

October 24-28, 2016

Mississippi Fall Severe Weather Preparedness Week

MISSISSIPPI FALL SEVERE WEATHER PREPAREDNESS WEEK

October 24-28, 2016



Overview

Residents of Mississippi are no strangers to the many different forms of hazardous weather. Tornadoes, damaging winds, large hail, lightning, flooding, and even winter weather are all common weather phenomena that occur in Mississippi. When looking at statistics for the number of tornadoes, and tornado fatalities, Mississippi ranks near or at the top in every category. These statistics show a long history of tornado impacts across the state.

This presents a preparedness challenge to the residents of Mississippi. Unlike the traditional tornado alley of the Great Plains, tornadoes are difficult to spot in Mississippi. Some of the reasons for this are poor visibility in the form of numerous trees in the state, the fact that many tornadoes in Mississippi are rain-wrapped, and that many Mississippi tornadoes occur at night. In addition, many homes and other structures are not built as strong as buildings in other parts of the country.

All of these factors make it very important for residents of the Magnolia State to have multiple ways of receiving weather warnings, have a shelter plan in place ahead of time, and take outlooks, watches and warnings seriously. These actions contribute to reducing injuries and fatalities. Situational awareness and proper planning are essential to safety. In this brochure, there will be safety tips for each type of hazardous weather phenomenon we encounter in Mississippi during the fall and winter months.

Mississippi Fall Severe Weather Preparedness Week Events October 24 - October 28, 2016

Throughout the week, the National Weather Service, MEMA, and local emergency managers will present educational material via each office's webpage and social media outlets. A tornado drill will be conducted to help people prepare and protect themselves from tornadoes, damaging winds, hail, lightning, and flash floods. Each day of the week focuses on a specific type of severe weather, or on the warning and drill system.

- **Monday, October 24** will discuss ways to receive hazardous weather advisories, watches, and warnings.
- **Tuesday, October 25** will discuss severe thunderstorms. Lightning, large hail, and damaging winds from severe thunderstorms are much more frequent than tornadoes in the South.
- **Wednesday, October 26** will emphasize tornado safety. Repeatedly, people survive tornadoes by knowing weather safety rules and by taking appropriate and timely action. A statewide tornado drill will be conducted at **9:15 AM CDT**. Schools, businesses and other agencies are encouraged to participate with the goal of helping everyone learn life saving rules. Thursday will be the alternate drill day if adverse weather is expected on Wednesday.
- **Thursday, October 27** will draw attention to hazards of flooding and flash floods. Flooding is the number one cause of weather-related fatalities behind heat. Remember...Turn Around, Don't Drown!.
- **Friday, October 28** will focus on winter precipitation, extreme cold, and wind chill as winter events can affect the Magnolia state before winter officially begins in late December. Know what they are and how to prepare and protect yourself and your home.

Cover photos courtesy of:

- *December 23, 2015 EF4 tornado north of Ashland, MS in Benton County: John Ginn*
- *Flash flooding on County Rd 8 in Carroll County: Tammie Goss*
- *Ice accumulation on a holly bush in Batesville, MS: Jessica Casavant*

NOAA Weather Radio / Emergency Alert System / Wireless Emergency Alerts

Monday, October 24, 2016

The National Weather Service (NWS) utilizes NOAA Weather Radio All-Hazards to broadcast continuous weather information 24 hours a day, every day of the year. This is your direct link in receiving watches and warnings from the NWS. When properly programmed, with options for single or multiple counties, the NOAA weather radio will alert you of a warning for your area, day or night. With battery back-up, the radio will still be able to deliver life-saving information even if the power goes out due to the storms. The state of Mississippi is served by 16 NOAA Weather Radio (NWR) transmitters with several more surrounding transmitters in neighboring states covering additional counties. Approximately 95 percent of the people in Mississippi are within range of a NWR transmitter (see list of NWR transmitter locations and frequencies in table below).

While routine programming offers the latest forecasts, hazardous weather outlooks, current weather conditions, and official climate data, the broadcast cycle is automatically updated and at times interrupted whenever a specific weather watch, warning, or advisory is issued by an NWS Forecast Office. Watches, warnings, advisories and special weather statements are given the highest priority on NWR and are frequently updated with critical weather information.

In an emergency, each station will transmit a warning alarm tone in addition to the SAME (Specific Area Message Encoding) tone. Information on the emergency situation then follows. These alert tones, especially the SAME, are capable of activating specially-designed receivers by producing a visual and/or audible alarm. For the deaf and hard of hearing, special equipment is available to purchase for NOAA Weather Radio, such as strobe lights and bed shakers. Not all weather band receivers have this capability, but all radios that receive the NWR transmission can receive the emergency broadcasts. The warning alarms and SAME tones are **tested each Wednesday, typically between 11AM and noon, weather permitting**.

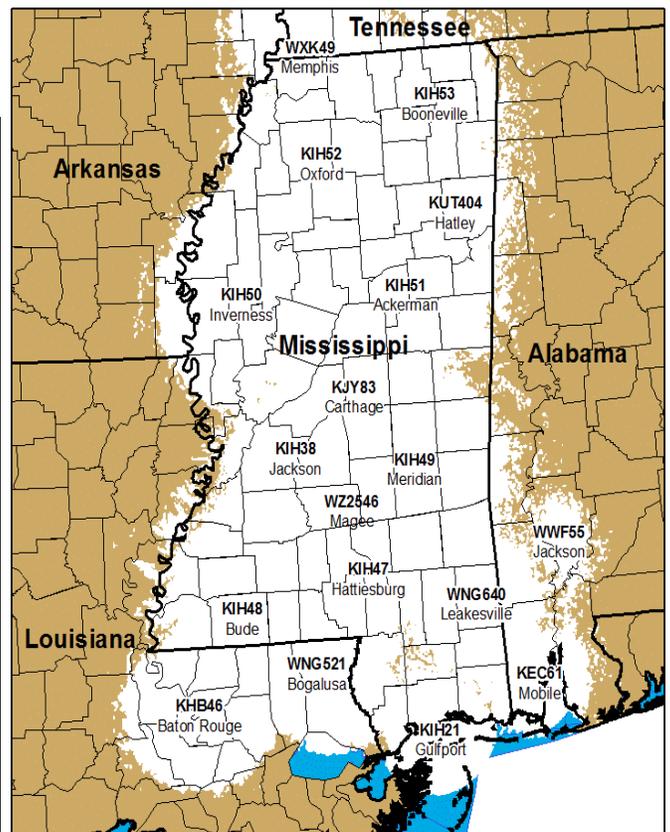
Commercial radio and television stations, as well as cable television companies, are encouraged to use NOAA Weather Radio in order to rebroadcast pertinent weather information to the general public. NWR is also a major part of the Emergency Alert System (EAS), which efficiently disseminates critical weather warning information through commercial broadcast outlets in order to save your life.

Wireless Emergency Alerts (WEA) are another avenue for government agencies to send urgent messages directly to cell phones in an area of interest. Applications or additional software are not needed, and the messages will look similar to text messages when they arrive on your phone. Additional information on WEA can be found at:

www.nws.noaa.gov/com/weatherreadynation/wea.html

Locations and Frequencies of NOAA Weather Radio Stations Serving Mississippi

Leakesville, MS	162.425	Magee, MS	162.525
Gulfport, MS	162.400	Baton Rouge, LA	162.400
Oxford, MS	162.550	Memphis, TN	162.475
Inverness, MS	162.425	Fountain Hill, AR	162.475
Ackerman, MS	162.475	Marvell, AR	162.525
Booneville, MS	162.400	Bogalusa, LA	162.525
Rose Hill, MS	162.550	Alexandria, LA	162.475
Jackson, MS	162.400	Florence, AL	162.475
Melba, MS	162.475	Winfield, AL	162.525
Bude, MS	162.550	Mobile, AL	162.550
Carthage, MS	162.500	Demopolis, AL	162.475
Aberdeen, MS	162.450	New Orleans, LA	162.550



Severe Thunderstorms

Tuesday, October 25, 2016



A severe thunderstorm approaching the Jackson-Medgar Wiley Evers International Airport - September 11, 2015
Photo by Alan Campbell

What is a Severe Thunderstorm?

A severe thunderstorm is a thunderstorm that produces one or more of the following: hail that has a diameter of one inch (quarter size) or larger, winds greater than or equal to 58 mph, and tornadoes. About 10% of all thunderstorms in the United States meet severe criteria.

Severe thunderstorms can occur at any time of the year, although the most common time of occurrence is during the spring months of March, April, and May. In addition, pulse-type thunderstorms that occur during the summer months can produce high winds, frequent lightning, and torrential downpours.

A secondary season of organized severe weather occurs during the fall in November and early December.

What is the Difference between a Watch and a Warning?

A severe thunderstorm/tornado watch means that **conditions are favorable for severe thunderstorms/tornadoes to develop**. These are issued by the Storm Prediction Center in Norman, OK, typically before severe weather develops. Watches tend to last several hours and cover many counties.

A severe thunderstorm/tornado warning means that a **severe thunderstorm/tornado has either been indicated on radar or witnessed by storm spotters**. Your local NWS Forecast Office issues severe thunderstorm warnings when severe weather is developing or occurring. Warnings tend to be less than an hour and cover a smaller area than a watch (i.e. 1-2 counties or less).



Newton/Kemper counties wind damage
January 5, 2007

Safety Tips

- **Have a plan.** Prepare ahead of time so you and your family know what actions to take when severe weather occurs.
- **Get indoors!** There is no safe place outdoors during a thunderstorm.
- **Stay informed!** When severe weather threatens, stay tuned to NOAA Weather Radio, local television and radio stations, or the NWS homepage online at www.weather.gov for up to date information on the weather situation. Click on the office that serves your area.
- **Know what county you are in.** When a warning is issued, the threatened area will be identified by the counties that contain the warned thunderstorm.
- **Have a NOAA Weather Radio.** This is the best way to receive the latest and most up to date weather information from the National Weather Service.

Damaging Winds: Not All Wind is a Tornado

A common misconception regarding severe weather is that if there was strong wind that did damage, it must have been a tornado. Not all wind damage occurs from tornadoes. In fact, some of the worst damage is not associated with tornadoes at all. There are several types of damaging wind storms that can occur in Mississippi.

Damaging wind, often also referred to as straight line winds, tends to be more common than tornadoes. Damage from these winds account for half of all severe reports in the continental United States. Wind speeds can reach up to 100 mph and produce a damage path extending for hundreds of miles, in association with both squall lines and supercell thunderstorms. While these winds can occur any time of the year, climatologically the number of damaging wind reports increases during the spring months and peaks during the summer months in Mississippi. One notable significant wind event was October 17, 2012. In this event, a squall line moved through the region, producing wind damage to portions of the Delta. 80-90mph winds were detected in Greenville, MS. Meteorologists can determine if the cause of the damage was from straight line winds or a tornado simply by looking at the direction the damage is laid out in. Straight line wind damage will push debris in the same direction the wind is blowing (hence the creation of the term straight line). Tornado damage will scatter the debris in a variety of different directions since the winds of a tornado are rotating violently. To reduce the damage from straight line winds, it is important to secure objects that can be blown by the wind and to keep trees well pruned. Tree branches falling on cars or houses produce a significant amount of damage in high wind events. Also make sure you are in a safe place when straight line winds strike such as in the interior of a brick home.

Another type of straight line wind that occurs is called a derecho. Derechos are created by the merging of many thunderstorm cells into a cluster, or solid line, extending for many miles. These tend to be fairly fast moving lines of thunderstorms that may travel 500 to 600 miles. Derechos typically occur in the summer months when complexes of thunderstorms form over the Great Plains. They are particularly dangerous because the damaging winds can last a long time and cover a large area. One such event occurred in June 2012, when a derecho plowed through the Mid-South, bringing 80 mph winds and structural damage to portions of the Mississippi Delta.

A third type of damaging wind that can occur are microbursts. While straight line winds tend to occur in weather systems that are widespread, microbursts are fairly localized. A microburst is a small, concentrated downburst that produces an outward burst of damaging winds at the surface. Microbursts are generally small (less than 4 km across) and short-lived, lasting only 5-10 minutes, with maximum wind speeds up to 100 mph. There are two kinds of microbursts: wet and dry. A wet microburst is accompanied by heavy precipitation at the surface, whereas dry microbursts occur with little or no precipitation reaching the ground. Microbursts tend to be a little more common during the spring and summer months in Mississippi, but can also occur in the fall and winter.



A shelf cloud near Eupora, MS - October 8, 2014
Photo by *Paula Allen Rumore*



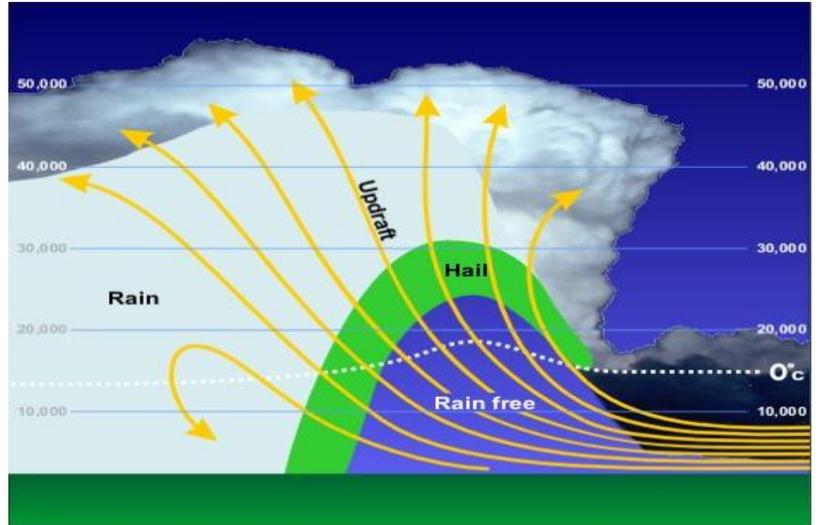
Wet Microburst - 1991 Photo by *William Bunting*

Severe Thunderstorms—Hail

Tuesday, October 25, 2016

How Is Hail Formed?

Hail is formed when water droplets are drawn into an area of strong upward moving air, known as an updraft, of a storm. Once the water droplets are transported above the freezing level, they combine with tiny airborne particles, such as dirt, salt, volcanic ash, etc., and freeze on contact, forming tiny ice particles. These ice particles are light enough that they remain suspended in the cloud, where they undergo processes that allow them to combine with other super-cooled water droplets and grow into hail stones. Once the hail stones are heavy enough to overcome the upward force of the updraft, they fall out of the cloud and can inflict significant damage to automobiles, buildings, crops, and even people.



Measuring Hail

It's often difficult to get an accurate measurement of hail diameter, especially when it's falling. The table below helps observers estimate the size of hail based on the average diameter of common items. When in doubt, play it safe and wait until the thunderstorm has moved away before going outside to measure the hail's size.

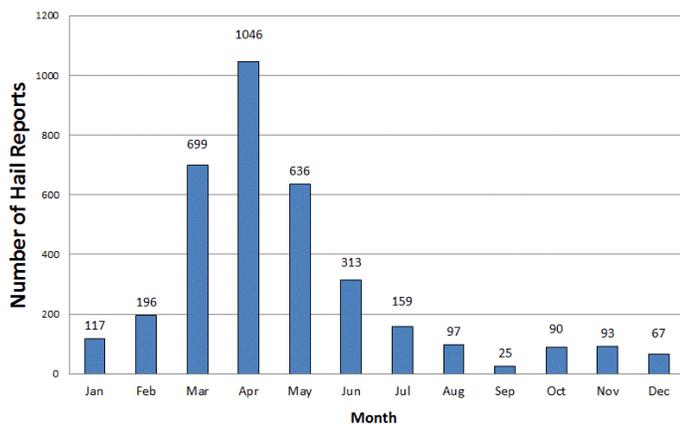


Tennis ball size hail in Clinton, MS - March 18, 2013
Photo by Will Hammons

Hail Size Estimates

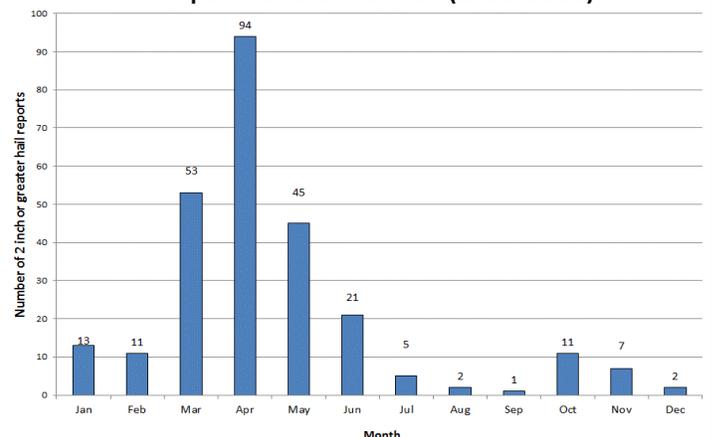
Pea.....	1/4 inch
Penny.....	3/4 inch
Nickle.....	7/8 inch
Quarter.....	1 inch
Half Dollar.....	1 1/4 inches
Golf Ball.....	1 3/4 inches
Tennis Ball.....	2 1/2 inches
Baseball.....	2 3/4 inches
Grapefruit.....	4 inches
Softball.....	4 1/2 inches

Reports of ≥ 1 inch Hail (1950-2015)



1 inch or greater hail reports across MS since 1950

Reports of ≥ 2 Inch Hail (1950-2015)



2 inch or greater hail reports in MS since 1950

Lightning

The Underrated Killer

Tuesday, October 25, 2016



Lightning strike in Weir, MS.
Photo by Sarah Stevenson

EVERY THUNDERSTORM CONTAINS LIGHTNING.

Lightning is an incredibly powerful electrical discharge, containing up to 100 million volts of electrical charge and capable of reaching 50,000 degrees Fahrenheit. Cloud to ground lightning is the result of incredible differences in electrical charge which forms within thunderstorms as well as between thunderstorms and the earth's surface. Recent science suggests that ice in thunderstorms is key to creating the massive charge differences which lead to lightning. Thunderstorm updrafts and downdrafts work to separate smaller ice particles from larger hail stones within the storm. As this happens many of the ice pieces collide resulting in a separation of electrical charge. The higher part of the storm contains primarily positively charged small ice crystals, with negatively charged larger chunks of ice down low. As the storm moves across the earth a pool of positively charged particles gathers near the ground. Eventually a brief electrical circuit is created as a negatively charged "step leader" descends from the storm toward the ground and eventually connects to the positive charge on the ground. The extreme heating of the air with lightning causes a rapid expansion of the air around it, leading to thunder. The sound of thunder will travel away from lightning at a speed around 1 mile every 5 seconds. If you can see lightning and hear thunder at your location you are not safe. If you hear thunder within 30 seconds after seeing lightning your life is in immediate danger.

Lightning Safety Rules - Outdoors

- **Seek shelter** inside a house, large building or an all metal vehicle with the windows rolled up (avoid convertibles or open top cars). It is the metal frame that protects from lightning, not the tires.
- **If your hair stands on end and your skin tingles, lightning is about to strike. Take cover immediately!**
- When boating, or in the water, head for shore and get into a shelter or vehicle.
- Once you hear thunder, stop your outside activity immediately and head for safe shelter!

AVOID

- Large trees, hilltops and other high places. Don't be the tallest object!
- Chain link fences and any other metal fences like those around ball parks and play grounds.
- Sports dugouts and open park pavilions.
- Motorcycles, scooters, golf carts, small metal sheds, bicycles, tractors and farm equipment that does not have an enclosed metal cab.



A lightning strike caused extensive damage to this driveway in Magee, MS.
Photo by Chris Curlee

Lightning Safety Rules - Indoors

- **Stay away from windows.** Avoid telephones and electrical appliances (wires connecting to these devices run outside of the home and act as lightning rods). Don't wash dishes or take a shower. The pipes will conduct electricity.
- **Unplug computers** and other sensitive electrical devices (time permitting) since surge suppressors may not protect these items if lightning hits close to the home.
- **Remember, there is no truth to the old myth that "lightning never strikes the same place twice."**
- **If a person is struck by lightning, there is no residual charge left on the body. The quick application of CPR may maintain vital body functions until medical help can be obtained.**

WHEN THUNDER ROARS, GO INDOORS!

Tornadoes

Wednesday, October 26, 2016



What is a Tornado?

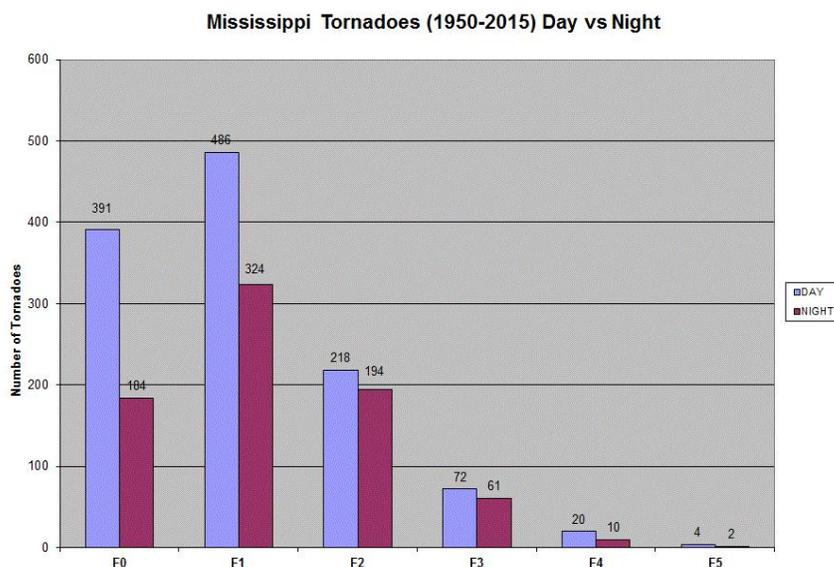
A tornado is a violently rotating column of air that extends from the base of a storm cloud to the ground. Some conditions that are conducive for tornado formation include warm, moist, unstable air, strong atmospheric winds that increase in speed and change direction with height, and a forcing mechanism to lift the air. When a combination of these factors comes together just right, tornadoes form. The most common time of year for tornado formation in Mississippi is during the spring months of March, April, and May, with a secondary tornado season in November. Tornadoes can occur at any time of day and at any point during the year given the right environment. Many tornadoes occur at night in Mississippi, especially during the fall and winter months.

EF2 tornado near Laurel, MS on December 23, 2014. Photo by *Eric Roberts*

Nocturnal Tornadoes Pose Greater Danger

Nocturnal tornadoes pose a greater danger than those that occur during the daylight because once most people go to bed, they are no longer connected to the watches or warnings issued by the NWS. Visibility is reduced at night, making observation of a tornado more difficult. Research by Gagan et al. 2010 compared tornado statistics from the Great Plains in the classic "Tornado Alley" to tornadoes in the Deep South or "Dixie Alley", and found that Dixie Alley had far greater amounts of killer strong/violent tornadoes between 9pm-9am timeframe. Dixie Alley had nearly twice the number of strong/violent tornadoes from midnight-noon timeframe than Tornado Alley from 1950-2007.

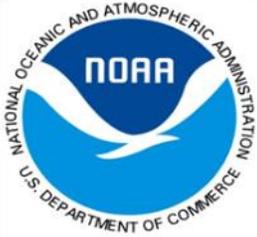
Having a properly programmed **All Hazards NOAA Weather Radio** with S.A.M.E. county coding technology will alarm individuals any time of day when a severe thunderstorm warning or tornado warning is issued for their county. This device has been credited for saving numerous lives during nocturnal tornado events.



Enhanced Fujita Scale (EF Scale)

Meteorologists rate tornado intensity based on the damage they create. The scale they use to rate them is called, the Enhanced Fujita Scale.

EF Rating	Wind Speeds	Potential Damage Threats
EF 0 (weak)	65-85 mph	Light damage, shallow rooted trees pushed over, some damage to gutters or siding.
EF 1 (weak)	86-110 mph	Moderate damage, mobile homes overturned, roof surfaces peeled off.
EF 2 (strong)	111-135 mph	Considerable damage, large trees uprooted or snapped, mobile homes destroyed.
EF 3 (strong)	136-165 mph	Severe damage, trains overturned, well built homes lose roofs and walls.
EF 4 (violent)	166-200 mph	Devastating damage, well built homes leveled, cars thrown.
EF 5 (extreme)	Over 200 mph	Incredible damage, well built homes disintegrated, automobile-sized objects thrown >300ft.



Tornado Safety Tips



When a tornado warning is issued:

- Get inside a sturdy, well built structure.
- Get on the lowest floor and in an interior room such as a hall, closet or bathroom. Get in a room that does not have any windows.
- Use something to protect your head such as a helmet, blankets, mattresses, pillows, cushions. Use something that will provide more protection than just your hands.
- If you are in a car: do not try to outrun a tornado. Take shelter in a sturdy building nearby. If none is available, get out of the car and get into the lowest part of the ground such as a ditch.
- Never take shelter under highway overpasses. Many are not constructed properly to provide adequate shelter, especially as the wind speeds increase as the tornado passes over.
- Mobile homes are not safe shelters. Plan to take shelter in a more sturdy building nearby or if no other shelter is available, get low to the ground in a ditch.
- For those in schools, nursing homes, hospitals, airports and shopping centers: take shelter in the designated shelter area. Stay away from large windows or glassed areas. Stay away from large rooms like dining halls, gymnasiums or warehouses because they have weakly supported roofs.

Develop a tornado safety plan **ahead of time!** Do not wait until the tornado is on your doorstep to figure out where to go, or what to do. Tornadoes form very quickly and may occur with little advance warning. You may only have a few seconds to find shelter, so it is important to know where to go and move quickly.



Outside walls of a home collapsed after being struck by a tornado. Interior walls remain standing (above). A 2x6 piece of wood through a refrigerator (left). Both of these photos show why being in the interior portion of a home/building is important, and why wearing a helmet is a good idea!

DRILL DAY
Wednesday, October 26, 2016
9:15 AM CDT

MISSISSIPPI'S
PrepareAthon!SM
for Tornado Safety

A STATEWIDE TORNADO DRILL will be conducted **Wednesday, October 26, 2016, at 9:15 AM CDT**, weather permitting, as part of FALL SEVERE WEATHER PREPAREDNESS WEEK in Mississippi. *If Wednesday's weather is inclement, the test will be conducted Thursday, October 27, 2016 at 9:15 AM CDT.*

The message will be sent under the Routine Weekly Test Product (RWT) disseminated by NOAA Weather Radio only. This will be broadcast on all NOAA weather radio transmitters across Mississippi. Many weather radios will alert for this test but some models will just flash a light. If your weather radio does not give an audible alert at 9:15 AM, proceed with your drill anyway.

A drill such as this gives schools, churches, businesses, hospitals, and plant safety managers across the state a chance to check the readiness of their Severe Weather Safety plans. If your office has a plan already in place, test it to make sure your employees know how to respond properly. If your employees know how the safety procedures work, they can carry them out effectively when the time comes.

IF YOUR WORK PLACE, SCHOOL OR CHURCH DOES NOT HAVE A SAFETY PLAN, NOW IS THE TIME TO START ONE!! Developing a safety plan is not difficult. If a plan is easy to operate, it is more likely to be successful when needed. Countless lives are saved each year by planning, preparedness and proper education. The U.S. population has grown in recent years, yet the number of tornado deaths has diminished. This is due to agencies and individuals developing weather safety plans and to people reacting in a prudent manner when severe weather threatens their areas.

For information on preparing your organization :

[Preparedness Information](#)

**YOUR SAFETY AND THAT OF YOUR FAMILY, FRIENDS, AND
CO-WORKERS DEPENDS ON YOU!!**

Graphical Tornado Database

Have you ever wanted to look back at historic data to see when and where tornadoes occurred and what their impacts were? The National Weather Service has developed an easy to use, interactive tornado databases that can display tornado data going all the way back to 1880.

Figure 1 shows an example of the December 23, 2014 tornado that tracked across Marion County in Southeast Mississippi, and its impacts on the county. Check it out today.

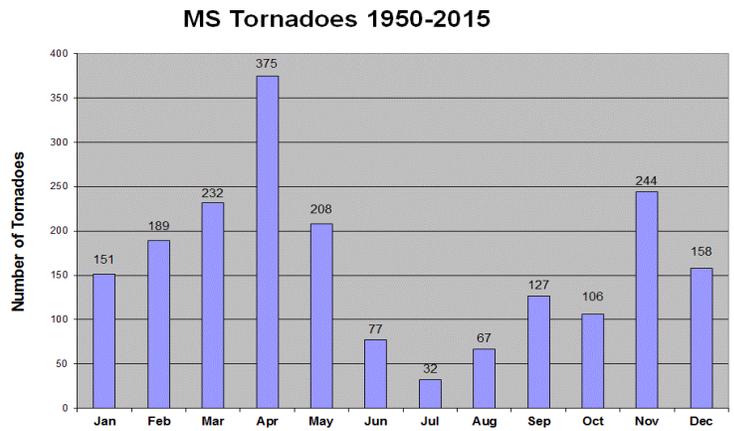
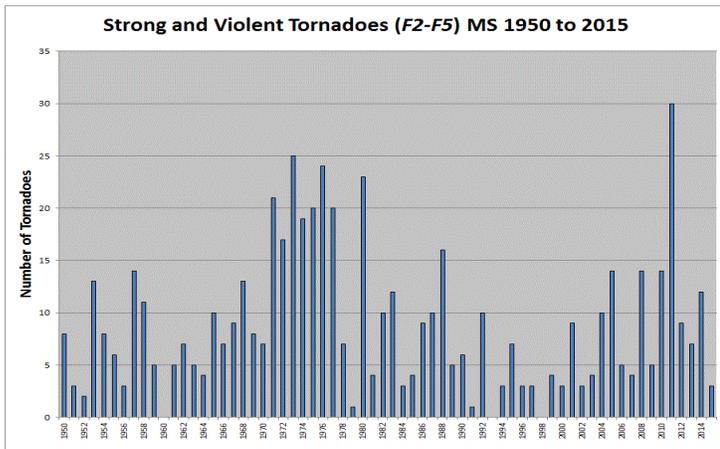
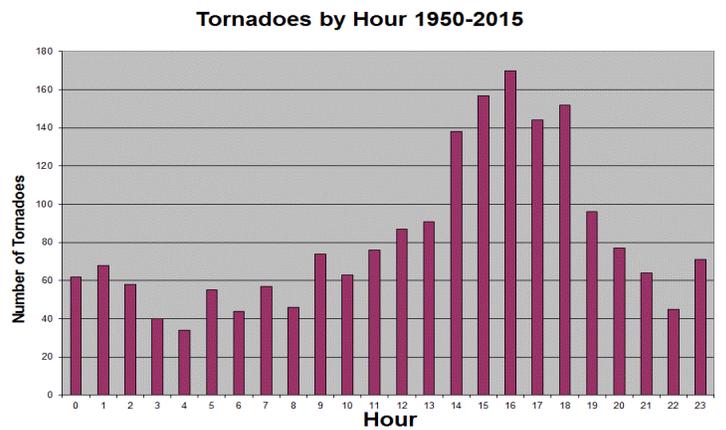
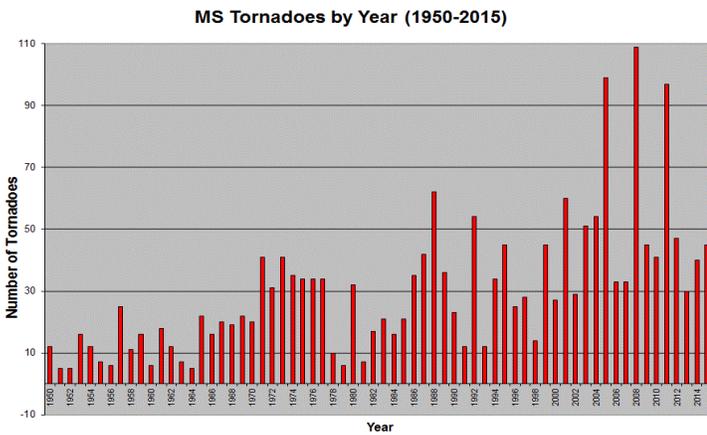
To access these databases, go to the following web links:

- Memphis (Northern MS)** – <http://midsouthtornadoes.msstate.edu/index.php?cw=meg>
- Jackson (Central and Southeast MS)** - <http://midsouthtornadoes.msstate.edu/index.php?cw=jan>
- Slidell, LA (Southwest & Coastal MS)** - <http://midsouthtornadoes.msstate.edu/index.php?cw=lix>
- Mobile, AL (Southeast MS)** - <http://midsouthtornadoes.msstate.edu/index.php?cw=mob>

Date: 12/23/2015	Time: 4:10 pm	NWS Memphis Counties Affected: Tate, MS Marshall, MS Benton, MS Tippah, MS Hardeman, TN McNairy, TN
Length of path (miles): 75.09	Width of Path (yards): 1300	Whole Path Info: Total Deaths: 9 Total Injuries: 36
Beg Lat/Lon: 34.60 / -89.71	End Lat/Lon: 35.15 / -88.57	F-scale: EF-4 (range of winds from 207-260 mph)
Fatalities: 0	Injuries: 0	



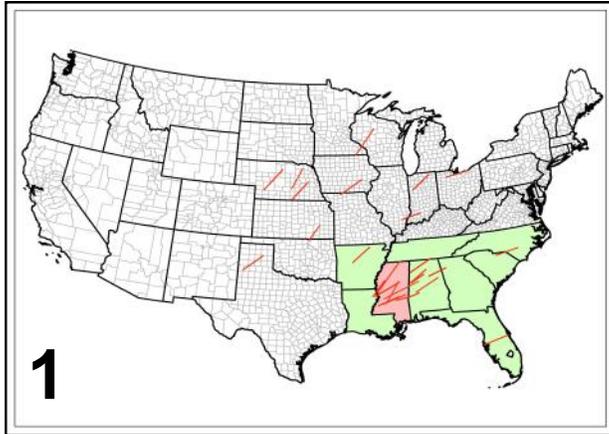
Figure 1. Example output from the Graphical Tornado Database, of an EF4 tornado that affected several North Mississippi counties on December 23, 2015.



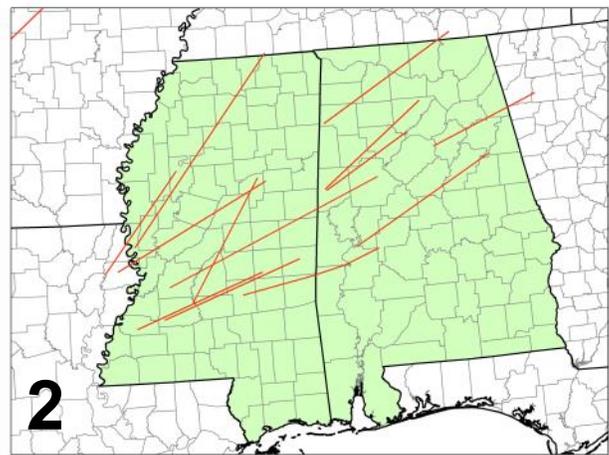
History of Violent, Long Track Tornadoes in Mississippi

Historically, the southeastern United States, and namely Mississippi, has been prone to violent (EF4 or EF5), long track (100+ miles) tornadoes. Since 1950, when the official tornado database began, a total of **26** violent, long track tornadoes have occurred across the United States (Figure 1). The Southeast (highlighted in green) accounts for **16 (~62%)** of the total violent, long track tornadoes. Even more frightening, the state of Mississippi (highlighted in red) has experienced **8 (31%)** of the nation's total violent, long track tornadoes (Figure 2). These eight violent, long track tornadoes shown impacting Mississippi in Figure 2 resulted in 224 fatalities and an estimated 2,375 injuries. These figures average out to 28 fatalities and nearly 297 injuries per violent, long track tornado in Mississippi. However, with heightened awareness, better technology, and increased warning lead times, the last two violent, long track tornadoes (2010, 2011) combined for a total of 17 fatalities and 268 injuries. Mississippi is the only state to have back to back years in which a violent, long track tornado occurred. The largest official fatality count of the eight is 58, which occurred twice, nearly five years apart, in 1966 and 1971. Unfortunately, Mississippi has three of the top ten deadliest tornadoes to strike the entire United States before the official tornado database began. These include tornadoes that affected Natchez (1840), Tupelo (1936), and Purvis (1908), ranking second, fourth, and seventh respectively.

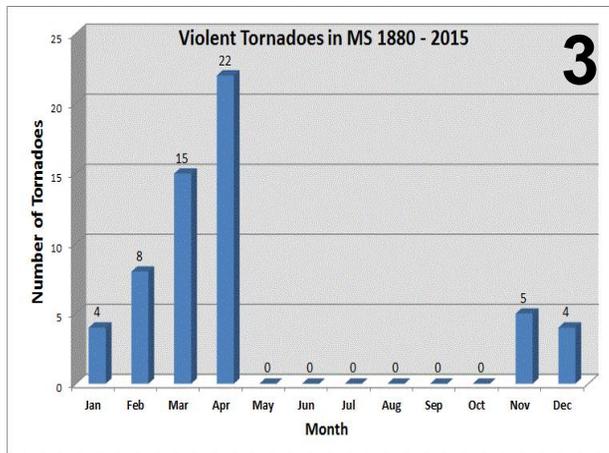
Traditionally, violent and long track tornadoes have occurred over a range of months from November through April (Figure 3). Interestingly, the tornado that struck Purvis in 1908 and the violent, long track tornado that struck Yazoo City in 2010 occurred on the same day, April 24th. Research analyzing all historical tornado paths since 1950 has shown Mississippi, and especially Smith County, to have the greatest probability of experiencing **any** tornado within a given year (Figure 4, Dixon et al. 2011). In terms of tornadic activity impacts, a large area of central Mississippi is equal to, if not greater than areas out in "Tornado Alley." On average, south central Mississippi will be impacted by at least one tornado in a given year with a greater likelihood of experiencing a violent and long track tornado. It's important to note that any area of Mississippi may be impacted by a tornado, not just those highlighted areas.



1
Figure 1: Violent, long track tornado paths from 1950-2015.

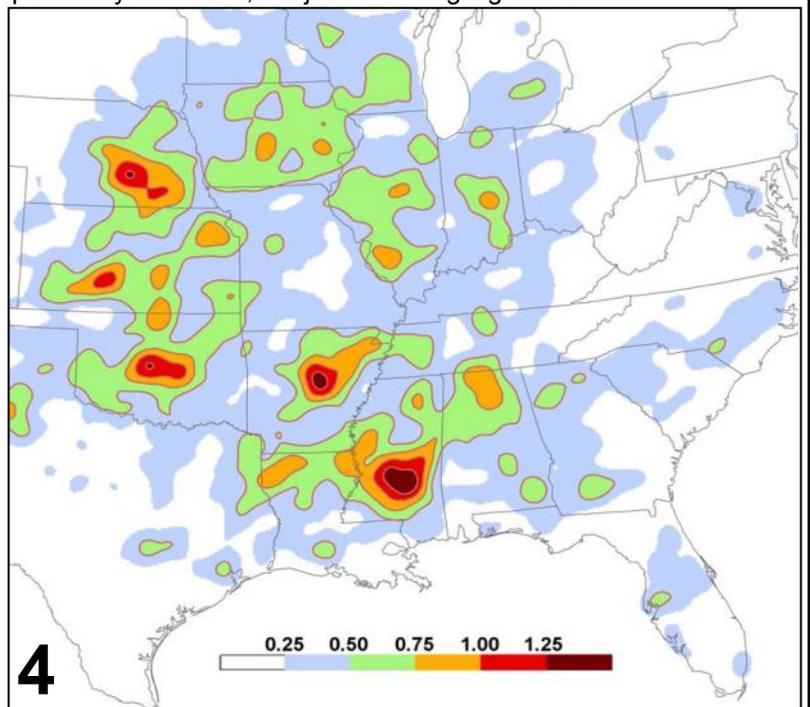


2
Figure 2: Violent, long track tornadoes across Mississippi and Alabama from 1950-2015.



3
Figure 3: Number of violent, long track tornadoes per month in Mississippi from 1950-2015.

4
Figure 4 (right): Average annual tornadoes within 25 miles of a point 1950-2015.



Severe Weather and the Holiday Season in Mississippi

In holiday songs and stories, a wintry scene is often depicted surrounding Thanksgiving, Christmas, and New Year's Day. In Mississippi, however, our holiday seasons are more prone to feature tornadoes than snow. November is the third most active month for tornadoes in the state. Historically, many of these tornadoes occur in the latter half of the month, typically around Thanksgiving. However, in both December 2014 and 2015, Mississippi saw deadly tornadoes rip across the state in the days leading up to the Christmas holidays.



An F4 tornado caused significant damage to the Fairfield subdivision near Madison, MS on November 24, 2001. Photo by NWS Jackson, MS

On Christmas Day 2012, a 61 mile long EF3 tornado struck Pearl River, Stone, Forrest, Perry, and Green counties during the afternoon hours, causing extensive damage and at least 12 injuries. On December 23, 2014, an EF3 tornado struck the town of Columbia in Marion County, and an EF2 tornado struck Jones County during the afternoon. Extensive damage and five fatalities were caused by these tornadoes. The Columbia tornado impacted a shopping area just two days before Christmas. Just one

An EF3 tornado destroyed this shed in east central Noxubee County on New Year's Day 2011. Photo by NWS Jackson, MS



In 2001, one particular tornado event produced F4 tornadoes in Madison and Bolivar counties during the overnight hours of November 24, 2001, which happened to be the Saturday after Thanksgiving. These violent tornadoes caused extensive damage and two fatalities. The days surrounding Thanksgiving are some of the most heavily traveled days of the year, which means that many people are in less familiar surroundings and more vulnerable than normal.



An EF3 tornado produced 140 mph winds near McNeil, MS in Pearl River County on Christmas Day 2012. Photo by NWS Slidell, LA

year later, EF3 and EF4 tornadoes tore across northern Mississippi on December 23rd. This resulted in 11 fatalities and 64 injuries. An EF0 tornado also affected Smith County on Christmas Day 2015.

On New Year's Eve 2010, four tornadoes impacted central parts of the state. After midnight that same night on New Year's Day 2011, seven more tornadoes occurred, including two EF3s. One EF3 tornado in Attala County touched down at 12:02 am, making it the first tornado of 2011 in the entire United States.

So this holiday season, whether you're cooking your Thanksgiving turkey, unwrapping presents on Christmas, or celebrating the arrival of 2017, remember to pay attention to the forecast and be prepared for severe weather. These situations may place you in different locations than throughout the year, so make sure and consider what actions you would take should a warning be issued.

Impact Based Warnings

Impact Based Warnings (IBW) were developed to improve communication of the most critical information the National Weather Service (NWS) provides in our text based warning products. In the past, critical information could have been missed as it was hard to find in the traditional warnings that contained plenty of text. With IBW, this information is more easily found and the overall warning is composed in a more concise manner. We still issue tornado/severe thunderstorm warnings as we did before, but now we have a way of expressing what we expect to occur and in a manner that can be quickly seen and understood. The goal of IBW is again to better communicate the most critical information. It also is trying to generate a better public response to the threat and better meet societal needs by clearly defining the hazard or threat and then indicating some typical impacts that often occur from such an event.

IBW was developed after the devastating tornadoes of 2011, mainly the Joplin, MO EF5. Initially this warning concept was tested in 2012 in five offices from the Plains and Midwest. It was later expanded to all NWS offices across the Plains and Midwest (38 offices) in 2013. In 2014, eight additional offices were added, one of which was NWS Jackson. In 2015, all remaining National Weather Service offices serving the state of Mississippi implemented IBW.

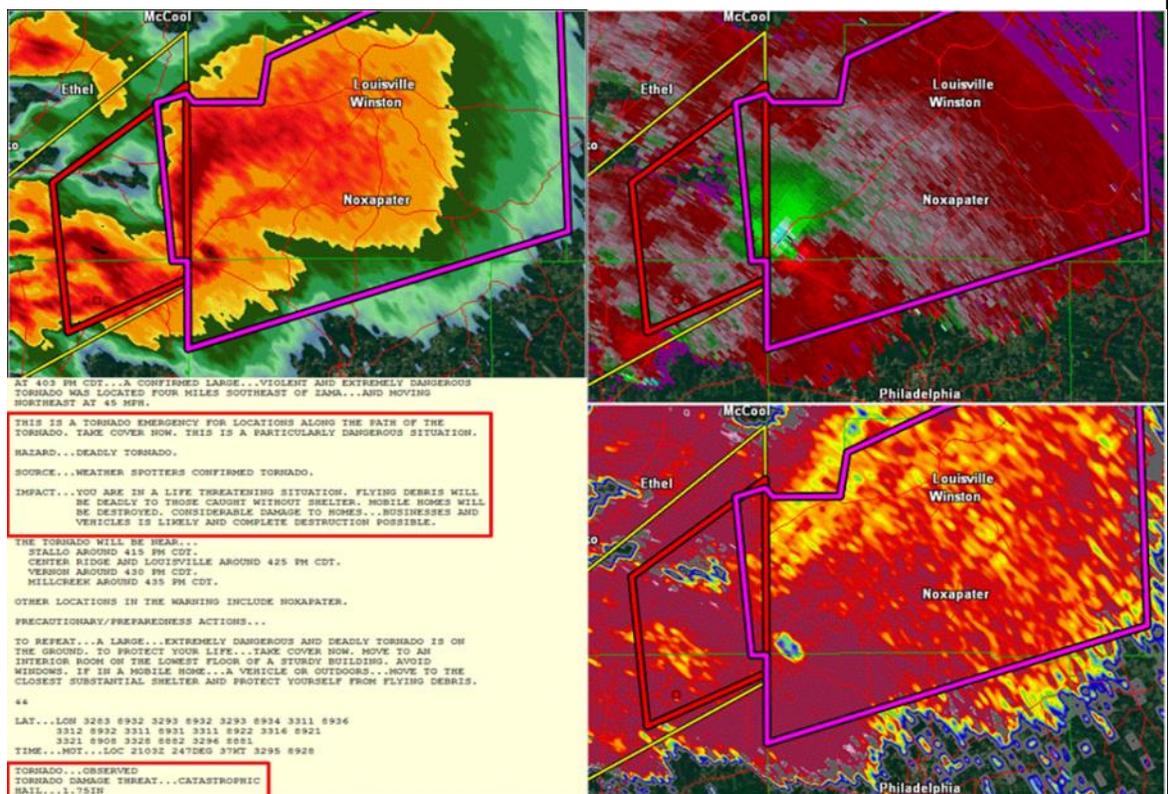
With the NWS radar fleet fully upgraded to dual polarization, IBW fits ideally with the enhancements the radar provides to warning forecasters. The most notable benefit to IBW, from the dual pol upgrade, is the detection of tornadic debris. This is truly a powerful tool which helps build confidence on when to use enhance wording, especially in tornado warnings and statements. The detection of the tornadic debris signature (TDS) provides high confidence that a tornado is occurring and doing damage, even when not observed by trained spotters. When a TDS exists, the warning forecaster can use wording such as “confirmed tornado”. Additionally, recent research has found a strong correlation to the height of the TDS to the intensity of a tornado. Utilizing this and other tools, warning forecasters can use wording such as “considerable” when they feel a strong (EF2 +) tornado is more likely, or even “catastrophic” (Tornado Emergency) when the possibility of a violent tornado (EF4 or EF5) exists. NWS Jackson has recently applied these findings to notable tornadic events such as the February 2013 Hattiesburg tornado, the East Mississippi tornado of April 2013, the April 28, 2014 outbreak and the December 23, 2014 Columbia tornado.

Here is a list of warning enhancements of critical information from IBW being used by the NWS in Mississippi:

- Using “confirmed tornado” from radar and/or spotters
- Anticipating the intensity of the tornado and the use of damage threat wording such as “considerable” or catastrophic”
- Use of hazard tags at the bottom of the warning that will state potential hail size, thunderstorm wind speeds, and tornado damage threats.

The following is an example of IBW and how it was implemented in a tornadic event in 2014.

Figure 1. Example of a violent tornado. Red text box shows “catastrophic” tag and “Tornado Emergency” wording, TDS detected. This violent tornado started in Leake County and moved across the corners of Neshoba and Attala counties, with Winston County being the hardest hit. A “Tornado Emergency” was issued based on the height of the TDS and spotter reports. This tornado was on the ground for 34 miles and rated EF4.



Flooding and Flash Flooding are the top weather related killers!

Thursday, October 27, 2016

FLASH FLOODING: Flash floods can occur within a few minutes or up to six hours after excessive rainfall, with a dam or levee failure, or with a sudden release of water held by an ice jam or mud slide. Flash floods can wash out roads and destroy buildings and bridges. Because flash floods happen in a short period of time (less than six hours after the causative event) they are more life threatening than other types of flooding. Areas most susceptible to flash flooding are mountainous streams and rivers, urban areas, low-lying areas, storm drains, and culverts.

A Flash Flood Warning is issued when flash flooding has been reported or is imminent. It focuses on specific communities, creeks or streams, or other geographic areas where flooding is imminent or occurring.



Tallahala Creek near Laurel flooding
Photo by NWS Jackson, MS

A **FLASH FLOOD EMERGENCY** is issued when there is confirmation of an immediate threat to life and property, many times in the form of water rescues or evacuations, due to rapidly rising water levels from either extremely heavy rainfall over an area or a dam failure.

RIVER FLOODING: This type of flooding is caused by an increased water level in established watercourses, such as a rivers, creeks, or streams. River flooding is slower to develop than flash flooding (more than six hours after the causative event); however, some smaller creeks and streams have a short lag time between the runoff from heavy rain and the onset of flooding. On the other hand, it may take several days for a flood crest to pass downstream points on major rivers such as the Pearl and Mississippi rivers. The NWS issues river flood warnings when rivers are expected to rise above flood stage. Persons in the warned area are advised to take necessary precautions immediately. River stages and crest forecasts are given for selected forecast

points along with known flood stages for each forecast point. While there is usually more advanced warning time with river floods than with flash floods, persons should be familiar with the flood prone areas they live and work in, and must know what action to take and where to go if a flood occurs. Advance planning and preparation is essential.

FLOOD WATCHES: The NWS issues a Flood Watch when conditions are anticipated that could result in either flooding or flash flooding within a designated area. Persons in the watch area are advised to check flood action plans, keep informed, and be ready to take action if a warning is issued or flooding is observed.

FLOOD SAFETY RULES: Follow these tips to stay safe during flood conditions...When a warning is issued get out of areas subject to flooding. These may include dips, low spots, stream beds, drainage ditches and culverts. If caught in low areas during flooding, go to high ground immediately.



Flash flooding at Rainbow Park in Burnsville, MS on September 29, 2015.
Photo from NWS Memphis, TN



Avoid already flooded and high velocity flow areas. A rapidly flowing stream or ditch can sweep you off your feet or even carry your car or truck downstream.

Never drive through a flooded area as the road bed may be washed away. Play it safe! If you encounter a flooded road - **TURN AROUND, DON'T DROWN!**

Be especially cautious at night when it is harder to recognize flood conditions, and never drive around a barricaded road.

Most flood deaths occur at night and when people become trapped in automobiles that stall in areas that are flooded. If your vehicle stalls, abandon it immediately and seek higher ground. The rising water may engulf the vehicle and the occupants inside. Do not camp or park your vehicle along streams or creeks during threatening conditions.

When a FLOOD WARNING is issued for your area, act quickly to save yourself. You may only have seconds!

Snow and Ice

Friday, October 28, 2016

NOT JUST A WINTER THREAT

An often overlooked hazard during the fall season is, surprisingly, a winter storm. While typically confined to the latter end of the season, significant snow and ice events have occurred across Mississippi in early December. These snow and ice events have paralyzed affected portions of the state by stranding motorists, closing airports, stopping the flow of supplies, and disrupting emergency and medical services. Snow and ice accumulation can cause roofs to collapse, trees and limbs to break, topple utility poles and communication towers, and bring down power lines, all resulting in the disruption of both power and communications. This can leave residents in the affected area isolated for days. The cost of both snow and ice removal, repairing damages, and the loss of business can have severe economic impacts on the affected cities and towns.



Icicles hang from bushes in Gulfport, MS on January 29, 2014. Photo by David Lee

BE PREPARED - At Home and Work

The **primary concerns** are the loss of heat and communication services, and a shortage of supplies if winter weather conditions persist for more than one day.

- **Have a flashlight and extra batteries**
- Battery-powered NOAA Weather Radio and portable radio to receive emergency information. These may be your **ONLY** link to the outside.
- **Extra food and water.** Store high energy food such as dried fruit, nuts, granola bars, and other foods the do not require cooking or refrigeration.
- **Keep extra medicine and baby items**
- **First-aid supplies**
- **Have an emergency heat source** such as a fireplace, wood stove, or some type of space or gas heater (i.e. propane or kerosene heater). Use these properly to prevent a fire and remember to ventilate properly.
- **Heating Fuel.** Remember to refuel before you're empty. Fuel carriers may not be able to reach you for days after the winter storm.
- Test smoke alarms and fire extinguishers once a month to ensure they work properly.
- Make sure pets have shelter and plenty of food and water.

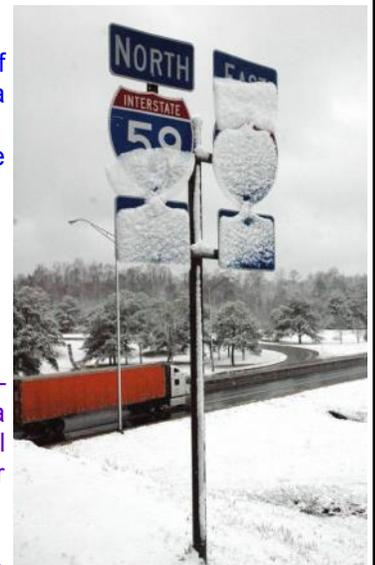
BE PREPARED - In Vehicles

Check the latest weather reports and plan your travel accordingly to avoid the storm!

- **Carry a Winter Storm survival kit equipped with some of the following items:** mobile phone, charger, and extra battery, blankets and sleeping bag, flashlight and extra batteries, first-aid kit, high-calorie non-perishable food, extra clothing to keep dry, small can and waterproof matches to melt snow for drinking water, sack of sand or cat litter for tire traction, windshield scraper, tool kit, and jumper cables
- **Keep** your gas tank near full to avoid ice in the tank and fuel lines.
- **Avoid** traveling alone and let someone know your timetable and primary/alternate routes.

If you get stuck on the road in a winter storm, keep these tips in mind:

- **Run** the motor about 10 minutes every hour for heat.
- **Open** the window a little for fresh air to avoid carbon monoxide poisoning.
- **Make** sure the exhaust pipe is not blocked.
- **Be visible to rescuers.**
- **Turn** the dome light on at night when running the engine.
- **Tie** a colored cloth, preferably red, to your antenna or car door.
- **After** snow stops falling, raise the hood to indicated you need help.



Snow-covered Interstate 59/20 road sign in Lauderdale County. Photo by The Meridian Star

Extreme Cold and Wind Chill

Friday, October 28, 2016

Exposure to extreme cold can cause frostbite or hypothermia and can become life-threatening. While we are all at risk if exposed, infants and elderly people are most susceptible. Here in the South, extreme cold is synonymous with a hard freeze. A hard freeze is generally when the temperature falls below freezing, often below the upper 20s, and does not rise above freezing for several hours. This type of freeze can cause pipes to burst if not properly insulated. When pipe bursting weather is expected, be sure to properly insulate pipes and leave cabinet doors open to ensure they receive warmth. It is also advised to let your faucets drip to prevent water from freezing and causing pipes to burst. Don't forget about providing adequate shelter for pets. Stock flashlights and batteries and avoid candles as they can be a fire hazard. Learn to use any emergency heating sources properly to prevent fires.

WIND CHILL: The wind chill is not the actual temperature, but rather how wind and cold feel in exposed skin. As the wind increases, heat is carried away from the body at an accelerated rate, thus causing body temperatures to drop. Animals are also affected by wind chill; however, cats, plants, and other objects are not.



		Temperature (°F)																	
		40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
Wind (mph)	5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
	10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
	15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
	20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
	25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
	30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
	35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
	40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
	45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
	50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
	55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
	60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes (light blue), 10 minutes (medium blue), 5 minutes (dark blue)

Wind Chill (°F) = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})
 Where, T= Air Temperature (°F) V= Wind Speed (mph) Effective 11/01/01

FROSTBITE: Frostbite is damage to body tissue cause by extreme cold. A wind chill of -20°F will cause frostbite in just 30 minutes. Frostbite causes a loss of feeling and a white or pale appearance in extremities, such as fingers, toes, ear lobes, or the tip of the nose. If symptoms are detected, get medical attention immediately! If you must wait for help, slowly rewarm affected areas. However, if the person is also showing signs of hypothermia, warm the body core before the extremities.

HYPOTHERMIA: Hypothermia is a condition brought on when the body's temperature drops below 95°F. This condition can be fatal. For those who are fortunate to survive, they are likely to experience lasting kidney, liver, and pancreas problems. Warning signs on hypothermia include uncontrollable shivering, memory loss, disorientation, slurred speech, drowsiness, and apparent exhaustion. Take the person's temperature. If below 95°F, seek medical care immediately!

IF MEDICAL CARE IS NOT AVAILABLE, warm the person slowly, beginning with the body's core. **DO NOT** warm the arms and legs first, as this will drive cold blood toward the heart, leading to heart failure. If necessary, use your body heat to aid in the warming process. Get the person into dry clothing and wrap in a warm blanket covering the head and neck. **DO NOT** give the person alcohol, drugs, coffee, or any other hot beverage of food. Warm broth is a more sufficient first food to offer.

DRESSING FOR THE COLD: Here are some easy, but effective, preparedness tips for dressing for cold weather.

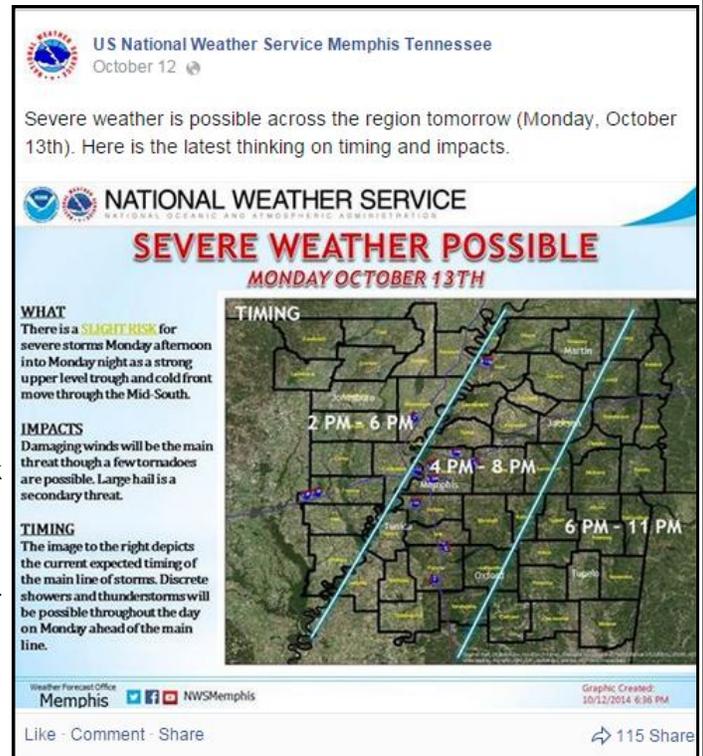
- Wear loose-fitting lightweight clothing in several layers.
- Remove layers to avoid perspiration and subsequent chill.
- Outer garments should be tightly woven, water repellent, and hooded.
- Wear a hat! Half of your body heat loss can be from you head.
- Cover your mouth to protect your lungs from extreme cold.
- Mittens, snug at the wrist, are better than gloves.
- Try to stay dry.



The Use of Social Media by the National Weather Service

One of the newest and most direct ways for distributing weather information by the National Weather Service is through social media. Over the past few years, we have established a presence on Facebook, Twitter, and most recently, YouTube. These platforms have allowed us to reach beyond our traditional text products and provide graphical weather information to a new audience. Not only does social media allow us to share critical forecast information with our followers; it also provides a way for us to directly interact with them, allowing us to answer questions and our followers to share their own weather reports.

We took our first step into the world of social media when we joined Facebook in April 2011. In the four years since, we have gained a significant number of followers. We routinely post forecast updates, interesting climate factoids, outreach events, storm survey information and interesting weather facts on our Facebook page. Along with our routine postings, our most significant usage is during severe weather events when we diligently post radar updates and storm reports. Perhaps some of the most important items we post on Facebook are our graphiccast products. Graphiccast posts allow us to provide early notice of upcoming severe weather outbreaks and other hazardous weather events, which can be easily shared by our followers. For instance, here is a graphiccast that was posted to the NWS Memphis Facebook page in advance of a severe weather event in mid-October 2014 (right).



Our newest social media outlet debuted in May 2013 when we joined YouTube. Unlike Facebook and Twitter, where we primarily share text and image updates, our YouTube account consists exclusively of video information. Updates run the gamut from weekly weather briefings, to time-lapse videos, to educational videos. Weather briefings are updated when hazardous weather is anticipated. Here's a screen capture from a briefing that was done before the significant cold snap in January of this year by NWS Jackson.

For a complete list of the Facebook, Twitter and YouTube accounts for each NWS office that serves Mississippi, see page 19.

Be aware! Getting weather information from social media is great and convenient. However, it is important to have other avenues, such as NOAA Weather Radio or local TV or radio outlets, to receive warning information. Timely warning information is not always posted on social media.

Just over a year after joining Facebook, we expanded our social media presence by joining Twitter in June 2012. Whereas Facebook is better suited for longer, more detailed forecast updates; Twitter is more geared towards shorter, but more frequent updates. This comes in handy during severe weather situations, when it is necessary for us to send out more frequent updates, including radar information and severe weather reports. Here's an example of NWS Jackson's use of Twitter during the Hattiesburg tornado in February 2013.



Tips from MEMA to Help Weather the Weather

To make sure you are prepared before, during and after severe weather, be sure to have an emergency disaster kit like this one recommended by MEMA:

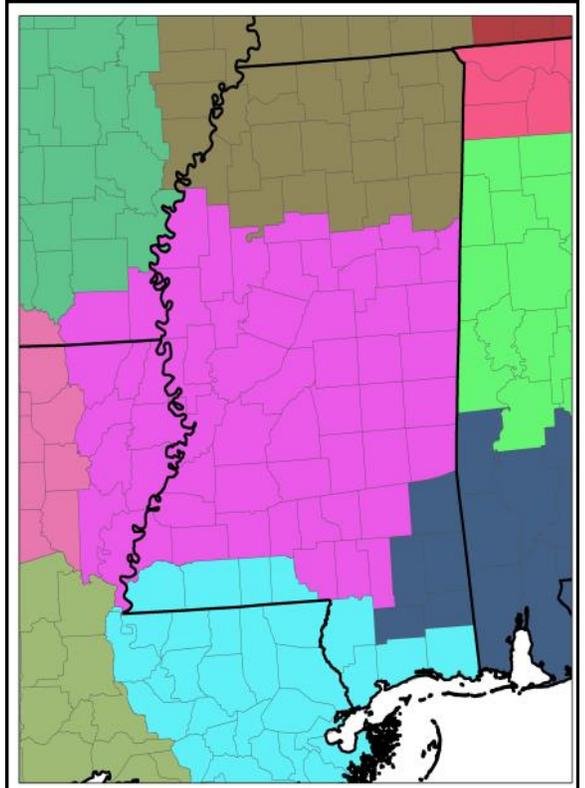
- | | |
|---|---|
| <ul style="list-style-type: none"> • Flashlights with extra batteries. Use flashlights instead of candles when the power goes out. • Portable radio with extra batteries. • NOAA Weather Radio. • Non-perishable food for at least 3 days. • Bottled water (1 gallon per person per day). • First Aid Kit with prescription medications. • Bedding and clothing for each family member. • Blankets and towels. • Plastic dishes/eating utensils. | <ul style="list-style-type: none"> • Baby supplies (food, diapers, medication). • Pet supplies (food, leash & carrier, vaccination records). • Toothbrush, toothpaste, soap, shampoo, towelettes, other toiletries. • Copies of important documents such as driver's license, SS card, insurance policies, birth and marriage certificates. • Cash, enough to fill up your vehicle with gas and travelers checks. • Helmet (bicycle, football, etc.) to protect your head during a tornado. |
|---|---|

For Your Information

This booklet contains materials useful for Fall Severe Weather Preparedness Week and other times. You're invited to contact your National Weather Service Office, state and county emergency management agency for interviews and answers to your questions. National Weather Service personnel and local emergency management are available for weather awareness programs to civic and industrial organizations, schools, hospitals, and others interested in weather safety. Each county in Mississippi is served by a designated National Weather Service office as identified below:

Please contact one of the offices listed below if you need more information.

Jackson, MS.....	Chad Entremont.....	(601) 939-2786
Memphis, TN.....	Gary Woodall.....	(901) 544-0411
Memphis, TN.....	Jim Belles.....	(901) 544-0411
New Orleans, LA.....	Frank Revitte.....	(985) 649-0357
New Orleans, LA.....	Ken Graham.....	(985) 649-0357
Mobile, AL.....	Jeff Medlin.....	(251) 633-6443
Mobile, AL.....	Jason Beaman.....	(251) 633-6443
Mississippi Emergency Management Agency.....		(866) 519-6362



Jackson, MS | Memphis, TN | New Orleans, LA | Mobile, AL

Information Resources on the World Wide Web

For additional resources, the following web sites are available:

- NWS Jackson:** www.weather.gov/jan
- NWS Memphis:** www.weather.gov/meg
- NWS New Orleans:** www.weather.gov/lix
- NWS Mobile:** www.weather.gov/mob



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<http://www.weather.gov>