3. RISK ASSESSMENT

2009 Update Overview

Element	Analysis	Result
§201.6(c)(2)(i) IDENTIFYING HAZARDS Risk Assessment **shall** include a description of the type….of all natural hazards that can affect the jurisdiction…	The LMSWG reviewed the 2004 data and determined the same hazards affect the County	Used 2004 data
§201.6(c)(2)(i) PROFILING HAZARDS Description of the …location and extent of all natural hazards that can affect…. **Shall** include info on previous occurrences…	The LMSWG reviewed the 2004 data and determined the most of the info is still current	Used some of the 2004 info and updated where needed (i.e. occurrences etc.)
§201.6(c)(2)(ii) ASSESSING VULNERABILITY Description of vulnerability to hazards in section (c)(2)(i)….	The LMSWG reviewed the 2004 data and determined that no significant change had occurred in the prevailing hazard analysis. The LMSWG did conclude that the data modeling process would be better served by utilizing the more current data provided by the Hazus MH modeling process over the formerly utlilized TAOS modeling process.	Hurricane and Flood modeling process re-analyzed utilizing Hazus MH Modeling.
§201.6(c)(2)(ii) ASSESSING VULNERABILITY:RLP …address NFIP insured structures that have been repetitively damaged by floods.	New element not an update	Obtained data from the State Floodplain Manager
§201.6(c)(2)(ii)(A) ASSESSING VULNERABILITY: IDENTIFYING STRUCTURES **SHOULD** describe vulnerability in terms of the types and numbers…	The LMSWG concluded that the data modeling process would be better served by utilizing the more current data provided by the Hazus MH modeling process over the formerly utlilized TAOS modeling process.	Hurricane and Flood modeling process re-analyzed utilizing Hazus MH Modeling.

§201.6(c)(2)(ii)(B) ASSESSING VULNERABILITY: ESTIMATING POTENTIAL LOSSES **SHOULD** give an estimate of the potential dollar losses to vulnerable structures identified….	The LMSWG concluded that the data modeling process would be better served by utilizing the more current data provided by the Hazus MH modeling process over the formerly utlilized TAOS modeling process.	Hurricane and Flood modeling process re-analyzed utilizing Hazus MH Modeling.
§201.6(c)(2)(ii)(C) ASSESSING VULNERABILITY: ANALYZING DEVELOPMENT TRENDS **SHOULD** provide a general description of land uses and development trends within the community…	The LMSWG reviewed the 2004 data/information and determined it needed to be completely updated.	This section was updated using the more recent Comprehensive Plan Evaluation Appraisal Report, BEBR and Census 2000 data
C§201.6(c)(2)(iii) MULTI-JURISDICTIONAL RISK ASSESSMENT **Must** assess each jurisdiction's risks where they vary from entire planning area.	The LMSWG reviewed the 2004 data to determine is updates were necessary.	New or updated data was integrated or replaced as appropriate keeping the assessment on a county wide basis as in 2004.

The challenge to maintaining a robust, ever-evolving county-wide mitigation strategy is to continually identify the current and future hazards the county faces and assess the potential vulnerability from each of these hazards. As part of the continuing process of maintaining the Calhoun County Local Mitigation Strategy, the Working Group periodically reviews new and existing emergency management materials and conducts their own analysis based on recent disasters and their own historical knowledge of the County, to determine which natural and manmade disasters presented the greatest threat to the County, and assesses the County's vulnerability to each of those threats. The 2009 updated Calhoun County Hazard Identification and Vulnerability Assessment represents that effort.

Each hazard addressed in this updated assessment presents Calhoun County with different challenges and opportunities. Some disasters are more likely than others, and some will impact certain residents more than others. However, one conclusion has always been clear; at some time, every resident in Calhoun County will feel the impact of one or more of these disasters.

This section of the Calhoun County LMS is divided into three subsections; Hazard Profile and Vulnerability, Land Use and Development Trends, and Risk Assessment. The Hazard Profile & Vulnerabilities Assessment together cover the identification of hazards to Calhoun County. The profile of these hazard events, the identification of county assets vulnerable to these hazards, the estimation of potential losses from these hazards, and a multi-jurisdictional risk assessment of these hazards. These two subsections are organized by hazard type and also include references to development trends affected by these hazards. The Land Use and Development Trends subsection reviews the affects of hazards on the land use and development in Calhoun County.

3.1. Hazard Profile and Vulnerability

This information is identified by using both primary and secondary research materials which includes, but is not limited to reports from local, state, and national agencies, as well as, media accounts, state and local weather records, and conversations with key personnel and residents in Calhoun County. This analysis will include the possible severity and magnitude as well as the potential impact of damage within the County from future hazards. This is not meant to be a scientific process, but will serve as a way to prioritize mitigation measures based on the potential frequency and the likely extent of damage from hazards known to affect the County. Due to the lack of resources the estimation of potential dollar losses to vulnerable structures and vulnerability in terms of the type and number of existing and future buildings, infrastructure and critical facilities were only provided for hurricanes. This assessment will be considered when specific mitigation measures are prioritized for implementation, along with other factors, such as stated community goals, citizen concerns, on-going projects, and opportunities for funding.

The criteria provided for the original development of the Local Hazard Mitigation Plan identified the following natural hazards and stated that, at a minimum, Calhoun County must address each of them: Earthquakes, Tsunamis, Coastal & Riverine Erosion, Landslides/Sinkholes, Hurricanes & Coastal Storms, Severe Thunderstorms & Tornadoes, Floods, Wildfires, Dam/Levee Failure, Drought/Heat Wave, and Winter Storms/Freezes. It should be noted that, several of the hazards established under the original minimum criteria were not relevant to the community and received a low hazard index ranking as a result. However, there are other hazards that were identified which are not in the minimum criteria established by FEMA that are included the discussion. Since the development of the original plan the jurisdictions are now required to include a description of the type…. of all natural hazards that can affect the jurisdictions… (§201.6(c)(2)(i)).

Disasters are classified by the magnitude of their effect. The recognized classification system is as follows:

- Minor Disaster - Any disaster that is likely to be within the response capabilities of local government and results in only minimal need for state or federal assistance.

- Major Disaster - Any disaster that will likely exceed local capabilities and require a broad range of state and federal assistance. The Federal Emergency Management Agency (FEMA) will be notified and potential federal assistance will be predominantly recovery-oriented.

- Catastrophic Disaster - Any disaster that will require massive state and federal assistance, including immediate military involvement. Federal assistance will involve response as well as recovery needs.

3.1.1. Earthquakes

Hazard Profile
Although Florida is not usually considered to be a state subject to earthquakes, several minor shocks have occurred over time, but only one caused any damage.

In January 1879, a shock occurred near St. Augustine that is reported to have knocked plaster from walls and articles from shelves. Similar effects were reported in Daytona Beach. The shock was felt in Tampa, throughout central Florida, and in Savannah, Georgia as well (Zirbes, 1971).

In January 1880 another earthquake occurred, this time with Cuba as the focal point. Shock waves were sent as far north as the town of Key West (Zirbes, 1971),

In August 1886, Charleston, South Carolina was the center of a shock that was felt throughout northern Florida. It rang church bells in St. Augustine and severely jolted other towns along sections of Florida's east coast. Jacksonville residents felt many of the strong aftershocks that occurred in September, October, and November, 1886 (Zirbes, 1971).

In June 1893, Jacksonville experienced a minor shock that lasted about 10 seconds. Another earthquake occurred in October 1893, and did not cause any damage either (Zirbes, 1971).

In November 1948, doors and windows rattled in Captiva Island, west of Ft.
Myers. It was reportedly accompanied by sounds like distant heavy explosions (Zirbes, 1971).

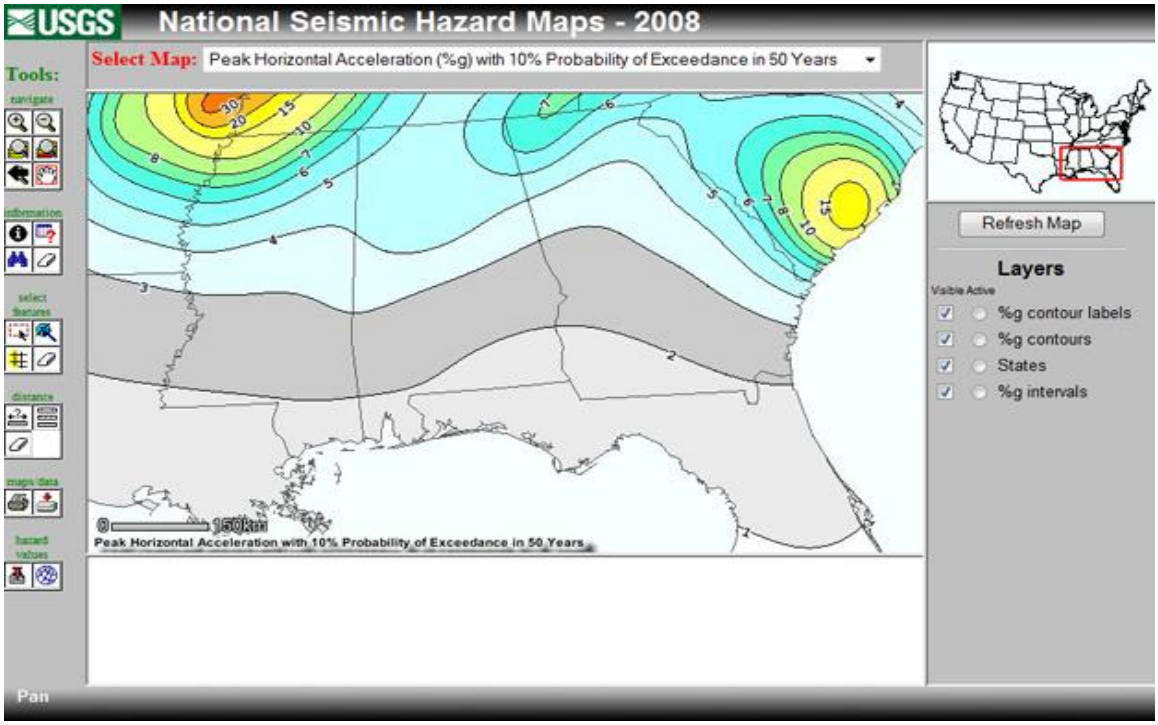
In November 1952, a slight tremor was felt in Quincy, a town located 20 miles northwest of Tallahassee. Windows and doors rattled, but no damage was reported (Zirbes, 1971).

In December 1973, Tremor reported at 11:30, Seminole and Orange counties. (USGS)

In December 1975, A MMIII to MMIV tremor was detected by most residents within a 10-mi radius of Daytona Beach (Stover et al., 1979).

In November 1977, a slight shock was recorded north over peninsular Florida. This tremor was not large enough to be felt, but was recorded as Richter magnitude .8. (USGS)

Vulnerability
There is no history of seismic activity in Calhoun County. The threat of an earthquake is considered virtually nonexistent. See figure below.



Source: www.usgs.gov 2008 National Seismic Hazard Map.

3.1.2. Tsunamis

Hazard Profile

A tsunami is a wave train, or series of waves, generated in a body of water by an impulsive disturbance that vertically displaces the water column. Earthquakes, landslides, volcanic eruptions, explosions, and even the impact of cosmic bodies, such as meteorites, can generate tsunamis. Tsunamis can savagely attack coastlines, causing devastating property damage and loss of life.

Vulnerability

The nearest coastline to Calhoun County is the Gulf of Mexico. Since the occurrence of Tsunamis has never been recorded in the Gulf of Mexico and since they primarily occur in the Pacific Ocean, the threat from this hazard to Calhoun County is nonexistent.

3.1.3. Coastal & Riverine Erosion

Hazard Profile

Soil Erosion

Soil erosion is the deterioration of soil by the physical movement of soil particles from a given site. Wind, water, animals, and the use of tools by man may all be reasons for erosion. The two most powerful erosion agents are wind and water; but in most cases these are damaging only after man, animals, insects, diseases, or fire have removed or depleted natural vegetation. Accelerated erosion caused by human activity is the most serious form of soil erosion because the rate is so rapid that surface soil may sometimes be blown or washed away right down to the bedrock.

Undisturbed by man, soil is usually covered by shrubs and trees, by dead and decaying leaves or by a thick mat of grass. Whatever the vegetation, it protects the soil when the rain falls or the wind blows. Root systems of plants hold the soil together. Even in drought, the roots of native grasses, which extend several feet into the ground, help tie down the soil and keep it from blowing away. With its covering of vegetation stripped away, soil is vulnerable to damage. Whether the plant cover is disturbed by cultivation, grazing, deforestation, burning, or bulldozing, once the soil is bare to the erosive action of wind and water, the slow rate of natural erosion is greatly increased. Losses of soil take place much faster than new soil can be created, and a kind of deficit spending of topsoil begins. With the destruction of soil structure, eroded land is even more susceptible to erosion.

The occurrence of erosion has greatly increased, usually at a rate at which soils cannot be sustained by natural soil regeneration. This is because of the activities of modern development and population growth, particularly agricultural intensification. It is also in the field of agriculture that most efforts have been made to conserve soils, with mixed success (Union of International Associations).

Beach Erosion
Wind, waves, and long shore currents are the driving forces behind coastal erosion. This removal and deposition of sand permanently changes beach shape and structure. Since Calhoun County has no beach front this hazard is not applicable.

Vulnerability
Calhoun County's vulnerability to Coastal erosion is nonexistent, since it has no coastline. The primary agent for riverine erosion in Calhoun County is water. The impact on the soil collapse of river banks and inland bodies is moderate except during high river cresting and floods. The vulnerabilities from this form of erosion from flooding are covered in the Floods hazard vulnerability assessment.

3.1.4. Landslides / Sinkholes

Hazard Profile
Sinkholes are a common feature of Florida's landscape. There is only one of many kinds of karst landforms which occur in Florida. This type includes caves, disappearing streams, springs, and underground drainage systems. Karst is a generic term which refers to the characteristic terrain produced by erosional processes associated with the chemical weathering and dissolution of limestone or dolomite, the two most common carbonate rocks in Florida. Dissolution of carbonate rocks begins when they are exposed to acidic water. Most rainwater is slightly acidic and usually becomes more acidic as it moves through decaying plant debris.

Limestone in Florida is porous, allowing the acidic water to percolate through their strata, dissolving some limestone and carrying it away in solution. Over eons of time, this persistent erosional process has created extensive underground voids and drainage systems in much of the carbonate rocks throughout the state. Collapse of overlying sediments into the underground cavities produces sinkholes.

When groundwater discharges from an underground drainage system, it is a spring, such as Wakulla Springs, Silver Springs, or Rainbow Springs. Sinkholes can occur in the beds of streams, sometimes taking all of the stream's flow, creating a disappearing stream. Dry caves are parts of karst drainage systems that are above the water table, such as Marianna Caverns (Florida Geological Survey).

Vulnerability
There are no known locations of Karst topography, which are most supportive of sinkhole development, in Calhoun County. Therefore, the threat of sinkhole development is considered virtually nonexistent.

3.1.5. Hurricanes & Coastal Storms

Hazard Profile
A cumulative list of Florida hurricanes would encompass approximately 486 tropical or subtropical cyclones that have affected the state of Florida in recorded history. More storms hit Florida than any other U.S. state,(US EPA 1998) and since 1851 only eighteen hurricane seasons have passed without a known storm impacting the state. Collectively, hurricanes caused a death toll of 10,272 people in the region, most of which occurring prior to the start of Hurricane Hunters flights in 1943. Additionally, the cumulative impact from the storms totaled over $115 billion in damage (2008 USD), primarily from Hurricane Andrew and hurricanes in the 2004 and 2005 seasons.

Tropical cyclones have affected Florida in every month of the year but January and March. Nearly one-third of the cyclones affected the state in September, and nearly three-fourths of the storms affected the state between August and October, which coincides with the peak of the hurricane season. Portions of the coastline have the lowest return period, or the frequency at which a certain intensity or category of hurricane can be expected within 86 mi (139 km) of a given location, in the country. Monroe County was struck by 26 hurricanes since 1926, which is the greatest total for any county in the United States (*National Hurricane Center 2006).*

In a Monthly Weather Review paper published in 1934, the U.S. Weather Bureau recognized Key West and Pensacola as the most hurricane-prone cities in the state; Key West experiences both storms developing from the western Atlantic Ocean and the Caribbean Sea, while Pensacola has received hurricanes crossing the state as well as storms re-curving in the northern Gulf of Mexico. (Richard Gray 1933)The earliest storm to affect the state was the 1952 Groundhog Day Tropical Storm, and the latest storm to impact the state was a hurricane making landfall on December 1, 1925.

The strongest tropical cyclone to make landfall on the state was the Labor Day Hurricane of 1935, which crossed the Florida Keys with a pressure of 892 mbar (hPa; 26.35 inHg). Out of the ten most intense land falling United States hurricanes, four struck Florida at peak strength (NOAA Atlantic hurricane research division 2008).

Rank	Hurricane	Season	Landfall pressure
1	"Labor Day"	1935	892 mbar (hPa)
2	Camille	1969	909 mbar (hPa)
3	Katrina	2005	920 mbar (hPa)
4	Andrew	1992	922 mbar (hPa)
5	"Indianola"	1886	925 mbar (hPa)
6	"Florida Keys"	1919	927 mbar (hPa)
7	"Okeechobee"	1928	929 mbar (hPa)
8	Donna	1960	930 mbar (hPa)
9	Carla	1961	931 mbar (hPa)
10	Hugo	1989	934 mbar (hPa)
Source: National Hurricane Center			

Florida has the most people at risk from hurricanes. During the 1990's, the number of people in Florida rose by 3 million--only California and Texas grew by more during the decade. This represents nearly a 23.5 percent increase in population over the decade. Slower growth is expected during the first decade of the 21st century with Florida's population expected to grow to 18,881,445 by April 1, 2010 (an 18.1 percent increase over 2000). Florida is expected to break the 20 million mark before April 1, 2015. While Florida's rate of growth was less during the 90's than during the 80's when growth was nearly 33 percent,

Florida currently remains the fourth largest state behind California with 36.8 million residents, Texas with 24.3 million residents, and New York with 19.5 million residents. Nationally, the U.S. grew by 13.2 percent between 1990 and 2000.Florida's population was estimated to be 18,807,219 on April 1, 2008, an increase of 2,824,395 over the 2000 census count of 15,982,824 (17.7 percent growth over the eight-year period).

Even with slowing population growth over the past year, Florida still ranks third in the nation in total population change between April 1, 2000 and July 1, 2008, behind Texas and California, respectively.

Hurricanes are tropical cyclones with winds that exceed 74 mph and blow counter-clockwise about their centers in the Northern Hemisphere. They are essentially heat pumping mechanisms that transfer the sun's heat energy from the tropical to the temperate and polar regions. This helps to maintain the global heat budget and sustain life as we know it. Hurricanes are formed from thunderstorms that form over tropical oceans with surface temperatures warmer than 81" Fahrenheit (26.5" Celsius). The ambient heat in the sea's surface and moisture in the rising air column set up a OW pressure center and convective conditions that allow formation of self sustaining circular wind patterns. Under the right conditions these winds may continue to intensify until they reach hurricane strength. This heat and moisture from the warm ocean water is the energy source of a hurricane,

Hurricanes weaken rapidly when deprived of their energy source by traveling over land or entering cooler waters.

A storm surge is a large dome of water often 50 to 100 miles wide and rising anywhere from 4 to 5 ft in a category 1 hurricane up to 20 ft in a category 5 storm. The storm surge arrives ahead of the storm's actual landfall and the more intense the hurricane is, the sooner the surge arrives. Water rise can be very rapid, posing a serious threat to those who have waited to evacuate flood prone areas. A storm surge is a wave that has outrun its generating source and become a long period swell. The surge is always highest in the right-front quadrant of the direction the hurricane is moving in. As the storm approaches shore the greatest storm surge will be to the north of the hurricane eye.

Such a surge of high water topped by waves driven by hurricane force winds can be devastating to coastal regions. The stronger the hurricane and the shallower the offshore water, the higher the surge will be. In addition, if the storm surge arrives at the same time as the high tide, the water height will be even greater. The storm tide is the combination of the storm surge and the normal astronomical tide.

Damage during hurricanes may also result from spawned tornadoes and inland flooding associated with heavy rainfall that usually accompanies these storms. Hurricane Andrew, a relatively "dry" hurricane, dumped 10 inches of rain on south Florida and left many buildings extensively water damaged. Rain water may seep into gaps in roof sheathing and saturate insulation and ceiling drywall, in some cases causing ceilings to collapse.

Aside from direct property damage, the potential for crop damage and economic disruption from hurricanes and tropical storms is significant.

Vulnerability

Calhoun County has been impacted by a number of disasters, many of the most significant being hurricanes or tropical storms and associated flooding. Many of these events have resulted in levels of damage that qualified for federal assistance. A list of federally declared disasters since 1985 is contained in this table,

Declared Disasters in Calhoun County (since 1985)

Declaration	Year	Event	Primary Damage
756	1985	Hurricane Kate	Flooding, downed trees, debris
862	1990	Flood	Flooding, debris
982	1993	Winter Storm	Flooding, debris
1035	1994	TS Alberto	Flooding, debris
1069	1995	Hurricane Opal	Flooding, debris
1195	1998	El Nino Floods	Flooding, debris
1249	1998	Hurricane Georges	Flooding
1381	2001	TS Allison	Flooding, debris
1545	2004	Hurricane Frances	Flooding, debris
1551	2004	Hurricane Ivan	Flooding, debris
1595	2005	Hurricane Dennis	Flooding, debris
1785	2008	TS Fay	Flooding, debris
1831	2009	Severe Storms	Flooding, debris

It is difficult to analyze Calhoun County's vulnerability to hurricanes, tropical storms and floods as separate events. In particular, it is unlikely the county will experience a hurricane or tropical

storm without also experiencing flooding. Nor must a hurricane or tropical storm pass directly through Calhoun County to result in flooding. the impacts from hurricanes, tropical storms and floods are so interconnected, the information in this assessment regarding these hazards may overlap.

Tropical storms are highly organized tropical systems with sustained winds between 38 and 74 miles per hour. Although wind damage to structures is possible, the greatest threat from tropical storms in Calhoun County is from flooding along the Apalachicola and Chipola Rivers due to heavy rains. As noted above, the tropical storm doesn't even have to 'hit" Calhoun to cause flooding. Hurricanes are major organized tropical storm events with sustained winds in excess of 74 miles per hour. Damage can be expected from both wind and, for those properties located in the floodplain or low lying areas, flood waters.

Saffir-Simpson Hurricane Scale

Storm Category	Sustained Winds (MPH)	Level of Damage	Examples
Tropical Storm	Less than 74	Not Rated	Tropical Storms Alberto(1994) and Georges(1998)
1	75 to 95	Minimal	Florence(1998)LA, Charley(1988)NC
2	96 to 110	Moderate	Kate(1985), Bob(1991)
3	111 to 130	Extensive	Wilma(2005)FL, Dennis(2005)FL, Jeanne(2004)FL, Ivan(2004)AL, Opal(1995)FL, Alicia(1983)TX
4	131 to 155	Extreme	Charley(2004)FL, Andrew(1992)FL, Hugo(1989)NC
5	Greater than 155	Catastrophic	Labor Day(1935)FL, Camille(1969)MS

Source: National Oceanic and Atmospheric Administration (NOAA)

The Saffir-Simpson Hurricane Scale in the table above describes tropical storms, the various types of hurricanes and the level of damage they may cause. The following table lists all tropical storms and hurricanes that have passed within 60 nautical miles of Blountstown over the last over the last fifty years.

Tropical Storms/Hurricanes Passing Within 60 NM of Blountstown Since 1950

Date	Name	Category	Rainfall	Max. Wind Speed of Storm (mph)*
25 May – 6 June 1953	Alice	TS	NA	69
14-21 Sept. 1953	--	TS	NA	69
23-28 Sept. 1953	Florence	3	NA	127
21-30 Sept. 1956	Flossy	1	NA	92
8-15 June 1957	--	TS	3.86	69
7-9 Sept. 1957	Debbie	TS	11.43	40
28 Aug. – 16 Sept. 1964	Dora	4	4.00	132
28 Sept. – 5 Oct. 1964	Hilda	4	12.42	150
11 – 18 June 1965	--	TS	14.08	52
4 – 14 June 1966	Alma	3	3.24	127
19 – 23 July 1970	Becky	TS	2.96	63
21 – 25 June 1972	Agnes	1	4.99	86
21 – 25 May 1976	Subtropical 1	TS	3.87	52
15 – 23 Nov. 1985	Kate	3	0.00	121
13 – 30 Sept. 1986	Charley	1	0.38	81

9 – 17 Aug. 1987	--	TS	6.31	46
14 – 19 Aug. 1994	Beryl	TS	10.45	58
3 – 11 June 1995	Allison	1	5.06	75
31 Aug. – 8 Sept. 1998	Earl	2	9.17	98
15 Sept. – 1 Oct. 1998	Georges	5	16.14	155
15 – 25 Sept. 2000	Helene	TS	9.50	60
5 – 17 June 2001	Allison	TS	10.13	45
2 – 7 Aug. 2001	Barry	TS	8.91	60
12 – 15 Sept. 2002	Hanna	TS	7.20	50
3-13 Aug.2004	Bonnie	TS	3.22	34
25 Aug. – 8 Sept. 2004	Frances	2	2.48	52
13 – 28 Sept. 2004	Jeanne	3	1.21	42
5 – 6 Oct. 2005	Tammy	TS	3.41	33
10 – 14 June 2006	Alberto	TS	3.25	33
15 – 26 Aug. 2008	Fay	TS	8.25	46

*Note: Historical rainfall records and wind speed data for any location within Calhoun, National Oceanic and Atmospheric Administration (NOAA)

The LMSWG recognizes the importance of statistical probability for tropical cyclone landfall. Below is a table outlining the probability of tropical cyclone landfall within the Calhoun County boundary including all municipal and unincorporated areas.

Tropical Cyclone Climatology Landfall Probabilities for Calhoun County

Time Period	Probability of Tropical Storm-Force (>= 40 mph) Wind Gusts in the County	Probability of Hurricane-Force (>= 75 mph) Wind Gusts in the County	Probability of Intense Hurricane-Force (>= 115 mph) Wind Gusts in the County	Probability of 1 or More Named Storms Making Landfall in the County	Probability of 1 or More Hurricanes Making Landfall in the County	Probability of 1 or More Intense Hurricanes Making Landfall in the County
2009(yearly)	21.9%	6.3%	1.6%	1.7%	.7%	.1%
50 Year	>99.9%	96.5%	55.4%	57.6%	30.8%	3.8%

*Note: Hurricane Landfall Probabilities provided by: www.e-transit.org/hurricane/map.asp

Often, the major impact of a hurricane is felt along the coast; however, the damage can extend far inland. Although Calhoun County is not on the coast, it is within 50 miles of the coast. This does not provide a very large land buffer to significantly reduce the hurricane's wind speeds before reaching the county. The battering effects of the wind from a major hurricane would likely cause significant damage throughout the county, damaging buildings and destroying vegetation.

High Winds Impact

The maps included in Appendix 9 predict the wind patterns for Category 1 through 5 hurricanes, respectively. Wind patterns for a tropical storm were not included because there was no significant difference in the wind speeds throughout the county. There are significant differences in wind speeds for hurricane category storms. Although it is difficult to determine a precise pattern from the maps, higher areas are generally expected to receive the maximum winds, whereas lower lying areas may receive much slower winds. For example, in a Category 2 hurricane, nearly the entire county should experience only Category 1 winds. In a Category 3 hurricane, most of the county should experience Category 2 hurricane winds and some areas will Category 1 winds. However, this pattern is not the same for Category 4 and 5 hurricanes. As the hurricane category increases, more lands are susceptible to the higher winds. However, even in a

Category 5 hurricane, many areas in the county should experience Category 4 hurricane winds. Although the wind impact areas are based on the model, and the boundaries are not exact, the data is useful to local officials when making land use and sighting decisions. For example, the data could be used as part of the hazard criteria when sighting a shelter, or some other critical facility. The locations of the County's critical facilities are depicted on each map. The vulnerability of each structure varies depending on the hurricane category. However, in a Category 2 hurricane, every critical facility is in at least a Category 1 hurricane wind area.

In addition to winds, tropical storms and hurricanes often force coastal waters onshore, in an action referred to as the storm surge. In fact the damage to coastal properties from the storm surge usually exceeds the damage caused by the winds. Although storm surges are generally associated with coastal communities, the surge waters can extend well inland under the proper circumstances. The current model predicts that some areas of Calhoun County may be impacted by storm surge in a Category 5 hurricane. The surge in this instance is caused by coastal waters that push back waters on the Apalachicola and Chipola Rivers. The impact of the surge is likely to be greatest on the Dead Lakes area below State Road 275. However, even though a small section of the county may be susceptible to a storm surge from a Category 5 hurricane, the potential impact from the storm surge is very minimal when compared to the overall wind and rain impact from the hurricane. Calhoun County will likely feel the full force of the winds. In addition, the area is very low lying and has experienced considerable repetitive flooding since 1990. The primary risk to residents in this area is not the storm surge, but the winds and rain.

The table below lists hurricane damage estimated by the modeling for each parcel type, including the number of structures damaged. Residential homes are at the greatest risk of damage. During a category 1 hurricane, less than 1% of residential structures will receive minor damage. Estimated minor damage increases to 15% with 2% of residential structures receiving moderate damage. Estimates from the modeling indicate that nearly every parcel type will receive some level of damage in a Category 2 hurricane. Although the number of parcels damaged and the value of damage are only estimates, this data can be of assistance to County emergency management personnel for pre- and post-disaster planning, such as when preparing disaster mitigation grant requests or post-disaster assistance applications.

Estimated Structural Damage by Category by Occupancy

Category 1 - Expected Building Damage by Occupancy					
	None	Minor	Moderate	Severe	Destruction
Occupancy	Count	Count	Count	Count	Count
Agriculture	3	0	0	0	0
Commercial	56	0	0	0	0
Education	2	0	0	0	0
Government	16	0	0	0	0
Industrial	16	0	0	0	0
Religion	11	0	0	0	0
Residential	4,941	15	0	0	0
Total	5,044	15	0	0	0

Category 2 - Expected Building Damage by Occupancy					
	None	Minor	Moderate	Severe	Destruction

Occupancy	Count	Count	Count	Count	Count
Agriculture	2	0	0	0	0
Commercial	50	5	1	0	0
Education	2	0	0	0	0
Government	15	1	0	0	0
Industrial	14	1	0	0	0
Religion	10	1	0	0	0
Residential	4,311	546	91	5	3
Total	4,403	555	93	6	3

Category 3 - Expected Building Damage by Occupancy					
	None	Minor	Moderate	Severe	Destruction
Occupancy	Count	Count	Count	Count	Count
Agriculture	1	1	1	0	0
Commercial	17	14	16	9	0
Education	1	1	1	0	0
Government	5	4	5	2	0
Industrial	5	4	4	3	0
Religion	3	4	3	1	0
Residential	1,922	1,688	1,053	197	97
Total	1,953	1,715	1,082	212	97

Category 4 - Expected Building Damage by Occupancy					
	None	Minor	Moderate	Severe	Destruction
Occupancy	Count	Count	Count	Count	Count
Agriculture	0	0	1	1	0
Commercial	3	5	15	30	2
Education	0	0	1	1	0
Government	1	1	4	9	0
Industrial	1	1	4	9	1
Religion	0	1	4	5	0
Residential	315	894	1,702	1,187	858
Total	320	904	1,730	1,244	862

Category 5 - Expected Building Damage by Occupancy					
	None	Minor	Moderate	Severe	Destruction
Occupancy	Count	Count	Count	Count	Count
Agriculture	0	0	0	2	1
Commercial	0	1	4	41	10
Education	0	0	0	2	0
Government	0	0	1	14	1
Industrial	0	0	1	13	2
Religion	0	0	1	8	1
Residential	12	88	534	1,564	2,758
Total	13	89	541	1,644	2,774

Source: Hazus Model

Estimated Dollar($) Damage by Category by Occupancy

Category 1 - Building-Related Economic Loss Estimates					
(Thousands of dollars)					
Category Area	**Residential**	**Commercial**	**Industrial**	**Others**	**Total**
Property Damage					
Building	$ 309.96	$ 8.23	$ 2.17	$ 4.69	$ 325.05
Content	$ 10.60	$ 0.03	$ 0.88	$ 0.01	$ 11.53
Inventory	$ -	$ -	$ 0.10	$ -	$ 0.10
Subtotal	$ 320.56	$ 8.26	$ 3.15	$ 4.70	$ 336.68
Business Interruption Loss					
Income	$ -	$ -	$ -	$ -	$ -
Relocation	$ 19.92	$ 0.02	$ -	$ 0.01	$ 19.95
Rental	$ 5.72	$ -	$ -	$ -	$ 5.72
Wage	$ -	$ -	$ -	$ -	$ -
Subtotal	$ 25.64	$ 0.02	$ -	$ 0.01	$ 25.67
Total	**$ 346.20**	**$ 8.28**	**$ 3.15**	**$ 362.35**	**$ 719.98**
Category 2 - Building-Related Economic Loss Estimates					
(Thousands of dollars)					
Category Area	**Residential**	**Commercial**	**Industrial**	**Others**	**Total**
Property Damage					
Building	$ 5,079.09	$ 249.70	$ 74.69	$ 105.52	$ 5,509.00
Content	$ 503.66	$ 59.18	$ 46.54	$ 18.38	$ 627.76
Inventory	$ -	$ 3.00	$ 9.87	$ 1.07	$ 13.94
Subtotal	$ 5,582.75	$ 311.88	$ 131.09	$ 124.97	$ 6,150.70
Business Interruption Loss					
Income	$ -	$ 49.16	$ 1.60	$ 15.32	$ 66.08
Relocation	$ 648.88	$ 61.70	$ 5.88	$ 27.92	$ 744.37
Rental	$ 197.98	$ 31.87	$ 1.36	$ 3.64	$ 234.84
Wage	$ -	$ 45.01	$ 2.67	$ 137.64	$ 185.32
Subtotal	$ 846.86	$ 187.73	$ 11.51	$ 184.51	$ 1,230.61
Total	**$ 6,429.61**	**$ 499.61**	**$ 142.61**	**$ 7,381.31**	**$ 14,453.14**
Category 3 - Building-Related Economic Loss Estimates					
(Thousands of dollars)					
Category Area	**Residential**	**Commercial**	**Industrial**	**Others**	**Total**
Property Damage					
Building	$ 36,448.59	$ 5,567.05	$ 1,680.34	$ 2,623.39	$ 46,319.37
Content	$ 9,894.95	$ 3,052.40	$ 1,269.74	$ 1,238.47	$ 15,455.55
Inventory	$ -	$ 166.33	$ 314.14	$ 21.66	$ 502.13
Subtotal	$ 46,343.54	$ 8,785.77	$ 3,264.22	$ 3,883.52	$ 62,277.05
Business Interruption Loss					
Income	$ 24.49	$ 841.61	$ 51.02	$ 78.34	$ 995.46
Relocation	$ 8,356.87	$ 1,529.48	$ 179.72	$ 845.77	$ 10,911.83
Rental	$ 2,442.06	$ 820.04	$ 33.59	$ 140.49	$ 3,436.18
Wage	$ 57.66	$ 997.90	$ 84.44	$ 728.43	$ 1,868.43
Subtotal	$ 10,881.08	$ 4,189.03	$ 348.77	$ 1,793.03	$ 17,211.90

Total	**$ 57,224.61**	**$ 12,974.81**	**$ 3,612.99**	**$ 79,488.96**	**$ 153,301.37**
Category 4 - Building-Related Economic Loss Estimates					
(Thousands of dollars)					
Category Area	**Residential**	**Commercial**	**Industrial**	**Others**	**Total**
Property Damage					
Building	$145,971.62	$ 24,204.91	$ 6,949.35	$ 12,003.69	$ 189,129.57
Content	$ 55,470.59	$ 16,824.79	$ 6,336.93	$ 7,564.95	$ 86,197.26
Inventory	$ -	$ 852.88	$ 1,538.39	$ 109.14	$ 2,500.41
Subtotal	$201,442.21	$ 41,882.58	$14,824.67	$ 19,677.78	$ 277,827.25
Business Interruption Loss					
Income	$ 280.75	$ 5,036.58	$ 200.73	$ 161.90	$ 5,679.96
Relocation	$ 28,443.90	$ 5,182.01	$ 534.24	$ 3,195.84	$ 37,355.99
Rental	$ 8,388.49	$ 3,224.53	$ 123.71	$ 589.61	$ 12,326.33
Wage	$ 660.90	$ 6,263.18	$ 333.47	$ 1,282.55	$ 8,540.11
Subtotal	$ 37,774.04	$ 19,706.30	$ 1,192.14	$ 5,229.90	$ 63,902.39
Total	**$239,216.26**	**$ 61,588.88**	**$16,016.82**	**$341,729.64**	**$ 658,551.60**
Category 5 - Building-Related Economic Loss Estimates					
(Thousands of dollars)					
Category Area	**Residential**	**Commercial**	**Industrial**	**Others**	**Total**
Property Damage					
Building	$294,948.88	$ 51,747.84	$14,309.65	$ 26,919.01	$ 387,925.37
Content	$129,133.67	$ 44,650.30	$15,805.70	$ 21,464.26	$ 211,053.93
Inventory	$ -	$ 2,095.68	$ 3,772.69	$ 292.52	$ 6,160.90
Subtotal	$424,082.55	$ 98,493.82	$33,888.03	$ 48,675.79	$ 605,140.19
Business Interruption Loss					
Income	$ 864.73	$ 10,070.27	$ 379.76	$ 376.95	$ 11,691.72
Relocation	$ 52,137.36	$ 8,953.57	$ 839.68	$ 5,800.74	$ 67,731.34
Rental	$ 16,414.72	$ 5,926.00	$ 217.39	$ 1,096.71	$ 23,654.82
Wage	$ 2,035.53	$ 12,770.52	$ 631.97	$ 2,855.00	$ 18,293.03
Subtotal	$ 71,452.34	$ 37,720.37	$ 2,068.79	$ 10,129.41	$ 121,370.91
Total	**$495,534.89**	**$136,214.19**	**$35,956.82**	**$ 58,805.20**	**$ 726,511.10**

Source: Hazus Model

Damage estimates are calculated assuming that a storm hits an area nearly equally from all directions and at the maximum speed. Therefore, a Category 2 hurricane is estimated to hit a community from many different directions at 110 mph. In addition, the model employs damage multipliers that standardize the level of damage among similar structures. Therefore, a wooden structure built in 1950 is assumed to have the same amount of damage as a structure built in 1999, and a concrete block building is assumed to have the same level of damage as a reinforced concrete block building. Clearly, these assumptions increase the likely impact of a tropical storm or hurricane.

In addition to structural damage, tropical storms and hurricanes can create a lot of debris. Fallen trees and structural debris can hamper vehicle traffic and response/recovery events. The public cost of removing debris and repairing damaged infrastructure is often the largest public expense associated with hurricanes. The following table displays the amount of debris estimated by the modeling that will be generated from a tropical storm and each category of hurricane. It is important to note that these values include not only debris from structures and contents, but debris

from forested areas and croplands as well. Unfortunately, the model does not distinguish between structural debris and trees debris.

Storm Debris Estimates

Storm Category	Amount of Debris (Tons)	Storm Category	Amount of Debris (Cubic Yards)
Tropical Storm	0*	Category 3 Hurricane	956,247
Category 1 Hurricane	47,386	Category 4 Hurricane	1,876,693
Category 2 Hurricane	414,728	Category 5 Hurricane	3,001,487

Source: Hazus MH. * (0 value result generated by Hazus model co-efficient of building damage, vegetative debris damage outside of Hazus model estimated at 8,000 CY historically).

3.1.6. Severe Thunderstorms & Tornadoes

Hazard Profile

Severe Thunderstorm/Lightning

A severe thunderstorm is defined as a thunderstorm containing one or more of the following phenomena: hail 3/4" or greater, winds gusting in excess of 57.5 mph, and/or a tornado. Severe weather can include lightning, tornadoes, damaging straight-line winds, and large hail. Most individual thunderstorms only last several minutes, however some can last several hours.

Long-lived thunderstorms are called super cell thunderstorms. A super cell is a thunderstorm that has a persistent rotating updraft. This rotation maintains the energy release of the thunderstorm over a much longer time than typical, pulse-type thunderstorms which occur in the summer months. Super cell thunderstorms are responsible for producing the majority of severe weather, such as large hail and tornadoes (National Oceanic and Atmospheric Administration). Downbursts are also occasionally associated with severe thunderstorms. A downburst is a strong downdraft resulting in an outward burst of damaging winds on or near the ground. Downburst winds can produce damage similar to a strong tornado. Although usually associated with thunderstorms, downbursts can even occur with showers too weak to produce thunder (National Oceanic and Atmospheric Administration). Strong squall lines can also produce widespread severe weather, primarily very strong winds and/or microburst.

When a severe thunderstorm approaches, the National Weather Service will issue alerts. Two possible alerts are:

- *Severe Thunderstorm Watch* - Conditions are favorable for the development of severe thunderstorms.

- *Severe Thunderstorm Warning* - Severe weather is imminent or occurring in the area.

Perhaps the most dangerous and costly effect of thunderstorms is lightning. As a thunderstorm grows, electrical charges build up within the cloud. Oppositely charged particles gather at the ground below. The attraction between positive and negative charges quickly grows strong enough to overcome the air's resistance to electrical flow. Racing toward each other, they conned and complete the electrical circuit. Charge from the ground then surges upward at nearly one-third the speed of light and produces a bright flash of lightning.

On average, more people are killed by lightning than any other weather event. Florida leads in the nation in lightning related deaths and injuries (National Lightning Safety Institute). Florida also has the most strikes, about 12 strikes per square kilometer per year in some places (National Lightning Safety Institute). Nationwide, lightning related economic losses amount to over $5 billion dollars per year, and the airline industry alone loses approximately $2 billion a year in operating costs and passenger delays from lightning. The peak months for lightning strikes are June, July, and August, but no month is safe from lightning danger.

Tornadoes
Florida ranks third in the United States in the number of tornado strikes, and the first in the number of tornadoes per square mile. The odds of a tornado striking any specific point in Florida are 0.04, Or once per 250 years.

Tornadoes are classified using the Fujita-Pearson scale as follows:

F = Intensity	P = Path Length	W = Mean Width
F0 = Light Damage	P0 = less than 1 mile	W0 = less than 0.01 mile
F1 = Moderate Damage	P1 = 1.0 to 3.1 miles	W1 = 0.01 to 0.03 mile
F2 = Considerable Damage	P2 = 3.2 to 9.9 miles	W2 = 0.04 to 0.09 mile
F3 = Severe Damage	P3 = 10.0 to 31.0 miles	W3= 0.10 to 0.31 mile
F4 = Devastating Damage	P4 = 32.0 to 99.0 miles	W4 = 0.32 to 0.99 mile
F5 = Catastrophic Damage	P5 = 100 miles or greater	W5 = 1.00 miles or wider

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud. It is generated by a thunderstorm (or sometimes as a result of a hurricane) and produced when cool air overrides a layer of warm air, forcing the warm air to rise rapidly. The damage from a tornado is a result of the high wind velocity and wind-blown debris. The most common type of tornado, the relatively weak and short-lived type, occurs in the warm season with June being the peak month. The strongest, most deadly tornadoes occur in the cool season, from December through April. Occasional storms such as the spring storm of May 17, 2009 are also widespread and destructive.

When a tornado threatens, only a short amount of time is available for life-or-death decisions. The National Weather Service (NWS) issues two types of alerts:

- A Tornado *Watch* means that conditions are favorable for tornadoes to develop.
- A Tornado Warning means that a tornado has actually been sighted.

Vulnerability

Calhoun County Severe Thunderstorm & Straight Line Wind (1960-2008)

Date	Time	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
4/3/1960	600	0 kts.	0	0	0	0
4/30/1963	930	0 kts.	0	0	0	0
2/5/1971	400	0 kts.	0	0	0	0
2/8/1971	400	0 kts.	0	0	0	0
7/11/1979	1110	0 kts.	0	0	0	0

12/5/1983	1630	0 kts.	0	0	0	0
12/6/1983	700	0 kts.	0	0	0	0
12/31/1985	1600	0 kts.	0	1	0	0
4/19/1991	1400	0 kts.	0	0	0	0
6/25/1994	845	0 kts.	0	0	1K	0
8/15/1994	1500	0 kts.	0	0	5K	0
6/10/1995	1515	0 kts.	0	0	0	0
7/13/1995	1710	0 kts.	0	0	0	0
7/16/1995	1835	0 kts.	0	0	0	0
7/18/1995	1755	0 kts.	0	0	0	0
3/25/1996	11:55 AM	0 kts.	0	0	0	0
1/15/1997	11:50 PM	0 kts.	0	0	10K	0
8/20/1997	4:44 PM	0 kts.	0	0	5K	0
6/22/1998	5:30 PM	0 kts.	0	0	5K	0
8/14/1999	3:30 PM	0 kts.	0	0	10K	0
9/6/1999	3:30 PM	0 kts.	0	0	1K	0
1/24/2000	5:00 AM	0 kts.	0	0	35K	0
1/24/2000	5:10 AM	0 kts.	0	0	20K	0
3/11/2000	7:50 PM	0 kts.	0	0	3K	0
7/16/2000	3:05 PM	0 kts.	0	0	20K	0
8/25/2000	5:00 PM	0 kts.	0	0	0K	0
10/13/2002	3:30 PM	0 kts.	0	0	1K	0
4/30/2004	2:00 AM	50 kts.	0	0	10K	0
3/26/2005	9:30 PM	60 kts.	0	0	1.0M	0
5/27/2006	4:26 PM	55 kts.	0	0	1K	0
6/22/2006	5:30 PM	50 kts.	0	0	2K	0
3/1/2007	23:30 PM	55 kts.	0	0	3K	0K
6/12/2007	14:00 PM	50 kts.	0	0	2K	0K
8/11/2007	15:30 PM	50 kts.	0	0	1K	0K
8/18/2007	20:15 PM	50 kts.	0	0	2K	0K
8/24/2007	13:18 PM	50 kts.	0	0	10K	0K
2/17/2008	21:11 PM	50 kts.	0	0	0K	0K
6/29/2008	15:40 PM	55 kts.	0	0	10K	0K
12/11/2008	5:30 AM	45 kts.	0	0	5K	0K

Nationally, Florida ranks fourth in the annual occurrence of tornadoes. Due to favorable weather conditions along the Gulf Coast, tornadoes are a common occurrence throughout the Panhandle. The most active season is May through August, with June being the peak month. During this season, warm, humid air from the Gulf moves inland and mixes with cooler air from squall lines. This allows the humid air to rise, resulting in an intense upper level disturbance. This upper-level

disturbance provides a strong vertical wind shear, which can result in a twisting updraft or super cell. The final result can be a tornado.

Tornado strength is measured using the Fujita (or F) scale, which describes the estimated damage caused by the tornado as it passes over man-made structures. Under the Fujita scale, F-0 and F-I tornadoes are considered "weak," F-2 and F-3 are "strong," and F-4 and F-5 are "violent" (USA Today Weather Almanac). Most tornadoes in Florida are either F-0 or F-1; very few exceed F-2. The estimated damages and wind speeds for each category of tornado are described in this table.

Description of Tornado Ratings

F-scale	Estimated Damage	Wind Speed
F-0	Light Damage	Wind up to 72 mph
F-1	Moderate Damage	Wind 73 to 112 mph
F-2	Considerable Damage	Wind 113 to 157 mph
F-3	Severe Damage	Wind 158 to 206 mph
F-4	Devastating Damage	Wind 207 to 260 mph
F-5	Incredible Damage	Wind above 261 mph

Source: NOAA

The Panhandle area has a rich history of tornado activity, especially during the warmer months. Since 1950, Calhoun County has experienced approximately 18 reported tornadoes. Tornadoes that touchdown in unpopulated areas often go unreported, so the actual count may be higher. Of the 18 reported tornadoes, 11 have been F-1 or less and 7 have been F-2. There have been no documented tornadoes of F-3 or higher within Calhoun. The only documented F-3 tornado in the region occurred 10 December 1967, in Bay County, killing 1 person and injuring 50. Calhoun County has been fortunate in this regard, as there have been only 22 reported injuries from tornadoes and 29 fatalities.

The following table provides a summary of reported tornadoes within Calhoun County, including magnitude, deaths/injuries, and property/crop damage, between 1952 and 2008.

Calhoun County Tornado History (1952 – 2008)

Date	Time	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
1/28/1952	530	F1	0	3	25K	0
6/20/1961	1250	F	0	0	0K	0
12/10/1967	900	F2	0	0	25K	0
5/8/1972	915	F2	0	0	25K	0
1/12/1975	1045	F2	0	0	250K	0
7/7/1975	1257	F0	0	0	25K	0
4/4/1979	840	F1	0	0	250K	0
10/25/1981	1630	F2	0	12	2.5M	0
12/5/1982	630	F1	0	0	25K	0
3/12/1993	2200	F	25	0	1.6B	2.5M
11/11/1995	954	F0	0	0	0	0

1/15/1997	11:43 PM	F2	0	1	50K	1K
1/15/1997	11:45 PM	F1	0	0	50K	0
10/24/1997	11:35 AM	F1	0	0	100K	0
10/26/1997	10:26 AM	F1	0	1	50K	0
3/12/2001	6:00 PM	N/A	0	0	0	0
3/15/2001	6:30 AM	F2	0	0	50K	0
9/15/2004	9:07 PM	F2	4	5	2.5M	0

Source: ncdc.noaa.gov

The unpredictability and sheer strength of tornadoes presents a unique challenge to community readiness. Tornado preparation is largely dependent on the effectiveness of the local warning system and an understanding by local residents of how they should respond during an actual tornado or a tornado warning. In Calhoun County, tornado watches / warnings are issued by the National Weather Service through the local television and radio networks. County emergency management has provided may public and private facilities (such as schools, day care center, community center, the Senior Center, health facilities, nursing homes, etc.) with National Oceanographic and Atmospheric Administration (NOAA) weather radios that provide automatic severe weather warnings. Early warning is especially important for residents of manufactured homes who may need to seek shelter at an alternate location. In addition to advanced warning, mitigation may also be achieved through building reinforcement and the construction of safe rooms.

3.1.7. Floods

Hazard Profile

Floods are the most common and widespread of all natural disasters. Most communities in the United States can experience some kind of flooding after spring rains, heavy thunderstorms, or winter snow thaws. Floods can be slow or fast rising but generally develop over a period of days.

Dam failures are potentially the worst flood events. A dam failure is usually the result of neglect, poor design, or structural damage caused by a major event such as an earthquake. When a dam fails, a gigantic quantity of water is suddenly let loose downstream, destroying anything in its path.

Flash floods usually result from intense storms dropping large amounts of rain within a brief period. Flash floods occur with little or no warning and can reach full peak in only a few minutes. (FEMA)

Sources of flood waters in Calhoun County include the Apalachicola and Chipola Rivers.

Vulnerability

Overview

Calhoun County is in the east-central Florida panhandle. The subzones are the Gulf coastal Lowlands, Fountain Slope, New Hope Ridge, and Grand Ridge. The Gulf Coastal Lowlands comprise much of the lower half of Calhoun County. This subzone is characterized by a generally flat and commonly swampy, seaward sloping, sandy plain. Most of the coastal lowlands area has been sculpted into a series of marine terraces by high standing Pleistocene seas. Elevations in

the Gulf Coastal Lowlands in Calhoun County range from 25 to 65 feet above mean sea level (MSL) at the southern edge of the county to about 100 feet above MSL at the point where the lowlands meet the higher ridges in the middle part of the county.

Three topographically higher subzones are in the northern portion of the county. They are Fountain Slope, New Hope Ridge, and Grand Ridge. Fountain Slope is the name given by White, Puri, and Vernon (1964) to the ramp like, northward-rising topographic slope separating the Gulf Coastal Lowlands and New Hope Ridge. The elevations of Fountain Slope range from about 100 feet above MSL at its southern edge, adjacent to the coastal lowlands, to about 180 feet above MSL at New Hope Ridge to the north. New Hope Ridge occupies northwestern Calhoun County, west of the Chipola River (White, Puri, and Vernon, 1964). The Chipola River valley separates New Hope Ridge from Grand Ridge, which has similar elevations and is in the eastern part of Calhoun County. Both ridges are believed to be stream-incised remnants of a once continuous highland spanning north Florida from the Alabama line eastward to Putnam County. New Hope Ridge and Grand Ridge are topographically high. They have elevations generally ranging between 150 and 250 feet above MSL. Both are comprised of resistant clayey-sands overlying limestone. Several collapse depressions and sinkhole lakes on New Hope Ridge belie a karstic nature of the underlying limestone,

The Apalachicola and Chipola Rivers are the major streams in Calhoun County. The Apalachicola River forms the eastern boundary of the county. In the northeastern part of the county, the elevation of the broad Apalachicola Valley averages about 50 feet above MSL. The valley forms a divide between the bluffs of the Tallahassee Hills to the east in Liberty County and the topographically lower, gently rolling hills of Grand Ridge. The river meanders southwestward through a three-mile wide valley, which descends to an elevation of about 25 feet above MSL at the southern edge of Calhoun County.

The Chipola River flows southward through the east-central part of Calhoun County and forms Dead Lake near the southern boundary of the county. In places, the river is well incised. In the northern part of Calhoun County, Miocene limestone and Pliocene shell beds are exposed along the course of the river. Several smaller surface streams contribute to the Chipola River. Ten-mile Creek, Four-mile Creek, and Juniper Creek form a southward succession of well-incised, northwest to southeast trending tributaries entering the Chipola River from the west. These creeks may define a parallel series of relict beach ridge systems. In the southern part of the county, Cypress Creek drains several low, swampy areas and ultimately empties into Dead Lake.

Flooding Assessment

In Calhoun, the greatest damage from a hurricane is likely to be from flooding. The map in Appendix 9 shows the floodzone and future land uses for the entire county. Altha is located outside of the 100-year floodplain. Based on current flood maps and the 2000 Census, nearly 29 percent of the unincorporated county and 31 percent of Blountstown are in the floodplain. The percentages could possibly increase when the flood maps are updated by the Federal Emergency Management Agency (FEMA) to include additional areas of the county and City of Blountstown in the floodplain. The status of the Map Modernization program is discussed in the Mitigation Strategy.

Calhoun County Flooding History (1994 – 2009)

Date	Time	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
7/5/1994	0	N/A	0	0	500K	50.0M
10/2/1994	1600	N/A	0	0	5.0M	0
3/10/1998	12:00 AM	N/A	0	0	367.0M	0
6/11/2001	6:00 PM	N/A	0	0	0	0
3/3/2002	2:00 AM	N/A	0	0	10K	0
9/14/2002	11:00 PM	N/A	0	0	10K	0
3/31/2009	20:00 PM	N/A	0	0	0K	0K

The most vulnerable populated area in the county is the City of Blountstown due to its close proximity to the Apalachicola River. Major areas of the City's northern, southern and eastern sections lie within the river's 100-year floodplain. The Apalachicola River has an average daily flow of 25,000 cubic feet/second, which is the greatest flow of any river in Florida. The Jim Woodruff Dam completed in 1957 and positioned approximately 30 miles north, in the City of Chattahoochee, moderately regulates the flow of the river. However, the main purpose of the dam is navigation, not flood control. During periods of up-river flooding, the dam must release water to maintain a safe height behind the dam. These waters can quickly overflow the river bank, filling the floodplain and flooding the city and major sections of the county.

According to a 1987 FEMA Flood Insurance Study, flooding within the city is further impacted due to inadequate drainage systems and the lack of sufficient road culverts and outlets. In addition to areas in the eastern section of the city, residents in the central part of the city, particularly along Sutton Creek and Lake Hilda, are also impacted by the lack of sufficient drainage. Sutton Creek flows southeast through the center of Blountstown draining nearly 13.7 square miles of the city. The creek rejoins the Apalachicola River south of the city. During flooding on the Apalachicola River, the creek often backs up, flooding central areas of the city.

The highest known flood in Blountstown occurred March 29, 1929 reaching a maximum elevation of 28.6 feet. The following table lists the most recent Apalachicola River flood elevation readings at the US Geological Survey Stream Gauge near Blountstown. It is important to note that the minimal reading that qualifies as a flood is 15 feet. Revised flood elevations for the Blountstown gauge defined the 100-year flood at 29.5 feet and the 50-year flood at 27.5 feet.

Apalachicola River, Calhoun County, Florida
Hydrologic Unit Code 03130011
Latitude 30°25'30", Longitude 85O01'53" NAD27
Drainage area 17,600.00 square miles
Contributing drainage area 17,600.00 square miles
Gage datum 26.96 feet above sea level NGVD29

Apalachicola River Flood Crests

Rank	Date	Flood Elevation
1	3/21/1929	28.6
2	1/24/1925	27.9
3	7/10/1994	27.4
4	3/13/1998	27.34
5	3/21/1990	26.3
6	1/29/1978	25.1
7	4/28/1928	24.6
8	3/08/1966	24.4
9	4/09/1960	24.3
10	7/01/1916	23.8
11	4/13/1964	23.7
12	3/03/1961	23.7
13	4/03/1944	23.6
14	4/15/1936	23.6
15	12/06/1948	23.5
16	3/27/1943	23.5

Source: National Weather Service

Chipola River, Calhoun County, Florida
Hydrology Unit Code 03130012
Latitude 30°32'02", Longitude 85O09'55" NAD27
Drainage area 781.00 square miles
Gage datum 19.95 feet above sea level NGVD29

Chipola River Flood Crests

Rank	Date	Flood Elevation
1	9/20/1926	33.55
2	4/05/1948	32.2
3	3/13/1998	31.23
4	7/11/1994	29.6
5	4/16/1975	29.43
6	4/08/1960	28.42
7	3/14/1978	26.98
8	3/13/1947	26.42
9	5/07/1964	26.05
10	10/02/1929	25.2
11	3/02/1979	25.1
12	5/22/1946	23.85
13	4/24/1925	23.7
14	7/31/1975	23.45
15	4/05/1973	23.42
16	1/15/1964	23.18

Source: National Weather Service

Both the County and the City of Blountstown have a large number of residents and property located in the floodplain. The following table describes the distribution of residents in the 100-year floodplain based on the 2000 Census. In Blountstown, 30 percent of city residents live in the floodplain and slightly more than 20 percent of those residents are aged 65 and over. This number may be somewhat lower due to the City's purchase of over 40 homes in the floodplain since 1996 under federal/state grants. In the unincorporated area of the county, the numbers are less, 18

percent of residents live in the floodplain, and 19 percent are aged 65 and over. This number may be slightly higher if recent development along the Chipola River is included. Note: The population distribution data in this table was determined by overlaying Census block information with the current Calhoun County floodplain map boundaries. In some cases, a Census block may extend beyond the floodplain boundaries. For this analysis, it was assumed that if any portion of a Census block was in a floodplain, the entire population of that block was in the floodplain.

Distribution of County and Municipal Residents in the Floodplain

Community	No. of Residents in Floodplain	Percentage	No. of Residents 65 and Over in Floodplain	Percentage
Altha	0	n/a	0	n/a
Blountstown	763	30%	153	20%
Unincorporated	1,770	18%	336	19%

Source: 2000 Census

The table below describes this distribution of residential dwellings in the 100-year floodplain based on the 2000 Census. In Blountstown 31 percent of homes are located in the floodplain, and they account for 25 percent of the value of all residential dwellings in the city, In the unincorporated areas of the county, 20 percent of homes are in the floodplain and they account for 20 percent of the value of all residential dwelling units in the county. As noted before, these numbers may be slightly lower or higher, depending on the level of housing activity since the last census. Once the structure identification for the E-911 base map is complete, the County will be able to prepare a more accurate assessment of population and properties located in the floodplain and other hazard susceptible areas. Again, the population distribution data in this table was determined by overlaying Census block information with the current Calhoun County floodplain map boundaries.

Distribution of County and Municipal Residential Dwellings in the Floodplain

Community	No. of Residents in Floodplain	Percentage	No. of Residents 65 and Over in Floodplain	Percentage
Altha	0	0	0	0
Blountstown	320	31%	$9,070,600	25%
Unincorporated	911	20%	$33,466,300	20%

Source: 2000 Census

Another important consideration is the number of hazardous materials facilities and critical facilities located in the floodplain. Of the seven fixed hazardous materials facilities (a detailed description of each facility is contained in the Hazardous Materials Analysis section) located in Calhoun County, only two are located in the floodplain or on the fringe of the floodplain. Blountstown's wastewater treatment plant is located in the floodplain, along Sutton Creek; and the GT Comm., Inc., building on State Road 71 North is located on the fringe of the floodplain. If the chlorine stored at the facility to treat water at the City's three potable water wells were stored at one of the well sites, no facility would be located directly in the floodplain; although the GT Comm. Facility would still be at some risk.

In addition to hazardous materials facilities, there are a number of critical facilities also located in the floodplain. Critical facilities are facilities the County has determined are critical to the maintenance of the health, safety and welfare of its residents, and are necessary to help the County respond to and recover from a disaster. The County has identified 35 critical facilities outlined in the following table, covering a wide range of structures and uses, including water

wells, wastewater treatment plants, medical facilities, elder care facilities, airstrips, and law enforcement.

A significant portion of development in the City of Blountstown is in the floodplain; therefore many of the critical facilities needed to help the community respond to and recover from a disaster are also located in the floodplain. Of the 35 facilities, 12 are located either in the floodplain or adjacent to the floodplain (see the following table and map). The vulnerable location of these facilities places an additional strain on the ability of the County to provide many of the services most needed following a major flood.

Critical Facilities Located In or Adjacent to 100-Year Floodplain

Facility Name	Facility Name
Landmark Health Care Center	Calhoun Hospital
Ropers Personal Home Care	5 Oaks Retirement Home
Bethel Christian School	Blountstown Wastewater Treatment Plant
Blountstown Junior High School	Cumbaa Enterprises C&D Landfill
Clarr Elementary/Junior High School	Clarksville Airfield
Calhoun County Correctional Institute	City of Blountstown Transfer Station

Source: Calhoun County Emergency Management

Although flooding is a serious hazard facing the county, it does not have to be a 100-year flood event to cause serious damage and disruption to everyday activities. As indicated earlier, there has not been a 100-year flood in the county this century. In fact, the three major floods that have occurred since 1990 have all been 50-year events or less. The 1990 March storm event was just shy of the 50-year flood elevation, while Tropical Storm Alberto exceeded it by six inches and the 1998 El Nino phenomena matched the 50-year gauge reading of 27.5 feet. Although these three events were at or near the 50-year elevation and each took place within a nine-year span, this activity should be considered abnormal. The last flood event that exceeded the "58-year" flood level was the 1929 event discussed earlier.

The floods associated with Tropical Storm Alberto damaged many properties throughout the county. Following the floods, Calhoun County and the City of Blountstown began a major mitigation effort to reduce future flood damages. Combined, the County and Blountstown bought and demolished nearly 50 residential structures located in the floodplain, elevated 20 residential structures and 2 public/commercial structures at least one foot above the base flood elevation, repaired and flood proofed manholes and wastewater lift stations, and upgraded the City's wastewater treatment plant.

Following the March 1998 El Nino floods, Calhoun County Emergency Management conducted a damage survey of flood damaged and/or isolated properties within the Apalachicola and Chipola River flood basins. The following tables summarize flood damages associated with the 1998 El Nino event for unincorporated Calhoun County and the City of Blountstown, respectively. The Town of Altha had no reported flood damage.

Damage from 1998 El Nino Flood, Unincorporated Calhoun County

Structure Type	Minor Damage	Major Damage	Destroyed	Isolated
Single Family	107	51	0	8
Mobile Home	36	0	39	1
Business	22	11	1	2
Public Facility	5	0	0	1
TOTALS	170	62	40	12

Source: Calhoun County Emergency Management

Damage from 1998 El Nino Flood, City of Blountstown

Structure Type	Minor Damage	Major Damage	Destroyed	Isolated
Single Family	15	23	2	84
Mobile Home	1	0	0	6
Business	10	3	0	0
Public Facility	2	1	0	1
TOTALS	28	27	2	91

Source: Calhoun County Emergency Management

County-wide, 198 properties received minor damage, 89 properties received major damage, 42 properties were destroyed, and 103 properties were isolated. The next table describes the level of damage by major structure type. The estimated impact to businesses was over $220,000 in lost income/contracts. On the positive side, the impact of the floods was reduced by an active mitigation program on the part of the County and City governments that included the purchase of over 50 homes in the floodplain; the elevation of more than 20 homes, public buildings or businesses in the floodplain; and improvements in public infrastructure, such as the upgrade of Blountstown's wastewater treatment plant, the repair and flood proofing of manholes, the elevation of wastewater lift stations, and the flood proofing of electrical sub-stations.

County-wide Structure Damage from El Nino Floods

Structure Type	Minor Damage	Major Damage	Destroyed
Single Family	122	74	2
Manufactured Homes	37	0	39
Multi-Family	0	0	0
Business	32	14	1
Public Facility	7	1	0

Source: Calhoun County Emergency Management

Calhoun County Emergency Management estimates the damages from the El Nino floods were less than from the Tropical Storm Alberto floods even though the flood levels were very similar. Indications are that a great deal of the damage reduction was due to the mitigation efforts of the County and City of Blountstown following Tropical Storm Alberto. Residents were more aware of the flood danger and many took personal efforts to lessen flood damage, such as moving household goods from homes or rooms they expected would flood. These sentiments are supported by the Blountstown City Manager who noted that the City spent far less money on recovery efforts for El Nino than they did for Tropical Storm Alberto

In response to mounting losses from flooding nationwide, the United States Congress initiated the National Flood Insurance Program in 1968. The program is administered through FEMA. Under this program, FEMA produces maps, which show areas subject to various levels of flooding under different conditions. This flood risk information is based on historic, meteorological, hydrologic, and hydraulic data, as well as open-space conditions, flood control works, and

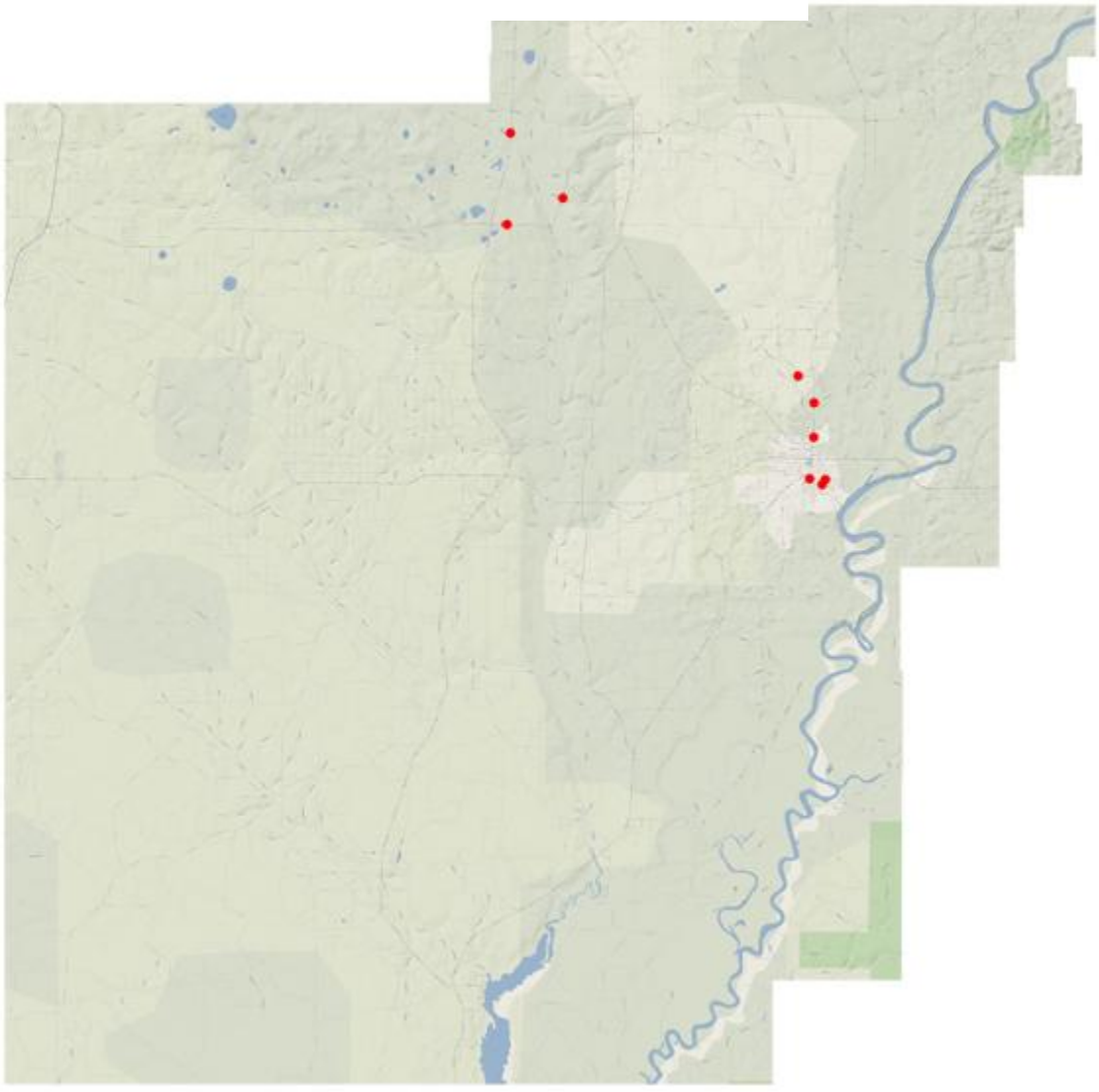
development. This information can be used to identify structures subject to repetitive flood losses. The Federal Emergency Management Agency defines repetitive loss as any insured loss, or combination of insured losses, of $1,000.00 or more within 10 years of the most recent flood event. Repetitive flood loss data is useful in not only identifying specific structures at risk, but for identifying areas at risk of flood damage and for developing local policies to limit flood-related damage in the future. The following table lists all structures listed by the National Flood Insurance Program (NFIP) as repetitively damaged.

Repetitive Loss Data (from National Flood Insurance Program)

ADDRESS	D of L	D of L	D of L	D of L	D of L	D of L
E AZALEA DR	03/11/1998	07/10/1994				
HOUSTON ST	03/09/1998	07/09/1994				
SE PALM ST	09/16/2004	03/09/1998				
N PEAR ST	03/15/2005	03/11/1998				
4.5 MI W OF ALTHA	07/10/1994	03/03/1991				
2 1/2 M N OF BOUNTSVILLE	07/10/1994	03/19/1990				
GENERAL DELIVERY	03/31/2005	03/09/1998				
HW 69 N 6 MI	03/11/1998	07/08/1994				
HW 69 NORTH	07/08/1994	03/20/1990				
ALTHA FL OFF ST	07/08/1994	03/01/1991	02/11/1986	03/05/1984	03/04/1979	03/10/1978
3 MI W OF ALTHA	03/12/1998	07/10/1994	03/03/1991			

Source: FEMA, National Flood Insurance Program (NFIP)

Map of Calhoun County Repetitive Loss Structures



Local flooding experience indicates this list should be much higher. One reason the number may be low is because so few households have flood insurance. There are over 2,700 dwellings in the floodplain. However, there are only 180 flood insurance policies written on structures in the County. If the number of households that received some type of federal and/or state post-disaster assistance were included, the number would undoubtedly be much higher. It should be noted that of the nine structures / properties listed in the table below, one has been elevated two feet above the base flood elevation, two have been acquired by the County under a federal / state disaster recovery grant from Tropical Storm Alberto, one is scheduled for acquisition under a current state grant, and two properties were probably acquired in 1997 under the Tropical Storm Alberto recovery grant. Unfortunately, detailed location information on the two properties was not provided from the NFIP. However, since the sections where the properties are located are in areas that flooded in March 1998, and neither property is listed as having any damage, it can be assumed the properties were acquired in 1996 or 1997.

The following table lists the nearly 200 properties by street that were identified during the County's post El Nino flood damage survey as having suffered some type of damage in one or more floods since 1990. Although the information is useful for planning purposes, its did suffer from some collection problems, and is not an accurate list of repetitively damaged properties in Calhoun County. Repetitively lost properties are discussed above. First, property owners were generally not available during the inspection period. As a result, whether or not a property had been flooded since 1990 was usually determined by interviewing non-flooded neighbors and/or the City / County building officials. Second, the amount of damage from previous floods was not determined during the survey. Therefore, it cannot be determined if the cumulative damage amount is $1,000 or more. Finally, the survey was NOT conducted uniformly throughout the county. There were several teams concentrating on different areas of the county and the data collection methods were not constant. As a result of these data collection problems, this table should be viewed as a planning tool only.

Areas Suffering Repetitive Loss (County Survey)

Location / Road Name	Est. No. of Properties with Repetitive Losses	Location / Road Name	Est. No. of Properties with Repetitive Losses
City of Blountstown:		**Apalachicola River Basin(Cont.):**	
East Central Ave. (State Road 20)	1	State Road 69 South (at Hughes Creek)	25
River Street	10	McDaniel Road	5
Palm Street	11	Sheard Road	3
Gadsden Street	7	Hough Street	5
Martin Luther King Dr.	1	Cooper Road	4
Azalea Street	4	Woods Cemetery Rd.	1
Lockwood Ave.	6		
Houston Street	4	**Chipola River Basin:**	
Boyd Street	1	Blackbottom Road	6
Mayhaw Street	4	Logan Road	2
Ridge Avenue	1	Lamb Eddy Road	10
Thomas Avenue	1	New Landing Road	2
Yates Street	1	Bailey Subdivision	15
Janet Street	3	Bailey Cemetery Rd	4
Pear Street	3	C.J. Roberts Road	2
		Jack Lake Road	5
Apalachicola River Basin:		State Road 71 (at Scott's Ferry)	4
State Road 69 North	2	Lee Bailey Road	14
M.G. Holley Road	1	Blon Carter Road	1
Van Lierop Road	1	Red Horse Sucker Dr.	2
Hickory Road	1	Holt Drive	1
Pine Street	1	Baker Road	2
Mason/Overholt Road	6	B.H. Stone Road	16
			Total Repetitive Loss Properties: 199

Source: Calhoun County Emergency Management

Although the information in the previous tables do not completely describe repetitive flood losses within the county, it is still very valuable to local elected officials, building officials and emergency management personnel in assessing the likely impact from a flood and developing

policies and procedures to limit the possible damage from future floods. For example, local officials could concentrate flood acquisition efforts in those areas most subject to repetitive flood damage. This is an approach the federal government appears to be taking. Initial planning efforts are underway to develop procedures for identifying structures the federal government believes would be cost beneficial to purchase rather than to continue providing flood-damage assistance (either from insurance or from disaster assistance payments).

Another area in which the general repetitive loss information may be useful is in assisting local building officials in post-disaster recovery efforts. Since many post-flood repairs in these areas are often made without the property owner acquiring a building permit, local building officials could develop procedures that concentrate post-flood inspections in the most susceptible areas, concentrating on particular portions of a structure, ensuring that building permits are issued as rapidly as possible, and that all required code requirements are met. The code requirement is of particular importance. As a participant in the National Flood Insurance Program (NFIP), the County is required to have any structure damaged at *50* percent or more of its market value brought up to current code requirements. This includes elevating structures two feet above base flood elevation. Failure to meet this requirement could jeopardize the County's continued participation in the NFIP.

In addition to flooding from measurable events (25-year flood, 50-year flood, 100-year flood, etc.) which do not generally occur on a yearly basis, many areas of the county are susceptible to rapid, heavy downpours which are extremely common throughout the year. Given the county's proximity to the Gulf, heavy rains, often associated with thunderstorms are common occurrences. Although the flood damage to structures is generally very limited from these storms, the rains often wash out major portions of the County's dirt roads. There are approximately 510 miles of road in Calhoun, with nearly 256 miles unpaved. Many of these unpaved roads are washed out several times each year from heavy rains. In recent years, the County has paved sections of the most vulnerable roads, as well as upgraded culverts and headwalls, in an attempt to reduce future damage from heavy rains and flooding. However, many roads remain vulnerable. In addition, some paved roads are also flooded during heavy rains due to inadequate culverts and drainage networks. The following table lists the most vulnerable roads. Several of the roads are also listed in table above referring to repetitive flood losses. This table emphasizes the identification of roads, and not properties, that are repetitively damaged even in relatively minor storms.

Flood Vulnerable County Roads

Road Name	Road Name	Road Name
Cypress Creek Bridge	L.K. Lona Road	Fortner Road
County Road 286	Charlie Wood Road	J.J. Young Road
Ten-Mile Creek Bridge	Leonard Varnum Road	Parrish Lake Road
Chipola Road	Woodman Road	Guiford Road
Hugh Creek Road	Bailey Cemetery Road	Go Cart Road
County Road 10	County Road 12	Palm Beach Drive
Blackbottom Road	Lee Farm Road	Terry Street
County Road 274	Dennis Parrish Road	Juniper Creek Road
Whitewater Road	Creek Road	County Road 1
Glory Hill Road	County Road 275A	John Redd Road
Newsome Road	Ocheessee Landing Rd.	Cook Road
Cain Road	Pendarvis Road	Tomato Patch Road
Lamb Eddy Road	Flatwood Road	Hanna Tower Road
Watson Road	Shorty Segers Road	Oak Street (Altha)
John F. Bailey Road	Harmon Harrell Road	Evans Street (Altha)
Van Lierop Road	Ira Fowler Road	Dirt Road south of Pine St.
Stafford Creek Road	County Road 4	(Pine Island subdivision)

Source: Calhoun County Road Department, Calhoun County Emergency Management

Clearly, flooding, either from a tropical storm, a hurricane or simply a heavy summer rain, poses a major hazard throughout the county. It is not necessary for development to be in the 100-year floodplain to be at risk. With heavy development along the Apalachicola and Chipola Rivers and their floodplains, numerous structures are at risk from more frequent flood events. Since 1990, the county has experienced three 35 to 50 year flood events, damaging or isolating hundreds of homes and dislocating hundreds of households. The risk of flood damage is not limited to structures. Numerous unpaved roads are at risk of being washed out on an annual basis, even if they are outside the floodplain. Mitigation efforts directed by County and Municipal officials at development in and/or near the floodplain offer a nearly immediate reduction in risk for residents and business owners located throughout the county. As seen in the above narrative, the likelihood of future flooding events in Calhoun County is a certainty.

3.1.8. Wildfires (Urban Interface Zone)

Hazard Profile

The wildfires that burned throughout Florida in the last several years are examples of the increasing wildfire threat which results from the Wildland/Urban Interface. The Wildland/Urban interface is defined as the area where structures and other human development meet with undeveloped wildland or vegetative fuels (Federal Emergency Management Agency). As residential areas expand into relatively untouched wildlands, people living in these communities are increasingly threatened by forest fires.

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

Rural and large tracts of unimproved lands are susceptible to brush and forest fires capable of threatening life, safety and property loss in adjacent developed areas if not effectively controlled. Wildfires are caused by numerous sources ranging from arson, carelessness by smokers, individuals burning debris, random sparks from heavy equipment, to children playing with matches. The largest number of fires is caused by lightning strikes which coincide with the height of the thunderstorm season. A major wildland fire can leave a large amount of scorched and barren land, and these areas may not return to pre-fire conditions for decades. If the wildland fire destroys the ground cover, other potential hazards, such as erosion, may develop.

Structures in the wildland/urban interface zone are vulnerable to ignition by three different ways: radiation, convection, and firebrands (National Wildland/Urban Interface Fire Protection Program). Radiating heat from a wildfire can cause ignition by exposure to the structure. The chances of ignition increase as the size of the flames increases, surface area exposed to flames increases, length of exposure time increases, and distance between the structure and the flames decreases.

Another source of ignition by wildfire is convection. Ignition of a structure by convection requires the flame to come in contact with the structure. Contact with the convection column is generally not hot enough to ignite a structure. Clearing to prevent flame contact with the structure must include any materials capable of producing even small flames. Wind and steep slopes will tilt the flame and the convection column uphill increasing the chance of igniting a structure. Structures extending out over a slope have the greatest likelihood of ignition from convection.

Firebrands also pose a threat to structures in the wildland/urban interface. A firebrand is a piece of burning material that detaches from a fire due to strong convection drafts in the burning zone. They can be carried a long distance (around 1 mile) by fire drafts and winds. The chance of these firebrands igniting a structure depends on the size of the firebrand, how long it burns after contact, and the materials, design, and construction of the structure.

Vulnerability

Due to Calhoun's rural nature, fires represent a major hazard, particularly for persons living outside municipal boundaries. Over 93 percent of the county's 367,936 acres is under the cover of trees (304,160 acres) or in pasture/cropland (41,487 acres), In addition, with more than 80 percent of county residents living outside of Blountstown or Altha, wildfires, and structural fires with the potential to turn into wildfires, are of significant concern.

Florida's vulnerability to wildfire was revealed during the summer of 1998. According to the Governor's Wildfire Response and Mitigation Review Committee, nearly 2,300 wildfires burned over 500,000 acres, damaged over 300 homes, destroyed more than $300 million worth of timber resources, and forced the evacuation of one entire county. The damage was concentrated in areas where homes were scattered on the outskirts of existing urban areas-the rural/urban interface. Over 230,000 additional acres have burned uncontrollably through the first six months of 1999. The county is served by nine volunteer fire departments: City of Blountstown, Town of Altha, Carr/Clarksville, Nettle Ridge, West Side, Mossy Pond, Scott's Ferry, Red Oak and Kinnard. With the exception of Blountstown, all volunteer fire departments are staffed by volunteers. The Blountstown Volunteer Fire Department is staffed by one full-time fire employee and on call fire-fighters.

On average, each fire department responds to 40-50 calls per year. In Blountstown, most of the fires are structural, and in Altha structural fires account for approximately half of all responses. In the county, however, the vast majority of fires are wood or wildfires. The Calhoun Firefighter's Association estimates they respond to six or seven wildfires for each structural fire in the county. Based on the number of average calls per year and a six/seven to one ratio, local volunteer fire departments respond to approximately 300 to 375 wood or wildfires each year. Most of these fires are small and are quickly contained by the local volunteer fire departments.

In order to mitigate the effects of future wildfires the Florida Division of Forestry (DOF) has embarked on a statewide fire mitigation program. Private land throughout the state is undergoing a rigorous fire risk analysis, which focuses on vulnerable populations in the rural/urban interface. The analysis identifies areas that require mitigation, including prescribed burns, mowing and clearing of dense undergrowth. Florida law (Chapter 590.125, F.S.) provides statutory authority for the identification of fire risk areas and the use of fire mitigation techniques to reduce the threat of wildfire on private lands. The legislation allows private landowners to stop the State from conducting prescribed burns on their (property owner's) land; however, landowners have a strong incentive to participate in the program since they can be held liable for damages to property due to wildfire originating on their land.

The Division of Forestry also assists firefighting efforts in the county by responding to fires that threaten forest land and select non-forest fires. Between 1994 and 2002, the Division of Forestry responded to 186 fires in the county, affecting almost 3600 acres (see table below). The figures below are for fires in which the Division of Forestry provided assistance, and do not include fires handled by the volunteer departments if the Division of Forestry did not provide assistance. According to the Calhoun County Firefighter's Association, the Division of Forestry responds to nearly half of the fires in the county and provides assistance 90 percent of the time. Rainfall information is only available from 1996. Rainfall amounts are provided from data recorded by the Southeast Regional Climate Center.

Reported Wildfire Incidents		
Year	Number of Fires	Acres Burned
1994	10	53.6
1995	18	368.8
1996	15	272.4
1997	17	1242.6
1998	25	313.1
1999	25	226.6
2000	34	333
2001	25	610
2002	17	167
2003	14	103
2004	26	104.1
2005	13	458.7
2006	36	1026
2007	32	183.8
2008	18	145.9

Source: Florida Dept. of Agriculture, Division of Forestry, Chipola District

According to data provided by the Division of Forestry, nearly 73 percent of these fires were caused either by lightning (21.8 percent), debris burning (32.7 percent) or incendiaries (18.2 percent). These three causes also accounted for over 92 percent of the acreage burned.

With the recent increase in fire awareness over the past few years in Florida, the Division of Forestry has set forth measures, such as controlled burns which is decreasing the threat of wild fires. Calhoun has an increasing population that is residing in the urban interface of the wooded areas. Even though the threat maybe mitigated, it is still likely that wildfires may pose a threat to the residence of Calhoun. The LMSWG deems the wildfire threat to be a continuing issue and will support any initiatives to mitigate the threat of wildfires.

3.1.9. Dam/Levee Failure

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

If dams have many benefits, they also can pose a risk to communities if not designed, operated, and maintained properly. In the event of a dam failure, the energy of the water stored behind even a small dam is capable of causing loss of life and great property damage if there are people downstream of the dam. (FEMA)

The Jim Woodruff Darn poses a minor Dam/Levee failure threat to the population and property of Calhoun County.

Vulnerability
The U.S. Army Corps of Engineers operates the Jim Woodruff Lock and Dam located in Gadsden County, north of Calhoun County, on the Apalachicola River. Located behind the Jim Woodruff Lock and Dam is Lake Seminole, which is created by the confluence of the Chattahoochee and Flint Rivers. The lock and dam is a multipurpose project for navigation, hydroelectric power production and related uses. The impoundment is maintained at a relatively constant 77.5 feet above mean sea level, although there is some fluctuation for power production. There is no storage for flood control. The facility maintains a safety and emergency notification plan, and conducts annual dam safety training. There have been no safety and/or structural problems noted at the dam. In the event of a possible failure, facility officials would initiate the notification procedures, which include notifying the Calhoun County Emergency Manager. Because of the volume of water impounded behind the dam, there are no local mitigation initiative, besides notification, that could reduce the devastating impact of the dam's failure. However, given the facility's safety record and recent flood experiences, the likelihood of failure is considered minimal.

3.1.10. Drought/Heat Wave

Hazard Profile
Drought
Drought is a normal, recurrent feature of climate, although many perceive it as a rare and random event. In fact, each year some part of the U.S. has severe or extreme drought. Although it has many definitions, drought originates from a deficiency of precipitation over an extended period of time, usually a season or more (National Drought Mitigation Center). It produces a complex web of impacts that spans many sectors of the economy and reaches well beyond the area producing physical drought. This complexity exists because water is essential to our ability to produce goods and provide services.

A few examples of direct impacts of drought are: reduced crop, rangeland, and forest productivity; increased fire hazard; reduced water levels; increased livestock and wildlife mortality rates; and damage to wildlife and fish habitat. Social impacts include public safety; health; conflicts between water users; reduced quality of life; and inequities in the distribution of impacts and disaster relief. Income loss is another indicator used in assessing the impacts of drought; reduced income for farmers has a ripple effect throughout the region's economy (National Drought Mitigation Center).

The web of impacts is so diffuse that it is very difficult to come up with financial estimates of damages. However, the Federal Emergency Management Agency (FEMA) estimates $6-8 billion in losses as the annual average.

Heat Wave
Temperatures that remain 10 degrees or more above the average high temperature for a region and last for several weeks are defined as extreme heat (FEMA). Humid conditions, which add to the discomfort of high temperatures, occur when an area of high atmospheric pressure traps hazy,

damp air near the ground. The highest temperature ever recorded in the state was on 29 June 1931 at 109°F in Monticello at an elevation of 207 *ft.* (National Climatic Data Center, 1996). In a normal year, approximately 175 Americans die from extreme heat. However, in 1995 the national death toll was 1,021 (National Weather Service).

Human bodies dissipate heat in one of three ways: by varying the rate and depth of blood circulation; by losing water through the skin and sweat glands; and by panting. As the blood is heated to above 98.6 degrees, the heart begins to pump more blood, blood vessels dilate to accommodate the increased flow, and the bundles of tiny capillaries penetrating through the upper layers of skin are put into operation. The body's blood is circulated closer to the surface, and excess heat is released into the cooler atmosphere. Water diffuses through the skin as perspiration. The skin handles about 90% of the body's heat dissipating function.

Heat disorders generally have to do with a reduction or collapse of the body's ability to cool itself by circulatory changes and sweating, or a chemical (salt) imbalance caused by too much sweating. When the body cannot cool itself, or when it cannot compensate for fluids and salt lost through perspiration, the temperature of the body's inner core begins to rise and heat-related illness may develop. Studies indicate that, other factors being equal, the severity of heat disorders tend to increase with age. Heat cramps in a 17-year-old may be heat exhaustion in someone 40 and heat stroke in a person over 60.

When the temperature gets extremely high, the NWS has increased its efforts to alert the general public as well as the appropriate authorities by issuing Special Weather Statements. Residents should heed these warnings to prevent heat related medical complications. As a result of the latest research findings, the NWS has devised the "Heat Index" (HI). The HI, given in degrees Fahrenheit, is an accurate measure of how hot it really feels when relative humidity is added to the actual air temperature. The NWS will initiate alert procedures when the HI is expected to exceed 105°F for at least two consecutive days. Possible heat disorders related to the corresponding HI are listed below.

Heat Index of 130 or Higher	Heatstroke/Sunstroke with exposure for people in higher risk groups
Heat Index of 105-130	Sunstroke, heat cramps and heat exhaustion likely and heatstroke possible with prolonged physical activity
Heat Index of 90-105	Sunstroke, heat cramps with prolonged exposure
Heat Index of 80-90	Fatigue possible with prolonged exposure and physical activity

Winter Storms / Freezes
According to the Department of Agriculture and Consumer Services, a moderate freeze may be expected every one to two years. Severe freezes may be expected on an average of once every 15 to 20 years. Freezes pose a major hazard to the agriculture industry on a recurring basis, and are a significant threat to the economic vitality of the state's vital agriculture industry.

Florida has experienced a number of severe or disastrous freezes, when the majority of the winter crops are lost. The lowest temperature ever recorded in the state is -2°F (National Climatic Data Center). Since December 1889, there have been at least 22 recorded severe freezes; the most

recent being in February 2001, when a Presidential Disaster Declaration was issued for 49 Florida counties that suffered crop losses from freezing temperatures.

Winter Storm watches and Warnings

- A *winter storm watch* indicates that severe winter weather may affect your area.
- A *winter storm warning* indicates that severe winter weather conditions are definitely on the way.

A blizzard warning means that large amounts of falling or blowing snow and sustained winds of at least 35 miles per hour are expected for several hours.

Vulnerability
Temperature extremes, both freezes and periods of excessive heat, impact communities with a larger senior population to a greater extent than those with younger populations. Inland communities away from the moderating influence of the ocean or the estuary are more vulnerable to temperature extremes, as are areas with significant agricultural assets. Calhoun County overall has a minimal vulnerability to the impacts from drought. Even though the potential for a drought exists every year, droughts pose a minimal threat to Calhoun. The last recorded droughts occurred in 1982 and more recently 2001. However, even then there was sufficient water to meet residential, commercial, industrial and agricultural needs. The county's source of water is the Floridian Aquifer, which provides an abundant supply to buffer the effects of a short-term drought. With so many county residents on private wells (essentially any resident located outside of the Blountstown or Altha municipal boundaries), the most significant impact of a drought might be the drawdown of the aquifer below the reach of many resident's water wells.

Even though the North Florida climate is considered mild, Calhoun County can be susceptible to future drought or heat threats; the probability is estimated by the LMSWG to be significant and will continue to support any initiatives and awareness to combat this threat.

3.1.11. Winter Storms / Freezes

The Climate in North Florida is mild. Calhoun County has limited vulnerability to moderate freezes every one to two years and severe freezes possibly once every 15 to 20 years. The unlikelihood of this hazard could be a basis for un-preparedness.

During the winter Florida has approximately double the amount of hours of sunlight than the states in the northeastern quadrant of the nation, and far milder temperatures. Mild and sunny winters are Florida's norm.

Florida lies within the extreme southern portion of the Northern Hemisphere humid subtropical climate zone, noted for its long hot and humid summers and mild and wet winters. Mean average temperatures during Florida's coldest month (January) range from the lower 50s to high 60s in the Northern region where Calhoun County is located.

Although Calhoun County doesn't experience the severe winter weather that occurs in other areas of the nation, we are still at risk of winter-related hazards. Some of the possible severe weather

includes freezing rain & subfreezing wind chill. Calhoun County has been impacted by a winter storm in recent history. In March 1993, the Blizzard of 1993 dumped record amounts of snow on an area that stretched from Alabama to New England. The storm left more than 170 people dead and caused hundreds of thousands of people to be without power for several days. Total damages were estimated at upward of $800 million. Calhoun was impacted by freezing rain, and wind during this event.

Some Characteristics of Winter Storms include:

Strong Winds: Sometimes winter storms are accompanied by strong winds creating dangerous wind chill. Strong winds with intense storms and cold fronts can knock down trees, utility poles, and power lines.

Extreme Cold: Extreme cold often accompanies a winter storm or is left in its wake. Prolonged exposure to the cold can cause frostbite or hypothermia and become life-threatening. Infants and elderly people are most susceptible. Because of the mild climate in Florida, "extreme cold", relative to what Floridians are unaccustomed to, can be near freezing temperatures. Freezing temperatures can cause severe damage to vegetation. Pipes may freeze and burst in homes that are poorly insulated or without heat.

Ice Storms: Heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days while utility companies work to repair the extensive damage. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians.

Besides rain, precipitation from winter storms may include:

Sleet: Sleet forms when snow falls through a layer of warm air and then refreezes in a layer of cold air just above the surface. The ice pellets formed can accumulate and cause problems for drivers. Many times, depending upon the temperature, sleet falls during a transition period before changing to snow or a cold rain.

Freezing Rain: Freezing Rain forms when snow falls in a pocket of warm air and melts. The rain droplets are then collected near freezing in a layer of cold air just above the surface and freeze as ice on contact.

Additional Hazards Identified

3.1.12. Hazardous Materials

Hazardous materials accidents can occur anywhere there is a road, rail line, pipeline, or fixed facility storing hazardous materials. Virtually the entire state is at risk to an unpredictable accident of some type. Most accidents are small spills and leaks, but some result in injuries, property damage, environmental contamination, and other consequences. These materials can be poisonous, corrosive, flammable, radioactive, or pose other hazards and are regulated by the Department of Transportation.

Emergencies involving hazardous materials can be expected to range from a minor accident with no off-site effects to a major accident that may result in an off-site release of hazardous or toxic materials. The overall objective of chemical emergency response planning and preparedness is to minimize exposure for a wide range of accidents that could produce off-site levels of contamination in excess of Levels of Concern (LOC) established by the U.S. Environmental Protection Agency. Minimizing this exposure will reduce the consequences of an emergency to people in the area near to facilities which manufacture, store, or process hazardous materials.

A large volume of hazardous materials are transported to and through the county by railroad, highway, and water daily. Within Calhoun County, there are a number of both public and private fixed facilities which produce or use hazardous materials. Coordinating procedures r hazardous material response are found within the County Comprehensive Emergency Management Plan.

Vulnerability

Hazardous materials in the form of natural and man-made chemicals are located throughout Calhoun County. In addition to materials stored in the county, numerous hazardous materials are transferred through the county on a daily basis, either by road or along the Apalachicola River. This section provides a general analysis of the hazardous materials that are either located in, or transferred through, Calhoun County.

A community's vulnerability to hazardous materials accidents depends on three factors. These are:

The major transportation routes that pass through the community; The hazardous material generators located in or near the community; and The resources in terms of people and property that are in an area of possible impact from a hazardous materials release.

Overall, unincorporated Calhoun County has a significant vulnerability to impacts from hazardous materials releases. The probability for future hazardous materials threats is considered high by the LMSWG.

Fixed Facilities

There are seven facilities in the county (two in Altha and five in Blountstown) that store extremely hazardous substances above the minimum threshold designated by the US Environmental Protection Agency. Five of the facilities are municipal and two are privately owned. A description of each facility for the most hazardous chemical stored at the site is provided below. It should be noted that the vulnerability zone represents a worst-case release from a facility storing the chemicals.

Town of Altha

Altha Farmer's Co-op - Many chemicals are stored in this facility, including: aldicarb, aluminum phosphide, dicrotophos ethoprophos, disulfoton mixture, terbufos, endosulfan, methamidophos, fenamiphos, methomyl, methyl parathion, and paraquat. Methyl parathion and paraquat have vulnerable zones (a radius of 2.8 miles and 3.7 miles, respectively) that include critical facilities in the Town of Altha. These critical facilities and the population at risk are listed in the table below. Not included as part of this analysis is the general population in the vulnerable zone. Based on 2000 US Census data, the permanent population in the vulnerable zone is

approximately 1,345, which includes the entire population of Altha (642 in 2000). The facility does not have an emergency plan.

Altha Farmer's Coop

Facility Name	Description	Distance from Coop	Max. Occupancy
Altha VFD	Fire Department	2.50 miles	5
Baptist Church	Church	2.50 miles	200
Altha School	Public School (K-12)	2.25 miles	706

Source: Calhoun County Fixed Facility Hazard Analysis Report, Appalachee Regional Planning Council

Town of Altha Water Treatment Plant - Chlorine is the only known hazardous material stored at this facility. With a radius of 0.50 miles, the vulnerability zone includes nearly half of Altha and the three critical facilities listed in the table below. Based on 2000 US Census data, the permanent population in the vulnerable zone is approximately 875. The facility does not have an emergency plan. Currently both town wells are collocated with the WTP. The town is currently building a third well in a separate location which will decrease the chance that Altha water sources would be affected by a single incident.

Altha Water Treatment Plan

Facility Name	Description	Distance from Coop	Max. Occupancy
Altha VFD	Fire Department	2.50 miles	5
Baptist Church	Church	2.50 miles	200
Altha School	Public School (K-12)	2.25 miles	706

Source: Calhoun County Fixed Facility Hazard Analysis Report, Appalachee Regional Planning Council

City of Blountstown

The City of Blountstown has recently developed the City of Blountstown Emergency Plan Booklet. This Booklet is still undergoing review and includes all Public Works Facilities in the city.

Water Treatment Plant - Well # 1 - Chlorine is the only known hazardous material stored at this facility. With a radius of 0.50 miles, the vulnerability zone includes a large area in the northwest area of the city. The critical facilities in the vulnerability zone are listed in the table below. Based on 2000 US Census data, the permanent population in the vulnerable zone is approximately 625.

Blountstown Water Treatment Plant – Well #1

Facility Name	Description	Distance from Well	Max. Occupancy
Blountstown Elementary	Public School	0.25	720
Blountstown High	Public School	0.25	445
Calhoun County Adult Education Center	School	0.25	45
Blountstown VFD/City Council Chambers	Fire Department	0.30	30
5 Oaks Retirement Center	Nursing Home	0.40	23
Ropers Personal Home Care	Nursing Home	0.40	25

Source: Calhoun County Fixed Facility Hazard Analysis Report, Appalachee Regional Planning Council

Water Treatment Plant - Well # 2 - Chlorine is the only known hazardous material stored at this facility. With a radius of 0.50 miles, the vulnerability zone includes a large area in the west-central area of the city. The critical facilities in the vulnerability zone are listed in the table below.

Based on 2000 US Census data, the permanent population in the vulnerable zone is approximately 790.

Blountstown Water Treatment Plant – Well #2

Facility Name	Description	Distance from Well	Max. Occupancy
Blountstown Health and Rehab Center	Nursing Home	0.30	100
Blountstown Police Dept.	Police Dept.	0.30	15
5 Oaks Retirement Center	Nursing Home	0.40	23
Ropers Personal Home Care	Nursing Home	0.40	25

Source: Calhoun County Fixed Facility Hazard Analysis Report, Appalachee Regional Planning Council

Water Treatment Plant - Well # 3 - Chlorine is the only known hazardous material stored at this facility. With a radius of 0.50 miles, the vulnerability zone includes an area west of the city. The critical facility in the vulnerability zone is listed in the table below. Based on 2000 US Census data, the permanent population in the vulnerable zone is approximately 300.

Blountstown Water Treatment Plant – Well #3

Facility Name	Description	Distance from Well	Max. Occupancy
Sam Atkins Park	Community Park	Site located within Park	2,000 during major events

Source: Calhoun County Fixed Facility Hazard Analysis Report, Appalachee Regional Planning Council

Wastewater Treatment Plant - The wastewater treatment plant recently underwent a major upgrade. As part of the upgrade, the chlorine treatment of the wastewater was replaced with ultraviolet treatment. However, chlorine is still stored at the facility for use at the three city water wells. With a radius of 0.50 miles, the vulnerability zone includes a large area in the west-central area of the city. There are no critical facilities in the vulnerability zone, but, based on 2000 US Census data, the permanent population in the vulnerable zone is approximately 580.

Fairpoint, Inc. - Sulfuric acid is the only known hazardous material stored at this facility (contained in industrial batteries used for power back-up for telephone operations). With a radius of 0.10 miles, the vulnerability zone includes a small area along SR 71 North (above SR 20). The only critical facility in the vulnerability zone is the police department (see table below). Based on the 2000 US Census, the permanent population in the vulnerable zone is approximately 35. This does not include persons who may be in the area on business. The facility is included in the Fairpoint Emergency Plan, which is currently being updated to include reorganization.

Fairpoint, Inc

Facility Name	Description	Distance from Well	Max. Occupancy
Blountstown Police Dept.	Police Dept.	0.10	15

Source: Calhoun County Fixed Facility Hazard Analysis Report, Appalachee Regional Planning Council

Facility operators and county emergency responders need to develop coordinated emergency response plans for each of these facilities. This should include operator responsibilities regarding notification of incidents involving the discharge of hazardous materials, first-responder responsibilities and equipment needs, and first-responder training. In addition, the City should consider moving the chlorine stored at the wastewater treatment plant to Well #3. This would reduce the at-risk population from 579 (near the wastewater treatment plant) to 287 (near Well

#3). The County Continuity of Operations Plan is currently being developed, and should be in place by January 2004.

Road Transportation

Although most residents tend to concentrate on hazardous materials facilities that are located near where they live, generally far more hazardous materials are shipped through an area by mad. According to data supplied by the Florida Department of Community Affairs (DCA), nearly 75 percent of all hazardous materials incidents between 1992 and 1996 in the nine counties served by the Appalachee Regional Planning Council (Calhoun, Franklin, Gadsden, Gulf, Jackson, Jefferson, Leon, Liberty, and Wakulla) were transportation related. Between 1992 and 1998 there were 10 reported hazardous material releases in Calhoun County, six were transportation related. Of the six transportation-related releases, five involved petroleum product spills and one was an unknown chemical. The five petroleum product spills occurred in 1992 (two spills) and 1994 (three spills). Most spills were less than 35 gallons; however, in November 1992, over 3,250 gallons of various petroleum products were spilled. The unknown chemical spill occurred in January 1995, and involved less than 25 gallons. No deaths or injuries resulted from any of the spills; however, the driver of the vehicle involved in the November 1992 spill died as a result of injuries received in the accident.

Companies that ship hazardous material by road are generally not required to report what types of materials they are shipping. This makes information on the types and amounts of hazardous materials shipments through an area difficult to determine. However, vehicles carrying hazardous materials are required by the US Department of Transportation to have placards on the truck / trailer identifying the material being transported. In 1996, the Appalachee Regional Planning Council conducted a hazardous materials placard survey over a six-month period along primary transportation routes through the region. The data collected included descriptions of the chemicals being transported, direction and route of travel, carrier name, date and time of observation, and type of vehicle.

One of the roads surveyed was State Road 20 in Liberty County, at the Liberty County Courthouse. Surveying from this point also captures traffic going from or going to Calhoun County. Data was collected in the morning and afternoon on two different days. A total of 15 vehicles transporting hazardous materials were noted. The vast majority of the vehicles, 12 of 15 (80 percent), were tanker trucks carrying gasoline. The remaining three tucks (two tankers and one small carrier) were transporting liquefied petroleum gas, argon and combustible liquids. Although it is not possible to determine the quantity of hazardous materials each truck was carrying, it is useful to note that fully loaded gasoline tankers carry approximately 9,000 gallons and loaded tankers carrying liquefied petroleum gas hold about 10,000 gallons. Assuming the numbers above represent a typical day for Calhoun County, the potential for a hazardous material spill is significant

River Transportation

Due to extremely low levels on the Apalachicola River, river transportation is currently limited. But historically hazardous materials have been transported by barge on the Apalachicola River. Some of the more hazardous materials transported on the river include petroleum products such as gasoline, asphalt, tar and pitch; fertilizers such as nitrogenous and phosphatic fertilizers, ammonia, and sodium hydroxide, also known as caustic soda. The majority of the materials transported are up bound, traveling north on the Apalachicola River towards the Flint or Chattahoochee Rivers.

Fertilizers and fertilizer related products have been the most common hazardous materials shipped on the Apalachicola River through Calhoun County, exceeding 160,000 tons annually. Petroleum and petroleum products are also a major component of hazardous materials transported on the river, but the amounts vary widely from year to year. The amount of chemicals not otherwise classified, which includes organic industrial chemicals, transported on the river have decreased over the past twelve years, from a high of 52 tons in 1991 down to less than 8 tons per year in the past two years.

Although there have been no reported spills, there is always the possibility one will occur. In addition to the potential environmental damage a spill may cause, there is also the possibility that spilled chemicals could injure first responders and/or persons located near the spill. As with fixed hazardous materials facilities, county emergency responders need to know what types of hazardous materials are likely to be shipped on the river and develop a coordinated emergency response plan for each hazardous material. This should include the identification of first-responder equipment needs and training.

Rail Transportation
There are no rail lines in Calhoun County. The spur was shut down in the 1970's and the track has been removed. However, rail transportation is available in nearby Jackson and Liberty Counties, and Calhoun County responders could be asked to provide initial assistance in the event of a train spill in either county. Molten sulfur, sodium hydroxide, liquefied petroleum gas, carbon dioxide, chlorine, sulfuric acid, anhydrous ammonia, styrene, ammonium nitrate and hydrochloric acid are the ten hazardous materials most frequently shipped in the region. According to a CSX Transportation study, these ten chemicals accounted for approximately 80 percent of all hazardous materials shipped between Jackson and Leon Counties. Chlorine, sulfuric acid and anhydrous ammonia present special hazards and have been identified as extremely hazardous by the US Environmental Protection Agency. All three of these chemicals can prove fatal if inhaled. Chlorine poses a particular danger to firefighters because when combined with water or steam it produces hydrochloric acid.

3.1.13. Power Failure (outages)

Hazard Profile
The major causes of a power failure are lightning and trees. Lightning strikes and trees falling onto power lines can shut down power for hundreds of people. Other factors that can cause a power failure may include the age of power facilities (transmission and distribution), community growth, and/or high winds. The location of power lines underground or above ground also has significance. Lines underground have the advantage of being less vulnerable to tree foliage; however they are still at risk from other underground hazards such as tree roots.

Vulnerability
Power failures have the same potential impacts in all of Calhoun County. The vulnerabilities of all communities to power failures are considered moderate. Given the heavy tree cover and rural nature of the county, a power failure is a constant possibility. Based on local experience, however, most power failures are localized and power is restored fairly quickly. It is possible, and highly likely, that a major power failure will occur in a major hurricane. Under this type of scenario, it is very unlikely that local mitigation initiatives can reduce the possibility of a power

failure. The City of Blountstown has identified the burying of electrical lines as an initiative, but this is an expensive effort, and, without outside funding assistance, it is unlikely the initiative will be accomplished. Private sector power providers have stated that the cost of burying and maintaining their lines will greatly exceed the expense of replacing lines lost in a hurricane.

3.1.14. Terrorism (and Civil Disturbances)

Hazard Profile
Since the attacks on the World Trade Center in 2001, a renewed awareness of terrorism in the United States has been prompted. Acts of terrorism committed in Florida have historically been thought of as improbable. The state has many critical and high-profile facilities, high concentrations of population and other potentially attractive venues for terrorist activity that are inherently vulnerable to a variety of terrorist methods. Governmental/political, transportation, commercial, infrastructure, cultural, academic, research, military, athletic, and other activities and facilities constitute ideal targets for terrorist attacks which may cause catastrophic levels of property and environmental damage, injury and loss of life. Furthermore, a variety of extremist groups are known to operate within Florida, and potential terrorist attacks have been investigated and averted in recent years. Terrorist attacks may take the form of the hazards described in this section when incidents of these types are executed for criminal purposes, such as induced dam or levee failures, the use of hazardous materials to injure or kill, or the use of biological weapons to create an epidemic. Acts of terrorism are capable of creating disasters which threaten the safety of a large number of citizens, Until 911, the United States was relatively untouched by the storm of terrorist activities experienced in other parts of the world. Because of so many uncertainties in identifying the numerous possibilities that terrorist could capitalize on, the true vulnerability of Calhoun County to terrorism may be immeasurable.

Vulnerability
To a certain extent the possibilities for terrorism and sabotage in Calhoun County are immeasurable. Although the county's susceptibility to terrorism is thought of by the general population as minimal, there are vulnerabilities that exist. The most obvious and straight forward comes from a nearby possible nuclear hazard.

The accidental or purposeful release of radioactive material in a populated area would result in a significant number of casualties, immediate injuries and long-term health considerations. The impact on the environment would also be significant. Although most radioactive release discussions and analysis deal with the accidental release from a nuclear power plant, recent national discussion regarding domestic terrorism have raised concerns regarding the potential use of nuclear weapons and/or materials by terrorist groups.

There are two nuclear power plants in Florida, but both are well outside of Calhoun County and should not pose any threat in the event of a release.

The Farley Nuclear Power Plant in Houston County, Alabama is within 50 miles of Calhoun and could pose a threat in the event of a release. The northern third of the county, to include the Town of Altha, is located in the 50-mile vulnerability zone of the plant. Based on the 2000 US Census, the total Calhoun County population in the vulnerability zone is approximately 2,971. Although the risk of exposure is based on a worse-case scenario, the County needs to be prepared to deal with the possibility of a release. The County is already familiar with the release scenarios and

responses contained in the Farley Nuclear Plan. According to the Department of Health, Division of Radiological Control, there are no other facilities actively using radioactive materials in quantities that pose a significant public safety hazard to residents of the county.

The potential use of nuclear weapons and/or materials by a terrorist group is very difficult to assess. The scenario generally depicted for this type of incident involves large, heavily populated urban areas with major government operations, and this does not fit with the county's general profile. Weapons of mass destruction are horrifying from the perspective of a possible target; however it is the vast surrounding zone of impact that is affected, simply because of its proximity to a target that creates uncertain trepidation. Calhoun County may not necessarily be a target, but it could easily be impacted due to proximity to the many surrounding targets. It is impossible to predict future events that could pose a threat of terrorism in Calhoun, however in the post 9/11 world that we live, the LMSWG will maintain a state of consideration in any measures that could decrease the vulnerabilities to possible threats.

Civil Disturbances
There is no history of civil disturbances within the county, and under normal circumstances civil disturbances are considered very unlikely. However, there is always the possibility of disturbances in response to adverse social and/or economic conditions. A devastating disaster, such as a major hurricane, that displaces numerous residents and disrupts the provision of public services, could result in a civil disturbance. However, the conditions under which a civil disturbance may occur make it difficult to conduct a reasonable vulnerability assessment. A disturbance at the State Prison is a possibility, but the Florida Department of Corrections has developed procedures, including notification of local officials, to deal with such an incident. Prison officials conduct periodic exercises to test those procedures.

3.2. Land Use and Development Trends

Calhoun County is located in rural, northwest Florida. It is bordered on the north by Jackson County, the east by Liberty County, the west by Bay County, and the South by Gulf County. The Apalachicola River delineates Calhoun on the eastern border, while the Chipola River flows through the County's center. Calhoun encompasses 574 square miles; 567 square miles of land and 7 square miles of water. State Road 20 is the County's major transportation route which provides east-west access through Blountstown, the county seat. The county is comprised of the Town of Blountstown, the Town of Altha, and unincorporated area.

According the University of Florida, Bureau of Economic and Business Research (BEBR), Population Program, Florida Statistical Abstract 2008, Calhoun County had an estimated 2007 population of 14,477. Calhoun is expected to see a 26% increase from 2007 to 2035 (see table below). Approximately 80% of the population resides in the unincorporated area of the county with the concentration being located around the City of Blountstown and the Town of Altha and a few other unincorporated areas. The City of Blountstown is located just west of the Apalachicola River and is the County seat. According to BEBR, the city's 2007 population is estimated at 2,473. Altha lies northwest of Blountstown, near the border with Jackson County, and has an estimated 2007 population of 568.

Population Growth Table

BEBR Projections**						
2010	**2015**	**2020**	**2025**	**2030**	**2035**	**% Change 2007 – 2035**
14800	15600	16300	17000	17700	18300	*26%*

**Source: University of Florida, Bureau of Economic and Business Research,
Population Program, Florida Statistical Abstract 2008, Gainesville, FL, 917 p.
Projections are BEBR Medium projections

Unincorporated Calhoun County has an estimated population of 11,436. Since 2000, there has been a slight shift in population from the incorporated to the unincorporated areas (see table below).

Population Distribution Table

	2000	**2005**	**2006**	**2007**
	Calhoun			
% in towns	22.66%	21.67%	21.53%	21.01%
% in unincorporated	77.34%	78.33%	78.47%	78.99%

Source: University of Florida, Bureau of Economic and Business Research,
Population Program, Florida Statistical Abstract 2008

The most common land use throughout the county is agriculture, accounting for 90 percent of the county's land mass (see table below). Approximately 83 percent of agricultural lands are managed by large timber companies for silviculture operations. Dispersed within the agricultural areas are residential areas where a majority of the county's population lives. In recent years, significant residential development has also occurred along the Chipola, and to a lesser extent, Apalachicola Rivers.
To help assess the development trends throughout the county, the Working Group referred to the 2000 Calhoun County Evaluation and Appraisal Report (EAR) as it was the most recent version available at the time of the LMS update. By Florida Statute, counties are required to review and revise their Comprehensive Plan every seven years through the EAR process. Although behind schedule Calhoun is currently in the process of developing a new EAR. The LMSWG recognizes the importance of incorporating the new EAR as the new data could change future conditions throughout the county in terms of development and thus vulnerability. After the new EAR is formally approved and adopted and during the subsequent review (whether annual or 5-year) of the LMS, the Working Group will evaluate and incorporate any new data as needed into the LMS.

Land Use Table

Calhoun County Land Use by Acreage	
Agriculture	332,487
Airport	29
Incorporated	2804
Industrial	13
Mixed-Use	13,710
Sub-Division	4488
Urban Fringe	10,145
Lakes and Ponds (not including rivers)	4502
Total (not including rivers)	368,178

Sources: Calhoun County Comprehensive Plan EAR, 2000

According to the Property Appraiser data, there are currently 6,377 land parcels in Calhoun County. The most common parcel is residential (with 3,170 parcels), followed by agriculture (with 2,724 parcels). The Table below lists the various parcel types. Comparing parcel data with the existing land use data, residential parcels, which account for nearly half of all parcels, are located on slightly more than one percent of land. Residential parcels account for nearly half of all parcels. Beyond land use descriptions, the physical geographic characteristics of the county are also important in preparing a vulnerability assessment. The northern one third of the county, where the Town of Altha is located, consists of a band of highlands and has the highest elevations in the county. Although Altha is located outside the 100-year floodplain, it may be more susceptible to wind damage due to its higher elevation. The southern two-thirds of the county, including the City of Blountstown, is made up of coastal lowlands, with gently sloping plains comprised of swamps and pine flat wood forests. This area of the county is more susceptible to flooding, but may receive less wind damage from a tropical storm or hurricane. Elevations within the county extend from approximately five feet above sea level in southern areas of the county along the Apalachicola River, to over 250 feet in northern areas. Soils in the northern area of the county are generally sandy and well drained. In the south, soils are mostly sandy with varying amounts of loamy sub soils. With this mixture, the soils have very poor drainage characteristics. When combined with low elevations, this area of the county is particularly susceptible to flooding.

Parcel Descriptions

Parcel Use	Number	Percentage
Residential	5194	43.3%
Residential (Manufactured Homes)	1114	9.3%
Commercial	300	2.5%
Industrial	50	.4%
Agriculture	3190	26.6%
Institutional	161	1.3%
Government	247	2.1%
Miscellaneous	1749	14.5%
TOTAL		100%

Source: Calhoun County Property Appraiser

As a result of the differing physical geographic characteristics of the county, the impacts from a natural disaster (such as a hurricane) are likely to differ throughout the county. Whereas areas in the southern part of the county may have greater flooding, areas at higher elevations may receive more wind-related damage. Areas of the county susceptible to various levels of wind and flood damage are depicted by modeling. The differing impacts from a similar natural disaster pose development and growth considerations that the County may need to consider when approving growth and/or making land use changes, and data from the current modeling should be an integral part of that consideration.

Looking into the future for Calhoun County, mitigation must remain on our minds, in our philosophies, in our daily practices, and in our hearts. Not only do we want to look at how we are developing into the future, but also how development affects our risks. Wherever possible, we want to try and develop in ways that will at a minimum, not increase our risks to hazards, and wherever possible, try and reduce the overall risks.

3.3. Risk Assessment

In order to effectively plan hazard mitigation projects and allocate scarce financial resources, a community's vulnerability to a specific hazard must be coupled with other critical factors to perform a risk assessment.

Risk, or the probability of loss, depends on three elements:

Frequency - How frequently does a known hazard produce an impact within the community?

Vulnerability - How vulnerable is a community is to the impacts produced by a known hazard?

Exposure - What is the community's exposure in terms of life and property to the impacts produced by a specific hazard?

Once these three factors are established, the risk level faced by a community with regard to any specific hazard can be calculated using the ARisk Triangle@ approach (Crichton, 1999).

In this approach, these three factors become the sides of a triangle, and the risk or Aprobability of loss@ is represented by the triangle=s area (see figure below). The larger the triangle=s area, the higher the community=s risk with respect to a given hazard. If a community wishes to reduce its potential for loss or risk of impacts from any given hazard, it can attack the problem by reducing any one of the three elements forming the sides of this triangle; the frequency of a hazard=s occurrence, the vulnerability of the community, or the exposure of the community.

In terms of natural hazards, there is very little, if anything that can be done to change the frequency with which they produce impacts in a community. Mitigation planning relative to those hazards must therefore focus on reducing the community's vulnerability or exposure. In terms of technological and societal hazards, the most cost-effective type of mitigation is to limit or reduce the frequency with which such hazards actually occur.

The Risk Assessment for Calhoun County was conducted on a county wide basis as all municipalities are susceptible to the hazards identified. Although all communities are susceptible to the identified hazards, the magnitudes of those disasters can differ. Natural disasters, primarily tropical storms, hurricanes, tornadoes, and wildfires pose the greatest threat to residents in the western half of the county. The threat from manmade disasters is low in this area. Although there are no fixed hazardous materials facilities in this area, there is the possibility of a road transportation related spill along State Road 20. In addition, residents in the northwest area are in the 50-mile vulnerability zone for a major nuclear release from the Farley Nuclear Power Plant in Houston County, Alabama (see map in Appendix 9).

Residents in the eastern half of the county are more susceptible to both natural and manmade disasters, but natural disasters pose the most likely threat. The impact of any disaster in this area is likely to be greater due to the higher population concentration. At the same time, recovery efforts are likely to be easier in a more populated area. As with the western half of the county, residents in the east could be impacted by a tropical storm, hurricane, tornado, or wildfire. This is

also the area of the county that experiences the greatest amount of flooding; the most common disaster the county encounters. The threat from a manmade disaster is higher in this area than it is in the western half of the county, but it is still relatively low. All the fixed hazardous materials facilities in the county are located in or around Blountstown or Altha. The remote chance of a major hazardous materials leak could threaten persons within a radius as large as 3.7 miles from one of the facilities. Major transportation routes, including State Road 20**,** State Road 71 and State Road 69 are located in this area, increasing the possibility of a road transportation related spill. The transportation of hazardous materials on the Apalachicola River presents another opportunity, although very limited, for a chemical spill.

The final conclusion is that every area of the county is susceptible to the hazards as described above. However, through proper planning and preparation, the impacts of these disasters can be reduced. The Calhoun County Local Mitigation Strategy represents a commitment by the community to identify and evaluate the various hazards the county faces and to develop the process and procedures to mitigate the impact from those hazards.