3.3: Tornado Assessment

Hazard Description

Tornadoes are nature's most violent storms. Spawned from powerful thunderstorms, tornadoes can cause fatalities and devastate a neighborhood in seconds. A tornado appears as a rotating, funnel-shaped cloud extending from a thunderstorm to the ground with whirling winds that can reach 300 miles per hour. Damage paths can be more than one mile wide and 50 miles long. Some tornadoes are visible, while rain or nearby low-hanging clouds may obscure others. Occasionally, tornadoes develop so rapidly that little warning is possible. Before a tornado hits, the wind may die down and the air may become very still. A cloud of debris can mark the location of a tornado even if a funnel is not visible. Tornadoes generally occur near the trailing edge of a thunderstorm. It is not uncommon to see clear, sunlit skies behind a tornado

Most tornadoes touch down in a region known as Tornado Alley, bordered by the Dakotas to the north, the Gulf Coast to the south, the Rocky Mountains to the west, and the Appalachian Mountains to the east. Tornadoes in some areas have become so common that tour guides often charge thousands of dollars to lead groups on weeklong tornado-watching tours.

An emerging area of concern is referred to as Dixie Alley. Dixie Alley spreads from the Lower Mississippi Valley to the Upper Tennessee Valley, including Arkansas, Mississippi, Louisiana, Alabama, Georgia, and the Florida panhandle. This area is of particular concern because it includes Mississippi but also because of the apparent trend for tornadoes in this area to strike at night when local populations are not as aware of weather conditions as they would be during daylight hours.

Quick facts about tornadoes:

- They may strike quickly, with little or no warning.
- They may appear nearly transparent until dust and debris are picked up or a cloud forms in the funnel.
- Tornadoes typically move from the southwest to the northeast, but tornadoes have been known to move in any direction.
- The average forward speed of a tornado is 30 mph but may vary from stationary to 70 mph.
- Tornadoes can accompany tropical storms and hurricanes as they make landfall.
- Waterspouts are tornadoes formed over water.
- Tornadoes are most frequently reported east of the Rocky Mountains during the spring and summer months.
- Peak tornado season in the southern states is March through May; in the northern states, it is late spring through early summer.
- Tornadoes are most likely to occur between 3 pm and 9 pm but can occur at any time.

The most common and practical way to determine the strength of a tornado is to look at the resulting damages. From the damage, we can estimate the wind speeds. Before February 2007, the Fujita Scale was used to measure tornado severity (**Table 3.2.1**).

Tornadoes are also rated based on their wind speeds. An average tornado has maximum wind speeds of about 112 mph or less, measures around 250 feet in width, and travels approximately one mile before dispersing. Extreme tornado events may have 300 mph winds easily exceeding the 165 mph winds created by Hurricane Andrew.

The Enhanced Fujita Scale, or EF Scale (**Table 3.2.2**), was implemented by the National Weather Service in 2007 to rate tornadoes more consistently and accurately. The EF-Scale considers more variables than the original Fujita Scale (F-Scale) when assigning a wind speed rating to a tornado, incorporating 28 damage indicators such as building type, structures, and trees. For each damage indicator, there are 8 degrees of damage ranging from the beginning of visible damage to significant and devastating destruction. The original F-scale did not consider these additional variables.

Table 3.2.1
Fujita Scale

F-Scale Number	Intensity Phrase	Wind Speed	F-Scale Number	Intensity Phrase	Wind Speed
F0	Gale tornado	42 – 72 mph	F3	Severe tornado	158 – 206 mph
F1	Moderate tornado	73 – 112 mph	F4	Devastating tornado	207 – 260 mph
F2	Significant tornado	113 – 157 mph	F5	Inconceivable tornado	261 – 318 mph

Source: NOAA

Table 3.2.2
Enhanced Fujita Scale

Enhanced Fujita Category	Wind Speed (mph)	Potential Damage
EFO	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; small to medium-sized projectiles generated; 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 and small missiles generated.
EF5	>200	**Incredible damage.** Strong frame houses leveled off foundations and swept away; automobile-sized projectiles fly through the air more than 100 m (109 yd); high-rise buildings have significant structural deformation; incredible

Source: NOAA

Hazard Profile

The hazard profile for tornadoes in Mississippi was updated from the previously approved plan of 2018 to include current statistics regarding tornado activity.

According to the Storm Prediction Center, an average of 1,224 tornadoes touch down per year across the United States. The top 10 states for tornadoes as of the most recent (1997-2022) average are represented in the table below. The table from the previous plan is shown for comparison. Two things are interesting to note here. First, the geographic distribution of the top ten states is changing. Secondly, the average number of tornadoes per year is increasing. These facts point to trends worth considering, particularly in light of the potential impacts on Mississippi.

Top 10 Tornado States 1997-2022		
State	No. of Tornadoes	Ranking
Texas	135	1
Kansas	92	2
Oklahoma	75	3
Alabama	69	4
Mississippi	67	5
Illinois	64	6
Iowa	62	7
Missouri	57	8
Florida	53	9
Nebraska	52	10

Source: NOAA

Top 10 Tornado States 1991-2015		
State	No. of Tornadoes	Ranking
Texas	146.7	1
Kansas	92.4	2
Oklahoma	65.4	3
Florida	54.6	4
Nebraska	54.6	4
Illinois	54	5
Colorado	49.5	6
Iowa	49.2	7
Alabama	47.1	8
Missouri	46.7	9
Mississippi	45.1	10

From 1950 to 2022, Mississippi experienced 3,096 tornadoes, accounting for 504 fatalities and 6,887 injuries. This averages less than one fatality per tornado, but more than two injuries per event.

The fewest number of tornadoes recorded during one year in Mississippi was five in 1964. The greatest number of tornadoes in Mississippi recorded by the National Weather Service was 147 in 2019. Tornadoes are not as easily spotted in Mississippi as they are in the Midwest where flat land and few trees make tornadoes more visible. Densely populated counties and communities throughout Mississippi tend to record more sightings of tornadoes than rural and less populated areas. It should be noted that tornadoes are often associated with severe weather events such as thunderstorms. Due to the climate conditions in Mississippi, tornadoes can occur every month of the year, but have a greater frequency from February through May and November, typically during the change of seasons.

Education and Outreach

The state of Mississippi declared November as Tornado Awareness Month. This is done as part of the state's effort to educate the public on tornado safety. In addition, a statewide test of the tornado warning system is conducted in February in conjunction with Severe Weather Awareness Week. The purpose is to encourage schools, government agencies, and businesses throughout the state to test their tornado emergency procedures.

Maximum Tornado Threat

A review of past tornado occurrences reveals that Hinds and Rankin Counties continue to have the most recorded tornadoes from 1950 – 2023. The counties with the most recorded tornadoes are listed in the table below.

Top 10 Tornado Counties

Counties	No. of Tornadoes	Ranking
Hinds	91	1
Rankin	77	2
Harrison	71	3
Leake / Smith	60	4
Neshoba	56	5
Jackson / Warren	54	6
Jones / Madison	53	7
Simpson	52	8
Scott	48	9
Lauderdale / Yazoo	47	10

The following images depict damage from storm events with significant impacts on the State of Mississippi assets.

Damage caused by an EF-4 tornado that occurred in the Hattiesburg (Forrest County) area on Sunday, Feb. 10, 2013, impacting multiple facilities on the University of Southern Mississippi (USM) campus.

Aerial view from Marsh Hall
Source: USM

Elam Arms Dormitory
Source: USM

Shafer Center for Crisis Intervention
Source: USM

Jazz Station
Source: USM

Picture taken by Eric Roberts, courtesy of NWS
Laurel (Jones County) - December 2014

Picture taken by Teresa Mergens, courtesy of NWS
Columbia (Marion County) - December 2014

Picture taken by Haskel Burns, courtesy of NWS
Columbia (Marion County) - December 2014

Picture taken by John Carter, courtesy of NWS
Heidelberg (Jasper County) - December 2014

Picture credit: Tom Malmay, Malmay & Associates
Near Holly Springs (Marshall County) - December 2015

More Precise Tornado Warnings

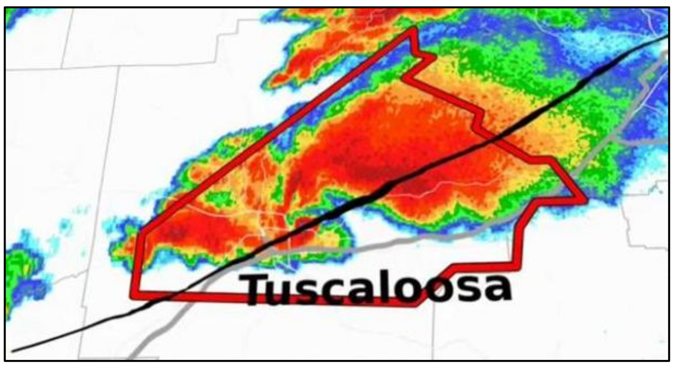
Tornado and severe thunderstorm warnings have not changed much in the passing decades. However, a NOAA research program is looking to improve lead time and the precision of warnings. An overhaul of the nation's weather warning process, including tornado warnings, currently in development aims to provide more precise warnings with increased lead time to help decision-makers and the general public respond accordingly.

The Forecasting a Continuum of Environmental Threats (FACET) program at NOAA's National Severe Storms Laboratory in Norman, Oklahoma, seeks to provide forecasters with a continuously-updating threat grid to supplement the current warning polygons. The current warning process has not changed much since the 1960s, except for the use of text-based bullet statements to more clearly highlight potential impacts (including the use of tornado and flash flood emergencies) and the use of focused storm polygons instead of warnings for whole counties.

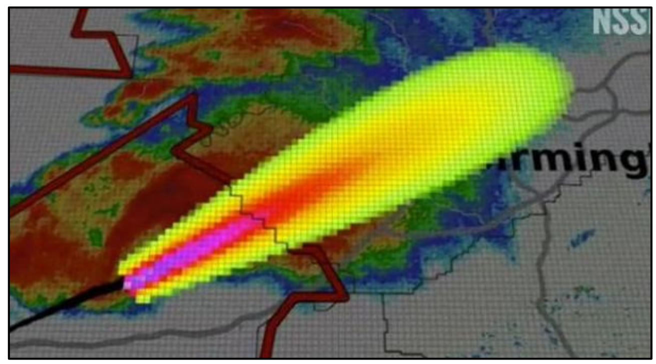
Tornado sirens and other alert systems provide limited early notification of approaching tornadoes. Even with new technologies offering “omnidirectional” signaling, tornado sirens may not provide adequate warnings to everyone potentially within a storm’s path. The graphical depiction of a warning is a polygon. If your location is in that polygon, taking shelter is highly recommended. However, false alarm challenges with tornado warnings are always an issue due to the limitations of Doppler radar detecting rotation near the ground. Early warning limitations combined with statistical data indicating frequent nighttime severe storm activity significantly increases the risk to human health and safety from severe storms and tornadoes in Mississippi.

This paradigm of warnings, together with dual-polarization of Doppler radar, severe storm research and a denser network of spotters has led to an average lead time of 13 minutes for tornado warnings. However, tornado warning polygons will always be larger than any actual tornado tracks due to uncertainty in the track of the parent thunderstorm when a warning is issued. Consider the infamous Tuscaloosa, Alabama, EF4 tornado during the April 27, 2011, super outbreak. While this warning technically was correct as a tornado was confirmed within the warned area and it likely saved lives, the fact remains that the large majority of the tornado-warned area was not hit by the tornado.

FACET seeks to provide a more precise probability threat map of a severe weather event, such as a tornado. This threat map, known as PHI or probabilistic hazard information, can ingest both conventional current data such as radar, satellite, and surface observations, as well as any high-resolution models, and can be adjusted in real-time by the forecaster. The PHI map more tightly represents the area of greatest threat, within the larger tornado warning.



Tornado warning (red polygon) and actual track (black line) of the Tuscaloosa, Alabama, EF4 tornado of April 27, 2011. Source: National Severe Storms Laboratory



Example of what a probability threat map from FACETs would look like for the April 27, 2011, Tuscaloosa, Alabama tornado. In this case, the dark red, and purple contours of the plume indicate the greatest likelihood of a tornado. Source: National Severe Storms Laboratory

FACET envisions the PHI maps and data could be used to prompt a "tornado threat increasing" alert when the PHI threat plume is pushing towards a given area but not yet close enough for a tornado warning, which would provide valuable lead time.

The benefits of more precise warnings with increased lead times are immense. However, this can only happen if the warnings are heeded. This is where the important component of social and behavioral science plays a role. FACET envisions the PHI maps and data could be used to prompt a "tornado threat increasing" alert when the PHI threat plume is pushing toward an area, but not yet close enough for a tornado warning, which would provide valuable extra lead time.

Incidentally, the PHI concept is not simply for tornado warnings. While the current focus is on hazards associated with thunderstorms such as tornadoes, hail, lightning, and flash flooding, this concept can also be extended to other hazardous weather, including winter weather.

The FACET program along with other NOAA initiatives such as Propagation, Evolution, and Rotation in Linear Storms (PERiLS) and Verification of the Origins of Rotation in Tornadoes Experiment (VORTEX) are further supported by the Tornado Observations Research and Notification Assessment for Development of Operations Act or the TORNADO Act that directs NOAA to maintain and improve the system by which the risks of hazardous weather and water events are communicated to the general public, to inform action and encourage response to prevent the loss of life and property. Through the TORNADO Act, Congress is directing NOAA to:

- Establish or direct an existing office to serve as a hazard risk communication office;
- Establish or maintain a research program to modernize the creation and communication of risk-based, statistically reliable, probabilistic hazard information to inform effective responses to hazardous weather and water events;
- Establish a pilot program to test the effectiveness of the implementation of the research conducted pursuant to this bill;
- Submit to Congress a strategic plan for developing and prioritizing the implementation of high-resolution probabilistic forecast guidance for tornadic conditions using a next-generation weather forecast and warning framework;
- Perform one or more post-storm surveys and assessments following each hazardous weather or water event that is of sufficient societal importance;
- Update, if necessary, the system for rating tornado severity; and
- Maintain the Vortex USA tornado research program.

It will be a few years before these probability threat maps accompany standard warnings issued by the National Weather Service. However, some aspects of FACETs/PHI will be rolled out at NOAA's Storm Prediction Center and the Weather Prediction Center in the near future.

Location/Past Occurrences

Mississippi is no stranger to tornado/severe weather threats and has had 34 Presidentially declared severe storm/tornado events since 1953. Declarations from 1991-2020 are shown in **Table 3.2.3**. Brief descriptions of significant events that occurred over the past ten years and summaries from the NCDC and FEMA on the impacts to people and property, plus the public assistance dollars obligated are provided in the summaries following the table.

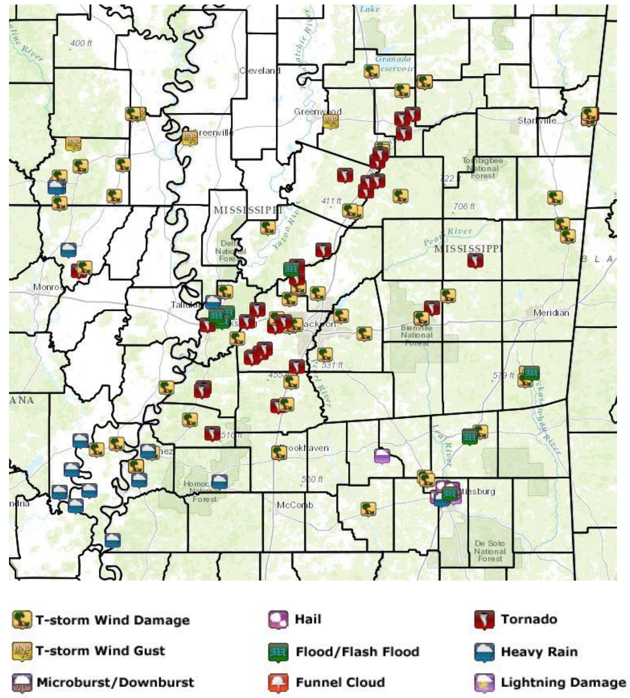
Table 3.2.3
Presidential Disaster Declarations - Tornado/Severe Weather

Declaration Number	Incident Period	No. of Counties Affected	Date of Major Declaration
DR-4478	January 10, 2020-January 11, 2020	13	March 12, 2020
DR-4470	October 26, 2019	19	December 6, 2019
DR-4450	April 13, 2019-April 14, 2019	9	June 20, 2019
DR-4429	February 22, 2019-March 29, 2019	24	April 23, 2019
DR-4415	December 27, 2018	11	February 14, 2019
DR-4314	April 30, 2017	9	May 22, 2017

DR-4295	January 20 – 21, 2017	4	January 25, 2017
DR-4248	December 23 – 28, 2015	12	January 4, 2016
DR-4205	December 23 – 24, 2014	1	January 7, 2015
DR-4175	April 28 – May 3, 2014	13	April 30, 2014
DR-4101	February 10 - 22, 2013	6	February 13, 2013
DR-1972	April 15 - 28, 2011	37	April 29, 2011
DR-1916	May 1 - 2, 2010	8	May 14, 2010
DR-1906	April 23 - 24, 2010	7	April 29, 2010
DR-1837	March 25 - 28, 2009	11	May 12, 2009
DR-1764	April 4, 2008	1	May 28, 2008
DR-1470	May 5 - 8, 2003	9	May 23, 2003
DR-1459	April 6 - 25, 2003	14	April 24, 2003
DR-1443	November 10 - 11, 2002	3	November 14, 2002
DR-1398	November 24 - December 17, 2001	17	December 7, 2001
DR-1360	February 16 - March 15, 2001	23	February 23, 2001
DR-1051	May 8 - 17, 1995	4	May 12, 1995
DR-968	November 21 - 22, 1992	9	November 25, 1992
DR-967	October 10, 1992	1	October 17, 1992
DR-939	March 9 - 10, 1992	4	March 20, 1992
DR-906	April 26 - May 31, 1991	32	May 17, 1991

Source: FEMA Disaster Declarations-Mississippi

DR - 4314 - April 30, 2017



During the early morning hours of April 30th, a squall line of severe thunderstorms developed across central Louisiana and pushed eastward across the National Weather Service Jackson, MS forecast area. The line intensified as it approached the Mississippi River and evolved into a Quasi-Linear Convective System (QLCS). Numerous tornadoes (29) developed along the line, with the most prolific damage occurring along the track of a large mesovortex which tracked from Claiborne County through western Hinds/Madison, eastern Yazoo, eastern Holmes, southeastern Carroll, Montgomery, and northwestern Webster counties.

This region is no stranger to tornadoes, squall lines, or tornado outbreaks. However, what occurred Sunday morning, April 30th, was rare. As the squall line of storms formed across central Louisiana, a mesoscale convective vortex (MCV) began to develop. This feature is on a smaller scale than traditional low-pressure areas and usually ranges in diameter between 20 to 50 miles. This particular MCV developed as a large cluster of storms merged with the evolving squall line. Intensifying downdrafts caused bowing segments in the line to surge out. Due to the strong ambient wind shear in place, strong updrafts along the bowing line became oriented more favorably with the underlying wind shear. As this occurred, smaller-scale circulations quickly developed. These circulations are called meso-vortices and are the features responsible for producing the tornadoes our region experienced. A feedback mechanism began at this point and the larger “parent” MCV was able to be maintained as it continued to modify the environment driving stronger wind shear which in turn supported strong, quickly developing meso-vortices as the system moved northeast. This all combined to support and maintain an efficient tornado-producing feature rarely seen. While hard to describe and visualize, this larger vortex was essentially on the ground and was generating smaller vortices that were rotating around the parent circulation. The result was substantially wide tornado paths, numerous tornadoes, and additional wind damage away from the tornadic vortices.

From a historical perspective, this event ranks 4th in the number of tornadoes (29) produced across the forecast area. Also of note, other similar efficient tornado-producing MCVs are quite hard to identify. Most recent are two that occurred during the early morning squall line from April 27, 2011. One was in central Mississippi (very near the recently impacted area), and the other was in northern Alabama. There are likely other instances of these systems in the past, but these likely occurred before Doppler Radar which is a tremendous tool in identifying the smaller scale meso-vortices and how the data aids the damage survey process.

In addition, strong straight-line winds occurred in some areas. A 71-mph wind gust was recorded at the Greenwood-Leflore Airport. Flash flooding was also reported in some areas including Vicksburg, Bentonia, Hattiesburg, and Laurel.

Impact Summary	Public Assistance Dollars Obligated Declared Counties		
• No of Counties Affected: 9 • Deaths: 1 • Injuries: 0 • Estimated Property Damage: $15,510,000	**Total PA Grants**	**Emergency Work (Categories A-B)**	**Permanent Work (Categories C-G)**
	$14,859,529.38	$12,693,708.75	$2,104,623.63

DR - 4295 - January 20-21, 2017

Petal, Miss Source: MS Army National Guard, Pfc. Christopher Shannon

Two rounds of severe weather impacted the ArkLaMiss region - one beginning shortly after midnight on early Saturday morning and continuing through shortly before daybreak and a second beginning during the evening hours and continuing until just before midnight Saturday night. During the early morning event, areas south of I-20 in Mississippi were impacted. Most notably, an EF-3 tornado tracked through Lamar and Forrest counties, killing four people in Hattiesburg and injuring over 50 others. In addition, trees and powerlines were downed and large hail was reported in other areas across south Mississippi. Heavy rainfall resulted in flash flooding in parts of Forrest, Marion, Jones, and Jefferson counties. An EF-2 tornado occurred in Lauderdale County near the Lauderdale community, injuring one. An EF-1 tornado occurred in Morehouse Parish tracking between Mer Rouge and Bonita. Also, a brief EF-0 tornado occurred near Hamburg in Ashley County. Wind damage was reported across parts of southeast Arkansas, southwest Mississippi, and East Mississippi. Meanwhile, large hail fell from central Louisiana through central and south Mississippi. Hail as large as 3.5" in diameter fell in Catahoula Parish.

Impact Summary	Public Assistance Dollars Obligated Declared Counties		
• No of Counties Affected: 4 • Deaths: 4 • Injuries: 58 • Estimated Property Damage: $9,635,000	**Total PA Grants**	**Emergency Work (Categories A-B)**	**Permanent Work (Categories C-G)**
	$8,910,037.31	$6,802,467.91	$2,107,569.40

DR - 4248 - December 23-28, 2015

Much above normal temperatures, with some record warmth, and high amounts of moisture in the region led to an active period of weather throughout December. With such warm and moist conditions in place, many upper disturbances and strong frontal systems sparked severe thunderstorms and tornadoes to develop across the region in December, with the strongest and most widespread tornado event in north Mississippi on December 23rd.

Prentiss County Source: National Weather Service

December 23, 2015 - This tornado touched down about a mile east of US Highway 61 and moved northeast, downing trees and power lines along the path. Damage in Bolivar County was rated EF-1 but the tornado continued into Coahoma County producing more significant damage farther northeast resulting in the EF-3 rating.

December 25, 2015 - A chicken house was damaged with a tin roof partially torn off along with trees downed. This damage occurred along County Road 529. Residents witnessed the tornado move through the area.

December 28, 2015 - This brief tornado touched down 2.5 miles southwest of Seminary and tracked to the northeast before crossing Seminary Sumrall Road where it destroyed a barn and snapped some trees. As it crossed the Road a shed was destroyed and more trees were uprooted and snapped. The tornado then crossed Tower Road and shortly after caused severe damage to a carport that fell on a vehicle. The tornado then crossed Seminary Mike Conner Road where it uprooted some trees. The tornado continued northeast at which point, several trailers were blown onto the highway and a fireworks stand was destroyed. Numerous trees were snapped in the area as the tornado crossed the highway. The tornado continued on the ground crossing Evergreen Church Road and Ray Harvey Road where it snapped more trees. In this area, it produced severe roof damage to a home and snapped trees.

Impact Summary	Public Assistance Dollars Obligated Declared Counties		
	Total PA Grants	**Emergency Work (Categories A-B)**	**Permanent Work (Categories C-G)**
• No of Counties Affected: 12 • Deaths: 11 • Injuries: 64 • Estimated Property Damage: $12,031,000	$5,548,643.40	$2,488,560.26	$3,060,083.14

DR - 4205 - December 23 - 24, 2014

During the afternoon of Dec 23rd, just enough ingredients came together to support numerous severe storms ahead of a cold front. Across the Lower Mississippi River Valley, peak heating contributed to decent instability in the developing warm sector in advance of the front. Sufficient low-level wind shear and strong winds aloft were also in place as a decent upper low was located to our north. This helped to support organized thunderstorm activity along with quite a few supercell storms.

A persistent storm tracked across the southeastern counties (near Columbia, Mississippi to Sumrall and Laurel to Heidelberg, and the Mississippi state line) and produced multiple tornadoes. Widespread damage occurred in southern Columbia, near Sumrall, Laurel, and areas in Marion, Jones, and Clarke counties. Five confirmed fatalities occurred, with three near Columbia in Marion County and two near Laurel in Jones County. Severe storms moved out of the region by late afternoon to early Tuesday evening. The front continued to track through the area through the evening of December 23rd.

Impact Summary	Public Assistance Dollars Obligated Declared Counties		
	Total PA Grants	Emergency Work (Categories A-B)	Permanent Work (Categories C-G)
• No of Counties Affected: 1 • Deaths: 5 • Injuries: 50 • Estimated Property Damage: $27,233,000	$2,966,616.03	$1,659,926.12	$1,270,103.91

DR - 4175 - April 28 - May 3, 2014

A powerful storm system brought a severe weather outbreak across a large portion of the country from April 27-30. This outbreak started across the Central Plains on the 27th and slowly migrated eastward over the following two days. A large tornado outbreak occurred across the Lower Mississippi River & Tennessee River Valleys on the 28th. The event ended on the 30th with additional severe weather and a historic flash flooding/heavy rain event along the Alabama and Florida gulf coasts where rainfall totals peaked between 15-25 inches.

Winston County / Source: WLBT

The tornado outbreak on April 28 produced significant impacts on the Jackson, Mississippi area. This event was driven by a classic severe weather pattern with a strong fast-moving jet stream and a deep surface cyclone over the central plains. These features helped to produce strong wind shear in the atmosphere which in turn combined with rich gulf moisture and set up a volatile atmospheric mix. Multiple supercell thunderstorms developed during the afternoon/evening and produced many instances of damaging wind and large hail along with multiple tornadoes. The most devastating tornado was the EF-4 which tore a path across NE Leake, the corners of Attala/Neshoba counties, and through the heart of Winston County where the city of Louisville was especially hard hit. This tornado was on the ground for 34.3 miles and resulted in 10 fatalities and multiple injuries. Other hard-hit counties included Lowndes, Rankin, Hinds, Scott, Newton, Montgomery, Warren, and Jones. Each of these counties experienced at least one tornado, some multiple tornadoes. Overall, 21 tornadoes were confirmed across the forecast area. Of these tornadoes, 3 were rated EF-3, 3 rated EF-2, 12 rated EF1, and 2 rated EF-0.

Impact Summary	Public Assistance Dollars Obligated Declared Counties		
	Total PA Grants	**Emergency Work (Categories A-B)**	**Permanent Work (Categories C-G)**
• No of Counties Affected: 13 • Deaths: 11 • Injuries: 145 • Estimated Property Damage: $157,059,000	$89,845,050.69	$21,767,778.80	$68,077,271.89

DR - 4101 - February 10 - 22, 2013

During the morning hours of Sunday, February 10, 2013, a line of severe thunderstorms moved into southeast Arkansas, northeast Louisiana, and central Mississippi, downing trees and power lines and destroying a barn near Silver City in Humphreys County. An approaching cold front, an unusually high amount of wind shear, and sufficient instability resulted in the severe weather outbreak.

As the storms continued to push eastward through the early afternoon, the cold front stalled. To the south and east of the line of storms, several supercell thunderstorms developed in the more unstable air mass over south Mississippi, with many of the storms exhibiting strong rotation on radar. Shortly after 4 pm, a tornado developed over southwest Marion County near the Pickwick community and tracked across the county into far western Lamar County before lifting.

The same storm that produced this tornado continued eastward across northern Lamar County, producing a large tornado that touched down west of Oak Grove, with EF-4 winds estimated at 170 mph. The tornado tracked through the West Hattiesburg area where emergency management reported 51 homes destroyed and 170 homes with major damage in Lamar County.

The tornado continued into Forrest County, tracking through the cities of Hattiesburg and Petal before ending in northwestern Perry County. Considerable damage occurred along the path of this storm before impacting the southeast corner of the University of Southern Mississippi campus. Numerous buildings were damaged in this area including several campus buildings and a large church. In Forrest County, emergency management reported 133 homes destroyed, 207 homes sustained major damage, and 63 injuries were reported. Scattered severe storms continued to affect the Pine Belt area through the remainder of Sunday evening and into the early morning hours of Monday, February 11, before finally moving out of the area.

In addition to severe winds, flash flooding was a major issue in several areas. From the 10th through the early morning hours of the 11th, heavy rainfall occurred over parts of southeast Mississippi, with five to seven inches of rainfall . Rainfall amounts of up to 3 1/2 inches occurred in the Jackson metro area, leading to considerable flash flooding.

Impact Summary	Public Assistance Dollars Obligated Declared Counties		
• No of Counties Affected: 8 • Deaths: 0 • Injuries: 74 • Estimated Property Damage: $39,315,000.00	**Total PA Grants**	**Emergency Work (Categories A-B)**	**Permanent Work (Categories C-G)**
	$4,451,913.70	$3,014,539.56	$1,437,374.14

DR - 1972 - April 15 - 28, 2011

An outbreak of tornadoes across Arkansas, Louisiana, and Mississippi began late on Tuesday, April 26th continuing into the early morning hours of Wednesday, April 27th. The event elevated again during the early afternoon of April 27th continuing into the early evening. The activity on April 26th began as supercell thunderstorms producing large hail and tornadoes across northeast Texas and portions of Arkansas before evolving into a squall line as it moved east.

This line of storms evolved as it moved across several states before dissipating. It produced wind damage as it pushed east and was responsible for 23 of the 32 tornadoes that occurred across the three-state area during this event. Of those 23, 12 were rated as strong (EF2, EF3) tornadoes.

On Wednesday (April 27th) the atmosphere became increasingly favorable for the production of additional severe storms by early afternoon. The driving force for the activity Wednesday afternoon was a low-pressure area at the surface that intensified during the day. The winds in the mid-level atmosphere increased to 80-

100 mph, causing the low-level winds to become stronger. The wind shear caused by the turning of the winds from southerly near the surface to westerly at higher elevations was rare for late April in the Deep South.

In addition, an abundance of low-level moisture returned to the area. Sunny skies during the morning interacted with the high levels of moisture, leading to an unstable air mass by early afternoon. The result was a rare mix of instability and wind shear. These ingredients, along with lift from an upper-level disturbance, led to the historic tornado outbreak of April 27, 2011.

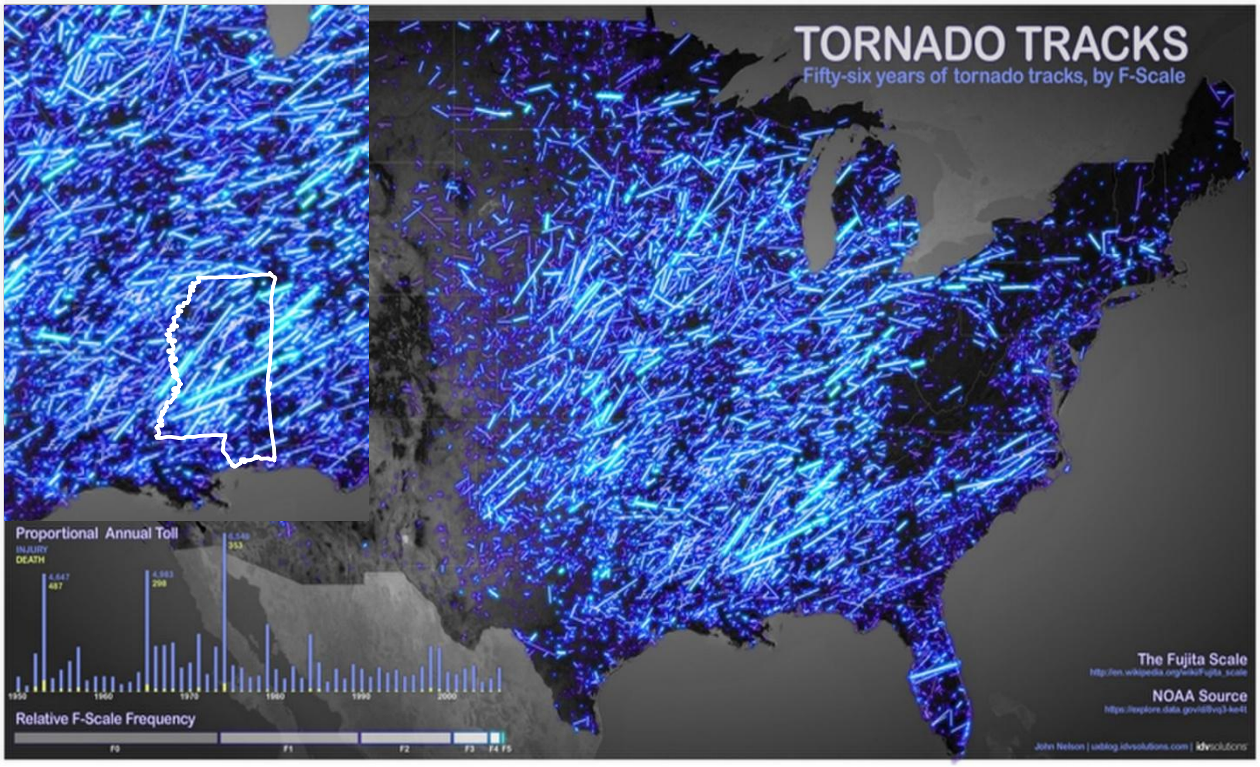
By early afternoon, several supercell thunderstorms developed across central and eastern Mississippi. These storms grew to supercell size and began producing tornadoes. The first tornado of the afternoon started in Neshoba County north of Philadelphia. This tornado ended up producing EF-5 damage and tracked for 29 miles across Neshoba, Kemper, Winston, and Noxubee Counties, causing severe damage inthe Town of Smithville.

Through the rest of the afternoon, multiple tornadoes developed, stemming from multiple supercell storms. Nearly all of the storms produced tornadoes. Another violent tornado impacted the Jackson forecast area and tracked across Smith, Jasper, and Clarke Counties continuing into Alabama with a total path length of 124 miles.

The loss of life during this event was significant. 321 people lost their lives, making this the second deadliest tornado outbreak in U.S. history. The March 18, 1925, Tri-State tornado outbreak was the first with 747 fatalities. This system produced the first EF-5 tornado in Mississippi since the Candlestick Park tornado on May 3, 1966, and marks the first time since statistics have been kept that two EF-5 tornadoes have been recorded on the same day in Mississippi. Four tornadoes had tracks over 100 miles across the southern states during this event, and all four were rated either EF-4 or EF-5.

Impact Summary	Public Assistance Dollars Obligated Declared Counties		
	Total PA Grants	**Emergency Work (Categories A-B)**	**Permanent Work (Categories C-G)**
• No of Counties Affected: 47 • Deaths: 32 • Injuries: 170 • Estimated Property Damage: $56,461,000	$22,811,869.44	$11,648,398.71	$11,163,470.73

Figure 3.2.1a
Recorded Tornado Events 1950 to 2017



Probability of Future Tornado Events

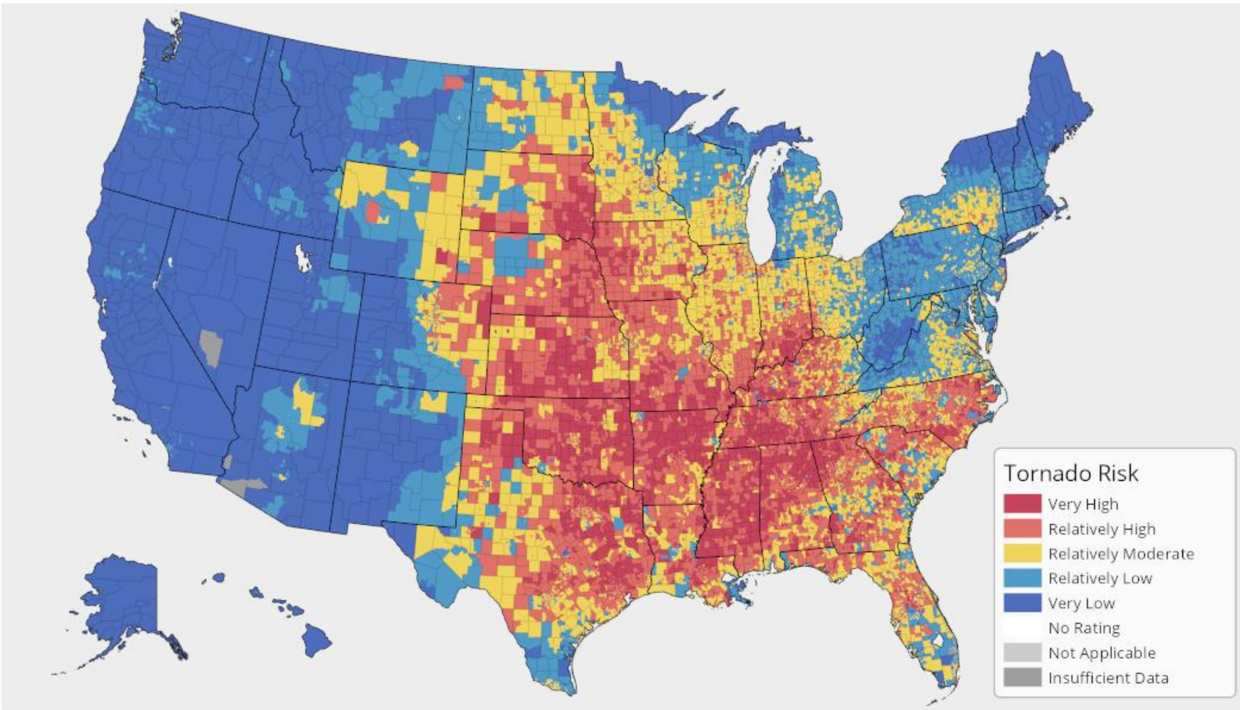
The National Weather Service is no closer to scientifically establishing a probability of future events in any one county or area. Tornadoes remain too random and unpredictable to accurately predict. Tornadoes have occurred in all of Mississippi's 82 counties. Current data indicates an average of 38 tornado events per year in Mississippi.

Assumptions from previous plan updates remain valid. Historic data indicates that more densely populated counties, such as Harrison, Hinds, Jackson, Jones, Rankin, and Smith have experienced a greater number of tornadoes. Based on historical data, the counties with the greatest number of past occurrences are those with the highest probability of reoccurrence.

Tornado Watches

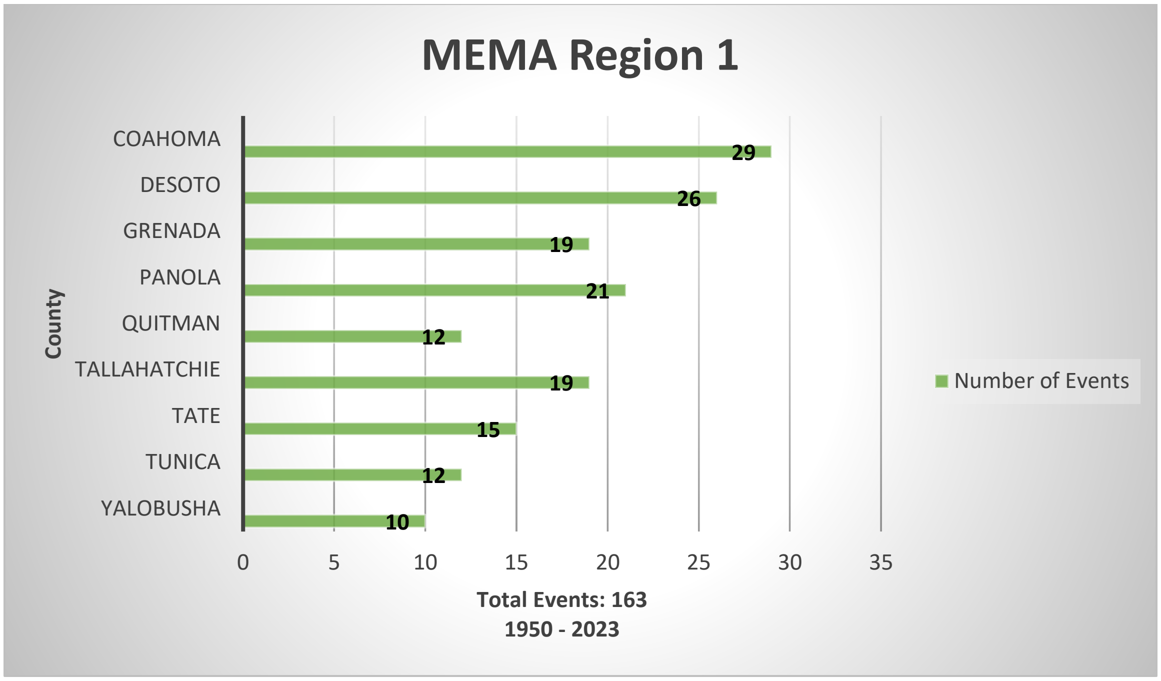
Figure 3.2.2. below further demonstrates Mississippi's vulnerability to potential tornado outbreaks. This graphic shows the national tornado risk index with Mississippi at a very high risk.

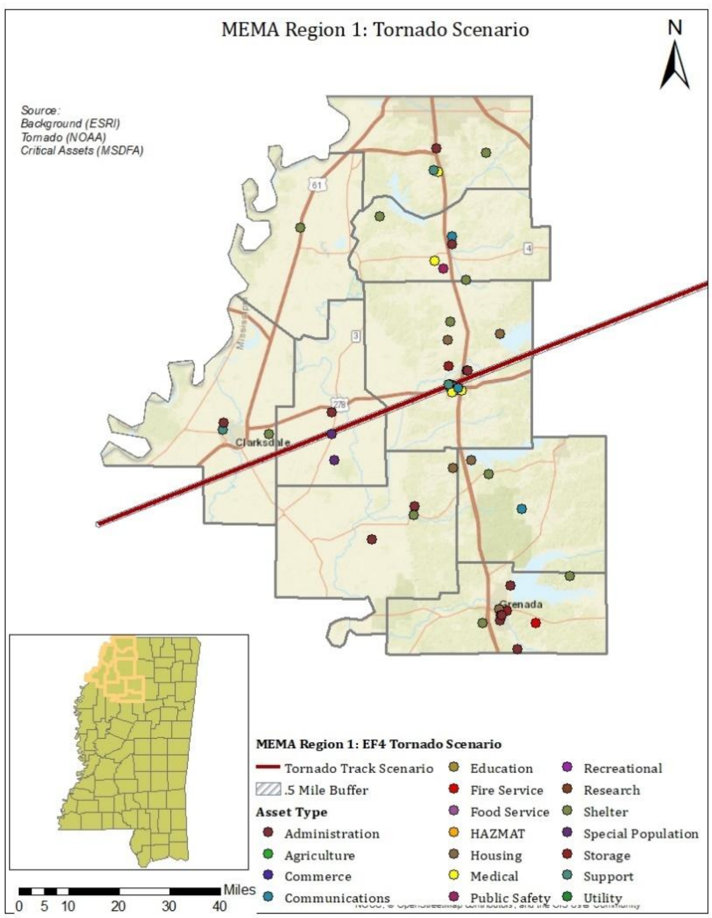
Figure 3.2.2
FEMA Tornado Risk Index

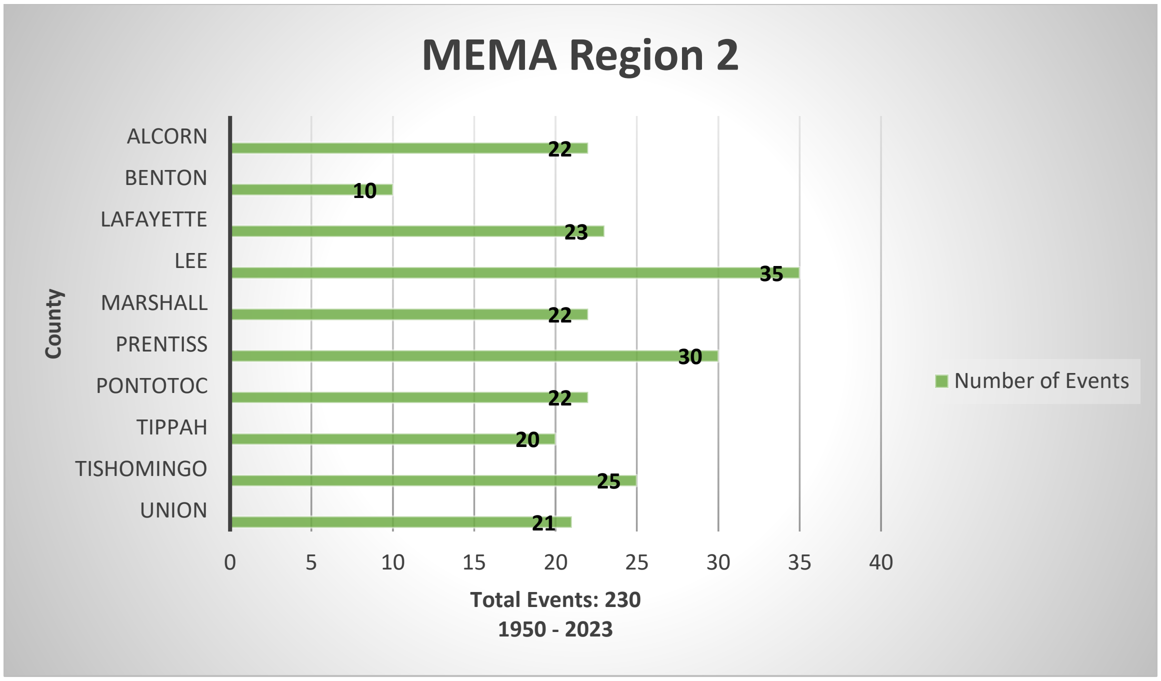


Events Per Region

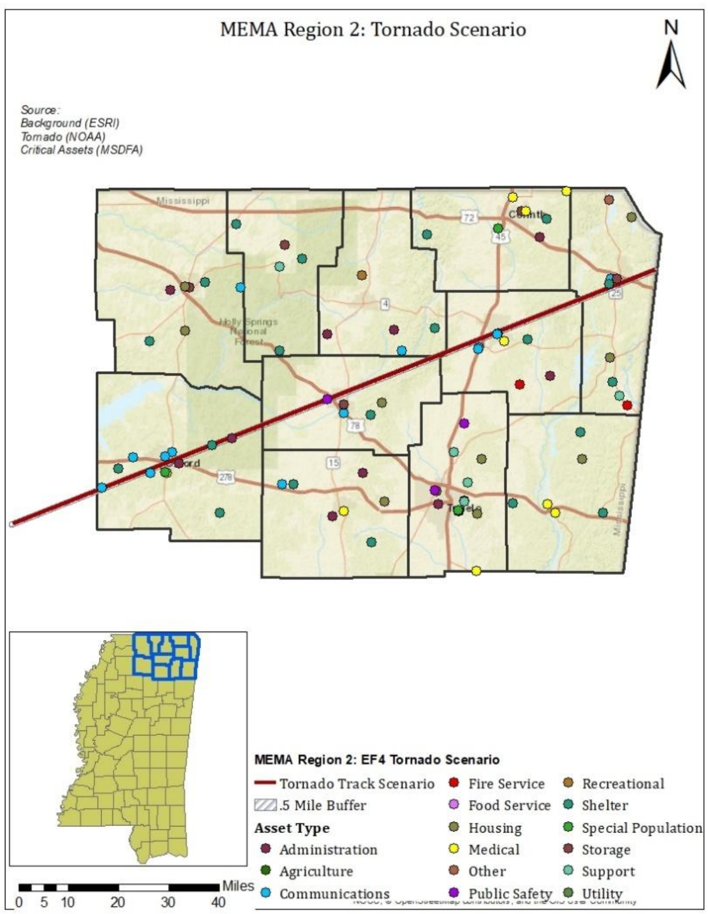
The following pages contain graphs depicting tornado events that have occurred in each MEMA Region. Each graph is accompanied by a regional map. An existing tornado track from the 1969 F4 just south of Jackson that killed more than 30 people was used. The historic track was shifted to intersect with critical assets typically near the center of each region. A half-mile buffer was added to the centerline of the track to encompass more of the anticipated damage swath. The resulting swath was analyzed with critical assets that intersect with the swath to produce the tabular data sheets.


MEMA Region 1
COAHOMA
DESOTO
GRENADA
PANOLA
QUITMAN
TALLAHATCHIE
TATE
TUNICA
YALOBUSHA
County
29
26
19
21
12
19
15
12
10
0 5 10 15 20 25 30 35
Total Events: 163
1950 - 2023
Number of Events

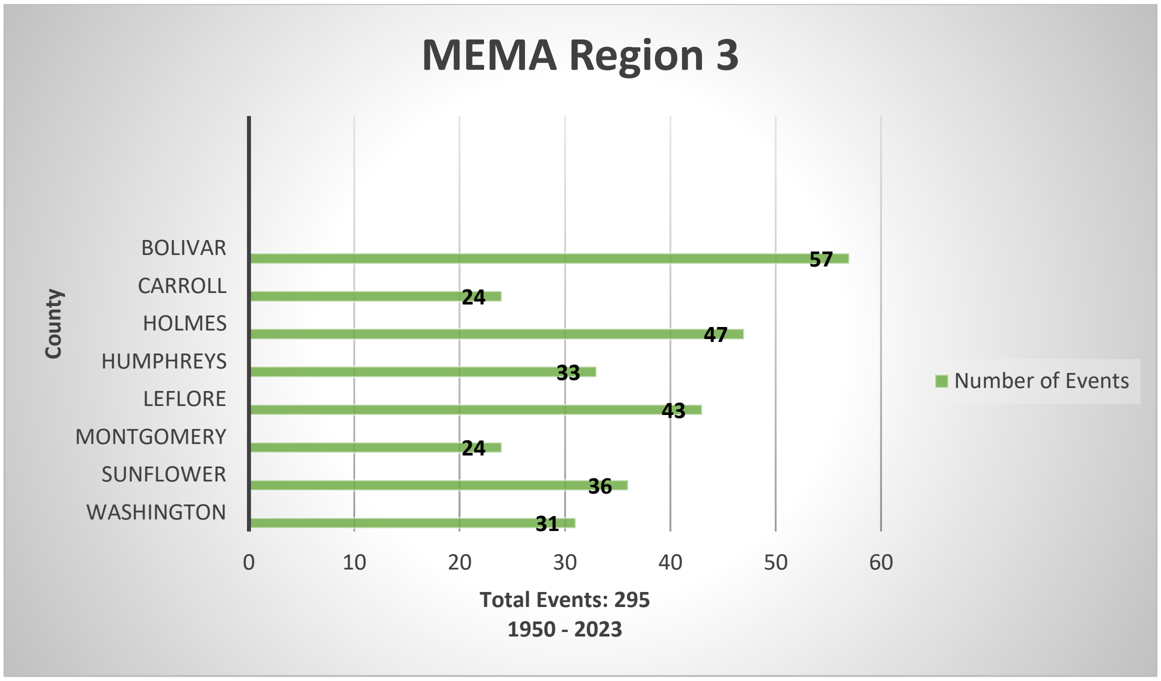

MEMA Region 1: Tornado Scenario
N
Source:
Background (ESRI)
Tornado (NOAA)
Critical Assets (MSDFA)
Clarksdale
Grenada
MEMA Region 1: EF4 Tornado Scenario
Tornado Track Scenario
.5 Mile Buffer
Asset Type
Administration
Agriculture
Commerce
Communications
Education
Fire Service
Food Service
HAZMAT
Housing
Medical
Public Safety
Recreational
Research
Shelter
Special Population
Storage
Support
Utility
Miles
0 5 10 20 30 40

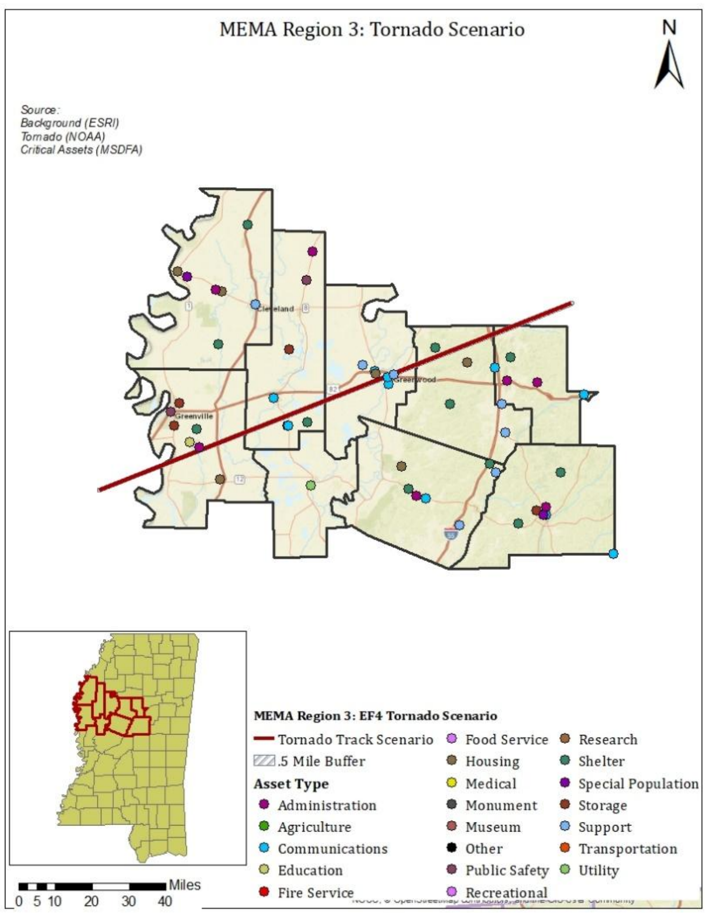


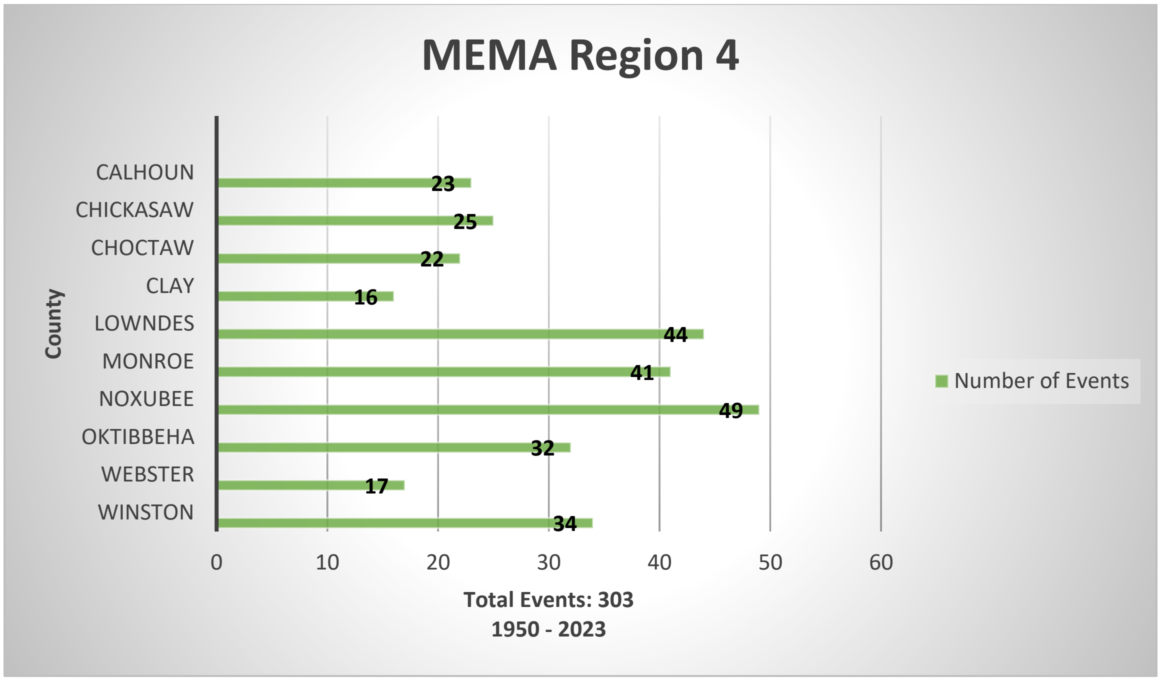
MEMA Region 2
County
ALCORN
BENTON
LAFAYETTE
LEE
MARSHALL
PRENTISS
PONTOTOC
TIPPAH
TISHOMINGO
UNION
22
10
23
35
22
30
22
20
25
21
0
5
10
15
20
25
30
35
40
Number of Events
Total Events: 230
1950 - 2023

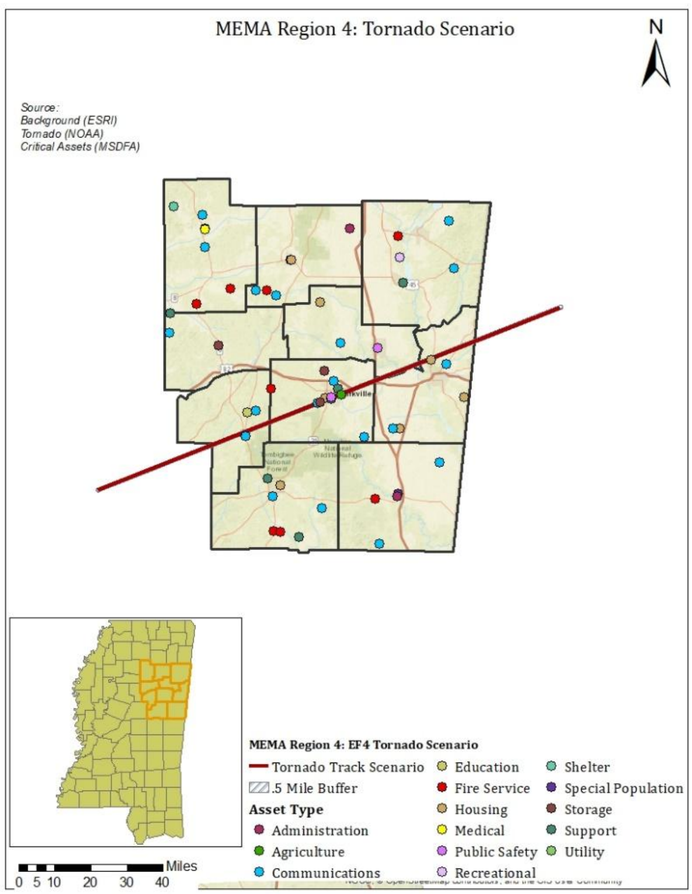


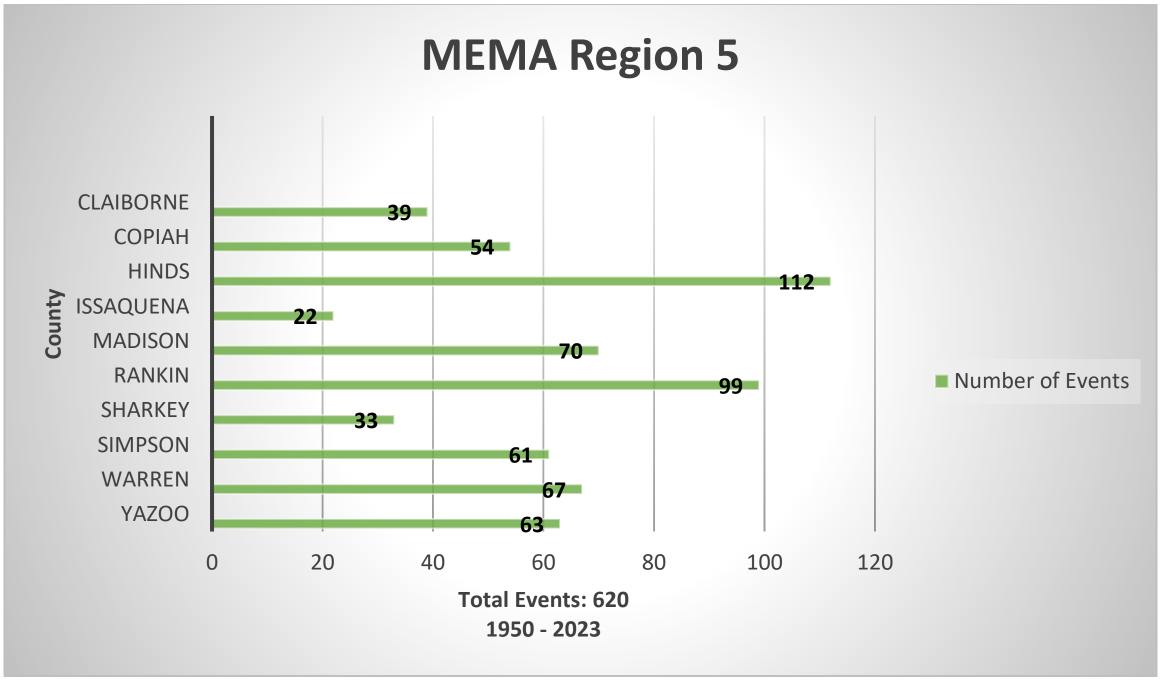
MEMA Region 2: Tornado Scenario
N
Source:
Background (ESRI)
Tornado (NOAA)
Critical Assets (MSDFA)
MEMA Region 2: EF4 Tornado Scenario
Tornado Track Scenario
.5 Mile Buffer
Asset Type
Administration
Agriculture
Communications
Fire Service
Food Service
Housing
Medical
Other
Public Safety
Recreational
Shelter
Special Population
Storage
Support
Utility
0 5 10 20 30 40
Miles

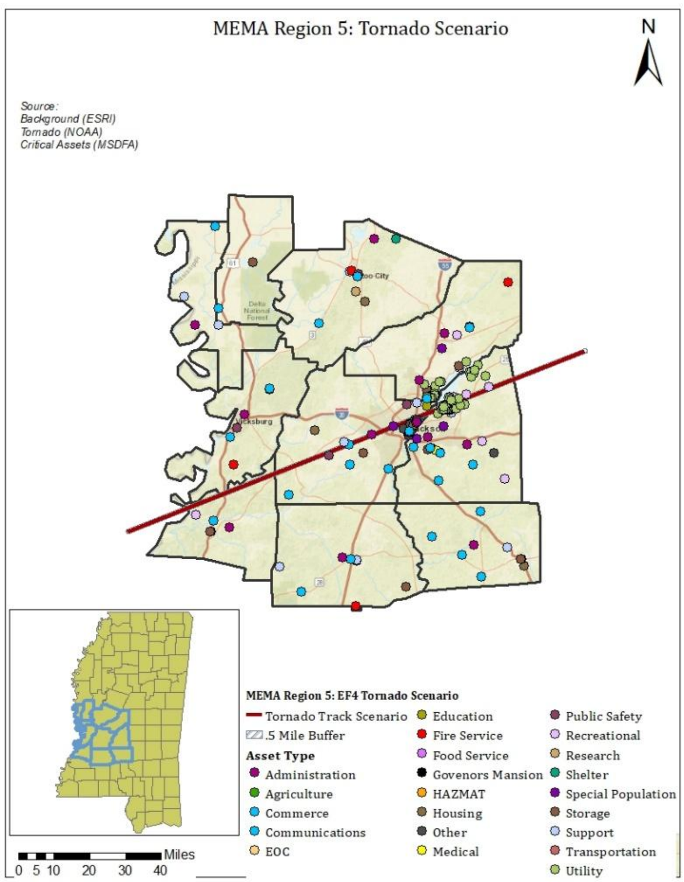

MEMA Region 3
County
BOLIVAR
CARROLL
HOLMES
HUMPHREYS
LEFLORE
MONTGOMERY
SUNFLOWER
WASHINGTON
57
24
47
33
43
24
36
31
0
10
20
30
40
50
60
Number of Events
Total Events: 295
1950 - 2023

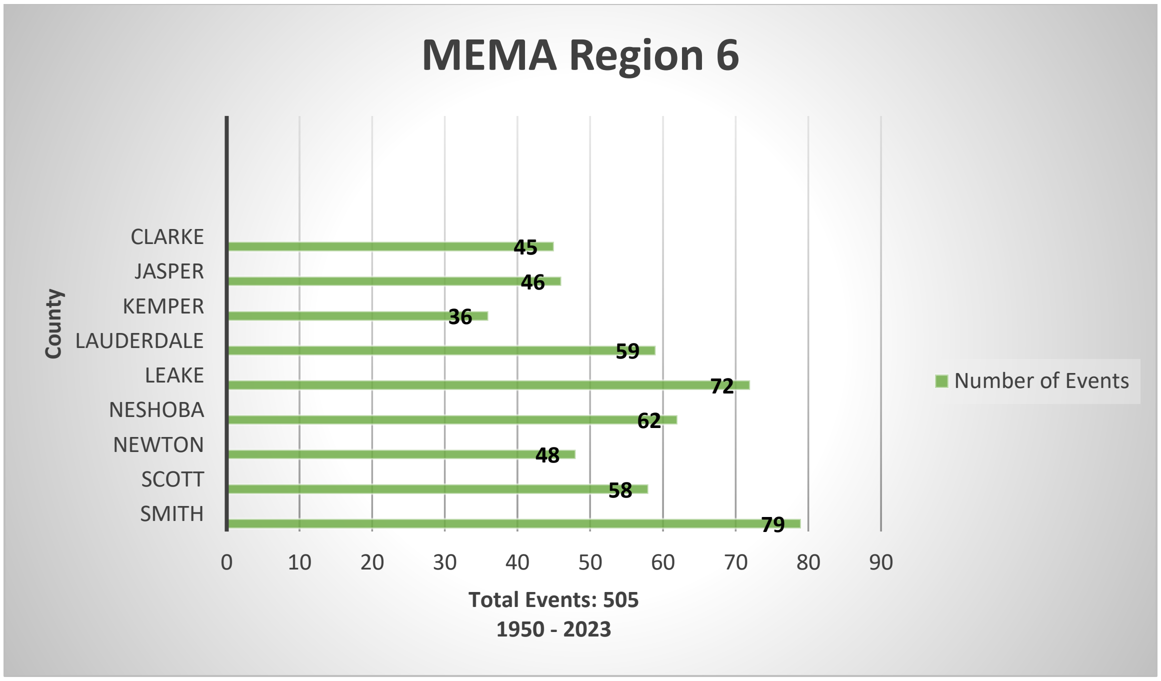

MEMA Region 3: Tornado Scenario
N
Source:
Background (ESRI)
Tornado (NOAA)
Critical Assets (MSDFA)
Cleveland
Greenville
Greenwood
MEMA Region 3: EF4 Tornado Scenario
Tornado Track Scenario
.5 Mile Buffer
Asset Type
Administration
Agriculture
Communications
Education
Fire Service
Food Service
Housing
Medical
Monument
Museum
Other
Public Safety
Recreational
Research
Shelter
Special Population
Storage
Support
Transportation
Utility
Miles
0 5 10 20 30 40

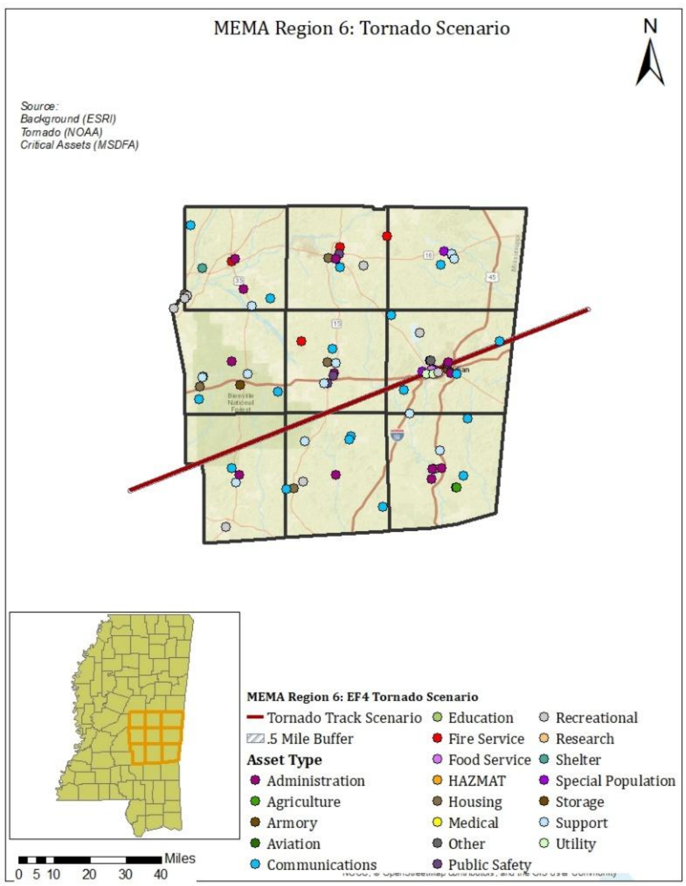

MEMA Region 4
County
CALHOUN
CHICKASAW
CHOCTAW
CLAY
LOWNDES
MONROE
NOXUBEE
OKTIBBEHA
WEBSTER
WINSTON
23
25
22
16
44
41
49
32
17
34
0
10
20
30
40
50
60
Number of Events
Total Events: 303
1950 - 2023

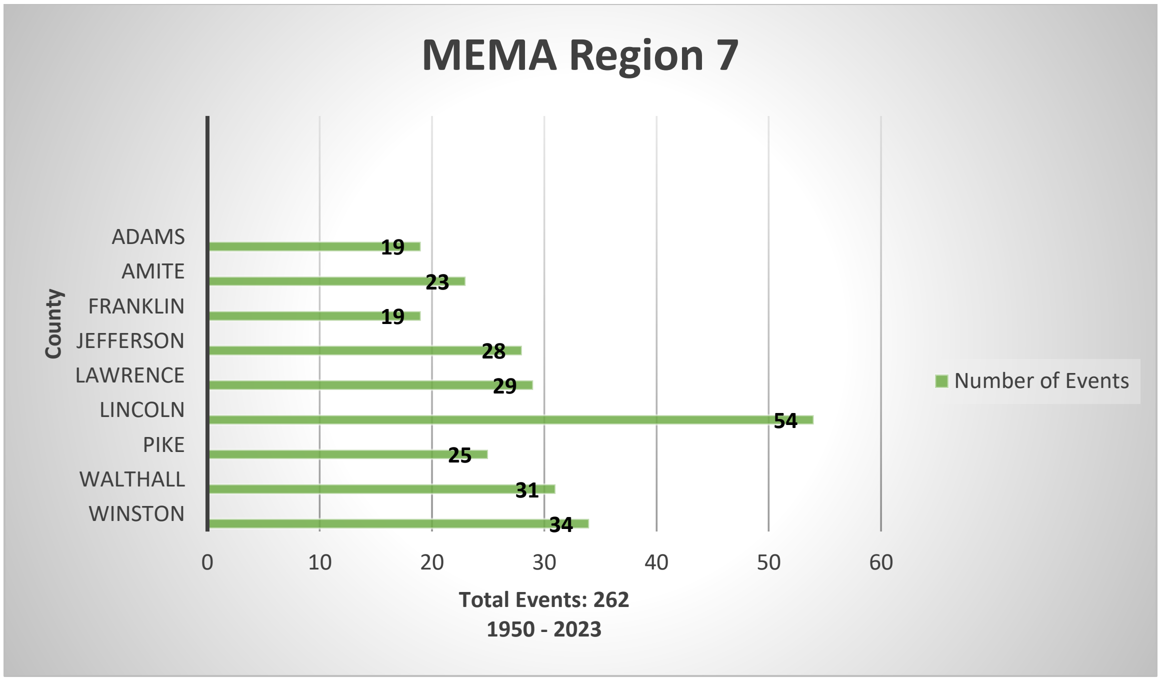

MEMA Region 4: Tornado Scenario
N
Source:
Background (ESRI)
Tornado (NOAA)
Critical Assets (MSDFA)
MEMA Region 4: EF4 Tornado Scenario
Tornado Track Scenario
.5 Mile Buffer
Asset Type
Administration
Agriculture
Communications
Education
Fire Service
Housing
Medical
Public Safety
Recreational
Shelter
Special Population
Storage
Support
Utility
Miles
0 5 10 20 30 40


MEMA Region 5
County
CLAIBORNE
COPIAH
HINDS
ISSAQUENA
MADISON
RANKIN
SHARKEY
SIMPSON
WARREN
YAZOO
39
54
112
22
70
99
33
61
67
63
0
20
40
60
80
100
120
Number of Events
Total Events: 620
1950 - 2023

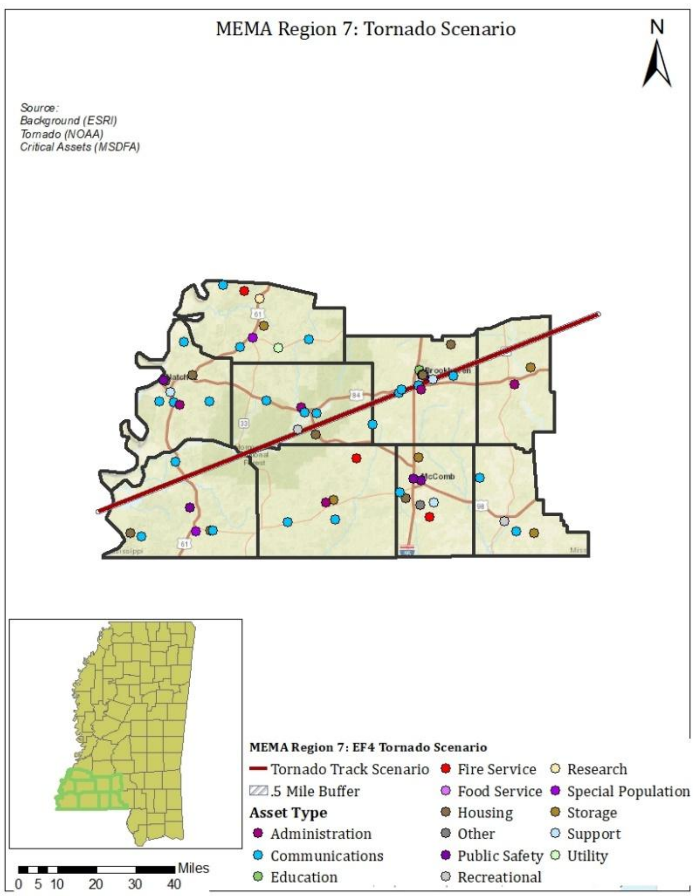

MEMA Region 5: Tornado Scenario
N
Source:
Background (ESRI)
Tornado (NOAA)
Critical Assets (MSDFA)
MEMA Region 5: EF4 Tornado Scenario
Tornado Track Scenario
.5 Mile Buffer
Asset Type
Administration
Agriculture
Commerce
Communications
EOC
Education
Fire Service
Food Service
Govenors Mansion
HAZMAT
Housing
Other
Medical
Public Safety
Recreational
Research
Shelter
Special Population
Storage
Support
Transportation
Utility
Miles
0 5 10 20 30 40


MEMA Region 6
County
CLARKE
JASPER
KEMPER
LAUDERDALE
LEAKE
NESHOBA
NEWTON
SCOTT
SMITH
45
46
36
59
72
62
48
58
79
0
10
20
30
40
50
60
70
80
90
Number of Events
Total Events: 505
1950 - 2023

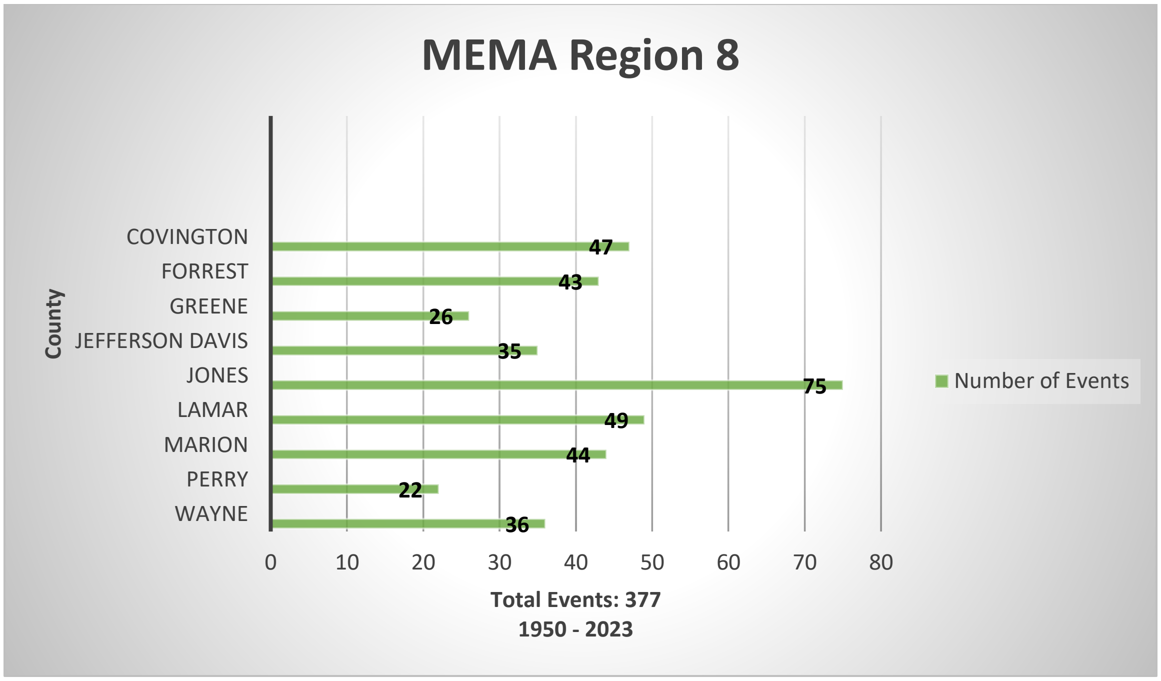

MEMA Region 6: Tornado Scenario
N
Source:
Background (ESRI)
Tornado (NOAA)
Critical Assets (MSDFA)
MEMA Region 6: EF4 Tornado Scenario
Tornado Track Scenario
.5 Mile Buffer
Asset Type
Administration
Agriculture
Armory
Aviation
Communications
Education
Fire Service
Food Service
HAZMAT
Housing
Medical
Other
Public Safety
Recreational
Research
Shelter
Special Population
Storage
Support
Utility
Miles
0 5 10 20 30 40

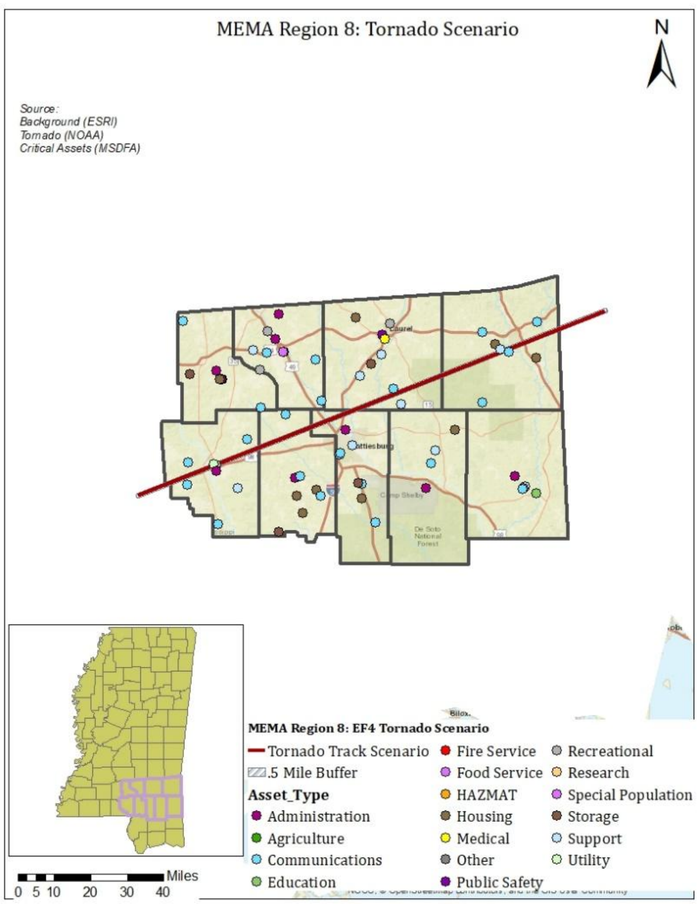


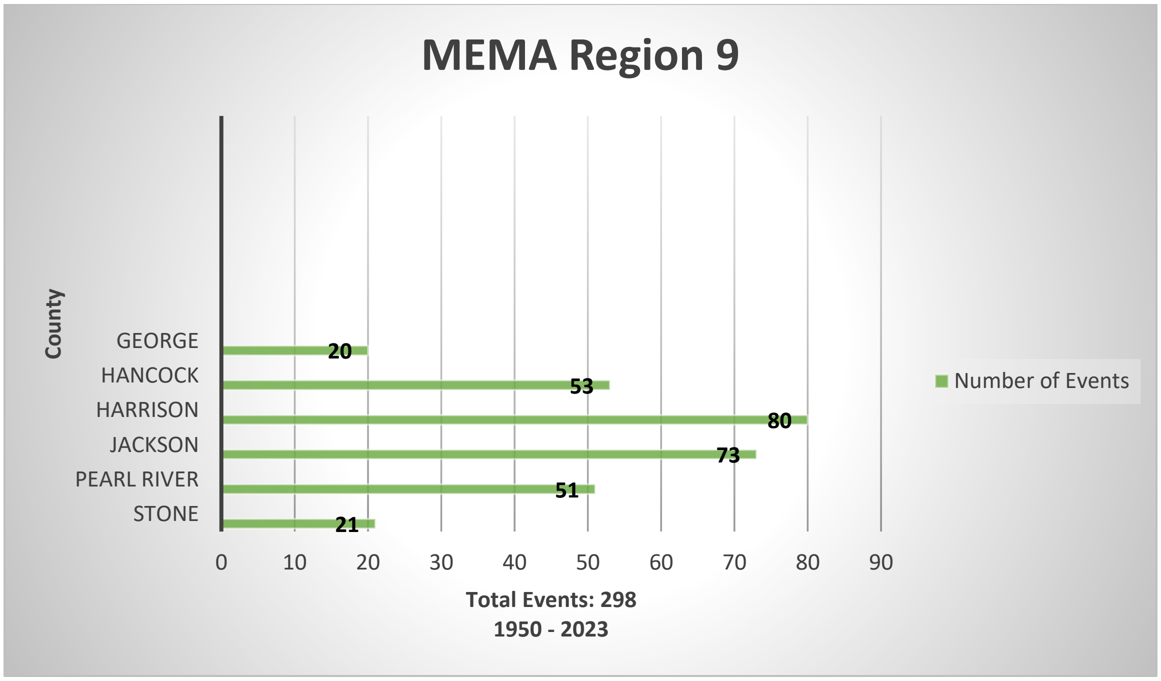
MEMA Region 7
County
ADAMS
AMITE
FRANKLIN
JEFFERSON
LAWRENCE
LINCOLN
PIKE
WALTHALL
WINSTON
19
23
19
28
29
54
25
31
34
0
10
20
30
40
50
60
Number of Events
Total Events: 262
1950 - 2023

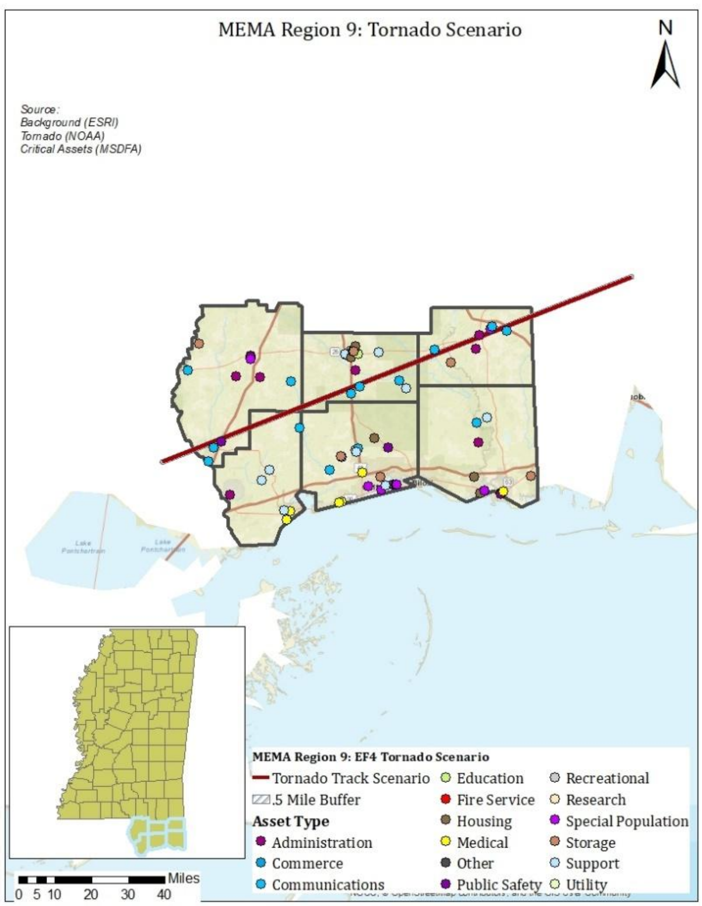


MEMA Region 7: Tornado Scenario
N
Source:
Background (ESRI)
Tornado (NOAA)
Critical Assets (MSDFA)
MEMA Region 7: EF4 Tornado Scenario
Tornado Track Scenario
.5 Mile Buffer
Asset Type
Administration
Communications
Education
Fire Service
Food Service
Housing
Other
Public Safety
Recreational
Research
Special Population
Storage
Support
Utility
Miles
0 5 10 20 30 40


MEMA Region 8
County
COVINGTON
FORREST
GREENE
JEFFERSON DAVIS
JONES
LAMAR
MARION
PERRY
WAYNE
47
43
26
35
75
49
44
22
36
0 10 20 30 40 50 60 70 80
Number of Events
Total Events: 377
1950 - 2023


MEMA Region 8: Tornado Scenario
N
Source:
Background (ESRI)
Tornado (NOAA)
Critical Assets (MSDFA)
MEMA Region 8: EF4 Tornado Scenario
Tornado Track Scenario
.5 Mile Buffer
Asset_Type
Administration
Agriculture
Communications
Education
Fire Service
Food Service
HAZMAT
Housing
Medical
Other
Public Safety
Recreational
Research
Special Population
Storage
Support
Utility
Miles
0 5 10 20 30 40


MEMA Region 9
County
GEORGE
HANCOCK
HARRISON
JACKSON
PEARL RIVER
STONE
20
53
80
73
51
21
0
10
20
30
40
50
60
70
80
90
Number of Events
Total Events: 298
1950 - 2023


MEMA Region 9: Tornado Scenario
N
Source:
Background (ESRI)
Tornado (NOAA)
Critical Assets (MSDFA)
MEMA Region 9: EF4 Tornado Scenario
Tornado Track Scenario
.5 Mile Buffer
Asset Type
Administration
Commerce
Communications
Education
Fire Service
Housing
Medical
Other
Public Safety
Recreational
Research
Special Population
Storage
Support
Utility
Miles
0 5 10 20 30 40

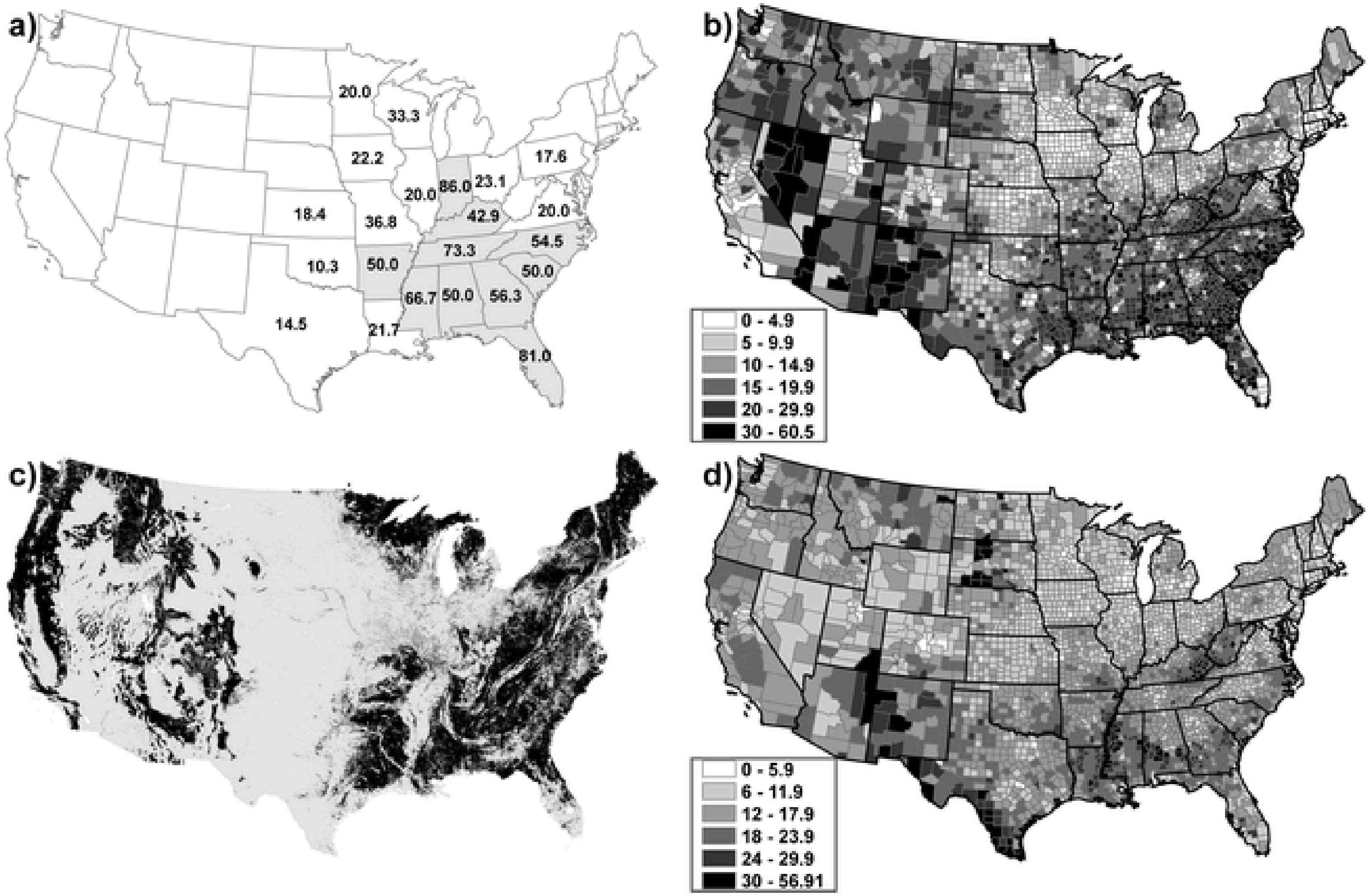
Assessing the Vulnerability of People to Tornadoes

Anyone occupying a structure that is not constructed as a storm shelter is vulnerable to the effects of tornadoes. However, occupants of mobile homes are at a statistically higher risk of tornado-related death or injury. According to a study at Michigan State University, there are roughly 9 million mobile homes in the United States. The United States averages well over 1,000 tornadoes per year. A 2008 Northern Illinois University study indicated that 45% of all fatalities during tornadoes occur in mobile homes, compared to 26% in traditional site-built houses

The study cited the prevalence of mobile homes in states such as Arkansas, Tennessee, Alabama, and Mississippi as a contributing factor to the high tornado-related fatality rate in the southeastern United States. **Table 3.2.4** illustrates the high percentage of mobile/manufactured housing throughout the state. Without appropriate warning or access to a tornado shelter, mobile home occupants can rapidly become involved in a life-threatening situation.

People who are outside of the siren warning area or with limited access to conventional communications such as telephones or weather radios, are also at risk. People with special needs and/or home-bound due to medical problems are especially vulnerable even to secondary effects of tornadoes including power outages.

Inadequate individual warnings and limited access to approved shelters during an event contribute to the number of fatalities resulting from tornadoes. People with mobility impairments, or the inability to hear or understand warnings, the very young, the elderly, and the handicapped are especially vulnerable to tornadoes. The following figure illustrates the unique vulnerabilities to tornadoes experienced by residents in the southeastern U.S. and particularly in Mississippi. Image (a) shows the percentage of night-time tornado fatalities by state from 1985-2005 with Mississippi at 66.7%. Image (b) illustrates the overall percentage of mobile homes by county. Image (c) shows forest cover and image (d) shows the percentage of county populations at or below the poverty level. These four factors combined contribute to an above-average high level of vulnerability of Mississippians to the devastating impacts of tornadoes.



(a) Percentage of nighttime tornado fatalities by state (illustrated for those states with greater than 10 tornado fatalities for 1985–2005; shaded states above the national average for nighttime tornado fatalities of 42.5%), (b) percentage of mobile homes by county (U.S. Census Bureau 2006), (c) forest cover (solid black) for the United States as determined by Advanced Very High Resolution Radiometer data (information online at http://nationalatlas.gov/articles/biology/a_forest.html), and (d) percent of county population in poverty (U.S. Census Bureau 2006).

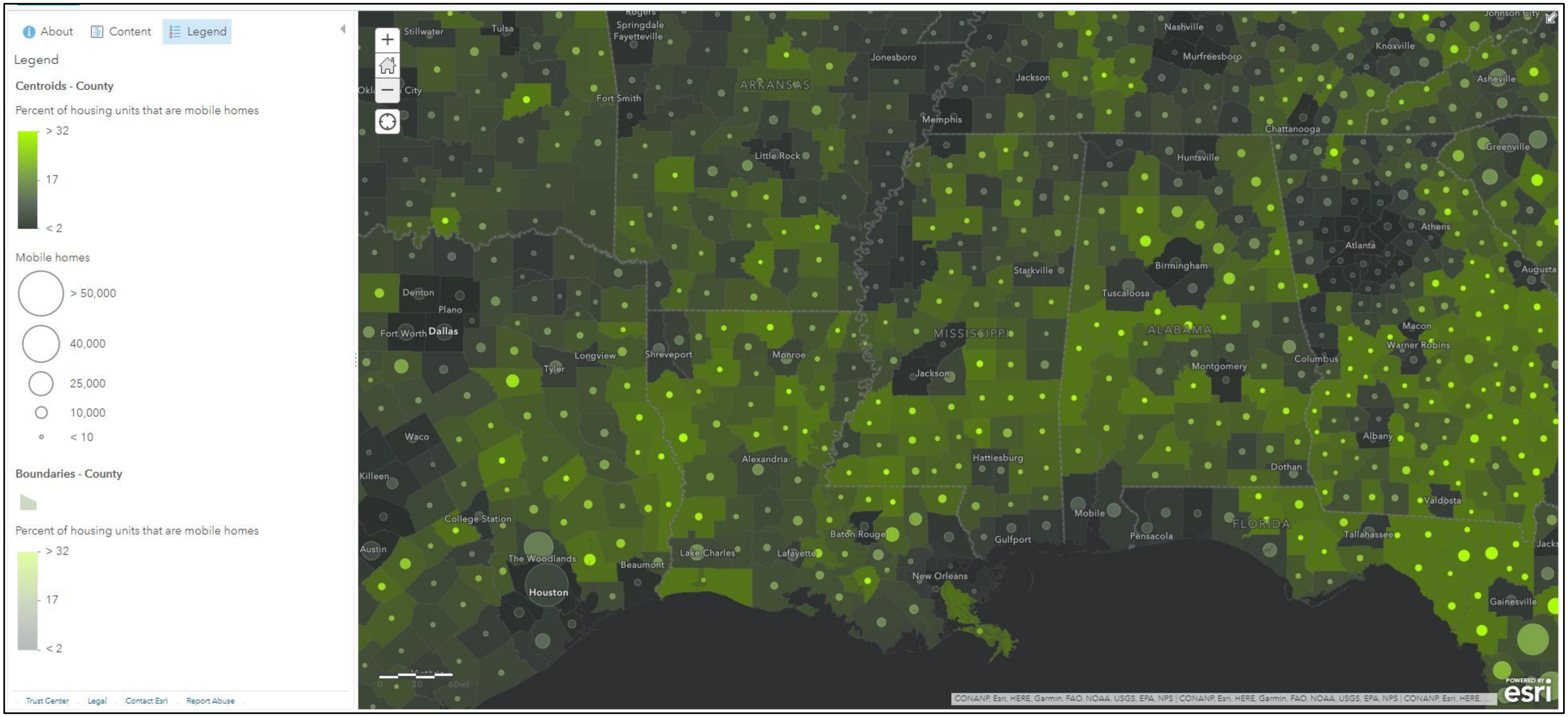
Table 3.2.4
Mobile/Manufactured Housing

County	Number of Mobile/ Manufactured Housing	Percentage of Total Housing		County	Number of Mobile/ Manufactured Housing	Percentage of Total Housing
MEMA Region 1 – 16,195						
Coahoma	1,057	9.8%		Tallahatchie	1,292	23.3%
DeSoto	2,971	4.6%		Tate	2,425	21.7%
Grenada	1,602	15.7%		Tunica	593	12.3%
Panola	4,044	27.4%		Yalobusha	1,767	27.7%
Quitman	444	12.4%				
MEMA Region 2 – 27,777						
Alcorn	2,479	14.5%		Pontotoc	3,232	25.7%
Benton	1,124	26.7%		Prentiss	2,128	19.2%
Itawamba	2,245	22.1%		Tippah	2,297	18.9%
Lafayette	2,594	10.8%		Tishomingo	1,945	22.3%
Lee	3,994	11.0%		Union	2,611	
Marshall	3,128	20.8%				
MEMA Region 3 – 11,604						
Attala	1,871	14.5%		Leflore	1,106	8.4%
Bolivar	1,537	26.7%		Montgomery	832	15.3%
Carroll	1,067	22.1%		Sunflower	470	4.8%
Holmes	2,518	10.8%		Washington	1,798	8.3%
Humphreys	405	11.0%				
MEMA Region 4 – 18,808						
Calhoun	1,368	19.7%		Monroe	3,615	22.0%
Chickasaw	1,958	26.1%		Noxubee	1,727	33.5%
Choctaw	728	17.5%		Oktibbeha	2,253	10.5%
Clay	1,448	15.7%		Webster	972	20.2%
Lowndes	3,106	11.5%		Winston	1,633	18.6%
MEMA Region 5 – 28,132						
Claiborne	1,512	35.8%		Rankin	7,739	13.3%
Copiah	3,271	26.9%		Sharkey	430	20.3%
Hinds	4,289	4.1%		Simpson	3,051	25.5%
Issaquena	152	27.4%		Warren	3,377	15.4%
Madison	2,080	5.1%		Yazoo	2,231	22.2%

MEMA Region 6 – 22,758						
Clarke	2,270	28.8%		Neshoba	2,431	19.7%
Jasper	2,549	31.0%		Newton	1,910	20.4%
Kemper	1,046	22.1%		Scott	3,471	30.2%
Lauderdale	4,866	13.9%		Smith	1,918	26.4%
Leake	2,297	24.4%				
MEMA Region 7 – 19,891						
Adams	1,704	11.6%		Lincoln	4,195	27.5%
Amite	1,928	29.1%		Pike	4,430	24.7%
Franklin	1,153	27.7%		Walthall	2,031	28.5%
Jefferson	1,265	34.4%		Wilkinson	1,772	35.1%
Lawrence	1,413	23.4%				
MEMA Region 8 – 23,521						
Covington	2,109	11.6%		Lamar	2,307	9.5%
Forrest	3,071	29.1%		Marion	2,882	24.3%
Greene	1,082	27.7%		Perry	1,938	35.1%
Jefferson Davis	1,567	34.4%		Wayne	2,865	31.1%
Jones	5,700	23.4%				
MEMA Region 9 – 24,622						
George	2,163	23.1%		Jackson	5,348	8.7%
Hancock	2,987	12.6%		Pearl River	4,734	19.3%
Harrison	7,783	8.7%		Stone	1,607	22.2%
Total Mobile/Manufactured Housing Mississippi						**193,308**

Source: U. S. Census Bureau: 2000 Census and Selected Housing Characteristics 2012-2016 American Community Survey 5-Year Estimates

Figure 3.2.3
Mobile/Manufactured Housing



Loss of Life

Statistically speaking, Mississippi has experienced less than one death per tornado incident on average since 1950. However, even one loss of life resulting from a tornado event is too many. **Table 3.2.5** shows data by decade from 1950-2022 with the number of deaths and injuries caused by tornadoes in each reported period. The data indicates a downward trend in both deaths and injuries indicating that perhaps our efforts towards education and early warning innovations are working but it also highlights that there is work still to be done.

Because of the widespread nature of tornado-related damage, death and injury can come from a variety of causes including windblown debris, structural failure, etc. Mitigation through education, continued development of early warning systems, and development of more resilient housing codes will continue to provide increased protection to Mississippi residents against injury and death resulting from tornadoes.

Table 3.2.5
Tornado Events with Death/Injury

Timeframe	# of Events	Deaths	Death(s)/Event	Injuries	Injuries/Event
1950-1960	179	78	0.44	715	3.99
1961-1970	216	113	0.52	1089	5.04
1971-1980	365	143	0.39	2455	6.73
1981-1990	319	30	0.09	684	2.14
1991-2000	330	25	0.08	524	1.59
2001-2010	665	29	0.04	611	0.92
2011-2020	807	81	0.10	794	0.98
2021-2022	219	1	0.00	6	0.03

Vulnerability of Natural Resources

Trees and decorative vegetation are all subject to damage from tornadoes. The force of a tornado is powerful enough to uproot trees and vegetation and deposit the debris in standing water, resulting in a polluted drinking water supply. Tornadoes also can cause animals to migrate prematurely.

Streams can become clogged with wind-blown debris and downed trees, causing flooding and resulting in a slow recovery. Habitat for local wildlife may become destroyed, resulting in a reduction of species. If debris is not removed from the forest floor, it can become fuel for a wildfire.

However, as we have experienced over decades of storm events, natural systems tend to be resilient and have the capacity to regenerate under the right conditions.

Local Plan Integration Summary

Below is a summary of the risk classification identified in the individual local mitigation plans, which includes all corresponding municipalities and Disaster Resistant University Plans by MEMA Region:

MEMA Region	Low	Medium	High	MEMA Region	Low	Medium	High
1	--	--	1	6	--	--	1
2	--	1	1	7	--	--	1
3	--	1	1	8	--	--	4
4	--	--	2	9	--	--	1
5	--	--	17*				

*Note- two additional plans in Region 5 ranked tornado as "yes" only and are not included in the above table.

Assessing Vulnerability by Jurisdiction Methodology and Potential Losses

The previous plans assessed each county's vulnerability to tornado events by utilizing a rating system devised to establish four ratings based on the following factors: the number of past tornado occurrences, the total valuation of private property in each county, the population density of each county, and historic tornado damage values. The sum of each of these ratings was used to determine an overall vulnerability rating for each county.

For the sake of consistency, this HIRA update used the same methodology as previous plan updates. Four factors are used, but they are not classified into groupings to assess a value. The value for each category is presented in Table 3.2.5 by MEMA Region.

The four factors are described in detail below with a summary of the results.

1. **Prior Events** - The total number of tornadoes reported is dependent on population density and weather radar coverage. For this plan, it is assumed that the overall frequency of tornadoes does not vary significantly across the state by any means other than seasonality. Southern portions of Mississippi appear to experience more tornadoes during the spring severe weather season whereas the northern portions experience their peak in the fall severe weather season.

   Summary of Prior Events: The number of events by county is provided in graph form in this section MEMA Region. Based on the frequency of occurrences and the unpredictable nature of tornadoes, all counties are considered at high risk.

2. **Private Property Values** - To relatively compare the value of assets vulnerable to loss by tornado damage in each county, the state of Mississippi utilized assessment data from the Mississippi Tax Commission. The values were obtained from the "Mississippi State Tax Commission Annual Report Fiscal Year Ending June 30, 2022."

The Annual Report provides private property assessments in two categories. These are "Real Property" and "Personal Property." The "Real Property" assessment represents the true value of all taxable land and improvements. The "Personal Property" assessment represents the value of the following: business inventories, furniture, fixtures, machinery, and equipment for non-residential property, mobile homes, and automobiles. To determine the Total Valuation of Property for each county, the "True Value" from the "Personal Property" assessment was added to the "True Value" from the "Real Property" assessment. This total private property valuation dollar value in itself is an indicator of the total value of each county's property (tangible assets). It is important to note that the Personal Property assessment only includes property reported for tax purposes and does not include furniture and fixtures located in non-institutional residential property.

Summary of Private Property Values: The Total Property Valuation ranged from $152,402,798 in Issaquena County to $16,657,627,680 in DeSoto County.

3. **Tornado Damage Values** - Total damages of past tornadoes were determined to be an important factor in assessing vulnerability. The National Weather Service database listed past events plus damage estimates from those events. These damage estimates were approximated.

   Summary of Tornado Damage Values: Lawrence County still leads in greatest loss with $504,289,000 in damages. The least amount of damage was in Stone County with $660,050 in damages.

Table 3.2.5
Tornado Damage Assessment by MEMA Region

MEMA Region 1				
County	**Event**	**Total Value of Property (2022 MS Department of Revenue)**	**Reported Property Damage (NCDC) 1950 - 2022**	**Percent of Property Damage**
Coahoma	29	$1,281,819,396	$33,761,000	2.63%
DeSoto	26	$16,657,627,680	$47,484,000	0.29%
Grenada	19	$1,468,796,667	$1,768,000	0.12%
Panola	21	$1,796,569,774	$29,910,000	1.66%
Quitman	12	$339,144,059	$31,209,000	9.20%
Tallahatchie	19	$774,556,385	$32,053,000	4.14%
Tate	15	$1,502,243,741	$1,000,000	0.07%
Tunica	12	$1,268,273,374	$3,607,000	0.28%
Yalobusha	10	$653,257,897	$25,685,000	3.93%
Totals	**163**	**$25,742,288,973**	**$206,477,000**	**1%**

MEMA Region 2				
County	**Event**	**Total Value of Property (2022 MS Department of Revenue)**	**Reported Property Damage (NCDC) 1950 - 2022**	**Percent of Property Damage**
Alcorn	22	$1,892,868,559	$4,336,000	0.23%
Benton	10	$527,511,910	$3,526,000	0.67%
Itawamba	15	$1,113,829,300	$4,630,000	0.42%
Lafayette	23	$5,665,566,207	$62,367,000	1.10%
Lee	35	$7,656,356,564	$27,026,000	0.35%
Marshall	22	$3,021,602,136	$6,441,000	0.21%
Pontotoc	22	$1,419,619,312	$30,235,000	2.13%
Prentiss	30	$1,050,326,214	$4,373,000	0.42%
Tippah	20	$974,048,479	$4,361,000	0.45%
Tishomingo	25	$1,363,445,628	$8,380,000	0.61%
Union	21	$2,067,997,215	$27,598,000	1.33%
Totals	**245**	**$26,753,171,524**	**$183,273,000**	**1%**

MEMA Region 3				
County	**Event**	**Total Value of Property (2022 MS Department of Revenue)**	**Reported Property Damage (NCDC) 1950 - 2022**	**Percent of Property Damage**
Atalla	53	$898,157,024	$95,085,000	10.59%
Bolivar	57	$2,203,682,435	$21,082,000	0.96%
Carroll	24	$585,705,944	$3,922,000	0.67%
Holmes	47	$619,606,167	$70,451,000	11.37%
Humphreys	33	$400,510,216	$10,738,000	2.68%
Leflore	43	$1,809,878,876	$33,721,000	1.86%
Montgomery	24	$462,825,632	$7,449,000	1.61%
Sunflower	36	$1,293,123,052	$8,305,000	0.64%
Washington	31	$2,355,187,844	$11,078,000	0.47%
Totals	**348**	**$10,628,677,190**	**$261,831,000**	**2%**

MEMA Region 4				
County	Event	Total Value of Property (2022 MS Department of Revenue)	Reported Property Damage (NCDC) 1950 - 2022	Percent of Property Damage
Calhoun	23	$716,133,531	$2,000,000	0.28%
Chickasaw	25	$698,025,197	$7,845,000	1.12%
Choctaw	22	$1,408,300,532	$119,564,000	8.49%
Clay	16	$1,448,437,688	$4,406,000	0.30%
Lowndes	46	$6,540,634,794	$78,106,000	1.19%
Monroe	41	$2,043,921,479	$15,897,000	0.78%
Noxubee	49	$499,557,894	$7,410,000	1.48%
Oktibbeha	32	$3,240,127,681	$7,460,000	0.23%
Webster	17	$524,755,280	$6,865,000	1.31%
Winston	35	$1,046,472,849	$122,555,000	11.71%
Totals	**306**	**$18,166,366,925**	**$372,108,000**	**2%**

MEMA Region 5				
County	Event	Total Value of Property (2022 MS Department of Revenue)	Reported Property Damage (NCDC) 1950 - 2022	Percent of Property Damage
Claiborne	39	$395,679,089	$27,225,000	6.88%
Copiah	54	$1,294,921,200	$10,812,000	0.83%
Hinds	112	$12,474,623,347	$95,838,000	0.77%
Issaquena	22	$152,402,798	$3,800,000	2.49%
Madison	70	$13,389,673,314	$46,583,000	0.35%
Rankin	99	$13,402,856,152	$144,866,000	1.08%
Sharkey	33	$284,485,274	$28,299,000	9.95%
Simpson	61	$1,529,314,041	$27,754,000	1.81%
Warren	67	$3,861,953,833	$34,047,000	0.88%
Yazoo	63	$1,308,545,622	$149,036,000	11.39%
Totals	**620**	**$48,094,454,670**	**$568,260,000**	**1%**

MEMA Region 6				
County	**Event**	**Total Value of Property (2022 MS Department of Revenue)**	**Reported Property Damage (NCDC) 1950 - 2022**	**Percent of Property Damage**
Clarke	45	$802,268,604	$29,181,000	3.64%
Jasper	47	$1,169,425,568	$50,472,000	4.32%
Kemper	36	$1,342,016,691	$43,480,000	3.24%
Lauderdale	59	$4,476,058,443	$20,172,000	0.45%
Leake	72	$886,379,169	$66,874,000	7.54%
Neshoba	62	$1,332,316,058	$76,999,000	5.78%
Newton	48	$1,039,226,380	$19,980,000	1.92%
Scott	58	$1,574,862,203	$10,148,000	0.64%
Smith	79	$957,505,257	$52,068,000	5.44%
Totals	**506**	**$13,580,058,373**	**$369,374,000**	**3%**

MEMA Region 7				
County	**Event**	**Total Value of Property (2022 MS Department of Revenue)**	**Reported Property Damage (NCDC) 1950 - 2022**	**Percent of Property Damage**
Adams	19	$2,098,880,294	$7,006,000	0.33%
Amite	24	$746,894,457	$2,272,000	0.30%
Franklin	19	$366,835,205	$4,041,000	1.10%
Jefferson	28	$307,888,952	$2,816,000	0.91%
Lawrence	30	$851,755,517	$506,239,000	59.43%
Lincoln	54	$2,219,547,189	$11,472,000	0.52%
Pike	25	$2,090,820,554	$29,078,000	1.39%
Walthall	31	$609,236,530	$2,293,000	0.38%
Wilkinson	13	$408,676,307	$1,153,000	0.28%
Totals	**243**	**$9,700,535,005**	**$566,370,000**	**6%**

MEMA Region 8				
County	**Event**	**Total Value of Property (2022 MS Department of Revenue)**	**Reported Property Damage (NCDC) 1950 - 2022**	**Percent of Property Damage**
Covington	47	$1,308,372,532	$66,415,000	5.08%
Forrest	43	$4,748,648,172	$45,084,000	0.95%
Greene	27	$711,963,409	$15,432,000	2.17%
Jefferson Davis	38	$490,566,790	$30,671,000	6.25%
Jones	75	$3,696,466,147	$85,161,000	2.30%
Lamar	49	$4,592,605,996	$25,113,000	0.55%
Marion	46	$1,164,500,611	$31,149,000	2.67%
Perry	22	$689,498,024	$1,088,000	0.16%
Wayne	36	$1,100,012,304	$27,602,000	2.51%
Totals	**383**	**$18,502,633,985**	**$327,715,000**	**2%**

MEMA Region 9				
County	**Event**	**Total Value of Property (2022 MS Department of Revenue)**	**Reported Property Damage (NCDC) 1950 - 2022**	**Percent of Property Damage**
George	20	$1,044,406,851	$1,552,000	0.15%
Hancock	53	$4,582,061,677	$27,450,000	0.60%
Harrison	80	$16,190,779,757	$64,093,000	0.40%
Jackson	73	$13,268,977,040	$3,568,000	0.03%
Pearl River	51	$2,882,458,402	$5,310,000	0.18%
Stone	21	$855,441,140	$660,050	0.08%
Totals	**298**	**$38,824,124,867**	**$102,633,050**	**0%**

Benefits of Mitigation

Warning Sirens

The Mississippi Emergency Management Agency partnered with the Federal Emergency Management Agency to improve tornado warning capabilities through participation in a storm siren grant program. This program required localities to provide minimum matching funds, document proposed sites. The program also required an estimate of the effective range and population to be warned should the project be funded. Funded entities were required to assume responsibility for the future maintenance of sirens funded through the program.

Safe Rooms

The State of Mississippi also offered a safe room program - “A Safe Place to Go” encouraged homeowners to construct individual safe rooms at their residences to protect their families. The program resulted in the development of more than 6,200 safe rooms.

The state also provided funding for FEMA 361 and Community Safe Rooms. With advanced notice, these safe rooms are opened for persons potentially vulnerable to tornadoes and other severe weather events.