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OKLAHOMA CLIMATE

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The Disaster That Struck Oklahoma

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Oklahoma Climate
Spring 2009

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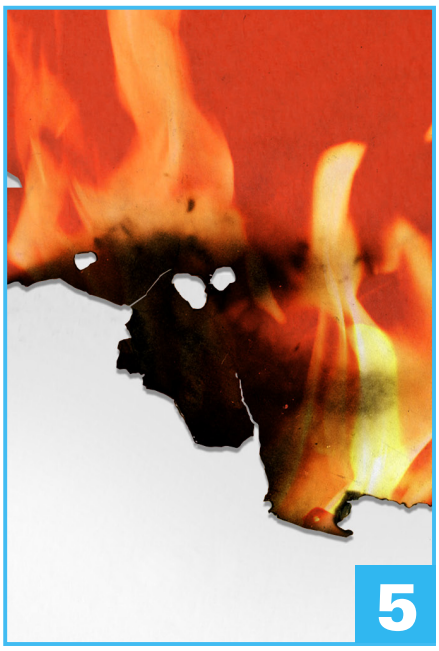


OKLAHOMA CLIMATOLOGICAL SURVEY

MAY 3RD, 1999: 10 YEARS LATER

by Doug Speheger NWS Meteorologist

Almost everyone who lived in central Oklahoma in May 1999 remembers the May 3 tornadoes, especially the tornado that struck Bridge Creek, south Oklahoma City, Moore and Del City. This tornado was one the most significant tornadoes in recent history. Thirty-six people were killed by the Bridge Creek-Oklahoma City-Moore tornado – the most fatalities in a single tornado in the United States since the Wichita Falls TX tornado on April 10, 1979. And this tornado is only one of three F5 tornadoes within the past 10 years (the others being tornadoes that struck Greensburg, Kansas, on May 4, 2007, and Parkersburg, Iowa, on May 25, 2008.)

The thunderstorm that produced the Bridge Creek-Oklahoma City-Moore tornado was first observed on radar as a developing shower at about 3:30 pm in southwest Oklahoma near Grandfield. It strengthened and moved northeast, producing its first weak tornado north of Lawton around 4:50 p.m. The storm then produced additional tornadoes across Caddo and Grady Counties, in cluding three strong tornadoes. The large F5 tornado initially touched down at 6:26 p.m. on the southeast side of Amber in Grady County, and would continue to move northeast for the next 82 minutes before finally dissipating at 7:48 p.m. on the west side of Midwest City. Despite the excellent warnings being distributed by the National Weather Service and the media, this tornado caused damage and numerous casualties across central Oklahoma. This 37-mile path tore through the community of Bridge Creek in northeastern Grady County killing 12 people before traveling through the northern tip of McClain County where it killed one person taking shelter under an interstate overpass. The tornado then moved into northern Cleveland County, killing 11 people in southwest Oklahoma City and Moore, and finally into Oklahoma County where another 12 people were killed in southeastern Oklahoma City and Del City. It is estimated that over 580 people were injured by this tornado as well and that the tornado caused nearly $1 Billion Dollars in damage.

The Bridge Creek-Oklahoma City-Moore tornado is also important in a scientific sense as researchers with the "Doppler on Wheels" (DOW) team were able to take scientific measurements, including an instantaneous wind speed measurement of 301 mph with their research radar – the highest wind speed ever recorded in a tornado. That does not necessarily mean this tornado is the strongest in history, however, as very few tornadoes have actually had wind speed measurements taken. And despite some media claims, this was not history's first F6 tornado. Even the scientists' initial estimate of a 318 mph wind speed measurement for the tornado (which has now been lowered to 301 mph) was defined as being an F5 tornado, and since wind speeds are measured in so few tornadoes, the correlation between extreme wind speeds and the intensity of damage is not known. While the intensity of the damage produced by the Bridge Creek-Oklahoma City-Moore tornado is rare, it is not unprecedented and is comparable to other F5 tornadoes that have occurred across the country in the past.

Although the Bridge Creek-Oklahoma City-Moore F5 tornado caused the most damage and is the most well-known, it may surprise a lot of people that this tornado was only one of 63 tornadoes that were observed in Oklahoma during an 11 hour period of May 3 and into the early morning hours of May 4. For comparison, the entire state of Oklahoma averages only 53 tornadoes per year. There were 10 different thunderstorms that produced tornadoes, and there were times where four tornadoes from four different storms were occurring in the state at the same moment. Besides the violent F5 tornado that struck the Oklahoma City metropolitan area, there were two other violent F4 tornadoes, one hitting the town of Dover in Kingfisher County and another moving through Mulhall in Logan County. Four different tornadoes caused fatalities (the three F4/F5 tornadoes and an F2 tornado that struck Shawnee), and seven other tornadoes caused injuries. In addition, there were another three tornadoes in southern Kansas, including an F4 tornado that moved through the Wichita, Kansas, metropolitan area.

Unfortunately, this tornado outbreak also exposed the danger of seeking shelter under a highway overpass, as three of the fatalities and many injuries that occurred that day were under

continued >>

overpasses. Despite videos that have been shown on television that seem to indicate highway overpasses offer protection from tornado winds, it can actually expose those under the overpass to more flying debris and is not recommended.

Tornadoes of the intensity and impact of the Bridge Creek-Oklahoma City-Moore tornado are very rare, even here in tornado alley. This is only the sixth F5 tornado to be recorded in Oklahoma since official tornado documentation began in 1950, and the only F5 tornado in the state since April 2, 1982, when an F5 tornado was documented in Choctaw and McCurtain Counties of southeast Oklahoma. Only five tornadoes have produced more fatalities in the state since statehood, and all of these occurred prior to 1950 (the deadliest tornado with over 100 fatalities having struck northwest Oklahoma including Woodward).

Even in the ten years since the May 3, 1999, outbreak, severe weather forecasting and dissemination of warnings and information has improved. Partially as a result of this outbreak, funding was allocated to build the National Weather Center building in Norman which allows operational meteorologists and researchers easier access to exchange information and ideas. Technology has advanced such that more information, including National Weather Service warnings and radar data is more accessible on the internet and even via cellular phones. The resolution of National Weather Service radar data has improved. Training performed by the Oklahoma Climatological Survey's OK-First program and by the National Weather Service for local emergency management personnel and officials helps prepare local communities for the possibility of severe weather. Of course, the outbreak was also a reminder that residents of Oklahoma need to be aware and have a plan of action should severe weather threaten, and make sure that there is a way to receive severe weather warnings, such as a NOAA Weather Radio or a service to send warnings via text message to your cellular phone (one of which is available through the Oklahoma Department of Emergence Management web site.)

Although the outbreak on May 3, 1999 was a rare event as were the intensity of the tornadoes, it does serve as a reminder of the power that tornadoes can produce and that Oklahomans should have a plan for when tornadoes threaten. ■

Classroom Answers

1. a) In Photo 1, the structure looks like it was a one-family residence. Also, there are some possible hardwood trees near the house. In Photo 2, the main structure is a one-family residence.

b) For Photo 1, I would give the tornado an EF5 or high-end EF4 rating based on the damage to the house (slab is completely swept clean). Some of the trees may have been snapped, but the observer is too far away to tell if the trees were debarked (maybe EF1 based on the trees). Since EF5 or high-end EF4 is the highest damage observed, this tornado would most likely be rated an EF5. For Photo 2, I would give the tornado an EF2 rating based on the fact that much of the exterior walls are collapsed (expected estimated speed around 132 mph).

c) I would give this torn ado a rating of EF5, since the greatest damage in Photos 1 and 2 gives a value of EF5.

2. a) In Photo 3, the structures include a small building (most likely a small professional building) and a possible mobile home (which is hard to see at this angle). In Photo 4, the main structure appears to be a single-family residence.

b) For Photo 3, I would rate the tornado as an EF3 because the exterior walls of the business are gone, leaving only the interior bathroom standing (expected estimated speed around 144 mph). The trailer looks like it was rolled over, but it is difficult to tell if there is any further damage. Looking at the visible damage, the rating would likely be EF1. Since we use the highest damage rating, the tornado would be rated as EF3. For Photo 4, I would rate the tornado as an EF5 because even the basement was carried away!

c) I would give this tornado a rating of EF5, since the greatest damage in Photos 1 and 2 gives a value of EF5.

3. Radar measurements tend to be instantaneous wind speeds, not 3-second averages. The wind speed will be lower if averaged over 3 seconds—the duration used for EF-scale winds. Also, the radar beam usually measures the wind at least several hundred feet above the ground (in this case, at about 105 feet above ground level) and wind speed tends to increase with height. So, chances are pretty good that the wind speed below the measurement will be lower.

APRIL FIRES

by LAURA MARTIN
OSU Mesonet Agricultural Extension Associate

It has been almost four months since wildfires devastated many communities across Oklahoma. Driven by dry conditions and high winds, these fires charred more than 100,000 acres, damaging businesses, homes and farmland.

April 9 began as an ordinary spring day in Oklahoma. Residents followed daily routines with no idea of the impending devastation.

"My husband and I shared our morning coffee as usual. Our parting ritual for the better part of 20 years has been a good-bye kiss, followed by 'I love you' and 'Be careful.' We both went to work," said Bonnie Milby. "He went to the headquarters of the Iowa Tribe Police Department south of Perkins. I went to my office in the Department of Agricultural Education, Communications and Leadership on the OSU Campus in Stillwater."

During the afternoon hours, a strong storm system moved into the state, pushing a dryline east of I-35, bringing high temperatures and low humidity. Near the dryline, temperatures approached 90°F and relative humidity fell as low as 6 percent.

"All the meteorological ingredients came together across western and central Oklahoma to create a 'perfect storm' for severe wildfire outbreaks," said Dr. J.D. Carlson, Fire Meteorologist at Oklahoma State University. "During the afternoon, winds in most areas were sustained at 30 to 40 mph with gusts as high as 74 mph."

David Milby, a volunteer firefighter with the Iowa Tribe of Oklahoma, deputy fire chief, and training officer for the fire department, was helping fight wildfires that day.

"He and his driver joined several other fire departments, including Wellston, to locate a wildfire line near I-44 and Route 66, which was being whipped by 58 mile-per-hour winds," said Bonnie Milby. "Smoke was clearly visible, but the edge of the fire line itself was obscured by the rough terrain."

Photo courtesy of the Oklahoman

Later that afternoon, Bonnie Milby received a message on her phone to contact Iowa tribal police officers. The fire truck David Milby was in became lodged in a ravine, forcing him to run for his life.

"When I spoke with [the officer], she told me that Dave had been injured near Wellston and that he was being taken to the Baptist Burn Center in Oklahoma City. It was terrible. I thought I would pass out," said Bonnie Milby. "I started contacting all my sons for assistance. One of them gave me a ride to the hospital where I was met by my married son and his family."

David Milby sustained second and third degree burns to 26 percent of his body along with inhalation injuries.

"I didn't get to the hospital before he was moved from the ER to the ICU, sometime around 8:00 p.m.," said Bonnie Milby. "It was truly horrible to see him unconscious in the intensive care unit. He was on a ventilator. He was hooked up to all kinds of monitors and tubes. His face and arms oozed pus and blood. The ICU nurse told me that he would probably swell severely. He did within 48 hours of his admission."

David Milby spent more than two months recuperating in the hospital and is continuing his recovery at home. cont. >>

Photos courtesy of the Oklahoman

"He is recovering well at home now," said Bonnie Milby. "Of course, he is improving more slowly than he would like."

The fateful day that changed the David Milby's life impacted many Oklahomans. More than 15 counties were affected by the April 9 wildfires. Hundreds of residents were evacuated as the threat of wildfire became imminent and Interstate 35 was closed in several locations because of large wildfires.

According to a report by the Oklahoma Department of Emergency Management, there were a total of 167 homes, 6 businesses and 30 other structures destroyed across the state. Midwest City and Choctaw were two Oklahoma County towns ravaged by these wildfires. "This was the largest fire that I can recall in Midwest City," said Mike Bower, Midwest City Emergency Management Director. More than 40 fire departments assisted Midwest City in battling the blazes, along with the Sheriff's Office, and many city agencies. "And, we needed everyone of them," said Bower.

Midwest City lost 12 homes in one subdivision and there was considerable damage to others. "All of these homes were built in 2001 and all of them are currently moving forward with rebuilding," said Bower. "There were 58 homes lost in the Choctaw area. A lot of these were older homes that had no insurance or were underinsured. A number of these homes are just sitting there as they were after they burned."

Although time will gradually erase scars left by the April 9 wildfires, the impact will continue to be remembered. ■

Steve Stadler

Interview by Maggie Hoey Mesonet Extension Assistant
Photographs by Todd Johnson

In life people usually specialize in one thing. Some people are gifted enough to be good at a couple things. Then there are the people that seamlessly juggle various tasks and wear multiple hats, making them a “jack-of-all-trades”.

Dr. Steve Stadler, professor of geography at Oklahoma State University and state geographer of Oklahoma, qualifies as a jack-of-all-trades.

Born the son of a Sherwin Williams executive, Stadler called many places home growing up. He was born in New Jersey, lived in northeastern Ohio, south of Chicago, and graduated high school in northern Ohio.

Growing up Stadler was never sure what he wanted to be, but had a love of reading and enjoyed the science of space. When asked if Stadler dreamed of being a geographer since a young age, he just chuckled.

“It was happenstance I got involved with geography and happenstance that I kept going,” Stadler said.

Stadler enrolled at Miami University with the dream of being a high school history teacher. It wasn’t until he was required to take a course in geography that he started rethinking his career path.

“I knew I liked geography, but I never thought I would be a geographer,” Stadler said. “Geography is typically something you are introduced to through education. Not many geographers dreamed of doing that from a young age.”

As graduation drew near, Stadler decided to put teaching social studies on hold to pursue a master’s degree in geography. It was during his graduate coursework where his teaching aspirations changed to focus on becoming a college professor.

Upon completion of his master’s degree in geography from Miami University in 1976, Stadler began pursuing a Ph.D. in physical geography at Indiana State University. cont. >>

> “My contribution to knowledge isn’t specifically climatology, it’s relating the atmosphere to people.”

For Stadler, this is when he took his interest in geography and began exploring climate.

“I knew I wanted to study climate,” Stadler said. “Climatology and geography have been combined for more than a hundred years. This combination interested me and I decided to focus on physical geography.”

After earning his PhD he began his teaching career with a temporary position at Michigan State University. In 1980, Stadler began his teaching career at OSU.

At OSU, Stadler coordinates a physical geography general education course that several hundred students take each semester. He also teaches a climatology course focusing on the big picture of climate and trends around the world. Each spring, Stadler teaches an introduction to meteorology course, studying short-term atmospheric trends.

Stadler is entering his 30th year of teaching at Oklahoma State University and he admits he sees no reason to leave now.

Although being a college professor can keep someone busy, that is only one hat that Stadler wears.

In 2004, Stadler was appointed by Governor Brad Henry as the state geographer of Oklahoma to serve as a geographic resource for the state.

“People can call me and get help from a geographic viewpoint for different decisions they might me making,” Stadler said. “It’s not a full-time job, but something that is a service to the geographic cause.”

He’s committed to sharing his knowledge of geography to help educate leaders throughout the state and Oklahoma Citizens.

“My contribution to knowledge isn’t specifically climatology, it’s relating the atmosphere to people,” Stadler said.

This contribution to knowledge made him an asset to developing the Oklahoma Mesonet.

Since day one, Stadler has been involved with the Oklahoma Mesonet as a cheerleader, steering committee member and advocate of the Oklahoma Mesonet’s mission.

As if juggling three hats isn’t enough, Stadler also serves as the co-director of the Oklahoma Wind Power Initiative.

The Oklahoma Wind Power Initiative, a joint project between OSU and the University of Oklahoma, has been investigating and promoting wind energy in Oklahoma since it began in July 2000.

“The future of wind energy in Oklahoma is very bright,” Stadler said. “Development is proceeding and will continue to proceed because we have such a good wind resource in our state.”

Although Stadler’s to-do list shifts depending on what hat he is wearing on a particular day, he is a valuable asset to Oklahoma State University, the Oklahoma Mesonet and the state of Oklahoma. ■

the DEEPFREEZE OF APRIL 2009

by Gary McManus Associate State Climatologist

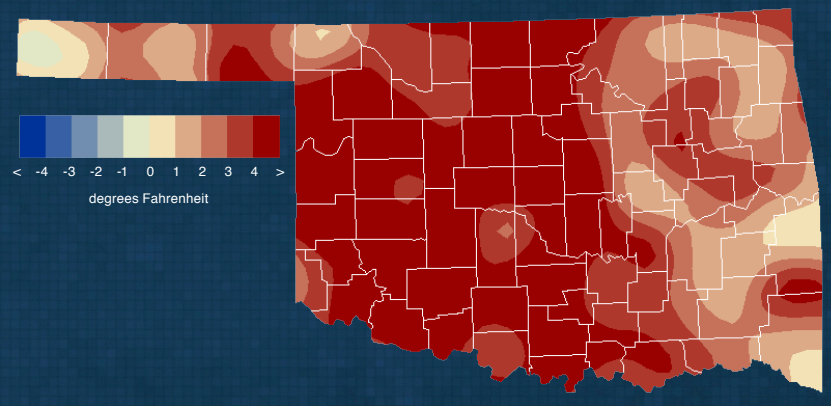
Oklahoma farmers have a lot to put up with from Mother Nature: if they aren't in drought, they're getting too much rain. When it does rain, it's generally at the wrong time of the year. If it's warm it should be cold, if it's cold it should be warm. And sometimes it's too warm too early or too cold too late … and if those two predicaments should coincide, disasters can happen. This is exactly what occurred in the spring of 2007 when an April freeze, certainly not out of the ordinary, occurred after Oklahoma's warmest March on record. Not only was the wheat crop in northern Oklahoma devastated, Oklahoma's burgeoning wine industry was hurt by a damaged grape crop. Farmer's aren't the only ones affected by freeze damage – ornamental plants and trees in urban settings are also hurt by the cold weather.

Late-winter and early-spring 2009 was also warm, much like 2007. In fact, the February-March 2009 period was the 13th warmest statewide at more than 3 degrees above normal. Southwestern and south central Oklahoma were close to 4 degrees above normal and ranked as the sixth- and ninth-warmest such periods on record for those areas. Droughty conditions dating back to fall 2008 had been occurring during this time as well. The October-March statewide average precipitation total was less than 10 inches, more than 5 inches below normal and the 13th driest such period since 1921. Wheat responds to drought and warmth by maturing more quickly, so at the end of March much of the Oklahoma wheat crop was weeks ahead of where it normally should be at that time of year – a disaster waiting to happen.

FEBRUARY-MARCH 2009
MESONET TEMPERATURE COMPARISON

Climate Division	Avg. Temperature (°F)	Departure from Normal (F)	Rank since 1895
Panhandle	44.6	2.1	24th Warmest
North Central	47.1	3.1	17th Warmest
Northeast	48.0	2.8	17th Warmest
West Central	48.9	3.9	10th Warmest
Central	50.4	4.0	11th Warmest
East Central	49.9	2.5	17th Warmest
Southwest	51.6	4.1	6th Warmest
South Central	52.8	3.7	9th Warmest
Southeast	51.1	2.2	21st Warmest
Statewide	49.3	3.2	13th Warmest

February-March 2009 Departure from Normal Temperatures



The first blow was a blizzard which struck northwestern Oklahoma on March 27-28. More than two feet of snow fell in the northwest and winds of more than 50 mph caused drifts of more than 10 feet in some places. Much of the northwestern half of Oklahoma spent between 20-50 hours below freezing with lows bottoming out in the mid-20s over the entire state. It was hoped that the snow helped protect the wheat crop by insulating it from the sub-freezing weather Nevertheless, some freeze

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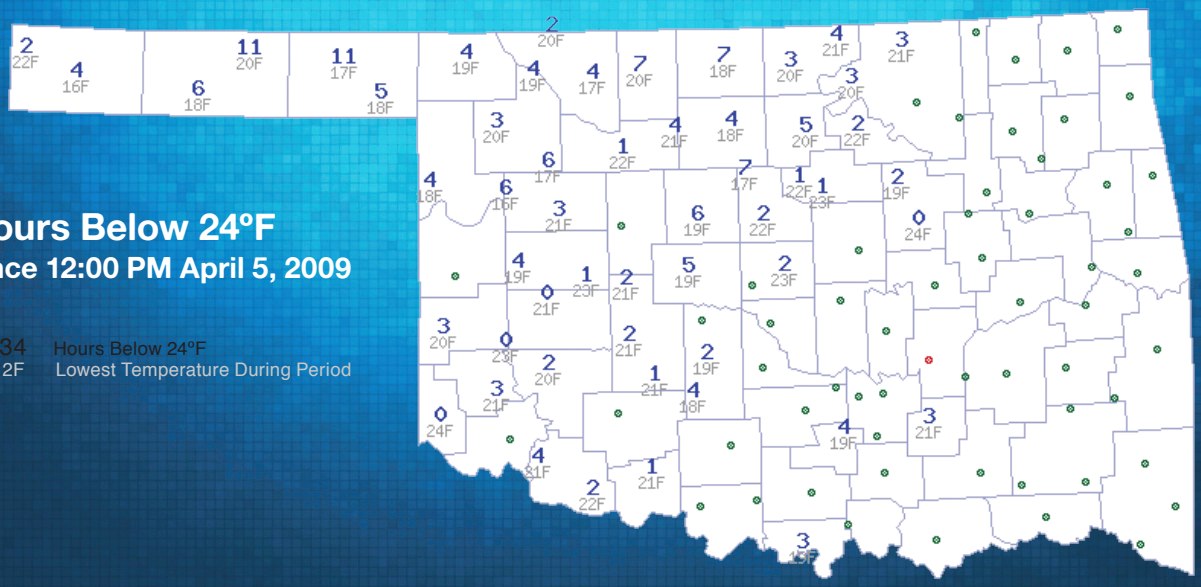
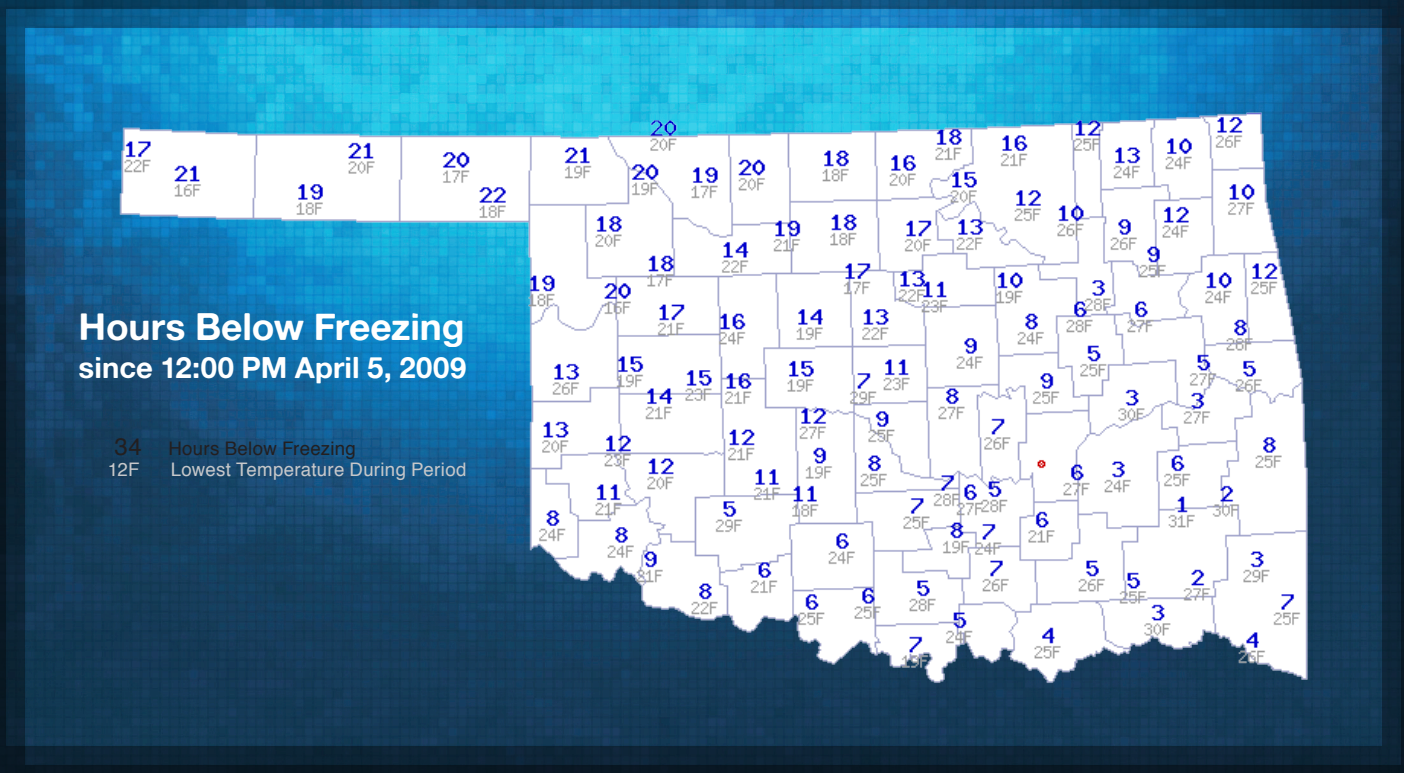


Hours Below 24°F
since 12:00 PM April 5, 2009

34 Hours Below 24°F
12F Lowest Temperature During Period

Hours Below 28°F
since 12:00 PM April 5, 2009

34 Hours Below 28°F
12F Lowest Temperature During Period



damage did occur. Looking for a silver lining, many farmers welcomed the moisture. The weather warmed into the 70s and 80s within a week and it looked like the worst was averted. However, Mother Nature had yet another shock in store for the state.

A strong upper-level storm system and associated surface low passed over the state on the fourth. Strong northerly winds ushered in dry Canadian air behind the front. That air wasn't shockingly cold, but a reinforcing shot from the north on the sixth combined overnight with light winds and clear skies to produce radiational cooling and plummeting temperatures. Readings were below freezing up to 20 hours across much of northwestern Oklahoma to about 5-10 hours across the south. Low temperatures settled into the upper-teens and low 20s across the state. A low of 19 degrees was reported the morning of the seventh in Burneyville, which also spent 7 hours below freezing.

Obviously the magnitude and duration of the freeze would determine the extent of the freeze damage. Oklahoma's wheat crop took a devastating blow across many sections of the state. The damage was worst in southern Oklahoma with many fields suffering 80-90 percent damage, a complete loss. Central sections of the state saw 40-60 percent damaged, with lesser amounts in the northern tier of counties. ■

WINTER 2008-2009 SUMMARY

by Gary McManus

Dry and warm would be the most apt way to describe winter's weather with a statewide average temperature that finished nearly 2 degrees above normal and a precipitation total that fell more than 2 inches below normal. The 31st warmest and 16th driest winter since 1895-96 was not without excitement of its own, however, as severe weather included several tornadoes and a significant ice storm. An EF1 tornado touched down in December but the real tornadic story was the six tornadoes during February, a total that included a violent EF4 twister that killed eight in Lone Grove. The ice storm struck eastern Oklahoma in late January and left 50,000 utility customers without power. Areas west of the ice storm were left paralyzed by snow, sleet and freezing rain.

Precipitation: Only the eastern one-third of the state saw significant precipitation during winter. In fact, much of the western one-half received less than two inches for the three-month period. Still, eastern Oklahoma was below normal by several inches. The southeast had a deficit of more than 4 inches. The Panhandle and west central Oklahoma received less than an inch of liquid precipitation, on average, and finished with their 3rd- and 5th-driest winters since 1895-96, respectively. Sallisaw recorded the most precipitation during the winter with 7.65 inches while Slapout brought up the rear with a paltry 0.21 inches.

Temperature: While most of the state was above normal, east central and the extreme northeast had areas that were slightly below normal. The extreme northwest corner of the state's main body was above normal by more than 4 degrees. The state's warmest reading was 91 degrees on February 26 at Madill and the lowest was -1 degrees at Buffalo on January 28th.

DECEMBER DAILY HIGHLIGHTS

December 1-7: December started out cold with a few light snow showers scattered about on the first and highs in the 30s and 40s. Strong northerly winds gusting to 30 mph helped drop wind chills into the teens and 20s. The state remained dry through the seventh and temperatures fluctuated around a cold front passage on the third. High temperatures managed to rise into the 60s and 70s by the seventh due to strong southerly winds ahead of an approaching storm system.

December 8-9: Moisture increased with the strong southerly winds as surface and upper-level low pressure systems approached from the west on the eighth. Low temperatures were in the 40s and 50s and high temperatures made it into the 70s. Light rain started early in the afternoon and became heavier into the evening. Storms reached severe levels in some areas with one-inch hail and strong winds gusting to over 60 mph. An EF1-rated twister touched down near Broken Arrow late on the eighth, destroying a mobile home and a barn. As the temperatures plunged, the rain changed to snow into the ninth in northern Oklahoma. Most reports had snow depths at 2 inches or less, but more than 3 inches was reported in Grant County and 4 inches fell in Major County. Scattered areas of freezing rain and drizzle fell farther to the south. Highs only rose into the 20s in northern Oklahoma, with 40s in the south.

December 10-14: High pressure at the surface made for a cold start the morning of the 10th. Low temperatures fell into the teens and 20s with a few single-digit lows scattered about the snow-covered areas of the northwest. High temperatures struggled into the 30s and 40s that afternoon. Temperatures warmed up through the 13th and highs that day reached into the 60s and 70s. An approaching cold front on the 14th kicked up strong winds from the south which allowed temperatures to soar into record territory. Tulsa set a record high temperature of 75 degrees on the 14th. The highest temperature of the month, 79 degrees, was first recorded at Tipton and Waurika that afternoon. The cold front roared through the state, rapidly dropping temperatures in its wake. By later that night, temperatures had fallen into the single digits in the northwest. A few spotty showers in the southeast provided some very light precipitation.

December 15-17: Possibly the strongest cold front since last January passed through the state and dropped temperatures into the single digits in the northwest. Combine that with gusty winds of about 30 mph and that area was also blessed with below-zero winds chills. Temperatures were about 30 degrees below normal, and McAlester, Oklahoma City and Tulsa all set records for coldest maximum temperatures on the 15th. The state's lowest recorded temperature of 2 degrees occurred at Kenton that morning. The cold weather hung around through the 17th, accompanied by light snow, freezing drizzle, and sleet.

December 18-23: Southerly flow returned late on the 18th and temperatures around midnight were in the 40s and 50s with dense fog. A center of surface low pressure in Kansas moved to the east and switched winds in Oklahoma to a westerly direction. The drying west winds cooled the air. Lows dropped into the 20s and 30s where the air had dried but remained in the 50s and 60s where the moisture hung around. A strong cold front on the 20th cooled the state once again. Single-digit lows returned to the northwest through the 22nd before teens prevailed on the 23rd. Strong southerly winds on that day, gusting to 50 mph, brought moisture and freezing drizzle into the state which made for slippery travel conditions. Clearing skies in the far western sections of the state allowed temperatures to rise into the 50s and 60s, but cool weather prevailed elsewhere with highs in the 30s and 40s.

December 24-27: A cold front overnight on the 24th generated light showers in southeastern Oklahoma and dropped temperatures from the 40s into the 20s. High pressure at the surface meant light winds and plenty of sunshine later that afternoon. Highs ranged from the 30s in the north to 50s in the south. Moisture returned on southerly winds kicked up by an approaching storm system on the 26th. The southerly winds, gusting to 40 mph, also brought record high temperatures. McAlester, Muskogee, Oklahoma City, and Tulsa all set highest maximum temperature records on the 26th, and Oklahoma City also set a record for highest minimum temperature as well. A dryline and cold front passed through the state overnight on the 27th and kicked off a round of storms, some of which exceeded severe limits. Scattered wind damage and golfball size hail were reported with the storms. Temperatures rose into the 60s and 70s ahead of the front but plummeted into the 30s and 40s following the front's passage.

December 28-31: As the upper-level storm system exited on the 28th, high pressure at the surface moved in. Lows were in the teens and 20s and high temperatures rebounded into the 50s. The weather warmed up for a couple of days with highs on the 30th in the 60s and 70s. A cold front ruined the nice weather and brought the state back to seasonable levels on the 31st. Lows were in the teens and 20s and highs were in the 30s and 40s.

JANUARY DAILY HIGHLIGHTS

January 1-3: The month had a warm start through the first three days with highs ranging from the 50s and 60s on the first to 70s and 80s on the third. The springtime temperatures quickly vanished later on the third as an arctic cold front swept through the state and dropped temperatures back into the 40s. The Oklahoma Mesonet stations at Burneyville and Newport recorded high temperatures of 82 degrees before the cold front passed, and four NWS observing stations set or tied record high temperatures for that day.

January 4-9: Winter weather returned after the arctic cold front. Winds gusted to over 30 mph the morning of the fourth and combined with temperatures in the teens and 20s to produce single-digit wind chills. A bit of freezing rain and sleet on the fifth gave way to a warm-up over the next couple of days. By the eighth and ninth, temperatures had risen into the 70s and 80s. Oklahoma City broke its high temperature record for the ninth with a reading of 75 degrees, and the Altus Mesonet site recorded a high of 81 degrees. A cold front moved through the state later that day and dropped temperatures back into the 50s and 60s, accompanied by wind gusts of over 50 mph.

January 10-12: Frigid temperatures on the 10th were the norm after the cold front. Northerly winds gusting over 50 mph accompanied low temperatures in the teens and 20s to produce wind chills close to zero. The weather warmed through the 12th until a late cold front brought the state back to the reality of winter.

January 13-16: Lows in the single digits on the 13th greeted the northwestern area of the state. A low pressure trough moved over the northwest in

the afternoon and switched winds around from north-to-south at 5-10 mph. Temperatures managed to climb into the 40s and 50s. A modest warm-up on the 14th gave way to a reinforcing shot of cold air on the 15th with yet another cold front passage. A smattering of snow occurred in the far northern parts of the state. Most amounts were around a half of an inch. High temperatures on the 15th were in the 20s and 30s, with single-digit wind chills. The cold air began to move east on the 16th and high temperatures rose into the 60s in some areas.

January 17-23: A weak cold front did little to diminish the warm weather on the 17th. Highs rose into the 50s and 60s that afternoon. Those temperatures were parlayed into 60s and 70s over the next couple of days before a cold front slowed things down a bit on the 19th. High temperatures rebounded quickly and were once again into the 60s and 70s through the 23rd. The month's high temperature of 84 degrees was recorded on the 22nd at the Waurika and Ringling Mesonet sites. A more powerful cold front arrived in the state on the 23rd, however, dropping highs into the 40s as it passed, and kicked winds up from the north at 40 mph.

January 24-27: Frigid temperatures on the 24th set the stage for the most significant storm of the season. Light snow flurries fell that day amidst temperatures in the teens and 20s. Northerly winds gusting to 40 mph produced wind chills in the single digits. By afternoon, the sun had come out and highs ranged from the upper 20s to the low 40s. A similar day on the 25th gave way to an icy 26th, courtesy of an upper-level storm system to the west. The precipitation started as light freezing drizzle in south central Oklahoma, increasing to light freezing rain as it moved towards central Oklahoma. Travel problems quickly erupted and by evening, travel was discouraged over much of the state. Freezing drizzle, freezing rain, sleet, and light snow continued overnight into the 27th. Some areas experienced thunder as well, signaling heavier convective precipitation. Up to 3 inches of sleet fell in central Oklahoma, and nearly 2 inches of ice accumulations were reported on power lines in east central Oklahoma. More than 50,000 electrical utility customers lost power in Oklahoma from downed power lines.

January 28-31: Temperatures were quite cold on the 28th, especially in the ice-encased areas. The month's low temperature reading of 31 degrees was recorded at Mesonet sites in Buffalo and Nowata. High temperatures rebounded into the low 50s in the west with plenty of sunshine and no ice. Where there was ice, however, temperatures struggled to rise into the 40s. A slow warm-up brought temperatures well into the 60s and 70s by the 31st. The ice melted quickly over those three days and gave some drought-stricken portions of Oklahoma a nice gentle soaking.

FEBRUARY DAILY HIGHLIGHTS

February 1-4: The first four days of the month were dry and a bit warm, despite a cold front on the first. Highs were 5-10 degrees above normal in the 50s, with a few 60s thrown in. Gusty winds made the mornings feel quite cool at times.

February 5-7: An area of low pressure at the surface moved into northwestern Oklahoma on the fifth, kicking up winds from the south gusting to 30 mph. Lows fell into the 20s and 30s but quickly rose into the 60s and 70s. Oklahoma City tied its record-high temperature on the sixth with a reading of 73 degrees. Warm moist air surged northward over the next couple of days until a cold front arrived late on the seventh. The Oklahoma Mesonet site at Guthrie registered a low of 61 degrees on the seventh.

February 8-11: Skies turned cloudy overnight on the eighth as an upper-level storm system moved in from the west. Lows were very mild and rain formed late with the surge of moisture from the Gulf of Mexico. Rain fell statewide, although it was heaviest in south central and central Oklahoma. Amounts were generally less than an inch. A pacific front moved across the state on the ninth and brought winds gusting up to 60 mph with it. Highs in the 60s and 70s prevailed despite the front. The front then started to lift back on the 10th as a warm front with a dryline and cold front farther to the west and north. Dewpoints increased throughout the day to the east of the dryline. Storms kicked off first in central and southwestern Oklahoma that afternoon, quickly becoming severe in the warm, moist air. Large hail to the size of softballs was reported in Osage County, while baseball size hail was reported in central Oklahoma. Unfortunately, tornadoes were included in the severe weather reports, the worst of which struck the small town of Lone Grove in Carter County. That twister was estimated by a NWS survey team as an EF4, the most powerful tornado reported in Oklahoma during February since accurate tornado statistics began in 1950. Its toll was tremendous, killing eight and injuring 25 others. Five other tornadoes were reported on the 10th. An EF2 twister struck Edmond and severely damaged several houses and injuring one person, according to preliminary reports. An EF1 tornado touched down in Logan County and damaged a few homes and trees. Three other weak tornadoes were reported that day as well with little damage reported. The storms produced more heavy rain than any other type of weather as they progressed to the northeast. Several flash flooding reports came in late on the 10th and early on the 11th as the storms dropped close to 4 inches of rain in the northeast corner of the state. The 11th turned out to be a pretty nice day following the violent weather of the 10th. High temperatures rose into the 50s and 60s under a sunny sky after lows in the 30s and 40s.

February 12-16: This five-day period was definitely quieter by comparison than the previous few days. The 12th and 13th were quite pleasant with seasonable lows to go along with highs mostly in the 60s and 70s. A cold front late on the 13th cooled things down for a bit, however, and the remainder of the period saw a slow warm up back into more seasonable territory.

February 17-20: An approaching cold front on the 17th brought gusty southerly winds and unseasonably warm temperatures. Highs rose into the 80s in southern Oklahoma but remained in the 50s in northeastern Oklahoma behind the front. The next three days were windy and dry, with cold mornings and warm afternoons. The strong winds and low humidity created dangerous wildfire conditions.

February 21-26: A strong cold front entered the state early on the 21st and dropped temperatures 10-20 degrees cooler than the previous day. Wind gusts up to 60 mph accompanied the front in western Oklahoma. High temperatures remained in the 40s and 50s. The following morning was clear and frigid with lows in the teens and 20s. A strong warm up occurred over the next several days along with strong southerly winds. Fire danger was high over the entire period. The warmth culminated on the 26th with record high temperatures over southern Oklahoma. Madill experienced February's highest temperature on the 26th with a reading of 91 degrees.

February 27-28: A powerful cold front roared through the state for the month's final two days. Northerly winds gusting to 35 mph combined with temperatures in the teens and 20s to produce wind chills down close to zero in some parts of the state. High temperatures on the 28th only rose into the 30s and 40s.

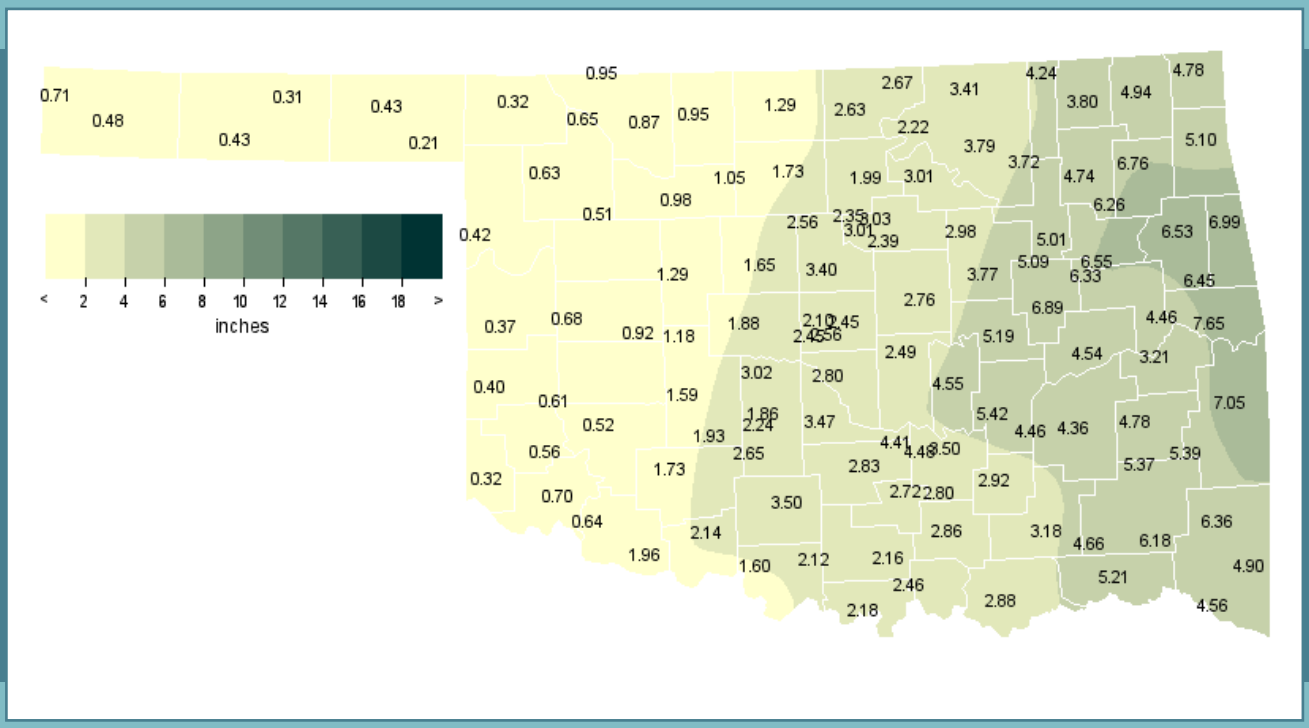
Winter 2008-09 Statewide Extremes

Description	Extreme	Station	Date
High Temperature	91°F	Madill	February 26
Low Temperature	-1°F	Buffalo	January 28
High Precipitation	7.65 in.	Sallisaw	
Low Precipitation	0.21in.	Slapout	

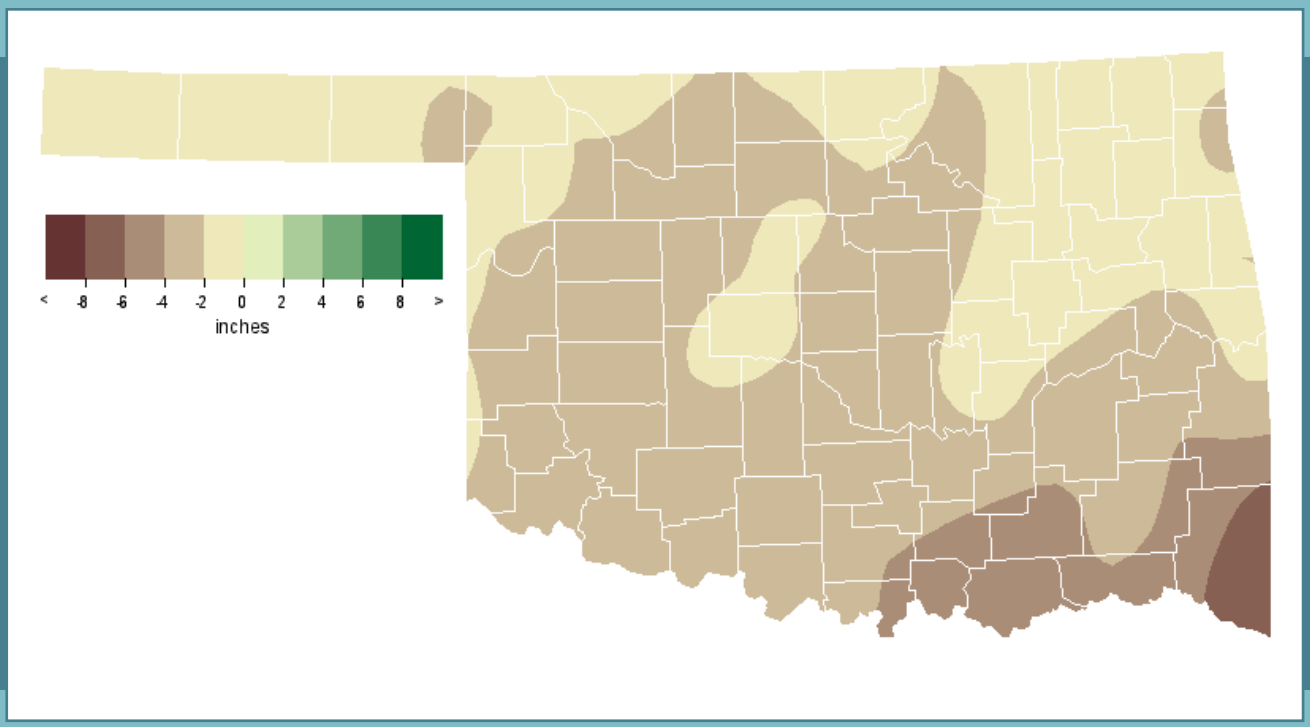
Winter 2008-09 Statewide Statistics

	Average	Depart.	Rank (1895-2009)
Temperature	40.5°F	1.7°F	31st Warmest
	Total	**Depart.**	**Rank (1895-2009)**
Precipitation	2.77 in.	-2.46 in.	16th Driest

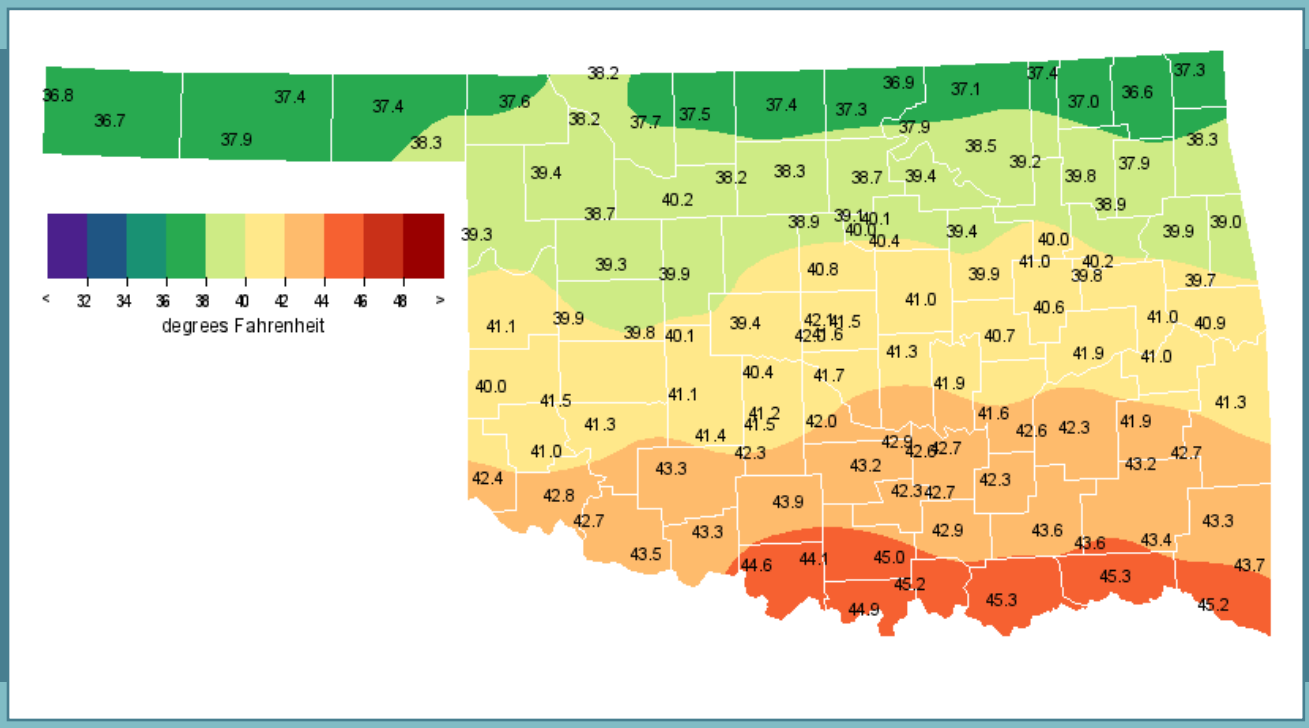
OBSERVED RAINFALL



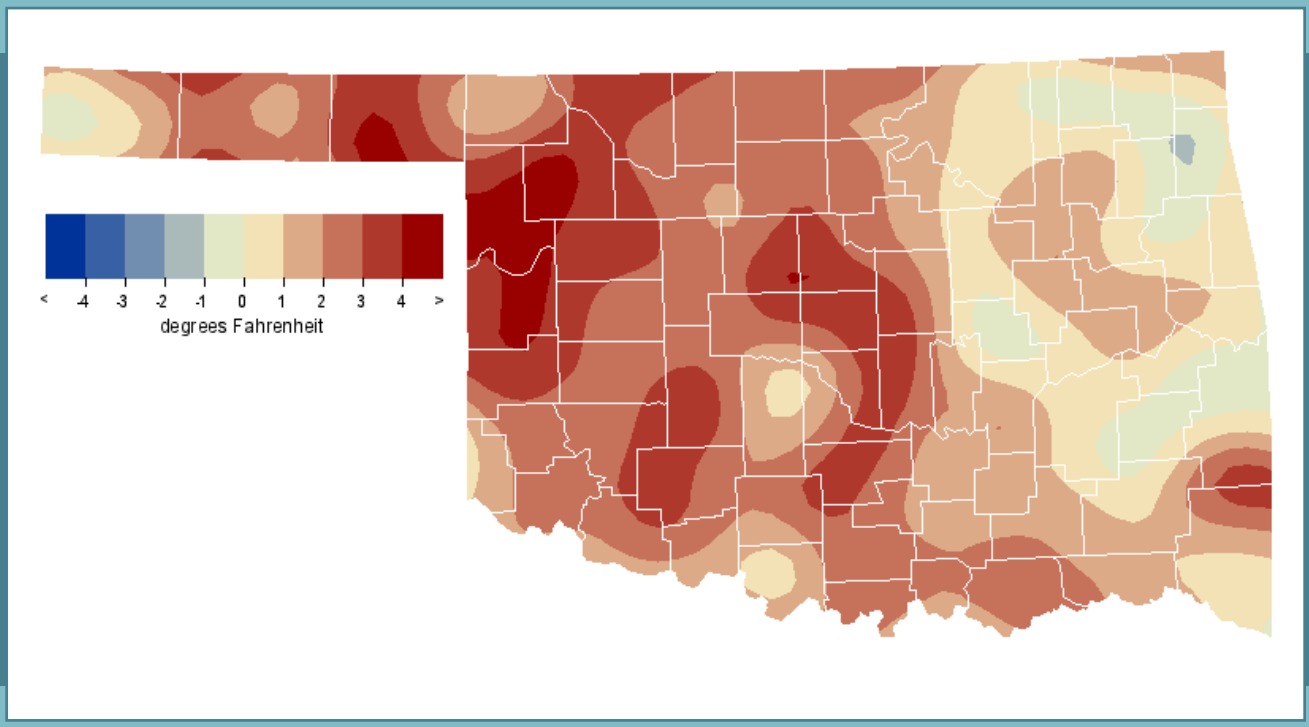
RAINFALL DEPARTURE FROM NORMAL



AVERAGE TEMPERATURE



TEMPERATURE DEPARTURE FROM NORMAL



MESONET PRECIPITATION COMPARISON

Climate Division	Precipitation (inches)	Departure from Normal (inches)	Rank since 1895	Wettest on Record (Year)	Driest on Record (Year)	2008
Panhandle	0.41	-1.45	3rd Driest	5.48 (2007)	0.10 (1904)	2.60
North Central	1.30	-2.15	13th Driest	7.78 (1985)	0.51 (2006)	5.75
Northeast	4.56	-1.27	45th Driest	15.24 (1985)	1.81 (2006)	9.29
West Central	0.71	-2.45	5th Driest	7.83 (1960)	0.21 (1909)	5.18
Central	2.82	-2.42	25th Driest	13.80 (1985)	0.38 (1909)	6.64
East Central	5.57	-1.97	34th Driest	14.59 (1938)	1.97 (1918)	7.56
Southwest	1.21	-2.56	10th Driest	9.05 (1985)	0.14 (1909)	3.88
South Central	2.91	-3.73	13th Driest	13.36 (1998)	0.53 (1909)	4.87
Southeast	5.45	-4.57	11th Driest	20.47 (1932)	3.13 (1963)	9.91
Statewide	2.77	-2.46	16th Driest	10.37 (1985)	1.24 (1909)	6.18

MESONET TEMPERATURE COMPARISON

Climate Division	Average Temp (F)	Departure from Normal (F)	Rank since 1895	Hottest on Record (Year)	Coldest on Record (Year)	2008
Panhandle	37.7	2.4	20th Warmest	40.1 (2000)	27.1 (1899)	35.3
North Central	38.2	1.9	28th Warmest	43.0 (1992)	27.5 (1979)	35.8
Northeast	38.4	0.7	45th Warmest	43.9 (1932)	29.4 (1979)	37.5
West Central	40.2	2.6	20th Warmest	43.4 (1992)	29.5 (1979)	38.6
Central	40.8	1.8	24th Warmest	44.7 (1992)	30.8 (1905)	39.4
East Central	40.9	0.7	50th Warmest	45.6 (1932)	32.7 (1978)	40.6
Southwest	42.1	2.1	25th Warmest	44.9 (1952)	32.4 (1899)	41.1
South Central	43.6	1.7	31st Warmest	47.6 (1952)	34.7 (1905)	41.9
Southeast	43.4	1.2	41st Warmest	48.4 (1932)	35.3 (1978)	42.1
Statewide	40.5	1.7	31st Warmest	44.0 (1992)	31.2 (1905)	39.0

MESONET EXTREMES FOR WINTER 2008-09

Climate Division	High Temp	Day	Station	Low Temp	Day	Station	High Monthly Rainfall	Station	High Daily Rainfall	Day	Station
Panhandle	84	Feb 6th	Beaver	-1	Jan 28th	Buffalo	0.71	Kenton	0.69	Feb 8th	Kenton
North Central	80	Feb 17th	Fairview	0	Jan 28th	Freedom	2.67	Newkirk	1.22	Feb 10th	Blackwell
Northeast	82	Feb 26th	Bixby	-1	Jan 28th	Nowata	6.76	Pryor	2.81	Feb 10th	Inola
West Central	83	Feb 26th	Bowlegs	1	Jan 28th	Marshall	5.19	Okemah	2.09	Feb 10th	Guthrie
Central	84	Feb 26th	Calvin	4	Dec 22nd	Cookson	7.65	Sallisaw	3.39	Jan 27th	Sallisaw
East Central	87	Feb 26th	Grandfield	1	Jan 28th	Mangum	2.14	Walters	0.67	Feb 10th	Walters
Southwest	91	Feb 26th	Madill	8	Jan 16th	Sulphur	4.48	Vanoss	1.47	Feb 10th	Vanoss
South Central	84	Feb 4th	Newport	8	Feb 1st	Sulphur	7.76	Durant	2.14	Feb 16th	Durant
Southeast	83	Feb 26th	Antlers	10	Dec 22nd	Wilburton	7.05	Wister	2.12	Dec 27th	Wister
Statewide	91	Feb 26th	Madill	-1	Jan 28th	Buffalo	7.65	Sallisaw	3.39	Jan 27th	Sallisaw

AgWatch

by Albert Sutherland, CPA, CCA
Mesonet Assistant Extension Specialist
Oklahoma State University

As we finish out April of 2009, Oklahoman farmers and ranchers have been left wondering, "What's next?" February will go down as a dry one for the Oklahoma wheat belt with less than a half-inch of precipitation. March continued on the dry side with slightly warmer temperatures than normal. The end of March saw a freeze across the state and a record setting snow event in the Panhandle. More than 2 feet of snow fell, a new record for Oklahoma. Wind-whipped snow piled up to form drifts 5-6 feet high.

Then April arrived, bringing freeze, fire and flood to Oklahoma. The month started with a devastating freeze (see Figure 1) that caused severe yield loss to the Oklahoma wheat crop. The map in Figure 2 shows the number of hours below 28°F and the minimum temperatures reached on the nights of April 5 and 6, 2009.

On Thursday, April 9th, wildfires swept across central Oklahoma. The most damaging of these blazes burned close to a 100 homes in Midwest City, prompting Midwest City Police Chief Brandon Clabes to exclaim, "This is probably the worst disaster in Midwest City's history, even worse that the May 3, 1999 tornadoes." Fortunately, no serious injuries were reported from the Midwest City fire. Others were not so fortunate, as 49 people were injured in a line of scattered fires from Ardmore to Ponca City. Fires destroyed more than 140 homes, with at least 52,000 acres burned.

After early April, storms crossed the state providing much needed rainfall. Statewide rainfall for April 2009 was 4.9 inches, 1.5 inches above normal. Burneyville recorded 12.42 inches on April 29, 2009. This broke past daily and monthly precipitation records for Burneyville. It was also the highest single day rainfall ever recorded at an Oklahoma Mesonet site.

Figure 1: Wheat field 15 days post-freeze near Chickasha, OK (April 22, 2009 photo).

Figure 2: Hours below 28˚F and min. air temperature for April 5 & 6, 2009.

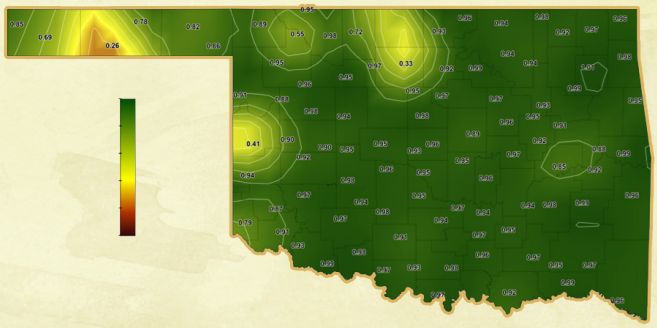


Figure 3: 25-cm (10") Fractional Water Index soil moisture April 30, 2008.

With the swings in weather, the 2008-09 wheat crop suffered from drought before being hammered by the March and April freezes. When the rain did arrive, it was too late, and in some cases too much. The estimates of this year's wheat crop are not looking good. Drought had pushed wheat maturity ahead, setting it up for high levels of damage, when the freezing weather arrived.

Pastures are generally in good shape because of April's rain. Growth has been a little slow to date, but should jump with warmer May weather and good soil moisture. The 10-inch soil moisture shown as "Fractional Water Index" in Figure 3 indicates good moisture levels across much of Oklahoma as of May 1, 2009. The vast majority of the fractional water index values are close to 1.00, the maximum wetness value. This will mean that most Oklahoma farmers will head into the summer months starting off with a good amount of moisture in the soil profile.

April storms have caused delays in field preparation and planting of row crops. The percentage of total crop planted was 50 percent for corn, 15 percent for soybeans, 10 percent for peanuts and 24 percent for watermelon by April's end. ■

To access the products highlighted in AgWatch go to Oklahoma AgWeather at **http://agweather.mesonet.org**.

Data on the Oklahoma Agweather Web site is from the Oklahoma Mesonet, managed in partnership by the University of Oklahoma and Oklahoma State University and operated by the Oklahoma Climatological Survey.

Urban Farmer

by Albert Sutherland, CPA, CCA
Mesonet Assistant Extension Specialist
Oklahoma State University

May

- Early May is a super time to plant all of those heat loving perennials and annuals. These plants like the warmer May weather, that leads to warmer soil temperatures. While picking out flowering plants at your favorite nursery or garden center, remember to take home colorful foliage plants, such as caladiums and coleus.
- Vegetables that do better when planted in May (soil temperatures close to 70°F) include okra, southern pea, sweet potato, cantaloupe, and watermelon.
- Bermudagrass will be ready for its second fertilizer application in late May. Consider using a slow release nitrogen product that will give your grass more uniform growth and color, while reducing the risk of nutrient runoff.
- After mid-May, soils are typically warm enough to seed bermudagrass or buffalograss.
- After warm-season lawns have "greened-up" and "filled-in," control broadleaf and grassy weeds with the appropriate weed control material.
- Clean out the water garden. Divide and repot water garden plants.

June

- Fertilize turfgrass areas in mid-June. Apply fertilizer ahead of a good rain or before watering lawn areas.
- Control broadleaf lawn weeds with a product containing 2,4-D hormonal herbicide on days when the air temperature stays below 90°F and the wind will not cause drift to nearby landscape plants. For best results, apply on days following a good rain or watering.
- Control young crabgrass plants with a MSMA product when daytime air temperatures are above 80°F and below 90°F.

June continued

- Apply an approved fungicide on tall fescue to control brown patch disease during times when the nighttime air temperature is consistently above 60°F and the nighttime humidity is above 80%.
- Mulch flower and shrub beds. Use finer mulches around flowers and coarser bark mulches for shrubs and trees. Leave a gap between a plant's main stem or trunk and the mulch.
- Keep an eye out for powdery mildew on ornamental plants and treat as needed.
- Control rose black spot with an approved fungicide.
- Take out weeds while they are still small. The larger the weed the more work it takes to pull or cut.
- Apply an approved fungicide for the pine needle blight disease, Dothistroma Needle Blight.
- Check plants for sucking insect pests and treat as needed.

July

- Check plants for water stress and water as needed.
- Control lawn white grubs with an approved insect growth hormone or systemic insecticide product.
- July is a good time for light to moderate pruning of ornamental trees and pines. The July heat helps reduce sap flow from branch cuts. Make your pruning cuts on the outside edge of the branch collar to hasten callus growth over cut surfaces.
- Continue treatment for rose black spot with an approved fungicide.
- Check plants for spider mites and treat before populations get too high.
- Divide and replant hybrid iris.
- Harvest garden vegetables in the morning, the coolest time of the day.
- Prepare and plant the fall vegetable garden. This is the month to plant frost sensitive vegetables, such as sweet corn, cilantro, pepper, and summer squash.

Nicole Giuliano, Mesonet Outreach Program Manager

Tornado Ratings

how to use the EF-Scale

How do meteorologists determine the strength of tornadoes? In the absence of wind observations (a common problem, since there are relatively few dense networks of wind sensors across the world), scientists observe the destruction caused by tornadoes. From the amount of destruction, we can find the estimated wind speeds expected to have caused the damage. These estimated wind speeds are associated with Enhanced Fujita (EF) scale ratings from EF0 to EF5, as shown in Table 1. The type of structure hit, as well as the degree of damage (for example, how badly a building or tree is damaged), determines the rating on the EF-scale. Please see the Spring 2007 issue of Oklahoma Climate for more information on the Enhanced Fujita Scale, including the differences between the F- and the EF-scales.

For this activity, you will need access to the Internet. Navigate to the following website: http://www.spc.noaa.gov/efscale/ef-scale.html

Table 1 - Wind Gusts (70 mph or greater) for July 2005

Speed in mph	Location	County	Day
71	Elmwood, OK	Beaver	1
70	Hooker, OK	Texas	1
70	Near Bessie, OK	Washita	1
71	Near Kaw City, OK	Kay	3
70	Near Milfay, OK	Creek	4
72	Near Minco, OK	Grady	4
75	Near Minco, OK	Grady	4
70	Near Blackwell, OK	Kay	4
71	Ponca City, OK	Kay	4
71	Ponca City, OK	Kay	4
78	Ponca City, OK	Kay	4
80	Blackwell, OK	Kay	4
102	Blackwell, OK	Kay	4
75	Near Meno, OK	Major	4
81	Near Meno, OK	Major	4

1 Scroll down to the Enhanced F Scale Damage Indicators table.

2 Choose the type of structure that was damaged. For example, let's say that a house was hit and its exterior walls collapsed, windows were blown out, and the garage door collapsed inward. We want the "One- or two-family residences" option, so we click on the number 2 link to the left of the listing.

3 Next, find the greatest degree of damage. In this case, the greatest damage was that the exterior walls collapsed (Degree of Damage 7). Look to the EXP column. This is the expected wind speed needed to create the house's level of destruction.

4 See Table 1 for the EF-scale wind speed that matches our EXP value (132 mph). A tornado with approximately 132 mph winds would likely be rated EF2. Even if the tornado was weaker over nearby houses (for example, creating EF1 damage), it will still be considered an EF2 tornado. The maximum rating is the final, overall rating for each tornado.

Classroom >>

CLASSROOM ACTIVITY

Nicole Giuliano, Mesonet Outreach Program Manager

You Be the Meteorologist!

Meteorologists at the National Weather Service are often kept busy by damage surveys, especially in the spring, when tornadoes are most prevalent in Oklahoma. These scientists visit the areas damaged by tornadoes, document the devastation and try to find the region of greatest destruction so that they can rate each tornado. In this activity, you will be the meteorologist out on a damage survey and you must come up with a rating for each of the following photos.

Note: If there is real damage near your home from either strong, straight-line winds or from a tornado, do NOT attempt to perform your own damage survey. There may be hazardous conditions in the area and you will be much safer at home!

Photo 1

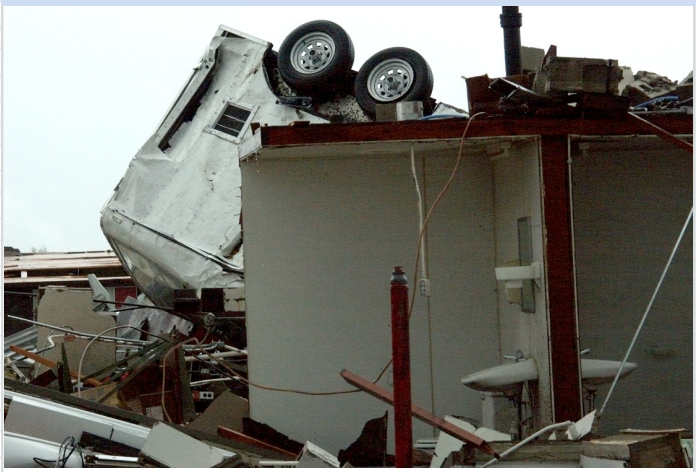
May 3, 1999 Damage in South Oklahoma City (Mike Branick, National Weather Service)

Photo 2

May 3, 1999 Damage in Northeastern Moore (Mike Branick, National Weather Service)

Classroom >>

Photo 3



May 4, 2007 Main Street Damage in Greensburg, KS (Nicole Giuliano)

Photo 4

May 4, 2007 Damage South of the Center of Greensburg, KS (Jeff Hutton, National Weather Service)

Questions

1. Looking at the first two photos (which were from the May 3, 1999 tornadoes that struck central Oklahoma):

   a) What damage indicators would you use to rate the tornado destruction in Photo 1? What about in Photo 2?

   b) What rating would you give the tornado based on Photo 1? Based on Photo 2?

   c) What overall rating would you give for this tornado? (HINT: Choose the maximum value of the two ratings)

2. Looking at the next two photos (which were from the May 4, 2007 tornado that struck Greensburg, Kansas):

   a) What damage indicators would you use to rate the tornado destruction in Photo 3? What about in Photo 4?

   b) What rating would you give the tornado based on Photo 3? Based on Photo 4?

   c) What overall rating would you give for this tornado? (HINT: Choose the maximum value of the two ratings)

3. BONUS: On May 3, 1999, radar measured an "instantaneous" wind speed of 302 mph (lowered from the initial estimate of 318 mph) near one of the tornadoes. Why do some scientists believe that the surface wind speeds of the tornado were lower than this measurement? (HINT: Read the Spring 2007 article "The Enhanced Fujita Scale" by Doug Speheger)

Answers on page 4

TORNADO SAFETY

GET IN! GET DOWN! COVER UP!

Tornadoes are the most violent atmospheric phenomenon on the planet. Winds of **200-300 mph** can occur with the most violent tornadoes. The following are instructions on what to do when a tornado warning has been issued for your area or whenever a tornado threatens:

- **IN HOMES OR SMALL BUILDINGS**
  Go to the basement (if available) or to an interior room on the lowest floor, such as a closet or bathroom. Wrap yourself in overcoats or blankets to protect yourself from flying debris. Put on a football helmet or bicycle helmet.

- **IN SCHOOLS, HOSPITALS, FACTORIES, OR SHOPPING CENTERS**
  Go to interior rooms and halls on the lowest floor. Stay away from glass enclosed places or areas with wide-span roofs such as auditoriums and warehouses. Crouch down and cover your head

- **IN HIGH-RISE BUILDINGS**
  Go to interior small rooms or halls. Stay away from exterior walls or glassy areas.

- **IN CARS OR MOBILE HOMES**
  ABANDON THEM IMMEDIATELY!! Most deaths occur in cars and mobile homes. If you are in either of those locations, leave them and go to a substantial structure or designated tornado shelter. DO NOT SEEK SHELTER UNDER AN OVERPASS!

- **IF NO SUITABLE STRUCTURE IS NEARBY**
  Lie flat in the nearest ditch or depression and use your hands to cover your head.

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