OKLAHOMA CLIMATE

Fall 2007

Historical Perspective

Always Watch Out for the Quiet One

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Oklahoma Climate Fall 2007

Cover Photo: by Ryan Davis. If you have a photo that you would like to be considered for the cover of Oklahoma Climate, please contact Gary McManus at gmcmanus@mesonet.org.

MESSAGE FROM THE EDITOR

Gary McManus

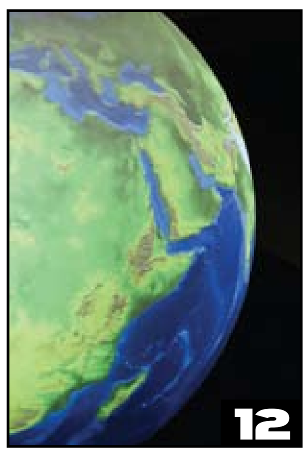
Oklahomans already have to watch the skies for a variety of different hazards, from tornadoes to hailstones the size of a breakfast fruit to bolts of fury hotter than the sun's surface. Well, move over twisters, there's a new girl in town and her name is "Erin". That refers to Tropical Storm Erin, of course, which started as an area of disturbed weather over the Gulf of Mexico and barely mustered enough strength to become a named storm before making landfall and weakening. Okay, that doesn't sound like that big of a deal, except for the fact that Erin later moved over Oklahoma and re-intensified to tropical storm strength. In fact, Erin's highest sustained winds and lowest atmospheric pressure – both key measures for the severity of a tropical system – were at their zenith over our state. Tropical systems aren't supposed to do that, of course; land is a tropical system's kryptonite. Add to this that Erin strengthened over an area with one of the most dense environmental observing networks in the world, the Oklahoma Mesonet, and you have the makings of an amazing scientific discovery. You can read all about Erin and the observations from the Oklahoma Mesonet in this edition of "Oklahoma Climate".

Additionally, we round out our year-long series celebrating a century of Oklahoma weather with our focus on our amazing autumns. Fall provides some of the most glorious weather of the year, made even better by the appearance of the pigskin flying through the air. Another feature story explains the mysterious globe hanging in the atrium of the National Weather Center in Norman. More than just an amazing sight, the globe is actually a terrific teaching tool used to demonstrate weather graphics in a very earthly manner. Our final feature story covers our state's secondary severe weather season in the fall. Not that our state particularly needs another severe weather season, but it's important to recognize its existence nonetheless.

Our classroom exercise allows students to learn about evaporation and how the Oklahoma Mesonet can help fine the optimum time to water the lawn. In addition, be sure to read our regular features dealing with agricultural weather, weather safety, and a weather summary of the summer months.

I sincerely hope you enjoy this issue of "Oklahoma Climate." If you have any questions or comments, please feel free to contact me at gmcmanus@mesonet.org.

Gary McManus – Editor



ALWAYS WATCH OUT FOR THE QUIET ONE

Autumn in Oklahoma somehow generates superlatives with an air of restraint

Derek Arndt Associate State Climatologist

Over the last year, I've had the very enjoyable opportunity to detail a century of each of our state's seasons. We first visited the "anything is possible" nature of our on-again-off-again winters. Then we walked through our "anything is probable" hyper-active spring seasons. Three months ago, we looked at summer's isolated detachment from the rest of the year's patterns. And now, we arrive at fall, which can do all of the above.

I admit it: I'm biased. But I'm gonna say it anyway. Let the chips fall where they may, here it goes:

Autumn is easily Oklahoma's most glorious season.

For those sun-lovers (including this volume's editor), severe weather junkies (including many reading this article) and winterscape enthusiasts recoiling in horror, please give me a chance to make my case!

Here is fall's beautiful secret: it does all of the above with an understated mellowness and a deceptively muted style. It has tremendous range, but it doesn't have to try too hard. It spends most of its time being effortlessly delightful, and you hardly notice when it does something majestic. It's the Cary Grant of seasons.

Perhaps the most wonderful time of the year is the one we call "Indian Summer". You know the drill: after a run of chilly days, November unwraps a week-long masterpiece of short-sleeves weather with highs in the low 80s and calm, crisp nights. Can you smell the oak in the fireplace and the pumpkin pie cooling on the stove? Somebody hand me my Robert Frost readings.

The Big Picture

On the climatologist's calendar, autumn is comprised of September, October and November. It's a transition season, which means, like spring, its weather patterns can be quite active. Frontal passages, absent during most of summer, typically return in earnest around September. Average temperatures decrease over the three-month period from September highs in the 80s (lows around 60) to November highs around 60 (lows in the 30s). This September-to-November temperature transition is the most rapid two-month rise or fall we have in Oklahoma.

See what I mean? Autumn just quietly exceeds the other seasons in its accomplishments. Maybe it's the Barry Sanders of seasons.

Fall also brings a secondary precipitation season that is important to Oklahoma's winter wheat crop and winter forage conditions. For most Oklahoma counties, September or October is the wettest non-spring month. In eastern Oklahoma, this secondary peak is more pronounced. In fact, September is the wettest month for a few locations east of Tulsa. With an increase in precipitation, there is an inevitable bump in severe weather, and the early fall months bring an occasional threat of severity to the plains.

No season is immune to Oklahoma's decadal variations in temperature and precipitation, but autumn has navigated the ups and downs of these trends in its typical low-key style. The statewide temperature history shown in Figure 1 holds fairly true for all parts of the state. Precipitation trends have been a little rockier, with wild mood swings in the last 30-40 years (see Figure 2). All three of the individual months of autumn have pitched in to make the dynamic precipitation patterns, and November has seen some of the largest changes of any month on the calendar. In fact, for the eastern third of the state, November rains of the last 30 years are nearly double the amount during the 30 years prior!

Hey, wait a second. Did we just reveal that autumn has some of the largest climate changes we've seen around? Hmmm. It seems like such a docile season. How did it slip that by us?

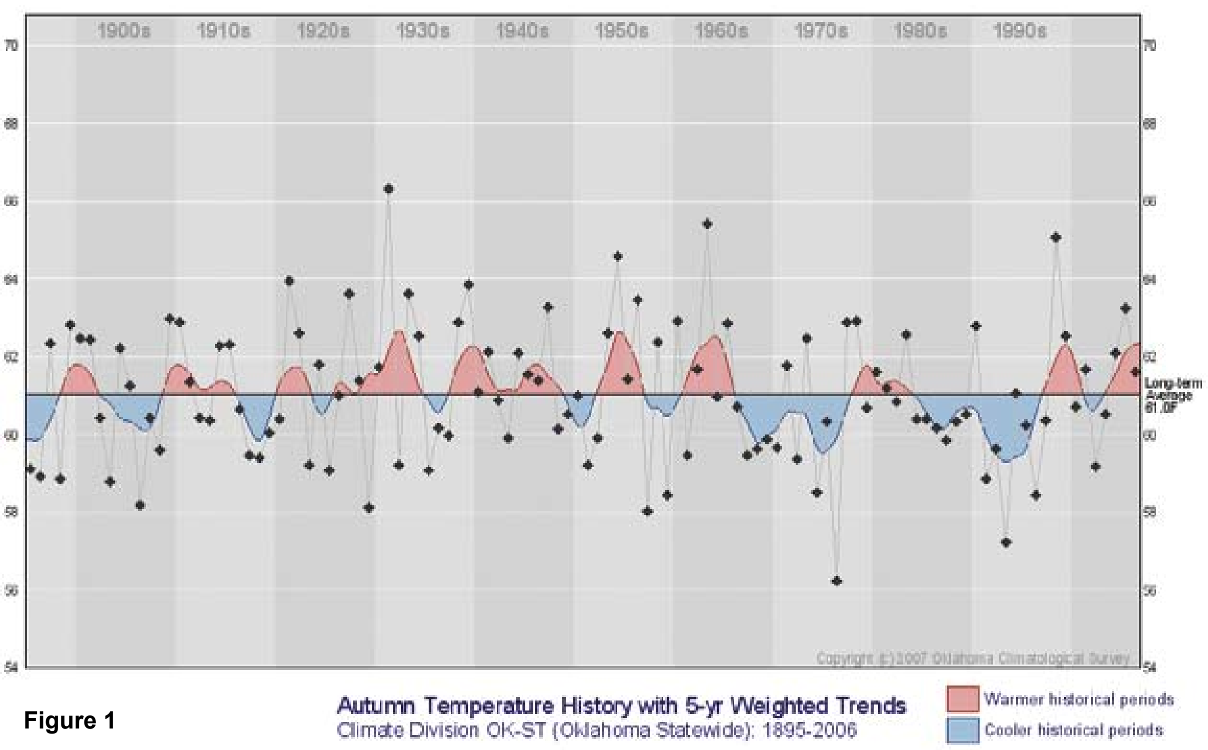


Figure 1

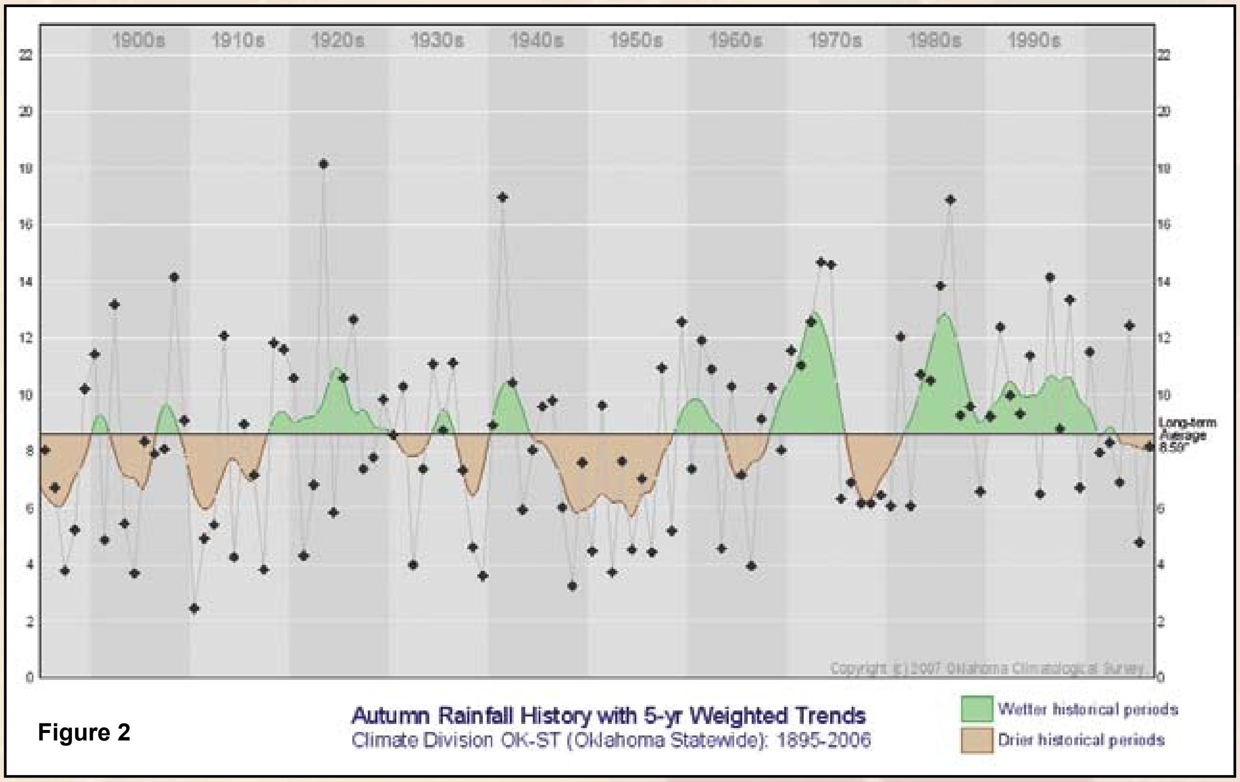


Figure 2

The Big Events

Leaves aren't the only items that give "fall" its colloquial name. Autumn raindrops can also fall – in colossal doses – for a variety of reasons. Flooding is fall's, and especially October's, most visible hazard. In fact, the state's largest 24-hour rainfall event occurred on October 10-11, 1973, when a single thunderstorm sat over Garfield County for hours. The official observation at Enid was 15.68"; unofficial amounts within the county approached 20 inches. Several people and hundreds of livestock were killed in the associated flooding.

The tenth month also holds the record for the wettest single month in state history. During October 1941, as war clouds loomed over the nation, literal clouds loomed over Oklahoma. Rain was reported somewhere in the state every day of the month. 23 of the month's 31 days featured reports of more than an inch. When it was all said and done, an average of 11.32" fell across the state. By the way, a slab of water 11.32" thick, spread across Oklahoma's 69,956 square miles, weighs about 57 billion tons, about the weight of 125 million fully-fueled and fully-loaded Boeing 747s.

Squeezed in-between the rainiest day and the rainiest month are a host of multiple-day records, such as the rainiest two days, three days, and so on. Let's just say October owns this category. The rainiest two-day through seven-day totals ever recorded at an Oklahoma rain gauge all came courtesy of the remnants of Hurricane Norma in October 1981. Norma may have hogged all of these records for herself, but she shared the wealth among rain gauges: Kingston, Coalgate and Tishomingo all got in on the act (Fig. 3). So, what made Norma so prolific? She was a hurricane whose moisture encountered a stalled front just right around the Red River. Fronts help provide focus for storm development, and Norma's non-stop moisture provided plenty of fuel. Fellow Pacific hurricanes Tico (1983) and Paine (1986) made the Octobers of the Eighties some of the soggiest we've seen.

Following an entire year of catastrophic flooding, Oklahoma City was hit with what its most devastating flood in its history in October 1923. This flood was triggered by a dam failure at Lake Overholser, which was triggered by days of heavy rains across waterlogged western Oklahoma. The impact of the event was enormous: $15 million in damages (1923 dollars!), and a major redistribution of residential districts. Indeed, the map of downtown Oklahoma City was re-drawn, and today's rail lines, business districts, and residential settings are quite different than those of 1923.

Autumn can also bring a bout of severe weather when it feels the need. One of Oklahoma's deadly early-century tornadoes touched down just south of Bethany and destroyed a school before rolling into the town limits on November 19, 1930. The storm killed 23 people, and is the only non-spring tornado among Oklahoma's ten deadliest. The tornado outbreak of October 4, 1998, brought 28 tornado touchdowns across Oklahoma. Despite zero tornado occurrences during the month's other 30 days, the 28 tornadoes of October 1998 still stands as the most tornadoes ever reported within any state during an October.

The Details

Duration	Ending Date	Total Precipitation	Location
1-Day	Oct 11, 1973	15.68”	Enid
2-Day	Oct 14, 1981	18.02”	Tishomingo
3-Day	Oct 14, 1981	18.68”	Kingston
4-Day	Oct 16, 1981	22.47”	Tishomingo
5-Day	Oct 17, 1981	23.12”	Tishomingo
6-Day	Oct 18, 1981	23.95”	Coalgate
7-Day	Oct 18, 1981	24.95”	Coalgate

Figure 3. Record multi-day rainfall totals for single stations within Oklahoma

Autumn is so good at quietly racking up superlatives that it has even created its own categories for records. It begs you to take it for granted while it silently re-writes the record books. Maybe it’s the Cliff Richard of seasons. The following two records are so improbable that their magnitude is only appreciated after years of retrospect.

On November 11, 1911 (yep, 11/11/11), Indian Summer was in full swing with a balmy early afternoon temperature of 83 degrees. A powerful cold front (and we’re using “powerful” in that casually-understated autumnal way) barreled through the state, dropping the temperature to 17 degrees by midnight. The single-day range of 66 degrees stood as a state record for years. To this day, 1911 holds Oklahoma City’s record high and record low for November 11. By the way, this November event paved the way for the snowiest winter in state history, which makes autumn something of a visionary whose impact isn’t felt until after it leaves office. Maybe autumn is the James Monroe of seasons.

Finally, perhaps the most quirky, romantic and truly autumn-esque record of all isn’t one you’ll find in the official record books. If there is a “Mr. Autumn” in Oklahoma history, it’s Bud Wilkinson. His autumn accomplishments are well-known. And, now that I think of it, he amassed his trophies in that cool, collected, somewhat dapper way that autumn amassed its trophies. So maybe it’s fitting that Wilkinson and autumn worked together to create a phenomenon that was so profound that it got its own name: “Bud Wilkinson Weather”. It is a fact that, despite autumn’s proclivity for flood-making, no measureable precipitation ever fell on the Oklahoma Sooners on Owen Field during Wilkinson’s head-coaching tenure at the University of Oklahoma. The odds of selecting 81 autumn days and having none of them produce measurable precipitation are about two million to one.

The Last Word

Where spring recklessly and ruthlessly pursues notorious weather, autumn dabbles in it. Where summer provides recreational possibilities, fall does the same, but knows to throttle back on the humidity. Where winter bludgeons us with nasty frontal passages, fall presents a sample, then moves on to more tasteful offerings. And yet, fall in Oklahoma holds the trophies: the sharpest two-month temperature transition, the most rapidly changing month, the wettest month in state history, the most precipitation the state has ever seen in one day, the most violent October in U.S. history, and a few records in categories it invented.

How does autumn make it seem so easy?

Stranger in a Strange Land: Tropical Storm Erin

Tropical Depression Erin unexpectedly reintensified during the late afternoon and overnight hours of August 18-19, 2007, over western Oklahoma. The resulting heavy rains, tornadic activity, and severe winds caused widespread damage to parts of the state, and the human tragedy of Tropical Storm Erin continued for several days after the event. Seven people drowned in floodwaters, including five victims who were recovered from their vehicles. Other occupants of stranded vehicles were rescued, including two persons who were lifted to safety by the Oklahoma Highway Patrol on live national television. Six rural electric cooperatives sustained over $860,000 in damages due to straight-line winds.

The Uniqueness of Erin

Although Oklahoma's southern border is 300 miles inland from the Gulf of Mexico, tropical cyclones originating in both the Atlantic and Pacific Oceans impact the local weather from time to time. The most common consequences of landfalling tropical systems on Oklahoma are heavy rains and associated inland flooding, often as the system or its remnants interact with a stalled frontal system. For example, Tropical Storm Dean formed in the northwest Gulf of Mexico in August 1995 and, with an overland path similar to that of Erin, interacted with a stationary front to produce 16 inches of rainfall across Oklahoma and major flooding along much of the Cimarron, Washita, Arkansas, and Salt Fork of the Arkansas Rivers.

Only four recorded tropical cyclones maintained tropical storm strength as far inland as Oklahoma, including the Galveston Hurricane of 1900 and Hurricane Carla in 1961. The Galveston Hurricane, estimated as Category-4 at landfall, delivered winds as high as 70 mph and dumped flooding rains across the pre-statehood Indian Territory. Likewise, Hurricane Carla (also Category-4) struck the Texas Gulf Coast in September 1961; it maintained tropical storm strength across Oklahoma, and rained up to nine inches when it interacted with a stationary front.

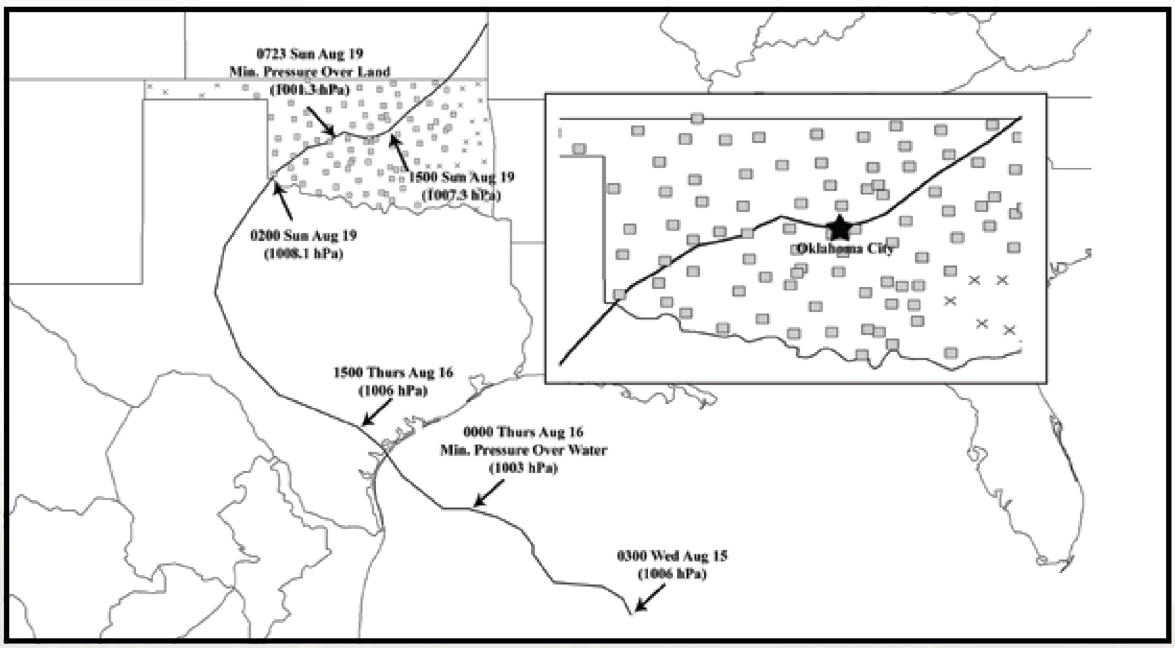
Erin's redevelopment was unique for the following reasons: (1) its location more than 300 miles within inland; (2) its inland intensification produced greater sustained wind observations and lower central pressure values than when it was over open water; and (3) the redevelopment occurred over a region equipped with a dense observing system, such as the Oklahoma Mesonet.

The Rise and Fall of Erin

Erin's life-cycle began as Atlantic Tropical Depression Five, which organized in the south-central Gulf of Mexico and moved generally northwestward. The depression was upgraded by NOAA's Tropical Prediction Center to Tropical Storm Erin at 10:30 a.m. on August 15. Erin spent less than 24 hours as a named storm in the Gulf, and given that its organization was unimpressive throughout its time over water, it never threatened to achieve hurricane status.

At 11:00 p.mm on August 18, Oklahoma Mesonet wind sensors detected Erin's circulation in southwestern Oklahoma. The first indication of Erin's intensification to tropical storm criteria was a series of 1-minute wind speeds that exceeded 39 mph between 11:15-11:40 p.m. at the Medicine Park Mesonet site. The longest duration of these stronger winds was four minutes. The Fort Cobb Mesonet site recorded tropical storm strength winds during most of the period from 12:15-12:40 a.m. According to Oklahoma Mesonet observations, the storm reached its greatest intensity near Watonga between 1:00-4:00 a.m. When the circulation's center passed just south of Watonga, the station recorded the event's peak sustained wind of 58 mph.

At 4:50 a.m., radar displayed the first appearance of an eye west of Geary. Additionally, spiral bands typical of tropical cyclones formed to the east and south of the eye. During the following 30-minute period, convective elements developed and weakened during the eye formation, and by 5:50 a.m., the eye wall was nine miles wide and centered just north of Calumet. During the next two hours, the eye fluctuated in diameter from 3-15 miles as convection pulsed within the surrounding eye wall. By 7:00 a.m., Erin's circulation had intensified significantly across west central Oklahoma and moved into central Oklahoma. At 9:50 a.m., the eye tracked over Oklahoma City and began to dissipate. The eye expanded in size while convection on the western side of the eye wall diminished. The intense convective cells associated with Erin propagated eastward into eastern Oklahoma and Arkansas while the general circulation translated to the northeast and began a more classic transition from a tropical to an extra-tropical system. By 7:00 p.m. the vortex had moved into southeast Kansas.



Tropical Storm Erin's track from August 15-19, 2007.

Erin's Impacts

Erin produced prolific rainfall over Oklahoma and rainfall amounts exceeded existing records for several time scales. The storm's greatest rainfall totals were observed in west central Oklahoma, where the Watonga NWS cooperative observer and Fort Cobb Mesonet site both reported daily rainfall of 9.1 inches and 9.0 inches on August 19, respectively. The value at Watonga exceeded the 100-year rainfall event. At the Fort Cobb Mesonet site, 9.3 inches was observed during the 24-hour period ending 8:00 a.m. on August 19, eclipsing the 100-year event for that duration. The vast majority of that total (9.1 inches) fell during 12 hours, which was nearly a 500-year event. The Fort Cobb rainfall of 7.4 inches during a 3-hour period easily exceeded the estimated 100-yearr event for that location and duration, and was comparable to the 500-year magnitude as well.

Radar Imagery of Tropical Storm Erin

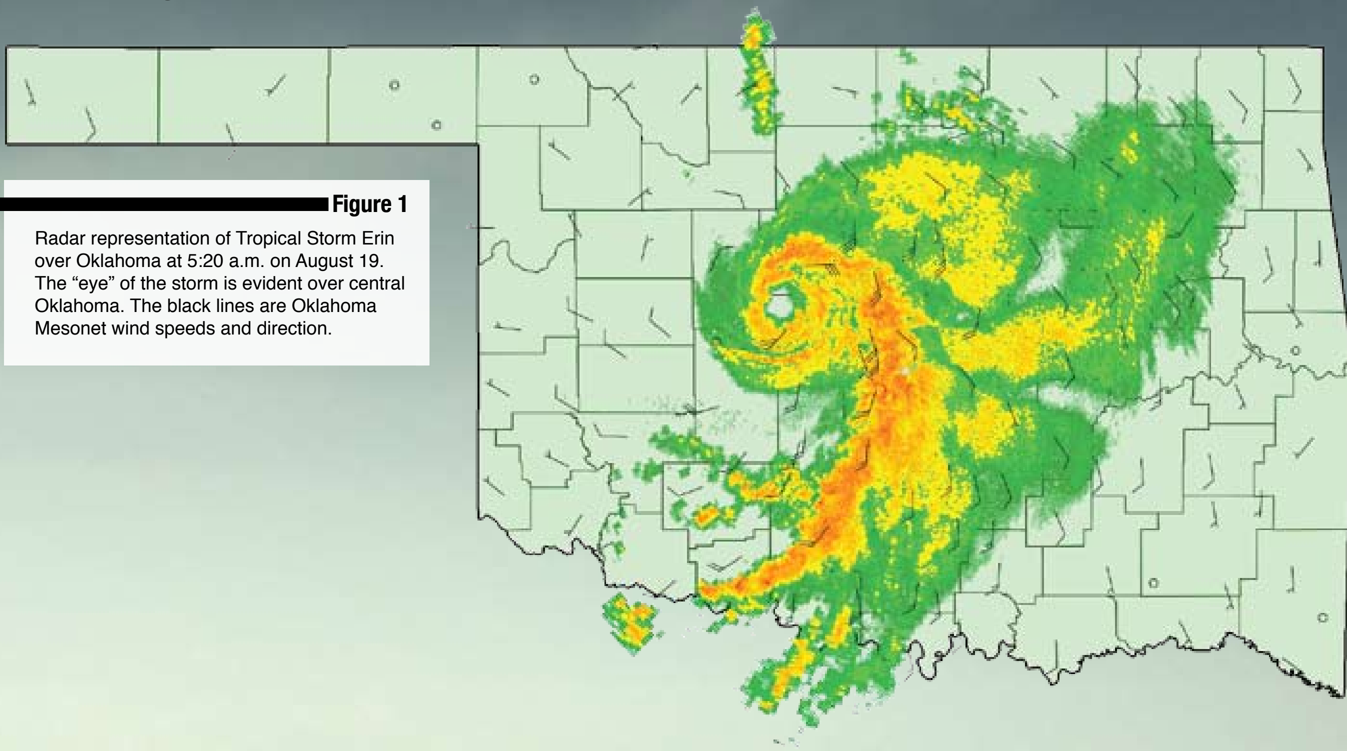


Figure 1

Radar representation of Tropical Storm Erin over Oklahoma at 5:20 a.m. on August 19. The “eye” of the storm is evident over central Oklahoma. The black lines are Oklahoma Mesonet wind speeds and direction.

Tropical Storm Erin Rainfall Totals

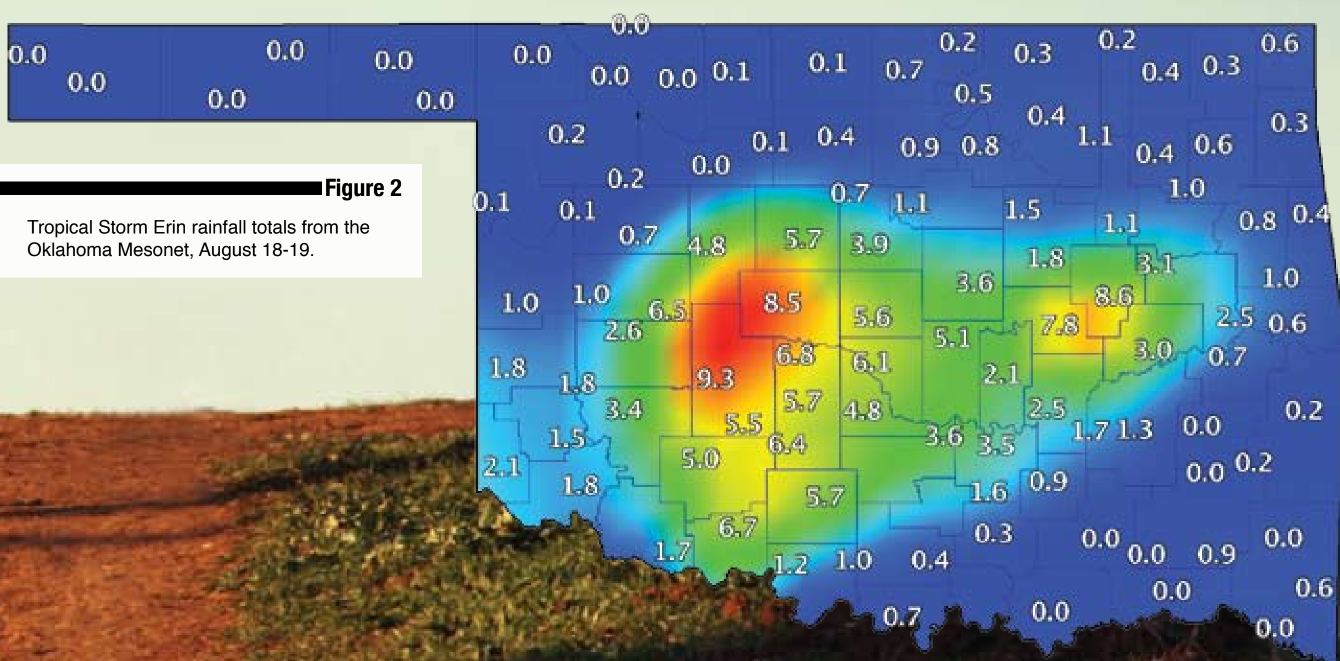
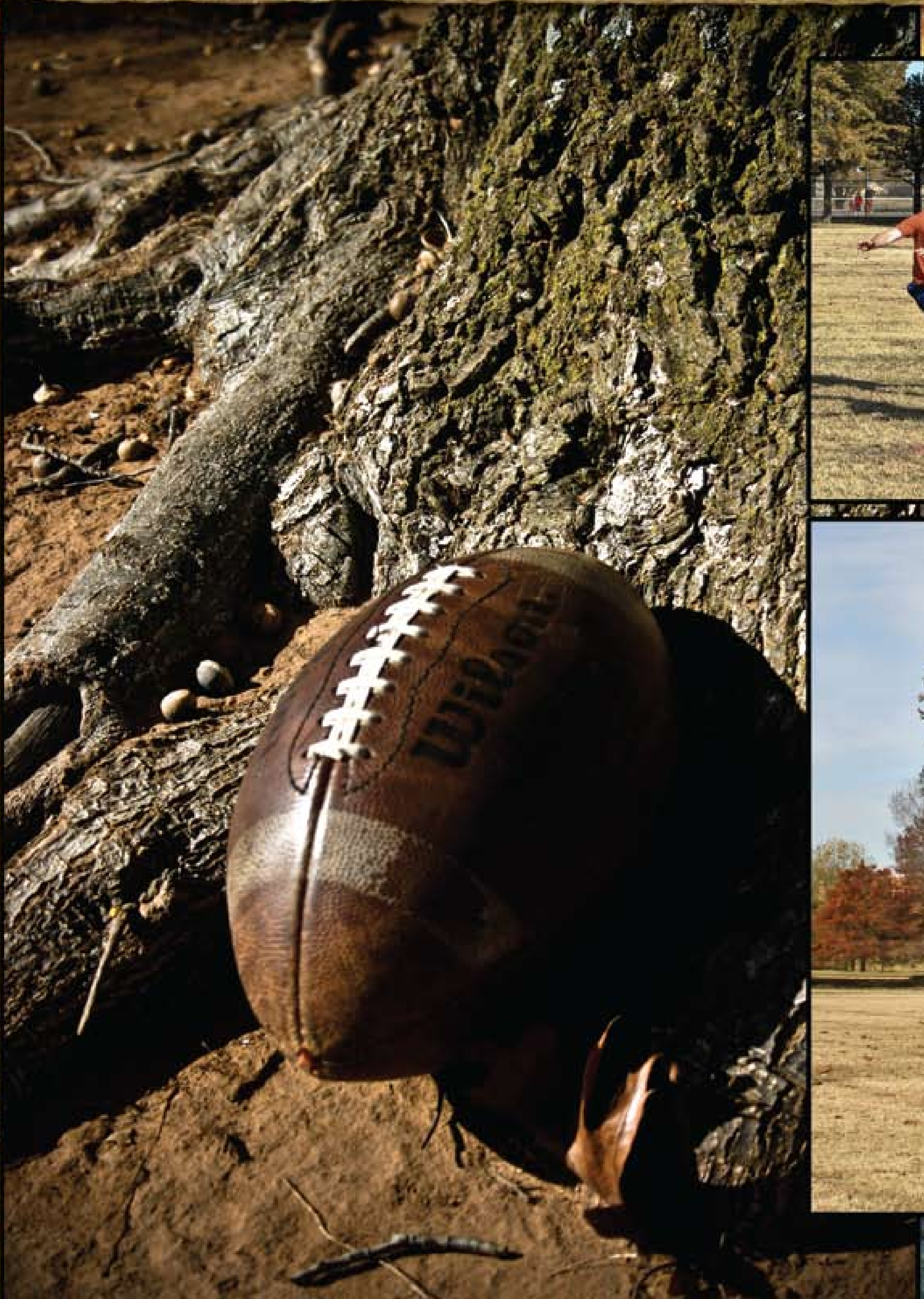
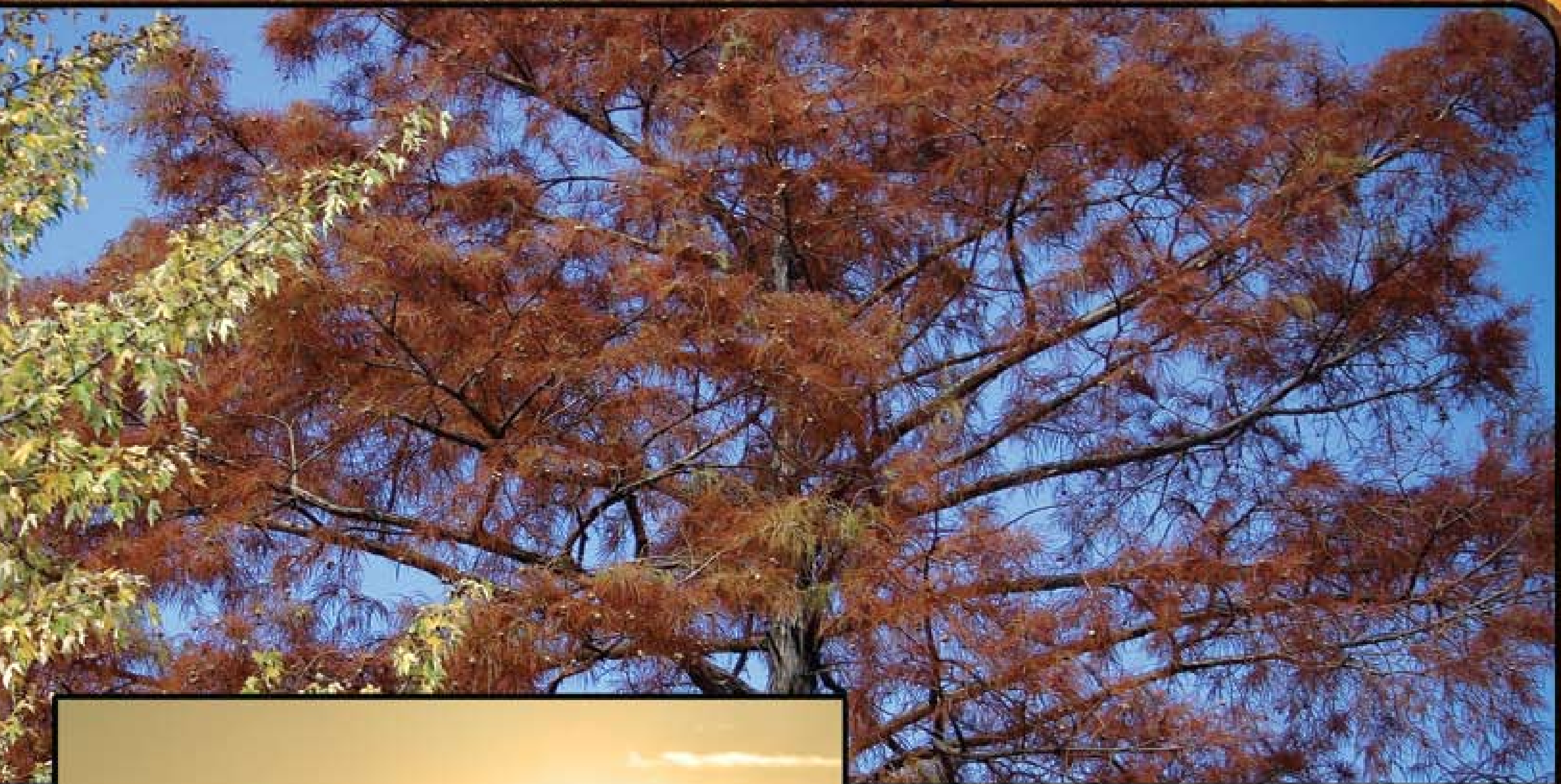


Figure 2

Tropical Storm Erin rainfall totals from the Oklahoma Mesonet, August 18-19.

Photos from the Fields of Fall





From **football** to the **foggy** mornings and nights to the **falling** of the leaves from the trees, these photos depict a few of the **fields of fall**.

Photos by: Laura K. Martin and John Humphrey

HOW DO YOU WANT YOUR WEATHER DATA? FLAT MAP or BEACH BALL?

by: Andrea Melvin, Outreach Program Manager

Imagine gazing upon Earth as you are suspended in orbit 22,000 miles above its surface. You watch as a hurricane forms, slowly gathering strength. It travels westward from Africa, across the Atlantic Ocean, and towards the Gulf of Mexico. The prevailing westerly winds materialize before your eyes. You can see the dry, brown deserts of Australia, Asia, and Africa in contrast to the adjacent green plains and forests. You can trace Earth's continuous plates from ocean depths to mountain chains. Our dynamic planet transforms before your eyes with the help of environmental data projected onto a movie-screen-like, white sphere.

Called "Science On a Sphere®," this spectacular vision of our Earth is the brainchild of Alexander (Sandy) MacDonald, Director of NOAA's Global Systems Division in Boulder, Colorado.

Many things scientific are worked out on napkins or envelope backs; NOAA's Science On a Sphere® owes its start to a beach ball. While this innovation may have had a low-tech beginning, it uses state of the art technology to educate, inform, and excite those who see it.

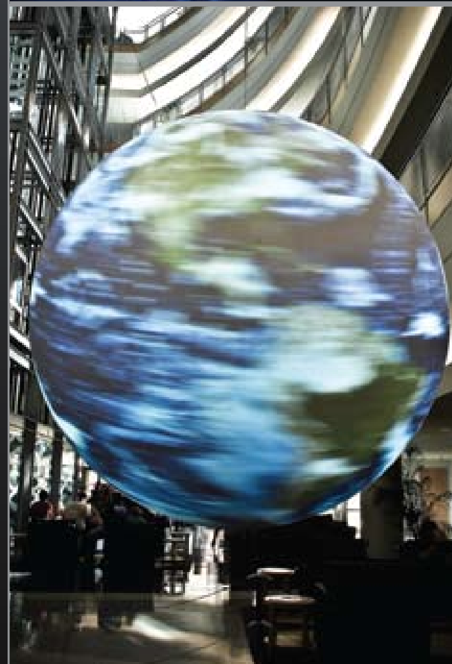
Until recently, scientific data were presented in two dimensions – on paper, a view graph, or computer screen. An image of the Earth can fit on a two-dimensional map, but not without some distortion. Some improvements to present data in three dimensions have helped students and scholars to better understand the information; however, even these improvements had limitations.

In 2002, NOAA unveiled a way to see information the way that nature presents it – on a sphere. Scribbles on napkins and a beach ball were the humble beginnings of this exciting scientific advancement.

"I started thinking about this several years ago and did some experiments on the deck of my house using a beach ball," said Sandy MacDonald, inventor of the Sphere. "I knew that putting NOAA climate, weather, oceanic, and geophysical information on a sphere would be a spectacular tool for explaining NOAA's science to a variety of audiences."

NOAA has an extraordinarily important scientific story to tell. Public actions are often guided by NOAA science and operations – everything from tornado warnings to predictions about the fate of the planet as greenhouse gases increase are derived from NOAA data. NOAA must not only deliver the best scientific answers possible, but also must ensure that the public, policy makers, and our children understand its discoveries.

The Science On a Sphere® system uses four video projectors to display images on a smooth, white fiberglass sphere. Each projector is driven by a computer. A fifth computer is used to control the operation of the display computers. The computers communicate with each other via a network. Each computer is a relatively powerful PC, with dual Pentium processors and high-end graphics cards.



The magic of Science On a Sphere® comes largely from the software that processes data so that it can be displayed on the globe. Written by NOAA scientists, this software takes information from several sources and creates data slices that are then recombined for display on the sphere. To create the seamless illusion of a planet in motion, synchronization of these slices has to be kept at the sub-millisecond level (i.e., very, very, small!).

The software can convert nearly any data for use. Datasets are currently available that project everything from nighttime lights on the Earth's surface, to temperature changes associated with rising atmospheric carbon dioxide, sea surface temperatures, shifts in the Earth's tectonic plates over time, and weather predictions.

Today, after five years of development, the new carbon-fiber sphere weighs 46 pounds, down from 230; five very fast computers run the system, down from the original 10; the four video projectors produce four times the resolution and almost four times the brightness of the original; and the system has become much less costly to purchase.

Science On a Sphere® is making appearances at meetings and conferences across the country and it is now permanently installed at multiple museums and science centers, mesmerizing audiences and helping to increase public awareness of the environment and the science behind NOAA's products and services.

According to creator Sandy MacDonald, Science On a Sphere® is "...a unique way to explain complex information using images. It can be used to illustrate geography, weather, climate, space weather, and a host of other kids of data. It's limited only by our imagination."

The National Weather Center (NWC) in Norman, Oklahoma, is one of the newest homes to Science On a Sphere®. The amazed gasps of "oohs" and "aahs" as visitors enter the building are priceless. Research scientists and operational forecasters see their unique datasets up on the "beach ball" for all to experience. Data are no longer confined to a computer screen or two in an office. With the Science On a Sphere® technology, the public witnesses scientific discoveries years before the research is ready for formal publication.

The largest viewing of the sphere in Norman occurred on October 20, 2007, during the National Weather Festival. The festival is an annual event for which the public has an opportunity to visit the facility, interact with meteorologists, view storm chaser vehicles, and see a weather balloon launch up close. Last year nearly 3,000 people participated in the festival. We expect the Science On a Sphere® to be an extremely useful tool to explain global weather patterns, ocean currents, and even glimpse the surface of other planets.

Tours of the NWC for the general public will be offered on Mondays, Wednesdays, and Fridays at 1 p.m. Each tour will last approximately 45 minutes. The public tour is a comprehensive overview of the NWC and the units housed within. The public tour includes visits to the School of Meteorology, the NWC observation deck, classroom and laboratory facilities, as well as NOAA's Storm Prediction Center, the Norman National Weather Service Forecast Office, and the National Severe Storms Laboratory. You must make reservations for a Public tour, as space is limited! If you have more than 8 people in your group, please schedule a Group tour. If you have special needs, please note those needs when you make reservations. For Public tours, contact the NWC Professional Staff Office at tours@nwc.ou.edu or call 405-325-1147.

Significant portions of this article were written by Jana Goldman and Rhonda Lange of NOAA's Office for Oceanic and Atmospheric Research as part of NOAA's bicentennial celebration.

SUMMER 2007 SUMMARY

By: Gary McManus

Precipitation of historic proportions and a visit from an unusual tropical friend were the highlights – or lowlights – of the summer weather. While most of the state was much wetter than normal, central Oklahoma upped the stakes with its wettest summer since records began in 1895 at nearly 14 inches above normal. The central region was already on its way to record summer rainfall when the remnants of tropical storm Erin approached the state from southwest Texas. While a tropical system affecting Oklahoma's weather is not unheard of, this visit became an exceedingly rare event when the diminishing storm intensified once again to tropical storm strength over the western half of the state. The storm's rainfall amounts exceeded the 100-year totals at the Fort Cobb Mesonet site for several different time intervals, and nearly reached the 500-year intensity level. Unlike the rest of the state, the Panhandle's seasonal total was below normal and ranked as the 18th driest on record. The state was cooler than normal for the most part, a by-product of the excessive rainfall. Eleven tornadoes touched down from June-August, but the main severe threat during summer was flooding.

Precipitation

The statewide average precipitation total of more than 16 inches ranks as the fourth wettest on record, more than six inches above normal. Central Oklahoma was by far the wettest area of the state, and its total of more than 23 inches beats the previous wettest summer, set in 1992, by more than five inches. The only other broad area not excessively above normal was the Panhandle, which was actually below normal by more than two inches. Localized areas of below-normal precipitation were found in far southwestern Oklahoma and in the northeast.

Temperature

Temperatures during the summer months in Oklahoma are often a reflection of the rainfall amounts – excessive rainfall means cooler temperatures while drought can mean extreme heat. With the summer's moist weather, it should come as no shock that the temperatures were on the cool side. Only three triple-digit temperatures were recorded by the Oklahoma Mesonet's 119 stations during June and July. During August, however, the triple-digit temperatures became abundant and widespread.

June Daily Highlights

June 1-2: A line of severe storms moved into the state from the northwest overnight on the first, pushing an outflow boundary ahead of them. As the outflow boundary traveled to the southwest, more intense rain-producing storms developed along the wind-shift in central Oklahoma. More than five inches fell in Stillwater with scattered amounts between 1-4 inches elsewhere in central Oklahoma. The rain continued into the night on the second, dropping another inch or so in the northeast. More storms in the northwest that evening, but amounts were generally less than an inch. Highs remained in the 80s nearly statewide.

June 3-6: The driest and most tranquil period during June, very little rain fell during these four days. Highs were generally in the 80s and 90s, with lows in the 60s and 70s. A developing upper-level storm system across the Central Plains on the sixth kicked winds up out of the south from 35-45 mph, with gusts greater than 50 mph in the west.

June 7-11: A powerful upper-level storm continued across the Northern Plains, kicking up strong southerly winds again on the seventh. A dryline was located just west of I-44 in the afternoon. Warm, humid conditions existed ahead of the dryline while hot, dry air lay behind the boundary. A few storms in northeastern Oklahoma managed to drop around an inch of rain. More storms on the morning of the eighth formed along a cold front which entered the state. Some locations had nearly an inch of rain from the storms. A sunny and mild afternoon was in store with the cooler air mass. Highs remained in the 70s and 80s. More storms for the next couple of days with amounts generally between one and two inches. The month's highest rainfall amount fell in a few hours on the morning of the eleventh at Copan. After more than two inches fell the night before, Copan saw another six inches that morning. Other areas in northeast had between 1-4 inches. Highs reached into the 80s and 90s.

June 12-15: More bouts of severe storms and heavy rainfall, courtesy of a wayward upper-level low pressure system. This period was very muggy with lows in the 60s and 70s and highs generally in the 80s and 90s. The worst of the severe weather occurred in western Oklahoma on the thirteenth into the early-morning hours of the 14th. Three weak tornadoes touched down in Major County near Orienta the evening of the 13th. No significant damage was reported. The Oklahoma Mesonet site at Erick measured a wind gust at 77 mph. Large hail reports were scattered across the state to go along with heavy rains and significant flooding. Grapefruit size hail was reported near Slapout on the 13th. The Oklahoma Mesonet site at Hobart reported 3.45 inches of rain in one hour just after midnight on the 14th. Between 3-5 inches fell in central and western Oklahoma during this four-day period.

June 16-17: The upper-level low remained in the area, but the rainfall amounts weren't quite as robust as the previous few days. Only about an inch fell at most both days, generally in central Oklahoma. High temperatures were in the 70s and low 80s.

June 18-23: More rain, of course, due to the upper-level low that remained in the area. Numerous instances of large hail were reported across western Oklahoma. Softball size hail fell near Goltry on the 19th. Low temperatures were in the 60s and 70s while highs were generally in the 80s, about 10 degrees below normal for this time of the year. The worst severe weather reported occurred on the 19th into the 20th. A wind gust of 80 mph was reported near Ringwood the evening of the 19th, along with hail to the size of golf balls elsewhere. Between 4-8 inches of rain fell in the center part of the state to go along with the flooding rainfall.

June 24-25: Another couple of days of respite from the seemingly endless flooding and stormy weather, this period saw rainfall amounts generally less than an inch scattered across the state. High temperatures were in the 80s after lows in the 60s and 70s.

June 26-28: A surface trough generated by a thunderstorm complex teamed with the meandering upper-level low pressure system to generate flooding rains throughout this three-day span. The Oklahoma Mesonet sites at Walters and Shawnee had more than five inches of rainfall on the 26th. Portions of southern and central Oklahoma saw as much as seven inches of rainfall during the period.

June 29-30: The month ended very fittingly with more showers and storms due to the ever-persistent upper-level low pressure system. The showers were much more scattered on the 30th compared to most of the month. Between 2-4 inches still fell in central and northern Oklahoma, however. High temperatures were well below average both days in the 70s and low 80s.

July Daily Highlights

July 1-5: The day started quietly on the first but showers and storms persisted during the afternoon, associated with an upper-level low pressure system in northeastern Oklahoma. Many flood warnings were posted in the eastern half of the state. The rain helped keep temperatures 10-15 degrees below normal, generally in the 70s and 80s. More heavy rain was in store on the second as well, bringing more flood warnings in the east. The following three days saw more scattered showers and thunderstorms develop and produce heavy rain in localized areas. High temperatures throughout this period were generally in the 80s, although far northwestern Oklahoma and the Panhandle saw 90s with the rain-free conditions.

July 6-8: After some widely scattered showers popped up near a weak cold front, the weather quieted down considerably during this three-day period. Mostly sunny skies and light winds meant highs in the 90s, with a couple of triple-digit temperatures reported in the Panhandle. The Oklahoma Mesonet site at Goodwell recorded the month's highest temperature of 103 degrees on the eighth while Hooker reported 101 degrees. An upper-level storm approached on the eighth and produced a few light showers in the Panhan.

July 9-13: The upper-level system arrived in the state and generated severe thunderstorms, complete with severe winds and flooding rainfall. Wind gusts of at least 70 mph were reported in central Oklahoma on the ninth. A tornado touched down near Warner in Muskogee County. Rated EF1 on the Enhanced-Fujita scale, the twister tore the roof from a church and damaged houses. The tornado was the only one spotted during the month. Wayward outflow boundaries kept storms – and flooding – in the forecast for the next few days. The heaviest rainfall during the five-day period occurred in central through southeast Oklahoma with amounts ranging from 4-9 inches. Temperatures during this time were unseasonably cool due to the cloud cover and precipitation, holding in the 80s for the most part.

July 14-21: Very little rainfall at all fell throughout this eight-day period, definitely an anomaly for the warm season this year. The lack of rain and plenty of sunshine allowed temperatures to approach actual summer-like values in the 90s. Low temperatures fell into the 70s.

July 22-24: A stationary front generated showers and storms in the east on the 22nd, but amounts remained less than an inch. Heat indices approached 100 degrees during the afternoon. More storms fired the next couple of days as well. Heavy rain was accompanied by small hail and strong winds as a few of the storms exceeded severe limits on the 23rd. The weather calmed a bit on the 24th as the frontal system exited the state. High temperatures rose into the mid-80s to low 90s following its passage.

July 25-28: Much quieter weather for the next few days, but still not without a bit of precipitation. The heaviest rainfall occurred in the Panhandle on the 26th with the Oklahoma Mesonet site at Kenton reporting almost an inch. Temperatures during this period were 5-10 degrees below normal, generally in the upper 80s and low 90s.

July 29-31: Yet another wet period in a very wet year. The heavy rain was confined to a few localized areas, however. An outflow boundary from storms in Kansas pushed into the state on the 29th and generated a few heavy rain producers in the east. The heaviest rain was saved for the 30th and 31st, however. Kingfisher was hit hard by flooding on the 30th as over three inches of rain fell in a very short time. Heavy rain also struck far southeastern Oklahoma on both days. Amounts there approached seven inches. Flood warnings were issued for several locations in Bryan County. High temperatures for this period were once again below normal in the 80s and 90s.

August Daily Highlights

August 1-2: The first two days of August brought heavy showers to the state. The Oklahoma Mesonet site at Slapout recorded more than three inches on the first, followed closely by Pauls Valley with exactly three inches. The slow-moving storms added to the state's wet July totals. Temperatures during this period were mainly in the 80s and 90s with lows in the 60s and 70s.

August 3-8: This six-day period portrayed a typical August run of hot and muggy weather. Very little rain fell as the state was dominated by an upper-level ridge of high pressure. The first serious run of triple-digit temperatures began on the fifth with highs in northwestern Oklahoma rising to the 105-degree mark. The winds kicked up from the south to about 30 mph between the sixth and eighth. Low temperatures were seasonable throughout the period.

August 9-15: The ninth saw slow-moving storms in the morning in northern Oklahoma. The Newkirk and Burbank Mesonet sites recorded more than an inch of precipitation. Winds of up to 74 mph were measured by the Kingfisher Mesonet site. That was the end to the stormy weather, however, as sunny skies and hot weather once again became the norm through the 15th. The state's highest temperature of the month (and the year thus far), 106 degrees, occurred at Hooker and Webbers Falls on the 12th and 13th, respectively.

August 16-19: This four-day stretch saw one of the rarest of events that Oklahoma will ever see weather-wise: the intensification of a tropical weather system. Remnants of Tropical Storm Erin first brought high clouds to the state on the 16th. Temperatures were still able to reach the 90s and 100s, however. More heat and a bit of rain were in store on the 17th as Erin continued moving through southwestern Texas, eventually turning to the northeast toward Oklahoma. The rain from Erin's remnants began early on the 18th, mainly in western Oklahoma. Two brief tornadoes spun up in between 3-5 pm near Hobart and Cordell. As the day wore on, the rain intensified west of I-35. Just before midnight, the remnants of TS Erin began to intensify. A definite eye and associated eye wall structure formed in southeastern Blaine County around 4 a.m. on the 19th. Wind gusts recorded during the intensification exceeded 70 mph, with a gust measured at the Watonga airport of 82 mph before the sensor stopped reporting. The Mesonet site at Watonga, near the center of the circulation, reported severe winds nearly continuously for two hours. During this time, sustained wind speeds over 40 miles per hour were reported. The eye then traveled east across Canadian and Oklahoma Counties before becoming unorganized. The slow-moving system dropped more than five inches of rainfall along its path, with over an inch common in a larger area from Erin's outer bands. Of the Mesonet sites, Fort Cobb picked up the highest total with 9.24 inches. However, a volunteer observer reported 11.00 inches northwest of Geary, while another observer three miles northeast of Eakly measured nearly 13 inches.

August 20-22: The heat returned with Erin's exit. Highs were once again into triple-digit territory over much of western Oklahoma on the 20th. A few showers and storms hit the northwest on the 20th and 21st, but amounts were less than an inch. Highs moderated to a more seasonable level on the 22nd in the 80s and 90s.

August 23-25: A very windy period that brought severe storms back to the state. A cold front began to slide into Oklahoma from the northwest. A wind advisory was issued for much of western Oklahoma on the 23rd as winds gusted to 40 mph. Storms in the northwest dumped over an inch of rain in Harper and Woods Counties. Storms persisted overnight and later formed farther east along and north of I-44. As the storms moved to the east late on the 24th they became much more efficient rain-producers and dropped up to four inches in northeastern Oklahoma. Flash flood warnings were issued for several locations in the northeast. Additional storms on the 25th produced over three inches of rainfall for McAlester. High temperatures throughout this period were in the 90s.

August 26-31: August could not escape without yet another bit of rainy weather, but not before some typical August weather first. The 26th-28th period was dominated by upper-level high pressure, which meant heat and humidity. Highs in the 90s combined with the moisture to produce heat indices above 100 throughout this period. A cold front entered the state from the northwest on the 29th, offering cooler weather and a focus for showers and thunderstorms. Most of the rainfall was confined to central and southern Oklahoma. The month ended with a splendid day under following the front's passage. Lower temperatures and humidity were a result, and low temperatures dropped into the 60s before rebounding into the 80srainfall for McAlester. High temperatures throughout this period were in the 90s.

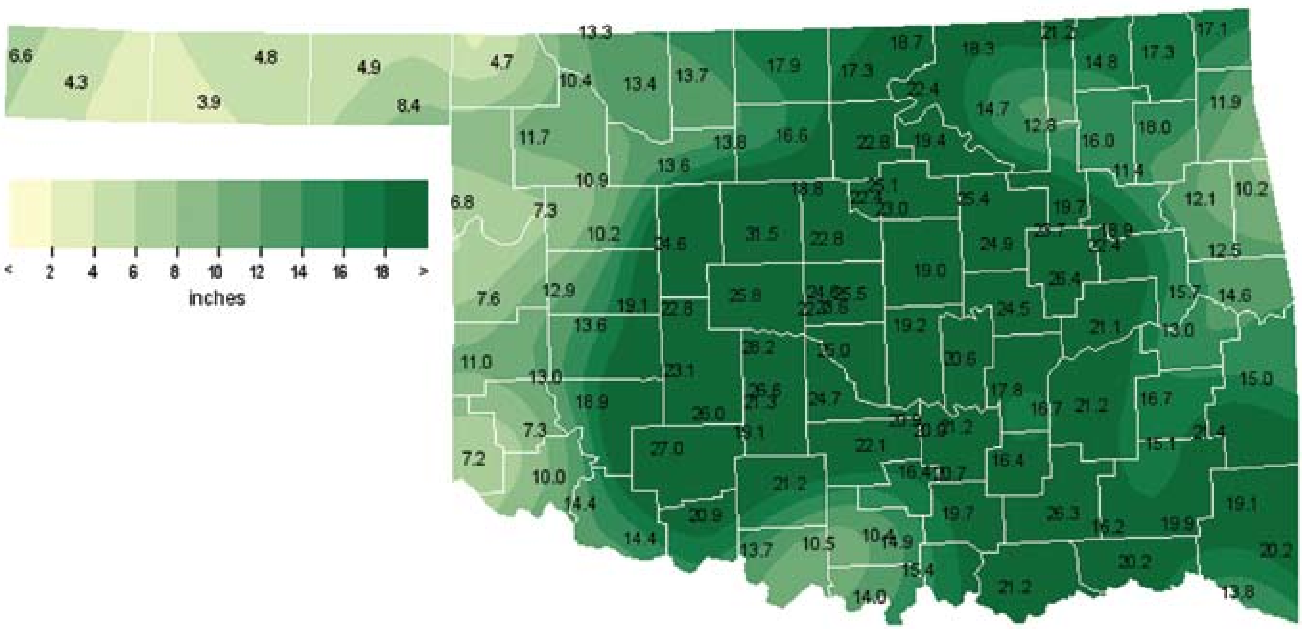
Summer 2007 Statewide Extremes

Description	Extreme	Station	Date
High Temperature	106ºF	Goodwell Hooker Webbers Falls	Aug. 20th Aug. 12th, 20th Aug. 13th
Low Temperature	38ºF	Boise City	June 8th
High Precipitation	31.53 in.	Kingfisher	
Low Precipitation	3.88 in.	Goodwell	

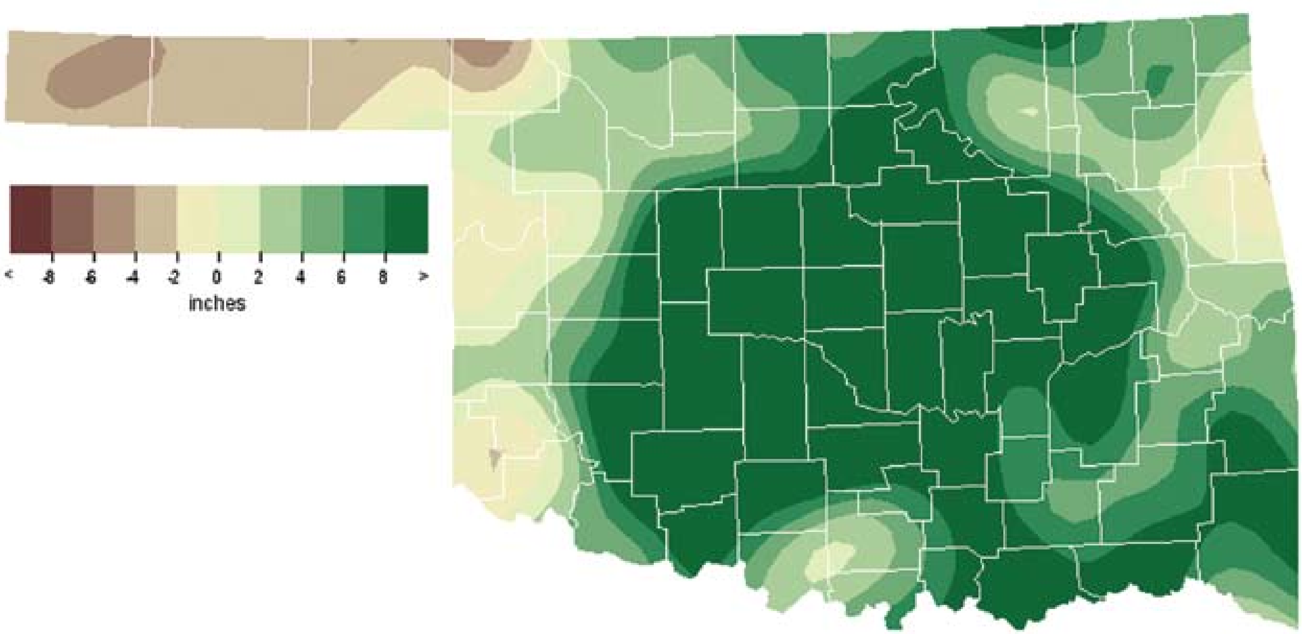
Summer 2007 Statewide Statistics

	Average	Depart	Rank
Temperature	78.7ºF	-0.8ºF	33rd Coolest
	Total	**Depart.**	**Rank**
Precipitation	16.08 in.	6.31 in.	4th Wettest

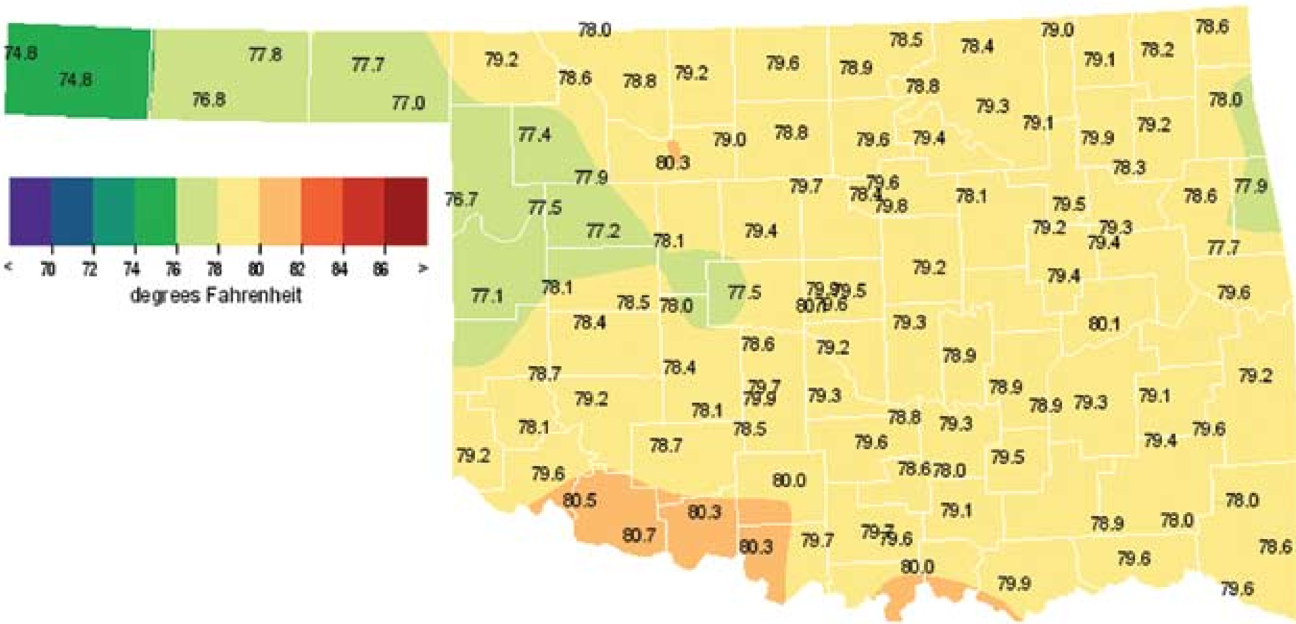
Observed Precipitation



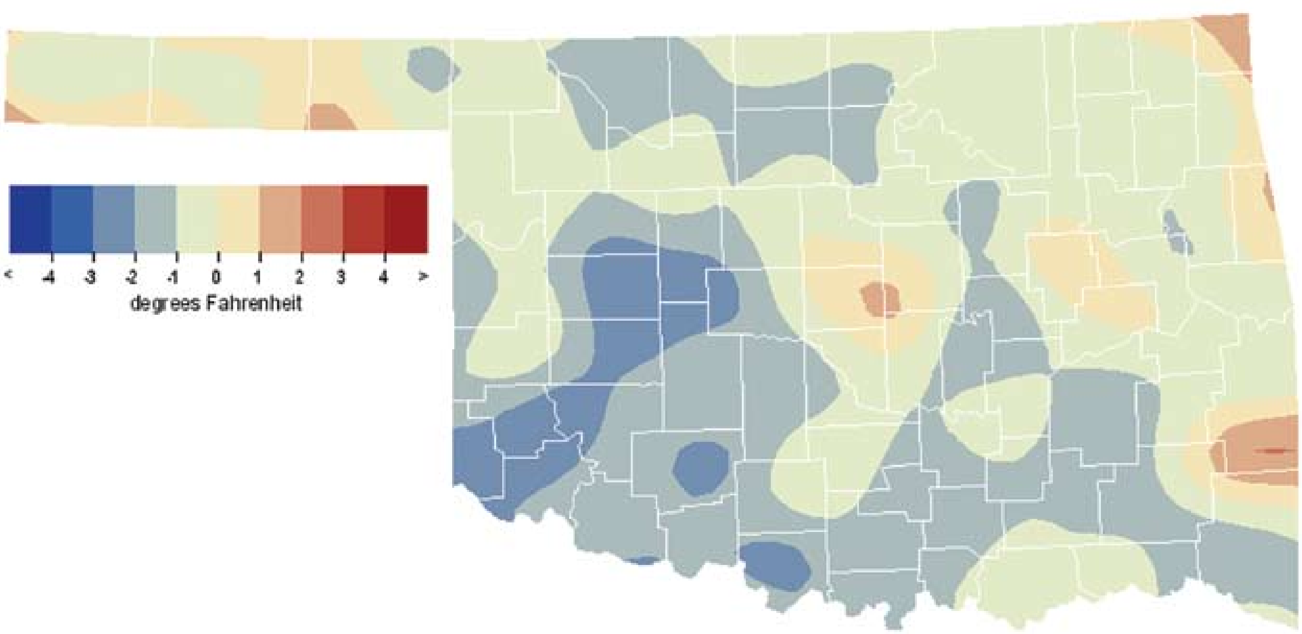
Precipitation Departure from Normal



Average Temperature



Temperature Departure from Normal



Summer 2007 Mesonet Precipitation Comparison

Climate Division	Precipitation (inches)	Departure from Normal (inches)	Rank since 1895	Wettest on Record (Year)	Driest on Record (Year)	2006
Panhandle	5.41	-2.55	18th Driest	17.32 (1950)	2.66 (1936)	8.59
North Central	15.05	5.08	13th Wettest	17.45 (2005)	3.73 (1936)	7.14
Northeast	16.83	5.87	11th Wettest	23.78 (1948)	2.97 (1936)	9.33
West Central	13.26	4.55	11th Wettest	16.53 (1995)	2.79 (1980)	8.01
Central	23.55	13.78	1st Wettest	17.61 (1992)	1.97 (1936)	8.56
East Central	17.08	6.37	12th Wettest	20.53 (1958)	1.54 (1936)	7.55
Southwest	15.91	6.88	3rd Wettest	16.22 (1996)	2.15 (1980)	5.88
South Central	17.43	7.71	3rd Wettest	19.72 (1950)	2.58 (1980)	3.29
Southeast	17.75	6.76	9th Wettest	21.23 (1945)	3.50 (1934)	6.95
Statewide	16.08	6.31	4th Wettest	17.26 (1950)	2.79 (1936)	7.29

Summer 2007 Mesonet Temperature Comparison

Climate Division	Average Temp (F)	Departure from Normal (F)	Rank since 1895	Hottest on Record (Year)	Coldest on Record (Year)	2006
Panhandle	76.8	-0.4	51st Coolest	81.9 (1934)	71.5 (1915)	79.1
North Central	78.8	-1.1	23rd Coolest	86.2 (1934)	74.3 (1915)	82.0
Northeast	79.0	0.1	55th Coolest	85.4 (1934)	73.8 (1915)	80.9
West Central	77.9	-1.5	19th Coolest	85.4 (1934)	74.6 (1915)	81.9
Central	79.2	-0.8	41st Coolest	85.6 (1934)	75.0 (1915)	82.4
East Central	79.0	-0.3	42nd Coolest	85.4 (1934)	75.0 (1915)	81.6
Southwest	79.2	-2.0	14th Coolest	86.0 (1980)	77.1 (1915)	83.6
South Central	79.4	-1.3	22nd Coolest	86.2 (1934)	77.0 (1906)	84.1
Southeast	79.0	-0.2	42nd Coolest	84.8 (1934)	75.3 (2004)	81.4
Statewide	78.7	-0.8	33rd Coolest	85.2 (1934)	74.9 (1915)	81.9

Summer 2007 Mesonet Extremes

Climate Division	High Temp	Day	Station	Low Temp	Day	Station	High Monthly Rainfall	Station	High Daily Rainfall	Day	Station
Panhandle	106	Aug 20th	Hooker	38	Jun 8th	Boise City	8.42	Slapout	3.13	Aug 1st	Slapout
North Central	105	Aug 12th	Fairview	47	Jun 8th	Freedom	22.76	Red Rock	3.71	Jun 29th	Medford
Northeast	105	Aug 14th	Claremore	54	Jun 9th	Jay	22.43	Burbank	6.05	Jun 11th	Copan
West Central	102	Aug 14th	Camargo	50	Jun 8th	Cheyenne	24.65	Watonga	6.52	Aug 18th	Weatherford
Central	105	Aug 14th	Stillwater	54	Jun 9th	Oilton	31.53	Kingfisher	7.77	Aug 19th	Okemah
East Central	106	Aug 13th	Webbers Falls	57	Jun 9th	Cookson	26.41	Okmulgee	8.55	Aug 19th	Okmulgee
Southwest	103	Aug 14th	Walters	55	Jun 5th	Mangum	27.01	Medicine Park	9.00	Aug 18th	Fort Cobb
South Central	103	Aug 14th	Newport	57	Jun 5th	Sulphur	22.13	Pauls Valley	5.22	Jun 15th	Byars
Southeast	104	Aug 13th	Wister	55	Jun 4th	Wister	21.37	Talihina	3.66	Jun 20th	Broken Bow
Statewide	106	Aug 20th	Hooker	38	Jun 8th	Boise City	31.53	Kingfisher	9.00	Aug 18th	Fort Cobb

AGRICULTURE WEATHER WATCH

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

As the last months of 2007 approach, Oklahoma farmers and ranchers find themselves being dealt one crazy card after another. After losing to drought in 2006, farmers folded to floods in 2007. Now the fall of 2007 is shaping up to be another time when agricultural producers hold their breath, waiting for the cards that might give them a winning hand in 2008.

Who would have thought that the summer floods of 2007 would turn to drought by the fall months of 2007? As of mid October, farmers in a number of Oklahoma locations were having trouble getting wheat started due to powder dry soils. The driest areas were and remain areas along the western border of Oklahoma and the Panhandle. The Panhandle counties that had excellent 2007 wheat yields from timely rains find themselves wondering if they will get a 2008 wheat crop started.

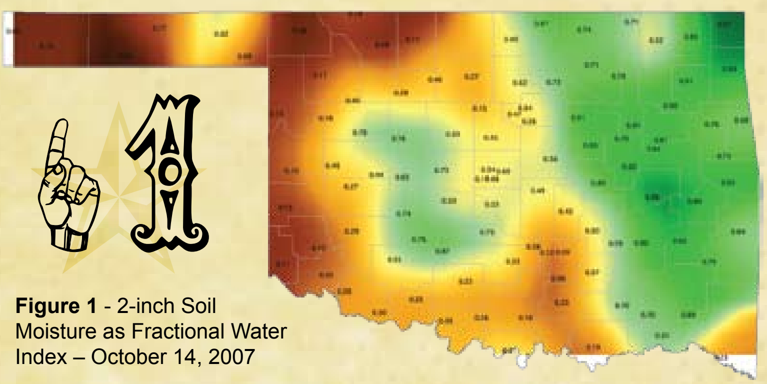


Figure 1 - 2-inch Soil Moisture as Fractional Water Index – October 14, 2007

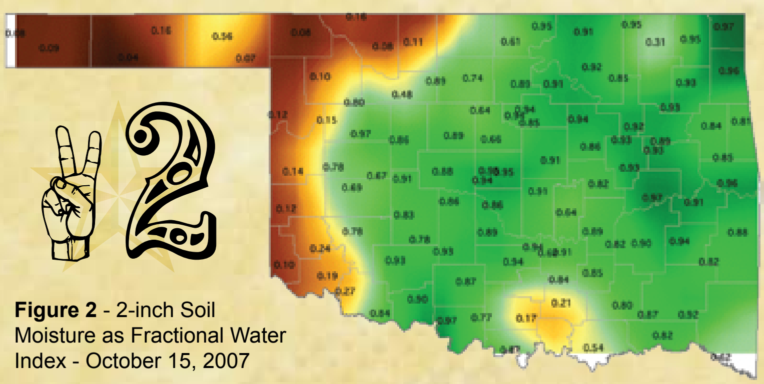


Figure 2 - 2-inch Soil Moisture as Fractional Water Index - October 15, 2007

A generous portion of central and eastern Oklahoma received a substantial rain on October 14 and 15. Figure 1 shows the dry areas in the state at the 2-inch planting depth as of October 14, 2007. Tan and brown map areas are dry soil locations where wheat planting and emergence have been delayed. The map in Figure 2 shows what a difference a good rain can make in planting depth moisture. Figure 2 is a map of soil moisture at the 2-inch depth one day later on October 15, 2007. For planting, farmers would like to see the Oklahoma Mesonet Fractional Water Index values at 0.80 or higher. Values below 0.40 indicate very dry soils.

While the right rain and soil moisture cards have been a challenge this year, the joker has been the soaring grain prices. This has been the year when the reality of moving massive volumes of corn from food to fuel production hit the grain market. Increased demand for corn to produce ethanol kicked in a dramatic rise in grain prices. Compounding this climb in grain prices was poor wheat production news from production areas around the world. The expectation of high demand and tight supplies caused grain prices to climb to historic levels.

With wheat prices at historic highs and delays in wheat planting, Oklahoma wheat pasture for stocker cattle is expected to be in short supply. With high wheat grain prices and the stress of two short wheat crops, wheat producers are hesitant to risk lower grain yields by contract grazing. This has made it a challenge for cattle producers to find sufficient wheat pasture for stocker cattle in the fall of 2007. Added to the short pasture supply is the pressure of higher supplemental feed costs. For producers who can secure the cattle pasture and feed, cattle market economists are predicting they will be rewarded with good cattle prices in the spring of 2008. That leaves ranchers scrambling to find alternative feed sources to keep stocker cattle gaining and ready for finishing next spring.

Eastern Oklahoma ranchers are one group that might be holding some winning cards. Cool-season grasses are grown extensively in eastern Oklahoma for winter pasture. Those cool-season pastures have flourished from timely rains and ideal air temperatures. These cool-season grass pastures may be a chance for at least some Oklahoma farmers and ranchers to win a hand or two as the 2008 cards are dealt.

To access the products mentioned 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.

BY: ALBERT SUTHERLAND, CPA, CCA
MESONET ASSISTANT EXTENSION SPECIALIST
OKLAHOMA STATE UNIVERSITY

NOVEMBER

- After the 4-inch 3-day average soil temperature under sod cools to 55ºF, plant tulip bulbs 6 inches deep.
- Fertilize tall fescue in early November. Use a quick release fertilizer at a rate of 1 pound of actual nitrogen per 1,000 square feet.
- Rake leaves, clean up flowerbeds, and build or add to your compost pile. A simple recipe for making a compost pile is to use 50% green and 50% dry plant material in alternating layers 3-4 inches thick.
- Prune trees, after the majority of their leaves have turned color or dropped to the ground.
- Dig and transplant young trees or deciduous shrubs that need to be moved, after the majority of their leaves have turned color or dropped to the ground.

DECEMBER

- Complete yard cleanup. It is important to remove leaves from cool-season lawns, so the grass does not die from being smothered.
- Prune trees. A proper pruning cut leaves the branch collar intact. The branch collar is a raised doughnut shaped area that circles the base of the branch. Skip painting pruning cuts. Pruning paint actually slows callus growth over open cuts.
- Clip holly or evergreen plants for Holiday Season decorations. Insert cut stems in florist foam that is in a decorative container with water to keep arrangements looking fresh longer.
- Roundup herbicide can be applied to dormant bermudagrass areas to control green winter weeds. For best results, apply on a day when the air temperature will be in the upper 40s or higher.

JANUARY

- Spray dormant oil to control insect pests on ornamentals and fruit trees. Apply when the daytime temperature is above 50ºF and the nighttime temperatures are above freezing for 3-4 days. For spraying evergreen shrubs, use the lower summer rate.
- Roundup herbicide can be applied to dormant bermudagrass areas to control green winter weeds. For best results, apply on a day when the air temperature will be in the upper 40s or higher.
- Prune trees that are prone to excessive sap flow, during a cold period. These include pines, willows, elms, and maples. Do not apply pruning paint. It will not reduce sap flow and slows callus growth over branch cuts.
- Peruse plant and seed catalogs or Web sites. Colorful catalogs and Web sites will provide you many ideas for landscape projects and brighten a cold, drab winter day.
- Plan spring and summer landscape projects.
- Collect seed trays, media, and seeds to start transplants. Start seeds for hardy herbs (cilantro, dill, parsley) and hardy vegetables (broccoli, cabbage, onion) to be transplanted after mid-March.

INTERPRETATION ARTICLE

We all enjoyed the green grass in the Summer of 2007. We loved our water bills even more. With the heavy rains from Mother Nature, we didn't have to water our lawns as often. Next summer could be disappointing and EXPENSIVE if we don't plan. Recreating the green grass caused by abundant rainfall is difficult. We have to keep in mind the limited water supply available. Our choices will determine if clean water continues to be available.

Plants need water for photosynthesis. In photosynthesis, plants produce food from carbon dioxide and water when sunlight is available. Water is a critical factor that can limit a plants ability to grow. No water means wimpy plants. No water means less photosynthesis. Less photosynthesis means less green.

Plants take in carbon dioxide through their stomata--microscopic openings on the undersides of leaves. Water is lost through the stomata during transpiration. Transpiration, along with evaporation from the soil surface, accounts for the moisture lost from the soil.

Weather conditions play an important role in getting or keeping water for plant use. When it rains lawns require less irrigation. Automatic sprinklers or your watering schedule should be adapted to reduce overwatering. A key issue for keeping water available for plants is the rate of evaporation. When the evaporation rate is high, the water is added to the atmosphere not the soil. Three weather conditions that impact the rate of evaporation are temperature, relative humidity and wind speeds.

- **Temperature** – High temperature values result in high evaporation rates. Low temperature values result in low evaporation rates
- **Wind Speed** – High wind speeds result in high evaporation rates. Low wind speeds result in low evaporation rates.
- **Relative Humidity** – Low relative humidity values result in high evaporation rates. High relative humidity values result in low evaporation rates.

Wise use of water by homeowners not only helps protect the environment, but saves money and provides for optimum growing conditions. Simple ways of reducing the amount of water used for irrigation include watering when the evaporation rate is low, using soaking systems that place the water at the roots instead of on top of the leaves, and accounting for rainfall. Since the water is applied directly to the soil, rather than onto the plant, evaporation from leaf surfaces is reduced.

CLASSROOM ACTIVITY

We all love to walk across a nice green lawn. Many of us rely on automated sprinkler systems to provide water during dry times. Oklahoma cycles through extreme wet seasons like the Spring and Summer of 2007 and extreme droughts like 2005-06. How do we conserve water and maintain lush yards? One way is to water your lawn when the evaporation rate is low. A low evaporation rate gives the water an opportunity to soak into the soil and reach the plant roots. At times with high evaporation rates, most of the water joins the atmosphere instead.

1. The graphs provided contain data from 1994 to 2006. Each hour on the graph represents the average of all the data collected during the period. Use these graphs to help determine the best time for watering your lawn.

2. Determine the maximum and minimum temperature for each site (Sallisaw, Slapout, and Spencer).

3. Determine the maximum and minimum relative humidity for each site (Sallisaw, Slapout, and Spencer).

4. Determine the maximum and minimum wind speed for each site (Sallisaw, Slapout, and Spencer).

5. Knowing that a high evaporation rate is dependent on high temperature, high winds, and low relative humidity, which of the three sites will observe the highest evaporation rate (based on the max/min ranges from Questions 1-3)?

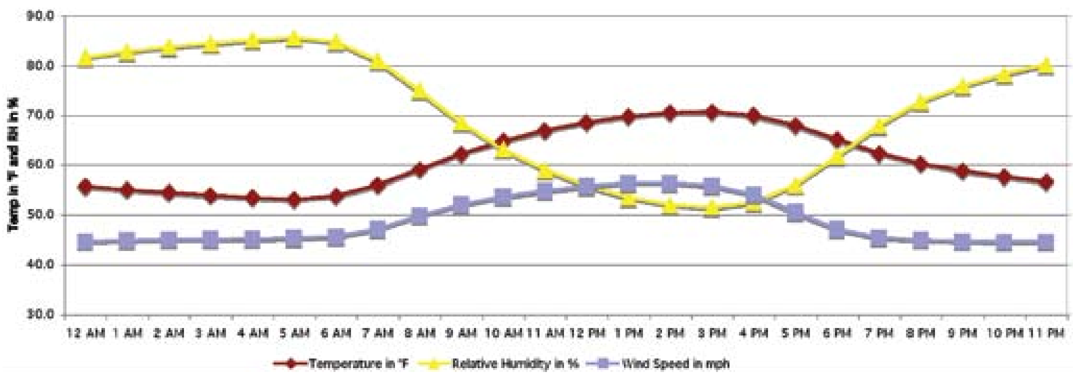
6. Knowing that a low evaporation rate is dependent on low temperature, low winds, and high relative humidity, which site will observe the lowest evaporation rate (based on the max/min ranges from Questions 1-3)?

7. For each site, what time of day is the evaporation rate high? Are the times consistent for all stations?

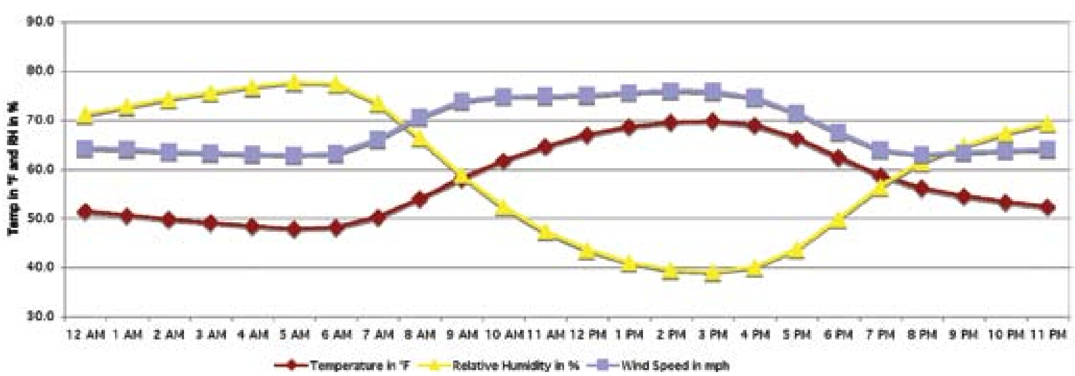
8. For each site, what time of day is the evaporation rate low? Are the times consistent for all stations?

9. You are writing articles on lawn watering for the Sallisaw, Slapout, and Spencer newspapers. Explain to readers the best time for watering and the worst time for watering.

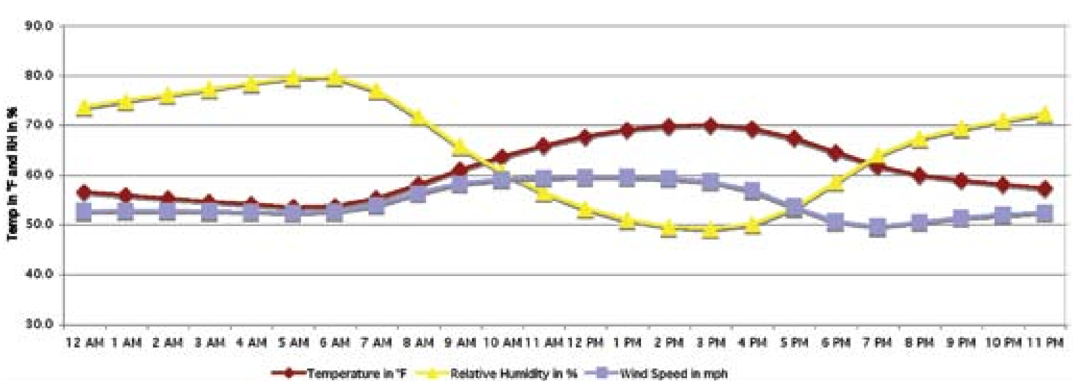
Graph 1 - Average Hourly Values from 1994-2006 - Sallisaw, OK



Graph 2 - Average Hourly Values from 1994-2006 - Slapout, OK



Graph 3 - Average Hourly Values from 1994-2006 - Spencer, OK



Fall Funnels

Autumn is the time when leaves exchange their verdant hues for brilliant golden shades. As temperatures drop, football takes over the lives of Oklahomans, and another burst of severe weather sometimes makes its return to Oklahoma after a summer respite. While the majority of tornadoes (and other severe weather threats) typically occur in the spring, Oklahoma occasionally experiences a secondary, weaker season of tornado activity in the fall, especially in early October (see Fig.1).

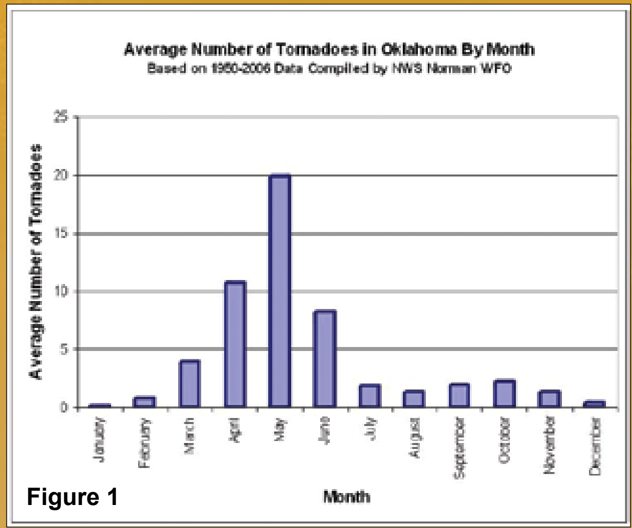


Figure 1

At this time of year, the jet stream is moving back down from the northern states, bringing back conditions that can be favorable for tornadoes. In addition, the remnants of tropical systems can track through Oklahoma in the fall. Since these moist systems often bring wind shear with them (weaker winds near the surface of the earth, stronger winds above the surface), tornadoes can form as a result.

One example of a fall tornado outbreak is the October 4, 1998, event in which at least 26 tornadoes destroyed homes and businesses across Oklahoma, breaking the record number of tornadoes for the month of October in any state. Fortunately, there were no fatalities and no major injuries; however, there was more than $5.6 million worth of damage to houses, businesses, and other structures.

Storm Details:
During this event, at least four supercells spawned numerous tornadoes. The first tornado – later rated as an F2 – touched down around 3:25 pm in southeastern Woods County and traveled northeast into western Alfalfa County, completely destroying barns, garages, office buildings, and a local gas plant. This same supercell later produced at least two more tornadoes, although of lesser strength than the first. The second supercell spawned weak tornadoes near Watonga and Dover which obliterated a hay barn, damaged several houses, and downed trees and power lines. Beginning around sunset and ending late in the evening, the third supercell produced several tornadoes – including at least five rated as F2 – that plowed through areas near Cyril, Ninnekah (Fig. 2 shows a radar image of the supercell around the time of this tornado), Blanchard, Newcastle, Moore, Meeker, and Prague.

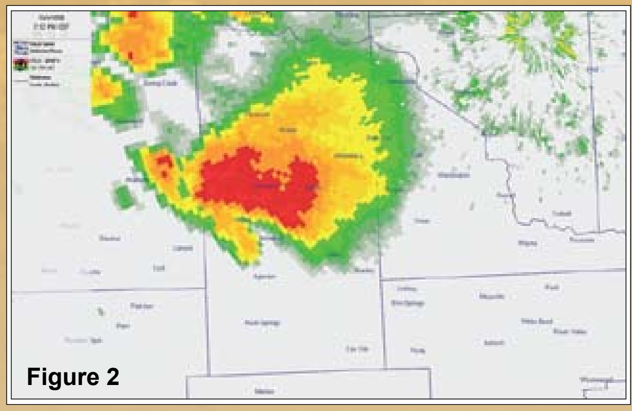


Figure 2

Damage in these locations ranged from minor roof damage, downed power lines and trees, and overturned mobile homes to completely destroyed barns, storage buildings, and residences. One of the most destructive tornadoes of this outbreak tracked through Moore, where many homes lost all or parts of their roofs. One home lost part of an exterior wall, while several residences were severely damaged or destroyed. Hundreds of other homes and businesses suffered minor damage. Near Prague, a mobile home containing a family of six was lifted and thrown 100 yards. All of the family members took shelter in an interior closet; fortunately, there were no fatalities (Note: NEVER take shelter in a mobile home during a tornado!). While the tornadoes near Prague and Meeker were wreaking havoc, the fourth and final supercell tracked from Shawnee to Prague. The storm not only produced a few weak tornadoes, but also spun up the strongest twister included in the damage survey – an F3 between Little and Prague. Notable damage from these tornadoes includes uprooted trees and signs, a tree that fell on and heavily damaged the Beard House in Shawnee, toppled brick walls in downtown Shawnee, significant damage to several residences, and a truck carrying hazardous materials that was blown over on Interstate 40.

A Final Note on Fall Severe Weather:

This fairly large tornado outbreak is not typical of the severe weather than can form in the fall. However, this case, in conjunction with others, such as the October 9, 2001, tornado outbreak, demonstrates that severe storms do not occur solely in the spring and that Oklahomans need to be prepared for severe weather year-round.

Extreme Weather:
Fall Myths and Myth-Conceptions

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As with any type of myth or legend, those of the weather variety can be quite entertaining. Who knew that sticking a knife in the ground in front of a tornado would cause it to split and bypass your area? Of course, with Oklahoma's proclivity for weather extremes, some of those myths can lead to disaster if taken at face value. When it comes to weather safety, it's always important to separate fact from fiction. And remember, if a tornado hits while you are reading this, don't bother opening any windows...TAKE COVER IMMEDIATELY!

True or False: If I know what the pavement under the flood waters should look like, then I know how much water I am attempting to drive through.
False! This is very dangerous. There is no guarantee that the road way still exists under the water, or that the roadbed hasn't been undercut by the flood waters.

True or False: If an area has had a "100 year flood" within the past several years, then the area is safe from another flood for several more years.
False! The "100 year flood" is only a statistical tool used to judge flood potential for a given area – not any kind of statistical guarantee.

True or False: Flash floods only happen when it's raining.
False! There only needs to be rain coming down further upstream for flash flooding to occur.

True or False: Flooding occurs only at low elevations along the coast.
False! Flooding is a result of elevation, drainage, soil type and surrounding development. It occurs along the coast and rivers as well as inland.

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