The Southern Plains Cyclone

A Weather Newsletter from your Norman Forecast Office for the Residents of western and central Oklahoma and western north Texas

We Make the Difference When it Matters Most!

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Meet Your Weatherman Rick Smith

Hi! I am Rick Smith, the Warning Coordination Meteorologist (WCM) at the National Weather Service's Norman Forecast Office.

My interest in weather began at a very early age. I can distinctly remember drawing weather pictures and making simple forecasts in first grade. Like most meteorologists, my fascination with weather began as fear. As a child growing up around Memphis, Tennessee, I was terrified of thunderstorms and tornadoes.

At some point later in life, that fear evolved into fascination, and I wanted to learn as much as I could about the storms that had scared me so much. When I heard that the NWS had storm spotters, I knew I wanted to be one. When I contacted the NWS, I was told that most of the spotters were amateur radio operators. As a result, in 1990, I obtained my amateur radio license and became active as a storm spotter and net control operator for the local Skywarn group in Memphis. Eventually, I got the opportunity to be at the NWS office during severe weather, gathering reports and interacting with the forecasters.

A few roadblocks had prevented me

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May 3rd, 1999 from the NWS's Perspective

By the Staff at YOUR Norman Forecast Office

Five years ago this 3rd of May, the worst tornado outbreak in Oklahoma history devastated portions of southwest and central Oklahoma. On this day, 61 tornadoes touched down in Oklahoma and Kansas, including one rated as an F5 and two as F4 on the Fujita Scale in the Norman county warning area alone. The costliest single tornado in United States history occurred during this event, as the Moore and Oklahoma City tornado produced over a billion dollars in damage. Tornadoes also raked through other communities, including Mulhall and Stroud.

While many events of this fateful day, of both the tragic and heroic variety, have been recounted countless times on the local news, in newspapers, and in television documentaries, one tale that has not yet been told concerns the thoughts, actions, and interesting occurrences in the Norman National Weather Service Forecast Office from the perspective of the forecasters, meteorological technicians, and management staff that worked the event.

Meteorologists constantly train for events of May 3rd's magnitude, all the while hoping that preparation will never be needed. Unfortunately, the years of study had to be put to use that day, albeit good use. The following stories told by those tasked with protecting the life and property of Oklahomans and Texans, including recounts of some unusual occurrences, provide a unique look at the May 3rd event, as well as what it is like to work in a forecast office during active weather.

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Severe Weather Services from NWS Norman

By Rick Smith, Warning Coordination Meteorologist

It's that time of year again – severe weather season in the Southern Plains! Your best defense against getting caught unprepared by severe thunderstorms is to stay informed. The Norman Forecast Office is the source for critical weather information before, during, and after springtime storms. You can take advantage of the services we provide by visiting our website or listening to Weather Radio. Our partners in the media – television and radio – also relay this information to help keep people informed.

Here is a short summary of the services we provide to keep you informed about severe thunderstorms.

Hazardous Weather Outlook...This is a good place to start your day during storm season. This outlook answers the most commonly asked questions about severe weather potential. What kinds of storms will we see? How bad will they be? When will they happen? Where will they most likely occur? The HWO is updated daily at 7 am and Noon and as needed on active weather days.

Regional Weather Discussion...The RWD is designed to fill the gap between the outlook and the beginning of the storms. Forecasters provide this service to help you visualize what is happening with the local weather and why. It will help you track important weather features such as fronts, drylines, and

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satellite and radar features.

Significant Weather Advisory... This new service covers a lot of different bases. It can be used to tell you about developing thunderstorms that have not yet become severe. We might also use it to give the public advance notice about approaching severe thunderstorms that are still some distance away. Use this product to give yourself an early heads-up about storms that might get nasty.

Warning Decision Update...This is a very technical service, intended mainly for emergency managers and the broadcast media. It is experimental so you will not see it during every severe weather event. It gives you information about why certain warning decisions are being made and what forecasters are thinking on the smaller storm scale.

Severe Thunderstorm Warning... This is issued when forecasters are expecting a thunderstorm to produce large hail – penny size or larger – or damaging winds – 58 miles per hour or more. Although they are fairly common during the spring season across this area, do not ignore Severe Thunderstorm Warnings or take them lightly. They are often issued prior to Tornado Warnings and may alert you to the potential for exceptionally dangerous weather such as destructive hail bigger than baseballs and violent winds.

Tornado Warning...This is issued when a tornado is occurring or is likely to happen, based on radar indications. The warning will tell you where the tornado might be, which way it is or will be moving, and who is in immediate danger.

Severe Weather Statement...This is a warning update used to update and provide additional details about previously issued Severe Thunderstorm and Tornado warnings, including updated storm location and movement, spotter reports, and changes in intensity.

Local Storm Report...This service provides a listing of received severe weather reports.

All of this information can be easily accessed on our Enhanced Weather Webpage, located at *www.srh.noaa.gov/oun/home.php*. Given the flow of information coming from your Norman Forecast Office, there is no excuse to be caught by surprise when dangerous thunderstorms roll through the area.

Three Simple Actions that Could Save Your Life

By Dan Miller, Forecaster

Spring is here, and that means severe weather season is upon us. As of early April, Oklahoma and north Texas have already had a couple of days with tornadoes and severe thunderstorms, and there will likely be many more before storm season winds down by late June. Although tornadoes and severe thunderstorms cannot be prevented, there are simple, yet exceptionally effective, actions we can take to protect ourselves from dangerous weather events.

The three core principles of tornado and severe thunderstorm safety can be summed up in six words: **Get In**, **Get Down**, and **Cover Up**. Taking these simple and effective actions will greatly reduce the risk of death or injury to you and your family and friends if you happen to find yourself in the path of a severe storm. You can think of these actions as the weather equivalent of "Stop, Drop, and Roll."

In tornadoes and other non-tornadic violent wind storms, a majority of deaths and injuries are caused by flying debris. To protect yourself from debris:

Get In...Get as far inside a strong building as you possibly can, and stay as far away from windows and doors as possible. The key is to put as many walls between you and the outside as possible, lessening the chance that any flying debris will reach you and cause harm.

Get Down...Get as low as possible. Being underground in a basement or storm shelter is best, but if getting underground is not possible, get to the lowest floor. Getting as low as you can also helps to minimize your exposure to flying debris.

Cover Up...Once you are underground or in an interior room on the lowest floor, cover yourself with whatever you can find. If you have a bicycle or motorcycle helmet, put it on to protect your head from flying debris. Use other objects, such as pillows, blankets, or mattresses, to protect the rest of your body. If possible, get underneath a sturdy piece of furniture like a workbench or table.

Meteorologists are frequently given many different scenarios and asked what should be done in those specific instances to stay safe. Whatever the scenario, just ask yourself three simple questions – Am I getting in? Am I getting down? Am I covering up? If the answer to any one of these questions is "no", then you are not as safe as you could be! If the answers to two or all of them are "no", then you are most certainly not in a safe place! Remember that in addition to tornadoes and strong wind storms, these concepts can also keep you safe from large hail and lightning.

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from attending college out of town so a degree in meteorology, while still a goal, was just out of reach. That was until the University of Memphis began offering a meteorology program. I changed my major as quickly as I could and began taking the required courses.

While attending school, I had the wonderful opportunity to work as a student volunteer at the NWS office in Memphis in 1992, working a few hours each day and earning college credits at the same time. Later that year, I was selected as a Student Trainee, which meant I was now getting paid to do what I would have gladly done for free! When I graduated in December of 1993, I moved immediately into a full-time meteorologist intern position at NWS Memphis. In 1997, I was selected as a forecaster at the NWS office in Tulsa, Oklahoma. In 1999, a new position – Performance and Evaluation Meteorologist – was established at Southern Region Headquarters in Fort Worth, Texas, for which I was selected. Therefore, in February of 1999, the family and I moved again.

In January of 2002, I was selected to become the new Warning Coordination Meteorologist at the NWS office in Norman. I now live in Norman, along with my wife Christina and our four children.

The Norman forecast office has a reputation for being a leader. I am excited to be here and be a small part of keeping that reputation alive. It is great to have a job that allows you to do something you enjoy.

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Expected Weather Severity...Senior forecaster Mike Branick worked the midnight to 8 am shift the morning of the 3rd. As the long-term forecaster, Mike was tasked with issuing the routine five-day forecast in addition to dealing with the impending severe weather situation.

Early in the morning, although the likelihood of widespread severe weather appeared great later that afternoon and evening, several questions remained about the location, scope, and severity of the thunderstorms that would occur. "The fact that there were tornadoes that day (May 3rd) was certainly no surprise," Mike said. "What was a shocker, and still is to me, is that they were so violent and so numerous." The presence of high clouds and differences among computer models in the placement of important weather features contributed to the uncertainty.

Despite the uncertainty, values of parameters used to forecast tornadoes were high enough to pique interest, prompting Mike to remark that he was "getting antsy about this." As a result, the Thunderstorm Outlook issued at 630 am mentioned the possibility of tornadoes.

Warning for the Oklahoma City Storm...Scott Curl followed Mike as the long-term forecaster on the 8 am to 4 pm shift. Echoing Mike's feelings from earlier in the morning, Scott commented, "Never did I get the impression or personally feel that it (May 3rd) was going to be near the event it turned out to be." Due to the severe weather potential, Scott was asked to work past 4 pm and monitor the storms for possible warnings.

Shortly after assuming his place at the warning desk, Scott noticed a rapidly strengthening storm in Comanche County and by 445 pm, issued the first severe thunderstorm warning. He "watched this storm take on supercell characteristics and turned the severe warning into a tornado warning sometime around 520 pm." As this initial storm moved northeastward along the H. E. Bailey Turnpike, other storms began to develop in western and southwestern Oklahoma. To allow Scott to keep his focus on this storm, Cheryl Sharpe joined him at the warning desk to monitor these new storms.

As the storm traversed the turnpike, Scott became "extremely concerned for the town of Chickasha," due in part to the video of the storm broadcast by local media. "It was not until after the storm moved northeast of Chickasha," Scott said, "that it entered my mind that Oklahoma City was now in the path of this storm, which showed no signs of weakening or changing course." As the storm moved closer to the Oklahoma City metro area, he asked himself "what else can I possibly do to help people in the path of this storm?" Scott continued to issue warnings and statements on the storm as it moved through Oklahoma and into Lincoln County, despite worry for his family who were in the direct path of the tornado.

Scott was relieved of his warning duties after receiving word that his mother-in-law's housing addition had been heavily damaged, although she was unharmed. "It was extremely hard for me to get up from that chair," he said. "I felt an obligation to continue to do my job of providing the warnings for the people of Oklahoma and western north Texas."

Tornado Emergency...Science and Operations Officer David Andra issued perhaps the most attention-grabbing statements of the event. "Between 530 and 630 pm, we realized we were watching a major tornado outbreak unfold," David said. "As the large tornado approached western sections of the OKC metro area, we asked ourselves more than once, 'Are we doing all we can do to provide the best warnings and information?'" It became apparent that unique and eye-catching phrases needed to be included in the products. "At one point we used the phrase 'Tornado Emergency' to paint the picture that a rare and deadly tornado was imminent in the metro area. We hoped that such dire phrases would prompt action from anyone that still had any questions about what was about to happen."

Notifying the Backup Office...Each NWS forecast office has another office designated as its backup office. In the event that the Norman forecast office is unable to fulfill its duties, due to computer software upgrades, weather disaster, or something as simple as a power outage, the Tulsa forecast office assumes all responsibilities for the Norman county warning area.

When the storm was only about 10 miles away from Norman, only a slight right turn by the storm would carry the tornado into the northern part of the city and right toward the forecast office. Senior forecaster Kevin Brown made the decision to contact Tulsa. "Kevin announced that he needed a list of our current warnings because he was going to call Tulsa to ask them to prepare to back us up, if needed," Cheryl recalled. "That request was probably the single most memorable operations-related event of the night for me." In the end, evacuation of the office was not necessary.

Backing up Weather Radio...After working the midnight to 8 am shift that morning, hydrometeorological technician Forrest Mitchell was asked to return to work near 4 pm. When he reached the office, his primary task was monitoring the new automated Weather Radio system, which, to that time, had not been used to broadcast warnings for a major weather event. To make sure that every warning and statement was properly broadcast, Forrest had to constantly monitor the system.

"There were several instances when the automated system would not properly SAME/Tone Alert a warning," Forrest recalled. "I intervened...setting off radios seconds after the warning was issued." Due to Forrest's watchful eye and quick action, Weather Radio listeners received all warnings and statements in a timely fashion that night.

Bearer of Bad News...The OKC metro area was not the only location disastrously affected by the May 3rd outbreak. Senior forecaster Chris Sohl remembered talking "with the emergency management official involved in ongoing search and rescue operations near the small community of Mulhall which had just been struck by a powerful tornado. The news I had for him wasn't good... there was another tornadic supercell headed toward Mulhall."

While most of you have seen or watched local television coverage of the May 3rd tornado outbreak in real-time, this marks the first in-depth look at operations in the Norman forecast office on that fateful day. As you can see, many interesting events happened to those who worked to help save the lives of citizens in Oklahoma and western north Texas.

Weather in Review: The March 4th-5th Damaging Wind and Flooding Event

By Karen Trammell, Meteorologist Intern

The 2004 spring severe weather season began with a flourish across Oklahoma and western north Texas on March 4th, as an intense squall line pushed quickly through the area during the early afternoon hours, causing some significant wind damage and widespread flooding. Parts of western north Texas and southwest Oklahoma were hit particularly hard by prolonged wind gusts in excess of 60 miles per hour, while north central and central Oklahoma received the brunt of the flash and river flooding.

A significant severe weather episode was expected several days in advance, as many weather features favorable for severe thunderstorms and substantial rainfall were converging on the Southern Plains. Portions of the area were placed under a moderate risk for severe weather up to two days prior to the event. This risk was later upgraded to a high risk on the morning of the 4th. Fifty total tornado, severe thunderstorm, and flash flood warnings were issued on the 4th, in addition to two tornado watches and a severe thunderstorm watch.

The north-to-south oriented squall line initiated during the morning hours of the 4th in western and central Texas and moved rapidly eastward. The first severe thunderstorm warning was issued for Knox and southern Baylor counties around noon as a small section of the line accelerated northeastward. As this segment moved into Baylor County, a strong and pronounced circulation developed, prompting the first tornado warning. This circulation persisted as the storm moved across Wilbarger, Wichita, Tillman, and Comanche counties, but no tornadoes occurred with it. However, the strongest reported wind gusts and the worst damage were associated with this feature.

The observing station at Sheppard Air Force Base measured a peak wind gust of 91 miles per hour, which is the strongest speed reported during the event. An 86-mile per hour gust was also measured by the Oklahoma Mesonet station near Medicine Park in Comanche County. Considerable tree, power pole, and structural damage were scattered across Wichita, Clay, Baylor, Jefferson, Tillman, Comanche, and Cotton counties. This portion of the line pushed into central Oklahoma, gradually weakening as it neared the Oklahoma City metro area.

As this segment declined, the southern portion of the squall line raked eastward across south central and southeast Oklahoma, also causing many severe wind gusts and some damage. In this area, a peak reported wind gust of 70 miles per hour occurred near Davis in Murray County, Allen in Pontotoc County, and Atwood in Hughes County. While the wind damage was much less severe across this part of the state, several reports of downed power lines and tree limbs and roof damage were received from Murray, Carter, and Marshall counties.

Large two-day rainfall amounts on March 3rd and 4th across much of Oklahoma and western north Texas resulted in widespread river and flash flooding. Scenes such as this one in Moore were common. Photo courtesy of Gayland Kitch.

Although all severe thunderstorms cleared the Norman county warning area by 4 pm, the river and flash flooding continued overnight and into the 5th due to the large volume of rainfall produced by the storm system. Two-day rainfall totals from the 3rd and 4th were well over two inches in most locations, with several areas seeing in excess of 5 inches of rain during this period. Kingfisher had the highest total of 5.55 inches, while Marshall came in a close second with 5.02 inches. Excessive rainfall during the early morning hours of the 4th led to many flooded intersections in the Oklahoma City area, creating headaches during the morning commute.

The first flash flood warning was issued for Hardeman, Harmon, and Jackson counties shortly after 10 am, and another warning followed shortly after for six counties in north central Oklahoma. This second warning was later extended through the evening hours of the 4th. Numerous reports of water covering roadways and the resulting closed roads were received from law enforcement and Department of Transportation officials. Kingfisher County was affected particularly harshly, as both the Cimarron River and Kingfisher Creek overflowed their banks, flooding the city of Kingfisher. A railroad track crossing the Cimarron south of Dover was partially washed away, causing a train derailment on the 5th.

What caused this strong early season severe weather outbreak? A warm front stretched across Oklahoma, and strong southerly winds just above the ground transported moisture from the Gulf of Mexico into Texas and Oklahoma. A powerful upper level storm system moved into west Texas from the southwestern United States. Oklahoma and western north Texas were also directly beneath two enhanced branches of the jet stream, helping to provide a lifting mechanism required for thunderstorm development. These ingredients combined to spur the severe weather on the 4th.

The forecasters and public service staff at the Norman forecast office would like to thank the dedicated storm spotters across western north Texas and Oklahoma who provided the critical storm reports and served as our eyes and ears during this significant event. Even though we have access to some of the best technology, our job would be more difficult without the benefit of your time and effort.

In Weather History: The 25th Anniversary of the Red River Outbreak

By Karen Trammell, Meteorologist Intern

The fifth anniversary of the May 3rd, 1999 central Oklahoma tornado outbreak is not the only major Oklahoma or western north Texas weather event anniversary marked by the coming of 2004. Twenty-five years ago, on April 10th, 1979, residents of north Texas and southwest Oklahoma endured a significant tornado outbreak of their own on a day come to be known simply as "Terrible Tuesday". Referred to as the Red River Outbreak, severe thunderstorms spawned 28 twisters from Lubbock to Tulsa in the 24-hour period between 6 am on the 10th and 6 am on the 11th. The most renowned tornado in the series, rated an F4 on the Fujita scale, devastated the city of Wichita Falls. This twister is also one of the most photographed in history. However, while the Wichita Falls tornado receives most of the notoriety, several other strong and violent tornadoes raked the Texoma region on this fateful afternoon.

The Wichita Falls tornado of April 10, 1979 ranks as the fifth deadliest tornado in Texas history and at the time, was the costliest twister ever recorded. This photograph was taken as it entered the southwest portion of the city. Photo courtesy of William Jones.

The stage was set for a major severe weather outbreak in the region during the early morning hours of the 10th. An intense surface low-pressure system had organized in northern Colorado and southern Wyoming by 5 am. The associated cold front stretched south of its center across western New Mexico and into Mexico, while a stationary front was located in Nebraska and South Dakota. The strength of the low pressure resulted in east-southeasterly winds in Oklahoma and Texas, enhancing shear and adding low-level moisture from the Gulf of Mexico. Just above the surface, the southerly low-level jet stream had also set up overnight. An elongated upper level trough extended from British Columbia, through the Great Basin, and into the southwestern United States. Higher in the atmosphere, a very strong speed maximum in the jet stream was positioned just south of the Big Bend area of Texas, placing Oklahoma and western north Texas in a favored region for enhanced lifting. These weather features moved eastward during the morning and early afternoon hours of the 10th, finally converging over Texas and Oklahoma and producing the fateful events that unfolded during the late afternoon and evening.

Three thunderstorms produced the tornadoes across western north Texas and southwest Oklahoma on the 10th. The first tornado from the first thunderstorm touched down in extreme southern Foard County near the community of Foard City at 3:05 pm. Rated an F2, the twister traveled 23 miles to the northeast, damaging homes, barns, and farm equipment in rural areas of the county and injuring one person. Approximately 8 minutes prior to this tornado's dissipation, a second, very large tornado developed approximately 2 miles to its southeast near Thalia. This tornado was also long-tracked, as it remained on the ground for 37 miles, including 11 miles in Oklahoma. Interestingly, as it moved into Wilbarger County, storm spotters had difficulty identifying it as a tornado due to its massive size. The F4 twister significantly affected the southern and eastern sides of Vernon, causing 27 million dollars in damage, primarily to residential areas. Eleven people were killed, with the first fatality occurring near the town of Lockett as an occupied automobile was tossed 200 yards. As this storm crossed the Red River, it produced three additional tornadoes, an F2 near Hollister at 4:05 pm, an F1 near Faxon at 4:35 pm, and an F3 in Lawton at 5:05 pm. The Lawton tornado killed 3 persons and damaged or destroyed over 500 structures along its 4-mile path.

At 3:55 pm, a second thunderstorm, located east of the initial storm, spawned its first tornado in Wilbarger County near Harrold. This large tornado traveled for a whopping 64 miles before lifting east of Lawton near the community of Pumpkin Center, and luckily, remained in mostly open country. Damage to several homes, a grain elevator, and the Grandfield Airport resulted in an F2 rating. This thunderstorm produced several relatively minor tornadoes, in addition to numerous microbursts, along its northeastward trek into central Oklahoma.

The third thunderstorm resulted in the most famous, damaging, and deadly tornadoes in the outbreak. The initial tornado from this storm dropped at 4:49 pm just northeast of Seymour. National Severe Storms Laboratory storm chasers snapped a fairly well known photograph of this tornado. The Seymour tornado avoided populated areas along its 11-mile trek, resulting in no fatalities, injuries, or structural damage.

Thirty-five minutes after this twister's dissipation, however, the most devastating tornado of the outbreak formed just east-northeast of Holliday in northern Archer County at 5:55 pm. The twister, first sighted by Amateur Radio storm spotters in the area, entered the southwest side of Wichita Falls at 6:04 pm, laying ruin to all in its path during its 6 minutes in the city. Memorial Stadium and McNeil Junior High School were the first major targets for the violent tornado. As it moved eastward, homes and businesses in the Western Hills and Faith Village residential neighborhoods were destroyed. The worst damage from the tornado occurred at Ben Milam Elementary

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School in Faith Village. Before exiting Wichita Falls, significant structural damage occurred at Sikes Center Mall and in the Southmoor, Sun Valley, and Colonial Park neighborhoods. The tornado traveled through rural Clay County and entered Oklahoma before dissipating on the western side of Waurika. In Wichita Falls, 42 fatalities and 400 million dollars in damage occurred, making it the most costly tornado in history at that time. The majority of the fatalities occurred in automobiles along Highway 287, as people attempted to flee the storm. In excess of 3,000 homes and 1,500 apartment units were demolished, leaving an estimated 20,000 people homeless. This tornado remained on the ground for 47 miles and amazingly, grew to one and a half miles in width.

A final long-tracked tornado emerged from the third thunderstorm at approximately 8:00 pm in southeastern Stephens County. On the ground for 27 miles, this twister damaged almost 50 homes in the community of Pruitt in northwest Carter County, resulting in an F3 rating. Fortunately, no casualties occurred.

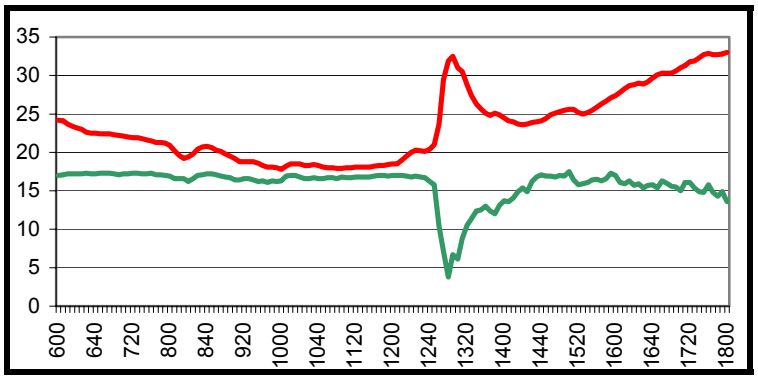
The Red River Outbreak remains one of the most devastating tornadic events in history. The Wichita Falls tornado, in fact, ranks as the fifth deadliest tornado in the state of Texas since 1900. Undoubtedly, this event remains fresh in the minds of residents in the area, leading to a heightened awareness of severe weather and safety procedures and making them adequately prepared for any future storms. Additional information about the April 10th, 1979 tornado outbreak can be found at *www.srh.noaa.gov/oun/storms/19790410*.

Did You Know?

After 292 tornado-less days in Oklahoma, an F0 tornado touched down near Muldrow in Sequoyah County on March 4th, ending the record-setting streak. Prior to this twister, the last confirmed touch down occurred on May 16th, 2003 near Ripley in Payne County.

Heat Bursts

By Karen Trammell, Meteorologist Intern



The increase in air temperature and decrease in dew point caused by heat bursts are very sharp, as shown in the above time series.

Picture it. You are relaxing in your recliner in front of the television watching the local weather on the 10 pm news broadcast. The radar shows a few declining thunderstorms in your area, but they do not appear to be significant. Suddenly, you hear the wind begin to howl and the sound of breaking tree limbs. Thinking this to be odd, considering the weather report you just saw, you walk outside to inspect the situation, and that is when you notice the temperature on your outdoor thermometer. 100 degrees!

While this exact scenario is fictitious, situations such as this one are not uncommon for residents of Oklahoma and western north Texas. These conditions result from an atmospheric phenomenon known as the heat burst. Heat bursts are characterized by a very sharp rise in temperature, an equally drastic decrease in dew point temperature, and gusty winds from wildly varying directions. An atmospheric pressure decrease also sometimes accompanies this activity. While the maximum wind gusts resulting from heat bursts, averaging about 40 miles per hour, generally do not exceed the 58 mile per hour severe wind threshold, severe winds and significant damage occasionally are produced by heat bursts. Due to the sometimes long-lived and intense heat, crop and vegetation damage has also been known to occur.

Heat bursts are caused by rapid downdrafts produced most often by dying thunderstorms and shrinking precipitation systems. Very dry air beneath the cloud helps accelerate the downdraft through evaporation. This activity typically occurs during the late evening and overnight hours through the late spring and summer months. The average heat burst lasts about an hour, although they have been known to last as short as five minutes and as long as six hours. Most heat bursts in this area have been observed across the western portion of the area, generally west of Interstate 35.

One of the most widespread and damaging heat bursts in this area occurred during the late afternoon and evening hours of May 22nd, 1996, affecting much of southwest and central Oklahoma. In some locations, temperatures rose from the 80s to the upper 90s and low 100s. Ninnekah reached a temperature of 105 degrees near midnight. Numerous severe wind gusts, several of which exceeded 70 miles per hour, were also measured. The maximum measured gust was 76 miles per hour near Rush Springs in southern Grady County. Significant damage to homes and other structures occurred in the cities of Lawton and Marlow, while minor roof, power pole, tree, and sign damage were reported in other areas. The entire event caused 18 million dollars in damage.

More recently, a smaller heat burst affected northern Archer and southern Wichita counties, including the city of Wichita Falls, between 10 pm and midnight on April 27th, 2003. The temperature at Sheppard Air Force Base, which was only grazed by the burst, rose from 79 to 90 degrees. Storm spotters in the area measured wind gusts ranging from 71 to 87 miles per hour. Tree, power pole, roof, and sign damage were prevalent along a five-mile path through the southern portion of Wichita Falls. Over 15 thousand dollars in damage resulted.

Due to their relative rarity, meteorologists have only begun to perform extensive research on heat burst activity. As a result, understanding of this phenomenon will continue to increase in the future.

Cooperative Observer Notes

Solving River Gage Safety Issues

By Steve Kruckenberg, Hydrologist

During the past couple of years, NWS Norman staff members have conducted surveys of bridges at river gage sites in the Norman Hydrologic Services Area (HSA). In order to ensure the safety of cooperative observers who regularly take river stage data, these surveys looked primarily at the guardrail height and highway shoulder width. Data from these surveys were collected, and after reviewing the data, some bridges with wire weight gages were found to not meet necessary safety requirements.

While most river gage sites in the Norman HSA have river gage equipment with telemetry available as the primary source for river stage data, there are some sites that use wire weight gages is the primary *and only* source for data.

To solve this problem, NWS Norman is currently in the process of replacing some of these wire weight gages with alternative measuring devices. These sites include the Cimarron River near Okeene and Perkins, the Washita River near Chickasha and Lindsey, the North Canadian River at Woodward and near Shawnee, and the Canadian River near Taloga.

Staff gages will be installed at five of these sites later this year. Some staff gages will be made of pressure-treated lumber and enameled staff gage sections, while others will be painted on bridge support columns using a template. Personnel at NWS Norman are currently surveying these sites, and coordinating with Oklahoma Department of Transportation officials in preparation for the installation of the new staff gages. Cooperative observers for these sites will be informed after the installations of these staff gages are complete.

At the two gage sites along the Washita River, other solutions will be used. A slight modification to the wire weight equipment and guardrail at the Lindsey site will make it safe to use again. However, a better solution at the Chickasha site will be used. Emergency management officials were able to use hazard mitigation funding to install a telemetered river gage at the site, and will make this data available to NWS Norman in the near future.

While the staff gage or guardrail modification solutions are good in the short term, it is hoped that more telemetered river gages can be installed at sites where manual river readings are the only source of data. Telemetered gages provide a constant source of data to the NWS and other agencies, and assist the weather forecast offices and river forecast centers in providing more accurate and timely flood forecasts and warnings.

In addition, the backup manual gages should be installed at sites that use telemetered gage equipment as the primary source for obtaining river stages. If data flow from the primary river gage is disrupted, a reading from a backup gage can provide critical information during a flood event. The NWS Norman staff will continue to look at both issues during the next few years.

Staff gages similar to this one will be installed near several bridges in the NWS Norman HSA. Photo courtesy of Daryl Williams, Hydrometeorological Technician.

New Observers

The NWS staff would like to welcome Roger Anderson, Billy Clark, Sabra Todd, David Lawson, Terry Stagg, and Louis Thomas to the NWS Norman cooperative observer program. We look forward to working with all these new observers for many years to come.

Steve Smart Returns to Corpus Christi

After spending two years at the National Weather Service Forecast Office in Norman, Hydrometeorological Technician Steve Smart returned to the forecast office in Corpus Christi, Texas in early February. The office threw Steve a going away party on January 30th, his last day in the office, and presented him with a framed photograph.

In addition to his normal shift duties in Norman, Steve served as team leader for the local Upper Air (weather balloon) Program and was also the primary contact for cooperative observers in southwest and west central Oklahoma and western north Texas. Steve's contributions to the office will surely be missed.

Notice to Observers in Southwest Oklahoma and Western North Texas

Due to Steve Smart's departure, if you are in need of any supplies or additional assistance, contact any coop program team member. We will all work to make sure your needs are addressed.

Remember to mail the previous month's cooperative observer forms and recording rain gage tapes by the 5th of the month!

The Norman NWS Cooperative Observer Program Team:

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