Sumter County

City of Sumter
Town of Mayesville
Town of Pinewood

Hazard Mitigation Plan
Update

October 2009

Prepared by:

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Outline of
Sumter County Hazard Mitigation Plan

Sections **Page Numbers**

Sumter County Hazard Risk Maps

SECTION 8-1
HAZARD IDENTIFICATION AND ANALYSIS

INTRODUCTION

This section identifies, describes and analyzes the natural hazards present in Sumter County that can threaten human life and damage property. It is broken down into the following three sections:

1. Potential Hazards (includes descriptions, historical occurrences, and map attachments)
2. Hazard Profile Risk Index
3. Conclusions on Hazard Risk

1. POTENTIAL HAZARDS

Due to its geographical setting, Sumter County and its municipalities are vulnerable to a wide array of natural hazards that threaten life and property. Shown in the Table A-1 below are the potential hazards that could impact the local jurisdictions in Sumter County.

Table A-1
Hazard Identification and Assessment
Jurisdiction Affected by Hazard Type
Sumter County and Local Governmental Units

Local Government	Flooding	Hurricane or Tropical or Coastal Storm	Tornado	Winter Storm / freezing / ice / snow	Dam Failure	Severe storm / wind / hail / lightning	Wildfire	Earthquake	Drought / Heat
Unincorporated Sumter County	X	X	X	X	X	X	X	X	X
Town of Pinewood	X	X	X	X	-	X	X	X	X
Town of Mayesville	X	X	X	X	-	X	X	X	X
City of Sumter	X	X	X	X	X	X	X	X	X

("X" indicates that the governmental entity could potentially experience the type hazard indicated)

Some of these hazards are interrelated (i.e., hurricanes can cause flooding and tornadoes), and some consist of hazardous elements that are not listed separately (i.e., severe thunderstorms can cause lightning). This section provides general descriptions for each of the above listed hazards along with their hazardous elements and provides information on historical hazard occurrences in Sumter County. Historical records are used to help us identify the level of risk, with the methodological assumption that the data sources cited are reliable and accurate.

A. FLOODING

Description:

Flooding is the most frequent and costly natural hazard in the United States. Floods are generally the result of excessive precipitation, and can be classified under two categories: *flash floods*, the product of heavy localized precipitation in a short time period over a given location; and *general floods*, caused by precipitation over a longer time period and over a given river basin. The severity of a flooding event is determined by a combination of stream and river basin topography, precipitation and weather

patterns, recent soil moisture conditions and the degree of vegetative clearing.
Flash flooding events usually occur within minutes or hours of heavy amounts of rainfall, from a dam or levee failure, or from a sudden release of water held by an ice jam. Most flash flooding is caused by slow-moving thunderstorms in a local area or by heavy rains associated with hurricanes and tropical storms. Although flash flooding occurs often along mountain streams, it is also common in urbanized areas where much of the ground is covered by impervious surfaces. General floods are usually longer-term events and may last for several days.

The primary types of general flooding include riverine flooding, coastal flooding and urban flooding. **Riverine flooding** is a function of excessive precipitation levels and water runoff volumes within the watershed of a stream or river. **Coastal flooding** is typically a result of storm surge, wind-driven waves, and heavy rainfall produced by hurricanes, tropical storms, nor'easters and other large coastal storms. **Urban flooding** occurs where man-made development has obstructed the natural flow of water and/or decreased the ability of natural groundcover to absorb and retain surface water runoff.

Periodic flooding of lands adjacent to rivers, streams and shorelines is a natural and inevitable occurrence that can be expected to take place based upon established recurrence intervals. The recurrence interval of a flood is defined as the average time interval, in years, expected between a flood event of a particular magnitude and an equal or larger flood. Flood magnitude increases with increasing recurrence interval.

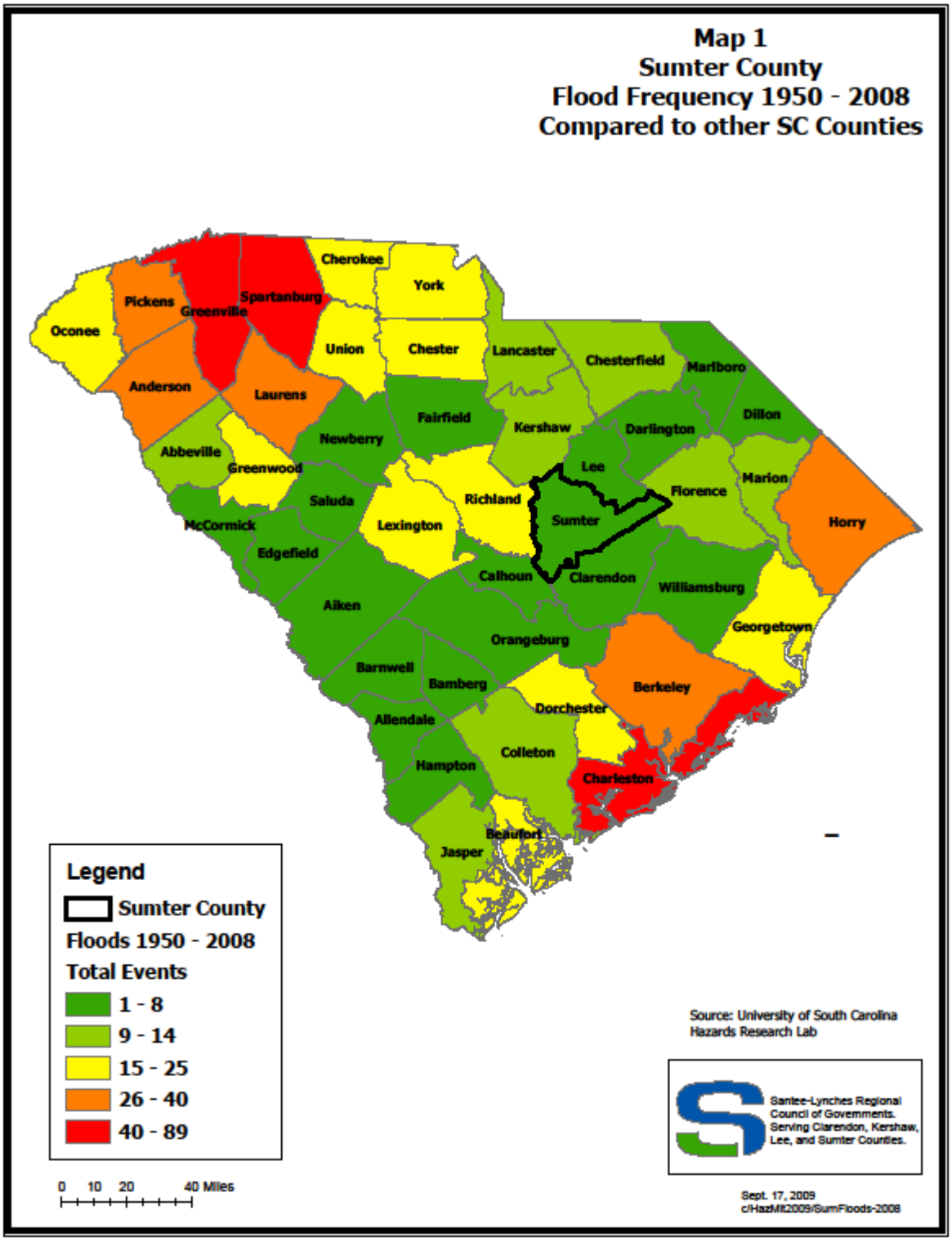
A "floodplain" is the lowland area adjacent to a river, lake or ocean. Floodplains are designated by the frequency of the flood that is large enough to cover them. For example, the 10-year floodplain will be covered by the 10-year flood and the 100-year floodplain by the 100-year flood.

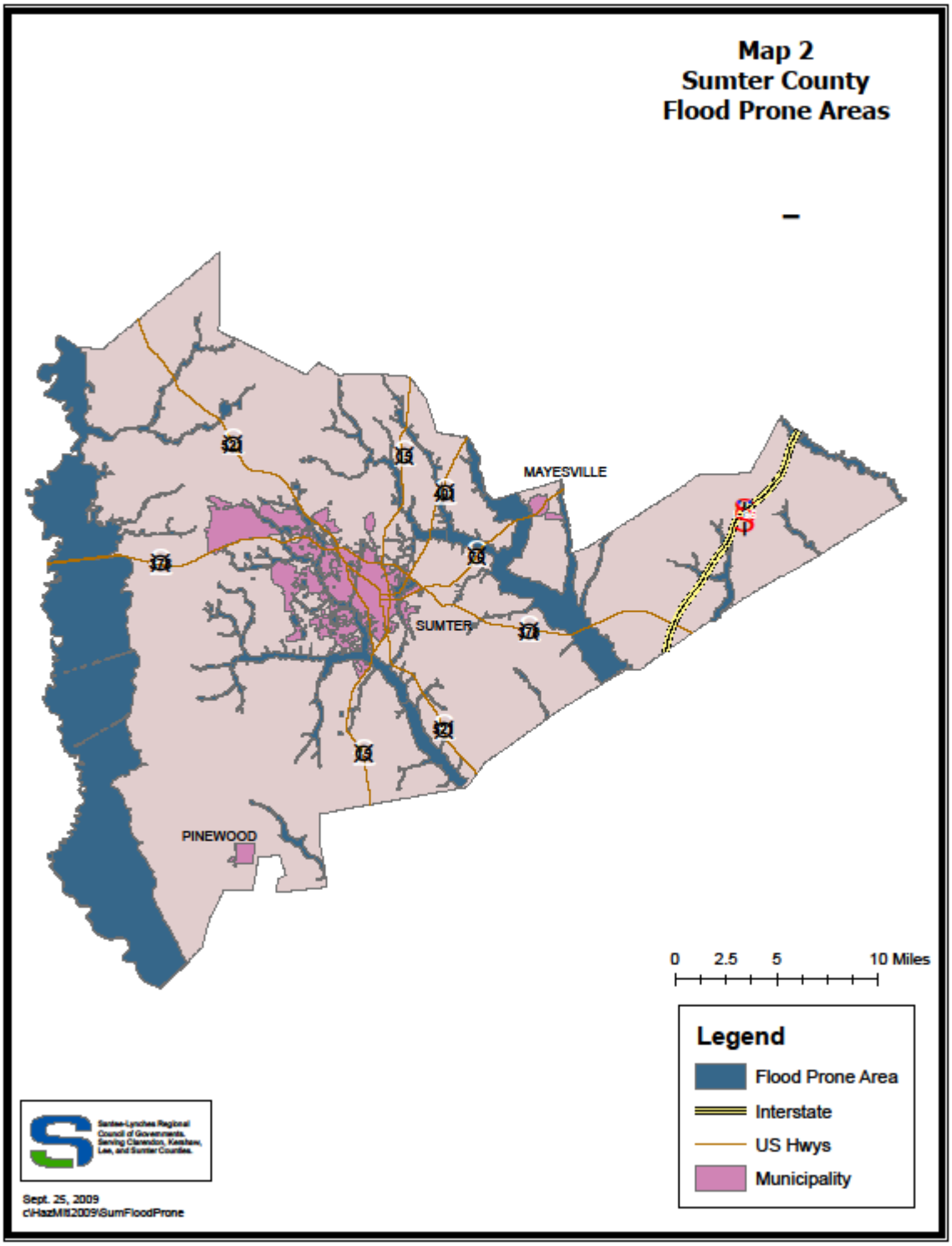
Flood frequencies, such as the "100-year flood," are determined by plotting a graph of the size of all known floods for an area and determining how often floods of a particular size occur. Another way of expressing the flood frequency is the chance of occurrence in a given year, which is the percentage of the probability of flooding each year. For example, the 100-year flood has a 1% chance of occurring in any given year.

Historical Occurrences:
Sumter County has experienced moderate flood events in the past. This can be attributed to the low elevation of the topography, the presence of a lake, and a river basin that is located in the center of the county. Most areas along these rivers determined to be in the 100-year floodplain are undeveloped or lie within forested areas.

According to historical flood data compiled by the National Climatic Data Center, there were 6 floods that occurred in Sumter County from 1994 - 2009, which resulted in $27 million in property damage and $58,000 in crop damage. However, during this 45-year period, 0 lives were lost, and no injuries occurred. **Map** 1 demonstrates how Sumter County compares to other areas of South Carolina within this period of time. **Map** 2, on the other hand, illustrates those areas of the county's municipalities that are prone to flooding.

Identification of floodplain areas within the county and the incorporated municipalities was based on the most recent Q3 data. These maps display the locations of all of the major water bodies in the county and delineate the 100-year floodplain boundaries (Zone


Map 1
Sumter County
Flood Frequency 1950 - 2008
Compared to other SC Counties
Cherokee
York
Pickens
Greenville
Spartanburg
Oconee
Union
Chester
Lancaster
Chesterfield
Marlboro
Anderson
Laurens
Fairfield
Kershaw
Dillon
Newberry
Darlington
Abbeville
Greenwood
Lee
Marion
Florence
Saluda
Richland
Sumter
Horry
McCormick
Lexington
Edgefield
Calhoun
Clarendon
Williamsburg
Aiken
Georgetown
Orangeburg
Barnwell
Bamberg
Berkeley
Dorchester
Allendale
Colleton
Hampton
Charleston
Beaufort
Jasper
Legend
Sumter County
Floods 1950 - 2008
Total Events
1 - 8
9 - 14
15 - 25
26 - 40
40 - 89
0 10 20 40 Miles
Source: University of South Carolina
Hazards Research Lab
Santee-Lynches Regional
Council of Governments.
Serving Clarendon, Kershaw,
Lee, and Sumter Counties.
Sept. 17, 2009
c/HazMit2009/SumFloods-2008


Map 2
Sumter County
Flood Prone Areas
MAYESVILLE
SUMTER
PINEWOOD
0 2.5 5 10 Miles
Legend
Flood Prone Area
Interstate
US Hwys
Municipality
Sept. 25, 2009
c\HazMit2009\SumFloodProne

A). These are areas that have a one percent chance of equaling or exceeding the recorded base flood elevation during any year. Based on these maps the unincorporated areas of Sumter County and two out of the four incorporated municipalities have 100-year floodplains within their jurisdictions.

Table A-2
Clarendon County Flood Hazard Areas

Jurisdiction	FEMA Mapped Special Flood Hazard Area	NFIP Participant in Good Standing
Sumter County (Unincorporated Areas Only)	Yes	Yes
City of Sumter	Yes	Yes
Town of Pinewood	Yes	Yes
Town of Mayesville	Yes	Yes

Table A-3
Hazard Probability

	Events	Years	Recurrence Interval	% Chance/Year
100 Year Flood	*	*	100	1.00%
500 Year Flood	*	*	500	0.20%

Flood Occurrences in Sumter County since 2002

Flash flood on August 29, 2004 at 6:30 pm – heavy rains from Tropical Storm Gaston caused several roads to flood and be temporarily closed in the eastern part of the county.

Flash flood on August 26, 2006 at 2:45 pm – the sheriff reported several streams out of their banks and flooding on Pinewood and Pipkin Roads.

Multi-jurisdictional Occurrences:

Sumter County

The critical facilities for the County are those that are found within the vicinity of the Pocotaligo and Black Rivers.

City of Sumter

As seen on **Map 2**, the City of Sumter is at a high to moderate risk for flooding due to its proximity to the Pocotaligo River. As such, most of its critical facilities are at risk, particularly the electric power substations on Wedgefield Rd and Red Bay Rd, the wastewater treatment facility, and the water treatment facilities near the Pocotaligo River.

Pinewood

The Town of Pinewood is not at a significant level of risk for flooding.

Mayesville

The Town of Mayesville is not at a significant risk for flooding.

Table A-4
Clarendon County
Multi-jurisdiction Analysis of Floods*

Jurisdictions	History	Vulnerability	Maximum Threat	Probability	Total Score	Jurisdiction Rating
Sumter	2	25	50	35	112	1
Pinewood	2	5	10	7	24	3
Mayesville	2	5	10	7	24	3
Unincorporated	10	25	50	35	110	2

Source: National Climatic Data Center
***See Appendix G for an explanation of the scoring system used for this table.**

Those jurisdictions with the highest numerical scores should and will be receiving priority attention for planning and/or mitigation purposes.

B. HURRICANES & TROPICAL STORMS

Description:

Hurricanes and tropical storms, both classified as *tropical cyclones*, are low-pressure storm systems that originate over warm ocean waters but are capable of causing immense destruction when crossing the coastline into land.

The primary damaging forces associated with these storms are high-level sustained winds, heavy precipitation and tornadoes. Coastal areas are also vulnerable to the additional forces of storm surge, wind-driven waves and tidal flooding. The key energy source for a tropical cyclone is the release of latent heat from the condensation of warm water. Their formation requires a low-pressure disturbance, sufficiently warm sea surface temperature, rotational force from the spinning of the earth and the absence of wind shear in the lowest 50,000 feet of the atmosphere.

Hurricanes and tropical storms can form in the Atlantic Ocean, Caribbean Sea and Gulf of Mexico from the months of June to November, but the peak of the Atlantic hurricane season is early to mid-September. The average number of storms that reach hurricane intensity per year in the Atlantic basin is about six.

As an incipient hurricane develops, barometric pressure at its center falls and **winds** increase. If the atmospheric and oceanic conditions are favorable, it can intensify into a tropical depression. When maximum sustained winds reach or exceed 39 miles per hour, the system is designated a tropical storm, given a name and closely monitored by the National Hurricane Center in Miami, Florida. When sustained winds reach or exceed 74 miles per hour, the storm is deemed a hurricane.

Hurricane intensity is further classified by the Saffir-Simpson Scale, which rates hurricane intensity on a scale of 1 to 5, with 5 being the most intense. The Saffir-Simpson scale is shown in **Table A-5**.

TABLE A-5
The Saffir-Simpson Scale

Saffir-Simpson Scale/ Category	Maximum Sustained Wind Speed (mph)	Minimum Surface Pressure (millibars)	Storm Surge (ft)
1	74-95	Greater than 980	5-Mar
2	96-110	979-965	8-Jun
3	111-130	964-945	12-Sep
4	131-155	944-920	13-18
5	155+	Less than 920	19+

Source: National Hurricane Center

The Saffir-Simpson scale categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure and storm surge potential, which are combined to estimate potential damage. Categories 3, 4, and 5 are classified as "major" hurricanes, and while hurricanes within this range comprise only 20% of total tropical cyclone landfalls, they account for over 70% of the damage in the U.S.

Table A-6 describes the damage that could be expected for each category hurricane.

TABLE A-6
Hurricane Damage Classification

Hurricane Damage Classification	Category Damage Level Description
1 – Minimal	No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Also, some coastal flooding and minor pier damage.
2 – Moderate	Some roofing material, door, and window damage. Considerable damage to vegetation, mobile homes, etc. Flooding damages piers and small craft in unprotected moorings may break their moorings.
3 – Extensive	Some structural damage to small residences and utility buildings, with a minor amount of curtainwall failures. Mobile homes are destroyed. Flooding near the coast destroys smaller structures with larger structures damaged by floating debris. Terrain may be flooded well inland.
4 – Extreme	More extensive curtainwall failures with some complete roof structure failure on small residences. Major erosion of beach areas. Terrain may be flooded well inland.
5 – Catastrophic	Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Flooding causes major damage to lower floors of all structures near the shoreline. Massive evacuation of residential areas may be required.

Source: National Hurricane Center

Damage during hurricanes may also result from **spawned tornadoes** and **inland flooding** associated with heavy rainfall that usually accompanies these storms. Hurricane Hugo in 1989, for example, caused massive inland flooding when it made landfall in Charleston County and proceeded inland towards Columbia and ultimately continued North through Sumter and Sumter Counties.

Historical Occurrences:
Reliable classification of the intensity of tropical cyclones began in 1886. Since that time, there have been 951 tropical cyclones that have been recorded in the Atlantic Ocean and the Gulf of Mexico. Approximately 294 or 31% of those tropical cyclones passed within 300 miles of South Carolina.

According to the University of South Carolina's Hazards Lab, 97 tropical cyclones have made direct landfall in South Carolina or have entered via adjacent states since 1886. Of these, 72 were tropical storms, 21 were minor hurricanes and 4 were major hurricanes.

1989 saw the most costly hurricane to ever hit South Carolina, **Hurricane Hugo**. Hurricane Hugo made landfall as a Category 4 storm near Charleston and its progression inland resulted in unprecedented, widespread damage across South Carolina. The Category 4 storm made landfall near Sullivan's Island, South Carolina, at 2300 EST on September 21, 1989. The hurricane caused 13 directly related deaths, 22 indirectly related deaths, and injured several hundred people in South Carolina. Damage within the Palmetto State from Hurricane Hugo has been estimated to exceed $7 billion, including $2 billion in crop damage. The estimated maximum sustained winds at landfall were 138 miles per hour.

According to the University of South Carolina's Hazards Lab and the National Climatic Data Center, there have been 7 hurricanes that have passed over Sumter County since 1964.

Table A-7
Hurricanes/Tropical Storms in Sumter County (1852-2009)

Name	Date	Wind mph	Category
Not Named	August 24, 1851	57	TS
Not Named	August 25, 1851	46	TS
Not Named	September 9, 1854	69	TS
Not Named	October 4, 1877	46	TS
Not Named	September 12, 1878	92	H1
Not Named	July 1, 1886	69	TS
Not Named	September 10, 1888	40	TS
Not Named	September 29, 1896	86	H1
Not Named	July 13, 1901	40	TS
Not Named	September 18, 1906	69	TS
Not Named	October 23, 1908	40	TS
Not Named	October 9, 1913	40	TS
Not Named	July 14, 1916	63	TS
Not Named	October 2, 1929	46	TS
Not Named	September 5, 1935	63	TS
Not Named	September 17, 1945	46	TS
Not Named	September 24, 1947	40	TS
Cindy	July 9, 1959	40	TS
Alma	May 26, 1970	29	TD
Agnes	June 21, 1972	35	TD
Subtrop 3	September 15, 1976	40	SS
Bob	July 25, 1985	63	TS
Hugo	September 22, 1989	98	H2
Gordon	November 21, 1994	23	TD
Helene	September 23, 2000	29	TD
Allison	June 13, 2001	29	SD

Not Named	August 29, 2004		TS
Not Named	September 20, 2004		TS

Map 3 displays the centerline of where the eye of these storms passed through Sumter County. The name (if applicable) appears on the centerline itself. The eye to Hurricane Hugo passed over an area between two of Sumter County's primary population centers.

Table A-8
Hazard Probability

	Events	Years	Recurrence Interval	% Chance/Year
Tropical Storm/ Tropical Depression	25	157	6.28	15.92%
Category 1	2	157	78.5	1.27%
Category 2	1	157	0	0
Category 3	0	157	0	0
Category 4	0	157	0	0.00

Tropical Storm Orccurrences in Sumter County since 2002:
Two known tropical storms have occurred in the general vicinity of Sumter County since the last plan.

On August 29, 2004 at 9:30 am large branches and a few small trees were down in eastern Chesterfield County due to tropical storm force winds.

On September 20, 2004 at 4:40 pm emergency manager reports on a home in Chesterfield County, shingles of a home.

Multi-jurisdictional Occurrences:

Sumter County

Given their wide-ranging impact, hurricanes affect all parts of the county and put all of its critical facilities at risk. Those that would need the most attention, due to their role in emergency services, would be fire/EMS stations and police stations.

City of Sumter

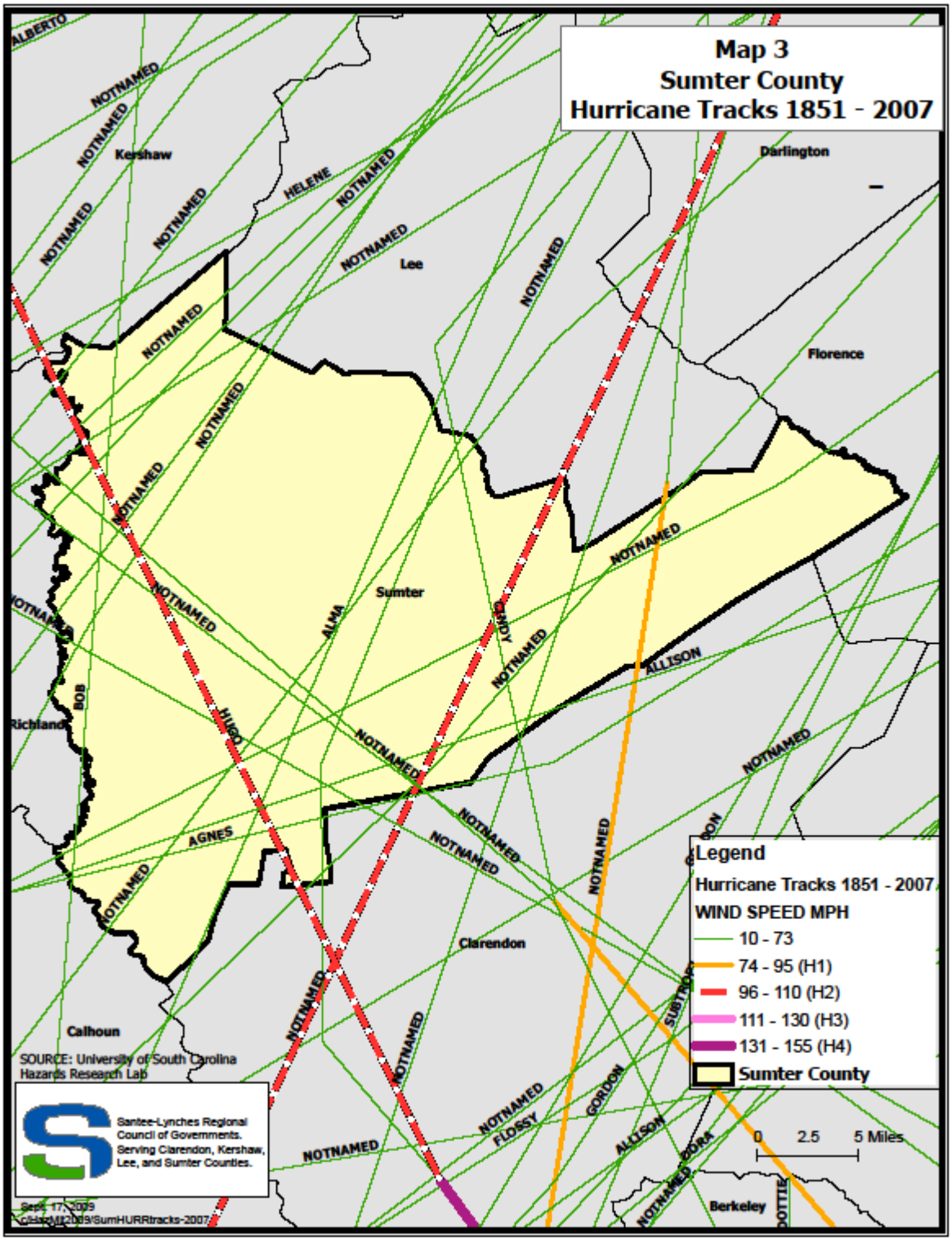
In addition to the need to protect fire and police structures, the City of Sumter also must consider mitigation measures for emergency shelters, Tuomey Hospital, and critical infrastructure, such as water, sewer, and power.

Pinewood

In addition to the need to protect fire and police structures, the Town of Pinewood also must consider mitigation measures for critical infrastructure, such as water, sewer, and power.

Mayesville

The Town of Mayesville's primary critical facility is the fire station, which could sustain damage during the occurrence of a hurricane.


Map 3
Sumter County
Hurricane Tracks 1851 - 2007
Kershaw
Lee
Darlington
Florence
Sumter
Richland
Clarendon
Calhoun
Berkeley
ALBERTO
HELENE
ALMA
HUGO
BOB
AGNES
CINDY
ALLISON
FLOSSY
GORDON
DORA
NOTNAMED
SUBTROP
Legend
Hurricane Tracks 1851 - 2007
WIND SPEED MPH
10 - 73
74 - 95 (H1)
96 - 110 (H2)
111 - 130 (H3)
131 - 155 (H4)
Sumter County
0 2.5 5 Miles
SOURCE: University of South Carolina
Hazards Research Lab
Santee-Lynches Regional
Council of Governments.
Serving Clarendon, Kershaw,
Lee, and Sumter Counties.
Sept 17, 2009
GIS\MXD\2009\SumHURRtracks-2007

C. TORNADOES

Description:

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground. It is most often generated by a thunderstorm (but sometimes results from hurricanes) and produced when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The damage from a tornado is a result of the high wind velocity and wind-blown debris, although they are commonly accompanied by large hail as well. The most violent tornadoes have rotating winds of 250 miles per hour or more and are capable of causing extreme destruction.

Most tornadoes are just a few dozen yards wide and touch down only briefly, but highly destructive tornadoes may carve out a path over a mile wide and several miles long. The level of destruction caused by tornadoes may range from light to inconceivable depending on the intensity, size and duration of the storm. Typically, tornadoes cause the greatest damage to structures of light construction, such as residential homes, and are quite localized in their impact.

Each year, an average of 800-1000 tornadoes are reported nationwide, and they are more likely to occur during the spring and early summer months of March through June. Tornadoes can occur at any time of day but are mostly likely to form in late afternoons and early evenings.

The Fujita-Pearson Scale for Tornadoes was developed to measure tornado strength, and is shown in **Table A-9**.

TABLE A-9

Fujita-Pearson Scale for Tornadoes

F Scale	Magnitude	Wind Speed	Damage Caused
F0	Gale tornado	40-72 mph	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards.
F1	Moderate tornado	73-112 mph	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
F2	Significant tornado	113-157 mph	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
F3	Severe tornado	158-206 mph	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
F4	Devastating tornado	207-260 mph	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
F5	Incredible tornado	261-318 mph	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel re-enforced concrete structures badly damaged.
F6	Inconceivable tornado	319-379 mph	These winds are very unlikely. The small area of damage they might produce would probably not be recognizable along with the mess produced by F4 and F5 wind that would surround the F6 winds. Missiles, such as cars and refrigerators would do serious secondary damage that could not be directly identified as F6 damage. If this level is ever achieved, evidence for it might only be found in some manner of ground swirl pattern, for it may never be identifiable through engineering studies.

Source: The Tornado Project

Historical Occurrences:

There were 670 confirmed tornado touchdown events in South Carolina between 1950 and 2001 according to the National Climatic Data Center that resulted in 72 deaths and 1842 injuries. Typically, South Carolina tornadoes are less severe than in other parts of the country.

According to the Hazards Lab, there have been 10 confirmed tornado events in Sumter County since 1950. The strongest tornado ever recorded in Sumter County is an F2, which occurred on September 29, 1963.

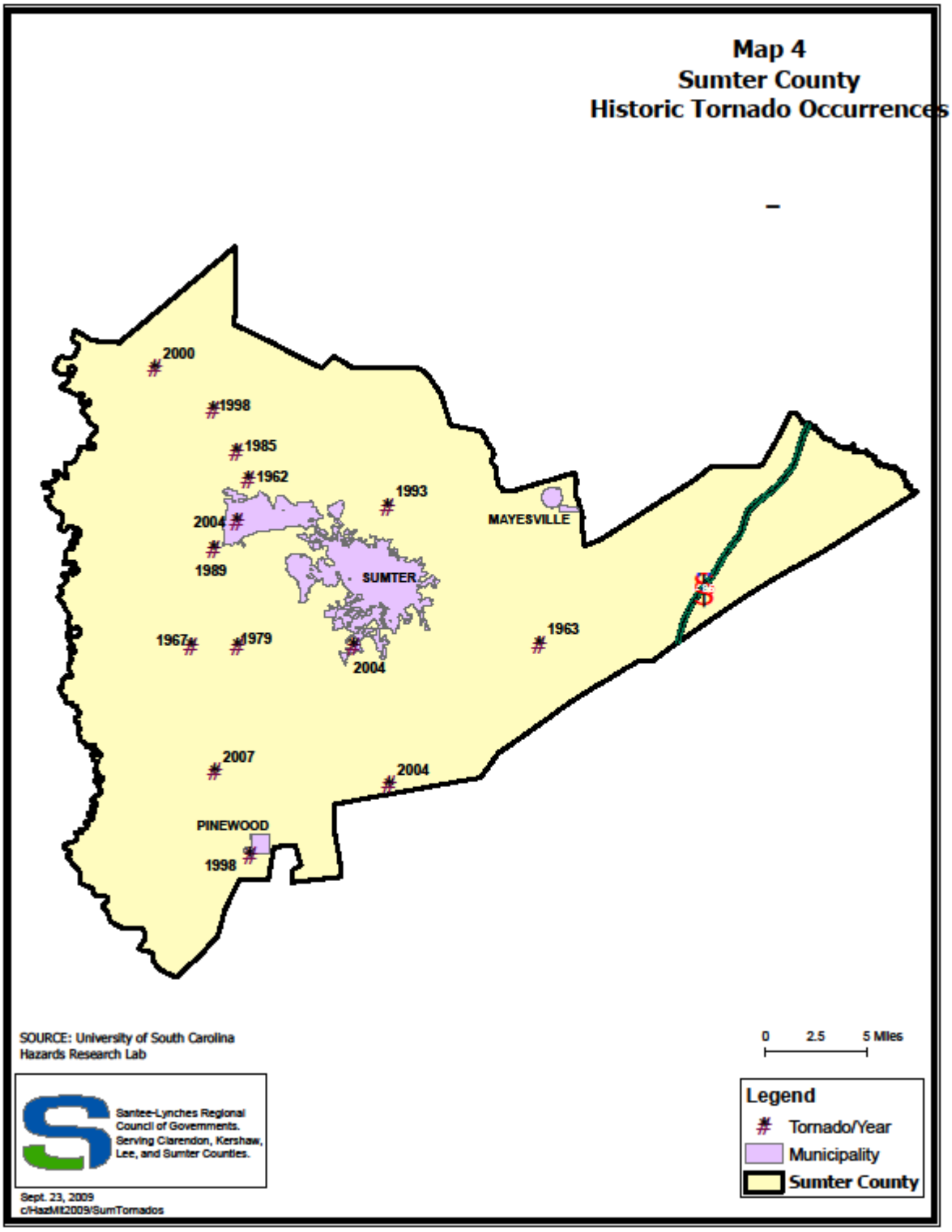
Table A-10 lists all tornado events reported for Sumter County between 1950 and September 30, 2001.

TABLE A-10

Tornadoes in Sumter County (1950 – October 2009)

Location	Date	Time	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Sumter	7/25/1962	12:00 PM	F0	0	0	$0	$0
Sumter	9/29/1963	1:00 PM	F2	0	0	$25,000	$0
Sumter	6/18/1964	5:00 PM	F1	0	0	$3,000	$0
Sumter	5/15/1967	6:15 PM	F1	0	0	$25,000	$0
Sumter	9/12/1971	12:30 PM	F1	0	0	$3,000	$0
Sumter	7/21/1979	7:30 PM	F0	0	0	$0	$0
Sumter	11/29/1985	3:00 PM	F0	0	0	$250,000	$0
Sumter	9/22/1989	2:30 PM	F1	0	0	$2,500,000	$0
Runnymeade Area	5/19/1993	2:30 PM	F0	0	0	$5,000	$0
Sumter	9/16/1996	5:16 PM	F2	0	0	$75,000	$0
Pinewood	5/10/1998	4:28 PM	F0	0	0	$0	$0
Rembert	6/6/1998	6:10 PM	F0	0	0	$2,000	$0
Rembert	3/16/2000	6:32 PM	F0	0	0	$0	$0
Sumter	9/7/2004	6:28 AM	F2	0	3	$1,700,000	$0
Shaw Afb	9/7/2004	9:03 AM	F1	0	0	$0	$0
Sumter	12/10/2004	5:30 AM	F0	0	0	$0	$0
Pinewood	4/15/2007	7:20 AM	F3	1	5	$0	$0
Pinewood	11/14/2008	10:53 PM	F0	0	0	$10,000	$5,000

Map 4 shows the location of these storms in the context of the geography of Sumter County. The red triangles on the map show where the tornadoes touched down and were mapped according to the latitude and longitude coordinates collected by the University of South Carolina Hazards Research Lab.


Map 4
Sumter County
Historic Tornado Occurrences
2000
1998
1985
1962
1993
2004
1989
MAYESVILLE
SUMTER
1967
1979
2004
1963
2007
2004
PINEWOOD
1998
SOURCE: University of South Carolina
Hazards Research Lab
0 2.5 5 Miles
Santee-Lynches Regional
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Sept. 23, 2009
c/HazMit2009/SumTornados
Legend
Tornado/Year
Municipality
Sumter County

Table A-11
Hazard Probability

	Events	Years	Recurrence Interval	% Chance/Year
Tornadoes	18	59	3.28	30.51%

Tornado Occurrences in Sumter County since 2002

On September 7, 2004 an F2 Tornado started 3 miles South West of Sumter and ended 2 miles west Northwest of Sumter. Emergency manager reported 55 homes damaged, 9 destroyed and 3 injuries.

On September 7, 2004 an F1 Tornado started near Shaw AFB and ended 3 miles north of Shaw AFB was reported. Shaw AFB reported many homes with light damage and a few with moderate damages as the Fl touched down between the runways and moved across the base. Many trees and powerlines were also down.

On December 10, 2004 an F0 Tornado, 9 miles south of Sumter and ended 9 miles southwest of Sumter, was reported. The Emergency Manager reported an F0 briefly touched down on a farm and damaged several out building south of Sumter.

On April 15, 2007 an F3 Tornado began 4 miles north northwest of Pinewood and ended 2 miles west northwest of Mayesville. An F3 Tornado traveled from southwest to northwest of Sumter destroying seven mobile homes , severely damaging nine framed houses, and doing light to moderate damage to an additional 62 mobile homes and frames houses. There was 1 fatality and 3 injuries. The tornado touched down as an Fl and ended up as an F3 where the fatality occurred at a mobile home on Highway 76. A cold front with strong dynamics and windshear pushed into the area late Saturday and early Sunday. Hail and microbursts accompanied the first wave of storms while the second wave of storms produced half dozen tornadoes. The largest was an F3 that killed one persona and injured 3 others.

On November 4, 2008 an F0 tornado touched down 6 miles southwest of Pinewood and ended 2 miles southwest of Pinewood. Storm survey found an F1 tornado touched down just southwest of Lone Star and continued northeast across Lake Marion into rural Sumter County. Several trees and a few powerlines were down along its path. Multicell thunderstorms produced some hail, wind damage, and one tornado. The Tornado touched down in Calhoun and Sumter Counties and damaged several homes, took down trees and powerlines, and destroyed several out buildings.

Multi-jurisdictional Occurrences:

According to the historical frequency of tornadoes in the County (see **Map 14**) the following deductions can be made for the jurisdictions within Sumter:

Sumter County

Given their unpredictable nature, tornados can occur anywhere, but by using the historical data as a sort of barometer, then it is apparent that the central part of the county, extending from Mayesville in the north down to the US 521 Corridor towards Clarendon County, is most vulnerable. County Assets in this area include the Dalzell

Fire Station; the Oswego Fire Station; the Dubose Fire Station; the Graham Fire Station; the Cherryvale Fire Station; and the electric power facility on North Jefferson Rd.

City of Sumter

The City of Sumter is highly vulnerable being located in an area that has experienced the most intense storm activity. Given the unpredictable nature of tornados all critical facilities are at risk

Pinewood

According to the historical data, Pinewood is at a low-to-moderate risk as are the critical facilities in the town.

Mayesville

According to the historical data, Mayesville is at a significant level of risk as are the critical facilities in the town.

D. SEVERE WINTER STORMS

Description:

Severe winter storms can produce an array of hazardous weather conditions, including **heavy snow**, **freezing rain and ice pellets**, **high winds** and **extreme cold**. Severe winter storms are usually extra-tropical cyclones (storms that form outside of the warm tropics) fueled by strong temperature gradients and an active upper-level cold jet stream. Winter storms can paralyze a community by shutting down normal day-to-day operations, as accumulating snow and ice result in downed trees, power outages and blocked or hazardous transportation routes. Heavy snow can also lead to the collapse of weak roofs or unstable structures. Frequently the loss of electric power means loss of heat for residents, which poses a significant threat to human life, particularly the elderly.

The level of impact severe winter weather will have upon the community greatly depends on its ability to manage and control its effects, such as the rapid mobilization of snow removal equipment. Due to the rare occurrence of severe winter weather in South Carolina, coupled with the expensive costs to acquire and maintain the necessary resources to combat their effects, many communities are not prepared for such events.

Historical Occurrences:

Although severe winter storms are typically associated with much colder climates, it is not uncommon for South Carolina to experience significant, even disastrous, winter weather events. Presidential disasters for winter storms were declared in South Carolina in January 2000, January 2003 and February 2004.

Since 1950, there have been 24 injuries and 2 deaths attributed to snow and ice events throughout the state. However, there have been an estimated 160.3 million dollars in property damage and an additional 5 million in crop damage. In most instances, these impacts are more likely to be felt in the mountains and Piedmont region of the state.

According to data acquired from the National Climatic Data Center, Sumter County had 7 ice or snow events between 2002 and 2009. **Map 5** shows Sumter County in relation to the rest of South Carolina. As indicated on the map, the central portion of the state, where Sumter is located experienced a low to moderate amount of storms during this eight-year period. However, in 2004 the County experienced a severe ice storm, which caused extensive damage and resulted in loss of power for several days.

Table A-12
Hazard Probability

	Events	Years	Recurrence Interval	% Chance/Year
Winter Storm	7	7	1	100.00%

Winter Storm and Ice Storm Occurrences in Sumter County since 2002

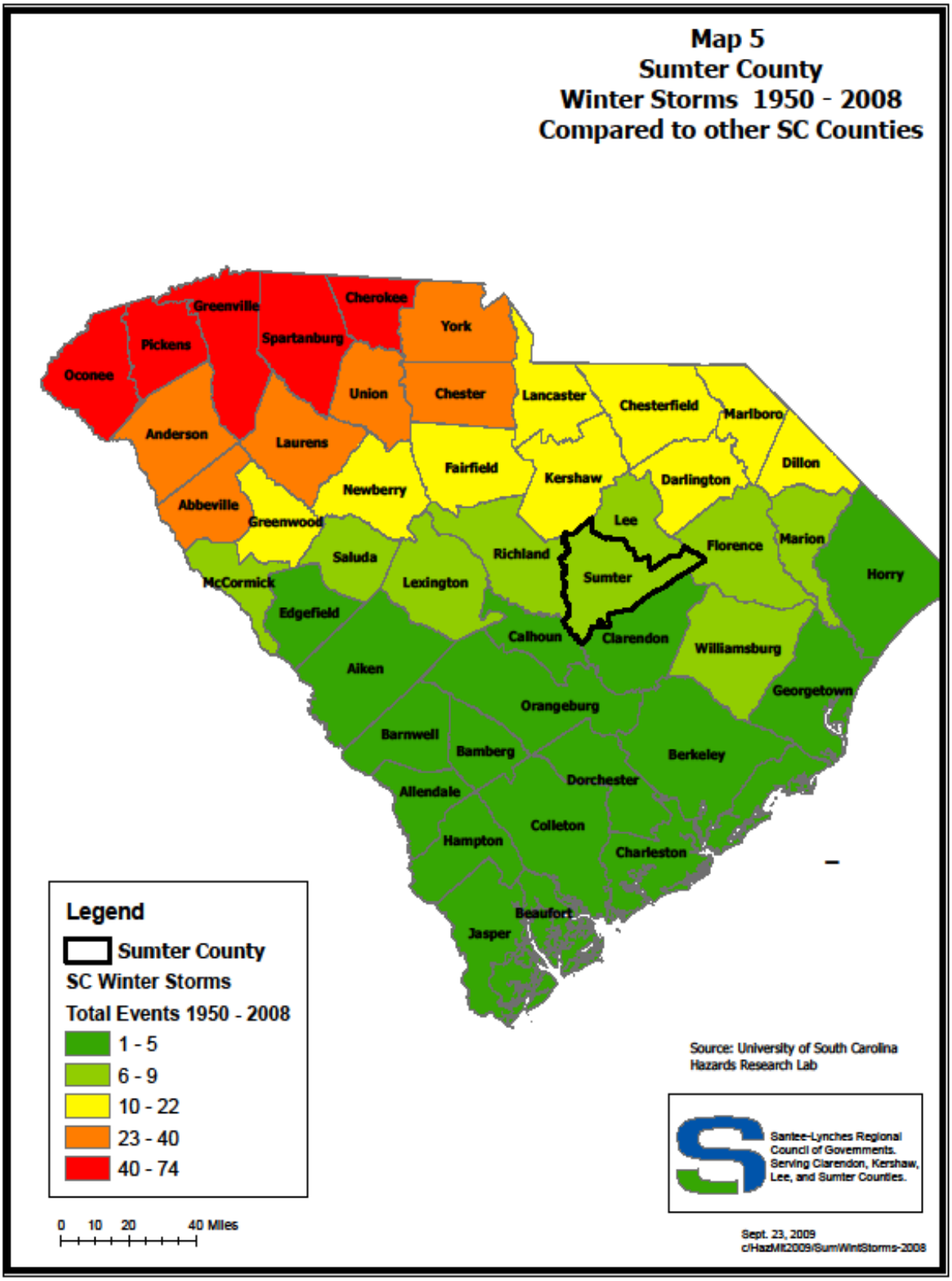
Winter storm on January 2, 2002 at 9:30 am – around 8 inches of snow fell over Lancaster County taking down trees and powerlines. A major winter storm moved through CSRA of Georgia and the midlands of South Carolina. Ice accumulations mainly occurred in the eastern third of CWA with mainly snow over the remainder of the CWA. Ice accumulations ranged from ¼ to 1 inch while snow accumulations ranged from 2 to 8 inches. Trees and powerlines were taken down. There were numerous accidents and driving conditions were treacherous.

Ice Storm on December 4, 2002 at 7:55 am – A major ice storm produced around an inch of ice that took down many trees and powerlines. Roads were hazardous. Many were without power for several days. Freezing rain fell over most of the Midlands, Pee Dee and western CSRA. Ice accumulations were around a quarter of an inch in McCormick, Saluda, Lexington, Richland, Sumter, and Lee Counties. Around a half inch of ice accumulated in Newberry, Fairfield, and Kershaw Counties. Lancaster and Chesterfield Counties were hardest hit with around an inch of ice. Many trees and powerlines were down in these two counties and people of Lancaster County were without power for several days.

Winter Storm on January 23, 2003 at 6:00 am – A winter storm produced 4 -7 inches of snow causing power outages for 3,500 homes. There were many traffic accidents with some injuries. A winter storm rapidly developed over the South Carolina central and northern midlands. This storm system produced 2 – 4 inches of snow in the central midlands and 4 – 7 inches of snow in the northern midlands. There were numerous traffic accidents with some minor injuries and no death. Some power outages occurred leaving about 10,000 homes without power for several hours.

Ice Storm on January 25, 2004 at 5:30 pm – An ice storm began over the Northern Midlands of South Carolina on Sunday night and gradually spread south into the Central Midlands and CSRS on Monday. The storm continued into Tuesday, but was mainly freezing drizzle during that time. Ice accumulations of ½ to ¾ of an inch occurred which brought numerous trees and powerlines down. The heaviest ice accumulations occurred in Lancaster, Chesterfield, Fairfield, Newberry, Saluda, McCormick, Orangeburg, and Clarendon Counties. Over 250,000 homes, businesses, and schools were without power for several days. Sleet also fell in Lancaster and Chesterfield Counties and accumulated up to t2 inches. Six people were injured in traffic related accidents and there were no deaths. Damage estimates from State Emergency Management were $28.5 million.

Ice Storm on December 26, 2006 at 4:15 am – an ice storm in the midlands produced ¼ to ¾ inch of ice taking down trees and power lines. Some areas also reported sleet that accumulated up to an inch. Several power outages were reported, some that lasted


Map 5
Sumter County
Winter Storms 1950 - 2008
Compared to other SC Counties
Greenville
Cherokee
York
Pickens
Spartanburg
Oconee
Union
Chester
Lancaster
Chesterfield
Marlboro
Anderson
Laurens
Fairfield
Kershaw
Darlington
Dillon
Newberry
Abbeville
Greenwood
Lee
Florence
Marion
Saluda
Richland
Horry
McCormick
Lexington
Sumter
Edgefield
Calhoun
Clarendon
Williamsburg
Aiken
Georgetown
Orangeburg
Barnwell
Bamberg
Berkeley
Dorchester
Allendale
Colleton
Hampton
Charleston
Beaufort
Jasper
Legend
Sumter County
SC Winter Storms
Total Events 1950 - 2008
1 - 5
6 - 9
10 - 22
23 - 40
40 - 74
0 10 20 40 Miles
Source: University of South Carolina
Hazards Research Lab
Santee-Lynches Regional
Council of Governments.
Serving Clarendon, Kershaw,
Lee, and Sumter Counties.
Sept. 23, 2009
c/HazMit2009/SumWintStorms-2008

almost a week. Numerous traffic accidents occurred.

Ice Storm on January 29, 2005 at 12:20 pm – An ice storm started late Friday night and continued off and on through Saturday night. Most areas received a quarter to a half inch of ice on trees and other structures. Some areas received a quarter to a half an inch of ice. These areas had some power outages which were of short duration. Overpasses and bridges iced up but ground temperatures of roadways kept the rain from freezing on them. Still, there were many accidents from people losing control when driving over the bridges and overpasses.

Winter Storm on January 20, 2009 at 4:00 am – Sheriff reported 1 to 3 inches of snow fell across Kershaw County closing some schools and some businesses. The deeper snow fell in the northern part of the county. A few secondary dirt roads were slushy and slippery at times. A winter weather event produced 1 to 4 inches of snow across the upper Midlands and Pee Dee region of South Carolina. There were few problems as surface temperatures were in the 40s and most of the snow melted when it came down on the highways, but remained on grassy surfaces for about a day.

Winter Weather on January 20, 2009 at 4:00 am – Sheriff reported a half inch to an inch of snow fell across northern Richland County closing some schools and causing 2 hour delays at others. A winter weather event produced 1 to 4 inches of snow across the Upper Midlands and Pee Dee region of South Carolina. There were few problems as surface temperatures were in the 40s and most of the snow melted when it came down on the highways, but remained on grassy surfaces for about a day.

Multi-jurisdictional Occurrences:

Sumter County

Given that severe winter storms tend to cover fairly large areas, the overall risk to the county is fairly equal, but the various jurisdictions have assets that are vulnerable to this type of hazard.

City of Sumter

The City of Sumter has electric power substations that would be susceptible to winter storms.

Pinewood

The Town of Pinewood has an electric power substation that would be susceptible to winter storms.

Mayesville

The Town of Mayesville does not have any assets that are at significant risk due to winter storms.

E. DAM FAILURE

Description:

Dams are water storage, control, or diversion barriers that impound water upstream in reservoirs. Dam failure is a collapse or breach in the structure. While most dams have storage volumes small enough that failures have little or no repercussions, dams with large storage amounts can cause significant flooding downstream.

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

- Prolonged periods of rainfall and flooding, which cause most failures
- Inadequate spillway capacity, resulting in excess overtopping flows.
- Internal erosion caused by embankment or foundation leakage or piping.
- Improper maintenance, including failure to remove trees, repair internal seepage problems, replace lost material from the cross section of the dam and abutments, or maintain gates, valves, and other operational components.
- Improper design, including the use of improper construction materials and construction practices.
- Negligent operation, including the failure to remove or open gates or valves during high flow periods.
- Failure of upstream dams in the same drainage basin.
- Landslides into reservoirs, which cause surges that result in overtopping.
- High winds, which can cause significant wave action and result in substantial erosion.
- Earthquakes, which typically cause longitudinal cracks at the tops of the embankments, leading to structural failure.

Dam Classification:

The South Carolina Department of Health and Environmental Control, Dam Safety Programs has classified dams that would pose a safety hazard to human life and property into two classifications. A Class I dam is one that would cause a loss of human life. A Class II dam is one that would cause significant property damage.

There were thirty-two (32) Class I and Class II dams in the Santee-Lynches Region. Kershaw County had the most Class I and Class II dams – 4 and 10 respectively. Sumter County has the second higher number of dams with 11 Class II dams. The number of Class I and II dams by County is indicated below. A list of dams with the name and location by Class is shown in Appendix H.

Table A-13
Dam Classes by County

County	Class I	Class II	Total
Clarendon County	0	3	3
Kershaw County	4	10	14
Lee County	0	4	4
Sumter County	0	11	11
SL Region	4	28	32

Historical Occurrences:

South Carolina has a large number of dams, ranging from large structures for power generation, recreation and water supply to smaller dams for industrial, agricultural or fishing purposes. More than 200 of these dams have been rated high hazard due to potential loss of life and property should failure occur. The overall potential for dam failure based on historical records is low. Flood conditions which occurred in the month of October 1990, however, resulted in the failure of 17 dams and the overtopping of an additional 31 dams. Four people were drowned as a result of the Kendall Dam failure in Camden, SC. None of the major dams in the state was threatened by the October 1990 floods.

Table A-14
Future Probabilities

	Events	Years	Recurrence Interval	% Change/Year
Dam Failure	1	20	20	5

Historical Occurrences:
According to a study done by the DNR Land Resources Conservation Commission, there are nine Class 1 dams in Sumter County. The Second Mill Dam has failed three times, causing flooding downstream. One home was destroyed.

Sumter County
Sumter County has a number of dams within the vicinity of the various watersheds in the County. The area most at risk for dam failure is the center of the County, because of the Pocotaligo River.

City of Sumter
The City of Sumter is at the most risk due to dam failure. Given the City's geographic location, many of its assets are at risk.

Pinewood
The Town of Pinewood is not at significant risk because the closest dams are located southwest, near the Wateree River.

Mayesville
Although Mayesville is located near the Black River, there are no dams close to the Town.

Table A-15
Sumter County
Multi-jurisdiction Analysis of Potential Dam Failures*

Jurisdictions	History	Vulnerability	Maximum Threat	Probability	Total Score	Jurisdiction Rating
Sumter	2	25	100	7	134	1
Pinewood	2	5	10	7	24	3
Mayesville	2	5	10	7	24	3
Unincorporated	2	25	50	7	84	2

***See Appendix G for an explanation of the scoring system used for this table.**

Those jurisdictions with the highest numerical scores should and will be receiving priority attention for planning and/or mitigation purposes.

F. SEVERE THUNDERSTORMS, WIND EVENTS, HAIL, & LIGHTNING
Description:
Severe thunderstorms are defined by the National Weather Service as storms that have wind speeds of 58 miles per hour or higher, produce hail at least three quarters of an inch in diameter, or produces tornadoes. In order to form, thunderstorms simply require moisture to form clouds and rain, coupled with an unstable mass of warm air that can rise rapidly.

Thunderstorms affect relatively small areas when compared with hurricanes and winter storms, as the average storm is 15 miles in diameter and lasts an average of 30 minutes. Nearly 1,800 thunderstorms are occurring at any moment around the world, however, of the estimated 100,000 thunderstorms that occur year in the United States only about 10 percent are classified as severe.

Thunderstorms are most likely to happen in the spring and summer months and during the afternoon and evening hours, but can occur year-round and at all hours. Despite their small size, all thunderstorms are dangerous and capable of threatening life and property in localized areas. Every thunderstorm produces **lightning**, which results from the buildup and discharge of electrical energy between positively and negatively charged areas. Each year, lightning is responsible for an average of 93 deaths (more than tornadoes), 300 injuries, and several hundred million dollars in damage to property and forests.

Thunderstorms can also produce large, damaging **hail**, which causes nearly $1 billion in damage to property and crops annually. **Straight-line winds**, which in extreme cases have the potential to exceed 100 miles per hour, are responsible for most thunderstorm wind damage. One type of straight-line wind, the **downburst**, can cause damage equivalent to a strong tornado and can be extremely dangerous to aviation. Thunderstorms are also capable of producing **tornadoes** and heavy rain that can lead to **flash flooding**.

Historical Occurrences:
Severe thunderstorms are fairly common in South Carolina, but only a small percentage of these actually cause damages.

According to the National Climatic Data Center, there were a total of 167 significant wind events in Sumter County during the period of 1950-2009. These storms caused 1 death, 2 injuries, $1.1 million in property damages, and $10,000 in crop damage. (These events do not include tornadoes which are discussed in 8-1.C.).

In addition, there were 82 hail events recorded for Sumter County during the same period that resulted in no deaths, injuries. They did; however, cause 9 injuries, $2,000 in property damage, and $5,000 in crop damage. There was 1 instance recorded between 1993 and 2001 for Sumter County where lightening caused $225,000 in property damage. **Map 6** (Wind Storm Frequency), **Map 7** (Hail Frequency), and **Map 8** (Lightning Storm Frequency) show how these hazards affect Sumter in relation to the rest of South Carolina. In all three cases, Sumter County is in the median range of frequency of occurrence; however, these storms are random in nature and do not follow geographic patterns.

Table A-16
Hazard Probability

	Events	Years	Recurrence Interval	% Chance/Year
Thunderstorm w/ High Winds	167	59	0.35	283.05%
Hail	82	59	0.72	138.98%
Lightning (Causing casualty or property damage)	1	16	16.00	6.25%

Thunderstorm & High Wind Occurrences in Sumter County since 2002

There have been 58 thunderstorm and high wind events reported in Sumter County between January 1, 2002 and May 31, 2009.

There have been 50 hail events reported in Sumter County between January 1, 2002 and October 2009.

Multi-jurisdictional Occurrences:

Sumter County

Severe weather events are not geographically specific, and can occur anywhere in the County affecting any of the County's assets.

City of Sumter

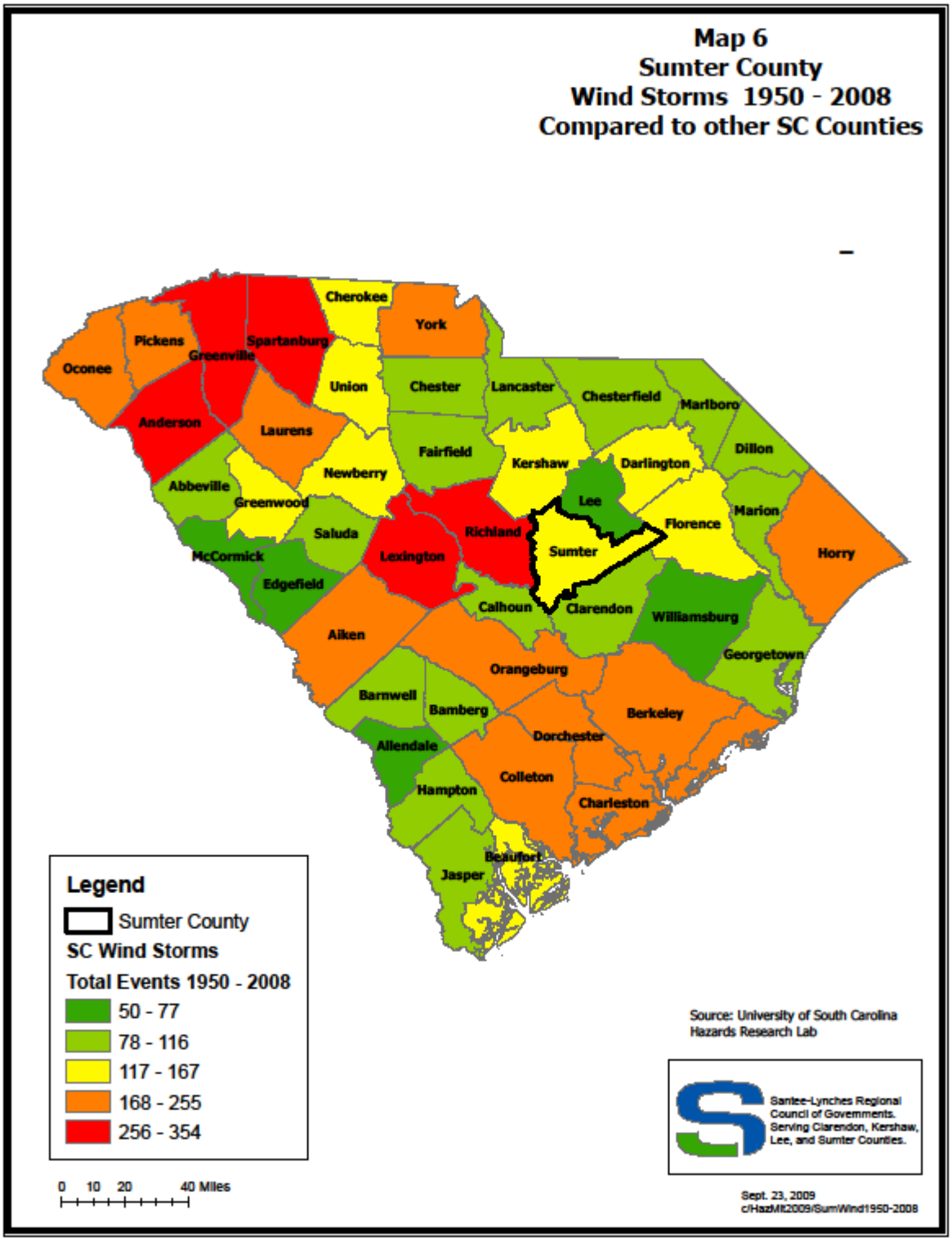
Severe weather events are not geographically specific, and can occur anywhere in the City affecting any of the City's assets. However, Sumter does have an electrical power substation that is especially susceptible to lightning.

Pinewood

Severe weather events are not geographically specific, and can occur anywhere in the Town affecting any of the Town's assets. However, Pinewood does have an electrical power substation that is especially susceptible to lightning.

Mayesville

Severe weather events are not geographically specific, and can occur anywhere in the Town and affecting any of the Town's assets.


Map 6
Sumter County
Wind Storms 1950 - 2008
Compared to other SC Counties
Cherokee
York
Pickens
Greenville
Spartanburg
Oconee
Union
Chester
Lancaster
Chesterfield
Marlboro
Anderson
Laurens
Fairfield
Kershaw
Darlington
Dillon
Abbeville
Greenwood
Newberry
Lee
Marion
Saluda
Richland
Florence
McCormick
Lexington
Sumter
Horry
Edgefield
Calhoun
Clarendon
Williamsburg
Aiken
Georgetown
Orangeburg
Barnwell
Bamberg
Berkeley
Allendale
Dorchester
Colleton
Hampton
Charleston
Beaufort
Jasper
Legend
Sumter County
SC Wind Storms
Total Events 1950 - 2008
50 - 77
78 - 116
117 - 167
168 - 255
256 - 354
0 10 20 40 Miles
Source: University of South Carolina
Hazards Research Lab
Santee-Lynches Regional
Council of Governments.
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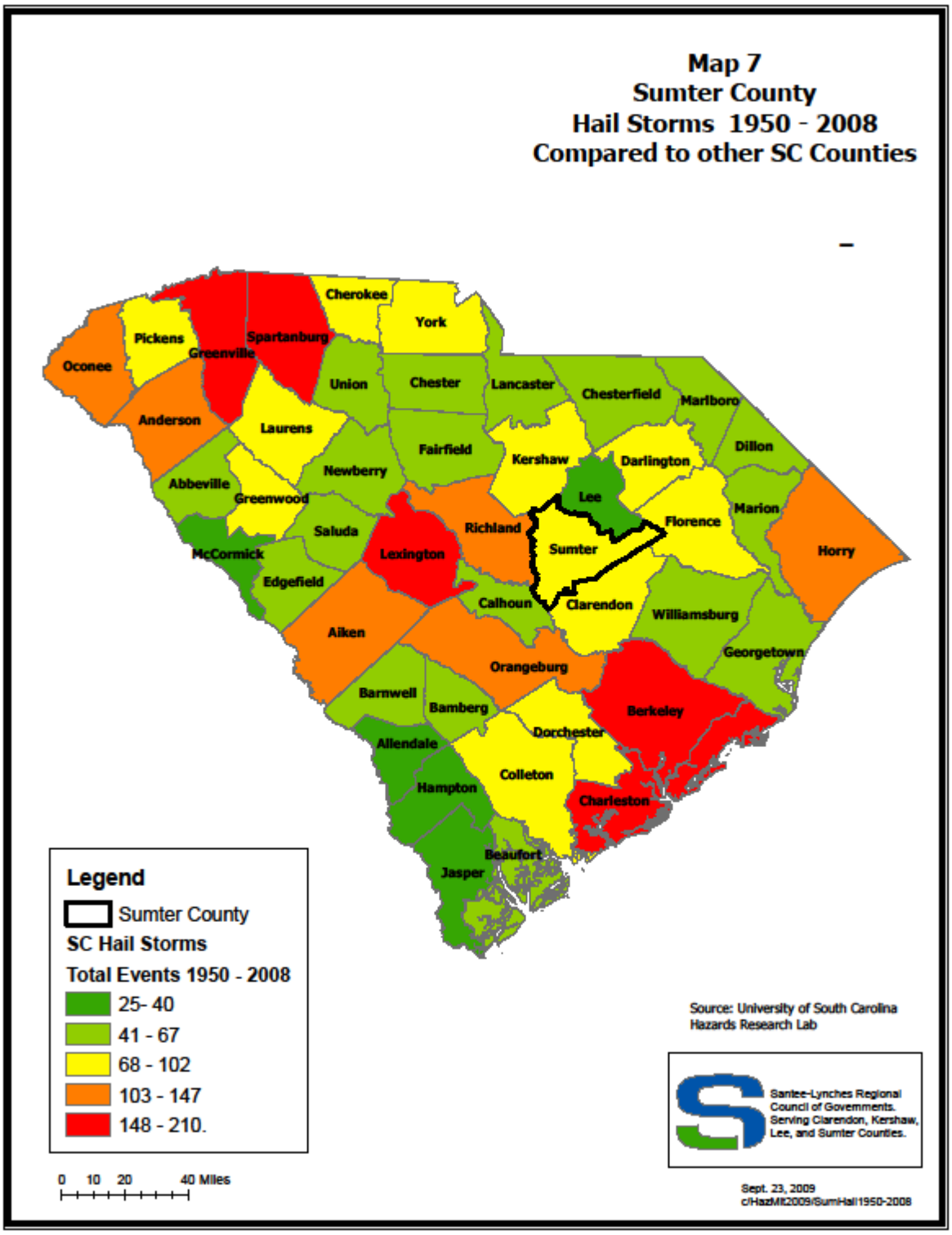
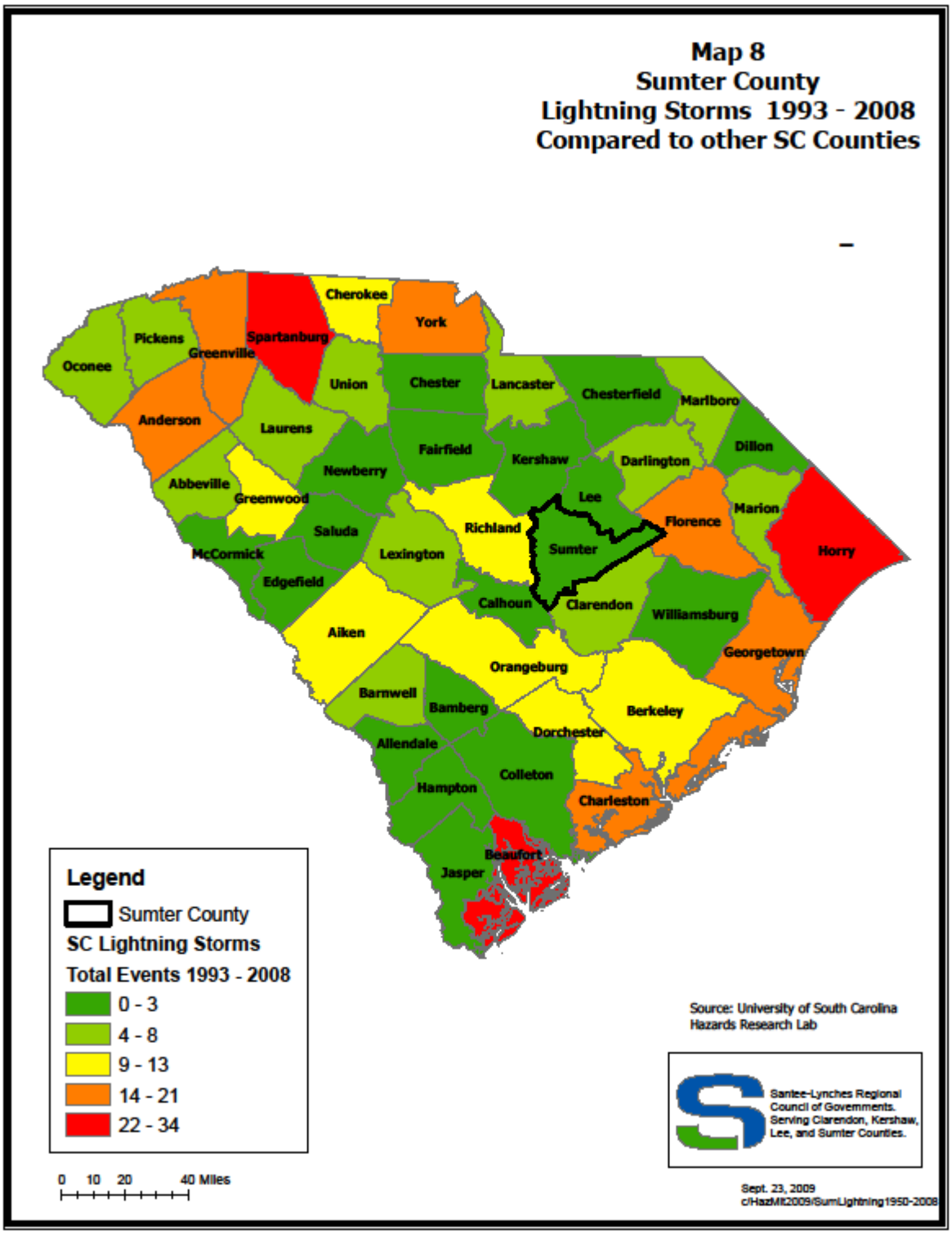
Sept. 23, 2009
c/HazMit2009/SumWind1950-2008


Map 7
Sumter County
Hail Storms 1950 - 2008
Compared to other SC Counties
Cherokee
York
Pickens
Greenville
Spartanburg
Oconee
Union
Chester
Lancaster
Chesterfield
Marlboro
Anderson
Laurens
Fairfield
Kershaw
Darlington
Dillon
Abbeville
Greenwood
Newberry
Lee
Marion
Saluda
Richland
Florence
McCormick
Lexington
Sumter
Horry
Edgefield
Calhoun
Clarendon
Williamsburg
Aiken
Orangeburg
Georgetown
Barnwell
Bamberg
Berkeley
Dorchester
Allendale
Colleton
Hampton
Charleston
Beaufort
Jasper
Legend
Sumter County
SC Hail Storms
Total Events 1950 - 2008
25- 40
41 - 67
68 - 102
103 - 147
148 - 210.
0 10 20 40 Miles
Source: University of South Carolina
Hazards Research Lab
Santee-Lynches Regional
Council of Governments.
Serving Clarendon, Kershaw,
Lee, and Sumter Counties.
Sept. 23, 2009
c/HazMit2009/SumHail1950-2008


Map 8
Sumter County
Lightning Storms 1993 - 2008
Compared to other SC Counties
Cherokee
York
Pickens
Spartanburg
Greenville
Oconee
Union
Chester
Lancaster
Chesterfield
Marlboro
Anderson
Laurens
Fairfield
Kershaw
Darlington
Dillon
Abbeville
Greenwood
Newberry
Lee
Marion
Richland
Florence
Saluda
Sumter
Horry
McCormick
Lexington
Edgefield
Calhoun
Clarendon
Williamsburg
Aiken
Georgetown
Orangeburg
Barnwell
Bamberg
Berkeley
Dorchester
Allendale
Colleton
Hampton
Charleston
Beaufort
Jasper
Legend
Sumter County
SC Lightning Storms
Total Events 1993 - 2008
0 - 3
4 - 8
9 - 13
14 - 21
22 - 34
0 10 20 40 Miles
Source: University of South Carolina
Hazards Research Lab
Santee-Lynches Regional
Council of Governments.
Serving Clarendon, Kershaw,
Lee, and Sumter Counties.
Sept. 23, 2009
c/HazMit2009/SumLightning1950-2008

G. WILDFIRES

Description:

A wildfire is an undesirable, uncontrolled burning of grasslands, brush or woodlands. According to the National Weather Service, more than 100,000 wildfires occur in the United States each year. About 90% of these wildfires are started by humans (i.e., campfires, debris burning, smoking, etc.); and the remaining 10% are started by lightning.

The potential for wildfire depends upon surface fuel characteristics, weather conditions, recent climate conditions, topography, and fire behavior. Fuels are anything that fire can and will burn, and are the combustible materials that sustain a wildfire. Typically, this is the most prevalent vegetation in a given area.

Weather is one of the most significant factors in determining the severity of wildfires. The intensity of fires and the rate with which they spread is directly rated to the wind speed, temperature and relative humidity. Climatic conditions such as long-term drought also play a major role in the number and intensity of wildfires, and topography is important because the slope and shape of the terrain can change the rate of speed at which fire travels.

There are four major types of wildfires. **Ground fires** burn in natural litter, duff, roots or sometimes high organic soils. Once started they are very difficult to control, and some ground fires may even rekindle after being extinguished. **Surface fires** burn in grasses and low shrubs (up to 4' tall) or in the lower branches of trees. They have the potential to spread rapidly, and the ease of their control depends upon the fuel involved. **Crown fires** burn in the tops of trees, and the ease of their control depends greatly upon wind conditions. **Spotting fires** occur when burning embers are thrown ahead of the main fire, and can be produced by crown fires as well as wind and topographic conditions.

Once spotting begins, the fire will be very difficult to control. Wildfires become significant threats to life and property along what is known as the "wildland/urban interface." The wildland/urban interface is defined as the area where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. Since 1985, approximately 9,000 homes have been lost to urban/wildland interface fires across the United States.

There is no wildfire mapping or location data available for Sumter County or its municipalities from the NCDC, USC Hazards Lab or local sources. The areas within the county that are at a greater risk of wildfires are those areas that have a higher density of vegetation and forests. The land cover shows forested and scrub/shrub areas, largely within the unincorporated county at risk from this hazard. Smaller county jurisdictions (Pinewood and Mayesville) with close proximity to high risk rural areas face a higher risk than the more urbanized jurisdiction of Sumter. Though the outskirts of urban areas are at risk due to the proximity of forested and vegetated areas, the risk in the urban core is comparatively low.

Wildfire occurrences in Sumter County since 2002

There were no wildfire events reported in Sumter County between January 1, 2002 and May 31, 2009.

Historical Occurrences:

All of South Carolina is susceptible to wildfire. According to the USC Hazards Lab, between 1988 and 2008, South Carolina has recorded a total of 92,286 wildfires that resulted in the damage of 359,277 acres. That's an average number of 5,373 fires per year. Although wildfires are possible throughout the year, normal fire season peaks for South Carolina are in the spring and late fall months.

From 1988-2008, Sumter County had 13,455 acres of land burned by wildfire, for an average of 1,121 acres per year. **Map 9** offers a comparison of Sumter to other counties in South Carolina. Like other counties in the southeastern part of the state, Sumter has experienced a large number of wildfires that can be attributed to a number of factors, ranging from climate to land use.

TABLE A-17
Twenty Year Summary of Wildfires in Clarendon County, By Number of Fires, Acres Consumed

Number of Fires	Acres Consumed
2662	13,455

Table A-18
Hazard Probability

	Events	Years	Recurrence Interval	% Chance/Year
Wildfires	2,662	20	0.0075	133.1

Multi-jurisdictional Occurrences:

Sumter County:

Wildfires are not geographically specific, and can occur anywhere in the County affecting any of the County's assets. The unincorporated county is more vulnerable to wildfires than the municipalities, simply because of the fact that there are more forested areas in the unincorporated county.

City of Sumter:

Wildfires are not geographically specific, and can occur where there is a forested area in the City and can affect any of the City's adjoining assets. The urban areas are less vulnerable to wildfires, simply because of the fact that there is less vegetation.

Town of Pinewood:

Wildfires are not geographically specific, and can occur where there is a forested area in the Town and can affect any of the Town's adjoining assets. The urban areas are less vulnerable to wildfires, simply because of the fact that there is less vegetation.

Town of Mayesville:

Wildfires are not geographically specific, and can occur where there is a forested area in the Town and can affect any of the Town's adjoining assets. The urban areas are less vulnerable to wildfires, simply because of the fact that there is less vegetation.

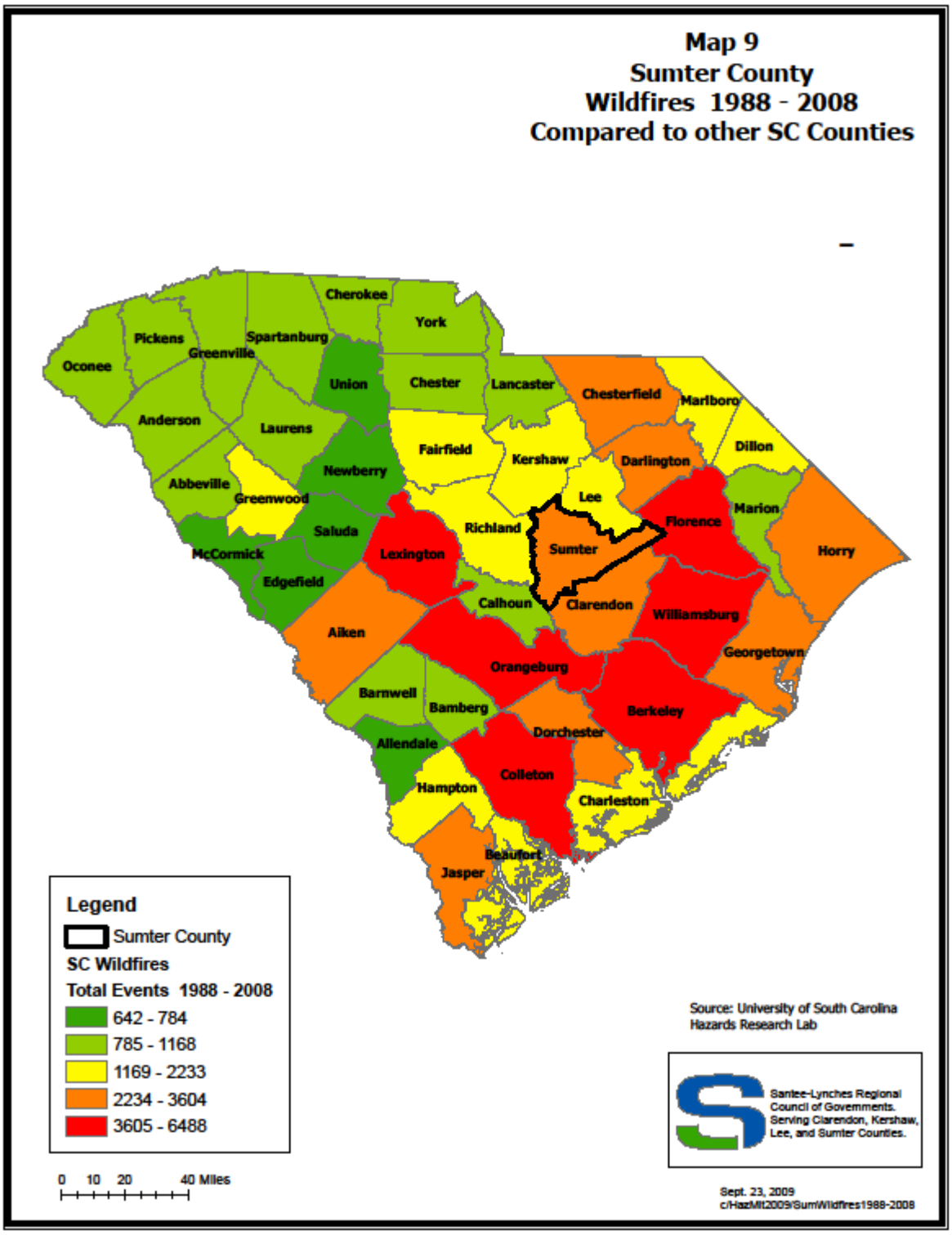

Map 9
Sumter County
Wildfires 1988 - 2008
Compared to other SC Counties
Cherokee
York
Pickens
Spartanburg
Greenville
Oconee
Union
Chester
Lancaster
Chesterfield
Marlboro
Anderson
Laurens
Fairfield
Kershaw
Darlington
Dillon
Newberry
Abbeville
Greenwood
Lee
Marion
Florence
Saluda
Richland
Sumter
Horry
McCormick
Lexington
Edgefield
Calhoun
Clarendon
Williamsburg
Aiken
Georgetown
Orangeburg
Barnwell
Bamberg
Berkeley
Dorchester
Allendale
Colleton
Hampton
Charleston
Beaufort
Jasper
Legend
Sumter County
SC Wildfires
Total Events 1988 - 2008
642 - 784
785 - 1168
1169 - 2233
2234 - 3604
3605 - 6488
0 10 20 40 Miles
Source: University of South Carolina
Hazards Research Lab
Santee-Lynches Regional
Council of Governments.
Serving Clarendon, Kershaw,
Lee, and Sumter Counties.
Sept. 23, 2009
c/HazMit2009/SumWildfires1988-2008

Table A-19
Sumter County
Multi-jurisdiction Analysis of Wildfires

Jurisdictions	History	Vulnerability	Maximum Threat	Probability	Total Score	Jurisdiction Rating
Sumter	10	50	50	35	145	3
Pinewood	10	50	50	70	180	2
Mayesville	10	50	50	35	145	3
Unincorporated	20	50	100	70	240	1

*NCDC data for individual occurrences was not available; therefore, data was utilized from a county wide scale utilizing a land cover GIS Shapefile (see map 24). As such, scores for wildfires were determined from analysis of this information.

*See Appendix G for an explanation of the scoring system used for this table.

Those jurisdictions with the highest numerical scores should and will be receiving priority attention for planning and/or mitigation purposes.

H. EARTHQUAKES

Description:

An earthquake is the motion or trembling of the ground produced by sudden displacement of rock in the Earth's crust. Earthquakes result from crustal strain, volcanism, landslides, or the collapse of caverns. Earthquakes can affect hundreds of thousands of square kilometers; cause damage to property measured in the tens of billions of dollars; result in loss of life and injury to hundreds of thousands of persons; and disrupt the social and economic functioning of the affected area.

Most property damage and earthquake-related deaths are caused by the failure and collapse of structures due to **ground shaking**. The level of damage depends upon the amplitude and duration of the shaking, which are directly related to the earthquake size, distance from the fault, site and regional geology. Other damaging earthquake effects in include **landslides**, the down-slope movement of soil and rock (mountain regions and along hillsides), and in which ground soil loses it ability to resist shear and flows much like quick sand. In the case of liquefaction, anything relying on the substrata for support can shift, tilt, rupture, or collapse.

Most earthquakes are caused by the release of stresses accumulated as a result of the rupture of rocks along opposing fault planes in the Earth’s outer crust. These fault planes are typically found along borders of the earth's ten tectonic plates. These plate borders generally follow the outlines of the continents, with the North American plate following the continental border with the Pacific Ocean in the west, but following the mid-Atlantic trench in the east. As earthquakes occurring in the mid-ocean trench usually pose little threat to humans, the greatest earthquake threat in North America is along the Pacific coast.

The areas of greatest tectonic instability occur at the perimeters of the slowly moving plates, as these locations are subjected to the greatest strains from plates traveling in opposite directions and at different speeds. Deformation along plate boundaries causes strain in the rock and the consequent buildup of stored energy. When the built-up stress exceeds the rocks' strength, a rupture occurs. The rock on both sides of the fracture is snapped, releasing the stored energy and producing seismic waves, generating an

earthquake.

Earthquakes are measured in terms of their magnitude and intensity. Magnitude is measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake through a measure of shock wave amplitude. Each unit increase in magnitude on the Richter Scale corresponds to a ten-fold increase in wave amplitude, or a 32-fold increase in energy. Intensity is most commonly measured using the Modified Mercalli Intensity (MMI) Scale. It is a twelve-level scale based on direct and indirect measurements of seismic effects. The scale levels are typically described using roman numerals, with a I corresponding to imperceptible (instrumental) events, IV corresponding to moderate (felt by people awake), to XII for catastrophic (total destruction).

A detailed description of the Modified Mercalli Scale of Earthquake Intensity and its correspondence to the Richter Scale is given in **Table A-20**.

TABLE A-20
Modified Mercalli Intensity Scale for Earthquakes

Modified Mercalli Intensity Scale for Earthquakes	Scale Intensity Description of Effects	Corresponding Richter Scale Magnitude
I	Detected only on seismographs	< 3.5
II	Feeble; Some people feel it	3.5
III	Slightly felt by people resting; like a truck rumbling by	4.2
IV	Moderate - Felt by people walking	4.5
V	Slightly Strong - Sleepers awake; church bells ring	4.8
VI	Strong - Trees sway; suspended objects swing, objects fall off shelves	5.4
VII	Very Strong Mild Alarm; walls crack; plaster falls	6.1
VIII	Destructive - Moving cars uncontrollable; masonry fractures, poorly constructed buildings damaged	6.5
IX	Ruinous - Some houses collapse; ground cracks; pipes break open	6.9
X	Disastrous - Ground cracks profusely; many buildings destroyed; liquefacation and landslides widespread	7.3
XI	Very Disastrous - Most buildings and bridges collapse; roads, railways, pipes and cables destroyed; general triggering of other hazards	8.1
XII	Catastrophic - Total destruction; trees fall; ground rises and falls in waves	>8.1

Historical Occurrences:

Earthquakes are relatively infrequent but not uncommon in South Carolina. From 1698 to 2001, 20 earthquakes occurred in South Carolina with a Richter Scale magnitude equal to or greater than 4. The most property damage in South Carolina ever attributed to an earthquake was caused by the August 31, 1886 Charleston, South Carolina shock. The quake left about 65 people dead in Charleston.

Sumter County has very little history with earthquakes. There has been 1 historical epicenter recorded within Sumter County between 1698 and 2001. **Map 10** shows the location of these earthquakes.

Table A-21
Earthquakes in Sumter County (1843-2009)

1/3/1929	3.3 Magnitude

Figure A-3 shows the peak acceleration (%g) with 10% Probability of Exceedance in 50 years for the central and east coast of the United States (U.S. Geological Survey, National Seismic Hazard Mapping Project, 1996). Sumter County is located in an area with less than 10%g (peak acceleration), which means it faces low seismic risk.

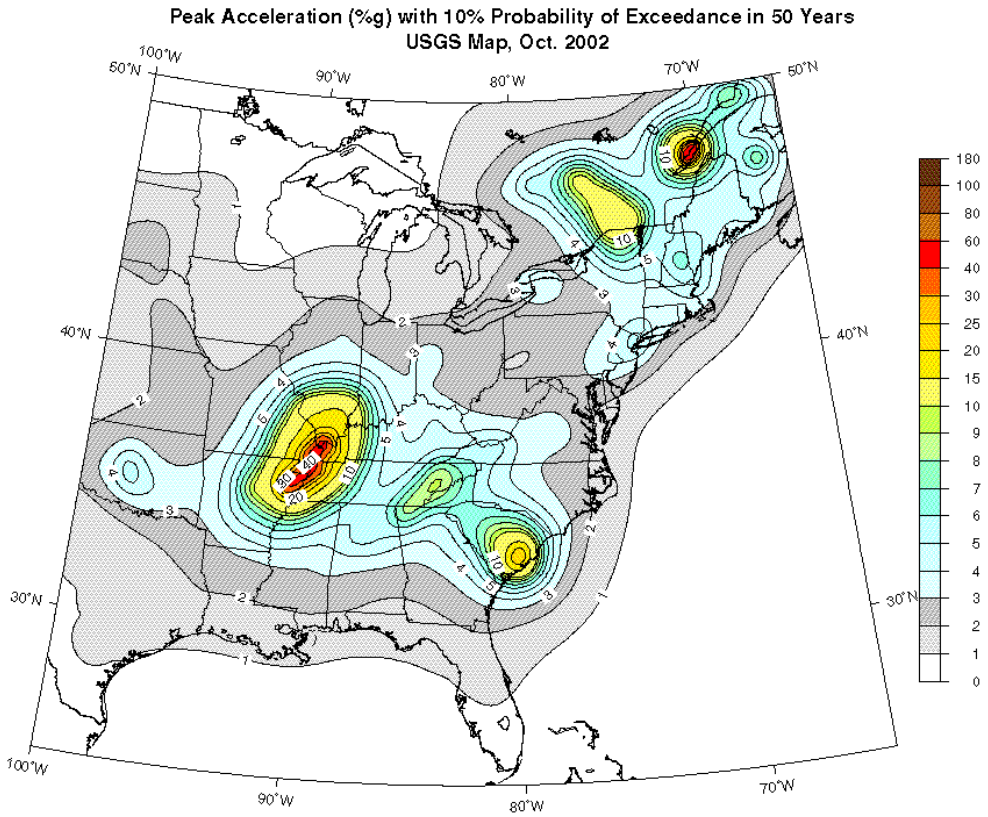


FIGURE A-3
Peak Acceleration (%g) with 10% Probability of Exceedance in 50 Years
Source: United States Geological Survey

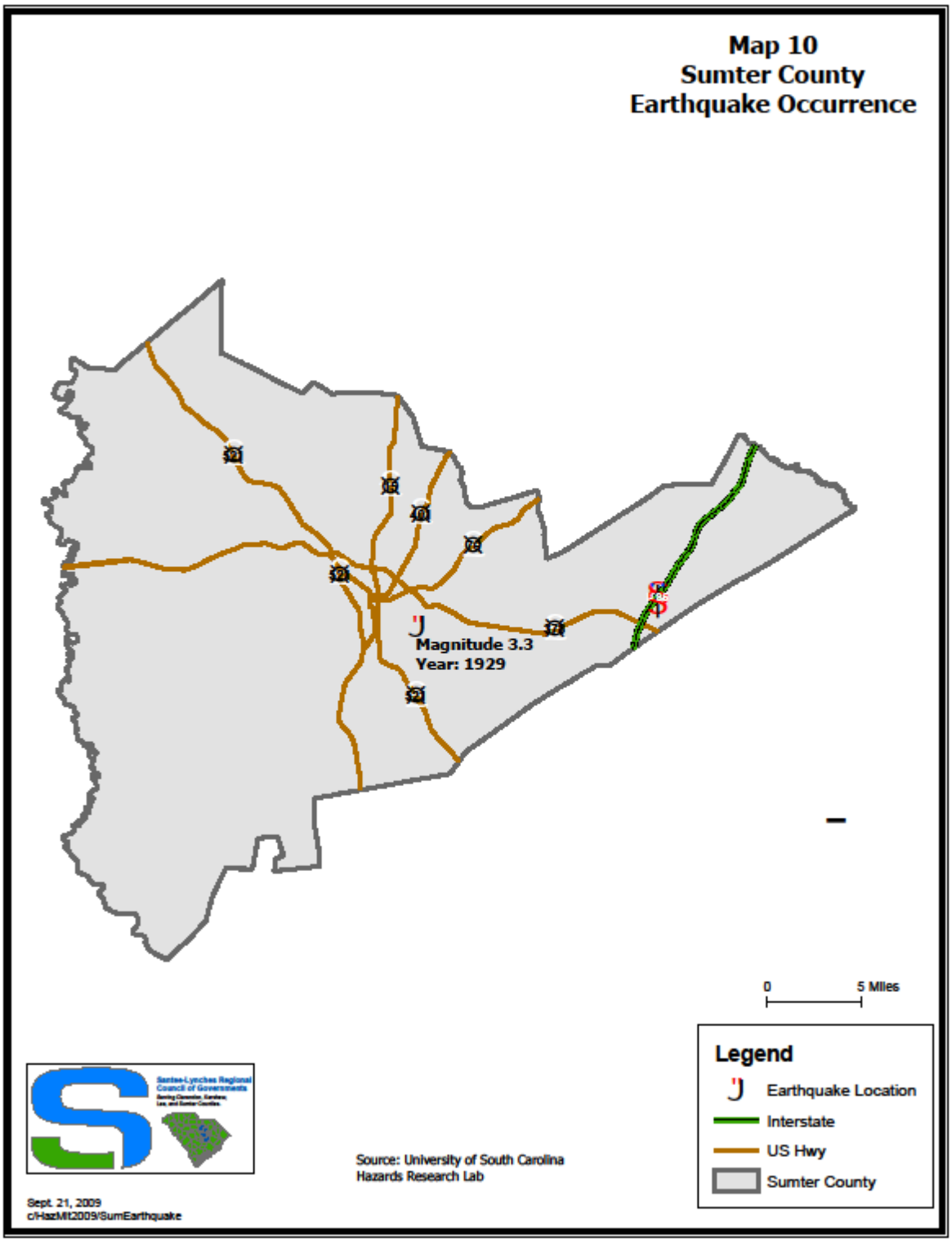

Map 10
Sumter County
Earthquake Occurrence
Magnitude 3.3
Year: 1929
0
5 Miles
Legend
Earthquake Location
Interstate
US Hwy
Sumter County
Source: University of South Carolina
Hazards Research Lab
Sept. 21, 2009
c/HazMit2009/SumEarthquake

Table A-22
Hazard Probability

	Events	Years	Recurrence Interval	% Chance/Year
Earthquake	1	307	307	0.33%

Earthquake Occurrences in Sumter County since 2002
There were no earthquake events reported between January 1, 2002 and May 31, 2009.

Multi-jurisdictional Occurrences:
Sumter County
Given that there has only been one earthquake in Sumter County, the area where it occurred is the only that can be considered at risk. The assets in this area include several of the County's fire stations and emergency shelters.

City of Sumter
Using the historical data in a gravity map, the City of Sumter falls within the higher risk areas for earthquakes. Those assets most at risk include the wastewater treatment plant on the Pocotaligo River, several water treatment plants, the hospital, emergency shelters, and emergency response facilities.

Town of Pinewood
According to the historical data, Pinewood is at a minimum level of risk, so its assets are not particularly threatened.

Town of Mayesville
According to the historical data, Mayesville is at a minimum level of risk, so its assets are not particularly threatened.

I. Drought
Description:
A simple definition of a drought is a period of prolonged dryness. However, a drought can have a wide range of impact that can affect a population in regards to the resulting water shortage that affects some activity, group, or environmental sector. Drought should be considered relative to some long-term average condition of balance between precipitation and evapotranspiration (i.e., evaporation + transpiration) in a particular area, a condition often perceived as "normal". It is also related to the timing (i.e., principal season of occurrence, delays in the start of the rainy season, occurrence of rains in relation to principal crop growth stages) and the effectiveness (i.e., rainfall intensity, number of rainfall events) of the rains. Other climatic factors such as high temperature, high wind, and low relative humidity are often associated with it in many regions of the world and can significantly aggravate its severity.

To better understand droughts, it can be useful to sub-classify them into the following groups:

- **Agricultural Drought**, defined by soil moisture deficiencies
- **Hydrological Drought**, defined by declining surface and groundwater supplies
- **Meteorological Drought**, defined by a lack of precipitation
- **Hydrological Drought & Land Use**, defined by a meteorological drought in one area that has hydrological drought impact in another area

- **Socioeconomic Drought**, defined as drought that impacts supply and demand of some economic activity

Source: The National Drought Mitigation Center

Meteorological Drought

Meteorological drought is defined usually on the basis of the degree of dryness (in comparison to some "normal" or average amount) and the duration of the dry period. Definitions of meteorological drought must be considered as region specific since the atmospheric conditions that result in deficiencies of precipitation are highly variable from region to region. For example, some definitions of meteorological drought identify periods of drought on the basis of the number of days with precipitation less than some specified threshold. This measure is only appropriate for regions characterized by a year-round precipitation regime such as a tropical rainforest, humid subtropical climate, or humid mid-latitude climate.

Agricultural Drought

Agricultural drought links various characteristics of meteorological (or hydrological) drought to agricultural impacts, focusing on precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, reduced ground water or reservoir levels, and so forth. Plant water demand depends on prevailing weather conditions, biological characteristics of the specific plant, its stage of growth, and the physical and biological properties of the soil. A good definition of agricultural drought should be able to account for the variable susceptibility of crops during different stages of crop development, from emergence to maturity. Deficient topsoil moisture at planting may hinder germination, leading to low plant populations per hectare and a reduction of final yield. However, if topsoil moisture is sufficient for early growth requirements, deficiencies in subsoil moisture at this early stage may not affect final yield if subsoil moisture is replenished as the growing season progresses or if rainfall meets plant water needs.

Hydrological Drought

Hydrological drought is associated with the effects of periods of precipitation (including snowfall) shortfalls on surface or subsurface water supply (i.e., streamflow, reservoir and lake levels, ground water). The frequency and severity of hydrological drought is often defined on a watershed or river basin scale. Although all droughts originate with a deficiency of precipitation, hydrologists are more concerned with how this deficiency plays out through the hydrologic system. Hydrological droughts are usually out of phase with or lag the occurrence of meteorological and agricultural droughts. It takes longer for precipitation deficiencies to show up in components of the hydrological system such as soil moisture, streamflow, and ground water and reservoir levels. As a result, these impacts are out of phase with impacts in other economic sectors. For example, a precipitation deficiency may result in a rapid depletion of soil moisture that is almost immediately discernible to agriculturalists, but the impact of this deficiency on reservoir levels may not affect hydroelectric power production or recreational uses for many months. Also, water in hydrologic storage systems (e.g., reservoirs, rivers) is often used for multiple and competing purposes (e.g., flood control, irrigation, recreation, navigation, hydropower, wildlife habitat), further complicating the sequence and quantification of impacts. Competition for water in these storage systems escalates during drought and conflicts between water users increase significantly.

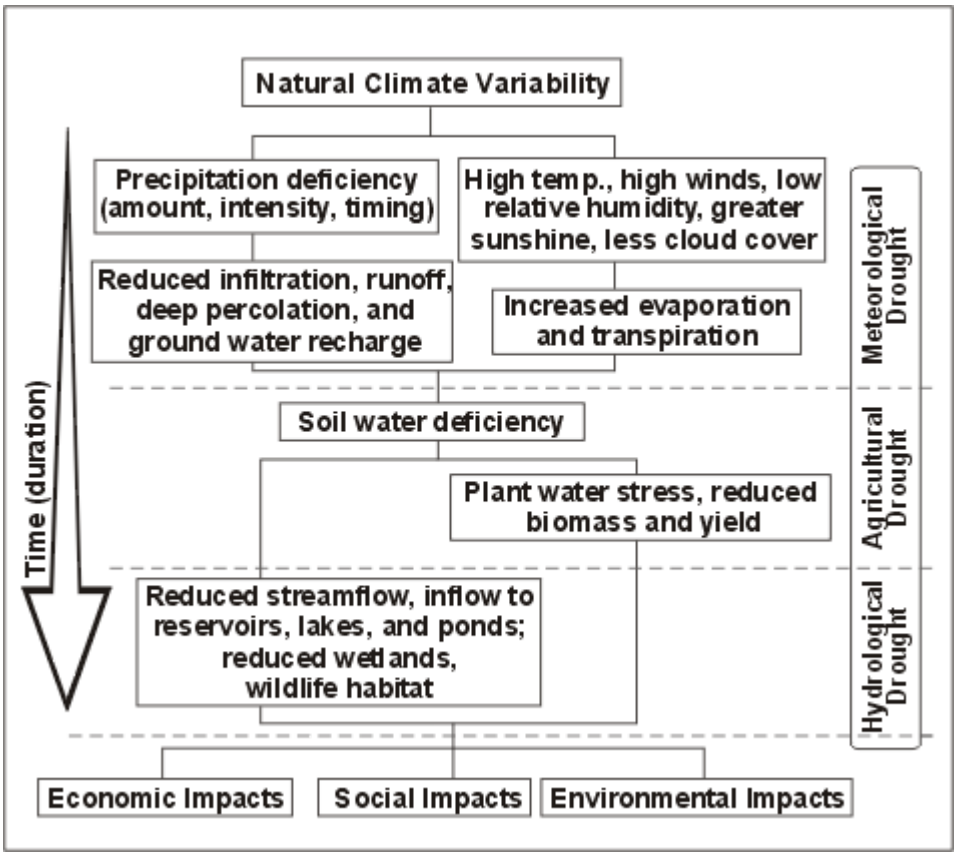
Hydrological Drought and Land Use

Although climate is a primary contributor to hydrological drought, other factors such as changes in land use (e.g., deforestation), land degradation, and the construction of dams all affect the hydrological characteristics of the basin. Because regions are interconnected by hydrologic systems, the impact of meteorological drought may extend well beyond the borders of the precipitation-deficient area. Land use change is one of the ways human actions alter the frequency of water shortage even when no change in the frequency of meteorological drought has been observed.

Socioeconomic Drought

Socioeconomic definitions of drought associate the supply and demand of some economic good with elements of meteorological, hydrological, and agricultural drought. It differs from the aforementioned types of drought because its occurrence depends on the time and space processes of supply and demand to identify or classify droughts. The supply of many economic goods, such as water, forage, food grains, fish, and hydroelectric power, depends on weather. Because of the natural variability of climate, water supply is ample in some years but unable to meet human and environmental needs in other years. Socioeconomic drought occurs when the demand for an economic good exceeds supply as a result of a weather-related shortfall in water supply.

Figure A-4 shows how climatic factors interact with one another and contribute to drought conditions, which can impact social, environmental, and social conditions.



Source: The National Drought Mitigation Center

The most commonly used indicator of drought and drought severity is the **Palmer Drought Severity Index (PDSI)**, which is published jointly by the National Oceanic and Atmospheric Administration (NOAA) and the US Department of Agriculture (USDA). The PDSI measures the difference between water supply (in terms of precipitation and stored soil moisture) and demand (the amount of water required to recharge soil and keep rivers, lakes, and reservoirs at normal levels). The result is a scale from +4 to -4, at 1.0 and 0.5 intervals. See **Table A-23** for a detailed description of the PDSI.

Table A-23
Palmer Drought Severity Index (PDSI)

Scale	Description
Above 4.0	extremely wet
3.0 to 3.99	very wet
2.0 to 2.99	moderately wet
1.0 to 1.99	slightly wet
0.5 to 0.99	incipient wet spell
0.49 to -0.49	near normal conditions
-0.5 to -0.99	incipient dry spell
-1.0 to -1.99	mild drought
-2.0 to -2.99	moderate drought
-3.0 to -3.99	severe drought
-4.0 or less	extreme drought

Keetch-Byram Drought Index (KBDI). A soil/duff drought index that ranges from 0 (no drought) to 800 (extreme drought) and is based on 8 inches of available moisture in the upper soil layers that can be used by vegetation for evapotranspiration. The index indicates deficit inches of available water in the soil. A KBDI reading of 450 means there is a deficit of 4.5 inches of ground water available to the vegetation. Factors in the index are maximum daily temperature, daily precipitation, antecedent precipitation, and annual precipitation.

TABLE A-24
Keetch-Byrum Drought Index (KBDI)

Index	Description
0-150	The fuels and ground are quite moist. Drying is generally limited to the fine surface fuels and the organic layers retain sufficient moisture to resist burning. Most of the heavy fuels (100 and 1000 hour) are to wet to ignite. Typical of spring dormant season following winter precipitation.
150-300	Scattered parches of surface litter remain in damp areas following a fire, and the organic layer remains basically undisturbed. Both pine and hardwood stumps may ignite, but seldom burn below ground. Snags a major threat for potential fire escape. Spotting usually minimal. Large acreages (500+) ignited can create intense conditions. Fire behavior is predictable. Typical of late spring, early growing season.

300-500	Fire consumes most surface litter along with a significant loss in organic soil material. Site preparation burns expose mineral soil, producing areas causing erosion problems. 100 and 1000 hour fuels contribute to fire intensity. Stumps and snags ignite. Spotting occurs. Escaped fire is difficult to control. Fire behavior is still predictable. Increased mop-up and petrol activities are required. This is typical in the late spring, early growing season at a K/B level below 400 KBDI. Above 400 KBDI, typical of late summer, early fall.
500-700	All surface litter and most of the organic layer are consumed by fire leaving excessive site damage. 1000 hour fuels contribute readily to fire intensity. Spotting is difficult to control. Above 600 KBDI, fire suppression is a major problem. Expect fire escape the nest day. Summer site preparations should be canceled when the KBDI surpasses 550. Near 700, understory vegetation wilts and is consumed by fire. Fire behavior is predictable, but often unpredicted. Extensive mop-up to fire suppression. The levels above 600 are associated with severe drought
700 Plus	Expect the same as the previous levels, only worse! Extreme fire behavior. Delay burning until the K/B index falls below 500

Source: South Carolina Drought Response Unit of the Department of Natural Resources

Historical Occurrences:

The state has high inter-annual and seasonal variability's of precipitation. The main cause of this is the strength and geographic placement of the Bermuda High Pressure System. As the high pressure continues its grip over the area, solar radiation increases, which in turn increases the temperature, which then decreases the cloud cover, thereby reducing the probability of substantial precipitation.

Droughts are sometimes alleviated by a tropical cyclone. During 1954 Hurricane Hazel ended an extreme drought in eastern South Carolina, although drought conditions continued in western sections. In 1990, the remnants of Hurricane Klaus and Tropical Storm Marco ended an extreme drought.

Precipitation occurs during periods of drought, however, it is highly localized, inconsequential, and generally evaporates within 24-hours after falling. Periods of insufficient rainfall for crop growth occur during some summers. There is approximately a one in four probability of a drought somewhere in South Carolina at any time (Guttman and Plantico, 1987). Field crops such as corn, cotton, and soybeans are greatly stressed when drought conditions extend over several weeks during the growing season because only 9% of all farms in the state have irrigated acres, as compared to 26% nationwide. However, the state has a similar proportion of irrigated acres when compared to Alabama, North Carolina, and Virginia. Only Florida and Georgia have higher percentages of irrigated land in the Southeast United States (U.S. Department of Commerce, 1993).

Severe Droughts have been documented at intervals of roughly every thirty years, with some exceptions, since the early 19th Century. Documented severe droughts have occurred statewide in 1818, 1845, 1890, 1925, 1933, 1954, 1977, 1983, 1986, 1988, 1990, and 1993. According to the University of South Carolina Hazards Research Lab, Sumter experienced two significant droughts for a combined 62 days from 1950 to 2008. **Map 11** shows how many droughts occurred in South Carolina Counties during this fifty-eight year period. Located in the central part of the state, which experienced the fewest number of droughts, Sumter did not endure the same amount of droughts experienced by the Upstate and Low Country areas of South Carolina.

Table A-25
Hazard Probability

	Events	Years	Recurrence Interval	% Chance/Year
Drought	1	59	59	1.69

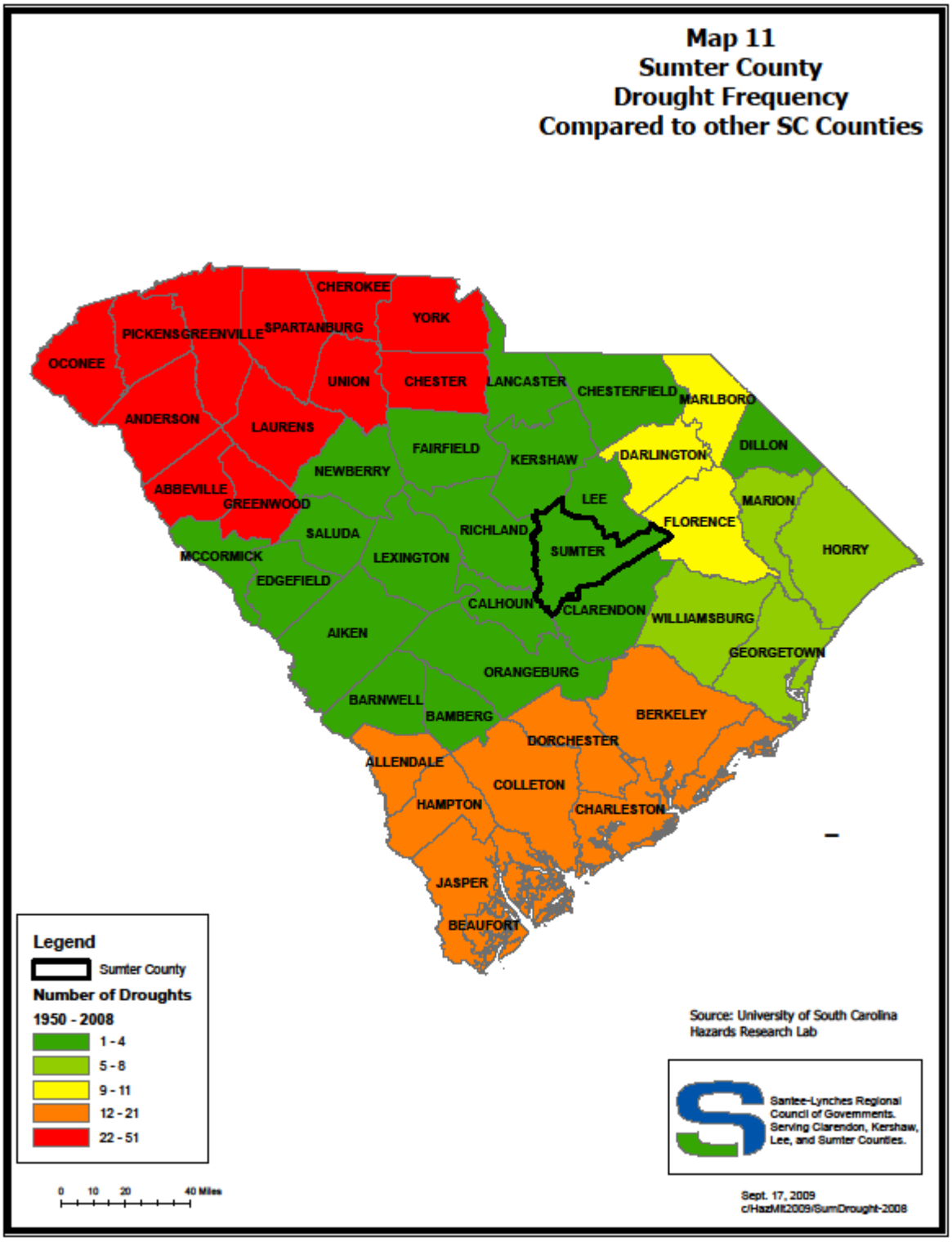
Drought Occurrences in Sumter County since 2002
There was one drought events reported between January 1, 2002 and May 31, 2009.

Multi-jurisdictional Occurrences:
Sumter County
Drought, by its definition, primarily affects agriculture, and, if severe enough, water supplies. As such, the County's critical facilities are not at risk due to drought.

City of Sumter
Drought, by its definition, primarily affects agriculture, and, if severe enough, water supplies. As such, the City's critical facilities are not at risk due to drought.

Town of Pinewood
Drought, by its definition, primarily affects agriculture, and, if severe enough, water supplies. As such, the Town's critical facilities are not at risk due to drought.

Town of Mayesville
Drought, by its definition, primarily affects agriculture, and, if severe enough, water supplies. As such, the Town's critical facilities are not at risk due to drought.


Map 11
Sumter County
Drought Frequency
Compared to other SC Counties
CHEROKEE
YORK
PICKENS
GREENVILLE
SPARTANBURG
OCONEE
UNION
CHESTER
LANCASTER
CHESTERFIELD
MARLBORO
ANDERSON
LAURENS
FAIRFIELD
DARLINGTON
DILLON
NEWBERRY
KERSHAW
ABBEVILLE
GREENWOOD
LEE
MARION
FLORENCE
SALUDA
RICHLAND
HORRY
MCCORMICK
LEXINGTON
SUMTER
EDGEFIELD
CALHOUN
CLARENDON
WILLIAMSBURG
AIKEN
GEORGETOWN
ORANGEBURG
BARNWELL
BAMBERG
BERKELEY
DORCHESTER
ALLENDALE
COLLETON
HAMPTON
CHARLESTON
JASPER
BEAUFORT
Legend
Sumter County
Number of Droughts
1950 - 2008
1 - 4
5 - 8
9 - 11
12 - 21
22 - 51
0 10 20 40 Miles
Source: University of South Carolina
Hazards Research Lab
Santee-Lynches Regional
Council of Governments.
Serving Clarendon, Kershaw,
Lee, and Sumter Counties.
Sept. 17, 2009
c/HazMit2009/SumDrought-2008

2. HAZARD PROFILE RISK INDEX

A. Social Vulnerability Index

In order to determine the **Social Vulnerability** of Sumter County, the University of South Carolina Hazards Research Lab included the following statistics from the 2000 Census on the Block Group Level:

- **Under 18 Population**
- **Over 65 Population**
- **Female Population**
- **Nonwhite Population**
- **Total Population**
- **Number of Houses**
- **Number Rental Units**
- **Number of Mobile Homes**

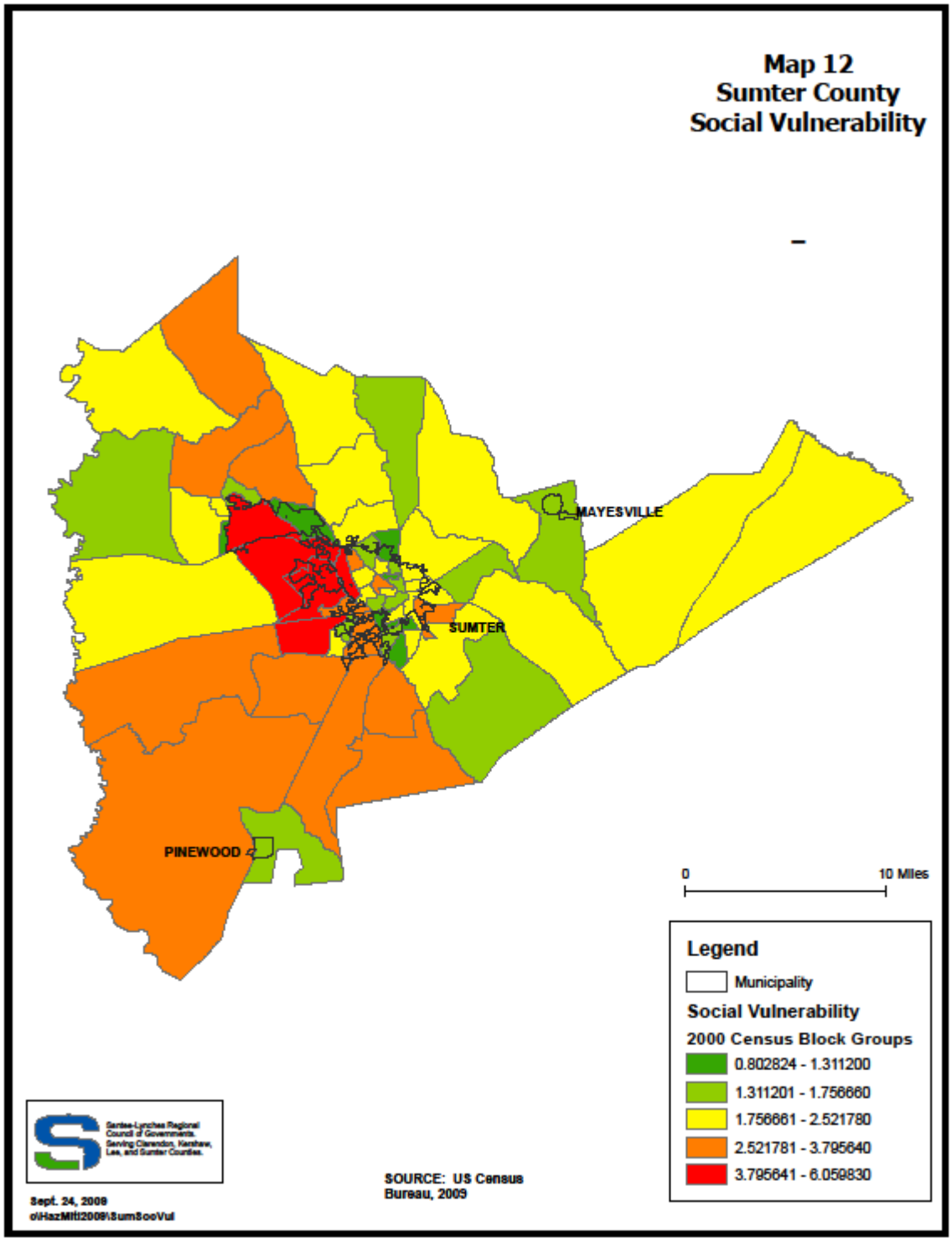
Once these statistics were determined from the Census tables, ratios were calculated by dividing the demographic data found in a block group by the county total. For example, the **Under 18 Population** for a block group would be divided by the total **Under 18 Population** for the County. Once the ratios were determined for these categories for each block group, the University stipulated that a **Vulnerability Score** should be calculated to determine how the vulnerable populations compare at the block group level. This was done by dividing the ratio for a block group by the highest ratio in the county. From this calculation, a vulnerability score was determined for each population segment for each block group. In addition to the demographic data collected for the ratios, the following information was also collected for vulnerability score:

- **Value_Dif (the difference between the mean house value for the block group and the average mean house value for the county)**
- **Value_Abs (the absolute difference in the between the value_dif for the block group and maximum value_dif for the entire county)**
- **Value Vulnerability (the standardized vulnerability score based on house value)**

Once these **Vulnerability Scores** were determined, they were added together and the sum of these numbers were placed in a database field titled, **Social Vulnerability.** By adding these various factors, the block groups most vulnerable to hazards due to population density, at risk groups, and property values, could be displayed on a map.

Map 12 shows the **Social Vulnerability** score on a thematically shaded map of 2000 Census Block Groups within Sumter County. The legend on the right indicates the range of the scores for the county.

The map shows, the most vulnerable area in the County is in and around the City of Sumter, which is the primary population center in Sumter County. The score for these Block Groups reflect that these areas have considerable population density and at –risk populations. By contrast, the Town of Mayesville is at a low risk due to the low population. The same holds true for the Town of Pinewood, which is also at a low risk for social vulnerability.


Map 12
Sumter County
Social Vulnerability
MAYESVILLE
SUMTER
PINEWOOD
0
10 Miles
Legend
Municipality
Social Vulnerability
2000 Census Block Groups
0.802824 - 1.311200
1.311201 - 1.756660
1.756661 - 2.521780
2.521781 - 3.795640
3.795641 - 6.059830
Santee-Lynches Regional Council of Governments. Serving Clarendon, Kershaw, Lee, and Sumter Counties.
SOURCE: US Census Bureau, 2009
Sept. 24, 2009
o\HazMit\2009\SumSocVul

B. Natural Hazards Index

The procedures defined by the University of South Carolina Hazards Research Lab for conducting a risk assessment involved compiling data for the natural hazards listed in Section 1 of this Appendix. Certain data sets were only available at the county level, meaning that individual occurrences of these hazards were not referenced. These events included: Winter Storms, Wildfires, Severe Winds, Lightning, and Hail.

Once the hazards were identified, a **Frequency Ratio** was calculated using the following formula:

Frequency = # of events / # of years in record

These **Frequency Ratios** were added together to form a base number on which an overall hazard scoring system could be based. Since this information was not available below the county level, the hazard score was uniform throughout the county for these factors. However, the risk assessment did include data sets that would facilitate various portions of the county to differentiate from one another according to the historical instances of the following hazards: Flood Prone Areas, Hurricanes, Tornadoes, and Earthquakes.

Flood Prone Areas

Map 2 displays the Flood Prone Areas in the County. In the case of Sumter County, this data was taken from Q3 data provided by the University of South Carolina. In the overall hazard scoring, the areas most likely to flood were weighted equally to the maximum (grid) value of earthquakes and tornadoes. This number was chosen in order for those areas affected by flood to:

- Become visually distinct from the base county-wide frequency ratio
- Not be submerged by scores obtained by the procedures stipulated by the University of South Carolina Hazards Research Lab concerning Hurricanes, Tornadoes, and Earthquakes

Hurricanes

The University of South Carolina Hazards Research Lab provided Hurricane track data that geographically referenced the linear direction by which an eye of a Hurricane passed (see **Map 3)**. From this information it was stipulated by the University that those tracks that passed within a 100 miles of the county be selected with the GIS software. Once these tracks were selected, a buffer was created that contained an attribute table that was coded according to the following values:

- Category 1 – 74 to 95 mph
- Category 2 – 96 to 110 mph
- Category 3 – 111 to 130 mph
- Category 4 – 131 to 155 mph
- Category 5 – 155 + mph
- Tropical Storms and Depressions accounted for all events with wind speeds less than 74 mph

Once these items were coded according to wind speed, a buffer distance needed to be established in order to show the area of impact for each storm. The buffer distance was determined to utilize the following values:

- Tropical Depression/Storm – 5 mile buffer on either side of the track

- Category 1 – 10 mile buffer
- Category 2 – 20 mile buffer
- Category 3 – 30 mile buffer
- Category 4 – 40 mile buffer
- Category 5 – 50 mile buffer

Once these buffers were established, they were clipped according to the county's boundaries (the area of the buffer that fell outside of the county was removed). Then, each category of hurricane (and tropical storm) was assigned a frequency ratio, using the same formula applied to the county-wide hazard data.

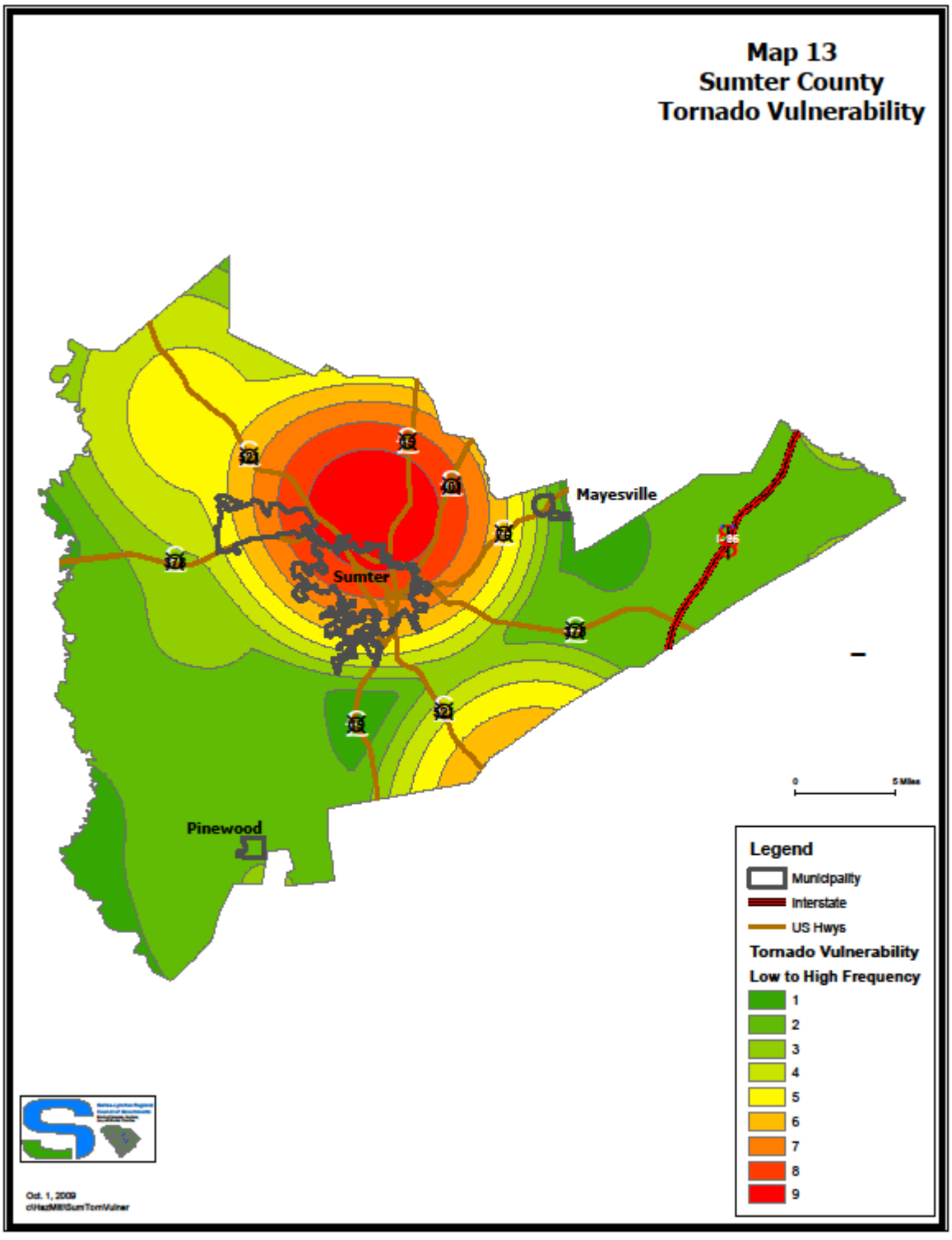
Tornadoes
The University of South Carolina Hazards Research Lab provided point locations for the tornado hazards that occurred in the state. Once these points were brought into GIS, those points that occurred in Sumter County were selected. Once these points were selected the tornado density was calculated utilizing a GIS Extension, called Spatial Analyst. Essentially, Spatial Analyst allows a user to create a grid (raster image) by the density or occurrence of points. In this example, it provides a gravity map (see **Map 13)** of tornadoes to add to the risk assessment. Once the density was established, the frequency ratio was applied to the density score of the gravity map.

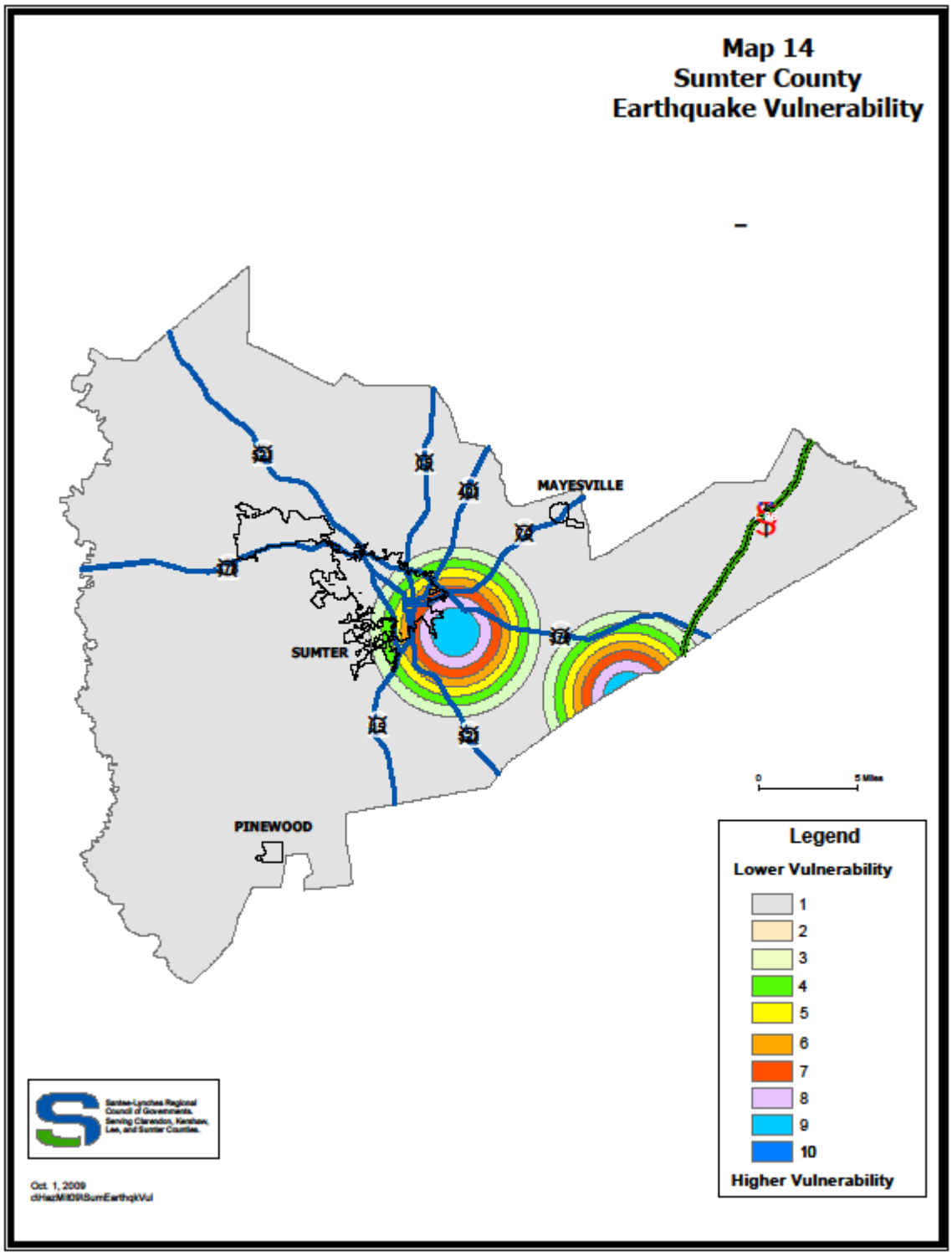
Earthquakes
The procedure for earthquakes was identical to the methodology the University stipulated for tornadoes; and, as a result, a similar frequency ratio was produced. **Map 14** displays the Earthquake density that was used to help calculate the overall risk assessment.

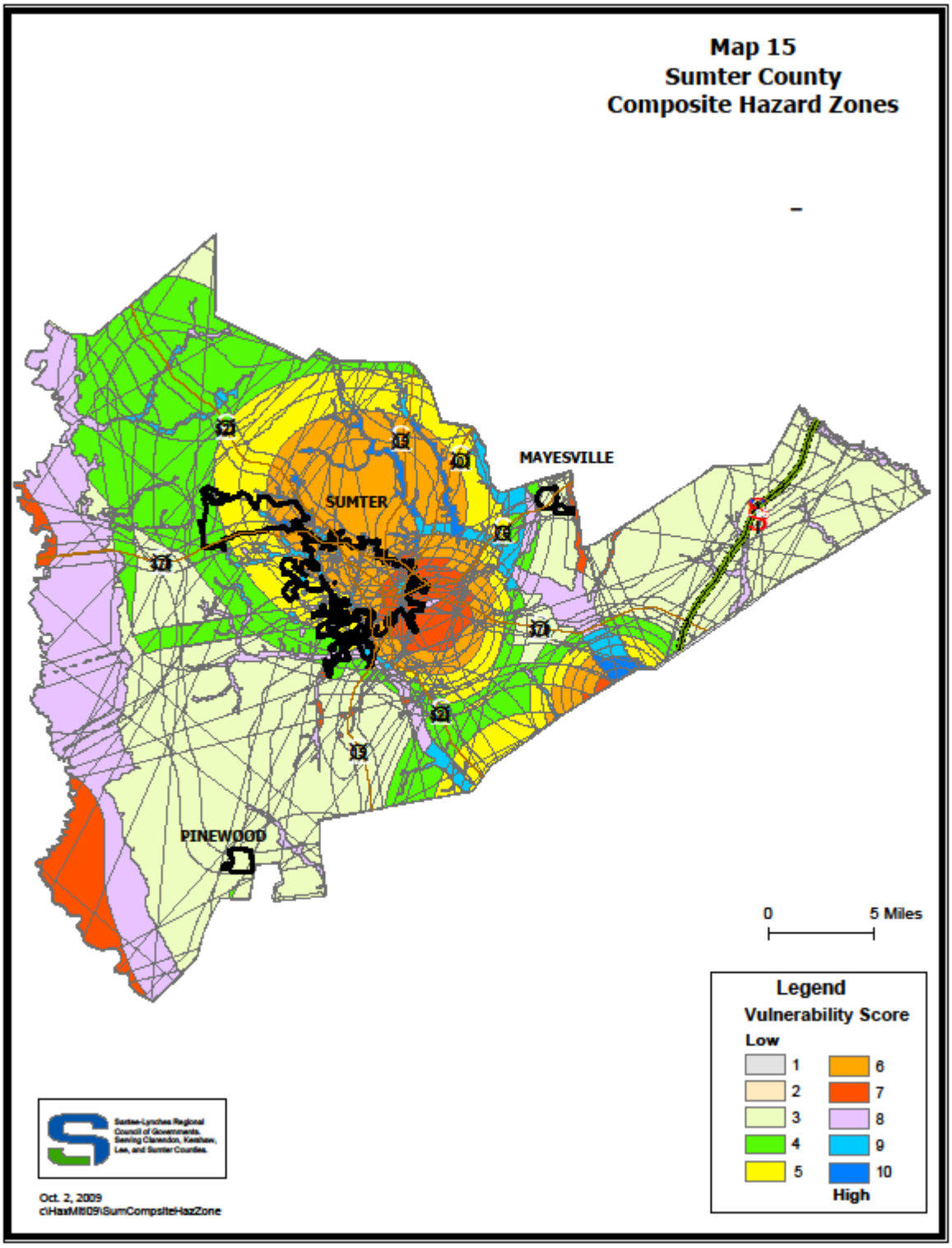
Hazards Profile Index
Once all of the hazards identified by the University of South Carolina Hazards Research Lab were gathered and their corresponding frequency ratios calculated, a **Composite Hazards Map** was created to show the geographic relation to the combined threat that these hazards presented to the County. In order to combine these layers of information in a geographic format, yet retain all of the data, a series of "unions" (this operation is performed on two layers at a time) were performed on each layer representing a natural hazard. For the sake of definition, a union combines two GIS layers together into one feature, and the data contained in each layer (attributes) are retained in a combined database (attribute table). The most important aspect of this combining process is that as two polygon features are brought together and intersect one another, areas of overlap *will have attributes of both features*. This is the key concept to this methodology, because as the frequency ratios are added, the sum total will yield an overall composite frequency score.

Map 16 is the sum result of this process for Sumter County. As the map shows, the overall risk is a combination of the geographically specific hazards, and the map should be seen as a comparison between the different areas within the County. In the case of Sumter County, the areas at the most risk due to historical occurrences of natural hazards are the following:

- The most vulnerable area of the County is the area in and around the City of Sumter, which ranges from moderate to high risk for hazard vulnerability. As the pattern on the map demonstrates, this can be attributed to tornado activity,


Map 13
Sumter County
Tornado Vulnerability
Mayesville
Sumter
Pinewood
0
5 Miles
Legend
Municipality
Interstate
US Hwys
Tornado Vulnerability
Low to High Frequency
1
2
3
4
5
6
7
8
9
Oct. 1, 2009


Map 14
Sumter County
Earthquake Vulnerability
MAYESVILLE
SUMTER
PINEWOOD
0
5 Miles
Legend
Lower Vulnerability
1
2
3
4
5
6
7
8
9
10
Higher Vulnerability
Santee-Lynches Regional Council of Governments, Serving Clarendon, Kershaw, Lee, and Sumter Counties.
Oct. 1, 2009


Map 15
Sumter County
Composite Hazard Zones
MAYESVILLE
SUMTER
PINEWOOD
0
5 Miles
Legend
Vulnerability Score
Low
1
2
3
4
5
6
7
8
9
10
High
Oct. 2, 2009
c\HazMit09\SumCompsiteHazZone

hurricanes, and, to a degree, the limited earthquake frequency.

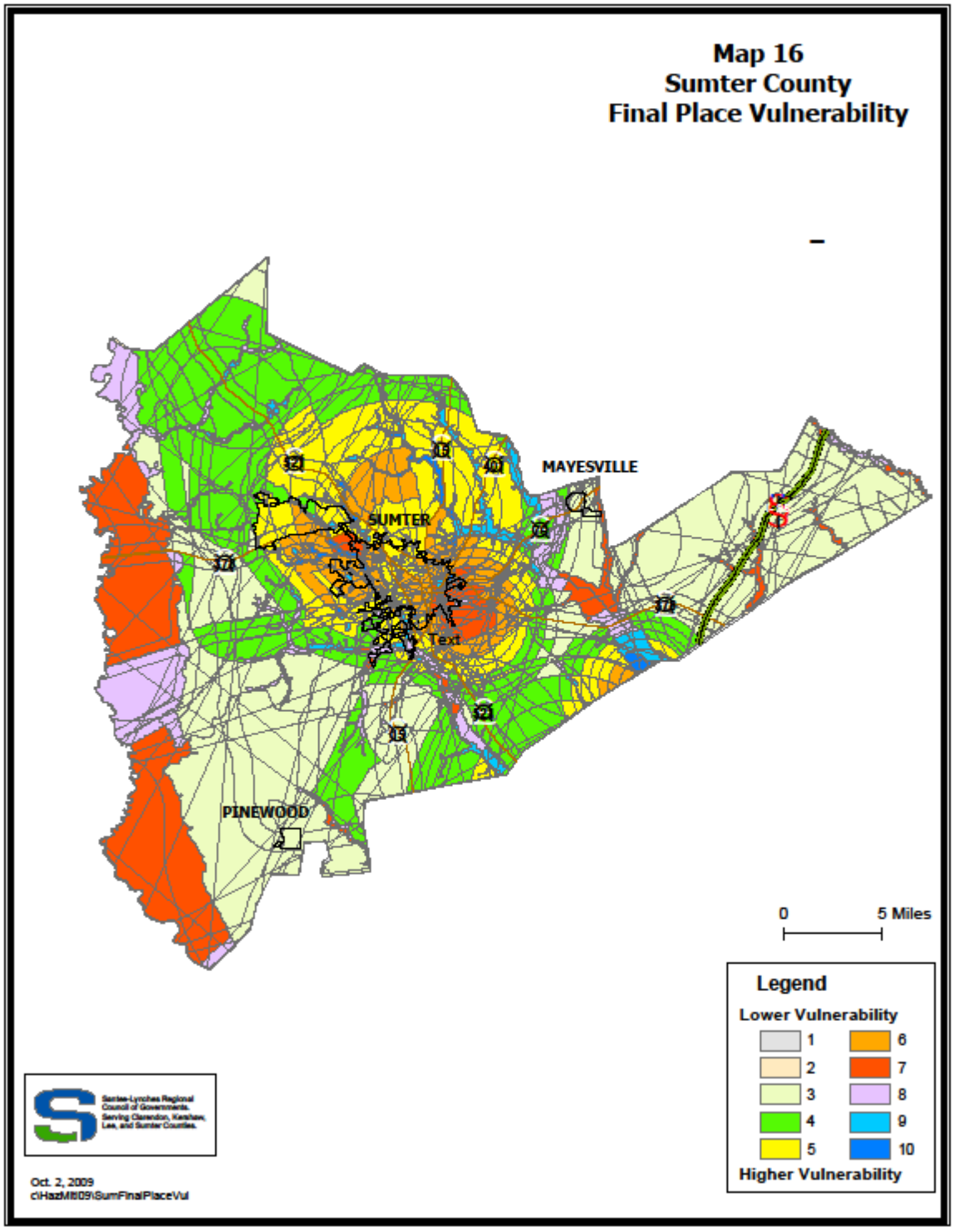
- The Town of Mayesville, however, is at a significant lesser degree of risk being located outside the high frequency radius for tornadoes and past hurricane tracts. Nevertheless, it is still at risk from flooding due to the Black River, which is just west of the Town.
- The Town of Pinewood is at a relatively low level of risk.
- After the City of Sumter, the area at greatest risk is the southeastern part of the County, located just southwest of where I-95 is bisected by US 378. This is due to flood prone areas around the Black River and past tornado frequency.

3. CONCLUSIONS ON HAZARD RISK

The final step in the University of South Carolina's procedures for risk assessment involved using the same GIS "union" procedure when combining the various hazards in order to obtain an overall composite frequency score (the sum of the frequency scores for all of the hazards listed in this Appendix). In this case, the GIS products created from the descriptions of the **Social Vulnerability Index** (section 2-A) and the **Natural Hazards Index** (section 2-B) are combined to form a **Combined Hazard Risk Assessment.**

Map 16 illustrates this union between social vulnerability and areas historically affected by hazards. In essence, this map merges this information, so that areas with both vulnerable populations and high incidences of natural hazards. In the case of Sumter, the social data impacts the final map in the following ways:

- When combining social vulnerability scores to the composite hazard index reflects the demographic composition in and around the City of Sumter, which is where the greatest changes occurred. For instance, the northwestern portion of the City experienced a significant shift in its level of risk primarily because of the higher housing values. By contrast, the area just west of this along the US 378 Corridor (known as the Cherryvale Community) also experienced an upward shift in vulnerability, but this is due to the presence of mobile homes and a larger number of at-risk population groups, such as nonwhite persons and those over the age of 65. Like the Cherryvale Community, the southeastern region of the City was also more vulnerable for these same factors.
- Because of its relatively low population, the Town of Mayesville and its surrounding area did not change due the social composition.
- The Town of Pinewood did not change in terms of risk vulnerability.


Map 16
Sumter County
Final Place Vulnerability
MAYESVILLE
SUMTER
Text
PINEWOOD
0
5 Miles
Legend
Lower Vulnerability
1
2
3
4
5
6
7
8
9
10
Higher Vulnerability
Oct. 2, 2009
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SECTION 8-2
CRITICAL FACILITY VULNERABILITY

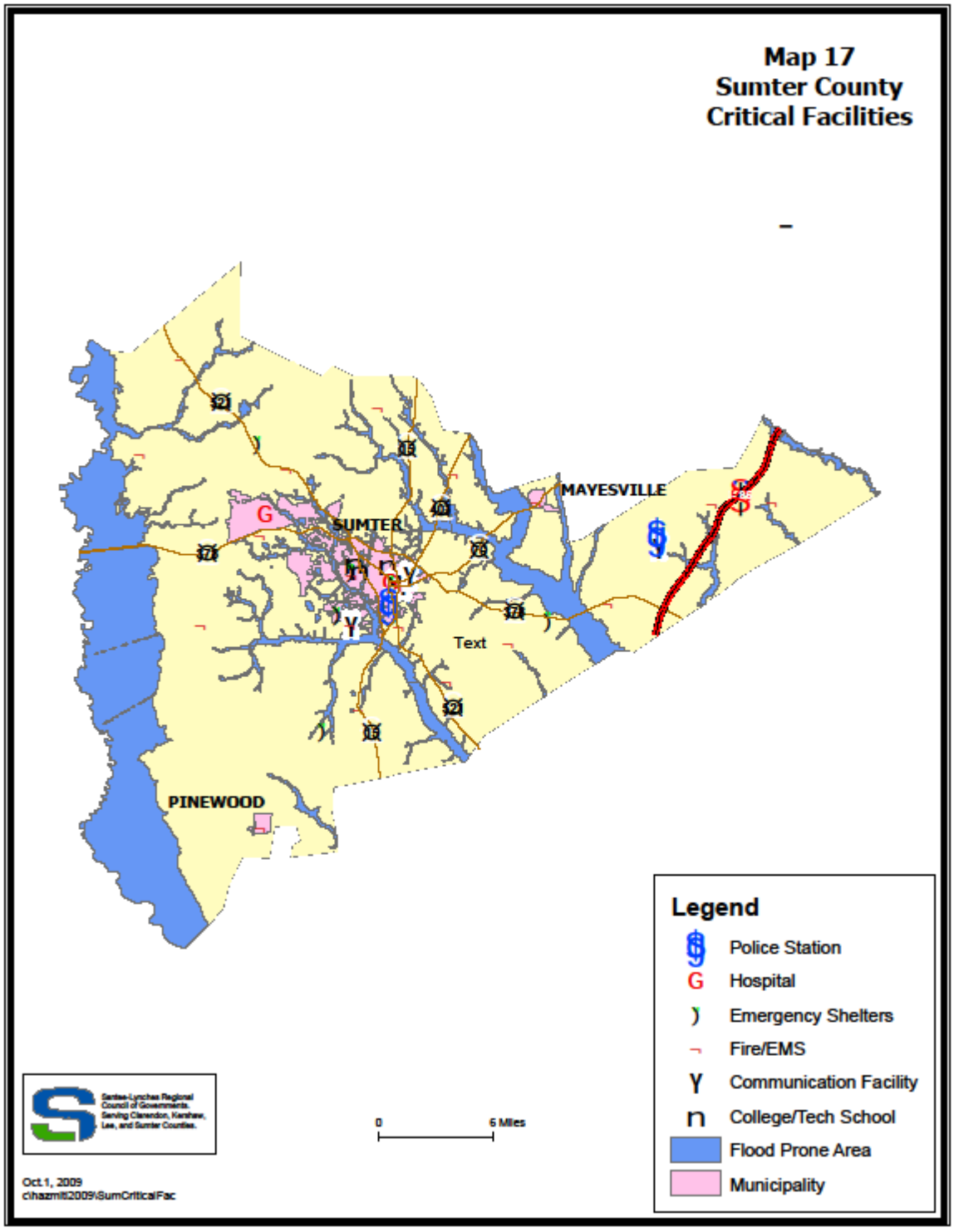
This part of the Natural Hazard Mitigation Plan addresses the assets within the County and the critical facilities located within their boundaries. The University of South Carolina Hazards Lab compiled the initial critical facilities data with the criteria that these critical facilities are vital to the safety and well fare of the community. Thus, they are seen as essential for community survivability, along with the continuation of government and must remain operational or return to operation within 72 hours following a disaster. Also included were facilities that served at-risk or special needs populations, which would need to be addressed in the event of a disaster. The critical facilities include the following:

- Police Stations
- Hospitals/Medical Clinics
- Emergency Shelters
- Fire Stations
- Dams
- Communication Facilities
- Schools
- Residential Care Facilities
- Daycare Centers
- Transportation Infrastructure
- Electric, Water, and Wastewater Utilities

Once SLRCOG received the critical facility data from the University it was reviewed by SLRCOG staff to ensure accuracy, and SLRCOG added data from their own GIS database in order for the information to be complete. Furthermore, the information was presented in a public meeting for general input and comments. A complete list of these critical facilities is included with this section of the plan.

Along with critical facilities list, a series of maps were created to display the geographic location of these facilities within the County. These maps are included at the end of this section.

- Map #17 (Critical Facilities) shows the geographic location of those structures whose proper function are considered to be essential.
- Map #18 (Special Needs Population) maps out the various structures that serve at-risk population and need special consideration in terms of emergency response.
- Map #19 (Critical Infrastructure: Transportation Systems) includes County assets essential for evacuation and community access to critical facilities.
- Map #20 (Critical Infrastructure: Electric Power Utilities) shows the County's electric power distribution system.
- Map #21 (Critical Infrastructure: Water Utilities) provides locations for the County's water lines and water storage facilities.
- Map #22 (Critical Infrastructure: Wastewater Utilities) provides locations for the County's sewer lines, and wastewater treatment plants.


Map 17
Sumter County
Critical Facilities
SUMTER
MAYESVILLE
PINEWOOD
Text
Legend
Police Station
Hospital
Emergency Shelters
Fire/EMS
Communication Facility
College/Tech School
Flood Prone Area
Municipality
0
6 Miles
Oct 1, 2009
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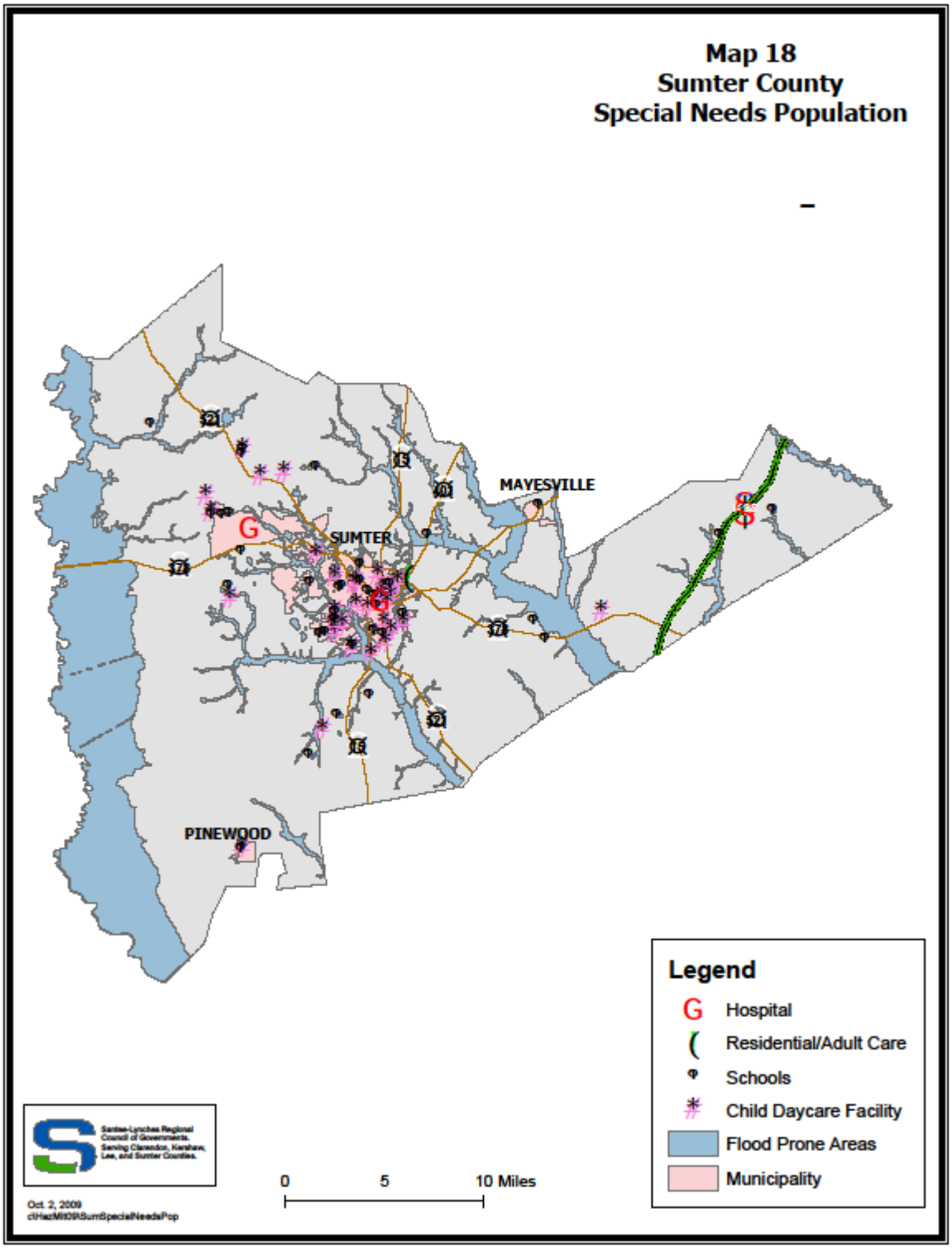
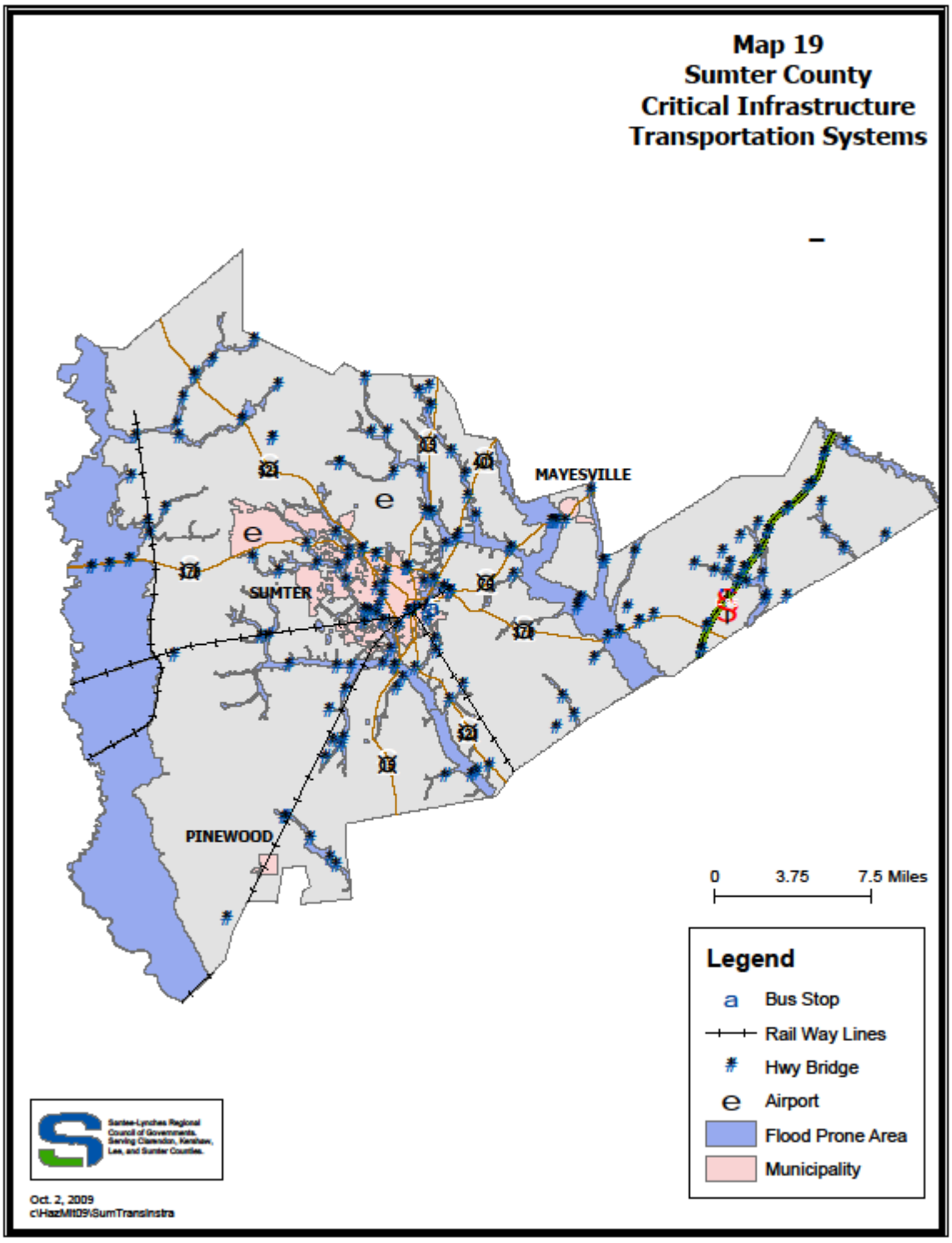

Map 18
Sumter County
Special Needs Population
SUMTER
MAYESVILLE
PINEWOOD
Legend
Hospital
Residential/Adult Care
Schools
Child Daycare Facility
Flood Prone Areas
Municipality
0
5
10 Miles
Oct. 2, 2009


Map 19
Sumter County
Critical Infrastructure
Transportation Systems
MAYESVILLE
SUMTER
PINEWOOD
0 3.75 7.5 Miles
Legend
Bus Stop
Rail Way Lines
Hwy Bridge
Airport
Flood Prone Area
Municipality
Santee-Lynches Regional Council of Governments, Serving Clarendon, Kershaw, Lee, and Sumter Counties.
Oct. 2, 2009
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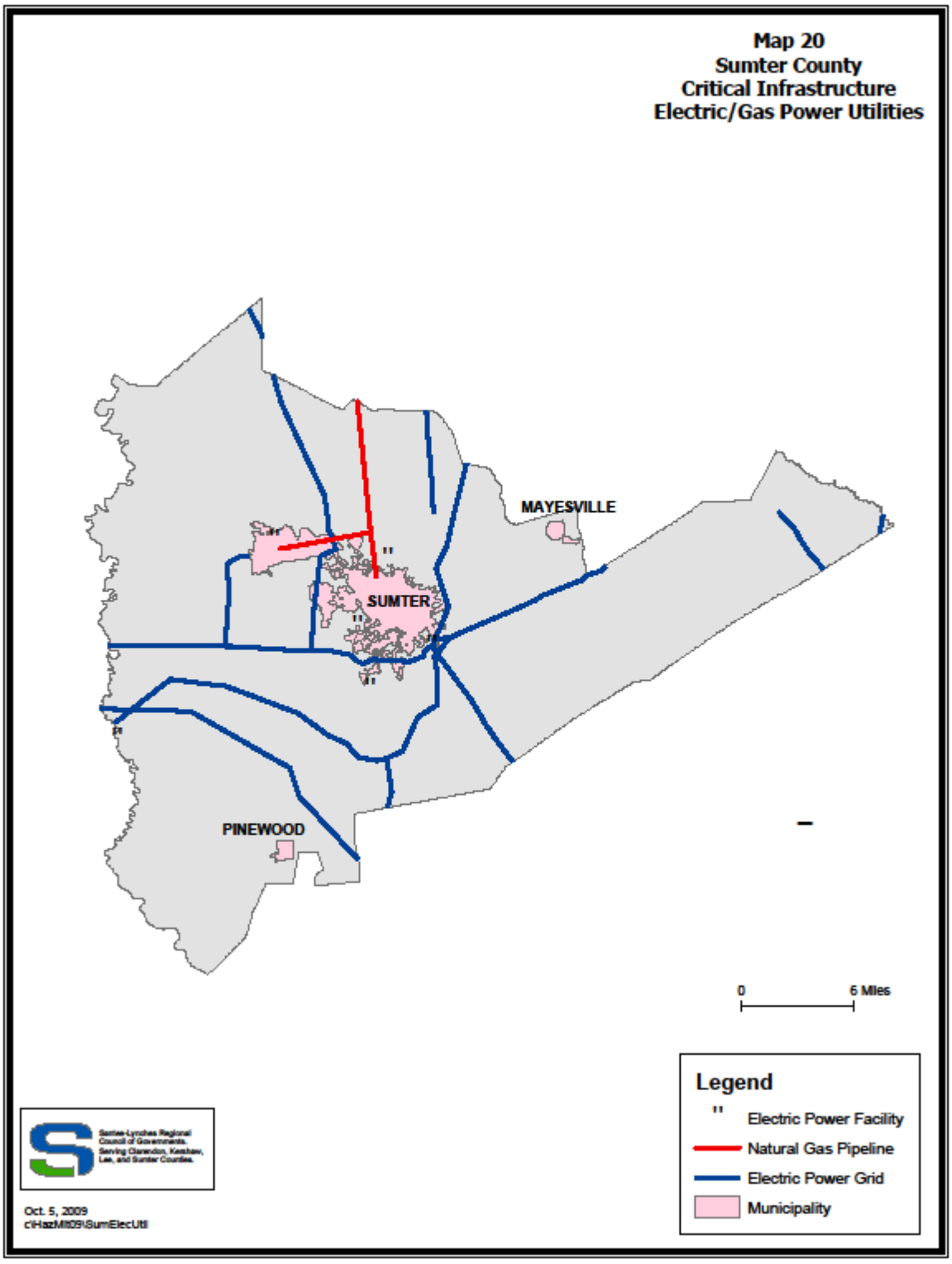
Map 20
Sumter County
Critical Infrastructure
Electric/Gas Power Utilities
MAYESVILLE
SUMTER
PINEWOOD
0
6 Miles
Legend
Electric Power Facility
Natural Gas Pipeline
Electric Power Grid
Municipality
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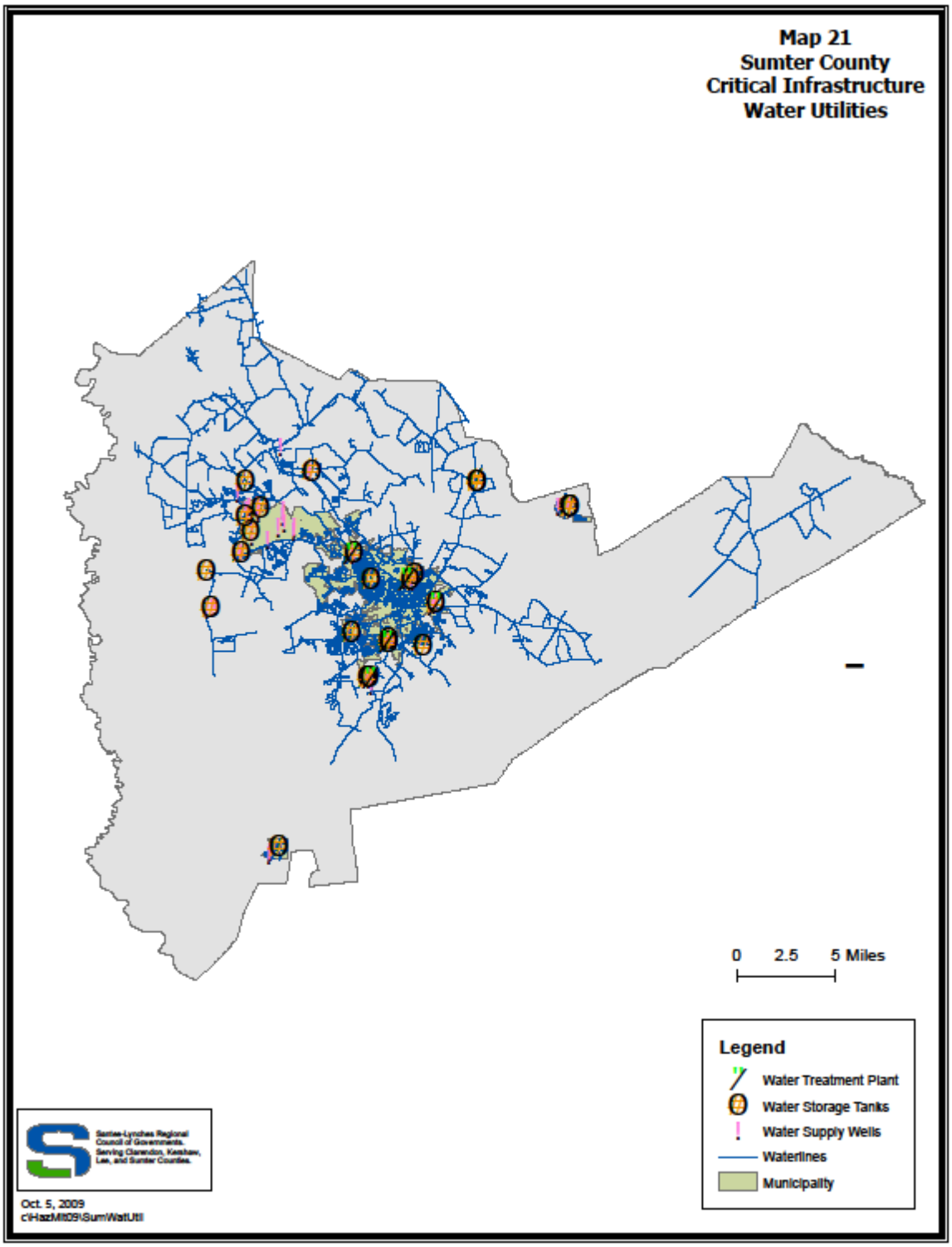
Map 21
Sumter County
Critical Infrastructure
Water Utilities
0 2.5 5 Miles
Legend
Water Treatment Plant
Water Storage Tanks
Water Supply Wells
Waterlines
Municipality
Santee-Lynches Regional Council of Governments. Serving Clarendon, Kershaw, Lee, and Sumter Counties.
Oct. 5, 2009
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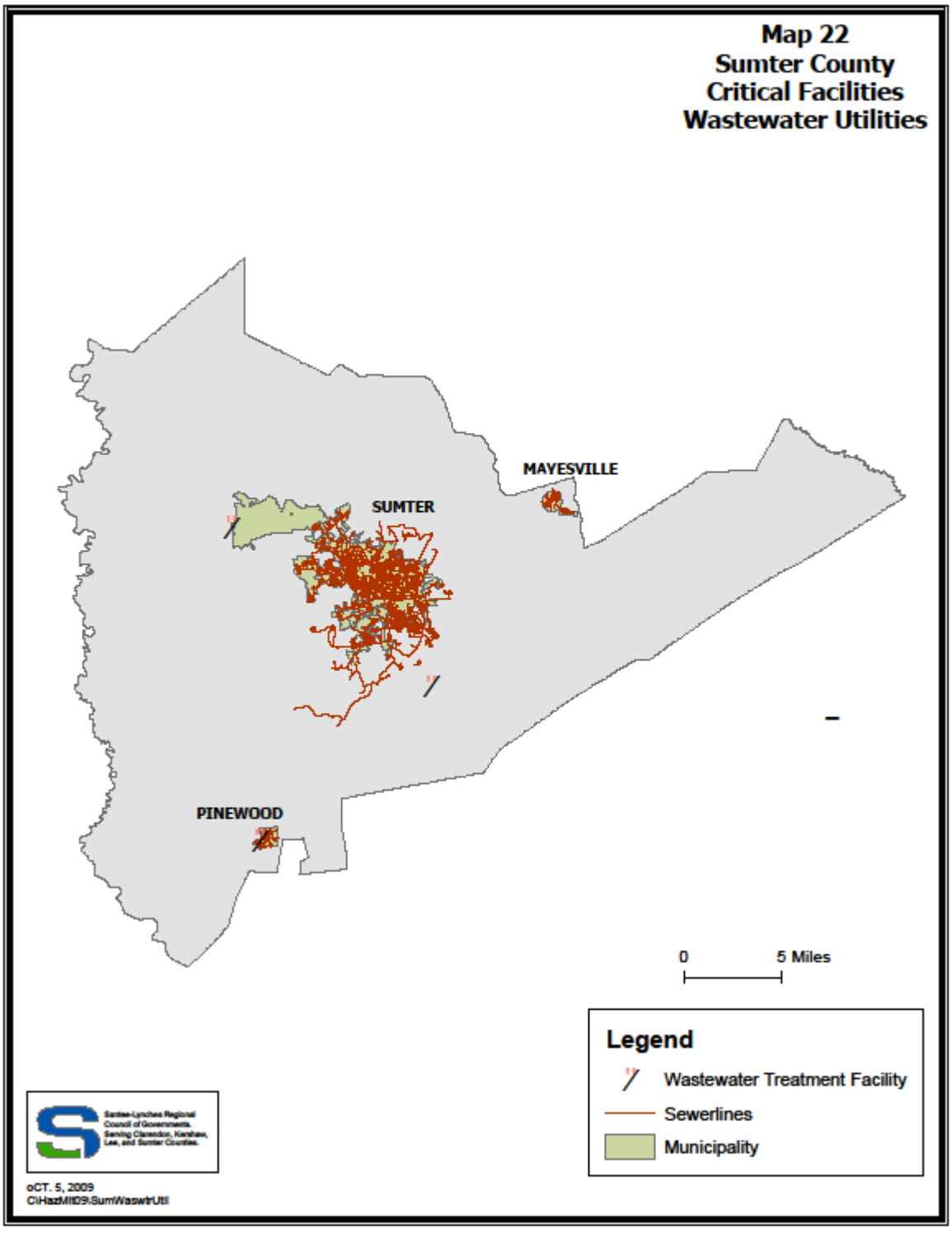
Map 22
Sumter County
Critical Facilities
Wastewater Utilities
MAYESVILLE
SUMTER
PINEWOOD
0
5 Miles
Legend
Wastewater Treatment Facility
Sewerlines
Municipality
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SECTION 8-3
MITIGATION CAPABILITY ASSESSMENT

The capability assessment describes the legal authority vested in local governments to pursue measures to mitigate the impacts of natural hazards. This capability assessment focuses on the evaluation of Sumter County's existing programs and policies to determine what vehicles are already in place to support mitigation activities. These policies and programs were identified based on a review of existing plans and ordinances for the county and each the municipalities

Sumter County

Sumter County Comprehensive Plan, Adopted December 14, 1996

Sumter County Flood Damage Prevention Ordinance, (Chapter 8 of the Code of Ordinance) September/October 2003
The purpose to this ordinance is to promote public health, safety, and general welfare of the citizens of the county and to minimize public and private property losses due to flood conditions in specific areas, pages 405-410.

Subdivision Regulations, adopted December 1999, (Chapter 17 of the Code of Ordinance)
A major portion of the County Subdivisions Regulations has been incorporated as Article 8, Design and Improvements Standards of the Sumter County Zoning and Development Standard Ordinance

This ordinance requires that no final plats be recorded until submitted to and approved by the Sumter County Planning Commission according to the procedures set forth in the ordinance.

Under Section 17.54, areas subject to flooding require that subdivisions being proposed in such areas to submit adequate plans and specifications for protection from flooding, page 907.

Sumter County Zoning and Development Standards Ordinance adopted December 1999
Established detail requirements for allowing land uses in various zoning districts.

Stormwater Regulations
The requirements for storm drainage improvements are included under Article I*X Utility Improvements and Standards, (*Section 92 Storm Drainage Requirements, of the Sumter County Subdivision Regulations).

Storm drainage systems are required to be installed in all new subdivisions.

Sumter County Emergency Operations Plan (EOP), revised December 2003
Establish emergency operation procedures for planning, coordinating, and managing all phases of disaster relief for Sumter County.

The function and operation of the Emergency Operation Center is detailed in the Plan along with specific duties and responsibilities of County and City Department, and private and public agencies.

The EOP Plan also identifies all the potential natural hazards impacting Sumter County.

International Building Code, 2000 Edition

Chapter 16 Structural Design has specific requirements for building design and construction to minimize the impact of natural hazards (snow loads, wind loads, flood loads and earthquake loads).

Appendix G of the Building Code has specific requirements for Flood Resistant Construction.

Administrative Staff/Enforcement Staff

To assist in implementing the mitigation measures and response activities, Sumter County has a full time county administrator, sheriff, and public works director. The building official, zoning officials, and fire chief serve both the city and county. Also, the county has a joint City/County planning commission and joint city-county zoning board of appeals.

City of Sumter

City of Sumter 2020 Comprehensive Plan, adopted October 19, 1999

City of Sumter Zoning and Development Standards Ordinance, adopted December 1999

The Zoning Ordinance provides for the review of all permits for construction or renovation of structures in the town whether it is residential, commercial, or industrial. The Zoning Ordinance governs the location of these buildings and structures.

International Building Code, 2000 Edition

The City of Sumter has a full time Building Official to enforce the provisions of the International Building Codes within the city limits.

Chapter 16 Structural Design, has specific requirements for building design and construction to minimize the impact of natural hazards (snow loads, wind loads, flood loads and earthquake loads)

Land Development Regulation/Subdivision Regulations, December 1999

The Land Development Regulations or Subdivision Regulations have been incorporated as Article 8, Design and Improvements Standards in the Sumter Zoning and Development Standard Ordinance.

Stormwater Management and Sediment Control Ordinance (Article I of Code of Ordinance)

The City of Sumter adopted a Stormwater Management and Sediment Control Ordinance with the purpose to protect the city's land and waters from the effects of excessive soil erosion and sedimentation, to prevent siltation of streams and lakes, to prevent clogging of drainage channels, to reduce excessive flood damage, and to prevent damage to the property of adjacent landowners.

Flood Damage Prevention, Chapter 42 of the Code of Ordinance

This ordinance provides detail requirements to minimize pubic and private losses due to flood conditions, page CD42:3

Administrative Staff/Enforcement Staff

The City of Sumter has a full time City Manager, Public Works Director, Building Official, Zoning Official, Police Chief and Fire Chief to implement the mitigation measures and emergency response activities. The City has an active joint City-County Planning Commission and joint City-County Zoning Board of Appeals. The building official, zoning office and fire chief serves both the city and county.

Town of Mayesville

Town of Mayesville Comprehensive Plan, adopted August 1995
The plan discusses the soil characteristics and the delineated flood hazard areas in the Town of Mayesville, page 5.

Population and other growth trends of the town are discussed along with land use, employment, infrastructure, and traffic patterns.

Public safety, fire protection, public safety and emergency medical service are discussed briefly, page 10.

Under the Community Problems and Concerns Section, standing water and the lack of maintenance of drainage ditches were listed as a concern, page 13.

Under Residential Objectives, on page 35, the policy of the town is to discourage high density residential development in areas having conservation values, economic deposit is discussed, page 15.

The Long Range Land Development Plan Map encourages the continuation of the current town's development patterns – residential to remain residential with the commercial areas in the downtown area and on the main corridors to continue.

Town of Mayesville Zoning Ordinance, adopted March 1969
The Town's Zoning Ordinance provides for a process, structure, and authority to review all building permits for conformance with requirements to regulate the location and placement of building and structures.

Section 608, Flood Plains and Flood Ways, and Section 720, Flood Plain Protective Area, provides regulations of new construction and substantial improvement of residential and non-residential structures. The main requirement being that the lowest floor must be elevated to or above the flood plain level.

Mobile Homes placed in Zone A of the Flood Hazard Boundary Map are required to be anchored to resist flotation, etc.

International Building Code, 2003 Edition
The Town of Mayesville does not employ a Building Official, however, under an intergovernmental agreement, the town contracts with Sumter City-County Planning Commission for enforcement of the International Building Code within the town limits

Chapter 16 Structural Design, has specific requirements for building design and construction to minimize the impact of natural hazards (snow loads, wind loads, flood loads and earthquake loads)

Administrative and Enforcement Staff
The Town has a part-time Town Clerk/Treasurer who assists in the administration of the town's affairs, and a full-time Police Chief who is also the Town's Zoning Administrator.

Town of Pinewood

Town of Pinewood Comprehensive Plan, adopted March 1993

Under the Natural Resource Section, the Plan discusses the soil and topography conditions followed by a discussion and identification of flood hazards areas.

The town's fire protection capabilities are discussed along with the mutual aid agreement with the county for assisting in fire fighting. The town has an ISO rating of six (6), page 23.

The Plan provides a Long Range Land Development Plan to guide development within the town limits, page 46.

The Plan outlines several natural resource objectives. A main objective states that future developments should not be adversely impacted by flooding and other natural disasters, page 39.

Town of Pinewood, adopted July 1997

The Zoning Ordinance provides a mechanism for restricting the location and placement of structures.

The ordinance does not provide detailed regulations governing development within the floodplain or flood way areas.

International Building Code, 2003 Edition

The Town of Pinewood does not employ a Building Official and under an "on-as needed-basis" contract with Sumter County/City Planning Department for inspection, etc., under the International Building Code within the town limits

Chapter 16, Structural Design, has specific requirements for building design and construction to minimize the impact of natural hazards (snow loads, wind loads, flood loads and earthquake loads).

Administrative and Enforcement Staff

The Town has a full-time Town Clerk/Treasurer and a Police Chief. The Zoning Administrator is a part-time citizen.

Summary of Capability Assessment – Sumter County

The assessment of each local government's policies, programs, and ordinances in Sumter County along with their technical/administrative and fiscal abilities indicate that Mayesville and Pinewood do not have the capability to implement a comprehensive range of mitigation initiatives.

It is noted that Sumter County, and the City of Sumter have the necessary ordinances, policies, and fiscal resources in place along with the administrative staff to implement mitigation strategies, goals, objectives, and an action plan.

Recommendations:

It is the recommendation of the Hazard Mitigation Steering Committee that formal and informal Intergovernmental Agreements and Memorandums of Understanding between the Town Councils of Mayesville and Pinewood be worked out to permit Sumter County to implement emergency response activities (preparedness, response, and mitigation) within their town limits.

The county will continue to utilize and make available to the Towns of Mayesville and Pinewood the County's Building and Planning Department for the enforcement of building and construction codes, the Sheriff's Department for law enforcement by supplementing and complementing local police efforts; and the county's Emergency Operation Center will be utilized for emergency response and mitigation activities. The County's Public Education and Awareness Program will be countywide in its scope and focus. In addition, any application for federal funds from FEMA, HUD, and other programs will be applied for and utilized on a countywide basis and on behalf of the Towns of Mayesville and Pinewood.

The mitigation efforts or measures that Sumter County will pursue include the following: prevention, property protection, public education and awareness, natural; resources protection, emergency services and structural projects as outlined in the Sumter County Action Plan in Section 8-4.

Section 8-4

Mitigation Strategy - Goals, Objectives, and Action Plan

This section puts forth a summation of the ideas and concepts, brought about by mitigation planning, through a list of goals and corresponding objectives for Sumter County and its municipalities. Each goal is listed and then accompanied by courses of action, which are bulleted items that follow. Finally, the section provides a table listing specific actions for the stated goals, along with priority of the project, and the responsible party and timeframe for implementation.

Goals are general guidelines that explain what is the desired outcome of the natural disaster mitigation planning process? As such, they are to be considered broad policy statements representing long-term results and also to address problems and situations identified through vulnerability and capability assessments.

Objectives, on the other hand, describe strategies or implementation steps to attain the identified goals. Objectives are more specific statements than goals, and the steps that they describe are usually measurable with defined completion times.

Finally, actions provide more detailed descriptions of specific work tasks to help a county or municipality achieve the goals and objectives. These, in turn, can be further elaborated as specific projects envisioned by a local government that addresses specific needs or desired outcomes.

Priority of Projects

Based on the recommendations of the Hazard Mitigation Steering Committee, the following implementation schedule has been developed. Projects have been listed with the ranking assigned by the Steering Committee (H=High, M=Medium, L=Low). Feasibility to implement the project is based on the results of the capability assessment.

High priority project with high feasibility
High priority projects with medium feasibility
Medium priority projects with high feasibility
Medium priority projects with medium feasibility
Medium priority projects with low feasibility
Low priority projects

The Hazard Mitigation Steering Committee ranked projects based on a cost-benefit review that showed which projects were most needed, which of these projects was the most likely to be accomplished, and which would most effectively address mitigation needs. In addition to reviewing potential monetary costs, the team considered the social impact of each potential project, the technical capabilities of the local government to carry through the project, impact on the environment, ability of the local government to maintain the project, and any political or legal effects of the decision. This cost-benefit review was the basis for each of the project feasibility rankings.

Funding

A list of the potential funding sources, please refer to Appendix B.

Responsible Party

Effective implementation of the actions is vital to the success of the Hazard Mitigation Plan. The following tables for the counties and incorporated city's and town's lay out the implementation strategy, i.e. and who is the responsible party for implementation of the strategy. The Hazard Mitigation Steering Committee has worked out this implementation strategy for each implementation action. The abbreviation or name of the following implementation agencies will be used in the action tables:

COG	Council of Governments
CC	County Council and City Council
TC	Town Council
DHEC	Department of Health and Environmental Control
FEMA	Federal Emergency Management Agency
DPA	County Disaster Preparedness Agency
EMD	Emergency Management Director
ARC	American Red Cross
DSS	SC Department of Social Services
PW	Public Works Department
UD	Utilities Department
PUP	Private Utility Provider
CiA	City Administrator
CoA	County Administrator
SBC	State Building Codes
SCDNR	South Carolina Department of Natural Resources
SCEMD	South Carolina Emergency Management Division

Timeframe

The recommended timeframe for the implementation of the specific action item is as follows:

On-going – Daily/Monthly
Immediate – within one (1) year or less

Short-Term
1-2 years ---2010 – 2012
2-4 years ---2012 – 2014

Long-Term
6-8 Years---2016 – 2018
8-10 Years---2018 – 2020

Mitigation Actions and Goals for Mayesville and Pinewood

The assessment of each local government's policies, programs, and ordinances in Sumter County along with their technical/administrative and fiscal abilities indicate that Pinewood and Mayesville do not have the capability to implement a comprehensive range of mitigation initiatives. Sumter County has historically assisted these jurisdictions in the implementation of programs, policies and activities outside the scope of jurisdictional capabilities. Given these limitations Mayesville and Pinewood requested that Sumter County assist them in the implementation of mitigation activities. Action items for those jurisdictions are included with the action items for Sumter County. Action items for Mayesville and Pinewood and indicated by M or P in the Sumter County action item listing. Sumter County Goals #2 and #10 apply to Pinewood and Mayesville.

4.1 Sumter County Mitigation Strategy

Goal #1 **Ensure the protection of critical facilities in the county.**

Objectives

- Identify needed repairs and improvements to critical facility structures and equipment.
- Identify critical facilities that are at risk of being damaged or incapacitated due to a natural disaster.

Goal #2 **Increase public education and awareness of natural hazards.**

Objectives

- Provide public education to increase awareness of hazards and publicize the effectiveness of mitigation by incorporating/developing web sites, pamphlets, radio, television, and print media.
- All interested individuals will be encouraged to participate in hazard mitigation planning and training activities.
- Educate the public about emergency shelters and evacuation procedures.

Goal #3 **Ensure that the availability and operation of the county's infrastructure will not be significantly disrupted by a natural disaster.**

Objectives

- Water, sewer, roads, power, and natural gas infrastructure must be assessed for their vulnerability, and be inspected for their ability to maintain functionality during the occurrence of a natural disaster.

Goal #4 **Reduce the potential impact of natural disasters on new and existing development**

Objectives

- Through comprehensive plans, building codes, or zoning ordinances and similar local government initiatives should address natural hazard mitigation and strengthen present policies to further protect the county and incorporated municipalities.
- Address identified data limitations regarding lack of detailed information about development build-out potential in high hazard areas.

Goal #5 **Ensure that emergency shelters have adequate capacity and resources.**

Objectives

- Ensure the availability of back up power through generators.
- Ensure that adequate and sufficient medical supplies and equipment are present.
- Utilize Census Block Group population counts to ensure that shelters are adequate in size to serve surrounding population.

Goal #6 **Reduce the impact of wildfires on homes, buildings, critical facilities, and infrastructure.**

Objectives

- Address identified data limitations regarding lack of detailed information about vegetation types and individual structures located within the more rural areas of the County.
- Develop a comprehensive approach to reducing the possibility of damage and loss of function due to the exposure of critical facilities and infrastructure to wildfire.

Goal #7 **Reduce the impact of severe winds on houses, buildings, critical facilities, and infrastructure.**

Objectives

- Pursue community oriented grants for structures

Goal #8 **Reduce the impact of floods on homes, buildings, critical facilities, and infrastructure.**

Objectives

- Develop a comprehensive approach, through long-range planning, ICC Code revisions and zoning enforcement, to reducing the possibility of damage to structures.
- Protect existing structures and assets that are most vulnerable to the effects of flooding.
- Promote the continuing purchase of flood insurance by property owners in flood hazard areas.
- Address identified data limitations regarding lack of detailed information about individual structures located in the 100 year floodplain; flood probabilities other than the 100 year flood plain; and first floor elevations for priority areas.

Goal #9 **Ensure the protection and function of Communications.**

Objectives

- Communication lines should be frequently inspected in order to determine vulnerability to natural hazards.
- Inadequate communication systems supporting emergency service operations will be retrofitted or relocated to withstand the impact of natural disasters.

Goal #10 **Facilitate the preparedness of Emergency Response**

Objectives

- Enhance response capacity of the County fire, sheriff, and emergency services personnel to at-risk populations.
- Obtain funding for new equipment and training in order to enhance response times and performance.

Accompanying Actions for Goals

Goal #1: Ensure the protection of critical facilities in the county.

Priority	Name	Action	Responsible Party	Timeframe
High	Facility Evaluation	Prepare facility audits by evaluating all critical facilities exposure to damage from natural hazards and power losses from downed power lines. Include a review of insurance coverage and identify where more information can be found on the property protection measures recommended by the audit.	Emergency Manager	12 Months
Medium	Repair Facilities	Make repairs found listed in the audits in order for the facility to remain operational in case a natural disaster occurs. Items to consider include replacing roofs, installing storm windows and hurricane shutters, improved electrical systems, and ensuring the structures meet the required building codes.	County Administrator & City Manager	1-2 Years
Low	Backup Power for Critical Facilities	All critical facilities should have a proper backup power supply in order to make sure that if power lines are downed, they can remain functional. Therefore, it is essential that critical facilities should be equipped with backup generators.	Emergency Manager	Within 5 Years

Goal #2: Increase public education and awareness of natural hazards.

Priority	Name	Action	Responsible Party	Timeframe
Medium	Public Education and Awareness information (M,P)	Prepare background information, articles and other explanations of hazard mitigation topics and provide them to County, municipal, and private offices for use in presentations, newsletter articles, websites, brochures, and other outreach projects.	Emergency Manager	12 Months
High	Public Education and Awareness (M,P)	Prepare and disseminate outreach projects based on any prepared material concerning hazard mitigation. These projects should be publicized by the utilization of newsletters, news releases, directed mailings, handouts, websites, radio, and television.	Emergency Manager	12 Months

Goal #3: Ensure that the county's infrastructure will not be significantly disrupted by a natural disaster.

Priority	Name	Action	Responsible Party	Timeframe
High	Inspection of Lines	Utility lines and structures need to be inspected for their ability to withstand a natural hazard.	Provider	12 Months
Low	Replace or Retrofit Outdated Structures	Any antiquated structures that are deemed vulnerable should be replaced or retrofitted.	Emergency Manager & Public Works	3 Years
Medium	Models and Database	The County and municipalities should develop geographically accurate models and databases of their infrastructure systems.	IT Department	3 Years

Goal #4: Reduce the impact of natural disasters on new and existing developments.

Priority	Name	Action	Responsible Party	Timeframe
High	Update Plans, Codes, and Ordinances	When comprehensive plans, land use plans, zoning, and subdivision ordinances are up for revision, they should include natural disaster mitigation provisions.	Planning Department	24 Months

Goal # 5: Ensure that emergency shelters have adequate capacity and resources

Priority	Name	Action	Responsible Party	Timeframe
High	Shelter Audit	Perform an audit of shelters to determine which of these structures are better-suited and equipped to serve at-risk populations. In addition, the audit should also determine what equipment is needed to meet these tasks.	Emergency Manager	Ongoing
Medium	Special Needs Population Survey	Use demographic data to determine the location of at-risk populations and develop plans to provide transportation in order to evacuate them to shelters that can provide medical care and meet any special needs that they may have.	Emergency Manager	Ongoing
Low	Backup Power	Make sure shelters have an adequate back up power supply by furnishing them with generators.	Emergency Manger	Ongoing
Low	Medical and Health Facilities	Public and private medical and health care facilities will be retrofitted or relocated to withstand natural disasters.	Emergency Manager	5 Years

Goal # 6: Reduce the impact of wildfires on homes, buildings, critical facilities, and infrastructure.

Priority	Name	Action	Responsible Party	Timeframe
Medium	Evaluate Areas Susceptible to Wildfires	Utilize GIS analysis to identify structures (homes and other buildings) that are in areas susceptible to wildfire.	Emergency Manager	5 Years

Goal # 7: Reduce the impact of severe wind on homes, buildings, critical facilities, and infrastructure.

Priority	Name	Action	Responsible Party	Timeframe
High	Vegetation Management	Inspect and manage vegetation that could damage Critical facilities if felled by wind.	Emergency Manager Public Works	12 Months

Goal # 8: Reduce the impact of floods on homes, buildings, critical facilities, and infrastructure.

Priority	Name	Action	Responsible Party	Timeframe
High	Drainage Ditch Maintenance	Implement a formal and regular drainage ditch and canal system maintenance program for storm water management.	Public Works	Ongoing
High	Update Flood Maps	Encourage FEMA to update flood maps.	Planning	Ongoing
High	Back Flow Prevention	Install back-flow prevention valves in sewer pipes.	Public Works	Ongoing
High	Storm Water Management	Implement the mandatory storm water utility/tax.	Public Works	Ongoing

Goal # 9: Ensure the protection and function of Communications.

Priority	Name	Action	Responsible Party	Timeframe
High	Inspection of Lines	An inspection of communication lines in order to determine what needs to be replaced, and to ensure that they are clear from tree limbs and other obstructions.	Provider	Ongoing
Low	Creation of Mobile Dispatch Unit	Create a mobile dispatch unit to ensure that communications are not lost as a result of a natural disaster.	County EM Director	Ongoing
Low	Retrofit and Relocate Communication System	Utility and communication systems supporting emergency services operations will be retrofitted or relocated to withstand the impact of a natural disaster.	Provider	Ongoing

Goal #10: Facilitate the preparedness of Emergency Response.

Priority	Name	Action	Responsible Party	Timeframe
High	Emergency Response Preparation Evaluation (M,P)	Conduct a review of emergency response plans and programs to identify where additional activities are needed to respond to natural hazards.	Emergency Manager	Ongoing
Medium	Emergency Response Preparation Equipment	Purchase any necessary equipment that is critical for the response to natural disasters and to ensure that personnel have adequate and up-to date training and the use of specific equipment.	Emergency Manager	Ongoing

4.2 City of Sumter Mitigation Strategy

Goal #1 **Ensure the protection of critical facilities in the city.**

Objectives

- Identify needed repairs and improvements to critical facility structures and equipment.
- Identify critical facilities that are at risk of being damaged or incapacitated due to a natural disaster.

Goal #2 **Increase public education and awareness of natural hazards.**

Objectives

- Provide public education to increase awareness of hazards and publicize the effectiveness of mitigation by incorporating/developing web sites, pamphlets, radio, television, and print media.
- All interested individuals will be encouraged to participate in hazard mitigation planning and training activities.
- Educate the public about emergency shelters and evacuation procedures.

Goal #3 **Ensure that the availability and operation of the city's infrastructure will not be significantly disrupted by a natural disaster.**

Objectives

- Water, sewer, roads, power, and natural gas infrastructure must be assessed for their vulnerability, and be inspected for their ability to maintain functionality during the occurrence of a natural disaster.

Goal #4 **Reduce the potential impact of natural disasters on new and existing development**

Objectives

- Through comprehensive plans, building codes, or zoning ordinances and similar local government initiatives should address natural hazard mitigation and strengthen present policies to further protect the city and incorporated municipalities.
- Address identified data limitations regarding lack of detailed information about development build-out potential in high hazard areas.

Goal #5 **Reduce the impact of wildfires on homes, buildings, critical facilities, and infrastructure.**

Objectives

- Address identified data limitations regarding lack of detailed information about vegetation types and individual structures located within the more forested or overgrown areas of the City.
- Develop a comprehensive approach to reducing the possibility of damage and loss of function due to the exposure of critical facilities and infrastructure to wildfire.

Goal #6 **Reduce the impact of severe winds on houses, buildings, critical facilities, and infrastructure.**

Objectives

- Pursue community oriented grants for structures

Goal #7 **Reduce the impact of floods on homes, buildings, critical facilities, and infrastructure.**

Objectives

- Develop a comprehensive approach, through long-range planning, ICC Code revisions and zoning enforcement, to reducing the possibility of damage to structures.
- Protect existing structures and assets that are most vulnerable to the effects of flooding.
- Promote the continuing purchase of flood insurance by property owners in flood hazard areas.
- Address identified data limitations regarding lack of detailed information about individual structures located in the 100 year floodplain; flood probabilities other than the 100 year flood plain; and first floor elevations for priority areas.

Goal #8 **Ensure the protection and function of Communications.**

Objectives

- Communication lines should be frequently inspected in order to determine vulnerability to natural hazards.
- Inadequate communication systems supporting emergency service operations will be retrofitted or relocated to withstand the impact of natural disasters.

Goal #9 **Facilitate the preparedness of Emergency Response**

Objectives

- Enhance response capacity of the City fire, police, and emergency services personnel to at-risk populations.
- Obtain funding for new equipment and training in order to enhance response times and performance.

Accompanying Actions for Goals

Goal #1: Ensure the protection of critical facilities in the city.

Priority	Name	Action	Responsible Party	Timeframe
High	Facility Evaluation	Prepare facility audits by evaluating all critical facilities exposure to damage from natural hazards and power losses from downed power lines. Include a review of insurance coverage and identify where more information can be found on the property protection measures recommended by the audit.	Emergency Manager	12 Months
Medium	Repair Facilities	Make repairs found listed in the audits in order for the facility to remain operational in case a natural disaster occurs. Items to consider include replacing roofs, installing storm windows and hurricane shutters, improved electrical systems, and ensuring the structures meet the required building codes.	City Manager	1-2 Years
Low	Backup Power for Critical Facilities	All critical facilities should have a proper backup power supply in order to make sure that if power lines are downed, they can remain functional. Therefore, it is essential that critical facilities should be equipped with backup generators.	EM	Within 5 Years

Goal #2: Increase public education and awareness of natural hazards.

Priority	Name	Action	Responsible Party	Timeframe
Medium	Public Education and Awareness information	Prepare background information, articles and other explanations of hazard mitigation topics and provide them to municipal and private offices for use in presentations, newsletter articles, websites, brochures, and other outreach projects.	EM	12 Months
High	Public Education and Awareness	Prepare and disseminate outreach projects based on any prepared material concerning hazard mitigation. These projects should be publicized by the utilization of newsletters, news releases, directed mailings, handouts, websites, radio, and television.	EM	12 Months

Goal #3: Ensure that the city's infrastructure will not be significantly disrupted by a natural disaster.

Priority	Name	Action	Responsible Party	Timeframe
High	Inspection of Lines	Utility lines and structures need to be inspected for their ability to withstand a natural hazard.	Provider	12 Months
Low	Replace or Retrofit Outdated Structures	Any antiquated structures that are deemed vulnerable should be replaced or retrofitted.	EM & Public Works	3 Years
Medium	Models and Database	The City should develop geographically accurate models and databases of their infrastructure systems.	IT Department	3 Years

Goal #4: Reduce the impact of natural disasters on new and existing developments.

Priority	Name	Action	Responsible Party	Timeframe
Medium	Update Plans, Codes, and Ordinances	When comprehensive plans, land use plans, zoning, and subdivision ordinances are up for revision, they should include natural disaster mitigation provisions.	Planning Department	2-4 Years
Low	Property Protection Measures	Incorporate retrofitting incentives by establishing a program of technical assistance and financial incentives to encourage property protection measures on private commercial property.	City Council	Ongoing
Low	Flood Control Projects	Implement flood control projects for areas such as farm drainage, bridge improvements, and repairing dams that are prone to failure.	Public Works	Ongoing

Goal #5: Reduce the impact of wildfires on homes, buildings, critical facilities, and infrastructure.

Priority	Name	Action	Responsible Party	Timeframe
High	Evaluate Areas Susceptible to Wildfires	Utilize GIS analysis to identify structures (homes and other buildings) that are in areas susceptible to wildfire.	EM & Planning Department	Ongoing

Goal #6: Reduce the impact of severe wind on homes, buildings, critical facilities, and infrastructure.

Priority	Name	Action	Responsible Party	Timeframe
High	Vegetation Management	Inspect and manage vegetation that could damage Critical facilities if felled by wind.	EM & Public Works	12 Months

Goal #7: Reduce the impact of floods on homes, buildings, critical facilities, and infrastructure.

Priority	Name	Action	Responsible Party	Timeframe
High	Drainage Ditch Maintenance	Implement a formal and regular drainage ditch and canal system maintenance program for storm water management.	Public Works	Ongoing
High	Flood Threat Recognition System	Determine the possibility of a flood threat recognition system that utilizes rain and stream gages, along with a central gage, to monitor and predict the occurrences of floods and flash floods.	Public Works	Ongoing
High	Update Flood Maps	Encourage FEMA to update flood maps.	Public Works	Ongoing
High	Back Flow Prevention	Install back-flow prevention valves in sewer pipes.	Public Works	Ongoing

Goal #8: Ensure the protection and function of Communications.

Priority	Name	Action	Responsible Party	Timeframe
High	Inspection of Lines	An inspection of communication lines in order to determine what needs to be replaced, and to ensure that they are clear from tree limbs and other obstructions.	Provider	Ongoing
Low	Creation of Mobile Dispatch Unit	Create a mobile dispatch unit to ensure that communications are not lost as a result of a natural disaster.	City EM Director	Ongoing
Low	Retrofit and Relocate Communication System	Utility and communication systems supporting emergency services operations will be retrofitted or relocated to withstand the impact of a natural disaster.	Provider	Ongoing

Goal #9: Facilitate the preparedness of Emergency Response.

Priority	Name	Action	Responsible Party	Timeframe
High	Emergency Response Preparation Evaluation	Conduct a review of emergency response plans and programs to identify where additional activities are needed to respond to natural hazards.	EM	Ongoing
Medium	Emergency Response Preparation Equipment	Purchase any necessary equipment that is critical for the response to natural disasters and to ensure that personnel have adequate and up-to date training and the use of specific equipment.	EM	Ongoing

4.3 Town of Mayesville Mitigation Strategy

Town of Mayesville Mitigation Strategy to Correct Deficiencies

The Town of Mayesville has a Special Flood Hazard Area within its jurisdictional boundaries; however, prior to 2006 the turn did not participate in the NFIP. To receive approval for its flood mitigation strategy the Town of Mayesville completed and submitted one or more of the following:

1. adopted the revised flood mitigation strategy that addresses how the Town of Mayesville will reduce future flood losses in the unincorporated areas for new development and infrastructure, and major improvements to existing structures;
2. adopted a flood damage prevention ordinance that complies with minimum NFIP standards, as contained in 44 CFR 60;

Goal #2 **Increase public education and awareness of natural hazards.**

Objectives

- Provide public education to increase awareness of hazards and publicize the effectiveness of mitigation by incorporating/developing web sites, pamphlets, radio, television, and print media.
- All interested individuals will be encouraged to participate in hazard mitigation planning and training activities.
- Educate the public about emergency shelters and evacuation procedures.

Goal #10 **Facilitate the preparedness of Emergency Response**

Objectives

- Enhance response capacity of the Town.
- Obtain funding for new equipment and training in order to enhance response times and performance.

Accompanying Actions for Goals

Goal #2: Increase public education and awareness of natural hazards.

Priority	Name	Action	Responsible Party	Timeframe
High	Public Education and Awareness information	Prepare background information, articles and other explanations of hazard mitigation topics and provide them to municipal and private offices for use in presentations, newsletter articles, websites, brochures, and other outreach projects.	Emergency Management	12 months
Medium	Public Education and Awareness	Prepare and disseminate outreach projects based on any prepared material concerning hazard mitigation. These projects should be publicized by the utilization of newsletters, news releases, directed mailings, handouts, websites, radio, and television.	Emergency Management	12 months

Goal #10: Facilitate the preparedness of Emergency Response

Priority	Name	Action	Responsible Party	Timeframe
High	Emergency Response Preparation Evaluation	Conduct a review of emergency response plans and programs to identify where additional activities are needed to respond to natural hazards.	Emergency Management	Ongoing

4.4 Town of Pinewood Mitigation Strategy

Town of Pinewood Mitigation Strategy Deficiencies

The Town of Pinewood has a Special Flood Hazard Area within its jurisdictional boundaries; however, prior to 2006 the Town did not participate in the NFIP and was sanctioned by the NFIP. To receive approval for its flood mitigation strategy the Town adopted and submitted (1) a revised flood mitigation strategy that addresses how the Town of Pinewood will reduce future flood losses in the unincorporated areas for new development and infrastructure, and major improvements to existing structures; and (2) a flood damage prevention ordinance that complies with minimum NFIP standards, as contained in 44 CFR 60;

Goal #2 Increase public education and awareness of natural hazards.

Objectives

- Provide public education to increase awareness of hazards and publicize the effectiveness of mitigation by incorporating/developing web sites, pamphlets, radio, television, and print media.
- All interested individuals will be encouraged to participate in hazard mitigation planning and training activities.
- Educate the public about emergency shelters and evacuation procedures.

Goal #10 Facilitate the preparedness of Emergency Response

Objectives

- Enhance response capacity of the Town fire, police, and emergency services personnel to at-risk populations.
- Obtain funding for new equipment and training in order to enhance response times and performance.

Accompanying Actions for Goals

Goal #2: Increase public education and awareness of natural hazards.

Priority	Name	Action	Responsible Party	Timeframe
Medium	Public Education and Awareness information	Prepare background information, articles and other explanations of hazard mitigation topics and provide them to municipal and private offices for use in presentations, newsletter articles, websites, brochures, and other outreach projects.	Emergency Management	12 months
High	Public Education and Awareness	Prepare and disseminate outreach projects based on any prepared material concerning hazard mitigation. These projects should be publicized by the utilization of newsletters, news releases, directed mailings, handouts, websites, radio, and television.	Emergency Management	12 months

Goal #10: Facilitate the preparedness of Emergency Response

Priority	Name	Action	Responsible Party	Timeframe
High	Emergency Response Preparation Evaluation	Conduct a review of emergency response plans and programs to identify where additional activities are needed to respond to natural hazards.	Emergency Management	Ongoing

Table ____

Sumter County Critical Facilities

Type	Name	Address	Owner	Lat	Long
Airport	Sumter Municipal Airport	Airport Rd	Sumter County	33.995	-80.3625
Fire Station	Bethel Station #13	US 15 S	Sumter County	33.826	-80.37411
Fire Station	Dabbs Station #19	US 378	Sumter County	33.90571	-80.14488
Fire Station	Byrd's Station #18	Douglas Swamp Rd	Sumter County	33.98211	-79.99294
Fire Station	Dalzell Station #6	Frierson Rd	Sumter County	34.01087	-80.43838
Fire Station	Wedgefield Station #7	Kings Hwy	Sumter County	33.89077	-80.51783
Fire Station	Pinewood Station #2	Epperson Ave	Sumter County	33.73577	-80.4639
Fire Station	Oswego Station #14	Oswego Hwy	Sumter County	34.00549	-80.28525
Fire Station	Pleasant Grove Station # 4	Pleasant Grove Rd	Sumter County	33.98091	-80.04796
Fire Station	Cherryvale Station #1	Plowden Mill Rd	Sumter County	33.87621	-80.23592
Fire Station	Dubose Station #12	Dubose Siding Rd	Sumter County	34.05663	-80.3541
Fire Station	Graham Station #3	Britton Rd	Sumter County	33.84672	-80.29258
Fire Station	Rembert Station #8	Camden Hwy	Sumter County	34.09506	-80.53477
Fire Station	Horatio Station #11	Sumter Landing Rd	Sumter County	34.02279	-80.57282
Fire Station	521 South Substation	1115 Manning Rd	Sumter County	33.88867	-80.33631
Fire Station	Cherryvale Substation	129 E Hayeston St	Sumter County	33.9592	-80.46304
Fire Station	City-County Center	107 E Hampton St	Sumter City County	33.92	-80.34
Fire Station	Mayesville Station	S Lafayette St	Sumter County	33.98424	-80.20923
Emergency Shelter	Alice Drive Middle	40 Miller Rd	Sumter County	33.932224	-80.38021
Emergency Shelter	Furman Middle	3400 Bethel Church Rd	Sumter County	33.809789	-80.40721
Emergency Shelter	Hillcrest Middle	SC 441 at US 521	Sumter County	34.029496	-80.46459
Emergency Shelter	Mayewood Reserve	4300 Brewington Rd	Sumter County	33.893253	-80.19916
Emergency Shelter	Sumter High	2580 Mccray's Mill Rd	Sumter County	33.89847	-80.39309
Emergency Shelter	Toumey Hospital	129 N Washington St	Sumter County	33.923325	-80.34369
Administration	County Administration Building	13 E Canal St	Sumter County	NA	NA
Administration	Sumter County EOC	141 N Main St	Sumter County	NA	NA
Administration	Sumter County EMS	127 E Hampton St	Sumter County	NA	NA
Administration	Sumter County Detention Center	1250 Winkles Rd	Sumter County	NA	NA
Administration	County Public Works	1289 N Main St	Sumter County	NA	NA
Fire Station	Headquarters	129 E Hampton St	City of Sumter	33.91991	-80.33768
Fire Station	Alice Dr Substation	225 Alice Dr	City of Sumter	33.92836	-80.379
Fire Station	Stadium Rd Substation	2041 Stadium Rd	City of Sumter	33.8907	-80.38078
Administration	Sumter City Hall	21 N Main St	City of Sumter	NA	NA
Administration	Sumter City Public Works	303 E Liberty St	City of Sumter	NA	NA
Sewer Treatment Facility	Pocotaligo Facility	Justin Lane	City of Sumter	33.850628	-80.31609
Sewer Treatment Facility	City of Sumter Plant	US 521	City of Sumter	NA	NA
Sewer Treatment Facility	Pinewood Facility	Ball Park Rd	Town of Pinewood	33.736597	-80.46834
Communication	WRJA-TV	18 N Harvin St	South Carolina	33.94936	-80.09661
Airport	Shaw AFB	Hwy 378/76	US Air Force	33.972778	-80.47305
Electric Power Facility	Shaw Field	Hwy 378/76	US Air Force	33.98	-80.47
Hospital	Shaw Hospital	431 Meadowlark St	US Air Force	33.976	-80.4576
Sewer Treatment Facility	Shaw Facility	Country Squire Ct	US Air Force	33.968546	-80.49264

Communication	Miller Communication	127 E Hampton Ave	Private	33.92	-80.34
Communication	WKHT	51 Commerce St	Private	33.92057	-80.33172
Communication	WSSC	201 Oswego Rd	Private	33.93	-80.33
Communication	WHRI	1965 Stadium Rd	Private	33.89	-80.38
Communication	The Item Newspaper	20 N Magnolia St	Private	NA	NA
Electric Power Facility	Sumter	315 E Red Bay Rd	Progressive Energy	33.9	-80.32
Electric Power Facility	Sumter Industrial	1175 Cockerill Rd	Progressive Energy	33.86	-80.38
Electric Power Facility	Sumter North	780 Jefferson Rd	Black River	33.97	-80.36
Electric Power Facility	Sumter-Wedgefield Rd	2434 Wedgefield Rd	Progressive Energy	33.91	-80.39
Electric Power Facility	Wateree	Unknown	Progressive Energy	33.83	-80.62
Water Facility	Dalzell Water	4305-C Camden Hwy	Private	NA	NA
Water Facility	High Hills Water District	SC 441	Private	NA	NA
Water Facility	Oswego Water Company	Rt 11 Box 228A	Private	NA	NA
Health Care	Sumter Dialysis Center	615 Wesmark Blvd	Private	33.951463	-80.39828
Health Care	Tuomey Medical Park	1215 Alice Dr	Private	33.950535	-80.38628
Health Care	Tuomey Cancer Center	130 N Washington St	Private	33.923852	-80.34479
Hospital	Tuomey Hospital	129 N Washington St	Private	33.92309	-80.34315