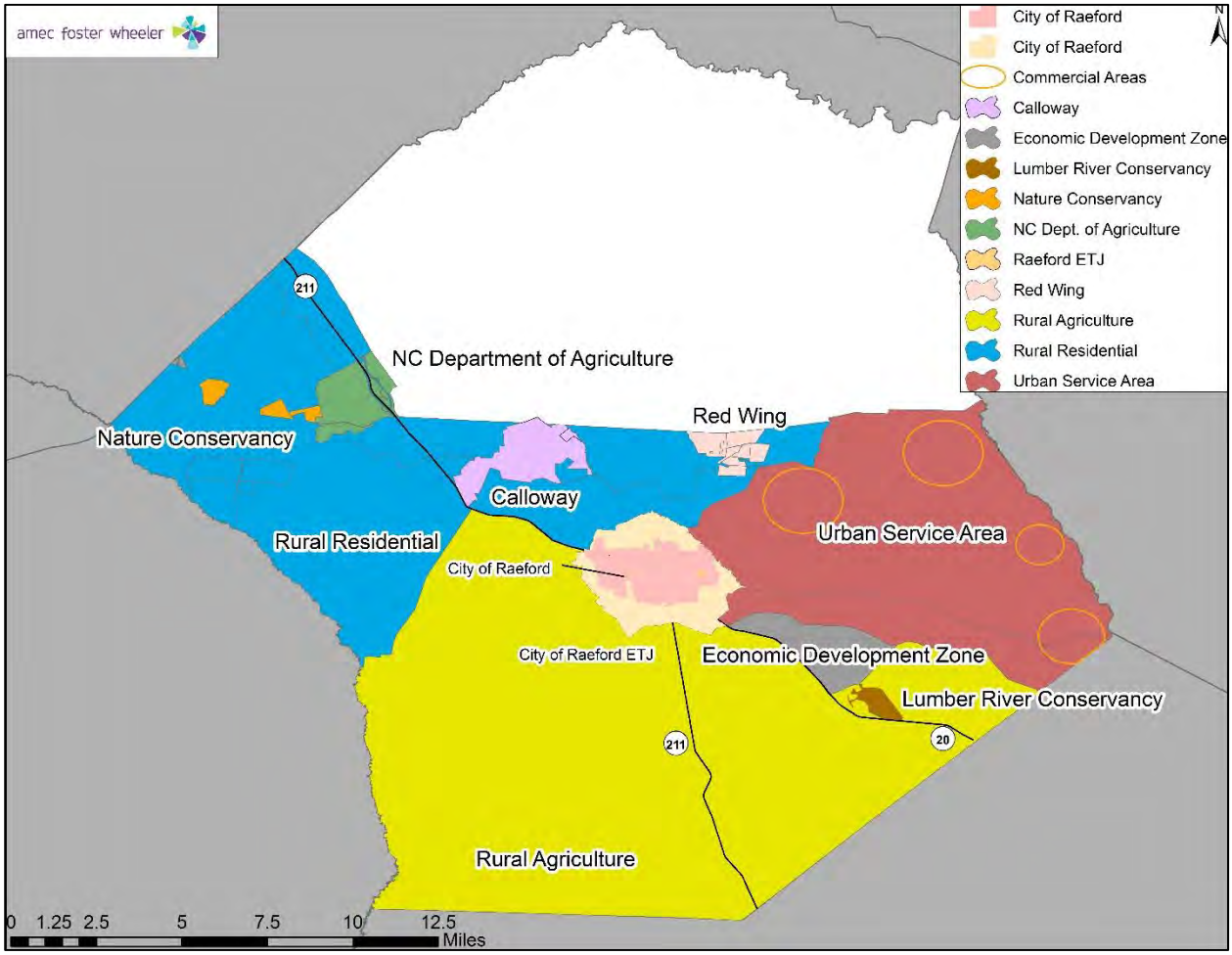


Figure 3.4 - Hoke County Existing Land Use

3.5 *Population and Demographics*

Table 3.10 provides population counts and percent change in population since 2010 for all participating jurisdictions.

Table 3.10 - Population Counts for Participating Jurisdictions

Jurisdiction	2010 Census Population	2014 Estimated Population	% Change 2010-2014
Cumberland County	319,431	324,002	1.4
City of Fayetteville	200,564*	202,421	0.9
Town of Eastover	3,628	3,679	1.4
Town of Falcon	258	274	6.2
Town of Godwin	139	123	-11.5
Town of Hope Mills	15,176	16,024	5.6

Jurisdiction	2010 Census Population	2014 Estimated Population	% Change 2010-2014
Town of Linden	130	156	20.0
Town of Spring Lake	11,964	13,101	9.5
Town of Stedman	1,028	1,134	10.3
Town of Wade	556	477	-14.2
Hoke County	46,952	50,034	6.6
City of Raeford	4,611	4,783	3.7

*Note: This population includes 17, 197 people living on Fort Bragg.
Source: U.S. Census Bureau: 2010 Census & 2014 American Community Survey

Based on the 2010 Census, the median age of residents in both Cumberland and Hoke Counties is 31.0. The racial characteristics of the participating jurisdictions are presented below in Table 3.11. Generally, whites make up the majority of the population in both counties. However, several jurisdictions have much higher minority populations than others including Fayetteville, Raeford, Spring Lake and Hope Mills.

Table 3.11 - Demographics of Participating Jurisdictions

Jurisdiction	White Persons, Percent (2010)	Black Persons, Percent (2010)	American Indian or Alaska Native, Percent (2010)	Asian Persons, Percent (2010)	Hispanic or Latino Persons, Percent (2010)[1]
Cumberland County	51.4	36.7	1.6	2.2	9.5
City of Fayetteville	45.7	41.9	1.1	2.6	10.1
Town of Eastover	74.9	19.2	1.9	0.9	3.0
Town of Falcon	73.6	14.3	0.8	0	14.0
Town of Godwin	70.5	27.3	0.0	0.7	0.0
Town of Hope Mills	61.9	26.5	1.9	1.8	10.0
Town of Linden	76.9	12.3	3.1	0.8	5.4
Town of Spring Lake	47.2	36.3	1.1	3.0	15.4
Town of Stedman	83.2	11.7	1.1	0.7	3.2
Town of Wade	74.6	20.9	0.7	1.3	3.2
Hoke County	45.3	33.5	9.6	1.0	12.4
City of Raeford	43.6	41.1	4.3	1.0	9.6

[1]Persons of Hispanic Origin may be of any race, so are also included in applicable race category.
Source: U.S. Census Bureau, 2010

3.6 *Growth and Development Trends*

The projected population in Cumberland County for the year 2035 is 367,939 according to the NC State Office of Budget and Management. This is a projected 13% increase over the next 20 years.

The projected population in Hoke County for the year 2035 is 76,234 which equals a 48% increase over the next 20 years.

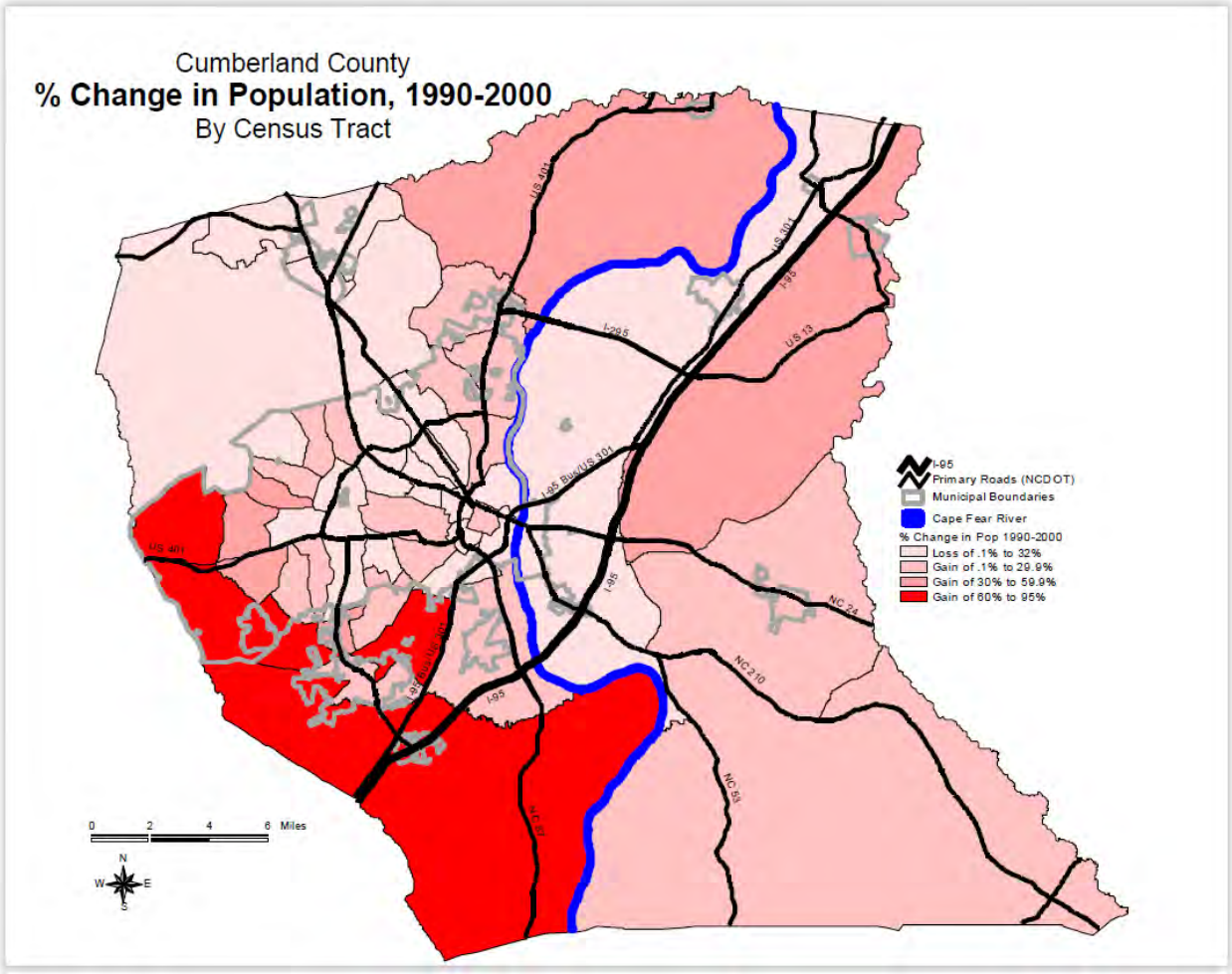
Table 3.12 – Historic and Projected Population Growth (1990 – 2035)

Year	Population	Growth	Percent Growth
Cumberland County			
1990	274,713	--	--
2000	302,962	28,249	10.3

Year	Population	Growth	Percent Growth
2010	319,431	16,469	5.4
2020	340,413	20,982	6.6
2030	358,765	18,352	5.4
2035	367,939	9,174	2.6
Hoke County			
1990	22,856	--	--
2000	33,646	10,790	47.2
2010	46,952	13,306	39.5
2020	57,919	10,967	23.4
2030	69,996	12,077	20.9
2035	76,234	6,238	8.9

Source: NC State Office of Budget and Management (http://www.osbm.nc.gov/demog/county-projections)

According to the Cumberland County 2030 Growth Vision Plan – Growth Factor Analysis, areas with the highest growth rate from 1990-2000 (60%-95%) were in the southwestern part of the County as shown in Figure 3.5 below. Factors that may have contributed to this growth include: availability of undeveloped land, utilities, proximity to Fort Bragg, and the proposed Outer Loop.



Source: Cumberland County 2030 Growth Vision Plan

Figure 3.5 - Cumberland County Population Change

4 HAZARD IDENTIFICATION

44 CFR Subsection D §201.6(c)(2): [The plan shall include] A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

The following section describes the Risk Assessment process for the development of the Cumberland-Hoke Regional Hazard Mitigation Plan. It describes how the HMPC met the following requirements from the 10-step planning process:

- Planning Step 4: Assess the Hazard
- Planning Step 5: Assess the Problem

As defined by FEMA, risk is a combination of hazard, vulnerability, and exposure. "It is the impact that a hazard would have on people, services, facilities, and structures in a community and refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage."

This risk assessment covers the entire geographical area of Cumberland and Hoke Counties in North Carolina. The risk assessment process identifies and profiles relevant hazards and assesses the exposure of lives, property, and infrastructure to these hazards. The process allows for a better understanding of a jurisdiction's potential risk to natural hazards and provides a framework for developing and prioritizing mitigation actions to reduce risk from future hazard events. This risk assessment followed the methodology described in the FEMA publication Understanding Your Risks—Identifying Hazards and Estimating Losses (FEMA 386-2, 2002), which breaks the assessment down to a four-step process:

1) Identify Hazards;

2) Profile Hazard Events;

3) Inventory Assets; and

4) Estimate Losses.

Data collected through this process has been incorporated into the following sections of this plan:

Chapter 4: **Hazard Identification** identifies the natural and man-made hazards that threaten the planning area.

Chapter 5: **Hazard Profiles** discusses the threat to the planning area and describes previous occurrences of hazard events and the likelihood of future occurrences.

Chapter 6: Vulnerability Assessment assesses the planning area's exposure to the hazards; considering assets at risk, critical facilities, and future development trends.

Chapter 7: Capability Assessment inventories existing mitigation activities and policies, regulations, and plans that pertain to mitigation and can affect net vulnerability.

The HMPC conducted a hazard identification study to determine the natural and man-made hazards that threaten Cumberland and Hoke Counties. Existing hazard data from NCEM, FEMA, the National Oceanic and Atmospheric Administration (NOAA), and other sources were examined to assess the significance of these hazards to the planning area. Significance was measured in general terms and focused on key

criteria such as frequency and resulting damage, which includes deaths and injuries, as well as property and economic damage.

To further focus on the list of identified hazards for this plan update, the HMPC researched past events that resulted in a federal disaster declarations in order to identify known hazards. Tables 4.1 and 4.2 present a list of all major disaster declarations that have occurred in Cumberland and Hoke Counties, respectively, since 1953. These tables present the foundation for identifying which hazards pose the greatest risk to the region.

Table 4.1 - Major Disaster Declarations in Cumberland County (1953 - 2015)

Declaration #	Date	Event Details
DR-28	10/17/1954	Hurricane Hazel
DR-699	03/30/1984	Severe Storms, Tornadoes
DR-1134	09/06/1996	Hurricane Fran
DR-1240	08/27/1998	Hurricane Bonnie
DR-1292	09/16/1999	Hurricane Floyd & Irene
DR-1490	09/18/2003	Hurricane Isabel
DR-1546	09/10/2004	Tropical Storm Frances
DR-1969	04/19/2011	Severe Storms, Tornadoes and Flooding

Source: FEMA

Table 4.2 - Major Disaster Declarations in Hoke County (1953 - 2015)

Declaration #	Date	Event Details
DR-1134	09/06/1996	Hurricane Fran
DR-1292	09/16/1999	Hurricane Floyd & Irene
DR-1312	01/31/2000	Winter Storm
DR-1546	09/10/2004	Tropical Storm Frances
DR-1969	04/19/2011	Severe Storms, Tornadoes and Flooding

Source: FEMA

Table 4.3 documents the decisions made by the HMPC as it relates to those hazards that were to be identified, analyzed, and addressed through the development of this regional plan. This table examines where or not the hazard was included in the 2013 State of North Carolina Hazard Mitigation Plan as well as the individual county plans from 2011. This table summarizes those hazards that were identified for inclusion as well as those that were not identified and the reasoning for the decision.

Table 4.3 – Hazard Evaluation

Hazard	Included in State 2013 Plan?	Included in Cumberland Co 2011 Plan?	Included in Hoke Co 2011 Plan?	Identified as a significant hazard to be included in the Regional Plan?
Coastal Hazards (coastal flooding, coastal erosion, storm surge & sea level rise)	Yes	No	No	No. Cumberland and Hoke Counties lie 100 miles inland from the coast.
Dam/Levee Failure	Yes	No	Yes	Yes
Drought	Yes	Yes	Yes	Yes

Hazard	Included in State 2013 Plan?	Included in Cumberland Co 2011 Plan?	Included in Hoke Co 2011 Plan?	Identified as a significant hazard to be included in the Regional Plan?
Earthquake	Yes	Yes	Yes	Yes
Erosion	No	No	Yes	Yes
Extreme Heat	No	Yes	Yes	Yes
Hurricane/Tropical Storm	Yes	Yes	Yes	Yes
Inland Flooding: 100-/500-year	Yes	Yes	Yes	Yes
Severe Weather (thunderstorm wind, lightning, & hail)	Yes	Yes	Yes	Yes
Sinkhole	Yes	No	Yes	Yes
Tornado	Yes	Yes	Yes	Yes
Wildfire	Yes	Yes	Yes	Yes
Winter Storm	Yes	Yes	Yes	Yes

The following hazards were evaluated by the HMPC and determined to be non-prevalent hazards that should not be included in the plan:

- **Avalanche** – According to the Federal Emergency Management Agency's Multi-hazard Identification and Risk Assessment, this hazard is only relevant to the western United States.
- **Landslide** – Based on the national U.S. Geological Survey map of landslide susceptibility and incidence, Cumberland and Hoke Counties rest within a zone of low incidence. The topography of the upper coastal plain does not provide enough elevation relief to support a landslide event.
- **Tsunami** - According to a 2009 report by the USGS titled Regional Assessment of Tsunami Potential in the Gulf of Mexico, there are no significant earthquake sources within the Atlantic Ocean that are likely to generate tsunamis. Furthermore, Cumberland and Hoke Counties lie 100 miles inland from the coast.
- **Volcano** – There are no known active volcanoes in the United States east of central New Mexico.

The complete list of hazards for inclusion in this 2015 Regional Plan is as follows:

- Dam/Levee Failure
- Drought
- Earthquake
- Erosion
- Extreme Heat
- Hurricane/Tropical Storm
- Inland Flooding: 100-/500-year
- Severe Weather (thunderstorm wind, lightning & hail)
- Sinkhole
- Tornado
- Wildfire
- Winter Storm

5 HAZARD PROFILES

The hazards identified in Chapter 4 - Hazard Identification, are profiled individually in this chapter. It consists of the following subsections:

- 5.1 Dam/Levee Failure
- 5.2 Drought
- 5.3 Earthquake
- 5.4 Erosion
- 5.5 Extreme Heat
- 5.6 Hurricane/Tropical Storm
- 5.7 Inland Flooding: 100-/500-year
- 5.8 Severe Weather (Thunderstorm Wind, Lightning & Hail)
- 5.9 Sinkhole
- 5.10 Tornado
- 5.11 Wildfire
- 5.12 Winter Storm
- 5.13 Hazard Profile Summary

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

Information provided by members of the HMPC has been integrated into this chapter with information from other data sources.

Each hazard is profiled in the following format:

Hazard Description

This section provides a description of the hazard followed by details specific to the regional planning area.

Location and Spatial Extent

This section includes information on the hazard extent, seasonal patterns, speed of onset/duration, magnitude and any secondary effects.

Past Occurrences

This section contains information on historical events, including the extent or location of the hazard within or near the regional planning area.

Probability of Future Occurrence

This section gauges the likelihood of future occurrences based on past events and existing data. The frequency is determined by dividing the number of events observed by the number of years on record and multiplying by 100. This provides the percent chance of the event happening in any given year (e.g. 10 hurricanes or tropical storms over a 30-year period equates to a 33 percent chance of experiencing a hurricane or tropical storm in any given year). The likelihood of future occurrences is categorized into one of the classifications as follows:

- ***Highly Likely*** – 100 percent chance of occurrence within the next year
- ***Likely*** – Between 11 and 99 percent chance of occurrence within the next year (recurrence interval of 10 years or less)

- ***Possible*** – Between 1 and 10 percent chance of occurrence within the next year (recurrence interval of 11 to 100 years)
- ***Unlikely*** – Less than 1 percent chance or occurrence within the next 100 years (recurrence interval of greater than every 100 years)

Consequence Analysis

This section examines effects of the hazard on people, first responders, continuity of operations, built environment, economy and natural environment.

Those hazards determined to be of high or medium significance were characterized as priority hazards that required further evaluation in Chapter 6 Vulnerability Assessment. Significance was determined by frequency of the hazard and resulting damage, including deaths/injuries and property, crop and economic damage. Hazards occurring infrequently or having little to no impact on the regional planning area were determined to be of low significance and not considered a priority hazard. These criteria allowed the HMPC to prioritize hazards of greatest significance and focus resources where they are most needed.

Study Area

Cumberland County includes nine participating municipalities and Hoke County contains one participating municipality. Table 5.1 provides a summary of the participating jurisdictions by County. Figure 5.1 provides a base map, for reference, of Cumberland and Hoke Counties and the participating municipalities.

Table 5.1 - Participating Jurisdictions

Cumberland County	
City of Fayetteville	Town of Linden
Town of Eastover	Town of Spring Lake
Town of Falcon	Town of Stedman
Town of Godwin	Town of Wade
Town of Hope Mills	
Hoke County	
City of Raeford	

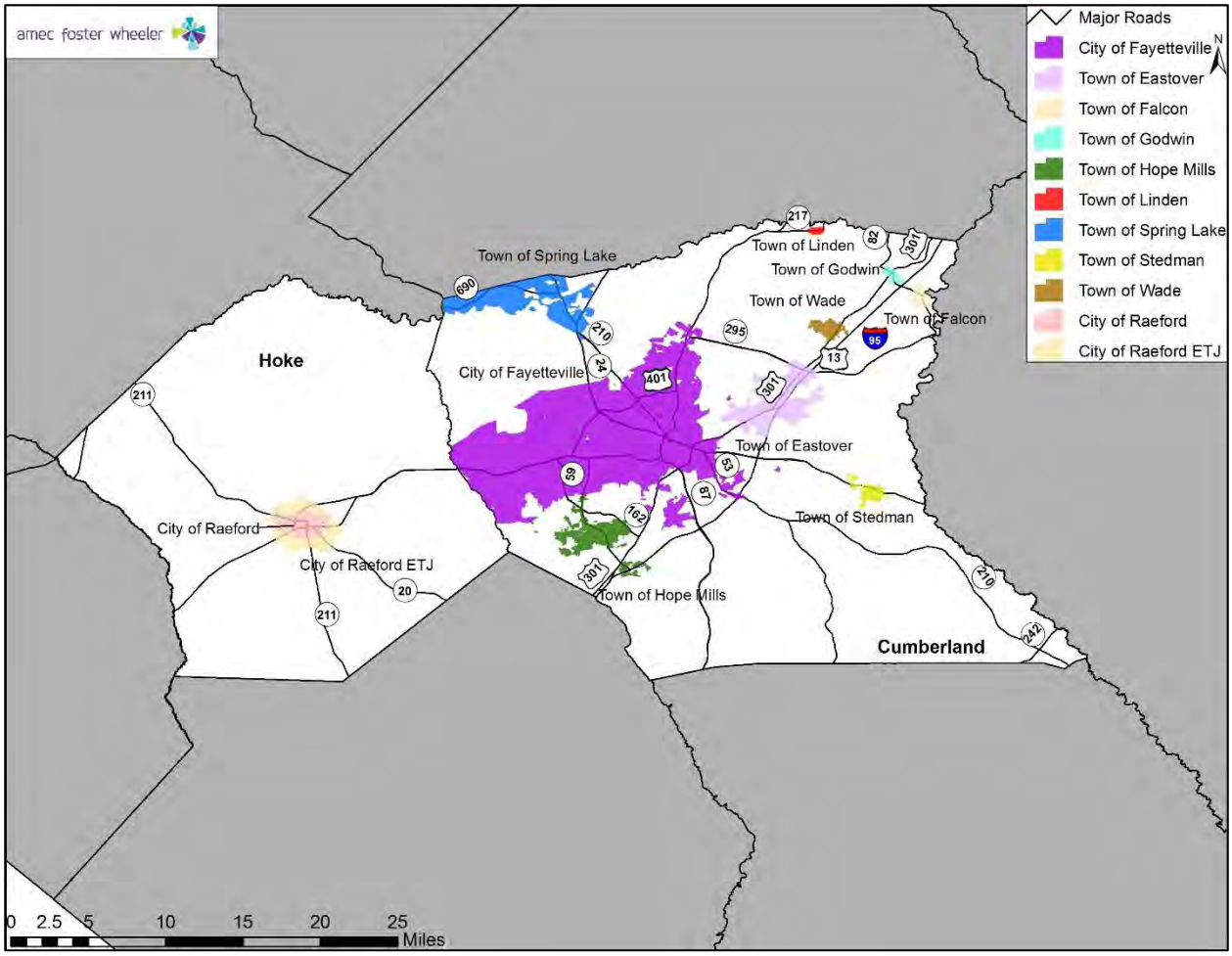


Figure 5.1 - Cumberland and Hoke County Base Map

Past Severe Weather Reports

NOAA's National Centers for Environmental Information (NCEI) [formerly National Climatic Data Center (NCDC)], has been tracking severe weather since 1950. Their Storm Events Database contains an archive of destructive storm or weather data and information which includes local, intense and damaging events. NCEI receives storm data from the National Weather Service (NWS). The NWS receives their information from a variety of sources, which include but are not limited to: county, state and federal emergency management officials, local law enforcement officials, SkyWarn spotters, NWS damage surveys, newspaper clipping services, the insurance industry and the general public, among others. This database contains 672 severe weather events that occurred in Cumberland and Hoke Counties between January 1950 and May 2015. Table 5.2 summarizes these events.

Table 5.2 - NCEI Severe Weather Reports (January 1950 – May 2015)

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Cumberland County					
Cold/Wind Chill	1	$0	$0	0	0
Flash Flood	40	$2,132,000	$0	0	0
Flood	2	$0	$0	0	0
Hail	128	$1,025,000	$0	0	0

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Heat	2	$0	$0	1	0
Heavy Rain	4	$1,500,000	$0	0	0
High Wind	5	$101,000	$0	0	0
Hurricane (Typhoon)	6	$28,000	$0	0	0
Lightning	15	$1,836,000	$0	0	4
Strong Wind	9	$118,000	$7,000	0	1
Thunderstorm Wind	198	$1,328,500	$0	0	8
Tornado	23	$132,127,500	$0	5	169
Tropical Storm	1	$0	$0	0	0
Winter Storm	19	$0	$0	0	0
Winter Weather	7	$0	$0	1	0
Hoke County					
Cold/Wind Chill	1	$0	$0	0	0
Flash Flood	15	$160,000	$0	0	0
Flood	2	$0	$0	0	0
Hail	52	$0	$0	0	0
Heat	1	$0	$0	0	0
Heavy Rain	2	$0	$0	0	0
Heavy Snow	1	$0	$0	0	0
High Wind	3	$1,000	$0	0	0
Hurricane (Typhoon)	5	$0	$0	0	0
Lightning	3	$60,000	$0	0	0
Strong Wind	5	$17,000	$5,000	0	0
Thunderstorm Wind	89	$427,000	$0	0	4
Tornado	10	$805,250	$0	1	6
Winter Storm	18	$0	$0	0	0
Winter Weather	5	$0	$0	0	0
Total:	**672**	**$141,666,250**	**$12,000**	**8**	**192**

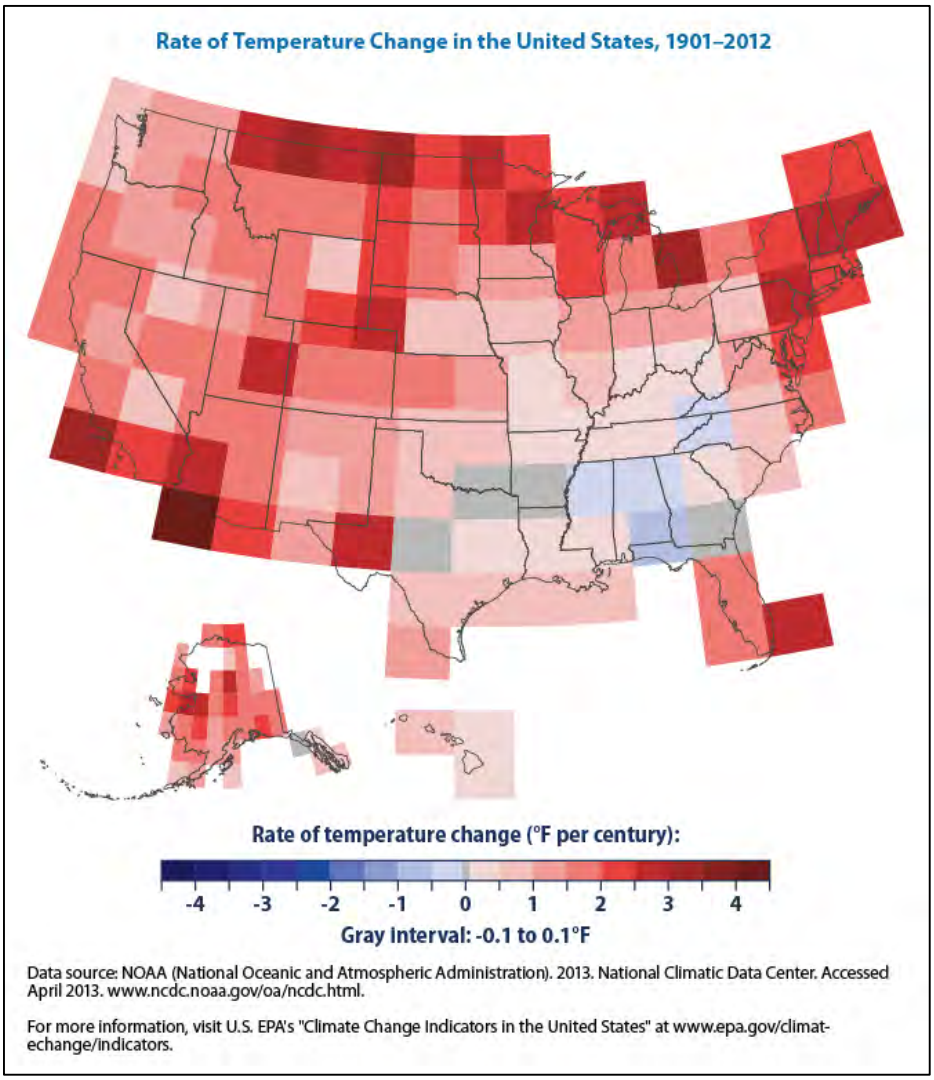
Source: National Climatic Data Center Storm Events Database, September 2015
Note: Losses reflect totals for all impacted areas within the County.

Climate Change

Climate change refers to a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions, and persistent anthropogenic changes in the composition of the atmosphere or in land use [(22)]. Climate change is a natural occurrence in which the earth has warmed and cooled periodically over geologic time. The recent and rapid warming of the earth over the past century has been cause for concern, as this warming is very likely due to the accumulation of human-caused greenhouse gases, such as CO2, in the atmosphere [(23)]. This warming is occurring almost everywhere in the world which suggests a global cause rather than changes in localized weather patterns.

Since 1901, the average surface temperature across the contiguous 48 states has risen at an average rate of 0.14°F per decade (1.4°F per century). Average temperatures have risen more quickly since the late 1970s (0.36 to 0.55°F per decade). Seven of the top 10 warmest years on record for the contiguous 48 states have occurred since 1998, and 2012 was the warmest year on record. The figure below, based on

data from NOAA and prepared by the EPA, shows how annual average air temperatures have changed in different parts of the United States since 1901. According to the Cumberland County Climate Resiliency Plan [21], the Cumberland-Hoke County region is projected to experience an additional 15-35 days annually with temperatures above 95°F, drastically increasing the number of extreme heat days. Furthermore, the average temperature in the Southeast United States is expected to increase by one to two degrees starting in 2050 [21].



The Cumberland County Climate Resiliency Plan identifies four climate risks projected to impact the Cumberland-Hoke region: 1) increasing temperatures; 2) increasing frequency and strength of severe weather events; 3) more heavy rain/flooding; and 4) more frequent and prolonged drought. A discussion of the effect of these climate risks on the individual hazards profiled below has been included in the Probability of Future Occurrence subsection for each hazard as applicable.

5.1 Dam/Levee Failure

5.1.1 Hazard Description

Dam Failure

A dam is a barrier constructed across a watercourse that stores, controls, or diverts water. Dams are usually constructed of earth, rock, or concrete. The water impounded behind a dam is referred to as the reservoir and is measured in acre-feet. One acre-foot is the volume of water that covers one acre of land to a depth of one foot. Dams can benefit farm land, provide recreation areas, generate electrical power, and help control erosion and flooding issues.

A dam failure is the collapse or breach of a dam that causes downstream flooding. Dam failures may be caused by natural events, human-caused events, or a combination. Due to the lack of advance warning, failures resulting from natural events, such as hurricanes, earthquakes, or landslides, may be particularly severe. Prolonged rainfall and subsequent flooding is the most common cause of dam failure.

Dam failures usually occur when the spillway capacity is inadequate and water overtops the dam or when internal erosion in dam foundation occurs (also known as piping). If internal erosion or overtopping cause a full structural breach, a high-velocity, debris-laden wall of water is released and rushes downstream, damaging or destroying anything in its path. Overtopping is the primary cause of earthen dam failure in the United States.

Dam failures can result from any one or a combination of the following:

- Prolonged periods of rainfall and flooding;
- Inadequate spillway capacity, resulting in excess overtopping flows;
- Internal erosion caused by embankment or foundation leakage or piping;
- Improper maintenance, including failure to remove trees, repair internal seepage problems, replace lost material from the cross-section of the dam and abutments, or maintain gates, valves, and other operational components;
- Improper design, including the use of improper construction materials and construction practices;
- Negligent operation, including the failure to remove or open gates or valves during high flow periods;
- Failure of upstream dams on the same waterway; and
- High winds, which can cause significant wave action and result in substantial erosion.

Water released by a failed dam generates tremendous energy and can cause a flood that is catastrophic to life and property. A catastrophic dam failure could challenge local response capabilities and require evacuations to save lives. Impacts to life safety will depend on the warning time and the resources available to notify and evacuate the public. Major casualties and loss of life could result, as well as water quality and health issues. Potentially catastrophic effects to roads, bridges, and homes are also of major concern. Associated water quality and health concerns could also be issues. Factors that influence the potential severity of a full or partial dam failure are the amount of water impounded; the density, type, and value of development and infrastructure located downstream; and the speed of failure.

Each state has definitions and methods to determine the Hazard Potential of a dam. In North Carolina, dams are regulated by the state if they are 25 feet or more in height and impound 50 acre-feet or more.

Dams and impoundments smaller than that may fall under state regulation if it is determined that failure of the dam could result in loss of human life or significant damage to property below the dam. The height of a dam is from the highest point on the crest of the dam to the lowest point on the downstream toe, and the storage capacity is the volume impounded at the elevation of the highest point on the crest of the dam.

Dam Safety Program engineers determine the "hazard potential" of a dam, meaning the probable damage that would occur if the structure failed, in terms of loss of human life and economic loss or environmental damage. Dams are assigned one of three classes based on the nature of their hazard potential:

1. Class A (Low Hazard) includes dams located where failure may damage uninhabited low value non-residential buildings, agricultural land, or low volume roads.
2. Class B (Intermediate Hazard) includes dams located where failure may damage highways or secondary railroads, cause interruption of use or service of public utilities, cause minor damage to isolated homes, or cause minor damage to commercial and industrial buildings. Damage to these structures will be considered minor only when they are located in backwater areas not subjected to the direct path of the breach flood wave; and they will experience no more than 1.5 feet of flood rise due to breaching above the lowest ground elevation adjacent to the outside foundation walls or no more than 1.5 feet of flood rise due to breaching above the lowest floor elevation of the structure.
3. Class C (High Hazard) includes dams located where failure will likely cause loss of life or serious damage to homes, industrial and commercial buildings, important public utilities, primary highways, or major railroads.

Table 5.3- Dam Hazard Classifications

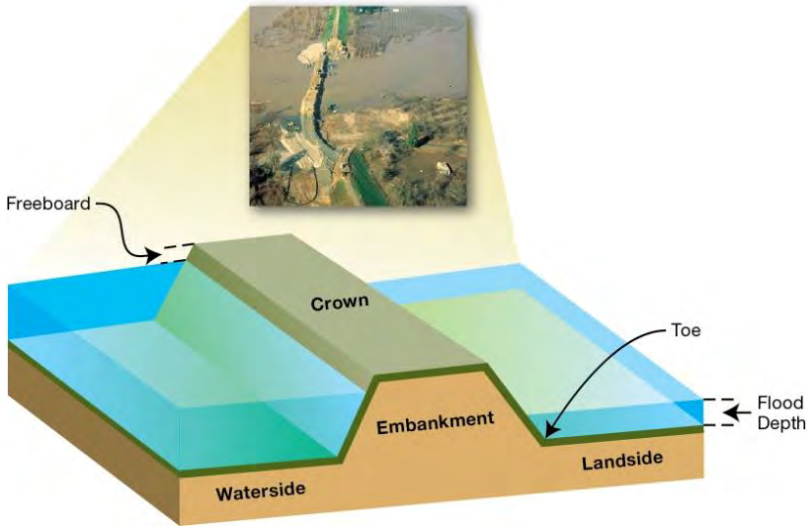
Hazard Classification	Description	Quantitative Guidelines
Low	Interruption of road service, low volume roads	Less than 25 vehicles per day
	Economic damage	Less than $30,000
Intermediate	Damage to highways, interruption of service	25 to less than 250 vehicles per day
	Economic damage	$30,000 to less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

Source: NCDENR

Levee Failure

FEMA defines a levee as “a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water in order to reduce the risk from temporary flooding.” Levee systems consist of levees, floodwalls, and associated structures, such as closure and drainage devices, which are constructed and operated in accordance with sound engineering practices. Levees often have “interior drainage” systems that work in conjunction with the levees to take water from the landward side to the water side. An interior drainage system may include culverts, canals, ditches, storm sewers, and/or pumps.

Levees and floodwalls are constructed from the earth, compacted soil or artificial materials, such as concrete or steel. To protect against erosion and scouring, earthen levees can be covered with grass and gravel or hard surfaces like stone, asphalt, or concrete. Levees and floodwalls are typically built parallel to a waterway, most often a river, in order to reduce the risk of flooding to the area behind it. Figure 5.2 below shows the components of a typical levee.



Source: FEMA, What is a Levee Fact Sheet, August 2011

Figure 5.2 - Components of a Typical Levee

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events. Levees reduce, not eliminate, the risk to individuals and structures behind them. A levee system failure or overtopping can create severe flooding and high water velocities. It is important to remember that no levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

5.1.2 Location and Spatial Extent

Table 5.4 provides details for 61 dams classified as high hazard in the North Carolina Dam Inventory that are located within Cumberland and Hoke Counties. Figure 5.3 reflects the location of the high hazard dams within the Counties. It should be noted that there are 61 additional dams located in Cumberland County (1 intermediate hazard, 60 low hazard), as well as 21 additional low hazard dams located in Hoke County.

Table 5.4 - North Carolina Dam Inventory for Cumberland and Hoke Counties

Dam Name	NIDID	County	Height (ft)	NID Storage (acre-feet)	Dam Status	River[1]
Clark Pond Dam	NC01229	Cumberland	24.0	Not available	IMPOUNDING	Cross Creek-Os
Kiest Lake Dam	NC00025	Cumberland	25.0	72	EXEMPT-DOD	Little River-Tr
Lake Rim Dam	NC00028	Cumberland	20.0	256	IMPOUNDING	Bones Creek

Dam Name	NIDID	County	Height (ft)	NID Storage (acre-feet)	Dam Status	River[1]
McFayden Lake Dam	NC00031	Cumberland	14.0	52	IMPOUNDING	Tank Creek
Hutaff Lake Dam	NC00032	Cumberland	15.9	108	EXEMPT-DOD	Stewart Creek
Gates Four Dam	NC00036	Cumberland	25.0	164	IMPOUNDING	Little Rockfish Creek
The Lakes Dam	NC02130	Cumberland	17.5	17	IMPOUNDING	Beaver Creek-Os
Murray Hill Lake Dam	NC04760	Cumberland	12.0	400	BREACHED	Branson Creek-Os
Tallywood Dam	NC02136	Cumberland	23.0	43	IMPOUNDING	Branson Creek Trib.
Loch Lommond	NC02137	Cumberland	21.0	Not available	IMPOUNDING	Stewarts Creek
Hope Mills Dam #1	NC01121	Cumberland	33.0	816	BREACHED	Little Rockfish Creek
Lake Charles Dam	NC01122	Cumberland	21.0	130	BREACHED	Rockfish Creek-Os
Long Valley Farm Lake Dam	NC01126	Cumberland	18.0	560	IMPOUNDING	Jumping Run Creek
Glenville Lake Dam	NC01130	Cumberland	16.0	132	IMPOUNDING	Little Cross Creek
Kornbow Lake Dam	NC01131	Cumberland	18.5	236	IMPOUNDING	Little Cross Creek
Mintz Lake Dam	NC01132	Cumberland	12.0	49	IMPOUNDING	Little Cross Creek
Forrest Lake Dam	NC01133	Cumberland	15.0	222	IMPOUNDING	Branson Creek
Wallace Lake Dam	NC01134	Cumberland	14.0	400	BREACHED	Buckhead Creek
Cumberland Lake Dam	NC01135	Cumberland	12.0	200	BREACHED	Buckhead Creek
Beaver Creek Dam	NC01143	Cumberland	22.0	650	IMPOUNDING	Beaver Creek
Arran Lakes Dam	NC01144	Cumberland	21.0	120	IMPOUNDING	Little Beaver Creek
Rhodes Lake Dam	NC01145	Cumberland	15.2	1920	IMPOUNDING	Black River
Bonnie Doone Lake Dam	NC01146	Cumberland	15.0	110	IMPOUNDING	Little Cross Creek

Dam Name	NIDID	County	Height (ft)	NID Storage (acre-feet)	Dam Status	River[1]
Rose Lake Dam	NC01152	Cumberland	15.2	480	BREACHED	Cross Creek
College Lake Dam	NC01154	Cumberland	20.0	264	DRAINED	Cape Fear River-Os
Lewis Lake Dam	NC01169	Cumberland	14.0	80	IMPOUNDING	Lower Little River-Os
Upchurch Lake Dam	NC01202	Cumberland	29.0	2137	IMPOUNDING	Rockfish Creek
Edens Lake	NC02140	Cumberland	26.3	Not available	IMPOUNDING	Beaver Creek-Os
Aaran Lakes West Dam	NC02141	Cumberland	15.0	Not available	IMPOUNDING	Beaver Creek-Os
Point East Dam	NC02144	Cumberland	17.0	36	BREACHED	Kirks Mill Creek
Harris Dam	NC02147	Cumberland	17.0	Not available	IMPOUNDING	Beaver Creek-Os
Summertime Dam	NC02148	Cumberland	16.0	20	IMPOUNDING	Hybarts Branch-Tr
Evans Dam	NC02149	Cumberland	18.0	50	IMPOUNDING	Hybarts Branch
North Lake Dam	NC02150	Cumberland	23.0	23	IMPOUNDING	Cape Fear River-Tr
Mirror Lake Dam	NC02151	Cumberland	12.0	Not available	IMPOUNDING	Hybarts Branch
Lockwood Dam	NC02152	Cumberland	14.0	Not available	BREACHED	Hybarts Creek
Bailey Lake	NC02153	Cumberland	23.0	Not available	BREACHED	Beaver Creek-Tr
Lake Clair Dam	NC02154	Cumberland	15.0	Not available	IMPOUNDING	Blounts Creek-Tr
Pritchard Dam	NC02155	Cumberland	16.5	Not available	IMPOUNDING	Little Cross Creek-Tr
Civitan Lake Dam	NC02156	Cumberland	16.5	Not available	IMPOUNDING	Cross Creek-Tr
Moose Lodge Dam	NC02159	Cumberland	12.0	38	BREACHED	Blounts Creek
Mt.Vernon Estates	NC02160	Cumberland	14.2	4056	IMPOUNDING	Kirks Mill Creek
Charles Smith Dam	NC02161	Cumberland	19.4	8	IMPOUNDING	Cape Fear River-Tr
Devonwood Lower Dam	NC04797	Cumberland	25.0	70	IMPOUNDING	Persimmon Ck-Tr
Gainey Mill Pond	NC04916	Cumberland	11.0	Not available	BREACHED	South River-Os

Dam Name	NIDID	County	Height (ft)	NID Storage (acre-feet)	Dam Status	River[1]
Monticello Pond Dam	NC04969	Cumberland	16.2	Not available	BREACHED	Rockfish Creek-Tr
Youngs Lake Dam	NC05024	Cumberland	23.0	Not available	EXEMPT-DOD	Tank Creek-Tr
Rayconda Upper Dam	NC05621	Cumberland	19.2	0	IMPOUNDING	Little Rockfish Creek TR
Chesapeake Dam	NC05725	Cumberland	23.5	Not available	BREACHED	Carver's Creek Tr
Strickland Bridge Dam	NC05990	Cumberland	15.3	Not available	IMPOUNDING	Rockfish Creek
Mildred White Crystal Lake Dam	NC06087	Cumberland	18.0	15	IMPOUNDING	Not available
Gables Drive Dam	NC06126	Cumberland	12.0	Not available	IMPOUNDING	Not available
Mott Lake Dam	NC00039	Hoke	23.0	442	EXEMPT-DOD	Nicholson Creek
Lake Mcarthur Dam	NC00044	Hoke	20.0	252	EXEMPT-DOD	Tuckahoe Creek
Wood Lake Dam	NC03090	Hoke	19.0	60	IMPOUNDING	Black Branch-Tr
Lupo Lake Dam	NC05151	Hoke	13.0	18	IMPOUNDING	Black Branch
Scull Lake Dam	NC05199	Hoke	22.0	44	IMPOUNDING	Puppy Creek-Os
Thomas Lake Dam #1	NC05212	Hoke	14.7	34	BREACHED	Toney Creek
Thomas Lake Dam #2	NC05213	Hoke	12.2	18	IMPOUNDING	Toney Creek-Os
Sunset Lake Dam	NC05301	Hoke	11.7	29	BREACHED	Trib. Rockfish Creek
Price Pond Dam	NC05670	Hoke	21.0	Not available	IMPOUNDING	Cross Creek-Os

Source: North Carolina Dam Inventory, December 2014

[1]If the dam is located on an unnamed stream/tributary, the unnamed stream/tributary name is followed with "-TR". If the dam is located off stream of an unnamed stream/tributary, the unnamed stream/tributary name is followed with "-OS".

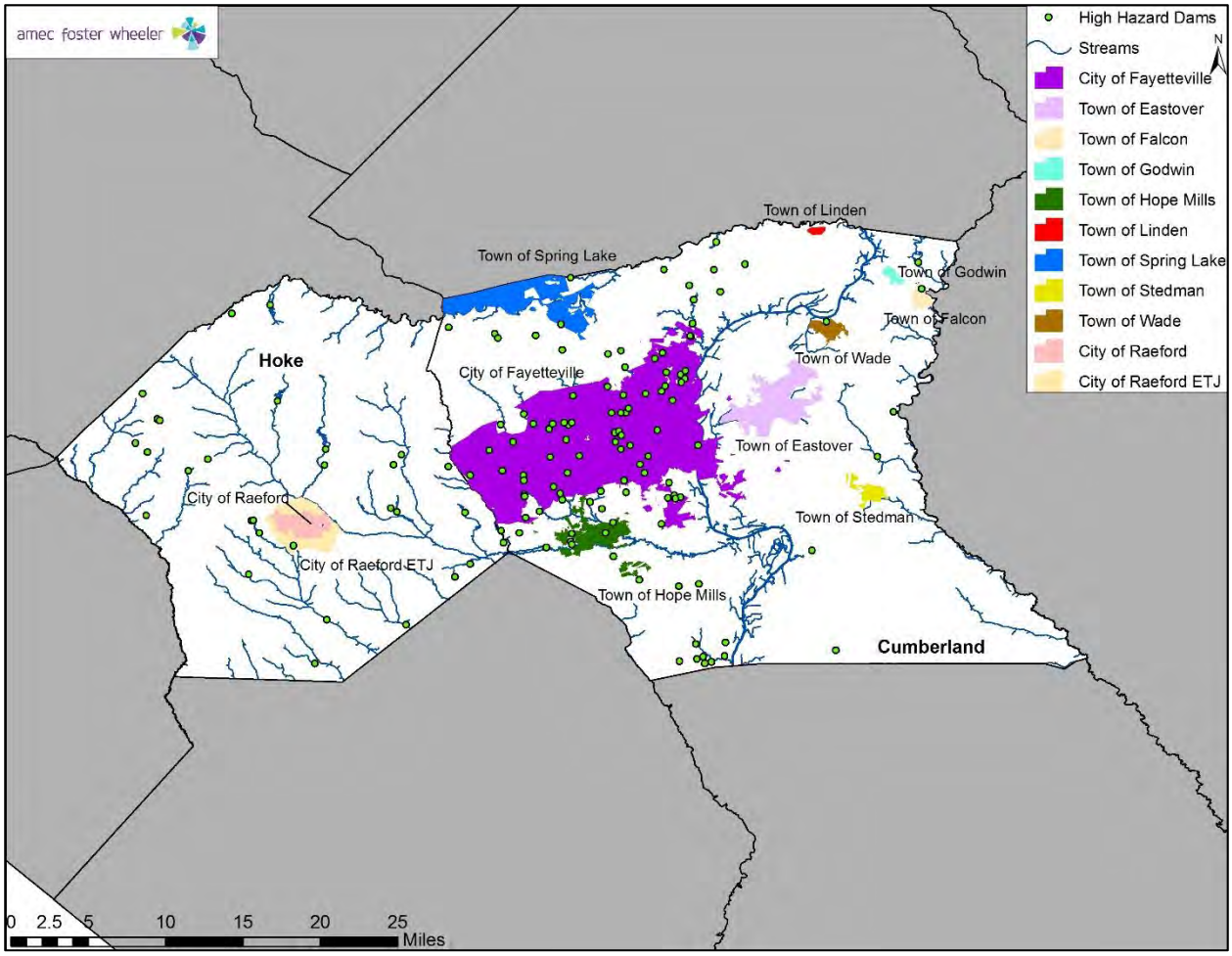


Figure 5.3- High Hazard Dam Locations

The National Levee Database (NLD), developed by the U.S. Army Corps of Engineers, contains levee system inspection and evaluation information for the NFIP. The NLD is a dynamic database with ongoing efforts to add levee data from federal agencies, states, and tribes. Currently, there are no levees located in Cumberland and Hoke Counties that are included in the U.S. Army Corps of Engineers NLD.

5.1.3 Past Occurrences

Table 5.5 details known past dam failures in Cumberland and Hoke Counties.

Table 5.5 - Known Dam Failures in Cumberland and Hoke Counties

LOCATION	COUNTY	DATE OF OCCURRENCE	RESULT OF FAILURE	DEATHS/ INJURIES	PROPERTY DAMAGE	DETAILS
Hope Mills Dam	Cumberland	5/26/2003	Heavy rains, dam gate would not open	0	$2.1 million	Dam embankment gave way and also destroyed 30 feet of the nearby Lakeview Road. About 40 homes and 1,600 people downstream were evacuated.

LOCATION	COUNTY	DATE OF OCCURRENCE	RESULT OF FAILURE	DEATHS/ INJURIES	PROPERTY DAMAGE	DETAILS
Hope Mills Dam	Cumberland	6/2010	Sinkhole	0		The dam failed in June 2010 when a sinkhole developed at the base of the dam.
Hope Mills Dam	Cumberland	NR	NR	0	NR	The 2013 NC State Hazard Mitigation Plan reports the dam has experienced 5 failures and has damage 11 homes.
Evans and Lockwood Dams	Cumberland	9/15/1989	Overtopping	2	>$10 million	
Country Club Lake	Cumberland	Multiple	NR	NR	NR	Small dam located on to perennial prongs of a tributary to Cross Creek. Multiple failures.
Jaycees Pond	Cumberland	6/19/1995	Flood	NR	NR	
Lake Lynn Dam	Cumberland	6/19/1995	Flood	NR	NR	
Wallace Lake Dam	Cumberland	1988	Piping	NR	NR	
Arabia	Hoke	10/18/1999	Flash Flood	0	NR	A small dam near Arabia started leaking late at night and finally broke later that morning. Several roads were inundated and a few homes sustained minor flooding.
Rockfish	Hoke	05/26/2003	Flash Flood	0	NR	A dam between McLaughlin Lake and Rockfish Creek collapsed.

LOCATION	COUNTY	DATE OF OCCURRENCE	RESULT OF FAILURE	DEATHS/ INJURIES	PROPERTY DAMAGE	DETAILS
Upchurch Pond Dam	Hoke	05/27/2003	Flash Flood	0	NR	A dam connecting Upchurch Pond and Rockfish Creek in neighboring Cumberland County caused flooding in Hoke County. Reconstruction cost estimated at more than $350,000. 4 additional dams damaged; another 15 overtopped during the rainfall even 4-6" in less than 24 hours).
McLaughlin Lake	Hoke	09/08/2004	Flood	0	NR	A dam failure at McLaughlin Lake on September 8, 2004 caused flooding to the Laurinburg Road area, damaging several homes and vehicles.
Edge Lake	Hoke	10/18/1999	Hurricane Floyd	0		Downstream homes were evacuated last night and early the morning of 10/18/1999. A shelter was opened at East Hoke Middle School for evacuated residents.
Sunset Lake Dam	Hoke	Unknown	Unknown	0	NR	Break reported.
McLonklin Lake Dam	Hoke	Unknown	Unknown	0	NR	Break reported.
All Low Hazards Dams	Hoke	1950–2009	Various	0	NR	Local perception is that all low hazard dams in the county seem to have broken at various points in time.

Sources: Association of State Dam Safety Officials; Hoke County 2010 Multi-Jurisdictional Hazard Mitigation Plan; National Performance of Dams Program database (npdp.standord.edu).

Note: The National Performance of Dams Program reports several "incidents" at dams that did not result in failure of the dam.

Note: Several of the dams listed are small dams and are not listed in the NC Dam Safety database.

5.1.4 Probability of Future Occurrence

High Hazard Dams

Likely - Based on historical occurrence information (23 records in 65 years), it can reasonably be assumed that intermediate to high hazard dams in Cumberland and Hoke Counties have a 35+% chance of this type of event occurring each year.

Low Hazard Dams

Highly Likely - Based on historical and anecdotal occurrence information (breach of all low hazard dams in 65 years), it can reasonably be assumed that low hazard dams have a near 100% chance of this type of event occurring each year in Cumberland and Hoke Counties.

Climate Change and Dam Failure

Studies have been conducted to investigate the impact of climate change scenarios on dam safety. The safety of dams for the future climate can be based on an evaluation of changes in design floods and the freeboard available to accommodate an increase in flood levels. The results from the studies indicate that the design floods with the corresponding outflow floods and flood water levels will increase in the future, and this increase will affect the safety of the dams in the future. Studies concluded that the total hydrological failure probability of a dam will increase in the future climate and that the extent and depth of flood waters will increase by the future dam break scenario [27].

5.1.5 Consequence Analysis

People

A person's immediate vulnerability to a dam failure is directly associated with the person's distance downstream of the dam as well as proximity to the stream carrying the floodwater from the failure. For dams that have an Emergency Action Plan (EAP), the vulnerability off loss of life for persons in their homes or on their property may be mitigated by following the EAP evacuation procedures; however, the displaced persons may still incur sheltering costs. For persons located on the river (e.g. for recreation) the vulnerability of loss of life is significant.

A large population is vulnerable to the loss of the uses of the lake upstream of the dam following failure. Several uses are minor, such as aesthetics or recreational use. However, some lakes serve as drinking water supplies and the loss of the lake could create a public health crisis if the drinking water supply is disrupted.

First Responders

For dams that fail slowly, first responders will be impacted similarly to other events that have advance warning. For dams that fail without prior warning, the impact is rapid and severe, requiring rapid response to the impacts. Although the response is generally restricted to the stream below the dam, the location of impact moves rapidly downstream requiring multiple response locations.

Continuity of Operations

Unless critical infrastructure or facilities essential to the operation of government are located in the impact area of the inundation area downstream of the dam, continuity of operations will likely not be disrupted. Emergency response, emergency management and law enforcement officials may have resources stretched or overwhelmed in the failure of a large dam.

Built Environment
Vulnerability to the built environment includes damage to the dam itself and any man-made feature located within the inundation area caused by the dam failure. Downstream of the dam, vulnerability includes potential damage to homes, personal property, commercial buildings and property, and government owned buildings and property; destruction of bridge or culvert crossings; weakening of bridge supports through scour; and damage or destruction of public or private infrastructure that cross the stream such as water and sewer lines, gas lines and power lines. Water dependent structures on the lake upstream of the dam, such as docks/piers, floating structures or water intake structures, may be damaged by the rapid reduction in water level during the failure.

Economy
Economic impact from small dams is generally small and impact is often limited to dam owner and the cost of first responder activities. Large failures can disrupt the economy through displacement of workers, damage to commercial employment centers or destruction of infrastructure that impacts commercial activities or access to other economic drivers.

Natural Environment
Aquatic species within the lake will either be displaced or destroyed. The velocity of the flood wave will likely destroy riparian and instream vegetation and destroy wetland function. The flood wave will like cause erosion within and adjacent to the stream. Deposition of eroded deposits may choke instream habitat or disrupt riparian areas. Sediments within the lake bottom and any low oxygen water from within the lake will be dispersed, potentially causing fish kills or releasing heavy metals found in the lake sediment layers.

5.2 Drought

5.2.1 Hazard Description

Drought is a deficiency in precipitation over an extended period. It is a normal, recurrent feature of climate that occurs in virtually all climate zones. The duration of droughts varies widely. There are cases when drought develops relatively quickly and lasts a very short period of time, exacerbated by extreme heat and/or wind, and there are other cases when drought spans multiple years, or even decades. Studying the paleoclimate record is often helpful in identifying when long-lasting droughts have occurred. Common types of drought are detailed below in Table 5.6.

Table 5.6 - Drought Classifications

Type	Details
Meteorological Drought	Meteorological Drought is based on the degree of dryness (rainfall deficit) and the length of the dry period.
Agricultural Drought	Agricultural Drought is based on the impacts to agriculture by factors such as rainfall deficits, soil water deficits, reduced ground water, or reservoir levels needed for irrigation.
Hydrological Drought	Hydrological Drought is based on the impact of rainfall deficits on the water supply such as stream flow, reservoir and lake levels, and ground water table decline.
Socioeconomic Drought	Socioeconomic drought is based on the impact of drought conditions (meteorological, agricultural, or hydrological drought) on supply and demand of some economic goods. Socioeconomic drought occurs when the demand for an economic good exceeds supply as a result of a weather-related deficit in water supply.

The wide variety of disciplines affected by drought, its diverse geographical and temporal distribution, and the many scales drought operates on make it difficult to develop both a definition to describe drought and an index to measure it. Many quantitative measures of drought have been developed in the United States, depending on the discipline affected, the region being considered, and the particular application. Several indices developed by Wayne Palmer, as well as the Standardized Precipitation Index, are useful for describing the many scales of drought.

The **U.S. Drought Monitor** provides a summary of drought conditions across the United States and Puerto Rico. Often described as a blend of art and science, the map is updated weekly by combining a variety of data-based drought indices and indicators and local expert input into a single composite drought indicator.

The **Standardized Precipitation Index** (SPI) is a way of measuring drought that is different from the Palmer Drought Index (PDI). Like the PDI, this index is negative for drought, and positive for wet conditions. But the SPI is a probability index that considers only precipitation, while Palmer's indices are water balance indices that consider water supply (precipitation), demand (evapotranspiration) and loss (runoff).

The **Palmer Drought Severity Index** (PDSI) devised in 1965, was the first drought indicator to assess moisture status comprehensively. It uses temperature and precipitation data to calculate water supply and demand, incorporates soil moisture, and is considered most effective for unirrigated cropland. It primarily reflects long-term drought and has been used extensively to initiate drought relief. It is more complex than the SPI and the Drought Monitor.

5.2.2 Location and Spatial Extent

According to the PDSI map shown in Figure 5.4 below, southeastern North Carolina has a relatively low risk for drought hazard. However, drought cannot be confined to geographic or political boundaries and some areas may experience more severe drought events than what is shown on the map.

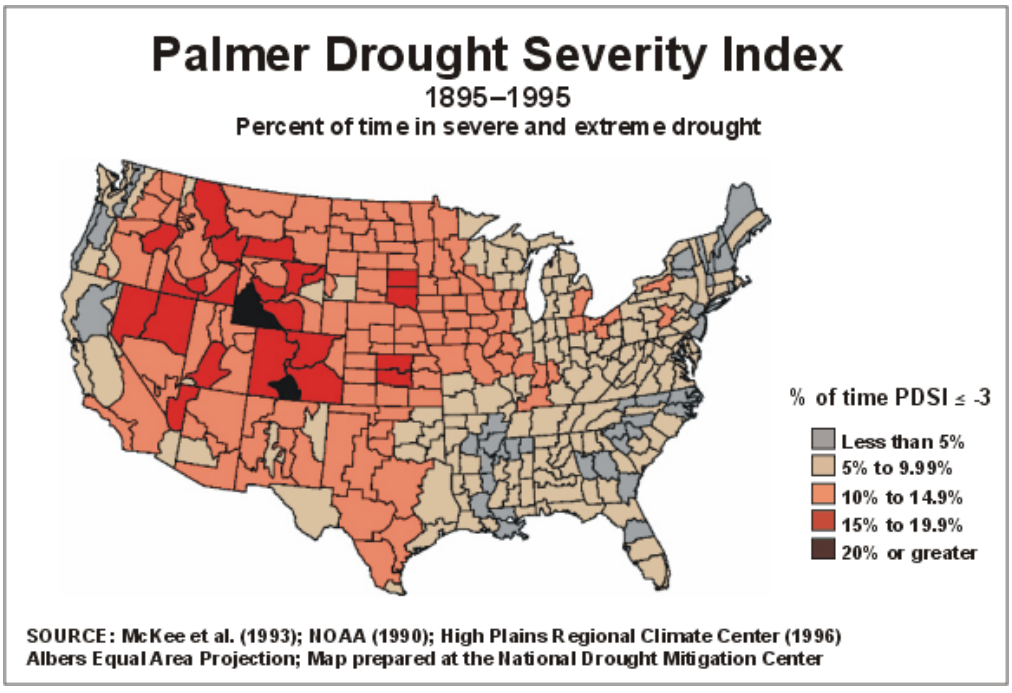


Figure 5.4- Palmer Drought Severity Index

Figure 5.5 shows the spatial pattern of SPI from May 2011 through April 2013. The red shading denotes dry conditions while the green shading indicates wet conditions. The index is negative for drought, and positive for wet conditions. The Cumberland and Hoke County region is designated as moderately dry.

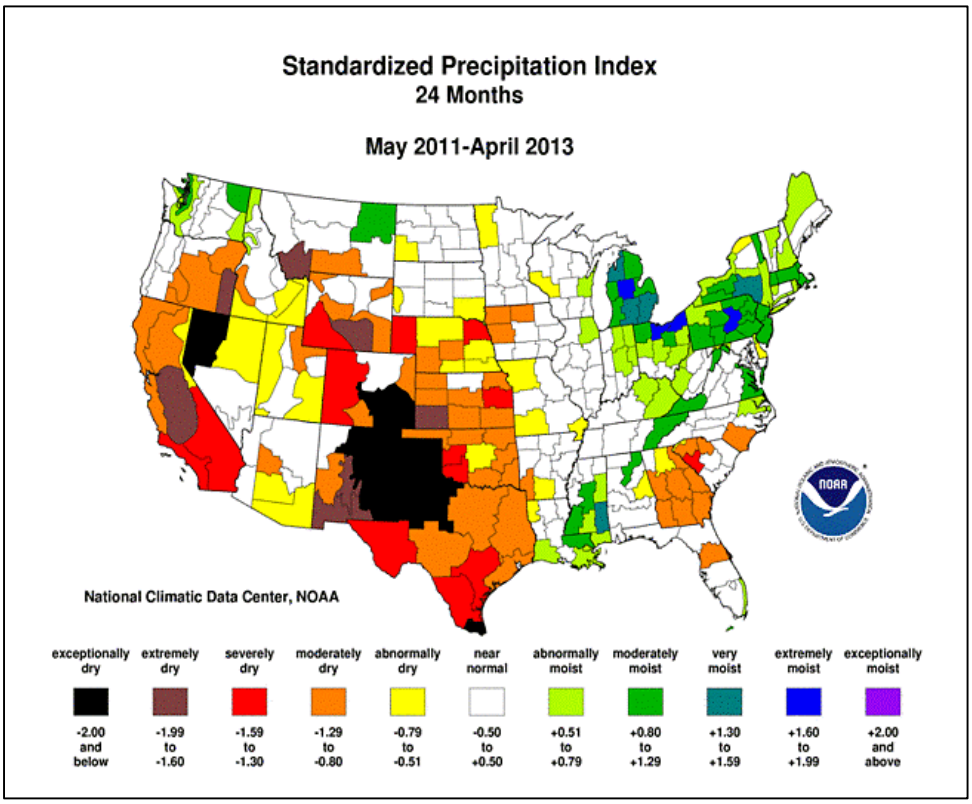


Figure 5.5 - Standardized Precipitation Index

5.2.3 Past Occurrences

According to the North Carolina Drought Monitor, Cumberland and Hoke Counties have experienced drought conditions every year since 2000. Table 5.7 shows the most severe classification for each year by County.

Table 5.7 - Historical Drought Occurrences

Year	Cumberland County	Hoke County
2000	Abnormally Dry	Moderate Drought
2001	Severe Drought	Severe Drought
2002	Extreme Drought	Exceptional Drought
2003	Abnormally Dry	Abnormally Dry
2004	Abnormally Dry	Abnormally Dry
2005	Abnormally Dry	Moderate Drought
2006	Moderate Drought	Moderate Drought
2007	Exceptional Drought	Exceptional Drought
2008	Exceptional Drought	Exceptional Drought

Year	Cumberland County	Hoke County
2009	Moderate Drought	Moderate Drought
2010	Moderate Drought	Moderate Drought
2011	Severe Drought	Severe Drought
2012	Moderate Drought	Moderate Drought
2013	Abnormally Dry	Moderate Drought
2014	Abnormally Dry	Abnormally Dry
2015	Moderate Drought	Abnormally Dry

Source: NC Drought Monitor

5.2.4 Probability of Future Occurrence

Highly Likely - Based on historical occurrence information (15 records in 15 years), it can reasonably be assumed that Cumberland and Hoke Counties have a 100% chance of this type of event occurring each year.

Climate Change and Drought

Drought is anticipated to increase in frequency and intensity during summer months under projected climate change scenarios [21]. The spring and summer seasons in the Cumberland-Hoke region are projected to observe 0-10% decrease in precipitation, while the fall and winter seasons may experience 0-10% increase in precipitation [21]. The HMPC expressed concern that prolonged droughts could potentially create a serious stress on reservoirs and the drinking water supply which is further discussed in Chapter 6 Vulnerability Assessment.

5.2.5 Consequence Analysis

People

Drought can affect people's health and safety. Examples of drought impacts on society include anxiety or depression about economic losses, conflicts when there is not enough water, reduced incomes, fewer recreational activities, higher incidents of heat stroke, and even loss of human life.

First Responders

The overall effect on first responders would be relatively limited when compared to other hazards. Exceptional drought conditions may impact the amount of water immediately available to respond to wildfires.

Continuity of Operations

Drought would have minimal impacts on continuity of operations due to the relatively long warning time that would allow for plans to be made to maintain continuity of operations.

Built Environment

Drought has the potential to affect water supply for residential, commercial, institutional, industrial, and government-owned areas. Drought can reduce water supply in wells and reservoirs. When drought conditions persist with no relief, local or State governments must often institute water restrictions.

Economy

Examples of economic impacts include farmers who lose money because drought destroyed their crops or who may have to spend more money to feed and water their animals. Businesses that depend on

farming, like companies that make tractors and food, may lose business when drought damages crops or livestock. Extreme drought also has the potential to impact local businesses such as landscaping, recreation and tourism, and public utilities. Businesses that sell boats and fishing equipment may not be able to sell some of their goods because drought has dried up lakes and other water sources.

Natural Environment

Plants and animals depend on water, just as people do. Drought can shrink their food supplies and damage their habitats. Sometimes this damage is only temporary, and other times it is irreversible.

Drought conditions can also provide a substantial increase in wildfire risk. As plants and trees wither and die from a lack of precipitation, increased insect infestations, and diseases—all of which are associated with drought—they become fuel for wildfires. Long periods of drought can equate to more wildfires and more intense wildfires, which affect the economy, the environment, and society in many ways such as by destroying neighborhoods, crops, and habitats.

5.3 Earthquake

5.3.1 Hazard Description

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

Earthquakes are measured in terms of their magnitude and intensity. Magnitude is measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake through a measure of shock wave amplitude. A detailed description of the Richter Scale is given in Table 5.8.

Table 5.8 - Richter Scale

Magnitude	Effects
Less than 3.5	Generally not felt, but recorded.
3.5 – 5.4	Often felt, but rarely causes damage.
5.4 – 6.0	At most slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions.
6.1 – 6.9	Can be destructive in areas up to 100 kilometers across where people live.
7.0 – 7.9	Major earthquake. Can cause serious damage over larger areas.
8.0 or greater	Great earthquake. Can cause serious damage in areas several hundred kilometers across.

Source: FEMA

5.3.2 Location and Spatial Extent

Approximately two-thirds of North Carolina is subject to earthquakes, with the western and southeast region most vulnerable to a very damaging earthquake. The state is affected by both the Charleston Fault in South Carolina and New Madrid Fault in Tennessee. Both of these faults have generated earthquakes measuring greater than 8.0 on the Richter Scale during the last 200 years. In addition, there are several smaller fault lines throughout North Carolina.

Figure 5.6 depicts the intensity level for North Carolina based on the national USGS map of peak acceleration with 2 percent probability of exceedance in 50 years. It is the probability that ground motion will reach a certain level during an earthquake. The data shows 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 2 percent probability of exceedance in 50 years. According to this map, Cumberland and Hoke Counties lie within an approximate zone level between 6 and 10% ground acceleration. This indicates that the region as a whole exists within an area of moderate seismic risk.

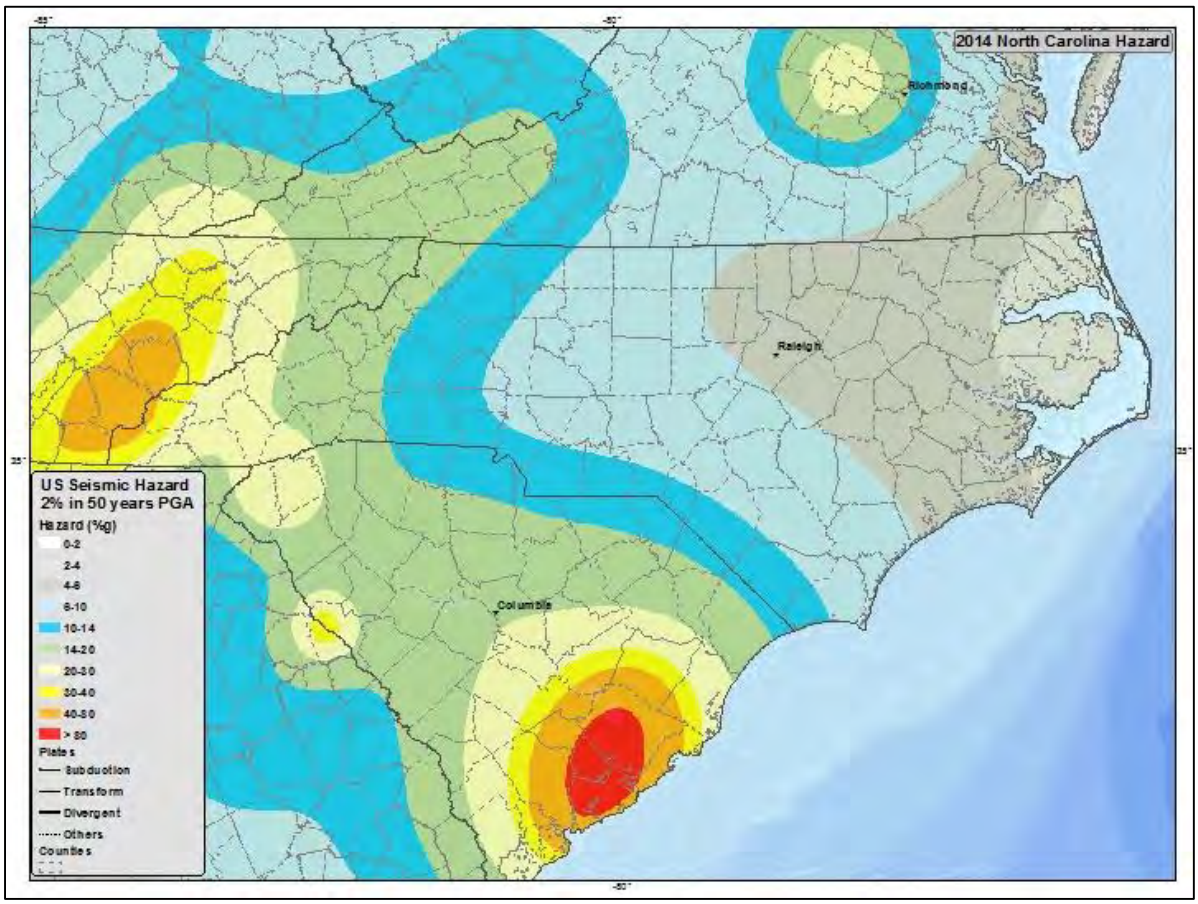


Figure 5.6 - Seismic Hazard Information for North Carolina

5.3.3 Past Occurrences

A list of earthquakes that have caused damaged in North Carolina is presented below in Table 5.9.

Table 5.9 - Earthquakes Affecting North Carolina

Date	Location	Richter Scale
12/16/1811	NE Arkansas	8.5
01/23/1812	New Madrid, MO	8.4
02/07/1812	New Madrid, MO	8.7
04/29/1852	Wytheville, VA	5.0
08/31/1861	Wilkesboro, NC	5.1
12/23/1875	Central Virginia	5.0
08/31/1886	Charleston, SC	7.3
05/31/1897	Giles County, VA	5.8
01/01/1913	Union County, SC	4.8
02/21/1916	Asheville, NC	5.5
07/08/1926	Mitchell County, NC	5.2
11/03/1928	Newport, TN	4.5
05/13/1957	McDowell County, NC	4.1
07/02/1957	Buncombe County, NC	3.7
11/24/1957	Jackson County, NC	4.0
10/27/1959	Chesterfield, SC	4.0
07/13/1971	Newry, SC	3.8
11/30/1973	Alcoa, TN	4.6
11/13/1976	Southwest Virginia	4.1
05/05/1981	Henderson County, NC	3.5

Source: Wake County 2014 Hazard Mitigation Plan. Information provided by NCEM.

5.3.4 Probability of Future Occurrence

Possible - Based on historical occurrences, the probability of a significant earthquake event affecting Cumberland and Hoke Counties is possible. There are a total of 20 records in North Carolina over the past 200 years. Therefore, the annual probability level for the county is estimated between 1 and 10 percent.

Climate Change and Earthquakes

Scientists are beginning to believe there may be a connection between climate change and earthquakes. Changing ice caps and sea-level redistribute weight over fault lines, which could potentially have an influence on earthquake occurrences. However, currently no studies quantify the relationship to a high level of detail, so recent earthquakes should not be linked with climate change. While not conclusive, early research suggest that more intense earthquakes and tsunamis may eventually be added to the adverse consequences that are caused by climate change.

5.3.5 Consequence Analysis

People
Earthquakes in the Cumberland and Hoke County region generally are not high impact events that cause injury or death. The public may typically experience some shaking in these events and the greatest threat to health and well-being is often from objects falling from shelves.

First Responders
A moderate earthquake is unlikely to damage infrastructure such as roads, bridges, or gas/power/water lines. Therefore, there would be little impact to first responders in the event of a moderate earthquake in Cumberland and Hoke Counties.

Continuity of Operations
There would likely be little disruption to services or operations due to a moderate earthquake.

Built Environment
Buildings can be damaged by the shaking itself or by the ground beneath them settling to a different level than it was before the earthquake (subsidence). Buildings can even sink into the ground if soil liquefaction occurs. If a structure (a building, road, etc.) is built across a fault, the ground displacement during an earthquake could seriously damage that structure. An earthquake can also break dams or levees along a river. The water from the river or the reservoir would then flood the area, damaging buildings and possibly drowning people. Finally, fires can be started by broken gas lines and power lines. Fires can be a serious problem, especially if the water lines that feed the fire hydrants have been damaged as well. Historically, Cumberland Hoke Counties have not been impacted by an earthquake with more than a moderate intensity so damage to the built environment is unlikely.

Economy
Economic losses associated with an earthquake include property damage, business interruption costs, and costs to repair damaged utilities and infrastructure. Historically, there have been no economic losses associated with earthquakes in Cumberland Hoke Counties.

Natural Environment
A moderate earthquake is unlikely to cause substantial impacts to the natural environment in Cumberland and Hoke Counties. Impacts to the built environment (e.g. ruptured gas line) could damage the surrounding environment. However, this type damage is unlikely based on historical occurrences.

5.4 Erosion

5.4.1 Hazard Description

Stream banks erode by a combination of processes. When the channel bends, water on the outside of the bend (the cut-bank) flows faster and water on the inside of the bend (the point) flows slower as shown in Figure 5.7. This distribution of velocity results in erosion occurring on the outside of the bend and deposition occurring on the inside of the bend.

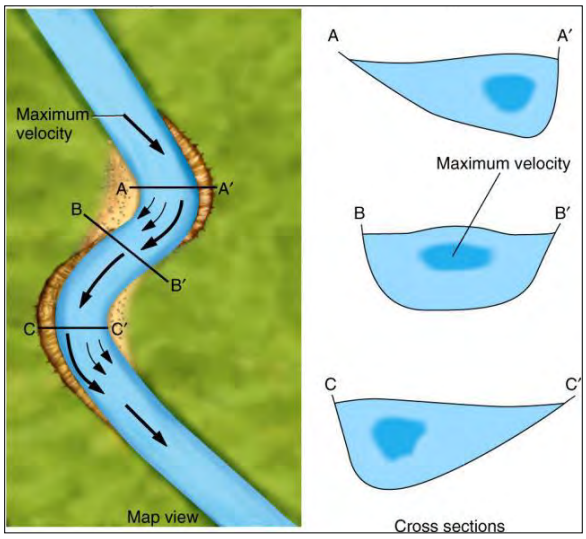


Figure 5.7- Stream Meanders

Stream bank erosion is a natural process, but acceleration of this natural process leads to a disproportionate sediment supply, stream channel instability, land loss, habitat loss and other adverse effects. Stream bank erosion processes, although complex, are driven by two major components: stream bank characteristics (erodibility) and hydraulic/gravitational forces. Many land use activities can affect both of these components and lead to accelerated bank erosion. The vegetation rooting characteristics can protect banks from fluvial entrainment and collapse, and also provide internal bank strength. When riparian vegetation is changed from woody species to annual grasses and/or forbs, the internal strength is weakened, causing acceleration of mass wasting processes. Stream bank aggradation or degradation is often a response to stream channel instability. Since bank erosion is often a symptom of a larger, more complex problem, the long-term solutions often involve much more than just bank stabilization. Numerous studies have demonstrated that stream bank erosion contributes a large portion of the annual sediment yield.

Determining the cause of accelerated streambank erosion is the first step in solving the problem. When a stream is straightened or widened, streambank erosion increases. Accelerated streambank erosion is part of the process as the stream seeks to re-establish a stable size and pattern. Damaging or removing streamside vegetation to the point where it no longer provides for bank stability can cause a dramatic increase in bank erosion. A degrading streambed results in higher and often unstable, eroding banks. When land use changes occur in a watershed, such as clearing land for agriculture or development, runoff increases. With this increase in runoff the stream channel will adjust to accommodate the additional flow, increasing streambank erosion. Addressing the problem of streambank erosion requires an understanding of both stream dynamics and the management of streamside vegetation.

For the purposes of this Hazard Mitigation Plan, stream bank erosion can be categorized as minor or major:

Minor stream bank erosion results in movement of the streambed and bank soils, but does not have an impact on the built (structural) environmental and does not result in risk life or property.

Major stream bank erosion does result in an impact on the built environment, especially roads and any infrastructure that requires relatively stable ground. Major erosion near roads can require continuous

repairs to stabilize the ground. Furthermore, sudden emergency incidents such as a strong storm causing bluff failure could result in injury or loss of life.

5.4.2 Location and Spatial Extent

Inland, riverine stream bank erosion is typically caused by flash flooding events. Minor stream bank erosion occurs in Cumberland and Hoke Counties, particularly along the banks of rivers and streams, but it is not a threat to life or property. The HMPC did not identify areas of concern with regard to erosion that need to be addressed by this Plan at this time.

5.4.3 Past Occurrences

Several sources were vetted to identify areas of minor or major erosion in the Counties. This included searching local newspapers, interviewing local officials, and reviewing the State of North Carolina Hazard Mitigation Plan. Minimal information could be found regarding the occurrence of minor or major erosion within the Counties.

5.4.4 Probability of Future Occurrence

Possible - Erosion is a natural, dynamic, and continuous process that can be expected to occur on a small scale within the future. The annual probability level assigned for erosion events is between 1% and 10% annually. Given the lack of threat to life or property, stream bank erosion will not be included in Chapter 6 Vulnerability Assessment.

Climate Change and Erosion

Although erosion is not currently considered a priority hazard for the region, future precipitation events are predicted to become more intense due to climate change which may lead to large, short-term inputs of water into streams. When runoff exceeds the capacity of the stream channel to carry the water, flooding may occur. Flooding events may increase erosion and sedimentation and may ultimately degrade stream habitat, particularly in streams that are already in poor condition. Targeting conservation practices to erosion prone areas, expanding conservation coverage, and adapting agronomic practices may be necessary to prevent excessive soil erosion and downstream sedimentation under climate change scenarios that include intensified precipitation [(26)].

5.4.5 Consequence Analysis

People

Erosion is typically a non-life threatening event; however, sudden emergency incidents such as a strong storm causing bluff failure could result in injury or loss of life. People with homes located next to waterways are most susceptible to erosion and its impact to their property. Since no major erosion areas were noted in the risk assessment, it is unlikely erosion will have an impact on people in the region.

First Responders

Erosion is unlikely to have an impact on first responders; however, a major erosion event could affect infrastructure such as bridge collapse due to scour around the abutment. Not only could this result in a loss of life, but emergency routes could be closed as well.

Continuity of Operations
Erosion should have little effect on continuity of operations in Cumberland and Hoke Counties since it typically happens at a slow rate that would allow for plans to be made to maintain continuity of operations.

Built Environment
Stream bank erosion can result in an impact on the built environment, especially roads and any infrastructure that require relatively stable ground. Major erosion near roads can require continuous repairs to stabilize the ground.

Economy
The health of soil is a primary concern to farmers whose livelihoods depend on agriculture. Sustainable land use can help to reduce the impacts of agriculture and livestock, preventing soil degradation and erosion and the loss of valuable land. Erosion also impacts the economy when it results in the rebuilding of structures or constant repairs to stabilize the ground.

Natural Environment
The effects of soil erosion go beyond the loss of fertile land. It has led to increased pollution and sedimentation in streams and rivers, clogging these waterways and causing declines in fish and other species. Degraded lands are also often less able to hold onto water, which can worsen flooding.

5.5 Extreme Heat

5.5.1 Hazard Description

According to the National Weather Service, about 175 Americans die from heat exposure, and nearly 20,000 people died between 1936 and 1975 from the effects of heat and solar radiation. Humans dissipate heat by varying the depth of blood circulation and sweating. Heat disorders typically occur when the body's ability to remove heat is disrupted, or by a chemical imbalance of salt caused by excessive sweating. Sun exposure, wind conditions, age and physical condition influence susceptibility to heat disorder.

Urban areas create stagnate that exacerbate heat conditions and many inner-city areas lack access to air conditioning. Sun exposure of outside workers, such as farming and construction workers elevates the risk of heat disorder.

To measure the risk of experiencing heat disorders, the National Weather Service has developed the "Heat Index Program". Figure 5.8 on the following page displays a heat wave brochure provided by the National Weather Service.

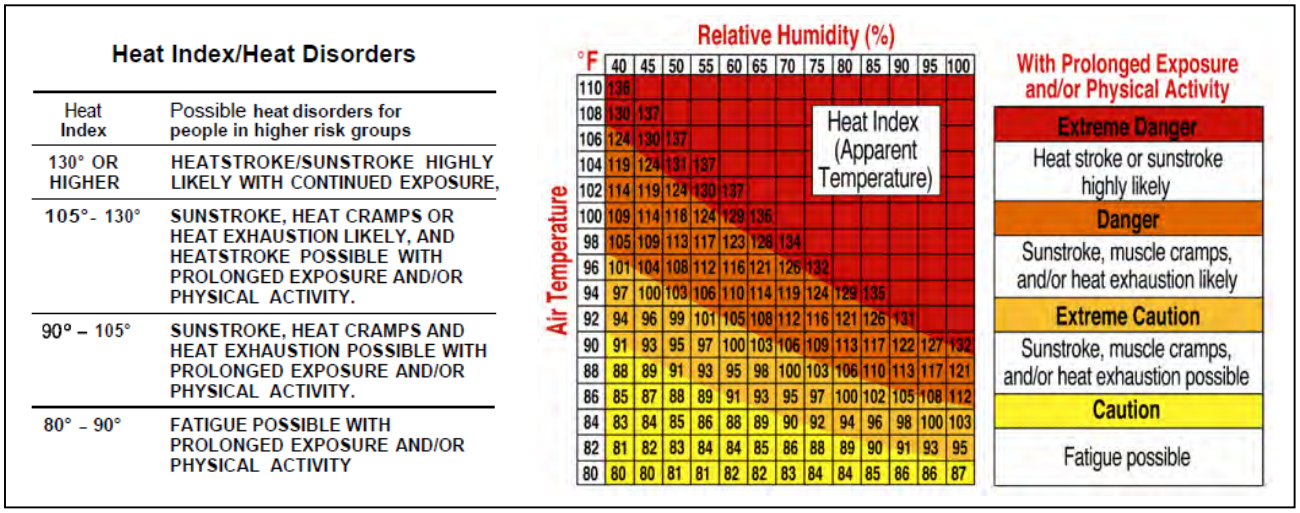


Figure 5.8 - National Weather Service Heat Wave Brochure

5.5.2 Location and Spatial Extent

Summers in North America are hot, with the southern US experiencing heat waves periodically each summer. Extreme heat typically occurs over large areas impacting multiple counties at one time. All of Cumberland County and Hoke County, and their respective jurisdictions are vulnerable to extreme heat.

5.5.3 Past Occurrences

According to the National Climatic Data Center, one instance of extreme heat was recorded in Cumberland and Hoke County beginning on July 22, 1998, and an additional instance of extreme heat was recorded in Cumberland beginning on August 10, 2007. No reports of property or crop damage were recorded by NCEI.

5.5.4 Probability of Future Occurrence

Possible - Based on historical occurrence information (2 records in 65 years), it can reasonably be assumed that an extreme heat event has a 3% chance of occurring each year in Cumberland and Hoke Counties.

Climate Change and Extreme Heat

Research shows that temperatures will continue to rise in the Southeast United States and globally, directly affecting the Cumberland-Hoke County region in North Carolina. The County is projected to experience an additional 15-35 days annually with temperatures above 95°F, drastically increasing the number of extreme heat days [21]. The average temperature in the Southeast United States is expected to increase by one to two degrees starting in 2050 [21].

5.5.5 Consequence Analysis

People

A person's vulnerability is directly related to their age and physical condition and to the Apparent Temperature and sun exposure. Heat disorders begin with fatigue and if not mitigated can worsen to muscle cramps, heat exhaustion and in extreme conditions ultimately exposure can result in death.

First Responders

First responders are especially vulnerable to heat disorders as their response activities often require special attire, heavy equipment and prolonged exposure to the environment or high additional heat sources such as fire.

Continuity of Operations

Continuity of operations is generally not disrupted by extreme heat.

Built Environment

Buildings are typically not impacted by heat. Road surfaces are damaged as asphalt softens and concrete sections may buckle under expansion caused by heat. Power transmission lines may sag from expansion and if contact is made with vegetation the line may short out causing power outages. Additional power demand for air conditioning also increases power line temperature adding to heat impacts. Train rails may distort or buckle under the stress of head induced expansion.

Economy

Livestock are particularly vulnerable to extreme heat, particularly pigs, rabbits and poultry. Milk production and cattle reproduction are suppressed. Crop yields can be significantly reduced by extreme heat, particularly when extreme heat occurs during drought conditions. Water demand on drinking water supplies is increased, causing both increases in treatment costs and potential depletion of supplies.

According to Christopher Adams of the Cooperative Institute for Research in the Atmosphere at Colorado State University, in 1980 consumers paid $1.3 billion more for electric power during the summer that they did in 1979. Additionally, demand soared above supply causing rolling blackouts.

Natural Environment

Wild animals are vulnerable to heat disorders similar to humans, including mortality. Vegetation growth will be stunted or plants may be killed if temperatures rise above their tolerance extremes.

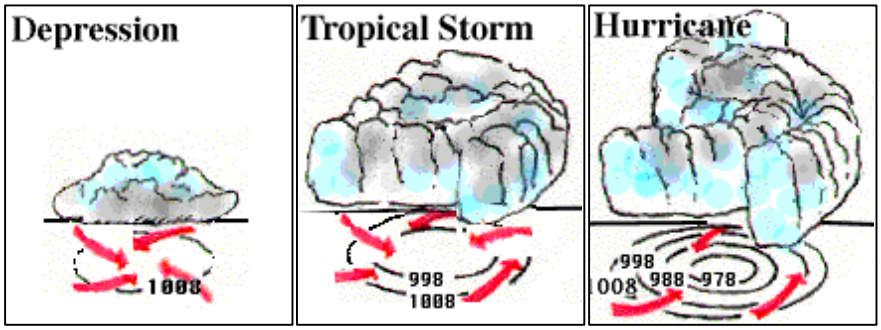
5.6 Hurricane/Tropical Storm

5.6.1 Hazard Description

A hurricane is a type of tropical cyclone or severe tropical storm that forms in the southern Atlantic Ocean, Caribbean Sea, Gulf of Mexico, and in the eastern Pacific Ocean. All Atlantic and Gulf of Mexico coastal areas are subject to hurricanes. The Atlantic hurricane season lasts from June to November, with the peak season from mid-August to late October.

While hurricanes pose the greatest threat to life and property, tropical storms and depressions also can be devastating. A tropical disturbance can grow to a more intense stage through an increase in sustained wind speeds. The progression of a tropical disturbance is described below and shown in Figure 5.9.

- **Tropical Depression:** A tropical cyclone with maximum sustained winds of 38 mph (33 knots) or less.
- **Tropical Storm:** A tropical cyclone with maximum sustained winds of 39 to 73 mph (34 to 63 knots).
- **Hurricane:** A tropical cyclone with maximum sustained winds of 74 mph (64 knots) or higher. In the western North Pacific, hurricanes are called typhoons; similar storms in the Indian Ocean and South Pacific Ocean are called cyclones.
- **Major Hurricane:** A tropical cyclone with maximum sustained winds of 111 mph (96 knots) or higher, corresponding to a Category 3, 4 or 5 on the Saffir-Simpson Hurricane Wind Scale.



Source: Department of Atmospheric Sciences at the University of Illinois at Urbana-Champaign

Figure 5.9 - Life Cycle of a Hurricane

The Saffir-Simpson Hurricane Wind Scale classifies hurricanes by intensity into one of five categories as shown in Table 5.10. This scale estimates potential property damage. Hurricanes reaching Category 3 and higher are considered major hurricanes because of their potential for significant loss of life and damage. Category 1 and 2 storms are still dangerous, however, and require preventative measures.

Table 5.10 – Saffir-Simpson Hurricane Wind Scale, 2012

Category	Wind Speed (mph)	Potential Damage
1	74-95	**Very dangerous winds will produce some damage**: Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110	**Extremely dangerous winds will cause extensive damage:** Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3	111-129	**Devastating damage will occur:** Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4	130-156	**Catastrophic damage will occur:** Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5	≥ 157	**Catastrophic damage will occur:** A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for

Category	Wind Speed (mph)	Potential Damage
		weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Source: National Hurricane Center/NOAA

Wind speed is the determining factor in the scale, as storm surge values are highly dependent on the slope of the continental shelf and the shape of the coastline in the landfall region. The following describes the characteristics of each category storm from the Saffir-Simpson Hurricane Wind Scale Extended Table:

Category 1 Hurricane - Winds 74 – 95 mph. Very dangerous winds will produce some damage. People, livestock, and pets struck by flying or falling debris could be injured or killed. Older (mainly pre-1994 construction) mobile homes could be destroyed, especially if they are not anchored properly as they tend to shift or roll off their foundations. Newer mobile homes that are anchored properly can sustain damage involving the removal of shingle or metal roof coverings, and loss of vinyl siding, as well as damage to carports, sunrooms, or lanais. Some poorly constructed frame homes can experience major damage, involving loss of the roof covering and damage to gable ends as well as the removal of porch coverings and awnings. Unprotected windows may break if struck by flying debris. Masonry chimneys can be toppled. Well-constructed frame homes could have damage to roof shingles, vinyl siding, soffit panels, and gutters. Failure of aluminum, screened-in, swimming pool enclosures can occur. Some apartment building and shopping center roof coverings could be partially removed. Industrial buildings can lose roofing and siding especially from windward corners, rakes, and eaves. Failures to overhead doors and unprotected windows will be common. Windows in high-rise buildings can be broken by flying debris. Falling and broken glass will pose a significant danger even after the storm. There will be occasional damage to commercial signage, fences, and canopies. Large branches of trees will snap and shallow rooted trees can be toppled. Extensive damage to power lines and poles will likely result in power outages that could last a few to several days.

Category 2 Hurricane - Winds 96-110 mph. Extremely dangerous winds will cause extensive damage. There is a substantial risk of injury or death to people, livestock, and pets due to flying and falling debris. Older (mainly pre-1994 construction) mobile homes have a very high chance of being destroyed and the flying debris generated can shred nearby mobile homes. Newer mobile homes can also be destroyed. Poorly constructed frame homes have a high chance of having their roof structures removed especially if they are not anchored properly. Unprotected windows will have a high probability of being broken by flying debris. Well-constructed frame homes could sustain major roof and siding damage. Failure of aluminum, screened-in, swimming pool enclosures will be common. There will be a substantial percentage of roof and siding damage to apartment buildings and industrial buildings. Unreinforced masonry walls can collapse. Windows in high-rise buildings can be broken by flying debris. Falling and broken glass will pose a significant danger even after the storm. Commercial signage, fences, and canopies will be damaged and often destroyed. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks. Potable water could become scarce as filtration systems begin to fail.

Category 3 Hurricane - Winds 111-129 mph. Devastating damage will occur. There is a high risk of injury or death to people, livestock, and pets due to flying and falling debris. Nearly all older (pre-1994) mobile homes will be destroyed. Most post-1994 mobile homes will sustain severe damage with potential for complete roof failure and wall collapse. Poorly constructed frame homes can be destroyed by the removal of the roof and exterior walls. Unprotected windows will be broken by flying debris. Well-built frame homes can experience major damage involving the removal of roof decking and gable ends. There will be a high percentage of roof covering and siding damage to apartment buildings and industrial buildings.

Isolated structural damage to wood or steel framing can occur. Complete failure of older metal buildings is possible, and older unreinforced masonry buildings can collapse. Numerous windows will be blown out of high-rise buildings resulting in falling glass, which will pose a threat for days to weeks after the storm. Most commercial signage, fences, and canopies will be destroyed. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to a few weeks after the storm passes.

Category 4 Hurricane - Winds 130 to 156 mph. Catastrophic damage will occur. There is a very high risk of injury or death to people, livestock, and pets due to flying and falling debris. Nearly all older (pre-1994) mobile homes will be destroyed. A high percentage of newer mobile homes also will be destroyed. Poorly constructed homes can sustain complete collapse of all walls as well as the loss of the roof structure. Well-built homes also can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Extensive damage to roof coverings, windows, and doors will occur. Large amounts of windborne debris will be lofted into the air. Windborne debris damage will break most unprotected windows and penetrate some protected windows. There will be a high percentage of structural damage to the top floors of apartment buildings. Steel frames in older industrial buildings can collapse. There will be a high percentage of collapse to older unreinforced masonry buildings. Most windows will be blown out of high-rise buildings resulting in falling glass, which will pose a threat for days to weeks after the storm. Nearly all commercial signage, fences, and canopies will be destroyed. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Long-term water shortages will increase human suffering. Most of the area will be uninhabitable for weeks or months.

Category 5 Hurricane - Winds 157 mph or higher. Catastrophic damage will occur. People, livestock, and pets are at very high risk of injury or death from flying or falling debris, even if indoors in mobile homes or framed homes. Almost complete destruction of all mobile homes will occur, regardless of age or construction. A high percentage of frame homes will be destroyed, with total roof failure and wall collapse. Extensive damage to roof covers, windows, and doors will occur. Large amounts of windborne debris will be lofted into the air. Windborne debris damage will occur to nearly all unprotected windows and many protected windows. Significant damage to wood roof commercial buildings will occur due to loss of roof sheathing. Complete collapse of many older metal buildings can occur. Most unreinforced masonry walls will fail which can lead to the collapse of the buildings. A high percentage of industrial buildings and low-rise apartment buildings will be destroyed. Nearly all windows will be blown out of high-rise buildings resulting in falling glass, which will pose a threat for days to weeks after the storm. Nearly all commercial signage, fences, and canopies will be destroyed. Nearly all trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Long-term water shortages will increase human suffering. Most of the area will be uninhabitable for weeks or months.

5.6.2 Location and Spatial Extent

All Atlantic and Gulf of Mexico coastal areas are subject to hurricanes. While coastal areas are most directly exposed to land falling hurricanes and tropical storms, their impact can be felt hundreds of miles inland. The entire Cumberland and Hoke County region is equally susceptible to hurricanes and tropical storms.

5.6.3 Past Occurrences

Table 5.11 provides hurricane and tropical storm data reported by NCEI since 1950 for Cumberland and Hoke Counties. Major disaster declarations for hurricanes and tropical storms can be found in Tables 4.1 and 4.2.

Table 5.11 - NCEI Hurricane and Tropical Storm Events for Cumberland and Hoke Counties

Location	Date	Event Type	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland (Zone)	7/12/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/5/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	8/27/1998	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/4/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/15/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/18/2003	Hurricane (Typhoon)	0/0	$28,000.00	$0.00
Cumberland (Zone)	09/01/2006	Tropical Storm	0/0	$0.00	$0.00
Hoke (Zone)	7/12/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Hoke (Zone)	9/5/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Hoke (Zone)	8/27/1998	Hurricane (Typhoon)	0/0	$0.00	$0.00
Hoke (Zone)	9/4/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00
Hoke (Zone)	9/15/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00
			Total:	**$28,000.00**	**$0.00**

The following provides details on select hurricane events recorded in the NCEI database:

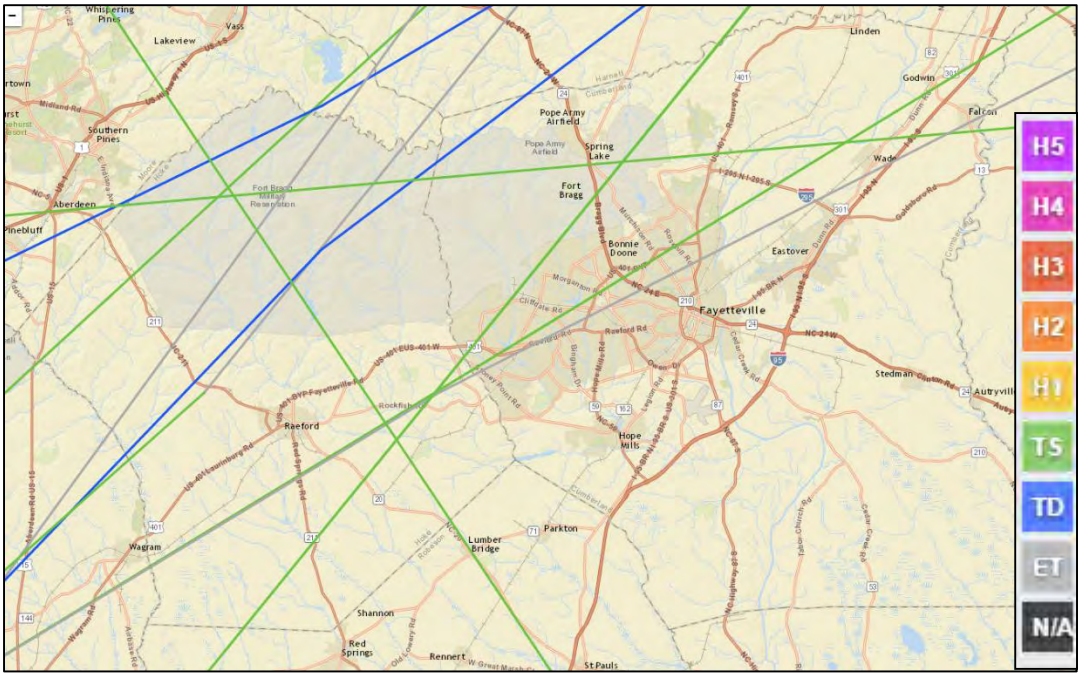
September 5, 1996 – The copious amount of rainfall associated with Hurricane Fran produced many severe flash and river floods.

August 27, 1998 - Torrential rains and strong gusty winds accompanied Hurricane Bonnie through the night on the 27th and into the daylight hours on the 28th. There were numerous reports of trees being blown down across Sampson, Wayne, Johnston, Wilson, Harnett, and Cumberland counties. About ten thousand people lost power in these areas sometime during the storm. Tobacco losses were extensive. The estimated total value of the tobacco crop lost due to Bonnie ranged from 25 to 50 million dollars.

September 15, 1999 - Hurricane Floyd produced 15-20 inches of rain that fell across the eastern half of the state, causing every river and stream to flood. Many rivers set new flood records. Whole communities were underwater for days, even weeks in some areas. Thousands of homes were lost. Crop damage was extensive. The infrastructure of the eastern counties, mainly roads, bridges, water plants, etc., was heavily damaged. Even worse was the loss of life, mainly due to flooding. Many Carolinians did not heed the call to evacuate and many more drove into flooded streams and rivers. In the central part of the state, 21 people lost their lives. Also, the loss of livestock was significant, mainly swine and poultry.

While not included in the NCEI database, Category 4 Hurricane Hazel (DR-28) came ashore in North Carolina on October 15, 1954 and caused substantial damage in the region. With winds reaching 125mph at Grannis Field, Hurricane Hazel caused an estimated $136 million in property damage; 19 deaths; 200 injuries; destruction of 15,000 homes and structures; and damage to 39,000 structures.

Figure 5.10 on the following page reflects past hurricane strike data for land falling storms in the Cumberland and Hoke County region as provided by the National Hurricane Center.



Source: NOAA/National Hurricane Center

Figure 5.10- NOAA Historical Hurricane Tracks

Legend	
H5 (Dark Purple) = Hurricane Category 5	H1 (Yellow) = Hurricane Category 1
H4 (Light Purple) = Hurricane Category 4	TS/SS (Green) = Tropical or Subtropical Storm
H3 (Dark Orange) = Hurricane Category 3	TD/SD (Blue) = Tropical or Subtropical Depression
H2 (Light Orange) = Hurricane Category 2	ET (Grey) = Extra-Tropical

5.6.4 Probability of Future Occurrences

Likely - Based on a historical record of 12 storm events over a period of 65 years (1950 - 2015), it can reasonably be assumed that this type of event has a 18% chance of occurring each year.

Climate Change and Hurricane/Tropical Storm

One of the primary factors contributing to the origin and growth of tropical storm and hurricanes systems is water temperature. Sea surface temperature may increase significantly in the main hurricane development region of the North Atlantic during the next century as well as in the Gulf of Mexico. Research shows that the increasing trend in strength, frequency and duration of hurricanes from the Atlantic Ocean since the early 1980s will continue [21]. It is "likely" (66-100% probability) that the average maximum wind speed of tropical cyclones will increase within the coming century, although not necessarily in every ocean basin [21].

5.6.5 Consequence Analysis

People

Hurricanes may affect human beings in a number of ways including causing deaths, causing injury, loss of property, outbreak of diseases, mental trauma and destroying livelihoods. During a hurricane, residential, commercial, and public buildings, as well as critical infrastructure such as transportation, water, energy, and communication systems may be damaged or destroyed by several of the impacts associated with hurricanes. The wind and flooding hazards associated with hurricanes can be tremendously destructive and deadly. Power outages and flooding are likely to displace people from their homes. Furthermore, water can become polluted making it undrinkable, and if consumed, diseases and infection can be easily spread.

First Responders

First responders responding to the impacts of a tropical storm or hurricane face many risks to their health and life safety. Responders face risk of injury or death during a storm event by flooding and high winds. Personnel or families of personnel may be harmed which would limit their response capability. Downed trees, power lines and flood waters may prevent access to areas in need which prolongs response time. Furthermore, hurricanes typically impact a large area which amplifies the number of emergency responses required.

Continuity of Operations

Continuity of operations may be affected if a hurricane event damages a critical facility or causes a loss of power. Hurricane events typically have ample lead time to prepare for and maintain continuity of operations.

Built Environment

Depending on the strength of a tropical storm or hurricane, structural damage to buildings may occur. A weak tropical storm may cause no damage whatsoever. The most likely impact from a category 1 or greater hurricane is the loss of glass windows and doors by high winds and debris. Loss of roof coverings, partial wall collapses, and other damages requiring significant repairs are possible in a major (category 3 to 5) hurricane. The level of damage is commensurate with the strength of the storm, as explained by the Saffir-Simpson Hurricane Wind Scale.

Loss of electric power, potable water, telecommunications, wastewater and other critical utilities is very possible during a hurricane. Some of this damage can be so severe that it may take days to weeks to restore.

Economy

Economic damages include property damage from wind, rain and flood, and also include intangibles such as business interruption and additional living expenses. Damage to infrastructure utilities include roads, water and power, and municipal buildings.

Natural Environment

Hurricanes can devastate wooded ecosystems and remove all the foliation from forest canopies, and they can change habitats so drastically that the indigenous animal populations suffer as a result. Specific foods can be taken away as high winds will often strip fruits, seeds and berries from bushes and trees.

Secondary impacts may occur as well. For example, high winds and debris may result in damage to an above-ground fuel tank, resulting in a significant chemical spill.

5.7 Inland Flooding: 100-/500-year

5.7.1 Hazard Description

Flooding is defined by the rising and overflowing of a body of water onto normally dry land. As defined by FEMA, a flood is a general and temporary condition of partial or complete inundation of 2 or more acres of normally dry land area or of 2 or more properties. Flooding can result from an overflow of inland waters or an unusual accumulation or runoff of surface waters from any source.

Sources and Types of Flooding

Flooding within the Cumberland and Hoke Counties can be attributed to two sources: 1) flash flooding resulting from heavy rainfall that overburdens the drainage system within the community; and 2) riverine flooding resulting from heavy and prolonged rainfall over a given watershed which causes the capacity of the main channel to be exceeded. Flooding on the larger streams results primarily from hurricanes, tropical storms and other major weather fronts, while flooding on the smaller streams is due mainly to localized thunderstorms.

Riverine Flooding: Cumberland Hoke Counties have numerous streams and tributaries running throughout its jurisdiction that are susceptible to overflowing their banks during and following excessive precipitation events. While flash flooding caused by surface water runoff is not uncommon in the region, riverine flood events (such as the "100-year flood") will cause significantly more damage and economic disruption for the area. Cumberland Hoke County floodplains have been studied and mapped by FEMA. The most recent Flood Insurance Study for Cumberland County is dated June 18, 2007, and the most recent Flood Insurance Study for Hoke County is dated July 7, 2014.

Flash or Rapid Flooding: Flash flooding is the result of heavy, localized rainfall, possibly from slow-moving intense thunderstorms that cause small streams and drainage systems to overflow. Flash flood hazards caused by surface water runoff are most common in urbanized cities, where greater population density generally increases the amount of impervious surface (e.g., pavement and buildings) which increases the amount of surface water generated. Flooding can occur when the capacity of the stormwater system is exceeded or if conveyance is obstructed by debris, sediment and other materials that limit the volume of drainage.

Flooding and Floodplains

The area adjacent to a channel is the floodplain, as shown in Figure 5.11. A floodplain is flat or nearly flat land adjacent to a stream or river that experiences occasional or periodic flooding. It includes the floodway, which consists of the stream channel and adjacent areas that carry flood flows, and the flood fringe, which are areas covered by the flood, but which do not experience a strong current. Floodplains are made when floodwaters exceed the capacity of the main channel or escape the channel by eroding its banks. When this occurs, sediments (including rocks and debris) are deposited that gradually build up over time to create the floor of the floodplain. Floodplains generally contain unconsolidated sediments, often extending below the bed of the stream.

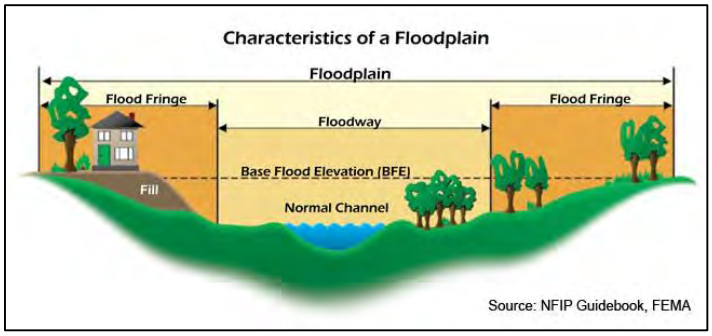


Figure 5.11 - Characteristics of a Floodplain

In its common usage, the floodplain most often refers to that area that is inundated by the 100-year flood, the flood that has a 1% chance in any given year of being equaled or exceeded. The 100-year flood is the national minimum standard to which communities regulate their floodplains through the NFIP. The 500-year flood is the flood that has a 0.2 percent chance of being equaled or exceeded in any given year. The potential for flooding can change and increase through various land use changes and changes to land surface, which result in a change to the floodplain. A change in environment can create localized flooding problems inside and outside of natural floodplains by altering or confining natural drainage channels. These changes are most often created by human activity.

The 100-year flood, which is the minimum standard used by most federal and state agencies, is used by the NFIP as the standard for floodplain management and to determine the need for flood insurance. Participation in the NFIP requires adoption and enforcement of a local floodplain management ordinance which is intended to prevent unsafe development in the floodplain, thereby reducing future flood damages. Participation in the NFIP allows for the federal government to make flood insurance available within the community as a financial protection against flood losses. Since floods have an annual probability of occurrence, have a known magnitude, depth and velocity for each event, and in most cases, have a map indicating where they will occur, they are in many ways often the most predictable and manageable hazard.

5.7.2 Location and Spatial Extent

Regulated floodplains are illustrated on inundation maps called Flood Insurance Rate Maps (FIRMs). It is the official map for a community on which FEMA has delineated both the SFHAs and the risk premium zones applicable to the community. SFHAs represent the areas subject to inundation by the 100-year flood event. Structures located within the SFHA have a 26-percent chance of flooding during the life of a standard 30-year mortgage. Flood prone areas were identified using the most current FIS and associated FIRMs developed by FEMA. Table 5.12 summarizes the flood insurance zones identified by the DFIRMs.

Table 5.12 - Mapped Flood Insurance Zones within Cumberland and Hoke Counties

Zone	Description
AE	AE Zones, also within the 100-year flood limits, are defined with BFEs that reflect the combined influence of stillwater flood elevations and wave effects less than 3 feet. The AE Zone generally extends from the landward VE zone limit to the limits of the 100-year flood from coastal sources, or until it reaches the confluence with riverine flood sources. The AE Zones also depict the SFHA due to riverine flood sources, but instead of being subdivided into separate zones of differing BFEs with possible wave

Zone	Description
	effects added, they represent the flood profile determined by hydrologic and hydraulic investigations and have no wave effects.
A	Areas subject to inundation by the 1-percent-annual-chance flood event generally determined using approximate methodologies. Because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.
0.2% Annual Chance (Zone X Shaded)	Moderate risk areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by a levee. No BFEs or base flood depths are shown within these zones. Zone X Shaded is used on new and revised maps in place of Zone B.
Zone X (unshaded)	Minimal risk areas outside the 1-percent and .2-percent-annual-chance floodplains. No BFEs or base flood depths are shown within these zones. Zone X (unshaded) is used on new and revised maps in place of Zone C.

Figure 5.12 reflects the mapped flood insurance zones for Cumberland and Hoke Counties. Note: A more detailed flood insurance zone map for each jurisdiction can be found within each community's annex.

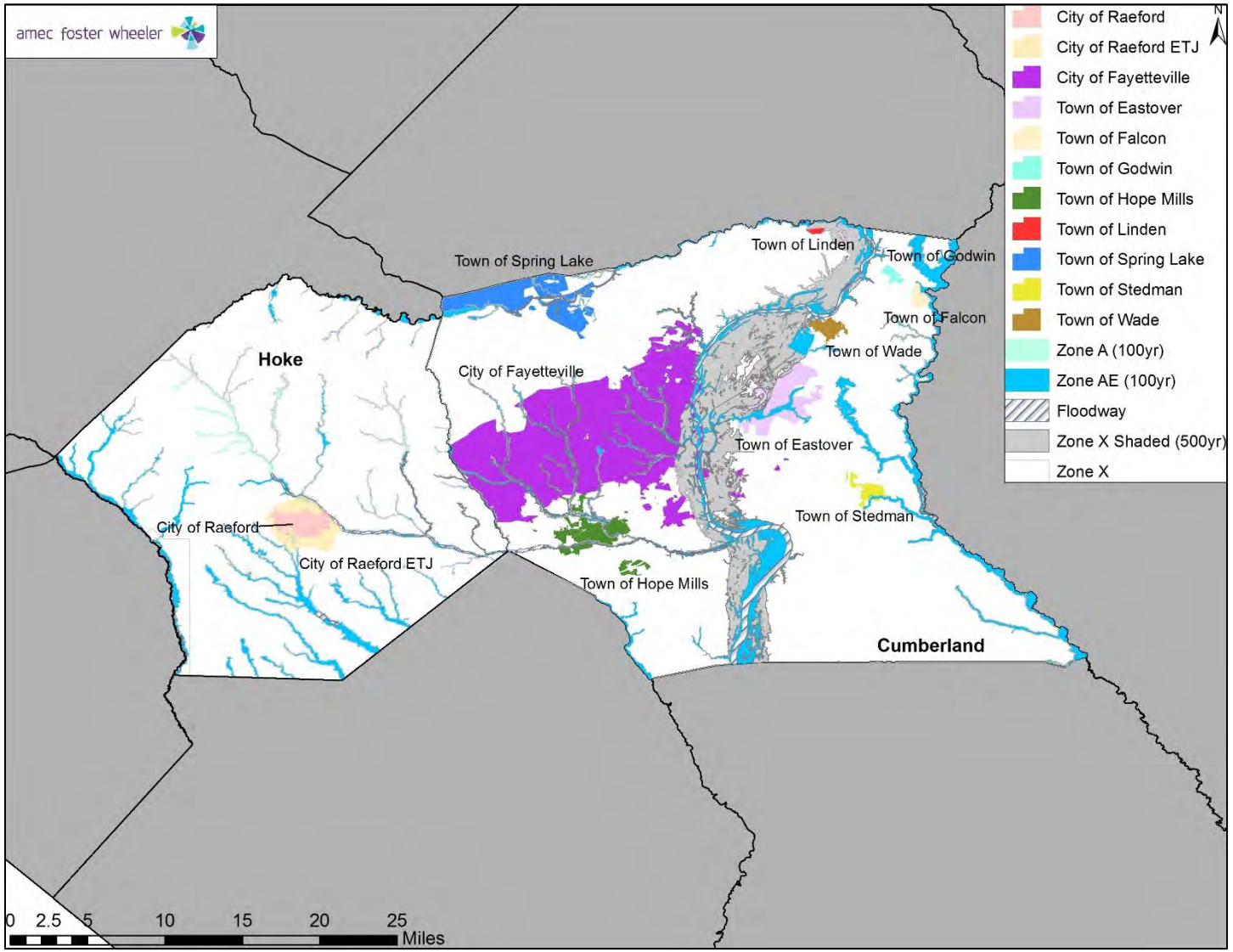


Figure 5.12 - Mapped Flood Insurance Zones for Cumberland and Hoke Counties

Table 5.13 provides a summary of acreage by flood zone for each County.

Table 5.13 - Summary of Flood Zone Acreage

Zone	Cumberland County	Hoke County
Zone AE	36,126	16,564
Zone A	128	2,420
Zone X Shaded (500-yr)	38,368	571
Zone X Unshaded	346,274	231,040
Total:	**420,896**	**250,595**

5.7.3 Past Occurrences

Table 5.14 shows detail for flood events reported by the NCEI since 1950 for Cumberland and Hoke Counties. There have been 65 recorded events causing close to $4M in property damage.

Table 5.14 - NCEI Flooding Events in Cumberland and Hoke Counties

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Cumberland County					
Flash Flood	40	$2,132,000	$0	0	0
Flood	2	$0	$0	0	0
Heavy Rain	4	$1,500,000	$0	0	0
Hoke County					
Flash Flood	15	$160,000	$0	0	0
Flood	2	$0	$0	0	0
Heavy Rain	2	$0	$0	0	0
Total:	**65**	**$3,792,000**	**$0**	**0**	**0**

Source: NCEI, September 2015

The following provides details on select flooding events recorded in the NCEI database:

August 2, 2012 - Multiple reported of flash flooding were received just west of downtown Fayetteville. Flooding was reported on Yadkin Road, on Santa Fe Road, on Strickland Bridge Road near the intersection of Graham Road and on Hope Mills Road, with several reports of stranded cars. Hybarts Branch Creek came out of its banks and flooded several yards. Several roads also flooded near the Cross Creek Mall, with some water getting into portions of the mall and cars in the parking lot had water over the tires.

June 25, 2010 - Strong to severe thunderstorms formed along the sea breeze in a moist and unstable atmosphere. Some of these storms produced isolated wind damage and flash flooding across portions of the Southern Coastal Plain and Sandhills of central North Carolina. Numerous roads were reported flooded across the county. The worst of the flooding was reported in Raeford, NC near Southern Avenue and South Main Street. At this location flooding was reported in and around an apartment complex, with water waist deep in the parking lot and surrounding streets.

August 2, 2009 - The Falcon community received around one inch or rainfall during the late morning hours with a long lull during the early afternoon before training thunderstorms dumped an additional 5 inches between 630 to 900 pm. Two to three feet of flood waters was flowing over Northwest and Brooks Streets in town. NC Highway 82 was closed due to the flood waters. Flood waters entered 3 structures.

December 11, 2008 - A powerful upper level disturbance with associated cold front pushed across the region the afternoon and evening of December 11. Over 2 inches of rain fell in many locations with several reports of minor urban flooding. One house was struck by lightning and burned to the ground.

5.7.4 Probability of Future Occurrences

Possible - By definition of the 100-year flood event, SFHAs are defined as those areas that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. Properties located in these areas have a 26 percent chance of flooding over the life of a 30-year mortgage.

The 500-year flood area is defined as those areas that will be inundated by the flood event having a 0.2-percent chance of being equaled or exceeded in any given year; it is not the flood that will occur once every 500 years.

Climate Change and Inland Flooding

It is likely (66-100% probability) that the frequency of heavy precipitation or the proportion of total rainfall from heavy falls will increase in the 21st century across the globe [21]. More specifically, it is "very likely" (90-100% probability) that most areas of the United States will exhibit an increase of at least 5% in the maximum 5-day precipitation by late 21st century [21]. The mean change in the annual number of days with rainfall over 1 inch for the Southeastern United States is 0.5 to 1.5 days [21]. As the number of heavy rain events increase, more flooding and pooling water can be expected.

5.7.5 Consequence Analysis

People

Certain health hazards are common to flood events. While such problems are often not reported, three general types of health hazards accompany floods. The first comes from the water itself. Floodwaters carry anything that was on the ground that the upstream runoff picked up, including dirt, oil, animal waste, and lawn, farm and industrial chemicals. Pastures and areas where farm animals are kept or their wastes are stored can contribute polluted waters to the receiving streams.

Floodwaters also saturate the ground, which leads to infiltration into sanitary sewer lines. When wastewater treatment plants are flooded, there is nowhere for the sewage to flow. Infiltration and lack of treatment can lead to overloaded sewer lines that can back up into low-lying areas and homes. Even when it is diluted by flood waters, raw sewage can be a breeding ground for bacteria such as e.coli and other disease causing agents.

The second type of health problem arises after most of the water has gone. Stagnant pools can become breeding grounds for mosquitoes, and wet areas of a building that have not been properly cleaned breed mold and mildew. A building that is not thoroughly cleaned becomes a health hazard, especially for small children and the elderly.

Another health hazard occurs when heating ducts in a forced air system are not properly cleaned after inundation. When the furnace or air conditioner is turned on, the sediments left in the ducts are circulated throughout the building and breathed in by the occupants. If the City water system loses pressure, a boil order may be issued to protect people and animals from contaminated water.

The third problem is the long-term psychological impact of having been through a flood and seeing one's home damaged and personal belongings destroyed. The cost and labor needed to repair a flood-damaged home puts a severe strain on people, especially the unprepared and uninsured. There is also a long-term

problem for those who know that their homes can be flooded again. The resulting stress on floodplain residents takes its toll in the form of aggravated physical and mental health problems.

First Responders

First responders are at risk when attempting to rescue people from their homes. They are subject to the same health hazards as the public mentioned above. Flood waters may prevent access to areas in need of response or the flood may prevent access to the critical facilities themselves which may prolong response time.

Continuity of Operations

Floods can severely disrupt normal operations, especially when there is a loss of power. For a detailed analysis of critical facilities at risk to flooding, see Chapter 6 Vulnerability Assessment.

Built Environment

Residential, commercial, and public buildings, as well as critical infrastructure such as transportation, water, energy, and communication systems may be damaged or destroyed by flood waters. For a detailed analysis of properties at risk to flooding, see Chapter 6 Vulnerability Assessment.

Economy

During floods (especially flash floods), roads, bridges, farms, houses and automobiles are destroyed. Additionally, the local government must deploy firemen, police and other emergency response personnel and equipment to help the affected area. It may take years for the affected communities to be re-built and business to return to normal.

Natural Environment

During a flood event, chemicals and other hazardous substances may end up contaminating local water bodies. Flooding kills animals and in general disrupts the ecosystem. Snakes and insects may also make their way to the flooded areas.

5.8 Severe Weather (Thunderstorm Wind, Lightning & Hail)

5.8.1 Hazard Description

Thunderstorms

Thunderstorms result from the rapid upward movement of warm, moist air. They can occur inside warm, moist air masses and at fronts. As the warm, moist air moves upward, it cools, condenses, and forms cumulonimbus clouds that can reach heights of greater than 35,000 ft. As the rising air reaches its dew point, water droplets and ice form and begin falling the long distance through the clouds towards earth‘s surface. As the droplets fall, they collide with other droplets and become larger. The falling droplets create a downdraft of air that spreads out at Earth‘s surface and causes strong winds associated with thunderstorms.

There are four ways in which thunderstorms can organize: single cell, multi-cell cluster, multi-cell lines (squall lines), and supercells. Even though supercell thunderstorms are most frequently associated with severe weather phenomena, thunderstorms most frequently organize into clusters or lines. Warm, humid conditions are favorable for the development of thunderstorms. The average single cell thunderstorm is approximately 15 miles in diameter and lasts less than 30 minutes at a single location. However, thunderstorms, especially when organized into clusters or lines, can travel intact for distances exceeding 600 miles.

Thunderstorms are responsible for the development and formation of many severe weather phenomena, posing great hazards to the population and landscape. Damage that results from thunderstorms is mainly inflicted by downburst winds, large hailstones, and flash flooding caused by heavy precipitation. Stronger thunderstorms are capable of producing tornadoes and waterspouts.

The NCEI divides wind events into several types including High Wind, Strong Wind, Thunderstorm Wind, Tornado and Hurricane. For the purpose of this severe weather risk assessment, the wind hazard will include data from High Wind, Strong Wind and Thunderstorm Wind. Hurricane Wind and Tornadoes are addressed as individual hazards. The following definitions come from the NCEI Storm Data Preparation document.

- High Wind – Sustained non-convective winds of 40mph or greater lasting for one hour or longer or winds (sustained or gusts) of 58 mph for any duration on a widespread or localized basis.

- Strong Wind – Non-convective winds gusting less than 58 mph, or sustained winds less than 40 mph, resulting in a fatality, injury, or damage.

- Thunderstorm Wind – Winds, arising from convection (occurring within 30 minutes of lightning being observed or detected), with speeds of at least 58 mph, or winds of any speed (non-severe thunderstorm winds below 58 mph) producing a fatality, injury or damage.

Lightning

Lightning is an electrical discharge between positive and negative regions of a thunderstorm. A lightning flash is composed of a series of strokes with an average of about four. The length and duration of each lightning stroke vary, but typically average about 30 microseconds.

Lightning is one of the more dangerous weather hazards in the United States. Each year, lightning is responsible for deaths, injuries, and millions of dollars in property damage, including damage to buildings, communications systems, power lines, and electrical systems. Lightning also causes forest and brush fires, and deaths and injuries to livestock and other animals. According to the National Lightning Safety Institute, lightning causes more than 26,000 fires in the United States each year. The institute estimates property damage, increased operating costs, production delays, and lost revenue from lightning and secondary effects to be in excess of $6 billion per year. Impacts can be direct or indirect. People or objects can be directly struck, or damage can occur indirectly when the current passes through or near it.

Hail

Hail is associated with thunderstorms that can also bring high winds and tornados. It forms when updrafts carry raindrops into extremely cold areas of the atmosphere where they freeze into ice. Hail falls when it becomes heavy enough to overcome the strength of the updraft and is pulled by gravity towards the earth. Hailstorms occur throughout the spring, summer, and fall in the region, but are more frequent in late spring and early summer. Hailstones are usually less than two inches in diameter and can fall at speeds of 120 mph. Hail causes nearly $1 billion in damage to crops and property each year in the United States.

5.8.2 Location and Spatial Extent

The entirety of Cumberland and Hoke Counties including all assets located within the Counties can be considered at risk to severe weather events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

5.8.3 Past Occurrences

Table 5.15 shows detail for severe weather events reported by the NCEI since 1950 for Cumberland and Hoke Counties. There have been over 500 recorded events causing 17 injuries and close to $5M in property damage.

Table 5.15 - NCEI Severe Weather Events in Cumberland and Hoke Counties

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Cumberland County					
Hail	128	$1,025,000	$0	0	0
High Wind	5	$101,000	$0	0	0
Lightning	15	$1,836,000	$0	0	4
Strong Wind	9	$118,000	$7,000	0	1
Thunderstorm Wind	198	$1,328,500	$0	0	8
Hoke County					
Hail	52	$0	$0	0	0
High Wind	3	$1,000	$0	0	0
Lightning	3	$60,000	$0	0	0
Strong Wind	5	$17,000	$5,000	0	0
Thunderstorm Wind	89	$427,000	$0	0	4
Total:	**507**	**$4,913,500**	**$12,000**	**0**	**17**

Source: NCEI, September 2015

The following provides details on select flooding events recorded in the NCEI database:

July 5, 1997 – A mobile home was blown off its foundation and into Highway 301 in extreme northern Cumberland County.

August 1, 1998 - A modular home was blown 10 to 20 feet off its foundation with debris strewn 100 yards to the east. Numerous pine trees were snapped off in the yard, several falling on the house. The damage was isolated and occurred in rural northeast Cumberland county near Godwin on Highway 301-N.

February 28, 1999 - Two houses sustained major roof damage and another house had minor damage as strong thunderstorm winds hit the small community of Wade off I-95. Three storage buildings were also destroyed.

July 2, 2002 – Lightning set fire to a home in Fayetteville.

August 19, 2002 – Lightning set fire to a home in Fayetteville.

August 23, 2003 - Lightning set fire to a home in Hope Mills.

June 12, 2007 - A fire began when a lightning strike burned through the upper floor of a 12 unit apartment building of the Rivers Edge apartment complex. The top floor units were destroyed.

May 16, 2010 - Microburst wind damage was observed as far south as Johnson Mill Road and Adcox Road, just south of Highway 401 and as far north as Plank Road near the Fort Bragg Military Reservation. The most significant structural damage occurred in the Willow Trace Mobile Home Park where 44 mobile home out of 50 suffered damage. Four mobile homes were destroyed. A dozen of automobiles within the mobile home park sustained damage from fallen trees and debris. Quarter size hail was also reported to have also caused damage to the homes. One person was known to have been transported to the hospital with a possible back injury and chest pains.

July 1, 2012 - Large hail up to the size of tennis balls fell at Stewart Nissan, causing damage to nearly all 300 cars parked at the dealership. Some rear and front windows were shattered along with lots of dented cars.

5.8.4 Probability of Future Occurrences

Highly Likely - Given the high number of previous events (507 records in 65 years), it is certain that severe weather events, including wind, lightning and hail, will occur in the future. This results in a probability level of highly likely (100 percent annual probability) for future severe weather events for the entire planning area.

Climate Change and Severe Weather

As discussed in subsection 5.6, research shows that the increasing trend in strength, frequency and duration of hurricanes from the Atlantic Ocean since the early 1980s will continue. According to the U.S. Global Change Research Program, there is low confidence however, on other trends in severe storms [21]. The frequency and intensity of individual rainfall events associated with thunderstorms is likely to increase which can overwhelm local stormwater drainage systems, leading to street flooding and ponded water.

5.8.5 Consequence Analysis

People

Thunderstorms are generally associated with hazards such as high wind, lightning and hail. High wind can cause trees to fall and potentially result in injuries or death and lightning can lead to house fires and serious injury. Hail can cause injury as well as severe property damage to homes and automobiles.

First Responders

First responders can be impacted in the same way as the general public. Downed trees, power lines and flood waters may prevent access to areas in need which prolongs response time.

Continuity of Operations

Thunderstorm events can result in a loss of power which may impact operations. Downed trees, power lines and flash flooding may prevent access to critical facilities and/or emergency equipment.

Built Environment

Thunderstorms can cause damage to commercial buildings and homes due to strong winds, lightning strikes and hail. Heavy rains associated with thunderstorm events may also lead to flash flooding which can damage roads and bridges.

Economy

Economic damages include property damage from wind, lightning and hail, and also include intangibles such as business interruption and additional living expenses.

Natural Environment

Thunderstorms have a huge impact on the environment. One of the most dangerous outcomes for the environment is when lightning causes sparks to flare up in surrounding forests or immense shrubs. This is often the cause of bush fires, which then spread quickly due to the fast winds that accompany the storm. High winds can also damage crops and trees. Flooding can kill animals and cause soil erosion.

5.9 Sinkhole

5.9.1 Hazard Description

According to the NC Division of Water Resources, a "sinkhole is a naturally occurring, roughly circular depression in the land surface, formed most commonly in are areas of limestone bedrock. Limestone is a type of rock composed entirely of the highly reactive mineral calcite (CaCO3), which readily dissolves in the presence of slightly acidic ground water. In areas of humid climate, rain water percolates downward through the soil cover into openings in the limestone bedrock, gradually dissolving the rock matrix. Void spaces in the subsurface will eventually form, ranging from microscopic to cavern size."

Figure 5.13 from the United States Geological Survey shows areas where rock types are susceptible to dissolution in water. These rocks are either evaporates (salt, gypsum, and anhydrite) or carbonates (limestone and dolomite), and underlie 35 - 40 percent of the United Sates, although in many areas the rock is at considerable depths. The figure indicates eastern North Carolina and areas near Cumberland and Hoke County are underlain by carbonate rock.

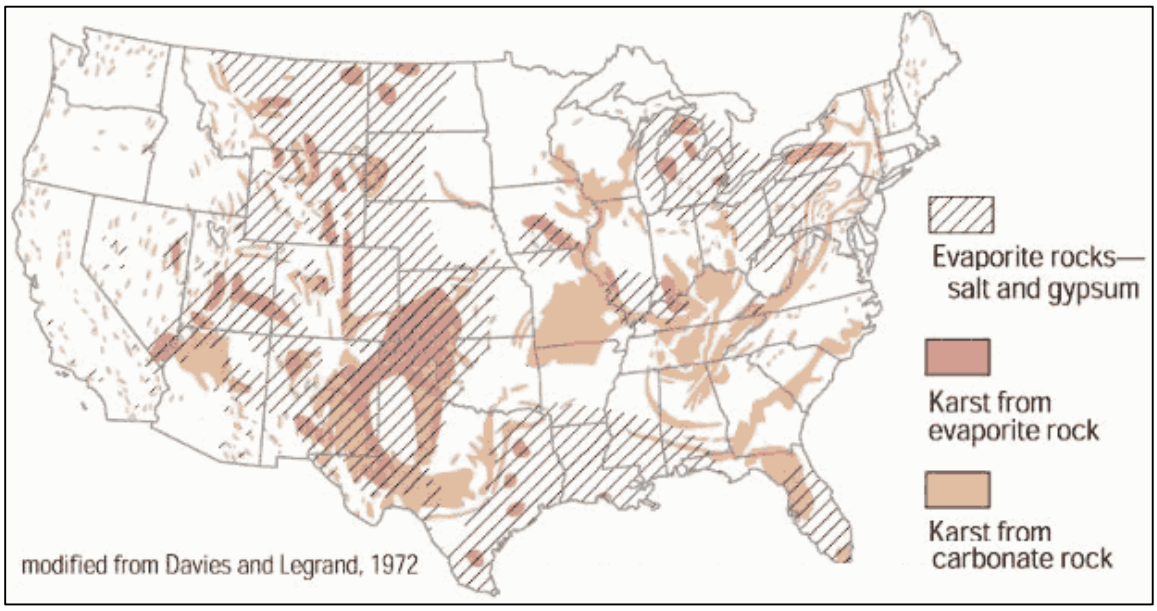


Figure 5.13 - Rock Formations in the United States

Figure 5.14 from the United States Geological Survey shows areas within North Carolina prone to sinkholes based on geologic setting. The figure indicates Hoke County and western Cumberland County are susceptible to sinkholes.

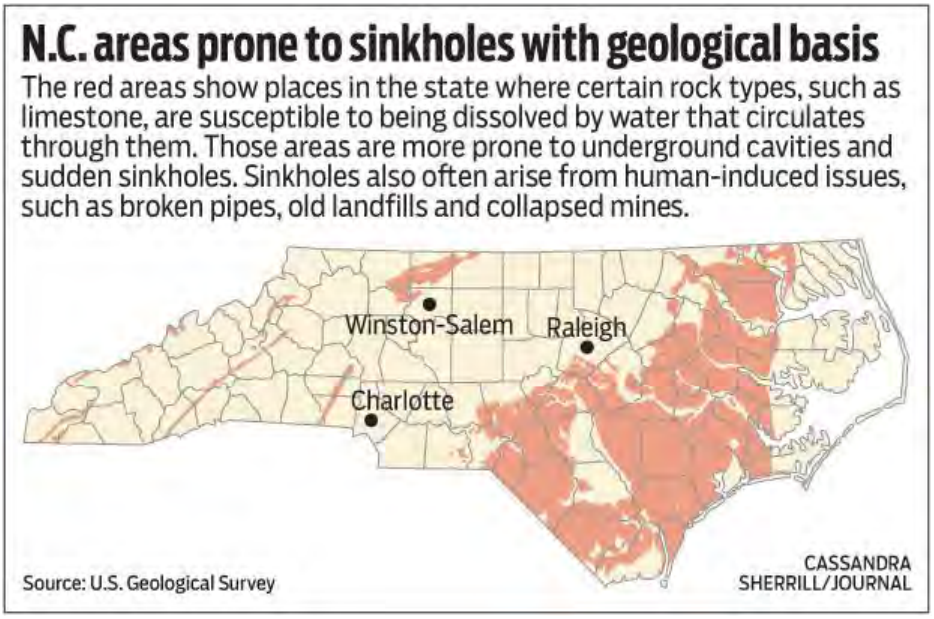


Figure 5.14 - North Carolina Areas Prone to Sinkholes

The NC HMP developed a vulnerability score for sinkholes as shown in Figure 5.15. This figure represents the relative location of sinkhole hazard vulnerability across the state of North Carolina. The vulnerability score for each county represents the scope, frequency, intensity, and destructive potential of this hazard and is an indication of future probability based on its relative score to other counties in the state. The use of cooler colors—such as blues, purples, or greens—on the various hazard score maps represents lower hazard vulnerability scores, while warmer colors—yellows, oranges, or reds—represent higher hazard vulnerability scores. The area of highest sinkhole vulnerability includes Cumberland and Hoke Counties.

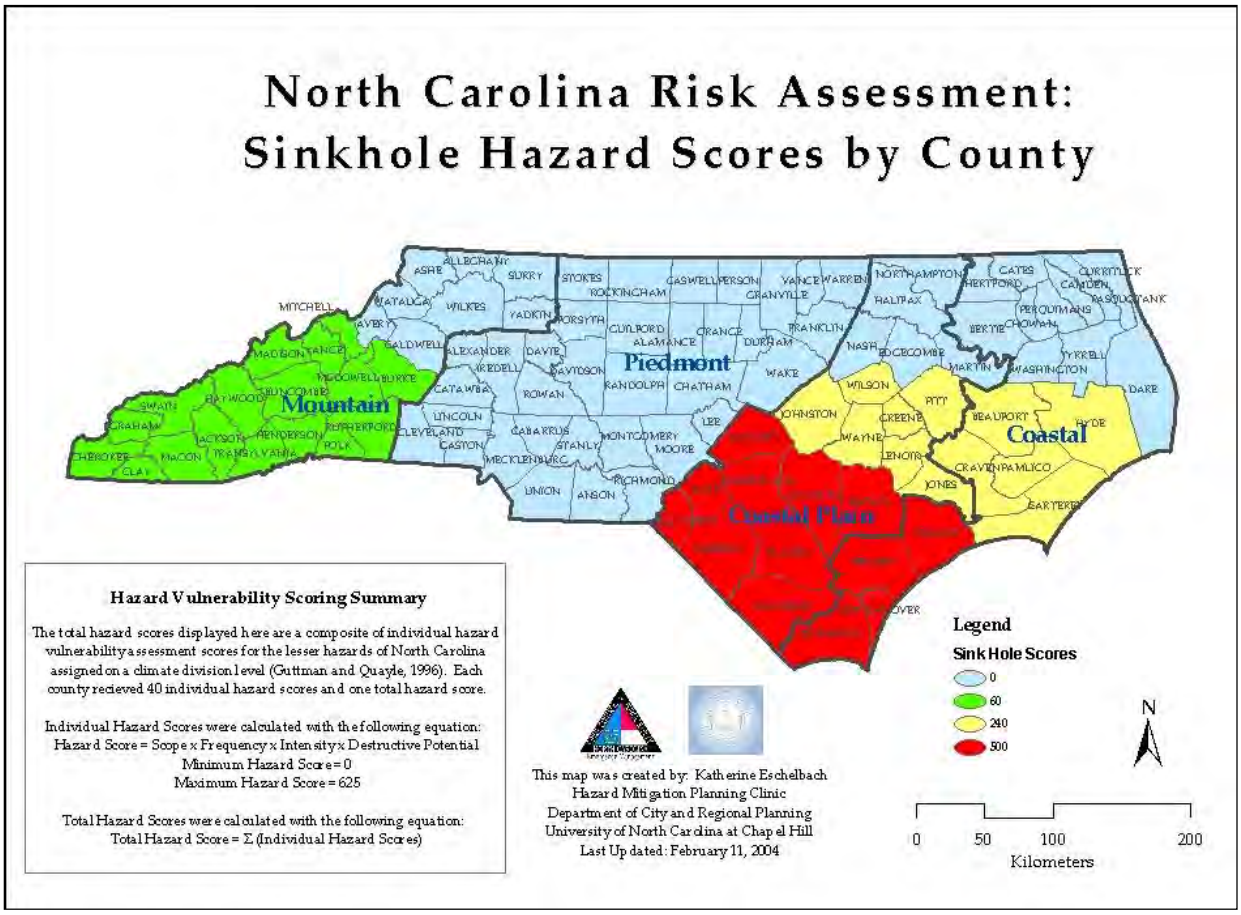


Figure 5.15 - Sinkhole Hazard Scores by County

5.9.2 Location and Spatial Extent

Data for the United State Geologic Survey and the 2013 NC State Hazard Mitigation Plan, Cumberland and Hoke Counties are underlain by rock formations susceptible to dissolution and are in the area of the State with the highest sinkhole vulnerability, indicating any location within the Counties is potentially susceptible to sinkhole formation.

5.9.3 Past Occurrences

Previous versions of the Cumberland County and Hoke County Hazard Mitigation Plans either did not include sinkholes or chose to not address sinkholes in the Hazard Mitigation Plan, based on a lack of historical occurrences.

The hazard experts that developed the 2013 NC State Hazard Mitigation Plan, as stated in the Plan, "felt strongly that although this hazard has not been a frequently occurring hazard in the past, this particular hazard has great potential for increasing in frequency as the population continues to grow in the coastal areas of North Carolina. Recent examples of this include a sinkhole that was forming under a dam in Hope Mills, NC and a sinkhole in Onslow County that was opened up in the wake of Hurricane Irene."

Searches of newspaper records indicate some instances of sinkholes opening up under roadways within Cumberland and Hoke Counties, although it was unclear if the occurrences were naturally occurring or associated with failure of man-made features.

5.9.4 Probability of Future Occurrences

Unlikely - Based on historical occurrence information (very few occurrences) and geologic setting, it can reasonably be assumed sinkhole events in Cumberland and Hoke Counties have a negligible to low chance of occurring each year.

Climate Change and Sinkholes

Direct effects from global warming and climate change such as an increase in droughts, floods and hurricanes could contribute to an increase in sinkholes. Climate change raises the likelihood of extreme weather, meaning the torrential rain and flooding conditions which often lead to the exposure of sinkholes are likely to become increasingly common. Certain events such as a hurricane following a period of drought can trigger a sinkhole due to low levels of groundwater combined with a heavy influx of rain. As discussed in subsection 5.6, research shows that the increasing trend in strength, frequency and duration of hurricanes from the Atlantic Ocean since the early 1980s will continue. Therefore, an increase in the occurrence of sinkholes in the future is possible.

5.9.5 Consequence Analysis

People

A person's vulnerability is directly related to the speed in which the sinkhole opens and the person being above the sinkhole. Records exist for deaths associated with sinkholes opening beneath homes while occupants were present or from motor vehicle deaths when drivers could avoid driving into the sinkhole before protective barriers were in place.

First Responders

First responders will be impacted similarly to other events that have advance warning.

Continuity of Operations

Continuity of operations is generally not disrupted by sinkholes.

Built Environment

Although sinkhole extents are localized, buildings located on or adjacent to a sinkhole are susceptible to foundation damage or building collapse. If the building is located close enough to the sinkhole it can be completely destroyed or in worst cases, completely collapse into the sinkhole. Remediation costs can be high due to costly foundation shoring or cost of stabilization of the sinkhole itself.

Economy

Sinkholes located in open areas or that impact only small numbers of buildings, while having a high impact to the local property owner, do not have substantial impacts to the economy. Sinkholes that open up in major traffic thoroughfares can include significant impact to daily work traffic and flow of goods.

Fayetteville Observer
Sinkhole and diverted traffic along N.C. 24 in Fayetteville

Natural Environment

Sinkholes are natural occurring process and local plants and animals adjust quickly. Many naturally occurring sinkholes fill with rainwater creating new aquatic habitat.

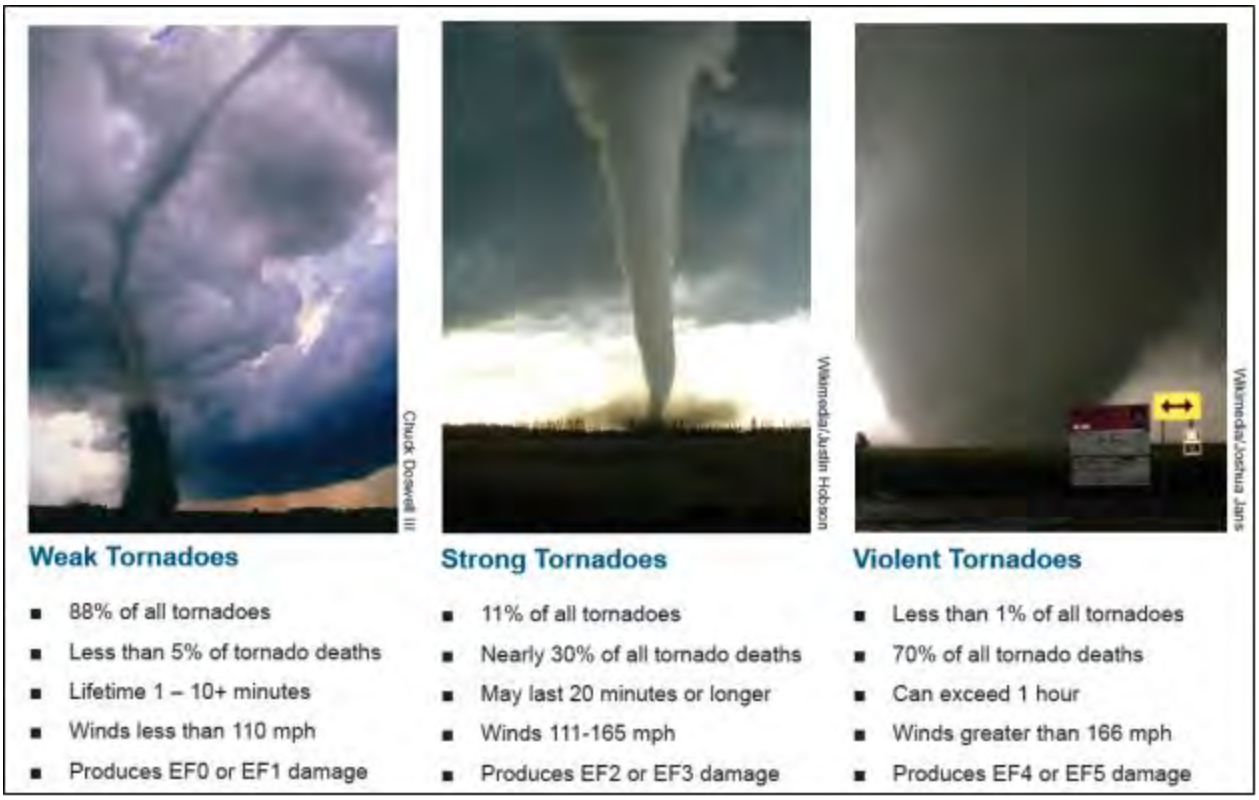
5.10 Tornado

5.10.1 Hazard Description

According to the Glossary of Meteorology (AMS 2000), a tornado is "a violently rotating column of air, pendant from a cumuliform cloud or underneath a cumuliform cloud, and often (but not always) visible as a funnel cloud." Tornadoes can appear from any direction. Most move from southwest to northeast, or west to east. Some tornadoes have changed direction amid path, or even backtracked.

Tornadoes are commonly produced by land falling tropical cyclones. Those making landfall along the Gulf coast traditionally produce more tornadoes than those making landfall along the Atlantic coast. Tornadoes that form within hurricanes are more common in the right front quadrant with respect to the forward direction, but can occur in other areas as well. According to the NHC, about 10% of the tropical cyclone-related fatalities are caused by tornadoes. Tornadoes are more likely to be spawned within 24 hours of landfall and are usually within 30 miles of the tropical cyclone's center.

Tornadoes have the potential to produce winds in excess of 200 mph (EF5 on the Enhanced Fujita Scale) and can be very expansive – some in the Great Plains have exceeded two miles in width. Tornadoes associated with tropical cyclones, however, tend to be of lower intensity (EF0 to EF2) and much smaller in size than ones that form in the Great Plains.



Source: NOAA National Weather Service

Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis, better correlation between damage and wind speed. It is also more precise because it takes into account the materials affected and the construction of structures damaged by a tornado. Table 5.16 shows the wind speeds associated with the enhanced Fujita scale ratings and the damage that could result at different levels of intensity.

Table 5.16 - Enhanced Fujita (EF) Scale

EF Number	3 Second Gust (mph)	Damage
0	65-85	**Light damage.** Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
1	96-110	**Moderate damage.** Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
2	111-135	**Considerable damage.** Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
3	136-165	**Severe damage.** Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.

EF Number	3 Second Gust (mph)	Damage
4	166-200	**Devastating damage.** Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
5	Over 200	**Incredible damage.** Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m; high-rise buildings have significant structural deformation; incredible phenomena will occur.

5.10.2 Location and Spatial Extent

Although tornadoes can occur in most locations, most of the tornado activity in the United States exists in the Mid-West and Southeast. An exact season does not exist for tornadoes; however, most occur within the time period of early spring to middle summer (February – June). Figure 5.16 shows tornado activity in the United States based on the number of recorded tornadoes per 1,000 square miles.

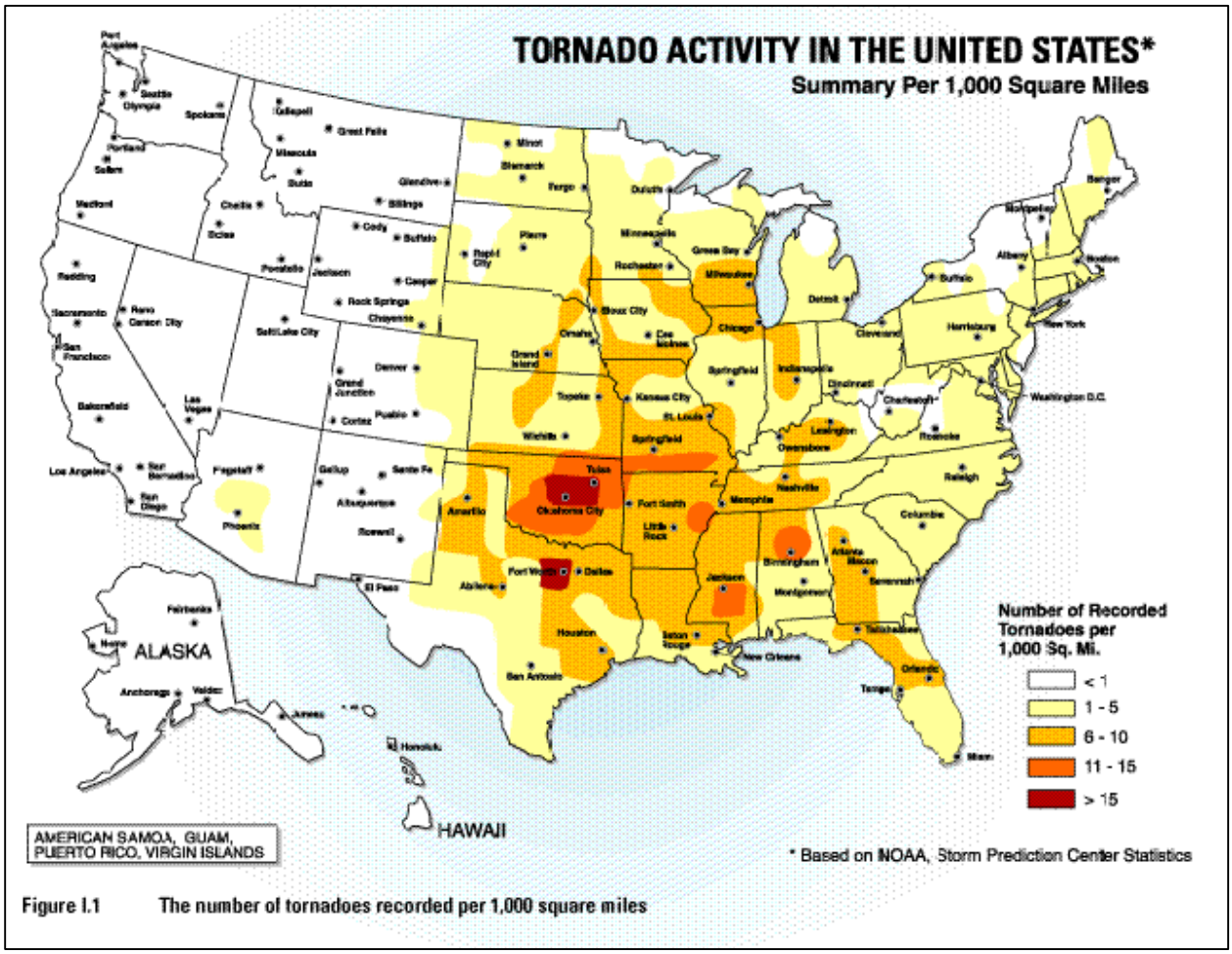


Figure 5.16 - Tornado Activity in the United States

5.10.3 Past Occurrences

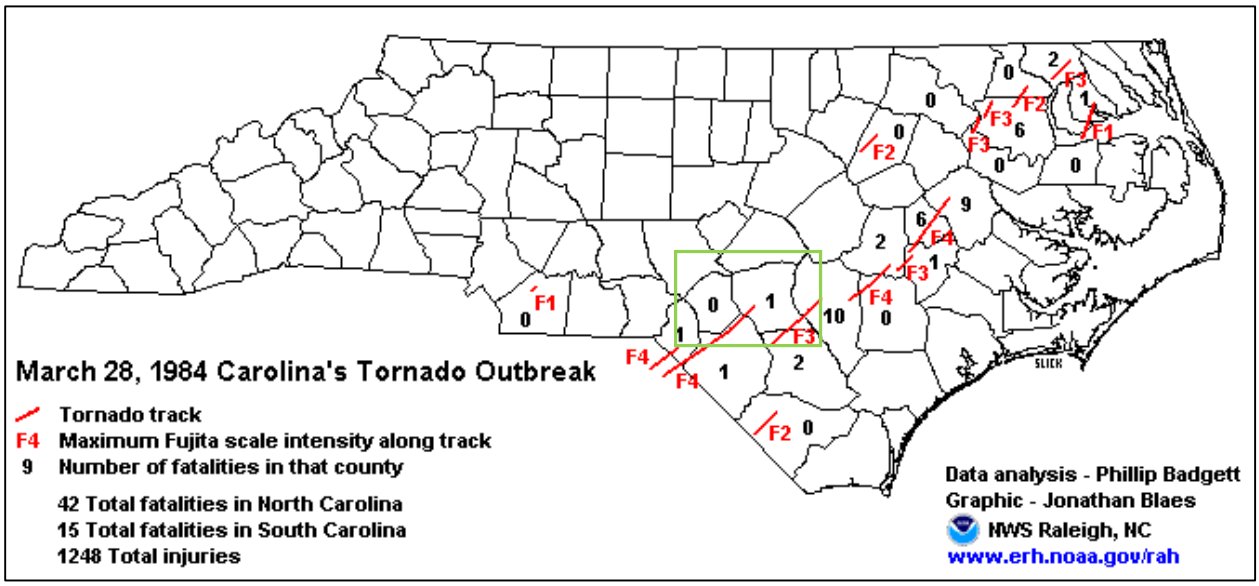
According to NCEI records, Cumberland and Hoke Counties have experienced 33 tornadoes since 1950. These events are reported to have caused six deaths, 175 injuries and close to $133M in property damage.

Table 5.17 - NCEI Records for Tornadoes in Cumberland and Hoke Counties (1950-2015)

Location	Date	Tornado Fujita Scale	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland Co	4/8/1957	F4	0/8	$250,000.00	$0.00
Cumberland Co	6/2/1959	F0	0/0	$25,000.00	$0.00
Cumberland Co	10/4/1960	F1	0/0	$25,000.00	$0.00
Cumberland Co	9/29/1963	F2	0/0	$250,000.00	$0.00
Cumberland Co	12/26/1964	F1	0/1	$2,500.00	$0.00
Cumberland Co	2/22/1971	F3	2/60	$2,500,000.00	$0.00
Cumberland Co	3/15/1971	F1	0/0	$250,000.00	$0.00
Cumberland Co	5/29/1973	F1	0/0	$25,000.00	$0.00
Cumberland Co	8/2/1974	F0	0/0	$25,000.00	$0.00
Cumberland Co	2/11/1981	F2	0/0	$250,000.00	$0.00
Cumberland Co	3/28/1984	F3	2/11	$25,000,000.00	$0.00
Cumberland Co	3/28/1984	F4	0/0	$2,500,000.00	$0.00
Cumberland Co	5/19/1986	F2	0/0	$250,000.00	$0.00
Cumberland Co	8/28/1988	F1	0/0	$250,000.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	5/28/2000	F0	0/0	$0.00	$0.00
Cumberland Co	12/17/2000	F0	0/0	$0.00	$0.00
Cumberland Co	3/27/2009	EF1	0/0	$225,000.00	$0.00
Cumberland Co	4/16/2011	EF3	1/85	$100,000,000.00	$0.00
Cumberland Co	4/16/2011	EF2	0/4	$250,000.00	$0.00
Cumberland Co	4/29/2014	EF1	0/0	$50,000.00	$0.00
Hoke Co	3/24/1975	F1	0/0	$250.00	$0.00
Hoke Co	2/11/1981	F2	1/0	$250,000.00	$0.00
Hoke Co	5/19/1986	F2	0/5	$250,000.00	$0.00
Hoke Co	5/19/1988	F0	0/0	$2,500.00	$0.00
Hoke Co	10/23/1990	F0	0/0	$2,500.00	$0.00
Hoke Co	5/19/1995	F1	0/1	$200,000.00	$0.00
Hoke Co	8/29/2004	F0	0/0	$0.00	$0.00
Hoke Co	9/7/2004	F0	0/0	$0.00	$0.00
Hoke Co	9/8/2004	F0	0/0	$0.00	$0.00
Hoke Co	4/16/2011	EF0	0/0	$100,000.00	$0.00
			Total:	**$132,932,750.00**	**$0.00**

The largest and most devastating tornado outbreak to affect North Carolina during the last century occurred on March 28, 1984. The outbreak produced 22 tornadoes that killed 57 people, including 42 in

North Carolina with 15 in South Carolina, and injured another 800. Roughly a third of the victims were in mobile homes. Figure 5.17 on the following page shows tornado track and intensity across the State for the 1984 outbreak.



Note: Green square indicates location of Cumberland and Hoke Counties.

Figure 5.17 - 1984 Tornado Outbreak

On April 16, 2011, a category EF2 tornado tore a 10-mile long path across western and northwestern sections of Fayetteville. Referred to in the media as the Fayetteville-Smithfield tornado, the storm produced more than 100 injuries and $116.1 million in damage [(21)].

5.10.4 Probability of Future Occurrences

Likely - The best available information to determine future probability of a tornado event is to review historic frequency. According to NCEI, 33 tornadoes have occurred between 1950 and 2015 (51% chance of occurring each year).

Climate Change and Tornadoes

Research published in 2015 suggests that changes in heat and moisture content in the atmosphere, brought on by a warming world, could be playing a role in making tornado outbreaks more common and severe in the U.S. [(28)]. The research concluded that the number of days with large outbreaks have been increasing since the 1950s and that densely concentrated tornado outbreaks are on the rise. It is notable that the research shows that the area of tornado activity is not expanding, but rather the areas already subject to tornado activity are seeing the more densely packed tornadoes.

5.10.5 Consequence Analysis

People

The rate of onset of tornado events is rapid, giving those in danger minimal time to seek shelter. The current average lead time according to NOAA is 13 minutes. Injury may result from the direct impact of a tornado, or it may occur afterward when people walk among debris and enter damaged buildings. A study of injuries after a tornado in Marion, Illinois, showed that 50 percent of the tornado-related injuries were

suffered during rescue attempts, cleanup, and other post-tornado activities. Common causes of injury included falling objects and heavy, rolling objects. Because tornadoes often damage power lines, gas lines, or electrical systems, there is a risk of fire, electrocution, or an explosion.

First Responders

Due to the rapid onset of tornado events, first responders could be critically affected by tornado events through direct impact of the tornado itself or injury received during response efforts. Response may be hindered as responders may be unable to access those that have been affected if storm conditions persist or if they are unable to safely enter affected areas. As mentioned above, a large percentage of tornado-related injuries are suffered during rescue attempts, cleanup, and other post-tornado activities due to walking among debris and entering damaged buildings.

Continuity of Operations

Continuity of operations could be greatly impacted by a tornado. Personnel or families of personnel may be harmed which would limit their response capability. Critical facilities and resources could also be damaged or destroyed during a tornado.

Built Environment

The weakest tornadoes, FO, can cause minor roof damage and strong tornadoes can destroy frame buildings and even badly damage steel reinforced concrete structures. Most building codes in the United States do not include provisions that provide protection against tornadic winds. Given the strength of the wind impact and construction techniques, buildings are vulnerable to direct impact, including potential destruction, from tornadoes and also from wind borne debris that tornadoes turn into missiles. Mobile homes particularly susceptible to damage and fatalities during tornadoes.

Economy

The largest impact of tornadoes is the economic damage caused by widespread destruction along their paths. More directly, there are many people killed by these storms, and to a lesser extent pets and farm animals. The major damage is the complete destruction of homes, buildings, and farms, the wrecking of cars and trucks, and the loss of power distribution systems. Winds as high as 300 mph blow down walls, tear up trees, and throw debris in every direction at high speeds. Indirect losses include workers who cannot report to jobs and commercial entities that most close to repair damages.

Natural Environment

There is no defense for plants and animals from a direct impact from a tornado. Plants and animals in the path of the tornado will receive significant damage, or be killed. Strong tornados can shred trees and lift grass from the ground.

5.11 Wildfire

5.11.1 Hazard Description

A wildfire is an uncontained fire that spreads through the environment. Wildfires have the ability to consume large areas, including infrastructure, property, and resources. When massive fires, or conflagrations, develop near populated areas, evacuations possibly ensue. Not only do the flames impact the environment, but the massive volumes of smoke spread by certain atmospheric conditions also impact the health of nearby populations. There are three general types of fire spread that are recognized.

Ground fires – burn organic matter in the soil beneath surface littler and are sustained by glowing combustion.

Surface fires – spread with a flaming front and burn leaf litter, fallen branches and other fuels located at ground level.

Crown fires – burn through the top layer of foliage on a tree, known as the canopy or crown fires. Crown fires, the most intense type of fire and often the most difficult to contain, need strong winds, steep slopes and a heavy fuel load to continue burning.

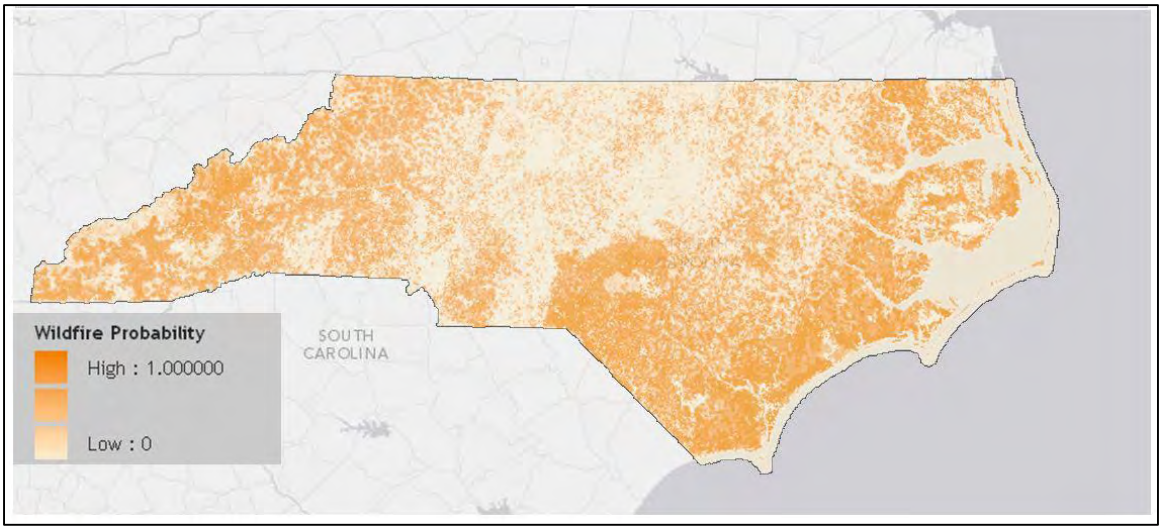
Generally, wildfires are started by humans, either through arson or carelessness. Fire intensity is controlled by both short-term weather conditions and longer-term vegetation conditions. During intense fires, understory vegetation, such as leaves, small branches, and other organic materials that accumulate on the ground, can become additional fuel for the fire. The most explosive conditions occur when dry, gusty winds blow across dry vegetation.

5.11.2 Location and Spatial Extent

The expansion of residential development from urban centers out into rural landscapes, increases the potential for wildland fire threat to public safety and the potential for damage to forest resources and dependent industries. The Wildland Urban Interface (WUI) is described as the area where structures and other human improvements meet and intermingle with undeveloped wildland or vegetative fuels. Population growth within the WUI substantially increases the risk of wildfire.

For the Cumberland County, NC project area, it is estimated that 301,884 people or 95 percent of the total project area population (319,404) live within the WUI [29]. For the Hoke County, NC project area, it is estimated that 46,629 people or 99 percent of the total project area population (46,964) live within the WUI [30]. Figures 5.19 and 5.20 on the following pages display the WUI for Cumberland and Hoke Counties, respectively.

Wildfires could potentially occur anywhere in the region. Figure 5.18 below shows areas of the state that have a high probability of experiencing a wildfire. Cumberland and Hoke Counties are located within the highest probability category.



Source: NC 2013 State Hazard Mitigation Plan

Figure 5.18 - Wildfire Probability Map

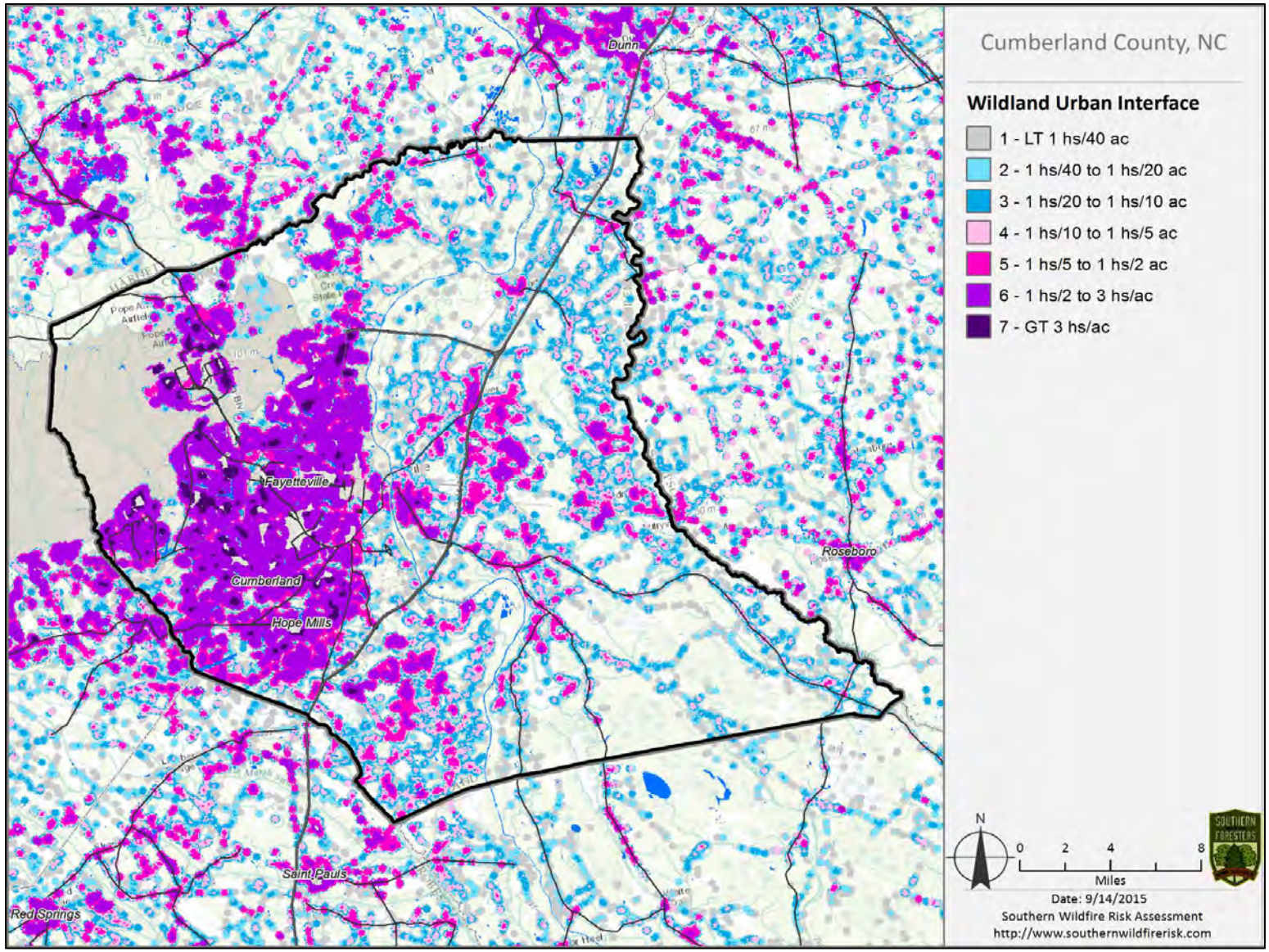


Figure 5.19 - Cumberland County Wildland Urban Interface

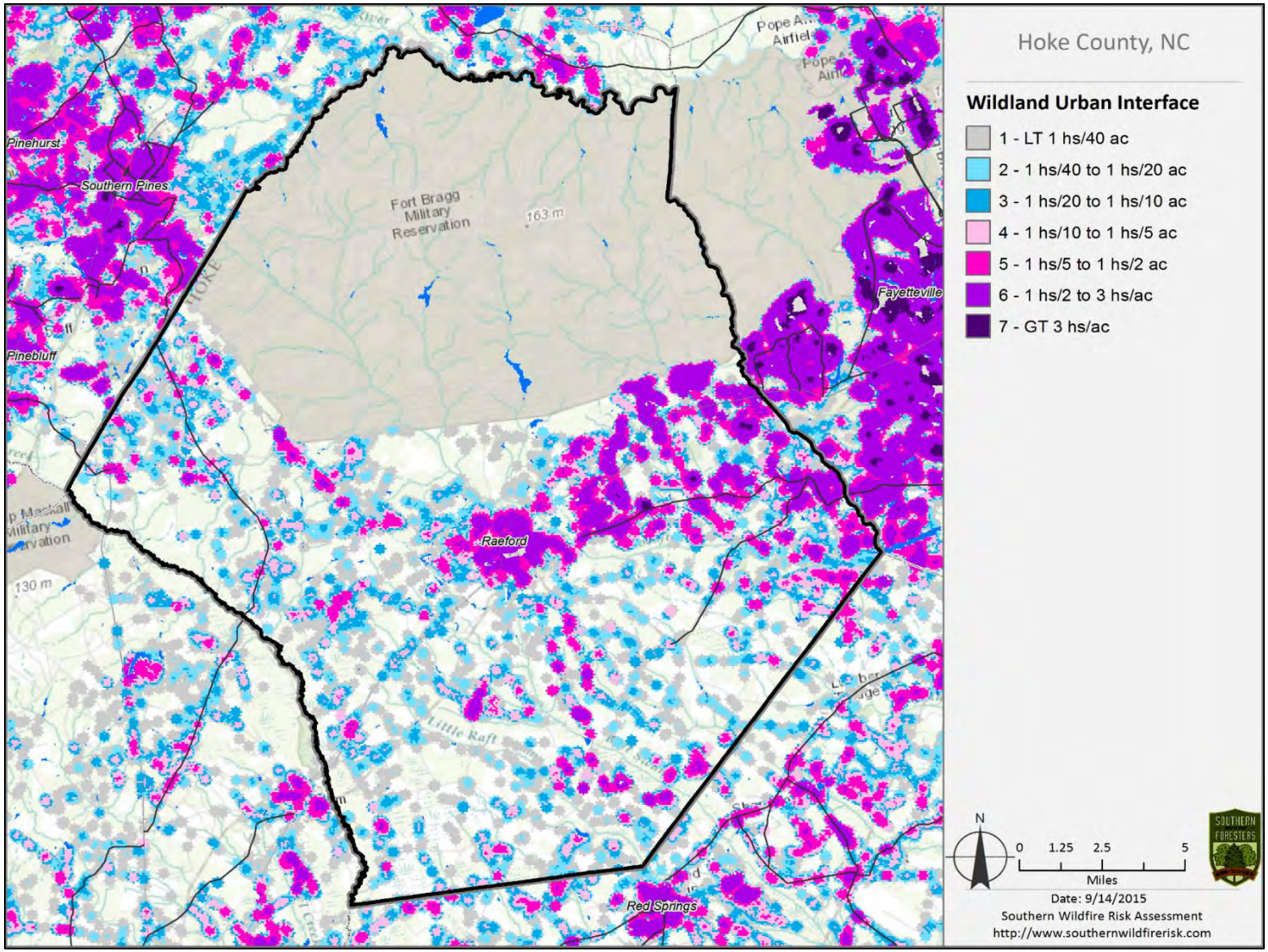


Figure 5.20 - Cumberland County Wildland Urban Interface

5.11.3 Past Occurrences

The North Carolina Forest Service (NCFS) began keeping records of fire occurrence on private and state-owned lands in 1928. Since this time, there has been an average of approximately 4,000 fires burning more than 115,000 acres annually. Recently, within the last 10 years, the State has averaged closer to 4,500 fires per year and 25,000 acres burned annually. Table 5.18 lists past occurrences of wildfire in Cumberland and Hoke Counties since 2005 as provided by the NCFS in September 2015.

Table 5.18 - Records for Wildfire in Cumberland and Hoke Counties

County	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Cumberland	57	75	94	49	21	59	47	24	36	38
Hoke	82	88	116	44	49	66	59	59	26	46
Total	**139**	**163**	**210**	**93**	**70**	**125**	**106**	**83**	**62**	**84**

5.11.4 Probability of Future Occurrences

Highly Likely - The best available information to determine future probability of a wildfire event is to review historic frequency. According to historic records, 1,135 wildfires have occurred between 2005 and 2015 (100% chance of occurring each year).

In support of forecasting for fire weather, the National Weather Service Fire Weather Program emerged in response to a need for weather support to large and dangerous wildfires. This service is provided to federal and state land management agencies for the prevention, suppression, and management of forest and rangeland fires. The National Weather Service Forecast Office in Raleigh provides year-round fire weather forecasts for Cumberland and Hoke Counties.

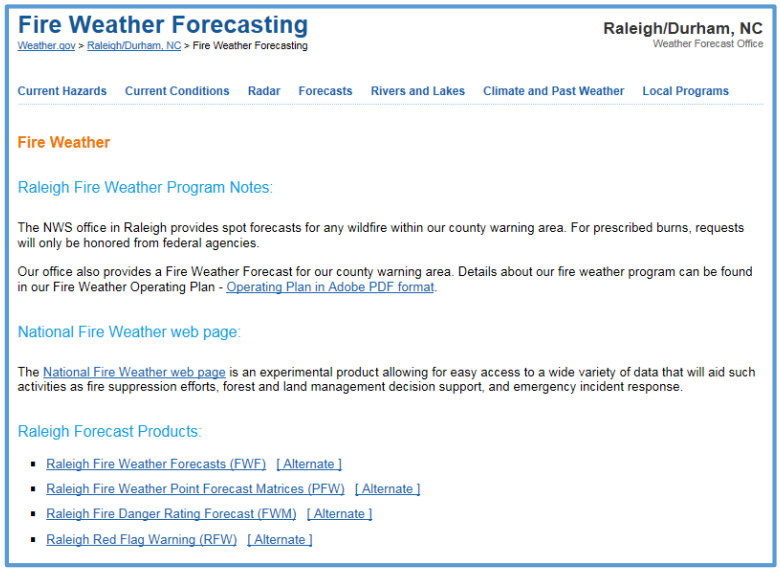


Figure 5.21 - Fire Weather Forecasting, NWS Raleigh
http://www.weather.gov/rah/fire

Climate Change and Wildfires

As mentioned in subsection 5.5, research shows that temperatures will continue to rise in the Southeast United States and globally, directly affecting the Cumberland-Hoke County region in North Carolina.

Higher temperatures will reduce the number of days prescribed burning can be performed. Reduction of prescribed burning will allow for growth of understory vegetation – providing fuel for destructive wildfires. Drought is also anticipated to increase in frequency and intensity during summer months under projected climate change scenarios [21]. Drought can lead to dead or dying vegetation and landscaping material close to structures which creates fodder for wildfires within both the urban and rural settings.

5.11.5 Consequence Analysis

People

The potential health risk from wildfire events and the resulting diminished air quality is a concern. Exposure to wildfire smoke can cause serious health problems within a community, including asthma attacks and pneumonia, and can worsen chronic heart and lung diseases. Vulnerable populations include people with respiratory problems or with heart disease. Even healthy citizens may experience minor symptoms, such as sore throats and itchy eyes.

First Responders

Public and firefighter safety is the first priority in all wildland fire management activities. Wildfires are a real threat to the health and safety of the emergency services. Most fire-fighters in rural areas are 'retained'. This means that they are part-time and can be called away from their normal work to attend to fires.

Continuity of Operations

Wildfire events can result in a loss of power which may impact operations. Downed trees, power lines and damaged road conditions may prevent access to critical facilities and/or emergency equipment.

Built Environment

Wildfires frequently damage community infrastructure, including roadways, communication networks and facilities, power lines, and water distribution systems. Restoring basic services is critical and a top priority. Efforts to restore roadways include the costs of maintenance and damage assessment teams, field data collection, and replacement or repair costs. Direct impacts to municipal water supply may occur through contamination of ash and debris during the fire, destruction of aboveground distribution lines, and soil erosion or debris deposits into waterways after the fire. Utilities and communications repairs are also necessary for equipment damaged by a fire. This includes power lines, transformers, cell phone towers, and phone lines.

Economy

Wildfires can have significant short-term and long-term effects on the local economy. Wildfires, and extreme fire danger, may reduce recreation and tourism in and near the fires. If aesthetics are impaired, local property values can decline. Extensive fire damage to trees can significantly alter the timber supply, both through a short-term surplus from timber salvage and a longer-term decline while the trees regrow. Water supplies can be degraded by post-fire erosion and stream sedimentation.

Wildfires can also have positive effects on local economies. Positive effects come from economic activity generated in the community during fire suppression and post-fire rebuilding. These may include forestry support work, such as building fire lines and performing other defenses, or providing firefighting teams with food, ice, and amenities such as temporary shelters and washing machines.

Natural Environment

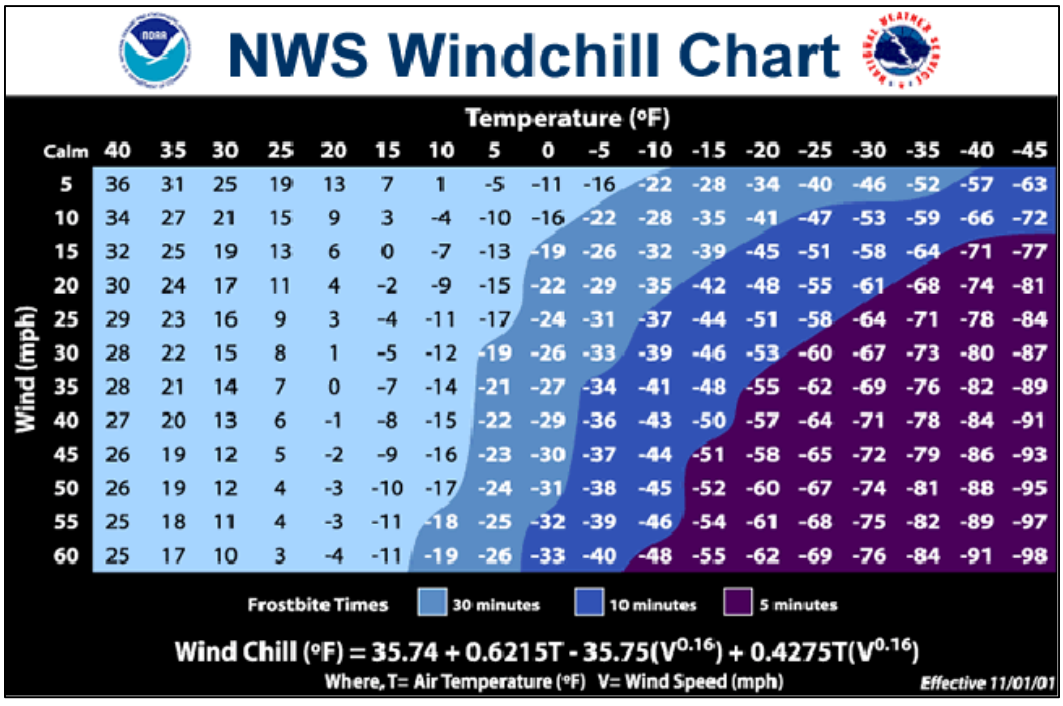
Wildfires cause damage to the natural environment, killing vegetation and occasionally animals. The risk of floods and debris flows increases due to the exposure of bare ground and the loss of vegetation. In addition, the secondary effects of wildfires, including erosion, landslides, introduction of invasive species, and changes in water quality, are often more disastrous than the fire itself.

5.12 Winter Storm

5.12.1 Hazard Description

North Carolina winter weather consists of storms that produce snow, sleet, freezing rain or a wintry mix of multiple precipitation types. Along with wintry precipitation, North Carolina winter weather also includes outbreaks of bitterly cold temperatures. The occurrence of severe winter weather has a substantial impact on communities, utilities, transportation systems and agriculture, and often results in loss of life due to accidents or hypothermia. In addition, severe winter weather may spawn other hazards such as flooding, severe thunderstorms, tornadoes, and extreme winds that may delay recovery efforts. For Cumberland and Hoke Counties, the NCEI Storm Events Database defines the following winter storm events:

- **Cold/Wind Chill** - Period of low temperatures or wind chill temperatures reaching or exceeding locally/regionally defined advisory. For the NWS Office in Raleigh, this means wind chill of -15°F or lower with wind speeds 10 mph or greater on a widespread or localized basis. The NWS Windchill Temperature Index, as presented in the figure below, provides a useful formula for calculating the dangers of winter winds and freezing temperatures.



Source: http://www.nws.noaa.gov/om/winter/windchill.shtml

Figure 5.22 – NWS Wind Chill Temperature Index

- **Heavy Snow** - Heavy snow can immobilize a community by stranding commuters, closing airports, stopping the flow of commerce, and disrupting emergency and medical services. The weight of snow can cause roofs to collapse and knock down trees and power lines. Residents may be isolated for days and unprotected livestock may be lost. The cost of snow removal, repairing damages, and the loss of business can have severe economic impacts on communities. Snow accumulation meeting or exceeding locally/regionally defined 12 and/or 24 hour warning criteria, on a widespread or localized basis. For the NWS Office in Raleigh, this means snow accumulation of 3 inches or greater in 12 hours (4 inches or more in 24 hours). In some heavy snow events, structural damage, due to the excessive weight of snow accumulations, may occur in the few days following the meteorological end of the event.
- **Ice Storm** - Ice accretion meeting or exceeding locally/regionally defined warning criteria. For the NWS Office in Raleigh, this means freezing rain accumulations ¼ inch or greater on a widespread or localized basis.
- **Winter Storm** - A winter weather event which has more than one significant hazard (i.e., heavy snow and blowing snow; snow and ice; snow and sleet; sleet and ice; or snow, sleet and ice) and meets or exceeds locally/regionally defined 12 and/or 24 hour warning criteria for at least one of the precipitation elements, on a widespread or localized basis.
- **Winter Weather** - A winter precipitation event that causes a death, injury, or a significant impact to commerce or transportation but does not meet locally/regionally defined warning criteria. A Winter Weather event could result from one or more winter precipitation types (snow, or blowing/drifting snow, or freezing rain/drizzle), on a widespread or localized basis.

5.12.2 Location and Spatial Extent

The entirety of Cumberland and Hoke Counties including all assets located within the Counties can be considered at risk to winter storm events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

5.12.3 Past Occurrences

According to NCEI records, Cumberland and Hoke Counties have experienced 30 and 29 winter storm events since 1996, respectively. These events are reported to have caused one death due to icy road conditions.

Table 5.19 - NCEI Records for Winter Storm Events in Cumberland and Hoke Counties (1996-2015)

Date	Location		Type of Winter Storm	Deaths/ Injuries	Property Damage	Crop Damage
1/6/1996	Cumberland County	Hoke County	Ice Storm	0/0	$0.00	$0.00
1/11/1996	Cumberland County	Hoke County	Ice Storm	0/0	$0.00	$0.00
2/2/1996	Cumberland County	Hoke County	Ice Storm	0/0	$0.00	$0.00
2/3/1996	Cumberland County	Hoke County	Cold/wind Chill	0/0	$0.00	$0.00
1/19/1998	n/a	Hoke County	Heavy Snow	0/0	$0.00	$0.00
12/23/1998	Cumberland County	Hoke County	Ice Storm	0/0	$0.00	$0.00
1/18/2000	Cumberland County	Hoke County	Winter Storm	0/0	$0.00	$0.00
1/22/2000	Cumberland County	Hoke County	Winter Storm	0/0	$0.00	$0.00
1/24/2000	Cumberland County	Hoke County	Winter Storm	0/0	$0.00	$0.00
1/28/2000	Cumberland County	Hoke County	Winter Storm	0/0	$0.00	$0.00
12/3/2000	Cumberland County	n/a	Winter Storm	0/0	$0.00	$0.00
1/3/2002	Cumberland County	Hoke County	Winter Storm	0/0	$0.00	$0.00

Date	Location		Type of Winter Storm	Deaths/ Injuries	Property Damage	Crop Damage
2/16/2003	n/a	Hoke County	Winter Storm	0/0	$0.00	$0.00
1/26/2004	Cumberland County	Hoke County	Winter Storm	0/0	$0.00	$0.00
2/26/2004	Cumberland County	Hoke County	Winter Storm	0/0	$0.00	$0.00
12/26/2004	Cumberland County	Hoke County	Winter Storm	0/0	$0.00	$0.00
2/1/2007	Cumberland County	Hoke County	Winter Weather	0/0	$0.00	$0.00
1/17/2008	Cumberland County	Hoke County	Winter Weather	0/0	$0.00	$0.00
1/19/2008	Cumberland County	Hoke County	Winter Weather	0/0	$0.00	$0.00
1/20/2009	Cumberland County	Hoke County	Winter Storm	0/0	$0.00	$0.00
2/4/2009	Cumberland County	n/a	Winter Weather	0/0	$0.00	$0.00
1/29/2010	Cumberland County	n/a	Winter Storm	0/0	$0.00	$0.00
1/30/2010	n/a	Hoke County	Winter Storm	0/0	$0.00	$0.00
2/12/2010	Cumberland County	Hoke County	Winter Storm	0/0	$0.00	$0.00
3/2/2010	Cumberland County	n/a	Winter Weather	0/0	$0.00	$0.00
12/16/2010	Cumberland County	Hoke County	Winter Weather	1/0	$0.00	$0.00
12/25/2010	Cumberland County	Hoke County	Winter Storm	0/0	$0.00	$0.00
1/10/2011	Cumberland County	Hoke County	Winter Storm	0/0	$0.00	$0.00
1/28/2014	Cumberland County	Hoke County	Winter Storm	0/0	$0.00	$0.00
2/11/2014	Cumberland County	Hoke County	Winter Storm	0/0	$0.00	$0.00
2/12/2014	Cumberland County	Hoke County	Winter Storm	0/0	$0.00	$0.00
2/16/2015	Cumberland County	Hoke County	Winter Storm	0/0	$0.00	$0.00
2/24/2015	Cumberland County	Hoke County	Winter Weather	0/0	$0.00	$0.00

Source: NCEI, September 2015

The following provides details on select flooding events recorded in the NCEI database:

December 23, 1998 - An ice storm began during the afternoon of 12/23/98 and continued through the early morning hours on 12/25/98. Most of the precipitation fell in the form of freezing rain across central North Carolina causing power outages to approximately 500,000 people sometime during the period. From Fayetteville to Goldsboro including most of the eastern Sandhills and Coastal Plain region of the state, rain was mixed with freezing rain. Some locations saw 1/4 inch accumulations of glaze on trees and power lines which caused numerous power outages. Travel conditions were not as severe as in the Piedmont region due to the mix with rain and temperatures ranging between 31 and 35 degrees.

January 18, 2000 - Light snow moved over the Triad area in the early morning hours of the 18th and spread slowly east-southeast, reaching the Sandhills and Coastal Plain before daybreak. The snow intensified in the morning in the Triad area where 4 to 6 inches of snow fell. The Sandhills and Coastal Plain received 1 to 3 inches before changing over to sleet and freezing rain in the mid-morning hours. Total accumulations of ice were less than a quarter of an inch. The snow and ice made for slick road conditions across the entire area. Most counties reported numerous accidents, causing many major roads to close.

January 24, 2000 - This record-setting snow storm began with freezing drizzle in the early morning hours of the 24th. Road surfaces quickly froze during this time when the temperature dropped from 32 degrees to 27 degrees. The Coastal Plain received 4 to 8 inches of snow with light icing at the end of the event.

December 3, 2000 - The first major winter storm of the season produced heavy snow across the Coastal Plain of North Carolina on the afternoon of December 3. A low pressure system developed off the coast and quickly moved northeast, preventing the snowfall from moving west of Raleigh.

December 3, 2002 - The first winter storm of the season brought significant snowfall to central North Carolina. An initial round of snow began to fall during the evening of the 2nd. The snow was heavy at times, and accumulated between 3 and 5 inches. The snow changed to sleet and light freezing rain in the Coastal Plain through the early morning hours of the 3rd. After a period of little or no precipitation on the morning of the 3rd, snow began to fall again across the entire area, and was heavy at times, adding an additional 4 to 8 inches.

February 26, 2004 - A strong storm arrived on February 26th and continued into the morning of the 27th. This storm hit the area with a one-two punch, affecting southern sections on the 26th, then northern sections late on the 26th and the 27th. The first punch dumped heavy snow over portions of the southern Piedmont and Sandhills. Accumulations totaled 6 to locally 10 inches in areas such as Laurinburg, Hamlet, Fayetteville, and Raeford.

February 4, 2009 - Light to moderate snow fell across the county with up to an inch of snow accumulation near Fort Bragg and south of Fayetteville.

February 12, 2010 - A rapidly moving coastal storm system along the North Carolina coast produced up to 4 to 5 inches of snow in the Coastal Plain, Sandhills and Piedmont. Around 2 to 3 inches of snow fell across the Northwest Piedmont and Triad. Due the weekend timing of the storm and lack of freezing rain impacts were minimal outside of a number of vehicle accidents.

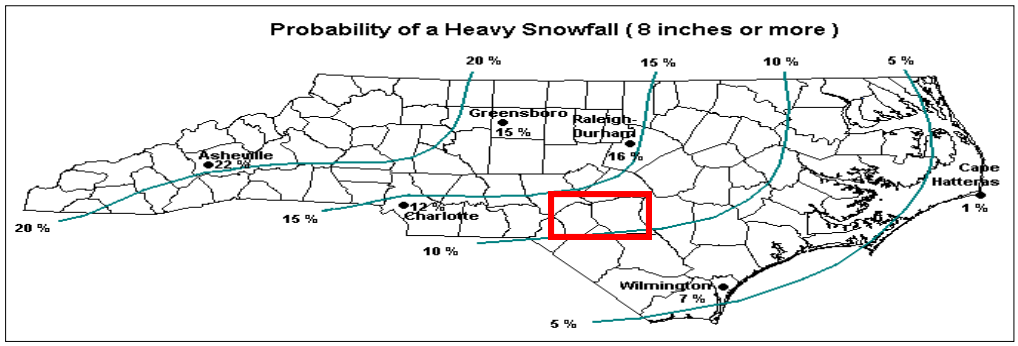
December 16, 2010 - A prolonged period of light snow and freezing rain in the morning resulted a half inch of snow with a tenth of an inch of freezing rain. This combination created hazardous driving conditions during the morning commute. A 50 year old man was killed in Fayetteville when a truck in the opposite lane slid on the ice striking a car in the oncoming traffic.

December 25, 2010 - Seven to nine inches of snow fell countywide including in Fayetteville. Many roads were impassible due to the heavy snow, however, other than a few minor accidents no other problems were reported due to the holiday.

5.12.4 Probability of Future Occurrences

Highly Likely - The best available information to determine future probability of a winter storm event is to review historic frequency. According to NCEI, 30 winter storm events have occurred over a 19 year period between 1996 and 2015 resulting in approximately 1.6 significant winter storm events per year.

The probability of a heavy snowfall occurring with that winter storm event is less likely. The figure below presents the probability of 8-inches or more of snowfall to be approximately 12.5% per year for the Cumberland and Hoke County Region.



Source: National Weather Service, Raleigh, NC
Note: Red square indicates location of Cumberland and Hoke Counties.

Figure 5.23 - Probability of Heavy Snowfall

Climate Change and Winter Storms

Climate change is fueling an increase in the intensity and snowfall of winter storms. The atmosphere now holds more moisture which drives heavier than normal precipitation, including heaver snowfall [31]. For the entire Northern Hemisphere, there is evidence of an increase in both storm frequency and intensity during the cold season since 1950 [32]. Extremely heavy snowstorms increased in number during the last century in northern and eastern parts of the United States, but have been less frequent since 2000. In contrast, the South and lower Midwest saw reduced snowstorm frequency during the last century [33]. Overall snow cover has decreased in the Northern Hemisphere, due in part to higher temperatures that shorten the time snow spends on the ground.

5.12.5 Consequence Analysis

People

Winter storms are considered to be deceptive killers because most deaths are indirectly related to the storm event. The leading cause of death during winter storms is from automobile or other transportation accidents. Exhaustion and heart attacks caused by overexertion are the two most likely causes of winter storm-related deaths.

Power outages during very cold winter storm conditions can result in a potentially dangerous situation. Elderly people account for the largest percentage of hypothermia victims. In addition, if the power is out for an extended period, residents are forced to find alternative means to heat their homes. The danger arises from carbon monoxide released from improperly ventilated heating sources such as space or kerosene heaters, furnaces, and blocked chimneys. House fires also occur more frequently in the winter due to lack of proper safety precautions when using an alternative heating source.

First Responders

Adverse impact expected to be severe for unprotected personnel and moderate to light for trained, equipped, and protected personnel.

Fire suppression during winter storms may present a great danger because water supplies may freeze and it may be difficult for firefighting equipment to get to the fire.

Clearing ice or snow covered roads is also a problem; with limited equipment in North Carolina due to the relative infrequency of events, priority is given to main thoroughfares and secondary roads are largely untouched during the initial hours after a storm has passed.

Continuity of Operations

Winter storm events can result in a loss of power which may impact operations. Downed trees, power lines and icy road conditions may prevent access to critical facilities and/or emergency equipment.

Built Environment

Localized impact to facilities and infrastructure in the areas of the incident. Power lines and roads most adversely affected.

Economy

Local economy and finances may be adversely affected, depending on damage. Utility companies will strive to restore power as quickly as possible; however, businesses without power may be forced to close for an extended period, resulting in financial losses for the local economy.

Natural Environment

Winter storm events may include ice or snow accumulation on trees which can cause large limbs, or even whole trees, to snap and potentially fall on residential homes, cars, or power lines. This potential for winter debris creates a dangerous environment to be outside in; significant injury may occur if a large limb snaps while a local resident is out driving or walking underneath it.

5.13 Hazard Profile Summary

Table 5.20 summarizes the results from the hazard profiles based on input from the HMPC. For each hazard profiled in this Chapter, this table includes the likelihood of future occurrence and whether or not the hazard is a considered a priority for the County. A Vulnerability Assessment is provided in Chapter 6 for priority hazards.

Table 5.20 - Summary of Hazard Profile Results

Hazard	Likelihood of Future Occurrence	Vulnerability Assessment
Dam/Levee Failure	Highly Likely	Yes
Drought	Highly Likely	Yes
Earthquake	Occasional	Yes
Erosion	Occasional	No*
Extreme Heat	Occasional	Yes
Hurricane/Tropical Storm	Likely	Yes
Inland Flooding: 100-/500-year	Occasional	Yes
Severe Weather (thunderstorm wind, lightning & hail)	Highly Likely	Yes
Sinkhole	Unlikely	No*
Tornado	Likely	Yes
Wildfire	Highly Likely	Yes
Winter Storm	Highly Likely	Yes

*The following hazards were evaluated by the HMPC and determined to be non-priority hazards that should not be included in Chapter 6 Vulnerability Assessment.

Erosion - Erosion can be expected to occur on a small scale within the future; however, there is no historic or known threat to life or property.

Sinkhole - Based on historical occurrence information and geologic setting, it can be assumed that sinkhole events have a negligible to low chance of occurring each year.

Any damage resulting from erosion or sinkhole would be localized and essentially unpredictable; therefore, it is not possible to generate maps or tables showing potential loss estimates for particularly at-risk structures or properties.

6 VULNERABILITY ASSESSMENT

Chapter 6 quantifies the vulnerability of Cumberland and Hoke Counties to the priority hazards identified in Chapter 5. It consists of the following subsections:

- 6.1 Methodology
- 6.2 Asset Inventory
- 6.3 Vulnerability Assessment Results
- 6.4 Priority Index

44 CFR Subsection D §201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. Plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged by floods. The plan should describe vulnerability in terms of:

A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;

(B): An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate; and

(C): Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

The HMPC conducted a vulnerability assessment of the hazards identified as a priority in order to assess the impact that each hazard would have on the region. The vulnerability assessment quantifies, to the extent feasible using best available data, assets at risk to natural hazards and estimates potential losses.

Vulnerability assessments followed the methodology described in the FEMA publication Understanding Your Risks—Identifying Hazards and Estimating Losses (August 2001). The vulnerability assessment first describes the total vulnerability and values at risk and then discusses vulnerability by hazard. Data used to support this assessment included the following:

- County GIS data (hazards, base layers, and assessor's data)
- Hazard layer GIS datasets from federal agencies
- Integrated Hazard Risk Management (IHRM) data provided by NCEM
- Written descriptions of inventory and risks provided by the State Hazard Mitigation Plan
- Other Existing plans and studies provided by the Counties

6.1 Methodology

The data provided by NCEM and the IHRM Program come from models and methods commonly used by government risk assessors. One of these methods is FEMA's Hazus-MH, a nationally applicable standardized set of models for estimating potential losses from earthquakes, floods, and hurricanes. Hazus uses Geographic Information System (GIS) technology to estimate physical, economic, and social impacts of disasters. Another method used is FEMA's Benefit-Cost Analysis software that calculates how much benefit comes from reducing a risk in a particular way. IHRM focused on collecting information on specific buildings and other critical infrastructure such as public utilities so that losses from damages could

be calculated for each building or piece of infrastructure. The results factor in overall risk and its components of probability, consequence, and vulnerability.

6.2 Asset Inventory

An inventory of assets within Cumberland and Hoke Counties and their incorporated municipalities was compiled in order to identify those properties potentially at risk to the identified hazards. Assets include elements such as buildings, property, business/industry goods, and civil infrastructure. All buildings – residential and nonresidential – with a building footprint of 800 square feet or greater were digitized by NCEM from recent aerial imagery if they were not readily available from state or county sources. Critical infrastructure and key resources, as defined by FEMA, were the focus of the non-building data collection. By understanding the type and number of assets that exist and where they are located in relation to known hazard areas, the relative risk and vulnerability for such assets can be assessed.

6.2.1 Properties at Risk

Properties identified to be at risk includes all improved properties in Cumberland and Hoke Counties according to building footprint data provided by NCEM. The information is detailed in Table 6.1 in terms of the number of buildings by occupancy type and total assessed value of improvements that may be exposed to the identified hazards. The building footprint data was available for all jurisdictions and it was used to provide an accurate assessment of how many buildings are located in hazard areas.

Table 6.1 - Properties at Risk in Cumberland and Hoke Counties

Occupancy Type	Total Number of Buildings	Total Building Value	Estimated Content Value	Total Value
Cumberland County				
Agricultural	1,324	$115,680,522	$115,746,678	$231,427,200
Commercial	5,891	$4,627,367,188	$4,700,654,458	$9,328,021,646
Education	633	$999,012,717	$1,129,625,098	$2,128,637,814
Government	296	$485,898,279	$515,342,361	$1,001,240,640
Industrial	750	$1,105,738,971	$1,527,510,966	$2,633,249,936
Religious	896	$714,600,529	$714,573,983	$1,429,174,512
Residential	119,919	$18,213,775,309	$8,663,350,048	$26,877,125,357
Hoke County				
Agricultural	1,023	$94,769,008	$94,567,626	$189,336,634
Commercial	587	$371,215,379	$381,212,774	$752,428,153
Education	137	$187,500,515	$188,853,303	$376,353,819
Government	115	$101,132,561	$117,590,066	$218,722,627
Industrial	122	$177,965,665	$257,724,062	$435,689,727
Religious	211	$280,896,481	$280,896,456	$561,792,937
Residential	20,233	$2,287,532,181	$1,103,124,908	$3,390,657,089
Total	**152,137**	**$29,763,085,305**	**$19,790,772,787**	**$49,553,858,091**

Source: North Carolina Emergency Management, Risk Management, 2015

Note: Content value estimations are generally based on the FEMA Hazus methodology of estimating value as a percent of improved structure values by property type. The residential property type assumes a content replacement value equal to 50% of the building value. Agricultural, commercial, education, government, and religious property types assume a content replacement value equal to 100% of the

building value. The industrial property type assumes a content replacement value equal to 150% of the building value.

6.2.2 Critical Facilities at Risk

Of significant concern with respect to any disaster event is the location of critical facilities in the planning area. Critical facilities are often defined as those essential services and facilities in a major emergency which, if damaged, would result in severe consequences to public health and safety or a facility which, if unusable or unreachable because of a major emergency, would seriously and adversely affect the health, safety, and welfare of the public. The total numbers of critical facilities by type within Cumberland Hoke Counties are listed in Table 6.2 and shown in Figures 6.1 and 6.2. Note: A more detailed list of critical facilities and a map for each jurisdiction can be found within each community's annex.

Table 6.2 - Critical Facilities at Risk in Cumberland and Hoke Counties

Community Name	Facility Type				
	Fire Station	Police Station	EOC	Hospital	School
Cumberland County Unincorporated Areas	8	0	0	0	19
City of Fayetteville	17	4	1	2	51
Town of Eastover	1	0	0	0	2
Town of Falcon	0	0	0	0	0
Town of Godwin	0	0	0	0	0
Town of Hope Mills	2	0	0	0	7
Town of Linden	1	0	0	0	0
Town of Spring Lake	1	1	0	0	2
Town of Stedman	1	0	0	0	2
Town of Wade	1	0	0	0	0
Hoke County Unincorporated Areas	7	0	0	0	7
City of Raeford (including ETJ)	2	3	1	0	5
Total	**41**	**8**	**2**	**2**	**95**

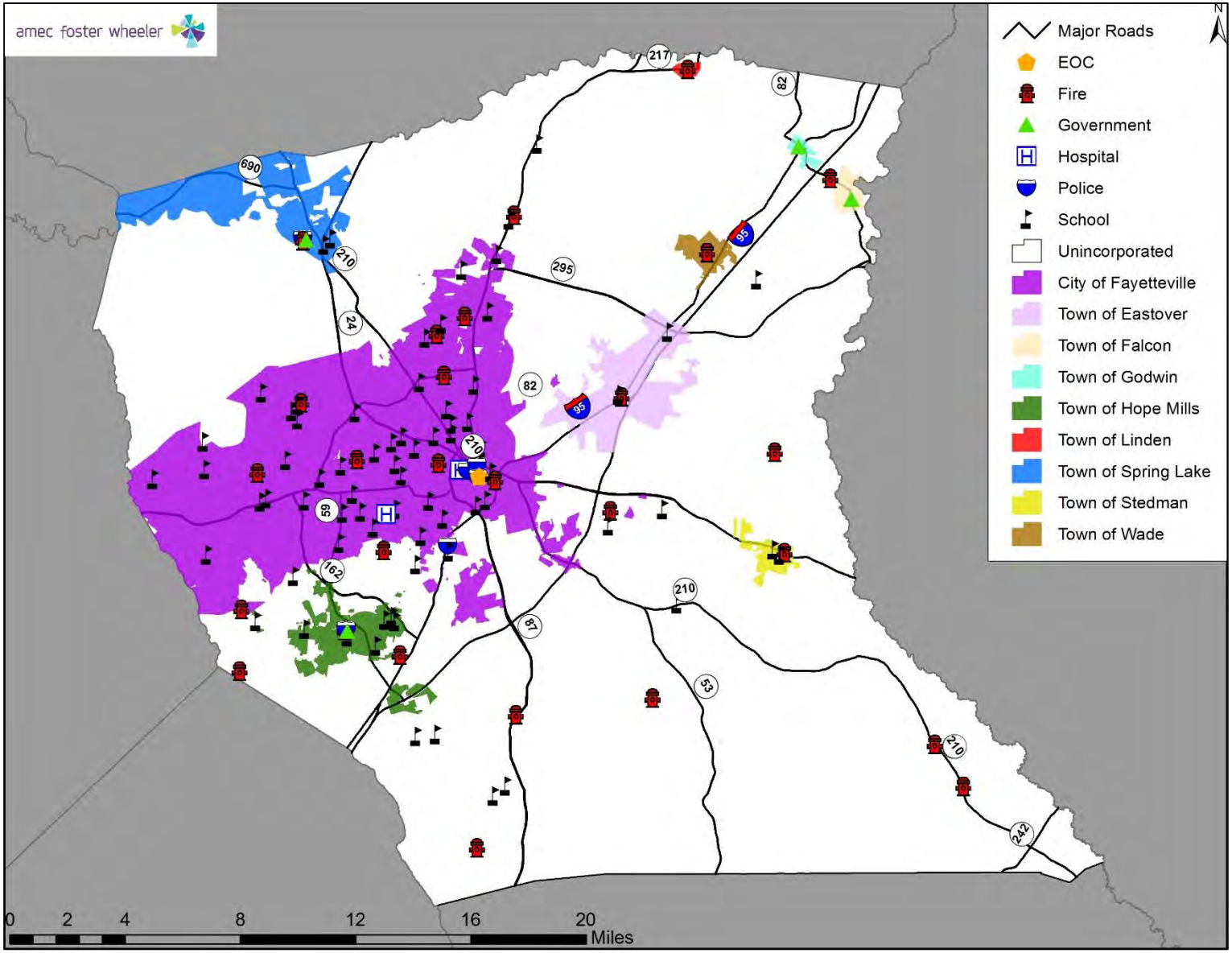


Figure 6.1 - Critical Facilities in Cumberland County

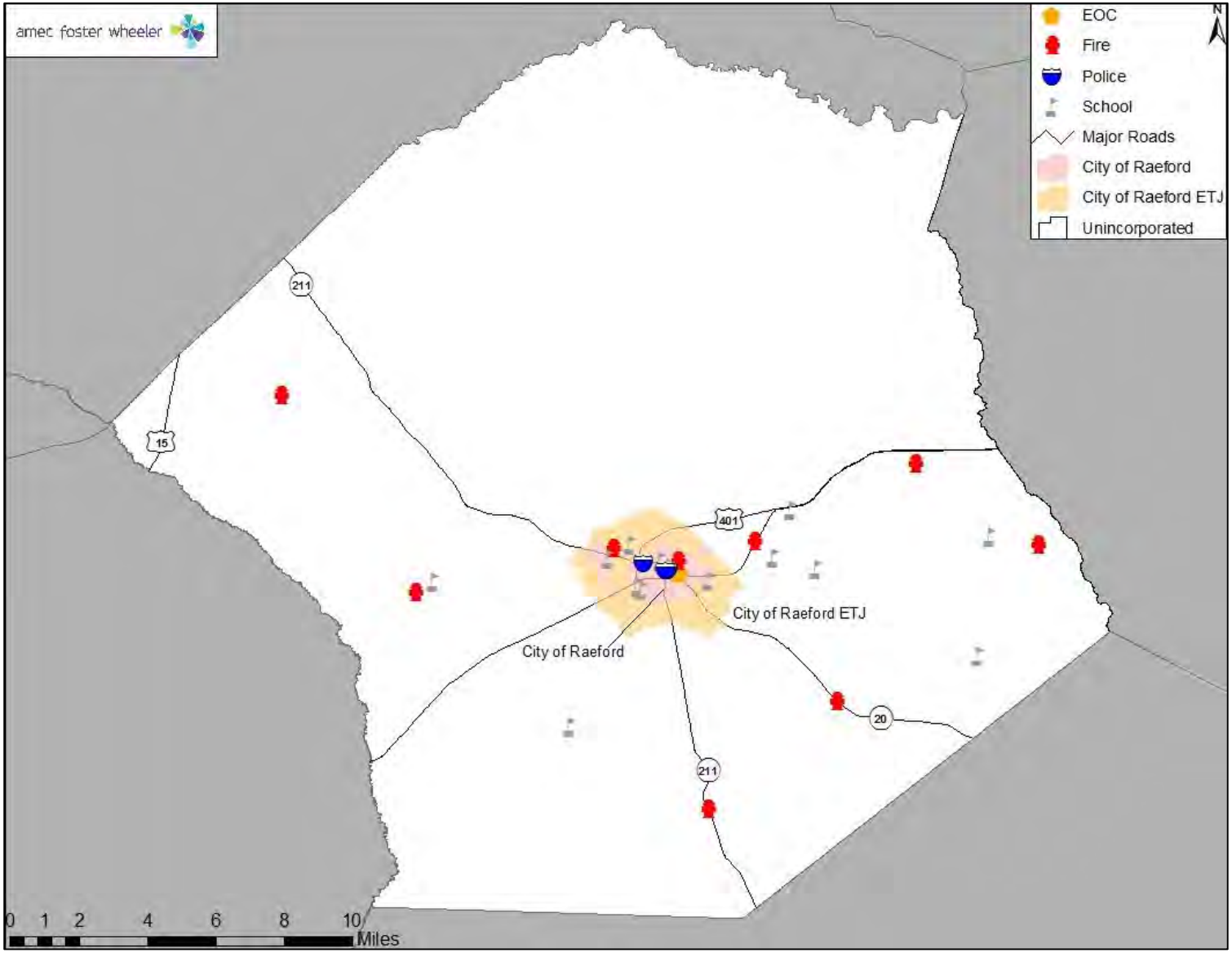


Figure 6.2- Critical Facilities in Hoke County

6.3 Vulnerability Assessment Results

The Disaster Mitigation Act regulations require that the HMPC evaluate the risks associated with each of the hazards identified in the planning process. This section summarizes the possible impacts and quantifies the region's vulnerability to each of the hazards identified as a priority hazard in Table 5.20 in Chapter 5.13 Hazard Profile Summary.

Vulnerability can be quantified in those instances where there is a known, identified hazard area, such as a mapped floodplain. In these instances, the numbers and types of buildings subject to the identified hazard can be counted and their values tabulated. Other information can be collected in regard to the hazard area, such as the location of critical community facilities (e.g., a fire station), historic structures, and valued natural resources (e.g., an identified wetland or endangered species habitat). Together, this information conveys the impact, or vulnerability, of that area to that hazard.

The conclusions drawn from the hazard profiling and vulnerability assessment process can be used to prioritize all potential hazards to the Cumberland and Hoke County region. The Priority Risk Index (PRI), discussed in detail in Chapter 6.4, is a good practice to use when prioritizing hazards because it provides a standardized numerical value so hazards can be compared against one another (the higher the PRI value, the greater the hazard risk). The PRI score is calculated through five categories: probability, impact, special extent, warning time, and duration. Hazards are then categorized in the following classifications based on the assigned risk value:

- **Low Risk** - Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium Risk** - Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High Risk** - Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread.

6.3.1 Dam/Levee Failure

Probability of Future Occurrence— Likely (High Hazard), Highly Likely (Low Hazard)
Vulnerability—Low Risk

Given the current dam inventory and historic data, a dam breach of a high hazard dam is likely (35 percent annual probability) in the future and a dam breach of a low hazard dam is highly likely occur in the future. However, regular monitoring can help mitigate or prevent failures if appropriate actions are taken when it is determined a failure may be likely.

As noted in Chapter 5.1, there are 61 high hazard dams, one (1) intermediate hazard dam and 81 low hazard dams in Cumberland and Hoke County. 16 of the dams are either breached or drained and were excluded from the vulnerability assessment. The NC Dam Safety's North Carolina Simplified Inundation Maps for Emergency Action Plans "assumed breach flood wave height" technique was used to estimate the inundation depth and distance downstream of each dam in the NC Dam Safety database (inventory data December 2, 2014). The initial flood wave heights are dependent upon the height of the dam and range from 3.5 feet to 16.5 feet. To estimate the exposure of buildings to the flood wave, the flood wave depth was compared to the North Carolina Floodplain Mapping Program's (NCFMP) building footprint data, available contour data and the NCFMP's 100-year floodplain elevations and depths.

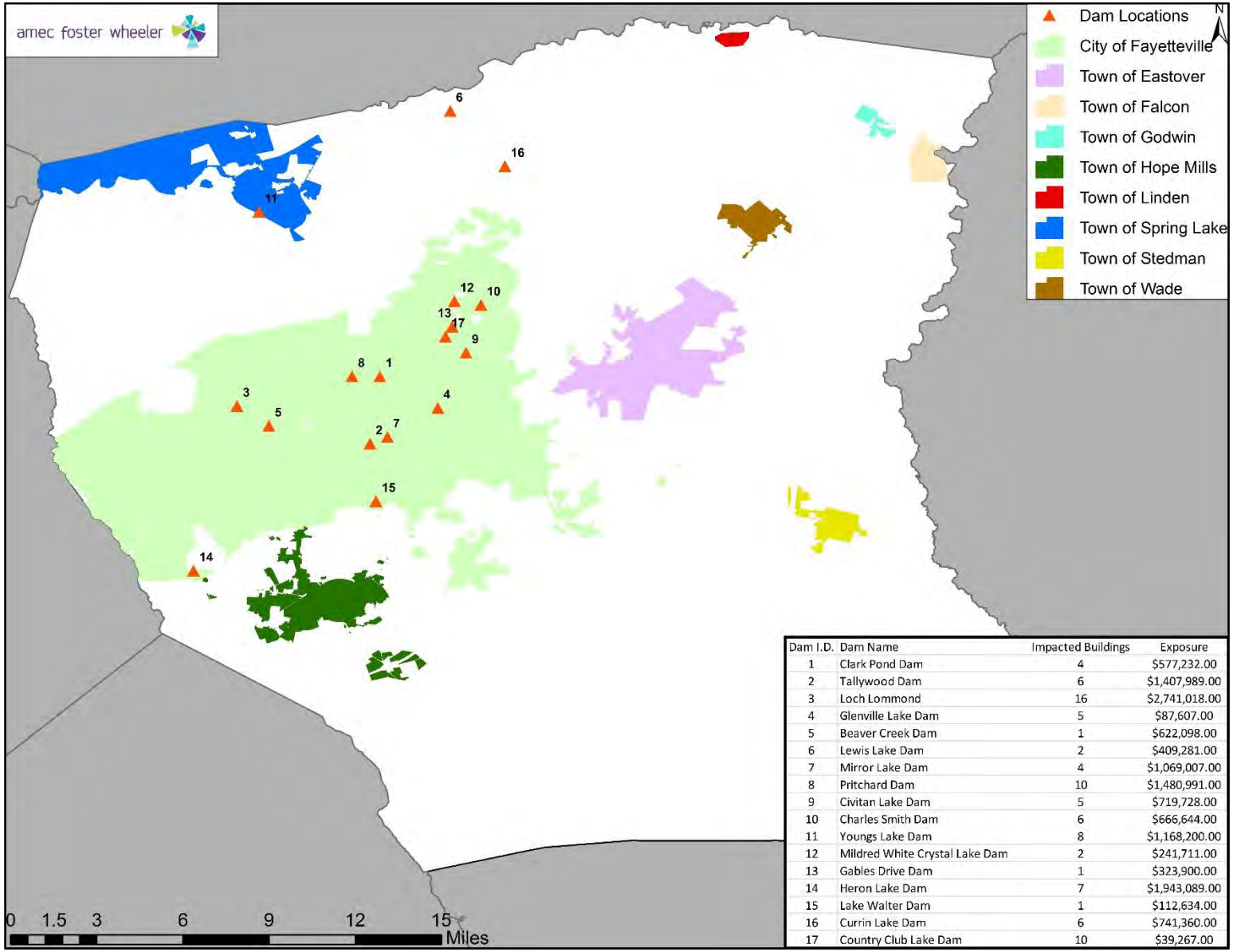
The estimated number and characteristics of buildings that could potentially be impacted by a dam failure are shown in Table 6.3. Figures 6.3 and 6.4 show the potential number of buildings that could be impacted by each dam. **Note: the numbers presented in Table 6.3 and Figures 6.3 and 6.4 are estimated based on the methodology described above. A dam inundation study including a hydrologic and hydraulic analysis was not performed.**

Table 6.3 - Properties Potentially at Risk to Dam Failure

County	Total Number of Buildings in Estimated Inundation Area	Total Building Value	Estimated Content Value	Total Value
Cumberland	94	$14,351,756	$7,641,354	$21,993,110
Hoke	6	$1,307,911	$638,240	$1,946,151
Total	100	$15,659,667	$8,279,594	$23,939,261

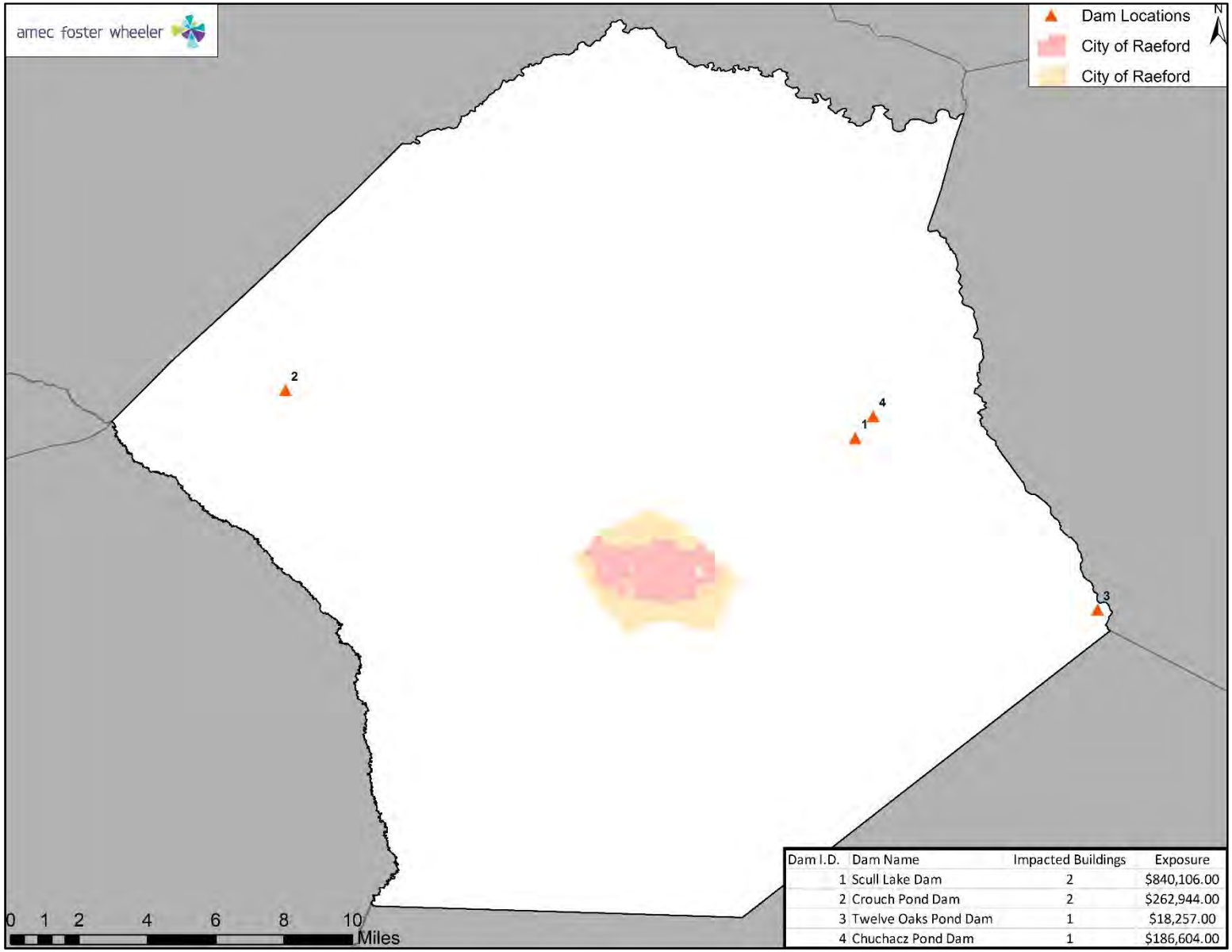
Note: Clark Dam and Upper Clark Dam would potential flood the same four buildings if either failed. The buildings are only counted once in this table.

Citizens displaced from their homes due to a dam failure may require accommodations in temporary emergency shelters. For planning purposes, Lock Lommond is estimated to impact the most buildings during a failure. If breached, this dam would potentially displace the occupants of 16 buildings. Using the 2009-2013 U.S. Census household factor for Cumberland County (2.55), an estimated 41 people could seek shelter.



Dam I.D.	Dam Name	Impacted Buildings	Exposure
1	Clark Pond Dam	4	$577,232.00
2	Tallywood Dam	6	$1,407,989.00
3	Loch Lommond	16	$2,741,018.00
4	Glenville Lake Dam	5	$87,607.00
5	Beaver Creek Dam	1	$622,098.00
6	Lewis Lake Dam	2	$409,281.00
7	Mirror Lake Dam	4	$1,069,007.00
8	Pritchard Dam	10	$1,480,991.00
9	Civitan Lake Dam	5	$719,728.00
10	Charles Smith Dam	6	$666,644.00
11	Youngs Lake Dam	8	$1,168,200.00
12	Mildred White Crystal Lake Dam	2	$241,711.00
13	Gables Drive Dam	1	$323,900.00
14	Heron Lake Dam	7	$1,943,089.00
15	Lake Walter Dam	1	$112,634.00
16	Currin Lake Dam	6	$741,360.00
17	Country Club Lake Dam	10	$39,267.00

Figure 6.3 - Cumberland County Dam Failure Impact



Dam I.D.	Dam Name	Impacted Buildings	Exposure
1	Scull Lake Dam	2	$840,106.00
2	Crouch Pond Dam	2	$262,944.00
3	Twelve Oaks Pond Dam	1	$18,257.00
4	Chuchacz Pond Dam	1	$186,604.00

Figure 6.4 - Hoke County Dam Failure Impact

6.3.2 Drought

Probability of Future Occurrence—Highly Likely
Vulnerability—High Risk

Although the State of North Carolina as a whole is vulnerable to drought, estimated potential losses are inherently difficult to calculate because drought tends to cause little damage to the built environment. Therefore, it is assumed that whereas all buildings and facilities in the planning area would technically be exposed to the drought hazard, there is no significant vulnerability to these buildings on a structural level.

One specific concern voiced by the HMPC was that population growth could contribute directly to this hazard, as an increased number of users pull from the available water supply within the region. It is estimated that seven percent of the population in the region relies on groundwater for drinking, and 47% of the population relies on surface water. It can reasonably be assumed that the remaining 46% depends on a private well for drinking water.

Surface water supply is at risk to a decrease in precipitation, population growth within the Cumberland-Hoke region and population growth in cities upstream that depend on the same surface water supply. Well water is at risk to contaminants such as pesticides and fertilizers which may enter waterways during heavy rains and flooding then concentrate in the soil as streams, rivers and lakes dry up. Furthermore, humans and agricultural activities will place an even greater demand upon wells, shallow and deep, as surface waters dry up. While there are five major aquifers beneath Cumberland County, subject matter experts agree that only two of those offer a viable possibility for additional water– driving a competition between humans, stock and crops [(21)].

6.3.3 Earthquake

Probability of Future Occurrence— Occasional
Vulnerability—Moderate Risk

Vulnerability for earthquake for the area is considered, in relative terms, to be limited should a significant earthquake event occur. Tables 6.4 through 6.6 provide loss estimates for the 500-, 1,000- and 2,500-year return periods based on probabilistic scenarios. Loss data was provided by NCEM's IHRM Program. These estimates include structural, contents and inventory losses for agricultural, commercial, education, government, industrial, religious and residential building occupancy types. The loss ratio is the loss estimate divided by the total potential exposure (i.e., total of improved and contents value for all buildings located within the 100-year floodplain) and displayed as a percentage of loss. FEMA considers loss ratios greater than 10% to be significant and an indicator a community may have more difficulties recovering from an event.

These loss estimates do not include income losses, such as lost wages, rental expenses, relocation costs, etc. that can occur following an earthquake. All future structures and infrastructure built in Cumberland and Hoke Counties will be vulnerable to seismic events and may also experience damage not accounted for in these estimated losses.

Table 6.4 - Estimated Building Damage and Content Loss – Earthquake 500-yr Return Period

Occupancy Type	Total Number of Buildings with Losses	Total Value (Building & Contents)	Estimated Total Damage	Estimated Loss Ratio
Cumberland County				
Agricultural	1,187	$218,567,084	$631,477	0.3%
Commercial	5,627	$8,841,796,467	$33,452,048	0.4%
Education	573	$1,889,543,587	$7,418,266	0.4%
Government	277	$809,604,567	$3,392,117	0.4%
Industrial	735	$2,537,383,395	$13,349,136	0.5%
Religious	866	$1,361,119,444	$5,590,871	0.4%
Residential	118,274	$26,264,652,317	$21,619,595	0.1%
Hoke County				
Agricultural	669	$169,196,391	$299,412	0.2%
Commercial	487	$665,293,635	$1,166,230	0.2%
Education	103	$351,439,779	$527,429	0.2%
Government	106	$213,194,297	$425,756	0.2%
Industrial	98	$426,513,158	$1,013,896	0.2%
Religious	176	$485,828,112	$747,911	0.2%
Residential	17,092	$3,129,492,941	$2,748,965	0.1%
Total	**146,270**	**$47,363,625,174**	**$92,383,109**	**0.20%**

Source: North Carolina Emergency Management, Risk Management, 2015

Table 6.5 - Estimated Building Damage and Content Loss – Earthquake 1,000-yr Return Period

Occupancy Type	Total Number of Buildings with Losses	Total Value (Building & Contents)	Estimated Total Damage	Estimated Loss Ratio
Cumberland County				
Agricultural	1,115	$212,981,494	$972,026	0.5%
Commercial	5,516	$8,759,138,704	$55,153,909	0.6%
Education	537	$1,812,170,289	$10,939,011	0.6%
Government	277	$847,880,429	$5,511,056	0.6%
Industrial	734	$2,537,167,257	$18,326,000	0.7%
Religious	839	$1,331,657,712	$8,913,838	0.7%
Residential	118,277	$26,490,546,389	$115,005,385	0.4%
Hoke County				
Agricultural	714	$181,288,793	$1,088,254	0.6%
Commercial	545	$725,965,066	$4,990,905	0.7%
Education	104	$353,187,591	$1,979,349	0.6%
Government	110	$218,021,077	$1,615,099	0.7%
Industrial	98	$426,513,158	$3,307,088	0.8%
Religious	203	$558,674,241	$4,117,841	0.7%
Residential	19,395	$3,536,159,247	$18,632,057	0.5%
Total	**148,464**	**47,991,351,447**	**250,551,818**	**1.0%**

Source: North Carolina Emergency Management, Risk Management, 2015

Table 6.6 - Estimated Building Damage and Content Loss – Earthquake 2,500-yr Return Period

Occupancy Type	Total Number of Buildings with Losses	Total Value (Building & Contents)	Estimated Total Damage	Estimated Loss Ratio
Cumberland County				
Agricultural	1,227	$226,176,153	$3,700,346	1.6%
Commercial	5,775	$9,058,054,286	$200,785,634	2.2%
Education	626	$2,076,449,384	$48,436,196	2.3%
Government	282	$849,896,891	$18,766,558	2.2%
Industrial	379	$2,540,202,955	$54,704,751	2.2%
Religious	894	$1,397,468,090	$32,329,807	2.3%
Residential	118,283	$26,491,455,804	$493,295,376	1.9%
Hoke County				
Agricultural	714	$181,288,793	$3,442,372	1.9%
Commercial	545	$725,965,066	$16,498,354	2.3%
Education	119	$353,187,591	$7,522,055	2.1%
Government	110	$218,021,077	$5,146,755	2.4%
Industrial	98	$426,513,158	$9,126,590	2.1%
Religious	203	$558,674,241	$12,623,666	2.3%
Residential	19,396	$3,536,237,934	$67,158,714	1.9%
Total	**148,651**	**$48,639,591,423**	**$973,537,174**	**2.0%**

Source: North Carolina Emergency Management, Risk Management, 2015

Population at Risk

A separate analysis was performed to determine the population at risk to earthquake. Those residential buildings with earthquake losses were counted and multiplied by a regional household factor of 2.76 as shown in Table 6.7. The regional household factor was determined by averaging the 2009-2013 Census Bureau household factors for Cumberland County (2.55) and Hoke County (2.96).

Table 6.7 – Regional Population at Risk to Earthquake

Earthquake Return Period	Residential Property Count	Population at Risk
500-year	135,366	373,610
1,000-year	137,672	379,975
2,500-year	137,679	379,994

Source: NCEM, U.S. Census Bureau 5-year Community Survey (2009-2013)

In conclusion, an earthquake has the potential to impact all existing and future buildings, facilities, and populations in Cumberland and Hoke Counties. Impacts of earthquakes include debris clean-up, service disruption and, in severe cases, fatalities due to building collapse. The worst case scenario (2,500-yr return period) estimated the regional building damage and content loss due to earthquake to be $973,537,174 or 2% of the total assets exposed in the region.

6.3.4 Extreme Heat

Probability of Future Occurrence— Occasional
Vulnerability—Moderate Risk

The HMPC has identified the extreme heat hazard as a hazard separate and distinct from the drought hazard. Common perception with regard to the extreme heat hazard is that it is more common than may officially be recorded by the National Weather Service and has a greater impact on the community than can be analyzed by weather reports or dollar losses. Extreme heat is not likely to impact the built environment, but may impact agriculture and pose a threat to humans. Elderly persons, persons with respiratory disabilities, and children may be at risk to experience health problems during extreme heat events, some of which could result in serious illness or death. Potential losses of human life due to extreme heat are not quantified in this Plan. There are no past reports of death or property or crop damage recorded by NCEI.

Under standard building design practices, as temperatures climb as a result of climate change, so go energy and water demands, stressing production and supply lines. Urban areas will experience even higher temperatures due to the urban heat island (UHI) effect. Algae blooms and bacterial overgrowth due to warmer water temperatures may taint rivers and streams, creating larger and more frequent fish-kills. Excessive heat can warp roads and railways, as well as weaken the structural integrity of bridges. Systems in older buildings may fail due to excessive heat build-up due to inadequate ventilation or insulation [(21)].

6.3.5 Hurricane/Tropical Storm

Probability of Future Occurrence— Likely
Vulnerability—High Risk

Hurricanes can cause catastrophic damage to coastlines and several hundred miles inland. Hurricanes can produce winds exceeding 157 mph as well as tornadoes and microbursts. Additionally, flash flooding can occur due to intense rainfall. Floods and flying debris from the excessive winds are often the deadly and destructive results of these weather events.

The very young, the elderly and the handicapped are especially vulnerable to harm from hurricanes. For those who are unable to evacuate for medical reasons, there should be provision to take care of special-needs patients and those in hospitals and nursing homes. Many of these patients are either oxygen-dependent, insulin-dependent, or in need of intensive medical care. There is a need to provide ongoing treatment for these vulnerable citizens, either on the coast or by air evacuation to upland hospitals. The stress from disasters such as a hurricane can result in immediate and long-term physical and emotional health problems among victims.

The probability of future occurrence of a hurricane or tropical storm in the region is likely. As discussed in Chapter 5 Hazard Profiles, there have been five past disaster declarations due to hurricanes and tropical storms in the region: Fran, Bonnie, Floyd & Irene, Isabel and Francis.

A vulnerability assessment was completed for hurricane wind using probabilistic parameters for the 100-yr return period. Table 6.8 displays loss estimates for the 100-year return period. Loss data was provided by NCEM's IHRM Program. These estimates include structural, contents and inventory losses for agricultural, commercial, education, government, industrial, religious and residential building occupancy types. The loss ratio is the loss estimate divided by the total potential exposure (i.e., total of improved and contents value for all buildings located within the 100-year floodplain) and displayed as a percentage of loss. FEMA considers loss ratios greater than 10% to be significant and an indicator a community may have more difficulties recovering from an event.

Table 6.8 - Estimated Building Damage and Content Loss – Hurricane Wind 100-yr Return Period

Occupancy Type	Total Number of Buildings with Losses	Total Value (Building & Contents)	Estimated Total Damage	Estimated Loss Ratio
Cumberland County				
Agricultural	1,324	$226,176,153	$655,383	0.3%
Commercial	5,891	$9,058,054,286	$34,490,403	0.4%
Education	630	$2,076,449,384	$6,364,363	0.3%
Government	294	$849,896,891	$4,502,012	0.5%
Industrial	750	$2,540,202,955	$7,877,057	0.3%
Religious	896	$1,397,468,090	$3,912,174	0.3%
Residential	119,919	$26,491,455,804	$198,473,202	0.7%
Hoke County				
Agricultural	1,023	$188,827,260	$471,280	0.2%
Commercial	587	$752,065,529	$5,116,346	0.7%
Education	121	$376,353,819	$3,334,819	0.9%
Government	115	$218,722,627	$653,109	0.3%
Industrial	122	$435,689,727	$1,283,409	0.3%
Religious	211	$561,423,322	$2,851,975	0.5%
Residential	20,233	$3,587,985,670	$46,459,843	1.3%
Total	**152,116**	**$48,760,771,517**	**$316,445,375**	**0.65%**

Source: North Carolina Emergency Management, Risk Management, 2015

Population at Risk

A separate analysis was performed to determine the population at risk to hurricane wind. Those residential buildings with hurricane wind losses were counted and multiplied by a regional household factor of 2.76 as shown in Table 6.9. The regional household factor was determined by averaging the 2009-2013 Census Bureau household factors for Cumberland County (2.55) and Hoke County (2.96).

Table 6.9 – Regional Population at Risk to Hurricane Wind

Hurricane Wind Return Period	Residential Property Count	Population at Risk
100-year	140,152	386,820

Source: NCEM, U.S. Census Bureau 5-year Community Survey (2009-2013)

In conclusion, hurricane wind has the potential to impact all existing and future buildings, facilities, and populations in Cumberland and Hoke Counties. Impacts of hurricanes include flood damage, debris clean-up, service disruption and possible fatalities due to flooding or flying debris. The estimated regional building damage and content loss due to hurricane wind (100-yr return period) is $316,445,375 or 0.65% of the total assets exposed in the region.

6.3.6 Inland Flooding: 100-/500-year

Probability of Future Occurrence— Occasional
Vulnerability—High Risk

Flood damage is directly related to the depth of flooding by the application of a depth damage curve. In applying the curve, a specific depth of water translates to a specific percent damage to the structure, which translates to the same percentage of the structure's replacement value. Figures 6.5 and 6.6 on the following pages depict the depth of flooding that can be expected within the region during the 100-year flood event.

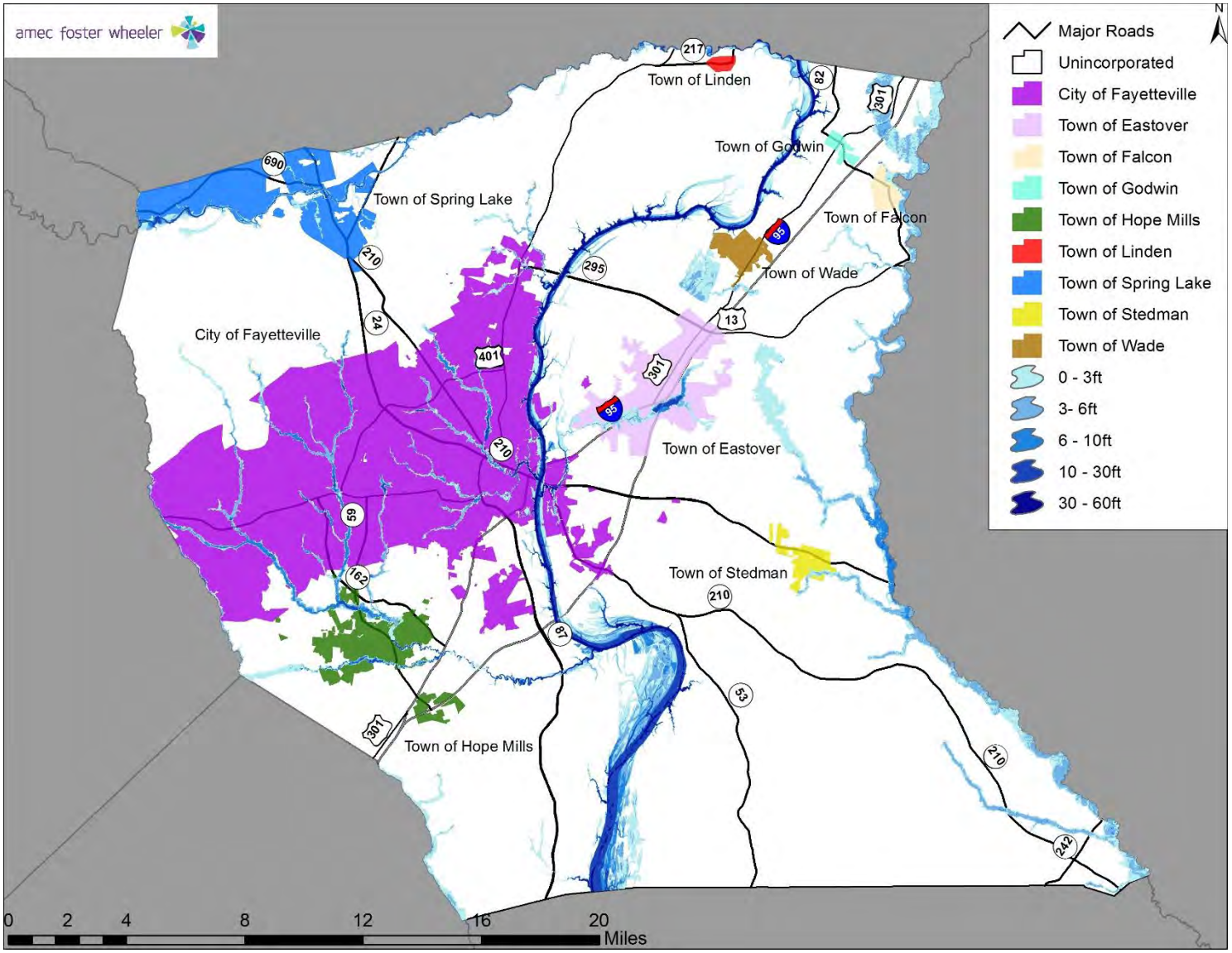


Figure 6.5 - Cumberland County Flood Depth Grid (100-yr)

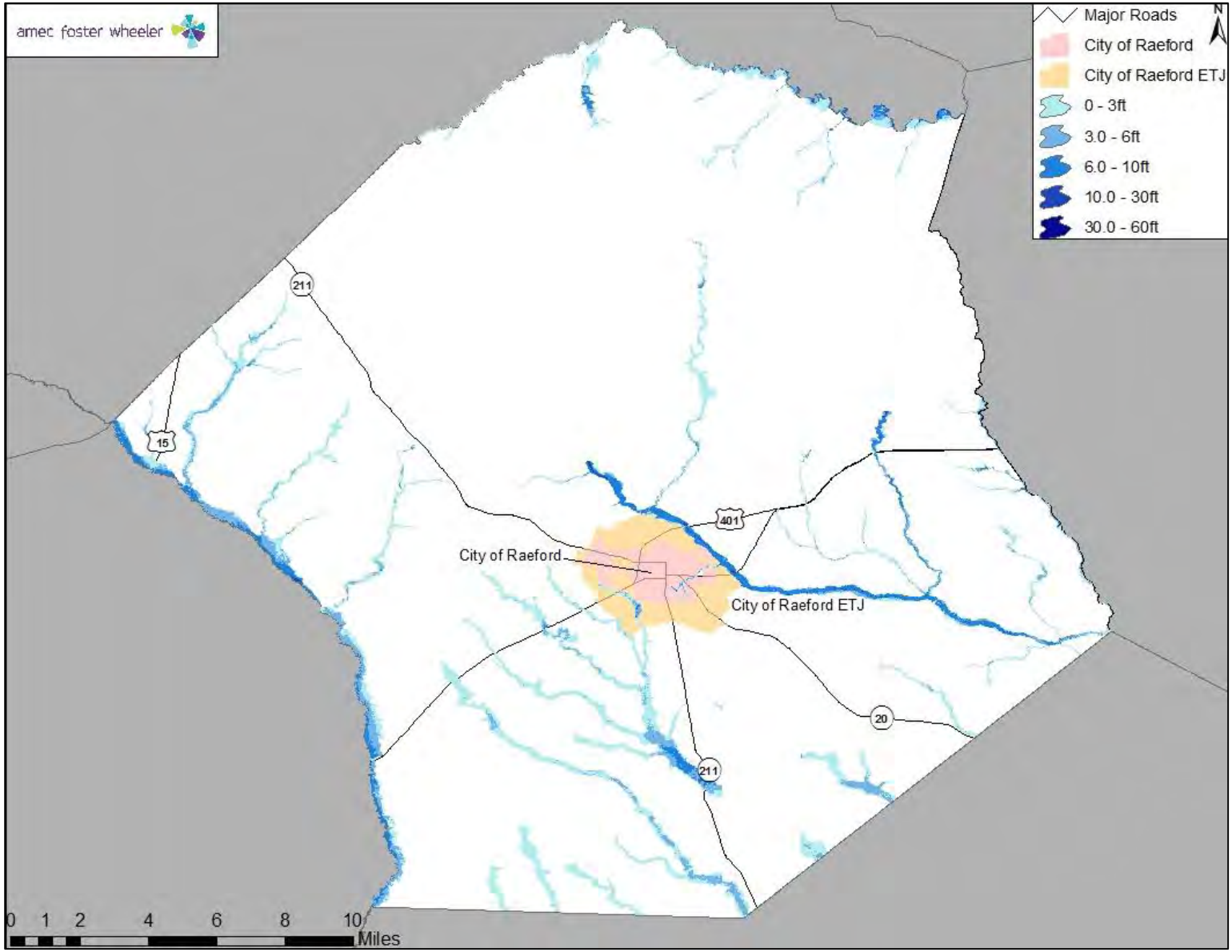


Figure 6.6 - Hoke County Flood Depth Grid (100-yr)

Methodology

All building attribute data and estimated flood damages are derived from the NCEM Risk Management iRisk database. NCEM utilized land use codes provided in the County parcel data to assign each building footprint a specific occupancy class (i.e. RES1, COM4, EDU2, etc.). An occupancy class is required in order to apply the correct depth damage factor which ensures the most accurate damage assessment.

Table 6.10 provides the depth damage factors that were used in calculating flood losses for the region. The depth damage factors were developed based on the Wilmington Corps depth damage curve. All depths assume the structure has no basement.

Table 6.10 - Flood Loss Damage Factors

Percent Damaged (%)							
Depth (ft)	Agricultural	Commercial	Education	Government	Industrial	Religious	Residential
0	0	15	4	5	2	12	9
1	6	20	22	8	7	17	14
2	11	29	29	10	12	19	23
3	15	37	34	10	19	22	28
4	19	44	39	11	25	25	32
5	25	50	44	13	30	28	36
6	30	55	48	14	36	32	39
7	35	62	53	15	41	37	43
8	41	67	57	16	46	43	46
9	46	71	62	17	51	48	49
10	51	75	66	18	56	53	52
11	57	79	70	20	61	58	56
12	63	84	75	21	66	63	60
13	70	88	79	22	71	68	64
14	75	97	83	24	76	73	68
15	79	100	87	25	81	78	73
16	82	100	91	26	86	83	80
17	84	100	95	27	91	88	81
18	87	100	99	28	96	93	83
19	89	100	100	29	100	98	84
20	90	100	100	30	100	100	85
21	92	100	100	31	100	100	85
22	93	100	100	32	100	100	85
23	95	100	100	33	100	100	85
24	96	100	100	34	100	100	85

Source: Hazus 2.1

Note: Government structures include pump stations, water treatment plants, etc. which accounts for the low percent damaged values.

Content value estimations are based on FEMA Hazus methodologies of estimating value as a percent of improved structure values by occupancy type. Table 6.11 shows the breakdown of the different occupancy types and their estimated content replacement value percentages.

Table 6.11 - Content Replacement Factors

Property Type	Content Replacement Values
Agricultural	100%
Residential	50%
Commercial	100%
Education	100%
Government	100%
Religious	100%
Industrial	150%

Loss Estimates

The loss estimate for flood is based on the total of improved building value and contents value. Land value is not included in any of the loss estimates as generally the land is not subject to loss from floods. Once the potential value of affected parcels was calculated, damage factors were applied to obtain loss estimates by flood zone.

Table 6.12 shows the building count, total value, estimated damages and loss ratio for buildings that fall within the 100-year floodplain by occupancy type on the regional level. A community specific analysis for each jurisdiction can be found within each community's annex.

The loss ratio is the loss estimate divided by the total potential exposure (i.e., total of improved and contents value for all buildings located within the 100-year floodplain) and displayed as a percentage of loss. FEMA considers loss ratios greater than 10% to be significant and an indicator a community may have more difficulties recovering from an event.

Table 6.12 - Estimated Building Damage and Content Loss - Flood 100-yr Return Period

Occupancy Type	Total Number of Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Cumberland County						
Agricultural	1	$220,223	$18,966	$86,444	$105,410	47.9%
Commercial	56	$18,269,153	$1,319,544	$3,278,890	$4,598,434	25.2%
Education	1	$74,249	$4,027	$11,052	$15,079	20.3%
Government	0	$0	$0	$0	$0	0.0%
Industrial	4	$1,293,866	$108,934	$166,066	$275,000	21.3%
Religious	5	$7,070,700	$415,061	$2,858,639	$3,273,700	46.3%
Residential	660	$99,168,345	$7,110,535	$5,016,517	$12,127,053	12.2%
Hoke County						
Agricultural	0	$0	$0	$0	$0	0.0%
Commercial	2	$822,753	$74,595	$278,720	$353,316	42.9%
Education	0	$0	$0	$0	$0	0.0%
Government	0	$0	$0	$0	$0	0.0%
Industrial	0	$0	$0	$0	$0	0.0%
Religious	2	$369,614	$8,928	$82,128	$91,057	24.6%

Occupancy Type	Total Number of Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Residential	39	$3,424,066	$101,973	$77,096	$179,070	5.2%
Total	**770**	**$130,712,969.00**	**$9,162,563.00**	**$11,855,552.00**	**$21,018,119.00**	**16.08%**

Source: North Carolina Emergency Management, Risk Management, 2015

Population at Risk

A separate analysis was performed to determine the population at risk to the individual FEMA flood zones. Using GIS, the DFIRM flood zones were intersected with the building footprint layer. Those residential buildings that intersected the flood zones were counted and multiplied by a regional household factor of 2.76 as shown in Table 6.13. The regional household factor was determined by averaging the 2009-2013 Census Bureau household factors for Cumberland County (2.55) and Hoke County (2.96).

Table 6.13 – Regional Population at Risk to Flood

Flood Return Period	Residential Property Count	Population at Risk
100-yr	699	1,930

Source: NCEM, FEMA DFIRM, U.S. Census Bureau 5-year Community Survey (2009-2013)

Critical Facilities at Risk

A separate analysis was performed to determine critical facilities located in the 100- and 500-year floodplains. Using GIS, the DFIRM flood zones were overlaid on the critical facility location data. Figures 6.7 and 6.8 on the following pages show critical facilities and DFIRM flood zones within Cumberland and Hoke Counties, respectively. Note: A more detailed list of critical facilities and map for each jurisdiction can be found within each community's annex.

Flood Insurance Analysis and Repetitive Loss

A flood insurance analysis and repetitive loss analysis for each jurisdiction can be found within each community's annex.

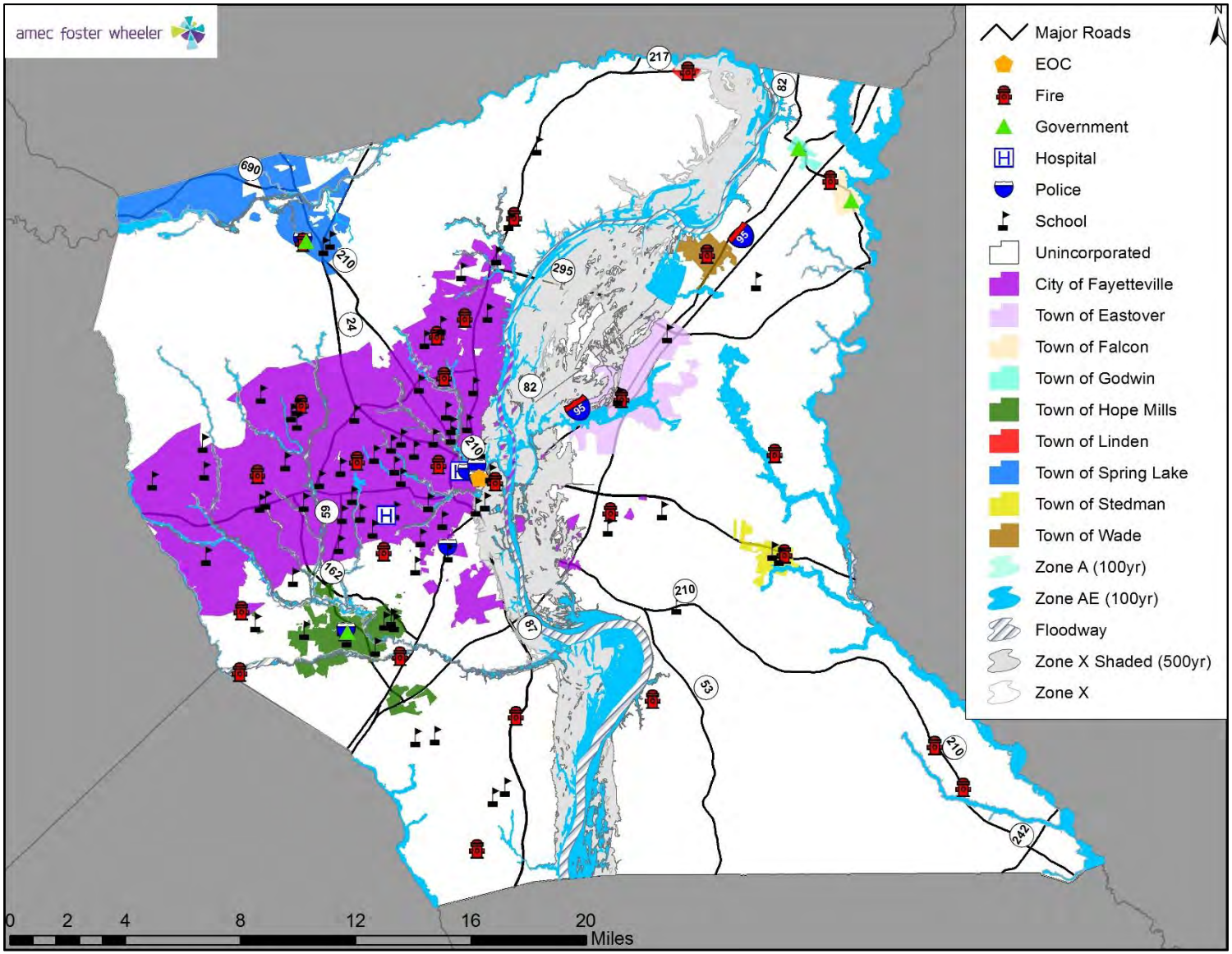


Figure 6.7 - Cumberland County Critical Facilities and FEMA Flood Zones

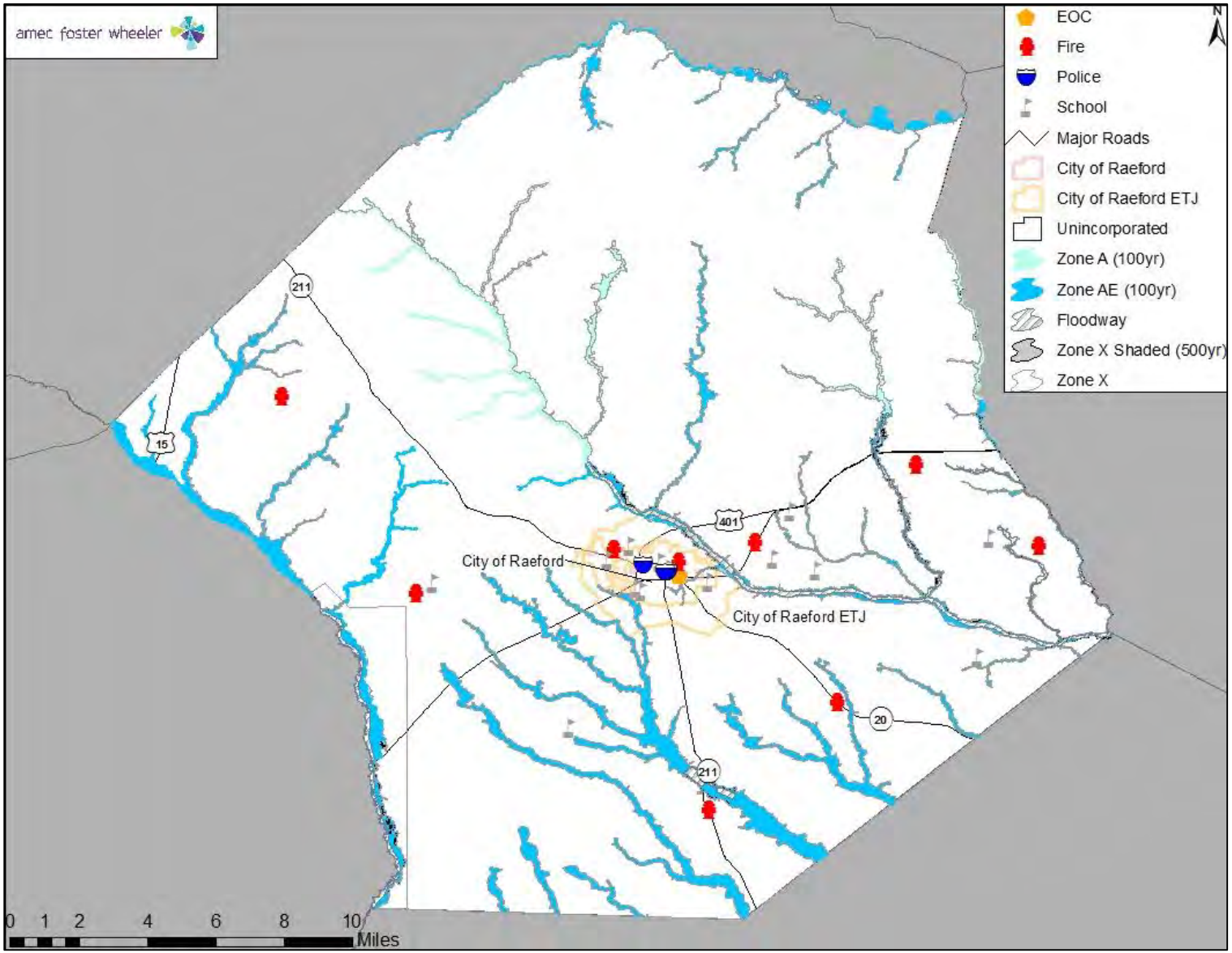


Figure 6.8 - Hoke County Critical Facilities and FEMA Flood Zones

6.3.7 Severe Weather (Thunderstorm, Lightning, & Hail)

Probability of Future Occurrence— Highly Likely
Vulnerability—High Risk

Given the high number of previous events (507 records in 65 years), it is certain that severe weather events, including wind, lightning and hail, 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 planning area.

Because it cannot be predicted where severe thunderstorm, lightning or hail damage may occur, it is not possible to map geographic boundaries for these hazards. Table 6.14 shows the building count, total value, estimated damages and loss ratio for buildings that are at risk to the 100-yr thunderstorm wind event.

Table 6.14 - Estimated Building Damage and Content Loss – Thunderstorm Wind 100-yr Return Period

Occupancy Type	Total Number of Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Cumberland County						
Agricultural	1,284	$230,288,012	$13,482,274	$345,299	$13,827,573	6.0%
Commercial	5,891	$9,137,996,320	$1,009,160,076	$143,693,912	$1,152,853,988	12.6%
Education	630	$2,112,590,221	$177,791,348	$22,214,255	$200,005,604	9.5%
Government	294	$861,730,128	$126,836,537	$25,495,019	$152,331,556	17.7%
Industrial	901	$20,992,167,829	$1,168,185,035	$49,109,876	$1,217,294,912	5.8%
Religious	896	$1,397,823,079	$111,512,248	$9,197,159	$120,709,407	8.6%
Residential	119,909	$26,629,888,682	$7,701,820,310	$177,049,158	$7,878,869,468	29.6%
Hoke County						
Agricultural	1,023	$188,827,260	$121,169	$4,636	$125,805	0.1%
Commercial	587	$752,065,529	$1,630,573	$296,730	$1,927,302	0.3%
Education	121	$376,353,819	$627,790	$142,358	$770,148	0.2%
Government	115	$218,722,627	$179,161	$16,652	$195,813	0.1%
Industrial	122	$435,689,727	$25,208	$347,423	$372,631	0.1%
Religious	211	$561,423,322	$900,579	$105,263	$1,005,842	0.2%
Residential	20,233	$3,587,985,670	$14,717,733	$796,503	$15,514,237	0.4%
Total	**152,217**	**67,483,552,225**	**10,326,990,041**	**428,814,243**	**10,755,804,286**	**15.94%**

Source: North Carolina Emergency Management, Risk Management, 2015

Population at Risk

A separate analysis was performed to determine the population at risk to thunderstorm wind events. Those residential buildings projected to sustain wind damage were counted and multiplied by a regional household factor of 2.76 as shown in Table 6.15. The regional household factor was determined by averaging the 2009-2013 Census Bureau household factors for Cumberland County (2.55) and Hoke County (2.96).

Table 6.15 – Regional Population at Risk to Thunderstorm Wind

Thunderstorm Wind Return Period	Residential Property Count	Population at Risk
100-yr	140,142	386,792

Source: NCEM, U.S. Census Bureau 5-year Community Survey (2009-2013)

In conclusion, severe weather events including thunderstorm wind, lightning and hail has the potential to impact all existing and future buildings, facilities, and populations in Cumberland and Hoke Counties. Impacts of severe weather events include wind damage, debris clean-up, hail damage, and potential fatalities due to lightning strikes and associated fires. The estimated regional building damage and content loss due to thunderstorm wind (100-yr return period) is $10,755,804,286 or 16% of the total assets exposed in the region.

6.3.8 Tornado

Probability of Future Occurrence— Likely
Vulnerability—High Risk

Historical evidence shows that most of North Carolina is vulnerable to tornado activity, which often is associated with other severe weather events such as thunderstorm activity or tropical cyclone activity. Because it cannot be predicted where a tornado may strike, it is not possible to map geographic boundaries for this hazard.

Tables 6.16 through 6.20 provide loss estimates for F0 – F4 tornado events based on probabilistic scenarios. Loss data was provided by NCEM's IHRM Program. These estimates include structural, contents and inventory losses for agricultural, commercial, education, government, industrial, religious and residential building occupancy types. The loss ratio is the loss estimate divided by the total potential exposure (i.e., total of improved and contents value for all buildings located within the 100-year floodplain) and displayed as a percentage of loss. FEMA considers loss ratios greater than 10% to be significant and an indicator a community may have more difficulties recovering from an event.

Table 6.16 - Estimated Building Damage and Content Loss – F0 Tornado

Occupancy Type	Total Number of Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Cumberland County						
Agricultural	1,227	$226,176,153	$11,001,281	$11,000,026	$22,001,307	9.7%
Commercial	5,775	$9,058,054,286	$218,329,523	$227,167,923	$445,497,445	4.9%
Education	626	$2,076,449,384	$41,463,971	$43,927,144	$85,391,115	4.1%
Government	282	$849,896,891	$8,575,788	$9,130,398	$17,706,185	2.1%
Industrial	739	$2,540,202,955	$61,013,610	$84,249,710	$145,263,320	5.7%
Religious	894	$1,397,468,090	$14,557,236	$14,556,683	$29,113,919	2.1%
Residential	118,283	$26,491,455,804	$943,603,818	$444,798,491	$1,388,402,309	5.2%
Hoke County						
Agricultural	714	$181,288,793	$9,991,589	$9,984,958	$19,976,546	11.0%
Commercial	545	$725,965,066	$18,343,538	$19,614,923	$37,958,461	5.2%
Education	104	$353,187,591	$8,868,888	$8,895,180	$17,764,068	5.0%
Government	110	$218,021,077	$2,099,621	$2,442,485	$4,542,106	2.1%
Industrial	98	$426,513,158	$9,962,190	$14,428,269	$24,390,460	5.7%
Religious	203	$558,674,241	$5,819,524	$5,819,523	$11,639,047	2.1%
Residential	19,396	$3,536,237,934	$150,406,622	$72,759,647	$223,166,269	6.3%
Total	**148,996**	**$48,639,591,423**	**$1,504,037,199**	**$968,775,360**	**$2,472,812,557**	**5.1%**

Table 6.17 - Estimated Building Damage and Content Loss – F1 Tornado

Occupancy Type	Total Number of Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Cumberland County						
Agricultural	1,227	$226,176,153	$73,156,953	$73,147,896	$146,304,849	64.7%
Commercial	5,775	$9,058,054,286	$1,232,391,458	$1,268,802,985	$2,501,194,443	27.6%
Education	626	$2,076,449,384	$195,309,707	$216,495,199	$411,804,906	19.8%
Government	282	$849,896,891	$69,040,326	$73,505,275	$142,545,601	16.8%
Industrial	739	$2,540,202,955	$440,403,287	$608,124,138	$1,048,527,425	41.3%
Religious	894	$1,397,468,090	$117,194,635	$117,190,184	$234,384,819	16.8%
Residential	118,283	$26,491,455,804	$6,850,253,925	$3,231,561,759	$10,081,815,684	38.1%
Hoke County						
Agricultural	714	$181,288,793	$65,495,080	$65,447,219	$130,942,299	72.2%
Commercial	545	$725,965,066	$101,168,958	$104,834,271	$206,003,228	28.4%
Education	104	$353,187,591	$37,352,517	$37,578,184	$74,930,701	21.2%
Government	110	$218,021,077	$16,903,227	$19,663,497	$36,566,724	16.8%
Industrial	98	$426,513,158	$71,908,241	$104,144,914	$176,053,154	41.3%
Religious	203	$558,674,241	$46,850,718	$46,850,714	$93,701,432	16.8%
Residential	19,396	$3,536,237,934	$1,092,958,667	$528,430,721	$1,621,389,388	45.9%
Total	**148,996**	**$48,639,591,423**	**$10,410,387,699**	**$6,495,776,956**	**$16,906,164,653**	**34.8%**

Table 6.18 - Estimated Building Damage and Content Loss – F2 Tornado

Occupancy Type	Total Number of Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Cumberland County						
Agricultural	1,227	$226,176,153	$109,624,915	$109,604,468	$219,229,383	96.9%
Commercial	5,775	$9,058,054,286	$3,078,319,714	$3,139,111,458	$6,217,431,172	68.6%
Education	626	$2,076,449,384	$563,393,771	$641,457,776	$1,204,851,547	58.0%
Government	282	$849,896,891	$249,827,042	$265,983,758	$515,810,800	60.7%
Industrial	739	$2,540,202,955	$995,187,369	$1,374,189,246	$2,369,376,615	93.3%
Religious	894	$1,397,468,090	$424,076,633	$424,060,525	$848,137,158	60.7%
Residential	118,283	$26,491,455,804	$13,800,631,142	$6,543,184,529	$20,343,815,671	76.8%
Hoke County						
Agricultural	714	$181,288,793	$88,981,438	$88,873,307	$177,854,746	98.1%
Commercial	545	$725,965,066	$245,533,346	$252,289,697	$497,823,043	68.6%
Education	104	$353,187,591	$99,923,630	$100,754,709	$200,678,338	56.8%
Government	110	$218,021,077	$61,165,459	$71,153,681	$132,319,140	60.7%
Industrial	98	$426,513,158	$162,492,367	$235,338,168	$397,830,536	93.3%
Religious	203	$558,674,241	$169,532,459	$169,532,444	$339,064,904	60.7%
Residential	19,396	$3,536,237,934	$2,020,343,652	$975,924,118	$2,996,267,770	84.7%
Total	**148,996**	**$48,639,591,423**	**$22,069,032,937**	**$14,391,457,884**	**$36,460,490,823**	**75.0%**

Table 6.19 - Estimated Building Damage and Content Loss – F3 Tornado

Occupancy Type	Total Number of Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Cumberland County						
Agricultural	1,227	$226,176,153	$113,099,036	$113,077,116	$226,176,153	100.0%
Commercial	5,775	$9,058,054,286	$4,216,199,355	$4,292,017,594	$8,508,216,949	93.9%
Education	626	$2,076,449,384	$864,063,297	$988,546,700	$1,852,609,997	89.2%
Government	282	$849,896,891	$397,377,675	$423,076,727	$820,454,402	96.5%
Industrial	739	$2,540,202,955	$1,066,937,978	$1,473,264,977	$2,540,202,955	100.0%
Religious	894	$1,397,468,090	$674,541,015	$674,515,393	$1,349,056,408	96.5%
Residential	118,283	$26,491,455,804	$17,646,982,066	$8,389,245,757	$26,036,227,823	98.3%
Hoke County						
Agricultural	714	$181,288,793	$90,702,359	$90,586,434	$181,288,793	100.0%
Commercial	545	$725,965,066	$335,130,673	$344,326,937	$679,457,609	93.6%
Education	104	$353,187,591	$151,054,158	$152,379,323	$303,433,481	85.9%
Government	110	$218,021,077	$97,290,460	$113,177,838	$210,468,298	96.5%
Industrial	98	$426,513,158	$174,207,675	$252,305,482	$426,513,158	100.0%
Religious	203	$558,674,241	$269,660,217	$269,660,194	$539,320,411	96.5%
Residential	19,396	$3,536,237,934	$2,376,202,540	$1,148,071,735	$3,524,274,275	99.7%
Total	**148,996**	**$48,639,591,423**	**$28,473,448,504**	**$18,724,252,207**	**$47,197,700,712**	**97.0%**

Table 6.20 - Estimated Building Damage and Content Loss – F4 Tornado

Occupancy Type	Total Number of Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Cumberland County						
Agricultural	1,227	$226,176,153	$113,099,036	$113,077,116	$226,176,153	100.0%
Commercial	5,775	$9,058,054,286	$4,461,356,897	$4,535,301,961	$8,996,658,858	99.3%
Education	626	$2,076,449,384	$953,543,293	$1,081,921,608	$2,035,464,902	98.0%
Government	282	$849,896,891	$411,637,807	$438,259,084	$849,896,891	100.0%
Industrial	739	$2,540,202,955	$1,066,937,978	$1,473,264,977	$2,540,202,955	100.0%
Religious	894	$1,397,468,090	$698,747,316	$698,720,774	$1,397,468,090	100.0%
Residential	118,283	$26,491,455,804	$17,954,352,570	$8,538,140,934	$26,492,493,504	100.0%
Hoke County						
Agricultural	714	$181,288,793	$90,702,359	$90,586,434	$181,288,793	100.0%
Commercial	545	$725,965,066	$355,488,733	$365,183,587	$720,672,320	99.3%
Education	104	$353,187,591	$170,849,074	$172,215,884	$343,064,959	97.1%
Government	110	$218,021,077	$100,781,786	$117,239,291	$218,021,077	100.0%
Industrial	98	$426,513,158	$174,207,675	$252,305,482	$426,513,158	100.0%
Religious	203	$558,674,241	$279,337,133	$279,337,109	$558,674,241	100.0%
Residential	19,396	$3,536,237,934	$2,384,178,558	$1,152,059,377	$3,536,237,934	100.0%
Total	**148,996**	**$48,639,591,423**	**$29,215,220,215**	**$19,307,613,618**	**$48,522,833,835**	**100%**

In conclusion, a tornado has the potential to impact all existing and future buildings, facilities, and populations in Cumberland and Hoke Counties. Impacts of tornadoes include building and contents damage, debris clean-up, service disruption and potentially numerous fatalities and injuries. The worst case F4 scenario estimated the regional building damage and content loss to be $48,522,833,835 or 100% of the total assets exposed in the region.

6.3.9 Wildfire

Probability of Future Occurrence—Highly Likely
Vulnerability—High Risk

The text and figures used to asses Cumberland and Hoke County's vulnerability to wildfire is based on the Southern Wildfire Risk Assessment (http://www.southernwildfirerisk.com/Home/LearnMore). Results of the assessment can be used to help prioritize areas in the state where mitigation treatments, community interaction and education, or tactical analyses might be necessary to reduce risk from wildfires.

The Wildland Urban Interface (WUI) Risk Index Layer is a rating of the potential impact of a wildfire on people and their homes. The key input, WUI, reflects housing density (houses per acre) consistent with Federal Register National standards. The location of people living in the Wildland Urban Interface and rural areas is key information for defining potential wildfire impacts to people and homes. The WUI Risk Index for Cumberland and Hoke Counties is displayed in Figures 6.9 and 6.10, respectively.

The WUI Risk Rating is derived using a Response Function modeling approach which involves assigning a net change in the value to a resource or asset based on susceptibility to fire at different intensity levels, such as flame length. The range of values is from -1 to -9, with -1 representing the least negative impact and -9 representing the most negative impact. For example, areas with high housing density and high flame lengths are rated -9 while areas with low housing density and low flame lengths are rated -1.

To calculate the WUI Risk Rating, the WUI housing density data was combined with Flame Length data and response functions were defined to represent potential impacts. The response functions were defined by a team of experts based on values defined by the SWRA Update Project technical team. By combining flame length with the WUI housing density data, you can determine where the greatest potential impact to homes and people is likely to occur.

	Class	Acres	Percent
	-9 Major Impact	1,118	0.5%
	-8	38,432	17.8%
	-7	36,316	16.8%
	-6	23,611	10.9%
	-5 Moderate	56,871	26.3%
	-4	28,850	13.3%
	-3	13,575	6.3%
	-2	14,557	6.7%
	-1 Minor Impacts	3,106	1.4%
	Total	216,435	100.0%

Source: Southern Wildfire Risk Assessment Summary Report for Cumberland County, NC 9/14/2015

Cumberland County Risk Index

	Class	Acres	Percent
	-9 Major Impact	221	0.3%
	-8	7,178	9.3%
	-7	12,264	15.9%
	-6	7,506	9.7%
	-5 Moderate	14,278	18.5%
	-4	10,732	13.9%
	-3	10,026	13.0%
	-2	12,793	16.5%
	-1 Minor Impacts	2,352	3.0%
	Total	77,351	100.0%

Source: Southern Wildfire Risk Assessment Summary Report for Hoke County, NC 9/14/2015

Hoke County Risk Index

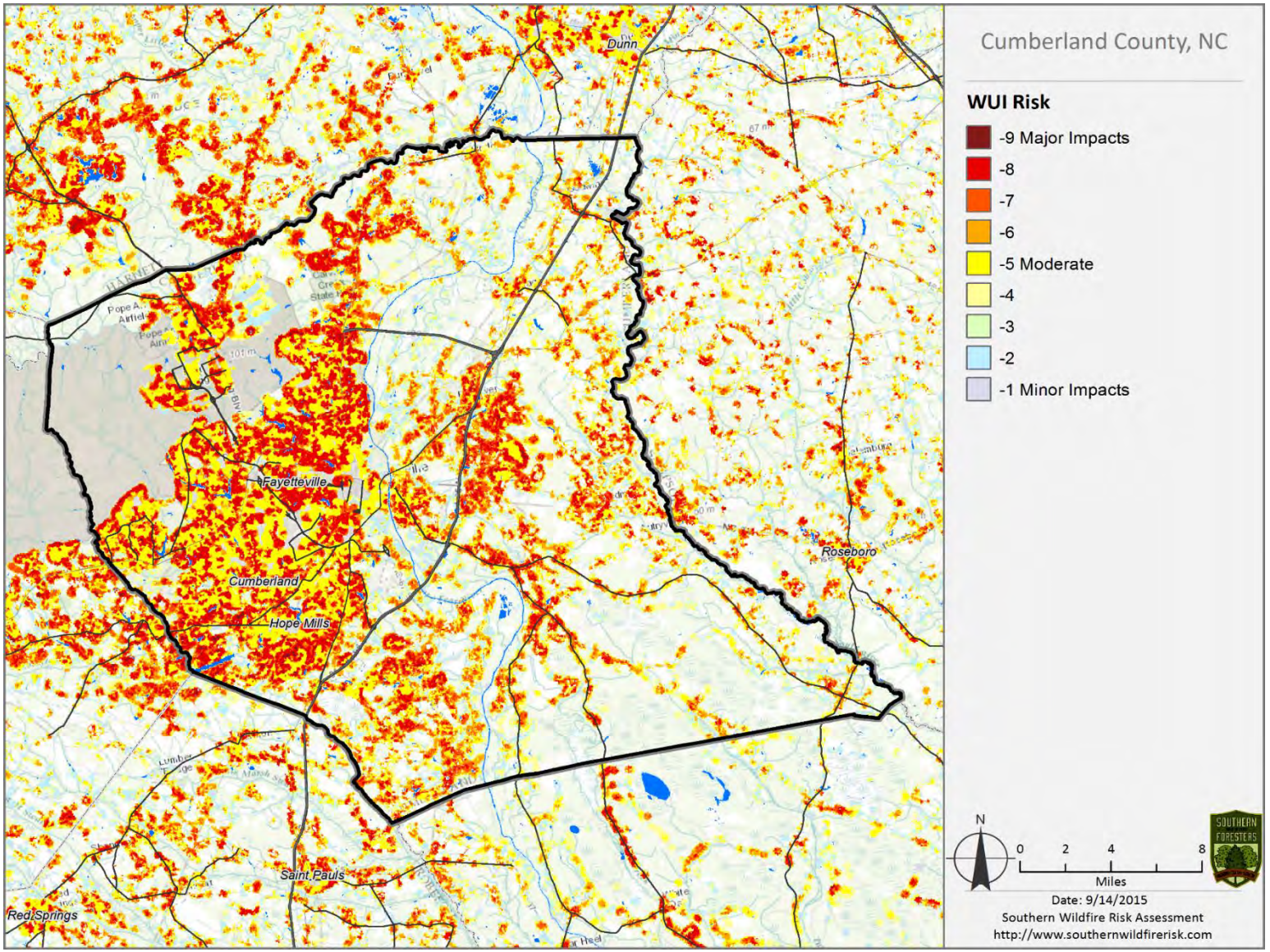


Figure 6.9 - Cumberland County Wildland Urban Interface Risk Index

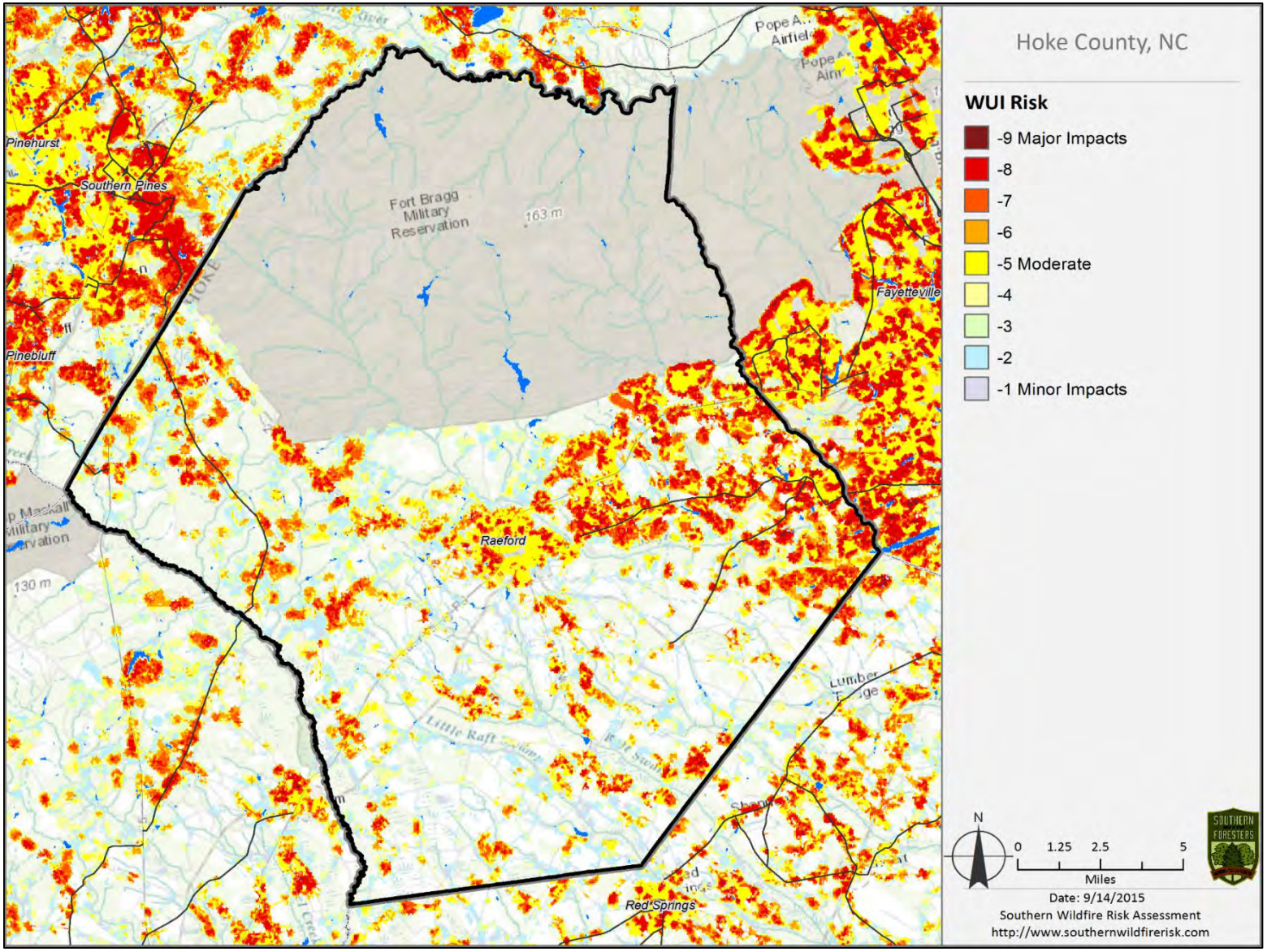


Figure 6.10 - Hoke County Wildland Urban Interface Risk Index

The Burn Probability (BP) layer depicts the probability of an area burning given current landscape conditions, percentile weather, historical ignition patterns and historical fire prevention and suppression efforts. It is the tendency of any given pixel to burn, given the static landscape conditions depicted by the LANDFIRE Refresh 2008 dataset, contemporary weather and ignition patterns, as well as contemporary fire management policies (entailing considerable fire prevention and suppression efforts). The BP layer for Cumberland and Hoke Counties is displayed in Figures 6.11 and 6.12, respectively.

Values in the Burn Probability (BP) data layer indicate, for each pixel, the number of times that cell was burned by an FSim-modeled fire, divided by the total number of annual weather scenarios simulated. Burn probability raster data was generated using the large fire simulator - FSim - developed for use in the Fire Program Analysis (FPA) project. FSim uses historical weather data and current land cover data for discrete geographical areas (Fire Planning Units - FPUs) and simulates fires in these FPUs. Using these simulated fires, an overall burn probability and marginal burn probabilities at four fire intensities (flame lengths) are returned by FSim for each 270m pixel in the FPU.

The fire growth simulations, when run repeatedly with different ignition locations and weather streams, generate burn probabilities and fire behavior distributions at each landscape location (i.e., cell or pixel). Results are objectively evaluated through comparison with historical fire patterns and statistics, including the mean annual burn probability and fire size distribution, for each FPU. This evaluation is part of the FSim calibration process for each FPU, whereby simulation inputs are adjusted until the slopes of the historical and modeled fire size distributions are similar and the modeled average burn probability falls within an acceptable range of the historical reference value (i.e., the 95% confidence interval for the mean).

	Class	Acres	Percent
	1	5,966	2.0%
	2	18,626	6.1%
	3	39,031	12.8%
	4	36,503	11.9%
	5	108,591	35.5%
	6	55,789	18.2%
	7	38,523	12.6%
	8	2,764	0.9%
	9	0	0.0%
	10	0	0.0%
	Total	**305,794**	**100.0%**

Source: Southern Wildfire Risk Assessment Summary Report for Cumberland County, NC, 9/14/2015

Cumberland County Burn Probability

	Class	Acres	Percent
	1	306	0.2%
	2	925	0.5%
	3	2,664	1.4%
	4	4,459	2.3%
	5	30,955	16.1%
	6	49,453	25.7%
	7	75,202	39.2%
	8	28,108	14.6%
	9	0	0.0%
	10	0	0.0%
	Total	**192,073**	**100.0%**

Source: Southern Wildfire Risk Assessment Summary Report for Hoke County, NC, 9/14/2015

Hoke County Burn Probability

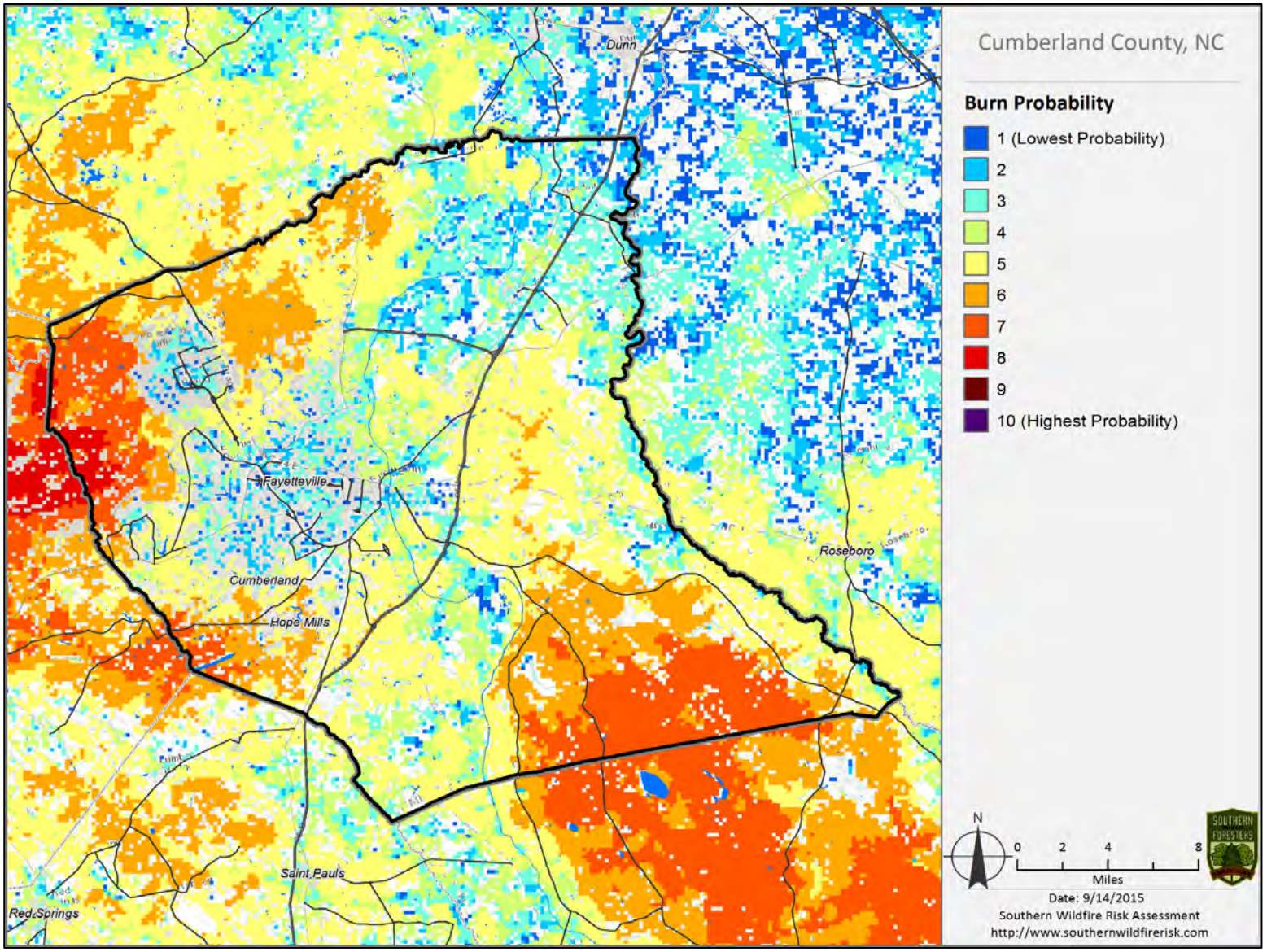


Figure 6.11 - Cumberland County Burn Probability

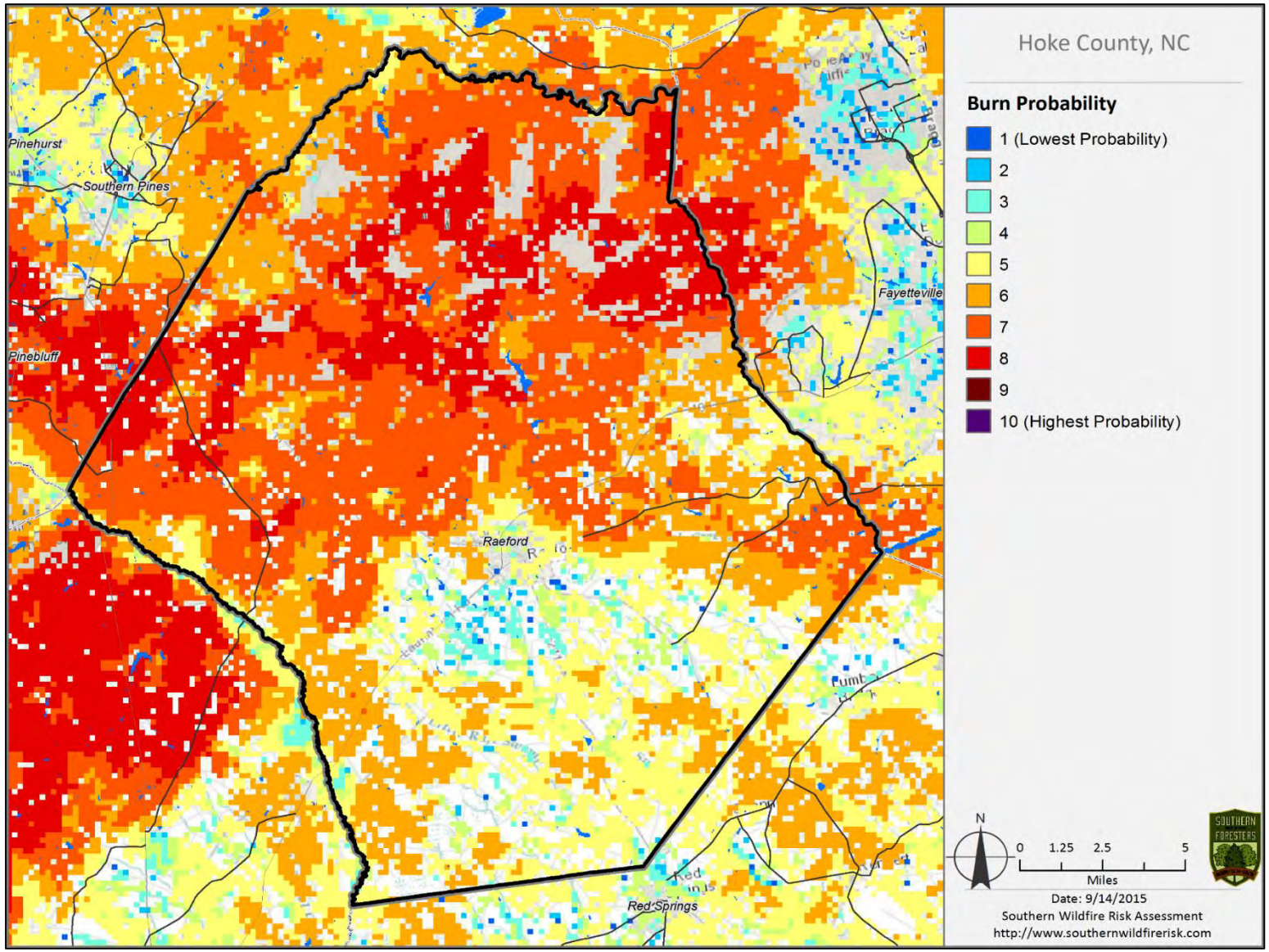


Figure 6.12 - Hoke County Burn Probability

Characteristic Rate of Spread is the typical or representative rate of spread of a potential fire based on a weighted average of four percentile weather categories. Rate of spread is the speed with which a fire moves in a horizontal direction across the landscape, usually expressed in chains per hour (ch/hr) or feet per minute (ft/min). For purposes of the Southern Wildfire Risk Assessment, this measurement represents the maximum rate of spread of the fire front. Rate of Spread is the metric used to derive the Community Protection Zones. The Rate of Spread layer for Cumberland and Hoke Counties is displayed in Figures 6.13 and 6.14, respectively.

Rate of spread is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography. Weather is by far the most dynamic variable as it changes frequently. To account for this variability, four percentile weather categories were created from historical weather observations to represent low, moderate, high, and extreme weather days for each weather influence zone in the South. A weather influence zone is an area where, for analysis purposes, the weather on any given day is considered uniform.

	Class	Acres	Percent
	Non-Burnable	123,933	29.4%
	0 – 5 (ch/hr)	33,493	7.9%
	5 – 10 (ch/hr)	50,431	12.0%
	10 – 15 (ch/hr)	63,768	15.1%
	15 – 20 (ch/hr)	70,521	16.7%
	20 – 30 (ch/hr)	69,940	16.6%
	30 – 50 (ch/hr)	9,124	2.2%
	50 – 150 (ch/hr)	202	0.0%
	150 + (ch/hr)	0	0.0%
	Total	421,411	100.0%

Source: Southern Wildfire Risk Assessment Summary Report for Cumberland County, NC, 9/14/2015

Cumberland County Rate of Spread

	Class	Acres	Percent
	Non-Burnable	60,636	24.1%
	0 – 5 (ch/hr)	21,427	8.5%
	5 – 10 (ch/hr)	33,299	13.3%
	10 – 15 (ch/hr)	47,176	18.8%
	15 – 20 (ch/hr)	40,310	16.1%
	20 – 30 (ch/hr)	34,584	13.8%
	30 – 50 (ch/hr)	12,557	5.0%
	50 – 150 (ch/hr)	1,120	0.4%
	150 + (ch/hr)	0	0.0%
	Total	251,108	100.0%

Source: Southern Wildfire Risk Assessment Summary Report for Hoke County, NC, 9/14/2015

Hoke County Rate of Spread

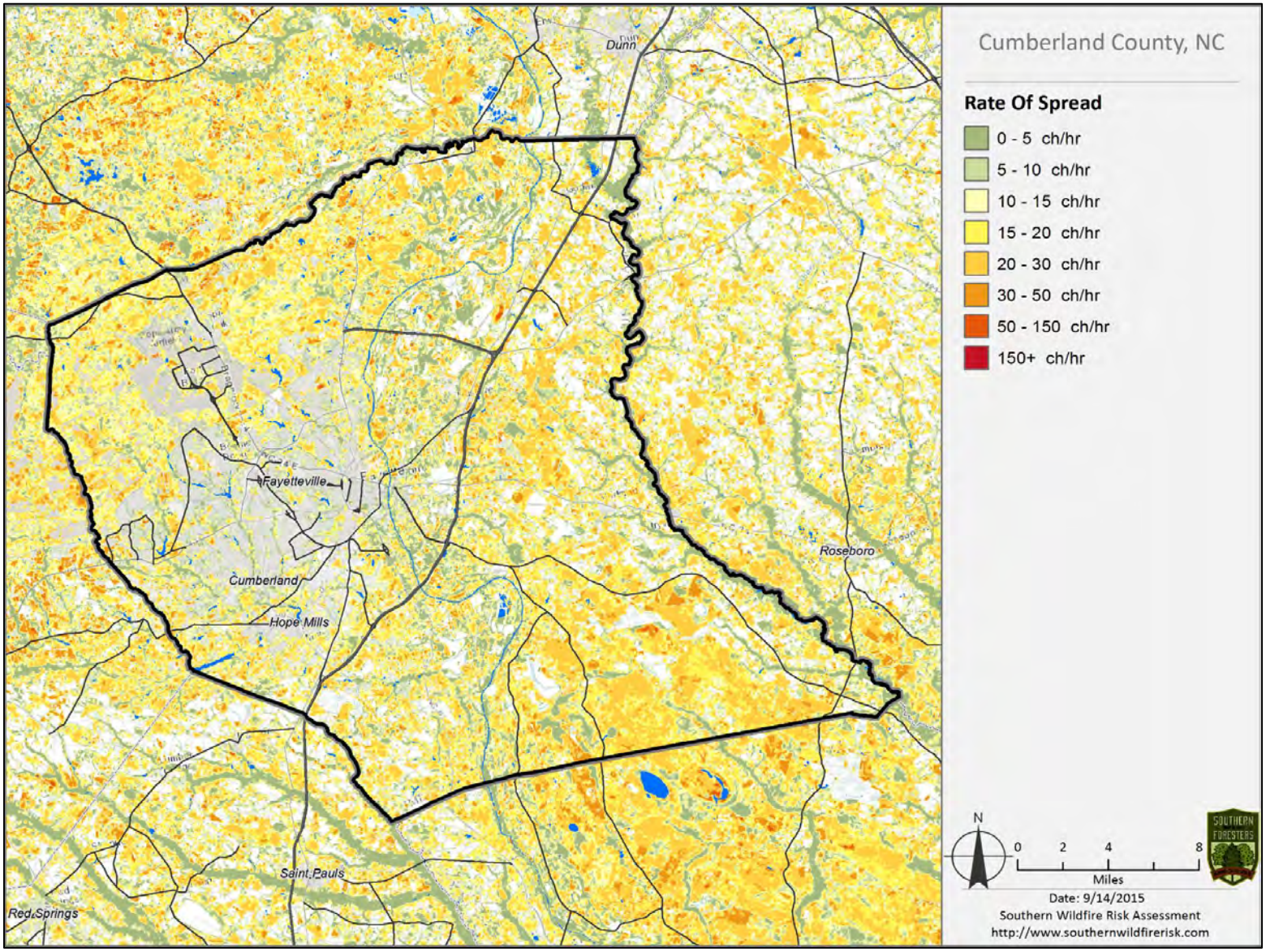


Figure 6.13 - Cumberland County Rate of Spread

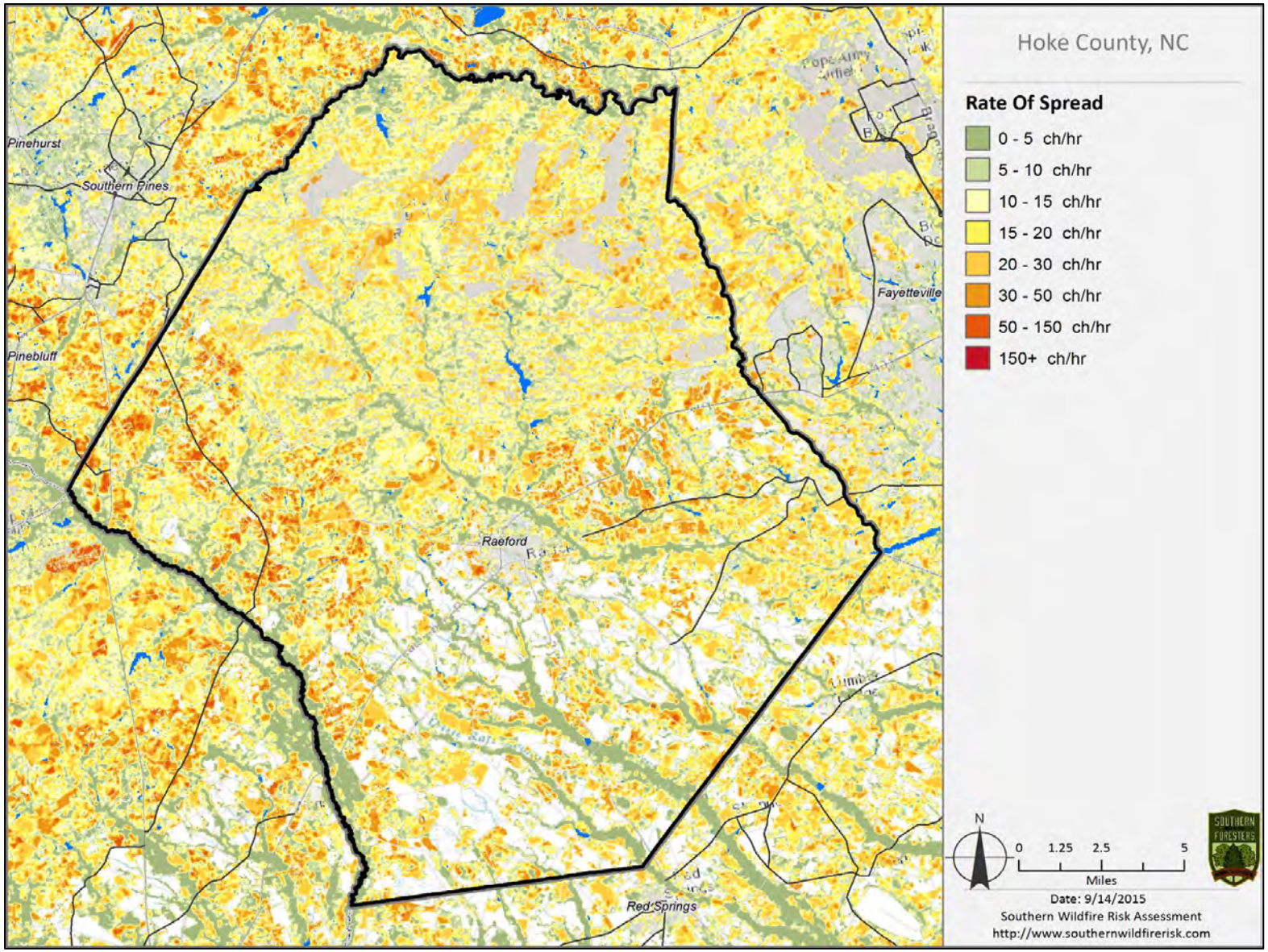


Figure 6.14 - Hoke County Rate of Spread

6.3.10 Winter Storm

Probability of Future Occurrence—Highly Likely
Vulnerability—Moderate Risk

Based on historical records, Cumberland and Hoke Counties have experienced 30 and 29 winter storm events since 1996, respectively. These events are reported to have caused one death due to icy road conditions. There are no historical records for property or crop damage.

A qualitative factor in terms of vulnerability is a general lack of awareness on the part of county residents in preparing for and responding to winter storm conditions in a manner that will minimize the danger to themselves and others. This lack of awareness is especially apparent when driving/roadway conditions catch motorists off-guard.

Potential losses associated with winter storms include the cost of the removal of snow from roadways, debris clean-up, and some indirect losses from power outages, etc. All future structures and infrastructure in the region will be vulnerable to winter storms.

6.4 Priority Risk Index

The purpose of the PRI is to categorize and prioritize all potential hazards for the Cumberland and Hoke County region as high, moderate, or low risk. The summary hazard classifications generated through the use of the PRI allows for the prioritization of those high hazard risks for mitigation planning purposes.

The application of the PRI results in numerical values that allow identified hazards to be ranked against one another (the higher the PRI value, the greater the hazard risk). PRI values are obtained by assigning varying degrees of risk to five categories for each hazard (probability, impact, spatial extent, warning time, and duration). Each degree of risk has been assigned a value (1 to 4) and weighting factor as summarized below in Table 6.21. The sum of all five categories equals the final PRI value, demonstrated in the equation below (the highest possible PRI value is 4.0).

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

Table 6.21 - Priority Risk Index for Cumberland and Hoke County Region

RISK ASSESSMENT CATEGORY	LEVEL	DEGREE OF RISK CRITERIA	INDEX	WEIGHT
PROBABILITY **What is the likelihood of a hazard event occurring in a given year?**	**UNLIKELY**	LESS THAN 1% ANNUAL PROBABILITY	**1**	**30%**
	POSSIBLE	BETWEEN 1 & 10% ANNUAL PROBABILITY	**2**	
	LIKELY	BETWEEN 10 &100% ANNUAL PROBABILITY	**3**	
	HIGHLY LIKELY	100% ANNUAL PROBABILTY	**4**	
IMPACT **In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?**	**MINOR**	VERY FEW INJURIES, IF ANY. ONLY MINOR PROPERTY DAMAGE & MINIMAL DISRUPTION ON QUALITY OF LIFE. TEMPORARY SHUTDOWN OF CRITICAL FACILITIES.	**1**	**30%**
	LIMITED	MINOR INJURIES ONLY. MORE THAN 10% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR > 1 DAY.	**2**	
	CRITICAL	MULTIPLE DEATHS/INJURIES POSSIBLE. MORE THAN 25% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR > 1 WEEK.	**3**	
	CATASTROPHIC	HIGH NUMBER OF DEATHS/INJURIES POSSIBLE. MORE THAN 50% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES > 30 DAYS.	**4**	
SPATIAL EXTENT **How large of an area could be impacted by a hazard event? Are impacts localized or regional?**	**NEGLIGIBLE**	LESS THAN 1% OF AREA AFFECTED	**1**	**20%**
	SMALL	BETWEEN 1 & 10% OF AREA AFFECTED	**2**	
	MODERATE	BETWEEN 10 & 50% OF AREA AFFECTED	**3**	
	LARGE	BETWEEN 50 & 100% OF AREA AFFECTED	**4**	
WARNING TIME **Is there usually some lead time associated with the hazard event? Have warning measures been implemented?**	**MORE THAN 24 HRS**	SELF DEFINED	**1**	**10%**
	12 TO 24 HRS	SELF DEFINED	**2**	
	6 TO 12 HRS	SELF DEFINED	**3**	
	LESS THAN 6 HRS	SELF DEFINED	**4**	
DURATION **How long does the hazard event usually last?**	**LESS THAN 6 HRS**	SELF DEFINED	**1**	**10%**
	LESS THAN 24 HRS	SELF DEFINED	**2**	
	LESS THAN 1 WEEK	SELF DEFINED	**3**	
	MORE THAN 1 WEEK	SELF DEFINED	**4**	

6.4.1 Priority Risk Index Results

Table 6.22 summarizes the degree of risk assigned to each identified hazard using the PRI method described above.

Table 6.22 - Summary of PRI Results

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Dam/Levee Failure	Likely	Limited	Small	Less than 6 hrs	Less than 6 hrs	2.4
Drought	Highly Likely	Minor	Large	More than 24 hrs	More than 1 week	2.8
Earthquake	Possible	Limited	Moderate	Less than 6 hrs	Less than 6 hrs	2.3
Erosion	Possible	Minor	Small	More than 24 hrs	More than 1 week	1.8
Extreme Heat	Possible	Minor	Large	More than 24 hrs	Less than 1 week	2.1
Hurricane/Tropical Storm	Likely	Critical	Large	More than 24 hrs	Less than 24 hrs	2.9
Inland Flooding: 100-/500-year	Possible	Critical	Moderate	6 to 12 hours	Less than 1 week	2.7
Severe Weather (thunderstorm wind, lightning, & hail)	Highly Likely	Critical	Moderate	6 to 12 hours	Less than 6 hrs	3.1
Sinkhole	Unlikely	Minor	Small	Less than 6 hrs	More than 1 week	1.8
Tornado	Likely	Critical	Small	Less than 6 hrs	Less than 6 hrs	2.7
Wildfire	Highly Likely	Limited	Small	Less than 6 hrs	Less than 1 week	2.9
Winter Storm	Highly Likely	Minor	Moderate	More than 24 hrs	Less than 1 week	2.5

6.4.2 Final Risk Classifications

The results from the PRI have been classified into three categories based on the assigned risk value:

- **Low Risk** - Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium Risk** - Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High Risk** - Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread.

Table 6.23 - Summary of Hazard Risk Classification

High Risk (> 2.5)	Severe Weather Hurricane/Tropical Storm Wildfire Drought Inland Flooding: 100-/500-year Tornado
Moderate Risk (2.0 – 2.5)	Dam/Levee Failure Winter Storm Earthquake Extreme Heat
Low Risk (< 2.0)	Erosion Sinkhole

7 CAPABILITY ASSESSMENT

Chapter 7 discusses the mitigation capabilities, including planning, programs, policies and land management tools, typically used by local jurisdictions to implement hazard mitigation activities. It consists of the following subsections:

- 7.1 Overview of Capability Assessment
- 7.2 Planning and Regulatory Capability
- 7.3 Floodplain Management
- 7.4 Administrative and Technical Capability
- 7.5 Fiscal Capability

7.1 Overview of Capability Assessment

The purpose of conducting a capability assessment is to determine the ability of each local jurisdiction to implement feasible mitigation actions based on an understanding of the capacity of those agencies or departments tasked with their implementation. A capability assessment should also identify opportunities for establishing or enhancing specific mitigation policies or programs. The process of conducting a capability assessment includes developing an inventory of relevant plans, ordinances, or programs already in place; as well as assessing the local jurisdiction's resources and ability to implement existing and/or new policies. Conclusions drawn from the capability assessment should identify any existing gaps or weaknesses in existing programs and policies as well as positive measures already in place which can and should be supported through future mitigation efforts.

A capability assessment survey was completed by each participating jurisdiction which included regulatory, administrative, technical, and fiscal capabilities. **A more detailed capability assessment for each participating jurisdiction is provided within the Annex for each community.**

7.2 Planning and Regulatory Capability

Planning and regulatory capabilities include plans, ordinances and programs that guide development and growth within the community. Table 7.1 lists local plans, ordinances and programs currently in place for all participating jurisdictions.

Table 7.1 - Planning and Regulatory Capability by Jurisdiction

Regulatory Tool (ordinances, codes, plans)	Cumberland Co	Fayetteville	Eastover	Falcon	Godwin	Hope Mills	Linden	Spring Lake	Stedman	Wade	Hoke Co	Raeford
Comprehensive Plan	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Zoning Ordinance	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
Subdivision Ordinance	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Floodplain Ordinance	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Regulatory Tool (ordinances, codes, plans)	Cumberland Co	Fayetteville	Eastover	Falcon	Godwin	Hope Mills	Linden	Spring Lake	Stedman	Wade	Hoke Co	Raeford
Stormwater Ordinance	N	Y	N	N	N	Y	N	Y	N	N	Y	Y
Erosion, Sedimentation, and Pollution Control Ordinance	N	N	N	N	N	Y	N	N	N	N	N	N
Building Code	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
BCEGS Rating	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
Stormwater Management Program	N	Y	N	N	N	Y	N	Y	N	N	N	N
Site Plan Review Requirements	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Capital Improvements Plan	Y	Y	N	N	N	Y	N	Y	N	N	N	N
Local Emergency Operations Plan	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Flood Insurance Study or Other Engineering Study for Streams	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Repetitive Loss Plan	N	N	N	N	N	N	N	N	N	N	N	N
Elevation Certificates	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N

A description of applicable plans, ordinances and programs follows to provide more detail on the relevance of each regulatory tool in examining the capabilities for each community.

Comprehensive Plan

A Comprehensive Plan, in broad terms, is a policy statement to guide the future placement and development of community facilities. It is the basis for a community's zoning, subdivision and design regulations and a community's official maps and amendments to the zoning, subdivision and design ordinances. The Comprehensive Plan identifies a future vision, values, principals and goals for the community, determines the projected growth for the community and identifies policies to plan, direct and accommodate anticipated growth.

Zoning Ordinance

Zoning typically consists of both a zoning map and a written ordinance that divides the jurisdiction into zoning districts, including various residential, commercial, mixed-use and industrial districts. The zoning regulations describe what type of land use and specific activities are permitted in each district, and also regulate how buildings, signs, parking, and other construction may be placed on a lot. The zoning regulations also provide procedures for rezoning and other planning applications.

Subdivision Ordinance

A subdivision ordinance is intended to regulate the development of residential, commercial, industrial, or other uses, including associated public infrastructure, as land is subdivided into lots for future

development. Subdivision design that accounts for natural hazards can reduce the exposure of future development to hazards.

Flood Insurance Study/Floodplain Ordinance

A Flood Insurance Study (FIS) provides information on the existence and severity of flood hazards within a community based on the 100-year flood event. The FIS also includes revised digital Flood Insurance Rate Maps (FIRMs) which reflect updated Special Flood Hazard Areas (SFHAs) and flood zones for the community.

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

Stormwater Management Program/Stormwater Ordinance

Stormwater runoff is increased when natural ground cover is replaced by urban development. Development in the watershed that drains to a river can aggravate downstream flooding, overload the community's drainage system, cause erosion, and impair water quality. A Stormwater Management Program can prevent flooding problems caused by stormwater runoff by 1) Regulating development in the floodplain to ensure that it will be protected from flooding and that it won't divert floodwaters onto other properties; 2) Regulating all development to ensure that the post-development peak runoff will not be greater than it was under pre-development conditions; and 3) Setting construction standards so buildings are protected from shallow water. A stormwater ordinance provides the community with the regulatory authority to implement its stormwater management standards.

Erosion, Sedimentation, and Pollution Control Ordinance

Surface water runoff can erode soil from development sites, sending sediment into downstream waterways. This can clog storm drains, drain tiles, culverts and ditches and reduce the water transport and storage capacity of river and stream channels, lakes and wetlands. The purpose of an erosion, sedimentation and pollution control ordinance is to minimize soil erosion and prevent off-site sedimentation by using soil erosion and sediment control practices designed in accordance with certain standards and specifications.

Site Plan Review

The purpose of the Site Plan Review Process is to review site plans for specific types of development to ensure compliance with all appropriate land development regulations and consistency with the Comprehensive Plan.

Building Code/Elevation Certificates

Building codes provide one of the best methods for addressing natural hazards. When properly designed and constructed according to code, the average building can withstand many of the impacts of natural hazards. Hazard protection standards for all new and improved or repaired buildings can be incorporated into the local building code. Building codes can ensure that the first floors of new buildings are constructed to be higher than the elevation of the 100-year flood (the flood that is expected to have a one percent chance of occurring in any given year).

Just as important as having code standards is the enforcement of the code. Adequate inspections are needed during the course of construction to ensure that the builder understands the requirements and is following them. Making sure a structure is properly elevated and anchored requires site inspections at each step. An Elevation Certificates serves as the official record that shows new buildings and substantial improvements in all identified SFHAs are properly elevated. This elevation information is needed to show compliance with the floodplain ordinance. Communities participating in the CRS are required to use the FEMA Elevation Certificate.

Capital Improvement Program

A Capital Improvement Plan (CIP) is a planning document that typically provides a five-year outlook for anticipated capital projects designed to facilitate decision makers in the replacement of capital assets. The projects are primarily related to improvement in public service, parks and recreation, public utilities and facilities. A community's mitigation strategy may include structural projects that could potentially be included in a CIP and funded through a Capital Improvement Program.

Emergency Operations Plan

An emergency operations plan outlines responsibilities and the means by which resources are deployed during and following an emergency or disaster.

Repetitive Loss Plan

A repetitive loss property is defined 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. Two of the claims paid must be more than 10 days apart but, within 10 years of each other. A Repetitive Loss Plan examines the cause of repetitive flooding and identifies mitigation measures to reduce or eliminate the flooding to repetitive loss properties.

7.3 Floodplain Management

The NFIP aims to reduce the impact of flooding on private and public structures. It does so by providing affordable insurance to property owners and by encouraging communities to adopt and enforce floodplain management regulations. These efforts help mitigate the effects of flooding on new and improved structures. Overall, the program reduces the socio-economic impact of disasters by promoting the purchase and retention of general risk insurance, but also of flood insurance, specifically.

Participation in the NFIP is voluntary for local governments. In order for a county or municipality to participate in the NFIP, the community must adopt a local flood damage prevention ordinance that requires that all new buildings and substantial improvements to existing buildings will be protected from damage by a 100-year flood event and that new development in the floodplain will not exacerbate existing flood problems or increase damage to other properties.

The Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. For CRS participating communities, flood insurance premium rates are discounted in increments of 5% (i.e., a Class 1 community would receive a 45% premium discount, while a Class 9 community would receive a 5% discount. A Class 10 is not participating in the CRS and receives no discount.

Table 7.2 provides NFIP policy and claim information for each participating jurisdiction.

Table 7.2 - NFIP Policy and Claim Information by Jurisdiction

Jurisdiction	Participating in the NFIP?	CRS Class	Current Effective Map Date	No. of Policies in Force	Insurance in Force	No. of Paid Losses	Total Payments to Date
Cumberland Co	Yes	8	12/18/07	393	$98,892,600	29	$287,550
Fayetteville	Yes	10	12/18/07	762	$183,798,900	82	$1,610,699
Eastover	Yes	10	12/18/07	0	0	0	0
Falcon	Yes	10	12/18/07	1	$140,000	0	0
Godwin	Yes	10	12/18/07	0	0	0	0
Hope Mills	Yes	10	12/18/07	1	$28,000	4	$45,449
Linden	Yes	10	12/18/07	0	0	0	0
Spring Lake	Yes	10	12/18/07	12	$2,364,800	0	0
Stedman	Yes	10	12/18/07	6	$1,358,000	0	0
Wade	Yes	10	12/18/07	1	$280,000	0	0
Hoke Co	Yes	10	7/7/14	76	$17,622,400	1	$1,986
Raeford	Yes	10	12/18/07	6	$1,790,000	0	0

7.4 Administrative and Technical Capability

Administrative and technical capability refers to the community's staff and their skills and tools that can be used for mitigation planning and to implement specific mitigation actions. It also refers to the ability to access and coordinate these resources effectively. The personnel employed by each jurisdiction should be considered as well as the level of knowledge and technical expertise of these resources. Resources include engineers, planners, emergency managers, GIS analysts, building inspectors, grant writers, floodplain managers, and more. Table 7.3 provides a summary of the administrative and technical capabilities for each participating jurisdiction.

Table 7.3 - Administrative and Technical Capability by Jurisdiction

Resources	Cumberland Co	Fayetteville	Eastover	Falcon	Godwin	Hope Mills	Linden	Spring Lake	Stedman	Wade	Hoke Co	Raeford
Planner/Engineer with knowledge of land development/land management practices	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Engineer/Professional trained in construction practices	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Planner/Engineer/Scientist with an understanding of natural hazards	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y
Personnel skilled in GIS	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Full-time building official	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Floodplain Manager	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Resources	Cumberland Co	Fayetteville	Eastover	Falcon	Godwin	Hope Mills	Linden	Spring Lake	Stedman	Wade	Hoke Co	Raeford
Emergency Manager	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Grant Writer	Y	Y	Y	Y	Y	N	Y	N	Y	Y	Y	Y
GIS data – Hazard Areas	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
GIS data – Critical Facilities	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
GIS data – Land use	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
GIS data – Building footprints	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
GID data – Links to Assessor's data	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Warning Systems/Services (CTY System)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

7.5 Fiscal Capability

Financial capabilities are the resources that a jurisdiction has access to or is eligible to use to fund mitigation actions. The costs associated with implementing mitigation activities vary. Some mitigation actions such as building assessment or outreach efforts require little to no costs other than staff time and existing operating budgets. Other actions, such as the acquisition of flood-prone properties, could require a substantial monetary commitment from local, State, and Federal funding sources. Some local governments may have access to a recurring source of revenue beyond property, sales, and income taxes, such as stormwater utility or development impact fees. These communities may be able to use the funds to support local mitigation efforts independently or as the local match or cost-share often required for grant funding. Table 7.4 provides a summary of the fiscal resources for each participating jurisdiction.

Table 7.4 – Fiscal Resources by Jurisdiction

Resources	Cumberland Co	Fayetteville	Eastover	Falcon	Godwin	Hope Mills	Linden	Spring Lake	Stedman	Wade	Hoke Co	Raeford
Community Development Block Grants	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Capital improvements project funding	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N	N
Authority to levy taxes for specific purposes	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Resources	Cumberland Co	Fayetteville	Eastover	Falcon	Godwin	Hope Mills	Linden	Spring Lake	Stedman	Wade	Hoke Co	Raeford
Fees for water, sewer, gas or electric services	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Impact fees for new development	N	Y	N	N	N	N	N	N	N	N	N	N
Incur debt through general obligation bonds	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
Incur debt through special tax bonds	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
Incur debt through private activity bonds	N	N	N	N	N	N	N	N	N	N	Y	Y

8 MITIGATION STRATEGY

Chapter 8 discusses the mitigation strategy process and mitigation action plan for the Cumberland-Hoke Regional Hazard Mitigation Plan. This chapter also describes how the HMPC met the following requirements from the 10-step planning process. This chapter consists of the following subsections:

- 8.1 Mitigation Strategy Overview
- 8.2 Goals
- 8.3 Identification and Analysis of Mitigation Activities

Requirement §201.6(c)(3)(ii): [The mitigation strategy section shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure. All plans approved by FEMA after October 1, 2008, must also address the jurisdiction's participation in the NFIP, and continued compliance with NFIP requirements, as appropriate.

8.1 Mitigation Strategy: Overview

The results of the planning process, the risk assessment, the goal setting, and the identification of mitigation actions led to the mitigation strategy and mitigation action plan for this HMP. The following umbrella mitigation strategy was used during development of this HMP:

Communicate the hazard information collected and analyzed through this planning process as well as HMPC success stories so that the community better understands what can happen where and what they themselves can do to be better prepared.

Implement the action plan recommendations of this plan.

Use existing rules, regulations, policies, and procedures already in existence.

Monitor multi-objective management opportunities so that funding opportunities may be shared and packaged and broader constituent support may be garnered.

8.1.1 Continued Compliance with the NFIP

Given the flood hazards in the planning area, an emphasis will be placed on continued compliance with the NFIP and participation in the CRS. Each participating jurisdiction will meet or exceed the following minimum requirements as set by the NFIP:

- Issuing or denying floodplain development/building permits
- Inspecting all development to assure compliance with the local ordinance
- Maintaining records of floodplain development
- Assisting in the preparation and revision of floodplain maps
- Helping residents obtain information on flood hazards, floodplain map data, flood insurance and proper construction measures

8.2 Goals

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

Chapters 4 through 6 document the hazards and associated risks that threaten Cumberland and Hoke Counties including the vulnerability to structures, infrastructure, and critical facilities. Chapter 7 evaluates the capacity of the participating jurisdictions to reduce the impact of those hazards. The intent of Goal Setting is to identify areas where improvements to existing capabilities (policies and programs) can be made so that community vulnerability is reduced. Goals are also necessary to guide the review of possible mitigation measures. This Plan needs to make sure that recommended actions are consistent with what is appropriate for the communities. Mitigation goals need to reflect community priorities and should be consistent with other plans in the community.

Goals are general guidelines that explain what is to be achieved. They are usually broad-based policy type statements, long term and represent global visions. Goals help define the benefits that the plan is trying to achieve.

8.2.1 Coordination with Other Planning Efforts

The goals of this plan need to be consistent with and complement the goals of other planning efforts. The primary planning document where the goals of this Plan must complement and be consistent with is the Comprehensive Plan. The Comprehensive Plan is important as it is developed and designed to guide future growth within the community. Therefore, there should be some consistency in the overall goals and how they relate to each other.

8.2.2 Goal Setting Exercise

On November 12 2015, the HMPC conducted an exercise to outline goals for this hazard mitigation plan. The first part of the exercise included asking each committee member: “What would you most like to see in your community’s future?” and “What should the goals be of our mitigation program?” Each member viewed Figures 8-1 and 8-2 in a PowerPoint presentation.

An open discussion took place on the current goals in the Cumberland County Multi-Jurisdictional Plan dated April 2011 and the Hoke County Multi-Jurisdictional Plan dated March 2010. Each member ranked the current goals in order of priority and also identified new goals. The goals for this 2016 Regional Plan have been updated to reflect the priority ranking and any new goals identified by the HMPC. The updated goals better reflect current hazards and current conditions within the participating communities.

Goals Exercise – Part 1

What would you most like to see in your community's future?

Here are possible answers to this question, listed in alphabetical order. Pick three that you think are most important. You may reword them or add new ones if you want.

- Educated children
- Improved air quality
- Improved water quality
- Less new development
- Less traffic congestion
- Improved/more businesses
- Improved/more cultural facilities
- Improved/more housing
- Improved/more public transportation
- Improved/more job opportunities
- Improved/more knowledgeable residents
- Improved/more open space
- Improved/more shopping
- New development confined to areas already developed
- Preserved historical/cultural sites
- Special attention given to elderly/disabled
- Special attention given to lower income areas
- Special attention given to newer shopping areas
- Special attention given to older business areas
- Younger people staying/moving into the area
- Other_____

Figure 8.1 - Goals Exercise - Part 1

Goals Exercise – Part 2

What should be the goals of our mitigation program?

Here are possible answers to this question, listed in alphabetical order. Pick three that you think are most important. You may reword them or add new ones if you want.

- Help people protect themselves
- Make sure future development doesn't make things worse
- Maximize the share paid by benefiting property owners
- Maximize use of state and federal funds
- Minimize property owner's expenditures
- Minimize public expenditures
- New developments should pay the full cost of protection measures
- Protect businesses from damage
- Protect cars and other vehicles
- Protect centers of employment
- Protect critical facilities
- Protect forests
- Protect homes
- Protect new/future buildings
- Protect people's lives
- Protect power stations and power lines
- Protect public health
- Protect public services (fire, police, etc.)
- Protect repetitively flooded areas
- Protect scenic areas, greenways, etc.
- Protect schools
- Protect shopping areas
- Protect streets
- Protect utilities (power, phone, water, sewer, etc.)
- Protect wetlands/environmentally sensitive areas
- Protect a particular area_____
- Protect a particular property_____
- Restrict development in hazardous areas
- Use public/private partnerships
- Other_____

Figure 8.2 - Goals Exercise - Part 2

8.2.3 Resulting Goals

At the end of the exercise, the HMPC agreed upon four general goals for this planning effort. The refined goals are as follows:

Goal #1

Protect properties and natural resources that are at risk of damage due to hazards and undertake cost-effective mitigation measures to minimize losses.

Goal #2

Reduce vulnerability of Cumberland and Hoke Counties and their municipalities to all hazards for existing development, future development, redevelopment and infrastructure.

Goal #3

Improve public awareness of hazards through a variety of education and outreach programs.

Goal #4

Establish and participate in local, state and federal mitigation-oriented and disaster-based programs and planning efforts to reduce damage and protect lives and property.

8.3 Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): [The mitigation strategy section shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure. All plans approved by FEMA after October 1, 2008, must also address the jurisdiction's participation in the NFIP, and continued compliance with NFIP requirements, as appropriate.

In order to identify and select mitigation projects to support the mitigation goals, each hazard identified in Chapter 4 - Hazard Identification was evaluated. The HMPC then analyzed viable mitigation options that supported the identified goals. The HMPC reviewed a PowerPoint presentation and handout covering the following six mitigation categories as well as examples of potential mitigation actions for each of these categories which are utilized as part of the CRS planning process:

- Prevention (Required to be evaluated)
- Property Protection
- Natural Resource Protection
- Emergency Services
- Structural Projects
- Public Information and Outreach

The HMPC was also provided with FEMA's *Mitigation Ideas* guidance document dated January 2013 which provides example mitigation actions organized by natural hazard. The HMPC was instructed to consider both future and existing buildings in evaluating possible mitigation actions and to also consider including projects from other plans and studies within the community including projects from the Capital Improvement Plan. A facilitated discussion then took place to examine and analyze the options. This discussion was followed by a brainstorming session that generated a list of preferred mitigation actions by hazard.

8.3.1 Prioritization Process

Once the mitigation actions were identified, the HMPC was provided with several decision-making tools, including FEMA's recommended prioritization criteria, STAPLEE sustainable disaster recovery criteria; Smart Growth principles; and others, to assist in deciding why one recommended action might be more important, more effective, or more likely to be implemented than another. To be a qualifying mitigation project, the project must meet at least four of the seven STAPLEE criteria. STAPLEE stands for the following:

- Social: Does the measure treat people fairly? (e.g. different groups, different generations)
- Technical: Is the action technically feasibly? Does it solve the problem?
- Administrative: Are there adequate staffing, funding and other capabilities to implement the project?
- Political: Who are the stakeholders? Will there be adequate political and public support for the project?
- Legal: Does the jurisdiction have the legal authority to implement the action? Is it legal?
- Economic: Is the action cost-beneficial? Is there funding available? Will the action contribute to the local economy?

- Environmental: Does the action comply with environmental regulations? Will there be negative environmental consequences from the action?

In accordance with the DMA requirements, an emphasis was placed on the importance of a benefit-cost analysis in determining action priority. It was agreed that the following four criteria would be used to determine the priority of the action items:

- Contribution of the action to save life or property
- Availability of funding and perceived cost-effectiveness
- Available resources for implementation
- Ability of the action to address the problem

With these criteria in mind, HMPC members were asked to prioritize each mitigation project based on whether the project should be considered a short range, medium range or long range priority. The priority time frames for project implementation were determined to be as follows:

Short Range = Project should be completed in less than one year
Medium Range = Project should be completed in two to three years
Long Range = Project should be completed in more than four years

The process of identification and analysis of mitigation alternatives allowed the HMPC to come to consensus and to prioritize recommended mitigation actions. The HMPC discussed the contribution of the action to saving lives or property as first and foremost, with additional consideration given to the benefit-cost aspect of a project; however, this was not a quantitative analysis. The team agreed that prioritizing the actions collectively enabled the actions to be ranked in order of relative importance and helped steer the development of additional actions that meet the more important objectives while eliminating some of the actions which did not garner much support. Benefit-cost was also considered in greater detail in the development of the Mitigation Action Plan detailed in Chapter 9. The cost-effectiveness of any mitigation alternative will be considered in greater detail through performing benefit-cost project analyses when seeking FEMA mitigation grant funding for eligible actions associated with this plan.

9 MITIGATION ACTION PLAN

Requirement §201.6(c)(3)(ii): [The mitigation strategy section shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure. All plans approved by FEMA after October 1, 2008, must also address the jurisdiction's participation in the NFIP, and continued compliance with NFIP requirements, as appropriate.

Chapter 9 presents the mitigation action plan developed by each participating jurisdiction. The action plans were developed to present the recommendations developed by the HMPC for how the communities can reduce the risk and vulnerability of people, property, infrastructure, and natural and cultural resources to future disaster losses. Emphasis was placed on both future and existing development. The action plan summarizes who is responsible for implementing each of the prioritized actions as well as when and how the actions will be implemented. **Table 9-1 identifies new and/or revised mitigation actions for each participating jurisdiction**. A status update for the previous mitigation actions from the 2011 Cumberland County Multi-Jurisdictional Plan and the 2010 Hoke County Multi-Jurisdictional Plan are detailed within the Annex for each community.

It should be clarified that the actions included in this mitigation strategy are subject to further review and refinement; alternatives analyses; and reprioritization due to funding availability and/or other criteria. The participating jurisdictions are not obligated by this document to implement any or all of these projects. Rather this mitigation strategy represents the desires of the each community to mitigate the risks and vulnerabilities from identified hazards.

Table 9.1 - Mitigation Action Plan by Jurisdiction

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
Cumberland County and All Jurisdictions										
1	Maintain an all Hazards public education program to educate and prepare residents for all of the hazards that impact Cumberland County.	To educate, enhance preparedness, and resiliency of Cumberland County and its municipal residents through public education programs that included booths at fairs, festivals and special events, websites, brochures, school programs, and etc.	Cumberland County Emergency Management	$90,000	Local Operating Budget	Short Range	New			All Hazards
2	Explore the Fire Adapted Communities concept implementation in Cumberland County.	To enhance the preparedness and resiliency of Cumberland County and its municipalities to the effects of wild land fire and urban interface, through education; programs such as Fire Wise, Ready Set Go, Community Wildfire Protection Plan; Fuel Management; local codes and ordinances.	Emergency Management, NC Forest Service and Fire Marshalls	Staff Hours	Local Operating Budget and Federal	Medium Range	New	X	X	Wildfire
3	Conduct a countywide infrastructure vulnerability assessment to identify priority needs for updating ill-designed or outdated critical structures.	It has been difficult to locate any comprehensive assessments of local infrastructure in Cumberland and Hoke Counties. With current and projected natural hazard occurrences, it is essential to have an accurate and comprehensive understanding of the current condition of critical facilities to ensure the ability to continue to provide for basic needs, such as water and electrical supplies, transportation routes, waste management, etc.	County/city structural and civil engineers in partnership with U.S. Army Corps of Engineers	Staff Hours	Local Operating Budget and Federal	Medium Range	New	X		All Hazards
4	Conduct social vulnerability analysis to identify priority needs and opportunities that will address the specific problems vulnerable populations face from a range of hazards, including barriers to evacuation, event-specific vulnerabilities, and impediments to recovery.	There exist various groups of individuals that have additional financial, social and/or environmental barriers to being resilient in the face of natural hazard events. In Cumberland County, for example, groups with significant number of people affected include about 10K outdoor workers with direct exposure to extreme heat days, elderly people and especially those with existing cardiovascular conditions, and other low-income and/or minority groups. As natural hazard events increase in intensity and frequency, these groups will find it harder to safely and efficiently get out of harm's way. These groups will also have difficulty in obtaining and paying for essential components to sustain life, such as medications, utilities, and transportation to/from a place of work, etc.	County Social Services Department and/or County Health Department	Staff Hours	Local Operating Budget	Medium Range	New			All Hazards
5	Collaborate with NC Cooperative Extension and NC Agriculture and Forestry Adaptation Working Group to provide more local support and encouragement of forest conservation and farmland preservation measures.	Forests and farmland provide a multitude of social, economic and environmental benefits, that when looked at comprehensively, far outweigh any profit/revenue projections of residential or commercial properties. Outside of development pressure, some of the other major health risks include: (1) increasing wildfire risk, (2) increasing number and types of insects and pests, (3) lack of sufficient water during the growing season for crops, and (4) increasing damage from strong winds and flooding. It is vital, especially in the face of a changing climate, to preserve these working lands and to support higher density development in already existing urban and suburban centers.	County Board of Commissioners, Conservation District Programs, and other land preservation organizations.	Unknown	NC Cooperative Extension, NC Forest Service, US Department of Agriculture and NC Wildlife Resources Commission.	Short Range	New		X	Wildfire, Inland Flooding
6	Include climate predictions from the Cumberland County Climate Resiliency Plan in the Regional Hazard Mitigation Plan.	To properly prepare for natural hazard occurrences, it is important to include predictions that warn of: (1) increasing temperatures and extreme heat days, (2) increasing frequency and strength of severe weather events, (3) more heavy rain/flooding, and (4) more frequent and prolonged drought. Although some climate	The Planning Department/Planning Director for each jurisdiction in Cumberland County	None	Existing FEMA grant	Short Range	New	X	X	All Hazards

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
		projections do not pose an immediate threat, any comprehensive mitigation plan for emergency management should at the very least, and by the very nature of the definition of "mitigation", acknowledge the changing climate and possibility of increased extreme weather and flooding events.								
7	Provide financial assistance for low-income residents to help with power bills and support services during extended periods of high temperature and other extreme weather.	Low-income households face challenges in keeping up with utility bills. Some low-income utility assistance programs are offered, but funds are limited. Extreme weather and increasing temperatures will place even greater pressure on these programs' ability to provide assistance to all those in need, and citizen's lives will be increasingly at stake.	County Health Department	Unknown	NC Department of Health and Human Services and County Department of Health	Medium Range	New			Extreme Heat, Winter Weather
8	Analyze and update local development ordinances to make buildings safer from wind and flooding, more energy and water efficient, more tolerant of heat waves and healthier to live in. Also, provide incentives for making buildings safer from wind, flooding, more energy and water efficient, and healthier to live in.	Energy and water efficiency will be increasingly important to a community's resiliency in the face of natural hazards specifically because of projections of increasing temperatures and extreme heat days, and prolonged periods of drought. Climate projections also state that precipitation will continue to follow a seasonal pattern, whereby hot, Summer months are classified with less precipitation and Winters with more precipitation. Extreme heat days will be specially taxing on buildings with older A/C systems or inadequate insulation and in low-income households where upkeep with rising utility costs could become a burden.	Planning and Code Departments of each jurisdiction	Staff Hours	Local Operating Budget	Medium Range	New		X	Inland Flooding, Hurricane Wind, Thunderstorm Wind, Extreme Heat, Winter Storms
9	Use natural systems, more open space and green surfaces to manage stormwater in a more resilient fashion.	Impervious surfaces typically found in urban centers, such as paved roads, buildings, parking lots and pavement, drastically increase flash floods and urban flooding, which seems to be a common occurrence in Cumberland County. For instance, within a 90 day period (March 1 – June 30, 2015), three flooding incidents were reported due to heavy rainfall events. Use of LID stormwater management practices is mentioned only in summary in the Growth Factor Analysis, stating it "…should be emphasized in sensitive areas…" This, coupled with the naturally flat topography of the eastern portions of the County also help to create excess runoff and subsequent urban flooding issues, especially in the Special Flood Hazard Areas (SFHA) of the County, and specifically around Blounts and Cross Creek, as referenced in various resources.	Engineering Department of each jurisdiction	Staff Hours	Local Operating Budget	Short Range	New		X	Inland Flooding
Cumberland County Unincorporated Areas										
1	Restrict Residential and Non-Compatible Uses within the Special Flood Hazard Area.	Prohibit developing within the Special Flood Hazard Area and promote the flood area as an environmental corridor and open space, while reducing potential losses during a flood hazard.	Cumberland County Planning and Inspections Department and Cumberland County Board of Commissioners	Staff Hours	Local Operating Budget	Short Range	Revised		X	Inland Flooding
2	Identify and map structures that are vulnerable to high winds.	By providing the location of structures that would be greatly impacted by high winds would assist in lessen the impact during a hazard event while also providing assistance to emergency responders.	Cumberland County Emergency Services	Unknown	Unknown	Short Range	Revised	X	X	Hurricane Wind, Thunderstorm Wind
3	Develop a tree ordinance to address clear cutting.	Provide more pervious area for natural drainage, while reducing the vulnerability to localized flooding and extreme heat.	Cumberland County Planning and Inspections Department and Cumberland County Board of Commissioners	Staff Hours $5,000 - $10,000	Local Operating Budget	Medium Range	Revised	X	X	Inland Flooding, Extreme Heat
4	Develop a greenway program as a means to protect natural	Provides a buffer from urban encroachment and reduces flooding and erosion.	Cumberland County and Fayetteville/Cumberland	Unknown	Unknown	Long Range	Revised		X	Inland Flooding

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
	areas along the rivers, streams, creeks and drain ways.		County Parks and Recreation Department							
5	Revise the Subdivision Ordinance requiring an additional access for emergency vehicles and to be used as an evacuation route for developments located near special flood hazard area.	This will provide an additional access for residents, public safety officials and emergency services to those developments located near a special flood hazard area, while reducing the possibility of a life threatening situation for residents, public officials and emergency services.	Cumberland County Board of Commissioners and Cumberland County Planning & Inspections Department	Staff Hours $5,000 - $10,000	Local Operating Budget	Medium Range	Revised		X	Inland Flooding
City of Fayetteville										
1	Provide stormwater infrastructure improvements to mitigate reported flooding.	The stormwater program provides drainage infrastructure improvements to protect property, health and safety as associated with reported flooding. This program is designed to be responsive and sensitive to the needs of residents and property owners and responds to customer inquiries regarding drainage and flooding issues in the city. Once reported, an investigation is conducted and recommended for improvements. Those projects identified are then scheduled based on priority and funding available as part of the City's Capital Improvements Program (CIP). Funding is available through the Stormwater Utility Fee.	City of Fayetteville Engineering and Infrastructure Department (Giselle Rodriguez, PE)	Unknown	Local Operating Budget	Short Range	New	X	X	Inland Flooding
2	Improve access to reliable and convenient emergency shelters.	Communities with sub-standard and/or mobile homes are especially at risk from severe weather events due to structural deficiencies. Mobile homes constitute the second highest housing unit types in Cumberland County (detached single-family homes being the highest) and tend to be concentrated in certain portions of the County. Observed and projected trends in severe weather events pose a significant threat to the health and safety of these communities, and reliable and convenient emergency shelters may not be available.	County and State Emergency Services	Unknown	FEMA and County/State Emergency Services	Short Range	New			All Hazards
Town of Eastover										
1	Restrict Residential and Non-Compatible Uses within the Special Flood Hazard Area.	Prohibit developing within the Special Flood Hazard Area and promote the flood area as an environmental corridor and open space, while reducing potential losses during a flood hazard.	Cumberland County Planning and Inspections Department and Town of Eastover	Staff Hours	Local Operating Budget	Short Range	Revised		X	Inland Flooding
2	Develop a tree ordinance to address clear cutting.	Provide more pervious are for natural drainage, while reducing the vulnerability to localized flooding and extreme heat.	Cumberland County Planning and Inspections Department and Town of Eastover	Staff Hours $5,000 - $10,000	Local Operating Budget	Medium Range	Revised		X	Inland Flooding, Extreme Heat
3	Develop a greenway program as a means to protect natural areas along the rivers, streams, creeks and drain ways.	Provides a buffer from urban encroachment and reduces flooding and erosion.	Town of Eastover and Fayetteville/Cumberland County Parks and Recreation Department	Staff Hours	Local Operating Budget	Long Range	Revised		X	Inland Flooding, Erosion
4	Revise the Subdivision Ordinance requiring an additional access for emergency vehicles and to be used as an evacuation route for developments located near special flood hazard area.	This will provide an additional access for residents, public safety officials and emergency services to those developments located near a special flood hazard area, while reducing the possibility of a life threatening situation for residents, public officials and emergency services.	Town of Eastover and Cumberland County Planning & Inspections Department	Staff Hours $5,000 - $10,000	Local Operating Budget	Medium Range	Revised		X	Inland Flooding

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
Town of Falcon										
1	Restrict Residential and Non-Compatible Uses within the Special Flood Hazard Area	Prohibit developing within the Special Flood Hazard Area and promote the flood area as an environmental corridor and open space, while reducing potential losses during a flood hazard.	Cumberland County Planning and Inspections Department and Town of Falcon	Staff Hours	Local Operating Budget	Short Range	Revised		X	Inland Flooding
2	Revise the Subdivision Ordinance requiring an additional access for emergency vehicles and to be used as an evacuation route for developments located near special flood hazard area.	This will provide an additional access for residents, public safety officials and emergency services to those developments located near a special flood hazard area, while reducing the possibility of a life threatening situation for residents, public officials and emergency services.	Town of Falcon and Cumberland County Planning & Inspections Department	Staff Hours $5,000 - $10,000	Local Operating Budget	Medium Range	Revised		X	Inland Flooding
Town of Godwin										
For the Town of Godwin, refer to "Cumberland County and All Jurisdictions" above. There are no new or revised projects in addition to those stated above.										
Town of Hope Mills										
1	Creek mitigation tied to Hope Mills Lake Dam	The Town of Hope Mills is currently making repairs to the Hope Mills Lake Dam with an anticipated completion of the end of 2016. At that time the lake will be filled back to the historical levels where there will then be a need for various activities tied to creek mitigation. These activities will assist in the preservation of the creek bank while reducing erosion levels.	Town of Hope Mills Public Works Department	Staff Hours	Local Operating Budget	Short Term	New	X	X	Dam Failure, Erosion
2	Restrict Residential And Non-Compatible Uses Within The 100-Year Floodplain.	Promote flood area as an environmental corridor and open space and prohibit development within the Special Flood Hazard Area, while reducing potential losses during a flood hazard.	Town of Hope Mills Planning Department and Storm Water Department	Staff Hours	Local Operating Budget	Short Range	Revised		X	Inland Flooding
3	Develop A Tree Ordinance To Address Clear Cutting, Protection Of Existing Trees And Vegetation.	Promote an amendment to the Town of Hope Mills Tree Ordinance that ties to the conditions of approvals for all developments that anticipate the removal of trees.	Town of Hope Mills Planning Department and Inspections Department	Staff Hours $5,000 - $10,000	Local Operating Budget	Medium Range	Revised	X	X	Inland Flooding, Extreme Heat
4	Revised Subdivision Ordinance Requiring Additional Access To Be Used As An Evacuation Route For Developments Located Near Special Hazard Areas.	The Town of Hope Mills Subdivision Ordinance was recently updated to include sidewalk requirements for new construction. Evacuation routes should be studied and language should be drafted to include requirements for evacuation routes where applicable.	Town of Hope Mills Planning Department and Inspections Department	Staff Hours $5,000 - $10,000	Local Operating Budget	Long Range	Revised		X	Inland Flooding
Town of Linden										
1	Develop a zoning ordinance for the Town.	Zoning ordinance helps protect the health, safety and welfare of its citizens as well as reduce vulnerability to natural hazards.	Town of Linden and Cumberland County Planning & Inspections Department	Staff Hours $5,000 - $10,000	Local Operating Budget	Long Range	Revised		X	All Hazards
Town of Spring Lake										
1	Review and Make Necessary Changes to the Town Stormwater Ordinances. Enhance and Expand, the Cleaning and Improvement to Existing Streams and Drainage Ways.	Continue to annually review and amend the Stormwater Ordinances to provide additional provisions to clean and improve drainage ways and streams to reduce flooding.	Spring Lake Utilities Department	Staff Hours	Local Operating Budget	Long Range	Revised	X	X	Inland Flooding, Erosion
Town of Stedman										

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
1	Revise the Subdivision Ordinance requiring an additional access for emergency vehicles and to be used as an evacuation route for developments located near special flood hazard area.	This will provide an additional access for residents, public safety officials and emergency services to those developments located near a special flood hazard area, while reducing the possibility of a life threatening situation for residents, public officials and emergency services.	Town of Stedman and Cumberland County Planning & Inspections Department	Staff Hours $5,000 - $10,000	Local Operating Budget	Medium Range	Revised		X	Inland Flooding
Town of Wade										
1	Revise the Subdivision Ordinance requiring an additional access for emergency vehicles and to be used as an evacuation route for developments located near special flood hazard area.	This will provide an additional access for residents, public safety officials and emergency services to those developments located near a special flood hazard area, while reducing the possibility of a life threatening situation for residents, public officials and emergency services.	Town of Wade and Cumberland County Planning & Inspections Department	Staff Hours $5,000 - $10,000	Local Operating Budget	Medium Range	Revised		X	Inland Flooding
Hoke County and All Jurisdictions										
1	Conduct a countywide infrastructure vulnerability assessment to identify priority needs for updating ill-designed or outdated critical structures.	It has been difficult to locate any comprehensive assessments of local infrastructure in Cumberland and Hoke Counties. With current and projected natural hazard occurrences, it is essential to have an accurate and comprehensive understanding of the current condition of critical facilities to ensure the ability to continue to provide for basic needs, such as water and electrical supplies, transportation routes, waste management, etc.	County/city structural and civil engineers in partnership with U.S. Army Corps of Engineers	Staff Hours	Local Operating Budget and Federal	Medium Range	New	X		All Hazards
2	Conduct social vulnerability analysis to identify priority needs and opportunities that will address the specific problems vulnerable populations face from a range of hazards, including barriers to evacuation, event-specific vulnerabilities, and impediments to recovery.	There exist various groups of individuals that have additional financial, social and/or environmental barriers to being resilient in the face of natural hazard events. As natural hazard events increase in intensity and frequency, these groups will find it harder to safely and efficiently get out of harm's way. These groups will also have difficulty in obtaining and paying for essential components to sustain life, such as medications, utilities, and transportation to/from a place of work, etc.	County Social Services Department and/or County Health Department	Staff Hours	Local Operating Budget	Medium Range	New			All Hazards
3	Collaborate with NC Cooperative Extension and NC Agriculture and Forestry Adaptation Working Group to provide more local support and encouragement of forest conservation and farmland preservation measures.	Forests and farmland provide a multitude of social, economic and environmental benefits, that when looked at comprehensively, far outweigh any profit/revenue projections of residential or commercial properties. Outside of development pressure, some of the other major health risks include: (1) increasing wildfire risk, (2) increasing number and types of insects and pests, (3) lack of sufficient water during the growing season for crops, and (4) increasing damage from strong winds and flooding. It is vital, especially in the face of a changing climate, to preserve these working lands and to support higher density development in already existing urban and suburban centers.	County Board of Commissioners, Conservation District Programs, and other land preservation organizations.	Unknown	NC Cooperative Extension, NC Forest Service, US Department of Agriculture and NC Wildlife Resources Commission.	Short Range	New		X	Wildfire, Inland Flooding
4	Include climate predictions from the Cumberland County Climate Resiliency Plan in the Regional Hazard Mitigation Plan.	To properly prepare for natural hazard occurrences, it is important to include predictions that warn of: (1) increasing temperatures and extreme heat days, (2) increasing frequency and strength of severe weather events, (3) more heavy rain/flooding, and (4) more frequent and prolonged drought. Although some climate	The Planning Department/Planning Director for each jurisdiction in Hoke County	None	Existing FEMA grant	Short Range	New	X	X	All Hazards

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
		projections do not pose an immediate threat, any comprehensive mitigation plan for emergency management should at the very least, and by the very nature of the definition of "mitigation", acknowledge the changing climate and possibility of increased extreme weather and flooding events.								
5	Provide financial assistance for low-income residents to help with power bills and support services during extended periods of high temperature and other extreme weather.	Low-income households face challenges in keeping up with utility bills. Some low-income utility assistance programs are offered, but funds are limited. Extreme weather and increasing temperatures will place even greater pressure on these programs' ability to provide assistance to all those in need, and citizen's lives will be increasingly at stake.	County Health Department	Unknown	NC Department of Health and Human Services and County Department of Health	Medium Range	New			Extreme Heat, Winter Weather
6	Analyze and update local development ordinances to make buildings safer from wind and flooding, more energy and water efficient, more tolerant of heat waves and healthier to live in.	Energy and water efficiency will be increasingly important to a community's resiliency in the face of natural hazards specifically because of projections of increasing temperatures and extreme heat days, and prolonged periods of drought. Climate projections also state that precipitation will continue to follow a seasonal pattern, whereby hot, Summer months are classified with less precipitation and Winters with more precipitation. Extreme heat days will be specially taxing on buildings with older A/C systems or inadequate insulation and in low-income households where upkeep with rising utility costs could become a burden.	Planning and Code Departments of each jurisdiction	Staff Hours	Local Operating Budget	Medium Range	New		X	Inland Flooding, Hurricane Wind, Thunderstorm Wind, Extreme Heat, Winter Storms
7	Use natural systems, more open space and green surfaces to manage stormwater in a more resilient fashion.	Impervious surfaces typically found in urban centers, such as paved roads, buildings, parking lots and pavement, drastically increase flash floods and urban flooding.	Engineering Department of each jurisdiction	Staff Hours	Local Operating Budget	Short Range	New		X	Inland Flooding
8	Update records for flood prone areas in Unincorporated Hoke County and the City of Raeford. Also create a database and GIS mapping available to the public.	Hoke County Emergency Management has in the past generated a list of flood prone areas and have mapped them for internal use. The list should be updated, mapped, and the map made available to the public for their awareness.	Hoke County Emergency Management and Hoke County GIS	Staff Hours	Local Operating Budget	Short Range	New	X	X	Inland Flooding
Unincorporated Hoke County										
1	Consider placing signs at flood prone areas identifying them as such	While a database and map available to the public is useful, placing signs at the location of flood prone areas would alert those living in the area and drivers.	Hoke County Addressing and NCDOT	Estimate $2000 for signs; plus staff labor putting the signs up.	Local Operating Budget	Short Range	New	X	X	Inland Flooding
2	Review zoning and subdivision ordinances in conjunction with Emergency Management to ensure they are up to date and include appropriate mitigation measures.	The Hoke County Zoning Ordinance was last comprehensively reviewed and updated several years ago. The level of development in the county has grown significantly. The ordinances should be reviewed and updated to reflect current need and expected growth.	Hoke County Planning Department	Staff Hours	Local Operating Budget	Medium Range	New		X	All Hazards
3	Upgrade the Emergency Operations Center building	The Emergency Operations Center lacks some structural needs that modern operation centers typically have. Upgrading the building would make sure the center can be used for emergency operations in the event of a natural disaster.	Hoke County Emergency Management	Unknown	Local Operating Budget	Long Range	New			All Hazards

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
4	Conduct survey of all county owned structures to determine if there are any mitigation projects that can be undertaken to repair / upgrade them to withstand natural disasters.	County schools are inspected once a year but other county facilities are not. By conducting a survey of the buildings county staff can identify areas that could be improved to help mitigate future issues brought about by natural disasters.	Hoke County Building Inspections, Fire Marshal, and Emergency Management	Staff Hours	Local Operating Budget	Medium Range	New			All Hazards
5	Create website that makes flood insurance information available to the public.	Citizens should have an area they can go to find ready general information about the importance of flood insurance. The Planning Department has some brochures and information sheets available to the public but an online resource would be available at all times.	Hoke County Planning	Staff Hours	Local Operating Budget	Short Range	New	X	X	Inland Flooding
6	Coordinate with Fort Bragg on protective measures for the Red Cockaded Woodpecker and other endangered species.	There are several threatened, endangered, and protected species in Hoke County. Currently the county government is not proactive in ensuring steps are taken to prevent development from further impacting the species. Fort Bragg has had an ongoing program to protect species on the base. Coordinating with Fort Bragg would be a resource to help protect the endangered species.	Hoke County Planning	Staff Hours	Local Operating Budget	Short Range	New		X	All Hazards
7	Investigate incentives for LEED / green structures.	Green infrastructure causes less impact on the natural environment and thus helps mitigate future environmental issues that could exacerbate or encourage a natural or environmental disaster. Using incentives through local zoning or taxes can encourage future green development.	County Manager's Office	Staff Hours	Local Operating Budget	Short Range	New		X	Inland Flooding, Erosion
8	Amend subdivision ordinance to allow cluster developments.	Cluster developments maximize density and open space to reduce the impact of development on the environment.	Hoke County Planning	Staff Hours	Local Operating Budget	Medium Range	New		X	Inland Flooding
9	Evaluate evacuation plans and other emergency procedures to ensure they incorporate new residential and commercial development.	Rapid growth throughout the county needs to be taken into account in emergency plans.	Hoke County Emergency Management	Staff Hours	Local Operating Budget	Short Range	New	X	X	All Hazards
10	Conduct annual progress meeting with Hazard Mitigation steering committee	Annual progress meetings keep projects on track and ensures the goals and objectives of the plan are met by the time of the next plan update.	Hazard Mitigation Steering Committee	Staff Hours	Local Operating Budget	Short Range	New			All Hazards
11	Pursue funding to relocate or demolish hazardous buildings	Rural areas of the county have abandoned or partially demolished residential and accessory structures that are potential fire hazards. Removing structures is a costly procedure. Finding a funding source to remove buildings would allow the county to remove at least one (1) or more hazardous structures a year.	Hoke County Emergency Management, Building Inspections, Planning	Staff Hours	Local Operating Budget	Medium Range	New	X		Wildfire
City of Raeford										
For the City of Raeford, refer to "Hoke County and All Jurisdictions" above. There are no new or revised projects in addition to those stated above.										

10 PLAN ADOPTION

44 CFR Subsection D §201.6(c)(5): [The plan shall include] documentation that the plan has been formally approved by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council).

The purpose of formally adopting this plan is to secure buy-in, raise awareness of the plan, and formalize the plan's implementation. The adoption of this plan completes Planning Step 9 of the 10-step planning process: Adopt the Plan, in accordance with the requirements of DMA 2000. This plan will be adopted by the appropriate governing body for each participating community pending FEMA and NCEM approval. An example resolution is shown below.

(INSERT COUNTY)

RESOLUTION NO. _____

ADOPTING THE CUMBERLAND HOKE REGIONAL HAZARD MITIGATION PLAN

WHEREAS, areas of (Insert County) are vulnerable to the human and economic costs of natural disasters; and

WHEREAS, (Insert County) realizes the importance of reducing or eliminating those vulnerabilities for the health, safety, and welfare of its citizens; and

WHERREAS, (Insert County) participated in a hazard mitigation planning process to identify mitigation projects that address the identified hazards the County is vulnerable to; and

WHEREAS, the Legislature of the State of North Carolina in Article 1 of Chapter 166A of the General Statues (Adopted in Session Law 2001-214, Senate Bill 300 Effective July 1, 2001) the eligible entity must have a hazard mitigation plan approved according the Stafford Act; and

WHEREAS, it is the intent of the Board of Commissioners of (Insert County) to fulfill this obligation in order that the County remains eligible for state and federal disaster assistance; and

WHEREAS, Section 322 of the Federal Disaster Mitigation Act of 2000 states that local governments must develop an All Hazards Mitigation Plan and update it every five-years in order to receive future Hazard Mitigation Grant Program funds;

NOW, THEREFORE, Be it resolved by the Board of Commissioners of (Insert County) hereby:

1. Adopt the Cumberland Hoke Regional Hazard Mitigation Plan
2. Request and instruct the appropriate agency personnel to pursue available funding opportunities for the implementation of mitigation projects designated therein,
3. (Insert County) will continue to participate in the updating and expansion of the Cumberland Hoke Regional Hazard Mitigation Plan,
4. Appoints (Insert Responsible Person) to oversee an annual review of the Cumberland Hoke Regional Hazard Mitigation Plan to ensure the mitigation projects are being implemented

Adopted this ____ Day of _____, 2016

_____

Chairman of the Board of County Commissioners

ATTEST:

_____

(Insert Clerk) (Seal)

11 PLAN MAINTENANCE

This Chapter provides an overview of the overall strategy for plan integration and maintenance and outlines the method and schedule for monitoring, evaluating, and updating the plan. The section also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement. It consists of the following subsections:

- 11.1 Integration into Local Planning Mechanisms
- 11.2 Monitoring, Evaluating, and Updating
- 11.3 Continued Public Involvement

Requirement §201.6(c)(4): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

11.1 Integration into Local Planning Mechanisms

Implementation and maintenance of the plan is critical to the overall success of hazard mitigation planning. This is Planning Step 10 of the 10-step planning process. An important implementation mechanism that is highly effective and low-cost is incorporation of the Hazard Mitigation Plan recommendations and their underlying principles into other plans and mechanisms. Where possible, plan participants will use existing plans and/or programs to implement hazard mitigation actions. As previously stated, mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms. These existing mechanisms include:

- Comprehensive Plans
- Emergency Management Plans
- Ordinances
- Flood/Stormwater Management/Master Plans
- Other plans, regulations, and practices with a mitigation focus

The HPMC has developed a process by which the principles and actions included in this hazard mitigation plan will be incorporated into other plans. During the planning process for new and updated local planning documents such as those listed above, the Cumberland County Department of Emergency Services or Hoke County Emergency Management (as appropriate) will provide a copy of the hazard mitigation plan to the advisory committee for each relevant planning document. The advisory committee will be directed to ensure that all goals and strategies of the new or updated local planning document are consistent with the hazard mitigation plan and will not increase the spatial extent or probability of future occurrence of the hazards.

Incorporation into existing planning mechanisms will be done through the routine actions of:

- Monitoring other planning/program agendas;
- Attending other planning/program meetings;
- Participating in other planning processes; and

- Monitoring community budget meetings for other community program opportunities.

It should be noted that most jurisdictions within Cumberland Hoke Counties are participants in the county-level version of each type of plan and do not have stand-alone plans of their own. Thus, the Cumberland County Department of Emergency Services and Hoke County Emergency Management will be acting on behalf of the municipalities when sharing and advising on the incorporation of the hazard mitigation plan. Therefore, each municipality's process for integrating the hazard mitigation plan into other planning mechanisms is the same as the county level process since the planning documents are often countywide plans and ordinances. It should also be noted that municipal representatives often participate in the update of multiple community documents due to the small size of the communities and limited staff. Therefore, participation in the hazard mitigation planning process will naturally transfer to the planning processes of other local planning documents.

11.2 Monitoring, Evaluating, and Updating

The HMPC identified in Chapter 2 will convene annually and following a hazard event. Cumberland County Emergency Management Agency will be responsible for facilitating, coordinating, and scheduling reviews and maintenance of the plan. The review of the Hazard Mitigation Plan will be conducted as follows:

- The Cumberland County Emergency Management Agency will be responsible for leading the meeting to review the plan.
- Notices will be emailed to the members of the HMPC, federal, state, and local agencies, non-profit groups, local planning agencies, representatives of business interests, neighboring communities, and others advising them of the date, time, and place for the review.
- Local City officials will be noticed by email.
- Prior to the review, department heads and others tasked with implementation of the various activities will be queried concerning progress on each activity in their area of responsibility and asked to present a report at the review meeting.
- A copy of the current plan will be available for public comment.
- After the review meeting, a status report will be developed outlining implementation of projects over the past year.

Criteria for Annual Reviews

The criteria recommended in 44 CFR 201 and 206 will be utilized in reviewing and updating the plan. More specifically, the annual reviews will include the following information:

- Community growth or change in the past year.
- The number of substantially damaged or substantially improved structures by flood zone.
- The renovations to public infrastructure including water, sewer, drainage, roads, bridges, gas lines, and buildings.
- Natural hazard occurrences that required activation of the Emergency Operations Center (EOC) and whether or not the event resulted in a presidential disaster declaration.
- Natural hazard occurrences that were not of a magnitude to warrant activation of the EOC or a federal disaster declaration but were severe enough to cause damage in the community or closure of businesses, schools, or public services.
- The dates of hazard events descriptions.
- Documented damages due to the event.

- Closures of places of employment or schools and the number of days closed.
- Road or bridge closures due to the hazard and the length of time closed.
- Assessment of the number of private and public buildings damaged and whether the damage was minor, substantial, major, or if buildings were destroyed. The assessment will include residences, mobile homes, commercial structures, industrial structures, and public buildings, such as schools and public safety buildings.
- Review of any changes in federal, state, and local policies to determine the impact of these policies on the community and how and if the policy changes can or should be incorporated into the Hazard Mitigation Plan. Review of the status of implementation of projects (mitigation strategies) including projects completed will be noted. Projects behind schedule will include a reason for delay of implementation.

Schedule for Five-year Update

The Cumberland and Hoke Counties will submit a five-year written update to NCEM and FEMA Region IV, unless disaster or other circumstances (e.g., changing regulations) require a change to this schedule. With this plan update anticipated to be fully approved and adopted in 2016, the next plan update will occur in 2021.

11.3 Continued Public Involvement

Continued public involvement is imperative to the overall success of the plan's implementation. The update process provides an opportunity to solicit participation from new and existing stakeholders and to publicize success stories from the plan implementation and seek additional public comment. The plan maintenance and update process will include continued public and stakeholder involvement and input through attendance at designated committee meetings, web postings, press releases to local media, and through public hearings.

Public Involvement Process for Annual Reviews

The public will be notified via the Cumberland and Hoke County websites.

Public Involvement for Five-year Update

When the HMPC reconvenes for the five-year update, they will coordinate with all stakeholders participating in the planning process—including those that joined the committee since the planning process began—to update and revise the plan. In reconvening, the HMPC will develop a plan for public involvement and will be responsible for disseminating information through a variety of media channels detailing the plan update process. As part of this effort, public meetings will be held and public comments will be solicited on the plan update draft.

ANNEX A - CUMBERLAND COUNTY UNINCORPORATED AREAS

A.1 Community Profile

A.1.1 Geography

Cumberland County is located in south central North Carolina in the Upper Coastal Plain physiographic region. Cumberland County is part of the Fayetteville, NC Metropolitan Statistical Area and is part of the Mid-Carolina Council of Governments. Cumberland County was established in 1754 from Bladen County, and the county seat is Fayetteville. According to the U.S. Census Bureau, the County has a total area of approximately 658 square miles of which 652 square miles is land and 6.1 square miles is water. Cumberland County is located in the Cape Fear River basin, with only the far southeast corner draining to the Lumber River basin.

A.1.2 Population and Demographics

Table A1 provides population counts and the percentage change in population since 2010 for Cumberland County Unincorporated Areas. Based on the 2010 census, the population density is 490 people per square mile.

Table A1 - Population Counts for Cumberland County Unincorporated Areas

Jurisdiction	2010 Census Population	2014 Estimated Population	% Change 2010-2014
Cumberland County	319,431	324,002	1.4

Source: U.S. Census Bureau, 2015

Based on the 2010 Census, the median age of residents in Cumberland County is 31.0. The racial characteristics of the County are presented below in Table A2.

Table A2 - Demographics of Cumberland County Unincorporated Areas

Jurisdiction	White Persons, Percent (2010)	Black Persons, Percent (2010)	American Indian or Alaska Native, Percent (2010)	Asian Persons, Percent (2010)	Hispanic or Latino Persons, Percent (2010)[1]
Cumberland County	51.4	36.7	1.6	2.2	9.5

[1]Persons of Hispanic Origin may be of any race, so are also included in applicable race category.
Source: U.S. Census Bureau, 2010

A.2 Risk Assessment

This subsection includes a hazard profile and vulnerability assessment for each of the priority hazards identified in Chapter 5 Subsection 13 (Table 5.20) as they pertain to Cumberland County Unincorporated Areas. **Additional information for each hazard can be found in Chapter 5 - Hazard Profiles and Chapter 6 – Vulnerability Assessment.**

A.2.1 Dam/Levee Failure

Location and Spatial Extent

Table A3 provides details for 57 dams included in the North Carolina Dam Inventory that are located within Cumberland County Unincorporated Areas.

Table A3 - North Carolina Dam Inventory for Cumberland County Unincorporated Areas

Dam Name	NIDID	Height (ft)	NID Storage (acre-feet)	Dam Status	River[1]	Hazard Classification
Cumberland Lake Dam	NC01135	12	240	BREACHED	Buckhead Creek	High
Gainey Mill Pond	NC04916	11	0	BREACHED	South River-Os	High
Gates Four Dam	NC00036	25	173	IMPOUNDING	Little Rockfish Creek	High
Hope Mills Dam #1	NC01121	33	1175	BREACHED	Little Rockfish Creek	High
Hutaff Lake Dam	NC00032	15.9	123	EXEMPT-DOD	Stewart Creek	High
Kiest Lake Dam	NC00025	25	80	EXEMPT-DOD	Little River-Tr	High
Lake Charles Dam	NC01122	21	156	BREACHED	Rockfish Creek-Os	High
Lewis Lake Dam	NC01169	14	96	IMPOUNDING	Lower Little River-Os	High
Long Valley Farm Lake Dam	NC01126	18	672	IMPOUNDING	Jumping Run Creek	High
McFayden Lake Dam	NC00031	14	65	IMPOUNDING	Tank Creek	High
Monticello Pond Dam	NC04969	16.2	24.24	BREACHED	Rockfish Creek-Tr	High
Mt.Vernon Estates	NC02160	14.2	79.52	IMPOUNDING	Kirks Mill Creek	High
Point East Dam	NC02144	17	113	BREACHED	Kirks Mill Creek	High
Rhodes Lake Dam	NC01145	15.2	2304	IMPOUNDING	Black River	High
Wallace Lake Dam	NC01134	14	480	BREACHED	Buckhead Creek	High
Multipurpose Trail Dam	NC05582	15.4	14	EXEMPT	Not Provided	Intermediate
Barbour Pond Dam	NC00037	16	57.6	IMPOUNDING	Gum Branch	Low
Barnes Lake Dam	NC01150	20	82	EXEMPT-HB_SIZE	Lower Little River-Os	Low
Bullard Road Dam	NC06079	16.5	28	EXEMPT	Cape Fear	Low
Clark Lake Dam	NC01149	13	125	EXEMPT	Lower Little River-Tr	Low
Currin Lake Dam	NC01151	14	264	EXEMPT	Carver Creek-Os	Low
Cypress Lake Dam	NC01119	10	416	EXEMPT	Grays Creek	Low

Dam Name	NIDID	Height (ft)	NID Storage (acre-feet)	Dam Status	River[1]	Hazard Classification
Davis Pond Dam	NC02128	9	0	EXEMPT	Cape Fear River-Os	Low
Dudley Lake Dam	NC01141	15	184	EXEMPT	Cedar Creek	Low
DuPont DERC Pond #3	NC05676	22	50	EXEMPT-HB_SIZE	Willis Creek, Cape Fear	Low
Dupont Lower Dam	NC05581	18	36	EXEMPT-HB_SIZE	Not Provided	Low
Fann Lake Dam	NC01136	22	104	EXEMPT-HB_SIZE	Cape Fear River-Os	Low
Gallberry Farm Pond	NC05097	14	0	EXEMPT	Grays Creek	Low
Heriot Wilkins Dam	NC02138	32	76.8	IMPOUNDING	Carvers Creek-Tr	Low
Heron Lake Dam	NC02129	16	38.4	IMPOUNDING	Rockfish Creek-Os	Low
Holt Pond Dam	NC02142	20	11	EXEMPT-HB_SIZE	Cape Fear River-Os	Low
Hulon Lake Dam	NC02139	18	43.2	IMPOUNDING	Rockfish Creek-Os	Low
Jaycees Pond Dam	NC04944	17	0	EXEMPT-HB_SIZE	Cape Fear River-Os	Low
King Lake Dam	NC00026	12	140	EXEMPT	Stewart Creek	Low
Lake Lynn Dam	NC01137	7	96	EXEMPT	Big Sandy Run	Low
Marsh Wood Lake Dam	NC01138	25	148	IMPOUNDING	Willis Creek	Low
Maxwell Dam	NC02135	17	88.4	IMPOUNDING	Rockfish Creek-Os	Low
Maxwell Mill Pond Dam	NC05156	10	0	EXEMPT	Big Creek	Low
Mckellar Lake Dam Lower	NC00029	12	125	EXEMPT-DOD	Mcpherson Creek	Low
Mckellar Lake Dam Upper	NC00030	12	74	EXEMPT-DOD	Mcpherson Creek	Low
Permastone Lake Dam	NC01120	14	156	EXEMPT	Rockfish Creek-Os	Low
Pinewood Lakes Dam	NC02143	20	32	EXEMPT-HB_SIZE	Rockfish Creek-Os	Low
Pond Site Zero Dam	NC05932	26	16	EXEMPT-DOD	Not Provided	Low
Purlator Products Dam	NC02145	16	32	IMPOUNDING	Buckhead Creek-Os	Low
Rainbow Lake Dam	NC01140	10	384	EXEMPT	Gray Creek	Low
Ryder Golf Course Dam	NC05928	15	16	EXEMPT-DOD	Not Provided	Low

Dam Name	NIDID	Height (ft)	NID Storage (acre-feet)	Dam Status	River[1]	Hazard Classification
Saddleridge Dam	NC05604	16.2	0	EXEMPT-HB_SIZE	Little Rockfish Creek - TR	Low
Simmons Lake Dam	NC01127	18	72	EXEMPT-DOD	Cross Creek-Os	Low
Smith Lake Dam	NC01129	10	238	EXEMPT-DOD	Cross Creek-Os	Low
Smith Lake Dam	NC01142	10	77	EXEMPT	Harrison Creek-Os	Low
Smith Lake Dam	NC01148	10	73	EXEMPT	Cape Fear River-Tr	Low
Texas Lake Dam	NC01128	10	65	EXEMPT-DOD	Cross Creek-Os	Low
Tyner Dam	NC06026	12.2	0	EXEMPT	Kirk's Mill Creek	Low
Upchurch Lake Dam	NC01202	29	2137	IMPOUNDING	Rockfish Creek	Low
Verdery Lake Dam	NC01139	14	87	EXEMPT	Swan Creek	Low
Warren Lake Dam	NC01123	14	56	EXEMPT	Cape Fear River-Os	Low
Watson Lake Dam	NC01124	10	61	EXEMPT	Cape Fear River-Os	Low

Source: North Carolina Dam Inventory, December 2014

[1]If the dam is located on an unnamed stream/tributary, the unnamed stream/tributary name is followed with "-TR". If the dam is located off stream of an unnamed stream/tributary, the unnamed stream/tributary name is followed with "-OS".

Past Occurrences

Table A4 details known past dam failures in Cumberland County Unincorporated Areas.

Table A4 – Known Dam Failures in Cumberland County Unincorporated Areas

Location	County	Date of Occurrence	Result of Failure	Deaths/ Injuries	Property Damage	Details
Jaycees Pond	Cumberland	6/19/1995	Flood	None reported	None reported	None reported
Lake Lynn Dam	Cumberland	6/19/1995	Flood	None reported	None reported	None reported
Wallace Lake Dam	Cumberland	1988	Piping	None reported	None reported	None reported

Probability of Future Occurrence

Possible - Based on historical occurrence information (3 records in 65 years), it can reasonably be assumed that Cumberland County Unincorporated Areas have a 5% chance of this type of event occurring each year.

Vulnerability Assessment

The estimated number and characteristics of buildings that could potentially be impacted by a dam failure are shown in Table A5. **Note: the numbers presented in Table A5 are estimated based on the methodology described in Chapter 6 Subsection 3.1. A dam inundation study including a hydrologic and hydraulic analysis was not performed.**

Table A5 - Properties Potentially at Risk to Dam Failure

Jurisdiction	Number of Buildings in Estimated Inundation Area	Total Building Value	Estimated Content Value	Total Value
Cumberland County (High Hazard Dams)	2	$409,281.00	$172,877.84	$582,158.84
Cumberland County (Low Hazard Dams)	17	$3,261,681.00	$1,587,747.78	$4,849,428.78
Total	**19**	**$3,670,962.00**	**$1,760,625.62**	**$5,431,587.62**

A.2.2 Drought

Location and Spatial Extent

Drought cannot be confined to geographic or political boundaries. The Cumberland County region is designated as moderately dry.

Past Occurrences

According to the North Carolina Drought Monitor, Cumberland County Unincorporated Areas have experienced drought conditions every year since 2000. Table A6 shows the most severe classification for each year.

Table A6 - Historical Drought Occurrences

Year	Cumberland County
2000	Abnormally Dry
2001	Severe Drought
2002	Extreme Drought
2003	Abnormally Dry
2004	Abnormally Dry
2005	Abnormally Dry
2006	Moderate Drought
2007	Exceptional Drought
2008	Exceptional Drought
2009	Moderate Drought
2010	Moderate Drought
2011	Severe Drought
2012	Moderate Drought
2013	Abnormally Dry
2014	Abnormally Dry
2015	Moderate Drought

Source: NC Drought Monitor

Probability of Future Occurrence

Highly Likely - Based on historical occurrence information (15 records in 15 years), it can reasonably be assumed that Cumberland County Unincorporated Areas have a 100% chance of this type of event occurring each year.

Vulnerability Assessment

It is assumed that whereas all buildings and facilities in the planning area would technically be exposed to the drought hazard, there is no significant vulnerability to these buildings on a structural level. Population growth could contribute directly to this hazard, as an increased number of users pull from the available water supply within the region

A.2.3 Earthquake

Location and Spatial Extent

As detailed in Chapter 5 – Hazard Profiles, Cumberland County Unincorporated Areas lie within an approximate zone level between 6 and 10% ground acceleration. This indicates that the region as a whole exists within an area of moderate seismic risk.

Past Occurrences

A list of earthquakes that have caused damaged in North Carolina is presented below in Table A7.

Table A7 - Earthquakes Affecting North Carolina

Date	Location	Richter Scale
12/16/1811	NE Arkansas	8.5
01/23/1812	New Madrid, MO	8.4
02/07/1812	New Madrid, MO	8.7
04/29/1852	Wytheville, VA	5.0
08/31/1861	Wilkesboro, NC	5.1
12/23/1875	Central Virginia	5.0
08/31/1886	Charleston, SC	7.3
05/31/1897	Giles County, VA	5.8
01/01/1913	Union County, SC	4.8
02/21/1916	Asheville, NC	5.5
07/08/1926	Mitchell County, NC	5.2
11/03/1928	Newport, TN	4.5
05/13/1957	McDowell County, NC	4.1
07/02/1957	Buncombe County, NC	3.7
11/24/1957	Jackson County, NC	4.0
10/27/1959	Chesterfield, SC	4.0
07/13/1971	Newry, SC	3.8
11/30/1973	Alcoa, TN	4.6
11/13/1976	Southwest Virginia	4.1

Date	Location	Richter Scale
05/05/1981	Henderson County, NC	3.5

Source: Wake County 2014 Hazard Mitigation Plan. Information provided by NCEM.

Probability of Future Occurrence

Possible - Based on historical occurrences, the probability of a significant earthquake event affecting Cumberland County Unincorporated Areas is possible. There are a total of 20 records in North Carolina over the past 200 years. Therefore, the annual probability level is estimated between 1 and 10 percent.

Vulnerability Assessment

An earthquake has the potential to impact all existing and future buildings, facilities, and populations in Cumberland County Unincorporated Areas. Impacts of earthquakes include debris clean-up, service disruption and, in severe cases, fatalities due to building collapse. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 3.

A.2.4 Extreme Heat

Location and Spatial Extent

Extreme heat typically occurs over large areas impacting multiple counties at one time. All of Cumberland County Unincorporated Areas are vulnerable to extreme heat.

Past Occurrences

According to the National Climatic Data Center, one instance of extreme heat was recorded in Cumberland County beginning on July 22, 1998, and an additional instance of extreme heat was recorded in Cumberland County beginning on August 10, 2007.

Probability of Future Occurrence

Possible - Based on historical occurrence information (2 records in 65 years), it can reasonably be assumed that an extreme heat event has a 3% chance of occurring each year in Cumberland County.

Vulnerability Assessment

Extreme heat is not likely to impact the built environment, but may impact agriculture and pose a threat to humans. Elderly persons, persons with respiratory disabilities, and children may be at risk to experience health problems during extreme heat events, some of which could result in serious illness or death. Potential losses of human life due to extreme heat are not quantified in this Plan. There are no past reports of death or property or crop damage recorded by NCEI.

A.2.5 Hurricane/Tropical Storm

Location and Spatial Extent

All Atlantic and Gulf of Mexico coastal areas are subject to hurricanes. While coastal areas are most directly exposed to land falling hurricanes and tropical storms, their impact can be felt hundreds of miles inland. The entire Cumberland County region is equally susceptible to hurricanes and tropical storms.

Past Occurrences

Table A8 provides hurricane and tropical storm data reported by NCEI since 1950 for Cumberland County.

Table A8 - NCEI Hurricane and Tropical Storm Events for Cumberland County

Location	Date	Event Type	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland (Zone)	7/12/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/5/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	8/27/1998	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/4/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/15/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/18/2003	Hurricane (Typhoon)	0/0	$28,000.00	$0.00
Cumberland (Zone)	09/01/2006	Tropical Storm	0/0	$0.00	$0.00
			Total:	**$28,000.00**	**$0.00**

While not included in the NCEI database, Category 4 Hurricane Hazel (DR-28) came ashore in North Carolina on October 15, 1954 and caused substantial damage in the region. With winds reaching 125mph at Grannis Field, Hurricane Hazel caused an estimated $136 million in property damage; 19 deaths; 200 injuries; destruction of 15,000 homes and structures; and damage to 39,000 structures.

Probability of Future Occurrence

Likely - Based on a historical record of eight storm events over a period of 65 years (1950 - 2015), it can reasonably be assumed that this type of event has a 12% chance of occurring each year.

Vulnerability Assessment

In conclusion, hurricane wind has the potential to impact all existing and future buildings, facilities, and populations in Cumberland County Unincorporated Areas. Impacts of hurricanes include flood damage, debris clean-up, service disruption and possible fatalities due to flooding or flying debris. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 5.

A.2.6 Inland Flooding: 100-/500-year

Location and Spatial Extent

The Cumberland County parcel layer and effective 2007 DFIRM were intersected and the flooded parcel area was calculated in acres. Flood zones were assigned to parcels based on the intersection of a parcel with a flood zone. Parcels can be located in multiple flood zones, and only the flooded acreage within the parcel was included in the calculation for each flood zone. Table A9 provides a summary of acreage by flood zone.

Table A9 - Flood Zone Acreage

Jurisdiction	Flood Zone Acreage					
	Zone A (100-year)	Zone AE (100-year)	Zone VE (100-year)	Zone X Shaded (500-year)	Zone X Unshaded	Total
Cumberland County Unincorporated Areas	119	29,485	0	32,356	275,115	337,075

Cumberland County's parcel and building footprint layers were used to examine the inventory of properties at risk. Table A10 provides the building count, estimated building value, estimated content value and estimated total value for all buildings located within each FEMA flood zone.

Table A10 - Properties at Risk

Occupancy Type	Total Number of Buildings in Floodplain	Total Building Value	Estimated Content Value	Total Value
Zone A				
Agricultural	0	$0	$0	$0
Commercial	0	$0	$0	$0
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	1	$175,665	$87,833	$263,798
Total	**1**	**$175,665**	**$87,833**	**$263,798**
Zone AE				
Agricultural	9	$318,681	$362,724	$681,405
Commercial	14	$1,286,841	$1,286,841	$2,573,683
Education	0	$0	$0	$0
Government	1	$66,184	$66,184	$132,368
Industrial	3	$533,172	$586,798	$1,119,970
Religious	4	$2,064,321	$2,064,321	$4,128,643
Residential	280	$25,160,189	$14,576,039	$39,736,228
Total	**311**	**$29,429,389**	**$18,942,908**	**$48,372,297**
Zone X (500-yr)				
Agricultural	162	$16,585,814	$16,591,182	$33,176,997
Commercial	124	$51,754,348	$51,754,345	$103,508,694
Education	5	$2,258,924	$2,258,924	$4,517,848
Government	10	$3,945,479	$3,945,476	$7,890,955
Industrial	48	$38,108,997	$55,944,945	$94,053,942
Religious	19	$12,361,353	$12,361,351	$24,722,704
Residential	2,264	$219,148,948	$104,489,198	$323,638,146
Total	**2,632**	**$344,163,864**	**$247,345,421**	**$591,509,285**
Zone X (Unshaded)				
Agricultural	1,047	$93,020,500	$93,048,636	$186,069,136
Commercial	1,006	$620,010,216	$620,084,528	$1,240,094,743
Education	129	$258,906,960	$258,796,503	$517,703,463
Government	34	$30,156,833	$36,863,091	$67,019,924
Industrial	239	$464,819,546	$634,482,441	$1,099,301,987
Religious	266	$203,230,864	$203,230,836	$406,461,700
Residential	36,500	$3,919,358,008	$1,789,465,014	$5,708,823,022
Total	**39,221**	**$5,589,502,927**	**$3,635,971,048**	**$9,225,473,975**

Source: North Carolina Emergency Management, Risk Management, 2013

Note: Content value estimations are generally based on the FEMA Hazus methodology of estimating value as a percent of improved structure values by property type. The residential property type assumes a content replacement value equal to 50% of the building value. Agricultural, commercial, education, government, and religious property types assume a content replacement value equal to 100% of the building value. The industrial property type assumes a content replacement value equal to 150% of the building value.

Past Occurrences

Table A11 shows detail for flood events reported by the NCEI since 1950 for Cumberland County. There have been 46 recorded events causing close to $3.6M in property damage.

Table A11 - NCEI Flooding Events in Cumberland County

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Flash Flood	40	$2,132,000	$0	0	0
Flood	2	$0	$0	0	0
Heavy Rain	4	$1,500,000	$0	0	0
Total:	**46**	**$3,632,000**	**$0**	**0**	**0**

Source: NCEI, September 2015

Probability of Future Occurrence

Possible - By definition of the 100-year flood event, SFHAs are defined as those areas that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. Properties located in these areas have a 26 percent chance of flooding over the life of a 30-year mortgage.

The 500-year flood area is defined as those areas that will be inundated by the flood event having a 0.2-percent chance of being equaled or exceeded in any given year; it is not the flood that will occur once every 500 years.

Vulnerability Assessment

Properties at Risk to Flooding

The loss estimate for flood is based on the total of improved building value and contents value. Land value is not included in any of the loss estimates as generally the land is not subject to loss from floods. Once the potential value of affected parcels was calculated, damage factors were applied to obtain loss estimates by flood zone.

Table A12 shows the building count, total value, estimated damages and loss ratio for buildings that fall within the Zone AE 100-year floodplain by occupancy type on the community level.

The loss ratio is the loss estimate divided by the total potential exposure (i.e., total of improved and contents value for all buildings located within the Zone AE 100-year floodplain) and displayed as a percentage of loss. FEMA considers loss ratios greater than 10% to be significant and an indicator a community may have more difficulties recovering from an event.

Table A12 - Estimated Building Damage and Content Loss – Flood 100-yr Return Period

Occupancy Type	Total Number of Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Zone AE						
Agricultural	1	$220,223	$18,966	$86,444	$105,410	47.9%
Commercial	9	$1,516,092	$57,367	$214,820	$272,187	18.0%
Education	0	$0	$0	$0	$0	n/a
Government	0	$0	$0	$0	$0	n/a
Industrial	2	$268,128	$15,893	$41,944	$57,837	21.6%

Occupancy Type	Total Number of Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Religious	1	$193,203	$11,592	$82,128	$93,720	48.5%
Residential	207	$20,437,768	$1,545,353	$984,303	$2,529,656	12.4%
Total	**220**	**$22,635,413**	**$1,649,171**	**$1,409,640**	**$3,058,811**	**13.5%**

Source: North Carolina Emergency Management, Risk Management, 2013

Critical Facilities at Risk to Flooding

Of significant concern with respect to any disaster event is the location of critical facilities in the planning area. Critical facilities are often defined as those essential services and facilities in a major emergency which, if damaged, would result in severe consequences to public health and safety or a facility which, if unusable or unreachable because of a major emergency, would seriously and adversely affect the health, safety, and welfare of the public. Critical facilities within the County are detailed in the Table A13 and Figure A1 below.

Table A13 - Critical Facilities and FEMA Flood Zones

Facility Name	Address	Facility Type	Estimated 100-yr Flood Depth (Ft)
Zone AE			
n/a	n/a	n/a	n/a
Zone A (100-yr)			
n/a	n/a	n/a	n/a
Zone X Shaded (500-yr)			
n/a	n/a	n/a	n/a
Zone X Unshaded			
Cotton Volunteer Fire Department	4618 Calico	Fire	n/a
Cumberland Road Fire Department	3543 Cumberland Rd	Fire	n/a
Grays Creek Fire Department	7010 Fire Department Rd	Fire	n/a
Godwin-Falcon Fire Department	7805 Godwin Falcon Rd	Fire	n/a
Beaver Dam Fire Department	11042 NC 210 HWY S	Fire	n/a
Westarea Fire Department	6989 Ramsey St	Fire	n/a
Vander Fire Department	4960 Tabor Church Rd	Fire	n/a
Bethany Rural Fire Department	2140 Wade Stedman Rd	Fire	n/a
Alderman Road Elementary	3036 Alderman	School	n/a
Pine Forest High School	437 Andrews Rd	School	n/a
Howard Hall Elementary School	526 Andrews Rd	School	n/a
Gallberry Farms Elementary School	8019 Byerly Dr	School	n/a
Grays Creek Middle School	5151 Celebration	School	n/a
Grays Creek High School	5301 Celebration	School	n/a
Cape Fear High School	4762 Clinton Rd	School	n/a

Facility Name	Address	Facility Type	Estimated 100-yr Flood Depth (Ft)
Mac Williams Middle School	4644 Clinton Rd	School	n/a
John Griffin Middle School	5551 Fisher Rd	School	n/a
Honeycutt Park Elementary School	4665 Lakewood Dr	School	n/a
E M Cashwell Elementary School	2970 Legion Rd	School	n/a
Seabrook School	4619 NC 210 HWY S	School	n/a
Beaver Dam Elementary School	12059 NC 210 HWY S	School	n/a
Pine Forest High School	6901 Ramsey St	School	n/a
Raleigh Road Elementary School	8334 Ramsey St	School	n/a
Jack Britt High School	7403 Rockfish Rd	School	n/a
Gray's Creek Elementary School	2964 School Rd	School	n/a
District 7 Elementary School	5721 Smithfield Rd	School	n/a
Sunnyside School	3876 Sunnyside School Rd	School	n/a

Source: Cumberland County Emergency Management Agency, 2015

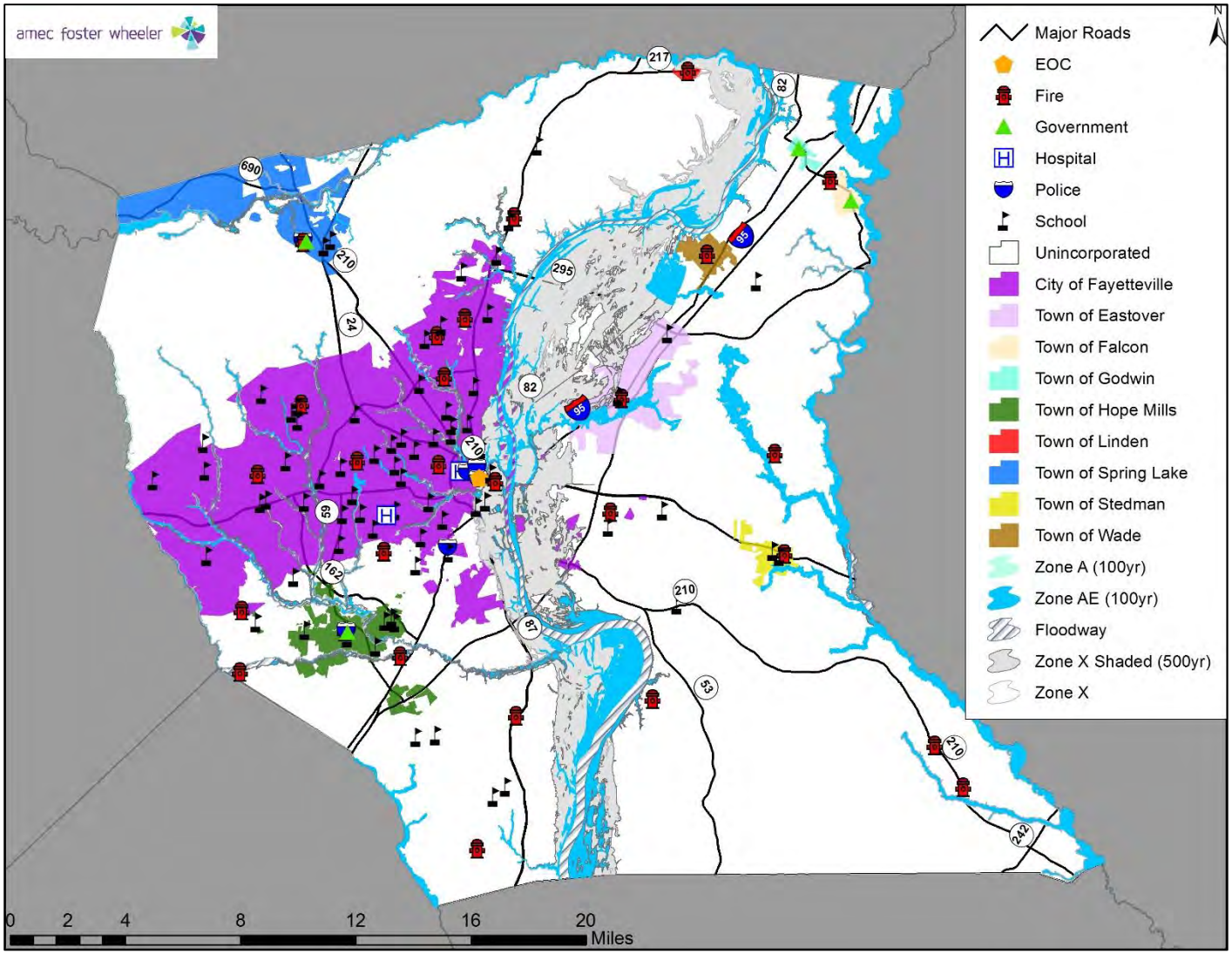


Figure A1 - Cumberland County Critical Facilities and FEMA Flood Zones

Repetitive Loss Properties

A repetitive loss property is a property for which two or more flood insurance claims of more than $1,000 have been paid by the NFIP within any 10-year period since 1978. An analysis of repetitive loss was completed by the County to examine repetitive loss properties against FEMA flood zones.

According to 2015 FEMA Community Information System records, there are a total of 2 unmitigated repetitive loss properties within Cumberland County. One property is located in the A or AE zone and 1 property is located in the B, C or X zone. Table A14 details repetitive loss building counts and number of losses for the unmitigated properties.

Table A14 - Cumberland County Unmitigated Repetitive Loss Summary

Property Type	Building Count		# of Losses	Total Repetitive Loss Payments ($)
	Insured	Uninsured		
Residential	2	0	4	$30,959.96
Commercial	0	0	0	0.00
Total	**2**	**0**	**4**	**$30,959.96**

Source: NC State NFIP Coordinator, September 2015, FEMA Community Information System, December 2015

A.2.7 Severe Weather (Thunderstorm Wind, Lightning & Hail)

Location and Spatial Extent

The entirety of Cumberland County Unincorporated Areas can be considered at risk to severe weather events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

Table A15 shows detail for severe weather events reported by the NCEI since 1950 for Cumberland County. There have been over 350 recorded events causing 13 injuries and over $4M in property damage.

Table A15 - NCEI Severe Weather Events in Cumberland County

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Hail	128	$1,025,000	$0	0	0
High Wind	5	$101,000	$0	0	0
Lightning	15	$1,836,000	$0	0	4
Strong Wind	9	$118,000	$7,000	0	1
Thunderstorm Wind	198	$1,328,500	$0	0	8
Total:	**355**	**$4,408,500**	**$7,000**	**0**	**13**

Probability of Future Occurrence

Highly Likely - Given the high number of previous events (355 records in 65 years), it is certain that severe weather events, including wind, lightning and hail, will occur in the future. This results in a probability level of highly likely (100 percent annual probability) for future severe weather events for the entire planning area.

Vulnerability Assessment

Severe weather events including thunderstorm wind, lightning and hail has the potential to impact all existing and future buildings, facilities, and populations in Cumberland County Unincorporated Areas.

Impacts of severe weather events include wind damage, debris clean-up, hail damage, and potential fatalities due to lightning strikes and associated fires. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 7.

A.2.8 Tornado

Location and Spatial Extent

The entirety of Cumberland County Unincorporated Areas can be considered at risk to tornado events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

According to NCEI records, Cumberland County has experienced 23 tornadoes since 1950. These events are reported to have caused five deaths, 169 injuries and close to $133M in property damage.

Table A16 - NCEI Records for Tornadoes in Cumberland County (1950-2015)

Location	Date	Tornado Fujita Scale	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland Co	4/8/1957	F4	0/8	$250,000.00	$0.00
Cumberland Co	6/2/1959	F0	0/0	$25,000.00	$0.00
Cumberland Co	10/4/1960	F1	0/0	$25,000.00	$0.00
Cumberland Co	9/29/1963	F2	0/0	$250,000.00	$0.00
Cumberland Co	12/26/1964	F1	0/1	$2,500.00	$0.00
Cumberland Co	2/22/1971	F3	2/60	$2,500,000.00	$0.00
Cumberland Co	3/15/1971	F1	0/0	$250,000.00	$0.00
Cumberland Co	5/29/1973	F1	0/0	$25,000.00	$0.00
Cumberland Co	8/2/1974	F0	0/0	$25,000.00	$0.00
Cumberland Co	2/11/1981	F2	0/0	$250,000.00	$0.00
Cumberland Co	3/28/1984	F3	2/11	$25,000,000.00	$0.00
Cumberland Co	3/28/1984	F4	0/0	$2,500,000.00	$0.00
Cumberland Co	5/19/1986	F2	0/0	$250,000.00	$0.00
Cumberland Co	8/28/1988	F1	0/0	$250,000.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	5/28/2000	F0	0/0	$0.00	$0.00
Cumberland Co	12/17/2000	F0	0/0	$0.00	$0.00
Cumberland Co	3/27/2009	EF1	0/0	$225,000.00	$0.00
Cumberland Co	4/16/2011	EF3	1/85	$100,000,000.00	$0.00
Cumberland Co	4/16/2011	EF2	0/4	$250,000.00	$0.00
Cumberland Co	4/29/2014	EF1	0/0	$50,000.00	$0.00
			Total:	**$132,932,750.00**	**$0.00**

Probability of Future Occurrence

Likely - The best available information to determine future probability of a tornado event is to review historic frequency. According to NCEI, 23 tornadoes have impacted Cumberland County over a 65 year period. It can reasonably be assumed that Cumberland County Unincorporated Areas have a 35% chance of experiencing a tornado each year.

Vulnerability Assessment

A tornado has the potential to impact all existing and future buildings, facilities, and populations in Cumberland County Unincorporated Areas. Impacts of tornadoes include building and contents damage, debris clean-up, service disruption and potentially numerous fatalities and injuries. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 10.

A.2.9 Wildfire

Location and Spatial Extent

Wildfires could potentially occur anywhere in the region. The Wildland Urban Interface (WUI) is described as the area where structures and other human improvements meet and intermingle with undeveloped wildland or vegetative fuels. Population growth within the WUI substantially increases the risk for wildfire. For the Cumberland County, NC project area, it is estimated that 301,884 people or 95 percent of the total project area population (319,404) live within the WUI. The WUI for Cumberland County is shown within Chapter 5 Subsection 11 (Figure 5.19).

Past Occurrences

Table A17 lists past occurrences of wildfire in Cumberland County since 2005 as provided by the NCFS in September 2015.

Table A17 - Records for Wildfire in Cumberland County

County	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Cumberland	57	75	94	49	21	59	47	24	36	38

Probability of Future Occurrence

Highly Likely - The best available information to determine future probability of a wildfire event is to review historic frequency. According to historic records, 500 wildfires have occurred in Cumberland County between 2005 and 2015 (100% chance of occurring each year).

Vulnerability Assessment

A wildfire has the potential to impact all existing and future buildings, facilities, and populations in Cumberland County Unincorporated Areas. Impacts of wildfire include building and contents damage, debris clean-up, service disruption and potentially numerous fatalities and injuries. Wildfires can also increase flood risk due to loss of vegetation. WUI Risk, Burn Probability and Rate of Spread are provided on the County level in Chapter 6 Subsection 11.

A.2.10 Winter Storm

Location and Spatial Extent

The entirety of Cumberland County Unincorporated Areas can be considered at risk to winter storm events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

According to NCEI records, Cumberland County has experienced 30 winter storm events since 1996, respectively. These events are reported to have caused one death due to icy road conditions.

Table A18 - NCEI Records for Winter Storm Events in Cumberland County (1996-2015)

Date	Location	Type of Winter Storm	Deaths/ Injuries	Property Damage	Crop Damage
1/6/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
1/11/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
2/2/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
2/3/1996	Cumberland County	Cold/wind Chill	0/0	$0.00	$0.00
12/23/1998	Cumberland County	Ice Storm	0/0	$0.00	$0.00
1/18/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/22/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/24/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/28/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
12/3/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/3/2002	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00
12/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/1/2007	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/17/2008	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/19/2008	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/20/2009	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/4/2009	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/29/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/12/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
3/2/2010	Cumberland County	Winter Weather	0/0	$0.00	$0.00
12/16/2010	Cumberland County	Winter Weather	1/0	$0.00	$0.00
12/25/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/10/2011	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/28/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/11/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/12/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/16/2015	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/24/2015	Cumberland County	Winter Weather	0/0	$0.00	$0.00

Source: NCEI, September 2015

Probability of Future Occurrence

Highly Likely - The best available information to determine future probability of a winter storm event is to review historic frequency. According to NCEI, 30 winter storm events have occurred over a 19 year period between 1996 and 2015 resulting in approximately 1.6 significant winter storm events per year.

The probability of a heavy snowfall occurring with that winter storm event is less likely. The figure below presents the probability of 8-inches or more of snowfall to be approximately 12.5% per year for the Cumberland County Region.

Vulnerability Assessment

Potential losses associated with winter storms include the cost of the removal of snow from roadways, debris clean-up, and some indirect losses from power outages, etc. All future structures and infrastructure in the region will be vulnerable to winter storms.

A.3 Priority Risk Index Results

Table A19 summarizes the degree of risk assigned to each identified hazard as it applies to Cumberland County Unincorporated Areas using the PRI method described in Chapter 6 Subsection 4.

Table A19 - Summary of PRI Results for Cumberland County Unincorporated Areas

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Dam/Levee Failure	Possible	Limited	Small	Less than 6 hrs	Less than 6 hrs	2.1
Drought	Highly Likely	Minor	Large	More than 24 hrs	More than 1 week	2.8
Earthquake	Possible	Limited	Moderate	Less than 6 hrs	Less than 6 hrs	2.3
Extreme Heat	Possible	Minor	Large	More than 24 hrs	Less than 1 week	2.1
Hurricane/Tropical Storm	Likely	Critical	Large	More than 24 hrs	Less than 24 hrs	2.9
Inland Flooding: 100-/500-year	Possible	Critical	Moderate	6 to 12 hours	Less than 1 week	2.7
Severe Weather (thunderstorm wind, lightning, & hail)	Highly Likely	Limited	Moderate	6 to 12 hours	Less than 6 hrs	2.8
Tornado	Likely	Critical	Small	Less than 6 hrs	Less than 6 hrs	2.7
Wildfire	Highly Likely	Limited	Small	Less than 6 hrs	Less than 1 week	2.9
Winter Storm	Highly Likely	Minor	Moderate	More than 24 hrs	Less than 1 week	2.5

As shown in Table A20 on the following page, the results from the PRI have been classified into three categories based on the assigned risk value:

- **Low Risk** - Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium Risk** - Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High Risk** - Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread.

Table A20 - Summary of Hazard Risk Classification

Hazard Category	Hazard Type
High Risk (> 2.5)	**Hurricane/Tropical Storm Wildfire Severe Weather Drought Inland Flooding: 100-/500-year Tornado**
Moderate Risk (2.0 – 2.5)	**Winter Storm Earthquake Extreme Heat Dam/Levee Failure**
Low Risk (< 2.0)	**N/A**

A.4 Capability Assessment

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

A.4.1 Planning and Regulatory Capability

Table A21 lists regulatory capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Cumberland County.

Table A21 - Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Y/N	Date	Comments
Comprehensive Plan	Y	4/20/09	2030 Growth Vision Plan and 2030 Growth Strategy Map
Zoning Ordinance	Y	7/3/72	
Subdivision Ordinance	Y	7/1/70	
Floodplain Ordinance	Y	2/1/82	
Stormwater Ordinance	N		Handled by NC DENR
Erosion, Sedimentation and Pollution Control Ordinance	N		Handled by NC DENR
Building Code	Y	1970's	2009 International Code and 2012 North Carolina Building Code
BCEGS Rating	Y	Conducted every 5 Years	Done by ISO
Stormwater Management Program	N		
Site Plan Review Requirements	Y	7/1/70	
Capital Improvements Plan	Y	6/2015	
Economic Development Plan	Y	2006	
Local Emergency Operations Plan	Y	6/18/07	
Flood Insurance Study or Other Engineering Study for Streams	Y	6/18/07	
Repetitive Loss Plan	N		
Elevation Certificates	Y	Since 1982	

A.4.2 Floodplain Management

Cumberland County joined the NFIP emergency program in 1975 and has been a regular participant in the NFIP since February 1982. The following tables reflect NFIP policy and claims data for the County categorized by structure type, flood zone, Pre-FIRM and Post-FIRM.

Table A22 - NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	366	$178,806	$89,934,100	28	$287,140.70
2-4 Family	6	$4,456	$1,267,500	0	$0.00

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
All Other Residential	3	$1,795	$1,030,000	0	$0.00
Non-Residential	18	$36,541	$6,661,000	1	$408.90
Total	**393**	**$221,598**	**$98,892,600**	**29**	**$287,548.00**

Source: FEMA Community Information System, December 2015

Table A23 - NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	70	$62,1029	$15,079,200	10	$112,934.60
A Zones	8	$6,492	$1,182,200	4	$33,191.16
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00
V Zones	0	$0	$0	0	$0.00
D Zones	0	$0	$0	0	$0.00
B, C & X Zone					
Standard	35	$51,865	$8,527,200	2	$12,970,.79
Preferred	280	$101,112	$74,104,000	13	$128,453.05
Total	**393**	**$221,598**	**$98,892,600**	**29**	**$287,548.00**

Source: FEMA Community Information System, December 2015

Table A24 - NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	21	$30,875	$3,329,400	7	$63,215.74
A Zones	6	$5,395	$696,000	4	$33,191.16
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00
V Zones	0	$0	$0	0	$0.00
D Zones	0	$0	$0	0	$0.00
B, C & X Zone	74	$44,127	$20,655,300	11	$128,030.68
Standard	10	$20,244	$2,878,300	2	$12,970.79
Preferred	64	$23,883	$17,777,000	9	$115,059.89
Total	**100**	**$80,397**	**$24,681,300**	**22**	**$224,436.00**

Source: FEMA Community Information System, December 2015

Table A25 - NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	49	$31,254	$11,749,800	3	$49,718.86
A Zones	3	$1,097	$485,600	0	$0.00
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00
V Zones	0	$0	$0	0	$0.00
D Zones	0	$0	$0	0	$0.00
B, C & X Zone	241	$108,850	$61,975,900	4	$13,393.16
Standard	25	$31,621	$5,648,900	0	$0.00
Preferred	216	$77,229	$56,327,000	4	$13,393.16
Total	**293**	**$141,201**	**$74,211,300**	**7**	**$63,111.00**

Source: FEMA Community Information System, December 2015

A.4.3 Administrative and Technical Capability

Table A26 lists administrative capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Cumberland County.

Table A26 - Administrative/Technical Capabilities

Resource	Y/N	Responsible Department
Planner/Engineer with knowledge of land development/land management practices	Y	Cumberland County Engineering & Public Utilities
Engineer/Professional trained in construction practices related to buildings and/or infrastructure	Y	Cumberland County Engineering & Public Utilities
Planner/Engineer/Scientist with an understanding of natural hazards	Y	Cumberland County Engineering & Public Utilities and Cumberland Planning & Inspections Department
Personnel skilled in GIS	Y	Cumberland County Information Services
Full time building official	Y	Cumberland County Planning & Inspections
Floodplain Manager	Y	Cumberland County Engineering & Public Utilities
Emergency Manager	Y	Cumberland County Emergency Services
Grant writer	Y	Cumberland County Planning & Inspections and Cumberland County Emergency Services
GIS data – Hazard areas	Y	Cumberland County Information Services
GIS data – Critical facilities	Y	Cumberland County Information Services
GIS data – Land use	Y	Cumberland County Planning & Inspections Department
GIS data – Building footprints	Y	Cumberland County Information Services
GIS data – Links to Assessor's data	Y	Cumberland County Information Services
Warning Systems/Services	Y	Cumberland County Emergency Services – Code Red Program

A.4.4 Fiscal Capability

Table A27 lists fiscal capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Cumberland County.

Table A27 - Fiscal Mitigation Capabilities

Resource	Accessible/Eligible to Use (Y/N)
Community Development Block Grants	Y
Capital improvements project funding	Y
Authority to levy taxes for specific purposes	Y
Fees for water, sewer, gas or electric services	Y
Impact fees for new development	N
Incur debt through general obligation bonds	Y
Incur debt through special tax bonds	Y
Incur debt through private activity bonds	N
Withhold spending in hazard prone areas	N

A.5 Mitigation Strategy

A.5.1 Status Update for 2011 Mitigation Actions

Table A28 provides a status update for each mitigation action detailed in the 2011 Cumberland County Multi-jurisdictional Hazard Mitigation Plan with Cumberland County designated as the responsible jurisdiction. This table provides a summary of progress to-date and also notes whether each action is to be deleted or carried forward into the 2016 Regional Plan.

Table A28 - Status of 2011 Mitigation Actions

Unincorporated Cumberland County								
Mitigation Action Number	**Action Description**	**Responsible Department**	**Current Status**			**2016 Plan Update**		**Summary of Progress To-Date**
			Complete	**In Progress**	**Not yet Started**	**Delete Action**	**Carry Forward**	
1	Restrict Residential And Non-Compatible Uses Within The 100-Year Flood Area.	Cumberland County Joint Planning Board		X			X (Revised)	Continuing to work on this, especially in those areas of the County that were zoned prior to Flood Maps of 1981 and where no Conservancy District was designated. The County Zoning Ordinance includes CD (Conservancy District) that applies mainly to the Special Flood Hazard Area which limits the type of permitted and special uses within the Special Flood Hazard Area. As rezoning cases are received by the Planning Department that includes portions of the Special Flood Hazard Area the Planning Staff and County Commissioners require that the Special Flood Hazard Areas be zoned for the Conservancy District which prohibits residential and non-compatible uses.
2	Increase The Lowest Floor Elevation To 2 Feet Above The Base Flood Elevation.	Cumberland County Engineering Department	X			X		Completed October 17, 2006 when the Commissioners adopted the revised Flood Damage Prevention Ordinance that includes 2 foot free boarding. Cumberland County CRS was lower to an 8 effective 10/1/2010 because of this requirement.
3	Encourage The Use Of Cluster Type Development To Preserve Special Flood Hazard Areas.	Cumberland County Planning Department	X			X		Completed on August 19, 2008 when the County Commissioners adopted the revised Cumberland County Subdivision Ordinance that allows Zero Lot Line Developments, Density Developments-Conditional Use District, and Planned Neighborhood Developments-Conditional Use District so that the developer can maximize their potential density and not encroach into the Special Flood Hazard Area. Also those areas currently zoned CD (Conservancy District) prohibits residential and non-compatible uses. The Conservancy District is mostly those areas of the County that are designated as the Special Flood Hazard Area.
4	Provide Incentives For Developers Willing To Use Environmentally Friendly Development Practices (Such As Preserving Open Space, Landscaping With Native Vegetation, Providing An Abundance Of Trees And Reduction Of Environmental Impact).	Cumberland County Planning Department	X			X		Completed - Cumberland County has regulations in their Zoning and Subdivision Ordinances that permit environmentally friendly type developments. These regulations include Density Developments-Conditional Use District, Zero Lot Line Developments, and Planned Neighborhood Developments-Conditional Use District. Currently 4 environmentally friendly subdivisions have been constructed in the County and 2 are under construction at this time.
5	Identify And Map Structures That Are Vulnerable To High Winds.	Cumberland County Emergency Services, Cumberland County Planning Department, and Cumberland County Tax Assessors' Office		X			X (Revised)	This project was planned as part of the County's short – term efforts to address mitigation by focusing efforts to structures that are most vulnerable to tornadoes, high winds, hurricanes and severe thunderstorms. Due to current limited resources, this effort has been changed to a long – term implementation. This change in implementation would allow for the development of an efficient workable warning system to alert the public and serve as a data base for any post disaster needs.
6	Develop Uniform Flood Damage Prevention Ordinance.	Cumberland County Engineering Department			X	X		Even though the Cumberland County, City of Fayetteville and the Towns of Hope Mills and Spring Lake Flood Damage Prevention Ordinances are largely the same now, each of these jurisdictions preferred to maintain and enforce their own Flood Damage Prevention Ordinance. The Cumberland County Flood Damage Prevention Ordinance applies to all of the smaller municipalities (Towns of Eastover, Falcon, Godwin, Linden, Stedman and Wade) within Cumberland County. Also Cumberland County participated in the Community Rating System (CRS) whereas the City of Fayetteville and Towns of Hope Mills and Spring Lake at this time do not participate. **The Technical Committee recommends that this action be deleted from Cumberland County's actions.**

Unincorporated Cumberland County								
Mitigation Action Number	Action Description	Responsible Department	Current Status			2016 Plan Update		Summary of Progress To-Date
			Complete	In Progress	Not yet Started	Delete Action	Carry Forward	
7	Revise Subdivision Ordinance To Require That All Utilities Be Placed Underground With The Exception Of High Voltage Electrical Transmission Lines.	All Electrical Providers in Cumberland County	X			X		Completed on August 19, 2008 when the Revised Cumberland County Subdivision Ordinance was adopted by the Board of Commissioners that requires all developments shall have utilities placed underground where practical. High voltage electrical lines are exempted from this requirement. Changed person(s) or Department Responsible to "All Electrical Providers in Cumberland County.
8	Develop A Program To Identify And Eliminate Existing Development That Is Below The 100-Year Flood Elevation.	Cumberland County Engineering Department, Cumberland County Planning Department, and Cumberland County Community Development Department		X		X		This information is provided to the County through NFIP and currently there are no buildings located below the Special Flood Hazard Area. This information will be monitored by the Cumberland County Engineering Department for the Unincorporated Area of the County and its participating jurisdictions.
9	Develop A Program To Ensure Drainage Ways, Culverts And Storm Drains Are Free Of Debris.	Cumberland County Engineering Department		X		X		Most all of the roads in the Unincorporated Area of the County are the responsibility of NC Department of Transportation and they maintain those drainage ways, storm drains and culverts that impact their roadways.
10	Adopt A Comprehensive Countywide Storm Water Ordinance.	Cumberland County Engineering Department			X	X		Recommend deletion of this action due to fact that enforcement of storm water regulations for the Unincorporated Area of Cumberland County and some of its small Towns is the responsibility of NC DENR while the City of Fayetteville, Towns of Hope Mills and Spring Lake have their own Storm Water Department that enforces Phase I and Phase II of their Storm Water Ordinance.
11	Limit The Amount Of Impervious Surfaces And Encourage The Use Of Pervious Type Surfaces.	Cumberland County Planning Department	X			X		Completed February 19, 2008. Cumberland County Zoning Ordinance allows non-residential uses with a structure or structures exceeding 20,000 square feet of floor area shall permanently surface 75% of parking area with the remaining 25% shall consist of a pervious surface.
12	Develop A Landscape Ordinance That Will Encourage Protection Of Natural Areas Through Design And Provide More Vegetation In Urban Development.	Cumberland County Planning Department	X			X		Completed on June 20, 2005 with the adoption of Revised Cumberland County Zoning Ordinance. The revised ordinance includes landscaping requirements that applies to non-residential and mix use developments.
13	Develop A Tree Ordinance To Address Clear Cutting, Protection Of Existing Trees And Vegetation.	Cumberland County Planning Department			X		X (Revised)	At this time a tree ordinance addressing clear cutting has not been considered. The County landscape requirements encourage the protection of existing trees and vegetation while allows these trees and vegetation to be counted towards meeting the standards. The County Landscape requirements are a part of the Zoning Ordinance.
14	Develop A Reforestation Program To Increase Vegetation Cover In Highly Urbanized Areas And In Denuded Areas In Flood Prone Areas.	U.S. Forest Service		X			X	The strategy of the County is to protect natural vegetation to enhance air quality, counteract extreme heat in urban areas and reduce sedimentation and pollution of waterways. Denuded areas were to be reforested by the public sector or non-profit organizations. Due to limited resources these efforts have been delayed. The County's focus now is protecting as much existing vegetation as possible and requiring developments to plant additional vegetation. These efforts have been addressed by the adoption of a Landscape Ordinance and the provision of development alternatives that protects vegetation and open space.
15	Develop A Greenway Program And Encourage Low Impact Uses In Those Areas As A Means To Protect Natural Areas Along Rivers, Streams, Creeks, And Drainage Ways.	Local Jurisdictions and Cape Fear River Assembly		X			X (Revised)	At this time a Greenway Plan has been developed inside the urban area of the County where density is the highest. As funds and resources become available extension to the rural area will be valid. Currently the protection of rivers, streams, creeks and drainage ways is accomplished through the Cumberland County Flood Damage Prevention Ordinance that includes small stream standards for those areas with no designation of a Special Flood Hazard Area.
16	Revised Subdivision Ordinance Requiring Additional Access For Emergency Vehicles And To Be Used As An Evacuation Route For Developments Located Near Special Hazard Areas.	Cumberland County Planning Department			X		X (Revised)	Currently Cumberland County Subdivision Ordinance does not require an additional access for evacuation route for developments located near special hazard prone areas. The Planning Board reviews the Subdivision Ordinance annually and could consider this action with its annual review.

Unincorporated Cumberland County								
Mitigation Action Number	Action Description	Responsible Department	Current Status			2016 Plan Update		Summary of Progress To-Date
			Complete	In Progress	Not yet Started	Delete Action	Carry Forward	
17	Identify Areas That Are Susceptible To Wildfires And Consider Prescribed Fire (Controlled Burning) Management Tool To Reduce The Impact Of Wildfire Hazards.	NC Forest Service		X			X (Revised)	Currently the Cumberland County office of Forest Service has developed a draft risk assessment of those areas of Cumberland County that are susceptible to wildfires. This risk assessment is general in nature and for in office use only. The NC Forest Service has completed five Community Wildfire Protection Plans for certain areas of Cumberland County.
18	Continue The Mutual Aid Agreement Between All Electrical Providers.	PWC, South River EMC, Lumbee River EMC, and Progress Energy	X			X		The mutual aid agreement currently exists with all of the electrical providers in Cumberland County.
19	Continue To Protect Wetlands And Environmental Sensitive Corridors.	Corp of Engineers		X		X		The Corp of Engineers is responsible for the mapping and enforcements of the wetland regulations within Cumberland County and its municipalities.
20	Develop And Maintain A Database And Provide A Mechanism For Monitoring And Evaluating Mitigation Efforts. The Database Would Contain Damage Assessment; Type Of Hazard; When And Where It Occurred; Death Or Injury; And Actual Replacement Cost.	Cumberland County Emergency Services						This information is currently reported to North Carolina Emergency Management from Cumberland County Emergency Management and NC Emergency Management maintains the database of type of hazard; damage assessment; when and where it occurred; death or injury; and replacement cost.
21	Encourage The Maintenance Of Trees Along Power Lines.	PWC, South River EMC, Lumbee River EMC, and Progress Energy	X			X		The electrical companies provide this maintenance for their power lines.
22	Encourage All Rest Homes To Have A Reciprocal Agreement.	Cumberland County Social Services Dept	X			X		The reciprocal agreement currently exists with all the rest homes located in Cumberland County. The agreement is handled through Cumberland County Emergency Services.
23	Provide A Better Multilingual Awareness Program Concerning Types Of Hazards, Their Effects, Warning Signs, What Action To Take And Location Of Emergency Shelters.	Cumberland County Emergency Services		X		X		Currently multilingual information concerning awareness about hazards is available through local, state and federal websites. Cumberland County Emergency Services website offers a link to multilingual information on the different hazards and preparation for those hazards.
24	Partner With Higher Education Institutions To Participate In The Education Of Citizens About Natural Hazards.	Cumberland County Emergency Services		X		X		Develop in conjunction with the institutions of higher education a program geared towards education the public about the various natural hazards and ways to protect life and property. This will be done through developing flyers, public service announcements and various other media. All activities will be created in Spanish and English.
25	Develop A Program To Train Volunteers To Assist The Vulnerable Population During A Hazard.	Cumberland County Social Services Dept		X		X		This program exists through coordination of the fire, police and emergency services entities.
26	Improve Distribution Of Hazard Awareness Materials To Citizens Through Website, Schools And Special Events.	Cumberland County Emergency Services		X			X (Revised)	This action is being accomplished through local media, fire, police and Cumberland County Emergency Services Department. The Cumberland County Emergency Services website includes all the types of hazards that affect Cumberland County and its municipalities and how to prepare for them. It is recommended that a link to this website be placed on all of Cumberland County's jurisdictions websites.

A.5.2 2016 Mitigation Action Plan

Table A29 identifies 14 new and/or revised mitigation actions for Cumberland County Unincorporated Areas as well as one unrevised, incomplete action from Table A28 that is to be carried forward into the 2016 Regional Plan.

Table A29 - 2016 Mitigation Action Plan

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
New/Revised Actions										
1	Maintain an all Hazards public education program to educate and prepare residents for all of the hazards that impact Cumberland County.	To educate, enhance preparedness, and resiliency of Cumberland County and its municipal residents through public education programs that included booths at fairs, festivals and special events, websites, brochures, school programs, and etc.	Cumberland County Emergency Management	$90,000	Local Operating Budget	Short Range	New			All Hazards
2	Explore the Fire Adapted Communities concept implementation in Cumberland County.	To enhance the preparedness and resiliency of Cumberland County and its municipalities to the effects of wild land fire and urban interface, through education; programs such as Fire Wise, Ready Set Go, Community Wildfire Protection Plan; Fuel Management; local codes and ordinances.	Emergency Management, NC Forest Service and Fire Marshalls	Staff Hours	Local Operating Budget and Federal	Medium Range	New	X	X	Wildfire
3	Conduct a countywide infrastructure vulnerability assessment to identify priority needs for updating ill-designed or outdated critical structures.	It has been difficult to locate any comprehensive assessments of local infrastructure in Cumberland and Hoke Counties. With current and projected natural hazard occurrences, it is essential to have an accurate and comprehensive understanding of the current condition of critical facilities to ensure the ability to continue to provide for basic needs, such as water and electrical supplies, transportation routes, waste management, etc.	County/city structural and civil engineers in partnership with U.S. Army Corps of Engineers	Staff Hours	Local Operating Budget and Federal	Medium Range	New	X		All Hazards
4	Conduct social vulnerability analysis to identify priority needs and opportunities that will address the specific problems vulnerable populations face from a range of hazards, including barriers to evacuation, event-specific vulnerabilities, and impediments to recovery.	There exist various groups of individuals that have additional financial, social and/or environmental barriers to being resilient in the face of natural hazard events. In Cumberland County, for example, groups with significant number of people affected include about 10K outdoor workers with direct exposure to extreme heat days, elderly people and especially those with existing cardiovascular conditions, and other low-income and/or minority groups. As natural hazard events increase in intensity and frequency, these groups will find it harder to safely and efficiently get out of harm's way. These groups will also have difficulty in obtaining and paying for essential components to sustain life, such as medications, utilities, and transportation to/from a place of work, etc.	County Social Services Department and/or County Health Department	Staff Hours	Local Operating Budget	Medium Range	New			All Hazards
5	Collaborate with NC Cooperative Extension and NC Agriculture and Forestry Adaptation Working Group to provide more local support and encouragement of forest conservation and farmland preservation measures.	Forests and farmland provide a multitude of social, economic and environmental benefits, that when looked at comprehensively, far outweigh any profit/revenue projections of residential or commercial properties. Outside of development pressure, some of the other major health risks include: (1) increasing wildfire risk, (2) increasing number and types of insects and pests, (3) lack of sufficient water during the growing season for crops, and (4) increasing damage from strong winds and flooding. It is vital, especially in the face of a changing climate, to preserve these working lands and to support higher density development in already existing urban and suburban centers.	County Board of Commissioners, Conservation District Programs, and other land preservation organizations.	Unknown	NC Cooperative Extension, NC Forest Service, US Department of Agriculture and NC Wildlife Resources Commission.	Short Range	N		X	Wildfire, Inland Flooding
6	Include climate predictions from the Cumberland County Climate Resiliency Plan in the Regional Hazard Mitigation Plan.	To properly prepare for natural hazard occurrences, it is important to include predictions that warn of: (1) increasing temperatures and extreme heat days, (2) increasing frequency and strength of severe weather events, (3) more heavy rain/flooding, and (4) more frequent and prolonged drought. Although some climate projections do not pose an	The Planning Department/Planning Director for each jurisdiction in Cumberland County	None	Existing FEMA grant	Short Range	New	X	X	All Hazards

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
		immediate threat, any comprehensive mitigation plan for emergency management should at the very least, and by the very nature of the definition of "mitigation", acknowledge the changing climate and possibility of increased extreme weather and flooding events.								
7	Provide financial assistance for low-income residents to help with power bills and support services during extended periods of high temperature and other extreme weather.	Low-income households face challenges in keeping up with utility bills. Some low-income utility assistance programs are offered, but funds are limited. Extreme weather and increasing temperatures will place even greater pressure on these programs' ability to provide assistance to all those in need, and citizen's lives will be increasingly at stake.	County Health Department	Unknown	NC Department of Health and Human Services and County Department of Health	Medium Range	New			Extreme Heat, Winter Weather
8	Analyze and update local development ordinances to make buildings safer from wind and flooding, more energy and water efficient, more tolerant of heat waves and healthier to live in. Also, provide incentives for making buildings safer from wind, flooding, more energy and water efficient, and healthier to live in.	Energy and water efficiency will be increasingly important to a community's resiliency in the face of natural hazards specifically because of projections of increasing temperatures and extreme heat days, and prolonged periods of drought. Climate projections also state that precipitation will continue to follow a seasonal pattern, whereby hot, Summer months are classified with less precipitation and Winters with more precipitation. Extreme heat days will be specially taxing on buildings with older A/C systems or inadequate insulation and in low-income households where upkeep with rising utility costs could become a burden.	Planning and Code Departments of each jurisdiction	Staff Hours	Local Operating Budget	Medium Range	New		X	Inland Flooding, Hurricane Wind, Thunderstorm Wind, Extreme Heat, Winter Storms
9	Use natural systems, more open space and green surfaces to manage stormwater in a more resilient fashion.	Impervious surfaces typically found in urban centers, such as paved roads, buildings, parking lots and pavement, drastically increase flash floods and urban flooding, which seems to be a common occurrence in Cumberland County. For instance, within a 90 day period (March 1 – June 30, 2015), three flooding incidents were reported due to heavy rainfall events. Use of LID stormwater management practices is mentioned only in summary in the Growth Factor Analysis, stating it "…should be emphasized in sensitive areas…" This, coupled with the naturally flat topography of the eastern portions of the County also help to create excess runoff and subsequent urban flooding issues, especially in the Special Flood Hazard Areas (SFHA) of the County, and specifically around Blounts and Cross Creek, as referenced in various resources.	Engineering Department of each jurisdiction	Staff Hours	Local Operating Budget	Short Range	New		X	Inland Flooding
10	Restrict Residential and Non-Compatible Uses within the Special Flood Hazard Area.	Prohibit developing within the Special Flood Hazard Area and promote the flood area as an environmental corridor and open space, while reducing potential losses during a flood hazard.	Cumberland County Planning and Inspections Department and Cumberland County Board of Commissioners	Staff Hours	Local Operating Budget	Short Range	Revised		X	Inland Flooding
11	Identify and map structures that are vulnerable to high winds.	By providing the location of structures that would be greatly impacted by high winds would assist in lessen the impact during a hazard event while also providing assistance to emergency responders.	Cumberland County Emergency Services	Unknown	Unknown	Short Range	Revised	X	X	Hurricane Wind, Thunderstorm Wind
12	Develop a tree ordinance to address clear cutting.	Provide more pervious area for natural drainage, while reducing the vulnerability to localized flooding and extreme heat.	Cumberland County Planning and Inspections Department and Cumberland County Board of Commissioners	Staff Hours $5,000 - $10,000	Local Operating Budget	Medium Range	Revised	X	X	Inland Flooding, Extreme Heat
13	Develop a greenway program as a means to protect natural areas along the rivers, streams, creeks and drain ways.	Provides a buffer from urban encroachment and reduces flooding and erosion.	Cumberland County and Fayetteville/Cumberland County Parks and Recreation Department	Unknown	Unknown	Long Range	Revised		X	Inland Flooding

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
14	Revise the Subdivision Ordinance requiring an additional access for emergency vehicles and to be used as an evacuation route for developments located near special flood hazard area.	This will provide an additional access for residents, public safety officials and emergency services to those developments located near a special flood hazard area, while reducing the possibility of a life threatening situation for residents, public officials and emergency services.	Cumberland County Board of Commissioners and Cumberland County Planning & Inspections Department	Staff Hours $5,000 - $10,000	Local Operating Budget	Medium Range	Revised		X	Inland Flooding
2011 Mitigation Actions Carried Forward										
1	Develop A Reforestation Program To Increase Vegetation Cover In Highly Urbanized Areas And In Denuded Areas In Flood Prone Areas.	The strategy of the County is to protect natural vegetation to enhance air quality, counteract extreme heat in urban areas and reduce sedimentation and pollution of waterways. Denuded areas were to be reforested by the public sector or non-profit organizations.	U.S. Forest Service	Staff Hours	U.S. Forest Service	Medium Range	In Progress		X	Inland Flooding, Erosion, Extreme Heat

ANNEX B – CITY OF FAYETTEVILLE

B.1 Community Profile

B.1.1 Geography

The City of Fayetteville is the county seat of Cumberland County and is located in south central North Carolina in the Upper Coastal Plain. As of the 2010 census, the population was 200,564. Fayetteville is within the Fayetteville, NC Metropolitan Statistical Area. Fayetteville was established in 1783 from a merger of a settlement named Cross Creek established in 1756 and Campbelltown established by the NC General Assembly in 1762. According to the U.S. Census Bureau, the City has a total area of approximately 147.7 square miles of which 145.8 square miles is land and 1.9 square miles is water. Fayetteville is located in the Cape Fear River basin.

B.1.2 Population and Demographics

Table B1 provides population counts and the percentage change in population since 2010 for the City of Fayetteville. Based on the 2010 census, the population density is 1,376 people per square mile.

Table B1 - Population Counts for City of Fayetteville

Jurisdiction	2010 Census Population	2014 Estimated Population	% Change 2010-2014
City of Fayetteville	200,564*	202,421	0.9

*Note: This population includes 17, 197 people living on Fort Bragg.
Source: U.S. Census Bureau, 2015.

Based on the 2010 Census, the median age of residents in the City of Fayetteville is 29.9. The racial characteristics of the City are presented below in Table B2.

Table B2 - Demographics of City of Fayetteville

Jurisdiction	White Persons, Percent (2010)	Black Persons, Percent (2010)	American Indian or Alaska Native, Percent (2010)	Asian Persons, Percent (2010)	Hispanic or Latino Persons, Percent (2010)[1]
City of Fayetteville	45.7	41.9	1.1	2.6	10.1

[1]Persons of Hispanic Origin may be of any race, so are also included in applicable race category.
Source: U.S. Census Bureau, 2010

B.2 Risk Assessment

This subsection includes a hazard profile and vulnerability assessment for each of the priority hazards identified in Chapter 5 Subsection 13 (Table 5.20) as they pertain to the City of Fayetteville. **Additional information for each hazard can be found in Chapter 5 - Hazard Profiles and Chapter 6 – Vulnerability Assessment.**

B.2.1 Dam/Levee Failure

Location and Spatial Extent

Table B3 provides details for 53 dams included in the North Carolina Dam Inventory that are located within the City of Fayetteville.

Table B3 - North Carolina Dam Inventory for the City of Fayetteville

Dam Name	NIDID	Height (ft)	NID Storage (acre-feet)	Dam Status	River[1]	Hazard Classification
Aaran Lakes West Dam	NC02141	15	54	IMPOUNDING	Beaver Creek-Os	High
Arran Lakes Dam	NC01144	21	144	IMPOUNDING	Little Beaver Creek	High
Bailey Lake	NC02153	23	0	BREACHED	Beaver Creek-Tr	High
Beaver Creek Dam	NC01143	22	1521	IMPOUNDING	Beaver Creek	High
Bonnie Doone Lake Dam	NC01146	15	200	IMPOUNDING	Little Cross Creek	High
Charles Smith Dam	NC02161	19.4	7.76	IMPOUNDING	Cape Fear River-Tr	High
Chesapeake Dam	NC05725	23.5	40	BREACHED	Carver's Creek Tr	High
Civitan Lake Dam	NC02156	16.5	26.4	IMPOUNDING	Cross Creek-Tr	High
College Lake Dam	NC01154	20	317	DRAINED	Cape Fear River-Os	High
Devonwood Lower Dam	NC04797	25	175	IMPOUNDING	Persimmon Ck-Tr	High
Edens Lake	NC02140	26.3	26.3	IMPOUNDING	Beaver Creek-Os	High
Evans Dam	NC02149	18	81	IMPOUNDING	Hybarts Branch	High
Forrest Lake Dam	NC01133	15	132	IMPOUNDING	Branson Creek	High
Gables Drive Dam	NC06126	12	0	IMPOUNDING	Not provided	High
Glenville Lake Dam	NC01130	16	242	IMPOUNDING	Little Cross Creek	High
Harris Dam	NC02147	17	27.2	IMPOUNDING	Beaver Creek-Os	High
Kornbow Lake Dam	NC01131	18.5	400	IMPOUNDING	Little Cross Creek	High
Lake Clair Dam	NC02154	15	41.22	IMPOUNDING	Blounts Creek-Tr	High
Lake Rim Dam	NC00028	20	272	IMPOUNDING	Bones Creek	High
Loch Lommond	NC02137	21	109.2	IMPOUNDING	Stewarts Creek	High

Dam Name	NIDID	Height (ft)	NID Storage (acre-feet)	Dam Status	River[1]	Hazard Classification
Lockwood Dam	NC02152	14	0	BREACHED	Hybarts Creek	High
Mildred White Crystal Lake Dam	NC06087	18	48	IMPOUNDING	Not provided	High
Mintz Lake Dam	NC01132	12	103	IMPOUNDING	Little Cross Creek	High
Mirror Lake Dam	NC02151	12	24	IMPOUNDING	Hybart's Branch	High
Moose Lodge Dam	NC02159	12	0	BREACHED	Blounts Creek	High
Murray Hill Lake Dam	NC04760	12	440	BREACHED	Branson Creek-Os	High
North Lake Dam	NC02150	23	30	IMPOUNDING	Cape Fear River-Tr	High
Pritchard Dam	NC02155	16.5	7.25	IMPOUNDING	Little Cross Creek-Tr	High
Rayconda Upper Dam	NC05621	19.2	20	IMPOUNDING	Little Rockfish Creek TR	High
Rose Lake Dam	NC01152	15.2	576	BREACHED	Cross Creek	High
Strickland Bridge Dam	NC05990	15.3	116	IMPOUNDING	Rockfish Creek	High
Summertime Dam	NC02148	16	33	IMPOUNDING	Hybarts Branch-Tr	High
Tallywood Dam	NC02136	23	55.2	IMPOUNDING	Branson Creek Trib.	High
The Lakes Dam	NC02130	17.5	21.6	IMPOUNDING	Beaver Creek-Os	High
Cape Fear Botanical Gardens	NC05889	7.2	2	EXEMPT	Not provided	Low
Cindy St. Dam	NC02146	14	0	EXEMPT	Beaver Creek-Os	Low
Clark Pond Dam	NC01229	24	67.2	IMPOUNDING	Cross Creek-Os	Low
Cottonade Dam	NC02132	16	64	EXEMPT-HB_SIZE	Beaver Creek	Low
Country Club Lake Dam	NC01153	10	77	EXEMPT-HB_SIZE	Cross Creek	Low
Devenwood Upper Dam	NC04911	15	48	EXEMPT-HB_SIZE	Persimmon Creek-Os	Low

Dam Name	NIDID	Height (ft)	NID Storage (acre-feet)	Dam Status	River[1]	Hazard Classification
Hall Pond Dam	NC02134	11	26	EXEMPT-HB_SIZE	Carver Creek-Tr	Low
Hall Pond Upper Dam	NC05918	0	0	EXEMPT	Carvers Creek	Low
Ivey Dam	NC05989	18.6	19	IMPOUNDING	Not provided	Low
Lake Walter Dam	NC01093	14	58	EXEMPT	Blount Creek	Low
Lake Williams Dam	NC00027	16	165	EXEMPT	Little Rockfish Creek	Low
Loraine Lake Dam	NC00033	14	53	EXEMPT	Stewart Creek	Low
Rayconda Lake Lower Dam	NC00035	24.2	62	EXEMPT	Little Rockfish Creek-Tr	Low
Raynor Pond Dam	NC02157	30	48	EXEMPT-HB_SIZE	Cape Fear River-Tr	Low
Sanders Lake Dam	NC00034	33	235	IMPOUNDING	Bones Creek-Tr	Low
Smith Pond Dam	NC02131	16	26	EXEMPT	Bones Creek-Tr	Low
Upper Clark Pond Dam	NC02158	14	0	EXEMPT	Little Cross Creek-Tr	Low
Upper Raynor Pond Dam	NC05869	18	13	EXEMPT	Not provided	Low
Wilson Lake Dam	NC01125	16	58	EXEMPT-HB_SIZE	Cape Fear River-Os	Low

Source: North Carolina Dam Inventory, December 2014

[1]If the dam is located on an unnamed stream/tributary, the unnamed stream/tributary name is followed with "-TR". If the dam is located off stream of an unnamed stream/tributary, the unnamed stream/tributary name is followed with "-OS".

Past Occurrences

Table B4 details known past dam failures in the City of Fayetteville.

Table B4 – Known Dam Failures in the City of Fayetteville

Location	County	Date of Occurrence	Result of Failure	Deaths/ Injuries	Property Damage	Details
Evans and Lockwood Dams	Cumberland	9/15/1989	Overtopping	2	>$10 million	None reported
Country Club Lake	Cumberland	Multiple	Not reported	Not reported	Not reported	Multiple failures.

Probability of Future Occurrence

Possible - Based on historical occurrence information (2 records in 65 years), it can reasonably be assumed that the City of Fayetteville has a 3% chance of this type of event occurring each year.

Vulnerability Assessment

The estimated number and characteristics of buildings that could potentially be impacted by a dam failure are shown in Table B5. **Note: the numbers presented in Table B5 are estimated based on the methodology described in Chapter 6 Subsection 3.1. A dam inundation study including a hydrologic and hydraulic analysis was not performed.**

Table B5 - Properties Potentially at Risk to Dam Failure

Jurisdiction	Number of Buildings in Estimated Inundation Area	Total Building Value	Estimated Content Value	Total Value
City of Fayetteville (High Hazard Dams)	56	$9,360,693.00	$4,780,727.25	$14,141,420.25
City of Fayetteville (Low Hazard Dams)	11	$151,901.00	$257,105.05	$409,006.05
Total	**67**	**$9,512,594.00**	**$5,037,832.30**	**$14,550,426.30**

B.2.2 Drought

Location and Spatial Extent

Drought cannot be confined to geographic or political boundaries. The Cumberland County region, including the City of Fayetteville, is designated as moderately dry.

Past Occurrences

According to the North Carolina Drought Monitor, Cumberland County has experienced drought conditions every year since 2000. Table B6 shows the most severe classification for each year.

Table B6 - Historical Drought Occurrences

Year	Cumberland County
2000	Abnormally Dry
2001	Severe Drought
2002	Extreme Drought
2003	Abnormally Dry
2004	Abnormally Dry
2005	Abnormally Dry
2006	Moderate Drought
2007	Exceptional Drought
2008	Exceptional Drought
2009	Moderate Drought
2010	Moderate Drought
2011	Severe Drought

Year	Cumberland County
2012	Moderate Drought
2013	Abnormally Dry
2014	Abnormally Dry
2015	Moderate Drought

Source: NC Drought Monitor

Probability of Future Occurrence

Highly Likely - Based on historical occurrence information (15 records in 15 years), it can reasonably be assumed that the City of Fayetteville has a 100% chance of this type of event occurring each year.

Vulnerability Assessment

It is assumed that whereas all buildings and facilities in the planning area would technically be exposed to the drought hazard, there is no significant vulnerability to these buildings on a structural level. Population growth could contribute directly to this hazard, as an increased number of users pull from the available water supply within the region. Drought has the ability to affect the City of Fayetteville's primary supply of drinking water – the Cape Fear River. In addition to population growth affecting water supply, there is a significant concern about interbasin transfers from upstream communities which will reduce the overall water supply from the river which could exacerbate supply problems during drought conditions.

B.2.3 Earthquake

Location and Spatial Extent

As detailed in Chapter 5 – Hazard Profiles, the City of Fayetteville lies within an approximate zone level between 6 and 10% ground acceleration. This indicates that the region as a whole exists within an area of moderate seismic risk.

Past Occurrences

A list of earthquakes that have caused damaged in North Carolina is presented below in Table B7.

Table B7 - Earthquakes Affecting North Carolina

Date	Location	Richter Scale
12/16/1811	NE Arkansas	8.5
01/23/1812	New Madrid, MO	8.4
02/07/1812	New Madrid, MO	8.7
04/29/1852	Wytheville, VA	5.0
08/31/1861	Wilkesboro, NC	5.1
12/23/1875	Central Virginia	5.0
08/31/1886	Charleston, SC	7.3
05/31/1897	Giles County, VA	5.8
01/01/1913	Union County, SC	4.8
02/21/1916	Asheville, NC	5.5
07/08/1926	Mitchell County, NC	5.2

Date	Location	Richter Scale
11/03/1928	Newport, TN	4.5
05/13/1957	McDowell County, NC	4.1
07/02/1957	Buncombe County, NC	3.7
11/24/1957	Jackson County, NC	4.0
10/27/1959	Chesterfield, SC	4.0
07/13/1971	Newry, SC	3.8
11/30/1973	Alcoa, TN	4.6
11/13/1976	Southwest Virginia	4.1
05/05/1981	Henderson County, NC	3.5

Source: Wake County 2014 Hazard Mitigation Plan. Information provided by NCEM.

Probability of Future Occurrence

Possible - Based on historical occurrences, the probability of a significant earthquake event affecting the City of Fayetteville is possible. There are a total of 20 records in North Carolina over the past 200 years. Therefore, the annual probability level is estimated between 1 and 10 percent.

Vulnerability Assessment

An earthquake has the potential to impact all existing and future buildings, facilities, and populations in the City of Fayetteville. Impacts of earthquakes include debris clean-up, service disruption and, in severe cases, fatalities due to building collapse. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 3.

B.2.4 Extreme Heat

Location and Spatial Extent

Extreme heat typically occurs over large areas impacting multiple counties at one time. The entirety of the City of Fayetteville is vulnerable to extreme heat.

Past Occurrences

According to the National Climatic Data Center, one instance of extreme heat was recorded in Cumberland County beginning on July 22, 1998, and an additional instance of extreme heat was recorded in Cumberland County beginning on August 10, 2007.

Probability of Future Occurrence

Possible - Based on historical occurrence information (2 records in 65 years), it can reasonably be assumed that an extreme heat event has a 3% chance of occurring each year in the City of Fayetteville.

Vulnerability Assessment

Extreme heat is not likely to impact the built environment, but may impact agriculture and pose a threat to humans. Elderly persons, persons with respiratory disabilities, and children may be at risk to experience health problems during extreme heat events, some of which could result in serious illness or death. Potential losses of human life due to extreme heat are not quantified in this Plan. There are no past reports of death or property or crop damage recorded by NCEI.

Recent analysis of public health records indicates that most heat-related illness in southeastern North Carolina occurs not during periods of extreme heat when people are adequately warned and prepared, but during high heat events prior to heat acclimation.

B.2.5 Hurricane/Tropical Storm

Location and Spatial Extent

All Atlantic and Gulf of Mexico coastal areas are subject to hurricanes. While coastal areas are most directly exposed to land falling hurricanes and tropical storms, their impact can be felt hundreds of miles inland. The entire City of Fayetteville region is equally susceptible to hurricanes and tropical storms.

Past Occurrences

Table B8 provides hurricane and tropical storm data reported by NCEI since 1950 for Cumberland County.

Table B8 - NCEI Hurricane and Tropical Storm Events for Cumberland County

Location	Date	Event Type	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland (Zone)	7/12/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/5/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	8/27/1998	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/4/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/15/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/18/2003	Hurricane (Typhoon)	0/0	$28,000.00	$0.00
Cumberland (Zone)	09/01/2006	Tropical Storm	0/0	$0.00	$0.00
			Total:	**$28,000.00**	**$0.00**

While not included in the NCEI database, Category 4 Hurricane Hazel (DR-28) came ashore in North Carolina on October 15, 1954 and caused substantial damage in the region. With winds reaching 125mph at Grannis Field, Hurricane Hazel caused an estimated $136 million in property damage; 19 deaths; 200 injuries; destruction of 15,000 homes and structures; and damage to 39,000 structures.

Probability of Future Occurrence

Likely - Based on a historical record of eight storm events over a period of 65 years (1950 - 2015), it can reasonably be assumed that this type of event has a 12% chance of occurring each year.

Vulnerability Assessment

In conclusion, hurricane wind has the potential to impact all existing and future buildings, facilities, and populations in the City of Fayetteville. Impacts of hurricanes include flood damage, debris clean-up, service disruption and possible fatalities due to flooding or flying debris. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 5.

B.2.6 Inland Flooding: 100-/500-year

Location and Spatial Extent

The City of Fayetteville parcel layer and effective 2007 DFIRM were intersected and the flooded parcel area was calculated in acres. Flood zones were assigned to parcels based on the intersection of a parcel with a flood zone. Parcels can be located in multiple flood zones, and only the flooded acreage within the parcel was included in the calculation for each flood zone. Table B9 provides a summary of acreage by

flood zone.

Table B9 - Flood Zone Acreage

Jurisdiction	Flood Zone Acreage				
	Zone A (100-year)	Zone AE (100-year)	Zone X Shaded (500-year)	Zone X Unshaded	Total
City of Fayetteville	9	4,761	4,327	51,152	60,249

The City of Fayetteville's parcel and building footprint layers were used to examine the inventory of properties at risk. Table B10 provides the building count, estimated building value, estimated content value and estimated total value for all buildings located within each FEMA flood zone.

Table B10 – Properties at Risk

Occupancy Type	Total Number of Buildings in Floodplain	Total Building Value	Estimated Content Value	Total Value
Zone AE				
Agricultural	1	$118,780	$118,780	$237,560
Commercial	66	$35,388,796	$35,112,845	$70,501,642
Education	2	$2,516,128	$3,723,178	$6,239,306
Government	2	$22,212,757	$22,212,757	$44,425,514
Industrial	3	$734,961	$1,102,441	$1,837,401
Religious	6	$3,964,501	$3,964,500	$7,929,001
Residential	564	$84,570,008	$39,314,287	$123,884,295
Total	**644**	**$149,505,931**	**$105,548,788**	**$255,054,719**
Zone X (500-yr)				
Agricultural	1	$118,780	$118,780	$237,560
Commercial	391	$237,262,664	$237,592,168	$474,854,832
Education	18	$23,124,796	$24,851,111	$47,975,907
Government	43	$81,367,936	$82,510,931	$163,878,867
Industrial	69	$120,513,462	$177,465,379	$297,978,841
Religious	79	$56,172,138	$56,172,128	$112,344,266
Residential	2,487	$318,447,384	$152,996,453	$471,443,838
Total	**3,088**	**$837,007,160.60**	**$731,706,949.90**	**$1,568,714,110.00**
Zone X (Unshaded)				
Agricultural	74	$3,424,830	$3,424,822	$6,849,652
Commercial	3373	$2,487,990,894	$2,558,220,958	$5,046,211,852
Education	378	$515,067,399	$630,948,323	$1,146,015,721
Government	171	$282,885,583	$298,378,610	$581,264,193
Industrial	310	$264,437,341	$365,309,177	$629,746,518
Religious	415	$321,857,711	$321,831,224	$643,688,935
Residential	63,085	$8,565,508,080	$4,074,506,588	$12,640,014,668
Total	**67,806**	**$12,441,171,837**	**$8,252,619,703**	**$20,693,791,540**

Source: North Carolina Emergency Management, Risk Management, 2013

Note: Content value estimations are generally based on the FEMA Hazus methodology of estimating value as a percent of improved structure values by property type. The residential property type assumes a content replacement value equal to 50% of the building value. Agricultural, commercial, education,

government, and religious property types assume a content replacement value equal to 100% of the building value. The industrial property type assumes a content replacement value equal to 150% of the building value.

Past Occurrences

Table B11 shows detail for flood events reported by the NCEI since 1950 for the City of Fayetteville. There have been 21 recorded events causing $1.5M in property damage.

Table B11 - NCEI Flooding Events in the City of Fayetteville

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Flash Flood	18	$2,000	$0	0	0
Heavy Rain	3	$1,500,000	$0	0	0
Total:	**21**	**$1,502,000**	**$0**	**0**	**0**

Source: NCEI, September 2015

According to a report provided by the USGS, a storm on September 15, 1989, in and around the City of Fayetteville, North Carolina, produced the most extensive flooding of Fayetteville since 1945. The flood inundated 925 acres in the city along Cross Creek and Blounts Creek and their tributaries, flooded 338 buildings, caused damages in excess of $10 million, and claimed the lives of 2 small children. Twenty-two roads and five earthen dams were overtopped. Three of the dams failed.

Recorded rainfall and streamflow data indicate that the storm and flood were relatively rare events. Recorded rainfall totals for durations of less than 2 hours were not exceptionally rare or unusual, but rainfall totals for 2-, 3-, and 6-hour durations recorded at a National Weather Service rain gage substantially exceeded 100-year rainfall amounts by approximately 31, 28, and 12 percent, respectively. Recorded unit-peak discharges ranged from 33 to 6,060 cubic feet per second per square mile, the latter downstream from a dam failure. Peak discharges at 6 of 10 stream-gaging sites had recurrence intervals greater than 100 years.

Flooding of Cross Creek and Blounts Creek upstream of Gillespie Street was generally less extensive than the 100-year flood, as delineated by FEMA. Downstream of Gillespie Street, the flooding was more extensive.

Probability of Future Occurrence

Possible - By definition of the 100-year flood event, SFHAs are defined as those areas that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. Properties located in these areas have a 26 percent chance of flooding over the life of a 30-year mortgage.

The 500-year flood area is defined as those areas that will be inundated by the flood event having a 0.2-percent chance of being equaled or exceeded in any given year; it is not the flood that will occur once every 500 years.

Vulnerability Assessment

Properties at Risk to Flooding

The loss estimate for flood is based on the total of improved building value and contents value. Land value is not included in any of the loss estimates as generally the land is not subject to loss from floods. Once the potential value of affected parcels was calculated, damage factors were applied to obtain loss estimates by flood zone.

Table B12 shows the building count, total value, estimated damages and loss ratio for buildings that fall within the Zone AE 100-year floodplain by occupancy type on the community level.

The loss ratio is the loss estimate divided by the total potential exposure (i.e., total of improved and contents value for all buildings located within the Zone AE 100-year floodplain) and displayed as a percentage of loss. FEMA considers loss ratios greater than 10% to be significant and an indicator a community may have more difficulties recovering from an event.

Table B12 - Estimated Building Damage and Content Loss – Flood 100-yr Return Period

Occupancy Type	Total Number of Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Zone AE						
Agricultural	0	$0	$0	$0	$0	n/a
Commercial	44	$14,857,721	$1,177,026	$2,747,689	$3,995,480	26.9%
Education	1	$74,249	$4,027	$11,053	$15,080	20.3%
Government	0	$0	$0	$0	$0	$0
Industrial	1	$123,057	$13,459	$51,775	$65,234	53.0%
Religious	4	$6,877,498	$403,469	$2,776,511	$3,179,980	46.2%
Residential	427	$75,056,692	$5,338,713	$3,796,196	$9,346,397	12.5%
Total	**477**	**$96,989,217**	**$6,936,693**	**$9,383,224**	**$16,602,170**	**17.1%**

Source: North Carolina Emergency Management, Risk Management, 2013

Critical Facilities at Risk to Flooding

Of significant concern with respect to any disaster event is the location of critical facilities in the planning area. Critical facilities are often defined as those essential services and facilities in a major emergency which, if damaged, would result in severe consequences to public health and safety or a facility which, if unusable or unreachable because of a major emergency, would seriously and adversely affect the health, safety, and welfare of the public. Critical facilities within the City are detailed in Table B13 and Figure B1 below.

Table B13 – Critical Facilities and FEMA Flood Zones

Facility Name	Address	Facility Type	Estimated 100-yr Flood Depth (Ft)
Zone A			
n/a	n/a	n/a	n/a
Zone AE (100-yr)			
Fayetteville State University	1200 Murchison Rd	School	4.93
Police Training Center/Recruiting Office	671 N. Eastern Blvd	Police	3.53
Zone X Shaded (500-yr)			
City of Fayetteville Station 1	607 Person St	Fire	n/a
City of Fayetteville Station 16	1126 Cedar Creek Road	Fire	n/a
Pauline Jones Middle School	225 B St	School	n/a
Walker Spivey Elementary	500 Fisher St	School	n/a

Facility Name	Address	Facility Type	Estimated 100-yr Flood Depth (Ft)
Early-In Special Education Preschool Program Educational Resource Center	396 Elementary Dr	School	n/a
Zone X Unshaded			
New Courthouse and Law Enforcement LD	117 Dick St	EOC	n/a
City of Fayetteville Fire Station 2	101 Olive Rd	Fire	n/a
City of Fayetteville Fire Station 3	3225 Rosehill Rd	Fire	n/a
City of Fayetteville Fire Station 4	406 Stamper Rd	Fire	n/a
City of Fayetteville Fire Station 5	3040 Boone Trl	Fire	n/a
City of Fayetteville Fire Station 6	4439 Cliffdale Rd	Fire	n/a
City of Fayetteville Fire Station 7	301 Stacy Weaver Dr	Fire	n/a
City of Fayetteville Fire Station 8	1116 Seventy First School Road	Fire	n/a
City of Fayetteville Fire Station 9	5091 Santa Fe Dr	Fire	n/a
City of Fayetteville Fire Station 10	3059 Control Tower Rd	Fire	n/a
City of Fayetteville Fire Station 11	7690 Raeford Rd	Fire	n/a
City of Fayetteville Fire Station 12	307 Hope Mills Rd	Fire	n/a
City of Fayetteville Fire Station 14	632 Langdon St	Fire	n/a
City of Fayetteville Fire Station 15	8434 Cliffdale Rd	Fire	n/a
City of Fayetteville Fire Station 17	6701 Bailey Lake Rd	Fire	n/a
City of Fayetteville Fire Station 19	3481 Walsh Parkway	Fire	n/a
High Smith-Rainey Hospital	150 Robeson St	Hospital	n/a
Cape Fear Valley Medical Center	3326 Village Dr	Hospital	n/a
Cross Creek Substation	6147 Raeford Rd	Police	n/a
Police Administration Building	467 Hay St	Police	n/a
Fayetteville State University	1389 Grace Black	School	n/a
Fayetteville Technical Institute	278 Devers St	School	n/a
Warrenwood Elementary	4945 Rosehill	School	n/a
Methodist University	5400 Ramsey St	School	n/a
Fayetteville State	630 Drum Cir	School	n/a
Longhill Elementary	6490 Ramsey St	School	n/a
Margaret Willis School	1412 Belvedere Ave	School	n/a
Brentwood Elementary School	1115 Bingham Dr	School	n/a
Morganton Rd Elementary School	102 Bonanza Dr	School	n/a
Westover High School	275 Bonanza Dr	School	n/a
Ponderosa Elementary School	311 Bonanza Dr	School	n/a
Camden Rd Elementary School	1608 Camden Rd	School	n/a

Facility Name	Address	Facility Type	Estimated 100-yr Flood Depth (Ft)
New Century International Elementary	7461 Century Cir	School	n/a
Fayetteville Academy	3200 Cliffdale Rd	School	n/a
Cliffdale Elementary School	6450 Cliffdale Rd	School	n/a
West Area Elementary School Country Club	941 Country Club Dr	School	n/a
Cumberland Road Elementary School	2608 Cumberland Rd	School	n/a
City of Fayetteville Board of Education	595 Executive Pl	School	n/a
Terry Sanford High School	2301 Fort Bragg Rd	School	n/a
Vanstory Elementary School	400 Foxhall Rd	School	n/a
US Finance Department Cumberland Co Schools	2491 Gillespie St	School	n/a
Montclair Elementary School	555 Glensford Dr	School	n/a
Lucile Souders Elementary	128 Hillview Ave	School	n/a
Lake Rim Elementary School	1455 Hoke Loop Rd	School	n/a
J W Coon Elementary School	905 Hope Mills Rd	School	n/a
Sherwood Park School	2115 Hope Mills Rd	School	n/a
Mary McArthur Elementary School	3809 Village Dr	School	n/a
Douglas Byrd Sr High School	1616 Ireland Dr	School	n/a
Ireland Dr Elementary School	1616 Ireland Dr	School	n/a
North St Elementary School	800 North St	School	n/a
Ramsey St High School	117 Quincy St	School	n/a
William H Owen Elementary School	4533 Raeford Rd	School	n/a
Seventy First High School	6764 Raeford Rd	School	n/a
Seventy First Elementary School	6882 Raeford Rd	School	n/a
Luther Nick Jeralds Middle School	2409 Ramsey St	School	n/a
Reilly Rd Elementary School	430 Reilly Rd N	School	n/a
Cumberland County Board of Education	1347 Rim Rd	School	n/a
EE Miller Elementary	1351 Rim Rd	School	n/a
Warrenwood Elementary	4618 Rosehill Rd	School	n/a
E Smith Sr High School	1800 Seabrook Rd	School	n/a
Ferguson Elementary School	1857 Seabrook Rd	School	n/a
Alger B Wilkins Elementary	1429 Skibo Rd	School	n/a
Anne Chestnutt Jr High School	2121 Skibo Rd	School	n/a
Lewis Chapel Elementary School	2150 Skibo Rd	School	n/a

Facility Name	Address	Facility Type	Estimated 100-yr Flood Depth (Ft)
Glendale Elementary School	2915 Skycrest	School	n/a
Ashely Elementary School	810 Trainer Dr	School	n/a
Mary McArthur Elementary School	3809 Village Dr	School	n/a

Source: Cumberland County Emergency Management Agency, 2015

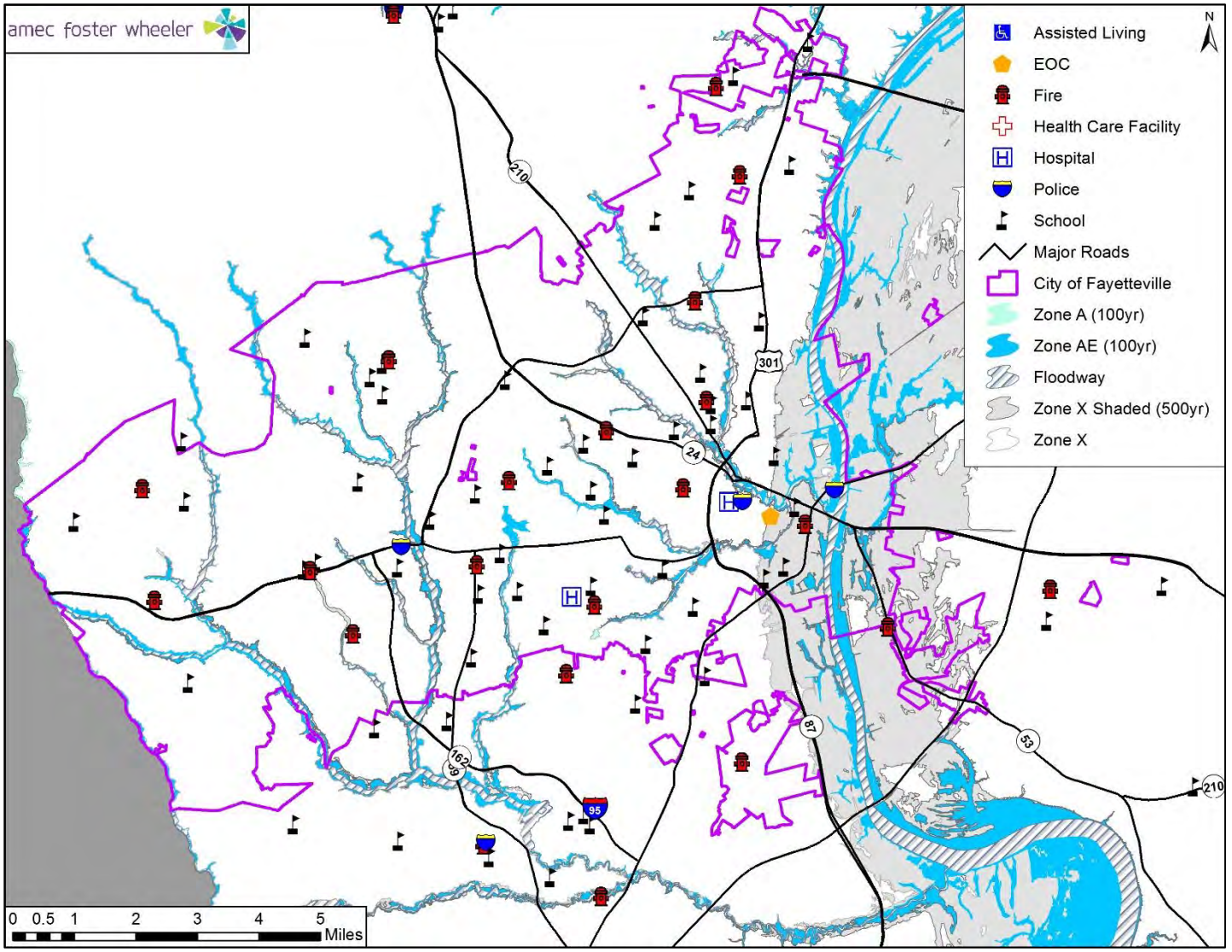


Figure B1 – City of Fayetteville Critical Facilities and FEMA Flood Zones

Repetitive Loss Properties

A repetitive loss property is a property for which two or more flood insurance claims of more than $1,000 have been paid by the NFIP within any 10-year period since 1978. An analysis of repetitive loss was completed by the City to examine repetitive loss properties against FEMA flood zones.

According to 2015 FEMA Community Information System records, there are a total of seven unmitigated repetitive loss properties within the City of Fayetteville. Note: two of the properties have been mitigated but the correction forms have not yet been submitted to FEMA. Table B14 details the repetitive loss building counts and number of losses for the unmitigated properties current with FEMA. Three properties are located in the A or AE zone and four properties are located in the B, C or X zone.

Table B14 – City of Fayetteville Unmitigated Repetitive Loss Summary

Property Type	Building Count		# of Losses	Total Repetitive Loss Payments ($)
	Insured	Uninsured		
Residential	4	2	15	$135,937.03
Commercial	0	1	4	$109,514.79
Total	**4**	**3**	**19**	**$245,451.82**

Source: NC State NFIP Coordinator, September 2015, FEMA Community Information System, December 2015

B.2.7 Severe Weather (Thunderstorm Wind, Lightning & Hail)

Location and Spatial Extent

The entirety of the City of Fayetteville can be considered at risk to severe weather events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

Table B15 shows detail for severe weather events reported by the NCEI since 1950 for the City of Fayetteville. There have been over 53 recorded events causing 4 injuries and close to $1.4M in property damage.

Table B15 - NCEI Severe Weather Events in the City of Fayetteville

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Hail	19	$1,000,000	$0	0	0
High Wind	0	$0	$0	0	0
Lightning	3	$255,000	$0	0	1
Strong Wind	0	$0	$0	0	0
Thunderstorm Wind	31	$105,500	$0	0	3
Total:	**53**	**$1,360,500**	**$0**	**0**	**4**

Probability of Future Occurrence

Likely - Given the high number of previous events (53 records in 65 years), it is certain that severe weather events, including wind, lightning and hail, will occur in the future. This results in a probability level of likely (82% annual probability) for future severe weather events for the entire planning area.

Vulnerability Assessment

Severe weather events including thunderstorm wind, lightning and hail has the potential to impact all existing and future buildings, facilities, and populations in the City of Fayetteville. Impacts of severe weather events include wind damage, debris clean-up, hail damage, and potential fatalities due to

lightning strikes and associated fires. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 7.

B.2.8 Tornado

Location and Spatial Extent

The entirety of the City of Fayetteville can be considered at risk to tornado events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

According to NCEI records, Cumberland County has experienced 23 tornadoes since 1950. These events are reported to have caused five deaths, 169 injuries and close to $133M in property damage.

Table B16 - NCEI Records for Tornadoes in Cumberland County (1950-2015)

Location	Date	Tornado Fujita Scale	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland Co	4/8/1957	F4	0/8	$250,000.00	$0.00
Cumberland Co	6/2/1959	F0	0/0	$25,000.00	$0.00
Cumberland Co	10/4/1960	F1	0/0	$25,000.00	$0.00
Cumberland Co	9/29/1963	F2	0/0	$250,000.00	$0.00
Cumberland Co	12/26/1964	F1	0/1	$2,500.00	$0.00
Cumberland Co	2/22/1971	F3	2/60	$2,500,000.00	$0.00
Cumberland Co	3/15/1971	F1	0/0	$250,000.00	$0.00
Cumberland Co	5/29/1973	F1	0/0	$25,000.00	$0.00
Cumberland Co	8/2/1974	F0	0/0	$25,000.00	$0.00
Cumberland Co	2/11/1981	F2	0/0	$250,000.00	$0.00
Cumberland Co	3/28/1984	F3	2/11	$25,000,000.00	$0.00
Cumberland Co	3/28/1984	F4	0/0	$2,500,000.00	$0.00
Cumberland Co	5/19/1986	F2	0/0	$250,000.00	$0.00
Cumberland Co	8/28/1988	F1	0/0	$250,000.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	5/28/2000	F0	0/0	$0.00	$0.00
Cumberland Co	12/17/2000	F0	0/0	$0.00	$0.00
Cumberland Co	3/27/2009	EF1	0/0	$225,000.00	$0.00
Cumberland Co	4/16/2011	EF3	1/85	$100,000,000.00	$0.00
Cumberland Co	4/16/2011	EF2	0/4	$250,000.00	$0.00
Cumberland Co	4/29/2014	EF1	0/0	$50,000.00	$0.00
			Total:	**$132,932,750.00**	**$0.00**

Figure B2 shows the track of the April 2011 tornado and points representing damaged buildings within the City of Fayetteville. The Cottonade neighborhood of Fayetteville was particularly damaged by this event.

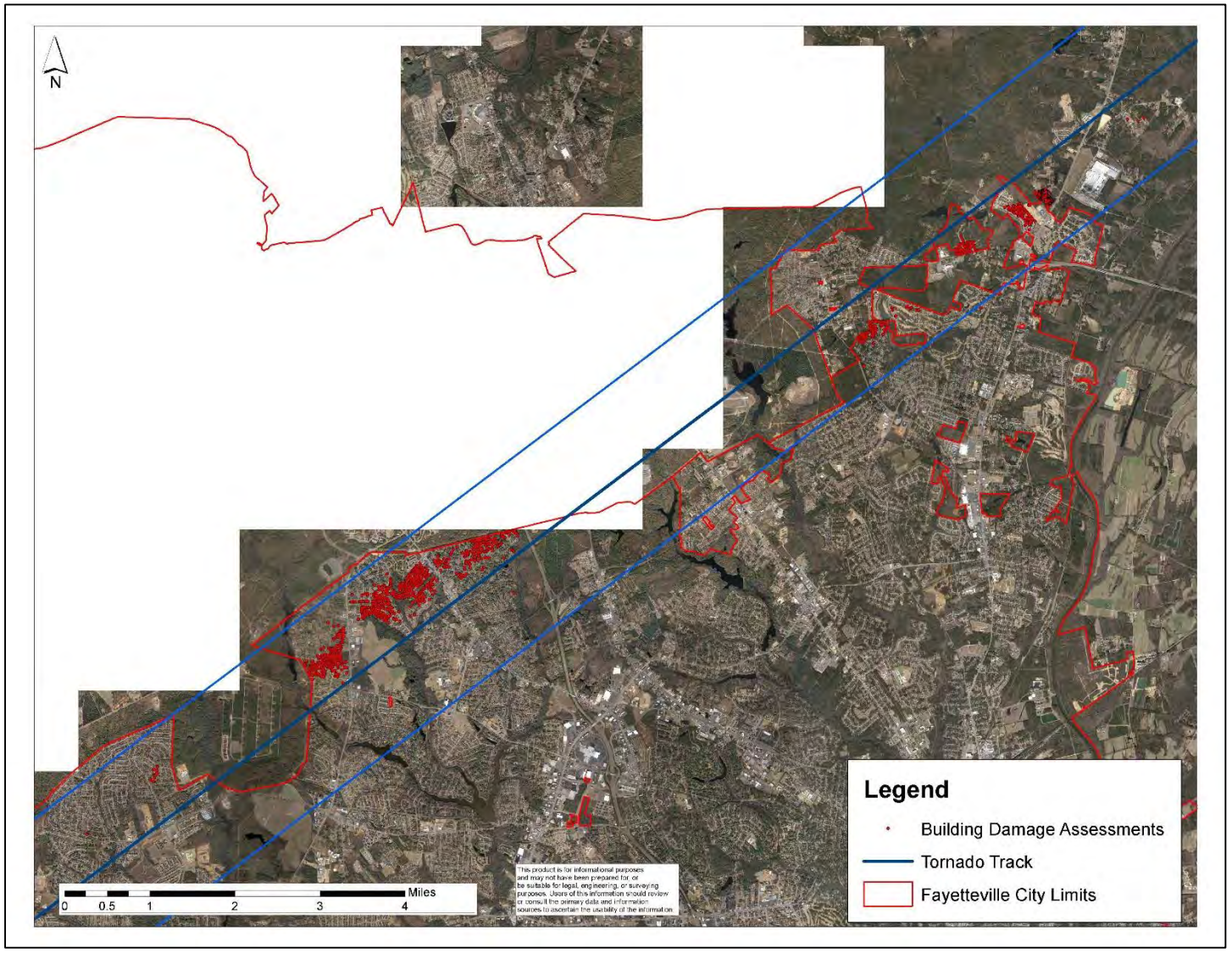


Figure B2 – April 2011 Building Damage within the City of Fayetteville

Probability of Future Occurrence

Likely - The best available information to determine future probability of a tornado event is to review historic frequency. According to NCEI, 23 tornadoes have impacted Cumberland County over a 65 year period. It can reasonably be assumed that the City of Fayetteville has a 35% chance of experiencing a tornado each year.

Vulnerability Assessment

A tornado has the potential to impact all existing and future buildings, facilities, and populations in the City of Fayetteville. Impacts of tornadoes include building and contents damage, debris clean-up, service disruption and potentially numerous fatalities and injuries. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 10.

B.2.9 Wildfire

Location and Spatial Extent

Wildfires could potentially occur anywhere in the region. The Wildland Urban Interface (WUI) is described as the area where structures and other human improvements meet and intermingle with undeveloped wildland or vegetative fuels. Population growth within the WUI substantially increases the risk for wildfire. For the Cumberland County, NC project area, it is estimated that 301,884 people or 95 percent of the total project area population (319,404) live within the WUI. The WUI for Cumberland County is shown within Chapter 5 Subsection 11 (Figure 5.19).

Past Occurrences

Table B17 lists past occurrences of wildfire in Cumberland County since 2005 as provided by the NCFS in September 2015.

Table B17 - Records for Wildfire in Cumberland County

County	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Cumberland	57	75	94	49	21	59	47	24	36	38

Probability of Future Occurrence

Highly Likely - The best available information to determine future probability of a wildfire event is to review historic frequency. According to historic records, 500 wildfires have occurred in Cumberland County between 2005 and 2015 (100% chance of occurring each year).

Vulnerability Assessment

A wildfire has the potential to impact all existing and future buildings, facilities, and populations in the City of Fayetteville. Impacts of wildfire include building and contents damage, debris clean-up, service disruption and potentially numerous fatalities and injuries. Wildfires can also increase flood risk due to loss of vegetation. WUI Risk, Burn Probability and Rate of Spread are provided on the County level in Chapter 6 Subsection 11.

B.2.10 Winter Storm

Location and Spatial Extent

The entirety of the City of Fayetteville can be considered at risk to winter storm events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

According to NCEI records, Cumberland County has experienced 30 winter storm events since 1996, respectively. These events are reported to have caused one death due to icy road conditions.

Table B18 - NCEI Records for Winter Storm Events in Cumberland County (1996-2015)

Date	Location	Type of Winter Storm	Deaths/ Injuries	Property Damage	Crop Damage
1/6/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
1/11/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
2/2/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
2/3/1996	Cumberland County	Cold/wind Chill	0/0	$0.00	$0.00
12/23/1998	Cumberland County	Ice Storm	0/0	$0.00	$0.00
1/18/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/22/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/24/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/28/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
12/3/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/3/2002	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00
12/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/1/2007	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/17/2008	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/19/2008	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/20/2009	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/4/2009	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/29/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/12/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
3/2/2010	Cumberland County	Winter Weather	0/0	$0.00	$0.00
12/16/2010	Cumberland County	Winter Weather	1/0	$0.00	$0.00
12/25/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/10/2011	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/28/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/11/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/12/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/16/2015	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/24/2015	Cumberland County	Winter Weather	0/0	$0.00	$0.00

Source: NCEI, September 2015

Probability of Future Occurrence

Highly Likely - The best available information to determine future probability of a winter storm event is to review historic frequency. According to NCEI, 30 winter storm events have occurred over a 19 year period between 1996 and 2015 resulting in approximately 1.6 significant winter storm events per year.

The probability of a heavy snowfall occurring with that winter storm event is less likely. The figure below presents the probability of 8-inches or more of snowfall to be approximately 12.5% per year for the Cumberland County Region.

Vulnerability Assessment

Potential losses associated with winter storms include the cost of the removal of snow from roadways, debris clean-up, and some indirect losses from power outages, etc. All future structures and infrastructure in the region will be vulnerable to winter storms.

B.3 Priority Risk Index Results

Table B19 summarizes the degree of risk assigned to each identified hazard as it applies to the City of Fayetteville using the PRI method described in Chapter 6 Subsection 4.

Table B19 - Summary of PRI Results for the City of Fayetteville

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Dam/Levee Failure	Possible	Limited	Small	Less than 6 hrs	Less than 6 hrs	2.1
Drought	Highly Likely	Minor	Large	More than 24 hrs	More than 1 week	2.8
Earthquake	Possible	Limited	Moderate	Less than 6 hrs	Less than 6 hrs	2.3
Extreme Heat	Possible	Minor	Large	More than 24 hrs	Less than 1 week	2.1
Hurricane/Tropical Storm	Likely	Critical	Large	More than 24 hrs	Less than 24 hrs	2.9
Inland Flooding: 100-/500-year	Possible	Critical	Moderate	6 to 12 hours	Less than 1 week	2.7
Severe Weather (thunderstorm wind, lightning, & hail)	Likely	Limited	Moderate	6 to 12 hours	Less than 6 hrs	2.5
Tornado	Likely	Critical	Small	Less than 6 hrs	Less than 6 hrs	2.7
Wildfire	Highly Likely	Limited	Small	Less than 6 hrs	Less than 1 week	2.9
Winter Storm	Highly Likely	Minor	Moderate	More than 24 hrs	Less than 1 week	2.5

As shown in Table B20 on the following page, the results from the PRI have been classified into three categories based on the assigned risk value:

- **Low Risk** - Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium Risk** - Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High Risk** - Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread.

Table B20 - Summary of Hazard Risk Classification

Hazard Category	Hazard Type
High Risk (> 2.5)	**Hurricane/Tropical Storm Wildfire Drought Inland Flooding: 100-/500-year Tornado**
Moderate Risk (2.0 – 2.5)	**Severe Weather Winter Storm Earthquake Extreme Heat Dam/Levee Failure**
Low Risk (< 2.0)	**N/A**

B.4 Capability Assessment

This subsection discusses the capability of the City of Fayetteville to implement hazard mitigation activities. More information on the purpose and methodology used to conduct the assessment can be found in Chapter 7 - Capability Assessment.

B.4.1 Planning and Regulatory Capability

Table B21 lists regulatory capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the City of Fayetteville.

Table B21 - Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Y/N	Date	Comments
Comprehensive Plan	Y	6/22/09	Fayetteville City Council adopted 2030 Growth Vision Plan and 2030 Growth Strategy Map on 6/22/09
Zoning Ordinance	Y	7/1/11	Zoning ordinance is now part of City's UDO, effective 7/1/11
Subdivision Ordinance	Y	7/1/11	Subdivision ordinance is now part of City's UDO, effective 7/1/11
Floodplain Ordinance	Y	2007	City adopted FEMA model ordinance in 2007
Stormwater Ordinance	Y	2009 & later amendments	Chapter 23-Stormwater Management Ordinance
Erosion, Sedimentation and Pollution Control Ordinance	N		Handled by NC DENR
Building Code	Y	1970's, with later amendments	2012 NC Building Code (for commercial & some residential, e.g. apts, condos, boarding houses) and 2012 NC Residential Code (for most residential, e.g., single-family, townhouses, duplex apts)
BCEGS Rating	Y	Conducted every 5 years	Rating of 4/4
Stormwater Management Program	Y	2013 Permit Renewal	NPDES Phase 1 (MS4) Municipal Discharge Permit
Site Plan Review Requirements	Y	7/1/11	Now part of City's UDO, effective 7/1/11
Capital Improvements Plan	Y		The City does use a CIP planning process and develops a 5 year funding model for approved projects
Local Emergency Operations Plan	Y	12/31/13	The EOP is updated annually. Link to 2013 plan: http://cofweb/Emergency_Management/2013EOPsigned.pdf
Flood Insurance Study or Other Engineering Study for Streams	Y	6/18/07	
Repetitive Loss Plan	N		
Elevation Certificates	Y		

B.4.2 Floodplain Management

The City of Fayetteville joined the NFIP emergency program in 1973 and has been a regular participant in the NFIP since October 1978. The following tables reflect NFIP policy and claims data for the City categorized by structure type, flood zone, Pre-FIRM and Post-FIRM.

Table B22 - NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	619	$314,104	$143,534,100	31	$643,896.25
2-4 Family	20	$14,805	$4,743,600	3	$31,976,16
All Other Residential	73	$56,884	$13,553,900	2	$3,442.97
Non-Residential	50	$105,087	$21,967,300	16	$931,383.60
Total	**762**	**$490,880**	**$183,798,900**	**82**	**$1,640,697.00**

Source: FEMA Community Information System, December 2015

Table B23 - NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	236	$240,083	$55,997,200	26	$976,517.23
A Zones	7	$5,277	$1,314,300	8	$114,133.62
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00
V Zones	0	$0	$0	0	$0.00
D Zones	0	$0	$0	0	$0.00
B, C & X Zone					
Standard	66	$72,825	$12,980,400	16	$221,897.06
Preferred	453	$172,745	$113,507,000	30	$295,819.86
Total	**762**	**$490,880**	**$183,798,900**	**80**	**$1,608,366.00**

Source: FEMA Community Information System, December 2015

Table B24 - NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	86	$142,790	$17,440,100	23	$955,842.96
A Zones	2	$1,947	$175,300	6	$100,006.71
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00
V Zones	0	$0	$0	0	$0.00

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
D Zones	0	$0	$0	0	$0.00
B, C & X Zone	154	$70,186	$39,313,800	37	$453,034.08
Standard	7	$14,312	$2,486,800	13	$197,964.79
Preferred	147	$55,874	$36,827,000	24	$255,069.29
Total	**242**	**$214,923**	**$56,929,200**	**66**	**$1,508,882.00**

Source: FEMA Community Information System, December 2015

Table B25 - NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	150	$142,790	$17,440,100	3	$20,674.27
A Zones	5	$1,947	$175,300	2	$14,126.81
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00
V Zones	0	$0	$0	0	$0.00
D Zones	0	$0	$0	0	$0.00
B, C & X Zone	365	$175,384	$87,173,600	9	$64,682.84
Standard	59	$58,513	$10,493,600	3	$23,932.27
Preferred	306	$116,871	$76,680,000	6	$40,750.57
Total	**520**	**$275,957**	**$126,869,700**	**14**	**$99,482.00**

Source: FEMA Community Information System, December 2015

B.4.3 Administrative and Technical Capability

Table B26 lists administrative capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the City of Fayetteville.

Table B26 - Administrative/Technical Capabilities

Resource	Y/N	Responsible Department
Planner/Engineer with knowledge of land development/land management practices	Y	Engineering and Infrastructure Department; Planning and Code Enforcement Department
Engineer/Professional trained in construction practices related to buildings and/or infrastructure	Y	Permitting and Inspections Department
Planner/Engineer/Scientist with an understanding of natural hazards	Y	Planning and Code Enforcement Department
Personnel skilled in GIS	Y	Information Technology Dept-GIS Section & various staff in other departments
Full time building official	Y	Permitting and Inspections Department

Resource	Y/N	Responsible Department
Floodplain Manager	Y	Planning and Code Enforcement Dept. has an Acting FP Manager
Emergency Manager	Y	City Level: Emergency Management Coordinator in Fire/Emergency Mgmt.
Grant writer	Y	Various staff members in various departments apply for grants, but it is not known whether there is a certain individual tasked with writing grants on a full-time basis
GIS data – Hazard areas	Y	Cumberland County Information Services
GIS data – Critical facilities	Y	Cumberland County Information Services
GIS data – Land use	Y	Planning and Code Enforcement Dept.
GIS data – Building footprints	Y	Cumberland County Information Services
GIS data – Links to Assessor's data	Y	Cumberland County Information Services
Warning Systems/Services	Y	Cumberland County Emergency Services

B.4.4 Fiscal Capability

Table B27 lists fiscal capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the City of Fayetteville.

Table B27 - Fiscal Mitigation Capabilities

Resource	Accessible/Eligible to Use (Y/N)
Community Development Block Grants	Y
Capital improvements project funding	Y - The City does use a CIP planning process and develops a 5 year funding model for approved projects
Authority to levy taxes for specific purposes	Y
Fees for water, sewer, gas or electric services	Y-The Public Works Commission (PWC) charges fees for
Impact fees for new development	Y-The Public Works Commission (PWC) charges a Facility
Incur debt through general obligation bonds	Y
Incur debt through special tax bonds	Y
Incur debt through private activity bonds	Y
Withhold spending in hazard prone areas	Y

B.5 Mitigation Strategy

B.5.1 Status Update for 2011 Mitigation Actions

Table B28 provides a status update for each mitigation action detailed in the 2011 Cumberland County Multi-jurisdictional Hazard Mitigation Plan with the City of Fayetteville designated as the responsible jurisdiction. This table provides a summary of progress to-date and also notes whether each action is to be deleted or carried forward into the 2016 Regional Plan.

Table B28 - Status of 2011 Mitigation Actions

City of Fayetteville								
Mitigation Action Number	**Action Description**	**Responsible Department**	**Current Status**			**2016 Plan Update**		**Summary of Progress To-Date**
			Complete	**In Progress**	**Not yet Started**	**Delete Action**	**Carry Forward**	
1	The City Should Modify The City Flood Damage Prevention Ordinance To Require That The Lowest Floor (Including Basement) Be Elevated To A Level At Least One Foot Above The Base Flood Elevation, Or To A More Restrictive Level.	Development Services staff with other members of the Technical Review Committee	X			X		Completed on October 23, 2006, when City Council amended ordinance to require all new construction to be placed a minimum of two feet above the Base Flood Elevation. These amendments were effective on January 5, 2007.
2	The City Should Modify The City Zoning Ordinance To Add A Conservation District (CD) Zone. (Currently Underway.) The New CD Zone Should Be Applied In The Recently Annexed Areas And As Cases Arise. When The State Delivers New Flood Maps, The City Should Apply The New CD Zone To All Designated Flood Hazard Areas.	The Planning and Zoning Division Staff within the Development Services Dept	X (Re: addition of new CD zone)	X (Re: application of new CD zone)	X (Re: application after new maps delivered)	X (Re: addition of new CD zone)	X (Re: application of new CD zone as cases arise and after new maps delivered)	**Re: Addition of New CD Zone**-Completed on February 23, 2004, when City Council added it to Zoning Ordinance. Zoning Ordinance was included in the new UDO, effective July 1, 2011. **Re: Application of New CD Zone**-Was applied to large new annexation area that became effective on September 30, 2005. Continues to be applied as cases arise on land where appropriate characteristics exist. **Re: Application of New CD Zone After New Flood Maps Delivered by State**-One set of new flood maps was delivered after 2010 Plan Update; CD zone not applied based on these maps. Another new set of flood maps is expected in Summer of 2016 or 2017; CD zone will hopefully be applied based on these newer maps.
3	When The State Delivers New Flood Maps, The City Should Identify Existing Buildings That Have Their Lowest Floor Below The 100-Year Base Flood Elevation And Develop An Acquisition/Relocation Program For These Buildings.	City Engineering Dept. survey crews could possibly determine if existing buildings have their lowest floor below the 100-year Base Flood Elevation. City GIS Analyst will tag these buildings in GIS. The Community Development Staff could develop and implement an acquisition/relocation program.			X	X (Re: acquisition/relocation program)	X (Re: identifying buildings)	The 2011 Plan Update recommended that this action item be deleted, because it had been determined that City resources would not be used to mitigate the risk of private property owners by purchasing and relocating their facilities. However, it is recommended that the City carry forward with the part of this item dealing with identifying the buildings.
4	The Stormwater Division Of The City Engineering And Maintenance Department Should Expand The Existing Stream Debris Cleaning Program.	Manager of Stormwater Program		X			X	The City's existing Stream Debris Cleaning Program continues across the City in watershed areas that have been identified as needing that service due to obstructions in the stream that lead to poor water flow and possible flooding. Although city stormwater fees have increased the last two years, those additional revenues are primarily for other infrastructure improvements to mitigate flooding issues. The Stream Cleaning Program currently appears to adequately address known issues, and any expansion or broadening of the service level would require additional funding that is currently not available.
5	The City Will Maintain/Improve Existing City Requirements That Limit The Amount Of Impervious Surfaces And That Encourage The Use Of Pervious Surfaces.	The Planning Staff has started the ordinance revision process. Technical Review Committee staff will be responsible for enforcing.		X			X	**New buffer/landscape planting area requirements:** added to Zoning Ordinance on July 24, 2006. (These requirements were included in new Unified Development Ordinance, which was adopted on December 13, 2010, effective July 1, 2011. The UDO also included new open space standards. UDO continues to be revised, as needed.) **New Stormwater Ordinance**: Completed on May 26, 2009, effective July 1, 2009. (Included provisions for minimizing disturbance of buffer areas adjacent to streams, minimizing impervious surfaces and promoting alternative methods

City of Fayetteville								
Mitigation Action Number	Action Description	Responsible Department	Current Status			2016 Plan Update		Summary of Progress To-Date
			Complete	In Progress	Not yet Started	Delete Action	Carry Forward	
								and materials for parking surfaces. The influence of the Stormwater Ordinance was extended by the UDO.) **Water Supply Ordinance**: continues to be in effect.
6	The City Should Make The City Flood Damage Prevention Ordinance As Similar As Possible To The County Flood Damage Prevention Ordinance.	Planning Staff	X			X		This item was completed on October 23, 2006 when the City Council adopted an ordinance that was very similar to the County Ordinance. The ordinance was effective on January 5, 2007. The differences in the ordinances have been reconciled. The City and County have adopted essentially the same standards. Each jurisdiction prefers to maintain and enforce its own ordinance.
7	The City Should Investigate The Possibility Of Participating In The CRS Program.	Development Services Department			X		X	Work has not yet started on this action since it was first proposed. In the next five years, the City should investigate the steps and resources necessary to participate in the program. At that point, a decision will be made on whether or not to participate. At beginning of investigation, City will determine number of properties that would qualify for reduction in flood insurance.
8	In Order To Promote More Evacuation Routes, The City Should Consider Amending The City Subdivision Ordinance To Require Additional Access Roads For Developments Located Near Potential Hazard-Prone Areas.	Planning Department initiate ordinance amendment and enforcement will be by the Inspections Department		X			X	A new Unified Development Ordinance, containing new subdivision standards for external connectivity and development entry points, was adopted on December 13, 2010, with an effective date of July 1, 2011. The entry point requirements for residential areas are based on the number of units. The requirements for other use types are based on the number of acres. At this time, there are no entry point requirements for developments located near potential hazard-prone areas; perhaps a requirement should be added. Also, retrofit of non-connected subdivisions in high hazard areas is needed and should be funded, based on results of the FAMPO connectivity study.
9	The City Should Encourage Electrical Utilities Other Than PWC To Expand Their Tree Pruning Programs. (The PWC Tree-Pruning Program Is Adequate.)	The City will initiate contacts with officials of electrical utilities other than PWC. It will be up to the other utilities to implement.			X		X	No work has yet started on this item since it was first proposed. However, it should be carried forward. Staff should contact all electric utilities operating in the City to discuss a strategy. One possible strategy is to request that all electric utilities operating in the City report on their general maintenance activities annually. Also, there should be expansion over time of undergrounding electric lines, so that tree conflicts are eliminated
10	The City Should Enhance Multilingual Information Brochures About Hazards And Distribute These Brochures In Neighborhoods With High Concentrations Of Foreign-Born Populations.	Human Relations Department with possible collaboration with the Community Development Department.		X			X	City has attempted to identify staff members who are fluent in foreign languages. These members might be able to assist in an emergency. In order to carry forward with this item, City staff should identify neighborhoods, other concentration areas, and organizations of foreign-born populations.
11	The City Will Maintain The Special GIS Database That Was Developed For The City's Plan. The Database Could Then Be Used To Assess Damages From Future Hazardous Events That Might Occur In The City And To Update The Plan.	Development Services Department or Information Technology Department GIS Analyst			X		X	Staff developed two separate databases for 2006 original plan and for 2011 update to plan. These databases have not been maintained as proposed in this item. However, it is still recommended that this item be carried forward, using GIS and the new flood maps that are expected in summer of 2016 or 2017.
12	The City Should Ask The County To Develop A Geographic Identifier For Individual Buildings. This Would Allow GIS Users To Link Tabular Tax Information About Buildings To The Individual Buildings.	City Planning Department or City GIS Analyst could initiate request to County. County Tax Department staff would develop the geographic identifier.			X		X	In the 2011 Update, the City proposed that this item be modified to call for the development and maintenance of a new building footprint layer, not just the development of a geographic identifier for each building. Around 2013, the state delivered a new building footprint layer. This City hopes that the County Tax Department and/or the County Addressing Department will be able to develop the proposed geographic identifier, based on the new building footprint layer. This would allow a link between tax and other information in GIS. Procedures will

City of Fayetteville								
Mitigation Action Number	Action Description	Responsible Department	Current Status			2016 Plan Update		Summary of Progress To-Date
			Complete	In Progress	Not yet Started	Delete Action	Carry Forward	
								need to be established for insuring that identifiers are assigned to new buildings as they are constructed.
13	The City Consider Options To Reduce The Risk Of Flooding For City-Owned Buildings That Are Located In Flood Hazard Areas.	City Planning Department would initiate action. City Staff preparing the Capital Improvements Plan (CIP) would include this action in the Plan.			X		X	Work has not yet started on this item, but it still seems important, so it is recommended that it be carried forward. City staff should evaluate the procedures and resources necessary to carry out this item. Staff should present findings to administration. Depending on the findings, a prioritized action list could be established. The evaluation might involve the following steps: Verify number of City-owned buildings that are in flood hazard areas. Determine number of buildings that need to have a reduction in flood risk. Track number of buildings annually that receive a reduction in flood risk.

B.5.2 2016 Mitigation Action Plan

Table B29 identifies 11 new and/or revised mitigation actions for the City of Fayetteville as well as 11 unrevised, incomplete actions from Table B28 that are to be carried forward into the 2016 Regional Plan.

Table B29 - 2016 Mitigation Action Plan

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
New/Revised Actions										
1	Maintain an all Hazards public education program to educate and prepare residents for all of the hazards that impact Cumberland County.	To educate, enhance preparedness, and resiliency of Cumberland County and its municipal residents through public education programs that included booths at fairs, festivals and special events, websites, brochures, school programs, and etc.	Cumberland County Emergency Management	$90,000	Local Operating Budget	Short Range	New			All Hazards
2	Explore the Fire Adapted Communities concept implementation in Cumberland County.	To enhance the preparedness and resiliency of Cumberland County and its municipalities to the effects of wild land fire and urban interface, through education; programs such as Fire Wise, Ready Set Go, Community Wildfire Protection Plan; Fuel Management; local codes and ordinances.	Emergency Management, NC Forest Service and Fire Marshalls	Staff Hours	Local Operating Budget and Federal	Medium Range	New	X	X	Wildfire
3	Conduct a countywide infrastructure vulnerability assessment to identify priority needs for updating ill-designed or outdated critical structures.	It has been difficult to locate any comprehensive assessments of local infrastructure in Cumberland and Hoke Counties. With current and projected natural hazard occurrences, it is essential to have an accurate and comprehensive understanding of the current condition of critical facilities to ensure the ability to continue to provide for basic needs, such as water and electrical supplies, transportation routes, waste management, etc.	County/city structural and civil engineers in partnership with U.S. Army Corps of Engineers	Staff Hours	Local Operating Budget and Federal	Medium Range	New	X		All Hazards
4	Conduct social vulnerability analysis to identify priority needs and opportunities that will address the specific problems vulnerable populations face from a range of hazards, including barriers to evacuation, event-specific vulnerabilities, and impediments to recovery.	There exist various groups of individuals that have additional financial, social and/or environmental barriers to being resilient in the face of natural hazard events. In Cumberland County, for example, groups with significant number of people affected include about 10K outdoor workers with direct exposure to extreme heat days, elderly people and especially those with existing cardiovascular conditions, and other low-income and/or minority groups. As natural hazard events increase in intensity and frequency, these groups will find it harder to safely and efficiently get out of harm's way. These groups will also have difficulty in obtaining and paying for essential components to sustain life, such as medications, utilities, and transportation to/from a place of work, etc.	County Social Services Department and/or County Health Department	Staff Hours	Local Operating Budget	Medium Range	New			All Hazards
5	Collaborate with NC Cooperative Extension and NC Agriculture and Forestry Adaptation Working Group to provide more local support and encouragement of forest conservation and farmland preservation measures.	Forests and farmland provide a multitude of social, economic and environmental benefits, that when looked at comprehensively, far outweigh any profit/revenue projections of residential or commercial properties. Outside of development pressure, some of the other major health risks include: (1) increasing wildfire risk, (2) increasing number and types of insects and pests, (3) lack of sufficient water during the growing season for crops, and (4) increasing damage from strong winds and flooding. It is vital, especially in the face of a changing climate, to preserve these working lands and to support higher density development in already existing urban and suburban centers.	County Board of Commissioners, Conservation District Programs, and other land preservation organizations.	Unknown	NC Cooperative Extension, NC Forest Service, US Department of Agriculture and NC Wildlife Resources Commission.	Short Range	New		X	Wildfire, Inland Flooding
6	Include climate predictions from the Cumberland County Climate Resiliency Plan in the Regional Hazard Mitigation Plan.	To properly prepare for natural hazard occurrences, it is important to include predictions that warn of: (1) increasing temperatures and extreme heat days, (2) increasing frequency and strength of severe weather events, (3) more heavy rain/flooding, and (4) more frequent and prolonged drought. Although some climate projections do not pose an immediate threat, any comprehensive mitigation plan for emergency management should at the very least, and by the very nature of the definition of "mitigation", acknowledge the changing climate and possibility of increased extreme weather and flooding events.	The Planning Department/Planning Director for each jurisdiction in Cumberland County	None	Existing FEMA grant	Short Range	New	X	X	All Hazards

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
7	Provide financial assistance for low-income residents to help with power bills and support services during extended periods of high temperature and other extreme weather.	Low-income households face challenges in keeping up with utility bills. Some low-income utility assistance programs are offered, but funds are limited. Extreme weather and increasing temperatures will place even greater pressure on these programs' ability to provide assistance to all those in need, and citizen's lives will be increasingly at stake.	County Health Department	Unknown	NC Department of Health and Human Services and County Department of Health	Medium Range	New			Extreme Heat, Winter Weather
8	Analyze and update local development ordinances to make buildings safer from wind and flooding, more energy and water efficient, more tolerant of heat waves and healthier to live in. Also, provide incentives for making buildings safer from wind, flooding, more energy and water efficient, and healthier to live in.	Energy and water efficiency will be increasingly important to a community's resiliency in the face of natural hazards specifically because of projections of increasing temperatures and extreme heat days, and prolonged periods of drought. Climate projections also state that precipitation will continue to follow a seasonal pattern, whereby hot, Summer months are classified with less precipitation and Winters with more precipitation. Extreme heat days will be specially taxing on buildings with older A/C systems or inadequate insulation and in low-income households where upkeep with rising utility costs could become a burden.	Planning and Code Departments of each jurisdiction	Staff Hours	Local Operating Budget	Medium Range	New		X	Inland Flooding, Hurricane Wind, Thunderstorm Wind, Extreme Heat, Winter Storms
9	Use natural systems, more open space and green surfaces to manage stormwater in a more resilient fashion.	Impervious surfaces typically found in urban centers, such as paved roads, buildings, parking lots and pavement, drastically increase flash floods and urban flooding, which seems to be a common occurrence in Cumberland County. For instance, within a 90 day period (March 1 – June 30, 2015), three flooding incidents were reported due to heavy rainfall events. Use of LID stormwater management practices is mentioned only in summary in the Growth Factor Analysis, stating it "…should be emphasized in sensitive areas…" This, coupled with the naturally flat topography of the eastern portions of the County also help to create excess runoff and subsequent urban flooding issues, especially in the Special Flood Hazard Areas (SFHA) of the County, and specifically around Blounts and Cross Creek, as referenced in various resources.	Engineering Department of each jurisdiction	Staff Hours	Local Operating Budget	Short Range	New		X	Inland Flooding
10	Provide stormwater infrastructure improvements to mitigate reported flooding.	The stormwater program provides drainage infrastructure improvements to protect property, health and safety as associated with reported flooding. This program is designed to be responsive and sensitive to the needs of residents and property owners and responds to customer inquiries regarding drainage and flooding issues in the city. Once reported, an investigation is conducted and recommended for improvements. Those projects identified are then scheduled based on priority and funding available as part of the City's Capital Improvements Program (CIP). Funding is available through the Stormwater Utility Fee.	City of Fayetteville Engineering and Infrastructure Department (Giselle Rodriguez, PE)	Unknown	Local Operating Budget	Short Range	New	X	X	Inland Flooding
11	Improve access to reliable and convenient emergency shelters.	Communities with sub-standard and/or mobile homes are especially at risk from severe weather events due to structural deficiencies. Mobile homes constitute the second highest housing unit types in Cumberland County (detached single-family homes being the highest) and tend to be concentrated in certain portions of the County. Observed and projected trends in severe weather events pose a significant threat to the health and safety of these communities, and reliable and convenient emergency shelters may not be available.	County and State Emergency Services	Unknown	FEMA and County/State Emergency Services	Short Range	New			All Hazards
2011 Mitigation Actions Carried Forward										
1	The City Should Modify The City Zoning Ordinance To Add A Conservation District (CD) Zone. (Currently Underway.) The New CD Zone Should Be Applied In The Recently Annexed Areas And As Cases Arise. When The State Delivers	Application of New CD Zone-Was applied to large new annexation area that became effective on September 30, 2005. Continues to be applied as cases arise on land where appropriate characteristics exist. Re: Application of New CD Zone After New Flood Maps Delivered by State-One set of new flood maps was delivered after 2010 Plan Update; CD zone not applied based on these maps. Another new set of flood maps is expected in Summer of 2016 or 2017; CD zone will hopefully be applied based on these newer maps.	The Planning and Zoning Division Staff within the Planning and Code Enforcement Services Department	Staff Hours	Local Operating Budget	Short Range	In Progress		X	Inland Flooding

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
	New Flood Maps, The City Should Apply The New CD Zone To All Designated Flood Hazard Areas.									
2	When The State Delivers New Flood Maps, The City Should Identify Existing Buildings That Have Their Lowest Floor Below The 100-Year Base Flood Elevation And Develop An Acquisition/Relocation Program For These Buildings.	The 2011 Plan Update recommended that this action item be deleted, because it had been determined that City resources would not be used to mitigate the risk of private property owners by purchasing and relocating their facilities. However, it is recommended that the City carry forward with the part of this item dealing with identifying the buildings.	City Engineering Dept. survey crews could possibly determine if existing buildings have their lowest floor below the 100-year Base Flood Elevation. City GIS Analyst will tag these buildings in GIS. The Community Development Staff could develop and implement an acquisition/relocation program.	Staff Hours	Local Operating Budget	Medium Range	In Progress	X		Inland Flooding
3	The Stormwater Division Of The City Engineering And Maintenance Department Should Expand The Existing Stream Debris Cleaning Program.	The City's existing Stream Debris Cleaning Program continues across the City in watershed areas that have been identified as needing that service due to obstructions in the stream that lead to poor water flow and possible flooding. Although city stormwater fees have increased the last two years, those additional revenues are primarily for other infrastructure improvements to mitigate flooding issues. The Stream Cleaning Program currently appears to adequately address known issues, and any expansion or broadening of the service level would require additional funding that is currently not available.	Manager of Stormwater Program	Unknown	Local Operating Budget	Medium Range	In Progress	X	X	Inland Flooding
4	The City Will Maintain/Improve Existing City Requirements That Limit The Amount Of Impervious Surfaces And That Encourage The Use Of Pervious Surfaces.	New buffer/landscape planting area requirements: added to Zoning Ordinance on July 24, 2006. (These requirements were included in new Unified Development Ordinance, which was adopted on December 13, 2010, effective July 1, 2011. The UDO also included new open space standards. UDO continues to be revised, as needed.) New Stormwater Ordinance: Completed on May 26, 2009, effective July 1, 2009. (Included provisions for minimizing disturbance of buffer areas adjacent to streams, minimizing impervious surfaces and promoting alternative methods and materials for parking surfaces. The influence of the Stormwater Ordinance was extended by the UDO.) Water Supply Ordinance: continues to be in effect.	The Planning Staff has started the ordinance revision process. Technical Review Committee staff will be responsible for enforcing.	Staff Hours	Local Operating Budget	Medium Range	In Progress	X	X	Inland Flooding
5	The City Should Investigate The Possibility Of Participating In The CRS Program.	Work has not yet started on this action since it was first proposed. In the next five years, the City should investigate the steps and resources necessary to participate in the program. At that point, a decision will be made on whether or not to participate. At beginning of investigation, City will determine number of properties that would qualify for reduction in flood insurance	Planning and Code Enforcement Services Department	Staff Hours	Local Operating Budget	Long Range	In Progress	X	X	Inland Flooding
6	In Order To Promote More Evacuation Routes, The City Should Consider Amending The City Subdivision Ordinance To Require Additional Access Roads For Developments Located Near Potential Hazard-Prone Areas.	A new Unified Development Ordinance, containing new subdivision standards for external connectivity and development entry points, was adopted on December 13, 2010, with an effective date of July 1, 2011. The entry point requirements for residential areas are based on the number of units. The requirements for other use types are based on the number of acres. At this time, there are no entry point requirements for developments located near potential hazard-prone areas; perhaps a requirement should be added. Also, retrofit of non-connected subdivisions in high hazard areas is needed and should be funded, based on results of the FAMPO connectivity study.	Planning and Code Enforcement Services Department	Staff Hours	Local Operating Budget	Medium Range	In Progress	X	X	All Hazards
7	The City Should Encourage Electrical Utilities Other Than PWC To Expand Their Tree Pruning Programs. (The PWC Tree-Pruning Program Is Adequate.)	Staff should contact all electric utilities operating in the City to discuss a strategy. One possible strategy is to request that all electric utilities operating in the City report on their general maintenance activities annually. Also, there should be expansion over time of undergrounding electric lines, so that tree conflicts are eliminated.	The City will initiate contacts with officials of electrical utilities other than PWC. It will be up to the other utilities to implement.	Staff Hours	Local Operating Budget	Medium Range	In Progress	X	X	Wildfire, Winter Storm
8	The City Should Enhance Multilingual Information Brochures About Hazards And Distribute These Brochures In	City has attempted to identify staff members who are fluent in foreign languages. These members might be able to assist in an emergency. In order to carry forward with this item, City staff should identify neighborhoods, other concentration areas, and organizations of foreign-born populations.	Human Relations Department with possible collaboration with the	Staff Hours	Local Operating Budget	Medium Range	In Progress			All Hazards

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
	Neighborhoods With High Concentrations Of Foreign-Born Populations.		Community Development Department.							
9	The City Will Maintain The Special GIS Database That Was Developed For The City's Plan. The Database Could Then Be Used To Assess Damages From Future Hazardous Events That Might Occur In The City And To Update The Plan.	Staff developed two separate databases for 2006 original plan and for 2011 update to plan. These databases have not been maintained as proposed in this item. However, it is still recommended that this item be carried forward, using GIS and the new flood maps that are expected in summer of 2016 or 2017.	Planning and Code Enforcement Services Department or Information Technology Department GIS Analyst	Staff Hours	Local Operating Budget	Medium Range	In Progress			All Hazards
10	The City Should Ask The County To Develop A Geographic Identifier For Individual Buildings. This Would Allow GIS Users To Link Tabular Tax Information About Buildings To The Individual Buildings.	In the 2011 Update, the City proposed that this item be modified to call for the development and maintenance of a new building footprint layer, not just the development of a geographic identifier for each building. Around 2013, the state delivered a new building footprint layer. This City hopes that the County Tax Department and/or the County Addressing Department will be able to develop the proposed geographic identifier, based on the new building footprint layer. This would allow a link between tax and other information in GIS. Procedures will need to be established for insuring that identifiers are assigned to new buildings as they are constructed.	Planning and Code Enforcement Services Department or City GIS Analyst could initiate request to County. County Tax Department staff would develop the geographic identifier.	Staff Hours	Local Operating Budget	Medium Range	In Progress	X	X	All Hazards
11	The City Consider Options To Reduce The Risk Of Flooding For City-Owned Buildings That Are Located In Flood Hazard Areas.	Work has not yet started on this item, but it still seems important, so it is recommended that it be carried forward. City staff should evaluate the procedures and resources necessary to carry out this item. Staff should present findings to administration. Depending on the findings, a prioritized action list could be established. The evaluation might involve the following steps: Verify number of City-owned buildings that are in flood hazard areas. Determine number of buildings that need to have a reduction in flood risk. Track number of buildings annually that receive a reduction in flood risk.	Planning and Code Enforcement Services Department would initiate action. City Staff preparing the Capital Improvements Plan (CIP) would include this action in the Plan.	Staff Hours	Local Operating Budget	Medium Range	In Progress	X		Inland Flooding

ANNEX C – TOWN OF EASTOVER

C.1 Community Profile

C.1.1 Geography

The Town of Eastover is within Cumberland County and is located in south central North Carolina in the Upper Coastal Plain. As of the 2010 census, the population was 3,628. Eastover is within of the Fayetteville, NC Metropolitan Statistical Area and is part of the Mid-Carolina Council of Governments. Eastover was established in 2007. According to the U.S. Census Bureau, the Town has a total area of approximately 11.4 square miles of which 11.39 square miles is land and 0.01 square miles is water. Eastover is located in the Cape Fear River basin.

C.1.2 Population and Demographics

Table C1 provides population counts and the percentage change in population since 2010 for the Town of Eastover. Based on the 2010 census, the population density is 319 people per square mile.

Table C1 - Population Counts for Town of Eastover

Jurisdiction	2010 Census Population	2014 Estimated Population	% Change 2010-2014
Town of Eastover	3,628	3,679	1.4

Source: U.S. Census Bureau, 2015

Based on the 2010 Census, the median age of residents in the Town of Eastover is 44.9. The racial characteristics of the Town are presented below in Table C2.

Table C2 - Demographics of Town of Eastover

Jurisdiction	White Persons, Percent (2010)	Black Persons, Percent (2010)	American Indian or Alaska Native, Percent (2010)	Asian Persons, Percent (2010)	Hispanic or Latino Persons, Percent (2010)[1]
Town of Eastover	74.9	19.2	1.9	0.9	3.0

[1]Persons of Hispanic Origin may be of any race, so are also included in applicable race category.
Source: U.S. Census Bureau, 2010

C.2 Risk Assessment

This subsection includes a hazard profile and vulnerability assessment for each of the priority hazards identified in Chapter 5 Subsection 13 (Table 5.20) as they pertain to the Town of Eastover. **Additional information for each hazard can be found in Chapter 5 - Hazard Profiles and Chapter 6 – Vulnerability Assessment.**

C.2.1 Dam/Levee Failure

Location and Spatial Extent

According to the North Carolina Dam Inventory that are no dams located within the Town of Eastover.

Past Occurrences

There are no known past dam failures in the Town of Eastover.

Probability of Future Occurrence

Unlikely - Based on historical occurrence information and zero dams located within the Town, it can reasonably be assumed that the Town of Eastover has less than a 1% chance of this type of event occurring each year.

Vulnerability Assessment

The estimated number of buildings that could potentially be impacted by a dam failure is zero.

C.2.2 Drought

Location and Spatial Extent

Drought cannot be confined to geographic or political boundaries. The Cumberland County region, including the Town of Eastover, is designated as moderately dry.

Past Occurrences

According to the North Carolina Drought Monitor, Cumberland County has experienced drought conditions every year since 2000. Table C3 shows the most severe classification for each year.

Table C3 - Historical Drought Occurrences

Year	Cumberland County
2000	Abnormally Dry
2001	Severe Drought
2002	Extreme Drought
2003	Abnormally Dry
2004	Abnormally Dry
2005	Abnormally Dry
2006	Moderate Drought
2007	Exceptional Drought
2008	Exceptional Drought
2009	Moderate Drought
2010	Moderate Drought
2011	Severe Drought
2012	Moderate Drought
2013	Abnormally Dry
2014	Abnormally Dry
2015	Moderate Drought

Source: NC Drought Monitor

Probability of Future Occurrence

Highly Likely - Based on historical occurrence information (15 records in 15 years), it can reasonably be assumed that the Town of Eastover has a 100% chance of this type of event occurring each year.

Vulnerability Assessment

It is assumed that whereas all buildings and facilities in the planning area would technically be exposed to the drought hazard, there is no significant vulnerability to these buildings on a structural level. Population growth could contribute directly to this hazard, as an increased number of users pull from the available water supply within the region.

C.2.3 Earthquake

Location and Spatial Extent

As detailed in Chapter 5 – Hazard Profiles, the Town of Eastover lies within an approximate zone level between 6 and 10% ground acceleration. This indicates that the region as a whole exists within an area of moderate seismic risk.

Past Occurrences

A list of earthquakes that have caused damaged in North Carolina is presented below in Table C4.

Table C4 - Earthquakes Affecting North Carolina

Date	Location	Richter Scale
12/16/1811	NE Arkansas	8.5
01/23/1812	New Madrid, MO	8.4
02/07/1812	New Madrid, MO	8.7
04/29/1852	Wytheville, VA	5.0
08/31/1861	Wilkesboro, NC	5.1
12/23/1875	Central Virginia	5.0
08/31/1886	Charleston, SC	7.3
05/31/1897	Giles County, VA	5.8
01/01/1913	Union County, SC	4.8
02/21/1916	Asheville, NC	5.5
07/08/1926	Mitchell County, NC	5.2
11/03/1928	Newport, TN	4.5
05/13/1957	McDowell County, NC	4.1
07/02/1957	Buncombe County, NC	3.7
11/24/1957	Jackson County, NC	4.0
10/27/1959	Chesterfield, SC	4.0
07/13/1971	Newry, SC	3.8
11/30/1973	Alcoa, TN	4.6
11/13/1976	Southwest Virginia	4.1
05/05/1981	Henderson County, NC	3.5

Source: Wake County 2014 Hazard Mitigation Plan. Information provided by NCEM.

Probability of Future Occurrence

Possible - Based on historical occurrences, the probability of a significant earthquake event affecting the Town of Eastover is possible. There are a total of 20 records in North Carolina over the past 200 years. Therefore, the annual probability level is estimated between 1 and 10 percent.

Vulnerability Assessment

An earthquake has the potential to impact all existing and future buildings, facilities, and populations in the Town of Eastover. Impacts of earthquakes include debris clean-up, service disruption and, in severe cases, fatalities due to building collapse. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 3.

C.2.4 Extreme Heat

Location and Spatial Extent

Extreme heat typically occurs over large areas impacting multiple counties at one time. The entirety of the Town of Eastover is vulnerable to extreme heat.

Past Occurrences

According to the National Climatic Data Center, one instance of extreme heat was recorded in Cumberland County beginning on July 22, 1998, and an additional instance of extreme heat was recorded in Cumberland County beginning on August 10, 2007.

Probability of Future Occurrence

Possible - Based on historical occurrence information (2 records in 65 years), it can reasonably be assumed that an extreme heat event has a 3% chance of occurring each year in the Town of Eastover.

Vulnerability Assessment

Extreme heat is not likely to impact the built environment, but may impact agriculture and pose a threat to humans. Elderly persons, persons with respiratory disabilities, and children may be at risk to experience health problems during extreme heat events, some of which could result in serious illness or death. Potential losses of human life due to extreme heat are not quantified in this Plan. There are no past reports of death or property or crop damage recorded by NCEI.

C.2.5 Hurricane/Tropical Storm

Location and Spatial Extent

All Atlantic and Gulf of Mexico coastal areas are subject to hurricanes. While coastal areas are most directly exposed to land falling hurricanes and tropical storms, their impact can be felt hundreds of miles inland. The entire Town of Eastover region is equally susceptible to hurricanes and tropical storms.

Past Occurrences

Table C5 provides hurricane and tropical storm data reported by NCEI since 1950 for Cumberland County.

Table C5 - NCEI Hurricane and Tropical Storm Events for Cumberland County

Location	Date	Event Type	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland (Zone)	7/12/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/5/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	8/27/1998	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/4/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00

Location	Date	Event Type	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland (Zone)	9/15/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/18/2003	Hurricane (Typhoon)	0/0	$28,000.00	$0.00
Cumberland (Zone)	09/01/2006	Tropical Storm	0/0	$0.00	$0.00
			Total:	**$28,000.00**	**$0.00**

While not included in the NCEI database, Category 4 Hurricane Hazel (DR-28) came ashore in North Carolina on October 15, 1954 and caused substantial damage in the region. With winds reaching 125mph at Grannis Field, Hurricane Hazel caused an estimated $136 million in property damage; 19 deaths; 200 injuries; destruction of 15,000 homes and structures; and damage to 39,000 structures.

Probability of Future Occurrence

Likely - Based on a historical record of eight storm events over a period of 65 years (1950 - 2015), it can reasonably be assumed that this type of event has a 12% chance of occurring each year.

Vulnerability Assessment

In conclusion, hurricane wind has the potential to impact all existing and future buildings, facilities, and populations in the Town of Eastover. Impacts of hurricanes include flood damage, debris clean-up, service disruption and possible fatalities due to flooding or flying debris. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 5.

C.2.6 Inland Flooding: 100-/500-year

Location and Spatial Extent

The Town of Eastover parcel layer and effective 2007 DFIRM were intersected and the flooded parcel area was calculated in acres. Flood zones were assigned to parcels based on the intersection of a parcel with a flood zone. Parcels can be located in multiple flood zones, and only the flooded acreage within the parcel was included in the calculation for each flood zone. Table C6 provides a summary of acreage by flood zone.

Table C6 - Flood Zone Acreage

Jurisdiction	Flood Zone Acreage				
	Zone A (100-year)	Zone AE (100-year)	Zone X Shaded (500-year)	Zone X Unshaded	Total
Town of Eastover	0	693	1,406	5,189	7,288

The Town of Eastover's parcel and building footprint layers were used to examine the inventory of properties at risk. Table C7 provides the building count, estimated building value, estimated content value and estimated total value for all buildings located within each FEMA flood zone.

Table C7 – Properties at Risk

Occupancy Type	Total Number of Buildings in Floodplain	Total Building Value	Estimated Content Value	Total Value
Zone AE				
Agricultural	0	$0	$0	$0
Commercial	3	$427,489	$427,489	$854,978

Occupancy Type	Total Number of Buildings in Floodplain	Total Building Value	Estimated Content Value	Total Value
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	1	$250,035	$250,035	$500,070
Religious	0	$0	$0	$0
Residential	19	$2,264,484	$959,017	$3,223,501
Total	**23**	**$2,942,008**	**$1,636,541**	**$4,578,549**
Zone X (500-yr)				
Agricultural	1	$54,177	$54,177	$108,355
Commercial	7	$2,016,744	$2,016,744	$4,033,489
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	1	$250,035	$250,035	$500,071
Religious	1	$263,517	$263,517	$527,034
Residential	262	$34,678,622	$16,213,264	$50,891,886
Total	**272**	**$37,263,096**	**$18,797,738**	$56,060,834
Zone X (Unshaded)				
Agricultural	12	$840,614	$829,234	$1,669,848
Commercial	52	$25,696,901	$25,908,575	$51,605,475
Education	10	$9,093,050	$9,093,048	$18,186,098
Government	2	$1,696,799	$2,389,252	$4,086,051
Industrial	18	$9,426,761	$12,975,562	$22,402,323
Religious	14	$8,513,645	$8,513,643	$17,027,288
Residential	1,484	$189,391,862	$87,371,939	$276,763,801
Total	**1,592**	**$244,659,631**	**$147,081,253**	**$391,740,885**

Source: North Carolina Emergency Management, Risk Management, 2013

Note: Content value estimations are generally based on the FEMA Hazus methodology of estimating value as a percent of improved structure values by property type. The residential property type assumes a content replacement value equal to 50% of the building value. Agricultural, commercial, education, government, and religious property types assume a content replacement value equal to 100% of the building value. The industrial property type assumes a content replacement value equal to 150% of the building value.

Past Occurrences

There have been no specific flood events recorded for the Town of Eastover. Table C8 shows detail for flood events reported by the NCEI since 1950 for Cumberland County. There have been 46 recorded events in the County causing over $3.6M in property damage.

Table C8 - NCEI Flooding Events in Cumberland County

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Flash Flood	40	$2,132,000	$0	0	0
Flood	2	$0	$0	0	0
Heavy Rain	4	$1,500,000	$0	0	0
Total:	**46**	**$3,632,000**	**$0**	**0**	**0**

Source: NCEI, September 2015

Probability of Future Occurrence

Possible - By definition of the 100-year flood event, SFHAs are defined as those areas that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. Properties located in these areas have a 26 percent chance of flooding over the life of a 30-year mortgage.

The 500-year flood area is defined as those areas that will be inundated by the flood event having a 0.2-percent chance of being equaled or exceeded in any given year; it is not the flood that will occur once every 500 years.

Vulnerability Assessment

Properties at Risk to Flooding

The loss estimate for flood is based on the total of improved building value and contents value. Land value is not included in any of the loss estimates as generally the land is not subject to loss from floods. Once the potential value of affected parcels was calculated, damage factors were applied to obtain loss estimates by flood zone.

Table C9 shows the building count, total value, estimated damages and loss ratio for buildings that fall within the Zone AE 100-year floodplain by occupancy type on the community level.

The loss ratio is the loss estimate divided by the total potential exposure (i.e., total of improved and contents value for all buildings located within the Zone AE 100-year floodplain) and displayed as a percentage of loss. FEMA considers loss ratios greater than 10% to be significant and an indicator a community may have more difficulties recovering from an event.

Table C9 - Estimated Building Damage and Content Loss – Flood 100-yr Return Period

Occupancy Type	Total Number of Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Zone AE						
Agricultural	0	$0	$0	$0	$0	n/a
Commercial	2	$509,105	$23,443	$110,462	$133,905	26.3%
Education	0	$0	$0	$0	$0	n/a
Government	0	$0	$0	$0	$0	n/a
Industrial	0	$0	$0	$0	$0	n/a
Religious	0	$0	$0	$0	$0	n/a
Residential	16	$2,306,037	$173,325	$194,069	$367,394	15.9%
Total	**18**	**$2,815,142**	**$196,768**	**$304,531**	**$501,299**	**17.8%**

Source: North Carolina Emergency Management, Risk Management, 2013

Critical Facilities at Risk to Flooding

Of significant concern with respect to any disaster event is the location of critical facilities in the planning area. Critical facilities are often defined as those essential services and facilities in a major emergency which, if damaged, would result in severe consequences to public health and safety or a facility which, if unusable or unreachable because of a major emergency, would seriously and adversely affect the health, safety, and welfare of the public. Critical facilities within the Town are detailed in Table C10 and Figure

C1 below.

Table C10 – Critical Facilities and FEMA Flood Zones

Facility Name	Address	Facility Type	Estimated 100-yr Flood Depth (Ft)
Zone AE			
n/a	n/a	n/a	n/a
Zone A (100-yr)			
n/a	n/a	n/a	n/a
Zone X Shaded (500-yr)			
n/a	n/a	n/a	n/a
Zone X Unshaded			
Armstrong Elementary School	3395 Dunn Rd	School	n/a
Eastover Central Elementary School	5174 Dunn Rd	School	n/a
Eastover Fire Department	3405 Dunn Rd	Fire	n/a
Eastover Gardens Assisted Living	3017 Dunn Rd	Assisted Living	n/a
Bethesda Health Care Facility	3532 Dunn Rd	Health Care	n/a

Source: Cumberland County Emergency Management Agency, 2015

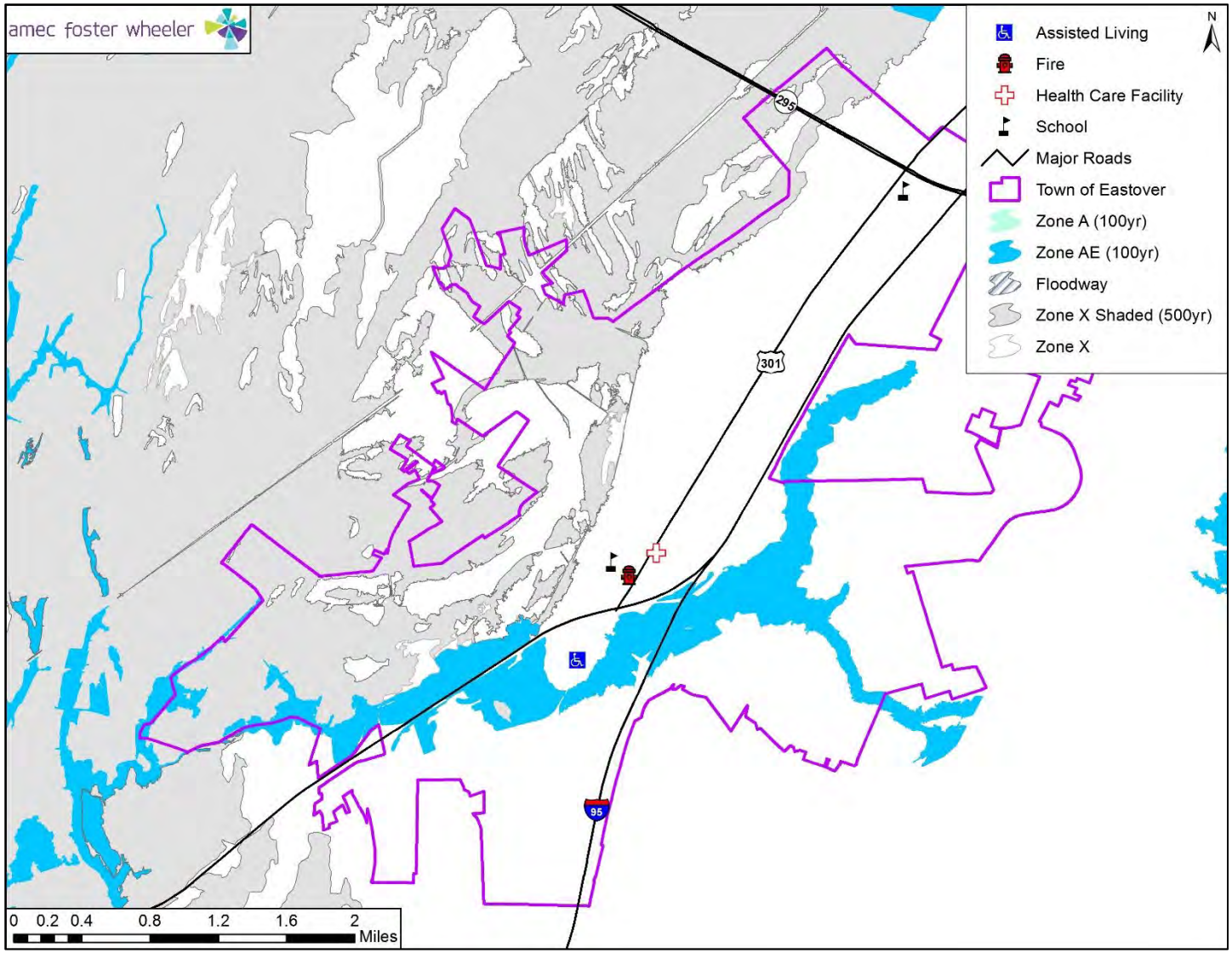


Figure C1 – Town of Eastover Critical Facilities and FEMA Flood Zones

Repetitive Loss Properties

The Town of Eastover contains no repetitive loss properties.

C.2.7 Severe Weather (Thunderstorm Wind, Lightning & Hail)

Location and Spatial Extent

The entirety of the Town of Eastover can be considered at risk to severe weather events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

Table C11 shows detail for severe weather events reported by the NCEI since 1950 for the Town of Eastover. There have been 11 recorded events causing $10,000 in property damage.

Table C11 - NCEI Severe Weather Events in the Town of Eastover

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Hail	6	$0	$0	0	0
High Wind	0	$0	$0	0	0
Lightning	0	$0	$0	0	0
Strong Wind	0	$0	$0	0	0
Thunderstorm Wind	5	$10,000	$0	0	0
Total:	**11**	**$10,000**	**$0**	**0**	**0**

Probability of Future Occurrence

Likely – 11 records in 65 years results in a probability level of likely (17% annual probability) for future severe weather events for the entire planning area.

Vulnerability Assessment

Severe weather events including thunderstorm wind, lightning and hail has the potential to impact all existing and future buildings, facilities, and populations in the Town of Eastover. Impacts of severe weather events include wind damage, debris clean-up, hail damage, and potential fatalities due to lightning strikes and associated fires. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 7.

C.2.8 Tornado

Location and Spatial Extent

The entirety of the Town of Eastover can be considered at risk to tornado events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

According to NCEI records, Cumberland County has experienced 23 tornadoes since 1950. These events are reported to have caused five deaths, 169 injuries and close to $133M in property damage.

Table C12 - NCEI Records for Tornadoes in Cumberland County (1950-2015)

Location	Date	Tornado Fujita Scale	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland Co	4/8/1957	F4	0/8	$250,000.00	$0.00

Location	Date	Tornado Fujita Scale	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland Co	6/2/1959	F0	0/0	$25,000.00	$0.00
Cumberland Co	10/4/1960	F1	0/0	$25,000.00	$0.00
Cumberland Co	9/29/1963	F2	0/0	$250,000.00	$0.00
Cumberland Co	12/26/1964	F1	0/1	$2,500.00	$0.00
Cumberland Co	2/22/1971	F3	2/60	$2,500,000.00	$0.00
Cumberland Co	3/15/1971	F1	0/0	$250,000.00	$0.00
Cumberland Co	5/29/1973	F1	0/0	$25,000.00	$0.00
Cumberland Co	8/2/1974	F0	0/0	$25,000.00	$0.00
Cumberland Co	2/11/1981	F2	0/0	$250,000.00	$0.00
Cumberland Co	3/28/1984	F3	2/11	$25,000,000.00	$0.00
Cumberland Co	3/28/1984	F4	0/0	$2,500,000.00	$0.00
Cumberland Co	5/19/1986	F2	0/0	$250,000.00	$0.00
Cumberland Co	8/28/1988	F1	0/0	$250,000.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	5/28/2000	F0	0/0	$0.00	$0.00
Cumberland Co	12/17/2000	F0	0/0	$0.00	$0.00
Cumberland Co	3/27/2009	EF1	0/0	$225,000.00	$0.00
Cumberland Co	4/16/2011	EF3	1/85	$100,000,000.00	$0.00
Cumberland Co	4/16/2011	EF2	0/4	$250,000.00	$0.00
Cumberland Co	4/29/2014	EF1	0/0	$50,000.00	$0.00
			Total:	**$132,932,750.00**	**$0.00**

Probability of Future Occurrence

Likely - The best available information to determine future probability of a tornado event is to review historic frequency. According to NCEI, 23 tornadoes have impacted Cumberland County over a 65 year period. It can reasonably be assumed that the Town of Eastover has a 35% chance of experiencing a tornado each year.

Vulnerability Assessment

A tornado has the potential to impact all existing and future buildings, facilities, and populations in the Town of Eastover. Impacts of tornadoes include building and contents damage, debris clean-up, service disruption and potentially numerous fatalities and injuries. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 10.

C.2.9 Wildfire

Location and Spatial Extent

Wildfires could potentially occur anywhere in the region. The Wildland Urban Interface (WUI) is described as the area where structures and other human improvements meet and intermingle with undeveloped wildland or vegetative fuels. Population growth within the WUI substantially increases the risk for wildfire. For the Cumberland County, NC project area, it is estimated that 301,884 people or 95 percent

of the total project area population (319,404) live within the WUI. The WUI for Cumberland County is shown within Chapter 5 Subsection 11 (Figure 5.19).

Past Occurrences

Table C13 lists past occurrences of wildfire in Cumberland County since 2005 as provided by the NCFS in September 2015.

Table C13 - Records for Wildfire in Cumberland County

County	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Cumberland	57	75	94	49	21	59	47	24	36	38

Probability of Future Occurrence

Highly Likely - The best available information to determine future probability of a wildfire event is to review historic frequency. According to historic records, 500 wildfires have occurred in Cumberland County between 2005 and 2015 (100% chance of occurring each year).

Vulnerability Assessment

A wildfire has the potential to impact all existing and future buildings, facilities, and populations in the Town of Eastover. Impacts of wildfire include building and contents damage, debris clean-up, service disruption and potentially numerous fatalities and injuries. Wildfires can also increase flood risk due to loss of vegetation. WUI Risk, Burn Probability and Rate of Spread are provided on the County level in Chapter 6 Subsection 11.

C.2.10 Winter Storm

Location and Spatial Extent

The entirety of the Town of Eastover can be considered at risk to winter storm events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

According to NCEI records, Cumberland County has experienced 30 winter storm events since 1996, respectively. These events are reported to have caused one death due to icy road conditions.

Table C14 - NCEI Records for Winter Storm Events in Cumberland County (1996-2015)

Date	Location	Type of Winter Storm	Deaths/ Injuries	Property Damage	Crop Damage
1/6/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
1/11/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
2/2/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
2/3/1996	Cumberland County	Cold/wind Chill	0/0	$0.00	$0.00
12/23/1998	Cumberland County	Ice Storm	0/0	$0.00	$0.00
1/18/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/22/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/24/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/28/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
12/3/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/3/2002	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00

Date	Location	Type of Winter Storm	Deaths/ Injuries	Property Damage	Crop Damage
2/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00
12/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/1/2007	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/17/2008	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/19/2008	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/20/2009	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/4/2009	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/29/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/12/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
3/2/2010	Cumberland County	Winter Weather	0/0	$0.00	$0.00
12/16/2010	Cumberland County	Winter Weather	1/0	$0.00	$0.00
12/25/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/10/2011	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/28/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/11/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/12/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/16/2015	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/24/2015	Cumberland County	Winter Weather	0/0	$0.00	$0.00

Source: NCEI, September 2015

Probability of Future Occurrence

Highly Likely - The best available information to determine future probability of a winter storm event is to review historic frequency. According to NCEI, 30 winter storm events have occurred over a 19 year period between 1996 and 2015 resulting in approximately 1.6 significant winter storm events per year.

The probability of a heavy snowfall occurring with that winter storm event is less likely. The figure below presents the probability of 8-inches or more of snowfall to be approximately 12.5% per year for the Cumberland County Region.

Vulnerability Assessment

Potential losses associated with winter storms include the cost of the removal of snow from roadways, debris clean-up, and some indirect losses from power outages, etc. All future structures and infrastructure in the region will be vulnerable to winter storms.

C.3 Priority Risk Index Results

Table C15 summarizes the degree of risk assigned to each identified hazard as it applies to the Town of Eastover using the PRI method described in Chapter 6 Subsection 4.

Table C15 - Summary of PRI Results for the Town of Eastover

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Dam/Levee Failure	Unlikely	Minor	Negligible	Less than 6 hrs	Less than 6 hrs	1.3
Drought	Highly Likely	Minor	Large	More than 24 hrs	More than 1 week	2.8
Earthquake	Possible	Limited	Moderate	Less than 6 hrs	Less than 6 hrs	2.3
Extreme Heat	Possible	Minor	Large	More than 24 hrs	Less than 1 week	2.1
Hurricane/Tropical Storm	Likely	Critical	Large	More than 24 hrs	Less than 24 hrs	2.9

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Inland Flooding: 100-/500-year	Possible	Critical	Moderate	6 to 12 hours	Less than 1 week	2.7
Severe Weather (thunderstorm wind, lightning, & hail)	Likely	Limited	Moderate	6 to 12 hours	Less than 6 hrs	2.5
Tornado	Likely	Critical	Small	Less than 6 hrs	Less than 6 hrs	2.7
Wildfire	Highly Likely	Limited	Small	Less than 6 hrs	Less than 1 week	2.9
Winter Storm	Highly Likely	Minor	Moderate	More than 24 hrs	Less than 1 week	2.5

As shown in Table C16, the results from the PRI have been classified into three categories based on the assigned risk value:

- **Low Risk** - Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium Risk** - Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High Risk** - Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread.

Table C16 - Summary of Hazard Risk Classification

Hazard Category	Hazard Type
High Risk (> 2.5)	**Hurricane/Tropical Storm Wildfire Drought Inland Flooding: 100-/500-year Tornado**
Moderate Risk (2.0 – 2.5)	**Severe Weather Winter Storm Earthquake Extreme Heat**
Low Risk (< 2.0)	**Dam/Levee Failure**

C.4 Capability Assessment

This subsection discusses the capability of the Town of Eastover to implement hazard mitigation activities. More information on the purpose and methodology used to conduct the assessment can be found in Chapter 7 - Capability Assessment.

C.4.1 Planning and Regulatory Capability

Table C17 lists regulatory capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Eastover.

Table C17 - Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Y/N	Date	Comments
Comprehensive Plan	Y	8/4/09	2030 Growth Vision Plan and 2030 Growth Strategy Map
Zoning Ordinance	Y	8/7/07	
Subdivision Ordinance	Y	8/7/07	
Floodplain Ordinance	Y	12/17/07	Adopted Cumberland County Flood Damage Prevention Ordinance
Stormwater Ordinance	N		Handled by NC DENR. The Town is currently in the final stages of a study for stormwater runoff, and a stormwater ordinance.
Erosion, Sedimentation and Pollution Control Ordinance	N		Handled by NC DENR
Building Code	Y	1970's	2009 International Code and 2012 North Carolina Building Code. Cumberland County Planning & Inspections enforces the building code within the Town of Eastover.
BCEGS Rating	Y	Conducted every 5 years	Done by ISO
Stormwater Management Program	N		
Site Plan Review Requirements	Y	8/7/07	
Capital Improvements Plan	N		
Local Emergency Operations Plan	Y	2006	
Flood Insurance Study or Other Engineering Study for Streams	Y	06/18/07	
Repetitive Loss Plan	N		No repetitive loss property located within the Town of Eastover.
Elevation Certificates	Y	Since 2007	

C.4.2 Floodplain Management

The Town of Eastover has been a regular participant in the NFIP since June 2009. The Town of Eastover contains no NFIP policies.

C.4.3 Administrative and Technical Capability

Table C18 lists administrative capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Eastover.

Table C18 - Administrative/Technical Capabilities

Resource	Y/N	Responsible Department
Planner/Engineer with knowledge of land development/land management practices	Y	Cumberland County Engineering & Public Utilities and Town of Eastover Contract Engineer
Engineer/Professional trained in construction practices related to buildings and/or infrastructure	Y	Cumberland County Engineering & Public Utilities and Town of Eastover Contract Engineer
Planner/Engineer/Scientist with an understanding of natural hazards	Y	Cumberland County Engineering & Public Utilities and Cumberland Planning & Inspections Department
Personnel skilled in GIS	Y	Cumberland County Information Services
Full time building official	Y	Cumberland County Planning & Inspections
Floodplain Manager	Y	Cumberland County Engineering & Public Utilities
Emergency Manager	Y	Cumberland County Emergency Services
Grant writer	Y	Cumberland County Planning & Inspections and Cumberland County Emergency Services
GIS data – Hazard areas	Y	Cumberland County Information Services
GIS data – Critical facilities	Y	Cumberland County Information Services
GIS data – Land use	Y	Cumberland County Planning & Inspections Department
GIS data – Building footprints	Y	Cumberland County Information Services
GIS data – Links to Assessor's data	Y	Cumberland County Information Services
Warning Systems/Services	Y	Cumberland County Emergency Services – Code Red Program

C.4.4 Fiscal Capability

Table C19 lists fiscal capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Eastover.

Table C19 - Fiscal Mitigation Capabilities

Resource	Accessible/Eligible to Use (Y/N)
Community Development Block Grants	Y
Capital improvements project funding	Y
Authority to levy taxes for specific purposes	Y
Fees for water, sewer, gas or electric services	N
Impact fees for new development	N
Incur debt through general obligation bonds	Y

Resource	Accessible/Eligible to Use (Y/N)
Incur debt through special tax bonds	Y
Incur debt through private activity bonds	N
Withhold spending in hazard prone areas	N

C.5 Mitigation Strategy

C.5.1 Status Update for 2011 Mitigation Actions

Table C20 provides a status update for each mitigation action detailed in the 2011 Cumberland County Multi-jurisdictional Hazard Mitigation Plan with the Town of Eastover designated as the responsible jurisdiction. This table provides a summary of progress to-date and also notes whether each action is to be deleted or carried forward into the 2016 Regional Plan.

Table C20 - Status of 2011 Mitigation Actions

Town of Eastover								
Mitigation Action Number	Action Description	Responsible Department	Current Status			2016 Plan Update		Summary of Progress To-Date
			Complete	In Progress	Not yet Started	Delete Action	Carry Forward	
1	Restrict Residential And Non-Compatible Uses Within The 100-Year Flood Area.	Cumberland County Joint Planning Board		X			X (Revised)	Town of Eastover adopted the Cumberland County Zoning Ordinance for its Town Limits. The County Zoning Ordinance includes CD Zoning Classification (Conservancy District) that applies to the Special Flood Hazard Area and limits the type of permitted and special uses within the Special Flood Hazard Area. Adopted by the Town on October 2, 2007.
2	Increase The Lowest Floor Elevation To 2 Feet Above The Base Flood Elevation.	Cumberland County Engineering Department	X			X		Town of Eastover adopted the revised Cumberland County Flood Damage Prevention Ordinance that requires the lowest floor elevation to be 2 feet above the base flood elevation. Adopted on November 5, 2007.
3	Encourage The Use Of Cluster Type Development To Preserve Special Flood Hazard Areas.	Cumberland County Planning Department	X			X		The Cumberland County Subdivision Ordinance in which the Town of Eastover adopted on October 2, 2007 includes the provision of Zero Lot Line Developments that allows developments to maximize their potential density and not encroach into the Special Flood Hazard Area.
4	Provide Incentives For Developers Willing To Use Environmentally Friendly Development Practices (Such As Preserving Open Space, Landscaping With Native Vegetation, Providing An Abundance Of Trees And Reduction Of Environmental Impact).	Cumberland County Planning Department	X			X		Town of Eastover (Cumberland County) has regulations in their Zoning and Subdivision Ordinances that permit environmentally friendly type developments. These ordinances included Density Developments-Conditional Use District, Zero Lot Line Developments, and Planned Neighborhood Developments-Conditional Use District.
5	Develop Uniform Flood Damage Prevention Ordinance.	Cumberland County Engineering Department			X	X		Mitigation Committee recommended in 2011 that this action be deleted.
6	Revise Subdivision Ordinance To Require That All Utilities Be Placed Underground With The Exception Of High Voltage Electrical Transmission Lines.	All Electrical Providers in Cumberland County	X			X		Current Subdivision Ordinance requires that all utilities be placed underground except High voltage electrical lines.
7	Develop A Program To Identify And Eliminate Existing Development That Is Below The 100-Year Flood Elevation.	Cumberland County Engineering Dept, Cumberland County Planning Dept, and Cumberland County Community Development Dept		X		X		This information is provided to the County through NFIP and currently there are no buildings located below the Special Flood Hazard Area within the Town of Eastover. This information will be monitor by the Cumberland County Engineering Department for the Town.
8	Develop A Program To Ensure Drainage Ways, Culverts And Storm Drains Are Free Of Debris.	Cumberland County Engineering Department		X		X		No program has been developed for the Town of Eastover at this time. A majority of their streets within the Town of Eastover are maintained by NCDOT or are privately maintained for those roads that are privately owned.
9	Limit The Amount Of Impervious Surfaces And Encourage The Use Of Pervious Type Surfaces.	Cumberland County Planning Department	X			X		Cumberland County Zoning Ordinance (adopted by the Town of Eastover) allows non-residential uses with structure(s) exceeding 20,000 square feet of floor area must permanently surface 75% of parking area with the remaining 25% consisting of a pervious surface (Adopted by the Town of Eastover on October 2, 2007).
10	Develop A Landscape Ordinance That Will Encourage Protection Of Natural Areas Through Design And Provide More Vegetation In Urban Development.	Cumberland County Planning Department	X			X		Cumberland County Zoning Ordinance (adopted by the Town of Eastover on October 2, 2007) landscaping requirements applies to non-residential and mix use developments.

Town of Eastover								
Mitigation Action Number	Action Description	Responsible Department	Current Status			2016 Plan Update		Summary of Progress To-Date
			Complete	In Progress	Not yet Started	Delete Action	Carry Forward	
11	Develop A Tree Ordinance To Address Clear Cutting, Protection Of Existing Trees And Vegetation.	Cumberland County Planning Department			X		X (Revised)	At this time a tree ordinance addressing clear cutting has not been considered. Current landscaping requirement encourages the protection of existing trees and vegetation and allows these trees and vegetation to be counted towards meeting the standards.
12	Develop A Reforestation Program To Increase Vegetation Cover In Highly Urbanized Area And In Denuded Areas In Flood Prone Areas.	U.S. Forest Service		X			X	The strategy of the Town of Eastover is to protect natural vegetation to enhance air quality, counteract extreme heat in urban areas and reduce sedimentation and pollution of waterways. Denuded areas were to be reforested by the public sector or non-profit organizations. Due to limited resources these efforts have been delayed. The Town's focus now is protecting as much existing vegetation as possible and requiring developments to plant additional vegetation. These efforts have been addressed by the adoption of a County Landscape Ordinance and the provision of development alternatives that protects vegetation and open space.
13	Develop A Greenway Program And Encourage Low Impact Uses In Those Areas As A Means To Protect Natural Areas Along Rivers, Streams, Creeks, And Drainage Ways.	Local Jurisdictions and Cape Fear River Assembly		X			X (Revised)	At this time a Greenway Plan has been developed inside the urban area of the County where density is the highest. As funds and resources become available extension to the rural area (including Town of Eastover) will be valid. Protection of rivers, streams, creeks and drainage ways is accomplished through the Cumberland County Flood Damage Prevention Ordinance that includes small stream standards for areas outside of the Special Flood Hazard Area along rivers streams, creeks and drain ways.
14	Revised Subdivision Ordinance Requiring Additional Access For Emergency Vehicles And To Be Used As An Evacuation Route For Developments Located Near Special Hazard Areas.	Cumberland County Planning Department			X		X (Revised)	Currently Cumberland County Subdivision Ordinance (adopted by the Town of Eastover) does not require an additional access for evacuation route for developments located near special hazard areas. The Planning Board reviews the Subdivision Ordinance annually and could consider this action with its annual review.
15	Identify Areas That Are Susceptible To Wildfires And Consider Prescribed Fire (Controlling Burning) Management Tool To Reduce The Impact of Wildfire Hazards.	NC Forest Service		X			X (Revised)	Currently the Cumberland County office of Forest Service has developed a draft risk assessment of those areas of Cumberland County (including the Town of Eastover) that are susceptible to wildfires. This risk assessment is general in nature and for in office use only. The NC Forest Service has completed five Community Wildfire Protection Plans for certain areas of Cumberland County.
16	Continue To Protect Wetlands And Environmental Sensitive Corridors.	Corp of Engineers		X		X		The Corp of Engineers is responsible for the mapping and enforcements of the wetland regulations.
17	Encourage All Rest Homes To Have A Reciprocal Agreement.	Cumberland County Social Services Department	X			X		This reciprocal agreement currently exists with all the rest homes located in Cumberland County (including Town of Eastover). The agreement is handled through Cumberland County Emergency Services.

C.5.2 2016 Mitigation Action Plan

Table C21 identifies 13 new and/or revised mitigation actions for the Town of Eastover and one unrevised, incomplete action from Table C20 that is to be carried forward into the 2016 Regional Plan.

Table C21 - 2016 Mitigation Action Plan

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
New/Revised Actions										
1	Maintain an all Hazards public education program to educate and prepare residents for all of the hazards that impact Cumberland County.	To educate, enhance preparedness, and resiliency of Cumberland County and its municipal residents through public education programs that included booths at fairs, festivals and special events, websites, brochures, school programs, and etc.	Cumberland County Emergency Management	$90,000	Local Operating Budget	Short Range	New			All Hazards
2	Explore the Fire Adapted Communities concept implementation in Cumberland County.	To enhance the preparedness and resiliency of Cumberland County and its municipalities to the effects of wild land fire and urban interface, through education; programs such as Fire Wise, Ready Set Go, Community Wildfire Protection Plan; Fuel Management; local codes and ordinances.	Emergency Management, NC Forest Service and Fire Marshalls	Staff Hours	Local Operating Budget and Federal	Medium Range	New	X	X	Wildfire
3	Conduct a countywide infrastructure vulnerability assessment to identify priority needs for updating ill-designed or outdated critical structures.	It has been difficult to locate any comprehensive assessments of local infrastructure in Cumberland and Hoke Counties. With current and projected natural hazard occurrences, it is essential to have an accurate and comprehensive understanding of the current condition of critical facilities to ensure the ability to continue to provide for basic needs, such as water and electrical supplies, transportation routes, waste management, etc.	County/city structural and civil engineers in partnership with U.S. Army Corps of Engineers	Staff Hours	Local Operating Budget and Federal	Medium Range	New	X		All Hazards
4	Conduct social vulnerability analysis to identify priority needs and opportunities that will address the specific problems vulnerable populations face from a range of hazards, including barriers to evacuation, event-specific vulnerabilities, and impediments to recovery.	There exist various groups of individuals that have additional financial, social and/or environmental barriers to being resilient in the face of natural hazard events. In Cumberland County, for example, groups with significant number of people affected include about 10K outdoor workers with direct exposure to extreme heat days, elderly people and especially those with existing cardiovascular conditions, and other low-income and/or minority groups. As natural hazard events increase in intensity and frequency, these groups will find it harder to safely and efficiently get out of harm's way. These groups will also have difficulty in obtaining and paying for essential components to sustain life, such as medications, utilities, and transportation to/from a place of work, etc.	County Social Services Department and/or County Health Department	Staff Hours	Local Operating Budget	Medium Range	New			All Hazards
5	Collaborate with NC Cooperative Extension and NC Agriculture and Forestry Adaptation Working Group to provide more local support and encouragement of forest conservation and farmland preservation measures.	Forests and farmland provide a multitude of social, economic and environmental benefits, that when looked at comprehensively, far outweigh any profit/revenue projections of residential or commercial properties. Outside of development pressure, some of the other major health risks include: (1) increasing wildfire risk, (2) increasing number and types of insects and pests, (3) lack of sufficient water during the growing season for crops, and (4) increasing damage from strong winds and flooding. It is vital, especially in the face of a changing climate, to preserve these working lands and to support higher density development in already existing urban and suburban centers.	County Board of Commissioners, Conservation District Programs, and other land preservation organizations.	Unknown	NC Cooperative Extension, NC Forest Service, US Department of Agriculture and NC Wildlife Resources Commission.	Short Range	N		X	Wildfire, Inland Flooding
6	Include climate predictions from the Cumberland County Climate Resiliency Plan in the Regional Hazard Mitigation Plan.	To properly prepare for natural hazard occurrences, it is important to include predictions that warn of: (1) increasing temperatures and extreme heat days, (2) increasing frequency and strength of severe weather events, (3) more heavy rain/flooding, and (4) more frequent and prolonged drought. Although some climate projections do not pose an immediate threat, any comprehensive mitigation plan for emergency management should at the very least, and by the very nature of the	The Planning Department/Planning Director for each jurisdiction in Cumberland County	None	Existing FEMA grant	Short Range	New	X	X	All Hazards

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
		definition of "mitigation", acknowledge the changing climate and possibility of increased extreme weather and flooding events.								
7	Provide financial assistance for low-income residents to help with power bills and support services during extended periods of high temperature and other extreme weather.	Low-income households face challenges in keeping up with utility bills. Some low-income utility assistance programs are offered, but funds are limited. Extreme weather and increasing temperatures will place even greater pressure on these programs' ability to provide assistance to all those in need, and citizen's lives will be increasingly at stake.	County Health Department	Unknown	NC Department of Health and Human Services and County Department of Health	Medium Range	New			Extreme Heat, Winter Weather
8	Analyze and update local development ordinances to make buildings safer from wind and flooding, more energy and water efficient, more tolerant of heat waves and healthier to live in. Also, provide incentives for making buildings safer from wind, flooding, more energy and water efficient, and healthier to live in.	Energy and water efficiency will be increasingly important to a community's resiliency in the face of natural hazards specifically because of projections of increasing temperatures and extreme heat days, and prolonged periods of drought. Climate projections also state that precipitation will continue to follow a seasonal pattern, whereby hot, Summer months are classified with less precipitation and Winters with more precipitation. Extreme heat days will be specially taxing on buildings with older A/C systems or inadequate insulation and in low-income households where upkeep with rising utility costs could become a burden.	Planning and Code Departments of each jurisdiction	Staff Hours	Local Operating Budget	Medium Range	New		X	Inland Flooding, Hurricane Wind, Thunderstorm Wind, Extreme Heat, Winter Storms
9	Use natural systems, more open space and green surfaces to manage stormwater in a more resilient fashion.	Impervious surfaces typically found in urban centers, such as paved roads, buildings, parking lots and pavement, drastically increase flash floods and urban flooding, which seems to be a common occurrence in Cumberland County. For instance, within a 90 day period (March 1 – June 30, 2015), three flooding incidents were reported due to heavy rainfall events. Use of LID stormwater management practices is mentioned only in summary in the Growth Factor Analysis, stating it "…should be emphasized in sensitive areas…" This, coupled with the naturally flat topography of the eastern portions of the County also help to create excess runoff and subsequent urban flooding issues, especially in the Special Flood Hazard Areas (SFHA) of the County, and specifically around Blounts and Cross Creek, as referenced in various resources.	Engineering Department of each jurisdiction	Staff Hours	Local Operating Budget	Short Range	New		X	Inland Flooding
10	Restrict Residential and Non-Compatible Uses within the Special Flood Hazard Area	Prohibit developing within the Special Flood Hazard Area and promote the flood area as an environmental corridor and open space, while reducing potential losses during a flood hazard.	Cumberland County Planning and Inspections Department and Town of Eastover	Staff Hours	Local Operating Budget	Short Range	Revised		X	Inland Flooding
11	Develop a tree ordinance to address clear cutting.	Provide more pervious are for natural drainage, while reducing the vulnerability to localized flooding and extreme heat.	Cumberland County Planning and Inspections Department and Town of Eastover	Staff Hours $5,000 - $10,000	Local Operating Budget	Medium Range	Revised		X	Inland Flooding, Extreme Heat
12	Develop a greenway program as a means to protect natural areas along the rivers, streams, creeks and drain ways.	Provides a buffer from urban encroachment and reduces flooding and erosion.	Town of Eastover and Fayetteville/Cumberland County Parks and Recreation Department	Staff Hours	Local Operating Budget	Long Range	Revised		X	Inland Flooding, Erosion
13	Revise the Subdivision Ordinance requiring an additional access for emergency vehicles and to be used as an evacuation route for developments located near special flood hazard area.	This will provide an additional access for residents, public safety officials and emergency services to those developments located near a special flood hazard area, while reducing the possibility of a life threatening situation for residents, public officials and emergency services.	Town of Eastover and Cumberland County Planning & Inspections Department	Staff Hours $5,000 - $10,000	Local Operating Budget	Medium Range	Revised		X	Inland Flooding
2011 Mitigation Actions Carried Forward										
1	Develop A Reforestation Program To Increase Vegetation Cover In Highly	The strategy of the County is to protect natural vegetation to enhance air quality, counteract extreme heat in urban areas and reduce sedimentation and pollution of	U.S. Forest Service	Staff Hours	U.S. Forest Service	Medium Range	In Progress		X	Inland Flooding,

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
	Urbanized Areas And In Denuded Areas In Flood Prone Areas.	waterways. Denuded areas were to be reforested by the public sector or non-profit organizations.								Erosion, Extreme Heat

ANNEX D – TOWN OF FALCON

D.1 Community Profile

D.1.1 Geography

The Town of Falcon is within Cumberland County and is located in south central North Carolina in the Upper Coastal Plain. As of the 2010 census, the population was 258. Falcon is within the Fayetteville, NC Metropolitan Statistical Area and is part of the Mid-Carolina Council of Governments. According to the U.S. Census Bureau, the Town has a total area of approximately 1.2 square miles, all of which is land. Falcon is located in the Cape Fear River basin.

D.1.2 Population and Demographics

Table D1 provides population counts and the percentage change in population since 2010 for the Town of Falcon. Based on the 2010 census, the population density is 215 people per square mile.

Table D1 - Population Counts for Town of Falcon

Jurisdiction	2010 Census Population	2014 Estimated Population	% Change 2010-2014
Town of Falcon	258	274	6.2

Source: U.S. Census Bureau, 2015

Based on the 2010 Census, the median age of residents in the Town of Falcon is 36.0. The racial characteristics of the Town are presented below in Table D2.

Table D2 - Demographics of Town of Falcon

Jurisdiction	White Persons, Percent (2010)	Black Persons, Percent (2010)	American Indian or Alaska Native, Percent (2010)	Asian Persons, Percent (2010)	Hispanic or Latino Persons, Percent (2010)[1]
Town of Falcon	73.6	14.3	0.8	0	14.0

[1]Persons of Hispanic Origin may be of any race, so are also included in applicable race category.
Source: U.S. Census Bureau, 2010

D.2 Risk Assessment

This subsection includes a hazard profile and vulnerability assessment for each of the priority hazards identified in Chapter 5 Subsection 13 (Table 5.20) as they pertain to the Town of Falcon. **Additional information for each hazard can be found in Chapter 5 - Hazard Profiles and Chapter 6 – Vulnerability Assessment.**

D.2.1 Dam/Levee Failure

Location and Spatial Extent

Table D3 provides details for one dam included in the North Carolina Dam Inventory that is located within the Town of Falcon.

Table D3 - North Carolina Dam Inventory for the Town of Falcon

Dam Name	NIDID	Height (ft)	NID Storage (acre-feet)	Dam Status	River[1]	Hazard Classification
Lake Falcon Dam	NC02127	14	14	EXEMPT	South River-Os	Low

Source: North Carolina Dam Inventory, December 2014

[1]If the dam is located on an unnamed stream/tributary, the unnamed stream/tributary name is followed with "-TR". If the dam is located off stream of an unnamed stream/tributary, the unnamed stream/tributary name is followed with "-OS".

Past Occurrences

Table D4 details known past dam failures in the Town of Falcon.

Table D4 – Known Dam Failures in the Town of Falcon

Location	County	Date of Occurrence	Result of Failure	Deaths/ Injuries	Property Damage	Details
None reported	Cumberland	None reported	n/a	n/a	n/a	n/a

Probability of Future Occurrence

Unlikely - Based on historical occurrence information (zero records in 65 years), it can reasonably be assumed that the Town of Falcon has less than a 1% chance of this type of event occurring each year.

Vulnerability Assessment

The estimated number and characteristics of buildings that could potentially be impacted by a dam failure are shown in Table D5. **Note: the numbers presented in Table D5 are estimated based on the methodology described in Chapter 6 Subsection 3.1. A dam inundation study including a hydrologic and hydraulic analysis was not performed.**

Table D5 - Properties Potentially at Risk to Dam Failure

Jurisdiction	Number of Buildings in Estimated Inundation Area	Total Building Value	Estimated Content Value	Total Value
Town of Falcon	$0	$0	$0	$0
Total	**$0**	**$0**	**$0**	**$0**

D.2.2 Drought

Location and Spatial Extent

Drought cannot be confined to geographic or political boundaries. The Cumberland County region, including the Town of Falcon, is designated as moderately dry.

Past Occurrences

According to the North Carolina Drought Monitor, Cumberland County has experienced drought conditions every year since 2000. Table D6 shows the most severe classification for each year.

Table D6 - Historical Drought Occurrences

Year	Cumberland County
2000	Abnormally Dry
2001	Severe Drought
2002	Extreme Drought
2003	Abnormally Dry
2004	Abnormally Dry
2005	Abnormally Dry
2006	Moderate Drought
2007	Exceptional Drought
2008	Exceptional Drought
2009	Moderate Drought
2010	Moderate Drought
2011	Severe Drought
2012	Moderate Drought
2013	Abnormally Dry
2014	Abnormally Dry
2015	Moderate Drought

Source: NC Drought Monitor

Probability of Future Occurrence

Highly Likely - Based on historical occurrence information (15 records in 15 years), it can reasonably be assumed that the Town of Falcon has a 100% chance of this type of event occurring each year.

Vulnerability Assessment

It is assumed that whereas all buildings and facilities in the planning area would technically be exposed to the drought hazard, there is no significant vulnerability to these buildings on a structural level. Population growth could contribute directly to this hazard, as an increased number of users pull from the available water supply within the region

D.2.3 Earthquake

Location and Spatial Extent

As detailed in Chapter 5 – Hazard Profiles, the Town of Falcon lies within an approximate zone level between 6 and 10% ground acceleration. This indicates that the region as a whole exists within an area of moderate seismic risk.

Past Occurrences

A list of earthquakes that have caused damaged in North Carolina is presented below in Table D7.

Table D7 - Earthquakes Affecting North Carolina

Date	Location	Richter Scale
12/16/1811	NE Arkansas	8.5

Date	Location	Richter Scale
01/23/1812	New Madrid, MO	8.4
02/07/1812	New Madrid, MO	8.7
04/29/1852	Wytheville, VA	5.0
08/31/1861	Wilkesboro, NC	5.1
12/23/1875	Central Virginia	5.0
08/31/1886	Charleston, SC	7.3
05/31/1897	Giles County, VA	5.8
01/01/1913	Union County, SC	4.8
02/21/1916	Asheville, NC	5.5
07/08/1926	Mitchell County, NC	5.2
11/03/1928	Newport, TN	4.5
05/13/1957	McDowell County, NC	4.1
07/02/1957	Buncombe County, NC	3.7
11/24/1957	Jackson County, NC	4.0
10/27/1959	Chesterfield, SC	4.0
07/13/1971	Newry, SC	3.8
11/30/1973	Alcoa, TN	4.6
11/13/1976	Southwest Virginia	4.1
05/05/1981	Henderson County, NC	3.5

Source: Wake County 2014 Hazard Mitigation Plan. Information provided by NCEM.

Probability of Future Occurrence

Possible - Based on historical occurrences, the probability of a significant earthquake event affecting the Town of Falcon is possible. There are a total of 20 records in North Carolina over the past 200 years. Therefore, the annual probability level is estimated between 1 and 10 percent.

Vulnerability Assessment

An earthquake has the potential to impact all existing and future buildings, facilities, and populations in the Town of Falcon. Impacts of earthquakes include debris clean-up, service disruption and, in severe cases, fatalities due to building collapse. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 3.

D.2.4 Extreme Heat

Location and Spatial Extent

Extreme heat typically occurs over large areas impacting multiple counties at one time. The entirety of the Town of Falcon is vulnerable to extreme heat.

Past Occurrences

According to the National Climatic Data Center, one instance of extreme heat was recorded in Cumberland County beginning on July 22, 1998, and an additional instance of extreme heat was recorded in Cumberland County beginning on August 10, 2007.

Probability of Future Occurrence

Possible - Based on historical occurrence information (2 records in 65 years), it can reasonably be assumed that an extreme heat event has a 3% chance of occurring each year in the Town of Falcon.

Vulnerability Assessment

Extreme heat is not likely to impact the built environment, but may impact agriculture and pose a threat to humans. Elderly persons, persons with respiratory disabilities, and children may be at risk to experience health problems during extreme heat events, some of which could result in serious illness or death. Potential losses of human life due to extreme heat are not quantified in this Plan. There are no past reports of death or property or crop damage recorded by NCEI.

D.2.5 Hurricane/Tropical Storm

Location and Spatial Extent

All Atlantic and Gulf of Mexico coastal areas are subject to hurricanes. While coastal areas are most directly exposed to land falling hurricanes and tropical storms, their impact can be felt hundreds of miles inland. The entire Town of Falcon region is equally susceptible to hurricanes and tropical storms.

Past Occurrences

Table D8 provides hurricane and tropical storm data reported by NCEI since 1950 for Cumberland County.

Table D8 - NCEI Hurricane and Tropical Storm Events for Cumberland County

Location	Date	Event Type	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland (Zone)	7/12/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/5/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	8/27/1998	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/4/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/15/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/18/2003	Hurricane (Typhoon)	0/0	$28,000.00	$0.00
Cumberland (Zone)	09/01/2006	Tropical Storm	0/0	$0.00	$0.00
			Total:	**$28,000.00**	**$0.00**

While not included in the NCEI database, Category 4 Hurricane Hazel (DR-28) came ashore in North Carolina on October 15, 1954 and caused substantial damage in the region. With winds reaching 125mph at Grannis Field, Hurricane Hazel caused an estimated $136 million in property damage; 19 deaths; 200 injuries; destruction of 15,000 homes and structures; and damage to 39,000 structures.

Probability of Future Occurrence

Likely - Based on a historical record of eight storm events over a period of 65 years (1950 - 2015), it can reasonably be assumed that this type of event has a 12% chance of occurring each year.

Vulnerability Assessment

In conclusion, hurricane wind has the potential to impact all existing and future buildings, facilities, and populations in the Town of Falcon. Impacts of hurricanes include flood damage, debris clean-up, service disruption and possible fatalities due to flooding or flying debris. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 5.

D.2.6 Inland Flooding: 100-/500-year

Location and Spatial Extent

The Town of Falcon parcel layer and effective 2007 DFIRM were intersected and the flooded parcel area was calculated in acres. Flood zones were assigned to parcels based on the intersection of a parcel with a flood zone. Parcels can be located in multiple flood zones, and only the flooded acreage within the parcel was included in the calculation for each flood zone. Table D9 provides a summary of acreage by flood zone.

Table D9 - Flood Zone Acreage

Jurisdiction	Flood Zone Acreage				
	Zone A (100-year)	Zone AE (100-year)	Zone X Shaded (500-year)	Zone X Unshaded	Total
Town of Falcon	0	128	0	681	809

The Town of Falcon's parcel and building footprint layers were used to examine the inventory of properties at risk. Table D10 provides the building count, estimated building value, estimated content value and estimated total value for all buildings located within each FEMA flood zone.

Table D10 – Properties at Risk

Occupancy Type	Total Number of Buildings in Floodplain	Total Building Value	Estimated Content Value	Total Value
Zone AE				
Agricultural	0	$0	$0	$0
Commercial	0	$0	$0	$0
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	0	$0	$0	$0
Total	**0**	**$0**	**$0**	**$0**
Zone X (500-yr)				
Agricultural	0	$0	$0	$0
Commercial	0	$0	$0	$0
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	3	$639,813	$302,712	$942,524
Total	**3**	**$639,813**	**$302,712**	**$942,524**
Zone X (Unshaded)				
Agricultural	6	239434.78	$239,434	$478,869
Commercial	3	$600,660	$600,660	$1,201,320
Education	0	$0	$0	$0
Government	1	$172,244	$172,244	$344,488
Industrial	3	$4,065,012	$6,097,519	$10,162,531
Religious	12	$7,978,916	$7,978,916	$15,957,832

Occupancy Type	Total Number of Buildings in Floodplain	Total Building Value	Estimated Content Value	Total Value
Residential	145	$26,669,064	$13,107,060	$39,776,125
Total	**170**	**$39,725,332**	**$28,195,833**	**$67,921,165**

Source: North Carolina Emergency Management, Risk Management, 2013

Note: Content value estimations are generally based on the FEMA Hazus methodology of estimating value as a percent of improved structure values by property type. The residential property type assumes a content replacement value equal to 50% of the building value. Agricultural, commercial, education, government, and religious property types assume a content replacement value equal to 100% of the building value. The industrial property type assumes a content replacement value equal to 150% of the building value.

Past Occurrences

Table D11 shows detail for flood events reported by the NCEI since 1950 for the Town of Falcon. There has been one recorded event originating within the Town causing $10,000 in property damage.

Table D11 - NCEI Flooding Events in the Town of Falcon

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Flash Flood	1	$10,000	$0	0	0
Total:	**1**	**$10,000**	**$0**	**0**	**0**

Source: NCEI, September 2015

Probability of Future Occurrence

Possible - By definition of the 100-year flood event, SFHAs are defined as those areas that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. Properties located in these areas have a 26 percent chance of flooding over the life of a 30-year mortgage.

The 500-year flood area is defined as those areas that will be inundated by the flood event having a 0.2-percent chance of being equaled or exceeded in any given year; it is not the flood that will occur once every 500 years.

Vulnerability Assessment

Properties at Risk to Flooding

The loss estimate for flood is based on the total of improved building value and contents value. Land value is not included in any of the loss estimates as generally the land is not subject to loss from floods. Once the potential value of affected parcels was calculated, damage factors were applied to obtain loss estimates by flood zone.

Table D12 shows the building count, total value, estimated damages and loss ratio for buildings that fall within the Zone AE 100-year floodplain by occupancy type on the community level.

The loss ratio is the loss estimate divided by the total potential exposure (i.e., total of improved and contents value for all buildings located within the Zone AE 100-year floodplain) and displayed as a percentage of loss. FEMA considers loss ratios greater than 10% to be significant and an indicator a community may have more difficulties recovering from an event.

Table D12 - Estimated Building Damage and Content Loss – Flood 100-yr Return Period

Occupancy Type	Total Number of Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Zone AE						
Agricultural	0	$0	$0	$0	$0	n/a
Commercial	0	$0	$0	$0	$0	n/a
Education	0	$0	$0	$0	$0	n/a
Government	0	$0	$0	$0	$0	n/a
Industrial	0	$0	$0	$0	$0	n/a
Religious	0	$0	$0	$0	$0	n/a
Residential	0	$0	$0	$0	$0	n/a
Total	**0**	**$0**	**$0**	**$0**	**$0**	**n/a**

Source: North Carolina Emergency Management, Risk Management, 2013

Critical Facilities at Risk to Flooding

Of significant concern with respect to any disaster event is the location of critical facilities in the planning area. Critical facilities are often defined as those essential services and facilities in a major emergency which, if damaged, would result in severe consequences to public health and safety or a facility which, if unusable or unreachable because of a major emergency, would seriously and adversely affect the health, safety, and welfare of the public. Critical facilities within the Town are detailed in Table D13 and Figure D1 below.

Table D13 – Critical Facilities and FEMA Flood Zones

Facility Name	Address	Facility Type	Estimated 100-yr Flood Depth (Ft)
Zone AE			
n/a	n/a	n/a	n/a
Zone A (100-yr)			
n/a	n/a	n/a	n/a
Zone X Shaded (500-yr)			
n/a	n/a	n/a	n/a
Zone X Unshaded			
Falcon Town Hall	7156 West St	Government	n/a

Source: Cumberland County Emergency Management Agency, 2015

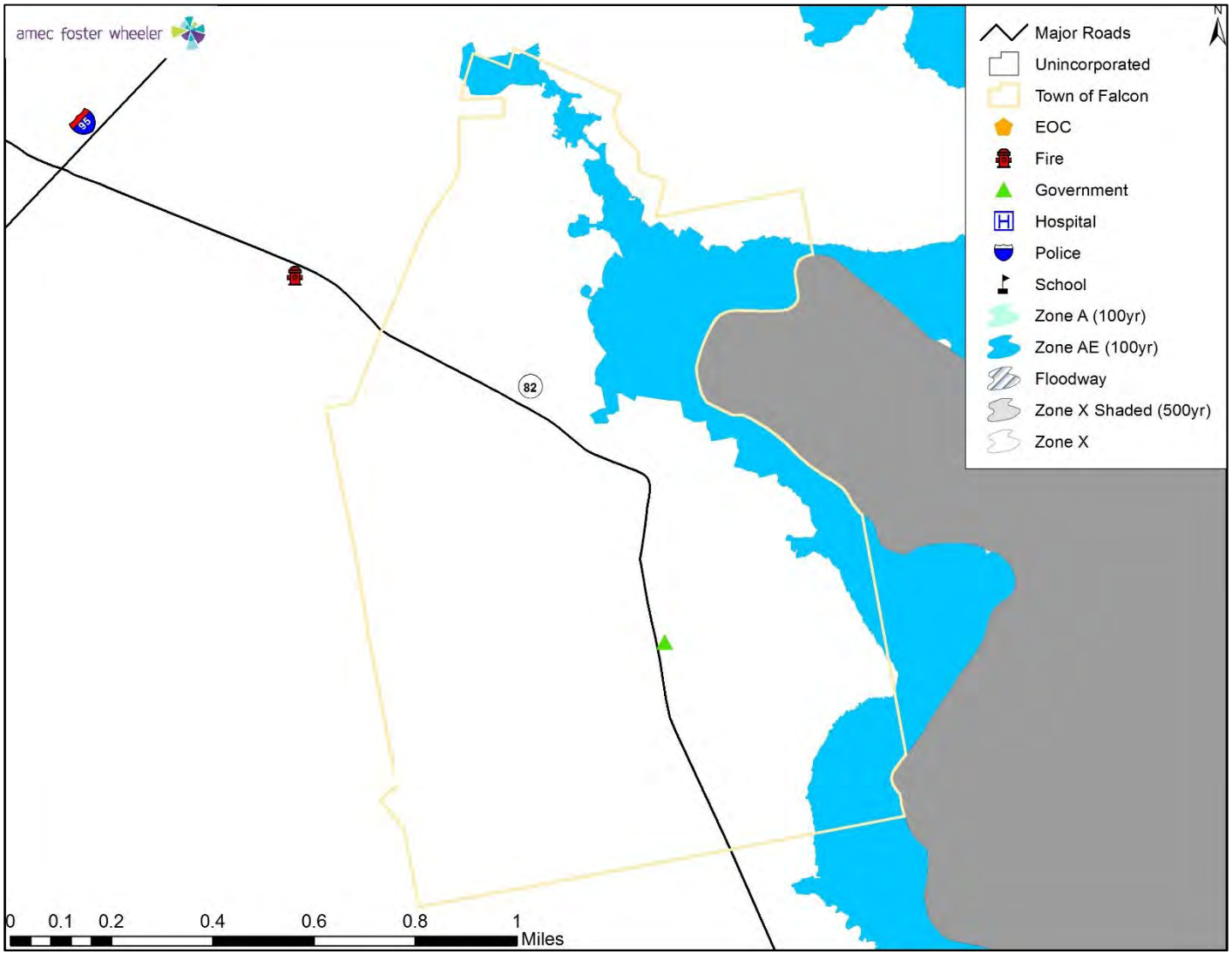


Figure D1 – Town of Falcon Critical Facilities and FEMA Flood Zones

Repetitive Loss Properties

The Town of Falcon contains no repetitive loss properties.

D.2.7 Severe Weather (Thunderstorm Wind, Lightning & Hail)

Location and Spatial Extent

The entirety of the Town of Falcon can be considered at risk to severe weather events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

Table D14 shows detail for severe weather events reported by the NCEI since 1950 for the Town of Falcon. There have been four recorded events causing $6,000 in property damage.

Table D14 - NCEI Severe Weather Events in the Town of Falcon

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Hail	1	$0	$0	0	0
High Wind	0	$0	$0	0	0
Lightning	0	$0	$0	0	0
Strong Wind	0	$0	$0	0	0
Thunderstorm Wind	3	$6,000	$0	0	0
Total:	**4**	**$6,000**	**$0**	**0**	**0**

Probability of Future Occurrence

Possible - It is possible that severe weather events, including wind, lightning and hail, will occur in the future. Four records over a period of 65 years results in a 6% annual probability level for future severe weather events.

Vulnerability Assessment

Severe weather events including thunderstorm wind, lightning and hail has the potential to impact all existing and future buildings, facilities, and populations in the Town of Falcon. Impacts of severe weather events include wind damage, debris clean-up, hail damage, and potential fatalities due to lightning strikes and associated fires. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 7.

D.2.8 Tornado

Location and Spatial Extent

The entirety of the Town of Falcon can be considered at risk to tornado events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

According to NCEI records, Cumberland County has experienced 23 tornadoes since 1950. These events are reported to have caused five deaths, 169 injuries and close to $133M in property damage.

Table D15 - NCEI Records for Tornadoes in Cumberland County (1950-2015)

Location	Date	Tornado Fujita Scale	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland Co	4/8/1957	F4	0/8	$250,000.00	$0.00

Location	Date	Tornado Fujita Scale	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland Co	6/2/1959	F0	0/0	$25,000.00	$0.00
Cumberland Co	10/4/1960	F1	0/0	$25,000.00	$0.00
Cumberland Co	9/29/1963	F2	0/0	$250,000.00	$0.00
Cumberland Co	12/26/1964	F1	0/1	$2,500.00	$0.00
Cumberland Co	2/22/1971	F3	2/60	$2,500,000.00	$0.00
Cumberland Co	3/15/1971	F1	0/0	$250,000.00	$0.00
Cumberland Co	5/29/1973	F1	0/0	$25,000.00	$0.00
Cumberland Co	8/2/1974	F0	0/0	$25,000.00	$0.00
Cumberland Co	2/11/1981	F2	0/0	$250,000.00	$0.00
Cumberland Co	3/28/1984	F3	2/11	$25,000,000.00	$0.00
Cumberland Co	3/28/1984	F4	0/0	$2,500,000.00	$0.00
Cumberland Co	5/19/1986	F2	0/0	$250,000.00	$0.00
Cumberland Co	8/28/1988	F1	0/0	$250,000.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	5/28/2000	F0	0/0	$0.00	$0.00
Cumberland Co	12/17/2000	F0	0/0	$0.00	$0.00
Cumberland Co	3/27/2009	EF1	0/0	$225,000.00	$0.00
Cumberland Co	4/16/2011	EF3	1/85	$100,000,000.00	$0.00
Cumberland Co	4/16/2011	EF2	0/4	$250,000.00	$0.00
Cumberland Co	4/29/2014	EF1	0/0	$50,000.00	$0.00
			Total:	**$132,932,750.00**	**$0.00**

Probability of Future Occurrence

Likely - The best available information to determine future probability of a tornado event is to review historic frequency. According to NCEI, 23 tornadoes have impacted Cumberland County over a 65 year period. It can reasonably be assumed that the Town of Falcon has a 35% chance of experiencing a tornado each year.

Vulnerability Assessment

A tornado has the potential to impact all existing and future buildings, facilities, and populations in the Town of Falcon. Impacts of tornadoes include building and contents damage, debris clean-up, service disruption and potentially numerous fatalities and injuries. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 10.

D.2.9 Wildfire

Location and Spatial Extent

Wildfires could potentially occur anywhere in the region. The Wildland Urban Interface (WUI) is described as the area where structures and other human improvements meet and intermingle with undeveloped wildland or vegetative fuels. Population growth within the WUI substantially increases the risk for wildfire. For the Cumberland County, NC project area, it is estimated that 301,884 people or 95 percent

of the total project area population (319,404) live within the WUI. The WUI for Cumberland County is shown within Chapter 5 Subsection 11 (Figure 5.19).

Past Occurrences

Table D16 lists past occurrences of wildfire in Cumberland County since 2005 as provided by the NCFS in September 2015.

Table D16 - Records for Wildfire in Cumberland County

County	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Cumberland	57	75	94	49	21	59	47	24	36	38

Probability of Future Occurrence

Highly Likely - The best available information to determine future probability of a wildfire event is to review historic frequency. According to historic records, 500 wildfires have occurred in Cumberland County between 2005 and 2015 (100% chance of occurring each year).

Vulnerability Assessment

A wildfire has the potential to impact all existing and future buildings, facilities, and populations in the Town of Falcon. Impacts of wildfire include building and contents damage, debris clean-up, service disruption and potentially numerous fatalities and injuries. Wildfires can also increase flood risk due to loss of vegetation. WUI Risk, Burn Probability and Rate of Spread are provided on the County level in Chapter 6 Subsection 11.

C.2.10 Winter Storm

Location and Spatial Extent

The entirety of the Town of Falcon can be considered at risk to winter storm events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

According to NCEI records, Cumberland County has experienced 30 winter storm events since 1996, respectively. These events are reported to have caused one death due to icy road conditions.

Table D17 - NCEI Records for Winter Storm Events in Cumberland County (1996-2015)

Date	Location	Type of Winter Storm	Deaths/ Injuries	Property Damage	Crop Damage
1/6/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
1/11/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
2/2/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
2/3/1996	Cumberland County	Cold/wind Chill	0/0	$0.00	$0.00
12/23/1998	Cumberland County	Ice Storm	0/0	$0.00	$0.00
1/18/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/22/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/24/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/28/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
12/3/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/3/2002	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00

Date	Location	Type of Winter Storm	Deaths/ Injuries	Property Damage	Crop Damage
12/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/1/2007	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/17/2008	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/19/2008	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/20/2009	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/4/2009	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/29/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/12/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
3/2/2010	Cumberland County	Winter Weather	0/0	$0.00	$0.00
12/16/2010	Cumberland County	Winter Weather	1/0	$0.00	$0.00
12/25/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/10/2011	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/28/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/11/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/12/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/16/2015	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/24/2015	Cumberland County	Winter Weather	0/0	$0.00	$0.00

Source: NCEI, September 2015

Probability of Future Occurrence

Highly Likely - The best available information to determine future probability of a winter storm event is to review historic frequency. According to NCEI, 30 winter storm events have occurred over a 19 year period between 1996 and 2015 resulting in approximately 1.6 significant winter storm events per year.

The probability of a heavy snowfall occurring with that winter storm event is less likely. The figure below presents the probability of 8-inches or more of snowfall to be approximately 12.5% per year for the Cumberland County Region.

Vulnerability Assessment

Potential losses associated with winter storms include the cost of the removal of snow from roadways, debris clean-up, and some indirect losses from power outages, etc. All future structures and infrastructure in the region will be vulnerable to winter storms.

D.3 Priority Risk Index Results

Table D18 summarizes the degree of risk assigned to each identified hazard as it applies to the Town of Falcon using the PRI method described in Chapter 6 Subsection 4.

Table D18 - Summary of PRI Results for the Town of Falcon

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Dam/Levee Failure	Unlikely	Minor	Negligible	Less than 6 hrs	Less than 6 hrs	1.3
Drought	Highly Likely	Minor	Large	More than 24 hrs	More than 1 week	2.8
Earthquake	Possible	Limited	Moderate	Less than 6 hrs	Less than 6 hrs	2.3
Extreme Heat	Possible	Minor	Large	More than 24 hrs	Less than 1 week	2.1
Hurricane/Tropical Storm	Likely	Critical	Large	More than 24 hrs	Less than 24 hrs	2.9
Inland Flooding:	Possible	Critical	Moderate	6 to 12 hours	Less than 1 week	2.7

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
100-/500-year						
Severe Weather (thunderstorm wind, lightning, & hail)	Possible	Limited	Moderate	6 to 12 hours	Less than 6 hrs	2.2
Tornado	Likely	Critical	Small	Less than 6 hrs	Less than 6 hrs	2.7
Wildfire	Highly Likely	Limited	Small	Less than 6 hrs	Less than 1 week	2.9
Winter Storm	Highly Likely	Minor	Moderate	More than 24 hrs	Less than 1 week	2.5

As shown in Table D19, the results from the PRI have been classified into three categories based on the assigned risk value:

- **Low Risk** - Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium Risk** - Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High Risk** - Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread.

Table D19 - Summary of Hazard Risk Classification

Hazard Category	Hazard Type
High Risk (> 2.5)	**Hurricane/Tropical Storm Wildfire Drought Inland Flooding: 100-/500-year Tornado**
Moderate Risk (2.0 – 2.5)	**Winter Storm Earthquake Severe Weather Extreme Heat**
Low Risk (< 2.0)	**Dam/Levee Failure**

D.4 Capability Assessment

This subsection discusses the capability of the Town of Falcon to implement hazard mitigation activities. More information on the purpose and methodology used to conduct the assessment can be found in Chapter 7 - Capability Assessment.

D.4.1 Planning and Regulatory Capability

Table D20 lists regulatory capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Falcon.

Table D20 - Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Y/N	Date	Comments
Comprehensive Plan	Y	7/13/09	2030 Growth Vision Plan and 2030 Growth Strategy Map
Zoning Ordinance	Y	3/5/91	
Subdivision Ordinance	Y	6/2/98	
Floodplain Ordinance	Y	5/1/00	Adopted Cumberland County Flood Damage Prevention Ordinance
Stormwater Ordinance	N		Handled by NC DENR
Erosion, Sedimentation and Pollution Control Ordinance	N		Handled by NC DENR
Building Code	Y	1970's	2009 International Code and 2012 North Carolina Building Code. Cumberland County Planning & Inspections Department enforces the building code within the Town of Falcon.
BCEGS Rating	Y	Conducted every 5 years	Done by ISO
Stormwater Management Program	N		
Site Plan Review Requirements	Y	6/2/98	
Capital Improvements Plan	N		
Local Emergency Operations Plan	Y	2006	
Flood Insurance Study or Other Engineering Study for Streams	N	5/1/00	
Repetitive Loss Plan	Y		No repetitive loss property located within the Town of Falcon.
Elevation Certificates	Y	Since 2000	

D.4.2 Floodplain Management

The Town of Falcon has been a regular participant in the NFIP since January 2007. The following tables reflect NFIP policy and claims data for the Town categorized by structure type, flood zone, Pre-FIRM and Post-FIRM.

Table D21 - NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	0	$0	$0	$0	$0.00
2-4 Family	0	$0	$0	0	$0.00
All Other Residential	1	$310	$140,000	0	$0.00
Non-Residential	0	$0	$0	0	$0.00
Total	**1**	**$310**	**$140,000**	**0**	**$0.00**

Source: FEMA Community Information System, December 2015

Table D22 - NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	0	$0	$0	0	$0.00
A Zones	0	$0	$0	0	$0.00
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00
V Zones	0	$0	$0	0	$0.00
D Zones	0	$0	$0	0	$0.00
B, C & X Zone					
Standard	0	$0	$0	0	$0.00
Preferred	1	$310	$140,000	1	$0.00
Total	**1**	**$310**	**$140,000**	**1**	**$0.00**

Source: FEMA Community Information System, December 2015

Table D23 - NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	0	$0	$0	0	$0.00
A Zones	0	$0	$0	0	$0.00
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00
V Zones	0	$0	$0	0	$0.00

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
D Zones	0	$0	$0	0	$0.00
B, C & X Zone	1	$310	$140,000	0	$0.00
Standard	0	$0	$0	0	$0.00
Preferred	1	$310	$140,000	0	$0.00
Total	**1**	**$310**	**$140,000**	**0**	**$0.00**

Source: FEMA Community Information System, December 2015

Table D24 - NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	0	$0	$0	0	$0.00
A Zones	0	$0	$0	0	$0.00
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00
V Zones	0	$0	$0	0	$0.00
D Zones	0	$0	$0	0	$0.00
B, C & X Zone	0	$0	$0	0	$0.00
Standard	0	$0	$0	0	$0.00
Preferred	0	$0	$0	0	$0.00
Total	**0**	**$0**	**$0**	**0**	**$0.00**

Source: FEMA Community Information System, December 2015

D.4.3 Administrative and Technical Capability

Table D25 lists administrative capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Falcon.

Table D25 - Administrative/Technical Capabilities

Resource	Y/N	Responsible Department
Planner/Engineer with knowledge of land development/land management practices	Y	Cumberland County Engineering & Public Utilities and Town of Falcon Contract Engineer
Engineer/Professional trained in construction practices related to buildings and/or infrastructure	Y	Cumberland County Engineering & Public Utilities and Town of Falcon Contract Engineer
Planner/Engineer/Scientist with an understanding of natural hazards	Y	Cumberland County Engineering & Public Utilities and Cumberland Planning & Inspections Department
Personnel skilled in GIS	Y	Cumberland County Information Services
Full time building official	Y	Cumberland County Planning & Inspections
Floodplain Manager	Y	Cumberland County Engineering & Public Utilities
Emergency Manager	Y	Cumberland County Emergency Services

Resource	Y/N	Responsible Department
Grant writer	Y	Cumberland County Planning & Inspections and Cumberland County Emergency Services
GIS data – Hazard areas	Y	Cumberland County Information Services
GIS data – Critical facilities	Y	Cumberland County Information Services
GIS data – Land use	Y	Cumberland County Planning & Inspections Department
GIS data – Building footprints	Y	Cumberland County Information Services
GIS data – Links to Assessor's data	Y	Cumberland County Information Services
Warning Systems/Services	Y	Cumberland County Emergency Services – Code Red Program

D.4.4 Fiscal Capability

Table D26 lists fiscal capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Falcon.

Table D26 - Fiscal Mitigation Capabilities

Resource	Accessible/Eligible to Use (Y/N)
Community Development Block Grants	Y
Capital improvements project funding	Y
Authority to levy taxes for specific purposes	Y
Fees for water, sewer, gas or electric services	Y
Impact fees for new development	N
Incur debt through general obligation bonds	Y
Incur debt through special tax bonds	Y
Incur debt through private activity bonds	N
Withhold spending in hazard prone areas	N

D.5 Mitigation Strategy

D.5.1 Status Update for 2011 Mitigation Actions

Table D27 provides a status update for each mitigation action detailed in the 2011 Cumberland County Multi-jurisdictional Hazard Mitigation Plan with the Town of Falcon designated as the responsible jurisdiction. This table provides a summary of progress to-date and also notes whether each action is to be deleted or carried forward into the 2016 Regional Plan.

Table D27 - Status of 2011 Mitigation Actions

Town of Falcon								
Mitigation Action Number	**Action Description**	**Responsible Department**	**Current Status**			**2016 Plan Update**		**Summary of Progress To-Date**
			Complete	**In Progress**	**Not yet Started**	**Delete Action**	**Carry Forward**	
1	Restrict Residential And Non-Compatible Uses Within The Special Flood Hazard Area.	Cumberland County Planning Department		X			X (Revised)	The Town adopted the CD-Conservation District on October 1, 2007. The CD (Conservancy District) applies mainly to the Special Flood Hazard Area which limits the type of permitted and special uses within the Special Flood Hazard Area. As rezoning cases are received by the Planning Department that includes portions of the Special Flood Hazard Area the Planning Staff and Falcon Town Board will require that the Special Flood Hazard Areas be zoned CD (Conservancy District), which prohibits residential and non-compatible uses.
2	Encourage The Use Of Cluster Type Development To Preserve Special Hazard Areas.	Cumberland County Planning Department	X			X		The Town adopted Zero Lot Line development standards on October 1, 2007 so that a developer can maximize their potential density and not encroach within the Special Flood Hazard Area. **Note: Those areas zoned CD (Conservancy District) prohibits residential and non- compatible uses.**
3	Develop Uniform Flood Damage Prevention Ordinance.	Cumberland County Engineering Department			X	X		The Town of Falcon adopted the revised Cumberland County Flood Damage Prevention Ordinance and new FIRM maps on October 18, 2006. Originally the Town had no 100 year Floodplain within its town limits until the new digital FIRM maps were adopted by the Town which now designates Special Flood Hazard Area within the Town. Also continues compliance with NFIP. **See Unincorporated Area Action #6 for further explanation of the deletion of this action.**
4	Revise Subdivision Ordinance To Require That All Utilities Be Placed Underground With The Exception Of High Voltage Electrical Transmission Lines.	Cumberland County Planning Department and Electrical Providers	X			X		Currently, Falcon's Subdivision Ordinance requires "All development shall have utilities placed underground, where practical." Mapping of underground utilities is the responsibility of the electrical providers for the Town.
5	Develop A Program To Identify And Eliminate Existing Development That Is Below The Special Flood Hazard Elevation.	Cumberland Co Engineering Dept, Cumberland Co Planning Dept, and Cumberland Co Community Development	X			X		Based on the adopted new FIRM maps and the County's aerial photos, no existing buildings are located below the Special Flood Hazard base flood elevation.
6	Develop A Program To Ensure Drainage Ways, Culverts And Storm Drains Are Free Of Debris.	Cumberland County Engineering Department		X		X		Currently the Town ensures that the drainageways, culverts and storm drains are free of debris on Town streets and property. North Carolina DOT roads are maintained by the Department of Transportation.
7	Increase The Lowest Floor Elevation To 2 Feet Above The Base Flood Elevation.	Cumberland County Engineering Department	X			X		The Town of Falcon adopted the revised Cumberland County Flood Damage Prevention Ordinance that requires the lowest floor elevation to be two feet above the base flood elevation.
8	Develop A Landscape Ordinance That Will Encourage Protection To Natural Areas Through Design And Provide More Vegetation In Urban Development.	Cumberland County Planning Department	X			X		The Town of Falcon adopted landscape requirements for new non-residential development's yard space and parking areas on January 9, 2006.
9	Revise Subdivision Ordinance Requiring Additional Access To Be Used As An Evacuation Route For Developments Located Near Special Hazard Areas.	Cumberland County Planning Department			X		X (Revised)	Currently, no amendments has been adopted for this action and also no new developments have taken place in or around Special Flood Hazard Areas since the adoption of this Mitigation Plan in January 2006.

Town of Falcon								
Mitigation Action Number	Action Description	Responsible Department	Current Status			2016 Plan Update		Summary of Progress To-Date
			Complete	In Progress	Not yet Started	Delete Action	Carry Forward	
10	Encourage All Rest Homes To Have A Reciprocal Agreement.	Cumberland County Social Services Department	X			X		This reciprocal agreement currently exists with all rest homes located in Cumberland County (including Town of Falcon).The agreement is handled through Cumberland County Emergency Services.
11	Identify Areas That Are Susceptible To Wildfires And Consider Prescribed Fire (Controlled Burning) Management Tool To Reduce The Impact Of Wildfire Hazards.	NC Forest Service		X			X (Revised)	Currently the Cumberland County office of Forest Service has developed a draft risk assessment of those areas of Cumberland County (including Town of Falcon) that are susceptible to wildfires. This risk assessment is general in nature and for in office use only. The NC Forest Service has completed five Community Wildfire Protection Plans for certain areas of Cumberland County.

D.5.2 2016 Mitigation Action Plan

Table D28 identifies 11 new and/or revised mitigation actions for the Town of Falcon. There are no unrevised, incomplete actions from Table D27 that are to be carried forward into the 2016 Regional Plan.

Table D28 - 2016 Mitigation Action Plan

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
New/Revised Actions										
1	Maintain an all Hazards public education program to educate and prepare residents for all of the hazards that impact Cumberland County.	To educate, enhance preparedness, and resiliency of Cumberland County and its municipal residents through public education programs that included booths at fairs, festivals and special events, websites, brochures, school programs, and etc.	Cumberland County Emergency Management	$90,000	Local Operating Budget	Short Range	New			All Hazards
2	Explore the Fire Adapted Communities concept implementation in Cumberland County.	To enhance the preparedness and resiliency of Cumberland County and its municipalities to the effects of wild land fire and urban interface, through education; programs such as Fire Wise, Ready Set Go, Community Wildfire Protection Plan; Fuel Management; local codes and ordinances.	Emergency Management, NC Forest Service and Fire Marshalls	Staff Hours	Local Operating Budget and Federal	Medium Range	New	X	X	Wildfire
3	Conduct a countywide infrastructure vulnerability assessment to identify priority needs for updating ill-designed or outdated critical structures.	It has been difficult to locate any comprehensive assessments of local infrastructure in Cumberland and Hoke Counties. With current and projected natural hazard occurrences, it is essential to have an accurate and comprehensive understanding of the current condition of critical facilities to ensure the ability to continue to provide for basic needs, such as water and electrical supplies, transportation routes, waste management, etc.	County/city structural and civil engineers in partnership with U.S. Army Corps of Engineers	Staff Hours	Local Operating Budget and Federal	Medium Range	New	X		All Hazards
4	Conduct social vulnerability analysis to identify priority needs and opportunities that will address the specific problems vulnerable populations face from a range of hazards, including barriers to evacuation, event-specific vulnerabilities, and impediments to recovery.	There exist various groups of individuals that have additional financial, social and/or environmental barriers to being resilient in the face of natural hazard events. In Cumberland County, for example, groups with significant number of people affected include about 10K outdoor workers with direct exposure to extreme heat days, elderly people and especially those with existing cardiovascular conditions, and other low-income and/or minority groups. As natural hazard events increase in intensity and frequency, these groups will find it harder to safely and efficiently get out of harm's way. These groups will also have difficulty in obtaining and paying for essential components to sustain life, such as medications, utilities, and transportation to/from a place of work, etc.	County Social Services Department and/or County Health Department	Staff Hours	Local Operating Budget	Medium Range	New			All Hazards
5	Collaborate with NC Cooperative Extension and NC Agriculture and Forestry Adaptation Working Group to provide more local support and encouragement of forest conservation and farmland preservation measures.	Forests and farmland provide a multitude of social, economic and environmental benefits, that when looked at comprehensively, far outweigh any profit/revenue projections of residential or commercial properties. Outside of development pressure, some of the other major health risks include: (1) increasing wildfire risk, (2) increasing number and types of insects and pests, (3) lack of sufficient water during the growing season for crops, and (4) increasing damage from strong winds and flooding. It is vital, especially in the face of a changing climate, to preserve these working lands and to support higher density development in already existing urban and suburban centers.	County Board of Commissioners, Conservation District Programs, and other land preservation organizations.	Unknown	NC Cooperative Extension, NC Forest Service, US Department of Agriculture and NC Wildlife Resources Commission.	Short Range	N		X	Wildfire, Inland Flooding
6	Include climate predictions from the Cumberland County Climate Resiliency Plan in the Regional Hazard Mitigation Plan.	To properly prepare for natural hazard occurrences, it is important to include predictions that warn of: (1) increasing temperatures and extreme heat days, (2) increasing frequency and strength of severe weather events, (3) more heavy rain/flooding, and (4) more frequent and prolonged drought. Although some climate projections do not pose an immediate threat, any comprehensive mitigation plan for emergency management should at the very least, and by the very nature of the	The Planning Department/Planning Director for each jurisdiction in Cumberland County	None	Existing FEMA grant	Short Range	New	X	X	All Hazards

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
		definition of "mitigation", acknowledge the changing climate and possibility of increased extreme weather and flooding events.								
7	Provide financial assistance for low-income residents to help with power bills and support services during extended periods of high temperature and other extreme weather.	Low-income households face challenges in keeping up with utility bills. Some low-income utility assistance programs are offered, but funds are limited. Extreme weather and increasing temperatures will place even greater pressure on these programs' ability to provide assistance to all those in need, and citizen's lives will be increasingly at stake.	County Health Department	Unknown	NC Department of Health and Human Services and County Department of Health	Medium Range	New			Extreme Heat, Winter Weather
8	Analyze and update local development ordinances to make buildings safer from wind and flooding, more energy and water efficient, more tolerant of heat waves and healthier to live in. Also, provide incentives for making buildings safer from wind, flooding, more energy and water efficient, and healthier to live in.	Energy and water efficiency will be increasingly important to a community's resiliency in the face of natural hazards specifically because of projections of increasing temperatures and extreme heat days, and prolonged periods of drought. Climate projections also state that precipitation will continue to follow a seasonal pattern, whereby hot, Summer months are classified with less precipitation and Winters with more precipitation. Extreme heat days will be specially taxing on buildings with older A/C systems or inadequate insulation and in low-income households where upkeep with rising utility costs could become a burden.	Planning and Code Departments of each jurisdiction	Staff Hours	Local Operating Budget	Medium Range	New		X	Inland Flooding, Hurricane Wind, Thunderstorm Wind, Extreme Heat, Winter Storms
9	Use natural systems, more open space and green surfaces to manage stormwater in a more resilient fashion.	Impervious surfaces typically found in urban centers, such as paved roads, buildings, parking lots and pavement, drastically increase flash floods and urban flooding, which seems to be a common occurrence in Cumberland County. For instance, within a 90 day period (March 1 – June 30, 2015), three flooding incidents were reported due to heavy rainfall events. Use of LID stormwater management practices is mentioned only in summary in the Growth Factor Analysis, stating it "…should be emphasized in sensitive areas…" This, coupled with the naturally flat topography of the eastern portions of the County also help to create excess runoff and subsequent urban flooding issues, especially in the Special Flood Hazard Areas (SFHA) of the County, and specifically around Blounts and Cross Creek, as referenced in various resources.	Engineering Department of each jurisdiction	Staff Hours	Local Operating Budget	Short Range	New		X	Inland Flooding
10	Restrict Residential and Non-Compatible Uses within the Special Flood Hazard Area	Prohibit developing within the Special Flood Hazard Area and promote the flood area as an environmental corridor and open space, while reducing potential losses during a flood hazard.	Cumberland County Planning and Inspections Department and Town of Falcon	Staff Hours	Local Operating Budget	Short Range	New		X	Inland Flooding
11	Revise the Subdivision Ordinance requiring an additional access for emergency vehicles and to be used as an evacuation route for developments located near special flood hazard area.	This will provide an additional access for residents, public safety officials and emergency services to those developments located near a special flood hazard area, while reducing the possibility of a life threatening situation for residents, public officials and emergency services.	Town of Falcon and Cumberland County Planning & Inspections Department	Staff Hours $5,000 - $10,000	Local Operating Budget	Medium Range	New		X	Inland Flooding

ANNEX E – TOWN OF GODWIN

E.1 Community Profile

E.1.1 Geography

The Town of Godwin is within Cumberland County and is located in south central North Carolina in the Upper Coastal Plain. As of the 2010 census, the population was 139. Godwin is within the Fayetteville, NC Metropolitan Statistical Area and is part of the Mid-Carolina Council of Governments. According to the U.S. Census Bureau, the Town has a total area of approximately 0.5 square miles, all of which is land. Godwin is located in the Cape Fear River basin.

E.1.2 Population and Demographics

Table E1 provides population counts and the percentage change in population since 2010 for the Town of Godwin. Based on the 2010 census, the population density is 278 people per square mile.

Table E1 - Population Counts for Town of Godwin

Jurisdiction	2010 Census Population	2014 Estimated Population	% Change 2010-2014
Town of Godwin	139	123	-11.5

Source: U.S. Census Bureau, 2015

Based on the 2010 Census, the median age of residents in the Town of Godwin is 31.0. The racial characteristics of the Town are presented below in Table E2.

Table E2 - Demographics of Town of Godwin

Jurisdiction	White Persons, Percent (2010)	Black Persons, Percent (2010)	American Indian or Alaska Native, Percent (2010)	Asian Persons, Percent (2010)	Hispanic or Latino Persons, Percent (2010)[1]
Town of Godwin	70.5	27.3	0.0	0.7	0.0

[1]Persons of Hispanic Origin may be of any race, so are also included in applicable race category.
Source: U.S. Census Bureau, 2010

E.2 Risk Assessment

This subsection includes a hazard profile and vulnerability assessment for each of the priority hazards identified in Chapter 5 Subsection 13 (Table 5.20) as they pertain to the Town of Godwin. **Additional information for each hazard can be found in Chapter 5 - Hazard Profiles and Chapter 6 – Vulnerability Assessment.**

E.2.1 Dam/Levee Failure

Location and Spatial Extent

According to the North Carolina Dam Inventory that are no dams located within the Town of Godwin.

Past Occurrences

There are no known past dam failures in the Town of Godwin.

Probability of Future Occurrence

Unlikely - Based on historical occurrence information and zero dams located within the Town, it can reasonably be assumed that the Town of Godwin has less than a 1% chance of this type of event occurring each year.

Vulnerability Assessment

The estimated number of buildings that could potentially be impacted by a dam failure is zero.

E.2.2 Drought

Location and Spatial Extent

Drought cannot be confined to geographic or political boundaries. The Cumberland County region, including the Town of Godwin, is designated as moderately dry.

Past Occurrences

According to the North Carolina Drought Monitor, Cumberland County has experienced drought conditions every year since 2000. Table E3 shows the most severe classification for each year.

Table E3 - Historical Drought Occurrences

Year	Cumberland County
2000	Abnormally Dry
2001	Severe Drought
2002	Extreme Drought
2003	Abnormally Dry
2004	Abnormally Dry
2005	Abnormally Dry
2006	Moderate Drought
2007	Exceptional Drought
2008	Exceptional Drought
2009	Moderate Drought
2010	Moderate Drought
2011	Severe Drought
2012	Moderate Drought
2013	Abnormally Dry
2014	Abnormally Dry
2015	Moderate Drought

Source: NC Drought Monitor

Probability of Future Occurrence

Highly Likely - Based on historical occurrence information (15 records in 15 years), it can reasonably be assumed that the Town of Godwin has a 100% chance of this type of event occurring each year.

Vulnerability Assessment

It is assumed that whereas all buildings and facilities in the planning area would technically be exposed to the drought hazard, there is no significant vulnerability to these buildings on a structural level. Population growth could contribute directly to this hazard, as an increased number of users pull from the available water supply within the region

E.2.3 Earthquake

Location and Spatial Extent

As detailed in Chapter 5 – Hazard Profiles, the Town of Godwin lies within an approximate zone level between 6 and 10% ground acceleration. This indicates that the region as a whole exists within an area of moderate seismic risk.

Past Occurrences

A list of earthquakes that have caused damaged in North Carolina is presented below in Table E4.

Table E4 - Earthquakes Affecting North Carolina

Date	Location	Richter Scale
12/16/1811	NE Arkansas	8.5
01/23/1812	New Madrid, MO	8.4
02/07/1812	New Madrid, MO	8.7
04/29/1852	Wytheville, VA	5.0
08/31/1861	Wilkesboro, NC	5.1
12/23/1875	Central Virginia	5.0
08/31/1886	Charleston, SC	7.3
05/31/1897	Giles County, VA	5.8
01/01/1913	Union County, SC	4.8
02/21/1916	Asheville, NC	5.5
07/08/1926	Mitchell County, NC	5.2
11/03/1928	Newport, TN	4.5
05/13/1957	McDowell County, NC	4.1
07/02/1957	Buncombe County, NC	3.7
11/24/1957	Jackson County, NC	4.0
10/27/1959	Chesterfield, SC	4.0
07/13/1971	Newry, SC	3.8
11/30/1973	Alcoa, TN	4.6
11/13/1976	Southwest Virginia	4.1
05/05/1981	Henderson County, NC	3.5

Source: Wake County 2014 Hazard Mitigation Plan. Information provided by NCEM.

Probability of Future Occurrence

Possible - Based on historical occurrences, the probability of a significant earthquake event affecting the Town of Godwin is possible. There are a total of 20 records in North Carolina over the past 200 years. Therefore, the annual probability level is estimated between 1 and 10 percent.

Vulnerability Assessment

An earthquake has the potential to impact all existing and future buildings, facilities, and populations in the Town of Godwin. Impacts of earthquakes include debris clean-up, service disruption and, in severe cases, fatalities due to building collapse. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 3.

E.2.4 Extreme Heat

Location and Spatial Extent

Extreme heat typically occurs over large areas impacting multiple counties at one time. The entirety of the Town of Godwin is vulnerable to extreme heat.

Past Occurrences

According to the National Climatic Data Center, one instance of extreme heat was recorded in Cumberland County beginning on July 22, 1998, and an additional instance of extreme heat was recorded in Cumberland County beginning on August 10, 2007.

Probability of Future Occurrence

Possible - Based on historical occurrence information (2 records in 65 years), it can reasonably be assumed that an extreme heat event has a 3% chance of occurring each year in the Town of Godwin.

Vulnerability Assessment

Extreme heat is not likely to impact the built environment, but may impact agriculture and pose a threat to humans. Elderly persons, persons with respiratory disabilities, and children may be at risk to experience health problems during extreme heat events, some of which could result in serious illness or death. Potential losses of human life due to extreme heat are not quantified in this Plan. There are no past reports of death or property or crop damage recorded by NCEI.

E.2.5 Hurricane/Tropical Storm

Location and Spatial Extent

All Atlantic and Gulf of Mexico coastal areas are subject to hurricanes. While coastal areas are most directly exposed to land falling hurricanes and tropical storms, their impact can be felt hundreds of miles inland. The entire Town of Godwin region is equally susceptible to hurricanes and tropical storms.

Past Occurrences

Table E5 provides hurricane and tropical storm data reported by NCEI since 1950 for Cumberland County.

Table E5 - NCEI Hurricane and Tropical Storm Events for Cumberland County

Location	Date	Event Type	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland (Zone)	7/12/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/5/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	8/27/1998	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/4/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00

Location	Date	Event Type	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland (Zone)	9/15/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/18/2003	Hurricane (Typhoon)	0/0	$28,000.00	$0.00
Cumberland (Zone)	09/01/2006	Tropical Storm	0/0	$0.00	$0.00
			Total:	**$28,000.00**	**$0.00**

While not included in the NCEI database, Category 4 Hurricane Hazel (DR-28) came ashore in North Carolina on October 15, 1954 and caused substantial damage in the region. With winds reaching 125mph at Grannis Field, Hurricane Hazel caused an estimated $136 million in property damage; 19 deaths; 200 injuries; destruction of 15,000 homes and structures; and damage to 39,000 structures.

Probability of Future Occurrence

Likely - Based on a historical record of eight storm events over a period of 65 years (1950 - 2015), it can reasonably be assumed that this type of event has a 12% chance of occurring each year.

Vulnerability Assessment

In conclusion, hurricane wind has the potential to impact all existing and future buildings, facilities, and populations in the Town of Godwin. Impacts of hurricanes include flood damage, debris clean-up, service disruption and possible fatalities due to flooding or flying debris. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 5.

E.2.6 Inland Flooding: 100-/500-year

Location and Spatial Extent

The Town of Godwin parcel layer and effective 2007 DFIRM were intersected and the flooded parcel area was calculated in acres. Flood zones were assigned to parcels based on the intersection of a parcel with a flood zone. Parcels can be located in multiple flood zones, and only the flooded acreage within the parcel was included in the calculation for each flood zone. Table E6 provides a summary of acreage by flood zone.

Table E6 - Flood Zone Acreage

Jurisdiction	Flood Zone Acreage				
	Zone A (100-year)	Zone AE (100-year)	Zone X Shaded (500-year)	Zone X Unshaded	Total
Town of Godwin	0	0	0	337	337

The Town of Godwin's parcel and building footprint layers were used to examine the inventory of properties at risk. Table E7 provides the building count, estimated building value, estimated content value and estimated total value for all buildings located within each FEMA flood zone.

Table E7 – Properties at Risk

Occupancy Type	Total Number of Buildings in Floodplain	Total Building Value	Estimated Content Value	Total Value
Zone AE				
Agricultural	0	$0	$0	$0
Commercial	0	$0	$0	$0

Occupancy Type	Total Number of Buildings in Floodplain	Total Building Value	Estimated Content Value	Total Value
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	0	$0	$0	$0
Total	**0**	**$0**	**$0**	**$0**
Zone X (500-yr)				
Agricultural	0	$0	$0	$0
Commercial	0	$0	$0	$0
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	0	$0	$0	$0
Total	**0**	**$0**	**$0**	**$0**
Zone X (Unshaded)				
Agricultural	4	115266.1	$115,266	$230,532
Commercial	2	$278,138	$278,138	$556,276
Education	0	$0	$0	$0
Government	1	$198,552	$198,552	$397,104
Industrial	1	$139,689	$139,689	$279,378
Religious	3	$1,195,229	$1,195,229	$2,390,459
Residential	72	$7,250,963	$3,547,676	$10,798,639
Total	**83**	**$9,177,838**	**$5,474,550**	**$14,652,388**

Source: North Carolina Emergency Management, Risk Management, 2013

Note: Content value estimations are generally based on the FEMA Hazus methodology of estimating value as a percent of improved structure values by property type. The residential property type assumes a content replacement value equal to 50% of the building value. Agricultural, commercial, education, government, and religious property types assume a content replacement value equal to 100% of the building value. The industrial property type assumes a content replacement value equal to 150% of the building value.

Past Occurrences

Table E8 shows detail for flood events reported by the NCEI since 1950 for the Town of Godwin. There has been one recorded event originating within the Town.

Table E8 - NCEI Flooding Events in the Town of Godwin

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Flash Flood	1	$0	$0	0	0
Total:	**1**	**$0**	**$0**	**0**	**0**

Source: NCEI, September 2015

Probability of Future Occurrence

Possible - By definition of the 100-year flood event, SFHAs are defined as those areas that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. Properties located in these areas have a 26 percent chance of flooding over the life of a 30-year mortgage.

The 500-year flood area is defined as those areas that will be inundated by the flood event having a 0.2-percent chance of being equaled or exceeded in any given year; it is not the flood that will occur once every 500 years.

Vulnerability Assessment

Properties at Risk to Flooding

The loss estimate for flood is based on the total of improved building value and contents value. Land value is not included in any of the loss estimates as generally the land is not subject to loss from floods. Once the potential value of affected parcels was calculated, damage factors were applied to obtain loss estimates by flood zone.

Table E9 shows the building count, total value, estimated damages and loss ratio for buildings that fall within the Zone AE 100-year floodplain by occupancy type on the community level.

The loss ratio is the loss estimate divided by the total potential exposure (i.e., total of improved and contents value for all buildings located within the Zone AE 100-year floodplain) and displayed as a percentage of loss. FEMA considers loss ratios greater than 10% to be significant and an indicator a community may have more difficulties recovering from an event.

Table E9 - Estimated Building Damage and Content Loss – Flood 100-yr Return Period

Occupancy Type	Total Number of Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Zone AE						
Agricultural	0	$0	$0	$0	$0	n/a
Commercial	0	$0	$0	$0	$0	n/a
Education	0	$0	$0	$0	$0	n/a
Government	0	$0	$0	$0	$0	n/a
Industrial	0	$0	$0	$0	$0	n/a
Religious	0	$0	$0	$0	$0	n/a
Residential	0	$0	$0	$0	$0	n/a
Total	**0**	**$0**	**$0**	**$0**	**$0**	n/a

Source: North Carolina Emergency Management, Risk Management, 2013

Critical Facilities at Risk to Flooding

Of significant concern with respect to any disaster event is the location of critical facilities in the planning area. Critical facilities are often defined as those essential services and facilities in a major emergency which, if damaged, would result in severe consequences to public health and safety or a facility which, if unusable or unreachable because of a major emergency, would seriously and adversely affect the health, safety, and welfare of the public. Critical facilities within the Town are detailed in Table E10 and Figure E1 below.

Table E10 – Critical Facilities and FEMA Flood Zones

Facility Name	Address	Facility Type	Estimated 100-yr Flood Depth (Ft)
Zone AE			
n/a	n/a	n/a	n/a
Zone A (100-yr)			
n/a	n/a	n/a	n/a
Zone X Shaded (500-yr)			
n/a	n/a	n/a	n/a
Zone X Unshaded			
Godwin Town Hall	4924 Markham St	Government	n/a

Source: Cumberland County Emergency Management Agency, 2015

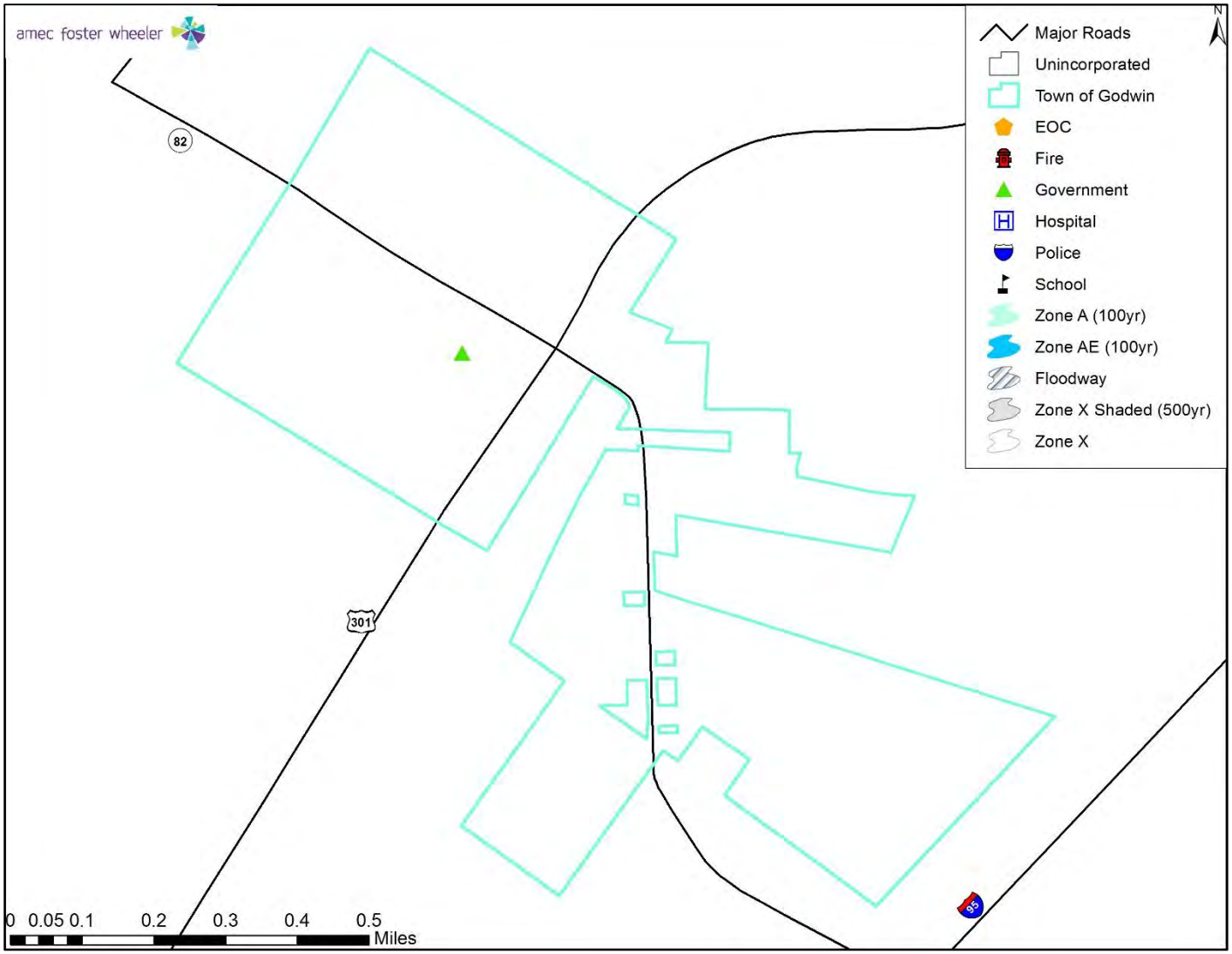


Figure E1 – Town of Godwin Critical Facilities and FEMA Flood Zones

Repetitive Loss Properties

The Town of Godwin contains no repetitive loss properties.

E.2.7 Severe Weather (Thunderstorm Wind, Lightning & Hail)

Location and Spatial Extent

The entirety of the Town of Godwin can be considered at risk to severe weather events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

Table E11 shows detail for severe weather events reported by the NCEI since 1950 for the Town of Godwin. There have been eight recorded events causing $30,000 in property damage.

Table E11 - NCEI Severe Weather Events in the Town of Godwin

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Hail	3	$0	$0	0	0
High Wind	0	$0	$0	0	0
Lightning	0	$0	$0	0	0
Strong Wind	0	$0	$0	0	0
Thunderstorm Wind	5	$30,000	$0	0	0
Total:	**8**	**$30,000**	**$0**	**0**	**0**

Probability of Future Occurrence

Likely - It is likely that severe weather events, including wind, lightning and hail, will occur in the future. Eight records over a period of 65 years results in a 12% annual probability of future severe weather events.

Vulnerability Assessment

Severe weather events including thunderstorm wind, lightning and hail has the potential to impact all existing and future buildings, facilities, and populations in the Town of Godwin. Impacts of severe weather events include wind damage, debris clean-up, hail damage, and potential fatalities due to lightning strikes and associated fires. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 7.

E.2.8 Tornado

Location and Spatial Extent

The entirety of the Town of Godwin can be considered at risk to tornado events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

According to NCEI records, Cumberland County has experienced 23 tornadoes since 1950. These events are reported to have caused five deaths, 169 injuries and close to $133M in property damage.

Table E12 - NCEI Records for Tornadoes in Cumberland County (1950-2015)

Location	Date	Tornado Fujita Scale	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland Co	4/8/1957	F4	0/8	$250,000.00	$0.00

Location	Date	Tornado Fujita Scale	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland Co	6/2/1959	F0	0/0	$25,000.00	$0.00
Cumberland Co	10/4/1960	F1	0/0	$25,000.00	$0.00
Cumberland Co	9/29/1963	F2	0/0	$250,000.00	$0.00
Cumberland Co	12/26/1964	F1	0/1	$2,500.00	$0.00
Cumberland Co	2/22/1971	F3	2/60	$2,500,000.00	$0.00
Cumberland Co	3/15/1971	F1	0/0	$250,000.00	$0.00
Cumberland Co	5/29/1973	F1	0/0	$25,000.00	$0.00
Cumberland Co	8/2/1974	F0	0/0	$25,000.00	$0.00
Cumberland Co	2/11/1981	F2	0/0	$250,000.00	$0.00
Cumberland Co	3/28/1984	F3	2/11	$25,000,000.00	$0.00
Cumberland Co	3/28/1984	F4	0/0	$2,500,000.00	$0.00
Cumberland Co	5/19/1986	F2	0/0	$250,000.00	$0.00
Cumberland Co	8/28/1988	F1	0/0	$250,000.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	5/28/2000	F0	0/0	$0.00	$0.00
Cumberland Co	12/17/2000	F0	0/0	$0.00	$0.00
Cumberland Co	3/27/2009	EF1	0/0	$225,000.00	$0.00
Cumberland Co	4/16/2011	EF3	1/85	$100,000,000.00	$0.00
Cumberland Co	4/16/2011	EF2	0/4	$250,000.00	$0.00
Cumberland Co	4/29/2014	EF1	0/0	$50,000.00	$0.00
			Total:	**$132,932,750.00**	**$0.00**

Probability of Future Occurrence

Likely - The best available information to determine future probability of a tornado event is to review historic frequency. According to NCEI, 23 tornadoes have impacted Cumberland County over a 65 year period. It can reasonably be assumed that the Town of Godwin has a 35% chance of experiencing a tornado each year.

Vulnerability Assessment

A tornado has the potential to impact all existing and future buildings, facilities, and populations in the Town of Godwin. Impacts of tornadoes include building and contents damage, debris clean-up, service disruption and potentially numerous fatalities and injuries. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 10.

E.2.9 Wildfire

Location and Spatial Extent

Wildfires could potentially occur anywhere in the region. The Wildland Urban Interface (WUI) is described as the area where structures and other human improvements meet and intermingle with undeveloped wildland or vegetative fuels. Population growth within the WUI substantially increases the risk for wildfire. For the Cumberland County, NC project area, it is estimated that 301,884 people or 95 percent

of the total project area population (319,404) live within the WUI. The WUI for Cumberland County is shown within Chapter 5 Subsection 11 (Figure 5.19).

Past Occurrences

Table E13 lists past occurrences of wildfire in Cumberland County since 2005 as provided by the NCFS in September 2015.

Table E13 - Records for Wildfire in Cumberland County

County	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Cumberland	57	75	94	49	21	59	47	24	36	38

Probability of Future Occurrence

Highly Likely - The best available information to determine future probability of a wildfire event is to review historic frequency. According to historic records, 500 wildfires have occurred in Cumberland County between 2005 and 2015 (100% chance of occurring each year).

Vulnerability Assessment

A wildfire has the potential to impact all existing and future buildings, facilities, and populations in the Town of Godwin. Impacts of wildfire include building and contents damage, debris clean-up, service disruption and potentially numerous fatalities and injuries. Wildfires can also increase flood risk due to loss of vegetation. WUI Risk, Burn Probability and Rate of Spread are provided on the County level in Chapter 6 Subsection 11.

E.2.10 Winter Storm

Location and Spatial Extent

The entirety of the Town of Godwin can be considered at risk to winter storm events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

According to NCEI records, Cumberland County has experienced 30 winter storm events since 1996, respectively. These events are reported to have caused one death due to icy road conditions.

Table E14 - NCEI Records for Winter Storm Events in Cumberland County (1996-2015)

Date	Location	Type of Winter Storm	Deaths/ Injuries	Property Damage	Crop Damage
1/6/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
1/11/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
2/2/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
2/3/1996	Cumberland County	Cold/wind Chill	0/0	$0.00	$0.00
12/23/1998	Cumberland County	Ice Storm	0/0	$0.00	$0.00
1/18/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/22/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/24/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/28/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
12/3/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/3/2002	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00

Date	Location	Type of Winter Storm	Deaths/ Injuries	Property Damage	Crop Damage
12/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/1/2007	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/17/2008	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/19/2008	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/20/2009	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/4/2009	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/29/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/12/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
3/2/2010	Cumberland County	Winter Weather	0/0	$0.00	$0.00
12/16/2010	Cumberland County	Winter Weather	1/0	$0.00	$0.00
12/25/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/10/2011	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/28/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/11/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/12/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/16/2015	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/24/2015	Cumberland County	Winter Weather	0/0	$0.00	$0.00

Source: NCEI, September 2015

Probability of Future Occurrence

Highly Likely - The best available information to determine future probability of a winter storm event is to review historic frequency. According to NCEI, 30 winter storm events have occurred over a 19 year period between 1996 and 2015 resulting in approximately 1.6 significant winter storm events per year.

The probability of a heavy snowfall occurring with that winter storm event is less likely. The figure below presents the probability of 8-inches or more of snowfall to be approximately 12.5% per year for the Cumberland County Region.

Vulnerability Assessment

Potential losses associated with winter storms include the cost of the removal of snow from roadways, debris clean-up, and some indirect losses from power outages, etc. All future structures and infrastructure in the region will be vulnerable to winter storms.

E.3 Priority Risk Index Results

Table E15 summarizes the degree of risk assigned to each identified hazard as it applies to the Town of Godwin using the PRI method described in Chapter 6 Subsection 4.

Table E15 - Summary of PRI Results for the Town of Godwin

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Dam/Levee Failure	Unlikely	Minor	Negligible	Less than 6 hrs	Less than 6 hrs	1.3
Drought	Highly Likely	Minor	Large	More than 24 hrs	More than 1 week	2.8
Earthquake	Possible	Limited	Moderate	Less than 6 hrs	Less than 6 hrs	2.3
Extreme Heat	Possible	Minor	Large	More than 24 hrs	Less than 1 week	2.1
Hurricane/Tropical Storm	Likely	Critical	Large	More than 24 hrs	Less than 24 hrs	2.9
Inland Flooding:	Possible	Critical	Moderate	6 to 12 hours	Less than 1 week	2.7

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
100-/500-year						
Severe Weather (thunderstorm wind, lightning, & hail)	Likely	Limited	Moderate	6 to 12 hours	Less than 6 hrs	2.5
Tornado	Likely	Critical	Small	Less than 6 hrs	Less than 6 hrs	2.7
Wildfire	Highly Likely	Limited	Small	Less than 6 hrs	Less than 1 week	2.9
Winter Storm	Highly Likely	Minor	Moderate	More than 24 hrs	Less than 1 week	2.5

As shown in Table E16, the results from the PRI have been classified into three categories based on the assigned risk value:

- **Low Risk** - Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium Risk** - Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High Risk** - Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread.

Table E16 - Summary of Hazard Risk Classification

Hazard Category	Hazard Type
High Risk (> 2.5)	**Hurricane/Tropical Storm** **Wildfire** **Drought** **Inland Flooding: 100-/500-year** **Tornado**
Moderate Risk (2.0 – 2.5)	**Severe Weather** **Winter Storm** **Earthquake** **Extreme Heat**
Low Risk (< 2.0)	**Dam/Levee Failure**

E.4 Capability Assessment

This subsection discusses the capability of the Town of Godwin to implement hazard mitigation activities. More information on the purpose and methodology used to conduct the assessment can be found in Chapter 7 - Capability Assessment.

E.4.1 Planning and Regulatory Capability

Table E17 lists regulatory capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Godwin.

Table E17 - Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Y/N	Date	Comments
Comprehensive Plan	Y	7/20/09	2030 Growth Vision Plan and 2030 Growth Strategy Map
Zoning Ordinance	Y	10/22/13	
Subdivision Ordinance	Y	6/16/98	
Floodplain Ordinance	Y	5/15/00	Adopted Cumberland County Flood Damage Prevention Ordinance
Stormwater Ordinance	N		Handled by NC DENR
Erosion, Sedimentation and Pollution Control Ordinance	N		Handled by NC DENR
Building Code	Y	1970's	2009 International Code and 2012 North Carolina Building Code. Cumberland County Planning & Inspections Department enforces the building code within the Town of Godwin.
BCEGS Rating	Y	Conducted every 5 years	Done by ISO
Stormwater Management Program	N		
Site Plan Review Requirements	Y	6/16/98	
Capital Improvements Plan	N		
Local Emergency Operations Plan	Y	2006	
Flood Insurance Study or Other Engineering Study for Streams	Y	5/15/00	
Repetitive Loss Plan	N		No repetitive loss property located within the Town of Godwin.
Elevation Certificates	Y	Since 2000	

E.4.2 Floodplain Management

The Town of Godwin joined the NFIP emergency program in 2000 and has been a regular participant in the NFIP since January 2007. The Town of Eastover contains no NFIP policies.

E.4.3 Administrative and Technical Capability

Table E18 lists administrative capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Godwin.

Table E18 - Administrative/Technical Capabilities

Resource	Y/N	Responsible Department
Planner/Engineer with knowledge of land development/land management practices	Y	Cumberland County Engineering & Public Utilities and Town of Godwin Contract Engineer
Engineer/Professional trained in construction practices related to buildings and/or infrastructure	Y	Cumberland County Engineering & Public Utilities and Town of Godwin Contract Engineer
Planner/Engineer/Scientist with an understanding of natural hazards	Y	Cumberland County Engineering & Public Utilities and Cumberland Planning & Inspections Department
Personnel skilled in GIS	Y	Cumberland County Information Services
Full time building official	Y	Cumberland County Planning & Inspections
Floodplain Manager	Y	Cumberland County Engineering & Public Utilities
Emergency Manager	Y	Cumberland County Emergency Services
Grant writer	Y	Cumberland County Planning & Inspections and Cumberland County Emergency Services
GIS data – Hazard areas	Y	Cumberland County Information Services
GIS data – Critical facilities	Y	Cumberland County Information Services
GIS data – Land use	Y	Cumberland County Planning & Inspections Department
GIS data – Building footprints	Y	Cumberland County Information Services
GIS data – Links to Assessor's data	Y	Cumberland County Information Services
Warning Systems/Services	Y	Cumberland County Emergency Services – Code Red Program

E.4.4 Fiscal Capability

Table E19 lists fiscal capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Godwin.

Table E19 - Fiscal Mitigation Capabilities

Resource	Accessible/Eligible to Use (Y/N)
Community Development Block Grants	Y
Capital improvements project funding	Y
Authority to levy taxes for specific purposes	Y
Fees for water, sewer, gas or electric services	Y
Impact fees for new development	N

Resource	Accessible/Eligible to Use (Y/N)
Incur debt through general obligation bonds	Y
Incur debt through special tax bonds	Y
Incur debt through private activity bonds	N
Withhold spending in hazard prone areas	N

E.5 Mitigation Strategy

E.5.1 Status Update for 2011 Mitigation Actions

Table E20 provides a status update for each mitigation action detailed in the 2011 Cumberland County Multi-jurisdictional Hazard Mitigation Plan with the Town of Godwin designated as the responsible jurisdiction. This table provides a summary of progress to-date and also notes whether each action is to be deleted or carried forward into the 2016 Regional Plan.

Table E20 - Status of 2011 Mitigation Actions

Town of Godwin								
Mitigation Action Number	**Action Description**	**Responsible Department**	**Current Status**			**2016 Plan Update**		**Summary of Progress To-Date**
			Complete	**In Progress**	**Not yet Started**	**Delete Action**	**Carry Forward**	
1	Develop Uniform Flood Damage Prevention Ordinance.	Cumberland County Engineering Department			X	X		The Town of Godwin adopted the Revised Cumberland County Flood Damage Prevention Ordinance and the new FIRM on October 16, 2006. The new digital firm map adopted by the Town indicates there is no Special Flood Hazard Area within its Town Limits. Also continues compliance with NFIP. **See Unincorporated Area Action #6 for further explanation for the deletion of this action.**
2	Revise Subdivision Ordinance To Require That All Utilities Be Placed Underground With The Exception Of High Voltage Electrical Transmission Lines.	Cumberland County Planning Department and Electrical Providers	X			X		Currently, Godwin's Subdivision Ordinance requires "all development shall have utilities placed underground where practical". Mapping of underground electrical utilities is the responsibility of electrical providers.
3	Develop A Program To Ensure Drainage Ways, Culverts And Storm Drains Are Free Of Debris.	Cumberland County Engineering Department		X		X		The Town of Godwin ensures that the drainageways, culverts and storm drains are free of debris on Town streets and property. The NC Department of Transportation maintains streets that are a part of the State Road system within the Town.
4	Develop A Landscape Ordinance That Will Encourage Protection To Natural Areas Through Design And Provide More Vegetation In Urban Development.	Cumberland County Planning Department	X			X		Landscaping requirements are included in the Town of Godwin Zoning Ordinance. These landscaping requirements apply to non-residential and mixed use developments adopted June 20, 2005.
5	Identify Areas That Are Susceptible To Wildfires And Consider Prescribed Fire (Controlled Burning) Management Tool To Reduce The Impact Of Wildfire Hazards.	NC Forest Service		X			X (Revised)	Currently the Cumberland County office of Forest Service has developed a draft risk assessment of those areas of Cumberland County (including Town of Godwin) that are susceptible to wildfires. This risk assessment is general in nature and for in office use only. The NC Forest Service has completed five Community Wildfire Protection Plans for certain areas of Cumberland County.

E.5.2 2016 Mitigation Action Plan

Table E21 identifies nine new and/or revised mitigation actions for the Town of Godwin. There are no unrevised, incomplete actions from Table E20 that are to be carried forward into the 2016 Regional Plan.

Table E21 - 2016 Mitigation Action Plan

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
New/Revised Actions										
1	Maintain an all Hazards public education program to educate and prepare residents for all of the hazards that impact Cumberland County.	To educate, enhance preparedness, and resiliency of Cumberland County and its municipal residents through public education programs that included booths at fairs, festivals and special events, websites, brochures, school programs, and etc.	Cumberland County Emergency Management	$90,000	Local Operating Budget	Short Range	New			All Hazards
2	Explore the Fire Adapted Communities concept implementation in Cumberland County.	To enhance the preparedness and resiliency of Cumberland County and its municipalities to the effects of wild land fire and urban interface, through education; programs such as Fire Wise, Ready Set Go, Community Wildfire Protection Plan; Fuel Management; local codes and ordinances.	Emergency Management, NC Forest Service and Fire Marshalls	Staff Hours	Local Operating Budget and Federal	Medium Range	New	X	X	Wildfire
3	Conduct a countywide infrastructure vulnerability assessment to identify priority needs for updating ill-designed or outdated critical structures.	It has been difficult to locate any comprehensive assessments of local infrastructure in Cumberland and Hoke Counties. With current and projected natural hazard occurrences, it is essential to have an accurate and comprehensive understanding of the current condition of critical facilities to ensure the ability to continue to provide for basic needs, such as water and electrical supplies, transportation routes, waste management, etc.	County/city structural and civil engineers in partnership with U.S. Army Corps of Engineers	Staff Hours	Local Operating Budget and Federal	Medium Range	New	X		All Hazards
4	Conduct social vulnerability analysis to identify priority needs and opportunities that will address the specific problems vulnerable populations face from a range of hazards, including barriers to evacuation, event-specific vulnerabilities, and impediments to recovery.	There exist various groups of individuals that have additional financial, social and/or environmental barriers to being resilient in the face of natural hazard events. In Cumberland County, for example, groups with significant number of people affected include about 10K outdoor workers with direct exposure to extreme heat days, elderly people and especially those with existing cardiovascular conditions, and other low-income and/or minority groups. As natural hazard events increase in intensity and frequency, these groups will find it harder to safely and efficiently get out of harm's way. These groups will also have difficulty in obtaining and paying for essential components to sustain life, such as medications, utilities, and transportation to/from a place of work, etc.	County Social Services Department and/or County Health Department	Staff Hours	Local Operating Budget	Medium Range	New			All Hazards
5	Collaborate with NC Cooperative Extension and NC Agriculture and Forestry Adaptation Working Group to provide more local support and encouragement of forest conservation and farmland preservation measures.	Forests and farmland provide a multitude of social, economic and environmental benefits, that when looked at comprehensively, far outweigh any profit/revenue projections of residential or commercial properties. Outside of development pressure, some of the other major health risks include: (1) increasing wildfire risk, (2) increasing number and types of insects and pests, (3) lack of sufficient water during the growing season for crops, and (4) increasing damage from strong winds and flooding. It is vital, especially in the face of a changing climate, to preserve these working lands and to support higher density development in already existing urban and suburban centers.	County Board of Commissioners, Conservation District Programs, and other land preservation organizations.	Unknown	NC Cooperative Extension, NC Forest Service, US Department of Agriculture and NC Wildlife Resources Commission.	Short Range	New		X	Wildfire, Inland Flooding
6	Include climate predictions from the Cumberland County Climate Resiliency Plan in the Regional Hazard Mitigation Plan.	To properly prepare for natural hazard occurrences, it is important to include predictions that warn of: (1) increasing temperatures and extreme heat days, (2) increasing frequency and strength of severe weather events, (3) more heavy rain/flooding, and (4) more frequent and prolonged drought. Although some climate projections do not pose an immediate threat, any comprehensive mitigation plan for emergency management should at the very least, and by the very nature of the definition of "mitigation", acknowledge the changing climate and possibility of increased extreme weather and flooding events.	The Planning Department/Planning Director for each jurisdiction in Cumberland County	None	Existing FEMA grant	Short Range	New	X	X	All Hazards

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
7	Provide financial assistance for low-income residents to help with power bills and support services during extended periods of high temperature and other extreme weather.	Low-income households face challenges in keeping up with utility bills. Some low-income utility assistance programs are offered, but funds are limited. Extreme weather and increasing temperatures will place even greater pressure on these programs' ability to provide assistance to all those in need, and citizen's lives will be increasingly at stake.	County Health Department	Unknown	NC Department of Health and Human Services and County Department of Health	Medium Range	New			Extreme Heat, Winter Weather
8	Analyze and update local development ordinances to make buildings safer from wind and flooding, more energy and water efficient, more tolerant of heat waves and healthier to live in. Also, provide incentives for making buildings safer from wind, flooding, more energy and water efficient, and healthier to live in.	Energy and water efficiency will be increasingly important to a community's resiliency in the face of natural hazards specifically because of projections of increasing temperatures and extreme heat days, and prolonged periods of drought. Climate projections also state that precipitation will continue to follow a seasonal pattern, whereby hot, Summer months are classified with less precipitation and Winters with more precipitation. Extreme heat days will be specially taxing on buildings with older A/C systems or inadequate insulation and in low-income households where upkeep with rising utility costs could become a burden.	Planning and Code Departments of each jurisdiction	Staff Hours	Local Operating Budget	Medium Range	New		X	Inland Flooding, Hurricane Wind, Thunderstorm Wind, Extreme Heat, Winter Storms
9	Use natural systems, more open space and green surfaces to manage stormwater in a more resilient fashion.	Impervious surfaces typically found in urban centers, such as paved roads, buildings, parking lots and pavement, drastically increase flash floods and urban flooding, which seems to be a common occurrence in Cumberland County. For instance, within a 90 day period (March 1 – June 30, 2015), three flooding incidents were reported due to heavy rainfall events. Use of LID stormwater management practices is mentioned only in summary in the Growth Factor Analysis, stating it "…should be emphasized in sensitive areas…" This, coupled with the naturally flat topography of the eastern portions of the County also help to create excess runoff and subsequent urban flooding issues, especially in the Special Flood Hazard Areas (SFHA) of the County, and specifically around Blounts and Cross Creek, as referenced in various resources.	Engineering Department of each jurisdiction	Staff Hours	Local Operating Budget	Short Range	New		X	Inland Flooding

ANNEX F – TOWN OF HOPE MILLS

F.1 Community Profile

F.1.1 Geography

The Town of Hope Mills is within Cumberland County and is located in south central North Carolina in the Upper Coastal Plain. As of the 2010 census, the population was 15,176. Hope Mills is within the Fayetteville, NC Metropolitan Statistical Area and is part of the Mid-Carolina Council of Governments. According to the U.S. Census Bureau, the Town has a total area of approximately 7.0 square miles, of which 6.9 square miles is land and 0.1 square miles is water. Hope Mills is located in the Cape Fear River basin.

F.1.2 Population and Demographics

Table F1 provides population counts and the percentage change in population since 2010 for the Town of Hope Mills. Based on the 2010 census, the population density is 2,199 people per square mile.

Table F1 - Population Counts for Town of Hope Mills

Jurisdiction	2010 Census Population	2014 Estimated Population	% Change 2010-2014
Town of Hope Mills	15,176	16,024	5.6

Source: U.S. Census Bureau, 2015

Based on the 2010 Census, the median age of residents in the Town of Hope Mills is 31.0. The racial characteristics of the Town are presented below in Table F2.

Table F2 - Demographics of Town of Hope Mills

Jurisdiction	White Persons, Percent (2010)	Black Persons, Percent (2010)	American Indian or Alaska Native, Percent (2010)	Asian Persons, Percent (2010)	Hispanic or Latino Persons, Percent (2010)[1]
Town of Hope Mills	61.9	26.5	1.9	1.8	10.0

[1]Persons of Hispanic Origin may be of any race, so are also included in applicable race category.
Source: U.S. Census Bureau, 2010

F.2 Risk Assessment

This subsection includes a hazard profile and vulnerability assessment for each of the priority hazards identified in Chapter 5 Subsection 13 (Table 5.20) as they pertain to the Town of Hope Mills. **Additional information for each hazard can be found in Chapter 5 - Hazard Profiles and Chapter 6 – Vulnerability Assessment.**

F.2.1 Dam/Levee Failure

Location and Spatial Extent

Table F3 provides details for three dams included in the North Carolina Dam Inventory that are located within the Town of Hope Mills.

Table F3 - North Carolina Dam Inventory for the Town of Hope Mills

Dam Name	NIDID	Height (ft)	NID Storage (acre-feet)	Dam Status	River[1]	Hazard Classification
Hope Mills Dam #1	NC01121	33	1,175	BREACHED	Little Rockfish Creek	High
Maxwell Dam	NC02135	17	88.4	IMPOUNDING	Rockfish Creek-Os	Low
Pinewood Lakes Dam	NC02143	20	32	EXEMPT-HB_SIZE	Rockfish Creek-Os	Low

Source: North Carolina Dam Inventory, December 2014

[1]If the dam is located on an unnamed stream/tributary, the unnamed stream/tributary name is followed with "-TR". If the dam is located off stream of an unnamed stream/tributary, the unnamed stream/tributary name is followed with "-OS".

Past Occurrences

Table F4 details known past dam failures in the Town of Hope Mills.

Table F4 – Known Dam Failures in the Town of Hope Mills

Location	County	Date of Occurrence	Result of Failure	Deaths/ Injuries	Property Damage	Details
Hope Mills Dam	Cumberland	5/26/203	Heavy rains, dam gate would not open.	0	$2.1 million	Dam embankment gave way and also destroyed 30 feet of the nearby Lakeview Road. About 40 homes and 1,600 people downstream were evacuated.
Hope Mills Dam	Cumberland	Jun-10	Sinkhole	0	Not reported	The dam failed in June 2010 when a sinkhole developed at the base of the dam.
Hope Mills Dam	Cumberland	Not reported	Not reported	0	NR	The 2013 NC State Hazard Mitigation Plan reports the dam has experienced 5 failures and has damage 11 homes.

Probability of Future Occurrence

Possible - Based on historical occurrence information (3 records in 65 years), it can reasonably be assumed that the Town of Hope Mills has a 5% chance of this type of event occurring each year.

Vulnerability Assessment

The estimated number and characteristics of buildings that could potentially be impacted by a dam failure are shown in Table F5. **Note: the numbers presented in Table F5 are estimated based on the methodology described in Chapter 6 Subsection 3.1. A dam inundation study including a hydrologic and hydraulic analysis was not performed.**

Table F5 - Properties Potentially at Risk to Dam Failure

Jurisdiction	Number of Buildings in Estimated Inundation Area	Total Building Value	Estimated Content Value	Total Value
Town of Hope Mills (High Hazard Dams)	0	$0	$0	$0
Town of Hope Mills (Low Hazard Dams)	0	$0	$0	$0
Total	**0**	**$0**	**$0**	**$0**

Note: No damage is shown for the currently breached Hope Mills dam; when the dam is rebuilt the potential failure exposure is 4 buildings at estimated at $659,113 of building value, $892,925.03 of contents value and $1,552,038.03 total value.

F.2.2 Drought

Location and Spatial Extent

Drought cannot be confined to geographic or political boundaries. The Cumberland County region, including the Town of Hope Mills, is designated as moderately dry.

Past Occurrences

According to the North Carolina Drought Monitor, Cumberland County has experienced drought conditions every year since 2000. Table F6 shows the most severe classification for each year.

Table F6 - Historical Drought Occurrences

Year	Cumberland County
2000	Abnormally Dry
2001	Severe Drought
2002	Extreme Drought
2003	Abnormally Dry
2004	Abnormally Dry
2005	Abnormally Dry
2006	Moderate Drought
2007	Exceptional Drought
2008	Exceptional Drought
2009	Moderate Drought
2010	Moderate Drought
2011	Severe Drought
2012	Moderate Drought
2013	Abnormally Dry
2014	Abnormally Dry
2015	Moderate Drought

Source: NC Drought Monitor

Probability of Future Occurrence

Highly Likely - Based on historical occurrence information (15 records in 15 years), it can reasonably be assumed that the Town of Hope Mills has a 100% chance of this type of event occurring each year.

Vulnerability Assessment

It is assumed that whereas all buildings and facilities in the planning area would technically be exposed to the drought hazard, there is no significant vulnerability to these buildings on a structural level. Population growth could contribute directly to this hazard, as an increased number of users pull from the available water supply within the region

F.2.3 Earthquake

Location and Spatial Extent

As detailed in Chapter 5 – Hazard Profiles, the Town of Hope Mills lies within an approximate zone level between 6 and 10% ground acceleration. This indicates that the region as a whole exists within an area of moderate seismic risk.

Past Occurrences

A list of earthquakes that have caused damaged in North Carolina is presented below in Table F7.

Table F7 - Earthquakes Affecting North Carolina

Date	Location	Richter Scale
12/16/1811	NE Arkansas	8.5
01/23/1812	New Madrid, MO	8.4
02/07/1812	New Madrid, MO	8.7
04/29/1852	Wytheville, VA	5.0
08/31/1861	Wilkesboro, NC	5.1
12/23/1875	Central Virginia	5.0
08/31/1886	Charleston, SC	7.3
05/31/1897	Giles County, VA	5.8
01/01/1913	Union County, SC	4.8
02/21/1916	Asheville, NC	5.5
07/08/1926	Mitchell County, NC	5.2
11/03/1928	Newport, TN	4.5
05/13/1957	McDowell County, NC	4.1
07/02/1957	Buncombe County, NC	3.7
11/24/1957	Jackson County, NC	4.0
10/27/1959	Chesterfield, SC	4.0
07/13/1971	Newry, SC	3.8
11/30/1973	Alcoa, TN	4.6
11/13/1976	Southwest Virginia	4.1
05/05/1981	Henderson County, NC	3.5

Source: Wake County 2014 Hazard Mitigation Plan. Information provided by NCEM.

Probability of Future Occurrence

Possible - Based on historical occurrences, the probability of a significant earthquake event affecting the Town of Hope Mills is possible. There are a total of 20 records in North Carolina over the past 200 years. Therefore, the annual probability level is estimated between 1 and 10 percent.

Vulnerability Assessment

An earthquake has the potential to impact all existing and future buildings, facilities, and populations in the Town of Hope Mills. Impacts of earthquakes include debris clean-up, service disruption and, in severe cases, fatalities due to building collapse. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 3.

F.2.4 Extreme Heat

Location and Spatial Extent

Extreme heat typically occurs over large areas impacting multiple counties at one time. The entirety of the Town of Hope Mills is vulnerable to extreme heat.

Past Occurrences

According to the National Climatic Data Center, one instance of extreme heat was recorded in Cumberland County beginning on July 22, 1998, and an additional instance of extreme heat was recorded in Cumberland County beginning on August 10, 2007.

Probability of Future Occurrence

Possible - Based on historical occurrence information (2 records in 65 years), it can reasonably be assumed that an extreme heat event has a 3% chance of occurring each year in the Town of Hope Mills.

Vulnerability Assessment

Extreme heat is not likely to impact the built environment, but may impact agriculture and pose a threat to humans. Elderly persons, persons with respiratory disabilities, and children may be at risk to experience health problems during extreme heat events, some of which could result in serious illness or death. Potential losses of human life due to extreme heat are not quantified in this Plan. There are no past reports of death or property or crop damage recorded by NCEI.

F.2.5 Hurricane/Tropical Storm

Location and Spatial Extent

All Atlantic and Gulf of Mexico coastal areas are subject to hurricanes. While coastal areas are most directly exposed to land falling hurricanes and tropical storms, their impact can be felt hundreds of miles inland. The entire Town of Hope Mills region is equally susceptible to hurricanes and tropical storms.

Past Occurrences

Table F8 provides hurricane and tropical storm data reported by NCEI since 1950 for Cumberland County.

Table F8 - NCEI Hurricane and Tropical Storm Events for Cumberland County

Location	Date	Event Type	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland (Zone)	7/12/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/5/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	8/27/1998	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/4/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00

Location	Date	Event Type	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland (Zone)	9/15/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/18/2003	Hurricane (Typhoon)	0/0	$28,000.00	$0.00
Cumberland (Zone)	09/01/2006	Tropical Storm	0/0	$0.00	$0.00
			Total:	**$28,000.00**	**$0.00**

While not included in the NCEI database, Category 4 Hurricane Hazel (DR-28) came ashore in North Carolina on October 15, 1954 and caused substantial damage in the region. With winds reaching 125mph at Grannis Field, Hurricane Hazel caused an estimated $136 million in property damage; 19 deaths; 200 injuries; destruction of 15,000 homes and structures; and damage to 39,000 structures.

Probability of Future Occurrence

Likely - Based on a historical record of eight storm events over a period of 65 years (1950 - 2015), it can reasonably be assumed that this type of event has a 12% chance of occurring each year.

Vulnerability Assessment

In conclusion, hurricane wind has the potential to impact all existing and future buildings, facilities, and populations in the Town of Hope Mills. Impacts of hurricanes include flood damage, debris clean-up, service disruption and possible fatalities due to flooding or flying debris. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 5.

F.2.6 Inland Flooding: 100-/500-year

Location and Spatial Extent

The Town of Hope Mills parcel layer and effective 2007 DFIRM were intersected and the flooded parcel area was calculated in acres. Flood zones were assigned to parcels based on the intersection of a parcel with a flood zone. Parcels can be located in multiple flood zones, and only the flooded acreage within the parcel was included in the calculation for each flood zone. Table F9 provides a summary of acreage by flood zone.

Table F9 - Flood Zone Acreage

Jurisdiction	Flood Zone Acreage				
	Zone A (100-year)	Zone AE (100-year)	Zone X Shaded (500-year)	Zone X Unshaded	Total
Town of Hope Mills	0	354	93	3,979	4,426

The Town of Hope Mills' parcel and building footprint layers were used to examine the inventory of properties at risk. Table F10 provides the building count, estimated building value, estimated content value and estimated total value for all buildings located within each FEMA flood zone.

Table F10 – Properties at Risk

Occupancy Type	Total Number of Buildings in Floodplain	Total Building Value	Estimated Content Value	Total Value
Zone AE				
Agricultural	0	$0	$0	$0
Commercial	2	$749,318	$749,318	$1,498,637

Occupancy Type	Total Number of Buildings in Floodplain	Total Building Value	Estimated Content Value	Total Value
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	1	$451,340	$451,340	$902,680
Religious	0	$0	$0	$0
Residential	3	$284,427	$142,214	$426,641
Total	**6**	**$1,485,086**	**$1,342,872**	**$2,827,958**
Zone X (500-yr)				
Agricultural	0	$0	$0	$0
Commercial	7	$3,024,255	$3,024,255	$6,048,510
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	1	$451,340	$451,340	$902,680
Religious	0	$0	$0	$0
Residential	17	$1,907,851	$902,767	$2,810,619
Total	**25**	**$5,383,447**	**$4,378,362**	**$9,761,809**
Zone X (Unshaded)				
Agricultural	0	0	$0	$0
Commercial	222	$155,790,786	$157,145,045	$312,935,831
Education	44	$71,490,173	$71,490,168	$142,980,341
Government	12	$6,486,621	$7,702,010	$14,188,631
Industrial	4	$22,855,293	$34,282,940	$57,138,233
Religious	32	$30,918,664	$30,918,659	$61,837,322
Residential	5,213	$645,775,200	$311,026,157	$956,801,357
Total	**5,527**	**$933,316,736**	**$612,564,979**	**$1,545,881,715**

Source: North Carolina Emergency Management, Risk Management, 2013

Note: Content value estimations are generally based on the FEMA Hazus methodology of estimating value as a percent of improved structure values by property type. The residential property type assumes a content replacement value equal to 50% of the building value. Agricultural, commercial, education, government, and religious property types assume a content replacement value equal to 100% of the building value. The industrial property type assumes a content replacement value equal to 150% of the building value.

Past Occurrences

Table F11 shows detail for flood events reported by the NCEI since 1950 for the Town of Hope Mills. There have been seven recorded events causing $2.1M in property damage.

Table F11 - NCEI Flooding Events in the Town of Hope Mills

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Flash Flood	7	$2,100,000	$0	0	0
Total:	**7**	**$2,100,000**	**$0**	**0**	**0**

Source: NCEI, September 2015

Probability of Future Occurrence

Possible - By definition of the 100-year flood event, SFHAs are defined as those areas that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. Properties located in these areas have a 26 percent chance of flooding over the life of a 30-year mortgage.

The 500-year flood area is defined as those areas that will be inundated by the flood event having a 0.2-percent chance of being equaled or exceeded in any given year; it is not the flood that will occur once every 500 years.

Vulnerability Assessment

Properties at Risk to Flooding

The loss estimate for flood is based on the total of improved building value and contents value. Land value is not included in any of the loss estimates as generally the land is not subject to loss from floods. Once the potential value of affected parcels was calculated, damage factors were applied to obtain loss estimates by flood zone.

Table F12 shows the building count, total value, estimated damages and loss ratio for buildings that fall within the Zone AE 100-year floodplain by occupancy type on the community level.

The loss ratio is the loss estimate divided by the total potential exposure (i.e., total of improved and contents value for all buildings located within the Zone AE 100-year floodplain) and displayed as a percentage of loss. FEMA considers loss ratios greater than 10% to be significant and an indicator a community may have more difficulties recovering from an event.

Table F12 - Estimated Building Damage and Content Loss – Flood 100-yr Return Period

Occupancy Type	Total Number of Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Zone AE						
Agricultural	0	$0	$0	$0	$0	n/a
Commercial	1	$1,386,235	$61,709	$205,919	$267,628	19.3%
Education	0	$0	$0	$0	$0	n/a
Government	0	$0	$0	$0	$0	n/a
Industrial	1	$902,681	$79,582	$72,347	$151,929	16.8%
Religious	0	$0	$0	$0	$0	n/a
Residential	3	$426,641	$31,789	$34,686	$66,474	15.6%
Total	**5**	**$2,715,557**	**$173,080**	**$312,952**	**$486,031**	**17.9%**

Source: North Carolina Emergency Management, Risk Management, 2013

Critical Facilities at Risk to Flooding

Of significant concern with respect to any disaster event is the location of critical facilities in the planning area. Critical facilities are often defined as those essential services and facilities in a major emergency which, if damaged, would result in severe consequences to public health and safety or a facility which, if unusable or unreachable because of a major emergency, would seriously and adversely affect the health, safety, and welfare of the public. Critical facilities within the Town are detailed in Table F13 and Figure F1 below.

Table F13 – Critical Facilities and FEMA Flood Zones

Facility Name	Address	Facility Type	Estimated 100-yr Flood Depth (Ft)
Zone AE			
n/a	n/a	n/a	n/a
Zone A (100-yr)			
n/a	n/a	n/a	n/a
Zone X Shaded (500-yr)			
n/a	n/a	n/a	n/a
Zone X Unshaded			
Town of Hope Mills Fire Department	5788 Rockfish Rd	Fire	n/a
Westarea Volunteer Fire Department	4731 Main St	Fire	n/a
Hope Mills Government Building	5770 Rockfish Rd	Government	n/a
Southview High School	4100 Elk Rd	School	n/a
Cumberland Mills Elementary School	2576 Hope Mills Rd	School	n/a
Hope Mills Elementary School	4441 Legion Rd	School	n/a
Hope Mills High School	4975 Cameron Rd	School	n/a
Rockfish Elementary School	5763 Rockfish Rd	School	n/a
Town of Hope Mills Police Department	5776 Rockfish Rd	School	n/a
C Wayne Collier Elementary School	3522 Sturbridge Rd	School	n/a

Source: Cumberland County Emergency Management Agency, 2015

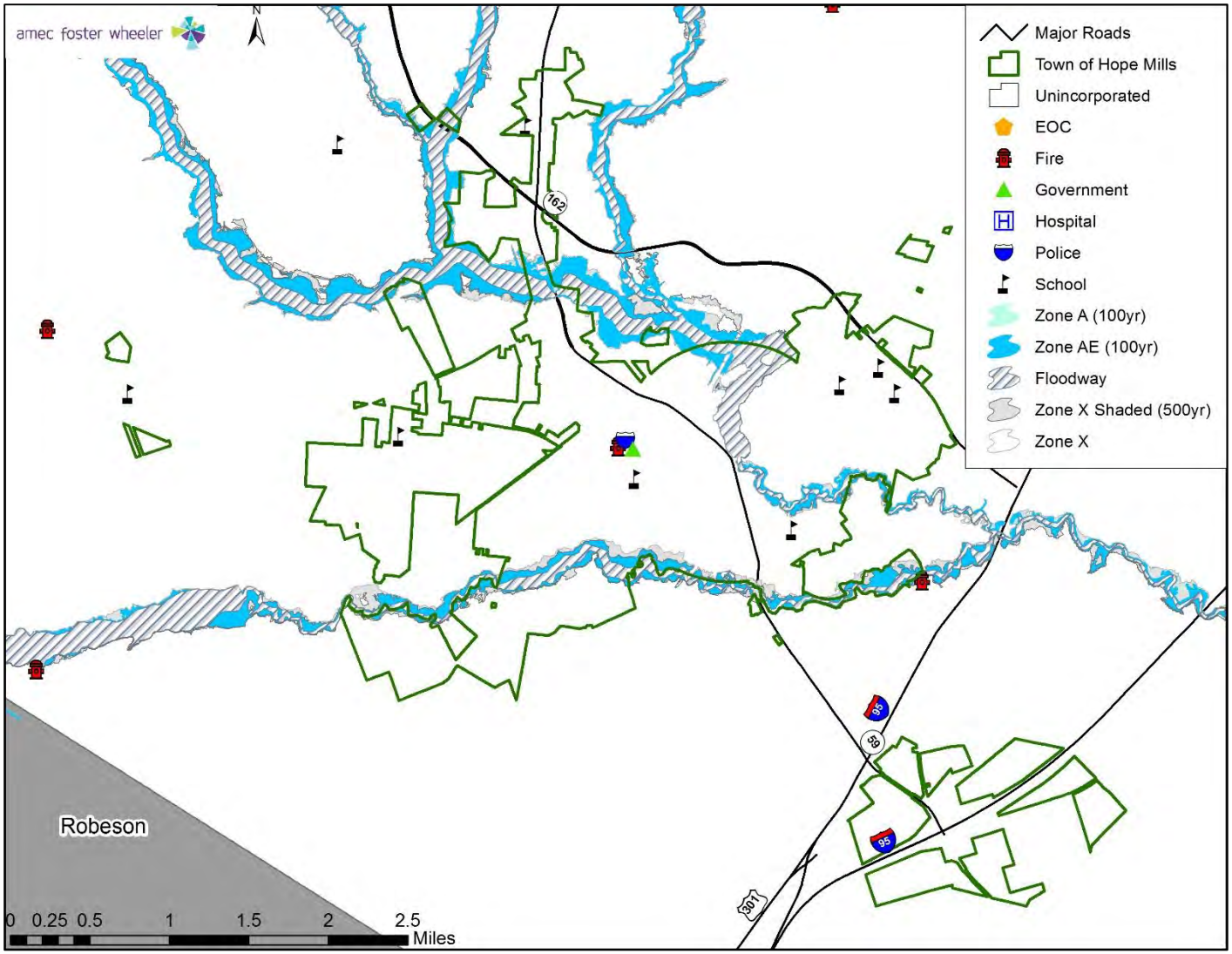


Figure F1 – Town of Hope Mills Critical Facilities and FEMA Flood Zones

Repetitive Loss Properties

A repetitive loss property is a property for which two or more flood insurance claims of more than $1,000 have been paid by the NFIP within any 10-year period since 1978. An analysis of repetitive loss was completed by the City to examine repetitive loss properties against FEMA flood zones.

According to 2015 FEMA Community Information System records, there is a total of 1 unmitigated repetitive loss property within Hope Mills. The property is located in the B, C or X zone. Table F14 details repetitive loss building counts and number of losses for the unmitigated properties.

Table F14 – Town of Hope Mills Unmitigated Repetitive Loss Summary

Property Type	Building Count		# of Losses	Total Repetitive Loss Payments ($)
	Insured	Uninsured		
Residential	0	1	2	$11,976.64
Commercial	0	0	0	0.00
Total	**0**	**1**	**2**	**$11,976.64**

Source: NC State NFIP Coordinator, September 2015, FEMA Community Information System, December 2015

F.2.7 Severe Weather (Thunderstorm Wind, Lightning & Hail)

Location and Spatial Extent

The entirety of the Town of Hope Mills can be considered at risk to severe weather events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

Table F15 shows detail for severe weather events reported by the NCEI since 1950 for the Town of Hope Mills. There have been 27 recorded events causing $120,000 in property damage.

Table F15 - NCEI Severe Weather Events in the Town of Hope Mills

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Hail	12	$0	$0	0	0
High Wind	0	$0	$0	0	0
Lightning	1	$105,000	$0	0	0
Strong Wind	0	$0	$0	0	0
Thunderstorm Wind	14	$15,000	$0	0	0
Total:	**27**	**$120,000**	**$0**	**0**	**0**

Probability of Future Occurrence

Likely - Given the high number of previous events (27 records in 65 years), it is likely that severe weather events, including wind, lightning and hail, will occur in the future. This results in an annual probability level of 42% for future severe weather events for the entire planning area.

Vulnerability Assessment

Severe weather events including thunderstorm wind, lightning and hail has the potential to impact all existing and future buildings, facilities, and populations in the Town of Hope Mills. Impacts of severe weather events include wind damage, debris clean-up, hail damage, and potential fatalities due to lightning strikes and associated fires. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 7.

F.2.8 Tornado

Location and Spatial Extent

The entirety of the Town of Hope Mills can be considered at risk to tornado events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

According to NCEI records, Cumberland County has experienced 23 tornadoes since 1950. These events are reported to have caused five deaths, 169 injuries and close to $133M in property damage.

Table F16 - NCEI Records for Tornadoes in Cumberland County (1950-2015)

Location	Date	Tornado Fujita Scale	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland Co	4/8/1957	F4	0/8	$250,000.00	$0.00
Cumberland Co	6/2/1959	F0	0/0	$25,000.00	$0.00
Cumberland Co	10/4/1960	F1	0/0	$25,000.00	$0.00
Cumberland Co	9/29/1963	F2	0/0	$250,000.00	$0.00
Cumberland Co	12/26/1964	F1	0/1	$2,500.00	$0.00
Cumberland Co	2/22/1971	F3	2/60	$2,500,000.00	$0.00
Cumberland Co	3/15/1971	F1	0/0	$250,000.00	$0.00
Cumberland Co	5/29/1973	F1	0/0	$25,000.00	$0.00
Cumberland Co	8/2/1974	F0	0/0	$25,000.00	$0.00
Cumberland Co	2/11/1981	F2	0/0	$250,000.00	$0.00
Cumberland Co	3/28/1984	F3	2/11	$25,000,000.00	$0.00
Cumberland Co	3/28/1984	F4	0/0	$2,500,000.00	$0.00
Cumberland Co	5/19/1986	F2	0/0	$250,000.00	$0.00
Cumberland Co	8/28/1988	F1	0/0	$250,000.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	5/28/2000	F0	0/0	$0.00	$0.00
Cumberland Co	12/17/2000	F0	0/0	$0.00	$0.00
Cumberland Co	3/27/2009	EF1	0/0	$225,000.00	$0.00
Cumberland Co	4/16/2011	EF3	1/85	$100,000,000.00	$0.00
Cumberland Co	4/16/2011	EF2	0/4	$250,000.00	$0.00
Cumberland Co	4/29/2014	EF1	0/0	$50,000.00	$0.00
			Total:	**$132,932,750.00**	**$0.00**

Probability of Future Occurrence

Likely - The best available information to determine future probability of a tornado event is to review historic frequency. According to NCEI, 23 tornadoes have impacted Cumberland County over a 65 year period. It can reasonably be assumed that the Town of Hope Mills has a 35% chance of experiencing a tornado each year.

Vulnerability Assessment

A tornado has the potential to impact all existing and future buildings, facilities, and populations in the

Town of Hope Mills. Impacts of tornadoes include building and contents damage, debris clean-up, service disruption and potentially numerous fatalities and injuries. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 10.

F.2.9 Wildfire

Location and Spatial Extent

Wildfires could potentially occur anywhere in the region. The Wildland Urban Interface (WUI) is described as the area where structures and other human improvements meet and intermingle with undeveloped wildland or vegetative fuels. Population growth within the WUI substantially increases the risk for wildfire. For the Cumberland County, NC project area, it is estimated that 301,884 people or 95 percent of the total project area population (319,404) live within the WUI. The WUI for Cumberland County is shown within Chapter 5 Subsection 11 (Figure 5.19).

Past Occurrences

Table F17 lists past occurrences of wildfire in Cumberland County since 2005 as provided by the NCFS in September 2015.

Table F17 - Records for Wildfire in Cumberland County

County	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Cumberland	57	75	94	49	21	59	47	24	36	38

Probability of Future Occurrence

Highly Likely - The best available information to determine future probability of a wildfire event is to review historic frequency. According to historic records, 500 wildfires have occurred in Cumberland County between 2005 and 2015 (100% chance of occurring each year).

Vulnerability Assessment

A wildfire has the potential to impact all existing and future buildings, facilities, and populations in the Town of Hope Mills. Impacts of wildfire include building and contents damage, debris clean-up, service disruption and potentially numerous fatalities and injuries. Wildfires can also increase flood risk due to loss of vegetation. WUI Risk, Burn Probability and Rate of Spread are provided on the County level in Chapter 6 Subsection 11.

F.2.10 Winter Storm

Location and Spatial Extent

The entirety of the Town of Hope Mills can be considered at risk to winter storm events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

According to NCEI records, Cumberland County has experienced 30 winter storm events since 1996, respectively. These events are reported to have caused one death due to icy road conditions.

Table F18 - NCEI Records for Winter Storm Events in Cumberland County (1996-2015)

Date	Location	Type of Winter Storm	Deaths/ Injuries	Property Damage	Crop Damage
1/6/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
1/11/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00

Date	Location	Type of Winter Storm	Deaths/ Injuries	Property Damage	Crop Damage
2/2/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
2/3/1996	Cumberland County	Cold/wind Chill	0/0	$0.00	$0.00
12/23/1998	Cumberland County	Ice Storm	0/0	$0.00	$0.00
1/18/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/22/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/24/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/28/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
12/3/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/3/2002	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00
12/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/1/2007	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/17/2008	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/19/2008	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/20/2009	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/4/2009	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/29/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/12/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
3/2/2010	Cumberland County	Winter Weather	0/0	$0.00	$0.00
12/16/2010	Cumberland County	Winter Weather	1/0	$0.00	$0.00
12/25/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/10/2011	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/28/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/11/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/12/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/16/2015	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/24/2015	Cumberland County	Winter Weather	0/0	$0.00	$0.00

Source: NCEI, September 2015

Probability of Future Occurrence

Highly Likely - The best available information to determine future probability of a winter storm event is to review historic frequency. According to NCEI, 30 winter storm events have occurred over a 19 year period between 1996 and 2015 resulting in approximately 1.6 significant winter storm events per year.

The probability of a heavy snowfall occurring with that winter storm event is less likely. The figure below presents the probability of 8-inches or more of snowfall to be approximately 12.5% per year for the Cumberland County Region.

Vulnerability Assessment

Potential losses associated with winter storms include the cost of the removal of snow from roadways, debris clean-up, and some indirect losses from power outages, etc. All future structures and infrastructure in the region will be vulnerable to winter storms.

F.3 Priority Risk Index Results

Table F19 summarizes the degree of risk assigned to each identified hazard as it applies to the Town of Hope Mills using the PRI method described in Chapter 6 Subsection 4.

Table F19 - Summary of PRI Results for the Town of Hope Mills

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Dam/Levee Failure	Unlikely	Minor	Small	Less than 6 hrs	Less than 6 hrs	1.3
Drought	Highly Likely	Minor	Large	More than 24 hrs	More than 1 week	2.8
Earthquake	Possible	Limited	Moderate	Less than 6 hrs	Less than 6 hrs	2.3
Extreme Heat	Possible	Minor	Large	More than 24 hrs	Less than 1 week	2.1
Hurricane/Tropical Storm	Likely	Critical	Large	More than 24 hrs	Less than 24 hrs	2.9
Inland Flooding: 100-/500-year	Possible	Critical	Moderate	6 to 12 hours	Less than 1 week	2.7
Severe Weather (thunderstorm wind, lightning, & hail)	Possible	Limited	Moderate	6 to 12 hours	Less than 6 hrs	2.2
Tornado	Likely	Critical	Small	Less than 6 hrs	Less than 6 hrs	2.7
Wildfire	Highly Likely	Limited	Small	Less than 6 hrs	Less than 1 week	2.9
Winter Storm	Highly Likely	Minor	Moderate	More than 24 hrs	Less than 1 week	2.5

As shown in Table F20, the results from the PRI have been classified into three categories based on the assigned risk value:

- **Low Risk** - Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium Risk** - Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High Risk** - Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread.

Table F20 - Summary of Hazard Risk Classification

Hazard Category	Hazard Type
High Risk (> 2.5)	**Hurricane/Tropical Storm Wildfire Drought Inland Flooding: 100-/500-year Tornado**
Moderate Risk (2.0 – 2.5)	**Winter Storm Earthquake Severe Weather Extreme Heat**
Low Risk (< 2.0)	**Dam/Levee Failure**

F.4 Capability Assessment

This subsection discusses the capability of the Town of Hope Mills to implement hazard mitigation activities. More information on the purpose and methodology used to conduct the assessment can be found in Chapter 7 - Capability Assessment.

F.4.1 Planning and Regulatory Capability

Table F21 lists regulatory capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Hope Mills.

Table F21 - Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Y/N	Date	Comments
Comprehensive Plan	Y	7/20/09	2030 Growth Vision Plan and 2030 Growth Strategy Map
Zoning Ordinance	Y	1985	
Subdivision Ordinance	Y	1985	
Floodplain Ordinance	Y	12-18-06	
Stormwater Ordinance	Y	11-5-07	
Erosion, Sedimentation and Pollution Control Ordinance	Y		Handled by NC DENR
Building Code	Y	7/1/11	2012 NC Building Code
BCEGS Rating	Y	Conducted every 5 years	Done by ISO
Stormwater Management Program	Y	11-5-07	
Site Plan Review Requirements	Y	1985	
Capital Improvements Plan	Y		There are stormwater projects that are completed with capital improvement funds
Local Emergency Operations Plan	Y	2006	
Flood Insurance Study or Other Engineering Study for Streams	Y	06/18/07	Some minor studies have been conducted
Repetitive Loss Plan	N		
Elevation Certificates	Y	12/18/06	Inspections Department

F.4.2 Floodplain Management

The Town of Hope Mills joined the NFIP emergency program in 1975 and has been a regular participant in the NFIP since November 1981. The following tables reflect NFIP policy and claims data for the County categorized by structure type, flood zone, Pre-FIRM and Post-FIRM.

Table F22 - NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	1	$129	$28,000	4	$45,448.97
2-4 Family	0	$0	$0	0	$0.00
All Other Residential	0	$0	$0	0	$0.00
Non-Residential	0	$0	$0	0	$0.00
Total	**1**	**$129**	**$28,000**	**4**	**$45,448.97**

Source: FEMA Community Information System, December 2015

Table F23 - NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	0	$0	$0	0	$0.00
A Zones	0	$0	$0	0	$0.00
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00
V Zones	0	$0	$0	0	$0.00
D Zones	0	$0	$0	0	$0.00
B, C & X Zone					
Standard	0	$0	$0	2	$11,976.64
Preferred	1	$129	$28,000	2	$33,472.33
Total	**1**	**$129**	**$28,000**	**4**	**$45,448.97**

Source: FEMA Community Information System, December 2015

Table F24 - NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	0	$0	$0	0	$0.00
A Zones	0	$0	$0	0	$0.00
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00
V Zones	0	$0	$0	0	$0.00

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
D Zones	0	$0	$0	0	$0.00
B, C & X Zone	0	$0	$0	3	$32,762.85
Standard	0	$0	$0	2	$11,976.64
Preferred	1	$0	$0	1	$20,786.21
Total	**0**	**$0**	**$0**	**3**	**$32,762.70**

Source: FEMA Community Information System, December 2015

Table F25 - NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	0	$0	$0	0	$0.00
A Zones	0	$0	$0	0	$0.00
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00
V Zones	0	$0	$0	0	$0.00
D Zones	0	$0	$0	0	$0.00
B, C & X Zone	1	$129	$28,000	1	$12,686.12
Standard	0	$0	$0	0	$0.00
Preferred	1	$129	$28,000	1	$12,686.12
Total	**1**	**$129**	**$28,000**	**1**	**$12,816.12**

Source: FEMA Community Information System, December 2015

F.4.3 Administrative and Technical Capability

Table F26 lists administrative capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Hope Mills.

Table F26 - Administrative/Technical Capabilities

Resource	Y/N	Responsible Department
Planner/Engineer with knowledge of land development/land management practices	Y	Development and Planning Department
Engineer/Professional trained in construction practices related to buildings and/or infrastructure	Y	Public Works Department
Planner/Engineer/Scientist with an understanding of natural hazards	Y	Development and Planning Department
Personnel skilled in GIS	Y	
Full time building official	Y	Town of Hope Mills Inspection Department
Floodplain Manager	Y	Town of Hope Mills
Emergency Manager	Y	Cumberland County Emergency Services

Resource	Y/N	Responsible Department
Grant writer	N	
GIS data – Hazard areas	Y	Cumberland County Information Services
GIS data – Critical facilities	Y	Cumberland County Information Services
GIS data – Land use	Y	Cumberland County Planning & Inspections Department
GIS data – Building footprints	Y	Cumberland County Information Services
GIS data – Links to Assessor's data	Y	Cumberland County Information Services
Warning Systems/Services	Y	Cumberland County Emergency Services

F.4.4 Fiscal Capability

Table F27 lists fiscal capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Hope Mills.

Table F27 - Fiscal Mitigation Capabilities

Resource	Accessible/Eligible to Use (Y/N)
Community Development Block Grants	Y
Capital improvements project funding	N (Storm water fees)
Authority to levy taxes for specific purposes	Y
Fees for water, sewer, gas or electric services	Y
Impact fees for new development	N
Incur debt through general obligation bonds	N
Incur debt through special tax bonds	N
Incur debt through private activity bonds	N
Withhold spending in hazard prone areas	N

F.5 Mitigation Strategy

F.5.1 Status Update for 2011 Mitigation Actions

Table F28 provides a status update for each mitigation action detailed in the 2011 Cumberland County Multi-jurisdictional Hazard Mitigation Plan with the Town of Hope Mills designated as the responsible jurisdiction. This table provides a summary of progress to-date and also notes whether each action is to be deleted or carried forward into the 2016 Regional Plan.

Table F28 - Status of 2011 Mitigation Actions

Town of Hope Mills								
Mitigation Action Number	Action Description	Responsible Department	Current Status			2016 Plan Update		Summary of Progress To-Date
			Complete	In Progress	Not yet Started	Delete Action	Carry Forward	
1	Restrict Residential And Non-Compatible Uses Within The 100-Year Floodplain.	Cumberland County Planning Dept		X			X (Revised)	Enforced through the Conservation Ordinance. (All new developments forced to be zoned Conservation District)
2	Increase The Lowest Floor Elevation To 2 Feet Above The Base Flood Elevation.	Cumberland County Planning Dept	X			X		Completed October 17, 2006 when the Commissioners adopted the revised Flood Damage Prevention Ordinance that includes 2 foot free boarding.
3	Encourage The Use Of Cluster Type Development To Preserve Special Hazard Areas.	Cumberland County Planning Dept	X			X		Enforced through Zero Lot Line Development
4	Provide Incentives For Developers Willing To Use Environmentally Friendly Development Practices (Such As Preserving Open Space, Landscaping With Native Vegetation, Providing Abundance Of Trees And Reduction Of Environmental Impact).	Cumberland County Planning Dept	X			X		Completed - Cumberland County has regulations in their Zoning and Subdivision Ordinances that permit environmentally friendly type developments. These regulations include Density Developments-Conditional Use District, Zero Lot Line Developments, and Planned Neighborhood Developments-Conditional Use District. Currently 4 environmentally friendly subdivisions have been constructed in the County and 2 are under construction at this time.
5	Develop Uniform Flood Damage Preventive Ordinance.	Cumberland County Planning Dept			X	X		Committee Recommended Deletion
6	Revised Subdivision Ordinance To Require That All Utilities Be Placed Underground With The Exception Of High Voltage Electrical Transmission Lines.	All Electrical providers that serve the Town	X			X		System already in place
7	Develop A Program To Identify And Eliminate Existing Development That Is Below The Special Flood Hazard Elevation.	Town of Hope Mills, Cumberland County Planning Department and Cumberland County Community Development		X			X	This information is provided to the County through NFIP and currently there are no buildings located below the Special Flood Hazard Area. This information will be monitored by the Cumberland County Engineering Department for the Unincorporated Area of the County and its participating jurisdictions.
8	Develop A Program To Ensure Drainage Ways, Culverts And Storm Drains Are Free Of Debris.	Public Works, Street, Parks and Recreation, Building and Grounds Departments and Department of Transportation	X			X		Enforced through the Stormwater Ordinance
9	Adopt A Comprehensive Countywide Stormwater Ordinance.	Cumberland County Planning Dept	X			X		Recommend deletion of this action due to fact that enforcement of storm water regulations for the Unincorporated Area of Cumberland County and some of its small Towns is the responsibility of NC DENR while the City of Fayetteville, Towns of Hope Mills and Spring Lake have their own Storm Water

Town of Hope Mills								
Mitigation Action Number	Action Description	Responsible Department	Current Status			2016 Plan Update		Summary of Progress To-Date
			Complete	In Progress	Not yet Started	Delete Action	Carry Forward	
								Department that enforces Phase I and Phase II of their Storm Water Ordinance.
10	Limit The Amount Of Impervious Surfaces And Encourage The Use Of Pervious Type Surfaces.	Cumberland County Planning Dept	X			X		System currently in place
11	Develop A Landscape Ordinance That Will Encourage Protection To Natural Areas Through Design And Provide More Vegetation In Urban Development.	Cumberland County Planning Dept	X			X		System currently in place
12	Develop A Tree Ordinance To Address Clear Cutting, Protection Of Existing Trees And Vegetation.	Cumberland County Planning Dept		X			X (Revised)	Tree ordinance to be strengthened to address clear cutting
13	Develop A Reforestation Program To Increase Vegetation Cover In Highly Urbanized Area And In Denuded Areas In Flood Prone Areas.	U.S. Forest Service & Town of Hope Mills			X		X	The strategy of the County is to protect natural vegetation to enhance air quality, counteract extreme heat in urban areas and reduce sedimentation and pollution of waterways. Denuded areas were to be reforested by the public sector or non-profit organizations. Due to limited resources these efforts have been delayed. The County's focus now is protecting as much existing vegetation as possible and requiring developments to plant additional vegetation. These efforts have been addressed by the adoption of a Landscape Ordinance and the provision of development alternatives that protects vegetation and open space.
14	Develop A Greenway Program And Encourage Low Impact Uses In Those Areas As A Means To Protect Natural Areas Along Rivers, Streams, Creeks, And Drainage Ways.	Cumberland County Planning, Parks and Recreation Departments, Cape Fear River Assembly, and State of North Carolina			X		X	Future development plans to be included in Lake Property and Heritage Park designs
15	Revised Subdivision Ordinance Requiring Additional Access To Be Used As An Evacuation Route For Developments Located Near Special Hazard Areas.	Cumberland County Planning Dept		X			X (Revised)	Currently Cumberland County Subdivision Ordinance does not require an additional access for evacuation route for developments located near special hazard prone areas. The Planning Board reviews the Subdivision Ordinance annually and could consider this action with its annual review.
16	Continue To Protect Wetlands And Environmental Sensitive Corridors.	Corp of Engineers, Inspections Department, and non-profit organizations	X			X		The Corp of Engineers is responsible for the mapping and enforcements of the wetland regulations within Cumberland County and its municipalities.
17	Encourage All Rest Homes To Have A Reciprocal Agreement.	Cumberland County Social Services Department	X			X		The reciprocal agreement currently exists with all the rest homes located in Cumberland County. The agreement is handled through Cumberland County Emergency Services.

F.5.2 2016 Mitigation Action Plan

Table F29 identifies 13 new and/or revised mitigation actions for the Town of Hope Mills. There are three unrevised, incomplete actions from Table F28 that are to be carried forward into the 2016 Regional Plan.

Table F29 - 2016 Mitigation Action Plan

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
New/Revised Actions										
1	Maintain an all Hazards public education program to educate and prepare residents for all of the hazards that impact Cumberland County.	To educate, enhance preparedness, and resiliency of Cumberland County and its municipal residents through public education programs that included booths at fairs, festivals and special events, websites, brochures, school programs, and etc.	Cumberland County Emergency Management	$90,000	Local Operating Budget	Short Range	New			All Hazards
2	Explore the Fire Adapted Communities concept implementation in Cumberland County.	To enhance the preparedness and resiliency of Cumberland County and its municipalities to the effects of wild land fire and urban interface, through education; programs such as Fire Wise, Ready Set Go, Community Wildfire Protection Plan; Fuel Management; local codes and ordinances.	Emergency Management, NC Forest Service and Fire Marshalls	Staff Hours	Local Operating Budget and Federal	Medium Range	New	X	X	Wildfire
3	Conduct a countywide infrastructure vulnerability assessment to identify priority needs for updating ill-designed or outdated critical structures.	It has been difficult to locate any comprehensive assessments of local infrastructure in Cumberland and Hoke Counties. With current and projected natural hazard occurrences, it is essential to have an accurate and comprehensive understanding of the current condition of critical facilities to ensure the ability to continue to provide for basic needs, such as water and electrical supplies, transportation routes, waste management, etc.	County/city structural and civil engineers in partnership with U.S. Army Corps of Engineers	Staff Hours	Local Operating Budget and Federal	Medium Range	New	X		All Hazards
4	Conduct social vulnerability analysis to identify priority needs and opportunities that will address the specific problems vulnerable populations face from a range of hazards, including barriers to evacuation, event-specific vulnerabilities, and impediments to recovery.	There exist various groups of individuals that have additional financial, social and/or environmental barriers to being resilient in the face of natural hazard events. In Cumberland County, for example, groups with significant number of people affected include about 10K outdoor workers with direct exposure to extreme heat days, elderly people and especially those with existing cardiovascular conditions, and other low-income and/or minority groups. As natural hazard events increase in intensity and frequency, these groups will find it harder to safely and efficiently get out of harm's way. These groups will also have difficulty in obtaining and paying for essential components to sustain life, such as medications, utilities, and transportation to/from a place of work, etc.	County Social Services Department and/or County Health Department	Staff Hours	Local Operating Budget	Medium Range	New			All Hazards
5	Collaborate with NC Cooperative Extension and NC Agriculture and Forestry Adaptation Working Group to provide more local support and encouragement of forest conservation and farmland preservation measures.	Forests and farmland provide a multitude of social, economic and environmental benefits, that when looked at comprehensively, far outweigh any profit/revenue projections of residential or commercial properties. Outside of development pressure, some of the other major health risks include: (1) increasing wildfire risk, (2) increasing number and types of insects and pests, (3) lack of sufficient water during the growing season for crops, and (4) increasing damage from strong winds and flooding. It is vital, especially in the face of a changing climate, to preserve these working lands and to support higher density development in already existing urban and suburban centers.	County Board of Commissioners, Conservation District Programs, and other land preservation organizations.	Unknown	NC Cooperative Extension, NC Forest Service, US Department of Agriculture and NC Wildlife Resources Commission.	Short Range	N		X	Wildfire, Inland Flooding
6	Include climate predictions from the Cumberland County Climate Resiliency Plan in the Regional Hazard Mitigation Plan.	To properly prepare for natural hazard occurrences, it is important to include predictions that warn of: (1) increasing temperatures and extreme heat days, (2) increasing frequency and strength of severe weather events, (3) more heavy rain/flooding, and (4) more frequent and prolonged drought. Although some climate projections do not pose an immediate threat, any comprehensive mitigation plan for emergency management should at the very least, and by the very nature of the definition of "mitigation", acknowledge the changing climate and possibility of increased extreme weather and flooding events.	The Planning Department/Planning Director for each jurisdiction in Cumberland County	None	Existing FEMA grant	Short Range	New	X	X	All Hazards

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
7	Provide financial assistance for low-income residents to help with power bills and support services during extended periods of high temperature and other extreme weather.	Low-income households face challenges in keeping up with utility bills. Some low-income utility assistance programs are offered, but funds are limited. Extreme weather and increasing temperatures will place even greater pressure on these programs' ability to provide assistance to all those in need, and citizen's lives will be increasingly at stake.	County Health Department	Unknown	NC Department of Health and Human Services and County Department of Health	Medium Range	New			Extreme Heat, Winter Weather
8	Analyze and update local development ordinances to make buildings safer from wind and flooding, more energy and water efficient, more tolerant of heat waves and healthier to live in. Also, provide incentives for making buildings safer from wind, flooding, more energy and water efficient, and healthier to live in.	Energy and water efficiency will be increasingly important to a community's resiliency in the face of natural hazards specifically because of projections of increasing temperatures and extreme heat days, and prolonged periods of drought. Climate projections also state that precipitation will continue to follow a seasonal pattern, whereby hot, Summer months are classified with less precipitation and Winters with more precipitation. Extreme heat days will be specially taxing on buildings with older A/C systems or inadequate insulation and in low-income households where upkeep with rising utility costs could become a burden.	Planning and Code Departments of each jurisdiction	Staff Hours	Local Operating Budget	Medium Range	New		X	Inland Flooding, Hurricane Wind, Thunderstorm Wind, Extreme Heat, Winter Storms
9	Use natural systems, more open space and green surfaces to manage stormwater in a more resilient fashion.	Impervious surfaces typically found in urban centers, such as paved roads, buildings, parking lots and pavement, drastically increase flash floods and urban flooding, which seems to be a common occurrence in Cumberland County. For instance, within a 90 day period (March 1 – June 30, 2015), three flooding incidents were reported due to heavy rainfall events. Use of LID stormwater management practices is mentioned only in summary in the Growth Factor Analysis, stating it "…should be emphasized in sensitive areas…" This, coupled with the naturally flat topography of the eastern portions of the County also help to create excess runoff and subsequent urban flooding issues, especially in the Special Flood Hazard Areas (SFHA) of the County, and specifically around Blounts and Cross Creek, as referenced in various resources.	Engineering Department of each jurisdiction	Staff Hours	Local Operating Budget	Short Range	New		X	Inland Flooding
10	Creek mitigation tied to Hope Mills Lake Dam	The Town of Hope Mills is currently making repairs to the Hope Mills Lake Dam with an anticipated completion of the end of 2016. At that time the lake will be filled back to the historical levels where there will then be a need for various activities tied to creek mitigation. These activities will assist in the preservation of the creek bank while reducing erosion levels.	Town of Hope Mills Public Works Department	Staff Hours	Local Operating Budget	Short Term	New	X	X	Dam Failure, Erosion
11	Restrict Residential And Non-Compatible Uses Within The 100-Year Floodplain.	Promote flood area as an environmental corridor and open space and prohibit development within the Special Flood Hazard Area, while reducing potential losses during a flood hazard.	Town of Hope Mills Planning Department and Storm Water Department.	Staff Hours	Local Operating Budget	Short Range	Revised		X	Inland Flooding
12	Develop A Tree Ordinance To Address Clear Cutting, Protection Of Existing Trees And Vegetation.	Promote an amendment to the Town of Hope Mills Tree Ordinance that ties to the conditions of approvals for all developments that anticipate the removal of trees.	Town of Hope Mills Planning Department and Inspections Department.	Staff Hours $5,000 - $10,000	Local Operating Budget	Medium Range	Revised	X	X	Inland Flooding, Extreme Heat
13	Revised Subdivision Ordinance Requiring Additional Access To Be Used As An Evacuation Route For Developments Located Near Special Hazard Areas.	The Town of Hope Mills Subdivision Ordinance was recently updated to include sidewalk requirements for new construction. Evacuation routes should be studied and language should be drafted to include requirements for evacuation routes where applicable.	Town of Hope Mills Planning Department and Inspections Department.	Staff Hours $5,000 - $10,000	Local Operating Budget	Long Range	Revised		X	Inland Flooding
2011 Mitigation Actions Carried Forward										
1	Develop A Program To Identify And Eliminate Existing Development That Is Below The Special Flood Hazard Elevation.		Town of Hope Mills, Cumberland County Planning Dept, &	Staff Hours	Local Operating Budget	Medium Range	In Progress	X		Inland Flooding

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
			Cumberland County Community Development							
2	Develop A Reforestation Program To Increase Vegetation Cover In Highly Urbanized Area And In Denuded Areas In Flood Prone Areas.		U.S. Forest Service & Town of Hope Mills	Unknown	Local Operating Budget	Medium Range	In Progress	X	X	Inland Flooding
3	Develop A Greenway Program And Encourage Low Impact Uses In Those Areas As A Means To Protect Natural Areas Along Rivers, Streams, Creeks, And Drainage Ways.		Cumberland County Planning, Parks & Recreation Dept, Cape Fear River Assembly, and State of NC	Unknown	Unknown	Long Range	In Progress		X	Inland Flooding

ANNEX G – TOWN OF LINDEN

G.1 Community Profile

G.1.1 Geography

The Town of Linden is within Cumberland County and is located in south central North Carolina in the Upper Coastal Plain. As of the 2010 census, the population was 130. Linden is within the Fayetteville, NC Metropolitan Statistical Area and is part of the Mid-Carolina Council of Governments. According to the U.S. Census Bureau, the Town has a total area of approximately 0.5 square miles all of which is land. Linden is located in the Cape Fear River basin.

G.1.2 Population and Demographics

Table G1 provides population counts and the percentage change in population since 2010 for the Town of Linden. Based on the 2010 census, the population density is 260 people per square mile.

Table G1 - Population Counts for Town of Linden

Jurisdiction	2010 Census Population	2014 Estimated Population	% Change 2010-2014
Town of Linden	130	156	20.0

Source: U.S. Census Bureau, 2015

Based on the 2010 Census, the median age of residents in the Town of Linden is 44.0. The racial characteristics of the Town are presented below in Table G2.

Table G2 - Demographics of Town of Linden

Jurisdiction	White Persons, Percent (2010)	Black Persons, Percent (2010)	American Indian or Alaska Native, Percent (2010)	Asian Persons, Percent (2010)	Hispanic or Latino Persons, Percent (2010)[1]
Town of Linden	76.9	12.3	3.1	0.8	5.4

[1]Persons of Hispanic Origin may be of any race, so are also included in applicable race category.
Source: U.S. Census Bureau, 2010

G.2 Risk Assessment

This subsection includes a hazard profile and vulnerability assessment for each of the priority hazards identified in Chapter 5 Subsection 13 (Table 5.20) as they pertain to the Town of Linden. **Additional information for each hazard can be found in Chapter 5 - Hazard Profiles and Chapter 6 – Vulnerability Assessment.**

G.2.1 Dam/Levee Failure

Location and Spatial Extent

According to the North Carolina Dam Inventory that are no dams located within the Town of Linden.

Past Occurrences

There are no known past dam failures in the Town of Linden.

Probability of Future Occurrence

Unlikely - Based on historical occurrence information and zero dams located within the Town, it can reasonably be assumed that the Town of Linden has less than a 1% chance of this type of event occurring each year.

Vulnerability Assessment

The estimated number of buildings that could potentially be impacted by a dam failure is zero.

G.2.2 Drought

Location and Spatial Extent

Drought cannot be confined to geographic or political boundaries. The Cumberland County region, including the Town of Linden, is designated as moderately dry.

Past Occurrences

According to the North Carolina Drought Monitor, Cumberland County has experienced drought conditions every year since 2000. Table G3 shows the most severe classification for each year.

Table G3 - Historical Drought Occurrences

Year	Cumberland County
2000	Abnormally Dry
2001	Severe Drought
2002	Extreme Drought
2003	Abnormally Dry
2004	Abnormally Dry
2005	Abnormally Dry
2006	Moderate Drought
2007	Exceptional Drought
2008	Exceptional Drought
2009	Moderate Drought
2010	Moderate Drought
2011	Severe Drought
2012	Moderate Drought
2013	Abnormally Dry
2014	Abnormally Dry
2015	Moderate Drought

Source: NC Drought Monitor

Probability of Future Occurrence

Highly Likely - Based on historical occurrence information (15 records in 15 years), it can reasonably be assumed that the Town of Linden has a 100% chance of this type of event occurring each year.

Vulnerability Assessment

It is assumed that whereas all buildings and facilities in the planning area would technically be exposed to the drought hazard, there is no significant vulnerability to these buildings on a structural level. Population growth could contribute directly to this hazard, as an increased number of users pull from the available water supply within the region

G.2.3 Earthquake

Location and Spatial Extent

As detailed in Chapter 5 – Hazard Profiles, the Town of Linden lies within an approximate zone level between 6 and 10% ground acceleration. This indicates that the region as a whole exists within an area of moderate seismic risk.

Past Occurrences

A list of earthquakes that have caused damaged in North Carolina is presented below in Table G4.

Table G4 - Earthquakes Affecting North Carolina

Date	Location	Richter Scale
12/16/1811	NE Arkansas	8.5
01/23/1812	New Madrid, MO	8.4
02/07/1812	New Madrid, MO	8.7
04/29/1852	Wytheville, VA	5.0
08/31/1861	Wilkesboro, NC	5.1
12/23/1875	Central Virginia	5.0
08/31/1886	Charleston, SC	7.3
05/31/1897	Giles County, VA	5.8
01/01/1913	Union County, SC	4.8
02/21/1916	Asheville, NC	5.5
07/08/1926	Mitchell County, NC	5.2
11/03/1928	Newport, TN	4.5
05/13/1957	McDowell County, NC	4.1
07/02/1957	Buncombe County, NC	3.7
11/24/1957	Jackson County, NC	4.0
10/27/1959	Chesterfield, SC	4.0
07/13/1971	Newry, SC	3.8
11/30/1973	Alcoa, TN	4.6
11/13/1976	Southwest Virginia	4.1
05/05/1981	Henderson County, NC	3.5

Source: Wake County 2014 Hazard Mitigation Plan. Information provided by NCEM.

Probability of Future Occurrence

Possible - Based on historical occurrences, the probability of a significant earthquake event affecting the Town of Linden is possible. There are a total of 20 records in North Carolina over the past 200 years. Therefore, the annual probability level is estimated between 1 and 10 percent.

Vulnerability Assessment

An earthquake has the potential to impact all existing and future buildings, facilities, and populations in the Town of Linden. Impacts of earthquakes include debris clean-up, service disruption and, in severe cases, fatalities due to building collapse. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 3.

G.2.4 Extreme Heat

Location and Spatial Extent

Extreme heat typically occurs over large areas impacting multiple counties at one time. The entirety of the Town of Linden is vulnerable to extreme heat.

Past Occurrences

According to the National Climatic Data Center, one instance of extreme heat was recorded in Cumberland County beginning on July 22, 1998, and an additional instance of extreme heat was recorded in Cumberland County beginning on August 10, 2007.

Probability of Future Occurrence

Possible - Based on historical occurrence information (2 records in 65 years), it can reasonably be assumed that an extreme heat event has a 3% chance of occurring each year in the Town of Linden.

Vulnerability Assessment

Extreme heat is not likely to impact the built environment, but may impact agriculture and pose a threat to humans. Elderly persons, persons with respiratory disabilities, and children may be at risk to experience health problems during extreme heat events, some of which could result in serious illness or death. Potential losses of human life due to extreme heat are not quantified in this Plan. There are no past reports of death or property or crop damage recorded by NCEI.

G.2.5 Hurricane/Tropical Storm

Location and Spatial Extent

All Atlantic and Gulf of Mexico coastal areas are subject to hurricanes. While coastal areas are most directly exposed to land falling hurricanes and tropical storms, their impact can be felt hundreds of miles inland. The entire Town of Linden region is equally susceptible to hurricanes and tropical storms.

Past Occurrences

Table G5 provides hurricane and tropical storm data reported by NCEI since 1950 for Cumberland County.

Table G5 - NCEI Hurricane and Tropical Storm Events for Cumberland County

Location	Date	Event Type	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland (Zone)	7/12/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/5/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	8/27/1998	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/4/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00

Location	Date	Event Type	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland (Zone)	9/15/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/18/2003	Hurricane (Typhoon)	0/0	$28,000.00	$0.00
Cumberland (Zone)	09/01/2006	Tropical Storm	0/0	$0.00	$0.00
			Total:	**$28,000.00**	**$0.00**

While not included in the NCEI database, Category 4 Hurricane Hazel (DR-28) came ashore in North Carolina on October 15, 1954 and caused substantial damage in the region. With winds reaching 125mph at Grannis Field, Hurricane Hazel caused an estimated $136 million in property damage; 19 deaths; 200 injuries; destruction of 15,000 homes and structures; and damage to 39,000 structures.

Probability of Future Occurrence

Likely - Based on a historical record of eight storm events over a period of 65 years (1950 - 2015), it can reasonably be assumed that this type of event has a 12% chance of occurring each year.

Vulnerability Assessment

In conclusion, hurricane wind has the potential to impact all existing and future buildings, facilities, and populations in the Town of Linden. Impacts of hurricanes include flood damage, debris clean-up, service disruption and possible fatalities due to flooding or flying debris. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 5.

G.2.6 Inland Flooding: 100-/500-year

Location and Spatial Extent

The Town of Linden parcel layer and effective 2007 DFIRM were intersected and the flooded parcel area was calculated in acres. Flood zones were assigned to parcels based on the intersection of a parcel with a flood zone. Parcels can be located in multiple flood zones, and only the flooded acreage within the parcel was included in the calculation for each flood zone. Table G6 provides a summary of acreage by flood zone.

Table G6 - Flood Zone Acreage

Jurisdiction	Flood Zone Acreage				
	Zone A (100-year)	Zone AE (100-year)	Zone X Shaded (500-year)	Zone X Unshaded	Total
Town of Linden	0	0	76	173	249

The Town of Linden's parcel and building footprint layers were used to examine the inventory of properties at risk. Table G7 provides the building count, estimated building value, estimated content value and estimated total value for all buildings located within each FEMA flood zone.

Table G7 – Properties at Risk

Occupancy Type	Total Number of Buildings in Floodplain	Total Building Value	Estimated Content Value	Total Value
Zone AE				
Agricultural	0	$0	$0	$0
Commercial	0	$0	$0	$0

Occupancy Type	Total Number of Buildings in Floodplain	Total Building Value	Estimated Content Value	Total Value
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	0	$0	$0	$0
Total	**0**	**$0**	**$0**	**$0**
Zone X (500-yr)				
Agricultural	0	$0	$0	$0
Commercial	1	$95,020	$95,020	$190,039
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	3	$254,938	$124,090	$379,028
Total	**4**	**$349,958**	**$219,109**	**$569,067**
Zone X (Unshaded)				
Agricultural	7	425687.5	$425,687	$851,374
Commercial	7	$1,661,050	$1,661,050	$3,322,100
Education	1	$1,485,142	$1,485,142	$2,970,284
Government	5	$1,981,231	$2,404,732	$4,385,964
Industrial	4	$786,296	$1,051,409	$1,837,705
Religious	4	$1,564,537	$1,564,537	$3,129,075
Residential	61	$7,379,841	$3,648,874	$11,028,716
Total	**89**	**$15,283,785**	**$12,241,432**	**$27,525,217**

Source: North Carolina Emergency Management, Risk Management, 2013

Note: Content value estimations are generally based on the FEMA Hazus methodology of estimating value as a percent of improved structure values by property type. The residential property type assumes a content replacement value equal to 50% of the building value. Agricultural, commercial, education, government, and religious property types assume a content replacement value equal to 100% of the building value. The industrial property type assumes a content replacement value equal to 150% of the building value.

Past Occurrences

There have been no specific flood events recorded for the Town of Linden. Table G8 shows detail for flood events reported by the NCEI since 1950 for Cumberland County. There have been 46 recorded events in the County causing over $3.6M in property damage.

Table G8 - NCEI Flooding Events in Cumberland County

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Flash Flood	40	$2,132,000	$0	0	0
Flood	2	$0	$0	0	0
Heavy Rain	4	$1,500,000	$0	0	0
Total:	**46**	**$3,632,000**	**$0**	**0**	**0**

Source: NCEI, September 2015

Probability of Future Occurrence

Possible - By definition of the 100-year flood event, SFHAs are defined as those areas that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. Properties located in these areas have a 26 percent chance of flooding over the life of a 30-year mortgage.

The 500-year flood area is defined as those areas that will be inundated by the flood event having a 0.2-percent chance of being equaled or exceeded in any given year; it is not the flood that will occur once every 500 years.

Vulnerability Assessment

Properties at Risk to Flooding

The loss estimate for flood is based on the total of improved building value and contents value. Land value is not included in any of the loss estimates as generally the land is not subject to loss from floods. Once the potential value of affected parcels was calculated, damage factors were applied to obtain loss estimates by flood zone.

Table G9 shows the building count, total value, estimated damages and loss ratio for buildings that fall within the Zone AE 100-year floodplain by occupancy type on the community level.

The loss ratio is the loss estimate divided by the total potential exposure (i.e., total of improved and contents value for all buildings located within the Zone AE 100-year floodplain) and displayed as a percentage of loss. FEMA considers loss ratios greater than 10% to be significant and an indicator a community may have more difficulties recovering from an event.

Table G9 - Estimated Building Damage and Content Loss – Flood 100-yr Return Period

Occupancy Type	Total Number of Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Zone AE						
Agricultural	0	$0	$0	$0	$0	n/a
Commercial	0	$0	$0	$0	$0	n/a
Education	0	$0	$0	$0	$0	n/a
Government	0	$0	$0	$0	$0	n/a
Industrial	0	$0	$0	$0	$0	n/a
Religious	0	$0	$0	$0	$0	n/a
Residential	0	$0	$0	$0	$0	n/a
Total	**0**	**$0**	**$0**	**$0**	**$0**	**n/a**

Source: North Carolina Emergency Management, Risk Management, 2013

Critical Facilities at Risk to Flooding

Of significant concern with respect to any disaster event is the location of critical facilities in the planning area. Critical facilities are often defined as those essential services and facilities in a major emergency which, if damaged, would result in severe consequences to public health and safety or a facility which, if unusable or unreachable because of a major emergency, would seriously and adversely affect the health, safety, and welfare of the public. Critical facilities within the Town are detailed in Table G10 and Figure G1 below.

Table G10 – Critical Facilities and FEMA Flood Zones

Facility Name	Address	Facility Type	Estimated 100-yr Flood Depth (Ft)
Zone AE			
n/a	n/a	n/a	n/a
Zone A (100-yr)			
n/a	n/a	n/a	n/a
Zone X Shaded (500-yr)			
n/a	n/a	n/a	n/a
Zone X Unshaded			
Linden & West Area Volunteer Fire Department	4731 Main St	Fire	n/a

Source: Cumberland County Emergency Management Agency, 2015

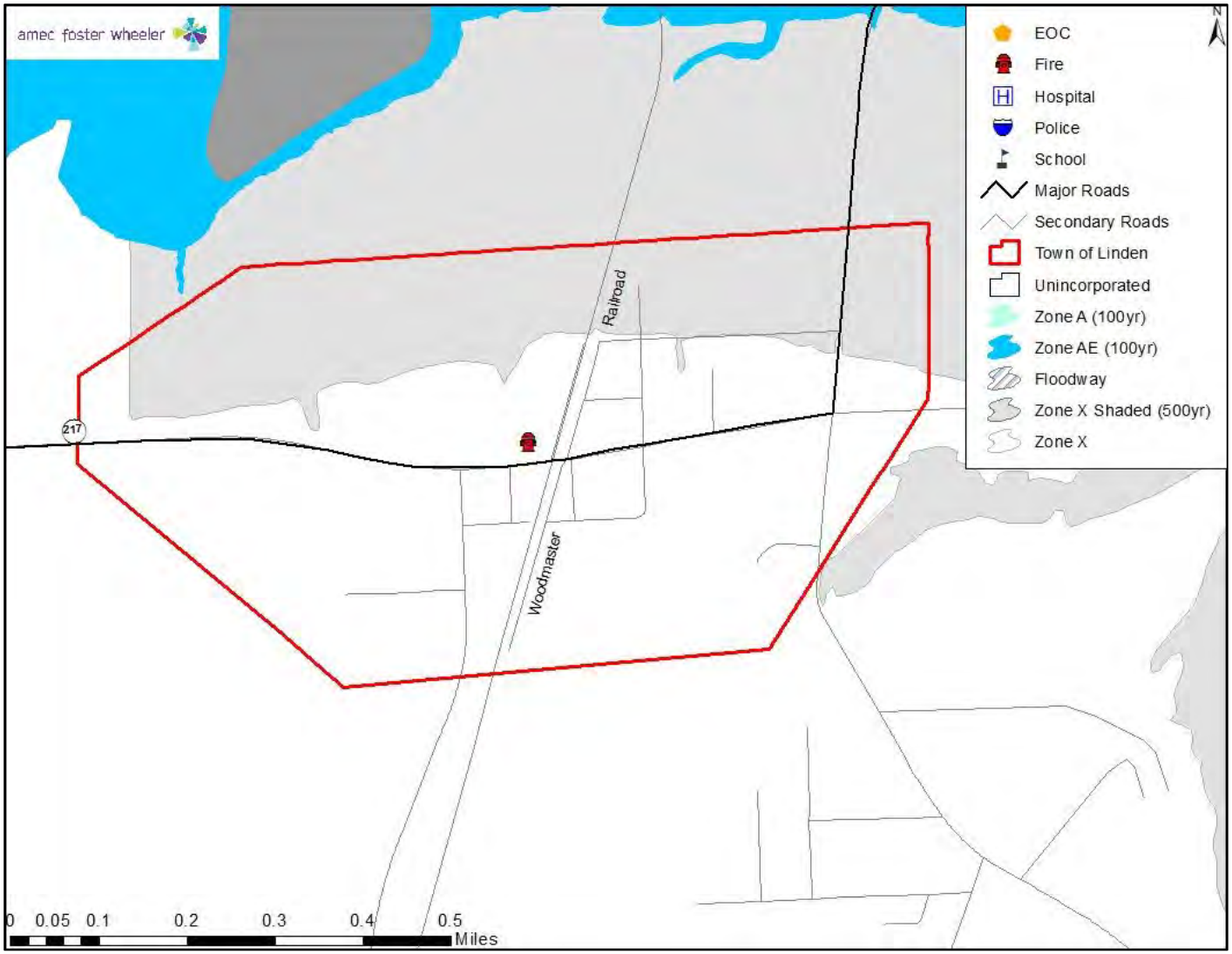


Figure G1 – Town of Linden Critical Facilities and FEMA Flood Zones

Repetitive Loss Properties

The Town of Linden contains no repetitive loss properties.

G.2.7 Severe Weather (Thunderstorm Wind, Lightning & Hail)

Location and Spatial Extent

The entirety of the Town of Linden can be considered at risk to severe weather events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

Table G11 shows detail for severe weather events reported by the NCEI since 1950 for the Town of Linden. There have been four recorded events causing $23,000 in property damage.

Table G11 - NCEI Severe Weather Events in the Town of Linden

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Hail	0	$0	$0	0	0
High Wind	0	$0	$0	0	0
Lightning	0	$0	$0	0	0
Strong Wind	0	$0	$0	0	0
Thunderstorm Wind	4	$23,000	$0	0	0
Total:	**4**	**$23,000**	**$0**	**0**	**0**

Probability of Future Occurrence

Possible – Four records in 65 years results in an annual probability level of 6% for future severe weather events affecting the Town of Linden.

Vulnerability Assessment

Severe weather events including thunderstorm wind, lightning and hail has the potential to impact all existing and future buildings, facilities, and populations in the Town of Linden. Impacts of severe weather events include wind damage, debris clean-up, hail damage, and potential fatalities due to lightning strikes and associated fires. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 7.

G.2.8 Tornado

Location and Spatial Extent

The entirety of the Town of Linden can be considered at risk to tornado events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

According to NCEI records, Cumberland County has experienced 23 tornadoes since 1950. These events are reported to have caused five deaths, 169 injuries and close to $133M in property damage.

Table G12 - NCEI Records for Tornadoes in Cumberland County (1950-2015)

Location	Date	Tornado Fujita Scale	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland Co	4/8/1957	F4	0/8	$250,000.00	$0.00
Cumberland Co	6/2/1959	F0	0/0	$25,000.00	$0.00

Location	Date	Tornado Fujita Scale	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland Co	10/4/1960	F1	0/0	$25,000.00	$0.00
Cumberland Co	9/29/1963	F2	0/0	$250,000.00	$0.00
Cumberland Co	12/26/1964	F1	0/1	$2,500.00	$0.00
Cumberland Co	2/22/1971	F3	2/60	$2,500,000.00	$0.00
Cumberland Co	3/15/1971	F1	0/0	$250,000.00	$0.00
Cumberland Co	5/29/1973	F1	0/0	$25,000.00	$0.00
Cumberland Co	8/2/1974	F0	0/0	$25,000.00	$0.00
Cumberland Co	2/11/1981	F2	0/0	$250,000.00	$0.00
Cumberland Co	3/28/1984	F3	2/11	$25,000,000.00	$0.00
Cumberland Co	3/28/1984	F4	0/0	$2,500,000.00	$0.00
Cumberland Co	5/19/1986	F2	0/0	$250,000.00	$0.00
Cumberland Co	8/28/1988	F1	0/0	$250,000.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	5/28/2000	F0	0/0	$0.00	$0.00
Cumberland Co	12/17/2000	F0	0/0	$0.00	$0.00
Cumberland Co	3/27/2009	EF1	0/0	$225,000.00	$0.00
Cumberland Co	4/16/2011	EF3	1/85	$100,000,000.00	$0.00
Cumberland Co	4/16/2011	EF2	0/4	$250,000.00	$0.00
Cumberland Co	4/29/2014	EF1	0/0	$50,000.00	$0.00
			Total:	**$132,932,750.00**	**$0.00**

Probability of Future Occurrence

Likely - The best available information to determine future probability of a tornado event is to review historic frequency. According to NCEI, 23 tornadoes have impacted Cumberland County over a 65 year period. It can reasonably be assumed that the Town of Linden has a 35% chance of experiencing a tornado each year.

Vulnerability Assessment

A tornado has the potential to impact all existing and future buildings, facilities, and populations in the Town of Linden. Impacts of tornadoes include building and contents damage, debris clean-up, service disruption and potentially numerous fatalities and injuries. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 10.

G.2.9 Wildfire

Location and Spatial Extent

Wildfires could potentially occur anywhere in the region. The Wildland Urban Interface (WUI) is described as the area where structures and other human improvements meet and intermingle with undeveloped wildland or vegetative fuels. Population growth within the WUI substantially increases the risk for wildfire. For the Cumberland County, NC project area, it is estimated that 301,884 people or 95 percent of the total project area population (319,404) live within the WUI. The WUI for Cumberland County is

shown within Chapter 5 Subsection 11 (Figure 5.19).

Past Occurrences

Table G13 lists past occurrences of wildfire in Cumberland County since 2005 as provided by the NCFS in September 2015.

Table G13 - Records for Wildfire in Cumberland County

County	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Cumberland	57	75	94	49	21	59	47	24	36	38

Probability of Future Occurrence

Highly Likely - The best available information to determine future probability of a wildfire event is to review historic frequency. According to historic records, 500 wildfires have occurred in Cumberland County between 2005 and 2015 (100% chance of occurring each year).

Vulnerability Assessment

A wildfire has the potential to impact all existing and future buildings, facilities, and populations in the Town of Linden. Impacts of wildfire include building and contents damage, debris clean-up, service disruption and potentially numerous fatalities and injuries. Wildfires can also increase flood risk due to loss of vegetation. WUI Risk, Burn Probability and Rate of Spread are provided on the County level in Chapter 6 Subsection 11.

G.2.10 Winter Storm

Location and Spatial Extent

The entirety of the Town of Linden can be considered at risk to winter storm events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

According to NCEI records, Cumberland County has experienced 30 winter storm events since 1996, respectively. These events are reported to have caused one death due to icy road conditions.

Table G14 - NCEI Records for Winter Storm Events in Cumberland County (1996-2015)

Date	Location	Type of Winter Storm	Deaths/ Injuries	Property Damage	Crop Damage
1/6/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
1/11/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
2/2/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
2/3/1996	Cumberland County	Cold/wind Chill	0/0	$0.00	$0.00
12/23/1998	Cumberland County	Ice Storm	0/0	$0.00	$0.00
1/18/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/22/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/24/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/28/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
12/3/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/3/2002	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00
12/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00

Date	Location	Type of Winter Storm	Deaths/ Injuries	Property Damage	Crop Damage
2/1/2007	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/17/2008	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/19/2008	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/20/2009	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/4/2009	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/29/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/12/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
3/2/2010	Cumberland County	Winter Weather	0/0	$0.00	$0.00
12/16/2010	Cumberland County	Winter Weather	1/0	$0.00	$0.00
12/25/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/10/2011	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/28/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/11/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/12/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/16/2015	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/24/2015	Cumberland County	Winter Weather	0/0	$0.00	$0.00

Source: NCEI, September 2015

Probability of Future Occurrence

Highly Likely - The best available information to determine future probability of a winter storm event is to review historic frequency. According to NCEI, 30 winter storm events have occurred over a 19 year period between 1996 and 2015 resulting in approximately 1.6 significant winter storm events per year.

The probability of a heavy snowfall occurring with that winter storm event is less likely. The figure below presents the probability of 8-inches or more of snowfall to be approximately 12.5% per year for the Cumberland County Region.

Vulnerability Assessment

Potential losses associated with winter storms include the cost of the removal of snow from roadways, debris clean-up, and some indirect losses from power outages, etc. All future structures and infrastructure in the region will be vulnerable to winter storms.

G.3 Priority Risk Index Results

Table G15 summarizes the degree of risk assigned to each identified hazard as it applies to the Town of Linden using the PRI method described in Chapter 6 Subsection 4.

Table G15 - Summary of PRI Results for the Town of Linden

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Dam/Levee Failure	Unlikely	Minor	Small	Less than 6 hrs	Less than 6 hrs	1.3
Drought	Highly Likely	Minor	Large	More than 24 hrs	More than 1 week	2.8
Earthquake	Possible	Limited	Moderate	Less than 6 hrs	Less than 6 hrs	2.3
Extreme Heat	Possible	Minor	Large	More than 24 hrs	Less than 1 week	2.1
Hurricane/Tropical Storm	Likely	Critical	Large	More than 24 hrs	Less than 24 hrs	2.9
Inland Flooding: 100-/500-year	Possible	Critical	Moderate	6 to 12 hours	Less than 1 week	2.7

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Severe Weather (thunderstorm wind, lightning, & hail)	Possible	Limited	Moderate	6 to 12 hours	Less than 6 hrs	2.2
Tornado	Likely	Critical	Small	Less than 6 hrs	Less than 6 hrs	2.7
Wildfire	Highly Likely	Limited	Small	Less than 6 hrs	Less than 1 week	2.9
Winter Storm	Highly Likely	Minor	Moderate	More than 24 hrs	Less than 1 week	2.5

As shown in Table G16, the results from the PRI have been classified into three categories based on the assigned risk value:

- **Low Risk** - Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium Risk** - Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High Risk** - Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread.

Table G16 - Summary of Hazard Risk Classification

Hazard Category	Hazard Type
High Risk (> 2.5)	**Hurricane/Tropical Storm Wildfire Drought Inland Flooding: 100-/500-year Tornado**
Moderate Risk (2.0 – 2.5)	**Winter Storm Earthquake Severe Weather Extreme Heat**
Low Risk (< 2.0)	**Dam/Levee Failure**

G.4 Capability Assessment

This subsection discusses the capability of the Town of Linden to implement hazard mitigation activities. More information on the purpose and methodology used to conduct the assessment can be found in Chapter 7 - Capability Assessment.

G.4.1 Planning and Regulatory Capability

Table G17 lists regulatory capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Linden.

Table G17 - Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Y/N	Date	Comments
Comprehensive Plan	Y	8/18/09	2030 Growth Vision Plan and 2030 Growth Strategy Map
Zoning Ordinance	N		
Subdivision Ordinance	Y	10/20/09	
Floodplain Ordinance	Y	8/15/2000	Adopted Cumberland County Flood Damage Prevention Ordinance
Stormwater Ordinance	N		Handled by NC DENR
Erosion, Sedimentation and Pollution Control Ordinance	N		Handled by NC DENR
Building Code	Y	1970's	2009 International Code and 2012 North Carolina Building Code. Cumberland County Planning & Inspections Department enforces the building code within the Town of Linden.
BCEGS Rating	Y	Conducted every 5 years	Done by ISO
Stormwater Management Program	N		
Site Plan Review Requirements	Y	10/20/09	
Capital Improvements Plan	N		
Local Emergency Operations Plan	Y	2006	
Flood Insurance Study or Other Engineering Study for Streams	Y	06/2007	
Repetitive Loss Plan	N		No repetitive loss property located within the Town of Linden.
Elevation Certificates	Y	Since 2000	

G.4.2 Floodplain Management

The Town of Linden joined the NFIP emergency program in 2001 and has been a regular participant in the NFIP since January 2007. The Town of Linden contains no NFIP policies.

G.4.3 Administrative and Technical Capability

Table G18 lists administrative capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Linden.

Table G18 - Administrative/Technical Capabilities

Resource	Y/N	Responsible Department
Planner/Engineer with knowledge of land development/land management practices	Y	Cumberland County Engineering & Public Utilities and Town of Linden Contract Engineer
Engineer/Professional trained in construction practices related to buildings and/or infrastructure	Y	Cumberland County Engineering & Public Utilities and Town of Linden Contract Engineer
Planner/Engineer/Scientist with an understanding of natural hazards	Y	Cumberland County Engineering & Public Utilities and Cumberland Planning & Inspections Department
Personnel skilled in GIS	Y	Cumberland County Information Services
Full time building official	Y	Cumberland County Planning & Inspections
Floodplain Manager	Y	Cumberland County Engineering & Public Utilities
Emergency Manager	Y	Cumberland County Emergency Services
Grant writer	Y	Cumberland County Planning & Inspections and Cumberland County Emergency Services
GIS data – Hazard areas	Y	Cumberland County Information Services
GIS data – Critical facilities	Y	Cumberland County Information Services
GIS data – Land use	Y	Cumberland County Planning & Inspections Department
GIS data – Building footprints	Y	Cumberland County Information Services
GIS data – Links to Assessor's data	Y	Cumberland County Information Services
Warning Systems/Services	Y	Cumberland County Emergency Services – Code Red Program

G.4.4 Fiscal Capability

Table G19 lists fiscal capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Linden.

Table G19 - Fiscal Mitigation Capabilities

Resource	Accessible/Eligible to Use (Y/N)
Community Development Block Grants	Y
Capital improvements project funding	Y
Authority to levy taxes for specific purposes	Y
Fees for water, sewer, gas or electric services	Y
Impact fees for new development	N

Resource	Accessible/Eligible to Use (Y/N)
Incur debt through general obligation bonds	Y
Incur debt through special tax bonds	Y
Incur debt through private activity bonds	N
Withhold spending in hazard prone areas	N

G.5 Mitigation Strategy

G.5.1 Status Update for 2011 Mitigation Actions

Table G20 provides a status update for each mitigation action detailed in the 2011 Cumberland County Multi-jurisdictional Hazard Mitigation Plan with the Town of Linden designated as the responsible jurisdiction. This table provides a summary of progress to-date and also notes whether each action is to be deleted or carried forward into the 2016 Regional Plan.

Table G20 - Status of 2011 Mitigation Actions

Town of Linden								
Mitigation Action Number	**Action Description**	**Responsible Department**	**Current Status**			**2016 Plan Update**		**Summary of Progress To-Date**
			Complete	**In Progress**	**Not yet Started**	**Delete Action**	**Carry Forward**	
1	Develop A Subdivision Ordinance For The Town.	Cumberland County Planning Department	X			X		The Town adopted a subdivision ordinance on October 20, 2009.
2	Develop A Zoning Ordinance For The Town.	Cumberland County Planning Department		X			X (Revised)	Tabled by the Town Board.
3	Develop Uniform Flood Damage Prevention Ordinance.	Cumberland County Engineering Department			X	X		The Town of Linden adopted the revised Cumberland County Flood Damage Prevention Ordinance and new FIRM on October 17, 2006. The new digital FIRM map adopted by the Town indicates there is no Special Flood Hazard Area within its Town Limits. Also continues compliance with NFIP. **See Unincorporated Area Action #6 for further explanation for the deletion of this action.**
4	Develop A Program To Ensure Drainage Ways, Culverts And Storm Drains Are Free Of Debris.	Cumberland County Engineering Department		X		X		The Town of Linden ensures that the drainageways, culverts and storm drains are free of debris on Town streets and property. The NC Department of Transportation State Roads are a part of the State Road system and their responsibility for maintenance.
5	Identify Areas That Are Susceptible To Wildfires And Consider Prescribed Fire (Controlled Burning) Management Tool To Reduce The Impact Of Wildfire Hazards.	NC Forest Service		X			X (Revised)	Currently the Cumberland County office of Forest Service has developed a draft risk assessment of those areas of Cumberland County (including Town of Linden) that are susceptible to wildfires. This risk assessment is general in nature and for in office use only. The NC Forest Service has completed five Community Wildfire Protection Plans for certain areas of Cumberland County.

G.5.2 2016 Mitigation Action Plan

Table G21 identifies 10 new and/or revised mitigation actions for the Town of Linden. There are no unrevised, incomplete actions from Table G20 that are to be carried forward into the 2016 Regional Plan.

Table G21 - 2016 Mitigation Action Plan

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
New/Revised Actions										
1	Maintain an all Hazards public education program to educate and prepare residents for all of the hazards that impact Cumberland County.	To educate, enhance preparedness, and resiliency of Cumberland County and its municipal residents through public education programs that included booths at fairs, festivals and special events, websites, brochures, school programs, and etc.	Cumberland County Emergency Management	$90,000	Local Operating Budget	Short Range	New			All Hazards
2	Explore the Fire Adapted Communities concept implementation in Cumberland County.	To enhance the preparedness and resiliency of Cumberland County and its municipalities to the effects of wild land fire and urban interface, through education; programs such as Fire Wise, Ready Set Go, Community Wildfire Protection Plan; Fuel Management; local codes and ordinances.	Emergency Management, NC Forest Service and Fire Marshalls	Staff Hours	Local Operating Budget and Federal	Medium Range	New	X	X	Wildfire
3	Conduct a countywide infrastructure vulnerability assessment to identify priority needs for updating ill-designed or outdated critical structures.	It has been difficult to locate any comprehensive assessments of local infrastructure in Cumberland and Hoke Counties. With current and projected natural hazard occurrences, it is essential to have an accurate and comprehensive understanding of the current condition of critical facilities to ensure the ability to continue to provide for basic needs, such as water and electrical supplies, transportation routes, waste management, etc.	County/city structural and civil engineers in partnership with U.S. Army Corps of Engineers	Staff Hours	Local Operating Budget and Federal	Medium Range	New	X		All Hazards
4	Conduct social vulnerability analysis to identify priority needs and opportunities that will address the specific problems vulnerable populations face from a range of hazards, including barriers to evacuation, event-specific vulnerabilities, and impediments to recovery.	There exist various groups of individuals that have additional financial, social and/or environmental barriers to being resilient in the face of natural hazard events. In Cumberland County, for example, groups with significant number of people affected include about 10K outdoor workers with direct exposure to extreme heat days, elderly people and especially those with existing cardiovascular conditions, and other low-income and/or minority groups. As natural hazard events increase in intensity and frequency, these groups will find it harder to safely and efficiently get out of harm's way. These groups will also have difficulty in obtaining and paying for essential components to sustain life, such as medications, utilities, and transportation to/from a place of work, etc.	County Social Services Department and/or County Health Department	Staff Hours	Local Operating Budget	Medium Range	New			All Hazards
5	Collaborate with NC Cooperative Extension and NC Agriculture and Forestry Adaptation Working Group to provide more local support and encouragement of forest conservation and farmland preservation measures.	Forests and farmland provide a multitude of social, economic and environmental benefits, that when looked at comprehensively, far outweigh any profit/revenue projections of residential or commercial properties. Outside of development pressure, some of the other major health risks include: (1) increasing wildfire risk, (2) increasing number and types of insects and pests, (3) lack of sufficient water during the growing season for crops, and (4) increasing damage from strong winds and flooding. It is vital, especially in the face of a changing climate, to preserve these working lands and to support higher density development in already existing urban and suburban centers.	County Board of Commissioners, Conservation District Programs, and other land preservation organizations.	Unknown	NC Cooperative Extension, NC Forest Service, US Department of Agriculture and NC Wildlife Resources Commission.	Short Range	N		X	Wildfire, Inland Flooding
6	Include climate predictions from the Cumberland County Climate Resiliency Plan in the Regional Hazard Mitigation Plan.	To properly prepare for natural hazard occurrences, it is important to include predictions that warn of: (1) increasing temperatures and extreme heat days, (2) increasing frequency and strength of severe weather events, (3) more heavy rain/flooding, and (4) more frequent and prolonged drought. Although some climate projections do not pose an immediate threat, any comprehensive mitigation plan for	The Planning Department/Planning Director for each jurisdiction in Cumberland County	None	Existing FEMA grant	Short Range	New	X	X	All Hazards

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
		emergency management should at the very least, and by the very nature of the definition of "mitigation", acknowledge the changing climate and possibility of increased extreme weather and flooding events.								
7	Provide financial assistance for low-income residents to help with power bills and support services during extended periods of high temperature and other extreme weather.	Low-income households face challenges in keeping up with utility bills. Some low-income utility assistance programs are offered, but funds are limited. Extreme weather and increasing temperatures will place even greater pressure on these programs' ability to provide assistance to all those in need, and citizen's lives will be increasingly at stake.	County Health Department	Unknown	NC Department of Health and Human Services and County Department of Health	Medium Range	New			Extreme Heat, Winter Weather
8	Analyze and update local development ordinances to make buildings safer from wind and flooding, more energy and water efficient, more tolerant of heat waves and healthier to live in. Also, provide incentives for making buildings safer from wind, flooding, more energy and water efficient, and healthier to live in.	Energy and water efficiency will be increasingly important to a community's resiliency in the face of natural hazards specifically because of projections of increasing temperatures and extreme heat days, and prolonged periods of drought. Climate projections also state that precipitation will continue to follow a seasonal pattern, whereby hot, Summer months are classified with less precipitation and Winters with more precipitation. Extreme heat days will be specially taxing on buildings with older A/C systems or inadequate insulation and in low-income households where upkeep with rising utility costs could become a burden.	Planning and Code Departments of each jurisdiction	Staff Hours	Local Operating Budget	Medium Range	New		X	Inland Flooding, Hurricane Wind, Thunderstorm Wind, Extreme Heat, Winter Storms
9	Use natural systems, more open space and green surfaces to manage stormwater in a more resilient fashion.	Impervious surfaces typically found in urban centers, such as paved roads, buildings, parking lots and pavement, drastically increase flash floods and urban flooding, which seems to be a common occurrence in Cumberland County. For instance, within a 90 day period (March 1 – June 30, 2015), three flooding incidents were reported due to heavy rainfall events. Use of LID stormwater management practices is mentioned only in summary in the Growth Factor Analysis, stating it "…should be emphasized in sensitive areas…" This, coupled with the naturally flat topography of the eastern portions of the County also help to create excess runoff and subsequent urban flooding issues, especially in the Special Flood Hazard Areas (SFHA) of the County, and specifically around Blounts and Cross Creek, as referenced in various resources.	Engineering Department of each jurisdiction	Staff Hours	Local Operating Budget	Short Range	New		X	Inland Flooding
10	Develop a zoning ordinance for the Town.	Zoning ordinance helps protect the health, safety and welfare of its citizens as well as reduce vulnerability to natural hazards.	Town of Linden and Cumberland County Planning & Inspections Department	Staff Hours $5,000 - $10,000	Local Operating Budget	Long Range	Revised		X	All Hazards

ANNEX H – TOWN OF SPRING LAKE

H.1 Community Profile

H.1.1 Geography

The Town of Spring Lake is within Cumberland County and is located in south central North Carolina in the Upper Coastal Plain. As of the 2010 census, the population was 11,964. Spring Lake is within the Fayetteville, NC Metropolitan Statistical Area and is part of the Mid-Carolina Council of Governments. According to the U.S. Census Bureau, the Town has a total area of approximately 23.3 square miles of which 23.1 square miles is land and 0.2 square miles is water. Spring Lake is located in the Cape Fear River basin.

H.1.2 Population and Demographics

Table H1 provides population counts and the percentage change in population since 2010 for the Town of Spring Lake. Based on the 2010 census, the population density is 518 people per square mile.

Table H1 - Population Counts for Town of Spring Lake

Jurisdiction	2010 Census Population	2014 Estimated Population	% Change 2010-2014
Town of Spring Lake	11,964	13,101	9.5

Source: U.S. Census Bureau, 2015

Based on the 2010 Census, the median age of residents in the Town of Spring Lake is 24.9. The racial characteristics of the Town are presented below in Table H2.

Table H2 - Demographics of Town of Spring Lake

Jurisdiction	White Persons, Percent (2010)	Black Persons, Percent (2010)	American Indian or Alaska Native, Percent (2010)	Asian Persons, Percent (2010)	Hispanic or Latino Persons, Percent (2010)[1]
Town of Spring Lake	47.2	36.3	1.1	3.0	15.4

[1]Persons of Hispanic Origin may be of any race, so are also included in applicable race category.
Source: U.S. Census Bureau, 2010

H.2 Risk Assessment

This subsection includes a hazard profile and vulnerability assessment for each of the priority hazards identified in Chapter 5 Subsection 13 (Table 5.20) as they pertain to the Town of Spring Lake. **Additional information for each hazard can be found in Chapter 5 - Hazard Profiles and Chapter 6 – Vulnerability Assessment.**

H.2.1 Dam/Levee Failure

Location and Spatial Extent

Table H3 provides details for one dam included in the North Carolina Dam Inventory that is located within the Town of Spring Lake.

Table H3 - North Carolina Dam Inventory for the Town of Spring Lake

Dam Name	NIDID	Height (ft)	NID Storage (acre-feet)	Dam Status	River[1]	Hazard Classification
Youngs Lake Dam	NC05024	23	n/a	EXEMPT-DOD	Tank Creek-Tr	High

Source: North Carolina Dam Inventory, December 2014

[1]If the dam is located on an unnamed stream/tributary, the unnamed stream/tributary name is followed with "-TR". If the dam is located off stream of an unnamed stream/tributary, the unnamed stream/tributary name is followed with "-OS".

Past Occurrences

Table H4 details known past dam failures in the Town of Spring Lake.

Table H4 – Known Dam Failures in the Town of Spring Lake

Location	Date of Occurrence	Result of Failure	Deaths/ Injuries	Property Damage	Details
None Reported	n/a	n/a	n/a	n/a	n/a

Probability of Future Occurrence

Possible – Although there are no past records of dam failure within the Town of Spring Lake, it is possible that this type event could occur in the future.

Vulnerability Assessment

The estimated number and characteristics of buildings that could potentially be impacted by a dam failure are shown in Table H5. **Note: the numbers presented in Table H5 are estimated based on the methodology described in Chapter 6 Subsection 3.1. A dam inundation study including a hydrologic and hydraulic analysis was not performed.**

Table H5 - Properties Potentially at Risk to Dam Failure

Jurisdiction	Number of Buildings in Estimated Inundation Area	Total Building Value	Estimated Content Value	Total Value
Spring Lake	8	$1,168,200.00	$522,755.62	$1,690,955.62
Total	**8**	**$1,168,200.00**	**$522,755.62**	**$1,690,955.62**

H.2.2 Drought

Location and Spatial Extent

Drought cannot be confined to geographic or political boundaries. The Cumberland County region, including the Town of Spring Lake, is designated as moderately dry.

Past Occurrences

According to the North Carolina Drought Monitor, Cumberland County has experienced drought conditions every year since 2000. Table H6 shows the most severe classification for each year.

Table H6 - Historical Drought Occurrences

Year	Cumberland County
2000	Abnormally Dry
2001	Severe Drought
2002	Extreme Drought
2003	Abnormally Dry
2004	Abnormally Dry
2005	Abnormally Dry
2006	Moderate Drought
2007	Exceptional Drought
2008	Exceptional Drought
2009	Moderate Drought
2010	Moderate Drought
2011	Severe Drought
2012	Moderate Drought
2013	Abnormally Dry
2014	Abnormally Dry
2015	Moderate Drought

Source: NC Drought Monitor

Probability of Future Occurrence

Highly Likely - Based on historical occurrence information (15 records in 15 years), it can reasonably be assumed that the Town of Spring Lake has a 100% chance of this type of event occurring each year.

Vulnerability Assessment

It is assumed that whereas all buildings and facilities in the planning area would technically be exposed to the drought hazard, there is no significant vulnerability to these buildings on a structural level. Population growth could contribute directly to this hazard, as an increased number of users pull from the available water supply within the region

H.2.3 Earthquake

Location and Spatial Extent

As detailed in Chapter 5 – Hazard Profiles, the Town of Spring Lake lies within an approximate zone level between 6 and 10% ground acceleration. This indicates that the region as a whole exists within an area of moderate seismic risk.

Past Occurrences

A list of earthquakes that have caused damaged in North Carolina is presented below in Table H7.

Table H7 - Earthquakes Affecting North Carolina

Date	Location	Richter Scale
12/16/1811	NE Arkansas	8.5

Date	Location	Richter Scale
01/23/1812	New Madrid, MO	8.4
02/07/1812	New Madrid, MO	8.7
04/29/1852	Wytheville, VA	5.0
08/31/1861	Wilkesboro, NC	5.1
12/23/1875	Central Virginia	5.0
08/31/1886	Charleston, SC	7.3
05/31/1897	Giles County, VA	5.8
01/01/1913	Union County, SC	4.8
02/21/1916	Asheville, NC	5.5
07/08/1926	Mitchell County, NC	5.2
11/03/1928	Newport, TN	4.5
05/13/1957	McDowell County, NC	4.1
07/02/1957	Buncombe County, NC	3.7
11/24/1957	Jackson County, NC	4.0
10/27/1959	Chesterfield, SC	4.0
07/13/1971	Newry, SC	3.8
11/30/1973	Alcoa, TN	4.6
11/13/1976	Southwest Virginia	4.1
05/05/1981	Henderson County, NC	3.5

Source: Wake County 2014 Hazard Mitigation Plan. Information provided by NCEM.

Probability of Future Occurrence

Possible - Based on historical occurrences, the probability of a significant earthquake event affecting the Town of Spring Lake is possible. There are a total of 20 records in North Carolina over the past 200 years. Therefore, the annual probability level is estimated between 1 and 10 percent.

Vulnerability Assessment

An earthquake has the potential to impact all existing and future buildings, facilities, and populations in the Town of Spring Lake. Impacts of earthquakes include debris clean-up, service disruption and, in severe cases, fatalities due to building collapse. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 3.

H.2.4 Extreme Heat

Location and Spatial Extent

Extreme heat typically occurs over large areas impacting multiple counties at one time. The entirety of the Town of Spring Lake is vulnerable to extreme heat.

Past Occurrences

According to the National Climatic Data Center, one instance of extreme heat was recorded in Cumberland County beginning on July 22, 1998, and an additional instance of extreme heat was recorded in Cumberland County beginning on August 10, 2007.

Probability of Future Occurrence

Possible - Based on historical occurrence information (2 records in 65 years), it can reasonably be assumed that an extreme heat event has a 3% chance of occurring each year in the Town of Spring Lake.

Vulnerability Assessment

Extreme heat is not likely to impact the built environment, but may impact agriculture and pose a threat to humans. Elderly persons, persons with respiratory disabilities, and children may be at risk to experience health problems during extreme heat events, some of which could result in serious illness or death. Potential losses of human life due to extreme heat are not quantified in this Plan. There are no past reports of death or property or crop damage recorded by NCEI.

H.2.5 Hurricane/Tropical Storm

Location and Spatial Extent

All Atlantic and Gulf of Mexico coastal areas are subject to hurricanes. While coastal areas are most directly exposed to land falling hurricanes and tropical storms, their impact can be felt hundreds of miles inland. The entire Town of Spring Lake region is equally susceptible to hurricanes and tropical storms.

Past Occurrences

Table H8 provides hurricane and tropical storm data reported by NCEI since 1950 for Cumberland County.

Table H8 - NCEI Hurricane and Tropical Storm Events for Cumberland County

Location	Date	Event Type	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland (Zone)	7/12/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/5/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	8/27/1998	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/4/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/15/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/18/2003	Hurricane (Typhoon)	0/0	$28,000.00	$0.00
Cumberland (Zone)	09/01/2006	Tropical Storm	0/0	$0.00	$0.00
			Total:	**$28,000.00**	**$0.00**

While not included in the NCEI database, Category 4 Hurricane Hazel (DR-28) came ashore in North Carolina on October 15, 1954 and caused substantial damage in the region. With winds reaching 125mph at Grannis Field, Hurricane Hazel caused an estimated $136 million in property damage; 19 deaths; 200 injuries; destruction of 15,000 homes and structures; and damage to 39,000 structures.

Probability of Future Occurrence

Likely - Based on a historical record of eight storm events over a period of 65 years (1950 - 2015), it can reasonably be assumed that this type of event has a 12% chance of occurring each year.

Vulnerability Assessment

In conclusion, hurricane wind has the potential to impact all existing and future buildings, facilities, and populations in the Town of Spring Lake. Impacts of hurricanes include flood damage, debris clean-up, service disruption and possible fatalities due to flooding or flying debris. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 5.

H.2.6 Inland Flooding: 100-/500-year

Location and Spatial Extent

The Town of Spring Lake parcel layer and effective 2007 DFIRM were intersected and the flooded parcel area was calculated in acres. Flood zones were assigned to parcels based on the intersection of a parcel with a flood zone. Parcels can be located in multiple flood zones, and only the flooded acreage within the parcel was included in the calculation for each flood zone. Table H9 provides a summary of acreage by flood zone.

Table H9 - Flood Zone Acreage

Jurisdiction	Flood Zone Acreage				
	Zone A (100-year)	Zone AE (100-year)	Zone X Shaded (500-year)	Zone X Unshaded	Total
Town of Spring Lake	0	632	81	7,572	8,285

The Town of Spring Lake's parcel and building footprint layers were used to examine the inventory of properties at risk. Table H10 provides the building count, estimated building value, estimated content value and estimated total value for all buildings located within each FEMA flood zone.

Table H10 – Properties at Risk

Occupancy Type	Total Number of Buildings in Floodplain	Total Building Value	Estimated Content Value	Total Value
Zone AE				
Agricultural	0	$0	$0	$0
Commercial	0	$0	$0	$0
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	11	$3,137,659	$1,378,103	$4,515,762
Total	**11**	**$3,137,659**	**$1,378,103**	**$4,515,762**
Zone X (500-yr)				
Agricultural	0	$0	$0	$0
Commercial	0	$0	$0	$0
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	16	$4,426,044	$2,022,296	$6,448,340
Total	**16**	**$4,426,044**	**$2,022,296**	**$6,448,340**
Zone X (Unshaded)				
Agricultural	0	$0	$0	$0
Commercial	207	$122,858,459	$119,602,192	$242,460,651
Education	17	$25,808,093	$28,948,338	$54,756,432
Government	6	$11,748,593	$14,334,951	$26,083,544
Industrial	8	$1,852,803	$2,739,846	$4,592,649
Religious	26	$21,250,825	$21,250,821	$42,501,645
Residential	2,782	$334,749,917	$161,943,692	$496,693,609

Occupancy Type	Total Number of Buildings in Floodplain	Total Building Value	Estimated Content Value	Total Value
Total	**3,046**	**$518,268,691**	**$348,819,840**	**$867,088,530**

Source: North Carolina Emergency Management, Risk Management, 2013

Note: Content value estimations are generally based on the FEMA Hazus methodology of estimating value as a percent of improved structure values by property type. The residential property type assumes a content replacement value equal to 50% of the building value. Agricultural, commercial, education, government, and religious property types assume a content replacement value equal to 100% of the building value. The industrial property type assumes a content replacement value equal to 150% of the building value.

Past Occurrences

There have been no specific flood events recorded for the Town of Spring Lake. Table H11 shows detail for flood events reported by the NCEI since 1950 for Cumberland County. There have been 46 recorded events in the County causing over $3.6M in property damage.

Table H11 - NCEI Flooding Events in Cumberland County

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Flash Flood	40	$2,132,000	$0	0	0
Flood	2	$0	$0	0	0
Heavy Rain	4	$1,500,000	$0	0	0
Total:	**46**	**$3,632,000**	**$0**	**0**	**0**

Source: NCEI, September 2015

Probability of Future Occurrence

Possible - By definition of the 100-year flood event, SFHAs are defined as those areas that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. Properties located in these areas have a 26 percent chance of flooding over the life of a 30-year mortgage.

The 500-year flood area is defined as those areas that will be inundated by the flood event having a 0.2-percent chance of being equaled or exceeded in any given year; it is not the flood that will occur once every 500 years.

Vulnerability Assessment

Properties at Risk to Flooding

The loss estimate for flood is based on the total of improved building value and contents value. Land value is not included in any of the loss estimates as generally the land is not subject to loss from floods. Once the potential value of affected parcels was calculated, damage factors were applied to obtain loss estimates by flood zone.

Table H12 shows the building count, total value, estimated damages and loss ratio for buildings that fall within the Zone AE 100-year floodplain by occupancy type on the community level.

The loss ratio is the loss estimate divided by the total potential exposure (i.e., total of improved and contents value for all buildings located within the Zone AE 100-year floodplain) and displayed as a percentage of loss. FEMA considers loss ratios greater than 10% to be significant and an indicator a community may have more difficulties recovering from an event.

Table H12 - Estimated Building Damage and Content Loss – Flood 100-yr Return Period

Occupancy Type	Total Number of Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Zone AE						
Agricultural	0	$0	$0	$0	$0	n/a
Commercial	0	$0	$0	$0	$0	n/a
Education	0	$0	$0	$0	$0	n/a
Government	0	$0	$0	$0	$0	n/a
Industrial	0	$0	$0	$0	$0	n/a
Religious	0	$0	$0	$0	$0	n/a
Residential	4	$9,056,132	$9,929	$171	$10,100	0.1%
Total	**4**	**$9,056,132**	**$9,929**	**$171**	**$10,100**	**0.1%**

Source: North Carolina Emergency Management, Risk Management, 2013

Critical Facilities at Risk to Flooding

Of significant concern with respect to any disaster event is the location of critical facilities in the planning area. Critical facilities are often defined as those essential services and facilities in a major emergency which, if damaged, would result in severe consequences to public health and safety or a facility which, if unusable or unreachable because of a major emergency, would seriously and adversely affect the health, safety, and welfare of the public. Critical facilities within the Town are detailed in Table H13 and Figure H1 below.

Table H13 – Critical Facilities and FEMA Flood Zones

Facility Name	Address	Facility Type	Estimated 100-yr Flood Depth (Ft)
Zone AE			
n/a	n/a	n/a	n/a
Zone A (100-yr)			
n/a	n/a	n/a	n/a
Zone X Shaded (500-yr)			
n/a	n/a	n/a	n/a
Zone X Unshaded			
Spring Lake Police Department	300 Ruth St	Police	n/a
Spring Lake Fire Department	301 Ruth St	Fire	n/a
Manchester Elementary	611 Spring Ave	School	n/a
Lilian Black Elementary	125 Third St	School	n/a

Source: Cumberland County Emergency Management Agency, 2015

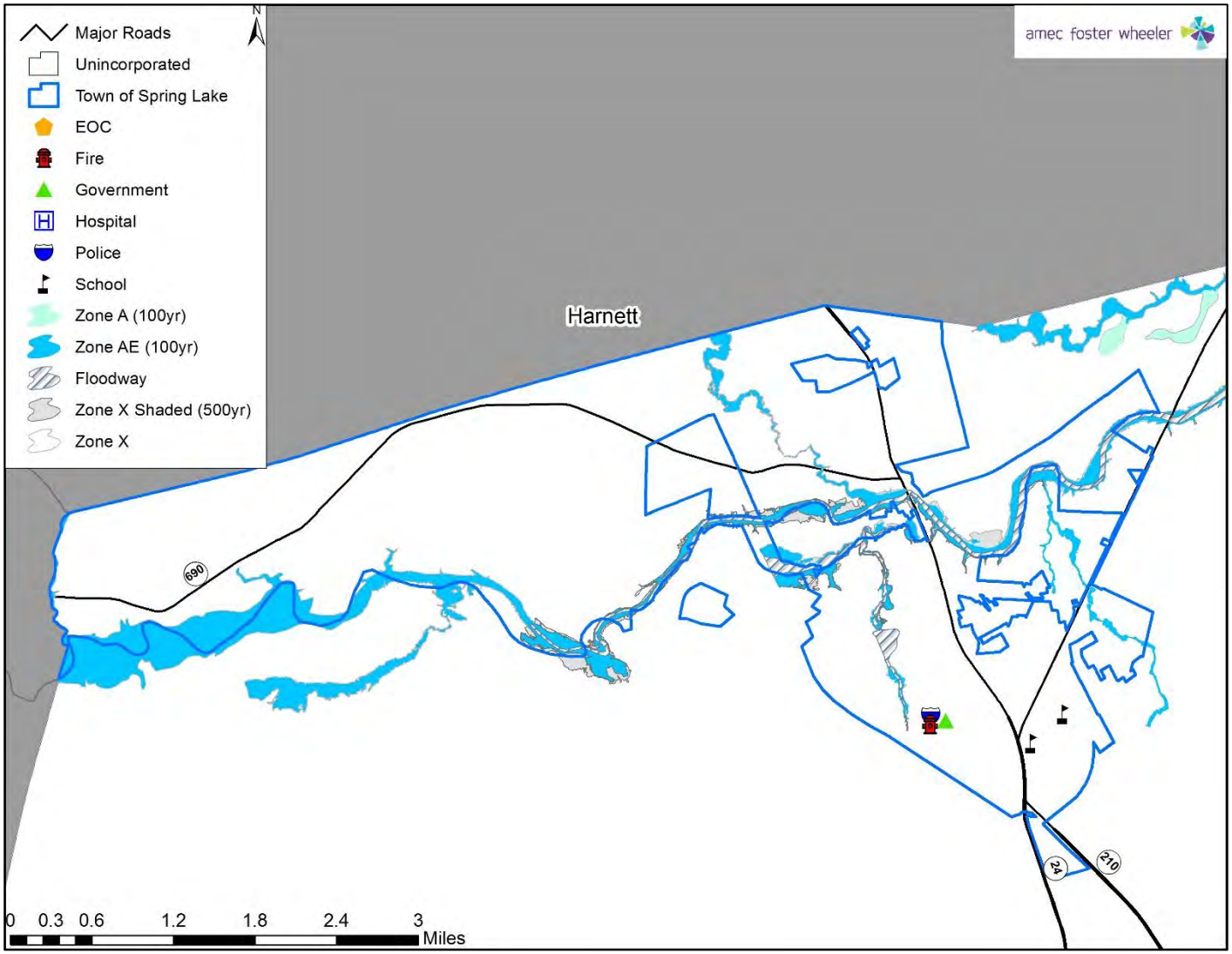


Figure H1 – Town of Spring Lake Critical Facilities and FEMA Flood Zones

Repetitive Loss Properties

The Town of Spring Lake contains no repetitive loss properties.

H.2.7 Severe Weather (Thunderstorm Wind, Lightning & Hail)

Location and Spatial Extent

The entirety of the Town of Spring Lake can be considered at risk to severe weather events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

Table H14 shows detail for severe weather events reported by the NCEI since 1950 for the Town of Spring Lake. There have been 13 recorded events causing $750,000 in property damage.

Table H14 - NCEI Severe Weather Events in the Town of Spring Lake

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Hail	9	$0	$0	0	0
High Wind	0	$0	$0	0	0
Lightning	1	$750,000	$0	0	0
Strong Wind	0	$0	$0	0	0
Thunderstorm Wind	3	$0	$0	0	0
Total:	**13**	**$750,000**	**$0**	**0**	**0**

Probability of Future Occurrence

Likely - Given the high number of previous events (13 records in 65 years), it is likely that severe weather events, including wind, lightning and hail, will occur in the future. This results in an annual probability level of 20% for future severe weather events to affect the Town.

Vulnerability Assessment

Severe weather events including thunderstorm wind, lightning and hail has the potential to impact all existing and future buildings, facilities, and populations in the Town of Spring Lake. Impacts of severe weather events include wind damage, debris clean-up, hail damage, and potential fatalities due to lightning strikes and associated fires. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 7.

H.2.8 Tornado

Location and Spatial Extent

The entirety of the Town of Spring Lake can be considered at risk to tornado events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

According to NCEI records, Cumberland County has experienced 23 tornadoes since 1950. These events are reported to have caused five deaths, 169 injuries and close to $133M in property damage.

Table H15 - NCEI Records for Tornadoes in Cumberland County (1950-2015)

Location	Date	Tornado Fujita Scale	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland Co	4/8/1957	F4	0/8	$250,000.00	$0.00

Location	Date	Tornado Fujita Scale	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland Co	6/2/1959	F0	0/0	$25,000.00	$0.00
Cumberland Co	10/4/1960	F1	0/0	$25,000.00	$0.00
Cumberland Co	9/29/1963	F2	0/0	$250,000.00	$0.00
Cumberland Co	12/26/1964	F1	0/1	$2,500.00	$0.00
Cumberland Co	2/22/1971	F3	2/60	$2,500,000.00	$0.00
Cumberland Co	3/15/1971	F1	0/0	$250,000.00	$0.00
Cumberland Co	5/29/1973	F1	0/0	$25,000.00	$0.00
Cumberland Co	8/2/1974	F0	0/0	$25,000.00	$0.00
Cumberland Co	2/11/1981	F2	0/0	$250,000.00	$0.00
Cumberland Co	3/28/1984	F3	2/11	$25,000,000.00	$0.00
Cumberland Co	3/28/1984	F4	0/0	$2,500,000.00	$0.00
Cumberland Co	5/19/1986	F2	0/0	$250,000.00	$0.00
Cumberland Co	8/28/1988	F1	0/0	$250,000.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	5/28/2000	F0	0/0	$0.00	$0.00
Cumberland Co	12/17/2000	F0	0/0	$0.00	$0.00
Cumberland Co	3/27/2009	EF1	0/0	$225,000.00	$0.00
Cumberland Co	4/16/2011	EF3	1/85	$100,000,000.00	$0.00
Cumberland Co	4/16/2011	EF2	0/4	$250,000.00	$0.00
Cumberland Co	4/29/2014	EF1	0/0	$50,000.00	$0.00
			Total:	**$132,932,750.00**	**$0.00**

Probability of Future Occurrence

Likely - The best available information to determine future probability of a tornado event is to review historic frequency. According to NCEI, 23 tornadoes have impacted Cumberland County over a 65 year period. It can reasonably be assumed that the Town of Spring Lake has a 35% chance of experiencing a tornado each year.

Vulnerability Assessment

A tornado has the potential to impact all existing and future buildings, facilities, and populations in the Town of Spring Lake. Impacts of tornadoes include building and contents damage, debris clean-up, service disruption and potentially numerous fatalities and injuries. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 10.

H.2.9 Wildfire

Location and Spatial Extent

Wildfires could potentially occur anywhere in the region. The Wildland Urban Interface (WUI) is described as the area where structures and other human improvements meet and intermingle with undeveloped wildland or vegetative fuels. Population growth within the WUI substantially increases the risk for wildfire. For the Cumberland County, NC project area, it is estimated that 301,884 people or 95 percent

of the total project area population (319,404) live within the WUI. The WUI for Cumberland County is shown within Chapter 5 Subsection 11 (Figure 5.19).

Past Occurrences

Table H16 lists past occurrences of wildfire in Cumberland County since 2005 as provided by the NCFS in September 2015.

Table H16 - Records for Wildfire in Cumberland County

County	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Cumberland	57	75	94	49	21	59	47	24	36	38

Probability of Future Occurrence

Highly Likely - The best available information to determine future probability of a wildfire event is to review historic frequency. According to historic records, 500 wildfires have occurred in Cumberland County between 2005 and 2015 (100% chance of occurring each year).

Vulnerability Assessment

A wildfire has the potential to impact all existing and future buildings, facilities, and populations in the Town of Spring Lake. Impacts of wildfire include building and contents damage, debris clean-up, service disruption and potentially numerous fatalities and injuries. Wildfires can also increase flood risk due to loss of vegetation. WUI Risk, Burn Probability and Rate of Spread are provided on the County level in Chapter 6 Subsection 11.

H.2.10 Winter Storm

Location and Spatial Extent

The entirety of the Town of Spring Lake can be considered at risk to winter storm events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

According to NCEI records, Cumberland County has experienced 30 winter storm events since 1996, respectively. These events are reported to have caused one death due to icy road conditions.

Table H17 - NCEI Records for Winter Storm Events in Cumberland County (1996-2015)

Date	Location	Type of Winter Storm	Deaths/ Injuries	Property Damage	Crop Damage
1/6/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
1/11/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
2/2/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
2/3/1996	Cumberland County	Cold/wind Chill	0/0	$0.00	$0.00
12/23/1998	Cumberland County	Ice Storm	0/0	$0.00	$0.00
1/18/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/22/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/24/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/28/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
12/3/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/3/2002	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00

Date	Location	Type of Winter Storm	Deaths/ Injuries	Property Damage	Crop Damage
12/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/1/2007	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/17/2008	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/19/2008	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/20/2009	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/4/2009	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/29/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/12/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
3/2/2010	Cumberland County	Winter Weather	0/0	$0.00	$0.00
12/16/2010	Cumberland County	Winter Weather	1/0	$0.00	$0.00
12/25/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/10/2011	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/28/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/11/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/12/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/16/2015	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/24/2015	Cumberland County	Winter Weather	0/0	$0.00	$0.00

Source: NCEI, September 2015

Probability of Future Occurrence

Highly Likely - The best available information to determine future probability of a winter storm event is to review historic frequency. According to NCEI, 30 winter storm events have occurred over a 19 year period between 1996 and 2015 resulting in approximately 1.6 significant winter storm events per year.

The probability of a heavy snowfall occurring with that winter storm event is less likely. The figure below presents the probability of 8-inches or more of snowfall to be approximately 12.5% per year for the Cumberland County Region.

Vulnerability Assessment

Potential losses associated with winter storms include the cost of the removal of snow from roadways, debris clean-up, and some indirect losses from power outages, etc. All future structures and infrastructure in the region will be vulnerable to winter storms.

H.3 Priority Risk Index Results

Table H18 summarizes the degree of risk assigned to each identified hazard as it applies to the Town of Spring Lake using the PRI method described in Chapter 6 Subsection 4.

Table H18 - Summary of PRI Results for the Town of Spring Lake

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Dam/Levee Failure	Possible	Limited	Small	Less than 6 hrs	Less than 6 hrs	2.1
Drought	Highly Likely	Minor	Large	More than 24 hrs	More than 1 week	2.8
Earthquake	Possible	Limited	Moderate	Less than 6 hrs	Less than 6 hrs	2.3
Extreme Heat	Possible	Minor	Large	More than 24 hrs	Less than 1 week	2.1
Hurricane/Tropical Storm	Likely	Critical	Large	More than 24 hrs	Less than 24 hrs	2.9
Inland Flooding:	Possible	Critical	Moderate	6 to 12 hours	Less than 1 week	2.7

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
100-/500-year						
Severe Weather (thunderstorm wind, lightning, & hail)	Likely	Limited	Moderate	6 to 12 hours	Less than 6 hrs	2.5
Tornado	Likely	Critical	Small	Less than 6 hrs	Less than 6 hrs	2.7
Wildfire	Highly Likely	Limited	Small	Less than 6 hrs	Less than 1 week	2.9
Winter Storm	Highly Likely	Minor	Moderate	More than 24 hrs	Less than 1 week	2.5

As shown in Table H19, the results from the PRI have been classified into three categories based on the assigned risk value:

- **Low Risk** - Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium Risk** - Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High Risk** - Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread.

Table H19 - Summary of Hazard Risk Classification

Hazard Category	Hazard Type
High Risk (> 2.5)	**Hurricane/Tropical Storm Wildfire Drought Inland Flooding: 100-/500-year Tornado**
Moderate Risk (2.0 – 2.5)	**Severe Weather Winter Storm Earthquake Extreme Heat Dam/Levee Failure**
Low Risk (< 2.0)	**N/A**

H.4 Capability Assessment

This subsection discusses the capability of the Town of Spring Lake to implement hazard mitigation activities. More information on the purpose and methodology used to conduct the assessment can be found in Chapter 7 - Capability Assessment.

H.4.1 Planning and Regulatory Capability

Table H20 lists regulatory capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Spring Lake.

Table H20 - Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Y/N	Date	Comments
Comprehensive Plan	Y	7/27/2009	2030 Growth Plan and 2030 Growth Strategy Map
Zoning Ordinance	Y	11/22/1965	
Subdivision Ordinance	Y	12/14/1970	
Floodplain Ordinance	Y	1/8/2007	
Stormwater Ordinance	Y	6/11/2007	Town of Spring Lake Stormwater Department
Erosion, Sedimentation and Pollution Control Ordinance	N		Handled by NCDENR
Building Code	Y		Spring Lake adopted NC Building Codes
BCEGS Rating	Y	Every 5 years	Done by ISO
Stormwater Management Program	Y	6/11/2007	Town of Spring Lake Stormwater Department
Site Plan Review Requirements	Y	12/14/1970	
Capital Improvements Plan	Y	1/27/2015	
Local Emergency Operations Plan	Y	2006	
Flood Insurance Study or Other Engineering Study for Streams	Y	06/2007	
Repetitive Loss Plan	N		
Elevation Certificates	Y	1/8/2007	

H.4.2 Floodplain Management

The Town of Spring Lake has been a regular participant in the NFIP since February 1997. The following tables reflect NFIP policy and claims data for the County categorized by structure type, flood zone, Pre-FIRM and Post-FIRM.

Table H21 - NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	12	$5,004	$2,364,800	0	$0.00
2-4 Family	0	$0	$0	0	$0.00
All Other Residential	0	$0	$0	0	$0.00
Non-Residential	0	$0	$0	0	$0.00
Total	**12**	**$5,004**	**$2,364,800**	**0**	**$0.00**

Source: FEMA Community Information System, December 2015

Table H22 - NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	7	$3,638	$1,748,800	0	$0.00
A Zones	0	$0	$0	0	$0.00
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00
V Zones	0	$0	$0	0	$0.00
D Zones	0	$0	$0	0	$0.00
B, C & X Zone					
Standard	0	$0	$0	0	$0.00
Preferred	5	$1,366	$616,000	0	$0.00
Total	**12**	**$5,004**	**$2,364,800**	**0**	**$0.00**

Source: FEMA Community Information System, December 2015

Table H23 - NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	0	$0	$0	0	$0
A Zones	0	$0	$0	0	$0
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00
V Zones	0	$0	$0	0	$0.00

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
D Zones	0	$0	$0	0	$0.00
B, C & X Zone	2	$785	$490,000	0	$0.00
Standard	0	$0	$0	0	$0
Preferred	2	$785	$490,000	0	$0.00
Total	**2**	**$785**	**$490,000**	**0**	**$0.00**

Source: FEMA Community Information System, December 2015

Table H24 - NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	7	$3,638	$1,748,800	0	$0.00
A Zones	0	$0	$0	0	$0.00
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00
V Zones	0	$0	$0	0	$0.00
D Zones	0	$0	$0	0	$0.00
B, C & X Zone	3	$581	$126,000	0	$0.00
Standard	0	$0	$0	0	$0.00
Preferred	3	$581	$126,000	0	$0.0
Total	**10**	**$4,219**	**$1,874,800**	**0**	**$0.00**

Source: FEMA Community Information System, December 2015

H.4.3 Administrative and Technical Capability

Table H25 lists administrative capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Spring Lake.

Table H25 - Administrative/Technical Capabilities

Resource	Y/N	Responsible Department
Planner/Engineer with knowledge of land development/land management practices	Y	Cumberland County Planning Department
Engineer/Professional trained in construction practices related to buildings and/or infrastructure	Y	Town of Spring Lake Inspections Department
Planner/Engineer/Scientist with an understanding of natural hazards	N	
Personnel skilled in GIS	Y	Cumberland County Planning Department
Full time building official	Y	Spring Lake Inspections Department
Floodplain Manager	Y	Spring Lake Town Manager
Emergency Manager	Y	Cumberland County Emergency Services

Resource	Y/N	Responsible Department
Grant writer	N	
GIS data – Hazard areas	Y	Cumberland County Information Services
GIS data – Critical facilities	Y	Cumberland County Information Services
GIS data – Land use	Y	Cumberland County Planning & Information Services
GIS data – Building footprints	Y	Cumberland County Information Services
GIS data – Links to Assessor's data	Y	Cumberland County Information Services
Warning Systems/Services	Y	Cumberland County Emergency Services

H.4.4 Fiscal Capability

Table H26 lists fiscal capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Spring Lake.

Table H26 - Fiscal Mitigation Capabilities

Resource	Accessible/Eligible to Use (Y/N)
Community Development Block Grants	Y
Capital improvements project funding	Y
Authority to levy taxes for specific purposes	Y
Fees for water, sewer, gas or electric services	Y
Impact fees for new development	N
Incur debt through general obligation bonds	Y
Incur debt through special tax bonds	Y
Incur debt through private activity bonds	N
Withhold spending in hazard prone areas	Y

H.5 Mitigation Strategy

H.5.1 Status Update for 2011 Mitigation Actions

Table H27 provides a status update for each mitigation action detailed in the 2011 Cumberland County Multi-jurisdictional Hazard Mitigation Plan with the Town of Spring Lake designated as the responsible jurisdiction. This table provides a summary of progress to-date and also notes whether each action is to be deleted or carried forward into the 2016 Regional Plan.

Table H27 - Status of 2011 Mitigation Actions

Town of Spring Lake								
Mitigation Action Number	Action Description	Responsible Department	Current Status			2016 Plan Update		Summary of Progress To-Date
			Complete	In Progress	Not yet Started	Delete Action	Carry Forward	
1	Review And Make Necessary Changes To Town Policies And Procedures Relevant To Hazard Mitigation.	Planning Department	X			X		Policies and procedures were reviewed with no necessary changes identified. Spring Lake does have a water use policy in place for drought conditions.
2	Review And Make Necessary Changes To The Town Zoning Ordinance Pertaining To Hazards And Hazard Mitigation Issues.	Planning Department		X			X	A Conservancy District (CD) was implemented into the zoning ordinance to use on a case by case basis for Special Flood Hazard Areas (SFHA) and other conservation areas. Ordinances will continue to be reviewed and amended on a as need basis.
3	Recommend Adoption of A Town Landscape Ordinance.	Planning Department	X			X		The Town of Spring Lake adopted landscaping provisions into the Zoning Ordinance on October 24, 2005.
4	Review and Make Necessary Changes to the Town Subdivision Ordinance. Recommend Requiring Additional Evacuation Routes from Subdivisions Prone To Hazards	Planning Department	X			X		The Spring Lake Subdivision Ordinance requires an additional access point for group developments. The Town has also adopted Appendix D in the Fire Provisions of the North Carolina Building Code requiring additional access for subdivisions based on the number of residential lots.
5	Consider And Adopt A New Regulation In The Subdivision Ordinance Requiring Underground Utilities In New Developments, Excluding High Voltage Electrical Transmission Lines.	Planning Department	X			X		The Spring Lake Subdivision Ordinance requires that all developments have utilities placed underground where practical, except high voltage electrical lines.
6	Review And Make Necessary Changes To The Town Stormwater Utility Ordinance. Enhance And Expand, The Cleaning And Improvements To Existing Streams And Drainage Ways.	Planning and Water & Wastewater Resources Departments		X			X (Revised)	Stormwater Ordinances are currently under review for compliance with Session Law 2015-264. Draft amendments will be forwarded to the State by March 2016 for initial approval before being reviewed by the Board of Alderman. Ordinances will be reviewed annually and amended as needed.
7	Continue To Enforce The Flood Damage Prevention Ordinance And Periodically Review And Seek Out Improvements To This Ordinance As Needed To Meet The Town Goals.	Planning and Inspections Department		X			X	Spring Lake will review and amend the Flood Damage Prevention Ordinance as needed.
8	Review The Current Developments And Land Uses Within Spring Lake To Identify Potential Hazard Areas. Develop Accurate Maps Using New Flood Information From The State.	Planning, Inspections, and Water and Wastewater Resources Departments	X			X		Used digital FIRM maps to Identify and inventory structures within the 100-year and 500-year floodplain. Incorporated structures into GIS mapping along with floodplain data. Information is updated as needed with any changes to land use or state identified floodplain information.
9	Distribute Educational Materials Through Newsletters And Conduct Public Meetings In Conjunction With Other Agencies Such As The Public Media To Improve The Community Awareness Of Hazards And Hazard Mitigation.	Planning Department	X			X		This item will be incorporated into a new county-wide educational outreach goal to provide more comprehensive education to the citizens of the County.
10	Develop A Multilingual Awareness Program About Hazards And Hazard Mitigation Within The Town Of Spring Lake's Region.	Planning Department	X			X		This item will be incorporated into a new county-wide educational outreach goal to provide more comprehensive education to the citizens of the County.

H.5.2 2016 Mitigation Action Plan

Table H28 identifies 10 new and/or revised mitigation actions for the Town of Spring Lake as well as two unrevised, incomplete actions from Table H27 that are to be carried forward into the 2016 Regional Plan.

Table H28 - 2016 Mitigation Action Plan

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
New/Revised Actions										
1	Maintain an all Hazards public education program to educate and prepare residents for all of the hazards that impact Cumberland County.	To educate, enhance preparedness, and resiliency of Cumberland County and its municipal residents through public education programs that included booths at fairs, festivals and special events, websites, brochures, school programs, and etc.	Cumberland County Emergency Management	$90,000	Local Operating Budget	Short Range	New			All Hazards
2	Explore the Fire Adapted Communities concept implementation in Cumberland County.	To enhance the preparedness and resiliency of Cumberland County and its municipalities to the effects of wild land fire and urban interface, through education; programs such as Fire Wise, Ready Set Go, Community Wildfire Protection Plan; Fuel Management; local codes and ordinances.	Emergency Management, NC Forest Service and Fire Marshalls	Staff Hours	Local Operating Budget and Federal	Medium Range	New	X	X	Wildfire
3	Conduct a countywide infrastructure vulnerability assessment to identify priority needs for updating ill-designed or outdated critical structures.	It has been difficult to locate any comprehensive assessments of local infrastructure in Cumberland and Hoke Counties. With current and projected natural hazard occurrences, it is essential to have an accurate and comprehensive understanding of the current condition of critical facilities to ensure the ability to continue to provide for basic needs, such as water and electrical supplies, transportation routes, waste management, etc.	County/city structural and civil engineers in partnership with U.S. Army Corps of Engineers	Staff Hours	Local Operating Budget and Federal	Medium Range	New	X		All Hazards
4	Conduct social vulnerability analysis to identify priority needs and opportunities that will address the specific problems vulnerable populations face from a range of hazards, including barriers to evacuation, event-specific vulnerabilities, and impediments to recovery.	There exist various groups of individuals that have additional financial, social and/or environmental barriers to being resilient in the face of natural hazard events. In Cumberland County, for example, groups with significant number of people affected include about 10K outdoor workers with direct exposure to extreme heat days, elderly people and especially those with existing cardiovascular conditions, and other low-income and/or minority groups. As natural hazard events increase in intensity and frequency, these groups will find it harder to safely and efficiently get out of harm's way. These groups will also have difficulty in obtaining and paying for essential components to sustain life, such as medications, utilities, and transportation to/from a place of work, etc.	County Social Services Department and/or County Health Department	Staff Hours	Local Operating Budget	Medium Range	New			All Hazards
5	Collaborate with NC Cooperative Extension and NC Agriculture and Forestry Adaptation Working Group to provide more local support and encouragement of forest conservation and farmland preservation measures.	Forests and farmland provide a multitude of social, economic and environmental benefits, that when looked at comprehensively, far outweigh any profit/revenue projections of residential or commercial properties. Outside of development pressure, some of the other major health risks include: (1) increasing wildfire risk, (2) increasing number and types of insects and pests, (3) lack of sufficient water during the growing season for crops, and (4) increasing damage from strong winds and flooding. It is vital, especially in the face of a changing climate, to preserve these working lands and to support higher density development in already existing urban and suburban centers.	County Board of Commissioners, Conservation District Programs, and other land preservation organizations.	Unknown	NC Cooperative Extension, NC Forest Service, US Department of Agriculture and NC Wildlife Resources Commission.	Short Range	N		X	Wildfire, Inland Flooding
6	Include climate predictions from the Cumberland County Climate Resiliency Plan in the Regional Hazard Mitigation Plan.	To properly prepare for natural hazard occurrences, it is important to include predictions that warn of: (1) increasing temperatures and extreme heat days, (2) increasing frequency and strength of severe weather events, (3) more heavy rain/flooding, and (4) more frequent and prolonged drought. Although some climate projections do not pose an immediate threat, any comprehensive mitigation plan for emergency management should at the very least, and by the very nature of the definition of "mitigation", acknowledge the changing climate and possibility of increased extreme weather and flooding events.	The Planning Department/Planning Director for each jurisdiction in Cumberland County	None	Existing FEMA grant	Short Range	New	X	X	All Hazards

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
7	Provide financial assistance for low-income residents to help with power bills and support services during extended periods of high temperature and other extreme weather.	Low-income households face challenges in keeping up with utility bills. Some low-income utility assistance programs are offered, but funds are limited. Extreme weather and increasing temperatures will place even greater pressure on these programs' ability to provide assistance to all those in need, and citizen's lives will be increasingly at stake.	County Health Department	Unknown	NC Department of Health and Human Services and County Department of Health	Medium Range	New			Extreme Heat, Winter Weather
8	Analyze and update local development ordinances to make buildings safer from wind and flooding, more energy and water efficient, more tolerant of heat waves and healthier to live in. Also, provide incentives for making buildings safer from wind, flooding, more energy and water efficient, and healthier to live in.	Energy and water efficiency will be increasingly important to a community's resiliency in the face of natural hazards specifically because of projections of increasing temperatures and extreme heat days, and prolonged periods of drought. Climate projections also state that precipitation will continue to follow a seasonal pattern, whereby hot, Summer months are classified with less precipitation and Winters with more precipitation. Extreme heat days will be specially taxing on buildings with older A/C systems or inadequate insulation and in low-income households where upkeep with rising utility costs could become a burden.	Planning and Code Departments of each jurisdiction	Staff Hours	Local Operating Budget	Medium Range	New		X	Inland Flooding, Hurricane Wind, Thunderstorm Wind, Extreme Heat, Winter Storms
9	Use natural systems, more open space and green surfaces to manage stormwater in a more resilient fashion.	Impervious surfaces typically found in urban centers, such as paved roads, buildings, parking lots and pavement, drastically increase flash floods and urban flooding, which seems to be a common occurrence in Cumberland County. For instance, within a 90 day period (March 1 – June 30, 2015), three flooding incidents were reported due to heavy rainfall events. Use of LID stormwater management practices is mentioned only in summary in the Growth Factor Analysis, stating it "…should be emphasized in sensitive areas…" This, coupled with the naturally flat topography of the eastern portions of the County also help to create excess runoff and subsequent urban flooding issues, especially in the Special Flood Hazard Areas (SFHA) of the County, and specifically around Blounts and Cross Creek, as referenced in various resources.	Engineering Department of each jurisdiction	Staff Hours	Local Operating Budget	Short Range	New		X	Inland Flooding
10	Review and Make Necessary Changes to the Town Stormwater Ordinances. Enhance and Expand, the Cleaning and Improvement to Existing Streams and Drainage Ways.	Continue to annually review and amend the Stormwater Ordinances to provide additional provisions to clean and improve drainage ways and streams to reduce flooding.	Spring Lake Utilities Department	Staff Hours	Local Operating Budget	Long Range	New	X	X	Inland Flooding, Erosion
2011 Mitigation Actions Carried Forward										
1	Review And Make Necessary Changes To The Town Zoning Ordinance Pertaining To Hazards And Hazard Mitigation Issues.	A Conservancy District (CD) was implemented into the zoning ordinance to use on a case by case basis for Special Flood Hazard Areas (SFHA) and other conservation areas. Ordinances will continue to be reviewed and amended on a as need basis.	Spring Lake Planning Department	Staff Hours	Local Operating Budget	Short Range	In Progress	X	X	Inland Flooding
2	Continue To Enforce The Flood Damage Prevention Ordinance And Periodically Review And Seek Out Improvements To This Ordinance As Needed To Meet The Town Goals.	Spring Lake will review and amend the Flood Damage Prevention Ordinance as needed.	Spring Lake Planning and Inspections Departments	Staff Hours	Local Operating Budget	Short Range	In Progress	X	X	Inland Flooding

ANNEX I – TOWN OF STEDMAN

I.1 Community Profile

I.1.1 Geography

The Town of Stedman is within Cumberland County and is located in south central North Carolina in the Upper Coastal Plain. As of the 2010 census, the population was 1,028. Stedman is within the Fayetteville, NC Metropolitan Statistical Area and is part of the Mid-Carolina Council of Governments. Stedman was settled in 1841 and was incorporated in 1917. According to the U.S. Census Bureau, the Town has a total area of approximately 2.1 square miles, all of which is land. Stedman is located in the Cape Fear River basin.

I.1.2 Population and Demographics

Table I1 provides population counts and the percentage change in population since 2010 for the Town of Stedman. Based on the 2010 census, the population density is 490 people per square mile.

Table I1 - Population Counts for Town of Stedman

Jurisdiction	2010 Census Population	2014 Estimated Population	% Change 2010-2014
Town of Stedman	1,028	1,134	10.3

Source: U.S. Census Bureau, 2015

Based on the 2010 Census, the median age of residents in the Town of Stedman is 37.2. The racial characteristics of the Town are presented below in Table I2.

Table I2 - Demographics of Town of Stedman

Jurisdiction	White Persons, Percent (2010)	Black Persons, Percent (2010)	American Indian or Alaska Native, Percent (2010)	Asian Persons, Percent (2010)	Hispanic or Latino Persons, Percent (2010)[1]
Town of Stedman	83.2	11.7	1.1	0.7	3.2

[1]Persons of Hispanic Origin may be of any race, so are also included in applicable race category.
Source: U.S. Census Bureau, 2010

I.2 Risk Assessment

This subsection includes a hazard profile and vulnerability assessment for each of the priority hazards identified in Chapter 5 Subsection 13 (Table 5.20) as they pertain to the Town of Stedman. **Additional information for each hazard can be found in Chapter 5 - Hazard Profiles and Chapter 6 – Vulnerability Assessment.**

I.2.1 Dam/Levee Failure

Location and Spatial Extent

According to the North Carolina Dam Inventory that are no dams located within the Town of Stedman.

Past Occurrences

There are no known past dam failures in the Town of Stedman.

Probability of Future Occurrence

Unlikely - Based on historical occurrence information and zero dams located within the Town, it can reasonably be assumed that the Town of Stedman has less than a 1% chance of this type of event occurring each year.

Vulnerability Assessment

The estimated number of buildings that could potentially be impacted by a dam failure is zero.

C.2.2 Drought

Location and Spatial Extent

Drought cannot be confined to geographic or political boundaries. The Cumberland County region, including the Town of Stedman, is designated as moderately dry.

Past Occurrences

According to the North Carolina Drought Monitor, Cumberland County has experienced drought conditions every year since 2000. Table I3 shows the most severe classification for each year.

Table I3 - Historical Drought Occurrences

Year	Cumberland County
2000	Abnormally Dry
2001	Severe Drought
2002	Extreme Drought
2003	Abnormally Dry
2004	Abnormally Dry
2005	Abnormally Dry
2006	Moderate Drought
2007	Exceptional Drought
2008	Exceptional Drought
2009	Moderate Drought
2010	Moderate Drought
2011	Severe Drought
2012	Moderate Drought
2013	Abnormally Dry
2014	Abnormally Dry
2015	Moderate Drought

Source: NC Drought Monitor

Probability of Future Occurrence

Highly Likely - Based on historical occurrence information (15 records in 15 years), it can reasonably be assumed that the Town of Stedman has a 100% chance of this type of event occurring each year.

Vulnerability Assessment

It is assumed that whereas all buildings and facilities in the planning area would technically be exposed to the drought hazard, there is no significant vulnerability to these buildings on a structural level. Population growth could contribute directly to this hazard, as an increased number of users pull from the available water supply within the region

I.2.3 Earthquake

Location and Spatial Extent

As detailed in Chapter 5 – Hazard Profiles, the Town of Stedman lies within an approximate zone level between 6 and 10% ground acceleration. This indicates that the region as a whole exists within an area of moderate seismic risk.

Past Occurrences

A list of earthquakes that have caused damaged in North Carolina is presented below in Table I4.

Table I4 - Earthquakes Affecting North Carolina

Date	Location	Richter Scale
12/16/1811	NE Arkansas	8.5
01/23/1812	New Madrid, MO	8.4
02/07/1812	New Madrid, MO	8.7
04/29/1852	Wytheville, VA	5.0
08/31/1861	Wilkesboro, NC	5.1
12/23/1875	Central Virginia	5.0
08/31/1886	Charleston, SC	7.3
05/31/1897	Giles County, VA	5.8
01/01/1913	Union County, SC	4.8
02/21/1916	Asheville, NC	5.5
07/08/1926	Mitchell County, NC	5.2
11/03/1928	Newport, TN	4.5
05/13/1957	McDowell County, NC	4.1
07/02/1957	Buncombe County, NC	3.7
11/24/1957	Jackson County, NC	4.0
10/27/1959	Chesterfield, SC	4.0
07/13/1971	Newry, SC	3.8
11/30/1973	Alcoa, TN	4.6
11/13/1976	Southwest Virginia	4.1
05/05/1981	Henderson County, NC	3.5

Source: Wake County 2014 Hazard Mitigation Plan. Information provided by NCEM.

Probability of Future Occurrence

Possible - Based on historical occurrences, the probability of a significant earthquake event affecting the Town of Stedman is possible. There are a total of 20 records in North Carolina over the past 200 years. Therefore, the annual probability level is estimated between 1 and 10 percent.

Vulnerability Assessment

An earthquake has the potential to impact all existing and future buildings, facilities, and populations in the Town of Stedman. Impacts of earthquakes include debris clean-up, service disruption and, in severe cases, fatalities due to building collapse. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 3.

I.2.4 Extreme Heat

Location and Spatial Extent

Extreme heat typically occurs over large areas impacting multiple counties at one time. The entirety of the Town of Stedman is vulnerable to extreme heat.

Past Occurrences

According to the National Climatic Data Center, one instance of extreme heat was recorded in Cumberland County beginning on July 22, 1998, and an additional instance of extreme heat was recorded in Cumberland County beginning on August 10, 2007.

Probability of Future Occurrence

Possible - Based on historical occurrence information (2 records in 65 years), it can reasonably be assumed that an extreme heat event has a 3% chance of occurring each year in the Town of Stedman.

Vulnerability Assessment

Extreme heat is not likely to impact the built environment, but may impact agriculture and pose a threat to humans. Elderly persons, persons with respiratory disabilities, and children may be at risk to experience health problems during extreme heat events, some of which could result in serious illness or death. Potential losses of human life due to extreme heat are not quantified in this Plan. There are no past reports of death or property or crop damage recorded by NCEI.

I.2.5 Hurricane/Tropical Storm

Location and Spatial Extent

All Atlantic and Gulf of Mexico coastal areas are subject to hurricanes. While coastal areas are most directly exposed to land falling hurricanes and tropical storms, their impact can be felt hundreds of miles inland. The entire Town of Stedman region is equally susceptible to hurricanes and tropical storms.

Past Occurrences

Table I5 provides hurricane and tropical storm data reported by NCEI since 1950 for Cumberland County.

Table I5 - NCEI Hurricane and Tropical Storm Events for Cumberland County

Location	Date	Event Type	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland (Zone)	7/12/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/5/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	8/27/1998	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/4/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00

Location	Date	Event Type	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland (Zone)	9/15/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/18/2003	Hurricane (Typhoon)	0/0	$28,000.00	$0.00
Cumberland (Zone)	09/01/2006	Tropical Storm	0/0	$0.00	$0.00
			Total:	**$28,000.00**	**$0.00**

While not included in the NCEI database, Category 4 Hurricane Hazel (DR-28) came ashore in North Carolina on October 15, 1954 and caused substantial damage in the region. With winds reaching 125mph at Grannis Field, Hurricane Hazel caused an estimated $136 million in property damage; 19 deaths; 200 injuries; destruction of 15,000 homes and structures; and damage to 39,000 structures.

Probability of Future Occurrence

Likely - Based on a historical record of eight storm events over a period of 65 years (1950 - 2015), it can reasonably be assumed that this type of event has a 12% chance of occurring each year.

Vulnerability Assessment

In conclusion, hurricane wind has the potential to impact all existing and future buildings, facilities, and populations in the Town of Stedman. Impacts of hurricanes include flood damage, debris clean-up, service disruption and possible fatalities due to flooding or flying debris. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 5.

I.2.6 Inland Flooding: 100-/500-year

Location and Spatial Extent

The Town of Stedman parcel layer and effective 2007 DFIRM were intersected and the flooded parcel area was calculated in acres. Flood zones were assigned to parcels based on the intersection of a parcel with a flood zone. Parcels can be located in multiple flood zones, and only the flooded acreage within the parcel was included in the calculation for each flood zone. Table I6 provides a summary of acreage by flood zone.

Table I6 - Flood Zone Acreage

Jurisdiction	Flood Zone Acreage				
	Zone A (100-year)	Zone AE (100-year)	Zone X Shaded (500-year)	Zone X Unshaded	Total
Town of Stedman	0	67	0	1,001	1,068

The Town of Stedman's parcel and building footprint layers were used to examine the inventory of properties at risk. Table I7 provides the building count, estimated building value, estimated content value and estimated total value for all buildings located within each FEMA flood zone.

Table I7 – Properties at Risk

Occupancy Type	Total Number of Buildings in Floodplain	Total Building Value	Estimated Content Value	Total Value
Zone AE				
Agricultural	0	$0	$0	$0
Commercial	0	$0	$0	$0

Occupancy Type	Total Number of Buildings in Floodplain	Total Building Value	Estimated Content Value	Total Value
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	3	$328,500	$164,250	$0
Total	**3**	**$328,500**	**$164,250**	**$492,750**
Zone X (500-yr)				
Agricultural	0	$0	$0	$0
Commercial	0	$0	$0	$0
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	0	$0	$0	$0
Total	**0**	**$0**	**$0**	**$0**
Zone X (Unshaded)				
Agricultural	0	0	$0	$0
Commercial	39	$11,384,842	$11,446,075	$22,830,916
Education	7	$12,977,698	$12,977,698	$25,955,396
Government	4	$1,300,718	$1,696,020	$2,996,738
Industrial	6	$3,293,625	$4,915,809	$8,209,435
Religious	7	$4,815,433	$4,815,432	$9,630,865
Residential	343	$37,829,938	$18,102,981	$55,932,918
Total	**406**	**$71,602,254**	**$53,954,014**	**$125,556,268**

Source: North Carolina Emergency Management, Risk Management, 2013

Note: Content value estimations are generally based on the FEMA Hazus methodology of estimating value as a percent of improved structure values by property type. The residential property type assumes a content replacement value equal to 50% of the building value. Agricultural, commercial, education, government, and religious property types assume a content replacement value equal to 100% of the building value. The industrial property type assumes a content replacement value equal to 150% of the building value.

Past Occurrences

Table I8 shows detail for flood events reported by the NCEI since 1950 for the Town of Stedman.

Table I8 - NCEI Flooding Events in the Town of Stedman

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Flash Flood	2	$0	$0	0	0
Heavy Rain	0	$0	$0	0	0
Total:	**2**	**$0**	**$0**	**0**	**0**

Source: NCEI, September 2015

Probability of Future Occurrence

Possible - By definition of the 100-year flood event, SFHAs are defined as those areas that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. Properties located in these areas have a 26 percent chance of flooding over the life of a 30-year mortgage.

The 500-year flood area is defined as those areas that will be inundated by the flood event having a 0.2-percent chance of being equaled or exceeded in any given year; it is not the flood that will occur once every 500 years.

Vulnerability Assessment

Properties at Risk to Flooding

The loss estimate for flood is based on the total of improved building value and contents value. Land value is not included in any of the loss estimates as generally the land is not subject to loss from floods. Once the potential value of affected parcels was calculated, damage factors were applied to obtain loss estimates by flood zone.

Table I9 shows the building count, total value, estimated damages and loss ratio for buildings that fall within the Zone AE 100-year floodplain by occupancy type on the community level.

The loss ratio is the loss estimate divided by the total potential exposure (i.e., total of improved and contents value for all buildings located within the Zone AE 100-year floodplain) and displayed as a percentage of loss. FEMA considers loss ratios greater than 10% to be significant and an indicator a community may have more difficulties recovering from an event.

Table I9 - Estimated Building Damage and Content Loss – Flood 100-yr Return Period

Occupancy Type	Total Number of Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Zone AE						
Agricultural	0	$0	$0	$0	$0	n/a
Commercial	0	$0	$0	$0	$0	n/a
Education	0	$0	$0	$0	$0	n/a
Government	0	$0	$0	$0	$0	n/a
Industrial	0	$0	$0	$0	$0	n/a
Religious	0	$0	$0	$0	$0	n/a
Residential	2	$197,761	$6,063	$7,093	$13,156	6.7%
Total	**2**	**$197,761**	**$6,063**	**$7,093**	**$13,156**	**6.7%**

Source: North Carolina Emergency Management, Risk Management, 2013

Critical Facilities at Risk to Flooding

Of significant concern with respect to any disaster event is the location of critical facilities in the planning area. Critical facilities are often defined as those essential services and facilities in a major emergency which, if damaged, would result in severe consequences to public health and safety or a facility which, if unusable or unreachable because of a major emergency, would seriously and adversely affect the health, safety, and welfare of the public. Critical facilities within the Town are detailed in Table I10 and Figure I1 below.

Table I10 – Critical Facilities and FEMA Flood Zones

Facility Name	Address	Facility Type	Estimated 100-yr Flood Depth (Ft)
Zone AE			
n/a	n/a	n/a	n/a
Zone A (100-yr)			
n/a	n/a	n/a	n/a
Zone X Shaded (500-yr)			
n/a	n/a	n/a	n/a
Zone X Unshaded			
Stedman Volunteer Fire Department	7595 Clinton Dr	Fire	n/a
Stedman Elementary School	175 Circle Dr	School	n/a
Stedman Primary Elementary School	155 East First St	School	n/a

Source: Cumberland County Emergency Management Agency, 2015

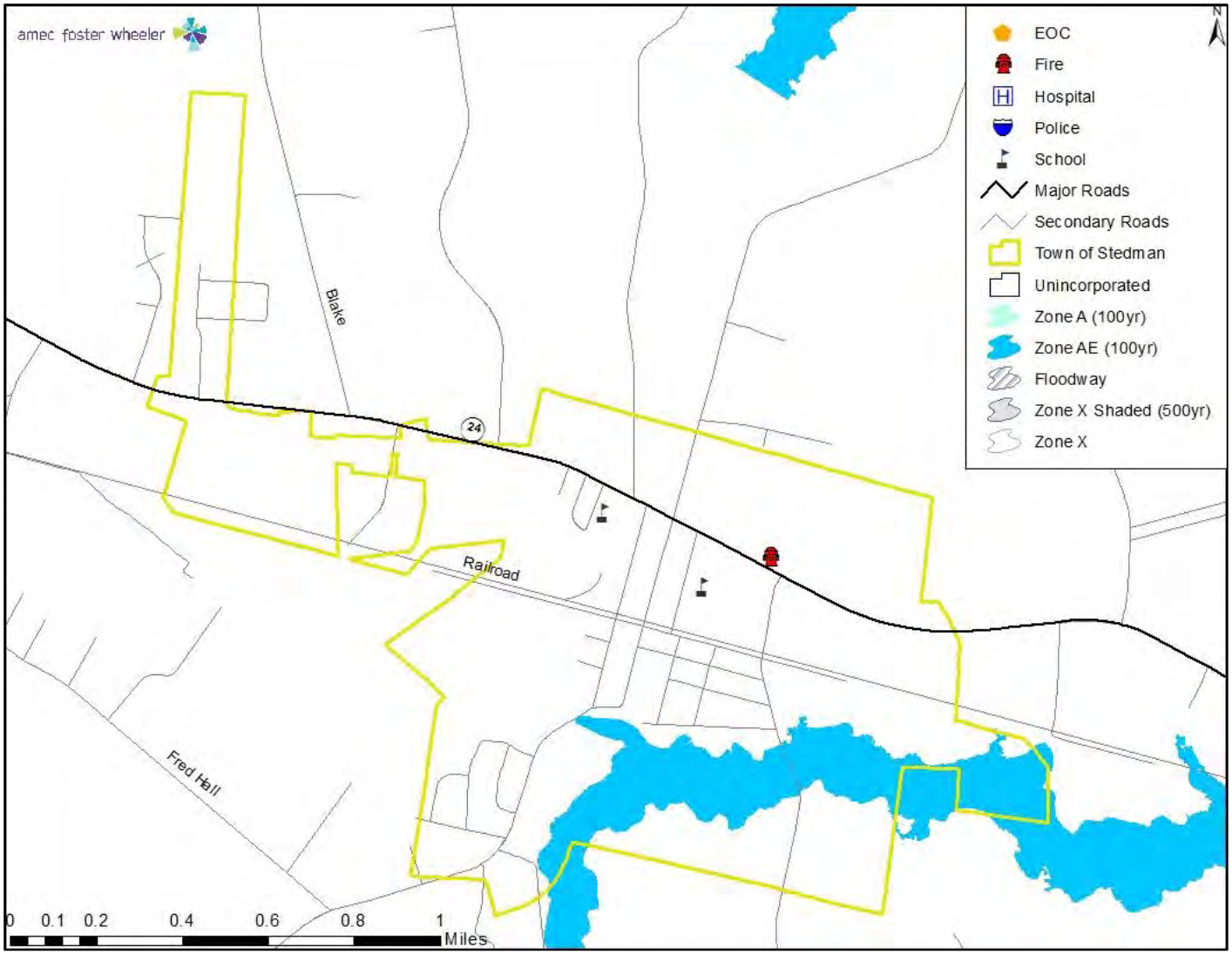


Figure I1 – Town of Stedman Critical Facilities and FEMA Flood Zones

Repetitive Loss Properties

The Town of Stedman contains no repetitive loss properties.

I.2.7 Severe Weather (Thunderstorm Wind, Lightning & Hail)

Location and Spatial Extent

The entirety of the Town of Stedman can be considered at risk to severe weather events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

Table I11 shows detail for severe weather events reported by the NCEI since 1950 for the Town of Stedman. There have been 14 severe weather events causing one injury.

Table I11 - NCEI Severe Weather Events in the Town of Stedman

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Hail	4	$0	$0	0	0
High Wind	0	$0	$0	0	0
Lightning	1	$0	$0	0	1
Strong Wind	0	$0	$0	0	0
Thunderstorm Wind	9	$0	$0	0	0
Total:	**14**	**$0**	**$0**	**0**	**1**

Probability of Future Occurrence

Likely - Given 14 records in 65 years, there is a 22% annual probability that severe weather events, including wind, lightning and hail, will occur in the future.

Vulnerability Assessment

Severe weather events including thunderstorm wind, lightning and hail has the potential to impact all existing and future buildings, facilities, and populations in the Town of Stedman. Impacts of severe weather events include wind damage, debris clean-up, hail damage, and potential fatalities due to lightning strikes and associated fires. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 7.

I.2.8 Tornado

Location and Spatial Extent

The entirety of the Town of Stedman can be considered at risk to tornado events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

According to NCEI records, Cumberland County has experienced 23 tornadoes since 1950. These events are reported to have caused five deaths, 169 injuries and close to $133M in property damage.

Table I12 - NCEI Records for Tornadoes in Cumberland County (1950-2015)

Location	Date	Tornado Fujita Scale	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland Co	4/8/1957	F4	0/8	$250,000.00	$0.00
Cumberland Co	6/2/1959	F0	0/0	$25,000.00	$0.00

Location	Date	Tornado Fujita Scale	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland Co	10/4/1960	F1	0/0	$25,000.00	$0.00
Cumberland Co	9/29/1963	F2	0/0	$250,000.00	$0.00
Cumberland Co	12/26/1964	F1	0/1	$2,500.00	$0.00
Cumberland Co	2/22/1971	F3	2/60	$2,500,000.00	$0.00
Cumberland Co	3/15/1971	F1	0/0	$250,000.00	$0.00
Cumberland Co	5/29/1973	F1	0/0	$25,000.00	$0.00
Cumberland Co	8/2/1974	F0	0/0	$25,000.00	$0.00
Cumberland Co	2/11/1981	F2	0/0	$250,000.00	$0.00
Cumberland Co	3/28/1984	F3	2/11	$25,000,000.00	$0.00
Cumberland Co	3/28/1984	F4	0/0	$2,500,000.00	$0.00
Cumberland Co	5/19/1986	F2	0/0	$250,000.00	$0.00
Cumberland Co	8/28/1988	F1	0/0	$250,000.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	5/28/2000	F0	0/0	$0.00	$0.00
Cumberland Co	12/17/2000	F0	0/0	$0.00	$0.00
Cumberland Co	3/27/2009	EF1	0/0	$225,000.00	$0.00
Cumberland Co	4/16/2011	EF3	1/85	$100,000,000.00	$0.00
Cumberland Co	4/16/2011	EF2	0/4	$250,000.00	$0.00
Cumberland Co	4/29/2014	EF1	0/0	$50,000.00	$0.00
			Total:	**$132,932,750.00**	**$0.00**

Probability of Future Occurrence

Likely - The best available information to determine future probability of a tornado event is to review historic frequency. According to NCEI, 23 tornadoes have impacted Cumberland County over a 65 year period. It can reasonably be assumed that the Town of Stedman has a 35% chance of experiencing a tornado each year.

Vulnerability Assessment

A tornado has the potential to impact all existing and future buildings, facilities, and populations in the Town of Stedman. Impacts of tornadoes include building and contents damage, debris clean-up, service disruption and potentially numerous fatalities and injuries. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 10.

I.2.9 Wildfire

Location and Spatial Extent

Wildfires could potentially occur anywhere in the region. The Wildland Urban Interface (WUI) is described as the area where structures and other human improvements meet and intermingle with undeveloped wildland or vegetative fuels. Population growth within the WUI substantially increases the risk for wildfire. For the Cumberland County, NC project area, it is estimated that 301,884 people or 95 percent of the total project area population (319,404) live within the WUI. The WUI for Cumberland County is

shown within Chapter 5 Subsection 11 (Figure 5.19).

Past Occurrences

Table I13 lists past occurrences of wildfire in Cumberland County since 2005 as provided by the NCFS in September 2015.

Table I13 - Records for Wildfire in Cumberland County

County	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Cumberland	57	75	94	49	21	59	47	24	36	38

Probability of Future Occurrence

Highly Likely - The best available information to determine future probability of a wildfire event is to review historic frequency. According to historic records, 500 wildfires have occurred in Cumberland County between 2005 and 2015 (100% chance of occurring each year).

Vulnerability Assessment

A wildfire has the potential to impact all existing and future buildings, facilities, and populations in the Town of Stedman. Impacts of wildfire include building and contents damage, debris clean-up, service disruption and potentially numerous fatalities and injuries. Wildfires can also increase flood risk due to loss of vegetation. WUI Risk, Burn Probability and Rate of Spread are provided on the County level in Chapter 6 Subsection 11.

I.2.10 Winter Storm

Location and Spatial Extent

The entirety of the Town of Stedman can be considered at risk to winter storm events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

According to NCEI records, Cumberland County has experienced 30 winter storm events since 1996, respectively. These events are reported to have caused one death due to icy road conditions.

Table I14 - NCEI Records for Winter Storm Events in Cumberland County (1996-2015)

Date	Location	Type of Winter Storm	Deaths/ Injuries	Property Damage	Crop Damage
1/6/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
1/11/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
2/2/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
2/3/1996	Cumberland County	Cold/wind Chill	0/0	$0.00	$0.00
12/23/1998	Cumberland County	Ice Storm	0/0	$0.00	$0.00
1/18/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/22/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/24/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/28/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
12/3/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/3/2002	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00
12/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00

Date	Location	Type of Winter Storm	Deaths/ Injuries	Property Damage	Crop Damage
2/1/2007	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/17/2008	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/19/2008	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/20/2009	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/4/2009	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/29/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/12/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
3/2/2010	Cumberland County	Winter Weather	0/0	$0.00	$0.00
12/16/2010	Cumberland County	Winter Weather	1/0	$0.00	$0.00
12/25/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/10/2011	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/28/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/11/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/12/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/16/2015	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/24/2015	Cumberland County	Winter Weather	0/0	$0.00	$0.00

Source: NCEI, September 2015

Probability of Future Occurrence

Highly Likely - The best available information to determine future probability of a winter storm event is to review historic frequency. According to NCEI, 30 winter storm events have occurred over a 19 year period between 1996 and 2015 resulting in approximately 1.6 significant winter storm events per year.

The probability of a heavy snowfall occurring with that winter storm event is less likely. The figure below presents the probability of 8-inches or more of snowfall to be approximately 12.5% per year for the Cumberland County Region.

Vulnerability Assessment

Potential losses associated with winter storms include the cost of the removal of snow from roadways, debris clean-up, and some indirect losses from power outages, etc. All future structures and infrastructure in the region will be vulnerable to winter storms.

I.3 Priority Risk Index Results

Table I15 summarizes the degree of risk assigned to each identified hazard as it applies to the Town of Stedman using the PRI method described in Chapter 6 Subsection 4.

Table I15 - Summary of PRI Results for the Town of Stedman

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Dam/Levee Failure	Unlikely	Minor	Small	Less than 6 hrs	Less than 6 hrs	1.3
Drought	Highly Likely	Minor	Large	More than 24 hrs	More than 1 week	2.8
Earthquake	Possible	Limited	Moderate	Less than 6 hrs	Less than 6 hrs	2.3
Extreme Heat	Possible	Minor	Large	More than 24 hrs	Less than 1 week	2.1
Hurricane/Tropical Storm	Likely	Critical	Large	More than 24 hrs	Less than 24 hrs	2.9
Inland Flooding: 100-/500-year	Possible	Critical	Moderate	6 to 12 hours	Less than 1 week	2.7

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Severe Weather (thunderstorm wind, lightning, & hail)	Likely	Limited	Moderate	6 to 12 hours	Less than 6 hrs	2.5
Tornado	Likely	Critical	Small	Less than 6 hrs	Less than 6 hrs	2.7
Wildfire	Highly Likely	Limited	Small	Less than 6 hrs	Less than 1 week	2.9
Winter Storm	Highly Likely	Minor	Moderate	More than 24 hrs	Less than 1 week	2.5

As shown in Table I16, the results from the PRI have been classified into three categories based on the assigned risk value:

- **Low Risk** - Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium Risk** - Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High Risk** - Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread.

Table I16 - Summary of Hazard Risk Classification

Hazard Category	Hazard Type
High Risk (> 2.5)	**Hurricane/Tropical Storm Wildfire Drought Inland Flooding: 100-/500-year Tornado**
Moderate Risk (2.0 – 2.5)	**Severe Weather Winter Storm Earthquake Extreme Heat**
Low Risk (< 2.0)	**Dam/Levee Failure**

I.4 Capability Assessment

This subsection discusses the capability of the Town of Stedman to implement hazard mitigation activities. More information on the purpose and methodology used to conduct the assessment can be found in Chapter 7 - Capability Assessment.

I.4.1 Planning and Regulatory Capability

Table I17 lists regulatory capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Stedman.

Table I17 - Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Y/N	Date	Comments
Comprehensive Plan	Y	8/6/09	2030 Growth Vision Plan and 2030 Growth Strategy Map
Zoning Ordinance	Y	9/15/87	
Subdivision Ordinance	Y	1/5/95	
Floodplain Ordinance	Y	4/6/00	Adopted Cumberland County Flood Damage Prevention Ordinance
Stormwater Ordinance	N		Handled by NC DENR
Erosion, Sedimentation and Pollution Control Ordinance	N		Handled by NC DENR
Building Code	Y	1970's	2009 International Code and 2012 North Carolina Building Code. Cumberland County Planning & Inspections Department enforces the building code within the Town of Stedman.
BCEGS Rating	Y	Conducted every 5 years	Done by ISO
Stormwater Management Program	N		
Site Plan Review Requirements	Y	1/5/95	
Capital Improvements Plan	N		
Local Emergency Operations Plan	Y	2006	
Flood Insurance Study or Other Engineering Study for Streams	Y	4/6/00	
Repetitive Loss Plan	N		No repetitive loss property located within the Town of Stedman.
Elevation Certificates	Y	8/6/09	2030 Growth Vision Plan and 2030 Growth Strategy Map

I.4.2 Floodplain Management

The Town of Stedman joined the NFIP emergency program in 2000 and has been a regular participant in the NFIP since January 2007. The following tables reflect NFIP policy and claims data for the County categorized by structure type, flood zone, Pre-FIRM and Post-FIRM.

Table I18 - NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	6	$1,805	$1,358,000	0	$0.00
2-4 Family	0	$0	$0	0	$0.00
All Other Residential	0	$0	$0	0	$0.00
Non-Residential	0	$0	$0	0	$0.00
Total	**6**	**$1,805**	**$1,358,000**	**0**	**$0.00**

Source: FEMA Community Information System, December 2015

Table I19 - NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	0	$0	$0	0	$0.00
A Zones	0	$0	$0	0	$0.00
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00
V Zones	0	$0	$0	0	$0.00
D Zones	0	$0	$0	0	$0.00
B, C & X Zone					
Standard	0	$0	$0	0	$0.00
Preferred	6	$1,805	$1,358,000	0	$0.00
Total	**6**	**$1,805**	**$1,358,000**	**0**	**$0.00**

Source: FEMA Community Information System, December 2015

Table I20 - NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	0	$0	$0	0	$0
A Zones	0	$0	$0	0	$0
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
V Zones	0	$0	$0	0	$0.00
D Zones	0	$0	$0	0	$0.00
B, C & X Zone	5	$1,435	$1,008,000	0	$0.00
Standard	0	$0	$0	0	$0
Preferred	5	$1,435	$1,008,000	0	$0.00
Total	**5**	**$1,435**	**$1,008,000**	**0**	**$0.00**

Source: FEMA Community Information System, December 2015

Table I21 - NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	0	$0	$0	0	$0.00
A Zones	0	$0	$0	0	$0.00
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00
V Zones	0	$0	$0	0	$0.00
D Zones	0	$0	$0	0	$0.00
B, C & X Zone	1	$370	$350,000	0	$0.00
Standard	0	$0	$0	0	$0.00
Preferred	1	$370	$350,000	0	$0.0
Total	**1**	**$370**	**$350,000**	**0**	**$0.00**

Source: FEMA Community Information System, December 2015

I.4.3 Administrative and Technical Capability

Table I22 lists administrative capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Stedman.

Table I22 - Administrative/Technical Capabilities

Resource	Y/N	Responsible Department
Planner/Engineer with knowledge of land development/land management practices	Y	Cumberland County Engineering & Public Utilities and Town of Stedman Contract Engineer
Engineer/Professional trained in construction practices related to buildings and/or infrastructure	Y	Cumberland County Engineering & Public Utilities and Town of Stedman Contract Engineer
Planner/Engineer/Scientist with an understanding of natural hazards	Y	Cumberland County Engineering & Public Utilities and Cumberland Planning & Inspections Department
Personnel skilled in GIS	Y	Cumberland County Information Services
Full time building official	Y	Cumberland County Planning & Inspections
Floodplain Manager	Y	Cumberland County Engineering & Public Utilities

Resource	Y/N	Responsible Department
Emergency Manager	Y	Cumberland County Emergency Services
Grant writer	Y	Cumberland County Planning & Inspections and Cumberland County Emergency Services
GIS data – Hazard areas	Y	Cumberland County Information Services
GIS data – Critical facilities	Y	Cumberland County Information Services
GIS data – Land use	Y	Cumberland County Planning & Inspections Department
GIS data – Building footprints	Y	Cumberland County Information Services
GIS data – Links to Assessor's data	Y	Cumberland County Information Services
Warning Systems/Services	Y	Cumberland County Emergency Services - Code Red Program

I.4.4 Fiscal Capability

Table I23 lists fiscal capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Stedman.

Table I23 - Fiscal Mitigation Capabilities

Resource	Accessible/Eligible to Use (Y/N)
Community Development Block Grants	Y
Capital improvements project funding	Y
Authority to levy taxes for specific purposes	Y
Fees for water, sewer, gas or electric services	Y
Impact fees for new development	N
Incur debt through general obligation bonds	Y
Incur debt through special tax bonds	Y
Incur debt through private activity bonds	N
Withhold spending in hazard prone areas	N

I.5 Mitigation Strategy

I.5.1 Status Update for 2011 Mitigation Actions

Table I24 provides a status update for each mitigation action detailed in the 2011 Cumberland County Multi-jurisdictional Hazard Mitigation Plan with the Town of Stedman designated as the responsible jurisdiction. This table provides a summary of progress to-date and also notes whether each action is to be deleted or carried forward into the 2016 Regional Plan.

Table I24 - Status of 2011 Mitigation Actions

Town of Stedman								
Mitigation Action Number	**Action Description**	**Responsible Department**	**Current Status**			**2016 Plan Update**		**Summary of Progress To-Date**
			Complete	**In Progress**	**Not yet Started**	**Delete Action**	**Carry Forward**	
1	Encourage The Use Of Cluster Type Development To Preserve Special Hazard Areas.	Cumberland County Planning Department	X			X		Adopted Zero Lot Line Development standards as part of the Stedman Subdivision Ordinance on December 1, 2005 so that developers can maximize their potential density and not encroach into the Special Flood Hazard Area.
2	Develop Uniform Flood Damage Prevention Ordinance.	Cumberland County Engineering Department			X	X		Adopted revised Cumberland County Flood Damage Prevention Ordinance and FIRM maps on October 19, 2006. Due to the fact that County Flood Damage Prevention Ordinance applies to the Town of Stedman, the Technical Committee recommends that this action be deleted from Town of Stedman's actions **(See action #6 under Unincorporated Area for further explanation for the deletion of this action).**
3	Revise The Subdivision Ordinance To Require That All Utilities Be Placed Underground With The Exception Of High Voltage Electrical Transmission Lines.	Cumberland County Planning Department and Electrical Providers	X			X		Approved an amendment that states "All utilities within a development shall be placed underground except for high voltage electrical lines" on December 1, 2005. Mapping of underground utilities is the responsibility of the electrical providers for the Town.
4	Develop A Program To Ensure Drainage Ways, Culverts And Storm Drains Are Free Of Debris.	Town of Stedman, NC Department of Transportation		X		X		The Town of Stedman ensures that the drainage ways, culverts and storm drains are free of debris on Town streets and property. NC Department of Transportation roads are their responsible for the maintenance of storm drains.
5	Develop A Landscape Ordinance That Will Encourage Protection To Natural Areas Through Design And Provide More Vegetation In Urban Development.	Cumberland County Planning Department	X			X		The Town of Stedman adopted street tree requirements for all developments within the Town on December 12, 2005.
6	Revise The Subdivision Ordinance Requiring Additional Access To Be Used As An Evacuation Route For Developments Located Near Special Hazard Areas.	Cumberland County Planning Department			X		X (Revised)	At this time, Stedman has not adopted an amendment to their Subdivision Ordinance to satisfy this action. The new FIRM of the Town adopted in 2006 indicates a Special Flood Hazard Area along the southern portion of the Town and at this time 68% of those parcels that contain flood area are not developed.
7	Identify Areas That Are Susceptible To Wildfires And Consider Prescribed Fire (Controlling Burning) Management Tool To Reduce The Impact of Wildfire Hazards.	NC Forest Service		X			X (Revised)	Currently the Cumberland County office of Forest Service has developed a draft risk assessment of those areas of Cumberland County (including the Town of Stedman) that are susceptible to wildfires. This risk assessment is general in nature and for in office use only. The NC Forest Service has completed five Community Wildfire Protection Plans for certain areas of Cumberland County.

I.5.2 2016 Mitigation Action Plan

Table I25 identifies 10 new and/or revised mitigation actions for the Town of Stedman. There are no unrevised, incomplete actions from Table I24 that are to be carried forward into the 2016 Regional Plan.

Table I25 - 2016 Mitigation Action Plan

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
New/Revised Actions										
1	Maintain an all Hazards public education program to educate and prepare residents for all of the hazards that impact Cumberland County.	To educate, enhance preparedness, and resiliency of Cumberland County and its municipal residents through public education programs that included booths at fairs, festivals and special events, websites, brochures, school programs, and etc.	Cumberland County Emergency Management	$90,000	Local Operating Budget	Short Range	New			All Hazards
2	Explore the Fire Adapted Communities concept implementation in Cumberland County.	To enhance the preparedness and resiliency of Cumberland County and its municipalities to the effects of wild land fire and urban interface, through education; programs such as Fire Wise, Ready Set Go, Community Wildfire Protection Plan; Fuel Management; local codes and ordinances.	Emergency Management, NC Forest Service and Fire Marshalls	Staff Hours	Local Operating Budget and Federal	Medium Range	New	X	X	Wildfire
3	Conduct a countywide infrastructure vulnerability assessment to identify priority needs for updating ill-designed or outdated critical structures.	It has been difficult to locate any comprehensive assessments of local infrastructure in Cumberland and Hoke Counties. With current and projected natural hazard occurrences, it is essential to have an accurate and comprehensive understanding of the current condition of critical facilities to ensure the ability to continue to provide for basic needs, such as water and electrical supplies, transportation routes, waste management, etc.	County/city structural and civil engineers in partnership with U.S. Army Corps of Engineers	Staff Hours	Local Operating Budget and Federal	Medium Range	New	X		All Hazards
4	Conduct social vulnerability analysis to identify priority needs and opportunities that will address the specific problems vulnerable populations face from a range of hazards, including barriers to evacuation, event-specific vulnerabilities, and impediments to recovery.	There exist various groups of individuals that have additional financial, social and/or environmental barriers to being resilient in the face of natural hazard events. In Cumberland County, for example, groups with significant number of people affected include about 10K outdoor workers with direct exposure to extreme heat days, elderly people and especially those with existing cardiovascular conditions, and other low-income and/or minority groups. As natural hazard events increase in intensity and frequency, these groups will find it harder to safely and efficiently get out of harm's way. These groups will also have difficulty in obtaining and paying for essential components to sustain life, such as medications, utilities, and transportation to/from a place of work, etc.	County Social Services Department and/or County Health Department	Staff Hours	Local Operating Budget	Medium Range	New			All Hazards
5	Collaborate with NC Cooperative Extension and NC Agriculture and Forestry Adaptation Working Group to provide more local support and encouragement of forest conservation and farmland preservation measures.	Forests and farmland provide a multitude of social, economic and environmental benefits, that when looked at comprehensively, far outweigh any profit/revenue projections of residential or commercial properties. Outside of development pressure, some of the other major health risks include: (1) increasing wildfire risk, (2) increasing number and types of insects and pests, (3) lack of sufficient water during the growing season for crops, and (4) increasing damage from strong winds and flooding. It is vital, especially in the face of a changing climate, to preserve these working lands and to support higher density development in already existing urban and suburban centers.	County Board of Commissioners, Conservation District Programs, and other land preservation organizations.	Unknown	NC Cooperative Extension, NC Forest Service, US Department of Agriculture and NC Wildlife Resources Commission.	Short Range	N		X	Wildfire, Inland Flooding
6	Include climate predictions from the Cumberland County Climate Resiliency Plan in the Regional Hazard Mitigation Plan.	To properly prepare for natural hazard occurrences, it is important to include predictions that warn of: (1) increasing temperatures and extreme heat days, (2) increasing frequency and strength of severe weather events, (3) more heavy rain/flooding, and (4) more frequent and prolonged drought. Although some climate projections do not pose an immediate threat, any comprehensive mitigation plan for	The Planning Department/Planning Director for each jurisdiction in Cumberland County	None	Existing FEMA grant	Short Range	New	X	X	All Hazards

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
		emergency management should at the very least, and by the very nature of the definition of "mitigation", acknowledge the changing climate and possibility of increased extreme weather and flooding events.								
7	Provide financial assistance for low-income residents to help with power bills and support services during extended periods of high temperature and other extreme weather.	Low-income households face challenges in keeping up with utility bills. Some low-income utility assistance programs are offered, but funds are limited. Extreme weather and increasing temperatures will place even greater pressure on these programs' ability to provide assistance to all those in need, and citizen's lives will be increasingly at stake.	County Health Department	Unknown	NC Department of Health and Human Services and County Department of Health	Medium Range	New			Extreme Heat, Winter Weather
8	Analyze and update local development ordinances to make buildings safer from wind and flooding, more energy and water efficient, more tolerant of heat waves and healthier to live in. Also, provide incentives for making buildings safer from wind, flooding, more energy and water efficient, and healthier to live in.	Energy and water efficiency will be increasingly important to a community's resiliency in the face of natural hazards specifically because of projections of increasing temperatures and extreme heat days, and prolonged periods of drought. Climate projections also state that precipitation will continue to follow a seasonal pattern, whereby hot, Summer months are classified with less precipitation and Winters with more precipitation. Extreme heat days will be specially taxing on buildings with older A/C systems or inadequate insulation and in low-income households where upkeep with rising utility costs could become a burden.	Planning and Code Departments of each jurisdiction	Staff Hours	Local Operating Budget	Medium Range	New		X	Inland Flooding, Hurricane Wind, Thunderstorm Wind, Extreme Heat, Winter Storms
9	Use natural systems, more open space and green surfaces to manage stormwater in a more resilient fashion.	Impervious surfaces typically found in urban centers, such as paved roads, buildings, parking lots and pavement, drastically increase flash floods and urban flooding, which seems to be a common occurrence in Cumberland County. For instance, within a 90 day period (March 1 – June 30, 2015), three flooding incidents were reported due to heavy rainfall events. Use of LID stormwater management practices is mentioned only in summary in the Growth Factor Analysis, stating it "…should be emphasized in sensitive areas…" This, coupled with the naturally flat topography of the eastern portions of the County also help to create excess runoff and subsequent urban flooding issues, especially in the Special Flood Hazard Areas (SFHA) of the County, and specifically around Blounts and Cross Creek, as referenced in various resources.	Engineering Department of each jurisdiction	Staff Hours	Local Operating Budget	Short Range	New		X	Inland Flooding
10	Revise the Subdivision Ordinance requiring an additional access for emergency vehicles and to be used as an evacuation route for developments located near special flood hazard area.	This will provide an additional access for residents, public safety officials and emergency services to those developments located near a special flood hazard area, while reducing the possibility of a life threatening situation for residents, public officials and emergency services.	Town of Stedman and Cumberland County Planning & Inspections Department	Staff Hours $5,000 - $10,000	Local Operating Budget	Medium Range	New		X	Inland Flooding

ANNEX J – TOWN OF WADE

J.1 Community Profile

J.1.1 Geography

The Town of Wade is within Cumberland County and is located in south central North Carolina in the Upper Coastal Plain. As of the 2010 census, the population was 556. Wade is within the Fayetteville, NC Metropolitan Statistical Area and is part of the Mid-Carolina Council of Governments. Wade was charted in 1869, but this charter was later abandoned. Wade was charted again in 1913. There are no records the town conducted business between 1936 and 1967. In 1967, citizens began work to reactive the Town's charter, holding the Town's first election in 1968. According to the U.S. Census Bureau, the Town has a total area of approximately 1.8 square miles, all of which is land except 0.01 square miles of water. Wade is located in the Cape Fear River basin.

J.1.2 Population and Demographics

Table J1 provides population counts and the percentage change in population since 2010 for the Town of Wade. Based on the 2010 census, the population density is 309 people per square mile.

Table J1 - Population Counts for Town of Wade

Jurisdiction	2010 Census Population	2014 Estimated Population	% Change 2010-2014
Town of Wade	556	477	-14.2

Source: U.S. Census Bureau, 2015

The racial characteristics of the Town are presented below in Table J2.

Table J2 - Demographics of Town of Wade

Jurisdiction	White Persons, Percent (2010)	Black Persons, Percent (2010)	American Indian or Alaska Native, Percent (2010)	Asian Persons, Percent (2010)	Hispanic or Latino Persons, Percent (2010)[1]
Town of Wade	74.6	20.9	0.7	1.3	3.2

[1]Persons of Hispanic Origin may be of any race, so are also included in applicable race category.
Source: U.S. Census Bureau, 2010

J.2 Risk Assessment

This subsection includes a hazard profile and vulnerability assessment for each of the priority hazards identified in Chapter 5 Subsection 13 (Table 5.20) as they pertain to the Town of Wade. **Additional information for each hazard can be found in Chapter 5 - Hazard Profiles and Chapter 6 – Vulnerability Assessment.**

J.2.1 Dam/Levee Failure

Location and Spatial Extent

Table J3 provides details for one dam included in the North Carolina Dam Inventory that is located within the Town of Wade.

Table J3 - North Carolina Dam Inventory for the Town of Wade

Dam Name	NIDID	Height (ft)	NID Storage (acre-feet)	Dam Status	River[1]	Hazard Classification
House Street Dam	NC06061	17.5	17	EXEMPT	Tributary to Cape Fear	Low

Source: North Carolina Dam Inventory, December 2014

[1]If the dam is located on an unnamed stream/tributary, the unnamed stream/tributary name is followed with "-TR". If the dam is located off stream of an unnamed stream/tributary, the unnamed stream/tributary name is followed with "-OS".

Past Occurrences

Table J4 details known past dam failures in the Town of Wade.

Table J4 – Known Dam Failures in the Town of Wade

Location	Date of Occurrence	Result of Failure	Deaths/ Injuries	Property Damage	Details
None Reported	n/a	n/a	n/a	n/a	n/a

Probability of Future Occurrence

Possible - Although there are no past records of dam failure within the Town of Wade, it is possible that this type event could occur in the future.

Vulnerability Assessment

The estimated number and characteristics of buildings that could potentially be impacted by a dam failure are shown in Table J5. **Note: the numbers presented in Table J5 are estimated based on the methodology described in Chapter 6 Subsection 3.1. A dam inundation study including a hydrologic and hydraulic analysis was not performed.**

Table J5 - Properties Potentially at Risk to Dam Failure

Jurisdiction	Number of Buildings in Estimated Inundation Area	Total Building Value	Estimated Content Value	Total Value
Town of Wade	0	$0.00	$0.00	$0.00
Total	**0**	**$0.00**	**$0.00**	**$0.00**

J.2.2 Drought

Location and Spatial Extent

Drought cannot be confined to geographic or political boundaries. The Cumberland County region, including the Town of Wade, is designated as moderately dry.

Past Occurrences

According to the North Carolina Drought Monitor, Cumberland County has experienced drought conditions every year since 2000. Table J6 shows the most severe classification for each year.

Table J6 - Historical Drought Occurrences

Year	Cumberland County
2000	Abnormally Dry
2001	Severe Drought
2002	Extreme Drought
2003	Abnormally Dry
2004	Abnormally Dry
2005	Abnormally Dry
2006	Moderate Drought
2007	Exceptional Drought
2008	Exceptional Drought
2009	Moderate Drought
2010	Moderate Drought
2011	Severe Drought
2012	Moderate Drought
2013	Abnormally Dry
2014	Abnormally Dry
2015	Moderate Drought

Source: NC Drought Monitor

Probability of Future Occurrence

Highly Likely - Based on historical occurrence information (15 records in 15 years), it can reasonably be assumed that the Town of Wade has a 100% chance of this type of event occurring each year.

Vulnerability Assessment

It is assumed that whereas all buildings and facilities in the planning area would technically be exposed to the drought hazard, there is no significant vulnerability to these buildings on a structural level. Population growth could contribute directly to this hazard, as an increased number of users pull from the available water supply within the region

J.2.3 Earthquake

Location and Spatial Extent

As detailed in Chapter 5 – Hazard Profiles, the Town of Wade lies within an approximate zone level between 6 and 10% ground acceleration. This indicates that the region as a whole exists within an area of moderate seismic risk.

Past Occurrences

A list of earthquakes that have caused damaged in North Carolina is presented below in Table J7.

Table J7 - Earthquakes Affecting North Carolina

Date	Location	Richter Scale
12/16/1811	NE Arkansas	8.5

Date	Location	Richter Scale
01/23/1812	New Madrid, MO	8.4
02/07/1812	New Madrid, MO	8.7
04/29/1852	Wytheville, VA	5.0
08/31/1861	Wilkesboro, NC	5.1
12/23/1875	Central Virginia	5.0
08/31/1886	Charleston, SC	7.3
05/31/1897	Giles County, VA	5.8
01/01/1913	Union County, SC	4.8
02/21/1916	Asheville, NC	5.5
07/08/1926	Mitchell County, NC	5.2
11/03/1928	Newport, TN	4.5
05/13/1957	McDowell County, NC	4.1
07/02/1957	Buncombe County, NC	3.7
11/24/1957	Jackson County, NC	4.0
10/27/1959	Chesterfield, SC	4.0
07/13/1971	Newry, SC	3.8
11/30/1973	Alcoa, TN	4.6
11/13/1976	Southwest Virginia	4.1
05/05/1981	Henderson County, NC	3.5

Source: Wake County 2014 Hazard Mitigation Plan. Information provided by NCEM.

Probability of Future Occurrence

Possible - Based on historical occurrences, the probability of a significant earthquake event affecting the Town of Wade is possible. There are a total of 20 records in North Carolina over the past 200 years. Therefore, the annual probability level is estimated between 1 and 10 percent.

Vulnerability Assessment

An earthquake has the potential to impact all existing and future buildings, facilities, and populations in the Town of Wade. Impacts of earthquakes include debris clean-up, service disruption and, in severe cases, fatalities due to building collapse. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 3.

J.2.4 Extreme Heat

Location and Spatial Extent

Extreme heat typically occurs over large areas impacting multiple counties at one time. The entirety of the Town of Wade is vulnerable to extreme heat.

Past Occurrences

According to the National Climatic Data Center, one instance of extreme heat was recorded in Cumberland County beginning on July 22, 1998, and an additional instance of extreme heat was recorded in Cumberland County beginning on August 10, 2007.

Probability of Future Occurrence

Possible - Based on historical occurrence information (2 records in 65 years), it can reasonably be assumed that an extreme heat event has a 3% chance of occurring each year in the Town of Wade.

Vulnerability Assessment

Extreme heat is not likely to impact the built environment, but may impact agriculture and pose a threat to humans. Elderly persons, persons with respiratory disabilities, and children may be at risk to experience health problems during extreme heat events, some of which could result in serious illness or death. Potential losses of human life due to extreme heat are not quantified in this Plan. There are no past reports of death or property or crop damage recorded by NCEI.

J.2.5 Hurricane/Tropical Storm

Location and Spatial Extent

All Atlantic and Gulf of Mexico coastal areas are subject to hurricanes. While coastal areas are most directly exposed to land falling hurricanes and tropical storms, their impact can be felt hundreds of miles inland. The entire Town of Wade region is equally susceptible to hurricanes and tropical storms.

Past Occurrences

Table J8 provides hurricane and tropical storm data reported by NCEI since 1950 for Cumberland County.

Table J8 - NCEI Hurricane and Tropical Storm Events for Cumberland County

Location	Date	Event Type	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland (Zone)	7/12/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/5/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	8/27/1998	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/4/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/15/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00
Cumberland (Zone)	9/18/2003	Hurricane (Typhoon)	0/0	$28,000.00	$0.00
Cumberland (Zone)	09/01/2006	Tropical Storm	0/0	$0.00	$0.00
			Total:	**$28,000.00**	**$0.00**

While not included in the NCEI database, Category 4 Hurricane Hazel (DR-28) came ashore in North Carolina on October 15, 1954 and caused substantial damage in the region. With winds reaching 125mph at Grannis Field, Hurricane Hazel caused an estimated $136 million in property damage; 19 deaths; 200 injuries; destruction of 15,000 homes and structures; and damage to 39,000 structures.

Probability of Future Occurrence

Likely - Based on a historical record of eight storm events over a period of 65 years (1950 - 2015), it can reasonably be assumed that this type of event has a 12% chance of occurring each year.

Vulnerability Assessment

In conclusion, hurricane wind has the potential to impact all existing and future buildings, facilities, and populations in the Town of Wade. Impacts of hurricanes include flood damage, debris clean-up, service disruption and possible fatalities due to flooding or flying debris. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 5.

J.2.6 Inland Flooding: 100-/500-year

Location and Spatial Extent

The Town of Wade parcel layer and effective 2007 DFIRM were intersected and the flooded parcel area was calculated in acres. Flood zones were assigned to parcels based on the intersection of a parcel with a flood zone. Parcels can be located in multiple flood zones, and only the flooded acreage within the parcel was included in the calculation for each flood zone. Table J9 provides a summary of acreage by flood zone.

Table J9 - Flood Zone Acreage

Jurisdiction	Flood Zone Acreage				
	Zone A (100-year)	Zone AE (100-year)	Zone X Shaded (500-year)	Zone X Unshaded	Total
Town of Wade	0	6	29	1,075	1,110

The Town of Wade's parcel and building footprint layers were used to examine the inventory of properties at risk. Table J10 provides the building count, estimated building value, estimated content value and estimated total value for all buildings located within each FEMA flood zone.

Table J10 – Properties at Risk

Occupancy Type	Total Number of Buildings in Floodplain	Total Building Value	Estimated Content Value	Total Value
Zone AE				
Agricultural	0	$0	$0	$0
Commercial	0	$0	$0	$0
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	0	$0	$0	$0
Total	**0**	**$0**	**$0**	**$0**
Zone X (500-yr)				
Agricultural	0	$0	$0	$0
Commercial	1	$585,295	$585,295	$1,170,590
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	0	$0	$0	$0
Total	**1**	**$585,295**	**$585,295**	**$1,170,590**
Zone X (Unshaded)				
Agricultural	11	426390	$426,390	$852,780
Commercial	15	$3,907,176	$4,493,530	$8,400,706
Education	0	$0	$0	$0
Government	4	$1,942,948	$2,731,753	$4,674,701
Industrial	9	$6,664,382	$9,889,214	$16,553,596
Religious	6	$2,965,045	$2,965,044	$5,930,090
Residential	269	$23,354,854	$10,816,719	$34,171,573

Occupancy Type	Total Number of Buildings in Floodplain	Total Building Value	Estimated Content Value	Total Value
Total	**314**	**$39,260,795**	**$31,322,650**	**$70,583,445**

Source: North Carolina Emergency Management, Risk Management, 2013

Note: Content value estimations are generally based on the FEMA Hazus methodology of estimating value as a percent of improved structure values by property type. The residential property type assumes a content replacement value equal to 50% of the building value. Agricultural, commercial, education, government, and religious property types assume a content replacement value equal to 100% of the building value. The industrial property type assumes a content replacement value equal to 150% of the building value.

Past Occurrences

There have been no specific flood events recorded for the Town of Wade. Table J11 shows detail for flood events reported by the NCEI since 1950 for Cumberland County. There have been 46 recorded events in the County causing over $3.6M in property damage.

Table J11 - NCEI Flooding Events in Cumberland County

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Flash Flood	40	$2,132,000	$0	0	0
Flood	2	$0	$0	0	0
Heavy Rain	4	$1,500,000	$0	0	0
Total:	**46**	**$3,632,000**	**$0**	**0**	**0**

Source: NCEI, September 2015

Probability of Future Occurrence

Possible - By definition of the 100-year flood event, SFHAs are defined as those areas that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. Properties located in these areas have a 26 percent chance of flooding over the life of a 30-year mortgage.

The 500-year flood area is defined as those areas that will be inundated by the flood event having a 0.2-percent chance of being equaled or exceeded in any given year; it is not the flood that will occur once every 500 years.

Vulnerability Assessment

Properties at Risk to Flooding

The loss estimate for flood is based on the total of improved building value and contents value. Land value is not included in any of the loss estimates as generally the land is not subject to loss from floods. Once the potential value of affected parcels was calculated, damage factors were applied to obtain loss estimates by flood zone.

Table J12 shows the building count, total value, estimated damages and loss ratio for buildings that fall within the Zone AE 100-year floodplain by occupancy type on the community level.

The loss ratio is the loss estimate divided by the total potential exposure (i.e., total of improved and contents value for all buildings located within the Zone AE 100-year floodplain) and displayed as a percentage of loss. FEMA considers loss ratios greater than 10% to be significant and an indicator a community may have more difficulties recovering from an event.

Table J12 - Estimated Building Damage and Content Loss – Flood 100-yr Return Period

Occupancy Type	Total Number of Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Zone AE						
Agricultural	0	$0	$0	$0	$0	n/a
Commercial	0	$0	$0	$0	$0	n/a
Education	0	$0	$0	$0	$0	n/a
Government	0	$0	$0	$0	$0	n/a
Industrial	0	$0	$0	$0	$0	n/a
Religious	0	$0	$0	$0	$0	n/a
Residential	0	$0	$0	$0	$0	n/a
Total	**0**	**$0**	**$0**	**$0**	**$0**	**n/a**

Source: North Carolina Emergency Management, Risk Management, 2013

Critical Facilities at Risk to Flooding

Of significant concern with respect to any disaster event is the location of critical facilities in the planning area. Critical facilities are often defined as those essential services and facilities in a major emergency which, if damaged, would result in severe consequences to public health and safety or a facility which, if unusable or unreachable because of a major emergency, would seriously and adversely affect the health, safety, and welfare of the public. Critical facilities within the Town are detailed in Table J13 and Figure J1 below.

Table J13 – Critical Facilities and FEMA Flood Zones

Facility Name	Address	Facility Type	Estimated 100-yr Flood Depth (Ft)
Zone AE			
n/a	n/a	n/a	n/a
Zone A (100-yr)			
n/a	n/a	n/a	n/a
Zone X Shaded (500-yr)			
n/a	n/a	n/a	n/a
Zone X Unshaded			
Wade Community Fire Department	3926 Church St	Fire	n/a

Source: Cumberland County Emergency Management Agency, 2015

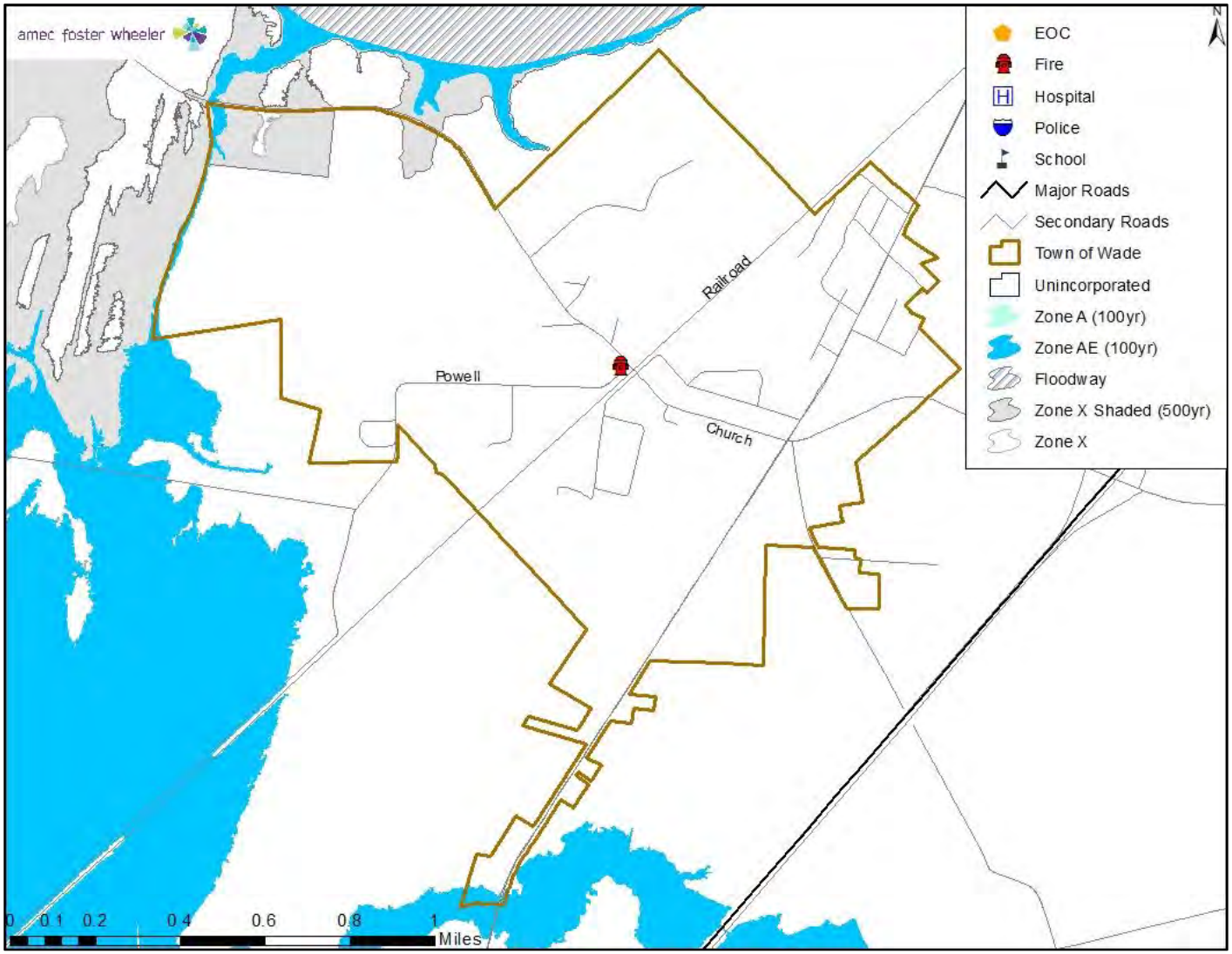


Figure J1 – Town of Wade Critical Facilities and FEMA Flood Zones

Repetitive Loss Properties

The Town of Wade has no repetitive loss properties.

J.2.7 Severe Weather (Thunderstorm Wind, Lightning & Hail)

Location and Spatial Extent

The entirety of the Town of Wade can be considered at risk to severe weather events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

Table J14 shows detail for severe weather events reported by the NCEI since 1950 for the Town of Wade. There have been five recorded events causing $30,000 in property damage.

Table J14 - NCEI Severe Weather Events in the Town of Wade

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Hail	2	$0	$0	0	0
High Wind	0	$0	$0	0	0
Lightning	1	$10,000	$0	0	0
Strong Wind	0	$0	$0	0	0
Thunderstorm Wind	2	$20,000	$0	0	0
Total:	**5**	**$30,000**	**$0**	**0**	**0**

Probability of Future Occurrence

Possible - Given five records in 65 years, there is an eight percent annual probability that severe weather events, including wind, lightning and hail, will occur in the future.

Vulnerability Assessment

Severe weather events including thunderstorm wind, lightning and hail has the potential to impact all existing and future buildings, facilities, and populations in the Town of Wade. Impacts of severe weather events include wind damage, debris clean-up, hail damage, and potential fatalities due to lightning strikes and associated fires. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 7.

J.2.8 Tornado

Location and Spatial Extent

The entirety of the Town of Wade can be considered at risk to tornado events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

According to NCEI records, Cumberland County has experienced 23 tornadoes since 1950. These events are reported to have caused five deaths, 169 injuries and close to $133M in property damage.

Table J15 - NCEI Records for Tornadoes in Cumberland County (1950-2015)

Location	Date	Tornado Fujita Scale	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland Co	4/8/1957	F4	0/8	$250,000.00	$0.00

Location	Date	Tornado Fujita Scale	Deaths/ Injuries	Property Damage	Crop Damage
Cumberland Co	6/2/1959	F0	0/0	$25,000.00	$0.00
Cumberland Co	10/4/1960	F1	0/0	$25,000.00	$0.00
Cumberland Co	9/29/1963	F2	0/0	$250,000.00	$0.00
Cumberland Co	12/26/1964	F1	0/1	$2,500.00	$0.00
Cumberland Co	2/22/1971	F3	2/60	$2,500,000.00	$0.00
Cumberland Co	3/15/1971	F1	0/0	$250,000.00	$0.00
Cumberland Co	5/29/1973	F1	0/0	$25,000.00	$0.00
Cumberland Co	8/2/1974	F0	0/0	$25,000.00	$0.00
Cumberland Co	2/11/1981	F2	0/0	$250,000.00	$0.00
Cumberland Co	3/28/1984	F3	2/11	$25,000,000.00	$0.00
Cumberland Co	3/28/1984	F4	0/0	$2,500,000.00	$0.00
Cumberland Co	5/19/1986	F2	0/0	$250,000.00	$0.00
Cumberland Co	8/28/1988	F1	0/0	$250,000.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	11/4/1992	F0	0/0	$0.00	$0.00
Cumberland Co	5/28/2000	F0	0/0	$0.00	$0.00
Cumberland Co	12/17/2000	F0	0/0	$0.00	$0.00
Cumberland Co	3/27/2009	EF1	0/0	$225,000.00	$0.00
Cumberland Co	4/16/2011	EF3	1/85	$100,000,000.00	$0.00
Cumberland Co	4/16/2011	EF2	0/4	$250,000.00	$0.00
Cumberland Co	4/29/2014	EF1	0/0	$50,000.00	$0.00
			Total:	**$132,932,750.00**	**$0.00**

Probability of Future Occurrence

Likely - The best available information to determine future probability of a tornado event is to review historic frequency. According to NCEI, 23 tornadoes have impacted Cumberland County over a 65 year period. It can reasonably be assumed that the Town of Wade has a 35% chance of experiencing a tornado each year.

Vulnerability Assessment

A tornado has the potential to impact all existing and future buildings, facilities, and populations in the Town of Wade. Impacts of tornadoes include building and contents damage, debris clean-up, service disruption and potentially numerous fatalities and injuries. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 10.

J.2.9 Wildfire

Location and Spatial Extent

Wildfires could potentially occur anywhere in the region. The Wildland Urban Interface (WUI) is described as the area where structures and other human improvements meet and intermingle with undeveloped wildland or vegetative fuels. Population growth within the WUI substantially increases the risk for wildfire. For the Cumberland County, NC project area, it is estimated that 301,884 people or 95 percent

of the total project area population (319,404) live within the WUI. The WUI for Cumberland County is shown within Chapter 5 Subsection 11 (Figure 5.19).

Past Occurrences

Table J16 lists past occurrences of wildfire in Cumberland County since 2005 as provided by the NCFS in September 2015.

Table J16 - Records for Wildfire in Cumberland County

County	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Cumberland	57	75	94	49	21	59	47	24	36	38

Probability of Future Occurrence

Highly Likely - The best available information to determine future probability of a wildfire event is to review historic frequency. According to historic records, 500 wildfires have occurred in Cumberland County between 2005 and 2015 (100% chance of occurring each year).

Vulnerability Assessment

A wildfire has the potential to impact all existing and future buildings, facilities, and populations in the Town of Wade. Impacts of wildfire include building and contents damage, debris clean-up, service disruption and potentially numerous fatalities and injuries. Wildfires can also increase flood risk due to loss of vegetation. WUI Risk, Burn Probability and Rate of Spread are provided on the County level in Chapter 6 Subsection 11.

J.2.10 Winter Storm

Location and Spatial Extent

The entirety of the Town of Wade can be considered at risk to winter storm events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

According to NCEI records, Cumberland County has experienced 30 winter storm events since 1996, respectively. These events are reported to have caused one death due to icy road conditions.

Table J17 - NCEI Records for Winter Storm Events in Cumberland County (1996-2015)

Date	Location	Type of Winter Storm	Deaths/ Injuries	Property Damage	Crop Damage
1/6/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
1/11/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
2/2/1996	Cumberland County	Ice Storm	0/0	$0.00	$0.00
2/3/1996	Cumberland County	Cold/wind Chill	0/0	$0.00	$0.00
12/23/1998	Cumberland County	Ice Storm	0/0	$0.00	$0.00
1/18/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/22/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/24/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/28/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
12/3/2000	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/3/2002	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00

Date	Location	Type of Winter Storm	Deaths/ Injuries	Property Damage	Crop Damage
12/26/2004	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/1/2007	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/17/2008	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/19/2008	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/20/2009	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/4/2009	Cumberland County	Winter Weather	0/0	$0.00	$0.00
1/29/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/12/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
3/2/2010	Cumberland County	Winter Weather	0/0	$0.00	$0.00
12/16/2010	Cumberland County	Winter Weather	1/0	$0.00	$0.00
12/25/2010	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/10/2011	Cumberland County	Winter Storm	0/0	$0.00	$0.00
1/28/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/11/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/12/2014	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/16/2015	Cumberland County	Winter Storm	0/0	$0.00	$0.00
2/24/2015	Cumberland County	Winter Weather	0/0	$0.00	$0.00

Source: NCEI, September 2015

Probability of Future Occurrence

Highly Likely - The best available information to determine future probability of a winter storm event is to review historic frequency. According to NCEI, 30 winter storm events have occurred over a 19 year period between 1996 and 2015 resulting in approximately 1.6 significant winter storm events per year.

The probability of a heavy snowfall occurring with that winter storm event is less likely. The figure below presents the probability of 8-inches or more of snowfall to be approximately 12.5% per year for the Cumberland County Region.

Vulnerability Assessment

Potential losses associated with winter storms include the cost of the removal of snow from roadways, debris clean-up, and some indirect losses from power outages, etc. All future structures and infrastructure in the region will be vulnerable to winter storms.

J.3 Priority Risk Index Results

Table J18 summarizes the degree of risk assigned to each identified hazard as it applies to the Town of Wade using the PRI method described in Chapter 6 Subsection 4.

Table J18 - Summary of PRI Results for the Town of Wade

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Dam/Levee Failure	Possible	Minor	Small	Less than 6 hrs	Less than 6 hrs	1.6
Drought	Highly Likely	Minor	Large	More than 24 hrs	More than 1 week	2.8
Earthquake	Possible	Limited	Moderate	Less than 6 hrs	Less than 6 hrs	2.3
Extreme Heat	Possible	Minor	Large	More than 24 hrs	Less than 1 week	2.1
Hurricane/Tropical Storm	Likely	Critical	Large	More than 24 hrs	Less than 24 hrs	2.9
Inland Flooding:	Possible	Critical	Moderate	6 to 12 hours	Less than 1 week	2.7

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
100-/500-year						
Severe Weather (thunderstorm wind, lightning, & hail)	Possible	Limited	Moderate	6 to 12 hours	Less than 6 hrs	2.2
Tornado	Likely	Critical	Small	Less than 6 hrs	Less than 6 hrs	2.7
Wildfire	Highly Likely	Limited	Small	Less than 6 hrs	Less than 1 week	2.9
Winter Storm	Highly Likely	Minor	Moderate	More than 24 hrs	Less than 1 week	2.5

As shown in Table J19, the results from the PRI have been classified into three categories based on the assigned risk value:

- **Low Risk** - Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium Risk** - Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High Risk** - Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread.

Table J19 - Summary of Hazard Risk Classification

Hazard Category	Hazard Type
High Risk (> 2.5)	**Hurricane/Tropical Storm Wildfire Drought Inland Flooding: 100-/500-year Tornado**
Moderate Risk (2.0 – 2.5)	**Winter Storm Earthquake Severe Weather Extreme Heat**
Low Risk (< 2.0)	**Dam/Levee Failure**

J.4 Capability Assessment

This subsection discusses the capability of the Town of Wade to implement hazard mitigation activities. More information on the purpose and methodology used to conduct the assessment can be found in Chapter 7 - Capability Assessment.

J.4.1 Planning and Regulatory Capability

Table J20 lists regulatory capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Wade.

Table J20 - Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Y/N	Date	Comments
Comprehensive Plan	Y	7/14/09	2030 Growth Vision Plan and 2030 Growth Strategy Map
Zoning Ordinance	Y	10/9/13	
Subdivision Ordinance	Y	3/12/97	
Floodplain Ordinance	Y	4/11/00	Adopted Cumberland County Flood Damage Prevention Ordinance
Stormwater Ordinance	N		Handled by NC DENR
Erosion, Sedimentation and Pollution Control Ordinance	N		Handled by NC DENR
Building Code	Y	1970's	2009 International Code and 2012 North Carolina Building Code. Cumberland County Planning & Inspections Department enforces the building code within the Town of Wade.
BCEGS Rating	Y	Conducted every 5 years	Done by ISO
Stormwater Management Program	N		
Site Plan Review Requirements	Y	3/13/97	
Capital Improvements Plan	N		
Local Emergency Operations Plan	Y	2006	
Flood Insurance Study or Other Engineering Study for Streams	Y	4/11/00	
Repetitive Loss Plan	N		No repetitive loss property located within the Town of Wade.
Elevation Certificates	Y	Since 2000	

J.4.2 Floodplain Management

The Town of Wade joined the NFIP emergency program in 2000 and has been a regular participant in the NFIP since January 2007. The following tables reflect NFIP policy and claims data for the County categorized by structure type, flood zone, Pre-FIRM and Post-FIRM.

Table J21 - NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	1	$348	$280,000	0	$0.00
2-4 Family	0	$0	$0	0	$0.00
All Other Residential	0	$0	$0	0	$0.00
Non-Residential	0	$0	$0	0	$0.00
Total	**1**	**$348**	**$280,000**	**0**	**$0.00**

Source: FEMA Community Information System, December 2015

Table J22 - NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	0	$0	$0	0	$0.00
A Zones	0	$0	$0	0	$0.00
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00
V Zones	0	$0	$0	0	$0.00
D Zones	0	$0	$0	0	$0.00
B, C & X Zone					
Standard	0	$0	$0	0	$0.00
Preferred	1	$348	$280,000	0	$0.00
Total	**1**	**$348**	**$280,000**	**0**	**$0.00**

Source: FEMA Community Information System, December 2015

Table J23 - NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	0	$0	$0	0	$0
A Zones	0	$0	$0	0	$0
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00
V Zones	0	$0	$0	0	$0.00

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
D Zones	0	$0	$0	0	$0.00
B, C & X Zone	1	$348	$280,000	0	$0.00
Standard	0	$0	$0	0	$0
Preferred	1	$348	$280,000	0	$0.00
Total	**1**	**$348**	**$280,000**	**0**	**$0.00**

Source: FEMA Community Information System, December 2015

Table J24 - NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	0	$0	$0	0	$0.00
A Zones	0	$0	$0	0	$0.00
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00
V Zones	0	$0	$0	0	$0.00
D Zones	0	$0	$0	0	$0.00
B, C & X Zone	0	$0	$0	0	$0.00
Standard	0	$0	$0	0	$0.00
Preferred	0	$0	$0	0	$0.0
Total	**0**	**$0**	**$0**	**0**	**$0.00**

Source: FEMA Community Information System, December 2015

J.4.3 Administrative and Technical Capability

Table J25 lists administrative capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Wade.

Table J25 - Administrative/Technical Capabilities

Resource	Y/N	Responsible Department
Planner/Engineer with knowledge of land development/land management practices	Y	Cumberland County Engineering & Public Utilities and Town of Wade Contract Engineer
Engineer/Professional trained in construction practices related to buildings and/or infrastructure	Y	Cumberland County Engineering & Public Utilities and Town of Wade Contract Engineer
Planner/Engineer/Scientist with an understanding of natural hazards	Y	Cumberland County Engineering & Public Utilities and Cumberland Planning & Inspections Department
Personnel skilled in GIS	Y	Cumberland County Information Services
Full time building official	Y	Cumberland County Planning & Inspections
Floodplain Manager	Y	Cumberland County Engineering & Public Utilities
Emergency Manager	Y	Cumberland County Emergency Services

Resource	Y/N	Responsible Department
Grant writer	Y	Cumberland County Planning & Inspections and Cumberland County Emergency Services
GIS data – Hazard areas	Y	Cumberland County Information Services
GIS data – Critical facilities	Y	Cumberland County Information Services
GIS data – Land use	Y	Cumberland County Planning & Inspections Department
GIS data – Building footprints	Y	Cumberland County Information Services
GIS data – Links to Assessor's data	Y	Cumberland County Information Services
Warning Systems/Services	Y	Cumberland County Emergency Services – Code Red Program

J.4.4 Fiscal Capability

Table J26 lists fiscal capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Wade.

Table J26 - Fiscal Mitigation Capabilities

Resource	Accessible/Eligible to Use (Y/N)
Community Development Block Grants	Y
Capital improvements project funding	Y
Authority to levy taxes for specific purposes	Y
Fees for water, sewer, gas or electric services	Y
Impact fees for new development	N
Incur debt through general obligation bonds	Y
Incur debt through special tax bonds	Y
Incur debt through private activity bonds	N
Withhold spending in hazard prone areas	N

J.5 Mitigation Strategy

J.5.1 Status Update for 2011 Mitigation Actions

Table J27 provides a status update for each mitigation action detailed in the 2011 Cumberland County Multi-jurisdictional Hazard Mitigation Plan with the Town of Wade designated as the responsible jurisdiction. This table provides a summary of progress to-date and also notes whether each action is to be deleted or carried forward into the 2016 Regional Plan.

Table J27 - Status of 2011 Mitigation Actions

Town of Wade								
Mitigation Action Number	**Action Description**	**Responsible Department**	**Current Status**			**2016 Plan Update**		**Summary of Progress To-Date**
			Complete	**In Progress**	**Not yet Started**	**Delete Action**	**Carry Forward**	
1	Encourage The Use Of Cluster Type Development To Preserve Special Hazard Areas.	Cumberland County Planning Department	X			X		The Town of Wade amended their Subdivision Ordinance to include Zero Lot Line Development on January 11, 2005. This allows a developer to maximize their potential density and not encroach into the Special Flood Hazard Area.
2	Develop Uniform Flood Damage Prevention Ordinance.	Cumberland County Engineering Department			X	X		The Town of Wade adopted the revised Cumberland County Flood Damage Prevention Ordinance and new FIRM maps on October 17, 2006. Originally the Town had no 100 year Floodplain within its town limits. The new digital FIRM maps adopted by the Town have designated Special Flood Hazard Area within the Town. Also continues compliance with NFIP. **See Unincorporated Area Action #6 for further explanation for the deletion of this action.**
3	Revise Subdivision Ordinance To Require That All Utilities Be Placed Underground With The Exception Of High Voltage Electrical Transmission Lines.	Cumberland County Planning Department	X			X		Currently the Wade Subdivision Ordinance requires "all development shall have utilities placed underground where practical". Mapping of underground electrical utilities is the responsibility of the electrical provider.
4	Develop A Program To Ensure Drainage Ways, Culverts And Storm Drains Are Free Of Debris.	Cumberland County Engineering Department		X		X		The Town of Wade ensures that the drainage ways, culverts and storm drains are free of debris on Town streets and property. The NC Department of Transportation maintains streets that are a part of the State Road system.
5	Develop A Landscape Ordinance That Will Encourage Protection To Natural Areas Through Design And Provide More Vegetation In Urban Development.	Cumberland County Planning Department	X			X		Landscaping requirements are included in the Town of Wade Zoning Ordinance adopted October 2013.
6	Revise Subdivision Ordinance Requiring Additional Access To Be Used As An Evacuation Route For Developments Located Near Special Hazard Areas.	Cumberland County Planning Department			X		X (Revised)	Currently, there are no subdivisions in the Town affected by special flood hazard areas. The Planning Staff will review the Wade's Subdivision Ordinance for any necessary updates pertaining to this action.
7	Identify Areas That Are Susceptible To Wildfires And Consider Prescribed Fire (Controlled Burning) Management Tool To Reduce The Impact Of Wildfire Hazards.	NC Forest Service		X			X (Revised)	Currently the Cumberland County office of Forest Service has developed a draft risk assessment of those areas of Cumberland County (including Town of Wade) that are susceptible to wildfires. This risk assessment is general in nature and for in office use only. The NC Forest Service has completed five Community Wildfire Protection Plans for certain areas of Cumberland County.

J.5.2 2016 Mitigation Action Plan

Table J28 identifies 10 new and/or revised mitigation actions for the Town of Wade. There are no unrevised, incomplete actions from Table J27 that are to be carried forward into the 2016 Regional Plan.

Table J28 - 2016 Mitigation Action Plan

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
New/Revised Actions										
1	Maintain an all Hazards public education program to educate and prepare residents for all of the hazards that impact Cumberland County.	To educate, enhance preparedness, and resiliency of Cumberland County and its municipal residents through public education programs that included booths at fairs, festivals and special events, websites, brochures, school programs, and etc.	Cumberland County Emergency Management	$90,000	Local Operating Budget	Short Range	New			All Hazards
2	Explore the Fire Adapted Communities concept implementation in Cumberland County.	To enhance the preparedness and resiliency of Cumberland County and its municipalities to the effects of wild land fire and urban interface, through education; programs such as Fire Wise, Ready Set Go, Community Wildfire Protection Plan; Fuel Management; local codes and ordinances.	Emergency Management, NC Forest Service and Fire Marshalls	Staff Hours	Local Operating Budget and Federal	Medium Range	New	X	X	Wildfire
3	Conduct a countywide infrastructure vulnerability assessment to identify priority needs for updating ill-designed or outdated critical structures.	It has been difficult to locate any comprehensive assessments of local infrastructure in Cumberland and Hoke Counties. With current and projected natural hazard occurrences, it is essential to have an accurate and comprehensive understanding of the current condition of critical facilities to ensure the ability to continue to provide for basic needs, such as water and electrical supplies, transportation routes, waste management, etc.	County/city structural and civil engineers in partnership with U.S. Army Corps of Engineers	Staff Hours	Local Operating Budget and Federal	Medium Range	New	X		All Hazards
4	Conduct social vulnerability analysis to identify priority needs and opportunities that will address the specific problems vulnerable populations face from a range of hazards, including barriers to evacuation, event-specific vulnerabilities, and impediments to recovery.	There exist various groups of individuals that have additional financial, social and/or environmental barriers to being resilient in the face of natural hazard events. In Cumberland County, for example, groups with significant number of people affected include about 10K outdoor workers with direct exposure to extreme heat days, elderly people and especially those with existing cardiovascular conditions, and other low-income and/or minority groups. As natural hazard events increase in intensity and frequency, these groups will find it harder to safely and efficiently get out of harm's way. These groups will also have difficulty in obtaining and paying for essential components to sustain life, such as medications, utilities, and transportation to/from a place of work, etc.	County Social Services Department and/or County Health Department	Staff Hours	Local Operating Budget	Medium Range	New			All Hazards
5	Collaborate with NC Cooperative Extension and NC Agriculture and Forestry Adaptation Working Group to provide more local support and encouragement of forest conservation and farmland preservation measures.	Forests and farmland provide a multitude of social, economic and environmental benefits, that when looked at comprehensively, far outweigh any profit/revenue projections of residential or commercial properties. Outside of development pressure, some of the other major health risks include: (1) increasing wildfire risk, (2) increasing number and types of insects and pests, (3) lack of sufficient water during the growing season for crops, and (4) increasing damage from strong winds and flooding. It is vital, especially in the face of a changing climate, to preserve these working lands and to support higher density development in already existing urban and suburban centers.	County Board of Commissioners, Conservation District Programs, and other land preservation organizations.	Unknown	NC Cooperative Extension, NC Forest Service, US Department of Agriculture and NC Wildlife Resources Commission.	Short Range	N		X	Wildfire, Inland Flooding
6	Include climate predictions from the Cumberland County Climate Resiliency Plan in the Regional Hazard Mitigation Plan.	To properly prepare for natural hazard occurrences, it is important to include predictions that warn of: (1) increasing temperatures and extreme heat days, (2) increasing frequency and strength of severe weather events, (3) more heavy rain/flooding, and (4) more frequent and prolonged drought. Although some climate projections do not pose an immediate threat, any comprehensive mitigation plan for emergency management should at the very least, and by the very nature of the definition of "mitigation", acknowledge the changing climate and possibility of increased extreme weather and flooding events.	The Planning Department/Planning Director for each jurisdiction in Cumberland County	None	Existing FEMA grant	Short Range	New	X	X	All Hazards

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
7	Provide financial assistance for low-income residents to help with power bills and support services during extended periods of high temperature and other extreme weather.	Low-income households face challenges in keeping up with utility bills. Some low-income utility assistance programs are offered, but funds are limited. Extreme weather and increasing temperatures will place even greater pressure on these programs' ability to provide assistance to all those in need, and citizen's lives will be increasingly at stake.	County Health Department	Unknown	NC Department of Health and Human Services and County Department of Health	Medium Range	New			Extreme Heat, Winter Weather
8	Analyze and update local development ordinances to make buildings safer from wind and flooding, more energy and water efficient, more tolerant of heat waves and healthier to live in. Also, provide incentives for making buildings safer from wind, flooding, more energy and water efficient, and healthier to live in.	Energy and water efficiency will be increasingly important to a community's resiliency in the face of natural hazards specifically because of projections of increasing temperatures and extreme heat days, and prolonged periods of drought. Climate projections also state that precipitation will continue to follow a seasonal pattern, whereby hot, Summer months are classified with less precipitation and Winters with more precipitation. Extreme heat days will be specially taxing on buildings with older A/C systems or inadequate insulation and in low-income households where upkeep with rising utility costs could become a burden.	Planning and Code Departments of each jurisdiction	Staff Hours	Local Operating Budget	Medium Range	New		X	Inland Flooding, Hurricane Wind, Thunderstorm Wind, Extreme Heat, Winter Storms
9	Use natural systems, more open space and green surfaces to manage stormwater in a more resilient fashion.	Impervious surfaces typically found in urban centers, such as paved roads, buildings, parking lots and pavement, drastically increase flash floods and urban flooding, which seems to be a common occurrence in Cumberland County. For instance, within a 90 day period (March 1 – June 30, 2015), three flooding incidents were reported due to heavy rainfall events. Use of LID stormwater management practices is mentioned only in summary in the Growth Factor Analysis, stating it "…should be emphasized in sensitive areas…" This, coupled with the naturally flat topography of the eastern portions of the County also help to create excess runoff and subsequent urban flooding issues, especially in the Special Flood Hazard Areas (SFHA) of the County, and specifically around Blounts and Cross Creek, as referenced in various resources.	Engineering Department of each jurisdiction	Staff Hours	Local Operating Budget	Short Range	New		X	Inland Flooding
10	Revise the Subdivision Ordinance requiring an additional access for emergency vehicles and to be used as an evacuation route for developments located near special flood hazard area.	This will provide an additional access for residents, public safety officials and emergency services to those developments located near a special flood hazard area, while reducing the possibility of a life threatening situation for residents, public officials and emergency services.	Town of Wade and Cumberland County Planning & Inspections Department	Staff Hours $5,000 - $10,000	Local Operating Budget	Medium Range	New		X	Inland Flooding

ANNEX K – HOKE COUNTY UNINCORPORATED AREAS

K.1 Community Profile

K.1.1 Geography

Hoke County is located in south central North Carolina in the Upper Coastal Plain and Sandhills physiographic regions. As of the 2010 census, the population was 46,952. Hoke County is part of the Fayetteville, NC Metropolitan Statistical Area and is part of the Lumber River Council of Governments. Hoke County was established in 1911 from parts of Cumberland County and Robeson County, and the county seat is Raeford. According to the U.S. Census Bureau, the County has a total area of 392.6 square miles of which 391 square miles is land and 1.6 square miles is water. Hoke County is located in the Lumber River basin and Cape Fear River basin.

K.1.2 Population and Demographics

Table K1 provides population counts and the percentage change in population since 2010 for Hoke County Unincorporated Areas. Based on the 2010 census, the population density is 120 people per square mile.

Table K1 - Population Counts for Hoke County Unincorporated Areas

Jurisdiction	2010 Census Population	2014 Estimated Population	% Change 2010-2014
Hoke County	46,952	50,034	6.6

Source: U.S. Census Bureau, 2015

Based on the 2010 Census, the median age of residents in Hoke County is 30.9. The racial characteristics of the County are presented below in Table K2.

Table K2 - Demographics of Hoke County Unincorporated Areas

Jurisdiction	White Persons, Percent (2010)	Black Persons, Percent (2010)	American Indian or Alaska Native, Percent (2010)	Asian Persons, Percent (2010)	Hispanic or Latino Persons, Percent (2010)[1]
Hoke County	45.3	33.5	9.6	1.0	12.4

[1]Persons of Hispanic Origin may be of any race, so are also included in applicable race category.
Source: U.S. Census Bureau, 2010

K.2 Risk Assessment

This subsection includes a hazard profile and vulnerability assessment for each of the priority hazards identified in Chapter 5 Subsection 13 (Table 5.20) as they pertain to Hoke County Unincorporated Areas. **Additional information for each hazard can be found in Chapter 5 - Hazard Profiles and Chapter 6 – Vulnerability Assessment.**

K.2.1 Dam/Levee Failure

Location and Spatial Extent

Table K3 provides details for 29 dams included in the North Carolina Dam Inventory that are located within Hoke County Unincorporated Areas.

Table K3 - North Carolina Dam Inventory for Hoke County Unincorporated Areas

Dam Name	NIDID	Height (ft)	NID Storage (acre-feet)	Dam Status	River[1]	Hazard Classification
Lake Mcarthur Dam	NC00044	20	288	EXEMPT-DOD	Tuckahoe Creek	High
Lupo Lake Dam	NC05151	13	26	IMPOUNDING	Black Branch	High
Mott Lake Dam	NC00039	23	442	EXEMPT-DOD	Nicholson Creek	High
Price Pond Dam	NC05670	21	15	IMPOUNDING	Not Provided	High
Scull Lake Dam	NC05199	22	57	IMPOUNDING	Puppy Creek-Os	High
Sunset Lake Dam	NC05301	11.7	39	BREACHED	Trib. Rockfish Creek	High
Thomas Lake Dam #1	NC05212	14.7	41	BREACHED	Toney Creek	High
Thomas Lake Dam #2	NC05213	12.2	24	IMPOUNDING	Toney Creek-Os	High
Wood Lake Dam	NC03090	19	76	IMPOUNDING	Black Branch-Tr	High
C. Atkins Pond Dam	NC03096	17.4	40	EXEMPT-HB_SIZE	Drowning Creek-Tr	Low
Cameron Pond Dam	NC03087	18	43	EXEMPT-HB_SIZE	Quewhiffle Creek-Tr	Low
Chuchacz Pond Dam	NC03092	20	24	IMPOUNDING	Puppy Creek-Tr	Low
Crouch Pond Dam	NC03086	16	10	EXEMPT-HB_SIZE	Quewhiffle Creek-Tr	Low
Fred Booth Pond Dam	NC03095	15	72	EXEMPT-HB_SIZE	Buffalo Creed	Low
Hendrix Lake Dam	NC00048	15	67	EXEMPT-HB_SIZE	Raft Swamp-Tr	Low
Hodgins Lake Dam	NC00041	8	312	EXEMPT	Big Raft Swamp	Low
Holland Lake Dam	NC00045	20	88	EXEMPT-DOD	James Creek-Tr	Low
John King Dam	NC03093	24.5	53	EXEMPT-HB_SIZE	Quewhiffle Creek-Tr	Low
Kaco-English Dam	NC04812	14	56	EXEMPT	Gully Branch	Low
Lindsay Farms Pond Dam	NC05660	18.8	13	EXEMPT-HB_SIZE	Not Provided	Low
Mcgougan Lake Dam	NC00054	16	67	EXEMPT-HB_SIZE	Rockfish Creek-Tr	Low

Dam Name	NIDID	Height (ft)	NID Storage (acre-feet)	Dam Status	River[1]	Hazard Classification
Mckiethan Lake Dam	NC00046	12	169	EXEMPT	Juniper Creek	Low
Mcneil Lake Dam	NC00040	14	300	EXEMPT	Little Raft Swamp	Low
Mcneil Lake Dam	NC00089	7	154	EXEMPT	Big Marsh Swamp	Low
Rorie Pond Dam	NC03088	24	77	EXEMPT-HB_SIZE	Mountain Creek	Low
Twelve Oaks Pond Dam	NC03089	20	128	EXEMPT-HB_SIZE	Stewart Creek-Tr	Low
Upchurch Milling Co. Dam	NC03094	21	344	EXEMPT	Nicholson Creek-Tr	Low
Wright Lake Dam	NC00047	16	196	EXEMPT-HB_SIZE	Toney Creek	Low
Wright Pond Dam	NC03091	18	22	EXEMPT-HB_SIZE	Cabin Branch	Low

Source: North Carolina Dam Inventory, December 2014

[1]If the dam is located on an unnamed stream/tributary, the unnamed stream/tributary name is followed with "-TR". If the dam is located off stream of an unnamed stream/tributary, the unnamed stream/tributary name is followed with "-OS".

Past Occurrences

Table K4 details known past dam failures in Hoke County Unincorporated Areas.

Table K4 – Known Dam Failures in Hoke County Unincorporated Areas

Location	Date of Occurrence	Result of Failure	Deaths/ Injuries	Property Damage	Details
Upchurch Pond Dam	5/27/2003	Flash Flood	0	None reported	A dam connecting Upchurch Pond and Rockfish Creek in neighboring Cumberland County caused flooding in Hoke County.
					Reconstruction cost estimated at more than $350,000.
					4 additional dams damaged; another 15 overtopped during the rainfall even 4-6” in less than 24 hours).
McLaughlin Lake	9/8/2004	Flood	0	None reported	A dam failure at McLaughlin Lake on September 8, 2004 caused flooding to the Laurinburg Road area, damaging several homes and vehicles.
Edge Lake	10/18/1999	Hurricane Floyd	0	None reported	Downstream homes were evacuated previous night and early the morning of 10/18/1999. A shelter was opened at East Hoke Middle School for evacuated residents.

Location	Date of Occurrence	Result of Failure	Deaths/ Injuries	Property Damage	Details
Sunset Lake Dam	Unknown	Unknown	0	None reported	Break reported.
McLonklin Lake Dam	Unknown	Unknown	0	None reported	Break reported.
All Low Hazards Dams	1950–2009	Various	0	None reported	Local perception is that all low hazard dams in the county seem to have broken at various points in time.

Probability of Future Occurrence

Possible - Based on historical occurrence information (5 records in 65 years), it can reasonably be assumed that Hoke County Unincorporated Areas have an eight percent chance of this type of event occurring each year.

Vulnerability Assessment

The estimated number and characteristics of buildings that could potentially be impacted by a dam failure are shown in Table K5. **Note: the numbers presented in Table K5 are estimated based on the methodology described in Chapter 6 Subsection 3.1. A dam inundation study including a hydrologic and hydraulic analysis was not performed.**

Table K5 - Properties Potentially at Risk to Dam Failure

Jurisdiction	Number of Buildings in Estimated Inundation Area	Total Building Value	Estimated Content Value	Total Value
Hoke County	6	$1,208,523.00	$638,239.56	$1,846,762.56
Total	**6**	**$1,208,523.00**	**$638,239.56**	**$1,846,762.56**

K.2.2 Drought

Location and Spatial Extent

Drought cannot be confined to geographic or political boundaries. The Hoke County region is designated as moderately dry.

Past Occurrences

According to the North Carolina Drought Monitor, Hoke County Unincorporated Areas have experienced drought conditions every year since 2000. Table K6 shows the most severe classification for each year.

Table K6 - Historical Drought Occurrences

Year	Hoke County
2000	Moderate Drought
2001	Severe Drought
2002	Exceptional Drought
2003	Abnormally Dry

Year	Hoke County
2004	Abnormally Dry
2005	Moderate Drought
2006	Moderate Drought
2007	Exceptional Drought
2008	Exceptional Drought
2009	Moderate Drought
2010	Moderate Drought
2011	Severe Drought
2012	Moderate Drought
2013	Moderate Drought
2014	Abnormally Dry
2015	Abnormally Dry

Source: NC Drought Monitor

Probability of Future Occurrence

Highly Likely - Based on historical occurrence information (15 records in 15 years), it can reasonably be assumed that Hoke County Unincorporated Areas have a 100% chance of this type of event occurring each year.

Vulnerability Assessment

It is assumed that whereas all buildings and facilities in the planning area would technically be exposed to the drought hazard, there is no significant vulnerability to these buildings on a structural level. Population growth could contribute directly to this hazard, as an increased number of users pull from the available water supply within the region.

K.2.3 Earthquake

Location and Spatial Extent

As detailed in Chapter 5 – Hazard Profiles, Hoke County Unincorporated Areas lie within an approximate zone level between 6 and 10% ground acceleration. This indicates that the region as a whole exists within an area of moderate seismic risk.

Past Occurrences

A list of earthquakes that have caused damaged in North Carolina is presented below in Table K7.

Table K7 - Earthquakes Affecting North Carolina

Date	Location	Richter Scale
12/16/1811	NE Arkansas	8.5
01/23/1812	New Madrid, MO	8.4
02/07/1812	New Madrid, MO	8.7
04/29/1852	Wytheville, VA	5.0
08/31/1861	Wilkesboro, NC	5.1

Date	Location	Richter Scale
12/23/1875	Central Virginia	5.0
08/31/1886	Charleston, SC	7.3
05/31/1897	Giles County, VA	5.8
01/01/1913	Union County, SC	4.8
02/21/1916	Asheville, NC	5.5
07/08/1926	Mitchell County, NC	5.2
11/03/1928	Newport, TN	4.5
05/13/1957	McDowell County, NC	4.1
07/02/1957	Buncombe County, NC	3.7
11/24/1957	Jackson County, NC	4.0
10/27/1959	Chesterfield, SC	4.0
07/13/1971	Newry, SC	3.8
11/30/1973	Alcoa, TN	4.6
11/13/1976	Southwest Virginia	4.1
05/05/1981	Henderson County, NC	3.5

Source: Wake County 2014 Hazard Mitigation Plan. Information provided by NCEM.

Probability of Future Occurrence

Possible - Based on historical occurrences, the probability of a significant earthquake event affecting Hoke County Unincorporated Areas is possible. There are a total of 20 records in North Carolina over the past 200 years. Therefore, the annual probability level is estimated between 1 and 10 percent.

Vulnerability Assessment

An earthquake has the potential to impact all existing and future buildings, facilities, and populations in Hoke County Unincorporated Areas. Impacts of earthquakes include debris clean-up, service disruption and, in severe cases, fatalities due to building collapse. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 3.

K.2.4 Extreme Heat

Location and Spatial Extent

Extreme heat typically occurs over large areas impacting multiple counties at one time. All of Hoke County Unincorporated Areas are vulnerable to extreme heat.

Past Occurrences

According to the National Climatic Data Center, one instance of extreme heat was recorded in Hoke County beginning on July 22, 1998.

Probability of Future Occurrence

Possible - Based on historical occurrence information (one record in 65 years), it can reasonably be assumed that an extreme heat event has a 2% chance of occurring each year in Hoke County.

Vulnerability Assessment

Extreme heat is not likely to impact the built environment, but may impact agriculture and pose a threat to humans. Elderly persons, persons with respiratory disabilities, and children may be at risk to experience health problems during extreme heat events, some of which could result in serious illness or death. Potential losses of human life due to extreme heat are not quantified in this Plan. There are no past reports of death or property or crop damage recorded by NCEI.

K.2.5 Hurricane/Tropical Storm

Location and Spatial Extent

All Atlantic and Gulf of Mexico coastal areas are subject to hurricanes. While coastal areas are most directly exposed to land falling hurricanes and tropical storms, their impact can be felt hundreds of miles inland. The entire Hoke County region is equally susceptible to hurricanes and tropical storms.

Past Occurrences

Table K8 provides hurricane and tropical storm data reported by NCEI since 1950 for Hoke County.

Table K8 - NCEI Hurricane and Tropical Storm Events for Hoke County

Location	Date	Event Type	Deaths/ Injuries	Property Damage	Crop Damage
Hoke (Zone)	7/12/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Hoke (Zone)	9/5/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Hoke (Zone)	8/27/1998	Hurricane (Typhoon)	0/0	$0.00	$0.00
Hoke (Zone)	9/4/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00
Hoke (Zone)	9/15/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00
			Total:	**$0.00**	**$0.00**

Probability of Future Occurrence

Possible - Based on a historical record of five storm events over a period of 65 years (1950 - 2015), it can reasonably be assumed that this type of event has an eight percent chance of occurring each year.

Vulnerability Assessment

In conclusion, hurricane wind has the potential to impact all existing and future buildings, facilities, and populations in Hoke County Unincorporated Areas. Impacts of hurricanes include flood damage, debris clean-up, service disruption and possible fatalities due to flooding or flying debris. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 5.

K.2.6 Inland Flooding: 100-/500-year

Location and Spatial Extent

The Hoke County parcel layer and effective 2014 DFIRM were intersected and the flooded parcel area was calculated in acres. Flood zones were assigned to parcels based on the intersection of a parcel with a flood zone. Parcels can be located in multiple flood zones, and only the flooded acreage within the parcel was included in the calculation for each flood zone. Table K9 provides a summary of acreage by flood zone.

Table K9 - Flood Zone Acreage

Jurisdiction	Flood Zone Acreage				
	Zone A (100-year)	Zone AE (100-year)	Zone X Shaded (500-year)	Zone X Unshaded	Total
Hoke County Unincorporated Areas	2,420	16,222	513	225,493	244,648

Hoke County's parcel and building footprint layers were used to examine the inventory of properties at risk. Table K10 provides the building count, estimated building value, estimated content value and estimated total value for all buildings located within each FEMA flood zone.

Table K10 - Properties at Risk

Occupancy Type	Total Number of Buildings in Floodplain	Total Building Value	Estimated Content Value	Total Value
Zone A				
Agricultural	0	$0	$0	$0
Commercial	0	$0	$0	$0
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	1	$335,179.64	$167,589.82	$802,769.46
Total	**1**	**$335,179.64**	**$167,589.82**	**$802,769.46**
Zone AE				
Agricultural	6	$297,395	$211,979	$509,374
Commercial	3	$513,676	$513,676	$1,027,351
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	2	$184,807	$184,807	$369,614
Residential	49	$3,429,421	$1,671,660	$5,101,081
Total	**60**	**$4,425,298**	**$2,582,122**	**$7,007,420**
Zone X (500-yr)				
Agricultural	8	$326,212	$240,795	$567,007
Commercial	5	$940,805	$940,805	$1,881,610
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	2	$184,807	$184,807	$369,614
Residential	71	$6,358,048	$3,052,158	$9,410,206
Total	**86**	**$7,809,872**	**$4,418,565**	**$12,228,438**
Zone X (Unshaded)				
Agricultural	984	$93,056,699	$93,026,153	$186,082,852
Commercial	305	$227,226,235	$223,020,931	$450,247,166
Education	65	$127,926,632	$127,843,565	$255,770,197
Government	59	$58,712,906	$70,020,763	$128,733,669
Industrial	56	$36,164,719	$49,524,900	$85,689,619

Occupancy Type	Total Number of Buildings in Floodplain	Total Building Value	Estimated Content Value	Total Value
Religious	148	$232,184,678	$232,184,660	$464,369,338
Residential	17,444	$2,036,672,866	$984,159,851	$3,020,832,716
Total	**19,061**	**$2,811,944,734**	**$1,779,780,822**	**$4,591,725,557**

Source: North Carolina Emergency Management, Risk Management, 2013

Note: Content value estimations are generally based on the FEMA Hazus methodology of estimating value as a percent of improved structure values by property type. The residential property type assumes a content replacement value equal to 50% of the building value. Agricultural, commercial, education, government, and religious property types assume a content replacement value equal to 100% of the building value. The industrial property type assumes a content replacement value equal to 150% of the building value.

Past Occurrences

Table K11 shows detail for flood events reported by the NCEI since 1950 for Hoke County. There have been 19 recorded events causing $160,000 in property damage.

Table K11 - NCEI Flooding Events in Hoke County

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Flash Flood	15	$160,000	$0	0	0
Flood	2	$0	$0	0	0
Heavy Rain	2	$0	$0	0	0
Total:	**19**	**$160,000**	**$0**	**0**	**0**

Source: NCEI, September 2015

Probability of Future Occurrence

Possible - By definition of the 100-year flood event, SFHAs are defined as those areas that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. Properties located in these areas have a 26 percent chance of flooding over the life of a 30-year mortgage.

The 500-year flood area is defined as those areas that will be inundated by the flood event having a 0.2-percent chance of being equaled or exceeded in any given year; it is not the flood that will occur once every 500 years.

Vulnerability Assessment

Properties at Risk to Flooding

The loss estimate for flood is based on the total of improved building value and contents value. Land value is not included in any of the loss estimates as generally the land is not subject to loss from floods. Once the potential value of affected parcels was calculated, damage factors were applied to obtain loss estimates by flood zone.

Table K12 shows the building count, total value, estimated damages and loss ratio for buildings that fall within the Zone AE 100-year floodplain by occupancy type on the community level.

The loss ratio is the loss estimate divided by the total potential exposure (i.e., total of improved and contents value for all buildings located within the Zone AE 100-year floodplain) and displayed as a percentage of loss. FEMA considers loss ratios greater than 10% to be significant and an indicator a

community may have more difficulties recovering from an event.

Table K12 - Estimated Building Damage and Content Loss – Flood 100-yr Return Period

Occupancy Type	Total Number of Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Zone AE						
Agricultural	1	$87,020	$2,903	$4,962	$7,865	9.0%
Commercial	2	$822,753	$74,595	$278,720	$353,316	42.9%
Education	0	$0	$0	$0	$0	n/a
Government	0	$0	$0	$0	$0	n/a
Industrial	0	$0	$0	$0	$0	n/a
Religious	2	$369,614	$8,928	$34,552	$43,480	11.8%
Residential	35	$3,186,551	$97,280	$73,410	$170,690	5.4%
Total	**40**	**$4,465,938**	**$183,707**	**$391,644**	**$575,351**	**12.9%**

Source: North Carolina Emergency Management, Risk Management, 2013

Critical Facilities at Risk to Flooding

Of significant concern with respect to any disaster event is the location of critical facilities in the planning area. Critical facilities are often defined as those essential services and facilities in a major emergency which, if damaged, would result in severe consequences to public health and safety or a facility which, if unusable or unreachable because of a major emergency, would seriously and adversely affect the health, safety, and welfare of the public. Critical facilities within the County are detailed in the Table K13 and Figure K1 below.

Table K13 - Critical Facilities and FEMA Flood Zones

Facility Name	Address	Facility Type	Estimated 100-yr Flood Depth (Ft)
Zone AE			
n/a	n/a	n/a	n/a
Zone A (100-yr)			
n/a	n/a	n/a	n/a
Zone X Shaded (500-yr)			
n/a	n/a	n/a	n/a
Zone X Unshaded			
Pine Hill Fire Department	6390 Calloway Rd	Fire	n/a
Rockfish Fire Station	7600 Phillipi Church Rd	Fire	n/a
Puppy Creek Fire Station	445 Pittman Grove Church Rd	Fire	n/a
Hillcrest Fire Department	HWY 401 Business	Fire	n/a
West Hoke Fire Department	6650 Turnpike Rd	Fire	n/a
Stonewall Rural Fire	5569 St Pauls Rd	Fire	n/a
Antioch Volunteer Fire Department	6931 Red Springs Rd	Fire	n/a

Facility Name	Address	Facility Type	Estimated 100-yr Flood Depth (Ft)
Don D Steed Elementary	800 Phillipi Church Rd	School	n/a
East Hoke Middle School	4702 Fayetteville Rd	School	n/a
Rockfish Hoke Elementary School	6251 Rockfish Rd	School	n/a
Scurlock Elementary School	775 Rockfish Rd	School	n/a
West Hoke Elementary School	6050 Turnpike Rd	School	n/a
Sandy Grove Elementary School	8452 N Old Wire Rd	School	n/a

Source: Cumberland County Emergency Management Agency, 2015

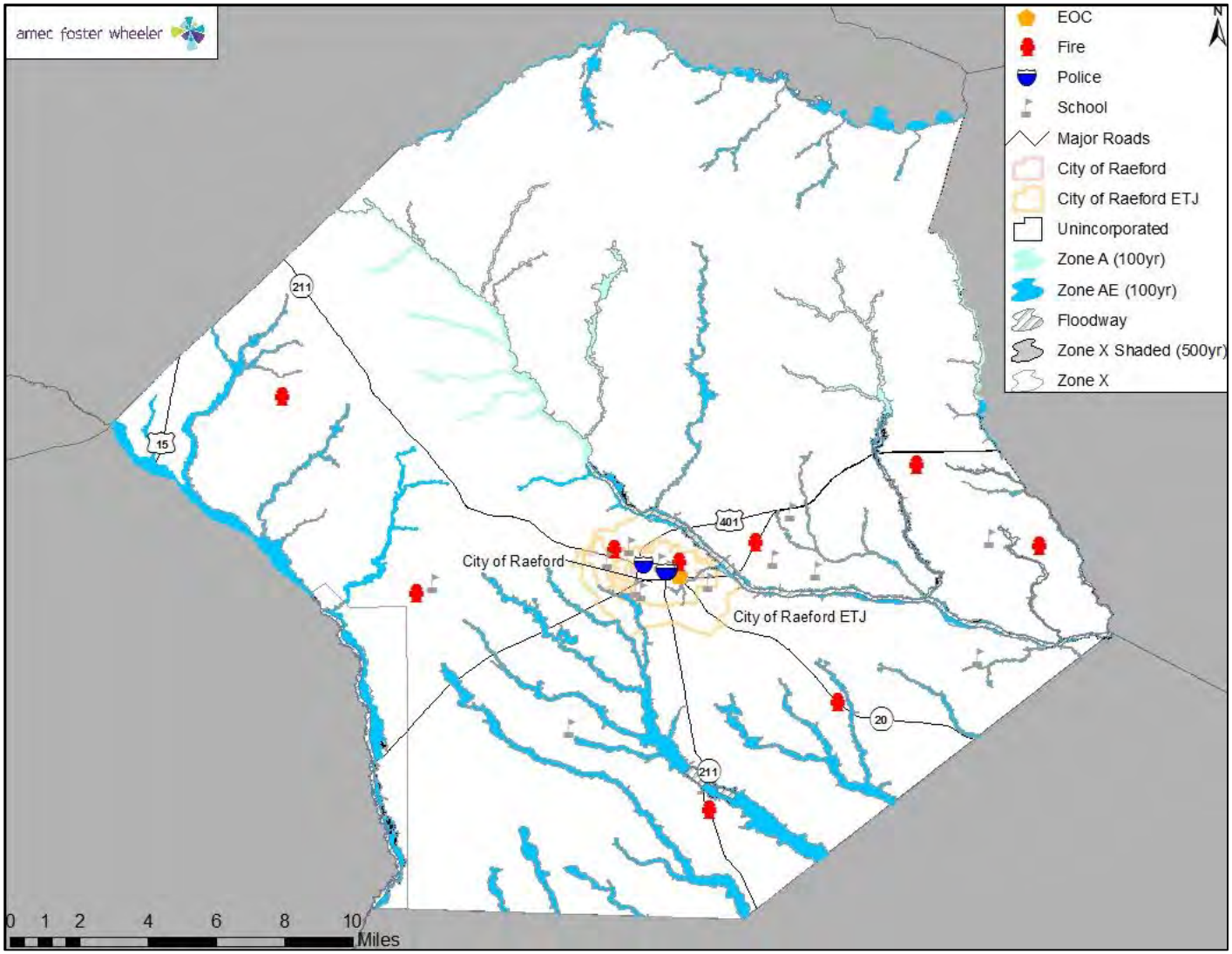


Figure K1 - Hoke County Critical Facilities and FEMA Flood Zones

Repetitive Loss Properties

Hoke County Unincorporated Areas contain no repetitive loss properties.

K.2.7 Severe Weather (Thunderstorm Wind, Lightning & Hail)

Location and Spatial Extent

The entirety of Hoke County Unincorporated Areas can be considered at risk to severe weather events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

Table K14 shows detail for severe weather events reported by the NCEI since 1950 for Hoke County. There have been over 150 recorded events causing four injuries and over $500,000 in property damage.

Table K14 - NCEI Severe Weather Events in Hoke County

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Hail	52	$0	$0	0	0
High Wind	3	$1,000	$0	0	0
Lightning	3	$60,000	$0	0	0
Strong Wind	5	$17,000	$5,000	0	0
Thunderstorm Wind	89	$427,000	$0	0	4
Total:	**152**	**$505,000**	**$5,000**	**0**	**4**

Probability of Future Occurrence

Highly Likely - Given the high number of previous events (152 records in 65 years), it is certain that severe weather events, including wind, lightning and hail, will occur in the future. This results in a probability level of highly likely (100 percent annual probability) for future severe weather events for the entire planning area.

Vulnerability Assessment

Severe weather events including thunderstorm wind, lightning and hail has the potential to impact all existing and future buildings, facilities, and populations in Hoke County Unincorporated Areas. Impacts of severe weather events include wind damage, debris clean-up, hail damage, and potential fatalities due to lightning strikes and associated fires. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 7.

K.2.8 Tornado

Location and Spatial Extent

The entirety of Hoke County Unincorporated Areas can be considered at risk to tornado events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

According to NCEI records, Hoke County has experienced 10 tornadoes since 1950. These events are reported to have caused one deaths, six injuries and close to $1M in property damage.

Table K15 - NCEI Records for Tornadoes in Hoke County (1950-2015)

Location	Date	Tornado Fujita Scale	Deaths/ Injuries	Property Damage	Crop Damage
Hoke Co	3/24/1975	F1	0/0	$250.00	$0.00
Hoke Co	2/11/1981	F2	1/0	$250,000.00	$0.00
Hoke Co	5/19/1986	F2	0/5	$250,000.00	$0.00
Hoke Co	5/19/1988	F0	0/0	$2,500.00	$0.00
Hoke Co	10/23/1990	F0	0/0	$2,500.00	$0.00
Hoke Co	5/19/1995	F1	0/1	$200,000.00	$0.00
Hoke Co	8/29/2004	F0	0/0	$0.00	$0.00
Hoke Co	9/7/2004	F0	0/0	$0.00	$0.00
Hoke Co	9/8/2004	F0	0/0	$0.00	$0.00
Hoke Co	4/16/2011	EF0	0/0	$100,000.00	$0.00
			Total:	**$805,250**	**$0.00**

Probability of Future Occurrence

Likely - The best available information to determine future probability of a tornado event is to review historic frequency. According to NCEI, 10 tornadoes have impacted Hoke County over a 65 year period. It can reasonably be assumed that Hoke County Unincorporated Areas have a 15% chance of experiencing a tornado each year.

Vulnerability Assessment

A tornado has the potential to impact all existing and future buildings, facilities, and populations in Hoke County Unincorporated Areas. Impacts of tornadoes include building and contents damage, debris clean-up, service disruption and potentially numerous fatalities and injuries. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 10.

K.2.9 Wildfire

Location and Spatial Extent

Wildfires could potentially occur anywhere in the region. The Wildland Urban Interface (WUI) is described as the area where structures and other human improvements meet and intermingle with undeveloped wildland or vegetative fuels. Population growth within the WUI substantially increases the risk for wildfire. For the Hoke County, NC project area, it is estimated that 46,629 people or 99 percent of the total project area population (46,964) live within the WUI. The WUI for Hoke County is shown within Chapter 5 Subsection 11 (Figure 5.20).

Past Occurrences

Table K16 lists past occurrences of wildfire in Hoke County since 2005 as provided by the NCFS in September 2015.

Table K16 - Records for Wildfire in Hoke County

County	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Hoke	82	88	116	44	49	66	59	59	26	46

Probability of Future Occurrence

Highly Likely - The best available information to determine future probability of a wildfire event is to review historic frequency. According to historic records, 635 wildfires have occurred in Hoke County between 2005 and 2015 (100% chance of occurring each year).

Vulnerability Assessment

A wildfire has the potential to impact all existing and future buildings, facilities, and populations in Hoke County Unincorporated Areas. Impacts of wildfire include building and contents damage, debris clean-up, service disruption and potentially numerous fatalities and injuries. Wildfires can also increase flood risk due to loss of vegetation. WUI Risk, Burn Probability and Rate of Spread are provided on the County level in Chapter 6 Subsection 11.

K.2.10 Winter Storm

Location and Spatial Extent

The entirety of Hoke County Unincorporated Areas can be considered at risk to winter storm events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

According to NCEI records, Hoke County has experienced 29 winter storm events since 1996, respectively. These events are reported to have caused one death due to icy road conditions.

Table K17 - NCEI Records for Winter Storm Events in Hoke County (1996-2015)

Date	Type of Winter Storm	Deaths/ Injuries	Property Damage	Crop Damage
1/6/1996	Ice Storm	0/0	$0.00	$0.00
1/11/1996	Ice Storm	0/0	$0.00	$0.00
2/2/1996	Ice Storm	0/0	$0.00	$0.00
2/3/1996	Cold/wind Chill	0/0	$0.00	$0.00
1/19/1998	Heavy Snow	0/0	$0.00	$0.00
12/23/1998	Ice Storm	0/0	$0.00	$0.00
1/18/2000	Winter Storm	0/0	$0.00	$0.00
1/22/2000	Winter Storm	0/0	$0.00	$0.00
1/24/2000	Winter Storm	0/0	$0.00	$0.00
1/28/2000	Winter Storm	0/0	$0.00	$0.00
1/3/2002	Winter Storm	0/0	$0.00	$0.00
2/16/2003	Winter Storm	0/0	$0.00	$0.00
1/26/2004	Winter Storm	0/0	$0.00	$0.00
2/26/2004	Winter Storm	0/0	$0.00	$0.00
12/26/2004	Winter Storm	0/0	$0.00	$0.00
2/1/2007	Winter Weather	0/0	$0.00	$0.00
1/17/2008	Winter Weather	0/0	$0.00	$0.00
1/19/2008	Winter Weather	0/0	$0.00	$0.00
1/20/2009	Winter Storm	0/0	$0.00	$0.00
1/30/2010	Winter Storm	0/0	$0.00	$0.00
2/12/2010	Winter Storm	0/0	$0.00	$0.00
12/16/2010	Winter Weather	1/0	$0.00	$0.00
12/25/2010	Winter Storm	0/0	$0.00	$0.00

Date	Type of Winter Storm	Deaths/ Injuries	Property Damage	Crop Damage
1/10/2011	Winter Storm	0/0	$0.00	$0.00
1/28/2014	Winter Storm	0/0	$0.00	$0.00
2/11/2014	Winter Storm	0/0	$0.00	$0.00
2/12/2014	Winter Storm	0/0	$0.00	$0.00
2/16/2015	Winter Storm	0/0	$0.00	$0.00
2/24/2015	Winter Weather	0/0	$0.00	$0.00

Source: NCEI, September 2015

Probability of Future Occurrence

Highly Likely - The best available information to determine future probability of a winter storm event is to review historic frequency. According to NCEI, 29 winter storm events have occurred over a 19 year period between 1996 and 2015 resulting in approximately 1.5 significant winter storm events per year.

The probability of a heavy snowfall occurring with that winter storm event is less likely. The figure below presents the probability of 8-inches or more of snowfall to be approximately 12.5% per year for the Hoke County Region.

Vulnerability Assessment

Potential losses associated with winter storms include the cost of the removal of snow from roadways, debris clean-up, and some indirect losses from power outages, etc. All future structures and infrastructure in the region will be vulnerable to winter storms.

K.3 Priority Risk Index Results

Table K18 summarizes the degree of risk assigned to each identified hazard as it applies to Hoke County Unincorporated Areas using the PRI method described in Chapter 6 Subsection 4.

Table K18 - Summary of PRI Results for Hoke County Unincorporated Areas

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Dam/Levee Failure	Possible	Limited	Small	Less than 6 hrs	Less than 6 hrs	2.1
Drought	Highly Likely	Minor	Large	More than 24 hrs	More than 1 week	2.8
Earthquake	Possible	Limited	Moderate	Less than 6 hrs	Less than 6 hrs	2.3
Extreme Heat	Possible	Minor	Large	More than 24 hrs	Less than 1 week	2.1
Hurricane/Tropical Storm	Possible	Limited	Large	More than 24 hrs	Less than 24 hrs	2.3
Inland Flooding: 100-/500-year	Possible	Limited	Moderate	6 to 12 hours	Less than 1 week	2.4
Severe Weather (thunderstorm wind, lightning, & hail)	Highly Likely	Limited	Moderate	6 to 12 hours	Less than 6 hrs	2.8
Tornado	Likely	Critical	Small	Less than 6 hrs	Less than 6 hrs	2.7
Wildfire	Highly Likely	Limited	Small	Less than 6 hrs	Less than 1 week	2.9
Winter Storm	Highly Likely	Minor	Moderate	More than 24 hrs	Less than 1 week	2.5

As shown in Table K19, the results from the PRI have been classified into three categories based on the assigned risk value:

- **Low Risk** - Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium Risk** - Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High Risk** - Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread.

Table K19 - Summary of Hazard Risk Classification

Hazard Category	Hazard Type
High Risk (> 2.5)	**Wildfire Severe Weather Drought Tornado**
Moderate Risk (2.0 – 2.5)	**Winter Storm Inland Flooding: 100-/500-year Hurricane/Tropical Storm Earthquake Extreme Heat Dam/Levee Failure**
Low Risk (< 2.0)	**N/A**

K.4 Capability Assessment

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

K.4.1 Planning and Regulatory Capability

Table K20 lists regulatory capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Hoke County.

Table K20 - Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Y/N	Date	Comments
Comprehensive Plan	Y	09/08/2008	City of Raeford Land Use Plan
Zoning Ordinance	Y	08/03/2009	Effective 01/01/2010 (UDO)
Subdivision Ordinance	Y	08/03/2009	Included in UDO
Floodplain Ordinance	Y	08/03/2009	Included in UDO
Stormwater Ordinance	Y	08/03/2009	Included in UDO
Erosion, Sedimentation and Pollution Control Ordinance	N		NCDENR
Building Code	Y	2012	City Code Enforcement
BCEGS Rating			
Stormwater Management Program	N		
Site Plan Review Requirements	Y	08/03/2009	UDO Effective Since 01/01/2010
Capital Improvements Plan			In Progress
Local Emergency Operations Plan	Y		Hoke County Emergency Director
Flood Insurance Study or Other Engineering Study for Streams	Y	07/07/2014	
Repetitive Loss Plan	N		None Available
Elevation Certificates	N		None Available

K.4.2 Floodplain Management

Hoke County joined the NFIP emergency program in 1979 and has been a regular participant in the NFIP since December 1989. The following tables reflect NFIP policy and claims data for the County categorized by structure type, flood zone, Pre-FIRM and Post-FIRM.

Table K21 - NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	76	$30,746	$17,622,400	1	$1,985.96
2-4 Family	0	$0	$0	0	$0.00
All Other Residential	0	$0	$0	0	$0.00
Non-Residential	0	$0	$0	0	$0.00
Total	**76**	**$30,746**	**$17,622,400**	**1**	**$1,985.96**

Source: FEMA Community Information System, December 2015

Table K22 - NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	7	$7,380	$1,475,400	0	$0.00
A Zones	0	$0	$0	0	$0.00
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00
V Zones	0	$0	$0	0	$0.00
D Zones	0	$0	$0	0	$0.00
B, C & X Zone					
Standard	1	$977	$194,000	0	$0.00
Preferred	68	$22,389	$15,953,000	1	$1,985.96
Total	**76**	**$30,746**	**$17,622,400**	**1**	**$1,985.96**

Source: FEMA Community Information System, December 2015

Table K23 - NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	3	$1,984	$450,700	0	$0.00
A Zones	0	$0	$0	0	$0.00
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00
V Zones	0	$0	$0	0	$0.00
D Zones	0	$0	$0	0	$0.00
B, C & X Zone	5	$1,564	$1,113,000	0	$1,985.96
Standard	0	$0	$0	0	$0.00
Preferred	5	$1,564	$1,113,000	0	$1,985.96
Total	**8**	**$3,548**	**$1,563,700**	**3**	**$1,985.96**

Source: FEMA Community Information System, December 2015

Table K24 - NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	4	$5,396	$1,024,700	0	$0.00
A Zones	0	$0	$0	0	$0.00
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00
V Zones	0	$0	$0	0	$0.00
D Zones	0	$0	$0	0	$0.00
B, C & X Zone	64	$21,802	$15,034,00	0	$0.00
Standard	1	$977	$194,000	0	$0.00
Preferred	63	$20,825	$14,840,000	0	$0.00
Total	**68**	**$27,198**	**$16,058,700**	**0**	**$0.00**

Source: FEMA Community Information System, December 2015

K.4.3 Administrative and Technical Capability

Table K25 lists administrative capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Hoke County.

Table K25 - Administrative/Technical Capabilities

Resource	Y/N	Responsible Department
Planner/Engineer with knowledge of land development/land management practices		Planning, Zoning & Inspections
Engineer/Professional trained in construction practices related to buildings and/or infrastructure		Planning, Zoning & Inspections Contract
Planner/Engineer/Scientist with an understanding of natural hazards		Planning, Zoning & Inspections Contract
Personnel skilled in GIS		Planning, Zoning & Inspections
Full time building official		Planning, Zoning & Inspections
Floodplain Manager		Planning, Zoning & Inspections
Emergency Manager	Y	Hoke County Emergency Director
Grant writer		Planning, Zoning & Inspections
GIS data – Hazard areas	N	Planning, Zoning & Inspections
GIS data – Critical facilities	Y	Planning, Zoning & Inspections
GIS data – Land use		Planning, Zoning & Inspections
GIS data – Building footprints		Hoke County
GIS data – Links to Assessor's data		Hoke County
Warning Systems/Services	y	Hoke Emergency Communications

K.4.4 Fiscal Capability

Table K26 lists fiscal capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Hoke County.

Table K26 - Fiscal Mitigation Capabilities

Resource	Accessible/Eligible to Use (Y/N)
Community Development Block Grants	Y - LRCOG/PZI
Capital improvements project funding	TBD
Authority to levy taxes for specific purposes	Y
Fees for water, sewer, gas or electric services	Y
Impact fees for new development	N
Incur debt through general obligation bonds	Y
Incur debt through special tax bonds	Y
Incur debt through private activity bonds	Y
Withhold spending in hazard prone areas	N

K.5 Mitigation Strategy

K.5.1 Status Update for 2011 Mitigation Actions

Table K27 provides a status update for each mitigation action detailed in the 2010 Hoke County Multi-jurisdictional Hazard Mitigation Plan with Hoke County designated as the responsible jurisdiction. This table provides a summary of progress to-date and also notes whether each action is to be deleted or carried forward into the 2016 Regional Plan.

Table K27 - Status of 2011 Mitigation Actions

Unincorporated Hoke County								
Mitigation Action Number	**Action Description**	**Responsible Department**	**Status**			**2016 Plan Update**		**Summary of Progress To-Date**
			Complete	**In Progress**	**Not yet Started**	**Delete Action**	**Carry Forward**	
1	Implement dam overspill controls in the Puppy Creek community of Unincorporated Hoke County	Emergency Services			X		X	Working with dam owners to address overspill / overflow issues that can lead to dam-breach -
2	Implement dam overspill and protection controls in the Rockfish community of Unincorporated Hoke County	Emergency Services			X		X	Working with dam owners to address overspill / overflow issues that can lead to dam-breach -
3	Allow for more overspill in the Johnson Mill Road area of Unincorporated Hoke County	Emergency Management			X		X	Working with dam estate representatives to address overspill / overflow issues that can lead to dam-breach and flooding of John Mill Road -
4	Implement dam overspill and protection controls for those dams within or along the Fort Bragg Military Reservation in order to minimize related flooding in the lower portions of Hoke County	Emergency Management			X		X	Will contact Fort Bragg Environmental Office to address this issue with Post Officials responsible
5	Prohibit or limit floodplain development through regulatory and/or incentive-based measures	County Board of Commissioners	X			X		Addressed within our Zoning Ordinance
6	Implement public warning system (i.e., siren, specialty radio receiver, etc.)	Emergency Management	X			X		An Emergency Telephone Notification System (ETNS) is in place capable of contacting all phones with a Hoke County Address – Controlled by the Hoke County 9-1-1 Center
7	Promote flood insurance and floodplain awareness through education and outreach initiatives on a countywide basis	Local Floodplain Administrator			X	X		Hoke County is part of the Flood Assurance Plan -
8	Promote and actively enforce use of proper tie downs and/or appropriate permanent foundation anchors on all manufactured (mobile) homes (both new and existing buildings), focusing first on pre-HUD homes (built prior to 1976) and second on homes built between 1976 and 1993	Building Inspections	X			X		Addressed within our Zoning Ordinance and existing manufactured (Mobile) home owners have been made aware of this recommendation.
9	Enhance inter-departmental coordination within Hoke County and between Hoke County and the City of Raeford with specific attention on plans and ordinances	County Manager's Office		X			X	There is on-going collaboration between the City of Raeford and the County of Hoke Planning Issues
10	Promote safe storm shelters for mobile home parks	Emergency Management	X			X		Addressed in our Emergency Operation Plan and Storm Shelters when needed are made available for Public Use.
11	Acquire or relocate structures and preserve lands subject to repetitive flooding in cooperation with voluntary property owners	Undetermined				X		Affected Homeowners have refused to modify or comply with this action.
12	Ensure zoning ordinance encourages higher densities only outside of known hazards areas	County Board of Commissioners	X			X		Our Hoke County Zoning Ordinance addresses this issue.

Unincorporated Hoke County								
Mitigation Action Number	Action Description	Responsible Department	Status			2016 Plan Update		Summary of Progress To-Date
			Complete	In Progress	Not yet Started	Delete Action	Carry Forward	
13	Use prescribed burning to reduce fuel loads that threaten public safety and property	Fire Marshal's Office & North Carolina Forestry	X			X		NC Open burning laws are promoted on-line, by all FD, NC Forestry as well as the FM Office on an on-going basis
14	Develop a public awareness campaign for use in times of high fire danger	Emergency Management	X			X		We utilized the NC Forestry Readiness Plan and advertise
15	Store digital or hard copies of vital public records in hazard-free offsite locations	County Manager's Office	X			X		Our records are downloaded and stored offsite.
16	Update the countywide 1991 Emergency Operations Plan (EOP), including the Disaster Recovery Plan and Radiological Emergency Plan portions of the EOP	N.C. Division of Emergency Management	X			X		Our EOP was updated in October 2015 and placed on line -
17	Purchase generators to maintain water supply during emergency situations	Building & Utilities	X			X		Each water supply source or storage tanks come with auxiliary power
18	Implement redundant emergency communications system and mobile data communications for both Hoke County and the City of Raeford	Undetermined	X			X		Implemented 800 MHZ – With UHF Back-up
19	Explore potential funding sources to ensure that emergency management and emergency medical services can fully support the population growth expected for Hoke County in the coming years	Emergency Management		X			X	Both Hoke County EM and Cape Fear Valley EMS budget for anticipated annual growth.
20	Review building codes to address assessed structural risks	Building Inspections	X			X		The zoning board complies with this requirement and code enforcement officers assist.
21	Require floodplain certification by surveyor on plats	Inspections & Zoning	X			X		Part of our Zoning Requirements and required on all plot plans to be certified with an Engineer Stamp of approval.
22	Prepare plan for emergency and non-emergency access to secondary, non-State roads	Emergency Management		X			X	Conducted on an-going basis by the Hoke County Emergency Management Agency and NC DOT
23	Survey tributary system to identify areas of blockage or areas prone to blockage	Undetermined		X			X	Hoke County EM is working with Hoke County DOT Officials on an on-going basis
24	Evaluate the feasibility of moving power lines underground in key residential areas of unincorporated Hoke County and encouraging buried power lines in new development	Lumbee River EMC & Duke Power		X			X	Addressed during the building phase of new residential neighborhoods with code enforcement officials as well as through our Zoning Ordinance
25	Investigate potential pre-disaster agreements with out-of-area vendors for supplies and services that will be needed immediately following a disaster event	Emergency Management/County Manager's Office		X			X	This is on-going whereas all standing contracts have an expiration date and are renewed accordingly
26	Incorporate procedures for tracking high water marks following a flood into the Hoke County Emergency Action Plan	Emergency Management		X			X	Assigned to the Hoke County Emergency Management Office for inclusion and updates to the Hoke County EAP.
27	Send appropriate local officials to FEMA's Emergency Management Institute and other emergency management/disaster-related courses for continuing education	Emergency Management		X			X	Because of personnel changes this is an on-going action – All EM Personnel attend EMI & EM Courses on an on-going basis – The entire county and city leadership attended an IEMC Course in 2005

Unincorporated Hoke County								
Mitigation Action Number	Action Description	Responsible Department	Status			2016 Plan Update		Summary of Progress To-Date
			Complete	In Progress	Not yet Started	Delete Action	Carry Forward	
28	Consider development of a Continuity of Operations Plan covering the unincorporated areas of Hoke County and the City of Raeford	Emergency Management	X			X		An updated Continuity of Operations is on file in the EM Office
29	Complete requirements for the Hoke County Animal Protection Plan under the North Carolina State Animal Response Team (SART) program to handle animal-related issues during and immediately following a disaster event	Emergency Management/CART Coordinator		X			X	In Progress – Hoke County has a CAMET and works with the local Animal Control Office and SART as required
30	Fully utilize the Hoke County Emergency Management Web site to convey hazard mitigation-related information to those Hoke County residents with convenient Internet access	Emergency Management	X			X		Our current and past Mitigations Plans are posted on the Hoke County EM Web Page -
31	Investigate and evaluate future participation in the NFIP's Community Rating System (CRS)	Emergency Management	X			X		Hoke County Zoning Departments participates with the CRS.
32	Establish a program to assess risk to and vulnerability of historic properties and major archaeological sites within Hoke County	Undetermined			X		X	This will be addressed by Hoke County EM directly with property owners falling into this category in the coming Fiscal Year.

K.5.2 2016 Mitigation Action Plan

Table K28 identifies 19 new and/or revised mitigation actions for Hoke County Unincorporated Areas as well as 14 unrevised, incomplete actions from Table K27 that are to be carried forward into the 2016 Regional Plan.

Table K28 - 2016 Mitigation Action Plan

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
New/Revised Actions										
1	Conduct a countywide infrastructure vulnerability assessment to identify priority needs for updating ill-designed or outdated critical structures.	It has been difficult to locate any comprehensive assessments of local infrastructure in Cumberland and Hoke Counties. With current and projected natural hazard occurrences, it is essential to have an accurate and comprehensive understanding of the current condition of critical facilities to ensure the ability to continue to provide for basic needs, such as water and electrical supplies, transportation routes, waste management, etc.	County/city structural and civil engineers in partnership with U.S. Army Corps of Engineers	Staff Hours	Local Operating Budget and Federal	Medium Range	New	X		All Hazards
2	Conduct social vulnerability analysis to identify priority needs and opportunities that will address the specific problems vulnerable populations face from a range of hazards, including barriers to evacuation, event-specific vulnerabilities, and impediments to recovery.	There exist various groups of individuals that have additional financial, social and/or environmental barriers to being resilient in the face of natural hazard events. As natural hazard events increase in intensity and frequency, these groups will find it harder to safely and efficiently get out of harm's way. These groups will also have difficulty in obtaining and paying for essential components to sustain life, such as medications, utilities, and transportation to/from a place of work, etc.	County Social Services Department and/or County Health Department	Staff Hours	Local Operating Budget	Medium Range	New			All Hazards
3	Collaborate with NC Cooperative Extension and NC Agriculture and Forestry Adaptation Working Group to provide more local support and encouragement of forest conservation and farmland preservation measures.	Forests and farmland provide a multitude of social, economic and environmental benefits, that when looked at comprehensively, far outweigh any profit/revenue projections of residential or commercial properties. Outside of development pressure, some of the other major health risks include: (1) increasing wildfire risk, (2) increasing number and types of insects and pests, (3) lack of sufficient water during the growing season for crops, and (4) increasing damage from strong winds and flooding. It is vital, especially in the face of a changing climate, to preserve these working lands and to support higher density development in already existing urban and suburban centers.	County Board of Commissioners, Conservation District Programs, and other land preservation organizations.	Unknown	NC Cooperative Extension, NC Forest Service, US Department of Agriculture and NC Wildlife Resources Commission.	Short Range	N		X	Wildfire, Inland Flooding
4	Include climate predictions from the Cumberland County Climate Resiliency Plan in the Regional Hazard Mitigation Plan.	To properly prepare for natural hazard occurrences, it is important to include predictions that warn of: (1) increasing temperatures and extreme heat days, (2) increasing frequency and strength of severe weather events, (3) more heavy rain/flooding, and (4) more frequent and prolonged drought. Although some climate projections do not pose an immediate threat, any comprehensive mitigation plan for emergency management should at the very least, and by the very nature of the definition of "mitigation", acknowledge the changing climate and possibility of increased extreme weather and flooding events.	The Planning Department/Planning Director for each jurisdiction in Hoke County	None	Existing FEMA grant	Short Range	New	X	X	All Hazards
5	Provide financial assistance for low-income residents to help with power bills and support services during extended periods of high temperature and other extreme weather.	Low-income households face challenges in keeping up with utility bills. Some low-income utility assistance programs are offered, but funds are limited. Extreme weather and increasing temperatures will place even greater pressure on these programs' ability to provide assistance to all those in need, and citizen's lives will be increasingly at stake.	County Health Department	Unknown	NC Department of Health and Human Services and County Department of Health	Medium Range	New			Extreme Heat, Winter Weather

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
6	Analyze and update local development ordinances to make buildings safer from wind and flooding, more energy and water efficient, more tolerant of heat waves and healthier to live in.	Energy and water efficiency will be increasingly important to a community's resiliency in the face of natural hazards specifically because of projections of increasing temperatures and extreme heat days, and prolonged periods of drought. Climate projections also state that precipitation will continue to follow a seasonal pattern, whereby hot, Summer months are classified with less precipitation and Winters with more precipitation. Extreme heat days will be specially taxing on buildings with older A/C systems or inadequate insulation and in low-income households where upkeep with rising utility costs could become a burden.	Planning and Code Departments of each jurisdiction	Staff Hours	Local Operating Budget	Medium Range	New		X	Inland Flooding, Hurricane Wind, Thunderstorm Wind, Extreme Heat, Winter Storms
7	Use natural systems, more open space and green surfaces to manage stormwater in a more resilient fashion.	Impervious surfaces typically found in urban centers, such as paved roads, buildings, parking lots and pavement, drastically increase flash floods and urban flooding.	Engineering Department of each jurisdiction	Staff Hours	Local Operating Budget	Short Range	New		X	Inland Flooding
8	Update records for flood prone areas in Unincorporated Hoke County and the City of Raeford. Also create a database and GIS mapping available to the public.	Hoke County Emergency Management has in the past generated a list of flood prone areas and have mapped them for internal use. The list should be updated, mapped, and the map made available to the public for their awareness.	Hoke County Emergency Management and Hoke County GIS	Staff Hours	Local Operating Budget	Short Range	New	X	X	Inland Flooding
9	Consider placing signs at flood prone areas identifying them as such.	While a database and map available to the public is useful, placing signs at the location of flood prone areas would alert those living in the area and drivers.	Hoke County Addressing and NCDOT	Estimate $2000 for signs; plus staff labor putting the signs up.	Local Operating Budget	Short Range	New	X	X	Inland Flooding
10	Review zoning and subdivision ordinances in conjunction with Emergency Management to ensure they are up to date and include appropriate mitigation measures.	The Hoke County Zoning Ordinance was last comprehensively reviewed and updated several years ago. The level of development in the county has grown significantly. The ordinances should be reviewed and updated to reflect current need and expected growth.	Hoke County Planning Department	Staff Hours	Local Operating Budget	Medium Range	New		X	All Hazards
11	Upgrade the Emergency Operations Center building	The Emergency Operations Center lacks some structural needs that modern operation centers typically have. Upgrading the building would make sure the center can be used for emergency operations in the event of a natural disaster.	Hoke County Emergency Management	Unknown	Local Operating Budget	Long Range	New			All Hazards
12	Conduct survey of all county owned structures to determine if there are any mitigation projects that can be undertaken to repair / upgrade them to withstand natural disasters.	County schools are inspected once a year but other county facilities are not. By conducting a survey of the buildings county staff can identify areas that could be improved to help mitigate future issues brought about by natural disasters.	Hoke County Building Inspections, Fire Marshal, and Emergency Management	Staff Hours	Local Operating Budget	Medium Range	New			All Hazards
13	Create website that makes flood insurance information available to the public.	Citizens should have an area they can go to find ready general information about the importance of flood insurance. The Planning Department has some brochures and information sheets available to the public but an online resource would be available at all times.	Hoke County Planning	Staff Hours	Local Operating Budget	Short Range	New	X	X	Inland Flooding
14	Coordinate with Fort Bragg on protective measures for the Red Cockaded Woodpecker and other endangered species.	There are several threatened, endangered, and protected species in Hoke County. Currently the county government is not proactive in ensuring steps are taken to prevent development from further impacting the species. Fort Bragg has had an ongoing program to protect species on the base. Coordinating with Fort Bragg would be a resource to help protect the endangered species.	Hoke County Planning	Staff Hours	Local Operating Budget	Short Range	New		X	All Hazards

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
15	Investigate incentives for LEED / green structures.	Green infrastructure causes less impact on the natural environment and thus helps mitigate future environmental issues that could exacerbate or encourage a natural or environmental disaster. Using incentives through local zoning or taxes can encourage future green development.	County Manager's Office	Staff Hours	Local Operating Budget	Short Range	New		X	Inland Flooding, Erosion
16	Amend subdivision ordinance to allow cluster developments.	Cluster developments maximize density and open space to reduce the impact of development on the environment.	Hoke County Planning	Staff Hours	Local Operating Budget	Medium Range	New		X	Inland Flooding
17	Evaluate evacuation plans and other emergency procedures to ensure they incorporate new residential and commercial development.	Rapid growth throughout the county needs to be taken into account in emergency plans.	Hoke County Emergency Management	Staff Hours	Local Operating Budget	Short Range	New	X	X	All Hazards
18	Conduct annual progress meeting with Hazard Mitigation steering committee	Annual progress meetings keep projects on track and ensures the goals and objectives of the plan are met by the time of the next plan update.	Hazard Mitigation Steering Committee	Staff Hours	Local Operating Budget	Short Range	New			All Hazards
19	Pursue funding to relocate or demolish hazardous buildings	Rural areas of the county have abandoned or partially demolished residential and accessory structures that are potential fire hazards. Removing structures is a costly procedure. Finding a funding source to remove buildings would allow the county to remove at least one (1) or more hazardous structures a year.	Hoke County Emergency Management, Building Inspections, Planning	Staff Hours	Local Operating Budget	Medium Range	New	X		Wildfire
2010 Mitigation Actions Carried Forward										
1	Implement dam overspill controls in the Puppy Creek community of unincorporated Hoke County		Emergency Services	Unknown	Local Operating Budget	Long Range	In Progress	X	X	Dam Failure, Inland Flooding
2	Implement dam overspill and protection controls in the Rockfish community of unincorporated Hoke County		Emergency Services	Unknown	Local Operating Budget	Long Range	In Progress	X	X	Dam Failure, Inland Flooding
3	Allow for more overspill in the Johnson Mill Road area of unincorporated Hoke County		Emergency Management	Unknown	Local Operating Budget	Long Range	In Progress	X	X	Dam Failure, Inland Flooding
4	Implement dam overspill and protection controls for those dams within or along the Fort Bragg Military Reservation in order to minimize related flooding in the lower portions of Hoke County		Emergency Management	Unknown	Local Operating Budget	Long Range	In Progress	X	X	Dam Failure, Inland Flooding
5	Enhance inter-departmental coordination within Hoke County and between Hoke County and the City of Raeford with specific attention on plans and ordinances		County Manager's Office	Staff Hours	Local Operating Budget	Short Range	In Progress			All Hazards
6	Explore potential funding sources to ensure that emergency management and emergency medical services can fully support the population		Emergency Management	Staff Hours	Local Operating Budget	Short Range	In Progress		X	All Hazards

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
	growth expected for Hoke County in the coming years									
7	Prepare plan for emergency and non-emergency access to secondary, non-State roads		Emergency Management	Staff Hours	Local Operating Budget	Short Range	In Progress		X	All Hazards
8	Survey tributary system to identify areas of blockage or areas prone to blockage		Undetermined	Staff Hours	Local Operating Budget	Short Range	In Progress		X	Inland Flooding
9	Evaluate the feasibility of moving power lines underground in key residential areas of unincorporated Hoke County and encouraging buried power lines in new development		Lumbee River EMC & Duke Power	Staff Hours	Local Operating Budget	Short Range	In Progress	X	X	Severe Weather, Winter Storm
10	Investigate potential pre-disaster agreements with out-of-area vendors for supplies and services that will be needed immediately following a disaster event	This is on-going whereas all standing contracts have an expiration date and are renewed accordingly.	Emergency Management/County Manager's Office	Staff Hours	Local Operating Budget	Short Range	In Progress			All Hazards
11	Incorporate procedures for tracking high water marks following a flood into the Hoke County Emergency Action Plan		Emergency Management	Staff Hours	Local Operating Budget	Short Range	In Progress		X	Inland Flooding
12	Send appropriate local officials to FEMA's Emergency Management Institute and other emergency management/disaster-related courses for continuing education	Because of personnel changes this is an on-going action – All EM Personnel attend EMI & EM Courses on an on-going basis – The entire county and city leadership attended an IEMC Course in 2005.	Emergency Management	Staff Hours	Local Operating Budget	Short Range	In Progress			All Hazards
13	Complete requirements for the Hoke County Animal Protection Plan under the North Carolina State Animal Response Team (SART) program to handle animal-related issues during and immediately following a disaster event	In Progress – Hoke County has a CAMET and works with the local Animal Control Office and SART as required.	Emergency Management/CART Coordinator	Staff Hours	Local Operating Budget	Short Range	In Progress			All Hazards
14	Establish a program to assess risk to and vulnerability of historic properties and major archaeological sites within Hoke County		Undetermined	Staff Hours	Local Operating Budget	Short Range	In Progress	X		All Hazards

ANNEX L – CITY OF RAEFORD

L.1 Community Profile

L.1.1 Geography

The City of Raeford is the county seat of Hoke County and is located in south central North Carolina in the Upper Coastal Plain and Sandhills physiographic regions. As of the 2010 census, the population was 4,611. Raeford is within of the Fayetteville, NC Metropolitan Statistical Area and is part of the Lumber River Council of Governments. Raeford was established in 1898. According to the U.S. Census Bureau, the City has a total area of approximately 3.8 square miles of which less than 0.3% is water. Raeford is located in the Lumber River basin and Cape Fear River basin.

L.1.2 Population and Demographics

Table L1 provides population counts and the percentage change in population since 2010 for the City of Raeford. Based on the 2010 census, the population density is 1,213 people per square mile.

Table L1 - Population Counts for City of Raeford

Jurisdiction	2010 Census Population	2014 Estimated Population	% Change 2010-2014
City of Raeford	4,611	4,783	3.7

Source: U.S. Census Bureau, 2015

Based on the 2010 Census, the median age of residents in the City of Raeford is 34.6. The racial characteristics of the City are presented below in Table L2.

Table L2 - Demographics of City of Raeford

Jurisdiction	White Persons, Percent (2010)	Black Persons, Percent (2010)	American Indian or Alaska Native, Percent (2010)	Asian Persons, Percent (2010)	Hispanic or Latino Persons, Percent (2010)[1]
City of Raeford	43.6	41.1	4.3	1.0	9.6

[1]Persons of Hispanic Origin may be of any race, so are also included in applicable race category.
Source: U.S. Census Bureau, 2010

L.2 Risk Assessment

This subsection includes a hazard profile and vulnerability assessment for each of the priority hazards identified in Chapter 5 Subsection 13 (Table 5.20) as they pertain to the City of Raeford. **Additional information for each hazard can be found in Chapter 5 - Hazard Profiles and Chapter 6 – Vulnerability Assessment.**

L.2.1 Dam/Levee Failure

Location and Spatial Extent

Table L3 provides details for one dam included in the North Carolina Dam Inventory that is located within the City of Raeford (including the ETJ).

Table L3 - North Carolina Dam Inventory for City of Raeford

Dam Name	NIDID	Height (ft)	NID Storage (acre-feet)	Dam Status	River[1]	Hazard Classification
Williamson Lake Dam	NC00042	14	156	EXEMPT	Big Pine Creek-Tr	Low

Source: North Carolina Dam Inventory, December 2014

[1]If the dam is located on an unnamed stream/tributary, the unnamed stream/tributary name is followed with "-TR". If the dam is located off stream of an unnamed stream/tributary, the unnamed stream/tributary name is followed with "-OS".

Past Occurrences

Table L4 details known past dam failures in the City of Raeford.

Table L4 – Known Dam Failures in City of Raeford

Location	Date of Occurrence	Result of Failure	Deaths/ Injuries	Property Damage	Details
All Low Hazards Dams	1950–2009	Various	0	NR	Local perception is that all low hazard dams in the county seem to have broken at various points in time.

Probability of Future Occurrence

Possible - Based on historical occurrence information that most if not all low hazard dams have breached in previous years, it can reasonably be assumed that this type event may possibly occur in the future.

Vulnerability Assessment

The estimated number and characteristics of buildings that could potentially be impacted by a dam failure are shown in Table L5. **Note: the numbers presented in Table L5 are estimated based on the methodology described in Chapter 6 Subsection 3.1. A dam inundation study including a hydrologic and hydraulic analysis was not performed.**

Table L5 - Properties Potentially at Risk to Dam Failure

Jurisdiction	Number of Buildings in Estimated Inundation Area	Total Building Value	Estimated Content Value	Total Value
Raeford	0	$0.00	$0.00	$0.00
Total	**0**	**$0.00**	**$0.00**	**$0.00**

L.2.2 Drought

Location and Spatial Extent

Drought cannot be confined to geographic or political boundaries. The Hoke County region is designated as moderately dry.

Past Occurrences

According to the North Carolina Drought Monitor, the City of Raeford has experienced drought conditions every year since 2000. Table L6 shows the most severe classification for each year.

Table L6 - Historical Drought Occurrences

Year	Hoke County
2000	Moderate Drought
2001	Severe Drought
2002	Exceptional Drought
2003	Abnormally Dry
2004	Abnormally Dry
2005	Moderate Drought
2006	Moderate Drought
2007	Exceptional Drought
2008	Exceptional Drought
2009	Moderate Drought
2010	Moderate Drought
2011	Severe Drought
2012	Moderate Drought
2013	Moderate Drought
2014	Abnormally Dry
2015	Abnormally Dry

Source: NC Drought Monitor

Probability of Future Occurrence

Highly Likely - Based on historical occurrence information (15 records in 15 years), it can reasonably be assumed that the City of Raeford has a 100% chance of this type of event occurring each year.

Vulnerability Assessment

It is assumed that whereas all buildings and facilities in the planning area would technically be exposed to the drought hazard, there is no significant vulnerability to these buildings on a structural level. Population growth could contribute directly to this hazard, as an increased number of users pull from the available water supply within the region.

L.2.3 Earthquake

Location and Spatial Extent

As detailed in Chapter 5 – Hazard Profiles, the City of Raeford lies within an approximate zone level between 6 and 10% ground acceleration. This indicates that the region as a whole exists within an area of moderate seismic risk.

Past Occurrences

A list of earthquakes that have caused damaged in North Carolina is presented below in Table L7.

Table L7 - Earthquakes Affecting North Carolina

Date	Location	Richter Scale
12/16/1811	NE Arkansas	8.5

Date	Location	Richter Scale
01/23/1812	New Madrid, MO	8.4
02/07/1812	New Madrid, MO	8.7
04/29/1852	Wytheville, VA	5.0
08/31/1861	Wilkesboro, NC	5.1
12/23/1875	Central Virginia	5.0
08/31/1886	Charleston, SC	7.3
05/31/1897	Giles County, VA	5.8
01/01/1913	Union County, SC	4.8
02/21/1916	Asheville, NC	5.5
07/08/1926	Mitchell County, NC	5.2
11/03/1928	Newport, TN	4.5
05/13/1957	McDowell County, NC	4.1
07/02/1957	Buncombe County, NC	3.7
11/24/1957	Jackson County, NC	4.0
10/27/1959	Chesterfield, SC	4.0
07/13/1971	Newry, SC	3.8
11/30/1973	Alcoa, TN	4.6
11/13/1976	Southwest Virginia	4.1
05/05/1981	Henderson County, NC	3.5

Source: Wake County 2014 Hazard Mitigation Plan. Information provided by NCEM.

Probability of Future Occurrence

Possible - Based on historical occurrences, the probability of a significant earthquake event affecting the City of Raeford is possible. There are a total of 20 records in North Carolina over the past 200 years. Therefore, the annual probability level is estimated between 1 and 10 percent.

Vulnerability Assessment

An earthquake has the potential to impact all existing and future buildings, facilities, and populations in the City of Raeford. Impacts of earthquakes include debris clean-up, service disruption and, in severe cases, fatalities due to building collapse. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 3.

K.2.4 Extreme Heat

Location and Spatial Extent

Extreme heat typically occurs over large areas impacting multiple counties at one time. All of the City of Raeford is vulnerable to extreme heat.

Past Occurrences

According to the National Climatic Data Center, one instance of extreme heat was recorded in Hoke County beginning on July 22, 1998.

Probability of Future Occurrence

Possible - Based on historical occurrence information (one record in 65 years), it can reasonably be assumed that an extreme heat event has a 2% chance of occurring each year in the City of Raeford.

Vulnerability Assessment

Extreme heat is not likely to impact the built environment, but may impact agriculture and pose a threat to humans. Elderly persons, persons with respiratory disabilities, and children may be at risk to experience health problems during extreme heat events, some of which could result in serious illness or death. Potential losses of human life due to extreme heat are not quantified in this Plan. There are no past reports of death or property or crop damage recorded by NCEI.

L.2.5 Hurricane/Tropical Storm

Location and Spatial Extent

All Atlantic and Gulf of Mexico coastal areas are subject to hurricanes. While coastal areas are most directly exposed to land falling hurricanes and tropical storms, their impact can be felt hundreds of miles inland. The entire Hoke County region is equally susceptible to hurricanes and tropical storms.

Past Occurrences

Table L8 provides hurricane and tropical storm data reported by NCEI since 1950 for Hoke County.

Table L8 - NCEI Hurricane and Tropical Storm Events for Hoke County

Location	Date	Event Type	Deaths/ Injuries	Property Damage	Crop Damage
Hoke (Zone)	7/12/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Hoke (Zone)	9/5/1996	Hurricane (Typhoon)	0/0	$0.00	$0.00
Hoke (Zone)	8/27/1998	Hurricane (Typhoon)	0/0	$0.00	$0.00
Hoke (Zone)	9/4/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00
Hoke (Zone)	9/15/1999	Hurricane (Typhoon)	0/0	$0.00	$0.00
			Total:	**$0.00**	**$0.00**

Probability of Future Occurrence

Possible - Based on a historical record of five storm events over a period of 65 years (1950 - 2015), it can reasonably be assumed that this type of event has an eight percent chance of occurring each year.

Vulnerability Assessment

In conclusion, hurricane wind has the potential to impact all existing and future buildings, facilities, and populations in the City of Raeford. Impacts of hurricanes include flood damage, debris clean-up, service disruption and possible fatalities due to flooding or flying debris. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 5.

L.2.6 Inland Flooding: 100-/500-year

Location and Spatial Extent

The City of Raeford parcel layer and effective 2014 DFIRM were intersected and the flooded parcel area was calculated in acres. Flood zones were assigned to parcels based on the intersection of a parcel with a flood zone. Parcels can be located in multiple flood zones, and only the flooded acreage within the parcel was included in the calculation for each flood zone. Table L9 provides a summary of acreage by flood zone.

Table L9 - Flood Zone Acreage

Jurisdiction	Flood Zone Acreage				
	Zone A (100-year)	Zone AE (100-year)	Zone X Shaded (500-year)	Zone X Unshaded	Total
City of Raeford	0	342	58	5,547	5,947

The City of Raeford's parcel and building footprint layers were used to examine the inventory of properties at risk. Table L10 provides the building count, estimated building value, estimated content value and estimated total value for all buildings located within each FEMA flood zone.

Table L10 - Properties at Risk

Occupancy Type	Total Number of Buildings in Floodplain	Total Building Value	Estimated Content Value	Total Value
Zone AE				
Agricultural	0	$0	$0	$0
Commercial	0	$0	$0	$0
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	3	$369,290	$173,399	$542,689
Total	**3**	**$369,290**	**$173,399**	**$542,689**
Zone X (500-yr)				
Agricultural	0	$0	$0	$0
Commercial	0	$0	$0	$0
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	6	$738,288	$348,615	$1,086,903
Total	**6**	**$738,288**	**$348,615**	**$1,086,903**
Zone X (Unshaded)				
Agricultural	0	0	$0	$0
Commercial	199	$105,900,850	$116,924,318	$222,825,168
Education	56	$51,311,524	$52,747,380	$104,058,904
Government	42	$36,426,031	$41,575,680	$78,001,711
Industrial	66	$141,800,946	$208,199,162	$350,000,108
Religious	26	$22,557,827	$22,557,825	$45,115,653
Residential	1,542	$237,896,077	$115,008,568	$352,904,645
Total	**1,931**	**$595,893,256**	**$557,012,933**	**$1,152,906,189**

Source: North Carolina Emergency Management, Risk Management, 2013

Note: Content value estimations are generally based on the FEMA Hazus methodology of estimating value as a percent of improved structure values by property type. The residential property type assumes a content replacement value equal to 50% of the building value. Agricultural, commercial, education, government, and religious property types assume a content replacement value equal to 100% of the building value. The industrial property type assumes a content replacement value equal to 150% of the building value.

Past Occurrences

Table L11 shows detail for flooding events reported by the NCEI since 1950 for the City of Raeford. There have been seven recorded events causing $160,000 in property damage.

Table L11 - NCEI Flooding Events in City of Raeford

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Flash Flood	5	$160,000	$0	0	0
Flood	0	$0	$0	0	0
Heavy Rain	2	$0	$0	0	0
Total:	**7**	**$160,000**	**$0**	**0**	**0**

Source: NCEI, September 2015

Probability of Future Occurrence

Possible - By definition of the 100-year flood event, SFHAs are defined as those areas that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. Properties located in these areas have a 26 percent chance of flooding over the life of a 30-year mortgage.

The 500-year flood area is defined as those areas that will be inundated by the flood event having a 0.2-percent chance of being equaled or exceeded in any given year; it is not the flood that will occur once every 500 years.

Vulnerability Assessment

Properties at Risk to Flooding

The loss estimate for flood is based on the total of improved building value and contents value. Land value is not included in any of the loss estimates as generally the land is not subject to loss from floods. Once the potential value of affected parcels was calculated, damage factors were applied to obtain loss estimates by flood zone.

Table L12 shows the building count, total value, estimated damages and loss ratio for buildings that fall within the Zone AE 100-year floodplain by occupancy type on the community level.

The loss ratio is the loss estimate divided by the total potential exposure (i.e., total of improved and contents value for all buildings located within the Zone AE 100-year floodplain) and displayed as a percentage of loss. FEMA considers loss ratios greater than 10% to be significant and an indicator a community may have more difficulties recovering from an event.

Table L12 - Estimated Building Damage and Content Loss – Flood 100-yr Return Period

Occupancy Type	Total Number of Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Zone AE						
Agricultural	0	$0	$0	$0	$0	n/a
Commercial	0	$0	$0	$0	$0	n/a
Education	0	$0	$0	$0	$0	n/a
Government	0	$0	$0	$0	$0	n/a
Industrial	0	$0	$0	$0	$0	n/a
Religious	0	$0	$0	$0	$0	n/a

Occupancy Type	Total Number of Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Residential	2	$37,233	$2,650	$2,675	$18,739	50.3%
Total	**2**	**$37,233**	**$2,650**	**$2,675**	**$18,739**	**50.3%**

Source: North Carolina Emergency Management, Risk Management, 2013

Critical Facilities at Risk to Flooding

Of significant concern with respect to any disaster event is the location of critical facilities in the planning area. Critical facilities are often defined as those essential services and facilities in a major emergency which, if damaged, would result in severe consequences to public health and safety or a facility which, if unusable or unreachable because of a major emergency, would seriously and adversely affect the health, safety, and welfare of the public. Critical facilities within the City are detailed in the Table L13 and Figure L1 below.

Table L13 - Critical Facilities and FEMA Flood Zones

Facility Name	Address	Facility Type	Estimated 100-yr Flood Depth (Ft)
Zone AE			
n/a	n/a	n/a	n/a
Zone A (100-yr)			
n/a	n/a	n/a	n/a
Zone X Shaded (500-yr)			
n/a	n/a	n/a	n/a
Zone X Unshaded			
West Hoke Middle	W Palmer St	School	n/a
J. W. Turlington Alternative School	326 N Stewart St	School	n/a
MacDonald High School	187 High School	School	n/a
Gibson Side High School	S Bethel Rd	School	n/a
Armory Building	423 E Central Ave	EOC	n/a
Fire Station	1106 Turnpike Rd	Fire	n/a
Fire Department	415 E Prospect Ave	Fire	n/a
Tag Agency	520 W Donaldson Ave	Police	n/a
Jail Complex	N Stewart St	Police	n/a
Hoke County Courthouse	304 Main St	Police	n/a

Source: Hoke County Emergency Management Agency, 2015

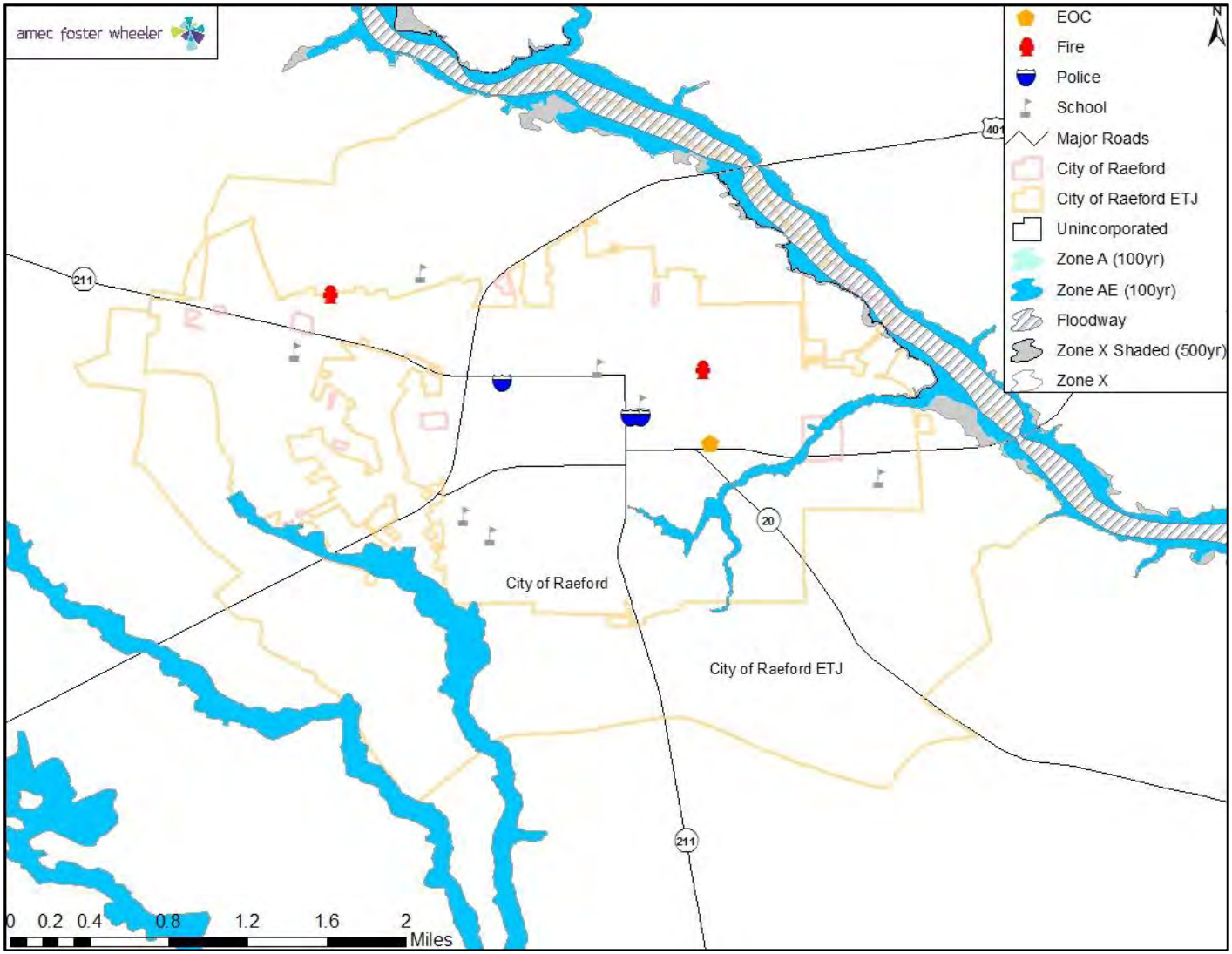


Figure L1 – City of Raeford Critical Facilities and FEMA Flood Zones

Repetitive Loss Properties

The City of Raeford contains no repetitive loss properties.

L.2.7 Severe Weather (Thunderstorm Wind, Lightning & Hail)

Location and Spatial Extent

The entirety of the City of Raeford can be considered at risk to severe weather events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

Table L14 shows detail for severe weather events reported by the NCEI since 1950 for the City of Raeford. There have been 50 recorded events causing over $350,000 in property damage.

Table L14 - NCEI Severe Weather Events in City of Raeford

Type	# of Events	Property Damage	Crop Damage	Deaths (Direct)	Injuries (Direct)
Hail	21	$0	$0	0	0
High Wind	0	$0	$0	0	0
Lightning	2	$50,000	$0	0	0
Strong Wind	0	$0	$0	0	0
Thunderstorm Wind	27	$303,000	$0	0	0
Total:	**50**	**$353,000**	$0	0	0

Probability of Future Occurrence

Likely - Given the high number of previous events (50 records in 65 years), it is likely that severe weather events, including wind, lightning and hail, will occur in the future. The annual probability level is 77%.

Vulnerability Assessment

Severe weather events including thunderstorm wind, lightning and hail has the potential to impact all existing and future buildings, facilities, and populations in the City of Raeford. Impacts of severe weather events include wind damage, debris clean-up, hail damage, and potential fatalities due to lightning strikes and associated fires. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 7.

L.2.8 Tornado

Location and Spatial Extent

The entirety of the City of Raeford can be considered at risk to tornado events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

According to NCEI records, Hoke County has experienced 10 tornadoes since 1950. These events are reported to have caused one deaths, six injuries and close to $1M in property damage.

Table L15 - NCEI Records for Tornadoes in Hoke County (1950-2015)

Location	Date	Tornado Fujita Scale	Deaths/ Injuries	Property Damage	Crop Damage
Hoke Co	3/24/1975	F1	0/0	$250.00	$0.00
Hoke Co	2/11/1981	F2	1/0	$250,000.00	$0.00

Location	Date	Tornado Fujita Scale	Deaths/ Injuries	Property Damage	Crop Damage
Hoke Co	5/19/1986	F2	0/5	$250,000.00	$0.00
Hoke Co	5/19/1988	F0	0/0	$2,500.00	$0.00
Hoke Co	10/23/1990	F0	0/0	$2,500.00	$0.00
Hoke Co	5/19/1995	F1	0/1	$200,000.00	$0.00
Hoke Co	8/29/2004	F0	0/0	$0.00	$0.00
Hoke Co	9/7/2004	F0	0/0	$0.00	$0.00
Hoke Co	9/8/2004	F0	0/0	$0.00	$0.00
Hoke Co	4/16/2011	EF0	0/0	$100,000.00	$0.00
			Total:	**$805,250**	**$0.00**

Probability of Future Occurrence

Likely - The best available information to determine future probability of a tornado event is to review historic frequency. According to NCEI, 10 tornadoes have impacted Hoke County over a 65 year period. It can reasonably be assumed that the City of Raeford has a 15% chance of experiencing a tornado each year.

Vulnerability Assessment

A tornado has the potential to impact all existing and future buildings, facilities, and populations in the City of Raeford. Impacts of tornadoes include building and contents damage, debris clean-up, service disruption and potentially numerous fatalities and injuries. Estimated building damage and content loss are provided on the County level in Chapter 6 Subsection 10.

L.2.9 Wildfire

Location and Spatial Extent

Wildfires could potentially occur anywhere in the region. The Wildland Urban Interface (WUI) is described as the area where structures and other human improvements meet and intermingle with undeveloped wildland or vegetative fuels. Population growth within the WUI substantially increases the risk for wildfire. For the Hoke County, NC project area, it is estimated that 46,629 people or 99 percent of the total project area population (46,964) live within the WUI. The WUI for Hoke County is shown within Chapter 5 Subsection 11 (Figure 5.20).

Past Occurrences

Table L16 lists past occurrences of wildfire in Hoke County since 2005 as provided by the NCFS in September 2015.

Table L16 - Records for Wildfire in Hoke County

County	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Hoke	82	88	116	44	49	66	59	59	26	46

Probability of Future Occurrence

Highly Likely - The best available information to determine future probability of a wildfire event is to review historic frequency. According to historic records, 635 wildfires have occurred in Hoke County between 2005 and 2015 (100% chance of occurring each year).

Vulnerability Assessment

A wildfire has the potential to impact all existing and future buildings, facilities, and populations in the City of Raeford. Impacts of wildfire include building and contents damage, debris clean-up, service disruption and potentially numerous fatalities and injuries. Wildfires can also increase flood risk due to loss of vegetation. WUI Risk, Burn Probability and Rate of Spread are provided on the County level in Chapter 6 Subsection 11.

L.2.10 Winter Storm

Location and Spatial Extent

The entirety of the City of Raeford can be considered at risk to winter storm events. This includes the entire population and all critical facilities, buildings (commercial and residential), and infrastructure.

Past Occurrences

According to NCEI records, Hoke County has experienced 29 winter storm events since 1996, respectively. These events are reported to have caused one death due to icy road conditions.

Table L17 - NCEI Records for Winter Storm Events in Hoke County (1996-2015)

Date	Type of Winter Storm	Deaths/ Injuries	Property Damage	Crop Damage
1/6/1996	Ice Storm	0/0	$0.00	$0.00
1/11/1996	Ice Storm	0/0	$0.00	$0.00
2/2/1996	Ice Storm	0/0	$0.00	$0.00
2/3/1996	Cold/wind Chill	0/0	$0.00	$0.00
1/19/1998	Heavy Snow	0/0	$0.00	$0.00
12/23/1998	Ice Storm	0/0	$0.00	$0.00
1/18/2000	Winter Storm	0/0	$0.00	$0.00
1/22/2000	Winter Storm	0/0	$0.00	$0.00
1/24/2000	Winter Storm	0/0	$0.00	$0.00
1/28/2000	Winter Storm	0/0	$0.00	$0.00
1/3/2002	Winter Storm	0/0	$0.00	$0.00
2/16/2003	Winter Storm	0/0	$0.00	$0.00
1/26/2004	Winter Storm	0/0	$0.00	$0.00
2/26/2004	Winter Storm	0/0	$0.00	$0.00
12/26/2004	Winter Storm	0/0	$0.00	$0.00
2/1/2007	Winter Weather	0/0	$0.00	$0.00
1/17/2008	Winter Weather	0/0	$0.00	$0.00
1/19/2008	Winter Weather	0/0	$0.00	$0.00
1/20/2009	Winter Storm	0/0	$0.00	$0.00
1/30/2010	Winter Storm	0/0	$0.00	$0.00
2/12/2010	Winter Storm	0/0	$0.00	$0.00
12/16/2010	Winter Weather	1/0	$0.00	$0.00
12/25/2010	Winter Storm	0/0	$0.00	$0.00
1/10/2011	Winter Storm	0/0	$0.00	$0.00
1/28/2014	Winter Storm	0/0	$0.00	$0.00
2/11/2014	Winter Storm	0/0	$0.00	$0.00
2/12/2014	Winter Storm	0/0	$0.00	$0.00
2/16/2015	Winter Storm	0/0	$0.00	$0.00
2/24/2015	Winter Weather	0/0	$0.00	$0.00

Source: NCEI, September 2015

Probability of Future Occurrence

Highly Likely - The best available information to determine future probability of a winter storm event is to review historic frequency. According to NCEI, 29 winter storm events have occurred over a 19 year period between 1996 and 2015 resulting in approximately 1.5 significant winter storm events per year.

The probability of a heavy snowfall occurring with that winter storm event is less likely. The figure below presents the probability of 8-inches or more of snowfall to be approximately 12.5% per year for the Hoke County Region.

Vulnerability Assessment

Potential losses associated with winter storms include the cost of the removal of snow from roadways, debris clean-up, and some indirect losses from power outages, etc. All future structures and infrastructure in the region will be vulnerable to winter storms.

L.3 Priority Risk Index Results

Table L18 summarizes the degree of risk assigned to each identified hazard as it applies to the City of Raeford using the PRI method described in Chapter 6 Subsection 4.

Table L18 - Summary of PRI Results for City of Raeford

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Dam/Levee Failure	Possible	Minor	Small	Less than 6 hrs	Less than 6 hrs	1.8
Drought	Highly Likely	Minor	Large	More than 24 hrs	More than 1 week	2.8
Earthquake	Possible	Limited	Moderate	Less than 6 hrs	Less than 6 hrs	2.3
Extreme Heat	Possible	Minor	Large	More than 24 hrs	Less than 1 week	2.1
Hurricane/Tropical Storm	Possible	Limited	Large	More than 24 hrs	Less than 24 hrs	2.3
Inland Flooding: 100-/500-year	Possible	Limited	Moderate	6 to 12 hours	Less than 1 week	2.4
Severe Weather (thunderstorm wind, lightning, & hail)	Likely	Limited	Moderate	6 to 12 hours	Less than 6 hrs	2.8
Tornado	Likely	Critical	Small	Less than 6 hrs	Less than 6 hrs	2.7
Wildfire	Highly Likely	Limited	Small	Less than 6 hrs	Less than 1 week	2.9
Winter Storm	Highly Likely	Minor	Moderate	More than 24 hrs	Less than 1 week	2.5

As shown in Table L19, the results from the PRI have been classified into three categories based on the assigned risk value:

- **Low Risk** - Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium Risk** - Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High Risk** - Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread.

Table L19 - Summary of Hazard Risk Classification

Hazard Category	Hazard Type
High Risk (> 2.5)	**Wildfire** **Severe Weather** **Drought** **Tornado**
Moderate Risk (2.0 – 2.5)	**Winter Storm** **Inland Flooding: 100-/500-year** **Hurricane/Tropical Storm** **Earthquake** **Extreme Heat**
Low Risk (< 2.0)	**Dam/Levee Failure**

L.4 Capability Assessment

This subsection discusses the capability of the City of Raeford to implement hazard mitigation activities. More information on the purpose and methodology used to conduct the assessment can be found in Chapter 7 - Capability Assessment.

L.4.1 Planning and Regulatory Capability

Table L20 lists regulatory capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the City of Raeford.

Table L20 - Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Y/N	Date	Comments
Comprehensive Plan	Y	09/08/2008	City of Raeford Land Use Plan
Zoning Ordinance	Y	08/03/2009	Effective 01/01/2010 (UDO)
Subdivision Ordinance	Y	08/03/2009	Included in UDO
Floodplain Ordinance	Y	08/03/2009	Included in UDO
Stormwater Ordinance	Y	08/03/2009	Included in UDO
Erosion, Sedimentation and Pollution Control Ordinance	N		NCDENR
Building Code	Y	2012	City Code Enforcement
BCEGS Rating			
Stormwater Management Program	N		
Site Plan Review Requirements	Y	08/03/2009	UDO Effective Since 01/01/2010
Capital Improvements Plan			In Progress
Local Emergency Operations Plan	Y		Hoke County Emergency Director
Flood Insurance Study or Other Engineering Study for Streams	N		None Available
Repetitive Loss Plan	N		None Available
Elevation Certificates	N		None Available

L.4.2 Floodplain Management

The City of Raeford joined the NFIP emergency program in 1975 and has been a regular participant in the NFIP since June 1986. The following tables reflect NFIP policy and claims data for the City categorized by structure type, flood zone, Pre-FIRM and Post-FIRM.

Table L21 - NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	6	$2,593	$1,790,000	0	$0.00
2-4 Family	0	$0	$0	0	$0.00
All Other Residential	0	$0	$0	0	$0.00
Non-Residential	0	$0	$0	0	$0.00
Total	**6**	**$2,593**	**$1,790,000**	**0**	**$0.00**

Source: FEMA Community Information System, December 2015

Table L22 - NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	3	$1,466	$915,000	0	$0.00
A Zones	0	$0	$0	0	$0.00
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00
V Zones	0	$0	$0	0	$0.00
D Zones	0	$0	$0	0	$0.00
B, C & X Zone					
Standard	0	$0	$0	0	$0.00
Preferred	3	$1,127	$875,000	0	$0.00
Total	**6**	**$2,593**	**$1,790,000**	**0**	**$0.00**

Source: FEMA Community Information System, December 2015

Table L23 - NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	0	$0	$0	0	$0.00
A Zones	0	$0	$0	0	$0.00
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00
V Zones	0	$0	$0	0	$0.00
D Zones	0	$0	$0	0	$0.00
B, C & X Zone	2	$667	$525,000	0	$0.00
Standard	0	$0	$0	0	$0.00
Preferred	2	$667	$525,000	0	$0.00
Total	**2**	**$667**	**$525,000**	**0**	**$0.00**

Source: FEMA Community Information System, December 2015

Table L24 - NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	3	$1,466	$915,000	0	$0.00
A Zones	0	$0	$0	0	$0.00
AO Zones	0	$0	$0	0	$0.00
AH Zones	0	$0	$0	0	$0.00

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
AR Zones	0	$0	$0	0	$0.00
A99 Zones	0	$0	$0	0	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00
V Zones	0	$0	$0	0	$0.00
D Zones	0	$0	$0	0	$0.00
B, C & X Zone	1	$460	$350,000	0	$0.00
Standard	0	$0	$0	0	$0.00
Preferred	1	$460	$350,000	0	$0.00
Total	**68**	**$1,926**	**$1,265,000**	**0**	**$0.00**

Source: FEMA Community Information System, December 2015

L.4.3 Administrative and Technical Capability

Table L25 lists administrative capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the City of Raeford.

Table L25 - Administrative/Technical Capabilities

Resource	Y/N	Responsible Department
Planner/Engineer with knowledge of land development/land management practices		Planning, Zoning & Inspections
Engineer/Professional trained in construction practices related to buildings and/or infrastructure		Planning, Zoning & Inspections Contract
Planner/Engineer/Scientist with an understanding of natural hazards		Planning, Zoning & Inspections Contract
Personnel skilled in GIS		Planning, Zoning & Inspections
Full time building official		Planning, Zoning & Inspections
Floodplain Manager		Planning, Zoning & Inspections
Emergency Manager	Y	Hoke County Emergency Director
Grant writer		Planning, Zoning & Inspections
GIS data – Hazard areas	N	Planning, Zoning & Inspections
GIS data – Critical facilities	Y	Planning, Zoning & Inspections
GIS data – Land use		Planning, Zoning & Inspections
GIS data – Building footprints		Hoke County
GIS data – Links to Assessor's data		Hoke County
Warning Systems/Services	y	Hoke Emergency Communications

L.4.4 Fiscal Capability

Table L26 lists fiscal capabilities typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the City of Raeford.

Table L26 - Fiscal Mitigation Capabilities

Resource	Accessible/Eligible to Use (Y/N)
Community Development Block Grants	Y - LRCOG/PZI
Capital improvements project funding	TBD
Authority to levy taxes for specific purposes	Y
Fees for water, sewer, gas or electric services	Y
Impact fees for new development	N
Incur debt through general obligation bonds	Y
Incur debt through special tax bonds	Y
Incur debt through private activity bonds	Y
Withhold spending in hazard prone areas	N

L.5 Mitigation Strategy

L.5.1 Status Update for 2011 Mitigation Actions

Table L27 provides a status update for each mitigation action detailed in the 2010 Hoke County Multi-jurisdictional Hazard Mitigation Plan with City of Raeford designated as the responsible jurisdiction. This table provides a summary of progress to-date and also notes whether each action is to be deleted or carried forward into the 2016 Regional Plan.

Table L27 - Status of 2011 Mitigation Actions

City of Raeford								
Mitigation Action Number	**Action Description**	**Responsible Department**	**Status**			**2016 Plan Update**		**Summary of Progress To-Date**
			Complete	**In Progress**	**Not yet Started**	**Delete Action**	**Carry Forward**	
1	Update and enhance as necessary the Floodplain Management Plan and Flood Damage Prevention Ordinance with regard to hazard mitigation effectiveness	GIS (Floodplain Management Plan), Inspections (Flood Damage Prevention Ordinance)	X			X		City comes under the county flood plan which is complete
2	Promote and actively enforce use of proper tie downs on all manufactured (mobile) homes, focusing first on pre-HUD homes (built prior to 1976) and second on homes built between 1976 and 1993	Building Inspections		X			X	Inspections are scheduled in accordance with Section 106 of the North Carolina Fire Prevention Code
3	Build municipal-level GIS capability with regard to natural hazards data to compliment the county-level GIS/mapping department.	County GIS		X			X	Hoke County GIS provides GIS services to the City of Raeford
4	Ensure zoning ordinance encourages higher densities only outside of known hazards areas	Undetermined		X			X	Zoning Board is aware and has included this requisite in their process
5	Store digital or hard copies of vital public records in hazard-free offsite locations	City Manager's Office		X			X	Work is on-going in the process of identifying and selecting outside vendor to perform this tasking
6	Evaluate the feasibility of moving power lines underground in key residential areas of the City of Raeford and encouraging buried power lines in new development	Lumbee River EMC & Duke Energy		X			X	Talks with Duke Power and Lumbee River EMC Engineers are on-going and all new development have the issue raised during the planning and zoning process
7	Send appropriate local officials to FEMA's Emergency Management Institute and other emergency management/disaster-related courses for continuing education	Hoke County Emergency Management		X				City Officials participate with the County EM Program and training and attended the 2005 IEMC course
8	Investigate and evaluate future participation in the NFIP's Community Rating System (CRS)	Planning & GIS	X			X		Covered under the county plan

L.5.2 2016 Mitigation Action Plan

Table L28 identifies eight new and/or revised mitigation actions for the City of Raeford, as well as five unrevised, incomplete actions from Table L28 that are to be carried forward into the 2016 Regional Plan.

Table L28 - 2016 Mitigation Action Plan

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
New/Revised Actions										
1	Conduct a countywide infrastructure vulnerability assessment to identify priority needs for updating ill-designed or outdated critical structures.	It has been difficult to locate any comprehensive assessments of local infrastructure in Cumberland and Hoke Counties. With current and projected natural hazard occurrences, it is essential to have an accurate and comprehensive understanding of the current condition of critical facilities to ensure the ability to continue to provide for basic needs, such as water and electrical supplies, transportation routes, waste management, etc.	County/city structural and civil engineers in partnership with U.S. Army Corps of Engineers	Staff Hours	Local Operating Budget and Federal	Medium Range	New	X		All Hazards
2	Conduct social vulnerability analysis to identify priority needs and opportunities that will address the specific problems vulnerable populations face from a range of hazards, including barriers to evacuation, event-specific vulnerabilities, and impediments to recovery.	There exist various groups of individuals that have additional financial, social and/or environmental barriers to being resilient in the face of natural hazard events. As natural hazard events increase in intensity and frequency, these groups will find it harder to safely and efficiently get out of harm's way. These groups will also have difficulty in obtaining and paying for essential components to sustain life, such as medications, utilities, and transportation to/from a place of work, etc.	County Social Services Department and/or County Health Department	Staff Hours	Local Operating Budget	Medium Range	New			All Hazards
3	Collaborate with NC Cooperative Extension and NC Agriculture and Forestry Adaptation Working Group to provide more local support and encouragement of forest conservation and farmland preservation measures.	Forests and farmland provide a multitude of social, economic and environmental benefits, that when looked at comprehensively, far outweigh any profit/revenue projections of residential or commercial properties. Outside of development pressure, some of the other major health risks include: (1) increasing wildfire risk, (2) increasing number and types of insects and pests, (3) lack of sufficient water during the growing season for crops, and (4) increasing damage from strong winds and flooding. It is vital, especially in the face of a changing climate, to preserve these working lands and to support higher density development in already existing urban and suburban centers.	County Board of Commissioners, Conservation District Programs, and other land preservation organizations.	Unknown	NC Cooperative Extension, NC Forest Service, US Department of Agriculture and NC Wildlife Resources Commission.	Short Range	N		X	Wildfire, Inland Flooding
4	Include climate predictions from the Cumberland County Climate Resiliency Plan in the Regional Hazard Mitigation Plan.	To properly prepare for natural hazard occurrences, it is important to include predictions that warn of: (1) increasing temperatures and extreme heat days, (2) increasing frequency and strength of severe weather events, (3) more heavy rain/flooding, and (4) more frequent and prolonged drought. Although some climate projections do not pose an immediate threat, any comprehensive mitigation plan for emergency management should at the very least, and by the very nature of the definition of "mitigation", acknowledge the changing climate and possibility of increased extreme weather and flooding events.	The Planning Department/Planning Director for each jurisdiction in Hoke County	None	Existing FEMA grant	Short Range	New	X	X	All Hazards
5	Provide financial assistance for low-income residents to help with power bills and support services during extended periods of high temperature and other extreme weather.	Low-income households face challenges in keeping up with utility bills. Some low-income utility assistance programs are offered, but funds are limited. Extreme weather and increasing temperatures will place even greater pressure on these programs' ability to provide assistance to all those in need, and citizen's lives will be increasingly at stake.	County Health Department	Unknown	NC Department of Health and Human Services and County Department of Health	Medium Range	New			Extreme Heat, Winter Weather

Action Number	Action Description	Issue/Background Statement	Responsible Agency	Anticipated Cost	Funding Sources	Timeframe	Status	Addresses Current Development	Addresses Future Development	Hazard Addressed
6	Analyze and update local development ordinances to make buildings safer from wind and flooding, more energy and water efficient, more tolerant of heat waves and healthier to live in.	Energy and water efficiency will be increasingly important to a community's resiliency in the face of natural hazards specifically because of projections of increasing temperatures and extreme heat days, and prolonged periods of drought. Climate projections also state that precipitation will continue to follow a seasonal pattern, whereby hot, Summer months are classified with less precipitation and Winters with more precipitation. Extreme heat days will be specially taxing on buildings with older A/C systems or inadequate insulation and in low-income households where upkeep with rising utility costs could become a burden.	Planning and Code Departments of each jurisdiction	Staff Hours	Local Operating Budget	Medium Range	New		X	Inland Flooding, Hurricane Wind, Thunderstorm Wind, Extreme Heat, Winter Storms
7	Use natural systems, more open space and green surfaces to manage stormwater in a more resilient fashion.	Impervious surfaces typically found in urban centers, such as paved roads, buildings, parking lots and pavement, drastically increase flash floods and urban flooding.	Engineering Department of each jurisdiction	Staff Hours	Local Operating Budget	Short Range	New		X	Inland Flooding
8	Update records for flood prone areas in Unincorporated Hoke County and the City of Raeford. Also create a database and GIS mapping available to the public.	Hoke County Emergency Management has in the past generated a list of flood prone areas and have mapped them for internal use. The list should be updated, mapped, and the map made available to the public for their awareness.	Hoke County Emergency Management and Hoke County GIS	Staff Hours	Local Operating Budget	Short Range	New	X	X	Inland Flooding
2010 Mitigation Actions Carried Forward										
1	Promote and actively enforce use of proper tie downs on all manufactured (mobile) homes, focusing first on pre-HUD homes (built prior to 1976) and second on homes built between 1976 and 1993		Building Inspections	Staff Hours	Local Operating Budget	Short Range	In Progress	X	X	Dam Failure, Inland Flooding
2	Build municipal-level GIS capability with regard to natural hazards data to compliment the county-level GIS/mapping department.		County GIS	Staff Hours	Local Operating Budget	Short Range	In Progress			All Hazards
3	Ensure zoning ordinance encourages higher densities only outside of known hazards areas		Undetermined	Staff Hours	Local Operating Budget	Short Range	In Progress		X	All Hazards
4	Store digital or hard copies of vital public records in hazard-free offsite locations		City Manager's Office	Unknown	Local Operating Budget	Long Range	In Progress	X	X	All Hazards
5	Evaluate the feasibility of moving power lines underground in key residential areas of the City of Raeford and encouraging buried power lines in new development		Lumbee River EMC & Duke Energy	Staff Hours	Local Operating Budget	Short Range	In Progress			Hurricane Wind, Thunderstorm Wind, Winter Storms

APPENDIX A – 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*.

<table>
<tr><td>Jurisdiction:
Cumberland and Hoke Counties, NC</td><td colspan="2">Title of Plan:
Cumberland-Hoke Regional Hazard Mitigation Plan</td><td>Date of Plan:
January 2016 (Final Draft)</td></tr>
<tr><td colspan="2">Local Point of Contact:
Gene Booth</td><td colspan="2" rowspan="3">Address:
131 Dick Street
Fayetteville, NC 28301</td></tr>
<tr><td colspan="2">Title:
Emergency Management Program Coordinator</td></tr>
<tr><td colspan="2">Agency:
Emergency Services</td></tr>
<tr><td colspan="2">Phone Number:
910- 850-8166</td><td colspan="2">E-Mail:
wbooth@co.cumberland.nc.us</td></tr>
<tr><td>State Reviewer:</td><td>Title:</td><td colspan="2">Date:</td></tr>
<tr><td>FEMA Reviewer:</td><td>Title:</td><td colspan="2">Date:</td></tr>
<tr><td>Date Received in FEMA Region (insert #)</td><td colspan="3"></td></tr>
<tr><td>Plan Not Approved</td><td colspan="3"></td></tr>
<tr><td>Plan Approvable Pending Adoption</td><td colspan="3"></td></tr>
<tr><td>Plan Approved</td><td colspan="3"></td></tr>
</table>

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))	Chapter 2.1; 2.2; Appendix B	X	
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))	Chapter 2.1; 2.2; Appendix B	X	
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))	Chapter 2.2.1; Appendix B	X	
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))	Chapter 2.2.2; Chapter 7.2	X	
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))	Chapter 11.3	X	
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))	Chapter 11.2; 11.3	X	
LEMENT A: REQUIRED REVISIONS			

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
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))	Chapter 5	X	
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))	Chapter 5	X	
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))	Chapter 6	X	
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))	Individual Annex for each Jurisdiction	X	
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))	Chapter 7, Appendix C	X	
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))	Chapter 7.3	X	
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))	Chapter 8.2.3	X	
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))	Chapter 8; Chapter 9; Individual Annex for each Jurisdiction	X	
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))	Chapter 9; Individual Annex for each Jurisdiction	X	
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))	Chapter 11.1	X	

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
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))	Chapter 1.5; Chapter 6	X	
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))	Chapter 1.5; Chapters 8 & 9; Individual Annexes	X	
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	Chapter 1.5; Chapters 8 & 9; Individual Annexes	X	
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))	Chapter 10 (adoption pending FEMA approval)	X	
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))	Chapter 10 (adoption pending FEMA approval)	X	
ELEMENT E: REQUIRED REVISIONS			
ELEMENT F. ADDITIONAL STATE REQUIREMENTS (OPTIONAL FOR STATE REVIEWERS ONLY; NOT TO BE COMPLETED BY FEMA)			
F1.			
F2.			
ELEMENT F: REQUIRED REVISIONS			

SECTION 2:
PLAN ASSESSMENT

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

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

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

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

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

A. Plan Strengths and Opportunities for Improvement

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

Element A: Planning Process

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

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

Element B: Hazard Identification and Risk Assessment

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

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

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

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

Element C: Mitigation Strategy

How does the Plan go above and beyond minimum requirements to document the Mitigation Strategy with respect to:

- *Key problems identified in, and linkages to, the vulnerability assessment;*
- *Serving as a blueprint for reducing potential losses identified in the Hazard Identification and Risk Assessment;*
- *Plan content flow from the risk assessment (problem identification) to goal setting to mitigation action development;*
- *An understanding of mitigation principles (diversity of actions that include structural projects, preventative measures, outreach activities, property protection measures, post-disaster actions, etc);*
- *Specific mitigation actions for each participating jurisdictions that reflects their unique risks and capabilities;*
- *Integration of mitigation actions with existing local authorities, policies, programs, and resources; and*
- *Discussion of existing programs (including the NFIP), plans, and policies that could be used to implement mitigation, as well as document past projects.*

Element D: Plan Update, Evaluation, and Implementation (*Plan Updates Only*)

How does the Plan go above and beyond minimum requirements to document the 5-year Evaluation and Implementation measures with respect to:

- *Status of previously recommended mitigation actions;*
- *Identification of barriers or obstacles to successful implementation or completion of mitigation actions, along with possible solutions for overcoming risk;*
- *Documentation of annual reviews and committee involvement;*
- *Identification of a lead person to take ownership of, and champion the Plan;*
- *Reducing risks from natural hazards and serving as a guide for decisions makers as they commit resources to reducing the effects of natural hazards;*
- *An approach to evaluating future conditions (i.e. socio-economic, environmental, demographic, change in built environment etc.);*
- *Discussion of how changing conditions and opportunities could impact community resilience in the long term; and*
- *Discussion of how the mitigation goals and actions support the long-term community vision for increased resilience.*

B. Resources for Implementing Your Approved Plan

Ideas may be offered on moving the mitigation plan forward and continuing the relationship with key mitigation stakeholders such as the following:

- *What FEMA assistance (funding) programs are available (for example, Hazard Mitigation Assistance (HMA)) to the jurisdiction(s) to assist with implementing the mitigation actions?*
- *What other Federal programs (National Flood Insurance Program (NFIP), Community Rating System (CRS), Risk MAP, etc.) may provide assistance for mitigation activities?*
- *What publications, technical guidance or other resources are available to the jurisdiction(s) relevant to the identified mitigation actions?*
- *Are there upcoming trainings/workshops (Benefit-Cost Analysis (BCA), HMA, etc.) to assist the jurisdictions(s)?*
- *What mitigation actions can be funded by other Federal agencies (for example, U.S. Forest Service, National Oceanic and Atmospheric Administration (NOAA), Environmental Protection Agency (EPA) Smart Growth, Housing and Urban Development (HUD) Sustainable Communities, etc.) and/or state and local agencies?*

SECTION 3:
MULTI-JURISDICTION SUMMARY SHEET (OPTIONAL)

INSTRUCTIONS: For multi-jurisdictional plans, a Multi-jurisdiction Summary Spreadsheet may be completed by listing each participating jurisdiction, which required Elements for each jurisdiction were 'Met' or 'Not Met,' and when the adoption resolutions were received. This Summary Sheet does not imply that a mini-plan be developed for each jurisdiction; it should be used as an optional worksheet to ensure that each jurisdiction participating in the Plan has been documented and has met the requirements for those Elements (A through E).

MULTI-JURISDICTION SUMMARY SHEET

#	Jurisdiction Name	Jurisdiction Type (city/borough/ township/ village, etc.)	Plan POC	Mailing Address	Email	Phone	Requirements Met (Y/N)					
							A. Planning Process	B. Hazard Identification & Risk Assessment	C. Mitigation Strategy	D. Plan Review, Evaluation & Implementation	E. Plan Adoption	F. State Require-ments
1	Cumberland County Unincorporated Areas	County	Gene Booth	131 Dick Street Fayetteville, NC 28301	wbooth@co.cumberland.nc.us	(910) 850-8166	Y	Y	Y	Y	Pending	Y
2	Fayetteville	City	David Nash	433 Hay Street Fayetteville, NC 28301	dnash@ci.fay.nc.us	(910) 433-1995	Y	Y	Y	Y	Pending	Y
3	Eastover	Town	Kim Nazarchyk	3863 Dunn Rd Eastover, NC 2831	townmanager@eastovernc.com	(910) 323-0707	Y	Y	Y	Y	Pending	Y
4	Falcon	Town	Belinda White	7156 West St, Falcon, NC 28342	townoffalcon@embarqmail.com	(910) 980-1355	Y	Y	Y	Y	Pending	Y
5	Godwin	Town	Willie Burnette	PO Box 10 Godwin, NC 28344	tog@ncrbiz.com	(910) 980-1000	Y	Y	Y	Y	Pending	Y

MULTI-JURISDICTION SUMMARY SHEET												
#	Jurisdiction Name	Jurisdiction Type (city/borough/ township/ village, etc.)	Plan POC	Mailing Address	Email	Phone	Requirements Met (Y/N)					
							A. Planning Process	B. Hazard Identification & Risk Assessment	C. Mitigation Strategy	D. Plan Review, Evaluation & Implementation	E. Plan Adoption	F. State Require-ments
6	Hope Mills	Town	John Ellis	5770 Rockfish Rd. Hope Mills, NC 28348	jwellis@townofhopemills.com	(910) 426-4116	Y	Y	Y	Y	Pending	Y
7	Linden	Town	Ruby Hendges	PO Box 130 Linden, NC 28356	lindentownhall@embarqmail.com	(910) 980-0119	Y	Y	Y	Y	Pending	Y
8	Spring Lake	Town	Paul Hoover	300 Ruth Street, Spring Lake, NC 28390	phoover@spring-lake.org	910) 703 - 8908	Y	Y	Y	Y	Pending	Y
9	Stedman	Town	Billy Horne	PO Box 220, Stedman, NC 28391	stedmanboc@ncrrbiz.com	(910) 323-1892	Y	Y	Y	Y	Pending	Y
10	Wade	Town	Cindy Burchett	PO Box 127, Wade, NC 28395-0127	townofwade@nc.rr.com	(910) 485-3502	Y	Y	Y	Y	Pending	Y
11	Hoke County Unincorporated Areas	County	Freddy Johnson	429 E. Central Ave Raeford, NC 28376	fjohnson@hokecounty.org	(910) 875-4126	Y	Y	Y	Y	Pending	Y
12	Raeford	Town	Freddy Johnson	429 E. Central Ave Raeford, NC 28376	fjohnson@hokecounty.org	(910) 875-4126	Y	Y	Y	Y	Pending	Y

APPENDIX B – PLANNING PROCESS DOCUMENTATION

Planning Step 1: Organize to Prepare the Plan

Resolution Creating the HMPC

Cumberland County Hazard Mitigation Planning Committee

Municipality/Department

(ONE REPRESENTATIVE FROM EACH AGENCY)

Three-at-Large Citizens of Cumberland County

City of Fayetteville Emergency Management Coordinator

City of Fayetteville Planning Department

Cumberland County Department of Emergency Services

Cumberland County Department of Engineering, Infrastructure and Landscaping

Cumberland County Management

Cumberland County Planning and Inspections Department

Town of Eastover, Kim Nazarchyk, Town Manager

Town of Falcon, Belinda D. White, Town Clerk

Town of Godwin, Willie J. Burnette, Mayor

Town of Hope Mills, John W. Ellis III, Town Manager

Town of Linden, Ruby Hendges, Town Clerk

Town of Spring Lake, Paul Hoover, Public Works Department

Town of Stedman, Billy Horne, Mayor

Town of Wade, Cindy Burchett, Town clerk

American Red Cross –Highland Chapter, Ron Thompson, Disaster Program Specialist

Sustainable Sandhills, Alba Polonkey, Sustainability Program Manager

United Way of Cumberland County, Robert Hines, Executive Director

RESOLUTION
CREATION OF THE REGIONAL HAZARD MITIGATION PLANNING COMMITTEE FOR CUMBERLAND COUNTY

WHEREAS, Cumberland County participates in the National Flood Insurance Program's (NFIP) and Community Rating System (CRS) Program to reduce the cost of flood insurance to County residents; and

WHEREAS, currently Cumberland and Hoke Counties are developing a Regional Hazard Mitigation Plan that will protect the public health, safety and welfare of its residents while minimizing public and private losses due to natural hazards; and

WHEREAS, the public will be encouraged to become involved in the planning process and invited to attend all committee and public meetings held throughout the development of the Regional Hazard Mitigation Plan of Cumberland and Hoke Counties; and

WHEREAS, Hoke County has established their own Hazard Mitigation Planning Committee and will be involved in all public meetings and programs; and

WHEREAS, by Cumberland County participating in the National Flood Insurance Program (NFIP) and Community Rating System (CRS) an adopted Hazard Mitigation Plan that meets the standards outlined in 44 Code of Federal Regulation (CFR) 78.5., 78.6, and 201.6, will provide credit points toward the CRS Program; and

WHEREAS, Cumberland County has exposure to flood and other natural hazards that increase the vulnerability of life, property, environment and the County's economy; and

WHEREAS, both the Regional Hazard Mitigation Planning Committees will be involved in the assessment of the natural hazards that impact the Counties, developing goals that address the hazards, and creating various mitigation strategies to help reduce damage to structures and protect lives; and

WHEREAS, the Regional Hazard Mitigation Planning Committee has the responsibility to meet and fulfill the requirements of the Disaster Mitigation Act (DMA) of 2000 and FEMA's CRS Program; and

WHEREAS, both the Hazard Mitigation Planning Committees will serve until the completion of the Regional Hazard Mitigation Plan for Cumberland and Hoke Counties and upon adoption the Cumberland County Committee will dissolve; and

NOW, THEREFORE, BE IT RESOLVED that the Cumberland County Board of Commissioners hereby adopts the creation of the Regional Hazard Mitigation Planning Committee.

Cumberland County Hazard Mitigation Planning Committee

On this 17th day of August 2015

BY: Kenneth S. Edge
Kenneth S. Edge, Chairman
BOARD OF COUNTY COMMISSIONERS

ATTEST: Candice W. White
Candice White, Clerk to the Board

Attachment: Cumberland County Regional Hazard Mitigation Planning Committee

Cumberland County Hazard Mitigation Planning Committee

Table B-1: HMPC Meeting Dates

Meeting Type	Meeting Topic	Meeting Date/ Time	Meeting Location
HMPC #1 (Hoke Co Kick-off)	3) Introduction to DMA and CRS planning process 4) Organize resources: the role of the HMPC, planning for public involvement, and coordinating with other agencies and stakeholders	June 12, 2015 10:00am – Noon	227 N. Main Street, Raeford, NC 28376
HMPC #2 (Cumberland Co Kick-off)	3) Introduction to DMA, CRS and the planning process 4) Organize resources: the role of the HMPC, planning for public involvement, and coordinating with other agencies and stakeholders	June 16, 2015 2:00pm – 3:30pm	131 Dick Street, Fayetteville, NC 28301
HMPC #3	3) Review/discussion of Flood Risk Assessment (Assess the Hazard) 4) Review/discussion of Vulnerability Assessment (Assess the Problem)	September 30, 2015 10:00am – Noon	116 W Prospect St Raeford, NC 28376
HMPC #4	3) Review goals in existing Cumberland and Hoke Plans 4) Revise existing goals and create new goals for Regional Plan	November 12, 2015 1:30pm -3:30pm	1347 Rim Road, Fayetteville NC 28314
HMPC #5	3) Review mitigation actions in existing Cumberland and Hoke Plans 4) Create new actions for Regional Plan	December 14, 2015 2:00pm – 4:00 pm	1347 Rim Road, Fayetteville NC 28314
HMPC #6	3) Review "Draft" Hazard Mitigation Plan 4) Solicit comments and feedback from the HMPC	January 6, 2016 2:00pm – 4:00 pm	1347 Rim Road, Fayetteville NC 28314

Table B-2: Stakeholder Invitation List

	First Name	Last Name	Organization	Address 1	Address 2
CUMBERLAND/HOKE HAZARD MITIGATION PLAN STAKEHOLDERS					
Non-Profit Organizations					
	Phil	Harris	American Red Cross - Highlands Chapter	807 Carol Street	Fayetteville, NC 28303
	Donna	Foster	Cumberland County Soil & Water Conservation District	301 East Mountain Drive	Fayetteville, NC 28306-3422
	Alba	Polonkey	Sunstainable Sandhills	PO Box 144	Fayetteville, NC 28302
Educational Institutions					
	Barbara	Russo	Fayetteville State University Emergency Management & Environmental Health and Safety	1200 Murchison Road	Fayetteville, NC 28301
	L. Taylor	Blackley	Methodist University Environmental Health and Safety	5400 Ramsey Street	Fayetteville, NC 28311
	Cathy	Baxley	Fayetteville Technical Community College	2201 Hull Road	Fayetteville, NC 28303
	Bruce	Morrison	Cumberland County Public Schools	2465 Gillespie Street	Fayetteville, NC 28306
	Freddie	Williamson	Hoke County Public Schools	310 Wooley Street	Raeford, NC 28376
Surrounding Municipalities					
	Gary	Pope	Harnett County Emergency Management	PO Box 370	Lillington, NC 27546
	Ronald	Bass	Sampson County Emergency Management	PO Box 8	Clinton, NC 28328
	David	Howell	Bladen County Emergency Management	PO Box 1646	Elizabethtown, NC 28337
	Stephanie	Chavis	Robeson County Emergency Management	38 Legend Drive	Lumberton, NC 28358
	Scott	Brooks	Moore County Emergency Management	PO Box 905	Carthage, NC 28327
	Roylin	Hammond	Scotland County Emergency Management	1403 West Blvd	Laurinburg, NC 28352
Federal Government					
	Susan	Wilson	FEMA Region IV, Chief, Floodplain Management & Insurance Branch	3003 Chamblee Tucker Road	Atlanta, GA 30341
	Janice	Mitchell	FEMA Region IV, Mitigation Division	3003 Chamblee Tucker Road	Atlanta, GA 30341
	Mandy	Todd	ISO/CRS Specialist	1993 Meadowood Lane	Longs, SC 29568
	Mike	Bratcher	ISO/CRS Specialist	163 Arliss Albertson Road	Beulaville, NC 28518
	Sherry	Harper	ISO/CRS Technical Coordinator	2382 Susan Drive	Crestview, FL 32536
	Eric	Strom	USGS - Raleigh Field Office	3916 Sunset Ridge Road	Raleigh, NC 27607
	Document Management	Attn: IMSE-BRG-HRA-M	Fort Bragg	2175 Reilly Road, Stop A	Fort Bragg, NC 28310
	Renessa	Hardy-Brown	Natural Resources Conservation Service (NRCS)	301 E Mountain Drive, #229	Fayetteville, NC 28306
State Government					
	John	Gerber	State NFIP Coordinator	4218 Mail Service Center	Raleigh, NC 27699-4218
	Chris	Crew	State Hazard Mitigation Officer	4218 Mail Service Center	Raleigh, NC 27699-4218
	Ryan	Cox	State Hazard Mitigation Planning Supervisor	4218 Mail Service Center	Raleigh, NC 27699-4218
	John	Holley	NCDENR - Land Quality Section Regional Office	1628 Mail Service Center	Raleigh, NC 27699-1626
Business Community					
	Gloria	Gist	Lumbee Guaranty Bank	6313 Raeford Road	Fayetteville, NC 28304
	John	Canady	Insurance Service Center	3820 Raeford Road	Fayetteville, NC 28304
	Catharin	Shepard	The News-Journal	119 West Elwood Avenue	Raeford, NC 28376
	Andrew	Barksdale	Fayetteville Observer	PO Box 849	Fayetteville, NC 28302-0849

Example Stakeholder Coordination Letter (via email)

RANDY BEEMAN
Director/Fire Marshal

JAMES "TIM" MITCHELL
Deputy Director

CUMBERLAND COUNTY
NORTH CAROLINA
EMERGENCY SERVICES DEPARTMENT

September 25, 2015

MEMORANDUM

TO: Cumberland County Hazard Mitigation Planning Committee

FROM: Randy Beeman, Director

SUBJECT: Committee Information and Meeting Schedule

CC: David Stroud, Amec Foster Wheeler

Cumberland County is in the process of developing a regional hazard mitigation plan as a requirement to maintain eligibility for Federal Emergency Management Agency (FEMA) federal disaster funding. This plan increases Cumberland County's preparedness, recovery, response and mitigation development. We would like your participation, knowledge and feedback throughout the planning process.

If you have any information or data relating to any natural hazard (such as flooding, tornado, severe storms, etc.) affecting Cumberland County, we would appreciate you providing that data (reports, studies or links to information). This will help us in our effort to update the hazard identification and risk assessment (HIRA) portions of the plan. Your input and attendance at the proposed meetings is very much appreciated.

All upcoming Regional Hazard Mitigation Planning Committee (HMPC) meetings will be advertised on the Cumberland County website which can be found at www.co.cumberland.nc.us. Listed below is a schedule and location of the meetings:

10:00 AM., (Working Meeting) Wednesday, September 30, 2015 Hoke County Cooperative Extension, 116 W Prospect Avenue, Raeford, NC 28376, (910) 875-3461

2:00 P.M., (Working Meeting) Thursday, October 29, 2015 Cumberland County Emergency Operations Center, 131 Dick Street, Fayetteville NC 28301, (910) 321-6676

2:00 P.M. (Working Meeting) Monday, November 23, 2015 at Smith Recreation Center, 1520 Slater Avenue, Fayetteville, NC 28301 (910) 433-1571

6:00 P.M. (Public Meeting) November 23, 2015 at Smith Recreation Center, 1520 Slater Avenue, Fayetteville, NC 28301, (910) 433-1571.

Law Enforcement Center, 131 Dick Street, Room 114 • Fayetteville, North Carolina 28301
P.O. Drawer 1829 • Fayetteville, North Carolina 28301 • (910) 678-7688 • Fax: (910) 677-5552

HMPC Meeting Sign-in Sheets

HOKE COUNTY EMERGENCY MANAGEMENT AGENCY – Regional Hazardous Mitigation Kick-Off Meeting

10 AM - June 12, 2015 Commissioners Room, 227 N. Main Street, Raeford, North Carolina 28376

	NAME / TITLE - PRINT NEATLY	FIRM/COMPANY	ADDRESS	PHONE #	E-MAIL ADDRESS
01	Freddy L. Johnson Sr. Director	Hoke County EMA	429 E. Central Ave Raeford, NC 28376	910-875-4126	fjohnson@hokecounty.org
02	Robin A. Lorenzen EM Officer	Hoke County EMA	429 E. Central Ave Raeford, NC 28376	910-875-4126	rlorenzen@hokecounty.org
03	DAVID STROUD	AMEC FOSTER WHEELER	STIRRUP CREEK DR. DURHAM, NC	919-325-6497	david.stroud@amec.com
04	TERRY TAPP	City OF RAEFORD FD	315 N. MAIN ST	910 875-5150	TTAPP@RAEFORDNC.ORG
05	Jimmy Stewart	Hoke County Emergency Communications	Po Box 176 Raeford, NC 28376	910-904-2973	jstewart@hokecounty.org
06	Kenny Crumpler	RAEFORD PD	315 N. MAIN ST RAEFORD	910-857-4251	CHIEF CRUMPLER @ RAEFORDNC.ORG
07	John Joseph	Public at Large	1945 Johnson Mill Rd Raeford NC	910-875-4114	puppycreek@aol.com.
08	Robert L. Godwin	Hoke County EMS	375 TEAL Drive RAEFORD, NC	(910) 904-8992	RGODWIN@capefearvalley.com
09	KENDRIC MAYNOR	HOKE COUNTY PARKS & REC	423 E Central Ave	(910) 875-4035	kmaynor@hokecounty.org
10	Hubert A. Peterkin	Hoke Sheriff's Office	429 E. Central	(910) 875-5111	hpeterkin@hokesheriff.org
11	Lisa Beal	Hoke Tax List/GIS		875-8751	lbeal@hokecount.org

HOKE COUNTY EMERGENCY MANAGEMENT AGENCY – Regional Hazardous Mitigation Kick-Off Meeting June 12, 2015

##	NAME / TITLE – PRINT NEATLY	FIRM/COMPANY	ADDRESS	PHONE #	E-MAIL ADDRESS
12	ROBERT FARRELL PLANNER	PLANNING DEPT- HOKE	427 E. CENTRAL AVE	(910) 878 4022	rfarrell@hokecounty.org.
13	Ken MacDonald Publisher, News Jrn	The News Journal	119 W Elwood	875-2121	rcm@thenews-journal.com
14	Leonard McBryde Public Utilities Director	Hoke County		910-309-0819	lmcbryde@hokecounty.org
15					
16	Letitia J. Edens	Hoke County	227 N. Main St.	910-875-8751	ledens@hokecounty.org
17	Wanda Richardson	Hoke County LEPC	1600 Rosa Dr.	910-624-6836	Wrichardson@butterball.com
18					
19					
20					
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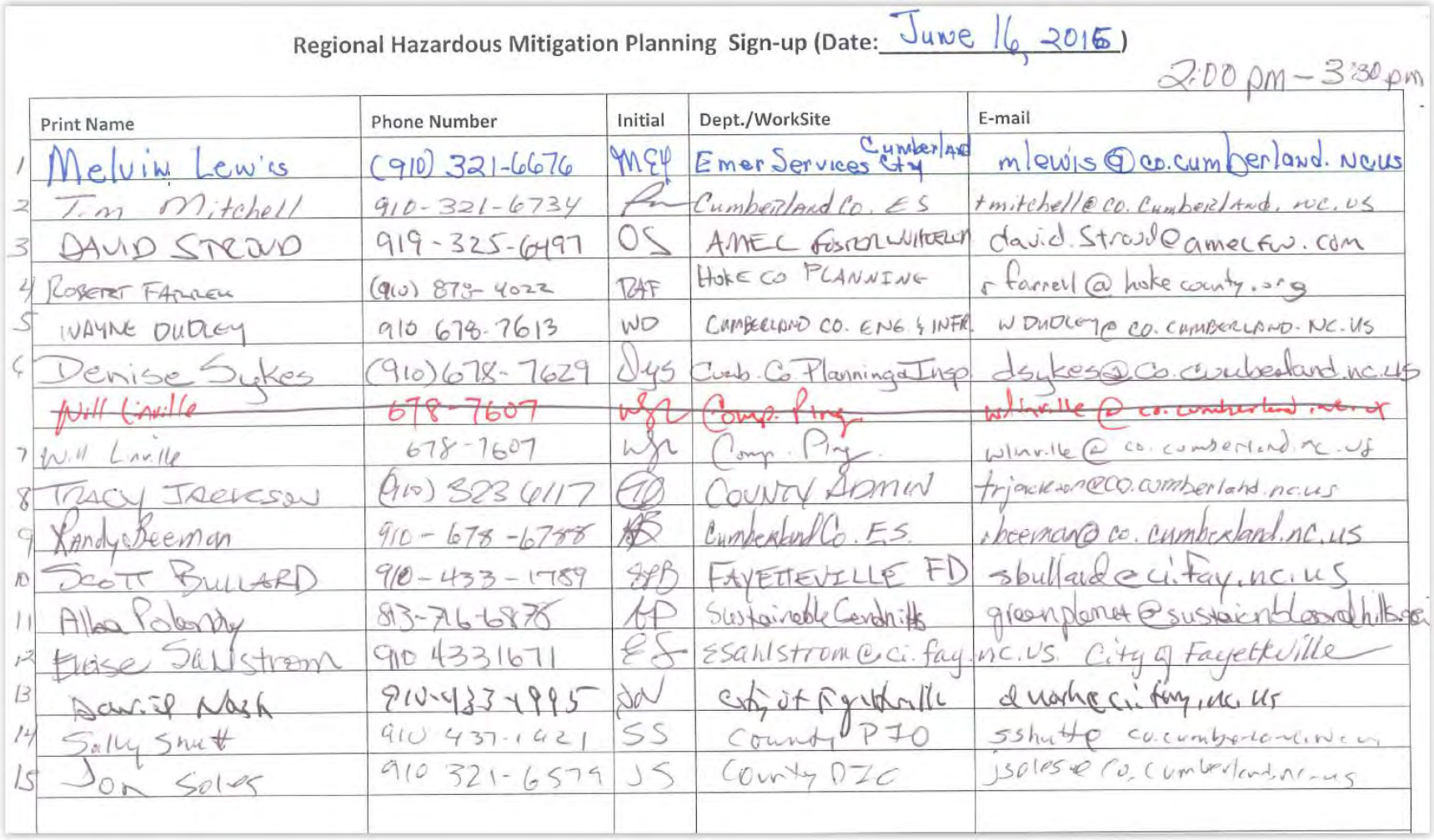


Regional Hazardous Mitigation Planning Sign-up (Date: June 16, 2015)

2:00 pm – 3:30 pm

	Print Name	Phone Number	Initial	Dept./WorkSite	E-mail
1	Melvin Lewis	(910) 321-6676	MCL	Emer Services Cumberland Cty	mlewis@co.cumberland.nc.us
2	Tim Mitchell	910-321-6734		Cumberland Co. ES	tmitchell@co.cumberland.nc.us
3	DAVID STROUD	919-325-6497	DS	AMEC FOSTER WHEELER	david.stroud@amecfw.com
4	ROBERT FARRELL	(910) 879-4022	RAF	HOKE CO PLANNING	rfarrell@hokecounty.org
5	WAYNE DUDLEY	910 678-7613	WD	CUMBERLAND CO. ENG & INFR.	WDUDLEY@CO.CUMBERLAND.NC.US
6	Denise Sykes	(910)678-7629	DJS	Cumb. Co Planning & Insp.	dsykes@co.cumberland.nc.us
	~~Will Linville~~	~~678-7607~~	~~WJL~~	~~Comp. Plng.~~	~~wlinville@co.cumberland.nc.us~~
7	Will Linville	678-7607	WJL	Comp. Plng.	wlinville@co.cumberland.nc.us
8	TRACY JACKSON	(910) 323 6117	TJ	COUNTY ADMIN	tjackson@co.cumberland.nc.us
9	Randy Reeman	910-678-7788	RR	Cumberland Co. ES	rreeman@co.cumberland.nc.us
10	SCOTT BULLARD	910-433-1759	SWB	FAYETTEVILLE FD	sbullard@ci.fay.nc.us
11	Alba Polonky	813-716-6878	AP	Sustainable Carolinas	greenplanet@sustainablecarolinas
12	Elise Sahlstrom	910 4331671	ES	ESAHLSTROM@ci.fay.nc.us City of Fayetteville	
13	David Nash	910-433-1995	DN	City of Fayetteville	dnash@ci.fay.nc.us
14	Sally Shutt	910 437-1421	SS	County PIO	sshutt@co.cumberland.nc.us
15	Jon Soles	910 321-6579	JS	County DIC	jsoles@co.cumberland.nc.us

Regional Hazardous Mitigation Public Forum Sign-up (Date: September 30, 2016)

Print Name	Phone Number	Initial	Dept./WorkSite	E-mail
DAVID STROUD	919 325-6497	DS	AMEC FOSTER WHEELER	david.stroud@amecfw.com
Robin Lorenzen	910 585-0808	RL	Hoke Co. EM	rlorenzen@hokecounty.org
Randy Beeman	910-678-7688	RB	Cumberland County Emergency Svc.	rbeeman@co.cumberland.nc.us
Tim Mitchell	910-321-6734	TM	Cumberland Co. EM	tmitchell@co.cumberland.nc.us
LARRY OVERBY	919-796-8818	LO	LINDEN, NC	LARRYOVERBY@HOTMAIL.COM
Gene Booth	910 850-8166	GB	CCEM Fayetteville, NC	wbooth@co.cumberland.nc.us
TERRY TAPP	910-875-5450	TT	RAEFORD FD	TTAPP@RAEFORDNC.ORG
Betty Smith	910-875-8161	BS	City of RAEFORD	bsmith@RAEfordnc.org
Bobby Lamb	910-308-2318	BL	RED CROSS	Lubob30@yahoo.com
F.K CRUMPLER	910-875-4251	FKC	RAEFORD POLICE DEPT	CHIEFCRUMPLER@RAEFORDNC.ORG
Denise Sykes	910-678-7629	DS	Cumberland Co. Planning	dsykes@co.cumberland.nc.us
WILL LINVILLE	910 678 7609	WL	Cumb Co. Plng	wlinville@co.cumberland.nc.us
FREDDY L. JOHNSON	910-875-4126	FJ	HOKE EM/FM/SO	FJOHNSON@HOKECOUNTY.ORG
Ken MacDonald	910-875-2121	KM	The News-Journal	ken@thenews-journal.com
ROBERT FARRELL	910-878-4024	RF	HOKE CO. PLANNING	rfarrell@hokecounty.org

Regional Hazardous Mitigation Working Meeting Sign-up (Date: November 12, 2015)

	Print Name	Phone Number	Initial	Dept./WorkSite	E-mail
1	Alexia N. Fields	910-432-8956 910-788-1756		DPTMS / Fort Bragg	Alexia.N.Fields.civ@mail.mil
2	Melvin Lewis	910-321-6676		Emergency Services Cumberland County	MLEWIS@co.cumberland.nc.us
3	LT Ray Downing	910 875 5111		Hoke Co. Sheriff	RDowning@hokesheriff.org
4	Robert A James	910-580-5668		DPTMS/Fort Bragg	robert.c.jamessr@mail.mil
5	Bobby Lurrie	910-308-2328		Red Cross	lurrieb30@yahoo.com
6	Larry Overby	919-796-8818		Town of Linden	larryoverby@hotmail.com
7	Robert Farrell	910 878 4022		Hoke Co. Planning	rfarrell@hokecounty.org
8	Steve Booth	910 850-8166		Cumberland Co. Sr	wboothe@co-cumberland.nc.us
9	Christian Wright	910-723-9524			cbwright528@gmail.com
10	Ora Bethea	910-483-7436			Bethora@aol.com
11	Barrett Lowe	910-964-2899		Fort Bragg / FORSCOM	barrylowe81@nc.rr.com
12	Robin Lorenzen	910 8580808		HC EM	rlorenzen@hokecounty.org
13	Scott Bullard	9104331789		Fayetteville FD	sbullard@ci.fay.nc.us
14	Tim Mitchell	910-321-6734		Cumberland Co.	tmitchell@co.Cumberland.nc.us
15	Randy Beeman	910-321-6960		Cumberland Co.	rbeeman@co.cumberland.nc.us
16	Denise Sykes	910-678-7629		County Planning & Insp.	dsykes@co.cumberland.nc.us
17	Alba Roberts	910-484-9098		Sustainable Sandhills	greenplanet@sustainablesandhills.org
18	Will Livingood	678-7807		Plng Dept.	wlivingood@co.cumberland.nc.us
19	Kim Nazarchyk	323-6707		Eastover	farmmanager@eastover.com
20	Daniel Nash	433-1995		City of Fay - Planning Dept	dnash@ci.fay.nc.us
21					
22					

Regional Hazardous Mitigation Working Meeting Sign-up (Date: December 14, 2015)

	Print Name	Phone Number	Initial	Dept./WorkSite	E-mail
1	Ora Bethea	910-483-7436	OLB	Citizen	Bethoea@aol.com
2	Gene Booth	910-850-8166	WEB	Cumberland Co ES	wbooth@co.cumberland.nc.us
3	Tim Mitchell	910-321-6734	[illegible]	Cumberland Co ES	tmitchell@co.cumberland.nc.us
4	Scott Bullard	910-433-1789	SB	Fayetteville FD	sbullard@ci.fay.nc.us
5	Melvin Lewis	910-321-6676	MEL	Cumb Cty ES	mlewis@co.cumberland.nc.us
6	Randy Beeman	910-321-6960	[illegible]	CCES	rbeeman@co.cumberland.nc.us
7	Robert Farrell	910-878-4022	RAF	Hoke Planning	rfarrell@hokecounty.org
8	Benny Nichols	910-391-7636	BN	Hoke County EM	bnichols@hokesheriff.org
9	George Marr	910.624.5128	GM	Hoke County S.O.	gmarr@hokesheriff.org
10	Bobby Currie	910-308-2318	BC	Red Cross	Lwbob30a@yahoo.com
11	Rob James	910-580-5668	RJ	Fort Bragg EM	Robert.c.James50.civ@mail.mil
12	Denise Sykes	(910)-678-7629	DS	Cumb. County	dsykes@co.cumberland.nc.us
13	Jennifer Oppenlander	(o	JO	Cumb. County	joppenlander@co.cumberland.nc.us
14	Tim Garner		TG	Town of Spring Lake	tgarner@spring-lake.org
15	Amy Crowley	615-516-8122	AC	AmeC	amy.crowley@amecfw.com
16	David Stroud	919-325-6497	DS	AMEC	david.stroud@amecfw.com
17	David Nash	910-433-1995	DN	City of Fayetteville	dnash@ci.fay.nc.us
18	Alba Polonkey	83-716-6878	AP	Sustainable Sandhills	greenpbran@sustainablesandhills.org
19	Angie Abraham	910-433-1220	AA	Parks&Rec/EE Miller	aabraham@ci.fay.nc.us
20					
21					
22					

Regional Hazardous Mitigation Working Meeting Sign-up (Date: December 14, 2015)

	Print Name	Phone Number	Initial	Dept./WorkSite	E-mail
1	CHAN GRAY-MCLAUGHLIN	910.426.4103	CGM	TOWN OF HOPE MILLS PLANNING	cmclaughlin@townofhopemills.com
2	Sally Shutt	910-321-1921	SS	County	sshutt@co.cumberland.nc.us

Regional Hazardous Mitigation Working Meeting 2:00 – 4:00 p.m. Sign-In (Date: January 6, 2016)

	Print Name	Phone Number	Initial	Dept./WorkSite	E-mail
1	Amy Crowley	919-381-1361	AC	Amec Foster Wheeler	[redacted] amy.crowley@amecfw.com
2	DAVID STROUD	919-325-6497	DS	AMEC FOSTER WHEELER	david.stroud@amecfw.com
3	Robin Lorenzen	910 585-0808	RL	Hoke EM/Fm	rlorenzen@hokecounty.org
4	Bobby Currie	910-308-2318	BC	Red Cross	lubob30@yahoo.com
5	Melvin Lewis	910 [illegible]-6676	ML	Emergency Services Cumberland NC	mlewis@co.cumberland.nc.us
6	TIM GARNER	336-963-5919	TG	Town of Spring Lake	tgarner@spring-lake.org
7	Alisa Palonkey	813-716-6878	AP	Sustainable Sandhills	greenplanet@sustainablesandhills.org
8	BARRETT LOWE	910-964-2897	BL	CITIZEN/FAYETTEVILLE	barrylowe81@nc.rr.com
9	ROBERT FARRELL	910 578-4072	RAF	HOKE PLANNING	rfarrell@hokecounty.org.
10	Denise Sykes	910-678-7629	DS	Cumb. Co.	dsykes@co.cumberland.nc.us
11	Jennifer Oppenlander	910-678-7611	JO	Cumb. Co.	joppenlander@co.cumberland.nc.us
12	Ken Boothe	910 850 6166	KB	Emergency Svs	wlboothe@co.cumberland.nc.us
13	David Nash	910-433-1995	DN	City of Fayetteville	dnash@ci.fay.nc.us
14	Scott Bullard	910 433-1789	SB	FAYETTEVILLE FD	sbullard@ci.fay.nc.us
15	Tim Mitchell	910-321-6734	TM	Cumb. Co.	tmitchell@co.cumberland.nc.us
16	~~[illegible]~~	910.426.4183	CM	TOWN OF HOPE MILLS	cmclaughlin@townofhopemills.com
17	Sally Shutt	910-437-1921	SS	CumbCo PIO	sshutt@co.cumberland.nc.us
18					
19					
20					
21					
22					

HMPC Meeting Agendas and Minutes

Cumberland-Hoke Regional Hazard Mitigation Plan

Hoke County Hazard Mitigation Planning Committee Kickoff Meeting Agenda

Hoke County Commissioners Room – Pratt Building

Raeford, NC

10:00 AM on June 12, 2015

1. Welcome and Introductions
2. Why Cumberland and Hoke Counties are joining together for this plan update
3. Why planning for natural disasters are important
4. Description of the Disaster Mitigation Act of 2000 planning requirements
5. Benefits of FEMA's National Flood Insurance Program's Community Rating System Program
6. Planning process to follow for plan update
7. Questions

Cumberland-Hoke Regional Hazard Mitigation Plan

Hoke County Hazard Mitigation Planning Committee Kickoff Meeting Minutes

Hoke County Commissioners Room – Pratt Building

Raeford, NC

10:00 AM on June 12, 2015

The kickoff meeting for the development of the Cumberland Hoke Regional Hazard Mitigation Plan began at 10:00 AM at the Hoke County Commissioner's Room in the Pratt Building on 227 North Main Street in Raeford, NC. Hoke County decided to have a separate kickoff meeting from Cumberland County.

The objective of the meeting is to inform the Hazard Mitigation Planning Committee (HMPC) of the requirements for a new regional hazard mitigation plan for both Cumberland and Hoke Counties. The 2011 Cumberland County Hazard Mitigation Plan and the 2010 Hoke County Hazard Mitigation Plan will be combined into one regional hazard mitigation plan.

Mr. Freddy Johnson, Director of Hoke County Emergency Management welcomed everyone to the meeting and introduced David Stroud with Amec Foster Wheeler who is the consultant to facilitate the planning process.

Mr. Stroud discussed the reasons that communities should plan in advance of natural disasters including the cost of past natural disasters across the United States. The time for planning is when a community is not faced with recovery. As important is that the plan is required to be updated every five years to be in compliance with the Disaster Mitigation Act (DMA) of 2000 and to make the community eligible for future federal disaster funding.

The Power Point presentation discussed the four phase of DMA along with the ten planning steps of the Community Rating System (CRS) program. Each of the 10 CRS planning steps fit within the four phases of DMA to create a seamless planning process. Mr. Stroud focused in detail on those four phases and ten planning steps.

Important for success of the plan update is to make sure the right people are at the table including city and county departments, citizens, regional agencies, etc. More importantly is to keep the public informed of the planning process throughout the process. Coordination with other agencies for supporting data and their knowledge will also make the planning process more effective.

Mr. Stroud also discussed the planning needs from each community including collection of plans, studies, reports and other data necessary to complete the plan update. Amec Foster Wheeler will be in contact to collect parcel data along with other planning documents.

Finally, Mr. Stroud entertained questions on the planning process and data needs from the City of Raeford and from Hoke County.

Cumberland-Hoke Regional Hazard Mitigation Plan

Cumberland County Hazard Mitigation Planning Committee Kickoff Meeting Agenda

Cumberland County Emergency Management Agency

Fayetteville, NC

2:00 PM on June 16, 2015

1. Welcome and Introductions
2. Why Cumberland and Hoke Counties are joining together for this plan update
3. Why planning for natural disasters are important
4. Description of the Disaster Mitigation Act of 2000 planning requirements
5. Benefits of FEMA's National Flood Insurance Program's Community Rating System Program
6. Planning process to be followed for plan update
7. Questions

Cumberland-Hoke Regional Hazard Mitigation Plan

Cumberland County Hazard Mitigation Planning Committee Kickoff Meeting Minutes

Cumberland County Emergency Management Agency

Fayetteville, NC

2:00 PM on June 16, 2015

The kickoff meeting for the development of the Cumberland Hoke Regional Hazard Mitigation Plan began at 2:00 PM at the Cumberland County Emergency Management Agency on 131 Dick Street in Fayetteville, NC. Cumberland County decided to have a separate kickoff meeting from Hoke County.

The objective of the meeting is to inform the Hazard Mitigation Planning Committee (HMPC) of the requirements for a new regional hazard mitigation plan for both Cumberland and Hoke Counties. The 2011 Cumberland County Hazard Mitigation Plan and the 2010 Hoke County Hazard Mitigation Plan will be combined into one regional hazard mitigation plan.

Mr. Gene Booth, Cumberland County Emergency Manager welcomed everyone to the meeting and introduced David Stroud with Amec Foster Wheeler who is the consultant to facilitate the planning process.

Mr. Stroud discussed the reasons that communities should plan in advance of natural disasters including the cost of past natural disasters across the United States. The time for planning is when a community is not faced with recovery. As important is that the plan is required to be updated every five years to be in compliance with the Disaster Mitigation Act (DMA) of 2000 and to make the community eligible for future federal disaster funding.

The Power Point presentation discussed the four phase of DMA along with the ten planning steps of the Community Rating System (CRS) program. Each of the 10 CRS planning steps fit within the four phases of DMA to create a seamless planning process. Mr. Stroud focused in detail on those four phases and ten planning steps.

Important for success of the plan update is to make sure the right people are at the table including city and county departments, citizens, regional agencies, etc. More importantly is to keep the public informed of the planning process throughout the process. Coordination with other agencies for supporting data and their knowledge will also make the planning process more effective.

Mr. Stroud also discussed the planning needs from each community including collection of plans, studies, reports and other data necessary to complete the plan update. Amec Foster Wheeler will be in contact to collect parcel data along with other planning documents.

Finally, Mr. Stroud entertained questions on the planning process and data needs from the Cumberland County and its municipalities.

Cumberland-Hoke Regional Hazard Mitigation Plan

Regional HMPC Agenda

Hoke County Cooperative Extension Service

Raeford, NC

10:00 AM on September 30, 2015

1. Welcome and Introductions
2. Discussion of Hazard Identification and Risk Assessment (HIRA)
3. Description of the natural hazard profiles for Cumberland and Hoke Counties
4. Description of the Hazard Vulnerability and Risk Assessment
5. Discussion of the Goals from the previous mitigation plans
6. Discussion of the Capability Assessment
7. Next Planning Steps
8. Questions

Cumberland-Hoke Regional Hazard Mitigation Plan

Hazard Mitigation Planning Committee Meeting Minutes

Hoke County Cooperative Extension Agency

Raeford, NC

10:00 AM on September 30th, 2015

The second Hazard Mitigation Planning Committee meeting for the development of the Cumberland-Hoke Regional Hazard Mitigation Plan began at 10:00 AM at the Hoke County Cooperative Extension Agency on 116 West Prospect Street in Raeford, NC.

The objective of the meeting is to review the results of the Hazard Identification and Risk Assessment (HIRA). Since the kickoff meeting, Amec Foster Wheeler has collected data and information from all communities and incorporated that data into the HIRA.

Mr. Stroud discussed the natural hazards profiled in the 2010 Hoke County Hazard Mitigation Plan and the hazards profiled in the Cumberland County 2011 Hazard Mitigation Plan. Then Mr. Stroud provided a listing of combined hazards to be addressed in the Cumberland-Hoke Regional Hazard Mitigation Plan. Those hazards include: Dam/Levee Failure, Drought, Earthquake, Erosion, Extreme Heat, Hurricane Tropical Storm, Inland Flooding 100-/500-year, Severe Weather (Thunderstorm wind, Lightning & Hail), Sinkhole, Tornado, Wildfire, and Winter Storms. This discussion included the following criteria: Hazard Description, Location and Spatial Extent, Past Occurrences, and Probability of Future Occurrences. An additional section of Consequence analysis is added for each hazard to discuss the effects of the hazards on people, first responders, continuity of operations, built environment, economy and natural environment.

Next, Mr. Stroud discussed the Vulnerability Assessment which included detail on the methodology utilized, assets inventory, vulnerability results and establishing a priority index. Amec Foster Wheeler utilized the State of North Carolina's Risk Data to prepare this section of the plan.

Many tables and maps were presented to the HMPC throughout this presentation. Amec Foster Wheeler provided copies of the draft HIRA to all communities and asked that it be posted on websites for public comment. Mr. Stroud entertained questions on the HIRA.

Cumberland-Hoke Regional Hazard Mitigation Plan

Regional HMPC Agenda

E.E. Miller Recreation Center

Fayetteville, NC

1:30 PM on November 12, 2015

1. Welcome and Introductions
2. Review existing goals from the 2011 Cumberland County HMP and 2010 Hoke County HMP
3. Goal setting exercise to rank goals from both plans
4. Description of the Hazard Vulnerability and Risk Assessment
5. Review the 6 FEMA mitigation categories:
    a. Prevention
    b. Property Protection
    c. Natural Floodplain Functions
    d. Emergency Services
    e. Structural Projects
    f. Public Information
6. Next Planning Steps
7. Questions

Cumberland-Hoke Regional Hazard Mitigation Plan

Hazard Mitigation Planning Public Meeting Minutes

E.E. Miller Recreation Center

Fayetteville, NC

1:30 PM on November 12th, 2015

The third Hazard Mitigation Planning Committee meeting for the development of the Cumberland-Hoke Regional Hazard Mitigation Plan began at 1:30 PM at the E.E. Miller Recreation Center on 1347 Rim Road in Fayetteville, NC.

The objective of the meeting is to review the goals in the current 2011 Cumberland County Hazard Mitigation Plan and the 2010 Hoke County Hazard Mitigation Plan. More importantly is to define new goals for the 2105 Regional Hazard Mitigation Plan.

Mr. David Stroud with Amec Foster Wheeler facilitated the goal setting exercise. Mr. Stroud indicated that the HMPC should consider the goals with respect to what they want to achieve with the new Regional hazard Mitigation Plan and that each mitigation project that is included in the mitigation strategy must align with one of the goals set for the plan.

The current seven goals from the 2011 Cumberland County Hazard Mitigation Plan and the 2010 Hoke County Hazard Mitigation Plan were presented to the HMPC. Mr. Stroud asked for discussion on these goals in terms of their applicability to the current hazards and to consider what they say and are they indeed providing guidance for the future of this planning effort.

To determine the effectiveness of the current goals, Mr. Stroud provided each HMPC member a goal ranking form. The object is to rank from highest to lowest the seven goals from both plans. Mr. Stroud added that if you want an entirely new goal or change to an existing goal to write it at the bottom. The HMPC spent around 30 minutes ranking the goals and providing a discussion. Mr. Stroud indicated that he would provide the ranking results and that the top 4 goals, revised goals, or new goals would be synthesized and redistributed to the HMPC.

Mr. Stroud next passed out each communities current mitigation projects and asked that each community review the projects and provide back a status report of the implementation of these projects from each community's current hazard mitigation plan. There were several questions on what kind of information would need to be provided to support the status of each project.

Next Mr. Stroud gave a brief overview of the six FEMA Mitigation categories of mitigation projects: Prevention, Property Protection, Natural Resource Protection, Emergency Services, Structural Projects, and Public Information which each new mitigation project must fit within. Additionally Mr. Stroud mentioned that projects in other planning documents, Capital Improve Program, FEMA Mitigation Ideas publication can be considered for mitigation projects. The next meeting of the HMPC will be a working session to create new projects for the 2015 Regional Hazard Mitigation Plan.

Cumberland-Hoke Regional Hazard Mitigation Plan

Regional HMPC Agenda

E.E. Miller Recreation Center

Fayetteville, NC

2:00 PM on December 14, 2015

1. Welcome and Introductions
2. Review existing mitigation projects
3. Working session to set new mitigation projects
4. Next Planning Steps
5. Questions

Cumberland-Hoke Regional Hazard Mitigation Plan

Hazard Mitigation Planning Public Meeting Minutes

E.E. Miller Recreation Center

Fayetteville, NC

2:00 PM on December 14th, 2015

The fourth Hazard Mitigation Planning Committee meeting for the development of the Cumberland-Hoke Regional Hazard Mitigation Plan began at 2:00 PM at the E.E. Miller Recreation Center on 1347 Rim Road in Fayetteville, NC.

The objective of the meeting is to review the mitigation projects in the current 2011 Cumberland County Hazard Mitigation Plan and the 2010 Hoke County Hazard Mitigation Plan. More importantly is to define new projects for the 2105 Regional Hazard Mitigation Plan.

Ms. Amy Crowley and Mr. David Stroud with Amec Foster Wheeler attended the meeting to help facilitate new projects for the plan. Mr. Stroud began with an overview of the six FEMA Mitigation categories of mitigation projects: Prevention, Property Protection, Natural Resource Protection, Emergency Services, Structural Projects, and Public Information. Additionally Mr. Stroud mentioned that projects in other planning documents, Capital Improve Program, FEMA Mitigation Ideas publication can be considered for mitigation projects.

Amy and David divided the HMPC members into two groups – those representing Hoke County at one table and those representing Cumberland County. Amy and David helped to answer questions about the status of existing projects and whether they should be carried forward. Additionally, Amy and David worked with both groups on the development of new projects to be included in the 2015 Regional Hazard Mitigation Plan. This working session lasted approximately 1.5 hours.

Mr. Stroud indicated a deadline to provide new projects for inclusion in the regional plan. Mr. Stroud and Ms. Crowley also covered the future dates for getting the draft plan completed and submitted to North Carolina Emergency Management.

Cumberland-Hoke Regional Hazard Mitigation Plan

HMPC Meeting Agenda

E.E. Miller Recreation Center

Fayetteville, NC

2:00 PM on January 6, 2016

1. Welcome and Introductions
2. Overview of the planning process and structure of the plan
3. Overview of the hazards and their impacts
4. Discussion of the new goals
5. Discussion of the mitigation projects
6. Next steps for public comment and revision to the plan
7. Questions

Cumberland-Hoke Regional Hazard Mitigation Plan

Hazard Mitigation Planning Public Meeting Minutes

E.E. Miller Recreation Center

Fayetteville, NC

6:30 PM on January 6th, 2016

The second Hazard Mitigation Planning public meeting for the development of the Cumberland-Hoke Regional Hazard Mitigation Plan began at 6:30 PM at the E.E. Miller Recreation Center on 1347 Rim Road in Fayetteville, NC.

The objective of the meeting is to discuss and debate the draft 2015 Cumberland-Hoke Regional Hazard Mitigation Plan. This meeting provided an opportunity for HMPC members to review the complete draft plan.

Ms. Amy Crowley with Amec Foster Wheeler started the meeting with a Power Point presentation and cover the objectives for this final HMPC meeting. Ms. Crowley indicated that the presentation would cover the following topics: Structure of the Plan, Description of the Planning Process, Review of the Hazards, and a Review of the Mitigation Strategy.

Ms. Crowley covered the structure of the plan and indicated how the plan was laid out and covered the content of each specific chapter. Ms. Crowley also covered the planning process in terms of the HMPC meetings and public meetings and how the public and other stakeholders were involved in each of the planning process beyond attending public meetings. Coordination throughout the planning process occurred for many of these stakeholders.

Mr. Stroud review the natural hazards which were included in the draft plan along with the new four goals of the plan. Finally, Mr. Stroud provided a synopsis of the mitigation projects for each community which included a description of the mitigation project, who is responsible for implementing the project, when the project will be completed, and how the project will be funded.

Ms. Crowley and Mr. Stroud answered questions from the HMPC members and indicated the deadline dates to provide comments on the draft plan.

HMPC Meeting Pictures

December 14, 2015

December 14, 2015

January 6, 2016

Table B-3: Public Meeting Dates

Meeting Type	Meeting Topic	Meeting Date/Time	Meeting Locations
Public Meeting #1	3) Introduction to DMA, CRS and the planning process 4) Introduction to hazard identification	June 16, 2015 6:30-8:00PM	Smith Recreation Center, 1520 Slater Ave, Fayetteville, NC 28301
Public Meeting #2	3) Review "Draft" Hazard Mitigation Plan 4) Solicit comments and feedback from the public	January 6, 2016 6:30-8:00PM	E.E. Miller Recreation Center, 1347 Rim Road, Fayetteville, NC 28314

Public Meeting Sign-in Sheets

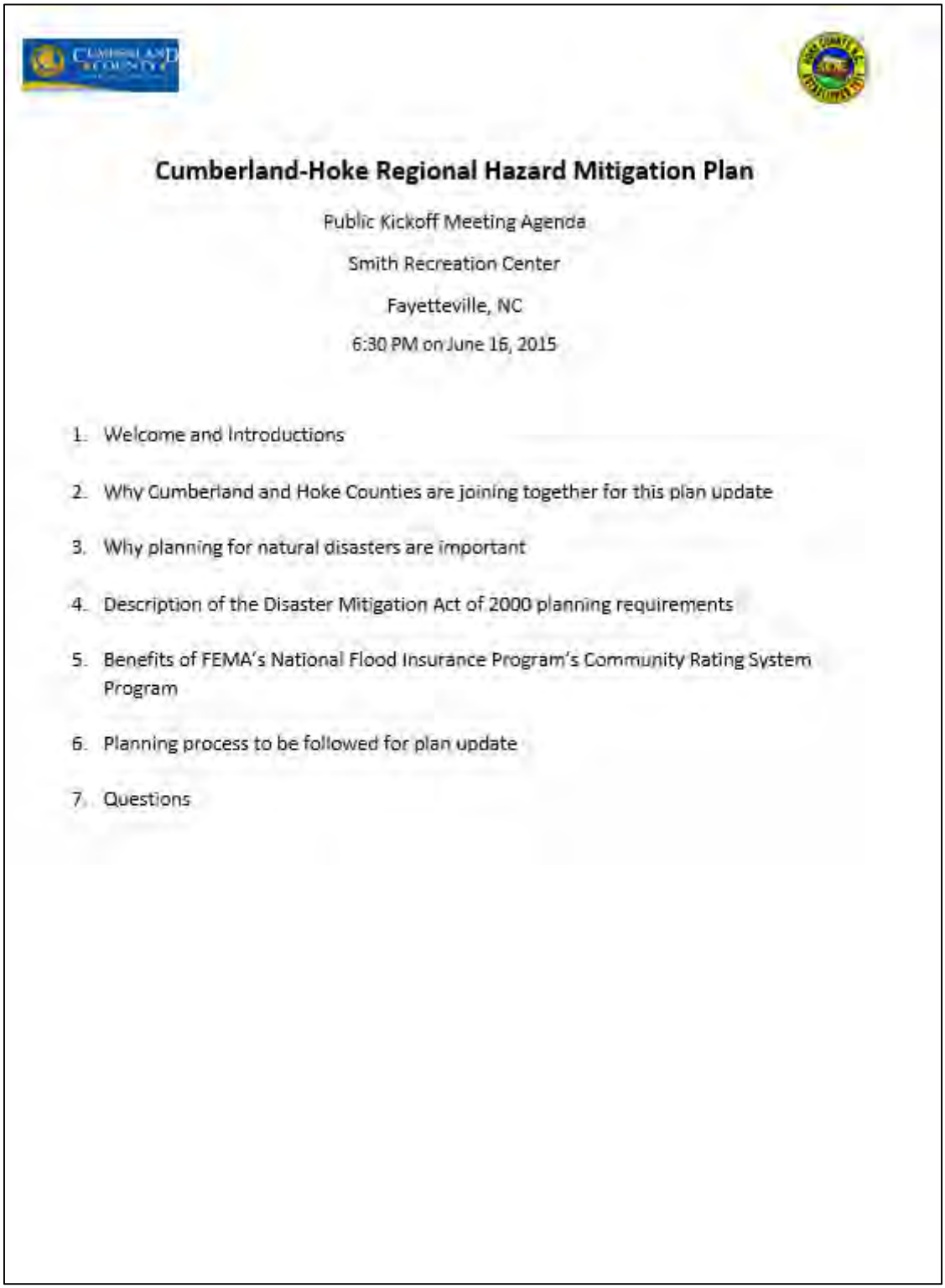
Regional Hazardous Mitigation Public Forum Sign-up (Date: June 16, 2016) 6:30 pm – 7:45 pm

	Print Name	Phone Number	Initial	Dept./WorkSite	E-mail
1	Melvin Lewis	910-321-6676	MLL	Emer Service Cumberland County	mlewis@co.cumberland.NC.US
2	Tim Mitchell	910-321-6734		Cumberland CO. ES.	tmitchell@co.cumberland.nc.us
3	DAVID STROUD	919-325-6497	DS	Amec Foster Wheeler	david.stroud@amecfosterwheeler
4	Lisa Madde	910-425-0642	L M	Citizen	~~dougl~~msc001madde@aol.com
5	Douglas B. Madde	910-425-0642	~~DM~~	Retired Fnte Anlyst-Army	douglasbmadde@aol.com
6	Will Linville	910-678-7607	WL	Cumb. Co. Plng	wlinville@co.cumberland.nc.us
7	Denise Sykes	910-678-7629	DS	Cumber Co. Planning	dsykes@co.cumberland.nc.us
8	Gene Booth	910-678-7641	WB	Cumberland Co. ES	wbooth@co.cumberland.nc.us
9	Randy Beeman	910-678-7688	RB	Cumberland County ESI	rbeeman@co.cumberland.nc.us
10					

Regional Hazardous Mitigation Working Meeting 6:30 p.m. – 8:00 p.m. Sign-In (Date: January 6, 2016)

	Print Name	Phone Number	Initial	Dept./WorkSite	E-mail
1	Melvin Lewis	910-580-2037		Emergency Services Cumberland County	mlewis@co.cumberland.nc.us
2	DAVID STRAUD	919-325-6497		Amec Foster Wheeler	david.straud@amecfw.com
3	Amy Crowley	919-381-1361		Amec Foster Wheeler	Amy.Crowley@amecfw.com
4	Robin Lorenzen	910-585-0808		Hoke Co EM/FM	rlorenzen@hokecounty.org
5	Douglas Modde	910-425-0642		Spokesperson SVC PLNG	douglasbmodde@aol.com
6	LISA Modde	910-425-0642	LM	CIVILIAN	mscoolmodde@aol.com
7	Gene Booth	910 850 8166		CCEM	gbooth@co.cumberland.nc.us
8	Tim Mitchell	910-321-6734		Cumb CO	tmitchell@co.cumberland.nc.us
9	FREDDY L. JOHNSON	910-476-7301		HOKE CO EM/SHERIFF	FJohnson@hokesheriff.org
10	OTIS Cuttino	910-885-3583		civilian	oncuttoe1@gmail.com
11					

Public Meeting Agendas and Minutes



Cumberland-Hoke Regional Hazard Mitigation Plan

Public Kickoff Meeting Agenda

Smith Recreation Center

Fayetteville, NC

6:30 PM on June 16, 2015

1. Welcome and Introductions
2. Why Cumberland and Hoke Counties are joining together for this plan update
3. Why planning for natural disasters are important
4. Description of the Disaster Mitigation Act of 2000 planning requirements
5. Benefits of FEMA's National Flood Insurance Program's Community Rating System Program
6. Planning process to be followed for plan update
7. Questions

Cumberland-Hoke Regional Hazard Mitigation Plan

Cumberland County Hazard Mitigation Planning Public Kickoff Meeting Minutes

Smith Recreation Center

Fayetteville, NC

6:30 P M on June 16, 2015

The public kickoff meeting for the development of the Cumberland-Hoke Regional Hazard Mitigation Plan began at 6:30 PM at the Cumberland County Emergency Management Agency on 1520 Slater Avenue in Fayetteville, NC. Cumberland County decided to have a separate kickoff meeting from Hoke County.

The objective of the meeting is to inform the public on the requirements for a developing a new regional hazard mitigation plan for both Cumberland and Hoke Counties. The 2011 Cumberland County Hazard Mitigation Plan and the 2010 Cumberland County Hazard Mitigation Plan will be combined into one regional hazard mitigation plan.

Mr. Gene Booth, Director of Cumberland County Emergency Management welcomed everyone to the meeting and introduced David Stroud with Amec Foster Wheeler who is the consultant to facilitate the planning process.

Mr. Stroud discussed the reasons that communities should plan in advance of natural disasters including the cost of past natural disasters across the United States. The time for planning is when a community is not faced with recovery. As important is that the plan is required to be updated every five years to be in compliance with the Disaster Mitigation Act (DMA) of 2000 and to make the community eligible for future federal disaster funding.

The Power Point presentation discussed the four phase of DMA along with the ten planning steps of the Community Rating System (CRS) program. Each of the 10 CRS planning steps fit within the four phases of DMA to create a seamless planning process. Mr. Stroud focused in detail on those four phases and ten planning steps.

Important for success of the plan update is to make sure the right people are at the table including city and county departments, citizens, regional agencies, etc. More importantly is to keep the public informed of the planning process throughout the process. Coordination with other agencies for supporting data and their knowledge will also make the planning process more effective.

Mr. Stroud also discussed the planning needs from each community including collection of plans, studies, reports and other data necessary to complete the plan update. Amec Foster Wheeler will be in contact to collect parcel data along with other planning documents.

Finally, Mr. Stroud entertained questions on the planning process and data needs from Cumberland County and all of its municipalities.

Cumberland-Hoke Regional Hazard Mitigation Plan

Public Meeting Agenda

E.E. Miller Recreation Center

Fayetteville, NC

6:30 PM on January 6, 2016

1. Welcome and Introductions
2. Overview of the planning process and structure of the plan
3. Overview of the hazards and their impacts
4. Discussion of the new goals
5. Discussion of the mitigation projects
6. Next steps for public comment and revision to the plan
7. Questions

Cumberland-Hoke Regional Hazard Mitigation Plan

Hazard Mitigation Planning Public Meeting Minutes

E.E. Miller Recreation Center

Fayetteville, NC

6:30 PM on January 6th, 2016

The second Hazard Mitigation Planning public meeting for the development of the Cumberland-Hoke Regional Hazard Mitigation Plan began at 6:30 PM at the E.E. Miller Recreation Center on 1347 Rim Road in Fayetteville, NC.

The objective of the meeting is to discuss and debate the draft 2015 Cumberland-Hoke Regional Hazard Mitigation Plan. This meeting provided an opportunity for HMPC members to review the complete draft plan.

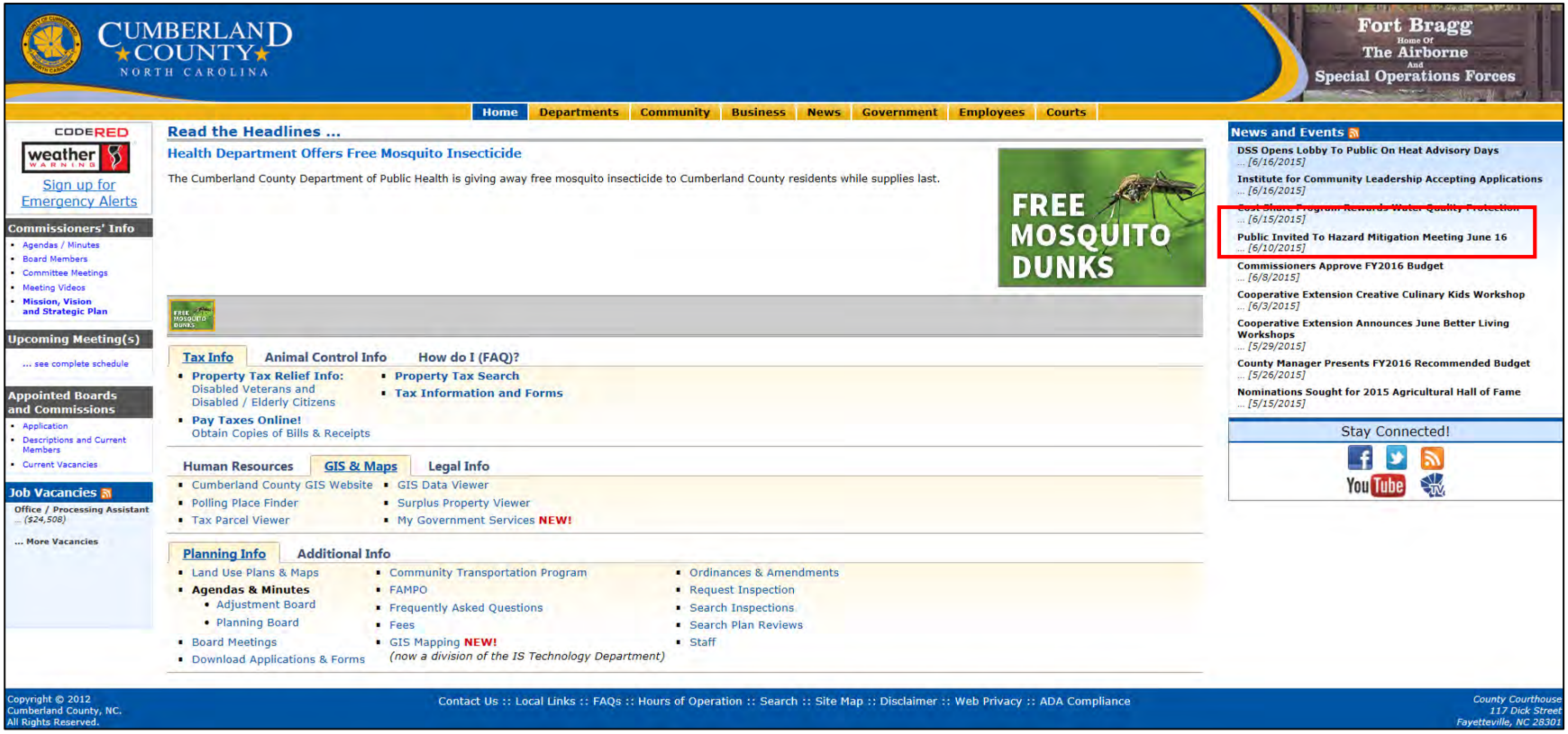
Ms. Amy Crowley with Amec Foster Wheeler started the meeting with a Power Point presentation and cover the objectives for this final HMPC meeting. Ms. Crowley indicated that the presentation would cover the following topics: Structure of the Plan, Description of the Planning Process, Review of the Hazards, and a Review of the Mitigation Strategy.

Ms. Crowley covered the structure of the plan and indicated how the plan was laid out and covered the content of each specific chapter. Ms. Crowley also covered the planning process in terms of the HMPC meetings and public meetings and how the public and other stakeholders were involved in each of the planning process beyond attending public meetings. Coordination throughout the planning process occurred for many of these stakeholders.

Mr. Stroud review the natural hazards which were included in the draft plan along with the new four goals of the plan. Finally, Mr. Stroud provided a synopsis of the mitigation projects for each community which included a description of the mitigation project, who is responsible for implementing the project, when the project will be completed, and how the project will be funded.

Ms. Crowley and Mr. Stroud answered questions from the HMPC members and indicated the deadline dates to provide comments on the draft plan.

June 16, 2015 Public Meeting Advertisement – Cumberland County Website:



June 16, 2015 Public Meeting Advertisement – The Fayetteville Observer

Cumberland, Hoke counties seeking public's input for developing hazard mitigation plan

Posted: Monday, June 15, 2015 1:30 pm

FAYETTEVILLE - Cumberland and Hoke counties are seeking the public's input in developing a regional hazard mitigation plan, a requirement to maintain eligibility for FEMA federal disaster funding and to increase credit in the Community Rating System (CRS) Program.

A kick-off meeting is scheduled Tuesday from 6:30 to 8 p.m. at Smith Recreation Center, 1520 Slater Ave.

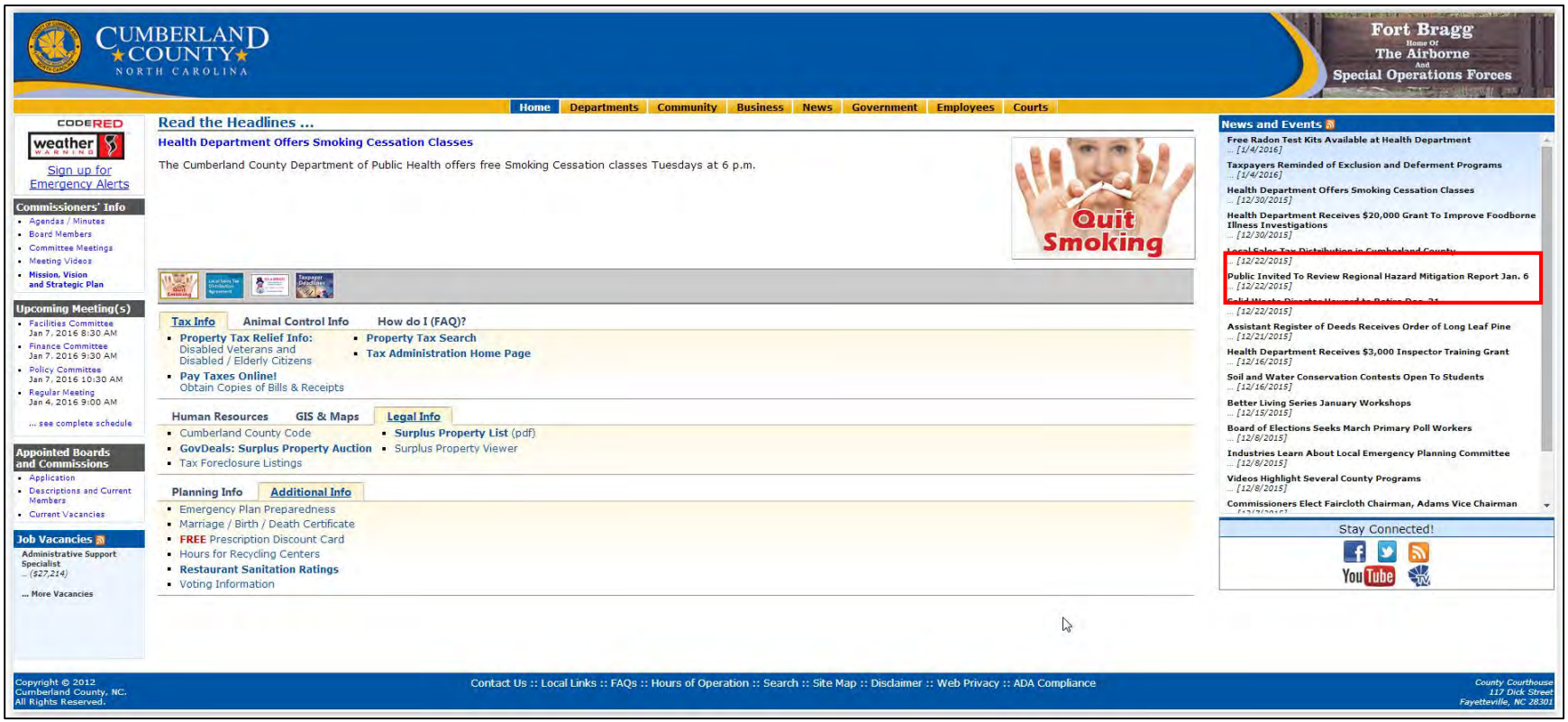
Participating individuals and organizations are being asked to provide information related to natural hazards, such as flooding, tornadoes and severe storms. The information will be used to update the hazard identification and risk assessment portions of the plan.

The next step in the process will be to form a Hazard Mitigation Planning Committee consisting of governmental agencies, community stakeholders and interested citizens.

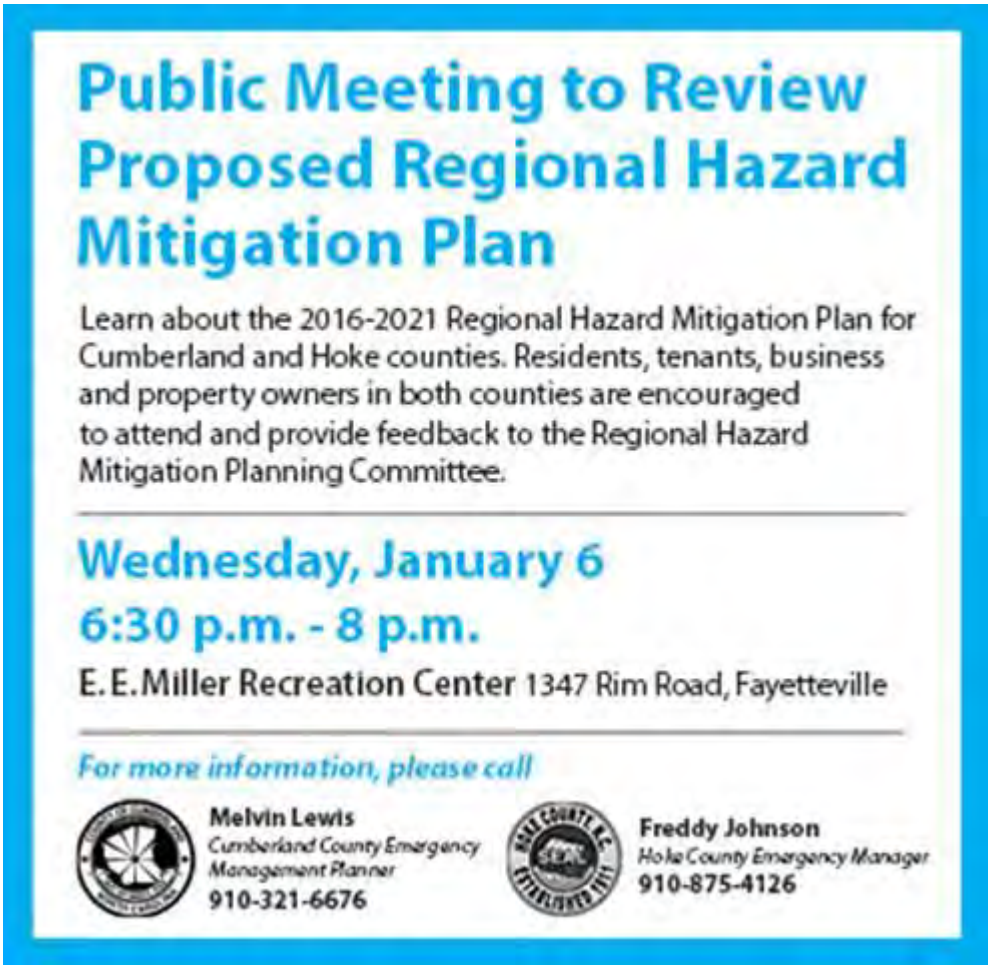
For more information, call Cumberland County Emergency Management Planner Melvin Lewis at 321-6676 or Hoke County Emergency Manager Freddy Johnson at 875-4126.

- Rodger Mullen

January 6, 2016 Public Meeting Advertisement – Cumberland County Website:



January 6, 2016 Public Meeting Advertisement – The Fayetteville Observer:



Public Meeting to Review Proposed Regional Hazard Mitigation Plan

Learn about the 2016-2021 Regional Hazard Mitigation Plan for Cumberland and Hoke counties. Residents, tenants, business and property owners in both counties are encouraged to attend and provide feedback to the Regional Hazard Mitigation Planning Committee.

Wednesday, January 6

6:30 p.m. - 8 p.m.

E. E. Miller Recreation Center 1347 Rim Road, Fayetteville

For more information, please call

Melvin Lewis
Cumberland County Emergency Management Planner
910-321-6676

Freddy Johnson
Hoke County Emergency Manager
910-875-4126

January 6, 2016 Newspaper Article – The Fayetteville Observer:

OCAL & STATE THE FAYETTEVILLE OBSERVER

fficials happy with web site

IT director Chris Butts the next day. Butts loved the site and the money county government could save.

"The level of customization Preston was able to put in for us, an outside firm would have charged a lot," said Butts.

Commission Chairman Nick Picerno, who has owned a computer and software company, calls it one of the best web sites he has ever seen. He is especially pleased with the transparency the website offers citizens.

"There is no excuse for a citizen not to know what's going on in Moore County," said Picerno.

The new site's home page features photos by the Sandhills Photography Club, but just as prominent are buttons, front and center, that take viewers straight to the county budget and progress reports.

Standardization was also a goal for the new website. Contact information for each of the nearly 30 county departments is located in the same spot on each page. A mobile version of the site streamlines information for phone or tablet users.

Robinson said for him, the experience was all about serving citizens.

"That's the end goal. It's about the citizens being able to use the website," he said.

And Robinson didn't walk away totally empty handed. Tuesday evening Commissioners presented him with a plaque of appreciation and a $100 gift card to Best Buy.

The web site address is moorecountync.gov.

Johanna Rayo can be reached at rayo@fayobserver.com.

Fayetteville Observer 1-6-16 MMM

HAZARD MITIGATION PLAN

Public input sought

The public is invited to review the proposed 2016-21 Regional Hazard Mitigation Plan at a meeting this evening in Fayetteville, Cumberland County spokesman Jon Soles said in a news release.

The meeting is scheduled for 6:30 p.m. at E.E. Miller Recreation Center, 1347 Rim Road.

The meeting is part of the planning process to complete a five-year Regional Hazard Mitigation Planning Committee report for Cumberland and Hoke counties.

Residents, property owners, business owners, tenants and others can review the proposed regional hazard mitigation plan and discuss it with the committee.

Interested parties can look up topography maps and risks online at cumberlandgis.maps.arcgis.com/home, Soles said.

For more information, call Cumberland County Emergency Management Planner Melvin Lewis at 910-321-6676 or Hoke County Emergency Manager Freddy Johnson at 910-875-4126.

— Paul Woolverton

pro tem says proposal spreads projects across city

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sembly, said he liked the bigger bond package but would do what he can to promote the current plan.

"I think it will pass, if the elected officials will get out and campaign for it," Hurley said. "The city is stagnant, and we need to move forward with progressive projects like this, and the green space is so important."

The city officials may have their work cut out for them, he said.

"I really don't think the

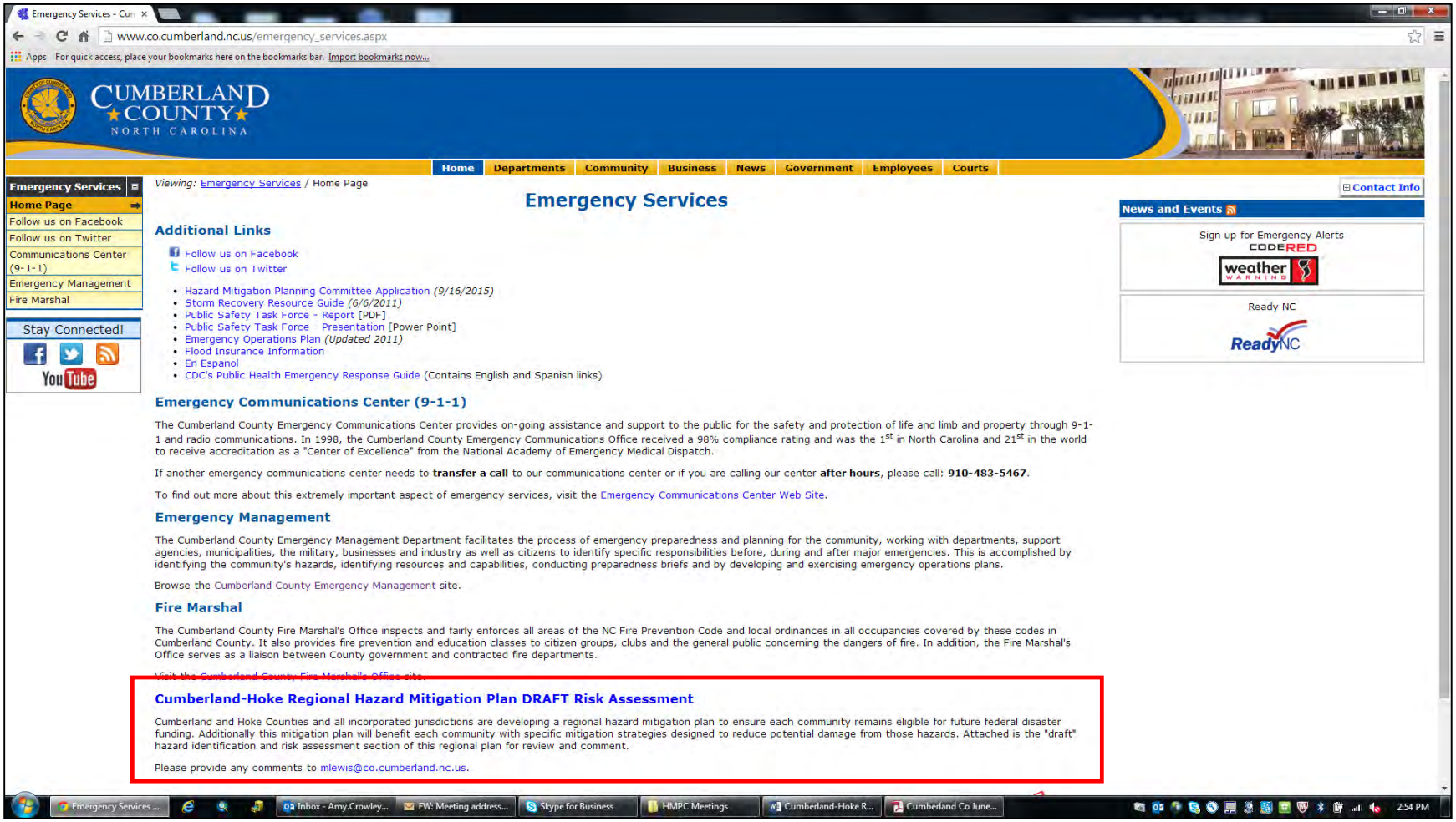
City voters since the 1980s have twice rejected parks and

Last fall, the Greater Fayetteville Chamber board of directors voted to support the city holding a parks referendum. The new board chairman, Brian Kent, said Tuesday he hasn't talked yet to the chamber's members about the revised bond package for March.

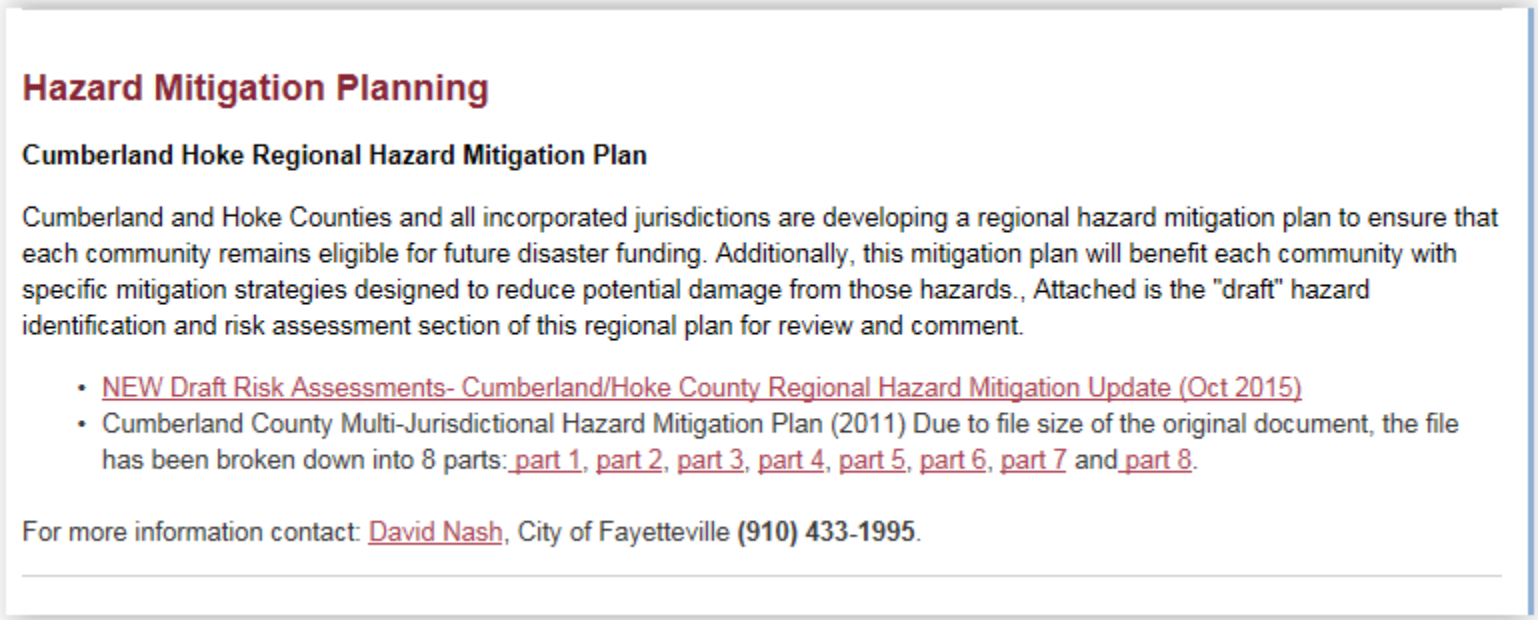
"But our thinking is we still support letting the people decide, because this is a self-imposed tax," Kent said.

A critic of the larger spending plan called the

Draft Risk Assessment Posted for Public Review and Comment – Cumberland County Website:



Draft Risk Assessment Posted for Public Review and Comment – City of Fayetteville Website:



Hazard Mitigation Planning

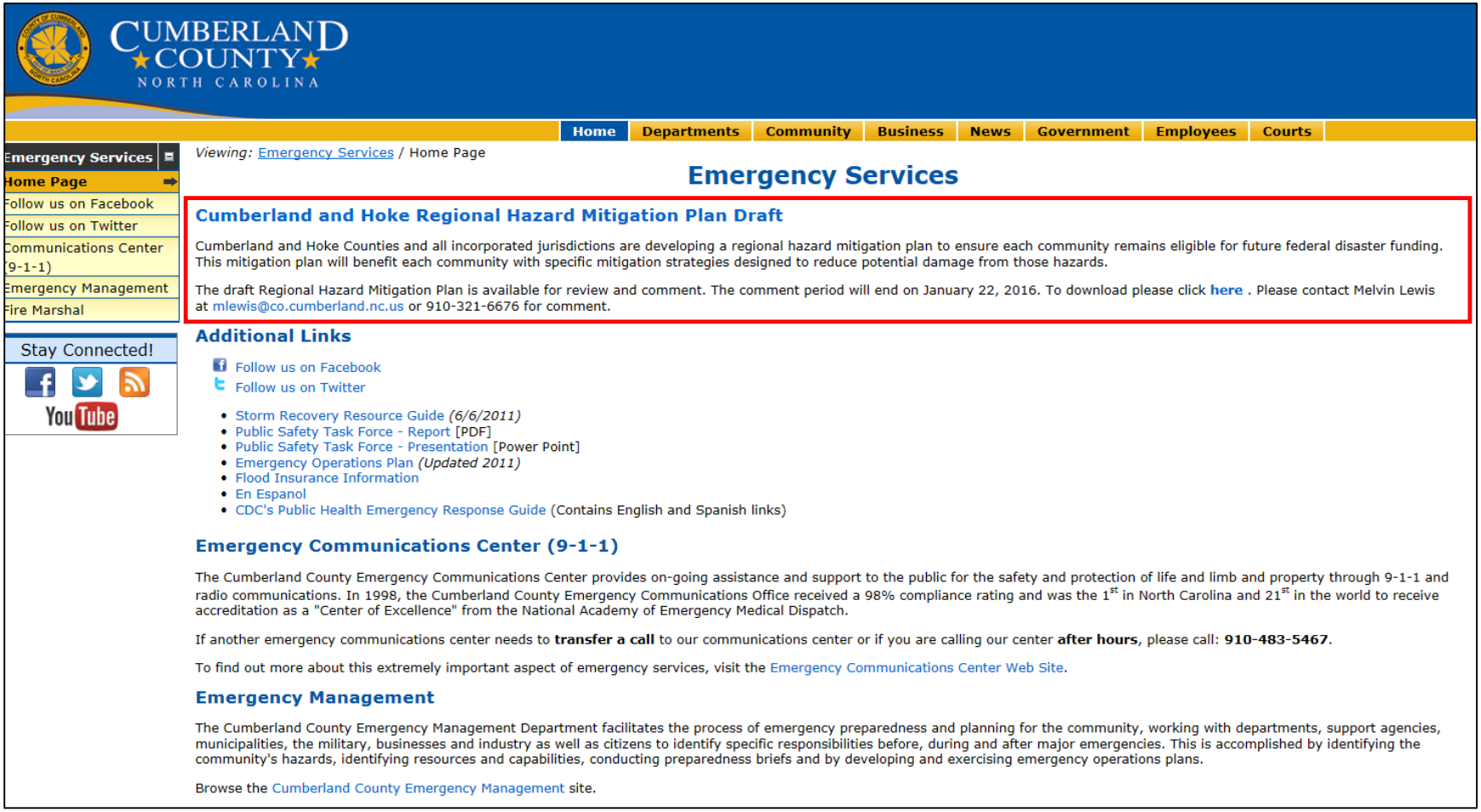
Cumberland Hoke Regional Hazard Mitigation Plan

Cumberland and Hoke Counties and all incorporated jurisdictions are developing a regional hazard mitigation plan to ensure that each community remains eligible for future disaster funding. Additionally, this mitigation plan will benefit each community with specific mitigation strategies designed to reduce potential damage from those hazards., Attached is the "draft" hazard identification and risk assessment section of this regional plan for review and comment.

- NEW Draft Risk Assessments- Cumberland/Hoke County Regional Hazard Mitigation Update (Oct 2015)
- Cumberland County Multi-Jurisdictional Hazard Mitigation Plan (2011) Due to file size of the original document, the file has been broken down into 8 parts: part 1, part 2, part 3, part 4, part 5, part 6, part 7 and part 8.

For more information contact: David Nash, City of Fayetteville **(910) 433-1995**.

Complete Draft Plan Posted for Public Review and Comment – Cumberland County Website:



CUMBERLAND COUNTY
NORTH CAROLINA

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- Communications Center (9-1-1)
- Emergency Management
- Fire Marshal

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Viewing: Emergency Services / Home Page

Emergency Services

Cumberland and Hoke Regional Hazard Mitigation Plan Draft

Cumberland and Hoke Counties and all incorporated jurisdictions are developing a regional hazard mitigation plan to ensure each community remains eligible for future federal disaster funding. This mitigation plan will benefit each community with specific mitigation strategies designed to reduce potential damage from those hazards.

The draft Regional Hazard Mitigation Plan is available for review and comment. The comment period will end on January 22, 2016. To download please click **here** . Please contact Melvin Lewis at mlewis@co.cumberland.nc.us or 910-321-6676 for comment.

Additional Links

Follow us on Facebook
Follow us on Twitter

- Storm Recovery Resource Guide *(6/6/2011)*
- Public Safety Task Force - Report [PDF]
- Public Safety Task Force - Presentation [Power Point]
- Emergency Operations Plan *(Updated 2011)*
- Flood Insurance Information
- En Espanol
- CDC's Public Health Emergency Response Guide (Contains English and Spanish links)

Emergency Communications Center (9-1-1)

The Cumberland County Emergency Communications Center provides on-going assistance and support to the public for the safety and protection of life and limb and property through 9-1-1 and radio communications. In 1998, the Cumberland County Emergency Communications Office received a 98% compliance rating and was the 1st in North Carolina and 21st in the world to receive accreditation as a "Center of Excellence" from the National Academy of Emergency Medical Dispatch.

If another emergency communications center needs to **transfer a call** to our communications center or if you are calling our center **after hours**, please call: **910-483-5467**.

To find out more about this extremely important aspect of emergency services, visit the Emergency Communications Center Web Site.

Emergency Management

The Cumberland County Emergency Management Department facilitates the process of emergency preparedness and planning for the community, working with departments, support agencies, municipalities, the military, businesses and industry as well as citizens to identify specific responsibilities before, during and after major emergencies. This is accomplished by identifying the community's hazards, identifying resources and capabilities, conducting preparedness briefs and by developing and exercising emergency operations plans.

Browse the Cumberland County Emergency Management site.

Complete Draft Plan Posted for Public Review and Comment – City of Fayetteville Website:

Hazard Mitigation Planning

Cumberland-Hoke Regional Hazard Mitigation Plan

Cumberland and Hoke Counties and all incorporated jurisdictions are developing a regional hazard mitigation plan to ensure that each community remains eligible for future disaster funding. Additionally, this mitigation plan will benefit each community with specific mitigation strategies designed to reduce potential damage from those hazards.

For the new Cumberland-Hoke Regional Hazard Mitigation Plan, the following items are posted:

- NEW Cumberland-Hoke Regional Hazard Mitigation Plan_Draft of Overall Report_(Jan 2016)

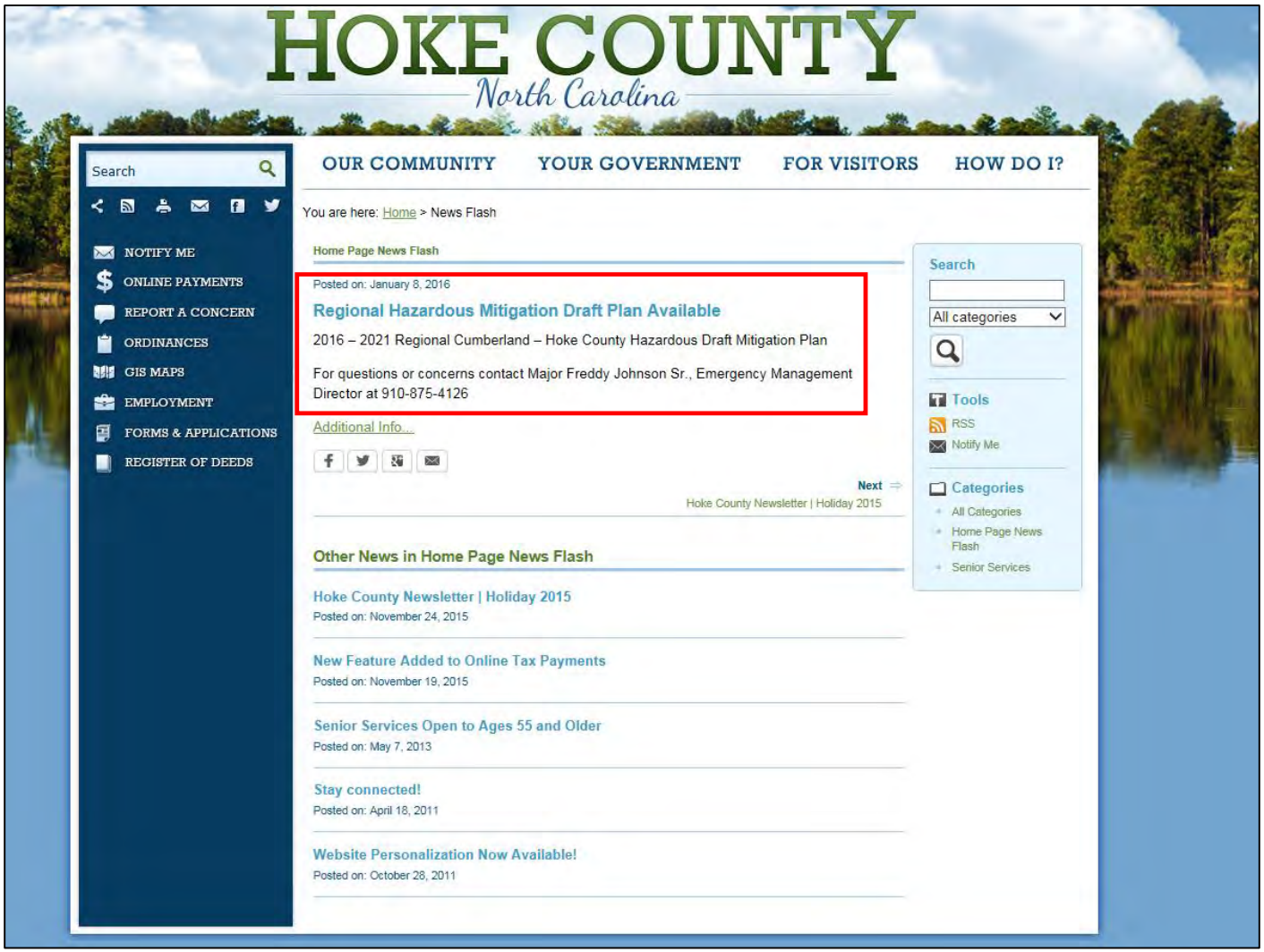
If you would like to submit comments on the Draft of the Overall Report, please submit them to David Nash, City of Fayetteville, by **Wednesday, January 20, 2016 at 5:00 PM**.

- NEW Draft Risk Assessments- Cumberland/Hoke County Regional Hazard Mitigation Update (Oct 2015)

Please note that the new Cumberland-Hoke Regional Hazard Mitigation Plan will replace the 2011 Cumberland County Multi-Jurisdictional Hazard Mitigation Plan. Due to the file size of the 2011 document, the 2011 document has been broken down into 8 parts: part 1, part 2, part 3, part 4, part 5, part 6, part 7 and part 8.

For more information contact: David Nash, City of Fayetteville **(910) 433-1995**.

Complete Draft Plan Posted for Public Review and Comment – Hoke County Website:



City of Fayetteville Media Release Seeking Public Comment on Complete Draft Plan:

City of Fayetteville North Carolina

MEDIA RELEASE

Kevin V. Arata, Corporate Communications Director

Release: IMMEDIATE	Contact: Nathan Walls, Public Information Specialist
Date: 1/14/2016	Phone: (910) 433-1578

Comments Sought for Hazard Mitigation Plan

(Fayetteville, N.C.) – Comments are being sought from the public about a draft Regional Hazard Mitigation Plan. Cumberland and Hoke Counties and all incorporated jurisdictions within the two counties are developing the plan to ensure each community remains eligible for future federal disaster funding. This Regional Hazard Mitigation Plan will benefit each community with specific mitigation strategies designed to reduce potential damage from those hazards.

Here is a link to the draft Regional Plan:
http://fayettevillenc.gov/home/showdocument?id=4098.

Residents can provide any comments by 5 p.m. on Wednesday, Jan. 20 to either: dnash@ci.fay.nc.us or sbullard@ci.fay.nc.us.

City staff members have been working with staff members from other units of government in Cumberland and Hoke Counties on the new Regional Hazard Mitigation Plan. This plan will replace the 2011 version of the plan. A consulting firm from Durham, AMEC Foster Wheeler, has been guiding this process.

For additional information, please contact: David Nash, City Senior Planner, at (910) 433-1995 or Scott Bullard, City Emergency Management Coordinator, at (910) 433-1789.

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The City of Fayetteville, North Carolina does not discriminate on the basis of race, sex, color, age, national origin, religion, or disability in its employment opportunities, programs, services, or activities.

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APPENDIX C – MITIGATION STRATEGY

CRS Alternative Mitigation Measures per Category

Note: the CRS Credit Sections are based on the 2013 CRS Coordinator's Manual.

Preventative and Regulatory Measures

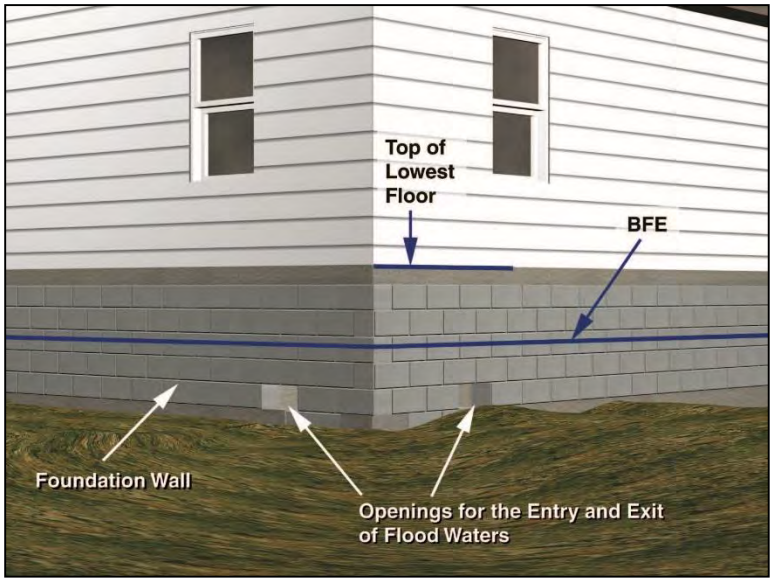
Preventative measures are designed to keep a problem - such as flooding - from occurring or from getting worse. The objective of preventative measures is to ensure that future development is not exposed to damage and does not cause an increase in damages to other properties. Building, zoning, planning and code enforcement offices usually administer preventative measures. Some examples of types of preventative measures include:

- Building codes
- Planning and zoning
- Open space preservation
- Stormwater management

Building Codes

Building codes provide one of the best methods of addressing natural hazards. When properly designed and constructed according to code, the average building can withstand many of the impacts of natural hazards. Hazard protection standards for all new and improved or repaired buildings can be incorporated into the local building code. Building codes can ensure that the first floors of new buildings are constructed to be higher than the elevation of the 100-year flood (the flood that is expected to have a one percent chance of occurring in any given year). This is shown in Figure C1.

Just as important as having code standards is the enforcement of the code. Adequate inspections are needed during the course of construction to ensure that the builder understands the requirements and is following them. Making sure a structure is properly elevated and anchored requires site inspections at each step.



Source: FEMA Publication: *Above the Flood: Elevating Your Floodprone House, 2000*

Figure C1 – Building Codes and Flood Elevations

Local Implementation

Cumberland County has adopted the North Carolina Building Code which adheres to the 2009 Edition of the International Building Code (IBC). In accordance with the IBC, the ground immediately adjacent to the foundation shall be sloped away from the building at a slope of not less than one unit vertical in 20 units horizontal (5-percent slope) for a minimum distance of 10 feet measured perpendicular to the face of the wall. If physical obstructions or lot lines prohibit 10 feet of horizontal distance, a 5-percent slope shall be provided to an *approved* alternative method of diverting water away from the foundation. Swales used for this purpose shall be sloped a minimum of 2 percent where located within 10 feet of the building foundation. Impervious surfaces within 10 feet of the building foundation shall be sloped a minimum of 2 percent away from the building.

ASCE 24 is a referenced standard in the International Building Code. Any building or structure that falls within the scope of the IBC that is proposed in a flood hazard area is to be designed in accordance with ASCE 24. Freeboard is required as a function of the nature of occupancy and the flood zone. Dwellings and most other buildings have 1-foot of freeboard; certain essential facilities have 2-3 feet; only agricultural facilities, temporary facilities and minor storage facilities are allowed to have their lowest floors at the BFE. Cumberland County Flood Damage Prevention Ordinance requires all new or substantial improvement construction in the flood hazard area to be constructed with 1-foot of freeboard above the base flood elevation.

Cumberland County Inspections Department is responsible for ensuring the public safety through the enforcement of federal, state, and local codes governing construction. County staff reviews plans, issues building permits, and performs inspections to ensure Code compliance related to aspects of life-safety, structural integrity, energy conversation, accessible design and electrical, plumbing, fuel gas, heating and air conditioning systems.

Reducing Future Flood Losses

Future flood losses in Cumberland County will be reduced through the implementation of the North Carolina Building Code/2009 IBC with the sloping requirement of grade away from buildings. Enforcement of the 1-foot freeboard requirement will provide an extra level of protection for buildings constructed in the County.

CRS Credit

The CRS encourages strong building codes. It provides credit in two ways: points are awarded based on the community's Building Code Effectiveness Grading Schedule (BCEGS) classification and points are awarded for adopting the International Code series. Cumberland County's BCEGS rating is a Class 5 for residential and 9E for commercial. Cumberland County currently receives credit for Activity 430 – Higher Regulatory Standards.

Planning and Zoning

Building codes provide guidance on how to build in hazardous areas. Planning and zoning activities direct development away from these areas, particularly floodplains and wetlands. They do this by designating land uses that are compatible with the natural conditions of land that is prone to flooding, such as open space or recreation. Planning and zoning activities can also provide benefits by simply allowing developers more flexibility in arranging improvements on a parcel of land through the planned development approach.

Local Implementation

Comprehensive Plan

Cumberland County Planning and Inspections Department is responsible for both short and long-range comprehensive planning in the County. The Cumberland County Growth Vision Comprehensive Plan 2030 is the current county-wide comprehensive plan for Cumberland County.

A Comprehensive Plan, in broad terms, is a policy statement to guide the future placement and development of community facilities. It is the basis for a community's zoning, subdivision and design regulations and a community's official maps and amendments to the zoning, subdivision and design ordinances.

Zoning and Subdivision Regulations

The purpose of the County's Land Development Regulations is to provide the minimum regulations necessary to facilitate safe and orderly growth, and to also ensure that growth forms an integral part of a community of functional neighborhoods, retail and commercial centers; increases collective security and community identity to promote civic awareness and responsibility; and enhances the quality of life for the entire County to ensure the greatest possible economic and social benefits for all residents. These regulations are intended to promote consistency with the goals, objectives and policies of the County's Comprehensive Plan. Cumberland County has a both a zoning ordinance and subdivision regulations.

Reducing Future Flood Losses

Zoning and comprehensive planning can work together to reduce future flood losses by directing development away from hazard prone areas. The County's zoning ordinance requires that floodplains be identified in all zoning applications. There are no other requirements for floodplains except for additional restrictions on development in floodplains from what is required under the flood damage prevention ordinance regarding building elevations. The County's subdivision regulations state that "no lot shall be approved that does not contain a suitable building site of sufficient elevation to permit construction utilizing a lowest floor elevation of at least the level of the 100-year flood. The entire lot shall be properly drained. Special emphasis will be placed on requirements as given in the county's flood damage prevention ordinance."

CRS Credit

CRS credits are available for regulations that encourage developers to preserve floodplains or other hazardous areas away from development. There is no credit for a plan, only for the enforceable regulations that are adopted pursuant to a plan. Fayetteville currently receives credit for Activity 430 – Higher Regulatory Standards.

Open Space Preservation

Keeping the floodplain and other hazardous areas open and free from development is the best approach to preventing damage to new developments. Open space can be maintained in agricultural use or can serve as parks, greenway corridors and golf courses.

Comprehensive and capital improvement plans should identify areas to be preserved by acquisition and other means, such as purchasing an easement. With an easement, the owner is free to develop and use private property, but property taxes are reduced or a payment is made to the owner if the owner agrees to not build on the part set aside in the easement.

Although there are some federal programs that can help acquire or reserve open lands, open space lands and easements do not always have to be purchased. Developers can be encouraged to dedicate park land

and required to dedicate easements for drainage and maintenance purposes. These are usually linear areas along property lines or channels. Maintenance easements also can be donated by streamside property owners in return for a community maintenance program.

Local Implementation

The Cumberland Comprehensive Vision 2030 Plan and Cumberland County Subdivision Ordinance promote open space in floodplain areas. Additionally, the County's Flood Damage Prevention Ordinance indicates that a subdivision will not be approved which is entirely located within the 100-year floodplain.

Reducing Future Flood Losses

Creating or maintaining open space is the primary way to reduce future flood losses. Cumberland County has many open space and natural parcels which serve to reduce future flood losses by remaining open. These open space areas create opportunities for the public to benefit from education and recreation while eliminating potential for future flooding.

CRS Credit

Cumberland County currently receives credit for Activity 420 – Open Space Preservation. Preserving flood prone areas as open space is one of the highest priorities of the Community Rating System. The credits in the 2013 manual have doubled for OSP (Open Space Preservation). Credit is based on the area of the floodplain that is designated as public undeveloped properties, parks, wildlife refuges, golf courses, or other uses that can be kept vacant through ownership or regulations.

Stormwater Management

Stormwater runoff is increased when natural ground cover is replaced by urban development. Development in the watershed that drains to a river can aggravate downstream flooding, overload the community's drainage system, cause erosion, and impair water quality. There are three ways to prevent flooding problems caused by stormwater runoff:

1) Regulating development in the floodplain to ensure that it will be protected from flooding and that it won't divert floodwaters onto other properties, and

2) Regulating all development to ensure that the post-development peak runoff will not be greater than it was under pre-development conditions.

3) Set construction standards so buildings are protected from shallow water.

Local Implementation

The County's Public Works Department is responsible for the operation and maintenance of the stormwater drainage systems of Cumberland County. This includes a stormwater utility which charges properties based on the amount of non-pervious areas on each lot or for land disturbance activities. The stormwater regulations are in compliance with the NPDES requirements from the EPA. Another function of the Department is to ensure compliance with a state-issued stormwater permit, which requires stormwater monitoring, private site inspections, and site development permitting. And lastly, the Department develops engineering plans, bids and installs capital drainage improvements projects.

Reducing Future Flood Losses

Stormwater management and the requirement that post development runoff cannot exceed pre-development conditions is one way to prevent future flood losses. Retention and detention requirements also help to reduce future flood losses.

CRS Credit

Cumberland County currently receives credit for Activity 450 – Stormwater Management. The community enforces regulations for stormwater management, soil and erosion control and water quality.

Conclusions (Adoption or revisions of such plans and ordinances)

- Most zoning ordinances don't designate floodplain as a special type of district.
- At least a minimal amount of the County's floodplain is open space in public ownership.

Recommendations

- The County should continue to implement activities in the CRS Program under the guidance of the 2013 CRS Coordinator's Manual
- The County should consider creating an Open Space Plan and create more open space parcels.

Floodplain Management Regulations/Current & Future Conditions

Maintaining adequate flood control is vital to a healthy and productive community. Natural floodplains protect human life and property from flood damage in the event of a storm. The beautiful, functioning wetlands, riparian buffers and marshlands offer economic and health benefits as well as their rich and diverse ecosystems. By making wise land use decisions in the development and management of floodplains, beneficial functions can be protected and negative impacts to the quality of the environment can be reduced.

The National Flood Insurance Program (NFIP) is administered by the Federal Emergency Management Agency (FEMA). As a condition of making flood insurance available for their residents, communities that participate in the NFIP agree to regulate new construction in the area subject to inundation by the 100-year (base) flood. The floodplain subject to these requirements is shown as an A or V Zone on the Flood Insurance Rate Map (FIRM).

Local Implementation

Cumberland County's Flood Damage Prevention Ordinance requires that all construction, additions, conversions and/or development located in areas of special flood hazard comply with certain minimum standards intended to minimize damage from floods. Furthermore, any substantially improved or substantially damaged home must be brought up to the NFIP and the County's Flood Ordinance requirements. The County has a Cumulative Substantial Improvement rule where improvements and damages to buildings are counted cumulatively until they reach 50%. Then the building must be brought up to current standards which most likely means the building must be elevated to at or above the BFE plus any freeboard.

In all areas of special flood hazard designated as A1-30, AE, AH, A (with estimated BFE), the following provisions are required:

(1) *New construction and/or substantial improvements.* Where base flood elevation data are available, new construction and/or substantial improvement of any structure or manufactured home shall have the lowest floor, including basement, elevated no lower than two foot above the base flood elevation.

All heating and air conditioning equipment and components (including ductwork), all electrical (except the main disconnect, the electric meter, and one ground fault interrupted outlet and switch), ventilation, plumbing fixtures and other service facilities shall be elevated at or above two foot above the base flood elevation.

(2) *Nonresidential construction.* New construction and/or the substantial improvement of any structure located in A1-30, AE, or AH zones, may be floodproofed in lieu of elevation. The structure, together with attendant utility and sanitary facilities, must be designed to be water-tight to one foot above the base flood elevation, with walls substantially impermeable to the passage of water, and structural components having the capability of resisting hydrostatic and hydrodynamic loads and the effect of buoyancy. A registered professional engineer or architect shall certify that the design and methods of construction are in accordance with accepted standards of practice for meeting the provisions above, and shall provide such certification to the official.

(3) *Standards for manufactured homes and recreational vehicles.* Where base flood elevation data are available:

(a) All manufactured homes placed and/or substantially improved on:

(i) Individual lots or parcels,

(ii) In new and/or substantially improved manufactured home parks or subdivisions,

(iii) In expansions to existing manufactured home parks or subdivisions, or

(iv) On a site in an existing manufactured home park or subdivision where a manufactured home has incurred "substantial damage" as the result of a flood, must have the lowest floor including basement, elevated no lower than one two above the base flood elevation.

(b) Manufactured homes placed and/or substantially improved in an either existing manufactured home park or subdivision must be elevated so that:

(i) The lowest horizontal structural member to the lowest floor of the manufactured home is elevated no lower than two foot above the level of the base flood elevation, or

(ii) The manufactured home chassis is elevated and supported by reinforced piers (or other foundation elements of at least an equivalent strength) of no less than 36 inches in height above grade.

(c) All manufactured homes must be securely anchored to an adequately anchored foundation system to resist flotation, collapse and lateral movement.

(d) All recreational vehicles placed on sites must either:

(i) Be on the site for fewer than 180 consecutive days.

(ii) Be fully licensed and ready for highway use, (a recreational vehicle is ready for highway use if it is licensed, on its wheels or jacking system, attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached structures or additions), or

(iii) The recreational vehicle must meet all the requirements for "New Construction", including the anchoring and elevation requirements of subsections (3)(a) and (b), above.

The following provisions apply in special flood hazard areas where streams exist but no base flood data have been provided (A-zones), or where base flood data have been provided but a floodway has not been delineated:

(1) When base flood elevation data or floodway data have not been provided the county engineer shall obtain, review, and reasonably utilize any scientific or historic base flood elevation and floodway data available from a federal, state, or other source, in order to administer the provisions of this article. Only if data are not available from these sources, then the following provisions ([subsections] (2) and (3)) shall apply.

(2) In special flood hazard areas without base flood elevation data, new construction and substantial improvements of existing structures shall have the lowest floor of the lowest enclosed area (including basement) elevated no less than three feet above the highest adjacent grade at the building site. (NOTE: Require the lowest floor to be elevated one foot above the estimated base flood elevation in A-zone areas where a limited detail study has been completed).
(3) All heating and air conditioning equipment and components (including ductwork), all electrical (except the main disconnect, the electric meter, and one ground fault interrupted outlet and switch), ventilation, plumbing fixtures, and other service facilities shall be elevated no less than three feet above the highest adjacent grade at the building site.
(4) The development services director shall certify the lowest floor elevation level and the record shall become a permanent part of the permit file.

The following provisions apply in SFHAs where streams with base flood elevations are provided but no floodways have been designated (zones AE):

(1) No encroachments, including fill material, new structures or substantial improvements shall be located within areas of special flood hazard unless:

(a) Any fill material or portion of any other improvement placed inside a special flood hazard area (SFHA) below base flood elevation shall be mitigated on site or on an adjacent site by an equal or greater volume of excavated material. The mitigation excavation must be connected to the special flood hazard area at an elevation less than or equal to an elevation two feet below the 100 year flood plain elevation; or,

(b) A stormwater conveyance system is sized and constructed to convey the 100-year 24-hour storm to a suitable outfall.

In either case, certification by a registered professional engineer shall be provided demonstrating that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood at any point within the community. The engineering certification should be supported by verifiable technical data that conforms to standard hydraulic engineering principles.

The following provisions apply in SFHAs designated "AO" shallow flooding areas. These areas have base flood depths of one to three feet above ground, with no clearly defined channel.

(1) All new construction and substantial improvements of residential and non-residential structures shall have the lowest floor, including basement, elevated to the flood depth number specified on the flood insurance rate map (FIRM), above the highest adjacent grade. If no flood depth number is specified, the lowest floor, including basement, shall be elevated at least three feet above the highest adjacent grade.

The development services director shall certify the lowest floor elevation level and the record shall become a permanent part of the permit file.

(2) New construction or the substantial improvement of a nonresidential structure may be floodproofed in lieu of elevation. The structure, together with attendant utility and sanitary facilities, must be designed to be water tight to the specified FIRM flood level plus one foot, above highest adjacent grade, with walls substantially impermeable to the passage of water, and structural components having the capability of resisting hydrostatic and hydrodynamic loads and the effect of buoyancy. A registered professional engineer or architect shall certify that the design and methods of construction are in accordance with accepted standards of practice for meeting the provisions above.

(3) Drainage paths shall be provided to guide floodwater around and away from any proposed structure.

Reducing Future Flood Losses

In addition to residential construction, non-residential construction and substantial improvements, all standards should be:

- Designed or modified and adequately anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy.
- Constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities, designated or located so as to prevent water from entering or accumulating within components during flooding.

CRS Credit

Cumberland County currently receives credit for Activity 430 – Higher Regulatory Standards. The County receives credit for enforcing regulations that require freeboard for new and substantial improvement construction, other higher regulatory standards, and state mandated regulatory standards. Credit is also provided for a BCEGS classification of 5/9E and for staff education and certification as a floodplain manager. Cumberland County has several CFMs on staff and is trying to add more.

Conclusions (Adoption or revisions of such plans and ordinances)

- The County's Flood Damage Prevention Ordinance includes a 2-food freeboard standard.
- The County's Flood Damage Prevention Ordinance incorporates Cumulative Substantial Improvement.

Recommendations

- Requiring compensatory storage preserves areas of the floodplain that can store flood water and minimizes increases in flood heights due to development.
- Create more open space in flood prone areas to reduce the potential damage to future buildings.
- Standards for protecting buildings from local drainage problems reduce flood losses and flood insurance claims, especially outside the floodplain.

Property Protection Measures

Property protection measures are used to modify buildings or property subject to damage. Property protection measures fall under three approaches:

- Modify the site to keep the hazard from reaching the building,

- Modify the building (retrofit) so it can withstand the impacts of the hazard, and
- Insure the property to provide financial relief after the damage occurs.

Property protection measures are normally implemented by the property owner, although in many cases technical and financial assistance can be provided by a government agency.

Keeping the Hazard Away
Generally, natural hazards do not damage vacant areas. As noted earlier, the major impact of hazards is to people and improved property. In some cases, properties can be modified so the hazard does not reach the damage-prone improvements. For example, a berm can be built to prevent floodwaters from reaching a house.

Flooding
There are five common methods to keep a flood from reaching and damaging a building:

- Erect a barrier between the building and the source of the flooding.
- Move the building out of the flood-prone area.
- Elevate the building above the flood level.
- Demolish the building.
- Replace the building with a new one that is elevated above the flood level.

Barriers
A flood protection barrier can be built of dirt or soil (a "berm") or concrete or steel (a "floodwall"). Careful design is needed so as not to create flooding or drainage problems on neighboring properties. Depending on how porous the ground is, if floodwaters will stay up for more than an hour or two, the design needs to account for leaks, seepage of water underneath, and rainwater that will fall inside the perimeter. This is usually done with a sump or drain to collect the internal groundwater and surface water and a pump and pipe to pump the internal drainage over the barrier.

Barriers can only be built so high. They can be overtopped by a flood higher than expected. Barriers made of earth are susceptible to erosion from rain and floodwaters if not properly sloped, covered with grass, and properly maintained. A berm can also settle over time, lowering its protection level. A floodwall can crack, weaken, and lose its watertight seal. Therefore, barriers need careful design and maintenance (and insurance on the building, in case of failure).

Relocation
Moving a building to higher ground is the surest and safest way to protect it from flooding. While almost any building can be moved, the cost increases for heavier structures, such as those with exterior brick and stone walls, and for large or irregularly shaped buildings. However, experienced building movers can handle any job. In areas subject to flash flooding, deep waters, or other high hazard, relocation is often the only safe approach. Relocation is also preferred for large lots that include buildable areas outside the floodplain or where the owner has a new flood-free lot (or portion of the existing lot) available.

Building Elevation
Raising a building above the flood level can be almost as effective as moving it out of the floodplain. Water flows under the building, causing little or no damage to the structure or its contents. Raising a building above the flood level is cheaper than moving it and can be less disruptive to a neighborhood. Elevation has proven to be an acceptable and reasonable means of complying with floodplain regulations that require new, substantially improved, and substantially damaged buildings to be elevated above the base flood elevation.

Demolition

Some buildings, especially heavily damaged or repetitively flooded ones, are not worth the expense to protect them from future damages. It is cheaper to demolish them and either replace them with new, flood protected structures, or relocate the occupants to a safer site. Demolition is also appropriate for buildings that are difficult to move - such as larger, slab foundation or masonry structures - and for dilapidated structures that are not worth protecting. Generally, demolition projects are undertaken by a government agency, so the cost is not borne by the property owner, and the land is converted to public open space use, like a park.

Pilot Reconstruction

If a building is not in good shape, elevating it may not be worthwhile or it may even be dangerous. An alternative is to demolish the structure and build a new one on the site that meets or exceeds all flood protection codes. FEMA funding programs refer to this approach as "pilot reconstruction." It is still a pilot program, and not a regularly funded option. Certain rules must be followed to qualify for federal funds for pilot reconstruction:

- Pilot reconstruction is only possible after it has been shown that acquisition or elevation are not feasible, based on the program's criteria.
- Funds are only available to people who owned the property at the time of the event for which funding is authorized.
- It must be demonstrated that the benefits exceed the costs.
- The new building must be elevated to the advisory base flood elevation.
- The new building must not exceed more than 10% of the old building's square footage.
- The new building must meet all flood and wind protection codes.
- There must be a deed restriction that states the owner will buy and keep a flood insurance policy.
- The maximum federal grant is 75% of the cost, up to $150,000. FEMA is developing a detailed list of eligible costs to ensure that disaster funds are not used to upgrade homes.

Local Implementation

Cumberland County currently receives minimal credit of 10 points for Activity 520 – Acquisition and Relocation. The County's Real Properties Department has submitted and received HMGP approval for 17 houses to be demolished in high-risk, flood-prone areas. Furthermore, the County may purchase more properties in the future when grant opportunities become available. The County does not currently receive credit for Activity 530 – Flood Protection.

Retrofitting

An alternative to keeping the hazard away from a building is to modify or retrofit the site or building to minimize or prevent damage. There are a variety of techniques to do this, as described below.

Dry Floodproofing

Dry floodproofing means making all areas below the flood protection level watertight. Walls are coated with waterproofing compounds or plastic sheeting. Openings, such as doors, windows and vents, are closed, either permanently, with removable shields, or with sandbags. Dry floodproofing of new and existing nonresidential buildings in the regulatory floodplain is permitted under state, FEMA and local regulations. Dry floodproofing of existing residential buildings in the floodplain is also permitted as long as the building is not substantially damaged or being substantially improved. Owners of buildings located outside the regulatory floodplain can always use dry floodproofing techniques.

Dry floodproofing is only effective for shallow flooding, such as repetitive drainage problems. It does not protect from the deep flooding along lakes and larger rivers caused by hurricanes or other storms.

Wet Floodproofing

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

Local Implementation

Cumberland County does not currently receive credit for Activity 530 – Flood Protection.

CRS Credit

The CRS provides the most credit points for acquisition and relocation under Activity 520, because this measure permanently removes insurable buildings from the floodplain. The CRS credits barriers and elevating existing buildings under Activity 530. Elevating a building above the flood level will also reduce the flood insurance premiums on that individual building. Because barriers are less secure than elevation, not as many points are provided. Higher scores are possible, but they are based on the number of buildings removed compared to the number remaining in the floodplain. Points are calculated for each protected building. Bonus points are provided for the protection of repetitive loss buildings and critical facilities.

Insurance

Technically, insurance does not mitigate damage caused by a natural hazard. However, it does help the owner repair, rebuild, and hopefully afford to incorporate some of the other property protection measures in the process. Insurance offers the advantage of protecting the property, as long as the policy is in force, without requiring human intervention for the measure to work.

Private Property

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

Public Property

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

Under Section 406(d) of the Stafford Act:

> "If an eligible insurable facility damaged by flooding is located in a [mapped floodplain] … and the facility is not covered (or is underinsured) by flood insurance on the date of such flooding, FEMA is required to reduce Federal disaster assistance by the maximum amount of insurance proceeds

that would have been received had the buildings and contents been fully covered under a National Flood Insurance Program (NFIP) standard flood insurance policy. [Generally, the maximum amount of proceeds for a non-residential property is $500,000.]

Communities Need to:

- Identify all insurable facilities, and the type and amount of coverage (including deductibles and policy limits) for each. The anticipated insurance proceeds will be deducted from the total eligible damages to the facilities.
- Identify all facilities that have previously received Federal disaster assistance for which insurance was required. Determine if insurance has been maintained. A failure to maintain the required insurance for the hazard that caused the disaster will render ineligible for Public Assistance funding…
- [Communities] must obtain and maintain insurance to cover [their] facility - buildings, equipment, contents and vehicles - for the hazard that caused the damage in order to receive Public Assistance funding. Such coverage must, at a minimum, be in the amount of the eligible project costs. FEMA will not provide assistance for that facility in future disasters if the requirement to purchase insurance is not met. - FEMA Response and Recovery Directorate Policy No. 9580.3, August 23, 2000
- In other words, the law expects public agencies to be fully insured as a condition of receiving federal disaster assistance.

Local Implementation

Flood insurance information for the County is provided earlier in this Annex.

CRS Credit

There is no credit for purchasing flood insurance, but the CRS does provide credit for local public information programs that explain flood insurance to property owners. The CRS also reduces the premiums for those people who do buy NFIP coverage. Cumberland County currently receives credit for Activity 330 – Outreach Projects.

Conclusions

- There are several ways to protect properties from flood damage. The advantages and disadvantages of each should be carefully examined for that particular situation.
- Property owners can implement some property protection measures at little cost, especially for sites in areas of low level flooding.
- The local government can promote and support property protection through outreach and financial incentives.
- Property protection measures can protect the most flood-prone buildings in the County such as those which are repetitively flooded.

Recommendations

- Encourage homeowners to take responsibility for protecting their own properties by providing retrofitting advice and assistance.
- Encourage the promotion of flood insurance to increase the policy base in Cumberland County.

APPENDIX D - REFERENCES

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