



Iowa Tornado Climatology 1980-2013



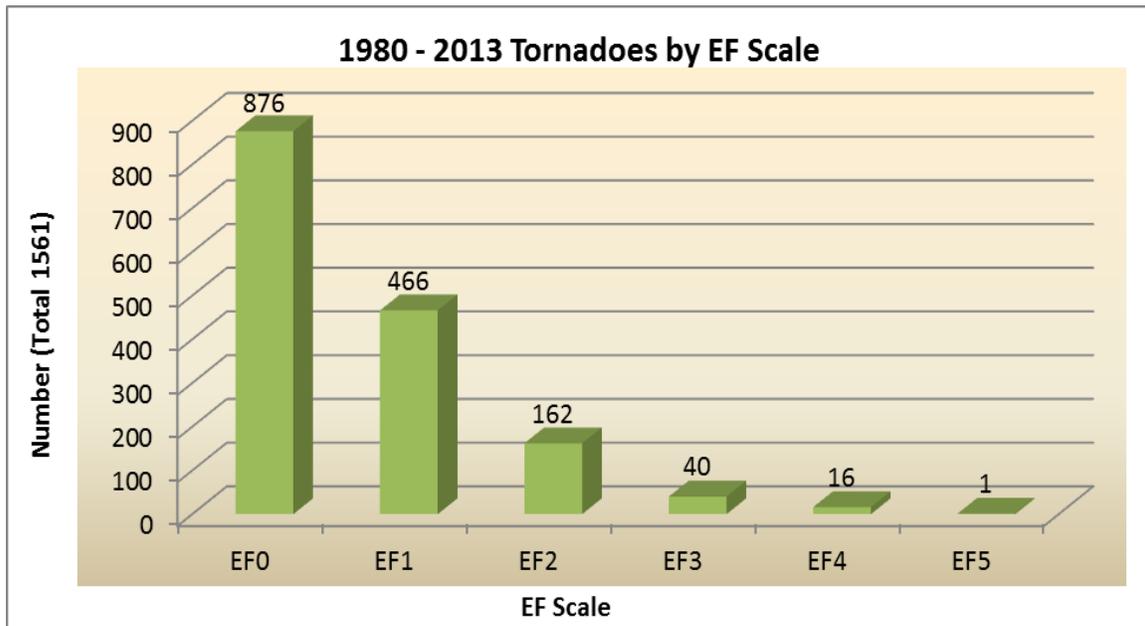
EF-5 Tornado near New Hartford, Iowa 5/25/2008
Courtesy of Rod Donavon

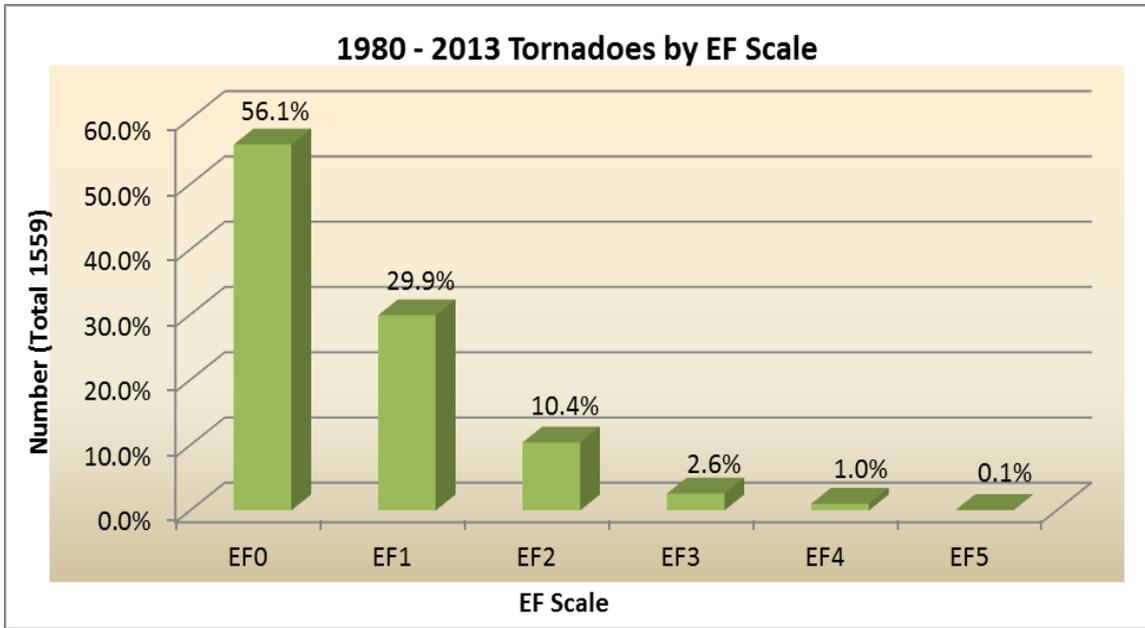
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The following data contains tornado information for the state of Iowa from 1980 through 2013. The information provided was derived from National Weather Service Storm Data reports archived at the National Climatic Data Center. The cutoff at 1980 was chosen for two particular reasons: First, reporting of tornadoes was much more sporadic prior to this time with numbers skewed heavily toward higher end events. These events tended to cause more damage, therefore attracting the attention of local authorities if not the general media as well. As a result, there was also a better chance for the stronger tornadoes to be reported to the local National Weather Service office for inclusion into Storm Data. Weak tornadoes, on the other hand, may have been observed, but due to the lack of damage and/or poor communications, the report never made it beyond the local coffee shop. Secondly, tornadoes are rated on the EF-scale (Enhanced Fujita scale) via a damage assessment. Prior to 1980, much of the assessment was done via newspaper articles and pictures often several years and in some instances, decades after the event. Although much information can be gleaned from these articles and pictures, a good F-scale assessment should be done as quickly as possible after the event and if possible, at the location of the event. This is not an attempt to minimize events prior to 1980, since many significant events occurred prior to this time (e.g. Jordon Tornado, Charles City Tornado, etc...). However, from a climatological perspective, it was felt that the better assessment and reporting procedures of the last 30 years would be used to build the database.

Totals Data

The total number of tornadoes for the 34 year period in Iowa was 1561. The first two charts below give an EF-scale breakdown of these tornadoes and their respective percentages.





What is obvious from the above charts is that a very large majority (86%) of the tornadoes are on the low end of the scale (EF0, EF1). The remaining 14 percent of tornadoes were rated EF2 through EF5. On May 25, 2008, the first EF5 occurred in Iowa since the Jordan tornado, which occurred in Boone and Story counties on June 13th, 1976.

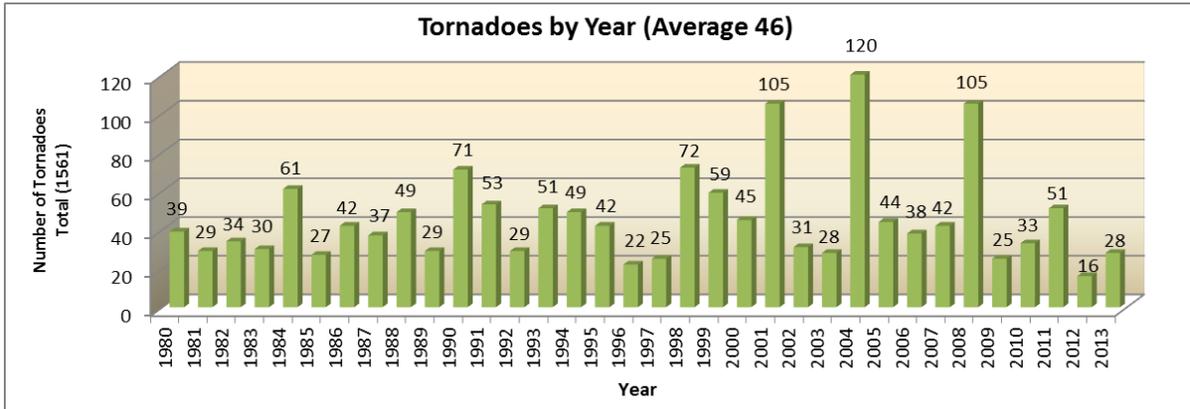
There was a transition in between the older F-scale (Fujita) and newer EF-scale (Enhanced Fujita) on Jan 31, 2007. The comparison between the scales is given below.

FUJITA SCALE		OPERATIONAL EF SCALE	
F Number	Fastest 1/4-mile (mph)	EF Number	3 Second Gust (mph)
0	40-72	0	65-85
1	73-112	1	86-110
2	113-157	2	111-135
3	158-207	3	136-165
4	208-260	4	166-200
5	261-318	5	Over 200

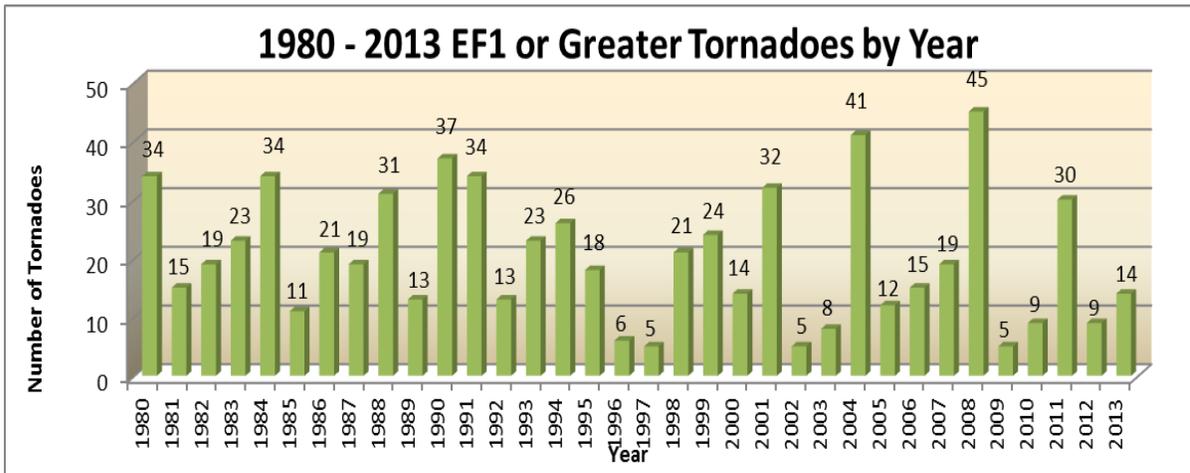
The Enhanced F-scale is still a set of wind estimates (not measurements) based on damage. It uses three-second gusts estimated at the point of damage based on a judgment of up to 10 levels of damage to the 28 indicators. These estimates vary with height and exposure.

Yearly Data

Next we will look at the number of tornadoes by year. Since 1980, there have been on average, 46 tornadoes per year in Iowa. However, the variation from year to year can be great as evident between the years of 2008 and 2009 that had 105 and 25 tornadoes respectively.



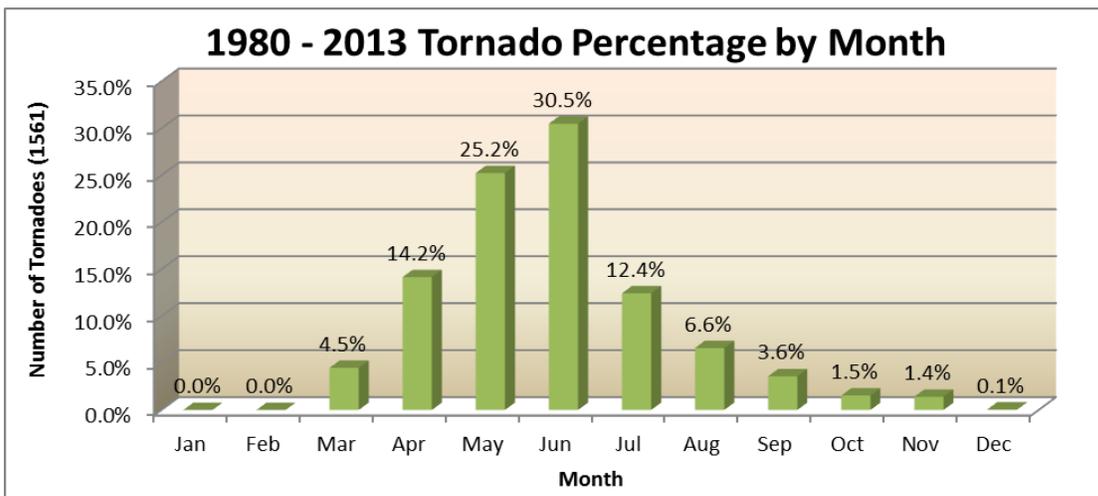
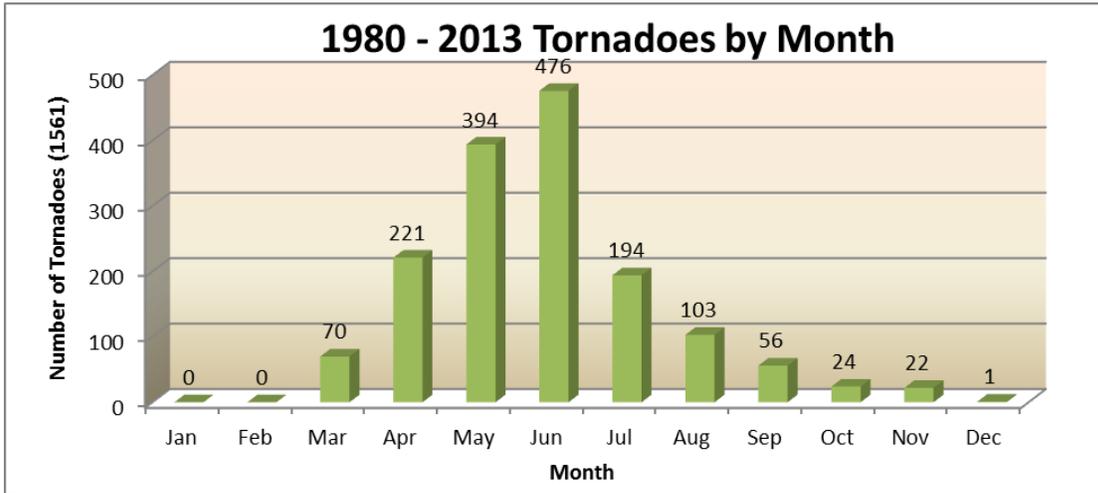
Of note on the above graph, Iowa has broken the yearly record for the number of tornadoes in 1998, 2001 and again in 2004. However, when taking out the EF0's from the data and plotting the number of tornadoes (graph below), we see that the number of EF1's to EF5's have been relatively flat over the last 30 years. It becomes obvious that most of the increase in tornado numbers over the period have come from the better reporting of EF0 tornadoes.



Monthly Data

Breaking the data down into monthly periods (graphs below), we see that May and June lead the way in the number of tornadoes. These two months have prime conditions for tornadoes including warm temperatures, ample moisture, and relatively strong winds at different levels in the atmosphere. However, it should be noted that tornadoes do occur

in every month of the year in Iowa. The data here only reflects tornadoes since 1980 with tornadoes having occurred in January and February in previous years.

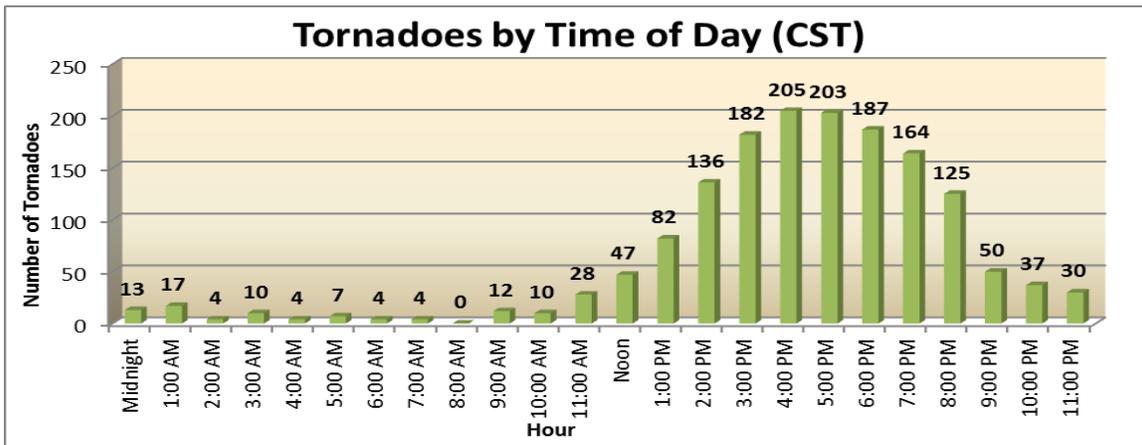


The rankings below provide the most tornadoes recorded in a one month period. May and June are heavily represented with a smattering of other months.

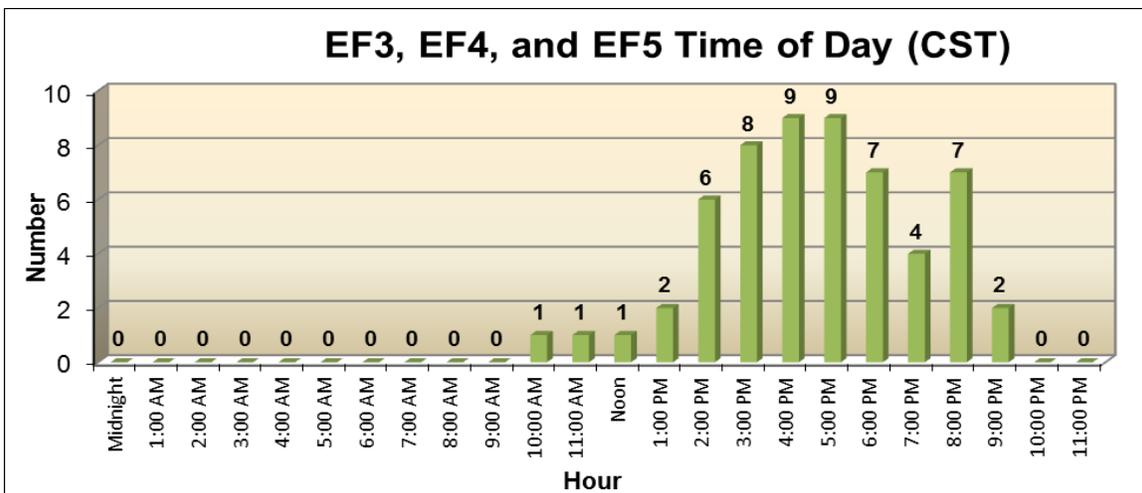
Rank	Date	Tornadoes	Rank	Date	Tornadoes
1.	May 2004	57	11.	May 1988	25
2.	June 1984	48		June 1998	25
	June 2008	48		May 2008	25
4.	April 2001	40	14.	May 2000	24
5.	June 1990	36	15.	April 2006	23
6.	May 1998	34	16.	May 1995	22
	June 2001	34	17.	June 1994	20
8.	June 2004	28		April 2011	20
9.	June 2010	27	19.	July 1994	19
10.	June 1993	26		April 1999	19
				June 1999	19

Daily Data

As with certain months being more favorable than others for tornadoes, the same applies to the time of day. From the chart below, it is easy to see that from mid afternoon until around sunset, there is a peak in activity. Tornadoes need plenty of energy in the atmosphere to develop and maintain their structure. The sun warms up the atmosphere and the peak temperatures of the day often occur by mid afternoon. This warmth, combined with moisture in the atmosphere provides much of the energy needed to produce tornadoes (although other factors are also necessary). They are able to feed off this energy fairly efficiently until sunset when the surface temperatures begin to cool more quickly. The cooling decreases the energy in the lower atmosphere and therefore tornadoes have a more difficult time developing, especially for much of the AM hours. However, note that this is not always the case as tornadoes can occur at any time during the day or night given the right conditions. The time of day given to a tornado is the time the tornado first “touched” the ground even if the tornado crossed over into a subsequent hour. In addition, a given time such as 5:00 PM includes all times between 5:00-5:59 PM.



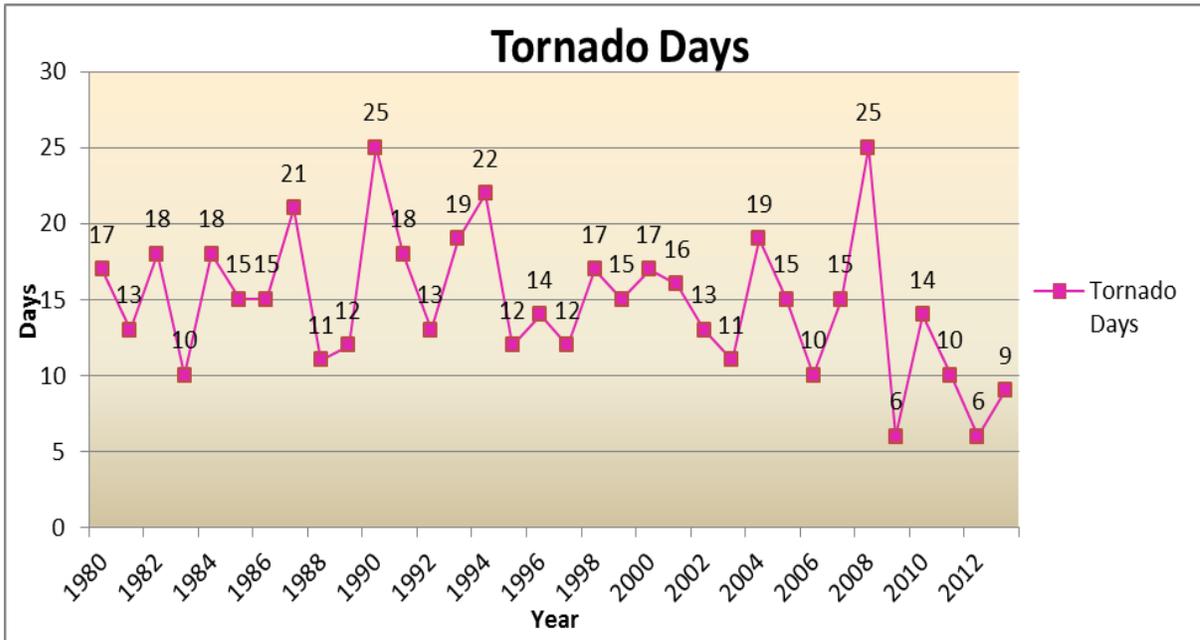
Notice that the more intense tornadoes (below chart), occur primarily with the heat of the day. None have occurred in the 12 hour period from 10 PM to 9 AM CST.



The following list provides the most tornadoes on an individual day. Again May and June have the most but some big events have also occurred in April. The October 4th event of this year made the list and is tied at #20 with three other days.

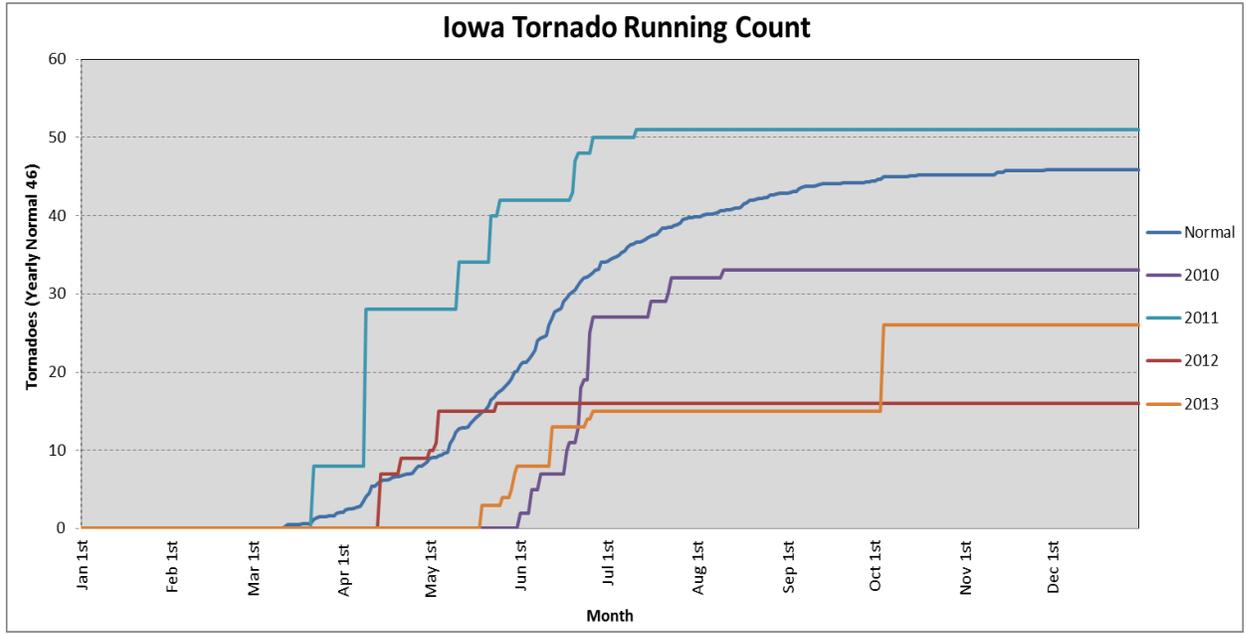
Rank	Date	Tornadoes	Rank	Date	Tornadoes
1.	April 11, 2001	28	12.	May 15, 1998	13
2.	June 11, 2004	24		May 16, 1999	13
3.	May 8, 1988	22	14.	March 22, 1991	12
4.	June 7, 1984	21		June 29, 1993	12
5.	May 22, 2004	20		May 9, 1995	12
	April 9, 2011	20		May 10, 2001	12
7.	June 1, 2001	18		Nov. 12, 2005	12
8.	April 8, 1999	16		April 13, 2006	12
	May 21, 2004	16	20.	June 16, 1990	11
	June 11, 2008	16		September 5, 2004	11
11.	March 13, 1990	14		April 10, 2008	11
				October 4, 2013	11

The number of days with tornadoes is shown below with an annual average of 15 days. This value has been fairly constant through the years, however since 2008; the annual number has been below normal in every year with the record minimum of 6 tornado days occurring twice during this time in 2009 and again in 2012.

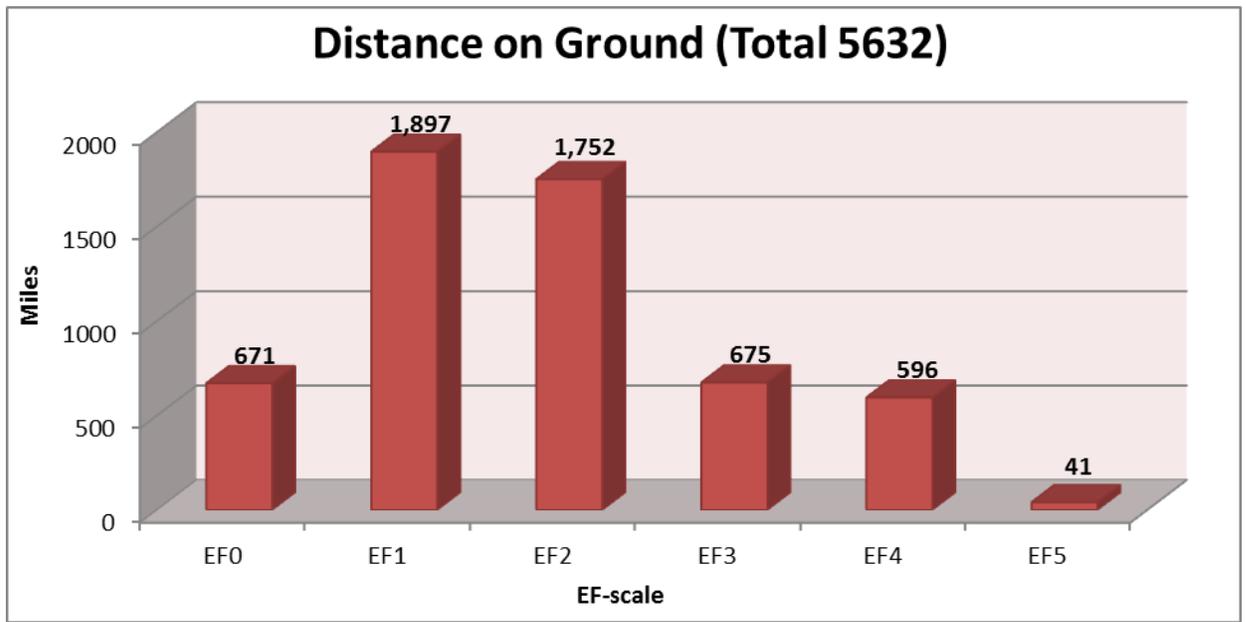


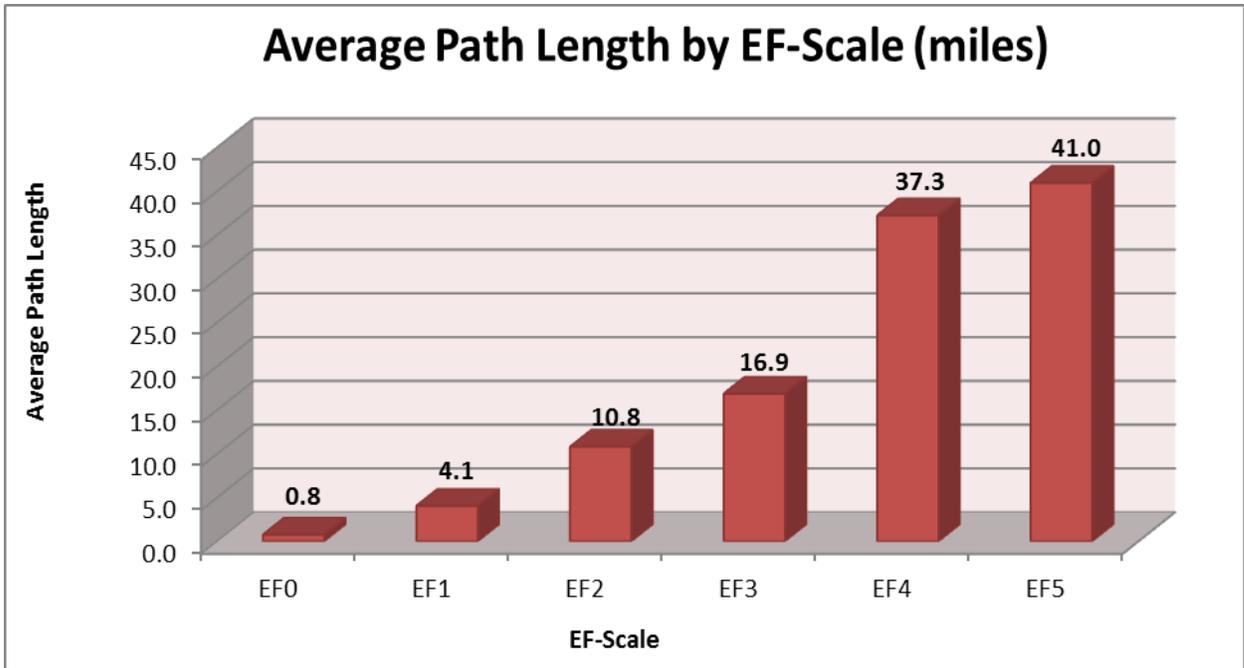
The running total for tornadoes in the past few years is provided below along with the average running total for all years. Out of the past 4 years, only 2011 had above normal

tornado numbers. All of the years have had a quiet late summer through fall time frame except for the October 4th event of 2013.



The first of the final two charts provides the distance on the ground travelled by all tornadoes in each of the EF-scale categories. The last chart is the average path length for each EF-scale category.





Injuries and Deaths

Since 1980, there have been 769 injuries and 27 deaths attributable to tornadoes. The following is a breakdown of each by year. This year was a bit unusual in that there were no injuries but one death reported. All other years that have had deaths have also had injuries as well. The death occurred on June 24th near Muscatine.

Year	Injuries	Deaths	Year	Injuries	Deaths	Year	Injuries	Deaths
1980	8	0	1995	3	0	2010	14	0
1981	12	0	1996	2	0	2011	16	0
1982	1	0	1997	0	0	2012	6	0
1983	35	0	1998	133	0	2013	0	1
1984	100	3	1999	28	2			
1985	30	2	2000	26	1			
1986	8	1	2001	12	2			
1987	0	0	2002	0	0			
1988	92	0	2003	0	0			
1989	9	0	2004	15	0			
1990	16	0	2005	14	1			
1991	4	0	2006	32	1			
1992	3	0	2007	7	0			
1993	9	0	2008	133	13			
1994	1	0	2009	0	0			

Iowa Tornado Statistics

1980 – 2013

Compiled by: Craig Cogil

Total Number of Tornadoes:	1561	
Average Tornadoes in a year:	46	
Most Tornadoes in a day:	28	April 11, 2001
Most Tornadoes in a month:	57	May 2004
Most Tornadoes in a year:	120	2004
Least Tornadoes in a year:	16	2012
Number of Injuries:	769	
Most Injuries in a Year:	133	1998 and 2008
Number of Deaths:	27	
Most Deaths Individual Tornado:	9	May 25, 2008
Most Deaths in a Year:	13	2008
Path Length of All Tornadoes:	5630 miles	
Average Path Length:	3.6 miles	
Longest Path Length Individual Tornado:	124 miles	June 7, 1984
Average Width:	67 Yards	
Largest Width Individual Tornado:	2640 Yards	April 9, 2011
Peak Hour Tornado Occurrence:	4PM - 5PM CST	
Peak Month Tornado Occurrence:	June	
Number of Tornado Days per Year:	15	
Most Tornado Days in One Year:	25	1990 and 2008
Least Tornado Days in One Year:	6	2009 and 2012

Contact Information

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