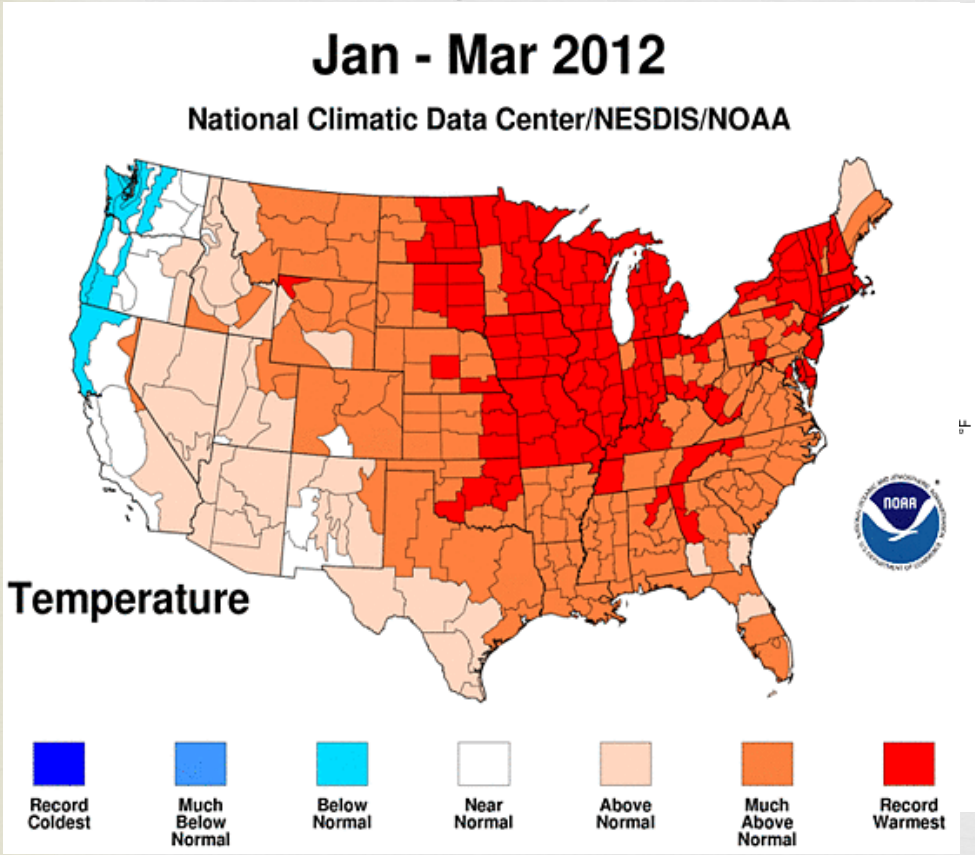
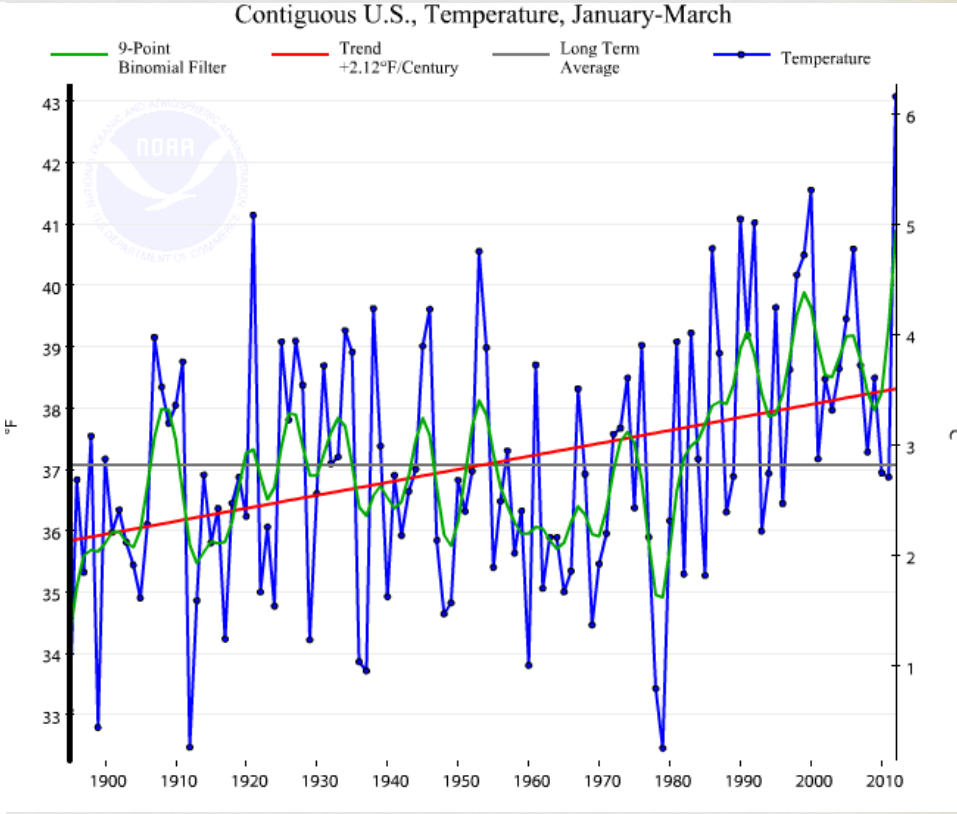
US Climate Review of 2012
The Hot and Dry

Melissa Ou (CPC)

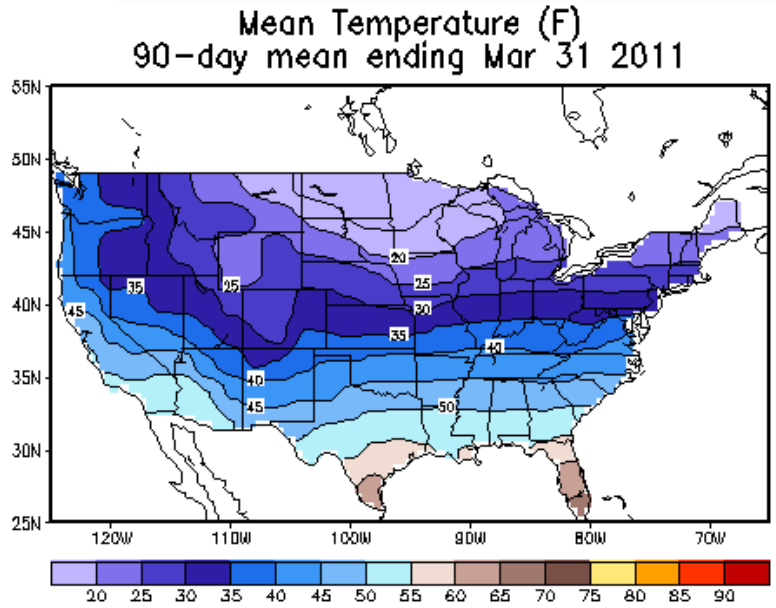
Record warm winter and spring

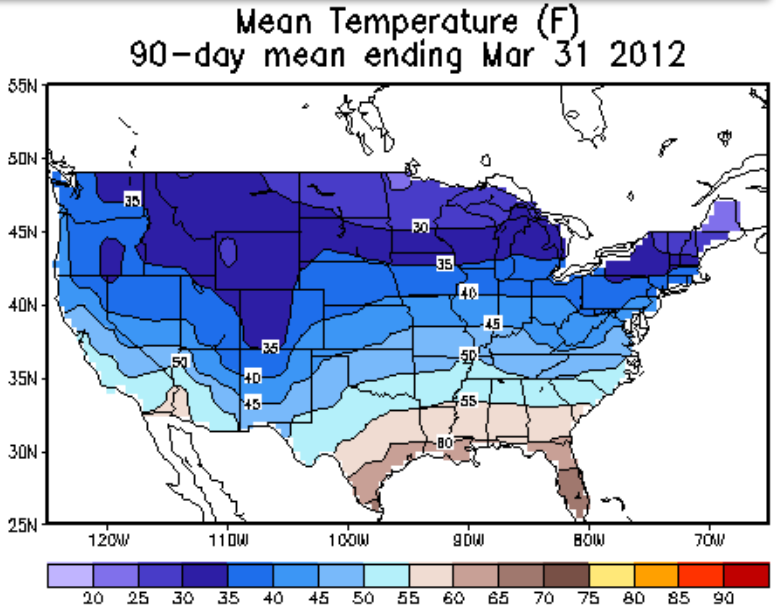
Average JFM temperature was ~43 degrees, which is 6.0 degrees above the long-term average.

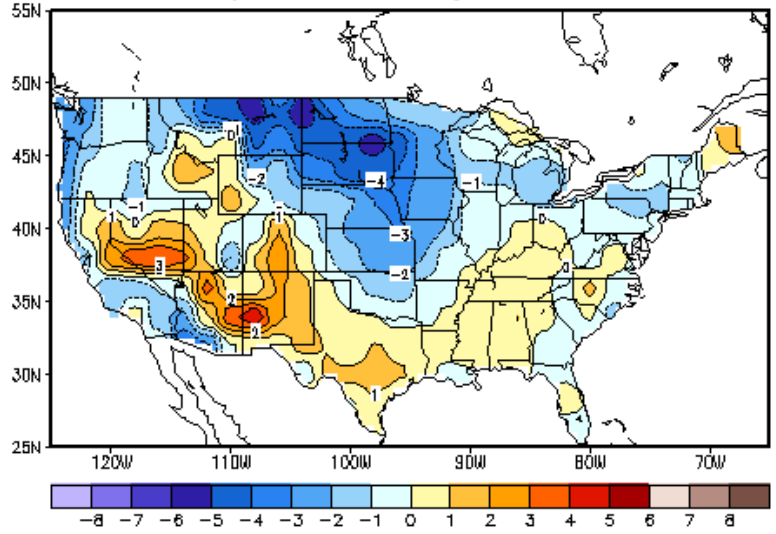


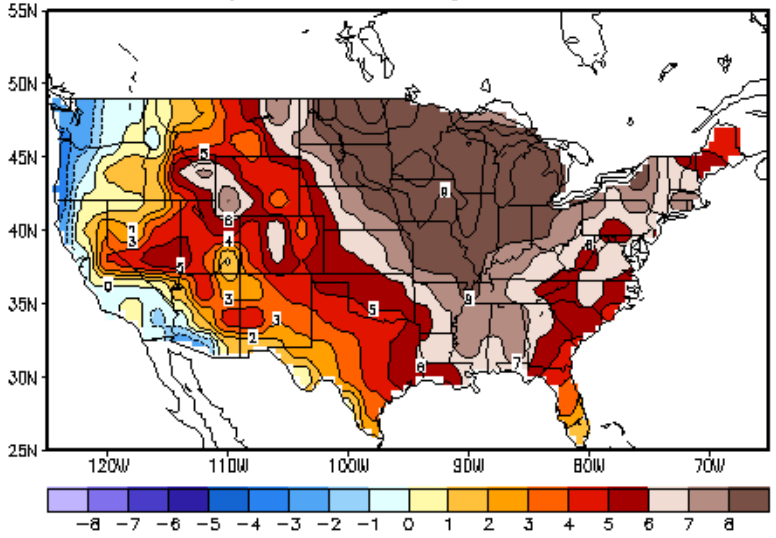


Mean temperatures – JFM 2011 vs. 2012

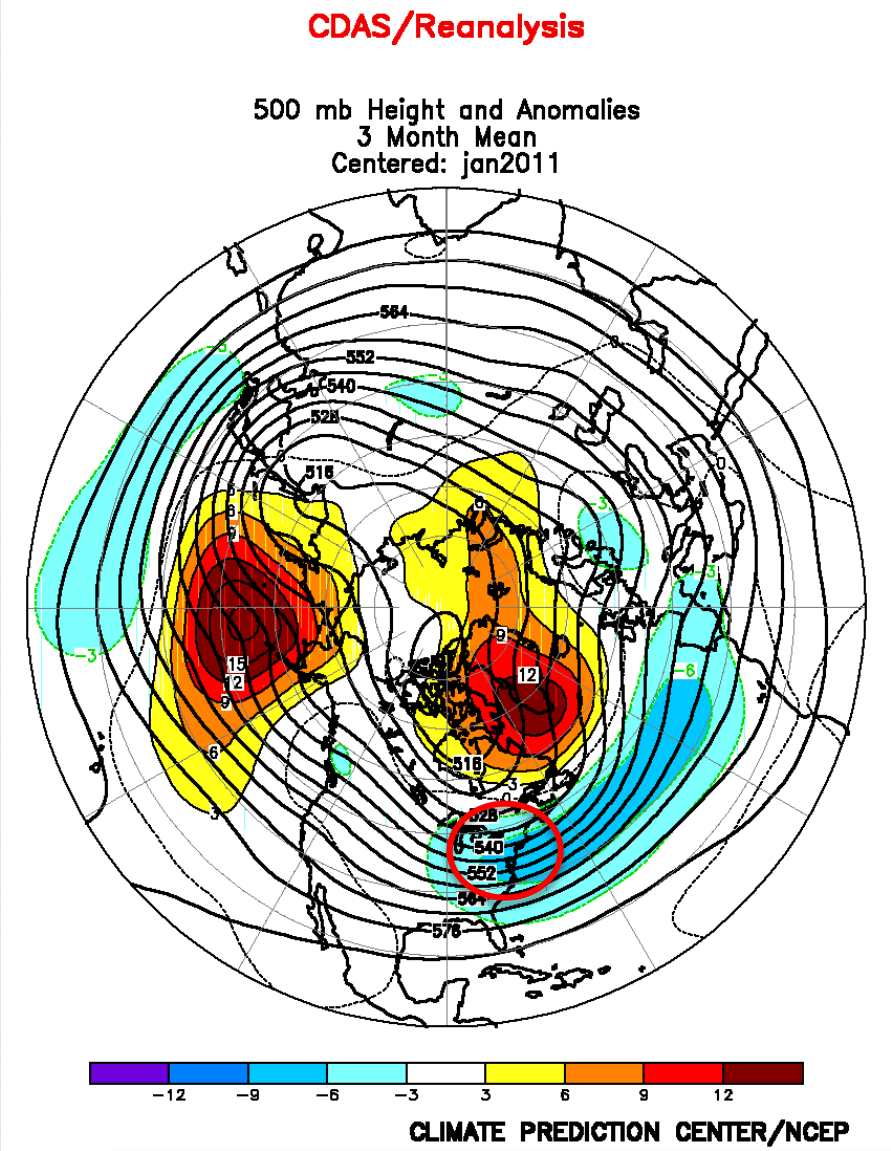


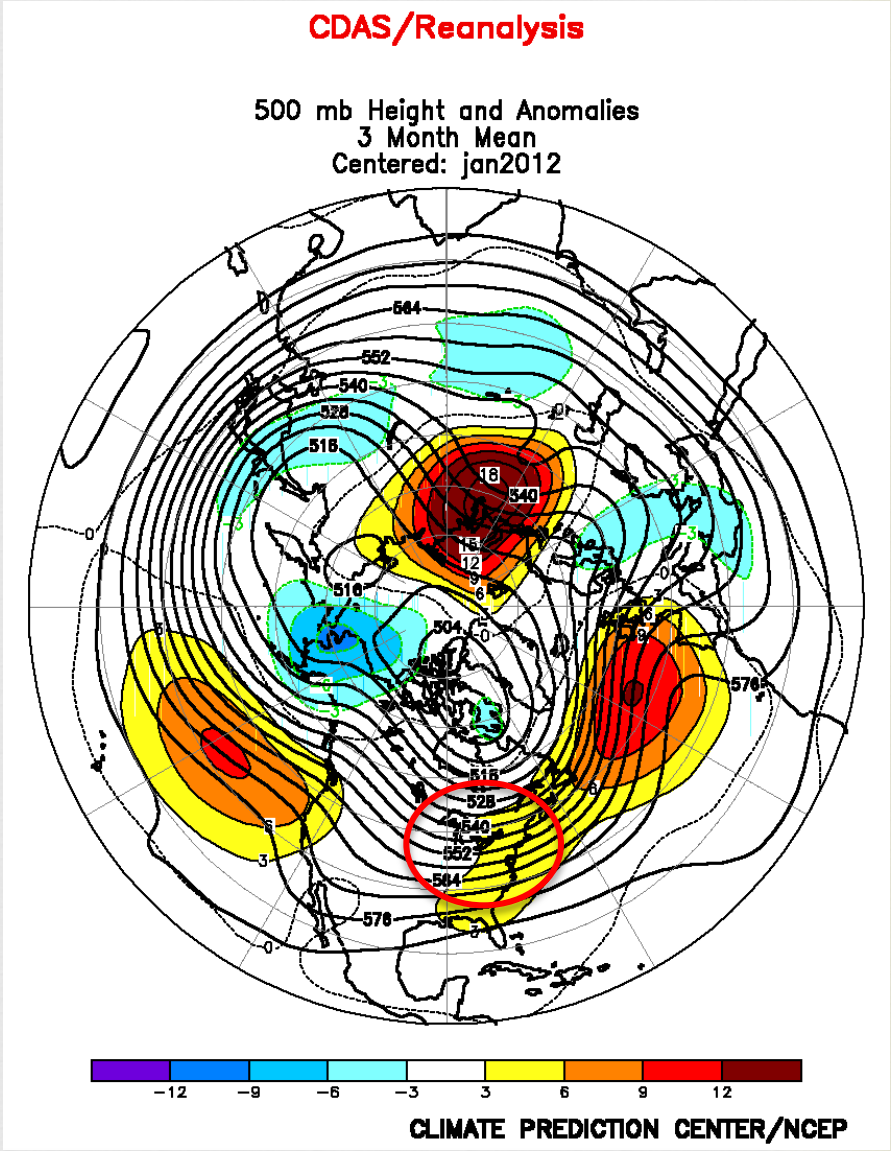






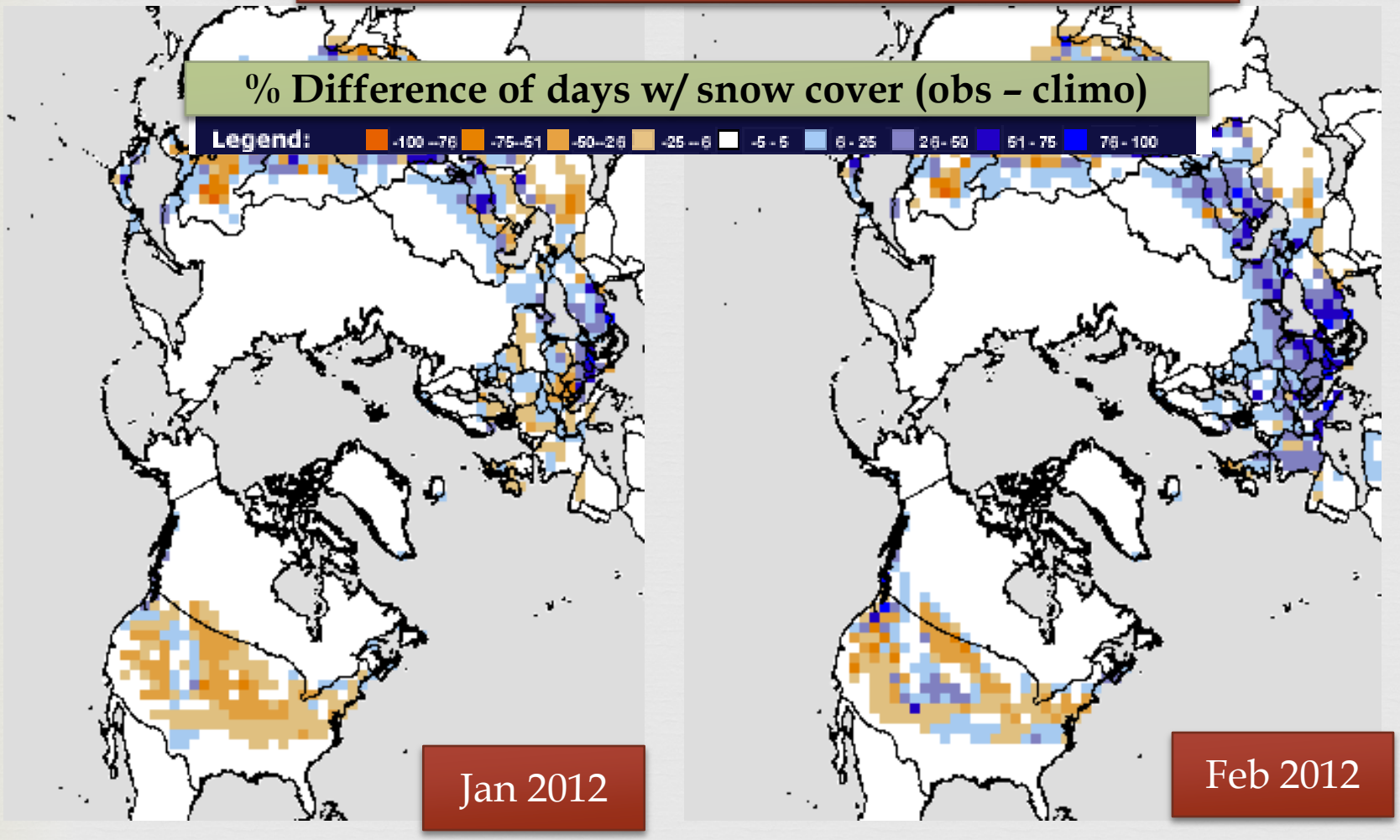
DJF 500mb heights/anomalies





Main cause of anomalous warm over the CONUS
was the location of the jet

Too little snow…



Images courtesy Rutgers University

3rd smallest snow cover in 46-year satellite period, especially in west

Impacts

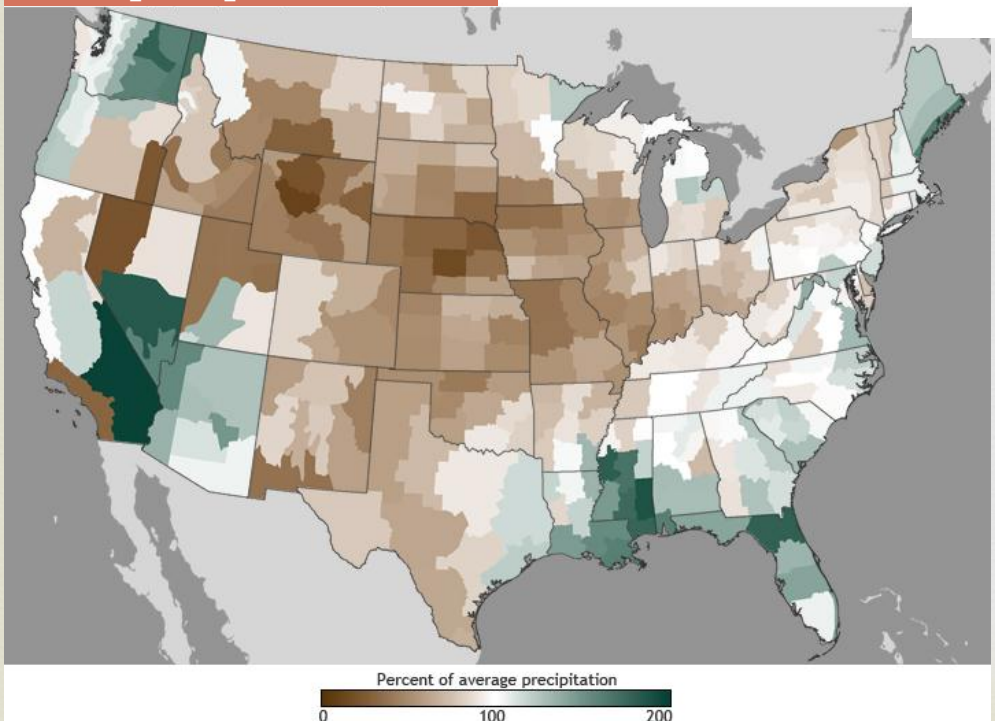
- Migrating animals and spring flowers arrived much earlier
- DC Cherry trees bloomed 2 weeks earlier - average peak bloom is April 4, it was March 20 in 2012
- Large profit losses to ski areas
- Early start to wildfires across the nation

The town lift climbs up the mountainside at Park City Mountain Resort, April 4, 2012, in Park City, Utah. (Tom Smart, Deseret News)

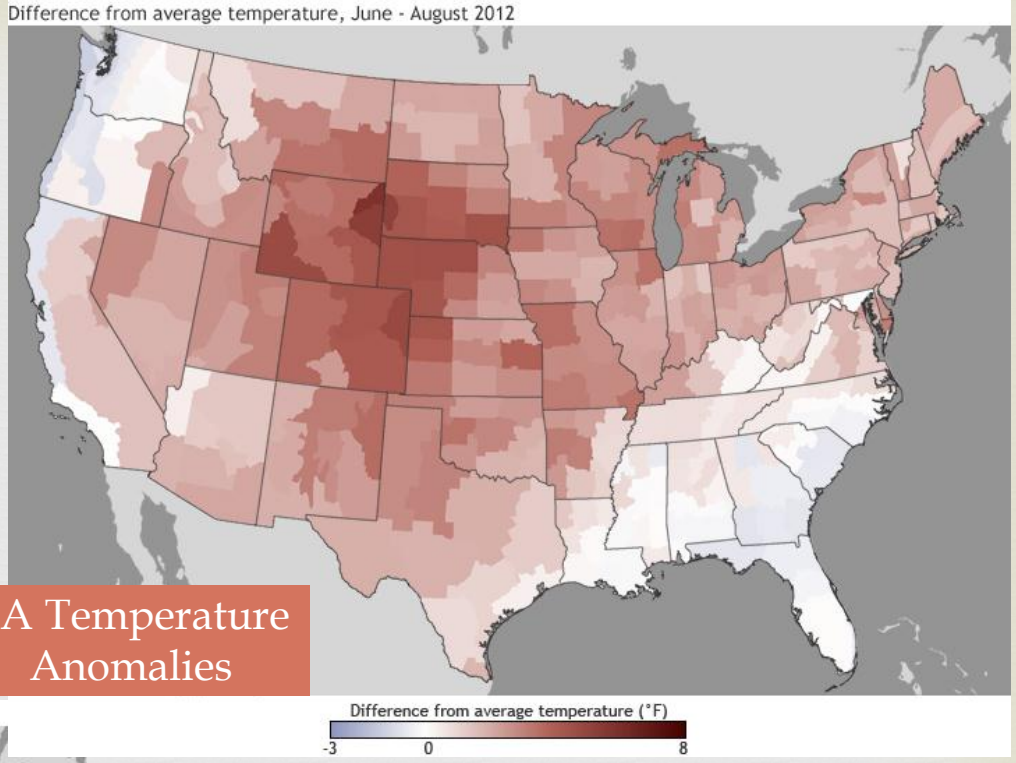
A hot and dry summer

JJA temperature and precipitation anomalies

JJA % of average precipitation

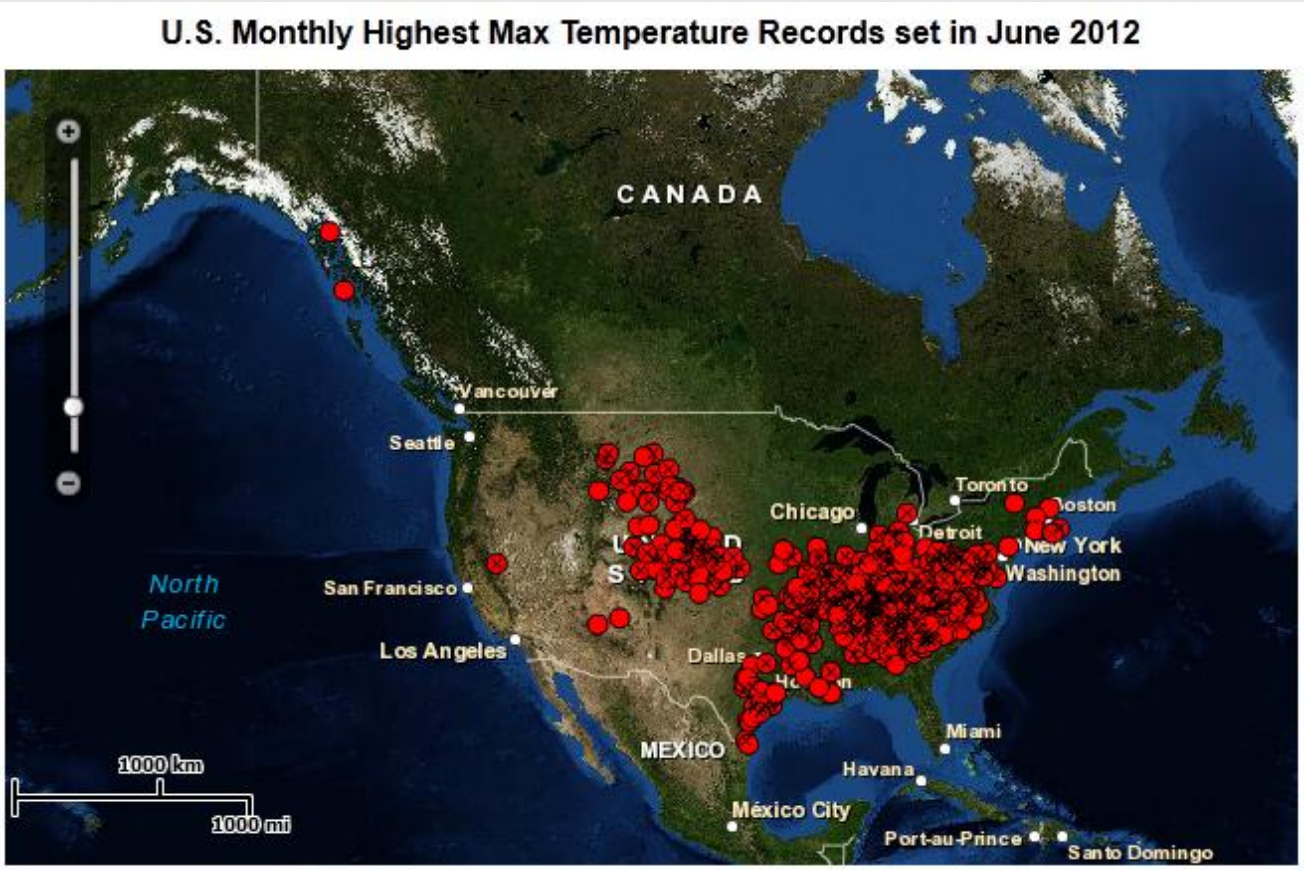


JJA Temperature Anomalies



- 3rd hottest summer on record (NCDC)
- The average CONUS temperature was more than 2 deg F above the 20th century average

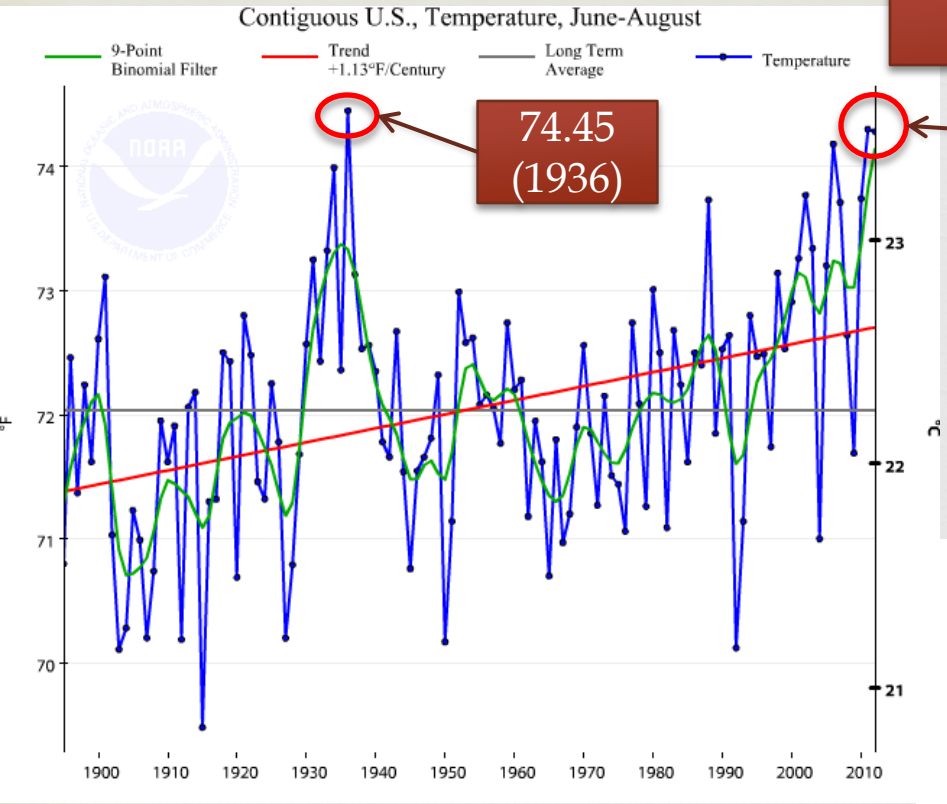
Heat wave in June

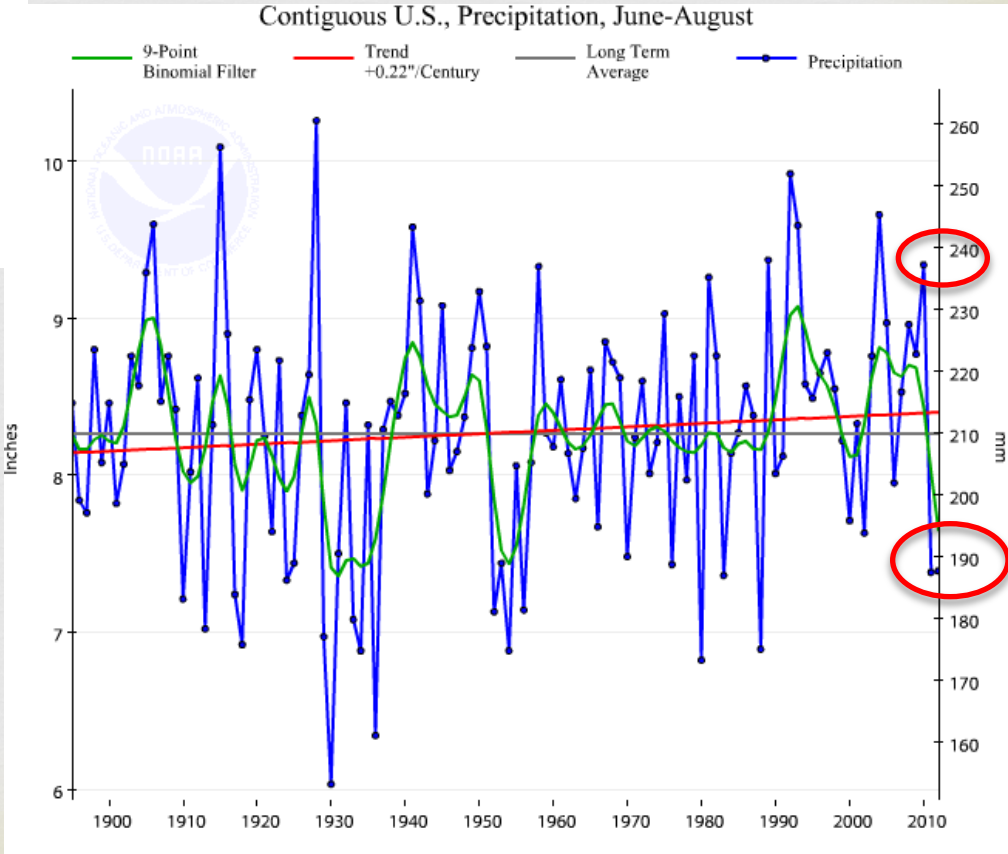


Out of a possible 174,182 records: 410 (Broken) + 235 (Tied) = 645 Total

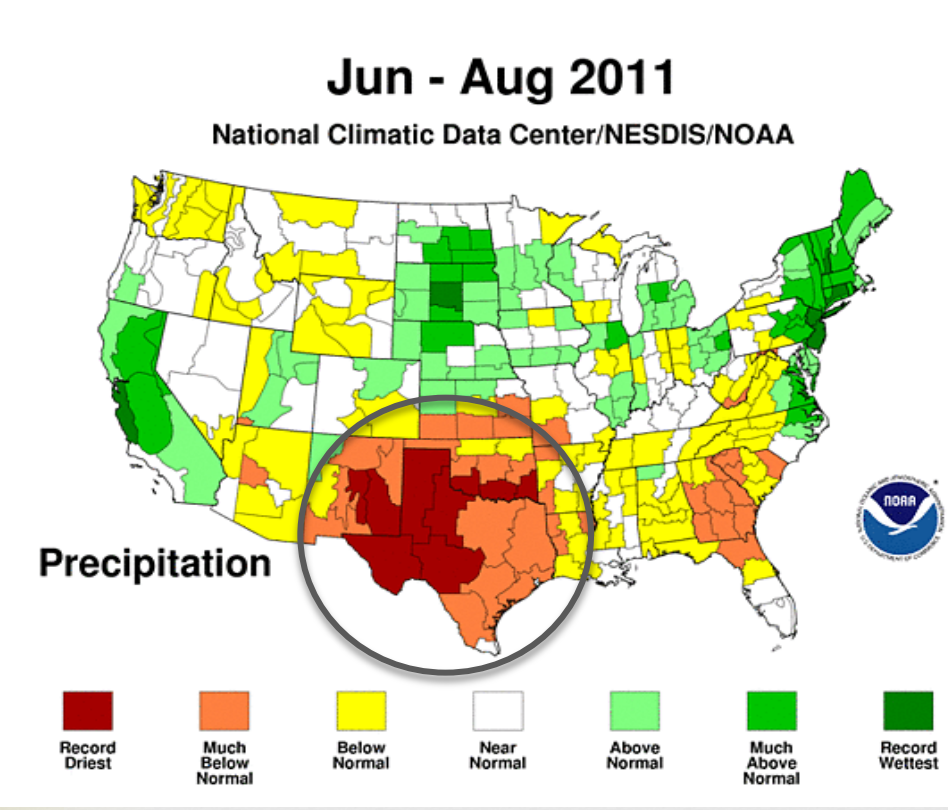
NOTE: These records are based on the historical daily observations archived in NCDC's Cooperative Summary of the Day data set and preliminary reports from Cooperative Observers and First Order National Weather Service stations, and as such are subject to change. The Period of Record (POR) represents the number of years with a minimum of 50% data completeness. All stations have a Period of Record of at least 30 years.

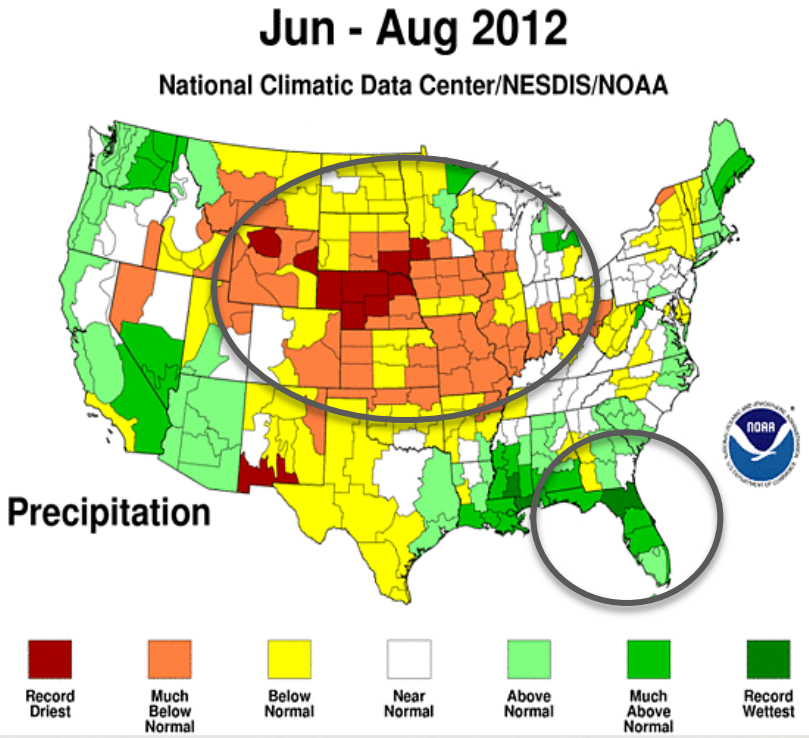
JJA timeseries





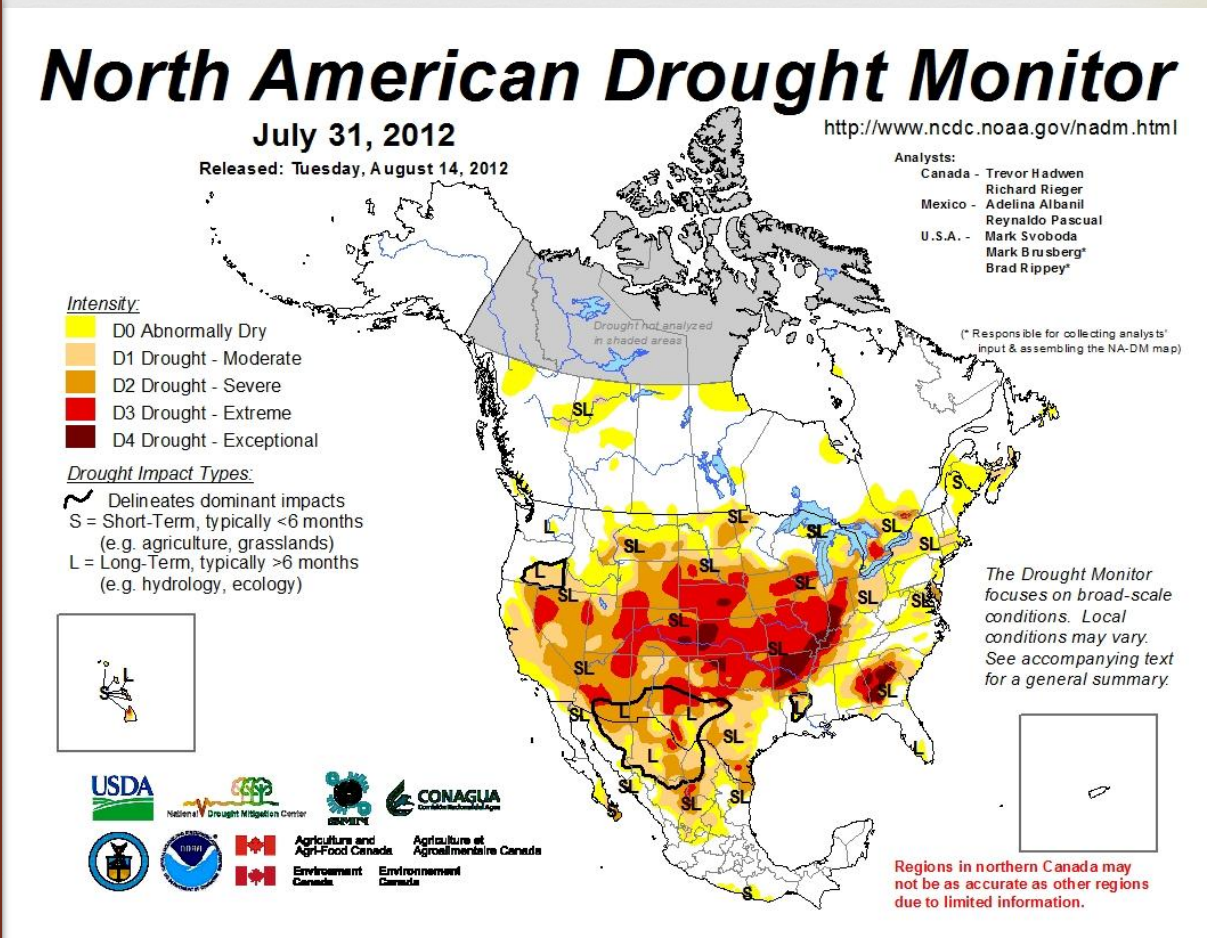
JJA 2012 Precipitation Rankings



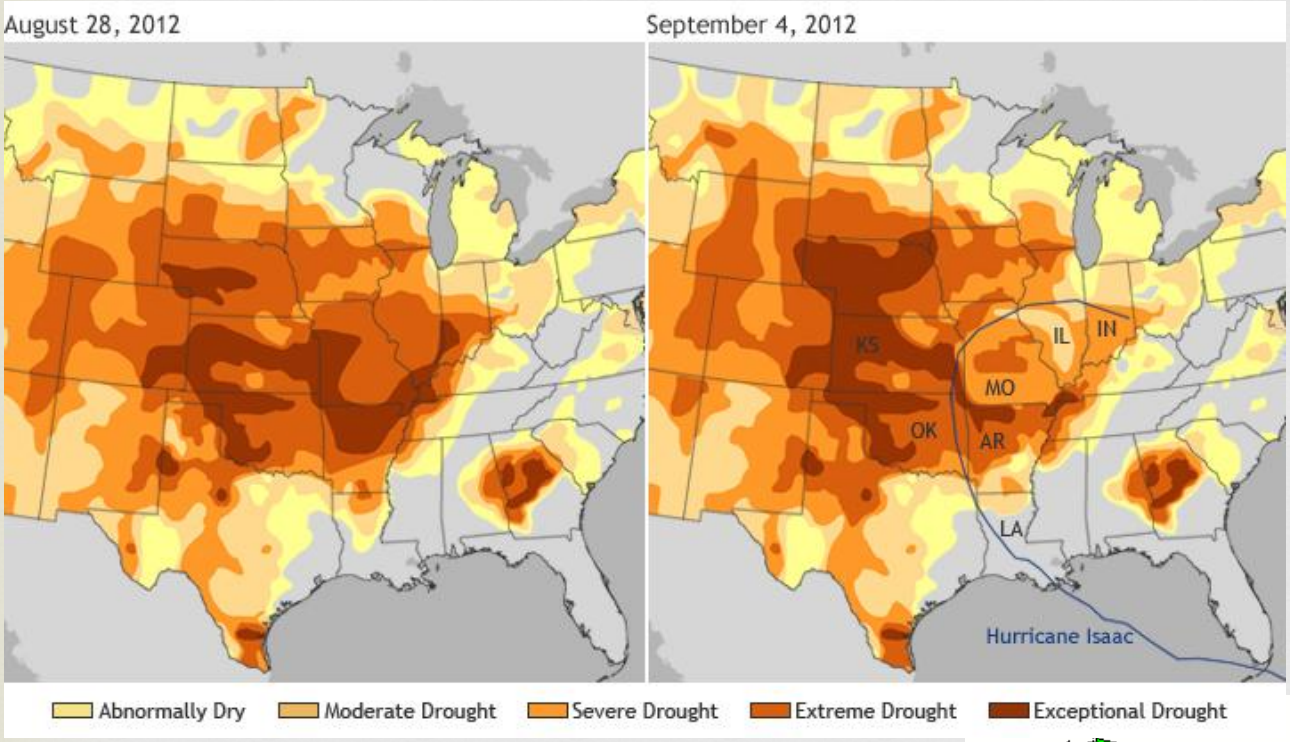


Impact on drought

- 62.9% of nation in D1-D4 (moderate-exceptional)
- Max value of 63.9% on July 24 is record in 13-year USDM history (NCDC SOTC)

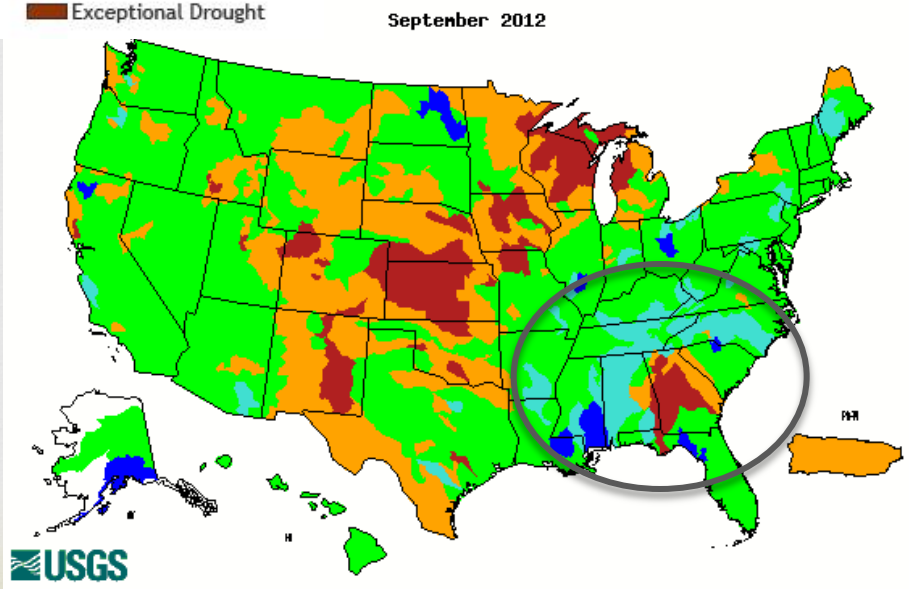


Hurricanes had little impact on drought

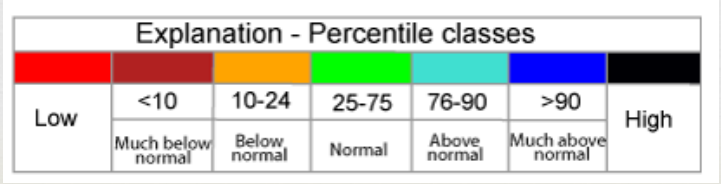


Hurricane Isaac made landfall August 28, 2012

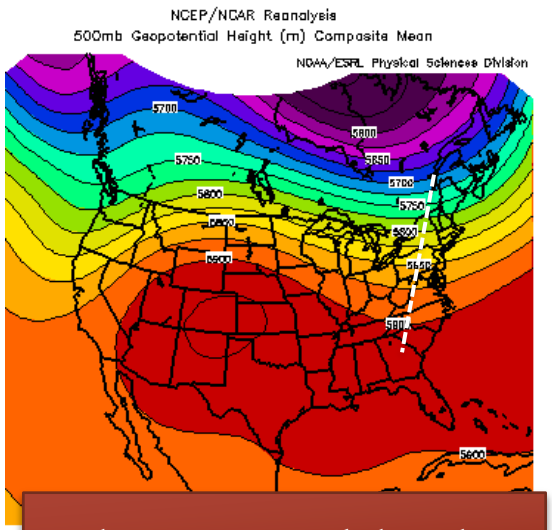
September 2012 average streamflow



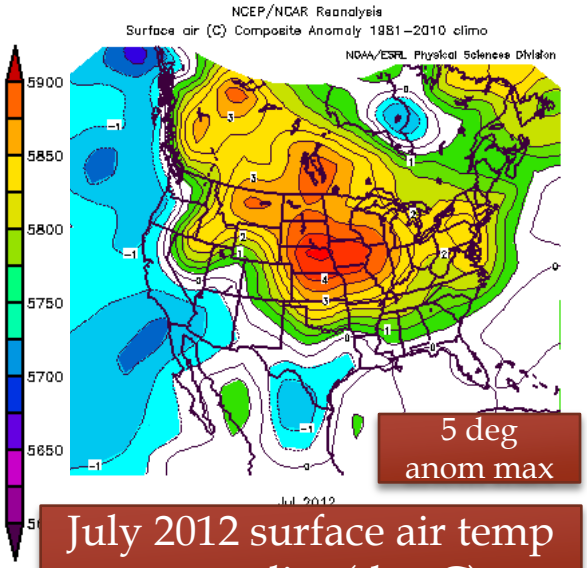
Courtesy of NCDC, Map by climate.gov



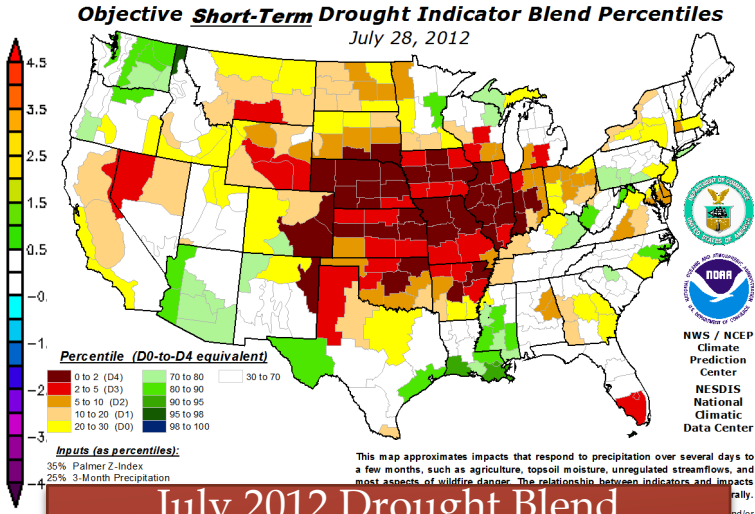
Drought Index July Analogs – 1954 & 2012



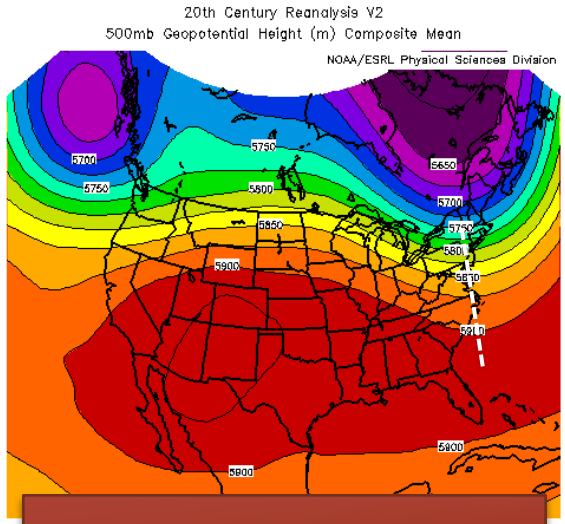
July 2012 500mb heights



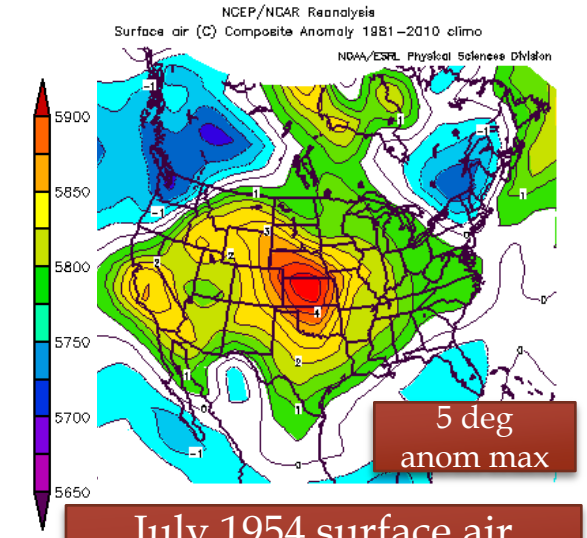
July 2012 surface air temp anomalies (deg C)



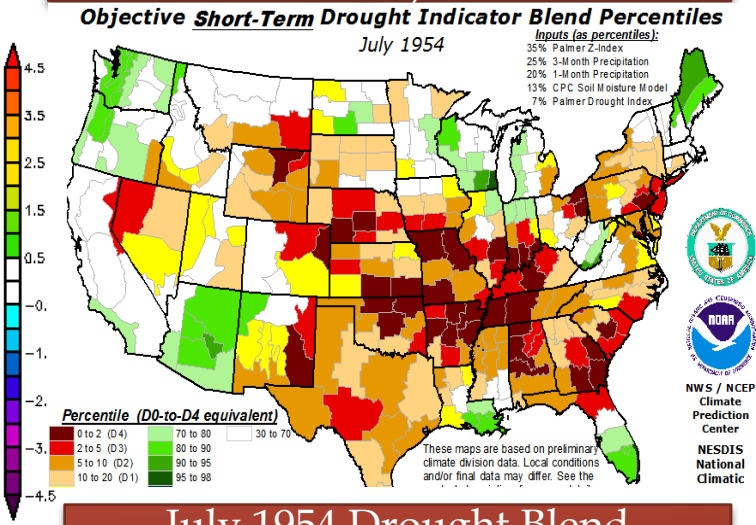
July 2012 Drought Blend (40.28% coverage D1+, 10.86% D4)



July 1954 500mb heights

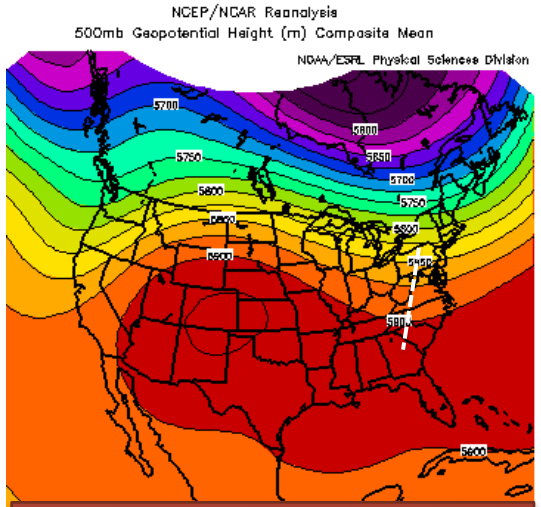


July 1954 surface air temp anomalies(deg C)

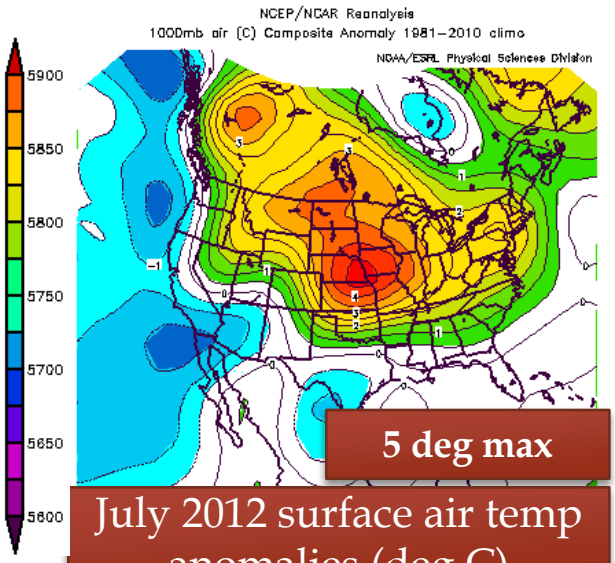


July 1954 Drought Blend (53.34% coverage D1+, 9.69% D4)

Precipitation Analogs – 1936 & 2012

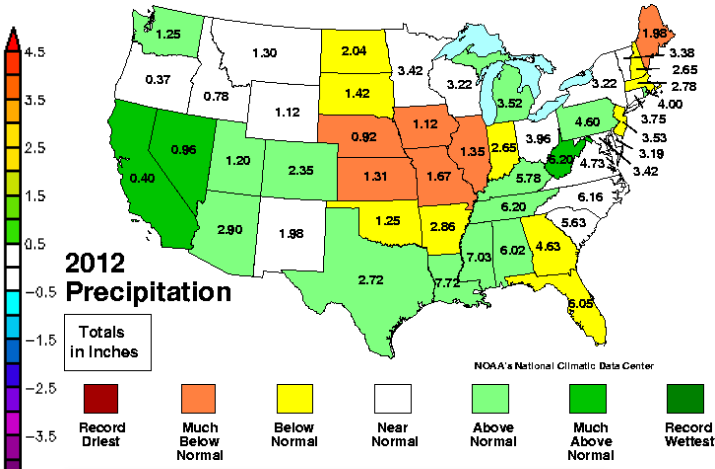


July 2012 500mb heights

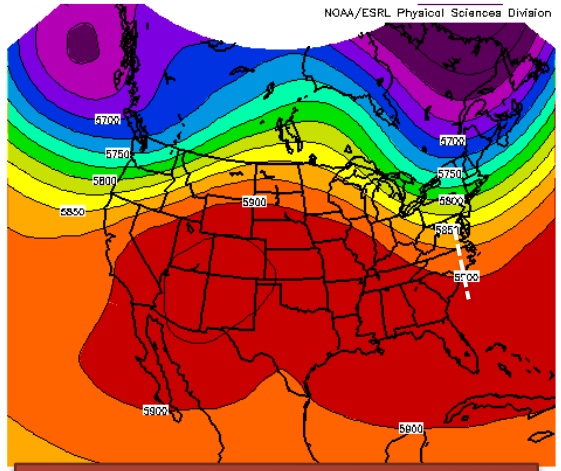


5 deg max

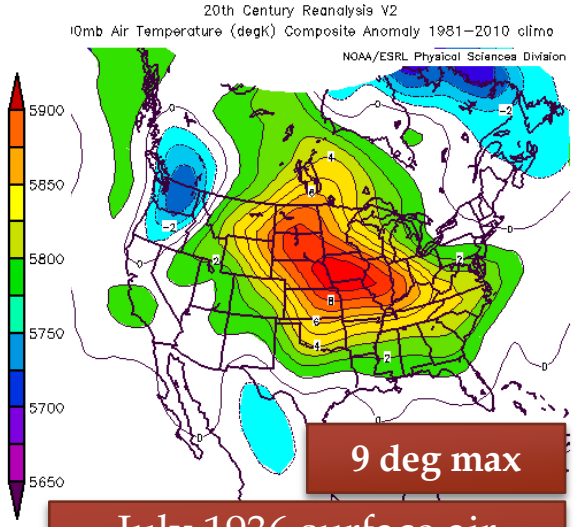
July 2012 surface air temp anomalies (deg C)



July 2012 precip (inches)

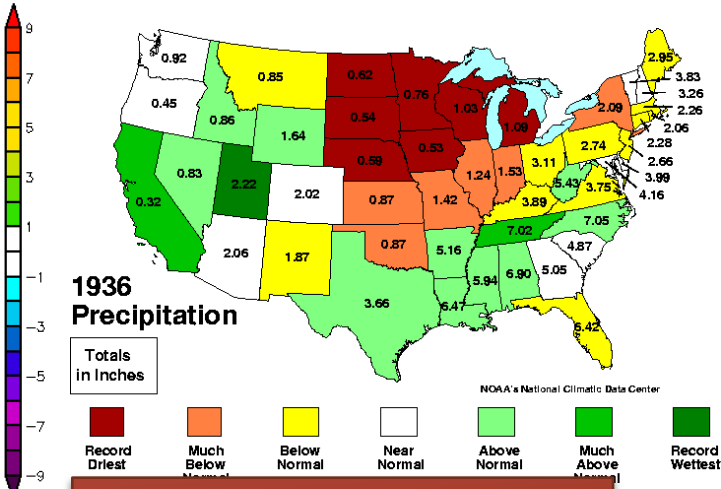


July 1936 500mb heights



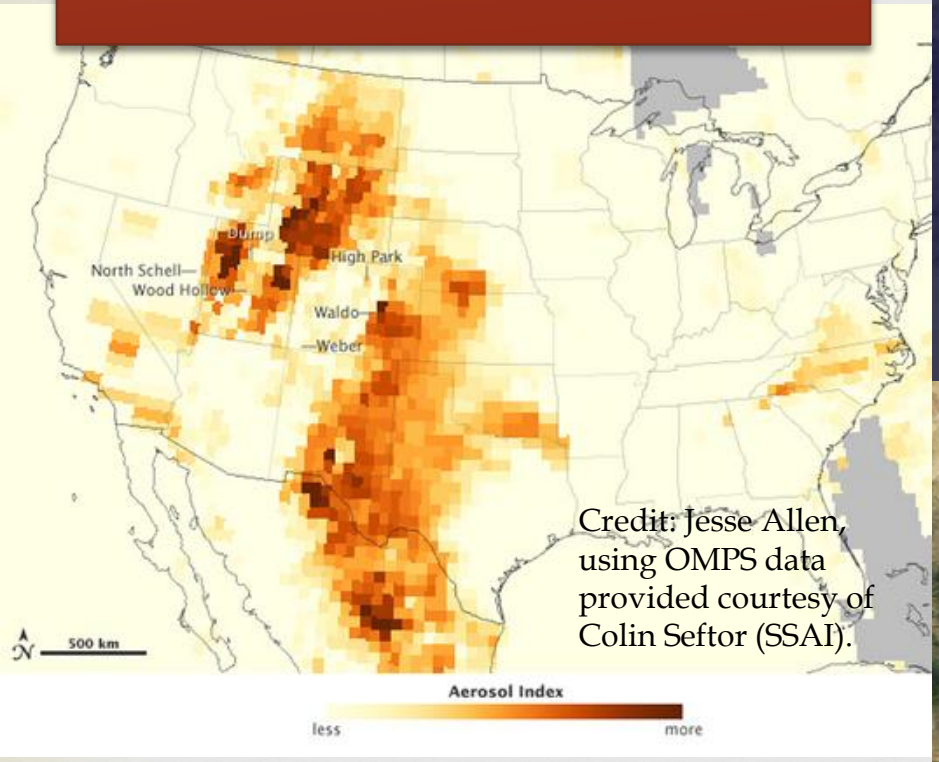
9 deg max

July 1936 surface air temp anomalies (deg K)



July 1936 precip (inches)

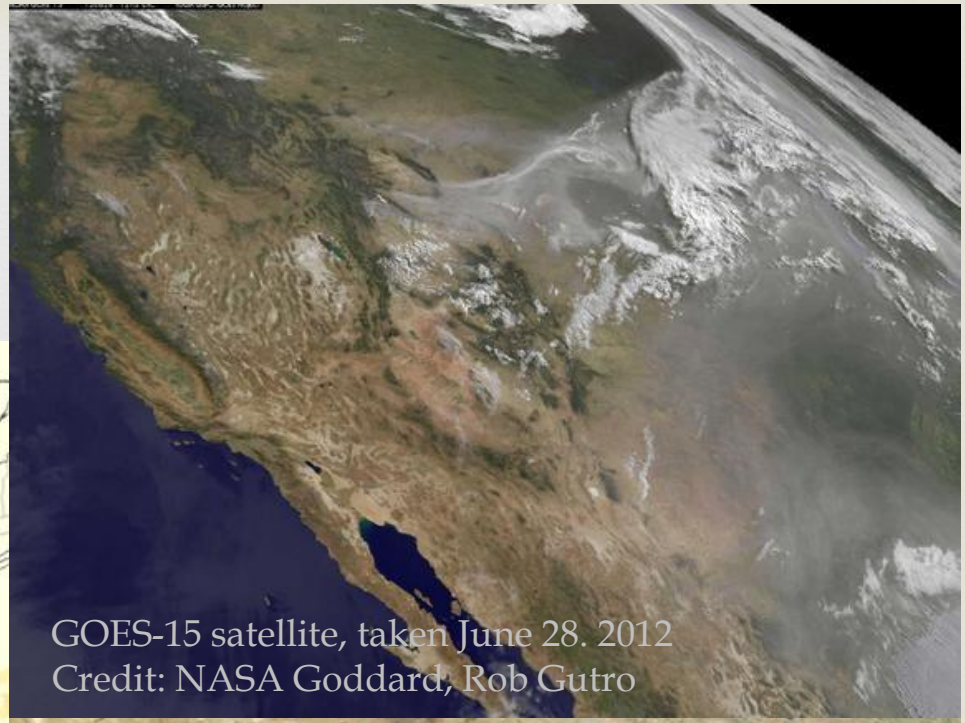
Dangerous fire weather conditions in the west in June



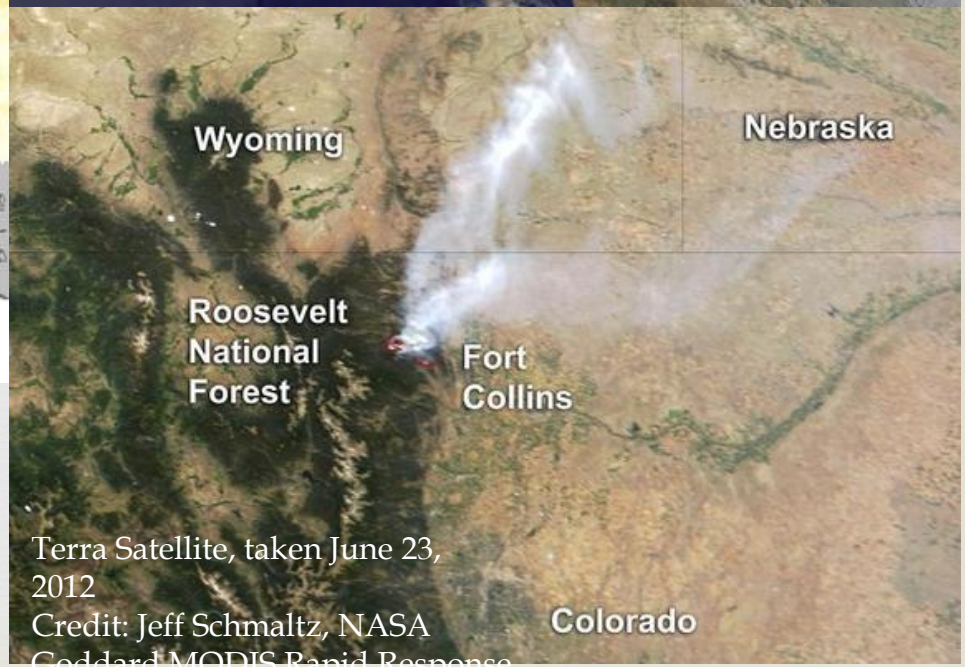
Credit: Jesse Allen, using OMPS data provided courtesy of Colin Seftor (SSAI).

Relative concentration of aerosols in the skies, June 26, 2012

Ozone Mapper Profiler Suite (OMPS) on the new Suomi National Polar-orbiting Partnership (S-NPP) satellite



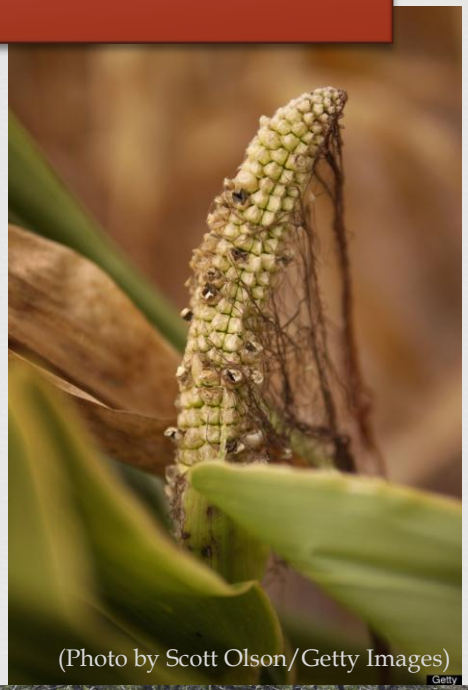
GOES-15 satellite, taken June 28. 2012
Credit: NASA Goddard, Rob Gutro



Terra Satellite, taken June 23, 2012
Credit: Jeff Schmaltz, NASA Goddard MODIS Rapid Response Team

Impacts

- Primary corn and soybean agricultural belt severely impacted
- This year's U.S. corn yield is projected to be the lowest since 1995 (NYTimes.com)
- Devastation to crops and livestock in Great Plains to Midwest
- Stress on water resources
- Fish kill due to dried up rivers and increased water temperatures

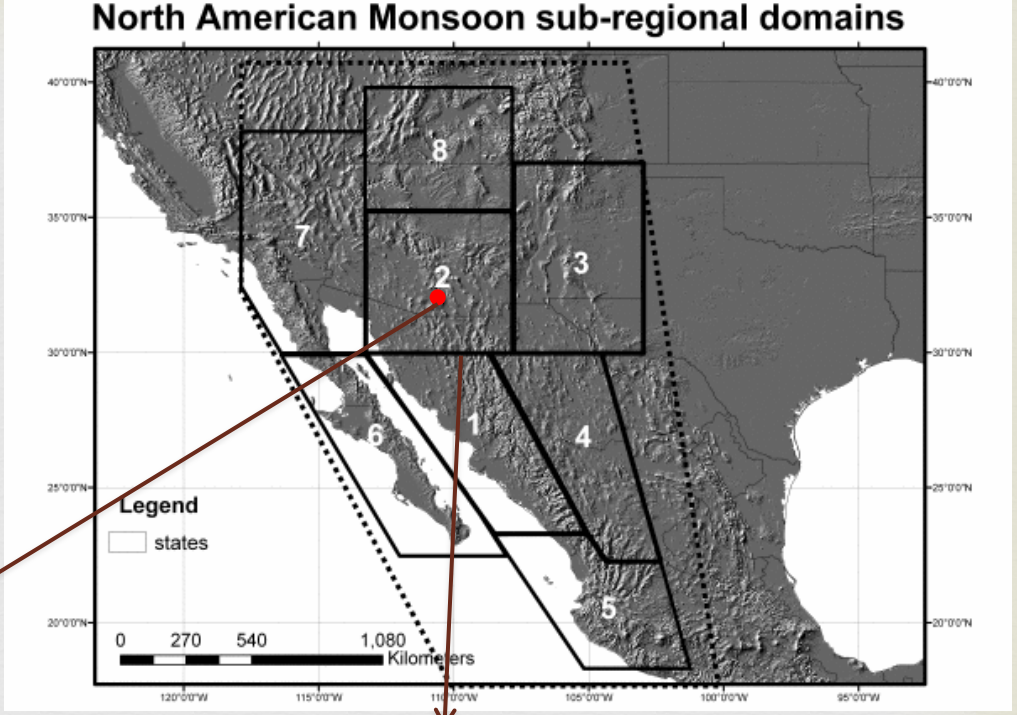

(Photo by Scott Olson/Getty Images)

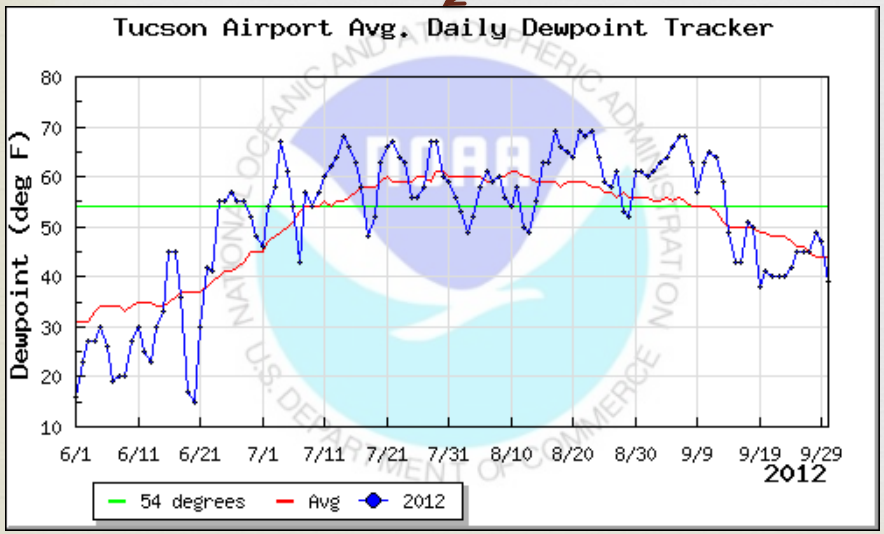

(AP Photo/The Hays Daily News, Steven Hausler)

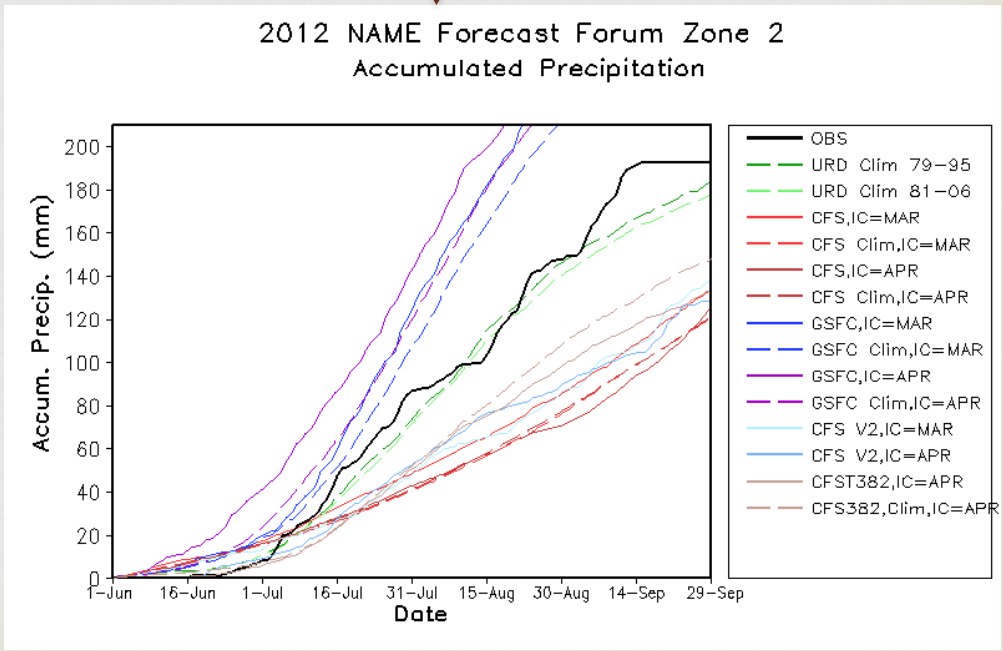

(AP Photo/Nati Harnik)

Southwest monsoon

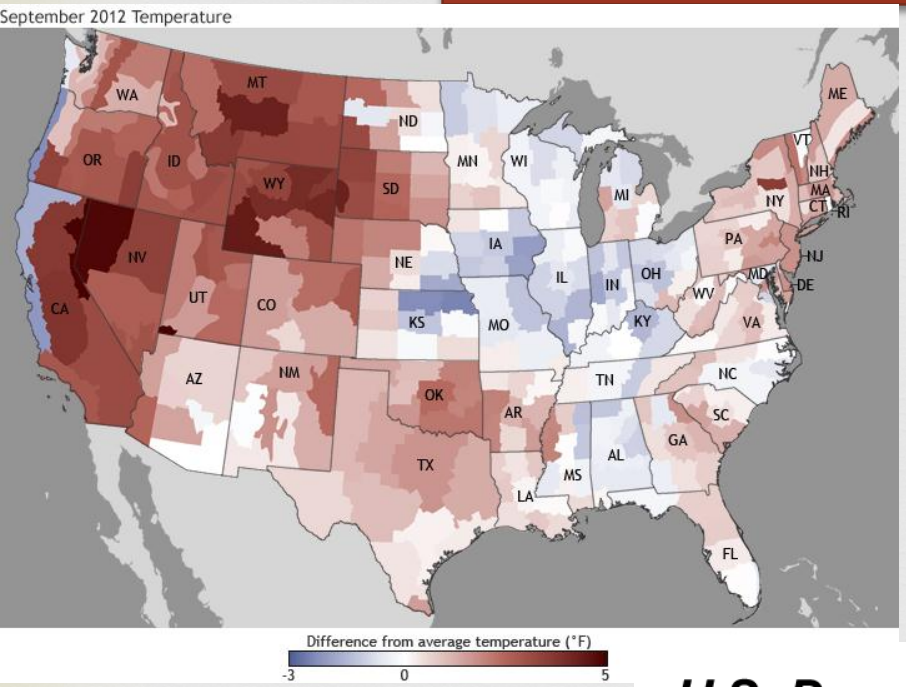
- Normal onset time
- Slightly above normal precipitation in the southwest
- All zones except 3,4, and 6 had above normal rain

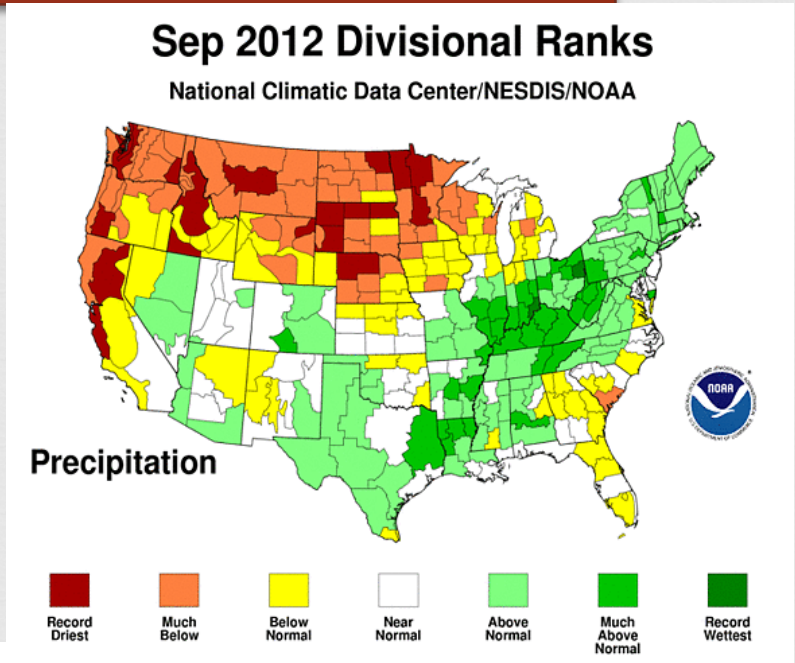




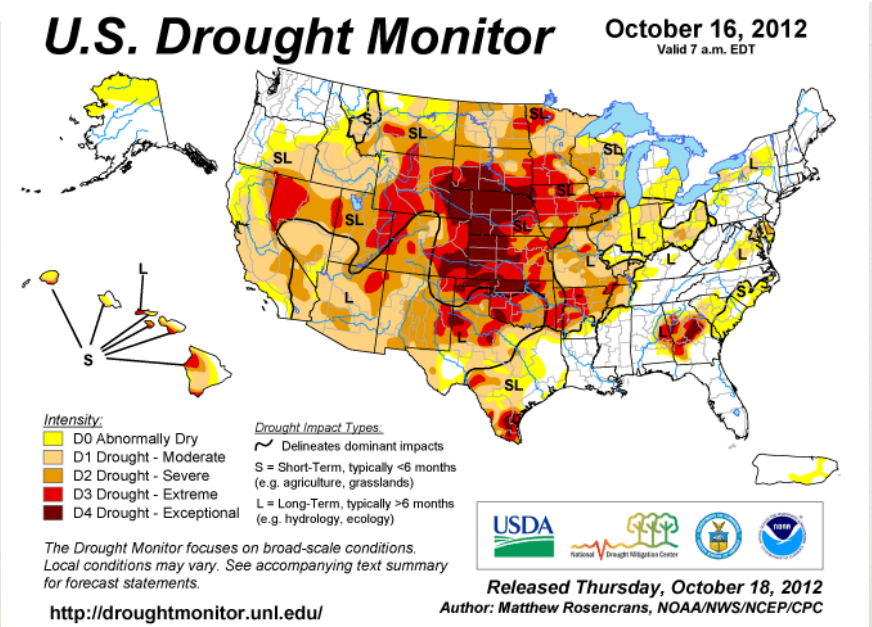


Recent Conditions





JJA Temperature Anomalies

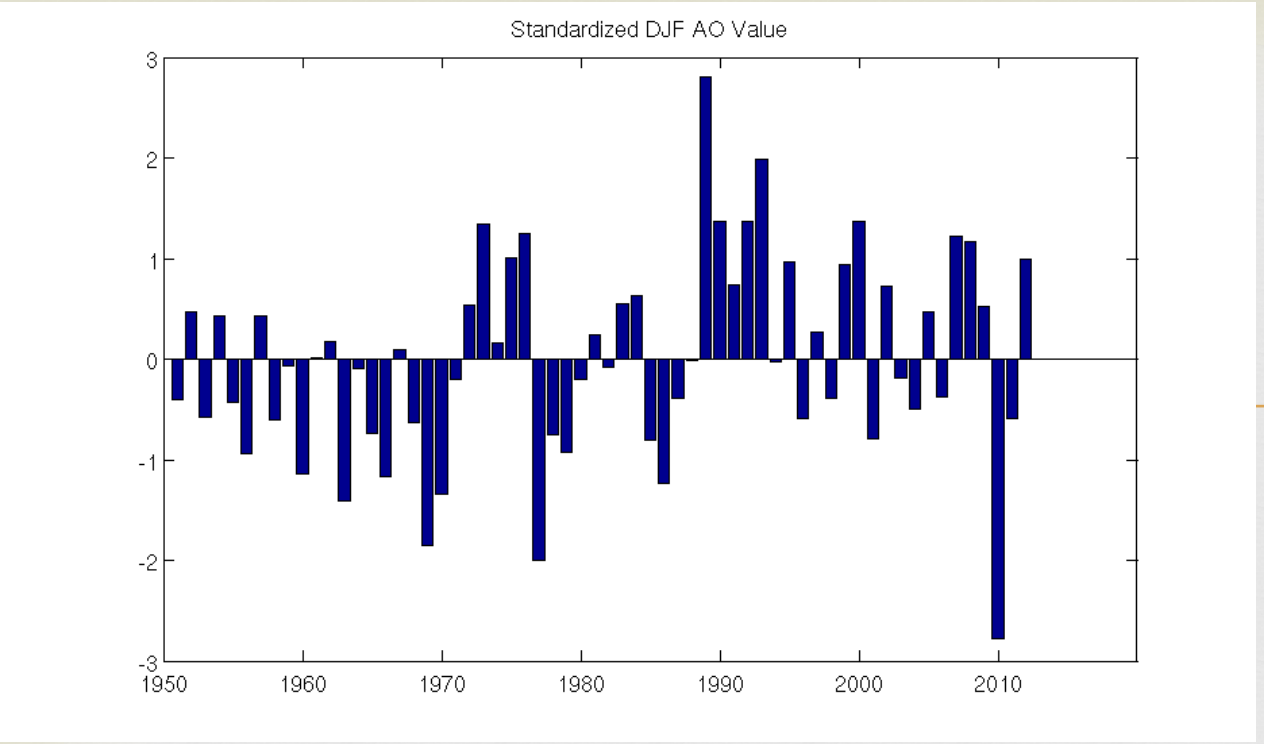


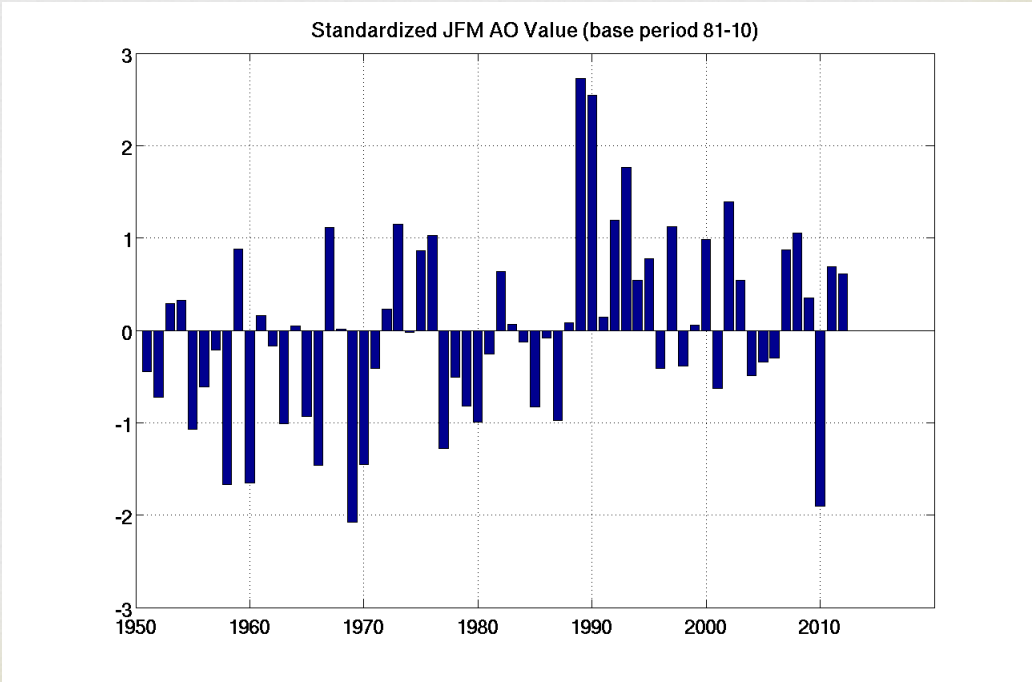
Fires at Rocky Mountain Park Oct 20, 2012

Summary

- Record breaking above normal temperatures over the CONUS for most of 2012
- Hot, dry conditions led to widespread severe drought over the US
- Significant impacts from climate on agriculture, livestock, and homes
- Most recent conditions were anomalously warm and dry across the northwest

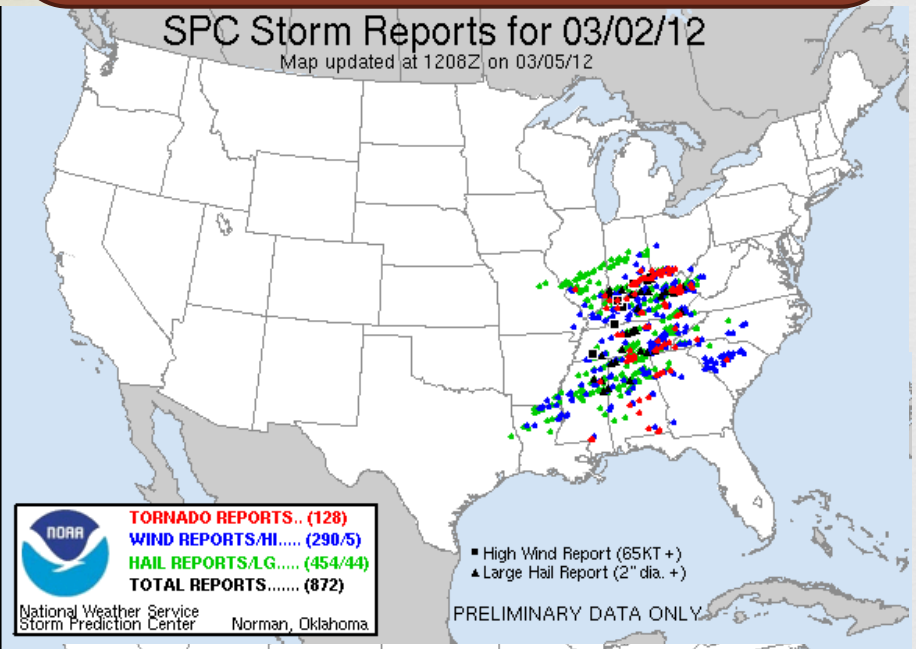
Thank you!
Especially NCDC
and Wei Shi (CPC)

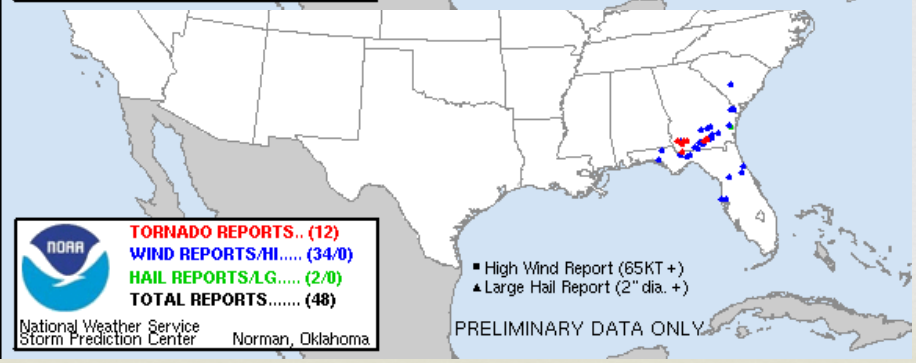

Standardized DJF AO Value
3
2
1
0
-1
-2
-3
1950
1960
1970
1980
1990
2000
2010

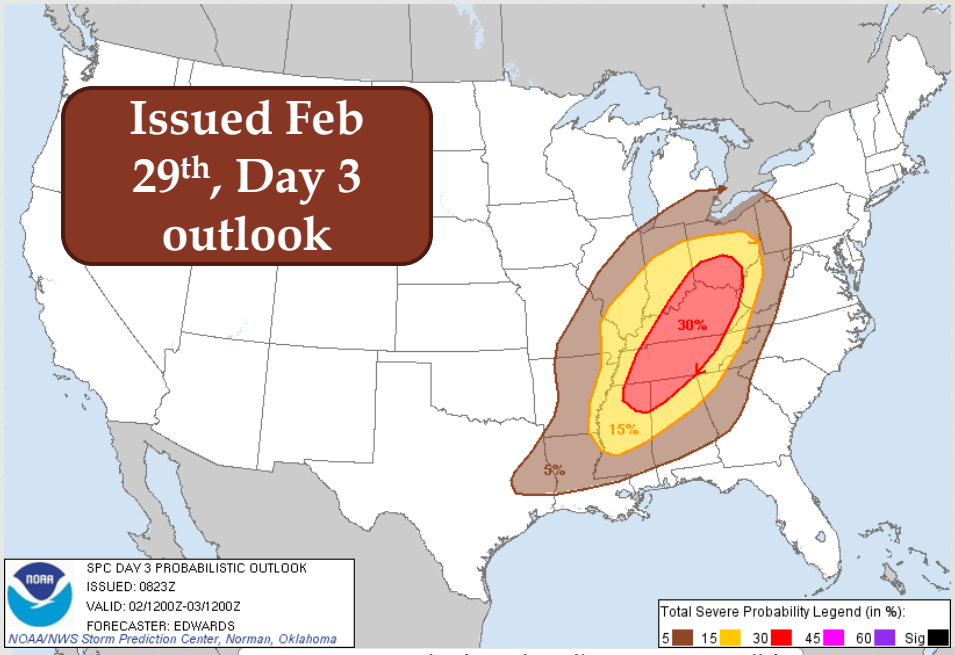

Standardized JFM AO Value (base period 81-10)
3
2
1
0
-1
-2
-3
1950
1960
1970
1980
1990
2000
2010

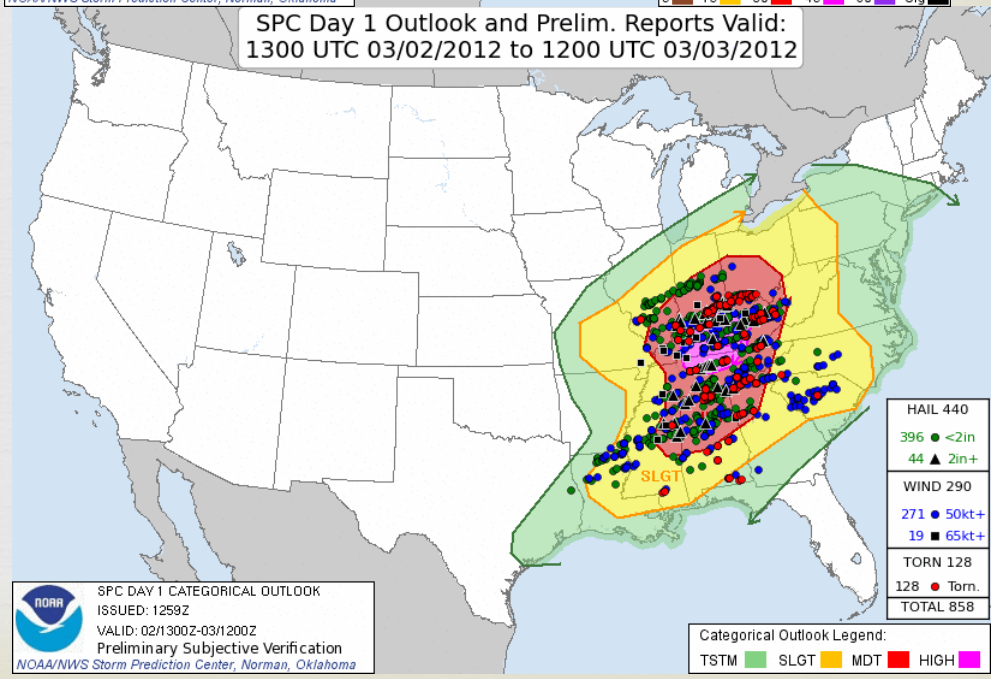
US Tornado Outbreak

- Feb 28-Mar 3
- 37 fatalaties
- ~ 40 tornadoes likely
- F2-F4 tornadoes

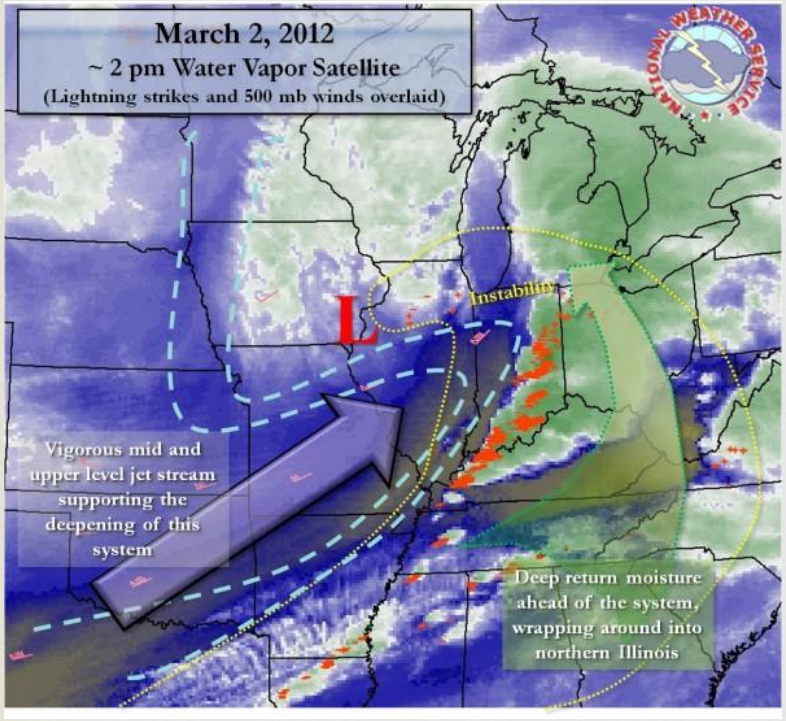






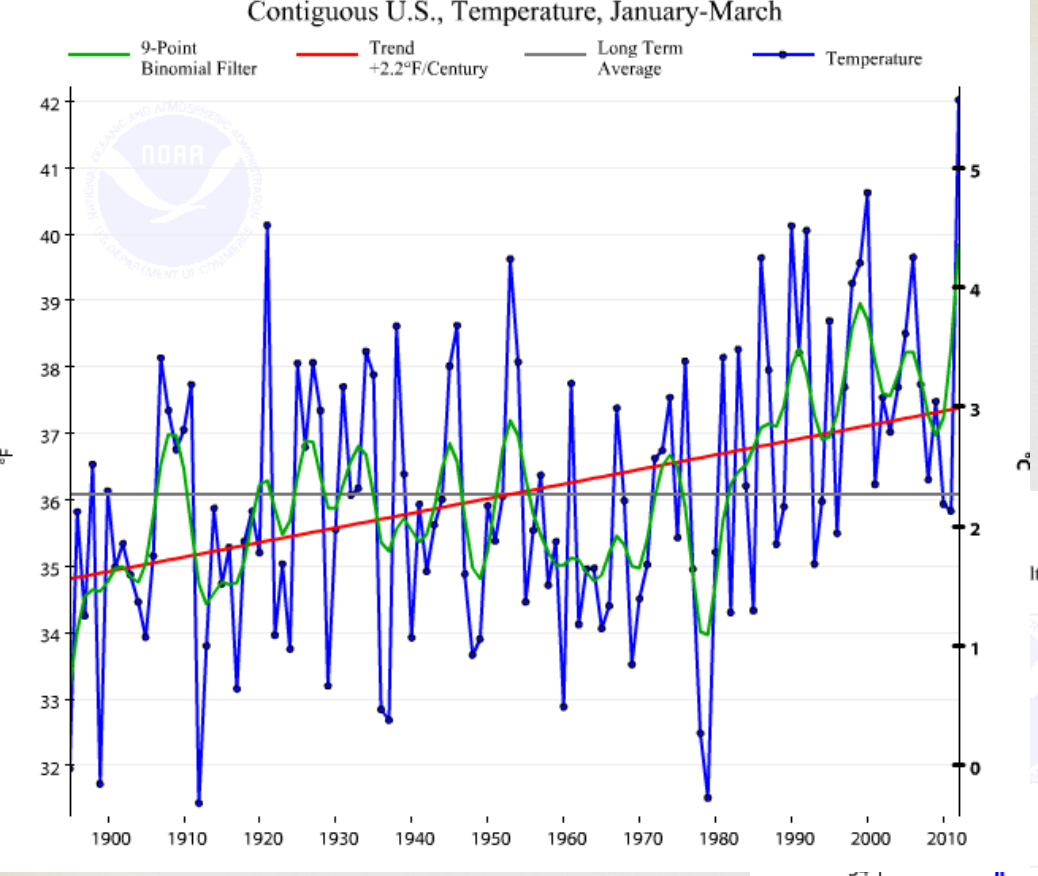


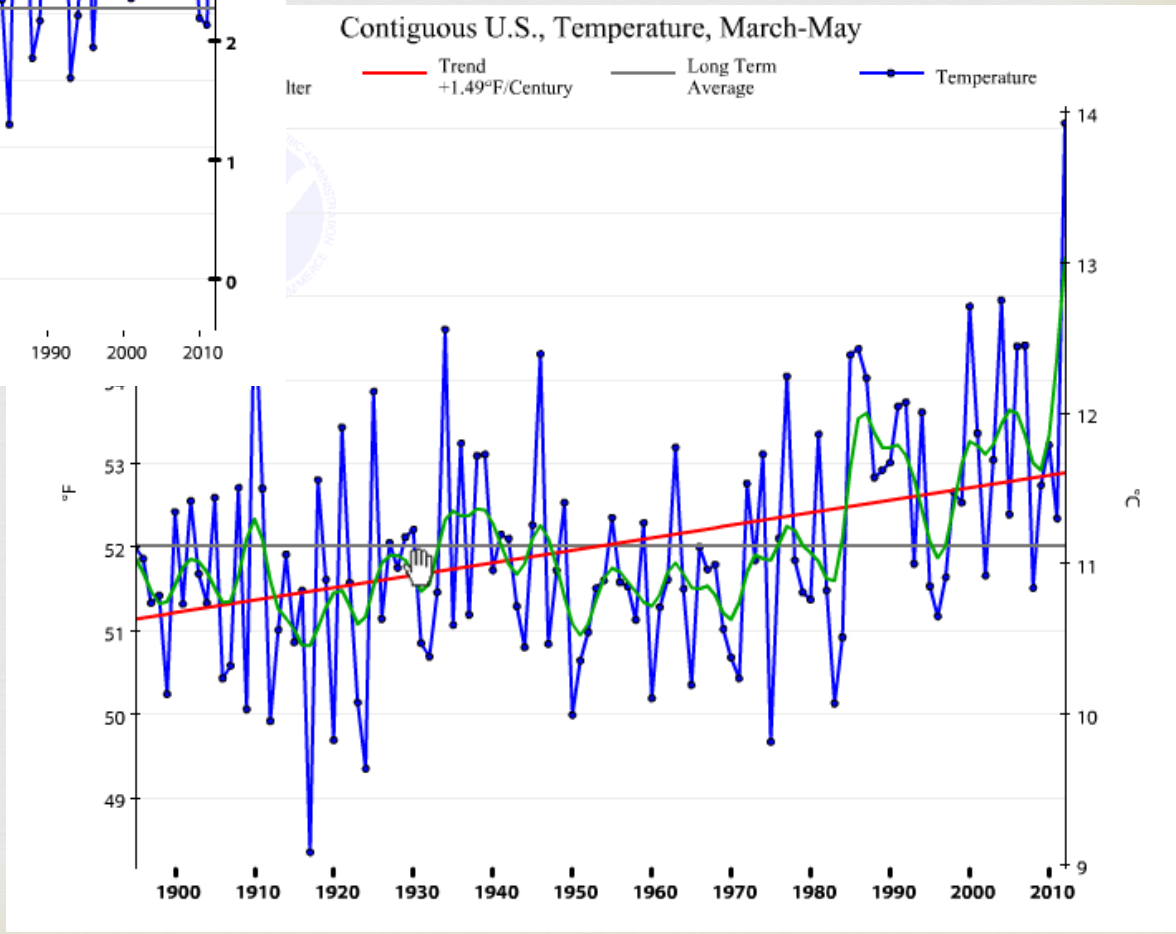
US Tornado Outbreak



- 2 storm systems over these days
- At least 52 fatalities from combined events
- This was the second deadliest early March tornado outbreak in the U.S. on record (1966 previously)

Saturday, March 3, 2012, in Marysville, Indiana (AP Photo/Al Behrman)


Contiguous U.S., Temperature, January-March
9-Point Binomial Filter
Trend +2.2°F/Century
Long Term Average
Temperature
°F
42
41
40
39
38
37
36
35
34
33
32
5
4
3
2
1
0
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010

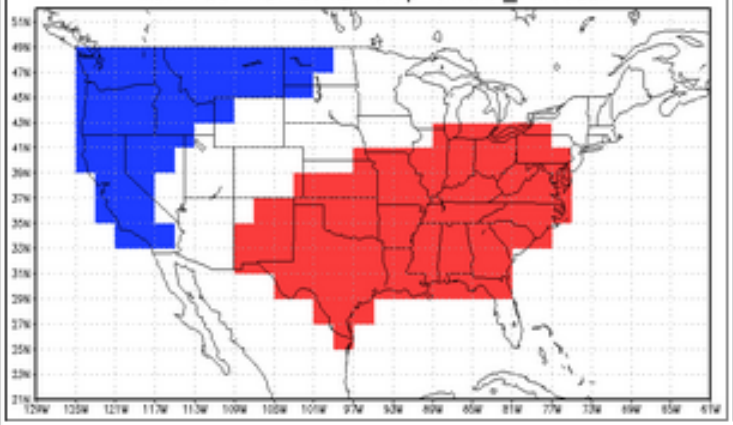

Contiguous U.S., Temperature, March-May
Trend +1.49°F/Century
Long Term Average
Temperature
°F
53
52
51
50
49
14
13
12
11
10
9
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010

Temperature Forecast Heidke Skill Scores :
Non-Equal Chance(non EC) forecasts: 54.79
All forecasts: 34.48
% coverage not Equal Chance forecasts : 62.93

Precipitation Forecast Heidke Skill Scores :
Non-Equal Chance(non EC) forecasts: 20.43
All forecasts: 14.44
% coverage not Equal Chance forecasts : 70.69

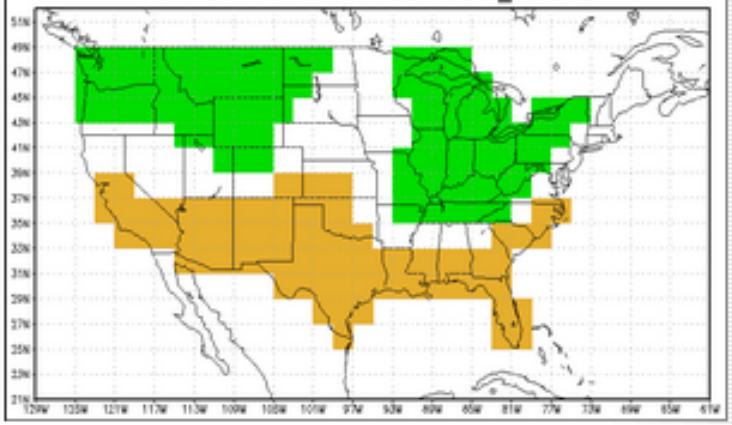
Temperature (Forecast)
Download Forecast Data Archive
(CAT, PROB ABOVE PROB BELOW)
How To Read Temperature Forecasts

Jan-Feb-Mar 2012 Temp Official_Forecast



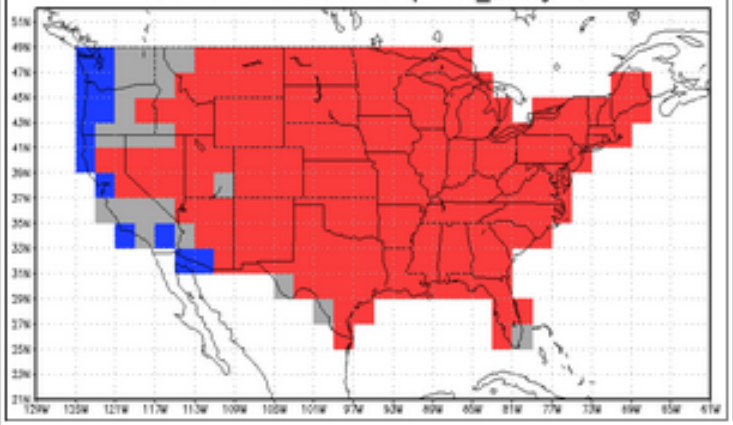
Precipitation (Forecast)
Download Forecast Data Archive
(CAT, PROB ABOVE PROB BELOW)
How To Read Precipitation Forecasts

Jan-Feb-Mar 2012 Prec Official_Forecast



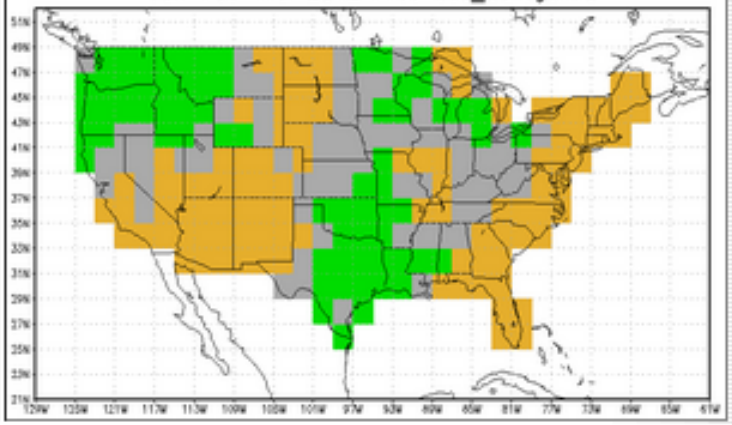
Temperature (Observations)
Download Observational Data Archive
(Temperature Observations)
How To Read Observations

Jan-Feb-Mar 2012 Temp Obs_Categories

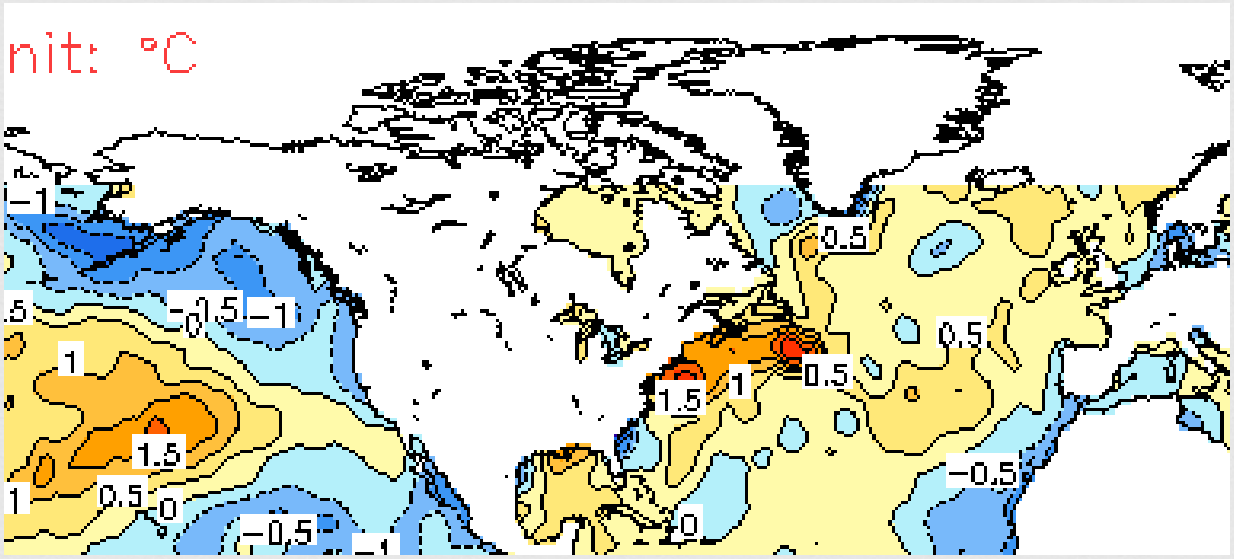


Precipitation (Observations)
Download Observational Data Archive
(Precipitation Observations)
How To Read Observations

Jan-Feb-Mar 2012 Prec Obs_Categories

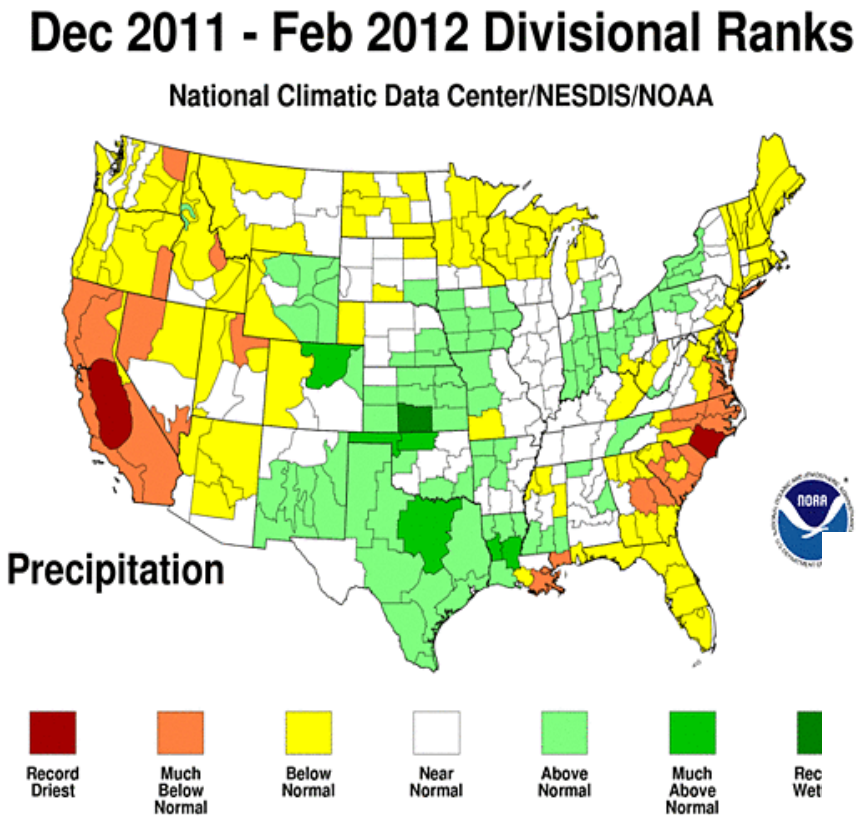


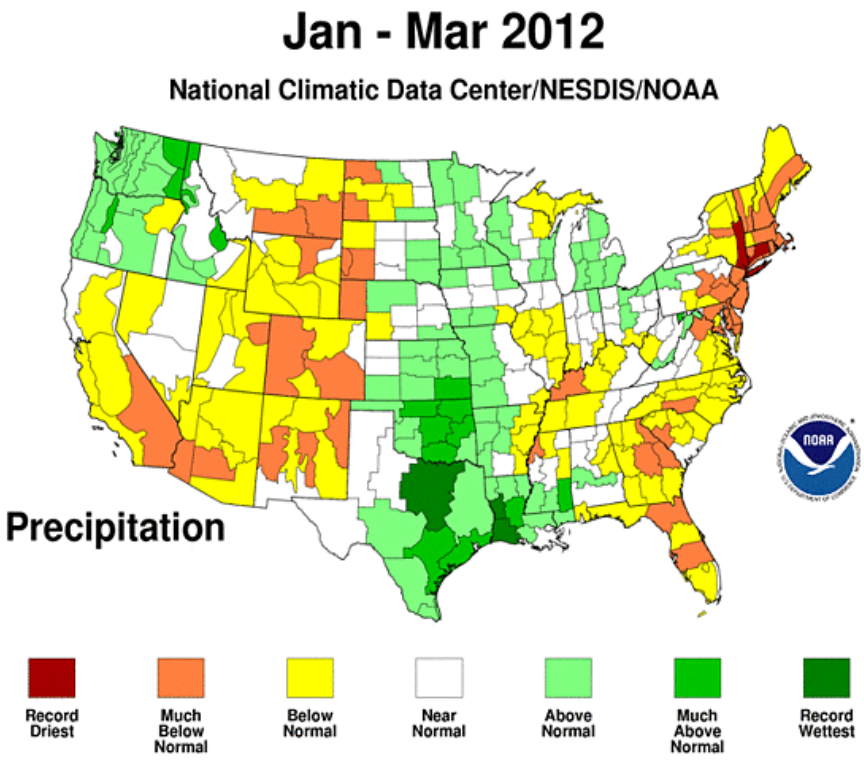
Winter SSTs



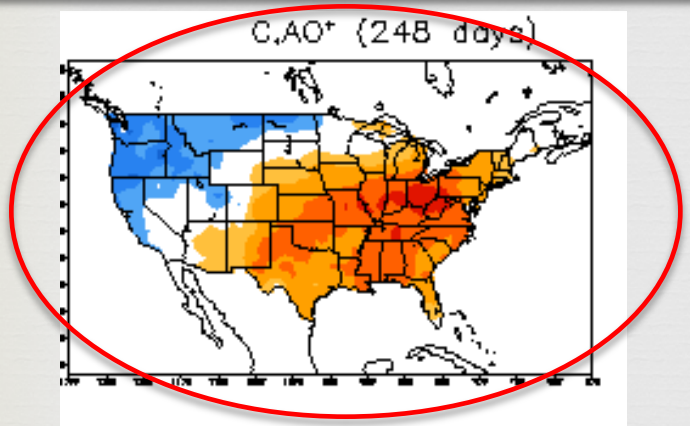
Optimum Interpolation SST
Anomaly, Feb 2012

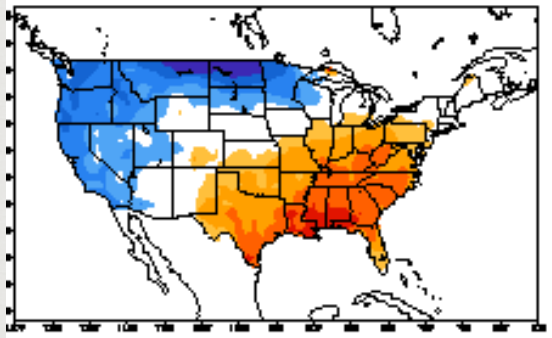
Winter precip

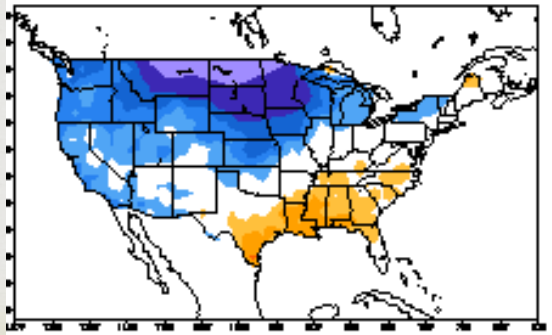


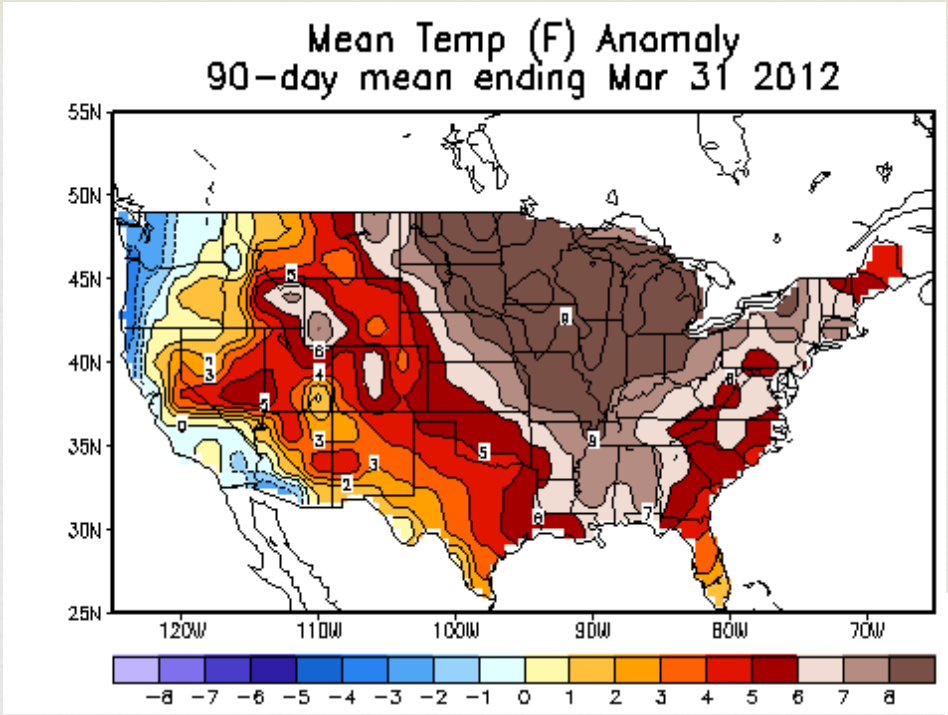


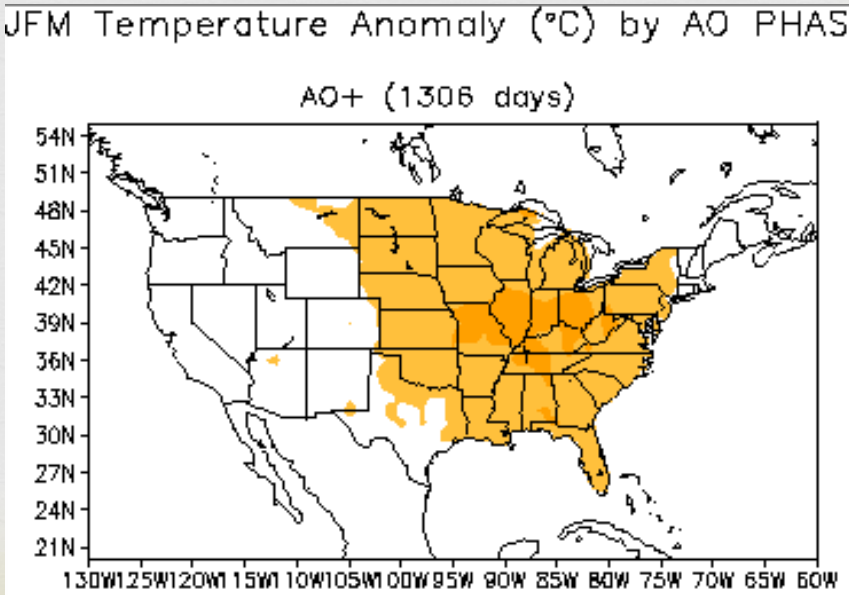
La Nina + pos AO composites of temperature for JFM (1950-2000)







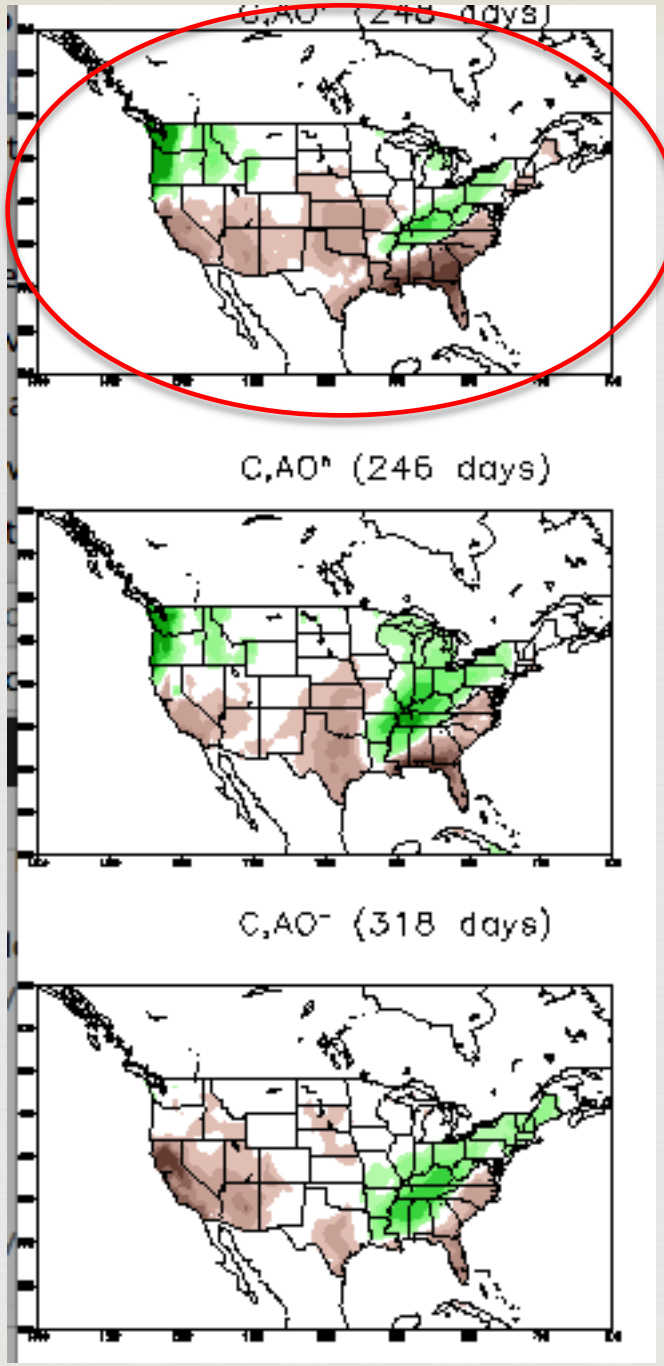


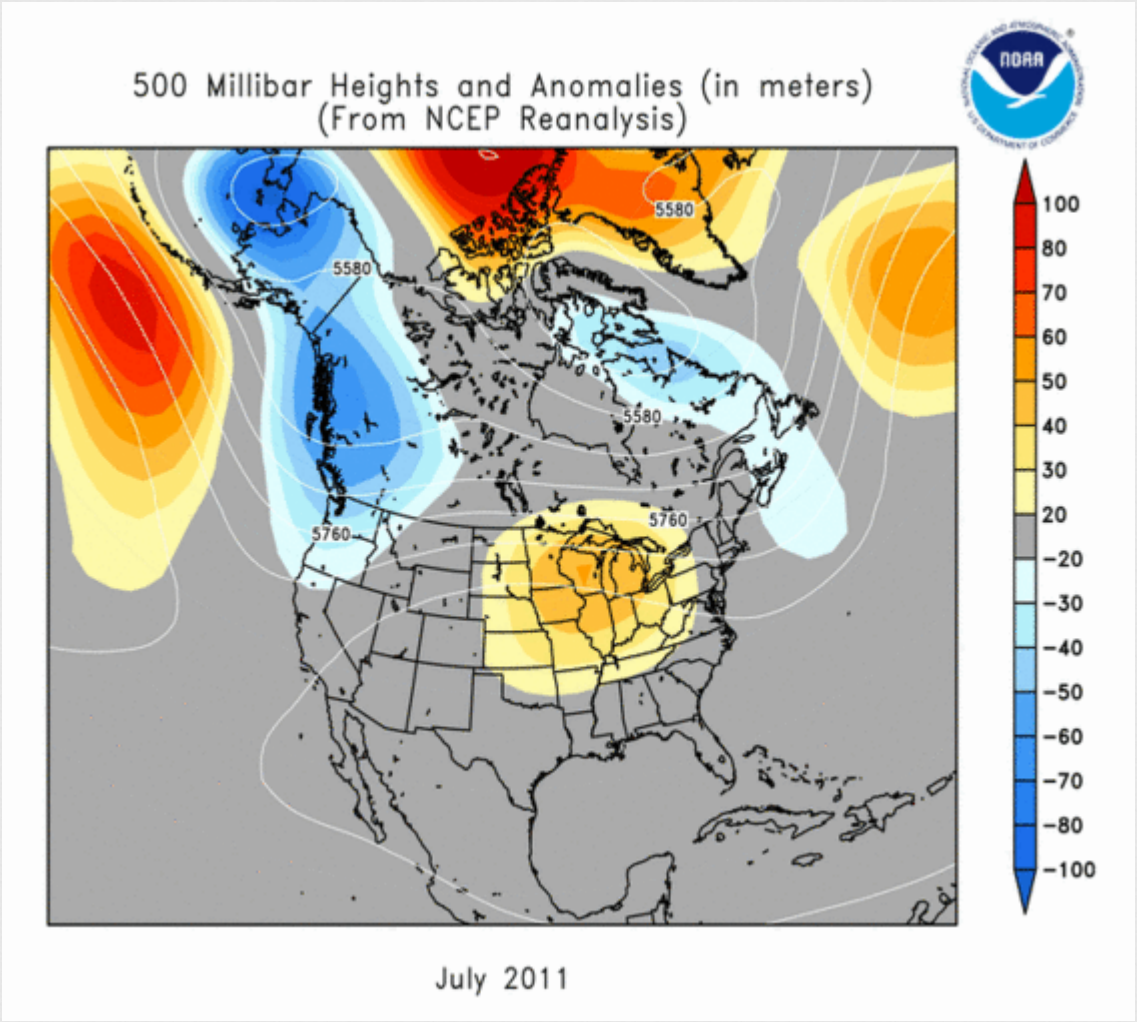


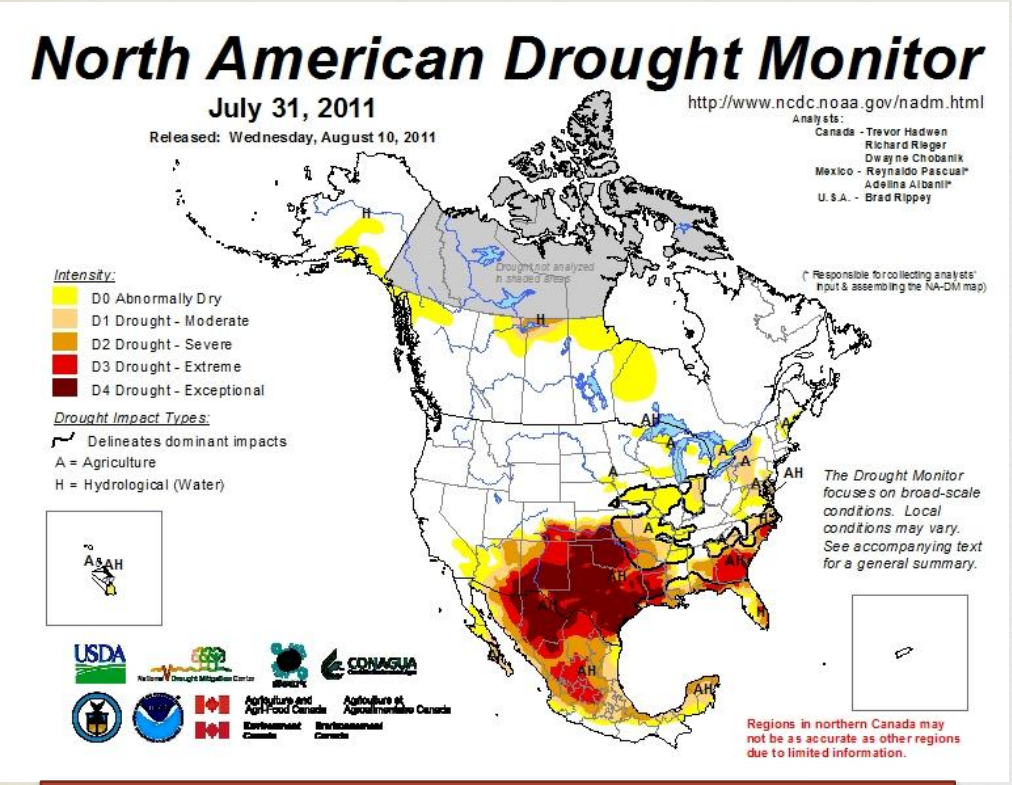
La Nina + pos AO composites of temperature for JFM (1950-2000)

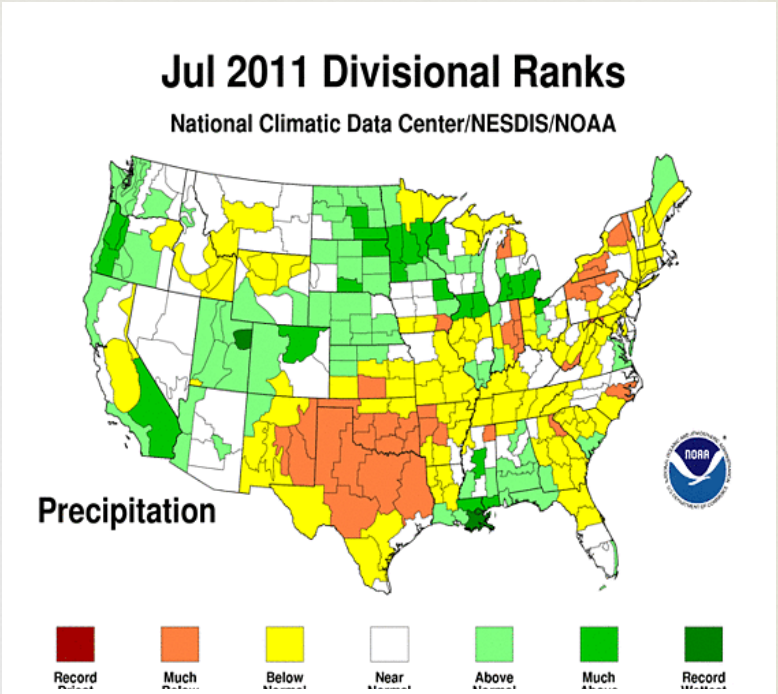
Last year – La Nina also. More La Nina -1.3 vs. -0.7 this year

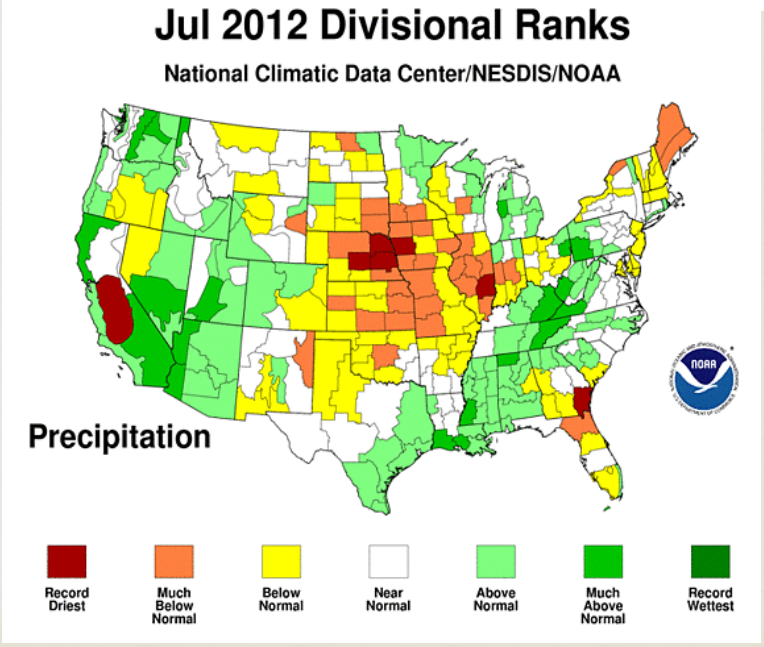
- AO in JFM 2011 was 0.433
- JFM 2012 was 0.267
- 2011 less negative, -1.7, 1.6, 1.4
- 2012 was -0.2, -0.036, 1.037



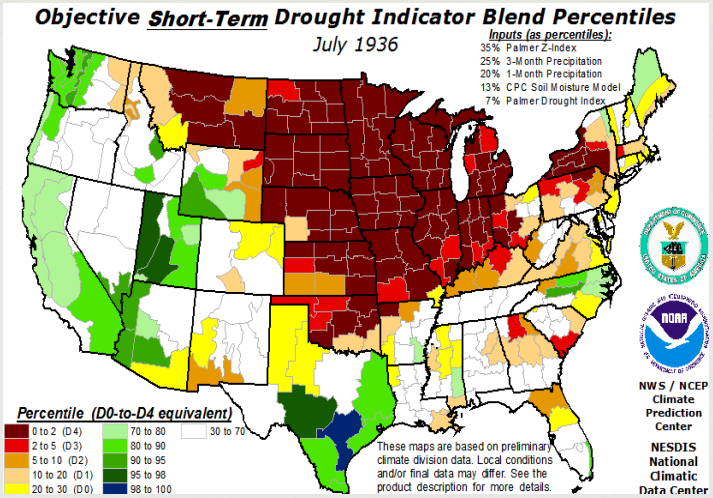

500 Millibar Heights and Anomalies (in meters)
(From NCEP Reanalysis)
NOAA
5580
5580
5580
5760
5760
100
80
70
60
50
40
30
20
−20
−30
−40
−50
−60
−70
−80
−100
July 2011







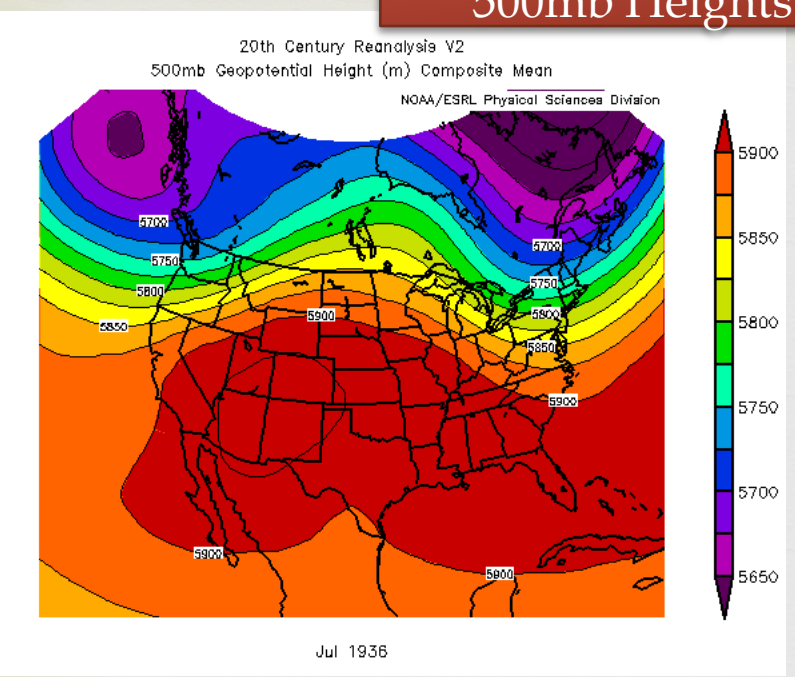
On a broad scale, the 1980s and 1990s were characterized by unusual wetness with short periods of extensive droughts, the 1930s and 1950s were characterized by prolonged periods of extensive droughts with little wetness, and the first decade of the 2000s saw extensive drought and extensive wetness (NCDC Drought overview for July 2012)

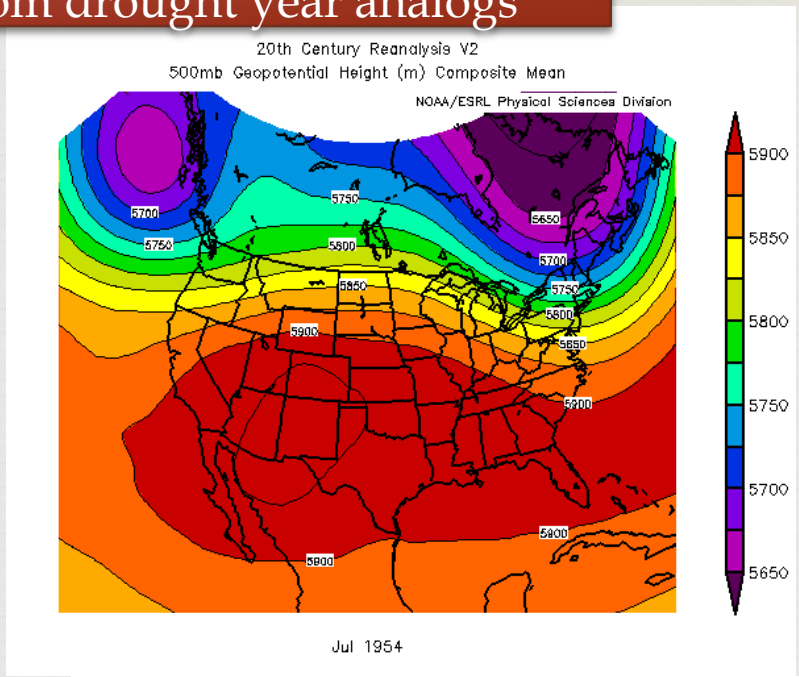


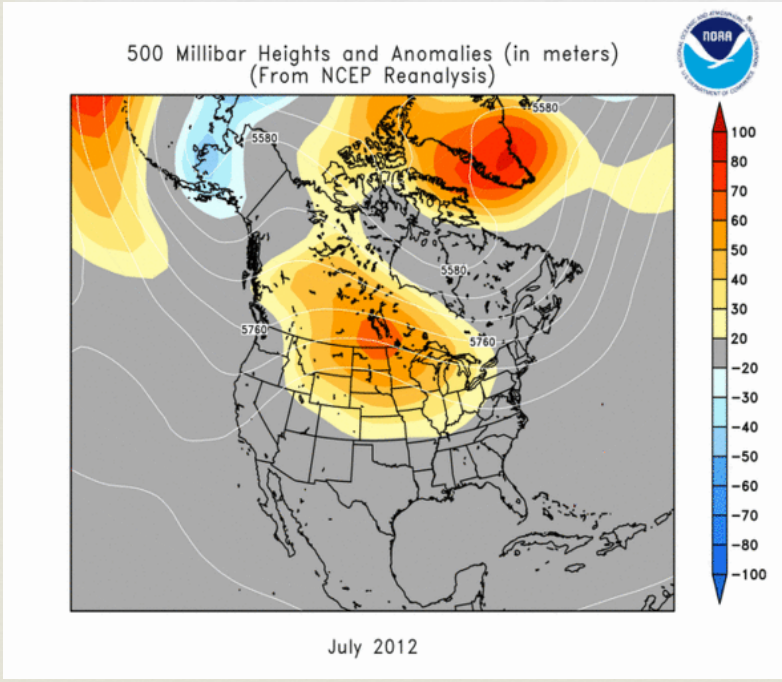
July 1936 Drought Blend
(43.78% coverage D1+,26.46% D4)

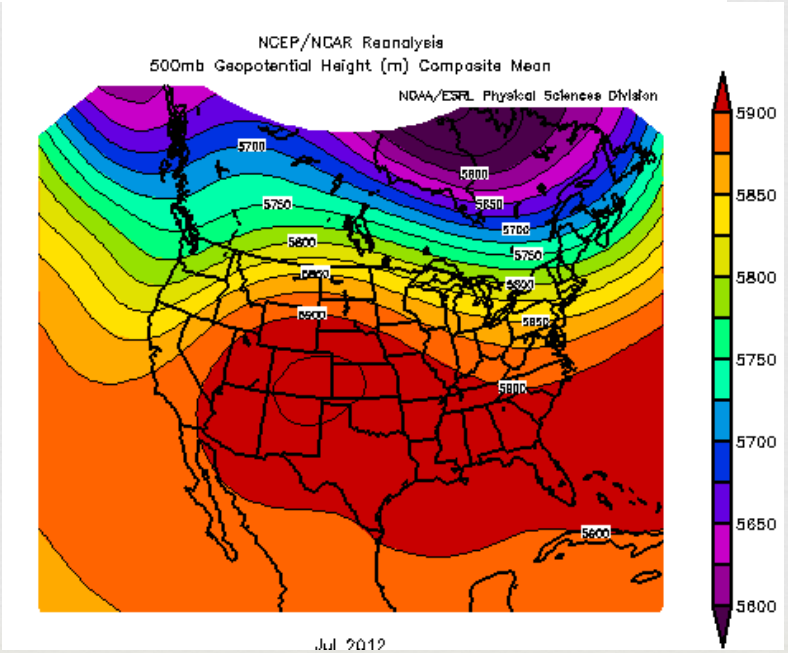
- Short-term drought approximates drought-related impacts that respond to precipitation on time scales ranging from a few days to a few months, such as wildfire danger, non-irrigated agriculture, topsoil moisture, range and pasture conditions, and unregulated streamflows.
- The Long-Term Blend approximates drought-related impacts that respond to precipitation on time scales ranging from several months to a few years, such as reservoir stores, irrigated agriculture, groundwater levels, and well water depth.

500mb Heights from drought year analogs

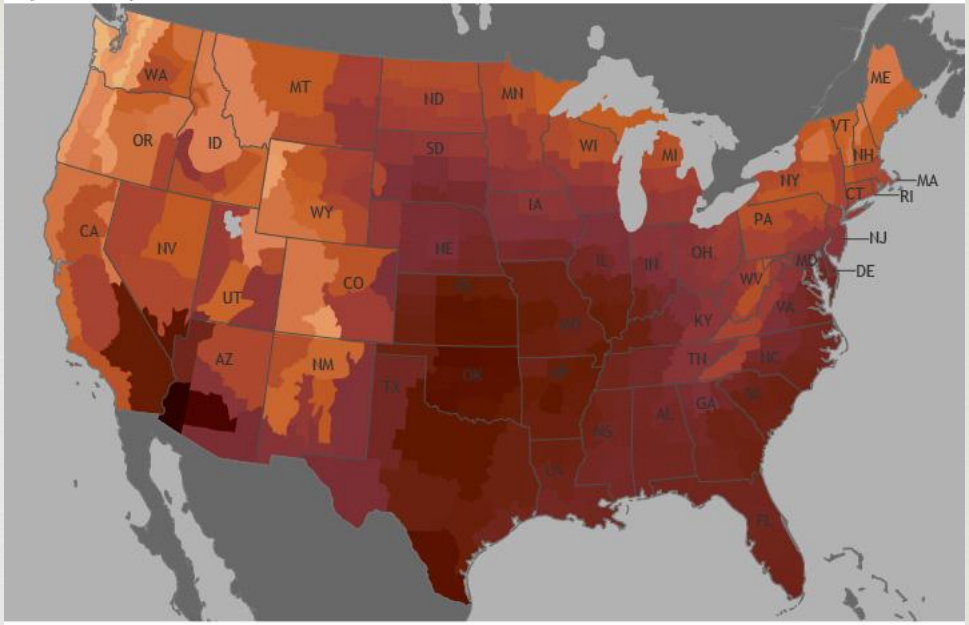








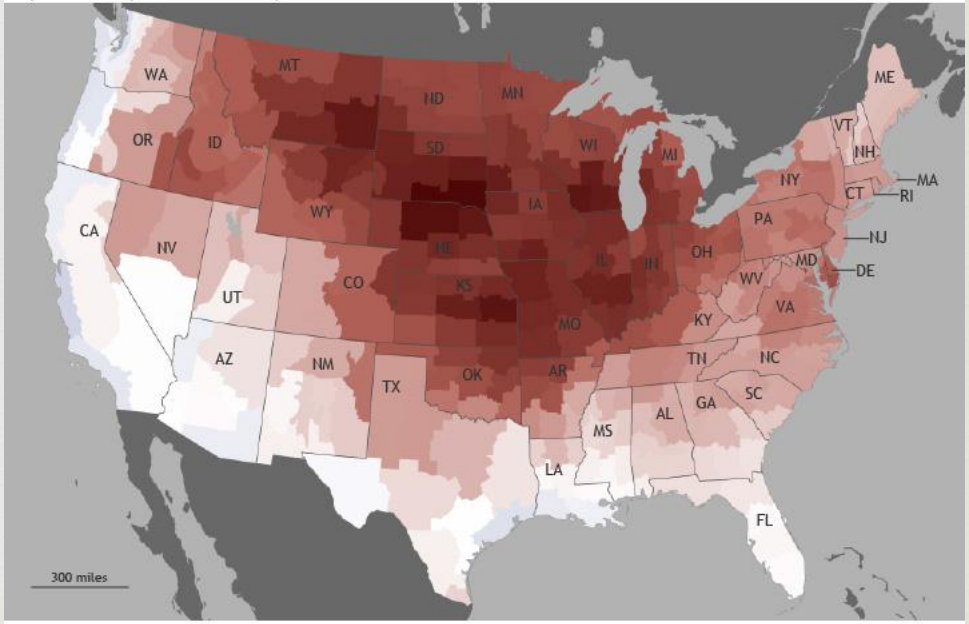
July 2012 temperature



Average temperature (°F)

55 75 95

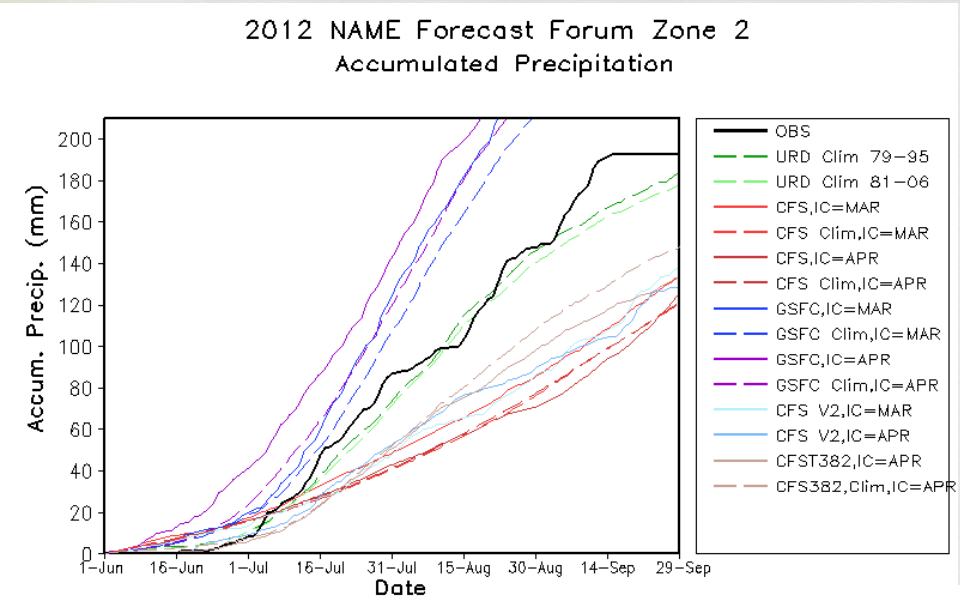
July 2012 temperature anomaly

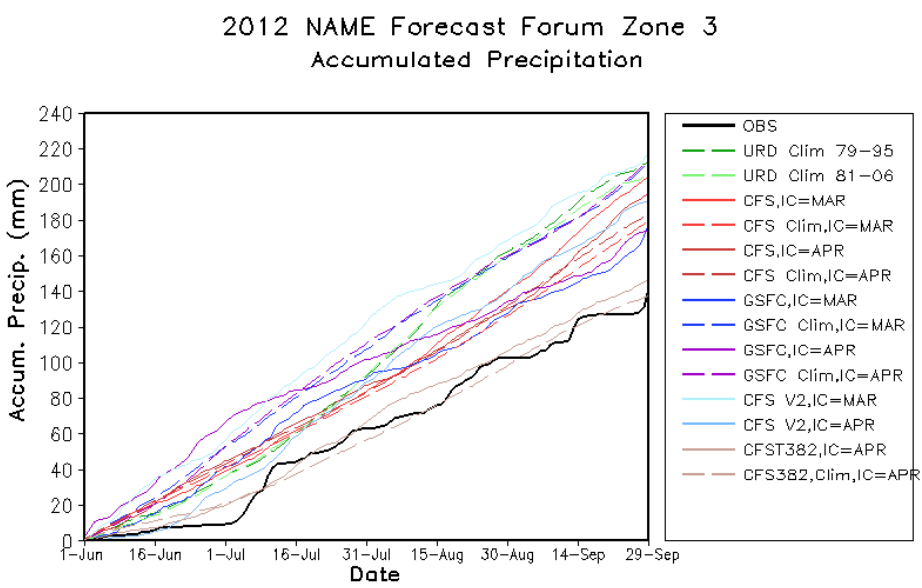


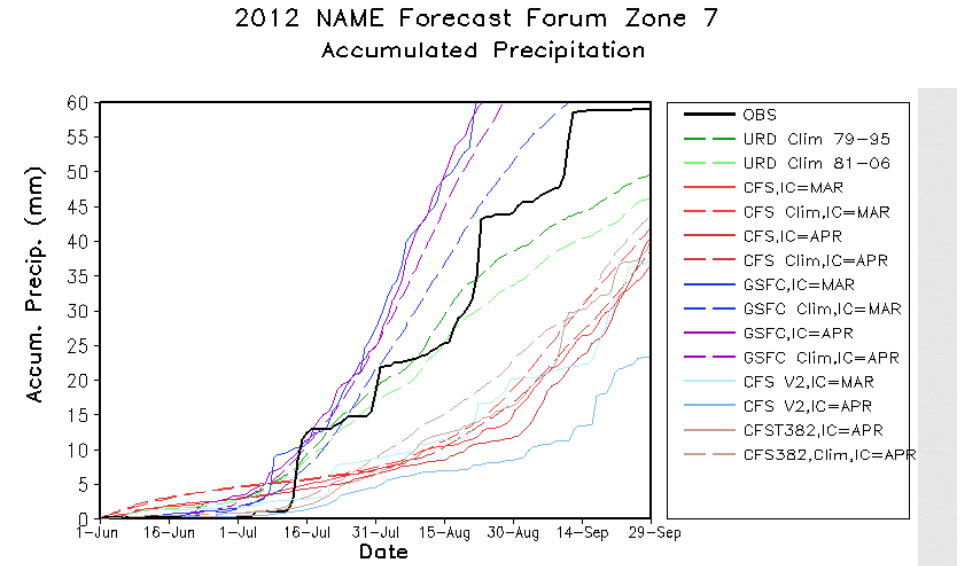
Difference from average temperature (°F)

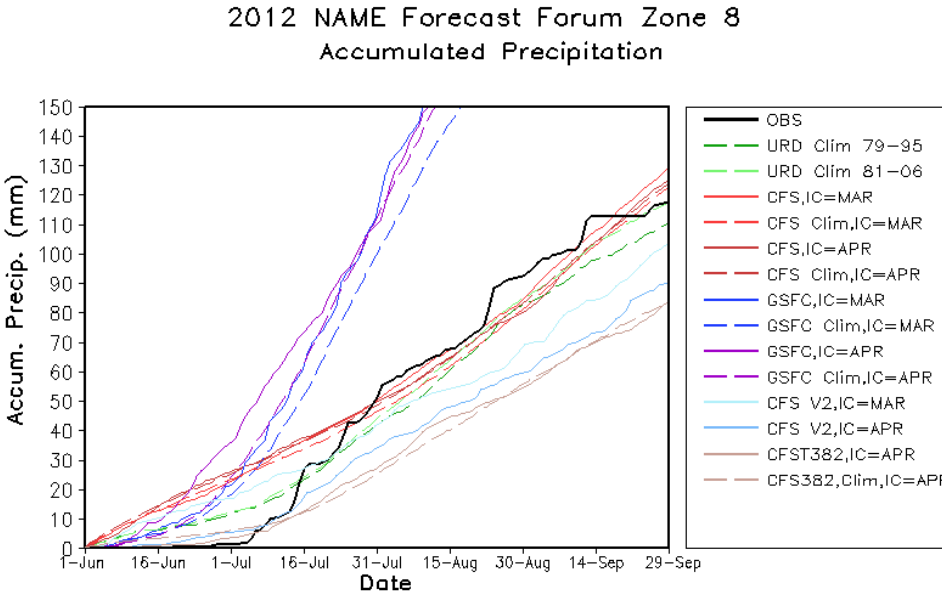
-2 0 8

SW Monsoon


2012 NAME Forecast Forum Zone 2
Accumulated Precipitation
Accum. Precip. (mm)
Date
1-Jun
16-Jun
1-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
OBS
URD Clim 79-95
URD Clim 81-06
CFS,IC=MAR
CFS Clim,IC=MAR
CFS,IC=APR
CFS Clim,IC=APR
GSFC,IC=MAR
GSFC Clim,IC=MAR
GSFC,IC=APR
GSFC Clim,IC=APR
CFS V2,IC=MAR
CFS V2,IC=APR
CFST382,IC=APR
CFS382,Clim,IC=APR


2012 NAME Forecast Forum Zone 3
Accumulated Precipitation
Accum. Precip. (mm)
Date
1-Jun
16-Jun
1-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
OBS
URD Clim 79-95
URD Clim 81-06
CFS,IC=MAR
CFS Clim,IC=MAR
CFS,IC=APR
CFS Clim,IC=APR
GSFC,IC=MAR
GSFC Clim,IC=MAR
GSFC,IC=APR
GSFC Clim,IC=APR
CFS V2,IC=MAR
CFS V2,IC=APR
CFST382,IC=APR
CFS382,Clim,IC=APR


2012 NAME Forecast Forum Zone 7
Accumulated Precipitation
Accum. Precip. (mm)
Date
1-Jun
16-Jun
1-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
OBS
URD Clim 79-95
URD Clim 81-06
CFS,IC=MAR
CFS Clim,IC=MAR
CFS,IC=APR
CFS Clim,IC=APR
GSFC,IC=MAR
GSFC Clim,IC=MAR
GSFC,IC=APR
GSFC Clim,IC=APR
CFS V2,IC=MAR
CFS V2,IC=APR
CFST382,IC=APR
CFS382,Clim,IC=APR


2012 NAME Forecast Forum Zone 8
Accumulated Precipitation
Accum. Precip. (mm)
Date
1-Jun
16-Jun
1-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
OBS
URD Clim 79-95
URD Clim 81-06
CFS,IC=MAR
CFS Clim,IC=MAR
CFS,IC=APR
CFS Clim,IC=APR
GSFC,IC=MAR
GSFC Clim,IC=MAR
GSFC,IC=APR
GSFC Clim,IC=APR
CFS V2,IC=MAR
CFS V2,IC=APR
CFST382,IC=APR
CFS382,Clim,IC=APR