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Tulsa Tornado Tribune

Where People Who Know the Weather Get Their Weather

National Weather Service Tulsa, Oklahoma — Summer, 2008

Craig Sullivan - Editor

More about the May 10 outbreak on pages 2 and 3.

SEVERE WEATHER TURNS DEADLY

On May 10, 2008, an already busy severe storm season turned deadly, when 14 tornadoes ripped across eastern Oklahoma and northwest Arkansas. Hardest hit was the town of Picher, OK, where six people lost their lives and much of the town was destroyed by an EF4 tornado.

After a few relatively quiet severe weather seasons, at least in terms of tornadoes, it seems that eastern Oklahoma and northwest Arkansas have made up for lost time in 2008. The first part of May is traditionally near the peak of tornado season in this part of the country, and this year did not disappoint. The already busy severe weather season reached a climax on the late afternoon of May 10, as several discrete supercell storms developed along a dry line across eastern Oklahoma. In all, these storms produced 14 confirmed tornadoes, including the first violent tornado to strike the NWS Tulsa forecast area in 15 years. Unfortunately, this tornado struck the town of Picher in far northeastern Oklahoma late that afternoon, killing six, injuring at least 100, and causing millions in damage.

Scenes like this one were all too common as residents of Picher, OK tried to pick up the pieces following an EF4 tornado.

The set-up was a little different from the "textbook" Oklahoma severe weather outbreak...that is a potent upper low moving from the southwest with a dry line over the western part of the state. On May 10, the storm track was more west-northwest with a rapidly deepening upper low tracking from the northern Rockies into the central plains. South winds picked up ahead of the system while a warm front surged north across eastern Oklahoma with a quick return of rich

May 10 *Continues on page 3*

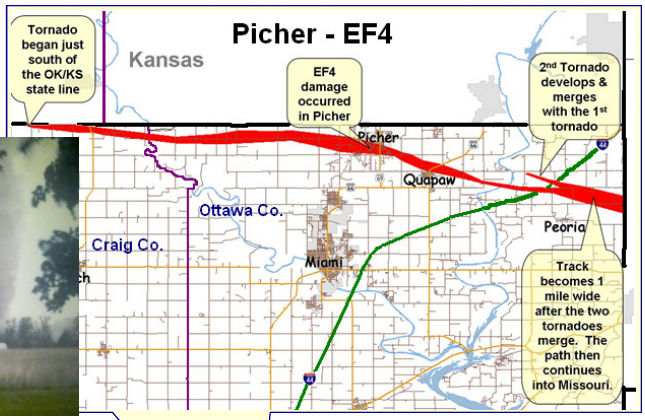
Deadly Tornadoes in Tulsa CWA since 1980

Location	Date	Dead	Injured
Picher, OK	5/10/08	6	150
Hulbert, OK	6/1/99	2	5
Ft. Smith, AR	4/21/96	2	89
St. Paul, AR	4/21/96	2	6
Tulsa/Catoosa, OK	4/24/93	7	100
Westport, OK	4/26/91	1	24
Copan, OK	4/26/91	1	10
Mannford, OK	4/29/84	1	60
Terlton, OK	4/26/84	3	37
Morris, OK	4/26/84	8	95
Bixby, OK	4/19/81	5	49

Inside this issue:

May 10 Outbreak

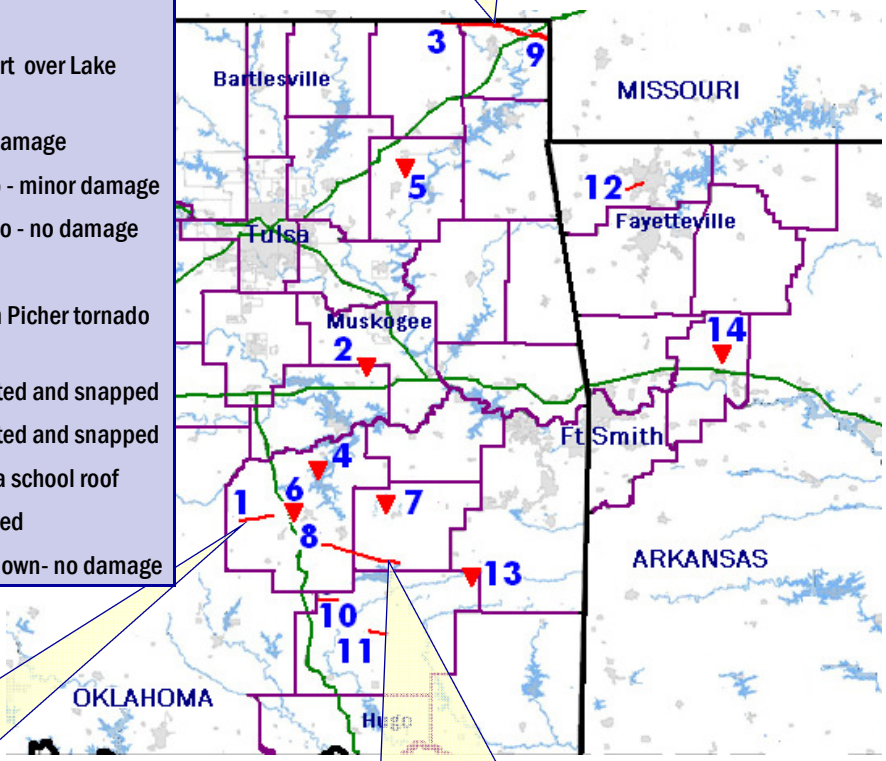
Below is a summary of the 14 confirmed tornadoes in the NWS Tulsa CWA on the evening of May 10, 2008. A post-event summary is located on the NWS Tulsa web page, under "Climate".

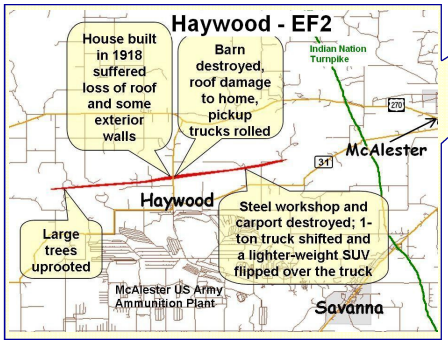


Above: This photo was taken just west of Picher as the tornado approached.

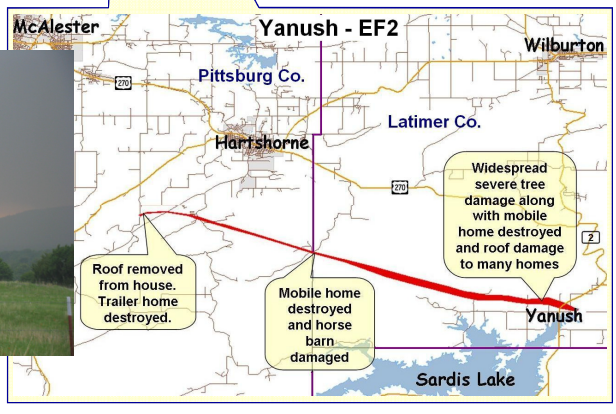
May 10, 2008 confirmed tornadoes

	Time (CDT)	Location	Rating	Description
1	5:03 - 5:21	Haywood	EF2	See Inset
2	5:19	3 NE Checotah	EF0	Brief touchdown- no damage
3	5:20 - 5:55	Picher	EF4	See Inset
4	5:21	3 S Crowder	EF0	Chaser report over Lake Eufaula
5	5:25	4 NE Pryor	EF0	Minor tree damage
6	5:25- 5:27	1 SW McAlester	EF0	Media video - minor damage
7	5:34	Near Wilburton	EF0	Spotter video - no damage
8	5:42 - 6:15	Yanush	EF2	See Inset
9	5:48 - 5:50	Near Peoria	EF1	Merged with Picher tornado (See Inset)
10	6:12 - 6:14	Near Adel	EF1	Trees uprooted and snapped
11	6:30 - 6:32	Near Snow	EF1	Trees uprooted and snapped
12	6:35 - 6:36	Bentonville	EF1	Damage to a school roof
13	6:35	5 SE Albion	EF1	Trees snapped
14	7:51	2 E Watalua	EF0	Brief touchdown- no damage





Right: The Yanush tornado seen approaching over a ridge top in southwest Latimer County.



May 10

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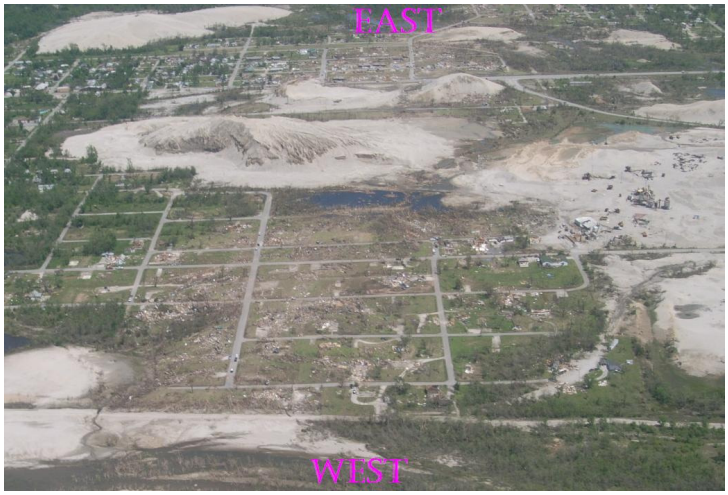


Aerial view of the damage path through Picher taken the day after the tornado

Gulf moisture. Some earlier strong to severe storms developed near the warm front, but this activity cleared out in time to allow things to heat up and become extremely unstable.

By around 4 pm, the dry line had moved into eastern Oklahoma and the cap was weakening. The extremely unstable air had now surged all the way north of the Kansas border...considerably farther north than had been anticipated in the days leading up to the event. Shortly thereafter, a large supercell storm rapidly developed near the Oklahoma, Kansas border...this storm was ultimately responsible for the Picher tornado. Within the next hour, the cap reached its "breaking point" and other supercells formed from east of Tulsa, south to near McAlester. Thus began one of the more significant outbreaks of severe weather in this area in recent years.

Five supercell storms were responsible for most of the severe weather that evening. All five of these cells very quickly became tornadic and produced at least one confirmed touchdown between 5 pm and 8 pm. In all, NWS Tulsa issued 24 tornado warnings during that three hour period. The Picher tornado continued on its deadly path into southwestern Missouri, where 15 fatalities were reported, many of them in automobiles. The total path length of this tornado was about 75 miles, and the path width reached a mile wide in a few spots.

Air Quality Alert

Ozone alerts for the Tulsa metropolitan area are now issued under a new product identifier. WFO Tulsa now relays Ozone Alert messages as an "Air Quality Alert", instead of a "Public Information Statement". This service improvement was made to enhance the dissemination of Ozone and other Air Quality Alert messages.

Air Quality Alerts are issued when external agencies notify us that Environmental Protection Agency (EPA) standards for poor air quality have been met or exceeded. Such conditions typically occur in the heat of summer as abundant sunshine interacts with pollutants from automobile emissions, industrial operations, etc. Conditions further deteriorate when a prolonged period of light winds and a capping layer of warm air aloft prevents significant air dispersion.

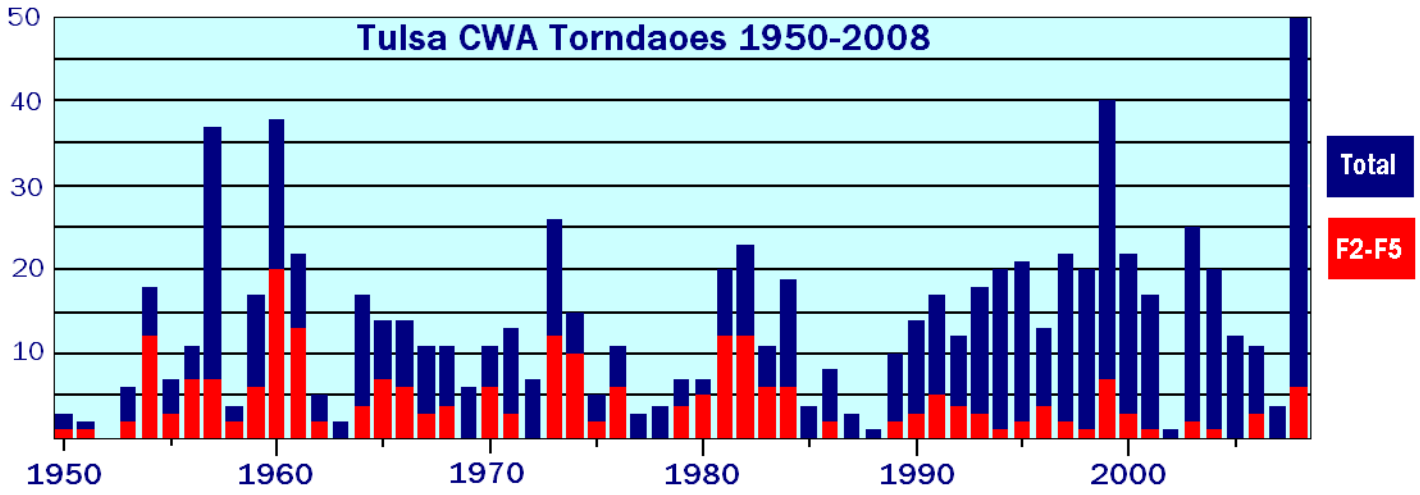
Numerous studies have shown that long-term exposure to high concentrations of ozone can cause a significant reduction in lung function, inflammation of the airways, and respiratory distress. People with lung diseases are particularly vulnerable to the respiratory effects of ozone. Studies have also suggested that children who played three or more outdoor sports in areas with high ozone concentrations were more than three times as likely to develop asthma as children who did not engage in sports activities.

What You Can Do

Take Action on Ozone Alert! Days

- Leave your car at home. Try different ways of getting to work - like walking, biking, carpooling or riding the bus. Avoid unnecessary trips.
- Avoid idling. Walk-in rather than drive-thru.
- Postpone refueling. If you must, do it in the evening.
- Postpone mowing with gasoline-powered mowers.
- Postpone errands. Do them another day.
- Sign up for Email Alert Notifications of Ozone Alert! days.

2008 Tornado Season in Perspective



No doubt about it…the 2008 tornado season has been the most active in several years across eastern Oklahoma and northwest Arkansas. The total of 50 confirmed tornadoes exceeds the most ever for the January through June period, dating back to 1950. The Picher tornado on May 10 was the first violent tornado (EF4 or EF5) in our forecast area since 1993, and unfortunately, caused the first tornado fatality in the area since 1999. So, indeed, it has been a busy and even historic season, but was it really "record-breaking?"

Tornado records, as you know, are quite subjective, and reports have increased dramatically in number over the years. Improved spotter networks, the wide availability of video recording equipment, higher population density and extensive National Weather Service damage surveys have all played a large part in better documenting the number of tornadoes. This, more than anything, is responsible for the increase in total tornado numbers since around 1990 as seen in the graph above.

What is interesting to note, is the number of significant tornadoes (for the purpose of this study…F2-F5) during the period of record seems to show a downward trend, especially since the early 1980s. The reasons for this are much less clear, and could even be due to a cyclical pattern that is often seen in climatological data (though, admittedly, 59 years of data makes for a VERY limited data set when dealing with climatology). So, should we expect the incidence of strong and violent tornadoes to increase again in the coming decades? Only time will answer that question. In any case, 2008 ranked only 13th in number of strong and violent tornadoes since 1950, and one need only go back to 1999 to find a year with more.

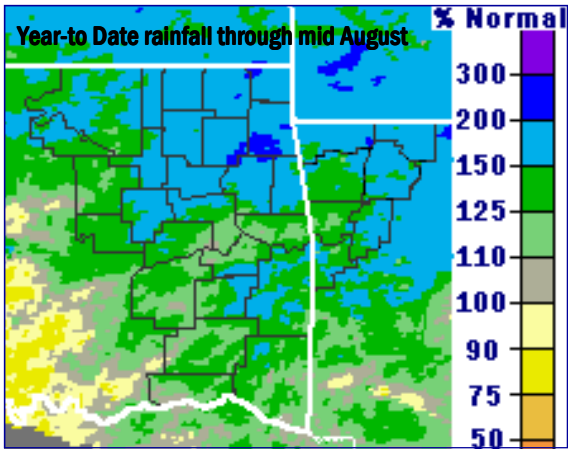
However, a disclaimer about F-scale ratings needs to be made here. Because the original Fujita Scale was not developed until the early 1970s, ratings for tornadoes prior to that time are been based on research meteorologists' judgment from historical accounts in newspapers and photographs.

So, all the subjectivity involved in tornado records makes it almost impossible to put a particular year in its proper historical perspective. Many of the earlier years in this sample likely had many tornadoes that never were recorded. Looking at the number of significant tornadoes versus the total number in more recent years, it may not be a big stretch to say a year such as 1960, when 20 significant tornadoes were reported, actually saw more tornadoes than 2008.

While a "record-breaking" tornado season makes for good journalistic fodder, there are simply too many unknowns when comparing tornado numbers to years in the past. Unfortunately, it is much more complicated than comparing temperatures or rainfall.

Near Record Pace

Just a couple of years ago, it seemed we couldn't buy a drop of rain. But, at times these last two years, it seemed it would never stop (recent dry spell notwithstanding). As of mid-summer, 2008 remained on pace to be one of the wettest years in Tulsa history, if not the wettest. In fact, from January 1 through July 15, a total of 40.62 inches of precipitation was recorded at Tulsa International Airport, making it the wettest such period on record. By comparison, Tulsa averages about 42 inches of precipitation in an entire year. For Fort Smith, the numbers are almost as impressive. The January 1 to July 15 total of 36.49 inches was second only to 1957 (39.31 inches) and 1990 (38.39).

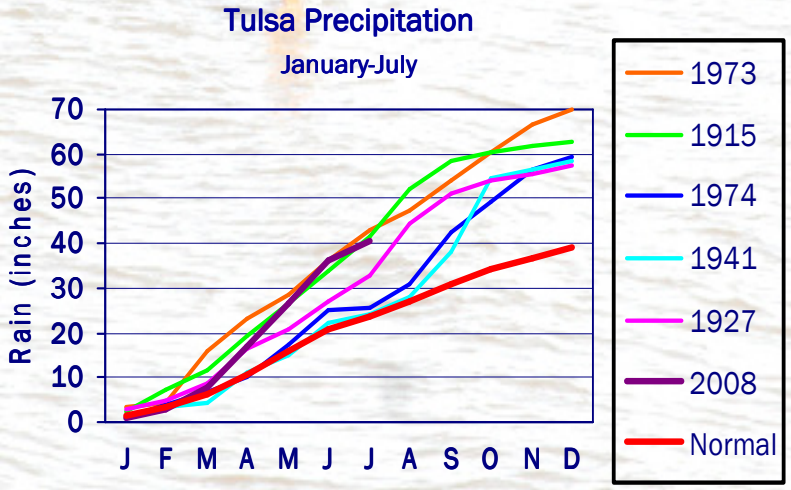


All of the NWS Tulsa forecast area has seen above average precipitation since January 1. Northeast Oklahoma has experienced its second wettest January through June period since 1921 according to the Oklahoma Climatological Survey, with east central Oklahoma ranking as 7th wettest and south central Oklahoma as 8th wettest.

Some other rainfall statistics of note: Tulsa experienced its wettest April on record, along with its second wettest spring (March-May). Fort Smith had the second wettest March on record, and its fourth wettest spring. For the Northeast Oklahoma Climate Division, this was the wettest June and second wettest March.

How does 2008 Compare?

The graph below shows a month-by month cumulative precipitation total for Tulsa for 2008, compared to the five wettest years on record. The bold red line represents the climatological average. As of Mid July, 2008 was the wettest, but since then has begun to lag behind and actually finished July in third place behind 1973 and 1915. So, there is still work to be done to reach the 69.88 inches that fell in 1973.



Déjà Vu...All Over Again!

A series of mesoscale convective complexes affected the region during the early part of June, leading to flooding for the second consecutive year. One such system affected primarily northeast Oklahoma on June 8, bringing 3 to 6 inches of rain along and north of a Pawnee to Tulsa to Pryor line, and 1 to 3 inches elsewhere. The next day, widespread rainfall again affected the area, with the heaviest amounts of 1.5 to 6 inches this time occurring primarily south of Interstate 40.

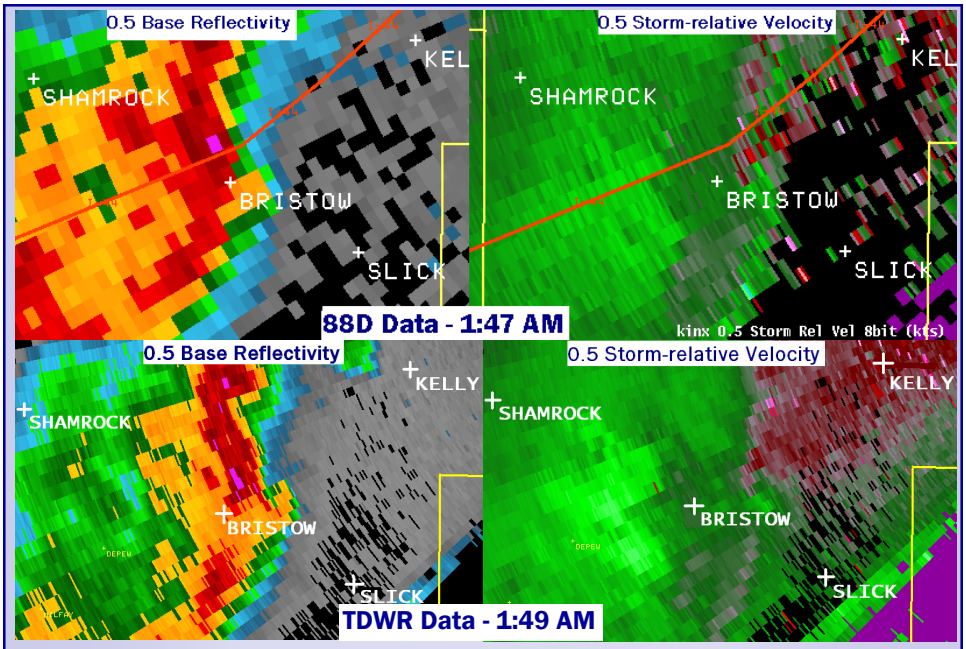
The heavy rain topped off the already soggy spring, and led to rising rivers. Water levels exceeded major flood stage at two locations. Bird Creek at Avant (AVTO2) crested at 27 feet at 6 pm on June 9th (major flood stage is 26 feet) and was above the major flood level for approximately 11 hours. The Caney River near Collinsville (CVLO2) also crested above its major flood stage at 11 pm on June 11th with a crest of 33.57 feet (major flood stage is 33 feet), and remained in major flooding for approximately 27 hours. Of the 39 river flood warnings issued in June, 15 were issued on the 9th, and 9 were issued on the 16th.

A Different View of Storms

Terminal Doppler Weather Radar (TDWR) data has recently become available to NWS Tulsa forecasters. TDWRs are Doppler radars located near many of the larger airports across the country, primarily to detect hazardous wind shear conditions (from thunderstorms, frontal passages, etc.) in the vicinity of these airports. There Federal Aviation Administration (FAA) has installed them near 45 airports across the United States, including Tulsa International Airport.

The range resolution of the TDWR is finer than what is available in the Weather Surveillance Radar, 1988 Doppler (WSR-88D)...150 meters (m) for Doppler data. It has a resolution of 150 m for reflectivity data within about 90 miles (135 km). By contrast, the WSR-88D has a maximum range gate resolution of 250 m for Doppler and 1 km for surveillance data. The angular (azimuth) resolution of the TDWR is nearly twice what is available in the WSR- 88D. Each radial in the TDWR has a beam width of 0.55 degrees. The average beam width for the WSR-88D is 0.95 degrees. This provides forecasters with high resolution data at close range... however its overall range is limited to approximately 90 miles.

Like the WSR-88D, the TDWR scan strategy is separated into either a clear air or precipitation mode. The TDWR clear air mode is referred to as "monitor mode" and the precipitation mode is called "hazardous weather mode". Update times will vary depending on the mode the radar is using. The lowest short-range scan of the "monitor mode" will update about every 5 minutes. However, the lowest scan of the "hazardous weather mode" will generate every minute, providing better temporal resolution of data as well.



Above is a comparison of WSR-88D data and TDWR data, viewing a supercell storm embedded within a squall line, early in the morning of May 2, 2008. This storm produced an EF-1 tornado near Bristow. Comparing the reflectivity images at right, the “hook echo” just east of Bristow is much more pronounced in the TDWR data due to the higher spatial resolution.

The Tulsa TDWR radar is located in Broken Arrow. This location, along with its slightly lower volume scan (0.3 degrees vs. 0.5 degrees with the WSR 88-D), is able to provide us with data considerably closer to the surface. Due to the curvature of the Earth's surface, the lowest standard atmosphere view of a feature over downtown Tulsa from the KINX 88-D radar is about 1300 feet above ground level. In comparison, the lowest scan from the TDWR is only about 400 feet.

Other News

New Method for Reporting

The National Weather Service eSpotter system is now operational. This online weather reporting system allows quick relay of severe weather reports to our office via the internet. When a report of severe weather is received by NWS Tulsa, a notification message will allow forecasters to view the report. For additional details, visit this website:

http://espotter.weather.gov

Staff Update

Nicole McGavock has been selected as the new Service Hydrologist at WFO Tulsa. Nicole has worked in the Tulsa office for six years, both as an intern and a forecaster.