FLOODING

Description

Flooding is a process that occurs when water temporarily inundates an area of normally dry land by the overflow and accumulation of excess water. Floods are one of the most common and costliest natural hazards in the United States. Some floods develop slowly, sometimes over a period of days, while flash floods develop quickly, sometimes in just a matter of minutes. Flood effects can be disastrous and can be local, impacting a single neighborhood or community, or very large, affecting an entire river basin or multiple states. There are several different types or causes of flooding. Most communities only experience a few of them. Flooding, which impacts Central Mississippi, can be classified according to three distinct hazard types or causes, and according to the State of Mississippi Standard Mitigation Plan, all three types occur in all river basins in Mississippi.

River (Riverine or Stream) flooding is the most common flood type and occurs along a channel, and includes overbank and flash flooding. Channels are defined ground features that carry water through and out of a watershed. Channels may include rivers, creeks, streams, or ditches. When a channel receives too much water, the excess water flows over its banks and inundates low-lying areas adjacent to the channel. River flooding usually develops gradually and has a longer duration than flash flooding. However, flash floods can impact river flooding rapidly, usually following a heavy down pour in a short amount of time impacting usually ditches or smaller streams or creeks.

Flash flooding occurs as a result of heavy localized rainfall over a short period of time due to slow-moving intense thunderstorms that can cause small creeks, streams, branches, and rivers to overflow.

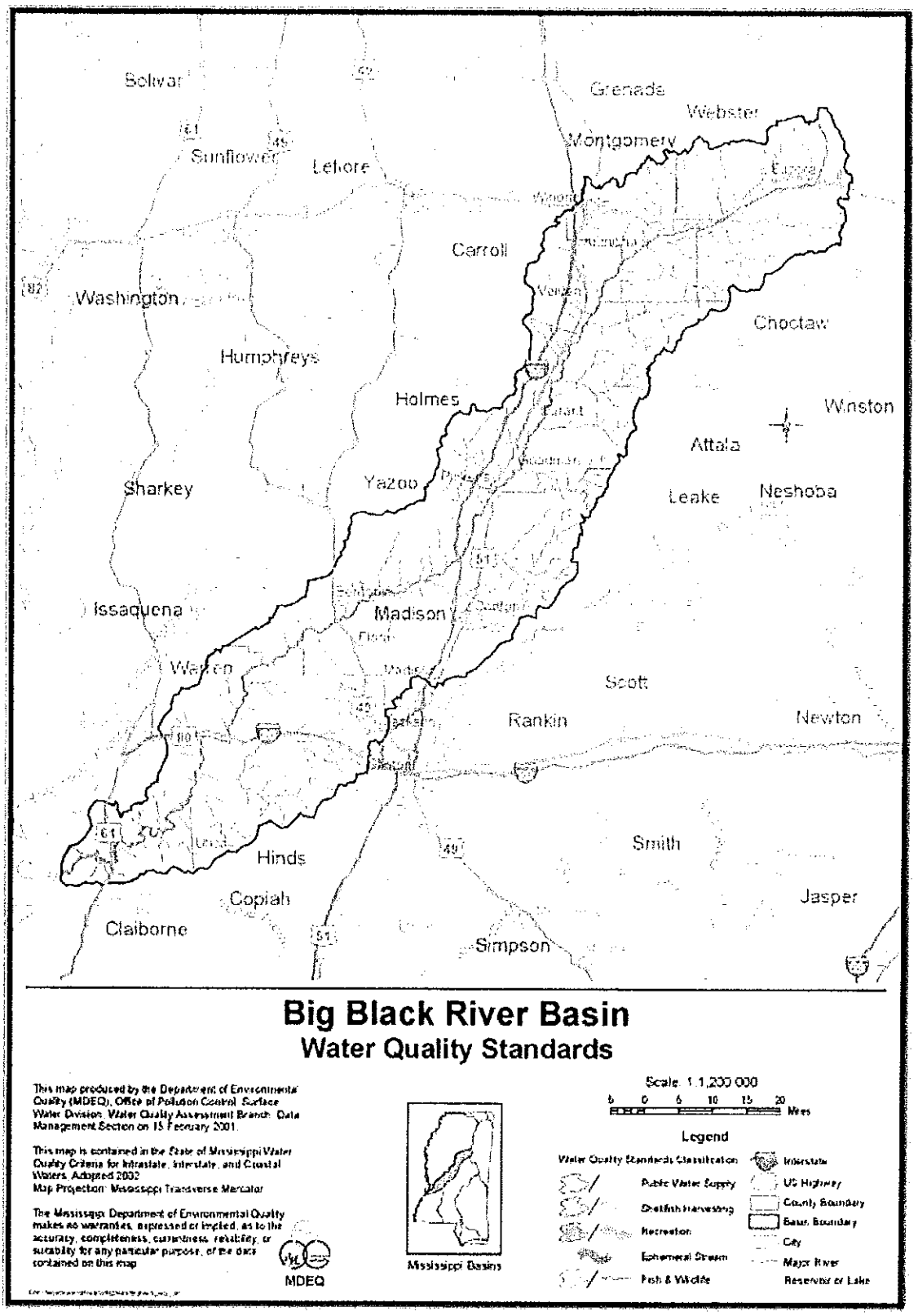
Drainage flooding occurs primarily in developed areas when the volume of run-off exceeds the capacity of the drainage system. Flooding of this nature can be the result of increased development, inadequate drainage, riverine flooding, flash flooding or a combination of each.

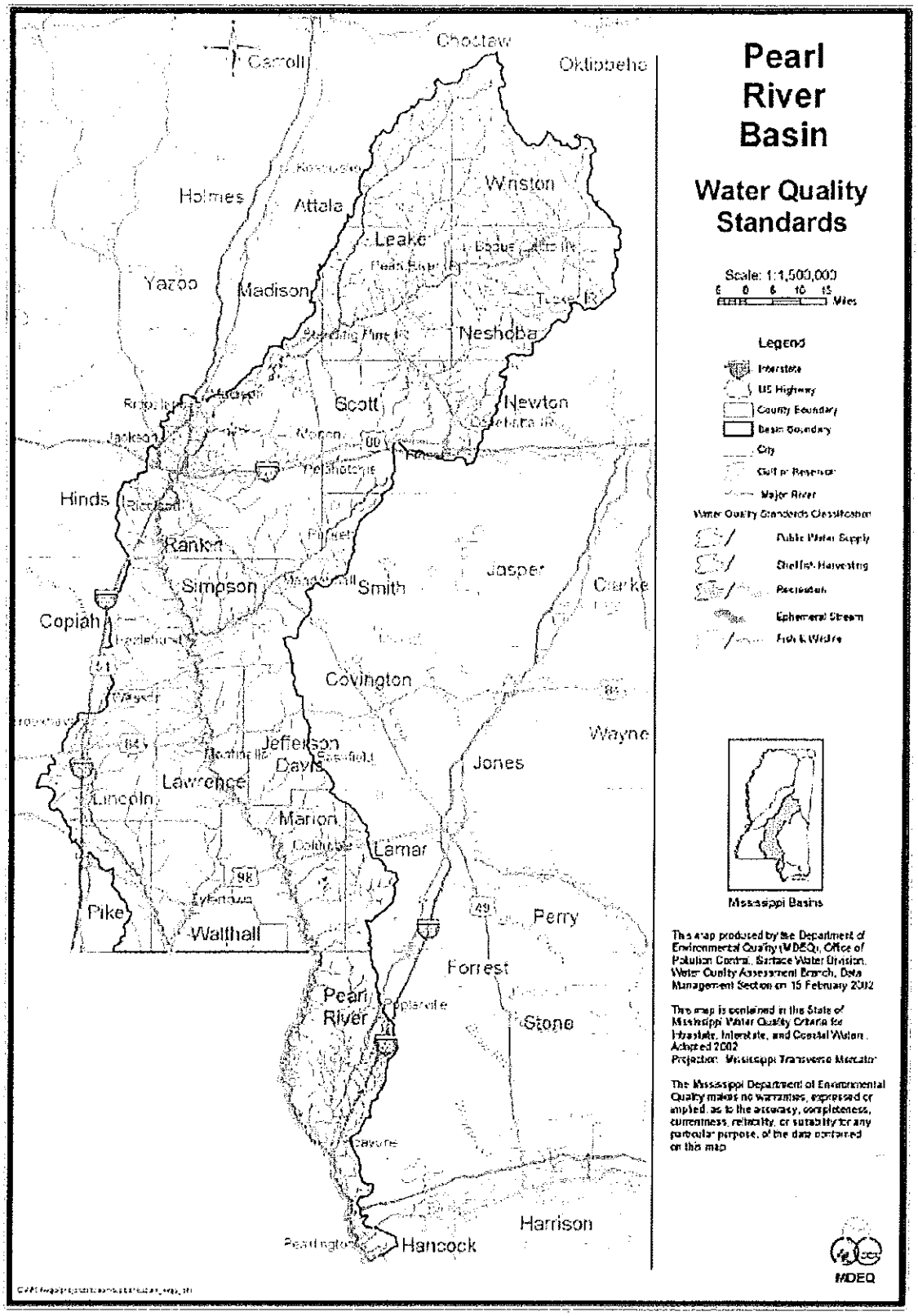
Location and Extent

There are nine primary river basins identified in Mississippi, and Madison County is part of the Pearl River and Big Black River Basins. The Big Black and Pearl Rivers, as well as, a large number of smaller rivers and tributaries, streams, lakes and other water bodies run throughout Madison County that are associated with special flood hazard areas as delineated by FEMA. Map 4.3 depicts the locations of all special flood hazard areas for Madison County as shown on current FEMA Digital Flood Insurance Rate Maps (DFIRMS).

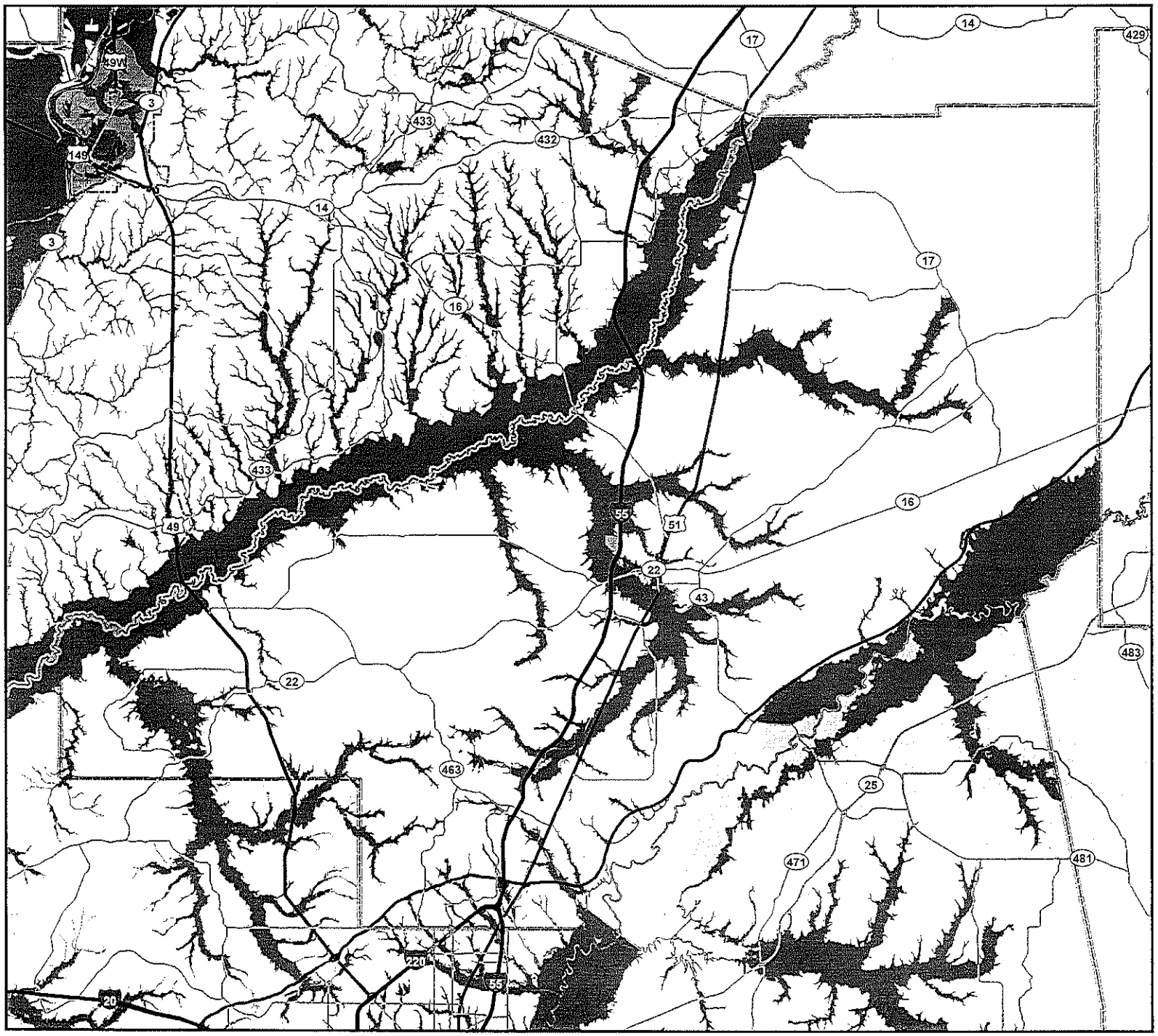
Special flood hazard areas identified on FEMA's DFIRMs are defined as the areas that will be inundated by a flood event having a 1 percent chance of being equaled or exceeded in any given year. The 1 percent annual chance flood is also referred to as the base flood or 100-year floodplain, and is the national minimum standard for applying FEMA's National Flood Insurance Program (NFIP) floodplain management regulations and mandatory flood insurance purchase requirements. Statistically, according to FEMA, the 100-year flood has a 26% chance of occurring during a 30-year period, the length of many mortgages. Contrary to what the term suggests, a 100-year flood is not a flood that occurs only once every 100 years. A 100-year flood can and often does occur multiple times in a century. Areas shown to be inundated by a 0.2 percent annual chance (500-year

floodplain) are considered moderate flood hazard areas, and areas outside of these areas are considered minimal flood hazard areas.


Bolivar
Grenada
Webster
Montgomery
Sunflower
Leflore
Carroll
Washington
Choctaw
Humphreys
Holmes
Winston
Attala
Sharkey
Yazoo
Leake
Neshoba
Issaquena
Madison
Warren
Scott
Rankin
Newton
Hinds
Smith
Copiah
Jasper
Claiborne
Simpson
Big Black River Basin
Water Quality Standards
This map produced by the Department of Environmental Quality (MDEQ), Office of Pollution Control, Surface Water Division, Water Quality Assessment Branch, Data Management Section on 15 February 2001.
This map is contained in the State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters, Adopted 2002
Map Projection: Mississippi Transverse Mercator
The Mississippi Department of Environmental Quality makes no warranties, expressed or implied, as to the accuracy, completeness, currentness, reliability, or suitability for any particular purpose, of the data contained on this map
MDEQ
Mississippi Basins
Scale 1:1,200,000
6 0 6 10 15 20
Miles
Legend
Water Quality Standards Classification
Public Water Supply
Shellfish Harvesting
Recreation
Ephemeral Stream
Fish & Wildlife
Interstate
US Highway
County Boundary
Basin Boundary
City
Major River
Reservoir or Lake


Pearl River Basin
Water Quality Standards
Scale: 1:1,500,000
Miles
Legend
Interstate
US Highway
County Boundary
Basin Boundary
City
Gulf or Reservoir
Major River
Water Quality Standards Classification
Public Water Supply
Shellfish Harvesting
Recreation
Ephemeral Stream
Fish & Wildlife
Mississippi Basins
This map produced by the Department of Environmental Quality (MDEQ), Office of Pollution Control, Surface Water Division, Water Quality Assessment Branch, Data Management Section on 15 February 2002
This map is contained in the State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters, Adopted 2002
Projection: Mississippi Transverse Mercator
The Mississippi Department of Environmental Quality makes no warranties, expressed or implied, as to the accuracy, completeness, currentness, reliability, or suitability for any particular purpose, of the data contained on this map
MDEQ
Carroll
Choctaw
Oktibbeha
Holmes
Attala
Winston
Leake
Yazoo
Madison
Neshoba
Scott
Newton
Hinds
Rankin
Simpson
Smith
Jasper
Clarke
Copiah
Covington
Wayne
Jefferson Davis
Jones
Lawrence
Lincoln
Marion
Lamar
Pike
Walthall
Perry
Forrest
Pearl River
Stone
Harrison
Hancock

FEMA Floodplain Data for Madison County, MS



FEMA DFIRM FLOOD DATA

Flood Zones

- 0.2% Annual Flood Hazard
- 100 Yr Floodplain
- Protected by Levee
- Municipalities
- County Boundaries
- Interstates
- Major Highways
- Major Local Roads

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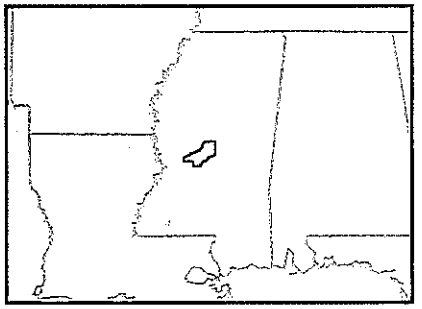


In the case of river, flash, and drainage flooding, the extent or severity of a flood event is categorized by the National Weather Service based on property damage and public threat for Minor, Moderate, and Major Flooding:

Minor Flooding – minimal or no property damage, but possibly some public threat or inconvenience

Moderate Flooding – some inundation of structures and roads near streams and some evacuations of people and/or transfer of property to higher elevations are necessary

Major Flooding – extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations

According to the National Weather Service, flooding along the Pearl River becomes a concern for Central Mississippi when the River reaches 28 feet, and flooding along the Big Black River becomes a concern when the River reaches 22 feet.

Table 4.9 Pearl River Flood Stages in Central Mississippi

Flood Categories	River Stage (in feet)
Major Flood Stage	36
Moderate Flood Stage	33
Flood Stage	28
Action Stage	24

Source: National Weather Service

Table 4.10 Big Black River Flood Stages Near Bentonia

Flood Categories	River Stage (in feet)
Major Flood Stage	29
Moderate Flood Stage	25
Flood Stage	22
Action Stage	21

Source: National Weather Service

The impact of flooding on life, health and safety is dependent upon several factors including the severity of the event and whether or not adequate warning time is provided to residents. However, exposure to flooding risk is not limited to only those that live in a defined hazard zone, but everyone that might travel through a flooded area as well. To estimate the population exposed to a flood event, floodplain boundaries were overlaid upon 2010 Census data using GIS mapping capabilities. The 2010 Census blocks with their centroid in the flood boundaries were used to calculate the estimated population and housing units exposed to this hazard. However, it should be noted that Census blocks do not follow the boundaries of floodplains and can lead to over or under estimated population figures. Using this method, it is estimated that 11,180 people and 4,155 housing units are exposed to a possible flood event in Madison County. This estimate should be used to gather a general understanding of who and what is at risk, and not used as an exact number.

Table 4.11 Identified Hazard Area Flooding

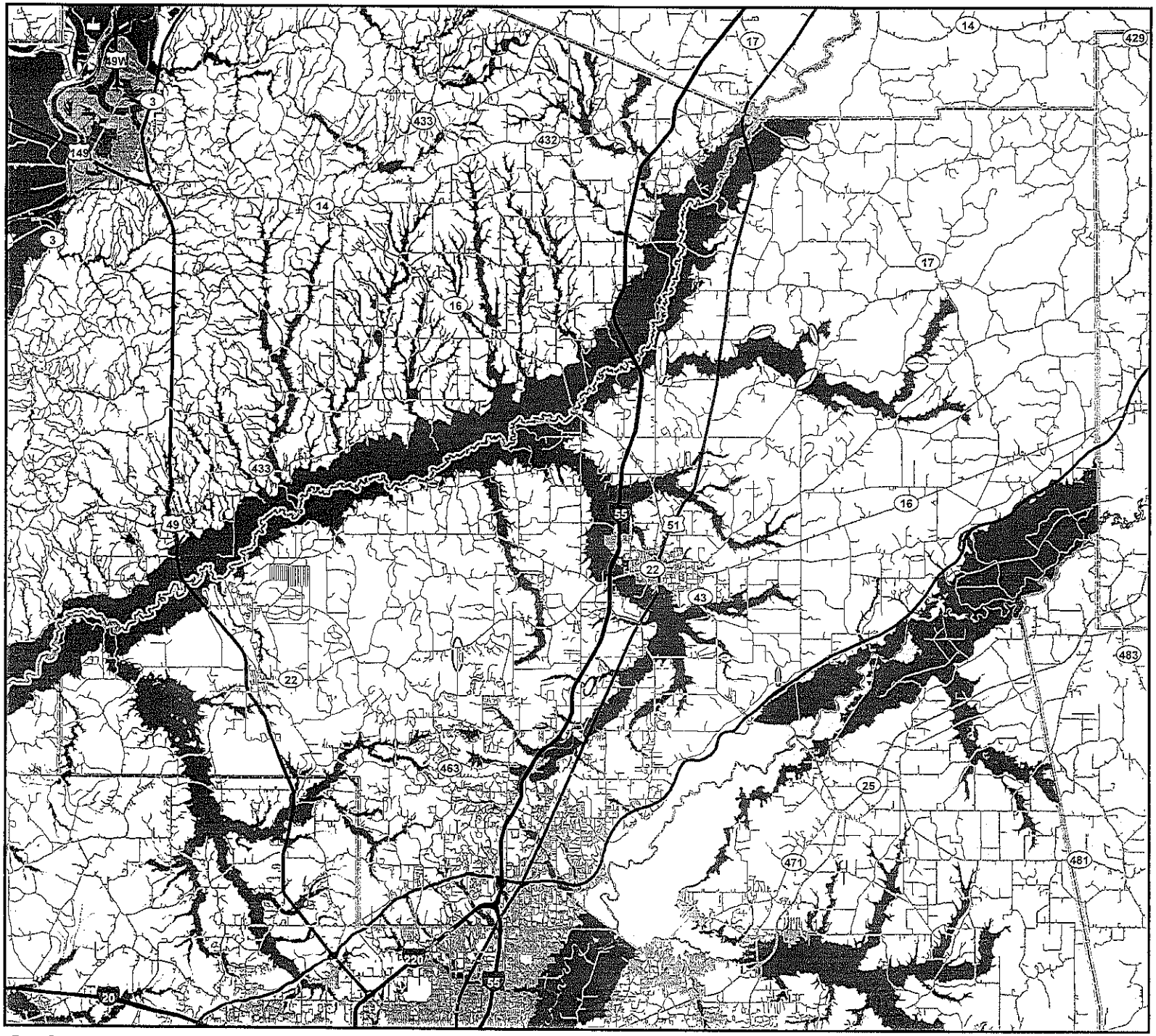
Flooding	Estimated Population	% of Total Population	Housing Units	% of Total Housing
1-percent	8,173	8.6%	3,284	3.4%
0.2-percent	3,007	7.6%	871	2.2%

Source: CMPDD

Areas in the county that experience repetitive flooding are of particular concern for the county due to the threat to structures located in these areas. These areas are a persistent problem for the county and include areas such as:

Old Highway 51 (North of Highway 17)
Ben Luckett Road
Endris Road (East of Highway 43)
King Ranch Road
McMillon Road
Way Road (North of Railroad Tracks)
Stump Bridge Road
Gunter Road
Gus Green Road
Weisenberger Road
Siwell Road

Flood Prone Areas in Madison County, MS



FEMA DFIRM FLOOD DATA

Flood Zones

- Flood Prone Areas
- 0.2% Annual Flood Hazard
- 100 Yr Floodplain
- Protected by Levee
- Municipalities
- County Boundaries
- Interstates
- Major Highways
- Major Local Roads

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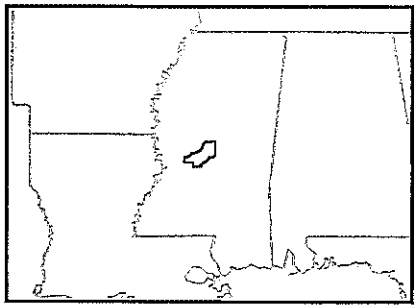


Previous Occurrences

Historical records gathered from the National Weather Service and the National Climatic Data Center indicates no river flood events have occurred along the Big Black and Pearl Rivers impacting Madison County in recent years. However, numerous annual flash flood or urban flood events have been identified.

Flash Flood Events

Note: Flood depth information is not available for flash flood events

Table 4. 12 Recent Flash Flood Events

Date	Location	Damage	
		Property	Crop
04/14/2014	Gluckstadt	10.00k	0.00k
04/14/2014	Canton	120.00k	0.00k
04/14/2014	Turnetta	5.00k	0.00k
04/14/2014	Farmhaven	5.00k	0.00k
04/14/2014	Maris Town	50.00k	0.00k
09/02/2014	Flora	5.00k	0.00k
09/24/2013	Countywide	0.00k	0.00k
02/10/2013	Madison	0.00k	0.00k
12/25/2012	Flora	0.00k	0.00k
07/19/2012	Madison Airport	4.00k	0.00k
09/05/2011	Way	250.00k	0.00k
09/05/2011	Ridgeland	5.00k	0.00k
09/05/2011	Ridgeland	50.00k	0.00k
09/04/2011	Ridgeland	30.00k	0.00k
07/23/2011	Cedar Hill	3.00k	0.00k
07/21/2011	Maris Town	5.00k	0.00k
01/01/2011	Canton	2.00k	0.00k
08/05/2010	Mansdale	3.00k	0.00k
06/29/2010	Ridgeland	25.00k	0.00k
06/17/2010	Madison Station	0.00k	0.00k
06/17/2010	Ridgeland	0.00k	0.00k
01/01/2010	Ridgeland	2.00k	0.00k
09/22/2009	Gluckstadt	2.00k	0.00k
07/29/2009	Way	15.00k	0.00k
07/29/2009	Ridgeland	15.00k	0.00k
07/29/2009	Gluckstadt	1.00k	0.00k
07/29/2009	Flora	15.00k	0.00k
07/22/2009	Flora	1.00k	0.00k
05/28/2008	Flora	50.00k	0.00k
05/22/2008	Flora	50.00k	0.00k
05/22/2008	Madison Station	1.00k	0.00k
05/15/2008	Gluckstadt	10.00k	0.00k
05/15/2008	Ridgeland	1.00k	0.00k
02/21/2008	Gluckstadt	10.00k	0.00k
10/16/2006	Canton	400.00k	0.00k
09/25/2005	West Portion of County	400.00k	300.00k
07/08/2005	Gluckstadt	20.00k	0.00k
12/09/2004	Madison	5.00k	0.00k
06/29/2004	Canton	0.00k	0.00k

Source: National Climatic Data Center

National Flood Insurance Program (NFIP) records indicate ten (10) repetitive loss properties have been identified in Madison County, which include three (3) residential structures, two (2) commercial structures, one (1) agricultural facility, and four (4) locations undetermined due to invalid addresses. Table 4.13 lists the number of losses and total claims payments for historical flood damages for those properties as recorded under the NFIP. It should be noted that this information only reflects previous losses as reported through claims under the NFIP, and that additional uninsured or unreported losses may have occurred throughout the county. Additional information regarding Madison County participation in the NFIP is located in Section 5 of this plan.

Table 4.13 NFIP Repetitive Loss Properties

Jurisdiction	Total Flood Losses	Total Claim Payments	# of Repetitive Loss Properties	# of Severe Repetitive Loss Properties
Madison County	25	$654,544	10	0

Source: MS Emergency Management Agency

National Flood Insurance Program Definitions:

Repetitive loss property is an NFIP insured structure that has had at least two paid flood losses of more than $1,000 each in any 10-year period since 1978.

Severe repetitive loss properties single or multifamily residential properties that are covered under the NFIP flood insurance policy and:

1. That have incurred flood related damage for which 4 or more separate claim payments have been made, with the amount of each claim (including building and contents payments) exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000; or
2. For which at least 2 separate claims payments (building payments only) have been made under such coverage, with cumulative amount of such claims exceeding the market value of the building.
3. In both instances, at least 2 of the claims must be within 10-years of each other, and claims made within 10-days of each other will be counted as 1 claim.

Source: FEMA

Probability of Future Occurrence

Given the history of flood events that have impacted Madison County, it is apparent that future flooding of varying degrees will continue to occur within the county annually. Major riverine floods will continue to be an occasional occurrence within Madison County, while drainage and flash flood events will likely occur more frequently. Table 4.14 summarizes the occurrences of flash flood events and their average annual occurrence rate for Madison County.

Table 4.14 Annual Flash Flood Events

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Average Annual Occurrence
# of Events	2	1	0	6	6	5	7	2	2	6	3.7

SEVERE THUNDERSTORM

Description

Thunderstorms are one of the most common and most noticed weather events. A thunderstorm is a rain shower during which you hear thunder. Since thunder comes from lightning, all thunderstorms have lightning. Thunderstorms typically produce heavy downpours of rain for a brief period, anywhere from 30 minutes to an hour. Some of the most severe thunderstorms occur when a single thunderstorm affects one location for an extended period of time. Warm humid conditions are highly favorable for thunderstorm development. Thunderstorms may occur singly, in clusters or in lines. The primary damaging forces associated with these storms are straight-line winds, hail, and lightning, but they can also cause flash flooding or spawn tornadoes. Thunderstorms are most likely in the spring and summer months and during the afternoon and evening hours, but they can occur year-round and at all hours.

Straight-line winds: any winds not associated with the rotation of a tornado. Straight-line winds are responsible for most thunderstorm wind damage. Strong thunderstorm winds come from a number of different processes. Most thunderstorm winds that cause damage at the ground are a result of outflow generated by a thunderstorm downdraft. Damaging winds are classified as those exceeding 50-60 mph. Straight-line winds can exceed 125 mph.

Hail: precipitation that is formed when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere. Hail falls to the surface when the thunderstorm's updraft can no longer support the weight of the ice. The stronger the updraft the larger the hailstone can grow. Hail has the potential to cause minor to major property damage, particularly the larger hailstones associated with severe thunderstorms. The size of hailstones is a direct result of the size and severity of the storm.

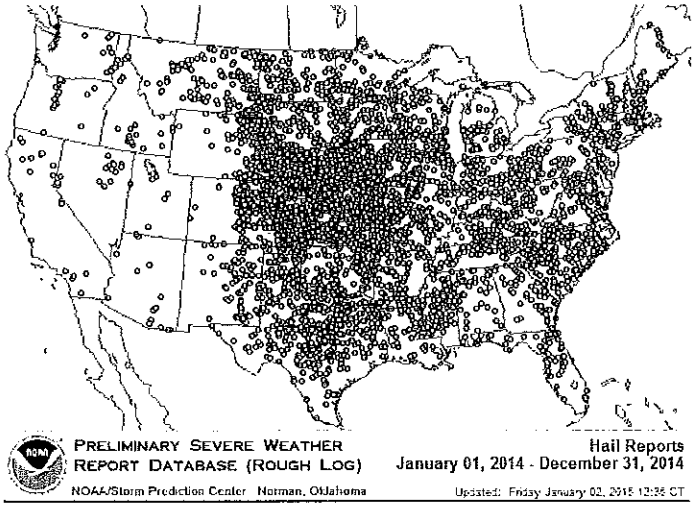
Lightning: a giant spark of electricity in the atmosphere between clouds, the air, or the ground. Energy from a lightning channel heats the air to around 18,000 degrees Fahrenheit, which causes the air to rapidly expand, creating a sound wave known as thunder.

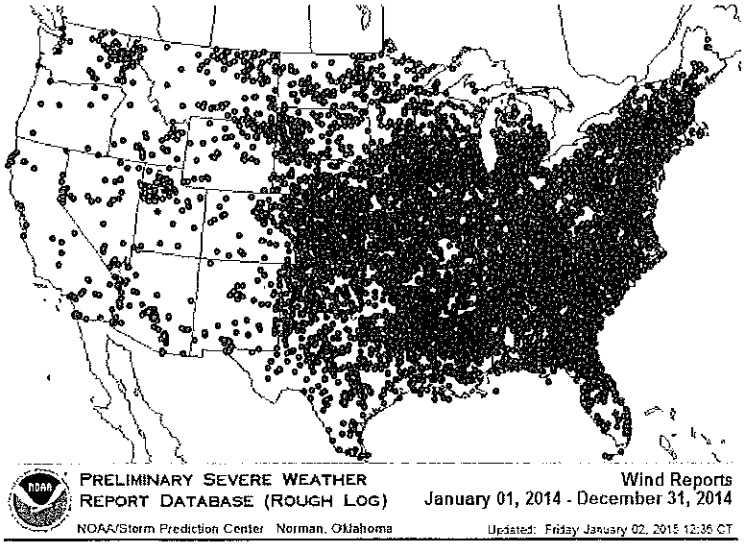
Location and Extent

All of Madison County is uniformly susceptible to the occurrence of severe thunderstorms. According to the National Weather Service, a thunderstorm is classified as "severe" if it produces one or more of the following:

- hail at least 1 inch in diameter,
- wind gusts of at least 58 miles per hour, or
- produces a tornado.

Under the right conditions, rainfall from thunderstorms can cause flash flooding; lightning can cause fires; strong straight-line winds can knock down trees, power lines and mobile homes; and tornadoes can destroy all structures in its path. Each of these potential hazards produced by thunderstorms can result in fatalities.





Previous Occurrences

Severe thunderstorms are a frequent occurrence in Mississippi. National Climatic Data Center historical records include a significant number of annual occurrences of severe thunderstorm events in Madison County. Tables 4.15 and 4.16 provide summary data for severe thunderstorm activity in Madison County since 2011. Tornado activity is discussed separately in this plan.

Table 4.15 Recent Severe Thunderstorm Wind Events January 2011-December 2015

Location	Event Date	Wind Speed Magnitude	Deaths	Injuries	Estimated Damages Property	Crop
Anderson	06/24/2015	50 kts. EG	0	0	5.00k	0.00k
Gluckstadt	05/31/2015	50kts.	0	0	8.00k	0.00k
Gluckstadt	05/26/2015	50 kts.	0	0	10.00k	0.00k
Tougaloo	05/15/2015	40 kts.	0	0	5.00k	0.00k
Maris Town	04/25/2015	55 kts.	0	0	9.00k	0.00k
Gluckstadt	04/25/2015	56 kts.	0	0	0.00k	0.00k
Richton	04/25/2015	53 kts.	0	0	5.00k	0.00k
Farmhaven	02/01/2015	54 kts.	0	0	3.00k	0.00k
Madison	08/21/2014	50 kts.	0	0	2.00k	0.00k
Ballard	08/10/2014	55 kts.	0	0	10.00k	0.00k
Stokes	08/09/2014	50 kts.	0	0	1.00k	0.00k
Farmhaven	06/09/2014	50 kts.	0	0	3.00k	0.00k
Madison	06/09/201	52 kts.	0	0	5.00k	0.00k
Madison	06/08/2014	52 kts.	0	0	15.00k	0.00k
Davis	06/08/2014	55 kts.	0	0	10.00k	0.00k
Sloan	04/28/2014	65 kts.	0	0	120.00k	0.00k
Canton	04/14/2014	50 kts.	0	0	3.00k	0.00k
Turnetta	06/28/2013	50 kts.	0	0	1.00k	0.00k
Canton	06/28/2013	50 kts.	0	0	25.00k	0.00k
Canton	06/06/2013	55 kts.	0	0	0.00k	0.00k
Flora	06/01/2013	50 kts.	0	0	3.00k	0.00k
Sharon	05/21/2013	50 kts.	0	0	2.00k	0.00k
Flora	05/21/2013	50 kts.	0	0	1.00k	0.00k
Camden	02/10/2013	50 kts.	0	0	2.00k	0.00k
Flora	02/10/2013	50 kts.	0	0	25.00k	0.00k
Madison Station	12/25/2012	50 kts.	0	0	1.00k	0.00k
Turnetta	12/20/2012	50 kts.	0	0	6.00k	0.00k
Cameron	12/20/2012	50 kts.	0	0	2.00k	0.00k
Mill Town	10/17/2012	60 kts.	0	0	30.00k	0.00k
Farmhaven	08/13/2012	50 kts.	0	0	3.00k	0.00k
Madison	07/19/2012	52 kts.	0	0	5.00k	0.00k
Canton	07/05/2012	50 kts.	0	0	10.00k	0.00k
Mansdale	06/11/2012	60 kts.	0	0	25.00k	0.00k
Canton	05/31/2012	52 kts.	0	0	20.00k	0.00k
Mannsdale	05/07/2012	50 kts.	0	0	2.00k	0.00k
Ridgeland	04/02/2012	60 kts.	0	0	150.00k	0.00k
Madison	03/02/2012	55 kts.	0	0	25.00k	0.00k

Table 4.15 continued

Location	Event Date	Wind Speed Magnitude	Deaths	Injuries	Estimated Damages Property	Crop
Flora	08/20/2011	50 kts.	0	0	5.00k	0.00k
Madison Campbell	08/18/2011	60 kts.	0	0	75.00k	0.00k
Flora	07/12/2011	50 kts.	0	0	60.00k	0.00k
Shocco	07/04/2011	50 kts.	0	0	3.00k	0.00k
Revive	06/16/2011	39 kts.	0	0	1.00k	0.00k
Ridgeland	06/13/2011	50 kts.	0	0	2.00k	0.00k
Gluckstadt	06/12/2011	50 kts.	0	0	3.00k	0.00k
Camden	06/07/2011	50 kts.	0	0	3.00k	0.00k
Shocco	06/05/2011	50 kts.	0	0	5.00k	0.00k
Shocco	06/05/2011	50 kts.	0	0	3.00k	0.00k
Flora	04/27/2011	60 kts.	0	0	25.00k	0.00k
Madison Station	04/04/2011	55 kts	0	0	2.00k	0.00k
Ballard	04/04/2011	65 kts.	0	0	50.00k	150.00k
Madison Campbell	03/14/2011	52 kts.	0	0	1.00k	0.00k
Mansdale	02/24/2011	50 kts.	0	0	3.00k	0.00k
Sharon	01/01/2011	50 kts.	0	0	3.00k	0.00k

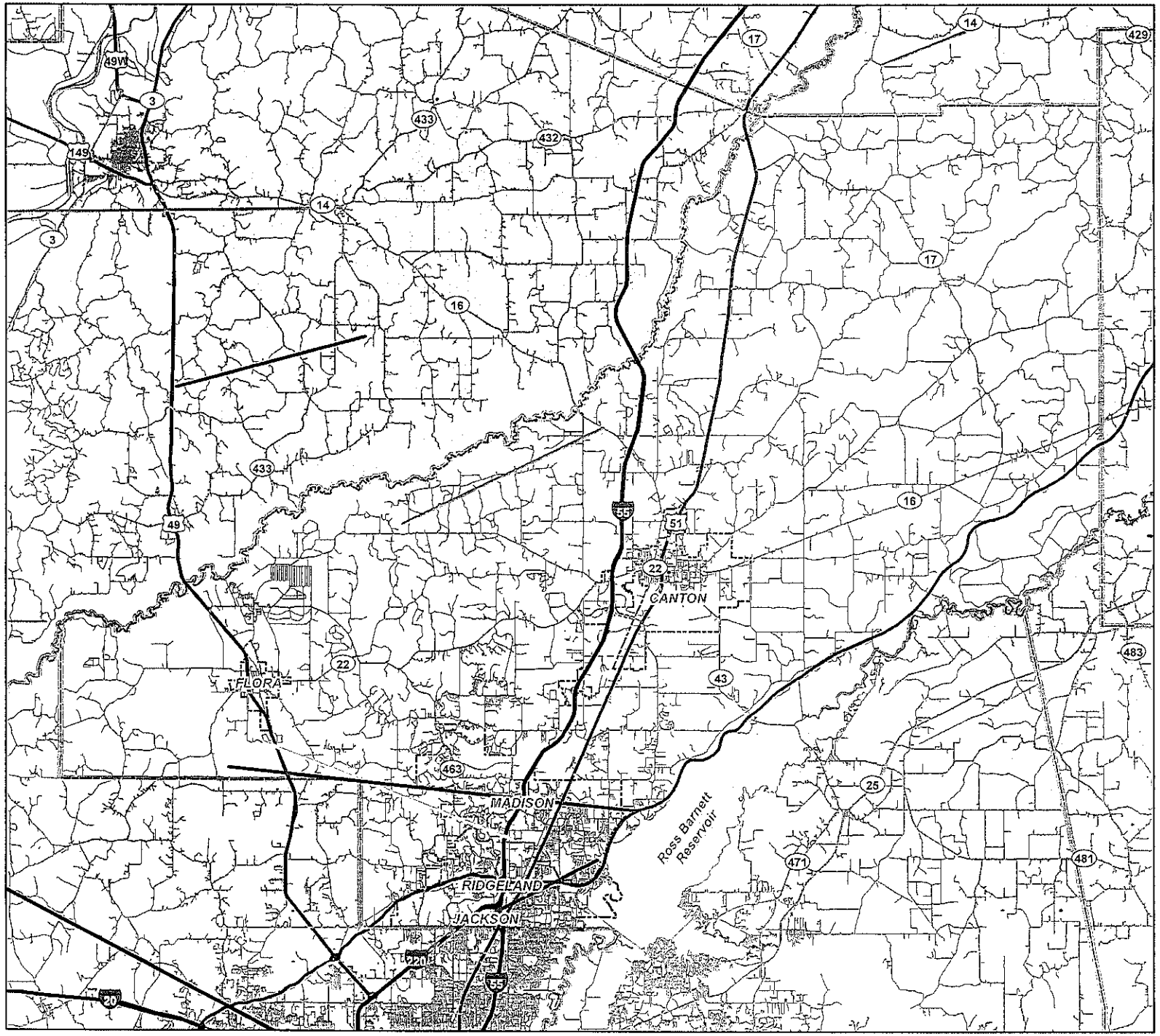
Source: National Climate Date Center

Table 4.16 Recent Severe Thunderstorm Hail Events January 2011-December 2015

Location	Event Date	Magnitude Inches	Deaths	Injuries	Estimated Damages Property	Crop
Cameron	04/08/2014	1.00	0	0	0.00k	0.00k
Stokes	04/28/2014	1.50	0	0	50.00k	0.00k
Flora	04/28/2014	1.00	0	0	0.00k	0.00k
Loring	03/28/2014	1.00	0	0	0.00k	0.00k
Flora	03/18/2013	1.75	0	0	400.00k	0.00k
Flora	11/05/2012	0.75	0	0	0.00k	0.00k
Canton	07/05/2012	1.00	0	0	0.00k	0.00k
Ridgeland	05/30/2012	0.75	0	0	0.00k	0.00k
Canton	04/05/2012	1.75	0	0	50.00k	0.00k
Sloan	04/05/2012	1.50	0	0	20.00k	0.00k
Ballard	04/05/2012	1.00	0	0	0.00k	0.00k
Farm Haven	07/04/2011	0.75	0	0	0.00k	0.00k
Revive	06/16/2011	1.00	0	0	20.00k	0.00k
Revive	06/07/2011	1.00	0	0	10.00k	0.00k
Davis	04/27/2011	1.00	0	0	0.00k	0.00k
Ridgeland	04/20/2011	1.75	0	0	0.00k	0,00k
Davis	04/04/2011	1.00	0	0	0.00k	0.00k

Source: National Climatic Data Center

NOAA SRVGIS Hail Data for Madison County, MS



NOAA SRVGIS Hail Storms
Hail Diameter (Inches)

- <0.75"
- 0.75" - 1.5"
- 1.5" - 2"
- 2" - 3"
- 3" - 4"
- 4" - 5"
- Municipalities
- Interstates
- Major Highways
- Major Local Roads

January 2010 - December 2014
Time Frame for all Data Represented

Incidents Per Year

Year	Madison Co	Statewide
2011	5	368
2012	6	202
2013	1	146
2014	4	183
2015	0	93

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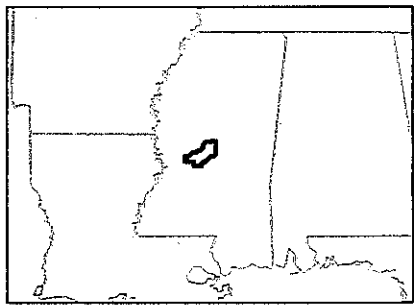
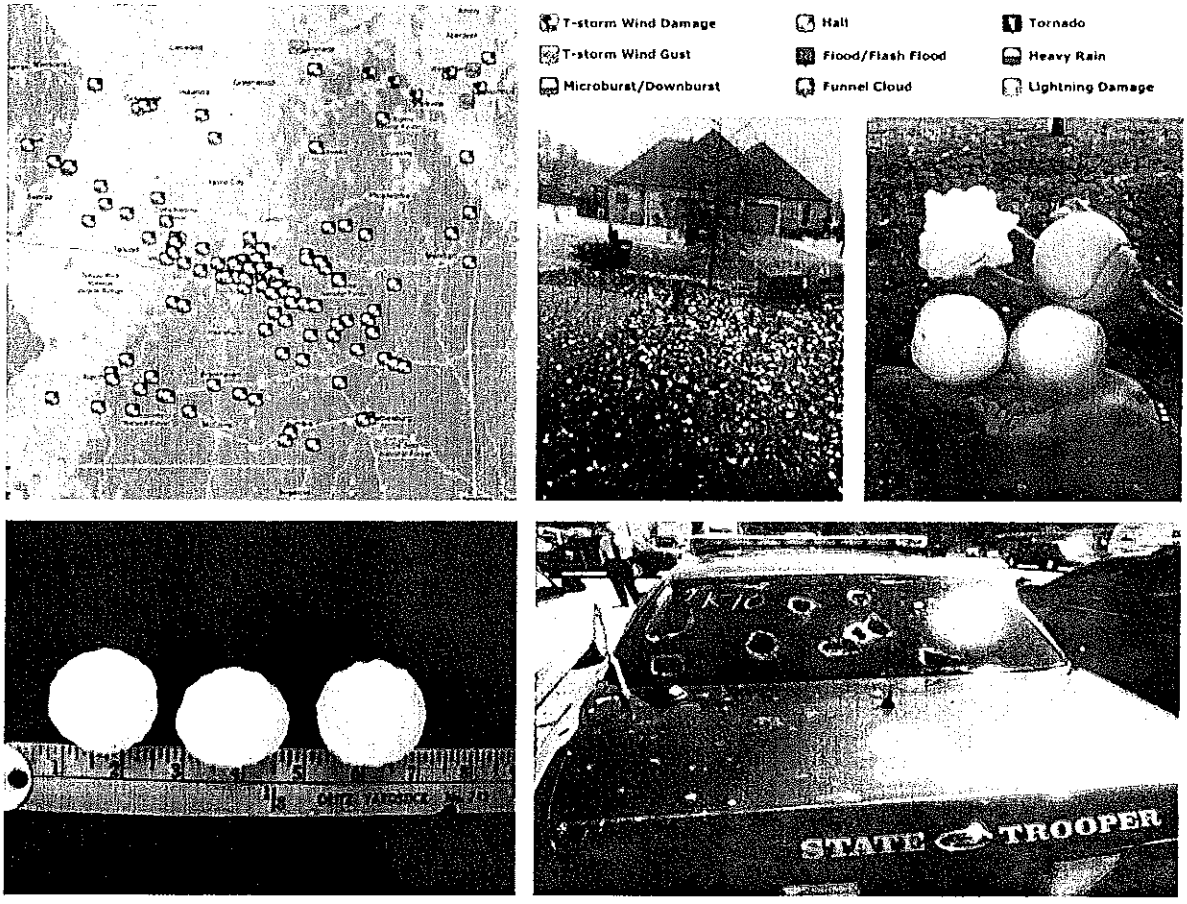


Event Summary:

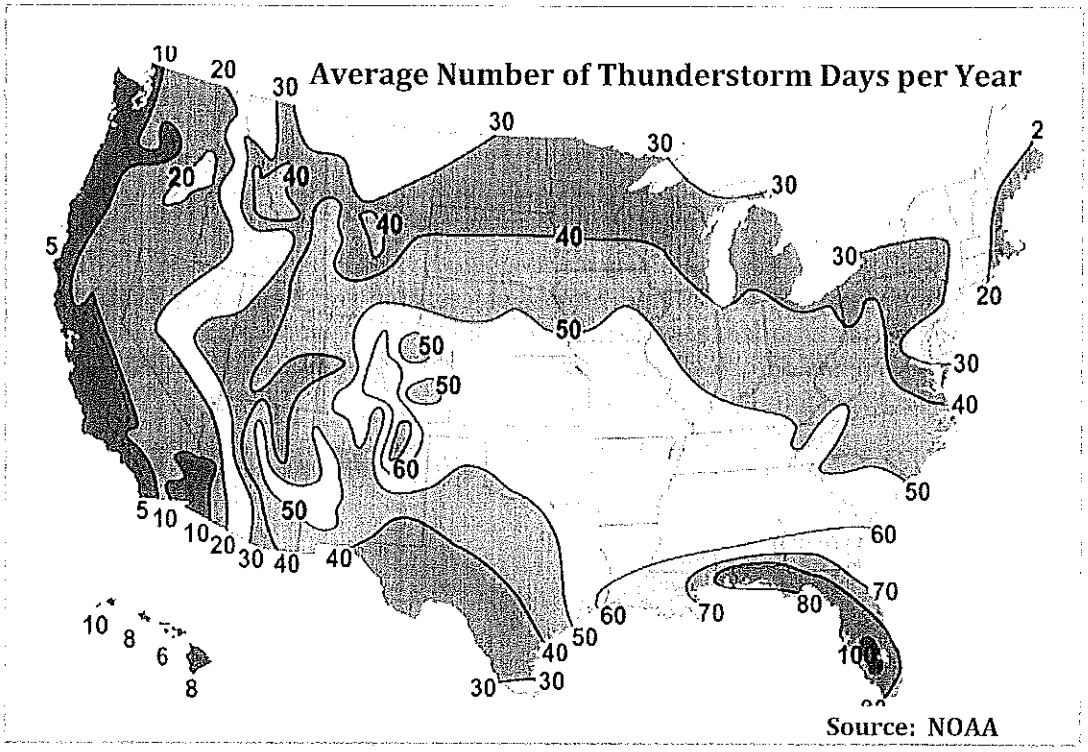
March 2013 Hail Storm

On March 18, 2013, a strong upper level disturbance combined with a strong cold front and associated surface low to produce a supercell as it moved from Louisiana into Mississippi. The storm as it moved through Central Mississippi grew in intensity and produced multiple reports of golf ball to baseball size hail. The largest hail stones reported were softball (4.25") hailstones which fell in Clinton in Hinds County around 3:50pm. The large hail from this supercell caused major roof damage, shattered windshields and caused dents in thousands of vehicles and damaged siding on numerous mobile homes throughout Central Mississippi. The amount of damages that occurred throughout Central Mississippi is staggering and will be remembered for years to come. The hailstones that fell in Clinton were the 3rd largest hailstones in March in Mississippi since 1950, only surpassed by grapefruit size hail in March 1993 in Puckett, MS. The March 2013 event is also the 7th largest hailstone to fall in Mississippi in any month.



Probability of Future Occurrence

Future severe thunderstorms are unavoidable in Mississippi due to its geographical location. Annual occurrences of severe thunderstorms are highly likely, meaning multiple severe thunderstorms are expected to occur annually. According to NOAA, Madison County averages 50 thunderstorm days per year.



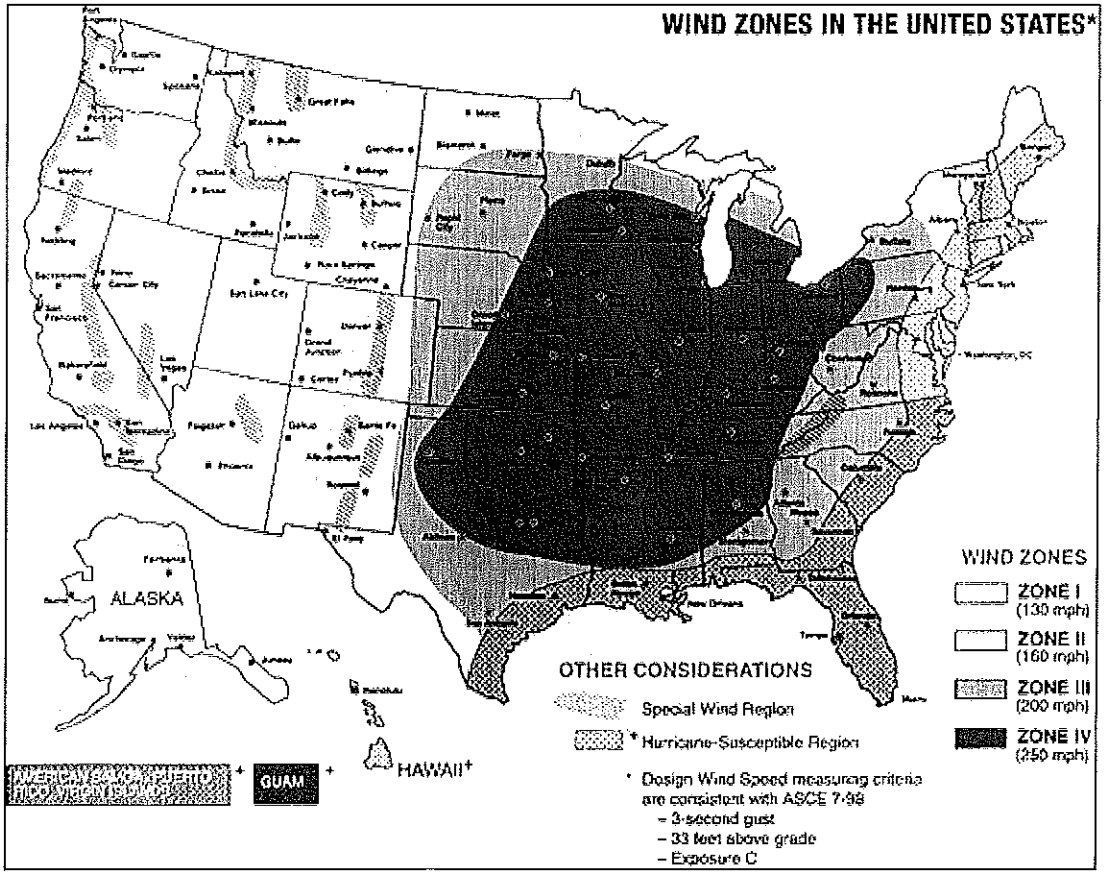
TORNADO

Description

Tornadoes are one of nature's most violent storms. A tornado is a violent windstorm characterized by a rotating or twisting, funnel-shaped cloud extending to the ground. Tornadoes are most often generated by strong thunderstorm activity (but can also be spawned from hurricanes and other coastal storms) when cool dry air intersects and overrides a layer of warm moist air forcing the warm air to rise rapidly. The damage caused by a tornado is a result of the high wind velocity and wind-blown debris, also accompanied by lightning or large hail. Most tornadoes are a few dozen yards wide and touch down only briefly, but even small short-lived tornadoes can inflict tremendous damage. Highly destructive tornadoes may carve out a path over a mile wide and several miles long.

Location and Extent

By virtue of its location, all of Madison County is recognized as a danger zone for tornado outbreaks. FEMA's map of Wind Zones in the United States, places Madison County in Zone IV, which is considered the highest risk area for tornado activity. Therefore, all of Madison County is uniformly susceptible to the occurrence of tornadoes. Historically Wind Zone IV has experienced the greatest number and strongest tornadoes in the United States.



The Enhanced Fujita Scale (EF-scale), shown in Table 4.17, is used to categorize the strength and magnitude of tornado events based on estimated wind speeds and related damage. This represents an update to the original Fujita Scale (F-scale) and has been implemented since February 2007.

Table 4.17 Enhanced Fujita Scale

Scale	Wind Speed MPH	Potential Damage
EF0	65-85	***Light Damage*** Peels surface off some roofs, some damage to gutters or siding, branches broken off trees, shallow-rooted trees pushed over.
EF1	86-110	***Moderate Damage*** Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors, windows and other glass broken
EF2	111-135	***Considerable Damage*** Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; cars lifted off ground
EF3	136-165	***Severe Damage*** Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance
EF4	166-200	***Devastating Damage*** Well-constructed houses and whole frame houses completely leveled; cars thrown
EF5	>200	***Incredible Damage*** Strong frame houses leveled off foundations and swept away; automobile size debris flies through the air in excess of 300 ft.; steel reinforced concrete structures badly damaged; high-rise buildings have significant structural deformation

Previous Occurrences

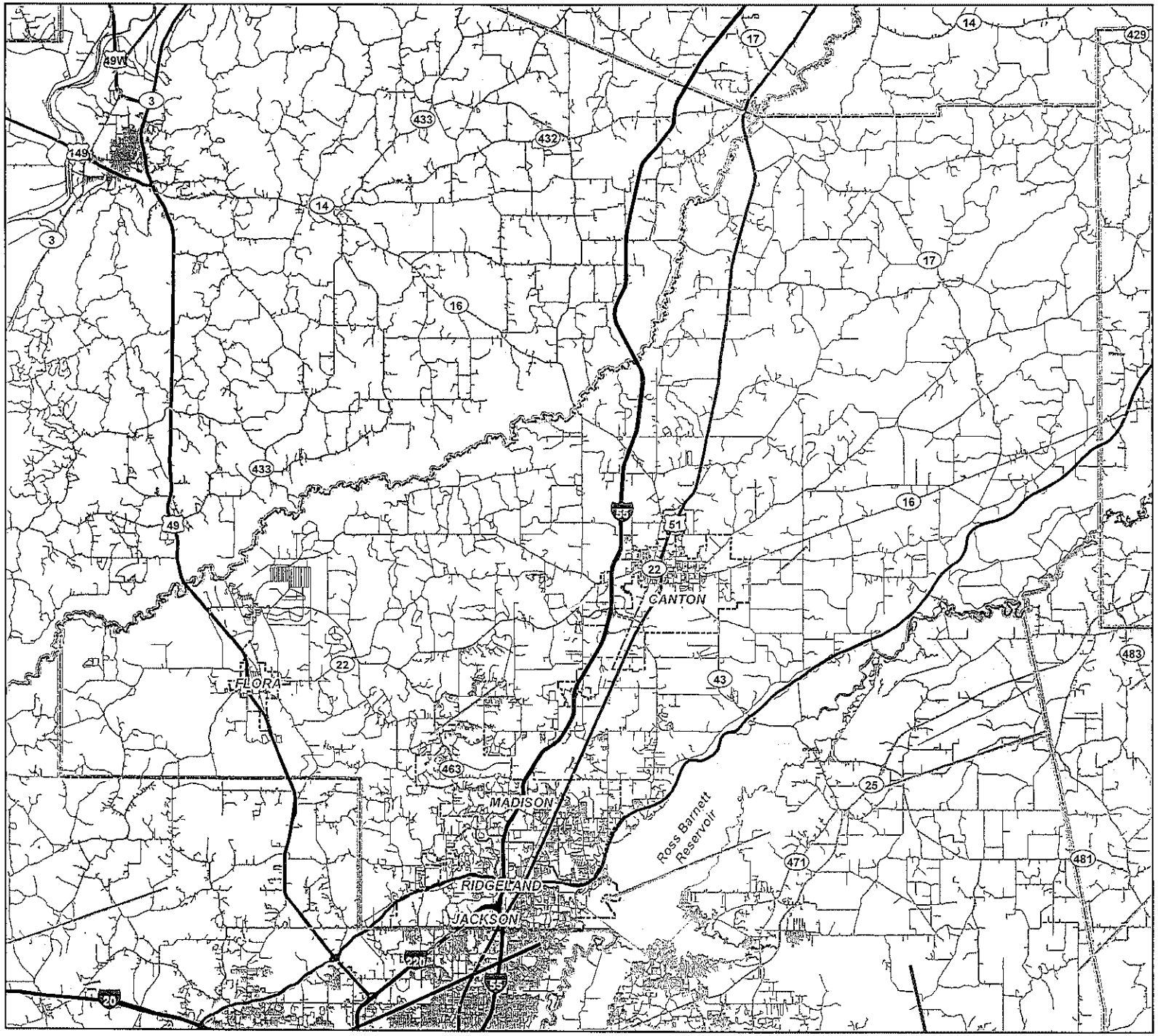
According to the National Climatic Data Center, several tornadoes have occurred in Madison County. Map 4.6 indicates the track of previous occurrences in Madison County between 2004 and 2015.

Table 4.18 Recent Tornado Activity in Madison County January 2011 – December 2015

Location	Date	Scale	Damage	
			Property	Crop
Turnetta	04/25/2015	EF1	20.00k	0.00k
Ballard	04/28/2014	EF0	50.00k	0.00k
Mansdale	04/28/2014	EF1	450.00k	0.00k
Madison Campbell Airport	04/15/2011	EF1	0.00k	0.00k

Source: National Climatic Data Center

NOAA SRVGIS Tornado Data for Madison County, MS



NOAA SRVGIS Tornado Paths
Enhanced Fujita Scale

- EF 0
- EF 1
- EF 2
- EF 3
- EF 4
- EF 5

Municipalities
Interstates
Major Highways
Major Local Roads

January 2010 - December 2014
Time Frame for all Data Represented

Incidents Per Year

Year	Madison Co	Statewide
2011	1	94
2012	0	48
2013	0	30
2014	2	40
2015	1	45

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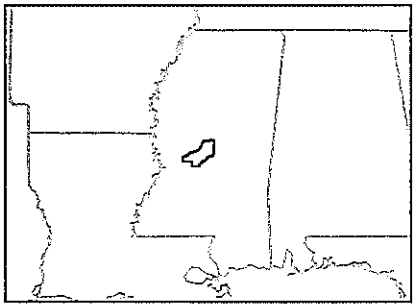
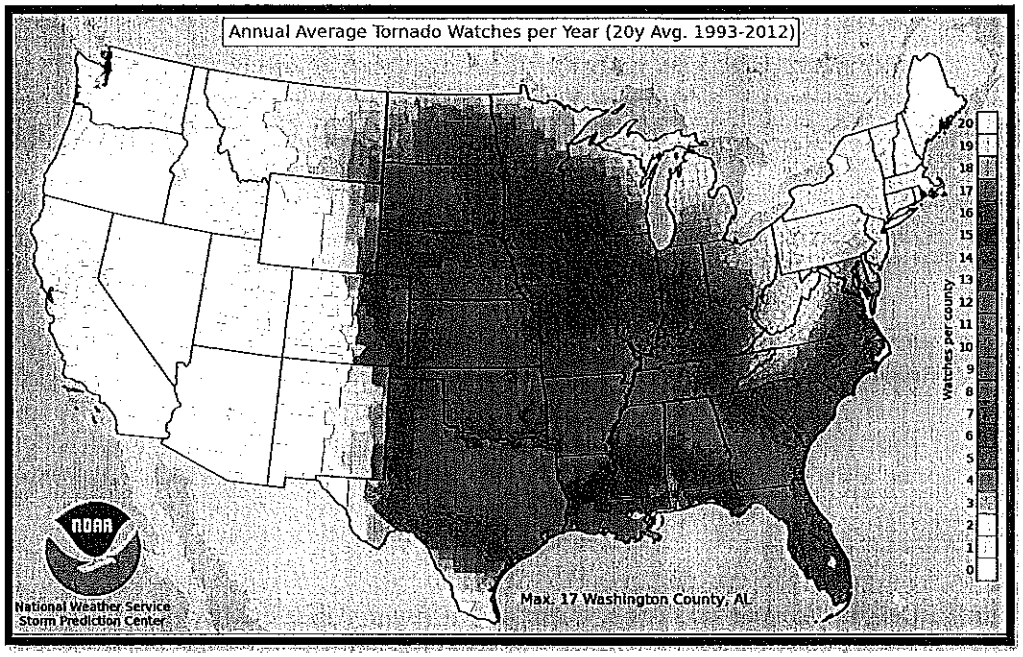
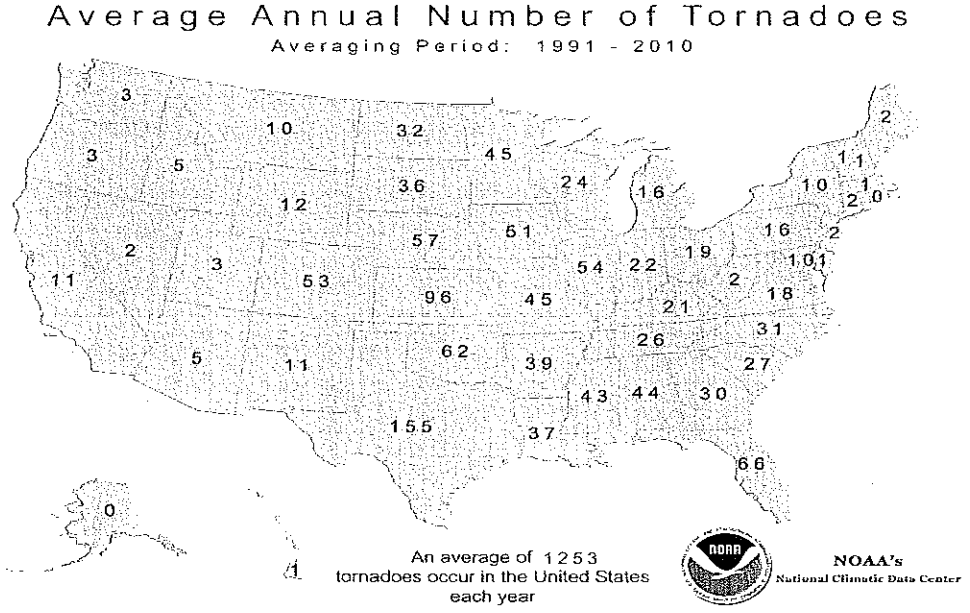


Probability of Future Occurrence

Mississippi is located in the middle latitudes, which provide some of the most favorable environment for tornado development. On average, 43 tornadoes occur in Mississippi annually according to NOAA. Therefore, future occurrences of tornado activity in Madison County is unavoidable and highly likely with multiple annual occurrences expected. However, scientists can't predict the precise location of when and where the next tornado will occur in Madison County. Tornadoes are the most unpredictable force of nature, they can strike anywhere at any time as long as atmospheric conditions are favorable. Tornadoes can leave a small path of destruction with very little to no visible damage, or they can leave a community completely destroyed with hundreds of lives lost.





TROPICAL STORMS

Description

According to the National Hurricane Center, a tropical cyclone is a rotating, organized system of clouds and thunderstorms that originate over tropical or subtropical waters and has a closed low-level circulation. Tropical cyclones rotate counterclockwise in the Northern Hemisphere. They are classified as follows:

Tropical Depression: a tropical cyclone with maximum sustained winds of 38 mph or less.

Tropical Storm: a tropical cyclone with maximum sustained winds of 39 to 73 mph.

Hurricane: a tropical cyclone with maximum sustained winds of 74 mph or higher.

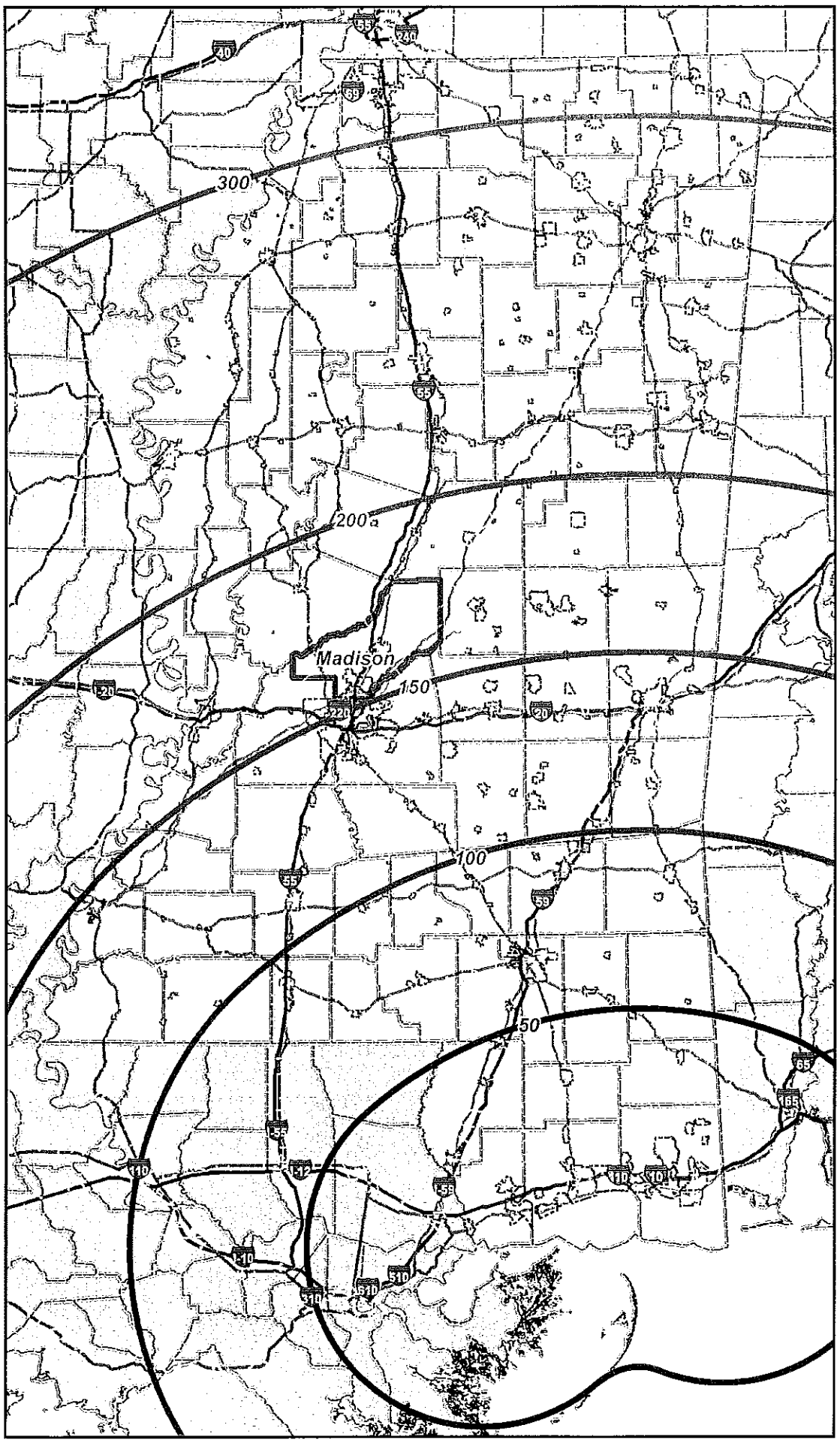
Major Hurricane: A tropical cyclone with maximum sustained winds of 111 mph or higher, corresponding to a Category 3,4, or 5 on the Saffir-Simpson Hurricane Wind Scale.

Hurricanes can produce extremely powerful winds, torrential rain, high waves, damaging storm surge, tornadoes, and even flash flooding. Cyclones feed on heat released in the ocean when moist air rises. When maximum sustained winds reach or exceed 39 miles per hour, the system is designated a tropical storm, given a name, and is closely monitored by the National Hurricane Center. When sustained winds reach or exceed 74 miles per hour the storm is deemed a hurricane. Once cyclones move over land they begin to lose their strength. Coastal areas are most vulnerable to the impacts of cyclones, but their wrath can be felt well inland depending upon the size and strength of the storm. Hurricane season in the Atlantic begins, June 1st and ends November 30th.

Location and Extent

Madison County, located just over 170 miles north of Mississippi's Gulf Coast, is not vulnerable to a direct impact of tropical storms; however, all of Madison County is susceptible to the impacts of Hurricanes and other tropical storms as they come ashore the Gulf Coast and move inland. Madison County is most susceptible to the spinoff effects of hurricanes such as possible tornadoes and heavy downpours, which can result in local flooding. In addition, strong winds can damage roof tops, vinyl siding, and unsecured items outside, as well as down trees and power lines.

Proximity to Mississippi Gulf Coast



Radius From MS Gulf Coast

Distance

- 300 Miles
- 200 Miles
- 150 Miles
- 100 Miles
- 50 Miles
- Municipalities
- Interstates
- Major Highways
- Major Local Roads

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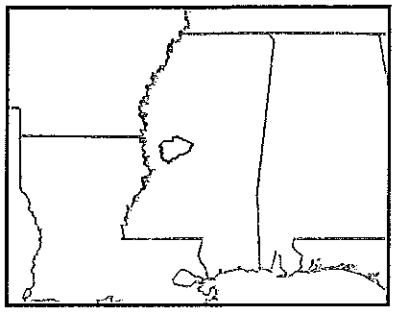


The strength and magnitude of a hurricane is measured using the Saffir-Simpson Wind Scale. The scale uses a 1 to 5 categorization distinguished by the intensities of a storm's sustained winds. Table 4.19 explains the various categories associated with the Saffir-Simpson Scale and the type of damage associated with each rising category.

Table 4.19 Saffir-Simpson Wind Scale

Category	Wind Speed (mph)	Summary	Types of Damage
One	74-95	Dangerous winds will produce some damage	Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
Two	96-110	Extremely dangerous winds will cause extensive damage	Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
Three	111-129	Devastating damage will occur	Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
Four	130-156	Catastrophic damage will occur	Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possible months. Most of the area will be uninhabitable for weeks or months.
Five	157 or higher	Catastrophic damage will occur	A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Source: National Hurricane Center

Previous Occurrences

Over the years, Mississippi has seen the wrath of many hurricanes most notably Hurricane Camille in 1969 and Hurricane Katrina in 2005. Hurricane Camille produced winds in excess of 200 mph and tides over 20 feet as it smashed into the Gulf Coast. At least 250 lives were lost, with another 100 missing. Some 5,000 homes were totally destroyed and 40,000 were heavily damaged. Hurricane Katrina, which is one of the nations' most costly natural disasters with over $81billion in damages, caused catastrophic damage across large portions of the Gulf Coast including Louisiana, Alabama and Mississippi. Entire neighborhoods were completely destroyed by the storm surge along the coast. However, the devastation was not only confined to the coastal region, widespread and significant damage was reported well inland including damage in parts of Madison County. Hurricane force winds which, were reported as far north as Central Mississippi, destroyed thousands of acres of forestland and damaged countless rooftops. Katrina produced winds in excess of 130 mph and storm surge over 35 feet as it came ashore. Over 1,600 deaths are attributed to Katrina with 231 reported in Mississippi. Recent hurricanes and/or tropical storms that have come ashore and impacted Mississippi are included in Table 4.20 and Map 4.8.

Table 4.20 Recent Tropical Storm Events 2004-2015

Date	Event
September 19, 2004	Hurricane Ivan
July 10, 2005	Hurricane Dennis
August 29, 2005	Hurricane Katrina
September 24, 2005	Hurricane Rita
September 1, 2008	Hurricane Gustav
September 11, 2008	Tropical Storm Ike
November 9, 2009	Tropical Storm Ida
September 2, 2011	Tropical Storm Lee
August 28, 2012	Hurricane Isaac

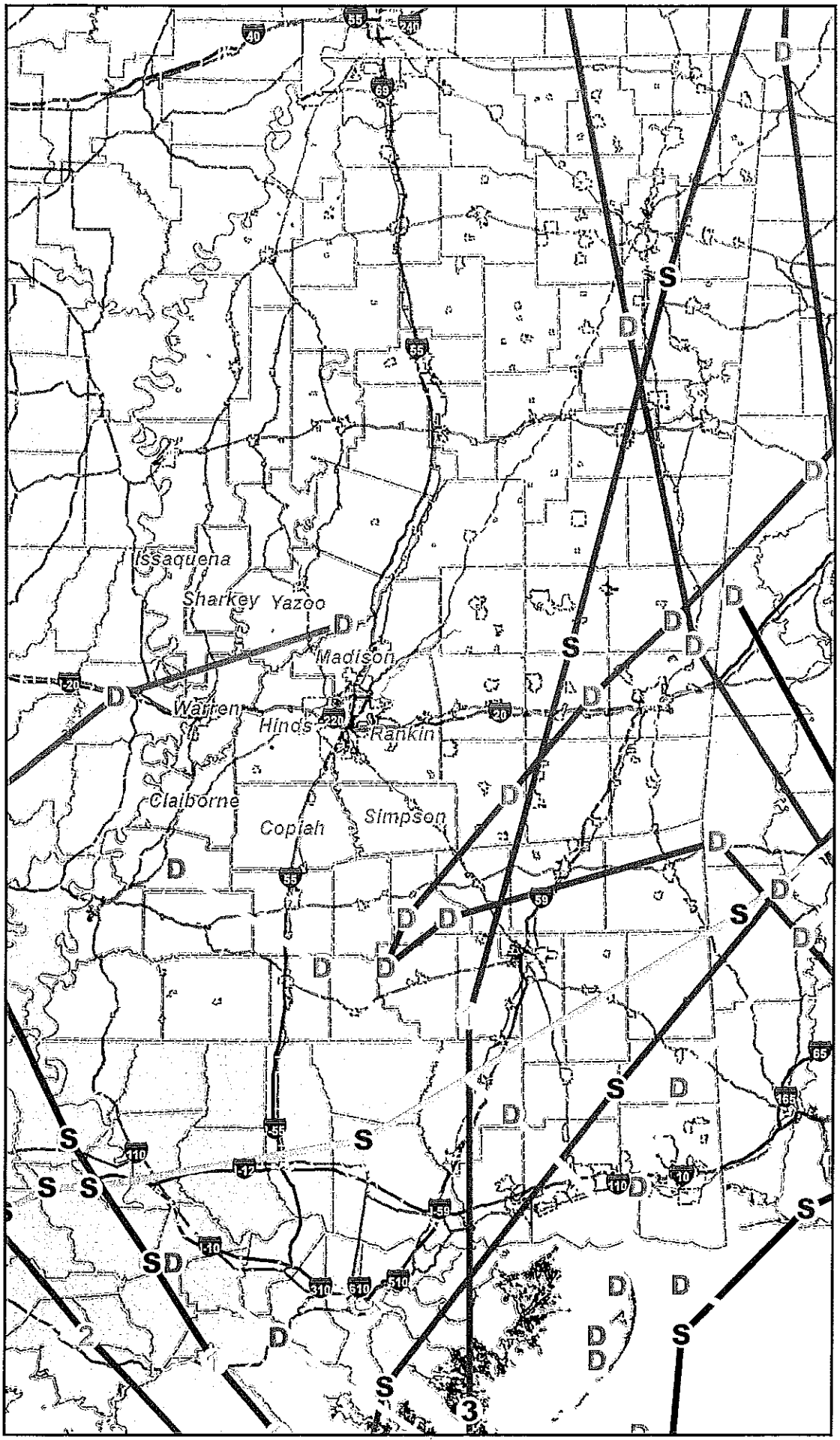
Event Summary:

Hurricane Katrina

As Katrina moved northward, the impact across Central, East-Central and Northeast Mississippi was widespread and significant. The region east of Monticello to Brandon to Ackerman saw millions of trees and power lines blown down. Three fatalities occurred across Simpson, Lauderdale and Leake counties. Each of these fatalities were from fallen trees. The agricultural industry was severely impacted across the region with the biggest losses in the timber and poultry industries. Thousands of power poles and countless miles of power lines were taken down by fallen trees and wind. The power outages across the region were widespread and lasted for a period of a few days to as long as 4 weeks. An example of how widespread the power outages were can be shown from the Jackson Metro area, which includes Hinds, Madison and Rankin counties. The first night, the Metro Area had 97% of the area out of power.

Source: National Climatic Data Center

NOAA Mississippi Tropical Storm Data



National Hurricane Center Wind Intensity

- 5 Category 5
- 4 Category 4
- 3 Category 3
- 2 Category 2
- 1 Category 1
- S Tropical Storm
- D Tropical Depression

Tropical Storm Path Season

- 2005
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
- 2014

- Municipalities
- Interstates
- Major Highways
- Major Local Roads

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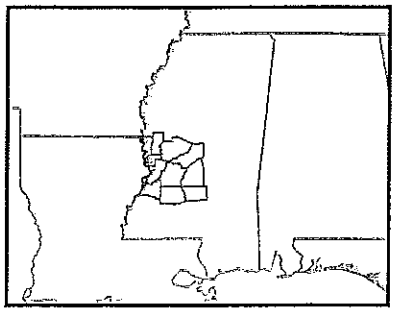
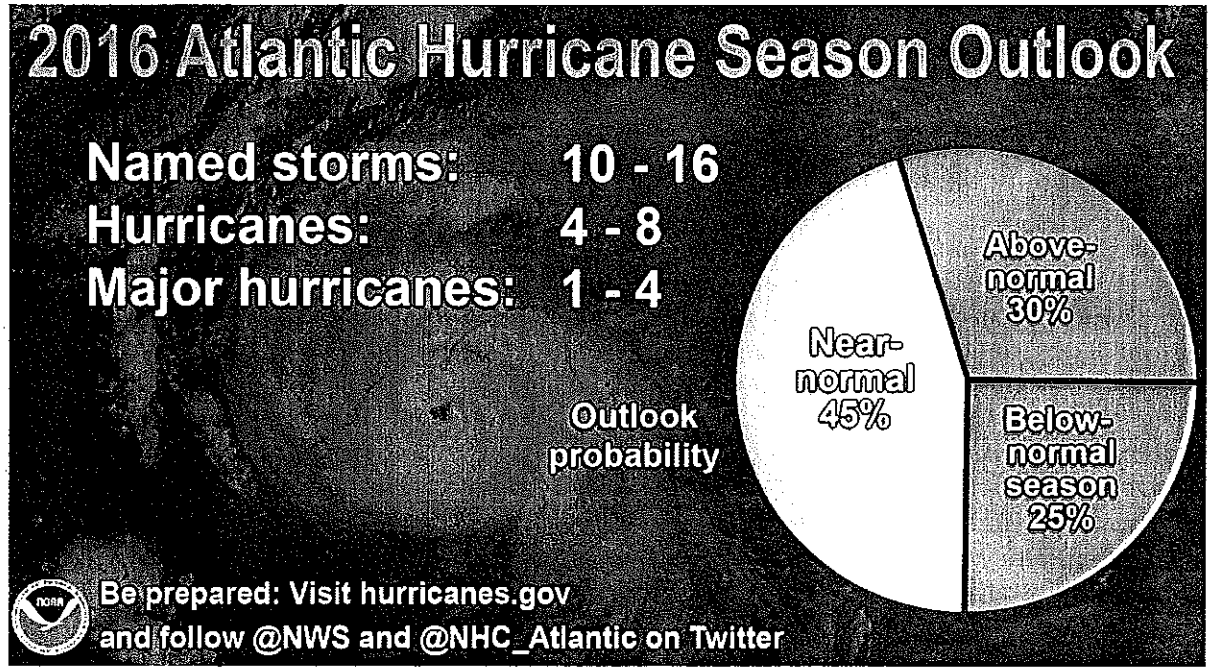


Probability of Future Occurrence

Future tropical related storms are unavoidable in Mississippi due to its geographical location. Forecasters with NOAA's Climate Prediction Center release an annual hurricane season outlook, which predicts tropical storm activity. The 2016 Atlantic Hurricane Season Outlook predicts a 25% chance of a below-normal season, a 45% chance of a near-normal season and a 30% chance of an above-normal season.



WILDFIRES

Description

A wildfire is an uncontrolled fire burning in an area of vegetative fuels such as grasslands, brush, or woodlands. Other names such as brush fire or forest fire may be used to describe a wildfire depending on the type of vegetation being burned. Heavier fuels with high continuity, steep slopes, high temperatures, low humidity, low rainfall, and high winds all work to increase the frequency and severity of wildfire for people and property located within wildfire hazard areas, and particularly for those in rural areas with limited capabilities for rapid fire suppression. When not quickly detected and contained, wildfires have the potential to cause extensive damage to property and threaten human life.

A wildfire can occur naturally such as a spark from lightning igniting a fire or as a result of human actions. However, the vast majority of wildfires across the United States are started as a result of human actions such as improperly discarding cigarettes, burning debris, or not extinguishing campfires. According to the Mississippi Forestry Commission (MFC) between July 1, 2013 and June 30, 2014, MFC suppressed 1,928 wildfires, which burned 25,870 acres across Mississippi. The average wildfire size was 13.4 acres

Location and Extent

Those most vulnerable to wildfires include those within a short distance of the interface between the built environment and the wildland environment. The wildland urban interface is defined as the area where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. The image located on the next page identifies the location of potential wildfire hazard areas across the region according to maps produced by the SILVIS Laboratory at the University of Wisconsin. The map identifies two types of wildland urban interface hazard areas: intermix and interface. Intermix areas are described as areas where housing and vegetation intermingle; interface areas are described as areas with housing in the vicinity of contiguous wildland vegetation.

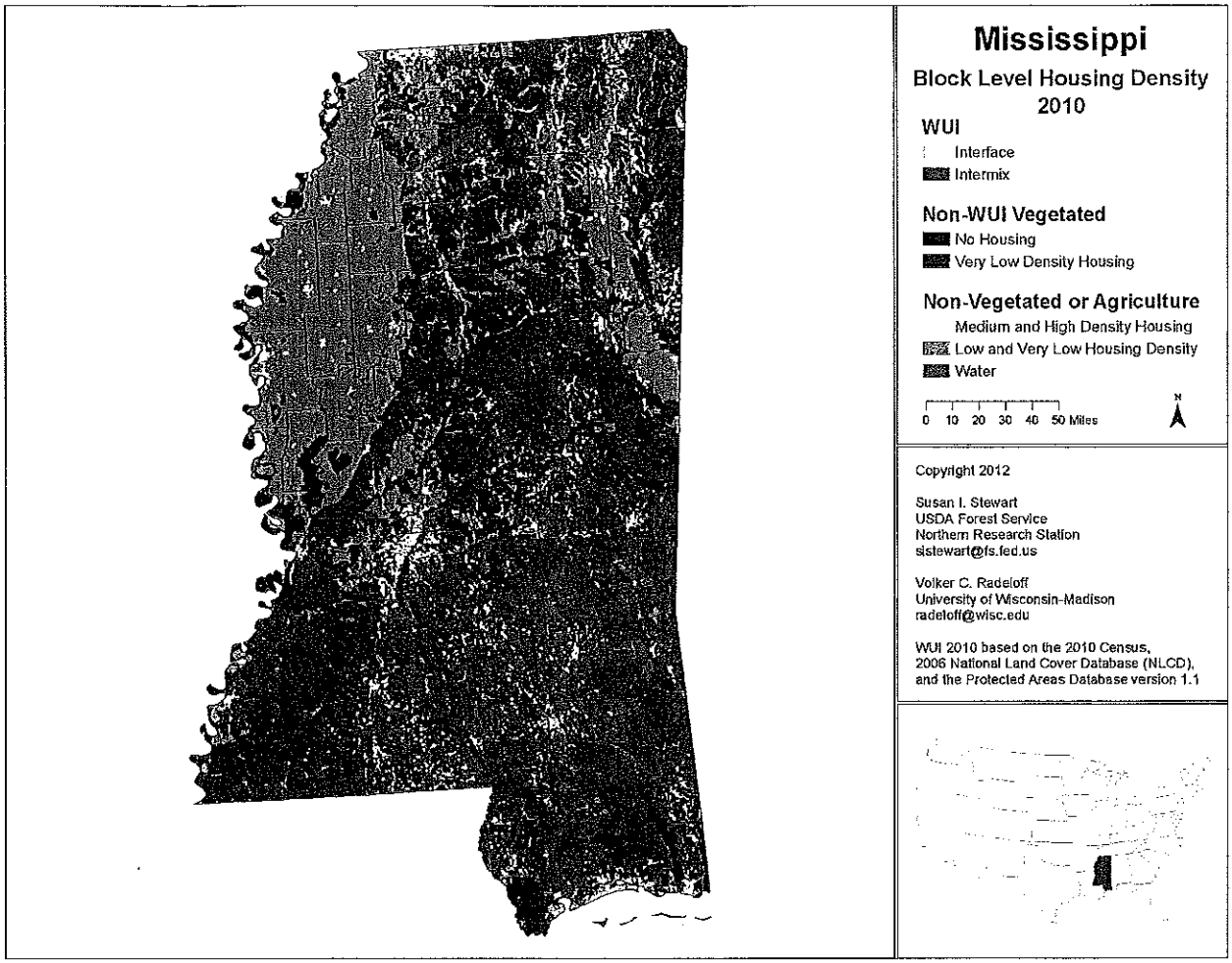
The magnitude of wildfire events are often characterized by their speed of propagation, total number of acres burned, and potential destructive impacts to people and property. The magnitude and severity of wildfires is greatly dependent on weather; fuel conditions; topography; and existing fire detection, control and suppression capabilities.

According to the forest inventory and analysis report by the Mississippi Forestry Commission, the area of forestland in Madison County totaled 244,497 acres.

Table 4.21 Forest Inventory

County	Pine (acres)	Hardwood (acres)	Forested (acres)
Madison County	146,203	98,294	244,497

Source: Mississippi Forestry Commission



Previous Occurrences

Map 4.9 depicts each recorded fire by the Mississippi Forestry Commission (MFC) for 2004 through 2013 for Madison County, color coded by fiscal year. The data collected by the MFC illustrates that 440 fires occurred between 2004 and 2013.

Table 4.22 Reported Wildfire Occurrences 2004-2013

County	Number of Fires	Total Acres Burned	Average Fire Size (Acres)
Madison County	440	6,165	18.80

Source: Mississippi Forestry Commission

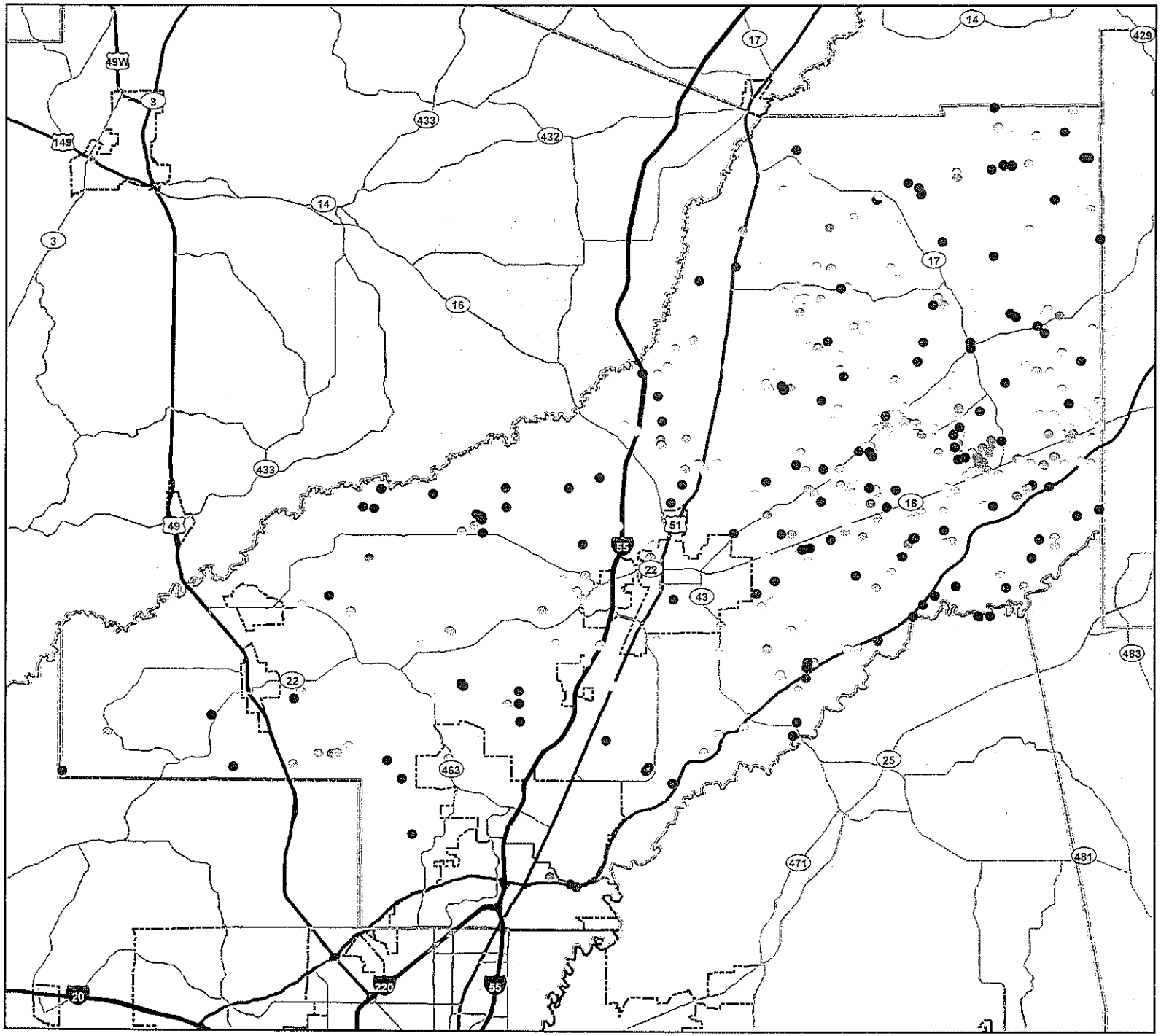
Probability of Future Occurrence

Due to the annual occurrence of wildfires throughout Madison County, they will continue to be a highly likely occurrence, meaning multiple annual occurrences are expected throughout the county. Furthermore, wildfires are a natural part of the ecosystem, and future fires are unavailable. However, through outreach and education programs the number of manmade wildfires can be significantly reduced. To determine possible locations of future wildfires Map 4.10 was created. The high occurrence fire areas were calculated by determining the distance between each fire recorded from 2004 through 2013.

Annual Average # of Wildfires	
Madison County	**44**

Source: MFC

MFC Wildfire Fiscal Year Data for Madison County, MS



MS Forestry Commission

Fiscal Years

- 2004
- 2005
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
- 2013

- Interstates
- Major Highways
- Major Local Roads
- Municipalities

January 2004 - December 2013
Time Frame for all Data Represented

N

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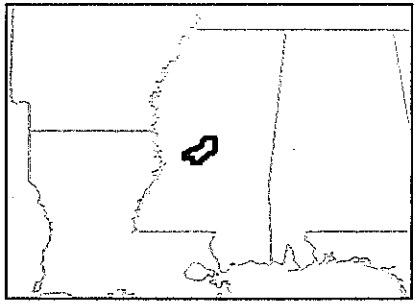
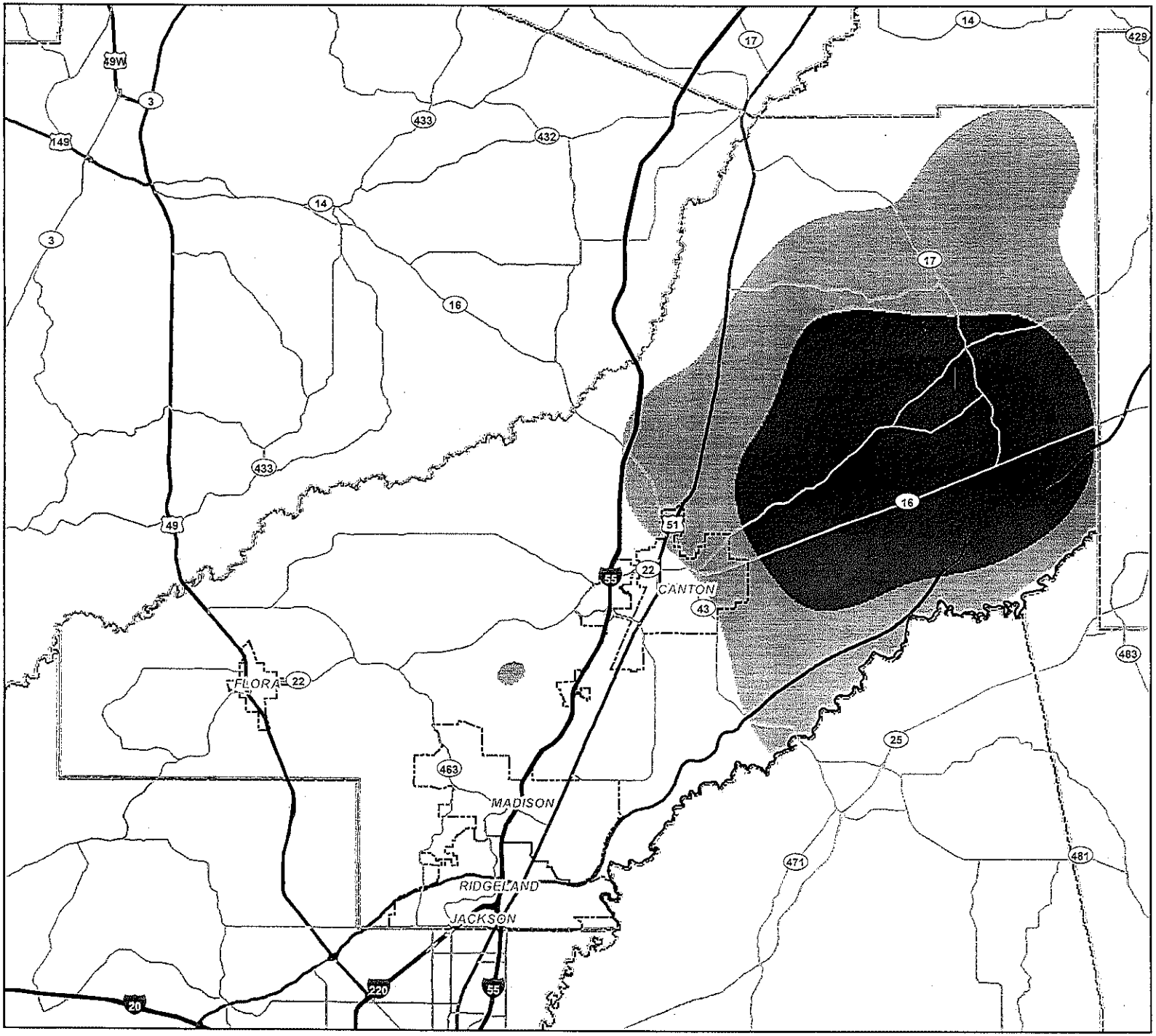


MFC High Occurrence Wildfire Areas for Madison County, MS



MS Forestry Commission
Occurrence Density
- High Concentration
- Medium Concentration
- Moderate Concentration
- Low Concentration
- Other
- Municipalities
- Interstates
- Major Highways
- Major Local Roads

January 2004 - December 2013
Time Frame for all Data Represented

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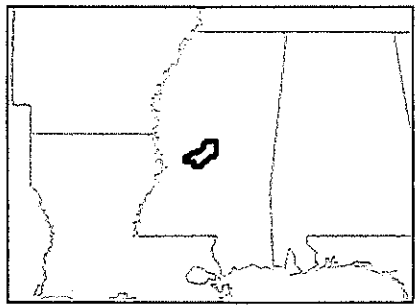
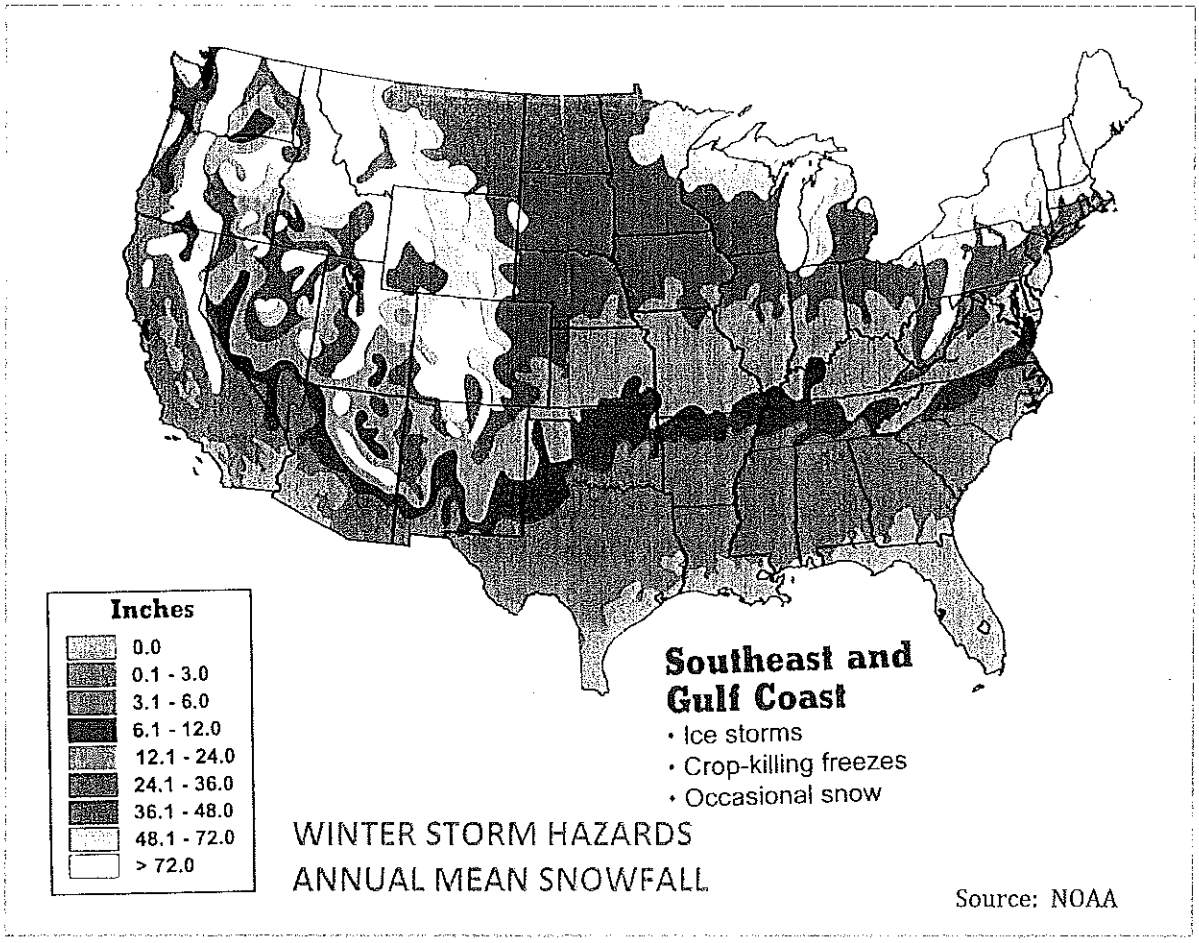


WINTER STORM

Description

Typically a winter storm in the south lasts several days and is accompanied by any combination of freezing rain, sleet, light snow, dangerously cold temperatures, and/or high winds.

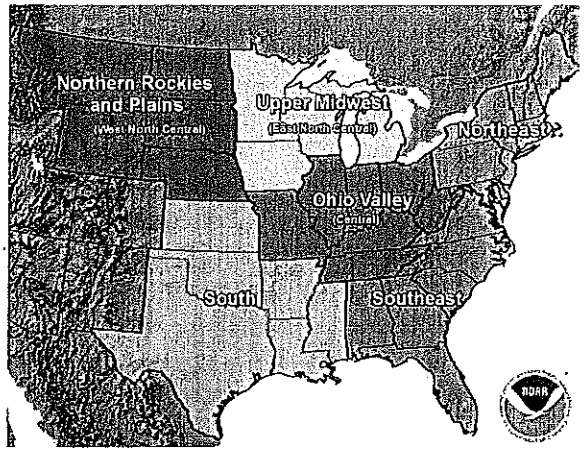
Snow	Sleet	Freezing Rain
Occurs when cloud temperature is cold enough for snow to form and the air above the ground does not melt it. Flurries: Light snow falling for short durations. No accumulation. Showers: Snow falling at varying intensities for brief periods of time. Some accumulation is possible. Blowing Snow: Wind driven snow that reduces visibility and causes significant drifting. Blowing snow is mostly loose snow on the ground that is picked up by the wind. Blizzard: Winds at least 35 mph with snow and blowing snow reducing visibility to ¼ mile or less.	Rain drops that freeze into ice pellets before reaching the ground. Sleet usually bounces when hitting a surface and does not stick to objects. However, it can accumulate like snow and cause a hazard to motorist. A ½ inch of sleet accumulation can be a serious hazard.	Rain that falls onto a surface with a temperature below freezing. This causes it to freeze to surfaces, such as trees, cars, and roads, forming a coating or glaze of ice. Even small accumulations of ice can cause a significant hazard.



Location and Extent

All of Madison County is susceptible to the occurrence of winter storms. According to the State of Mississippi Standard Hazard Mitigation Plan, an ice storm, heavy snow, or winter storm event is more likely to occur in areas north of Interstate 20, but occur throughout Central Mississippi on occasion.

Recently, the National Climatic Data Center (NCDC) developed the Regional Snowfall Index (RSI), which ranks the impacts of snowstorms from 0 to 5, similar to the Fajita scale for tornadoes or the Saffir-Simpson scale for hurricanes, using a mathematical equation that takes into account different thresholds. However, the RSI differs from other indices because it includes population. RSI is based on spatial extent of the storm, the amount of snowfall, and the juxtaposition of these elements with population. The RSI includes a separate index for each of the six NCDC climate regions in the



eastern two-thirds of the nation. Mississippi falls in the NCDC South region. Obviously, the amount of snowfall in the Northeast region is very different from the Southeast region, which is why it is important to place snow storms into perspective on a regional scale to understand their true impacts. For example, a snowstorm in the Southeast may receive less snow than the Northeast for the same storm, but the societal impacts may be similar. This is because the Northeast is more resilient to snowstorms, having more snow removal equipment and people with more experience driving in snowstorms, whereas a small storm may create the same impacts of a larger storm in the Northeast because the Southeast is not as resilient to snowstorms. The regional snowfall thresholds for the south are 2", 5", 10", and 15" while thresholds for the Upper Midwest region are 3", 7", 14" and 21". Table 4.23 list the regional snowfall thresholds for all NCDC regions.

Table 4.23 Regional Snowfall Index Thresholds

Northeast	Northern Rockies and Plains	Ohio Valley	Southeast	South	Upper Midwest
>=4"	>=3"	>=3"	>=2"	>=2"	>=3"
>=10"	>=7"	>=6"	>=5"	>=5"	>=7"
>=20"	>=14"	>=12"	>=10"	>=10"	>=14"
>=30"	>=21"	>=18"	>=15"	>=15"	>=21"

Source: National Climatic Data Center

RSI is reported as both a raw index value and a categorical value from 0 through 5. The raw index value can range from 0.01 to 35.00. These values are converted to categories, which are detailed in Table 4.24. Nationally, a Category 5 snowstorm is a very rare event while Category 0 and 1 snowstorms are quite typical.

Table 4.24 Regional Snowfall Index

Category	RSI Value	Description
5	>18	Extreme
4	10-18	Crippling
3	6-10	Major
2	3-6	Significant
1	1-3	Notable
0	<1	--

Source: National Climatic Data Center

Previous Occurrences

Table 4.25 Historical Winter Weather Activity

Event Type	Date	Magnitude	Death	Injuries	Damage Property	Damage Crop
Winter Weather	02/23/2015	Light freezing rain	0	0	4.00k	0.00k
Heavy Snow	01/28/2014	4" of snowfall	0	0	0.00K	0.00K
Heavy Snow	01/16/2013	Up to 3.5" snowfall	0	0	0.00K	0.00K
Ice Storm	02/03/2011	.25" ice accumulated	0	0	900.00K	0.00K
Ice storm	01/09/2011	Light sleet	0	0	75.00K	0.00K
Heavy Snow	02/11/2010	3" to 6.5" snowfall	0	0	1.200M	0..00K
Cold/Wind Chill	01/01/2010	N/A	0	0	600.00K	0.00K
Heavy Snow	12/11/2008	2" to 3" snowfall	0	0	15.00K	0.00K
Heavy Snow	01/19/2008	1" to 2" snowfall	0	0	0.00K	0.00K

Source: National Climatic Data Center

Table 4.26 Regional Snowfall Index Event Ratings

Region	Event Date	Category	Index
South	Jan. 28-Feb. 3, 2014	1	1.392
South	Jan. 15-16, 2013	0	0.008
South	Feb. 08-11, 2010	1	1.445

Source: National Climatic Data Center

Probability of Future Occurrence

Winter weather events will continue to be a likely occurrence within Madison County meaning at least one annual occurrence of light sleet, flurries, and/or snow accumulation is expected annually. According to the National Climatic Data Center, a snowfall greater than one inch occurs every 2 ½ years in Central Mississippi, heavy snowfall (three inches or greater) occurs once every four years, and the longest period between one inch snow fall has been seven years.

Man-Made Hazard Profiles

Although mitigation planning traditionally focuses on planning for and mitigating against natural hazards, federal and state officials encourage communities to take an all-hazard approach by looking at the impact of both man-made and natural hazards. Therefore, Madison County has elected to include two (2) human-caused hazard profiles in the development of this Hazard Mitigation Plan. However, at this time these two (2) human-caused hazards will not be analyzed in great length. Rather a brief explanation of why they pose a risk will be provided. However, this does not prevent these hazards from being profiled in more detail as future updates are made to this plan, and additional information is made available.

NUCLEAR POWER PLANTS

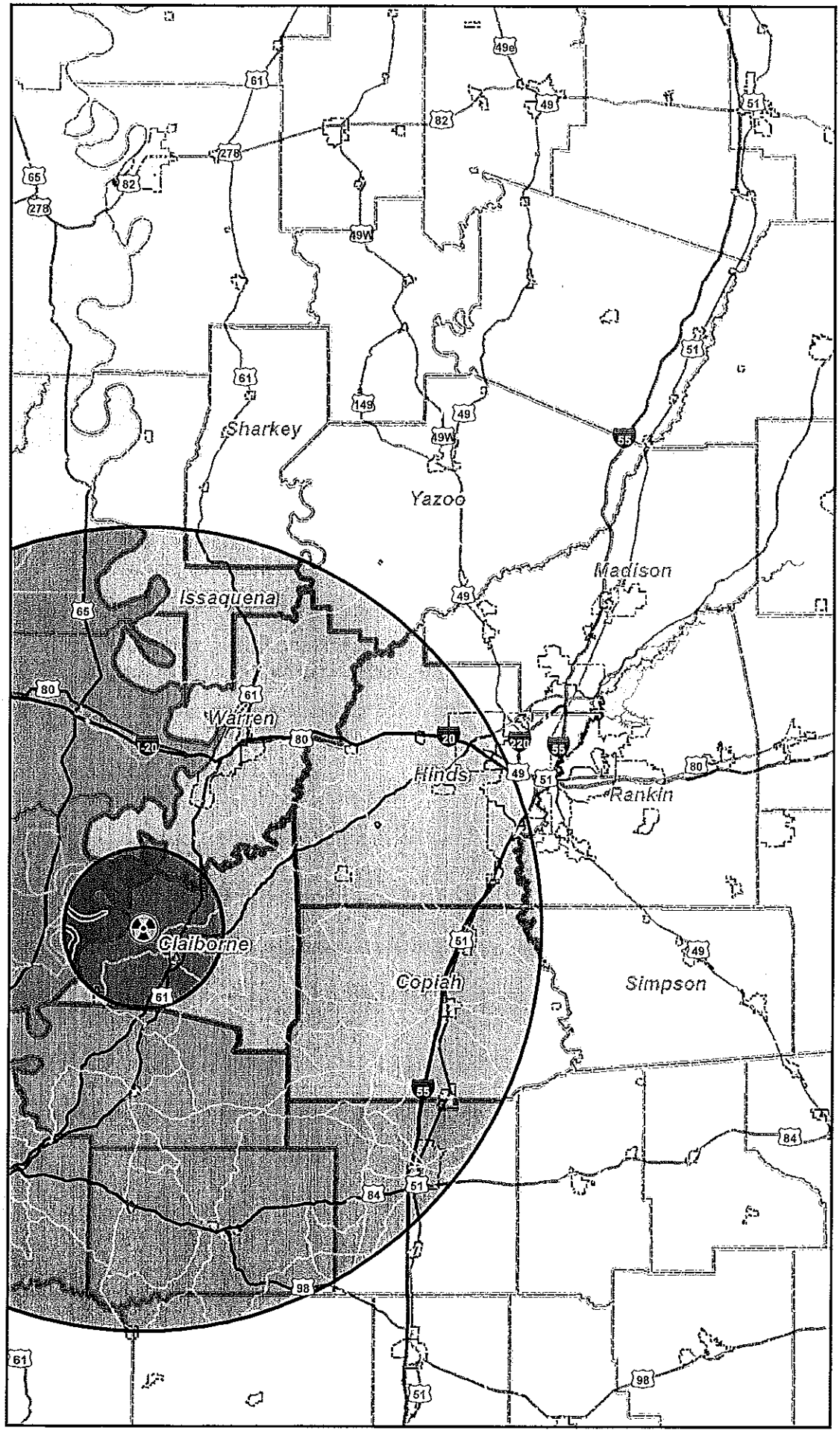
According to MEMA, there are two (2) commercial nuclear power plants, which may affect the health, safety and property of Mississippi residents. The first facility, River Bend Station, is located outside of Mississippi near St. Francisville, Louisiana approximately seventeen (17) miles south of Wilkinson County, and is a concern for South-West Mississippi. The second facility, Grand Gulf Nuclear Station is located approximately five (5) miles northwest of Port Gibson in Claiborne County, and is a concern for Central Mississippi.

Grand Gulf is the only nuclear power plant in Mississippi. In 2012, Grand Gulf completed a power upgrade that made the facility the largest single-unit nuclear power plant in the country and the fifth largest in the world. The facility operates a boiling water reactor with output to 1,443 megawatts. Mississippi maintains a Radiological Emergency Response Plan to prepare for radiological emergencies. The plan includes a Plume Exposure Pathway Zone (EPZ) with a 10-miles radius from the reactor, where the primary concern is people being harmed by direct radiation exposure. The second zone, an Ingestion Exposure Pathway Zone (IEP) includes a 50-mile radius from the facility, and the primary concern for this area is contamination by radioactive material of the water supplies, food crops and livestock. Mississippi counties at risk for an impact by nuclear facilities include:

County	Grand Gulf Nuclear Station	River Bend Station, LA
Claiborne	Plume exposure	
Warren	Ingestion	
Hinds	Ingestion	
Copiah	Ingestion	
Adams	Ingestion	Ingestion
Amite	Ingestion	Ingestion
Wilkinson	Ingestion	Ingestion
Franklin	Ingestion	Ingestion
Pike		Ingestion
Jefferson	Ingestion	
Lincoln	Ingestion	
Simpson	Ingestion	
Rankin	Ingestion	
Madison	**Ingestion**	
Yazoo	Ingestion	
Sharkey	Ingestion	
Issaquena	Ingestion	

The construction and operation of nuclear facilities are closely monitored and regulated by the Nuclear Regulatory Commission (NRC); however, accidents are still possible. According to FEMA, the primary concern following an incident or accident involving nuclear radiation is the extent of radiation inhalation and ingestion of radioactive isotopes, which can cause acute health effects (e.g. death, burns, and severe impairment), chronic health effects (e.g. cancer), and psychological effects.

Grand Gulf Nuclear Station 10 & 50 Mile Radius



GGNS 10- & 50-Mile Radius

- Grand Gulf Nuclear Station
- 10 Mile Radius
- 50 Mile Radius
- Interstates
- Major Highways
- Major Local Roads
- Municipalities
- County Boundaries

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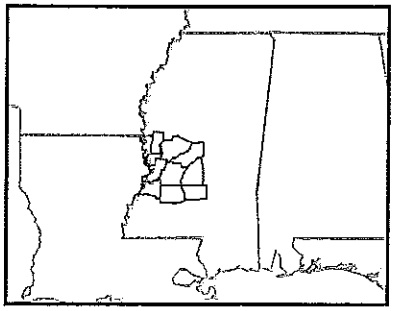


HAZARDOUS MATERIAL TRANSPORTATION ACCIDENTS

Hazardous materials are materials or substances which, because of their chemical, physical, or biological nature, pose a potential risk to life, health, property, or the environment if they are released. In today's society, all modes of transportation including air, rail, water, and roadways carry thousands of shipments of hazardous materials on a daily basis. Therefore, Madison County is subject to hazardous material accidents on any of its modes of transportation.

Major thoroughfares in Madison County include:

Highways: 51, 49, 22, 463, 43, and 16
Interstates: 55, 220
Railways: Canadian National/Kansas City Southern

Large-scale or serous hazardous material transportation incidents that involve a widespread release of harmful material can adversely impact the health, safety, and welfare of those in the immediate vicinity of the accident site, as well as those who come in contact with the spill or airborne plume. Almost all hazardous material transportation incidents are the result of an accident or other human error. Rarely are they caused by mechanical failure of the carrying vessel. While it is unlikely that small accidents would significantly impact a region, certain accidents could have regional secondary impacts such as a large-scale evacuation or disruption of critical transportation routes.

Madison County has been fortunate to not experience a major hazardous material transportation incident in recent history. However, numerous minor incidents have occurred, but none that resulted in multiple deaths or injuries.

Community Assets

Community assets are broadly described as anything that is important to the character and function of a community and generally include four categories: people, economy, the built environment, and the natural environment. Although all assets may be affected by hazards, some assets are more vulnerable because of their physical characteristics or socioeconomic uses. To better understand what is at risk in the county to the hazards identified, Madison County has identified Community Assets in this portion of the plan.

PEOPLE

The total population in Madison County according to the 2010 Census is 95,203. Table 4.27 list 2010 population numbers along with populations that may have unique vulnerabilities (elderly age 65 and over; youth under the age of 20; and population below the poverty level).

Table 4.27 Madison County Population

	2010 U.S. Census					American Community Survey	
Jurisdiction	Total Population	Pop. 65+	% Pop. 65+	Pop. under 20yrs	% Pop. Under 20	Pop. Below Poverty Level	% Below Poverty
Madison County	95,203	9,917	10.4%	28,171	29.6%	773	10.1%

Source: U.S. Census Bureau

Additional sectors of the population with unique vulnerabilities include students and visiting populations associated with colleges and universities. Populations with unique vulnerabilities may also include special needs populations such as hospital and long term care patients.

Table 4.28 Colleges and Universities

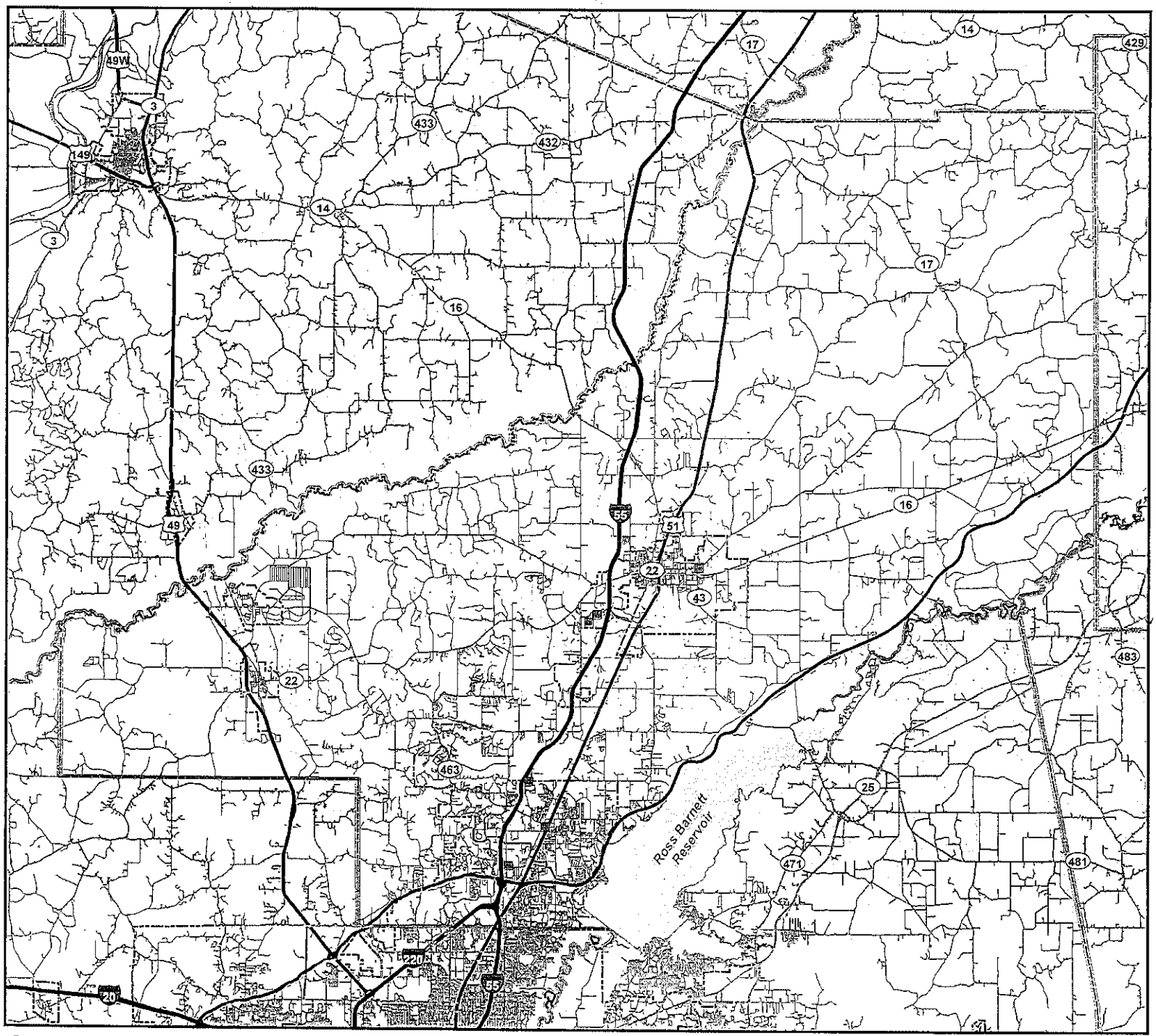
College/University	Address	City	2013-2014 Enrollment
Holmes Community College	412 West Ridgeland Ave.	Ridgeland	3,457
Jackson State University – Madison	382 Galleria Parkway	Madison	403
Tulane University	2115 Main Street	Madison	352

Table 4.29 Assisted Living / Long Term Care Facilities

Facility	*Location*
Madison River Oaks Hospital	Canton
Region 8 Mental Health	Canton
Canton Manor	Canton

Source: Local Mitigation Council

Vulnerable Population Data for Madison County, MS



ECONOMY

After a disaster, economic resiliency drives recovery. The loss or inoperability of major employers in Madison County could severely hamper the county's ability to recover from a disaster. Major employers identified by the Local Mitigation Council are listed in Table 4.30.

Table 4.30 Major Employers

Facility	*Type of Facility*	*Estimated Employees*
Nissan North America	Manufacturing	6,300
Madison County School District	Education	1,500
Peco Food of MS	Food Manufacturing	1,300
Xerox	Technical Services	1,250
Kasai (M-Tek)	Manufacturing	1,000
Yates Services	Manufacturing	690
DHL Supply Chain	Distribution	600
Faurecia	Manufacturing	520
MMC Materials	Construction	473
Comcast	Service Industry	460
L3	Aerospace	400
Levi Strauss & Company	Distribution	367

Source: Local Mitigation Council

CRITICAL FACILITIES

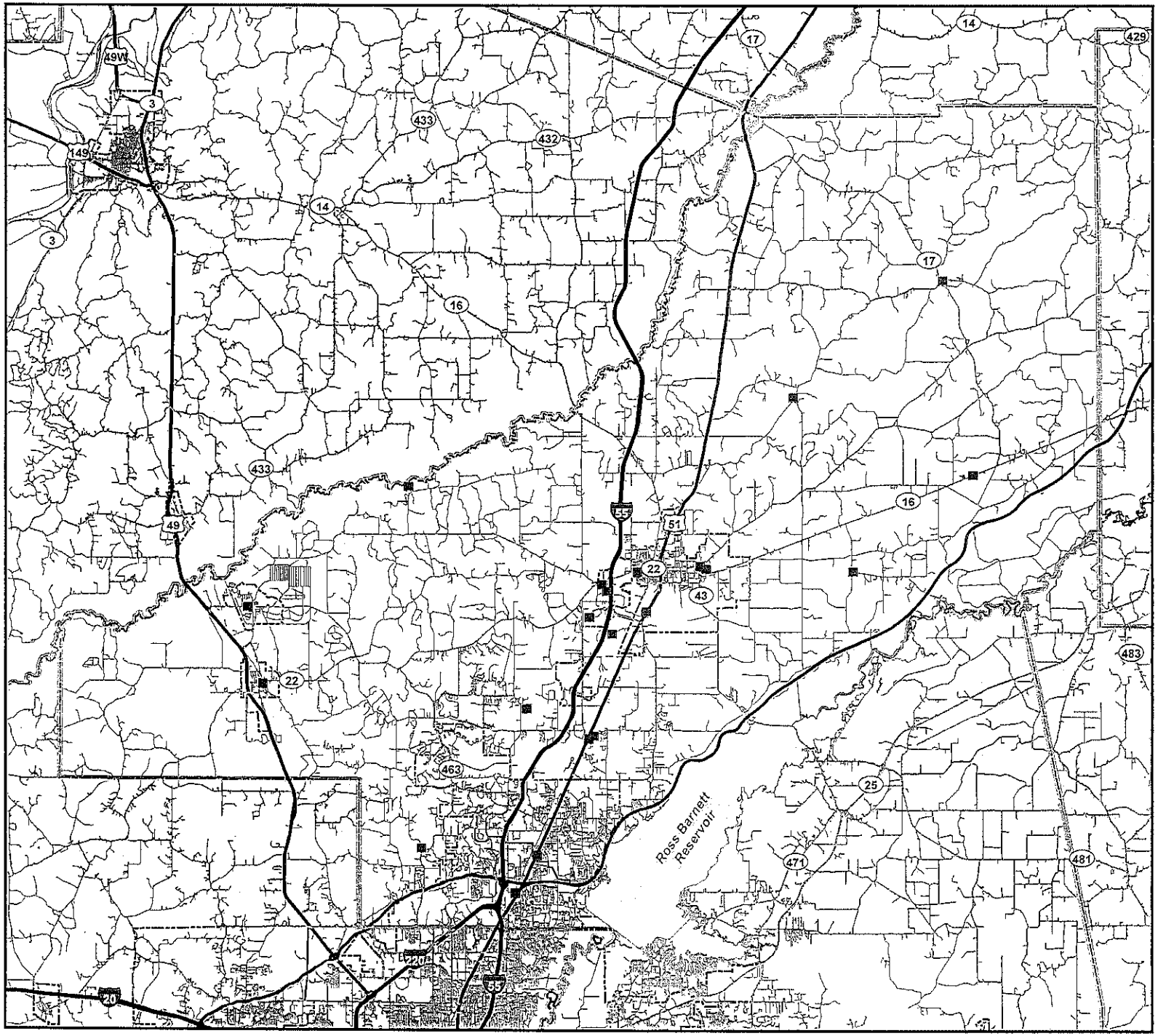
According to the State of Mississippi Standard Mitigation Plan, a critical facility is defined as any structure providing or housing critical services necessary to ensure the health and welfare of the population following a natural or man-made hazard event, including any facilities designated by the local governments in their Hazard Mitigation Plan. Critical infrastructure is defined as systems so vital to the State of Mississippi the incapacity of those systems would have a debilitating impact on security, economics, public health, safety, or any combination of those factors, including any infrastructure designated by local governments in their Hazard Mitigation Plan. Currently, Madison County has identified twenty-three (23) critical facilities and infrastructure components. Each component has been identified as an essential service whose presence or operation is vital to the health, safety, and welfare of the county's residents. Table 4.31 and Map 4.13 provides a summary report of the critical facilities identified. There are three (3) critical facilities located in the floodplain.

TABLE 4.31 Critical Facilities

Asset Name	Function	Address	Longitude	Latitude
Beattes Bluff	Wastewater Treatment	Mt Elm Rd.	-90.20930169	32.66129658
Camden Fire Department	Fire Safety	100 Parkside Drive	-89.838164	32.782414
Farmhaven Station #1	Fire Safety	3806 Hwy 16 E	-89.81743938	32.66746345
Farmhaven Station #2	Fire Safety	507 Ratliff Ferry Road	-89.900977	32.610308
Gluckstadt Fire Department	Fire Safety	114 Yandell Rd.	-90.08445610	32.51198151
Kearney Park Fire Station	Fire Safety	443 Livingston Veron Rd.	-90.32037692	32.58952769
Flora Fire Department	Fire Safety	137 Kearney Park Rd.	-90.31001393	32.54444587
Southwest Fire Department	Fire Safety	141 Lake Cavalier Rd.	-90.20078868	32.44708464
Gluckstadt Station #1	Fire Safety	114 Yandell Rd	-90.081068	32.513612
Gluckstadt Station #2	Fire Safety	520 Stribling Rd	-90.127739	32.529665
Valley View	Fire Safety	1273 Stump Bridge Road	-89.942117	32.713878
EOC Office	Communication Center	1633 W. Peace Street	-90.075462	32.603030
Sheriff's Department	Jail/Communication Center	2941 Hwy 51	-90.04464035	32.58683975
Administrative Complex	Government	125 W North Street	-90.036056	32.614590
Tax Assessor/Collector	Government	171 Cobblestone Drive	-90.120400	32.442930
Justice Court	Government	2961 Hwy 51	-90.135672	32.420947
Circuit Courthouse	Government	128 W. North Street	-90.035758	32.614199
Canton Manor	Elderly Housing	Hwy 43	-90.00292716	32.61222070
Region 8 Mental Health	Health Care	309 Park Dr.	-90.00701394	32.61395826
Merit Health Madison	Health Care	161 River Oaks Drive	-90.084184	32.583529
Nissan North America	Manufacturing	300 Nissan Drive	-90.068300	32.573693
Peco Foods	Chemical Storage	Fulton St.	-90.05069208	32.61084768
Peco Foods	Chemical Storage	Commercial Parkway	-90.07195669	32.59879094

Source: Mitigation Council

Critical Facility Data for Madison County, MS



LEGEND

- Critical Facilities
- Municipalities
- Interstates
- Major Highways
- Major Local Roads

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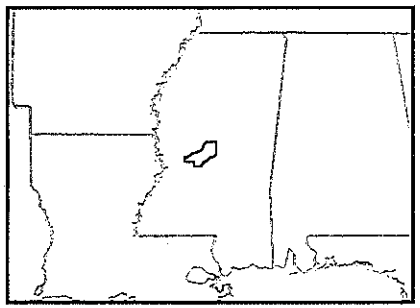

CULTURAL RESOURCES

Cultural resources and historic assets are generally unique or irreplaceable in nature due to their age or unique properties or characteristics. The National Register of Historic Places has identified seven-teen (17) cultural resources and historic assets in Madison County. There are two cultural resource located in the floodplain.

Table 4.32 Cultural Resources

Facility	Type Resource
Montgomery House	Building
Madison County Jail	Building
Strawberry Patch – McKay House	Building
John Curran House	Building
Madison-Ridgeland Public School	Building
Farr Mercantile Co	Building
Kirkpatrick Dental Office	Building
Charles F. Smith House	Building
Yazoo & Mississippi Valley Railroad Depot	Building
Canton High School	Building
Mt. Zion Baptist Church	Building
MS Institute of Aeronautics Aircraft Hangars	Building
Young House	Building
Fairview School	Building
Long Moss Plantation house	Building
John W. Boddie House	Building
Old Natchez Trace	Structures

Source: National Register of Historic Places
http://www.nps.gov/nr/research/data_downloads.htm

Community Asset Summary

There are 55,612 parcels in Madison County with a true value of $6,790,649,421, according to county tax records. The tables below provide details regarding the number of assets at risk to each identified hazard.

Table 4.33 Madison County Community Asset Summary

Type of Hazard	Identified Hazard Area	Population at Risk[2]	Estimated Housing Units at Risk[3]	Critical Facilities[4]	Historic Assets[5]
Dam/Levee Failure[1]	18	1-100	1-100	N/A	N/A
Drought	Countywide	95,203	39,773	23	17
Earthquake	Countywide	95,203	39,773	23	17
Expansive Soil	Isolated Areas	N/A	N/A	23	17
Flooding[6]					
100 year Floodplain	20.47%	8,173	3,284	3	1
500 year Floodplain	0.66%	3,007	871	0	1
Tropical Storms	Countywide	95,203	39,773	23	17
Severe Storms	Countywide	95,203	39,773	23	17
Tornado	Countywide	95,203	39,773	23	17
Wildfires	Countywide	95,203	39,773	23	17
Winter Storms	Countywide	95,203	39,773	23	17

[1] Identifies the number of High Hazard Dams
[2] Floodplain population is estimated using Census data.
[3] Based on estimated Census data
[4] Based on data provided by the Mitigation Council
[5] Based on National Park Service Register of Historic Places
[6] Results are not cumulative

Table 4.34 Madison County True Value Real Property

Real Property	Assessment
Value of Class I Improvements (Single-family, owner occupied residential)	$4,146,285,930
Value of Class II Improvements (All other real property, except CI and IV)	$2,635,221,964
Value of Mobile Homes	$9,141,527

Source: Madison County Land Roll 2015

Vulnerability Summary

As a result of the risk assessment conducted, the Mitigation Council determined the overall vulnerability to each hazard for Madison County remains the same as stated in previous hazard mitigation plans except for dam/levee failure due to the revised vulnerability assessment methodology. To maintain consistency with the State of Mississippi's Standard Hazard Mitigation Plan, Madison County examined six (6) risk characteristics to determine the overall vulnerability level each jurisdiction, faces from natural hazards and they included:

1. The percentage of the entity at risk to an impact from each hazard;
2. The health and safety consequences that can occur;
3. The amount of property damage that can occur;
4. The environmental damage that can occur;
5. The economic disruption that can occur; and
6. The probability of a future occurrence.

Risk Characteristic (Vulnerability)		Score
Area Impacted	No area in the community directly impacted	0
	Less than 25% of the community impacted	1
	Less than 50% of the community impacted	2
	Less than 75% of the community impacted	3
	Over 75% of the community impacted	4
Health and Safety Consequences	No health and safety impact	0
	Few injuries or illnesses	1
	Few fatalities but many injuries or illnesses	2
	Numerous fatalities	3
Property Damage	No property damage	0
	Few properties destroyed or damaged	1
	Few destroyed but many damaged	2
	Few damaged and many destroyed	2
	Many properties destroyed and damaged	4
Environmental Damage	Little or no environmental damage	0
	Resources damaged with short term recovery	1
	Resources damaged with long term recovery	2
	Resources destroyed beyond recovery	3
Economic Disruption	No economic impact	0
	Low direct and/or indirect costs	1
	High direct and low indirect costs	2
	Low direct and high indirect costs	2
	High direct and high indirect costs	3
Future Occurrence		
Probability of Future Occurrence	Unknown but anticipate rare occurrence	1
	1 - 4 documented occurrences over last 10 years	2
	5 - 7 documented occurrences over last 10 years	3
	8 – 10 documented occurrences over last 10 years	4
	More than 10 occurrences over last 10 years	5

Once the risk characterization was completed for each natural hazard by the Mitigation Council, the sum of the risk characteristics were added together for each hazard and multiplied by the probability of occurrence characteristic to determine each natural hazards total risk rating score.

Risk X Probability of Occurrence = Vulnerability Summary

Based upon each risk rating a determination was then made on whether each natural hazard poses a high, moderate, or low risk to Madison County based on the following criteria:

Risk Level	Total Rating Score
LOW	**0 - 15**
A hazard with a LOW RISK RATING is expected to have little to no impact upon the community. The hazard poses very minimal health and safety consequences to the community's residences, and is expected to cause little to no property damage. The occurrence of a hazard with a LOW RISK RATING is rare; however, due to other factors such as geographical location it is still possible for such a hazard to occur and even cause significant damage based upon the magnitude of the event.	
MODERATE	**16 – 30**
A hazard with a MODERATE RISK RATING is expected to have a slight impact upon the community. The hazard poses minor health and safety consequences with minor injuries expected and few to no fatalities. The hazard may cause some properties to be damaged or destroyed. The occurrence of a hazard with a MODERATE RISK RATING is likely at least once within the next 25 years.	
HIGH	**31 OR MORE**
A hazard with a HIGH RISK RATING is expected to have a significant impact upon the community. The hazard poses high health and safety consequences with numerous injuries and fatalities possible. The hazard may even cause some properties to be damaged or destroyed. A hazard with a HIGH RISK RATING is expected to occur at least once within a 12 month period, but can occur multiple times within a year.	

Table 4.35 Madison County Vulnerability Summary Assessment

	Earthquake	Expansive Soil	Dam/Levee Failure	Flooding	Drought	Tropical Storms	Severe Storms (hail & lightning)	Tornadoes	Wildfires	Winter Storms
Area Impacted	4	1	1	1	4	4	4	4	1	4
Health and Safety Consequences	1	0	1	1	1	1	1	2	1	1
Property Damage	1	1	4	2	1	1	2	4	2	1
Environmental Damage	0	1	1	1	1	1	1	2	2	1
Economic Disruption	1	1	3	3	1	1	2	3	2	3
TOTAL RISK CHARACTERISTIC SCORE	7	4	10	8	8	8	10	15	8	10
Probability of Occurrence	1	1	2	4	3	2	5	3	5	3
Total Risk Rating for Each Hazard (Sum of Vulnerability X Probability of Occurrence)	7	4	20	32	24	16	50	45	40	30

Table 4.36 Vulnerability Summary

Hazard	Overall Risk Level
Earthquakes	Low
Expansive Soil	Low
Dam/Levee Failure	Moderate
Flooding	High
Drought	Moderate
Tropical Storms	Moderate
Severe Storms (hail & lightning)	High
Tornadoes	High
Wildfires	High
Winter Storms	Moderate