

**OKLAHOMA CLIMATE EVENT SUMMARY**  
**MAY 8-9, 2003 CENTRAL OKLAHOMA**  
**TORNADOES**



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***Publication ES 2003-02***

# OKLAHOMA CLIMATE EVENT SUMMARY

## MAY 8-9, 2003 CENTRAL OKLAHOMA TORNADOES



Oklahoma Climatological Survey

### **Oklahoma Climatological Survey Climate Event Summary ES 2003-02**

As a service to citizens and decision-makers within Oklahoma, the Oklahoma Climatological Survey produces a publication series of Event Summaries. These summaries describe the conditions associated with severe or extreme weather events, impacts of those events, and a comparison to other notable historical occurrences. The summaries are part of the OCS Mission to “conduct and report on studies of climate and weather phenomena of significant socioeconomic importance to the state.” Summaries will be produced for any federally declared weather-related disaster in Oklahoma, or for other notable events that may not reach disaster proportions.

### **Acknowledgments**

The following people and institutions were of great assistance with the content of this document:

- The archives of The Daily Oklahoman
- The National Weather Service Forecast Office in Norman, Oklahoma
- Doug Speheger, Forecaster, National Weather Service, Norman Oklahoma
- Putnam Reiter, Information Technology Officer, Department of Emergency Management
- Michelann Ooten, Public Information Officer, Department of Emergency Management
- Mark Shafer, Director of Climate Information, Oklahoma Climatological Survey
- Derek Arndt, Assistant State Climatologist, Oklahoma Climatological Survey

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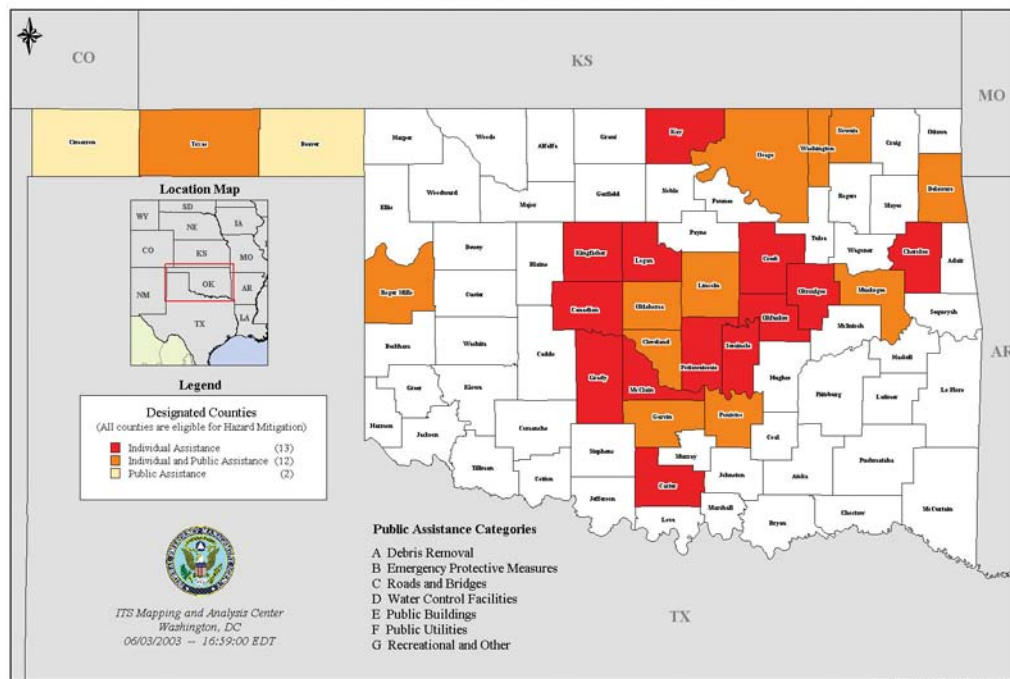
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## May 8-9, 2003: Central Oklahoma Tornado Outbreak

A series of violent tornadoes struck central Oklahoma on May 8<sup>th</sup> and 9<sup>th</sup>, prompting President Bush to declare the nine Oklahoma counties affected as disaster areas (Figure 1). The tornadoes and associated thunderstorms left 145 people injured and one dead. Estimates from the two days of violent weather are widely varying, but the 33 tornadoes that struck Oklahoma in early May did an estimated \$1.1 billion in damage. The majority of that damage estimate was attributed to the May 8-9 event, with another \$438 million provided by FEMA for uninsured losses and damage to public infrastructure. The damages included 2889 single-family homes damaged and 432 destroyed, five public buildings with major damage – three of which were schools, and more than 100 businesses damaged or destroyed. For some areas of Oklahoma, it was the third encounter with significant tornadoes within the last five years. In retrospect, the lack of more fatalities could be credited to the experience garnered from those previous storms, the advancement of severe weather detection and preparedness of local, state, and national authorities.

In a broader sense, the central Oklahoma tornadoes were dwarfed by the total nationally that week, which saw the country experience 393 tornadoes, the greatest number ever recorded in a single week in the U.S. In actuality, Oklahoma may have dodged the proverbial bullet, despite the damages which occurred. Given the weather conditions that spawned these tornadoes, many more twisters could have occurred on May 8<sup>th</sup> and 9<sup>th</sup> in Oklahoma. In all, 45 tornadoes touched down in Oklahoma during May, more than double the normal count of 20.

### FEMA - 1465 - DR, Oklahoma Disaster Declaration as of 06/03/2003



**Figure 1.** The 27 counties included in the disaster declaration by President Bush, including those in central Oklahoma affected by the May 8-9 storms (courtesy of FEMA).

## **May 8th: Moore, Oklahoma City, Midwest City, Choctaw**

Conditions were ripe for rotating supercells on the 8th, and state and local authorities were alerted that morning of the seriousness of the situation by the National Weather Service (NWS). At 7 a.m., NWS forecasters cautioned about the possibility for supercell thunderstorms and the threat of tornadoes in its “hazardous weather outlook” bulletin:

“Thunderstorms are expected to develop initially along and possibly ahead of the dry line around 3-4 p.m. as the upper disturbance arrives to provide mid-level lift. Rapid development and strengthening to severe levels is likely due to the expected high instability and the continued presence of strong vertical wind shear over the area. A few storms may evolve into supercells, with an attendant risk of very large hail, along with a few tornadoes.”

A strong upper level system had tracked into the Central Plains, dragging an associated surface low with it. A dryline in western Texas was expected to move eastward towards Oklahoma, and a strong warm front had moved into far northern Oklahoma, which provided ample moisture for thunderstorm development. A strong capping inversion, a layer of relatively warm air aloft, was expected to inhibit thunderstorm development until the late afternoon hours. By early afternoon, clouds had thinned in western Oklahoma, allowing temperatures to rise into the upper lower 90s, making the environment even more unstable. Showers and thunderstorms continued to form and dissipate throughout the afternoon, further eroding the capping inversion with each attempt. The Storm Prediction Center issued a tornado watch at 1:33 p.m. for much of western and central Oklahoma, classifying the severe weather scenario as a “particularly dangerous situation,” an indication that chances were high for supercell and tornado development. Wind profiles were indicative of environments supportive of long-lived violent tornadoes. After 3 p.m., storms formed that were able to sustain convection, rapidly intensifying to severe levels. At 4:09 p.m., the NWS office in Norman issued a severe thunderstorm warning for Grady County, southwest and upstream of the Oklahoma City area. Radar data showed the thunderstorm had developed into a supercell by 4:27 p.m. with rotation at mid levels indicated. At 4:33 p.m., radar indicated a possible tornado near Pocasset in Grady county, prompting the first tornado warning of the May 8th event. The classic supercellular thunderstorm continued to move eastward towards Moore and south Oklahoma City without producing a confirmed tornado thus far. At 4:49 p.m., a tornado warning was issued for Cleveland, McClain, and southern Oklahoma counties.

## **May 8th: The Tornadoes**

The first tornado touched down briefly 3.5 miles northwest of Newcastle in McClain County. The weak F0 twister, which was caught on tape by area stormchasers, was on the ground for less than one minute before dissipating. The tornadic supercell that spawned the first twister continued to move towards south Oklahoma City and Moore, however.

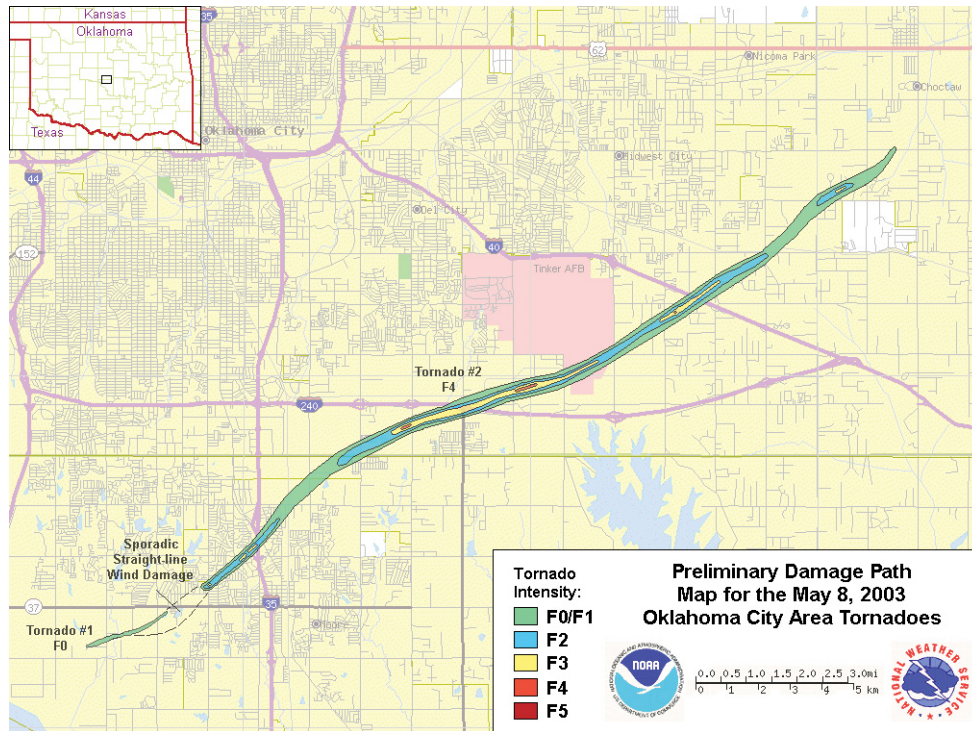
According to damage surveys conducted by the NWS, the second tornado dropped near SW 149th and Pennsylvania Avenue in south Oklahoma City shortly after 5 p.m. This weak F0 tornado traveled two miles towards the northeast before lifting near SW 134th and Western Avenue. The damage from this tornado consisted mainly of minor structural and tree damage. Although damage continued to occur along 134th between Western and Santa Fe Avenue, the NWS has concluded that straight line winds were the culprit, not tornadic winds.

The third and most violent tornado formed near N 5th and Sante Fe in Moore, quickly intensifying to F3 strength. The damage track was initially quite narrow, but its destructive path widened as it moved through northwest Moore towards I-35, leaving damaged and destroyed homes in its wake. Although the majority of damage in this area was F2 in strength, the tornado once again strengthened to F3 intensity near the intersection of Janeway Avenue and N 12th. The F3 damage continued until the tornado reached I-35. It was at this point that the damage in Moore was at its greatest. The tornado leveled several structures on the west side of I-35, including two hotels, several restaurants, and an office park. The tornado weakened as it crossed I-35 near Shields Boulevard and continued towards the northeast, with sporadic F2 damage noted by the survey team.

The tornado crossed from Cleveland County to Oklahoma County near SE 89th and Bryant. The tornado intensified to F4 strength briefly as it neared Sunnyslane Road, devastating a manufacturing plant just south of I-240. The tornado continued east-northeast and crossed I-240 near Sooner Rd. The tornado once again reached F4 strength as it hit the General Motors assembly plant just east of Air Depot Boulevard, inflicting over \$100 million in damage to the facility.

The tornado continued its trek towards the northeast, crossing Tinker Air Force Base as it neared I-40. It traveled through a subdivision along Kennington Lane and SE 45th along the way, where it reached F4 strength once again. It crossed I-40 west of Westminster Lane as it demolished homes, marching inexorably towards Midwest City and Choctaw. The tornado weakened briefly to F2 strength at this point, but strengthened once again to F4 intensity as it crossed into Choctaw near SE 15th between Hiawasse Road and Willow Drive. The tornado eventually weakened and dissipated near Reno Avenue and Choctaw Road.





**Figure 2.** The damage path of the Oklahoma City area tornadoes on May 8<sup>th</sup>, 2003, as determined by NWS damage-survey teams. Map courtesy of the Norman NWS office.

### May 8<sup>th</sup>: Damages

The tornadoes that struck Oklahoma City, Moore, Midwest City, and Choctaw on May 8<sup>th</sup> were on the ground approximately 33 minutes, travelled 17.5 miles, reached a maximum width of 700 yards, and a maximum intensity of F4. Structural damage included:

- Moore: 300 homes destroyed, 300 homes with major damage, 300 homes with minor damage, 150 homes affected, 30 multi-family homes with major damage, 22 businesses with minor damage and six businesses with major damage.
- Oklahoma City/Midwest City: 93 homes destroyed, 400 homes with major damage, 400 homes with minor damage, 15 mobile homes with minor damage, 10 multi-family units with major damage, 15 businesses with major damage and 5 businesses with minor damage.
- Choctaw: 29 homes destroyed, 28 homes with major damage, 47 homes with minor damage, 223 homes affected, 3 mobile homes destroyed and 1 mobile home with minor damage.

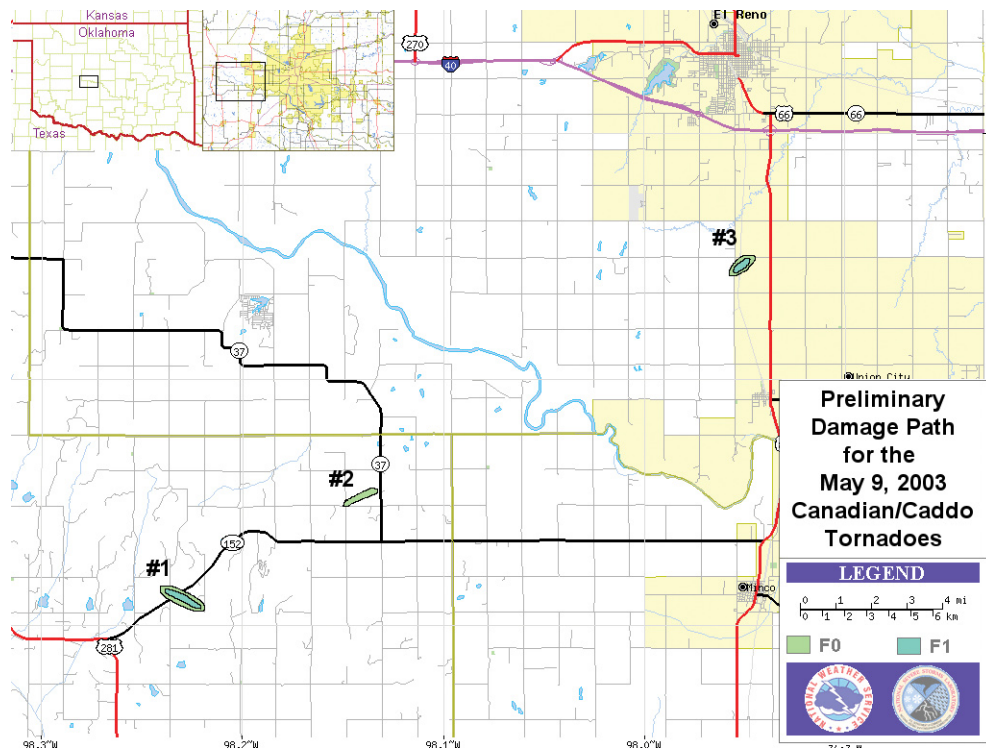
## May 9<sup>th</sup>: Bethany, Oklahoma City, Jones, Stroud

The weather conditions that spawned the destructive tornadoes in central Oklahoma on the 8<sup>th</sup> were still in place the following day. The dryline which triggered the previous day's tornadoes had moved back towards the west overnight. Strong southerly winds due to a strengthening surface low pressure system in Colorado once again provided the warm moist air needed for thunderstorms, and warm air aloft guaranteed only the most powerful thunderstorms would flourish after development. Wind shear parameters signaled that any thunderstorms that broke the warm-air cap in the upper-levels would have a tendency to rotate. Even as the NWS office in Norman was preparing to host a press conference at 2 p.m. concerning the previous day's powerful tornadoes, the forecasters in that office were preparing the public for another shot of severe weather.

At 1:17 p.m., the NWS office in Norman issued a regional weather discussion which mentioned the cap was weakening, and the approaching upper level disturbance and soaring daytime temperatures could trigger thunderstorms – with associated tornadoes – later in the afternoon:

“Conditions are expected to become increasingly favorable for supercell thunderstorm development as the day progresses. Storms that develop during the mid- to late-afternoon will have the potential to become severe very quickly, and some may produce tornadoes.”

At 3:20 p.m., thunderstorms southwest of Wichita Falls were entering the area most favorable for supercellular development, and at 3:29 p.m., a tornado watch was issued for 32 counties in the state, including those in central Oklahoma. Surface temperatures into the 90s and associated dewpoints in the low 70s made for a very unstable atmosphere in central Oklahoma at 4:30 p.m. A thunderstorm exploded along the dryline in Greer County, which prompted a severe thunderstorm warning at 6:32 p.m. The storm quickly became a supercell and plodded towards the northeast with baseball-sized hail and 70 mph winds into Beckham, Kiowa and Washita Counties. A new tornado watch was issued at 7:46 p.m. for a large portion of central Oklahoma. To demonstrate the ferocity of this large supercell, hail to the size of softballs was reported six miles south of Corn in Washita County at 8:07 p.m. The future tornado-producer traveled into Caddo County at 8:10 p.m., centered nine miles west of Eakly, moving to the east at 30 m.p.h. The first tornado warning for this storm was issued at 9:09 p.m. for Caddo County. Another tornado warning was issued for southern Canadian and northern Grady counties at 9:18 p.m.



**Figure 3.** The first three short-lived tornadoes in central Oklahoma on May 9<sup>th</sup> in Caddo and Canadian Counties. Map courtesy of the Norman NWS office.

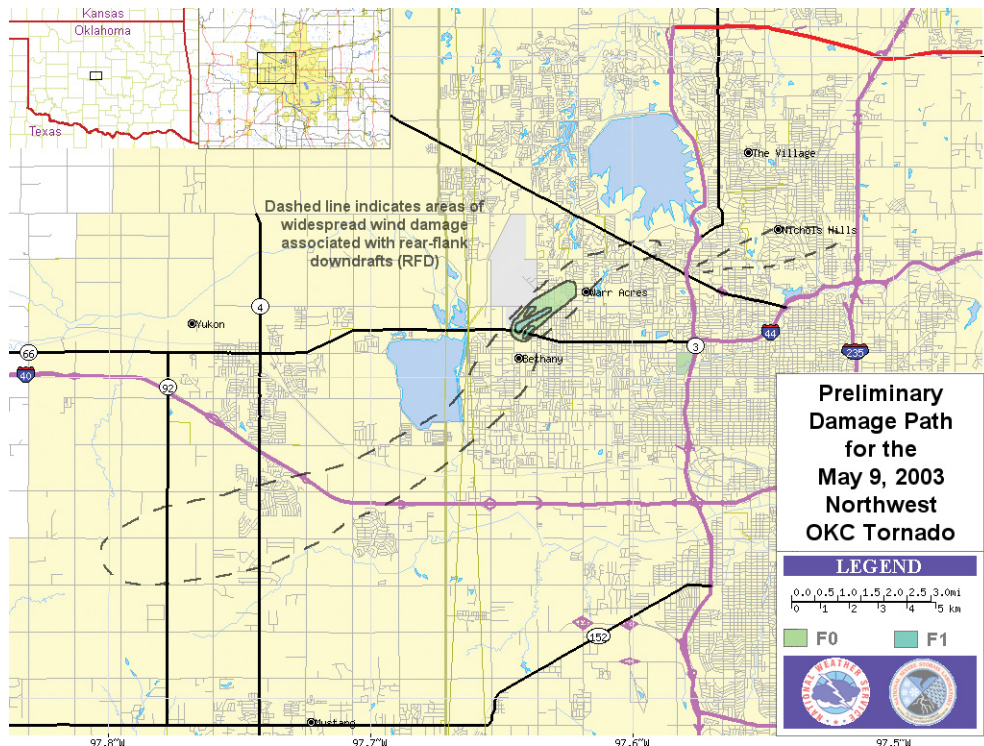
## May 9<sup>th</sup>: The Tornadoes

The first tornado touchdown occurred around 9:20 p.m. six miles west-southwest of Cogar, near the intersection of U.S. Highway 281 and Oklahoma Highway 152 (Figure 3). Lasting only a couple of minutes, this tornado was rated as an F1, according to a damage survey performed by the NWS damage survey team. The tornado was on the ground for approximately one mile before the damage path ended. The second tornado, an F0, struck two miles northwest of Cogar. The tornado lifted as it reached highway 37 due north of Cogar. This tornado was also on the ground for approximately one mile, dissipating after three minutes. The tornadic supercell continued its march to the east-northeast, however, and dropped a third tornado in the northwestern outskirts of Union City. Another short-lived tornado, this one reached F1 strength but disappeared after one minute and 1/8<sup>th</sup> of a mile on the ground.

The storm crossed over into Oklahoma County and continued doing damage from Yukon into parts of central Bethany, but this damage was determined by the NWS damage survey team to be a result of straight line winds (Figure 4). Figure 4 also indicates a fourth tornado hit Bethany and Warr Acres, causing damage to Wiley Post Airport along the way. This F1 tornado was on the ground for nearly 4 minutes as it cut a swath of destruction 880 yards wide and 1.5 miles long from NW 38<sup>th</sup> and Glade to NW 59<sup>th</sup> and Hammond. There were three distinct areas of F1 damage contained within a larger area of F0 damage, marking

this as a multiple-vortex tornado. The straight line wind damage continued on the outskirts of the tornadic damage, from Frisco Rd. between SW 29<sup>th</sup> and SW 15<sup>th</sup> in Yukon to Northwest Expressway and Meridian. Another area of straight line wind damage was found near Nichols Hills.

The fifth tornado of the night began near NE 82<sup>nd</sup> and Ridgeway Rd., just north of Wilshire Blvd, as detailed in Figure 5. It then traveled northeast and crossed I-35 between Britton and Hefner. An F1 at this point, the tornado then moved into the River Oaks addition east of I-35 and strengthened to an F3, doing considerable damage to homes in that area, and destroying the pre-kindergarten through third-grade classroom building at Oakdale School. The tornado weakened back to an F0/F1 before crossing N. Midwest Blvd. between NE 122<sup>nd</sup> and Hefner Rd., where it increased to F3 intensity briefly once again. It then turned to the right and traveled easterly for a short time, diminishing to F0/F1 intensity. The tornado then traveled to the northeast, approximately one mile south of I-44, paralleling the highway. It strengthened briefly to F2 intensity once more on the northern fringe of Jones before dissipating two miles south of Luther (Figure 6). This tornado was on the ground for 36 minutes and a distance of nine miles, reached a maximum width of 880 yards, and was officially rated F3 in strength.



**Figure 4.** The track of the 4<sup>th</sup> central Oklahoma tornado and damaging winds through northwest Oklahoma City on May 9<sup>th</sup>. Map courtesy of the Norman NWS office.



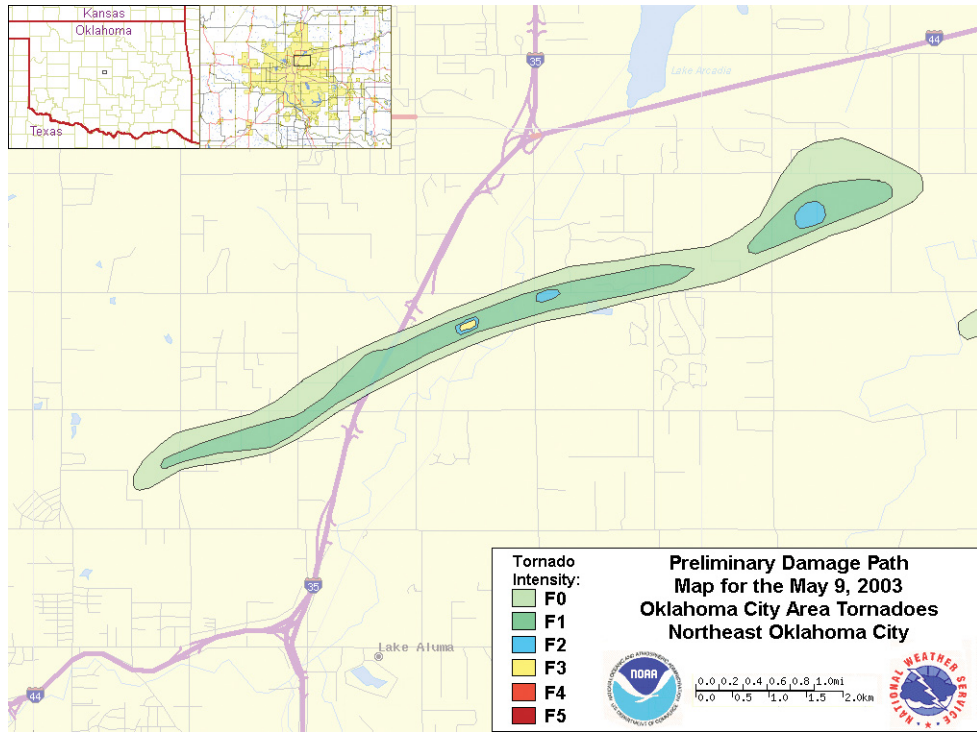


Figure 5. Track of the day's 5<sup>th</sup> tornado through northeast Oklahoma City. Map courtesy of the Norman NWS office.

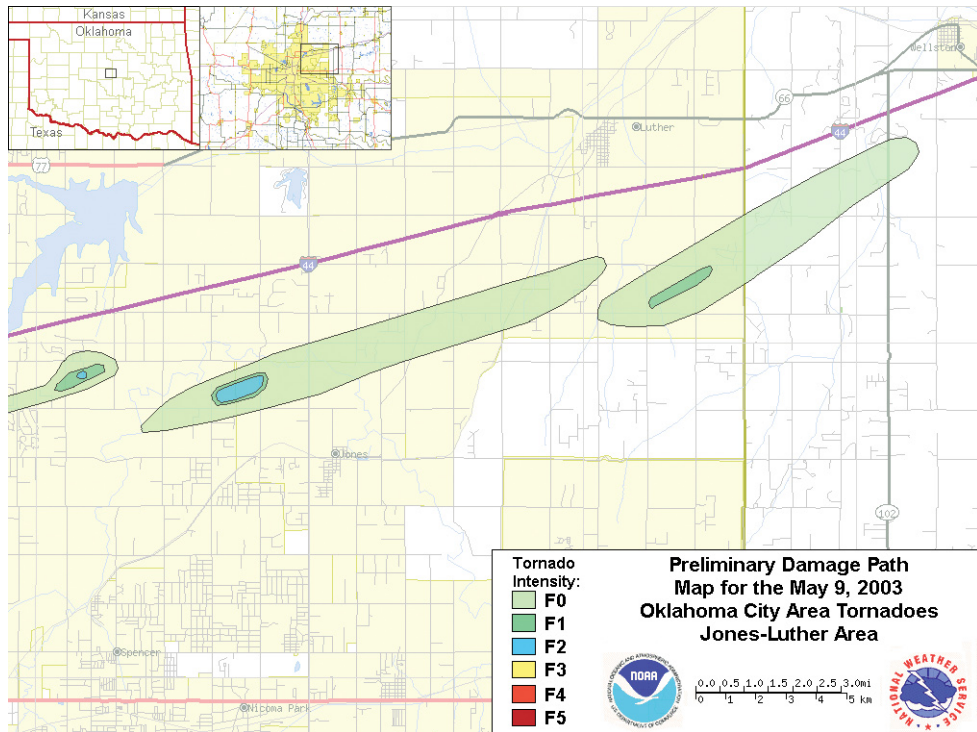
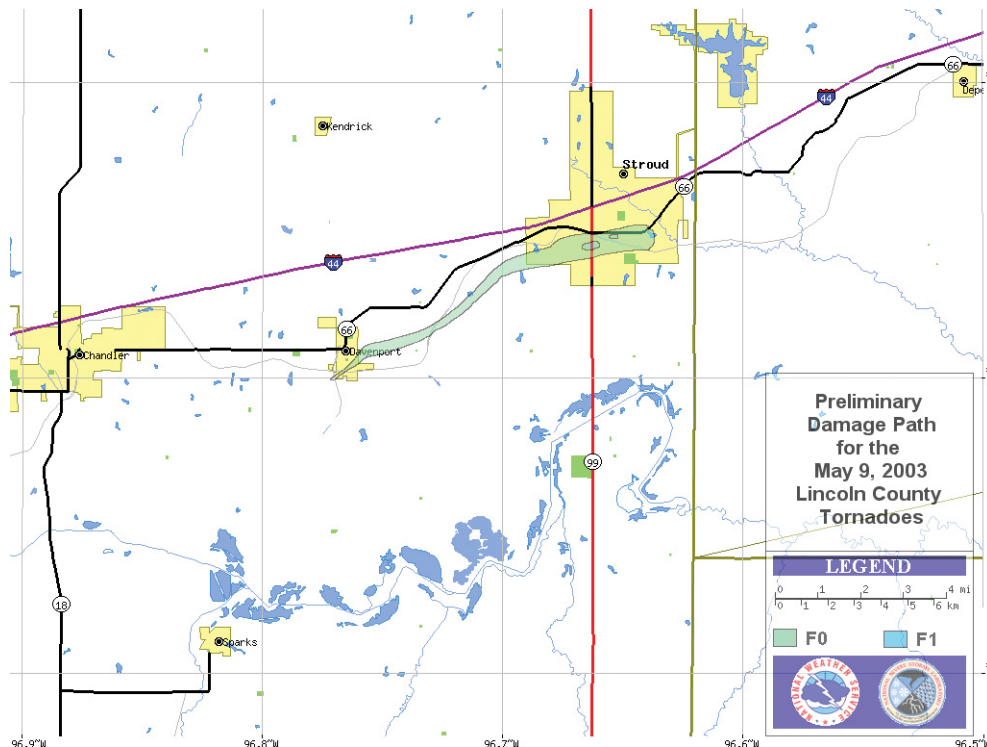


Figure 6. The damage path of the May 9<sup>th</sup> tornadoes through Jones and Luther. Map courtesy of the Norman NWS office.





**Figure 7.** Track of the 7<sup>th</sup> and final central Oklahoma tornado on May 9<sup>th</sup>. Map courtesy of the Norman NWS office.

Yet another tornado, the sixth of the night, formed almost immediately to the southeast of the endpoint of the previous tornado. This tornado once again traveled parallel to I-44 three miles south of Luther to 2.5 miles southwest of Wellston, crossing the Oklahoma-Lincoln County line in the process (Figure 6). This tornado was on the ground along a seven mile path, for duration of 18 minutes. It reached F1 strength, but predominantly did F0 damage.

The seventh, and final, tornado of the central Oklahoma outbreak dropped into southwestern portions of Davenport and moved northeast along the turnpike to the southern sections of Stroud. While the damage associated with this tornado was generally light (F0), more significant F1 damage occurred in Stroud, moments before the tornado dissipated (Figure 7).

### May 9<sup>th</sup>: Damages

Oklahoma City and the surrounding areas affected by this tornadic thunderstorm were extremely fortunate that the damages were not more severe. The twisters that dropped from the thunderstorm's base were actually more fleeting than it appeared at the time. Much of the damage from this day was a result of straight-line winds from the storm's rear-flank downdraft (RFD). Had a longer-lived tornado occurred as the storm traversed Oklahoma City's large population base, the damage could have been catastrophic. Regardless, the storm still inflicted sporadic amounts of significant damage along its path, although the amounts are not as clear as the previous day's tally. Those cities with confirmed damage figures include:

- Bethany: 471 homes affected, 10 destroyed; 5 public buildings with major damage;
- Stroud: 1 home with major damage and 30 homes with minor damage;
- Jones: 4 homes with major damage, 1 home with minor damage, 7 homes affected, 6 businesses destroyed, 3 businesses affected and 1 public building affected.

## Historical Perspective: Oklahoma Tornadoes

Oklahoma has earned its spot in the center of tornado alley, experiencing 828 significant tornadoes (F2-F5) since accurate statistics began in 1950. According to statistics provided by the National Climatic Data Center (NCDC), however, only five of those twisters were rated at the Fujita Scale’s highest level of F5.

The state’s most deadly tornado occurred before 1950, however, when an F5 tornado devastated the city of Woodward on April 9, 1947. That tornado began in Texas, where another twister slammed into the towns of Glazier and Higgins, before moving into Oklahoma. The tornadic storm left 69 dead in Texas. The tornado moved predominantly through rural areas after it crossed into Oklahoma, killing 8 and injuring another 42. The tornado, which was over a mile wide and moving at 50 mph, tore into Woodward at 8:42 p.m., leveling over 1000 homes and businesses. The storm left in its path 107 people killed and another 1000 injured. The cost of that tornado was massive in 1947-dollar amounts, yet even greater was the cost in human lives, as it left 116 Oklahomans dead in its wake as it crossed into Kansas.

The 10 deadliest tornadoes in Oklahoma history are detailed in Table 1.

Rank	City	Date	Killed
1	Woodward	April 9, 1947	116
2	Snyder	May 10, 1905	97
3	Peggs	May 2, 1920	71
4	Antlers	April 12, 1945	69
5	Pryor	April 27, 1942	52
6	Oklahoma City	May 3, 1999	40
7	Oklahoma City	June 12, 1942	35
8	Moore/Norman	April 25, 1893	31
9	Bethany	November 19, 1930	23
10	McAlester	May 8, 1882	21

**Table 1.** The 10 deadliest tornadoes in Oklahoma, ranked by fatalities (courtesy of the Norman NWS office).

### Significant Oklahoma Tornadoes: Oklahoma City

Oklahoma City’s history with tornadoes dates back to March 22, 1893, when an F2 twister traveled through the center of town “attended by a ‘sullen grinding noise,’” doing \$15,000 in damage. Moore, which has been struck by three tornadoes in the last five years, had its first encounter in 1893 as well. On April 25, 1893, Oklahoma’s 2<sup>nd</sup> recorded tornado, an F4, moved through Moore, Norman and Newcastle, killing 33 and injuring 100 more. Other significant Oklahoma City tornadoes include:

- November 19, 1930 – The tornado, an F4, moved through Bethany, destroying or damaging a fourth of the town, including the Camel Creek School. The tornado hit while school was in session, killing five students and a teacher.
- June 12, 1942 – An F2 struck southwest Oklahoma City, leaving 35 dead and 100 injured.
- April 12, 1945 – A massive F4 moved through southeastern Oklahoma City, killing 8 and injuring another 200. This was the first tornado whose damages exceeded \$1 million.
- April 28, 1960 – An F3 and accompanying hailstorm did approximately \$4 million in damage across the southern parts of Oklahoma City. No deaths resulted from this storm, although 57 were injured.
- April 30, 1970 – An F2 moved diagonally through Oklahoma City from Mustang to Arcadia, damaging homes, businesses, and public buildings to the tune of \$6.3 million. A car dealership accounted for \$1 million of those losses.
- November 19, 1973 – Another F3, this tornado moved from Blanchard up through Moore, killing five and injuring 53, and doing \$5.3 million in damage.
- May 8, 1986 – This F3 tornado touched down in far north Oklahoma City and traveled through Edmond, destroying 39 houses in two housing additions. Damages totaled \$6.5 million.
- June 13, 1998 – This tornado, while only an F2, is famous for striking the Frontier City amusement park. \$1 million in damages occurred in north Oklahoma City. Fortunately, there were no fatalities, although 17 people were injured in this storm.
- October 4, 1998 – The first of three tornadoes to strike Moore within five years, this F2 tornado struck in north Moore just west of I-35, doing \$2 million in damages. Fortunately, there were no injuries or fatalities with this storm.
- May 3, 1999 – Part of one of the largest tornado outbreaks in the state’s recorded history, this powerful F5 tornado formed southwest of Oklahoma City, devastating the town of Bridge Creek and the outlying parts of northwest Newcastle before entering southwest Oklahoma City and Moore – making it the second tornado to strike the Moore area in seven months. A mile wide at times, the tornado obliterated what it touched, destroyed 1800 homes, and damaged 2500 others, racking up over \$1 billion in damages. Its most terrible toll was in human lives, however, as 40 people lost their lives to this monstrous storm, with another 583 injuries attributed directly to the tornado. The fatality total affected six different communities: Bridge Creek – 12; Newcastle – 1; Oklahoma City – 9; Moore – 5; Del City – 6; and Midwest City – 3. This was one of nearly 60 tornadoes that touched down in central Oklahoma on that fateful day.
- May 3, 1999 – This tornado formed after the aforementioned F5 dissipated, striking the city of Choctaw. Dwarfed in size by its predecessor, this tornado only reached F2 strength, but was able to do \$3.2 million in damages, and injured 4.

Dates	Counties affected – 1 <sup>st</sup> day	Counties affected – 2 <sup>nd</sup> day
June 17-18, 1955	Alfalfa, Wood	Woods
May 9-10, 1959	Hughes, Pontotoc	Seminole
May 4-5, 1960	Cleveland, Pontotoc, Pottawatomie, Seminole, Stephens	Cleveland, Creek, Garvin, Lincoln, Okfuskee, Pottawatomie
May 7-8, 1961	Wagoner	Mayes
May 24-25, 1962	Jackson	Washita
June 10-11, 1967	Ellis	Custer
June 22-23, 1969	Lincoln	Payne
May 19-20, 1977	Garvin	Oklahoma, Pottawattomie
May 12-13, 1983	Greer, Jackson	Harmon, Kiowa
April 26-27, 1991	Kay	Garfield, Noble, Osage
May 8-9, 2003	Cleveland, Grady, Lincoln, Oklahoma	Canadian, Oklahoma, Lincoln

**Table 2.** Areas in Oklahoma which have been struck by significant tornadoes on successive days. To qualify, the tornadoes must have been within 50 miles of each other.

### **Successive Significant Tornadoes**

The occurrence of significant tornadoes in the same area on successive days, while rare, is not unheard of in Oklahoma. This scenario, when a localized area (within 50 miles) has been affected by significant tornadoes on consecutive days, has occurred 11 times since 1950 – including the May 8-9 central Oklahoma tornadoes.

The tornadic events that matched these criteria are detailed in Table 2:

### **For More Information**

Web sites, current as of December 2003, are subject to change.

The Oklahoma Climatological Survey (OCS) operates and archives data from the Oklahoma Mesonet, which allows detailed weather information from 115+ stations across the state. In addition, OCS maintains archives from other observing networks, storm reports, and other historical records. For more information about the weather event of December 3, 2002, or for related data, contact OCS at: 100 East Boyd, Suite 1210, Norman, OK 73019-1012, or via the World Wide Web at: <http://www.ocs.ou.edu/>.

The National Climatic Data Center (NCDC) publishes Storm Data and Unusual Weather Phenomena. Final summaries of qualifying events are usually available after 6-8 months. OCS maintains an archive of the publication, or one can contact NCDC at 151 Patton Avenue, Asheville, NC 28801-5001, or via the World Wide Web at: <http://www.ncdc.noaa.gov/>.

The Federal Emergency Management Agency (FEMA) evaluates the need for federal relief due to certain weather-related and other disasters. The May 8-9, 2003, central Oklahoma tornado outbreak is addressed as FEMA Disaster Number 1465-DR. FEMA can be contacted at 500 C Street, Washington, DC 20472 or via the World Wide Web at: <http://www.fema.gov/>.

The local National Weather Service (NWS) office in Norman, Oklahoma, has a page dedicated to the May 8-9, 2003, central Oklahoma Tornado outbreak. For information about this severe weather outbreak, as well as prior severe weather events, visit the Norman NWS online at: <http://www.srh.noaa.gov/oun/>.