APPENDIX C

OTHER PLANNING DOCUMENTS

Burke County Emergency Management Agency

Emergency Operations Plan

Plan Approved:
28-JAN-13

Revised:
16-JUL-18

Distribution List

Agency	Number of Copies
American Red Cross, Augusta Chapter	1
Burke Co. Board of Education-Transportation Dept.	1
Burke County Board of Commissioners	1
Burke County Board of Education	1
Burke County Board of Education	1
Burke County Building Inspector	1
Burke County DFACS Office	1
Burke County DFACS Office	0
Burke County Emergency Management Agency	0
Burke County Emergency Management Agency	2
Burke County Extension Agent	1
Burke County Fire Rescue	1
Burke County Health Department	1
Burke County High School	0
Burke County Roads Department	1
Burke County Sheriffs Office	1
Burke County Transit System	0
Burke Medical Center	1
City of Girard	1
City of Keysville	1
City of Midville	1
City of Sardis	1
City of Vidette	1
City of Waynesboro	1
Coroner's Office of Burke County	1
Georgia Forestry Commission	1
Magistrate Court of Burke County	0
Probate Court of Burke County	0
Waynesboro Department of Public Works	0
Waynesboro Fire Department	0
Waynesboro Police Department	0

Burke County
EMERGENCY OPERATIONS PLAN

Local Resolution

Record of Revisions

Distribution List

TABLE OF CONTENTS

PREFACE

This Emergency Operations Plan (EOP) describes the management and coordination of resources and personnel during periods of major emergency. This comprehensive local emergency operations plan is developed to ensure mitigation and preparedness, appropriate response and timely recovery from natural and man made hazards which may affect residents of Burke County.

This plan supersedes the Emergency Operations Plan dated from old eLEOP. It incorporates guidance from the Georgia Emergency Management Agency (GEMA) as well as lessons learned from disasters and emergencies that have threatened Burke County. The Plan will be updated at the latest, every four years. The plan:

- Defines emergency response in compliance with the State-mandated Emergency Operations Plan process.
- Establishes emergency response policies that provide Departments and Agencies with guidance for the coordination and direction of municipal plans and procedures.
- Provides a basis for unified training and response exercises.

The plan consists of the following components:

- The Basic Plan describes the structure and processes comprising a county approach to incident management designed to integrate the efforts of municipal governments, the private sector, and non-governmental organizations. The Basic Plan includes the: purpose, situation, assumptions, concept of operations, organization, assignment of responsibilities, administration, logistics, planning and operational activities.
- Appendices provide other relevant supporting information, including terms, definitions, and authorities.
- Emergency Support Function Annexes detail the missions, policies, structures, and responsibilities of County agencies for coordinating resource and programmatic support to municipalities during Incidents of Critical Significance.
- Support Annexes prescribe guidance and describe functional processes and administrative requirements necessary to ensure efficient and effective implementation of incident management objectives.
- Incident Annexes address contingency or hazard situations requiring specialized application of the EOP. The Incident Annexes describe the missions, policies, responsibilities, and coordination processes that govern the interaction of public and private entities engaged in incident management and emergency response operations across a spectrum of potential hazards. Due to security precautions and changing nature of their operational procedures, these Annexes, their supporting plans, and operational supplements are published separately.

The following is a summary of the 15 Emergency Support Functions:

1. *Transportation*: Support and assist municipal, county, private sector, and voluntary organizations requiring transportation for an actual or potential Incident of Critical Significance.

2. *Communications*: Ensures the provision of communications support to municipal, county, and private-sector response efforts during an Incident of Critical Significance.

3. *Public Works and Engineering*: Coordinates and organizes the capabilities and resources of the municipal and county governments to facilitate the delivery of services, technical assistance, engineering expertise, construction management, and other support to prevent, prepare for, respond to, and/or recover from an Incident of Critical Significance.

4. *Firefighting*: Enable the detection and suppression of wild-land, rural, and urban fires resulting from, or occurring coincidentally with an Incident of Critical Significance.

5. *Emergency Management Services*: Responsible for supporting overall activities of the County Government for County incident management.

6. *Mass Care, Housing and Human Services*: Supports County-wide, municipal, and non-governmental organization efforts to address non-medical mass care, housing, and human services needs of individuals and/or families impacted by Incidents of Critical Significance.

7. *Resource Support*: Supports volunteer services, County agencies, and municipal governments tracking, providing, and/or requiring resource support before, during, and/or after Incidents of Critical Significance.

8. *Public Health and Medical Services*: Provide the mechanism for coordinated County assistance to supplement municipal resources in response to public health and medical care needs (to include veterinary and/or animal health issues when appropriate) for potential or actual Incidents of Critical Significance and/or during a developing potential health and medical situation.

9. *Search and Rescue*: Rapidly deploy components of the National US Response System to provide specialized life-saving assistance to municipal authorities during an Incident of Critical Significance.

10. *Hazardous Materials*: Coordinate County support in response to an actual or potential discharge and/or uncontrolled release of oil or hazardous materials during Incidents of Critical Significance.

11. *Agriculture and Natural Resources*: supports County and authorities and other agency efforts to address: Provision of nutrition assistance; control and eradication of an outbreak of a highly contagious or economically devastating animal/zoonotic

disease; assurance of food safety and food security and; protection of natural and cultural resources and historic properties.

12. *Energy*: Restore damaged energy systems and components during a potential of actual Incident of Critical Significance.

13. *Public Safety and Security Services*: Integrates County public safety and security capabilities and resources to support the full range of incident management activities associated with potential or actual Incidents of Critical Significance.

14. *Long Term Recovery and Mitigation*: Provides a framework for County Government support to municipal governments, nongovernmental organizations, and the private sector designed to enable community recovery from the long-term consequences of an Incident of Critical Significance.

15. *External Affairs*: Ensures that sufficient County assets are deployed to the field during a potential or actual Incident of Critical Significance to provide accurate, coordinated, and timely information to affected audiences, including governments, media, the private sector, and the populace.

Georgia Emergency Operation Plan

2017

Approval and Implementation

The Georgia Emergency Management and Homeland Security Agency maintains the Georgia Emergency Operations Plan and presents the plan to the Governor for adoption once every four years, at a minimum.

The Georgia Emergency Operations Plan was developed by the Georgia Emergency Management and Homeland Security Agency, in coordination with other state agencies, non-governmental organizations and private sector partners and is aligned with the National Incident Management System as well as the National Response Framework and the National Disaster Recovery Framework. In addition, Georgia Emergency Management and Homeland Security Agency modified the Georgia Emergency Operations Plan, its appendices, Emergency Support Function Annexes and Support and Hazard Specific Annexes incorporate lessons learned from exercises, training, incidents and events.

This plan supersedes the Georgia Emergency Operation Plan dated January 2013.

11/13/17

Homer Bryson

Director

Georgia Emergency Management and

Homeland Security Agency

Date

Executive Summary

Georgia is vulnerable to a variety of hazards as identified in the State's Hazard Mitigation Strategy Plan. Thus the Georgia Emergency Operations Plan is written for the entire State Disaster Response Team, to include, but not limited to: all executives, state emergency management personnel, Private-Sector Partners, Non-Governmental Organization partners, local emergency managers, faith-based organizations and any other individuals or organizations expected to support disaster response efforts through emergency management functions.

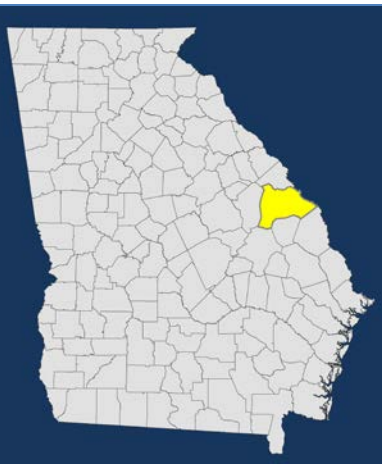
This Plan is intended to clarify expectations for an effective response by state and local officials in support of responders in the field which can save lives, protect property, and more quickly restore essential services.

This document represents decades of planning and coordination between local, state, federal and non-governmental partners operating within or supporting the State of Georgia and is intended to ensure seamless integration of federal and state resources when necessary.

This Plan is consistent with the National Response Framework and supports the local emergency operations plans for all 159 counties within the State.

This Page Intentionally Left Blank

Table of Contents



Hazard Risk Analyses
Supplement to the Burke County Joint Hazard Mitigation Plan

Carl Vinson
Institute of Government
UNIVERSITY OF GEORGIA

TABLE OF CONTENTS

List of Tables

List of Figures

Introduction

The Federal Disaster Mitigation Act of 2000 (DMA2K) requires state, local, and tribal governments to develop and maintain a mitigation plan to be eligible for certain federal disaster assistance and hazard mitigation funding programs.

Mitigation seeks to reduce a hazard's impacts, which may include loss of life, property damage, disruption to local and regional economies, and the expenditure of public and private funds for recovery. Sound mitigation must be based on a sound risk assessment that quantifies the potential losses of a disaster by assessing the vulnerability of buildings, infrastructure, and people.

In recognition of the importance of planning in mitigation activities, FEMA Hazus-MH, a powerful disaster risk assessment tool based on geographic information systems (GIS). This tool enables communities of all sizes to predict estimated losses from floods, hurricanes, earthquakes, and other related phenomena and to measure the impact of various mitigation practices that might help reduce those losses.

In 2018, the Georgia Department of Emergency Management partnered with the Carl Vinson Institute of Government at the University of Georgia to develop a detailed risk assessment focused on defining hurricane, riverine flood, and tornado risks in Burke County, Georgia. This assessment identifies the characteristics and potential consequences of the disaster, how much of the community could be affected by the disaster, and the impact on community assets.

Risk Assessment Process Overview

Hazus-MH Version 2.2 SP1 was used to perform the analyses for Burke County. The Hazus-MH application includes default data for every county in the US. This Hazus-MH data was derived from a variety of national sources and in some cases the data are also several years old. Whenever possible, using local provided data is preferred. Burke County provided building inventory information from the county's property tax assessment system. This section describes the changes made to the default Hazus-MH inventory and the modeling parameters used for each scenario.

County Inventory Changes

The default Hazus-MH site-specific point inventory was updated using data compiled from the Georgia Emergency Management Agency (GEMA). The default Hazus-MH aggregate inventory (General Building Stock) was also updated prior to running the scenarios. Reported losses reflect the updated data sets.

General Building Stock Updates

General Building Stock (GBS) is an inventory category that consists of aggregated data (grouped by census geography — tract or block). Hazus-MH generates a combination of site-specific and aggregated loss estimates based on the given analysis and user input.

The GBS records for Burke County were replaced with data derived from parcel and property assessment data obtained from Burke County. The county provided property assessment data was current as of October 2018 and the parcel data current as of November 2017. Records without improvements were deleted. The parcel boundaries were converted to parcel points located in the centroids of each parcel boundary; then, each parcel point was linked to an assessor record based upon matching parcel numbers. The parcel assessor match-rate for Burke County is 99.4%. The generated building inventory represents the approximate locations (within a parcel) of structures. The building inventory was aggregated by census block. Both the tract and block tables were updated. Table 1 shows the results of the changes to the GBS tables by occupancy class.

Table 1: GBS Building Exposure Updates by Occupancy Class*

General Occupancy	Default Hazus-MH Count	Updated Count	Default Hazus-MH Exposure	Updated Exposure
Agricultural	61	4	$14,975,000	$166,000
Commercial	428	449	$201,505,000	$65,682,000
Education	23	17	$24,082,000	$74,899,000
Government	27	6	$12,648,000	$546,000
Industrial	126	207	$113,160,000	$53,466,000
Religious	98	62	$57,355,000	$9,083,000
Residential	9,093	10,470	$1,244,265,000	$1,070,705,000
Total	9,856	11,215	$1,667,990,000	$1,274,547,000

*The exposure values represent the total number and replacement cost for all Burke County Buildings

For Burke County, the updated GBS was used to calculate hurricane wind losses. The flood losses and tornado losses were calculated from building inventory modeled in Hazus-MH as User-Defined Facility

(UDF)[1], or site-specific points. Figure 1 shows the distribution of buildings as points based on the county provided data.

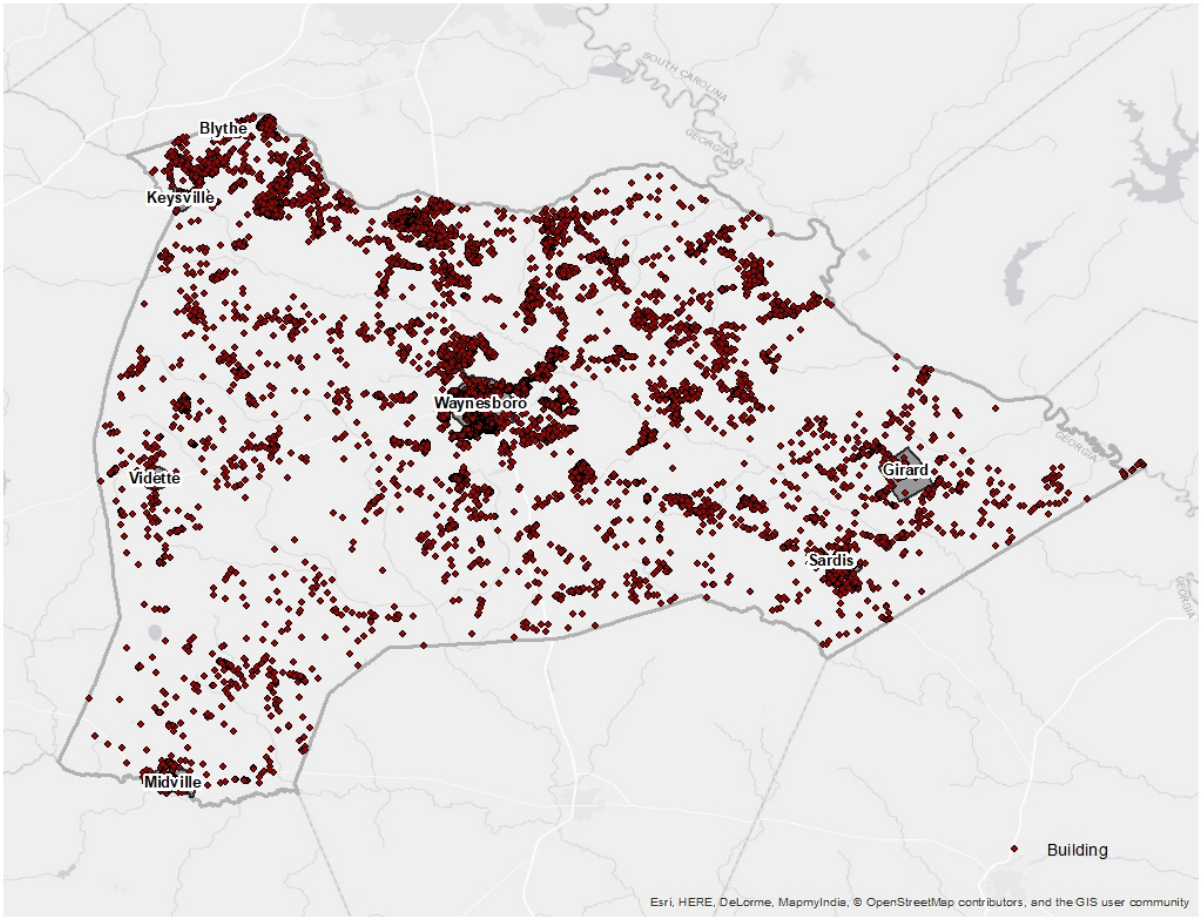


Figure 1: Burke County Overview

Essential Facility Updates

The default Hazus-MH essential facility data was updated to reflect improved information available in the Georgia Mitigation Information System (GMIS) as of October 2018. For these risk analyses, only GMIS data for buildings that Hazus-MH classified as Essential Facilities was integrated into Hazus-MH because the application provides specialized reports for these five facilities. Essential Facility inventory was updated for the analysis conducted for this report. The following table summarizes the counts and exposures, where available, by Essential Facility classification of the updated data.

Essential facilities include:

- Care facilities
- EOCs
- Fire stations
- Police stations
- Schools

[1] The UDF inventory category in Hazus-MH allows the user to enter site-specific data in place of GBS data.

Table 2: Updated Essential Facilities

Classification	Updated Count	Updated Exposure
Blythe		
EOC	0	$0
Care	0	$0
Fire	0	$0
Police	0	$0
School	0	$0
Total	0	$0
Girard		
EOC	0	$0
Care	0	$0
Fire	1	$385,000
Police	0	$0
School	0	$0
Total	1	$385,000
Keysville		
EOC	0	$0
Care	1	$258,000
Fire	0	$0
Police	0	$0
School	0	$0
Total	1	$258,000
Midville		
EOC	0	$0
Care	0	$0
Fire	1	$270,000
Police	1	$90,000
School	0	$0
Total	2	$360,000

Classification	Updated Count	Updated Exposure
	Sardis	
EOC	0	$0
Care	1	$250,000
Fire	1	$350,000
Police	1	$1,446,000
School	1	$6,804,000
Total	4	$8,850,000
	Vidette	
EOC	0	$0
Care	0	$0
Fire	0	$0
Police	0	$0
School	0	$0
Total	0	$0
	Waynesboro	
EOC	0	$0
Care	3	$4,286,000
Fire	1	$1,307,000
Police	1	$852,000
School	4	$51,845,000
Total	9	$58,290,000
	Unincorporated Areas of Burke County	
EOC	1	$880,000
Care	1	$258,000
Fire	9	$3,514,000
Police	2	$2,246,000
School	22	$29,955,000
Total	35	$36,853,000

Assumptions and Exceptions

Hazus-MH loss estimates may be impacted by certain assumptions and process variances made in this risk assessment.

- The Burke County analysis used Hazus-MH Version 2.2 SP1, which was released by FEMA in May 2015.
- County provided parcel and property assessment data may not fully reflect all buildings in the county. For example, some counties do not report not-for-profit buildings such as government buildings, schools and churches in their property assessment data. This data was used to update the General Building Stock as well as the User Defined Facilities applied in this risk assessment.
- Georgia statute requires that the Assessor's Office assign a code to all of the buildings on a parcel based on the buildings primary use. If there is a residential or a commercial structure on a parcel and there are also agricultural buildings on the same parcel Hazus-MH looks at the residential and commercial "primary" structures first and then combines the value of all secondary structures on that parcel with the value of the primary structure. The values and building counts are still accurate but secondary structures are accounted for under the same classification as the primary structure. Because of this workflow, the only time that a parcel would show a value for an agricultural building is when there are no residential or commercial structures on the parcel thus making the agricultural building the primary structure. This is the reason that agricultural building counts and total values seem low or are nonexistent.
- GBS updates from assessor data will skew loss calculations. The following attributes were defaulted or calculated:
  Foundation Type was set from Occupancy Class
  First Floor Height was set from Foundation Type
  Content Cost was calculated from Replacement Cost
- It is assumed that the buildings are located at the centroid of the parcel.
- The essential facilities extracted from the GMIS were only used in the portion of the analysis designated as essential facility damage. They were not used in the update of the General Building Stock or the User Defined Facility inventory.

The hazard models included in this risk assessment included:

- Hurricane assessment which was comprised of a wind only damage assessment.
- Flood assessment based on the 1% annual chance event that includes riverine assessments.
- Tornado assessment based on GIS modeling.

Hurricane Risk Assessment

Hazard Definition

The National Hurricane Center describes a hurricane as a tropical cyclone in which the maximum sustained wind is, at minimum, 74 miles per hour (mph)[2]. The term hurricane is used for Northern Hemisphere tropical cyclones east of the International Dateline to the Greenwich Meridian. The term typhoon is used for Pacific tropical cyclones north of the Equator west of the International Dateline. Hurricanes in the Atlantic Ocean, Gulf of Mexico, and Caribbean form between June and November with the peak of hurricane season occurring in the middle of September. Hurricane intensities are measured using the Saffir-Simpson Hurricane Wind Scale (Table 3). This scale is a 1 to 5 categorization based on the hurricane's intensity at the indicated time.

Hurricanes bring a complex set of impacts. The winds from a hurricane produce a rise in the water level at landfall called storm surge. Storm surges produce coastal flooding effects that can be as damaging as the hurricane's winds. Hurricanes bring very intense inland riverine flooding. Hurricanes can also produce tornadoes that can add to the wind damages inland. In this risk assessment, only hurricane winds, and coastal storm surge are considered.

Table 3: Saffir-Simpson Hurricane Wind Scale

Category	Wind Speed (mph)	Damage
1	74 - 95	Very dangerous winds will produce some damage
2	96 - 110	Extremely dangerous winds will cause extensive damage
3	111 - 130	Devastating damage will occur
4	131 -155	Catastrophic damage will occur
5	> 155	Catastrophic damage will occur

The National Oceanic and Atmospheric Administration's National Hurricane Center created the HURDAT database, which contains all of the tracks of tropical systems since the mid-1800s. This database was used to document the number of tropical systems that have affected Burke County by creating a 20-mile buffer around the county to include storms that didn't make direct landfall in Burke County but impacted the county. Note that the storms listed contain the peak sustained winds, maximum pressure and maximum attained storm strength for the entire storm duration. Since 1851, Burke County has had 31 tropical systems within 20 miles of its county borders (Table 4).

Table 4: Tropical Systems affecting Burke County[3]

YEAR	DATE RANGE	NAME	MAX WIND(Knots)	MAX PRESSURE	MAX CAT
1851	August 16-27	UNNAMED	100	0	H2

[2] National Hurricane Center (2011). "Glossary of NHC Terms." National Oceanic and Atmospheric Administration. http://www.nhc.noaa.gov/aboutgloss.shtml#h. Retrieved 2012-23-02.

[3] Atlantic Oceanic and Meteorological Laboratory (2012). "Data Center." National Oceanic and Atmospheric Administration. http://www.aoml.noaa.gov/hrd/data_sub/re_anal.html. Retrieved 7-20-2015.

YEAR	DATE RANGE	NAME	MAX WIND(Knots)	MAX PRESSURE	MAX CAT
1852	August 19-30	UNNAMED	100	961	H2
1852	October 06-11	UNNAMED	90	0	H1
1854	September 07-12	UNNAMED	110	950	H2
1856	August 25 - September 03	UNNAMED	100	969	H2
1877	September 21 - October 05	UNNAMED	100	0	H2
1884	September 10-20	UNNAMED	80	988	H1
1885	October 10-14	UNNAMED	60	0	TD
1886	June 17-24	UNNAMED	85	0	H1
1886	June 27 - July 02	UNNAMED	85	0	H1
1887	October 09-22	UNNAMED	75	0	H1
1898	August 30 - September 01	UNNAMED	75	0	H1
1901	September 09-19	UNNAMED	70	0	TD
1902	June 12-17	UNNAMED	50	0	TD
1915	July 31 - August 05	UNNAMED	65	1003	TD
1929	September 19 - October 05	UNNAMED	135	986	H4
1933	August 31 - September 07	UNNAMED	120	948	H3
1935	August 29 - September 10	UNNAMED	160	996	H5
1946	October 05-14	UNNAMED	85	993	H1
1950	October 18-22	LOVE	70	991	TD
1956	September 20 - October 03	FLOSSY	80	1011	H1
1964	August 20 - September 05	CLEO	135	1003	H4
1965	June 11-18	UNNAMED	45	0	TD
1968	June 01-13	ABBY	65	1005	TD
1972	June 14-23	AGNES	75	1001	H1
1990	October 09-13	MARCO	55	1007	TD
1998	August 31 - September 08	EARL	85	1005	H1
2000	September 15-25	HELENE	60	1012	TD
2001	June 05-19	ALLISON	50	1012	TD
2003	July 25-27	UNNAMED	30	1022	TD
2006	June 10-19	ALBERTO	60	1004	TD

Category Definitions:

TS – Tropical storm

TD – Tropical depression

H1 – Category 1 (same format for H2, H3, and H4)

E – Extra-tropical cyclone

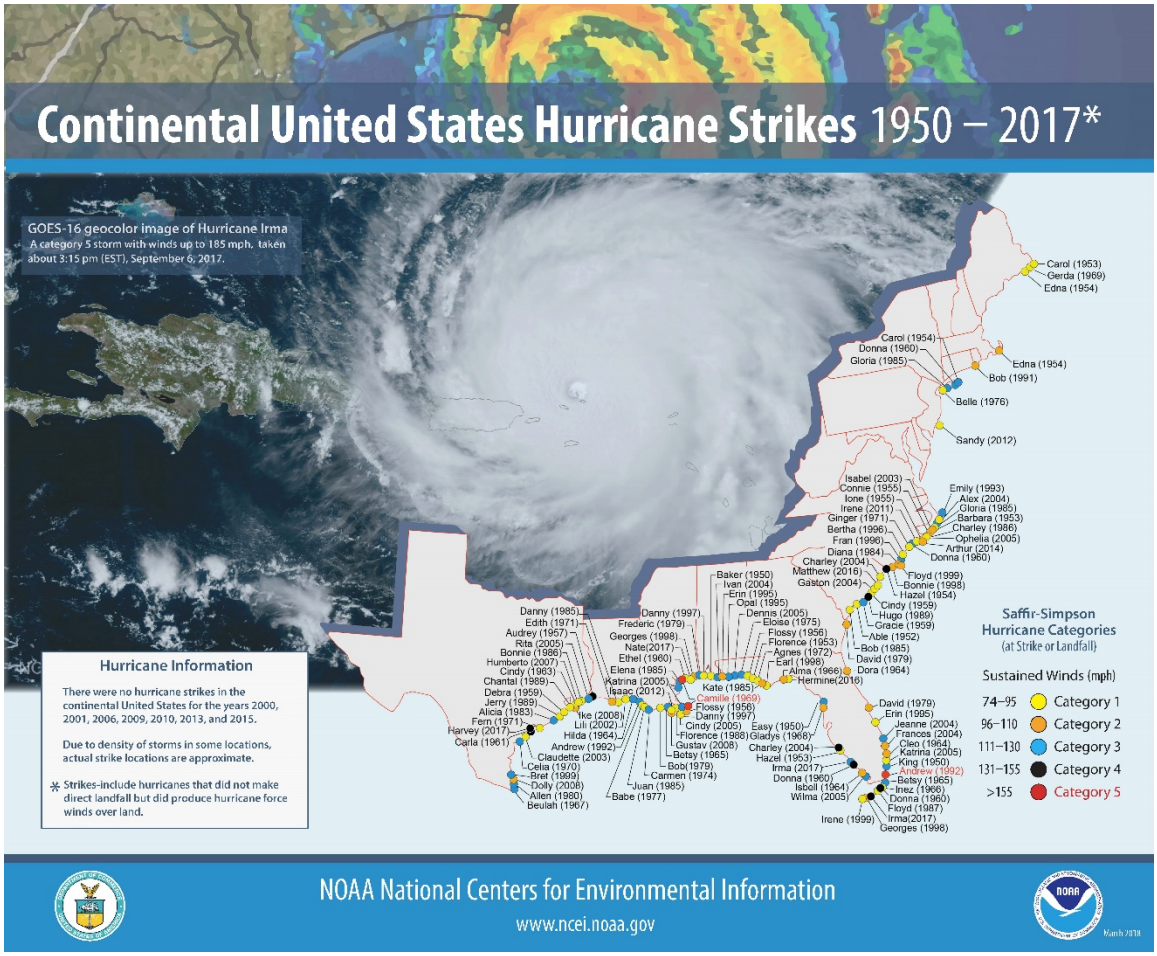


Figure 2: Continental United States Hurricane Strikes: 1950 to 2017[4]

Probabilistic Hurricane Scenario

The following probabilistic wind damage risk assessment modeled a Category 1 storm with maximum winds of 81 mph.

Wind Damage Assessment

Separate analyses were performed to determine wind and hurricane storm surge related flood losses. This section describes the wind-based losses to Burke County. Wind losses were determined from

[4] Source: NOAA National Centers for Environmental Information

probabilistic models run for the Category 1 storm which equates to the 1% chance storm event. Figure 3 shows wind speeds for the modeled Tropical Storm.

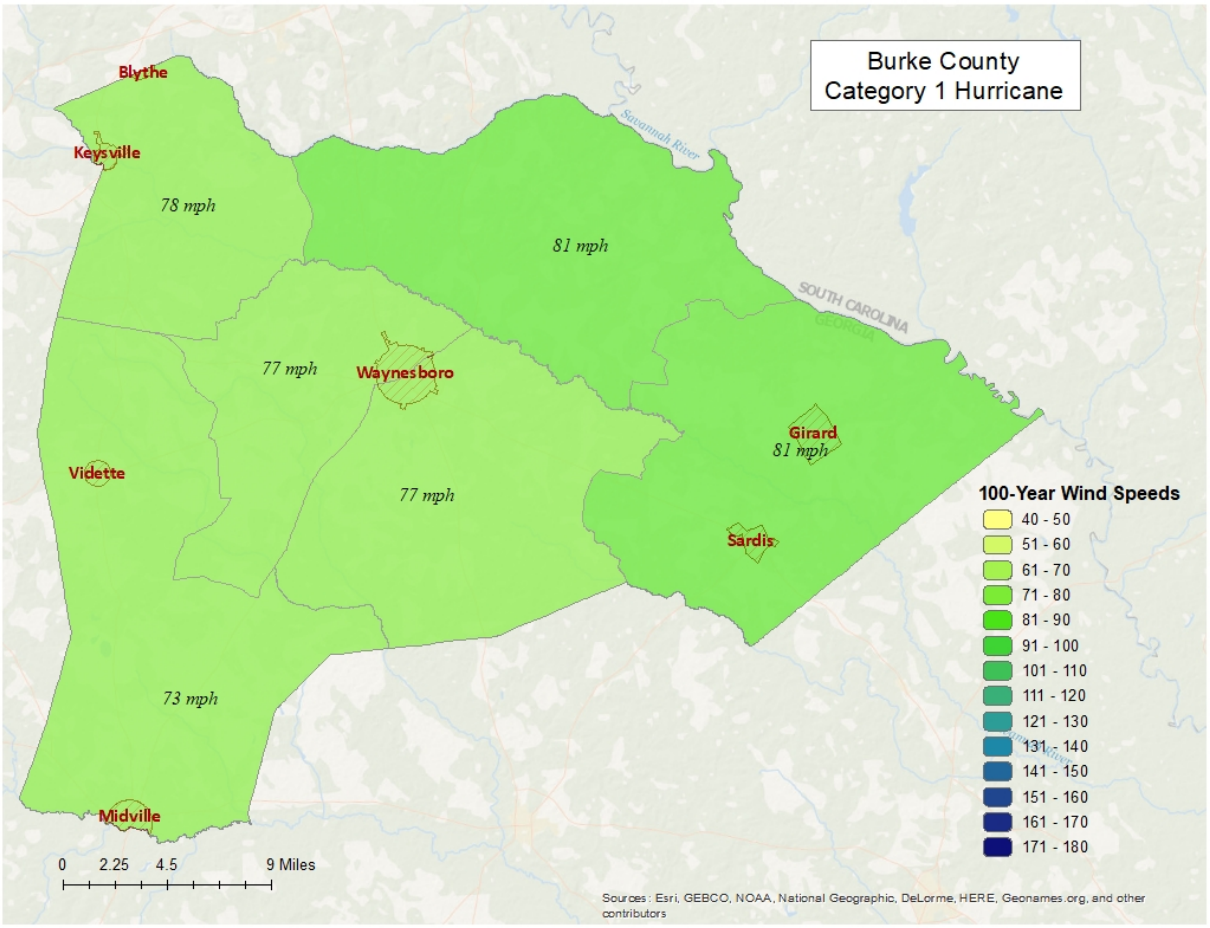


Figure 3: Wind Speeds by Storm Category

Wind-Related Building Damages

Buildings in Burke County are vulnerable to storm events, and the cost to rebuild may have significant consequences to the community. The following table shows a summary of the results of wind-related building damage in Burke County for the Category 1 (100 Year Event) storm. The loss ratio expresses building losses as a percentage of total building replacement cost in the county. Figure 4 illustrates the building loss ratios of the modeled Category 1 storm.

Table 5: Hurricane Wind Building Damage

Classification	Number of Buildings Damaged	Total Building Damage	Total Economic Loss[5]	Loss Ratio
Category 1 Storm	128	$3,395,140	$4,673,500	0.27%

Note that wind damaged buildings are not reported by jurisdiction. This is due to the fact that census tract boundaries – upon which hurricane building losses are based – do not closely coincide with jurisdiction boundaries.

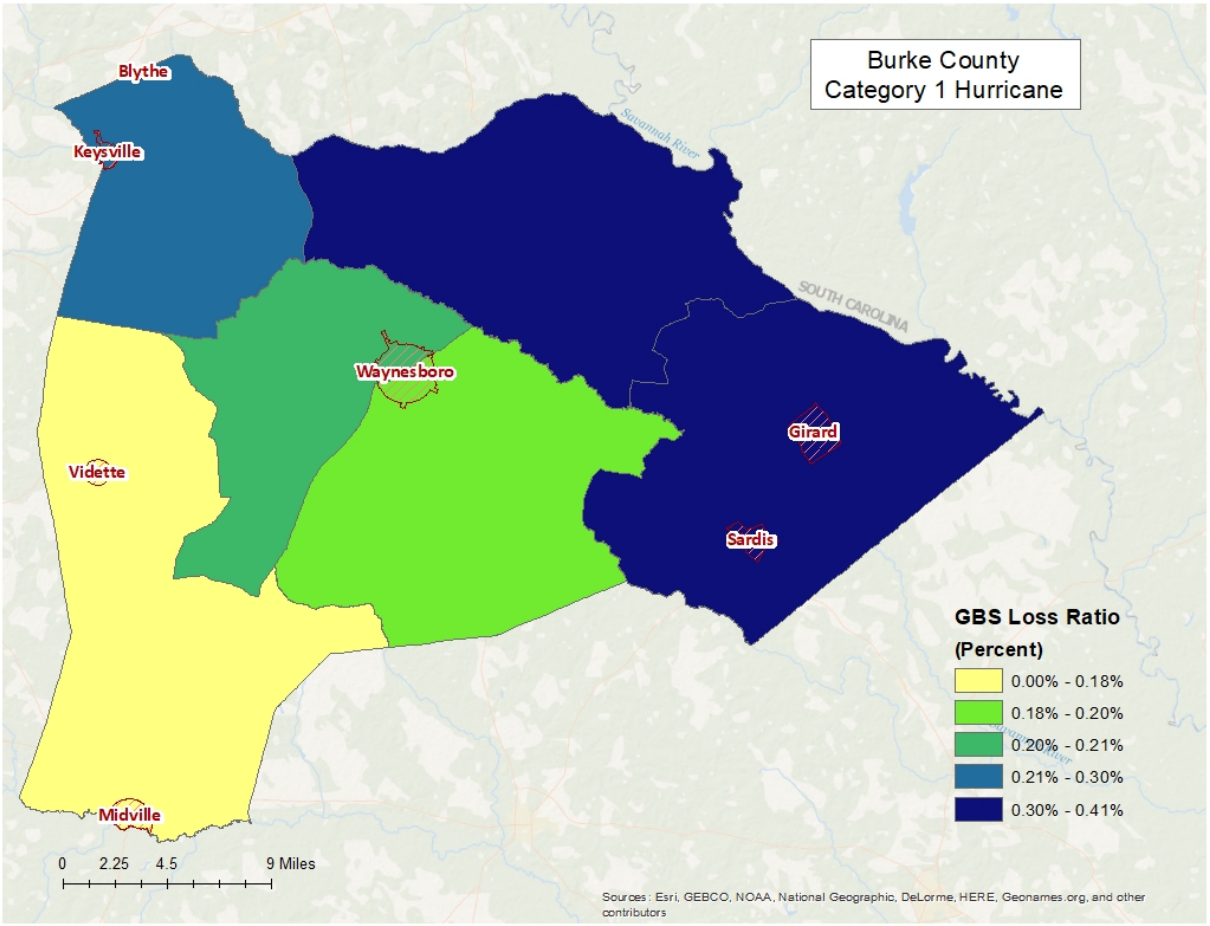


Figure 4: Hurricane Wind Building Loss Ratios

Essential Facility Losses

Essential facilities are also vulnerable to storm events, and the potential loss of functionality may have significant consequences to the community. Hazus-MH identified the

There are 52 essential facilities in Burke County.

Classification	Number
EOCs	1
Fire Stations	13
Care Facilities	6
Police Stations	5
Schools	27

[5] Includes property damage (infrastructure, contents, and inventory) as

essential facilities that may be moderately or severely damaged by winds. The results are compiled in Table 6.

Table 6: Wind-Damaged Essential Facility Losses

Classification	Facilities At Least Moderately Damaged > 50%	Facilities Completely Damaged > 50%	Facilities with Expected Loss of Use (< 1 day)
Category 1	0	0	52

Shelter Requirements

Hazus-MH estimates the number of households evacuated from buildings with severe damage from high velocity winds as well as the number of people who will require short-term sheltering. Since the 1% chance storm event for Burke County is a Category 1 Hurricane, the resulting damage is not enough to displace Households or require temporary shelters as shown in the results listed in Table 7.

Table 7: Displaced Households and People

Classification	# of Displaced Households	# of People Needing Short-Term Shelter
Category 1	0	0

Debris Generated from Hurricane Wind

Hazus-MH estimates the amount of debris that will be generated by high velocity hurricane winds and quantifies it into three broad categories to determine the material handling equipment needed:

- Reinforced Concrete and Steel Debris
- Brick and Wood and Other Building Debris
- Tree Debris

Different material handling equipment is required for each category of debris. The estimates of debris for this scenario are listed in Table 8. The amount of hurricane wind related tree debris that is estimated to require pick up at the public's expense is listed in the eligible tree debris column.

Table 8: Wind-Related Debris Weight (Tons)

Classification	Brick, Wood, and Other	Reinforced Concrete and	Eligible Tree Debris	Other Tree Debris	Total

		Steel			
Category 1	453	0	3,848	111,987	116,288

Figure 5 shows the distribution of all wind related debris resulting from a Category 1 hurricane. Each dot represents 20 tons of debris within the census tract in which it is located. The dots are randomly distributed within each census tract and therefore do not represent the specific location of debris sites.

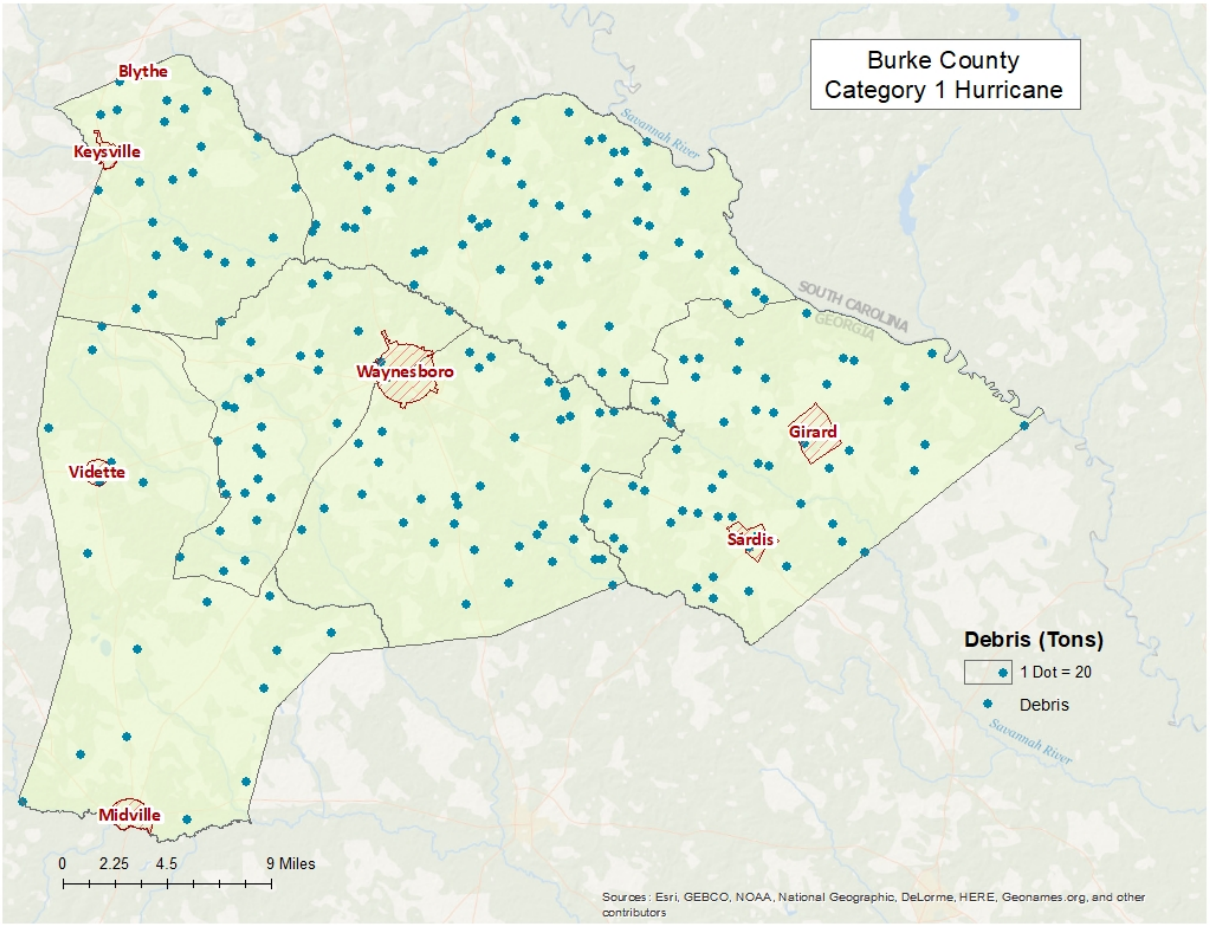


Figure 5: Wind-Related Debris Weight (Tons)

Flood Risk Assessment

Hazard Definition

Flooding is a significant natural hazard throughout the United States. The type, magnitude, and severity of flooding are functions of the amount and distribution of precipitation over a given area, the rate at which precipitation infiltrates the ground, the geometry and hydrology of the catchment, and flow dynamics and conditions in and along the river channel. Floods can be classified as one of three types: upstream floods, downstream floods, or coastal floods.

Upstream floods, also called flash floods, occur in the upper parts of drainage basins and are generally characterized by periods of intense rainfall over a short duration. These floods arise with very little warning and often result in locally intense damage, and sometimes loss of life, due to the high energy of the flowing water. Flood waters can snap trees, topple buildings, and easily move large boulders or other structures. Six inches of rushing water can upend a person; another 18 inches might carry off a car. Generally, upstream floods cause damage over relatively localized areas, but they can be quite severe in the local areas in which they occur. Urban flooding is a type of upstream flood. Urban flooding involves the overflow of storm drain systems and can be the result of inadequate drainage combined with heavy rainfall or rapid snowmelt. Upstream or flash floods can occur at any time of the year in Georgia, but they are most common in the spring and summer months.

Downstream floods, also called riverine floods, refer to floods on large rivers at locations with large upstream catchments. Downstream floods are typically associated with precipitation events that are of relatively long duration and occur over large areas. Flooding on small tributary streams may be limited, but the contribution of increased runoff may result in a large flood downstream. The lag time between precipitation and time of the flood peak is much longer for downstream floods than for upstream floods, generally providing ample warning for people to move to safe locations and, to some extent, secure some property against damage.

Coastal floods occurring on the Atlantic and Gulf coasts may be related to hurricanes or other combined offshore, nearshore, and shoreline processes. The effects of these complex interrelationships vary significantly across coastal settings, leading to challenges in the determination of the base (1-percent-annual-chance) flood for hazard mapping purposes. Land area covered by floodwaters of the base flood is identified as a Special Flood Hazard Area (SFHA). The Burke County flood risk assessment analyzed at risk structures in the SFHA.

> The SFHA is the area where the National Flood Insurance Program's (NFIP) floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies. The owner of a structure in a high-risk area must carry flood insurance, if the owner carries a mortgage from a federally regulated or insured lender or servicer.

The following probabilistic risk assessment involves an analysis of a 1% annual chance riverine flood event (100-Year Flood) and a 1% annual chance coastal flood.

Riverine 1% Flood Scenario

Riverine losses were determined from the 1% flood boundaries downloaded from the FEMA Flood Map Service Center in November 2018. The flood boundaries were overlaid with the USGS 10 meter DEM

using the Hazus-MH Enhanced Quick Look tool to generate riverine depth grids. The riverine flood depth grid was then imported into Hazus-MH to calculate the riverine flood loss estimates. Figure 6 illustrates the riverine inundation boundary associated with the 1% annual chance.

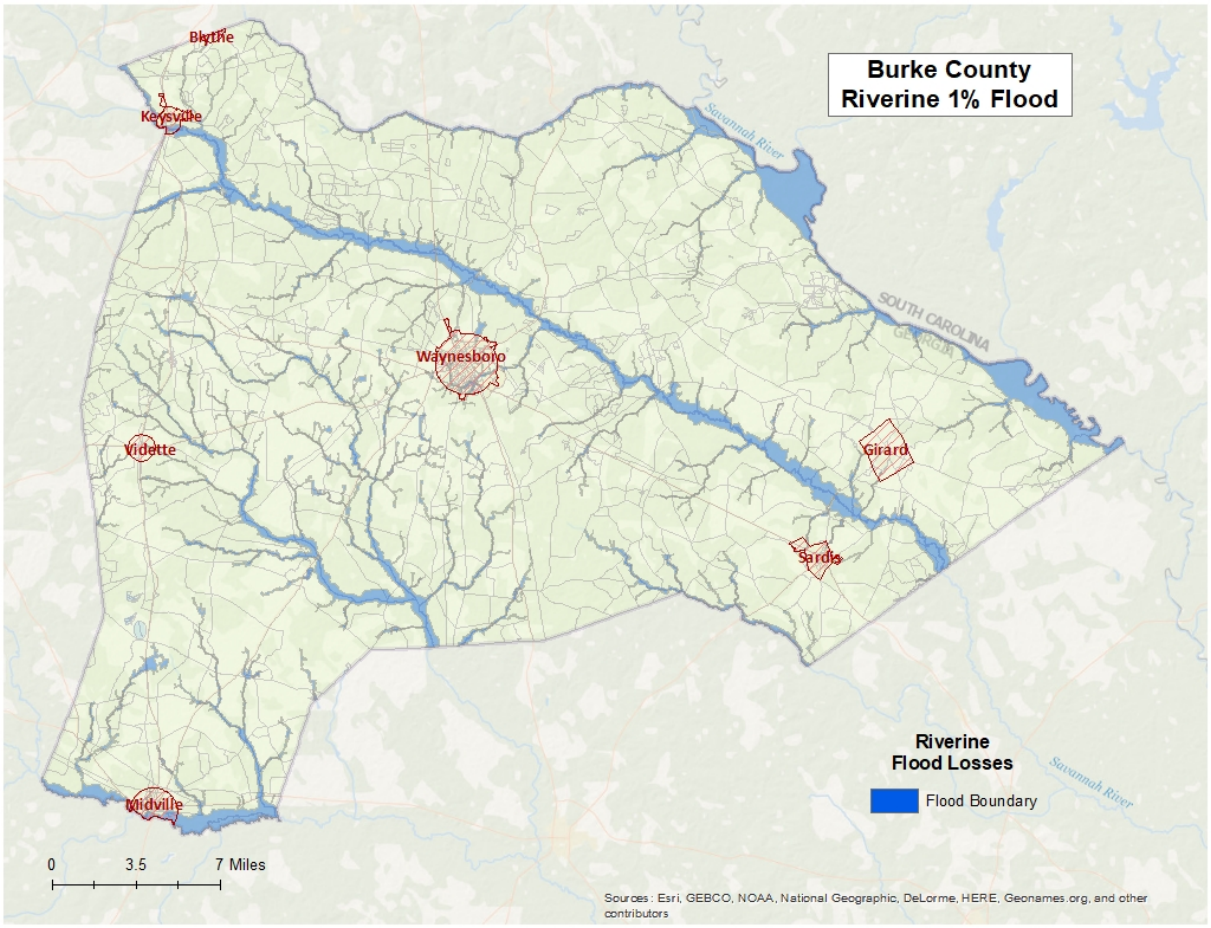


Figure 6: Riverine 1% Flood Inundation

Riverine 1% Flood Building Damages

Buildings in Burke County are vulnerable to flooding from events equivalent to the 1% riverine flood. The economic and social impacts from a flood of this magnitude can be significant. Table 9 provides a summary of the potential flood-related building damage in Burke County by jurisdiction that might be experienced from the 1% flood. Figure 7 maps the potential loss ratios of total building exposure to losses sustained to buildings from the 1% flood by 2010 census block and Figure 8 illustrates the relationship of building locations to the 1% flood inundation boundary.

Table 9: Burke County Riverine 1% Building Losses

Occupancy	Total Buildings in the Jurisdiction	Total Buildings Damaged in the Jurisdiction	Total Building Exposure in the Jurisdiction	Total Losses to Buildings in the Jurisdiction	Loss Ratio of Exposed Buildings to Damaged Buildings in the Jurisdiction
Keysville					
Residential	124	1	$8,599,015	$37,518	0.44%
Midville					
Residential	268	4	$28,612,222	$32,627	0.11%
Waynesboro					
Residential	1,684	3	$239,813,262	$208,856	0.09%
Unincorporated					
Residential	7,845	34	$742,935,809	$800,856	0.11%
County Total					
	9,921	**42**	**$1,019,960,308**	**$1,079,857**	

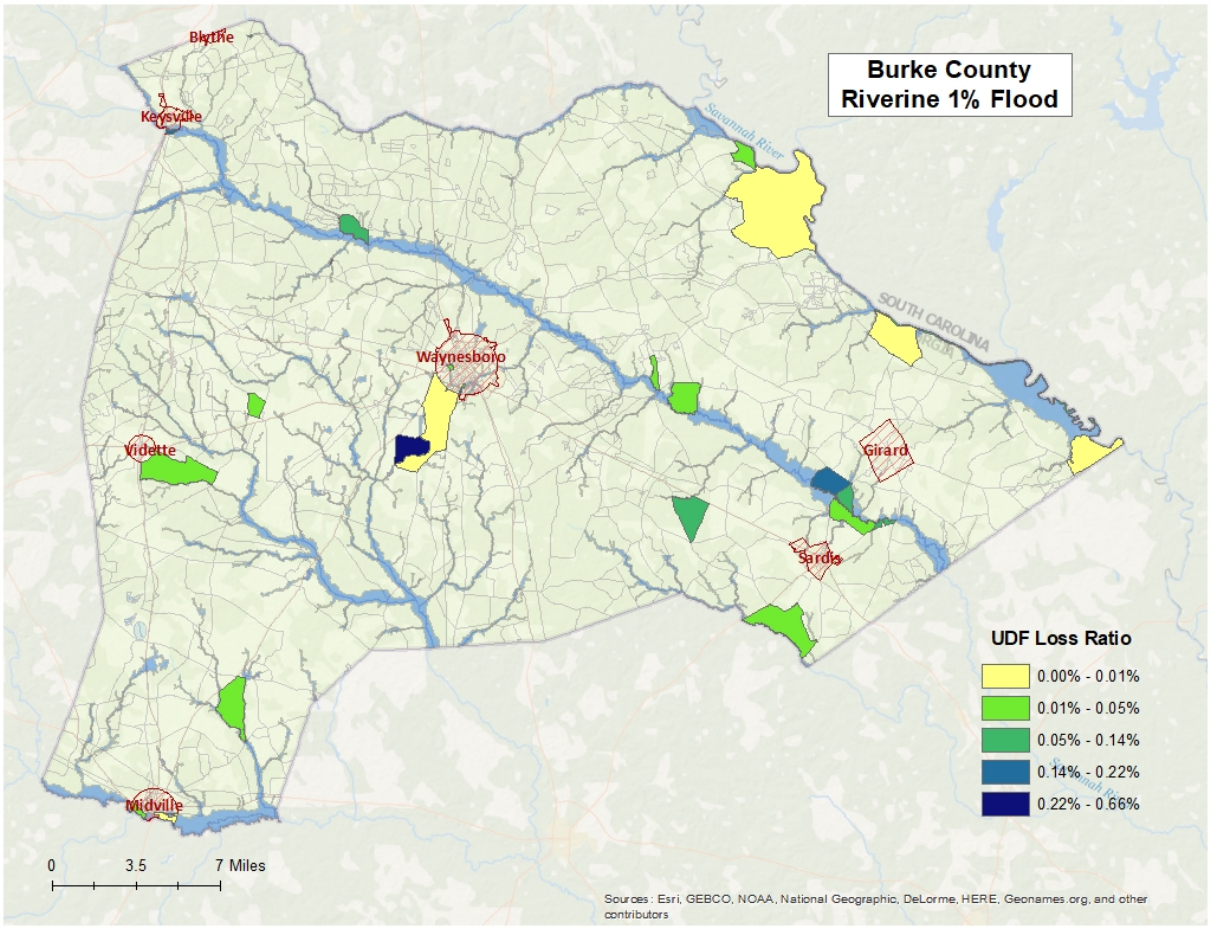


Figure 7: Burke County Potential Loss Ratios of Total Building Exposure to Losses Sustained to Buildings from the 1% Riverine Flood by 2010 Census Block

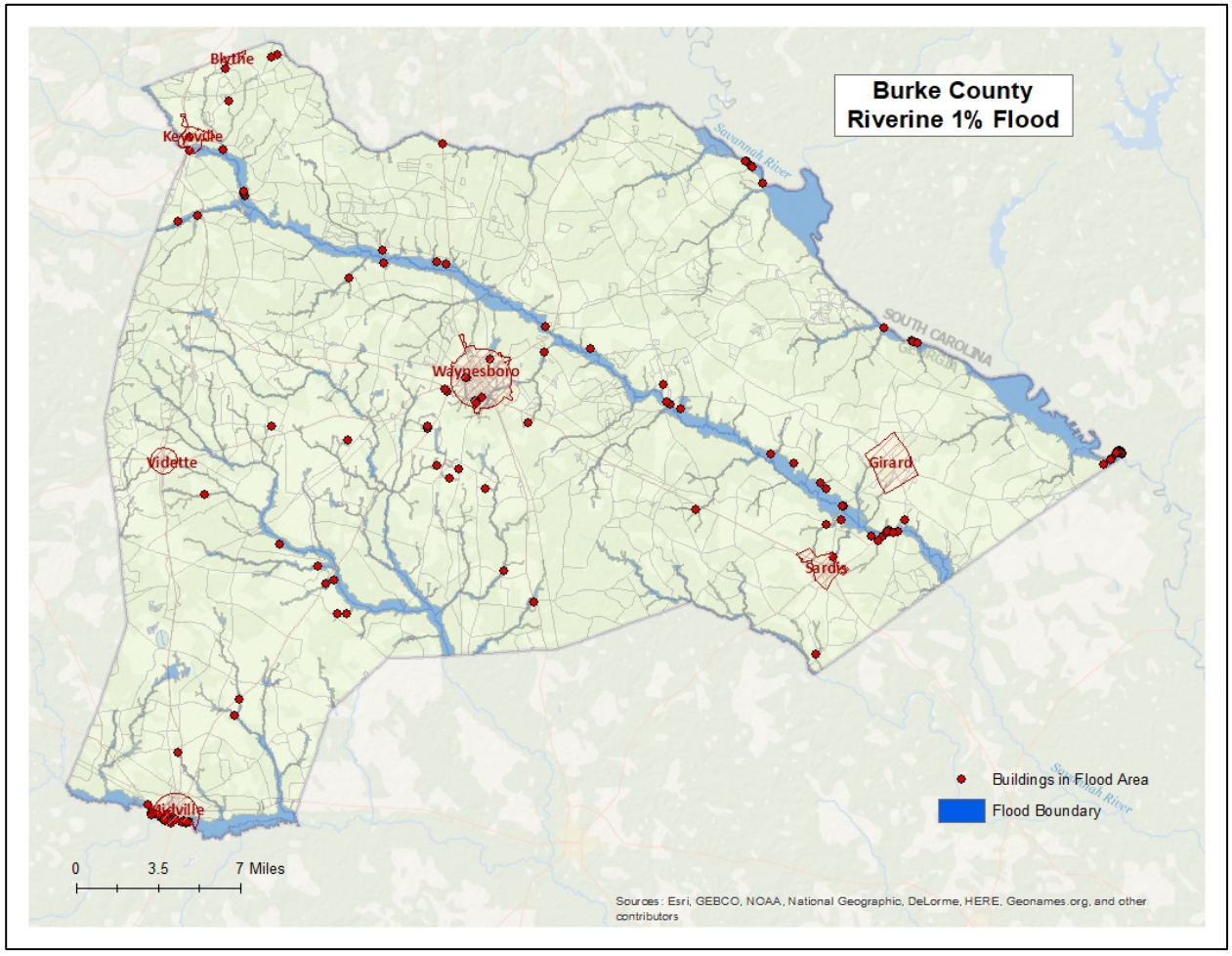


Figure 8: Burke County Damaged Buildings in Riverine Floodplain (1% Flood)

Riverine 1% Flood Essential Facility Losses

An essential facility may encounter many of the same impacts as other buildings within the flood boundary. These impacts can include structural failure, extensive water damage to the facility and loss of facility functionality (e.g. a damaged police station will no longer be able to serve the community). The analysis identified no essential facility that were subject to damage in the Burke County riverine 1% probability floodplain.

Riverine 1% Flood Shelter Requirements

Hazus-MH estimates that the number of households that are expected to be displaced from their homes due to riverine flooding and the associated potential evacuation. The model estimates 339 households might be displaced due to the flood. Displacement includes households evacuated within or very near to the inundated area. Displaced households represent 1,017 individuals, of which 419 may require short term publicly provided shelter. The results are mapped in Figure 9.

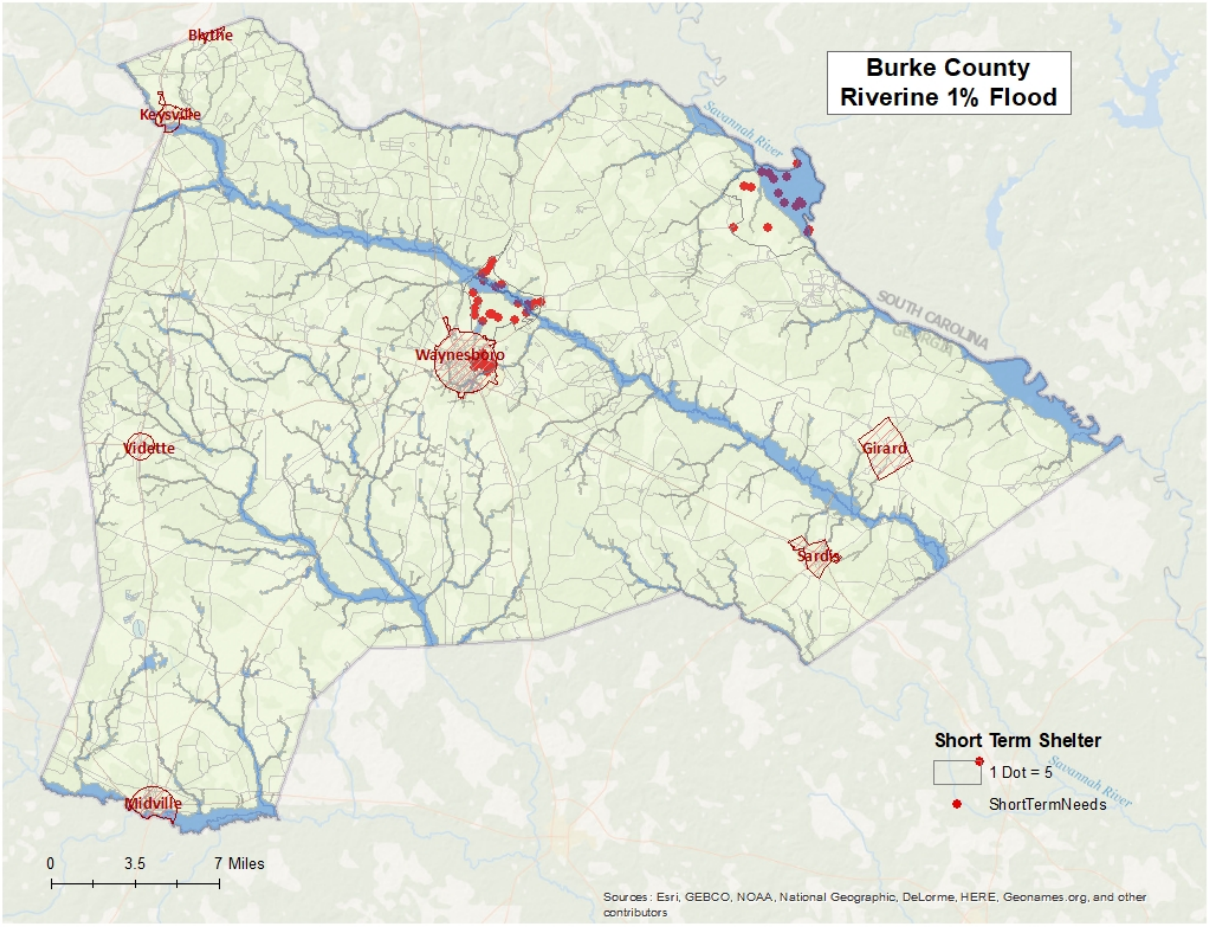


Figure 9: Riverine 1% Estimated Flood Shelter Requirements

Riverine 1% Flood Debris

Hazus-MH estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories:

- Finishes (dry wall, insulation, etc.)
- Structural (wood, brick, etc.)
- Foundations (concrete slab, concrete block, rebar, etc.)

Different types of material handling equipment will be required for each category. Debris definitions applied in Hazus-MH are unique to the Hazus-MH model and so do not necessarily conform to other definitions that may be employed in other models or guidelines.

The analysis estimates that an approximate total of 3,295 tons of debris might be generated: 1) Finishes- 1,353 tons; 2) Structural – 682 tons; and 3) Foundations- 1,259 tons. The results are mapped in Figure 10.

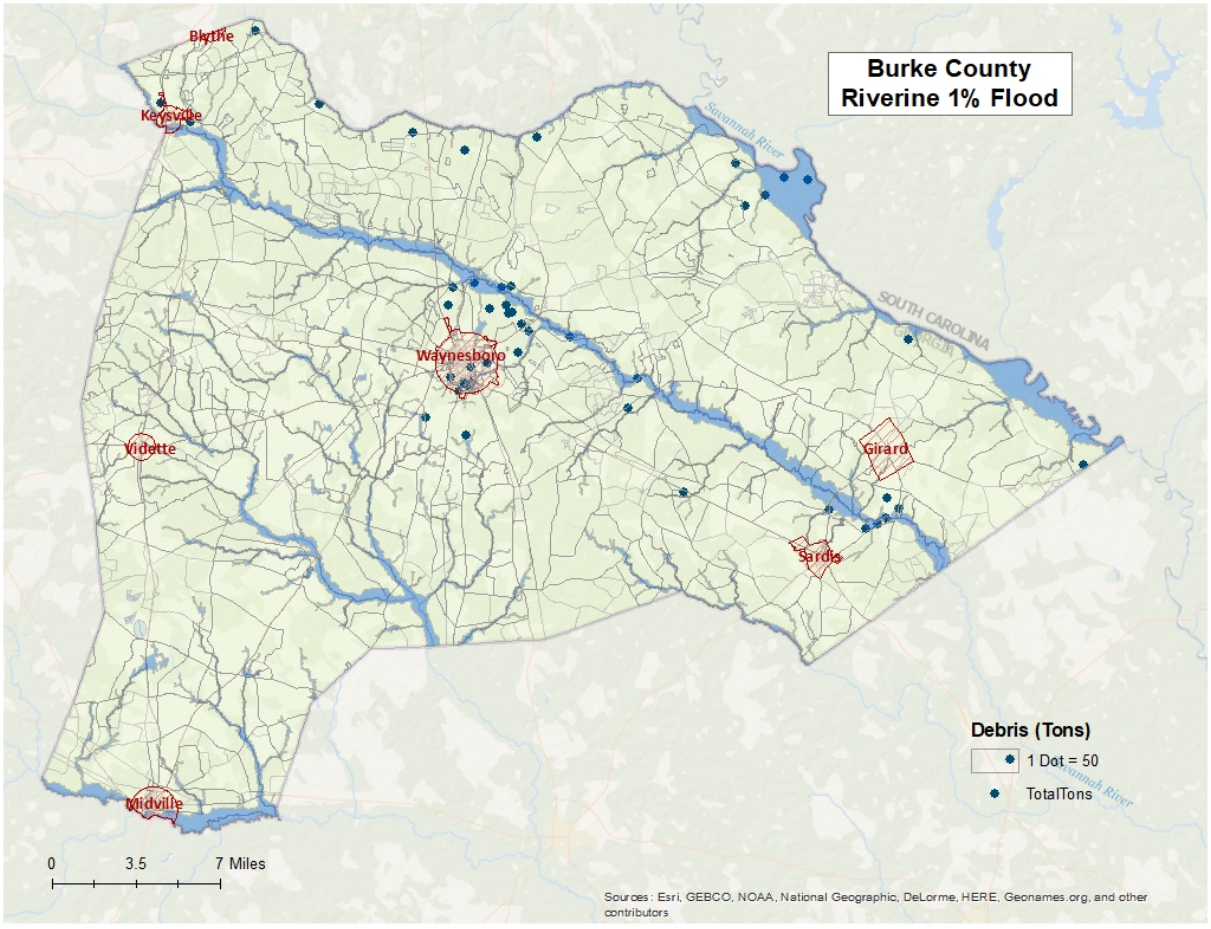


Figure 10: Riverine 1% Flood Debris Weight (Tons)

Tornado Risk Assessment

Hazard Definition

Tornadoes pose a great risk to the state of Georgia and its citizens. Tornadoes can occur at any time during the day or night. They can also happen during any month of the year. The unpredictability of tornadoes makes them one of Georgia's most dangerous hazards. Their extreme winds are violently destructive when they touch down in the region's developed and populated areas. Current estimates place the maximum velocity at about 300 miles per hour, but higher and lower values can occur. A wind velocity of 200 miles per hour will result in a wind pressure of 102.4 pounds per square foot of surface area—a load that exceeds the tolerance limits of most buildings. Considering these factors, it is easy to understand why tornadoes can be so devastating for the communities they hit.

Tornadoes are defined as violently-rotating columns of air extending from thunderstorms and cyclonic events. Funnel clouds are rotating columns of air not in contact with the ground; however, the violently-rotating column of air can reach the ground very quickly and become a tornado. If the funnel cloud picks up and blows debris, it has reached the ground and is a tornado.

Tornadoes are classified according to the Fujita tornado intensity scale. Originally introduced in 1971, the scale was modified in 2006 to better define the damage and estimated wind scale. The Enhanced Fujita Scale ranges from low intensity EF0 with effective wind speeds of 65 to 85 miles per hour, to EF5 tornadoes with effective wind speeds of over 200 miles per hour. The Enhanced Fujita intensity scale is included in Table 10.

Table 10: Enhanced Fujita Tornado Rating

Fujita Number	Estimated Wind Speed	Path Width	Path Length	Description of Destruction
EF0 *Gale*	65-85 mph	6-17 yards	0.3-0.9 miles	Light damage, some damage to chimneys, branches broken, sign boards damaged, shallow-rooted trees blown over.
EF1 Moderate	86-110 mph	18-55 yards	1.0-3.1 miles	Moderate damage, roof surfaces peeled off, mobile homes pushed off foundations, attached garages damaged.
EF2 Significant	111-135 mph	56-175 yards	3.2-9.9 miles	Considerable damage, entire roofs torn from frame houses, mobile homes demolished, boxcars pushed over, large trees snapped or uprooted.
EF3 Severe	136-165 mph	176-566 yards	10-31 miles	Severe damage, walls torn from well-constructed houses, trains overturned, most trees in forests uprooted, heavy cars thrown about.
EF4 Devastating	166-200 mph	0.3-0.9 miles	32-99 miles	Complete damage, well-constructed houses leveled, structures with weak foundations blown off for some distance, large missiles generated.
EF5 Incredible	> 200 mph	1.0-3.1 miles	100-315 miles	Foundations swept clean, automobiles become missiles and thrown for 100 yards or more, steel-reinforced concrete structures badly damaged.

Source: http://www.srh.noaa.gov

Hypothetical Tornado Scenario

For this report, an EF3 tornado was modeled to illustrate the potential impacts of tornadoes of this magnitude in the county. The analysis used a hypothetical path based upon an EF3 tornado event running along the predominant direction of historical tornados (southeast to northwest). The tornado path was placed to travel through Waynesboro. The selected widths were modeled after a re-creation of the Fujita-Scale guidelines based on conceptual wind speeds, path widths, and path lengths. There is no guarantee that every tornado will fit exactly into one of these categories. Table 11 depicts tornado path widths and expected damage.

Table 11: Tornado Path Widths and Damage Curves

Fujita Scale	Path Width (feet)	Maximum Expected Damage
EF-5	2,400	100%
EF-4	1,800	100%
EF-3	1,200	80%
EF-2	600	50%
EF-1	300	10%
EF-0	300	0%

Within any given tornado path there are degrees of damage. The most intense damage occurs within the center of the damage path, with decreasing amounts of damage away from the center. After the hypothetical path is digitized on a map, the process is modeled in GIS by adding buffers (damage zones) around the tornado path. Figure 11 describes the zone analysis.

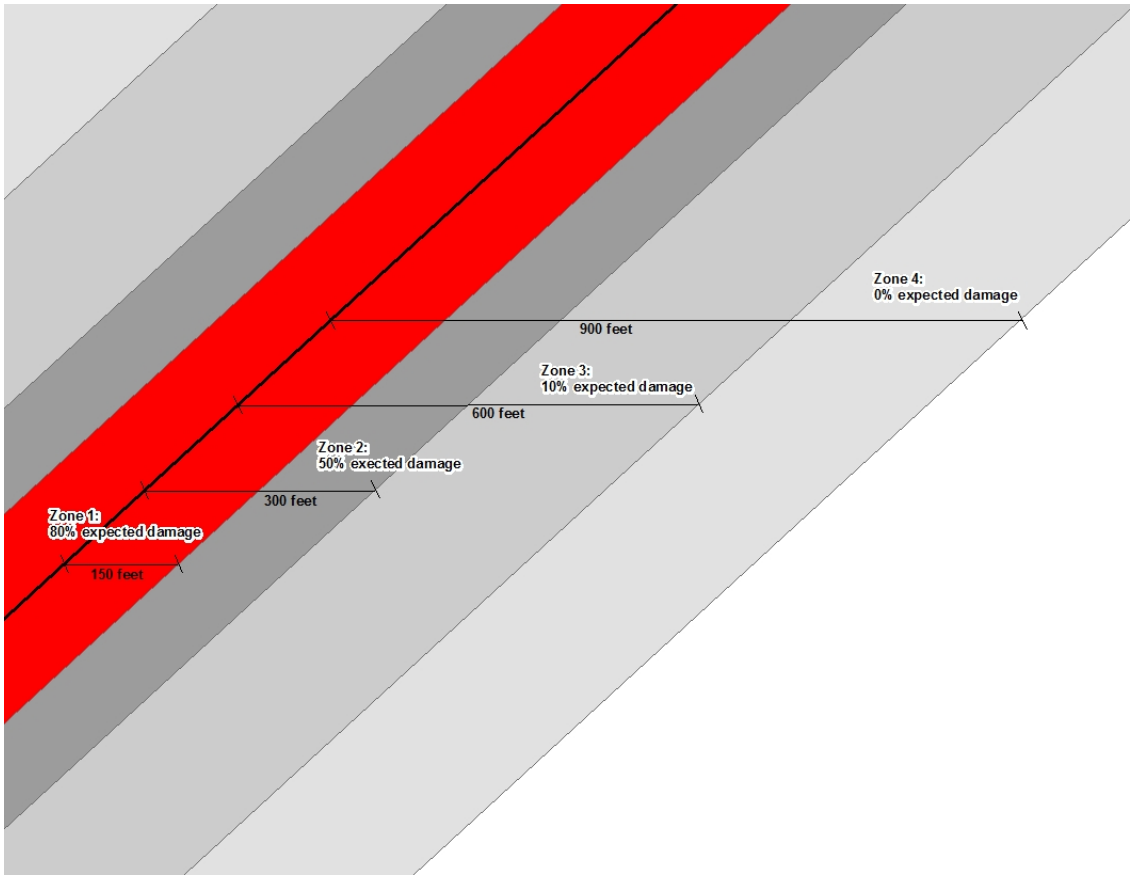


Figure 11: EF Scale Tornado Zones

An EF3 tornado has four damage zones, depicted in Table 12. Major damage is estimated within 150 feet of the tornado path. The outer buffer is 900 feet from the tornado path, within which buildings will not experience any damage. The selected hypothetical tornado path is depicted in Figure 12 and the damage curve buffer zones are shown in Figure 13.

Table 12: EF3 Tornado Zones and Damage Curves

Zone	Buffer (feet)	Damage Curve
1	0-150	80%
2	150-300	50%
3	300-600	10%
4	600-900	0%

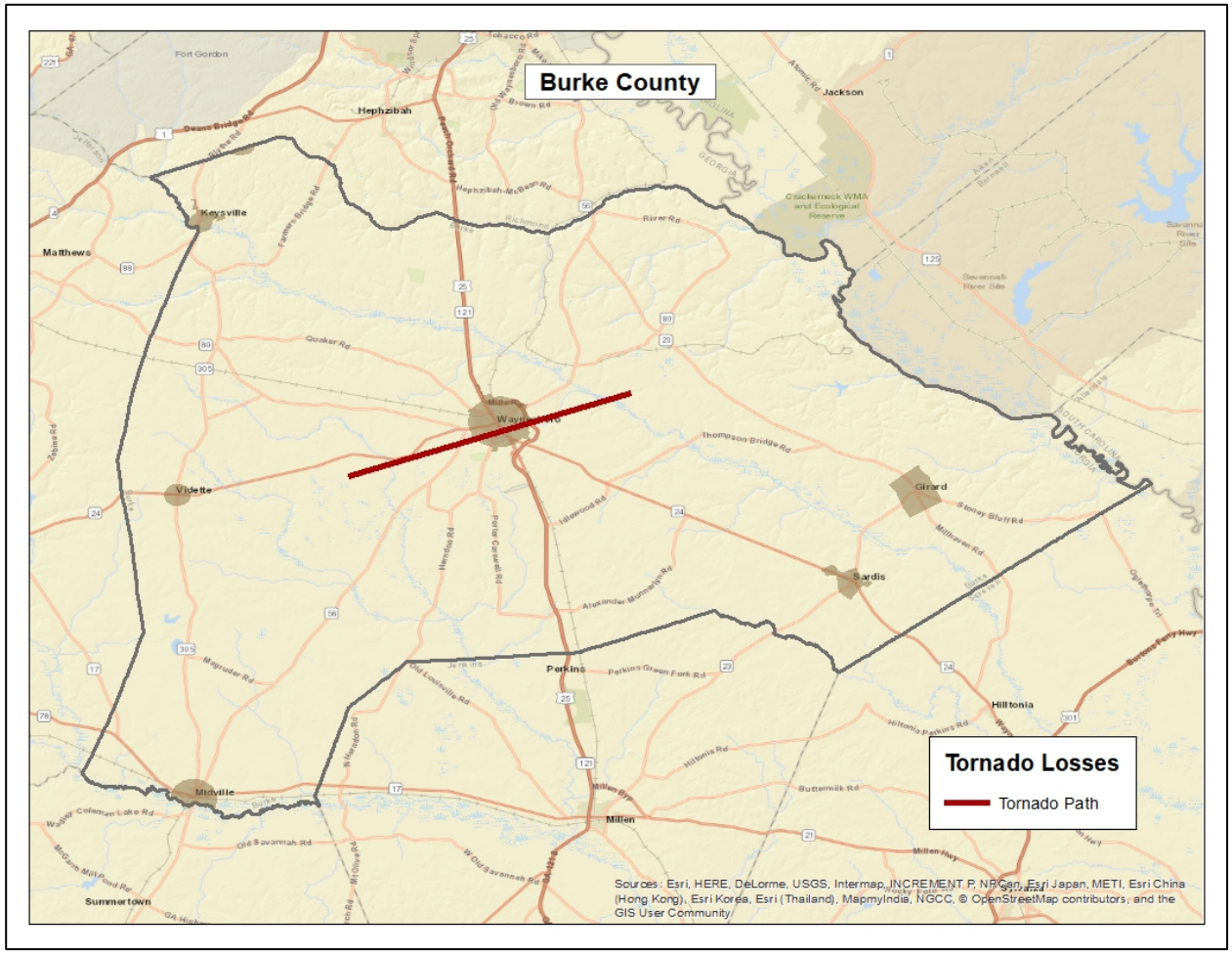


Figure 12: Hypothetical EF3 Tornado Path in Burke County

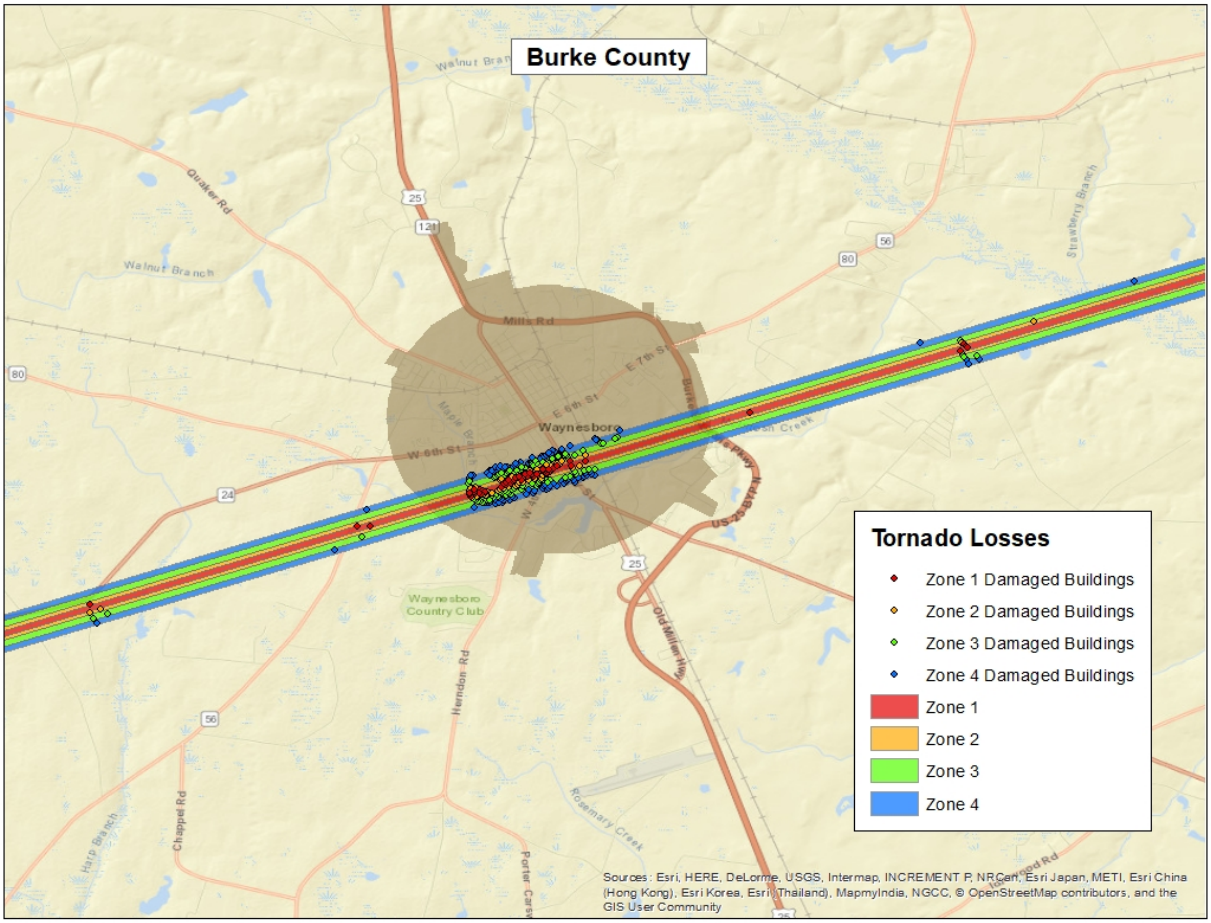


Figure 13: Modeled EF3 Tornado Damage Buffers in Burke County

EF3 Tornado Building Damages

The analysis estimated that approximately 323 buildings could be damaged, with estimated building losses of $13 million. The building losses are an estimate of building replacement costs multiplied by the percentages of damage. The overlay was performed against parcels provided by Burke County that were joined with Assessor records showing estimated property replacement costs. The Assessor records often do not distinguish parcels by occupancy class if the parcels are not taxable and thus the number of buildings and replacement costs may be underestimated. The results of the analysis are depicted in Table 13.

Table 13: Estimated Building Losses by Occupancy Type

Occupancy	Buildings Damaged	Building Losses
Residential	285	$9,969,547
Commercial	34	$3,418,690
Industrial	3	$63,945
Education	1	$0
Total	323	$13,452,182

EF3 Tornado Essential Facility Damage

There were four essential facility located in the tornado path – one school and three medical care facilities. Table 14 outlines the specific facility and the amount of damage under the scenario.

Table 14: Estimated Essential Facilities Damaged

Facility	Amount of Damage
Burke Medical Center	Major Damage
Brentwood Terrace Health Care	Major Damage
Burke County Health Department	Minor Damage
Edmund Burke Academy	Minor Damage

Edmund Burke Academy's enrollment was approximately 439 students as of October 2018. Depending on the time of day, a tornado strike as depicted in this scenario could result in significant injury and loss of life. In addition, arrangements would have to be made for the continued education of the students in another location.

There are six care facilities in the county, of which three are located in the tornado path. According to the Georgia Department of Public Health OASIS website, Burke Medical Center has 40 beds. The medical requirements of those patients already in the system, combined with injuries suffered during the storm event, could potentially overtax the medical infrastructure of the county. Also, having major damage occur to health facilities in Burke County (Brentwood Terrace Health Care and Burke County Health Department) will negatively impact the area. Displacement of the elderly will need to be addressed.

The location of the damaged Essential Facility is mapped in Figure 14.

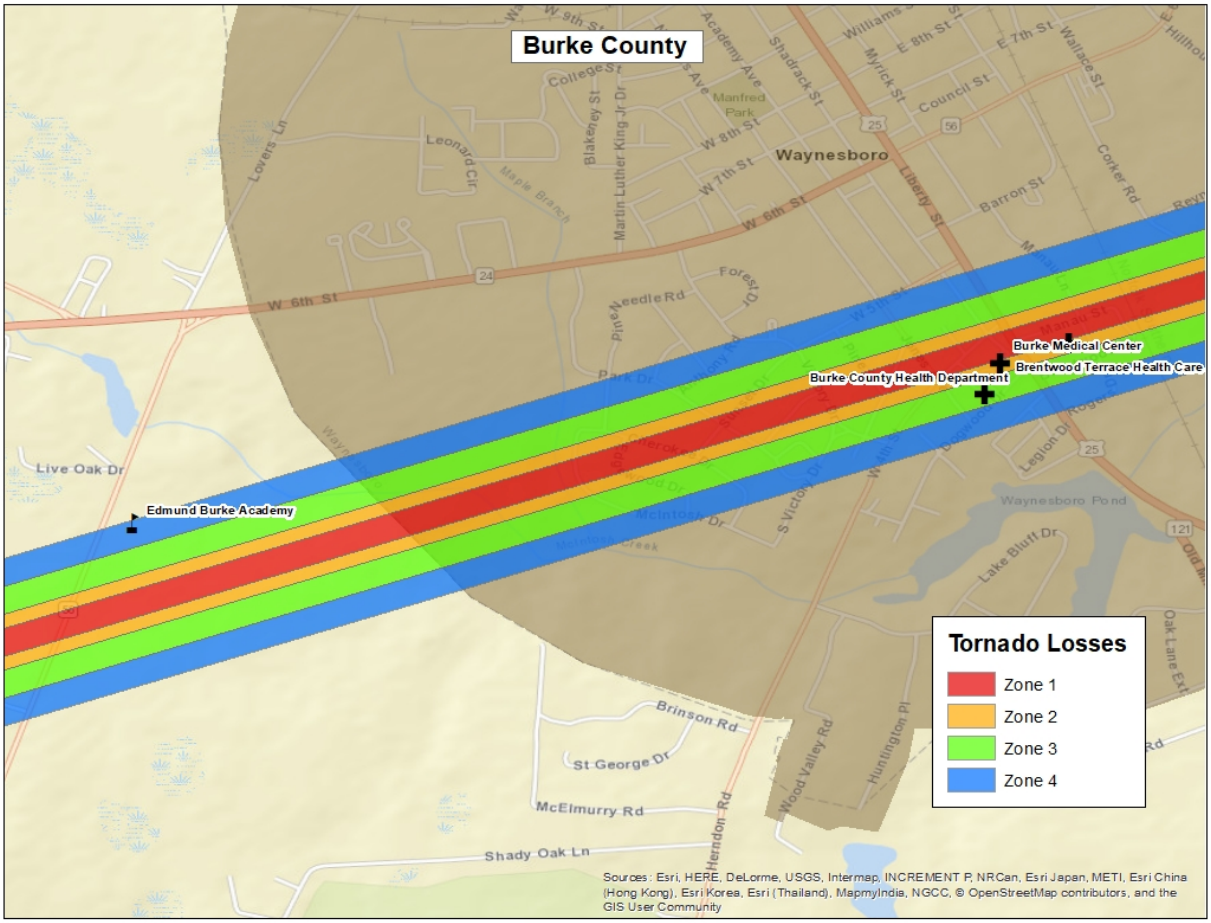


Figure 14: Modeled Essential Facility Damage in Burke County

Exceptions Report

Hazus Version 2.2 SP1 was used to perform the loss estimates for Burke County, Georgia. Changes made to the default Hazus-MH inventory and the modeling parameters used to setup the hazard scenarios are described within this document.

Reported losses reflect the updated data sets. Steps, algorithms and assumptions used during the data update process are documented in the project workflow named PDM_GA_Workflow.doc.

Statewide Inventory Changes

The default Hazus-MH Essential Facility inventory was updated for the entire state prior to running the hazard scenarios for Burke County.

Updates to the Critical Facility data used in GMIS were provided by Burke County in October 2018. These updates were applied by The Carl Vinson Institute of Government at the University of Georgia. Table 15 summarizes the difference between the original Hazus-MH default data and the updated data for Burke County.

Table 15: Essential Facility Updates

Site Class	Feature Class	Default Replacement Cost	Default Count	Updated Replacement Cost	Updated Count
EF	Care	$3,052,000	5	$5,052,000	6
EF	EOC	$880,000	1	$880,000	1
EF	Fire	$5,476,000	12	$5,826,000	13
EF	Police	$3,520,000	5	$4,634,000	5
EF	School	$93,740,000	31	$88,604,000	27

County Inventory Changes

The GBS records for Burke County were replaced with data derived from parcel and property assessment data obtained from Burke County. The county provided property assessment data was current as of October 2018 and the parcel data current as of November 2017.

General Building Stock Updates

The parcel boundaries and assessor records were obtained from Burke County. Records without improvements were deleted. The parcel boundaries were converted to parcel points located in the centroids of each parcel boundary. Each parcel point was linked to an assessor record based upon matching parcel numbers. The generated Building Inventory represents the approximate locations (within a parcel) of building exposure. The Building Inventory was aggregated by Census Block and

imported into Hazus-MH using the Hazus-MH Comprehensive Data Management System (CDMS). Both the 2010 Census Tract and Census Block tables were updated.

The match between parcel records and assessor records was based upon a common Parcel ID. For this type of project, unless the hit rate is better than 85%, the records are not used to update the default aggregate inventory in Hazus-MH. The Parcel-Assessor hit rate for Burke County was 99.4%.

Adjustments were made to records when primary fields did not have a value. In these cases, default values were applied to the fields. Table 16 outlines the adjustments made to Burke County records.

Table 16: Building Inventory Default Adjustment Rates

Type of Adjustment	Building Count	Percentage
Area Unknown	611	5%
Construction Unknown	1,403	12%
Condition Unknown	111	1%
Foundation Unknown	1,430	12%
Year Built Unknown	306	3%
Total Buildings	11,453	7%

Approximately 7% of the CAMA values were either missing (<Null> or '0'), did not match CAMA domains or were unusable ('Unknown', 'Other', 'Pending'). These were replaced with 'best available' values. Missing YearBuilt values were populated from average values per Census Block. Missing Condition, Construction and Foundation values were populated with the highest-frequency CAMA values per Occupancy Class. Missing Area values were populated with the average CAMA values per Occupancy Class.

The resulting Building Inventory was used to populate the Hazus-MH General Building Stock and User Defined Facility tables. The updated General Building Stock was used to calculate flood and tornado losses. Changes to the building counts and exposure that were modeled in Burke County are sorted by General Occupancy in Table 1 at the beginning of this report. If replacements cost or building value were not present for a given record in the Assessor data, replacement costs were calculated from the Building Area (sqft) multiplied by the Hazus-MH RS Means ($/sqft) values for each Occupancy Class.

Differences between the default and updated data are due to various factors. The Assessor records often do not distinguish parcels by occupancy class when the parcels are not taxable; therefore, the total number of buildings and the building replacement costs for government, religious/non-profit, and education may be underestimated.

User Defined Facilities

Building Inventory was used to create Hazus-MH User Defined Facility (UDF) inventory for flood modeling. Hazus-MH flood loss estimates are based upon the UDF point data. Buildings within the flood boundary were imported into Hazus-MH as User Defined Facilities and modeled as points.

Table 17: User Defined Facility Exposure

Class	Hazus-MH Feature	Counts	Exposure
BI	Building Exposure	11,215	$1,274,591,737
Riverine UDF	Structures Inside 1% Annual Chance Riverine Flood Area	172	$17,423,975

Assumptions

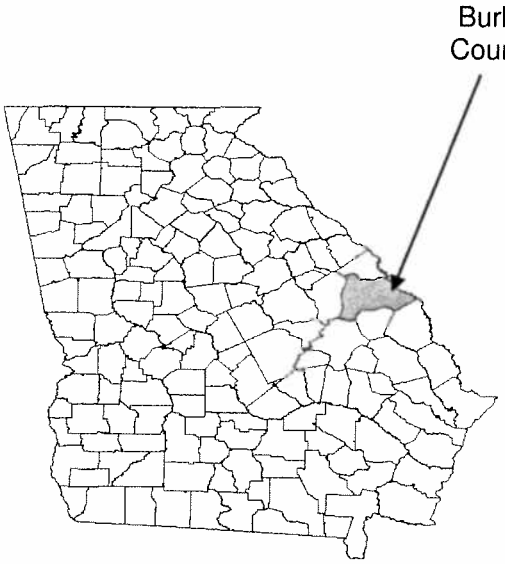
- Flood analysis was performed on Building Inventory. Building Inventory within the flood boundary was imported as User Defined Facilities. The point locations are parcel centroid accuracy.
- The analysis is restricted to the county boundary. Events that occur near the county boundary do not contain loss estimates from adjacent counties.
- The following attributes were defaulted or calculated:
  First Floor Height was set from Foundation Type
  Content Cost was calculated from Building Cost

FLOOD INSURANCE STUDY

BURKE COUNTY, GEORGIA

AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
BURKE COUNTY (UNINCORPORATED AREAS)	130022
GIRARD, TOWN OF	130023
KEYSVILLE, TOWN OF	130104
MIDVILLE, CITY OF	130024
SARDIS, TOWN OF	130455
VIDETTE, TOWN OF	130282
WAYNESBORO, CITY OF	130025



Effective: December 17, 2010

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
13033CV000A

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) report may not contain all data available within the Community Map Repository. Please contact the Community Map Repository for any additional data.

The Federal Emergency Management Agency (FEMA) may revise and republish part or all of this FIS report at any time. In addition, FEMA may revise part of this FIS report by the Letter of Map Revision process, which does not involve republication or redistribution of the FIS report. Therefore, users should consult with community officials and check the Community Map Repository to obtain the most current FIS report components.

Selected Flood Insurance Rate Map panels for this community contain information that was previously shown separately on the corresponding Flood Boundary and Floodway Map panels (e.g., floodways, cross sections). In addition, former flood hazard zone designations have been changed as follows:

Old Zone(s)	New Zone
C	X

Initial Countywide FIS Effective Date: December 17, 2010

TABLE OF CONTENTS

FIGURES

TABLES

EXHIBITS

FLOOD INSURANCE STUDY
BURKE COUNTY, GEORGIA AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and updates information on the existence and severity of flood hazards in the geographic area of Burke County, including the Cities of Midville, and Waynesboro; the Towns of Girard, Keysville, Sardis, and Vidette; and the unincorporated areas of Burke County (referred to collectively herein as Burke County), and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood-risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

Please note that the City of Blythe is geographically located in Richmond and Burke Counties. The City of Blythe is not included in this FIS report. Also note that the Town of Keysville is geographically located in Jefferson and Burke Counties. Only the Burke County portion of the Town of Keysville is included in this FIS Report. See the separately published FIS Reports and Flood Insurance Rate Maps (FIRMs) for flood-hazard information.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

The Digital Flood Insurance Rate Map (DFIRM) and FIS report for this countywide study have been produced in digital format. Flood hazard information was converted to meet the Federal Emergency Management Agency (FEMA) DFIRM database specifications and Geographic Information System (GIS) format requirements. The flood hazard information was created and is provided in a digital format so that it can be incorporated into a local GIS and be accessed more easily by the community.

1.2 Authority and Acknowledgments

The sources of authority for this FIS are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

Precountywide Analyses

Information on the authority and acknowledgements for each jurisdiction included in this countywide FIS, as compiled from their previously printed FIS reports, is shown below:

Burke County (Unincorporated Areas):	The hydrologic and hydraulic analyses for the September 15, 1989 FIS report (FEMA, 1989) were performed for McIntosh Creek and Savannah River by Mayes, Sudderth, and Etheredge Inc, for FEMA, under Contract No. Contract No, EMA-86-C-0111 The work was completed in September 1987.

The Cities of Midville, Waynesboro, and the Towns of Girard, Keysville, Sardis and Vidette have no previously printed FIS reports.

This Countywide FIS Report

The hydrologic and hydraulic analyses for this study were performed by Post, Buckley, Schuh, and Jernigan, Inc. (PBS&J), for FEMA, under Contract No. EMA-2008-CA-5870. The work was completed in June 2009.

The hydrologic and hydraulic analyses for the Savannah River were performed by The United States Army Corps of Engineers (USACE), Savannah District for the Federal Insurance Administration (FIA) under Interagency Agreement. IAA-H-7-76, Project Order No. 23 and Interagency Agreement IAA-H-10-77, Project orders No. 2. The work was completed in February of 1978 (FEMA, 1994a).

Base map information shown on the Flood Insurance Rate Map (FIRM) was derived from Ariel photography dated 2007 and captured at a resolution of one foot. The projection used in the preparation of this map is State Plane Georgia East, and the horizontal datum used is the North American Datum of 1983 (NAD83).

1.3 Coordination

Precountywide Analyses

An initial meeting is held with representatives from FEMA, the community, and the study contractor to explain the nature and purpose of a FIS, and to identify the streams to be studied or restudied. A final meeting is held with representatives from FEMA, the community, and the study contractor to review the results of the study.

The initial and final meeting dates for previous FIS reports for Burke County and its communities are listed in the following table:

Community	FIS Date	Initial Meeting	Final Meeting
Burke County	September 15, 1989	January 22, 1986	November 2, 1988

Countywide FIS Report

An initial meeting is held with representatives from FEMA, the community, and the study contractor to explain the nature and purpose of a FIS, and to identify the streams to be studied or restudied. A final meeting is held with representatives from FEMA, the community, and the study contractor to review the results of the study.

The initial meeting was held on July 9, 2008 and attended by representatives of FEMA, Burke, Lincoln, Jenkins, McDuffie, Taliaferro, and Wilkes Counties, Georgia Department of Natural Resources (DNR) and the URS Corporation.

The results of the study were reviewed at the final meeting held on October 7, 2009, and attended by representatives of PBS&J, FEMA, Georgia DNR, and the communities. All issues raised at that meeting were addressed.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Burke County, including the incorporated communities listed in Section 1.1. The areas studied by detailed methods were selected with priority given to all known flood hazards and areas of projected development or proposed construction through December 18, 2009.

The following streams are studied by detailed methods in this FIS report:

McIntosh Creek
Savannah River

The limits of detailed study are indicated on the Flood Profiles (Exhibit 1) and on the FIRM (Exhibit 2).

For this countywide FIS, the FIS report and FIRM were converted to countywide format, and the flooding information for the entire county, including both incorporated and unincorporated areas, is shown. Also, the vertical datum was converted from the National Geodetic Vertical Datum of 1929 (NGVD) to the North American Vertical Datum of 1988 (NAVD). In addition, the Transverse Mercator, State Plane coordinates, previously referenced to the North American Datum of 1927 (NAD27), are now referenced to the NAD83.

Approximate analyses were used to study those areas having low development potential or minimal flood hazards. The scope and methods of study were proposed to and agreed upon by FEMA and URS Corporation.

2.2 Community Description

Burke County, one of Georgia's original eight counties, is located in central eastern Georgia and is bordered on the south by Screven, Jenkins, and Emanuel Counties, Georgia; on the west by Jefferson County, Georgia; on the north by Richmond County, Georgia; and on the east by Aiken, Barnwell, and Allendale Counties, South Carolina, which lie across the Savannah River. The county is served by U.S. Route 25, State Routes 21, 23, 24, 56, 80, and 305, and the Norfolk Southern Railway. The county seat is the City of Waynesboro, approximately 159 miles east of the City of Atlanta. Burke County is the second largest county in Georgia; Burke County is the second largest county in Georgia covering approximately 835 square miles. The population count, in 2000 was reported to be 22,759 (U.S. Census Bureau, 2009).

2.3 Principal Flood Problems

Burke County has experienced major floods caused by frontal activity or hurricanes. The worst recorded flooding in Burke County occurred between September 30 and October 3, 1929, as a result of a hurricane that came ashore at the City of Pensacola, Florida, on September 30 and moved northeasterly across northern Florida and southeastern Georgia before turning up the Atlantic coastline.

Low-lying areas near the Savannah River and McIntosh Creek are subject to flooding when those waterways overflow their banks. Of particular note is flooding in the City of Waynesboro caused by the overflow of the McIntosh Creek.

2.4 Flood Protection Measures

Flood protection measures are not known to exist in Burke County.

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent

chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 1-percent-annual-chance (100-year) flood in any 50-year period is approximately 40 percent (4 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by detailed methods affecting the community.

Precountywide Analyses

The hydrologic analysis for McIntosh Creek, an ungaged stream, was based on U.S. Geological Survey (USGS) regional regression equations (FEMA, 1989). The equations relate the stream discharge to the watershed drainage area. Flows for developed areas were adjusted using an urbanization factor, which defines urbanization as a function of percentage of impervious watershed area and percentage of watershed area served by storm sewers. These equations were developed by synthesizing 75 years of flood record from short- and long-term stream flow and rainfall data, applying the log-Pearson Type III distribution with regional skew coefficients as recommended by the Water Resources Council (WRC,1976) and regionalizing by multiple regression techniques. Backwater effects from Brier Creek were determined using gage data from the Cates Bridge gage near the confluence with McIntosh Creek. The backwater effects are reflected in the flood profiles.

Flood-flow frequencies for the Savannah River were calculated by the USACE using procedures described in a USGS report of the Savannah River flood frequencies (USGS, 1990). Technical data subsequently submitted by the City of North Augusta, South Carolina, in support of an appeal to the hydrologic analysis were reviewed and accepted by FEMA (FEMA, 1994c).

Peak discharge-drainage area relationships for the 10-, 50-, 100-, and 500-year floods of each flooding sourced studied in detail in the community are shown in Table 1.

Table 1 – Summary of Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
MCINTOSH CREEK					
At confluence with Brier Creek	17.9	1,290	2,004	2,369	3,300
Thomson Bridge Road	17.0	1,252	1,943	2,296	3,100
Tributary No. 1	11.7	1,042	1,599	1,878	2,900
Sewage Disposal Station	9.3	935	1,423	1,664	2,250
SAVANNAH RIVER					
At Butler Creek Dam	7,508	55,000	175,000	250,000	500,000

This Countywide FIS Report

Discharges for approximate analysis streams were estimated using the published USGS regional regression equations for rural areas in Georgia (Stamey and Hess, 1993). Regression equations estimate the peak discharges for ungauged streams based on the characteristics of nearby gauged streams. Drainage areas were developed from USGS 30-meter Digital Elevation Models (DEMs).

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that flood elevations shown on the FIRM represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data Table in the FIS report. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS report in conjunction with the data shown on the FIRM.

Precountywide Analyses

Cross-section data for McIntosh Creek and Savannah River were obtained by field surveys or estimated from adjacent surveyed sections and topographic maps (USGS, various dates). All bridges and culverts were surveyed to obtain elevations and structural geometry.

For McIntosh Creek and Savannah River, water-surface elevations of (WSELs) floods of the selected recurrence intervals were computed using the USACE Hydrologic Engineering Center's (HEC) HEC-2 step backwater program (HEC, 1984).

Channel roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and based on field observations of the channel and floodplain areas. The Manning's "n" values for all detailed studied streams are listed in the following table:

Manning's "n" Values

Stream	Channel "n"	Overbank "n"
McIntosh Creek	0.045	0.025-0.175
Savannah River	0.045	0.025-0.175

This Countywide FIS Report

For the streams studied by approximate methods, cross section data was obtained from the USGS 10-meter DEMs. Hydraulically significant roads were modeled as bridges, with opening data approximated from available inventory data or approximated from the imagery. Top of road elevations were estimated from the best available topography. The studied streams were modeled using the computer program, HEC-RAS, version 4.0.0 (HEC, 2008).

For the streams studied by approximate methods, floodplains were delineated using the 1-percent-annual-chance-WSEL's and the USGS 10-meter DEMS (USGS, 2009).

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the FIRM (Exhibit 2).

The profile baselines depicted on the FIRM represent the hydraulic modeling baselines that match the flood profiles on this FIS report. As a result of improved topographic data, the profile baseline may deviate significantly from the channel centerline or appear outside the Special Flood Hazard Area in some cases.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the Flood Profiles (Exhibit 1) are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

3.3 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum in use for newly created or revised FIS reports and FIRMs was NGVD. With the finalization of NAVD, many FIS reports and FIRMs are being prepared using NAVD as the referenced vertical datum.

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD. Structure and ground elevations in the community must, therefore, be referenced to NAVD. It is important to note that adjacent communities may be referenced to NGVD. This may result in differences in Base Flood Elevations (BFEs) across the corporate limits between the communities. Some of the data used in this study were taken from the prior effective FIS reports and adjusted to NAVD. The average conversion factor that was used to convert the data in this FIS report to NAVD was calculated using the National Geodetic Survey's (NGS) VERTCON online utility (NGS, 2009). The data points used to determine the conversion are listed in Table 2.

Table 2 – Vertical Datum Conversion

Quad Name	Corner	Latitude	Longitude	Conversion from NGVD to NAVD
Avondale	SE	33.250	-82.250	-0.646
Blythe	SE	33.250	-82.125	-0.682
Hephzibah	SE	33.250	-82.000	-0.741
Mechanic Hill	SE	33.250	-81.250	-0.797
Matthews	SE	33.125	-82.250	-0.604
Keysville	SE	33.125	-82.125	-0.689
Storys Millpond	SE	33.125	-82.000	-0.761
McBean	SE	33.125	-81.875	0.774
Shell Bluff Landing	SE	33.125	-81.750	-0.827
Girard NW	SE	33.125	-81.625	-0.876
Kellys Pond	SE	33.000	-82.250	-0.627
Gough	SE	33.000	-82.125	-0.705
Waynesboro	SE	33.000	-82.000	-0.764
Idlewood	SE	33.000	81.875	-0.787
Alexander	SE	33.000	-81.750	-0.787
Girard	SE	33.000	-81.625	-0.814
Old Town	SE	32.875	-82.250	-0.663
Scotts Corner	SE	32.875	-82.125	-0.689
			Average:	-0.733

For additional information regarding conversion between NGVD and NAVD, visit the NGS website at www.ngs.noaa.gov, or contact the NGS at the following address:

Vertical Network Branch, N/CG13
National Geodetic Survey, NOAA
Silver Spring Metro Center 3
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

Temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the Technical Support Data Notebook associated with the FIS report and FIRM for this community. Interested individuals may contact FEMA to access these data.

To obtain current elevation, description, and/or location information for benchmarks shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each FIS provides 1-percent-annual-chance (100-year) flood elevations and delineations of the 1- and 0.2-percent-annual-chance (500-year) floodplain boundaries and 1-percent-annual-chance floodway to assist communities in developing floodplain management measures. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles, Floodway Data Table, and Summary of Stillwater Elevations Table. Users should reference the data presented in the FIS report as well as additional information that may be available at the local map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-annual-chance flood is employed to indicate additional areas of flood risk in the community.

For each stream studied by detailed methods, the 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using USGS 10-meter DEMs (USGS, 2009).

For the streams studied by approximate methods, between modeled cross sections, the boundaries were interpolated using USGS 10-meter DEMs (USGS, 2009).

The 1- and 0.2-percent-annual-chance floodplain boundaries are shown on the FIRM (Exhibit 2). On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zone A and AE), and the 0.2-percent-annual-chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1- and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-annual-chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 1-percent-annual-chance floodplain boundary is shown on the FIRM (Exhibit 2).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 1-percent-annual-chance flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodway presented in this FIS report and on the FIRM was computed for certain stream segments on the basis of equal-conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations have been tabulated for selected cross sections (Table 3). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary has been shown.

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
SAVANNAH RIVER								
A	866,976	13,583 / 419	148,325	0.9	107.2	107.2	108.2	1.0
B	875,688	13,194 / 0	156,108	0.9	108.0	108.0	109.0	1.0

[1]Feet above confluence with Atlantic Ocean

[2]Total width / width within County

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

BURKE COUNTY, GA
AND INCORPORATED AREAS

FLOODWAY DATA

SAVANNAH RIVER

The area between the floodway and 1-percent-annual-chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the WSEL of the 1-percent-annual-chance flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1.

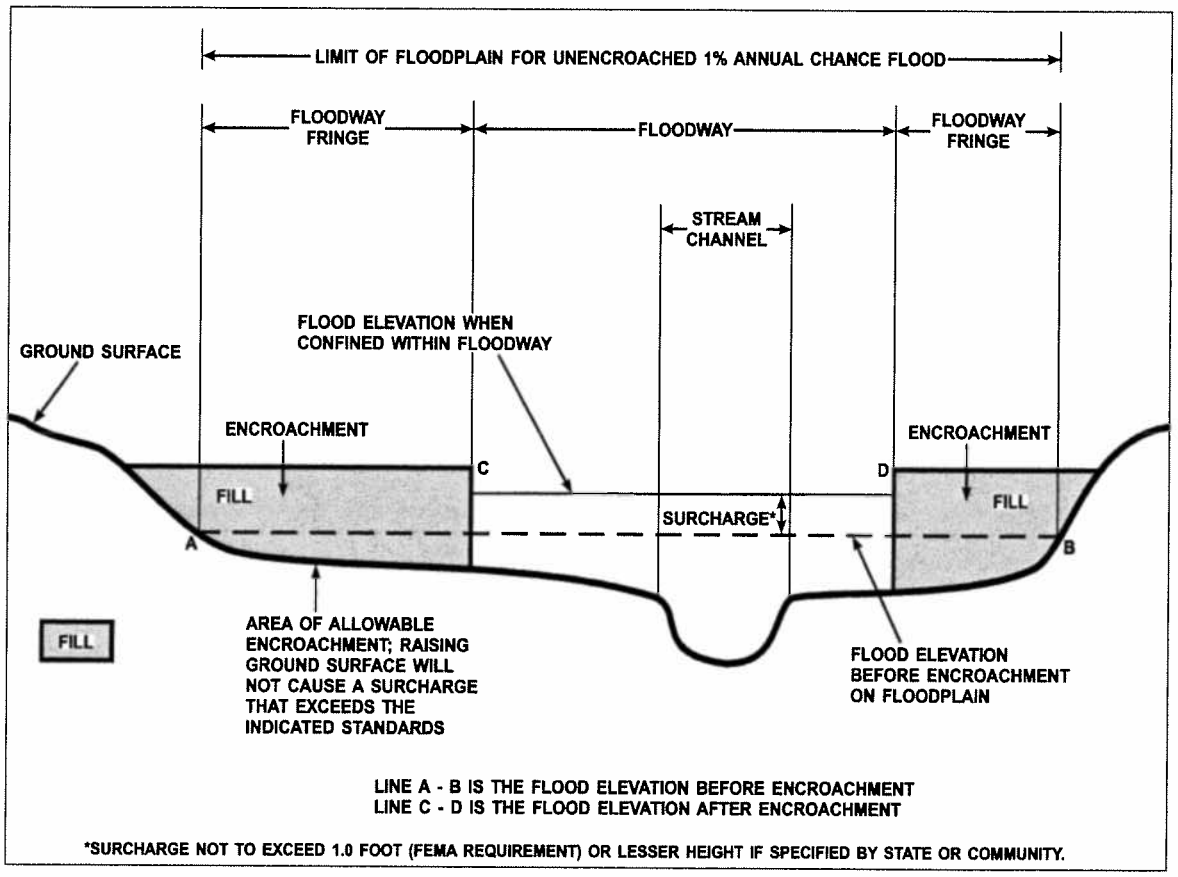


Figure 1 - Floodway Schematic

No floodways were computed for McIntosh Creek.

5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance risk zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS by approximate methods. Because detailed

hydraulic analyses are not performed for such areas, no BFEs or base flood depths are shown within this zone.

Zone AE

Zone AE is the flood insurance risk zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS by detailed methods. In most instances, whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance risk zone that corresponds to areas outside the 0.2-percent-annual-chance floodplain, areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by levees. No BFEs or base flood depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance risk zones as described in Section 5.0 and, in the 1-percent-annual-chance floodplains that were studied by detailed methods, shows selected whole-foot BFEs or average depths. Insurance agents use the zones and BFEs in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 1- and 0.2-percent-annual-chance floodplains, floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

The countywide FIRM presents flooding information for the entire geographic area of Burke County. Previously, FIRMs were prepared for each incorporated community and the unincorporated areas of the County identified as flood-prone. This countywide FIRM also includes flood-hazard information that was presented separately on Flood Boundary and Floodway Maps, where applicable. Historical data relating to the maps prepared for each community are presented in Table 4.

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISION DATE	FIRM EFFECTIVE DATE	FIRM REVISION DATE
Burke County (Unincorporated Areas)	March 10, 1978	None	September 15, 1989	None
Girard, Town of	September 6, 1974	January 23, 1976 November 9, 1979	December 17, 2010	None
Keysville, Town of	December 17, 2010	None	December 17, 2010	None
Midville, City of	July 11, 1975	July 21, 1978	July 3, 1986	None
Sardis, Town of	December 17, 2010	None	December 17, 2010	None
Vidette, Town of	December 17, 2010	None	December 17, 2010	None
Waynesboro, City of	June 14, 1974	March 26, 1976	August 1, 1987	None

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

BURKE COUNTY, GA
AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

A previous report has been prepared for the Unincorporated Areas of Richmond County, Georgia (FEMA, 1987).

This report either supersedes or is compatible with all previous studies on streams studied in this report and should be considered authoritative for purposes of the NFIP.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting FEMA, Federal Insurance and Mitigation Division, Koger Center – Rutgers Building, 3003 Chamblee Tucker Road, Atlanta, Georgia 30341.

9.0 BIBLIOGRAPHY AND REFERENCES

Federal Emergency Management Agency, Flood Insurance Study, Richmond County, Georgia (Unincorporated Areas), February 1987.

Federal Emergency Management Agency, Flood Insurance Study, County of Burke, Georgia, September 16, 1989.

Federal Emergency Management Agency, Flood Insurance Study, Aiken County, South Carolina, Unincorporated Areas, Flood Insurance Study Report, November 2, 1994a; Flood Insurance Rate Map, November 2, 1994b.

Federal Emergency Management Agency, Savannah River Appeal Resolution Summary of Technical Issues, Washington, D.C., February 16, 1994c.

Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Computer Program 723-X6-L202A, U.S. Army Corps of Engineers, Davis, California, April 1984.

Hydrologic Engineering Center, HEC-RAS River Analysis System, Version 4.0, U.S. Army Corps of Engineers, Davis, California, March 2008.

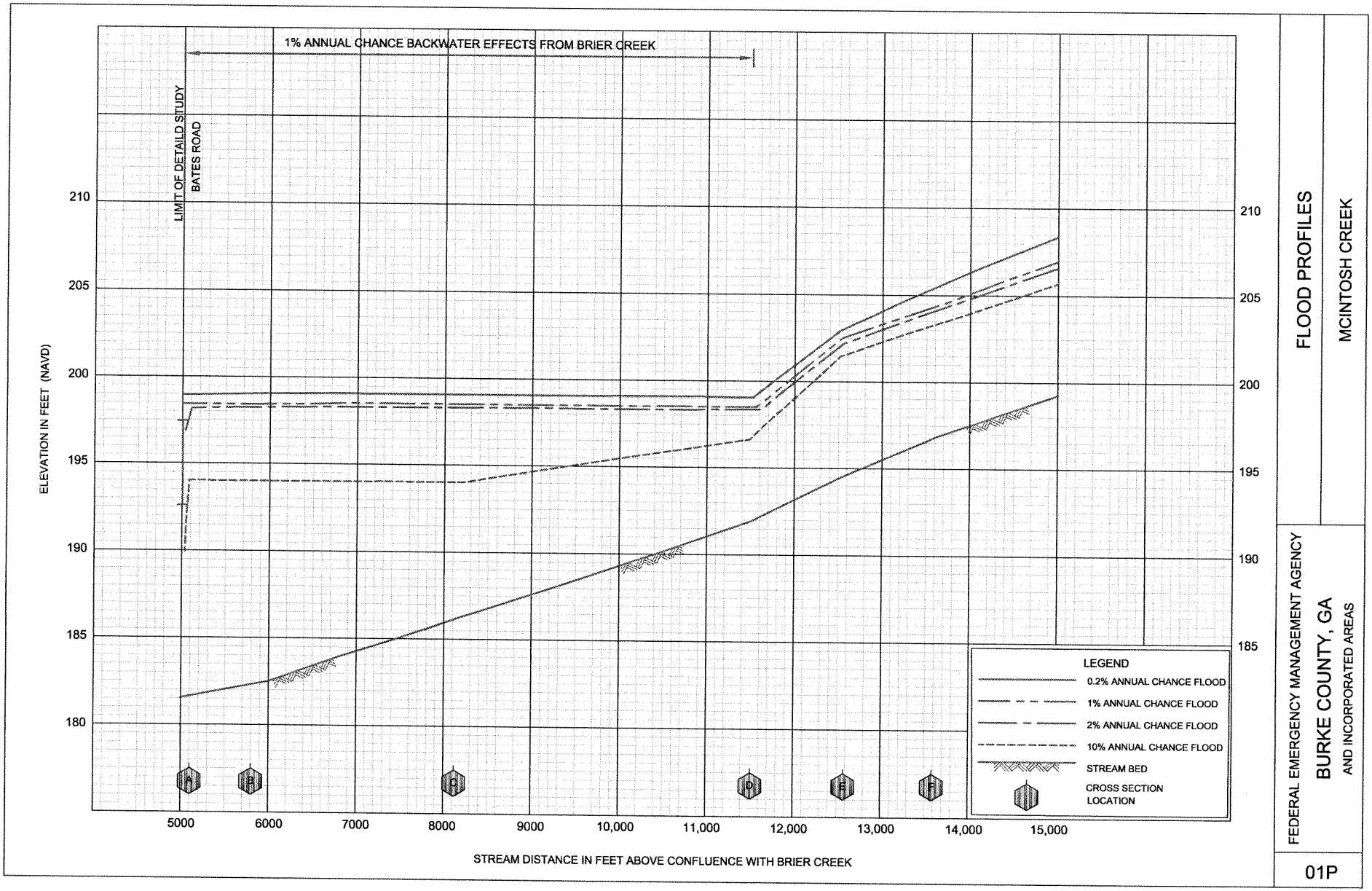
National Geodetic Survey, VERTCON-North American Vertical Datum Conversion Utility. Retrieved March 11, 2009, from http://www.ngs.noaa.gov/.

Stamey, T.C. and C.W. Hess, Techniques for Estimating Magnitude and Frequency of Floods in Rural Basins of Georgia, USGS Water Resources Investigations Report 93-4016, 1993.

U.S. Census Bureau, American Fact Finder, 2000 Retrieved March 13, 2009, from http://factfinder.census.gov.

U.S. Geological Survey, Seamless Data Distribution System-10-meter Digital Elevation Model. Downloaded March 2009, from http://seamless.usgs.gov.

U.S. Water Resources Council, Guidelines for Determining Flood Flow Frequency, Bulletin # 17, March 1976.



FLOOD PROFILES

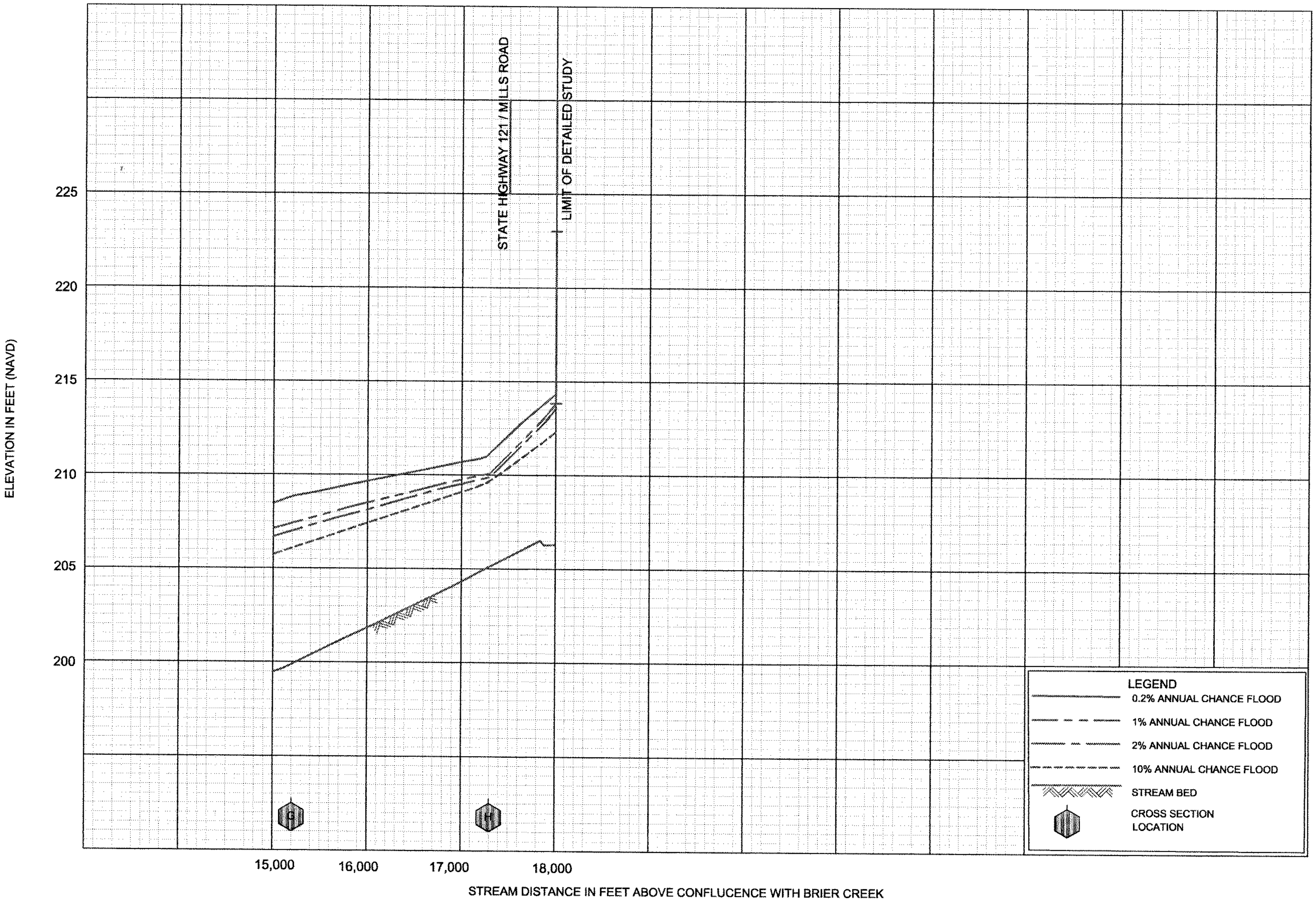
MCINTOSH CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BURKE COUNTY, GA

AND INCORPORATED AREAS

01P



FLOOD PROFILES

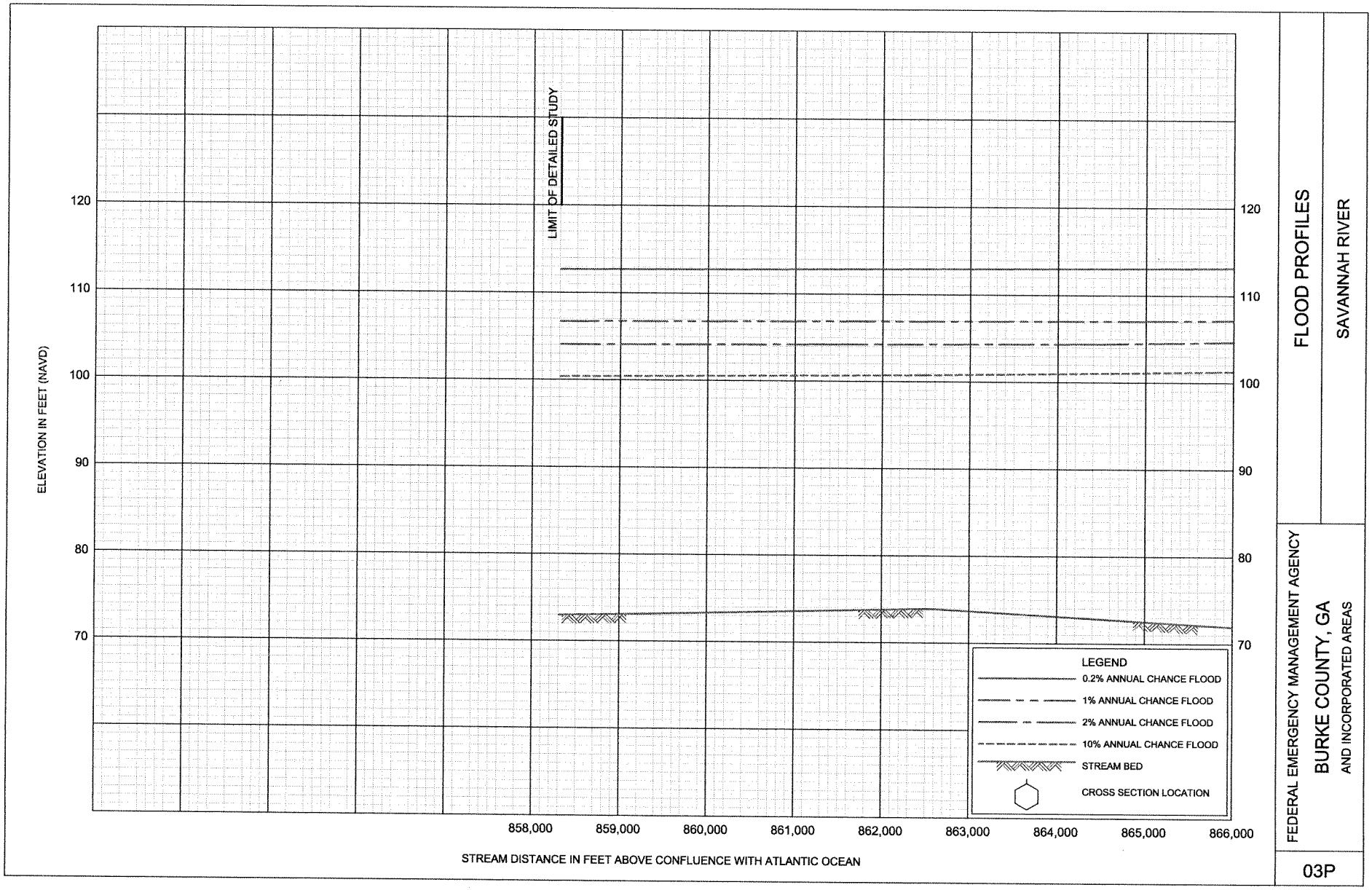
MCINTOSH CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BURKE COUNTY, GA

AND INCORPORATED AREAS

02P



FLOOD PROFILES

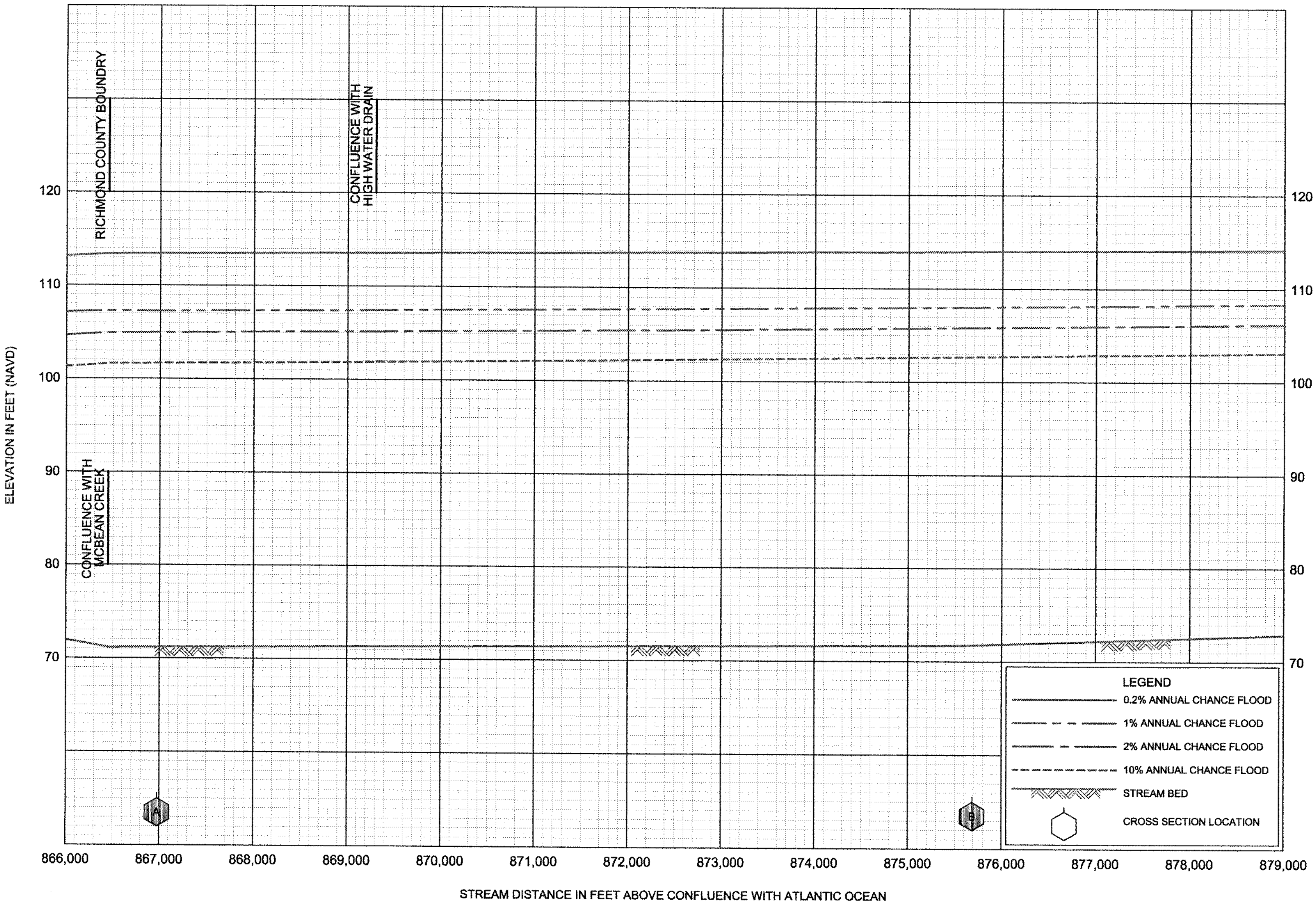
SAVANNAH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BURKE COUNTY, GA

AND INCORPORATED AREAS

03P



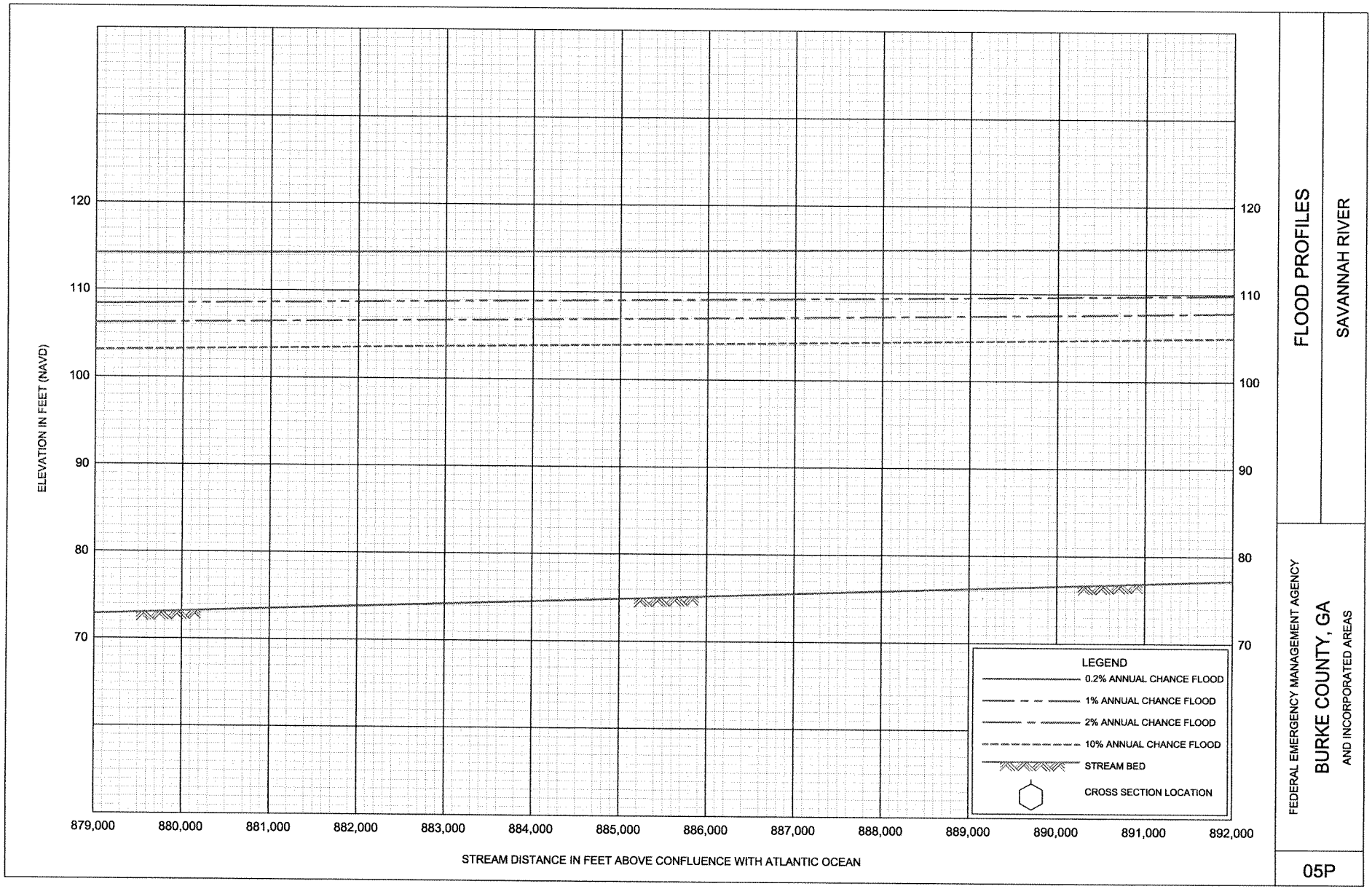
FLOOD PROFILES

SAVANNAH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BURKE COUNTY, GA

AND INCORPORATED AREAS



FLOOD PROFILES

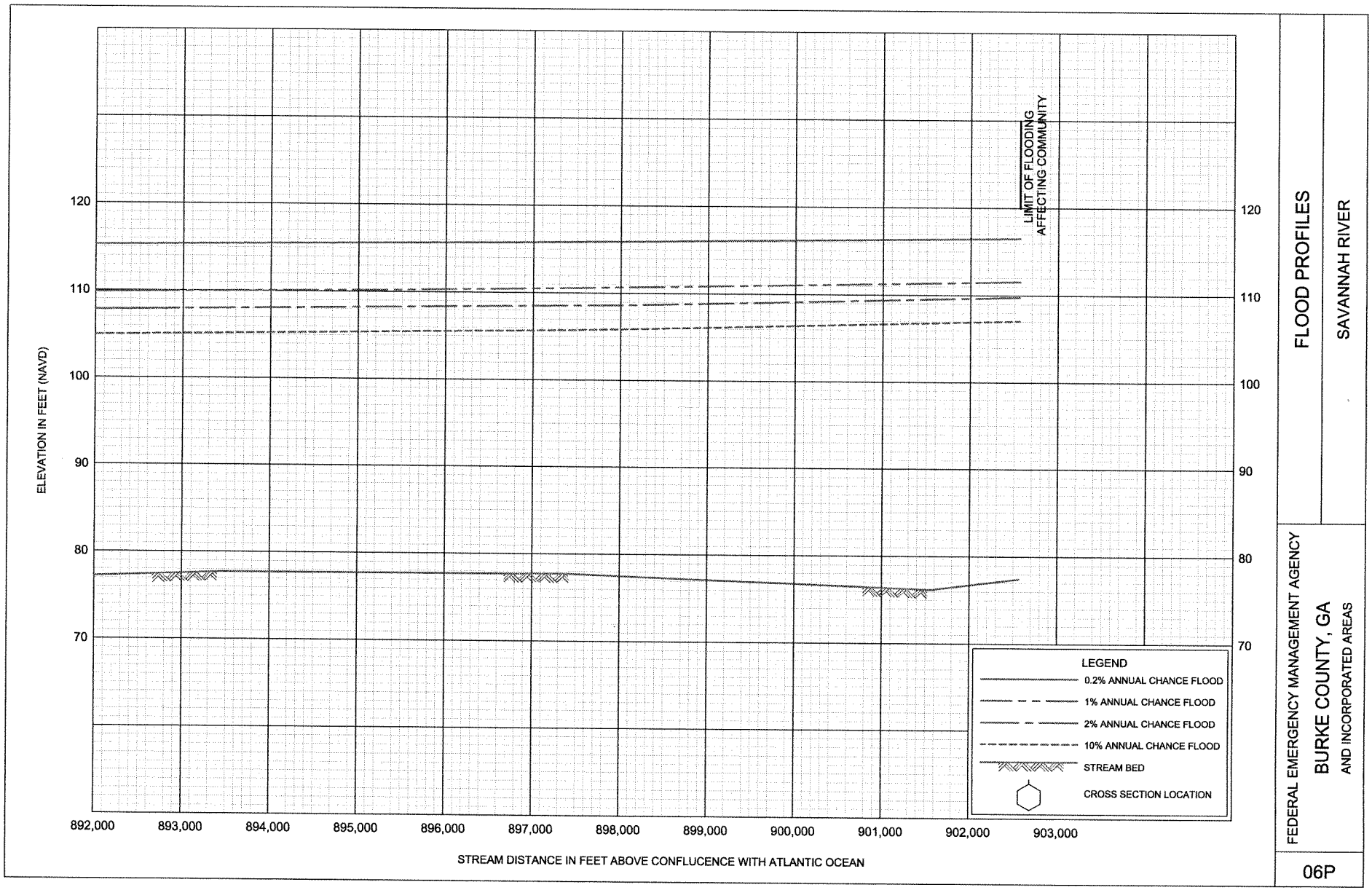
SAVANNAH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BURKE COUNTY, GA

AND INCORPORATED AREAS

05P



FLOOD PROFILES

SAVANNAH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BURKE COUNTY, GA

AND INCORPORATED AREAS

06P

GEORGIA FORESTRY COMMISSION

Community Wildfire Protection Plan

An Action Plan for Wildfire Mitigation and Conservation of Natural Resources

Burke County, Georgia

A Program of the Georgia Forestry Commission
with support from the U.S. Forest Service

+

JULY 28, 2013

TIMBER IMPACT ASSESSMENT

Georgia Ice Storm, February 11-13, 2014

By: James Johnson, Chip Bates & Gary White, Georgia Forestry Commission
(jjohnson@gfc.state.ga.us; cbates@gfc.state.ga.us ; gwhite@gfc.state.ga.us)

BACKGROUND

A winter storm impacted multiple southern states and more than 90 Georgia counties experienced some form of winter precipitation, beginning February 11th and lasting through the 13th. Northern tier counties recorded snowfalls of up to 13" (Rabun County), and although some timber / tree impacts occurred in this "snow zone," they were not widespread or considered severe.

During the storm, ice accumulation was measured from between a tenth of an inch and one inch (or possibly higher) in a zone from roughly north metro Atlanta to Augusta in northern Georgia, and from Macon to Sylvania in central Georgia. Because ice is much heavier than snow, widespread tree damage occurred, resulting in power disruption to nearly a million customers.

Governor Deal declared a state of emergency on Monday, February 10th, and a presidential declaration of emergency was issued as the storm hit the state. The map below depicts this zone (*Figure 1*).

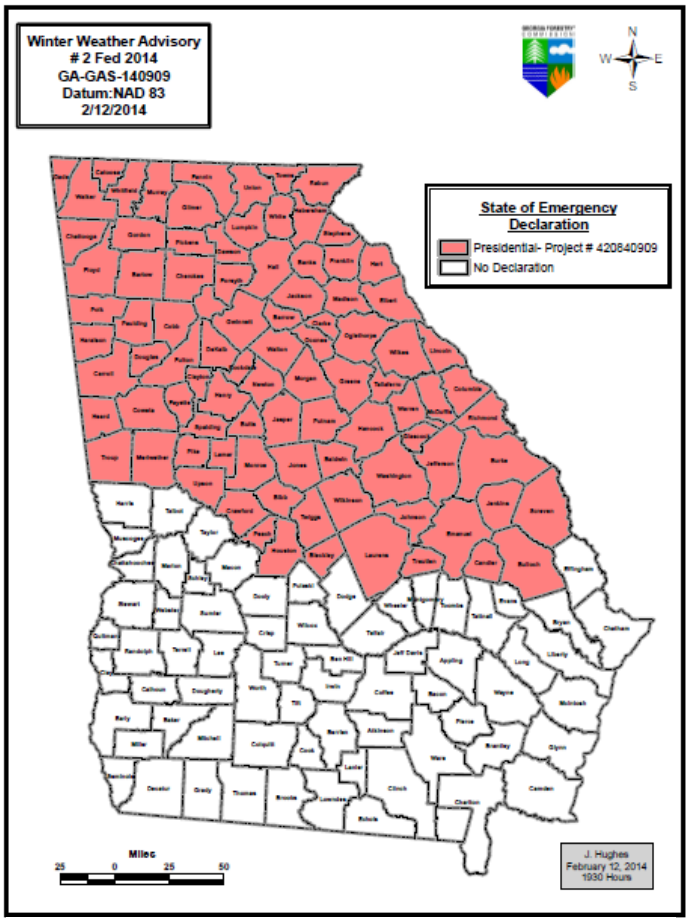


Figure 1: Counties included in the presidential declaration zone

The National Weather Service provided estimates of ice accumulations, and this information, coupled with field observation reports, helped define the area surveyed by the Georgia Forestry Commission for timber impact accounts. Small amounts of ice are known to affect trees, and higher amounts (especially exceeding three-fourths of an inch) can cause serious damage to certain timber types and age classes.

Another factor that affects tree damage is wind. Once ice accumulations peaked, a cold front moved through the state. Although wind speed varied, some areas reported winds of up to 35mph. Even minor winds during ice-loading can break or uproot trees. These occurrences were a major factor in the timber / tree damage associated with this storm, and may account for some of the variability detected.

OBSERVATIONS

A team of Georgia Forestry Commission foresters surveyed the zone believed to have endured the greatest impacts to our forests, and developed the map below. Please note that damage was observed beyond these counties, but it tended to be less intense than those shown by the map's shaded areas. Some of the highlighted counties had tremendous variations in the amount of damage observed. In addition, timber damage evaluation surveys were separated into rough categories of damage (at the county level), isolated timber stands within counties in the two lesser categories may have severe damage, and stands in the severe counties may only have minor damage. The variability of damage to similar stands even a few miles apart was extreme, so mangers should carefully evaluate timber throughout this broad region.

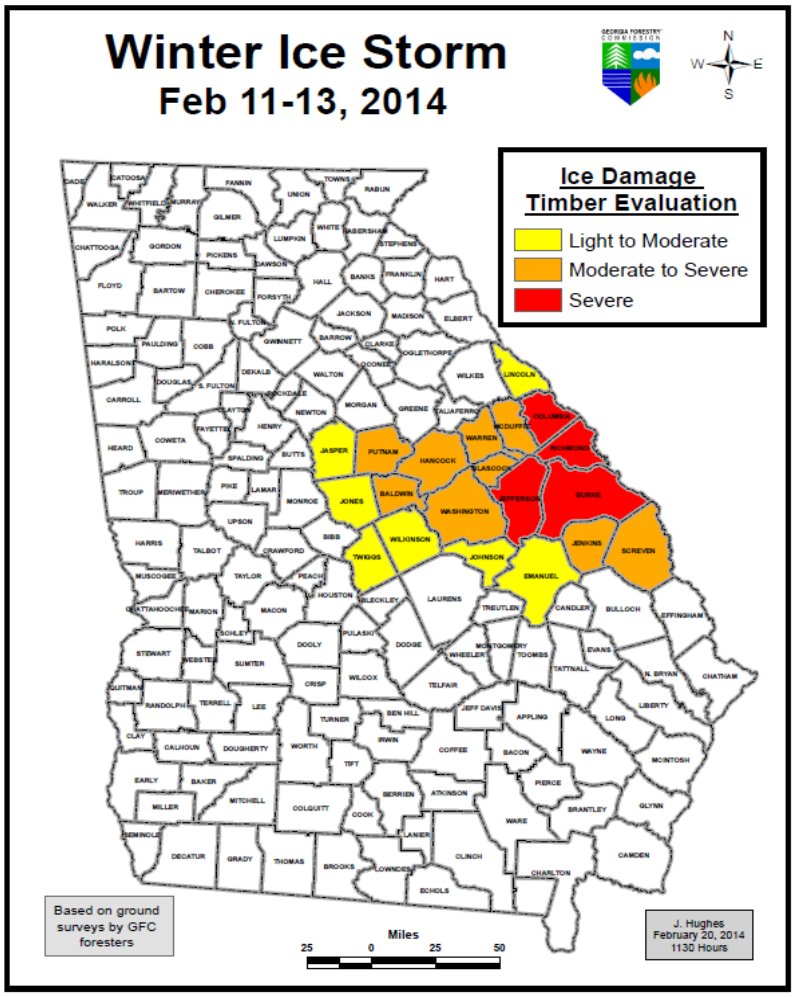


Figure 2: Counties with widespread Ice Damage

This survey examined landscape-level impacts and classifies them accordingly.

The categories of damage are based upon field observations about:

- Occurrence (frequency) of damage within a county.
- Levels of damage within two types of pine that were most frequently damaged (young pine stands, and pine stands on which a first-thinning had recently occurred.)

Ice Damage Intensity:

Light to moderate damage – Only branches and limbs broken from the tree, with minor damage to the overall stand and trees bent less than 45 degrees. No salvage operation will be necessary and the stand should recover with no additional management requirements, though long term yields will likely be impacted.

Moderate to severe damage – Branches and limbs broken from the trees with damage to the overall stand. More than 25% of stems broken and a salvage operation should be considered to minimize losses and remove trees that likely will not survive.

Severe damage – More than 30% of stems broken, tops broken out across the stand, limbs stripped, and trees bent more than 45 degrees. A salvage operation must be considered and a clearcut may be the prudent management decision.

Ice damage was not detected on most timber types but was concentrated on two types of pine: recently thinned pine stands, and younger stands less than 25 feet in height.

Recently thinned pine stands: These are primarily pine plantations that were thinned for the *first time* within the past several years. Trees adjust to the amount of space and competition within a stand, and those that have been thinned for the first time are adjusting to reduced protection from neighboring trees and are growing in diameter, which strengthens the main stem. They also respond by accelerating root growth which helps anchor the tree and aids in the increased moisture uptake needed to support larger live crowns. Depending on residual stand-density after thinning, it takes trees about five years to fully respond to the increased growing space. In the meantime, they are more prone to wind (and ice) damage.

These stands were particularly hard hit, which is unfortunate for landowners who have invested 15 to 20-plus years of growth getting their trees to this size. First-thinnings typically remove lower value wood (such as pulpwood / fuel wood), with the objective of allowing the residual stand to produce higher value products (such as sawtimber, plywood, and poles). From an investment standpoint, timber growth following a first thinning maximizes profits, so salvaging an ice-damaged stand is a devastating blow to expected returns.

Photo (left) – Twenty-one year old loblolly stand in Burke County; suffered over 30% stem breakage.

Thinning likely occurred two years ago.

Photo (right) – Nineteen year old loblolly stand in Jefferson County; suffered almost 50% stem breakage.

Thinning occurred within the past year.

Numerous older pine stands that had been thinned twice (or more) were also examined. Although some had damage, most would be considered minor, with many not requiring a salvage operation. The damage in these stands tended to be uprooted trees rather than stem breakage. This type of wind throw (tree that is completely uprooted) in older stands seemed prevalent throughout the region.

Landowners and managers of storm-damaged stands are highly encouraged to read and understand the implications of ice on different types of stands. Web links which provide detailed guidance are provided on the last page of this document.

Young pine stands: Pine plantations (of most species) that were 25 feet and taller - and *had never been thinned* - seemed to weather this ice storm well. The ability of dense stands to provide tree-to-tree support and prevent winds from uprooting individual trees was a big factor in these stands' withstanding minimal damage. Younger (and shorter) stands, however, didn't fare as well. One of the critical factors seemed to be that the trees still had many live branches almost to ground level, which likely accumulated so much ice that breaking points were reached for limbs and main stems.

Young stands of about six feet in height also seemed to fair well. Some of these have many bent stems (with some breakage), but young trees tend to correct this problem.

Some younger loblolly stands were damaged (especially in the counties noted as "Severe" on the map on page 2), but more damage occurred on longleaf and slash pine. Longleaf stands suffered the worst damage with stem and limb breakage but no stands seen were completely leveled. The resiliency of nature can be surprising, and the fate of these stands will become evident over the next few years. When tops break out, a lateral branch will assume dominance and there will be variation in long-term stem straightness.

Careful examination will be needed to determine the amount of permanent problems this storm has inflicted on each stand. Re-evaluation after the next growing season should give managers a better perspective on what lies ahead.

Photo (Left) – Five year old slash pine stand in Burke County showing many bent and leaning trees, with some breakage. Note the many leaning trees with limb breakage.

Photo (Right) – Nine year old longleaf pine stand in Burke County showing top and limb breakage. Note the many tops broken and some limb breakage.

EXTENT OF DAMAGE

GFC foresters evaluated the counties noted on the previous map and developed estimates of damage based upon a combination of this field work combined with a geospatial analysis of this region. These estimates do not include areas outside this zone, nor do they include hardwood, which was also impacted. Most hardwood damage consisted of limb and top breakage with most trees retaining enough live branches to support survival. Damage can be expected in the growth form of these trees and possibly in sluggish growth rates.

For pine type timber, an estimated 70,000+ acres were impacted, valued in excess of $65 million. The majority of these acres (61,000+) were in the recently thinned pine category. This estimate doesn't include damage outside of the zone shown on the map (page 2), and it does not account for hardwood damage acreages or values, so it should be considered conservative. Some of the merchantable pine will likely be salvaged, which could reduce the damage estimate somewhat. However, the values used were based upon landowners intending to grow these stands for at least 30 years, with the growing objective of solid wood products (sawtimber, plywood, and poles). So even if salvage occurs, part of the "loss" is in the future growth of these higher value products.

RECOMMENDATIONS

With the wide range of damage inflicted by this ice storm, there will likely be three distinct categories by which landowners make their evaluations:

1) Light damage or losses that may not warrant a salvage operation. This could include merchantable stands (trees are large enough to sell), which simply don't have enough timber damage to warrant a commercial harvest, or pre-merchantable stands where there is a good chance they will recover over time.

2) Stands with significant damage, mandating a salvage operation to recoup whatever value can be obtained from the stand. This might include a complete harvest for widespread damage, or a partial harvest of damaged timber to provide a commercial harvest.

3) Situations falling between the two scenarios above, in which a good bit of the timber is damaged but there might be enough timber to leave growing. In these cases, landowners are encouraged to use the services of a professional forester to help make the best decision for the situation. Immediately following a storm, it is difficult for landowners to accurately gauge how well a stand may recover, or to measure the amount of timber that could be allowed to remain for future growth and income.

For landowners facing a complete harvest to salvage their damaged timber, please consider reforesting the area. The Farm Service Agency has a cost share program that can assist with site preparation and planting costs called the Emergency Forest Restoration Program (EFRP). Apply at your local office.

Special thanks to other GFC foresters who helped develop this information:
Jeff Kastle, Chris Thompson, Chris Howell, Chris Barnes, Jeremy Hughes and Charles Bailey

URBAN TREE ASSESSMENTS

Georgia Forestry Commission certified arborist/foresters surveyed damage and storm-generated tree debris left to be removed from urban and rural communities. Survey results showed counties that experienced the most damage to their rural stands also suffered the most damage to their urban trees. The highest amount of damage, as one might expect, was found in Burke County.

Neighborhoods with large pine trees experienced the most loss, with the bulk of damage to branches and tree tops which were broken by the weight of ice. Additionally, "leaf on" trees, such as magnolia and cherry laurel, and old water oaks with structural issues, made up a large component of community forest tree failure. Crews observed very few trees that were completely destroyed or uprooted by the storm.

Much debris remains to be cut and stacked by homeowners and tree care companies before its removal from community rights-of-way can begin. Many trees that have lost more than 50% of their limbs, and trees that have been uprooted or split so that heartwood of the main trunk is evident, will need to be removed. Otherwise, impacted trees will require pruning, with particular attention being paid to higher risk trees with “hangers” (limbs broken, but not yet detached) and split limbs (see photo below). This will likely increase beyond initial assessments the total biomass that will eventually be collected.

Although the tree at left suffered minor ice damage, notice the branches that are broken and still hanging in the tree. These could impact the structure, the vehicle or humans. These “hangers” should be removed.

The pine tree at right lost half of the living portion of its crown and pruning is needed to remove branch stubs.

Special thanks to GFC foresters who helped with field work: Gary White, Joe Burgess, Joan Scales, Mark McClellan, Jeremy Hughes, Keith Murphy, Chris Howell and also Mark Millirons.

These resources can help forest landowners learn more about options and considerations for situations in which trees have been damaged by winter weather:

TIMBERLAND WIND / ICE DAMAGE:

How to Evaluate and Manage Storm-Damaged Forest Areas:
http://www.fs.fed.us/r8/foresthealth/pubs/storm_damage/contents.html

Evaluating wind / ice damage stands:
http://www.forestry.uga.edu/outreach/pubs/pdf/forestry/assessing_tornado_damaged_forest_stands5-30-08_1.pdf

Wind Wood Utilization (this has numerous documents and links that are beneficial):
http://www.windwoodutilization.org/salvage.asp

URBAN AND HAZARD TREE SAFETY:

http://www.gatrees.org/community-forests/management/trees-storm-safety/

Excellent site for Storm Damage…with an Urban Forestry angle:
http://hort.ifas.ufl.edu/treesandhurricanes/

TAXES:

National Timber Tax website (Master Index has good list of subject areas):
http://www.timbertax.org/

TIMBER SALES:

General information:
http://www.gatrees.org/forest-management/private-forest-management/timber-selling/

Landowners are encouraged to utilize professional foresters and arborists to help with decisions about timber management or potentially hazardous trees around homes and urban environments. Seeking independent advice is a sound way to reduce hasty judgments and insure all available options are considered.

Prepared by;
George Glenn, Chief Ranger Burke County
Will Fell CWPP Specialist
Georgia Forestry Commission
1508 US Hwy 25 South
Waynesboro GA 30830

The following report is a collaborative effort among various entities; the representatives listed below comprise the core decision-making team responsible for this report and mutually agree on the plan's contents:

Rusty Sanders
Chief Burke County Fire/Rescue and EMA Director
(706) 554-6651
rsanders@burkecounty-ga.gov

Merv Waldrop
Burke County Administrator
(706) 554-2324
Wmerv.waldrop@burkecounty-ga.gov

Robert Parrish
Deputy Chief Burke County Fire/Rescue
(706) 554-8037
rhparrish@bellsouth.net

George Glenn
Chief Ranger Burke County
Georgia Forestry Commission
(706) 554-2310
gglenn@gfc.state.ga.us

PLAN CONTENTS

Preface

The extreme weather conditions that are conducive to wildfire disasters (usually a combination of extended drought, low relative humidity and high winds) can occur in this area of Georgia as infrequently as every 10-15 years. This is not a regular event, but as the number of homes that have been built in or adjacent to forested or wildland areas increases, it can turn a wildfire under these weather conditions into a major disaster. Wildfires move fast and can quickly overwhelm the resources of even the best equipped fire department. Advance planning can save lives, homes and businesses.

This Community Wildfire Protection Plan (CWPP) includes a locally assessed evaluation of the wildland urban interface areas of the county, looking at the critical issues regarding access to these areas, risk to properties from general issues such as building characteristics and "fire wise" practices and response from local fire fighting resources. It further incorporates a locally devised action plan to mitigate these risks and hazards though planning, education and other avenues that may become available to address the increasing threat of wildland fire. The CWPP does not obligate the county financially in any way, but instead lays a foundation for improved emergency response if and when grant funding is available to the county.

The Plan is provided at no cost to the county and can be very important for county applications for hazard mitigation grant funds through the National Fire Plan, FEMA mitigation grants and Homeland Security. Under the Healthy Forest Restoration Act (HFRA) of 2003, communities (counties) that seek grants form the federal government for hazardous fuels reduction work are required to prepare a Community Wildfire Protection Plan.

This plan will:

- Enhance public safety
- Raise public awareness of wildfire hazards and risks
- Educate homeowners on how to reduce home ignitability
- Build and improve collaboration at multiple levels

The public does not have to fall victim to this type of disaster. Homes (and communities) can be designed, built and maintained to withstand a wildfire even in the absence of fire equipment and firefighters on the scene. It takes planning and commitment at the local level before the wildfire disaster occurs and that is what the Community Wildfire Protection Plan is all about.

I. OBJECTIVES

The mission of the following report is to set clear priorities for the implementation of wildfire mitigation in Burke County. The plan includes prioritized recommendations for the appropriate types and methods of fuel reduction and structure ignitability reduction that will protect this community and its essential infrastructure. It also includes a plan for wildfire suppression. Specifically, the plan includes community-centered actions that will:

- Educate citizens on wildfire, its risks, and ways to protect lives and properties,
- Support fire rescue and suppression entities,
- Focus on collaborative decision-making and citizen participation,
- Develop and implement effective mitigation strategies, and
- Develop and implement effective community ordinances and codes.

II. COMMUNITY COLLABORATION

The core team convened on Mar 5th, 2010 to assess risks and develop the Community Wildfire Protection Plan. The group is comprised of representatives from local government, local fire authorities, and the state agency responsible for forest management. Below are the groups included in the task force:

Burke County Government

Burke County Fire/Rescue Department
Emergency Management
Board of County Commissioners

Georgia Forestry Commission

It was decided to conduct community assessments on the basis selected communities in the county. The core team in Burke County assessed their districts and reconvened on April 30th, 2013 for the purpose of completing the following:

Risk Assessment	Assessed wildfire hazard risks and prioritized mitigation actions.
Fuels Reduction	Identified strategies for coordinating fuels treatment projects.
Structure Ignitability	Identified strategies for reducing the ignitability of structures within the Wildland interface.
Emergency Management	Forged relationships among local government and fire districts and developed/refined a pre-suppression plan.
Education and Outreach	Developed strategies for increasing citizen awareness and action and to conduct homeowner and community leader workshops.

III. COMMUNITY BACKGROUND AND EXISTING SITUATION

Burke County, whose eastern edge shares the border with South Carolina along the Savannah River, is one of Georgia's eight original counties. When the colony was established in 1732, the area now known as Burke County was called the Halifax District. In 1758 Georgia was divided into parishes, and the Halifax District became the parish of St. George. The county currently encompasses an area of 831 square miles after portions of it were incorporated into Screven (1793), Jefferson (1796), Richmond (1841), and Jenkins (1905) counties.

The original inhabitants of the area were Creek, Cherokee, and Catawba Indians, who lost their land when members of their leadership, often not speaking for all of them, signed treaties in 1733, 1736, and 1758 with the English. The first white settlers were "headright settlers," or those who acquired land via a system that granted parcels to the heads of families, with more land going to larger families. Almost all of the first landowners came from the older American colonies, especially after Georgia lifted its ban on slavery in 1751. The majority were farmers with small- and medium-sized operations who were attracted by the Savannah and Ogeechee rivers, which offered transportation and water for their livestock. A few other settlers came from parishes to the south, and some (mostly Scots-Irish Protestants) arrived from across the Atlantic.

In 1777 St. George Parish became one of Georgia's first counties, named for political philosopher and member of British Parliament Edmund Burke, who advocated appeasement of American colonial grievances. Many residents of Burke County remained loyal to the king, and ensuing conflicts during the Revolutionary War (1775-83) led to major property damage. Two military engagements in 1779 between the king's troops and the revolutionaries were notable: a skirmish at the Burke County Jail in January, during which the colonists defeated 400 British troops; and a British victory at the Battle of Brier (later Briar) Creek.

Waynesboro, laid out in 1783 and incorporated in 1812, is the county seat. It was named for General Anthony "Mad Anthony" Wayne. The current courthouse, built in 1857 and expanded in 1899, is one of the state's oldest brick buildings still in use. Other incorporated towns are Girard, Keysville, Midville, and Sardis.

By the end of the eighteenth century, the accrual of larger tracts of land by planters and the employment of slave labor resulted in a plantation system that replaced the county's small-farm economy, and Burke County became a prime cotton-producing area. However, many plantations did not survive the Civil War (1861-65), and the economy, still dependent on the production of cotton, moved to a system of small farms using tenant labor. Later these workers were forced to look for work in cities after being replaced by mechanized cotton pickers and row cultivators.

Former notable residents of the county include Lyman Hall, one of three Georgians who signed the Declaration of Independence and governor from 1783 to 1784; Edward Telfair, governor from 1786 to 1787; naturalist and illustrator John Abbot, who wrote The Natural History of the Rarer Lepidopterous Insects of Georgia (1797); nineteenth-century politician Herschel Johnson; and nineteenth-century historian Charles C. Jones Jr.

Places of interest include Bark Camp Church and Bellevue Plantation. Bark Camp Church was organized in 1788 as part of Bark Camp, which was established before the Revolution as a settlement camp for new migrants to the area. Bellevue Plantation, originally a grant to Samuel Eastlake by King George III in 1767, was damaged during Union general William T. Sherman's march to the sea nearly a century later. Both Confederate and Union soldiers were buried on the property after a skirmish there.

Augusta Technical College operates a satellite campus in Waynesboro.

According to the 2010 U.S. census, the population of Burke County is 23,316, an increase from the 2000 population of 22,243.

Courtesy *Elizabeth C Cooksey, New Georgia Encyclopedia*

Existing Situation

Burke County located in east central Georgia, despite its' large agricultural presence, is still over 62% forested. Perhaps with the exception of the large blocks of woodlands adjacent the Savannah River in northern Burke County, there are homes and communities scattered throughout the county. The risks and hazards from the wildland urban interface are fairly general and substantial throughout the county even on the edges of the incorporated cities.

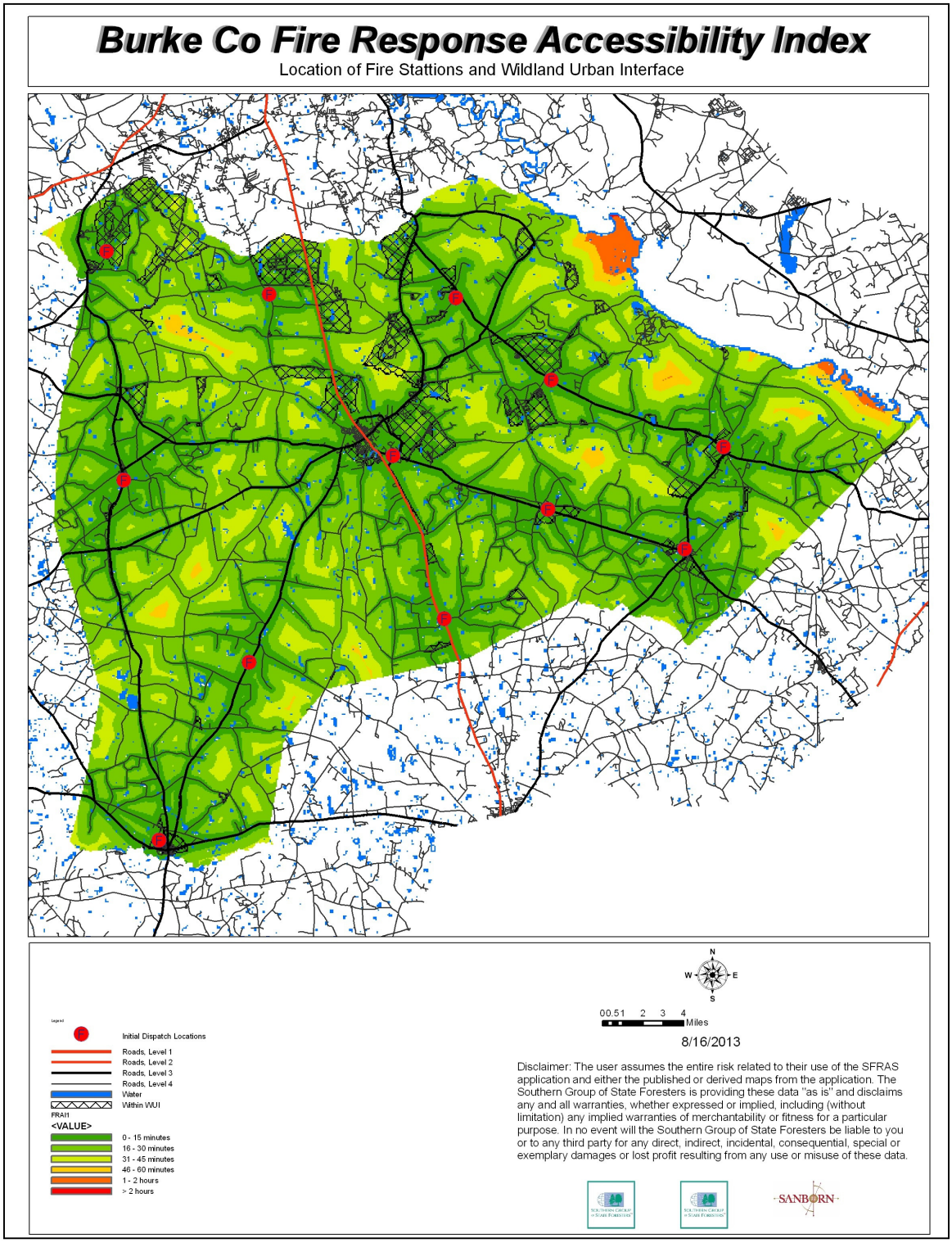
Burke County is protected by organized fire departments within the cities of Waynesboro, along with 12 well spaced fire stations staffed 24/7 under the jurisdiction of the Burke County Fire and Rescue.. The Georgia Forestry Commission maintains a county protection unit located about three miles south of Waynesboro on US Hwy 25 to respond to wildfires throughout the county. The cities of Waynesboro, Midville, Girard and Sardis are serviced by pressurized water systems with hydrants available.

Over the past fifty six years, Burke County has averaged 106 reported wildland fires per year, burning an average of 1089 acres per years. Using more recent figures over the past 20 years, this number has declined significantly to an average of 74 fires per year burning 694 acres annually. The occurrence of these fires during this period shows a pronounced peak during the months of January, February, March and April. There is a significant decrease during the remainder of the year, particularly during the summer months.

Over the past 20 years, the leading causes of these fires, was debris burning causing 49% of the fires and 37% of the acres burned. Over the past six years records show that over 19% of the debris fires originated from residential burning.

Georgia Forestry Commission Wildfire Records show that in the past ten years, 40 homes have been lost or damaged by wildfire in Burke County resulting in estimated losses of $457,000 along with 12 outbuildings valued at $74,100. According to reports during this period 232 homes have been directly or indirectly threatened by these fires. This is a substantial loss of non timber property attributed to wildfires in Burke County.

IV. COMMUNITY BASE MAP



V. COMMUNITY WILDFIRE RISK ASSESSMENT

The Wildland-Urban Interface

There are many definitions of the Wildland-Urban Interface (WUI), however from a fire management perspective it is commonly defined as an area where structures and other human development meet or intermingles with undeveloped wildland or vegetative fuels. As fire is dependent on a certain set of conditions, the National Wildfire Coordinating Group has defined the wildland-urban interface as a set of conditions that exists in or near areas of wildland fuels, regardless of ownership. This set of conditions includes type of vegetation, building construction, accessibility, lot size, topography and other factors such as weather and humidity. When these conditions are present in certain combinations, they make some communities more vulnerable to wildfire damage than others. This "set of conditions" method is perhaps the best way to define wildland-urban interface areas when planning for wildfire prevention, mitigation, and protection activities.

There are three major categories of wildland-urban interface. Depending on the set of conditions present, any of these areas may be at risk from wildfire. A wildfire risk assessment can determine the level of risk.

1. "Boundary" wildland-urban interface is characterized by areas of development where homes, especially new subdivisions, press against public and private wildlands, such as private or commercial forest land or public forests or parks. This is the classic type of wildland-urban interface, with a clearly defined boundary between the suburban fringe and the rural countryside.

2. "Intermix" wildland-urban interface areas are places where improved property and/or structures are scattered and interspersed in wildland areas. These may be isolated rural homes or an area that is just beginning to go through the transition from rural to urban land use.

3. "Island" wildland-urban interface, also called occluded interface, are areas of wildland within predominately urban or suburban areas. As cities or subdivisions grow, islands of undeveloped land may remain, creating remnant forests. Sometimes these remnants exist as parks, or as land that cannot be developed due to site limitations, such as wetlands.
(courtesy *Fire Ecology and Wildfire Mitigation in Florida* 2004)

Wildland Urban Interface Hazards

Firefighters in the wildland urban interface may encounter hazards other than the fire itself, such as hazardous materials, utility lines and poor access.

Hazardous Materials

- Common chemicals used around the home may be a direct hazard to firefighters from a flammability, explosion potential and/or vapors or off gassing. Such chemicals include paint, varnish and other flammable liquids, fertilizer, pesticides, cleansers, aerosol cans, fireworks, batteries and ammunition. In addition, some common household products such as plastics may give off very toxic fumes when they burn. Stay out of smoke form burning structures and any unknown sources such as trash piles.

Illicit Activities

- Marijuana plantations or drug production labs may be found in the wildland urban interface areas. Extremely hazardous materials such as propane tanks and flammable/toxic chemicals may be encountered.

Propane Tanks

- Both large (household size) and small (gas grill size) liquefied propane gas (LPG) tanks can present hazards to firefighters, including explosion. See the “LPG Tank Hazards” discussion for details

Utility Lines

- Utility Lines may be located above and below ground and may be cut or damaged by tools or equipment. Don’t spray water on utility lines or boxes.

Septic Tanks and Fields

- Below ground structures may not be readily apparent and may not support the weight of engines or other equipment.

New Construction Materials

- Many new construction materials have comparatively low melting points and may “off-gas” extremely hazardous vapors. Plastic decking materials that resemble wood are becoming more common and may begin softening and losing structural strength at 180 degrees F, though they normally do not sustain combustion once direct flame is removed. However if the continue to burn they exhibit the characteristics of flammable liquids.

Pets and Livestock

- Pets and livestock may be left when residents evacuate and will likely be highly stressed making them more inclined to bite and kick. Firefighters should not put themselves at risk to rescue pets or livestock.

Evacuation Occurring

- Firefighters may be taking structural protect actions while evacuations of residents are occurring. Be very cautious of people driving erratically. Distraught residents may refuse to leave their property and firefighters may need to disengage from fighting fire to contact law enforcement officers for assistance. In most jurisdictions firefighters do not have the authority to force evacuations. Firefighters should not put themselves at risk trying to protect someone who will not evacuate!

Limited Access

- Narrow one-lane roads with no turn around room, inadequate or poorly maintained bridges and culverts are frequently found in wildland urban interface areas. Access should be sized up and an evacuation plan for all emergency personnel should be developed.

The wildland fire risk assessments were conducted in 2013 by the Burke County CWPP assessment team. The risk assessment instrument used was the Hazard and Wildfire Risk Assessment Checklist which was developed looking at six areas of concern;

(1) Community Access looks at the number of entrances to the community, road width and condition, dead end roads, turn around areas along with road signs and address visibility.
(2) Surrounding Vegetation looks at the wildland fuels adjacent to and its closeness to structures.
(3) Building Construction looks at the flammability of roofing and siding materials and skirting or underpinning of structures.
(4) Fire Protection looks at the distance from staffed departments and the availability of supplemental water sources from pressurized hydrants, dry hydrants and drafting places.
(5) Utilities looks at hazards to fire suppression equipment, both engines and forestry plow units from electrical service lines, propane tanks and unmarked septic tanks.
(6) Additional Factors consider large adjacent areas of wildlands, canal or ditch presence, closeness of structures, presence of undeveloped unmaintained lots, wildfire history in the area and the availability of homeowner associations to remediate issues.

The following factors contributed to the wildfire hazard scores for Burke County:

- Narrow roads without drivable shoulders
- Unstable sandy roads in sections of the county, particularly during drought conditions.
- Slick red clay roads during rainy weather.
- Inadequate driveway access
- Minimal defensible space around structures
- Homes with wooden siding
- Unmarked septic tanks in yards
- Lack of pressurized or non-pressurized water systems available
- Large, adjacent areas of forest or wildlands
- Heavy fuel buildup in adjacent wildlands
- Lack of prescribed burning in many areas of the county
- Undeveloped lots comprising half the total lots in many rural communities.
- High occurrence of wildfires in the several locations
- Lack of homeowner or community organizations

Summary of Burke County Assessments

Area/Community	Community Access	Surrounding Vegetation	Bldg Construction	Fire Protection	Utilities	Add. Factors	Score	Hazard Rating
Timberwood	15	20	10	0	3	20	65	Moderate
Ridge Point	7	15	0	13	3	10	48	Low
Deerwood	12	15	10	13	6	15	71	Moderate
Northlake	15	15	0	11	4	10	55	Moderate
Big Bend	10	15	10	13	6	20	74	Moderate
Thankful Church Rd	12	15	5	25	7	30	94	High
Harris Village	5	20	10	25	8	24	92	High
Clarke Place Rd	2	20	10	25	5	15	77	High
Clarke Place Estates West	9	10	0	13	3	10	45	Low
Lake Crystal Rd	9	30	20	25	9	22	114	Very High
Duckhead Rd	10	45	20	25	9	30	139	Extreme
Shawville at Geo. Perkins Rd	6	20	0	13	5	30	74	Moderate
Shawville at Story Mill Rd	13	20	0	20	9	30	92	High
Farmers Bridge Cir	5	20	0	25	5	20	75	High
Pine Needles off Farmers Bridge	7	35	5	25	5	23	99	High
Keysville	4	20	0	25	7	15	71	Moderate

Southern Fire Risk Assessment System Maps.

The attached maps were generated from a computerized Geographical Information System (GIS) program developed by the Sanborn Company under contract from the Southern Group of State Foresters to model the various risks to life and property within the southeastern US. The program is known as the Southern Fire Risk Assessment System (SFRAS). It utilizes multiple layers of data developed cooperatively from the various states and the US Forest Service under the Southern Wildfire Risk Assessment (SWRA)

Wildland Urban Interface maps are developed using data from the SILVIS Lab at the University of Wisconsin at Madison. WUI is composed of both interface and intermix communities. In both interface and intermix communities, housing must meet or exceed a minimum density of one structure per 40 acres. Intermix communities are places where housing and vegetation intermingle. In intermix, wildland vegetation is continuous, more than 50 percent vegetation, in areas with more than one house per 40 acres. Interface communities are areas with housing in the vicinity of continuous vegetation. Interface areas have more than one house per 40 acres, have less than 50 percent vegetation, and are within 1.5 miles of an area (made up of one or more contiguous Census blocks) over 1,325 acres that is more than 75 percent vegetated. The minimum size limit ensures that areas surrounding small urban parks are not classified as interface WUI.

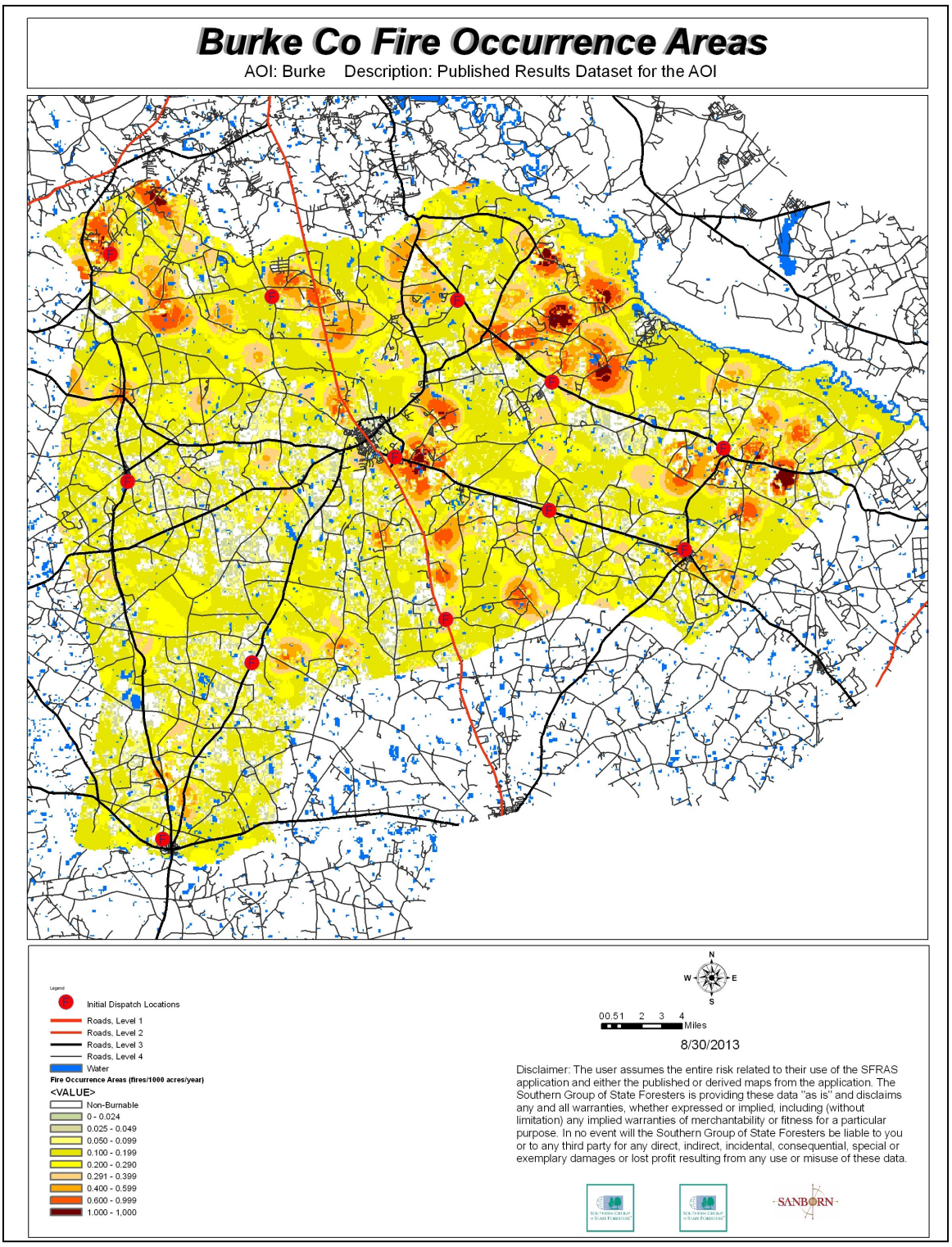
Fire Response Accessibility Index is a relative measure of how long it would take initial attack resources to drive from their station to various areas of the county. This index is derived from assigning average speeds to the various road classes in the county. For the purpose of this analysis the following speeds were assigned: 55 mph for level 1 roads, primarily interstates and four lane open highways, 50 mph for level 2 roads, primarily state and federal highways, 40 mph for level 3 roads, primarily paved two lanes collector roads and 25 mph for level 4 roads, mainly city streets and rural roads, paved and unpaved. For areas away from roads a travel speed of 3 mph is assigned as it is assumed travel will be by foot or extremely slow moving equipment.

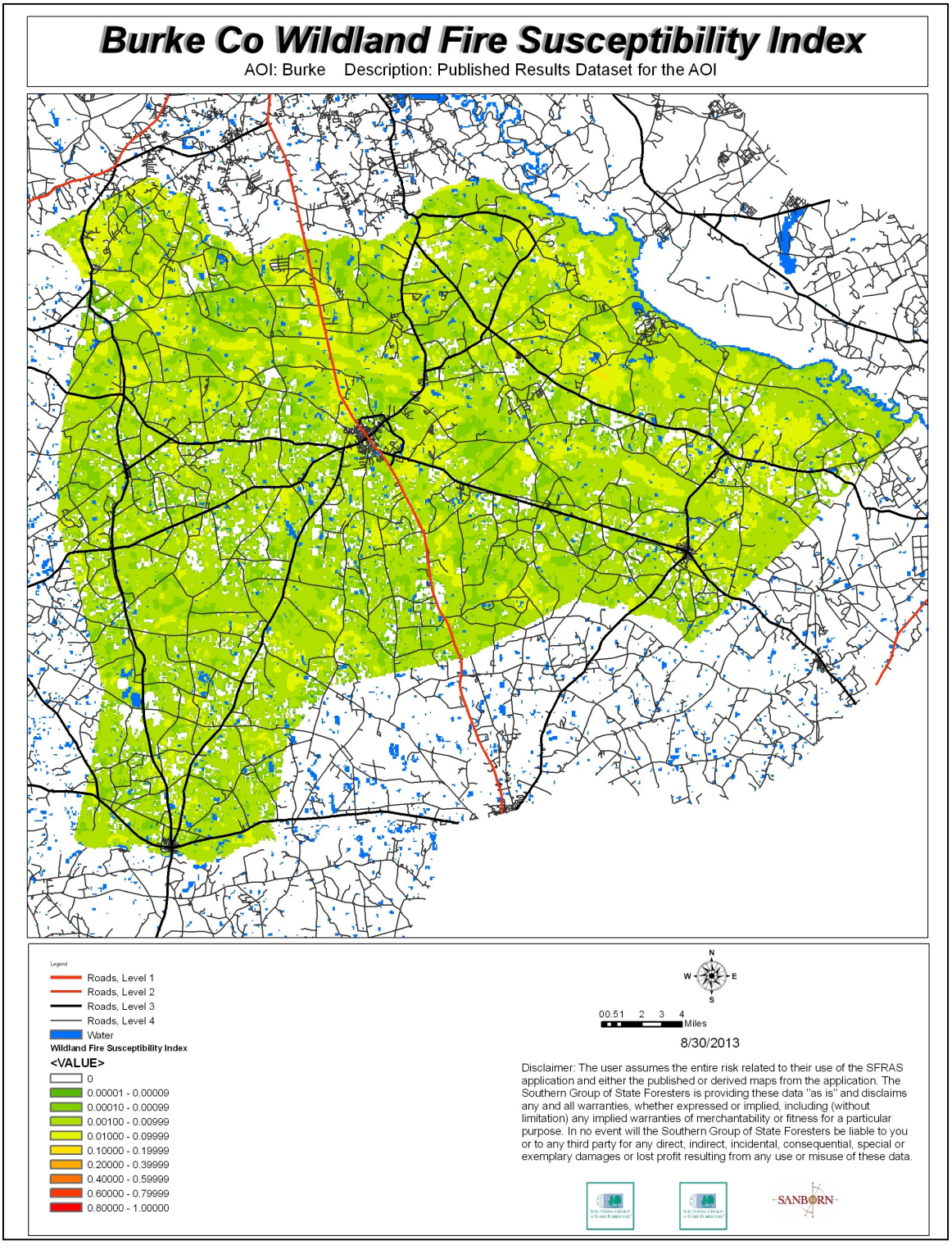
Fire Occurrence Areas maps use data from wildfire reports over the period from 1997-2002. The fire occurrence rates mapped are the probability of the number of fires occurring per 1000 acres per year base on this historic information.

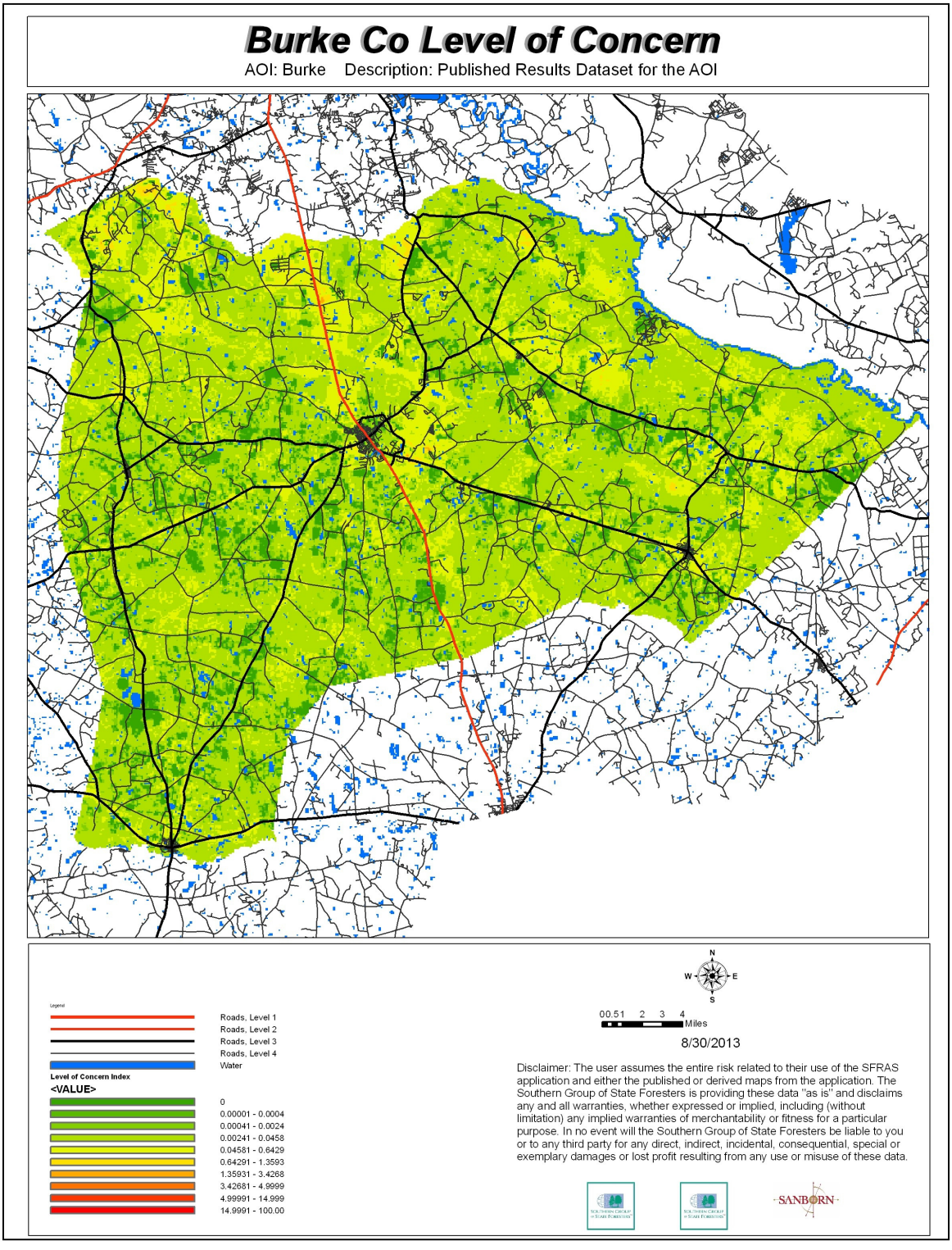
Wildland Fire Susceptibility maps show an index value between 0 and 1 and are developed by a mathematical calculation process for determining the probability of an acre burning and the expected final fire size. Many layers of data are used in developing this calculation including historic fire data, wildland fuels and rate of spread, canopy attributes (closure, height and density), weather influences, topography, soils and fire suppression effectiveness.

Level of Concern maps are a complex calculation using the Wildland Fire Susceptibility Index (previously described) and the Fire Effects Index which is calculated using data layers of transportation and infrastructure, urban interface and timber values along with suppression difficulty ratings. This provides an output categorizing the expected levels of concern from low to high.

VI. COMMUNITY HAZARDS MAPS




Burke Co Wildland Fire Susceptibility Index
AOI: Burke Description: Published Results Dataset for the AOI
Legend
Roads, Level 1
Roads, Level 2
Roads, Level 3
Roads, Level 4
Water
Wildland Fire Susceptibility Index
<VALUE>
0
0.00001 - 0.00009
0.00010 - 0.00099
0.00100 - 0.00999
0.01000 - 0.09999
0.10000 - 0.19999
0.20000 - 0.39999
0.40000 - 0.59999
0.60000 - 0.79999
0.80000 - 1.00000
N
W
E
S
0 0.5 1 2 3 4
Miles
8/30/2013
Disclaimer: The user assumes the entire risk related to their use of the SFRAS application and either the published or derived maps from the application. The Southern Group of State Foresters is providing these data "as is" and disclaims any and all warranties, whether expressed or implied, including (without limitation) any implied warranties of merchantability or fitness for a particular purpose. In no event will the Southern Group of State Foresters be liable to you or to any third party for any direct, indirect, incidental, consequential, special or exemplary damages or lost profit resulting from any use or misuse of these data.
SANBORN


Burke Co Level of Concern
AOI: Burke Description: Published Results Dataset for the AOI
Legend
Roads, Level 1
Roads, Level 2
Roads, Level 3
Roads, Level 4
Water
Level of Concern Index
<VALUE>
0
0.00001 - 0.0004
0.00041 - 0.0024
0.00241 - 0.0458
0.04581 - 0.6429
0.64291 - 1.3593
1.35931 - 3.4268
3.42681 - 4.9999
4.99991 - 14.999
14.9991 - 100.00
N
W
E
S
0 0.5 1 2 3 4
Miles
8/30/2013
Disclaimer: The user assumes the entire risk related to their use of the SFRAS application and either the published or derived maps from the application. The Southern Group of State Foresters is providing these data "as is" and disclaims any and all warranties, whether expressed or implied, including (without limitation) any implied warranties of merchantability or fitness for a particular purpose. In no event will the Southern Group of State Foresters be liable to you or to any third party for any direct, indirect, incidental, consequential, special or exemplary damages or lost profit resulting from any use or misuse of these data.
SANBORN

VII. PRIORITIZED MITIGATION RECOMMENDATIONS

Executive Summary

As Burke County continues to see increased growth from Augusta and other areas seeking less crowded and warmer climes, new development will occur more frequently on forest and wildland areas. Burke County will have an opportunity to significantly influence the wildland fire safety of new developments. It is important that new development be planned and constructed to provide for public safety in the event of a wildland fire emergency.

Over the past 20 years, much has been learned about how and why homes burn during wildland fire emergencies. Perhaps most importantly, case histories and research have shown that even in the most severe circumstances, wildland fire disasters can be avoided. Homes can be designed, built and maintained to withstand a wildfire even in the absence of fire services on the scene. The National Firewise Communities program is a national awareness initiative to help people understand that they don't have to be victims in a wildfire emergency. The National Fire Protection Association has produced two standards for reference: NFPA 1144 Standard for Reducing Structure Ignition Hazards from Wildland Fire. 2008 Edition and NFPA 1141 Standard for Fire Protection Infrastructure for Land Development in Suburban and Rural Areas.

When new developments are built in the Wildland/Urban Interface, a number of public safety challenges may be created for the local fire services: (1) the water supply in the immediate areas may be inadequate for fire suppression; (2) if the Development is in an outlying area, there may be a longer response time for emergency services; (3) in a wildfire emergency, the access road(s) may need to simultaneously support evacuation of residents and the arrival of emergency vehicles; and (4) when wildland fire disasters strike, many structures may be involved simultaneously, quickly exceeding the capability of even the best equipped fire departments.

The following recommendations were developed by the Burke County CWPP Core team as a result of surveying and assessing fuels and structures and by conducting meetings and interviews with county and city officials. A priority order was determined based on which mitigation projects would best reduce the hazard of wildfire in the assessment area.

Proposed Community Hazard and Structural Ignitability Reduction Priorities

Primary Protection for Community and Its Essential Infrastructure		
Treatment Area	Treatment Types	Treatment Method(s)
1. All Structures	Create minimum of 30-feet of defensible space**	Trim shrubs and vines to 30 feet from structures, trim overhanging limbs, replace flammable plants near homes with less flammable varieties, remove vegetation around chimneys.
2. Applicable Structures	Reduce structural ignitability**	Clean flammable vegetative material from roofs and gutters, store firewood appropriately, install skirting around raised structures, store water hoses for ready access, and replace pine straw and mulch around plantings with less flammable landscaping materials.
3. Community Clean-up Day	Cutting, mowing, pruning**	Cut, prune, and mow vegetation in shared community spaces.
4. Driveway Access	Right of Way Clearance	Maintain vertical and horizontal clearance for emergency equipment. See that adequate lengths of culverts are installed to allow emergency vehicle access.
5. Road Access	Identify needed road improvements	As roads are upgraded, widen to minimum standards with at least 50 foot diameter cul de sacs or turn arounds.
6. Codes and Ordinances	Examine existing codes and ordinances.	Amend and enforce existing building codes as they relate to skirting, propane tank locations, public nuisances (trash/debris on property), Property address marking standards and other relevant concerns Review Subdivision and development ordinances for public safety concerns. Enforce uniform addressing ordinance.
7. Burn Permits	Education and Enforcement	Greater Burn Permit enforcement and education from the Georgia Forestry Commission.

Proposed Community Wildland Fuel Reduction Priorities		
Treatment Area	Treatment Types	Treatment Method(s)
1. Adjacent WUI Lands	Reduce hazardous fuels	Encourage prescribed burning for private landowners and industrial timberlands particularly adjacent to residential areas. Seek grant for prescribed burning in WUI areas. Seek grant for WUI mitigation team.
2. Railroad Corridors	Reduce hazardous fuels	Encourage railroads to better maintain their ROW eliminating brush and grass through herbicide and mowing. Maintain firebreaks along ROW adjacent to residential areas.
3. Existing Fire Lines	Reduce hazardous fuels	Clean and re-harrow existing lines.
Proposed Improved Community Wildland Fire Response Priorities		
1. Water Sources	Dry Hydrants	Inspect, maintain and improve access to existing dry hydrants. Add signage along road to mark the hydrants. Locate additional dry hydrants as needed. Locate and pre-clear helicopter dip sites
2. Fire Stations	Equipment	Wildland hand tools. Lightweight Wildland PPE Gear.
3. Wildland Fire Response	GFC Office	Locate office in more central location. Pre-clear and Map Dip locations.
4. Mapping	GIS	Up to date mapping of roads and water sources.
5. Road Names	Road Signage	Improved Road Signage at Crossroads. “Dead End” or “No Outlet” Tags on Road Signs
6. Personnel	Training	Obtain Wildland Fire Suppression training for Fire Personnel.
**Actions to be taken by homeowners and community stakeholders		

Proposed Education and Outreach Priorities

1. Conduct "How to Have a Firewise Home" Workshop for Burke County Residents
Set up and conduct a workshop for homeowners that teach the principles of making homes and properties safe from wildfire. Topics for discussion include defensible space, landscaping, building construction, etc. Workshop will be scheduled for evenings or weekends when most homeowners are available and advertised through local media outlets. Target local schools, community groups and local senior centers. Distribute materials promoting firewise practices and planning through local community and governmental meetings.
2. Conduct "Firewise" Workshop for Community Leaders
Arrange for GFC Firewise program to work with local community leaders and governmental officials on the importance of "Firewise Planning" in developing ordinances and codes as the county as the need arises. Identify "Communities at Risk" within the county for possible firewise community recognition.
3. Spring Clean-up Event
Consider conducting an annual clean-up event in a selected high risk community involving the Georgia Forestry Commission, Burke County Fire Departments and community residents. Set up information table with educational materials and refreshments. Initiate the event with a morning briefing by GFC Firewise coordinator and local fire officials detailing plans for the day and safety precautions. Activities to include the following: • Clean flammable vegetative material from roofs and gutters • Trim shrubs and vines to 30 feet away from structures • Trim overhanging limbs • Clean hazardous or flammable debris from adjacent properties Celebrate the work with a community cookout, with Community officials, GFC and Burke County Fire Departments discussing and commending the work accomplished.
4. Informational Packets
Develop and distribute informational packets to be distributed by realtors and insurance agents. Included in the packets are the following: • Be Firewise Around Your Home • Firewise Guide to Landscape and Construction • Firewise Communities USA Bookmarks

5. Wildfire Protection Display
Create and exhibit a display for the general public at community festivals and other local events. Display can be independent or combined with the Georgia Forestry Commission display. Hold Open House at individual Fire Stations to promote Community Firewise Safety and develop community support and understanding of local fire departments and current issues.
6. Press
Invite the Augusta and local news media to community “Firewise” functions for news coverage and regularly submit press releases documenting wildfire risk improvements in Burke County.

VIII. ACTION PLAN

Roles and Responsibilities

The following roles and responsibilities have been developed to implement the action plan:

Role	Responsibility
Hazardous Fuels and Structural Ignitability Reduction	
Burke County WUI Fire Council	Create this informal team or council comprised of residents, GFC officials, Burke County and Waynesboro Fire Department officials, a representative from the city and county governments along with the EMA Director for Burke County. Meet periodically to review progress towards mitigation goals, appoint and delegate special activities, work with state, and local officials to assess progress and develop future goals and action plans. Work with residents to implement projects and firewise activities.
Key Messages to focus on	1 Defensible Space and Firewise Landscaping 2 Debris Burning Safety 3 Firewise information for homeowners 4 Prescribed burning benefits
Communications objectives	1 Create public awareness for fire danger and defensible space issues 2 Identify most significant human cause fire issues 3 Enlist public support to help prevent these causes 4 Encourage people to employ fire prevention and defensible spaces in their communities.
Target Audiences	1 Homeowners 2 Forest Landowners and users 3 Civic Groups 4 School Groups
Methods	1 News Releases 2 Radio and TV PSA's for area stations and cable access channels 3 Personal Contacts 4 Key messages and prevention tips 5 Visuals such as signs, brochures and posters

Spring Clean-up Day	
Event Coordinator	Coordinate day's events and schedule, catering for cookout, guest attendance, and moderate activities the day of the day of the event.
Event Treasurer	Collect funds from residents to cover food, equipment rentals, and supplies.
Publicity Coordinator	Advertise event through neighborhood newsletter, letters to officials, and public service announcements (PSAs) for local media outlets. Publicize post-event through local paper and radio PSAs.
Work Supervisor	Develop volunteer labor force of community residents; develop labor/advisory force from Georgia Forestry Commission, Burke County Fire Departments and Emergency Management Agency. Procure needed equipment and supplies. In cooperation with local city and county officials, develop safety protocol. Supervise work and monitor activities for safety the day of the event.

Funding Needs

The following funding is needed to implement the action plan:

Project	Estimated Cost	Potential Funding Source(s)
1. Create a minimum of 30 feet of defensible space around structures	Varies	Residents will supply labor and fund required work on their own properties.
2. Reduce structural ignitability by cleaning flammable vegetation from roofs and gutters; appropriately storing firewood, installing skirting around raised structures, storing water hoses for ready access, replacing pine needles and mulch around plantings with less flammable material.	Varies	Residents will supply labor and fund required work on their own properties.
3. Amend codes and ordinances to provide better driveway access, increased visibility of house numbers, properly stored firewood, minimum defensible space brush clearance, required Class A roofing materials and skirting around raised structures, planned maintenance of community lots.	No Cost	To be adopted by city and county governments.
4. Spring Cleanup Day	Varies	Community Business Donations.
5. Fuel Reduction Activities	$35/acre	FEMA & USFS Grants

POTENTIAL FUNDING SOURCES:

As funding is questionable in these times of tight government budgets and economic uncertainty, unconventional means should be identified whereby the need for funding can be reduced or eliminated.

Publications / Brochures –

- FIREWISE materials are available for cost of shipping only at www.firewise.org.
- Another source of mitigation information can be found at www.nfpa.org.
- Access to reduced cost or free of charge copy services should be sought whereby publications can be reproduced.
- Free of charge public meeting areas should be identified where communities could gather to be educated regarding prevention and firewise principles.

Mitigation –

- Community Protection Grant:
    - USFS sponsored prescribed burn program. Communities with at risk properties that lie within 3 miles of the USFS border may apply with the GFC to have their forest land prescribed burned free of charge.
- FEMA Mitigation Policy MRR-2-08-01: through GEMA - Hazard Mitigation Grant Program (HMGP) and Pre Disaster Mitigation (PDM)
    - To provide technical and financial assistance to local governments to assist in the implementation of long term cost effective hazard mitigation measures.
    - This policy addresses wildfire mitigation for the purpose of reducing the threat to all-risk structures through creating defensible space, structural protection through the application of ignition resistant construction, and limited hazardous fuels reduction to protect life and property.
    - With a complete and registered plan (addendum to the State plan) counties can apply for pre-mitigation funding. They will also be eligible for HMGP if the county is declared under a wildfire disaster.
- GFC - Plowing and burning assistance can be provided through the Georgia Forestry Commission as a low cost option for mitigation efforts.
- Individual Homeowners –
    - In most cases of structural protection ultimately falls on the responsibility of the community and the homeowner. They will bear the cost; yet they will reap the benefit from properly implemented mitigation efforts.
    - GEMA Grant - PDM (See above)

Ultimately it is our goal to help the communities by identifying the communities threatened with a high risk to wildfire and educate those communities on methods to implement on reducing those risks.

Assessment Strategy

To accurately assess progress and effectiveness for the action plan, the Burke County WUI Fire Council will implement the following:

- Annual wildfire risk assessment will be conducted to re-assess wildfire hazards and prioritize needed actions.
- Mitigation efforts that are recurring (such as mowing, burning, and clearing of defensible space) will be incorporated into an annual renewal of the original action plan.
- Mitigation efforts that could not be funded in the requested year will be incorporated into the annual renewal of the original action plan.
- Continuing educational and outreach programs will be conducted and assessed for effectiveness. Workshops will be evaluated based on attendance and post surveys that are distributed by mail 1 month and 6 months following workshop date.
- The Burke County WUI Council will publish an annual report detailing mitigation projects initiated and completed, progress for ongoing actions, funds received, funds spent, and in-kind services utilized. The report will include a "state of the community" section that critically evaluates mitigation progress and identifies areas for improvement. Recommendations will be incorporated into the annual renewal of the action plan.
- An annual survey will be distributed to residents soliciting information on individual mitigation efforts on their own property (e.g., defensible space). Responses will be tallied and reviewed at the next Burke County WUI Council meeting. Needed actions will be discussed and delegated.

This plan should become a working document that is shared by local, state, and federal agencies that will use it to accomplish common goals. An agreed-upon schedule for meeting to review accomplishments, solve problems, and plan for the future should extend beyond the scope of this plan. Without this follow up this plan will have limited value

GEORGIA FORESTRY
COMMISSION

P. O. Box 819, Macon, GA 31202
1-800-GA-TREES
GaTrees.org

The Georgia Forestry Commission provides leadership, service, and education in the protection and conservation of Georgia's forest resources. An Equal Opportunity Employer and Service Provider

CSRA REGIONAL PLAN 2035

Regional Assessment

Stakeholder Involvement Program

Table of Contents

CSRA REGIONAL PLAN 2035

Regional Assessment

Section 1: INTRODUCTION

1.1 Regional Plan Overview

The CSRA Regional Plan 2035 (hereinafter "the Plan") is the long-range plan for the management of the region's projected growth by local governments and the CSRA Regional Commission. The Plan's horizon is twenty years but will be updated in ten years to address changing regional conditions. The process is divided into three distinct parts, per the *Regional Planning Requirements* established by the Georgia Department of Community Affairs (DCA):

- Regional Assessment: Identification and analysis of existing conditions using available data
- Stakeholder Involvement Program: Strategy for public participation in the development of the Regional Agenda
- Regional Agenda: Regional vision and implementation program

The resulting analysis will assess the state of the region's socioeconomic, land use, and environmental opportunities and threats. The CSRA's vision and goals, together with an appraisal of the region, will set the strategic direction for the regional agenda. The regional agenda establishes program priorities for implementation.

This document contains the Regional Assessment and the Stakeholder Involvement Program, which will set the stage for the development of the Regional Agenda.

1.2 Regional Assessment Overview

This Regional Assessment includes a thorough analysis of issues and opportunities backed by extensive data gathering and analysis. It contains a map of Projected Development Patterns and an assessment of Areas Requiring Special Attention, which includes a range of categories, such as areas where rapid development is occurring or where infill or redevelopment is desirable. Finally, it includes an assessment of the region's development patterns in light of the state's Quality Community Objectives.

1.3 Stakeholder Involvement Program

This program outlines the process for participation by stakeholders in the creation of the Regional Agenda. It identifies stakeholders, outlines participation techniques and includes a schedule for the completion of the Regional Agenda.

1.4 Regional Agenda

The Regional Agenda is the culmination of the planning process. It will include a vision of the CSRA's future, along with an implementation program for how to get there.

1.5 How to Use This Plan

The CSRA Regional Plan is intended to serve as a reference and implementation point for potential users. A number of companion planning documents should be used in conjunction with the Regional Plan. These include:

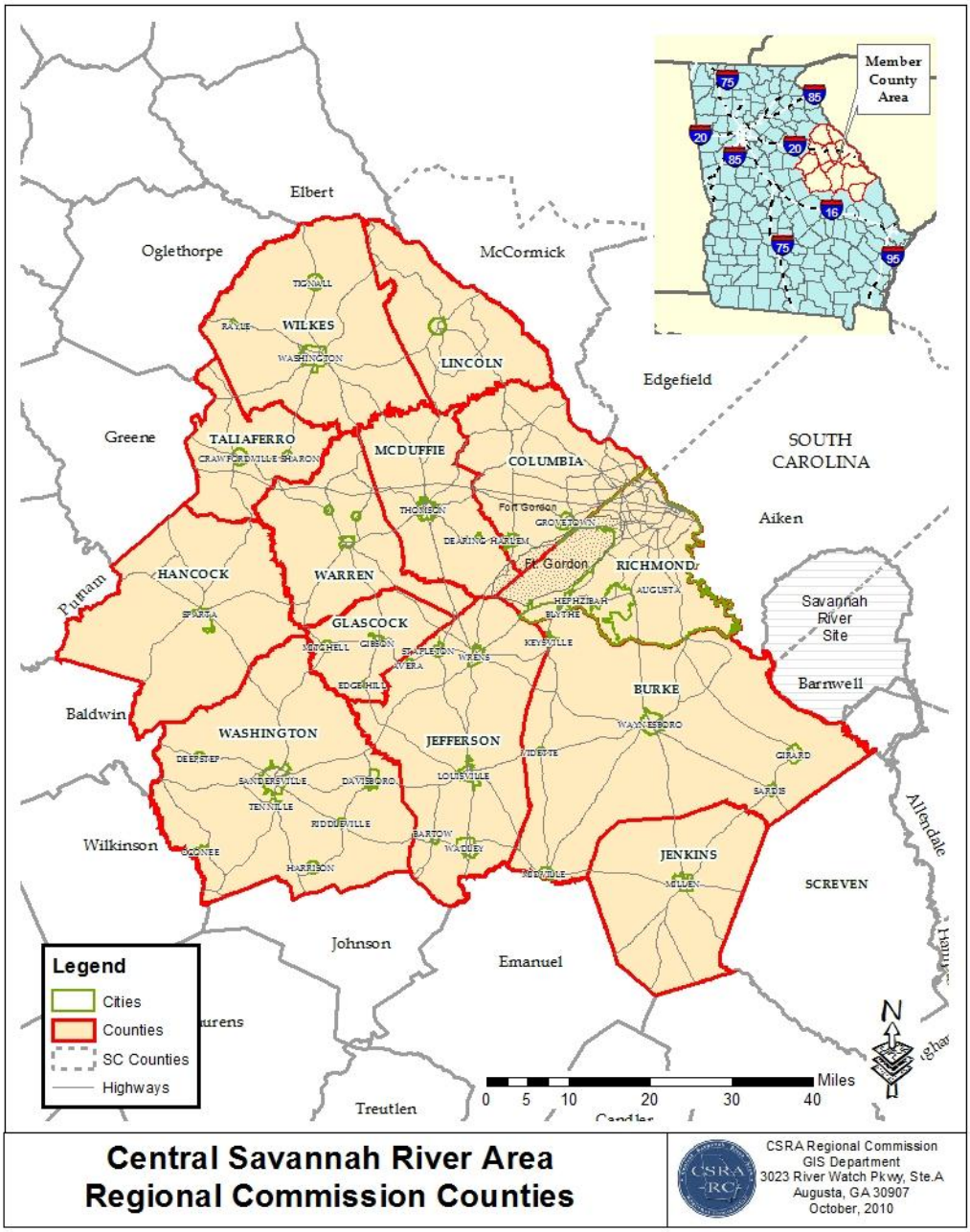
- CSRA Comprehensive Economic Development Strategy
- Augusta Area Diversification Initiative
- Fort Gordon Joint Land Use Study
- CSRA Regionally Important Resources Plan
- County and City Comprehensive Plans

- Statewide Plans

1.6 The Central Savannah River Area

The Central Savannah River Area (CSRA) encompasses an area nearly 6,500 square miles ð the largest political region in the state. Located in the east-central Georgia, along the Savannah River, the CSRA includes 13 counties: Burke, Columbia, Glascock, Hancock, Jefferson, Jenkins, Lincoln, McDuffie, Richmond, Taliaferro, Warren, Washington, and Wilkes (Figure 1). The largest city in the CSRA is Augusta ï the economic core of the region.

Figure 1: CSRA Location Map



1.6 About the CSRA Regional Commission

The CSRA Regional Commission (CSRA RC) serves thirteen counties and 41 municipalities in east-central Georgia, providing services in the areas of planning and land-use development, grant writing and administration, economic development, historic preservation, and geographic information systems development and implementation to member jurisdictions.

Additionally, the CSRA RC serves as the state-designated Area Agency on Aging (AAA) for the region. In this capacity, the CSRA RC works with local providers to ensure that services for the elderly are provided and monitored. By utilizing pass-through funds from state and federal sources, the Commissionôs AAA serves as a gateway for programs and resources aimed at helping senior citizens improve the quality of their lives during their retirement years.

The CSRA RC is also the parent company of the CSRA Business Lending. CSRA Business Lending makes loans to small and start-up businesses for the purposes of creating jobs and economic development opportunities within its service area.

Section 2: POTENTIAL REGIONAL ISSUES AND OPPORTUNITIES