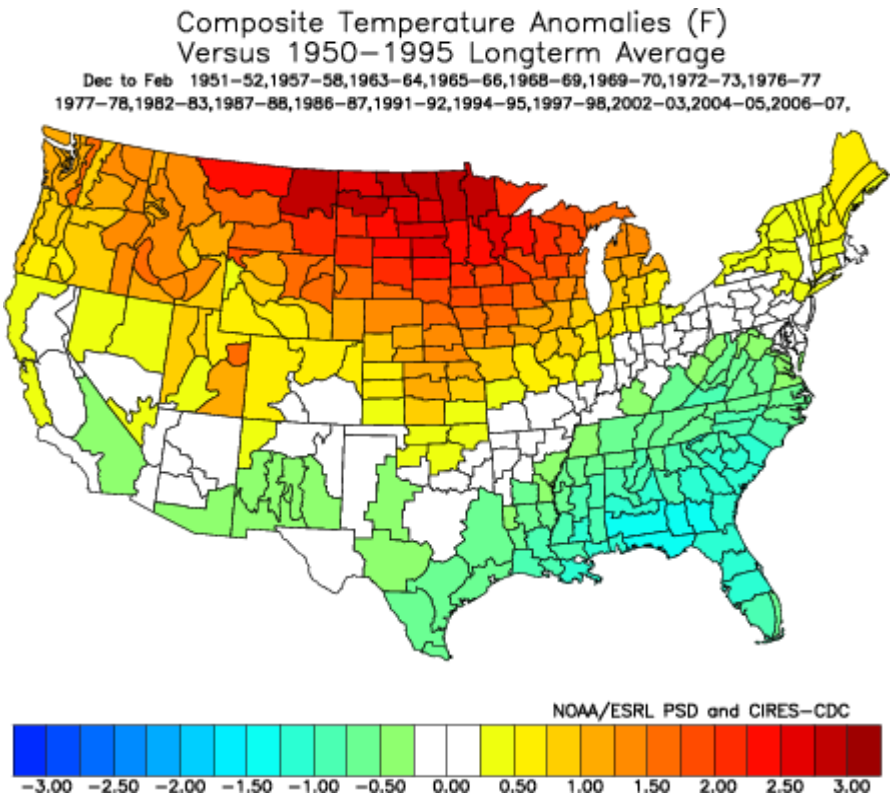
El Nino Impacts in Iowa

Prepared by: Craig Cogil

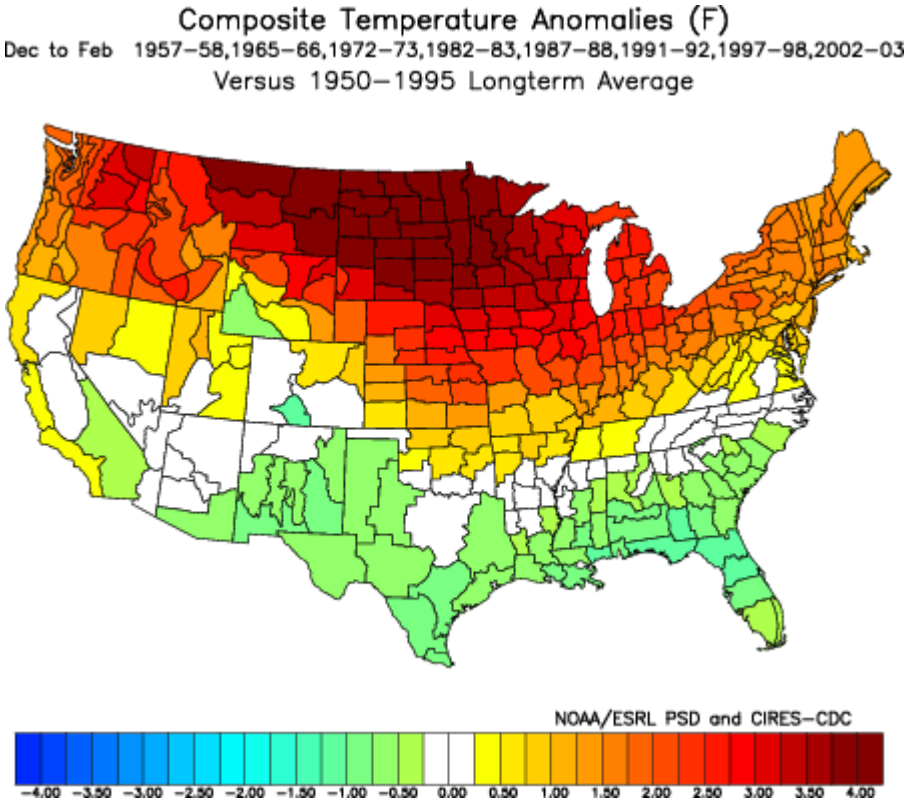
El Nino conditions currently exist across the equatorial Pacific Ocean. El Nino conditions are characterized by above normal sea surface temperatures near the equator in the eastern and central portions of the equatorial Pacific Ocean. While these conditions exist many thousands of miles away from Iowa, impacts from El Nino can be observed in Iowa and surrounding areas. El Nino and La Nina conditions are determined by the Oceanic Nino Index (ONI). For more information on the ONI, please click here. Meeting and exceeding the 0.5C threshold for 5 consecutive over-lapping seasons would be considered an El Nino.

Impacts on both temperature and precipitation become apparent across the county, including Iowa when El Nino years are compared to the average conditions. In this write-up, we will look at the historical impacts in Iowa from late fall into early spring. This may give us some insight as to what may happen this upcoming winter.

In the 1st graphic, we will look at temperature departures from average for all El Nino years from 1950-2008. Temperatures anomalies across the state average from about 1.0 to 2.0 degrees above normal during the winter months. However, not every year had above normal temperatures. For both Des Moines and Waterloo, 11 out of the 18 El Nino years had above normal readings or just over 60% of the time during El Nino. In fact, two very cold years occurred during El Nino episodes including the winters of 1976-1977 and 1977-1978. In other words, El Nino does not guarantee a warm winter, but certainly shifts the probabilities in that direction.



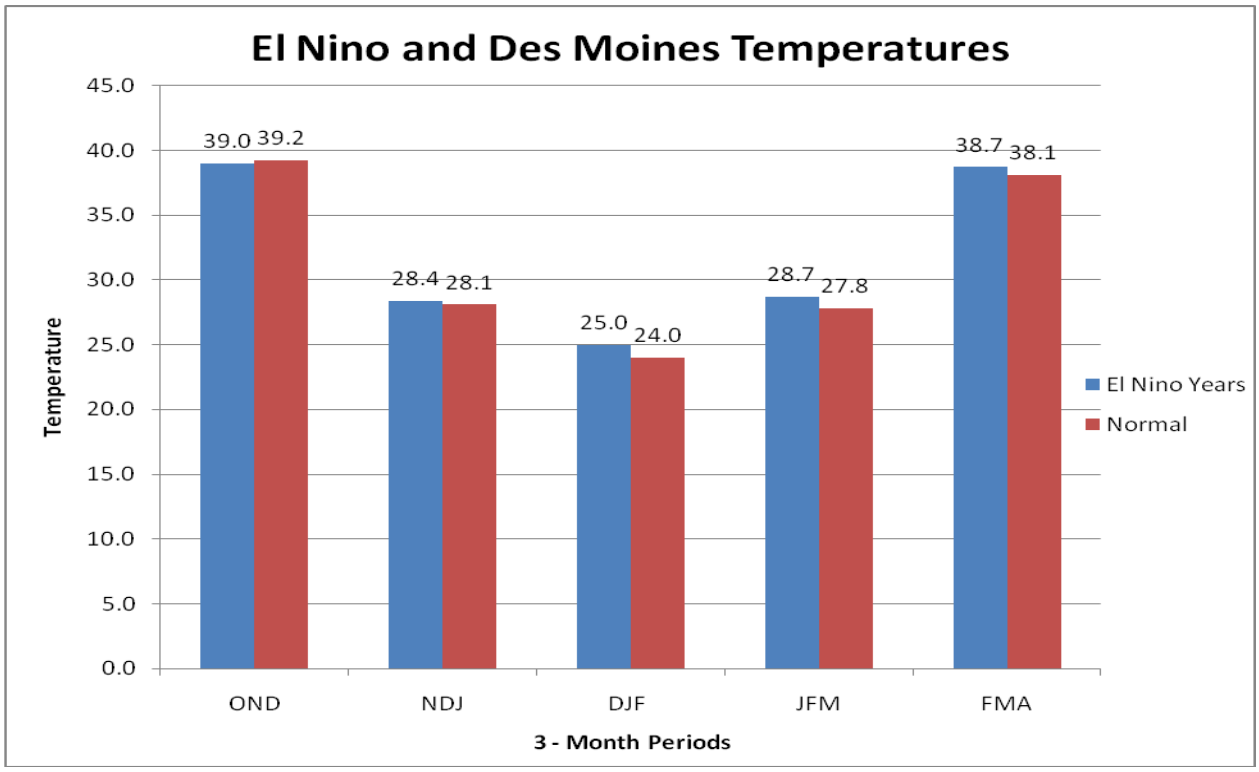
The 2nd graphic shows the temperature anomalies from the strongest El Nino's since 1950. An even stronger signal for above normal readings is apparent with Iowa temperatures ranging from about 2.5 to 3.5 degrees above normal. 6 out 8 years were above normal at both Des Moines and Waterloo or 75% of the time.

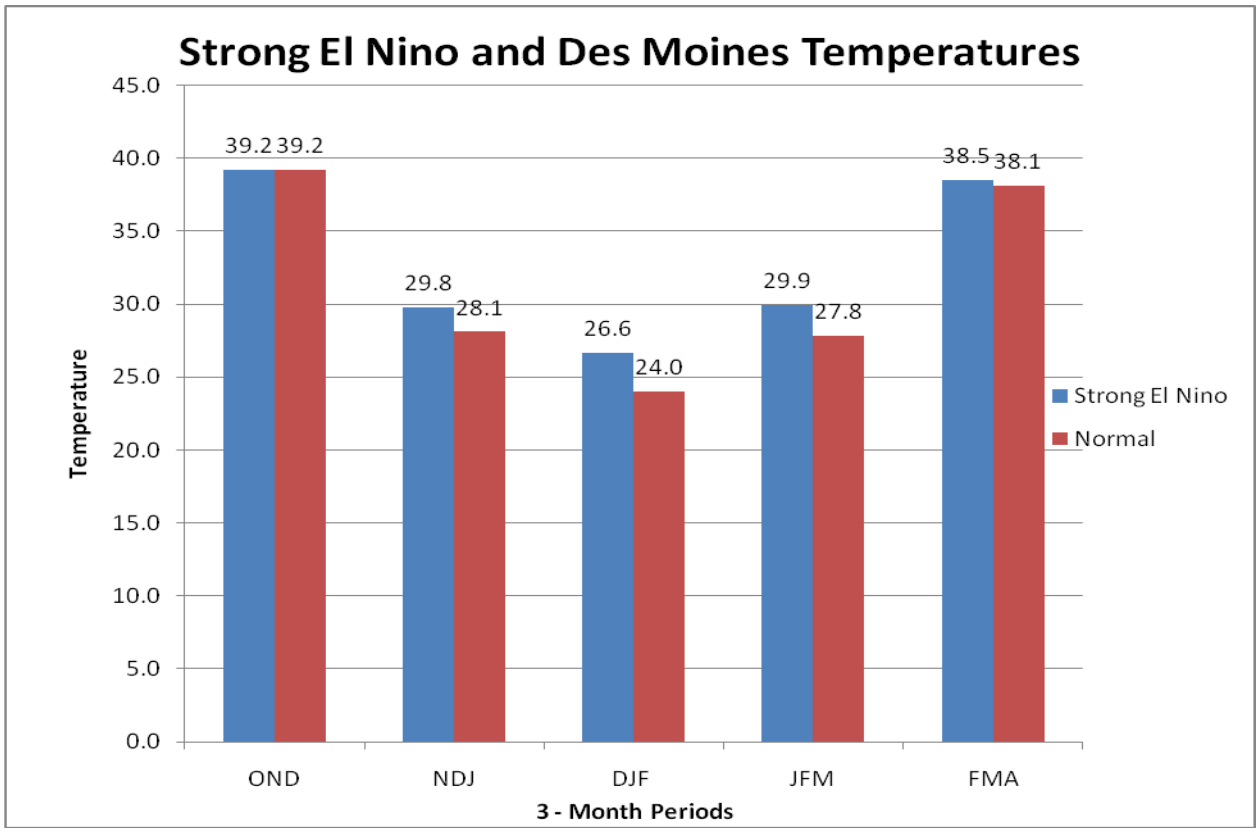


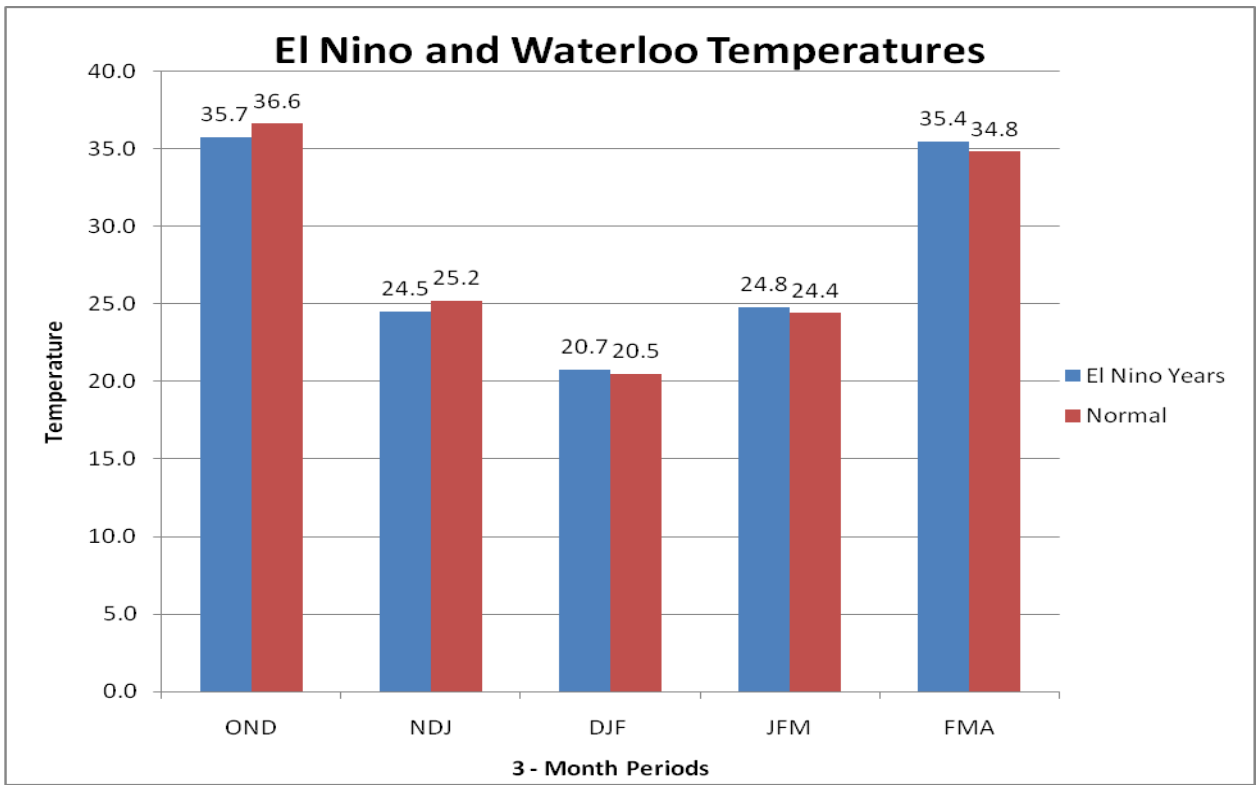
The next two graphs look at temperature departure for Des Moines during El Nino winters. The first graph is a comparison of temperatures between normal and El Nino years. This does indicate that the winter months tend to be warmer than normal during an "average" El Nino with a departure of 1.0F during the winter months of December, January and February (DJF on the graph).

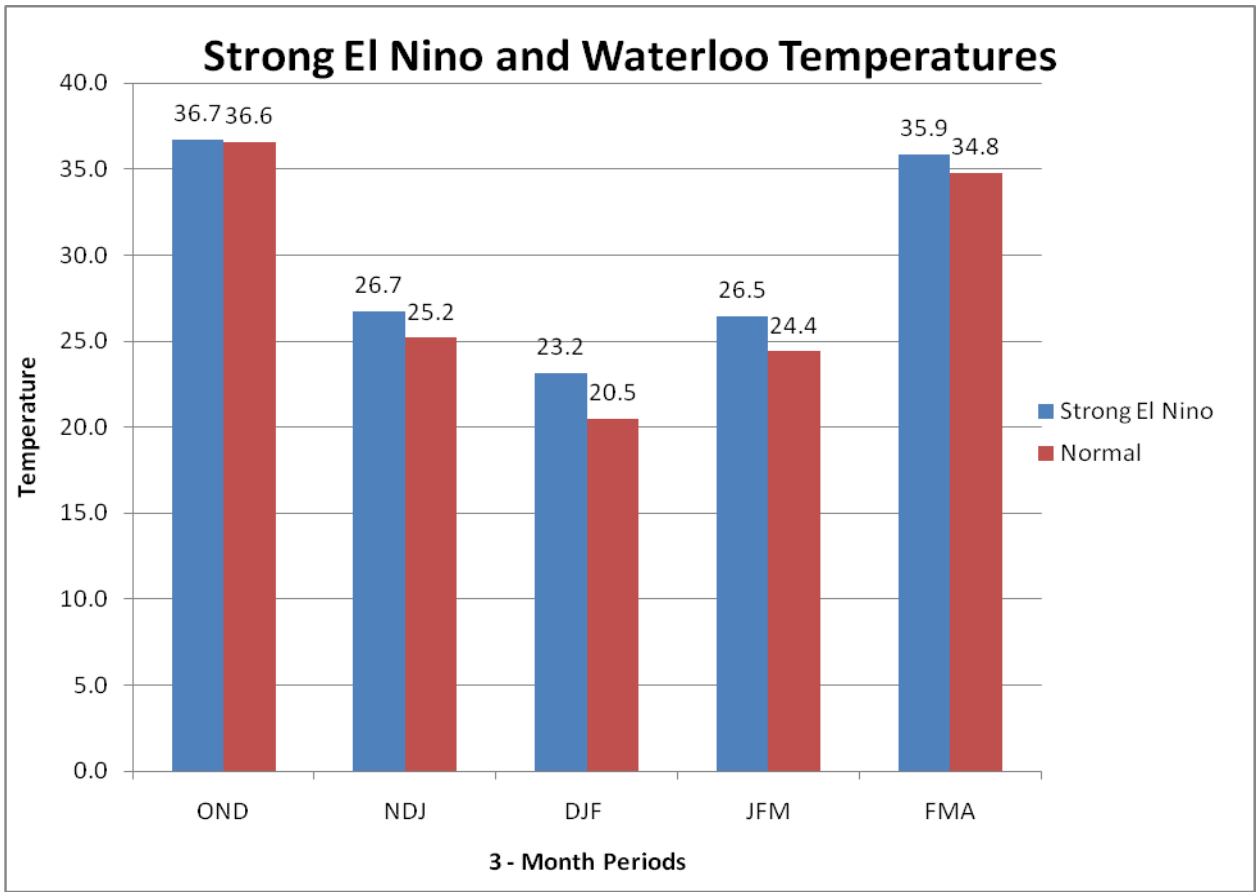
The second graph is a comparison of normal and relatively strong El Nino years (ONI > 1.4). There is a much stronger signal for above normal temperatures during these stronger events with Des Moines averaging 2.6 F degrees above normal.

The subsequent graphs are the same but for Waterloo. Similar results can be seen.

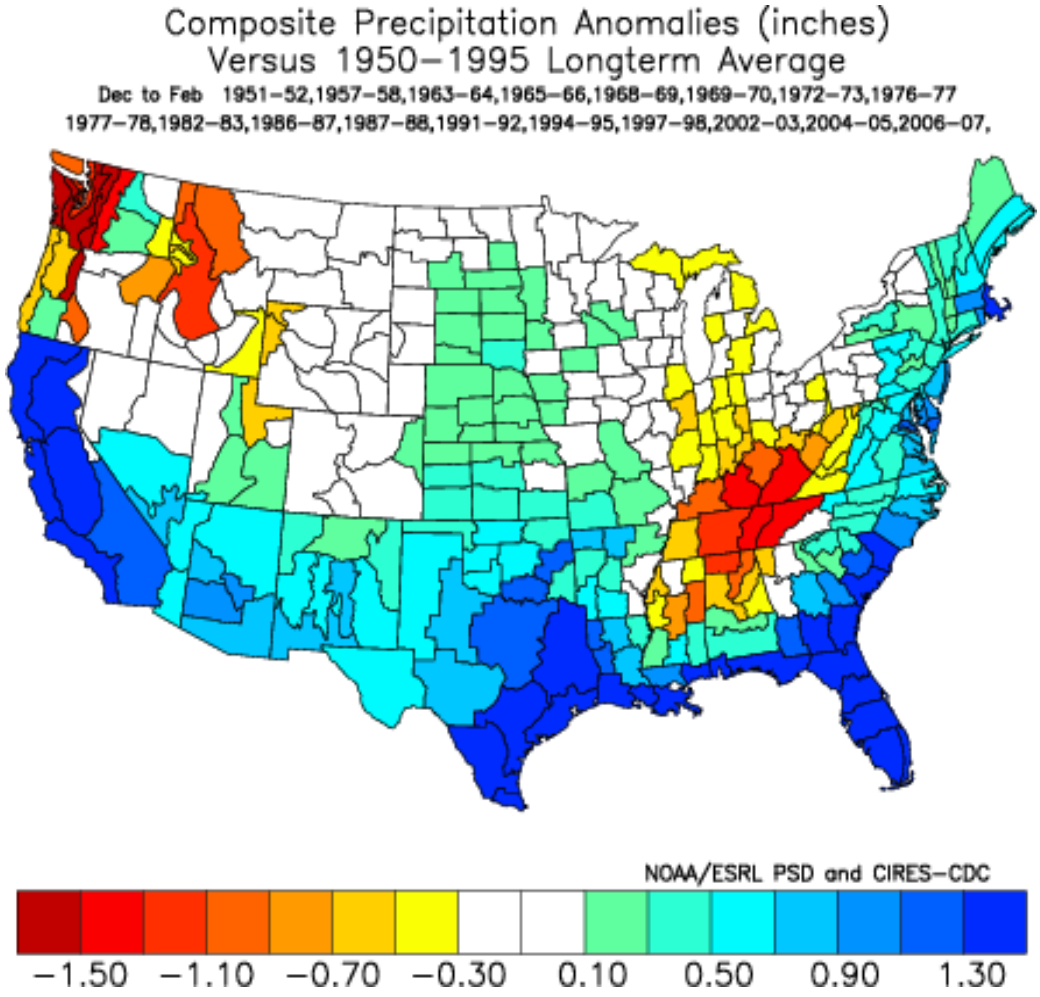

El Nino and Des Moines Temperatures
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Temperature
39.0 39.2
28.4 28.1
25.0 24.0
28.7 27.8
38.7 38.1
OND
NDJ
DJF
JFM
FMA
3 - Month Periods
El Nino Years
Normal


Strong El Nino and Des Moines Temperatures
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Temperature
39.2 39.2
29.8 28.1
26.6 24.0
29.9 27.8
38.5 38.1
OND
NDJ
DJF
JFM
FMA
3 - Month Periods
Strong El Nino
Normal

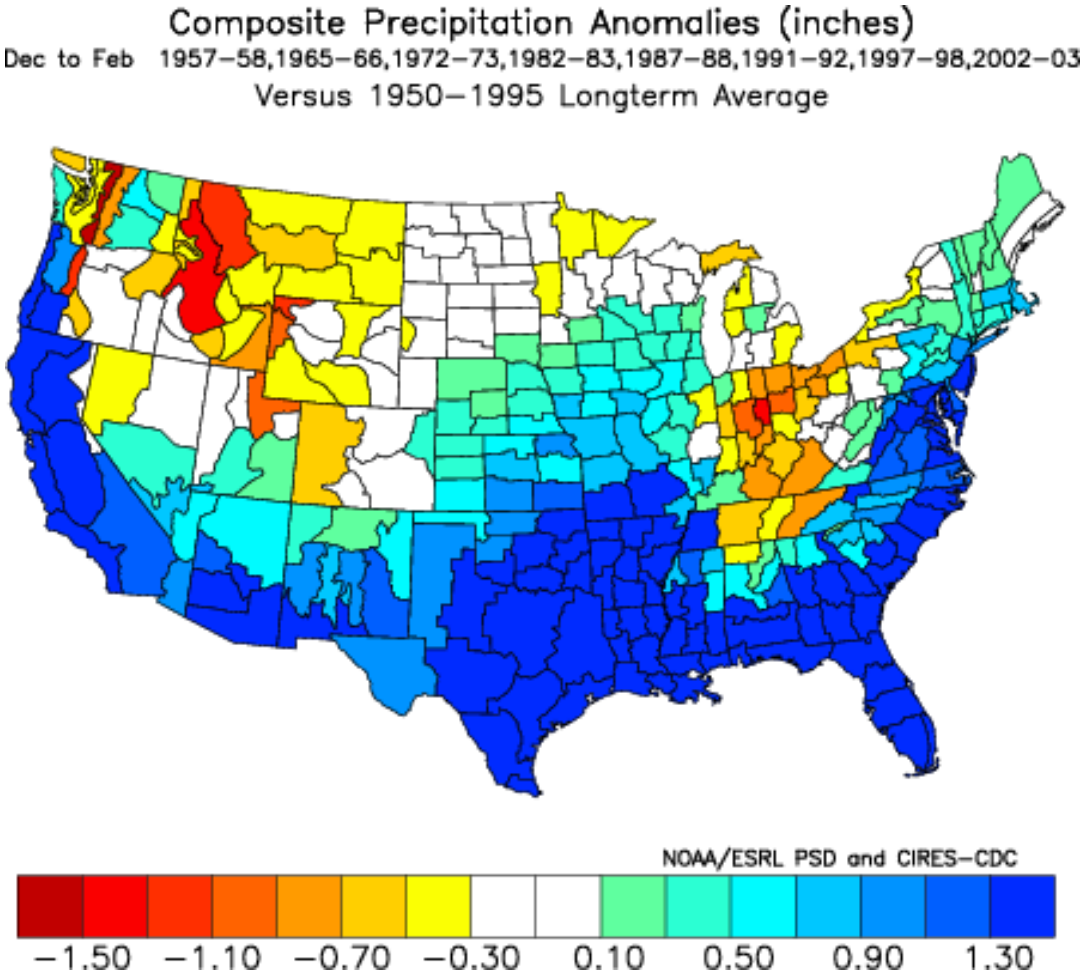

El Nino and Waterloo Temperatures
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Temperature
35.7
36.6
24.5
25.2
20.7
20.5
24.8
24.4
35.4
34.8
OND
NDJ
DJF
JFM
FMA
3 - Month Periods
El Nino Years
Normal


Strong El Nino and Waterloo Temperatures
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Temperature
36.7
36.6
26.7
25.2
23.2
20.5
26.5
24.4
35.9
34.8
OND
NDJ
DJF
JFM
FMA
3 - Month Periods
Strong El Nino
Normal

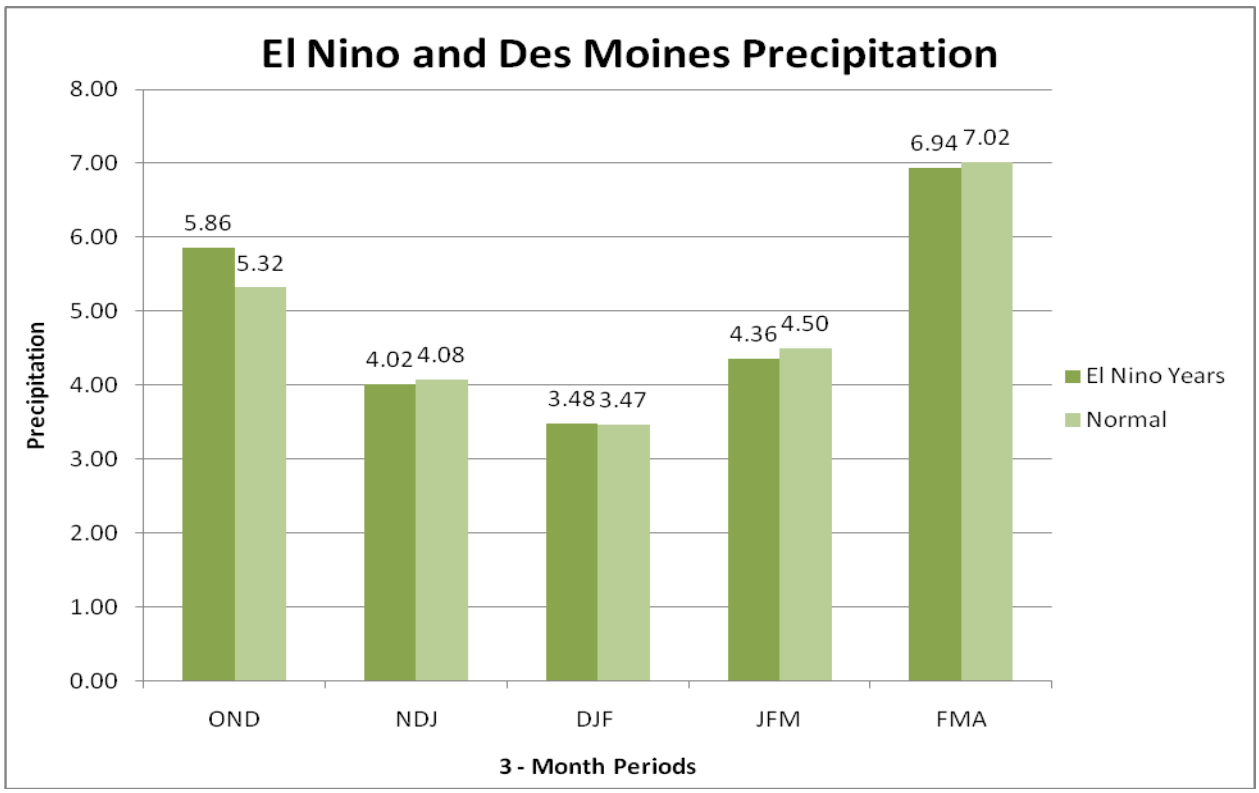
The next image indicates that precipiation across the county also has a distinct pattern during El Nino. The southern United States sees above average rainfall along with portions of the High Plains and the East Coast. The Pacific Northwest, the Lower Ohio and Tennessee River Valleys generally see below normal precipiation. Iowa generally sees above normal precipitation in the west with near normal precipitation elsewhere when all El Nino espisodes are considered.

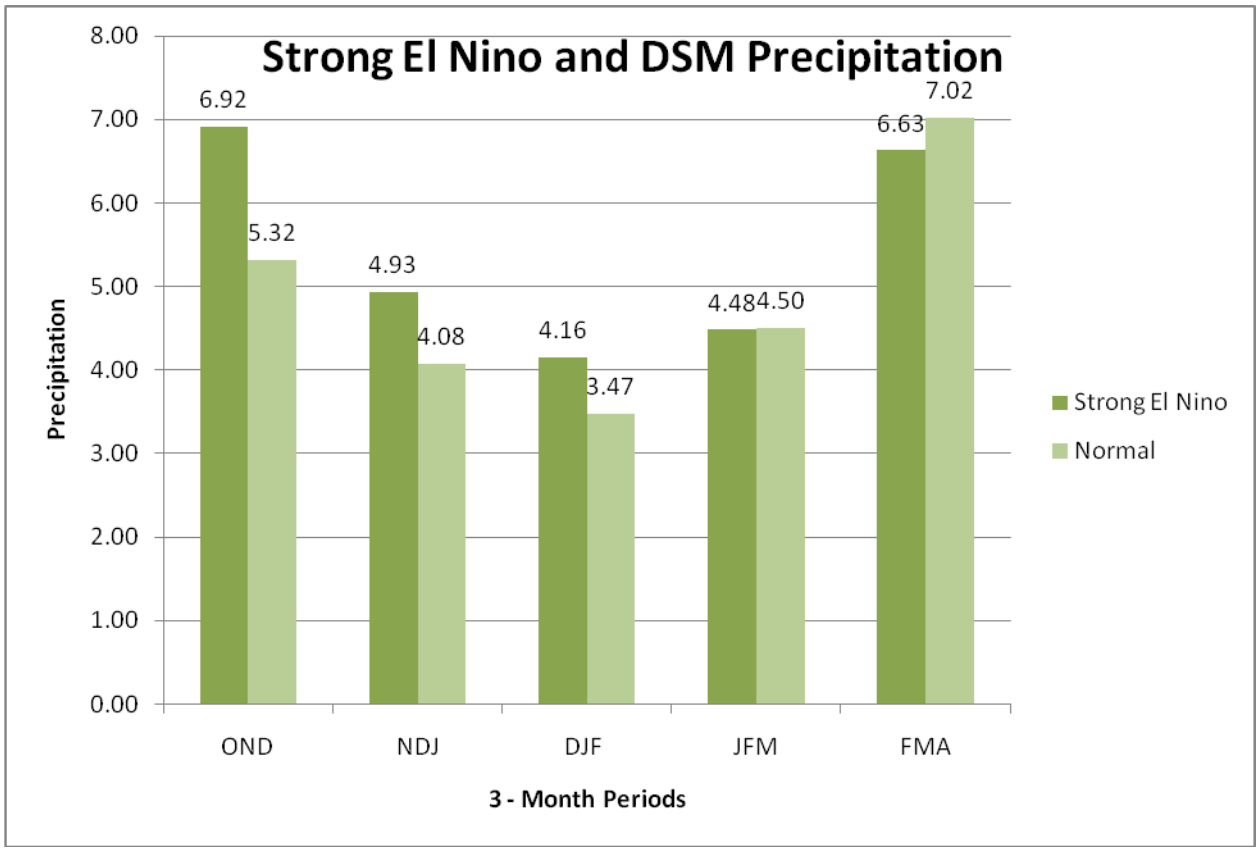


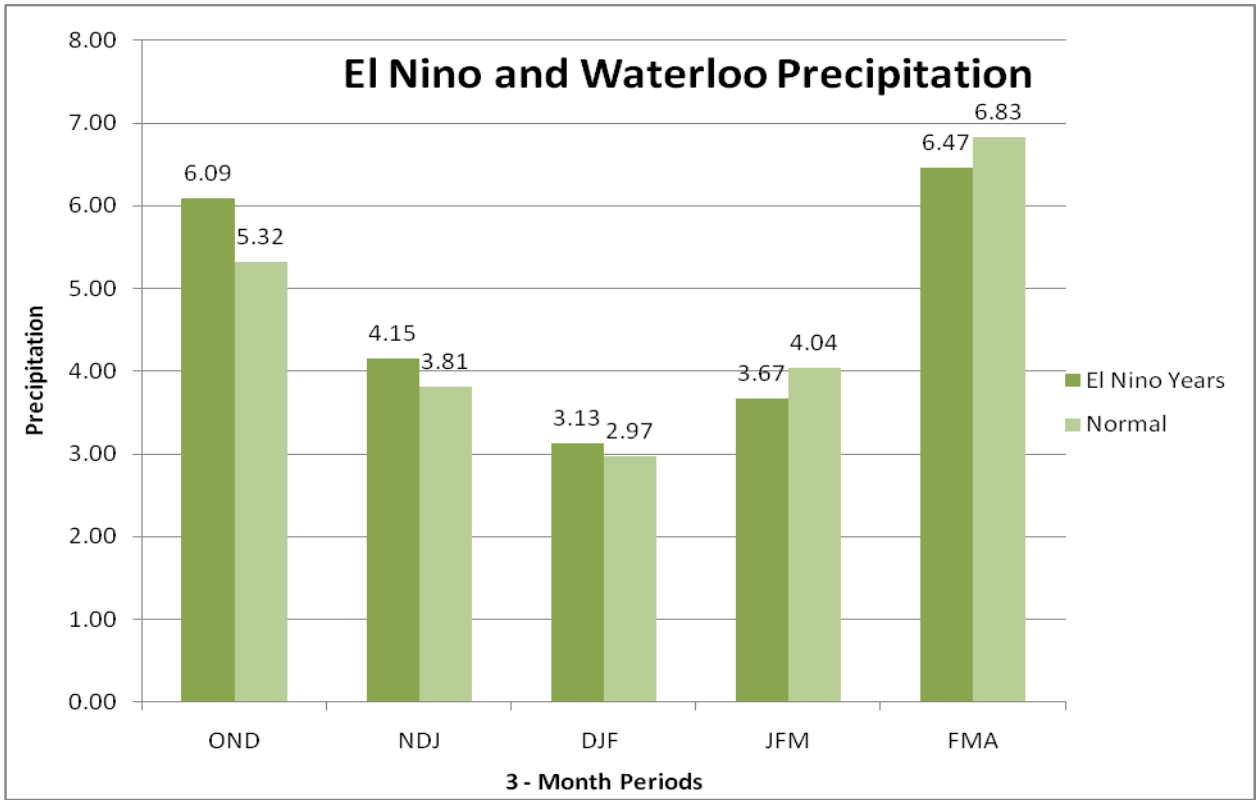
The second image below is for relatively strong El Nino cases (ONI > 1.4). This indicates a stronger signal for above normal precipitation into Iowa during the more intense El Nino's. California, the Deep South and the East Coast all continue to have strong indications of above normal precipitation as well. The drier than normal areas continue to be in the Pacific Northwest and the Ohio River Valley. Iowa certainly trends wetter during the strong episodes with the highest departure across the south.

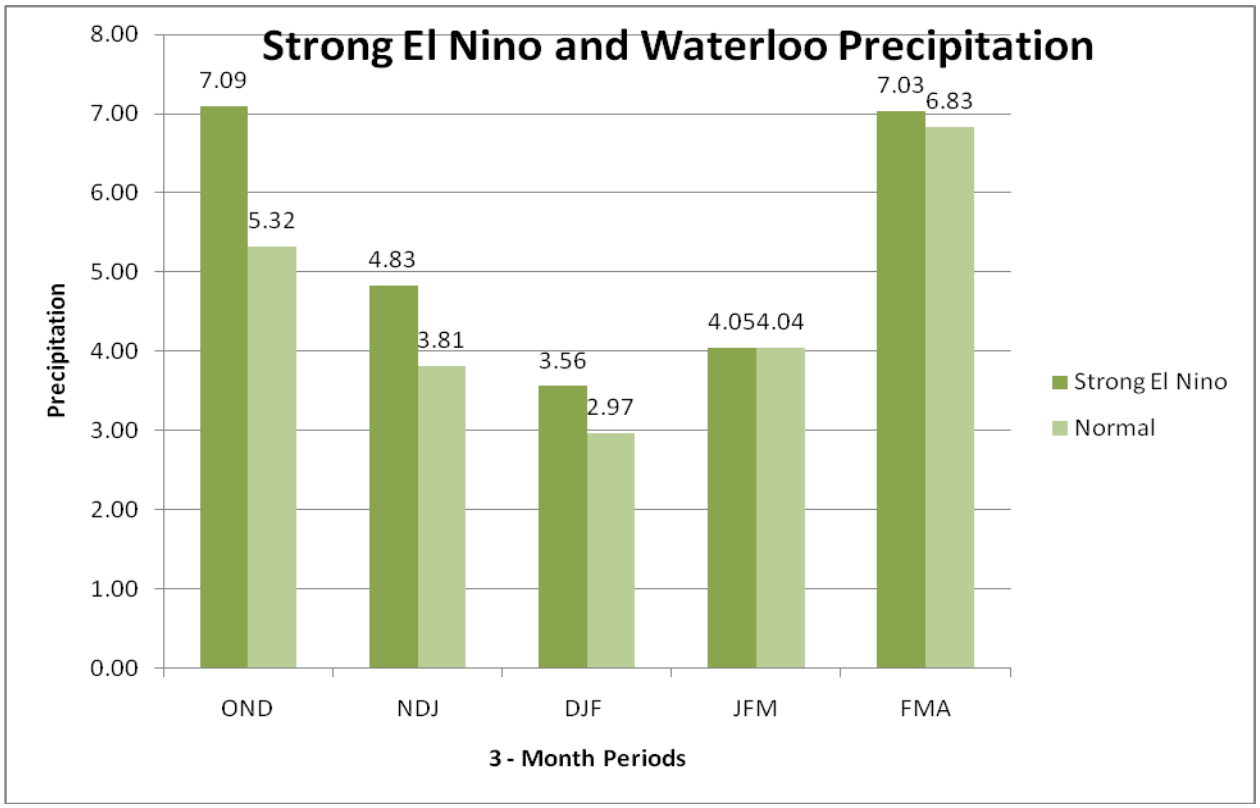


The following graphs are similar to the previous graphs but are for precipitation amounts in Des Moines and Waterloo. The 1st graph for both locations shows El Nino precipitation vs. normal precipitation for all El Nino events. The 2nd graph would be for the same except for only strong El Nino cases. In all El Nino cases, the falls tend to be slightly wetter than normal becoming near normal during the height of winter, then slightly below normal into early spring. For strong El Nino's, the wet conditions in fall tend to carry over into winter. Then precipitation trends to more normal heading into the early spring.


El Nino and Des Moines Precipitation
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Precipitation
5.86
5.32
4.02
4.08
3.48
3.47
4.36
4.50
6.94
7.02
OND
NDJ
DJF
JFM
FMA
3 - Month Periods
El Nino Years
Normal


Strong El Nino and DSM Precipitation
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Precipitation
6.92
5.32
4.93
4.08
4.16
3.47
4.48
4.50
6.63
7.02
OND
NDJ
DJF
JFM
FMA
3 - Month Periods
Strong El Nino
Normal


El Nino and Waterloo Precipitation
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Precipitation
6.09
5.32
4.15
3.81
3.13
2.97
3.67
4.04
6.47
6.83
OND
NDJ
DJF
JFM
FMA
3 - Month Periods
El Nino Years
Normal


Strong El Nino and Waterloo Precipitation
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Precipitation
7.09
5.32
4.83
3.81
3.56
2.97
4.054.04
7.03
6.83
OND
NDJ
DJF
JFM
FMA
3 - Month Periods
Strong El Nino
Normal

The upcoming seasonal outlooks for the nation can be found at the Climate Prediction Center website.

For the specific 3 – month outlooks across the nation, click here.

For local temperature outlooks for central Iowa, click here.

For any questions or comments, please contact craig.cogil@noaa.gov