



OKLAHOMA
CLIMATE
Summer 2006

**In the Heat
of the Night**

**The Drought of
2005-06** (An Update)

THE **CENTER** OF
WEATHER

SCIENCE FAIR

MESSAGE FROM THE EDITOR

Bursts come in many varieties: downbursts, microbursts, cloudbursts (we called them “gully-washers” in the Panhandle), starbursts – both the candy and firework varieties, and outbursts (for you parents out there). In the past decade or so, another “burst” has come onto the scene...the heatburst. Many of you that stay up past Leno or Letterman have probably experienced this before. After stormy weather late at night, you notice the wind howling and so you step outside, only to get the blast-furnace effect normally reserved for mid-July afternoons. Much of southwestern and central Oklahoma was pounded by a series of heatbursts on May 22-23, 1996, and as luck would have it, OCS had the perfect environmental monitoring network in place to observe it...the Oklahoma Mesonet. Our historical remembrance takes a look back at that strange episode, an eye-opening display of what happens when what goes up, comes back down.

The big story of the past nine months or so around these parts has been drought. When we hatched the idea to write a drought summary back in early May, the rain appeared to be flowing freely once again. We hoped the drought was in its last throes. We were wrong. The drought of 2005-06 trudges on leaving half a million Oklahoma acres burned and one decimated wheat crop. Our drought report details the sad statistics through May, and what the forecasts call for in the months to come. Also in this issue, read about our move to the new National Weather Center building this summer! The NWC will pool all the weather resources in Norman together in one place, making collaborations easier, leading to new advances in atmospheric science. Norman (and Oklahoma) is well on its way to becoming the weather capitol of the world. Further, read about our attempt to bring a new way to measure rain and snow to Oklahoma with the CoCoRaHS program. In fact, we'll be asking you to do the measuring!

We give a recap of the 14th Annual Mesonet/ARM Science Fair hosted by the Oklahoma Climatological Survey, along with some pretty cool photos of April's ScienceFest event, held at the Oklahoma City Zoo. In addition, be sure to read our regular features dealing with agricultural weather, weather safety, and the 2006 spring weather.

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@ou.edu.

Gary McManus – Editor

Oklahoma Climate Summer - 2006

Cover Photo: Photo by Jason Kissel and Erdogan Ergun. If you have a photo that you would like to be considered for the cover of Oklahoma Climate, please contact Gary McManus at gmcmanus@ou.edu.

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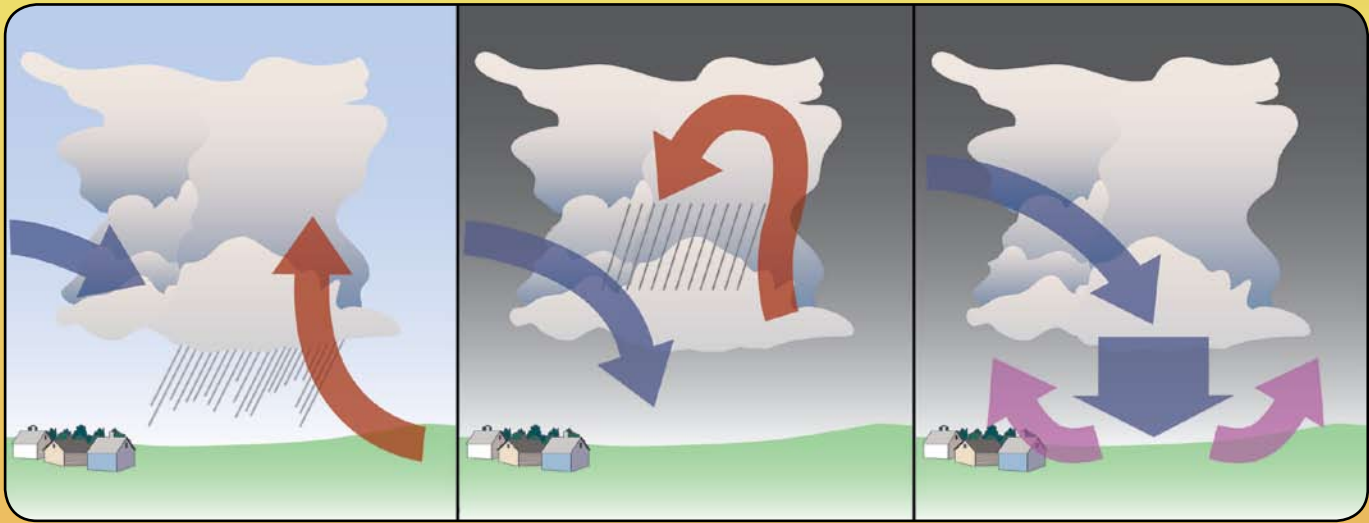
In the Heat of the Night

Gary McManus
Climatologist

Oklahomans have grown accustomed to wild and erratic weather, from massive F5 tornadoes to towering walls of churning wind-borne dust. Even the most veteran Oklahoma weather observers would be shocked to be hit in the face with triple-digit temperatures powered by 100 mph winds after dark, however. That is a distinct possibility during an event known as a “heatburst,” which is exactly what residents of southwestern and central Oklahoma experienced overnight on May 22-23, 1996.

Heatbursts

Similar to the more familiar thunderstorm phenomena known as “downbursts” and “microbursts”, heatbursts differ in that the air warms as it rushes toward the ground. Originating high up in a weakening storm, moist rain-laden air falls into a drier layer below and cools due to evaporation. The air then becomes denser than the surrounding air and plummets toward the ground, compressing and heating along the way. The air can be falling at a very fast rate, and much like a microburst, it spreads outwards as it hits the ground, becoming damaging straight line winds. The winds eventually die down as they spread farther and farther out due to the friction of the earth’s surface. As this wind passes, the air temperature rises dramatically just as the dewpoint decreases. Heatbursts were once thought to be relatively rare. The advent of the Oklahoma Mesonet, however, has allowed scientists to discover more heatbursts than ever thought possible. With more than 110 sites spaced an average of 32 km apart, measuring data every five minutes, the Mesonet has the perfect resolution to spot heatbursts. A research scientist at the Oklahoma Climatological Survey used Mesonet data in an attempt to quantify the frequency of heatbursts, with over 50 being detected in a five year period from 1993-1998.



During day, hot humid air feeds thunderstorm.

After sunset, hot humid air stop rising. Rain falls into cold air, evaporates and cools.

Cooled air plunges, heats up from compression and hits the ground as hot, dry wind.

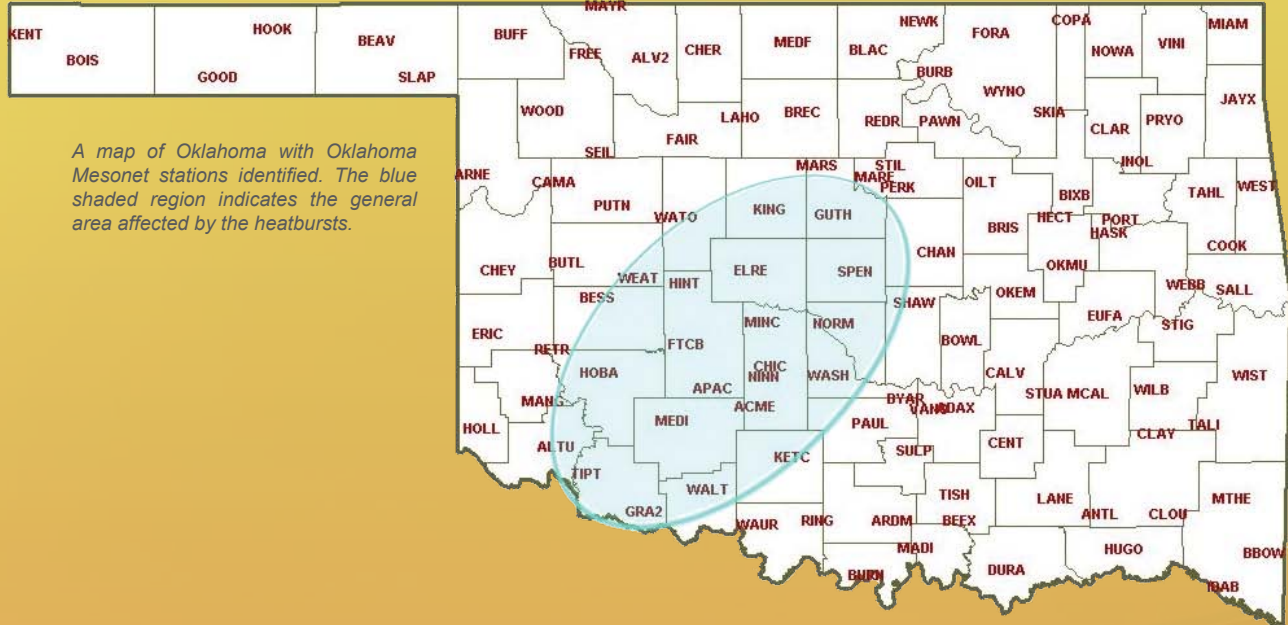
Wind Speed (mph)	Location
105	Tipton
95	Lawton
93	Rush Springs
91	Lawton
90	Apache
87	Marlow
80	Cyril
80	Lawton
80	Lindsay
76	Acme
76	Rush Springs
75	Apache
73	Altus
70	Chickasha
70	Cyril
68	Washington
64	Hobart
62	Fort Cobb
61	Tipton
60	Acme

The May 22-23, 1996, Heatburst

While heatbursts are not a common occurrence, the event in southwest and central Oklahoma during the night and early morning of May 22-23, 1996, was even stranger still. Actually a series of heatbursts, this event caused over \$18 million in damage and one injury as it blasted the area with 105 mph winds and temperatures up to 104 degrees, lasting a full seven hours. The National Weather Service Office in Norman, Oklahoma, noted the event as “gradient enhanced outflow,” and explained it with the following paragraph:

Widespread strong winds due to collapsing thunderstorms hit a large part of southwestern and portions of central Oklahoma. Comanche, Caddo, Grady, Kiowa, Jackson, Tillman, Cotton, Stephens, McClain and Garvin counties were the hardest hit, from preliminary reports. Numerous power outages due to the strong winds were reported throughout southwest Oklahoma.

The destruction from the heatbursts was extensive. Over 27,000 customers were without power due to toppled power poles.

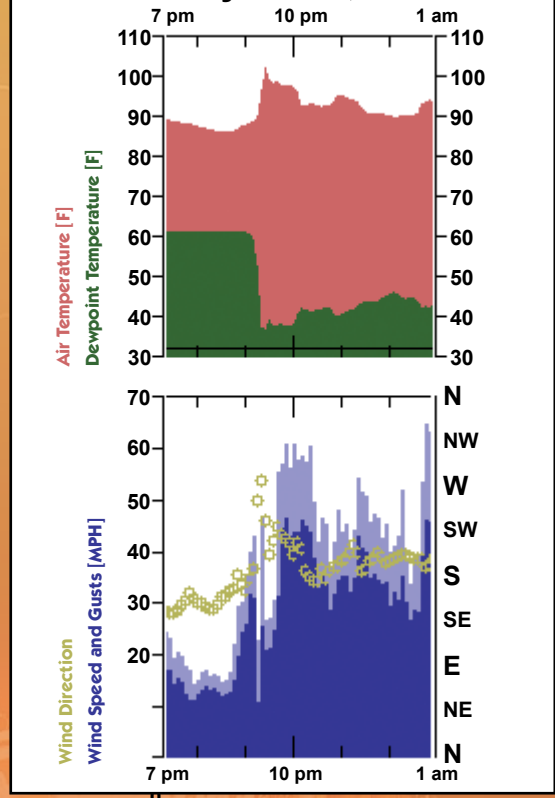


A map of Oklahoma with Oklahoma Mesonet stations identified. The blue shaded region indicates the general area affected by the heatbursts.

The Lawton area was perhaps the hardest hit. An estimated 90 percent of residences suffered at least minor damage in eastern Comanche and western Stephens counties. Damage estimates in that area alone were \$15 million. The city of Lindsay reported roof damage throughout the town with many store windows broken out. Near Gotebo, a child's swing set became airborne, striking and damaging a house, while an outbuilding was blown against two cars, also causing extensive damage.

Examples of damage such as these were prevalent throughout southwestern and central Oklahoma. One emergency management official even noted that the windstorm resembled "a hurricane without rain." Researchers hope that with the use of data from the Oklahoma Mesonet, a picture of the mesoscale environment can be developed that will allow forecasters to see these destructive events in advance. So don't be shocked if in the future, you see a scrawl across your favorite television program warning of "damaging heatburst winds."

Chickasha Mesonet Meteogram for May 22-23, 1996



A meteogram from the Chickasha Mesonet site, detailing the temperature and wind changes associated with the heatbursts. The temperature rose 16 degrees (from 86 degrees to 102 degrees) in 40 minutes around 9 pm. that evening as winds gusted over 60 mph.

THE DROUGHT OF 2005-06

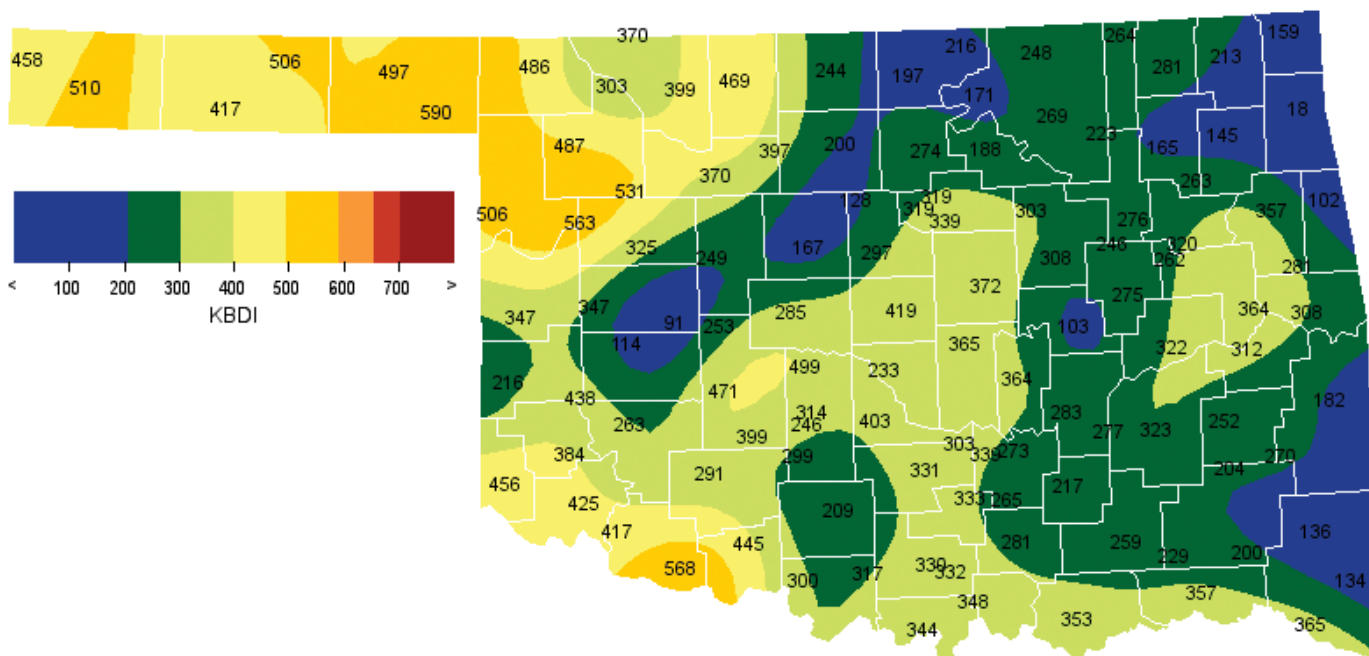
AN UPDATE
 BY DEREK ARNDT, ACTING STATE CLIMATOLOGIST

After some welcome heavy rains in late April and early May, the following weeks turned quite dry, re-igniting discussion of the “D word” in Oklahoma. Is this the start of another drought in Oklahoma? The answer is “no”, but not for optimistic reasons. The current episode is actually the continuation of an ongoing drought that began months ago.




Droughts, like many other phenomena in weather and climate, involve the interactions of processes on several time scales. One dry day does not make up a drought, but a cluster of them can make a dry spell of a few weeks. A cluster of these clusters can make up a short-term drought, which, in turn, can be a piece of a longer-term drought. The important point: these building blocks of drought are often separated by rainy days or even rainy periods. One rainfall event may close a chapter of a drought, but it won't end the whole drought. Instead, prolonged droughts end only with prolonged above-normal rainfall.

That's exactly what happened in much of Oklahoma during the two weeks sandwiched around May Day 2006: two to four inches of rain fell in a few days and ended the “Springtime Episode” of the ongoing drought. Unfortunately, as of early June, it looks as if a new chapter has begun for those areas. For other areas, particularly in the west, the rains of those weeks were scant, and one chapter bled right into the next.

Data from the Oklahoma Mesonet and from the Oklahoma Climatological Survey archives indicate that the state is undergoing drought on multiple timescales. In recent months, the drought took on two faces: a short-term event, with a timescale of months, that is worst in the western half of the state; and a historically-severe long-term drought (timescale of seasons to years) in the east. Central and southwest Oklahoma lie in the intersection of both timescales.



The Keetch-Byram Drought Index (KBDI) on June 7th, 2006. KBDI is one indicator of drought's impact on wildfire danger. As values increase, more subsurface organic matter is available as fuel for wildfire, and fires are more energetic and difficult to extinguish. For comparison, average June KBDI ranges from about 75 in southeast Oklahoma to about 210 in the northeast.

OK Region	Rank by Time Scale: For Periods Ending June 7th						
	30-Day	60-Day	90-Day	120-Day	180-Day	365-Day	Two-Year
1-Panhandle	4th	2nd	9th	4th	2nd	10th	43rd
2-North Central	6th	18th	21st	12th	6th	28th	34th
3-Northeast	10th	47th	42nd	30th	15th	11th	20th
4-West Central	12th	19th	22nd	13th	9th	37th	63rd
5-Central	1st	13th	16th	11th	3rd	15th	25th
6-East Central	5th	24th	28th	19th	9th	1st	14th
7-Southwest	5th	8th	17th	10th	4th	13th	31st
8-South Central	3rd	19th	34th	25th	12th	17th	30th
9-Southeast	20th	28th	48th	29th	14th	1st	2nd
OK-Statewide	2nd	14th	21st	12th	7th	10th	21st
 Historical Rank: Among five driest.				Description: These cells show the historical rank of recent precipitation on seven time scales. Current values are compared to history's analogous period ending June 7th.			
 Historical Rank: 6th through 10th driest.							
 Historical Rank: Among driest quarter.							

Historical Rank of the Current Drought

This table displays the historical rank of rainfall statistics at different timescales. Each is compared to a history made up of the equivalent time periods since 1921. For example: a rank of "6th" for north-central Oklahoma's 180-day rainfall indicates that the 180-day total (Dec 10th, 2005 through June 7th, 2006) is the 6th-driest such period of the 85 on record. The darkest shades of orange indicate that the current period is among the five-driest on record.

The southeast has experienced drought or near-drought conditions since 2002, with a distinct intensification in spring 2005. Summer and fall 2005 brought a northward expansion of drought to fill the state's eastern third. Recent months have brought some relief to the region, but the underlying hydrologic issues still remain. Severe drought impacts then advanced westward during the subsequent winter. Precipitation in April eased immediate problems, but a warm, dry May has exacerbated long-term drought conditions in much of Oklahoma.

A general rule-of-thumb for drought impacts is "Longer is Deeper". In other words, the longer a drought lasts, the deeper its impacts are felt. Within weeks of onset, dry surface conditions can lead to enhanced fire danger, much like Oklahoma witnessed during the disastrous winter months of 2005-06. During these months, more than half a million acres were consumed by wildfire in six months. For reference, this area is larger than that consumed by tornadoes during any decade in Oklahoma state history.

Shortly after enhanced wildfire danger, agricultural impacts are often seen. Of course, the total impact of a drought on agriculture depends on its timing, and the 2005-06 drought could not have come at a worse time for Oklahoma's winter wheat crop. Dryness took hold in western Oklahoma by October, when young wheat germinates. By crop's end in early summer, an estimated two-thirds of the total yield was wiped out by Mother Nature. The summer harvest, estimated to be at 68 million bushels, should be the state's smallest since the 1950s.

When drought lasts beyond weeks and months and into timescales of seasons and years, drought impacts go subterranean, and major hydrologic problems can develop. As the rainfall deficits surpass a year in the west, and two years in the east, groundwater storage and reservoir storage has suffered. Lake Eufaula in the east and Lake Thunderbird in central Oklahoma sit at about 75% conservation capacity. In other words, a fourth of the intended storage of each lake is gone. In western Oklahoma Altus-Lugert Reservoir sits at an eye-popping 49% of capacity: this does not bode well for cotton growers in the region.

Unfortunately, the outlook for coming months is not optimistic. Because large-scale weather patterns typically move northward during the summer months, Oklahoma's weather is more strongly influenced by local conditions. A larger component of summer weather is "homegrown", which makes summer in Oklahoma much more sensitive than other seasons to recent rainfall patterns during the previous weeks. When late spring is dry in Oklahoma, the subsequent summers show a tendency toward warmer and drier conditions.

NOAA's Climate Prediction Center calls for drought to persist across the western Oklahoma through August 2006. The silver lining in this scenario is that the confidence and skill of long-term forecasts is very low compared to short term (day-to-day) weather forecasts.

The Oklahoma Climatological Survey updates the state's drought information every day at: <http://climate.ocs.ou.edu/drought>.



PHOTOS FROM THE FEST





ScienceFest is an annual event held at the Oklahoma City Zoological Park and Botanical Garden in April for 4th and 5th grade students. The event is offered free to schools by the generous contribution of state agencies and energy companies. ScienceFest 2006 welcomed over 6,200 volunteers, teachers, and students.

The "Fin and Feather" show, a special aquatic performance - featuring sea lions, cockatoos, and cranes - was seen by the first 3,000 people entering the gates. During the show, students learned about the behaviors of sea lions and various birds. The animals helped encourage the students to recycle.

The Research Group of the Oklahoma Mesonet (Dr. Jeff Basara, Brad Illston, Danny Cheresnick, and two visiting interns from France) displayed their portable mesonet station. The stations can be transported on the back of a pickup truck with very little disassembly. Once unloaded and settled onto a flat area, the instruments can begin collecting weather data. Students blew across the anemometer to see who was the "windiest".

Twenty-three activity stations were positioned along the walking paths for students to visit. Students learned about protecting and wisely using our wind, water, air, and mineral resources. They learned about alternative fuel vehicles and methods of recycling.

At lunch, students helped collect 210 lbs of aluminum valued \$168 by recycling their soda cans. The money was donated to Lewa Wildlife Conservancy in Kenya.

Oklahoma is Cuckoo for

CoCoRaHS!

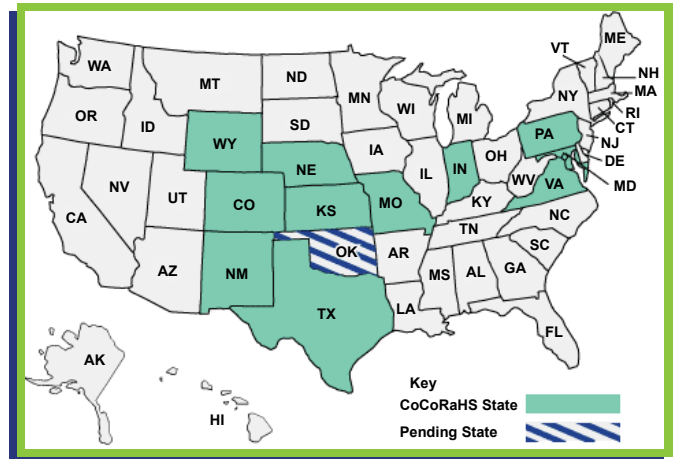
By Andrew Reader, Climatologist



On June 15, Oklahoma will join eleven other states in the Community Collaborative Rain, Hail and Snow Network (CoCoRaHS). CoCoRaHS is a grassroots volunteer network of backyard weather observers of all ages and backgrounds working together to measure and map precipitation (rain, hail and snow) in their local communities. The goal of CoCoRaHS is to provide a high quality rainfall observation network using low-cost measurement tools, education and training, and an interactive web-site.

The best feature of this program is that anyone can participate. CoCoRaHS is a community-minded project where everyone can help – young, old, and in-between. The only requirement is an enthusiasm for watching and reporting weather. Observers are asked to take measurements of precipitation each time a rain, hail or snow storm crosses your area. The precipitation reports are recorded on the CoCoRaHS website (www.cocorahs.org). The data are then displayed and organized for many of our end users to analyze and apply to daily situations ranging from water resource analysis and severe storm warnings to neighbors comparing how much rain fell in their backyards.

CoCoRaHS is used by a wide variety of organizations and individuals. The National Weather Service, other meteorologists, hydrologists, emergency managers, city utilities (water supply, water conservation, storm water), insurance adjusters, USDA, engineers, mosquito control, ranchers and farmers, outdoor & recreation interests, teachers, students, and neighbors in the community are just some examples of those who visit the CoCoRaHS website and use the data.



What does the program hope to accomplish? CoCoRaHS has several goals: 1) provide accurate high-quality precipitation data for our many end users on a timely basis; 2) increasing the density of precipitation data available throughout the country by encouraging volunteer weather observing; 3) encouraging citizens to have fun participating in meteorological science and heightening their awareness about weather; 4) providing enrichment activities in water and weather resources for teachers, educators and the community at large to name a few.

CoCoRaHS has the opportunity to thrive in Oklahoma. With the vast amount of weather knowledge our citizens possess, CoCoRaHS is a natural fit for the state. Oklahoma weather is the reason that programs like CoCoRaHS exists. Oklahoma thunderstorms can form and dissipate so quickly, that they may never pass over a Mesonet site or an NWS observation station. CoCoRaHS will help to fill the rainfall observations gaps across the state so that every drop will be recorded.

To sign up to become a CoCoRaHS observer, go to www.cocorahs.org and click on “Join CoCoRaHS” or contact:

Andrew Reader
CoCoRaHS State Coordinator
100 E. Boyd Suite 1210
Norman, OK 73019
areader@mesonet.org
405-325-3230



By: Gary McManus, Climatologist

Drought and heat were the two big stories during the spring season. While eastern Oklahoma's drought situation improved somewhat, the severity of the drought in the west increased. Much of eastern Oklahoma started the season suffering extreme or exceptional drought conditions, but near-normal rainfall totals alleviated the drought to more benign levels. The northwestern half of the state saw drought conditions worsen dramatically as rain stayed away from that area. As a whole, the state's average precipitation was the 31st driest on record. The Panhandle had the most miserable spring, at least by rank, suffering their 11th driest on record. There was not much difference in temperature statistics across the state, however. The entire state experienced either their warmest or 2nd warmest spring season on record, from three to four degrees above normal. Tornadoes were notable by their absence. According to preliminary statistics, only 17 twisters touched down in our state, half the normal total. Of those tornadoes, only two were significant (F2 or higher).

Precipitation

Most of eastern Oklahoma was near normal during the spring, with just a few localized areas above normal. The southern portions of both Love and Marshall counties were lucky enough to finish with a two-to-four inch surplus. Those totals managed to push the south central region to about an inch below normal. Southeastern and northeastern Oklahoma were similarly near normal. East central Oklahoma ended with a two-inch deficit. Antlers led the state with nearly 18 inches of rain, while some portions of the Oklahoma Panhandle struggled to exceed two inches. Madill managed to end up under a cloudburst and had nearly seven inches of rain on April 28th.

Temperature

Summer-like weather struck during every month of spring, but really came out in full force during the latter parts of May. Triple-digit temperatures were the norm during late May. As expected, the drier areas were the hottest. West central Oklahoma was nearly five degrees above normal, easily the hottest spring on record for that region. The southeast was the area closest to normal, but even that corner of the state was over three degrees above normal. Altus topped the season's temperatures with 104 degrees on May 20th. Kenton fell to a bone-chilling 10 degrees on March 21st.

March Daily Highlights

March 1-6: Highs on the 1st were in the 80s and 90s, with Oklahoma City setting a record high of 92 degrees. The next several days were much like a proper March period, with short intervals of showery weather and highs in the 60s and 70s. Lows for the most part were in the 40s, quite reasonable for that point of the year. The precipitation that did fall was quite light – generally on the order of a quarter of an inch. By the 6th, the weather had once again warmed into the 70s and 80s.

March 7-9: The 7th saw a true spring-like pattern position itself across the state. A stalled warm front across the SW was a sign of returning moisture from the Gulf of Mexico. Humidity increased along with warming temperatures into the 80s. Strong winds of 30-40 mph increased the fire danger considerably. Storms formed in north central Oklahoma with some moderate rainfall. Those storms continued into the early hours of the 8th, while the dryline remained positioned across western Oklahoma. More storms fired about midnight on the 9th across south central and eastern Oklahoma. Several of those thunderstorm complexes went severe, with golfball size hail and severe winds being the main threats. A cold front moved through later that day, touching off snow in the northwest and more storms in the east. Daytime highs were 10-20 degrees cooler than on the 8th, settling in the 40s and 50s.

March 10-13: The lingering storm system and its accompanying dryline produced more storms on the 10th. Soon after midnight, in the early morning hours of the 11th, the state's first tornado since October dropped from the clouds in Le Flore County. The F1 tornado was only on the ground for a matter of minutes, with little damage being reported. The real fireworks occurred late on the 12th. Storms fired along the dryline once again and became tornadic in more favorable conditions in eastern Oklahoma. An F3 tornado ripped through Cherokee and Delaware counties. The twister was on the ground for some 27 miles, first touching down near the town of Peggs before plowing through the small community of Twin Oaks on its way to Colcord, finally lifting near Bentonville, Arkansas. The damage path from this storm reached a mile wide at times. The heaviest damage was strung along a path from Twin Oaks to Colcord. This significant tornado was the first to hit the state since May 29, 2004

March 14-16: This three day period was relatively quiet, although strong winds and dry conditions kicked up the fire danger once again. Winds gusted to nearly 50 mph on the 15th. Temperatures were in the 60s and 70s throughout.

March 17-20: Lows on the 17th dropped into the 20s and 30s, while highs rebounded into the 40s and 50s. A slow-moving upper-level storm approached from the Four Corners area, triggering showers and thunderstorms throughout the four-day period. Oklahoma City set a precipitation record on the 18th, but the heaviest rainfall was due for the 19th. As it was, the northwestern half of the state received from two to six inches during the four days. The upper-level storm's passage left a gift of 3-6 inches of snowfall on the ground in the Oklahoma Panhandle. High temperatures in the rest of the state rose into the 50s, while remaining in the 30s in the snowfall area. Preliminary reports indicate a small tornado touched down in Dewey County near Putnam on the 20th.

March 21-23: The gray, overcast weather hung around for another few days. The first day of spring on the 21st was cool, and high temperatures in the 40s were made cooler by strong northerly winds, producing wind chills in the 30s. An upper-level storm brought snow on the 22nd and 23rd. The snow began late on the 22nd and continued overnight, dumping a band of around four inches from west central through central Oklahoma.

March 24-28: This period was fairly tranquil and pleasant with high pressure dominating the region. The 24th was unseasonably cool – Oklahoma City tied its record low temperature for the day, and highs barely managed to recover into the 50s. Cool mornings and seasonable afternoons continued through the 28th. Strong winds on the 26th did exacerbate the wildfire danger, but those winds calmed somewhat after a frontal passage the following day.

March 29-31: An approaching storm system kicked up moisture-laden winds from the south, which helped generate a few showers in south central parts of the state on the 29th. The main storm system arrived on the 30th, setting off a round of violent thunderstorms. Southern Oklahoma bore the brunt of the severe weather. A small tornado touched down briefly near Duncan; little damage was reported. The storm system dragged a weak cold front through the state overnight on the 31st, but temperatures rebounded into the 70s and 80s that day after lows in the 40s.

April Daily Highlights

April 1-4: An upper-level low pressure system moved in from the west overnight on the 1st, setting up the month's first day as a stormy one. A brief tornado touched down near the Tulsa airport late that evening. The weather quieted significantly after the storms, with highs in the 70s and 80s on the 2nd. A surface high pressure system moved in on the 3rd, cooling the state down to more seasonable levels in the 60s and 70s.

April 5-6: Humid air made its return to Oklahoma on the 5th. Low temperatures only fell into the 50s and 60s, and afternoon highs rose well into the 80s. Showers and storms developed early on the 6th, with more severe storms forming along a dryline later that afternoon. Large hail and winds exceeding 60 mph were reported in the northern half of the state, while three weak tornadoes touched down in northeastern Oklahoma. Winds behind the dryline in the west gusted to 60 mph, creating a large area of blowing dust.

April 7-12: The strong winds continued on the 7th and 8th, albeit from a northerly direction. Winds gusted to over 50 mph on the 7th to go along with lows in the 40s and 50s. Temperatures ahead of the front remained in the 70s and 80s, but fell into the 40s and 50s behind. The strong winds finally abated on the 9th, and temperatures plunged into the low twenties in the northwest. An approaching upper-level storm, centered over southern California, kicked winds up from the south on the 10th. The warmth returned on those southerly winds, finally rising into the 90s over southern Oklahoma by the 12th.

April 13-18: Summer-like conditions dominated this five-day period. Temperatures rose into the 90s each day, with several Mesonet sites recording triple-digit temperatures. Grandfield reported 102 degrees on both the 15th and 17th for the month's highest temperature, along with Walters on the 15th. Lows were generally in the 60s and 70s, while the highs remained 15-25 degrees above normal. A cold front on the 18th finally returned the state to more spring-like conditions.

April 19-22: The weather on the 19th was a drastic change from the previous few days, with low temperatures in the 20s and 30s over a good portion of the state, and highs in the 70s and 80s. The next two days were much of the same, with a few showers and thunderstorms thrown in. Rainfall amounts were light for the most part, however. The 22nd was warm as a ridge of high pressure built in, and highs climbed into the 80s and 90s under sunny skies.

April 23-27: More record-heat was in store on the 23rd as high temperatures once again rose near the triple-digit mark. The 23rd was also the beginning of another stormy period. Severe storms struck northwestern Oklahoma late that evening with large hail and strong winds. More powerful storms struck again on the 24th. A supercell thunderstorm produced simultaneous tornadoes – one cyclonic and one anti-cyclonic – near El Reno, the latter of which struck a hanger complex at the El Reno airport, causing severe damage to the structure and planes. The cold front eventually swept through the state that day, swinging the wind around to the north and keeping high temperatures firmly in the 60s. Low temperatures were much below normal for the next couple of days. Twenties were common in the northwest, with 30s and 40s elsewhere. The period ended with a very pleasant day on the 27th under sunny skies and highs in the 70s and 80s.

April 28-30: A powerful upper-level storm approached the state from Arizona, sending out several impulses which generated showers and thunderstorms over the state. The muggy weather on the 28th provided plenty of moisture for storms that night. Several waves of storms continuously moved across the eastern two-thirds of the state, with 24-hour rainfall totals exceeding nine inches in Love County near Marietta. S Flooding was reported in Marietta and Ponca City. A few severe storms flared up once again on the 30th in north central sections, but amounts were generally less than a half of an inch.

May Daily Highlights

May 1-6: A stationary front was draped across the state in the early morning hours on the 1st. That front later crossed the state but did little to cool temperatures that had risen into the 90s. The front didn't quite exit the state, and it was once again stationary as it triggered showers and thunderstorms early on the 2nd. Severe winds, baseball-size hail, and flash flooding were present with the storms. Storms formed once again that evening in the west and brought more severe weather to that area. A cold front moved through on the 3rd and dropped high

temperatures into the 60s and 70s, with some 50s in the northwest. More storms formed with this front, meaning more severe weather. The Idabel Mesonet site recorded a wind gust of 106 mph; those winds destroyed several outbuildings and blew out windows in residences. The rain and cooler weather continued through the 6th.

May 7-10: Yet another stormy period, the next four days saw more severe weather visited upon the state. Two weak tornadoes touched down near Stringtown and Beggs on the 9th and 10th, respectively, and Antlers reported nearly four inches of rainfall on the 9th. Hail to the size of baseballs was reported in Greer and Harmon counties. The moisture and cloudiness kept lows unseasonably warm, generally in the 60s and 70s.

May 11-17: A This week-long period was devoid of precipitation for the most part, meaning plenty of sunny skies and pleasantly warm temperatures. Morning lows fell into the 40s and 50s, and highs were generally in the 70s and 80s.

May 18-23: The real heat of the month began to build during these six days. High temperatures quickly built into triple-digits by the 19th. The month's highest temperature of 104 degrees occurred on the 20th in Altus. Oklahoma City tied the record high temperature of 97 degrees on the 19th, which had just been broken the previous year. Many more records for warmth were set during the next four days.

May 24-28: The heat continued, but the rain returned. A weak cool front in the northwest on the 24th set the stage for more showers and thunderstorms, mainly in northern Oklahoma. Despite the rain and cool front, highs still reached the 90s and 100s. The storms continued into the 25th as the cool front became a stationary front. One of nature's oddities struck on the 28th when a dying thunderstorm produced a heat burst. Temperatures quickly rose 20 degrees near Mangum, and the winds gusted to over 60 mph.

May 29-31: The rain continued during the month's final three days, the product of more severe storms. Rainfall amounts of nearly three inches were reported near Kingfisher on the 29th. Later that evening, more showers and storms formed along a gust front in northeast Oklahoma. High winds and hail were the most common severe threats with these storms. A 78 mph wind was reported in Harmon County on the 30th, along with flash flooding in Duncan on the month's last day. Areas in Beckham County received over four inches of rainfall on the 31st, while Erick reported well over three inches.

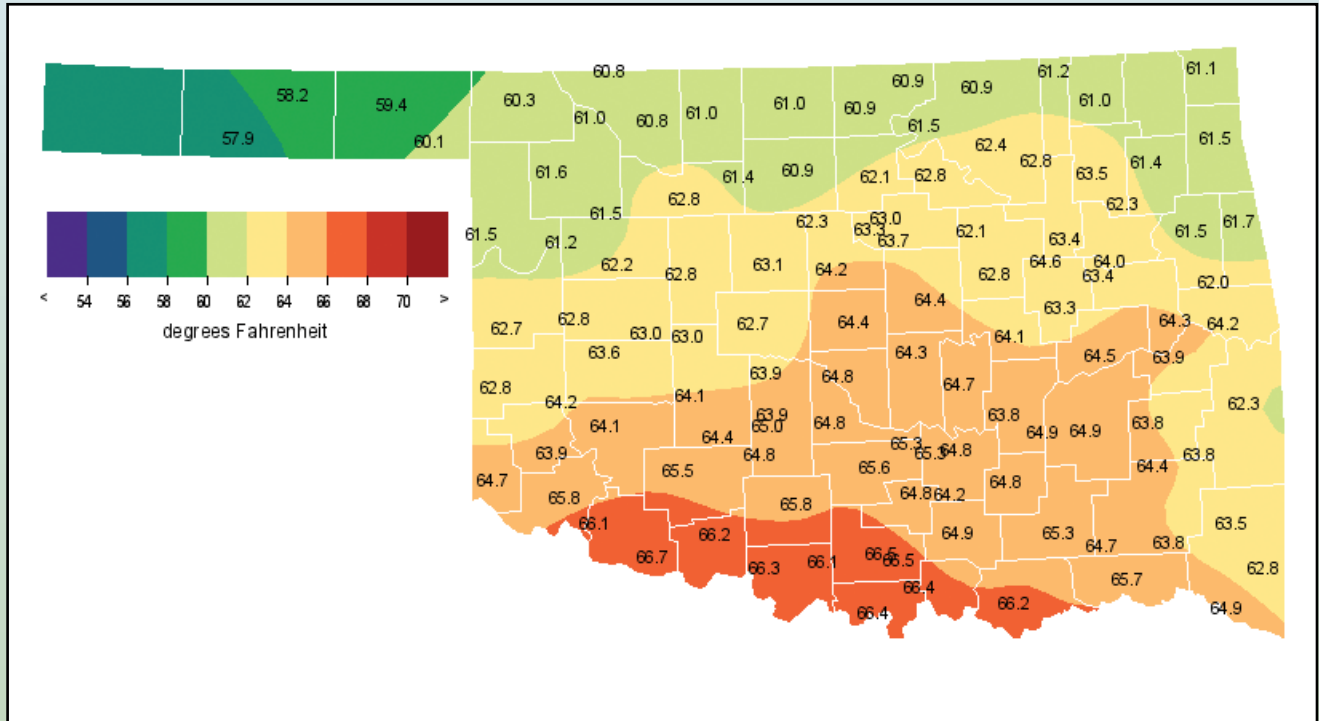
Spring 2006 Statewide Extremes

Description	Extreme	Station	Date
High Temperature	104°F	Altus	May 20th
Low Temperature	10°F	Kenton	March 21st
High Precipitation	17.46 in.	Antlers	
Low Precipitation	2.18 in.	Slapout	

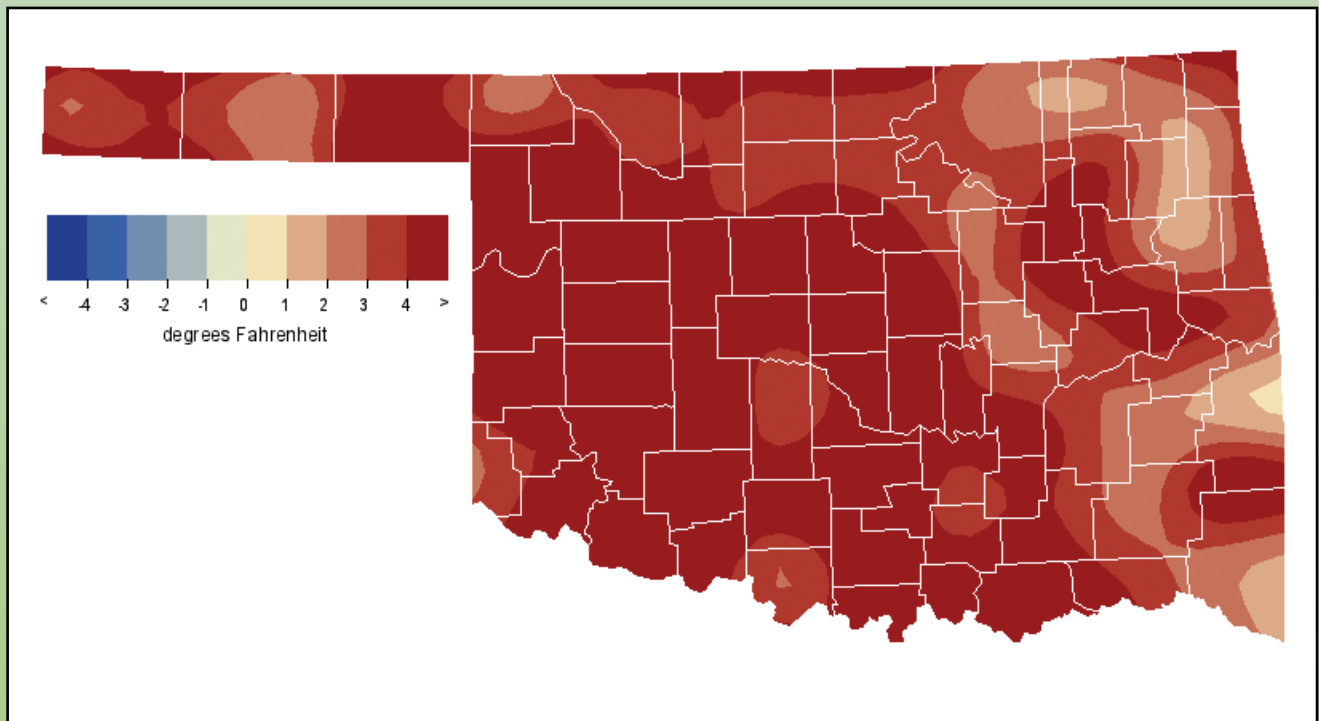
Spring 2006 Statewide Statistics

	Average	Depart.	Rank (1892-2006)
Temperature	63.1°F	4.0°F	1st Warmest
	Total	Depart.	Rank (1892-2006)
Precipitation	9.24 in.	-2.44 in.	31st Driest

Average Temperature



Temperature Departure from Normal



Spring 2006 Mesonet Precipitation Comparison

Climate Division	Precipitation (inches)	Departure from Normal (inches)	Rank since 1895	Wettest on Record (Year)	Driest on Record (Year)	2005
Panhandle	3.17	-3.68	11th Driest	(1957)	(1966)	4.30
North Central	7.33	-3.03	41st Driest	(1957)	(1895)	3.01
Northeast	11.71	-1.44	53rd Driest	(1957)	(1895)	6.64
West Central	7.35	-2.55	51st Driest	(1957)	(1971)	4.69
Central	8.58	-3.82	28th Driest	(1957)	(1932)	3.86
East Central	12.25	-2.06	41st Driest	(1990)	(1936)	8.20
Southwest	6.78	-3.12	27th Driest	(1957)	(1971)	5.03
South Central	11.77	-1.14	53rd Driest	(1957)	(2005)	4.50
Southeast	14.84	-0.49	53rd Wettest	(1990)	(1936)	8.46
Statewide	9.24	-2.44	31st Driest	(1957)	(1895)	5.28

Spring 2006 Mesonet Temperature Comparison

Climate Division	Average Temp (F)	Departure from Normal (F)	Rank since 1895	Hottest on Record (Year)	Coldest on Record (Year)	2005
Panhandle	59.6	4.3	1st Warmest	59.5 (1963)	49.4 (1915)	55.2
North Central	61.3	3.7	2nd Warmest	61.6 (1963)	52.8 (1924)	57.7
Northeast	62.1	3.6	1st Warmest	61.7 (1977)	53.5 (1924)	58.3
West Central	62.8	4.8	1st Warmest	61.9 (1963)	52.9 (1915)	58.2
Central	63.8	4.3	1st Warmest	63.1 (1974)	54.5 (1924)	59.4
East Central	63.6	3.6	2nd Warmest	63.7 (1974)	55.1 (1931)	59.6
Southwest	65.0	4.5	1st Warmest	64.4 (1963)	55.1 (1915)	59.9
South Central	65.6	4.3	1st Warmest	65.0 (1974)	56.5 (1931)	60.8
Southeast	64.0	3.2	2nd Warmest	64.3 (1938)	56.8 (1924)	58.6
Statewide	63.1	4.0	1st Warmest	62.5 (1974)	54.3 (1924)	58.6

Spring 2006 Mesonet Extremes

Climate Division	High Temp	Day	Station	Low Temp	Day	Station	High Monthly Rainfall	Station	High Daily Rainfall	Day	Station
Panhandle	102	May 19th	Buffalo	10	Mar 21st	Kenton	4.28	Arnett	0.90	May 5th	Buffalo
North Central	103	May 20th	Lahoma	19	Mar 14th	Cherokee	13.49	Newkirk	4.15	Apr 28th	Blackwell
Northeast	99	Apr 17th	Pawnee	21	Mar 14th	Burbank	14.65	Jay	3.56	Apr 28th	Foraker
West Central	101	May 20th	Camargo	17	Mar 14th	Camargo	10.51	Bessie	3.34	May 30th	Weatherford
Central	101	Apr 17th	Stillwater	17	Mar 14th	El Reno	10.32	Stillwater	2.90	Apr 28th	Ninnekah
East Central	97	Apr 17th	Okmulgee	22	Mar 24th	Cookson	14.43	Westville	2.73	May 4th	Cookson
Southwest	104	May 20th	Altus	21	Mar 24th	Mangum	8.65	Medicine Park	1.78	Mar 18th	Walters
South Central	100	Apr 17th	Burneyville	23	Mar 24th	Sulphur	17.25	Madill	6.80	Apr 28th	Madill
Southeast	97	Apr 18th	Antlers	23	Mar 25th	Wister	17.46	Antlers	4.19	Mar 19th	Mt. Herman
Statewide	104	May 20th	Altus	10	Mar 21st	Kenton	17.46	Antlers	6.80	Apr 28th	Madill

AGRICULTURE WEATHER WATCH

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

NOW WITH
**MORE
WHEAT!**

Oklahoma Climate Region Rainfall April 2, 2006 through May 31, 2006

Climate Division	Total Rainfall	Departure from Normal	% of Normal	Driest since	Wettest since	Rank since 1921 (85 periods)
Panhandle	5.22"	-6.04"	46%	2001-02 (4.34")	2004-05 (12.71")	5th driest
N. Central	10.52"	-8.03"	57%	1995-96 (5.75")	2004-05 (16.56")	9th driest
Northeast	15.60"	-10.63"	59%	1995-96 (11.14")	2004-05 (24.83")	6th driest
W. Central	8.87"	-8.48"	51%	1995-96 (5.16")	2004-05 (17.82")	4th driest
Central	11.13"	-12.98"	46%	1995-96 (10.23")	2004-05 (20.30")	2nd driest
E. Central	16.40"	-14.02"	54%	--	2004-05 (29.98")	1st driest
Southwest	9.37"	-9.01"	51%	1995-96 (6.64")	2004-05 (19.71")	4th driest
S. Central	16.58"	-10.32"	62%	1995-96 (12.72")	2004-05 (26.87")	7th driest
Southeast	21.83"	-13.55"	62%	1955-56 (19.56")	2004-05 (33.13")	5th driest
Statewide	12.73"	-10.38"	55%	1995-96 (10.88")	2004-05 (22.23")	3rd driest

Water Year: Oct 1, 2005 through May 31, 2006

Climate Division	Total Rainfall	Departure from Normal	% of Normal	Driest since	Wettest since	Rank since 1921 (86 periods)
Panhandle	3.08"	-3.66"	46%	2002 (2.48")	2005 (4.10")	9th driest
N. Central	7.09"	-3.09"	70%	2005 (2.95")	2004 (9.57")	26th driest
Northeast	11.72"	-1.19"	91%	2005 (6.52")	2004 (14.34")	41st driest
W. Central	6.76"	-2.99"	69%	2005 (4.72")	2004 (7.49")	25th driest
Central	8.31"	-3.88"	68%	2005 (3.58")	2002 (9.58")	20th driest
E. Central	12.21"	-1.83"	87%	2005 (7.06")	2002 (14.78")	31st driest
Southwest	6.93"	-2.83"	71%	2005 (4.89")	2004 (7.10")	21st driest
S. Central	11.71"	-0.97"	92%	2005 (4.80")	2002 (13.65")	40th driest
Southeast	14.79"	-0.25"	98%	2005 (8.53")	2002 (20.70")	42nd wettest
Statewide	9.12"	-2.36"	79%	2005 (5.11")	2002 (10.40")	26th driest

Oklahoma's wheat crop has really made the news lately. Why? Because Oklahoma wheat producers are harvesting the smallest crop since 1957. That means you have to jump back 50 years to find a year with so little production. With wheat at \$4.40 a bushel and a loss of 70 million bushels, wheat revenue will drop by \$280 million. Economic multipliers push the total economic state impact closer to \$1 billion. The worst part is this \$1 billion economic disaster will hit rural Oklahoma communities the most. These smaller communities are much more dependent on the farm income than larger metropolitan areas and will feel the pinch this summer and fall.

The low wheat production is the result of dry winter weather that held its grip on Oklahoma from October 2005 through March 2006. Once rain did fall, the wheat plants were too far along to take advantage of the moisture.

While April and early May saw some much needed rain fall across the state, this was followed by above average air temperatures and high winds in late May. This has pushed most of Oklahoma back into a poor soil moisture situation. Pond water levels are low, hay and grass fields are showing poor growth, and dry land summer crops are suffering.

Prices remain good for cattle, but lack of pasture has really taken a bite out of livestock profits. Livestock producers will be walking a tightrope to try and end the year with a profit instead of falling into the red from having to purchase feed.

With such low rainfall, the agricultural news is just plain bad news. Here is a table of rainfall by Oklahoma climate region for April and May from the Oklahoma Climatological Survey. Note the Percent of Normal and dryness Rank since 1921.

Now take a look at the Rank since 1921 for October 2005 through May 2006. All of the Oklahoma climate regions fall into the top 10 of driest years out of the last 85 years. The East Central Climate Region jumps out as the driest on record in 85 years. While the South Central and Southeast regions had the best moisture in April and May, they are still well short of normal for the water year.

To access the products mentioned previously and connect to the latest agricultural weather information, go to Oklahoma AgWeather at <http://agweather.mesonet.org>. This web site is a joint project of the University of Oklahoma and Oklahoma State University. It uses the latest information from the Oklahoma Mesonet and the Oklahoma Climatological Survey. If you have any questions or comments about the Oklahoma AgWeather site, please, contact Albert Sutherland by phone at 405-224-2216 or by email at albert.sutherland@okstate.edu.



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

JUNE

- Fertilize turfgrass areas. 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.
- Apply an approved fungicide on tall fescue to control brown patch disease during times of 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 it.
- Apply an approved fungicide for the pine needle blight disease, Dothistroma Needle Blight.
- Check plants for sucking insect pests and treat as needed.

JULY

- Water, water, water.
- 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 branch side of the branch collar to hasten callus growth over the cut surfaces.
- Continue treatments 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.
- 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.

AUGUST

- Keep up with water demand. Maybe its time to install a drip system in the garden or sprinkler system for lawn watering.
- If you missed white grub control in July, apply an approved fast acting insecticide when treating in August.
- Plan for new plantings with water efficiency in mind. Group plants with similar water needs together. Reserve areas closer to the water valve for high water demand plants.
- Children are heading back to school, so trim shrubs or trees near streets to maintain good driver visibility.
- Continue control of rose black spot with an approved fungicide.
- Plant frost hardy and short season vegetables. In August, plant cucumber, beet, broccoli, cabbage, Chinese cabbage, carrots cauliflower, collards, Irish potatoes, leaf lettuce, parsnip, green peas, radish, Swiss chard, and turnip.
- Prepare new garden areas by: 1) watering, 2) spraying weeds with glyphosate, 3) waiting 7-10 days, and 4) tilling the area.
- If a moderate to heavy rain event occurs, check pecan trees for emerging pecan weevil.

To create a full color poster, select pages 19-20 to print separately and then:

1. Choose "Scale to Fit" printer option.
2. Cut off excess white edges.
3. Flip over and tape back.
4. Display.



For a PDF of this Climate Summary, please visit:
http://climate.ocs.ou.edu/seasonal_summary.html



SCIENCE FAIR

ANDREA MELVIN | EARTHSTORM PROGRAM MANAGER

Students from Cheyenne High School, Cordell Elementary, Emerson Junior High (Enid), Enid High School, Gage Junior High, Jefferson Middle School (OKC), Monroe Elementary (Enid), and Sayre Elementary competed at the 14th Annual Mesonet/ARM Science Fair hosted by the Oklahoma Climatological Survey. The fair took place inside the Sam Noble Oklahoma Museum of Natural History. After their projects were judged, students, parents, and teachers were free to enjoy the museum.

The judging team spanned all education levels from undergraduates to professional meteorologists with a few non-meteorologists to balance the questions. The judges included undergraduates Christine Brown and Melissa Koeka; graduate students Christopher Godfrey, Elaine Godfrey, Kevin Goebbert, and Aaron Kennedy; meteorologists Nicki Hickmon from the Oklahoma Climatological Survey; Michael Klatt and Kyla McKnabb from the Environmental Verification and Analysis Center, Billy McPherson from the Center for Spatial Analysis; and non-meteorologists Cery Leffler, from the Oklahoma Climatological Survey, Laura McKay from Oklahoma State University-Oklahoma Mesonet, Dustin McKnabb, Norman Regional Hospital, and Al Sutherland, Oklahoma State University-Oklahoma Mesonet. The judges are an important part of helping the students critique their projects for regional and state competitions. The time they spend asking questions and making suggestions for additional research encourage the students to improve their speaking skills, board layout and design, unit usage, and catching those pesky spelling errors.

For example, the project "Up On The Rooftop" by Krystal Cato, Tanya Dodds and Rocio Manriquez received a Superior award at the Mesonet/ARM Science Fair. They did not receive a Best In Show award. The judges suggested better graphics to display their data results. The students had already qualified for the state science fair before competing in the Mesonet/ARM fair. The students were able to make modifications before the state competition based on the suggestions from our judges. Their project placed 3rd in Team Projects at the state fair. This is the first year a project from Jefferson Middle School has placed at the state competition.

The Upper Division winner "Dance To The Beat of A Distant Drum" compared the affect of pressure, temperature, and relative humidity on the tone and decibel output of a snare drum. Judges said, "Great project! You did a very good job going outside what is required of you and looking at the modes of the snare drum." The Lower Division winner "Breathe Easy" tracked his peak flow meter results for his asthma with rain events to see if there was a correlation. The judges said, "Great data documentation! Good use of scientific method and application of data. I would like to have seen a comparison to additional environmental factors (solar radiation or wind speeds). You are very well spoken and able to answer questions clearly and concisely.

The 2007 Science Fair will be held in the new National Weather Center Building. We hope to see you there.

UPPER DIVISION:

- 1 Colton Dyess**, 8th Grade
Thomas Jefferson Middle School, Oklahoma City
"Dance To The Beat Of A Distant Drum"
- 2 Kasey Painter**, 12th Grade
Enid High School, Enid
"A Statistical Study To Compare Automated Skin Temperature Measurements to Manual Observations of Pavement Temperature"
- 3 Chase Hensley and Dusta Kimzey**, 8th Grade
Cheyenne High School, Cheyenne
"Forecasting Moods"
- 3 Dalton Creed and Jacob Meining**, 7th Grade
Gage Junior High, Gage
"Is There A Correlation of Porosity, Permeability, and Soil Temperature?"

LOWER DIVISION:

- 1 Parker Stambaugh**, 6th Grade
Monroe Elementary, Enid
"Breathe Right"
- 2 Sidney Spieker**, 5th Grade
Sayre Elementary, Sayre
"Catching the Rays"
- 3 Denya Lara**, 6th Grade
Monroe Elementary, Enid
"How Dry I Am"

PRIZES:

- 1** Trophy
Midland - NOAA Weather Radio
AMS Weather Sybmol Umbrella
EarthBall
- 2** AMS Weather Sybmol Umbrella
EarthBall
- 3** Choice of:
AMS Weather Sybmol Umbrella
or EarthBall



WINNERS

THE CENTER OF WEATHER

By: Dr. Kevin Kloesel, Director of Outreach and
Dr. Renee McPherson, OCS Acting Director

Last year marked the 25th anniversary of the Oklahoma Climatological Survey (OCS). We celebrated being able to serve Oklahoma's citizens and government agencies with time-critical weather and climate information. This year marks another celebration — one shared by OCS and its sister weather and climate organizations in Norman, OK. In Summer 2006, OCS moves to the new National Weather Center building.





The National Weather Center (NWC) will house the National Oceanic and Atmospheric Administration's (NOAA) Norman Weather Partners, including the National Severe Storms Laboratory, the National Weather Service (NWS) Forecast Office—Norman, the NWS's Radar Operations Center, the NWS's Storm Prediction Center, and the NWS's Warning Decision Training Branch. Joining the NOAA Norman Weather Partners in the NWC will be the University of Oklahoma's (OU) School of Meteorology, OU's Cooperative Institute for Mesoscale Meteorological Studies, OU's Center for Analysis and Prediction of Storms, OU's Center for Spatial Analysis, OU's Center for Natural Hazards and Disaster Reduction, and (drum roll, please) the Oklahoma Climatological Survey.

The Norman Weather Industry Cluster

The building will house more than 600 faculty, staff, and students. In addition to the growing NOAA and OU organizations, there is also a rapidly expanding commercial weather presence in Norman. This emergent private weather sector is turning Norman into an industry cluster where scientists routinely transform weather measurements into products and services for decision-making, policy-making, and economic development. The weather industry in Norman now employs over 700 professionals — the Nation's 3rd largest weather/climate community — and has grown into a \$65 million per year enterprise.

Norman's weather industry cluster hosts world-renown expertise in a variety of weather and climate areas, spanning research, development, applications, operations, and education. The next-generation weather radar technology, including the use of dually polarized beams and electronically steered phased arrays, is being developed in Norman for deployment around the world. The Oklahoma Mesonet, an observing system that measures weather of all varieties in all seasons, is used by thousands of Oklahomans and is being prototyped for national deployment. The weather enterprise also includes expertise in the areas of weather and storm forecasting, regional climate, situational awareness and warning decision-making, geographic information systems, continuing education, and public outreach.

OCS's New Home

In 1992, OCS moved from first-floor office space to the 12th floor of the Sarkeys Energy Center. Because visitor parking was difficult to find near the Energy Center, the number of visitors to OCS declined over the years. Fortunately, during those years we were able to publish many of our products using a now-familiar communications mechanism — the World Wide Web. With thousands of products available at www.ocs.ou.edu, there became less of a need for people to visit our offices. We, however, missed the direct interaction with the public.

The new NWC building affords us the best of both worlds. We will be linked to a faster, more reliable network; we'll have backup power, backup communications, and backup air conditioning. We also will be back on ground level, with visitor parking nearby. By September 1, 2006, the public will be able to easily access our records and our record keepers, our data and our data analyzers, our teaching materials and our teachers.

The National Weather Center is located off of Highway 9 and Jenkins Avenue, near the Lloyd Noble Center. OCS's main offices are just off of the second-floor ceremonial entry. We also will occupy laboratory and machine shop space on the first floor (for the Oklahoma Mesonet sensor calibrations and repairs) and distance learning and computer operations space on the third floor.

Our intention is to move with minimal disruption to our services. We know that there will be times when we have to unplug a computer, but our system administrators have planned the details of how to minimize disruption. We promise not to disturb anything during hazardous weather anywhere in the state. If you experience trouble obtaining any products, please call our operations center at 405-325-3231.

Norman's weather industry cluster hosts world-renown expertise in a variety of weather and climate areas

Thank You!

Our new home would not have been built without your generous support. Through your service as an Oklahoma taxpayer, you have provided much of the funding for our offices. We intend to "pay you back" by providing more timely and relevant services to you, your local public safety officials, your schoolchildren, and your government leaders. We do this to save lives, reduce costs, and grow Oklahoma's economy. That's our way of saying, "thank you."



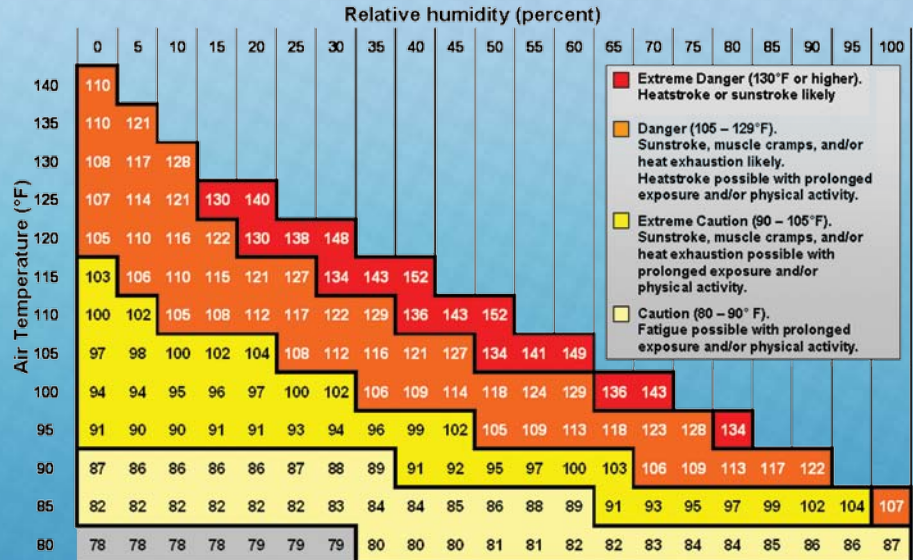
HEAT INDEX

Andrea Melvin | Earthstorm Program Manager

Oklahoma experiences long, hot summers. As the temperature and relative humidity increase, your risk for heat exhaustion and heat stroke increases. The "heat index" represents how a body reacts to the combination of relative humidity and high temperature.

When the human body gets too warm, it perspires. As the perspiration evaporates, the skin cools. When the relative humidity is high, the rate of evaporation slows and the perspiration falls off the skin. The body continues to produce perspiration without the benefit of evaporational cooling. This leads to fatigue, heatstroke and finally heat exhaustion. Ignoring the warning signs could lead to hospitalization.

How Hot the Combination of Temperature and Humidity Feels



Use this heat index chart to decide when you should slow down physical activity by taking frequent breaks and drinking more fluids.



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