

El Niño and La Niña Episodes and Their Impact On The Weather In The Las Vegas Valley

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Introduction

El Niño and La Niña episodes have been shown in numerous studies to have large scale and regional impacts on weather patterns and seasonal climate averages. This study presents the observed values of various weather parameters in the Las Vegas Valley in order to see what, if any, correlations there are due to El Niño and La Niña episodes on a more local scale.

Methodology

Oceanic Niño Index (ONI) values, defined as sea surface temperature anomalies in the Niño 3.4 region (located at 5°N to 5°S and 120° to 170°W) of the eastern and central equatorial Pacific Ocean based on the 1971-2000 base period, were obtained from the Climate Prediction Center (CPC) for each year since 1950 to the present. These values were analyzed for departures of 0.5°C warmer than normal for at least five consecutive overlapping three month seasons which indicated an El Niño episode and departures of 0.5°C cooler than normal for at least five consecutive overlapping three month seasons which inferred a La Niña episode for the purposes of this report. It should be noted that this criteria is also what CPC uses to define El Niño and La Niña episodes. Episodes were then defined from a July-June period for simplistic purposes for the compilation of this report.

The next step was to rate El Niño and La Niña episodes into three categories – strong, moderate and weak based on ONI values. At least three consecutive three month periods with a given value were used to rate episodes. The thresholds for rating ONI values were obtained from correspondence with CPC in a previous study on El Niño and La Niña episodes done by the author.

For El Niño episodes events were defined as:

Weak – ONI values from +0.5°C to +0.9°C

Moderate – ONI values from +1.0°C to +1.8°C

High – ONI values greater than +1.8°C

For La Niña episodes events were defined as:

Weak – ONI values from -0.5°C to -0.9°C

Moderate – ONI values from -1.0°C to -1.8°C

High – ONI values greater than -1.8°C

McCarran International Airport has been the official location for Las Vegas climate data since December 18, 1948 and was used in this study for all values noted with two exceptions. McCarran International Airport was the official snow measuring site for Las Vegas through January 31, 1996. Starting on February 1, 1996 the National Weather Service office located about 3 miles southwest of the McCarran International Airport tower became the official Las Vegas snow measuring site. This later location is climatologically representative of the airport with respect to terrain. Although other locations around the Las Vegas Valley do report weather observations daily, it was felt that using just a single long-term data point in the center of the valley would yield enough support for any trends in weather across the Las Vegas Valley. While the use of other stations would likely show that there are microclimates in the Las Vegas Valley, the overall impacts from El Niño and La Niña episodes should be quite similar. After identifying McCarran International Airport as the appropriate source, data was analyzed to determine if there were any observable effects on precipitation, snowfall, temperature, wind and fog. For precipitation and tornadoes, the 'cold season' period of November-April (as well as December-February for precipitation) was also looked at in order to analyze precipitation totals or the occurrence of tornadoes without any impacts from the monsoon. The December through February period was analyzed since these three months compose meteorological winter and this period often features synoptic scale storm systems that affect the Las Vegas Valley. Any tornado that was reported within the Las Vegas Valley was considered in this study.

For temperature, due to the increase in anthropogenic effects in recent years noted in this meteorological variable, it was decided to compare values from each decade to a 30 year rolling average in addition to 30 year normals from 1971-2000 for McCarran International Airport. Both the number of days with temperatures at or below freezing and the number of days with minimum temperatures below 20°F (the criteria for Freeze Warnings for the Las Vegas Valley is temperatures of 20°F or lower) were analyzed. For freeze events, a comparison was made to a 30 year normal from 1971-2000 as well as a decadal average due to the increased anthropogenic effects noted on temperature in Las Vegas.

Precipitation and Snowfall

The table below lists precipitation totals for the July-June period for years with an El Niño episode. Above normal values are shown in green and represent departures from normal of 110% or better. Brown values represent below normal values or 90% or less than normal. Above normal snowfall values are shown in blue and represent departures from normal of 110% or better, while below normal snowfall values are in purple and represent values of 90% or less than normal.

Episode	Strength of Episode	Las Vegas July-June Precipitation Total	Las Vegas July-June Seasonal Snowfall Total	Las Vegas November-April Precipitation Total	Las Vegas December-February Precipitation Total
1951-1952	Weak	5.58"	T	3.81"	1.30"
1957-1958	Moderate	6.29"	T	2.62"	1.17"
1963-1964	Weak	3.14"	T	0.45"	0.07"
1965-1966	Moderate	4.15"	T	3.34"	1.07"
1968-1969	Weak	4.54"	T	3.19"	2.60"
1969-1970	Weak	2.17"	T	1.25"	0.87"
1972-1973	Strong	8.43"	0.7"	5.59"	2.32"
1976-1977	Weak	5.06"	0.0"	0.55"	0.24"
1977-1978	Weak	7.24"	0.0"	5.07"	3.57"
1982-1983	Strong	4.45"	0.0"	3.42"	1.47"
1986-1987	Moderate	4.84"	0.6"	3.52"	2.05"
1987-1988	Moderate	5.03"	T	4.36"	1.80"
1991-1992	Moderate	8.77"	0.0"	7.19"	1.99"
1994-1995	Moderate	5.53"	T	4.81"	4.11"
1997-1998	Strong	7.68"	0.0"	4.53"	3.13"
2002-2003	Moderate	4.20"	0.0"	3.04"	2.22"
2004-2005	Weak	10.26"	0.0"	8.86"	6.62"
2006-2007	Weak	1.66"	T	0.42"	0.34"
30 Year Normal	N/A	4.49"	1.0"	2.73"	1.68"
18 Events	All Strengths	5.49"	T	3.67"	2.05"
Average for Moderate and Strong Events	N/A	5.94"	T	4.24"	2.13"

El Niño episodes were wetter than average in 10 of the 18 July-June seasons – or 56% of the seasons studied. However, when just cold season precipitation for the November through April period is looked at 13 of the 18 seasons or 72% of the episodes were wetter than average. The most variability took place with the overall precipitation totals for weak El Niño episodes. The two greatest cold season precipitation totals for the November through April period and the December through February period during El Niño episodes took place during weak to moderate El Niños. Snowfall was below normal in all El Niño episodes with only two instances of measurable snow: the winter of 1972-1973 and 1986-1987.

The table below lists precipitation totals for the July-June period for years with a La Niña episode. Above normal values are shown in green and represent departures from normal of 110% or better. Brown values represent below normal values or 90% or less than normal. Above normal snowfall values are shown in blue and represent departures from normal of 110% or better, while below normal snowfall values are in purple and represent values of 90% or less than normal.

Episode	Strength of Episode	Las Vegas July-June Precipitation Total	Las Vegas July-June Seasonal Snowfall Total	Las Vegas November-April Precipitation Total	Las Vegas December-February Precipitation Total
1949-1950	Moderate	0.73"	0.0"	0.23"	0.22"
1950-1951	Weak	2.63"	T	0.28"	0.21"
1954-1955	Moderate	5.02"	1.5"	2.24"	1.77"
1955-1956	Strong	3.65"	0.0"	0.36"	0.25"
1956-1957	Weak	2.95"	1.0"	1.07"	0.42"
1964-1965	Moderate	5.00"	4.0"	4.31"	0.50"
1967-1968	Weak	4.81"	2.0"	2.89"	1.05"
1970-1971	Moderate	3.79"	T	0.56"	0.18"
1971-1972	Weak	2.52"	T	0.70"	0.51"
1973-1974	Strong	2.52"	13.4"	2.42"	2.12"
1974-1975	Weak	4.15"	T	2.37"	0.65"
1975-1976	Moderate	4.55"	0.1"	2.69"	2.54"
1984-1985	Moderate	7.16"	T	3.20"	1.89"
1988-1989	Strong	1.84"	0.3"	0.70"	0.65"
1995-1996	Weak	0.56"	T	0.38"	0.28"
1998-1999	Moderate	3.91"	1.0"	1.57"	0.51"
1999-2000	Moderate	4.58"	0.0"	1.80"	1.59"
2000-2001	Weak	4.97"	T	3.32"	3.12"
2007-2008	Moderate	3.26"	0.0"	1.41"	0.69"
30 Year Normal	N/A	4.49"	1.0"	2.73"	1.68"
19 Events	All Strengths	3.61"	1.3"	1.71"	1.01"
Average for Moderate and Strong Events	N/A	3.83"	1.7"	1.79"	1.08"

Overall, precipitation during La Niña episodes in Las Vegas tends to be at or below normal 78% of the time during the July-June period, especially during strong La Niña episodes. Moderate to weak episodes tend to be more variable with four instances of above normal precipitation – three of them in moderate La Niña episodes. There was not as much of a variance with cold season precipitation totals with La Niña episodes as there were with El Niño episodes. Snowfall was highly variable with respect to the normal value of 1 inch. However, three of Las Vegas' seven snowiest months on record – January 1974, November 1964 and December 1967 all occurred during La Niña episodes.

Temperature

The table below lists the average temperature for meteorological winter (December through February) for years with an El Niño episode. Warmer than normal seasons were defined as those with departures from normal of greater than 2°F above normal and are depicted in orange, while cooler than normal seasons (depicted in blue) were defined as those with departures from normal less than 2°F below normal.

Episode	Strength of Episode	Las Vegas Average Temperature Compared to 30 Year Normal	Las Vegas Average Temperature Compared to Rolling ~30 Year Normal
1951-1952	Weak	44.2	44.2
1957-1958	Moderate	48.3	48.3
1941-1970 Normal: 46.2			
1963-1964	Weak	44.1	44.1
1965-1966	Moderate	44.5	44.5
1968-1969	Weak	44.9	44.9
1969-1970	Weak	47.4	47.4
1951-1980 Normal: 46.8			
1972-1973	Strong	43.9	43.9
1976-1977	Weak	48.8	48.8
1977-1978	Weak	50.6	50.6
1961-1990 Normal: 47.1			
1982-1983	Strong	47.6	47.6
1986-1987	Moderate	47.4	47.4
1987-1988	Moderate	46.7	46.7
1971-2000 Normal: 48.2			
1991-1992	Moderate	49.0	49.0
1994-1995	Moderate	51.2	51.2
1997-1998	Strong	48.0	48.0
1981-2007 Normal: 48.7			
2002-2003	Moderate	51.1	51.1
2004-2005	Weak	51.3	51.3
2006-2007	Weak	49.4	49.4
1991-2007 Normal: 49.4			
1971-2000 30 Year Normal	N/A	48.7	N/A
Average for Moderate and Strong Events	N/A	47.8	N/A

During strong El Niño events, temperatures have averaged near or below normal in Las Vegas while during weak to moderate episodes, there appears to be no strong correlation between El

Niño and temperatures. However, due to the significant increase in average temperature from anthropogenic effects over the past few decades, the effects from other phenomenon, including El Niño, are difficult to assess and no definitive conclusions can be made.

Episode	Strength of Episode	Las Vegas Average Temperature Compared to 30 Year Normal	Las Vegas Average Temperature Compared to Rolling ~30 Year Normal
1949-1950	Moderate	45.4	45.4
1937-1966 Normal: 46.3			
1950-1951	Weak	47.5	47.5
1954-1955	Moderate	42.8	42.8
1955-1956	Strong	47.5	47.5
1956-1957	Weak	48.1	48.1
1941-1970 Normal: 46.2			
1964-1965	Moderate	47.3	47.3
1967-1968	Weak	47.2	47.2
1951-1980 Normal: 46.8			
1970-1971	Moderate	46.2	46.2
1971-1972	Weak	45.2	45.2
1973-1974	Strong	45.4	45.4
1974-1975	Weak	46.2	46.2
1975-1976	Moderate	49.4	49.4
1961-1990 Normal: 47.1			
1984-1985	Moderate	45.3	45.3
1988-1989	Strong	46.6	46.6
1971-2000 Normal: 48.2			
1995-1996	Weak	50.7	50.7
1998-1999	Moderate	50.3	50.3
1999-2000	Moderate	51.2	51.2
1981-2007 Normal: 48.7			
2000-2001	Weak	48.6	48.6
2007-2008	Moderate	47.9	47.9
1991-2007 Normal: 49.4			
1971-2000 30 Year Normal	N/A	48.7	N/A
Average for Moderate and Strong Events	N/A	47.1	N/A

The table above lists the average temperature for meteorological winter (December through February) for years with a La Niña episode. Warmer than normal seasons were defined as those with departures from normal of greater than 2°F above normal and are depicted in orange, while

cooler than normal seasons (depicted in blue) were defined as those with departures from normal of less than 2°F below normal. Overall while strong La Niña episodes have shown below average temperatures when compared to the 1971-2000 normal, when they are compared to a rolling thirty year normal, there is not as much of a departure. Thus, as was the case with El Niño, the effects of La Niña are difficult to assess due to the affect of anthropogenic effects on temperature and no definitive conclusions can be made.

Freezes and Hard Freezes

The table below lists the number of days with minimum temperatures below 20°F (purple) and 32°F for years (below average years shown in blue) with an El Niño episode (July-June period).

Episode	Strength of Episode	Number of Days With Minimum Temperatures Below 20°F At Las Vegas Compared to a 30 Year Normal	Number of Days With Minimum Temperatures Below 20°F At Las Vegas Compared to a Decadal Normal	Number of Days With Minimum Temperatures of 32°F or Below At Las Vegas Compared to a 30 Year Normal	Number of Days With Minimum Temperatures of 32°F or Below At Las Vegas Compared to a Decadal Normal
1951-1952	Weak	2	2	55	55
1957-1958	Moderate	0	0	39	39
<i>1951-1960 Normal</i>		<i>0.8</i>		<i>46</i>	
1963-1964	Weak	0	0	63	63
1965-1966	Moderate	0	0	41	41
1968-1969	Weak	1	1	39	39
1969-1970	Weak	4	4	31	31
<i>1961-1970 Normal</i>		<i>1.7</i>		<i>41</i>	
1972-1973	Strong	4	4	36	36
1976-1977	Weak	0	0	41	41
1977-1978	Weak	0	0	3	3
<i>1971-1980 Normal</i>		<i>1.8</i>		<i>33</i>	
1982-1983	Strong	0	0	13	13
1986-1987	Moderate	0	0	26	26
1987-1988	Moderate	0	0	21	21
<i>1981-1990 Normal</i>		<i>1.3</i>		<i>25</i>	
1991-1992	Moderate	0	0	9	9
1994-1995	Moderate	0	0	12	12
1997-1998	Strong	0	0	8	8
<i>1991-2000 Normal</i>		<i>0.1</i>		<i>14</i>	
2002-2003	Moderate	0	0	11	11
2004-2005	Weak	0	0	3	3
2006-2007	Weak	0	0	15	15
<i>2001-2008 Normal</i>		<i>0</i>		<i>10</i>	
30 Year Normal	N/A	0.8	N/A	24	N/A

Overall there does not appear to be any correlations between El Niño and freeze events in Las Vegas. The only trend that can be seen in the table above is a decline in the number of freeze and hard freeze events at Las Vegas in more recent years which largely correlates to the increased anthropogenic effects in the Las Vegas Valley.

The table below lists the number of days with minimum temperatures below 20°F (purple) and 32°F for years (below average years shown in blue) with a La Niña episode (July-June period).

Episode	Strength of Episode	Number of Days With Minimum Temperatures Below 20°F At Las Vegas Compared to a 30 Year Normal	Number of Days With Minimum Temperatures Below 20°F At Las Vegas Compared to a Decadal Normal	Number of Days With Minimum Temperatures of 32°F or Below At Las Vegas Compared to a 30 Year Normal	Number of Days With Minimum Temperatures of 32°F or Below At Las Vegas Compared to a Decadal Normal
1949-1950	Moderate	10	10	50	50
<i>1941-1950 Normal</i>		5		58	
1950-1951	Weak	0	0	41	41
1954-1955	Moderate	0	0	68	68
1955-1956	Strong	0	0	45	45
1956-1957	Weak	1	1	52	52
<i>1951-1960 Normal</i>		0.8		46	
1964-1965	Moderate	0	0	42	42
1967-1968	Weak	0	0	37	37
<i>1961-1970 Normal</i>		1.7		41	
1970-1971	Moderate	4	4	42	42
1971-1972	Weak	2	2	54	54
1973-1974	Strong	2	2	39	39
1974-1975	Weak	0	0	32	32
1975-1976	Moderate	1	1	31	31
<i>1971-1980 Normal</i>		1.8		33	
1984-1985	Moderate	1	1	33	33
1988-1989	Strong	3	3	38	38
<i>1981-1990 Normal</i>		1.3		25	
1995-1996	Weak	0	0	18	18
1998-1999	Moderate	0	0	12	12
1999-2000	Moderate	0	0	8	8
<i>1991-2000 Normal</i>		0.1		14	
2000-2001	Weak	0	0	6	6
2007-2008	Moderate	0	0	13	13
<i>2001-2008 Normal</i>		0		10	
30 Year Normal	N/A	0.8	N/A	24	N/A

As was the case with El Niño, there does not appear to be any correlations between La Niña and freeze events in Las Vegas. The only trend that can be seen in the table above is a decline in the number of freeze and hard freeze events at Las Vegas in more recent years which largely correlates to the increased anthropogenic effects in the Las Vegas Valley.

Wind

The table below lists the average wind speeds during the cold season months from November through April with an El Niño episode (July-June period). Months with average wind speeds at least 1 mph above average are noted in red and average wind speeds of at least 1 mph below average are noted in aqua.

Episode	Strength of Episode	November Average Wind Speed	December Average Wind Speed	January Average Wind Speed	February Average Wind Speed	March Average Wind Speed	April Average Wind Speed
1951-1952	Weak	5.2 mph	7.2 mph	5.6 mph	6.7 mph	9.6 mph	6.5 mph
1957-1958	Moderate	6.2 mph	5.4 mph	6.9 mph	6.9 mph	10.6 mph	10.5 mph
1963-1964	Weak	7.5 mph	6.0 mph	8.0 mph	9.9 mph	11.1 mph	12.6 mph
1965-1966	Moderate	6.5 mph	7.7 mph	7.0 mph	8.2 mph	8.7 mph	9.3 mph
1968-1969	Weak	7.0 mph	7.5 mph	8.2 mph	8.9 mph	9.0 mph	10.4 mph
1969-1970	Weak	6.5 mph	6.9 mph	6.0 mph	7.7 mph	9.2 mph	10.3 mph
1972-1973	Strong	7.8 mph	9.2 mph	8.9 mph	8.4 mph	11.1 mph	12.7 mph
1976-1977	Weak	8.7 mph	7.4 mph	7.1 mph	9.9 mph	13.5 mph	10.6 mph
1977-1978	Weak	8.0 mph	6.6 mph	6.6 mph	9.0 mph	7.9 mph	11.3 mph
1982-1983	Strong	9.0 mph	9.5 mph	7.5 mph	9.4 mph	11.5 mph	13.4 mph
1986-1987	Moderate	8.6 mph	6.2 mph	8.8 mph	9.8 mph	10.0 mph	9.5 mph
1987-1988	Moderate	8.5 mph	8.8 mph	7.9 mph	8.0 mph	11.2 mph	10.4 mph
1991-1992	Moderate	8.2 mph	6.1 mph	5.8 mph	7.4 mph	7.7 mph	9.3 mph
1994-1995	Moderate	10.1 mph	7.1 mph	6.1 mph	7.0 mph	10.0 mph	12.0 mph
1997-1998	Strong	5.9 mph	8.5 mph	6.4 mph	8.6 mph	9.2 mph	10.6 mph
2002-2003	Moderate	5.9 mph	5.5 mph	4.5 mph	6.6 mph	8.0 mph	10.3 mph
2004-2005	Weak	6.4 mph	5.6 mph	6.2 mph	5.5 mph	8.3 mph	8.4 mph
2006-2007	Weak	5.6 mph	6.1 mph	7.0 mph	7.5 mph	7.3 mph	8.9 mph
30 Year Normal	N/A	7.3 mph	7.0 mph	7.1 mph	8.1 mph	9.6 mph	10.6 mph

Although there is little correlation between average monthly wind speeds and strong El Niño episodes from November through March, Aprils do appear to see near average winds to windier than normal conditions during strong episodes. Weak to moderate El Niño episodes appear to have no correlation with the average wind speed.

The table below lists the average wind speeds during the cold season months from November through April with a La Niña episode (July-June period). Months with average wind speeds at least 1 mph above average are noted in red and months with average wind speeds at least 1 mph below average are noted in aqua.

Episode	Strength of Episode	November Average Wind Speed	December Average Wind Speed	January Average Wind Speed	February Average Wind Speed	March Average Wind Speed	April Average Wind Speed
1949-1950	Moderate	4.8 mph	3.8 mph	7.2 mph	5.6 mph	8.9 mph	10.4 mph
1950-1951	Weak	6.0 mph	4.4 mph	6.4 mph	6.3 mph	8.4 mph	7.2 mph
1954-1955	Moderate	6.6 mph	5.6 mph	6.7 mph	11.0 mph	9.2 mph	13.8 mph
1955-1956	Strong	8.7 mph	6.9 mph	6.8 mph	10.9 mph	11.1 mph	12.3 mph
1956-1957	Weak	7.2 mph	8.3 mph	9.3 mph	8.3 mph	11.9 mph	14.4 mph
1964-1965	Moderate	9.3 mph	7.6 mph	8.3 mph	9.6 mph	8.6 mph	10.1 mph
1967-1968	Weak	6.0 mph	8.6 mph	6.7 mph	6.6 mph	9.3 mph	10.4 mph
1970-1971	Moderate	8.2 mph	7.2 mph	7.2 mph	8.3 mph	9.3 mph	10.5 mph
1971-1972	Weak	6.8 mph	8.5 mph	8.0 mph	8.0 mph	9.1 mph	12.8 mph
1973-1974	Strong	10.4 mph	8.3 mph	7.5 mph	9.3 mph	9.1 mph	11.7 mph
1974-1975	Weak	7.6 mph	7.9 mph	8.9 mph	9.6 mph	13.0 mph	12.1 mph
1975-1976	Moderate	9.9 mph	8.6 mph	7.6 mph	9.5 mph	11.3 mph	11.4 mph
1984-1985	Moderate	8.6 mph	7.8 mph	8.2 mph	8.7 mph	13.1 mph	10.8 mph
1988-1989	Strong	10.1 mph	10.1 mph	9.2 mph	10.7 mph	13.0 mph	11.8 mph
1995-1996	Weak	6.0 mph	6.6 mph	7.5 mph	8.0 mph	10.5 mph	11.1 mph
1998-1999	Moderate	6.6 mph	8.4 mph	8.0 mph	7.8 mph	10.6 mph	10.8 mph
1999-2000	Moderate	6.2 mph	7.9 mph	6.5 mph	8.1 mph	9.0 mph	10.3 mph
2000-2001	Weak	6.5 mph	5.3 mph	6.9 mph	8.1 mph	7.1 mph	11.0 mph
2007-2008	Moderate	4.3 mph	6.1 mph	6.1 mph	6.5 mph	7.6 mph	9.9 mph
30 Year Normal	N/A	7.3 mph	7.0 mph	7.1 mph	8.1 mph	9.6 mph	10.6 mph

Overall there are no correlations with average wind speed and La Niña in Las Vegas with the exception of strong La Niñas which tend to have windier than normal. The strong La Niña of 1988-1989 featured above average wind speeds throughout the cold season with much windier than normal conditions from November through March. Also of note is that the highest monthly average wind speed for April (1957) and December (1988) were both during La Niña episodes.

Fog

The table below lists the total number of days with fog and heavy fog (visibility dropping to or below $\frac{1}{4}$ of a mile) reported at McCarran International Airport during an El Niño episode (July-June period). Grey shading indicates a season with fog.

Episode	Strength of Episode	Number of Days With Fog At Las Vegas	Number of Days With Heavy Fog At Las Vegas
1951-1952	Weak	0	0
1957-1958	Moderate	1	1
1963-1964	Weak	0	0
1965-1966	Moderate	5	1
1968-1969	Weak	4	1
1969-1970	Weak	1	0
1972-1973	Strong	6	0
1976-1977	Weak	7	0
1977-1978	Weak	11	1
1982-1983	Strong	5	0
1986-1987	Moderate	11	0
1987-1988	Moderate	10	0
1991-1992	Moderate	7	2
1994-1995	Moderate	9	0
1997-1998	Strong	0	0
2002-2003	Moderate	0	0
2004-2005	Weak	3	1
2006-2007	Weak	0	0
30 Year Normal	N/A	N/A	0.6

Overall there does not appear to be any correlations between El Niño episodes and the occurrence of fog and heavy fog events in Las Vegas.

The table below lists the total number of days with fog and heavy fog (visibility dropping to or below ¼ of a mile) reported at McCarran International Airport during a La Niña episode (July-June period). Grey shading indicates a season with fog.

Episode	Strength of Episode	Number of Days With Fog At Las Vegas	Number of Days With Heavy Fog At Las Vegas
1949-1950	Moderate	0	0
1950-1951	Weak	0	0
1954-1955	Moderate	2	1
1955-1956	Strong	0	0
1956-1957	Weak	0	0
1964-1965	Moderate	1	1
1967-1968	Weak	1	0
1970-1971	Moderate	2	0
1971-1972	Weak	3	1
1973-1974	Strong	3	0
1974-1975	Weak	5	2
1975-1976	Moderate	4	1
1984-1985	Moderate	8	1
1988-1989	Strong	3	1
1995-1996	Weak	6	0
1998-1999	Moderate	1	1
1999-2000	Moderate	1	1
2000-2001	Weak	0	0
2007-2008	Moderate	0	0
30 Year Normal	N/A	N/A	0.6

Overall there does not appear to be any correlations between La Niña episodes and the occurrence of fog and heavy fog events in Las Vegas.

Tornadoes

The table below lists the total number of tornadoes reported for years with an El Niño episode (July-June period). The column on the right lists the number of cold season tornadoes.

Episode	Strength of Episode	Total Number of Tornadoes	Total Number of Cold Season (November-April) Tornadoes
1951-1952	Weak	0	0
1957-1958	Moderate	0	0
1963-1964	Weak	0	0
1965-1966	Moderate	0	0
1968-1969	Weak	0	0
1969-1970	Weak	0	0
1972-1973	Strong	0	0
1976-1977	Weak	0	0
1977-1978	Weak	0	0
1982-1983	Strong	0	0
1986-1987	Moderate	0	0
1987-1988	Moderate	0	0
1991-1992	Moderate	2	2
1994-1995	Moderate	0	0
1997-1998	Strong	0	0
2002-2003	Moderate	0	0
2004-2005	Weak	0	0
2006-2007	Weak	0	0
30 Year Normal	N/A	N/A	N/A

There have only been a total of five confirmed tornadoes in the Las Vegas Valley since the start of records. Two of them happened during El Niño episodes and took place in the cold season on the same date, March 30, 1992, one being rated a F0 and the other a F1. These are also the only two cold season tornadoes to occur in the Las Vegas Valley. The amount of tornadic data is insufficient to determine any conclusions.

The table below lists the total number of tornadoes reported for years with a La Niña episode (July-June period). The column on the right lists the number of cold season tornadoes.

Episode	Strength of Episode	Total Number of Tornadoes	Total Number of Cold Season (November-April) Tornadoes
1949-1950	Moderate	0	0
1950-1951	Weak	0	0
1954-1955	Moderate	0	0
1955-1956	Strong	0	0
1956-1957	Weak	0	0
1964-1965	Moderate	0	0
1967-1968	Weak	0	0
1970-1971	Moderate	0	0
1971-1972	Weak	0	0
1973-1974	Strong	0	0
1974-1975	Weak	0	0
1975-1976	Moderate	0	0
1984-1985	Moderate	0	0
1988-1989	Strong	0	0
1995-1996	Weak	0	0
1998-1999	Moderate	1	0
1999-2000	Moderate	0	0
2000-2001	Weak	0	0
2007-2008	Moderate	0	0
30 Year Normal	N/A	N/A	N/A

Only one tornado occurred during a La Niña episode in the Las Vegas Valley, and this was during September 1998. No cold season tornadoes have ever occurred in the Las Vegas Valley during a La Niña episode. The amount of data is insufficient to determine any conclusions due to the low frequency of tornadic events in the Las Vegas Valley.

Conclusions

Overall, the most significant correlation in the Las Vegas Valley with respect to El Niño and La Niña involved precipitation. El Niño episodes in Las Vegas tend to have normal to above normal precipitation for the period July-June as well as during the cold season months of November through April and to a lesser extent when just the December through February period was analyzed. La Niña episodes tend to have normal to below normal precipitation during both the July-June season and in the cold season months from November through April. The chances for measurable snow, especially significant measurable snows in excess of 2 inches, is greater than normal during a La Niña episode and less likely than normal during an El Niño episode.

During the three strong El Niño events, near normal to below normal temperature have been observed during meteorological winter (December, January and February). Due to the significant increase in average temperature from anthropogenic effects over the past few decades, the effects from other phenomenon, including El Niño and La Niña, are difficult to assess and no definitive conclusions can be made. No correlations were able to be determined for the occurrences of freezes, hard freezes, fog, and tornadoes in both El Niño and La Niña episodes due to limited amount of data. Windier than normal conditions were noted during strong La Nina episodes and overall La Nina episodes tend to be windier than El Niño events.

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