3.9: Extreme Winter Weather Risk Assessment

Hazard Description

The National Weather Service defines a winter storm as having three factors: cold air, moisture, and lift. These three factors acting together create conditions suitable for a winter storm. Below are definitions for winter weather events that could impact the State of Mississippi:

Snow Flurries*:* Light snow falling for short durations. No accumulation or light dusting is all that is expected.

Snow Showers: Snow falling at varying intensities for brief periods. Some accumulation is possible.

Sleet*:* Raindrops 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 motorists.

Freezing Rain*:* Rain that falls onto a surface with a temperature below freezing. This causes it to freeze on surfaces, such as trees, cars, and roads, forming a coating or glaze of ice. Even small accumulations of ice can cause a significant hazard.

Wind Chill*:* The combination of wind and temperature that serves as an estimate of how cold it feels to exposed human skin. Wind chill values below -19 degrees are considered dangerous.

Winter Storm Warning*:* Issued when hazardous winter weather in the form of heavy snow, heavy freezing rain, or heavy sleet is imminent or occurring. Winter Storm Warnings are usually issued 12 to 24 hours before the event is expected to begin.

Winter Storm Watch*:* Alerts the public to the possibility of a blizzard, heavy snow, heavy freezing rain, or heavy sleet. Winter Storm Watches are usually issued 12 to 48 hours before the beginning of a Winter Storm.

Winter Storm Outlook*:* Issued before a Winter Storm Watch. The Outlook is given when forecasters believe winter storm conditions are possible and are usually issued 3 to 5 days in advance of a winter storm.

Wind Chill Warning*:* Issued when wind chill temperatures are expected to be hazardous to life within several minutes of exposure.

Wind Chill Advisory: Issued when wind chill temperatures are expected to be a significant inconvenience to life with prolonged exposure and, if caution is not exercised, could lead to hazardous exposure.

Winter Weather Advisories*:* Issued for accumulations of snow, freezing rain, freezing drizzle, and sleet which will cause significant inconveniences and, if caution is not exercised, could lead to life-threatening situations.

Winter storms in the south typically consist of light snow (snow flurries with little to no accumulation), freezing rain (rain that falls when ground temperatures are below freezing), or sleet (transparently frozen or partially frozen raindrops).

Hazard Profile

The hazard profile for extreme winter weather in Mississippi was updated from the previously approved plan of 2018 to include current statistics regarding winter activity throughout the state.

Maximum Winter Storm Threat

Severe winter storms can cause economic losses to the state of Mississippi. Hampered transportation routes caused by closed or blocked roads can prevent the movement of essential economic goods by airports and waterways. An intense cold weather system during the winter of 1989–1990 brought about a widespread emergency in Central Mississippi. Unlike previous winter emergencies, this crisis occurred because manufacturers and product brokers were unable to gain access to essential transportation systems, such as pipelines, trucks, and rail tankers that move heating fuel (propane). This lack of fuel had a cascading effect on the domestic and manufacturing economies

Extreme winter weather in 2010 caused a similar disruption to the Central Mississippi economy. According to the National Weather Service (NWS), the winter of 2009-2010 was characterized by below-normal temperatures across the state of Mississippi. In Jackson, it was the fourth-coldest winter since temperature records were first collected in 1896. It was also the ninth-snowiest winter in Jackson, with one snowfall of 5.5 inches recorded by the NWS Forecast Office. In January, prolonged sub-freezing temperatures caused the massive failure of water mains throughout Jackson and the Central Mississippi region, creating problems for residents and causing emergency conditions at hospitals, police precincts, businesses, restaurants, communications systems, and state facilities. (See a recap of this event under the heading "Prolonged Sub-Freezing Temperatures – January 2010" in this section.)

Timber, a vital asset to the state's economy, was severely impacted by the February 1994 ice storm (FEMA-1009-DR-MS). Damage to public facilities, coupled with $1.3 billion from timber losses – resulted in one of the costliest disasters of this type in the State. Not only did the downed timber create a problem from potential wildfires, but. collapsed roofs and downed power lines resulted in the loss of heating, lighting, water, and sewer systems.

Other secondary problems included flooding from melting ice, snow, and rainfall on heavily glazed and saturated surfaces. Icy, snow-covered areas can create conditions leading to increased accidents involving drivers and walkers. Downed power lines can create a risk of electrocution to residents and electric power workers. Finally, frozen and broken water lines in homes are not only costly to repair but create additional hazards from electrocution.

Education and Outreach

Severe Weather Awareness Week occurs in February and is set each year in coordination with the National Weather Service. For more information on severe weather awareness call the MEMA Public Information number (866-519-6362) between 8 a.m. and 5 p.m. on weekdays.

Location/Past Occurrences

The NCDC improved its data for winter-weather events by enhancing classifications and reassessing the events from 1996 to current. The data for the years 1993 and 1994 were brought forward from the 2010

plan, but the data was not available through NCDC to verify any changes. **Table 3.9.1** was updated from the previous plan to reflect the new categories and number of events reported.

Table 3.9.1
Summary of Mississippi Winter Storm Events
1996-2022

Year	Incident Type (Events Recorded)				Total Property Damage ($)	Total Crop Damage ($)
	Heavy Snow	Ice Storm/Sleet	Winter Storm	Winter Weather		
2022	3	2	4	5	$0	$0
2021	2	4	3	5	$9,699,000	$0
2020	0	0	0	0	$0	$0
2019	0	0	0	0	$0	$0
2018	1	0	2	3	$270,000	$0
2017	0	22	0	14	$2,125,000	$0
2016	0	0	3	10	$0	$0
2015	0	0	0	2	$0	$0
2014	18	8	2	8	$0	$0
2013	28	24	0	18	$540,000	$0
2012	0	0	0	0	$0	$0
2011	41	71	44	29	$25,845,000	$240,000
2010	40	4	35	46	$12,695,000	$0
2009	24	0	6	23	$0	$0
2008	52	10	14	42	$3,390,000	$0
2007	0	0	0	19	$0	$0
2006	0	10	22	0	$1,372,000	$0
2005	0	0	0	0	$0	$0
2004	7	2	11	0	$408,700	$0
2003	3	4	0	0	$148,000	$0
2002	6	0	0	16	$30,000	$0
2001	0	0	0	0	$0	$0
2000	37	16	3	0	$1,415,000	$0
1999	0	0	0	0	$0	$0
1998	0	53	21	0	$16,699,000	$0
1997	16	0	0	0	$50,000	$0
1996	3	30	32	0	$3,500,000	$0
1995	0	0	0	0	$0	$0
1994	0	1	0	0	$500,000	$5,000,000,000
1993	0	1	0	0	$0	$0

Table 3.9.2 summarizes the number of incidents recorded by NCDC for winter weather events in Mississippi by MEMA Regions.

Table 3.9.2
Summary of Events by MEMA Region/County
1996-2022

County	No. of Events	Total Property Damage	Total Crop Damage	County	No. of Events	Total Property Damage	Total Crop Damage
MEMA Region 1				**MEMA Region 2**			
Coahoma	29	$37,000	$0	Alcorn	34	$27,100	$0
DeSoto	44	$33,000	$0	Benton	41	$25,100	$0
Grenada	20	$3,271,000	$0	Itawamba	24	$23,000	$0
Panola	27	$27,000	$0	Lafayette	29	$22,000	$0
Quitman	26	$31,000	$0	Lee	24	$43,000	$0
Tallahatchie	20	$30,000	$0	Marshall	42	$24,100	$0
Tate	36	$24,100	$0	Pontotoc	27	$27,000	$0
Tunica	41	$34,000	$0	Prentiss	27	$1,232,000	$0
Yalobusha	25	$30,000	$0	Tippah	39	$24,100	$0
				Tishomingo	28	$32,100	$0
				Union	30	$27,100	$0

County	No. of Events	Total Property Damage	Total Crop Damage	County	No. of Events	Total Property Damage	Total Crop Damage
MEMA Region 3				**MEMA Region 4**			
Atalla	21	$1,553,000	$0	Calhoun	21	$26,000	$0
Bolivar	34	$2,257,000	$0	Chickasaw	21	$26,000	$0
Carroll	19	$1,680,000	$0	Choctaw	22	$1,721,000	$0
Holmes	21	$1,304,000	$0	Clay	18	$1,065,000	$0
Humphreys	20	$1,190,000	$0	Lowndes	20	$1,293,000	$0
Leflore	22	$4,116,000	$0	Monroe	22	$26,000	$0
Montgomery	19	$1,438,000	$0	Noxubee	22	$1,243,000	$0
Sunflower	28	$2,540,000	$0	Oktibbeha	24	$2,463,000	$0
Washington	27	$2,437,000	$0	Webster	23	$1,636,000	$0
				Winston	22	$1,834,000	$0

County	No. of Events	Total Property Damage	Total Crop Damage	County	No. of Events	Total Property Damage	Total Crop Damage
MEMA Region 5				**MEMA Region 6**			
Claiborne	15	$1,318,000	$0	Clarke	11	$735,000	$0
Copiah	17	$1,565,000	$0	Jasper	13	$1,280,000	$0
Hinds	20	$3,558,000	$0	Kemper	20	$1,220,000	$0
Madison	20	$2,552,000	$0	Lauderdale	20	$2,560,000	$0
Rankin	20	$2,839,000	$0	Leake	19	$1,758,000	$0
Simpson	14	$1,570,000	$0	Neshoba	16	$1,650,000	$0
Warren	20	$2,859,000	$0	Newton	17	$1,815,000	$0
Yazoo	22	$2,288,000	$0	Scott	17	$1,545,000	$0
				Smith	15	$1,725,000	

County	No. of Events	Total Property Damage	Total Crop Damage	County	No. of Events	Total Property Damage	Total Crop Damage
MEMA Region 7				**MEMA Region 8**			
Adams	16	$1,563,000	$0	Covington	11	$1,775,000	$40,000
Amite	14	$0	$0	Forrest	8	$320,000	$0
Franklin	13	$220,000	$800,000	Greene	8	$0	$0
Jefferson	13	$1,065,000	$20,000	Jefferson Davis	12	$1,416,000	$0
Lawrence	12	$1,385,000	$0	Jones	12	$1,505,000	$40,000
Lincoln	13	$2,085,000	$20,000	Lamar	6	$315,000	$0
Pike	8	$0	$0	Marion	8	$405,000	$0
Walthall	8	$0	$0	Perry	6	$0	$0
Wilkinson	10	$0	$0	Wayne	11	$10,000	$0

County	No. of Events	Total Property Damage	Total Crop Damage	County	No. of Events	Total Property Damage	Total Crop Damage
MEMA Region 9							
George	4	$0	$0	Jackson	5	$0	$0
Hancock	5	$0	$0	Pearl River	6	$0	$0
Harrison	5	$0	$0	Stone	4	$0	$0

The following maps (**Figures 3.9.1 and 3.9.2**), "Winter Storm Events by County 1996 – 2017" indicate which counties were impacted by winter storms documented in **Table 3.9.2**. As illustrated on the map, event occurrence follows a geographic pattern. Winter storms occur most frequently in the northern counties with the frequency of occurrence diminishing in a southward pattern.

Snowfall in Mississippi occurs in the northern and central areas, but rarely in the southern areas. Snow in the northern counties is most frequent from December to March, with accumulations lasting only one or two days.

Figure 3.9.1

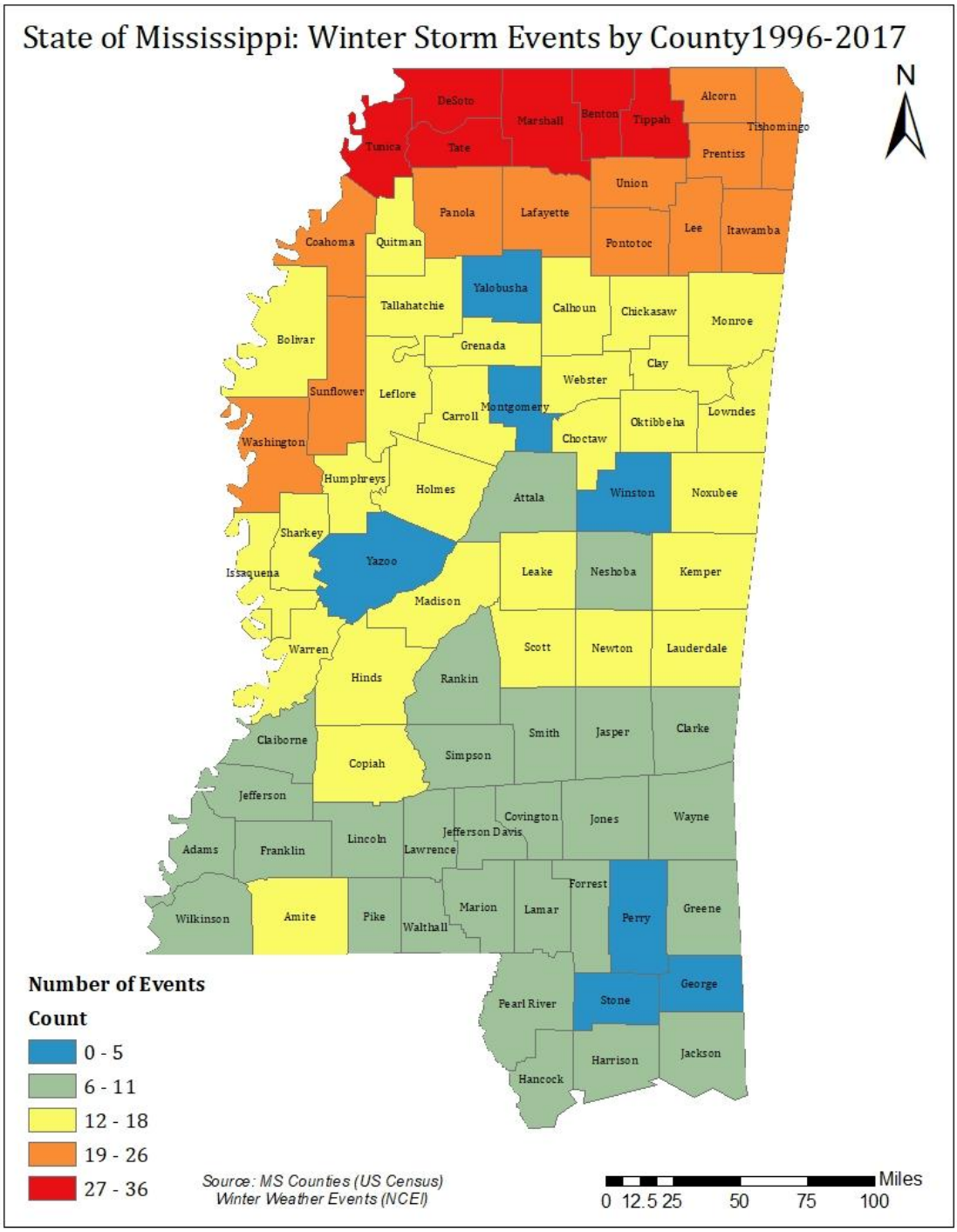
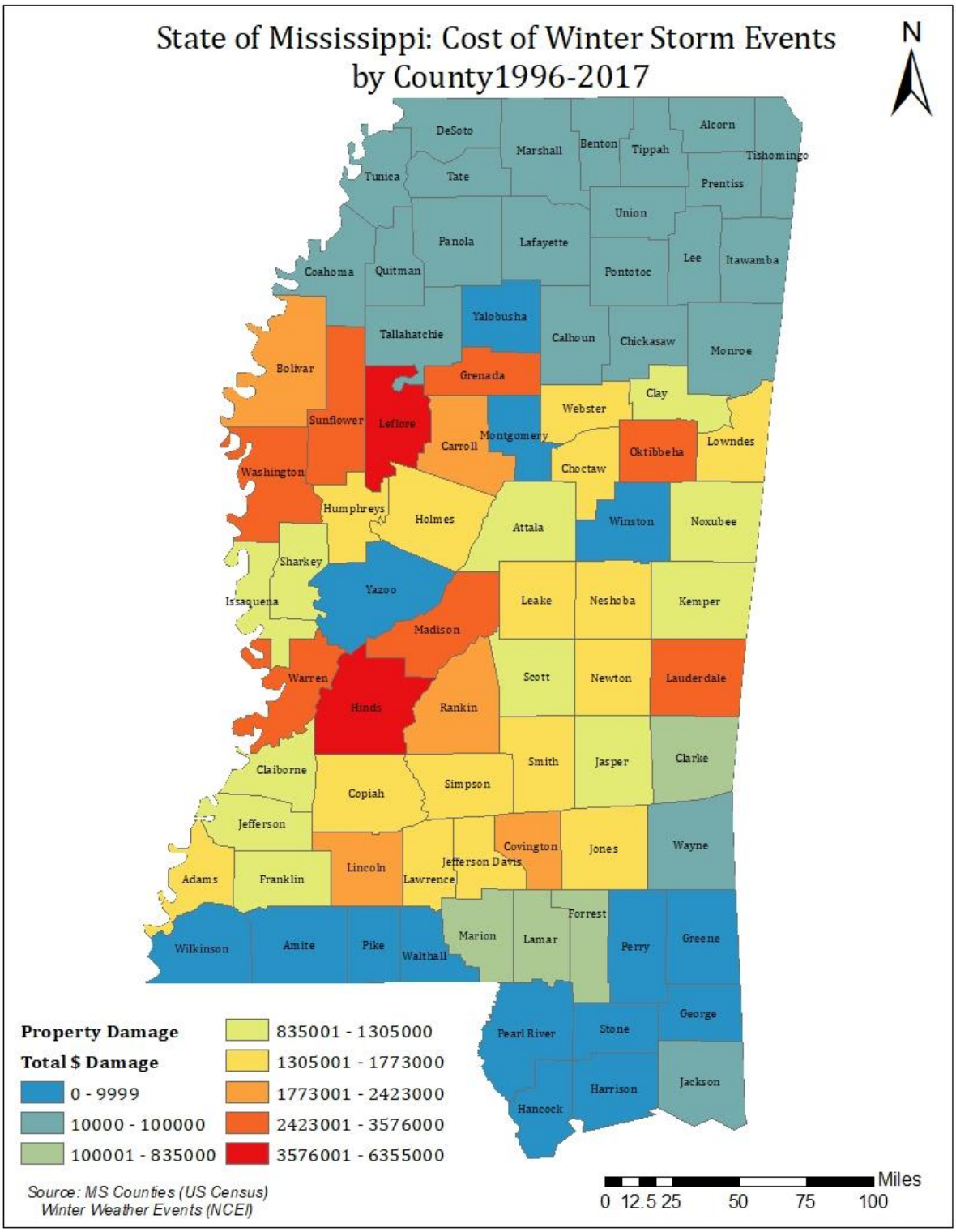


Figure 3.9.2


State of Mississippi: Cost of Winter Storm Events by County1996-2017
N
DeSoto
Marshall
Benton
Tippah
Alcorn
Tishomingo
Tunica
Tate
Prentiss
Union
Panola
Lafayette
Pontotoc
Lee
Itawamba
Coahoma
Quitman
Yalobusha
Calhoun
Chickasaw
Monroe
Tallahatchie
Bolivar
Grenada
Clay
Webster
Sunflower
Leflore
Carroll
Montgomery
Oktibbeha
Lowndes
Washington
Choctaw
Humphreys
Holmes
Attala
Winston
Noxubee
Sharkey
Yazoo
Issaquena
Leake
Neshoba
Kemper
Madison
Warren
Scott
Newton
Lauderdale
Hinds
Rankin
Smith
Jasper
Clarke
Claiborne
Copiah
Simpson
Jefferson
Covington
Jones
Wayne
Lincoln
Jefferson Davis
Adams
Franklin
Lawrence
Forrest
Marion
Lamar
Perry
Greene
Wilkinson
Amite
Pike
Walthall
George
Pearl River
Stone
Jackson
Harrison
Hancock
Property Damage
Total $ Damage
0 - 9999
10000 - 100000
100001 - 835000
835001 - 1305000
1305001 - 1773000
1773001 - 2423000
2423001 - 3576000
3576001 - 6355000
Source: MS Counties (US Census)
Winter Weather Events (NCEI)
Miles
0 12.5 25 50 75 100

Cold weather, including extreme cold and wind chill, impact Mississippi causing property damage and deaths. These events also impact aging infrastructure, as in 2010, which is described in the historical events section. **Table 3.9.3** and **Figure 3.9.3** provide details of these events and the counties impacted.

Table 3.9.3
Cold-Related Events

Event Type	Date	No. of Events	Counties Affected	Deaths	Property Damage
Winter Storm	February 1, 2023	2	DeSoto, Tunica	0	$0
Ice Storm	February 1, 2023	7	Panola, Quitman, Tippah, Benton, Coahoma, Marshall, Tate	0	$0
Ice Storm	January 31, 2023	6	Tate, Quitman, Panola, Tippah, Benton, Marshall	0	$0
Winter Storm	January 30, 2023	2	DeSoto, Tunica	0	$0
Cold/Wind Chill	December 23, 2022	22	Tunica, DeSoto, Tate, Quitman, Marshall, Coahoma, Panola, Alcorn, Lafayette, Benton, Tippah, Tishomingo, Union, Prentiss, Calhoun, Pontotoc, Itawamba, Yalobusha, Tallahatchie, Lee, Monroe, Chickasaw	0	$0
Extreme Cold/Wind Chill	December 23, 2022	22	Tunica, DeSoto, Tate, Quitman, Marshall, Coahoma, Panola, Alcorn, Lafayette, Benton, Tippah, Tishomingo, Union, Prentiss, Calhoun, Pontotoc, Itawamba, Yalobusha, Tallahatchie, Lee, Monroe, Chickasaw	0	$0
Winter Weather	March 11, 2022	23	Tunica, Quitman, Coahoma, Tallahatchie, Yalobusha, Monroe, Chickasaw, Calhoun, Leflore, Yazoo, Humphreys, Attala, Webster, Montgomery, Carroll, Choctaw, Grenada, Oktibbeha, Lowndes, Noxubee, Kemper, Winston, Neshoba	0	$0
Winter Storm	March 11, 2022	14	Marshall, Panola, Tate, DeSoto, Alcorn, Prentiss, Pontotoc, Union, Tippah, Lafayette, Benton, Tishomingio, Lee, Itawamba	0	$0
Heavy Snow	March 11, 2022	3	Bolivar, Sunflower, Washington	0	$0
Winter Weather	February 3, 2022	2	Coahoma, Bolivar	0	$0
Ice Storm	February 3, 2022	2	DeSoto, Tunica	0	$0

Event Type	Date	No. of Events	Counties Affected	Deaths	Property Damage
Winter Weather	January 16, 2022	5	Montgomery, Clarke, Union, Lafayette, Jasper	0	$0
Winter Storm	January 16, 2022	9	DeSoto, Prentiss, Alcorn, Benton, Tippah, Marshall, Panola, Tate, Tishomingo	0	$0
Heavy Snow	January 16, 2022	10	Scott, Madison, Attala, Neshoba, Newton, Choctaw, Winston, Lauderdale, Kemper, Smith	0	$0
Winter Weather	January 15, 2022	2	Yazoo, Holmes	0	$0
Heavy Snow	January 15, 2022	2	Leake, Rankin	0	$0
Winter Weather	January 2, 2022	9	Alcorn, Tishomingo, Webster, Choctaw, Winston, Oktibbeha, Clay, Noxubee, Kemper	0	$0
Winter Weather	February 17, 2021	2	Jefferson Davis, Lawrence	0	$10,000
Winter Storm	February 17, 2021	30	Bolivar, Sharkey, Sunflower, Washington, Warren, Yazoo, Jefferson, Leflore, Claiborne, Webster, Madison, Issaquena, Montgomery, Humphreys, Oktibbeha, Attala, Leake, Carroll, Holmes, Choctaw, Grenada, Clay, Lowndes, Pontotoc, Union, Itawamba, Lee, Monroe, Chickasaw, Calhoun	0	$2,085,000
Ice Storm	February 17, 2021	15	Adams, Lincoln, Hinds, Franklin, Copiah, Rankin, Smith, Simpson, Scott, Jasper, Noxubee, Newton, Kemper, Neshoba, Lauderdale	0	$1,400,000
Heavy Snow	February 17, 2021	15	Tunica, DeSoto, Tate, Coahoma, Quitman, Panola, Lafayette, Marshall, Yalobusha, Benton, Tallahatchie, Tishomingo, Alcorn, Tippah, Prentiss	0	$1,200,000
Winter Weather	February 16, 2021	5	Kemper, Lauderdale, Clarke, Lowndes, Noxubee	0	$0
Cold/Wind Chill	February 16, 2021	5	Marshall, Tate, Tunica, DeSoto, Benton	0	$0
Winter Weather	February 15, 2021	1	Forrest	0	$15,000
Winter Storm	February 15, 2021	11	Copiah, Lincoln, Lawrence, Scott, Simpson, Bolivar, Winston, Smith, Newton, Kemper, Lowndes	0	1,850,000
Sleet	February 15, 2021	26	Adams, Franklin, Claiborne, Jefferson, Warren, Hinds,	0	$1,300,000

Event Type	Date	No. of Events	Counties Affected	Deaths	Property Damage
			Madison, Yazoo, Issaquena, Sharkey, Holmes, Neshoba, Leake, Attala, Humphreys, Rankin, Washinton, Leflore, Choctaw, Sunflower, Carroll, Montgomery, Grenada, Clay, Oktibbeha, Webster		
Ice Storm	February 15, 2021	9	Marion, Jefferson Davis, Covington, Jasper, Jones, Lauderdale, Clarke, Noxubee, Lamar	0	$128,500
Winter Weather	February 14, 2021	11	Sharkey, Issaquena, Grenada, Yazoo, Rankin, Copiah, Leake, Choctaw, Carroll, Montgomery, Webster	0	$0
Winter Storm	February 14, 2021	22	Tunica, Tate, DeSoto, Coahoma, Pontotoc, Lee, Benton, Union, Yalobusha, Tippah, Panola, Calhoun, Lafayette, Tallahatchie, Quitman, Marshall, Monroe, Itawamba, Prentiss, Tishomingo, Alcorn.	0	$0
Sleet	February 14, 2021	8	Adams, Franklin, Warren, Madison, Hinds, Leflore, Humphreys, Holmes	0	$380,000
Winter Weather	February 11, 2021	19	Quitman, Marshall, Tate, Washington, Holmes, Leflore, Warren, Claiborne, Adams, Yazoo, Madison, Rankin, Hinds, Webster, Leake, Oktibbeha, Winston, Holmes	0	$39,000
Ice Storm	February 10, 2021	7	DeSoto, Coahoma, Tunica, Sunflower, Bolivar	0	$30,000
Winter Weather	January 10, 2021	20	Lincoln, Smith, Lawrence, Simpson, Franklin, Lauderdale, Tunica, Calhoun, Monroe, Itawamba, Chickasaw, Lee, Union, Pontotoc, Yalobusha, Lafayette, Tallahatchie, Panola, Quitman, Tate	0	$0
Heavy Snow	January 10, 2021	33	Adams, Warren, Claiborne, Copiah, Jefferson, Hinds, Madison, Rankin, Leflore, Grenada, Sunflower, Yazoo, Scott, Leake, Holmes, Humphreys, Bolivar, Washington, Issaquena,	0	$0

Event Type	Date	No. of Events	Counties Affected	Deaths	Property Damage
			Neshoba, Sharkey, Attala, Newton, Carroll, Oktibbeha, Choctaw, Winston, Montgomery, Kemper, Noxubee, Lowndes, Clay, Webster		
Cold/Wind Chill	December 12, 2019	1	Lauderdale	1	$0
Winter Weather	November 14, 2018	6	Coahoma, Tunica, Tippah, Benton, Marshall, DeSoto	0	$0
Extreme Cold/Wind Chill	January 17, 2018	1	Yazoo	1	$0
Winter Weather	January 16, 2018	59	Benton, Marshall, Prentiss, Union, Tishomingo, Alcorn, Tippah, Yalobusha, Tallahatchie, Quitman, Coahoma, Humphreys, Yazoo, Webster, Carroll, Sharkey, Hinds, Choctaw, Jefferson, Claiborne, Clay, Leake, Madison, Franklin, Oktibbeha, Neshoba, Rankin, Winston, Scott, Newton, Lowndes, Noxubee, Lee, Monroe, Chickasaw, Itawamba, Pontotoc, Calhoun, Copiah, Lauderdale, Kemper, Simpson, Adams, Smith, Jasper, Lincoln, Covington, Amite, Wilkinson, Clarke, Pearl River, Jones, Marion, Stone, George, Harrison, Forrest, Hancock, Jackson	0	$0
Winter Storm	January 16, 2018	7	Tate, Tunica, Panola, Lafayette, Wayne, Perry, Greene	0	$0
Sleet	January 16, 2018	3	Bolivar, Sunflower	0	$60,000
Heavy Snow	January 16, 2018	14	Washington, Bolivar, Leflore, Issaquena, Holmes, Grenada, Warren, Attala, Montgomery, Lawrence, Jefferson Davis, Walthall, Pearl River, Lamar	0	$210,000
Winter Storm	January 15, 2018	1	DeSoto	0	$0
Winter Weather	January 12, 2018	7	Lafayette, Panola, Quitman, Tunica, Union, Tishomingo, Prentiss	0	$0
Winter Storm	January 12, 2018	6	DeSoto, Marshall, Tate, Benton, Tippah, Alcorn	0	$0
Winter Weather	December 31, 2017	11	Chickasaw, Choctaw, Clay, Jasper, Lowndes, Monroe,	0	$0

Event Type	Date	No. of Events	Counties Affected	Deaths	Property Damage
			Montgomery, Newton, Oktibbeha, Rankin, Webster		
Heavy Snow/Winter Storm	December 7, 2017	48	Adams, Amite, Attala, Choctaw, Claiborne, Clarke, Clay, Copiah, Covington, Forrest, Franklin, Greene, George, Hancock, Harrison, Hinds, Jackson, Jasper, Jefferson, Jefferson Davis, Jones, Kemper, Lamar, Lauderdale, Lawrence, Leake, Lincoln, Lowndes, Madison, Marion, Neshoba, Newton, Noxubee, Oktibbeha, Pearl River, Perry, Pike, Rankin, Scott, Simpson, Smith, Stone, Walthall, Warren, Wayne, Wilkinson, Winston, Yazoo	1	$820,000
Winter Storm/Sleet/ Winter Weather/Ice Storm	January 6, 2017	36	Adams, Alcorn, Amite, Benton, Claiborne, Clarke, Copiah, Covington, DeSoto, Franklin, Hinds, Jasper, Jefferson, Jefferson Davis, Jones, Kemper, Lauderdale, Lawrence, Leake, Lincoln, Madison, Marshall, Neshoba, Newton, Noxubee, Rankin, Scott, Simpson, Smith, Tate, Tippah, Tunica, Warren, Wayne, Winston	0	$2,125,000
Winter Storm/Winter Weather	January 22, 2016	13	Benton, Coahoma, DeSoto, Lafayette, Marshall, Panola, Pontotoc, Quitman, Tallahatchie, Tate, Tippah, Tunica, Union	0	$0
Winter Storm/Sleet	March 4-5, 2015	46	Attala, Alcorn, Benton, Bolivar, Calhoun, Carroll, Chickasaw, Claiborne, Clay, Choctaw, Coahoma, DeSoto, Grenada, Hinds, Holmes, Humphreys, Issaquena, Itawamba, Lafayette, Lee, Leflore, Lowndes, Madison, Marshall, Montgomery, Monroe, Oktibbeha, Panola, Pontotoc, Prentiss, Quitman, Sharkey, Sunflower,	0	$0

Event Type	Date	No. of Events	Counties Affected	Deaths	Property Damage
			Tallahatchie, Tate, Tippah, Tishomingo, Tunica, Union, Warren, Washington, Wayne, Webster, Winston, Yalobusha, Yazoo		
Winter Storm/Heavy Snow	February 25, 2015	42	Alcorn, Attala, Benton, Bolivar, Calhoun, Carroll, Chickasaw, Choctaw, Clay, Coahoma, DeSoto, Grenada, Holmes, Humphreys, Issaquena, Itawamba, Lafayette, Lee, Leflore, Lowndes, Marshall, Montgomery, Monroe, Noxubee, Oktibbeha, Panola, Pontotoc, Prentiss, Quitman, Sharkey, Sunflower, Tallahatchie, Tate, Tippah, Tishomingo, Tunica, Winston, Washington, Webster, Union, Yalobusha, Yazoo	0	$0
Winter Weather	February 23, 2015	5	Bolivar, Hinds, Madison, Warren, Washington	0	$39,000
Winter Weather	February 20, 2015	25	Alcorn, Benton, Bolivar, Calhoun, Chickasaw, Coahoma, DeSoto, Hinds, Itawamba, Lafayette, Lee, Marshall, Monroe, Panola, Prentiss, Pontotoc, Quitman, Rankin, Tallahatchie, Tate, Tippah, Tishomingo, Tunica, Union, Yalobusha	0	$19,000
Winter Storm	February 16, 2015	8	Alcorn, Benton, DeSoto, Marshall, Tate, Tippah, Tishomingo, Tunica	0	$0
Winter Weather	January 9, 2015	1	Pike	0	$0
Winter Weather	November 13, 2014	1	Marshall	0	$0
Winter Storm/Winter Weather	March 3-4, 2014	4	Amite, DeSoto, Tunica, Wilkinson	0	$0
Winter Weather/Ice Storm	February 11, 2014	22	Adams, Alcorn, Calhoun, Chickasaw, Claiborne, Humphreys, Issaquena, Itawamba, Jefferson, Lafayette, Lee, Monroe, Prentiss, Pontotoc, Sharkey, Tippah, Tishomingo, Union, Warren, Washington, Yalobusha, Yazoo	0	$50,000

Event Type	Date	No. of Events	Counties Affected	Deaths	Property Damage
Winter Weather	February 2-4, 2014	1	Tunica	0	$0
Winter Storm/Sleet/Heavy Snow/Winter Weather	January 28, 2014	27	Adams, Amite, Claiborne, Clarke, Copiah, Covington, Franklin, Greene, Hancock, Harrison, Hinds, Jackson, Jasper, Jefferson, Jefferson Davis, Jones, Lauderdale, Lawrence, Newton, Pearl River, Pike, Rankin, Scott, Simpson, Smith, Walthall, Wayne	0	$0
Winter Weather	Jan 23-24, 2014	8	Amite, Hancock, Harrison, Jackson, Pearl River, Walthall, Wilkinson	0	$0
Winter Weather	December 6-7, 2013	8	DeSoto, Coahoma, Marshall, Panola, Quitman, Tate, Tippah, Tunica	0	$0
Ice Storm	January 13-17, 2013	50	Alcorn, Attala, Bolivar, Benton, Carroll, Chickasaw, Choctaw, Claiborne, Clay, Copiah, Grenada, Hinds, Holmes, Humphreys, Issaquena, Itawamba, Jefferson Davis, Kemper, Lafayette, Lauderdale, Leake, Leflore, Lowndes, Madison, Marshall, Monroe, Montgomery, Neshoba, Newton, Noxubee, Oktibbeha, Prentiss, Pontotoc, Quitman, Rankin, Scott, Sharkey, Simpson, Smith, Sunflower, Tallahatchie, Tippah, Tishomingo, Union, Warren, Washington, Webster, Winston, Yalobusha, Yazoo	0	$540,000
Cold/Wind Chill	Jan 1-14, 2010	47	Adams, Attala, Bolivar, Carroll, Choctaw, Claiborne, Clarke, Clay, Covington, Copiah, Forrest, Franklin, Grenada, Hinds, Holmes, Humphreys, Issaquena, Jasper, Jefferson, Jefferson Davis, Jones, Kemper, Lamar, Lauderdale, Lawrence, Leake, Leflore, Lincoln, Lowndes, Madison, Marion, Montgomery, Neshoba, Newton, Noxubee, Oktibbeha, Rankin, Scott, Sharkey, Simpson, Smith, Sunflower,	3	$15,180,000

Event Type	Date	No. of Events	Counties Affected	Deaths	Property Damage
			Warren, Washington, Webster, Winston, and Yazoo		
Cold/Wind Chill	Dec 25, 2004		Itawamba	1	$0
Cold/Wind Chill	Jan 24, 2003	1	Monroe	1	$0
Extreme Cold/ Wind Chill	Dec 31, 2000	1	Lafayette	1	$0
Cold/Wind Chill	Dec 18, 1996	8	Amite, Hancock, Harrison, Jackson, Pearl River, Pike, Walthall, and Wilkinson	0	$0
Cold/Wind Chill	Feb 1-2, 1996	10	Amite, Desoto, Hancock, Harrison, Jackson, Pearl River, Pike, Walthall, Wilkinson, and Yalobusha,	3	$100,000
Total				**10**	**$18,873,000**

As previously stated, Mississippi is susceptible to winter weather events causing deaths and significant property and crop damage. Table 3.9.4 identifies two presidentially declared events in 1994 and 1998, followed by brief descriptions of each. The 2010 and 2017 cold weather events, described in the historical events section, caused damage to water lines serving residents, and city and state agencies and crippled the city of Jackson. There have been no declarations since December 1998.

Table 3.9.4
Presidential Disaster Declarations – Winter Weather

Declaration Number	Incident Period	No. of Counties Affected	Date of Major Declaration
DR-4598	February 11-19, 2021	36	May 4, 2021
DR-1265	December 23 – 26, 1998	33	January 25, 1999
DR-1009	February 9 – 14, 1994	26	February 18, 1994

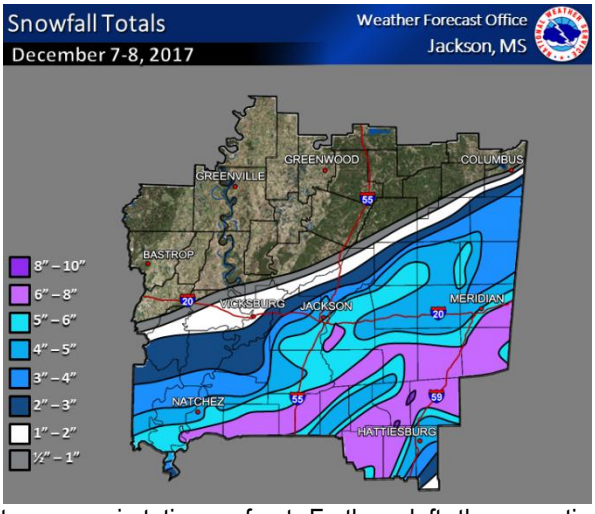
Historical Events

February 2021 Winter Storm

A weak disturbance on Sunday resulted in a seeder/feeder process and a period of light snow across much of the area with up to an inch falling. Bands of occasionally moderate sleet pushed across north Mississippi into southeast West Tennessee on Sunday evening, February 14th. The main mid-level trough rapidly strengthened and became negatively titled as it approached the Mid-South during the morning hours of Monday, February 15th. Precipitation rapidly developed over the Lower Mississippi Valley and spread northeast into the Mid-South by sunrise. Strong lift and deep moisture through the dendritic growth zone resulted in heavy winter precipitation during the morning hours before the system lifted to the northeast by mid-afternoon. Mainly snow fell across east Arkansas, the Missouri Bootheel, and Northwest Tennessee. A warm layer aloft, due to the rapidly strengthening nature of the system, resulted in a period of heavy sleet from northwest Mississippi into the Memphis area through southwest Tennessee before precipitation changed to all snow. A mixture of sleet, snow, and a little freezing rain fell across northeast Mississippi. Four

to seven inches of snow and sleet fell across areas west of a Tunica, MS to Somerville, TN to Union City, TN line. One to three inches of sleet and some snow fell to the southeast of this line.

December 8, 2017 Snow



Just three days before the winter storm, temperatures were in the upper 60s and lower 70s across much of the area ahead of a series of arctic cold fronts. The first arctic front moved through the area during the day on December 5th and ushered in a cooler and drier airmass in its wake as temperatures dropped into the 40s with dewpoints in the upper 20s. A second reinforcing arctic cold front moved through the ArkLaMiss region during the day on December 7th and brought another shot of drier and colder air. A modified continental polar airmass became locked in across the region with a 1035 mb high centered over the Southern Plains. As the stronger upper-level flow and support pulled away from the southeastern United States, the two arctic cold fronts slowed and eventually stalled over the northern Gulf of Mexico, helping to establish a strong quasi-stationary front. Further aloft, the synoptic pattern leading up to the winter storm was characterized by an upper-level longwave trough centered over the Northern Plains and Great Lakes with multiple shortwave troughs rotating through the Inter-Mountain West and Four Corners region. On the morning of December 7th, a stout shortwave trough was located over the Four Corners and was forecast to eject into the Southern Plains, thus setting the stage for a significant winter storm across the Deep South.

Source: JWS Photo: Zander Williamson

Strong upper-level divergence and ascent ahead of the advancing shortwave trough overspread the northern Gulf of Mexico in the vicinity of the stalled baroclinic zone and helped to induce surface cyclogenesis. The nose of a strengthening jet streak moved into southern Texas as the shortwave progressed into central Texas on the evening of December 7th. The resulting force for ascent allowed heavy snowfall to begin accumulating in many locations across the Deep South of Texas throughout the evening. This snowfall spread across south and east Texas and into Louisiana and Mississippi through the early morning hours of December 8th. Strong isentropic ascent on top of the sloped boundary, working in concert with exceptional upper-level divergence in the right entrance region of an impressive 180 kt jet, allowed heavy snowfall to spread across a large portion of central and southern Mississippi. While

surface temperatures were above freezing, evaporation and dynamical cooling due to a dry sub-cloud layer allowed surface temperatures to drop into the low 30s, and heavy snow began accumulating quickly as higher snowfall rates overspread the area through the morning hours. While the heaviest snow accumulations were limited to grassy and elevated surfaces, decent slushy accumulations were able to build on roadways, especially during the highest snowfall rates. Snowfall gradually tapered off from west to east through the day with snow ending in the Jackson metro by mid-morning and eventually ending in the south and east portion of the forecast area by mid-afternoon. The highest storm total snowfall amounts were focused along and southeast of a line from Brookhaven to Meridian where higher snowfall rates were realized in an area of banded snowfall that occurred in the presence of conditional symmetric instability.

The highest snowfall total was 8", which was reported in two different locations (see totals below) and was part of a heavy swath of widespread 6-7.5" from Brookhaven to Meridian where the aforementioned snow banding occurred. Elsewhere, totals dropped off gradually to the north with 4-6" in the Jackson metro. The official snowfall measurement at the NWS Jackson office was 5.1", which was high enough to rank as the 7th snowiest day of all time and the largest snowfall since 1982. In Meridian, the total was 5" and was the 3rd highest daily snowfall on record and the largest daily snowfall since 1993. For Hattiesburg, the event's total snowfall was 4.1"

January 6, 2017, Winter Weather

A complex weather pattern eventually evolved into a widespread winter weather event across the area on January 6th, 2017. A strong surface high, near 1030mb, was building in the central and southern Plains. On Tuesday, January 2nd, 2017 temperatures were more seasonal but included severe weather and tornadoes., Over the two days, strong surface high pressure with much cooler air gradually filtered in. The strongest push of high pressure and colder air began to enter the region on Friday morning.

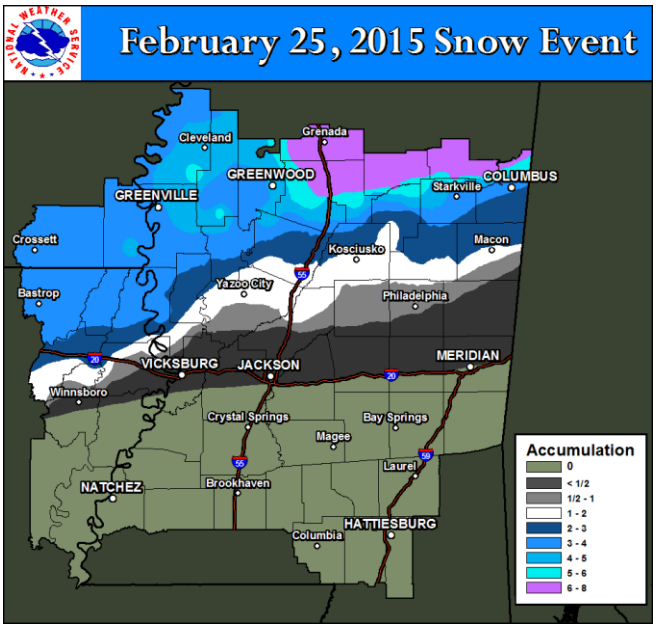
A sharp contrast in temperatures existed across the area from the lower Mississippi Valley into the Gulf of Mexico as a stalled frontal boundary stayed situated along the coast. This helped the cold air stay locked in place over the area, with temperatures near freezing Friday morning. In addition, a strong upper-level disturbance was helping to promote lift and an area of snowfall moving through the Oklahoma/Arkansas region by early Friday morning. This system mostly stayed to the north of the region. As the upper disturbance approached, moisture began to overrun the cold air below by early Friday morning. This moisture gradually spread across the entire region by mid-morning. The atmosphere contained a deep melting layer, so that as the snow fell, it completely melted. Because of the below-normal

air temperatures, the ground caused most of the precipitation to fall in the form of sleet and freezing rain. By early Friday morning, sleet began to fall over northeast Louisiana, spreading to the north and east into most of the ArkLaMiss region by mid-morning to late afternoon.

The main disturbance and lift occurred in the mid-to-late afternoon and the heaviest sleet production occurred during the late afternoon. Temperatures were hovering in the low 30s to upper 20s while precipitation was falling. The persistence of cold temperatures throughout the afternoon caused significant sleet accumulation, especially from Franklin Parish in Louisiana, southeast towards Adams County in Louisiana, over to Warren County in Mississippi, throughout the Jackson Metro area, east along I-20 towards Lauderdale County, and as far north as Noxubee County. Heavy sleet occurred throughout this region, with some areas approaching a 1/2 to 1 inch of sleet. In some areas of northeast Mississippi, the temperatures were cold enough for the precipitation to change to snow. With cold ground and road temperatures, significant icing and accumulation began to affect roadways throughout portions of northeast Louisiana, central, east, and northeast Mississippi, especially along the Interstate 20 corridor. This led to significant icing on roadways and bridges, leading to major traffic issues. Many accidents occurred across the region, causing temporary closures of several primary roadways. In addition, the Jackson International Airport had to be shut down due to icy runways. The disturbance gradually moved east, allowing the precipitation to taper off and move out by late evening.

The strong surface high-pressure system strengthened to near 1040mb, leading to much colder air through the weekend. This resulted in hard freeze conditions with highs barely reaching the freezing mark, especially across central and northern areas of the State. A snowpack existed over central Arkansas, northern Mississippi, and southern Tennessee. Northerly winds over that snowpack helped to lock in even colder air and single-digit wind chills over most of the area. Some areas in the Mississippi Delta stayed below freezing for over 60 hours. These conditions over the next several nights kept the winter weather conditions around through the weekend, with icy roadways for the next couple of days into Saturday, January 7th, and Sunday, January 8th.

February 25, 2015 Snow Event



Multiple rounds of wintry weather had occurred before this snowfall event. A cold front had moved through the region four days earlier on February 21st with a cold airmass in its wake. Several waves of upper-level disturbances moved through Mid-South, over the next three days. The night of the 22nd brought mostly rain to the region but some light icing occurred in the far northern Delta early on the 23rd. A second, more potent disturbance, moved through Central Mississippi during the afternoon and evening hours on the 23rd. This brought a stronger icing event in locations generally along and north of I-20, causing some power outages and accidents.

With the cold remaining in place, the final round of wintry weather moved in on the morning of February 25th. A strong upper-level disturbance

moved across the region, which induced a low-pressure system to move east across the northern Gulf of Mexico. With the cold air already entrenched over the region, this brought the moisture and atmospheric lift necessary to generate precipitation. The precipitation started as rain and freezing rain, with some light icing reported across the ArkLaMiss Region. As the atmosphere cooled through the late morning, the rain began to change to snow across southeast Arkansas, northeast Louisiana, and the Mississippi Delta. The line from rain to snow slowly progressed from northwest to southeast across northern portions of the ArkLaMiss region. By the time the change in conditions occurred near the I-20 corridor, the precipitation was moving off to the east into Alabama.

Those who experienced snow north of I-20 saw several heavier bursts, which led to some high snowfall totals. The highest totals were generally along and north of the Highway 82 corridor. Locations from Grenada to northern Lowndes County saw the highest amounts in our county warning area, with totals ranging from six to eight inches. Those who experienced the higher precipitation totals also dealt with trees being weighed down by the heavy snow. This led to snapping trees and numerous power outages.

January 28, 2014, Winter Storm

Temperatures on January 27th were in the upper 40s in the northwest Delta to the mid-50s to low 60s in southeastern Mississippi. However, a large upper trough was diving southeast, bringing an arctic front and 1032mb surface high pressure into the ArkLaMiss. Temperatures dropped rapidly in the evening as very dry air filtered into the region, with dewpoints falling into the single digits. The large spread between the surface and dewpoint temperature would plan an important role in the winter weather event on January 28th. As the upper trough deepened and strong upper-level winds began to move over the region, an upper-level low center over northern Mexico to the southwestern United States began to merge with the strong upper-level system and moistened the mid-levels of the atmosphere across the region. Temperatures were only in the low to mid-20s throughout the ArkLaMiss Region as the precipitation began to fall. Areas along and north of a line from around Natchez to just south of Meridian began to observe precipitation that initially fell as sleet but gradually transitioned to snow in just a few hours as temperatures cooled in the mid-levels of the atmosphere and the lower atmosphere saturated from falling precipitation and evaporative cooling. Due to a warm layer in the mid-levels of the atmosphere, mixed precipitation occurred from south of a line near Natchez to south of Meridian. The deep melting layer caused precipitation to remain as sleet throughout most of the afternoon south of that line. These areas had a prolonged period of sleet before finally transitioning over to snow in the mid to late afternoon hours. All precipitation moved out of the region by around 6-8 pm on the evening of January 28th.

In total, areas north of the mixed precipitation line had more significant snowfall. This was a heavy confined band of precipitation that dropped off quickly closer to the Jackson metro with areas in southeastern Rankin County having the highest snowfall totals. This area had 2-4 inches of snowfall, with a maximum of 4 inches in the Puckett area. Snow tapered off quickly near the Interstate 20 corridor with only ½ inch to 1 inch of snowfall. Snow accumulation extended into north central Mississippi up to the Highway 82 corridor near Indianola, and eastward towards Macon but only a light dusting occurred in these regions. South of the mixed precipitation line, significant icing and sleet occurred in the region with upwards of 1-3 inches of sleet and snow. The significant icing occurred far into southern Marion, Lamar, and Forrest counties.

Significant icing occurred on the roadways and led to multiple accidents and issues with travel. There was an extended hard freeze, with temperatures dropping into the low teens and single digits regionwide on the

morning of January 29th. This kept lingering snow and sleet accumulations frozen and made travel hazardous, especially along and south of the Interstate 20 corridor. Temperatures only climbed into the low to mid-30s on January 29th before falling back into the teens overnight on January 30th. The region finally warmed above freezing in the mid to late morning hours of January 30th.

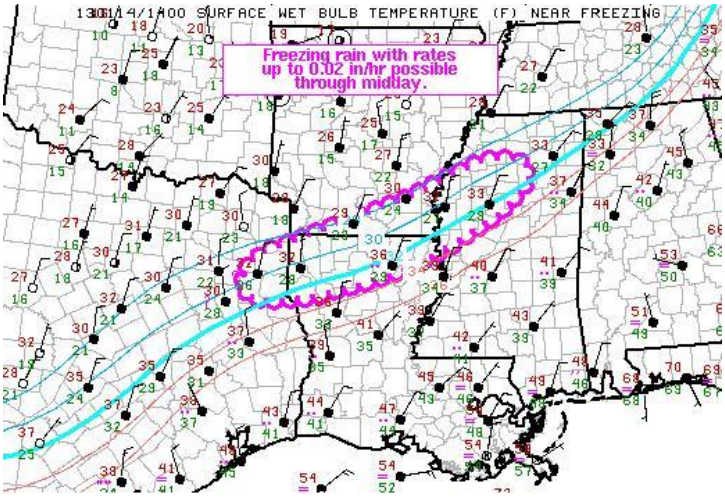
January 14-17, 2013 Snow and Ice

A near record-long duration of wet weather brought widespread flooding and two winter storms to the ArkLaMiss Region from January 6th through January 17th. Three key ingredients allowed this very active weather pattern to take shape.

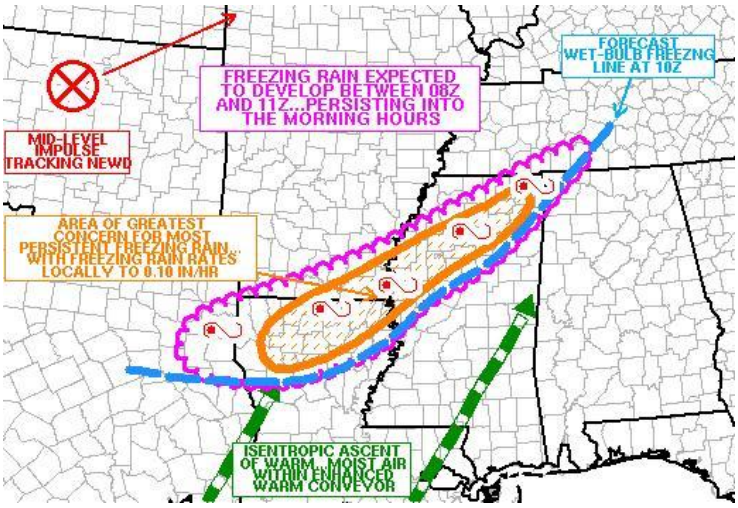
- An unseasonably strong and warm high-pressure center developed over the South Atlantic states. The clockwise flow around this high-pressure center trapped tropical moisture and transported it northward through the Lower Mississippi Valley.
- An upper-level trough took up residence over the western states and this created an upper-level southwest flow. Such upper-level patterns are favorable for heavy rain in our region because they focus very moist air along stalled fronts.
- The northern stream sent a series of cold fronts southward to the Gulf Coast. The cold air behind the front supported ice and snow, and the frontal lift allowed for multiple rounds of heavy rainfall that led to flooding.

Ice Storm – January 14-16, 2013

A strong cold front brought a shallow and very chilly air mass southward into the ArkLaMiss the night of January 13th. The cold air undercut relatively mild air aloft, thus setting the stage for freezing rain over northwest portions of the ArkLaMiss Region. A couple of episodes of moderate freezing rain accompanied by thunder occurred in this time frame with temperatures hovering near or just below 32 deg F.



These weather maps from the Storm Prediction Center, analyzed during the ice storm, depict the general set-up and potential area for heavier ice accumulation.



Just as the ice storm was ending in the Mississippi Delta, an upper-level low was moving steadily east toward the region and this ultimately brought the heavy snow that fell over much of the ArkLaMiss Region.

Heavy Snow – January 17, 2013

Very cold air associated with an upper-level low-pressure system made conditions more favorable for snow in the early morning hours of Thursday, January 17th. A strong lift caused widespread light to moderate rain to develop during the evening of January 16th as surface temperatures held just above freezing. Late that night rain transitioned briefly to sleet before switching to all snow across the State.

Two main occurrences of freezing rain caused icing over portions of northeast Louisiana, southeast Arkansas, and northwestern portions of central Mississippi - one during the daytime hours of January 14th and another during the daytime and evening hours of January 15th. In many areas, temperatures remained below freezing during this entire period. Because of consistently low temperatures, there was no melting between the two icing events. The above ice accumulation map represents the greatest reported total ice accumulation across the affected region. Some locations experienced cumulative amounts over the 2-to-3-day period. The greatest accumulation of approximately 1/2" of ice was in a corridor from near Bastrop, LA to Cleveland, MS. Most icing occurred on elevated surfaces, such as trees and other vegetation, cars, utility lines, and bridges. However, there was also some icing on roadways, resulting in several traffic accidents.

Snowfall totaled approximately 2-3" from the I-55 corridor between Grenada and Jackson eastward to the Alabama state line. Because of the nature of this system, there were multiple north-to-south oriented snow bands, creating significant variations in snow accumulations over short distances. For instance, there were snow accumulation amounts as great as 3.5" along the Pearl River in the Jackson area, while accumulations of as little as 1" were reported just to the west in Raymond and as little as 1.5" just to the east in Goshen Springs. The greatest reported snowfall accumulation in the NWS Jackson forecast area occurred under a heavier snow band over portions of Webster, Choctaw, western Clay, and western Oktibbeha counties. Approximately 6 inches of snow was reported just to the east of Ackerman.

Prolonged Sub-Freezing Temperatures – January 1-14, 2010

The Central Mississippi water supply failure of January 2010 is an example of how both metropolitan and rural areas can be affected by cold weather events. In the days leading up to January 11, 2010, Central

Mississippi experienced 11 straight nights of sub-freezing temperatures and six nights of temperatures of 20 degrees or less. From the evening of January 7 to the morning of January 10, temperatures remained below 32 degrees. By January 10, the Jackson, Mississippi water supply system began losing pressure, and when the daily high temperature reached 48 degrees on January 11, it became apparent Jackson and several other Central Mississippi communities would experience major water-pressure problems due to water main breaks.

On January 11, Governor Haley Barbour issued an emergency declaration that was eventually expanded to include all affected areas. The state's Emergency Operations Center was partially activated on January 13 to help cities and counties with the ongoing crisis. Staff specializing in public works, engineering, logistics management, and public health went on 12-hour shifts. The Mississippi Emergency Management Agency delivered bottled water to the affected areas.

The City of Jackson's water system sustained 80 major breaks resulting in the loss of 22 million gallons of water throughout the city. That number eventually reached 150 broken water mains with an unknown quantity of lost water. According to news reports, the City of Jackson reported up to 200,000 residents were without water. Adding to the problems, an electrical fire took a city water treatment plant offline and further diminished the city's capacity to pump water. Many Jackson residents were without water for more than 24 hours. The cities of Madison, Ridgeland, Hattiesburg, and Greenville offered water crews to help patch the leaks, and the city of Pearl furnished water for two of Jackson's largest hospitals.

On January 7, portions of Jackson and Byram, south of Jackson, were placed on a boil water notice that remained in effect until January 24. On January 11, the entire Jackson water system, including most of the metropolitan area, was placed under a boil water notice that lasted seven days. These requirements, combined with a lack of water pressure, caused multiple problems including business, restaurant, and school closures, relocation of two police precincts, and adjournment of the Mississippi Legislature, which was in session at the Capitol in Jackson. For locations that remained in operation, flushing toilets and other hygienic measures became a problem. The Jackson Convention Complex was forced to provide water and restroom facilities for a 400-person Affordable Housing Conference. Fire departments delivered water to jails and other critical facilities. Portable toilets were in such demand that vendors had to go out of state to supply the crisis.

AT&T, which operates switching centers for its cell and landlines and other providers that utilize the company's infrastructure, including emergency communications systems, found it necessary to park water-filled tanker trucks outside its facilities to cool equipment and provide fire protection. A National Guard tanker provided 5,000 gallons of water to cool computers for several state agencies providing essential services.

The Mississippi State Department of Health (MSDH) went into emergency mode. Tasked with providing engineers for Emergency Support Function (ESF) #3 of the State's Comprehensive Emergency Management Plan (CEMP), the MSDH also began emergency procedures to protect the health and safety of the public. That task included providing extra staff to sample and test potable water supplies from affected communities and inspect food service providers such as restaurants, shelters, clinics, and schools to

ensure safe operation. The department temporarily closed some restaurants until they could adjust to emergency operation requirements.

State Agencies Impacted

On Sunday, January 17 the boil-water alert was canceled for most of the city, ending a week of crises unequaled in recent Jackson history. This event left behind a legacy of business losses, school days to be made up, huge potholes to be repaired where water crews accessed system breaks, and a large budgetary problem for the City of Jackson. Mitigation of future problems for Jackson's aging water main system was projected to cost over $75 million. With tax revenues in decline, the City's water supply problem was significant.

Affected Cities and Counties

The following numbers of residents of Central Mississippi cities and counties were affected by the January 2010 water supply emergency:

> Emergency: Jackson (200,000); Lauderdale County (14,000); Port Gibson (10,500); Marks (2,300); Walnut (500); Vicksburg (250); Wayne County (150); Tunica County (number not available); Carroll County (number not available).

DR-1265 – December 23-26, 1998

A crippling ice storm struck Arkansas, Louisiana, and Mississippi on the evening of December 22, 1998, bringing freezing rain and sleet to the three-state region. Much of the fall and early winter season of late 1998 was very mild, but a strong surge of shallow arctic air drove southward and ended the unseasonable warmth. A moist southwest flow above the cold air brought several upper-level disturbances. The combination of cold air and moisture caused periods of freezing rain and sleet until Christmas morning.

Almost two inches of ice accumulated on power lines, causing outages for up to seven days. Tree and power line damage was moderate to severe from northeast Louisiana to northcentral Mississippi. Due to more foliage than usual on trees, the extra weight of ice accumulation caused large oaks and maples to split in half. Travel was severely hampered for several days with motorists stranded at airports, bus stations, and truck stops.

Counties in Mississippi affected by the storm included Leake, Lee, Leflore, Lowndes, Monroe, Montgomery, Neshoba, Noxubee, Oktibbeha, Pontotoc, Prentiss, Sharkey, Sunflower, Tallahatchie, Tishomingo, Union, Warren, Washington, Webster, Winston, Yalobusha, and Yazoo.

Impact Summary	Public Assistance Dollars Obligated Declared Counties		
• No of Counties Affected: 33 • Deaths: 0 • Injuries: 0 • Estimated Property Damage: $16,699,000	**Total PA Grants**	**Emergency Work (Categories A-B)**	**Permanent Work (Categories C-G)**
	$6,970,269	$2,590,192	$4,349,918

DR-1009 – February 9-14, 1994

In 1994, a damaging ice storm with freezing rain accumulations of three to six inches occurred across north Mississippi, southeast Arkansas, west Tennessee, northwest Alabama, north Louisiana, and extreme northeast Texas between February 9th and 11th. In Mississippi, the ice storm was the worst since 1951, with total damage estimates exceeding $300 million and a federal disaster declaration for 26 counties.

According to Mississippi Power Company estimates, 500,000 persons in roughly 200,000 homes were without electricity and 175,000 homes had no water as a result of freezing conditions. Twenty percent of Mississippians lost power for at least one day. Approximately 300 water systems were also affected for a week or more with over 300,000 customers subjected to boil water advisories.

The United States Department of Agriculture studied forest damage in the storm-affected area. There were 2.1 million acres of forest land in northeast Mississippi within the 3.7-million-acre study area. Less than 1 percent of the forest land was untouched by some degree of damage. Net loss to live-tree volume, due to probable mortality, amounted to 16.5 percent of hardwoods and 15.3 percent of softwoods. The majority of volume loss occurred in areas that received about 25 percent mortality to the forest resource.

Mississippi counties included in the federal disaster declaration included: Alcorn, Benton, Bolivar, Calhoun, Chickasaw, Coahoma, Desoto, Grenada, Itawamba, Lafayette, Lee, Leflore, Marshall, Panola, Pontotoc, Prentiss, Quitman, Sunflower, Tallahatchie, Tate, Tippah, Tishomingo, Tunica, Union, Washington, and Yalobusha.

Impact Summary	Public Assistance Dollars Obligated Declared Counties		
• No of Counties Affected: 26 • Deaths: 0 • Injuries:0 • Estimated Property Damage: $500,000 • Estimated Crop Damage: $5,000,000,000	**Total PA Grants**	**Emergency Work (Categories A-B)**	**Permanent Work (Categories C-G)**
	Unknown		

Source: NCDC

Source: FEMA

Winter Storm Events Before 1993

The National Weather Service, NCDC, has created a consistent database of winter events since 1993; however, there were many severe storms before this period. The chart below plus two specific events presents some of the significant historical winter storms in Mississippi.

Significant Historical Snow Storms
1940 – 2017

Year	Area	Inches
January 2017	Central and North Mississippi	2.5
January 2016	Central and North Mississippi	8
January 2015	Central and North Mississippi	1
January 2014	North and Central Mississippi	2
January 2013	North Mississippi	8
January 2012	Central Mississippi	4
January 2011	Adams County	3
January 2010	North Mississippi	6
January 2009	North Mississippi	7
January 2008	North Mississippi	10
January 2007	Central and South Mississippi	8
January 2006	North Mississippi	3
January 2005	Central and South Mississippi	9
January 2004	Chico and Bolivar County	6
January 2003	Covington, Jefferson Davis, and western Jones Counties,	5
January 2002	South Mississippi	4.5
March 1993	Mississippi	6
1974	Gulf Coast	5
1967 – 1968	Tate County	25.2
1966	Bolivar County	23
1960	Hinds County	9.1
1940	Hinds County	10.6

January 28 – February 5, 1951: Approximately $50 million in damages was incurred in Mississippi. Twenty-two people died in the storm throughout Mississippi, Louisiana, and Arkansas.

January 11 – 15, 1982: An ice storm centered in the northern and eastern parts of the state, caused heavy damage in 44 counties and affected 25% of the state's nurseries. One death was reported.

Probability of Future Winter Storm Events

Portions of Mississippi north of Interstate 20 are most likely to receive an ice storm, heavy snow, or winter storm activity. Based on data from the NCDC, winter events occur as early as mid-December and as late as mid-March. In the past 20 years, Mississippi recorded some magnitude of winter weather except for the years 1995, 1999, 2001, 2005, and 2012. Based on this data, the State of Mississippi has a 25% probability of experiencing a winter weather event in any given year

Assessing Vulnerability

An assessment of Mississippi's vulnerability to winter storms reveals that warnings are often not regarded or taken seriously enough. Preparedness for a winter storm is just as important as preparing for other hazards. As is the case with other natural hazards, the young, the elderly, persons with special needs, and persons with disabilities are vulnerable to winter storms. Officials also suggest that institutions housing these individuals develop a plan to include preparedness for lack of electricity, water, and fuel for heating.

Public buildings are not as vulnerable to winter storms as other forms of infrastructure such as electric transmission lines and utility poles that can all be weighed down by ice and freezing rain. During the 1994 ice storm, 8,000 utility poles were downed by the weight of ice, 4,700 miles of power lines were downed, and 491 water systems were affected, leaving 741,000 customers without water

Vulnerability of People to Winter Storms

The public warning systems tasked with alerting the general public of an impending storm are media outlets such as the National Weather Service and NOAA weather radios. Other less traditional means of communicating alerts include social media outlets such as Twitter, Facebook, and Instagram often provide alerts and other news critical for preparation in advance of a hazardous event.

Persons whose medical conditions require regular visits by home health care workers, and children living in those households make up the special needs group whose lives are most in danger when a power failure occurs. These citizens must rely on neighbors and relatives for contact, supplies, and assistance throughout the event.

Roads are often blocked by trees downed by heavy ice, and road and bridge conditions may prevent home healthcare workers from reaching their patients until emergency personnel can clear roads and offer transport

by ambulance. Any unnecessary automobile or pedestrian travel during icy conditions by citizens not involved in emergency assistance increases the burden on emergency personnel during these crises.

Loss of Life from Extreme Cold in Mississippi

Although the National Weather Service does not record cold-related deaths along with winter storm event statistics, the following information collected by the Mississippi State Department of Health, Bureau of Health Statistics, provides an understanding of recorded deaths in Mississippi due to extreme natural cold. **Table 3.9.5** below summarizes cold-related deaths over 28 years from 1984 to 2011, the last year for which data was available. During that time, a total of 175 deaths from this cause occurred, an average of 6.25 deaths per year. Information on the location of the deaths was not available.

Table 3.9.5
Loss of Life Due to Excessive Cold

Year	Exposure to Excessive Natural Cold
2019	1
2018	1
2017	1
2016	0
2015	0
2014	0
2013	0

Vulnerability of Natural Resources to Winter Storms

Trees, crops, and decorative vegetation are subject to damage from winter storms. Ice storm damage documented by the National Weather Service in 1994 caused damage to over 3.7 million acres of commercial forestland. The value of damaged timber was estimated at $27 million. The state's pecan crop was reduced by 25% over the following five-to-ten years at an estimated cost of $5.5 million per year.

Fallen timber and tree limbs during winter storms provide a possibility of wildfires later in the year. Forestry Commission officials and private landowners minimize the severity of wildfires by cutting and sawing fallen timber and debris to prevent the spread of fire.

Vulnerability of Private Improvements to Winter Storms

The weight of snow and ice accumulation can affect the structural integrity of roofs. Cars and passengers are vulnerable when driving on icy or wet roads and surfaces. Decorative trees and shrubs can be expensive to replace when damaged or destroyed by freezing conditions or the weight of ice or snow.

Businesses within affected areas are vulnerable to power outages and may be unable to open for business and may lose income as a result of the closure. Communications facilities, such as telephone lines, microwave, and cellular telephone repeater towers have been temporarily or permanently damaged in past events. The failure of nine fiber optic lines, 26 local telephone exchanges, and several cellular telephone repeater towers was caused by vulnerability to ice and snow accumulations as documented in the FEMA-1009-DR-MS (February 18, 1994) Hazard Mitigation Team Report.

Assessing Vulnerability by Jurisdiction Methodology

The 2018 plan update deferred to the local mitigation plan rating of vulnerability shown by MEMA Region in the table below. The 2023 plan update will do the same. Not all local mitigation plans (single jurisdictions, county, and regional plans) included winter weather in their plans, The State considers severe winter storms a medium risk primarily because of variations in severity by region.

MEMA Region	Low	Medium	High	MEMA Region	Low	Medium	High
1	-	9	-	6	-	9	-
2	-	11	-	7	9	-	-
3	4	5	-	8	10	-	-
4	-	-	10	9	6	-	-
5	-	40	-				

Past damages are a significant indicator of vulnerability. However, county-by-county damage information was not available for winter storm damages. The National Weather Service provides a single dollar amount for all counties impacted by a particular winter storm event. It is inaccurate to average this amount across the impacted counties. **Tables 3.7.1 and 3.7.3** provide the estimated damage losses by event/year.

The data collected by NWS reflects what is known by the state since the northern part of the state is more significantly impacted by winter storms than the southern part of the state.

Exposure Analysis

The following section consists of three exposure analyses, using three different sets of data. Exposure analyses are different from loss estimates because they present facilities and structures that may be exposed to winter storms, but do not attempt to estimate the dollar amount of damages resulting from a winter storm event. Loss estimations are discussed in the Potential Losses section following the exposure analyses.

Exposure Analysis of State-Owned Facilities

As previously discussed in this section, state-owned facilities are equally at risk of extreme winter weather events (including power outages associated with this type of event). These events can occur anywhere and with any severity.