

Iowa State Fair Weather History

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The Iowa State Fair hosts one of the largest open venues in the state of Iowa where people gather to celebrate on a yearly basis. Ample outdoor activities expose people to the variations of weather that Iowa receives and with fair attendance around one million on an annual basis, weather will continue to play a major role in the visitors experience during the fair.

The history of the fair is well known and extends over the past 160 years, primarily in Des Moines. However, prior to 1880, other locations across the state, mainly in eastern Iowa, provided a home to the fair. Lack of complete records for these sites provides obstacles when trying to develop a climatology for the fair. Des Moines, on the other hand, has nearly complete weather records dating back to 1878 and therefore provides the necessary data to produce a climatology for the fair. The data prior to 1940 came from a location in downtown Des Moines near the U.S. Courthouse. After that period and until the present, data has been obtained from the Des Moines International Airport. While temperature differences between these locations and the fairgrounds will generally be minimal, precipitation can vary widely over short distances. Therefore, values presented may not be truly representative of what occurred at the fairgrounds and may at times have differed significantly. One final note, the fair was not held in 1898 or from 1942 to 1945 during World War II.

Not just your average fair

Diving into averages for the fair is somewhat difficult since fairs were not held during a specific time frame. At the beginning of the period, mainly prior to 1900, the fair was held mostly in September. Over the past 125 years, the dates of the fair have pushed earlier in the year and now lie around the middle of August. This shifting of over 3 weeks certainly has some affect on temperatures experienced during the fair. This is due to the fact that Normals in early September are around 5 degrees cooler than the middle of August. This definitely accounts for some of the trends which are observed in this paper, however no attempt was made to normalize data to account for this change in time.

30 year averages

Earliest 30-year average (1880-1910)*

*-Does not include 1898 since no Fair was held

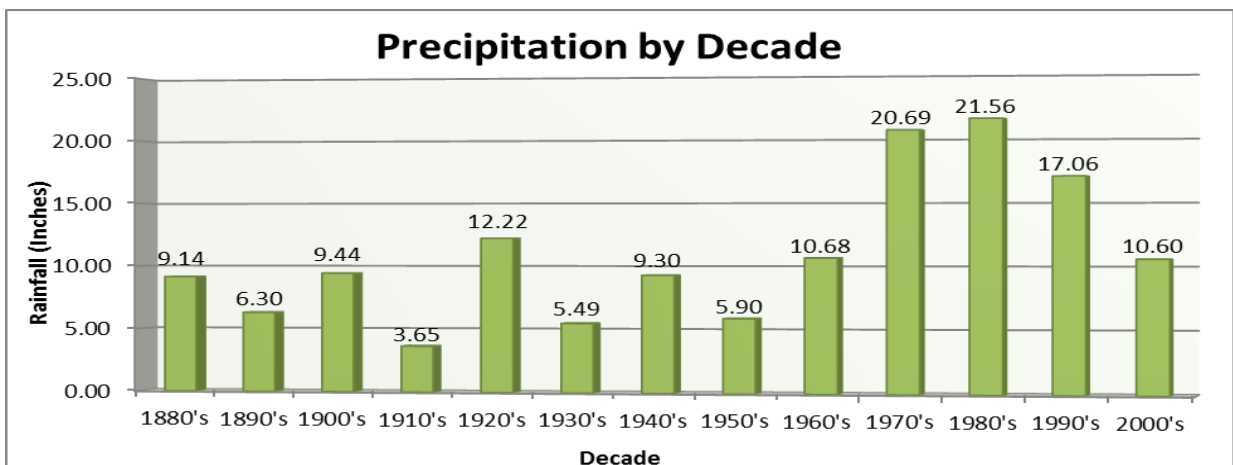
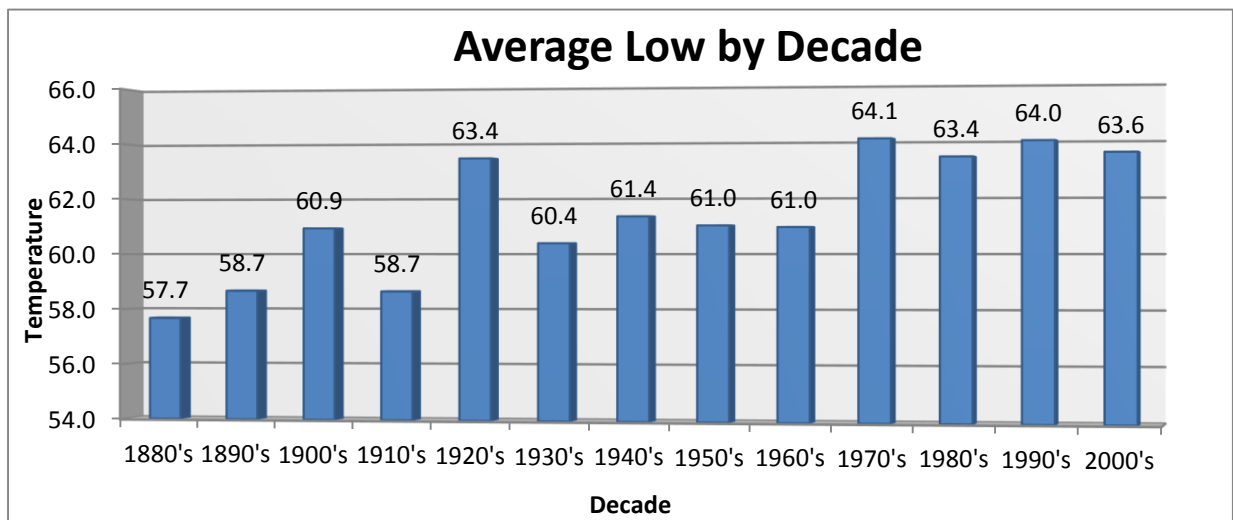
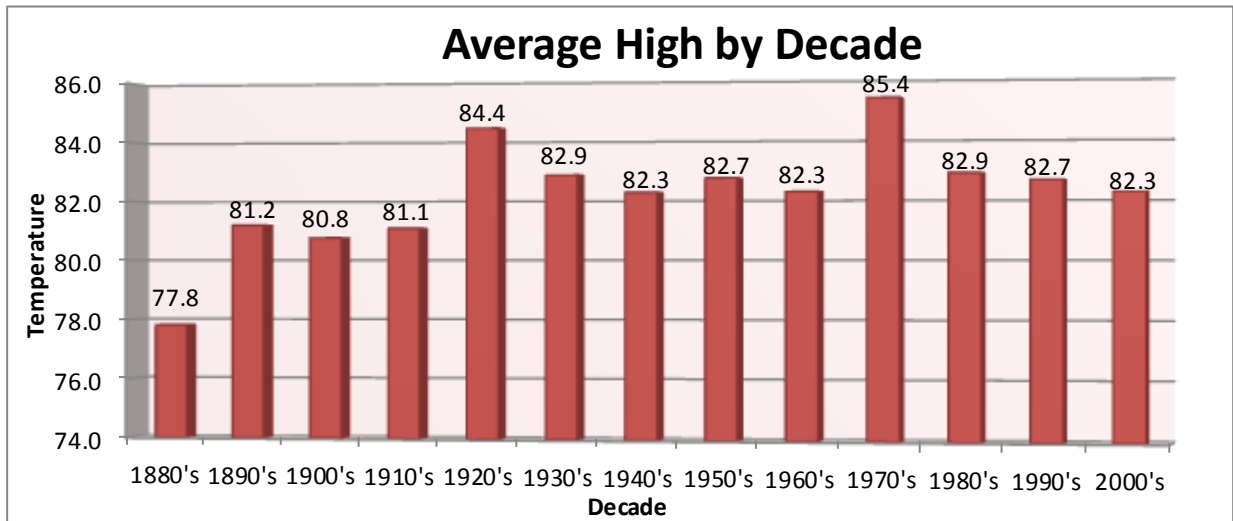
The average high was 79.7 F
The average low was 59.0 F
The average rainfall was 0.90"

Most recent 30-year average (1981-2010)

The average high was 82.7 F
The average low was 63.8 F
The average rainfall was 1.57"

It can easily be seen that the shift in time during which the fair took place has certainly had an effect on the averages experienced during the fair. High temperatures are three degrees warmer in recent years with lows a nearly five degrees warmer. In addition, recent fairs have observed an increase in rainfall which can also be partly explained by the earlier fair dates in August when heavier rainfall is more common.

The following charts give an idea how temperatures and precipitation have varied from decade to decade.



The 1880's were by far the coolest with all fair dates in September. The gradual shift to earlier dates becomes obvious in the subsequent decades as both highs and lows warm through the 1920's. Temperatures have generally leveled off since the peak in the 1920's except for the 1970's. Precipitation was relatively stable through most of the first 90 years of the record period. But in the 1970's, precipitation picked up dramatically with average rainfall doubling the prior trend. This higher rainfall continued into the 1980 with a gradual decrease in the 1990's and 2000's.

A look back at the 2014 fair

The 2014 fair continued the trend of 2012 and 2013 with cooler than normal temperatures. High temperatures were particularly cool with readings averaging nearly 3 degrees below normal. The highest temperature during the fair was 85 degrees which occurred on August 14th and 17th. 2004 was the last time the highest temperature during the fair was 85 or less. The coolest overnight low was 57 degrees on the 13th. Measurable rainfall occurred on three days, the 7th, 15th and 16th but overall rainfall remained below normal for the fair. For the 3rd year in a row, the weather was historically favorable with relatively pleasant temperatures and limited rainfall.

Dates	High	Low	Average Temp	Rainfall
August 7 th	71	68	70	0.03
August 8 th	80	66	73	Trace
August 9 th	80	68	74	Trace
August 10 th	79	67	73	Trace
August 11 th	81	64	73	0.00
August 12 th	80	58	69	0.00
August 13 th	84	57	71	0.00
August 14 th	85	63	74	Trace
August 15 th	73	68	71	0.32
August 16 th	79	68	74	0.10
August 17 th	85	64	75	0.00
Averages for 2013	79.7 F	64.6 F	72.2 F	0.45"
30-year average	82.7 F	63.8 F	73.3 F	1.57"
2012 Departure	-3.0 F	0.8 F	-1.1 F	-1.12"

How hot does the fair actually get?

Any topic involving the weather and the state fair would not be complete without a discussion of how hot it gets. The fair is generally held about two to three weeks after the average peak temperatures of the year. Average high temperatures during this time are generally in the mid 80s, however, any individual fair may see significant departures from these averages. Let's take a look at some of the numbers behind the heat.

Top 10 Highest Daily Temperatures (F)

1.	108	August 16 th , 1983
2.	104	August 18 th , 1983
3.	103	August 17 th , 1983
4.	101	August 10 th , 1983 August 19 th , 1983
6.	100	August 20 th , 1983
7.	99	August 23 rd , 1975 August 27 th , 1955 August 24 th , 1947
10.	98	August 15 th , 1983 August 22 nd , 1947 September 3 rd , 1937 September 4 th , 1925

Top 10 Warmest Fairs (By average temperature)

1.	84.4	1983
2.	80.9	1937
3.	80.4	1975
4.	80.0	1995
5.	79.6	2007
6.	79.4	1947
7.	79.0	1925 1921
9.	78.8	1948
10.	78.0	1998 1960

1983 easily goes down as the warmest fair on record. Only six days of the Iowa State Fair have seen 100 degree weather and all of them occurred in 1983. The remainder of the hottest days was spread out amongst a handful of dates from the mid 1920s to mid 1950s with August 23, 1975 the only outlier. The warmest fairs were spread out across the last century relatively evenly with 5 in the first half of the century and 5 in the last half. The decades of the 20's, 40's and 90's each had two of the warmest fairs with a smattering of other decades coming in with one a piece.

Top 10 Warmest Nightly Temperatures (F)

1.	80	August 17th, 1983
2.	79	August 13th, 1995
3.	77	August 12th, 2010 August 18th, 1983 August 23rd, 1975
	76	August 19th, 2007 August 18th, 1995 August 16th, 1983 August 19th, 1983 August 24th, 1978 August 21st, 1975 August 22nd, 1975 August 30th, 1951 August 30th, 1932 August 21st, 1924

The warmest nights have primarily occurred within the past quarter of a century. Eleven of the fourteen temperatures listed have occurred during this time with 1975, 1983 and 1995 well represented.

Other Heat related items:

Highest Average Daily Temperature: 92 degrees on August 16th and 17th of 1983

Highest Average Daily Highs for an entire fair: 96.8 degrees in 1983

Highest Average Daily Lows for an entire fair: 71.9 in 1983

Average number of days per fair which reach or exceed 90 degrees: 2

Fairs with the most days at or above 90 degrees: 1983 and 1937 both had 9 days which reached or exceeded 90. Finally, there have been 40 fairs since 1880 that have failed to reach 90 degrees, or about one fair in three.

The fair can be cool too!

Although heat seems to be the major consideration during fair time, this is not always the case. As was seen in 2004, there were several fairs where temperatures were relatively cool. This was especially the case during the early years of the fair when the event often took place in the early part of September. Here are some of the numbers when temperatures were not as hot.

Top 10 Coolest Daytime Highs (F)

1.	57	September 7th, 1885
2.	58	August 18th, 1963 September 8th, 1885
4.	60	September 9th, 1885
5.	61	August 25th, 1987 August 29th, 1935 August 29th, 1915 September 2nd, 1909
9.	62	August 26th, 1987 September 7th, 1881

Top 10 Coolest Fair (By average temperature)

1.	57.1	1885
2.	59.3	1880
3.	61.6	1915 1891
5.	62.5	1896
6.	63.7	1946
7.	65.3	2004
8.	65.5	1987
9.	65.6	1888
10.	65.7	1910

Top 10 Coolest Nights (F)

1.	38	September 1st, 1949
2.	40	September 4th, 1891
3.	42	September 2nd, 1893 September 3rd, 1891
5.	43	September 7th, 1953 August 29th, 1946 August 30th, 1915 September 9th, 1880
9.	44	August 24th, 1934 August 25th, 1934 September 5th, 1889

As noted above, almost all years which made the list in these three categories were in years which occurred prior to 1950. The only recent exceptions include 1987 and 2004. In fact, the 2004 fair was the coolest fair since 1946.

Other items related to cool weather:

Lowest Average Daily Temperature: 54 degrees on August 29th and 30th, 1915 and August 25th, 1958

Lowest Average Daily Highs for an entire fair: 63.0 in 1885.

Lowest Average Daily Lows for an entire fair: 49.4 in 1891.

A chance of rain

Rainfall has varied significantly over the decades with the most recent times seeing relatively moist weather during the fair. Since many activities of the fair take place outside, rain can have a large impact on the fairgoers experience. Let's take a look at some of the numbers.

Top 10 Wettest Fairs

1.	8.46"	1977
2.	6.22"	1993
3.	5.04"	1999
4.	4.87"	1987
5.	4.85"	1989
6.	4.55"	1979
7.	4.21"	1946
8.	3.86"	1903
9.	3.77"	1885
10.	3.03"	1981

Top 10 Driest Fairs

1.	0.00"	1939
		1893
3.	Trace	1986
		1983
		1933
		1913
		1899
8.	0.01"	1955
		1954
10.		1938*

*-includes 4 earlier years

Top 10 Daily Rainfalls

1.	4.18"	August 26 th , 1977
2.	3.45"	August 25 th , 1987
3.	3.16"	August 29 th , 1993
4.	2.92"	August 21 st , 1946
5.	2.65"	August 14 th , 1981
6.	2.35"	August 12 th , 1999
		August 29 th , 1907
8.	2.29"	August 27 th , 1977
9.	2.17"	August 22 nd , 1988
10.	2.04"	August 16 th , 1980

Of the top ten wettest fairs, eight of them have occurred in the past 40 years. Likewise, eight of the top 10 daily rainfalls have occurred in the past 30 years. Conversely, the driest years are clustered prior to the mid 1950's with the only recent occurrences in 1983 and 1986. It is difficult to explain why there is such a discrepancy between the first 90 years of record and the most recent 40 years. Some may be accounted for by the time shift into mid August and the likelihood for heavier rains, but this cannot explain the full doubling of rainfall that the averages show.

Conclusion

This climatology provides some insight into the past weather of the Iowa State Fair. Average conditions of early and recent fairs were highlighted with trends in both temperature and precipitation noted. The increase in temperatures was due primarily to the shifting of the fairs from early September to mid August. However, the increase in precipitation may only partially be explained by similar reasoning. Extreme events were also covered. The most notable finding was that only ONE fair had exceeded 100 degrees out of 125 years!

Please see the contact information below for any question regarding this paper.

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