

A Look at 100-Degree Days in Amarillo

By Robert Ashcraft

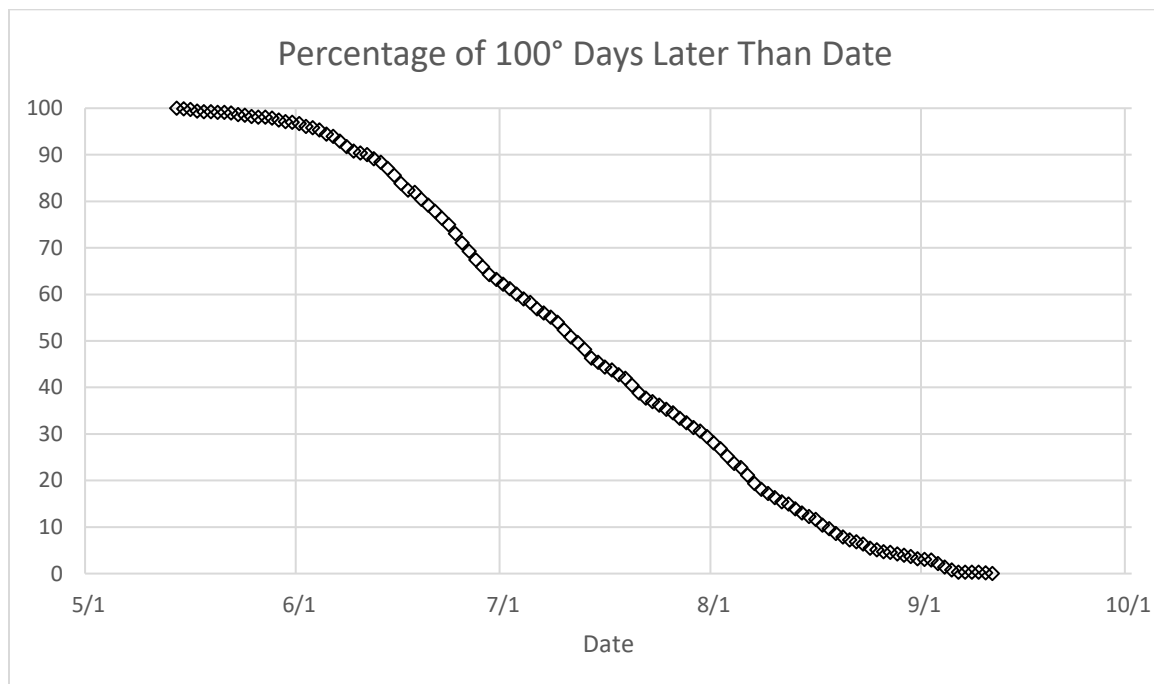
Retired Program Scientist - Pantex

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 2019, 100-degree days have occurred 663 times, and have occurred in 95 of the 128 years. All 100-degree days have occurred from May 15 (set in 1996) to September 11 (set in 1910).

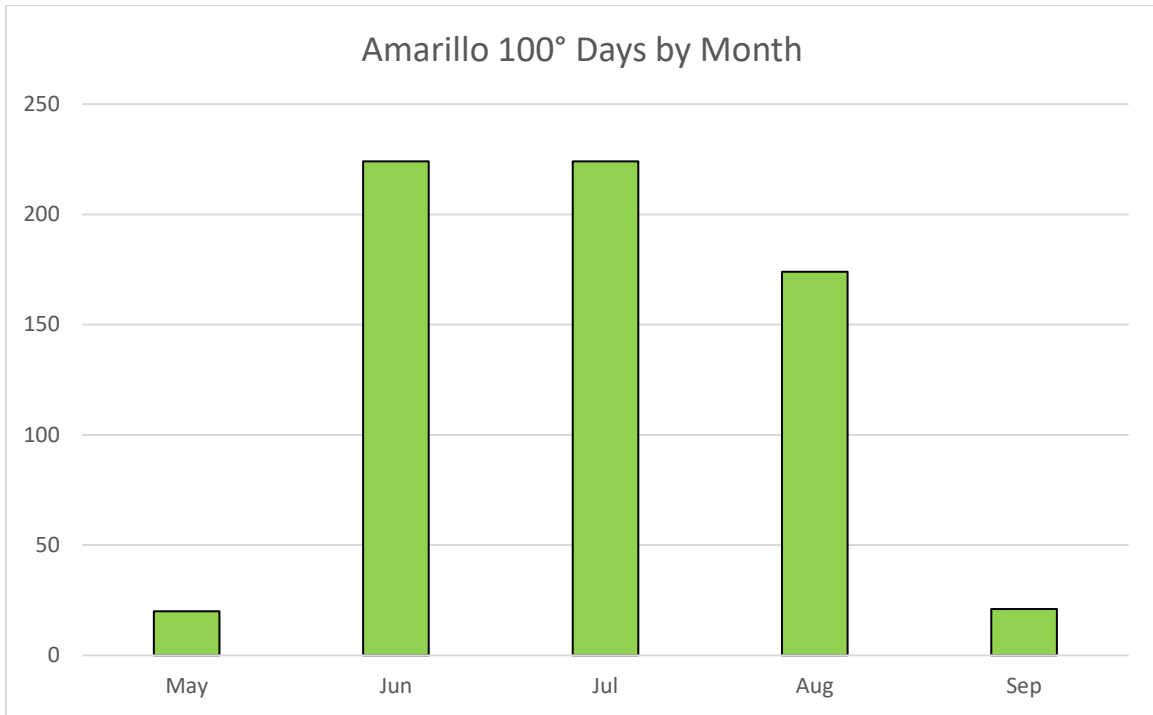
From the database, I was able to generate a frequency distribution (Appendix 1) of 100-degree days for each day in the range. June 24 and June 25 are tied for the most 100-degree days (13).

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 14, and 0% have occurred after September 11. The results for the entire range are shown in the following plot.

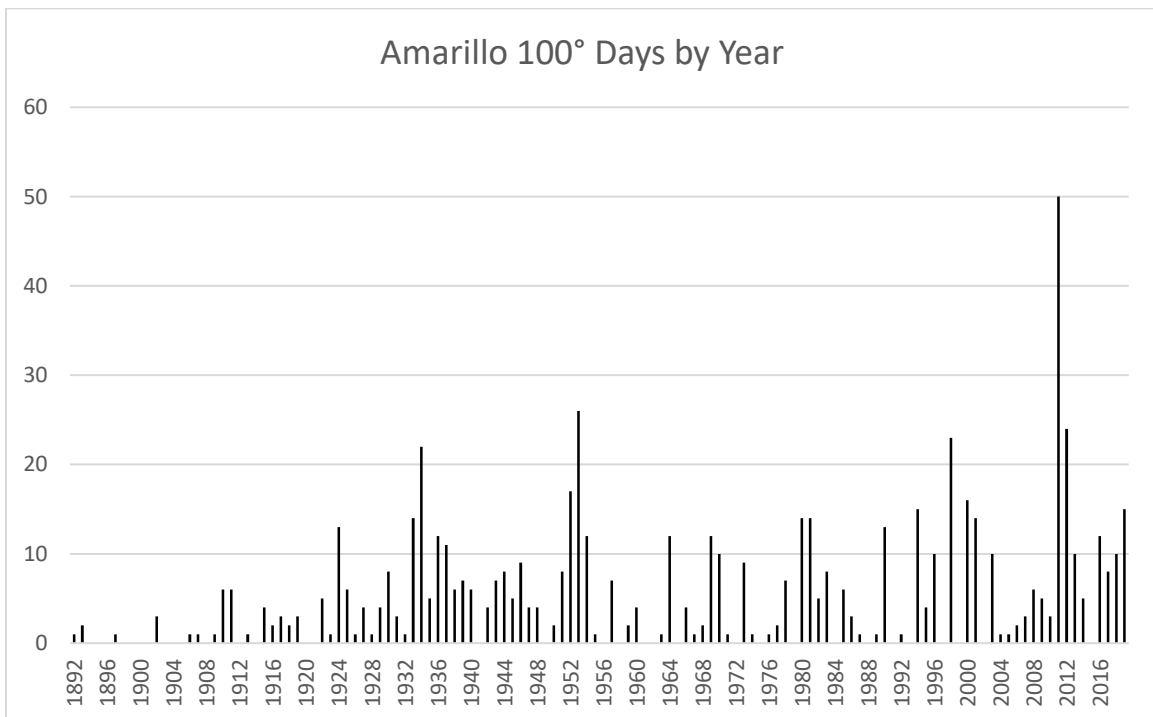


Thus, as the summer progresses without a 100-degree day, the chances for having one decrease. For example, only 10.41% of Amarillo’s 100-degree days have occurred later than August 17.

I was also able to determine the number of 100-degree days per month, and those numbers are shown in the following graph. The months of June and July are tied with 224 occurrences, and August is the runner up with 174 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. Until 2011, 1953 had been the most severe summer with 26 occurrences.

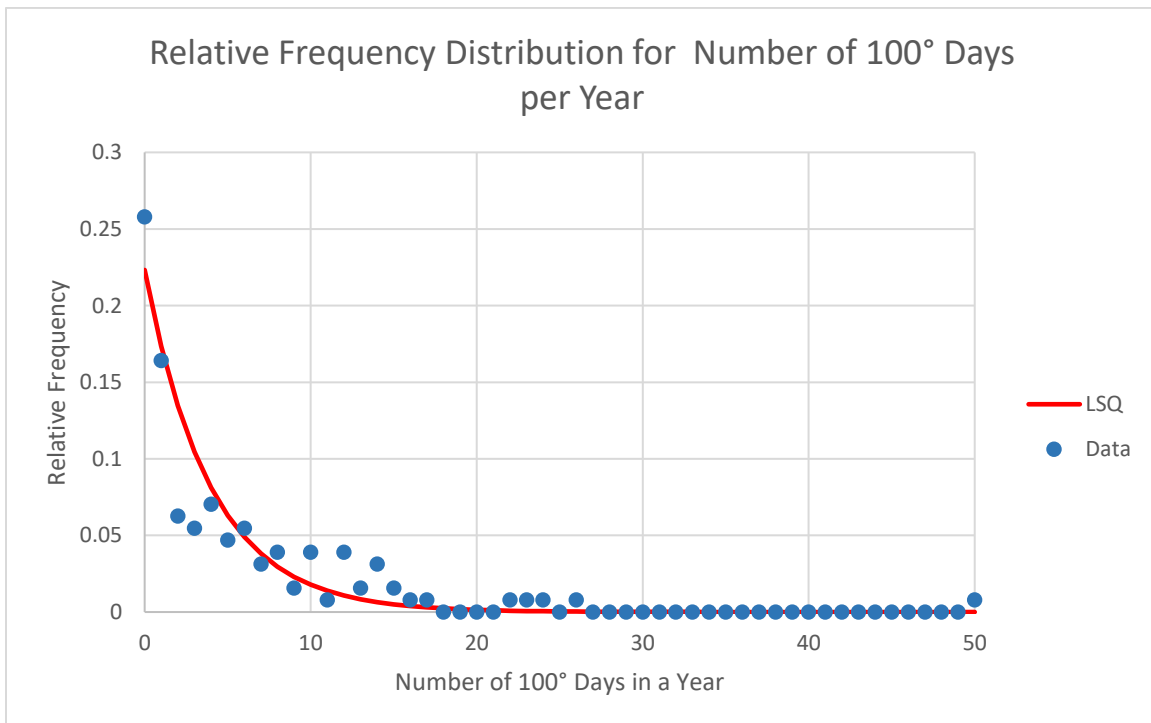
Finally, I was able to find the frequency distribution for the number of 100-degree days in a year. For a given number of 100-degree days, the distribution tells us how many years that number of 100-degree days has occurred. For example, seven of the 128 years have had three 100-degree days.

The distribution is shown in Appendix 3, along with the relative frequency distribution. The relative frequencies are computed by dividing the frequencies by 128, 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 0.223249.



APPENDIX 1

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

Example: 100-degree days have occurred 9 times on August 1.

| Day | Count |
|------|-------|
| 5/14 | 0 |
| 5/15 | 1 |
| 5/16 | 1 |
| 5/17 | 2 |
| 5/18 | 1 |
| 5/19 | 0 |
| 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 | 1 |
| 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 | 8 |
| 6/9 | 6 |
| 6/10 | 3 |
| 6/11 | 2 |
| 6/12 | 6 |
| 6/13 | 5 |
| 6/14 | 9 |
| 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 | 9 |
| 6/24 | 13 |
| 6/25 | 13 |
| 6/26 | 12 |
| 6/27 | 12 |
| 6/28 | 10 |
| 6/29 | 11 |
| 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 | 6 |
| 7/9 | 7 |
| 7/10 | 11 |
| 7/11 | 10 |
| 7/12 | 8 |
| 7/13 | 10 |
| 7/14 | 12 |
| 7/15 | 6 |
| 7/16 | 7 |
| 7/17 | 4 |
| 7/18 | 7 |
| 7/19 | 5 |
| 7/20 | 10 |
| 7/21 | 11 |
| 7/22 | 7 |
| 7/23 | 5 |
| 7/24 | 5 |
| 7/25 | 6 |
| 7/26 | 5 |
| 7/27 | 8 |
| 7/28 | 6 |
| 7/29 | 7 |
| 7/30 | 5 |
| 7/31 | 8 |

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

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

APPENDIX 2

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

Example: 3.02% of Amarillo's 100-degree days have occurred after September 1.

| Day | Pct. |
|------|--------|
| 5/14 | 100.00 |
| 5/15 | 99.85 |
| 5/16 | 99.70 |
| 5/17 | 99.40 |
| 5/18 | 99.25 |
| 5/19 | 99.25 |
| 5/20 | 99.10 |
| 5/21 | 99.10 |
| 5/22 | 98.94 |
| 5/23 | 98.64 |
| 5/24 | 98.49 |
| 5/25 | 98.19 |
| 5/26 | 98.04 |
| 5/27 | 98.04 |
| 5/28 | 97.89 |
| 5/29 | 97.44 |
| 5/30 | 97.13 |
| 5/31 | 96.98 |

| Day | Pct. |
|------|-------|
| 6/1 | 96.68 |
| 6/2 | 96.08 |
| 6/3 | 95.78 |
| 6/4 | 95.32 |
| 6/5 | 94.42 |
| 6/6 | 93.97 |
| 6/7 | 92.91 |
| 6/8 | 91.70 |
| 6/9 | 90.80 |
| 6/10 | 90.35 |
| 6/11 | 90.05 |
| 6/12 | 89.14 |
| 6/13 | 88.39 |
| 6/14 | 87.03 |
| 6/15 | 85.52 |
| 6/16 | 83.86 |
| 6/17 | 82.35 |
| 6/18 | 81.90 |
| 6/19 | 80.39 |
| 6/20 | 79.19 |
| 6/21 | 77.83 |
| 6/22 | 76.32 |
| 6/23 | 74.96 |
| 6/24 | 73.00 |
| 6/25 | 71.04 |
| 6/26 | 69.23 |
| 6/27 | 67.42 |
| 6/28 | 65.91 |
| 6/29 | 64.25 |
| 6/30 | 63.20 |

| Day | Pct. |
|------|-------|
| 7/1 | 62.14 |
| 7/2 | 61.24 |
| 7/3 | 60.03 |
| 7/4 | 58.97 |
| 7/5 | 58.22 |
| 7/6 | 56.86 |
| 7/7 | 55.96 |
| 7/8 | 55.05 |
| 7/9 | 54.00 |
| 7/10 | 52.34 |
| 7/11 | 50.83 |
| 7/12 | 49.62 |
| 7/13 | 48.11 |
| 7/14 | 46.30 |
| 7/15 | 45.40 |
| 7/16 | 44.34 |
| 7/17 | 43.74 |
| 7/18 | 42.68 |
| 7/19 | 41.93 |
| 7/20 | 40.42 |
| 7/21 | 38.76 |
| 7/22 | 37.71 |
| 7/23 | 36.95 |
| 7/24 | 36.20 |
| 7/25 | 35.29 |
| 7/26 | 34.54 |
| 7/27 | 33.33 |
| 7/28 | 32.43 |
| 7/29 | 31.37 |
| 7/30 | 30.62 |
| 7/31 | 29.41 |

| Day | Pct. |
|------|-------|
| 8/1 | 28.05 |
| 8/2 | 26.85 |
| 8/3 | 25.19 |
| 8/4 | 23.68 |
| 8/5 | 22.78 |
| 8/6 | 21.12 |
| 8/7 | 19.31 |
| 8/8 | 18.10 |
| 8/9 | 17.19 |
| 8/10 | 16.29 |
| 8/11 | 15.38 |
| 8/12 | 14.93 |
| 8/13 | 13.88 |
| 8/14 | 12.97 |
| 8/15 | 12.22 |
| 8/16 | 11.61 |
| 8/17 | 10.41 |
| 8/18 | 9.65 |
| 8/19 | 8.60 |
| 8/20 | 7.84 |
| 8/21 | 7.24 |
| 8/22 | 6.79 |
| 8/23 | 6.33 |
| 8/24 | 5.43 |
| 8/25 | 5.13 |
| 8/26 | 4.68 |
| 8/27 | 4.52 |
| 8/28 | 4.22 |
| 8/29 | 3.92 |
| 8/30 | 3.62 |
| 8/31 | 3.17 |

| Day | Pct. |
|------|------|
| 9/1 | 3.02 |
| 9/2 | 2.87 |
| 9/3 | 2.11 |
| 9/4 | 1.36 |
| 9/5 | 0.75 |
| 9/6 | 0.30 |
| 9/7 | 0.30 |
| 9/8 | 0.30 |
| 9/9 | 0.30 |
| 9/10 | 0.15 |
| 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 | 0.2578125 |
| 1 | 21 | 0.1640625 |
| 2 | 8 | 0.0625 |
| 3 | 7 | 0.0546875 |
| 4 | 9 | 0.0703125 |
| 5 | 6 | 0.046875 |
| 6 | 7 | 0.0546875 |
| 7 | 4 | 0.03125 |
| 8 | 5 | 0.0390625 |
| 9 | 2 | 0.015625 |
| 10 | 5 | 0.0390625 |
| 11 | 1 | 0.0078125 |
| 12 | 5 | 0.0390625 |
| 13 | 2 | 0.015625 |
| 14 | 4 | 0.03125 |
| 15 | 2 | 0.015625 |
| 16 | 1 | 0.0078125 |
| 17 | 1 | 0.0078125 |
| 18 | 0 | 0 |
| 19 | 0 | 0 |
| 20 | 0 | 0 |
| 21 | 0 | 0 |
| 22 | 1 | 0.0078125 |
| 23 | 1 | 0.0078125 |
| 24 | 1 | 0.0078125 |
| 25 | 0 | 0 |

| Number of 100° Days | Frequency | Relative Frequency |
|---------------------|-----------|--------------------|
| 26 | 1 | 0.0078125 |
| 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 | 0.0078125 |