

Historic Heat Wave

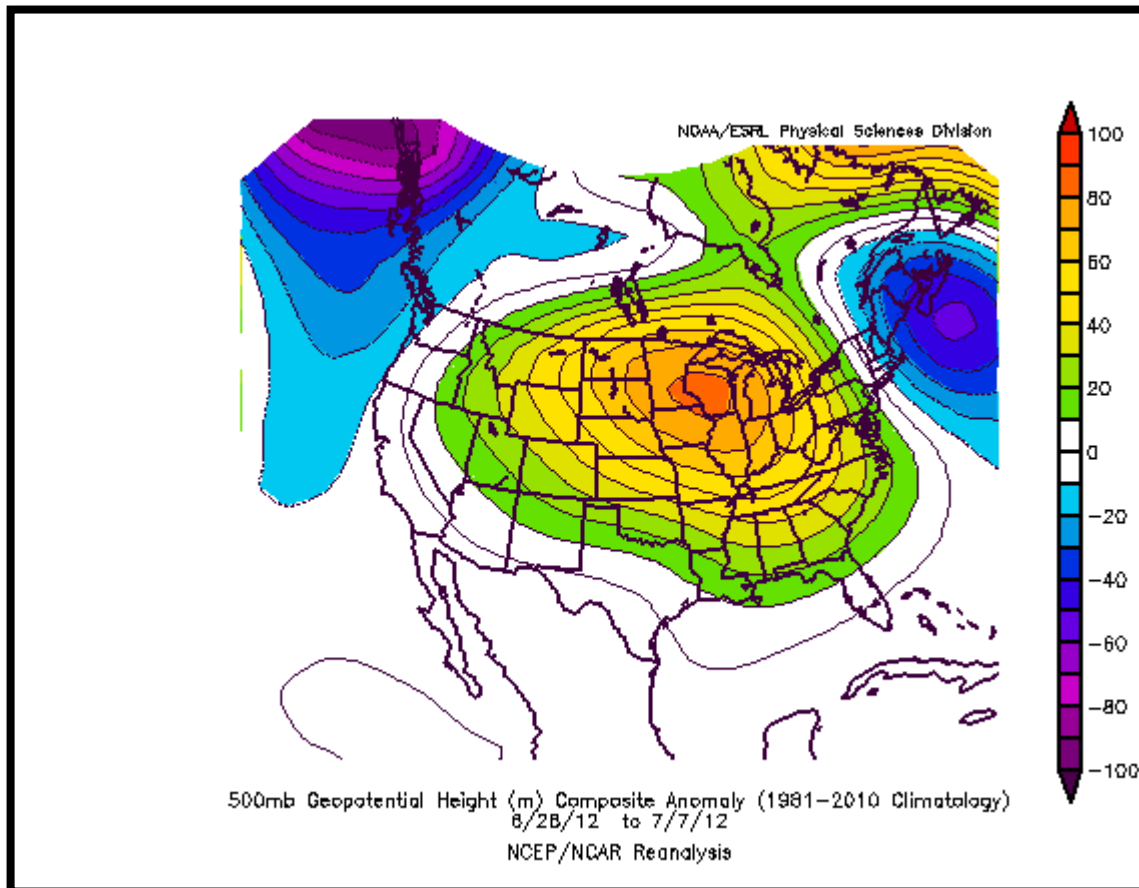
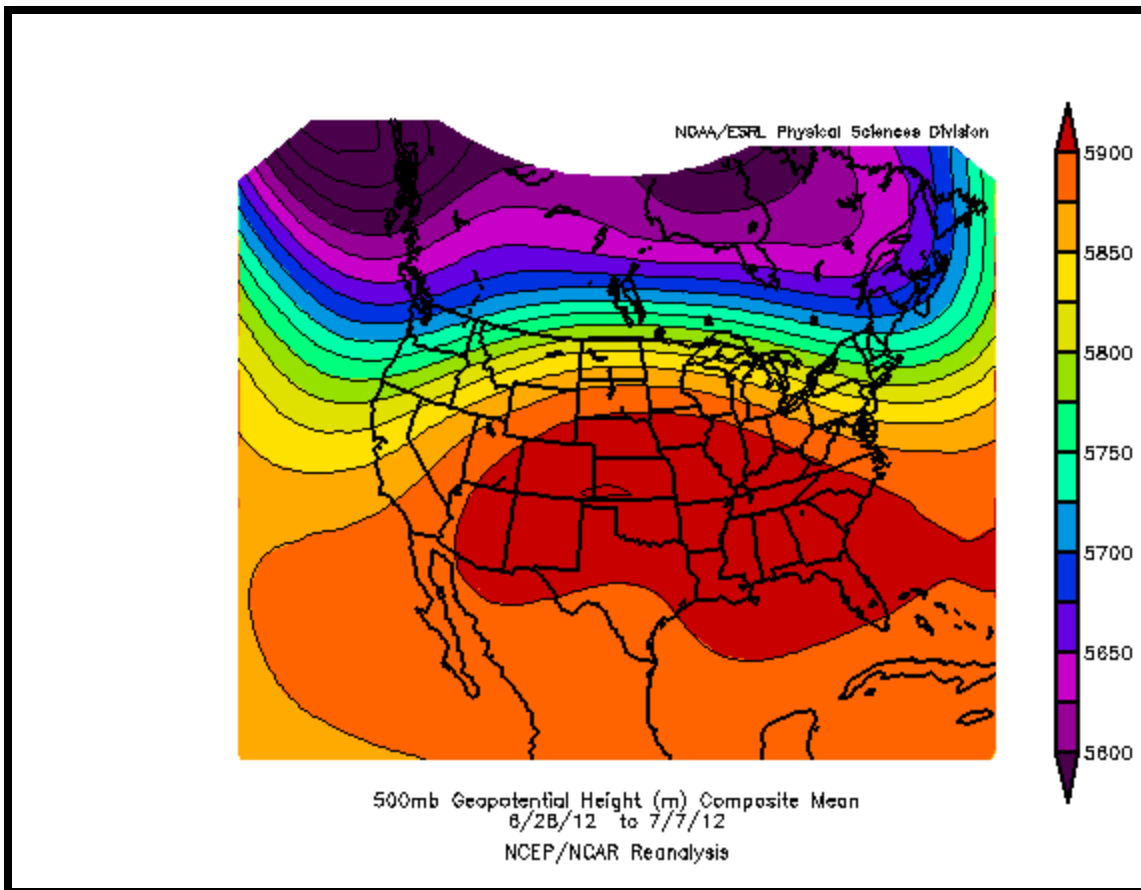
2012

Overview

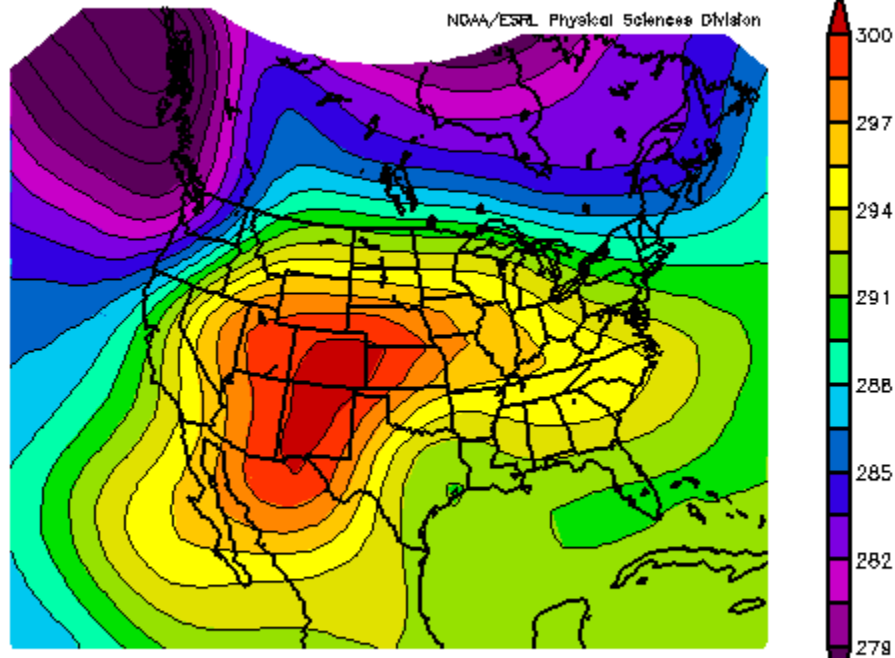
A historic heat wave built across the Midwest the last four days of June and continued through the holiday week, finally coming to an end on July 8th. The heat wave has been responsible for 18 deaths in the St. Louis metropolitan area. The maps below are a composite or averaged data from the period of June 28th through July 7th. Reanalysis data is often constructed to obtain patterns that are representative of certain weather phenomenon, which in this case of course, is a historic heat wave. Meteorologists also like to compare these mean plots to climatology or normal values to quantify the anomaly or difference. The following plots represent the height of 500 millibars (mb) (~20,000' above mean sea level (MSL)), temperatures at 850 mb (~5,000' above MSL), and surface temperatures. The anomalies of each are directly below them. Temperatures are in Kelvin and heights are in meters.

The large area of red on the 500 mb geopotential height map indicates that large area of high pressure in the middle atmosphere covered much of the country. This acted to keep the active storm track up along the U.S./Canadian border which suppressed rainfall over much of the central part of the country. This also brought almost cloud free skies which allowed for full solar heating during some of the longest days of the year. The 500mb anomaly map also shows that the pressure was above the mean for the ten day period, particularly over the Midwest. The 850mb temperature map showed that temperatures around 5000' MSL across Missouri and Illinois are around 296 Kelvin or +23° Celsius. The 850mb anomaly map showed that these temperatures were 4-7°C above normal. The surface temperature maps also show large areas over the lower and middle Mississippi Valley and the Central Plains over 303 Kelvin (30°C or 86°F). This is very impressive because this is an average 24 hour temperature for 10 straight days.

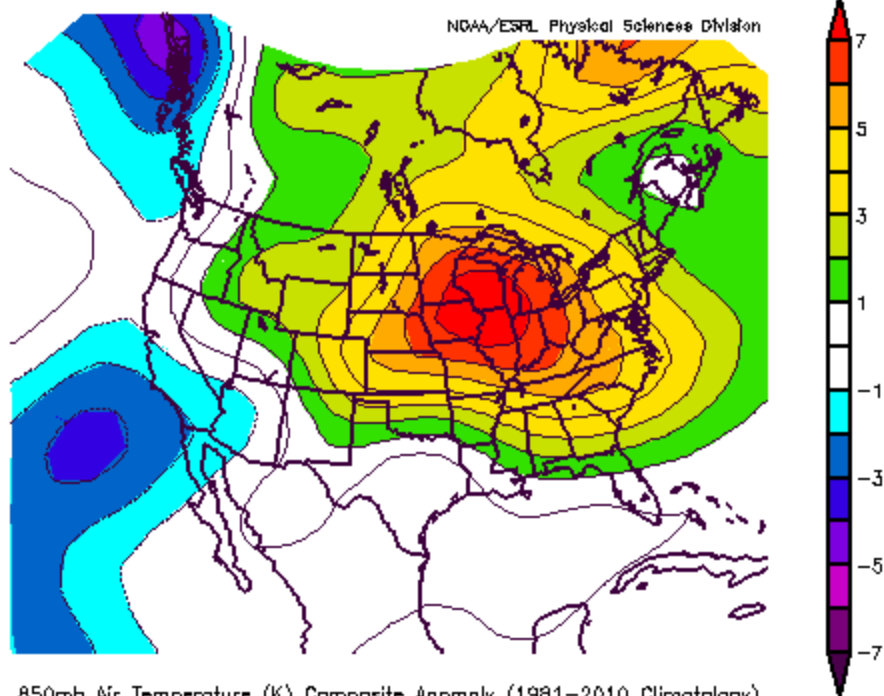
Environment-500 mb Heights



Environment-850 mb Temperatures

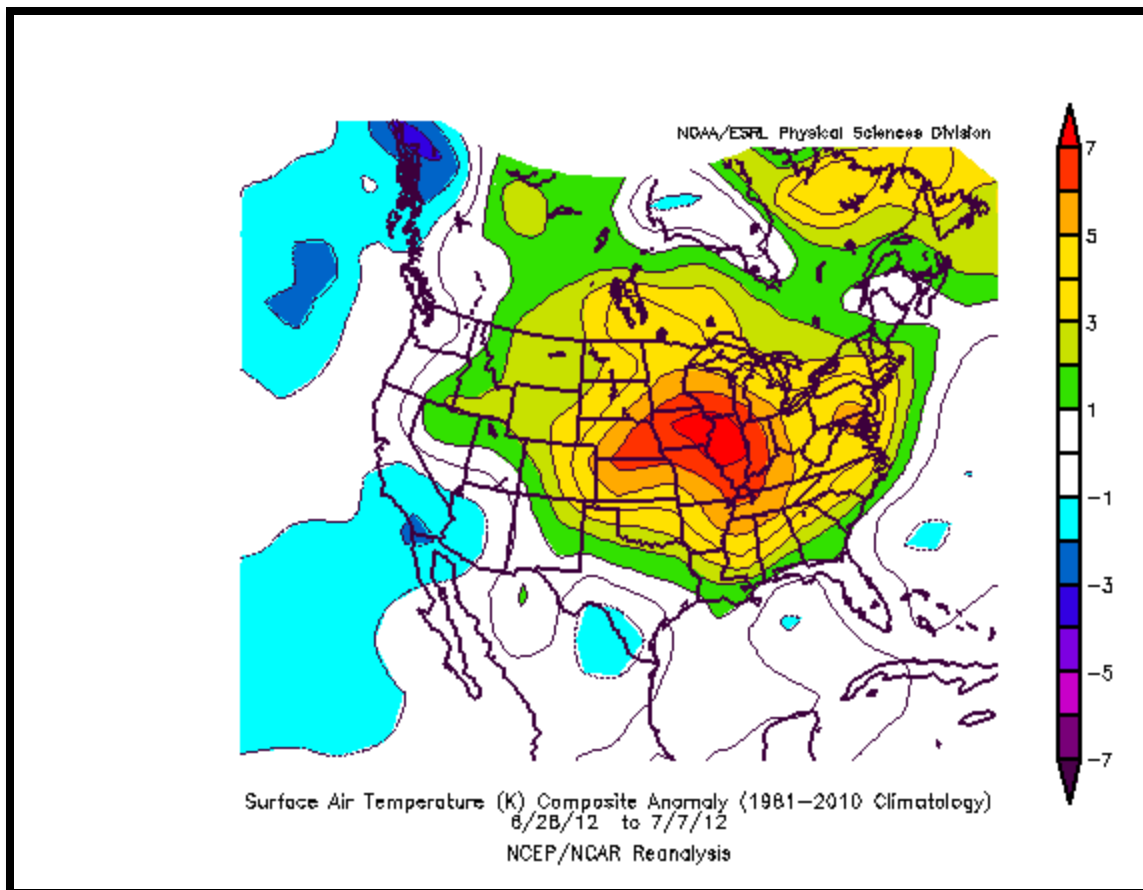
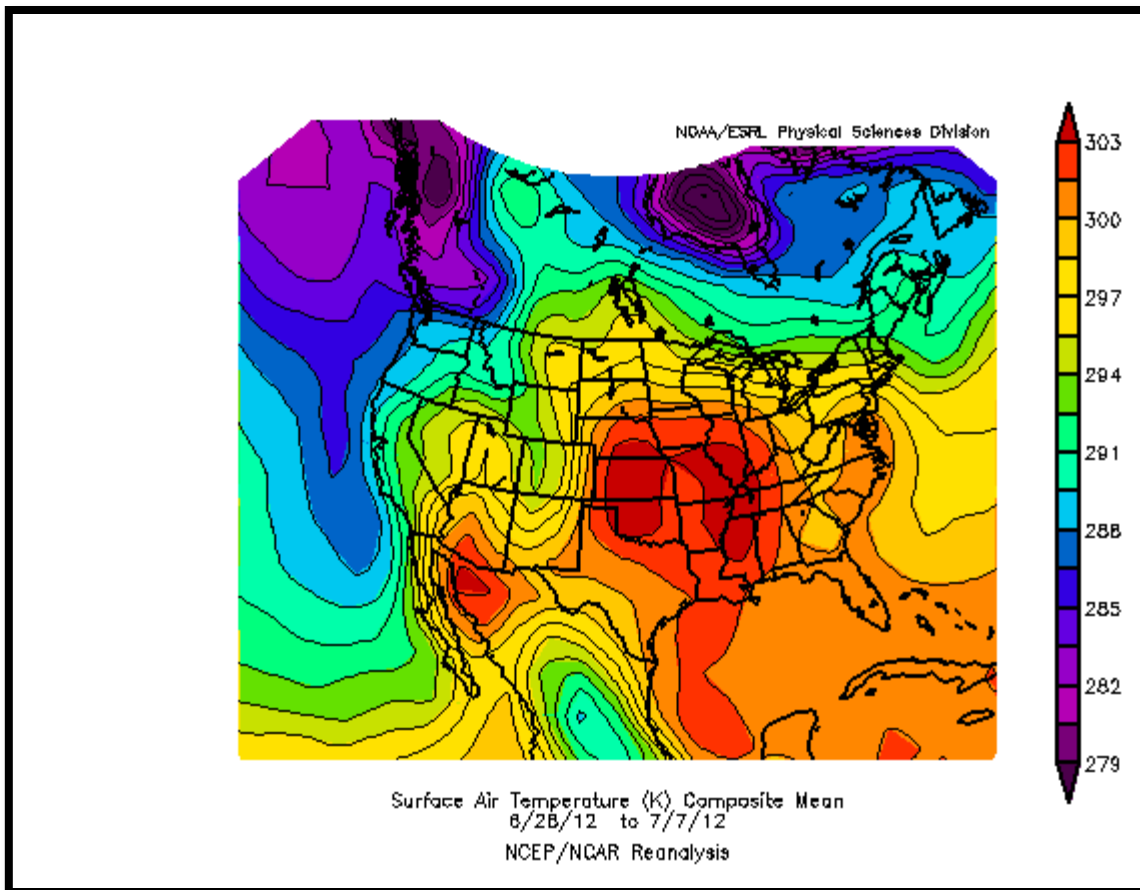


850mb Air Temperature (K) Composite Mean
8/28/12 to 7/7/12
NCEP/NCAR Reanalysis



850mb Air Temperature (K) Composite Anomaly (1981-2010 Climatology)
8/28/12 to 7/7/12
NCEP/NCAR Reanalysis

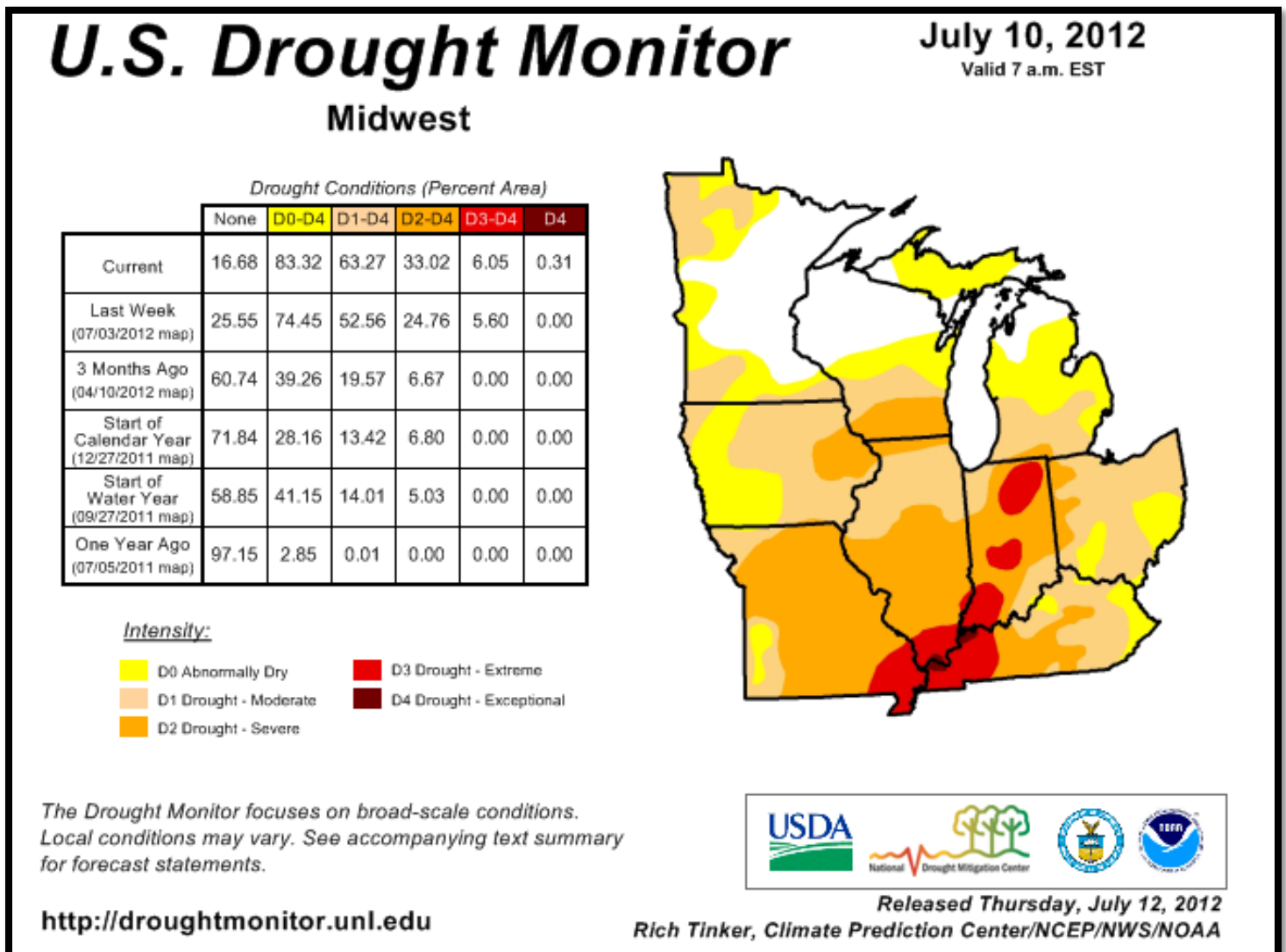
Environment-Surface Temperatures



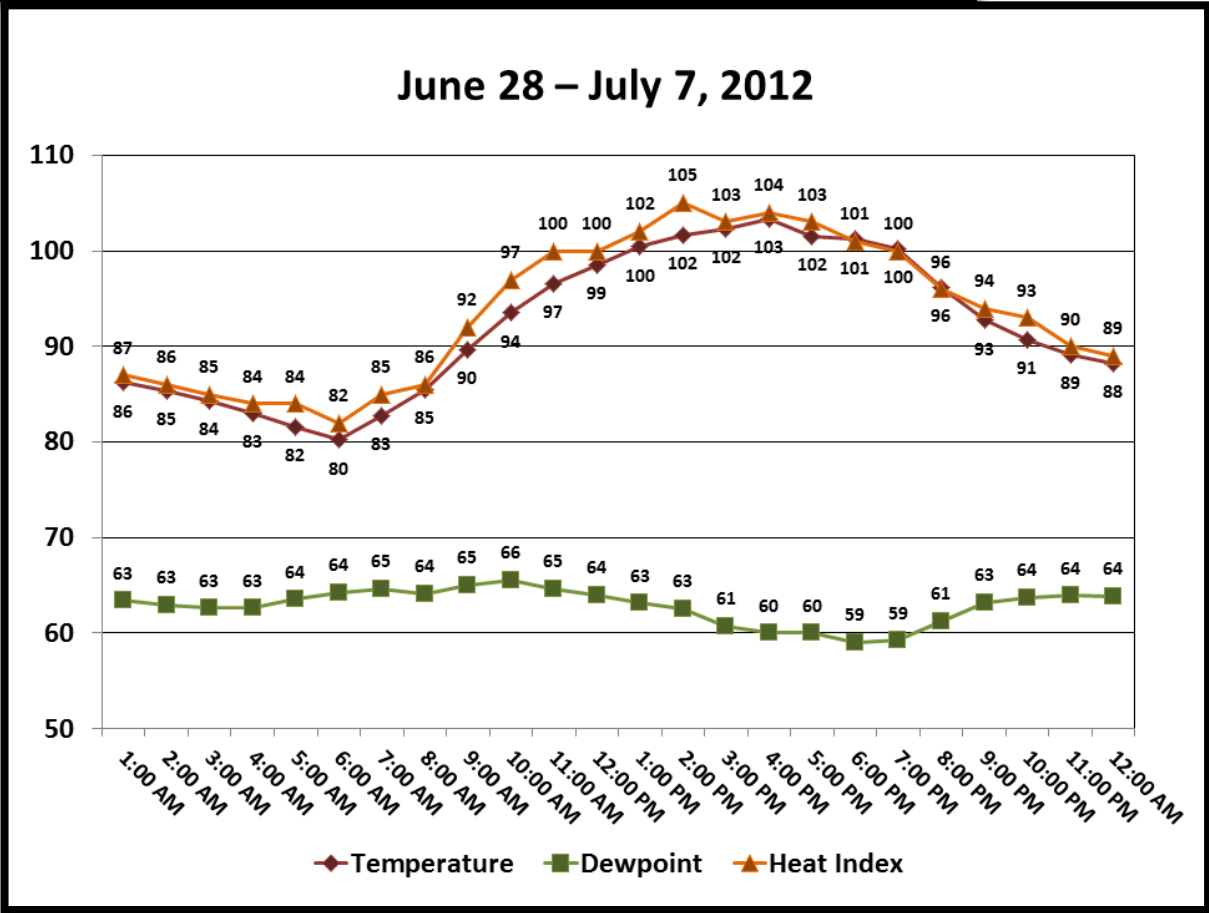
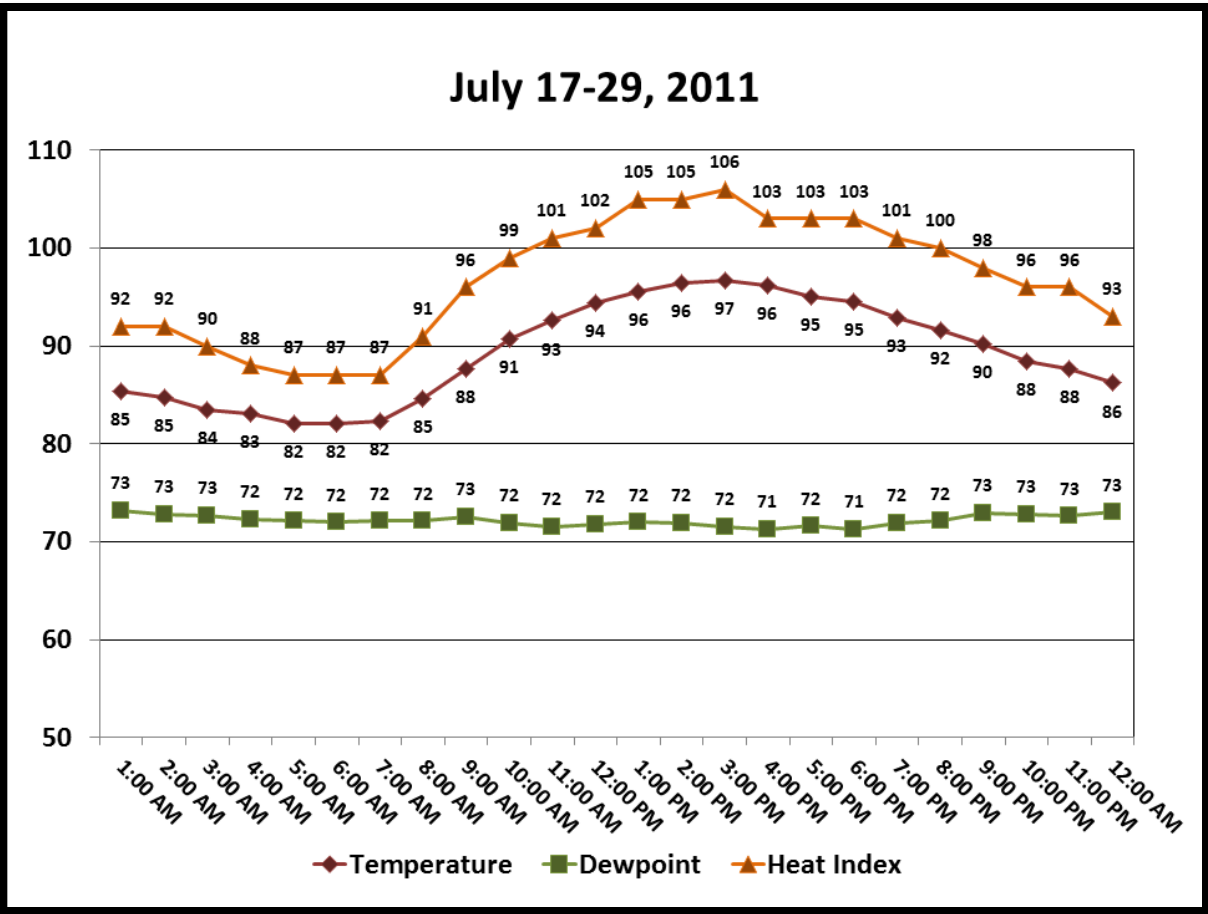
Severe Drought Contributions

Below are average hourly temperature, dewpoint, and heat index for two 10 day periods during excessive heat waves, one from July 17-29, 2011 and the other from the recent heat wave. The 2011 heat wave is more typical of the excessive heat events that have occurred in recent years in eastern Missouri and southwest Illinois. The hourly dewpoint varies little and remains in the 70s throughout the entire 24 hour period. The temperature does not fall below 80° at night and climbs into the upper 90s during the afternoon. The resulting heat index remains above the temperature and climbs to dangerous levels during the afternoon. In 2011 we were not in a drought, and there was evapotranspiration from the healthy, green vegetation.

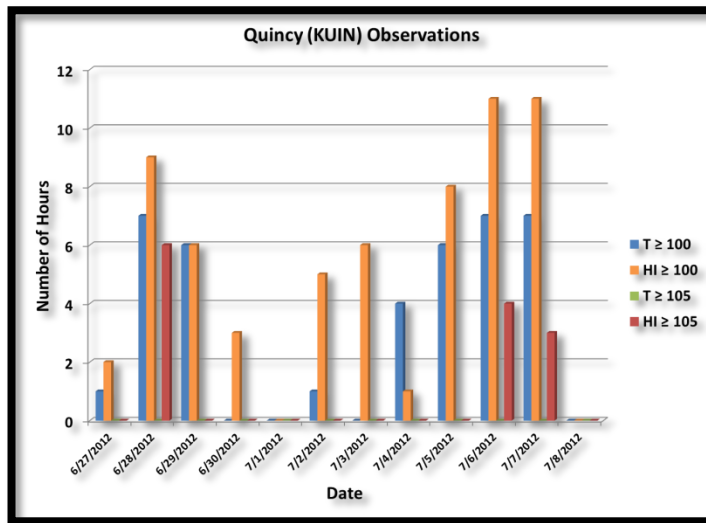
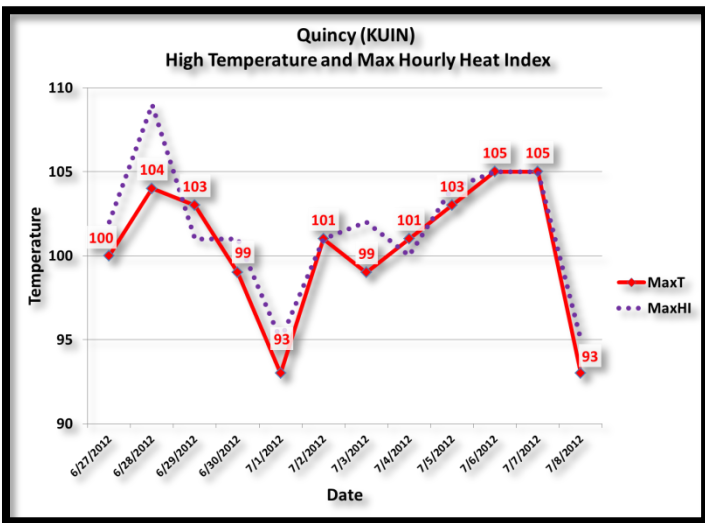
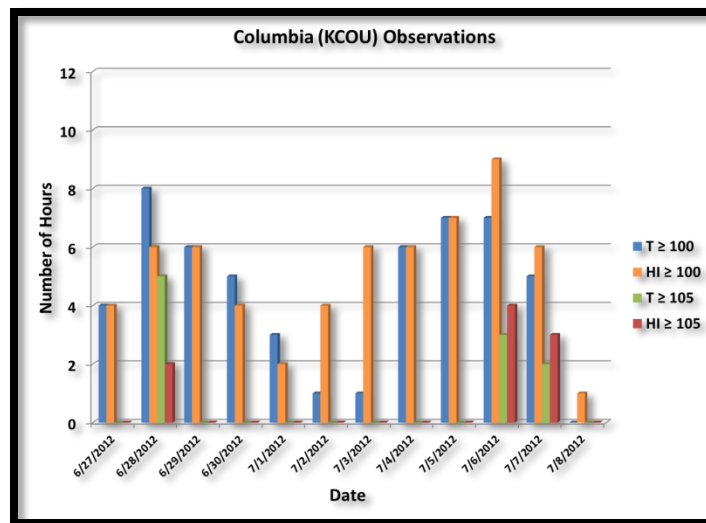
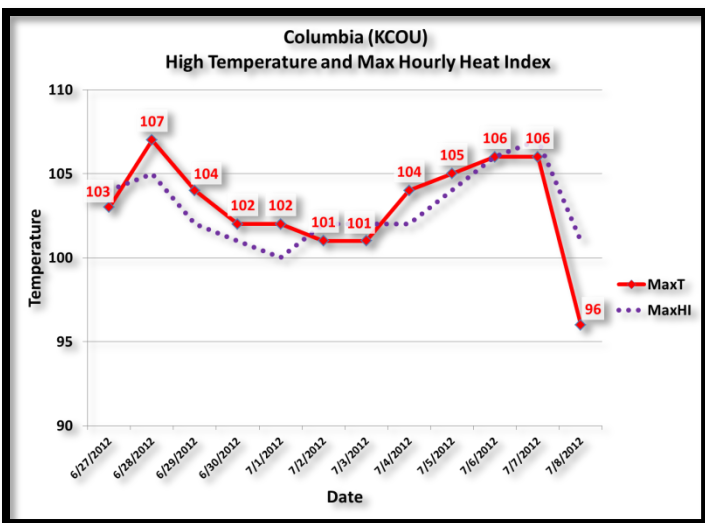
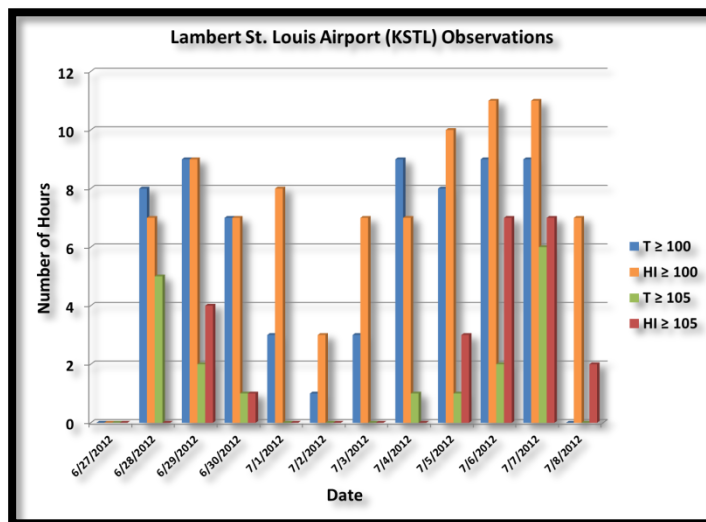
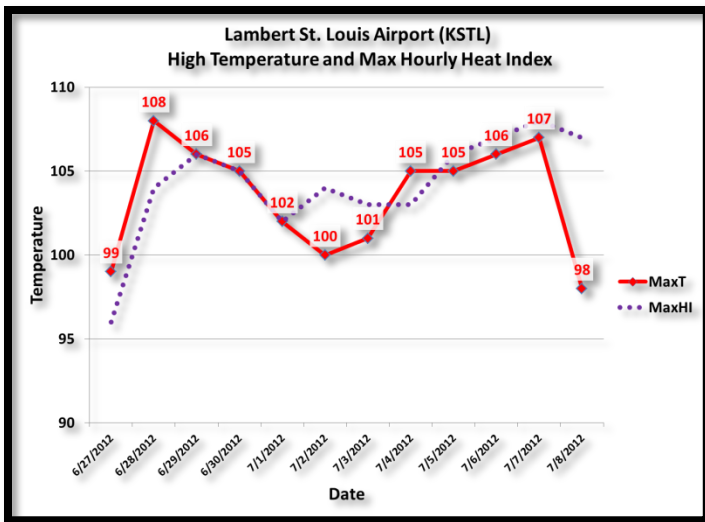
The 2012 heat wave occurred during a drought, which was classified as moderate to severe by the U.S. Drought Monitor. Vegetation is not releasing as much water vapor back into the atmosphere. In addition, the weather conditions that caused the drought kept moisture from being transported northward from the Gulf of Mexico. Consequently, the hourly dewpoints are considerably lower and actually fall during the warmest time of the day indicating that there is deep mixing in the lower atmosphere. Hourly temperatures show a greater spread throughout the 24 hour period, with slightly lower values than 2011 in the early morning, and 6° higher than 2011 during the hottest part of the day with rapid changes in the morning and evening hours. Hourly heat index values are not much higher or equal to the air temperatures. In fact, on some of the days (shown below) the dewpoints were so low that the heat index actually fell below the air temperature because of the evaporative cooling effect of low relative humidity.



Severe Drought Continued



Temperature and Heat Index Graphs



St. Louis and Columbia Heat Wave Summaries

St. Louis, Missouri (KSTL)

St. Louis set their all-time June monthly maximum temperature record on June 28th when the mercury rose to 108 degrees, smashing the old record of 105 degrees recorded on both 6/19/1936 and 6/29/1952. This was the hottest temperature observed since July 18, 1954 when the mercury rose to 112 degrees, and ranks as the seventh hottest temperature ever recorded. The all-time record high temperature remains 115 degrees set back on July 14, 1954.

St. Louis observed three consecutive record high temperatures at or above 105 degrees to end the month of June 2012. Each day either met or exceeded the previous all-time June record temperature of 105 degrees. Prior to this year, St. Louis had never had multiple days of 105 degree or higher temperatures in the month of June. This three day streak of 105 degree high temperatures ties for the fourth longest streak in history.

The mercury rose to 100 degrees or greater for ten consecutive days (June 28th - July 7th), the second longest streak of triple digit heat ever recorded. In those ten days there was a total of 66 hours of temperatures at or above 100 degrees. On four of those days, triple digit heat were observed nine consecutive hours. Record high temperatures were established eight of the ten days, with seven of them reaching or exceeding 105 degrees. From July 4th through July 7th, four record high minimum temperatures were established as the mercury failed to fall below 83 degrees. The mercury also rose to at least 105 degrees, which tied the record for the most consecutive days. The other four consecutive day streaks of 105 degree or higher high temperatures occurred on July 11-14, 1966 and July 21-24, 1901.

Columbia, Missouri (KCOU)

Columbia set their all-time June monthly maximum temperature record on June 28th when the mercury rose to 107 degrees, smashing the old record of 105 degrees recorded on 6/19/1936.

Columbia observed four consecutive days of temperatures exceeding 100 degrees to end the month of June 2012. This streak continued until July 7th with a total of eleven consecutive days, which ranks as the sixth longest streak in history. From July 5th - 7th the temperature reached or exceeded 105 degrees which ranks as the ninth longest streak in history. Columbia experienced 53 hours of triple digit heat during the heat wave with eight consecutive hours on June 28th.

A total of six record high temperatures were established during the heat wave with one record high minimum set. The highest temperature recorded in the heat wave was 107 degrees on June 28th which doesn't even break the top 30 warmest temperatures. In fact, just last year Columbia recorded a high temperature of 108 degrees on August 2nd.

Record Temperatures

St. Louis, Missouri

6/28 Record Maximum of 108 (Previously 104 in 1952)

**All-Time June Record Maximum of 108 (Previously 105 on 6/19/1936 and 6/25/1952)

6/29 Record Maximum of 106 (Previously 105 in 1952)

6/30 Record Maximum of 105 (Previously 103 in 1931)

7/03 Tied Record Maximum of 101 (Previously 101 in 1934)

7/04 Record Maximum of 105 (Previously 102 in 1990)

7/05 Record Maximum of 105 (Previously 102 in 1936)

7/06 Record Maximum of 106 (Previously 102 in 1936)

7/07 Record Maximum of 107 (Previously 103 in 1936)

7/04 Record High Minimum of 83 (Previously 82 in 1990)

7/05 Record High Minimum of 83 (Previously 80 in 1994)

7/06 Record High Minimum of 83 (Previously 79 in 1994)

7/07 Record High Minimum of 83 (Previously 79 in 2008)

Columbia, Missouri

6/27 Record Maximum of 103 (Previously 101 in 1980)

6/28 Record Maximum of 107 (Previously 103 in 1936)

**All-Time June Record Maximum of 107 (Previously 105 on 6/19/1936)

6/29 Tied Record Maximum of 104 (Previously 104 in 1901)

7/05 Tied Record Maximum of 105 (Previously 105 in 1911)

7/06 Record Maximum of 106 (Previously 101 in 1939)

7/07 Record Maximum of 106 (Previously 104 in 1890)

7/04 Record High Minimum of 78 (Previously 77 in 1939)

References:

Kalnay, E. and Coauthors, 1996: The NCEP/NCAR Reanalysis 40-year Project. Bull. Amer. Meteor. Soc., 77, 437-471.

Please note that while the severe weather data presented in this event synopsis has been quality controlled, it is still considered unofficial. Official reports & statistics for severe weather events can be found in the **Storm Data** publication (<http://www.ncdc.noaa.gov/IPS/sd/sd.html>) or **Storm Events Database** (<http://www.ncdc.noaa.gov/stormevents/>), available from the National Centers for Environmental Information (NCEI) web page [formerly the National Climate Data Center (NCDC)].

More detailed tornado track information can be accessed using the National Weather Service Damage Assessment Toolkit for all tornadoes beginning in 2012. <https://apps.dat.noaa.gov/StormDamage/DamageViewer/>

Any questions regarding this event review should be address to w-lsx.webmaster@noaa.gov