FORSYTH COUNTY
HAZARD MITIGATION PLAN 2021

Including the City of Cumming

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Chapter 1
Introduction

1.1 Purpose

The Disaster Mitigation Act of 2000 has helped to bring attention to the need for successful hazard mitigation planning throughout the United States. Section 322 of the Act emphasizes the importance of comprehensive multi-hazard planning at the local level, both natural and technological, and the necessity of effective coordination between State and local entities to promote an integrated, comprehensive approach to mitigation planning. The Hazard Mitigation Planning and Hazard Mitigation Grant Program (HMGP) interim final rule published on February 26, 2002, identifies these new local mitigation planning requirements. According to this rule, state and local governments are required to develop, submit, and obtain FEMA approval of a hazard mitigation plan (HMP). Completion of an HMP that meets the new Federal requirements will increase access to funds for local governments and allow them to remain eligible for Stafford Act assistance.

The HMP becomes part of the foundation for emergency management planning, exercises, training, preparedness and mitigation within the County. Such a plan sets the stage for long-term disaster resistance through identification of actions that will, over time, reduce the exposure of people and property to identifiable hazards. This plan provides an overview of the hazards that threaten the County, and what safeguards have been implemented, or may need to considered for implementation in the future.

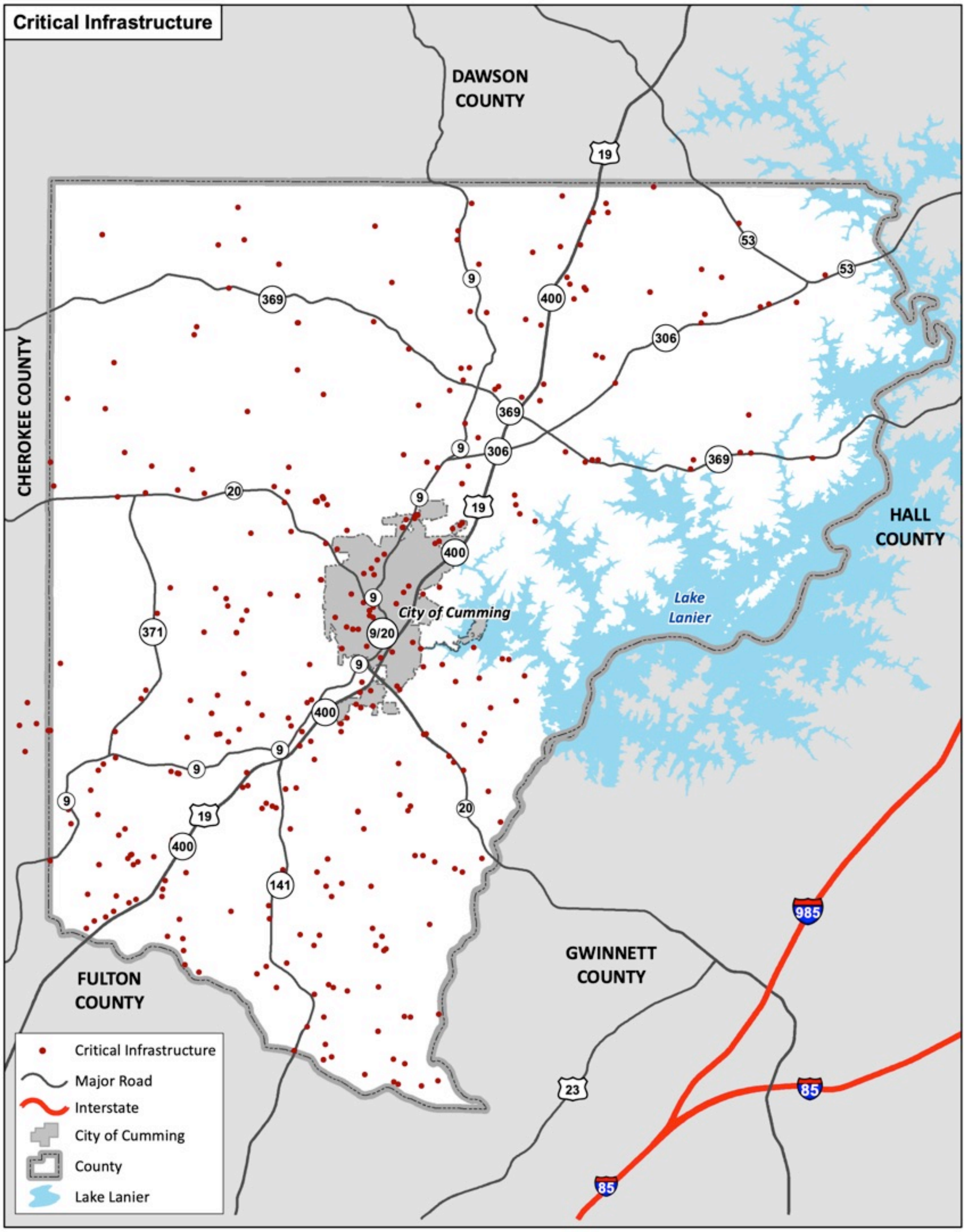
Hazards, for purposes of this plan, have been divided into two basic categories: natural and technological. Natural hazards include all hazards that are not caused either directly or indirectly by man and are frequently related to weather events, such as tornados and winter storms. Technological hazards include hazards that are directly or indirectly caused by man, including hazardous materials spills and weapons of mass destruction (WMD) events, although terrorism is not the particular focus of this Plan. This Plan also makes some recommendations that transcend this classification of natural and technological hazards. In other words, some of the recommendations contained within this Plan apply to many or all hazards. This is commonly referred to as an “all-hazards approach”. Most hazards throughout the United States could happen anytime and anywhere. However, the main focus of this plan is on those hazards that are most likely to affect Forsyth County and the City of Cumming in the future.

1.2 Organization of the Plan

The Hazard Mitigation Plan (HMP) consists of four main components: 1) the narrative plan, 2) the Hazard History Database, 3) the Hazard Frequency Table, and 4) a Critical Facilities Database. The narrative plan itself is the main component of the HMP. This part of the Plan includes an overview of the planning process, a summary of the County's hazard history, hazard frequency projections, a detailed discussion of proposed mitigation measures, and a description of how future reviews and updates to the Plan will be handled. The Hazard History Database is attached as a Microsoft Excel spreadsheet and includes relevant information on past hazards within the County. The Hazard Frequency Table is derived from the hazard history and provides frequency-related statistics for each discussed hazard. This table is also attached as a Microsoft Excel spreadsheet. Finally, the Critical Facilities Database is an online tool developed in part by UGA for GEMA that contains detailed information on critical facilities within the County. Critical facilities for the purposes of this plan are those facilities that are among the most important within a specific jurisdiction with regard to the security and welfare of the persons and property within that jurisdiction. Typical critical facilities include hospitals, fire stations, police stations, critical records storage locations, etc. These facilities will be given special consideration during mitigation planning. For instance, a critical facility should not be located in a floodplain if at all possible. Using the critical facilities information, including GPS coordinates and replacement values, along with different hazard maps from GEMA, this database becomes a valuable planning tool that can be used by Counties to help estimate losses and assess vulnerabilities. This interactive Critical Facilities Database will also help to integrate mitigation planning into their other planning processes.

The following map created by the Forsyth County GIS Department displays the location of critical facilities within Forsyth County and the City of Cumming. These facilities may also be viewed within GEMA's GMIS System which is based off of the same Critical Facilities Database. Access to this database is limited and can only be viewed with the permission of the EMA Director due to the sensitive nature of some of the information.

Forsyth County Critical Facilities Map (GEMA)



A risk assessment, which is composed of elements from each of the four main HMP components, provides the factual basis for all mitigation activities proposed within this Plan.

Inventory of Critical Facilities: Critical facilities are defined as facilities that provide essential products and services to the public. Many of these facilities are government buildings that provide a multitude of services to the public, including most public safety disciplines such as emergency management, fire, police, and EMS. Other government buildings/facilities commonly classified as critical facilities are water distribution systems, wastewater treatment facilities, public works, public schools, administrative services, and post offices. For the purposes of this Plan, critical facilities have been identified by the HMPC and important information gathered for each one. This information is located in the Critical Facilities Database (Appendix A).

Hazard Identification: During the planning process, a hazard history was created based upon available records from the past fifty years. This hazard history includes the natural and technological hazards that are most likely to affect the County. Unfortunately, record keeping was not as accurate or detailed decades ago as it is now. Therefore, the most useful information relating to these hazard events is found within the last ten to fifteen years. This fact is obvious upon review of the Hazard History Database (Appendix B), and the Hazard Frequency Table (Appendix C).

Profile of Hazard Events: Each hazard identified was analyzed to determine likely causes and characteristics, and what portions of the County's population and infrastructure were most affected. However, each of the hazards discussed in this Plan has the potential to negatively impact any given point within the County. A profile of each hazard discussed in this plan is provided in Chapter 2.

Vulnerability Assessment: This step is accomplished with the Critical Facilities Database by comparing GEMA hazard maps with the inventory of affected critical facilities, other buildings, and population exposed to each hazard (see Worksheets 3a).

Estimating Losses: Using the best available data, this step involved estimating structural and other financial losses resulting from a specific hazard. This is also accomplished to some degree using the Critical Facilities Database. Describing vulnerability in terms of dollar amounts provides the County with a rough framework in which to estimate the potential effects of hazards on the built environment.

Based on information gathered, the Plan identifies some specific mitigation goals, objectives, and actions to reduce exposure or impact from hazards that have the most impact on each community. A framework for Plan implementation and maintenance is also presented within this document.

Planning grant funds from the Federal Emergency Management Agency, administered by GEMA, funded the HMP. The HMP was developed by the HMPC, with technical assistance from GEMA and North Georgia Consulting Group.

1.3 Participants in Planning Process

This Hazard Mitigation Plan (HMP) is designed to protect both the unincorporated areas of the County as well as the City. Though the County facilitated this planning process, the City of Cumming provided critical input into the process. Without this mutual cooperation, the Plan would not exist in its present comprehensive form. Note: Please keep in mind that throughout this Plan, the term "county" typically refers to all of Forsyth County, including the City of Cumming.

The process for updating Forsyth County's Hazard Mitigation Plan can be found in the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Planning's "How To" Guides. According to "Getting Started: Building Support for Mitigation Planning;" the suggested process for preparing a Hazard Mitigation Plan is to 1) Organize resources and identify stakeholders and those holding technical expertise; 2) Access risks to the community; 3) Develop a Mitigation Plan and lastly; 4) Implement and Monitor that plan once it is adopted. (FEMA 386-1)

The Forsyth County Hazard Mitigation Planning Committee (HMPC) is made up of a variety of members. The EMA Director is responsible for all decisions relating to the overall direction of the Plan, retrieval of data from various departments, and serving as a central point of contact for all matters relating to the Plan. The consultant, NGCG, is responsible for facilitation of HMPC meetings, integration of updated data into the Plan, grant administration, and other administrative functions. Local government officials including County and City employees, representatives from State government, and others from private businesses and other organizations participated in the Plan update. Each jurisdiction had representatives on the HMPC who provided critical data for consideration through meetings, email, an/or site visits. This diverse group provided valuable input into the planning process including identifying hazards and developing important mitigation measures to be considered in the future. The HMPC met twice over the course of this planning process. These meetings occurred on March 9, 2021, October 7, 2021, February 8, 2022 and March 10, 2022. This was a more limited in-person meeting schedule than normal due to COVID-19. Other meetings and discussions were held throughout this planning process at various times between two or more HMPC members in order to accomplish smaller tasks. Two public meetings relating to this Plan are required by FEMA: one during the drafting stages of the Plan, and one after the final version of the Plan is completed. The first of these two meetings occurred on March 10, 2022 during the drafting stages of the Plan. Once necessary revisions were made to the Plan, a second public meeting was held on XXX where it was adopted by Forsyth County. A copy of the adoption resolution is included in the Appendices. All public meetings were advertised in the local newspaper and on the County website, and the draft Plan update was posted on the County website as shown on the following page. Prior to adoption at the final public meeting, the public was provided with an additional opportunity to review and comment on the Plan. This final version was then submitted to GEMA and FEMA for review and approval.

Agency/Preparation#publicHealth).

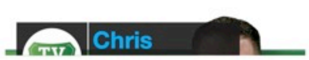
Hazard Mitigation Plan

Millions of dollars are spent each year on disaster response and recovery. By undertaking hazard mitigation activities, which will reduce the impact of future disasters, local governments can reduce these costs and minimize the impacts of potentially disastrous events. Hazard mitigation can also be considered disaster prevention and encourages the development of disaster resistant communities. Forsyth County Emergency Management Agency is the lead agency for the hazard mitigation program for Forsyth County and the City of Cumming. The purpose of the plan was to identify Forsyth County's major hazards, assess the risk and vulnerability of the county to those hazards,

and recommend actions to reduce vulnerability using the technical and programmatic resources of Forsyth County and the City of Cumming agencies. Ultimately, the plan strives to help protect the health, safety, property, environment, and economy of Forsyth County and the City of Cumming from the effects of natural hazards.

Currently the Forsyth County Emergency Management Agency in cooperation with our planning partners are updating the most recent Hazard Mitigation Plan. A DRAFT copy can for found by clicking the link below.

DRAFT Hazard Mitigation Plan (/Portals/0/DeptDoc/EMA/Forsyth%20County%20HMP%202015%20-%20DRAFT1.pdf?ver=2021-10-12-134843-723)



The Plan is the result of a community-wide effort put forth over the past several months utilizing FEMA's Hazard Mitigation Plan "How To" Guides to aid in laying out the planning process described above. Stakeholders and persons with technical expertise were identified early in the process. Full participation was provided by Forsyth County and the City of Cumming. Each jurisdiction had representatives on the Hazard Mitigation Planning Committee and provided critical data to the HMPC for consideration.

The public involvement elements of this Plan were reviewed by the HMPC. They were determined to have remained effective and were approved for use in the current Plan update process.

HMPC members are listed alphabetically in the following table:

Name	Jurisdiction/Dept
Daniel Chan	Georgia Forestry Commission Meteorologist
John Cunard	Forsyth County Engineering Department Director
Chris Grimes	Forsyth County EMA Director
Barry Head	Forsyth County Fire Chief
Jon Heard	City of Cumming Utilities Director
Michael Hoff	Forsyth County GIS Department Analyst
Renee Hoge	Forsyth County Engineering Department County Engineer
Steve Honn	Forsyth County Schools, School Safety Manager
John Kilgore	Forsyth County GIS Department Director
Ashley Lauria-Golden	Forsyth County Deputy EMA Director
Barry Lucas	Forsyth County Water & Sewer Dept Director
Scott Morgan	City of Cumming, Planning Director
Mark Palen	Georgia Department of Public Health, District 2 EC Director

Joe Perkins	Forsyth County Sheriff's Office, Chief Deputy
Rebecca Russell	Forsyth County 911 Center Deputy Director
Karen Shields	Forsyth County Communications Director
Wesley Sisk	Georgia Forestry Commission, Chief Ranger
Patrick Tittle	Forsyth County Roads & Bridges Superintendent

Various County and City departments, schools, and others participated in conversations with the EMA Director that directly contributed to the development of this Plan. Due to limited resources within the County and City, attendance at HMPC meetings for many was not an option. Nevertheless, their direct input was utilized by the HMPC to develop this Plan.

The Plan was posted on the county's website during the planning process. This was done to allow the general public, including other nearby communities, as well as other agencies to review and comment on the Plan utilizing the contact information provided on the website. The Plan was also forwarded to surrounding jurisdictions with a request they review the plan and provide any feedback they deem necessary. A copy of the email is included in Appendix D. No feedback or comments have been received to date.

1.4 HRV summary/Mitigation goals

Forsyth County has experienced a number of hazard events throughout its history, most resulting in fairly localized damage. Flooding, tornados, winter storms, wildfire, drought, severe thunderstorms (including hail and lightning), earthquakes, dam failure and hazardous materials to varying degrees represent known threats to Forsyth County. The Forsyth County HMPC used information gathered throughout this planning process to identify mitigation goals and objectives as well as some recommended mitigation actions. Each potential mitigation measure identifies an organization or agency responsible for initiating the necessary action, as well as potential resources, which may include grant programs and human resources. An estimated timeline is also provided for each mitigation action.

1.5 Multi-Jurisdictional Special Considerations

The City of Cumming were active participants and equal partner in the planning process as well as the previous planning process. As an active part of the HMPC, both jurisdictions contributed significantly to the identification of mitigation goals and objectives and potential mitigation measures contained within the HMP.

Participation in Mitigation Plan

Jurisdiction	***2016 Plan***	***2021 Plan***
Forsyth County	✓	✓
City of Cumming	✓	✓

1.6 Adoption, Implementation, Monitoring, Evaluation

Upon completion of the Plan, it will be forwarded to GEMA for initial review. GEMA will then forward the Plan to FEMA for final review and approval. Once final FEMA approval has been received, Forsyth County and the City of Cumming will be responsible for initiating the appropriate courses of action related to this Plan. Actions taken may be in coordination with one another or may be pursued separately. The "Plan Update and Maintenance" section of this document details the formal process that will ensure that the Forsyth County HMP remains an active and relevant document. The HMP maintenance process includes monitoring and evaluating the Plan annually, and producing a complete Plan revision every five years. Additionally, procedures will ensure public participation throughout the plan maintenance process. This Plan will be considered for integration into various existing plans and programs, including the Forsyth County Comprehensive Plan at its next scheduled update. Mitigation actions within the HMP may be used by the County and City as one of many tools to better protect the people and property of Forsyth County and the City of Cumming. Forsyth County and each of the municipalities are individually responsible for the processes necessary to formally adopt this Plan.

Adoption Status

Jurisdiction	***Date of Adoption***
Forsyth County	Upon GEMA & FEMA Approval
City of Cumming	Upon GEMA & FEMA Approval

1.7 Review and Incorporation

The HMPC recognized the need to integrate other plans, codes, regulations, procedures and programs into this Hazard Mitigation Plan (HMP). Forsyth County did not have the opportunity to incorporate the original HMP's strategy into other planning mechanisms, but will now ensure that during the planning process for new and updated local planning documents such as a comprehensive plan or Local Emergency Operations Plan, the EMA Director will provide a copy of the HMP to the appropriate parties, so incorporation will be considered in future updates. All goals and strategies of new and updated local planning documents should be consistent with, and support the goals of, the HMP and not contribute to increased hazards in the affected jurisdiction(s).

Record of Review

Existing planning mechanisms	Reviewed? (Yes/No)	Method of use in Hazard Mitigation Plan
Comprehensive Plan (multi-jurisdictional)	Yes	Development trends
Local Emergency Operations Plan	Yes	Identifying hazards; Assessing vulnerabilities
Storm Water Management / Flood Damage Protection Ordinance	Yes	Mitigation strategies
Building and Zoning Codes and Ordinances	Yes	Development trends; Future growth
Mutual Aid Agreements	Yes	Assessing vulnerabilities
State Hazard Mitigation Plan	Yes	Risk assessment
Land Use Maps	Yes	Assessing vulnerabilities; Development trends; Future growth
Critical Facilities Maps	Yes	Locations
Community Wildfire Protection Plan	Yes	Mitigation strategies

As set forth in the plan maintenance section of this plan (Section 6.4), the Hazard Mitigation Planning Committee will meet during the plan approval anniversary date of every year to complete a review of the Hazard Mitigation Plan. It is during this review process that the mitigation strategy and other information contained within the Hazard Mitigation Plan are considered for incorporation into other planning mechanisms as appropriate. Opportunities to integrate the requirements of this HMP into other local planning mechanisms will continue to be identified through future meetings of the HMPC on an annual basis. The primary means for integrating mitigation strategies into other local planning mechanisms will be through the revision, update and implementation of each jurisdiction's individual action plans that require specific planning and administrative tasks (e.g., plan amendments and ordinance revisions).

During the planning process for new and updated local planning documents such as a comprehensive plan or Local Emergency Operations Plan, the EMA Director will provide a copy of the HMP to the appropriate parties. It will be recommended that all goals and strategies of new and updated local planning documents be consistent with, and support the goals of, the HMP and will not contribute to increased hazards in the affected jurisdiction(s).

Although it is recognized that there are many benefits to integrating components of this plan into other local planning mechanisms, and that components are actively integrated into other planning mechanisms when appropriate, the development and maintenance of this stand-alone HMP is deemed by the committee to be the most effective method to ensure implementation of local hazard mitigation actions at this time. Therefore, the review and incorporation efforts made in this update and the last, which consisted of a simple review of the documents listed in the chart above by various members of the HMPC, are considered successful by the HMPC and will likely be utilized in future updates.

The County's EMA is committed to incorporating hazard mitigation planning into its Local Emergency Operations Plan and other public emergency management activities. As the EMA Director becomes aware of updates to other County or City plans, codes, regulations, procedures and programs, the Director will continue to look for opportunities to include hazard mitigation into these mechanisms.

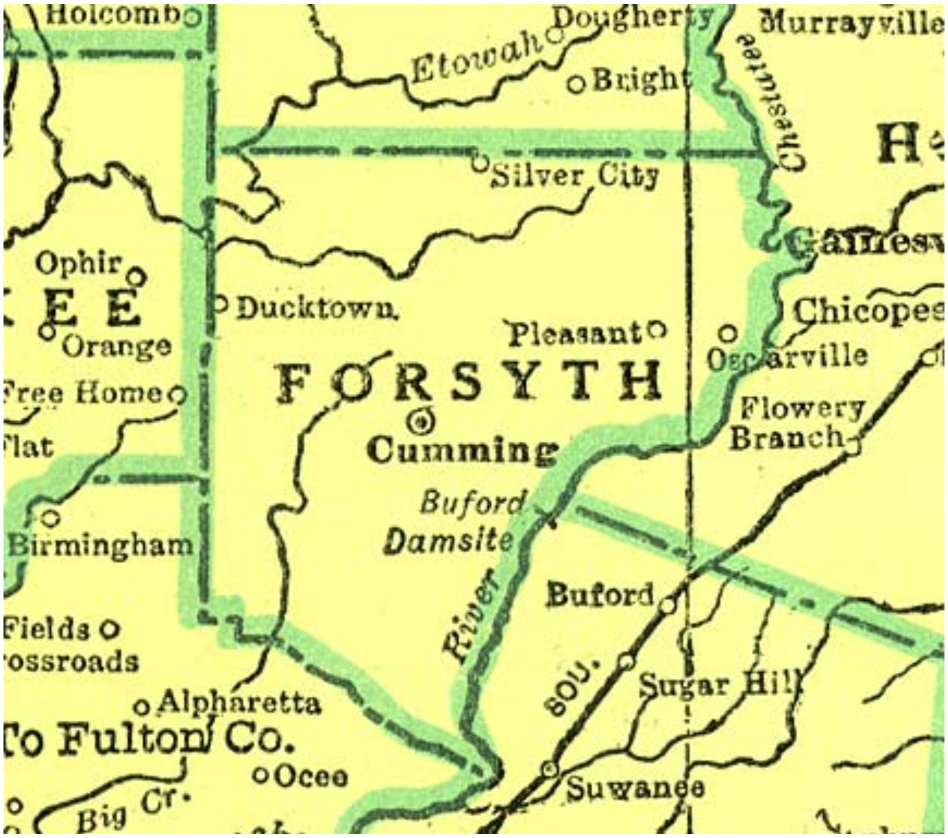
1.8 Scope of Updates

Changes have been made to the HMP in this updated version. These changes are summarized in the following table.

Chapter or Section	Chapter or Section Description	Changes this Update
1.2	Organization of the Plan	Descriptions
1.3	Participants in Planning Process	Data
1.5	Multi-Jurisdictional Special Considerations	Data
1.6	Adoption, Implementation, Monitoring, Evaluation	Descriptions, Data
1.7	Review and Incorporation	Descriptions, Data
1.8	Scope of Updates	Descriptions, Data
1.9	Brief County Overview	Descriptions, Data
2	Introduction	Descriptions, Data
2.1	Tornado	Descriptions, Data, Visual Aids
2.2	Severe Thunderstorm	Descriptions, Data, Visual Aids
2.3	Flooding	Descriptions, Data, Visual Aids
2.4	Winter Storm	Descriptions, Data, Visual Aids
2.5	Wildfire	Descriptions, Data, Visual Aids
2.6	Drought	Descriptions, Data, Visual Aids
2.7	Earthquake	Descriptions, Data, Visual Aids
3.1	Hazardous Materials Release	Descriptions, Data, Visual Aids
3.2	Dam Failure	Descriptions, Data, Visual Aids
3.3	Pandemic	Descriptions, Data, Visual Aids
4	Land Use and Development Trends	Descriptions, Data, Visual Aids
5	Hazard Mitigation Goals Objectives and Actions	Descriptions, Data

Chapter or Section	Chapter or Section Description	Changes this Update
6.1	Action Plan Implementation	Descriptions
6.2	Evaluation	Descriptions
6.3	Multi-Jurisdictional Strategy & Considerations	Descriptions
6.4	Plan Update and Maintenance	Descriptions, Data
7.2	References	Data
App. A	Critical Facilities Database	Data
App. B	Hazard History Database	Data
App. C	Hazard Frequency Table	Data
App. D	Other Planning Documents	Descriptions, Data, Visual Aids

1.5 Brief County Overview



County Formed: December 3, 1832

County Seat: City of Cumming

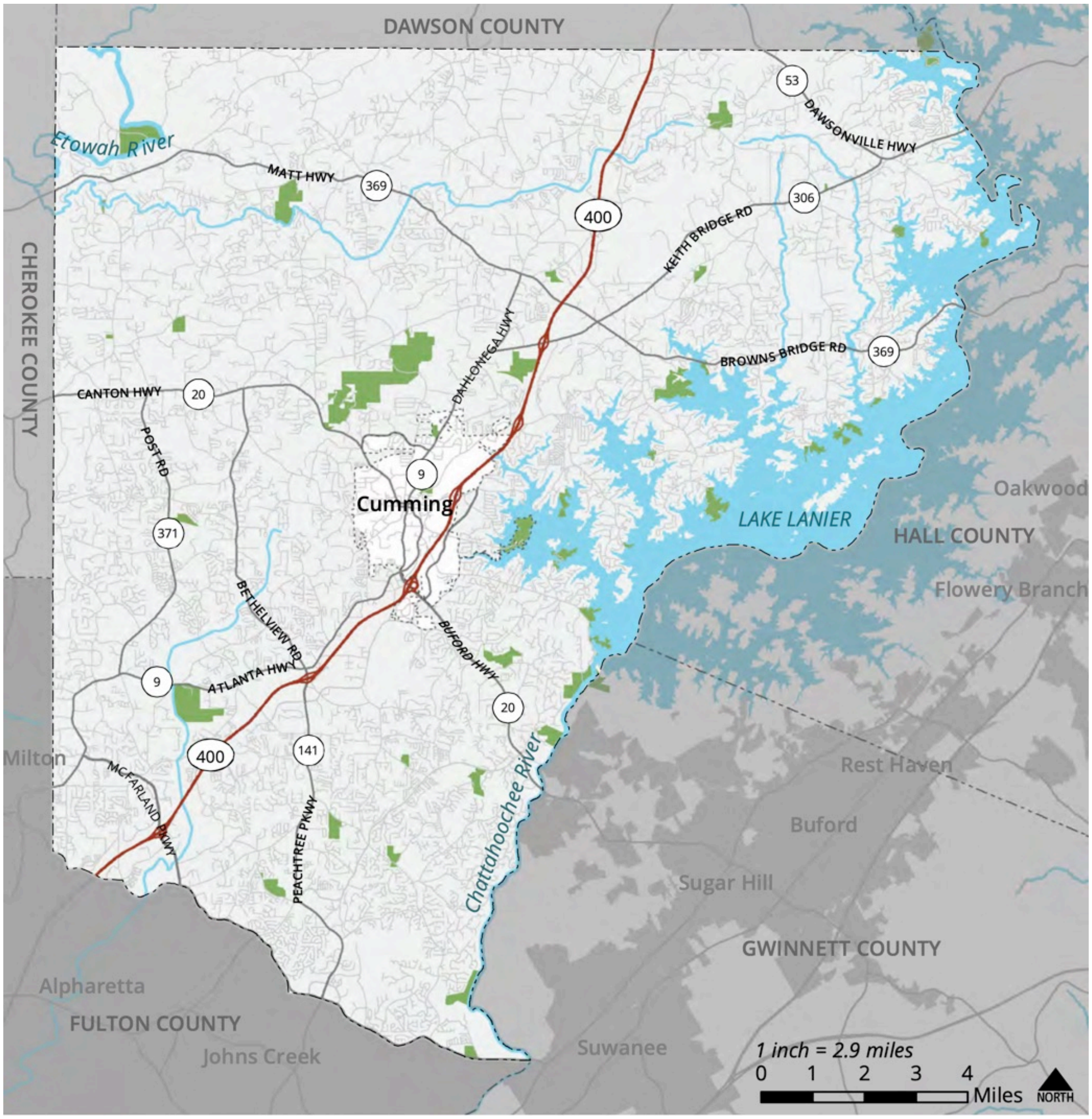
Incorporated Municipalities: City of Cumming

Total Area: 225.8 square miles

U.S. Census Bureau Estimated Population:

Jurisdiction	Population	Source
Forsyth County	244,252	2019, U.S. Census Bureau
City of Cumming	6,547	2019, U.S. Census Bureau

Forsyth County and City of Cumming Map:



Brief History:

Forsyth County was named for John Forsyth, the governor of Georgia from 1827 to 1829, who had a long and distinguished political career at the state and national levels. The County is located approximately forty miles north of Atlanta and has become one of the most vibrant and successful metro-Atlanta counties. Although the region was populated by Cherokee Indians for hundreds of years, white settlers began moving in after gold was discovered in 1829. In 1832 Georgia leaders divided the former Cherokee lands into ten counties, including Forsyth. The Cherokees were removed forcibly from their Georgia lands in 1838 and relocated to Oklahoma. One of the forts at which the Cherokees were assembled before removal, Fort Campbell, was located in Forsyth County.

Forsyth County prospered during the 1830s and 1840s because of gold mining and the Federal Road, which ran through the county and led settlers to open numerous roadside inns and taverns. The City of Cumming, the county seat, was incorporated in 1834, and by 1840 Forsyth County possessed several schools, including the Cumming Academy. By the early 1840s the heyday of the Georgia gold rush had ended, and the building of new roads and railroads in north Georgia diverted a large amount of traffic from the Federal Road, forcing many local businesses to close by the end of the decade.

The Civil War (1861-65) bypassed Forsyth County, but Reconstruction hit the region hard, and for the remainder of the nineteenth century the county remained rural and poor, with an economy based largely on cotton. During this period, Forsyth native Hiram Parks Bell served two terms in the U.S. House of Representatives, from 1873 to 1874 and from 1877 to 1878. He later served in both houses of the state legislature.

Today, outdoor recreation draws many visitors to Forsyth County. Thirty percent of the shoreline of Lake Lanier, a popular destination for boating, camping, and fishing enthusiasts, lies in Forsyth. The completion of Georgia Highway 400 has also helped turn Forsyth County into a suburb of Atlanta, further encouraging population growth. In 2008, Forbes Magazine named Forsyth County as the 2nd “Best Place in America to Get Ahead” and the 13th wealthiest county in the nation. Forsyth is now home to over 40 international companies, 15 of which have located their North American corporate headquarters in Forsyth County. These companies include Scientific Games, the producer of lottery tickets for the Georgia Lottery; Tyson Foods, which has maintained a poultry processing plant in downtown Cumming since the 1950s, Automation Direct, and New York Life Insurance Company.

Chapter 2
Local Natural Hazard, Risk and Vulnerability (HRV) Summary

The Forsyth County Hazard Mitigation Planning Committee (HMPC) identified seven natural hazards the County is most vulnerable to based upon available data including scientific evidence, known past events, and future probability estimates. As a result of this planning process, which included an analysis of the risks associated with probable frequency and impact of each hazard, the HMPC determined that each of these natural hazards pose a threat significant enough to address within this Plan. These include tornados, severe thunderstorms (including hail & lightning), flooding, winter storms, wildfire, drought and earthquakes. For this plan update, the HMPC reviewed the natural hazards listed in the 2019-2024 Georgia Hazard Mitigation Strategy Standard Plan Update to assess the applicability of these hazards to Forsyth County and the City of Cumming (See Table 2.1). Each of these natural hazards is addressed in this chapter of the Plan. An explanation and results of the vulnerability assessment are found in Tables 2-1 and 2-2.

The HMPC also discussed how changes in the climate may in some ways impact the County and City. If this is the case, at this point there is insufficient data to calculate how and to what degree such changes may impact Forsyth County in the future. However, it seems likely that the impact of any changes in climate would be manifested in the form of the same hazards currently addressed within this Plan, even though frequency, probability and severity of those hazards might change.

Table 2.1 – Hazards Terminology Differences

Hazards Identified in Georgia Hazard Mitigation Strategy Plan (2019-2024)	Equivalent/Associated Hazards identified in the current Forsyth County Plan	Difference
Tornadoes	Tornados	Grammatical only.
Wind	Severe Thunderstorms	HMPC views as an associated hazard.
Severe Weather	Severe Thunderstorms	Difference in terminology.
Hailstorm	Severe Thunderstorms	HMPC views as an associated hazard.
Lightning	Severe Thunderstorms	HMPC views as an associated hazard.
Tropical Cyclonic Events	Severe Thunderstorms Flooding	Due to the County's inland location, not directly viewed as a threat. Tropical weather has limited effects within the County and is generally considered in terms of Severe Thunderstorms and Flooding, associated hazards.
Inland Flooding	Flooding	Difference in terminology.
Earthquake	Earthquake	None
Severe Winter Storms	Winter Storms	Difference in terminology.
Wildfire	Wildfire	None
Drought	Drought	None

Table 2.2 – Vulnerability Assessment Survey Results - Natural Hazards

(see Keys A, B, and C below)

Hazard	Forsyth County	City of Cumming
Tornado – Severity	H	H
Tornado – Frequency	M	M
Tornado – Probability	H	H
Severe Thunderstorm (incl. Hail/Lightning) - Severity	H	H
Severe Thunderstorm (incl. Hail/Lightning) – Frequency	H	H
Severe Thunderstorm (incl. Hail/Lightning) - Probability	H	H
Flooding – Severity	H	L
Flooding – Frequency	M	L
Flooding – Probability	M	L
Winter Storm – Severity	H	H
Winter Storm – Frequency	M	M
Winter Storm – Probability	M	M
Wildfire – Severity	H	L
Wildfire – Frequency	M	L
Wildfire – Probability	M	L
Drought – Severity	H	H
Drought – Frequency	H	H
Drought – Probability	H	H
Earthquake – Severity	L	L
Earthquake – Frequency	L	L
Earthquake – Probability	L	L

Key A for Table 2.2 – Vulnerability Assessment Severity Definitions

Code	Definitions
L	Low Severity Average hazard event would typically result in relatively low damage. For example, a hazard that significantly affects less than 5% of the jurisdiction typically with no serious injuries. All data is compiled from the most recent vulnerability assessment survey responses.
M	Medium Severity Average hazard event would typically result in moderate damage. For example, a hazard that significantly affects up to 15% of the jurisdiction or results in multiple injuries. All data is compiled from the most recent vulnerability assessment survey responses.
H	High Severity Average hazard event would typically result in significant damage. For example, a hazard that significantly affects 25% of the jurisdiction or results in multiple injuries and/or deaths. All data is compiled from the most recent vulnerability assessment survey responses.

Key B for Table 2.2 – Vulnerability Assessment Frequency Definitions

Code	Definitions
L	Low Frequency The hazard has not occurred or has rarely occurred within the past five years. All data is compiled from the most recent vulnerability assessment survey responses and hazards history data.
M	Medium Frequency The hazard has occurred one or more times within the past five years. All data is compiled from the most recent vulnerability assessment survey responses and hazards history data.
H	High Frequency The hazard has occurred multiple times within the past five years, and at least once within the past year. All data is compiled from the most recent vulnerability assessment survey responses and hazards history data.

Key C for Table 2.2 – Vulnerability Assessment Probability Definitions

Code	Definitions
L	Low Probability The probability for the hazard to occur at least one time within the next five years is estimated to be between 1% and 30%. All data is compiled from the most recent vulnerability assessment survey responses.
M	Medium Probability The probability for the hazard to occur at least one time within the next five years is estimated to be between 31% and 70%. All data is compiled from the most recent vulnerability assessment survey responses.
H	High Probability The probability for the hazard to occur at least one time within the next five years is estimated to be between 71% and 100%. All data is compiled from the most recent vulnerability assessment survey responses.

2.1 Tornados

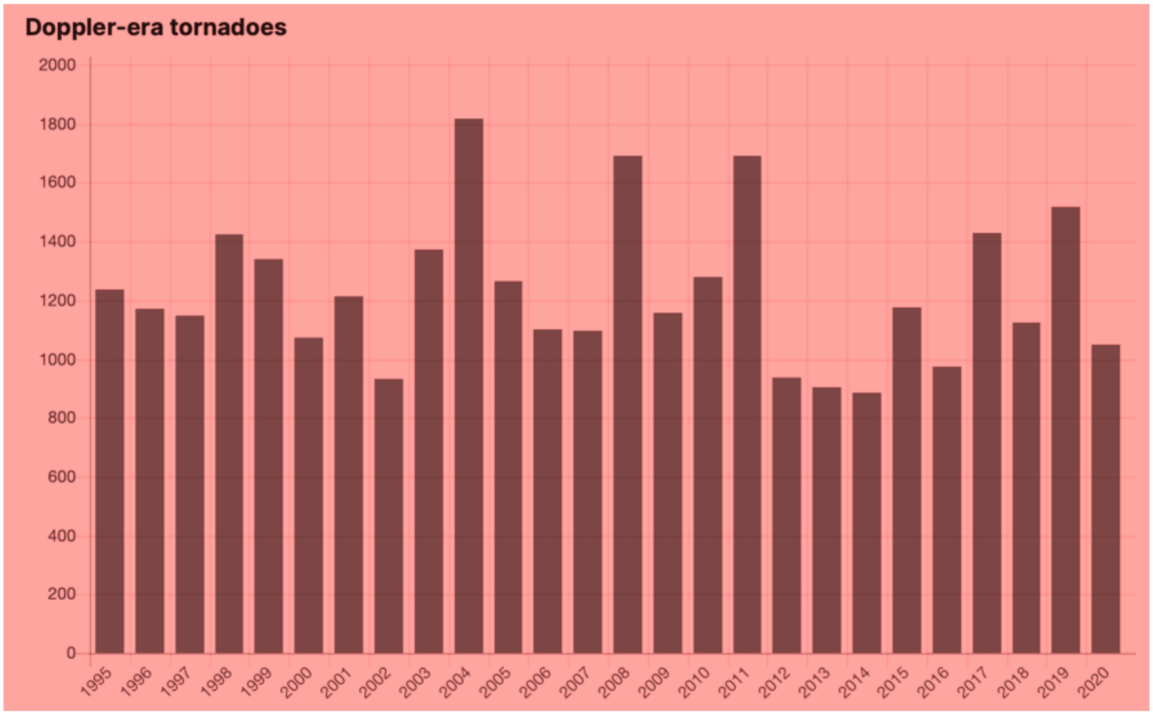
A. Hazard Identification – A tornado is a dark, funnel-shaped cloud containing violently rotating air that develops below a heavy cumulonimbus cloud mass and extends toward the earth. The funnel twists about, rises and falls, and where it reaches the earth causes great destruction. The diameter of a tornado varies from a few feet to a mile; the rotating winds attain velocities of 200 to 300 mph, and the updraft at the center may reach 200 mph. A tornado is usually accompanied by thunder, lightning, heavy rain, and a loud "freight train" noise. In comparison with a hurricane, a tornado covers a much smaller area but can be just as violent and destructive. The atmospheric conditions required for the formation of a tornado include great thermal instability, high humidity, and the convergence of warm, moist air at low levels with cooler, drier air aloft. A tornado travels in a generally northeasterly direction with a speed of 20 to 40 mph. The length of a tornado's path along the ground varies from less than one mile to several hundred.

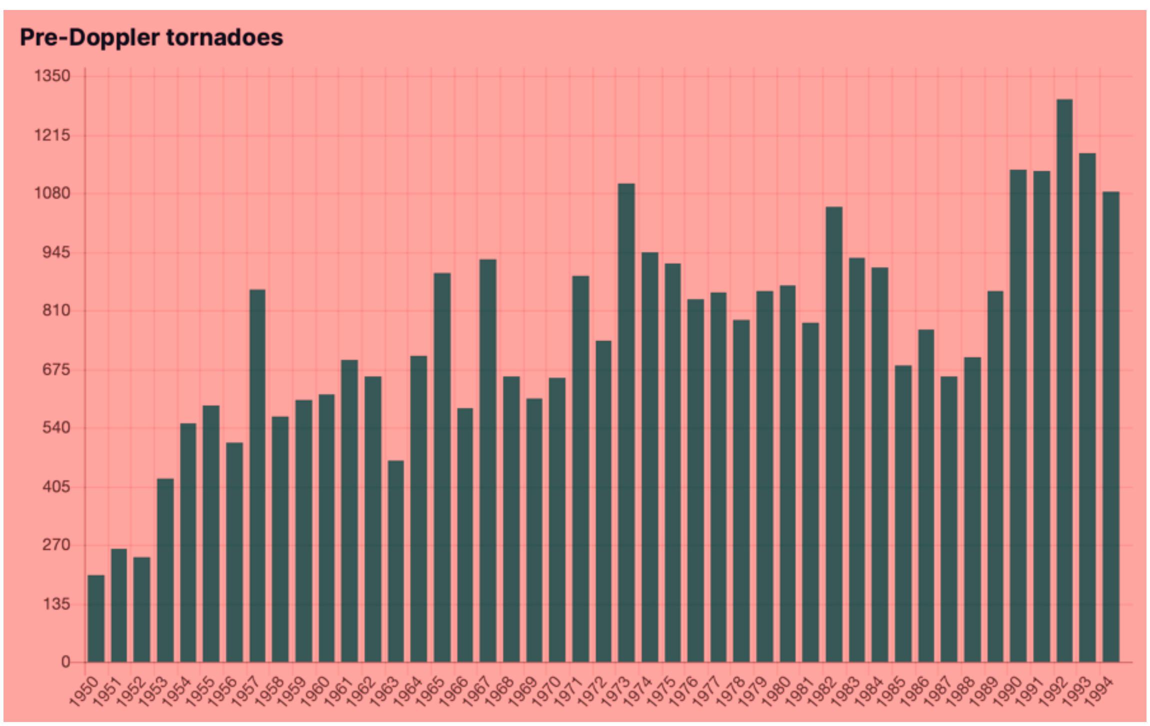
The Fujita Scale was the standard scale in the United States for rating the severity of a tornado as measured by the damage it causes from 1971 to 2007 (see table below).

The Fujita Scale of Tornado Intensity			
F-Scale Number	**Intensity Phrase**	**Wind Speed**	**Type of Damage Done**
F0	Gale tornado	40-72 mph	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards.
F1	Moderate tornado	73-112 mph	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
F2	Significant tornado	113-157 mph	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
F3	Severe tornado	158-206 mph	Roof and some walls torn off well constructed houses; trains overturned; most trees in forest uprooted
F4	Devastating tornado	207-260 mph	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
F5	Incredible tornado	261-318 mph	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel reinforced concrete structures badly damaged.

The Enhanced Fujita (EF) Scale for Tornado Damage is an update to the original Fujita Scale by a team of meteorologists and wind engineers that was implemented in the United States in 2007. The EF Scale is still a set of wind estimates (not measurements) based on damage. It uses three-second gusts estimated at the point of damage based on a judgment of 8 levels of damage to 28 indicators. These estimates vary with height and exposure. The three-second gust is not the same wind as in standard surface observations. Standard measurements are taken by weather stations in open exposures, using a directly measured, "one-minute mile" speed.

The adoption of Doppler radar, along with other technical advancements and increased storm observation, has led to the ability to detect weaker and/or short-lived tornados that would often have gone unreported. The 1995-2019 U.S. average was 1,239 tornadoes per year. The 1955-1994 average was much lower at 813 tornadoes per year. Source: ustornadoes.com

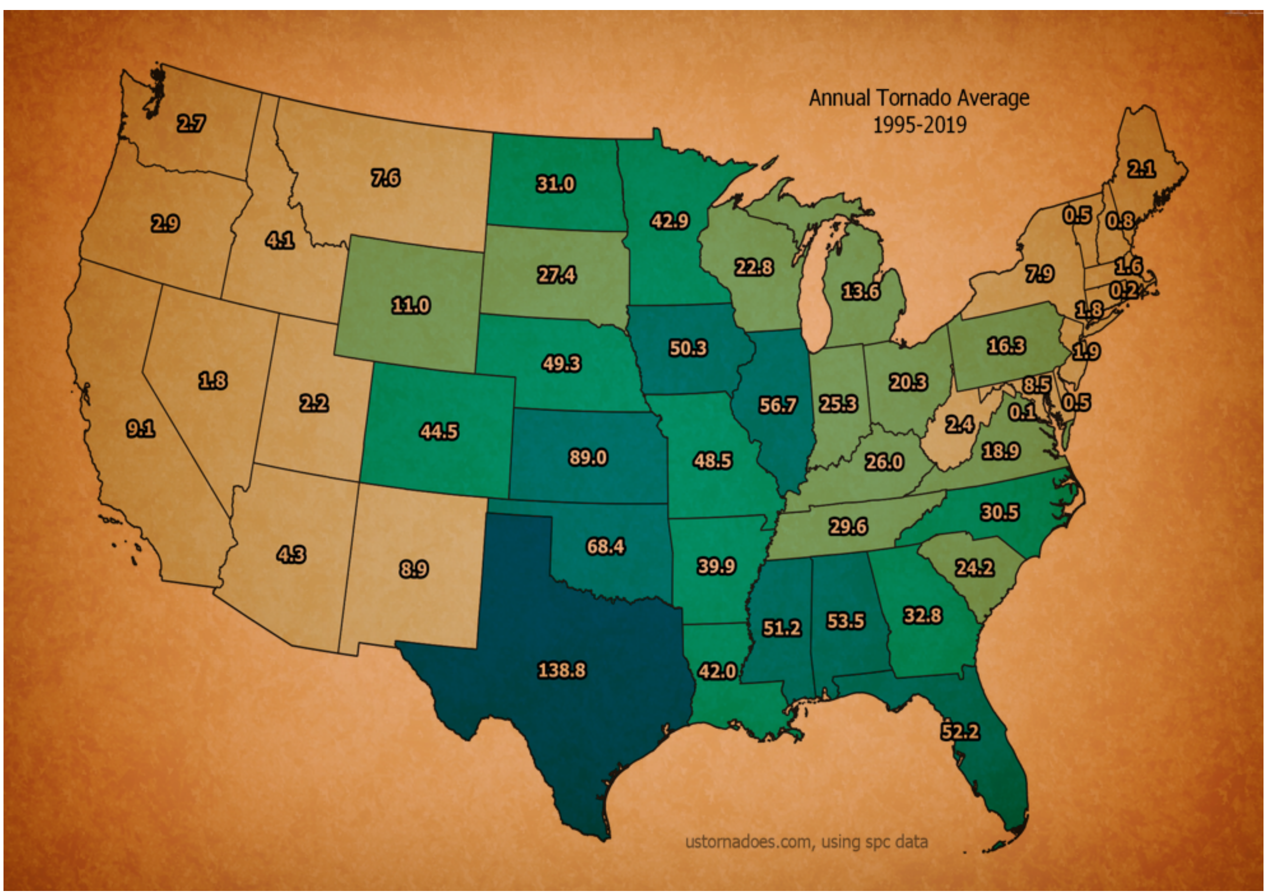




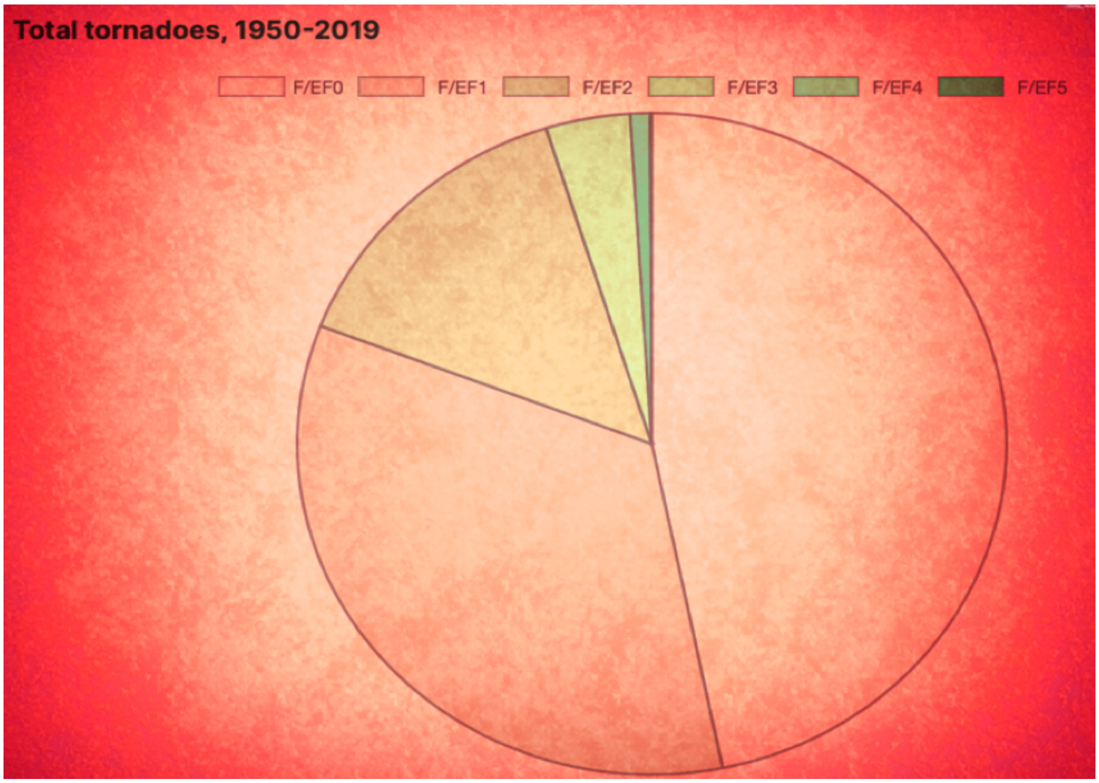
B. Hazard Profile – All areas within Forsyth County are vulnerable to the threat of a tornado. There is simply no method to determine exactly when or where a tornado will occur. The Forsyth County Hazard Mitigation Planning Committee (HMPC) reviewed historical data from the Georgia Tornado Database, the National Climatic Data Center, the National Weather Service and various other resources in researching the past effects of tornados within the County. With most of the County's recorded tornado events, only basic information was available. However, many dozens of tornado watches have been recorded during this period, and certainly some tornados go undetected or unreported. Therefore, any conclusions reached based upon available information on tornados within Forsyth County should be treated as the minimal possible threat. Forsyth County is located in both a state and a region known for high tornado activity.

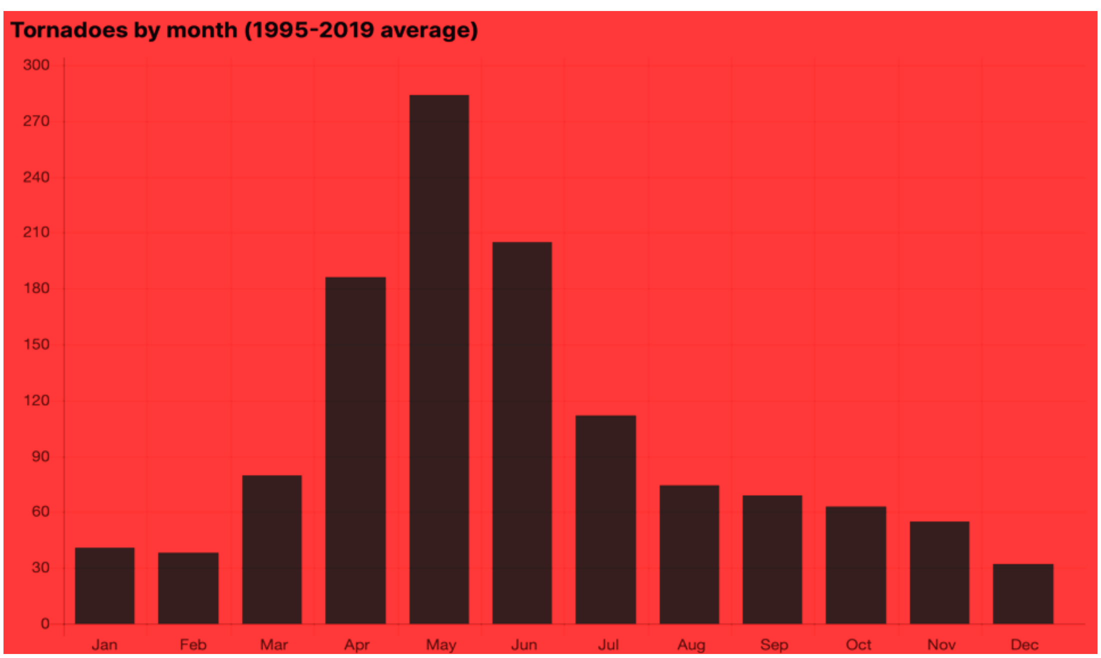
<u>National overview</u>:

The following map demonstrates the average number of tornados each year by state for the period 1995-2019.

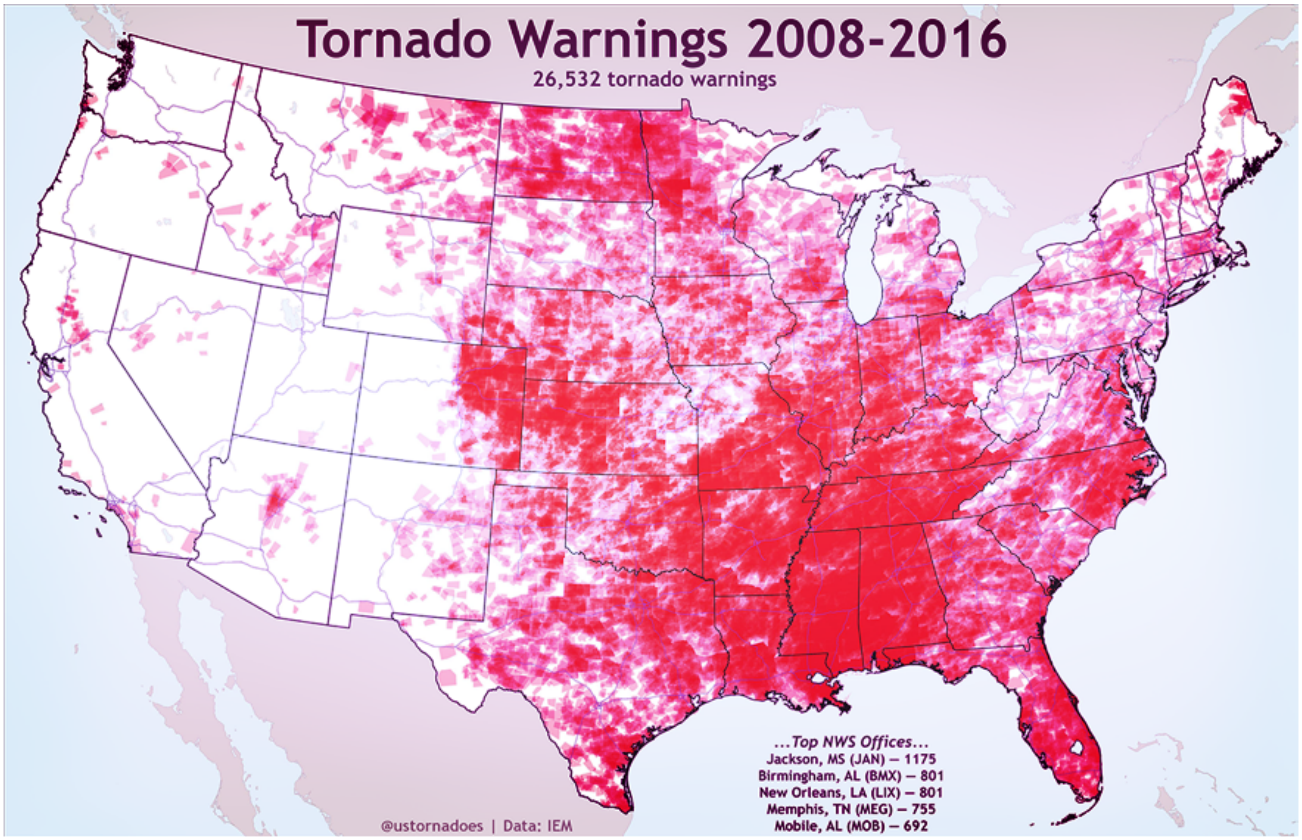


The first chart below, which includes data from 1950-2019, shows weak F/EF0 and F/EF1 tornadoes have comprised about 80 percent of all tornados. F/EF2 make up about 14%, F/EF3 roughly 4%, F/EF4 nearly 1%, and F/EF5 a mere 0.1%. Yet 63% of all fatalities have been caused by that one percent of F/EF4 and F/EF5 events. The second chart below demonstrates average tornados by month. Source: ustornadoes.com

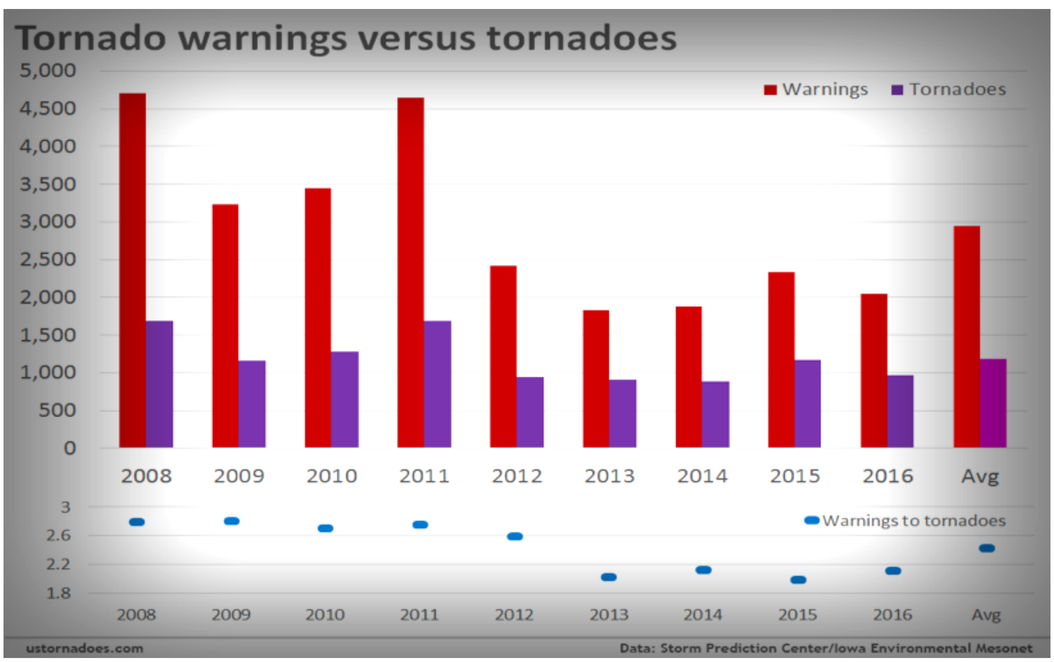




The following shapefile map, based off of National Weather Service data, demonstrates tornado warnings issued from 2008-2016 by state.

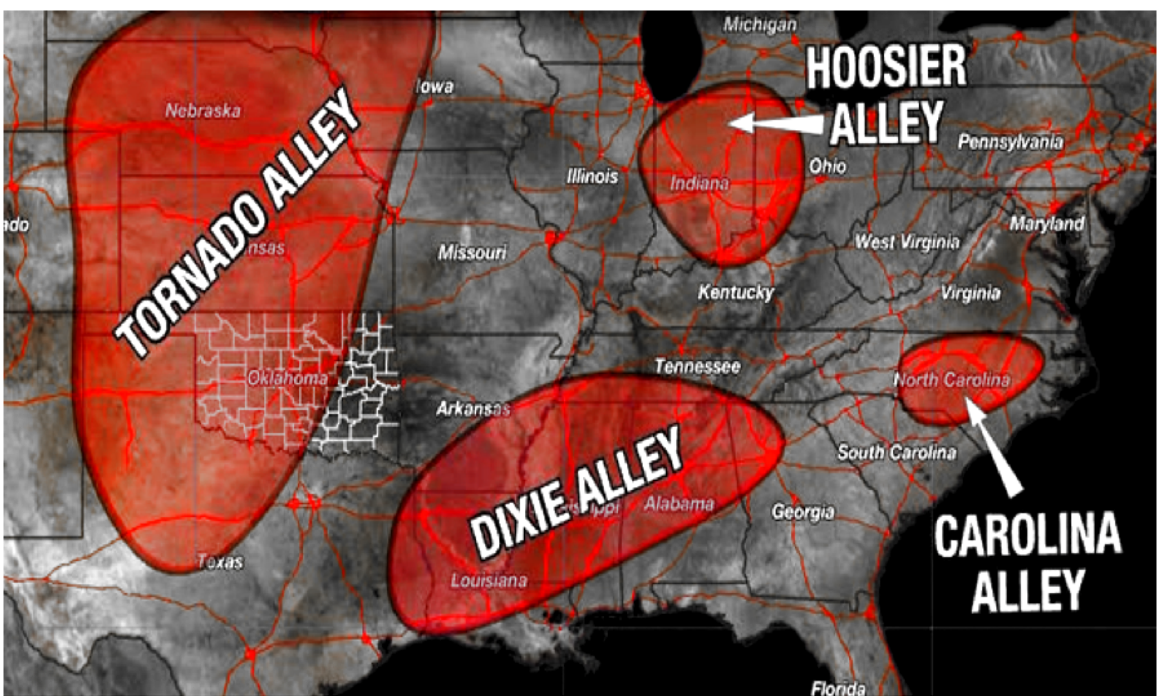


However, as shown in the chart below, tornado warnings don't always result in tornados.



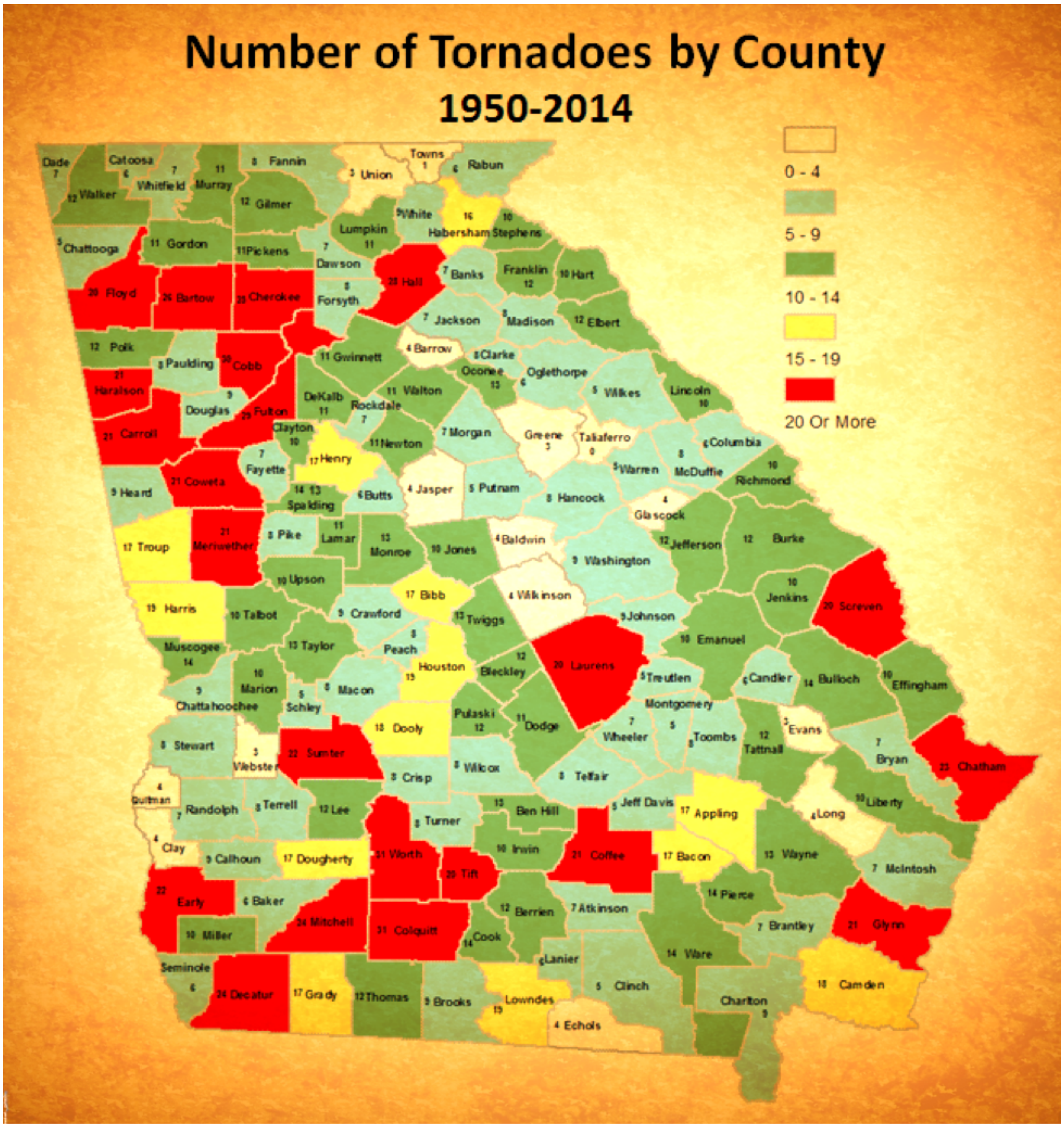
Regional overview:

Dixie Alley is the nickname given to the areas of the southern United States with a particularly high frequency of strong, long-track and violent tornadoes. The Dixie Alley region includes areas of the lower Mississippi Valley, and spans from eastern Texas and Arkansas across Louisiana, Mississippi, Tennessee, Alabama, Georgia, and to upstate South Carolina and western North Carolina. The term Dixie Alley was first used in 1971 by Allen Pearson, a director of the Storm Prediction Center after witnessing a violent and deadly tornado outbreak on February 21, 1971. Although tornadoes are less frequent than in the more well-known Tornado Alley, Dixie Alley experiences more deaths because of relatively higher numbers of strong long tracked tornadoes and higher population density of this region. New research indicates that Dixie Alley is essentially an extension of Tornado Alley. Tornadoes in this area are long-tracked and deadly and often occur during the night and early morning. Tornadoes in the Dixie Alley are often partially or fully wrapped in rain making it hard for storm spotters and chasers, law enforcement, and the public to spot. They often occur in early spring and late autumn, but can continue throughout the winter and into late spring. Some notable tornado outbreaks in the region includes: Great Natchez Tornado, the 1884 Enigma tornado outbreak, the April 1924 tornado outbreak, the 1932 Deep South tornado outbreak, the 1936 Tupelo-Gainesville tornado outbreak, the April 1957 Southeastern tornado outbreak, the 1984 Carolinas tornado outbreak, and the November 1992 tornado outbreak. See the map below of Dixie Alley.

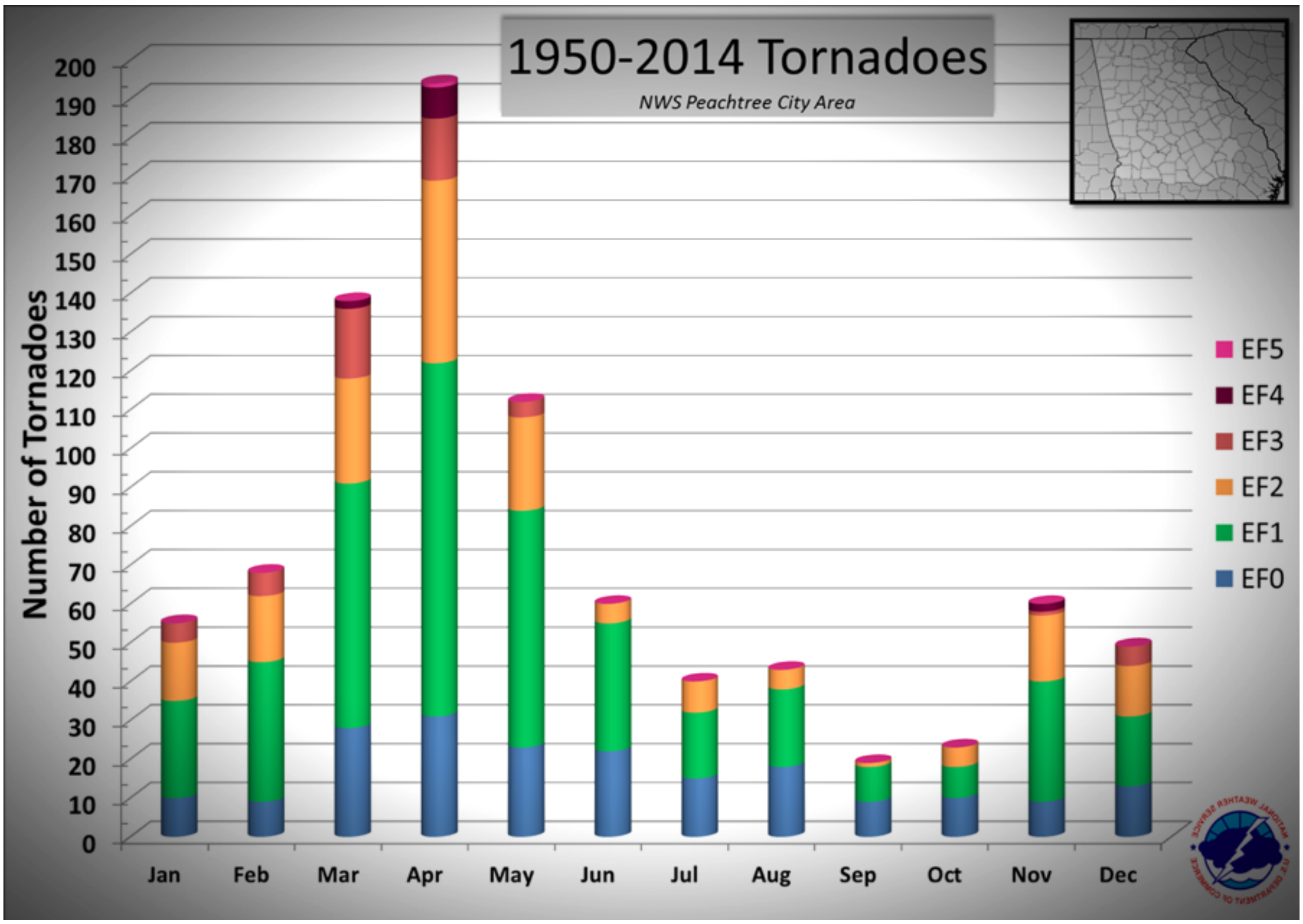


State overview:

The state of Georgia is also known for its relatively high historical level of tornado activity. The most recent version of this National Weather Service map below covers the period from 1950-2014. It demonstrates historic tornado activity of the County in relationship to surrounding counties, and the entire state. The map shows 8 Forsyth County tornados on record from the specific time period, however, a total of 11 tornados have actually been recorded over the past fifty years (1971-2020).



Tornados are considered to be the most unpredictable and destructive of weather events in Georgia, even though they are not the most frequently occurring natural hazard within Forsyth County. Tornado season in Georgia is ordinarily said to run from March through August, with the peak activity being in April. However, tornados can strike at any time of the year when certain atmospheric conditions are met, including during the coldest months of the year. See the National Weather Service graph below, which covers the NWS Peachtree City County Warning Area (CWA).



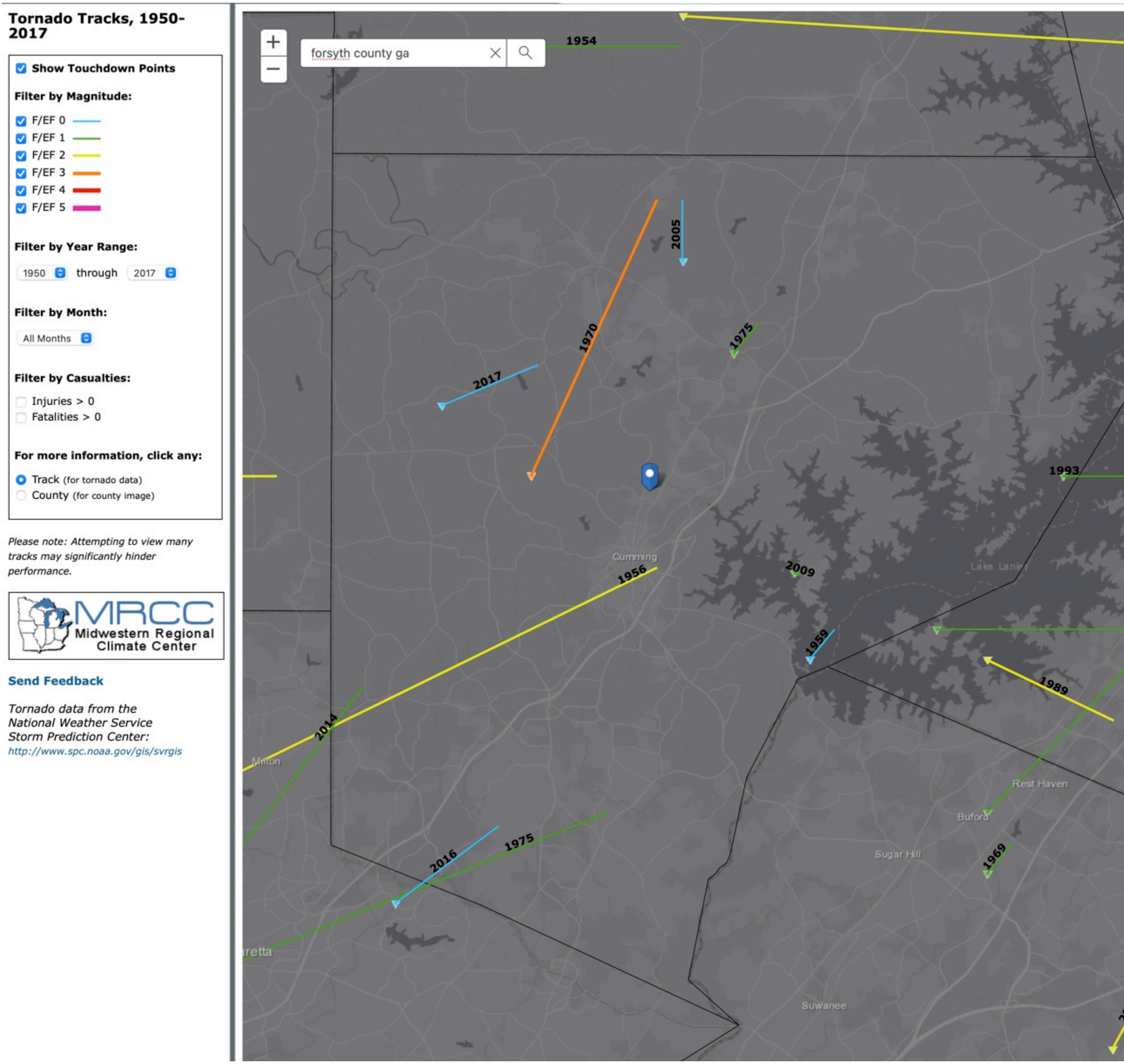
In the Peachtree City County Warning Area (CWA), which includes Forsyth County, the average number of tornado days per year is six, according to the National Weather Service. While tornadoes have been reported in all months of the year, most occur in the months of March, April, and May. During this "tornado season" the most likely time of occurrence is from mid-afternoon through early evening. Tornado intensities of F2 or greater are involved in 37% of the events when the data is broken down into a county-by-county basis. These strong tornados are more likely to occur during the month of April than in any other month.

Local overview:

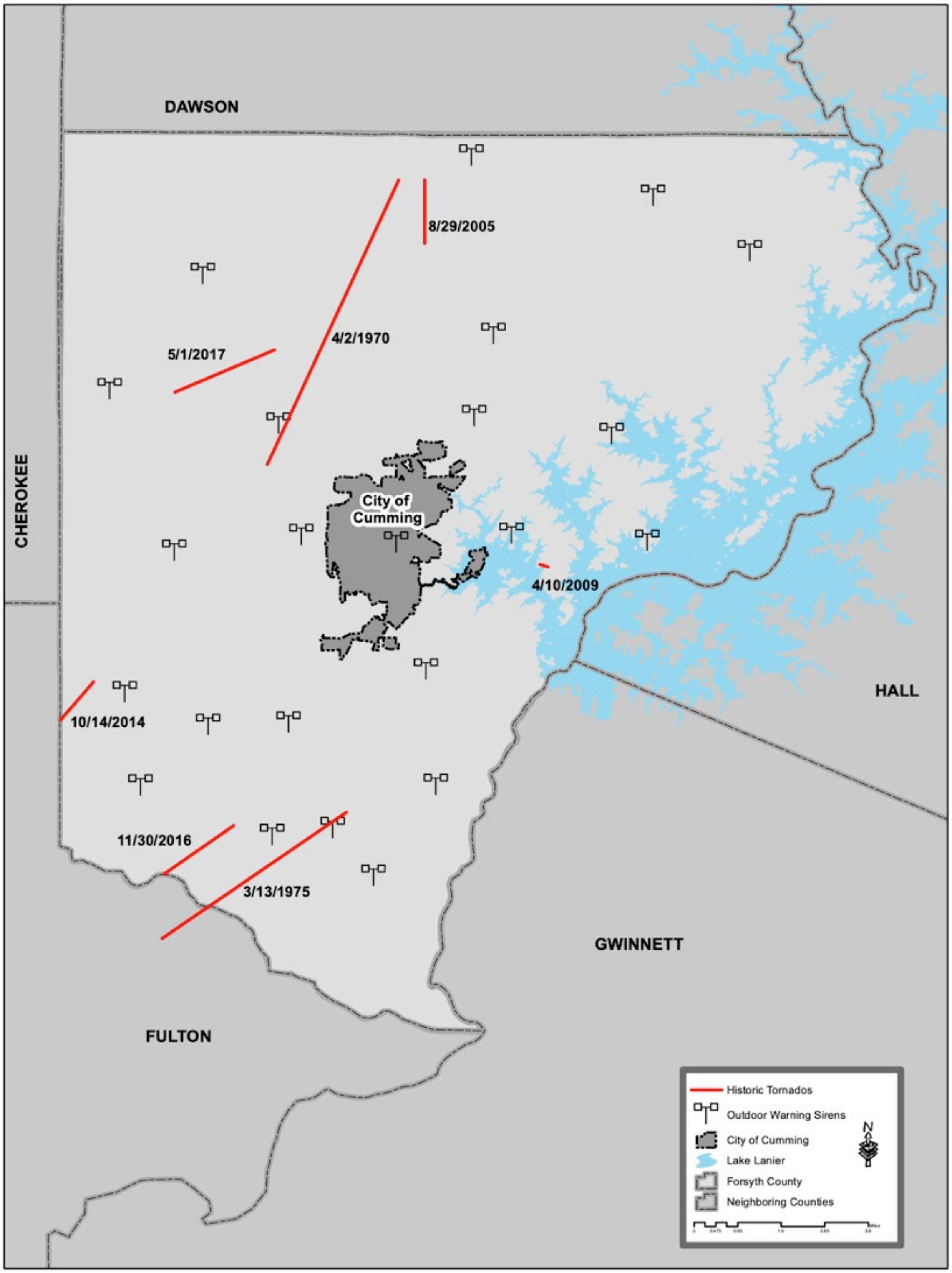
A total of 11 tornados have been recorded to have occurred in Forsyth County over the past fifty years (1971-2020). See the following chart which shows all 11 recorded tornados.

Forsyth County - Recorded tornados 1971 through 2020		
Date	**Time**	**Intensity**
3/7/1975	3:00pm	F1
3/13/1975	7:35pm	F1
5/7/1998	7:00pm	--
6/12/2003	6:30pm	--
8/29/2005	5:15pm	F0
3/15/2008	12:38pm	--
2/18/2009	5:25pm	--
4/10/2009	5:57pm	EF-1
10/14/2014	5:08pm	EF-0
11/30/2016	2:09pm	EF-0
5/1/2017	9:24am	EF-0

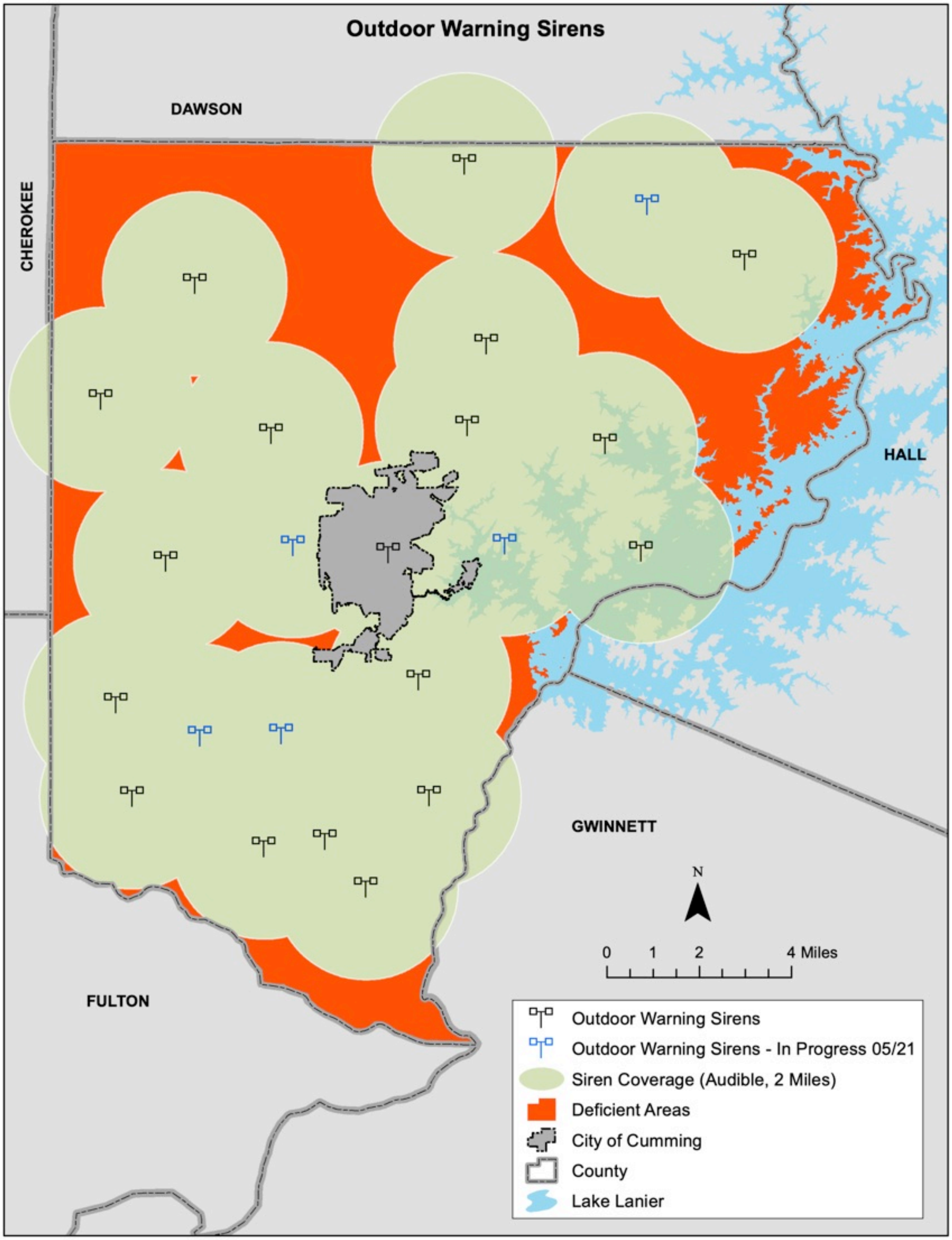
There are 11 recorded tornado events in Forsyth County for the 50-year period from 1971 to 2020. The following Midwestern Regional Climate Center (MRCC) map shows the estimated paths and intensities of those tornados in Forsyth County even though the actual map considers events from 1950 to 2017. Source: MRCC



Map of Forsyth County Warning Siren Locations



Map of Forsyth County Warning Siren Coverage

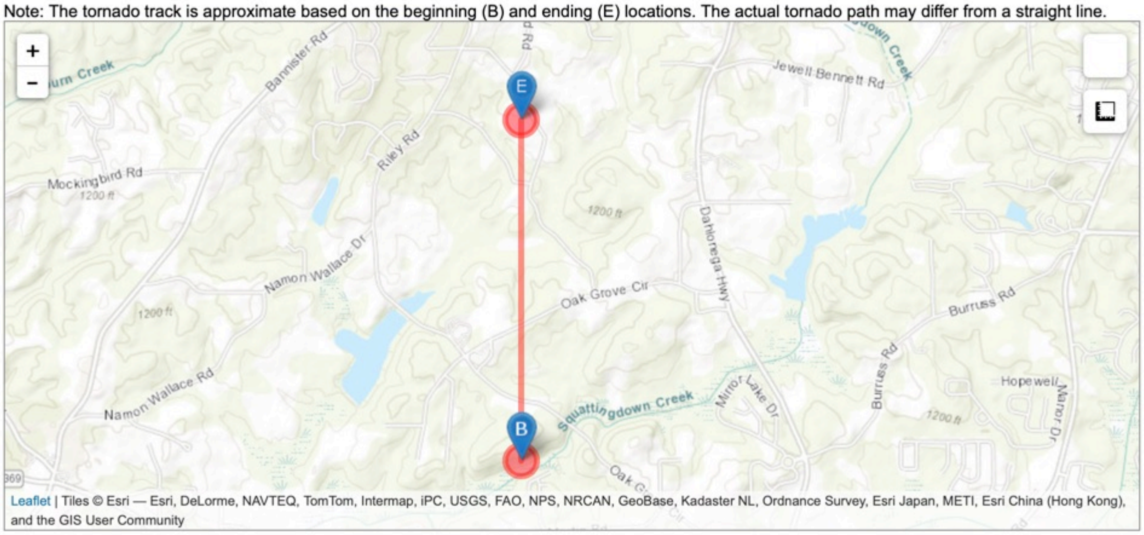


August 29, 2005 F0 Tornado

The Forsyth County Emergency Management Director reported that an F0 tornado touched down in a small subdivision near A. C. Smith Road, Jewell Bennett, and Conner Roads, just south of Silver City near the Dawson county line. The tornado caused roof damage to four homes. Two of the homes had moderate damage with wood siding blown off and windows blown out. A number of large pecan and oak trees were also down in the area. The overall path of the tornado was determined to be 1/2 mile with a path width of 50 yards. Reports of funnel clouds were also received from the public near the time of the tornado.

Event Map:

Note: The tornado track is approximate based on the beginning (B) and ending (E) locations. The actual tornado path may differ from a straight line.



February 18, 2009 Tornado

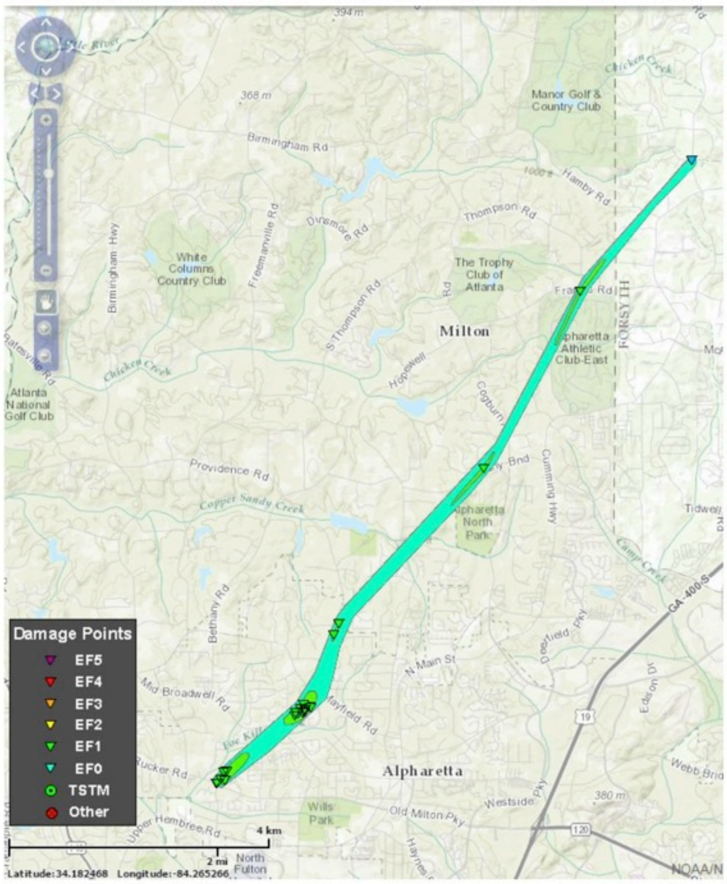
On February 18, 2009 the Forsyth County Emergency Management Director relayed a report of a funnel cloud in the Buford Dam area of the far southeast part of the county on the south end of Lake Lanier. It was reported that a few trees were blown down in the Buford Dam area. The Forsyth County News also reported that the Spondivits restaurant in Cumming had a door ripped off and suffered significant roof damage.

April 10, 2009 EF-1 Tornado

The tornado outbreak of April 9–11, 2009 was a tornado outbreak that affected large portions of the Southern United States. At least 5 people were killed by tornadoes including three in Mena, Arkansas and two in Murfreesboro, Tennessee. A total of 85 tornadoes were confirmed over the two days. This event is sometimes referred to as the Good Friday tornado outbreak of 2009. One of these tornados, a brief EF-1 tornado/waterspout, touched down on the shores of Lake Lanier on April 10, 2009 and damaged at least 100 trees, some falling on a house, and destroyed several boats, docks and vehicles. The tornado path was approximately a half mile. A damage survey conducted by the National Weather Service Forecast Office in Peachtree City, Georgia, confirmed that an EF1 tornado had touched down just west of a home at the end of Bay Circle off an inlet of Lake Lanier. The tornado tracked across this home and across a small inlet of Lake Lanier to another home at the end of Bay Court on the other side of the lake inlet. At least 50 large trees were uprooted or snapped around the home off Bay Circle, several of which fell on and caused considerable damage to the structure. Two vehicles in the driveway of this home were crushed when large trees fell on them. Three boats and two boat docks were destroyed. The boat docks, and one of the boats, were blown inland some 200 yards, overturned, and portions wrapped around or underneath fallen trees. The home on Bay Court on the other side of the Lake Lanier inlet suffered minor roof and structural damage from downed trees. However, at least another 50 large trees were uprooted or snapped on the adjacent land between the home and the lake inlet. The tornado lifted as it approached a steep hill behind the home on Bay Court. A couple of adjacent homes also suffered minor roof and window damage.

October 14, 2014 EF-1 Tornado

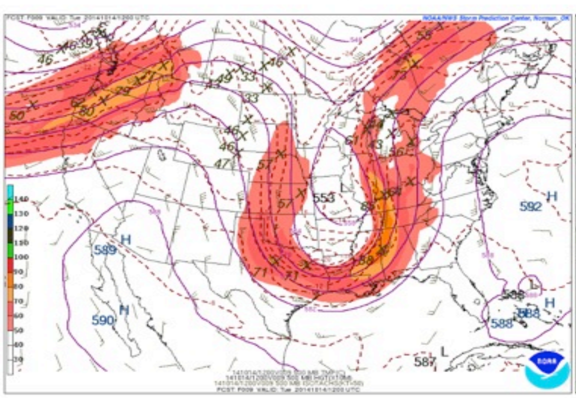
An EF-1 tornado with maximum winds estimated at 105mph touched down two miles west of Alpharetta and traveled 7.5 miles through Milton before lifting in Forsyth County. Hundreds of trees along this path were snapped or uprooted. Damage to homes was primarily due to the falling trees with moderate roof damage being the most common result. The maximum path width was 100yds, although there was considerable damage outside this path due to the straightline winds within the squall line.



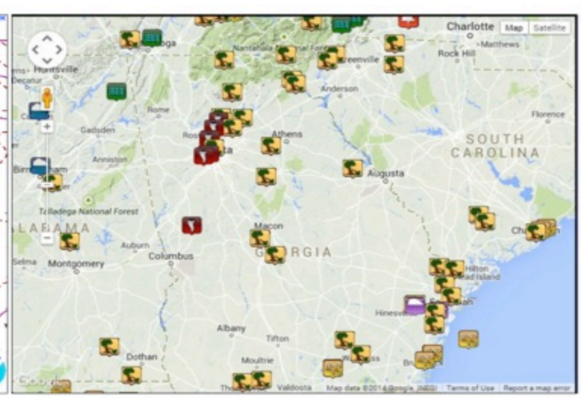
Damage Path

County	Rating	# of Injuries
Fulton/Forsyth	EF-1	0

Rating:	EF-1
Peak Wind:	105 MPH
Path Length:	7.5 MILES
Path Width:	100 YARDS
Fatalities:	0
Injuries:	0



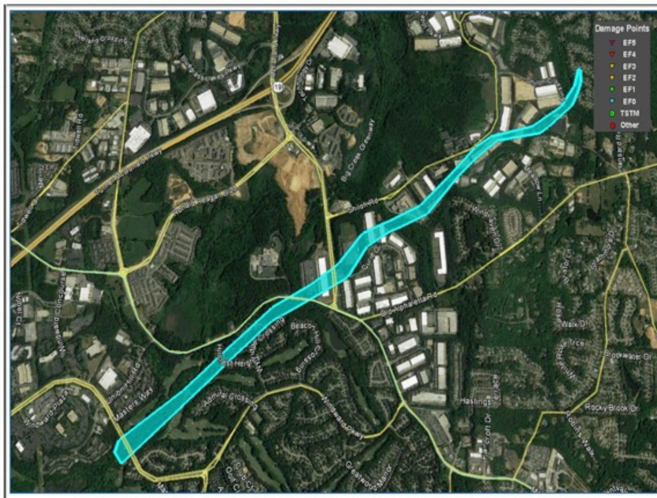
500-mb pattern on October 14, 2014



Local Storm Reports from October 14, 2014

November 30, 2016 EF-0 Tornado

On November 30, 2016 just after 2pm, a weak EF-0 tornado initially touched down in extreme northern Fulton County where some pine trees were uprooted on Windward Parkway. The tornado continued moving northeast where it crossed into southern Forsyth County. Several trees were snapped on McGinnis Ferry Road, and a traffic light was damaged at the intersection of McGinnis Ferry Road and Curie Drive. Additional trees and tree limbs were downed along the path before the tornado lifted along Ridgefield Drive.



Damage Path - North Fulton County / South Forsyth County

County	Rating	# of Injuries	KML
North Fulton / South Forsyth	EF-0	0	

Rating:	EF-0
Peak Wind:	80 MPH
Path Length:	3.0 MILES
Path Width:	100 YARDS
Fatalities:	0
Injuries:	0
Start Date:	November 30, 2016
Start Time:	2:07 PM EST
Start Location:	3.5 miles NE of Alpharetta
Start Lat/Lon:	34.0905 / -84.2336
End Date:	November 30, 2016
End Time:	2:13 PM EST
End Location:	1.0 mile W of Big Creek
End Lat/Lon:	34.1158 / -84.1927

Some trees were uprooted by this weak EF-0 tornado.

Tree damage was the primary noticeable damage from this weak EF-0 tornado.

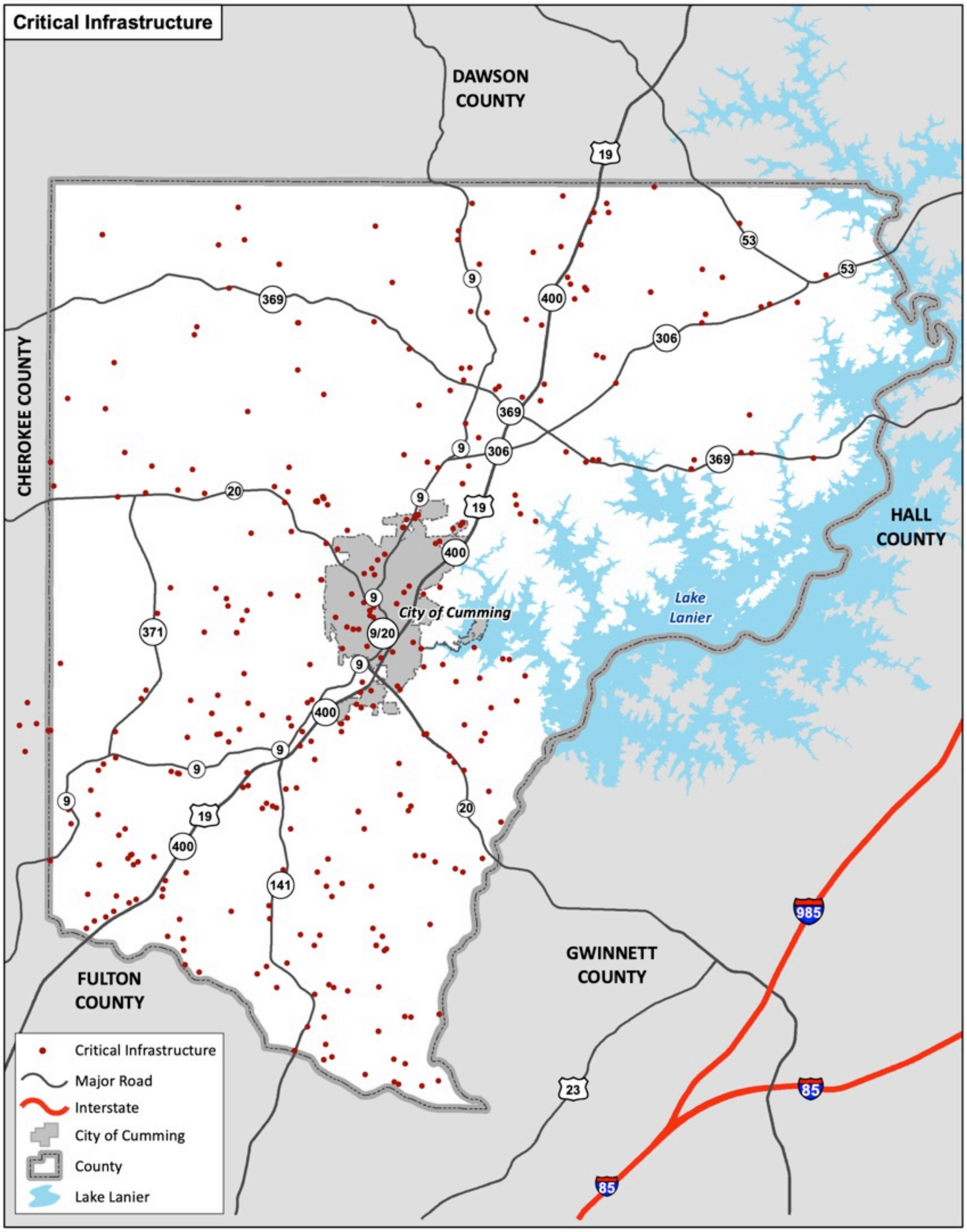
<u>May 1, 2017 EF-0 Tornado</u>

A brief tornado touched down in Forsyth County on Monday, downing trees and damaging at least one mobile home. The tornado was a relatively weak Category EF-0, with maximum wind speed of 80 m.p.h., said Keith Stellman, meteorologist in charge at the National Weather Service office in Peachtree City. It was the only tornado known to have touched down in the metro Atlanta area as a wave of storms worked their way through the region Monday. No tornado warning was issued. The tornado touched down near Ducktown, a couple of miles northwest of Cumming. It first touched down at 10:24 a.m. along McConnell Road, traveling into areas near Bridgeshaw Drive and Pleasant Grove Road. Along Pleasant Grove, 7 or 8 trees were uprooted, including one that fell on a mobile home, Stellman said. In all, the tornado's path was 2.5 miles long and 150 yards wide. It lifted at 10:28 a.m.

(National Climatic Data Center) NCDC and other records show that 11 tornados occurred within the County over the past fifty years, which equates to a 22% annual frequency of reported events. However, in the past twenty years the County has averaged a 40% annual frequency. It would appear that tornado activity has increased over time within the County. This may be the case or it may simply be that record keeping and technology have improved significantly over the course of time, reflecting the higher numbers. It may also be a combination of these factors. The following chart provides annual frequency of reported events over the past five, ten, twenty, and fifty-year periods. The most recent five-year period, covering the span of time since the last update to this Plan, is highlighted in gold.

Forsyth County – Tornado Frequency (based on Reported Events)				
Time Period	**5yrs (2016-2020)**	**10yrs (2011-2020)**	**20yrs (2001-2020)**	**50yrs (1971-2020)**
Number of Reported Events	**2**	**3**	**8**	**11**
Frequency Average per Year	**0.40**	**0.30**	**0.40**	**0.22**
Frequency Percent per Year	**40%**	**30%**	**40%**	**22%**

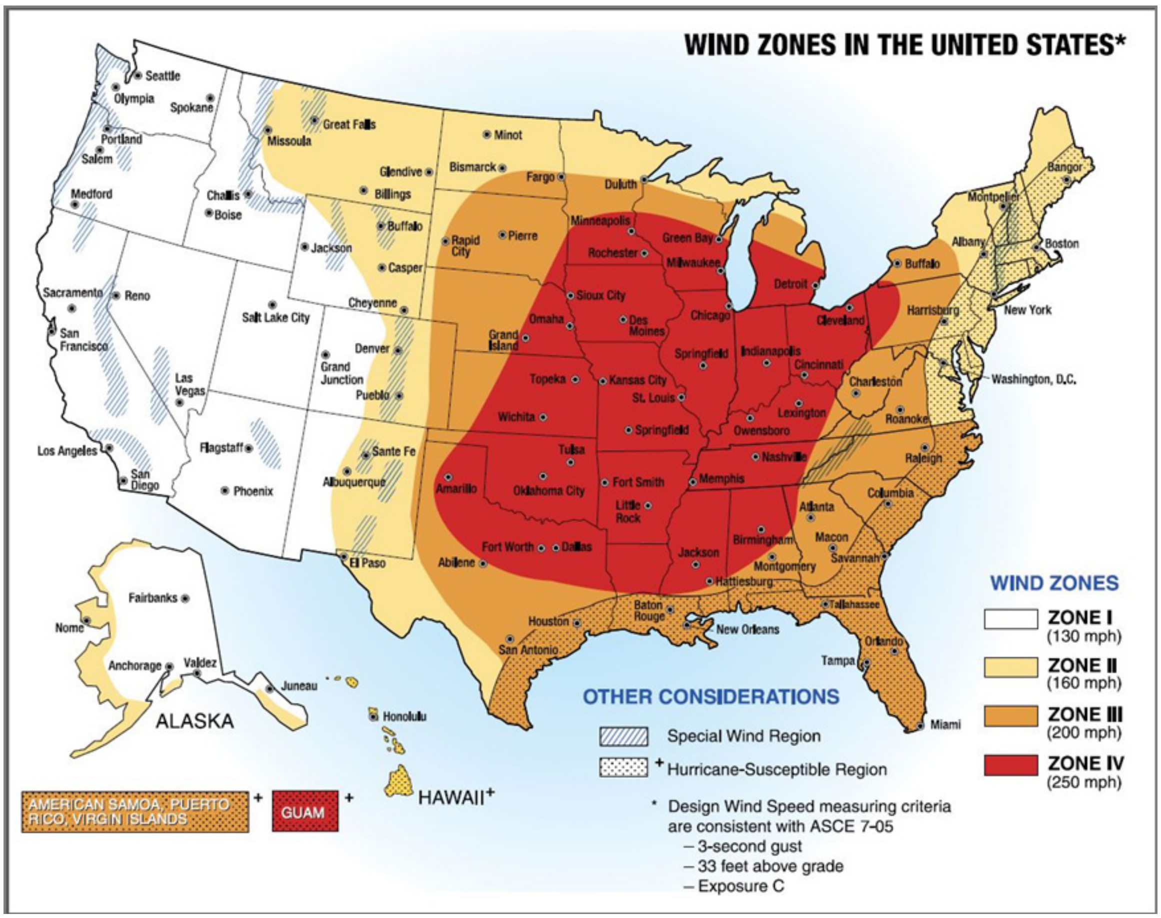
C. Assets Exposed to Hazard - Tornados are unpredictable and are indiscriminate as to when or where they strike. All public and private property including critical facilities are susceptible to tornados since this hazard is not spatially defined. The GEMA map below identifies critical facilities located within the hazard area, which in the case of tornados includes all areas within the County and City.

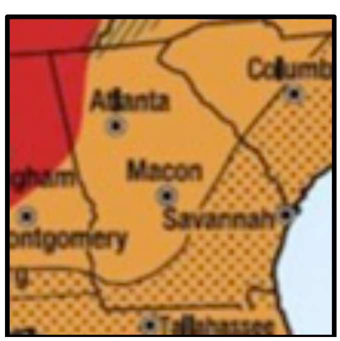


D. Estimate of Potential Losses – For loss estimate information, please refer to the Critical Facilities Database (Appendix A).

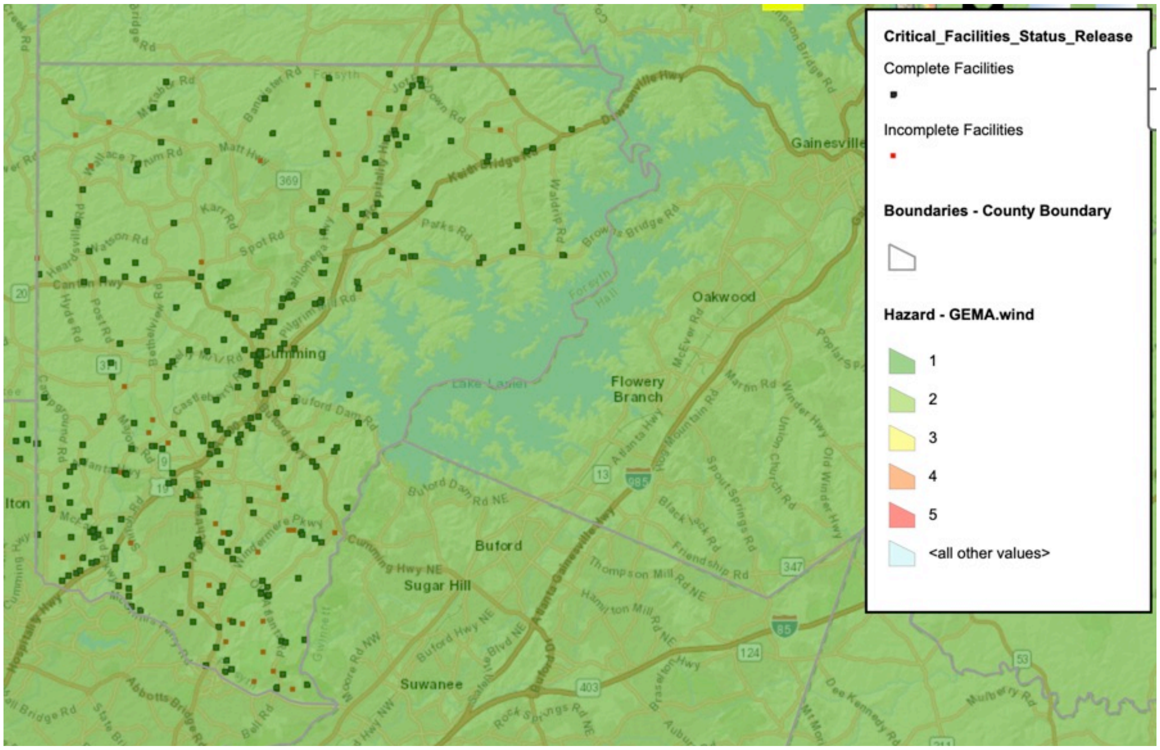
E. Multi-Jurisdictional Concerns - Forsyth County and the City of Cumming have a design wind speed of 200 mph as determined by the American Society of Civil Engineers (ASCE). Since no part of the County is immune from tornados, any mitigation steps taken related to tornados will be undertaken on a countywide basis, including the City of Cumming. See the following ASCE design wind speed map, and GMIS wind hazard map.

ASCE Design Wind Speed Map





GMIS Wind Hazard Map



The Wind Hazard Scores are based on the 2000 International Building Code, figure 1609 contours showing 3 second gust wind speeds with a 50-year return interval. The Northwest portion of the state scored an additional point for the 250mph community tornado shelter design zone according to FEMA publications.

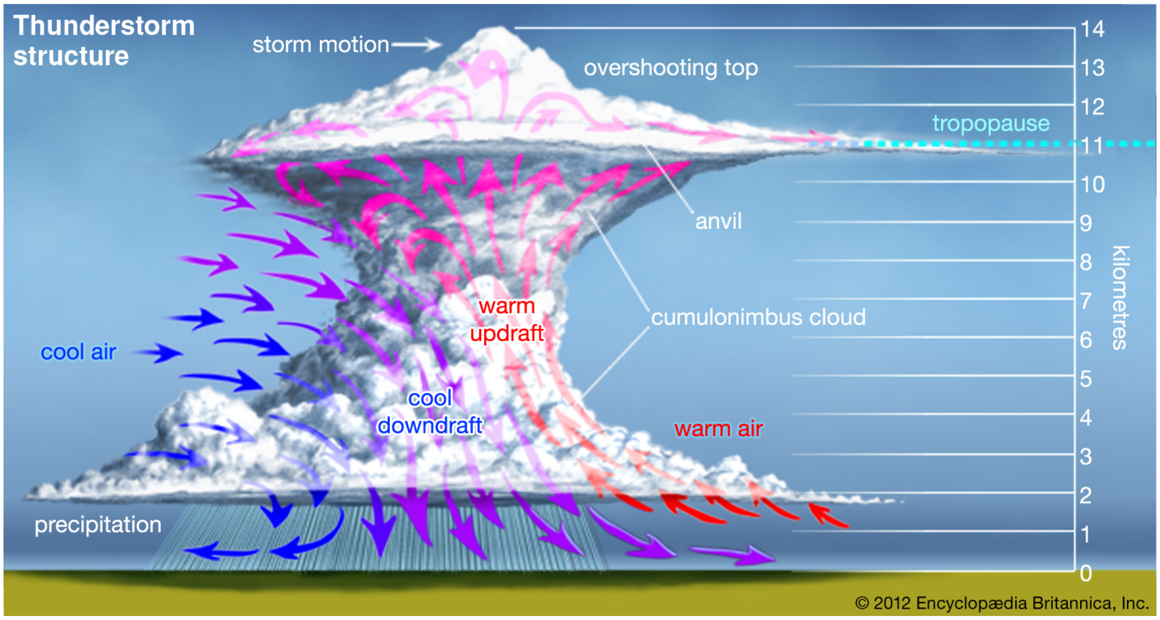
Score	Original Value	Description
5	> 120 mph	3 second gust greater than 120 mph
4	110 to 119 mph	
3	100 to 109 mph	
2	90 to 99 mph (or ZONE IV)	This score is also given to an area with Zone IV of the "Design Wind Speed Map for Community Shelters," representing an area exposed to 250 mph winds. This area is the Northwestern corner of the state.
1	< 90 mph	

F. Hazard Summary – Based on its history, Forsyth County has a high exposure to potential damage from tornados. Should a tornado strike residential areas or critical facilities, significant damage and loss of life could occur. Due to the destructive power of tornados it is essential that the mitigation measures identified in this plan receive full consideration. Specific mitigation recommendations related to tornados are identified in *Chapter 5*.

2.2 Severe Thunderstorms (including Hail & Lightning)

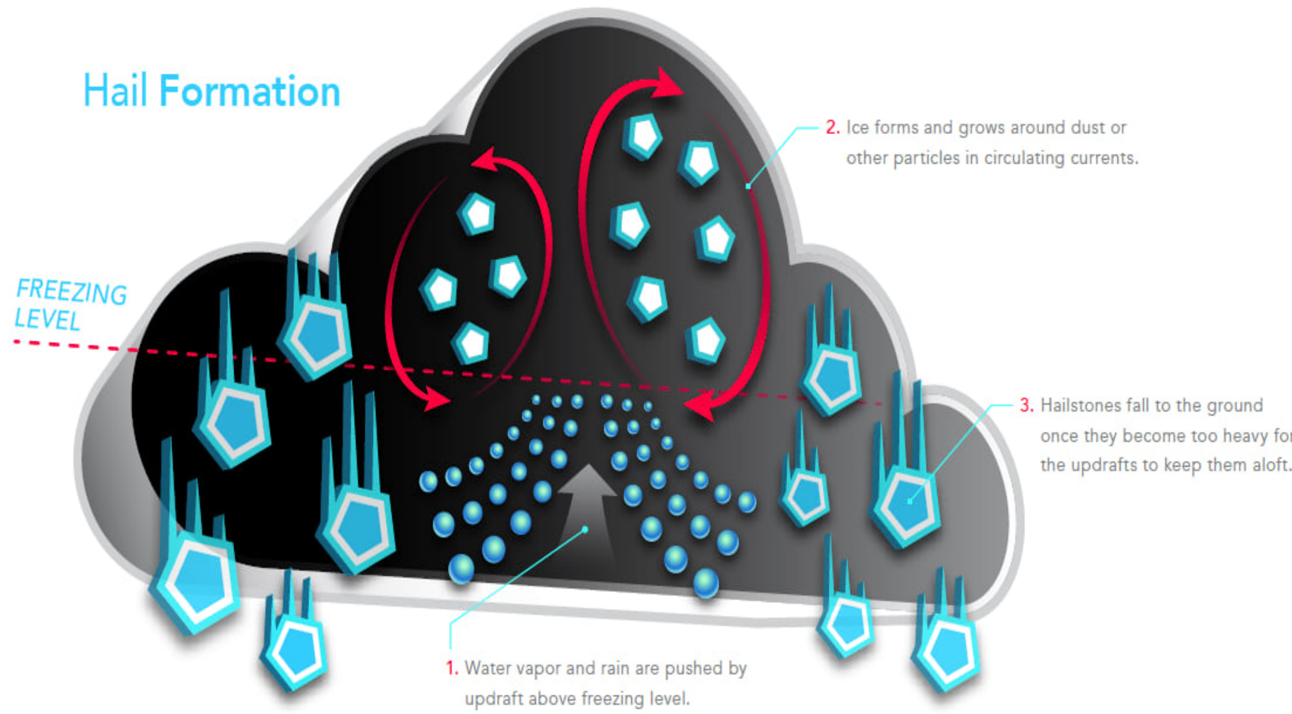
A. Hazard Identification – A Severe Thunderstorm is defined as a thunderstorm producing wind at or above 58 mph and/or hail ¾ of an inch in diameter or larger. This threshold is met by approximately 10% of all thunderstorms. These storms can strike any time of year, but similar to tornados, are most frequent in the spring and summer months. They are nature's way of providing badly needed rainfall, dispersing excessive atmospheric heat buildup and cleansing the air of harmful pollutants. Not only can severe thunderstorms produce injury and damage from violent straight-line winds, hail, and lightning, but these storms can produce tornados very rapidly and without warning. Note: For the purposes of this Plan, severe thunderstorms that result from tropical storms and hurricanes are included in this section.

Thunderstorms are violent short-lived weather disturbances that are almost always associated with lightning, thunder, dense clouds, heavy rain or hail, and strong gusty winds. Thunderstorms arise when layers of warm, moist air rise in a large, swift updraft to cooler regions of the atmosphere. There the moisture contained in the updraft condenses to form towering cumulonimbus clouds and eventually precipitation. Columns of cooled air then sink earthward, striking the ground with strong downdrafts and horizontal winds. At the same time, electrical charges accumulate on cloud particles (water droplets and ice). Lightning discharges occur when the accumulated electric charge becomes sufficiently large. Lightning heats the air it passes through so intensely and quickly that shock waves are produced; these shock waves are heard as claps and rolls of thunder. On occasion, severe thunderstorms are accompanied by swirling vortices of air that become concentrated and powerful enough to form tornadoes. See structure of a thunderstorm in the following diagram. Source: Encyclopedia Britannica



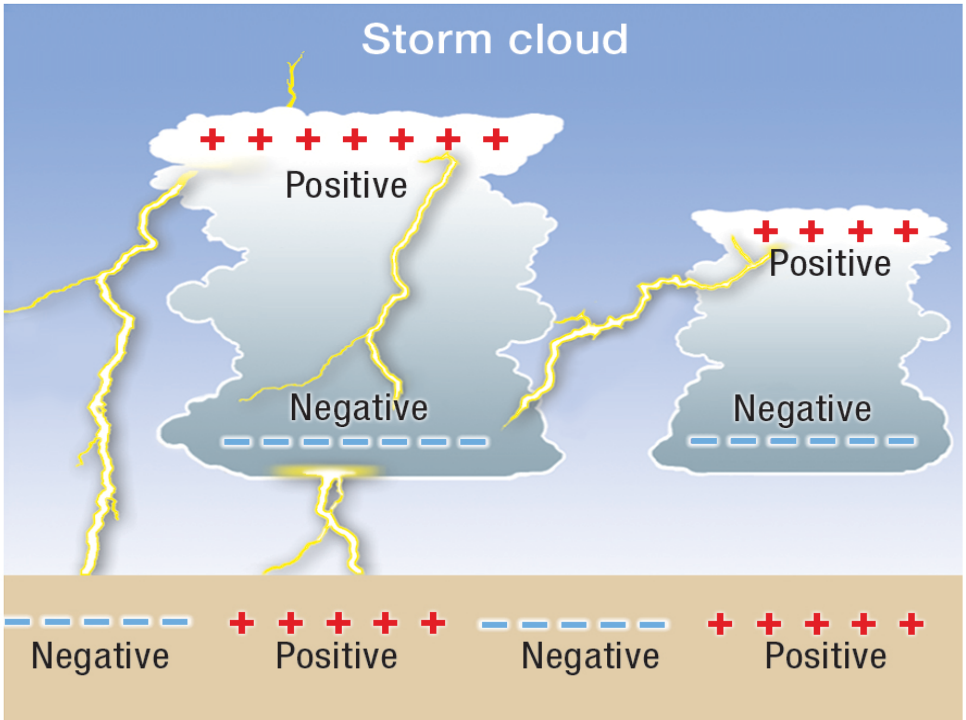
The most damaging phenomena associated with thunderstorms, excluding tornado activity, are thunderstorm winds. These winds are generally short in duration involving straight-line winds and/or gusts in excess of 50 mph. However, these winds can gust to more than 100 miles an hour, overturning trailers, unroofing homes, and toppling trees and power lines. Such winds tend to affect areas of the County with significant tree stands, as well as areas with exposed property, infrastructure, and above-ground utilities. Resulting damage often includes power outages, transportation and economic disruptions, and significant property damage. Severe thunderstorms can ultimately leave a population with injuries and loss of life. Thunderstorms produce two types of wind. Tornados are characterized by rotational winds. The other more predominant winds from a thunderstorm, downbursts, are small areas of rapidly descending air beneath a thunderstorm that strike the ground producing isolated areas of significant damage. Every thunderstorm produces a downburst. The typical downburst consists of only a 25mph gusty breeze, accompanied by a temperature drop of as much as 20 degrees within a few minutes. However, severe downburst winds can reach from 58 to 100 mph, or more, significantly increasing the potential for damage to structures. Downbursts develop quickly with little or no advance warning and come from thunderstorms whose radar signatures appear non-severe. There is no sure method of detecting these events, but atmospheric conditions have been identified which favor the development of downbursts. Severe downburst winds have been measured in excess of 120 miles per hour, or the equivalent of an F2 tornado, on the Fujita Scale. Such winds have the potential to produce both a loud “roaring” sound and the widespread damage typical of a tornado. This is why downbursts are often mistaken for tornados.

Hail can also be a destructive aspect of severe thunderstorms. Hail causes more monetary loss than any other type of thunderstorm-spawned severe weather. Annually, the United States suffers about one billion dollars in crop damage from hail. Storms that produce hailstones only the size of a dime can produce dents in the tops of vehicles, damage roofs, break windows and cause significant injury or even death. Unfortunately, hail is often much larger than a dime and can fall at speeds in excess of 100 mph. Hailstones are created when strong rising currents of air called updrafts carry water droplets high into the upper reaches of thunderstorms where they freeze. These frozen water droplets fall back toward the earth in downdrafts. In their descent, these frozen droplets bump into and coalesce with unfrozen water droplets and are then carried back up high within the storm where they refreeze into larger frozen drops. This cycle may repeat itself several times until the frozen water droplets become so large and heavy that the updraft can no longer support their weight. Eventually, the frozen water droplets fall back to earth as hailstones. See the diagram below.



Finally, one of the most frightening aspects of thunderstorms is lightning. Lightning kills nearly one hundred people every year in the United States and injures hundreds of others. A possible contributing reason for this is that lightning victims frequently are struck before or just after the occurrence of precipitation at their location. Many people apparently feel safe from lightning when they are not experiencing rain. Lightning tends to travel the path of least resistance and often seeks out tall or metal objects. With lightning however, it's all relative. A 'tall' object can be an office tower, a home, or a child standing on a soccer field. Lightning can and does strike just about any object in its path. Some of the most dangerous and intense lightning may occur with severe thunderstorms during the summer months, when outdoor activities are at their peak.

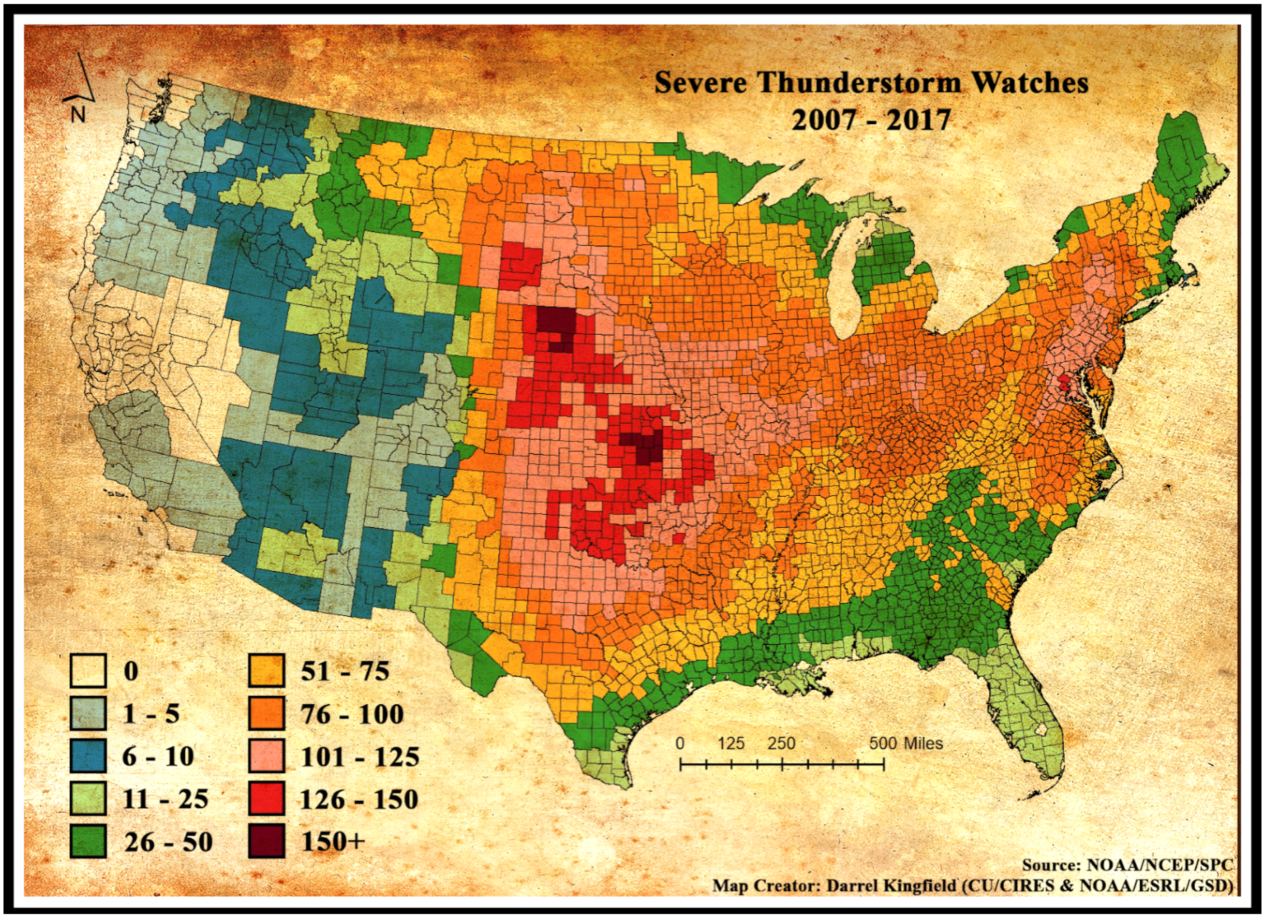
Lightning is produced as a result of charge separation within the atmosphere. Lightning (a spark discharge between centers of positive and negative charge) can occur within clouds, between clouds and between clouds and the ground. See diagram below.

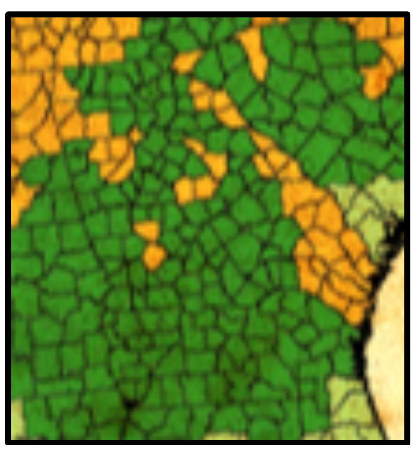


B. Hazard Profile – Severe thunderstorms, hail, and lightning are serious threats to the residents of Forsyth County. Over the course of a year, the County experiences dozens of thunderstorms, with about one in ten being severe. Severe thunderstorms occur more frequently than any other natural hazard event within Forsyth County. Many of these storms include lightning and/or hail.

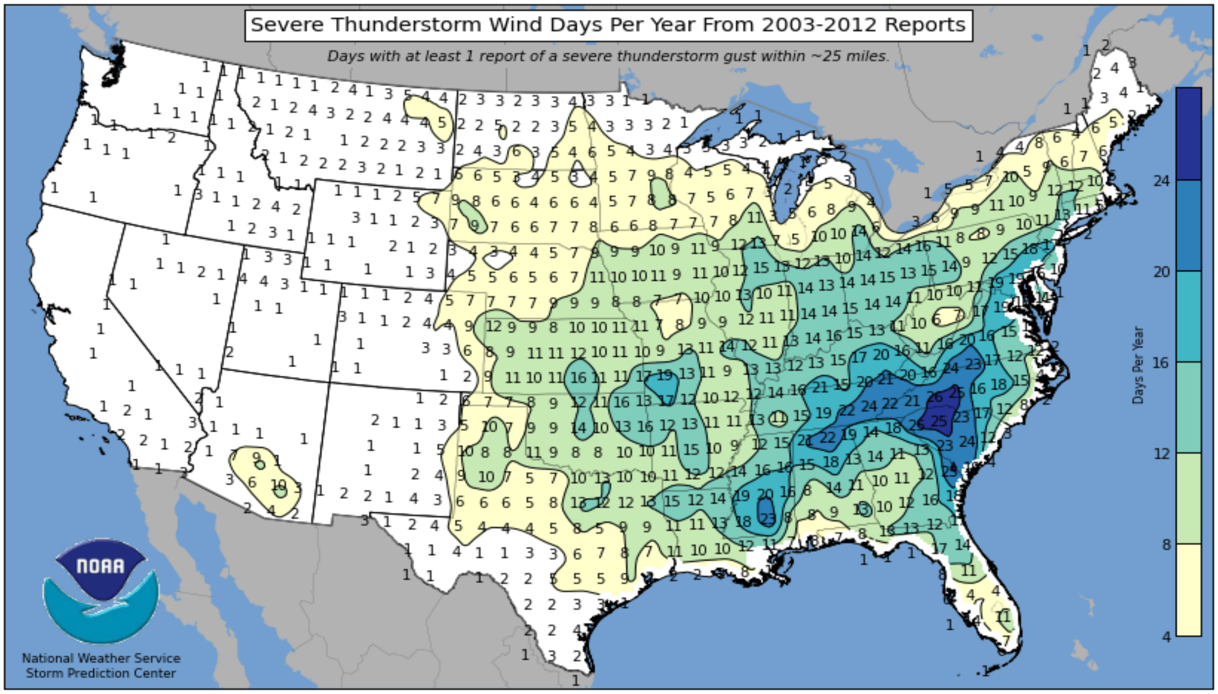
Most of the available information relating to severe thunderstorms, hail, and lightning occurrences within Forsyth County fails to describe damage estimates in great detail. However, with each thunderstorm event it is likely there are unreported costs related to infrastructure and utilities repair and public safety costs, at a minimum. Severe thunderstorms have occurred in all parts of the day and night within Forsyth County. They have also taken place in every single month of the year.

Forsyth County is located in one of the more active areas of the United States as it relates to severe thunderstorms. The following map based upon NOAA data shows the average number of severe thunderstorm watches in the U.S. per county from 2007-2017, which for Forsyth County was between 26 and 50.

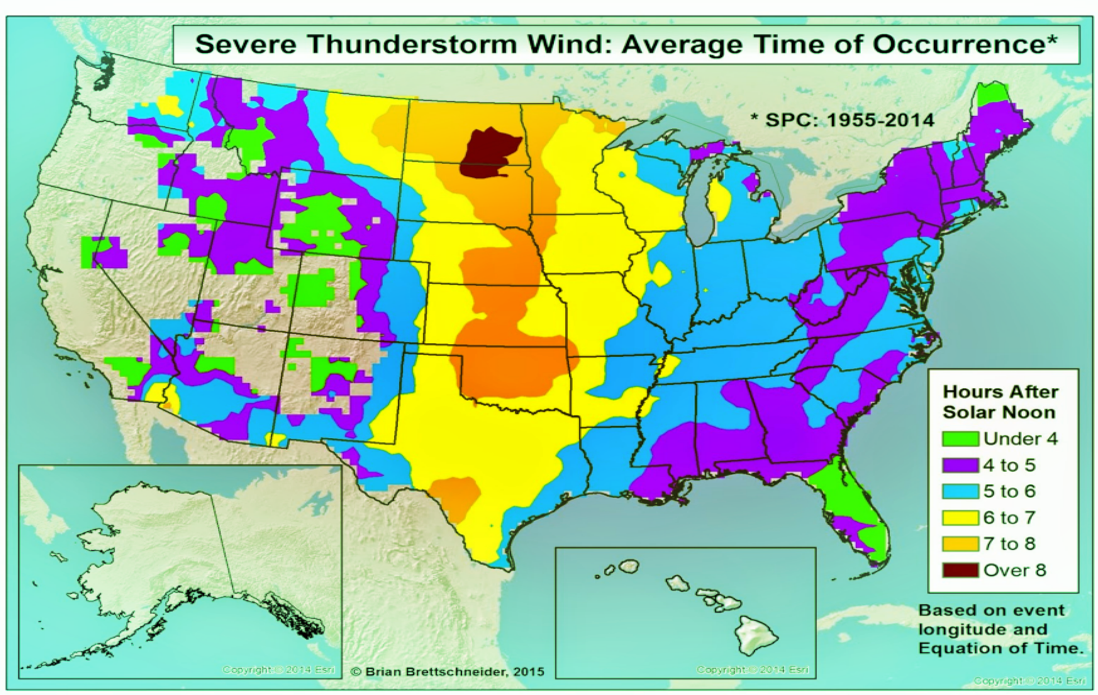




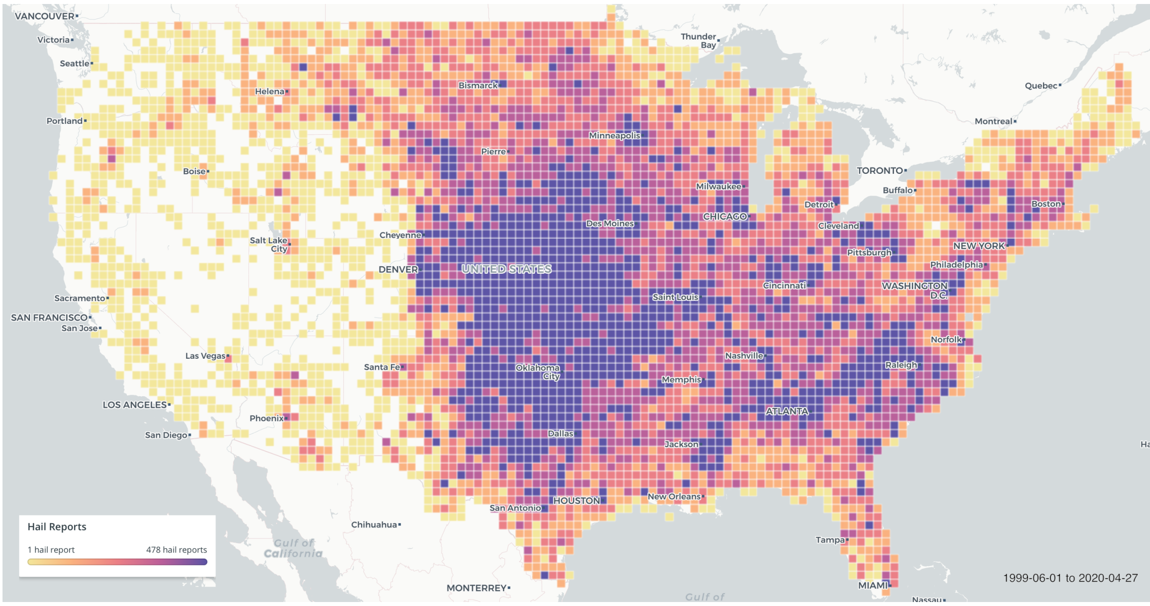
Although a little outdated, the most recent version of the following NOAA map demonstrates the average number of severe thunderstorm wind days per year. For this particular time period, Forsyth County averaged 14 days per year.

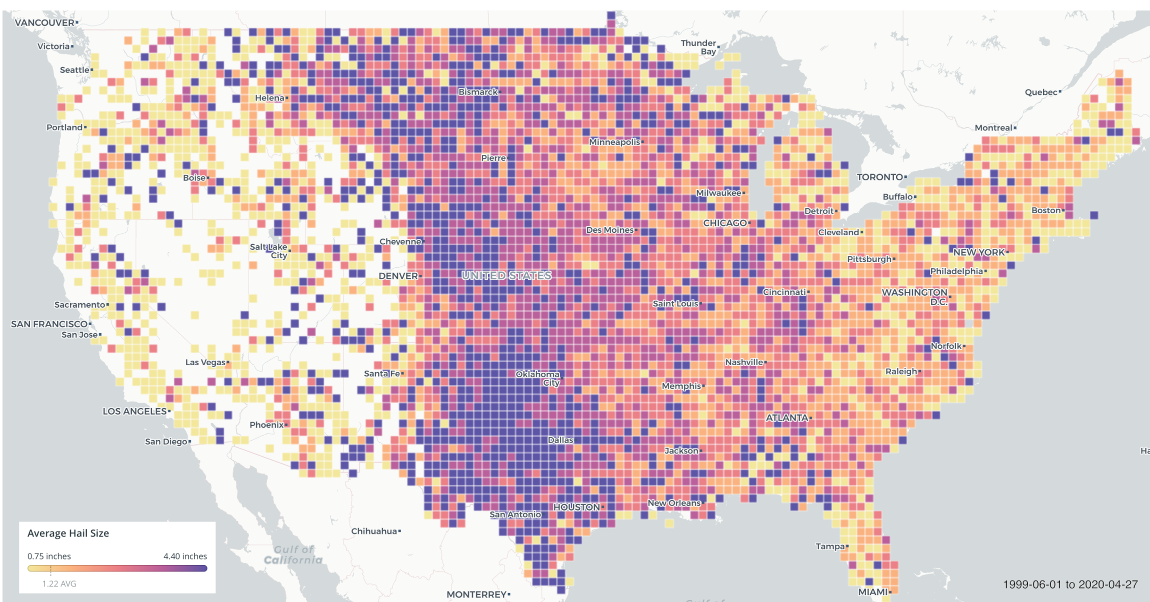


Severe thunderstorms can occur at any time of day. In Forsyth County they tend to occur in the late afternoon/early evening. The following map demonstrates the average time of occurrence of severe thunderstorm winds across the country.

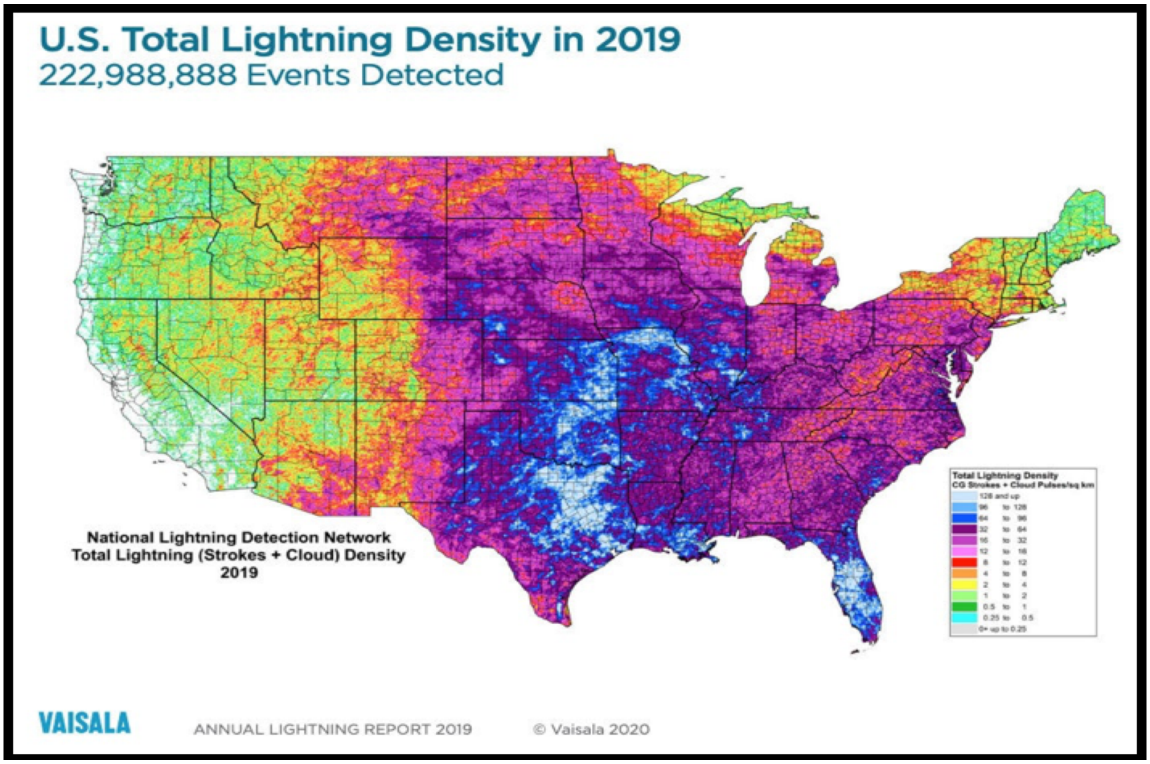


In the two maps below, NOAA Storm Prediction Center data shows both the number of reported hail events and the average hail size for the period 1999 to 2020. According to the data, Forsyth County is on the high end of the spectrum with regard to number of hail reports (first map) and near mid-range with regard to average hail size (second map).

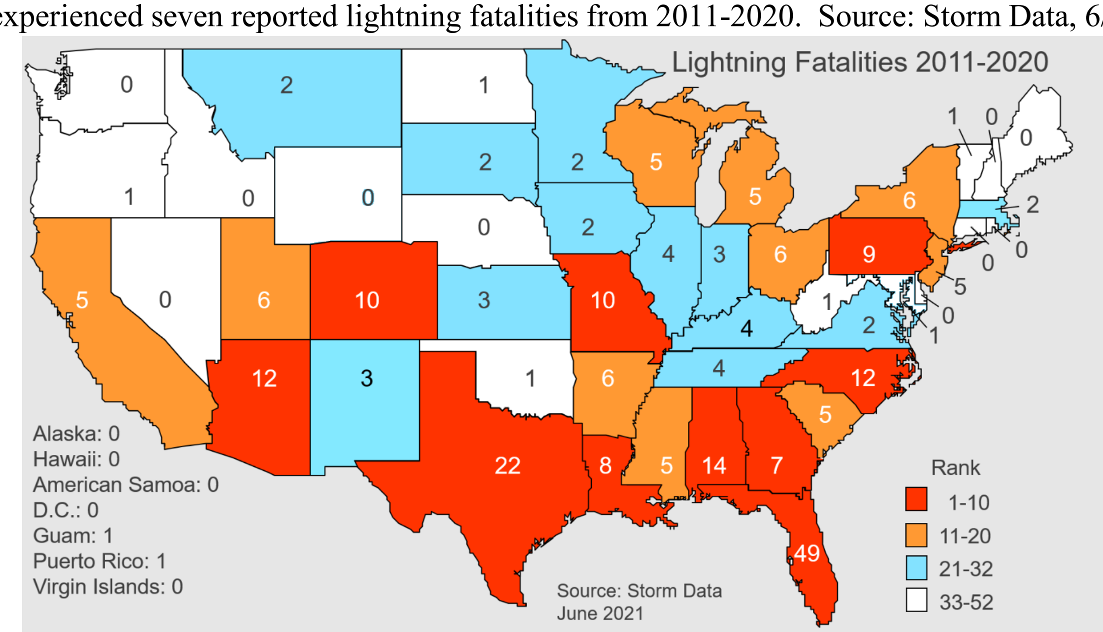




Lightning is another aspect of severe thunderstorms that can cause great devastation. The map below shows lightning activity nationwide for the year 2019. According to the data, Forsyth County experienced between 12 and 16 flashes of lightning per square mile on average in 2019. Source: Vaisala



Lightning can be a deadly phenomenon. As shown in the map below, Georgia has experienced seven reported lightning fatalities from 2011-2020. Source: Storm Data, 6/21



The table below shows the frequency of lightning fatalities cumulative by month nationwide from 2011-2020. It is clear that the second half of the year is drastically more dangerous than the first half with regard to lightning fatalities. Source: National Lightning Safety Council

Average Number of Lightning Fatalities Through Each Day of the Year

10-Year Average (2011-2020)

Day	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1	0	0	0	0	1	4	9	17	22	24	25	25
2	0	0	0	0	1	4	9	17	22	24	25	25
3	0	0	0	0	1	4	9	17	22	24	25	25
4	0	0	0	0	2	4	9	17	22	24	25	25
5	0	0	0	0	2	4	9	18	22	24	25	25
6	0	0	0	0	2	4	10	18	23	24	25	25
7	0	0	0	1	2	4	10	18	23	24	25	25
8	0	0	0	1	2	5	10	18	23	24	25	25
9	0	0	0	1	2	5	10	18	23	24	25	25
10	0	0	0	1	2	5	11	18	23	24	25	25
11	0	0	0	1	2	5	11	18	23	24	25	25
12	0	0	0	1	2	5	12	19	23	24	25	25
13	0	0	0	1	2	6	12	19	23	24	25	25
14	0	0	0	1	2	6	12	19	23	24	25	25
15	0	0	0	1	2	6	13	19	24	24	25	25
16	0	0	0	1	3	6	13	19	24	24	25	25
17	0	0	0	1	3	6	13	19	24	24	25	25
18	0	0	0	1	3	6	13	20	24	24	25	25
19	0	0	0	1	3	6	14	20	24	24	25	25
20	0	0	0	1	3	6	14	20	24	24	25	25
21	0	0	0	1	3	6	14	20	24	25	25	25
22	0	0	0	1	3	6	14	20	24	25	25	25
23	0	0	0	1	3	7	15	20	24	25	25	25
24	0	0	0	1	3	7	15	20	24	25	25	25
25	0	0	0	1	3	7	15	20	24	25	25	25
26	0	0	0	1	3	7	16	21	24	25	25	25
27	0	0	0	1	3	8	16	21	24	25	25	25
28	0	0	0	1	4	8	16	21	24	25	25	25
29	0	0	0	1	4	8	16	21	24	25	25	25
30	0		0	1	4	8	16	21	24	25	25	25
31	0		0		4		16	22		25		25

Compiled by John Jensenius
National Lightning Safety Council

The specific list of lightning fatalities in Georgia from 2006-2020 is shown below. One of the fatalities was in Forsyth County and another in Dawson County. Source: National Lightning Safety Council

Georgia Lightning Fatalities
2006-2020

Date	Day of Week	State	City	Age	Sex	Location	Activity	Name
7/3/2020	Friday	GA	Moultrie	9	F	Wooden shelter near tree	Walking	Nicol Mateo Pedro
7/4/2018	Wednesday	GA	Dalton	37	M	Pond	Fishing	Egan Stanley
9/7/2014	Sunday	GA	Lowndes County	57	M	Under pole barn	Sheltering from storm	Larry Dasher
7/11/2014	Friday	GA	Dawsonville	48	F	Back yard	Trimming hedges	Mary Jo Fortune Kinney
7/22/2013	Monday	GA	Bainbridge	21	M	Road	Had been working on farm	Mauselio Gomes
8/9/2012	Thursday	GA	Atlanta	35	M	Outside under roof of building	Building Maintenance	
7/13/2012	Friday	GA	Peachtree City	52	M	Under tree by boat ramp	Fishing	Burnette Hayes
7/13/2010	Tuesday	GA	Austell	16	F	Under tree	Walking home	Chaquille Hunter
7/13/2010	Tuesday	GA	Austell	14	F	Under tree	Walking home	Theresa Seabrum
6/29/2010	Tuesday	GA	McDonough	14	M	Outside home	Sheltering under tree	Eric Jarrell West
8/26/2007	Sunday	GA	Alpharetta	15	M	Parking lot	Riding bicycle	Kevin Avalar
6/30/2007	Saturday	GA	Tifton	23	M	Under tree	Taking shelter	Pablo Figueroa
6/25/2007	Monday	GA	Cummings, Forsyth County	27	M	Unfinished house	Taking shelter	Jose DeJesus-Cruz
6/21/2006	Wednesday	GA	Columbus	24	M	Under Tree	Mowing lawn, riding lawn mower	Adam White
5/13/2006	Saturday	GA	Tifton	31	M	Yard	Getting to Car	Max Hancock

The NCDC tables below contain information on two of the costliest hail events on record for Forsyth County. The first occurred May 22, 2020 and had estimated property damage at $5 million. The second occurred on March 15, 2012 and had estimated property damage at $4.76 million. Additional significant hail events follow the second table.

Storm Events Database

Search Results / Next

Event Details:

Event	**Hail**
Magnitude	**1.75 in.**
State	**GEORGIA**
County/Area	**FORSYTH**
WFO	**FFC**
Report Source	**Public**
NCEI Data Source	**CSV**
Begin Date	**2020-05-22 12:05 EST-5**
Begin Location	**1SSE DREW**
Begin Lat/Lon	**34.1853/-84.2101**
End Date	**2020-05-22 12:25 EST-5**
End Location	**1WSW DUNN**
End Lat/Lon	**34.2253/-84.14**
Deaths Direct/Indirect	**0/0** (fatality details below, when available...)
Injuries Direct/Indirect	**0/0**
Property Damage	**5.00M**
Crop Damage	
Episode Narrative	**Scattered to numerous thunderstorms along a warm front lifting north across the state resulted in scattered strong to severe thunderstorms across north and central Georgia during the afternoon and evening hours.**
Event Narrative	**The public reported hail the size of quarters to half dollars near the Polo Golf and Country Club and hail the size of golf balls 1 mile north of Cumming.**

Prev / Search Results / Next

Storm Events Database

Event Details:

Event	**Hail**
Magnitude	**1.75 in.**
State	**GEORGIA**
County/Area	**FORSYTH**
WFO	**FFC**
Report Source	**Public**
NCEI Data Source	**CSV**
Begin Date	**2012-03-15 23:27 EST-5**
Begin Location	**1NE CUMMING**
Begin Lat/Lon	**34.21/-84.14**
End Date	**2012-03-15 23:39 EST-5**
End Location	**1NE CUMMING**
End Lat/Lon	**34.21/-84.14**
Deaths Direct/Indirect	**0/0** (fatality details below, when available...)
Injuries Direct/Indirect	**0/0**
Property Damage	**4760.00K**
Crop Damage	
Episode Narrative	**As had been the case for a few days, the Southeast states remained on the northern periphery of weak upper level ridging on the 15th. Ample moisture and warm temperatures, very summer-like in nature, allowed for enough instability to produce scattered thunderstorms especially across north Georgia. A few of these thunderstorms were able to reach severe levels, with scattered reports of large hail.**
Event Narrative	**The public called to report golf ball size hail fell for over ten minutes between 12:27 AM EDT to 12:39 AM EDT.**

HEARDVILLE	FORSYTH CO.	GA	04/11/2013	19:43	EST-5	Hail	1.75 in.	0	0	4.760M	0.00K
COAL MTN	FORSYTH CO.	GA	03/15/2008	12:48	EST-5	Hail	2.00 in.	0	0	3.000M	0.00K
CUMMING	FORSYTH CO.	GA	06/12/2007	18:40	EST-5	Hail	1.75 in.	0	0	2.700M	0.00K
DREW	FORSYTH CO.	GA	03/15/2008	13:40	EST-5	Hail	2.00 in.	0	0	2.500M	0.00K
CUMMING	FORSYTH CO.	GA	04/10/2009	16:36	EST-5	Hail	1.75 in.	0	0	2.000M	0.00K
COAL MTN	FORSYTH CO.	GA	05/25/2006	15:30	EST	Hail	1.75 in.	0	0	1.800M	0.00K
CUMMING	FORSYTH CO.	GA	02/21/2005	18:25	EST	Hail	1.75 in.	0	0	930.00K	0.00K
MATT	FORSYTH CO.	GA	04/03/2007	16:30	EST-5	Hail	1.75 in.	0	0	355.00K	0.00K

The NCDC tables below contain information on two of the costliest thunderstorm wind events on record for Forsyth County. The first occurred February 26, 2008 and had estimated property damage at $2 million. The second occurred on April 8, 2006 and had estimated property damage at $250K. Additional significant thunderstorm wind events follow the second table.

Storm Events Database

Search Results / Next

Event Details:

Event	**Thunderstorm Wind**
Magnitude	**52 kts.**
State	**GEORGIA**
County/Area	**FORSYTH**
WFO	**FFC**
Report Source	**Emergency Manager**
NCEI Data Source	**CSV**
Begin Date	**2008-02-26 06:35 EST-5**
Begin Location	**0N DREW**
Begin Lat/Lon	**34.2/-84.22**
End Date	**2008-02-26 06:45 EST-5**
End Location	**4SE CUMMING**
End Lat/Lon	**34.1591/-84.1005**
Deaths Direct/Indirect	**0/0** (fatality details below, when available...)
Injuries Direct/Indirect	**0/0**
Property Damage	**2.00M**
Crop Damage	**0.00K**
Episode Narrative	**A deep upper trough was moving from the mid-south toward the southeast U.S. early on the 26th. A strong cold front accompanied the upper system. A squall line of thunderstorms developed after midnight on the 25th across Mississippi and Alabama and reached the Georgia/Alabama border around 5 am EST. The line of thunderstorms intensified and bowed out just as it was moving in Georgia during the early morning hours. Wind gusts in excess 60 mph affected many counties as these thunderstorms rolled through the area during the early morning hours, causing extensive wind damage to trees, power lines, and some structures from the west and northwest side of Atlanta toward the Alabama border. In addition, two tornadoes, one an EF3, developed along the stronger part of the line as it moved through Carroll county before daybreak causing extensive damage along their paths.**
Event Narrative	**The Forsyth County Emergency Management Director reported that numerous trees and power lines were down across the southern half of the county. Significant damage to homes was reported in the southern part of the county from near the Fulton county line northeast of Alpharetta to Cumming. Fifteen homes were damaged in this portion of the county, mostly from trees which fell on the structures. Much of the damage was concentrated in the area along Atlanta Highway, Georgia Highway 9 in the southern portion of the county and along Georgia Highway 400 near McFarland Road. The winds blew in the door of a fire station near McFarland Road. A total of 30 homes within the county sustained some damage.**

Prev / Search Results / Next

Storm Events Database

Event Details:

Event	**Thunderstorm Wind**
Magnitude	**54 kts.**
State	**GEORGIA**
County/Area	**FORSYTH**
WFO	**FFC**
Report Source	**GENERAL PUBLIC**
NCEI Data Source	**PDS**
Begin Date	**2006-04-08 03:17 EST**
Begin Location	**2S BIG CREEK**
Begin Lat/Lon	**34.07/-84.18**
End Date	**2006-04-08 03:22 EST**
End Location	**7SW CUMMING**
End Lat/Lon	**34.13/-84.23**
Deaths Direct/Indirect	**0/0** (fatality details below, when available...)
Injuries Direct/Indirect	**0/0**
Property Damage	**250K**
Crop Damage	
Event Narrative	**The public measured a wind gust of 62 mph on a home weather instrument. Several small and large trees were also blown down in the area by the strong winds. Pea-sized hail was also observed in the area at the time. Further southwest in the Brookwood area near the Fulton county line, more than 30 trees were uprooted or snapped off. A number of power lines were down in the same area and several homes sustained roof damage. The public also reported damage to large sections of a metal and rock fence at the Laurel Springs Subdivision on Mathis Airport Road between Paddock Parkway and Laurel Springs Parkway in southern Forsyth county, near Brookwood. The thunderstorm that caused this damage was the same storm that spawned the tornado that traveled across northern Cobb and northern Fulton counties.**

CUMMING	FORSYTH CO.	GA	06/30/2007	18:25	EST-5	Thunderstorm Wind	52 kts. EG	0	0	250.00K	0.00K
MATT	FORSYTH CO.	GA	07/22/2008	17:03	EST-5	Thunderstorm Wind	52 kts. EG	0	0	250.00K	0.00K
HIGHTOWER	FORSYTH CO.	GA	06/18/2011	16:41	EST-5	Thunderstorm Wind	52 kts. EG	0	0	250.00K	0.00K
CUMMING	FORSYTH CO.	GA	08/01/2012	15:37	EST-5	Thunderstorm Wind	65 kts. EG	0	0	200.00K	0.00K
CUMMING	FORSYTH CO.	GA	07/21/2018	05:10	EST-5	Thunderstorm Wind	60 kts. EG	0	0	125.00K	0.00K
DUNN	FORSYTH CO.	GA	04/06/2016	22:55	EST-5	Thunderstorm Wind	61 kts. EG	0	0	100.00K	0.00K
OSCARVILLE	FORSYTH CO.	GA	08/03/2020	13:35	EST-5	Thunderstorm Wind	55 kts. EG	0	0	100.00K	0.00K
DUNN	FORSYTH CO.	GA	06/28/2010	20:00	EST-5	Thunderstorm Wind	50 kts. EG	0	0	75.00K	0.00K

The NCDC tables below contain information on two of the costliest lightning events on record for Forsyth County. The first occurred August 13, 2005 and had estimated property damage at $750K. The second occurred on September 22, 2000 and had estimated property damage at $500K. Additional significant lightning events follow the second table.

Storm Events Database

Search Results / Next

Event Details:

Event	**Lightning**
State	**GEORGIA**
County/Area	**FORSYTH**
WFO	**FFC**
Report Source	**EMERGENCY MANAGER**
NCEI Data Source	**PDS**
Begin Date	**2005-08-13 15:30 EST**
End Date	**2005-08-13 16:30 EST**
End Location	**COUNTYWIDE**
Deaths Direct/Indirect	**0/0** (fatality details below, when available...)
Injuries Direct/Indirect	**0/0**
Property Damage	**750K**
Crop Damage	
Event Narrative	**The Forsyth County Emergency Management Director as well as the Forsyth County News of Cumming reported that strong thunderstorms caused numerous lightning-related incidents across the county during the late afternoon. During an approximate one-hour period, at least 10 homes were struck by lightning in the county. Three of these homes sustained major damage or were destroyed, while seven others sustained minor damage. The majority of the incidents occurred across the eastern portion of the county, east of Georgia Highway 400.**

Storm Events Database

Prev / Search Results / Next

Event Details:

Event	**Lightning**
State	**GEORGIA**
County/Area	**FORSYTH**
WFO	**FFC**
Report Source	**NEWSPAPER**
NCEI Data Source	**PDC**
Begin Date	**2000-09-22 05:00 EST**
End Date	**2000-09-22 05:00 EST**
End Location	**CUMMING**
Deaths Direct/Indirect	**0/0** (fatality details below, when available...)
Injuries Direct/Indirect	**0/0**
Property Damage	**500K**
Crop Damage	
Event Narrative	**The Forsyth County News reported that lightning struck and set on fire HLB Custom Cabinets at 2680 Friendship Road in Cumming. The building was completely destroyed.**

CUMMING	FORSYTH CO.	GA	08/01/2012	15:30	EST-5	Lightning	0	0	400.00K	0.00K
COAL MTN	FORSYTH CO.	GA	07/08/2008	22:45	EST-5	Lightning	0	0	350.00K	0.00K
CUMMING	FORSYTH CO.	GA	07/24/1999	14:30	EST	Lightning	0	0	300.00K	0.00K
CUMMING	FORSYTH CO.	GA	06/25/2007	15:06	EST-5	Lightning	0	0	300.00K	0.00K
COUNTYWIDE	FORSYTH CO.	GA	06/04/2002	19:30	EST	Lightning	0	0	250.00K	0.00K
CUMMING	FORSYTH CO.	GA	06/13/2004	01:00	EST	Lightning	0	0	250.00K	0.00K
CUMMING	FORSYTH CO.	GA	06/12/2007	18:39	EST-5	Lightning	0	0	250.00K	0.00K
DREW	FORSYTH CO.	GA	06/15/2011	17:10	EST-5	Lightning	0	0	250.00K	0.00K
CUMMING	FORSYTH CO.	GA	06/29/2008	17:50	EST-5	Lightning	0	0	200.00K	0.00K
CUMMING	FORSYTH CO.	GA	07/31/2002	15:20	EST	Lightning	0	0	175.00K	0.00K
CUMMING	FORSYTH CO.	GA	04/21/1998	16:45	EST	Lightning	0	0	120.00K	0.00K

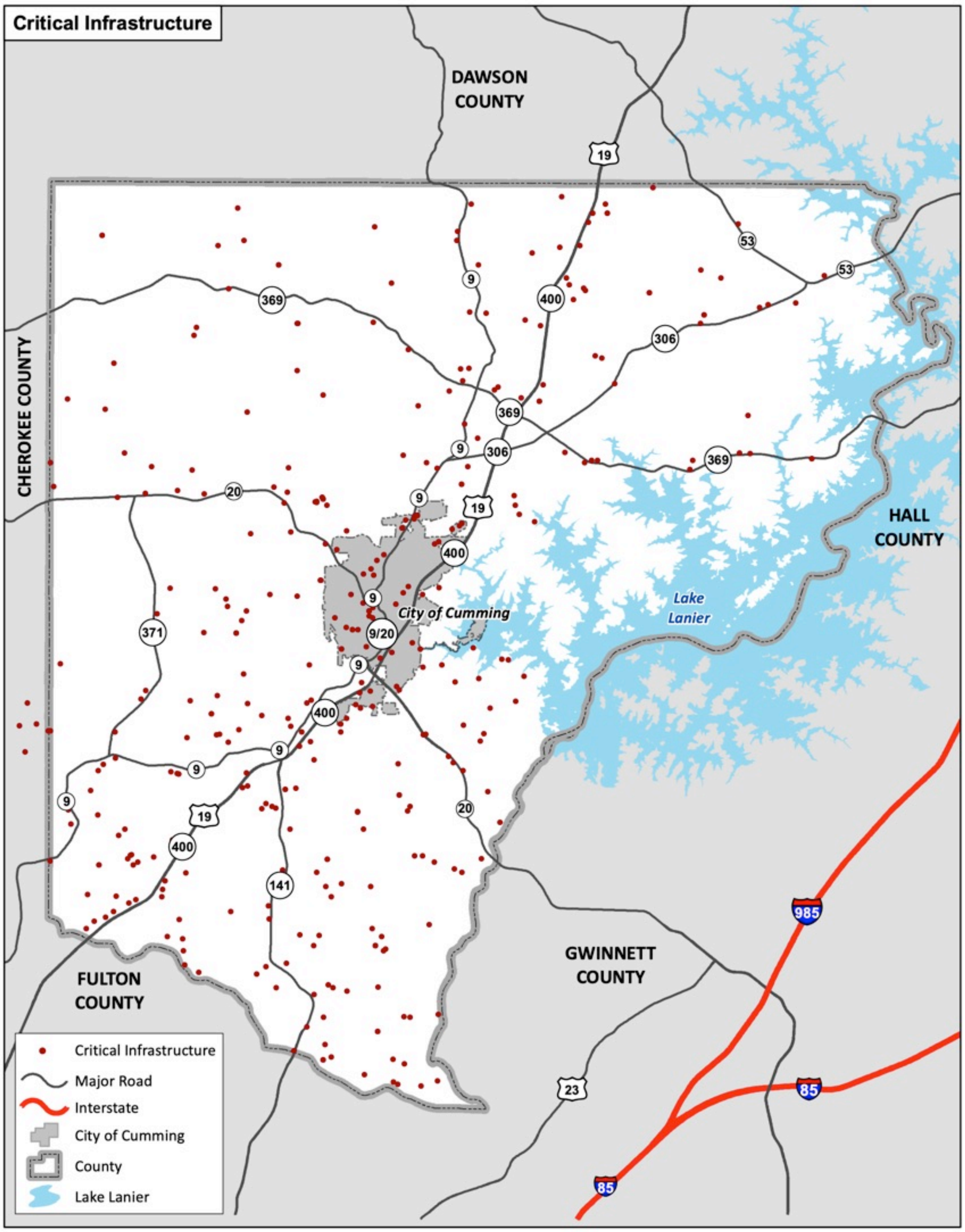
The Forsyth County HMPC utilized data from the National Climatic Data Center, the National Weather Service, numerous weather-related news articles and various online resources, and the Forsyth County Emergency Operations Plan in researching severe thunderstorms and their impact on the County. With most of the County's recorded severe thunderstorm events, only basic information was available. It is also likely that some severe thunderstorm events have gone unrecorded. Therefore, any conclusions reached based upon available information on severe thunderstorms within Forsyth County should be treated as the minimal possible threat.

NCDC records show that 270 severe thunderstorms occurred within the County over the past fifty years, which equates to a 540% annual frequency based upon reported events. Over the past twenty years that frequency has increased to 880%. It would appear that severe thunderstorm activity has increased over time within the County. This may be the case or it may simply be that record keeping and technology have improved significantly over the course of time, reflecting the higher numbers. It may also be a combination of these two factors. The following chart provides annual frequency of reported events over the past five, ten, twenty, and fifty-year periods. The most recent five-year period, covering the span of time since the last update to this Plan, is highlighted in gold.

Forsyth County – Severe Thunderstorm Frequency including Hail & Lightning (based on Reported Events)

Time Period	5yrs (2016-2020)	10yrs (2011-2020)	20yrs (2001-2020)	50yrs (1971-2020)
Number of Reported Events	44	85	178	270
Frequency Average per Year	8.80	8.50	8.90	5.40
Frequency Percent per Year	880%	850%	890%	540%

C. Assets Exposed to Hazard – All public and private property including critical facilities are susceptible to severe thunderstorms, hail, and lightning since this hazard is not spatially defined. The Forsyth County GIS Department map below identifies critical facilities located within the hazard area, which in the case of severe thunderstorms includes all areas within the County and City.



D. Estimate of Potential Losses – For loss estimate information, please refer to the Critical Facilities Database (Appendix A).

E. Multi-Jurisdictional Concerns – Any portion of Forsyth County can be negatively impacted by severe thunderstorms, hail, and lightning. Therefore, any mitigation steps taken related to these weather events will be pursued on a countywide basis and include the City of Cumming.

F. Hazard Summary – Overall, severe thunderstorm, hail, and lightning events pose one of the greatest threats to Forsyth County in terms of property damage, injuries and loss of life. These weather events represent the most frequently occurring natural hazard within Forsyth County and have a great potential to negatively impact the County each year. Based on the frequency of this hazard, as well as its ability to negatively impact any part of the County, the HMPC recommends that the mitigation measures identified in this plan for severe thunderstorm, hail, and lightning be aggressively pursued. Specific mitigation actions related to these weather events are identified in *Chapter 5*.

2.3 Flooding

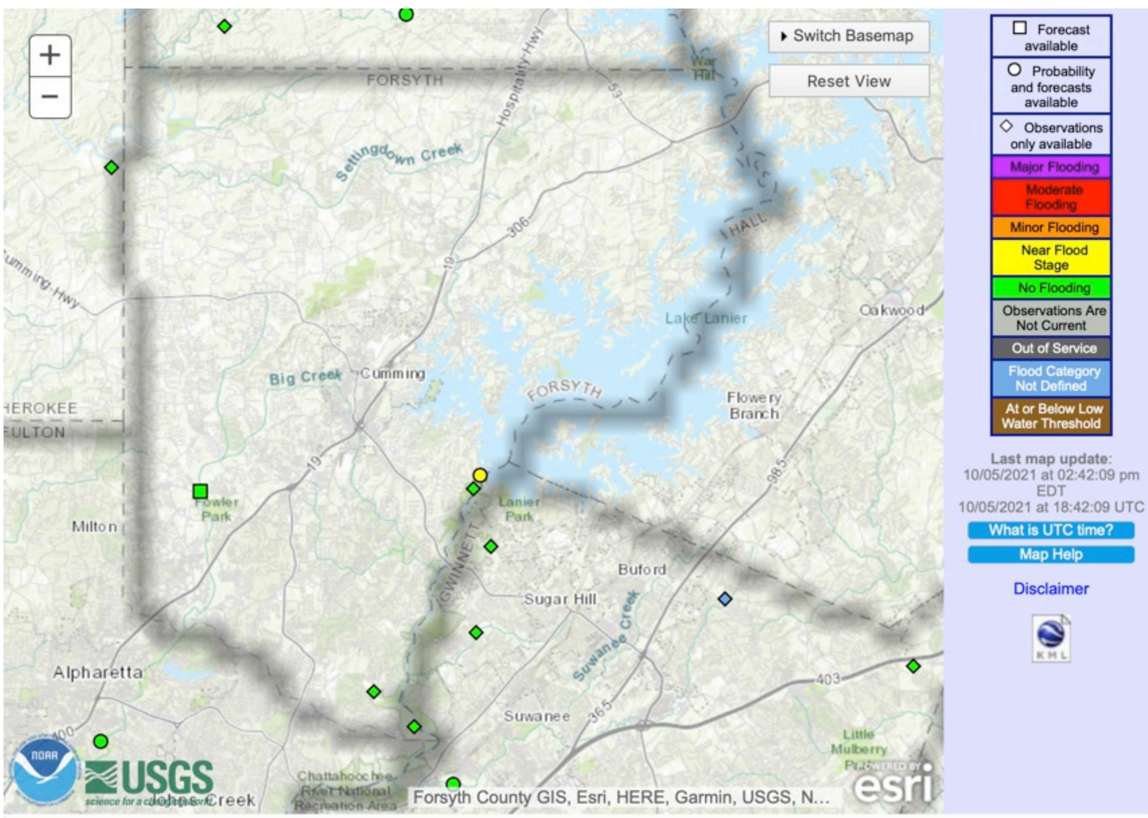
A. Hazard Identification: According to NOAA, flooding is an overflowing of water onto land that is normally dry. Floods can happen during heavy rains, when ocean waves come on shore, when snow melts quickly, or when dams or levees break. Damaging flooding may happen with only a few inches of water, or it may cover a house to the rooftop. Floods can occur within minutes or over a long period, and may last days, weeks, or longer. Floods are the most common and widespread of all weather-related natural disasters.

Flash floods are the most dangerous kind of floods, because they combine the destructive power of a flood with incredible speed. Flash floods occur when heavy rainfall exceeds the ability of the ground to absorb it. They also occur when water fills normally dry creeks or streams or enough water accumulates for streams to overtop their banks, causing rapid rises of water in a short amount of time. They can happen within minutes of the causative rainfall, limiting the time available to warn and protect the public.

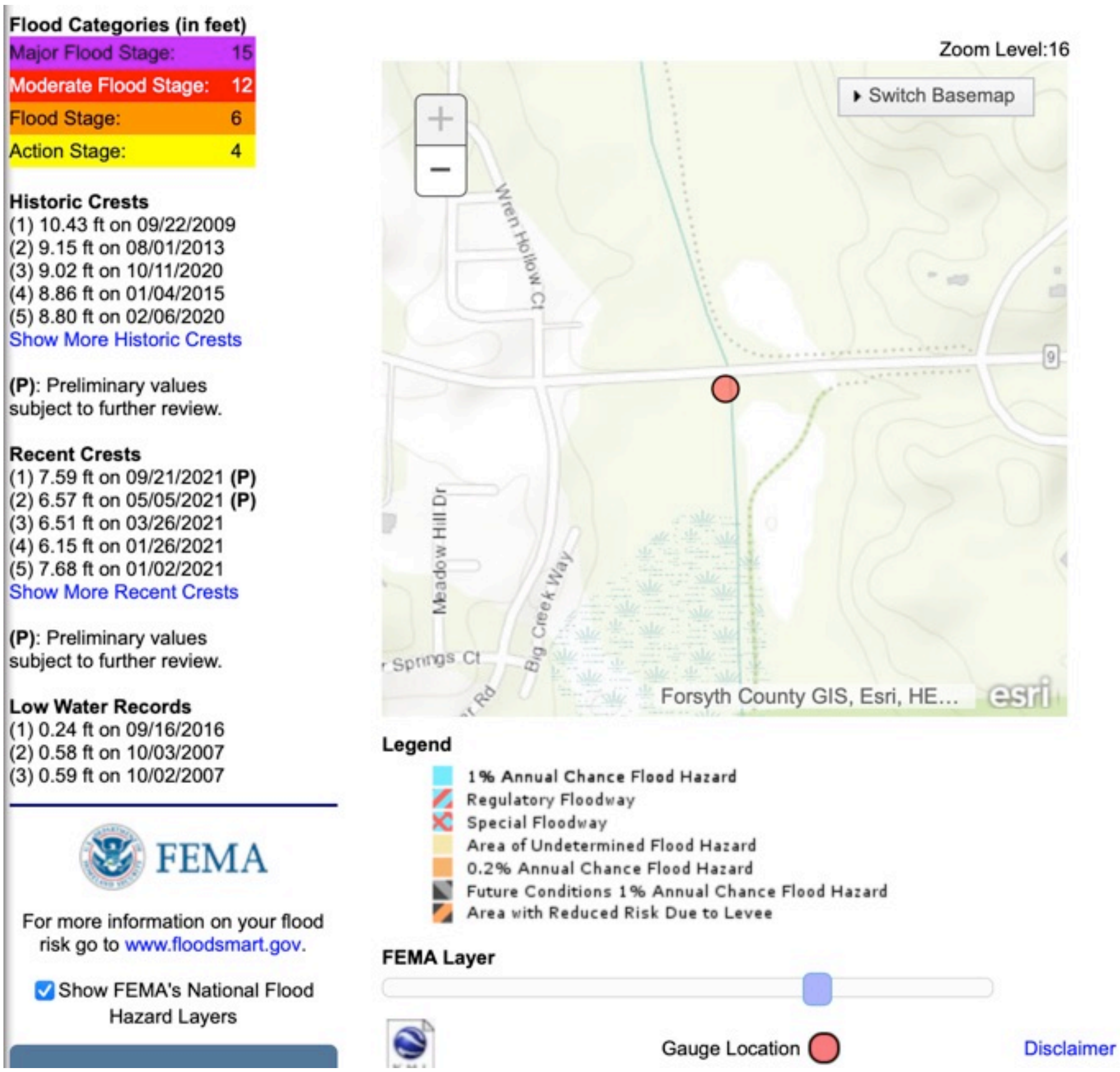
The vulnerability of a river or stream to flooding depends upon several variables. Among these are topography, ground saturation, rainfall intensity and duration, soil types, drainage, drainage patterns of streams, and vegetative cover. A large amount of rainfall over a short time span can result in flash flood conditions. Nationally, the total number of flash flood deaths has exceeded tornado fatalities during the last several decades. Two factors seem to be responsible for this: public apathy regarding the flash flood threat and increased urbanization. A small amount of rain can also result in floods in locations where the soil is saturated from a previous wet period or if the rain is concentrated in an area of impermeable surfaces such as large parking lots, paved roadways, etc. Topography and ground cover are also contributing factors for floods in that water runoff is greater in areas with steep slopes and little or no vegetation.

B. Hazard Profile: Over the past fifty years, flood events on record in Forsyth County have usually been associated with areas in the vicinity of the County's rivers, creeks and lakes. Other areas affected by flooding were associated with storm drain systems within the City of Cumming. Relatively little information on flooding damage estimates, in terms of dollars, is available. However, with each of these events there were certainly significant costs related to private property, road repair, infrastructure repair, and public safety, at a minimum. Roads and culverts washing out have been the most common flooding problem.

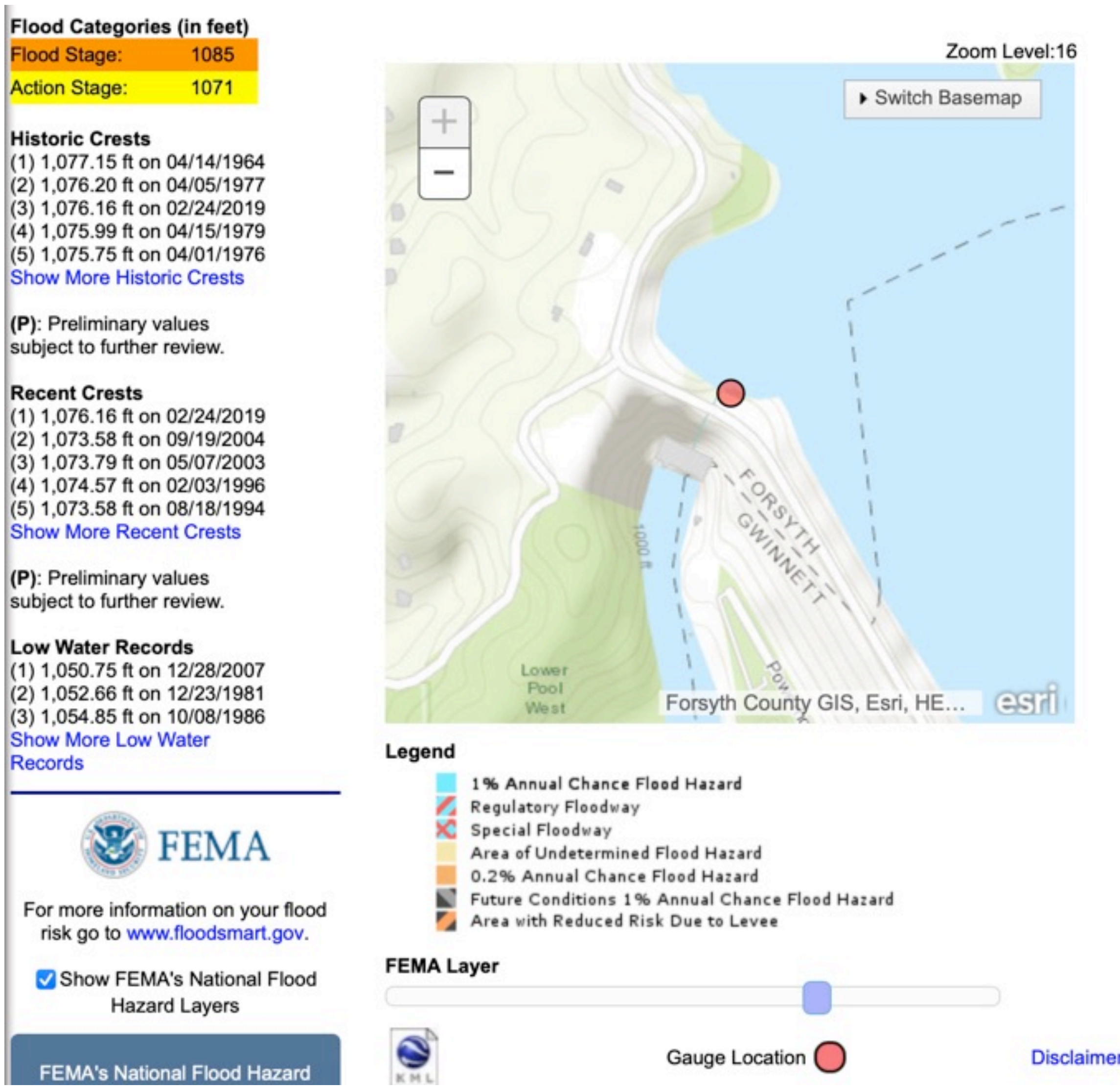
There are five flood gauges tracked by the National Weather Service in Forsyth County. These locations represent some of the most significant flooding events on record within the County. A description and map of each follows.



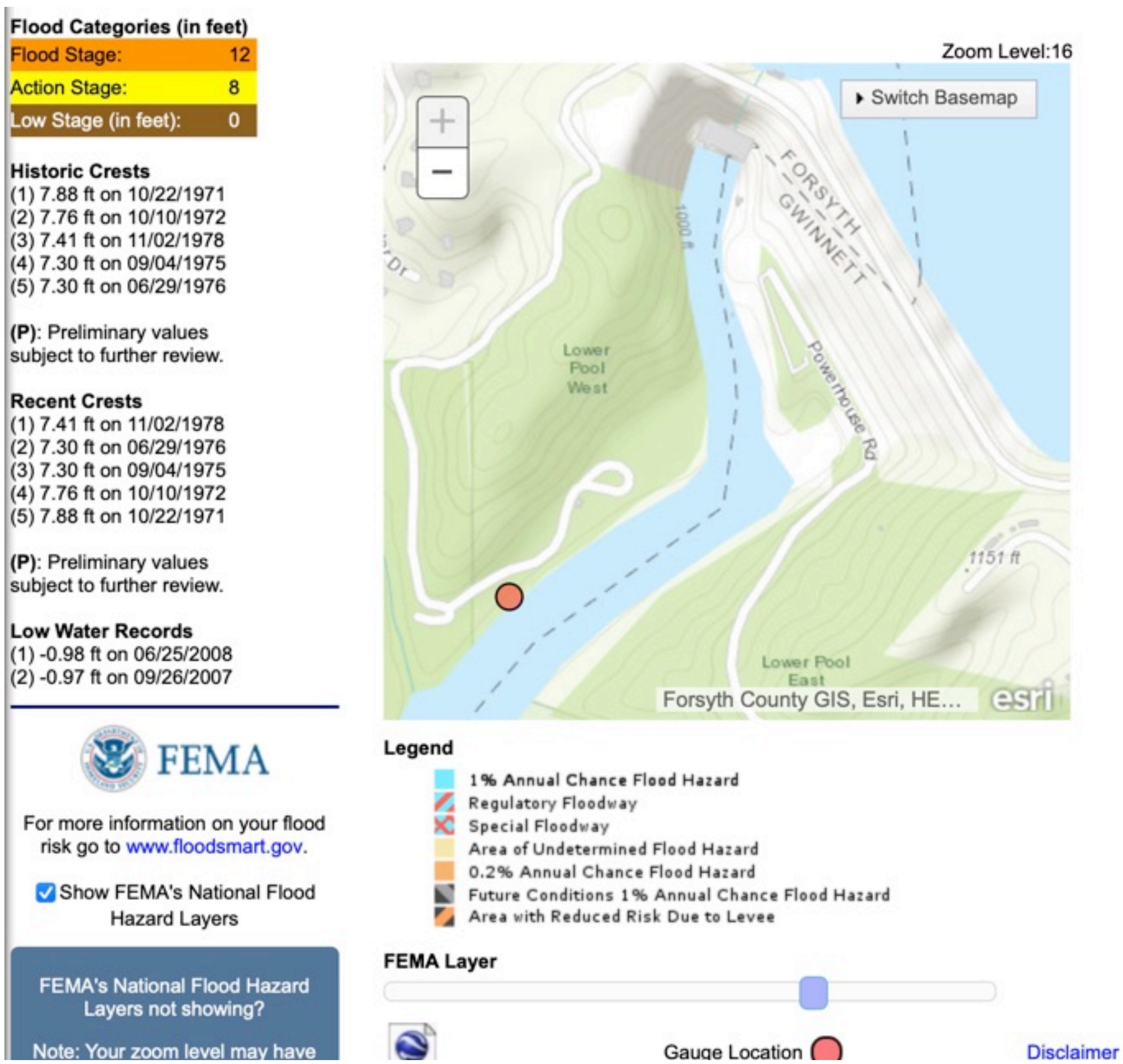
Below is a National Weather Service graphic illustrating both the historical and recent crests of the Big Creek near Cumming, GA, as well as flood categories (in feet). The record historic crest was 10.43ft on September 22, 2009. This fell within the category of "Flood Stage". A more recent crest was 7.59ft on September 21, 2021. This fell within the category of "Flood Stage".



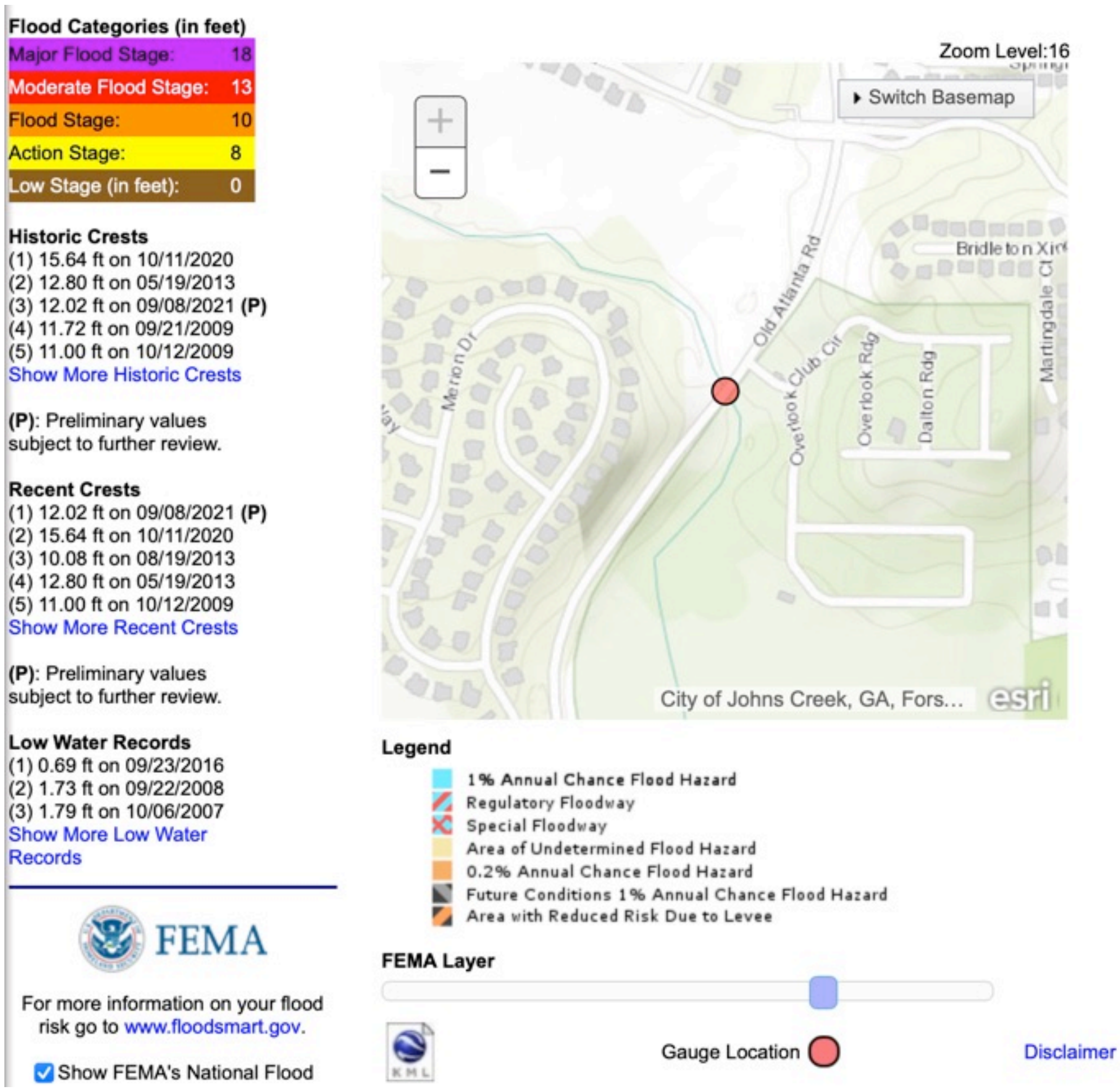
Below is a National Weather Service graphic illustrating both the historical and recent crests of the Chattahoochee River at Lake Lanier, as well as flood categories (in feet). The record historic crest was 1,077.15ft on April 14, 1964. This fell within the category of “Action Stage”. A more recent crest was 1,076.16ft on February 24, 2019. This fell within the category of “Action Stage”.



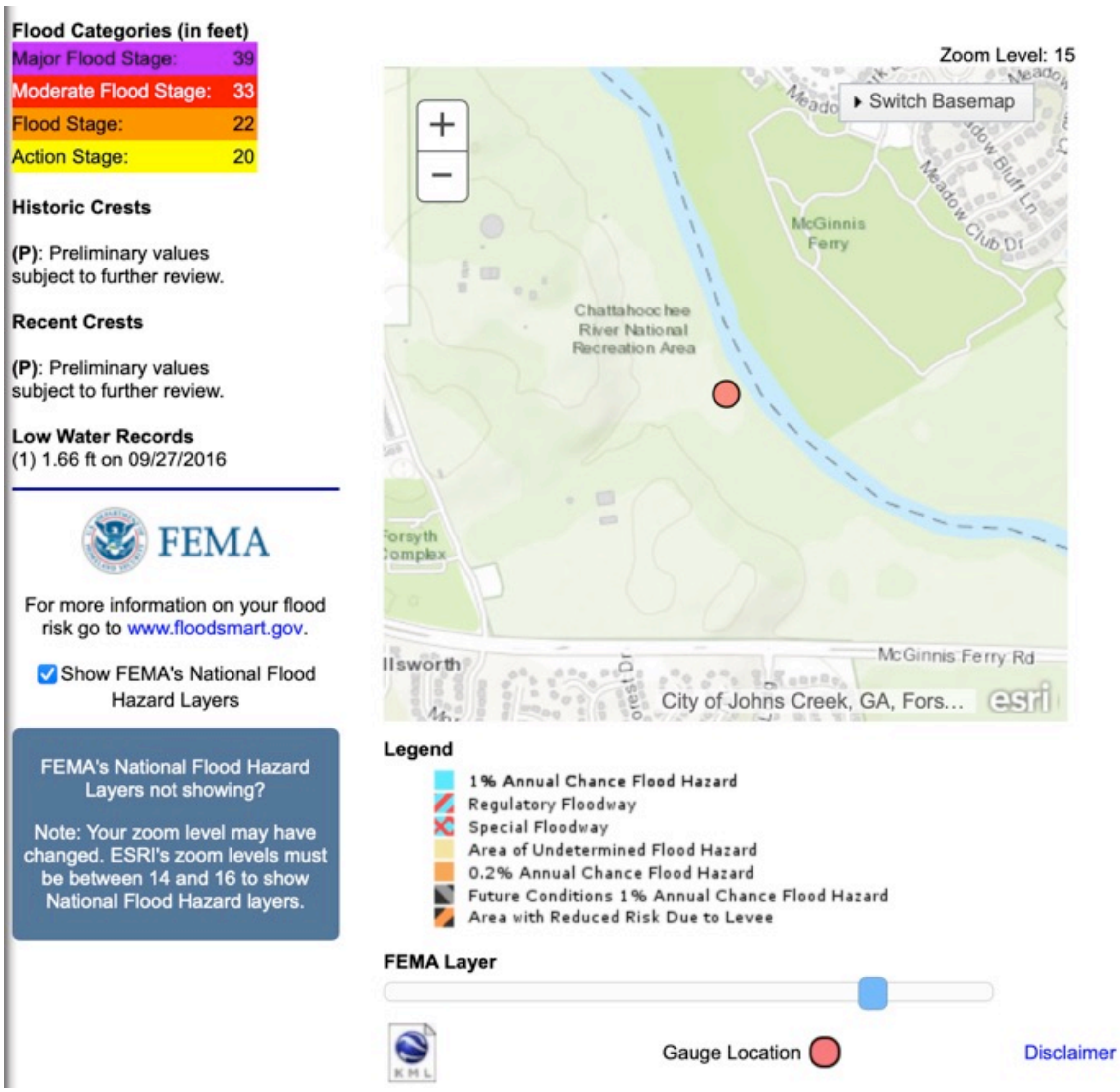
Below is a National Weather Service graphic illustrating both the historical and recent crests of the Chattahoochee River near Buford, GA, as well as flood categories (in feet). The record historic crest was 7.88ft on October 22, 1971. This fell within the category of “Low Stage”. A more recent crest was 7.41ft on November 2, 1978. This fell within the category of “Low Stage”.



Below is a National Weather Service graphic illustrating both the historical and recent crests of the Dick Creek near Suwanee, GA, as well as flood categories (in feet). The record historic crest was 15.64ft on October 11, 2020. This fell within the category of "Moderate Flood Stage". A more recent crest was 12.02ft on September 8, 2021. This fell within the category of "Flood Stage".



Below is a National Weather Service graphic illustrating the location of the Chattahoochee River flood gauge near West Suwanee, GA. Water level values are not available at this time.



The extent of flooding within Forsyth County

The main flooding threat within Forsyth County is the Etowah River. The Etowah River enters northwest Forsyth County from neighboring Dawson County. Flooding of the Etowah River within Dawson County has been successfully mitigated to a large degree thanks to past federal and state mitigation projects. A Dawson County flooding mitigation project during the 1970's involved the raising of a flood control dam, Etowah River Reach Sub Watershed Structure No. 12 – State I.D. No. 042-007-00625, to a height of approximately 57.6 feet in order to increase the control of Etowah River floodwaters. Another important mitigation project within Dawson County was completed in the early 1990's that reduced Etowah River flooding at SR 53 and the present location of the Georgia Forestry Commission Dawsonville offices and near the Etowah Water & Sewer Authority water intake. This project involved the addition of numerous erosion control measures and materials including the altering of the Etowah River banks in that area. Unfortunately, Forsyth County still experiences significant flooding of the Etowah River at a point where the Etowah makes a sharp turn near Old Federal Rd and Nicholson Rd. Such flooding has occurred on many occasions throughout Forsyth County history.

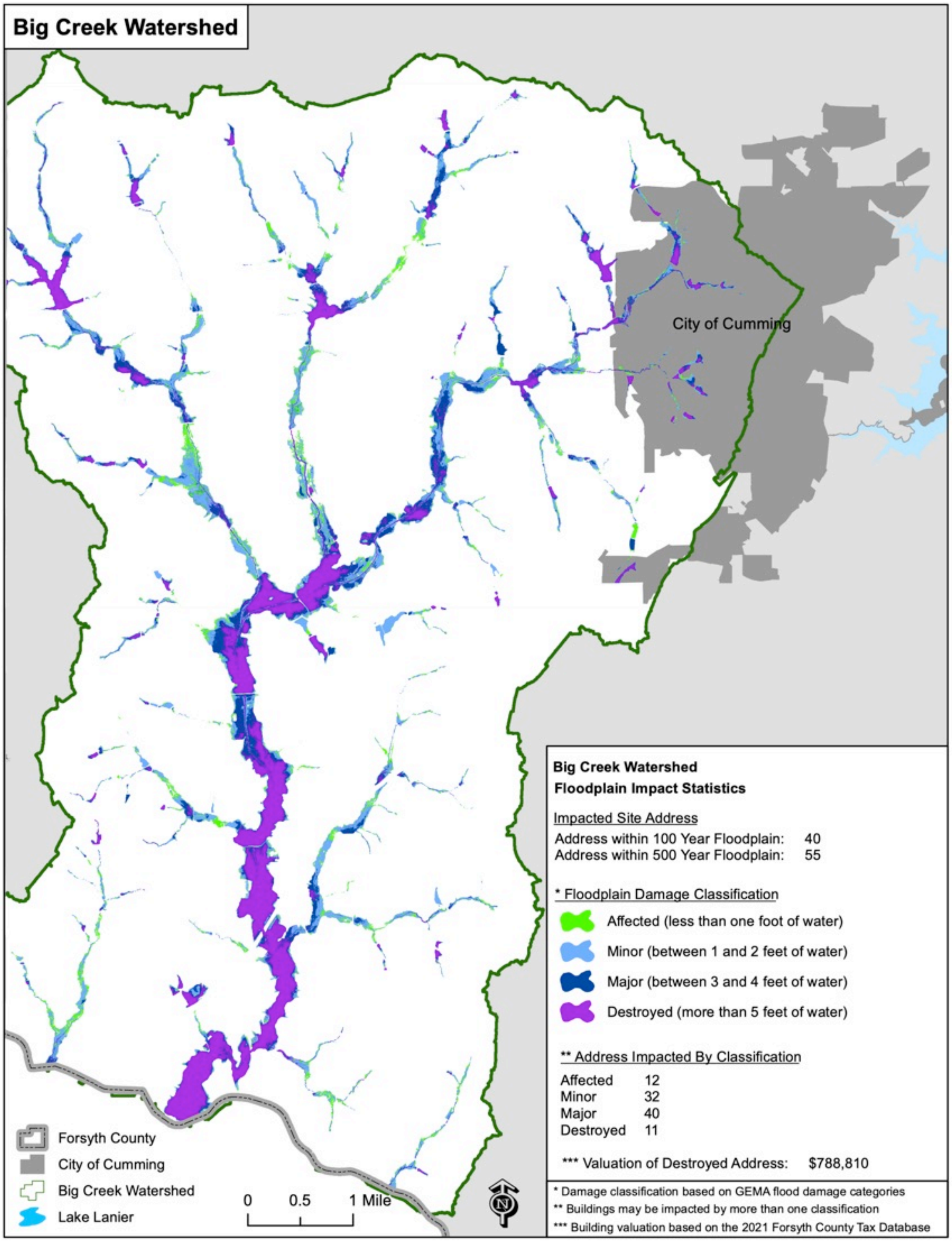
A second significant flood threat is found near the intersection of State Route 9 and Big Creek. This includes the areas located near Fowler Rd. Flooding of Big Creek has also occurred on many occasions in the past.

The extent of flooding within the City of Cumming

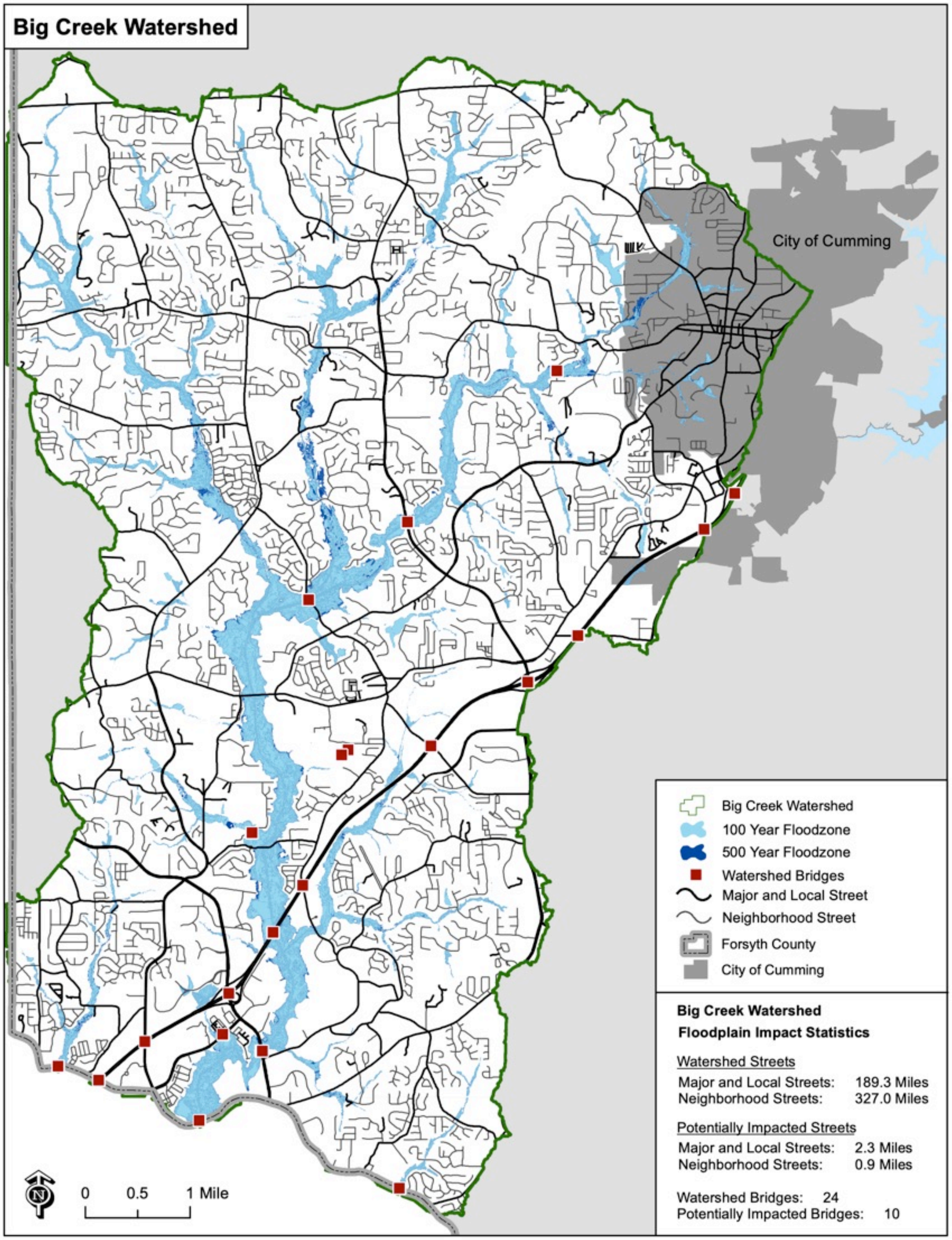
Within the City of Cumming, a flood threat exists on State Route 9 at the City of Cumming Water Treatment Facility. Sawnee Creek, located near the Water Treatment Facility, occasionally overflows its banks and, combined with a large volume of stormwater from adjoining parking lots and baseball fields, can flood the property. One consequence of this has been a six to seven foot hole washed out around a power pole that provides power to the Water Treatment Facility. Another fear is that, under the worst of circumstances, flooding could contaminate the City's water supply. Sawnee Creek also causes flooding problems along the residential streets of Pirklewood Circle, Franklin Way, and surrounding areas. Within this area, homes and streets have been flooded in the past.

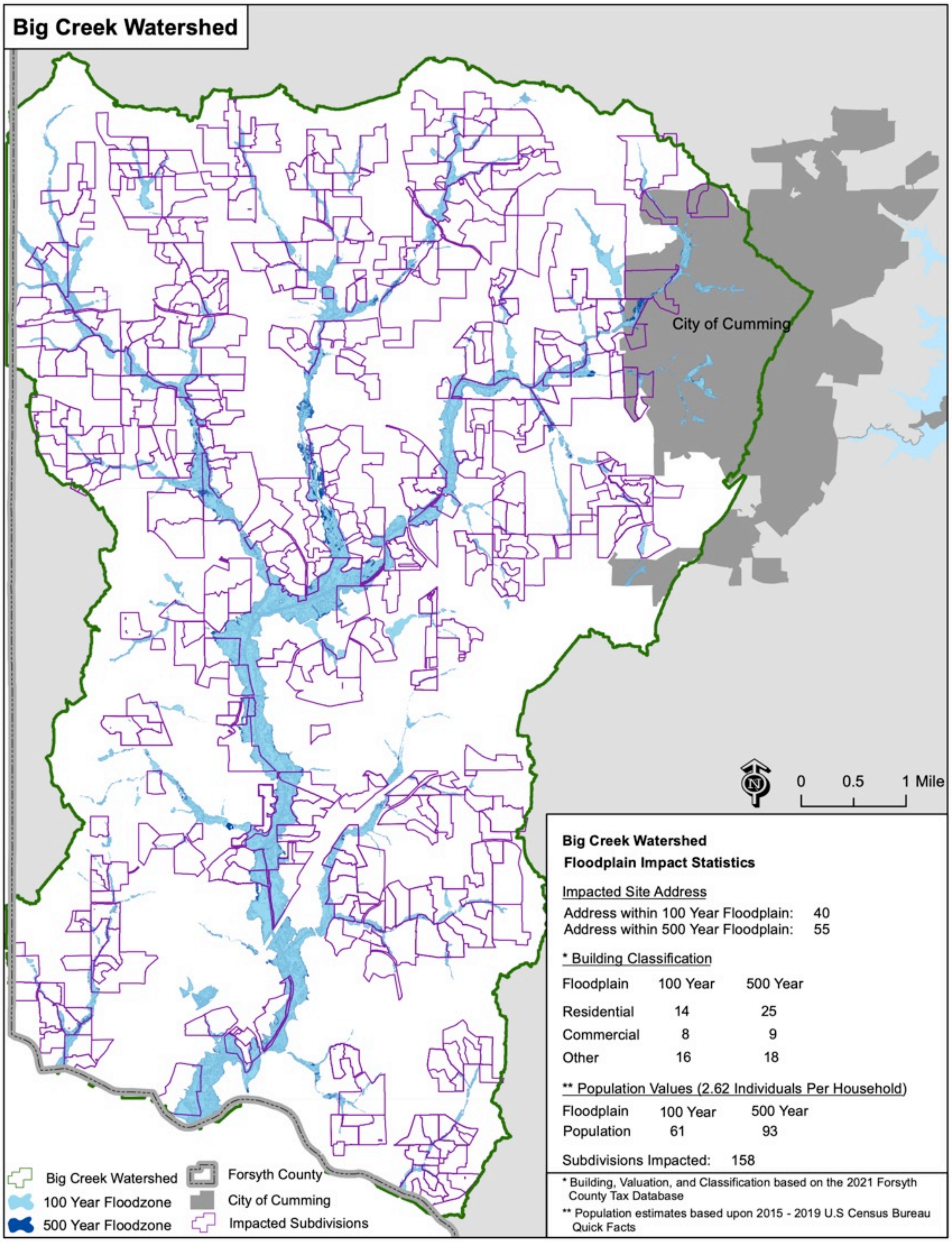
Flooding within the City of Cumming also occurs along Pine Lake Drive and Hickory Knoll in the Hickory Ridge Subdivision. The source of flooding is Mill Branch. This flooding threatens to wash out these roads and has even flooded homes in the past. A main culvert in this area is undersized and will need to be replaced to correct this problem.

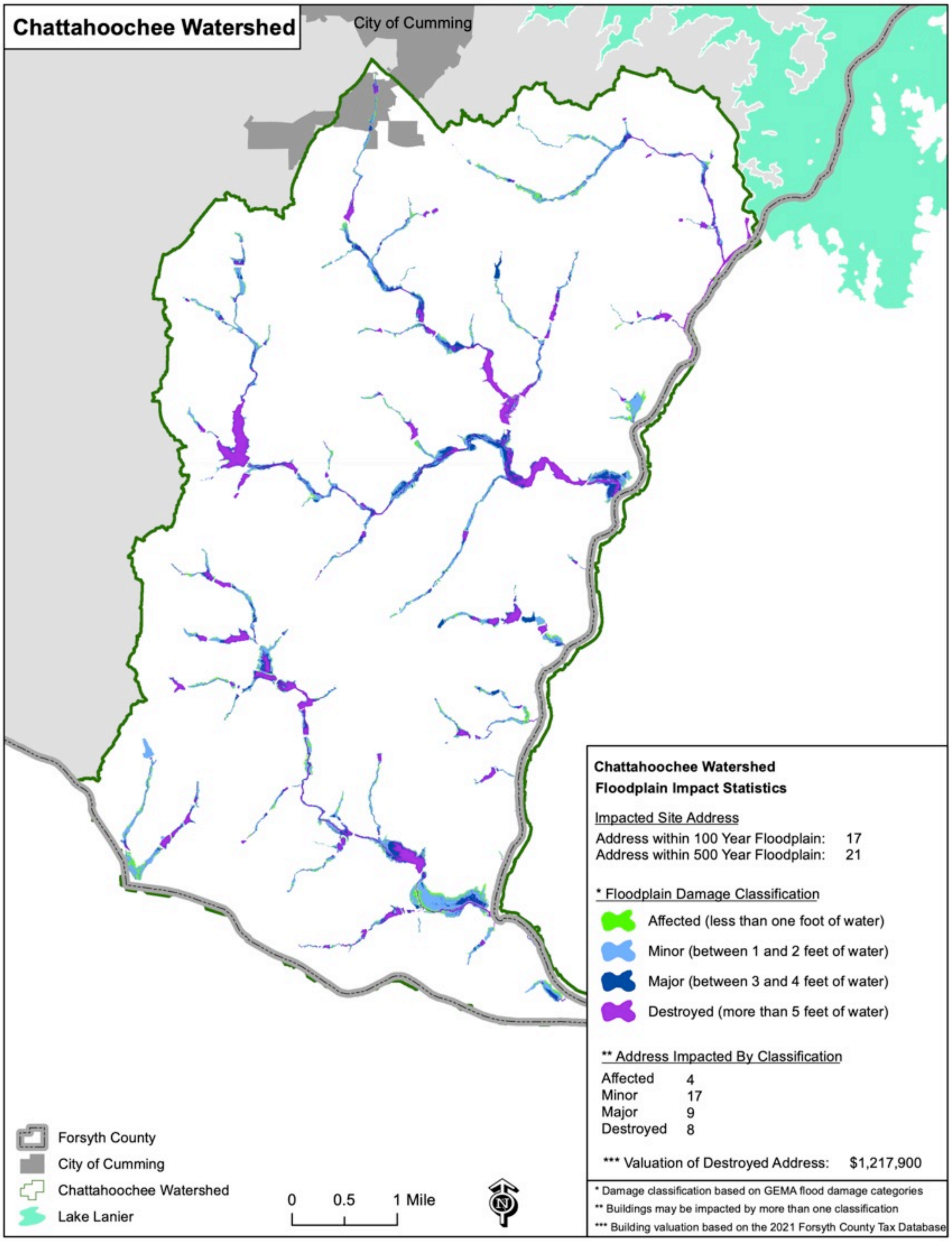
The following 12 maps display the flood hazard areas broken down by each individual watershed (four watersheds; three maps each).

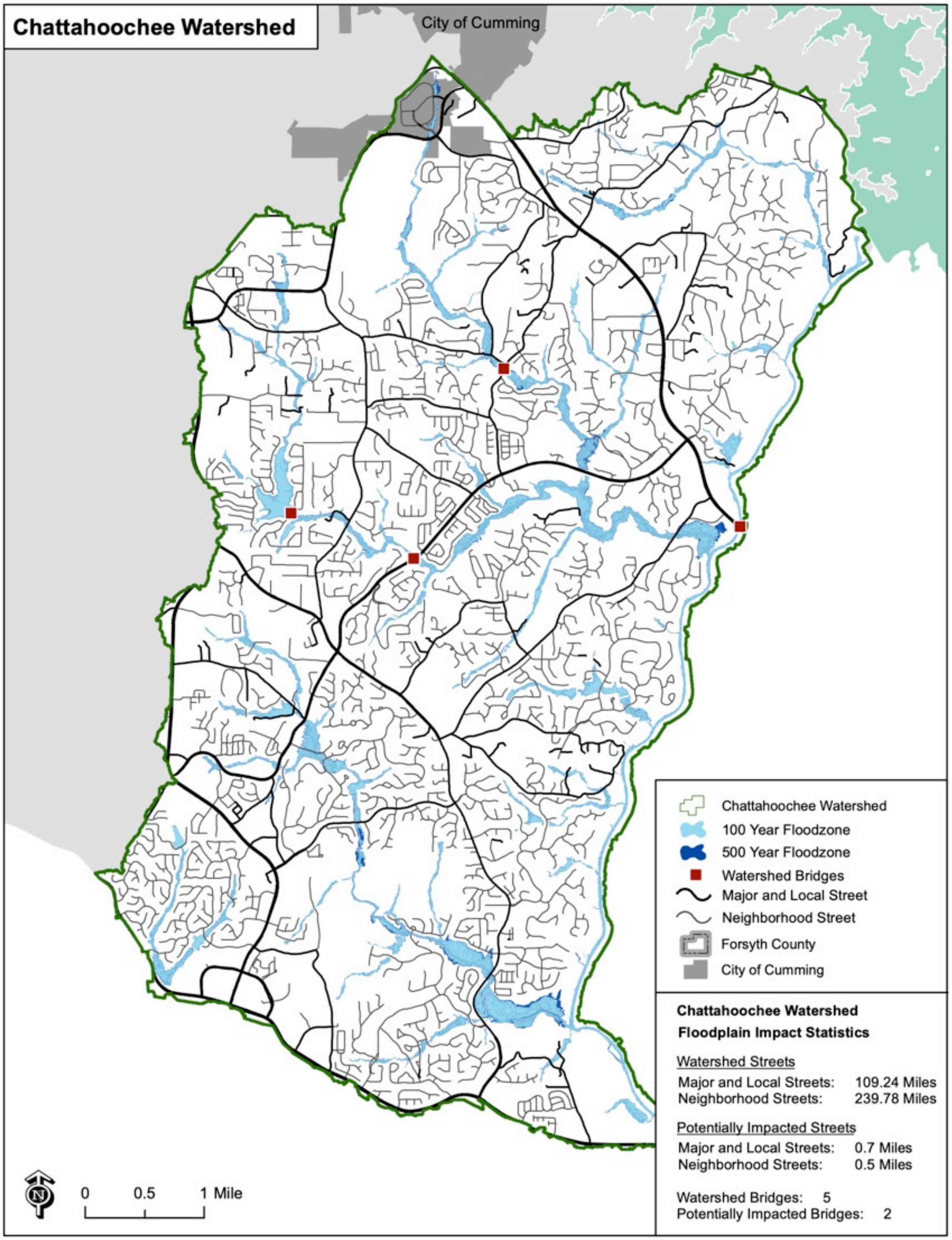


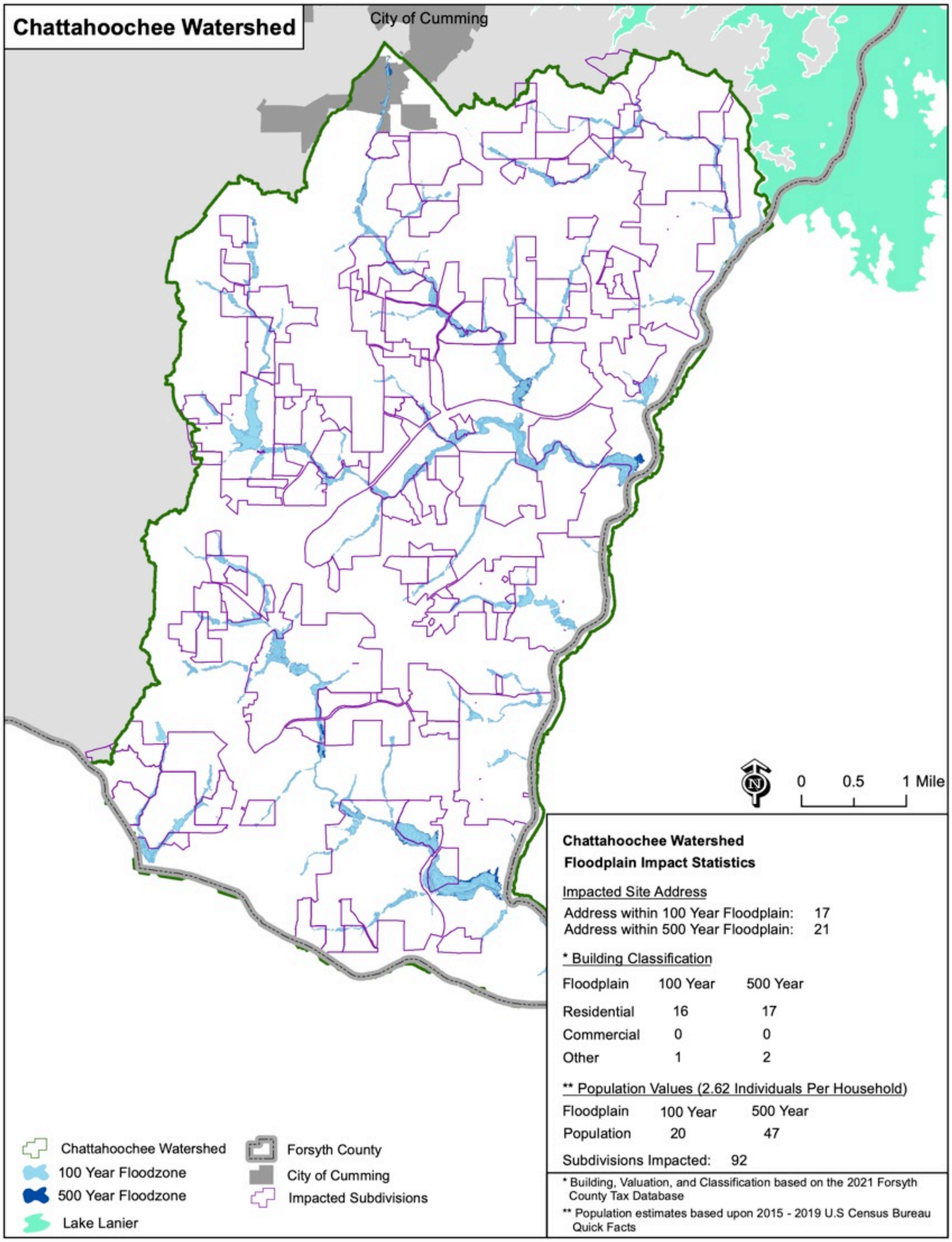
Big Creek Watershed
City of Cumming
Big Creek Watershed
Floodplain Impact Statistics
Impacted Site Address
Address within 100 Year Floodplain: 40
Address within 500 Year Floodplain: 55
* Floodplain Damage Classification
Affected (less than one foot of water)
Minor (between 1 and 2 feet of water)
Major (between 3 and 4 feet of water)
Destroyed (more than 5 feet of water)
** Address Impacted By Classification
Affected 12
Minor 32
Major 40
Destroyed 11
*** Valuation of Destroyed Address: $788,810
* Damage classification based on GEMA flood damage categories
** Buildings may be impacted by more than one classification
*** Building valuation based on the 2021 Forsyth County Tax Database
Forsyth County
City of Cumming
Big Creek Watershed
Lake Lanier
0 0.5 1 Mile
N

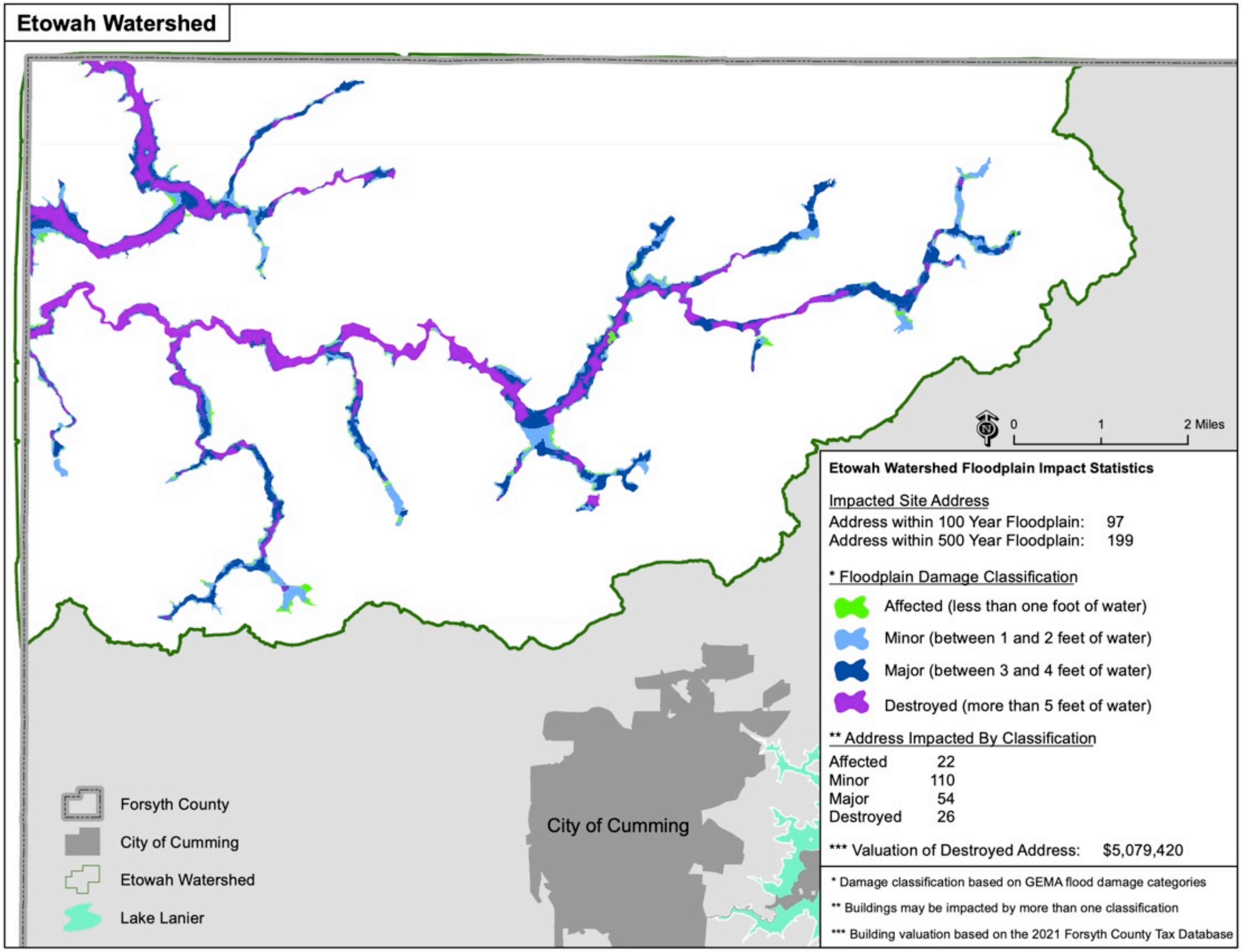

Big Creek Watershed
City of Cumming
Big Creek Watershed
100 Year Floodzone
500 Year Floodzone
Watershed Bridges
Major and Local Street
Neighborhood Street
Forsyth County
City of Cumming
Big Creek Watershed
Floodplain Impact Statistics
Watershed Streets
Major and Local Streets: 189.3 Miles
Neighborhood Streets: 327.0 Miles
Potentially Impacted Streets
Major and Local Streets: 2.3 Miles
Neighborhood Streets: 0.9 Miles
Watershed Bridges: 24
Potentially Impacted Bridges: 10
N
0
0.5
1 Mile

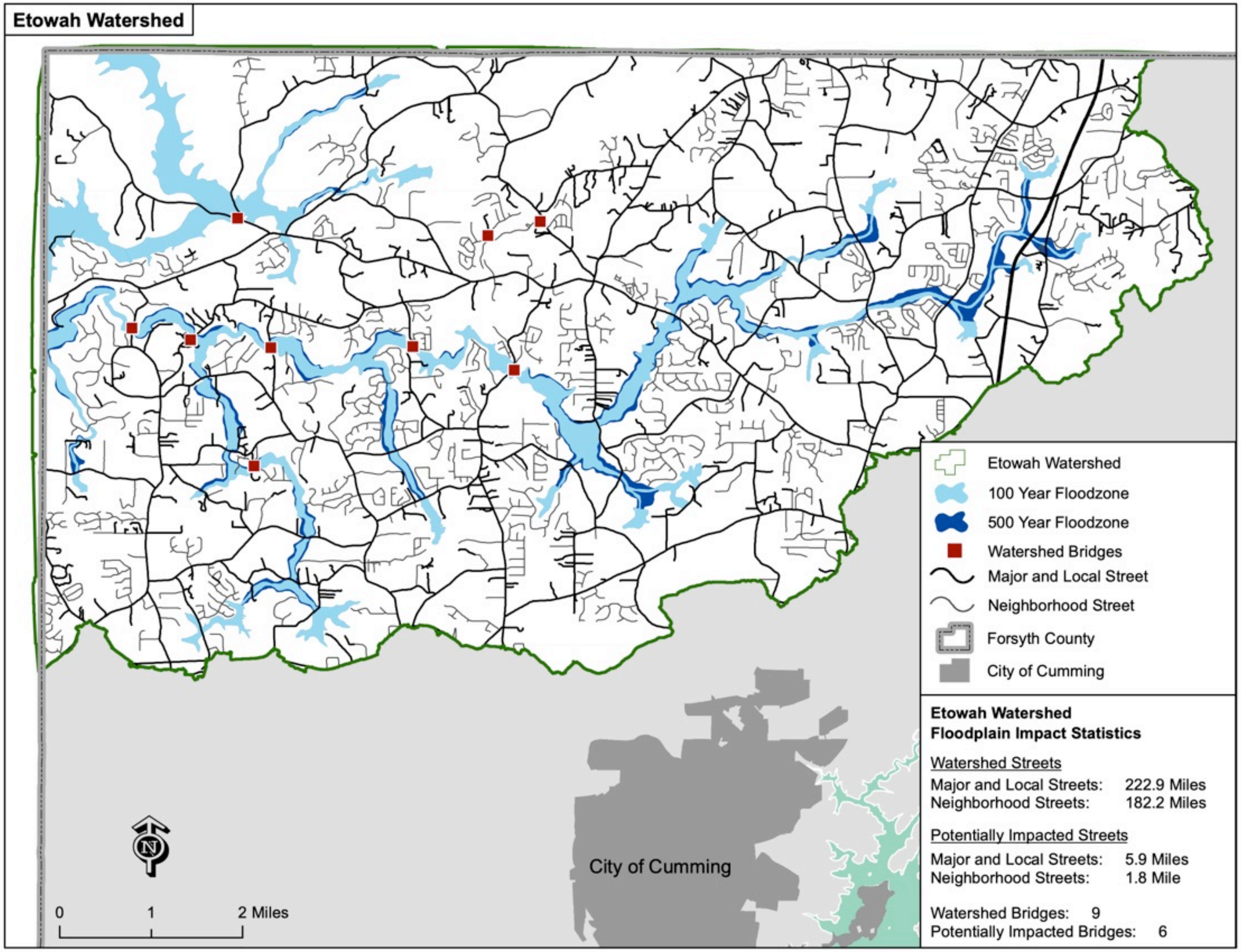

Big Creek Watershed
City of Cumming
0 0.5 1 Mile
Big Creek Watershed
Floodplain Impact Statistics
Impacted Site Address
Address within 100 Year Floodplain: 40
Address within 500 Year Floodplain: 55
* Building Classification
Floodplain 100 Year 500 Year
Residential 14 25
Commercial 8 9
Other 16 18
** Population Values (2.62 Individuals Per Household)
Floodplain 100 Year 500 Year
Population 61 93
Subdivisions Impacted: 158
* Building, Valuation, and Classification based on the 2021 Forsyth County Tax Database
** Population estimates based upon 2015 - 2019 U.S Census Bureau Quick Facts
Big Creek Watershed
100 Year Floodzone
500 Year Floodzone
Forsyth County
City of Cumming
Impacted Subdivisions

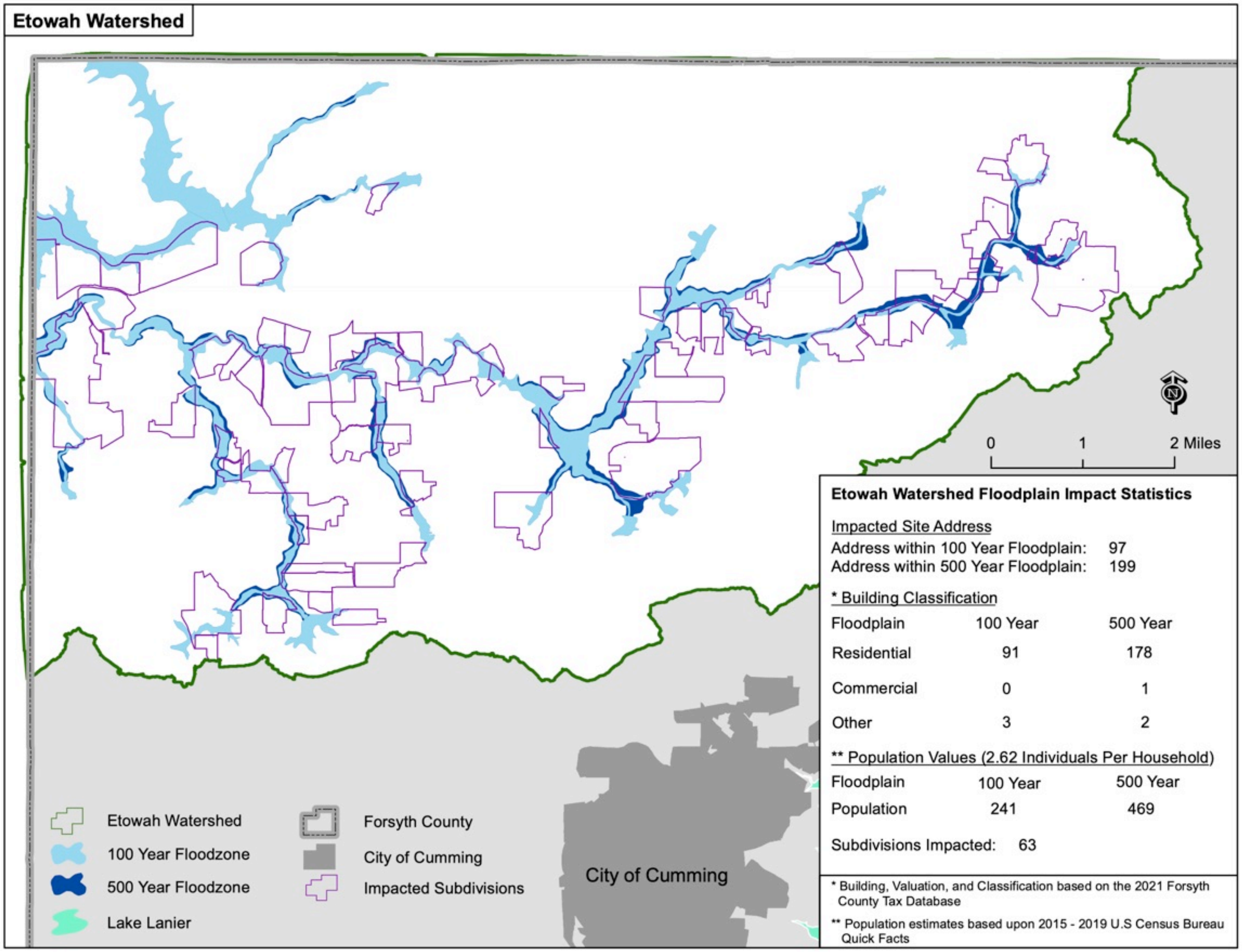

Chattahoochee Watershed
City of Cumming
Chattahoochee Watershed
Floodplain Impact Statistics
Impacted Site Address
Address within 100 Year Floodplain: 17
Address within 500 Year Floodplain: 21
* Floodplain Damage Classification
Affected (less than one foot of water)
Minor (between 1 and 2 feet of water)
Major (between 3 and 4 feet of water)
Destroyed (more than 5 feet of water)
** Address Impacted By Classification
Affected 4
Minor 17
Major 9
Destroyed 8
*** Valuation of Destroyed Address: $1,217,900
* Damage classification based on GEMA flood damage categories
** Buildings may be impacted by more than one classification
*** Building valuation based on the 2021 Forsyth County Tax Database
Forsyth County
City of Cumming
Chattahoochee Watershed
Lake Lanier
0 0.5 1 Mile
N

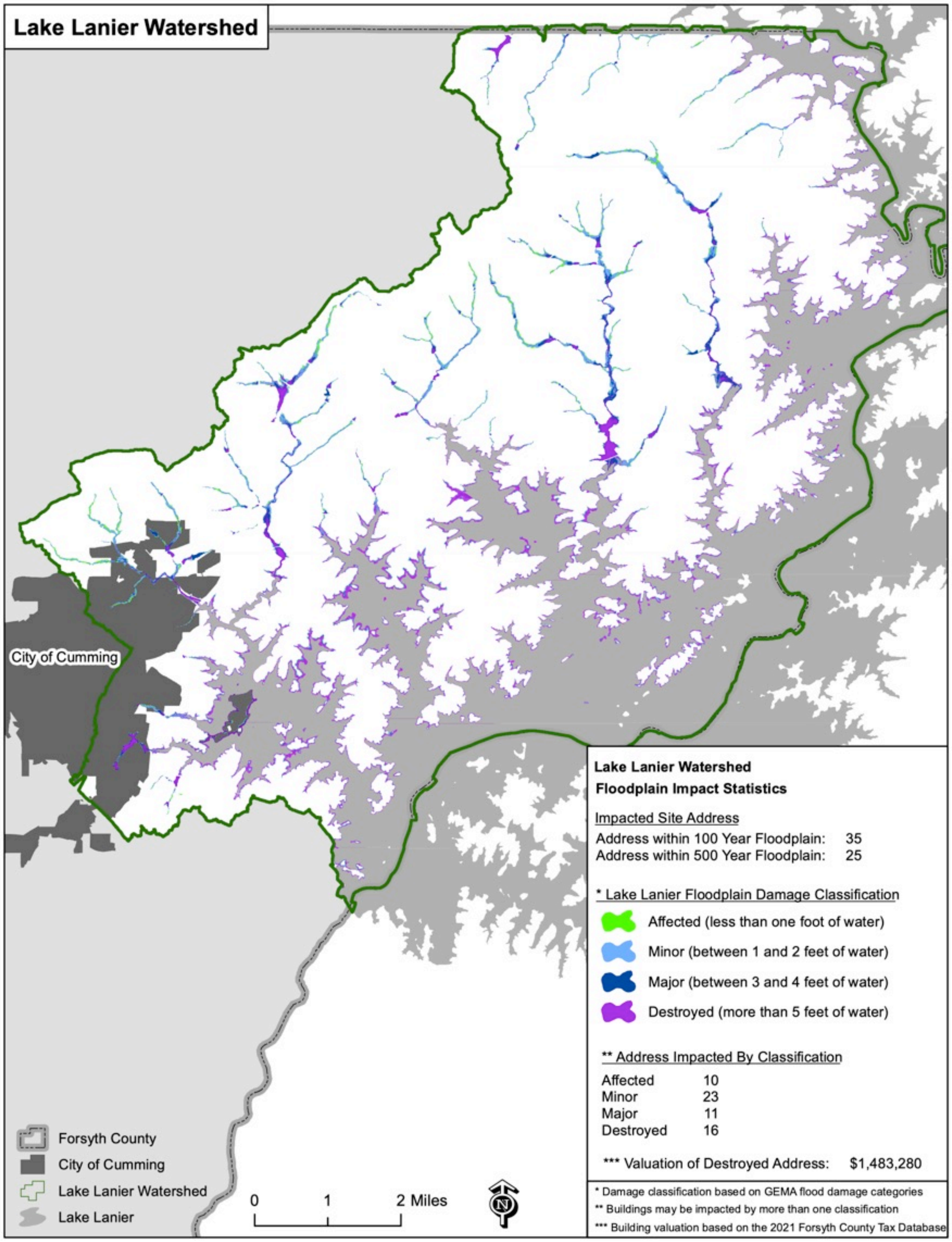

Chattahoochee Watershed
City of Cumming
Chattahoochee Watershed
100 Year Floodzone
500 Year Floodzone
Watershed Bridges
Major and Local Street
Neighborhood Street
Forsyth County
City of Cumming
Chattahoochee Watershed
Floodplain Impact Statistics
Watershed Streets
Major and Local Streets: 109.24 Miles
Neighborhood Streets: 239.78 Miles
Potentially Impacted Streets
Major and Local Streets: 0.7 Miles
Neighborhood Streets: 0.5 Miles
Watershed Bridges: 5
Potentially Impacted Bridges: 2
N
0 0.5 1 Mile

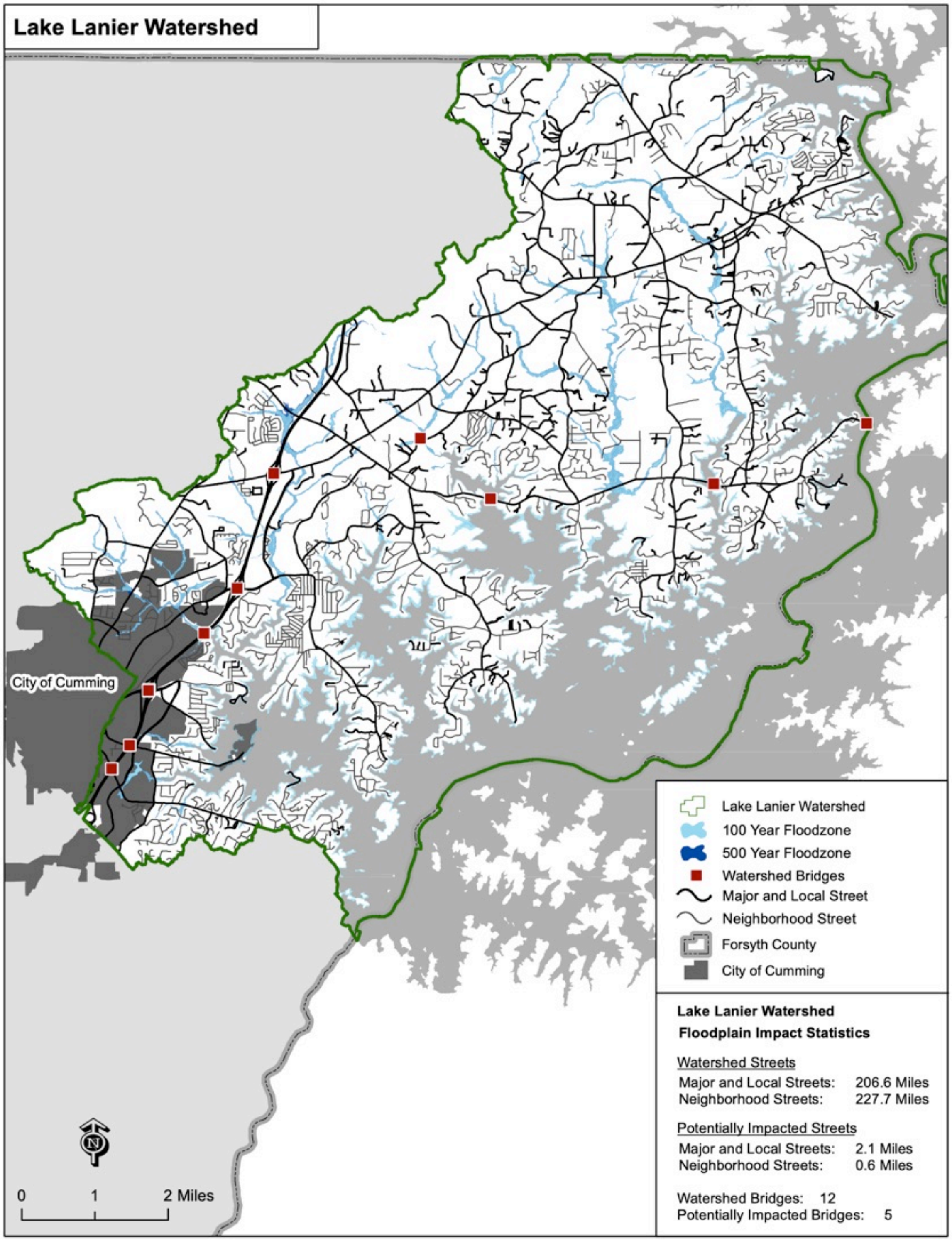

Chattahoochee Watershed
City of Cumming
0
0.5
1 Mile
Chattahoochee Watershed
Floodplain Impact Statistics
Impacted Site Address
Address within 100 Year Floodplain: 17
Address within 500 Year Floodplain: 21
* Building Classification
Floodplain 100 Year 500 Year
Residential 16 17
Commercial 0 0
Other 1 2
** Population Values (2.62 Individuals Per Household)
Floodplain 100 Year 500 Year
Population 20 47
Subdivisions Impacted: 92
* Building, Valuation, and Classification based on the 2021 Forsyth County Tax Database
** Population estimates based upon 2015 - 2019 U.S Census Bureau Quick Facts
Chattahoochee Watershed
100 Year Floodzone
500 Year Floodzone
Lake Lanier
Forsyth County
City of Cumming
Impacted Subdivisions

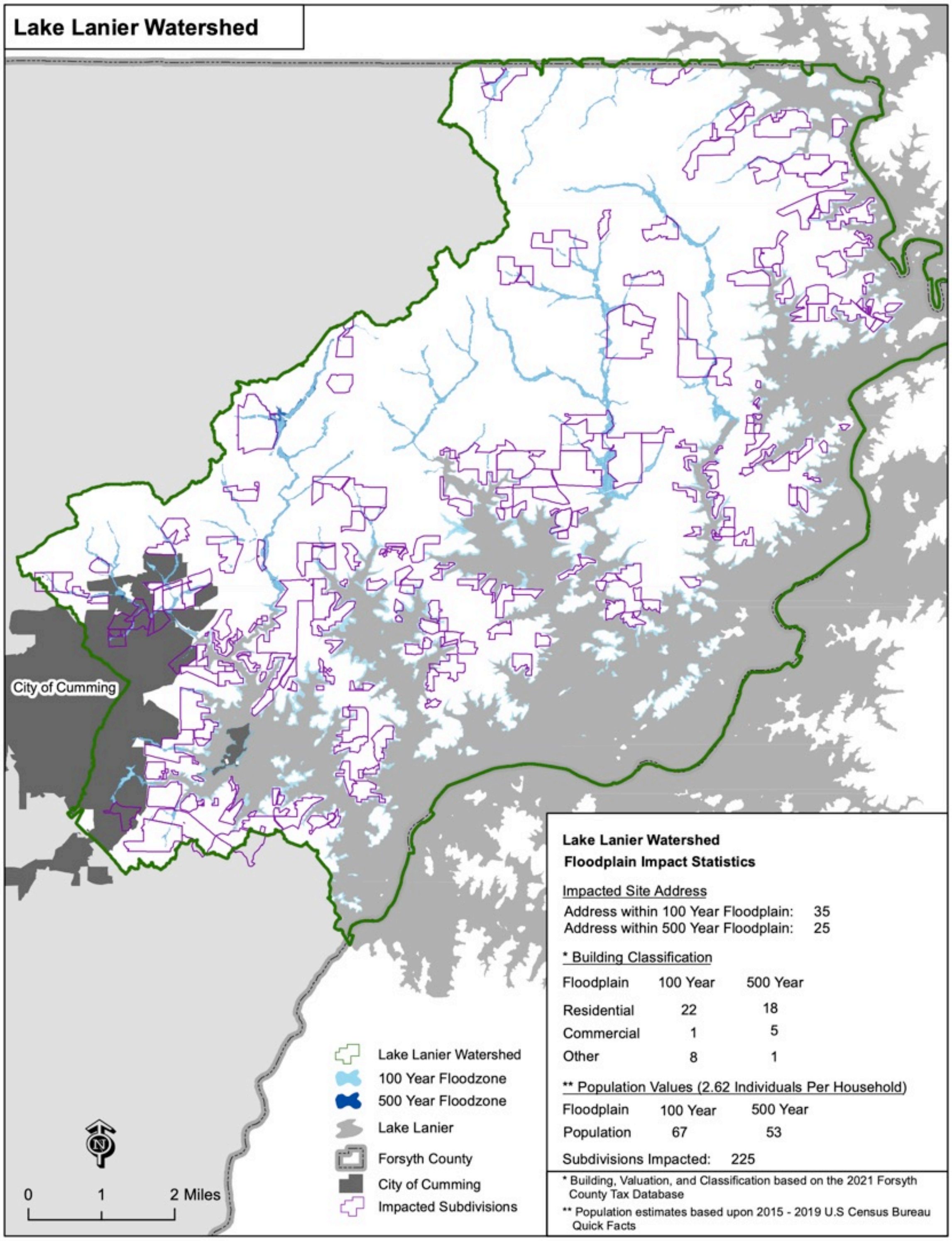

Etowah Watershed
0
1
2 Miles
Etowah Watershed Floodplain Impact Statistics
Impacted Site Address
Address within 100 Year Floodplain: 97
Address within 500 Year Floodplain: 199
* Floodplain Damage Classification
Affected (less than one foot of water)
Minor (between 1 and 2 feet of water)
Major (between 3 and 4 feet of water)
Destroyed (more than 5 feet of water)
** Address Impacted By Classification
Affected 22
Minor 110
Major 54
Destroyed 26
*** Valuation of Destroyed Address: $5,079,420
* Damage classification based on GEMA flood damage categories
** Buildings may be impacted by more than one classification
*** Building valuation based on the 2021 Forsyth County Tax Database
City of Cumming
Forsyth County
City of Cumming
Etowah Watershed
Lake Lanier


Etowah Watershed
Etowah Watershed
100 Year Floodzone
500 Year Floodzone
Watershed Bridges
Major and Local Street
Neighborhood Street
Forsyth County
City of Cumming
Etowah Watershed
Floodplain Impact Statistics
Watershed Streets
Major and Local Streets: 222.9 Miles
Neighborhood Streets: 182.2 Miles
Potentially Impacted Streets
Major and Local Streets: 5.9 Miles
Neighborhood Streets: 1.8 Mile
Watershed Bridges: 9
Potentially Impacted Bridges: 6
City of Cumming
0
1
2 Miles
N


Etowah Watershed
0
1
2 Miles
Etowah Watershed Floodplain Impact Statistics
Impacted Site Address
Address within 100 Year Floodplain: 97
Address within 500 Year Floodplain: 199
* Building Classification
Floodplain 100 Year 500 Year
Residential 91 178
Commercial 0 1
Other 3 2
** Population Values (2.62 Individuals Per Household)
Floodplain 100 Year 500 Year
Population 241 469
Subdivisions Impacted: 63
* Building, Valuation, and Classification based on the 2021 Forsyth County Tax Database
** Population estimates based upon 2015 - 2019 U.S Census Bureau Quick Facts
Etowah Watershed
100 Year Floodzone
500 Year Floodzone
Lake Lanier
Forsyth County
City of Cumming
Impacted Subdivisions
City of Cumming


Lake Lanier Watershed
City of Cumming
Lake Lanier Watershed
Floodplain Impact Statistics
Impacted Site Address
Address within 100 Year Floodplain: 35
Address within 500 Year Floodplain: 25
* Lake Lanier Floodplain Damage Classification
Affected (less than one foot of water)
Minor (between 1 and 2 feet of water)
Major (between 3 and 4 feet of water)
Destroyed (more than 5 feet of water)
** Address Impacted By Classification
Affected 10
Minor 23
Major 11
Destroyed 16
*** Valuation of Destroyed Address: $1,483,280
* Damage classification based on GEMA flood damage categories
** Buildings may be impacted by more than one classification
*** Building valuation based on the 2021 Forsyth County Tax Database
Forsyth County
City of Cumming
Lake Lanier Watershed
Lake Lanier
0
1
2 Miles
N


Lake Lanier Watershed
City of Cumming
Lake Lanier Watershed
100 Year Floodzone
500 Year Floodzone
Watershed Bridges
Major and Local Street
Neighborhood Street
Forsyth County
City of Cumming
Lake Lanier Watershed
Floodplain Impact Statistics
Watershed Streets
Major and Local Streets: 206.6 Miles
Neighborhood Streets: 227.7 Miles
Potentially Impacted Streets
Major and Local Streets: 2.1 Miles
Neighborhood Streets: 0.6 Miles
Watershed Bridges: 12
Potentially Impacted Bridges: 5
N
0
1
2 Miles



Lake Lanier Watershed
City of Cumming
Lake Lanier Watershed
100 Year Floodzone
500 Year Floodzone
Lake Lanier
Forsyth County
City of Cumming
Impacted Subdivisions
0
1
2 Miles
Lake Lanier Watershed
Floodplain Impact Statistics
Impacted Site Address
Address within 100 Year Floodplain: 35
Address within 500 Year Floodplain: 25
* Building Classification
Floodplain 100 Year 500 Year
Residential 22 18
Commercial 1 5
Other 8 1
** Population Values (2.62 Individuals Per Household)
Floodplain 100 Year 500 Year
Population 67 53
Subdivisions Impacted: 225
* Building, Valuation, and Classification based on the 2021 Forsyth County Tax Database
** Population estimates based upon 2015 - 2019 U.S Census Bureau Quick Facts

NCDC records show that 36 flood events occurred within the County over the past fifty years, which equates to a 72% annual frequency based upon reported events. However, flooding events were obviously underreported during the first few decades of the fifty-year history since reported events for the twenty-year history equals a slightly lower 33. The more recent twenty-year history presents a much more active picture with a 165% annual frequency. In addition, it is clear that NCDC data does not account for what is probably dozens of smaller flood events. There are also no records at the local level for such events, even though members of the HMPC have a general recollection of some of them, albeit without dates or depth data. As a result, the NCDC data is incomplete and cannot be relied upon in any significant way. The following chart provides annual frequency of reported events over the past five, ten, twenty, and fifty-year periods. The most recent five-year period, covering the span of time since the last update to this Plan, is highlighted in gold.

Forsyth County – Flooding Frequency (based on Reported Events)				
Time Period	**5yrs (2016-2020)**	**10yrs (2011-2020)**	**20yrs (2001-2020)**	**50yrs (1971-2020)**
Number of Reported Events	**3**	**13**	**33**	**36**
Frequency Average per Year	**0.60**	**1.30**	**1.65**	**0.72**
Frequency Percent per Year	**60%**	**130%**	**165%**	**72%**

Forsyth County (CID No. 130312) and the City of Cumming (CID No. 130236) each participate in the National Flood Insurance Program (NFIP) and follow the Program guidelines to ensure future development is carried out in the best interests of the public. According to NFIP guidelines, each participating jurisdiction has executed a Flood Damage Prevention Ordinance. The purpose of this ordinance is to minimize the loss of human life and health as well as to minimize public and private property losses due to flood conditions. The ordinance requires that potential flood damage be evaluated at the time of initial construction of structures, facilities and utilities, and that certain uses be restricted or prohibited based on this County evaluation. The ordinance also requires that potential homebuyers be notified that property is located in a flood area. In addition, all construction must adhere to the Georgia State Minimum Standard Codes (Uniform Codes Act). The minimum standards established by these codes provide reasonable protection to persons and property within structures that comply with the regulations for most natural hazards.

According to the National Flood Insurance Reform Act, a repetitive loss structure is defined as "…a building covered by a contract for flood insurance that has incurred flood-related damages on two occasions during a 10-year period ending on the date of the event for which a second claim is made, in which the cost of repairing the flood damage, on the average, equaled or exceeded 25 percent of the market value of the building at the time of each such flood event." **As of December 2020, there are five official residential "repetitive loss structure" on file for Forsyth County.** Information relating to specific events and associated costs is located in the chart below. *Specific addresses for repetitive loss structures cannot be included in this Plan, but a current list of these structures may be viewed in GMIS by authorized individuals, as determined by the EMA Director.*

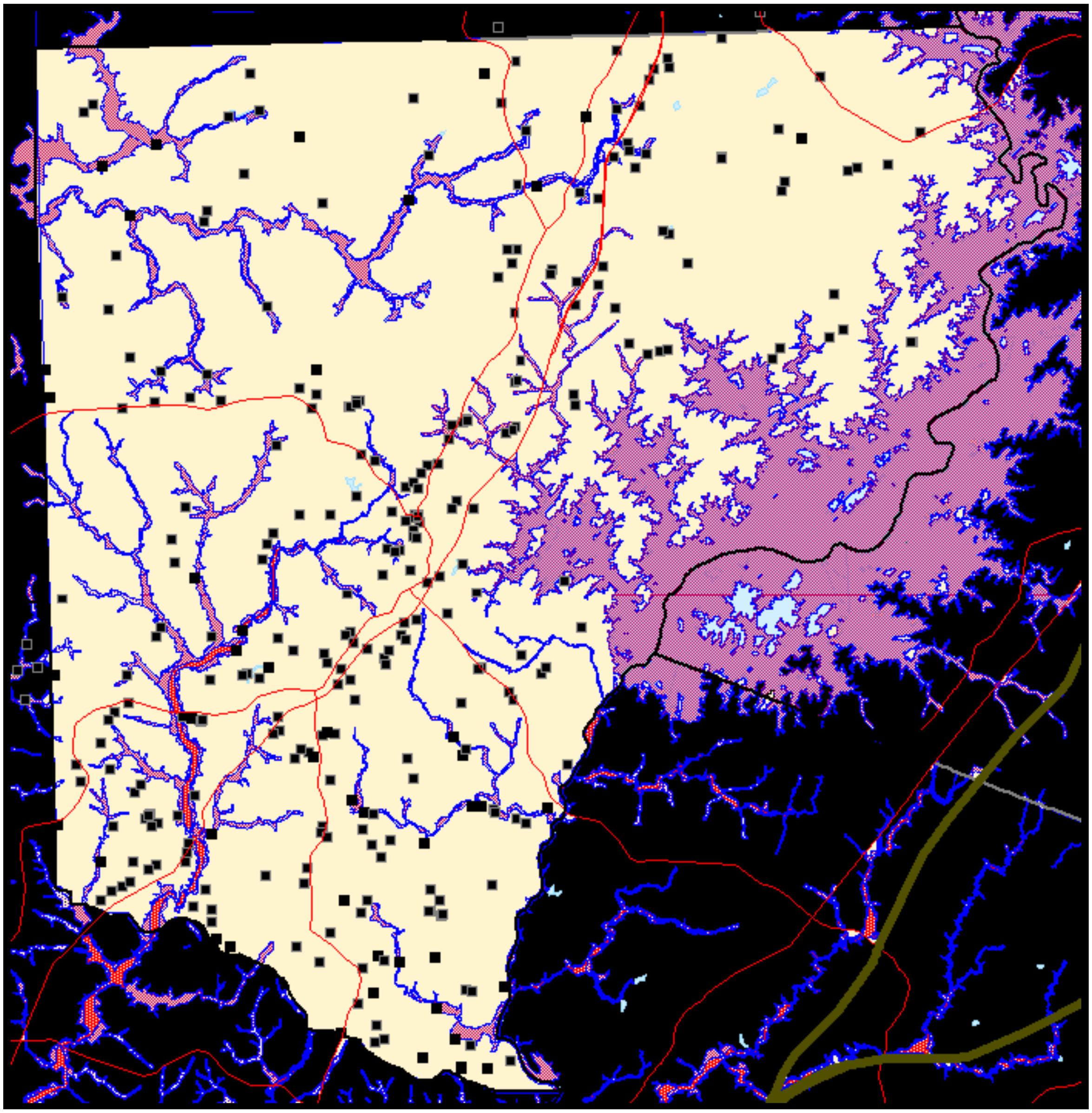
Community Name	Community Nu	Occupancy 1	Mitigated	Cumulative Building Payment	Cumulative Contents Payment	Total Losses	Total Paid
FORSYTH COUNTY *	130312	SINGLE FMLY	NO	22903.3	0	2	22903.3
FORSYTH COUNTY *	130312	SINGLE FMLY	NO	108478.51	51460.98	3	159939.49
FORSYTH COUNTY *	130312	SINGLE FMLY	NO	5860.08	0	2	5860.08
FORSYTH COUNTY *	130312	SINGLE FMLY	NO	3628.07	3850.37	2	7478.44
FORSYTH COUNTY *	130312	SINGLE FMLY	NO	4865.77	0	2	4865.77

C. Assets Exposed to Hazard – In evaluating assets that may potentially be impacted by the effects of flooding, the HMPC attempted to identify all known structures located within or close to the identified 100-year floodplain.

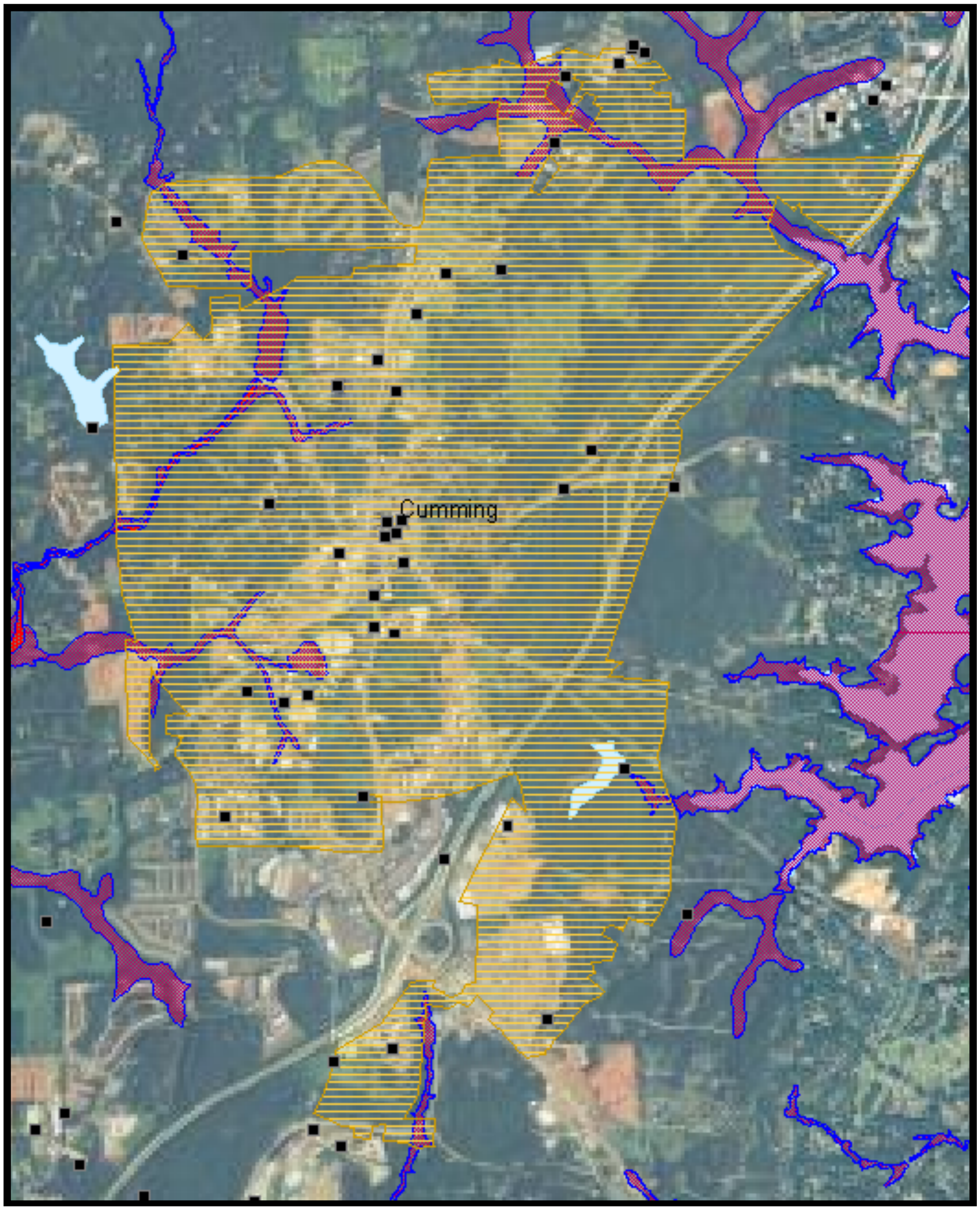
Flood hazard scores are derived from the FEMA Q3 "Zone" values. The Q3 layer is derived from the FEMA paper flood insurance rate maps. The table below describes the different flood zones and applies to the flood maps that follow. These particular maps identify the locations of critical facilities in relationship to the known flooding hazard areas within Forsyth County and the City of Cumming.

Score	Original Value	Description
4 (red)	Floodway	Floodway (within zone AE)
	V	1% with Velocity no Base Flood Elevation (BFE)
	VE	1% with Velocity BFE
3 (amaranth, a deep pink color)	A	1% Annual Chance no BFE
	A99	1% Federal flood protection system
	AE	1% has BFE
	AH	1% Ponding has BFE
	AO	1% Sheet Flow has depths
	AR	1% Federal flood protection system
2 (purple)	X500	0.2% Annual Chance
1 (blue)	ANI	Area not included in survey
	D	Undetermined but possible
0 (gray)	UNDES	Undesignated
	X	Outside Flood Zones

Forsyth County



City of Cumming



D. Estimate of Potential Losses – For loss estimate information, please refer to the Critical Facilities Database (Appendix A).

Additional flood risk estimates by FloodFactor for both of the jurisdictions are located on the pages that follow. Flood Factor is a free online tool created by the nonprofit First Street Foundation to assist Americans in finding their property's estimated risk of flooding. FEMA flood maps identify flood hazard areas, and while the maps can provide detailed information for homeowners on their flood risks, they are not available everywhere. Flood Factor's national flood model shows that flood risk is more widespread in the United States and includes flood risk from urban stormwater flooding and storm surge. As with all models and risk assessments, the following estimates should not be relied upon for total accuracy, but may be one tool of many to help give a general idea of flood risk for each jurisdiction.

Flood risk overview for Forsyth County

There are **3,469** properties in Forsyth County that have **greater than a 26% chance** of being severely affected by flooding over the next 30 years. This represents **4%** of all properties in the county.

In addition to damage on properties, flooding can also cut off access to utilities, emergency services, transportation, and may impact the overall economic well-being of an area. Overall, **Forsyth County has a minor risk of flooding** over the next 30 years, which means flooding is likely to impact day to day life within the community.

Overall risk level ⓘ

Minimal **Minor** Moderate Major Severe Extreme

Forsyth County has a minor risk of flooding over the next 30 years.

Residential ⓘ	**Minor**
Road ⓘ	**Minor**, increasing
Commercial ⓘ	**Minor**, increasing
Infrastructure ⓘ	**Moderate**, increasing
Social ⓘ	**Minor**, increasing

Explore the maps below to learn more about the homes, roads, businesses, and services at risk in Forsyth County.

Map View:

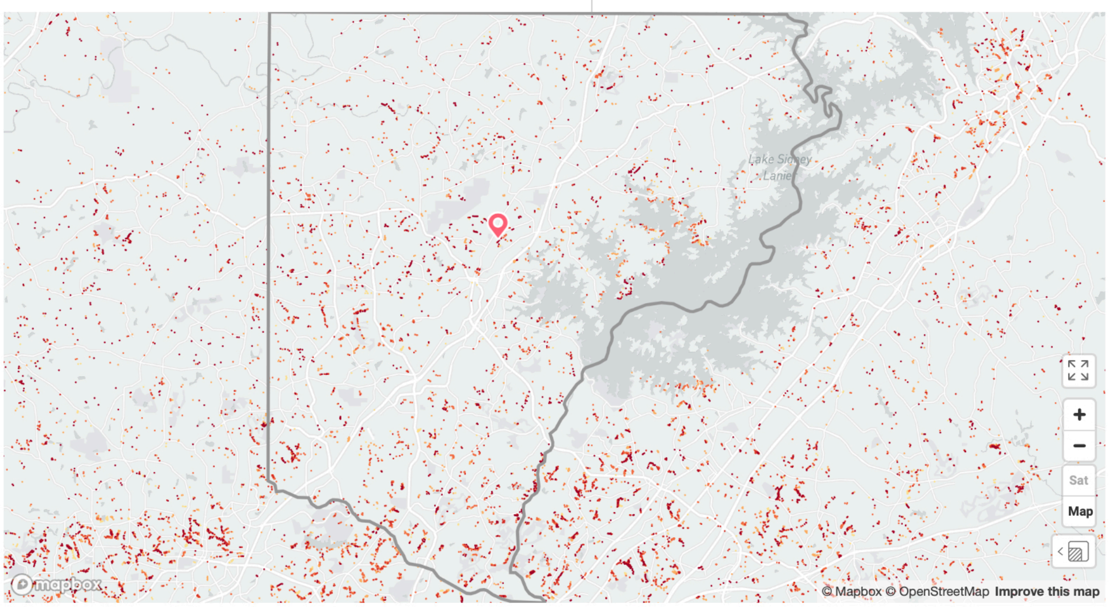
Overall Risk

- Compare areas
- Points on map

Filter by levels:

- [ ] All
- [ ] Minimal
- [x] Minor
- [x] Moderate
- [x] Major
- [x] Severe
- [x] Extreme

Minimal Minor Moderate Major Severe Extreme



Flood risk overview for Cumming

There are **127** properties in Cumming that have **greater than a 26% chance** of being severely affected by flooding over the next 30 years. This represents **4%** of all properties in the city.

In addition to damage on properties, flooding can also cut off access to utilities, emergency services, transportation, and may impact the overall economic well-being of an area. Overall, **Cumming has a moderate risk of flooding** over the next 30 years, which means flooding is likely to impact day to day life within the community.

Overall risk level ⓘ

Minimal | Minor | **Moderate** | Major | Severe | Extreme

Cumming has a moderate risk of flooding over the next 30 years.

Residential ⓘ	**Minor**, increasing
Road ⓘ	**Moderate**, increasing
Commercial ⓘ	**Minor**, increasing
Infrastructure ⓘ	**Severe**, increasing
Social ⓘ	**Minimal**

Explore the maps below to learn more about the homes, roads, businesses, and services at risk in Cumming.

Map View:

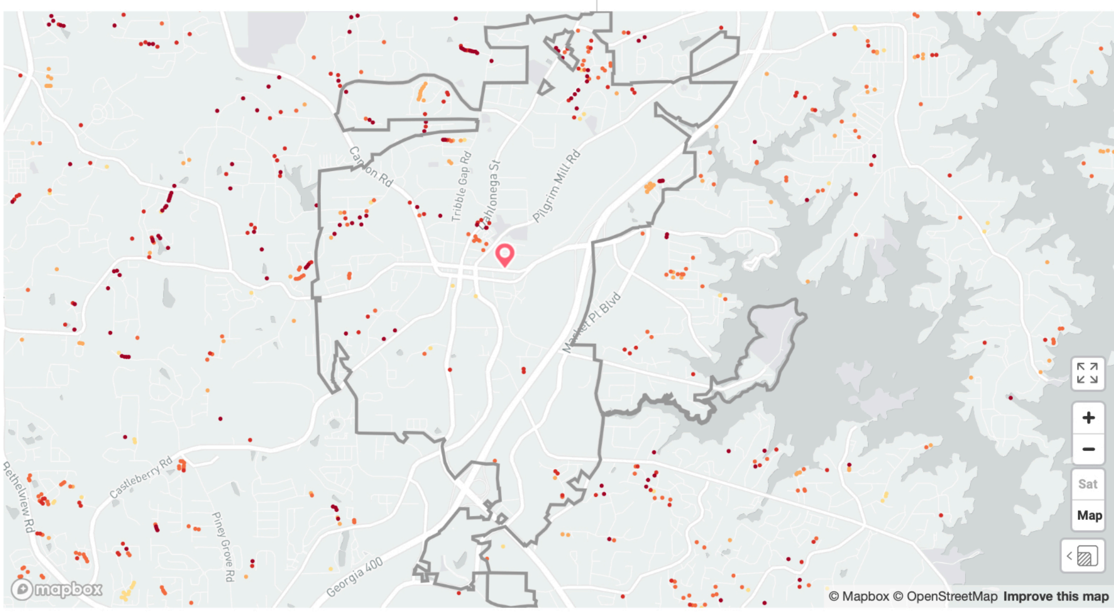
Overall Risk

- Compare areas
- Points on map

Filter by levels:

- All
- Minimal
- Minor
- Moderate
- Major
- Severe
- Extreme

Minimal | Minor | Moderate | Major | Severe | Extreme

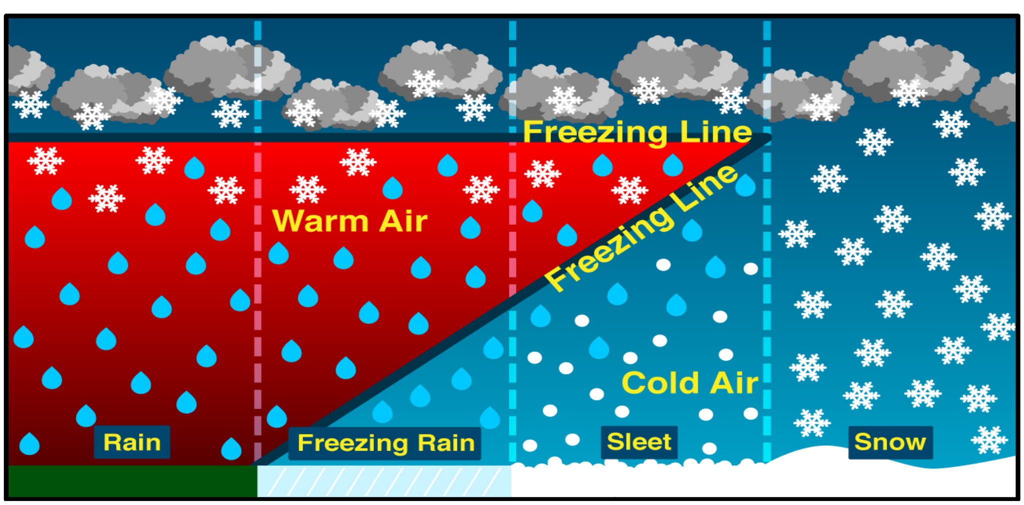


E. Multi-Jurisdictional Concerns – Any portion of Forsyth County can potentially be impacted by flooding. According to GMIS flood maps, the County and each of the municipalities all have significant flood-prone areas within their jurisdictions. All mitigation steps taken related to flooding will be pursued on a countywide basis and include the City of Cumming.

F. Hazard Summary – Severe flooding has the potential to inflict significant damage within Forsyth County. Mitigation of flood damage requires the community to have knowledge of flood-prone areas, including roads, bridges, bodies of water, and critical facilities, as well as the location of the County's designated shelters. The Forsyth County HMPC identified flooding as a hazard requiring mitigation measures and identified specific mitigation goals, objectives and action items they deemed necessary to lessen the impact of flooding. These findings are found in *Chapter 5*.

2.4 Winter Storms

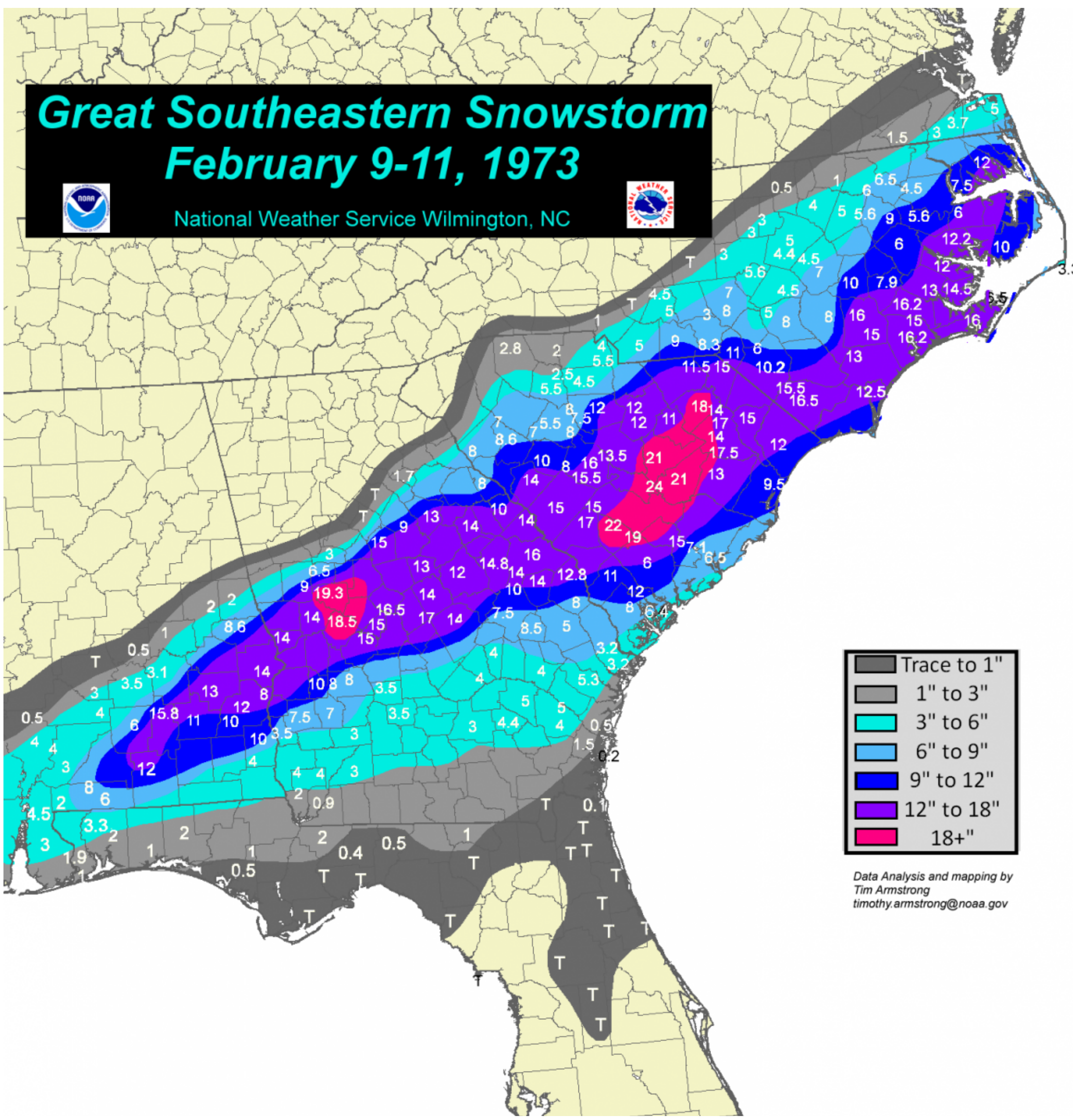
A. Hazard Identification – The Forsyth County HMPC researched historical data from the National Climatic Data Center, The National Weather Service, as well as information from past newspaper articles and various online resources relating to winter storms in Forsyth County. Winter storms bring the threat of freezing rain, ice, sleet, snow and the associated dangers. A heavy accumulation of ice, especially when accompanied by high winds, devastates trees and power lines. Such storms make highway travel or any outdoor activity extremely hazardous due to falling trees, ice, and other debris. The diagram below demonstrates the formation of these different forms of precipitation.



B. Hazard Profile – Although winter storms occur relatively infrequently, they have the potential to wreak havoc on the community when they do strike. Winter storms within Forsyth County typically cause damage to power lines, trees, buildings, structures, and bridges, to varying degrees. Portions of the County with higher elevations have highways with steep grades, resulting in very hazardous travel conditions when they are covered with frozen precipitation. Another hazard exists due to the large tree population. Trees and branches weighed down by snow and ice become very dangerous to person and property.

February 9-11, 1973 Great Southeastern Snowstorm

One of the greatest snowstorms in Southeastern United States history occurred February 9-11, 1973. This storm dropped one to two feet of snow across a region that typically sees only an inch or two of snow per year. New all-time snowfall records were established in a number of locations in Georgia, North Carolina and South Carolina. Measurable snow fell along the Gulf Coast from Texas to Florida.



Deep South of Nation Is Knee-Deep in Snow

ATLANTA (UPI)—A "once-in-a-hundred-years" snow-storm whipped across the Deep South today, blanketing the Mississippi Gulf Coast and dumping nearly a foot of snow on the midsection of Georgia.

The storm, rolling rapidly out of Louisiana, was blamed for three traffic deaths as it whipped through Mississippi and Alabama and spawned a line of squalls in Florida that damaged half a dozen homes near Stuart.

Eleven inches of snow was on the ground at Macon and the city was practically snowbound. The mayor there declared a state of emergency.

The National Guard was called out to rescue stranded motorists in central and south Georgia. It was the heaviest snowfall in a decade on the Mississippi Gulf Coast

Sleet and freezing rain hit the Carolinas' coastland early today and Wilmington, N.C., was blanketed with six inches of snow.

The storm followed a belt-line pattern, and except for frigid temperatures, missed Atlanta and North Georgia completely.

"This is probably what you would call a once-in-a-hundred years snow," said Columbus Mayor J. R. Allen. "And certainly the city is not equipped with snowplows and equipment for this situation."

The city measured nine inches of snow by early today.

Hazardous travel warnings were issued for northwest Florida and winds of from 25 to 30 miles an hour brought rough seas and high tides to Tampa.

South Carolina braced against sleet and freezing rain along the coastal areas and in the vicinity of Charleston and up to five inches of snow was expected today in the Aiken and Orangeburg areas.

The snow on the Mississippi Gulf Coast was the heaviest in a decade.

In Mississippi, the National Weather Service reported accumulations of two to four inches of snow along the coast and the state's highway patrol said most major bridges in the area were impassable.

Mississippi Power & Light Co. said electric service was interrupted in some areas north of the coastal region when ice accumulations snapped tree limbs and knocked down wires.

In Georgia, Columbus, Macon and Augusta reported seven inches of snow on the ground by Friday night, the heaviest ever recorded by the National Weather Service since recordkeeping was first started in 1947.

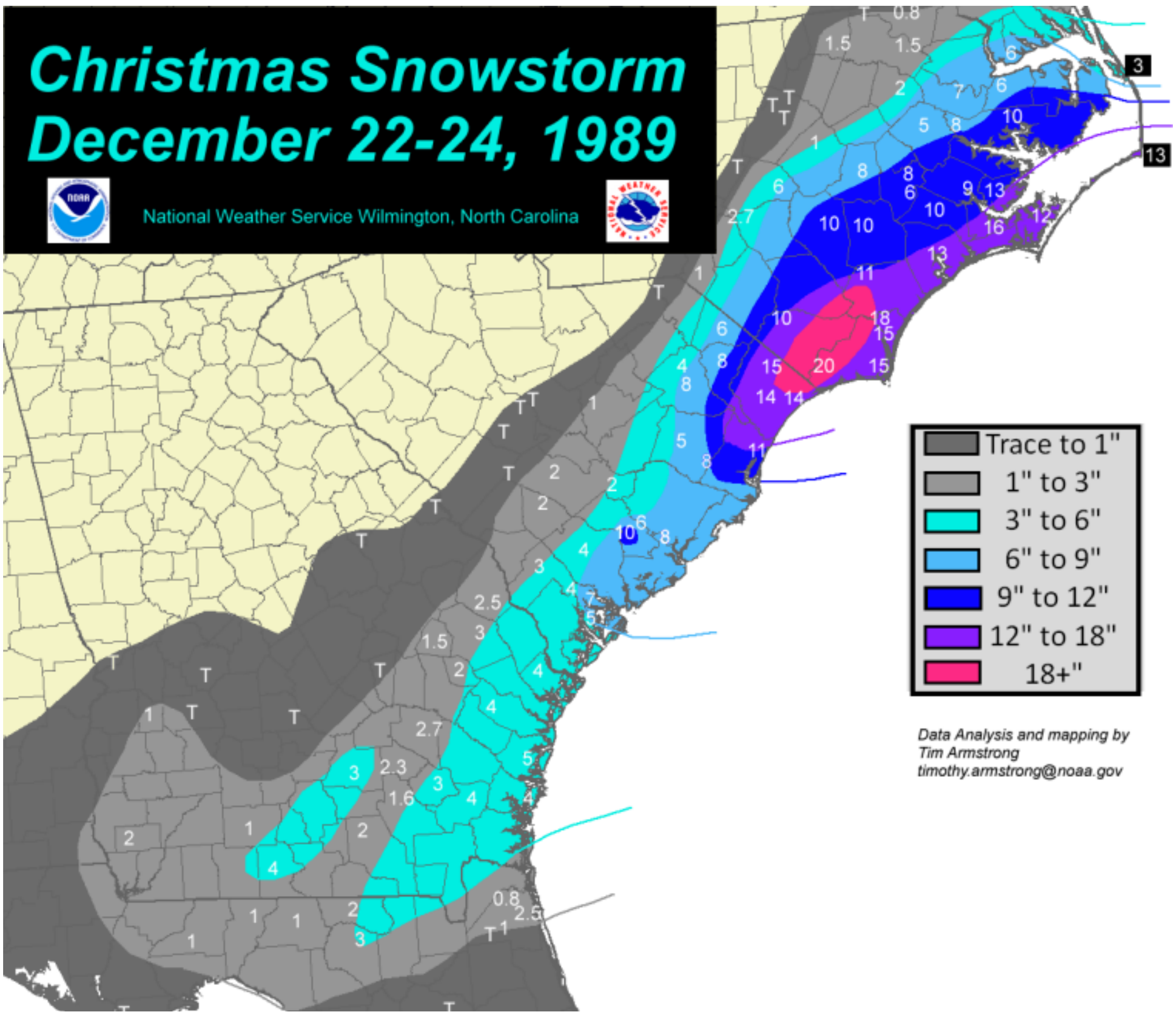
"Please get off the streets and go home for your own safety," said Columbus Mayor J. R. Allen in a special bulletin. City offices, schools and businesses shut down at noon Friday as the snow began to mount.

Georgia Gov. Jimmy Carter ordered the National Guard into rescue work on U.S. Highway 80 below Thomaston, where some 20 vehicles, including a Greyhound bus, were snowed in. The rescue teams evacuated occupants of the vehicles, sending them to a special disaster shelter for the night.

National Guard generators also provided emergency power for the hospital at Preston, in Webster County.

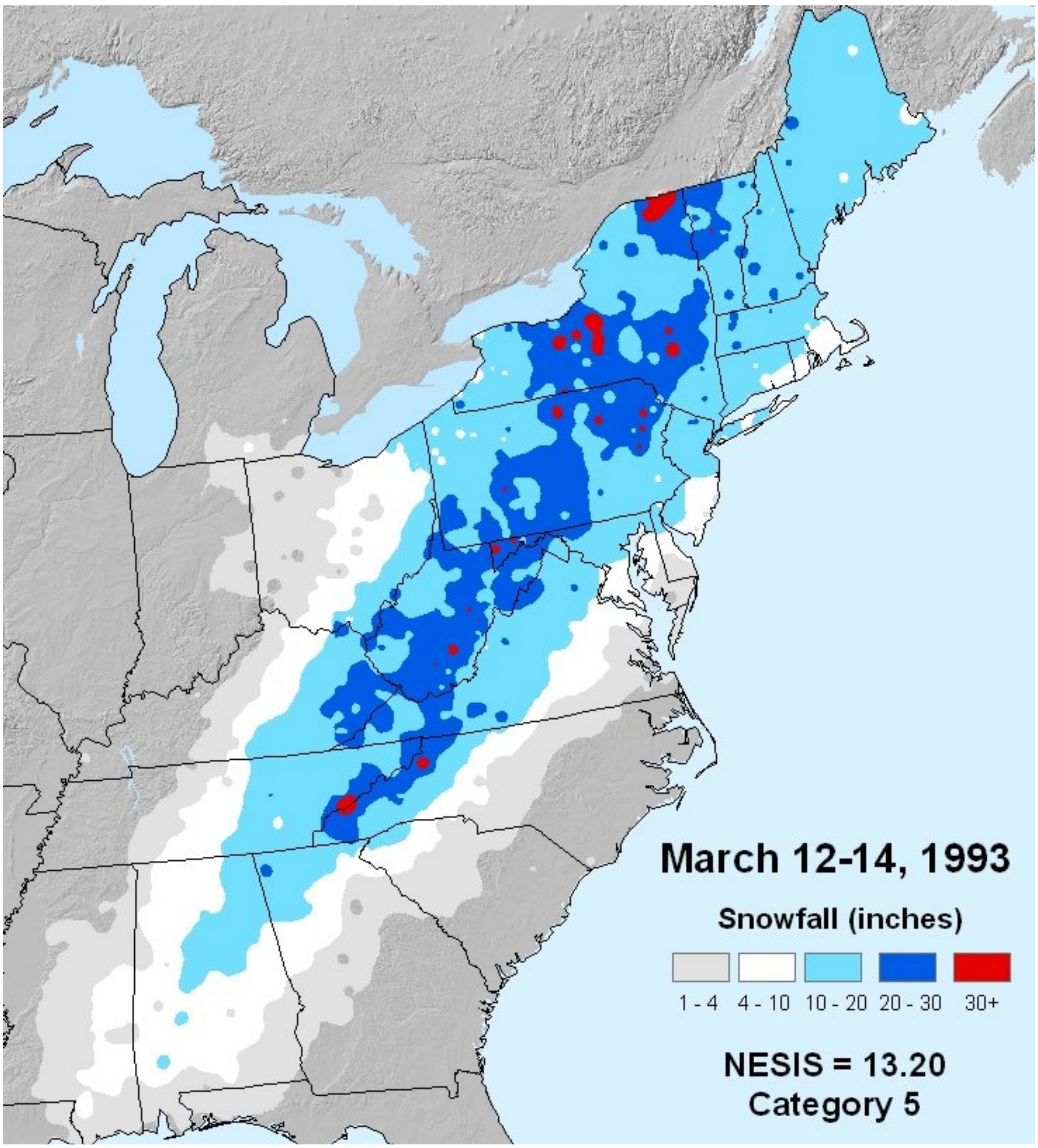
December 22-24, 1989 Christmas Snowstorm

The largest snowstorm in history for the Southeast U.S. coast occurred just before Christmas 1989. This storm broke all-time snowfall records in Wilmington (15.3 inches), Cape Hatteras (13.3 inches), Charleston (8 inches), and Savannah (3.6 inches). Measurable snow fell as far south as Jacksonville and Tallahassee, Florida, and snow flurries were reported in Tampa and near Sarasota. In addition to record amounts of snow unprecedentedly cold temperatures accompanied the storm. All-time record lows were smashed across coastal North Carolina. Arctic air flooded south into Florida as well with record lows observed all across the peninsula. Even Key West, FL reached 44 degrees tying the coldest December temperature ever seen. The Florida citrus industry suffered severe injury with newspaper reports indicating "nearly total destruction”. This particular storm had little effect on Forsyth County specifically, but shows the threat to the area.



March 12-14, 1993 Storm of the Century

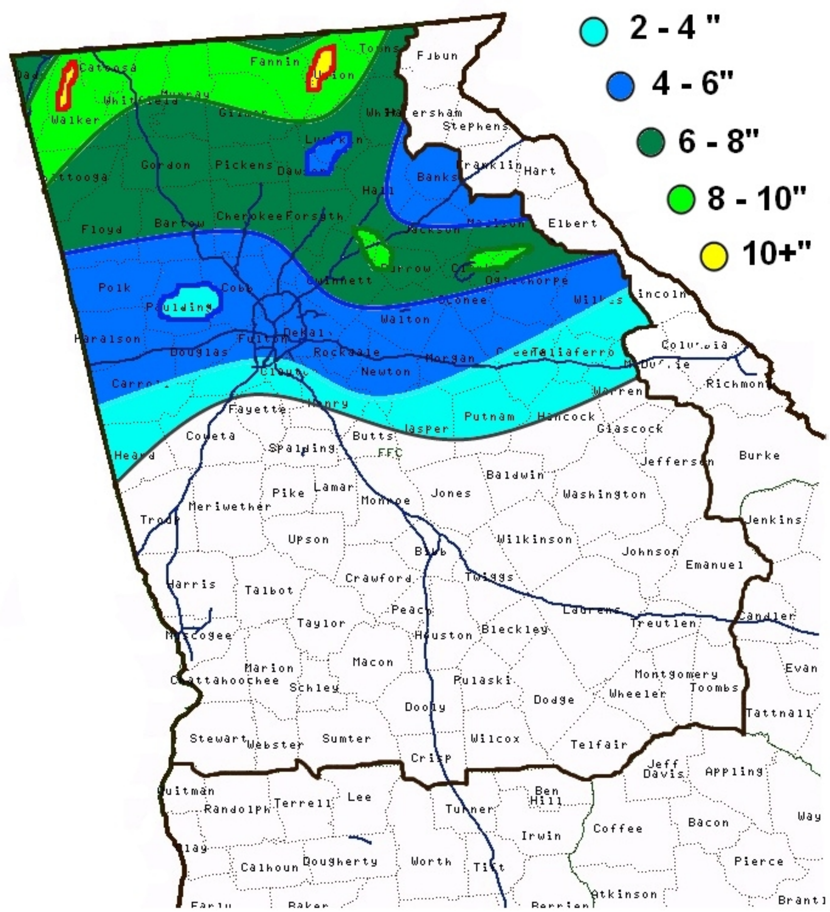
The Superstorm of 1993 (also called the Storm of the Century) was one of the most intense mid-latitude cyclones ever observed over the Eastern United States. The storm will be remembered for its tremendous snowfall totals from Alabama through Maine, high winds all along the East coast, extreme coastal flooding along the Florida west coast, incredibly low barometric pressures across the Southeast and Mid-Atlantic, and for the unseasonably cold air that followed behind the storm. In terms of human impact the Superstorm of 1993 was more significant than most landfalling hurricanes or tornado outbreaks and ranks among the deadliest and most costly weather events of the 20th century. Forsyth County accumulation was between 10 and 20 inches.



January 9-10, 2011 Winter Storm

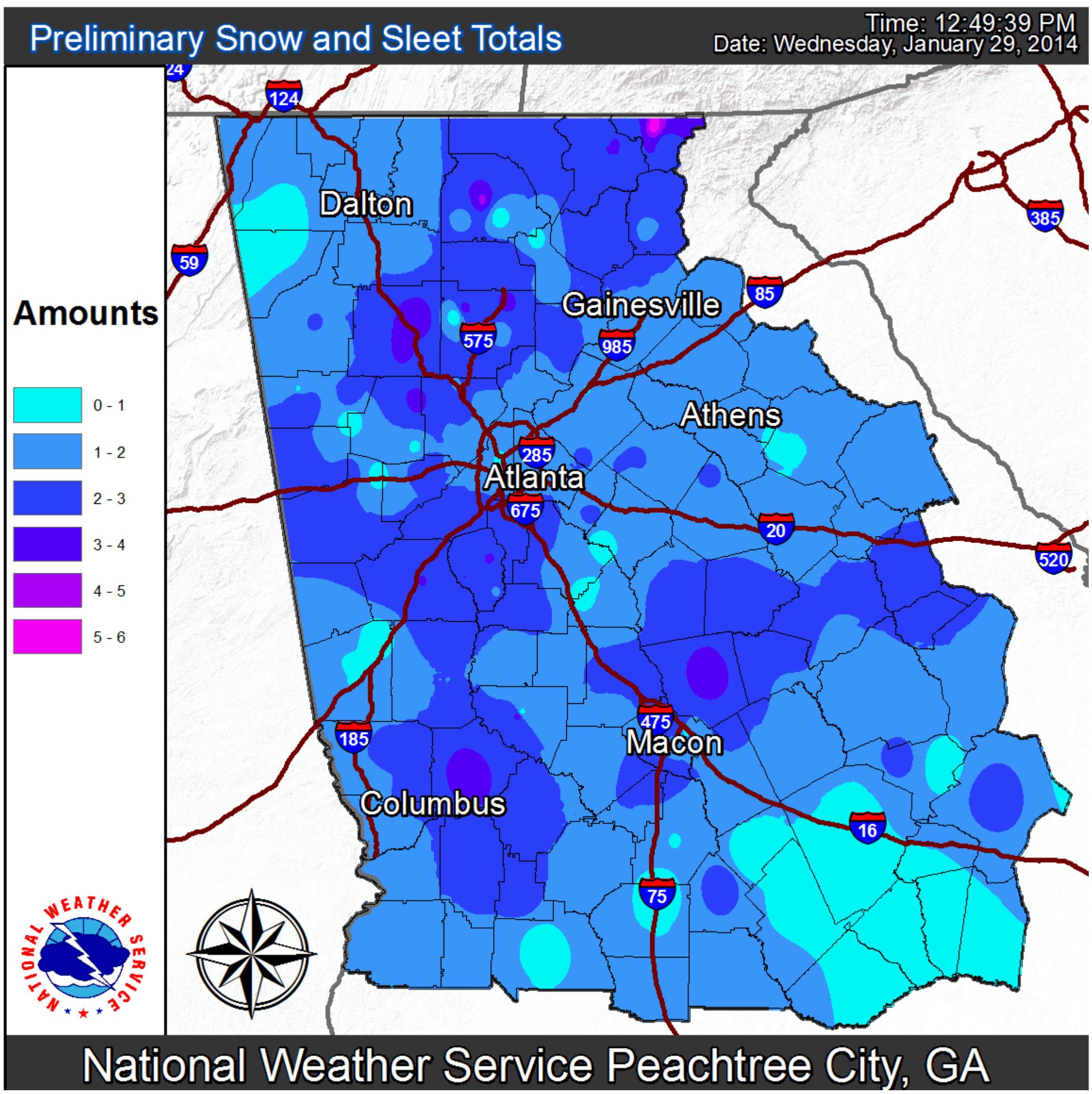
Beginning Sunday, January 9, 2011, a mix of rain, sleet and snow fell across central Georgia, with accumulations of up to two inches. In north Georgia, where the cold air was deeper, precipitation fell in the form of mostly snow with some sleet. Between 10 p.m. and midnight on Sunday, an area of intense snow developed along and just north of the I-20 corridor, contributing to a narrow band of 6-8.5 inches total snowfall amounts in Eastern Georgia. To the north of I-20, the airmass was sufficiently cold and moist to produce widespread snowfall amounts greater than 6 inches. In the northernmost counties of Georgia, and especially at higher elevations, snowfall amounts of 8-10 inches were common. The heavier snow and sleet accumulations began tapering off by mid-day Monday, but temperatures hovered at or below freezing throughout the day. Persistent freezing drizzle and light freezing rain across much of central and northern Georgia on Monday helped extend the winter event into the afternoon. Reports of ice accumulations from 0.1- 0.5 inches were received on Monday – mainly across central Georgia. Forsyth County averaged 6-8 inches.

Snow and Sleet Accumulation 1/9-10/2011



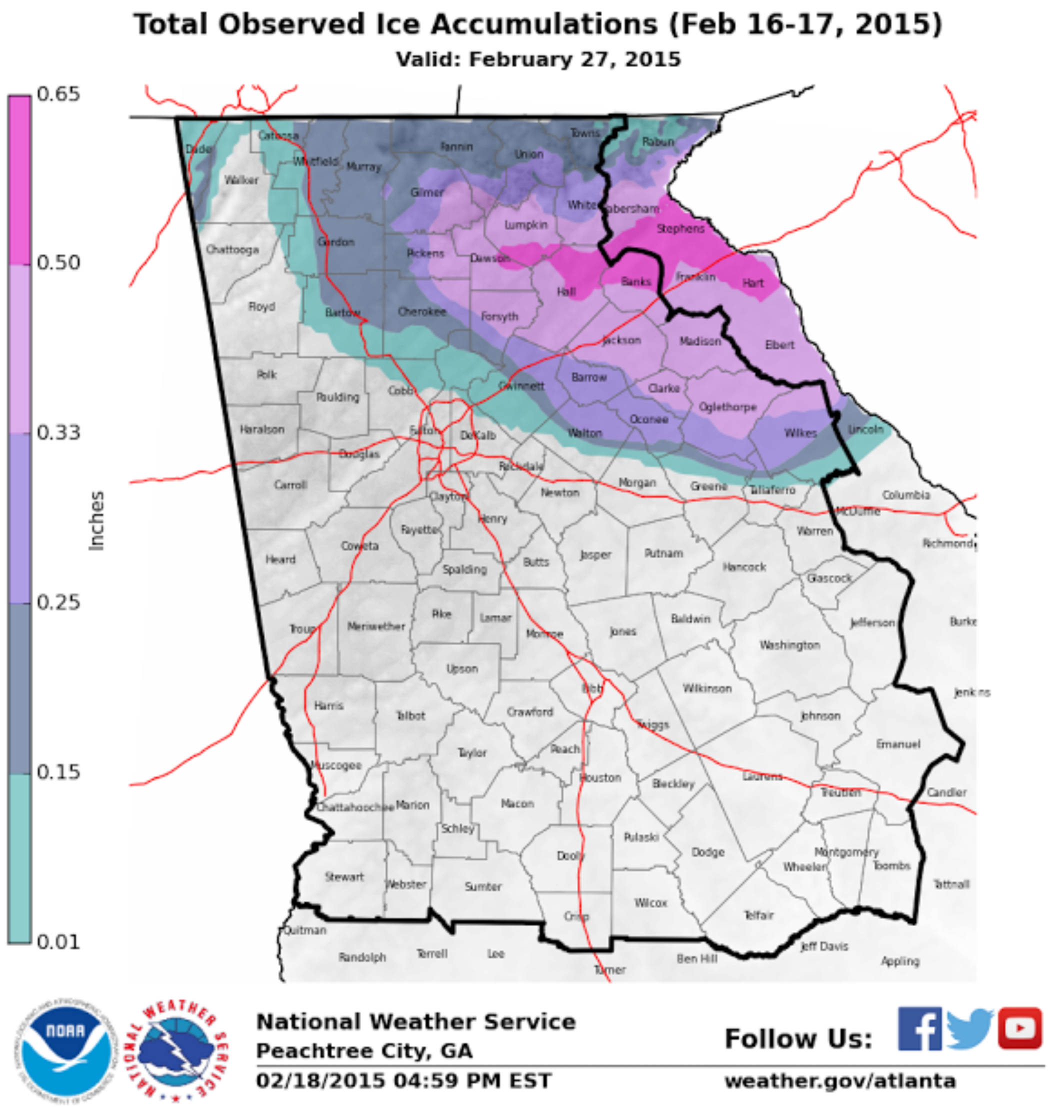
January 28, 2014 Winter Storm

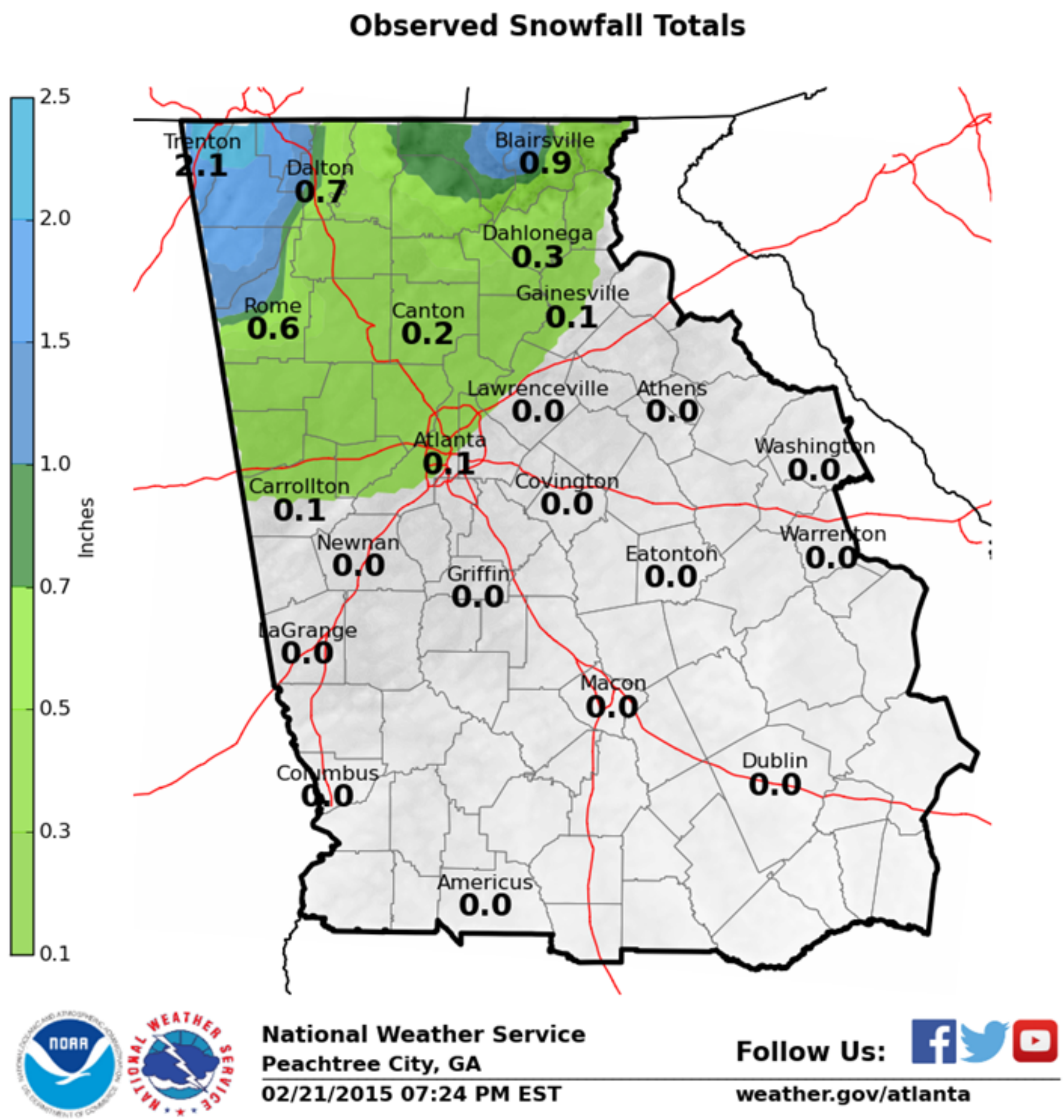
A cold arctic airmass that originated over northern Canada moved rapidly across the central United States on Monday, January 27, 2014. The advancing cold front moved rapidly out of the midwest and across north and central Georgia Monday night. By Tuesday morning, January 28, 2014, temperatures were already below freezing across northwest Georgia, and by afternoon, north and west Georgia temperatures were below freezing. By Tuesday night freezing temperatures were reported across the entire area. During this time, a 500 millibar (mb) short wave was moving out of the southwest United States and into the western Gulf of Mexico. By Tuesday this disturbance was spreading moisture out of the Gulf and across the Southeast. This resulted in a mix of winter precipitation across north and central Georgia with mostly snow across north Georgia, and a mix of freezing rain, sleet and snow across much of central Georgia. Forsyth County accumulation totals were between 1 and 3 inches.



February 16-17, 2015 Winter Storm

A significant winter storm to affect Forsyth County occurred in mid-February of 2015. A strong cold front pushed across Georgia by the morning of February 15th, bringing in plenty of below freezing temperatures to north Georgia. As a low-pressure system approached the area from the west on February 16th, warmer temperatures surged northward, bringing much of the area above freezing. However, temperatures at the surface across parts of north and northeast Georgia hovered at or below freezing as the rainfall increased, thanks to a wedge of cold air. Freezing rain continued for these areas into the early morning hours of February 17th before coming to an end. Freezing rain totals reached from 1/4" to 1/2" in some areas, leading to widespread tree and power line damage. By the morning of February 17th, more than 200,000 customers were without power, generally for the northeast Atlanta metro area and points north and east. The following map shows ice accumulations and snowfall totals in Forsyth County and surrounding areas.

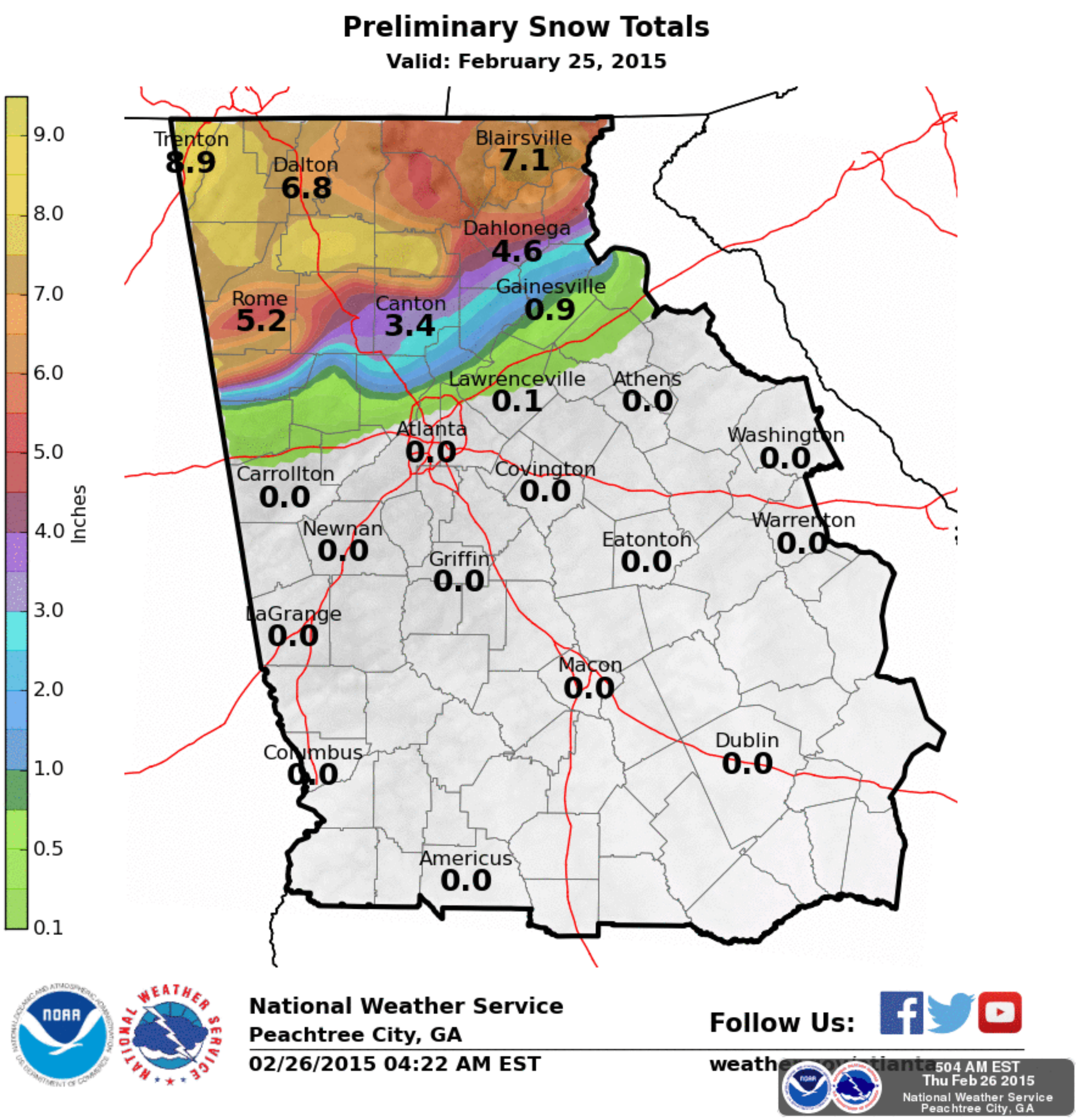




On April 6, 2015, Governor Nathan Deal requested a major disaster declaration due to the severe winter storm during the period of February 15-17, 2015. On April 20, 2015, President Obama declared that a major disaster exists in the State of Georgia. This declaration made Public Assistance requested by the Governor available to state and eligible local governments and certain private nonprofit organizations on a cost-sharing basis for emergency work and the repair or replacement of facilities damaged by the severe winter storm in Banks, Barrow, Dawson, Elbert, Forsyth, Franklin, Habersham, Hall, Jackson, Lumpkin, Madison, Oglethorpe, Pickens, Stephens, and White Counties. This declaration also made Hazard Mitigation Grant Program assistance requested by the Governor available for hazard mitigation measures statewide.

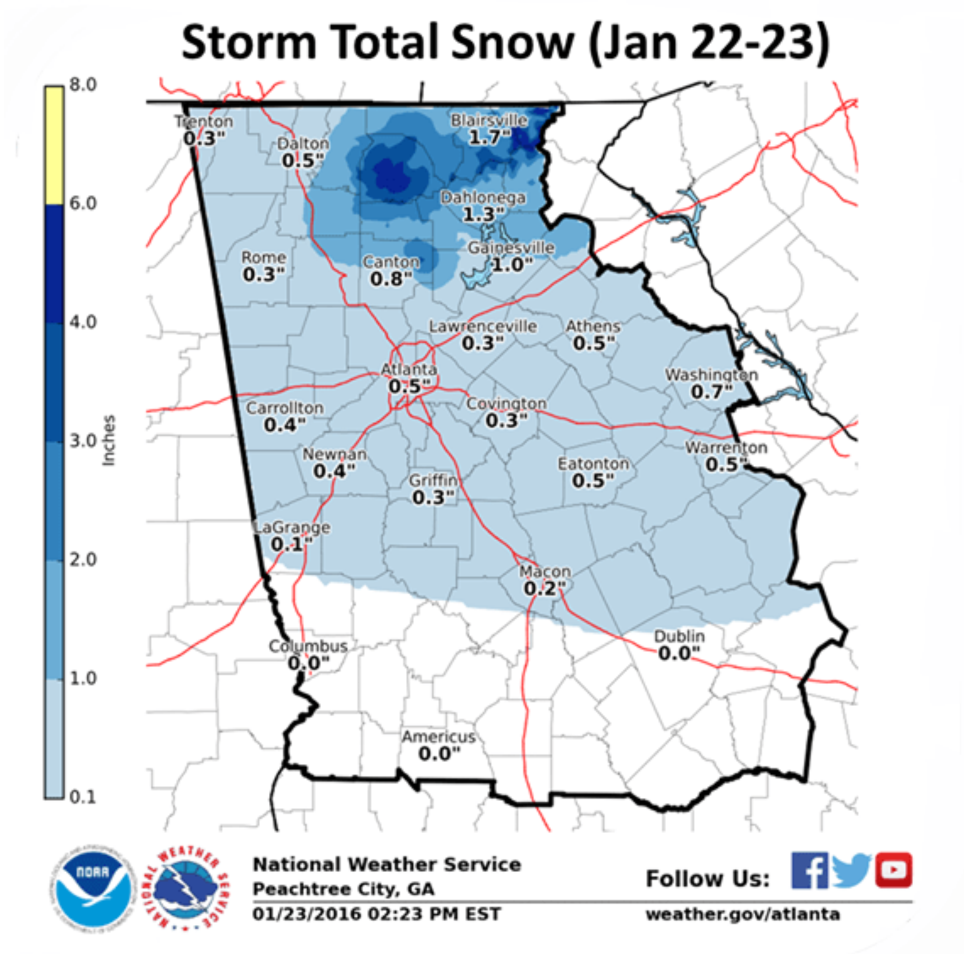
February 25, 2015 Winter Storm

Winter continued to let its presence be known across north Georgia on February 25, 2015. Moisture across the southeast spread over-top of dry, cold surface air already in place across north Georgia, causing temperatures to rapidly cool to near or just below freezing. Rain changed to a heavy, wet snow, generally across the Atlanta metro and areas northward. Towards evening, the surface low advected warmer air from the Gulf as far north as the Atlanta metro, changing snow to a rain/freezing rain mix. Areas north of the metro continued to experience snow, heavy at times, as low-level cold air remained in place. Most areas across far north Georgia received between 7-10 inches of snow, with a tight snow gradient setting up just north of the metro. Travel impacts were significant and widespread, as the heavy, wet snow stuck to roadways and accumulated quickly. This system rapidly exited the area overnight and into the morning hours of February 26, 2015. Forsyth County accumulation varied between approximately 1 and 4 inches.

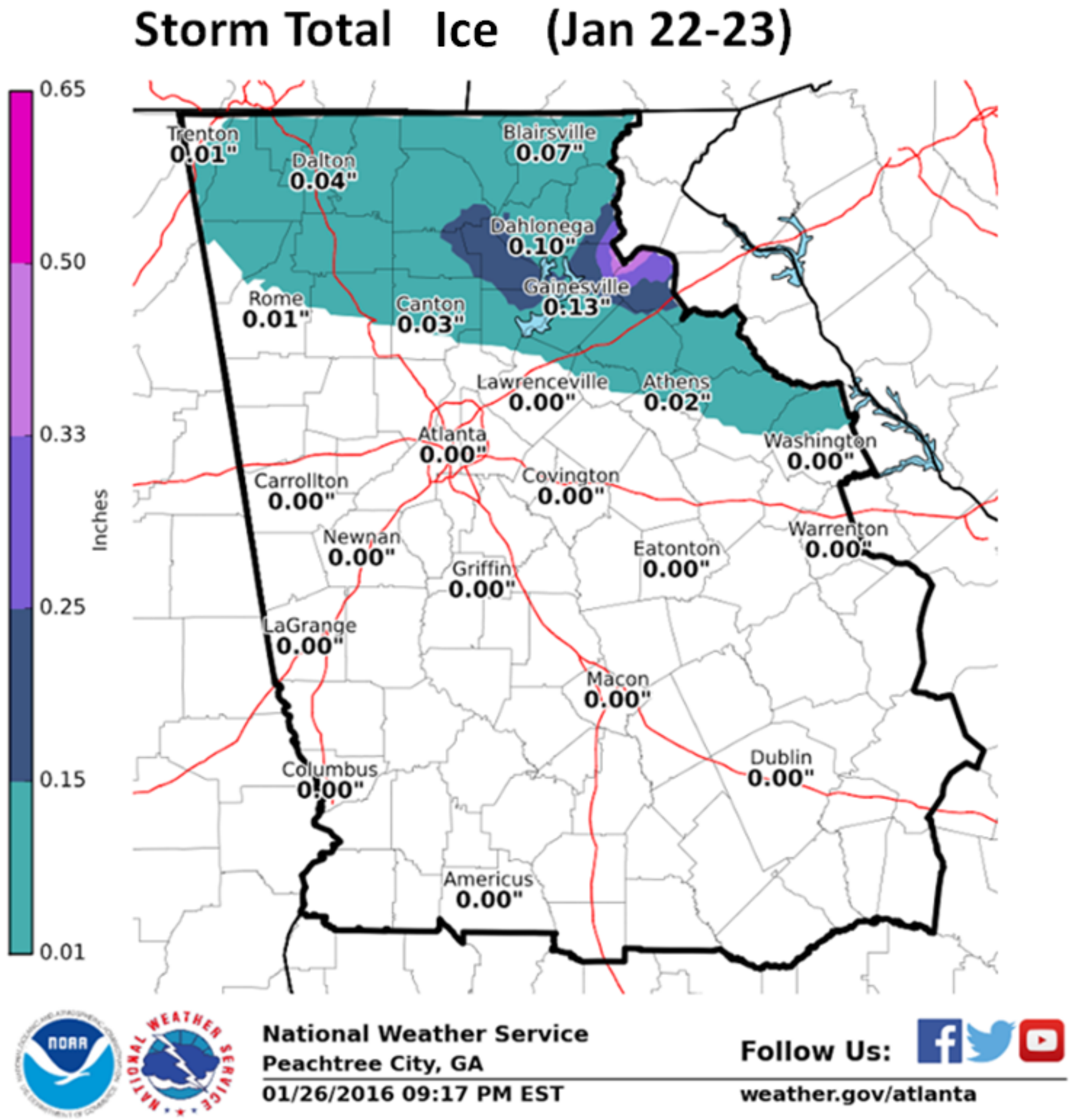


January 22-23, 2016 Winter Storm

A winter weather event impacted most of north Georgia from Friday, January 22nd through the morning of Saturday, January 23rd. This event resulted in light snowfall accumulations as far south as central Georgia, with more significant snow and ice accumulations in the north Georgia mountains. Snow totals ranged as high as 6+" in far north Georgia. This snow and ice was in association with a low pressure system moving into Georgia. Rain changed to frozen precipitation as cold air filtered in, which led to bands of light snow across a large portion of the area. The rain initially changed to freezing rain and snow in northeast Georgia as a wedge of cold air advected into these locations. By midnight Saturday morning, most of the remaining precipitation had transitioned into snow. This is the same system that led to blizzard conditions across the mid-Atlantic and parts of the northeastern United States. Forsyth County received between 1 and 2 inches of snow.

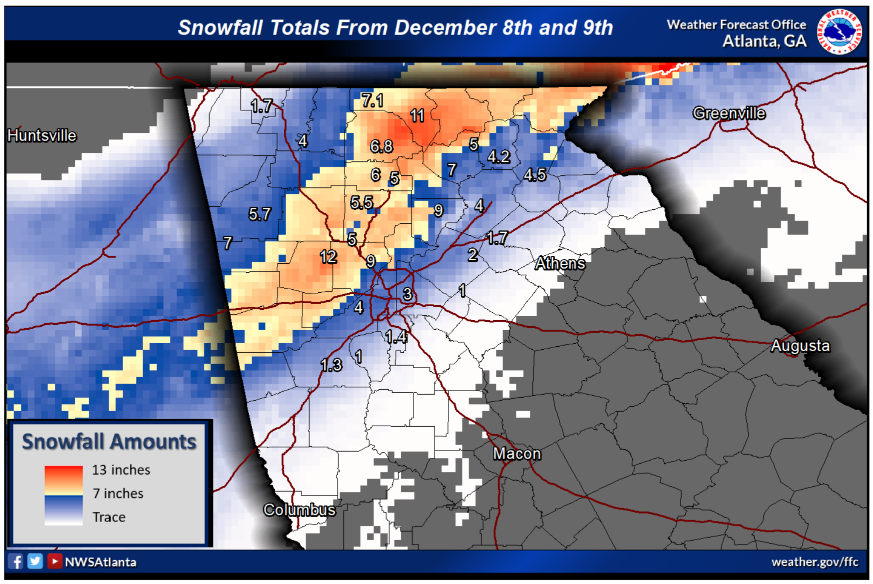


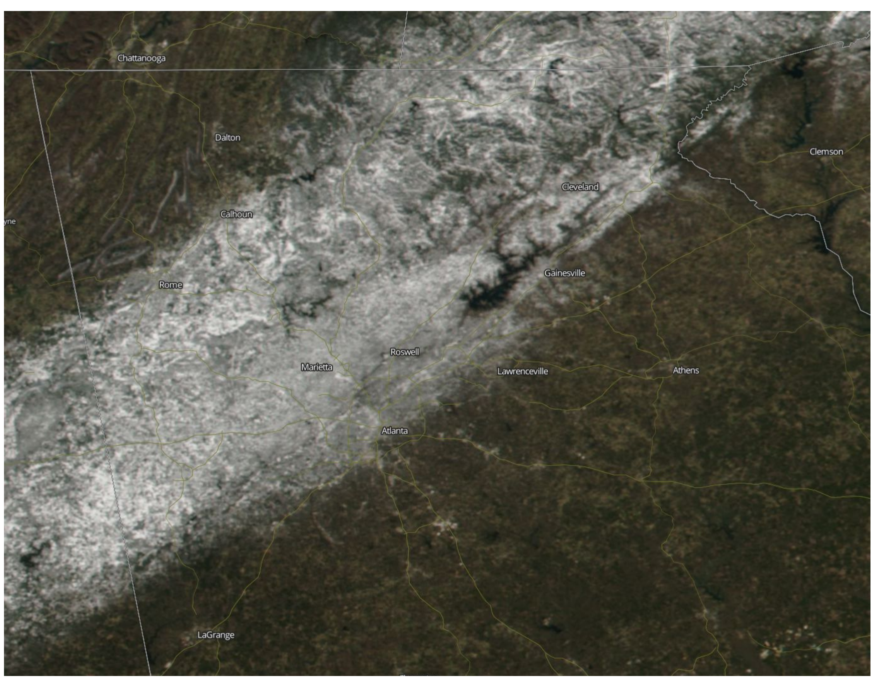
Some accumulations of freezing rain also occurred prior to the onset of most of the snow. Accumulations were light across portions of north Georgia, though a couple of locations did see accumulations over 1/4 inch. Forsyth County saw accumulations of 0.15 inches.



December 8, 2017 Winter Storm

A major early-season heavy snowfall affected north Georgia from Friday, December 8th into the morning of Saturday, December 9th. Many locations recorded up to a foot of snowfall, which is exceptionally rare for Georgia, especially in early December. This heavy snowfall also led to numerous power outages. At the height of the storm over 200,000 customers in north Georgia were in the dark. There was a sharp northwest to southeast gradient of accumulating snow through metro Atlanta. Areas southeast of Atlanta did not receive much accumulating snow, while areas north and west of the city received very significant totals. Forsyth County received up to 9 inches of snow.



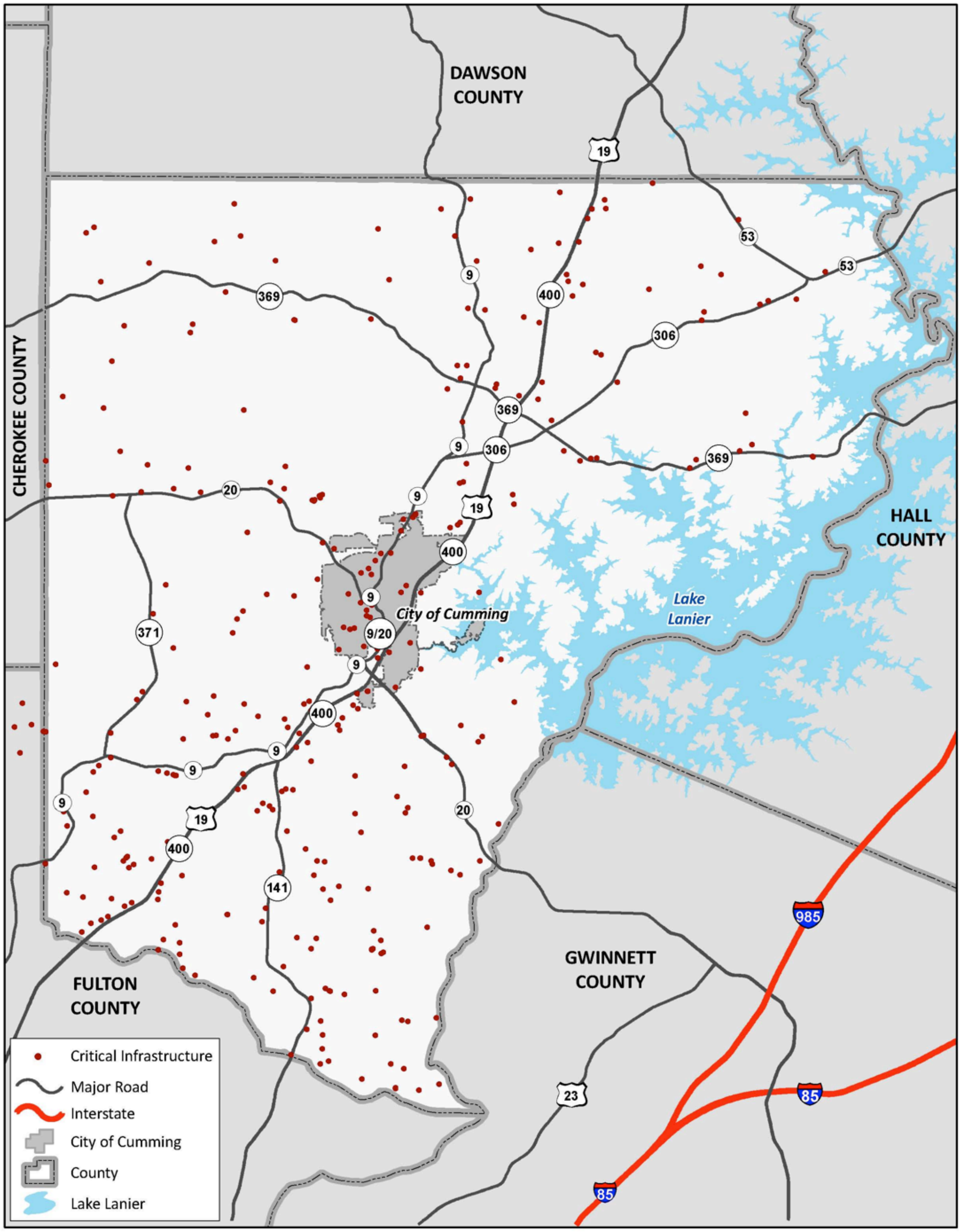


NCDC records show that 44 winter storms occurred within the County over the past fifty years, which equates to an 88% annual frequency based upon reported events. Winter storm events for the twenty-year history equals 36, equating to a much higher 180% annual frequency. It would appear that winter storm activity has increased over time within the County. This may be the case or it may simply be that record keeping and technology have improved significantly over the course of time, reflecting the higher numbers. It may also be a combination of these two factors. The following chart provides annual frequency of reported events over the past five, ten, twenty, and fifty-year periods. The most recent five-year period, covering the span of time since the last update to this Plan, is highlighted in gold.

Forsyth County – Winter Storm Frequency (based on Reported Events)

Time Period	5yrs (2016-2020)	10yrs (2011-2020)	20yrs (2001-2020)	50yrs (1971-2020)
Number of Reported Events	8	17	36	44
Frequency Average per Year	1.60	1.70	1.80	0.88
Frequency Percent per Year	160%	170%	180%	88%

C. Assets Exposed to Hazard - All public and private property including critical facilities are susceptible to winter storms since this hazard is not spatially defined. The GEMA map below identifies critical facilities located within the hazard area, which in the case of winter storms includes all areas within the County and City.



D. Estimate of Potential Losses - For loss estimate information, please refer to the Critical Facilities Database (Appendix A).

E. Multi-Jurisdictional Concerns – Any portion of Forsyth County can be negatively impacted by winter storms. Therefore, any mitigation steps taken related to winter storms will be pursued on a countywide basis and include the City of Cumming.

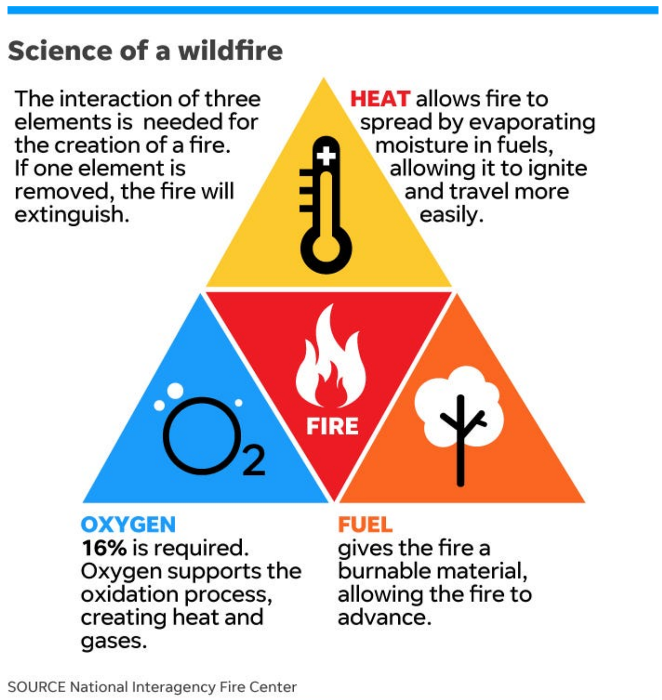
G. Hazard Summary – Winter storms, unlike other natural hazards, typically afford communities some advance warning. The National Weather Service issues winter storm warnings and advisories as these storms approach. Unfortunately, even with advance warning, some of the most destructive winter storms have occurred in the Southern United States, where buildings, infrastructure, crops, and livestock are not well-equipped for severe winter conditions. Motorists, not accustomed to driving in snow and icy conditions, pose an additional danger on roads and highways. The Forsyth County HMPC recognized the potential threats of winter storms and identified specific mitigation actions. These can be found in *Chapter 5*.

2.5 Wildfire

A. Hazard Identification – The Forsyth County HMPC utilized data from Georgia Forestry Commission (GFC) and the Community Wildfire Protection Plan (CWPP) in researching wildfires and their impact on the County.

A wildfire is defined as an uncontrolled fire occurring in any natural vegetation. For a wildfire to occur, there must be available oxygen, a supply of fuel, and enough heat to kindle the fuel. Often, these fires are begun by combustion and heat from surface and ground fires and can quickly develop into a major conflagration. A large wildfire may crown, which means it may spread rapidly through the topmost branches of the trees before involving undergrowth or the forest floor. As a result, violent blowups are common in forest fires, and on rare occasion they may assume the characteristics of a firestorm. A firestorm is a violent convection caused by a continuous area of intense fire and characterized by destructively violent surface indrafts. Sometimes it is accompanied by tornado-like whirls that develop as hot air from the burning fuel rises. Such a fire is beyond human intervention and subsides only upon the consumption of everything combustible in the locality. No records were found of such an event ever occurring within Forsyth County, but this potential danger will be considered when planning mitigation efforts.

The threat of wildfire varies with weather conditions: drought, heat, and wind participate in drying out the timber or other fuel, making it easier to ignite. Once a fire is burning, drought, heat, and wind all increase its intensity. Topography also affects wildfire, which spreads quickly uphill and slowly downhill. Dried grass, leaves, and light branches are considered flash fuels; they ignite readily, and fire spreads quickly in them, often generating enough heat to ignite heavier fuels such as tree trunks, heavy limbs, and the matted duff of the forest floor. Such fuels, ordinarily slow to kindle, are difficult to extinguish. Green fuels (growing vegetation) are not considered flammable, but an intense fire can dry out leaves and needles quickly enough to allow ready ignition. Green fuels sometimes carry a special danger: evergreens, such as pine, cedar, fir, and spruce, contain flammable oils that burst into flames when heated sufficiently by the searing drafts of a wildfire.



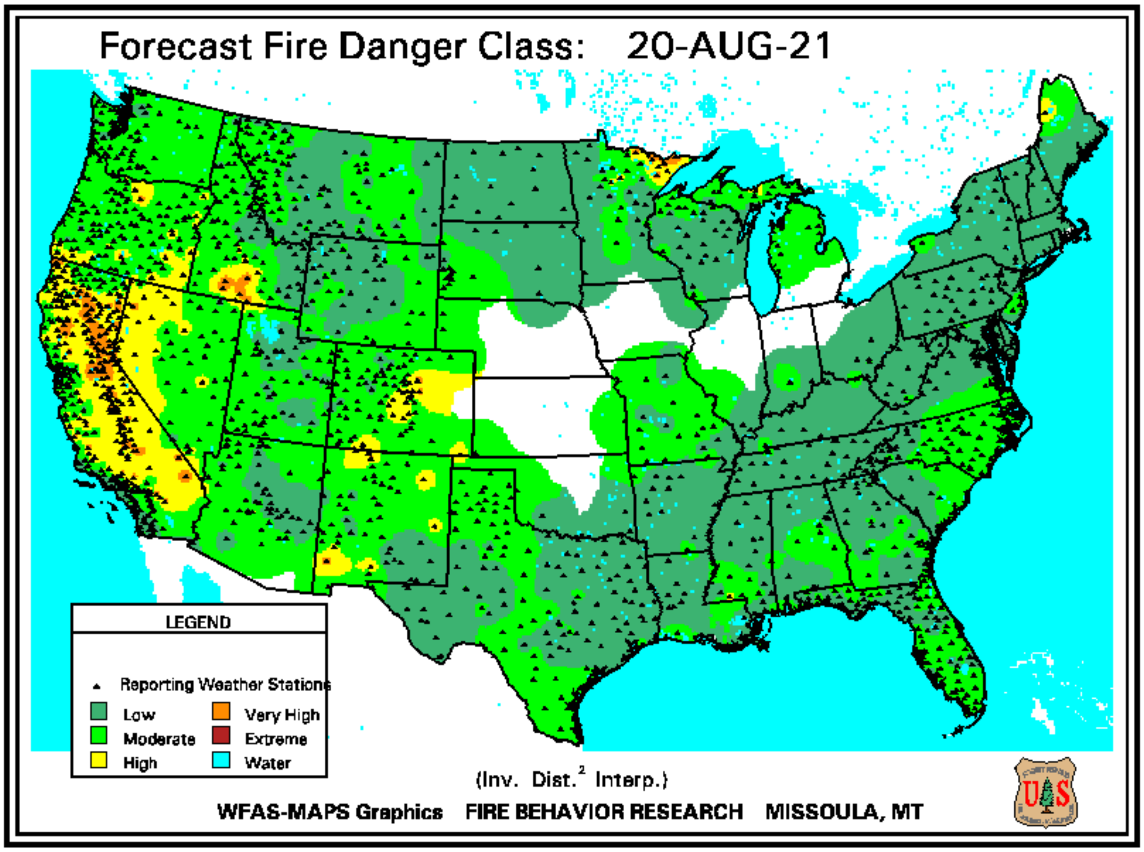
Tools for fighting wildfires range from the standard equipment of fire departments to portable pumps, tank trucks, and earth-moving equipment. Firefighting forces specially trained to deal with wildfire are maintained by local, state and federal entities including the Forsyth County Fire Department, Georgia Forestry, and U.S. Forest Service. These trained firefighters may attack a fire directly by spraying water, beating out flames, and removing vegetation at the edge of the fire to contain it behind a fire line. When the very edge is too hot to approach, a fire line is built at a safe distance, sometimes using strip burning or backfire to eliminate fuel in the path of the uncontrolled fire or to change the fire's direction or slow its progress. Backfiring is used only as a last resort.

The control of wildfires has developed into an independent and complex science costing hundreds of millions of dollars annually in the United States. Because of the extremely rapid spreading and customary inaccessibility of fires once started, the chief aim of this work is prevention. However, despite the use of modern techniques (e.g., radio communications, rapid helicopter transport, and new types of chemical firefighting apparatus) more than 10 million acres of forest are still burned annually. Of these fires, about two thirds are started accidentally by people, almost one quarter are of incendiary origin, and more than 10% are due to lightning.

B. Hazard Profile – Wildfires are a serious threat to Forsyth County.

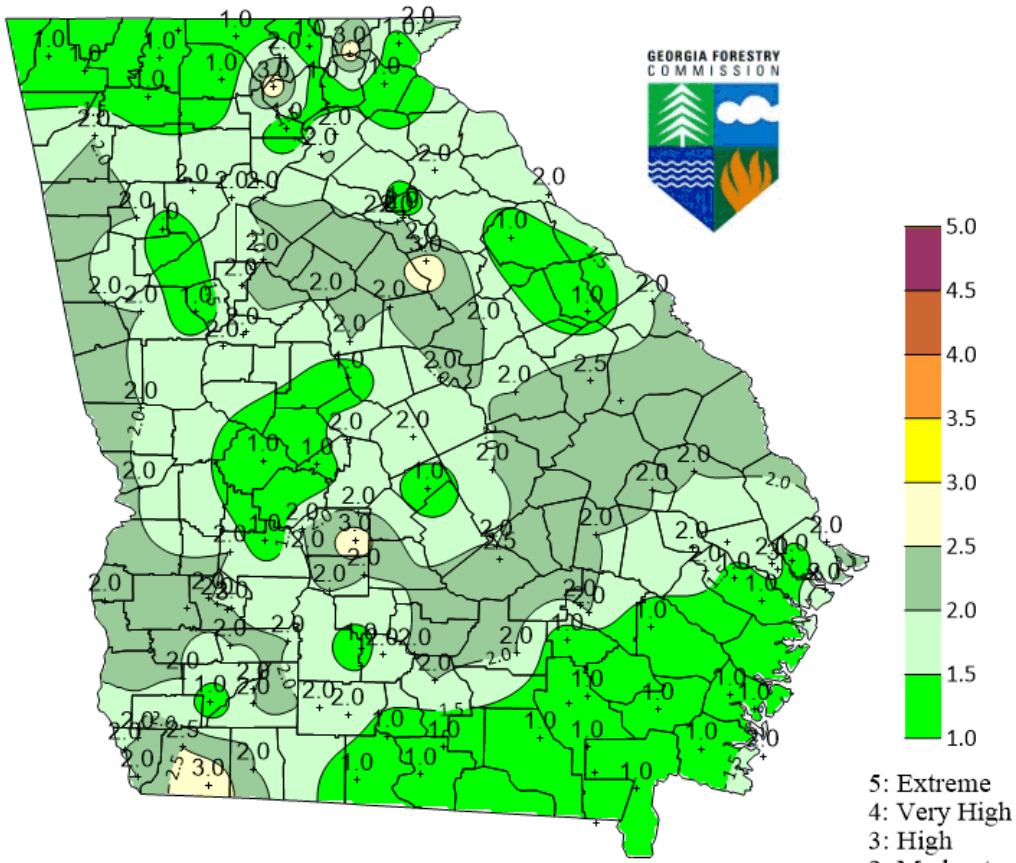
The South is one of the fastest growing regions in the nation, with an estimated population growth of 1.5 million people per year. The South also consistently has the highest number of wildfires per year. Population growth is pushing housing developments further into natural and forested areas where most of these wildfires occur. This situation puts many lives and communities at risk each year. In particular, the expansion of residential development from urban centers out into rural landscapes, increases the potential for wildland fire threat to public safety and the potential for damage to forest resources and dependent industries. This increase in population across the region will impact counties and communities that are located within the Wildland Urban Interface (WUI). The WUI is described as the area where structures and other human improvements meet and intermingle with undeveloped wildland or vegetative fuels. Population growth within the WUI substantially increases the risk from wildfire.

As of August 20, 2021, Forsyth County's threat of wildfire was classified as "low" by the U.S. Forest Service. However, this status can change from week to week. See the following map.



As of August 19, 2021, Forsyth County's "Fire Danger Rating" is classified as "low" to "moderate".

Fire Danger Rating
as of August 19, 2021 230pm



5: Extreme
4: Very High
3: High
2: Moderate
1: Low

Georgia Automated Environmental Mornitoring Network provided 75% of the stations in the map.

The Georgia Forestry Commission meteorologist produces the above map each afternoon at 230pm by utilizing National Fire Danger Rating System output from weather station locations across Georgia. Values are interpolated between the stations to produce the map.
The system is designed to cover large geographical areas. Localized conditions may differ from the above map based on local rainfall, windspeeds, and relative humidity.

For more detailed information select 'weather' on our web site.

If you have questions contact Daniel Chan at 1-800-GATREES.

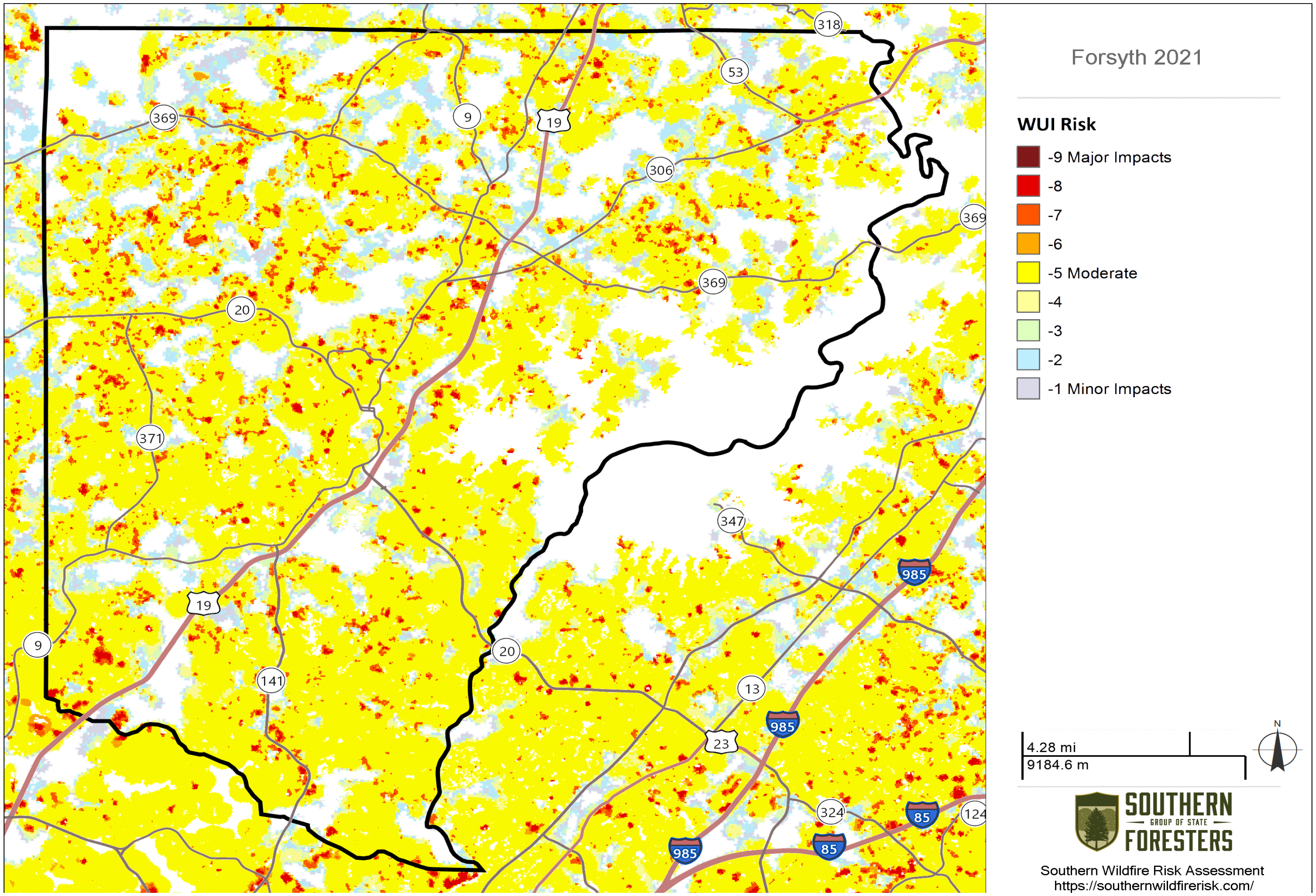
GFC records show that 1,694 wildfires occurred within the County over the past fifty years, which equates to a 3,388% annual frequency based upon reported events. Over the course of the entire 50-year period that frequency has steadily declined. It would appear that wildfire activity has decreased over time within the County. The following chart provides annual frequency of reported events over the past five, ten, twenty, and fifty-year periods. The most recent five-year period, covering the span of time since the last update to this Plan, is highlighted in gold.

Forsyth County – Wildfire (based on Reported Events)				
Time Period	5yrs (2016-2020)	10yrs (2011-2020)	20yrs (2001-2020)	50yrs (1971-2020)
Number of Reported Events	21	54	188	1694
Frequency Average per Year	4.20	5.40	9.40	33.88
Frequency Percent per Year	420%	540%	940%	3388%

C. Assets Exposed to Hazard – In evaluating assets that are susceptible to wildfire, the committee determined that all public and private property is susceptible to wildfire, including all critical facilities. The maps on the following pages display the wildfire risk potential for Forsyth County and each of the municipalities, including locations of critical facilities within the hazard areas.

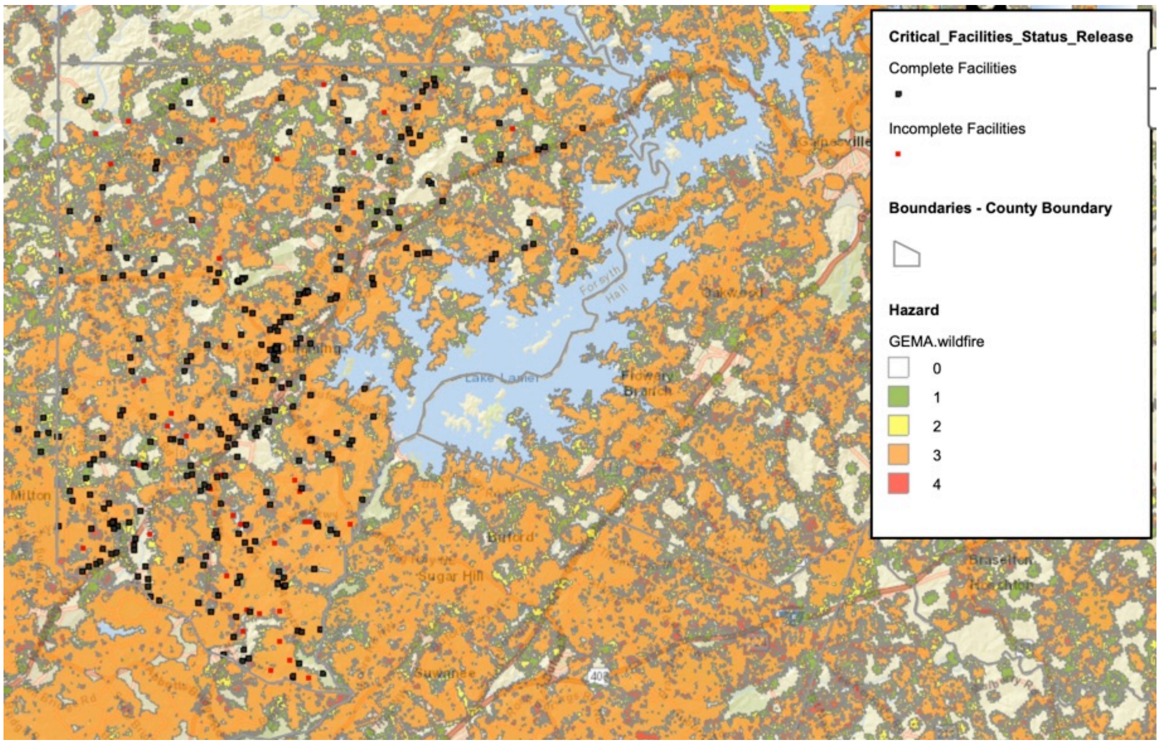
The Wildland Urban Interface (WUI) Risk Index layer is a rating of the potential impact of a wildfire on people and their homes. The key input, WUI, reflects housing density (houses per acre) consistent with Federal Register National standards. The location of people living in the Wildland Urban Interface and rural areas is key information for defining potential wildfire impacts to people and homes. The WUI Risk Rating is derived using a Response Function modeling approach. Response functions are a method of assigning a net change in the value to a resource or asset based on susceptibility to fire at different intensity levels, such as flame length. The range of values is from -1 to -9, with -1 representing the least negative impact and -9 representing the most negative impact. For example, areas with high housing density and high flame lengths are rated -9 while areas with low housing density and low flame lengths are rated -1. To calculate the WUI Risk Rating, the WUI housing density data was combined with Flame Length data and response functions were defined to represent potential impacts. The response functions were defined by a team of experts based on values defined by the SWRA Update Project technical team. By combining flame length with the WUI housing density data, you can determine where the greatest potential impact to homes and people is likely to occur. Fire intensity data is modeled to incorporate penetration into urban fringe areas so that outputs better reflect real world conditions for fire spread and impact in fringe urban interface areas. With this enhancement, houses in urban areas adjacent to wildland fuels are incorporated into the WUI risk modeling. All areas in the South have the WUI Risk Index calculated consistently, which allows for comparison and ordination of areas across the entire region. Data is modeled at a 30-meter cell resolution, which is consistent with other SWRA layers.

Forsyth County Wildland Urban Interface (WUI) Risk Map 2021



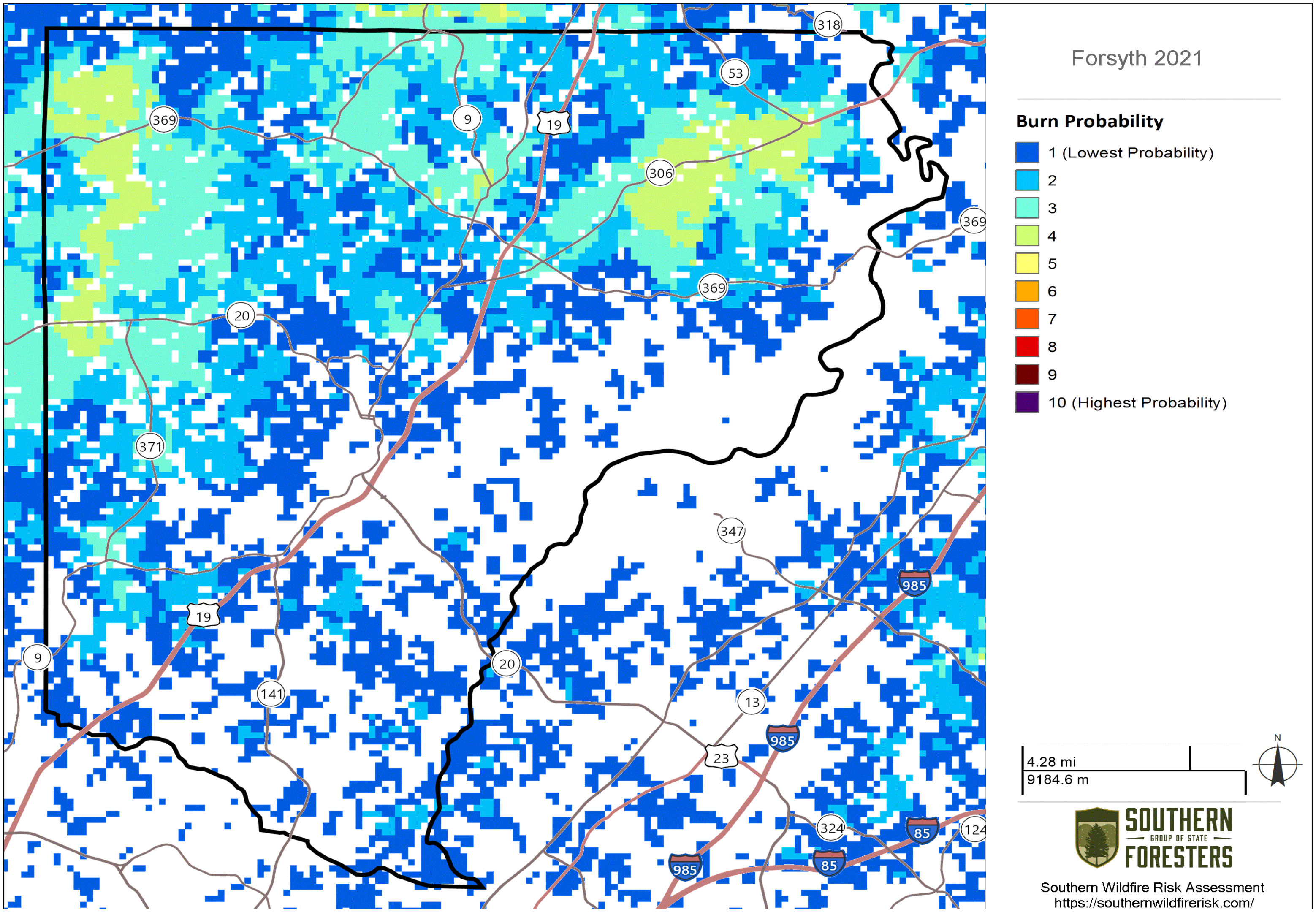
When considering the WUI Risk map above, many portions of the County and City have been classified under WUI Risk Rating classes 1 through 3, which represent lower risks and WUI Risk Rating classes 4 through 6, which represent more moderate risks. However, there are many smaller pockets scattered throughout the County classified under WUI Risk Rating classes 7 through 9, which represent more major risks to those areas. These higher risk pockets are pretty evenly spread throughout the County.

The following is GEMA's version of the same WUI Risk Map above.



Another useful tool in determining wildfire threat is the Burn Probability (BP) layer. The BP layer depicts the probability of an area burning given current landscape conditions, percentile weather, historical ignition patterns and historical fire prevention and suppression efforts. Described in more detail, it is the tendency of any given pixel to burn, given the static landscape conditions depicted by the LANDFIRE Refresh 2008 dataset (as resampled by FPA), contemporary weather and ignition patterns, as well as contemporary fire management policies (entailing considerable fire prevention and suppression efforts). The BP data does not, and is not intended to, depict fire-return intervals of any vintage, nor do they indicate likely fire footprints or routes of travel. Nothing about the expected shape or size of any actual fire incident can be interpreted from the burn probabilities. Instead, the BP data, in conjunction with the Fire Program Analysts FIL layers, are intended to support an actuarial approach to quantitative wildfire risk analysis (e.g., see Thompson et al. 2011). Values in the Burn Probability (BP) data layer indicate, for each pixel, the number of times that cell was burned by an FSim-modeled fire, divided by the total number of annual weather scenarios simulated. Burn probability raster data was generated using the large fire simulator - FSim - developed for use in the Fire Program Analysis (FPA) project. FSim uses historical weather data and current landcover data for discrete geographical areas (Fire Planning Units - FPUs) and simulates fires in these FPUs. Using these simulated fires, an overall burn probability and marginal burn probabilities at four fire intensities (flame lengths) are returned by FSim for each 270m pixel in the FPU. The fire growth simulations, when run repeatedly with different ignition locations and weather streams, generate burn probabilities and fire behavior distributions at each landscape location (i.e., cell or pixel). Results are objectively evaluated through comparison with historical fire patterns and statistics, including the mean annual burn probability and fire size distribution, for each FPU. This evaluation is part of the FSim calibration process for each FPU, whereby simulation inputs are adjusted until the slopes of the historical and modeled fire size distributions are similar and the modeled average burn probability falls within an acceptable range of the historical reference value (i.e., the 95% confidence interval for the mean).

Forsyth County Burn Probability Map 2021



According to the Burn Probability map above, it is clear that the entire County and the City each have a relatively low to moderate burn probability. No areas within the County borders are rated higher than a 4 (on a scale of 1 to 10) on the Burn Probability Scale.

Characteristic Fire Intensity Scale (FIS) is yet another way to gauge wildfire risk. FIS specifically identifies areas where significant fuel hazards and associated dangerous fire behavior potential exist based on a weighted average of four percentile weather categories. Similar to the Richter scale for earthquakes, FIS provides a standard scale to measure potential wildfire intensity. FIS consist of 5 classes where the order of magnitude between classes is ten-fold. The minimum class, Class 1, represents very low wildfire intensities and the maximum class, Class 5, represents very high wildfire intensities. Refer to descriptions below.

Class 1, Very Low
Very small, discontinuous flames, usually less than 1 foot in length; very low rate of spread; no spotting. Fires are typically easy to suppress by firefighters with basic training and non-specialized equipment.

Class 2, Low
Small flames, usually less than two feet long; small amount of very short range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.

Class 3, Moderate
Flames up to 8 feet in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.

Class 4, High
Large Flames, up to 30 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.

Class 5, Very High
Very large flames up to 150 feet in length; profuse short-range spotting, frequent long-range spotting; strong fire-induced winds. Indirect attack marginally effective at the head of the fire. Great potential for harm or damage to life and property.

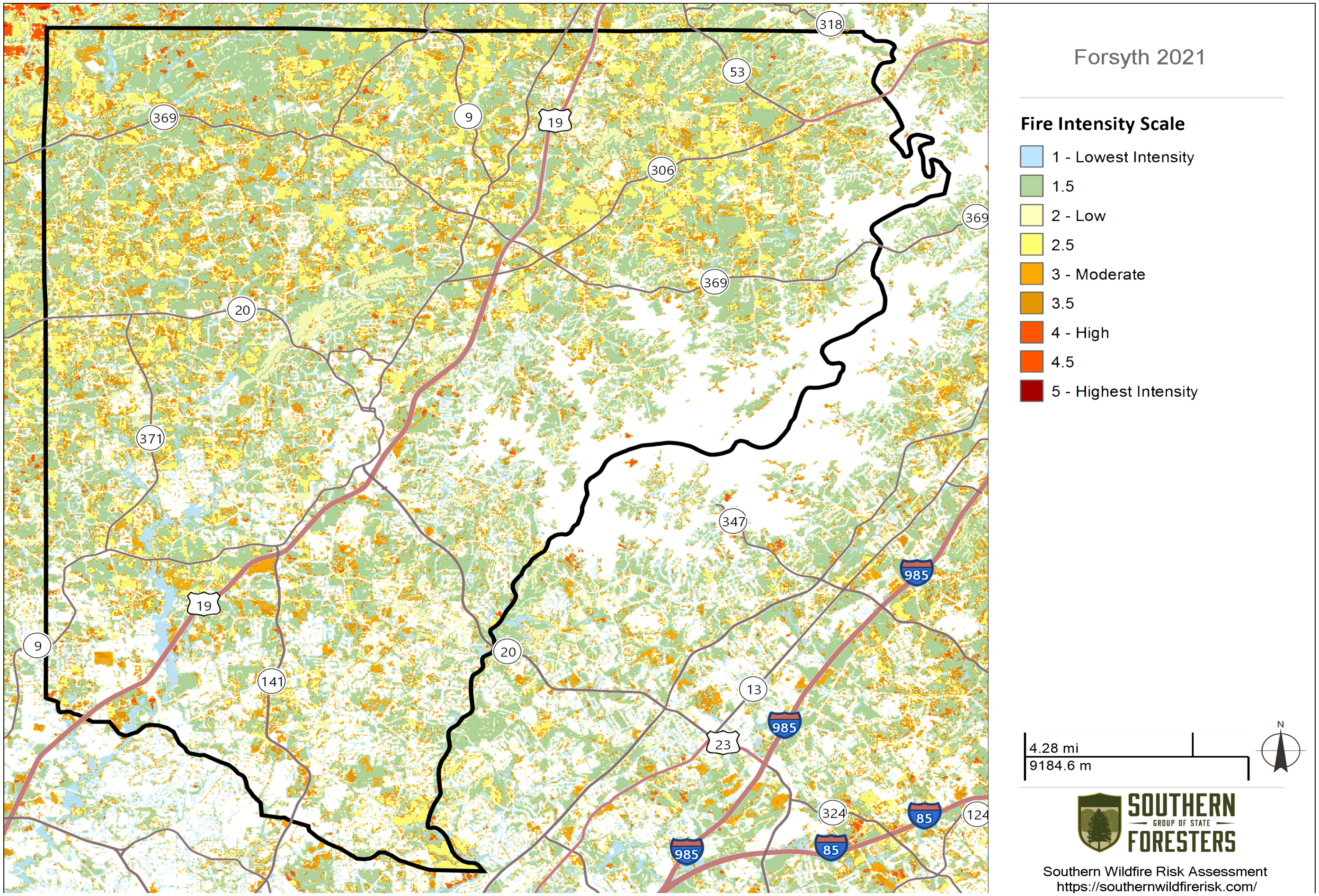
This dataset was derived from updated fuels and canopy data as part of the 2010 SWRA Update Project recently completed in May 2014. Since all areas in the South have fire intensity scale calculated consistently, it allows for comparison and ordination of areas across the entire region.

Fire intensity scale is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography.

Weather is by far the most dynamic variable as it changes frequently. To account for this variability, four percentile weather categories were created from historical weather observations to represent low, moderate, high, and extreme weather days for each weather influence zone in the South. A weather influence zone is an area where, for analysis purposes, the weather on any given day is considered uniform.

The Fire Intensity Scale Map is derived at a 30-meter resolution. This scale of data was chosen to be consistent with the accuracy of the primary surface fuels dataset used in the assessment. While not appropriate for site specific analysis, it is appropriate for regional, county or local planning efforts. See the map on the following page.

Forsyth County Fire Intensity Scale Map 2021



A review of the Fire Intensity Scale map above shows that, generally speaking, the highest fire intensities would tend to occur in northern and western portions of the County. Although there are plenty of smaller pockets scattered throughout the County that would also be prone to higher fire intensities. No portion of the County or City can truly be overlooked when considering fire intensities.

D. Estimate of Potential Losses – In most of the documented cases of wildfire within Forsyth County, relatively little information on damages, in terms of dollars, was available. The potential commercial value of the land lost to wildfire cannot be accurately calculated, other than replacement costs of structures and infrastructure. With regard to the land itself, aside from the loss of timber and recreation, the damage is inestimable in terms of land rendered useless by ensuing soil erosion, elimination of wildlife cover and forage, and the loss of water reserves collected by a healthy forest. For available loss estimate information, please refer to the Critical Facilities Database (Appendix A).

E. Multi-Jurisdictional Concerns – As shown in the current WUI Risk map, not only does the County have a serious risk of wildfire, but the City as well. Any steps taken to mitigate the effects of wildfire should be undertaken on a countywide basis and include the City of Cumming. For Forsyth County, it is estimated that **99.2 % percent of the total project area population live within the WUI**.

F. Hazard Summary – Wildfires pose a serious threat to Forsyth County in terms of property damage, as well as injuries and loss of life. Wildfires are one of the most frequently occurring natural hazards within the County each year. Based on the frequency of this hazard, as well as its ability to inflict devastation most anywhere in the County, the mitigation measures identified in this plan will be thoroughly pursued. Specific mitigation actions related to wildfire are identified in *Chapter 5*.

2.6 Drought

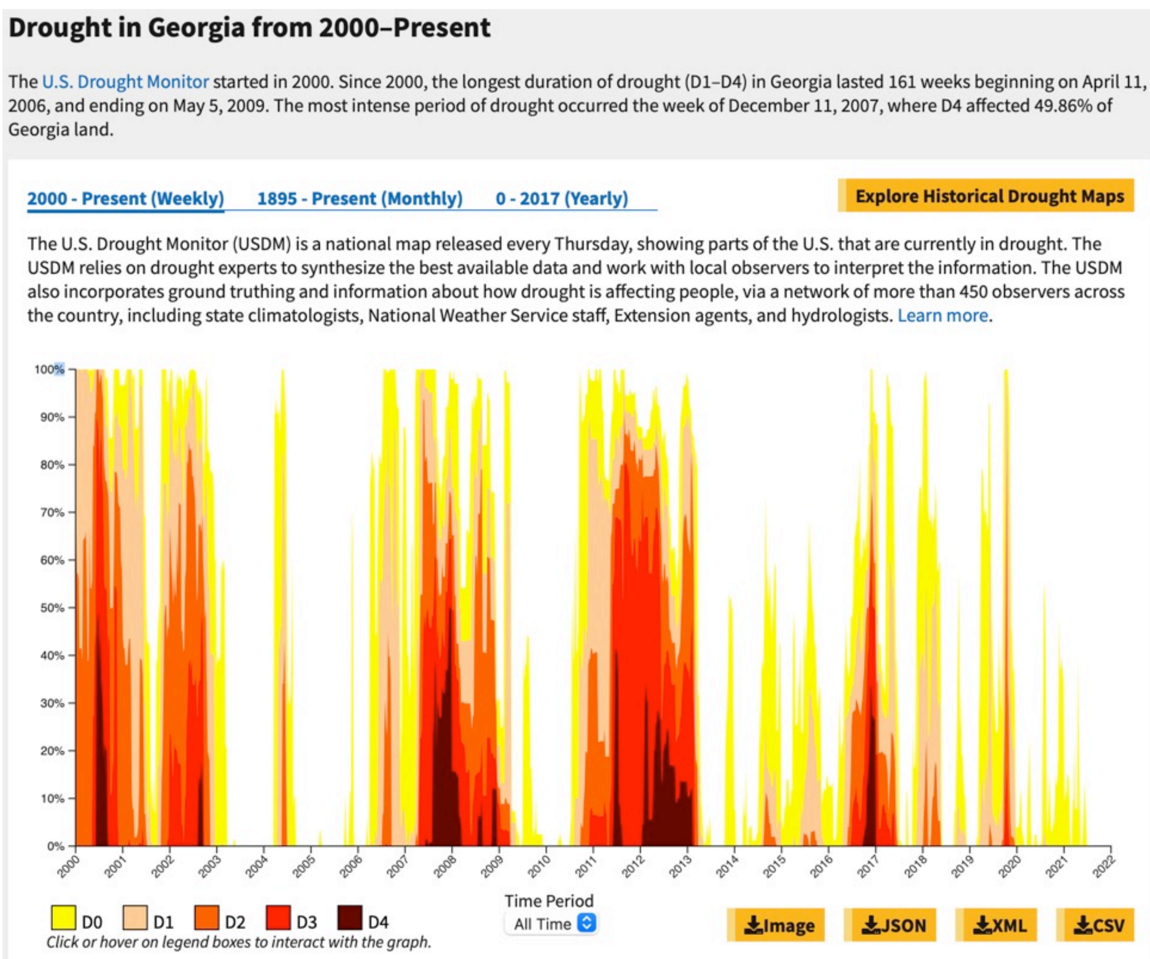
A. Hazard Identification –The term "drought" has various meanings, depending upon context. To a farmer, a drought is a period of moisture deficiency that affects the crops under cultivation (even two weeks without rainfall can stress many crops during certain periods of the growing cycle). To a water manager, a drought is a deficiency in water supply that affects water availability and water quality. To a meteorologist, a drought is a prolonged period when precipitation is less than normal. To a hydrologist, a drought is an extended period of decreased precipitation and streamflow.

Drought is a normal, recurrent feature of climate. It occurs almost everywhere, although its features vary from region to region. Droughts in Georgia historically have severely affected municipal and industrial water supplies, agriculture (including both livestock and crops), stream water quality, recreation at major reservoirs, hydropower generation, navigation, and forest resources. Drought is also a key factor in wildfire development by making natural fuels (grass, brush, trees, dead vegetation) more fire prone.

In Georgia, droughts have been documented at U.S. Geological Survey (USGS) streamflow gaging stations since the 1890's. From 1910 to 1940, about 20 streamflow gaging stations were in operation. Since the early 1950's through the late 1980's, about 100 streamflow gaging stations were in operation. Currently, the USGS streamflow gaging network consists of more than 135 continuous-recording gages. Groundwater levels are currently monitored at 165 wells equipped with continuous recorders.

B. Hazard Profile – The Forsyth County HMPC reviewed historical data from the National Oceanic and Atmospheric Administration (NOAA), the National Climatic Data Center (NCDC), the U.S. Geological Survey (USGS), the Georgia Department of Natural Resources (GA DNR) and the Georgia Forestry Commission (GFC) in researching drought events of the County and the State. Most historical information related to drought within this Plan has been derived from USGS streamflow data and NOAA precipitation data. Due to the nature of drought to affect large areas of the State simultaneously and the availability of only very limited County-specific drought information, the threat of drought is looked at within this Plan from a statewide perspective. Similarly, due to limited month-by-month information on drought, this hazard will be quantified on an annual basis (either there was a drought or there was not for any given year within the State). These guidelines are also used in Appendix B and Appendix C with regard to historical hazard information.

In the State of Georgia significant drought events, as identified by USGS, NOAA and other sources, have occurred in 24 of the last 50 years. Forsyth County was affected to varying degrees in each of those years.



Some of the most extreme droughts to affect the State include the following:

1903-1905: According to the USGS, the 1903 to 1905 drought is "the earliest recorded severe drought in Georgia." In 1904, the U.S. Weather Bureau (today's National Weather Service) reported, "Levels in streams and wells were the lowest in several years. Many localities had to conserve water for stock and machinery and many factories were forced to close or operate at half capacity." When the 1903 drought struck, farm jobs dried up as quickly as the fields. The cities attracted many of these workers who migrated to Atlanta.

1924-1927: The drought that struck from 1924 to 1927 affected a wider area than simply north Georgia, affecting the Coosa River and Altamaha Basin as well at the Chattahoochee River. The U.S. Weather Bureau reported the lowest stream levels ever recorded in north Georgia in July-September of 1925, stating that the drought not only affected agricultural operations, but industrial operations as well. The scarcity of water had a profound influence on industrial and agricultural conditions in Georgia. This may have been the first time Georgia media used the term "Drought of the Century". Combined with the ongoing devastation from the boll weevil and technological advances in agriculture that increased efficiency and thereby reduced the number of farm jobs, migration from rural Georgia to urban Georgia increased significantly. The impact of this drought, plus other natural events, helped send the Georgia economy into a depression well before the rest of the United States.

1930-1935: Although the drought of 1930-1935 had little long-term impact on north Georgia, it contributed to the ongoing economic problems throughout the state and the United States as a whole. The USGS reports that the severity of this drought "exceeded a 25-year recurrence interval" in central and southwestern Georgia and affected much of the Country. In extreme northern and southeastern Georgia, the recurrence interval was 10–25 years. This period was also referred to as the "Drought of the Century."

1938-1944: Many of the same areas that suffered during the 1930 to 1935 drought endured severe drought again from 1938 to 1944. The drought of 1938-1944 struck the upper Coosa River basin and the Chattahoochee River basin. According to USGS the recurrence interval exceeded 50 years in those areas. In extreme northern and southwestern Georgia, the drought had recurrence intervals of 10–25 years. It was this drought that convinced politicians to move towards massive hydroelectric projects that would supply power and keep water available to constituents throughout long dry spells. One of the key supporters of hydroelectric power in the United States was Senator Richard B. Russell, member of the Senate Appropriations Committee. The first such dam in the State, Allatoona, was begun in 1941 and completed after World War II.

1950-1957: A large statewide drought lasted from 1950 to 1957. Most streamflows had recurrence intervals exceeding 25 years according to USGS. The catastrophic drought devastated crops by 1954. This event also earned the title as "Drought of the Century." This drought was most severe in southern Georgia, with most streamflows having recurrence intervals exceeding 25 years. In northeastern Georgia, the drought severity also exceeded the 25-year recurrence interval. The low rainfall affected the length of time it took to fill Lake Lanier for the first time since its creation in 1950 and completion in 1956. In northwestern Georgia, the recurrence interval of the drought was between 10 and 25 years.

1976-1978: According to USGS, beginning in 1976, the weather over southwest Georgia turned towards a persistent pattern of late-summer drought including parts of the Chattahoochee Valley.

1980-1982: The 1980 to 1982 drought resulted in the lowest streamflows since 1954 in most areas, and the lowest streamflows since 1925 in others. Recurrence intervals of 10–25 years were common in most of Georgia. Pool levels at four major reservoirs receded to the lowest levels since first filling. Groundwater levels in many observation wells were lower than previously observed. Nearly continuous declines were recorded in some wells for as long as 20 consecutive months, and water levels remained below previous record lows for as long as nine consecutive months.

1985-1989: Many North Georgia residents remember the drought of 1985 to 1989 that saw Lake Lanier reach its lowest levels since it was filled in 1950. Streamflows touched the lows reached during the 1925 drought. Water-supply shortages occurred in Georgia in 1986. Shortages first occurred in a few Atlanta metropolitan systems, primarily because of large demand and small reservoir storage. As the drought continued, other systems in the southern part of the metropolitan area also had water-supply problems, as did several municipalities in northern and central Georgia. During 1986, the U.S. Army Corps of Engineers significantly decreased the release of water from Lake Lanier, but reservoir levels continued to recede to about 2 feet above the record minimum lake level. Ground-water levels in northern Georgia were significantly less than normal during the 1985 to 1989 drought, and shortages in ground-water supplies from domestic wells occurred in the northern one-third of the State.

1998-2002: From 1998 through 2002, with a brief respite in 2000-2001, North Georgia suffered through a historic drought. The term "historic," in this instance, is used by weathermen to describe a drought of unusually long duration, one of the three measures of a drought. While the regional impact of a long-term drought is massive, in North Georgia's case, the drought's effect was mitigated, simply because of technology, mostly the dams built by the Corps of Engineers and others. Earlier droughts, however, did not have the benefit of these dams and had a "historic" impact on North Georgia. Shortages of surface-water supplies similar to those during 1986 occurred in the 1998 to 2002 drought. Water shortages during the summer of 2000 prompted the Georgia Department of Natural Resources to institute statewide restrictions on outdoor water use.

2006-2009: Beginning in late 2006 another drought struck north Georgia, on the heels of the earlier 5-year drought. River levels plummeted, causing lakes to fill up more slowly when water was released. Georgia politicians battled against the Army Corps of Engineers' continuous flow requirement for Lake Lanier due to the looming water shortages. The Georgia Environmental Protection Division (EPD) declared a level four drought response across the northern third of Georgia, including Forsyth County, which prohibits most types of outdoor residential water use effective immediately.

Lake Lanier and Lake Allatoona 2007 (L to R)

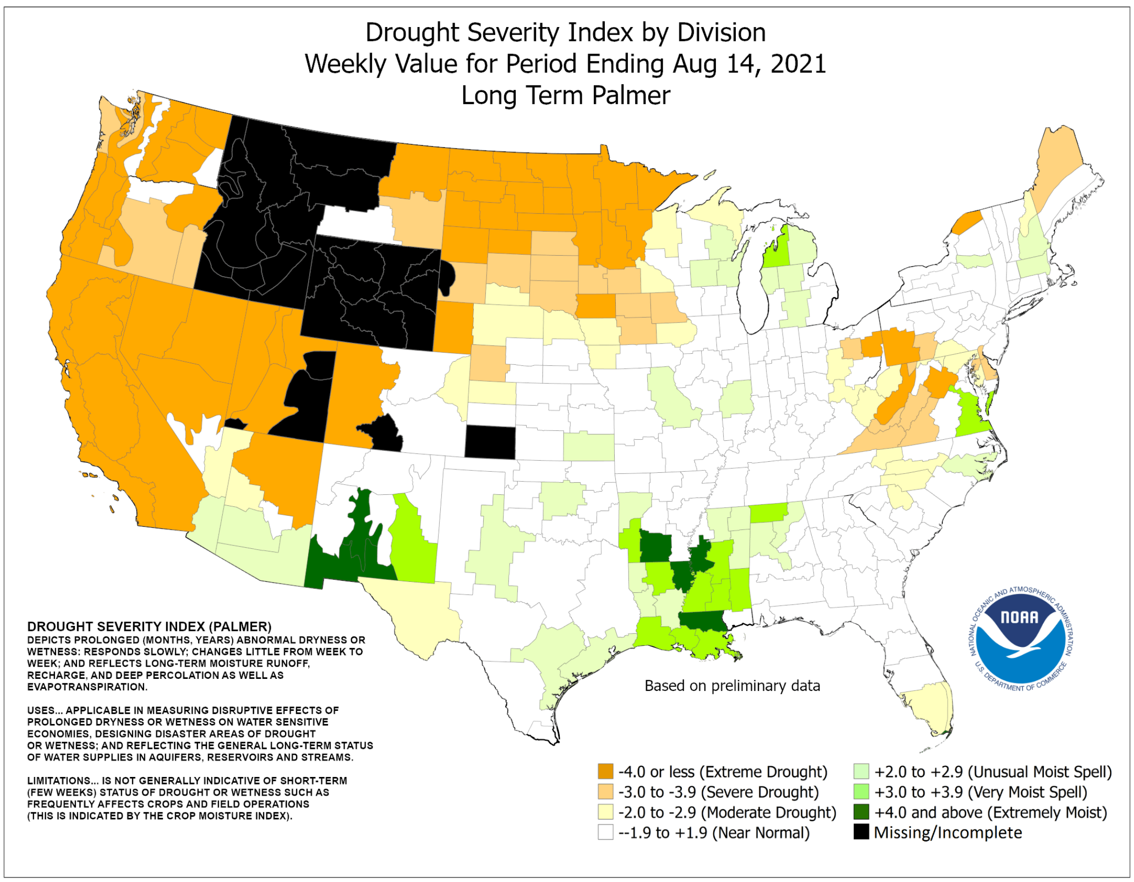
2011-2012: For two years beginning in 2011, the County was impacted once again by a relatively short, but severe drought.

2016-2017: The most recent drought began in 2016 and ended mid 2017.

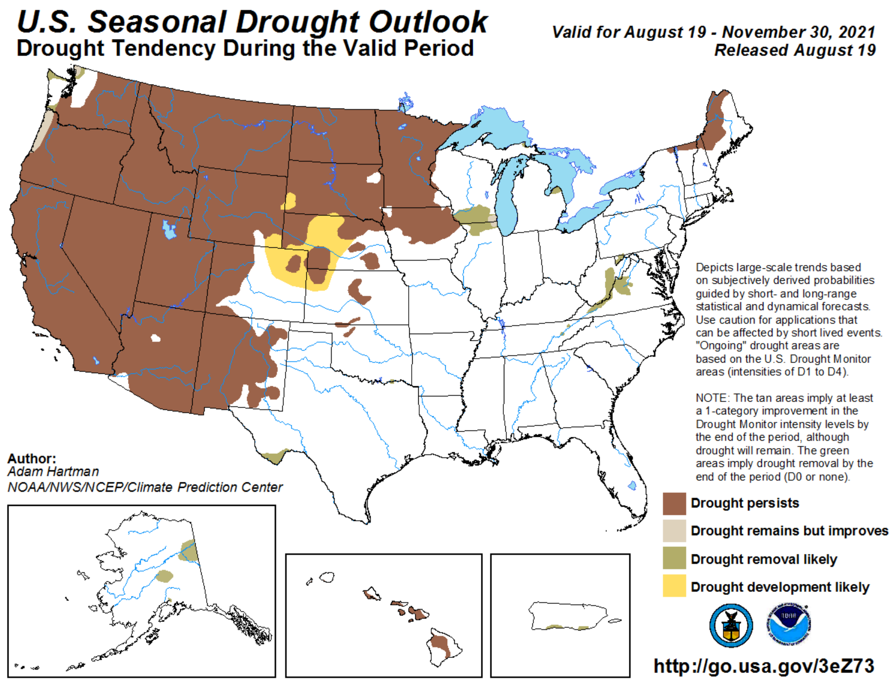
Lake Blue Ridge

Agricultural crop damage during periods of drought is difficult to estimate. Water supplies, industries, power generation, agriculture, forests, wetlands, stream water quality, navigation, and recreation for the State of Georgia have been severely impacted over time. Because of the extremely unpredictable nature of drought (to include duration), reliably calculating a recurrence interval is difficult. The Hazard Frequency Table in Appendix C analyzes historical data from the past fifty years to provide a general idea of the frequency of drought within the State.

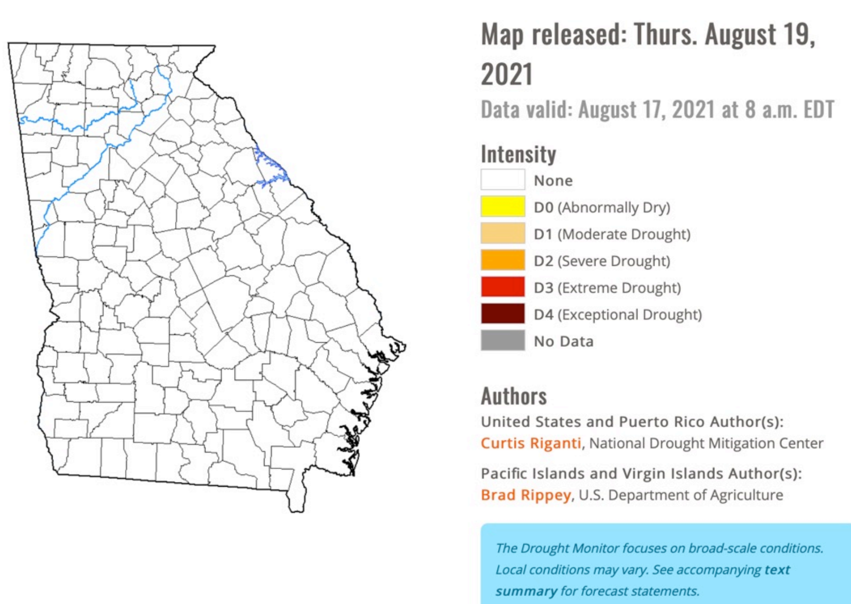
The Palmer Drought Severity Index map shows current drought conditions nationwide and is updated weekly. According to the map, the County's current drought status, as of August 14, 2021, is "near normal".



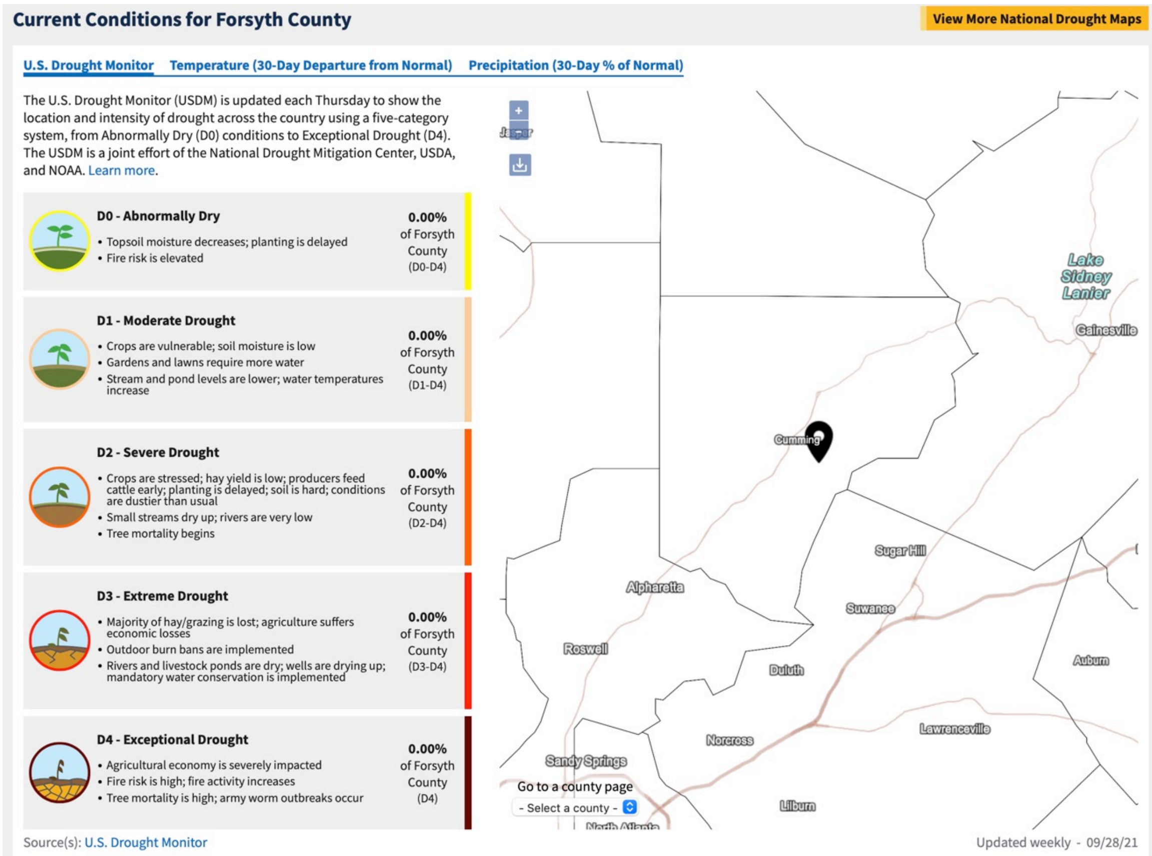
The U.S. Seasonal Drought Outlook map, forecasts likely drought conditions through November 30, 2021, which indicates that drought conditions are unlikely in Forsyth County within this time period.



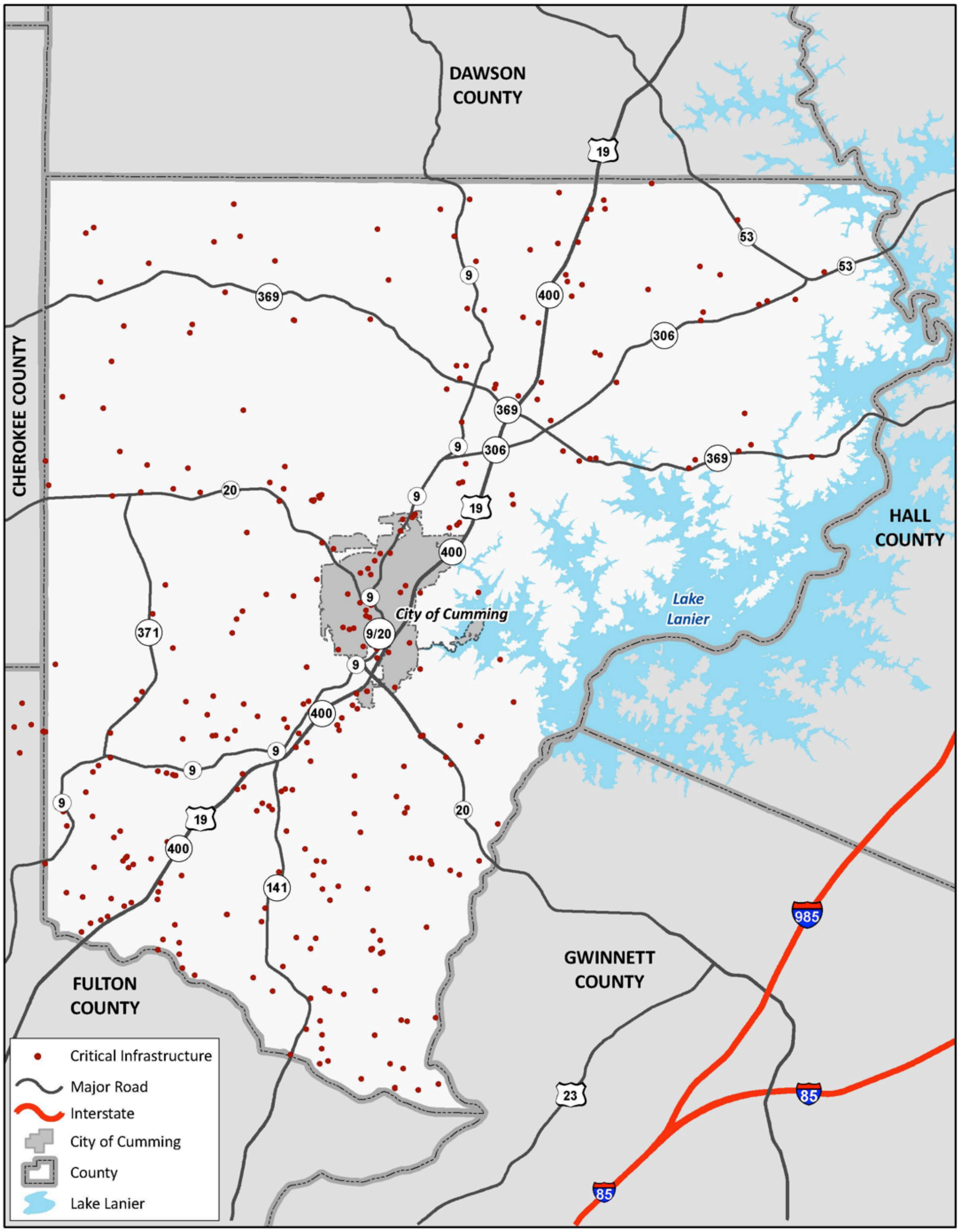
The U.S. Drought Monitor indicates that as of August 19, 2021, Forsyth County is not experiencing drought conditions at this time.



According to the National Integrated Drought Information System, Forsyth County is experiencing no drought conditions as of September 28, 2021. See map below.



C. Assets Exposed to Hazard – All public and private property including critical facilities are susceptible to drought since this hazard is not spatially defined. The danger of drought is compounded due to the fact that drought conditions create a heightened risk for wildfire. The GEMA map below identifies critical facilities located within the hazard area, which in the case of drought includes all areas within the County and City.

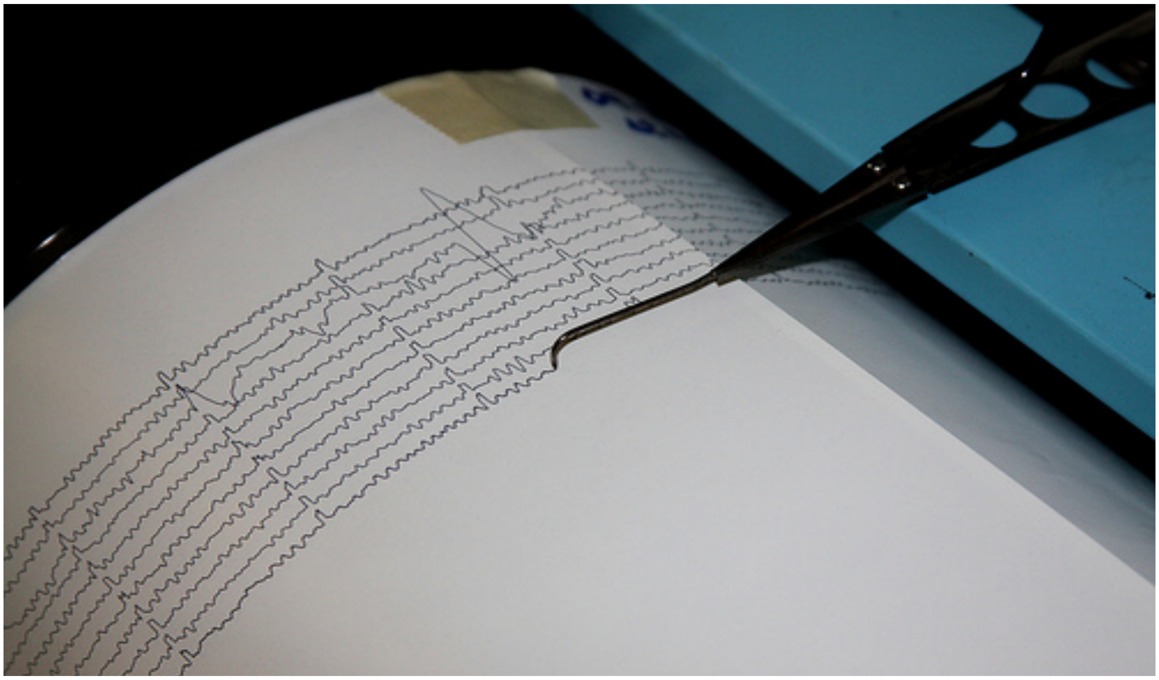


D. Estimate of Potential Losses – No damage to facilities is anticipated as a result of drought conditions, aside from the threat of wildfire. Crop damage cannot be accurately quantified due to several unknown variables: duration of the drought, temperatures during the drought, severity of the drought, rainfall requirements for specific crops and livestock, and the different growing seasons. There may also be financial losses related to water system shortages. For loss estimate information, please refer to Appendix A, the Critical Facilities Database, and Appendix D, Worksheet 3a, for each jurisdiction.

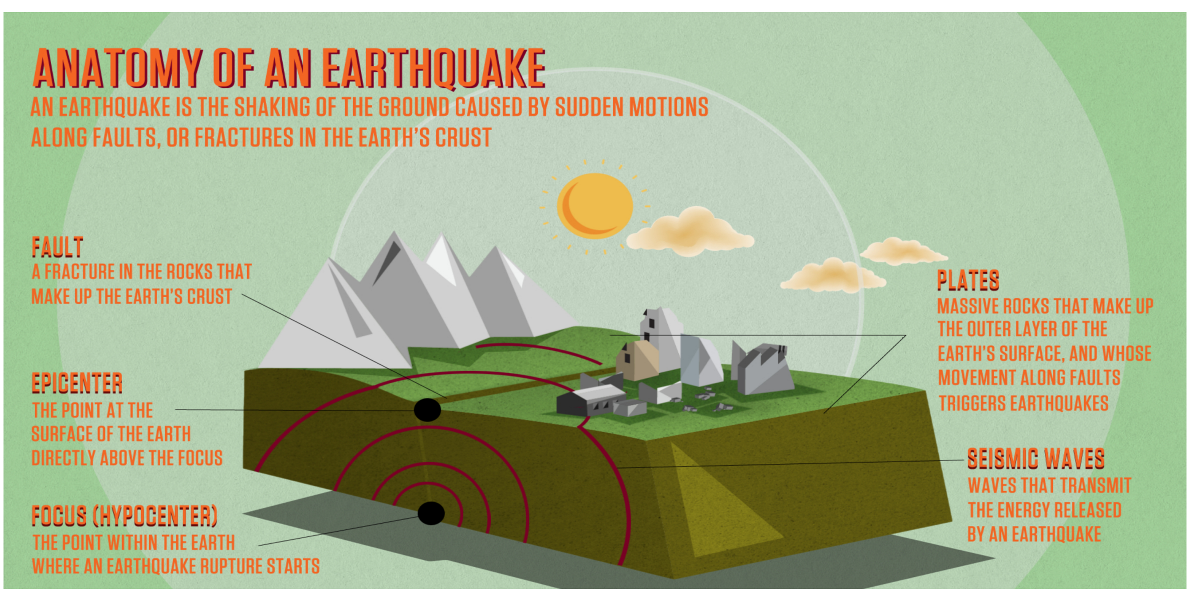
E. Multi-Jurisdictional Concerns – Agricultural losses associated with drought are more likely to occur in the rural, less concentrated areas of the County. Although the City of Cumming may be slightly less likely to experience agricultural-related drought losses than the County, they can be financially impacted by water resource-related drought losses.

F. Hazard Summary – Unlike other hazard events, drought causes damage slowly. A sustained drought can cause severe economic stress to the agricultural interests of the County and even the entire State or Region. The potential negative effects of sustained drought are numerous. In addition to an increased threat of wildfires, drought can affect water supplies, stream-water quality, water recreation facilities, hydropower generation, as well as agricultural and forest resources. The HMPC realized the limitations associated with mitigation actions for drought, but did identify some basic mitigation measures in *Chapter 5*.

2.7 Earthquakes

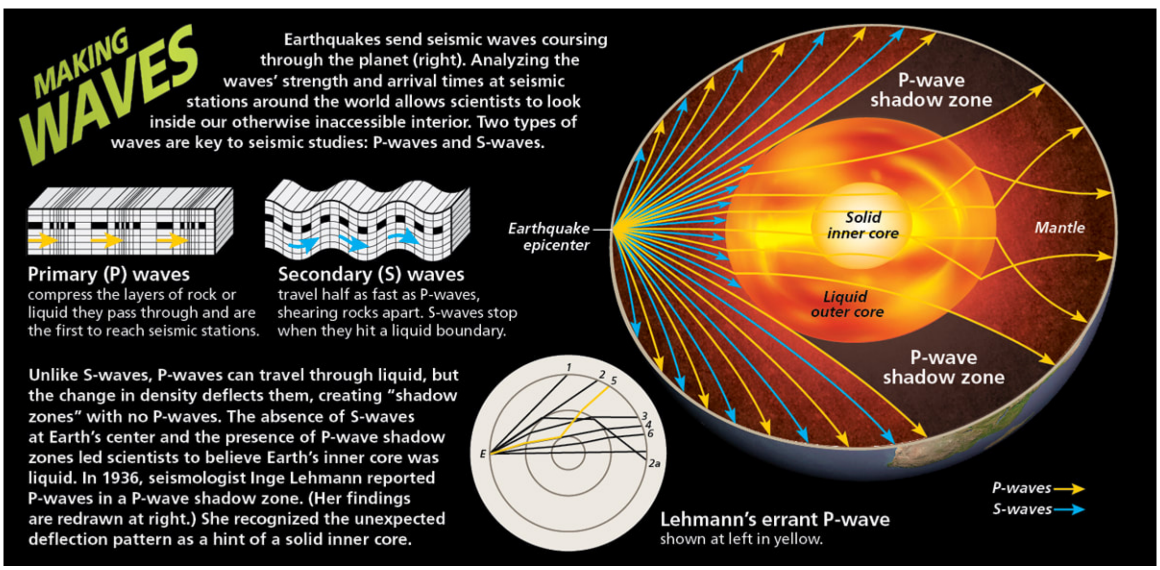


A. Hazard Identification – One of the most frightening and destructive natural hazards is a severe earthquake. An earthquake is a sudden movement of the Earth, caused by the abrupt release of strain that has accumulated over a long time. The forces of plate tectonics shape the Earth as the huge plates that form the Earth's surface slowly move 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. If the earthquake occurs in a populated area, it may cause many deaths, injuries and extensive property damage.



The goal of earthquake prediction is to give warning of potentially damaging earthquakes early enough to allow appropriate response to the disaster, enabling people to minimize loss of life and property. The U.S. Geological Survey conducts and supports research on the likelihood of future earthquakes. This research includes field, laboratory, and theoretical investigations of earthquake mechanisms and fault zones. A primary goal of earthquake research is to increase the reliability of earthquake probability estimates. Ultimately, scientists would like to be able to specify a high probability for a specific earthquake on a particular fault within a particular year. Scientists estimate earthquake probabilities in two ways: by studying the history of large earthquakes in a specific area and the rate at which strain accumulates in the rock.

Scientists study the past frequency of large earthquakes in order to determine the future likelihood of similar large shocks. For example, if a region has experienced four magnitude 7 or larger earthquakes during 200 years of recorded history, and if these shocks occurred randomly in time, then scientists would assign a 50 percent probability (that is, just as likely to happen as not to happen) to the occurrence of another magnitude 7 or larger quake in the region during the next 50 years. But in many places, the assumption of random occurrence with time may not be true, because when strain is released along one part of the fault system, it may actually increase on another part.

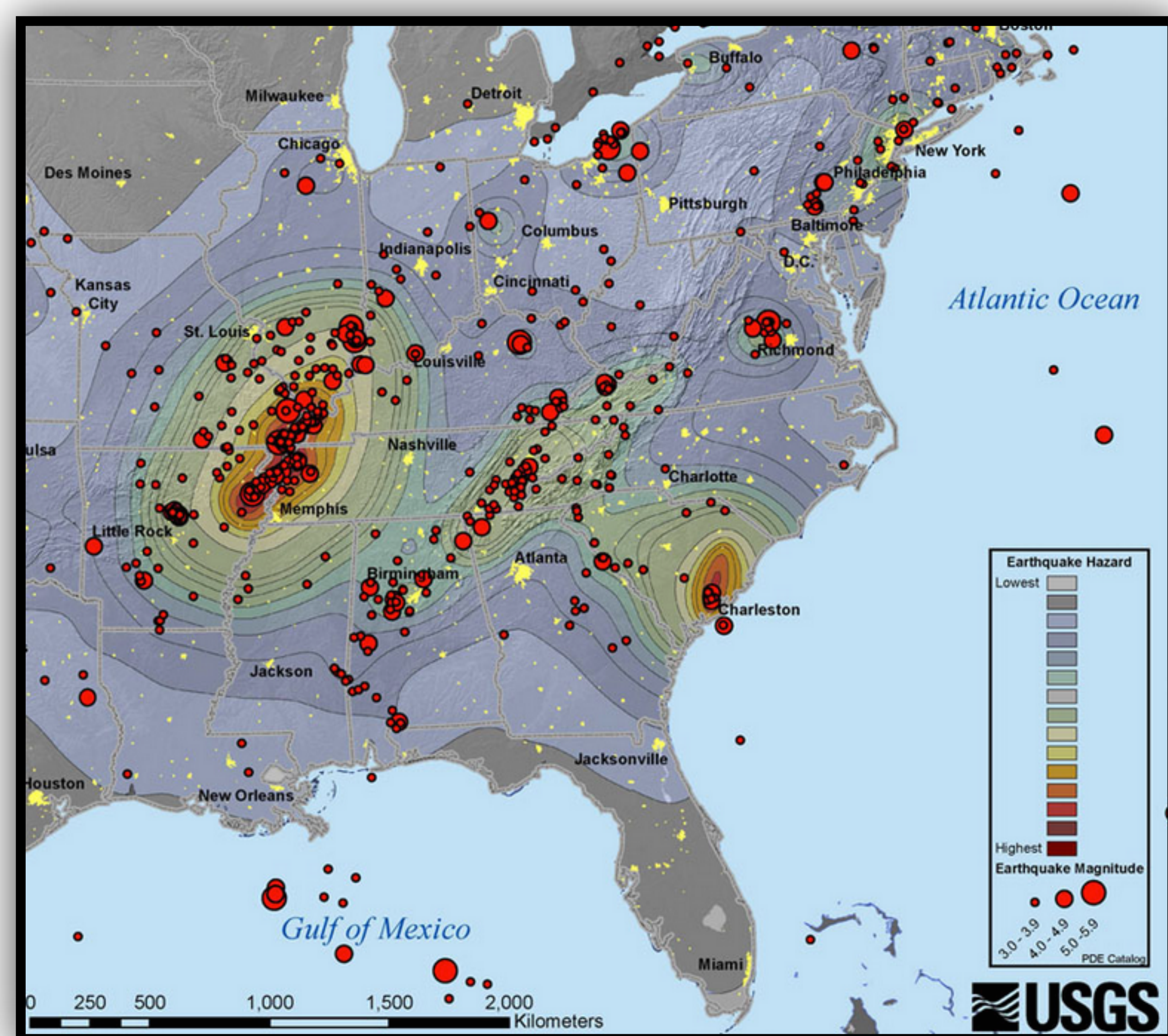


Another way to estimate the likelihood of future earthquakes is to study how fast strain accumulates. When plate movements build the strain in rocks to a critical level, like pulling a rubber band too tight, the rocks will suddenly break and slip to a new position. Scientists measure how much strain accumulates along a fault segment each year, how much time has passed since the last earthquake along the segment, and how much strain was released in the last earthquake. This information is then used to calculate the time required for the accumulating strain to build to the levels that result in an earthquake. This simple model is complicated by the fact that such detailed information about faults is rare. In the United States, only the San Andreas Fault system has adequate records for using this prediction method.

Magnitude and intensity measure different characteristics of earthquakes. Magnitude measures the energy released at the source of the earthquake and is determined from measurements on seismographs. Intensity measures the strength of shaking produced by the earthquake at a certain location and is determined from effects on people, human structures, and the natural environment. The following table compares the Richter Scale and the Modified Mercalli Intensity Scale, and describes intensities that are typically observed at locations near the epicenter of earthquakes of different magnitudes.

Richter Magnitude Scale (M)	Modified Mercalli Intensity Scale (MMI)	Magnitude/Intensity felt near an earthquake epicenter
1.0- 1.9	I	An M=1 is roughly equivalent to a quarry blast and can be generated by non-earthquake related events (such as a rock fall). Earthquakes of this intensity are generally not felt.
2.0-2.9	II	Felt by only a few people at rest, especially on the upper floors of buildings.
3.0-3.9	III	Felt noticeably by people indoors or on upper floors of buildings, but may not be recognized as an earthquake (similar to shaking by a passing truck, typically very short in duration).
4.0-4.9	IV-V	Felt noticeably by people both indoors and outdoors. Will wake some sleeping people. Walls will make cracking noises, and dishes, doors, and windows will rattle or move. Motor vehicles will rock noticeably. MMI=5 will cause unstable objects to fall or overturn; pendulum clocks may stop.
5	VI-VII	An M=5 earthquake is roughly equivalent to the force of a 10 kiloton nuclear blast (like Hiroshima). Earthquakes of this magnitude are felt by practically everyone. Damage is negligible in well-constructed buildings. Plaster may crack and fall; some chimneys may be broken.
6	V11-IX	Damage negligible in well-designed buildings. Slight to great damage to buildings and infrastructure of poor design.
7	VIII and higher	Well designed buildings may experience some damage. Building and bridges may shift off their foundations or partially collapse.
8	X and higher	Wooden building may be destroyed. Few masonry structures remain standing. Bridges destroyed; rail lines are bent.
9	XII	Damage total. The ground is distorted. Objects are thrown into the air.

The following USGS map provides a historical view of earthquakes in the Eastern United

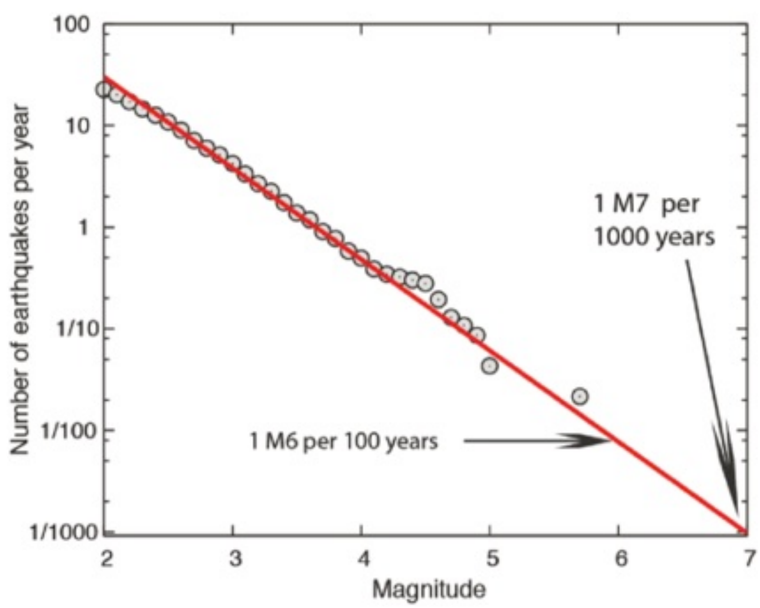


States.

B. Hazard Profile – Today, earthquakes are much more common and severe on the West Coast than they are on the East Coast. Significant earthquakes in Georgia are uncommon, which often leads to complacency over these potentially devastating events. Earthquakes that occur in the eastern U.S. are quite efficient at transmitting seismic energy over large distances. So the destruction and damage of these earthquake may be more significant than their magnitude would indicate.

Any portion of Georgia can feel the effects of an earthquake from time to time. The northern half of Georgia is the most seismically active, particularly in the most northwestern counties. Seismic activity in northwest Georgia is frequent by the standards of the State, but damage from this activity is usually minor or moderate at worst. The area usually experiences one magnitude 4.0 earthquake about every 5 to 10 years. This typically involves a startling vibration what may rock objects off shelves or crack some plaster, but does not involve devastating destruction.

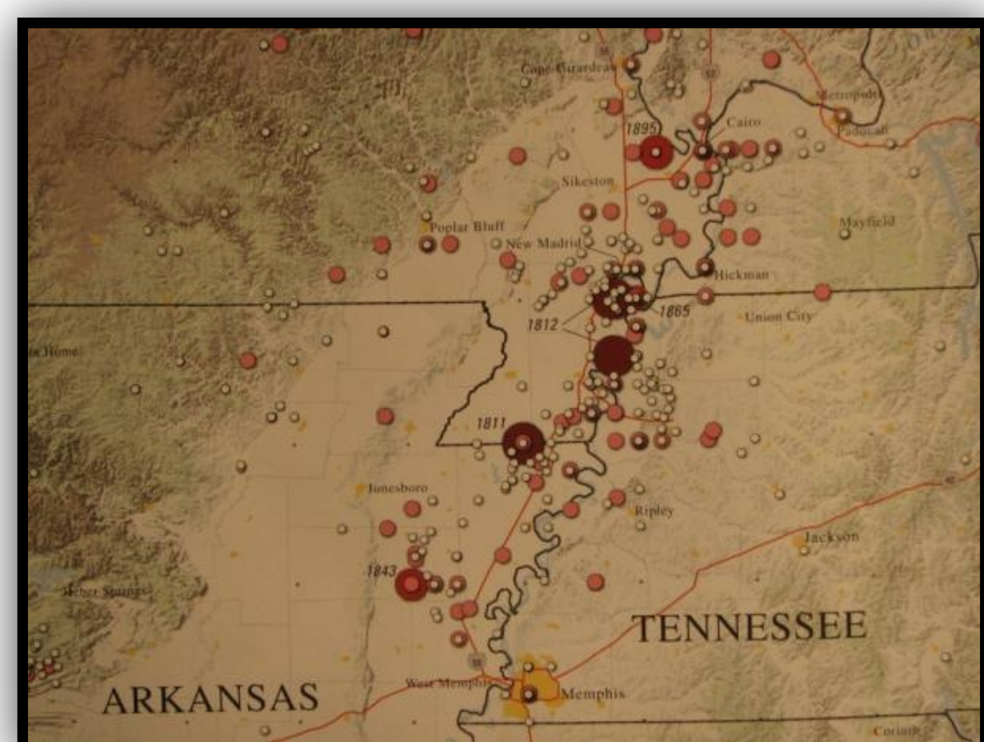
The greatest earthquake threat to the State of Georgia is most likely a repeat of a major earthquake outside of its borders. Both the great Charleston earthquake of 1886 and the New Madrid earthquakes of 1811-1812 caused the greatest damage within Georgia of any other known earthquakes on record. Damages included toppled chimneys, broken windows, cracked plaster, and other similar damage. Due to population growth, a similar earthquake today would have the potential to be much more devastating. On average, these major earthquakes have the potential to occur about once every 100 years in the eastern U.S.



Using the earthquakes recorded in and around Georgia since 1962 the long-term estimated return period of larger earthquakes can be estimated. A magnitude 6 is expected about every 100 years and a magnitude 7 about every 1000 years. See graph above.

Significant and/or recent earthquakes that impacted Georgia

1811-1812: The first earthquakes recorded as being felt in Georgia were the great New Madrid earthquakes of 1811-1812 (also known as the Mississippi River Valley earthquakes) centered in northeast Arkansas and New Madrid, Missouri. There were hundreds of earthquakes during the two month period between December 16, 1811 and February 7, 1812. On the basis of the large area of damage (600,000 square kilometers), the widespread area of perceptibility (5,000,000 square kilometers), and the complex physiographic changes that occurred, this series of earthquakes rank as some of the largest in the United States since its settlement by Europeans. The area of strong shaking associated with these shocks is two to three times larger than that of the 1964 Alaska earthquake and 10 times larger than that of the 1906 San Francisco earthquake. The first three major earthquakes occurred in northeast Arkansas on December 16, 1811 (three shocks - Mfa 7.2/MSn 8.5; Mfa 7.0/MSn 8.0; and MSn 8.0). There were six aftershocks on December 16th and 17th alone in the range of M5.5 to M6.3 (Note: aftershocks actually *are* earthquakes). The fourth earthquake occurred in Missouri on January 23, 1812 (Mfa 7.1/MSn 8.4). The fifth earthquake occurred in New Madrid, Missouri on February 7, 1812 (Mfa 7.4/ MSn 8.8). This is the earthquake that created Reelfoot Lake, located in northwest Tennessee. It was reported to have been formed as the Mississippi River flowed backward for 10–24 hours to fill the lake. As a result of this earthquake, the original town of New Madrid now lies under the Mississippi River.



This accounted for a total of five earthquakes of magnitude MSn 8.0 or higher occurring in a period of 54 days. The first earthquake caused only slight damage to man-made structures, mainly because the region was so sparsely populated. However, as the earthquakes continued, they began to open deep cracks in the ground, created landslides on the steeper bluffs and hillsides, large areas of land were uplifted, and sizable sink areas were created. These five main earthquakes, and several aftershocks, were felt over almost all of the eastern United States including the State of Georgia. In Georgia this series of earthquakes was strong enough to have shaken bricks from chimneys and other minor damage.

August 31, 1886: The great Charleston, South Carolina, earthquake of 1886 killed approximately 60 people. The magnitude 7.3 earthquake is the most damaging earthquake on record to occur in the southeastern U.S. and one of the largest historic shocks in the eastern U.S. It damaged or destroyed many buildings in the old city of Charleston. Property damage was estimated at $5-$6 million. Structural damage was reported several

hundred kilometers from Charleston including in the State of Georgia. On August 31, 1886 at 9:25 pm, preceded by a low rumble, the shock waves reached Savannah. People had difficulty remaining standing. One woman died of fright as the shaking cracked walls, felled chimneys, and broke windows. Panic at a revival service left two injured and two more were injured in leaping from upper story windows. Several more were injured by falling bricks. Ten buildings in Savannah were damaged beyond repair and at least 240 chimneys damaged. People spent the night outside. At Tybee Island light station the 134 foot lighthouse was cracked near the middle where the walls were six feet thick, and the one-ton lens moved an inch and a half to the northeast. In Augusta, the shaking was the most severe (VIII on the Modified Mercalli scale) in the State. An estimated 1,000 chimneys and many buildings were damaged. The business and social life was paralyzed for two days. Brunswick and Darien were affected as well.

June 17, 1872: An earthquake on June 17, 1872 in Milledgeville, GA and had an intensity of at least V on the Modified Mercalli scale, the lowest intensity in which some damage may occur. It was reported as a sharp shock, jarring brick buildings and rattling windows.

November 1, 1875: On November 1, 1875, at 9:55 in the evening, an intensity VI earthquake occurred near the South Carolina border. It was felt from Spartanburg and Columbia, South Carolina, to Atlanta and Macon, Georgia, from Gainesville to Augusta, and generally over an area of 25,000 square miles.

October 18, 1902: A more local event occurred on October 18, 1902, with a sharp shock felt along the east face of Rocky Face Mountain, just west of Dalton, GA with intensity VI and at LaFayette, GA with intensity V. The earthquake was felt over an area of about 1500 square miles including Chattanooga, Tennessee.

January 23, 1903: The Savannah, GA area was shaken with an intensity VI earthquake on January 23, 1903. Centering near Tybee Island, it was felt over an area of 10,000 square miles including Savannah (intensity VI), Augusta (intensity III), Charleston (intensity IV-V), and Columbia (intensity III-IV). Houses were strongly shaken.

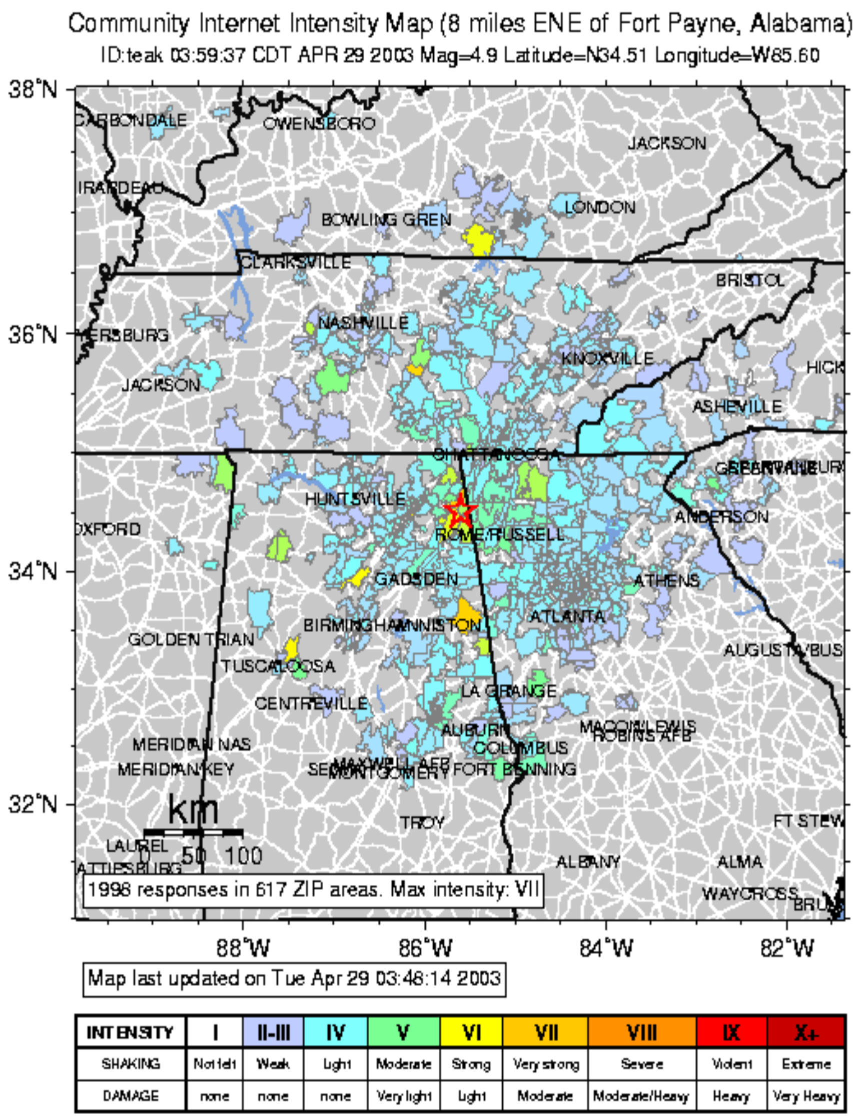
June 20, 1912: Another shock was felt on June 20, 1912, at Savannah with intensity V.

March 5, 1914: According to USGS, Georgia experienced another earthquake on March 5, 1914. Magnitude 4.5.

March 5, 1916: On March 5, 1916, an earthquake centered 30 miles southeast of Atlanta was felt over an area of 50,000 square miles, as far as Cherokee County, North Carolina, by several people in Raleigh, and in parts of Alabama and Tennessee.

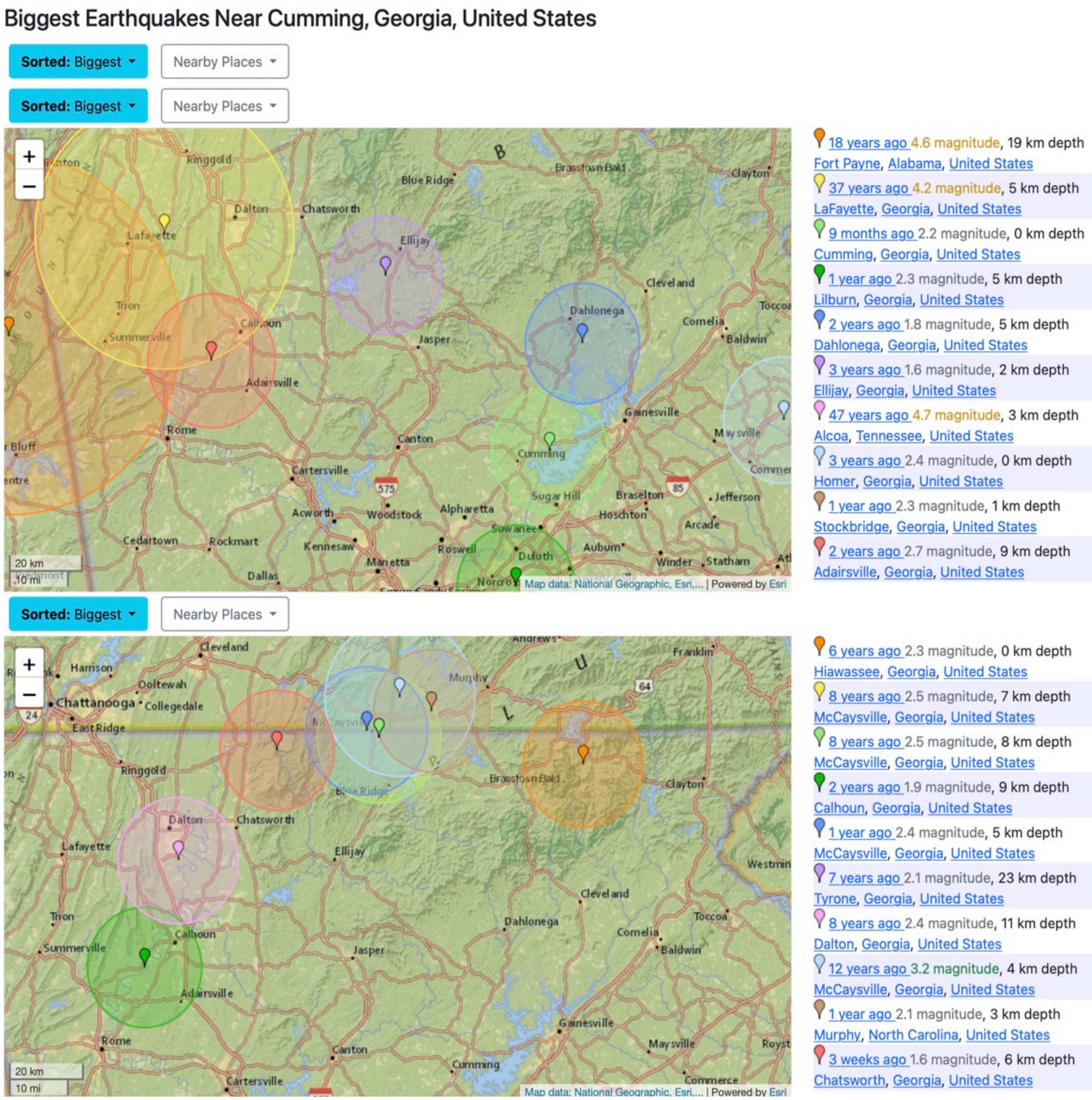
March 12, 1964: An earthquake of intensity V or over occurred on March 12, 1964, centered near Haddock, GA less than 20 miles northeast of Macon. Intensity V was recorded at Haddock while shaking was felt in four counties over a 400-square-mile area.

April 29, 2003: On April 29, 2003 just before 5:00 a.m. a moderate earthquake, rated 4.9 on the Richter Scale, shook most of the northwest corner of Georgia, south to Atlanta. The epicenter was located in Menlo, GA, about 37 miles south of Chattanooga. See map to right.



August 23, 2011: On August 23, 2011 at 1:51pm, a 5.8 magnitude earthquake originated near Louisa and Mineral, Virginia. It struck Washington DC (about 100 miles away from epicenter) causing moderate shaking and potentially significant damage. The earthquake was recorded all along the Appalachians, from Georgia to New England. The earthquake was felt so widely because it was a shallow earthquake, and geologic conditions in the eastern U.S. allow the effects of earthquakes to propagate and spread much more efficiently than in the western United States. Only mild movement was felt in Forsyth County.

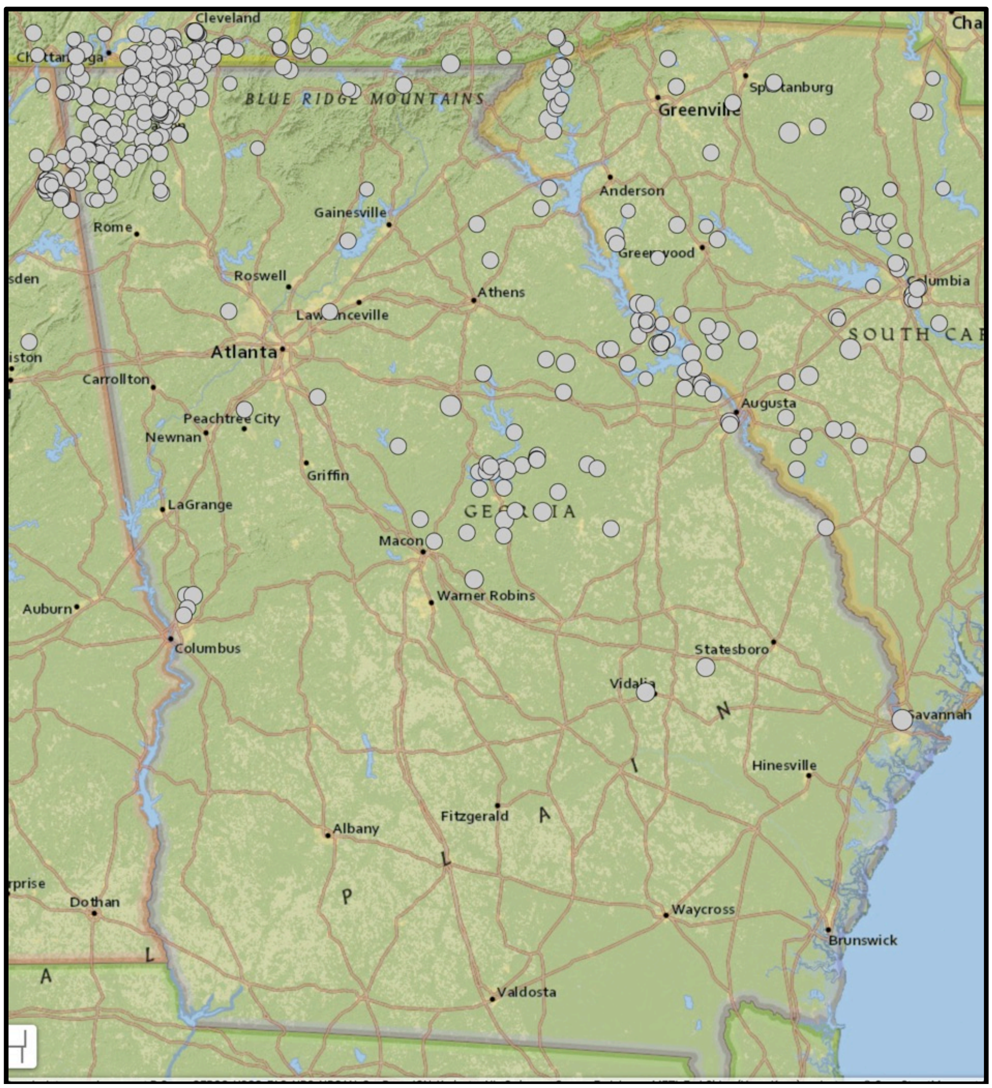
December 21, 2018: The following two maps show 20 mild earthquakes that have occurred in the vicinity of Forsyth County within the past 50 years.



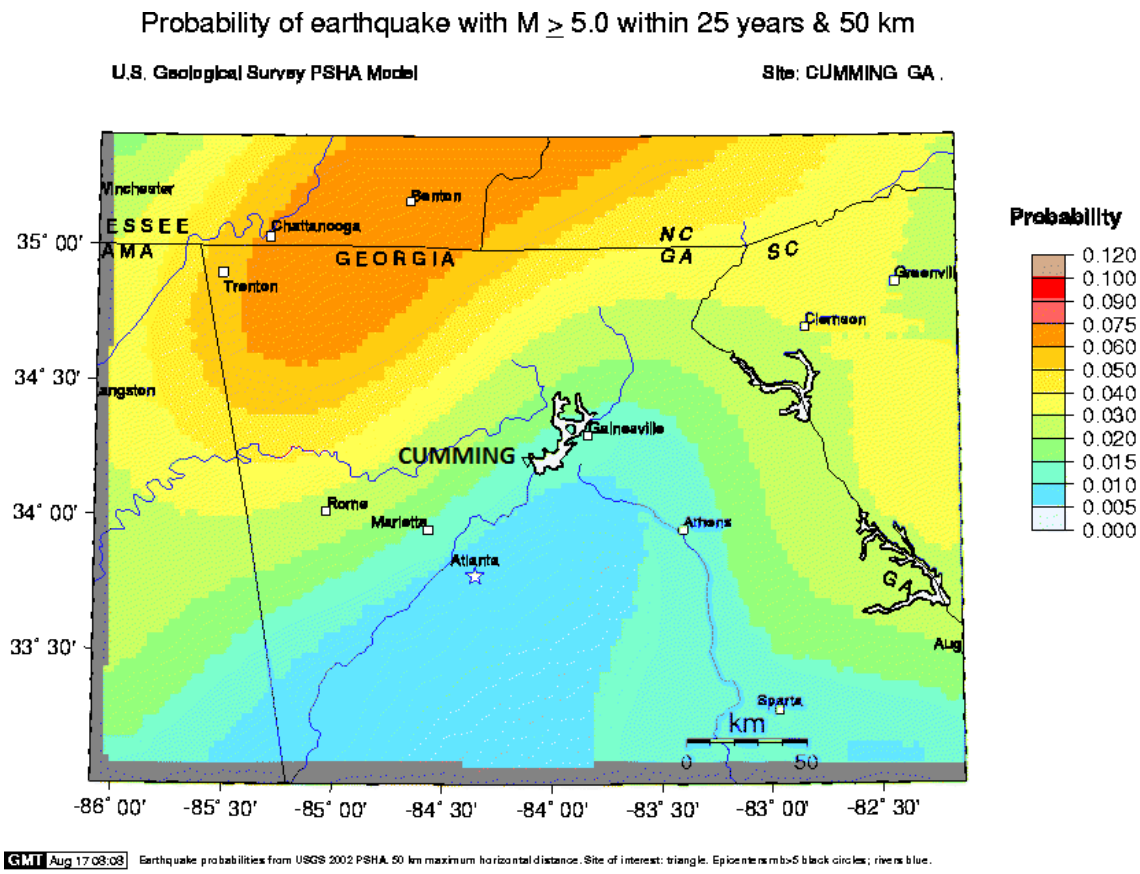
In researching earthquake history for this Plan, two problems have greatly limited the ability to develop concise technical data regarding the number of and magnitude of earthquakes that would have impacted Forsyth County. The first is that beyond the past couple of decades, record keeping for minor earthquakes in this area was quite limited. The second is the difficulty in determining which earthquakes should be counted.

Earthquakes from many states away that are "felt" but cause no damage sometimes merit mention, but are not truly a hazard event for the County. Likewise, very minor earthquakes nearby that are inconsequential and cause very little or no damage are also not truly considered hazard events by the County. For the purposes of this plan many of these types of unimpactful earthquakes might be compared to snow flurries (vs. winter storm) or minor thunderstorm (vs. severe thunderstorm). Sure, they demonstrate that the potential for a true hazard exists, but the events themselves are not hazards. In summary, the HMPC has concluded that, while many minor or distant earthquakes may be felt in the County, the true earthquake threat is probably more straightforward. It is likely the major earthquake that occurs once every hundred plus years. With that in mind, the examples of earthquakes shown on previous pages do not represent an all-inclusive list. They simply represent some of the more historic and/or recent earthquakes that had an impact, however minor, on Forsyth County.

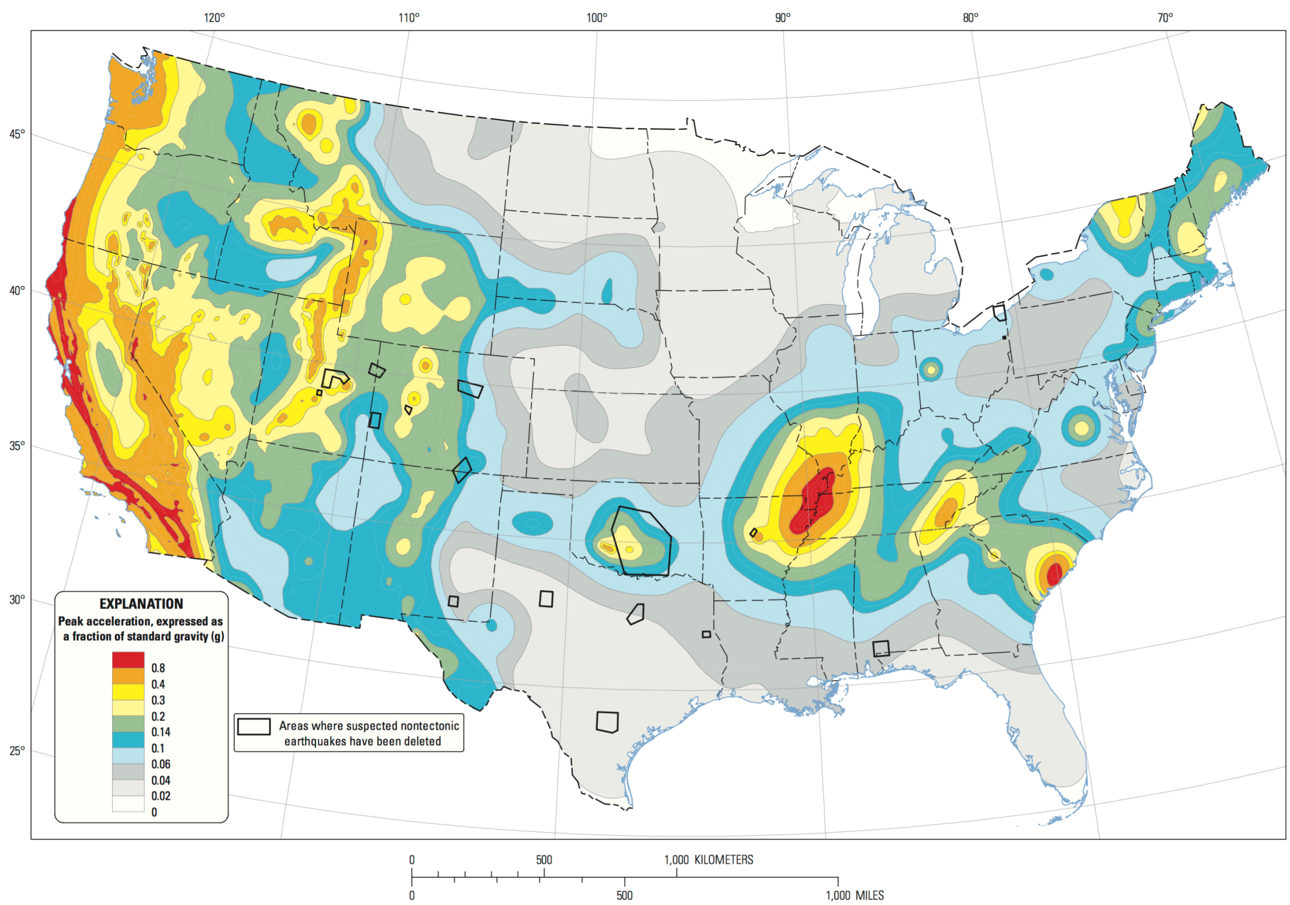
Seismic activity for the State of Georgia is shown on the following USGS map for the period 1900 to present.



Based on U.S. Geological Survey estimations using the earthquake frequency method described in the section above, the probability of an earthquake of a magnitude over 5.0 within Forsyth County over the next 25 years is between 1% and 3% (see map below). As discussed above, such predictions are based on limited information, and cannot necessarily be relied upon for their precision. However, they do help demonstrate that the threat of earthquakes cannot be overlooked especially in the northwestern portions of Georgia.



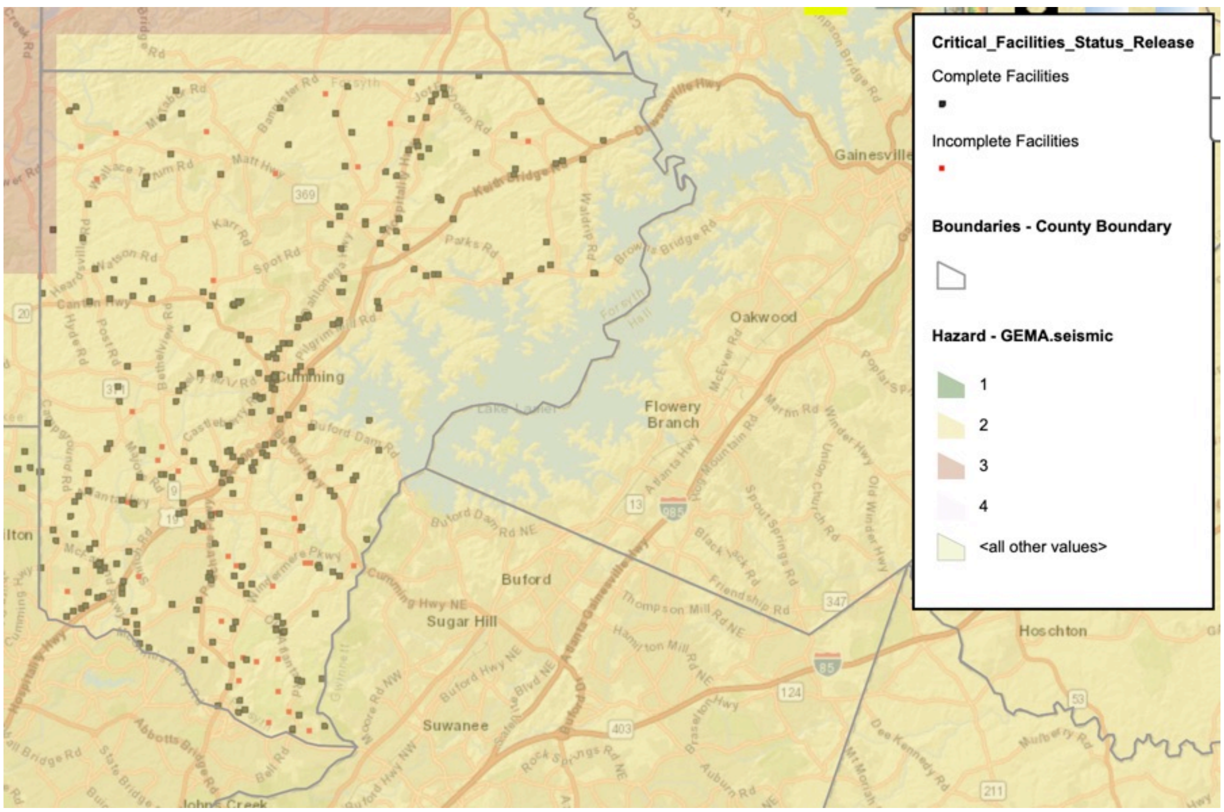
The 2014 U.S. Geological Survey (USGS) National Seismic Hazard Maps, including the one on the following page, display earthquake ground motions for various probability levels across the United States and are applied in seismic provisions of building codes, insurance rate structures, risk assessments, and other public policy. The updated maps represent an assessment of the best available science in earthquake hazards and incorporate new findings on earthquake ground shaking, faults, seismicity, and geodesy. The USGS National Seismic Hazard Mapping Project developed these maps by incorporating information on potential earthquakes and associated ground shaking obtained from interaction in science and engineering workshops involving hundreds of participants, review by several science organizations and State surveys, and advice from expert panels and a Steering Committee. The new probabilistic hazard maps represent an update of the seismic hazard maps; previous versions were developed by Petersen and others (2008) and Frankel and others (2002), using the methodology developed Frankel and others (1996). Algermissen and Perkins (1976) published the first probabilistic seismic hazard map of the United States which was updated in Algermissen and others (1990).



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

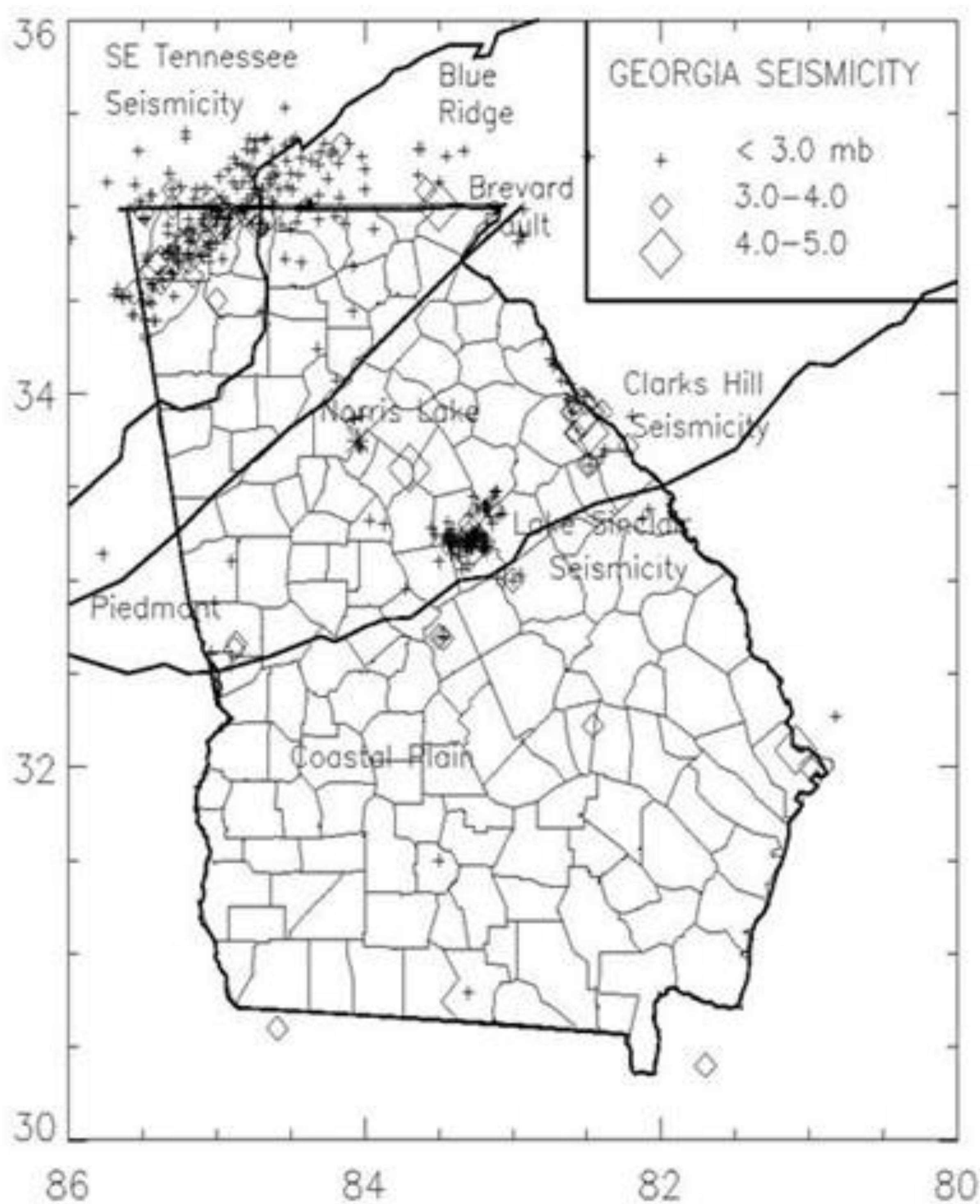
C. Assets Exposed to Hazard - All structures and facilities within Forsyth County are susceptible to earthquake damage since they can occur in any portion of the County or City. The likelihood of an earthquake in Forsyth County and the City of Cumming ranges from moderate to high.

The seismic hazard layer used in the map that follows is based on the USGS Probabilistic Seismic Hazard Map, showing the percentage of gravity that the area has a 2 percent probability of exceedance in 50 years. The score classification reflects that used by the IRC Seismic Design Categories. The horizontal positional accuracy is unknown for this layer. The entire County and the City of Cumming are located within Seismic Threat Category 3, "moderate to high threat."



	Seismic Threat Category	Original Value	Description
	1	A	0-17% gravity (lowest threat)
	2	B	17-33% gravity (low to moderate threat)
	3	C	33-50% gravity (moderate to high threat)
	4	D1	50-83% gravity (highest threat)
	*	Not applicable	All other values

Georgia has a few large faults. The Blue Ridge fault extends from Alabama through Georgia and into Tennessee. The Brevard Fault extends from Alabama through Georgia and into South Carolina. This fault line is located along the southern and eastern borders of Forsyth County.



D. Estimate of Potential Losses – For loss estimate information, please refer to Appendix A, the Critical Facilities Database, and Appendix D, Worksheet 3a, for each jurisdiction.

E. Multi-Jurisdictional Concerns – All of Forsyth County has the potential to be affected by earthquakes. The threat appears to be moderate and fairly uniform throughout the County and City. Any steps taken to mitigate the effects of earthquake will be undertaken on a countywide basis and include the City of Cumming.

F. Hazard Summary – Scientific understanding of earthquakes is of vital importance to the Nation. As the population increases, expanding urban development and construction works encroach upon areas susceptible to earthquakes. With a greater understanding of the causes and effects of earthquakes, we may be able to reduce damage and loss of life from this destructive phenomenon. The HMPC was limited in its ability to develop mitigation measures associated with earthquakes, but did provide some guidance in *Chapter 5*.

Chapter 3
Local Technological/Biological Hazard, Risk and Vulnerability (HRV) Summary

The Forsyth County Hazard Mitigation Planning Committee (HMPC) has also included information relating to technological/biological hazards into this plan. The term, "technological hazard" refers to incidents resulting from human activities such as the manufacture, transportation, storage, and use of hazardous materials, or perhaps the failure of a manmade structure. The term, "biological hazard", also known as a biohazard, is an organism or a by-product from an organism that is harmful or potentially harmful to other living things, primarily human beings. Common types of biological hazards include bacteria, viruses, medical waste and toxins that were produced by organisms. This would include pandemics.

Unfortunately, the information relating to technological/biological hazards is much more limited, due largely to the very limited historical data available. This causes a greater level of uncertainty with regard to mitigation measures. However, enough information has been gathered to provide a basic look at technological/biological hazards within Forsyth County.

The Forsyth County Hazard Mitigation Planning Committee (HMPC) identified technological/biological hazards that the County is vulnerable to based upon available data including scientific evidence, known past events, and future probability estimates. As a result of this planning process, which included an analysis of the risks associated with probable frequency and impact of each hazard, the HMPC determined that each of the technological/biological hazards included in this chapter pose a threat significant enough to address within this Plan. An explanation and results of the vulnerability assessment are found in Tables 3-1 and 3-2.

Table 3.1 – Hazards Terminology Differences

Hazards Identified in Georgia Hazard Mitigation Strategy Plan (2019-2024)	Equivalent/Associated Hazards identified in the current Forsyth County Plan	Difference
Hazards Identified in Georgia Hazard Mitigation Strategy Plan (2019-2024)	Equivalent/Associated Hazards identified in the current Forsyth County Plan	Difference

Table 3.2 – Vulnerability Assessment - Technological Hazards

(see Keys A, B, C below)

Hazard	Forsyth County	City of Cumming
Hazardous Materials Release - Severity	H	H
Hazardous Materials Release – Frequency	H	H
Hazardous Materials Release - Probability	H	H
Dam Failure – Severity	H	H
Dam Failure – Frequency	L	L
Dam Failure – Probability	H	H
Pandemic – Severity	H	H
Pandemic – Frequency	L	L
Pandemic – Probability	L	L

Key A for Table 3.2 – Vulnerability Assessment Severity Definitions

Code	Definitions
L	Low Severity Average hazard event would typically result in relatively low damage. For example, a hazard that significantly affects less than 5% of the jurisdiction typically with no serious injuries. All data is compiled from the most recent vulnerability assessment survey responses.
M	Medium Severity Average hazard event would typically result in moderate damage. For example, a hazard that significantly affects up to 15% of the jurisdiction or results in multiple injuries. All data is compiled from the most recent vulnerability assessment survey responses.
H	High Severity Average hazard event would typically result in significant damage. For example, a hazard that significantly affects 25% of the jurisdiction or results in multiple injuries and/or deaths. All data is compiled from the most recent vulnerability assessment survey responses.

Key B for Table 3.2 – Vulnerability Assessment Frequency Definitions

Code	Definitions
L	Low Frequency The hazard has not occurred or has rarely occurred within the past five years. All data is compiled from the most recent vulnerability assessment survey responses and hazards history data.
M	Medium Frequency The hazard has occurred one or more times within the past five years. All data is compiled from the most recent vulnerability assessment survey responses and hazards history data.
H	High Frequency The hazard has occurred multiple times within the past five years, and at least once within the past year. All data is compiled from the most recent vulnerability assessment survey responses and hazards history data.

Key C for Table 3.2 – Vulnerability Assessment Probability Definitions

Code	Definitions
L	Low Probability The probability for the hazard to occur at least one time within the next five years is estimated to be between 1% and 30%. All data is compiled from the most recent vulnerability assessment survey responses.
M	Medium Probability The probability for the hazard to occur at least one time within the next five years is estimated to be between 31% and 70%. All data is compiled from the most recent vulnerability assessment survey responses.
H	High Probability The probability for the hazard to occur at least one time within the next five years is estimated to be between 71% and 100%. All data is compiled from the most recent vulnerability assessment survey responses.

3.1 Hazardous Materials Release

A. Hazard Identification – Hazardous materials (hazmat) refers to any material that, because of its quantity, concentration, or physical or chemical characteristics, may pose a real hazard to human health or the environment if it is released. Hazmat includes flammable and combustible materials, toxic materials, corrosive materials, oxidizers, aerosols, and compressed gases. Specific examples of hazmat are gasoline, bulk fuels, propane, propellants, mercury, asbestos, ammunition, medical waste, sewage, and chemical, biological, radiological, nuclear, and explosive (CBRNE) threat agents. Specific federal and state guidelines exist on transport and shipping hazardous materials. Research institutes, industrial plants, individual households, and government agencies all generate chemical waste. Approximately one percent is classified as hazardous.

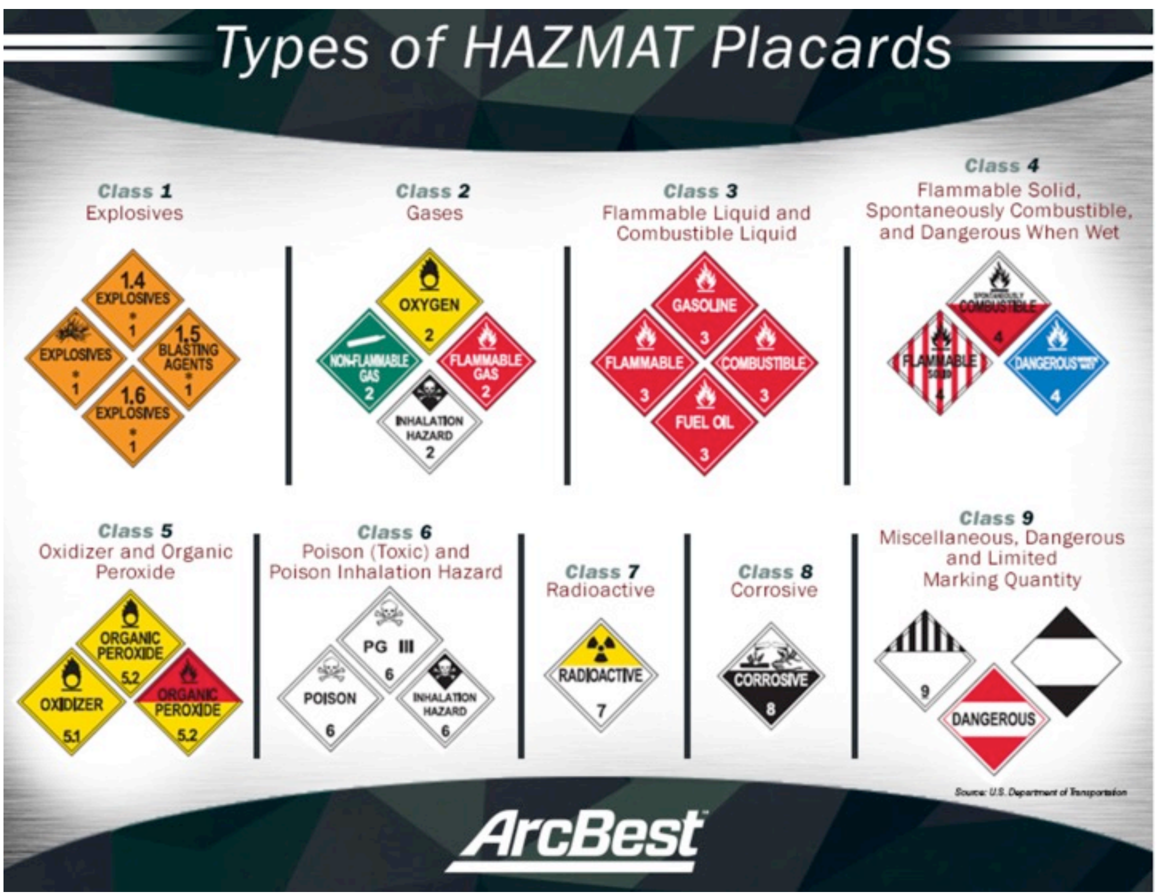
A hazmat spill or release occurs when hazardous material or waste gets into the environment in an uncontrolled fashion. Many manufacturing processes use hazardous materials or generate hazardous waste, but a hazardous spill doesn't always come from a chemical plant or a factory. Any substance in the wrong place at the wrong time in too large an amount can cause harm to the environment. The response to a spill depends on the situation. When the emergency response team is notified of a spill, it must quickly decide what sort of danger is likely. Members of the team collect appropriate clothing and equipment and travel to the scene. There they try to contain the spill, sometimes testing a sample to identify it. If necessary, they decontaminate themselves before leaving the area. Once material has been identified, other personnel arrive to remove it.

When transporting hazardous materials, hazmat placards provide details about the kind of cargo a truck is carrying. The United States Department of Transportation (DOT) requires carriers to display these signs when moving hazardous goods because they inform emergency responders of what substances are involved in case of an accident. More than two dozen truck placards are used to represent dangerous goods, and you can determine what a truck is carrying by the specific details on the sign.

A hazmat placard has six main parts (though not every sign includes all six):

Hazard class number
UN/NA number
Compatibility letters
Color
Words
Graphics

See hazmat placard chart below. Source: ArcBest.



Hazard class numbers

Numbers 1-9 represent the different hazardous classes and their divisions (class numbers are located at the bottom of the sign and division numbers are in the middle):

Class 1 — Explosives
1.1: Products with the potential to create a mass explosion
1.2: Products with the potential to create a projectile hazard
1.3: Products with the potential to create a fire or minor blast
1.4: Products with no significant risk of creating a blast
1.5: Products considered very insensitive that are used as blasting agents
1.6: Products considered extremely insensitive with no risk to create a mass explosion

Class 2 — Gases
2.1: Flammable gases
2.2: Nonflammable gases
2.3: Toxic gases

Class 3 — Flammable and combustible liquids

Class 4 — Flammable materials
4.1: Flammable solids
4.2: Spontaneously combustible
4.3: Dangerous when wet

Class 5 — Oxidizer and organic peroxide
5.1: Oxidizing substances
5.2: Organic peroxides

Class 6 — Poisons
6.1: Toxic substances
6.2: Infectious substances

Class 7 — Radioactive
Class 8 — Corrosive
Class 9 — Miscellaneous

United Nations/North American numbers

Four-digit numbers ranging from 0004-3534 are called United Nations (UN) numbers. They help identify hazardous international cargo traveling in the United States. Goods that aren't classified or regulated by the United Nations receive North American (NA) numbers. These four-digit numbers range from 8000-9279 and are assigned by the DOT. All UN and NA placards come with an identifier that helps shippers determine the cargo's class, division and compatibility group.

Compatibility letters

On some placards, you may see the letters A-S. These compatibility letters help shippers and carriers know which explosives can be loaded together onto a trailer.

Colors, words and graphics

One of the easiest ways to identify hazmat placards, other than the class numbers, is by the color (along with the words and graphics on each sign):

Orange
Orange represents explosive materials which can include products like dynamite, fireworks and ammunition. These signs typically have the words explosives or blasting agents on them and a graphic indicating something blowing up. They'll also have the number 1 to indicate the class.

Red
Red is for flammable goods like gasoline, rubbing alcohol, paint and acetone, which can fall into Classes 2 or 3. These placards feature a flame image and usually have the words flammable, gasoline, combustible or fuel oil.

Green
If the truck has a green sign, it's transporting nonflammable substances like compressed and liquefied gases. You'll see the word nonflammable gas, an image of a gas canister and the number 2.

Yellow
Yellow indicates oxidizers — substances, that when mixed with oxygen, are likely to combust (Classes 2 or 5). Common oxidizers include ammonium nitrate, potassium nitrate, halogens and nitric acid. These signs have oxygen written on them and a graphic of an "O" with flames.

White
White indicates poisonous and biohazardous substances like dyes, acids, aerosols and medical waste. For toxic materials, the sign will be labeled poison, PG III (PG = packing group) or inhalation hazard with a skull-and-crossbones image. For biohazards, the placard will say infectious substance and have a biohazard symbol (three circles overlapping one center circle). These types of materials can fall into Classes 2 or 6.

Blue

Blue represents goods that are dangerous when wet — meaning when these materials meet water, they can become flammable. Examples include sodium, calcium and potassium. You'll see dangerous when wet, an image of a flame and the number 4 on these placards.

Red and white

If you see a sign that's half red and half white with spontaneously combustible written on it, a flame graphic and the number 4, that means there are substances present that may ignite when exposed to air. This can include things like aluminum and lithium alkyls or white phosphorous.

Red and white stripes

Signs that have red and white vertical stripes with the number 4 represent flammable solids such as matches and magnesium. These placards are labeled flammable solid and have a fire graphic.

Red and yellow

Red and yellow indicate organic peroxides which have the potential to ignite or explode (these fall under the division 5.2). Common examples are methyl ethyl ketone peroxide and benzoyl peroxide. These signs say organic peroxide and will either have the graphic of "O" with flames or just a normal fire graphic.

Yellow and white

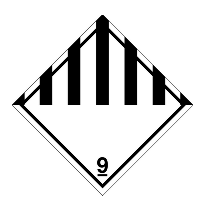
Yellow and white represent radioactive substances that are often found in medical equipment. You'll see the word radioactive, the radiation symbol of three blades surrounding a small circle, and the number 7.

White and black

Half white and half black signifies corrosive materials that can irritate and harm the skin. Examples include batteries, hydrochloric acid, sulfuric acid and sodium hydroxide. These signs say corrosive, show substances spilling onto hands, and have the number 8.

White with black stripes

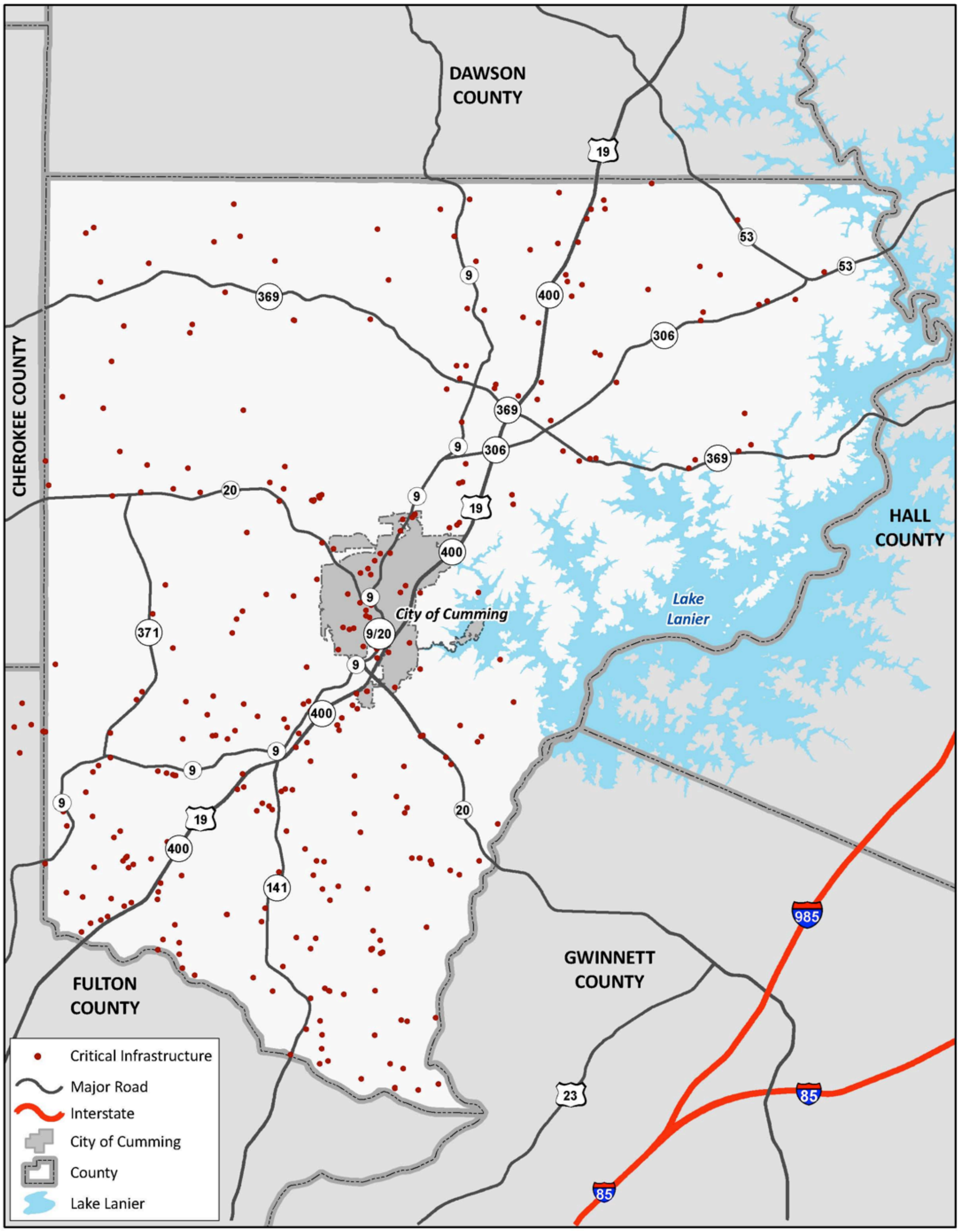
A white sign with black vertical stripes at the top and the number 9 at the bottom signals miscellaneous dangerous goods. This includes environmentally hazardous substances that don't fall into a specific class like asbestos and dry ice.



B. Hazard Profile – Hazmat spills are usually categorized as either fixed releases, which occur when hazmat is released on the site of a facility or industry that stores or manufactures hazmat, or transportation-related releases, which occur when hazmat is released during transport from one place to another. Both fixed and transportation-related hazmat spills represent tremendous threats to Forsyth County. Potential fixed hazmat spills within the County could come from local commercial and industrial establishments, such as the carpet industry. Transportation-related hazmat spills could come from commercial traffic on major highways.

C. Assets Exposed to Hazard – The environment is especially vulnerable to hazardous materials releases, with waterways being at greatest risk of contamination. Georgia EPD tracks information on waterways within Forsyth County that have been contaminated to varying degrees due to hazmat spills. These incidents include contamination to creeks, lakes, storm sewers, wells, and drainage ditches. Such releases are also a potential threat to all property and persons within any primary highway corridors of Forsyth County since certain hazmat releases can create several square miles of contamination. The same holds true of property and persons located in the vicinity of facilities or industries that produce or handle large amounts of hazardous materials. The most common hazmat releases have generally included diesel, gasoline, oil, and sewage. Unfortunately, Georgia EPD no longer makes specific hazmat spill information available to the public as they once did. If at some point this changes, that data will be considered at the next Plan update.

All public and private property including critical facilities are susceptible to hazardous materials release since this hazard is not spatially defined. The map below identifies critical facilities located within the hazard area, which in the case of drought includes all areas within the County and City.



D. Estimate of Potential Losses - It is difficult to determine potential damage to the environment caused by hazardous materials releases. What can be calculated are the significant response costs incurred once a hazmat release does occur including emergency response, road closings, evacuations, watershed protection, expended man-hours, and cleanup materials and equipment. Corridors for GA 400, State Routes 9, 20, 53, 141, 306, and 369 are most vulnerable to transportation-related releases. However, such releases can occur in virtually any part of the County accessible by road. Fixed location releases are not as likely to affect the more rural areas of the County. For additional loss estimate information, please refer to the Critical Facilities Database (Appendix A).

E. Multi-Jurisdictional Concerns – All of Forsyth County, including the City of Cumming, is vulnerable to both fixed and transportation-related hazardous materials releases. Both jurisdictions contain numerous commercial and industrial facilities and experience busy state route traffic.

F. Hazard Summary – Hazardous materials releases are a significant threat to Forsyth County. Unknown quantities and types of hazmat are transported through the County by truck on a daily basis. The main corridors of concern are GA 400, State Routes 9, 20, 53, 141, 306, and 369. These hazmat shipments pose a great potential threat to all of Forsyth County. The fact that the County is unable to track these shipments seriously limits the mitigation measures that can be put into place. Fixed hazmat releases are also considered to be a major threat to Forsyth County due to the industries located therein. Therefore, the Forsyth County HMPC has identified specific mitigation actions for hazardous materials releases in *Chapter 5*.

3.2 Dam Failure

A. Hazard Identification – Georgia law defines a dam as any artificial barrier which impounds or diverts water, is 25 feet or more in height from the natural bed of the stream, or has an impounding capacity at maximum water storage evaluation of 100 acre-feet (equivalent to 100 acres one foot deep) or more. Dams are usually constructed to provide a ready supply of water for drinking, irrigation, recreation and other purposes. They can be made of rock, earth, masonry, or concrete or of combinations of these materials.

Dam failure is a term used to describe the major breach of a dam and subsequent loss of contained water. Dam failure can result in loss of life and damage to structures, roads, utilities, crops, and livestock. Economic losses can also result from a lowered tax base, lack of utility profits, disruption of commerce and governmental services, and extraordinary public expenditures for food relief and protection. National statistics show that overtopping due to inadequate spillway design, debris blockage of spillways, or settlement of the dam crest account for one third of all U.S. dam failures. Foundation defects, including settlement and slope instability, account for another third of all failures. Piping and seepage, and other problems cause the remaining third of national dam failures. This includes internal erosion caused by seepage, seepage and erosion along hydraulic structures, leakage through animal burrows, and cracks in the dam. The increasing age of dams nationwide is a contributing factor to each of the problems above.

B. Hazard Profile – Congress first authorized the US Army Corps of Engineers to inventory dams in the United States with the National Dam Inspection Act (Public Law 92-367) of 1972. The Water Resources Development Act of 1986 (P.L. 99-662) authorized the Corps to maintain and periodically publish an updated National Inventory of Dams

(NID), with re-authorization and a dedicated funding source provided under the Water Resources Development Act of 1996 (P.L. 104-3). The Corps also began close collaboration with the Federal Emergency Management Agency (FEMA) and state regulatory offices to obtain more accurate and complete information. The National Dam Safety and Security Act of 2002 (P.L. 107-310) reauthorized the National Dam Safety Program and included the maintenance and update of the NID by the Corps of Engineers.

The most recent Dam Safety Act of 2006 reauthorized the maintenance and update of the NID.

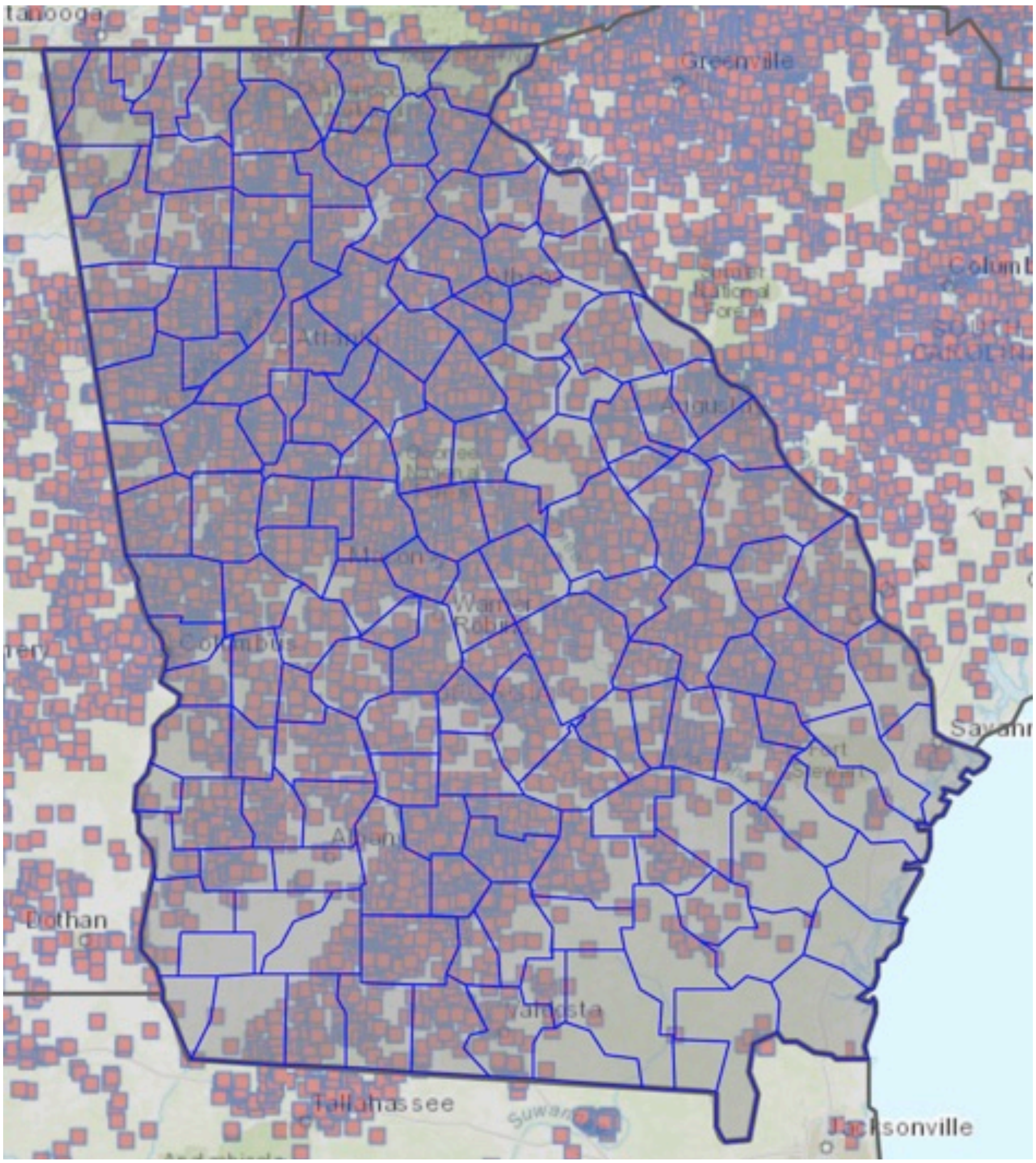
The NID consists of dams meeting at least one of the following criteria:

1) High hazard classification - loss of one human life is likely if the dam fails,
2) Significant hazard classification - possible loss of human life and likely significant property or environmental destruction,
3) Equal or exceed 25 feet in height and exceed 15 acre-feet in storage,
4) Equal or exceed 50 acre-feet storage and exceed 6 feet in height.

The goal of the NID is to include all dams in the U.S. that meet these criteria, yet in reality, is limited to information that can be gathered and properly interpreted with the given funding. The inventory initially consisted of approximately 45,000 dams, which were gathered from extensive record searches and some feature extraction from aerial imagery. Since continued and methodical updates have been conducted, data collection has been focused on the most reliable data sources, which are the various federal and state government dam construction and regulation offices. In most cases, dams within the NID criteria are regulated (construction permit, inspection, and/or enforcement) by federal or state agencies, who have basic information on the dams within their jurisdiction. Therein lies the biggest challenge, and most of the effort to maintain the NID; periodic collection of dam characteristics from states, territories, and 18 federal offices. Database management software is used by most state agencies to compile and export update information for the NID. With source agencies using such software, the Corps of Engineers receives data that can be parsed and has the proper NID codes. The Corps can then resolve duplicative and conflicting data from the many data sources, which helps obtain the more complete, accurate, and updated NID.

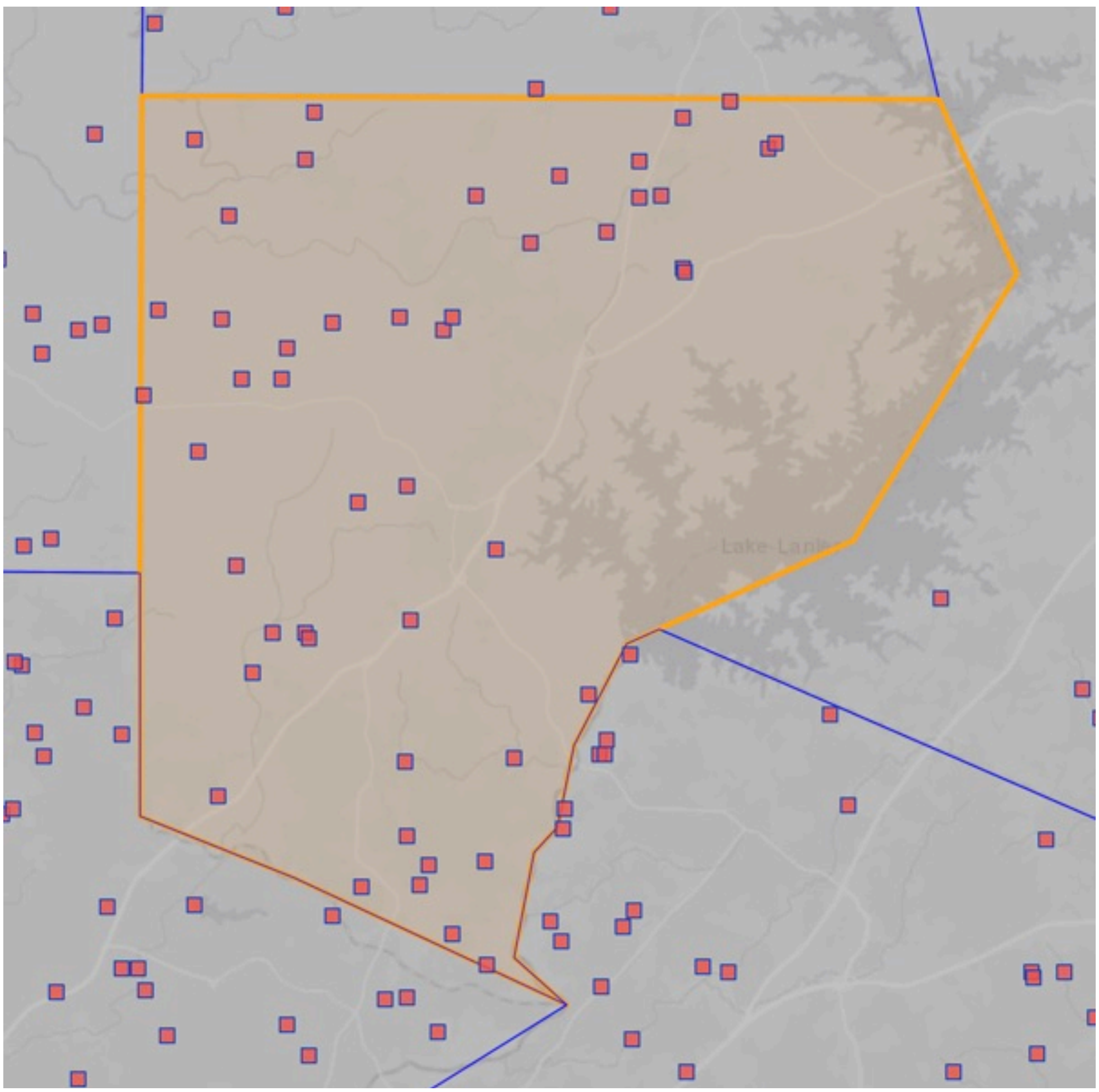
The National Inventory of Dams Map for the State of Georgia is located below and displays a State inventory of 5,306 dams. According to the data, the average age of a dam in Georgia is 56 years. Only 2% of Georgia dams are regulated by a Federal agency and 9% of Georgia dams are regulated by a State agency. 1% of Georgia dams generate hydropower. 62% of Georgia high hazard potential dams have an emergency action plan.

U.S Army Corps of Engineers National Inventory of Dams



The National Inventory of Dams Map for Forsyth County is located below and displays a county inventory of 49 dams. According to the data, the average age of a dam in Forsyth County is 58 years. 2% of Forsyth County dams are regulated by a Federal agency and 24% of Forsyth County dams are regulated by a State agency. 2% of Forsyth County dams generate hydropower. 85% of Forsyth County high hazard potential dams have an emergency action plan.

U.S Army Corps of Engineers National Inventory of Dams – Forsyth Co.



The Georgia Safe Dams Act of 1978 established Georgia's Safe Dams Program following the November 6, 1977 failure of the Kelly Barnes Dam in Toccoa, GA, in which 39 people lost their lives when the breached dam, which held back a 45-acre lake, sent a 30-foot-high wall of water sweeping through Toccoa Falls College.

The Kelly Barnes Dam failed about 1:30 a.m., on November 6, 1977. The dam went through various stages of development. First as a rock crib dam and then with subsequent stages as an earth dam. The rock crib dam was completed about 1899 to back up water which would be used to power a small hydroelectric plant located near the foot of the Falls. About 1937, the Toccoa Falls Bible Institute was interested in developing a more dependable power source and decided to build an earth dam over the rock crib dam. This construction was performed with equipment provided by a local manufacturer. After World War II, the earth fill was raised to a point where an earth spillway on the left side of the valley could be utilized, and a low point on the rim on the right side away from the dam would serve as a secondary spillway in case high flows occurred. The final height of the dam was approximately 42 feet above the rock foundation. This installation served as a power source until 1957 for the Toccoa Falls Bible Institute, which later became the Toccoa Falls College. At this time, the development of power was stopped but the dam continued to be used as a recreation lake. The Federal Investigative Board could not determine a sole cause of the failure. It does conclude that a combination of factors caused the failure. The most probable causes are a local slide on the steep downstream slope probably associated with piping, an attendant localized breach in the crest followed by progressive erosion, saturation of the downstream embankment, and subsequently a total collapse of the structure.

The Environmental Protection Division (EPD) within the Georgia Department of Natural Resources (DNR) is responsible for administering the Safe Dams Program. The purpose of the Program is to *provide for the inspection and permitting of certain dams in order to protect the health, safety, and welfare of all citizens of the state by reducing the risk of failure of such dams.* The Program has two main functions: (1) to inventory and classify dams and (2) to regulate and permit high hazard dams. Structures below the State minimum height and impoundment requirements (25 feet or more in height or an impounding capacity of 100 acre-feet or more) are exempt from regulation by the Georgia Safe Dams Program. The Program checks the flood plain of the dam to determine its hazard classification. Specialized software is used to build a computer model to simulate a dam breach and establish the height of the flood wave in the downstream plain. If the results of the dam breach analysis, also called a flood routing, indicate that a breach of the dam would result in a probable loss of human life, the dam is classified as Category I (high-hazard). The Safe Dams Program also approves plans and specifications for construction and repair of all Category I dams. In addition, Category I dams are continuously monitored for safety by Georgia EPD.

To date, the Safe Dam Program has identified **nine Category I dams** that reside within Forsyth County. These dams are Buford Dam, Settingdown Creek Watershed Structure

No. 6, Settingdown Creek Watershed Structure No. 25, Settingdown Creek Sub-Watershed Structure No. 27, Settingdown Creek Watershed Structure No. 54, Settingdown Creek Watershed Structure No. 56, Etowah River Sub-Watershed Structure No. 1, Dunroven Lake Dam, and Pine Lake Dam. The additional 27 identified dams located within the County are Category II dams (21) or exempt (6). There may be a number of unclassified dams within the County as well. The Program requires all Category II dams to be inventoried at least every five years.

The Forsyth County HMPC reviewed data from the US Army Corps of Engineers National Inventory of Dams, the Environmental Protection Division (EPD) within the Georgia Department of Natural Resources (Georgia Safe Dams Program), as well as County records in their research involving dam failure within Forsyth County. Fortunately, Forsyth County has never experienced a total dam failure with a Category I dam. It is possible that some small private dams have been breached at some point in the past, but no records have been found to indicate any type of emergency response related to such a failure, or even that such a failure has taken place. However, the potential for such a disaster does exist, and the appropriate steps must be taken to minimize such risks. Both the National Inventory of Dams and the Georgia Safe Dams Program help to accomplish that.

C. Assets Exposed to Hazard – Areas most vulnerable to the physical damages associated with dam failure within Forsyth County are the low-lying and downstream areas associated with Buford Dam, Settingdown Creek, Etowah River, Dunroven Lake, and Pine Lake. Physical damages and the effect on local economies would be devastating if Buford Dam were to fail. The Buford Dam Break Study created by the U.S. Army Corps of Engineers in 1982, provides estimates of the probable timeline and flood elevations downstream from Buford Dam in the event of a break. Although physical damages associated with other dam failures within the County would be limited to certain areas, the damage to the local economy and problems associated with delivery of water and other utilities could be felt Countywide. Note: Due to security concerns, the Buford Dam Break Study will not be available to the public without authorization from the Forsyth County EMA Director.

D. Estimate of Potential Losses - Loss estimation due to dam failure is an approximate effort, at best. Direct loss to infrastructure, critical facilities and businesses in terms of repair and replacement may be roughly estimated. Most flood inundation studies that would provide additional data related to losses are not available to the public for obvious security reasons and therefore cannot be made a part of this Plan. For additional loss estimate information, please refer to the Critical Facilities Database (Appendix A).

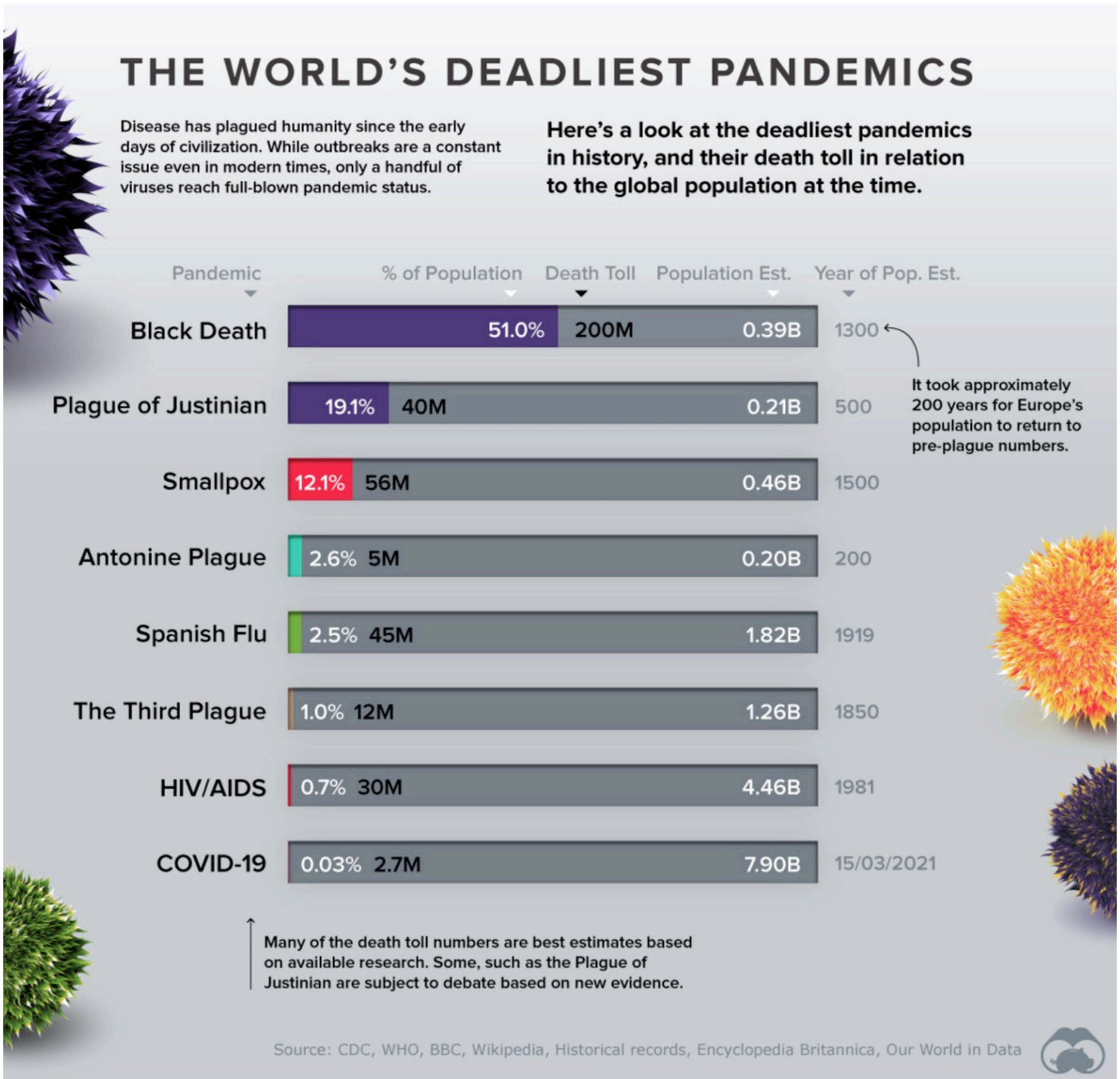
E. Multi-Jurisdictional Concerns – All of Forsyth County, including the City of Cumming, is vulnerable to the negative impact of dam failure.

F. Hazard Summary – A total failure of a high hazard dam has never been recorded in Forsyth County. However, with nine Category I dams located in the County, including Buford Dam, risks associated with dam failure cannot be ignored. The Forsyth County HMPC has identified some specific mitigation actions for dam failure in *Chapter 5*.

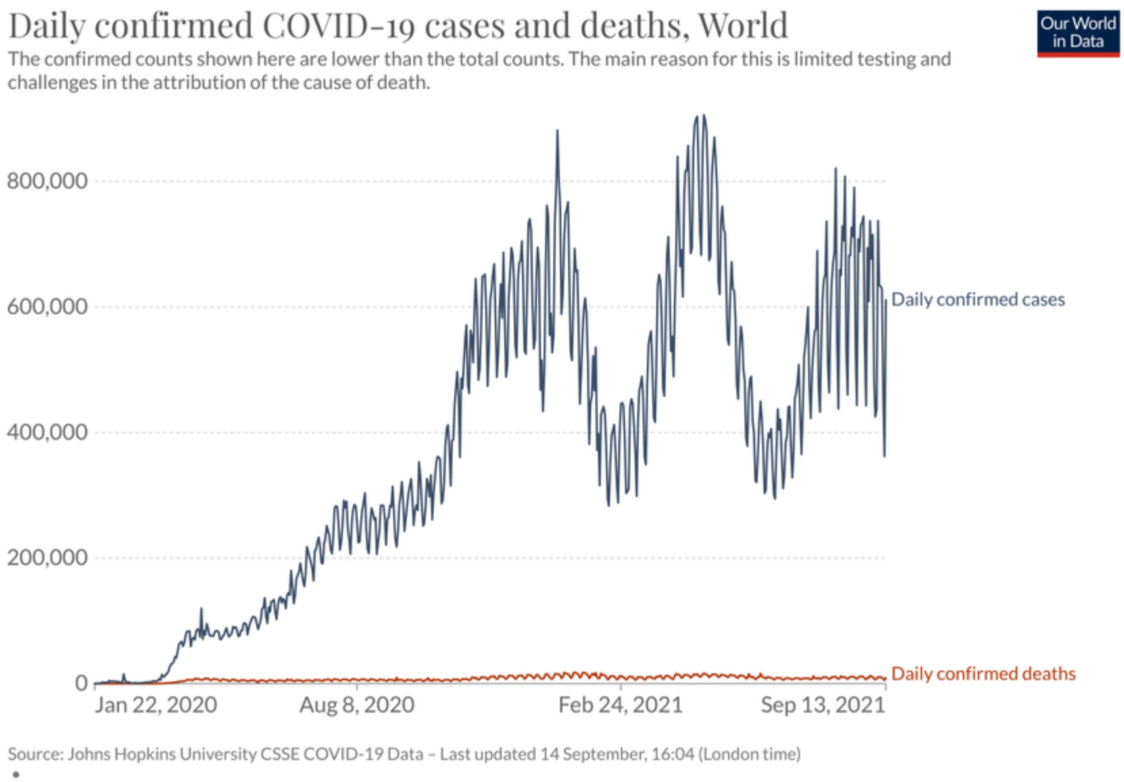
3.3 Pandemic

A. Hazard Identification – A pandemic is defined as an outbreak of a disease that occurs over a wide geographic area and affects an exceptionally high proportion of the population. A widespread endemic disease with a stable number of infected people is not a pandemic. Widespread endemic diseases with a stable number of infected people such as recurrences of seasonal influenza are generally excluded as they occur simultaneously in large regions of the globe rather than being spread worldwide. A pandemic is an epidemic occurring on a scale that crosses international boundaries, usually affecting people on a worldwide scale. A disease or condition is not a pandemic merely because it is widespread or kills many people; it must also be infectious. For instance, cancer is responsible for many deaths but is not considered a pandemic because the disease is neither infectious nor contagious.

B. Hazard Profile – Throughout history, there have been a number of pandemics of diseases such as smallpox and tuberculosis. The most fatal pandemic recorded in human history was the Black Death (also known as The Plague), which killed an estimated 200 million people in the 14th century. Other notable pandemics include the 1918 influenza pandemic (Spanish flu). Current pandemics include HIV/AIDS and COVID-19. See the chart below showing some of the most significant pandemics in history.



COVID-19 cases have been persistent.



C. Assets Exposed to Hazard –. All areas within Forsyth County are susceptible to pandemics since they can occur anywhere that people are located. The more densely populated the specific area, the higher the likelihood of transmission. The likelihood of a pandemic in Forsyth County and the City of Cumming is low, but the consequences should one occur has the potential to be extremely high.

D. Estimate of Potential Losses - For loss estimate information, please refer to Appendix A, the Critical Facilities Database, and Appendix D, Worksheet 3a, for each jurisdiction.

E. Multi-Jurisdictional Concerns – All of Forsyth County, including the City of Cumming, is vulnerable to the negative impact of pandemics.

F. Hazard Summary – The Forsyth County HMPC has identified some specific mitigation actions for pandemic in *Chapter 5*.

Chapter 4
Land Use and Development Trends

After review by the HMPC, it was determined that the growth that occurred in Forsyth County, including the City of Cumming within the past five years did not significantly impact or alter the vulnerabilities of these jurisdictions.

The most current land use and community development assessments and objectives available are summarized below. This information is derived primarily from the most recent update to the Comprehensive Plan.

Presently, Forsyth County finds itself at a crossroads of suburban and rural development. Growth patterns in the Atlanta region for the past 30 to 40 years have seen outward growth into counties outside the central core of the region to accommodate the increasing population. Outer suburbs in the Atlanta region have typically become hotspots for rapid growth because of attractive qualities such as lower costs of land and housing, access to great schools, safety, a family-friendly environment, and continued access to a powerful regional economy, jobs, and resources. At the same time, outer communities like Forsyth County provide a reprieve from other challenges in more centralized communities such as congestion and aging housing stock. Forsyth County has experienced significant and rapid population growth for over 20 years. This growth speaks to the County's attractiveness as a place to invest and live within metropolitan Atlanta. Among these traits, Forsyth County has some of the highest ranked schools and parks in the State of Georgia, unparalleled access to regional natural resources and metro Atlanta jobs, and an affordable cost of living. With this desirability and the accompanying sudden and sharp population growth, the County has experienced a series of changes, such as transitioning from largely undeveloped land to an urbanized community, particularly south of the City of Cumming. With that change, the County has experienced change in its most basic form: increasing demand and requests to convert large estate or agricultural properties to new subdivisions.

Forsyth County is well positioned for economic growth. With large, greenfield sites in north Fulton County becoming increasingly scarce or expensive, the march of growth up GA 400 is expected to continue. Sites with good highway access will be sought after, drawing retail, mixed-use, and office development to south Forsyth County. Meanwhile, older existing retail centers should see redevelopment or re-tenanting opportunities to serve the educated and affluent households coming to the County. Assets such as Lanier Tech, University of North Georgia (UNG)-Cumming campus, and Northside Hospital-Forsyth, should help to provide skilled jobs for local workers.

Forsyth County has a broad range of community, natural, and historic and cultural resources. The County has made a concerted, ongoing effort to invest in its community facilities and services. These facilities will help meet existing needs for park space and services, and are largely located in the areas with the most space for growth. Future development will need to be mindful of both natural and cultural resources. Because of the County's location on Lake Lanier and in the Chattahoochee Basin, future development not only impacts the County's residents, but may have effects on the water supply downstream. To maintain Forsyth County's character, development will also need to consider the remaining agricultural lands and historic and cultural resources.

A large percentage of Forsyth County's housing stock can be characterized as newer units (constructed since 1990) that supports a family-oriented and relatively wealthy community. Although rents and housing values of owner-occupied units are high when compared to neighboring counties, there do not appear to be unique housing affordability issues specific to Forsyth County when compared to other nearby counties. The County has seen an uptick in multi-family housing units in recent years, but the numbers are still minimal when compared to the high concentration of single-family homes. There is an abundance of single family housing, and commercial development tends to be located along major transportation routes.

Increased levels of congestion are a principal concern for County residents. These concerns include congestion, lack of transportation connectivity east-west, over reliance on GA 400, and increasing road capacity.

Residents often express frustration with the current rapid pace of development flowing into the County. Recognizing the market pressures for growth and the rights of private property owners, residents acknowledge that future growth will occur; however, they desire high-quality development that is coupled with supportive infrastructure in a pattern that allows for the preservation of some rural land.

Forsyth County Existing Land Use Map

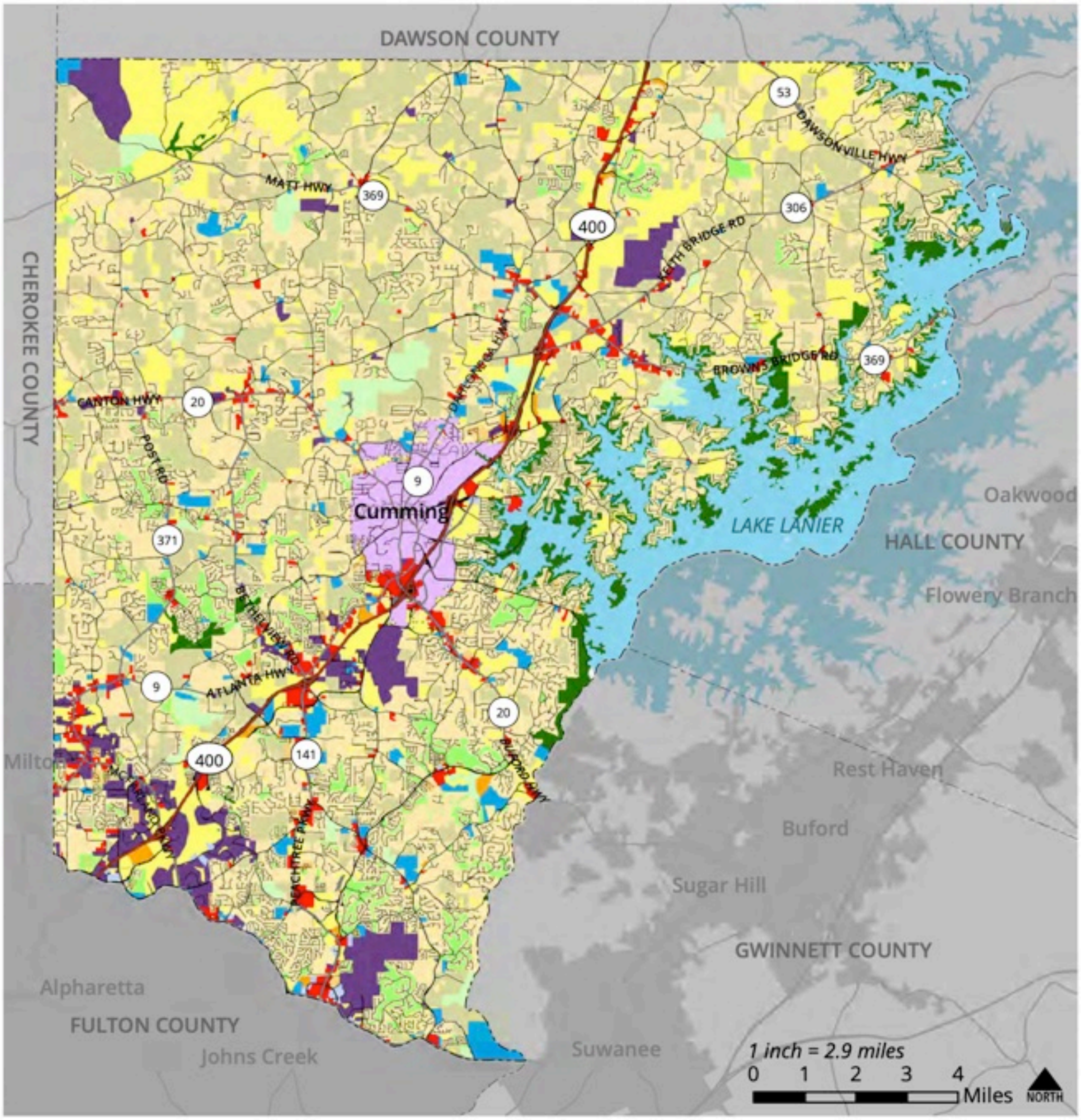


Figure A.50:Existing Land Use (2016 Update)

- Public Parks/Recreation
- Private Open Space
- Conservation
- Transportation/Comms/Utilities
- City of Cumming
- Right of Way
- Undeveloped
- Agriculture
- Institutional/Public
- Attached Single Family
- Detached Single Family
- Multi-Family
- Commercial
- Industrial
- Office

Forsyth County Character Area Map

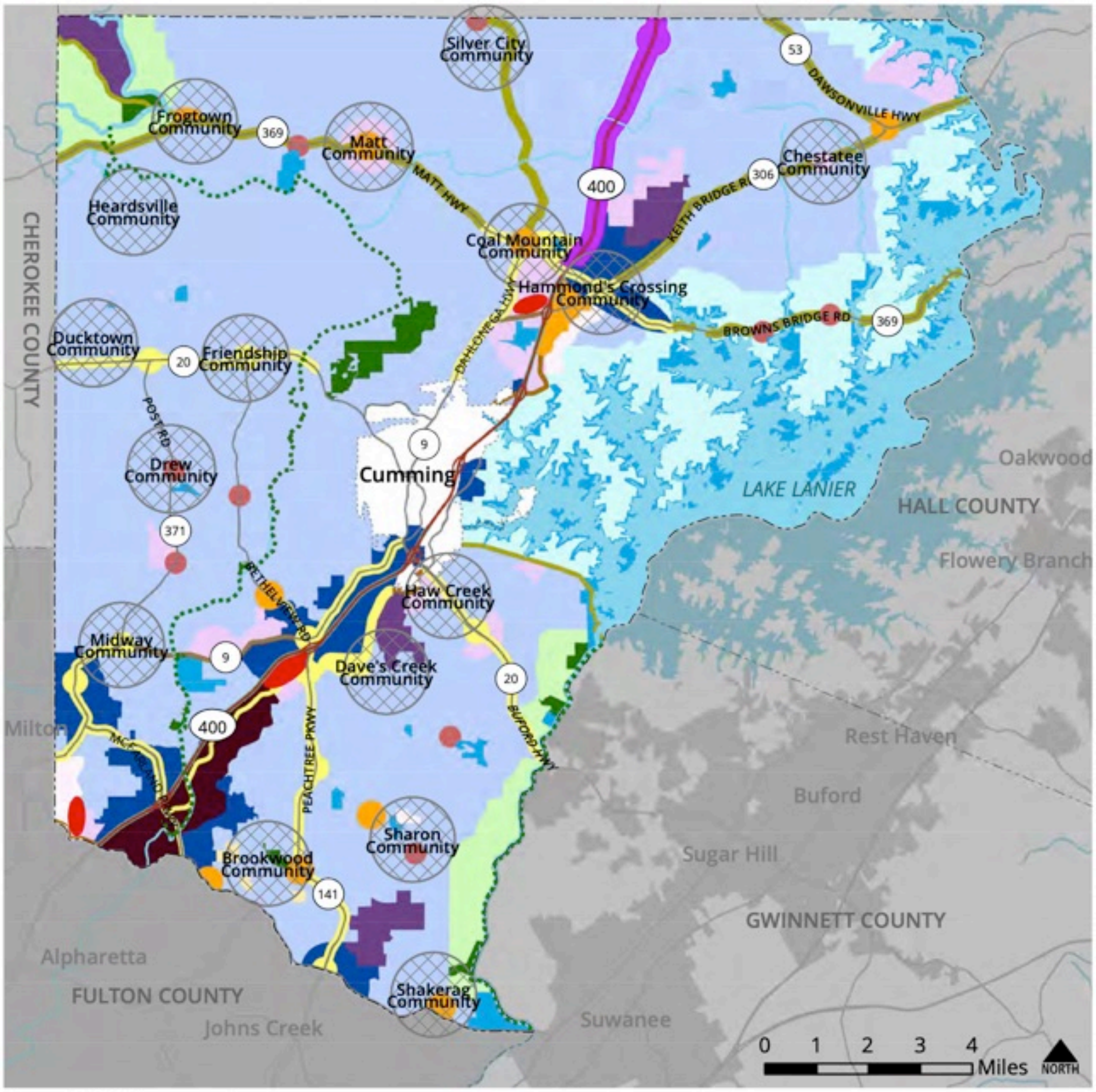


Figure A.59: Character Areas

- Development Corridor
- Neighborhood Center
- Town Center
- Regional Center
- Employment Center
- Major Highway Corridor
- Business and Retail Pkwy Corridor
- McFarland-Stoney Point LCI
- Heavy Industrial
- Lakeside Residential
- River Residential
- Estate Residential
- Suburban Living
- Suburban Attached Living
- Village Living
- Transitional Corridor
- Recreation Area
- Thoroughfare
- Conservation Area
- Conservation Area
- Community Node

Source: GIS Department, Forsyth County Georgia

Local Capabilities
Local mitigation capabilities are existing authorities, policies, programs and resources that reduce hazard impacts or that could be used to implement hazard mitigation activities.

Plan, Code/Ordinance, Tool or Funding Method	In place to address hazard mitigation by following jurisdictions (F=Forsyth C=Cumming)	Adequately utilized or enforced to address hazard mitigation	Updated regularly or as required by law	Notes
Comprehensive Plan	F, C	Y	Y	2017-2037
Local Emergency Operations Plan (LEOP)	F	Y	Y	2016 update
Transportation Plan	F	Y	Y	2021 update
Community Wildfire Protection Plan (CWPP)	F, C	Y	Y	updated as required
Building Code	F, C	Y	Y	2021 International Building Code
Site Plan Review	F, C	Y	Y	process continuously updated
ISO Rating	F, C	Y	Y	ISO 3
Zoning Ordinance	F, C	Y	Y	Unified Development Code v.47 2016
Subdivision Ordinance	F, C	Y	Y	Unified Development Code v.47 2016
Floodplain Ordinance	F, C	Y	Y	as required by NFIP participation
Planning Commission	F	Y	Y	5-member board
Hazard Mitigation Planning Committee (HMPC)	F, C	Y	Y	2021 HMP update in progress
Debris Management Plan	F	Y	Y	2021
Mutual Aid Agreements	F, C	Y	Y	State and local jurisdictions
Mass Notification System	F	Y	Y	Swiftreach
Grant Writing	F, C	Y	NA	staff grant writers
CERT Team	F	Y	Y	education & training ongoing
Public outreach & education programs	F	Y	Y	see mitigation actions chart
GEMA School Safety Plan	F	Y	Y	updated annually & submitted to local EMA and GEMA
Storm Ready Certification	F	Y	Y	updated regularly
Capital improvement projects	F, C	Y	NA	see mitigation actions chart
Impact fees	F, C	Y	NA	enacted in 2004
Bonds, taxes, utility fees	F, C	Y	NA	ongoing
Hazard Risk Analysis (UGA)	F, C	Y	Y	2022

Chapter 5
Hazard Mitigation Goals, Objectives, & Actions

When Forsyth County and the City of Cumming begin any large-scale planning effort, it is imperative that the planning process is driven by a clear set of goals and objectives. Goals and objectives are the foundation of an effective Hazard Mitigation Plan. They address the key problems and opportunities to help establish a framework for identifying risks and developing strategies to mitigate those risks. During the planning process, Forsyth County's multi-jurisdictional Hazard Mitigation Planning Committee (HMPC) reviewed the previous plan and took into consideration community growth and minor changes that were made to infrastructure in order to evaluate to what extent the previously identified hazards had affected the jurisdictions since the last plan revision. While this information was used to review all of the goals, objectives, and action items from the previous plan for relevance and usability, there were no changes in overall priorities identified at the time of this plan update.

In order to fully understand the hazard mitigation goals, objectives, and actions, it is necessary to clearly define the terms **"goal"**, **"objective"**, and **"action"**:

A **goal** is a broad-based statement of intent that establishes the direction for the Forsyth County Hazard Mitigation Plan. Goals can essentially be thought of as the desired "outcomes" of successful implementation of the Plan.
An **objective** is the stated "means" of achieving each goal, or the tasks to be executed in the process of achieving goals.
An **action** is a project-specific strategy to mitigate a particular hazard event within the context of the overarching goals and objectives.

While specific mitigation actions are listed later in this chapter, it is important to note that the actions were selected and evaluated in relation to the overarching hazard mitigation goals and objectives of this plan, which are as follows:

Goal #1. Protect life and minimize loss of property damage.

Objective 1-1. Implement mitigation actions that will assist in protecting lives and property by making homes, businesses, public facilities, and infrastructure more resistant to vulnerable hazards.
Objective 1-2. Review existing ordinances, building codes, and safety inspection procedures to help ensure that they employ the most recent and generally acceptable standards for the protection of buildings.
Objective 1-3. Ensure that public and private facilities and infrastructure meet established building codes and enforce the codes to address any deficiencies.
Objective 1-4. Implement mitigation actions that encourage the protection of the environment.

Objective 1-5. Integrate the recommendations of this plan into existing land use plans and capital improvement programs.
Objective 1-6. Build upon past databases to ensure that vulnerable hazards' risks are accurate.
Goal #2. Increase Public Awareness.

Objective 2-1. Develop and implement additional education and outreach programs to increase public awareness of the risks associated with hazards and on specific preparedness activities available.
Objective 2-2. Encourage homeowners and businesses to take preventative actions and purchase hazard insurance.

Goal #3. Encourage Partnerships.

Objective 3-1. Strengthen inter-jurisdictional and inter-agency communication, coordination, and partnerships to foster hazard mitigation actions designed to benefit multiple jurisdictions.
Objective 3-2. Identify and implement ways to engage public agencies with individual citizens, nonprofit organizations, business, and industry to implement mitigation activities more effectively.

Goal #4. Provide for Emergency Services.

Objective 4-1. Where appropriate, coordinate and integrate hazard mitigation actions with existing emergency operations plans.
Objective 4-2. Identify the need for, and acquire, any special emergency services and equipment to enhance response capabilities for specific hazards.
Objective 4-3. Encourage the establishment of policies to help ensure the prioritization and implementation of mitigation actions designed to benefit critical facilities, critical services, and emergency traffic routes.

Format Utilized to Develop Mitigation Actions

The HMPC reviewed each jurisdiction's annual budget, multiyear work programs, and comprehensive plans to determine existing mitigation actions that met the goals and objectives of this Plan. The committee then developed a list of tentative mitigation actions based on committee members' personal knowledge, interviews with other officials of each jurisdiction, and knowledge of successful actions implemented in other communities.

The committee members developed a prioritized list of mitigation actions utilizing the GEMA recommended STAPLEE prioritization methodology, with special emphasis on the following:

1. Cost effectiveness (and when potential federal projects are anticipated, cost-benefit reviews will be conducted prior to application);
2. Comprehensiveness, i.e. addresses a specific goal and objective;
3. Addresses reducing effects of hazards on new and existing buildings and infrastructure;
4. Addresses reducing effects of hazards on critical facilities where necessary; and,
5. Identification of future public buildings and infrastructure (Note: recognizing that the Plan may be modified and evaluated during the monitoring and evaluation period, and will definitely be completely updated within the federally mandated five year approval cycle, future development including future buildings will only include the five year period from Plan completion).

Each individual HMPC member, or non-member participant, was provided with information on the STAPLEE method and asked to prioritize the list of mitigation actions according to the criteria, with special emphasis on what they would consider most beneficial to the community. Once this information was received from participating individuals, these individual prioritization rankings of mitigation actions were composited to represent the consensus of the HMPC.

Through this prioritization process, several projects emerged as being a greater priority than others. Some of the projects involved expending considerable amounts of funds to initiate the required actions. Most projects allowed the community to pursue completion of the project using potential grant funding. Still others required no significant financial commitment by the community. All proposed mitigation actions were evaluated to determine the degree to which the County would benefit in relation to the project costs. After a final review by the HMPC, the composited prioritization list of mitigation measures, as presented within this Plan, was determined.

This same method of prioritization was utilized for the prior update to this Plan. Additionally, it was reviewed by the HMPC during the current plan update process and approved for continued use due to its effectiveness. No changes were recommended.

Mitigation Actions

Each mitigation action is presented by jurisdiction, or in the case of joint actions by multiple jurisdictions, or by independent public bodies, or by private nonprofits, in priority order (objective), by best estimate of cost, if applicable, by potential funding source if other than operating budgets, by department or agency that will administer the action, and by timeframe. Timeframes do not begin until funding is obtained for any particular project unless otherwise indicated.

The City of Cumming have relatively small populations when compared to that of the County. Due to limited financial and human resources, much support with regard to public safety is provided by Forsyth County. This includes assistance with emergency management, fire protection, and law enforcement. The City does have some capability, but it is augmented by the County. Therefore, many mitigation actions included on behalf of the County in the Plan are likely to have an indirect benefit for the City of Cumming. Other mitigation actions are fully supported and actively engaged by multiple jurisdictions.

Many of the mitigation actions included within this Plan update are carried over from the previous 5-year planning period. Some of these action items were left unchanged while others were revised as needed. This is not uncommon in the more rural counties of North Georgia. It is not a result of failure to review existing mitigation actions carefully or to consider new ones. Rather, it is primarily the result of the unavailability of funding, whether that be general funds, private and private grants, or other sources. The HMPC selects mitigation actions during the planning process based upon perceived benefit, not based upon likelihood of funding opportunities. To do otherwise would result in a very short list of mitigation actions.

Each mitigation action listed in the Mitigation Actions Chart on the pages that follow is designed to mitigate one or more hazards discussed in this Plan. Those specific hazards are listed for each mitigation action at the end of each mitigation action description. The term “All” as used in the “Hazards Addressed” section below refers to all hazards discussed in this Plan. Each mitigation action listed may be supported by one or more jurisdictions. Mitigation actions that will be joint projects between all jurisdictions are listed under the “Jurisdictional Participants” section as “All.” Each mitigation action that follows mitigates the effects of hazards on existing structures/infrastructure, future structures/infrastructure, or both, as indicated. In addition, the status of each mitigation action that follows is indicated by one of the following three terms:

PRELIMINARY – unfunded projects or projects in planning stages.
IN PROGRESS – funded projects that have begun but aren’t completed.
ONGOING – continuous projects that are never truly completed; may be funded or unfunded at any given time but are expected to continue unless removed from Plan.
**Note: fully completed or deleted projects are not found below, but in Appendix D.*

Priority	Mitigation Action	Hazard	Jurisdictions Involved	Project Implemented by	Project Status	Cost Estimate	Project Length	Goals and Objectives	Structures & Infrastructure Impacted
1	Watershed Improvement Project / Stream Bank Restoration	Flooding	F	FC Engineering Dept	In progress	$1 million	5 years	1-1, 1-4	Existing
2	Debris Management Plan	All	F, C	EMA	In progress	$25K	1 year (estimated completion 2021)	1-6, 3-1, 3-2, 4-1, 4-2, 4-3	Existing and Future
3	Dam Inspections once every 5 years (partially complete in that Pine Lake Dam inspected quarterly, project will remain ongoing)	Dam Failure, Flooding	F, C	FC Planning Dept	Ongoing	Staff time	5 years	1-1, 1-2, 1-3, 1-4	Existing
4	Rerouting Vulnerable Water Lines from GA 400 Overpasses	All	C	Cumming Utilities Dept	Preliminary	$1.8 million	2 years	1-1	Existing and Future
5	Advanced Water Reclamation Facility Security System	All	C	Cumming Utilities Dept	Preliminary	$15K	6 months	1-1, 4-2	Existing
6	Water Distribution & Collection Division Shop Security System	All	C	Cumming Utilities Dept	In progress	$20K	1 year	1-1, 4-2	Existing
7	Forsyth County Water Treatment Facility – Backup Generator	All	F	FC Water & Sewer Dept	Preliminary	$2 million	1 year	1-1, 4-2	Existing
8	City of Cumming stormwater system improvements (see complete list in appendix)	Flooding	C	City of Cumming Utlities Dept	Preliminary	$10 million+	5 years	1-2, 1-3, 1-6, 2-1, 2-2, 4-3	Existing and Future
9	Reverse Osmosis Water Purification Unit	All	F, C	FC Water & Sewer Dept, and Cumming Utilities Dept	In progress	$150K	1 year	1-1, 4-2	Existing
10	Backup Generators for Critical Facilities and Infrastructure	All	F, C	EMA	Ongoing	Up to $100K each	5 years	1-1, 4-2	Existing
11	Culvert / Pipe Upgrades	Flooding, Severe Tstorm	F, C	FC Roads & Bridges Dept	Ongoing	$200K per year	5 years	1-1, 1-3	Existing
12	Outdoor Warning Sirens	Tornado	F, C	EMA	In progress	$25,000 per unit	5 years	1-6, 4-2	Existing and Future
13	GIS Aerial Imagery	All	F, C	FC GIS Dept	Ongoing	$200K per update – every 2 years	2 years	1-6	Existing
14	Storm Shelter	Tornado, Severe Thunderstorm, Winter Storm	F, C	EMA	Preliminary	$30,000	5 years	1-3, 2-1	Existing and Future
15	NOAA Weather Radios (mitigation funded)	All	F, C	EMA	Ongoing	$50K	5 years	4-2	Existing and Future

Priority	Mitigation Action	Hazard	Jurisdictions Involved	Project Implemented by	Project Status	Cost Estimate	Project Length	Goals and Objectives	Structures & Infrastructure Impacted
16	Road Maintenance – sanding, salting, snow equipment	All	F, C	FC Roads & Bridges and Cumming Street Dept	Ongoing	$100K per year	5 years	1-1, 1-3, 4-1, 4-2	Existing
17	Public Awareness Campaigns including PSAs, forums, mailings, flyers, and electronic communications	All	F, C	EMA	Ongoing	$15K per year	5 years	2-1, 2-2, 3-2, 4-3	Existing and Future
18	Etowah River Flooding – Old Federal Rd / Nicholson Rd Engineering Study	Flooding	F, C	FC Engineering Dept, Cumming Planning Dept	In Progress	$60K	5 years	1-1, 1-3, 4-1	Existing and Future
19	Big Creek Flooding Engineering Study	Flooding	F	FC Engineering Dept	In Progress	$60K	5 years	1-1, 1-3, 4-1	Existing and Future
20	Sawnee Creek Flooding	Flooding	C	Cumming Planning Dept	Preliminary	Need from City	5 years	1-1, 1-3, 4-1	Existing and Future
21	Mill Branch Flooding	Flooding	C	Cumming Planning Dept	Preliminary	$50K	5 years	1-1, 1-3, 4-1	Existing and Future
22	Community Rating System	Flooding	F, C	FC Planning Dept, Cumming Planning Dept	Ongoing	Staff time	5 years	1-2, 1-3, 1-6, 2-1, 2-2, 4-3	Existing and Future
23	Acquisition/Relocation Projects	Flooding	F, C	FC Engineering Dept, Cumming Planning Dept	Preliminary	$500K per year	5 years	1-1, 1-3, 4-1	Existing and Future
24	Fuel Reduction Plan	Wildfire	F, C	FC Fire Dept	Preliminary	$100K per year	5 years	1-1, 1-4, 1-6, 3-1, 4-1	Existing
25	Community Wildfire Protection Plan (updated every five years)	Wildfire	F, C	FC Fire Dept	Ongoing	Staff time	5 years	1-1, 1-4, 1-5, 1-6, 3-1, 4-1	Existing and Future
26	Power Line Maintenance	All	F, C	Sawnee EMC, Georgia Power	Ongoing	Costs borne by private utilities	5 years	1-1, 1-3, 1-4, 1-5, 3-1, 3-2	Existing
27	GEMA School Safety Plan (updated annually)	All	F, C	EMA	Ongoing	Staff time	1 year	1-1, 1-2, 1-3, 4-1	Existing
28	Hazmat Vehicle	Hazmat Release	F, C	FC Fire Dept	In progress	$250K	1 year	4-1, 4-2	Existing and Future
29	Response Training on Ammonia, Chlorine Gas, Natural Gas, Propane Releases & Petroleum Products	Hazmat Release	F, C	FC Fire Dept	Ongoing	$100K per year	5 years	4-1, 4-2	Existing and Future
30	Floating River Boom (PIGS)	Hazmat Release	F, C	FC Fire Dept	Ongoing	$50K	5 years	4-1, 4-2	Existing and Future
31	Sheriff's Office Equipment	All	F	FCSO	Preliminary	$75K	5 years	4-2	Existing
32	Radiological Detection equipment	Hazmat Release	F, C	EMA	Preliminary	$40K	5 years	4-1, 4-2	Existing and Future

Priority	Mitigation Action	Hazard	Jurisdictions Involved	Project Implemented by	Project Status	Cost Estimate	Project Length	Goals and Objectives	Structures & Infrastructure Impacted
33	Additional Fire Stations and Engines (partially completed – new Fire Station No. 11, but overall project will remain ongoing)	All	F	FC Fire Dept	Ongoing	$34 million for total ISO compliance; $685K per pumper, $1.3 million per hook & ladder		4-1, 4-2, 4-3	Existing and Future
34	Increased Fire Dept Staffing – 375 additional firefighter	All	F	FC Fire Dept	Ongoing	$46,000 per employee	5 years	4-1, 4-3	Existing and Future
35	Special Needs Shelters	All	F, C	EMA	Preliminary	$150K	5 years	1-3, 2-1	Existing and Future
36	Fire Boat	All	F, C	FC Fire Dept	In progress	$2 million	3 years	4-1, 4-2	Existing and Future
37	Forsyth County Major Transportation Plan Update	All	F, C	FC Engineering Dept, Cumming Planning Dept	In progress	$250K	7 months	1-1, 1-3, 1-5, 1-6, 3-1, 4-1, 4-3	Existing and Future
38	Bomb Team Coordination	Hazmat Release	F, C	FC Fire Dept	In Progress	Staff time	5 years	3-1, 4-2	Existing and Future
39	Public Safety emergency shelter and supplies	All	F, C	EMA	Preliminary	$250K	2 years	1-3, 2-1	Existing and Future
40	IPAWS	All	F, C	EMA	Preliminary	$20K	1 year	3-1, 3-2, 4-1, 4-3	Existing and Future
41	EOC Redundant Communications for internet service	All	F, C	EMA	Preliminary	$40K	6 months	3-1, 4-1, 4-2	Existing and Future

Chapter 6
Executing the Plan

6.1 – Action Plan Implementation

The hazard mitigation planning process was overseen by the Forsyth County Emergency Management Agency. Facilitation of the planning process was conducted by North Georgia Consulting Group, LLC. Once GEMA completes its initial review of this Plan, it will be presented to the Forsyth County Board of Commissioners for consideration. Once adopted, the Forsyth County EMA Director shall assume responsibility for the maintenance of the Plan. It shall be the responsibility of the EMA Director to ensure that this Plan is utilized as a guide for initiating the identified mitigation measures within the community. The EMA Director shall be authorized to convene a committee to review and update this Plan annually. The Plan will also have to be updated and resubmitted once every five years. Through this Plan updating process, the EMA Director shall identify projects that have been successfully undertaken in initiating mitigation measures within the community. These projects shall be noted within the planning document to indicate their completion. Additionally, the committee called together by the EMA Director shall help to identify any new mitigation projects that can be undertaken in the community.

Members of the HMPC prioritized the potential mitigation measures identified in this Plan. A list of mitigation goals, objectives and related action items was compiled from the inputs of the HMPC, as well as from others within the community. The subcommittee prioritized the potential mitigation measures based on what they considered most beneficial to the community. Several criteria were established to assist HMPC members in the prioritization of these suggested mitigation actions. Criteria included perceived cost benefit or cost effectiveness, availability of potential funding sources, overall feasibility, measurable milestones, multiple objectives, and both public and political support for the proposed actions. Through this prioritization process, several projects emerged as being a greater priority than others. Some of the projects involved expending considerable amounts of funds to initiate the required actions. Most projects allowed the community to pursue completion of the project using potential grant funding. Still others required no significant financial commitment by the community. All proposed mitigation actions were evaluated to determine the degree to which the County will benefit in relation to the project costs. After review by the HMPC, the prioritized list of mitigation measures, as presented within this Plan, was determined.

6.2 – Evaluation

As previously stated, the Forsyth County EMA Director will be charged with ensuring that this plan is monitored and updated at least annually or more often if deemed necessary. The method of evaluation will consist of utilizing a checklist to determine what mitigation actions were undertaken, the completion date of these actions, the cost associated with each completed action, and whether actions were deemed to be successful. A committee, perhaps with much of the same membership as the existing HMPC, will convene in order to accomplish the annual plan evaluation. Additionally, the EMA Director is encouraged to maintain a schedule of regular meetings, either quarterly or semiannually to preserve continuity throughout the continuing process. These meetings will provide an opportunity to discuss the progress of the action items and maintain the partnerships that are essential for the sustainability of the HMP. The EMA Director will ensure the results of the evaluation(s) are reported to the Forsyth County Board of Commissioners, as well as to any agencies or organizations having an interest in the hazard mitigation activities identified in the plan.

6.3 – Multi-Jurisdictional Strategy and Considerations

As set forth by Georgia House Bill 489, the Emergency Management Agency is the overall implementing agency for projects such as hazard mitigation. Forsyth County will work in the best interests of the County as well as the City of Cumming. Each of these municipalities played an active role in the planning process. Participation from each jurisdiction was solicited and received by Forsyth County EMA. As a result, a truly multi-jurisdictional plan was created for Forsyth County and the City of Cumming, with ideas and viewpoints of all participants included.

6.4 – Plan Update and Maintenance

According to the requirements set forth in the Disaster Mitigation Act of 2000, Forsyth County is required to update and revise the Hazard Mitigation Plan every five years. However, the Hazard Mitigation Planning Committee will meet on the plan approval anniversary date of every year, or within 30 days of said date as determined and scheduled by the EMA Director, to complete a review of the Hazard Mitigation Plan. At each such meeting, the HMPC will review the main facets of the HMP including the vulnerability assessment, critical facilities inventory, and mitigation goals, objectives, and actions. All revisions will be posted to the County website for public review and comment. Further revisions may take place based upon public comments received.

It is during this review process that the mitigation strategies and other information contained within the Hazard Mitigation Plan are considered for incorporation into other planning mechanisms as appropriate. Opportunities to integrate the requirements of this HMP into other local planning mechanisms will continue to be identified through future meetings of the HMPC on an annual basis.

The HMPC recognizes the need to integrate other plans, codes, regulations, procedures and programs into future Hazard Mitigation Plan (HMP) updates. This plan is multi-jurisdictional; therefore the mechanism for implementation of various mitigation plan items may vary by jurisdiction. This includes reviewing other local planning documents, processes or mechanisms for possible integration with the HMP.

To Be Reviewed in Future Update

Existing planning mechanisms	**Method of use in Hazard Mitigation Plan**
Comprehensive Plan (multi-jurisdictional)	Development trends
Local Emergency Operations Plan	Identifying hazards; Assessing vulnerabilities
Storm Water Management / Flood Damage Protection Ordinance	Mitigation strategies
Building and Zoning Codes and Ordinances	Development trends; Future growth
Mutual Aid Agreements	Assessing vulnerabilities
State Hazard Mitigation Plan	Risk assessment
Land Use Maps	Assessing vulnerabilities; Development trends; Future growth
Critical Facilities Maps	Locations
Community Wildfire Protection Plan	Mitigation strategies

It will be the responsibility of each participating jurisdiction to determine additional implementation procedures when appropriate.

During the planning process for new and updated local planning documents such as a comprehensive plan or Local Emergency Operations Plan, the EMA Director will provide a copy of the HMP to the appropriate parties. It will be recommended that all goals and strategies of new and updated local planning documents be consistent with, and support the goals of, the HMP and will not contribute to increased hazards in the affected jurisdiction(s).

Although it is recognized that there are many benefits to integrating components of this plan into other local planning mechanisms, and that components are actively integrated into other planning mechanisms when appropriate, the development and maintenance of this stand-alone HMP is deemed by the committee to be the most effective method to ensure implementation of local hazard mitigation actions at this time. Therefore, the review and incorporation efforts made in this update and the last, which consisted of a simple review of the documents listed in the chart above by various members of the HMPC, are considered successful by the HMPC and will likely be utilized in future updates.

The County's EMA is committed to incorporating hazard mitigation planning into its Local Emergency Operations Plan and other public emergency management activities. As the EMA Director becomes aware of updates to other County or City plans, codes, regulations, procedures and programs, the Director will continue to look for opportunities to include hazard mitigation into these mechanisms.

The Forsyth County HMPC will reconvene not later than the fourth anniversary of the plan approval anniversary date, as determined and scheduled by the EMA Director, to begin planning for the formal Hazard Mitigation Plan revision process. The revision process will include a clear schedule and timeline, and identify any agencies or organizations participating in the plan revision. The committee will review the mitigation goals, objectives and actions to determine their relevance to changing situations within the different jurisdictions, as well as changes in State or Federal policy, and to ensure current and expected conditions are being addressed. The HMPC will also review the prior vulnerability assessments to determine if this information should be updated or modified, given any new available data.

Forsyth County is dedicated to involving the public directly in reviews and updates of the HMP. During the plan revision process, the committee will conduct, at a minimum, two public hearings during the revision process. These public hearings will provide the public a forum for which they can express their concerns, opinions, or ideas about the Plan. Additionally, if persons from the community express interest in participation in the planning process, they will be provided the opportunity, via meetings, the County website, social media, and/or public forums, to suggest possible mitigation measures for the community. Documentation will be maintained to indicate all efforts at continued public involvement. All relevant information will be forwarded to GEMA and FEMA as a product of the proposed plan revision. Public involvement activities will continue throughout the 5-year planning cycle and will be evaluated for effectiveness by the HMPC next planning cycle.

The EMA Director will ensure the revised plan is presented to the governing body of each jurisdiction for formal adoption. In addition, all holders of the HMP will be notified of affected changes. The EMA Director shall submit a revised Hazard Mitigation Plan not later than the five-year anniversary of the most recently updated HMP to the Georgia Emergency Management Agency for review and subsequent submittal to the Federal Emergency Management Agency for ultimate approval.

Once approved by FEMA, copies of the Forsyth County Hazard Mitigation Plan will be provided by the EMA Director to the appropriate governmental jurisdictions, agencies, and/or departments for review and possible inclusion into plans and programs. The HMP will be distributed by the EMA Director to the appropriate officials to allow them to review the Plan and determine to what extent the Plan should be integrated into, or referenced by, other plans and programs. Limitations may be placed on certain sensitive information by the EMA Director.

Chapter 7
Conclusion

7.1 – Summary

Forsyth County has gained a great deal of knowledge relating to the County's disaster history and future potential for disaster as a result of the hazard mitigation planning process. This includes an extensive hazard history of recorded hazard events from the past fifty years, a detailed critical facilities database with valuable information on some of most critical county and city structures, as well as some valuable ideas from the community abroad concerning measures that should be considered for future hazard mitigation. Community involvement has been at the heart of this effort. Not only did the planning process include the creation of a Hazard Mitigation Planning Committee with representatives from all walks of life, but two public hearings were conducted to provide all Forsyth County citizens with the opportunity to comment on, and offer suggestions concerning potential hazard mitigation measures within the community. Forsyth County and the City of Cumming all worked in concert to ensure a broad range of citizens were represented. Elected officials, local government employees, public safety officials, Red Cross representatives, GA Forestry representatives, businesspersons, media, and other volunteers and interested parties provided important varying viewpoints to create a workable Plan. GEMA and NGCG provided valuable assistance as well. These efforts have all had the effect of better protecting our Community from the threats of nature and technology. While it would be naïve to believe this Plan provides complete protection to Forsyth County and its residents, it is the hope of all parties involved in this planning process that the recommended mitigation measures contained within the Plan will provide some level of increased preparedness as well as spur further discussion and planning related to the important subject of Hazard Mitigation.

7.2 – References

Publications/Documents:
The Disaster Mitigation Act of 2000
Robert T. Stafford Disaster Relief and Emergency Assistance Act
FEMA Pre-Disaster Mitigation *How-to Guides #1, 2, 3, 7*
GEMA Supplements to FEMA Pre-Disaster Mitigation How-to Guides
Georgia Tornado Database 1808 – 2002 (Westbrook)
Earthquake Information Bulletin, Volume 3, Number 6, November-December 1971
Forsyth County Hazard Mitigation Plan

Web Sites:
www.fema.gov (FEMA)
www.usfa.fema.gov (USFA)
www.fs.fed.us (USFS Fire Danger Class)
www.cpc.ncep-noaa.gov (Drought Severity Index)
www.ncdc.noaa.gov (National Climatic Data Center)
http://eqint.cr.usgs.gov (USGS Earthquake Probability Maps)
www.tornadoproject.com (Tornado Project Online)
www.disastercenter.com (The Disaster Center)
www.gema.state.ga.us (GEMA)
www.gfc.state.ga.us (GFC)
www.georgiadrought.org (Drought in Georgia)
www.weather.com (The Weather Channel)
www.accuweather.com (AccuWeather)

Other Sources:
American Red Cross
American Society of Civil Engineers
Forsyth County
City of Cumming
Federal Emergency Management Agency
Georgia Department of Natural Resources
Georgia Emergency Management Agency
Georgia Forestry Commission
Georgia Safe Dams Program
National Climatic Data Center
National Oceanic & Atmospheric Administration
National Weather Service
U.S. Army Corps of Engineers
U.S. Census Bureau
U.S. Fire Administration
U.S. Forest Service
U.S. Geological Survey

Appendices

Appendix A – Critical Facilities Database

Appendix B – Hazard History Database

Appendix C – Hazard Frequency Table

Appendix D – Worksheet 3a Forms

Appendix E – Hazard Risk Analysis (UGA)

Appendix F – GMIS Reports

Appendix G – Other Planning Documents

Appendix H - Glossary