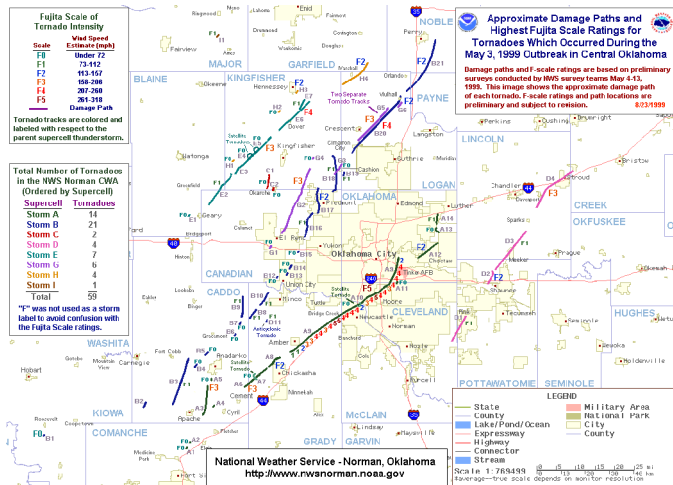


National Climatic Data Center



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Neal Lott, Sam McCown, Tom Ross



US Department of Commerce
 NOAA/ NESDIS
 National Climatic Data Center
 Asheville, NC 28801-5696
 November, 1999
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INTRODUCTION

This report provides climatological summaries and maps for tornadoes in the United States, with specific information concerning tornadoes during 1998-1999. The years 1998 and 1999 were quite active for tornadoes in the U.S., with well-above average numbers of fatalities. It is interesting to note that the winter-spring of 1998 was dominated by El Nino conditions, while the winter-spring of 1999 was dominated by La Nina, thus showing that active tornado seasons may occur in either situation. However, the 1998 season was much more active in the southeast, while 1999 saw a shift of activity farther west—very much as expected. Also, these 2 years produced a total of 3 tornadoes of F5 intensity and 11 tornadoes of F4 intensity, for a total of 14 in the violent F4-F5 category.

1998 STATISTICS

For 1998, NOAA’s Storm Prediction Center reported that 1424 tornadoes occurred for the year across the U.S. This was a new record, resulting in 130 fatalities, the most since 1974. It's important to note that recent years' tornado statistics are more complete, so it's quite possible that the 1424 total has been exceeded at least once during the 1900's. Table 1 is a list of tornadoes which resulted in fatalities during 1998.

Table 1: Fatalities Due to Tornadoes, 1998, Storm Prediction Center

#	DATE	TIME	LOCATION	Deaths	A	B	C	D	WATCH#	F	CIRC
=	=====	=====	=====	=====	=	=	=	=	=====		
1	FEB 22	2155	SOUTH DAYTONA FL	1	1	0	0	0	WT0058	F2	01M
2	FEB 22	2241	WINTER GARDEN FL	3	3	0	0	0	WT0058	F3	03M
3	FEB 22	2310	SANFORD FL	13	13	0	0	0	WT0058	F3	12M 01H
4	FEB 22	2340	KISSIMMEE FL	25	25	0	0	0	WT0058	F3	14M 11V
5	MAR 20	0525	2S MURRAYVILLE GA	12	0	0	0	12		F3	11M 01V
6	MAR 20	1425	STONEVILLE NC	2	2	0	0	0	WT0116	F3	01V 01H
7	MAR 29	1630	COMFREY MN	1	1	0	0	0	WT0132	F4	01H
8	MAR 29	1718	ST PETER MN	1	1	0	0	0	WT0132	F3	01V
9	APR 01	1806	BEAVER DAM VA	2	0	0	2	0		F3	02H
10	APR 08	1852	PLEASANT GROVE AL	32	32	0	0	0	WT0194	F5	29H 03M
11	APR 08	1956	2NNE MOODY AL	2	2	0	0	0	WT0194	F2	02M
12	APR 08	2235	1SE DUNWOODY GA	1	1	0	0	0	WT0192	F2	01H
13	APR 09	0345	3NE PEMBROKE GA	2	2	0	0	0	WT0197	F3	02M
14	APR 09	0435	4 ENE DONALD GA	3	3	0	0	0	WT0197	F2	03M
15	APR 09	0445	FT STEWART GA	1	1	0	0	0	WT0197	F2	01P
16	APR 16	0150	MANILA AR	2	2	0	0	0	WT0222	F4	02M
17	APR 16	0300	RO ELLEN TN	2	2	0	0	0	WT0222	F3	02M
18	APR 16	1430	NASHVILLE TN	1	1	0	0	0	WT0232	F3	01O
19	APR 16	1545	GLASGOW KY	2	2	0	0	0	WT0234	F3	01M 01O
20	APR 16	1553	WISDOM KY	1	1	0	0	0	WT0234	F2	01H
21	APR 16	1615	8SW WAYNESBORO TN	3	3	0	0	0	WT0232	F5	02M 01H
22	APR 16	2220	7W CLEVELAND TN	1	1	0	0	0	WT0239	F1	01H
23	MAY 07	1815	EDGEFIELD SC	1	1	0	0	0	WT0303	F3	01M
24	MAY 10	1525	SUMMERVILLE SC	1	1	0	0	0	WT0327	F2	01M
25	MAY 15	1540	ALBANY MN	1	1	0	0	0	WS0354	F1	01O

26	MAY	30	1926	SPENCER	SD	6	6	0	0	0	WT0468	F4	06P				
27	MAY	31	1850	SALISBURY	PA	1	1	0	0	0	WT0483	F3	01V				
28	JUN	02	2000	LAKE CAREY	PA	2	2	0	0	0	WT0493	F3	02H				
29	JUN	27	1805	SUMMERFIELD	OH	1	0	1	0	0	WS0682	F2	01M				
30	SEP	03	0638	ST HELENA IS	SC	1	0	0	0	1		F2	01M				
31	SEP	10	2240	CUT OFF	LA	1	0	0	0	1		F2	01M				
32	OCT	17	0915	SILVER CITY	TX	1	0	0	0	1		F2	01M				
33	OCT	18	0530	BROOKSHIRE	TX	1	0	0	0	1		F2	01M				
TOTALS:						--	--	-	-	-							
						130	110	2	2	16							
BY STATE:																	
FL	42	AL	34	GA	19	TN	07	SD	06	KY	03	MN	03	PA	03	SC	03
AR	02	NC	02	TX	02	VA	02	LA	01	OH	01						

BY CIRCUMSTANCE: 65M 40H 15V 07P 03O

LEGEND

TIME = The local time that the tornado struck the location.

A = Fatalities occurred in tornado watch area

B = Fatalities occurred in severe thunderstorm watch area

C = Fatalities occurred "close" to the watch (15 minutes or 25 miles) area

D = Fatalities occurred with no watch in effect

WATCH# = The watch number in effect at the time of the tornado, as defined by WS or WT.

WS = Severe thunderstorm watch (followed by watch number)

WT = Tornado watch (followed by watch number)

F = Fujita scale damage rating, if available. If not known, "?" is used. See notes on page 16.

CIRC = Circumstance for fatalities, as defined by letters below. For example, "01M" = 1 fatality in mobile home.

H = House

M = Mobile home

O = Outdoors

P = Permanent structure (school, garage, factory, warehouse, truck stop, etc.)

V = Vehicle (includes parked RVs)

1999 STATISTICS

For 1999, 1343 tornadoes were documented—see Figure 1 for a long-term graph. This ranks as

the second most active year, behind the count of 1424 recorded in 1998. Tornadoes resulted in 94 fatalities during 1999. It's important to note that the tornado observations have generally improved with time as better observing practices and instrumentation (especially weather radar and satellites) were utilized. Therefore, the number of tornadoes reported in earlier years was probably lower than what actually occurred. Table 2 provides details on fatalities due to tornadoes during 1999, while Table 3 provides monthly statistics for 1996-1999.

Figure 1

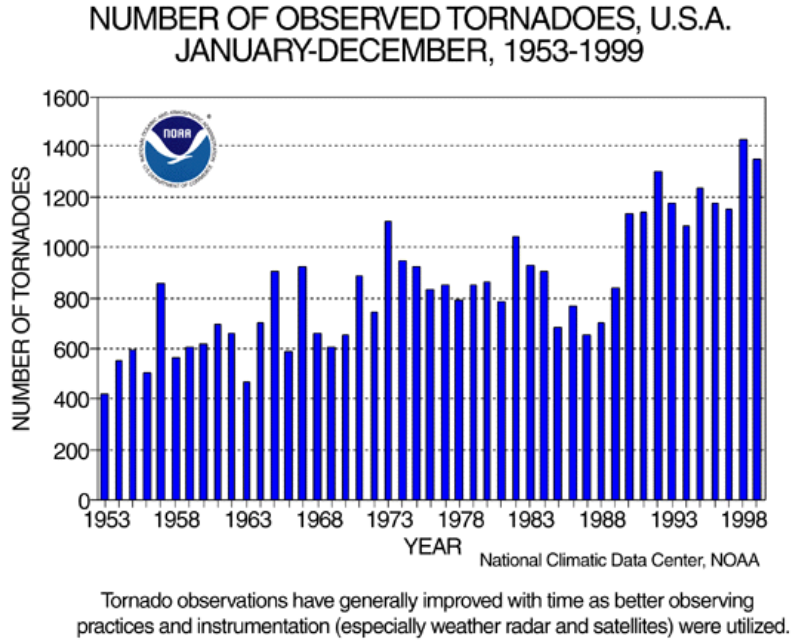


Table 2: Fatalities Due to Tornadoes, 1999, Storm Prediction Center

State	Killer Torns.	Deaths	F Scale	Killer Torns.	Deaths
OK	6	42	F0	0	0
TN	5	12	F1	5	6
AR	4	8	F2	8	9
LA	1	7	F3	9	14
KS	1	6	F4	8	29
OH	1	4	F5	1	36
TX	5	6	F?	0	0
IL	3	3	TOTAL	31	94
IA	1	2			
NC	1	1			
MS	1	1			
UT	1	1			
SD	1	1			
TOTAL	31	94			

Num	Date	Time	Location	Deaths	F	Watch#
January			Killer Tornadoes: 9	Fatalities: 18		
01	Jan 2	12:55 AM	Buna TX	001	F2	WT0003
The tornado rolled a tied-down mobile home at least 5 times. This is where the fatality occurred.						
02	Jan 17	06:25 PM	Bemis TN	006	F4	WT0012
The tornado destroyed over 200 homes.						
03	Jan 17	06:40 PM	Saulsbury TN	001	F1	WT0012
Over 40 homes were damaged or destroyed.						
04	Jan 17	07:05 PM	Atwood TN	001	F1	WT0013
The tornado moved northeast from Atwood.						
05	Jan 21	04:45 PM	Center Hill AR	002	F2	WT0018
06	Jan 21	06:20 PM	Sunnydale AR	001	F2	WT0018
A woman was killed when her mobile home was thrown by the tornado.						
07	Jan 21	06:47 PM	Little Rock AR	003	F3	WT0018
At least 750 structures were damaged by this tornado. People were killed in a grocery store, in a mobile home, and in a car.						
08	Jan 21	07:35 PM	Beebe AR	002	F3	WT0018
An elderly woman and an infant were killed in Beebe.						
09	Jan 22	03:30 AM	7N Camden TN	001	F3	WT0027
This tornado killed a woman when she left her shelter to retrieve her dogs.						
March			Killer Tornadoes: 1	Fatalities: 1		
10	Mar 2	06:55 PM	Holly Springs TX	001	F3	WS0063
A fast moving tornado partially demolished a brick home where a woman was killed.						
April			Killer Tornadoes: 6	Fatalities: 15		
11	Apr 3	04:03 PM	Benton LA	007	F4	WT0112
Over 380 businesses and homes were destroyed by this violent tornado.						
12	Apr 8	07:57 PM	Ashland IL	001	F1	WT0138
13	Apr 8	09:35 PM	3N Cisco IL	001	F1	WT0138
14	Apr 9	04:15 AM	Blue Ash OH	004	F4	WT0141
This early morning tornado killed 2 people in homes and 2 people in vehicles.						
15	Apr 14	10:00 PM	Hebron MS	001	F3	WT0156
This tornado injured 30 and killed a man in a mobile home.						
16	Apr 15	07:15 PM	3E Pembroke NC	001	F2	WT0159

	May		Killer Tornadoes: 10	Fatalities: 53		
17	May 3	05:23 PM	Bridge Creek/Moore OK	036	F5	WT0198
	Large tornado formed near Chickasha OK and tracked nearly 40 miles across the southern suburbs of Oklahoma City.					
18	May 3	07:30 PM	Haysville/Wichita KS	006	F4	WT0200
19	May 3	08:05 PM	Shawnee OK	001	F2	WT0198
20	May 3	08:10 PM	Dover OK	001	F4	WT0198
21	May 3	08:36 PM	Abell OK	001	F4	WT0198
22	May 3	09:20 PM	6S Perry OK	001	F2	WT0198
23	May 4	01:04 PM	6SE Talco TX	001	F3	WT0208
24	May 5	07:20 PM	Linden TN	003	F4	WT0218
25	May 11	05:05 PM	Loyal Valley TX	001	F4	WT0248
26	May 16	03:16 PM	3S Logan IA	002	F3	WT0272
	June		Killer Tornadoes: 3	Fatalities: 4		
27	Jun 1	04:35 PM	4W Hulbert OK	002	F3	WT0352
28	Jun 1	06:00 PM	Raymond IL	001	F3	WT0353
29	Jun 4	06:30 PM	Ogdala SD	001	F2	WT????
	Two tornadoes reported. 30-50 buildings damaged.					
	August		Killer Tornadoes: 1	Fatalities: 1		
30	Aug 11	11:46 AM	Salt Lake City UT	001	F2	
	First tornado fatality in Utah recorded history.					
	December		Killer Tornadoes: 1	Fatalities: 2		
31	Dec 3	09:40 PM	Chico TX	002	F1	WS713

See **Table 1** for legend of letters used above.

Table 3: Monthly Tornado Statistics, 1996-1999, Storm Prediction Center

	Number of Tornadoes						Number of Tornado Deaths			
	1999		1998		1997	1996	1999	1998	1997	1996
	Prelim	Final	Prelim	Final	Final	Final				
JAN	169	212	20	47	50	35	18	-	2	1
FEB	18	22	56	72	23	14	-	42	1	1
MAR	28	56	66	72	102	71	1	16	28	6
APR	152	176	196	182	114	177	15	55	1	12
MAY	325	311	309	312	225	235	54	10	29	1
JUN	275	289	372	376	193	128	4	3	-	-
JUL	82	100	59	80	188	202	-	-	4	1
AUG	86	79	32	61	84	72	1	-	1	-
SEP	42	56	61	104	32	101	-	2	1	-
OCT	5	18	64	86	100	68	-	2	-	-
NOV	10	9	18	26	25	55	-	-	-	2
DEC	13	15	1	6	12	15	2	-	-	1
Total	1205	1343	1254	1424	1148	1173	94	130	67	25

REVIEW OF SEVERAL EVENTS DURING 1998-1999

February 1998

During the late evening of February 22 and early morning of February 23, 1998, a series of tornadoes ripped across central Florida. At least one of the tornadoes reached an estimated F4 intensity. Forty-two fatalities occurred, over 800 residences were destroyed, another 700 were left uninhabitable, over 3500 were damaged to some extent, and 135,000 utility customers lost power at the height of the storms. Damages from the tornado outbreak exceeded \$60 million, and Florida's overall storm damage total for fall 1997 through winter 1998 was approximately \$500 million. Hardest hit locations in the tornado outbreak were Winter Garden, Altamonte Springs, Sanford, and Campbell. Overall, 54 of Florida's 67 counties were declared federal disaster areas due to storms over the fall-winter period. See Figures 6-8 for NEXRAD images of the storm system crossing the state.

April 1998

As the El Nino winter of 1998 continued (with the resulting strong subtropical jet stream across the southern U.S.), another series of tornadoes struck the southeast from April 8 through April 16. An F5 intensity tornado hit Pleasant Grove, AL on April 8, killing 32 people. The same storm system resulted in numerous tornadoes across Alabama and Georgia, resulting in 41 deaths on April 8-9.

Then, on April 16, another outbreak—this time across Arkansas and Tennessee, produced one F4 tornado (Manila, AR) and one F5 (near Waynesboro, TN). Twelve fatalities occurred on this day, bringing the death toll for the month to 55. Storm-related losses across the southeast during

winter-spring 1998 were well over \$1 billion (mainly due to tornadoes, with some damage due to flooding), and the death toll was 132.

January 1999

The weather pattern took on a spring-like flavor during late January 1999 as milder temperatures returned to the lower half of the country. This trend in combination with fast moving storms coming in from the Pacific spawned a record number of January tornadoes. Three significant tornado outbreaks occurred, resulting in 18 deaths. The first outbreak occurred on January 2 in southeast Texas and along the western Gulf coast; the second outbreak occurred on January 17 in Tennessee (including one F4); and the third on January 21-22, again mostly in and near Arkansas and Tennessee. Overall damages for these events exceeded \$1 billion.

Final figures show January 1999 with 212 reported tornadoes - 1325% of the normal for the month, which is 16 based on the 1953-1998 period. This is the highest number of tornadoes ever reported in the month of January; the second highest January total was 52 back in 1975. Systematic recording and reporting of tornadoes by the National Weather Service (NWS) began in 1916. However, it is impractical to make a comparison of recent tornado data with the early historical records due to population growth, increased alertness to and general interest in these storms, and advances in monitoring and observational techniques.

May 1999

Devastating tornadoes hit portions of Oklahoma and Kansas on Monday evening May 3, 1999. The death toll was 50, with 44 storm-related fatalities in Oklahoma and six in the Wichita, KS area. Additionally, the same storm system resulted in one death in Texas and four deaths in Tennessee, bringing its total to 55. The largest tornado (F-5) on the Fujita-Pearson Tornado Scale formed about 30 miles southwest of Oklahoma City and cut a path at least a half-mile wide as it moved north and east across the Oklahoma City area, staying on the ground for 1 hour and 22 minutes. Additionally, this system produced four F4 tornadoes, for an amazing total of five in the F4-F5 range. An estimated 76 tornadoes occurred during the event across the southern plains states. Oklahoma officials estimate that 8093 homes or businesses were damaged or destroyed; while Kansas estimates 1109 homes or businesses were destroyed. A track map (Figure 9), courtesy of the NWS Office in Norman, OK, shows the approximate damage paths and highest Fujita scale ratings for tornadoes occurring in Central Oklahoma on May 3, 1999. Overall damages exceeded \$1 billion.

CLIMATOLOGY

Table 4 shows the locations of tornado-related fatalities during the period 1985-1998. As expected, mobile homes lead the list, followed by permanent homes and vehicles.

Table 5 is a tabulation of F5 tornadoes during the period 1880-1999. It's important to note that the tornado observations have generally improved with time as better observing practices and instrumentation (especially weather radar and satellites) were utilized. Therefore, the number of F5 tornadoes reported in earlier years was probably lower than what actually occurred.

Figures 2-5 show the average number of tornadoes by state for the period 1950-1995, in four presentations. The first shows the average number of strong to violent (F2-F5) tornadoes by state, and the second shows the average number of strong to violent tornadoes per 10,000 square miles by state. The third shows the average for all tornadoes (F0-F5), while the fourth shows the average per 10,000 square miles by state. The maps showing averages per 10,000 square miles are much more representative of our true climatology for tornadoes, since states vary greatly in areal coverage. The map showing averages for strong to violent tornadoes per 10,000 square miles is very representative of risks for fatalities and serious damage, since most damage and fatalities are related to F2 to F5 tornadoes. Figure 10 shows the trend for F3 to F5 tornadoes, with annual totals for 1950 through 1999.

Table 4: Tornado Fatalities by Circumstance, 1985-1998, Storm Prediction Center

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	Total
Mobile Home	28	7	24	21	12	7	20	20	13	26	8	14	30	65	295
Permanent Home	40	3	7	6	8	11	3	18	6	14	15	8	23	40	202
Vehicle	4	3	3	3	16	14	4	-	7	3	4	2	3	15	81
Business	-	-	-	2	4	15	-	-	3	-	-	-	3	7	34
Outside Open	-	-	3	-	-	1	12	1	3	26	3	-	7	3	59
Other/Unknown	22	2	-	-	1	-	-	-	-	-	-	1	1	-	27
School	-	-	-	-	9	5	-	-	1	-	-	-	-	-	15
Long-span Roof	-	-	22	-	-	-	-	-	-	-	-	-	-	-	22
Total	94	15	59	32	50	53	39	39	33	69	30	25	67	130	735

Table 5: Historical F5 Tornadoes

List of U.S. F5 Tornadoes (1880 - 1999)						
	Date	Time (LST)	Location	Deaths	Injuries	Distance (Miles)/ Width (Yards)
1	Apr 24, 1880	1850	IL West Prairie	6	33	13 miles/500 yd
2	Jun 12, 1881	1630	MO Hopkins Area	2	15	30 miles/800 yd
3	Jun 17, 1882	1830	IA Grinnell	65	300	105 miles/800 yd
4	Apr 1, 1884	1700	IN Oakville	8	70	12 miles/600 yd
5	May 22, 1893	1700	WI Willow Springs Township	3	10	20 miles/1200 yd
6	Jul 6, 1893	1635	IA Pomeroy	71	200	40 miles/ 800 yd
7	Sep 21, 1894	1930	IA Kossuth Co. Area	43	200	75 miles/1600 yd
8	May 1, 1895	1630	KS Harvey Co.Area	8	25	22 miles/1200 yd
9	May 15, 1896	1600	TX Sherman	73	200	15 miles/300 yd
10	May 25, 1896	1930	Ortonville - Oakwood Area	47	100	27 miles/800 yd
11	Jun 11, 1899	1700	NE / IA Salix, IA	5	2	13 miles/200 yd
12	May 10, 1905	1800	OK Synder	97	150	40 miles/800 yd
13	Jun 5, 1906	1630	IA / MN / WI Houston Co. (MN) Area	4	18	55 miles/800 yd
14	Apr 23, 1908	1800	NE Cuming - Thurston Cos.	3	10	15 miles/400 yd
15	May 12, 1908	1730	IA Frement - Page Cos.	0	20	20 miles/400 yd
16	Jun 5, 1908	2030	NE Fillmore Co. Area	11	30	35 miles/800 yd

17	Apr 20, 1912	1630	OK Kingfisher Co.	0	6	15 miles/1600 yd
18	Apr 27, 1912	1230	OK Kiowa - Canadian Cos.	15	40	90 miles/800 yd
19	Jun 11, 1915	1930	KS Kiowa Co.	0	0	15 miles/1600 yd
20	May 25, 1917	1400	KS Andale & Sedgwick Areas	23	70	65 miles/1200 yd
21	Jun 5, 1917	1705	KS Topeka Area	9	50	25 miles/600 yd
22	May 21, 1918	1430	IA Crawford -Greene Cos.	6	30	50 miles/800 yd
23	Jun 22, 1919	1600	MN Fergus Falls	59	200	15 miles/400 yd
24	Apr 15, 1921	1410	Harrison Co (TX) - Pike Co (AR) Hempstead Co AR	62	300	105 miles/2000 yd
25	Mar 11, 1923	2000	TN Pinson	20	70	15 miles/400 yd
26	Mar 18, 1925	1301	MO /IL/ IN Reynolds Co (MO)- Gibson CO (IN) Deaths: MO:13 IL:609 IN:76 Murphysboro (IL): 234, W. Frankfort (IL): 148, De Soto (IL): 69 Tri-State Tornado	695	2027	219 miles/1320 yd
27	May 7, 1927	1800	KS Barber Co. - McPherson Co.	10	300	95 miles/1600 yd
28	May 22, 1933	1820	NE Tryon Area	8	10	25 miles/1200 yd
29	Apr 26, 1938	1415	NE Oshkosh Area	3	6	30 miles/1600 yd
30	Apr 14, 1939	2300	OK / KS Woodward Co. (OK) - Barber Co. (KS)	7	19	75 miles/800 yd
31	Jun 18, 1939	1510	MN Hennepin Co. - Anoka Co.	9	222	25 miles/400 yd

32	Mar 16, 1942	1600	IL Peoria Co. - Marshall Co.	7	70	35 miles/400 yd
33	Apr 29, 1942	2230	KS Oberlin Area	15	25	20 miles/300 yd
34	Jun 22, 1944	2030	WI / IL Grant Co. (WI) - Stevenson Co (IL)	9	80	80 miles/400 yd
35	Apr 12, 1945	1740	OK Antlers	69	353	28 miles/800 yd
36	Apr 9, 1947	1742	TX / OK / KS Hemphill Co (TX) - Barber Co (KS) Woodward (OK) Higgins, Glazier (TX)	167	1000	170 miles/2000 yd
37	May 21, 1949	1700	IL / IN Palestine (IL)	4	7	8 miles/50 yd
38	Mar 21, 1952	2145	MS / TN Marshall Co. (MS) - Fayette Co (TN) Byhalia (MS) & Moscow (TN)	17	66	30 miles/400 yd
39	May 11, 1953	1610	TX Waco Downtown Devastated: Bricks 5 feet deep	114	597	23 miles/660 yd
40	May 29, 1953	2000	ND Ft. Rice (Morton Co.)	2	20	20 miles/600 yd
41	Jun 8, 1953	2030	MI Genesee Co. Flint	116	867	20 miles/800 yd
42	Jun 27, 1953	1545	IA Adair Area	1	2	10 miles/200 yd
43	Dec 5, 1953	1735	MS Warren Co. Vicksburg	38	270	7 miles/500 yd
44	May 25, 1955	2126	OK / KS Blackwell (OK) Remarkable electrical activity Glowing Funnel	20	280	23 miles/500 yd

45	May 25, 1955	2215	OK / KS Kay Co. (OK) - Cowley Co. (KS) Udall (KS)	80	270	30 miles/800 yd
46	Apr 3, 1956	1830	MI Allegan Co. - Montcalm Co. Hudsonville (Grand Rapids)	18	340	65 miles/400 yd
47	May 20, 1957	1815	KS / MO Osage Co. (KS) - Jackson Co. (MO) Kansas City Suburbs: Ruskin Heights Deaths: MO: 37, KS: 7	44	531	71 miles/700 yd
48	Jun 20, 1957	1828	ND / MN Fargo (ND) & Moorhead (MN)	10	103	9 miles/400 yd
49	Dec 18, 1957	1635	IL Sunfield (Perry Co.)	1	6	5 miles/200 yd
50	Jun 4, 1958	1730	WI St. Croix Co. - Chippewa Co. Colfax & Menomonie	21	110	32 miles/880 yd
51	May 5, 1960	1700	OK Pottawatomie Co. - Creek Co. Prague & Sapulpa	5	81	85 miles/800 yd
52	May 30, 1961	1700	NE Custer Co. - Valley Co.	0	0	45 miles/400 yd
53	Apr 3, 1964	1435	TX Wichita Falls / Sheppard AFB	7	111	6 miles/500 yd
54	May 5, 1964	1830	NE Clay Co. - Butler Co. Near Bradshaw	4	50	70 miles/800 yd
55	Apr 11, 1965	1910	IN St Joseph Co. - La Grange Co. Dunlap Palm Sunday Outbreak	36	320	35 miles/400 yd
56	Apr 11, 1965	1950	IN Montgomery Co. - Hamilton Co. Lebanon & Sheridan Palm Sunday Outbreak	28	123	45 miles/800 yd

57	May 8, 1965	1730	NE Howard Co. - Boone Co. Primrose	4	53	50 miles/400 yd
58	May 8, 1965	1715	SD Tripp Co. Near Colome	0	1	25 miles/1600 yd
59	Mar 3, 1966	1600	MS Hinds Co. - Leake Co. Jackson Area County Deaths: Hinds: 19, Scott: 26, Rankin: 6, Leake: 6	57	504	80 miles/900 yd
60	Jun 8, 1966	1900	KS Topeka \$470 million damage*	16	406	22 miles/800 yd
61	Oct 14, 1966	1355	IA Belmond Area	6	172	12 miles/1000 yd
62	Apr 23, 1968	1605	KY / OH Greenup Co. (KY) - Gallia Co. (OH) Wheelersburg & Gallipolis (OH)	7	92	38 miles/400 yd
63	May 15, 1968	1510	IA Floyd Co. - Howard Co. Charles City	13	462	65 miles/600 yd
64	May 15, 1968	1557	IA Oelwein & Maynard	5	156	15 miles/500 yd
65	Jun 13, 1968	1850	MN Tracy	9	125	13 miles/150 yd
66	May 11, 1970	2035	TX Lubbock (downtown) \$530 million damage*	26	500	8 miles/1600 yd
67	Feb 21, 1971	1450	LA / MS Madison Parish (LA) - Leflore Co. (MS) Inverness (MS) Mississippi Delta Outbreak	47	510	110 miles/600 yd
68	Apr 27, 1971	2153	KY Gosser Ridge Questionable F5 status	2	72	14 miles/300 yd
69	May 6, 1973	1925	TX McLennon Co. - Bosque Co. Valley Hills	0	0	10 miles/100 yd

Apr 3, 1974		Super Outbreak	Seven F5 Tornadoes			
70	Apr 3, 1974	1420	IN Perry Co. - Scott Co. Martinsburg (Daisy Hill)	6	76	62 miles/1600 yd
71	Apr 3, 1974	1615	IN / KY / OH Ohio Co.(IN) - Boone Co.(KY)- Hamilton Co. (OH) Cincinnati (Saylor Park)	3	210	21 miles/500 yd
72	Apr 3, 1974	1530	OH Xenia \$310 million damage*	34	1150	32 miles/800 yd
73	Apr 3, 1974	1530	KY / IN Breckinridge Co.(KY) - Harrison Co.(IN) Brandenburg, KY	31	270	34 miles/800 yd
74	Apr 3, 1974	1750	AL Lawrence Co. - Madison Co. Nr Hunstville (Mt. Hope, Moulton & Harvest) Cty Deaths: Lawrence: 14, Limestone: 5, Madison: 9	28	267	51 miles/500 yd
75	Apr 3, 1974	1825	AL / TN Lawrence Co.(AL) - Lincoln Co.(TN) Tanner, AL AL; 16 deaths, TN: 6 deaths ½ - 1 mi N of Moulton tornado #74	22	241	50 miles/500 yd
76	Apr 3, 1974	1950	MS / AL Monroe Co.(MS) - Limestone Co.(AL) Guin, AL Aloft over Huntsville Damage path visible by satellite	30	332	102 miles/800 yd
77	Mar 26, 1976	1528	OK Leflore Co. Spiro	2	64	12 miles/300 yd
78	Apr 19, 1976	1730	TX Brownwood Area	0	11	10 miles/300 yd
79	Jun 13, 1976	1410	IA Jordan Area	0	9	20 miles/1000 yd

80	Apr 4, 1977	1640	AL Birmingham 4 miles NW of downtown	22	130	15 miles/550 yd
81	Apr 2, 1982	1550	OK Choctaw Co. - McCurtain Co. Speer	0	29	53 miles/800 yd
82	Jun 7-8, 1984	2341	WI Iowa Co. - Dane Co. Barneveld	9	200	36 miles/450 yd
83	May 31, 1985	1730	OH / PA Portage Co.(OH) - Mercer Co.(PA) Niles & Hubbard (OH) Wheatland (PA)	18	310	47 miles/450 yd
84	Mar 13, 1990	1634	KS Reno Co. - McPherson Co. Burrton & Hesston	1	60	48 miles/1320 yd
85	Mar 13, 1990	1634	KS Harvey Co. - Marion Co. Developed as #84 Dissipated Goessel	1	0	22 miles/1320 yd
86	Aug 28, 1990	1430	IL Kendall Co. - Will Co. Plainfield & Crest Hill \$192 million damage*	29	350	16 miles/600 yd
87	Apr 26, 1991	1655	KS Sedwick Co. - Butler Co. Andover/Wichita (McConnell AFB)	17	225	45 miles/700 yd
88	Jun 16, 1992	1600	MN Chandler	1	3	16 miles/280 yd
89	Jul 18, 1996	1805	WI Oakfield	0	12	13 miles/400 yd
90	May 27, 1997	1440	TX Jarrell Pavement removed from 2 roads	27	12	5 miles/650 yd
91	Apr 8, 1998	1842	AL Tuscaloosa Co. - Jefferson Co. Oak Grove, Pleasant Grove, McDonalds Chapel 3 miles W downtown Birmingham	32	259	24 miles/1320 yd

			TN			
92	Apr 16, 1998	1615	Wayne Co. - Lawrence Co. Grass/Dirt pulled from ground	3	27	46 miles/1760 yd
			OK			
93	May 3, 1999	1717	Grady Co. - Oklahoma Co. Amber, Newcastle, Moore, Oklahoma City Pavement Removed from Roads Estimated 318 mph winds	36	~680	37 miles/1320 yd

NOTES ABOUT TORNADO CLASSIFICATIONS

The Fujita Tornado Scale has been used by meteorologists to classify tornado intensities since it was formulated by Dr. Theodore Fujita in 1971. Because it is a subjective damage assessment tool, there are differences in the intensity classifications for individual tornadoes, depending upon the source used. This list depends upon three sources:

1. "Storm Data" Publication (used as a source after 1982 for this report) and the "U.S. Local Storm Reports" Database, by the National Climatic Data Center;
2. National Weather Service's (NWS) National Severe Storm Forecast Center / Storm Prediction Center WWW page covering tornadoes from 1950 to present;
3. "Violent Tornado Climatology, 1880-1982" by T.P. Grazulis and the U.S. Nuclear Regulatory Commission (NUREG).

Rather than try to reconcile such differences, the above list includes all indicated F5 tornadoes, regardless of the three sources. Differences are noted below.

1. Tornadoes listed as F5 by the NWS, but not by NUREG:
Numbers: 38,40,41,43,44,47,50,62,67, and 75
2. Tornadoes listed as F5 by NUREG, but not by NWS:
Numbers: 52,55,56,57,68

There are at least two other tornado data sources (not necessarily independent of those listed above) which may exhibit additional differences. These are the University of Chicago's Damage Area Per Path Length (DAPPL) database and the Tornado Project.

* Damage estimates are derived from the National Weather Service's (NWS) National Severe Storm Forecast Center / Storm Prediction Center web page entitled "The 10 Costliest U.S. Tornadoes." Property damage has been adjusted to 1995 dollars. As with all statistics given on this page, the values are for single tornado events. Only four of the top ten costliest tornadoes were of F5 category; five of the remaining six were F4, and one was F2.

Reference:

1984: Grazulis. T.P., "Violent Tornado Climatology, 1880-1982," NUREG/CR-3670, PNL-5006 RB, U.S. Nuclear Regulatory Commission, Washington D.C., 184 pp.

ACKNOWLEDGMENTS

Much of the statistical information in this report was collected and provided by NOAA's Storm Prediction Center in Norman, OK. Also, we obtained information from the National Weather Service (especially the Norman, OK office) and the Federal Emergency Management Agency. We gratefully acknowledge their contributions. For additional information and data, contact the National Climatic Data Center -- <http://www.ncdc.noaa.gov>, info@ncdc.noaa.gov, 828-271-4800.

Figure 2

Annual Average Number of Strong-Violent (F2-F5) Tornadoes, 1950-1995

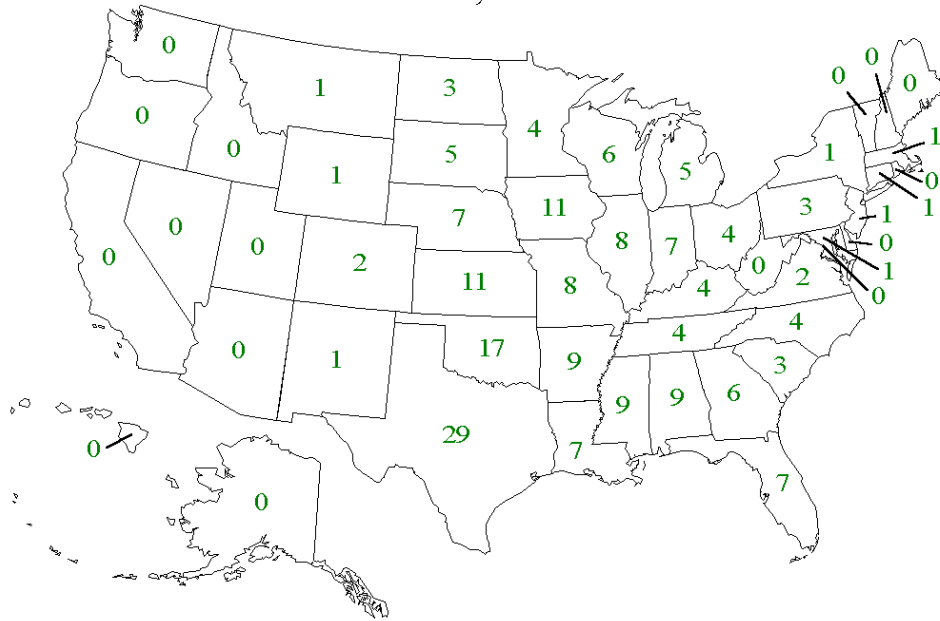


Figure 3

Average Annual Number of Strong-Violent (F2-F5) Tornadoes per 10,000 Square Miles by State, 1950-1995

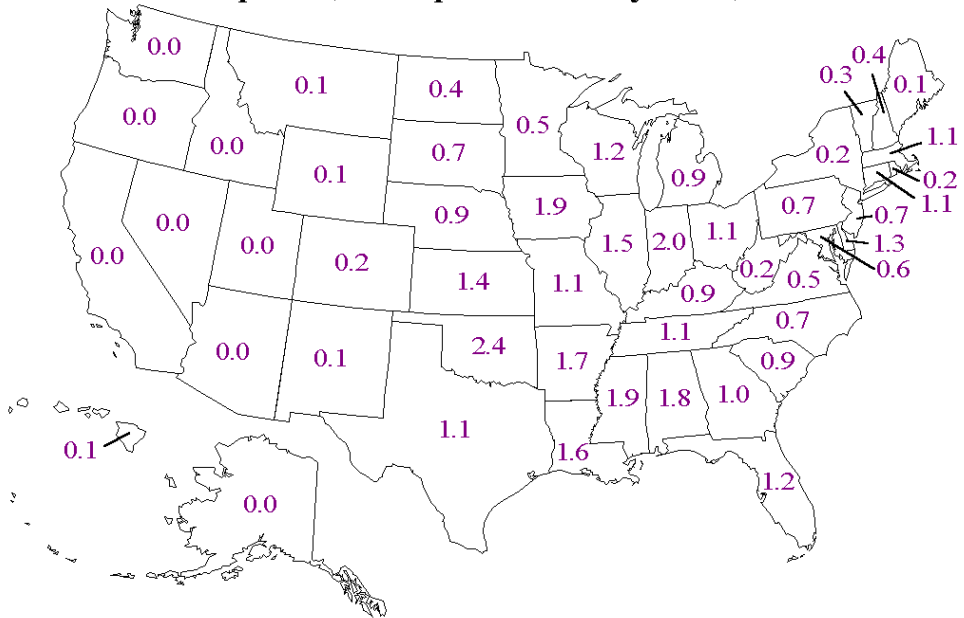


Figure 4

Annual Average Number of Tornadoes, 1950-1995

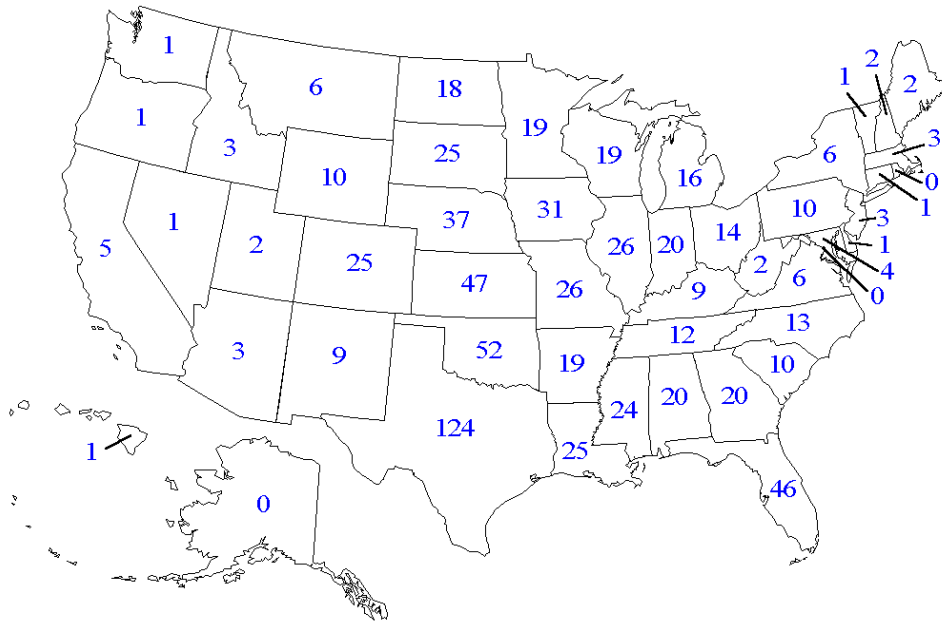
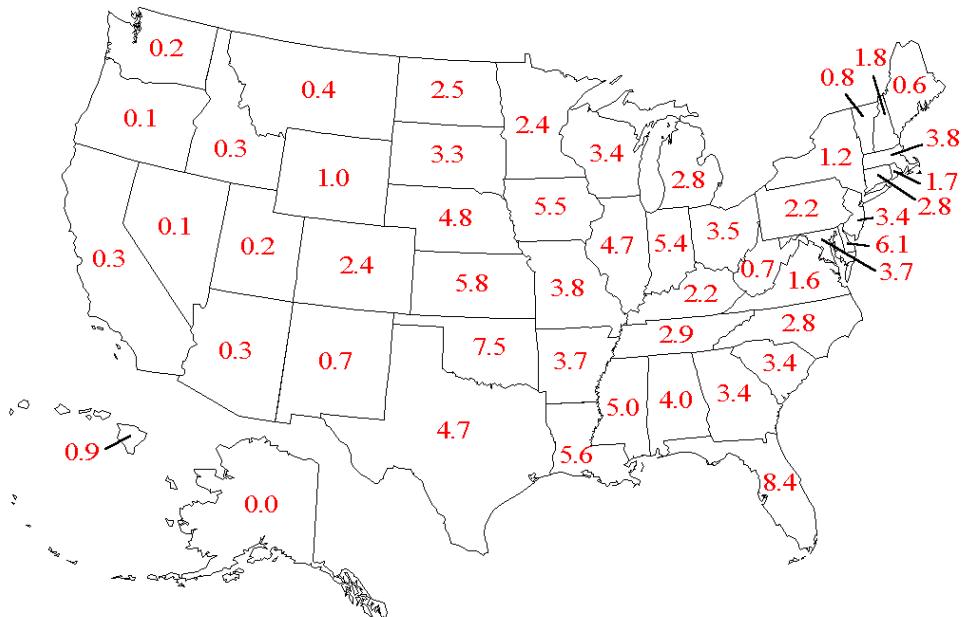


Figure 5

Annual Average Number of Tornadoes per 10,000 Square Miles by State, 1950-1995



Figures
6-8

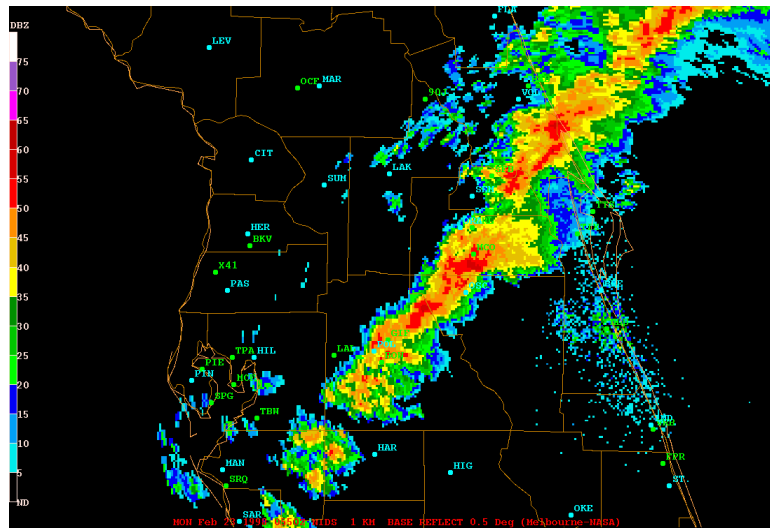
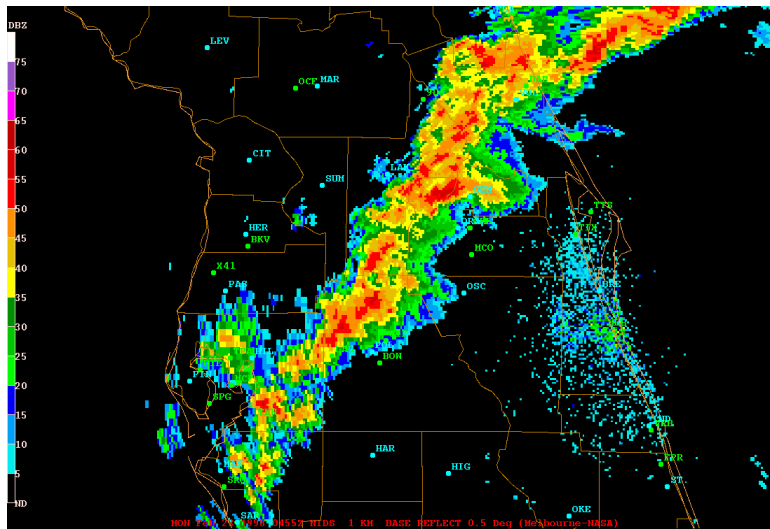
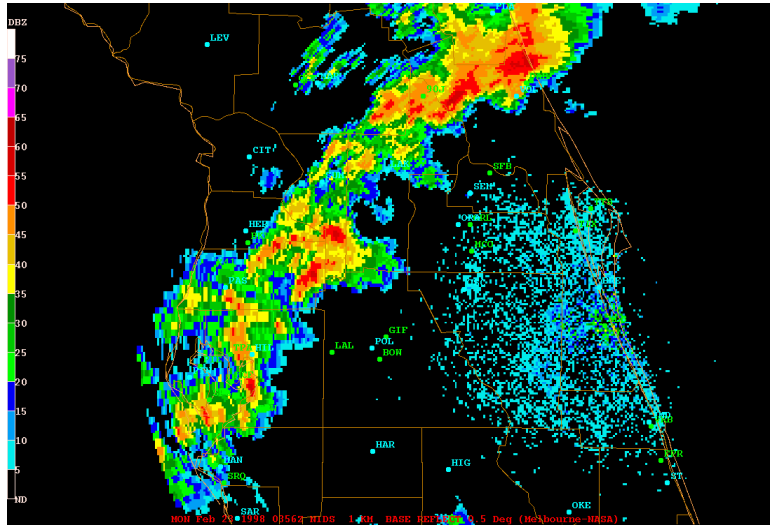


Figure 9

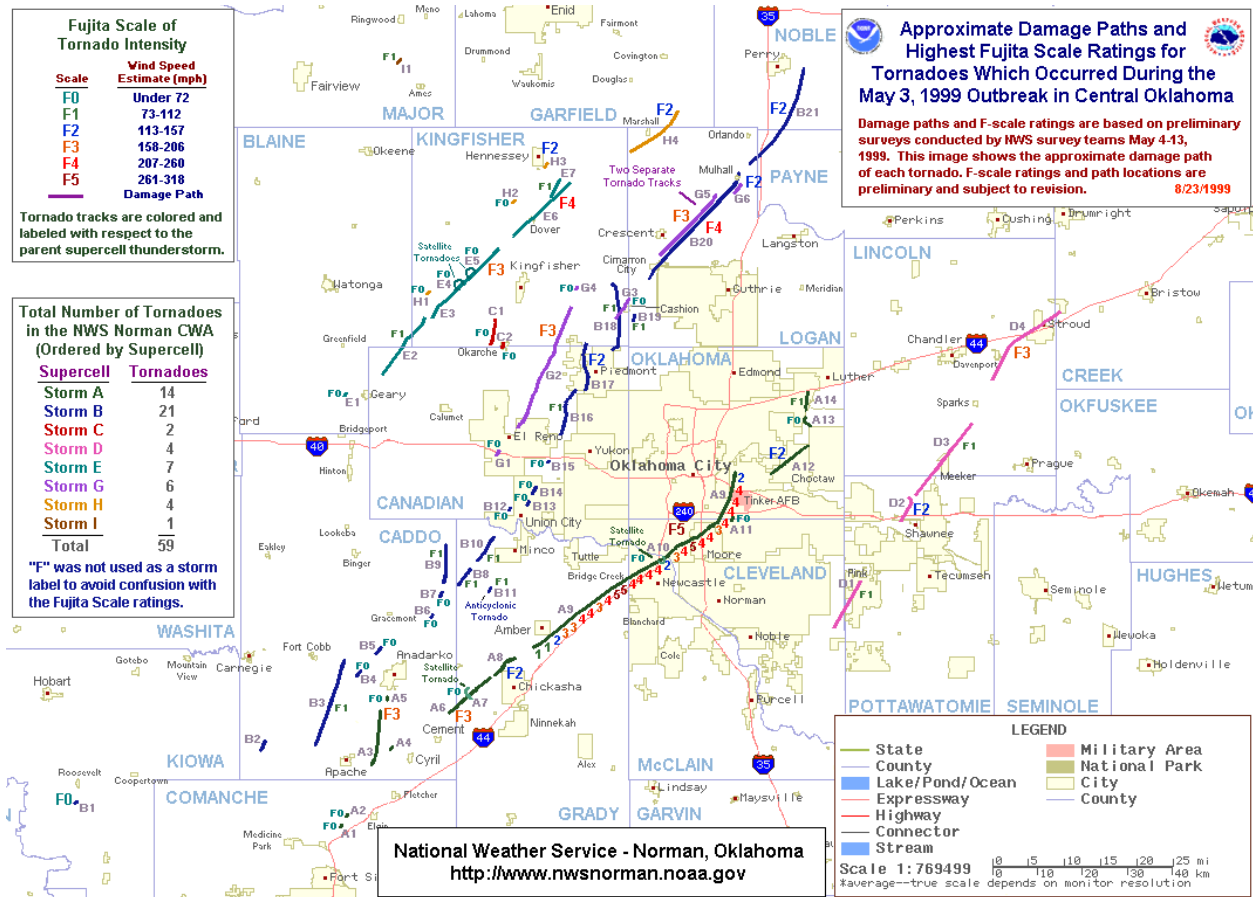
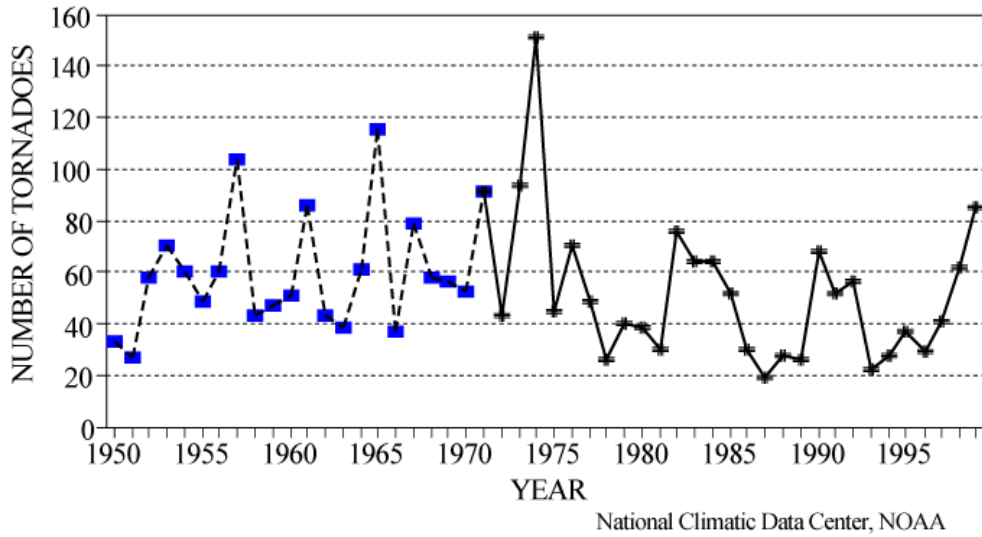


Figure 10

U.S.A. ANNUAL TORNADO COUNT, 1950-1999 VERY STRONG THROUGH VIOLENT TORNADOES



Annual total number of very strong through violent (F3-F5) tornadoes, which are defined as having estimated wind speeds from 158 to 318 mph. The Fujita tornado classification scale was implemented in 1971. Prior to 1971, these data are based on storm damage reports.