

# 1999 OKLAHOMA ANNUAL SUMMARY

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## 1999 ANNUAL SUMMARY

The tragically wild evening of May 3 provided a virtual re-write of Oklahoma's tornado record book in 1999. The 146 tornadoes reported in 1999 far exceeded the previous record (107 in 1957), based on the reasonably reliable counts that exist only since 1950. The 42 tornado deaths during 1999 were the most suffered in the state during any year since the devastating Woodward tornado of 1947 killed 107 in that community, alone. All but two of this year's tornado deaths occurred on May 3, most of those in the Oklahoma City metropolitan area. National Weather Service, local emergency management personnel, broadcast media, and local police, ambulance, and fire personnel provided a high level of warning and response to keep fatalities as low as they were.

The state parlayed mild weather in the months that typically are cold and a generally wet spring to produce a year that was both warmer and wetter than normal. Annual precipitation, averaged statewide, was 37.82 inches, 3.58 inches greater than normal, ranking this as the 29<sup>th</sup> wettest year since 1892. The year divided neatly into a wet first half (7.32 inches greater than normal precipitation, the 7<sup>th</sup> greatest January-June precipitation in state annals) and a dry second half (3.74 inches less than normal precipitation, despite a wet December). The annual average temperature for the state was 61.6 degrees (1.3 degrees above normal, 19<sup>th</sup> highest). The state experienced its warmest November on record (56.2 degrees) and its 5<sup>th</sup> warmest February. It is worth mentioning that March, which featured the most significant snowstorm of the year, actually had a lower statewide-averaged temperature than did February.

Three of the four seasons (based on complete months and including December 1998 while excluding December 1999) were warmer than normal (spring was cool) and three seasons were wetter than normal (autumn was dry), statewide. Seasons' temperatures, departures from normal temperature, rank (warmest=1, coolest=108), seasons' precipitation, departures from normal precipitation, and rank (1=wettest, 108=driest) follow (temperatures in degrees Fahrenheit, precipitation in inches):

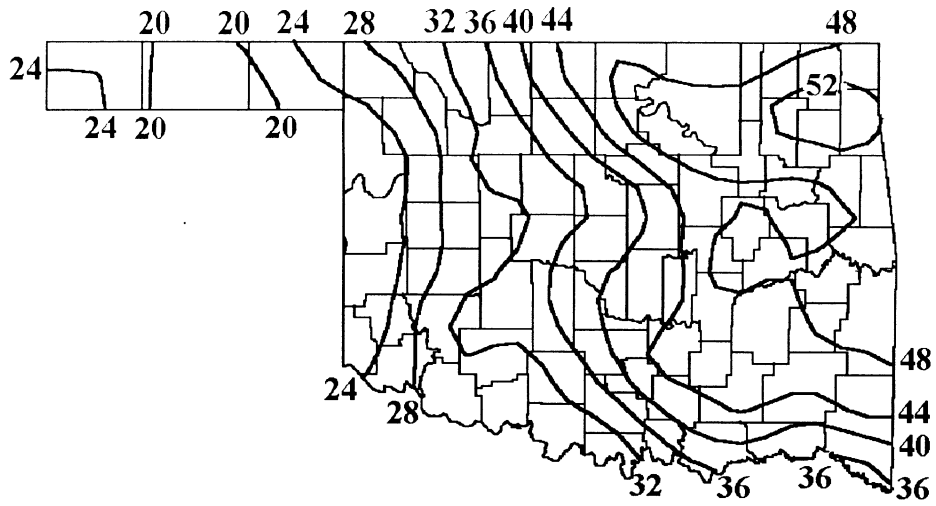
Season	T	Dep.	Rank	P	Dep.	Rank
Winter (Dec. '98-Feb. '99)	43.6	+3.8	19	4.93	+0.23	47
Spring (Mar. through May)	58.7	-1.3	80	15.50	+4.74	7
Summer (Jun.-Aug.)	80.6	+0.6	41	9.43	+0.04	59
Autumn (Sep.-Nov.)	62.9	+1.3	34	6.71	-2.72	73

The tornado outbreak of May 3 and 4 far overshadowed all other weather events of the year, but there were a number of other happenings that deserve documentation:

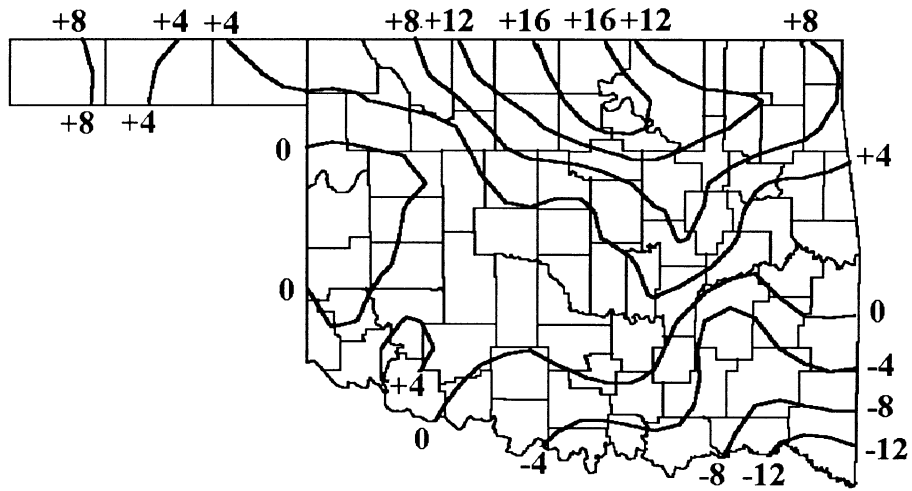
- 1) A major winter storm January 28-30 dropped 10-13 inches of snow in the Panhandle and produced enough heavy rain to cause flooding in eastern Kay County.
- 2) A shortage of precipitation during the state's 5<sup>th</sup> warmest February since 1892 led to the imposition of outdoor burning restriction that lasted through the first third of March.

- 3) Thirty-three wildfires in Pushmataha, Choctaw, and Atoka counties from March 3 through 10 were curtailed by precipitation associated with a major winter storm.
- 4) 19 inches of snow fell at Medford on March 12-13 (12 inches or more elsewhere in northern and central Oklahoma). 14 deaths (including 13 from traffic mishaps) were attributed to this storm. Regnier (Cimarron County) recorded 12 inches of snow later in the month (18<sup>th</sup>).
- 5) The 9<sup>th</sup> wettest April in state records was generated largely by a sequence of weather systems that impacted the state from the 21<sup>st</sup> through the 26<sup>th</sup>. Several tornadoes were reported during that period, as was significant flooding along the Deep Fork, North Canadian, and Salt Fork rivers and Salt, Tar, and Choctaw creeks.
- 6) A tornado on June 1<sup>st</sup> that probably began as a waterspout on Fort Gibson Lake killed two residents of a Cherokee County rural housing addition.
- 7) Rain brought about the cancellation of many July 4 firework shows, especially in central Oklahoma.
- 8) Dry, hot weather dominated from early July through the first third of September. A heat wave, beginning in late July led to 8 heat-related deaths during the last week of July. Temperatures reached at least 100 degrees somewhere in the state each day in August. Guthrie (Logan) recorded 111 degrees, the year's highest temperature, on August 27.
- 9) A line of severe thunderstorms on September 10<sup>th</sup> broke the drought in central Oklahoma, but lightning forced the suspension or cancellation of many high school football games. The thunderstorms preceded the passage of a cold front that introduced a welcome moderation of temperatures, but failed to bring precipitation to the western third and extreme southeastern portion of the state.
- 10) Precipitation in excess of one-half inch occurred on only two days in November (22<sup>nd</sup> and 23<sup>rd</sup>).
- 11) December was wet but warm in most areas: as much as 10 inches of snow fell in the northwest from the 2<sup>nd</sup> through the 4<sup>th</sup>, but quickly melted; snow and sleet fell in many areas from the 7<sup>th</sup> through the 9<sup>th</sup>, and heavy rain fell in most areas on the 11<sup>th</sup> and 12<sup>th</sup>.

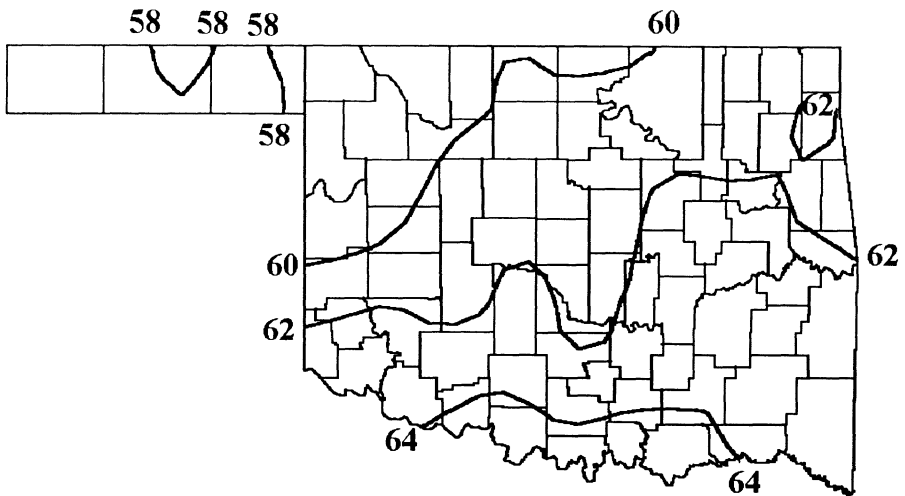
Howard L. Johnson



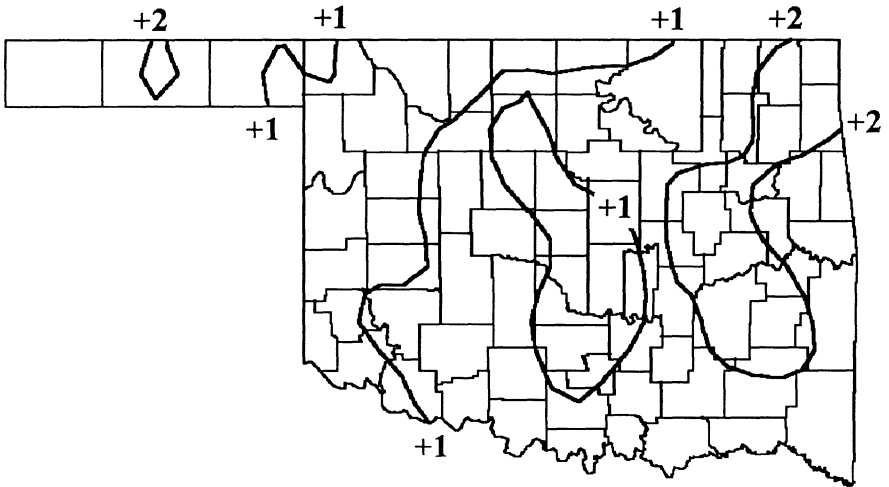
1999 Annual Precipitation (inches)



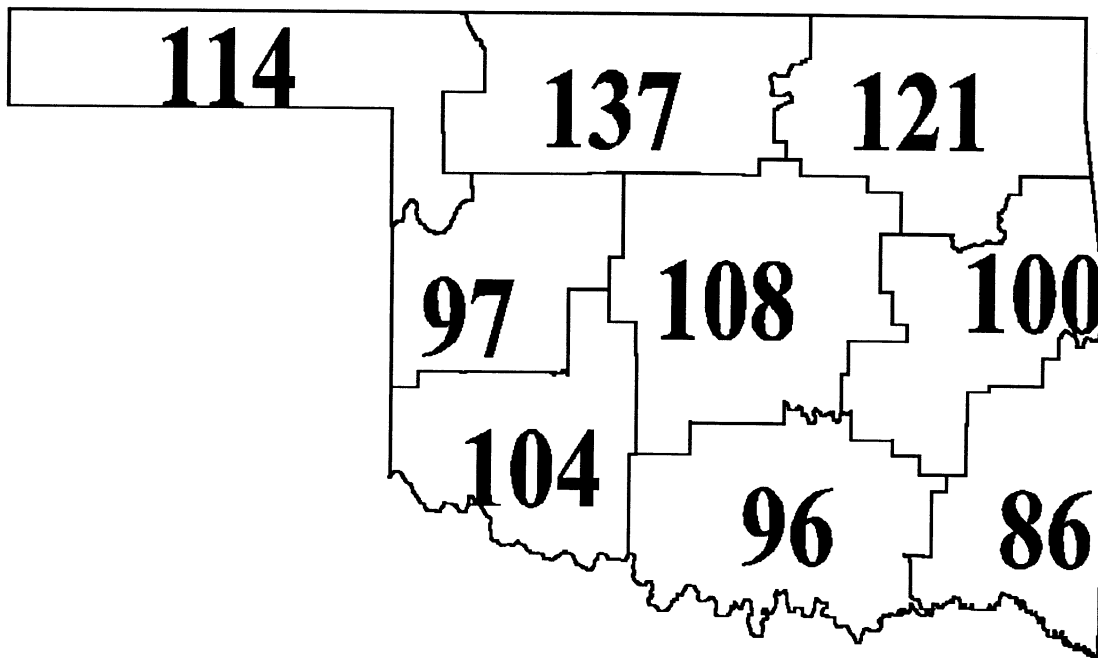
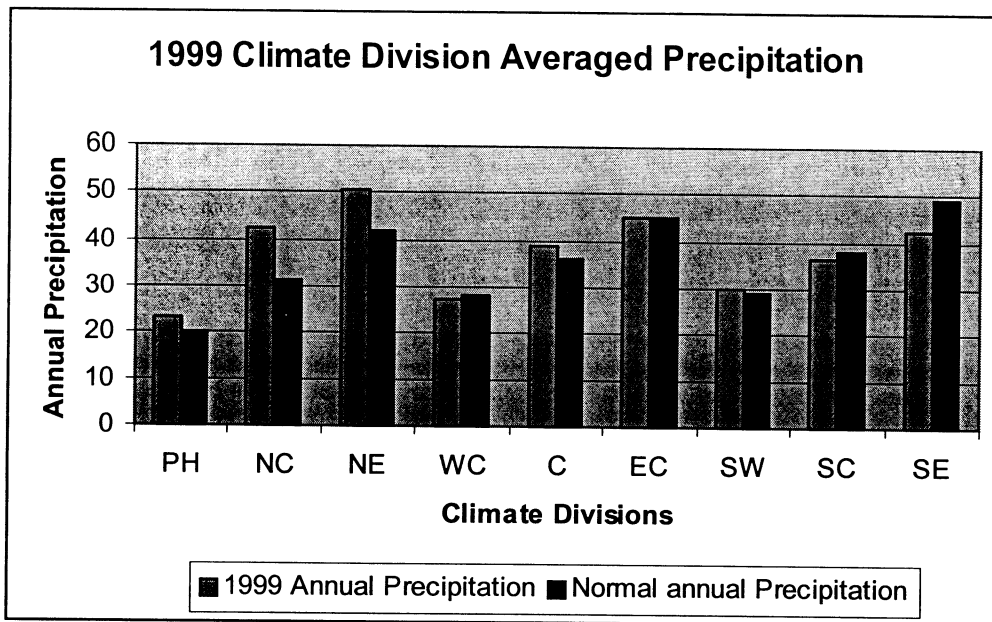
1999 Annual  
Departure from Normal Precipitation (inches)



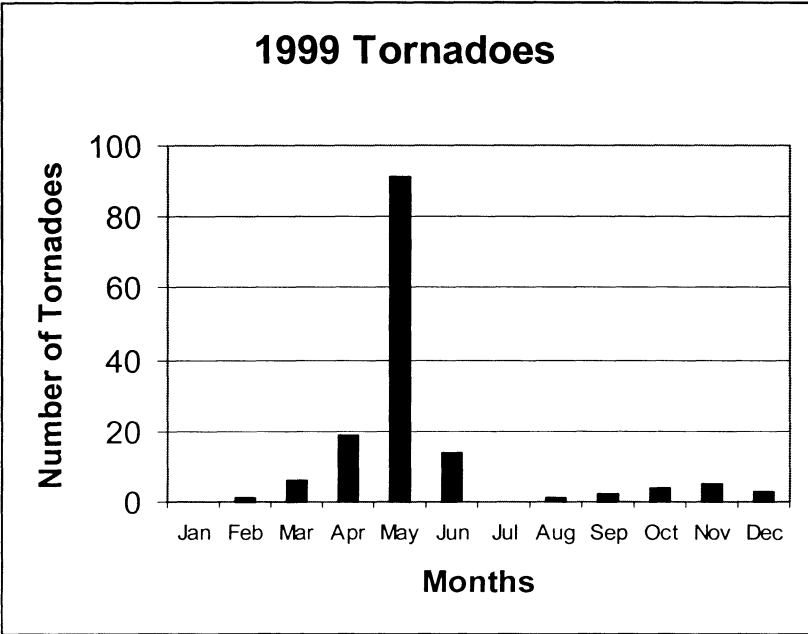
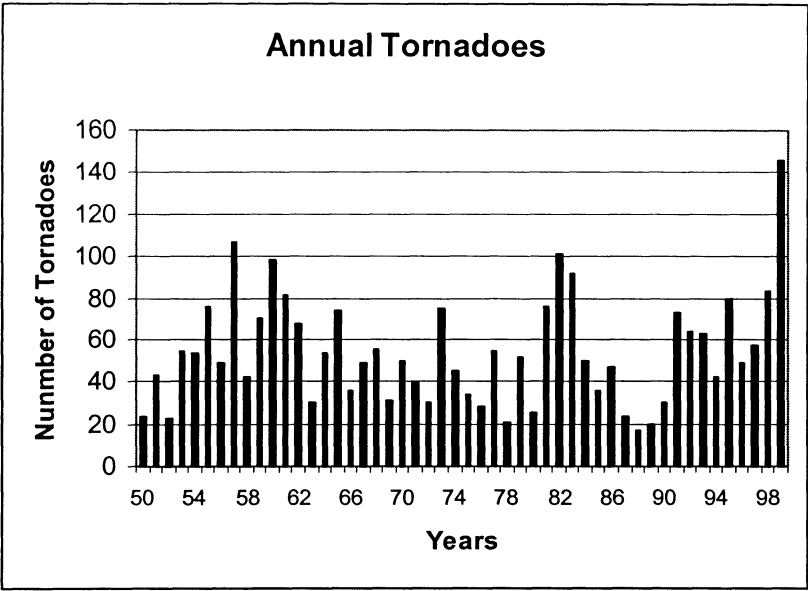
**1999 Annual Mean Temperature (Fahrenheit)**



**1999 Annual Departure from Normal Temperature (Fahrenheit)**

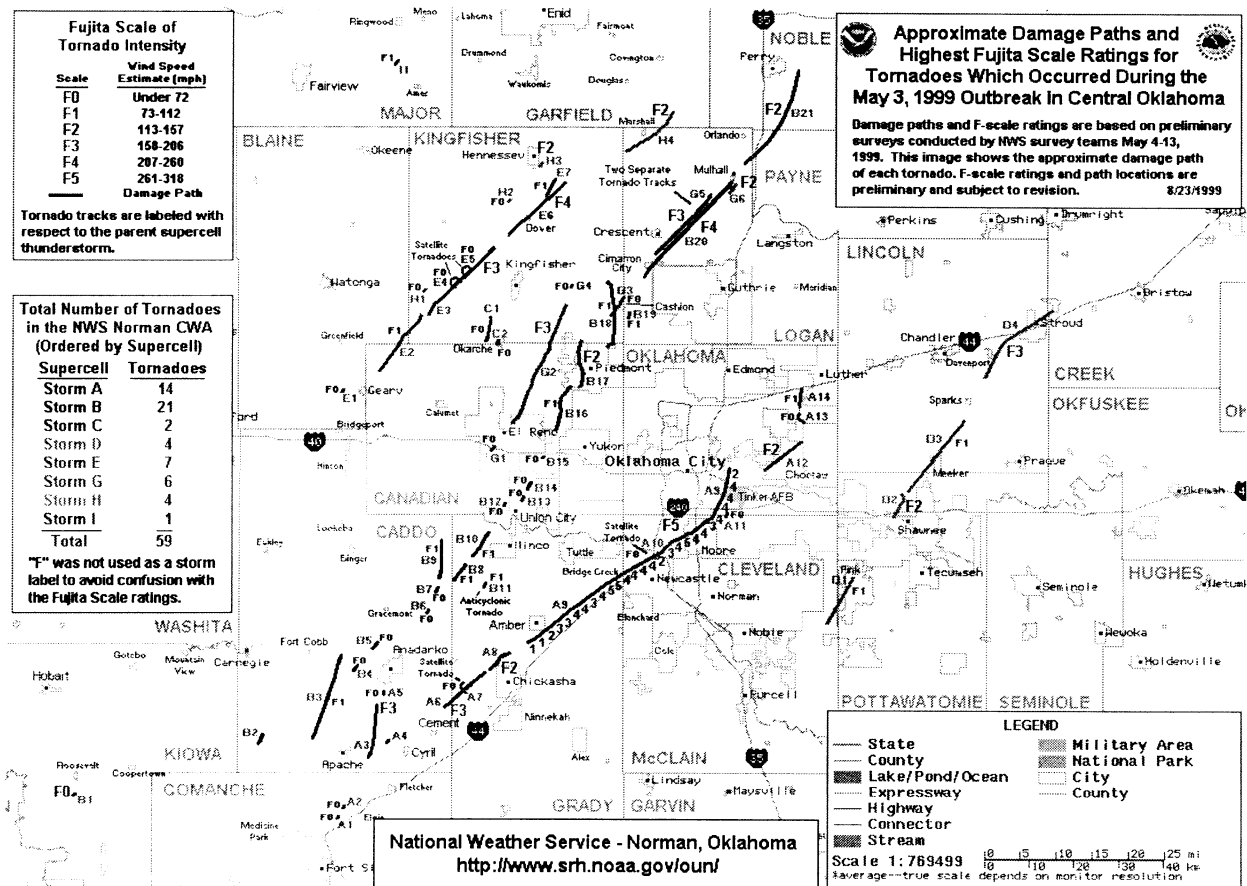


1999 Percent of Normal Precipitation



## THE RECORD-SETTING 1999 TORNADO SEASON, OR WAS IT?

The devastating tornadoes in 1999 will stand out in memory for many years. Seven separate storms on May 3 spawned 61 tornadoes, killing 40 people, injuring more than 600, and inflicting more than \$1 Billion in damage across central Oklahoma. The largest and longest-track tornado of the day, rated an F5 (on a scale of F0 to F5), was responsible for 36 deaths, destroyed 1800 homes, and damaged another 2500 in the towns of Bridge Creek, Newcastle, Oklahoma City, Moore, Del City, and Midwest City (Grady-McClain-Cleveland-Oklahoma Counties). A separate F4 tornado destroyed over 60% of the homes in Mulhall (Logan County). Despite the enormity of damage from this storm, there was only one fatality. One person was killed in Dover (Kingfisher County), which took a direct hit from an F4 tornado. One third of Dover's structures were destroyed. The town of Stroud (Lincoln), although suffering no fatalities, suffered tremendous economic losses when its three major employers – Sygma food distribution, Stroud Municipal Hospital, and Tanger Outlet Mall were heavily damaged or destroyed by an F3 tornado.



The 146 tornadoes confirmed by the National Weather Service for 1999 far exceed the previous state record of 107 set in 1957. The 61 tornadoes spawned during the May 3 outbreak also set a new record, surpassing the 26 tornadoes recorded on May 13, 1983. So what caused so many tornadoes in 1999? The answer lies probably not so much in the production of tornadoes, but in our ability to detect them. Two factors transpired to increase detection: technology and verification. Through the use of WSR-88D (NEXRAD) radars, the National Weather Service has increased its ability to detect signatures of potential tornadoes in parent storms, which provide clues as to where to look for signs of damage. The National Weather Service, since the 1980s, has more aggressively sought out storm reports as a means to improve its ability to distinguish severe from non-severe events. The media and academic chase teams have also sought to document tornadoes, providing further feedback to the verification activities. Because weak tornadoes often do little damage, many previously went unreported. Research indicates (e.g., see Thomas



Grazulis, *Significant Tornadoes*) that earlier tornado statistics may underestimate the true number of tornadoes by as much as 70%!

Of the 146 tornadoes, 26 were classified as “significant” (F2 or greater), placing 1999 in a tie for 9<sup>th</sup> in the number of significant tornadoes, from 1950-1999. The record remains the 49 significant tornadoes (of 98 overall) in 1960, which included an outbreak on May 5 that killed 32 people and injured more than 200, leaving the town of Wilburton (Latimer) devastated. The 17 significant tornadoes from the May 3, 1999 outbreak was also not the greatest among outbreaks of significant tornadoes; that record is the 19 significant tornadoes that hit Oklahoma on June 8, 1974. During that outbreak, 14 people died and more than 200 were injured as an F4 cut a 55-mile long path across Payne, Creek, Pawnee, and Osage Counties. The May 5, 1960 outbreak also had 16 tornadoes classified as “significant.”

One remarkable fact about the May 3 outbreak was not the number of tornadoes or strength, but that considering the path of the storms so few people died. Considering that an F5 – the top of the tornado intensity scale – cut a 38-mile-long path through a heavily populated area, the loss of life could have been much worse. In previous years, similar strong tornadoes killed many more people in less sparsely populated areas. A review of past tornadic events in Oklahoma puts the May 3 event in better perspective:

- April 9, 1947 – An F5 tornado cut through the northern part of Woodward (Woodward) in what is the deadliest tornado in Oklahoma history. Over 100 city blocks were devastated, 1,000 homes damaged or destroyed, and 107 people in Woodward lost their lives (181 total including deaths in Texas).
- May 10, 1905 – The town of Snyder (Kiowa) was virtually destroyed by an F5 tornado, whose roar could reportedly be heard some 12 miles away. The tornado claimed 97 lives, 87 of them in Snyder.
- May 2, 1920 – Nearly one third of the population, 71 people, of Peggs (Cherokee) were killed as an F4 tornado destroyed all but seven buildings in the town. Because the town was not on the railroad line, news of the disaster did not reach another town for six hours.
- April 12, 1945 – In what has sometimes been called the “secret tornado”, the town of Antlers (Pushmataha) was heavily damaged by an F5 tornado, killing 69. The disaster was overshadowed, even in local press, by the death of President Roosevelt.
- April 27, 1942 – The WWII boom town of Pryor (Mayes) was hit by an F4 tornado, killing 52 and destroying a third of the town. Many of the buildings that were destroyed had been hastily built in order to accommodate the housing needs of people working at the nearby defense plants.
- June 12, 1942 – Less than two months after Pryor was devastated, southwest Oklahoma City (Oklahoma) was hit by a short-track – 2.3 miles – F4 tornado, killing 35.
- April 25, 1893 – In a track that was nearly identical to the May 3, 1999 tornado, an F4 tornado cut a track from near Newcastle (McClain) through Moore (Cleveland), killing 31. Over one-hundred years later, the F5 that cut through a much more densely populated Moore killed 36 – a testament to the successes achieved in detection and warning.
- November 19, 1930 – A rare late-fall tornado, F4, crossed through Bethany (Oklahoma), killing 23. Nearly one fourth of the homes in the town were damaged, including the Camel Creek School where five students and a teacher were killed, apparently with little warning.
- May 8, 1882 – The small mining community of McAlester (Pittsburg) was hit by an F3 tornado, which killed 21 people in the town.
- May 25, 1955 – A pair of F5 tornadoes cut across parts of Kay County. One tornado destroyed 400 homes and killed 20 people in Blackwell, while the other did most of its damage in Udall, Kansas where 75 people were killed. The Blackwell tornado was said to be glowing from the intense electrical activity associated with it.

These and many more events are chronicled in *Significant Tornadoes* by Thomas Grazulis, a compendium of significant tornadoes in the United States from 1680-1991. For more information about the book visit his website at <http://www.tornadoproject.com/>. More information about the May 3, 1999 tornado outbreak is available from the National Weather Service Office in Norman’s web page, <http://www.srh.noaa.gov/oun/storms/19990503>. The National Symposium on the Great Plains Tornado Outbreak of 3 May 1999, held in May 2000, also has abundant information and analyses of the event. Information is available from their web site: <http://geowww.ou.edu/~kkd/may3.htm>.

1999 TOTAL PRECIPITATION AND DEPARTURES FROM NORMAL (INCHES)

Panhandle

	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		ANN		
	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	
ARNETT	1.83	1.37	0.39	-0.62	2.02	0.39	6.31	4.53	1.64	-2.49	2.74	-0.96	2.12	0.23	1.02	-1.39	1.51	-1.02	0.00	-1.83	0.00	-1.43	1.78	1.01	21.37	-2.21	
BEAVER	1.60	1.20	0.00	-0.78	2.43	0.98	3.74	2.19	1.71	-1.33	5.74	2.25	2.38	-0.48	2.48	-0.47	2.07	0.25	1.97	0.78	0.00	-1.02	0.37	-0.22	24.49	3.35	
BOISE CITY	1.30	1.00	0.15	-0.34	1.55	0.67	4.67	3.49	5.92	3.34	2.21	-0.58	2.79	0.04	6.54	4.09	1.54	-0.29	2.04	1.18	0.00	-0.72	0.30	-0.08	29.02	11.80	
BUFFALO	*	*	0.00	-1.04	2.35	0.49	5.70	3.35	3.20	-1.16	9.43	5.44	1.00	-1.99	0.64	-2.82	*	*	0.60	-1.34	0.00	-1.62	0.40	-0.40	*	*	
FARGO	2.05	1.58	0.11	-0.87	1.08	-0.55	7.44	5.43	2.63	-1.06	4.66	1.35	2.50	0.46	0.51	-2.20	1.66	-0.61	0.06	-1.58	0.00	-1.30	0.78	0.01	23.49	0.66	
GATE	2.73	2.17	0.01	-0.83	3.40	1.72	4.38	2.55	3.91	0.88	6.03	3.12	*	*	1.95	-0.93	4.01	1.92	1.28	-0.13	0.00	-1.10	1.21	0.51	*	*	
GOODWELL	*	*	0.00	-0.42	1.80	0.93	4.19	2.96	2.19	-0.92	*	*	*	*	*	*	0.41	-1.27	2.20	1.24	0.00	-0.73	0.32	0.04	*	*	
GUYMON	0.00	*	0.00	*	1.10	*	3.49	*	0.71	*	2.29	*	0.51	*	1.19	*	*	*	*	*	*	*	*	*	*	*	*
HOOVER	1.80	1.41	0.01	-0.58	2.70	1.54	3.81	2.43	2.85	-0.11	4.55	1.61	0.33	-1.96	1.34	-0.97	0.94	-1.11	2.19	1.25	*	*	0.46	0.05	*	*	
KENTON	0.79	0.51	0.04	-0.31	2.02	1.24	*	*	*	*	1.63	-0.53	*	*	4.75	2.11	*	*	3.20	2.25	*	*	*	*	*	*	
LAVERNE	2.21	1.68	0.00	-0.97	1.73	0.03	8.06	6.44	3.69	0.40	5.88	2.81	0.60	-1.93	0.67	-2.19	2.79	0.77	0.45	-0.96	0.00	-1.17	1.46	0.73	27.56	5.64	
RANGE	1.90	*	0.00	*	3.04	*	3.78	*	2.09	*	4.11	*	0.00	*	*	*	0.59	*	2.34	*	0.00	*	0.34	*	*	*	
REGNIER	0.87	0.57	0.00	-0.32	1.55	0.82	4.63	3.54	3.35	1.10	0.97	-1.27	2.08	-0.26	5.48	3.60	1.38	-0.32	2.09	1.33	0.03	-0.53	0.07	-0.26	22.51	8.00	

North Central

	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		ANN	
	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP
ALVA	2.51	*	0.43	*	3.04	*	8.06	*	3.41	*	8.81	*	*	*	4.34	*	1.75	*	0.18	*	0.06	*	2.90	*	*	*
VANCE AFB	*	*	1.25	*	3.63	*	4.90	*	2.77	*	*	*	1.12	*	*	*	2.73	*	1.79	*	0.14	*	*	*	*	*
BILLINGS	3.92	2.92	*	*	4.82	2.13	7.05	3.96	5.40	0.89	7.28	3.13	*	*	2.12	-1.01	5.11	0.57	2.05	-0.68	0.50	-1.77	4.49	3.12	*	*
BLACKWELL 2E	3.62	2.68	1.27	0.20	3.70	1.30	7.08	4.11	*	*	10.01	6.10	*	*	4.33	1.14	6.98	2.90	2.06	-0.64	0.45	-1.83	3.52	2.17	*	*
BRAMAN	3.42	*	*	*	5.32	*	5.51	*	7.66	*	11.05	*	3.62	*	2.39	*	4.85	*	2.63	*	1.13	*	3.79	*	*	*
CEDARDALE	1.59	*	0.95	*	3.62	*	7.23	*	2.13	*	6.28	*	2.19	*	0.84	*	2.29	*	0.84	*	0.03	*	1.42	*	29.42	*
CHEROKEE	*	*	*	*	*	*	11.29	8.91	2.02	-1.87	11.37	7.55	0.75	-1.99	0.81	-2.21	*	*	*	*	*	*	2.85	1.72	*	*
ENID	*	*	1.36	-0.05	3.53	1.24	7.38	4.51	3.91	-0.89	9.51	5.37	*	*	3.59	0.41	4.11	0.63	2.14	-0.97	0.29	-1.92	3.23	2.09	*	*
FT SUPPLY	2.04	1.59	*	*	*	*	7.21	5.47	1.98	-1.71	*	*	1.19	-1.00	1.60	-1.22	3.21	0.90	0.33	-1.21	0.00	-1.26	0.68	-0.04	*	*
FREEDOM	*	*	0.16	-0.72	2.79	0.93	*	*	*	*	5.59	2.45	0.94	-1.42	*	*	*	*	*	*	0.02	-1.33	2.01	1.20	*	*
GRT SALT PLNS	2.75	2.06	*	*	3.27	0.91	7.37	4.71	3.70	-0.15	11.08	7.58	2.91	0.22	0.37	-2.90	4.11	0.78	1.02	-1.04	1.54	-0.29	3.63	2.81	*	*
HARDY	2.76	*	1.34	*	3.42	*	5.65	*	7.31	*	8.79	*	4.28	*	1.64	*	3.93	*	2.05	*	0.50	*	3.18	*	44.86	*
HELENA	2.49	1.72	0.74	-0.41	4.11	1.72	6.83	4.35	3.78	-0.24	7.04	3.22	2.50	-0.12	3.48	0.72	3.27	0.04	1.24	-0.85	1.36	-0.45	3.37	2.39	40.22	12.09
JEFFERSON	2.50	1.65	0.87	-0.30	3.53	0.94	7.00	4.24	7.24	2.72	7.34	3.30	4.05	0.72	0.81	-2.42	4.74	1.05	2.19	-0.46	0.93	-1.25	4.35	3.16	45.56	13.35
LAMONT	2.72	*	1.29	*	3.62	*	6.55	*	6.49	*	8.85	*	3.22	*	1.80	*	4.99	*	2.41	*	0.33	*	4.08	*	46.35	*
MEDFORD	3.52	*	0.74	*	4.68	*	7.39	*	6.66	*	8.25	*	3.65	*	1.60	*	6.20	*	2.17	*	1.04	*	4.37	*	50.28	*
MORRISON	1.83	*	0.83	*	3.67	*	8.34	*	7.37	*	6.88	*	4.51	*	2.26	*	5.36	*	2.83	*	0.10	*	4.70	*	48.68	*
MUTUAL	1.87	1.27	0.74	-0.33	2.95	0.89	6.24	3.81	1.33	-2.69	4.18	0.87	0.71	-1.64	0.40	-1.80	2.40	-0.25	0.45	-1.23	0.00	-1.40	2.35	1.61	23.62	-0.89
NEWKIRK	4.37	3.50	1.37	0.20	5.02	2.65	7.58	4.49	7.44	2.55	9.42	4.97	4.93	1.65	2.09	-1.36	6.28	2.01	3.11	-0.12	0.30	-2.11	3.95	2.52	55.87	20.95
ORIENTA	1.54	0.83	0.83	-0.20	2.63	0.54	*	*	*	*	1.80	-1.91	1.64	-0.96	2.22	-0.52	2.29	-0.77	0.81	-1.07	1.06	-0.66	3.33	2.52	*	*
PERRY	2.93	1.99	*	*	3.42	0.71	*	*	6.76	1.49	6.47	2.58	2.38	-0.71	2.33	-0.93	7.32	2.94	*	*	0.15	-1.97	5.69	4.36	*	*
PONCA CITY	4.84	3.81	*	*	4.31	1.78	4.15	1.33	8.94	4.38	11.61	7.69	2.03	-1.67	2.56	-0.86	8.19	3.85	*	*	*	*	4.46	3.05	*	*
RED ROCK	3.91	3.01	1.09	-0.29	*	*	4.70	1.94	8.56	3.95	12.75	8.66	2.10	-0.79	5.38	2.55	5.75	1.52	1.85	-0.94	0.20	-1.89	6.65	5.31	*	*
WOODWARD	2.27	1.73	0.27	-0.76	2.73	0.91	7.97	5.92	1.29	-2.67	10.55	7.37	0.68	-1.91	0.48	-2.44	3.01	0.67	*	*	0.00	-1.37	1.00	0.16	*	*

1999 TOTAL PRECIPITATION AND DEPARTURES FROM NORMAL (INCHES)

Northeast

	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		ANN		
	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	
BARNSDALL	3.40	2.01	0.93	-0.92	3.63	-0.07	8.48	5.14	9.78	4.98	8.79	4.05	0.33	-2.60	*	*	7.58	1.97	1.39	-1.80	0.32	-2.66	3.14	1.24	*	*	
BARTLESVILLE	2.73	1.46	1.48	-0.10	4.62	1.37	6.82	3.43	7.01	2.61	7.28	3.23	1.58	-1.02	3.00	-0.15	5.13	0.56	1.18	-2.12	0.58	-2.14	3.89	2.26	45.30	9.39	
BIXBY	*	*	*	*	*	*	*	*	7.42	2.42	9.96	5.34	*	*	0.00	-2.75	5.45	0.74	1.45	-2.25	2.63	-0.51	3.67	1.71	*	*	
BURBANK	3.82	2.68	0.93	-0.47	3.99	1.00	5.44	2.68	9.08	4.35	7.71	3.41	2.09	-1.15	1.90	-1.51	7.76	3.10	2.47	-0.62	0.10	-2.44	5.13	3.63	50.44	14.66	
CHELSEA	2.87	*	1.37	*	4.90	*	8.34	*	8.05	*	14.76	*	1.71	*	1.20	*	5.48	*	1.66	*	2.83	*	5.03	*	58.20	*	
CLAREMORE	2.81	1.21	1.90	-0.10	4.79	1.21	*	*	8.51	3.87	9.31	4.71	1.48	-1.49	1.19	-1.88	5.81	1.36	1.58	-1.98	3.09	-0.14	4.29	2.11	*	*	
FORAKER	2.15	1.13	2.12	0.79	3.03	0.21	5.97	2.85	4.63	-0.47	5.20	1.30	3.66	0.59	1.77	-1.69	5.87	1.03	2.37	-1.07	0.22	-2.36	4.69	3.19	41.68	5.50	
HOLLOW	2.01	0.53	1.06	-0.72	4.08	0.40	10.05	6.43	9.46	4.44	8.91	4.24	1.05	-2.11	0.93	-2.28	4.30	-0.73	1.40	-2.23	0.00	-3.50	5.44	3.41	48.70	7.88	
HOMINY	2.36	1.11	1.04	-0.62	3.37	-0.07	9.09	6.02	11.08	6.53	9.11	5.22	2.95	-0.12	1.11	-2.17	5.34	0.22	1.69	-1.27	0.12	-2.51	4.34	2.77	51.62	15.11	
LENAPAH	2.39	*	1.39	*	3.45	*	7.59	*	9.19	*	8.53	*	1.35	*	1.06	*	4.01	*	1.30	*	1.63	*	4.51	*	46.40	*	
MANNFORD	2.40	1.08	1.10	-0.85	*	*	*	*	*	*	*	*	*	*	1.00	-2.28	7.95	3.39	1.66	-1.42	0.44	-2.40	3.68	1.89	*	*	
MARAMEC	3.15	1.88	0.71	-0.85	4.25	1.05	7.42	4.37	9.48	4.69	8.96	5.16	3.35	0.56	1.88	-1.30	6.96	2.27	1.93	-1.09	0.12	-2.51	3.89	2.41	52.11	16.64	
NOWATA	2.94	1.35	1.13	-0.74	*	*	*	*	*	*	9.61	5.05	1.26	-1.57	1.80	-1.52	6.17	0.82	1.24	-2.10	1.94	-1.30	*	*	*	*	
PAWHUSKA	3.43	2.15	1.40	-0.40	5.03	1.78	8.12	4.78	8.98	4.14	9.95	5.41	2.15	-1.03	1.73	-1.85	8.92	3.99	1.60	-1.60	0.71	-2.11	4.22	2.55	56.24	17.81	
PAWNEE	3.21	1.99	1.05	-0.64	4.99	1.90	8.01	4.90	8.51	3.61	8.88	5.04	2.90	0.17	2.01	-1.20	8.35	3.31	3.08	0.25	0.44	-2.09	4.67	3.14	56.10	20.38	
PRYOR	2.68	0.93	1.72	-0.32	*	*	10.22	6.31	8.70	4.03	7.57	2.58	1.51	-1.24	0.74	-2.53	4.94	0.19	1.54	-2.27	2.86	-0.76	*	*	*	*	
RALSTON	2.67	1.52	1.67	0.04	4.93	1.85	*	*	*	*	*	*	2.75	-0.19	3.82	0.51	6.23	1.56	2.62	-0.27	0.33	-2.21	4.47	2.91	*	*	
SKIATOOK	2.81	1.44	1.41	-0.39	5.11	1.83	7.51	4.06	10.36	5.67	7.56	3.36	1.28	-1.86	0.64	-2.52	9.98	5.13	1.36	-1.82	1.97	-1.07	4.98	3.32	54.97	17.15	
SPAVINAW	2.30	0.60	2.34	0.40	5.82	2.24	8.33	4.34	8.15	3.38	12.60	7.70	1.76	-1.26	*	*	6.30	1.52	1.07	-2.62	1.84	-1.90	3.77	1.27	*	*	
TULSA	3.02	1.48	1.26	-0.71	3.56	0.09	7.21	3.49	9.56	3.96	4.93	0.49	0.40	-2.69	0.42	-2.70	9.69	4.99	1.75	-1.91	1.32	-1.81	5.11	2.95	48.23	7.63	
UPPER SPAVINAW	*	*	3.80	*	4.85	*	7.71	*	8.86	*	8.73	*	1.77	*	2.44	*	6.09	*	1.35	*	*	*	*	*	*	*	*
WAGONER	2.20	0.24	2.88	0.81	3.84	0.27	6.08	1.82	10.51	5.56	6.31	0.89	0.12	-2.71	0.78	-2.25	*	*	2.07	-2.05	1.84	-1.74	3.25	0.81	*	*	
WANN	2.18	*	1.50	*	5.29	*	6.92	*	9.37	*	7.65	*	1.84	*	1.77	*	3.86	*	1.27	*	1.02	*	3.83	*	46.51	*	
WYONONA	3.40	*	0.91	*	4.07	*	8.28	*	7.69	*	9.26	*	2.01	*	0.79	*	7.32	*	1.73	*	0.14	*	4.64	*	50.25	*	

West Central

	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		ANN	
	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP	PCP	DEP
CANTON DAM	1.84	1.22	*	*	4.34	2.26	*	*	1.59	-2.75	6.32	2.50	1.56	-0.79	3.98	1.57	*	*	*	*	1.94	0.16	3.15	2.33	*	*
CLINTON	1.67	0.73	*	*	*	*	*	*	*	*	*	*	1.63	-0.46	2.40	-0.77	2.88	-0.85	1.92	-0.90	1.38	-0.44	2.56	1.57	*	*
COLONY	1.93	*	0.16	*	3.83	*	5.06	*	3.50	*	3.14	*	3.85	*	2.35	*	2.68	*	2.48	*	0.37	*	6.43	*	35.79	*
CORDELL	1.42	0.51	0.08	-1.12	3.49	1.54	4.37	2.34	5.81	1.12	5.14	1.29	0.53	-1.40	1.67	-1.41	0.82	-2.79	1.89	-0.63	1.27	-0.48	1.84	0.94	28.34	-0.09
ELK CITY	1.40	0.71	0.23	-0.97	2.39	0.35	4.06	2.00	3.69	-0.88	*	*	1.60	-0.29	2.49	-0.39	1.23	-2.05	0.80	-1.19	*	*	1.57	0.80	*	*
ERICK	1.72	1.19	*	*	2.58	0.88	3.67	1.63	4.38	0.29	3.49	-0.21	1.34	-0.35	1.94	-0.57	2.02	-1.20	0.32	-1.84	0.00	-1.33	0.66	-0.05	*	*
HAMMON	2.40	1.72	*	*	3.19	1.30	*	*	4.05	-0.19	*	*	*	*	*	*	1.91	-1.18	0.38	-1.60	0.00	-1.62	*	*	*	*
LEEDY	0.63	0.14	2.00	0.98	2.34	0.62	6.07	3.83	4.37	-0.05	2.57	-0.95	0.28	-1.50	0.32	-2.23	2.13	-0.58	0.39	-1.51	0.00	-1.55	1.03	0.39	22.13	-2.41
MACKIE	1.52	*	0.00	*	2.27	*	6.57	*	3.10	*	4.81	*	0.32	*	2.03	*	1.73	*	0.08	*	0.00	*	1.11	*	23.54	*
MORAVIA	0.64	-0.07	0.20	-0.96	2.80	0.99	4.43	2.42	4.50	-0.17	3.59	-0.21	1.90	0.14	2.23	-0.28	1.03	-2.38	0.94	-1.45	0.05	-1.33	1.26	0.44	23.58	-2.86
OKEENE	1.92	1.15	0.55	-0.66	5.04	2.90	*	*	*	*	6.86	2.71	1.24	-1.12	3.28	0.55	1.63	-2.06	2.70	0.25	2.90	0.95	4.14	3.09	*	*
RETROP	0.82	*	0.12	*	3.14	*	5.39	*	4.82	*	3.71	*	1.07	*	1.19	*	0.94	*	1.08	*	0.08	*	1.63	*	23.99	*
SAYRE	1.26	0.79	0.28	-0.54	2.50	0.97	3.13	1.21	4.24	-0.09	3.05	-0.61	1.31	-0.36	1.86	-0.56	2.51	-0.53	0.61	-1.55	0.00	-1.35	0.98	0.39	21.73	-2.23
SWEETWATER	1.06	*	0.17	*	2.00	*	3.85	*	2.56	*	3.50	*	0.05	*	1.72	*	2.00	*	0.00	*	0.00	*	0.98	*	17.90	*
TALOGA	1.46	0.76	0.44	-0.65	3.37	1.46	8.01	5.65	1.95	-2.79	5.42	1.71	1.03	-1.20	2.51	0.08	1.13	-1.84	0.69	-1.31	0.05	-1.75	2.61	1.93	28.69	2.05
THOMAS	2.09	*	0.08	*	3.65	*	5.17	*	4.01	*	5.75	*	2.06	*	3.73	*	1.22	*	1.72	*	1.26	*	2.46	*	33.20	*
VICI	1.99	1.26	1.07	-0.13	3.35	1.12	7.27	4.80	1.62	-2.79	2.67	-0.87	0.88	-1.28	1.40	-0.88	0.96	-1.68	0.34	-1.62	2.10	0.51	0.45	-0.41	24.11	-1.97
WATONGA	2.56	1.61	0.10	-1.16	4.08	1.87	4.36	1.96	2.33	-2.29	3.74	-0.31	1.48	-0.79	1.33	-0.96	1.55	-1.82	2.01	-0.37	1.61	-0.20	4.19	3.13	29.34	0.67
WEATHERFORD	2.04	1.22	0.07	-1.07	3.69	1.78	*	*	*	*	*	*	1.18	-0.92	1.28	-1.56	1.71	-2.03	2.27	-0.42	*	*	2.67	1.78	*	*