

A Look at 100-Degree Days in Amarillo

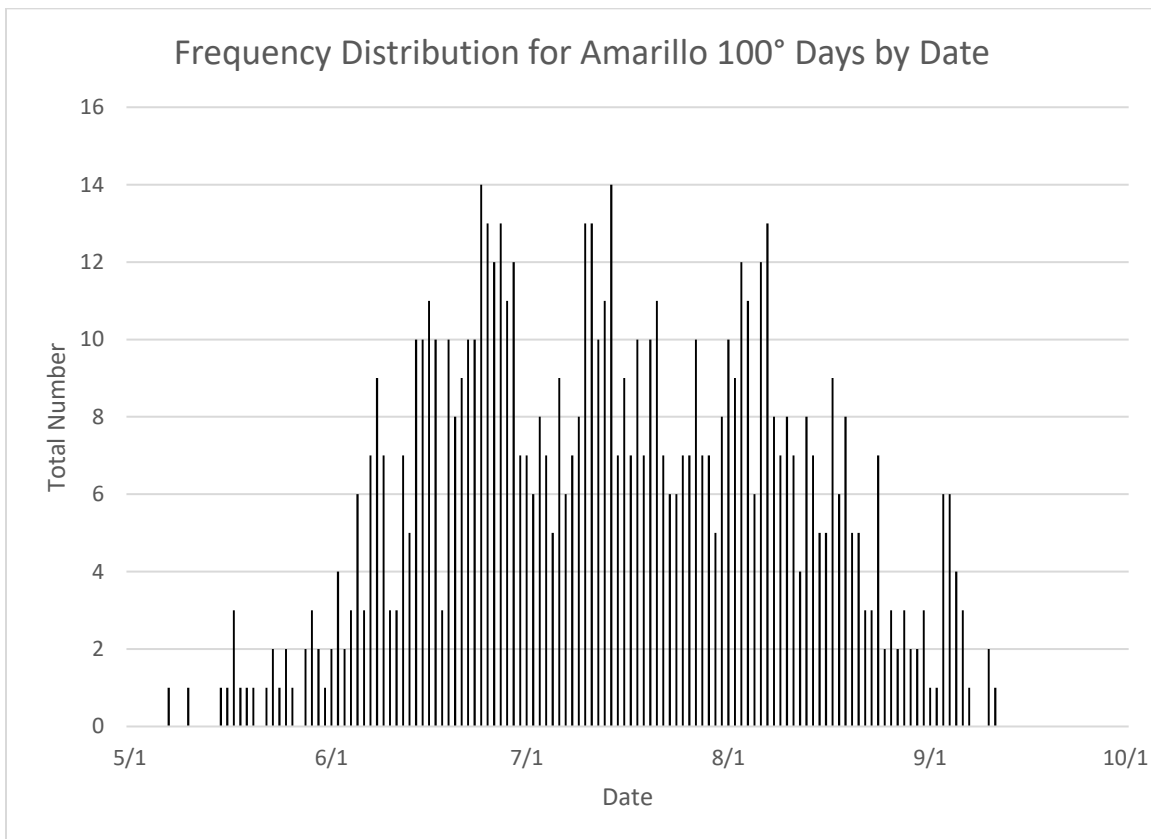
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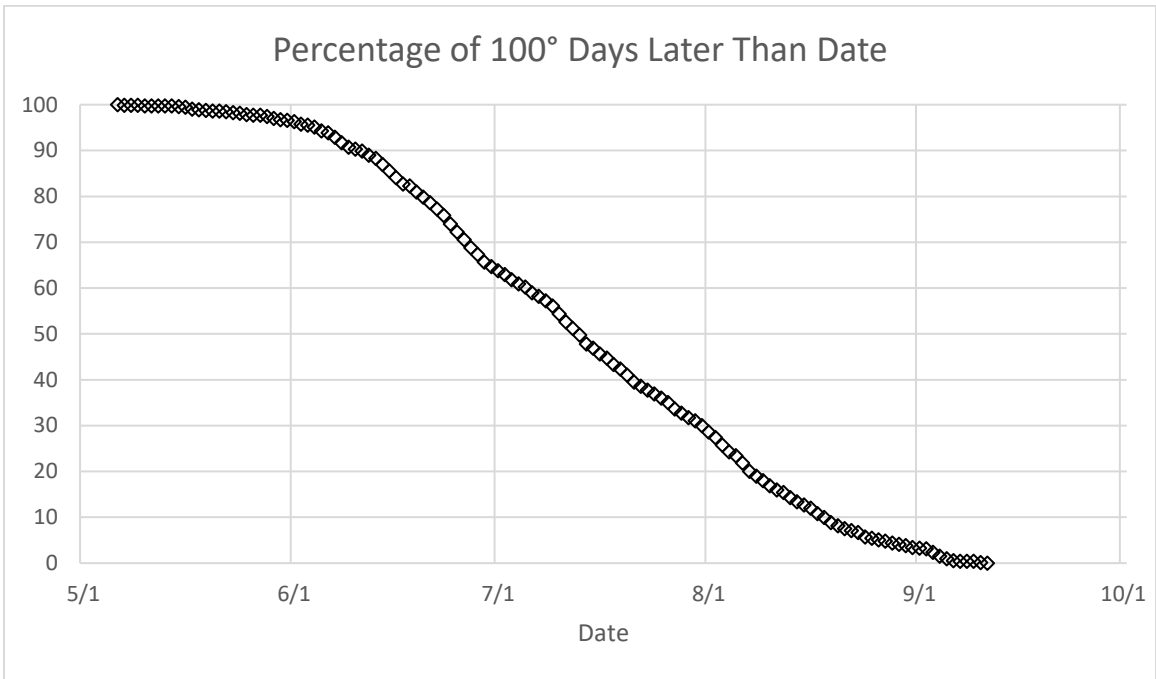
Any day in which the high temperature exceeds 99° is called a “100-degree day” or a “triple digit day.” I looked at Amarillo’s 100-degree days back to 1892 by accessing the NOAA Online Weather Data (NOWData) website. The first recorded 100-degree day was June 9, 1892, and it was the only one that year.

Through the end of the summer of 2023, 100-degree days have occurred 734 times, and have occurred in 99 of the 132 years. We had twenty six 100-degree days this summer, tying the record set in 1953. All 100-degree days have occurred from May 7 (set in 2022) to September 11 (set in 1910).

From the database, I was able to generate a frequency distribution (Appendix 1) of 100-degree days for each day in the range. June 24 and July 14 are tied for the most 100-degree days (14). As seen in the following plot, the distribution is bimodal.

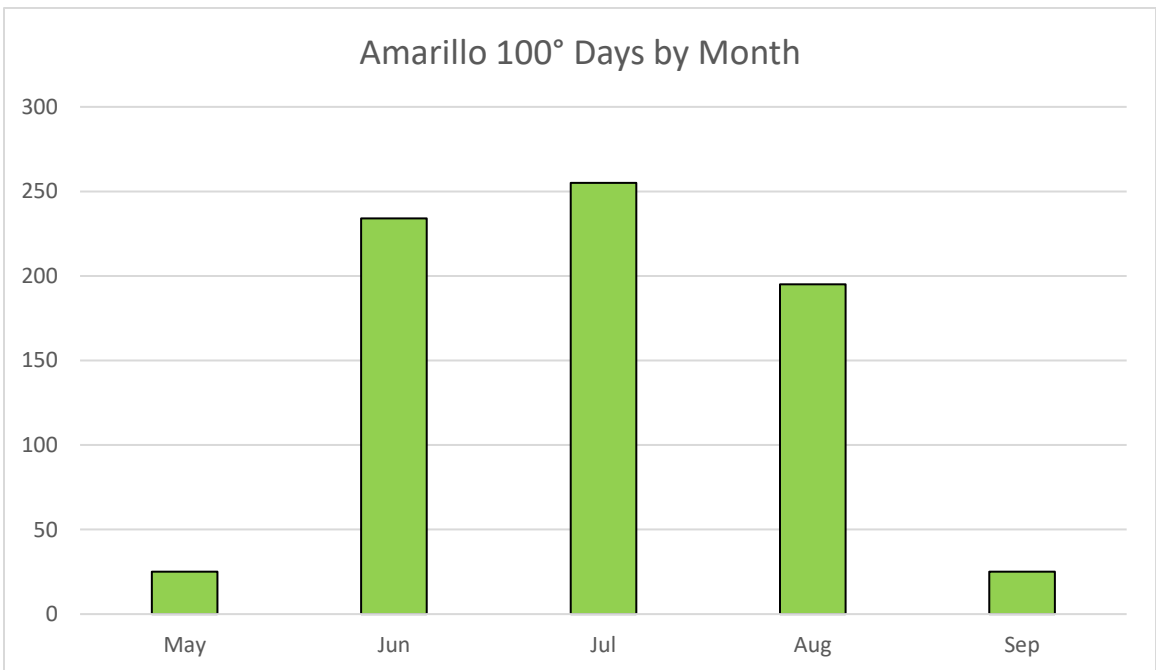


By generating a cumulative distribution (Appendix 2), we can determine how many 100-degree days have occurred after a specific day and convert these values to percentages. For example, 100% of all 100-degree days have occurred later than May 6, and 0% have occurred after September 11. The results for the entire range are shown in the following plot.

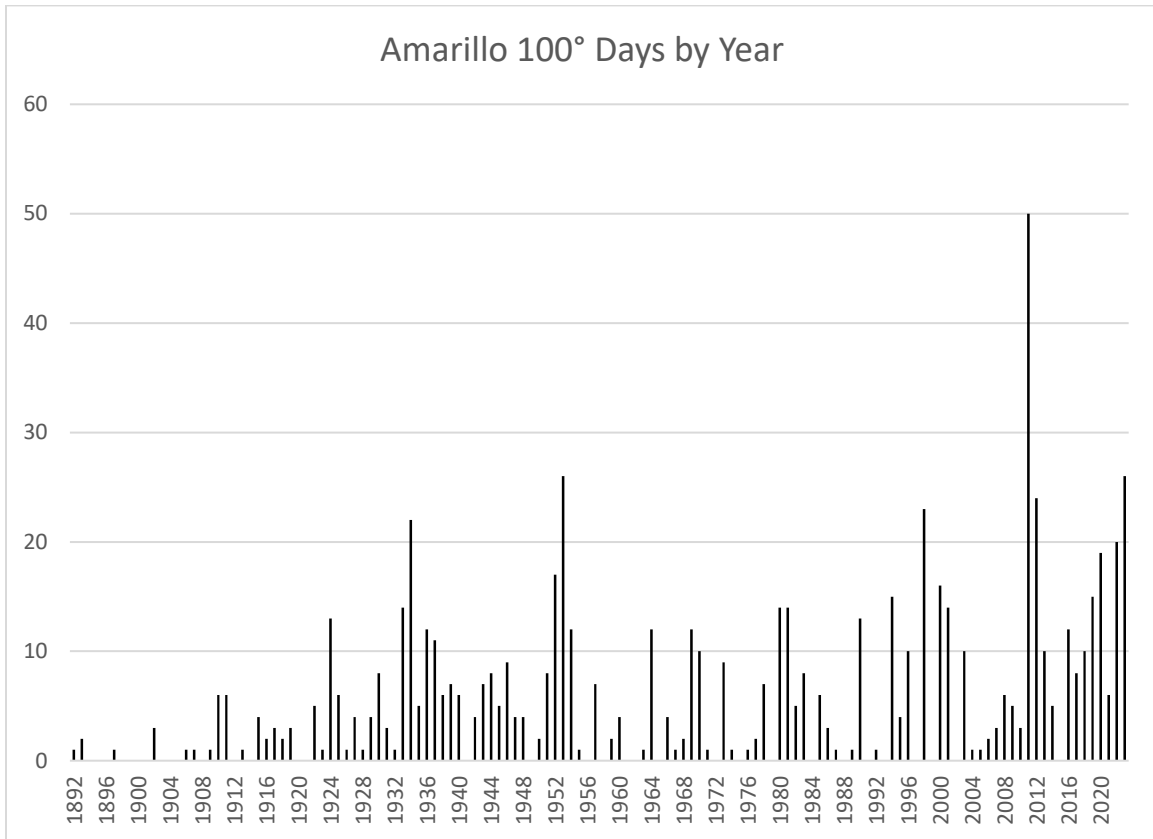


Thus, as the summer progresses without a 100-degree day, the chances for having one decrease. For example, only 20.02725% of Amarillo's 100-degree days have occurred later than August 7.

I was also able to determine the number of 100-degree days per month, and those numbers are shown in the following graph. The month of July has the most occurrences (255), and June is the runner up with 234 occurrences.



I was also able to determine from the database the number of 100-degree days per year, and those numbers are shown in the following graph:



The graph enables us to see just how severe the summer of 2011 was, with 50 occurrences of 100-degree days. 2023 and 1953 are now tied for second place, with 26 occurrences each.

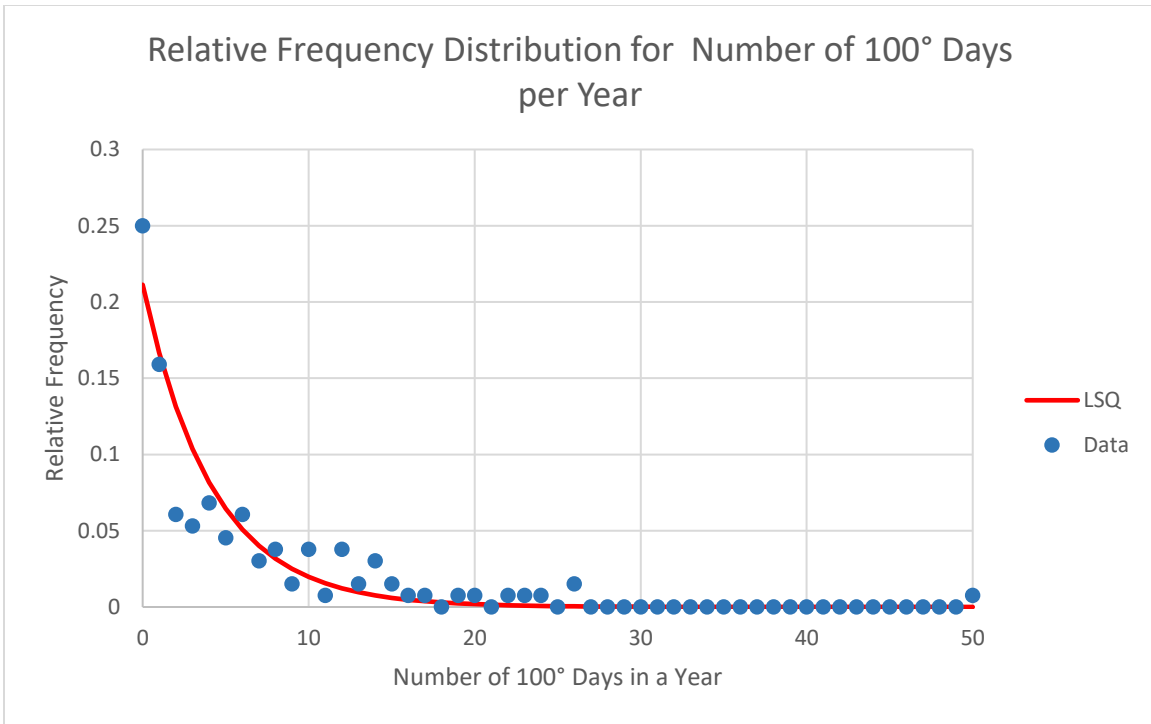
Next, I was able to find the frequency distribution for the number of 100-degree days in a year. For a given number of 100-degree days, the distribution tells us how many years that number of 100-degree days has occurred. For example, seven of the 132 years have had three 100-degree days.

The distribution is shown in Appendix 3, along with the relative frequency distribution. The relative frequencies are computed by dividing the frequencies by 132, the total number of years.

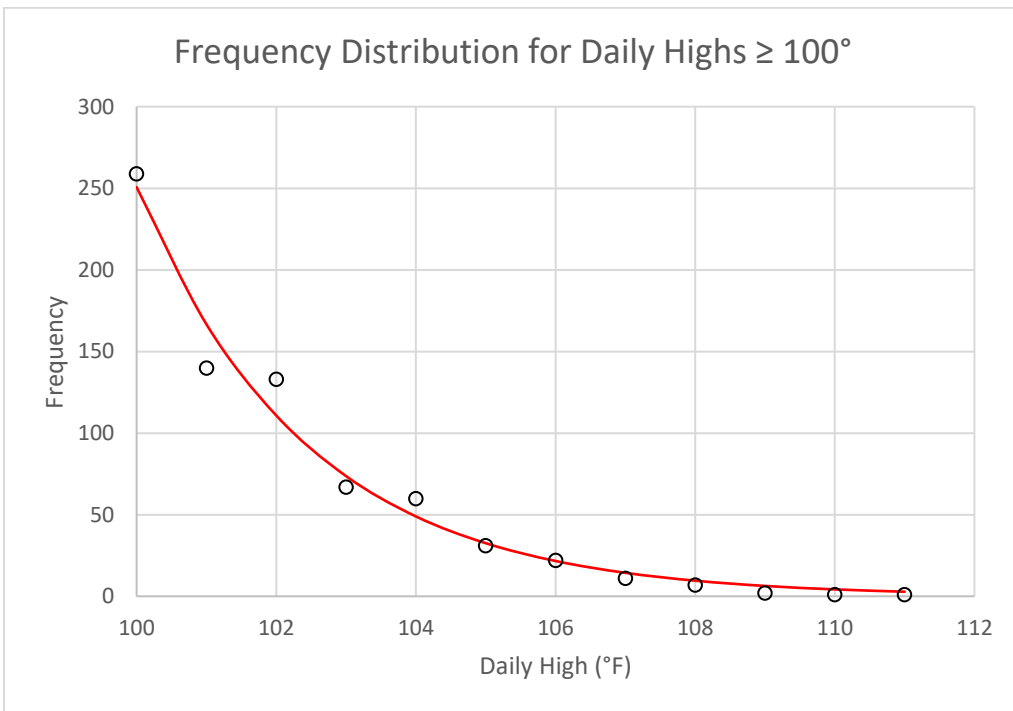
The following plot shows the relative frequency distribution, along with a regression model of the form

$$rf(n) = (1 - p)^n p$$

where rf is the relative frequency, n is the number of 100-degree days in the year, and p is the regression parameter. For these data, the value of p is 0.213162.



Finally, I was able to create a frequency distribution for the number of occurrences of daily highs of 100° and higher. The distribution is shown in Appendix 4 and here is a graph:



For example, during the 132-year period of record, Amarillo has experienced a daily high of 104° a total of 60 times.

The red curve is the best fit exponential of the form

$$f(T) = Ae^{k(T-100)}$$

where $f(T)$ is the frequency, T is the daily high, and A and k are the curve fit parameters. Their values are $A = 250.6733$ and $k = -0.40832$.

With the exception of 101° (too few) and 102° (too many), the exponential curve is an excellent fit to the data.

Appendix 5 and Appendix 6 show some additional information about Amarillo's 100-degree days.

APPENDIX 1

Frequency Distribution for Amarillo's 100-Degree Days per Day

Example: 100-degree days have occurred 10 times on August 1.

Day	Count
5/6	0
5/7	1
5/8	0
5/9	0
5/10	1
5/11	0
5/12	0
5/13	0
5/14	0
5/15	1
5/16	1
5/17	3
5/18	1
5/19	1
5/20	1
5/21	0
5/22	1
5/23	2
5/24	1
5/25	2
5/26	1
5/27	0
5/28	2
5/29	3
5/30	2
5/31	1

Day	Count
6/1	2
6/2	4
6/3	2
6/4	3
6/5	6
6/6	3
6/7	7
6/8	9
6/9	7
6/10	3
6/11	3
6/12	7
6/13	5
6/14	10
6/15	10
6/16	11
6/17	10
6/18	3
6/19	10
6/20	8
6/21	9
6/22	10
6/23	10
6/24	14
6/25	13
6/26	12
6/27	13
6/28	11
6/29	12
6/30	7

Day	Count
7/1	7
7/2	6
7/3	8
7/4	7
7/5	5
7/6	9
7/7	6
7/8	7
7/9	8
7/10	13
7/11	13
7/12	10
7/13	11
7/14	14
7/15	7
7/16	9
7/17	7
7/18	10
7/19	7
7/20	10
7/21	11
7/22	7
7/23	6
7/24	6
7/25	7
7/26	7
7/27	10
7/28	7
7/29	7
7/30	5
7/31	8

Day	Count
8/1	10
8/2	9
8/3	12
8/4	11
8/5	6
8/6	12
8/7	13
8/8	8
8/9	7
8/10	8
8/11	7
8/12	4
8/13	8
8/14	7
8/15	5
8/16	5
8/17	9
8/18	6
8/19	8
8/20	5
8/21	5
8/22	3
8/23	3
8/24	7
8/25	2
8/26	3
8/27	2
8/28	3
8/29	2
8/30	2
8/31	3

Day	Count
9/1	1
9/2	1
9/3	6
9/4	6
9/5	4
9/6	3
9/7	1
9/8	0
9/9	0
9/10	2
9/11	1
9/12	0

APPENDIX 2

Cumulative Relative Frequency Distribution for Amarillo's 100-Degree Days per Day

Example: 3.27% of Amarillo's 100-degree days have occurred after September 1.

Day	Pct.
5/6	100.00
5/7	99.86
5/8	99.86
5/9	99.86
5/10	99.73
5/11	99.73
5/12	99.73
5/13	99.73
5/14	99.73
5/15	99.59
5/16	99.46
5/17	99.05
5/18	98.91
5/19	98.77
5/20	98.64
5/21	98.64
5/22	98.50
5/23	98.23
5/24	98.09
5/25	97.82
5/26	97.68
5/27	97.68
5/28	97.41
5/29	97.00
5/30	96.73
5/31	96.59

Day	Pct.
6/1	96.32
6/2	95.78
6/3	95.50
6/4	95.10
6/5	94.28
6/6	93.87
6/7	92.92
6/8	91.69
6/9	90.74
6/10	90.33
6/11	89.92
6/12	88.96
6/13	88.28
6/14	86.92
6/15	85.56
6/16	84.06
6/17	82.70
6/18	82.29
6/19	80.93
6/20	79.84
6/21	78.61
6/22	77.25
6/23	75.89
6/24	73.98
6/25	72.21
6/26	70.57
6/27	68.80
6/28	67.30
6/29	65.67
6/30	64.71

Day	Pct.
7/1	63.76
7/2	62.94
7/3	61.85
7/4	60.90
7/5	60.22
7/6	58.99
7/7	58.17
7/8	57.22
7/9	56.13
7/10	54.36
7/11	52.59
7/12	51.23
7/13	49.73
7/14	47.82
7/15	46.87
7/16	45.64
7/17	44.69
7/18	43.32
7/19	42.37
7/20	41.01
7/21	39.51
7/22	38.56
7/23	37.74
7/24	36.92
7/25	35.97
7/26	35.01
7/27	33.65
7/28	32.70
7/29	31.74
7/30	31.06
7/31	29.97

Day	Pct.
8/1	28.61
8/2	27.38
8/3	25.75
8/4	24.25
8/5	23.43
8/6	21.80
8/7	20.03
8/8	18.94
8/9	17.98
8/10	16.89
8/11	15.94
8/12	15.40
8/13	14.31
8/14	13.35
8/15	12.67
8/16	11.99
8/17	10.76
8/18	9.95
8/19	8.86
8/20	8.17
8/21	7.49
8/22	7.08
8/23	6.68
8/24	5.72
8/25	5.45
8/26	5.04
8/27	4.77
8/28	4.36
8/29	4.09
8/30	3.81
8/31	3.41

Day	Pct.
9/1	3.27
9/2	3.13
9/3	2.32
9/4	1.50
9/5	0.95
9/6	0.54
9/7	0.41
9/8	0.41
9/9	0.41
9/10	0.14
9/11	0.00

APPENDIX 3

Frequency Distribution for Amarillo's 100-Degree Days per Year

Examples: 33 years have had no 100-degree days, 21 years have had one 100-degree day, 8 years have had two 100-degree days, etc.

Number of 100° Days	Frequency	Relative Frequency
0	33	0.25
1	21	0.15909091
2	8	0.06060606
3	7	0.0530303
4	9	0.06818182
5	6	0.04545455
6	8	0.06060606
7	4	0.03030303
8	5	0.03787879
9	2	0.01515152
10	5	0.03787879
11	1	0.00757576
12	5	0.03787879
13	2	0.01515152
14	4	0.03030303
15	2	0.01515152
16	1	0.00757576
17	1	0.00757576
18	0	0
19	1	0.00757576
20	1	0.00757576
21	0	0
22	1	0.00757576
23	1	0.00757576
24	1	0.00757576
25	0	0

Number of 100° Days	Frequency	Relative Frequency
26	2	0.01515152
27	0	0
28	0	0
29	0	0
30	0	0
31	0	0
32	0	0
33	0	0
34	0	0
35	0	0
36	0	0
37	0	0
38	0	0
39	0	0
40	0	0
41	0	0
42	0	0
43	0	0
44	0	0
45	0	0
46	0	0
47	0	0
48	0	0
49	0	0
50	1	0.00757576

APPENDIX 4

Frequency Distribution for the number of Occurrences of Daily Highs

Example: During the 132-year period of record, Amarillo has experienced a daily high of 104° a total of 60 times.

T (°F)	f(T)
100	259
101	140
102	133
103	67
104	60
105	31
106	22
107	11
108	7
109	2
110	1
111	1

APPENDIX 5

Evolution of the Record for 100-Degree Days in a Year

As mentioned earlier, when the period of record began in 1892 there was one 100-degree day that year, so that set a record. The following table shows how the record has evolved over the years. Hopefully, the record set in 2011 will never be challenged.

Year	Record
1892	1
1893	2
1902	3
1910	6
1924	13
1933	14
1934	22
1953	26
2011	50

APPENDIX 6

The Year that a 100-Degree Day was First Observed in a Given Month

The following table shows the year that a 100-degree day was first observed for a given month. For example, it was 1925 before a 100-degree day was observed in May.

Month	Year
May	1925
June	1892
July	1910
August	1909
September	1910