

Lake Havasu City 2016 Weather Summary

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Introduction

2016 was the warmest year on record, from a global perspective, for the third year in a row. Conversely, Lake Havasu City's temperatures were nominal with no monthly averages breaking either warmest or coolest records and only a hand full of individual hottest and coldest days. There were no days below freezing and snow was restricted to one day in January in the Mohave Mountains. The summer started with a bang in June, getting up to 123.6°F at the Fire Station #5 weather station and then high temperatures stayed within normal ranges the rest of the summer. Total rainfall was above normal, but only with the help from December's weather. Details of this year's weather are given below.

Temperatures

Globally, 2016 exceeded 2015's warm record by (0.07°F) making it the warmest year on record at 58.69°F. The 20th century global average was 57.0°F. In comparison, Lake Havasu City's 2016 mean temperature was 76.36°F, 0.23°F lower than last year's average mean and 1.62°F higher than the city's 39-year average of 74.74°F. That difference was skewed a little more to the overnight low temperatures (2.47°F warmer) rather than the daily high temperatures (0.76°F warmer).

January 2016 high temperatures averaged over 5°F cooler than in 2015 and 2°F cooler than the 39-year average. The low temperatures were 3.4°F cooler than in 2015 and almost even with the 38-year average. As with other years, cold fronts passed over the city at all times of the day, including in the late evening when the lowest temperatures were record (7th and 31st). February also had two days when fronts passed through near midnight (18th and 23rd). High temperatures from March through April largely stayed below 2015 averages, but picked up in May to exceed 2015's average, but still 3.42°F below the 39-year average of 95.34°F for May. June continued the trend at 107.85°F, but FS#5 station recorded 119.7°F on June 4th, the highest temperature ever recorded that early in the year (Figure 1). July really ramped up at 110°F, just above the 39-year average and the warmest since 2009. August and September cooled by almost 7°F and over 5°F, respectively, relative to 2015. The temperatures stayed warmer than in 2015 for the rest of the year and November was the 4th warmest on record at 77.53°F, over 6°F warmer than in 2015.

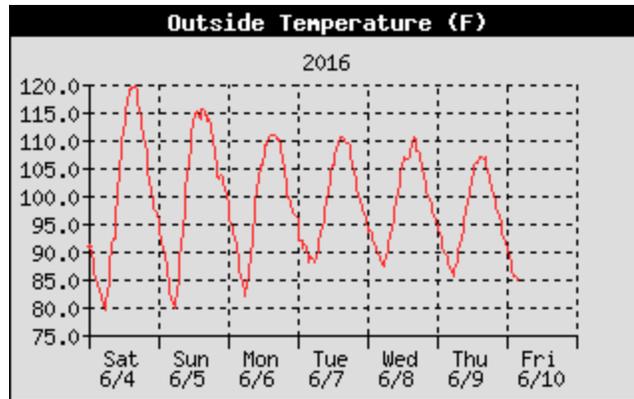


Figure 1: Temperature trend from the Fire Station #5 weather station beginning with essentially 120°F on June 4th, the earliest in the year on record.

Six official record temperatures were reported in 2016, one daily high and five daily lows (Table 1). Unofficially, four other record high temperatures, all reported from the Fire Station #5 station (FS#5), were reported with the highest temperature of the year at 123.6°F. There were also seven temperature ties for record, four high temperatures and three low temperatures.

Table 1: Record and tied-record temperatures reported in 2015.

Date	Temperature	Previous Record	Weather Station	Comments
5/7/16	54°F	55°F in 1986	OMF	Record daily low temp.
5/8/16	52°F	54°F in 1995	OMF	Record daily low temp.
5/22/16	58°F	62°F in 1998	OMF	Record daily low temp.
5/27/16	63°F	tied	OMF	
5/28/16	63°F	tied	OMF	
6/4/16	116°F	tied	OMF	
6/4/16	119.7°F		FS#5	Unofficial Record daily high
6/5/16	115.7°F	115°F in 1996	FS#5	Unofficial Record daily high
6/19/16	118°F	tied	OMF	
6/19/16	120°F		FS#5	Unofficial Record daily high
6/20/16	122°F	117°F in 1980	OMF	Record high daily temp.
6/20/16	123.6°F		FS#5	Unofficial Record daily high
9/15/16	65°F	tied	OMF	
9/23/16	61°F	62°F in 1988	OMF	Record low daily temp.
10/4/16	59°F	60°F in 2009	OMF	Record low daily temp.
10/22/16	99°F	tied	OMF	
11/9/16	88°F	tied	OMF	

The first 100°F day this year was on May 5th (101°F at OMF and 103.1°F at FS#5) and the first temperature at or above 110°F was on June 2nd (111°F at OMF and 114.1°F at FS#5).

There were only 106 days officially at or above 100°F (114 days at FS#5), which was the fewest since 1998 and the fourth lowest since records have been kept (1977). However, 41 of those days were at or above 110°F (54 days at FS#5), five more days than in 2015. The official coldest temperature of the year was 36°F on February 4th. There were 12 days with low temperatures below 40°. On the other side of the coin, there were 20 days with overnight official lows above 90°F and 2 days at or above 95°F. Unofficially, overnight lows at FS#5 included 37 days at or above 90°F and 6 days above 95°F. There has been an ongoing, but inconsistent noted discrepancy between the overnight lows at OMF and all four other stations that are monitored. This is particularly true during the summer monsoon season and with the passage of cold fronts. The last set of values given here are supported by the stations at FS#5, City Hall, the LHC Airport, and the station on the south side of the city.

High and low temperature relationships for 2016 and comparisons with 10 and 39 year averages along with daily records are given in Figures 2 and 3.

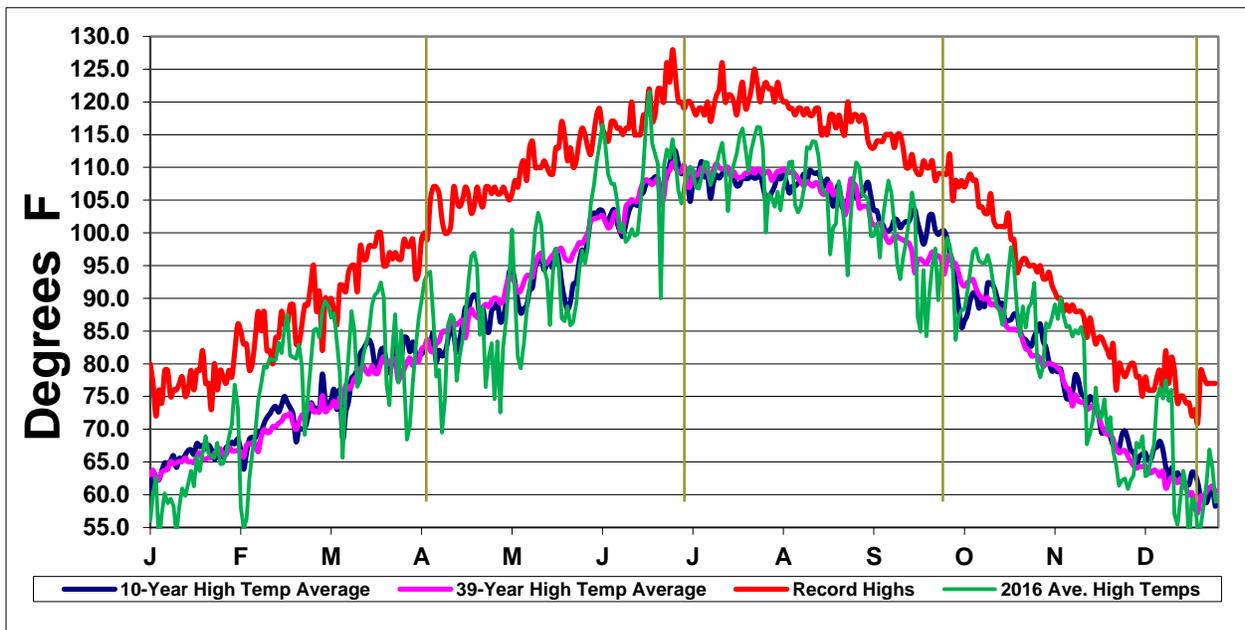


Figure 2: High daily temperatures for 2016 and comparison with 10 and 39 year averages and record high temperatures.

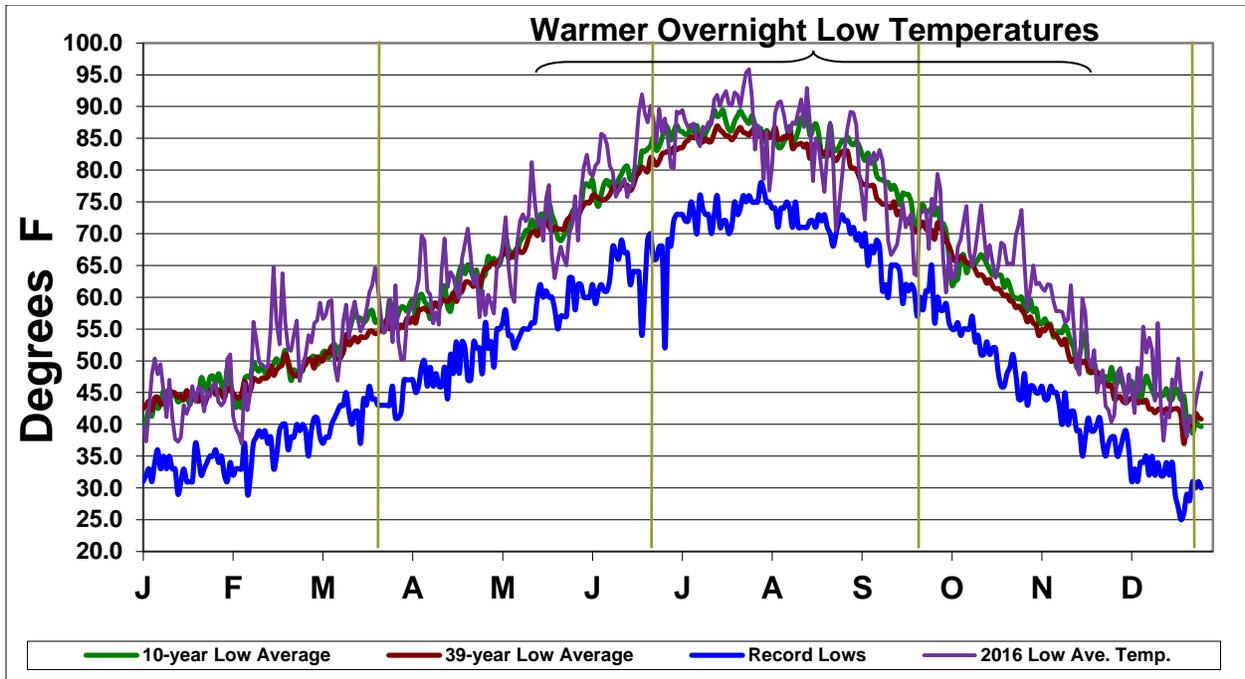


Figure 3: 2016 low daily temperatures and comparisons with 10 and 38 year averages and record daily low temperatures.

Large and quick temperature swings are common with the passage of fronts from late September through May. A couple of examples in 2016 occurred at the start (cold front) and end of the year (rare warm front) (Figure 4).

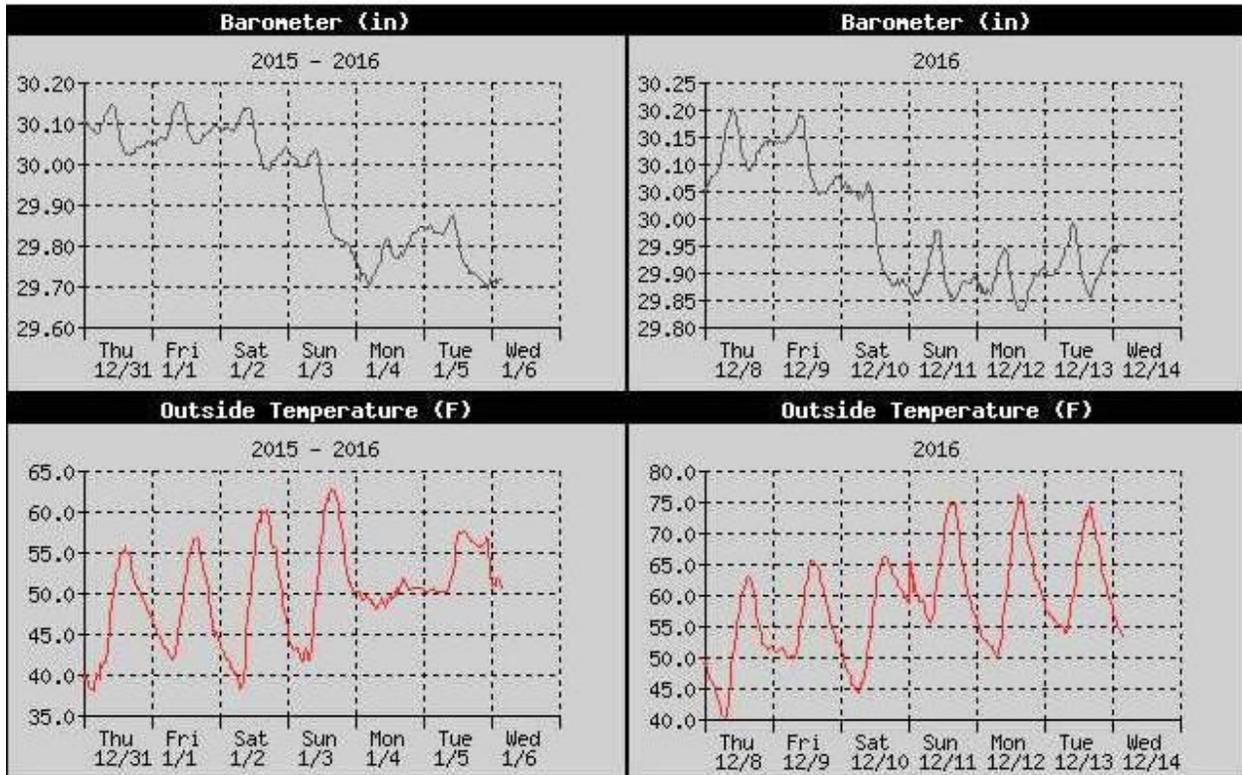


Figure 4: Low pressure cyclones or fronts may bring in cooler or warmer air, depending where they originate. At the start of 2016, a cold front dropped air temperatures by 13oF and another front in December probably originated off the southwest coast of California, bringing in warmer and not going anywhere fast as low pressure persisted for at least 3 days.

Precipitation

Lake Havasu City received above normal rainfall in 2016 (4.21-6.95 inches), but almost half of the average total 4.79" fell in December with over 2" (Table 2). Four cold fronts passed over the city from Dec. 16th to the 30th. One front on the 21st released half of December's precipitation total. The second highest rainfall amount occurred in August, which averaged 1" over the five stations. The south side station skewed the data with a record of 1.65". Since August is in the monsoon season, convective thunderstorms with spotty distribution accounted for this difference between stations. January and April tied for third rainiest months, averaging 0.83". The rain in April was mostly related to a closed low pressure system (Figure 5). As usual, June was the

driest month with no precipitation reported from OMF, FS#5, and the City Hall stations. The south side station recorded 0.02” and the airport station, 0.01”. June precipitation recorded at higher elevations just east of the city in the Mohave Mountains occurred on the last day of the month. The higher elevation rain gauges also had greater accumulations for the year, up to 8.7 inches at the Crossman Peak rain gauge.

Table 2: 2016 Precipitation monthly totals (in inches) for 14 rain gauges in the Lake Havasu City area. Note that the rainfall amounts in the upper elevations are higher than in the city.

Elevations:	472'	503'	1057'	730'	716'	4688'	2410'	1260'	682'	605'	675'	2395'	1045'	1556'	
	PWMF	LHCFS	LHC South Side	City Hall	Airport	Crossman Peak	Pittsburg Mine	Horizon Six	Desert Hills	Crystal Beach	North Havasu	Ram Peak	Castle Rock Wash	Mohave Mtns.	Ave. Monthly
January	0.82	0.64	0.98	0.67	1.04	2.71	1.56	1.00	0.92	1.04	0.76	0.72	1.03	1.00	1.06
February	0.04	0.05	0.09	0.04	0.05	0.16	0.32	0.12	0.00	0.04	0.00	0.00	0.08	0.12	0.08
March	0.03	0.03	0.06	0.04	n/a	0.04	0.04	0.04	0.04	0.04	0.00	0.00	0.00	0.00	0.03
April	0.86	0.59	0.60	0.87	1.37	0.84	0.80	0.32	1.08	1.32	0.68	0.84	1.32	1.28	0.90
May	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
June	0.00	0.00	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.20	0.44	0.06
July	0.00	0.04	0.00	0.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.28	0.00	0.20	0.04
August	0.73	0.85	1.65	0.78	n/a	0.48	0.60	1.52	0.52	0.44	0.60	1.76	1.08	0.44	0.88
September	0.36	0.27	0.39	0.24	n/a	0.52	0.36	0.24	0.20	0.20	0.20	0.20	0.20	0.20	0.28
October	0.22	0.25	0.45	0.24	0.11	0.36	0.28	0.36	0.12	0.20	0.64	0.16	0.08	0.12	0.26
November	0.15	0.04	0.11	0.04	0.15	0.36	0.20	0.04	0.16	0.12	0.12	0.12	0.32	0.60	0.18
December	2.03	1.45	2.60	2.16	1.84	3.2	3.8	2.44	2.08	2.04	1.8	1.64	2.28	2.68	2.29
Yearly Total	5.24	4.21	6.95	5.08	4.61	8.71	7.96	6.08	5.12	5.44	4.80	5.88	6.59	7.08	5.98

250 mb Heights (dm) / Isotachs (knots)

0-hour analysis valid 0000 UTC Thu 07 Apr 2016

RAP (00z 07 Apr)

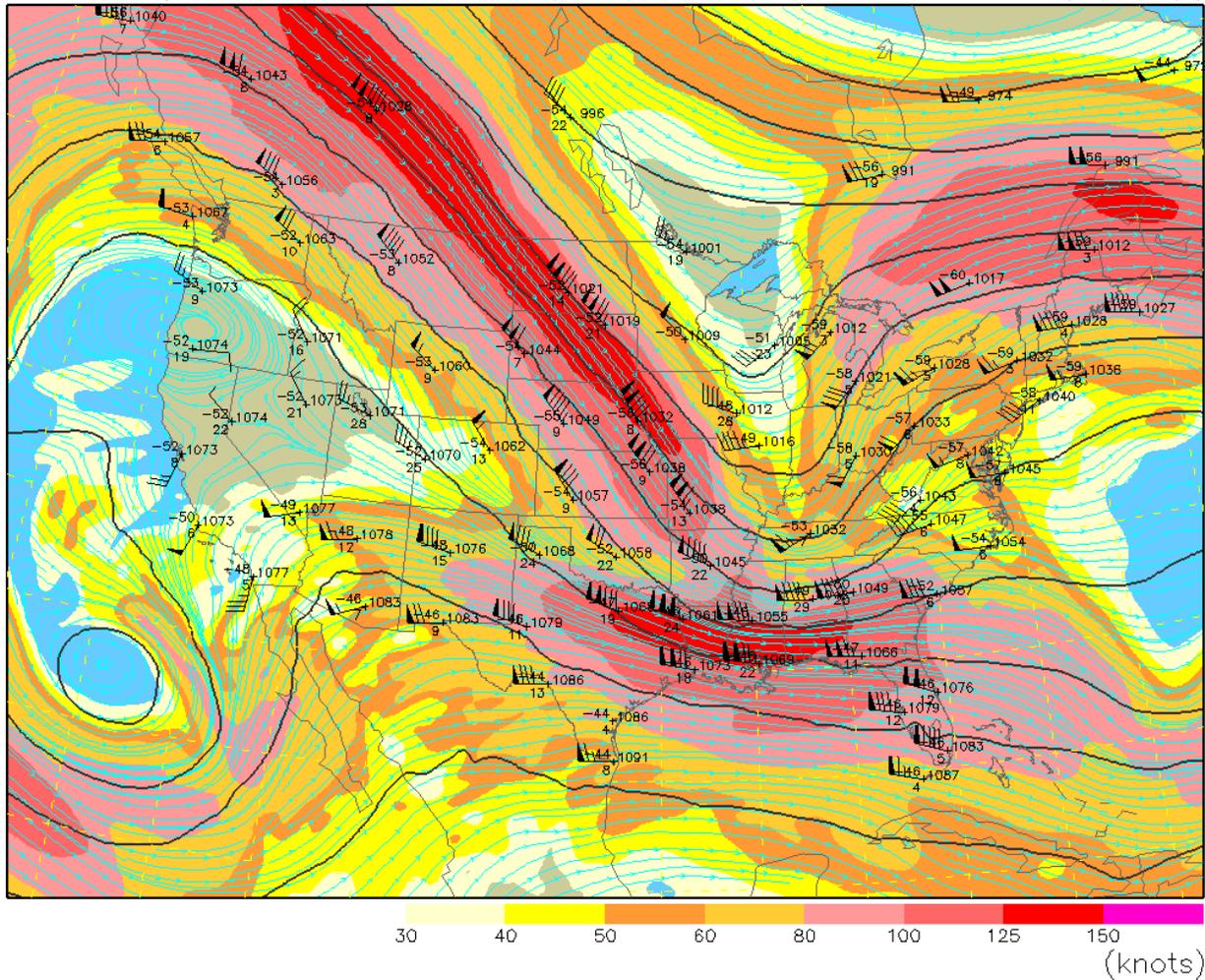


Figure 5: Closed low pressure system off the California coast brought rain to Lake Havasu City in early April.

Humidity-Dew Point Temperatures and Monsoon

Similar to 2015, there were no extremely dry periods ($<2\%$ RH and $< -5^{\circ}\text{F}$ dew point temperature) in 2016. There were no negative dew point temperatures with the lowest at 1.1°F for 30 minutes on July 5th, corresponding with the lowest recorded relative humidity of the year at 2%. Summer humidity arrived with a spike around June 9th, followed by a short respite before

taking off June 20th, dipping again over the July 4th week, and rose dramatically beginning July 12th (Figure 6). This yo-yo effect to the start of the monsoon season contrasts with earlier years of the 2000's in which the monsoon season began with a hard start the second week or so in July. Dew point temperatures began to fluctuate in early September and continued to do so into early November. This year's monsoon event continued a recent trend of extended high humidity before and after the traditional start and end of the monsoon season, one of two noticeable side effects of regional climate change (the other is higher overnight low temperatures mentioned earlier).

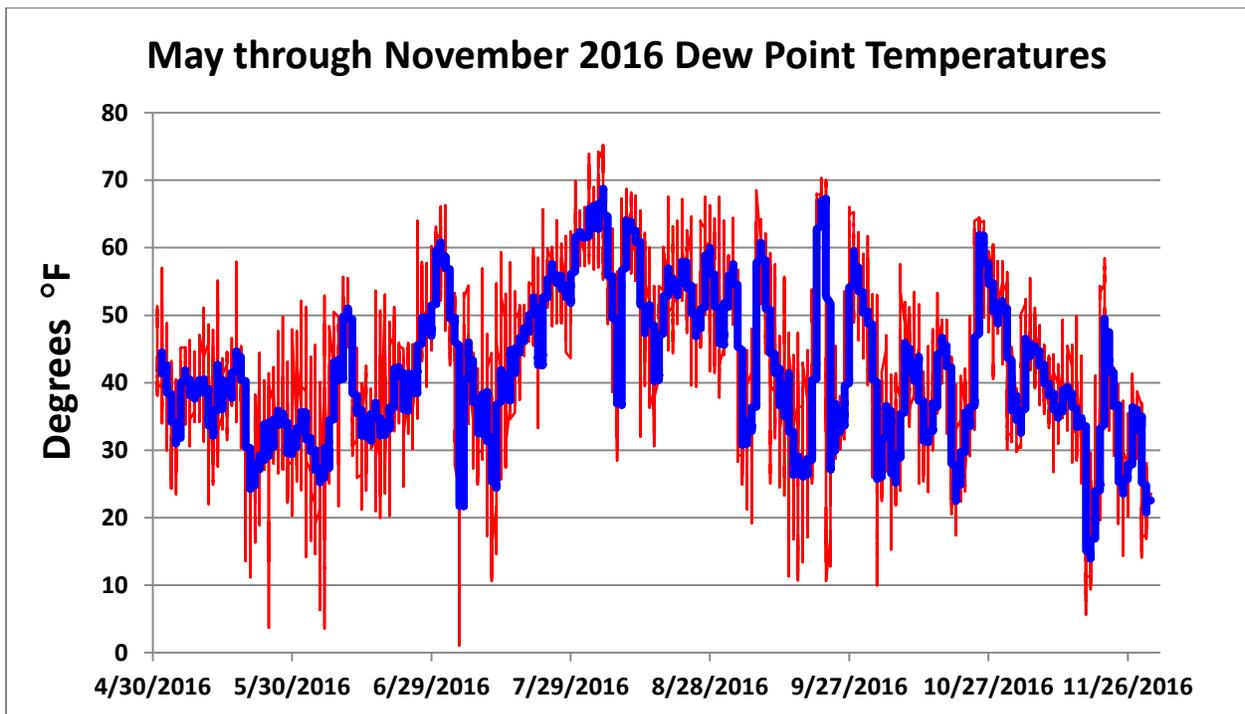


Figure 6: Dew point temperatures in 2016 from Fire Station #5 weather station over the period from May through November. The blue bold line is the daily dew point temperature average, which more clearly illustrates the overall humidity level. Dew point spikes in late November are related to cold front rain events.

The spikes of higher humidity in mid-November in Figure 4 resulted from a cold front passing through the area as shown in Figure 7. The low pressure trough associated with the front is clearly seen in the satellite image.

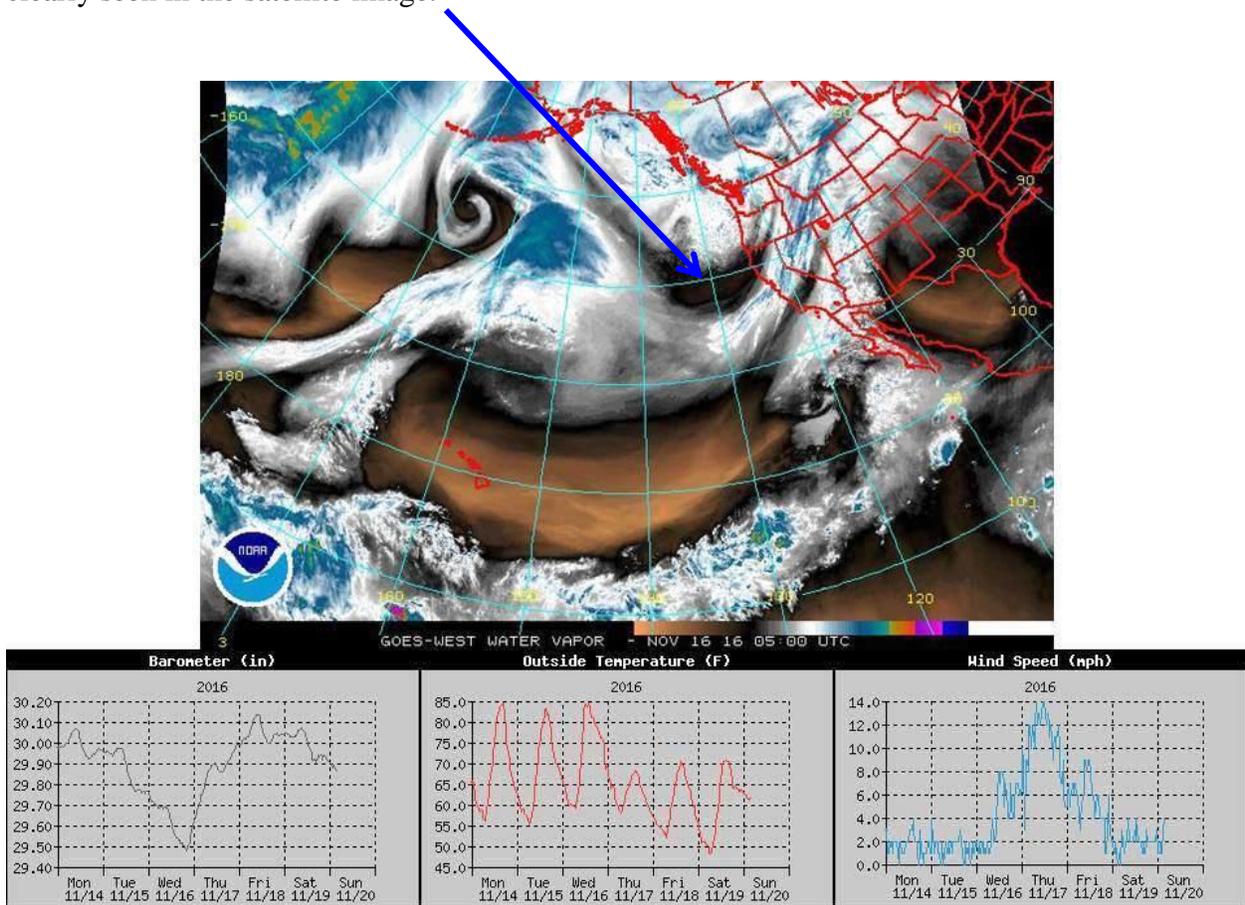


Figure 7: Satellite water vapor image, barometric pressure, temperature, and wind speed trends from November 14th to 20th showing the passage of a cold front around midnight of November 16th. As the low pressure past through, cooler air moved in over the next couple of days.

Monsoon season usually produces one or two impressive electrical storms and 2016 was no exception. Storms on August 26th and October 24th provided good examples (Figure 8).



Figure 8: Lightning storms in Lake Havasu City on August 26th (top) and on October 24th (bottom).

Peak Winds

After two years of lower than normal peak winds, overall peak wind speed increased to levels consistent with earlier years. The average overall annual peak wind speed was 9.42 mph. Even so, the top peak wind speed of 48 mph recorded at the airport station in 2016 was nothing like that experienced at the airport in 2015. In 2016, July was the windiest month and January the least windy month (Table 3).

Table 3: Monthly average of peak wind speeds for four weather stations recording wind speed. The airport monthly and annual averages are consistently higher than the other three stations.

Month	LHCFS	MCC	City Hall	Airport	ave.
January	6.57	5.99	7.13	8.17	6.97
February	8.75	7.22	8.65	12.52	9.29
March	8.63	8.34	8.94		8.64
April	10.37	9.19	9.93	11.98	10.37
May	11.13	10.05	10.31	12.69	11.04
June	11.78	10.36	10.99	13.11	11.56
July	12.40	9.93	11.33	13.54	11.80
August	11.16	9.59	10.06		10.27
September	9.23	8.11	8.58		8.64
October	7.91	6.73	7.43	9.18	7.81
November	7.65	6.19	7.02	9.63	7.62
December	9.67	6.88	8.25	11.25	9.01
Yearly Average	9.60	8.22	9.05	11.34	9.42

2016 Weather in Photos

The following are a few photos of clouds, dust events, and showers over the Lake Havasu City area in 2016. All photos were taken within LHC city limits.



Figure 8: Low-lying dust layer over Chemehuevi Valley on 4-6-2016.



Figure 9: Altocumulus clouds at sunset on 12-10-2016.



Figure 10: Closer view of altocumulus clouds and uneven base creating shadows, 12-10-16.



Figure 11: Lenticular clouds on July 17th.



Figure 12: May 6th dust event. No rain in the city.



Figure 13: Complex scattered showers configuration on August 27th.