

**Durham County
Resolutions/Approvals/Minutes of Public Meetings
Specific approval sections are highlighted**

Durham County
Hazard Mitigation Certifications

I, Mark Schell, Emergency Management Coordinator for the County of Durham, State of North Carolina, do hereby certify that public involvement and input regarding the Hazard Mitigation Plan was carried out in accordance with the plan and in accordance with local policy and ordinance.

I further certify that public notification and public input was sought by placing notice to the public in the Durham Herald Sun on February 12, 2007 and February 19, 2007. I further certify that a plan briefing of Board and council members was published and the public invited, per the "Open Meetings" laws of North Carolina. I further certify that agendas of regular meetings of Boards and Councils in Durham County and the respective municipality were published prior to consideration for approval of the Hazard Mitigation Task Force for Durham County and that such citizens had ample opportunity for input in plan development. I further certify that copies of Board and or Council meeting minutes, kept in accordance with North Carolina law, regarding approval of the Hazard Mitigation Plan, are on file and available for members of the public, state and Federal agencies. Inspection may be made upon reasonable request to the respective jurisdictional authority.

This certification is in accordance with provisions of the Disaster Mitigation Act 2000 (44 CFR 201.6 and NCGS 62A.

This the 15th day of March, 2007.

**North Carolina,
Durham County**

I, SUSAN B. PAGE, a Notary Public for said County and State, do hereby certify that Mark Schell personally appeared before me this day and acknowledged the due the foregoing instrument.

Witness my hand and seal this the 15TH day of MARCH, 2007.

Susan B. Page Notary Public My Commission expires 12-20-2010



County of Durham
State of North Carolina

RESOLUTION

WHEREAS, the State of North Carolina, in Senate Bill 300 enacted in June 2001 and HB 1584 filed on June 5, 2002, ordained that every county and incorporated municipality in the State was required to have a Hazard Mitigation Plan approved by the North Carolina Division of Emergency Management or they would be ineligible for State disaster assistance after November 2004; and

WHEREAS, the Federal Emergency Management Administration (FEMA) under the Hazard Mitigation Act of 2000 ordained that every county and incorporated municipality in the county was required to have a Hazard Mitigation Plan approved by FEMA in order to be eligible for Hazard Mitigation Grant Program funding for Presidentially-declared disasters after November 2004; and

WHEREAS, under the Hazard Mitigation Act of 2000, the Federal Emergency Management Agency (FEMA) has issued an Interim Final Rule that details the minimum criteria for local hazard mitigation plans; and

WHEREAS, the County and municipalities agree with the concept of, and necessity for, hazard mitigation planning; and


WHEREAS, the Durham County Local Emergency Planning Committee recommends the approval of the Hazard Mitigation Plan; and

WHEREAS, the State of North Carolina Division of Emergency Management has conducted a review of the Hazard Mitigation Plan:

NOW THEREFORE, we the Durham Board of County Commissioners hereby approve the Durham County Hazard Mitigation Plan as submitted this 26th day of February, 2007.



Chairman, Durham Board of County Commissioners



Clerk to the Board

DURHAM



1869
CITY OF MEDICINE

CITY OF DURHAM

OFFICE OF THE CITY CLERK
101 CITY HALL PLAZA • DURHAM, NC 27701
919.560.4166 • fax 919.560.4835
www.durhamnc.gov



SUBJECT: THE DURHAM COUNTY HAZARD MITIGATION PLAN

To receive public comments on the Durham County Hazard Mitigation Plan; and

To adopt a resolution approving the Durham County Hazard Mitigation Plan.

Mayor Pro Tempore Cole-McFadden open the public hearing.

No one present spoke on this item. The public hearing was declared closed by Mayor Pro Tempore Cole-McFadden.

MOTION by Council Member Stith seconded by Council Member Woodard to receive public comments on the Durham County Hazard Mitigation Plan; and

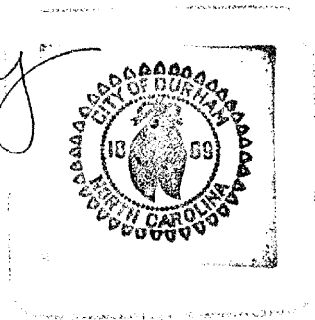
To adopt a resolution approving the Durham County Hazard Mitigation Plan was approved at 8:56 p.m. by the following vote: Ayes: Mayor Bell, Mayor Pro Tempore Cole-McFadden and Council Members Brown, Catotti, Clement, Stith and Woodard. Noes: None.

**NORTH CAROLINA
DURHAM COUNTY**

I, D. Ann Gray, duly appointed City Clerk of the City of Durham, North Carolina, do hereby certify that the above action was taken by the Durham City Council at its regular meeting held on Monday, March 5, 2007.

WITNESS my hand and the corporate seal of the City of Durham, North Carolina, this the 12th day of March 2007.


D. Ann Gray, CMC
City Clerk



Good Things are Happening in Durham

City of Durham
State of North Carolina

**RESOLUTION APPROVING THE DURHAM COUNTY HAZARD
MITIGATION PLAN**

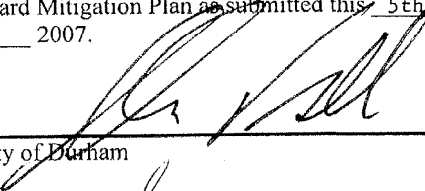
WHEREAS, the Disaster Mitigation Act of 2000, the Code of Federal Regulations and North Carolina General Statutes require the development of a Hazard Mitigation Plan and

WHEREAS, A Hazard Mitigation Plan has been developed by Durham County and the Municipality has been reviewed by members of this Council, staff and the public and

WHEREAS, the Durham County Local Emergency Planning Committee recommends the approval of the Hazard Mitigation Plan and

WHEREAS, the State of North Carolina Division of Emergency Management has conducted a review of the Hazard Mitigation Plan,

NOW THEREFORE, we the City Council of Durham hereby approve the Durham County Hazard Mitigation Plan as submitted this 5th day of March 2007.



Mayor – City of Durham



City Clerk



In Accordance with the Disaster Mitigation Act of 2000 (44CFR 201.6)

1. Executive Summary and General Problem Statement

Webster defines mitigate as "*to make mild, to make or become milder, less severe or less painful, moderate.*" The Federal Emergency Management Agency (FEMA) defines mitigation as "*any action taken to permanently eliminate or sharply reduce the long term vulnerability of human life and property from hazards.*" There is a distinction between mitigation and prevention and both are discussed in this plan. Senate Bill 300 (NCGS 166A as modified) and the Disaster Mitigation Act of 2000 and 44CFR 201.6 mandate counties and municipality to construct and then implement a hazard mitigation plan in order to receive state and Federal disaster and mitigation assistance funding. The local governing body on or before November 1, 2004 must approve the plan. Draft plans must be submitted for review to the North Carolina Division of Emergency Management, Hazard Mitigation Section on or before January 30, 2004. Failure to complete the plan and have it approved would mean the loss of eligibility for thousands of dollars in disaster recovery and mitigation grant funding. The plan must also be submitted to the state hazard mitigation officer for review and ultimately forwarded by the state to the Federal Emergency Management Agency for approval. The plan must also be reviewed and updated every five years thereafter.

This plan will outline the hazards faced by Durham County and the City of Durham (hereafter, also referred to as the municipality) of both historical and potential events. A rating is given to each hazard for the purposes of prioritizing the mitigation process. This rating is reflective of information from the State of North Carolina and the concerns of Durham County and the municipality. Not all mitigation is possible or cost effective.

This plan also considers the current political climate on a global, national, state and local level. Perception of the public and government officials of realistic mitigation, realistic hazards and realistic prevention may differ widely from this plan.

Meetings with top government officials, local planners, state mitigation planners, the public and others that make up Durham County's Hazard Mitigation Task Force, were held and input sought prior to its' completion and submission for approval. The public was notified of the planning process via newspaper publications of the agendas of local or jurisdictional governing bodies.

Durham County and the municipality face a number of hazards everyday. During the past decade and a half we have faced the effects of damaging tornadoes, severe winter storms, high winds, freezing temperatures, chemical spills and more. We have learned from each disaster and each incident and your emergency services and response forces are better trained and better equipped to deal with these hazards than ever before. Numerous hazard mitigation efforts have been ongoing in Durham County and continue to evolve to this day.

Problems that Durham County and municipality face in an all hazard mitigation program are numerous, as are the challenges to have an effective mitigation program. Durham County and the municipality are vulnerable to a variety of hazards and those hazards have been identified (3. Hazard Identification). Because of the number of both natural and manmade hazards that have occurred and that have effectively been controlled, Durham County and the municipality have a better understanding of the level of vulnerability and each has taken many steps, as outlined in this plan, to mitigate that vulnerability. This plan further outlines areas of concern and recommendations to address those concerns for future mitigation efforts.

Durham County, and the municipality, following the intent of Senate Bill 300, and the Disaster Mitigation Act of 2000, have assessed their vulnerability to hazards and they are incorporated herein. When mitigation issues and strategies are unique to a municipality they are included as separate items as required by 44CRF 201.6.(3).

2. Purpose

The local Hazard Mitigation Plan identifies long-term disaster resistance through identification of actions that can reduce the exposure of people and property to natural and/or technological hazards. The plan also determines the jurisdiction's commitment to their citizens by determining goals, objectives, policies and programs that will reduce or eliminate losses. The plan can serve as a catalyst for citizens, businesses, and governments to educate and create public awareness of the risks facing the community as a whole. The plan can also:

- Provide for additional grant funding (pre-disaster and post-disaster)
- Provide for additional credit under the Community Rating System (CRS)
- Speed recover and development after a disaster event
- Comply with both state and Federal requirements for Hazard Mitigation Plans

3. Authority and Government

County of Durham – consists of a body of five commissioners, elected at-large, who oversees the affairs of County government in a commissioner-manager format where the Board of Commissioners appoints a County Manager to execute the affairs of the County, including budgetary and personnel issues. Durham County was founded in 1881 under an act of the state's General Assembly that apportioned the County's territory from the neighboring counties of Orange & Wake. Durham County has one (1) major municipality, the City of Durham, which is the County seat.

City of Durham – consists of a city council of seven (7) members, elected in a combination of three at-large and three wards plus a mayor, who governs the affairs of this major municipality in Durham County. Chartered in 1869, the city is operated under a council-manager structure that provides for day-to-day operations and budgetary issues to be executed by a council-appointed City Manager.

The Durham County Board of Commissioners and the Durham City Council have adopted the Hazard Mitigation Plan by resolution.

The plan has been developed in accordance with rules and regulations governing local hazard mitigation plans to maintain compliance with the following legislation:

- A. NC General Statutes, Chapter 166A: North Carolina Emergency Management Act as amended by Senate Bill 300.
- B. The Robert T. Stafford Disaster Relief and Emergency Assistance Act as amended by the Disaster Mitigation Act of 2000.

Planning Task Force Members

The following department and agencies are members of the Mitigation Planning Committee:

Agency	Person	Title
EMS/Hospitals	Mike Smith, EMS	Director
Finance	George Quick	Director
Fire	Jeff Batten	County Fire Marshal
Law Enforcement	Wes Crabtree	Chief Deputy
Planning	Bonnie Estes	Assistant Planning Director
Public Information	Wil Glenn	PI Specialist
Public Works	Kati Kalb, City PW Glen Whisler, County Engineering	Director Director
Transportation	Steve Mancuso, DATA	DATA Director
Utilities	Mike Turner, County GSA	Director
Water Resources	Terry Rolan	Director

Concept

Hazard and vulnerability mitigation can be an all encompassing program that can be complex or it can be resolved to do only those things necessary, practical or cost effective to accomplish. Reduction or elimination of a threat or the potential damages and loss of life from a catastrophic incident is the main goal of hazard mitigation. Hazard and vulnerability mitigation is not just a government function. It involves government certainly, but both the public and private sector must work together to reduce risks for the good of the community.

Mitigation can be in the form of legal measures, new building codes and construction techniques or simply restricting parking near critical facilities. Details of recommendations are found in later documents.

Planning

Each jurisdiction agreed that it was important to have a multi-jurisdictional plan and that it be coordinated. Interviews with local County and municipal officials were used to identify existing capabilities. Interviews are helpful developing the critical professional relationship needed to build a mitigation network. These personal interviews also allow in-depth questioning when a particular question or response prompts additional issues. Where interviews are not possible, survey questionnaires can be used to obtain data regarding each department's specific programs and authorities. These surveys, like the interviews, seek information from appropriate representatives about their department's day-to-day and emergency programs. In addition, questionnaires allow respondents the opportunity to make recommendations for improvement in their own agencies and in others where it might not otherwise be welcomed. This data provides a valid starting point for gathering information for the vulnerability assessment. Additional information is sought from individuals, agencies or departments via email. This electronic means of communications has allowed for rapid questioning and the receipt of information. Internet resources were and are used extensively.

Following the recommendations of the Division of Emergency Management (NC Department of Crime Control and Public Safety) and the Federal Emergency Management Agency (FEMA), Durham County has taken the necessary action and determined its capability to develop an exemplary hazard mitigation plan. The Capability Assessment for Durham County included the following categories:

- Legal – An inventory of the powers available to local governments enumerated in the North Carolina General Statutes to identify which can be used to craft hazard mitigation measures at the local level, and also assess legislation that may impose limits on certain mitigation efforts.

- Institutional – A description of the type of government, including an inventory of key decision-making positions (both long range and day-to-day).
- Political Capability – Discussion as to how mitigation can be inserted into everyday decision-making, and aid in de-politicizing the issue.
- Fiscal – Inventory of sources of funding available to communities to implement local hazard mitigation plans, including both government and private programs.

Similar techniques are used in data collection. The information gathered will assist in making suggestions for suitable mitigation opportunities.

In addition to the items listed above, Durham County also seeks to identify local practices, which may weaken existing mitigation efforts or even exacerbate risk.

Local Mitigation planning activities include:

- The identification and analysis of hazards that threaten the community;
- An assessment of vulnerable properties and populations;
- An assessment of local capabilities to implement various mitigation programs and policies; and
- the identification and prioritization of feasible mitigation opportunities.

Planning Process

The planning process will include meetings with a multi-jurisdictional Hazard Mitigation Task Force where discussions regarding the hazards (based on the priority as outlined in the hazard matrix), are identified and rated, as well as numerous meetings, interviews and conversations with staff, local citizens, state officials and others. Current policy, County ordinance, building code, general statute or Federal code was examined for possible mitigation efforts for each hazard. Each hazard mitigation effort was assessed for the capability of the community to respond effectively as well as its potential for effective recovery. An assessment was made for mitigation potential from either legal or voluntary means or a combination of those means. Interim conclusions were drawn and recorded. From the Interim conclusions goals were established which may include recommendations for policy, code or ordinance or outreach education programs to achieve those goals. Formal recommendations can then be made to appropriate officials for action. Implementation of the goals, policy, procedure, or ordinance of each hazard to be mitigated will be assigned to the appropriate department or agency for conclusion. The effectiveness will be monitored for a period of not more than two years and a report of the effectiveness will be forwarded to the Chair of the Hazard Mitigation Task Force, as outlined below. Revisions, updates or modifications below. The Federal Emergency Management Agency (FEMA) will conduct a thorough plan review and update not more than five years from the date of formal approval.

Durham County, and the municipality, following the intent of Senate Bill 300, and the Disaster Mitigation Act of 2000, has assessed their vulnerability to hazards.

HMP Team Meetings

The Hazard Mitigation Planning (HMP) Team, consisting of representatives from interested County departments, met one (1) time on June 9, 2004. However, coordination between Team members was ongoing throughout the planning process through email, telephone calls and personal interviews.

The planning process also played an important part in generating community understanding of and support for hazard mitigation by creating a forum for discussion and publicizing the need for hazard mitigation planning.

Public Input

First Public Hearing

On June 9, 2004, Durham County gave public notice of the start of the hazard mitigation planning process at the Durham County Planning Commission public meeting. The meeting was advertised in the Durham Herald Sun (local daily newspaper) and was announced on the County's website (www.co.durham.nc.us).

Neighboring communities, State and Federal Agencies, businesses, academia, nonprofits, and other interested parties were invited by advertising a public announcement in the Durham Herald Sun Newspaper as well as through email on the County website.

At the meeting, a presentation was made describing the purpose of the hazard mitigation planning process and the schedule for plan development. The section of the plan on hazard identification and analysis was also presented. No public comments were received.

In addition to the meeting, public announcement of the meeting provided an address and phone number for persons who were unable to attend the meeting but who wanted to receive more information about the planning process. During the planning process, drafts of the plan were also available for public review at the Durham County Emergency Services Department.

Second Public Hearing

A second public hearing was advertised in the Durham Herald Sun (local daily newspaper) and was announced on the County's website (www.co.durham.nc.us). The meeting was held February 26, 2007 and March 5, 2007 to receive public input and comment about the proposed mitigation plan. There was no public comment. The Durham County Board of Commissioners and the Durham City Council approved and adopted the Plan in their respective meetings.

Public Involvement / Participants

Prior to beginning work on the plan, an initial meeting with key officials was held. A "kick off" meeting was then held with members of the Durham Planning Commission on June 9, 2004 to describe project approach, goals and objectives of the project, technical services available to the County and municipality, specific projects and expectations of results. The task force reviewed the plan. Durham County went to great lengths to ensure the public was informed of the planning process. A copy of the certification is contained in the Hazard Mitigation Plan. The draft was submitted to the Hazard Mitigation Branch of the North Carolina Division of Emergency Management on January 28, 2005. The North Carolina Division of Emergency Management completed its review and returned the plan on April 28, 2005 with comments and concerns. Those comments and concerns were addressed and the plan returned to the State on August 12, 2005. Final approval was given by the State on February 7, 2006 and the plan was sent to the Federal Emergency Management Agency for Approval.

Additional meetings were held as necessary, and often on an individual department, agency or personal basis. Input was sought from state and Federal mitigation planners as necessary or appropriate. A final draft was prepared and submitted to the Board of Commissioners and the municipal Councils and Boards for approval. The approved mitigation plan was then copied and distributed to users, including the appropriate state and Federal agencies.

County Commissioners
County Manager
County Engineering
Emergency Services (EMS, Communications, Fire, Sheriff, Rescue)
Emergency Management

GIS / Mapping
Public Utilities (public member)
Social Services
Health Department
Sheriff's Department
Durham Regional Medical Center (public member)
Durham County Tax Office
Durham Public Schools
City Manager
City-County Planning
Chamber of Commerce (public member)
Council of Governments (Regional government coordination)
NC Emergency Management
NC DOT
NC State Highway Patrol

Whenever possible or practical, the public was notified and invited to participate in the planning process. This was conducted by advertising in a local newspaper the availability, at a public place or by Internet, of the plan inspection and comment by members of the public (see Durham County Hazard Mitigation Certifications). An opportunity for comment was open for a period of not less than ten nor more than thirty days from the date of publication. When revisions to the plan are required, requested or recommended and these revisions are beyond the scope of administrative correction, drafts of those items to be included in the plan will be offered for public inspection and comment. This will be accomplished in the same manner as previously stated in this paragraph. Public comments on the plan will be accepted in the time period up until the governing body convenes to consider the plan for adoption.

In general, it is anticipated that any opposition to the final plan will be low given the history of the County with numerous severe weather and chemical events. It has been demonstrated in disaster planning literature that citizens place mitigation high on their agendas as much as a year and a half after the most recent events. Durham County has faced numerous disasters in a period of 17 years; most County residents understand the risk they face and favor a proactive approach.

4. Hazard Identification

Durham County and the municipality identified the hazards that are addressed in this plan. These hazards were identified through an extensive process that utilized input from Hazard Mitigation Task Force members, public input, researching past disaster declarations in the County, a review of current FIRMs (Flood Insurance Rate Maps), and risk assessments completed by Durham County Emergency Management, CEM Associates, a private emergency management consulting firm and the North Carolina Division of Emergency Management Hazard Mitigation Section as well as the Federal Emergency Management Agency.

The City and County Planning Department provided considerable data regarding current and projected land use and this data was then analyzed to assess potential problem areas, including critical facilities. Initial data from this study was also used to determine those hazards that present the greatest risk to the County and the municipality. Hazards were assigned a "risk value" by potential. This assignment was made upon the recommendations of the Hazard Mitigation Task Force, city and County agencies, the State of North Carolina, FEMA and the public. Based upon the "risk value", analysis was made for those hazards with the highest ratings first. Additional in depth analysis was also performed on hazards with lower ratings as outlined in the Hazard Vulnerability Assessment section of this plan. Durham County and the municipality agreed that an all hazards approach would serve the needs of the community better and provide a better planning tool for future growth.

The hazards identified include those listed below. Other natural or man made hazards that could occur in other parts of the country (i.e.: volcanoes, tsunamis, commercial aircraft accidents, etc.) were not analyzed because of (1) the location of our jurisdiction, (2) there was no history of any such occurrence and the likelihood of such an occurrence was less than .1%, (3) there was no indication in any researched document that such events were ever likely to occur and (4) possible or potential mitigation was outside of the geographical or political jurisdiction of the County and the municipality. Therefore, the Hazard Mitigation Task Force felt it appropriate that time and limited resources be used to identify and analyze those realistic hazards listed below.

Drought
Earthquake
Floods
Forest Fires
Hazardous Materials
Hurricanes
Terrorist Activity (biologics, disease, etc)
Thunderstorms
Tornadoes
Winter Storms

Other threats that were considered, but when examined rated less than 1 on the hazard rating.

Fixed Nuclear Facility	Power Failure
Mass Casualty	Large Structural Fires
Nor'easter	Landslide
Tsunami	Landfill fires

5. Hazard and Vulnerability Analysis

Durham County and the municipality have conducted exhaustive research into existing documents, history, land use, demographics, ordinances, state and Federal law and accepted codes and practices. Durham County also reviewed existing FIRMs (flood insurance rate maps) from the Federal Emergency Management Agency and incorporated that review onto GIS maps along with assistance from HazardPro, a GIS mapping product available through the Hazard Mitigation branch of NC Emergency Management and the North Carolina Center for Geographic Information Analysis (NCCGIA). Additional maps were produced by the contractor as needed, to illustrate vulnerable areas.

Extensive analysis and assessment was then conducted with input from the public, local, state and Federal agencies, planning agencies and others. The analysis and assessments were then presented to the Hazard Mitigation Task Force for discussion and inclusion or exclusion. This was done in the form of a draft document. This draft was available for inspection and comment both in printed form and on the internet.

The results of this study, taking place over a period of several months, resulted in the following information and documentation.

- A. Critical facilities
- B. Risk assessment by hazard or threat and rating associated with each hazard
- C. Data Used
- D. Data developed
- E. Vulnerability assessment
- F. Maps

6. Hazard and Vulnerability Mitigation

Durham County and the municipality jointly developed, with guidance from the North Carolina Division of Emergency Management and the Federal Emergency Management Agency, the overall concept of the Hazard Mitigation Plan, including the format of the plan and then developed its planning process. Durham County developed a Hazard Mitigation Task Force as a planning group. Members of this task force were appointed by elected officials or by city and County managers or served as volunteers.

The following outline was developed to access those areas of the plan of the greatest interest or concern.

- A. Concept
- B. Planning
- C. Planning Process and responsibility assignment
- D. Participants in / Public Involvement
- E. Coordination, Maintenance and Approval
- F. Current legal measures
- G. Current mitigation measures
- H. Need to modify current measures
- I. Current development trends - Future needs planning

7. Implementation

The most thoughtful and discussed portion of the Durham County Hazard Mitigation Plan was the implementation process. Debate centered on funding for the initiatives outlined in the Mitigation Strategy. Most agreed that with sufficient funding the primary goal as well as the objectives that were outlined could be accomplished within specified time periods. The Hazard Mitigation Task Force decided on the "action plan" approach, which outlines the actions that will be taken to achieve the objective, as well as time lines and the primary area or agency that will have the responsibility for carrying out the action. Objectives were not only enumerated, but also expanded upon to give detail of how those objectives *may* be carried out.

Without guarantees of funding, specific actions or timelines for implementation for each objective that was identified became supposition. Without funding, the Hazard Mitigation Task Force felt that the time required to develop an action plan for each objective would be extensive.

The entire plan is presented as a "living document" and one that will be changed, reviewed, updated and reprocessed over the next five-year period. It was noted that while the objectives were listed and discussed, many of the objectives would require modification or adoption of local ordinances. This will require the County and the municipality to hold public hearings, allowing for input from the public and established due process, before implementation of the objective can occur or be considered.

General action plans were developed. The following outline was developed to access those areas of the plan of interest or concern.

- A. Mitigation Strategy
 - 1. Action Plan - Research
 - 2. Action Plan - Hazard Mapping and Assessments
 - 3. Action Plan - Real-Time Monitoring
 - 4. Action Plan - Loss Assessment
 - 5. Action Plan - Information Collection, Interpretation, and Dissemination
 - 6. Action Plan - Guidelines and Training
 - 7. Action Plan - Public Awareness and Education
 - 8. Action Plan - Implementation of Loss Reduction Measures
 - 9. Action Plan - Emergency Preparedness, Response, and Recovery

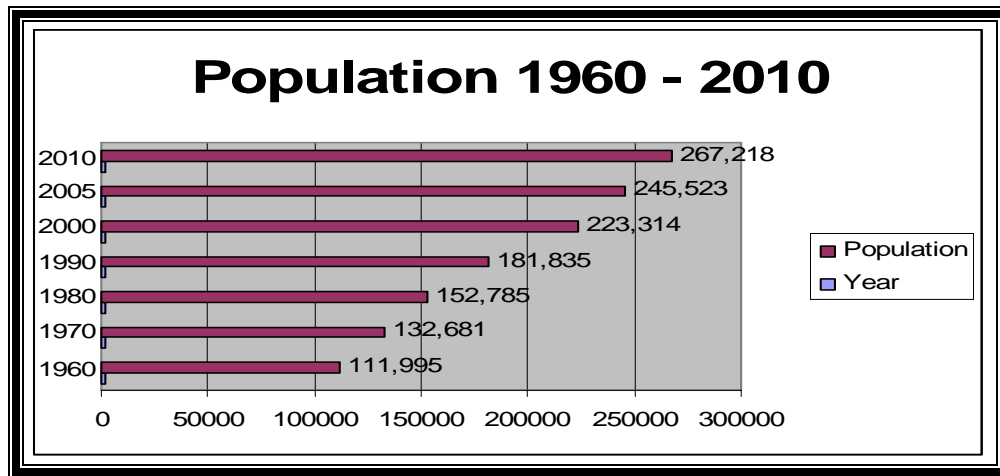
- 10. Action Plan - Define reasonable and measurable goals and objectives
- B. Adopting new or additional legal or voluntary measures
- C. Goals / Action Plan Priority Table
- D. Goals detailed
- E. Potential program funding sources

County Overview

Durham County is located in the rolling Piedmont Region of North Carolina about halfway between the Blue Ridge Mountains and the pristine beaches of the Outer Banks. Current population estimates indicate that Durham County is home to 249,654 citizens, a number which ranks Durham County among the most populated in the state. Durham County has one (1) major municipality, the City of Durham, with a population of 210,553. Of the 249,654 citizens within the County, 84% reside in the City of Durham.

Durham County is also home to Research Triangle Park (RTP), the largest and most successful planned research park in the United States. The park is located on 7,000 acres of North Carolina pine forest and nearly 75% of the Park's property and 95% of the corporate enterprises are located in Durham County. (www.durhamchamber.org/business/rtp.html)

Population



**Population 1960 – 2000
Projected Population 2005 and 2010**

	1960	1970	1980	1990	2000	2005	2010
Total	111,995	132,681	152,785	181,835	223,314	245,523	267,218
Change		20,686	20,104	29,050	41,479	22,209	21,695
Percent Change		18.5%	15.2%	19.0%	22.8%	9.9%	8.8%

(Census 2000 analyzed by the Social Science Data Analysis Network (SSDAN))

Climate

Durham County encompasses 299 square miles (773 sq km) and the City of Durham has 90 square miles (234 sq km). The City of Durham encompasses 30% of the total land within Durham County. It is physically located 406 feet above sea level. Climate of the area is as follows:

Climate Characteristics

Average Summer High/Low	87/66 F
Average Winter High/Low	51/31 F
Annual Precipitation	41.3 Inches
Annual Snowfall	7.9 Inches
Prevailing Wind (Southwest)	7.5 MPH
Coldest Month	January
Warmest Month	July
Wettest Month	August
Driest Month	October
Annual Sunshine Days	212 Days

City of Durham Overview

Durham Demographics

Group	Countywide	City Only
Total County Population (2003 estimate)	236,781	198,376
Median Age	32.2 years	31.0 years
Households	89,015	74,981
Housing Units	95,452	80,797

Gender	Countywide	City Only
Female	51.8%	51.9%
Male	48.2%	48.1%

Age Distribution	Countywide	City Only
Under 5	6.9%	7.2%
5-9	6.6%	6.6%
10-14	6.1%	6.0%
15-19	6.7%	6.9%
20-24	9.4%	10.4%
25-34	19.0%	20.1%
35-44	15.8%	15.5%
45-54	12.7%	11.8%
55-59	4.1%	3.9%
60-64	3.0%	2.7%
65-74	4.9%	4.6%
75-84	3.5%	3.5%
85 and Over	1.2%	1.3%

Race and Ethnicity	Countywide	City Only
White	50.9%	45.5%
Black	39.5%	43.8%
Asian	2.8%	3.6%
Native Hawaiian or Pacific Islander	0.0%	0.0%
American Indian	0.3%	0.3%
Some Other Race	4.2%	4.7%
Two Or More Races	1.8%	1.9%
Hispanic (any race)	7.6%	8.6%

Educational Attainment	City Only	
Population 25 years and over	118,100	100
Less than 9th grade	1,980	6.8
9th to 12th grade, no diploma	12,568	10.6
High school graduate (includes equivalency)	20,793	17.6
Some college, no degree	20,911	17.7
Associate degree	6,541	5.5
Bachelor's degree	27,678	23.4
Graduate or professional degree	21,629	18.3
Percent high school graduate or higher	82.6	(X)
Percent bachelor's degree or higher	41.8	(X)

Income Characteristics	City Only	County
Mean Household Income (dollars)	\$41,160	\$43,337
Median Family Income (dollars)	\$51,162	\$53,223
Per Capita Income (dollars)	\$22,526	\$23,156

Source: US Census 2000

Hazard Ratings and Risk Assessment

Durham County, and the municipality, following the intent of Senate Bill 300, and the Disaster Mitigation Act of 2000, has assessed their vulnerability to hazards.

The hazards identified include those listed below. Other natural or man-made hazards that could occur in other parts of the country (i.e.: volcanoes, tsunamis, aircraft accidents, etc.) were not analyzed because of (1) the location of our jurisdiction, (2) there were no history of any such occurrence and the likelihood of such an occurrence was less than .1%, (3) there was no indication in any researched document that such events were ever likely to occur, therefore, the Hazard Mitigation Task Force felt it appropriate that time and very limited resources be used to identify and analyze those realistic hazards listed below.

The contractor that facilitated the planning process also conducted research on the potential for hazard occurrence from a number of sources, but the primary source was the “History of Hazards by County” from the NC Division of Emergency Management. A public meeting was held on June 9, 2004 at the Durham County City Hall. The focus of the forum was limited to natural hazards that have occurred in Durham County. Each hazard was discussed individually and included the hazard specific threat, the frequency of occurrence in history and the probability for future occurrence. The task force chose to add Hazardous Materials to the threat due to the large numbers of incidents in the County and the city, mostly from transportation accidents and the potential for future occurrence. Table 2 – Historical Weather Events, presents the number and types on incidents that have occurred in the past. After considerable discussion the Hazard Mitigation Task Force/LEPC agreed and adopted the findings in Table 1. This table differs slightly from Table 3 – Hazard Risk By Climate Division provided by the NCDEM Hazard Mitigation Branch.

The County and the Municipality were well represented during Task Force meetings and concurred with the ratings below. In the criteria for mitigation plans, “for multi jurisdictional plans, the risk assessment (see Table 1 below) must determine each jurisdiction’s risks where they vary from the risks facing the entire planning area.” The County and the municipality agree they each face the same threat level from each of the threats listed in Table 1 and at the same level of threat. The frequency at which these threats occur is supported in Table 2, which is a consolidated table of the history of incidents from 1955 until 2004. Hazardous Materials incidents were researched for the record period of 1988 until 2002. Also see Current Mitigation Measures. Also see Hazard Vulnerability Assessments.

Probable Level of Impact

The probable level of impact, or estimated strength and damage potential, of a particular hazard within a specific jurisdiction is classified in one of four categories as described in the Table below.

Description of Hazard Probable Level of Impact

Level	Area Affected	Impact ¹
Catastrophic	More than 50%	<ul style="list-style-type: none"> • Multiple deaths. • Complete shutdown of facilities for 30 days or more. • More than 50% of property is severely damaged.
Critical	25 to 50%	<ul style="list-style-type: none"> • Multiple severe injuries. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25% of property is severely damaged.

Level	Area Affected	Impact ¹
Limited	10 to 25%	<ul style="list-style-type: none"> • Some injuries. • Complete shutdown of critical facilities for more than 1 week. • More than 10% of property is severely damaged.
Negligible	Less than 10%	<ul style="list-style-type: none"> • Minor injuries. • Minimal quality of life impact. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10% of property is severely damaged.

Source: "Keeping Natural Hazards from Becoming Disasters", NC Division of Emergency Management, November 2001, p. 12.

¹ The impact of a natural hazard is a combination of the severity of the occurrence, the magnitude of the event, and the density of human activity in the affected area

Likelihood of Occurrence

The likelihood, or frequency, of occurrence of a particular hazard within a specific jurisdiction will be classified in one of four categories. These four categories are explained in the Table below.

Explanation of Hazard Likelihood of Occurrence

Likelihood	Frequency of Occurrence
Highly Likely	Near 100% probability in the next year.
Likely	Between 10% and 100% probability in the next year or at least one chance within the next ten years.
Possible	Between 1% and 10% probability in the next year, or at least one chance in the next 100 years.
Unlikely	Less than 1% probability in the next year, or less than one chance in the next 100 years.

Source: "Keeping Natural Hazards from Becoming Disasters", NC Division of Emergency Management, November 2001, p. 11.

Likely Range of Impact

The likely range of impact, or predictable size and location, of a particular hazard within a specific jurisdiction will be classified in one of three categories. These three categories are described in the Table below.

Description of Likely Range of Impact

Size of Area	Description
Small	10 % or less of the total jurisdictional area
Medium	10 % to 40 % of the total jurisdictional area
Large	40 % to 100 % of the total jurisdictional area

Source: "Keeping Natural Hazards from Becoming Disasters", NC Division of Emergency Management, November 2001, p. 11

Mitigation Strategies for New and Existing structures can be found in pages 115-118.

Durham County Risk Assessment

Types of Hazards and Associated Elements	Likelihood of Occurrence Highly Likely – 4 Likely – 3 Possible – 2 Unlikely -1	Intensity Rating Relative Terms Severe – 3 Moderate – 2 Mild - 1	Impact Catastrophic – 4 Critical – 3 Limited – 2 Negligible – 1	Conclusion
				Rank Determined by Sum of Assessments
Thunderstorms	4	3	1	8
Flooding	3	1	1	5
Winter Storm	3	2	2	7
Tornadoes	2	2	3	7
Hurricanes	2	2	3	7
Drought/Heat Wave	2	2	2	6
Earthquakes	2	2	2	6
Landslides/Sinkholes	2	1	1	4
Wildfires	3	1	1	5
Dam Failure	1	2	1	4
Hazardous Materials	4	1	1	6
Terrorism	1	2	2	5

Historical Weather Events in Durham County and Municipality

Event	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 Durham	3/5/1955	1615	Hail	1.50 in.	0	0	0	0
2 Durham	4/24/1955	2050	Hail	2.75 in.	0	0	0	0
3 Durham	4/15/1956	2245	Tstm Wind	0 kts.	0	0	0	0
4 Durham	11/8/1957	1500	Tstm Wind	65 kts.	0	0	0	0
5 Durham	4/22/1958	1500	Tstm Wind	0 kts.	0	0	0	0
6 Durham	7/20/1958	1400	Tstm Wind	0 kts.	0	0	0	0
7 Durham	7/20/1958	1400	Tstm Wind	0 kts.	0	0	0	0
8 Durham	5/13/1959	1000	Tstm Wind	0 kts.	0	0	0	0
9 Durham	4/28/1961	1600	Hail	0.75 in.	0	0	0	0
10 Durham	7/21/1962	1950	Tstm Wind	80 kts.	0	0	0	0
11 Durham	5/21/1963	1553	Tstm Wind	65 kts.	0	0	0	0
12 Durham	5/21/1963	1600	Hail	0.75 in.	0	0	0	0
13 Durham	3/17/1965	1730	Tstm Wind	50 kts.	0	0	0	0
14 Durham	10/1/1966	1240	Tstm Wind	0 kts.	0	0	0	0
15 Durham	5/14/1967	1650	Hail	1.75 in.	0	0	0	0
16 Durham	5/24/1968	1700	Tstm Wind	0 kts.	0	0	0	0
17 Durham	6/2/1969	1700	Tstm Wind	0 kts.	0	0	0	0
18 Durham	8/10/1969	1348	Tstm Wind	50 kts.	0	0	0	0
19 Durham	7/20/1970	1222	Tstm Wind	65 kts.	0	0	0	0
20 Durham	6/29/1971	1310	Tstm Wind	57 kts.	0	0	0	0
21 Durham	3/16/1972	1455	Tstm Wind	50 kts.	0	0	0	0
22 Durham	5/15/1972	1700	Hail	1.00 in.	0	0	0	0
23 Durham	7/29/1972	1530	Hail	1.00 in.	0	0	0	0
24 Durham	7/29/1972	1530	Tstm Wind	50 kts.	0	0	0	0
25 Durham	9/29/1972	2206	Tstm Wind	53 kts.	0	0	0	0

Event	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
26 Durham	12/31/1975	1615	Tornado	F0	0	0	0	0
27 Durham	1/9/1978	215	Hail	1.75 in.	0	0	0	0
28 Durham	6/22/1978	1500	Hail	1.00 in.	0	0	0	0
29 Durham	7/27/1981	1745	Tstm Wind	0 kts.	0	0	0	0
30 Durham	1/4/1982	600	Tstm Wind	70 kts.	0	0	0	0
31 Durham	3/20/1984	2330	Tstm Wind	0 kts.	0	0	0	0
32 Durham	3/20/1984	2345	Tstm Wind	0 kts.	0	0	0	0
33 Durham	4/4/1984	1800	Tornado	F2	0	4	2.5M	0
34 Durham	4/4/1984	1930	Tstm Wind	0 kts.	0	0	0	0
35 Durham	5/6/1984	700	Hail	1.00 in.	0	0	0	0
36 Durham	5/8/1984	1400	Tstm Wind	50 kts.	0	0	0	0
37 Durham	5/8/1984	1430	Tstm Wind	0 kts.	0	0	0	0
38 Durham	3/24/1985	1805	Hail	0.75 in.	0	0	0	0
39 Durham	5/22/1985	1925	Tstm Wind	0 kts.	0	0	0	0
40 Durham	7/10/1985	2000	Hail	1.75 in.	0	0	0	0
41 Durham	7/10/1985	2015	Tstm Wind	0 kts.	0	0	0	0
42 Durham	10/15/1985	1540	Tstm Wind	61 kts.	0	0	0	0
43 Durham	4/6/1986	1700	Tstm Wind	0 kts.	0	1	0	0
44 Durham	4/6/1986	1723	Tstm Wind	0 kts.	0	0	0	0
45 Durham	4/26/1986	1710	Hail	1.00 in.	0	0	0	0
46 Durham	4/26/1986	1730	Hail	1.00 in.	0	0	0	0
47 Durham	7/26/1986	1630	Tstm Wind	0 kts.	0	0	0	0
48 Durham	7/26/1986	1700	Tstm Wind	0 kts.	0	0	0	0
49 Durham	8/2/1986	1805	Tstm Wind	0 kts.	0	0	0	0
50 Durham	8/2/1986	1820	Tstm Wind	0 kts.	0	0	0	0
51 Durham	8/2/1986	1835	Tstm Wind	0 kts.	0	0	0	0
52 Durham	8/11/1986	1338	Tstm Wind	0 kts.	1	0	0	0
53 Durham	8/27/1986	1335	Tstm Wind	0 kts.	0	0	0	0
54 Durham	8/27/1986	1405	Tstm Wind	0 kts.	0	0	0	0
55 Durham	8/28/1986	240	Hail	1.75 in.	0	0	0	0
56 Durham	6/3/1987	1850	Tstm Wind	0 kts.	0	0	0	0
57 Durham	7/8/1987	1515	Tstm Wind	0 kts.	0	0	0	0
58 Durham	12/10/1987	2200	Tstm Wind	0 kts.	0	0	0	0
59 Durham	5/16/1988	1500	Tstm Wind	0 kts.	0	0	0	0
60 Durham	5/19/1988	1805	Hail	0.75 in.	0	0	0	0
61 Durham	5/23/1988	2030	Tstm Wind	0 kts.	0	0	0	0
62 Durham	7/10/1988	1745	Tstm Wind	0 kts.	0	0	0	0
63 Durham	9/24/1988	1350	Hail	1.75 in.	0	0	0	0
64 Durham	3/15/1989	1630	Hail	0.75 in.	0	0	0	0
65 Durham	4/25/1989	2140	Tstm Wind	0 kts.	0	1	0	0
66 Durham	4/27/1989	1730	Tstm Wind	0 kts.	0	0	0	0
67 Durham	5/5/1989	1540	Hail	0.75 in.	0	0	0	0
68 Durham	5/5/1989	1720	Tornado	F2	0	0	25.0M	0
69 Durham	5/6/1989	1252	Tstm Wind	0 kts.	0	0	0	0
70 Durham	5/15/1989	1440	Hail	1.75 in.	0	0	0	0
71 Durham	6/12/1989	1730	Hail	0.75 in.	0	0	0	0
72 Durham	6/16/1989	1305	Hail	1.75 in.	0	0	0	0

Event	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
73 Durham	6/16/1989	1730	Tstm Wind	0 kts.	0	0	0	0
74 Durham	6/28/1989	1425	Hail	1.00 in.	0	0	0	0
75 Durham	7/16/1989	835	Tornado	F1	0	0	25K	0
76 Durham	4/2/1990	1646	Hail	1.00 in.	0	0	0	0
77 Durham	4/2/1990	1926	Hail	0.75 in.	0	0	0	0
78 Durham	5/1/1990	1800	Tstm Wind	0 kts.	0	0	0	0
79 Durham	6/3/1990	1655	Tstm Wind	0 kts.	0	0	0	0
80 Durham	6/22/1990	1032	Tstm Wind	0 kts.	0	0	0	0
81 Durham	7/10/1990	1630	Tstm Wind	0 kts.	0	0	0	0
82 Durham	7/11/1990	1600	Tstm Wind	0 kts.	0	0	0	0
83 Durham	8/4/1991	1715	Tstm Wind	0 kts.	0	0	0	0
84 Durham	4/24/1992	1920	Tstm Wind	0 kts.	0	0	0	0
85 Durham	6/24/1992	1425	Hail	0.75 in.	0	0	0	0
86 Durham	6/24/1992	1425	Hail	0.75 in.	0	0	0	0
87 Durham	6/25/1992	1305	Tstm Wind	0 kts.	0	0	0	0
88 Durham	6/26/1992	1515	Tstm Wind	0 kts.	0	0	0	0
89 RDU	3/27/1993	1624	Hail	0.75 in.	0	0	0	0
90 Durham	4/21/1993	1907	Hail	0.75 in.	0	0	0	0
91 Durham	4/21/1993	1915	Hail	0.75 in.	0	0	0	0
92 Durham	8/3/1993	1540	Hail	0.88 in.	0	0	0	0
93 Durham	8/3/1993	1628	Thunderstorm Winds	N/A	0	0	0	0
94 Durham	8/3/1993	1700	Lightning	N/A	0	1	0	0
95 Durham	8/17/1993	1910	Thunderstorm Winds	N/A	0	0	5K	0
96 Quail Roost	8/26/1993	1318	Hail	0.75 in.	0	0	0	0
97 Northern And Central	1/3/1994	1800	Heavy Snow	N/A	0	0	0	0
98 Northern Interior And	2/10/1994	1000	Ice Storm	N/A	0	0	0	0
99 Durham	7/11/1994	1341	Lightning	N/A	0	0	5K	0
100 Durham	3/8/1995	1530	Hail	0.75 in.	0	0	0	0
101 Durham	5/10/1995	2317	Thunderstorm Winds	N/A	0	0	0	0
102 Durham	6/8/1995	2045	Thunderstorm Winds	N/A	0	0	0	0
103 Durham	7/4/1995	2200	Flash Flood	N/A	0	0	0	0
104 NCAZ033>034-049-055-0	10/5/1995	700	Flash Flood	N/A	0	0	0	0
105 Durham	10/27/1995	1730	Thunderstorm Winds	N/A	0	0	25K	0
106 Durham	10/27/1995	2100	Thunderstorm Winds	N/A	0	0	0	0
107 NCZ025	1/6/1996	1:00 PM	Winter Storm	N/A	0	0	0	0
108 NCZ025	1/11/1996	10:00 PM	Ice Storm	N/A	0	0	0	0
109 Durham	1/19/1996	7:58 AM	Hail	0.75 in.	0	0	0	0
110 Durham	1/19/1996	7:58 AM	Tstm Wind	0 kts.	0	0	0	0
111 NCZ025	2/2/1996	2:00 AM	Ice Storm	N/A	0	0	0	0
112 NCZ025	2/3/1996	10:00 PM	Extreme Cold	N/A	0	0	0	0
113 NCZ025	2/16/1996	6:00 AM	Heavy Snow	N/A	0	0	0	0

Event	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
114 Durham	5/11/1996	3:50 PM	Tstm Wind	0 kts.	0	0	30K	0
115 Durham County	5/27/1996	6:30 PM	Tstm Wind	0 kts.	0	0	30K	0
116 Durham	5/29/1996	5:30 PM	Hail	1.75 in.	0	0	0	0
117 Durham	5/29/1996	7:35 PM	Hail	0.75 in.	0	0	0	0
118 Durham	5/29/1996	7:35 PM	Tstm Wind	0 kts.	0	0	0	0
119 Durham	6/4/1996	6:40 PM	Hail	0.75 in.	0	0	0	0
120 Durham	6/11/1996	6:55 PM	Hail	0.75 in.	0	0	0	0
121 Bahama	6/20/1996	3:30 PM	Flash Flood	N/A	0	0	0	0
122 Durham	7/2/1996	3:30 PM	Tstm Wind	0 kts.	0	0	0	0
123 NCZ007>011 - 021>028 - 038>043 - 073>078 - 083>086 - 088>089	7/12/1996	8:00 AM	Hurricane	N/A	0	0	0	0
124 Durham	7/18/1996	4:15 PM	Hail	0.75 in.	0	0	0	0
125 Durham	8/7/1996	4:00 PM	Flash Flood	N/A	0	0	20K	0
126 Durham	8/16/1996	3:53 PM	Hail	0.75 in.	0	0	0	0
127 NCZ007>011 - 021>028 - 038>043 - 073>078 - 083>086 - 088>089	9/5/1996	5:00 PM	Hurricane	N/A	7	2	0	0
128 Countywide	9/6/1996	2:00 AM	Flash Flood	N/A	0	0	0	0
129 Durham	9/6/1996	7:30 AM	Flash Flood	N/A	0	0	0	0
130 Durham	3/5/1997	7:20 PM	Hail	0.75 in.	0	0	0	0
131 Durham	3/5/1997	7:20 PM	Tstm Wind	50 kts.	0	0	0	0
132 Durham	4/28/1997	10:35 PM	Flash Flood	N/A	0	0	0	0
133 5NW RDU Airport	5/1/1997	3:42 PM	Hail	0.75 in.	0	0	0	0
134 East Durham	5/1/1997	3:50 PM	Hail	0.75 in.	0	0	0	0
135 Durham	7/4/1997	10:23 PM	Hail	1.00 in.	0	0	0	0
136 Durham	7/16/1997	4:00 PM	Lightning	N/A	0	0	0	0
137 Durham	7/16/1997	4:05 PM	Tstm Wind	50 kts.	0	0	0	0
138 Countywide	7/24/1997	7:40 AM	Flash Flood	N/A	0	0	0	0
139 Durham	9/10/1997	6:05 PM	Tstm Wind	50 kts.	0	0	20K	0
140 Durham	1/16/1998	12:55 PM	Hail	0.75 in.	0	0	0	0
141 NCZZZ024> 025 - 039>041 - 074>075 - 077 - 088	2/3/1998	9:00 PM	High Wind	35 kts.	0	0	0	0
142 Durham	2/3/1998	12:00 PM	Heavy Rain	N/A	0	0	0	0
143 NCZ007>011 - 021>028 - 038>043 - 073>078 - 083>086 - 088>089	2/16/1998	10:00 PM	High Wind	52 kts.	0	0	0	0
144 Durham	2/16/1998	12:00 PM	Heavy Rain	N/A	0	0	0	0

Event	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
145 Durham	3/19/1998	4:00 AM	Flash Flood	N/A	0	0	0	0
146 Durham	3/20/1998	6:20 PM	Hail	0.75 in.	0	0	0	0
147 Bahama	3/20/1998	6:30 PM	Tornado	F2	0	1	600K	0
148 Bahama	3/20/1998	7:30 PM	Hail	0.75 in.	0	0	0	0
149 Durham	3/20/1998	8:30 PM	Hail	1.00 in.	0	0	0	0
150 Durham	3/20/1998	9:45 PM	Hail	1.00 in.	0	0	0	0
151 Durham	5/26/1998	3:21 AM	Hail	1.75 in.	0	0	0	0
152 Durham	5/26/1998	3:27 AM	Hail	1.75 in.	0	0	0	0
153 Durham	6/3/1998	8:15 PM	Hail	0.75 in.	0	0	0	0
154 Durham	6/3/1998	9:20 PM	Tstm Wind	50 kts.	0	0	0	0
155 NCZ007>011 - 021>028 - 038>043 - 073>078 - 083>086 - 088>089	7/22/1998	11:00 AM	Excessive Heat	N/A	0	0	0	0
156 NCZ007>011 - 021>028 - 038>043 - 073>078 - 083>086 - 088>089	12/23/1998	2:00 PM	Ice Storm	N/A	0	0	0	0
157 Durham	3/3/1999	1:25 PM	Tstm Wind/hail	0 kts.	0	0	0	0
158 Durham	3/3/1999	1:59 PM	Tstm Wind/hail	0 kts.	0	0	0	0
159 Durham	3/21/1999	2:00 PM	Lightning	N/A	0	0	20K	0
160 Parkwood	7/6/1999	3:48 PM	Hail	0.75 in.	0	0	0	0
161 Durham	8/14/1999	2:25 PM	Hail	0.75 in.	0	0	0	0
162 NCZz007>011 - 021>028 - 038>043 - 073>078 - 083>086 - 088>089	9/4/1999	9:00 PM	Hurricane	N/A	0	0	0	3.0M
163 Countywide	9/5/1999	1:00 PM	Flash Flood	N/A	0	0	0	0
164 NCZ007>011 - 021>028 - 038>043 - 073>078 - 083>086 - 088>089	9/15/1999	4:00 PM	Hurricane	N/A	0	0	3.0B	500.0M
165 Countywide	9/16/1999	3:30 AM	Flash Flood	N/A	0	0	0	0
166 Countywide	9/27/1999	8:08 AM	Flash Flood	N/A	0	0	0	0
167 Countywide	9/28/1999	5:30 PM	Flash Flood	N/A	0	0	0	0
168 Countywide	9/30/1999	12:30 AM	Flash Flood	N/A	0	0	0	0
169 NCZ007>011 - 021>028 - 038>043 - 073>078 - 083>086 - 088>089	1/18/2000	2:00 AM	Winter Storm	N/A	0	0	0	0

Event	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
170 NCZ007>011 - 021>028 - 038>043 - 073>078 - 083>086 - 088>089	1/22/2000	6:00 PM	Winter Storm	N/A	0	0	0	0
171 NCZ007>011 - 021>028 - 038>043 - 073>078 - 083>086 - 088>089	1/24/2000	5:00 AM	Winter Storm	N/A	0	0	0	0
172 NCZ007>011 - 021>028 - 038>043 - 073>077 - 083>086 - 088>089	1/28/2000	10:00 AM	Winter Storm	N/A	0	0	0	0
173 Durham	4/8/2000	3:15 PM	Tstm Wind	50 kts.	0	0	0	0
174 Durham	4/17/2000	9:43 PM	Hail	1.75 in.	0	0	0	0
175 Durham	4/29/2000	5:05 PM	Hail	1.00 in.	0	0	0	0
176 Durham	5/20/2000	7:40 PM	Tstm Wind	50 kts.	0	0	0	0
177 Durham	5/20/2000	8:00 PM	Tstm Wind	50 kts.	0	0	0	0
178 Durham	5/25/2000	9:55 AM	Tstm Wind	60 kts.	0	0	0	0
179 Durham	7/23/2000	11:30 PM	Flash Flood	N/A	0	0	0	0
180 Durham	8/4/2000	4:58 PM	Flash Flood	N/A	0	0	0	0
181 Durham	8/10/2000	1:40 AM	Tstm Wind	50 kts.	0	0	0	0
182 Durham	8/13/2000	12:40 PM	Hail	0.75 in.	0	0	0	0
183 NCZ007>011 - 021>028 - 038>043 - 073>077 - 083	11/19/2000	11:00 AM	Heavy Snow	N/A	0	0	0	0
184 Durham	12/17/2000	4:10 AM	Tstm Wind	50 kts.	0	0	0	0
185 Durham	6/22/2001	7:45 PM	Flash Flood	N/A	0	0	0	0
186 Durham	8/27/2001	6:40 PM	Hail	0.88 in.	0	0	0	0
187 Durham	8/27/2001	7:00 PM	Tstm Wind	50 kts.	0	0	0	0
188 NCZ007>011 - 021>028 - 038>043 - 073>078 - 083>086 - 088>089	1/3/2002	12:00 AM	Winter Storm	N/A	0	0	0	0
189 Durham	5/13/2002	6:40 PM	Tstm Wind	50 kts.	0	0	0	0
190 Durham	9/15/2002	4:11 PM	Tstm Wind	50 kts.	0	0	0	0
191 Durham	10/11/2002	6:10 AM	Flash Flood	N/A	0	0	0	0
192 Durham	10/11/2002	8:45 AM	Flash Flood	N/A	0	0	0	0
193 NCZ007>011 - 021>028 - 038>043 - 073>077 - 083>084	12/4/2002	3:00 PM	Winter Storm	N/A	0	0	0	0

Event	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
194 NCZ007>011 - 021>027 - 038>043 - 073>077 - 083>084 - 086	2/16/2003	12:00 PM	Winter Storm	N/A	0	0	0	0
195 Durham	2/22/2003	12:15 PM	Tstm Wind	50 kts.	0	0	0	0
196 NCZ007>009 - 021>025 - 038>041	2/27/2003	12:00 AM	Winter Storm	N/A	0	0	0	0
197 NCZ007>009 - 021>026 - 038>041 - 073>075 - 077 - 083>084 - 086 - 088	3/20/2003	6:30 AM	Flood	N/A	0	0	150K	0
198 NCZ021>023 - 025 - 038>041 - 073>076 - 083	4/10/2003	12:15 PM	Flood	N/A	0	0	0	0
199 Durham	4/26/2003	5:40 PM	Hail	0.75 in.	0	0	0	0
200 Gorman	4/26/2003	6:00 PM	Hail	0.75 in.	0	0	0	0
201 Countywide	8/9/2003	8:35 PM	Flash Flood	N/A	0	0	0	0
202 East Durham	8/22/2003	1:54 PM	Hail	0.75 in.	0	0	0	0
203 NCZ007>011 - 025>028 - 041 - 043 - 078 - 088	9/18/2003	9:00 AM	Hurricane/ typhoon	N/A	1	0	7.3M	0
204 NCZ007>011 - 021>028 - 038>043 - 073>078 - 083>086 - 088>089	1/26/2004	4:30 AM	Winter Storm	N/A	0	0	0	0
205 NCZ007>011 - 021>027 - 038>039 - 041	2/15/2004	11:00 PM	Winter Storm	N/A	0	0	0	0
206 NCZ007 - 021>028 - 038>039 - 041>043 - 073>078 - 083>086 - 088>089	2/26/2004	9:00 AM	Winter Storm	N/A	0	0	0	0
207 NCZ007>011 - 021>028 - 038>043 - 073>078 - 083>086 - 088>089	3/7/2004	7:20 PM	High Wind	65 kts.	0	0	136K	0
208 Durham	5/23/2004	1:00 AM	Flash Flood	N/A	0	0	0	0
209 Durham	6/11/2004	7:40 PM	Tstm Wind	50 kts.	0	0	0	0
210 Quail Roost	8/2/2004	6:21 PM	Flash Flood	N/A	0	0	0	0
211 Durham	8/12/2004	3:30 PM	Flash Flood	N/A	0	0	0	0
212 Durham	9/28/2004	4:20 AM	Tstm Wind	60 kts.	0	0	0	0

Event	Date	Time	Type	Mag	Dth	Inj	PrD	CrD	
					Totals:	9	10	3.036B	503.000M

Source –<http://www4.ncdc.noaa.gov/cgi-win/wwwcgi.dll?wwwevent~storms>, NOAA National Climate Data Center

Hazard Risk for Durham County by Climate Division

Climate Division (NOAA)	Earthquake	Landslide	Hurricane	Nor'easter	Tornado	Severe Winter Weather	Wildfire	Flood
3	Low	Mod	Low	Low	Mod	Mod	Low	Mod

Source – NCDEM Hazard Mitigation Branch

Hazard Identification

Wildfire: Also see current mitigation measures or the hazard rating. Also see wildfire hazard assessment.

A wildfire is an uncontrolled burning of grasslands, brush or woodlands. According to information provided by FEMA, people start more than four out of every five forest fires. Negligent human behavior such as smoking in forested areas or improperly extinguishing campfires is the cause of many fires. The other cause of forest fires is lightning.

The potential for wildfire depends upon surface fuel characteristics, recent climate conditions, current meteorological conditions and fire behavior. Hot, dry summers and dry vegetation increase susceptibility to fire in the fall, a particularly dangerous time of year for wildfire. (www.ncem.org)

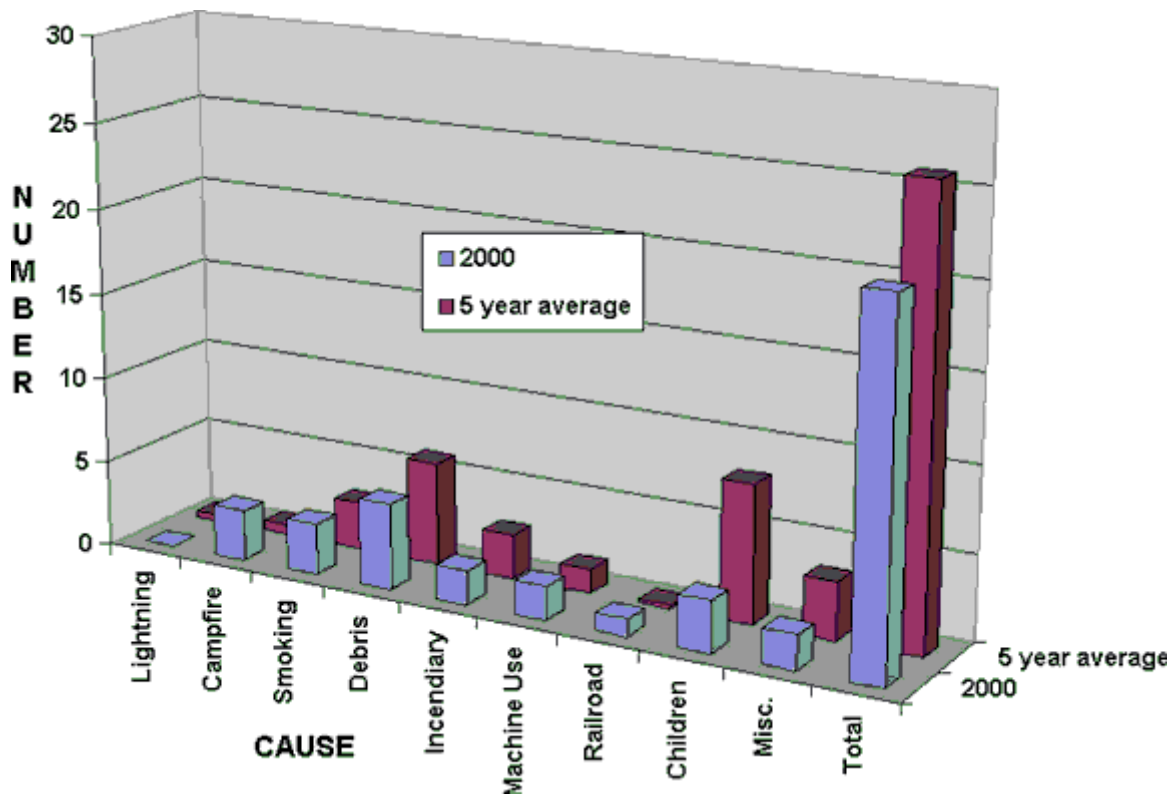
A **wildland fire** is a wildfire in an area which development is essentially nonexistent, except for roads, railroads, power lines and similar facilities. An **urban-wildland interface fire** is a wildfire in a geographical area where structures and other human development meet or intermingle with wildland or vegetative fuels. (NCEM: *Keeping Natural Hazards From Becoming Disasters*, May 2003)

There are three different classes of wildland fires. A **surface fire** is the most common type and burns along the floor of a forest, moving slowly and killing or damaging trees. A **ground fire** is usually started by lightning and burns on or below the forest floor. **Crown fires** spread rapidly by wind and move quickly by jumping along the tops of trees. Wildland fires are usually signaled by dense smoke that fills the area for miles around. (www.fema.gov)

All of North Carolina is susceptible to wildfire; however, according to the NC Division of Emergency Management, Durham County is at “low” risk. Although wildfires are possible throughout the year, normal fire season peaks for central North Carolina are in the spring and fall months.

According to information attained from the NC Division of Forestry Resources for 1990, Durham County has 186,538 total acres. Of these 89,242 is classified as forestland. Therefore, 48% of the total land within Durham County is forest. Of these forest lands, 73,928 are privately owned; 235 acres are owned by the forest industry; Federal government owns 7,891; state government owns 4,556; and County and municipal government own 2,632.

From 1996-2000, Durham County reported no loss of life or property as a result of wildfires. A five-year summary (1996-2000) of wildfires in Durham County, by cause is provided below:



Five Year Summary of Wildfires in Durham County, By Cause

Cause	2000 Numbers	Average Number / 5 years
Lightning	0	0.4
Campfire	3	0.6
Smoking	3	2.8
Debris	5	6
Incendiary	2	2.6
Machine Use	2	1.4
Railroad	1	0.2
Children	3	8
Miscellaneous	2	3.4
Total # of Fires	21	4.2

(NC Forest Service, Division of Forest Resources, www.dfr.state.nc.us/contacts/durham.htm)

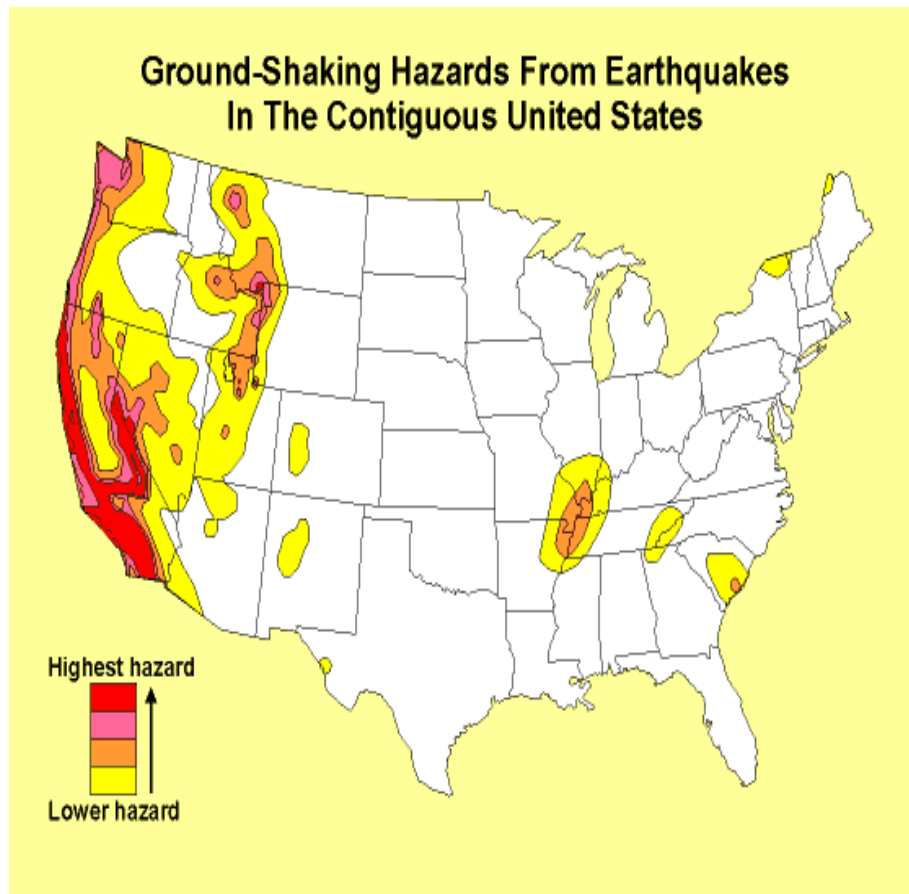
Earthquake: Also see current mitigation measures or the hazard rating. Also see earthquake hazard assessment.

An earthquake is a sudden, rapid shaking of the Earth caused by the breaking and shifting of rock beneath the Earth's surface. For hundreds of millions of years, the forces of plate tectonics have shaped the Earth as the huge plates that form the Earth's surface move slowly over, under, and past each other. Sometimes the movement is gradual. At other times, the plates are locked together, unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free causing the ground to shake. Most earthquakes occur at the boundaries where the plates meet; however, some earthquakes occur in the middle of plates.

Ground shaking from earthquakes can collapse buildings and bridges; disrupt gas, electric, and phone service; and sometimes trigger landslides, avalanches, flash floods, fires, and huge, destructive ocean waves (tsunamis). Buildings with foundations resting on unconsolidated landfill

and other unstable soil, and trailers and manufactured homes not tied to their foundations are at risk because they can be shaken off their mountings during an earthquake. When an earthquake occurs in a populated area, it may cause deaths and injuries and extensive property damage.

Earthquakes strike suddenly, without warning. Earthquakes can occur at any time of the year and at any time of the day or night. Where earthquakes have occurred in the past, they will happen again. There are 45 states and territories in the United States at moderate to very high risk from earthquakes, and they are located in every region of the country. (*National Earthquake Hazards Reduction Program*)



Hazards from Earthquakes in the Contiguous United States.
This map shows in color those parts of the contiguous 48 states that have a 10% chance of experiencing an earthquake strong enough to cause appreciable damage in a 50-year period. In the yellow areas, maximum ground shaking would be 8-16% of the force of gravity, which is strong enough to damage unreinforced masonry buildings, even those built on bedrock. Darker colors are at the same risk for more intense shaking, while areas left blank would have less intense shaking.

(www.usgs.gov)

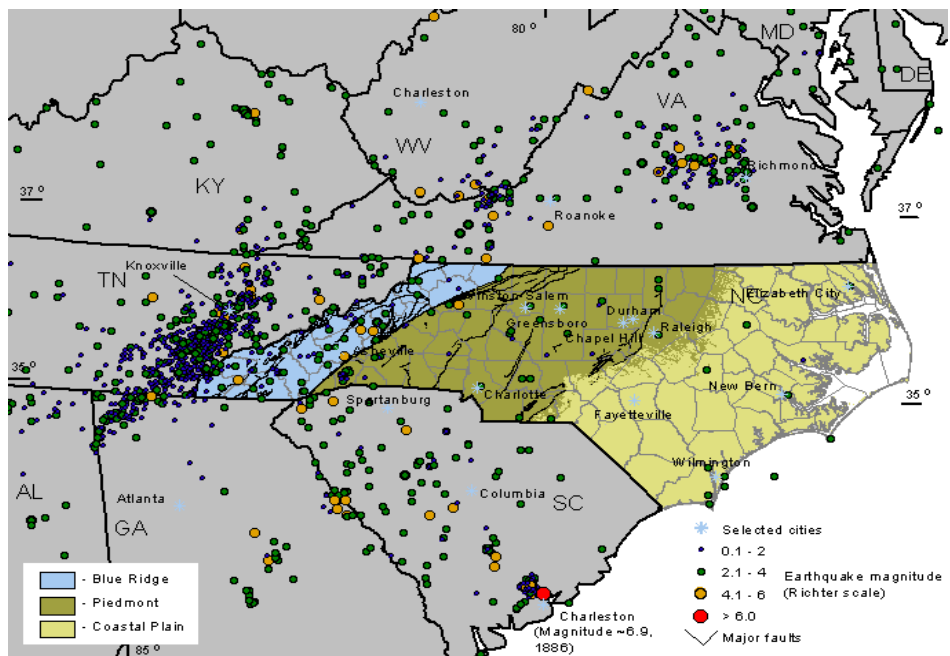
Earthquakes are measured in terms of their magnitude and intensity. Magnitude is measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake through a measure of shock wave amplitude. Each unit increase in magnitude on the Richter Scale corresponds to a 10-fold increase in wave amplitude, or a 244 - fold increase in energy. (USGS, 1996) Intensity is most commonly measured using the Modified Mercalli Intensity (MMI) Scale. It is a 12-level scale based on direct and indirect measurements of seismic effects. The scale levels are typically described using roman numerals, with a corresponding to imperceptible (instrumental) events, IV corresponding to moderate (felt by people awake), to XII for catastrophic (total destruction). A detailed description of the Modified Mercalli Scale of Earthquake Intensity (and its correspondence to the Richter Scale) is given in the table below:

Modified Mercalli Scale of Earthquake Intensity

Scale	Intensity	Description of Effects	Maximum Acceleration (mm/sec)	Corresponding Richter Scale
I	Instrumental	Detected only on seismographs	<10	
II	Feeble	Some people feel it	<25	<4.2
III	Slight	Felt by people resting; like a truck rumbling by	<50	
IV	Moderate	Felt by people walking	<100	
V	Slightly Strong	Sleepers awake; church bells ring	<250	<4.8
VI	Strong	Trees sway; suspended objects swing, objects fall off shelves	<500	<5.4
VII	Very Strong	Mild alarm; walls crack; plaster falls	<1000	<6.1
VIII	Destructive	Moving cars uncontrollable; masonry fractures, poorly constructed buildings damaged	<2500	
IX	Ruinous	Some houses collapse; ground cracks; pipes break open	<5000	<6.9
X	Disastrous	Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread	<7500	<7.3
XI	Very Disastrous	Most buildings and bridges collapse; roads, railways, pipes and cables destroyed; general triggering of other hazards	<9800	<8.1
XII	Catastrophic	Total destruction; trees fall; ground rises and falls in waves	>9800	>8.1

The following figure shows the epicenters of earthquakes occurring in and around North Carolina between 1698 – 1997. (www.geology.enr.state.nc.us/haz/quake.htm) Epicenters are generally concentrated in the active Eastern Tennessee Seismic Zone, which is second in activity in the eastern US only to the New Madrid Fault.

Earthquake Epicenters in North Carolina and Portions of Adjacent States (1698-1997)



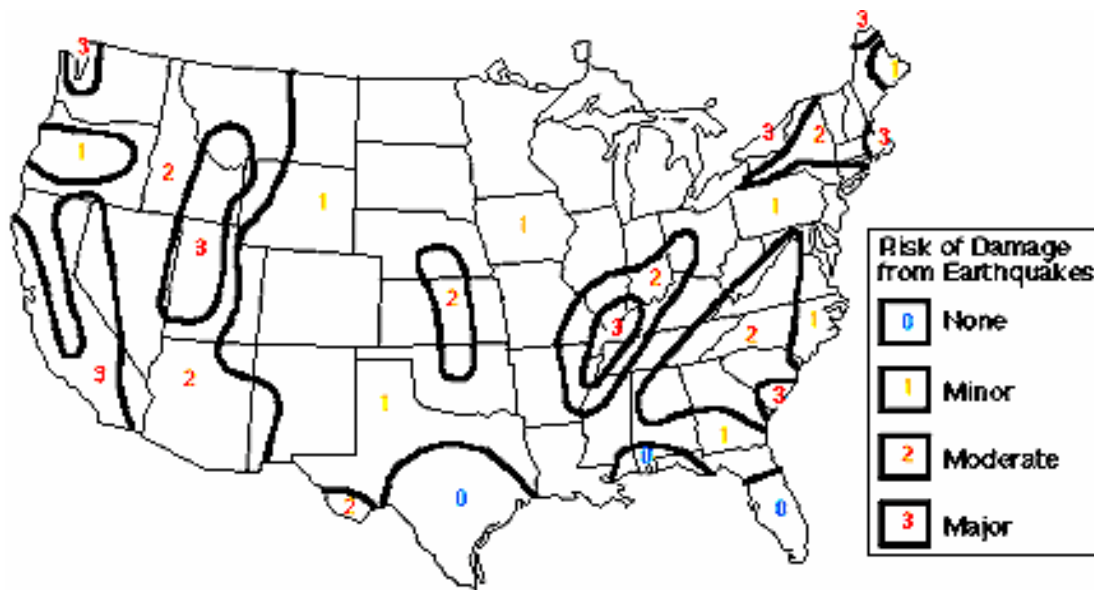
The Eastern Tennessee Seismic Zone is part of a crescent of moderate seismic activity risk extending from Charleston, South Carolina, northwestward into eastern Tennessee and then curving northeastward into central Virginia. While there have not been any earthquakes with a MMI intensity greater than IV since 1928 in this area, it has the potential to produce an earthquake of significant intensity in the future.

North Carolina's vulnerability to earthquakes decreases from west to east in relation to the Eastern Tennessee Seismic Zone. Generally, there are three different zones of seismic risk in North Carolina that correspond to different effective peak velocity-related accelerations of ground movement. The eastern portion of the state faces minimal effects from seismic activity. Locations in the middle and southeastern areas of the state face a moderate hazard from seismic activity, while the area from Mecklenburg County west through the Blue Ridge Mountains faces the greatest risk from seismic activity. These different levels of risk correspond to proximity to areas with historical seismic activity and changes in topography.

The steep topography of western North Carolina exacerbates the potential for damage from this area of seismic activity. There could be significant ground movement on steep slopes from seismic activity. This could result in human injuries, damage to property, and road closures, which would add difficulty to bringing in relief supplies and fire protection equipment. (www.ncem.org/mitigation)

Below is a map showing the risk of damage by earthquakes for the continental United States. As indicated by the map, Durham County and the Municipality are considered to be at moderate risk for an earthquake.

MMI – Maximum Modified Mercalli Intensity at epicenter



(Modified from Stearns & Miller, 1977)

Earthquakes are relatively infrequent, but not uncommon in North Carolina. The earliest North Carolina earthquake on record is that of March 8, 1735, near Bath. This event was probably less than intensity V (Slightly strong; sleepers awake). The great earthquake of 1811 centered in the Mississippi Valley near New Madrid, Missouri, was felt throughout North Carolina. Intensity VI (Strong; trees sway) effects were observed in the western part of the state. The most property damage in North Carolina ever attributed to an earthquake, however, was caused by the August 31, 1886, Charleston, South Carolina shock. The quake left about 65 people dead in Charleston and led to chimney collapses, fallen plaster and cracked walls in Abbottsburg, Charlotte, Elizabethtown, Henderson, Hillsborough, Raleigh, Waynesville, and Whiteville. On February 21, 1916, the Asheville area was the center for a large intensity VI earthquake, which was felt in Alabama, Georgia, Kentucky, South Carolina, Tennessee, and Virginia - some 518,000 square kilometers in all. Subsequent minor earthquakes have caused damage in North Carolina in 1926, 1928, 1957, 1959, 1971, 1973 and 1976. (www.ncem.org/mitigation/earthquake.htm).

Additionally, the following information is provided to show the historically damaging earthquakes in North Carolina as well as additional information regarding smaller earthquakes that have occurred within North Carolina.

Earthquakes that Have Caused Damage in North Carolina

Date	Location	Mag	MMI	MM in NC
1811 December 16 (a)	NE Arkansas	8.5	XI	VI
1811 December 16 (b)	NE Arkansas	8.0	X	VI
1811 December 16 (c)	NE Arkansas	8.0	X	VI
1812 January 23	New Madrid, MO	8.4	XI	VI
1812 February 7	New Madrid, MO	8.7	XII	VI
1852 April 29	Wytheville, VA	5.0	VI	VI
1861 August 31	Wilkesboro, NC	5.1	VII	VII
1875 December 23	Central Virginia	5.0	VII	VI
1886 August 31	Charleston, SC	7.3	X	VII
1897 May 31	Giles County, VA	5.8	VIII	VI

Date	Location	Mag	MMI	MM in NC
1913 January 1	Union County, SC	4.8	VII	VI
1916 February 21	Asheville, NC	5.5	VII	VII
1926 July 8	Mitchell County, NC	5.2	VII	VII
1928 November 3	Newport, TN	4.5	VI	VI
1957 May 13	McDowell County, NC	4.1	VI	VI
1957 July 2	Buncombe County, NC	3.7	VI	VI
1957 November 24	Jackson County, NC	4.0	VI	VI
1959 October 27*	Chesterfield, SC	4.0	VI	VI
1971 July 13	Newry, SC	3.8	VI	VI
1973 November 30	Alcoa, TN	4.6	VI	VI
1976 September 13	Southwest Virginia	4.1	VI	VI
1981 May 5	Henderson County, NC	3.5	VI	VI

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

Mag – Richter magnitude

MM in NC – Maximum Modified Mercalli Intensity within North Carolina

Dr. Kenneth B. Taylor from the following sources produced the “Earthquakes Which Has Caused Damage in North Carolina” table above:

- National Earthquake Center
- “Earthquakes of the US” by Carl von Hake, 1983
- A compilation of newspaper reports for earthquakes in the Eastern Tennessee Seismic Zone compiled by Arch Johnston, CERL, Memphis State University, 1983

The University of Tennessee regional seismic network and the US Geological Survey's National Seismic Network have collected additional earthquake information pertinent to Western North Carolina as follows:

Date	Location	Description	Mag
July 7, 2001	Swain County (2 miles SW of Cherokee)	Shaking felt, no damage recorded	2.4
July 9, 2001	Swain County (4 miles SW of Cherokee – between Cherokee & Bryson City)	Shaking felt, no damage recorded	2.4
July 9, 2001	Swain County (4 miles SW of Cherokee)	Shaking felt, no damage recorded	1.5
July 10, 2001	Swain County (4 miles SW of Cherokee)	Shaking felt, no damage recorded	2.3
May 8, 2002	Swain County (7 miles WSW of Bryson City)	No damage recorded	2.0
July 10, 2002	Swain County (7 miles WSW of Bryson City)	No damage recorded	2.0
September 8, 2002	Madison County (4 miles north of Marshall)	No damage recorded	2.2
April 29, 2003	Alabama (4 miles S of Mentone, AL/41 miles SSW of Chattanooga, TN)	Shaking felt as far east as Caldwell County	2.4
December 9, 2003	Richmond, Virginia (Approx 30 miles west of Richmond)	Shaking felt as far south as Orange County	4.5

Additional information about this earthquake, or other earthquakes in or near East Tennessee, can be found on the internet at <http://tanasi.gg.utk.edu/> or by sending an email message to quake@tanasi.gg.utk.edu.

Flooding: Also see current mitigation measures or the hazard rating. Also see the flood hazard assessment.

Floods are the most common and widespread of all natural disasters—except fire. Most communities in the United States have experienced some kind of flooding, after spring rains, heavy thunderstorms, or winter snow thaws. (www.fema.gov)

Flooding is a localized hazard that is generally the result of excessive precipitation. Floods can be generally considered in two categories: flash floods, the product of heavy localized precipitation in a short time period over a given location; and general floods, caused by precipitation over a longer time period and over a given river basin.

Flooding is the most common environmental hazard, due to the widespread geographical distribution of river valleys and coastal areas, and the attraction of human settlements to these areas. Usually, Presidential declarations of major disasters are associated with flash and general floods.

Flash floods occur within a few minutes or hours of heavy amounts of rainfall, from a dam or levee failure, or from a sudden release of water held by an ice jam. Flash floods can destroy buildings and bridges, uproot trees, and scour out new drainage channels. Heavy rains that produce flash floods can also trigger mudslides. Most flash flooding is caused by slow-moving thunderstorms, repeated thunderstorms in a local area, or by heavy rains from hurricanes and tropical storms. Although flash flooding occurs often along mountain streams, it is also common in urban areas where much of the ground is covered by impervious surfaces. Roads and buildings generate greater amounts of runoff than typical forested land. Fixed drainage channels in urban areas may be unable to contain the runoff that is generated by relatively small, but intense, rainfall events.

The severity of a flooding event is determined by a combination of river basin terrain, local thunderstorm movement, past soil moisture conditions and the degree of vegetative clearing. Abnormal weather patterns may also contribute to flooding of a local area. Large-scale climatic events, such as the El Niño-Southern Oscillation in the Pacific, have been linked to increased storm activity and flooding in the United States. Nationally, July is the month in which most flash flooding events occur, and nearly 90 percent of flash floods occur during the April through September period.

While flash floods occur within hours of a rain event, general flooding is a longer-term event, and may last for several days. The primary types of flooding are **riverine flooding**, **coastal flooding** and **urban flooding**.

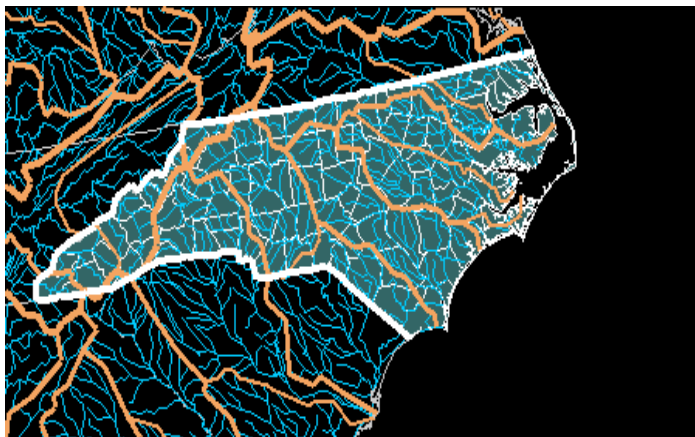
Periodic flooding of lands adjacent to non-tidal rivers and streams is a natural and inevitable occurrence. When stream flow exceeds the capacity of the normal watercourse, some of the above-normal stream flow spills over onto adjacent lands within the floodplain. **Riverine flooding** is a function of precipitation levels and water runoff volumes within the watershed of the stream or river. The recurrence interval of a flood is defined as the average time interval, in years, expected to take place between the occurrence of a flood of a particular magnitude and an equal or larger flood. Flood magnitude increases with increasing recurrence interval.

Floodplains are divided into areas that experience different levels of floods depending on their elevation. A 100-year flood will inundate the 100-year zone of that floodplain. A 500-year flood will inundate the 500-year flood zone, which is higher in elevation. The chances of a 100-year flood event occurring for any given year are 1 percent; for a 500-year event, the chances drop to 0.2 percent for any one-year period. The Army Corps of Engineers calls a 100-year flood an Intermediate Regional Flood, while a Standard Project flood describes a major flood that could be expected to occur from a combination of severe meteorological and hydrologic conditions. Most dam and flood-related structures have been designed to meet 100-year flood conditions.

Coastal flooding is typically a result of storm surge, wind-driven waves, and heavy rainfall. These conditions are produced by hurricanes during the summer and fall, and nor'easters and other large coastal storms during the winter and spring. Storm surges may overrun barrier islands and push seawater up coastal rivers and inlets, blocking the downstream flow of inland runoff. Thousands of acres of crops and forestlands may be inundated by both saltwater and freshwater. Escape routes, particularly from barrier islands, may be cut off quickly, stranding residents in flooded areas and hampering rescue efforts.

Urban flooding occurs where there has been development within stream floodplains. This is partly a result of the use of waterways for transportation purposes in earlier times. Sites adjacent to rivers and coastal inlets provided convenient places to ship and receive commodities. The price of this accessibility was increased flooding of the ensuing urban areas. Urbanization increases the magnitude and frequency of floods by increasing impermeable surfaces, increasing the speed of drainage collection, reducing the carrying capacity of the land and, occasionally, overwhelming sewer systems.

Flood hazard varies by location and type of flooding. Coastal areas are most at risk from flooding caused by hurricanes, tropical storms and nor'easters. Low-lying coastal areas in close proximity to the shore, sounds or estuaries are exposed to the threat of flooding from storm surge associated with these systems. In mountainous regions, population areas typically lie in narrow valleys, which lack the ability to store and dissipate large amounts of water. Consequently, stream flow tends to increase rapidly. Large amounts of impervious surfaces in urban areas increase runoff amounts and decrease the lag time between the onset of rainfall and stream flooding. Manmade channels may also constrict stream flow and increase flow velocities.



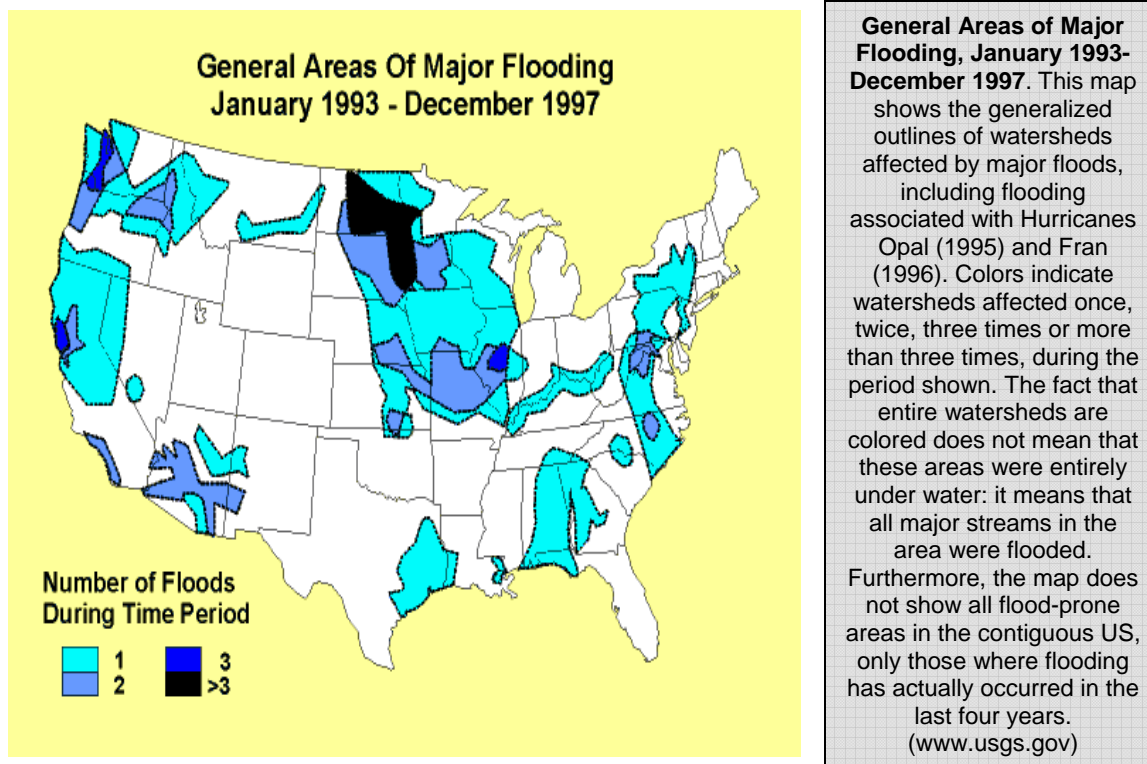
North Carolina is divided into 13 river basins: Hiwassee, Upper Little Tennessee, Tuckasegee, Upper French Broad, Upper Broad, Upper New, Upper Yadkin, Upper Dan, Haw, Lumber, Upper Neuse, Upper Tar and Abemarle. These river basins are shown in *Figure (2)*. State lines are in thick white, County lines are in thin white, streams are in thin gray, and river basin boundaries are in thick gray.

Figure (2) North Carolina River Basins (USGS, 1998)

The severity of a flooding event is determined by a number of local factors, including river basin topography, precipitation patterns, recent soil moisture conditions and vegetative state. For coastal areas, flooding potential associated with hurricanes is mapped in Inundation Maps prepared as part of the Eastern North Carolina Hurricane Evacuation Study, aerial photographs of the coastal area (updated at five-year intervals by the North Carolina Coastal Resources Commission), and flood maps prepared for the National Flood Insurance Program.

All parts of North Carolina have been flooded with rainfall associated with tropical storms and hurricanes. The mountains were devastated by hurricane-induced rains in 1916, 1928, 1940, and 1995 (Opal); the Piedmont was impacted in those years plus 1945; and the Coastal Plain was adversely affected in 1945, 1954, 1955, 1996 (Fran), and 1999 (Floyd). (www.ncem.org/mitigation)

According to the National Climatic Data Center statistics, Durham County and the Municipality have been impacted by flooding events 22 times between 1950 – 2003.



A flood, as defined by the National Flood Insurance Program is: "A general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties (at least one of which is your property) from:

- Overflow of inland or tidal waters,
- Unusual and rapid accumulation or runoff of surface waters from any source, or
- A mudflow.

[The] collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood."

Floods can be slow, or fast rising but generally develop over a period of days. **Mitigation** includes any activities that prevent an emergency, reduce the chance of an emergency happening, or lessen the damaging effects of unavoidable emergencies. Investing in mitigation steps now, such as, engaging in floodplain management activities, constructing barriers, such as levees, and purchasing flood insurance will help reduce the amount of structural damage to your home and financial loss from building and crop damage should a flood or flash flood occur. (www.fema.gov)

The Mitigation Division, a component of the Federal Emergency Management Agency (FEMA), manages the National Flood Insurance Program. The three components of the National Flood Insurance Program (NFIP) are:

- Flood Insurance
- Floodplain Management
- Flood Hazard Mapping

Nearly 20,000 communities across the United States and its territories participate in the NFIP by adopting and enforcing floodplain management ordinances to reduce future flood damage. In exchange, the NFIP makes Federally backed flood insurance available to homeowners, renters, and business owners in these communities. Community participation in the NFIP is voluntary.

Flood insurance is designed to provide an alternative to disaster assistance to reduce the escalating costs of repairing damage to buildings and their contents caused by floods. Flood damage is reduced by nearly \$1 billion a year through communities implementing sound floodplain management requirements and property owners purchasing of flood insurance. Additionally, buildings constructed in compliance with NFIP building standards suffer approximately 80 percent less damage annually than those not built in compliance. And, every \$3 paid in flood insurance claims saves \$1 in disaster assistance payments.

In addition to providing flood insurance and reducing flood damages through floodplain management regulations, the NFIP identifies and maps the Nation's floodplains. Mapping flood hazards creates broad-based awareness of the flood hazards and provides the data needed for floodplain management programs and to actuarially rate new construction for flood insurance.

Repetitive Loss Property Data as of 12/31/2003

Mitigated	Insured	City	Zip Code	Occupancy	Zone	Firm	Building Payment	Contents Payment	Building Value	Losses	Total Paid	Average Pay	As of Date
No	Yes	Durham	277121916	Single Fmly	AE	N	11,915.80	1,726.06	100,416	2	17,954.63	8,977.32	12/31/2003
No	Yes	Durham	27704	Single Fmly	X	N	3,209.82	0.00	58,608	2	9,342.53	4,671.27	12/31/2003
No	Yes	Durham	27704	Single Fmly	AE	N	3,959.74	0.00	81,972	2	8,693.06	4,346.53	12/31/2003
No	Yes	Durham	27704	Single Fmly	AE	N	1,607.02	0.00	64,837	3	10,270.92	3,423.64	12/31/2003
No	Yes	Durham	277044218	Single Fmly	AE	N	4,078.40	0.00	73,500	2	15,622.07	7,811.04	12/31/2003
No	Yes	Durham	277044218	Single Fmly	A04	N	2,501.95	0.00	49,832	2	7,419.66	3,709.83	12/31/2003
No	Yes	Durham	27705	Single Fmly	X	N	7,879.23	0.00	77,854	2	14,185.52	7,092.76	12/31/2003
No	Yes	Durham	277070000	Single Fmly	A03	Y	2,960.81	0.00	118,745	2	6,998.71	3,499.36	12/31/2003
No	Yes	Durham	277045007	Single Fmly	A04	N	5,988.70	0.00	91,170	3	24,945.77	8,315.26	12/31/2003
No	Yes	Durham	277070000	Other Resid	A03	N	39,804.87	20,888.39	774,000	2	110,793.26	55,396.63	12/31/2003
No	No	Durham	277071625	Single Fmly	X	N	5,923.20	0.00	250,000	2	7,087.70	3,543.85	12/31/2003
No	Yes	Durham	277050000	Non Residnt	A04	Y	16,563.29	33,911.98	200,000	2	54,736.87	27,368.44	12/31/2003
No	No	Durham	27703	Assmd Condo	A	N	9,455.52	0.00	Assumed Condo	2	18,102.02	9,051.01	12/31/2003
No	Yes	Durham	277010000	Assmd Condo	B	N	8,466.46	0.00	Assumed Condo	2	14,241.16	7,120.58	12/31/2003
No	No	Durham	27701	Other Resid	X	N	25,000.00	0.00	526,680	2	32,938.32	16,469.16	12/31/2003
No	Yes	Durham	277122231	Single Fmly	X	N	4,775.25	0.00	128,375	4	35,184.07	8,796.02	12/31/2003
No	No	Durham	277122231	Single Fmly	X	N	3,212.01	1,135.73	152,100	2	11,836.55	5,918.28	12/31/2003
Yes	No	Durham	277122834	Single Fmly	A05	N	10,729.82	5,706.50	111,179	2	40,136.32	20,068.16	12/31/2003

Severe Winter Storm: Also see current mitigation assessment or the hazard rating. Also see winter storm vulnerability assessment.

Severe winter storms can produce an array of hazardous weather conditions, including heavy snow, blizzards, freezing rain, ice pellets, and extreme cold. Extreme snow events are the most potentially disruptive to society, for they can bring down power lines, trees, and lead to roof collapses. All forms of severe winter weather can make travel treacherous. Severe winter storms are extra-tropical cyclones (*storms that form outside of the warm tropics*) fueled by strong temperature gradients and an active upper-level jet stream. The winter storms that impact North Carolina generally form in the Gulf of Mexico or off the southeast Atlantic Coast. Few of these storms result in blizzard conditions, defined by the presence of winds in excess of 35 miles per hour, falling or blowing snow, and a maximum temperature of 20 degrees Fahrenheit.

While the frequency and magnitude of snow events are highest in the mountains due to elevation, the geographical orientation of the mountains and piedmont contribute to a regular occurrence of freezing precipitation events (*e.g., ice pellets and freezing rain*) in the piedmont. Such ice events (*up to and including ice storms*) are often the result of cold air damming. Cold air damming is a shallow, surface-based layer of relatively cold, stably-stratified air entrenched against the eastern slopes of the Appalachian Mountains. With warmer air above, falling precipitation in the form of snow melts, then becomes either supercooled (*liquid below the melting point of water*) or refreezes. In the former case, supercooled droplets can freeze on impact (*freezing rain*), while in the latter case, the re-frozen water particles are ice pellets (*or sleet*). The figure below shows the general location of cold air damming events.



Region where cold air damming occurs in the eastern U.S.

(Hartfield et al. 1996)

The entire state of North Carolina has a likelihood of experiencing severe winter weather. The threat varies by location and by type of storm. Coastal areas typically face their greatest threat from Nor'easters and other severe winter coastal storms. These storms can contain strong waves and result in extensive beach erosion and flooding. Freezing rain and ice storms typically occur once every several years at coastal locations, and severe snowstorms have been recorded occasionally in coastal areas.

As mentioned previously, cold air damming contributes to elevated freezing rain and ice storm events in the piedmont of North Carolina. These events occur at least as often as moderate or severe snow events in this region.

The mountains of North Carolina usually receive several snowfalls of four to six inches in a given winter weather season. There has been at least one severe winter storm at some location in the mountains each year during the 1984-1993 period. The western area of the state is more likely to experience greater and more frequent snowfalls and blizzards than other locations in the state. The mountains also have the highest number of extreme one-day snowfalls. (*NCEM: Keeping Natural Hazards From Becoming Disasters, May 2003*) The most obvious parameter in winter weather is snow. It is extreme snow that is the most potentially disruptive to society, for it can bring down power lines, trees and lead to roof collapses. (www.ncem.org/mitigation)

Durham County and the Municipality have experienced 17 severe winter storms and/or extreme cold events during the years of 1950-2003 according to statistics from the National Climatic Data Center. No property damages or crop damages were listed with these event statistics.

Hurricanes: Also see current mitigation measures or the hazard rating. Also see hurricane vulnerability assessment.

A hurricane is a tropical storm with winds that have reached a constant speed of 74 miles per hour or more. Hurricane winds blow in a large spiral around a relative calm center known as the "eye." The "eye" is generally 20 to 30 miles wide, and the storm may extend outward 400 miles. As a hurricane approaches, the skies will begin to darken and winds will grow in strength. As a hurricane nears land, it can bring torrential rains, high winds, and storm surges. A single hurricane can last for more than 2 weeks over open waters and can run a path across the entire length of the eastern seaboard. August and September are peak months during the hurricane season that lasts from June 1 through November 30.

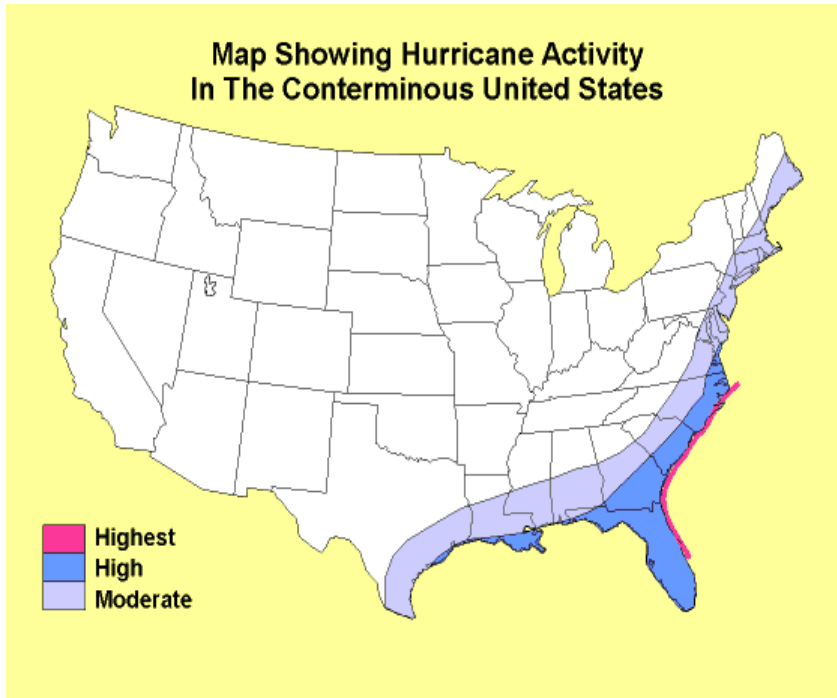
The center, or eye, of a hurricane is relatively calm. The most violent activity takes place in the area immediately around the eye, called the eye wall. At the top of the eye wall (about 50,000 feet), most of the air is propelled outward, increasing the air's upward motion. Some of the air, however, moves inward and sinks into the eye, creating a cloud-free area.

Tropical cyclones are classified as follows:

- | | |
|----------------------------|---|
| Tropical Depression | An organized system of clouds and thunderstorms with a defined circulation and maximum sustained winds of 38 mph (33 knots) or less. |
| Tropical Storm | An organized system of strong thunderstorms with a defined circulation and maximum sustained winds of 39 to 73 mph (34-63 knots). |
| Hurricane | An intense tropical weather system with a well-defined circulation and maximum sustained winds of 74 mph (64 knots) or higher. Hurricanes are called "typhoons" in the western Pacific, while similar storms in the Indian Ocean are called "cyclones." |

Hurricanes form in the Atlantic Ocean, Gulf of Mexico, Indian Ocean, Caribbean Sea and Pacific Ocean. Hurricane winds in the Northern Hemisphere circulate in a counterclockwise motion around the hurricane's center or "eye," while hurricane winds in the Southern Hemisphere circulate clockwise. Natural phenomena, which affect a storm, include temperature of the water, the Gulf Stream, and steering wind currents. Powered by heat from the sea, they are steered by the easterly trade winds and the temperate westerlies as well as by their own ferocious energy. Around their core, winds grow with great velocity, generating violent seas. Moving ashore, they sweep the ocean inward while spawning tornadoes and producing torrential rains and floods.

In the eastern Pacific, hurricanes begin forming by mid-May, while in the Atlantic, Caribbean, and Gulf of Mexico, hurricane development starts in June. For the United States, the peak hurricane threat exists from mid-August to late October although the official hurricane season extends through November. Over other parts of the world, such as the western Pacific, hurricanes can occur year-round. Areas in the United States vulnerable to hurricanes include the Atlantic and Gulf coasts from Texas to Maine, the territories in the Caribbean, and tropical areas of the western Pacific, including Hawaii, Guam, American Samoa, and Saipan.



Map Showing Hurricane Activity in the Conterminous United States. The areas shown reflect the number of hurricanes per 100 years expected to pass within 75 nautical miles (159 km) of any point in the colored regions. The highest-risk area (red line) shows where 60 hurricanes per 100 years skim up the east coast. The high-risk area would see 40-60 hurricanes per 100 years, and the moderate-risk area would see 20-40 hurricanes per 100 years. The period of observation is 1888 to 1988.

(www.usgs.gov)

**Saffir-Simpson Hurricane Scale
(Simpson and Reihl, 1981)**

Saffir-Simpson Category	Maximum sustained wind speed			Minimum surface pressure Millibars (mb)	Storm surge	
	mph	meters/ sec	knots		feet	meters
1	74-96	33-42	64-83	Greater than 980	3-5	1.0-1.7
2	97-111	43-49	84-96	979-965	6-8	1.8-2.6
3	112-131	50-58	97-113	964-945	9-12	2.7-3.8
4	132-155	59-69	114-135	944-920	13-18	3.9-5.6
5	156+	70+	136+	Less than 920	19+	5.7+

Damage Classification

Cat.	Level	Description	Example
1	Minimal	Damage primarily to shrubbery, trees, foliage, and unanchored homes. No real damage to other structures. Some damage to poorly constructed signs. Low-lying coastal roads inundated, minor pier damage, some small craft in exposed anchorage torn from moorings.	Hurricane Jerry (1989)
2	Moderate	Considerable damage to shrubbery and tree foliage; some trees blown down. Major damage to exposed mobile homes. Extensive damage to poorly constructed signs. Some damage to roofing materials of buildings; some window and door damage. No major damage to buildings. Coast roads and low-lying escape routes inland cut by rising water two to four hours before arrival of hurricane center. Considerable damage to piers. Marinas flooded. Small craft in unprotected anchorages torn from moorings. Evacuation of some shoreline residences and low-lying areas required.	Hurricane Bob (1991)
3	Extensive	Foliage torn from trees; large trees blown down. Practically all poorly constructed signs blown down. Some damage to roofing materials of buildings; some window and door damage. Some structural damage to small buildings. Mobile homes destroyed. Serious flooding at coast and many smaller structures near coast destroyed; larger structures near coast damaged by battering waves and floating debris. Low-lying escape routes inland cut by rising water three to five hours before hurricane center arrives. Flat terrain five feet or less above sea level flooded inland eight miles or more. Evacuation of low-lying residences within several blocks of shoreline possibly required.	Hurricane Gloria (1985)
4	Extreme	Shrubs and trees blown down; all signs down. Extensive damage to roofing materials, windows and doors. Complete failure of roofs on many small residences. Complete destruction of mobile homes. Flat terrain 10 feet or less above sea level flooded inland as far as six miles. Major damage to lower floors of structures near shore due to flooding and battering by waves and floating debris. Low-lying escape routes inland cut by rising water three to five hours before hurricane center arrives. Major erosion of beaches. Massive evacuation of all residences within 500 yards of shore possibly required, and of single-story residences within 2 miles of shore.	Hurricane Andrew (1992)
5	Catastrophic	Shrubs and trees blown down; considerable damage to roofs of buildings; all signs down. Very severe and extensive damage to windows and doors. Complete failure of roofs on many residences and industrial buildings. Extensive shattering of glass in windows and doors. Some complete building failures. Small buildings overturned or blown away. Complete destruction of mobile homes. Major damage to lower floors of all structures less than 15 feet above sea level within 500 yards of shore. Low-lying escape routes inland cut by rising water three to five hours before hurricane center arrives. Massive evacuation of residential areas on low ground within five to 10 miles of shore possibly required.	Hurricane Camille (1969)

Hurricanes are considered to be major hurricanes (the most potentially dangerous) when the Saffir-Simpson classification is three or higher. These intense hurricanes cause over 70 percent of the damage in the USA, even though they account for only 20 percent of tropical cyclone landfalls. (www.ncem.org)

By virtue of its position along the Atlantic Ocean adjacent to and protruding to the edge of the Gulf Stream, North Carolina is frequently impacted by hurricanes. In fact, North Carolina has experienced the fourth greatest number of hurricane landfalls of any state in the 20th century (after Florida, Texas and Louisiana). (www.ncem.org)

Durham County and the Municipality have equal occurrence rates from storms entering from the Atlantic and from the Gulf of Mexico. The geographic location of the County and city make it vulnerable from both types of storms.

All areas of the state are vulnerable to hurricane hazards, but the greatest impact associated with storm surge is limited to the 18 counties bordering the shoreline and sounds. (www.ncem.org) However, hurricane events have affected the mountains and the middle portions of our state.

North Carolina has had an extensive hurricane history dating back to colonial times, with notable nineteenth century storms occurring in 1837, 1846, 1856, 1879, 1883 and 1899. From 1960 to 1990, there was a lull in land falling major hurricanes, with only one (Hurricane Donna in 1960). The 1950s were a busy time for hurricanes in North Carolina, including Hazel, Connie, Diane and Ione. Recent years have proven busy as well, with Hugo (1989), Emily (1993), Opal (1995), Bertha (1996), Fran (1996), Bonnie (1998), Dennis (1999), and Floyd (1999) all leaving their mark from the coast across the state of North Carolina. (www.ncem.org)

Durham County and the Municipality, has been impacted by 5 hurricanes from 1950 – 2003. The following information was provided by the National Climatic Data Center:

Date	Hurricane	Deaths	Injuries
July 12, 1996	Bertha	0	0
September 5, 1996	Fran	1	2
September 4, 1999	Dennis	0	0
September 15, 1999	Floyd	0	0
September 18, 2003	Isabel	0	0

Severe Thunderstorms: Also see current mitigation measures or the hazard rating. Also see thunderstorm hazard assessment.

A thunderstorm is formed from a combination of moisture, rapidly raising warm air and a force capable of lifting air such as a warm and cold front, a sea breeze or a mountain. Thunderstorms may occur singly, in clusters or in lines. Thus, it is possible for several thunderstorms to affect one location in the course of a few hours. Some of the most severe weather occurs when a single thunderstorm affects one location for an extended time. Straight-line winds, which in extreme cases have the potential to exceed 100 miles per hour, are responsible for most thunderstorm wind damage. One type of straight-line wind, the downburst, can cause damage equivalent to a strong tornado. Thunderstorms are also associated with tornadoes and heavy rains that can lead to flooding. (www.fema.gov/hazards)

All thunderstorms contain lightning. Lightning is an electrical discharge that results from the buildup of positive and negative charges within a thunderstorm. When the buildup becomes strong enough, lightning appears as a "bolt." This flash of light usually occurs within the clouds or between the clouds and the ground. A bolt of lightning reaches a temperature approaching 50,000 degrees Fahrenheit in a split second. The rapid heating and cooling of air near the lightning causes thunder. Lightning is a major threat during a thunderstorm. In the United States, between 75 to 100 Americans are hit and killed each year by lightning. If you are caught outdoors, avoid natural lightning rods such as tall, isolated trees in an open area or the top of a hill and metal objects such as wire fences, golf clubs and metal tools. It is a myth that lightning never strikes twice in the same place. In fact, lightning will strike several times in the same place in the course of one discharge. The power of lightning's electrical charge and intense heat can electrocute on contact, split trees, ignite fires and cause electrical failures. (www.fema.gov/hazards)

Hail is produced by many strong thunderstorms. "Hailstones are products of the updrafts and downdrafts that develop inside the cumulonimbus clouds of a thunderstorm, where super cooled water droplets exist. The transformation of droplets to ice requires not only a temperature below 32 degrees F (0C), but also a catalyst in the form of tiny particles of solid matter, or freezing nuclei. Continued deposits of super cooled water cause the ice crystals to grow into hailstones" (www.weather.andthensome.com, 2003) Hail can be smaller than a pea or as large as a softball and can be very destructive to property, crops, livestock, and people. (www.fema.gov/hazards)

Thunderstorms are common throughout North Carolina, and have occurred in all months. Thunderstorm-related deaths and injuries in North Carolina (1959-1992) have peaked during July and August. Most tornadoes in North Carolina develop in areas of atmospheric disturbance, including along squall lines ahead of an advancing cold front; in an area where warm air masses converge; in some local summer thunderstorms; and in association with a tropical cyclone.

Event	Date	Damages
Thunderstorm	August 17, 1993	\$5,000.00
Lightning	July 11, 1994	\$5,000.00
Thunderstorm Winds	October 27, 1995	\$25,000.00
Thunderstorm Winds	May 11, 1996	\$30,000.00
Thunderstorm Winds	May 27, 1996	\$30,000.00
Thunderstorm Winds	September 10, 1997	\$20,000.00
Lightning	March 21, 1999	\$20,000.00

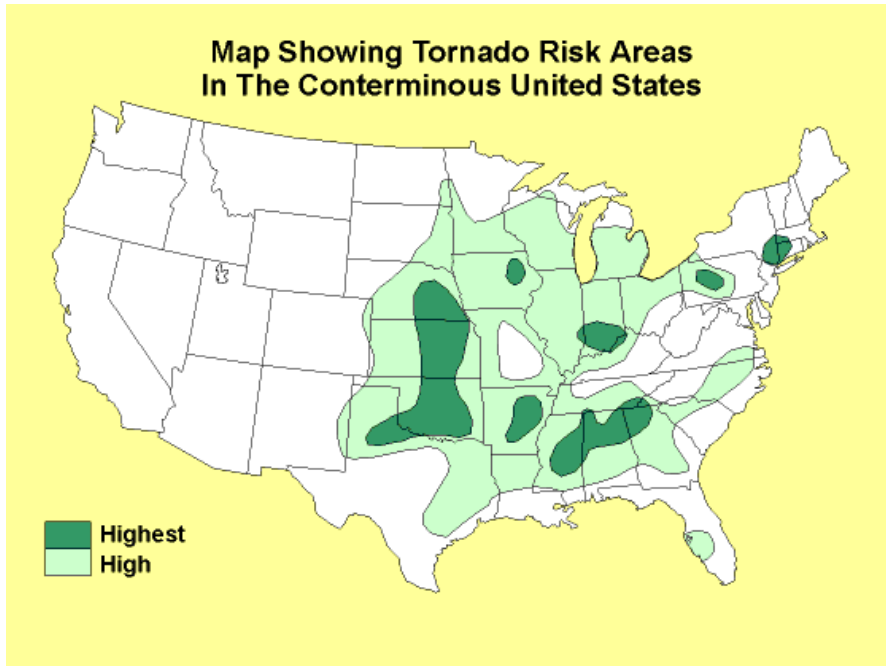
Because mountainous areas disrupt the inflow of air near the surface of squall lines and individual thunderstorms, organized thunderstorm activity is generally not as strong in western North Carolina, and thus tornadic activity is muted in this region. Hurricane-induced tornadic activity generally occurs close to the coastline as a hurricane makes landfall. (www.ncem.org/mitigation) However, due to Durham County and the Municipality's proximity to both the mountains and the coast, many times the warm and cold air meets in the middle region of North Carolina developing into severe and frequent thunderstorm activity in this area.

Severe thunderstorms are common in North Carolina. Durham County and the Municipality are no exception. According to the National Climatic Data Center, there were a total of 87 thunderstorms between the years 1950-2003. In addition, there were 62 hail and 4 lightning events recorded for Durham County. These totals do not include the 5 tornado events listed in the Tornado Hazard description. Information recorded as to damage for specific thunderstorm events are reported by the National Climatic Data Center as follows:

Tornadoes: Also see current mitigation measures or the hazard rating. Also see tornado hazard assessment.

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud. It is spawned by a thunderstorm (or sometimes as a result of a hurricane) and produced when cool air overrides a layer of warm air, forcing the warm air to rise rapidly. A funnel does not need to reach to the ground for a tornado to be present. A debris cloud beneath a thunderstorm is all that is needed to confirm the presence of a tornado, even without a condensation runnel. The damage from a tornado is a result of the high wind velocity and wind-blown debris. Tornado season is generally March through August, although tornadoes can occur at any time of year. They tend to occur in the afternoons and evenings. Over 80% of all tornadoes strike between noon and midnight. (www.fema.gov)

The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. Damage paths can be in excess of 1 mile wide and 50 miles long. (www.noaa.gov 2003) Even with advances in meteorology, warning times for tornadoes may be short or sometimes not possible. Tornadoes can occur in any state, but are more frequent in the Midwest, Southeast and Southwest. (www.fema.gov) A **tornado watch** is issued by the National Weather Service when tornadoes are possible in your area. This is the time for people to relocate to the safest areas of their homes and listen to the radio or television for further developments. A **tornado warning** is issued when a tornado has been sighted or indicated by weather radar. (*National Weather Service*)

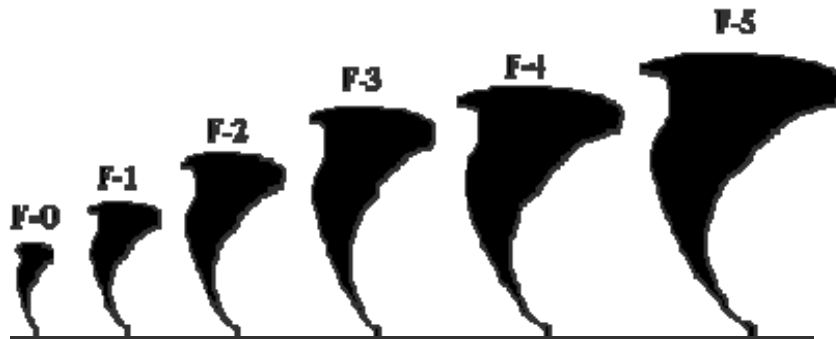


(www.usgs.gov)

Map Showing Tornado Risk Areas in the Conterminous United States. The categories shown reflect the tornado recurrence interval at a single point. In the highest risk areas, a tornado of significant strength would be expected to occur once every 2000 years, at each point in the area shown. For the high-risk areas, the interval would be once every 5000 years. The data base is 800 cases of significant tornadoes for the period 1954-1992.

The intensity, path length and width of tornadoes are rated according to a scale developed by T. Theodore Fujita and Allen D. Pearson. The Fujita-Pearson Tornado Scale is presented below. Tornadoes classified as F0-F1 are considered weak, those classified as F2-F3 are considered strong, while those classified as F4-F5 are considered violent.

Fujita - Pearson Tornado Scale



Fujita – Pearson Tornado Scale Description Table

F-Scale	Damage	Winds (mph)	Description
F-0	Light	40-72	<ul style="list-style-type: none"> Chimney damage Tree branches broken
F-1	Moderate	73-112	<ul style="list-style-type: none"> Mobile homes pushed off foundation or overturned
F-2	Considerable	113-157	<ul style="list-style-type: none"> Considerable damage Mobile homes demolished Trees uprooted

F-Scale	Damage	Winds (mph)	Description
F-3	Severe	158-206	<ul style="list-style-type: none"> • Roofs and walls torn down • Trains overturned • Cars thrown
F-4	Devastating	207-260	<ul style="list-style-type: none"> • Well-constructed walls leveled
F-5	Incredible	261-318	<ul style="list-style-type: none"> • Homes lifted off foundation and carried considerable distances • Autos thrown as far as 100 meters
F-6	Inconceivable	319-379	<ul style="list-style-type: none"> • Unknown

(www.fema.gov and www.ncem.org)

The majority of tornadoes (71%) reported in North Carolina have been classified as weak, 28% as strong, and about 1% as violent. Weak tornadoes have caused 3% of North Carolina tornado deaths, similar to the national figure. Strong tornadoes were responsible for 49% of North Carolina deaths (compared to 70% for the nation). Based on state tornado statistics (SERC, 1996), North Carolina ranks 22nd in total number of tornadoes and 18th in tornado deaths for the period 1953-1995.

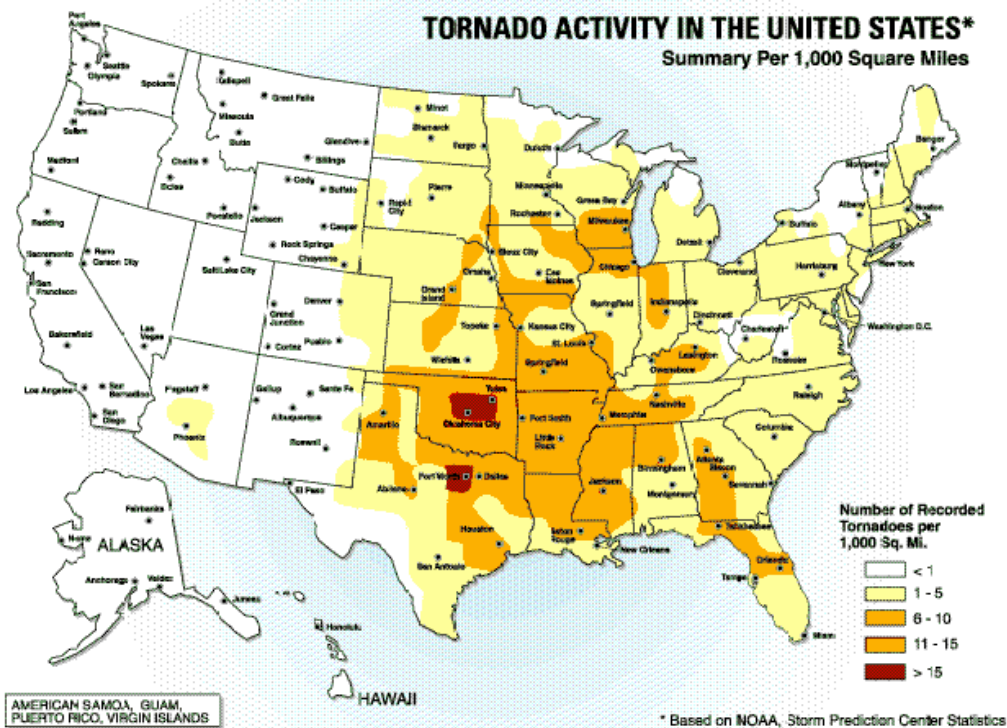


Figure I.1 The number of tornadoes recorded per 1,000 square miles

(www.fema.gov)

Of all tornadoes reported in North Carolina between 1953 and 1990, 71 percent have been classified as weak, 28 percent as strong, and about one percent as violent. Weak tornadoes have caused three percent of North Carolina tornado deaths, similar to the national figure. Strong tornadoes were responsible for 49 percent of North Carolina deaths (versus 30 percent nationwide), while violent tornadoes caused 48 percent of North Carolina deaths, compared to 70 percent for the nation. Based on state tornado statistics (SERCC, 1996), North Carolina ranks 22nd in total number of tornadoes and 18th in tornado deaths for the period 1953-1995.

Although tornadoes have been reported in North Carolina throughout the year, most of them have occurred in the spring, with 13 percent in March, 11 percent in April, 22 percent in May and 14 percent in June. The most severe tornadoes have also taken place during the spring, with more than half of all F2 or strongest storms occurring in that time period. (www.ncem.org/mitigation)

The mountains and northern piedmont of North Carolina experience the lowest frequency of tornadoes because of less favorable conditions for severe thunderstorm activity in those regions. The highest frequency of tornadoes historically has occurred in the southeastern portion of the State. (NCEM: *Keeping Natural Hazards From Becoming Disasters, May 2003*)

Tornadoes have occurred in Durham County and the Municipality. Based on information from the National Climatic Data Center, the recorded tornado events occurred in Durham County on the following dates and with the recorded damage totals listed:

December 31, 1975	No Damages Recorded
April 4, 1984	\$2,500,000.00
May 5, 1989	\$25,000.00
July 16, 1989	\$25,000.00
March 20, 1998	\$600,000.00

At least two of these tornado events have been included in Federal declared disasters.

Hazardous Materials: Also see current mitigation measures or the hazard rating. Also see hazardous materials assessment. Also see a listing of known Extremely Hazardous Materials facilities.

Hazardous materials are chemical substances, which if released or misused can pose a threat to the environment or health. These chemicals are used in industry, agriculture, medicine, research, and consumer goods. Hazardous materials come in the form of explosives, flammable and combustible substances, poisons, and radioactive materials. These substances are most often released as a result of transportation accidents or because of chemical accidents in plants.

Hazardous materials in various forms can cause death, serious injury, long-lasting health effects, and damage to buildings, homes, and other property. Many products containing hazardous chemicals are used and stored in homes routinely. Varying quantities of hazardous materials are manufactured, used, or stored at an estimated 4.5 million facilities in the United States--from major industrial plants to local dry cleaning establishments or gardening supply stores.

Hazardous materials accidents can occur anywhere. Communities located near chemical manufacturing plants are particularly at risk. However, hazardous materials are transported on our highways, railways, waterways, and pipelines daily, so any area is considered vulnerable to an accident. (www.fema.gov)

**Hazardous Materials Incidents by Transportation Mode
(1983 – 1990)**

Mode of Transportation	Number of Accidents	Associated Deaths	Associated Injuries
Air	1,220	0	153
Highway	41,781	79	1,569
Railway	7,886	1	423
Water	83	1	35
Other	29	0	2
Total	50,999	81	2,182

(www.fema.gov)

Additionally, from 1982–1991, annual average hazardous materials transportation incidents were 6,774. In 1991, there were 9,069 transportation incidents that resulted in 10 deaths and 436 injuries.

As many as 500,000 products pose physical or health hazards and can be defined as "hazardous chemicals." Each year, over 1,000 new synthetic chemicals are introduced. In an average city of 100,000 residents, 23.5 tons of toilet bowl cleaner, 13.5 tons of liquid household cleaners, and 3.5 tons of motor oil are discharged into city drains each month.

The Department of Transportation regulates routes and speed limits used by carriers and monitor the types of hazardous materials crossing state lines. The U.S. Department of Transportation employs a labeling and placarding system for identifying the types of hazardous materials that are transported along the nation's highways, railways, and waterways. This system enables local emergency officials to identify the nature and potential health threat of chemicals being transported into your community. Were a chemical accident to occur in your community, local emergency officials and the fire department would be able to determine the proper emergency response procedures for the situation by the type of placard or warning label.

In 1986, Congress passed the Superfund Amendments and Reauthorization Act (SARA) of 1986. Title III of this legislation requires that each community establish a Local Emergency Planning Committee (LEPC) to be responsible for developing an emergency plan for preparing for and responding to chemical emergencies in that community. This emergency plan must include the following: an identification of local facilities and transportation routes where hazardous material are present; the procedures for immediate response in case of an accident (this must include a community-wide evacuation plan); a plan for notifying the community that an incident has occurred; the names of response coordinators at local facilities; and a plan for conducting exercises to test the plan. The plan is reviewed by the State Emergency Response Commission (SERC) and publicized throughout the community. The LEPC is required to review, test, and update the plan each year. (www.fema.gov)

Two major interstate passes, I-85 and I-40, increase Durham County and the Municipality's vulnerability to hazardous materials incidents. Additionally, there are approximately six other state and Federal roadways within the boundaries of the County and city. Also, CSX and Norfolk Southern freight rail carriers travel through the area daily. With the extreme amount of highway and rail travel that occurs daily throughout Durham County and the Municipality, the vulnerability of hazardous materials incidents for the area is extremely high.

The location of Research Triangle Park (RTP) also increases the vulnerability of hazardous materials incidents occurring within the area. RTP is the largest and most successful planned research park in the US and is located on 7,000 acres. Nearly 75% of the park's property and 95% of its corporate enterprises are located in Durham County. Organizations in the park represent some of this country's and the world's largest and most prestigious corporate and governmental organizations engaged in scientific and technological research. There are currently over 45,000 persons employed by over 130 firms in the park. The Park houses the United States EPA's largest operation outside of Washington, DC. (www.durhamchamber.org/business/rtp.html) With the levels of research and development at the Park, it is a viable possibility that hazardous materials incidents will occur.

**Hazardous Materials Incident by Type per Year by Fiscal Year
(October 1 - September 30)**

Incident Type	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Fixed	11,404	12,536	13,556	14,656	15,080	12,067	10,388	10,961	11,230	11,813	12,441
Unknown Sheen	3,794	3,784	4,416	5,087	5,147	4,433	4,228	4,809	4,802	4,016	4,147
Vessel	2,914	2,690	2,886	3,598	3,967	4,091	3,778	3,886	3,877	3,945	4,378
Mobile	1,832	1,850	2,782	3,456	3,133	2,511	2,490	2,718	2,835	3,597	3,216
Pipeline	1,794	2,030	1,918	1,945	1,530	1,737	1,740	1,657	1,404	1,618	1,841
Platform	2,331	2,166	1,617	1,671	1,770	2,106	1,943	1,570	1,465	1,428	1,355
Storage Tank	Prior to 2000, Storage Tank Incidents were taken as FIXED Reports									1,379	3,140
Railroad Non-Release	248	441	502	493	455	446	586	823	1,049	1,335	1,235
Railroad	966	1,162	1,425	1,530	1,578	1,645	1,883	2,266	2,252	1,332	1,241
Continuous	333	323	476	215	183	177	170	304	376	938	238
Aircraft	138	203	264	265	225	173	207	181	241	248	297
Drill/Exercise	0	0	88	188	228	349	349	503	532	669	789
Unknown	0	0	6	21	8	46	14	3	52	84	0
Terrorist Non-Release	Prior to 1998, the NRC did not take Terrorist Reports							18	51	33	42
TOTAL	25,754	27,185	29,936	33,125	33,304	29,781	27,776	29,699	30,166	32,435	34,360

(www.nrc.uscg.mil/incident.htm)

Fixed Nuclear Facility: Also see current mitigation measures or the hazard rating.

Durham County falls within the 50-mile ingestion exposure of the Progress Energy, Harris Nuclear Plant. The 50-mile radius of the ingestion exposure Emergency Planning Zone (EPZ) is based on a number of considerations. One of those considerations is that the downwind range, potentially threatened by contamination, would generally be limited to about 10-miles or less from the power plant because of wind shifts, wind speed during the release, and radioactive decay. Another is that the particulate material from a radioactive plume would have been deposited on the ground within 50 miles of the facility. Considerable information regarding nuclear facilities can be found in the state emergency operations plan and in state emergency response procedures. Human health and safety risks would be from ingesting contaminated food and water.

Terrorist Activity: current mitigation measures or the hazard rating. Also see terrorism hazard assessment.

Terrorism is the use of force or violence against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion or ransom. Terrorists often use threats to create fear among the public, to try to convince citizens that their government is powerless to prevent terrorism, and to get immediate publicity for their causes.

FEMA's role in managing terrorism includes both **anti-terrorism** and **counter terrorism** activities. Antiterrorism refers to defensive measures used to reduce the vulnerability of people and property to terrorist acts, while counter terrorism includes offensive measures taken to prevent, deter, and

respond to terrorism. Within the emergency management arena, antiterrorism is a hazard mitigation activity and counter terrorism falls within the scope of preparedness, response and recovery.

The Federal Bureau of Investigation (FBI) categorizes terrorism in the United States as one of two types--domestic or international.

Domestic terrorism involves groups or individuals whose terrorist activities are focused at elements of our government or population without foreign direction.

International terrorism involves groups or individuals whose terrorist activities are foreign-based and/or directed by countries or groups outside the United States or whose activities transcend national boundaries.

A terrorist attack can take several forms, depending on the technological means available to the terrorist, the nature of the political issue motivating the attack, and the points of weakness of the terrorist's target. Bombings have been the most frequently used terrorist method in the United States. Other possibilities include an attack at transportation facilities, an attack against utilities or other public services or an incident involving chemical or biological agents.

Biological agents are infectious microbes or toxins used to produce illness or death in people, animals or plants. Biological agents can be dispersed as aerosols or airborne particles. Terrorists may use biological agents to contaminate food or water because they are extremely difficult to detect. Chemical agents kill or incapacitate people, destroy livestock or ravage crops. Some chemical agents are odorless and tasteless and are difficult to detect. They can have an immediate effect (*a few seconds to a few minutes*) or a delayed effect (*several hours to several days*).

Biological and chemical weapons have been used primarily to terrorize an unprotected civilian population and not as a weapon of war. This is because of fear of retaliation and the likelihood that the agent would contaminate the battlefield for a long period of time as evidenced in World War I.

The effects of terrorism can vary significantly from loss of life and injuries to property damage and disruptions in services such as electricity, water supply, public transportation and communications. Terrorists look for visible targets where they can avoid detection before or after an attack such as international airports, large cities, major international events, resorts, and high-profile landmarks.

In the United States, most terrorist incidents have involved small extremist groups who use terrorism to achieve a designated objective. Local, State and Federal law enforcement officials monitor suspected terrorist groups and try to prevent or protect against a suspected attack. Additionally, the U.S. government works with other countries to limit the sources of support for terrorism.

Terrorist incidents in this country prior to the September 11, 2001 attack have included bombings of the World Trade Center in New York City, the Murrah Federal Building in Oklahoma City, the United States

Capitol Building in Washington, D.C. and Mobil Oil corporate headquarters in New York City. On February 29, 1993, a bombing in the parking garage of the World Trade Center in New York City resulted in the deaths of five people and thousands of injuries. The bomb left a crater 200 by 100 feet wide and five stories deep. The World Trade Center was the second largest building in the world and housed 100,000 workers and visitors each day.

Before the September 11, 2001 attacks on New York and the Pentagon, most terrorist incidents in the United States have been bombing attacks, involving detonated and un-detonated explosive devices, tear gas and pipe and firebombs. (www.fema.gov)

The Durham County area is vulnerable to terrorism for several reasons:

- Raleigh-Durham International Airport
- Major universities
 - Duke University
 - University of North Carolina – Chapel Hill
 - North Carolina State University
 - Durham Technical Community College
- Research Triangle Park (130+ research firms & 45,000 employees)
- EPA's largest operation outside of Washington, DC
- Interstate Highway I-85 and I-40 (provides immediate access to the Southeast's "Boom Belt")
- Norfolk Southern & CSX freight railway carriers
- Amtrak Passenger Service (twice daily service)

To date there have been no known terrorism incidents within the confines of Durham County or the Municipality. However, with the large influx of people that travel daily through the area and with the large populations that are located in small areas of the County, it is quite possible that the County or city could become a target for terrorism activity.

Dam/Levee Failures

A dam/levee is a barrier constructed across a watercourse for the purpose of storage, control, or diversion of water. (*FEMA, 1997*) Dams are typically constructed of earth, rock, concrete, or mine tailings. The North Carolina Dam Safety Program within Land Resources of the NC Department of Environment and Natural Resources defines event types of dams/levees within North Carolina:

Earth Dams

- Majority of dams/levees in North Carolina
- Safe if properly designed, constructed, and maintained
- Not designed to be overtopped

Concrete Gravity

- Mass utilized to resist sliding and shape to resist overturning
- Used where a strong foundation is present
- Relatively resistant to overtopping and seismic events

Arch Dams

- Used to narrow sites with strong abutments
- Use less concrete than gravity dams & increase over the top spill capacity
- More difficult to design and construct than gravity dams

Gravity Arch

- Conservative design but uses more concrete

Buttress

- Requires a strong foundation but resistant to sliding, overturning, and overflowing
- Conserves concrete, but difficult to design and construct

Additionally, the NC Dam Safety Program classifies dams into three hazard categories within the state:

Low Hazard (Class A)

Failure of the dam would not be expected to result in loss of life, but may damage uninhabited low value non-residential buildings, agriculture land, or low volume roads.

Intermediate Hazard (Class B)

Failure of the dam would not be expected to result in loss of life, but may damage moderately traveled roads, interrupt use or service of public utilities, and may cause minor damage to isolated homes, commercial or industrial buildings in back water areas.

High Hazard (Class C)

Failure of the dam would likely cause loss of life or serious damage to homes, industrial and commercial buildings, important public utilities, and heavily traveled roads.

There are about 80,000 dams in the United States today, the majority of which are privately owned. Other owners are state and local authorities, public utilities, and Federal agencies. The benefits of dams are numerous: they provide water for drinking, navigation, and agricultural irrigation. Dams also provide hydroelectric power and create lakes for recreation. Most important, dams save lives by preventing or reducing floods.

If dams have many benefits, they also can pose a risk to communities if not designed, operated, and maintained properly. In the event of a dam failure, the energy of the water stored behind even a small dam is capable of causing loss of life and great property damage if there are people downstream of the dam. The National Dam Safety Program is dedicated to protecting the lives of American citizens and their property from the risks associated with the development, operation, and maintenance of America's dams. (www.fema.gov/hazards)

Durham County and the Municipality currently have 76 dams located within the County and city that are monitored by the NC Dam Safety Program. However, within every County in North Carolina, there are many more small privately owned dams that do not meet the criteria necessary to be monitored and inspected by the state dam safety program. A dam must be 15 feet high and capable of impounding at least 10 acre feet or be classified as high hazard potential to be regulated. The small dams are not listed or inspected because they pose no real threat to persons or property.

Although it is possible that a dam failure incident could occur within the boundaries of Durham County or the Municipality, the threat is relatively low. In the past there have been no reported injuries or deaths resulting from dam failures and no significant loss of property. However, if the population continues to grow and development continues the potential for possible future losses will rise.

The following table gives a breakdown of the number and types of dams located within the County/City boundaries:

Durham County Dam Classification Listing				
Classification	Class A	Class B	Class C	Total
Number	39	18	19	76

Landslides/sinkholes:

Landslides are the descent of a mass of earth down a slope. Landslides may be caused when water from rain and melting snow sinks into the earth on the top of a slope, seeps through cracks and pores in underlying rock, and then encounters a layer of slippery material, such as shale or clay, inclined toward a valley. If the support is sufficiently weakened, a mass of earth and rock can slide down along the well-lubricated layer. Earthquakes may also trigger landslides. (Buncombe County Hazard Mitigation Plan, 2004) Landslides are also typically associated with periods of heavy rainfall or rapid snow melt and tend to worsen the effects of flooding that often accompanies these events. (www.fema.gov)

Landslides are a serious geologic hazard common to almost every state in the United States. It is estimated that nationally they cause up to \$2 billion in damages and from 25 to 50 deaths annually. Globally, landslides cause billions of dollars in damage and thousands of deaths and injuries each year. Landslides are especially troubling because they often occur with other natural hazards, such as earthquakes or floods.

Some landslides move slowly and cause damage gradually, whereas others move so rapidly that they can destroy property and take lives suddenly and unexpectedly. Gravity is the force driving landslide movement. Factors that can cause landslides include: saturation by water, steepening of slopes by erosion or construction, mining, forestry, highway construction, alternate freezing or thawing, earthquake shaking, and volcanic eruptions.

Landslides are typically associated with periods of heavy rainfall or rapid snow melt and tend to worsen the effects of flooding that often accompanies these events. In areas burned by forest and brush fires, a lower threshold of precipitation may initiate landslides. (www.fema.gov)

Debris flows (also referred to as mudslides, mudflows, or debris avalanches), are a common type of fast-moving landslide that generally occur during intense rainfall on water-saturated soil. They usually start on steep hillsides as soil slumps or slides that liquefy and accelerate to speeds as great as 35 miles per hour or more. They continue flowing down hills and into channels depositing sand, mud, boulders, and organic material onto more gently sloping ground. Their consistency ranges from watery mud to thick, rocky mud (like wet cement), which is dense enough to carry boulders, trees, and cars. Debris flows from many different sources can combine in channels, where their destructive power may be greatly increased. (www.ncem.org/mitigation) Mudflows are covered under the National Flood Insurance Program; however, landslides are not. (www.fema.gov)

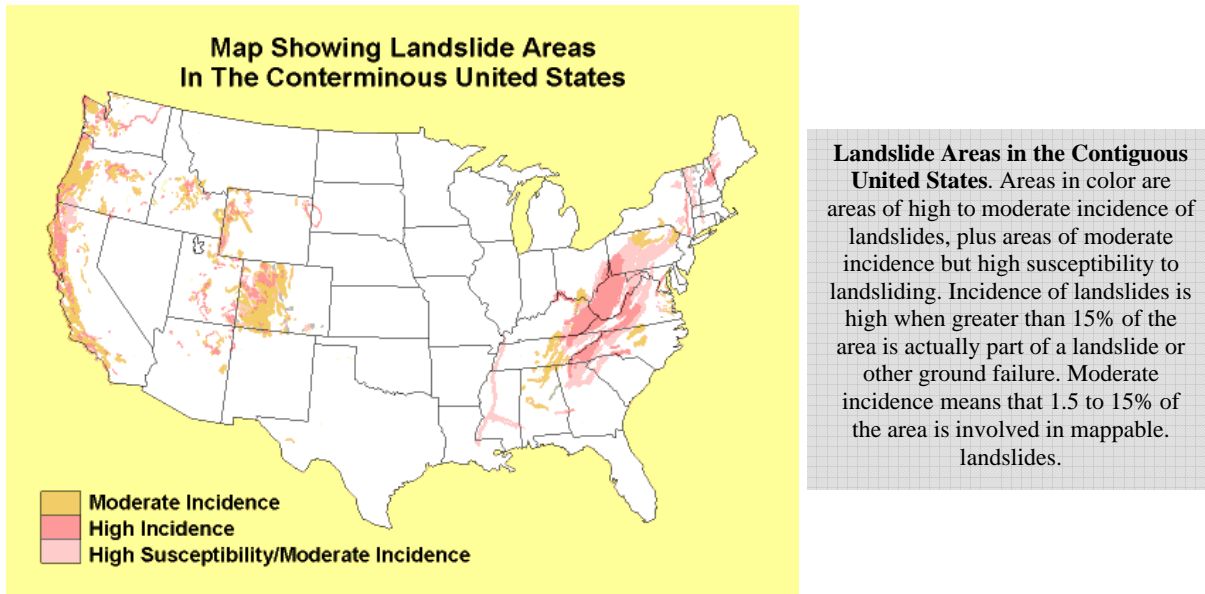
In the eastern United States, landslides are common throughout the mountainous Appalachian region and New England, predominantly from sliding of clay-rich soils. The USGS identifies landslide incidence/susceptibility for the eastern United States by (1) classifying geographic areas by high, medium, or low landslide incidence and (2) evaluating geologic formations in these areas by high, medium, or low susceptibility to landsliding.

Susceptibility to landsliding is defined by the USGS as the probable degree of response of geologic formations to natural or artificial cutting, loading of slopes, or to unusually high precipitation. Generally, it is assumed that unusually high precipitation or changes in existing conditions can initiate landslide movement in areas where rocks and soils have experienced numerous landslides in the past.

Historical records suggest that destructive landslides and debris flows in the Appalachian Mountains occur when unusually heavy rain from hurricanes and intense storms soaks the ground, reducing the ability of steep slopes to resist the down slope pull of gravity. During Hurricane Camille in 1969, such conditions generated debris flows in Nelson County, Virginia. The hurricane caused 150 deaths, mostly attributed to debris flows, and more than \$100 million in property damage. Likewise, 72 hours of storms in Virginia and West Virginia during early November 1985 caused debris flows and flooding in the Potomac and Cheat River basins that were responsible for 70 deaths and \$1.3 billion in damage to homes, businesses, roads, and farmlands.

Scientists have documented 51 historical debris-flow events between 1844 and 1985 in parts of the Appalachians -- most of them in the Blue Ridge area. Recent studies of deposits exposed in stream channels during the 1995 storms in Madison County, Virginia, found evidence of prehistoric debris flows. Radiocarbon dating of plant remains from debris-flow deposits near Graves Mill, Virginia, indicates that these processes have occurred there repeatedly over the last 34,000 years. (www.ncem.org/mitigation)

Landslides:



(www.usgs.gov)

Sinkholes occur when groundwater dissolves a vulnerable land surface such as limestone, causing the land surface to collapse from a lack of support. In June 1993, a 100-foot wide, 25-foot deep sinkhole formed under a hotel parking lot in Atlanta, killing two people and engulfing numerous cars. (www.fema.gov) Additionally, on August 15, 2002, in Hickory, North Carolina, Buffalo's Southwest Café on Highway 70 experienced a sinkhole. After weeks of heavy rain, a sinkhole estimated to be 150 feet long X 40 feet wide X 40 feet deep developed in the parking lot of the popular restaurant. A new Corvette was swallowed into the crevice and was not recovered. (www.findarticles.com)

A. Drought/Extreme Heat

A drought is defined by FEMA (1997) as being a water shortage caused by a deficiency of rainfall. It is a condition where and when the water supply is deficient enough for a long enough period of time to damage the growth of vegetation, industrial production, or domestic activities. The National Drought Mitigation Center states that in the most general sense, drought originates from a deficiency of precipitation over an extended period of time, resulting in a water shortage for some activity, group, or environmental sector. Drought may or may not be accompanied by intense heat. Intense heat only expounds on the drought condition by increasing evaporation.

Drought intensity categories are based on six key indicators and numerous supplementary indicators. The accompanying drought severity classification table shows the ranges for each indicator for each dryness level. Because the ranges of the various indicators often don't coincide, the final drought category tends to be based on what the majority of the indicators show. The analysts producing the map also weight the indices according to how well they perform in various parts of the country and at different times of the year. Also, additional indicators are often needed in the West, where winter snowfall has a strong bearing on water supplies. (*National Drought Mitigation Center*)

Drought Severity Classification

Category	Description	Possible Impacts	Ranges				
			Palmer Drought Index	CPS Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)	Satellite Vegetation Health Index
DO	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures; fire risk above average. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered	-1.0 to -1.9	21-30	21-30	-0.5 to -0.7	36-45
D1	Moderate Drought	Some damage to crops, pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested	-2.0 to -2.9	11-20	11-20	-0.8 to -1.2	26-35
D2	Severe Drought	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed	-3.0 to -3.9	6-10	6-10	-1.3 to -1.5	16-25
D3	Extreme Drought	Major crop/pasture losses; extreme fire danger; widespread water shortages or restrictions	-4.0 to -4.9	3-5	3-5	-1.6 to -1.9	6-15
D4	Exception Drought	Exceptional & widespread crop/pasture losses; exceptional fire risk; shortages of water in reservoirs, streams, & wells, creating water emergencies	-5.0 or less	0-2	0-2	-2.0 or less	1-5

(*National Drought Mitigation Center: Additional indices used, mainly during the growing season, include the USDA/NASS Topsoil Moisture, Crop Moisture Index (CMI), and Keetch Byram Drought Index (KBDI). Indices used primarily during the snow season and in the West include the River Basin Snow Water Content, River Basin Average Precipitation, and the Surface Water Supply Index (SWSI)*)

Extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when a "dome" of high atmospheric pressure traps hazy, damp air near the ground. Excessively dry and hot conditions can provoke dust storms and low visibility. Droughts occur when a long period passes without substantial rainfall. A heat wave combined with a drought is a very dangerous situation.

Heat kills by pushing the human body beyond its limits. Under normal conditions, the body's internal thermostat produces perspiration that evaporates and cools the body. However, in extreme heat and high humidity, evaporation is slowed and the body must work extra hard to maintain a normal temperature. (*www.fema.gov*)

Extreme heat can cause the following disorders:

Heat Stroke: Body's inability to control its temperature. Temperature will rise rapidly. Sweating does not occur. This can cause permanent disability. Highest risk populations include outdoor laborers, elderly, children, and people with poor health.

Heat Exhaustion: Occurs when there is an excessive loss of water and salt released in sweat. Those at highest risk include the elderly, people with high blood pressure, outdoor laborers, and those exercising outdoors.

Heat Syncope: Results in a sudden loss of consciousness, which generally returns when the person lies down. There is little or no permanent harm as a result of heat syncope. This disorder is usually associated with people who are not properly acclimated to the weather.

Heat Cramps: Occurs as a result of a mild fluid and electrolyte imbalance and generally ceases to be a problem after becoming accustomed to the heat. This occurs in people who exercise outdoors when they are not used to the activity.
(FEMA, 1997)

National Weather Service Heat Index to Heat Disorders

Level	Danger Category	Heat Disorder	Temperature
I	Caution	Fatigue possible with prolonged exposure and physical activity	80 – 90
II	Extreme Caution	Sunstroke, heat cramps, or heat exhaustion possible with prolonged exposure and physical activity	90 – 105
III	Danger	Sunstroke, heat cramps, or heat exhaustion likely, heat stroke possible with prolonged exposure and physical activity	105 – 130
IV	Extreme Danger	Heat stroke or sunstroke imminent	>130

According to the National Climatic Data Center information for 1950 – 2003, drought and excessive heat plagued central North Carolina (including Durham County and the City of Durham) during July 22 through July 23, 1998. Maximum temperatures reached the 98 to 103 degree range combined with dew points in the 78 to 80 degree range with little wind to give heat index values of around 110 degrees for several hours each afternoon. To make matters worse, the minimum temperatures did not fall below 80 at several locations and those that did achieved that feat for only an hour or two. Strong thunderstorms ended the 2 day excessive heat ordeal on the evening of the 23 when rain cooled the environment enough to send temperatures into the lower 70s at most locations.

Power Failure: Also see current mitigation measures.

There are four electrical power providers for Durham County: Duke Energy, Progress Energy, Wake Electric Co-Op, and Piedmont Electric Co-Op. Duke Energy serves the largest number of customers

in Durham County. Duke Power reports a reliability rate of 99.98%, which means that the average Durham customer may see power interruptions totaling 1.75 hours per year.

A major electrical power failure is defined as a failure of the electrical distribution system that will exceed twenty-four hours in duration and affect greater than 33% of the geographical area of the County. Electrical distribution systems can be interrupted for a number of reasons, but those that have historically been the main cause are high winds (tornadoes, hurricanes and severe thunderstorms) and severe winter storms, such as ice. A prolonged major electrical distribution system failure during the middle of winter accompanied with very cold temperatures can have dramatic effects on a population.

Mass Casualty: Also see current mitigation measures.

Defined as any occurrence in which twenty (20) or more persons are killed or sustain injury. Mass casualty incidents are rare but are most likely to occur in transportation accidents. While mass casualty incidents are possible in severe weather, they are also rare.

Large Structural Fires: Also see current mitigation measures.

Generally a large structure is defined as any structure exceeding 25,000 square feet. Large structural fires therefore would include fully involved structures of this size or greater such as hospitals, government centers, manufacturing facilities, warehouses, barns and other multi-level buildings.

Landfill Fires: Also see current mitigation measures.

Landfill fires are not restricted to publicly owned landfill operations. Private landfills, Construction and Demolition landfills are also included. Landfill fires are perhaps some of the most difficult fires to fight because they are often deep beneath tons of debris or other such materials. Landfill fires can be fueled by methane gas trapped in pockets or by wood and paper debris. Effective methods of fighting such fires have been developed by the Durham County Solid Waste Department.

Nor'easter: current mitigation measures mirror those for hurricane.

Mid-latitude cyclones, known as Nor'easters when they track northward along the East Coast of North America, have a long history of producing severe, and sometimes catastrophic, blizzard conditions along the eastern seaboard. The coastal region east of the Carolinas, in association with the warm Gulf Stream current, has been identified as an epicenter of extratropical cyclogenesis in previous climatological studies; this is due in part to the semi-permanent thermal gradient found along the western edge of the Gulf Stream. (Neil A. Jacobs, AirDat LLC, Morrisville, NC; and S. Raman and G. M. Lackmann)

It is the temperature structure of the continental air mass and the position of the temperature gradient along the Gulf Stream that drives this cyclone development. As low pressure deepens, winds and waves can quickly increase and cause serious damage to coastal areas as the storm generally moves to the northeast. A pair of researchers, Davis and Dolan (1993) has proposed an intensity scale that is based upon levels of coastal degradation. See the table below:

**The Dolan-Davis Nor'easter Intensity Scale
(Davis and Dolan, 1993)**

Storm Class	Beach Erosion	Dune Erosion	Overwash	Property Damage
1 (Weak)	Minor changes	None	No	No
2 (Moderate)	Modest; mostly to lower beach	Minor	No	Modest
3 (Significant)	Erosion extends across beach	Can be significant	No	Loss of many structures at local level
4 (Severe)	Severe beach erosion and recession	Severe dune erosion or destruction	On low beaches	Loss of structures at community-scale
5 (Extreme)	Extreme beach erosion	Dunes destroyed over extensive areas	Massive in sheets and channels	Extensive at regional-scale; millions of dollars

Analysis of nor'easter frequency by researchers reveals fewer nor'easters during the 1980s. However, the frequency of major nor'easters (class 4 and 5 on the Dolan-Davis Scale) has increased in recent years. In the period 1987 to 1993, at least one class 4 or 5 storm has occurred each year along the Atlantic seaboard of the United States, a situation duplicated only once in the last 50 years. Table 3 ("Hazard Risk by Climate Division" - Page 28) depicts Durham County's potential vulnerability to nor'easters.

Sources

Sources of information contained in this Hazard Identification document and elsewhere throughout this Disaster Mitigation Plan were derived from:

Federal Emergency Management Agency
 North Carolina DCCPS – Division of EM
 County computer aided dispatch Records / EM43
 U.S. Department of Homeland Security
 NC Department of Environment and
 Duke Energy
 Natural Resources
 National Oceanic and Atmospheric Administration
 NC Department of Agriculture
 The Tornado Project
 Wake Forest University – Disasters in the US
 North Carolina Utilities Commission
 National Weather Service
 NC Department of Administration
 U.S. Army Corps of Engineers
 Department of Transportation

North Carolina General Statues
 Codes and ordinances of the City (Planning Office)
 Federal Aviation Administration
 North Carolina Highway Patrol
 Codes and ordinances of the County
 Department of Energy – Nuclear Regulatory Agency
 North Carolina Division of Forest Resources
 County GIS (GIS / Mapping)
 U.S. Department of Agriculture
 NC Office of the State Geologist
 Hazardous Materials Emergencies, Cashman, 1998
 Blue Sky Foundation
 U.S. Geological Survey
 National Association for Search and Rescue (NASAR)
 The Emergency Management Institute
 FEMA – HAZUS computer models and projections
 National Fire Protection Association (NFPA)

Hazard Vulnerability Assessment

Durham County, and the municipality, following the intent of Senate Bill 300, and the Disaster Mitigation Act of 2000, has assessed their vulnerability to hazards.

The hazards identified include those listed below. Other natural or man-made hazards that could occur in other parts of the country (i.e.: volcanoes, tsunamis, aircraft accidents, etc.) were not analyzed because of (1) the location of our jurisdiction, (2) there was no history of any such occurrence and the likelihood of such an occurrence was less than, 1%, (3) there was no identification in any researched document that such events were ever likely to occur, therefore, the Hazard Mitigation Task Force felt it appropriate that time and very limited resources be used to identify and analyze those realistic hazards listed below.

Hazards were identified based upon (1) local reports, (2) state records, (3) Federal agency records, (4) input from local staff, elected officials, administration, local volunteer response personnel and the public.

Also see Current Mitigation Measures (click on one of the links below to view analysis details)
 Levels = 5 High, 4 Moderate, 3 Moderate, 2 Low, 1 Low

Table 4: Hazard Vulnerability Assessment

Durham County Threat / Hazard Index	Potential / Probability for future occurrence	Potential Impact (Catastrophic, Critical, Limited, Negligible)	Risk Area (Countywide includes the Municipality)	Conclusion Rating (for planning purposes only)
Drought	2	2	2	6
Earthquake	2	2	2	6
Floods	3	1	1	5
Forest Fires	4	2	1	7
Hazardous Materials	4	2	2	8

Other natural or manmade hazards that were considered, but when examined rated less than 1 on the hazard rating.

Fixed Nuclear Facility
 Mass Casualty
 Nor'easter

Power Failure
 Large Structural Fires
 Landslide

Hazard Vulnerability Assessment

Drought:

General information index. Also see current hazard mitigation.

Since 1999 Durham County, as well as the majority of North Carolina cities, towns and counties have faced a moderate to severe drought.

Drought has several meanings, as outlined in the general information index. Generally, drought reduces the amount of water available for agriculture, municipality, industry, commerce, tourism, fire suppression, and wildlife. Reduction of electrical power generation and water quality deterioration is likely.



Water shortages in some communities have had dramatic effects on local budgets, revenues, and citizens. Near panic situations among some members of the public, have caused elected officials to spend considerable revenue to assist the public.

As drought continued in North Carolina into the summer of 2002, it led to a declaration of disaster for agriculture drought. This led to funding becoming available for many farmers in the form of Small Business Administration low interest loans.

The Drought Monitoring Council, a council of various state agencies, is organized to coordinate activities of state agencies in the assessment and the response to drought and activities the Drought Assessment and Response Plan, a part of the North Carolina Emergency Operations Plan. The Agriculture Assistance Act of 2003 *may* provide assistance to the agriculture community during times of crop or livestock losses during drought periods.

Drought effects are often severe. Drought can last for extended periods and drought effects all citizens, businesses and government. Durham County government has the authority to restrict use of certain water resources.

*Population

Population	Per Capita Income	Average Housing value (2000)
249,654 (2006 est)	\$23,156.00 (2003)	\$129,000.00

** Estimated potential economic impact from a catastrophic, prolonged meteorological, agriculture, hydrological or socioeconomic drought.

Event	Cost
Structural Damage (generally due to loss from fire or abandonment)	\$13,440,000
Non-structural (i.e. crop damages, livestock losses, etc.)	\$8,800,000
Contents	\$1,000,000
Lost inventory (livestock losses, business losses – fire)	\$3,050,000
Capital losses	\$2,750,000
Wages lost (fire, agriculture loss, abandonment)	\$7,500,000
Water demand increased costs (\$)	\$6,282,279
Total Potential Losses	\$42,726,279

(\$) Highest 25% of Water Bills for Households with Median Income

* Avg. income = 24,162. Avg. household expense water = 1.0% \$237.38 per annum) based on a median cost increase per household of 2.5% (Source: *Public Utility Consulting Selinsgrove, PA*)

*Source NCDC EDIS

**Based upon total tax value at a maximum loss of 1% of total tax value or actual estimated losses

*** NCDC and NOAA 2002

Hazard Vulnerability Assessment

Earthquakes:

General Information index. Also see current earthquake mitigation measures.

Earthquakes are relatively infrequent but not uncommon in North Carolina. Earthquakes are also unpredictable. From 1568 to 2003, 159 earthquakes have occurred in North Carolina. North Carolina is affected by both the New Madrid fault in Missouri and the Charleston fault in South Carolina. Both of these faults have generated Earthquakes measuring greater than 8 on the Richter scale during the last two hundred years. Durham County has experienced at least three earthquakes and has been in proximity to others. While no significant damages have ever been recorded in Durham County, the proximity to earthquakes faults makes Durham County, as well as all the municipalities vulnerable to such damages.



Note: An Earthquake's severity is expressed in both magnitude and intensity. The two terms are sometimes confused for one another. Magnitude is related to the amount of seismic energy released at the hypocenter of an earthquake. It is measured using the Richter Magnitude Scale. Intensity is based on the observed effects on the earth's surface such as ground shaking or a building moving. These effects vary according to your location relative to the epicenter. Intensity is measured using the Modified Mercalli Intensity Scale.

The following is an abbreviated description of the 12 levels of Modified Mercalli intensity.

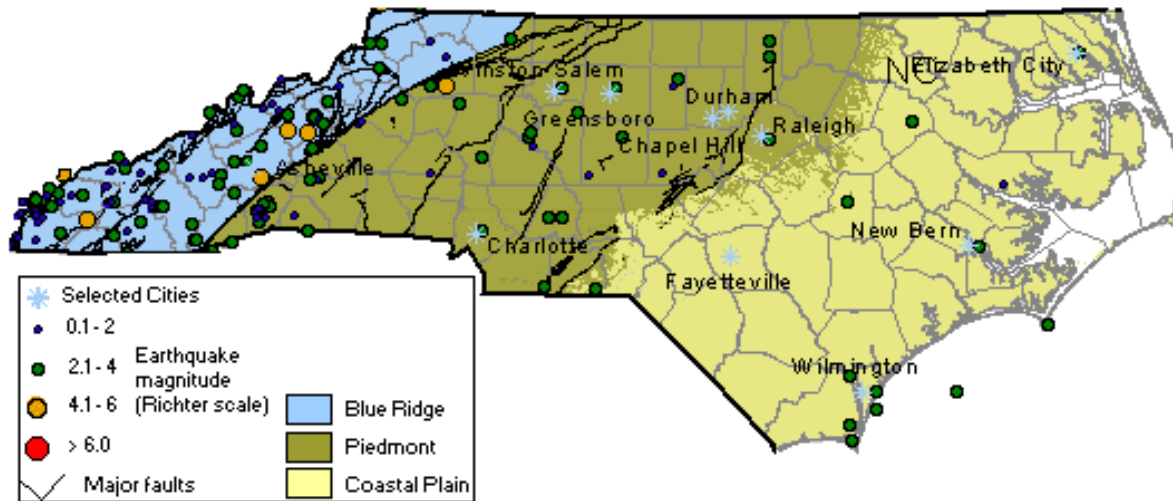
1. Not felt except by a very few under especially favorable conditions.
2. Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.
3. Felt quiet noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration similar to the passing of a truck. Duration estimated.
4. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
5. Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned.
6. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
7. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
8. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
9. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.

10. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rail bent.
11. Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
12. Damage total. Lines of sight and level are distorted. Objects thrown into the air.

Date	Location	Description	Mag
July 7, 2001	Swain County (2 miles SW of Cherokee)	Shaking felt, no damage recorded	2.4
July 9, 2001	Swain County (4 miles SW of Cherokee – between Cherokee & Bryson City)	Shaking felt, no damage recorded	2.4
July 9, 2001	Swain County (4 miles SW of Cherokee)	Shaking felt, no damage recorded	1.5
July 10, 2001	Swain County (4 miles SW of Cherokee)	Shaking felt, no damage recorded	2.3
May 8, 2002	Swain County (7 miles WSW of Bryson City)	No damage recorded	2.0
July 10, 2002	Swain County (7 miles WSW of Bryson City)	No damage recorded	2.0
September 8, 2002	Madison County (4 miles north of Marshall)	No damage recorded	2.2
April 29, 2003	Alabama (4 miles S of Mentone, AL/41 miles SSW of Chattanooga, TN)	Shaking felt as far east as Caldwell County	2.4
December 9, 2003	Richmond, Virginia (Approx 30 miles west of Richmond)	Shaking felt as far south as Orange County	4.5

Additional information about earthquakes in North Carolina, or other earthquakes in or near Eastern Tennessee, can be found on the internet at <http://tanasi.gg.utk.edu/> or by sending an email message to quake@tanasi.gg.utk.edu.

Seismic Information By Region, North Carolina
(Image courtesy: North Carolina Geological Survey)



Potential Economic Impact in Durham County (including municipality) from a greater than 6.0 (Richter scale) earthquake **

Effect	Loss
Structural Damage	\$56,330,000
Non-structural (i.e. power distribution systems, etc.)	\$179,470,000
Contents	\$74,670,000
Lost inventory	\$3,930,000
Relocation losses (cost of relocating population)	\$57,640,000
Capital losses	\$26,200,000
Wages lost	\$31,440,000
Retail income losses	\$22,270,000
Total Potential Losses	\$451,192,000

*Source – NC Department of Commerce Economic Development Information System

** HAZUS information Data base – FEMA – Dunn and Bradstreet 1994. Adjusted to 2002 by 31%. Worst-case scenario.

Hazard Vulnerability Assessment

Flooding:

General information index. Also see current hazard mitigation measures. Also see Durham County, and the municipality' flood plain maps (FIRMs).

Durham County and the municipality have all experienced the effects of flooding. Fortunately there are only a handful of areas that are subject to routine, repetitive, flash flooding and in these areas there are no known residential or commercial structures at this time.

Thirty-five deaths blamed on Floyd

Raleigh, Sept. 20, 1999 – “State officials confirm 19 deaths in eastern North Carolina in Hurricane Floyd's wake. A total of 35 are presumed dead based on the incidents in this County-by-County list. Two others are known to be missing.”

To examine its vulnerability to flooding and make an appropriate assessment, the County and the municipality choose several sources for information. One is the HAZUS program offered by FEMA. HAZUS provides a computer model whereby certain data can be obtained based on local conditions. The flood loss estimation methodology consists of two basic analytical processes: flood hazard analysis and flood loss estimation module. Physical damage and economic loss is calculated based on the results of the hazard analysis. Another method was to examine currently available FIRMs (Flood Insurance Rate Maps) also provided by FEMA. The FIRM maps are available from Durham County GIS and were instrumental in providing data for the number of structures likely to be affected. This floodplain layer was then used to input data into the damages model. The results are listed below.

Zone	Description
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined
AO	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AE	Base flood elevations determined
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined
ANI	Area not included. No flood hazard data available
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one (1) square mile; or areas protected by levees from the base flood.

Zone	Description
C	Areas of minimal flooding
D	Areas of undetermined, but possible, flood hazards
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined
X	Areas determined to be outside 100-year flood plain.
X1-X30	Areas of 500-year flood; areas of 100-year flood with average depths of less than one (1) foot.

For the purposes of planning, the vulnerability assessment of this hazard used Durham County GIS. The GIS was used to locate structures in the floodplain based on contour data. Listing these structures by road will enhance Durham County's warning system. Enhancement of that warning system, however, is not part of this analysis. There may be overlaps in population because a number of these waterways merge at various points. The Eno River and several tributaries feed Lake Michie, the Little River Reservoir, and Falls Lake – all are part of the drinking water supply system. On the South side of the County, the New Hope Creek and several tributaries feed Lake Jordan, which is part of the Cape Fear River Basin. All river levels are controlled by dams and flood gates. Therefore high water flooding in these areas is unlikely. Still, they are considered as having a potential threat from flooding. Digital images of the Durham County 100-year flood plain and FEMA Flood Insurance Rate Maps (FIRMs) are available from FEMA, Durham County Emergency Management and Durham County GIS. New flood plain maps produced by FEMA and North Carolina Emergency Management recently became available.

There are no known critical facilities in either the 100 or 500-year flood plain!

There may be X Zones included in the estimates below. Elevation, discharge, and flow were not calculated and location information was extrapolated only from within the boundary of the 100-year flood plain. The following are maximum numbers for planning purposes and analysis only, Structural counts listed below are approximate and based upon a manual count of structures in the flood plain using the Durham County GIS system. It was often difficult to determine if the structure was a habitable structure or large outbuilding. Address information could not be obtained at this time. Q3 data is not available for Durham County. New mapping projects for flood purposes are expected in 2005.

* Damage estimates that may result from a catastrophic 100-year flood event:

Effect	Loss
Structural Damage	\$37,530,000
Non-structural (i.e. vehicles, boats, etc.)	\$2,900,000
Contents	\$550,000
Lost inventory	Not Calculated
Relocation losses (cost of relocating population)	\$24,000,000
Capital losses	Not Calculated
Wages lost	\$2,500,000
Retail income losses	Not Calculated
Total Potential Losses	\$67,480,000

Dams in Durham County

As of June 6, 2004, the Department of Environment and Natural Resources lists 83 structures on the Dam Inventory List for all of Durham County. Many of these structures are in rural areas with minimal risk to the public at large. Those identified by the state as being of low hazard have not been included in this analysis. However, within the County, 22 structures are deemed high hazard with another 18 identified as

being of intermediate hazard. The remaining 43 structures are of low hazard. Those within unincorporated Durham County are depicted on the appropriate Critical Facilities Maps for the designated Geographic Planning Areas.

**** Dams listed in Durham County**

Identification Number	Dam Name	Surface area (in acres)	Across – body of water
DURHA-001	Crystal Lake Dam	9.0	Eno River-Tributary (Tr)
DURHA-002	Quail Roost Lake Dam #2		Mountain Creek-Tr
DURHA-003	Quail Roost Lake Dam #3		Mountain Creek-Tr
DURHA-004	Quail Roost Lake Dam #1	4.0	Mountain Creek
DURHA-005	Newcomb Lake Dam	20.0	Seven Mile Creek
DURHA-006	Lakewinds Dam	11.0	Flat River-Tr
DURHA-007	Mcfarland Lake Dam	7.0	Flat River-Tr
DURHA-008	Lake Michie Dam	460.0	Flat River
DURHA-009	Sykes Lake Dam	13.0	Cabin Branch-Tr
DURHA-010	Hester Pond Dam #2		Camp Creek-Tr
DURHA-011	Hester Lake Dam #1	6.0	Camp Creek-Tr
DURHA-012	Allen Lake Dam	8.0	Northeast Creek-Tr
DURHA-013	Twin Lake Dam #1	10.0	Little Lick Creek-Tr
DURHA-014	Twin Lake Dam #2	10.0	Little Lick Creek-Tr
DURHA-015	Bailey Lake Dam		Little Lick Creek-Tr
DURHA-016	Little Lake Unity Dam		Chunky Pipe Creek-Tr
DURHA-017	Lake Unity Dam		Chunky Pipe Creek-Tr
DURHA-018	Petty Lake Dam		Neuse River-Tr
DURHA-019	Lake Shore Dam	19.0	Stirrup Iron Creek-Tr
DURHA-020	Durham Wildlife Club Lake Dam	9.0	Kit Creek-Tr
DURHA-021	Lake Elton Dam	13.0	Northeast Creek-Tr
DURHA-022	Parkwood Lake Dam	25.0	Northeast Creek
DURHA-023	Lakehurst S/D Dam	5.0	Northeast Creek-Tr
DURHA-024	Straford Lake Dam #2	6.0	Third Fork Creek-Tr
DURHA-025	Straford Lake Dam #1	6.0	Third Fork Creek-Tr
DURHA-026	Cook Lake Dam	6.0	Third Fork Creek-Tr
DURHA-027	Eden Lake Dam	15.0	Little River-Tr
DURHA-028	Matthews Pond Dam	0.8	New Hope Creek-Tr
DURHA-029	Matthews Lake Dam	12.0	New Hope Creek-Tr
DURHA-030	Few Lake Dam	6.0	New Hope Creek-Tr
DURHA-031	Bay Meadows Lake Dam	8.0	Morgan Creek-Tr
DURHA-032	Thompson Lake Dam		Little Creek-Tr
DURHA-033	Clark Lake Dam	4.0	New Hope Creek-Tr
DURHA-034	Cole Lake Dam	9.0	Eno River-Tr
DURHA-035	Willowhaven Lake Dam #2	7.0	Seven Mile Creek
DURHA-036	Willowhaven Lake Dam #1	5.0	Eno River-Tr
DURHA-037	Chandler Lake Dam	4.0	Little Lick Creek-Tr
DURHA-038	General Electric #1 Dam	3.0	Stirrup Iron Creek

Identification Number	Dam Name	Surface area (in acres)	Across – body of water
DURHA-039	General Electric Dam #2	8.0	Stirrup Iron Creek
DURHA-040	Van Trine Lake Dam	2.0	New Hope Creek-Tr
DURHA-041	Quail Roost Fox Hound Lake Dam #1	2.0	Mountain Creek-Tr
DURHA-042	Quail Roost Fox Hound Lake Dam #2	2.0	Mountain Creek-Tr
DURHA-043	Quail Roost Fox Hound Lake Dam #3	2.0	Mountain Creek-Tr
DURHA-044	Dairy Pond Dam	3.6	Eno River-Tr
DURHA-045	Boles Lake Dam	6.4	Eno River-Tr
DURHA-046	Little River Dam		Little River
DURHA-048	Georgiade Dam	2.0	Sandy Creek-Os
DURHA-053	Page Dam	4.0	Lick Creek-Tr
DURHA-054	Perry Dam	3.5	Laurel Creek-Tr
DURHA-055	Edwards Pond Dam	1.5	Northeast Creek-Tr
DURHA-062	Spring Hill Dam		New Hope Creek-Tr
DURHA-067	I B M Pond Dam		Burden Creek-Tr
DURHA-068	Sykes Pond Dam		Stirrup Iron Creek-Tr
DURHA-069	Cotton Pond Dam		Stirrup Iron Creek-Tr
DURHA-070	Cornwall Pond	4.0	Lick Creek-Tr
DURHA-071	Parrish Pond Dam		Little Briar Creek-Tr
DURHA-089	Baldwin Dam		Ellerbe Creek-Tr
DURHA-092	John Shaw Pond	5.0	Lick Creek-Tr
DURHA-098	Jordan Dam	3.0	Dial Creek-Tr
DURHA-102	Waller Pond Dam	1.0	Mud Creek-Tr
DURHA-103	Page Dam	3.0	Little Briar Creek-Tr
DURHA-104	Stone Throw Apartments Pond Dam		Burdens Creek-Tr
DURHA-105	Niehs Lake Dam		Burdens Creek-Tr
DURHA-106	Eno West Point Dam		Eno River
DURHA-107	Infinity Rd Raw Water Res.	10.0	Cabin Branch-Tr
DURHA-108	Weaver Pond Dam		Ellerbe Creek-Tr
DURHA-109	Wrightenberry Pond Dam	4.0	Little Lick Creek-Tr
DURHA-110	R.L. Hicks Dam	3.0	Little Lick Creek-Tr
DURHA-111	C.B. Weatherly Pond	3.0	Lick Creek-Tr
DURHA-112	Hardscrabble Dam		Little River-Tr
DURHA-113	WDNC Dam	2.0	Ellerbe Creek
DURHA-114	Grove Park Dam		Crooked Creek
DURHA-115	N. Durham Quarry East Dam		
DURHA-116	N. Durham Quarry West Dam		
DURHA-117	Hock Dam		Eno River-Tr
DURHA-118	Oxford Commons Dam		Eno River-Tr
DURHA-119	Glaxo Dam		Northeast Creek-Tr

Available Flood Insurance Rate Maps (FIRMs)



Hazard Vulnerability Assessment

Forest / Wildfires:

General information index. Also see current hazard Mitigation

Wildfires, also known as forest fires, are a naturally occurring hazard that faces every Community. While they do occur naturally, usually started by lightning, more often the cause is man-made: improperly campfires, a smoldering cigarette or sparks from someone burning brush or trash.

The North Carolina Department of Environment and Natural Resources, Division of Air Quality says, "there are a lot of misunderstandings about air burning in North Carolina. Some people think it is okay to burn trash in barrels because they have always done it that way. It's not! Others think it is always okay to burn leaves and branches in the fall, but that is not so in cities and counties that pick up yard waste."

The North Carolina Department of Environmental and Natural Resources, Division of Air Quality enforces the state open burning rules and many local governments have additional restrictions on outdoor fires. Violating rules can be expensive, not just in fines (up to \$10,000) but in the cost for other fires that may result. Our local fire departments respond to dozens of "woods fires" every year as does the North Carolina Division of Forest Resources (NCDFR is also known as the Forestry Service).

Naturally occurring dead trees or dying trees in our forests and on other public and private property often adds fuel to a fire and as the fuel builds up from ice storms, drought, pine beetle damages, tornadoes and hurricanes (Fran, 1996) the risk for significant wildfires increases. From 2000 to 2004, Durham County experienced several small wildfires. The entire County and all citizens have the potential to experience loss from wildfire. There are, however, specific areas of concern: residential build-up, fuel build-up, access, terrain, and suppression water supply to cite the most serious.

The North Carolina Division of Forest Resources, under the Department of Environment and Natural Resources, has the responsibility for protecting state and privately owned forest land from forest fires. The program is managed on a cooperative basis with the counties. All one-hundred counties participate in the forest fire protection program. Emphasis in the fire program include fire prevention efforts; presuppression activities (including extensive training of Division and non-Division personnel); aggressive suppression efforts on all wildfires; and law enforcement follow-up.

Staff assistance in forest fire control is provided to the field units by the Forest Protection Section Fire Staff, consisting of a Program Head, Senior Staff Forester for Training, Staff Forester for Operations & B.R.I.D.G.E (Young Offenders Forest Conservation Program), Staff Forester for Research and Development and a Law Enforcement Staff of four investigators.

The Division has a very extensive training program in forest fire protection. The National Interagency Incident Management System (NIIMS) training courses are used in all fire organization and fire behavior training. The Incident Command System (ICS) is used to organize and manage all forest fires. The ICS is an all risk organization designed to organize and manage all natural and man-caused disasters other than wars and civil disturbances. Maintaining a well trained, proficient forest fire control organization is very similar to maintaining a well trained Army. New personnel are constantly being trained to replace veterans that are retiring or leaving the program due to promotions, transfers, or disability. Veteran fire fighters periodically undergo refresher training in suppression tactics, strategy, organization, and management.

Hazard Vulnerability Assessment

Chemical: Fixed Facilities and Hazardous Materials

Emergency planning from the Durham County Local Emergency Planning Committee is available for the following facilities determined by S.A.R.A. (Title III) to hold reportable quantities of extremely hazardous materials. This planning information is available through the Durham County Office of Emergency Management.

The listing is as complete as possible as of March 1, 2006. The listing is only for facilities that have reported. Additional companies report under Title III, but none use extremely hazardous substances. Information regarding these facilities, as well as Tier II reports, are available for inspection through the Durham County Office of Emergency Management and the Durham County Local Emergency Planning Committee (LEPC) and was part of this assessment for research purposes.

Extremely hazardous substances (EHS), are those materials defined in Appendix A of the Federal Register, Volume 52, Entitlement is "The list of Extremely Hazardous Substances and Their Threshold Planning Quantities.

Extremely Hazardous Materials Durham County

List of EPA-Regulated Facilities

Tri Facility Id	Facility Information	Facility Name	Address	County Name	Submissions
27709RCSPC11TRI	View Facility Information	AIRCO Special Gases	11 Triangle Drive Research Triangle Park, NC 27709	Durham	3
27702STHCH2000E	View Facility Information	Brenntag Southeast Incorporated	2000 East Pettigrew Street Durham, NC 27703	Durham	115
27703CRRSR4600S	View Facility Information	Cree Research Incorporated	4600 Silicon Drive Durham, NC 27703	Durham	10

Tri Facility Id	Facility Information	Facility Name	Address	County Name	Submissions
27709GLXNC5MOOR	View Facility Information	GlaxoSmithkline	5 Moore Drive Research Triangle Park, NC 27709	Durham	6
27709BM 3039C	View Facility Information	International Business Machine	3039 Cornwallis Road Research Triangle Park, NC 27709	Durham	13
27709JMCSNONEIN	View Facility Information	JMC (USA), Inc.	1 Innovation Drive, P.O. Box 12138 Durham, NC 27709	Durham	32
27701LGGTTWESTM	View Facility Information	Liggett Group Incorporated	700 West Main Street Durham, NC 27701	Durham	22
27709SCMMT2601W	View Facility Information	Scm Metal Products Incorporated dba OMG Americas	2601 Weck Drive Research Triangle Park, NC 277092166	Durham	69
27702STHRN901MA	View Facility Information	Southern States Feed Mill	901 Mallard Avenue Durham, NC 27701	Durham	27
27709SMTML78ALE	View Facility Information	Sumitomo Electric Lightwave Corporation	78 Alexander Drive Research Triangle Park, NC 27709	Durham	9
27701HNYWL921HO	View Facility Information	Tecstar Electro Systems Division	921 Holloway Street Durham, NC 27702	Durham	9

Hazard Vulnerability Assessment

Chemical – Transportation

General information index Also see current hazmat mitigation measures.

Durham County has U.S. Highways, North Carolina highways and secondary roads. The N. C. Department of Motor Vehicles estimates 75,000 vehicles pass on Interstate I-85 in Durham County, according to the Annual Average Daily Traffic count.

Highway System – Durham County

I-85	I-40	I-540
US 15	US 501	NC 98
NC 54	NC 55	NC 157
NC 147	NC 751	

For the purposes of planning the vulnerability to this hazard is divided into two groups: Critical Facilities and Commercial and Residential structures. There are overlaps of facilities and residential neighborhoods in each corridor. Often highways intersect and/or parallel one another.

It should be noted that while the overall area is high, the population in the corridor is high, and the potential for occurrence is high (See Hazard Vulnerability Assessment – Table 4 for rating), the potential to effect the entire population in each corridor is low. Hazardous materials spills or leaks generally do not affect areas larger than a one-mile perimeter and or one mile down wind.

Hazard Vulnerability Assessment

Hurricanes:

General information index. Also see current hazard mitigation measures.

Durham County has experienced the inland effects of a hurricane. Perhaps the most memorable hurricane to directly affect the area was Hurricane Fran in 1996. Other storms however have had impacts ranging from flooding to “spin-off” tornadoes, storm surge, high winds. Generally these storms effect the entire population. Past effects have been direct devastation to homes and businesses as well as public buildings and utilities. Hurricane Fran resulted in structural and non-structural (i.e. power distribution system) damages over \$8 million dollars. One traffic death was recorded in Durham County as a direct cause of a hurricane, but most deaths that occur from hurricanes occur from inland flooding. Freshwater floods accounted for more than half (59% of U.S. hurricane deaths over the past 30 years. Those floods are why 63% of U.S. hurricane deaths during that period occurred in inland counties.

This vulnerability assessment assumes worst case, Category 5 hurricane that travels the entire length or width of the County:

Population	Per Capita Income	Average Housing Value (2000)	Historical Storm Losses
249,654 (2006 est)	\$23,156.00 (2003)	\$129,000.00	N/A

** Potential Economic Impact from a Category 1 hurricane, or equivalent wind event 20% population affected

Structural Damage	\$56,330,000
Non- structural (i.e. power distribution systems, etc.)	\$179,470,000
Contents	\$74,670,000
Lost inventory	\$3,930,000
Relocation losses (cost of relocating population)	\$57,640,000
Capital losses	\$26,200,000
Wages lost	\$31,440,000
Retail income losses	\$22,270,000
Total Potential Losses	\$451,192,000

*** Potential Debris generated from a Category 1 hurricane or equivalent wind event.

Total Cubic Yards	435,831
Total Acres needed to bury	45

Storage acres needed	27
Processing acres needed	18
Woody Debris (cubic yards)	130,749
Construction and demolition debris (cubic yards)	305,082
Burnable debris (cubic yards)	128,134
Soil debris (cubic yards)	15,254
Metals (cubic yards) – possible recycle	45,762
Land filled debris (cubic yards)	115,931
Minimum cubic yards potential (+/- 30%)	305,082
Maximum cubic yards potential (+/- 30%)	566,580

Source – NC Department of Commerce Economic Development Information System

** HAZUS Information Data base – FEMA – Dunn and Bradstreet 1994. Adjusted to 2002 by 31%. Worst-case scenario.

*** Debris management program mathematical formulas – FEMA – NCDem – GCEM – 1999.

Hazard Vulnerability Assessment

Terrorist Activity (including biological, unknown and weapons of mass destruction)

General information Index. Also see current Mitigation measures



The Defense Against Weapons of Mass Destruction Act – 1966 Defines weapons of mass destruction as “any weapon or device that is intended, or has the capability, to cause death or serious bodily injury to a significant number of people through the release, dissemination, or impact of – (A) toxic or poisonous chemicals or their precursors; (B) a disease organism; or (C) radiation or radioactivity.” President Clinton’s Executive Order 12938 – entitled “Proliferation of Weapons of Mass Destruction” – of November 14, 1994 also defines weapons of mass destruction to be “nuclear, biological, and chemical weapons.” (NBC)

The first recorded use of biological agents was by the Romans, using dead animals to foul the water supply of their enemies. The modern history of biological warfare starts during World War One followed with specialized programs in 1918 by the Japanese formation of a special section of the Japanese Army (Unit 731) dedicated to biological weapons. The thought at the times was “Science and technology are the keys to winning the war and biological weaponry is the most cost effective.” The U.S. program of biological warfare started in 1942.

Biological and chemical warfare and the use of chemical and biological weapons is now expressly forbidden by United Nations treaty. Recent events in our country have made us re-examine the realistic threat to all communities.

Direct attacks such as the Oklahoma City bombing of the Murrah Federal Building are considered acts of domestic terrorism. The attacks on the World Trade Center in 2001 were acts of international terrorism. Attacks can take many forms. They are all designed to literally terrorize citizens by disrupting the civil form of government we enjoy in the United States of America.

While Durham County has not been affected to date by direct attacks, there have been events linked to domestic and international terrorism. No recommendations are included in the development of this portion of the mitigation plan and an in-depth analysis would have to be performed. It should be emphasized that no structure is 100% secure and that all citizens and all areas are subject to the effects of terrorism even if the event does not occur in Durham County. Numerous local citizens were traumatized by the events at the World Trade Center, the Pentagon and in Pennsylvania on September 11, 2001. The incidents of anthrax being sent through the mail in other parts of the country had citizens in Durham County so

concerned, many would not open their mail and dozens of cases of suspicious white powder were reported and responded to by local emergency responders. No positive results for anthrax contamination were found in Durham County.

***Population**

Population	Per Capita Income	Total Terrorism-related losses in previous 10 year period
249,654 (2006 est)	\$23,156.00 (2003)	\$0

There is no known method or model to project physical and economic losses in a terrorism event. However, if all critical facilities in the County were destroyed in a worst case scenario or rendered unsafe, losses can be generally calculated as below.

Structural Damage	\$109,404,246
Non- structural (i.e. power distribution systems, etc.)	\$9,000,000
Contents	\$4,550,000
Lost Inventory	\$3,930,000
Relocation losses (cost of relocating to temporary facilities)	\$69,564,000
Capital losses	Unknown
Wages lost (60 day period)	\$3,984,000
Retail income losses	Unknown
Total Potential Losses	\$200,432,246

Source NCDC EDIS

Hazard Vulnerability Assessment

Severe Thunderstorms:

General information index. Also see Current Hazard Mitigation.

Thunderstorms are underrated in the damage, injury, and death they can bring. As lightning moves through the atmosphere, it can generate temperatures up to 54,000 degrees Fahrenheit. This intense heating generates shockwaves, which turn into sound waves, thus generating thunder.

Warm, humid conditions encourage thunderstorms as the warm, wet air updrafts into the storm. As warm, moisture rich air rises; it forms cumulus nimbus clouds, thunderstorm clouds, usually with a flattened top or an anvil shape, reaching to 40,000 feet or more. If this air is unstable, the conditions are right to cause hail, damaging winds and tornadoes.

As a thunderstorm grows, electrical charges build up within the clouds. Oppositely charged particles exist at the ground level. These forces become so strong that the air's resistance to electrical flow is overcome. The particles from both top and bottom then race towards each other to complete a circuit. Charge from the ground then surges upward at nearly one third the speed of light to produce lightning.

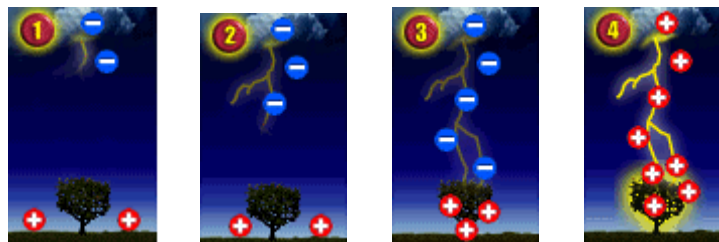


Figure Source: USA TODAY

Each year lightning kills an average of 66 people, mostly during the spring/summer season. Typical thunderstorms last anywhere from one-half to 1 hour. Most lightning strikes occur in the afternoon, 70% occur between noon and 6:00pm. This is because as air temperatures warm, evaporation increases. Sundays have 24% more deaths from lightning than any other day, followed by Wednesday. Lightning reports reach their peak in July.

Men are hit by lightning four times more often than women. Men account for 84% of lightning fatalities and 82% of injuries. However, the actual number of deaths and injuries due to lightning have decreased over the last 35 years. This is attributed to improved forecasts and warnings, better lightning awareness, more substantial buildings, socioeconomic changes, and improved medical care.

In the United States, the National Weather Service recorded 3,239 deaths and 9818 injuries due to lightning strikes between 1959 and 1994. Only 20% of lightning strikes cause immediate death. 70% of lightning strike victims that survive experience residual effects, most commonly affecting the brain (neuropsychiatric, visual, and auditory). These effects can develop slowly. Lightning strike victims have typically been walking in an open field or swimming before they are struck. Other lightning victims have been holding metal objects such as golf clubs, fishing poles, hayforks, or umbrellas.

Damage to property from direct or indirect lightning can take the form of an explosion, a burn, or destruction. Damage to property has increased over the last 35 years. This is probably due to increased population. The National Weather Service recorded 19,814 incidents of property damage between 1959 and 1994. Yearly losses are estimated at \$35 million by the National Weather Service. This amount is compiled from newspaper reports, but many strikes are not reported. The National Lightning Safety Institute estimates damages at \$4 to \$5 billion. This information is compiled from insurance reports and other sources that keep track of weather damages.

Thunderstorm winds also cause widespread damage and death. Thunderstorm 'straight line' wind occurs when rain-cooled air descends with accompanying precipitation. A thunderstorm is considered severe when winds exceed 57.5 mph. At the very extreme, winds of 160 mph have been recorded. These winds can smash buildings and uproot and snap trees, and are often mistaken for tornadoes.

'Downbursts' can occur during a thunderstorm. This is an excessive burst of wind that is sometimes confused with tornadoes. Downbursts are defined as a surface wind in excess of 125 mph caused by a small-scale downdraft from the base of a convective cloud. A downburst occurs when rain-cooled air within a convective cloud becomes heavier than its surroundings. Since cool air is heavier than warm air, it rushes toward the ground with a destructive force; exactly what triggers the sudden down rush is still unknown. A downburst appears to strike at a central point and blow outwards. (Picture a bucket of water dashed against grass. If it hits straight on, the grass will be flattened in a circular pattern. If it hits at an angle, the grass will be flattened in a teardrop pattern). Downbursts resulted in 268 deaths and 8 related accidents between 1974 and 1982.

Downbursts can be further classified into two categories:

Microburst: Less than 2 1/2 miles wide at the surface, duration less than 5 minutes and winds up to 146 miles per hour.

Macroburst: Greater than 2 1/2 miles wide at the surface, duration of 5-30 minutes with winds up to 117 miles per hour.

Durham County has experienced severe thunderstorms. Many hazardous weather events are associated with thunderstorms. Fortunately, the area affected by any one of them is fairly small and – most of the time- the damage is fairly light. Lightning is responsible for many fires each year, as well as causing deaths when people are struck. Under the right conditions, rainfall from thunderstorms causes flash flooding. Hail up to the size of softballs damages cars and windows, and kills wildlife caught out in the open. Strong (up to more than 120 mph) straight-line winds associated with thunderstorms knock down trees and power lines. Straight-line winds are often thought to be tornadoes because of their often-violent destruction. Tornadoes (with winds up to about 300 mph) can destroy all but the best-built man-made

structures. Therefore the number of thunderstorms and the potential for a variety of other weather events makes this hazard one of the most potentially devastating.

To a limited degree, potential thunderstorm development is predictable, as is the possible track of storms likely to produce severe thunderstorms and super-cell thunderstorms. While super-cell storms are very rare, they are possible. It is also possible that a super-cell or other severe thunderstorm can develop and strike any facility, business or residential area. **The entire County, including the municipality are vulnerable, as is the entire population.** Reasonable expectation however would be for storms of considerably less intensity, resulting in a considerable reduction in the calculations below. This assessment assumes multiple severe thunderstorms producing at least one super-cell producing straight-line winds of maximum magnitude of 120 miles per hour. It should be noted that these damages are approximate to an F2 tornado.

*** Population**

Population	Per Capita Income	Total storm losses in previous 10 year period
249,654 (2006 est)	\$23,156.00 (2003)	\$100,000.00

**** Estimated / Potential Economic Impact from a catastrophic wind event**

Structural Damage	\$18,776,000
Non-structural (i.e. power distribution systems, etc.)	\$59,823,000
Contents	\$24,890,000
Lost inventory	\$1,310,000
Relocation losses (cost of relocating population)	\$19,213,000
Capital Losses	\$8,733,000
Wages lost	\$10,480,000
Retail income loss	\$7,423,000
Total Potential Losses	\$150,648,000

***** Estimated / Potential Debris generated from a severe thunderstorm which generates a F2 tornado.**

Total Cubic Yards	174,332
Total Acres needed to bury	18
Storage acres needed	11
Processing acres needed	7
Woody Debris (cubic yards)	52,299
Construction and demolition debris (cubic yards)	122,033
Burnable debris (cubic yards)	51,254
Soil debris (cubic yards)	6,102
Metals (cubic yards) – possible recycle	18,305
Land filled debris (cubic yards)	46,372
Minimum cubic yards potential (+/- 30%)	122,033
Maximum cubic yards potential (+/- 30%)	226,632

****** Potential Death and injury totals in a severe thunderstorm**

Deaths	Serious Injury
50	100

* Source – NC Department of Commerce Economic Development Information System

** HAZUS Information Data Base-FEMA – Dunn and Bradstreet 1994. Adjusted to 2002 by 31%. Worst-case scenario.

*** Debris Management program mathematical formulas – FEMA – NCDem – GCEM – 1999

**** Based on historical information 1950 – 2000 – Tornado Project Online (www.tornadoproject.com).

Hazard Vulnerability Assessment

Tornadoes:

General information index. Also see Current Hazard Mitigation. See the Durham County tornado history map.



Durham County, like much of North Carolina, has had experience with tornadoes in recent history. The most recent out break of tornado activity was in 1998. Tornadoes recorded or suspected in Durham County have been of the F0 to F2 class. Research of tornadoes in Durham County has shown that each “section” of the County (north, south, east and west) has experienced this violent type of storm. History has also shown the type of tornado-experienced displays a narrow path or track with duration of less than one (1) minute. Damage estimates have averaged less than \$500,000 per storm.

There have been no deaths or serious injuries in the ten-year period.

To a limited degree, the potential for tornado development is predictable, as is the possible track of storms likely to produce tornadoes. The National Weather Service in Raleigh issues tornado watches and warnings.

While F5 Tornadoes are very, very rare, they are possible. It is also possible that a tornado can develop and strike any facility, business or residential area (an F4 tornado hit Raleigh and Wake County in 1988). The entire County, including the municipality are vulnerable, as is the entire population. Reasonable expectation would be for tornadoes of considerably less intensity, resulting in a considerable reduction in the calculations below. A key point to remember is the size of a tornado is not necessarily an indication of its intensity.

This vulnerability assessment assumes worst case (F5) that travels the entire length or width of the County:

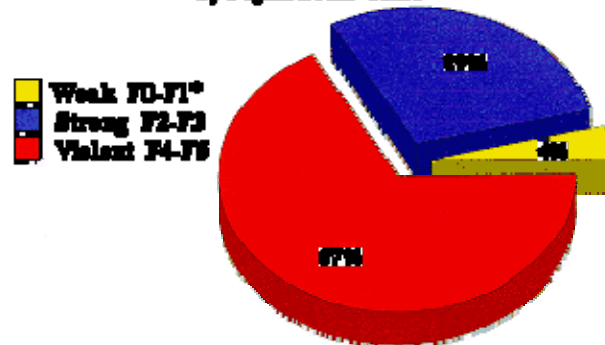
* Population

Population	Per Capita Income	Total storm losses in previous 10 year period
249,654 (2006 est)	\$23,156.00 (2003)	\$600,000.00

The "Percentage of Tornado-Related Deaths 1950-1994" pie chart shows that while violent tornadoes are few in number, they cause a very high percentage of tornado-related deaths. The Tornado Project has analyzed data prior to 1950, and found that the percentage of deaths from violent tornadoes was even greater in the past. This is because the death tolls prior to the introduction of the forecasting/awareness programs were enormous: 695 dead (Missouri-Illinois-Indiana, March 18, 1925); 317 dead (Natchez, Mississippi, May 7, 1840); 255 dead (St. Louis, Missouri and East St. Louis, Illinois, May 27, 1896); 216 dead (Tupelo, Mississippi, April 5, 1936); 203 dead (Gainesville, GA, April 6, 1936). No single tornado has killed more than 50 people since 1971.

Provided by: *The Tornado Project*

**Percent of Tornado Related Deaths 1950-1994
by Fujita Scale Class**



** Potential Economic Impact from an F5 tornado, catastrophic wind event or earthquake

Structural Damage	\$56,330,000
Non-structural (i.e. power distribution systems, etc.)	\$179,470,000
Contents	\$74,670,000
Lost inventory	\$3,930,000
Relocation losses (cost of relocating population)	\$57,640,000
Capital Losses	\$26,200,000
Wages lost	\$31,440,000
Retail income loss	\$22,270,000
Total Potential Losses	\$451,192,000

***** Potential Debris generated from an F5 tornado or catastrophic wind event.**

Total Cubic Yards	435,831
Total Acres needed to bury	45
Storage acres needed	27
Processing acres needed	18
Woody Debris (cubic yards)	130,749
Construction and demolition debris (cubic yards)	305,082
Burnable debris (cubic yards)	128,134
Soil debris (cubic yards)	15,254
Metals (cubic yards) – possible recycle	45,762
Land filled debris (cubic yards)	115,931
Minimum cubic yards potential (+/- 30%)	305,082
Maximum cubic yards potential (+/- 30%)	566,580

****** Potential Death and injury totals from an F5 tornado or catastrophic wind event**

Deaths	Serious Injury
50	100

Hazard Vulnerability Assessment

Winter Storms:

General information index. Also see Current Hazard Mitigation.



Photo courtesy of Jim Rimkunas and James Weismuller (NOAA / NWS)

Durham County, as well as the municipality, has experienced severe winter storms. The most memorable storm in recent history was the ice storm of December 5 2002, with thousands without power for a week and one reported death. The ice storm in 1996 left several thousand citizens without electric power for up to nine days. Shelters were opened and some roads were impassable for up to four days. Considerable disruption to business, industry, schools

and government services occurred.

Winter storms in Durham County have inherent problems and often considerable costs associated with snow and ice removal or clearing, shelters that may have to be opened, numerous traffic accidents, power outages, and citizens who will lack proper food supplies or adequate heat. Citizens also inappropriately use a variety of heating devices that can and do cause fires. Some even cause toxic fumes to build up in a

residence that can lead to death. Death can result from a fire itself, toxic gases or when no heat is present, hypothermia.

The entire County and the entire population is vulnerable to a severe winter storm.

*** Population**

Population	Per Capita Income	Historical storm losses
249,654 (2006 est)	\$23,156.00 (2003)	\$.00

**** Estimated / Potential Economic Impact from catastrophic ice storm**

Structural Damage	\$8,776,000
Non-structural (i.e. power distribution systems, etc.)	\$18,823,000
Contents	\$1,000,000
Lost inventory	\$1,310,000
Relocation losses (cost of relocating population)	\$2,213,000
Capital Losses	\$8,733,000
Wages lost	\$10,480,000
Snow and ice removal	\$4,500,000
Total Potential Losses	\$55,835,000

* Source – NC Department of Commerce Economic Development Information System

** Source – Durham County FEMA DSRs 94/96 adjusted to 2002 values.

Hazard and Vulnerability Mitigation

Coordination, Maintenance and Approval:

Coordination shall be the responsibility of the Durham County Office of Emergency Management (EM). In this role, EM is responsible for organizing meetings and agendas, arranging technical assistance, gathering pertinent documents for distribution and compiling recommendations for the Task Force. The County Manager, or his designee, serves as the Task Force Chair, unless it is determined that those duties need to be assumed by another member of the Task Force. The County Manager will make the final presentation to the Board of Commissioners for adoption of the Hazard Mitigation Plan. The City Manager will be responsible for making their presentation to the City Council. The County Manager and City Manager may elect for the contractor to present the plan to the various elected bodies. It is the intent of the County and the municipality that this plan be a “living” document that can and will be updated and modified as often as necessary or required.

The plan will be reviewed annually and it shall be the responsibility of the Mitigation Task Force Chair to conduct this review. Administrative changes, wording corrections, hazard analysis or other such portions of the Mitigation Plan, do not require additional action by the County Board of Commissioners or City Council. However, changes that may have a significant impact or significant expenditure of non-budgeted funds may require action by respective elected bodies. In such cases, it is the responsibility of the Mitigation Task Force Chair to render judgment whether the change or modification to the Mitigation Plan, will require such action. Whenever possible, changes will be made electronically. A signed and dated approval sheet shall accompany each printed copy of the plan. Resolutions of adoption will be kept on file with the County Clerk to the Board of Commissioners and the respective municipal city clerk. At a minimum, the plan will be updated every five (5) years by the Hazard Mitigation Task Force, and or as required under 44CFR201.6© (4) (i). Plan updates will be submitted to the NC Hazard Mitigation Officer and FEMA for approval.

The public will be kept informed of proposed changes, modifications, reviews and updates to the plan by advertising that such updates, modifications and reviews are being considered. This advertisement shall

be in the form of newspaper articles, legal notices (as required), radio and via internet. The public will be invited to participate in accord with the open meeting laws of North Carolina. Public comments, suggestions, recommendations and other input will be received by the Durham County Emergency Management Coordinator or during public meetings, as local ordinance requires or as otherwise directed by the Mitigation Task Force Chair.

Data Used and legal documents included:

A variety of documents, including legal measures, have been examined and included as part of the overall mitigation plan. Where appropriate, the source of information has been cited and included. To avoid duplication of documents that currently exist on County or City websites, some of the references below are links to documents on City or County websites. A connection to the Internet is necessary to access these documents. Some files require Adobe Reader to view. Documents listed below were used as reference and research documents.

Critical facility and building information
Durham Growth Management Plan
NFIP (National Flood Insurance Program) maps
North Carolina Administrative Code (15A NCAC 02B.0243)
SBCCI Standard for Flood Plain Management (SSTD 4-89)
NCGS 162B Continuity of Local Government in an Emergency
Federal Requirements for Local Hazard Mitigation Plans (44 CRF 201.6)
NC Mitigation Plan Minimum Requirements 0 NCHMW – NCDEM
Durham City-County Uniform Development Ordinance (UDO)

Data Developed:

Data has been developed via information from the Durham City-County Planning Department and other organizations, including FEMA and the North Carolina Division of Emergency Management. The jurisdictions jointly developed information regarding critical facilities. This information included the address, the general function, back-up power availability, and approximate square footage of the main facility as well as approximate replacement cost, including contents. Durham County feels that with this data it can be better prepared to mitigate effects of potential hazards that may affect some or all of the operations of government. Additional data was developed regarding hazards and placed into a hazard matrix that can quickly be examined regarding the potential of the hazard and the efforts that need to be put forward to address each hazard level (high, medium, or low). Supporting information regarding these specific threats was also obtained from local records, map development, data development, Internet sources, the National Weather Service, the State of North Carolina, DOT, Forest Service, FEMA and others.

Vulnerability analysis was conducted with the best possible information available, using a number of sources for information such as HAZUS, National Weather Service (NWS), Tornado Project, ChemInfo, HazardPro, Division of Emergency Management and Department of Transportation information. Legal data was obtained from Durham City-County Planning, Durham Code Enforcement and North Carolina General Statutes (NCGS), North Carolina Administrative Code and from the codifying agency for Durham City and County. Developing this information in a digital format was challenging but with assistance from the various departments including Administration it was carried out. Some legal data was retyped and/or excerpted for sake of brevity. The entire mitigation plan was formatted into an interactive digital form by a private company (EPLAN LLC) and numerous documents that accompany this plan were formatted to operate seamlessly in the plan. This development includes the ability to update the plan and to print copies of the plan or otherwise reproduce it as appropriate as well as placing it on internet or intranet computer servers, at the discretion of the County and City.

Additional data regarding recommendations for strengthening local law or local building practices have been developed as a part of this plan and upon approval of the Durham County Board of Commissioners and the Durham City Council will become an active part of this plan. As part of the data that was developed, Durham County and Durham City have examined their history and records and have

determined, based upon this information, that there are no known repetitive loss facilities or structures in the flood plain (100 and 500 year). There are no repetitive loss facilities or structures in other hazard concerns identified in this plan.

Durham County and Durham City developed or had developed a number of other documents relative to County and City plans. These included development plans, mitigation plans, growth plans, and projections, demographics and more. Many of these documents are unique to the respective jurisdiction. These documents, either by reference or in their entirety have been included as part of this plan.

Need to modify current measures: (Durham County)

Durham County feels it has strong measures to help mitigate many hazards. Most of these measures are found in the local ordinance, North Carolina law or Federal code or regulations. County ordinances have been examined in detail by the Hazard Mitigation Task Force and are found adequate regarding flood damage mitigation, especially the adoption of The Durham County Flood Damage Prevention Ordinance. The County is an active participant in the National Flood Insurance Program (NFIP) (370085). Building codes is rigidly enforced. "Hurricane strapping" has been found to be of minimal value in this region of the state when weighed against the expense and the added cost to new home construction and is not required by building code, nor recommended as individual voluntary measures.

There are no known hazardous chemical manufacturing facilities in Durham County. Many facilities (as listed in the Durham County Emergency Operations Plan, LEPC) are users of hazardous materials. Most facilities involved in such activity or storing hazardous materials are required by the Superfund Authorization and Reauthorization Act (S.A.R.A.) Title III to report quantities of such materials. Mitigation efforts have taken place for the past decade to (1) eliminate the use of such chemicals by the manufacturer or (2) encourage the manufacturer to use chemical alternatives that are less injurious and more environmentally favorable. *There is a need to closely monitor the importation of hazardous materials and their use.* Planning is mandated for all extremely hazardous substances reported under Title III. This has been carried out and reviews are held annually with companies that continue the use of such products. Mitigation efforts continue routinely to address this important task of reducing the amount and type of chemicals being used or stored.

At this time Durham County does not have an immediate need to alter its current mitigation measures, however, Durham County will continue its review of legal, regulatory or voluntary measures on an ongoing basis and modifications may be made accordingly. Changes to goals and objectives will be a coordinated effort and based on the planning process outline previously covered in this document. Recommendations for new goals and objectives are found in Mitigation Strategy.

City of Durham. The City of Durham has numerous strong mitigation measures in place and those have been incorporated into Current Mitigation Measures. Durham has gone to great lengths to ensure that it has quality hazard mitigation and has developed some initiatives that are unique to the City as well as a joint mitigation strategy to develop and implement those initiatives. It has developed a flood plain management ordinance that is similar to that of the County. The Uniform Development Ordinance identifies "built-in" mitigation efforts as well as penalties, including total stop work provisions.

The City of Durham participates with the County on many levels and one of those is the area of Emergency Management. The Emergency Management coordinator for the County also serves the City. The City has and continues to participate in exercises for preparedness. The City is an active participant in the National Flood Insurance Program (NFIP) (370086) and has adopted a flood damage prevention ordinance that regulates many areas of development and reduces the vulnerability to this particular hazard.

Industries in the corporate limits of Durham that use chemicals, requiring reporting under S.A.R.A. Title III, report this information to Durham County Emergency Management and the Fire Department. There are a few facilities in that report as an EHS (extremely hazardous substances) facility. These facilities are listed

in the Durham County Emergency Plan and planning process, as required under Title III, is on file in the office of Emergency Management.

At this time the City of Durham feels that it does not have an immediate strong need to significantly alter its current mitigation measures. Periodic monitoring and reporting of progress is required to ensure that Plan goals and objectives are kept current and that local mitigation efforts are being accomplished. The Durham County Multi-Jurisdictional Hazard Mitigation Plan shall be reviewed annually, or more often as the local situation may require following a disaster declaration, to ensure that progress is being made on achieving stated goals and objectives. The Plan will also undergo periodic evaluation and updates as required by FEMA and the State.

A. Annual Review / Progress Report

The County Manager/City Manager shall direct the Hazard Mitigation Planner to take responsibility for conducting the annual review. The annual review shall include the re-initiation of the hazard mitigation team planning process utilized during development of the plan. The team will include representatives of all affected County and City departments.

The general public will be notified through a variety of media, including but not limited to the local newspaper, the Durham County website, and mailed or emailed notices, of the review process and the opportunity to comment on the Plan review.

The annual review shall ensure:

1. That the Task Force receives an annual report and/or presentation on the progress of Plan implementation; the report includes a status report on the implementation of mitigation actions.
2. That the County Commissioners and City Council receives an annual report and/or presentation on the progress of Plan implementation along with a recommendation from the Hazard Mitigation Planning Committee regarding on-going implementation of the Plan.
3. The annual report includes an evaluation of the effectiveness and appropriateness of the mitigation actions included in the Plan.
4. The annual report recommends, as appropriate, any necessary revisions or amendments to the Plan.

If the County Board of Commissioners determines that the recommendations warrant amendment of the Plan, the Board may initiate an amendment through the process described below.

B. Periodic Plan Review and Update

Periodic evaluation and revision of the Plan will help ensure that local mitigation efforts include the latest and most effective mitigation techniques. These periodic revisions may also be necessary to keep the Plan in compliance with Federal and State statutes and regulations. The Plan will need to be updated to reflect changes, such as new development in the area, implementation of mitigation efforts, revisions of the mitigation processes, and changes in Federal and State statutes and regulations.

In the context of a Federal disaster declaration, State and local governments are allowed to update or expand an existing plan to reflect circumstances arising out of the disaster. An updated plan in this circumstance might include a re-evaluation of the hazards and the jurisdiction's exposure to them, a re-assessment of existing mitigation capabilities, and new or additional mitigation recommendations.

The Plan shall be reviewed at a minimum every five (5) years to determine if there have been any significant changes that would affect the Plan. Increased development, increased exposure to certain hazards, the development of new mitigation capabilities or techniques, and changes to Federal or State legislation may affect the appropriateness of the Plan.

The plan will be updated at a minimum every five (5) years and will be forwarded to NCEM and FEMA for review and approval.

Review of the Plan

The procedure for reviewing and updating the Plan shall begin with a report prepared by the Hazard Mitigation Planner and submitted to the Task Force for consideration and recommendation to the Board of Commissioners and City Council. The report shall include a summary of progress on implementation of hazard mitigation strategies and a recommendation, as appropriate, for any changes or amendments to the Plan.

The review shall include an evaluation of the effectiveness and appropriateness of the Plan. Specifically, the evaluation shall involve a review of the consistency of day-to-day land use decisions to determine if the hazard mitigation policies are being implemented. The review shall recommend if plan amendments are warranted and if any revisions to regulatory tools (zoning, land development regulations, etc.) are necessary to assist in implementing the policies of the Plan.

If the Board of Commissioners or the City Council determines that such report raises issues that warrant modification of the Plan, or if the Task Force recommends that issues have been raised which warrant modification of the Plan, the Board or Council may initiate an amendment as delineated below, or may direct the County or City Manager to undertake a complete update of the Plan.

Procedure for Amending the Plan

An amendment to the Plan shall be initiated by the Board of Commissioners or City Council either at its own initiative or upon the recommendation of the Task Force, the Hazard Mitigation Planner, or any other City or County agency who demonstrates that an amendment should be considered.

Upon initiation of a text or map amendment, the Hazard Mitigation Planner shall re-convene the hazard mitigation task force and notify other interested parties as described in the Annual Review/Progress Report subsection above. The team will consider any proposed amendment(s) which shall then be forwarded to affected parties, including, but not limited to, County departments, City Departments, and other interested agencies such as the North Carolina Division of Emergency Management, the United States Army Corps of Engineers, and the Federal Emergency Management Agency for a ninety (90) day review and comment period.

At the end of the comment period, the proposed amendment(s) shall be forwarded along with all review comments to the Task Force for consideration. If no comments are received from the reviewing department or agency within the specified review period, such shall be noted in the report to the Task Force.

Task Force Review and Recommendation

The Task Force shall review the proposed amendment(s), the report and recommendation of the Hazard Mitigation Planner, and any comments received from other local governments and State and Federal agencies. The Task Force shall submit a recommendation on the proposed amendment to the Board of Commissioners and City Council within sixty (60) days. Failure of the Task Force to submit a recommendation within this time period shall constitute a favorable recommendation.

In deciding whether to recommend approval or denial of an amendment request, the Hazard Mitigation Planning Committee shall consider whether the proposed amendment is necessary based upon one or more of the following factors:

1. There are errors or omissions made in the identification of issues or needs during the preparation of the original Plan;
2. New issues or needs have been identified which were not adequately addressed in the original Plan;
3. There has been a change in projections or assumptions from those in the original Plan.

Board of Commissioners / City Council Review and Approval

Upon receiving the recommendation of the Task Force, the Board of Commissioners / City Council shall hold a public hearing. The Boards shall review the Task Force recommendation (including the factors delineated above), the report and recommendation from the Hazard Mitigation Planner, and any oral or written comments received at the public hearing. Following that review, the Board shall take one of the following actions:

1. Adopt the proposed amendment as presented or with modifications,
2. Deny the proposed amendment,
3. Refer the amendment request back to the Task Force for further consideration, or
4. Defer the amendment request for further consideration and/or hearing.

Durham County Vital Facility List (Critical Facilities)

Updated: June 2004

Vital Facilities are defined for the purpose of this document as those facilities essential to the preservation of life and property during a disaster and or those facilities critical to the continuity of government as well as those necessary to ensure timely recovery. Some square footage dimensions are approximate. The methodology used to calculate replacement costs is outlined below.

Durham County Government Office Building	Durham Community College (all facilities)
Durham County Court	Durham Schools (all facilities)
Durham County Sheriff's Department	Durham County School Bus Garage
Durham County Detention Facilities	Electric Distribution System
Durham County Communications (EOC) Center	City Office Buildings (all facilities)
Durham County Solid Waste Facility	Fire Department (all stations)
Durham County Health Department	Police Department (all stations)
Durham County Dept of Social Services	Water Filtration Plant / WWT (all facilities)
Durham County Emergency Medical Service (all stations)	Garage/Equipment Shed (all facilities)
Durham County Animal Control	Civic Center
Durham County General Services	NC Department of Transportation (all facilities)
County Volunteer Fire Departments (all stations)	NC Highway Patrol station

Medical Centers (all facilities)

There are no vital facilities, structures (public or private) that are known to have repetitive losses*. Common losses have been incurred in utility distribution systems, but these losses have not always been at the same locations and are therefore not considered repetitive. There are no known residential or commercial structures that have experienced repetitive losses. The **methodology** used to calculate replacement value was based on (1) current tax records available at the time, (2) land values, (3) value of contents based upon records. These figures were combined and elevated to year 2003 values, based on current local property valuation. It should be emphasized the figures in the "replacement value" column of each table are *only* estimates and would have to be recalculated for actual loss at the time such loss occurred.

* Repetitive Losses – sites that have had repeated claims or losses from the same hazard.

VITAL FACILITY LIST

The **Durham County Government Office Building**, encompasses numerous County agencies, including the County Managers' office, County Commission meeting area, Finance, Purchasing, Clerk to the Board, Tax Assessor, Tax Collector, Human Resources, Switchboard, Veterans Service, GIS/Mapping, Elections, Information Systems, Emergency Management, Emergency Communications and other local government agencies. Each of these departments is critical to the continuity of County government.

Vital Facility Name	Address		Operates 24/7 Y/N	Has Generator Y/N	Approx. Square Footage	Replacement Value
Old County Courthouse	Main St	Durham, NC	Y (lt Only)	Y (lt Only)	109,136	N/A

The **Durham County Courthouse** is the main facility for all court operations in Durham County and includes offices Clerk of Superior Court, courtrooms for both District and Superior Court. It also houses judges' chambers, Finance Office, County Manager, Tax Collector, Tax Assessor, Mapping, Maintenance, US House of Representative and offices for the District Attorney.

Vital Facility Name	Address	Operates 24/7 Y/N	Has Generator Y/N	Approx. Sq. Footage	Replacement Value
Judicial Building	Main Street, Durham, NC	Y	Y	141,562	N/A

City Hall. This facility houses a number of city offices including administration, light and water billing, planning, codes enforcement, mayors office, personnel and the police department.

Vital Facility Name	Address	Operates 24/7 Y/N	Has Generator Y/N	Approx. Sq. Footage	Replacement Value
Camden Avenue Tower	Camden Avenue Durham, NC 27704	Y	N	N/A	\$400,000
Campus Hills Recreation Center	Alston Ave Durham, NC 27702	N	N	34,000	\$5,100,000
City Hall	City Hall Plaza Durham, NC 27702	N	N	126,514	\$15,181,680
City/County Planning	Mangum Street Durham, NC 27702	N	Y	56,877	\$5,687,700

Durham County Sheriff's Office These vital facilities are the main law enforcement buildings for the County. They have full generator back up power as well as radio remote. The facility is operated 24/7. The facility has back-up communications in the form of two-way radio.

Agency	Address	Is the facility operated 24/7? (yes/no)	Does the facility have a generator (yes/no)	Facility main phone number	Approximate Square footage	Replacement Value
Sheriff Eastern Satellite	Wake Forest Highway	Y	Y	N/A	3,038	N/A
Sheriff South Satellite	Old Page Road	Fuel Tank Only	N	N/A	0	N/A
Sheriff North Satellite	Highway 501	Y	Y	N/A	2,946	450,000

Durham County Dept of Social Services: Provides assistance to citizens in many forms including food stamp program, etc. It houses mostly office space and some small conference room space.

Agency	Address	Is the facility operated 24/7? (yes/no)	Does the facility have a generator (yes/no)	Facility main phone number	Approximate Square footage	Replacement Value
Dept. Of Social Services	Main Street	N	N	N/A	43,776	N/A

City Fire Departments Provide general and specialized fire and emergency response. VFD's are contracted to provide service to the County.

Agency	Address	Operated 24/7? (yes/no)	Does the facility have a generator (yes/no)	Approximate Square footage	Replacement Value
Fire Admin.	Club Blvd.	N	N	22450	2,918,500
Fire Maintenance	Camden	No	No	8,991	481,000
Fire Station #10	Cole Mill Rd.	Yes	Yes	4,450	225,500
Fire Station #1	Morgan St.	Yes	Yes	18,000	1,800,000
Fire Station #11	Cornwallis Rd.	Yes	Yes	5,328	532,800
Fire Station #12	Carpenter Fletcher	Yes	Yes	5,328	532,800
Fire Station #2	Ninth St.	Yes	Yes	16,644	1,076,200
Fire Station #3	Miami Boulevard	Yes	Yes	6,750	845,000
Fire Station #4	Riddle Rd.	Yes	Yes	6,750	845,000
Fire Station #5	Chapel Hill Rd.	Yes	Yes	5,348	534,800
Fire Station #7	Duke Street	Yes	Yes	5,130	443,000
Fire Station #9	Club Blvd.	Yes	No	2,970	240,000
Fire Station #13	Miami Boulevard	Yes	Yes	6,750	845,000
Fire Station #14	Umstead Rd.	Yes	Yes	6,750	845,000
Fire Station #6	Swathmore St.	Yes	Yes	5,626	562,600
Fire Station #8	Lick Creek	Yes	Yes	6,750	845,000

County Fire Department. There is generally one main station associated with each fire department. The station houses general fire fighting equipment, sleeping quarters and training areas. The main station also houses administration. Each facility has back-up communications in the form of two-way radio.

Agency	Address	Is the facility operated 24/7? (yes/no)	Does the facility have a generator (yes/no)	Approximate Square footage	Replacement Value
Bahama Fire Station #1	Bahama Rd.	Y	Y	4350	500,000
Bahama Fire Station #2	US Hwy 501	Y	Y	6500	400,000
Bethseda Fire Station #1	Miami Blvd.	Y	Y	9800	750,000
Bethseda Fire Station #2	Leesville Rd.	Y	Y	3655	250,000
Lebanon Fire Station #1	Russell Rd.	Y	Y	5000	400,000
Parkwood Fire Station #1	Seaton Rd	N/A	N/A	N/A	N/A
Parkwood Fire Station #2	Farrington Rd.	N/A	N/A	N/A	N/A
Parkwood Fire Station #3	Old Page Rd.	N/A	N/A	N/A	N/A
Redwood Fire Station #1	Cheek Rd.	N/A	N/A	N/A	N/A
Redwood Fire Station #2	Hamlin Rd.	N/A	N/A	N/A	N/A
Redwood Fire Station #3	Wake Forest Hwy.	N/A	N/A	N/A	N/A

Durham County Schools

Agency	Address	Is the facility operated 24/7? (yes/no)	Does the facility have a generator (yes/no)	Facility main phone number	Approximate Square footage	Replacement Value (includes contents)
Burton Geo-World Magnet School	1500 Mathison St. Durham, NC 27701	No	N/A	560-3908	N/A	N/A
Eno Valley Elementary	117 Milton Rd. Durham, NC 27712	No	N/A	560-3915	N/A	N/A
Fayetteville St. Lab Elementary	2905 Fayetteville St. Durham, NC 27707	No	N/A	560-3944	N/A	N/A
George Watts Elementary	700 Watts St. Durham, NC 27701	No	N/A	560-3947	N/A	N/A
C.C. Spaulding Biosphere Magnet	1531 S. Roxboro Rd. Durham, NC 27707	No	N/A	560-3974	N/A	N/A

Agency	Address	Is the facility operated 24/7? (yes/no)	Does the facility have a generator (yes/no)	Facility main phone number	Approximate Square footage	Replacement Value (includes contents)
Y.E. Smith Science & Tech. Magnet Elementary	2410 E. Main St. Durham, NC 27703	No	N/A	560-3900	N/A	N/A
Little River Elementary	2315 Snow Hill Rd. Durham, NC 27712	No	N/A	560-3940	N/A	N/A
Merrick-Moore Elementary	2325 Cheek Rd. Durham, NC 27704	No	N/A	560-3952	N/A	N/A
Pearsontown Year-Round Elementary	4915 Barbee Rd. Durham, NC 27713	No	N/A	560-3964	N/A	N/A
Glenn Elementary	2415 E. Greer St. Durham, NC 27704	No	N/A	560-3920	N/A	N/A
Eastway Elementary	610 Alston Ave. Durham, NC 27701	No	N/A	560-3910	N/A	N/A
Mangum Elementary	9008 Quail Roost Rd. Bahama, NC 27503	No	N/A	560-3948	N/A	N/A
Parkwood Elementary	5207 Revere Rd. Durham, NC 27713	No	N/A	560-3962	N/A	N/A
Lakewood Lab Elementary	2520 Vesson Ave. Durham, NC 27707	No	N/A	560-3939	N/A	N/A
Morehead Montessori Elementary	909 Cobb St. Durham, NC 27707	No	N/A	560-3954	N/A	N/A
Easley Elem. School	302 Lebanon Cir. Durham, NC 27712	No	N/A	560-3913	N/A	N/A
Forest View Elementary	3007 Mt. Sinai Rd. Durham, NC 27705	No	N/A	560-3932	N/A	N/A
Oak Grove Elementary	3810 Wake Forest Rd. Durham, NC 27703	No	N/A	560-3960	N/A	N/A
W.G. Pearson Lab Elementary	600 E. Umstead St. Durham, NC 27701	No	N/A	560-3988	N/A	N/A
Bethesda Elem.	2009S. Miami Blvd. Durham, NC 27703	No	N/A	560-3904	N/A	N/A
Club Boulevard	400 W. Club Blvd. Durham, NC 27704	No	N/A	560-3918	N/A	N/A
R.N. Harris	1520 Cooper St. Durham, NC 27703	No	N/A	560-3967	N/A	N/A
Hillandale	2730 Hillandale Rd. Durham, NC 27705	No	N/A	560-3924	N/A	N/A
Holt	4019 Holt School Rd. Durham, NC 27704	No	N/A	560-3928	N/A	N/A
Hope Valley	3005 Dixon Rd. Durham, NC 27707	No	N/A	560-3980	N/A	N/A
E.K. Powe	913 9 th St. Durham, NC 27705	No	N/A	560-3963	N/A	N/A

Agency	Address	Is the facility operated 24/7? (yes/no)	Does the facility have a generator (yes/no)	Facility main phone number	Approximate Square footage	Replacement Value (includes contents)
Southwest	2320 Cook Rd. Durham, NC 27713	No	N/A	560-3972	N/A	N/A
Chewing Middle Sch.	6819 Red Mill Rd. Durham, NC 27704	No	N/A	560-3914	N/A	N/A
Lowe's Grove Middle School	4418 S. Alston Ave. Durham, NC 27713	No	N/A	560-3946	N/A	N/A
Rogers-Herr Middle School	911 Cornwallis Rd. Durham, NC 27707	No	N/A	560-3970	N/A	N/A
Githens Middle School	4800 Chapel Hill Rd. Durham, NC 27707	No	N/A	560-3966	N/A	N/A
Carrington Middle School	227 Milton Rd. Durham, NC 27704	No	N/A	560-3916	N/A	N/A
Neal Middle School	201 Baptist Rd. Durham, NC 27704	No	N/A	560-3955	N/A	N/A
Shepard Middle School	2401 Dakota St. Durham, NC 27707	No	N/A	560-3938	N/A	N/A
Brogden Middle School	1001 Leon St. Durham, NC 27704	No	N/A	560-3906	N/A	N/A
Southern High School	800 Clayton Rd. Durham, NC 27703	No	N/A	560-3968	N/A	N/A
Durham School of the Arts	400 N. Duke St. Durham, NC 27701	No	N/A	560-3926	N/A	N/A
Lakeview School	3507 Dearborn Dr. Durham, NC 27704	No	N/A	560-2520	N/A	N/A
Northern High School	117 Tom Wilkinson Rd. Durham, NC 27712	No	N/A	560-3956	N/A	N/A
J.D. Clement Early College	712 Cecil St. Durham, NC 27707	No	N/A	530-7793	N/A	N/A
Jordan High	6806 Garrett Rd. Durham, NC 27707	No	N/A	560-3912	N/A	N/A
Riverside High School	3218 Rose of Sharon Rd. Durham, NC 27712	No	N/A	560-3965	N/A	N/A
Hillside High School	3727 Fayetteville St. Durham, NC 27707	No	N/A	560-3925	N/A	N/A
Duke University	P.O. Box 3039 Durham, NC 27710	No	N/A	684-5684	N/A	N/A
Durham Technical Community College	Durham, NC	No	N/A	N/A	N/A	N/A
North Carolina Central University	Durham, NC	No	N/A	N/A	N/A	N/A

Agency	Address	Is the facility operated 24/7? (yes/no)	Does the facility have a generator (yes/no)	Facility main phone number	Approximate Square footage	Replacement Value (includes contents)
Watts School of Nursing	Durham, NC	No	N/A	N/A	N/A	N/A

Police Department: Headquarters provides law enforcement services for the jurisdiction of the County/city. This facility houses Durham 9-1-1 Center as well as after hours and emergency contact for light and water operations. Offices include those for patrol, investigations, narcotics, records and administration. Each facility has back-up communications in the form of two-way radio.

Agency	Address	Is the facility operated 24/7? (yes/no)	Does the facility have a generator (yes/no)	Facility main phone number	Approximate Square footage	Replacement Value
Police Dist. 1	Holloway St. Durham	Yes	No	N/A	6400	LEASE
Police Dist. 2	Northgate Mall, Durham	Yes	No	N/A	3280	LEASE
Police Dist. 3	Lakewood Shop. Ctr., Durham	Yes	No	N/A	5500	LEASE
Police Dist. 4	Pilot St. Apt. A-7	Yes	No	N/A	3400	LEASE
Police Dist. 5	Chapel Hill St.	Yes	Yes	N/A	In police HQ	LEASE
Police Headquarters	Chapel Hill St.	Yes	Yes	N/A	75,629	7,562,900

NC State Highway Patrol Office (state office) Provides offices for the highway patrol, Troop F. This office is commanded locally by a First Sergeant. In addition, it houses administration for the local troop, as well as offices and facilities for the drivers license division of the NC Department of Motor Vehicles. The facility has back-up communications in the form of two-way radio in SHP vehicles.

Agency	Address	Is the facility operated 24/7? (yes/no)	Does the facility have a generator (yes/no)	Facility main phone number	Approximate Square footage	Replacement Value
NC DMY /HWY Patrol	South Miami Blvd	N/A	N/A	N/A	N/A	N/A

Durham County Detention Facilities (Jail) This vital facility is the central detention center for the County. It is a brick and mortar high security building.

Agency	Address	Is the facility operated 24/7? (yes/no)	Does the facility have a generator (yes/no)	Facility main phone number	Approximate Square footage	Replacement Value
Durham County Detention Facility	Magnum	Durham County	Y	Y	290,919	N/A
Jail Annex	Main Street	Durham County	N	N	38,385	N/A

Communications Maintenance - Provides routine and emergency maintenance and repairs on the fleet radios

Agency	Address	Is the facility operated 24/7? (yes/no)	Does the facility have a generator (yes/no)	Approximate Square footage	Replacement Value
Communications Maintenance Building	Camden Avenue Durham, NC 27704	N	Y	5800	437000
Durham 911	Chapel Hill Rd Durham, NC 27701	Y	Y	See Pol. HQ	N/A

Durham City Solid Waste Facility This vital facility would supply the City with almost all debris management in the event of a disaster that generated such debris.

Agency	Address	Is the facility operated 24/7? (yes/no)	Does the facility have a generator (yes/no)	Facility main phone number	Approximate Square footage	Replacement Value
Solid Waste Landfill Office	East Club Blvd.	No	No	N/A	B. 1,680	C. \$57,080
Sanitation (Solid Waste)	Camden Ave	N/A	N/A	N/A	N/A	N/A

Durham County Health Department: Provides health and related services and is the agency responsible for communicating information to the public regarding biological issues and other health issues. The facility has limited back-up communications in the form of two-way radio, cell phones and paging.

Agency	Address	Is the facility operated 24/7? (yes/no)	Does the facility have a generator (yes/no)	Facility main phone number	Approximate Square footage	Replacement Value
Durham County Health Dept.	Main Street	Y (Drugs)	Y (Portable)	N/A	73,000	N/A

Durham County Emergency Medical Service Has two bases of operation. The main base is located on Stadium Drive. This facility not only houses EMS units 24/7, but also houses offices for the director, supervisor, training officer and the billing division. Each facility has back-up communications in the form of two-way radio.

Agency	Address	Is the facility operated 24/7? (yes/no)	Does the facility have a generator (yes/no)	Facility main phone number	Approximate Square footage	Replacement Value
Durham County EMS Main	Stadium Drive	Y	Y	N/A	10,370	850,000
Durham County EMS Duke Base	Pratt St	Y	Y	N/A	73,000	N/A
Durham County EMS Holloway	Holloway St	N	N	N/A	37,872	N/A
Durham County EMS Dfd Station 5	Chapel Hill Rd	Y	Y	N/A	10,325	N/A
Durham County EMS Lincoln Base	Fayetteville	Y	Y	N/A	1,864	N/A
Durham County EMS 6 & Trng	Milton Rd	Y	Y	N/A	7,805	600,000
Durham County EOC	Broad St	Y	Y	N/A	6215	500,000

Durham City Garage (fleet maintenance) Provides routine and emergency maintenance and repairs on the County vehicular fleet. Without this facility and the repairs and maintenance it carries out the fleet of vehicles operated by various agencies would deteriorate quickly.

Agency	Address	Is the facility operated 24/7? (yes/no)	Does the facility have a generator (yes/no)	Facility main phone number	Approximate Square footage	Replacement Value
Fleet Maintenance	Camden Ave Durham, NC 27704	N	Y	N/A	37,700	3,016,000
DATA Maintenance	Faye St Durham, NC	Y	Y	N/A	50,000	10,000,000

Pump Stations

Agency	Address	Is the facility operated 24/7? (yes/no)	Does the facility have a generator (yes/no)	Facility main phone number	Approximate Square footage	Replacement Value
Bren Rose Circle Pump Station	Bren Rose	N/A	N/A	N/A	N/A	N/A
Cedar Creek Dr. Pump Station	Cedar Creek	N/A	N/A	N/A	N/A	N/A

Agency	Address	Is the facility operated 24/7? (yes/no)	Does the facility have a generator (yes/no)	Facility main phone number	Approximate Square footage	Replacement Value
Central Park Pump Station	Miami Boulevard	N/A	N/A	N/A	N/A	N/A
Cooksbury Pump Station	Cooksbury	N/A	N/A	N/A	N/A	N/A
Data General Pump Station		N/A	N/A	N/A	N/A	N/A
Davis Drive Pump Station	Davis Drive	N/A	N/A	N/A	N/A	N/A
Dearborne Pump Station	Dearborne Drive	N/A	N/A	N/A	N/A	N/A
Duke Lane Pump Station	Old Oxford Highway	N/A	N/A	N/A	N/A	N/A
East End Ave Pump Station	East End Ave.	N/A	N/A	N/A	N/A	N/A
Eno Pump Station New	Nello Teer Quarry	N/A	N/A	N/A	N/A	N/A
Finley Rd Pump Station	Finley St	N/A	N/A	N/A	N/A	N/A
Fletcher's Chapel Pump Station	Fletcher's Chapel	N/A	N/A	N/A	N/A	N/A
Frazier Forest Pump Station	Freeman Rd	N/A	N/A	N/A	N/A	N/A
Glenn Road Pump Station Number 1	Wayburn	N/A	N/A	N/A	N/A	N/A
Glenn Road Pump Station Number 2	Wayburn	N/A	N/A	N/A	N/A	N/A
Goodwin Road Pump Station	Goodwin Road	N/A	N/A	N/A	N/A	N/A
Greer Street Pump Station	Greer Street	N/A	N/A	N/A	N/A	N/A
Guess Rd Pump Station	Guess Rd	N/A	N/A	N/A	N/A	N/A
Heritage Dr. Pump Station	Hillock	N/A	N/A	N/A	N/A	N/A
Hickory Drive Pump Station	Hickory Drive	N/A	N/A	N/A	N/A	N/A
Hwy 70 Pump	Hwy 70	N/A	N/A	N/A	N/A	N/A
Influent Pump	Hyw 55	N/A	N/A	N/A	N/A	N/A
Landis Dr. Pump Station	Chancer Dr	N/A	N/A	N/A	N/A	N/A
Latravail Pump Station	Old Oxford	N/A	N/A	N/A	N/A	N/A
Lockhaven Hills Pump Station	Lockhaven	N/A	N/A	N/A	N/A	N/A

Agency	Address	Is the facility operated 24/7? (yes/no)	Does the facility have a generator (yes/no)	Facility main phone number	Approximate Square footage	Replacement Value
National Driving Pump Station		N/A	N/A	N/A	N/A	N/A
Northern Pumpstation	Northgate Road	N/A	N/A	N/A	N/A	N/A
Page Point Pump Station	Page Road Exit	N/A	N/A	N/A	N/A	N/A
Page Road Pump Station	Emperial	N/A	N/A	N/A	N/A	N/A
Plantation Pump Station	Plantation Dr	N/A	N/A	N/A	N/A	N/A
Rivermont Pump Station	Rivermont	N/A	N/A	N/A	N/A	N/A
Rose Of Sharon Pump Station	Misty Morning	N/A	N/A	N/A	N/A	N/A
Slater Road Pump Station	Slater Road	N/A	N/A	N/A	N/A	N/A
Snow Hill Road Pump Station	Snow Hill Road	N/A	N/A	N/A	N/A	N/A
Sparger Rd Pump Station	Sparger	N/A	N/A	N/A	N/A	N/A
Stage Road Pump Station	State Rd	N/A	N/A	N/A	N/A	N/A
Stirrup Creek Pump Station	Page Road	N/A	N/A	N/A	N/A	N/A
Trapp Hill Pump Station	Cole Mill Rd	N/A	N/A	N/A	N/A	N/A
Trey Burn Pump Station Number 3	Vintage Hill	N/A	N/A	N/A	N/A	N/A
Trey Burn Pump Station Number 1	Teknika	N/A	N/A	N/A	N/A	N/A
Trey Burn Pump Station Number 2	International Drive	N/A	N/A	N/A	N/A	N/A
Turnkey Pump Station	Keystone Drive	N/A	N/A	N/A	N/A	N/A
UNC TV Pump Station		N/A	N/A	N/A	N/A	N/A
Wellington Pump Station	Hillandale Rd	N/A	N/A	N/A	N/A	N/A

Water (source U.S. EPA Safe Water Drinking System) Water system replacement costs are not available. The entire system depends upon and includes numerous parts such as pumps, hydrants, elevated tanks and distribution line. The average replacement cost per mile of water line is estimated by local water distribution system professionals to be \$60,000.

Agency	Address	Is the facility operated 24/7? (yes/no)	Does the facility have a generator (yes/no)	Facility main phone number	Approximate Square footage	Replacement Value
Water Resources	Mist Lake	N/A	N/A	N/A	N/A	N/A
Brown Water Treatment Plant	Infinity Rd	N/A	N/A	N/A	N/A	N/A

NC Department of Transportation (state office) The district office complex provides office and shop space for this vital agency. NCDOT also has personnel and vehicles that can respond within reasonable periods to emergency roadway conditions. This agency also has snow removal and other debris removal equipment.

Agency	Address	Is the facility operated 24/7? (yes/no)	Does the facility have a generator (yes/no)	Facility main phone number	Approximate Square footage	Replacement Value
NC Dot Maintenance Yard	Guess Rd.	N/A	N/A	N/A	N/A	N/A

Medical Centers Provide general hospital care, emergency care and other hospital related functions. In addition to patient care, these facilities also houses offices for administration and non-patient care operations.

Agency	Address	Operated 24/7? (yes/no)	Generator (yes/no)	Main phone number	Approximate Square footage	Beds	Replacement Value
Veterans Adm Hospital	Fulton 508	Y	Y	N/A	N/A	N/A	N/A
Lincoln Community Health Ctr	Fayetteville St	N/A	N	N/A	N/A	N/A	N/A
Lennox Baker Children's Hospital	Erwin Rd.	N/A	N/A	N/A	N/A	N/A	N/A
Durham Regional Hospital	Roxboro Road	Y	Y	N/A	N/A	N/A	N/A
Duke Univ. Med. Ctr	Erwin Rd	Y	Y	N/A	N/A	N/A	N/A

Durham County School Bus Garage

Agency	Address	Is the facility operated 24/7? (yes/no)	Does the facility have a generator (yes/no)	Facility main phone number	Approximate Square footage	Replacement Value
School Maintenance Facility	Hamlin Road	N/A	N/A	N/A	N/A	N/A

Energy distribution system

Agency	Address	Is the facility operated 24/7? (yes/no)	Does the facility have a generator (yes/no)	Facility main phone number	Total distribution miles	Number of Customers Served	Replacement Value
Duke North		N/A	N/A	N/A	N/A	N/A	N/A
Duke Power Durham Main	Washington St	N/A	N/A	N/A	N/A	N/A	N/A
Duke Power East Durham Tie	Hamlin Rd	N/A	N/A	N/A	N/A	N/A	N/A
Duke Power Parkwood Tie	Scott King Rd	N/A	N/A	N/A	N/A	N/A	N/A
Duke South	Fulton	N/A	N/A	N/A	N/A	N/A	N/A

Water Reclamation Facilities

Agency	Address	Is the facility operated 24/7? (yes/no)	Does the facility have a generator (yes/no)	Facility main phone number	Total distribution miles	Number of Customers Served	Replacement Value
South Durham Water Reclamation	Farrington	Y	Y	N/A	N/A	N/A	N/A
North Durham Water Reclamation	Club Blvd	Y	Y	N/A	N/A	N/A	N/A
Triangle Waste Water Treatment Plant	Hwy 55 South	Y	Y				

Current Mitigation Measures - By Hazard

Durham County is fortunate to have a number of hazard mitigation efforts in place. Some exist as legal measures through local ordinance, state law or Federal regulation. A general outline of those efforts is listed by hazard. Many efforts overlap into multiple hazards to make Durham County and Durham City hazard resistant communities.

Durham County and Durham City continue to incorporate numerous mitigation measures through the processes of land use and development.

Drought	Hurricanes
Earthquake	Terrorist Activity
Floods	Thunderstorms
Forest Fires	Tornadoes
Hazardous Materials	Winter Storms

Other Mitigation Measures - Hazards, less than 1% Probability

Large Structural Fires	Power Failure	Mass Casualty	Landfill Fires
Tsunami	Landslides	Nor'easter	Dam Failures

Drought: General information regarding drought and the definition is available in the hazard identification index. Also see the vulnerability assessment for drought.

- A. Direct contact with the National Weather Service regarding drought predictions.
- B. Direct contact and consultation with NC Cooperative Extension Service regarding agriculture drought predictions.
- C. Monitor reservoirs and reservoir levels during dry periods.
- D. Private water companies monitor wells and storage tanks.
- E. Voluntary water conservation practices are put in place as necessary.
- F. Mandatory water conservation practices are put in place as necessary.
- G. Auxiliary water sources are identified.
- H. Maintains contact with the USGS regarding real time drought conditions and drought forecasts.
- I. Maintains contact with the NC Drought Monitoring Council regarding potential long-term conditions.

Earthquake: General information regarding earthquake and the definition is available in the hazard identification index. Also see the vulnerability assessment for earthquake hazard.

- A. Increased awareness of earthquake potential by local government officials.
- B. Increased awareness of earthquake potential by the public.
- C. Increased awareness of the availability of information from the USGS.
- D. Encouraged citizens to check for hazards in their home in accordance with FEMA publications.
- E. Encouraged homeowners to review insurance policies as part of an overall family disaster plan.
- F. Shelter agreements are in place via Red Cross to provide shelter operations.
- G. Encouraged citizens, business owners, and others to develop emergency preparedness plans, emergency response plans and emergency recovery plans.

Floods: General information regarding floods and the definition is available in the hazard identification index. Also see the vulnerability assessment for floods.

- A. Durham County (370164) is a participant in the FIRMS
- B. Flood Insurance Rate Maps (FIRMS) are available in the GIS offices.

- C. Durham County Flood Damage Prevention Ordinance
- D. SBCCI Standard for Flood Plain Management (SSTD 4-89)
- E. Greater awareness of public and private sector regarding flooding potential.
- F. Digital floodplain maps are now available to emergency management and other emergency planners and responders.
- G. Potential road closure listings from NC DOT are available.
- H. Access to and considerable cooperation from local broadcast media to warn the public of the potential for flooding. (EAS)
- I. Watches and warnings issued by the National Weather Service.
- J. Public education in flood potential and the availability of flood insurance.
- K. Public education programs regarding flooding and emergency management are conducted as often as possible or requested.
- L. Weather alert radios are in each school and day care center to provide early warning. Radios are also in use in many government agencies.
- M. Discouragement of the public and developers from developing property in flood zones.
- N. Shelter agreements are in place via Red Cross to provide shelter operations.
- O. Repeat loss locations are known so work can begin on further mitigation efforts.

Forest Fires: General information regarding forest fires and the definition is available in the hazard identification index. Also see the vulnerability assessment for forest fires.

- A. Public awareness of the causes of forest fires have helped reduce the overall number of occurrences.
- B. Direct contact with the District Forestry office that issues "fire potential" reports daily by radio.
- C. Burning bans are imposed and rigidly enforced as needed. Citations have been issued in the past.
- D. Education by fire marshals and fire departments, as well as the Department of Environment and Natural Resources has reduced outdoor burning of trash, reducing the number of forest fires.
- E. Aggressive training and response by local fire departments and state forestry are targeted to diminish acreage consumed by forest fires.
- F. Most fire departments are equipped (minimally) with specialized equipment to help fight forest fires.
- G. Fire safety education in schools is conducted by the Fire Marshals office and is coordinated with each participating fire department.
- H. NC Forestry responds to all reports of forest (or brush) fires and can therefore coordinate the response of Forestry resources directly, as needed.

Hazardous Materials: General information regarding hazardous materials and the definition is available in the hazard identification index. Also see vulnerability assessment for hazardous materials.

- A. Each fire department is trained to at least the "Awareness Level" under OSHA 1910.120 standards. Some personnel meet standards for "Operations level". Durham County has access to at least four persons trained at the technician level and over a dozen qualified trainers within a two hour response time.
- B. Community "Right to Know" is in place and has educated many members of the public regarding chemical hazards in the area.
- C. S.A.R.A. Title III is in place in Durham County and has been since 1988. Tier II reports are required annually from each company that keeps, stocks or maintains certain levels of hazardous chemicals. This information is shared with local fire departments, and upon request, to the public.
- D. Extremely Hazardous Substances (EHS) facilities are required by law to have pre-planning. These plans are reviewed by Emergency Management and/or the LEPC annually. There are several EHS facilities in Durham County.
- E. At least one NCDEM Regional Response Team (RRT) is within a two-hour response from Durham County.
- F. Durham County has a written statewide mutual aid agreement, executed on July 8, 2002.
- G. Durham County keeps a current list of spill clean up companies available to business, industry, transportation companies and emergency response personnel.
- H. Dispatch and response procedures are in place for all reports of chemical accidents.

- I. Emergency Management responds to hazardous materials calls upon request and is notified of all hazardous materials incidents in the County.

Hurricanes: General information regarding hurricanes and the definition is available in the hazard identification index. Also see the vulnerability assessment for hurricanes.

- A. Durham County Emergency Management participates in hurricane preparedness planning as a potential reception area for coastal evacuees as well as practical exercises and it assists in actual hurricane events when called upon by the State or through the mutual aid agreement signed by Durham County.
- B. Hurricane awareness information is presented to the public as often as possible or practical.
- C. Hurricanes are tracked in the EOC and by the Emergency Management Coordinator as they develop and government officials and the media are kept informed of the preparations of response forces.
- D. Response forces are experienced and well trained.
- E. Emergency plans are in place and exercised.
- F. Hurricane watches and warnings are issued by the National Weather Service and monitored by Emergency Management and the Emergency Operations Center.
- G. Watches and warnings are received via weather alert radios in schools and day care centers as well as many government offices.
- H. Watch and warning procedures to further alert agencies are carried out by emergency communications.
- I. Shelter agreements are in place via Red Cross to provide shelter operations.

Landfill Fires: General information regarding landfill fires and the definition is available in the hazard identification index.

- A. Procedures have been developed by the City Solid Waste Department to effectively extinguish the majority of fires.
- B. Practical experience as well as training has been conducted with many fire departments.
- C. Response procedures have been enhanced.
- D. Necessary equipment and manpower (through contractors) have been located as resources that can respond.
- E. Regulations at facilities prohibit the deposit of flammable liquids, chemicals or other such substances.
- F. The City Solid Waste Facility is inspected for and mitigation efforts installed to prevent methane gas buildup, thereby reducing the potential for fire.

Large Structural Fires: General information regarding large structural fires and the definition is available in the hazard identification index.

- A. Fire inspections are conducted as often as possible at businesses and industry by fire marshals on a schedule.
- B. Building evacuations must be posted.
- C. Fire extinguishers clearly marked, available, tested and recharged on a regular basis.
- D. Fire extinguisher use classes are taught as often as possible.
- E. NFPA standards and codes are followed.
- F. Fire code is rigidly enforced with citations issued for violations.
- G. Fire departments regularly conduct pre-plans for facilities, businesses and industry in their respective jurisdictions.
- H. Additional fire safety and fire education programs are conducted as often as possible.

Mass Casualty: General information regarding mass casualty and the definition is available in the hazard identification index.

- A. The hospitals have developed coordinated procedures to handle mass casualty incidents.
- B. Emergency Medical Services has developed a Mass Casualty plan.
- C. Plans are exercised on a regular basis.

- D. Training and exercises have been and continue to be conducted on mass casualty events including transportation, water, fixed facility, aircraft and schools.
- E. Inspections are conducted on new construction to insure compliance with building codes.
- F. Buildings are inspected regularly by fire marshals to ensure compliance with fire codes and ensure that fire exits are not locked or otherwise obstructed.
- G. Mutual aid agreements have been entered into that may assist in supplying additional resources in a mass casualty incident.

Other or Unknowns (biologics, disease, etc): General information regarding other or unknown hazards and the definition is available in the hazard identification index.

- A. The hospitals have developed coordinated procedures to handle infectious diseases and has an infectious disease coordinator.
- B. Training has been conducted with area responders and agencies regarding biological hazards.
- C. The Health Department, in conjunction with Emergency Management, area medical providers and others, is developing a bio-terrorism plan.
- D. The Health Department is in constant contact with state and Federal agencies regarding biological and disease threats.
- E. The Cooperative Extension Service has conducted training for government agencies and the public regarding foot and mouth disease and the procedures that have been developed to prevent an outbreak and procedures have been developed if an outbreak is detected.
- F. State laboratories have increased efforts to more quickly identify such threats or hazards.
- G. Durham County participates in the Health Alert Network.

Power Failure: General information regarding major power failures and the definition is available in the hazard identification index.

- A. Formal emergency plans are in place at both the local level and state level by the electric utility companies to restore power as quickly as possible.
- B. Electric power system personnel are available 24/7 in emergency situations.
- C. Response unit (fleet) maintenance programs are in place at each utility.
- D. Public education in the form of public program presentations, publications, brochures and flyers is distributed upon request by each electric utility, which includes 24-hour emergency contact and reporting information.
- E. 24-hour emergency dispatch of personnel to locate and resolve distribution problems.
- F. 24-hour telephone numbers available to the public.
- G. Pole maintenance programs, whereby distribution poles are inspected and if necessary replaced.
- H. Work plans in place to build new or upgrade substations.
- I. Right-of-Way maintenance programs, whereby right-of-ways are cleared of trees or other debris that may cause an outage.
- J. Media centers or information distributed to the public to keep the public informed regarding outages and the progress on repairs.
- K. Technical representatives are available upon request for the Emergency Operations Center.
- L. Contracted emergency assistance to provide supplies, equipment and manpower as part of an emergency plan.
- M. Installation of underground systems where feasible, cost effective or otherwise appropriate.

Terrorist Activity: General information regarding terrorist activity and the definition is available in the hazard identification index. Also see the vulnerability assessment for terrorist threats.

- A. The hospitals have developed coordinated procedures to handle infectious diseases and has an infectious disease coordinator.
- B. Training has been conducted with area responders and agencies regarding terrorist activity and potential biological hazards or other hazards, such as bombings.
- C. The Health Department, in conjunction with Emergency Management, area medical providers and others, is developing a bio-terrorism plan.

- D. The Health Department is in constant contact with state and Federal agencies regarding biological and disease threats.
- E. The Cooperative Extension Service has conducted training for government agencies and the public regarding foot and mouth disease and the procedures that have been developed to prevent an outbreak and procedures that have been developed if an outbreak is detected. These procedures are also developed for the poultry industry and flock diseases that may effect producers.
- F. State laboratories have increased efforts to more quickly identify such threats or hazards.
- G. Law enforcement has received additional training and awareness regarding terrorist activity with increased coordination between local, state and Federal law enforcement to exchange information.
- H. Response agencies have received additional training regarding terrorist potential.
- I. The public has been kept informed.
- J. Local response procedures have been developed for suspicious packages and or mail.
- K. Additional procedures and efforts have been made regarding mass casualty incidents that may result from a terrorist act.
- L. Increased levels of security or additional security measures have been put into place at many government facilities.

Thunderstorms: General information regarding thunderstorms and the definition is available in the hazard identification index. Also see the vulnerability assessment for thunderstorms.

- A. Close contact is maintained by telephone with the National Weather Service (NWS)
- B. Durham County Communications has the capability to monitor weather systems, as well as the potential intensity of the storms, via NWS and other electronic means.
- C. NWS issues watches and warnings to the public and government agencies.
- D. Public education continues to take place regarding watches and warnings.
- E. Weather alert radios have been placed in each school and day center as well as many government agencies.
- F. Access to and considerable cooperation from local broadcast media to warn the public of the potential for severe thunderstorms.
- G. When necessary the Emergency Action System (EAS) can be activated at the local level by appropriate officials.
- H. Power and or utility restoration plans and mitigation efforts are in place with the various electric utilities.
- I. Debris clearance, as required, can be requested from various agencies, including NC DOT.

Tornadoes: General information regarding tornadoes and the definition is available in the hazard identification index. Also see the vulnerability assessment for tornadoes.

- A. Close contact is maintained by telephone with the National Weather Service (NWS)
- B. Durham County Communications has the capability to monitor storms approaching the County, as well as the potential intensity of the storms.
- C. NWS issues watches and warnings to the public and government agencies.
- D. Public education continues to take place regarding watches and warnings.
- E. Weather alert radios have been placed in each school and day center as well as many government agencies.
- F. Access to and considerable cooperation from local broadcast media to warn the public of the potential for severe storms.
- G. When necessary the Emergency Action System (EAS) can be activated at the local level by appropriate officials.
- H. Power and or utility restoration plans and mitigation efforts are in place with the various electric utilities.
- I. Debris clearance, as required, can be requested from various agencies, including NC DOT.
- J. Emergency Management has conducted numerous "courtesy" inspections and recommendations regarding tornado shelters at area businesses.
- K. Backup warning systems exist, including call down lists. As many notification calls as possible are made prior to the entry of the storm system into the County, as an additional warning method.

- L. If necessary or appropriate, fire department sirens can be sounded as an additional warning method to the public.
- M. Broadcasts are made via all emergency radio frequencies to all emergency services agencies regarding watches and warnings.
- N. Shelter agreements are in place via Red Cross to provide shelter operations.

Winter Storms: General information regarding winter storms and the definition is available in the hazard identification index. Also see the vulnerability assessment for winter storms.

- A. Close contact is maintained by telephone with the National Weather Service (NWS)
- B. Durham County Communications has the capability to monitor storms approaching the County, as well as the potential intensity of the storms. Numerous other weather-monitoring stations are available to the communications center and the emergency operations center.
- C. NWS issues watches and warnings to the public and government agencies.
- D. Public education continues to take place regarding watches and warnings.
- E. Weather alert radios have been placed in each school and day center as well as many government agencies.
- F. Access to and considerable cooperation from local broadcast media to warn the public of the potential for severe storms.
- G. When necessary the Emergency Action System (EAS) can be activated at the local level by appropriate officials.
- H. Power and or utility restoration plans and mitigation efforts are in place with the various electric utilities.
- I. Debris clearance, as required, can be requested from various agencies, including NC DOT. Pre-determined routes for clearance are in place by NC DOT.
- J. Snow and ice removal methods are in place by the city and NC DOT.
- K. Backup warning systems exist, including call down lists. As many notification calls as possible are made prior to the entry of the storm system into the County, as an additional warning method.
- L. If necessary or appropriate, fire department sirens can be sounded as an additional warning method to the public.
- M. Broadcasts are made via all emergency radio frequencies to all emergency services agencies regarding watches and warnings.
- N. Shelter agreements are in place via Red Cross to provide shelter operations.

Community Capability Assessment

A community's capability assessment gauges their current position in relation to hazard mitigation as well as their ability to implement future mitigation measures. This section of the hazard mitigation plan evaluates current ordinances, programs, policies, and procedures that relate to hazard mitigation in order to determine a community's strengths and weaknesses. By strengthening existing policies and programs and/or implementing new ones requires examination of a community's legal, institutional, political, fiscal, and technical capabilities. *(NCDEM: Local Hazard Mitigation Planning Manual, November, 1998)*

Local governments possess only the legal authority that is delegated to them by the state in which they are located. The principle, known as "Dillon's Rule," applies to all political subdivisions in North Carolina. North Carolina grants a wide variety of powers to its local jurisdictions. However, local regulations enacted within the parameters of the State's enabling authority must conform to the constitutional framework, both state and Federal, within which all acts of government must take place. Examples of such limitations include the Fifth Amendment to the United States Constitution and its State counterpart, that require private property be taken for public purposes only after payment of just compensation and the Fourteenth Amendment requiring that all governmental activity be undertaken only within the procedural requirements of due process of law. *(NCDEM: Local Hazard Mitigation Planning Manual, November, 1998)*

All local governments power fall into one or more of the following categories:

- Regulation
- Acquisition
- Taxation
- Spending

Regulatory powers granted by the State to local government include general police power, building codes and inspections, and land use. Land use regulations can be further implemented into zoning, floodway regulation, planning, and subdivision regulation. *(NCDEM: Local Hazard Mitigation Planning Manual, November, 1998)*

The ability of existing policies, ordinances, and programs to help the community achieve its goals and reach its objectives will be the primary tools used to create hazard mitigation projects.

The following table lists the ordinances and policies that are in place in Durham County and the City of Durham at present.

Review of Policies, Programs, & Ordinances

Community Capability Review

Jurisdiction	Ordinances, Policies, and Programs
Durham County	<ul style="list-style-type: none"> • Flood Damage Prevention Ordinance/CRS Program (Appendix B) • Subdivision Ordinance (Appendix B) • Zoning Ordinances (Appendix B) • Soil Erosion & Sedimentation Control Ordinance (Appendix B) • Water Protection Ordinance (Appendix B) • Safe & Sanitary Housing Ordinance (Chapter 6) • Fire Prevention/Hazardous Materials Permitting & Storage (Chapter 16) • Floodplain Management Program (Chapter 16) • Emergency Operations Plan Ordinance (Chapter 10) • Tree-Trimming Programs for Storm Damage Prevention (Appendix A) • Storm Water Management Plan (Chapter 14) • Comprehensive Land Use Plan (Appendix A) • Use of NC Building Code as standard w/additional more stringent local requirements (Chapter 6)
City of Durham	<ul style="list-style-type: none"> • Flood Damage Prevention Ordinance (Chapter 24) • Subdivision Ordinance (Chapter 19) • Zoning Ordinances (Chapter 24) • Soil Erosion & Sedimentation Control Ordinance (Chapter 24) • Water Protection Ordinance (Chapter 24) • Safe & Sanitary Housing Ordinance (Chapter 6) • Fire Prevention/Hazardous Materials Permitting & Storage (Chapter 9) • Floodplain Management Program (Chapter 23) • Tree-Trimming Programs for Storm Damage Prevention (Chapter 21) • Use of NC Building Code as standard w/additional more stringent local requirements (Chapter 6)

The above mentioned ordinances were established to help the communities achieve goals and objectives relative to the health, safety, and welfare of its citizens, as well as control development. Local ordinances, policies, and programs were not instituted as mechanisms for hazard mitigation projects; however, they have provided a means to create future projects.

The challenge of “strengthening” existing policies, ordinances, and programs is not to improve or increase them, but to clarify, simplify, and prioritize them in a way that placed more emphasis on implementing them. In addition, local programs designed to understand and take advantage of state and Federal funding opportunities should be emphasized. Finally, the appropriation of funds needs to maximize the reduction of costs to the community of future hazards.

As the population grows in Durham County, hazard mitigation laws must prevent new structures from being built in areas susceptible to unusual occurrences. For example, new building construction in low lying flood areas must be prohibited, limited, or built in such a manner to withstand flooding. Similarly, future construction sites of industry must have mechanisms in place that will self contain, or significantly limit, effects of potential catastrophic incidents.

Local government and the private sector must provide ongoing training and public information sessions to its citizens. Clear, unbiased, knowledge is a key ingredient for safety enhancement for the public. Ongoing training could include public information notices, ongoing training sessions at local libraries, hospitals, or schools. Part of the cost of this training should be borne by those private parties who ask or have businesses that may contribute to an unusual occurrence. For example, construction of a new electrical substation, a natural gas company building a new facility, a professional dry cleaning

establishment, a new gas station, etc. potentially could have impact fees assessed to offset the mitigation training costs.

Training and equipment to prepare for and subsequently resolve hazard situations are necessary and vital. Alternative financial resources must be assessed and located in addition to including these costs in all respective budgets.

Periodic review and revision of the local government ordinances, policies, and programs must occur at least annually.

Forms of Government in Durham County

Government	Form of Government	Details
Durham County	Commissioner-Manager	5 Commissioners – Elected At Large Board of Commissioners appoint a County Manager
City of Durham	Council-Manager	7 Council Members – Elected 3 At Large and 3 Wards plus a Mayor Council appoint a City Manager

All emergency management operations are coordinated through the Durham County Emergency Management Office. Emergency Management is dually funded by the City and The County. The regulatory authority for emergency management in Durham County is set forth in the Durham County Emergency Management Ordinance and by North Carolina General Statute 166-A.

Technical and Fiscal Capability

The Durham County Emergency Management Agency is the coordinating agency for all resource needs and requests during an emergency or disaster. Emergency plans for the different agencies and department within the County and city are maintained by the Emergency Management Agency. After an emergency or disaster where damage assessment reports are required, the Emergency Management Agency will coordinate with all agencies within the jurisdictions to conduct on-site damage assessments to be forwarded to state or Federal agencies for consideration of a state or presidential declaration. Various agency personnel are utilized to perform the actual assessments to include inspection departments, emergency management staff, fire department personnel, private sector personnel, contract individuals, and/or other County personnel as required.

Durham County Emergency Management Agency also coordinates shelter operation, mass feeding, and evacuation of affected populations during emergencies or disasters. Durham County and the City of Durham stockpile some disaster supplies; however, shelter operations are usually a coordinated effort between County agencies and the local chapter of the American Red Cross.

Durham County maintains the Emergency Operations Plan which sets forth functional responsibilities within the County departments to ensure continuity of government during an emergency or disaster as well as effective emergency response and delivery of necessary services to victims. Activation of the Emergency Operations Plan is the responsibility of the Emergency Management Coordinator or their designee. Normal update of the Emergency Operations Plan occurs every two years or after an emergency or disaster on an as needed basis. Additionally, Durham County also maintains a local level Resource Manual describing an inventory of all County and/or city resources and equipment that is available for utilization during an emergency or disaster. Local vendors and business information is also contained within the Resource Manual to enable the County and/or city to obtain resources locally when necessary.

Seven (7) fire departments, medical units, and rescue squads serve Durham County. The City of Durham’s coverage is provided by 14 Durham Fire Department fire stations distributed throughout the city. Information provided indicated 2 additional stations are planned for future development.

Community Goals

Durham County and the City of Durham have identified four mitigation goal statements for purposes of the Hazard Mitigation Plan. Each goal is general and broad in nature and will be achieved through long-term implementation of specific objectives. Mitigation objectives and actions determined in the Mitigation Strategies section of this plan will be addressed and evaluated.

- Goal #1** Increase Durham County's and the City of Durham's capability to be able to mitigate the effects of natural and technological hazards.
- Goal #2** Reduce vulnerability to the impacts of natural and technological hazards by implementing new and maintaining existing County and/or City policies, plans, and ordinances.
- Goal #3** Provide more effective and efficient protection for populations and critical facilities by utilizing new and existing technologies and cost effective strategies to implement mitigation projects.
- Goal #4** Protecting the community and citizens with the successful implementation of increased public awareness programs and preparedness information to allow personal accountability and responsibility so the public may protect their own health, safety, and welfare.

Community Goals Analysis

Goals are statements of conditions that are desired to be achieved at sometime in the future. Goals are usually descriptive rather than quantified statements and should be expressed in general terms. A goal is not a tool for achieving something else. Goals should not be negative observations about the community but should be structured as positive statements that are attainable. *(NCDEM: Local Hazard Mitigation Planning Manual, November 1998)*

Reducing risks posed by natural disasters to people and property is the primary goal in hazard mitigation planning. Additionally, Durham County and the City of Durham have included manmade and technological hazards in their mitigation plan. However, goals are best structured when they represent a cross-section of public interests. When hazard mitigation goals are written in this way, it illustrates the ways in which mitigation is intermingled with other public concerns. For example, the goals of a hazard mitigation plan may support such interests as creating open space, preserving natural areas, improving water quality, or sustaining farmland. *(NCDEM: Local Hazard Mitigation Planning Manual, November 1998)*

The goals of Durham County and the City of Durham were reviewed for their relevance to hazard mitigation and are listed in the table below:

Community Goals

Jurisdiction	Goals
Durham County	<ul style="list-style-type: none"> • Continue participation in the National Flood Insurance and Community Rating System programs • Support the initiatives outlined in the Land Use Plan in regards to zoning, subdivisions, tree-trimming programs, • Administer and enforce soil erosion and storm water ordinances • Ensure the continued safety and integrity of existing housing stock through implementation of the housing ordinance • Continue fire prevention programs and public education • Continue enforcement and implementation of hazardous materials permitting and storage • Protection of roadways, bridges, and other thoroughfares to provide for continuous movement of traffic as needed for effective and unencumbered provision of emergency services • Reduction and mitigation of rainstorm hazards and problems • Collection of flood data information and analysis. Completion of a Countywide database which incorporates a wider range of data for property, topographical, storm drainage, rainfall amounts, building permits, insurance, and history of flooding. • Protection of “critical facilities” vital to public safety and disaster response including Emergency Services structures and all other emergency related equipment and facilities involved with transportation, communication, and energy.
City of Durham	<ul style="list-style-type: none"> • Continue participation in the National Flood Insurance Program • Support the initiatives outlined in the Land Use Plan in regards to zoning, subdivisions, tree-trimming programs, • Administer and enforce soil erosion ordinance • Reduce fire loss through effective delivery of fire code enforcement services • Ensure the continued safety and integrity of existing housing stock through implementation of the housing ordinance • Continue fire prevention programs and public education • Continue enforcement and implementation of hazardous materials permitting and storage • Protection of roadways, bridges, and other thoroughfares to provide for continuous movement of traffic as needed for effective and unencumbered provision of emergency services • Reduction and mitigation of rainstorm hazards and problems • Collection of flood data information and analysis. Completion of a Countywide database, which incorporates a wider range of data for property, topographical, storm drainage, rainfall amounts, building permits, insurance, and history of flooding. • Protection of “critical facilities” vital to public safety and disaster response including Emergency Services structures and all other emergency related equipment and facilities involved with transportation, communication, and energy.

The Mitigation Planning Committee has developed a goal statement specifically focused on multi-hazards. Durham County and the City of Durham’s mitigation goal statement are consistent with the North Carolina Division of Emergency Management’s mitigation goals and mission statements.

Mission Statement

We promote and protect public health, safety, and the environment by identifying natural and technological hazards, increasing awareness of those hazards, and fostering teamwork among public and private agencies to mitigate our vulnerabilities to those hazards.

Although these goals and mission do not address hazard mitigation specifically, mitigation concepts are incorporated and represent the cross-section of public interest that the North Carolina Division of Emergency Management recommends be included in determining hazard mitigation goals. Improved water quality, effective application of technology in public safety, sustainable development, environmental stewardship, storm water management systems, code enforcement, fire prevention programs, and other goals listed all work together to produce governments and organizations that are dedicated to the health, safety, and quality of life for their citizens. No actions or goals were found to deter hazard mitigation programs or projects.

Land Use Overview

The Comprehensive Plan is Durham's statement of how we want to grow and develop. The Plan guides where and how private development should occur. It guides how the City and County should provide public facilities and services to support future growth. The Plan is long range in scope, focusing on the ultimate needs of the community rather than the pressing concerns of today. Chapter 2, the Land Use Element, of the Comprehensive Plan is appended to the end of this Hazard Mitigation Plan. The complete comprehensive plan and maps can be found at the local Library or at the city's website, <http://www.ci.durham.nc.us/departments/planning>.

Hazard Mitigation Strategies

Durham County and the City of Durham have worked to develop the mitigation actions shown on pages 110-112. Mitigation actions were developed with an eye toward reducing vulnerability to all natural hazards that can be addressed in a practicable way at the local level. The listed actions do, however, primarily focus on ways Durham County and the participating municipalities can act to lessen and, ideally, eventually eliminate repetitive flood losses and prevent future flood losses from inappropriate new development.

The Mitigation Planning Task Force committee put an emphasis on three (3) areas of concern in the development of the mitigation strategies included in this plan. Considerations of all the mitigation actions have been determined to include an emphasis on:

- A. Cost effective, *i.e.* (returns or savings produced by implementation of the action outweigh the cost of implementation);
- B. Environmentally sound, *i.e.* (actions were designed to protect environmentally fragile areas as natural storm water storage areas); and
- C. Technically feasible, *i.e.* (actions are to be undertaken by the County using current staff and resources except where grant funds are available.)

A special emphasis on cost-benefit analysis will be placed on any physical mitigation projects arising from these mitigation strategies. These considerations will serve as the criteria by which all future physical mitigation projects and strategies are prioritized.

Mitigation strategies and actions serve as the means to achieve each County and City's goals for mitigation. The following mitigation strategies were comprised after examining the present and future ordinances, programs, and goals for Durham County. North Carolina Division of Emergency Management planning tools and other sample hazard mitigation plans were used to develop the strategies. Upon review of the culmination of the area hazard identification, capability assessment, vulnerability assessment, and community goals, the following strategies were developed.

Incorporate hazard mitigation into the planning process of each jurisdiction.

As indicated earlier during the Community Capability Assessment positive steps have already been taken toward hazard mitigation through ordinances, policies, and procedures. The goals and principles of hazard mitigation often cross many aspects of public interest. The next step is to make a conscious effort to integrate hazard mitigation into the planning process of each jurisdiction. A person from the Administration Department and the Planning Department should be included in the review process of the draft hazard mitigation plan. These individuals can then educate their departments on the importance of hazard mitigation. The establishment of a Hazard Mitigation Plan Evaluation and Review committee should begin with members to include: Emergency Management Coordinator, Emergency Management Planner, representatives from Administration and Planning Departments, and any other individuals that will have input or participation in the hazard mitigation planning and projects process. The committee will evaluate the plan upon completion and also work together to revise the plan on a scheduled or as needed basis. The North Carolina Division of Emergency Management documents listed below can be utilized for providing the committee with hazard mitigation concepts:

Tools & Techniques: Putting a Hazard Mitigation Plan to Work (October 1999)

Keeping Natural Hazards From Becoming Disasters: A Basic Workbook for Local Governments (May 2000)

A lead person should be established for the committee and that individual will be responsible for coordination of committee functions. The committee should be formed and functional before January 1, 2005.

Evaluate and strengthen existing ordinances as needed

Evaluation of policies, procedures, and ordinances in the Community Capability section determined the existing mitigation measures that are currently addressed—directly or indirectly. Local conditions are constantly changing due to increased development, technology advances, changes in local mitigation capabilities, or disaster events. Therefore, the evaluation of hazard mitigation strategies must be an ongoing process. The initial capability assessment will serve as a starting point rather than an end result. Because changing conditions know no timeline, it will be difficult to change policy when needed. An update schedule will need to be determined for evaluation of the policies, procedures, and ordinances. If a community realizes a significant and/or rapid change of conditions, the committee can meet and address the issues as they arise. Also, many times the opportunity for change presents itself during and after a disaster or emergency. The effectiveness of the policies, procedures, and ordinances can be evaluated at that time and changes can be made as appropriate.

Enforcement of policies, procedures, and ordinances.

Enforcement of policies, procedures, and ordinances is the most effective method to ensure that the hazard mitigation goals are being met. Development of such policies, procedures, and ordinances is only the beginning. Effectiveness can be determined through enforcement. Each jurisdiction will need to make determine a method by which to track enforcement. Plan acceptance or rejection, warnings, citations, permits issues, etc. are all methods and means to keep data necessary to determine if the policies, procedures, and ordinances are being keep in compliance. In conjunction with the Hazard Mitigation Plan Evaluation and Review Committee, the enforcement tracking methods should be reviewed annually.

Educate the public regarding hazard mitigation concepts.

Local governments take measures to protect the health and safety of their citizens. However, property owners also have a responsibility to protect their homes, families, and businesses. The citizens of

Durham County can be more responsible if hazard mitigation information is provided to them through public education programs.

The Durham County website will include detailed information on hazard mitigation information and projects. An emergency management employee or other specified individual within the County will need to be responsible for keeping the public informed via website venues about hazard mitigation issues and opportunities

National Flood Insurance Program, including the Community Rating System, participation will continue.

Durham County has participated in the National Flood Insurance Program (NFIP) since February 15, 1979. Additionally, the County implemented the Community Rating System (CRS) portion of the NFIP on October 1, 1992. The program recognizes and encourages community flood plain management activities that exceed the minimum NFIP standards. Under the CRS, flood insurance premium rates are adjusted to reflect the reduced flood risk resulting from community activities that meet the three goals of the CRS:

- A. Reduce flood losses
- B. Facilitate accurate insurance rating
- C. Promote the awareness of flood insurance

(www.fema.gov/nfip/crs.htm)

Community Rating System requirements are revised every three years. New criteria may include giving CRS credit for multi-hazard mitigation planning. Floodplain management and community rating system criteria should be coordinated through the County's Floodplain Management Administrator or through the office that is tasked with NFIP coordination and implementation.

Continuance of the hazard mitigation planning process and seeking of funds for emerging needs

The identification and development of hazard mitigation strategies are one step in a cyclical process. The Hazard Mitigation Plan is a constantly evolving document that will continue to change as conditions change within Durham County. The plan includes procedures for monitoring, evaluating, updating and revising the plan as situations and conditions change. An integral part of the plan process will be the search for hazard mitigation funding sources for current and future needs. Funding sources will need to be determined to address a number of needs to include:

- Staff training and certification
- Equipment
- Purchase of repetitive loss structures
- Purchase or mitigation of structures located within floodways and floodplains

Projects requiring funding are not limited to those listed above but will include any type of project that will allow Durham County to protect the County from the loss of lives and property. Suggestions for possible mitigation projects should be accepted from any source or person interested in making their community more disaster resistant. Hazard mitigation elements will be the responsibility of the Emergency Management and Planning Departments as needs emerge.

For the purposes of implementation and monitoring, these mitigation strategies have been translated into the following mitigation actions for the City of Durham and for Durham County (also specified in the UDO):

City of Durham Hazard Mitigation Strategies

Mitigation Strategy	Geographic Planning Area	Hazard this Policy will Target	Funding Source	Responsible Party Start and Completion Dates	Benchmarks and Indicators of Progress (Monitoring and Evaluation)	Priority for Mitigation (High, Medium, Low)
Continued enforcement of Flood Damage Prevention Ordinance	City of Durham	Flood	Self-Funded	City-County Planning Dept Continuous	A decrease or no significant increase in flood damage	High
Continued enforcement of Subdivision Ordinance	City of Durham	Flood, all-hazards for ingress and egress.	Self-Funded	City-County Planning Dept Continuous	A decrease or no significant increase in flood damage	High
Continued enforcement of City Zoning Ordinance	City of Durham	Flood	Self-Funded	City-County Planning Dept Continuous	A decrease or no significant increase in flood damage	Medium
Continued enforcement of Soil Erosion and Sedimentation Control Ordinance	City of Durham	Flood, subsidence,	Self-Funded	City-County Planning Dept Continuous	A decrease or no significant increase in soil erosion or turbidity in streams	Medium
Continued enforcement of Safe and Sanitary Housing Ordinance	City of Durham	Primarily weather-related hazards	Self-Funded	Durham Housing Authority; City-County Insp. Continuous	A decrease or no significant increase in substandard housing	Medium
Continued enforcement of Fire Prevention/Hazardous Materials Permitting and Storage regulations	City of Durham	Hazardous Materials and possibly terrorism	Self-Funded	Durham Fire Dept. Continuous	A decrease or no significant increase in hazardous materials accidents	High
Continue all aspects of the Floodplain Management Program	City of Durham	Flood	Self-Funded	City-County Planning Continuous	A decrease or no significant increase in structures located in the floodplain	High
Continue tree-trimming programs for storm damage prevention	City of Durham	All weather-related hazards	Self-Funded	City General Services Dept Continuous	A decrease or no significant increase in tree-related damage and debris	High

Mitigation Strategy	Geographic Planning Area	Hazard this Policy will Target	Funding Source	Responsible Party Start and Completion Dates	Benchmarks and Indicators of Progress (Monitoring and Evaluation)	Priority for Mitigation (High, Medium, Low)
Continued enforcement of state building codes and more stringent local building requirements	City of Durham	All hazards	Self-Funded	City-County Inspections Continuous	A decrease or no significant increase in damage to new structures from natural hazards	High
Look for opportunities to mitigate repetitive loss structures.	City of Durham	Floods	HMGP or PDM with local or state match	Durham County Emergency Mgt Continuous	A decrease or no significant increase in repetitive loss structures	Medium

Durham County Hazard Mitigation Strategies

Mitigation Strategy	Geographic Planning Area	Hazard this Policy will Target	Funding Source	Responsible Party Start and Completion Dates	Benchmarks and Indicators of Progress (Monitoring and Evaluation)	Priority (High, Medium, Low)
Continued enforcement of Flood Damage Prevention Ordinance	Durham County	Flood	Self-Funded	City-County Planning Continuous	A decrease or no significant increase in flood damage	High
Continued participation in the CRS program	Durham County	Flood	Self-Funded	City-County Planning Continuous	A decrease or no significant increase in flood damage	High
Continued enforcement of Subdivision Ordinance	Durham County	Flood, all-hazards for ingress and egress.	Self-Funded	City-County Planning Continuous	A decrease or no significant increase in flood damage	High
Continued enforcement of County Zoning Ordinance	Durham County	Mainly technological hazards but also natural hazards, indirectly.	Self-Funded	City-County Planning Continuous	A decrease or no significant increase in zoning-related public safety issues	Medium
Continued enforcement of County Soil Erosion and Sedimentation Control Ordinance	Durham County	Flood, subsidence,	Self-Funded	County Engineering Continuous	A decrease or no significant increase in soil erosion or turbidity in streams	Medium
Continued enforcement of Safe and Sanitary Housing Ordinance	Durham County	Primarily weather-related hazards	Self-Funded	City-County Inspections Continuous	A decrease or no significant increase in substandard housing	Medium
Continued enforcement of Fire Prevention/Hazardous Materials Permitting and Storage regulations	Durham County	Hazardous Materials and possibly terrorism	Self-Funded	Durham County Fire Marshal Continuous	A decrease or no significant increase in hazardous materials accidents	High
Continue tree-trimming programs for storm damage prevention	Durham County	All weather-related hazards	Self-Funded	Durham County Forestry Continuous	A decrease or no significant increase in tree-related damage and debris	High

Mitigation Strategy	Geographic Planning Area	Hazard this Policy will Target	Funding Source	Responsible Party Start and Completion Dates	Benchmarks and Indicators of Progress (Monitoring and Evaluation)	Priority (High, Medium, Low)
Continued implementation of Stormwater management Plan	Durham County	Flood	Self-Funded	County Engineering Continuous	A decrease or no significant increase stormwater flooding and non-point source water pollution	High
Continued implementation of Comprehensive Plan	Durham County	Mainly flood but also all geographical hazards such as erosion or subsidence.	Self-Funded	City-County Planning Continuous	A decrease or no significant increase stormwater flooding and non-point source water pollution	Medium
Continue all aspects of the Floodplain Management Program	Durham County	Flood	Self-Funded	City-County Planning Continuous	A decrease or no significant increase in structures located in the floodplain	High
Continued enforcement of state building codes and more stringent local building requirements	Durham County	All hazards	Self-Funded	City-County Inspections Continuous	A decrease or no significant increase in damage to new structures from natural hazards	High
Look for opportunities to mitigate repetitive loss structures.	Durham County	Floods	HMGP or PDM with local or state match	Durham County Emergency Mgt Continuous	A decrease or no significant increase in repetitive loss structures	Medium
Continue all-hazards public information campaigns	Durham County	All-Hazards	Self-Funded but will look for add'l support and partners	County Emergency Management Continuous	A increase or no significant decrease in local hazard awareness	Medium

Adoption and Implementation

The Hazard Mitigation Plan Evaluation and Review Committee, as described in Hazard Mitigation Strategies, will review a completed draft of the plan and recommend any needed changes. The draft of the Durham County Hazard Mitigation Plan will then be submitted to the North Carolina Division of Emergency Management Mitigation Section for review. If the NCDDEM Mitigation Section recommends changes, the Committee will meet in order to discuss and implement their recommendations. Upon approval of a draft plan by NCDDEM Mitigation Section, each jurisdiction will adopt the plan according to their standard adoption procedures. Such procedures include providing notice of a public hearing in the local newspaper, availability of the document for review by the public, conducting a public hearing, and adopting the plan at the governing body's next meeting following the public hearing.

Periodic monitoring and reporting of progress is required to ensure that Plan goals and objectives are kept current and that local mitigation efforts are being accomplished. The Durham County Multi-Jurisdictional Hazard Mitigation Plan shall be reviewed annually, or more often as the local situation may require following a disaster declaration, to ensure that progress is being made on achieving stated goals and objectives. The Plan will also undergo periodic evaluation and update as required by FEMA and the State.

Annual Review/Progress Report

The County Manager shall direct the Hazard Mitigation Planner to take responsibility for conducting the annual review. The annual review shall include the re-initiation of the hazard mitigation team planning process utilized during development of the Plan. The team will include representatives of all affected County departments, as well as each of the participating jurisdiction.

The general public will be notified through a variety of media, including but not limited to, the local newspaper, the Durham County website, and mailed or emailed notices, of the review process and the opportunity to comment on the Plan review.

The annual review shall ensure:

- A. That the Hazard Mitigation planning team receives an annual report and/or presentation on the progress of Plan implementation. The report will include a status report on the implementation of mitigation actions.
- B. That the County Board of Commissioners receives an annual report and/or presentation on the progress of Plan implementation along with a recommendation from the Hazard Mitigation Planning Committee regarding on-going implementation of the Plan.
- C. The annual report will include an evaluation of the effectiveness and appropriateness of the mitigation actions included in the Plan.
- D. The annual report will recommend, as appropriate, any necessary revisions or amendments to the Plan.

If the County Board of Commissioners determines that the recommendations warrant amendment of the Plan, the Board may initiate an amendment through the process described below.

Periodic Plan Review and Update

Periodic evaluation and revision of the Plan will help ensure that local mitigation efforts include the latest and most effective mitigation techniques. These periodic revisions may also be necessary to keep the Plan in compliance with Federal and State statutes and regulations. The Plan will need to be updated to reflect changes, such as new development in the area, implementation of mitigation efforts, revisions of the mitigation processes, and changes in Federal and State statutes and regulations.

In the context of a Federal disaster declaration, State and local governments are allowed to update or expand an existing plan to reflect circumstances arising out of the disaster. An updated plan in this

circumstance might include a re-evaluation of the hazards and the jurisdiction's exposure to them, a re-assessment of existing mitigation capabilities, and new or additional mitigation recommendations.

The Plan shall be reviewed at a minimum every five (5) years to determine if there have been any significant changes that would affect the Plan. Increased development, increased exposure to certain hazards, the development of new mitigation capabilities or techniques, and changes to Federal or State legislation may affect the appropriateness of the Plan.

The plan will be updated at a minimum every five (5) years and will be forwarded to NCEM and FEMA for review and approval.

Review of the Plan

The procedure for reviewing and updating the Plan shall begin with a report prepared by the Hazard Mitigation Planner and submitted to the Hazard Mitigation Planning Committee for consideration and recommendation to the Board of Commissioners. The report shall include a summary of progress on implementation of hazard mitigation strategies and a recommendation, as appropriate, for any changes or amendments to the Plan.

The review shall include an evaluation of the effectiveness and appropriateness of the Plan. Specifically, the evaluation shall involve a review of the consistency of day-to-day land use decisions to determine if the hazard mitigation policies are being implemented. The review shall recommend if plan amendments are warranted and if any revisions to regulatory tools are necessary to assist in implementing the policies of the Plan.

If the Board of Commissioners determines that such report raises issues that warrant modification of the Plan, or if the Hazard Mitigation Planning Committee recommends that issues have been raised which warrant modification of the Plan, the Board may initiate an amendment as delineated below, or may direct the County Manager to undertake a complete update of the Plan.

Procedure for Amending the Plan

An amendment to the Plan shall be initiated by the Board of Commissioners either at its own initiative or upon the recommendation of the Hazard Mitigation Planning Committee, the Hazard Mitigation Planner, or any other Durham or agency who demonstrates that an amendment should be considered.

Upon initiation of a text or map amendment, the Hazard Mitigation Planner shall re-convene the hazard mitigation planning team and notify other interested parties as described in the Annual Review/Progress Report subsection above. The team will consider any proposed amendment(s) which shall then be forwarded to affected parties, including, but not limited to, County departments, municipalities within the County, and other interested agencies such as the North Carolina Division of Emergency Management, the United States Army Corps of Engineers, and the Federal Emergency Management Agency for a ninety (90) day review and comment period.

At the end of the comment period, the proposed amendment(s) shall be forwarded along with all review comments to the Hazard Mitigation Planning Committee for consideration. If no comments are received from the reviewing department or agency within the specified review period, such shall be noted in the report to the Hazard Mitigation Planning Committee.

Hazard Mitigation Planning Committee Review and Recommendation

The Hazard Mitigation Planning Committee shall review the proposed amendment(s), the report and recommendation of the Hazard Mitigation Planner, and any comments received from other local governments and State and Federal agencies. The Hazard Mitigation Planning Committee shall submit a recommendation on the proposed amendment to the Board of Commissioners within sixty (60) days.

Failure of the Hazard Mitigation Planning Committee to submit a recommendation within this time period shall constitute a favorable recommendation.

In deciding whether to recommend approval or denial of an amendment request, the Hazard Mitigation Planning Committee shall consider whether or not the proposed amendment is necessary based upon one or more of the following factors:

- A. There are errors or omissions made in the identification of issues or needs during the preparation of the original Plan;
- B. New issues or needs have been identified which were not adequately addressed in the original Plan;
- C. There has been a change in projections or assumptions from those on which the original Plan was based.

Board of Commissioners Review and Approval

Upon receiving the recommendation of the Hazard Mitigation Planning Committee, the Board of Commissioners shall hold a public hearing. The Board shall review the Hazard Mitigation Planning Committee recommendation (including the factors delineated above), the report and recommendation from the Hazard Mitigation Planner, and any oral or written comments received at the public hearing. Following that review, the Board shall take one of the following actions:

- A. Adopt the proposed amendment as presented or with modifications.
- B. Deny the proposed amendment.
- C. Refer the amendment request back to the Hazard Mitigation Planning Committee for further consideration.
- D. Defer the amendment request for further consideration and/or hearing.

