



# US Climate Review of 2012

## The Hot and Dry

Melissa Ou (CPC)



<http://blogs.hotrod.com>



Brandon Converse



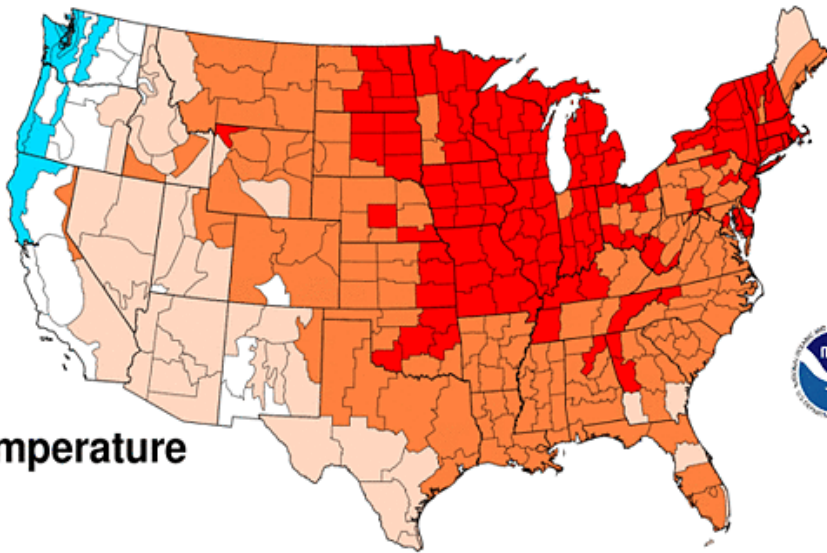
Connie Modzelewski

# Record warm winter and spring

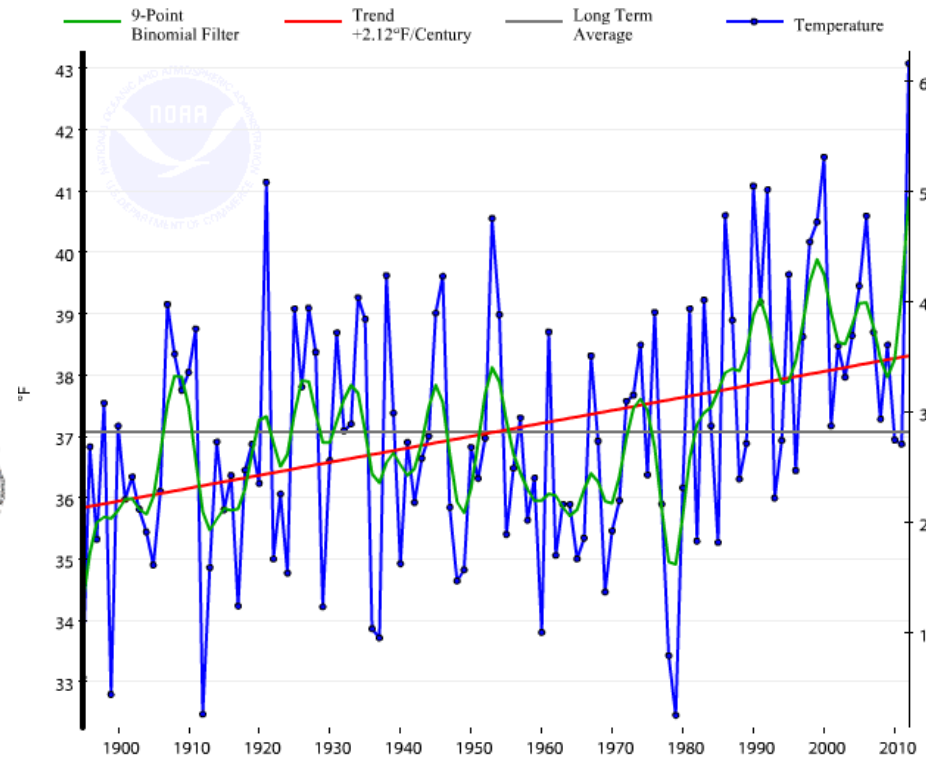
Average JFM temperature was ~43 degrees, which is 6.0 degrees above the long-term average.

## Jan - Mar 2012

National Climatic Data Center/NESDIS/NOAA



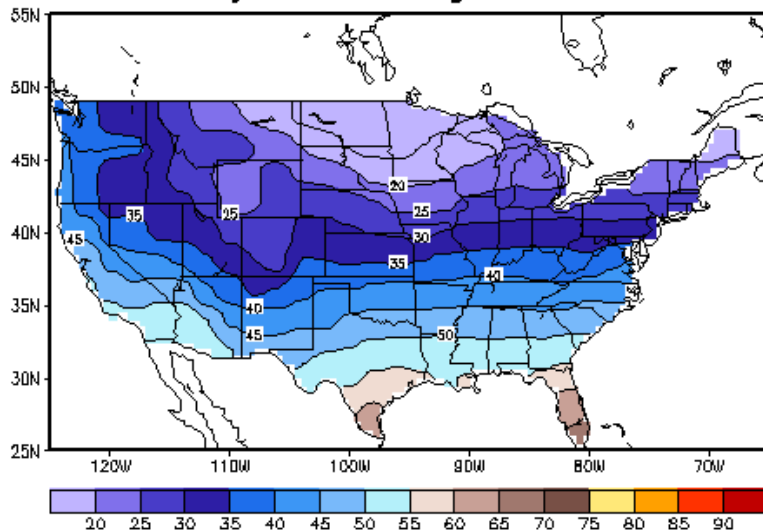
Contiguous U.S., Temperature, January-March



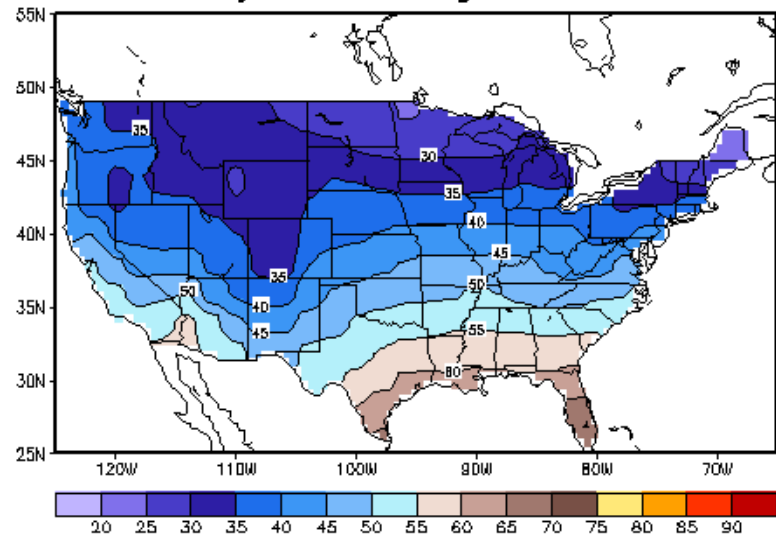
Record Coldest    Much Below Normal    Below Normal    Near Normal    Above Normal    Much Above Normal    Record Warmest

# Mean temperatures – JFM 2011 vs. 2012

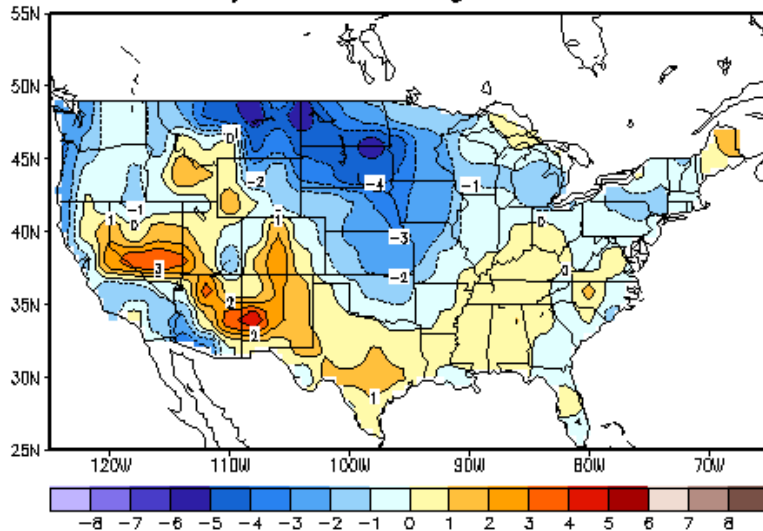
Mean Temperature (F)  
90-day mean ending Mar 31 2011



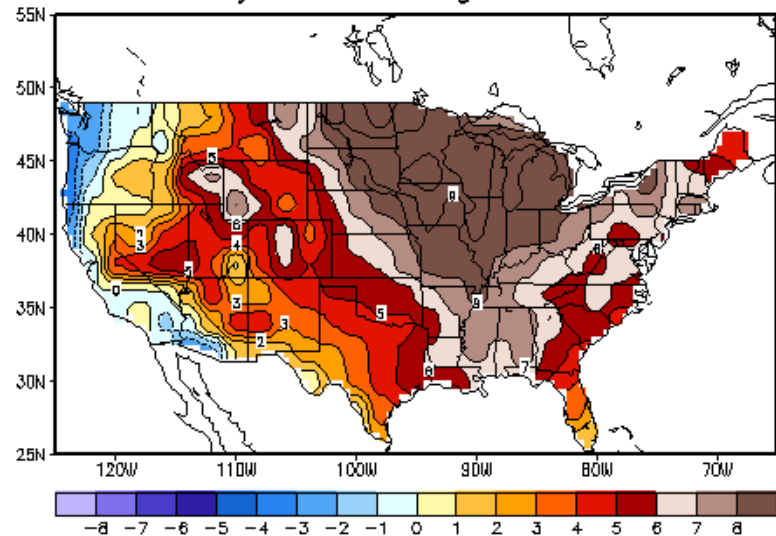
Mean Temperature (F)  
90-day mean ending Mar 31 2012



Mean Temp (F) Anomaly  
90-day mean ending Mar 31 2011



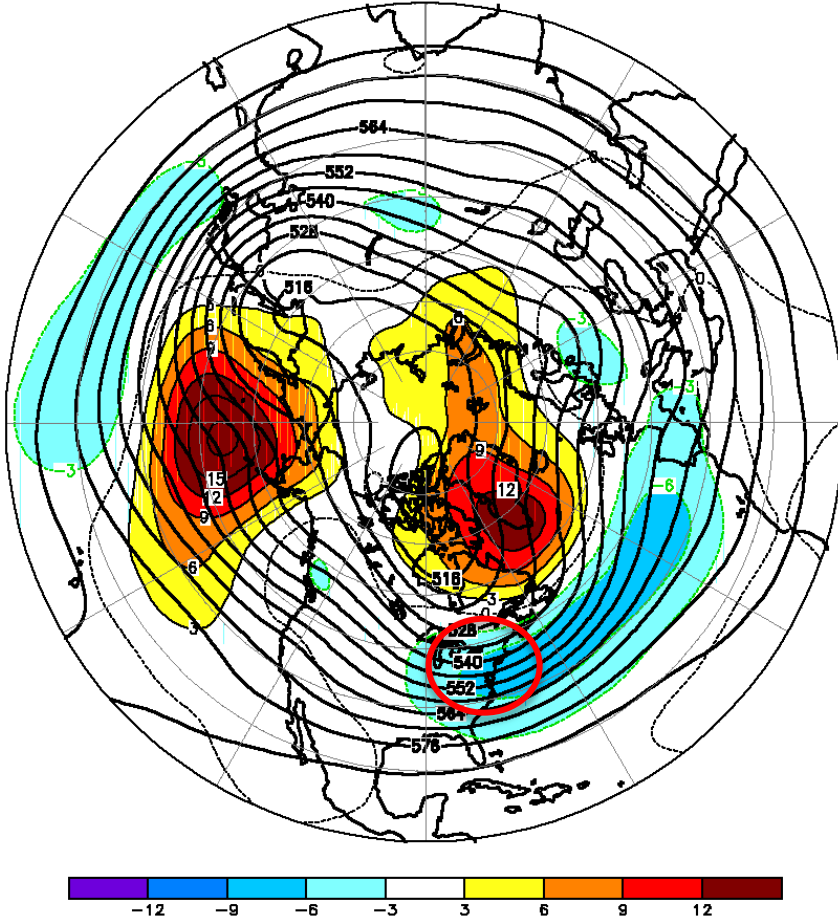
Mean Temp (F) Anomaly  
90-day mean ending Mar 31 2012



# DJF 500mb heights/anomalies

CDAS/Reanalysis

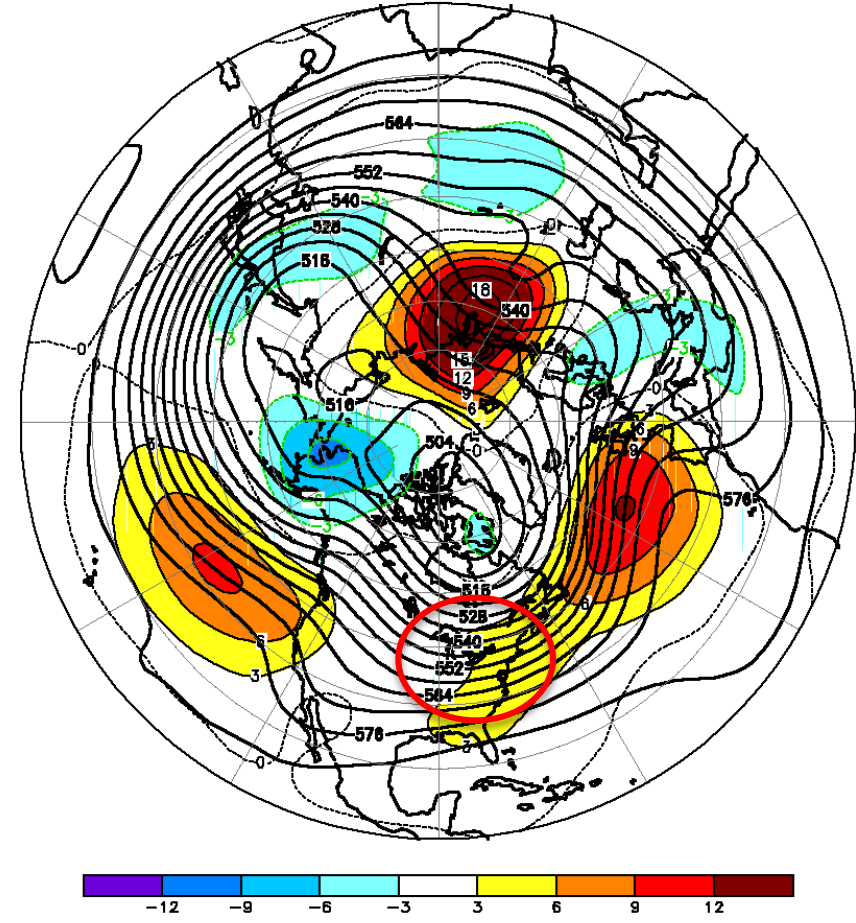
500 mb Height and Anomalies  
3 Month Mean  
Centered: jan2011



CLIMATE PREDICTION CENTER/NCEP

CDAS/Reanalysis

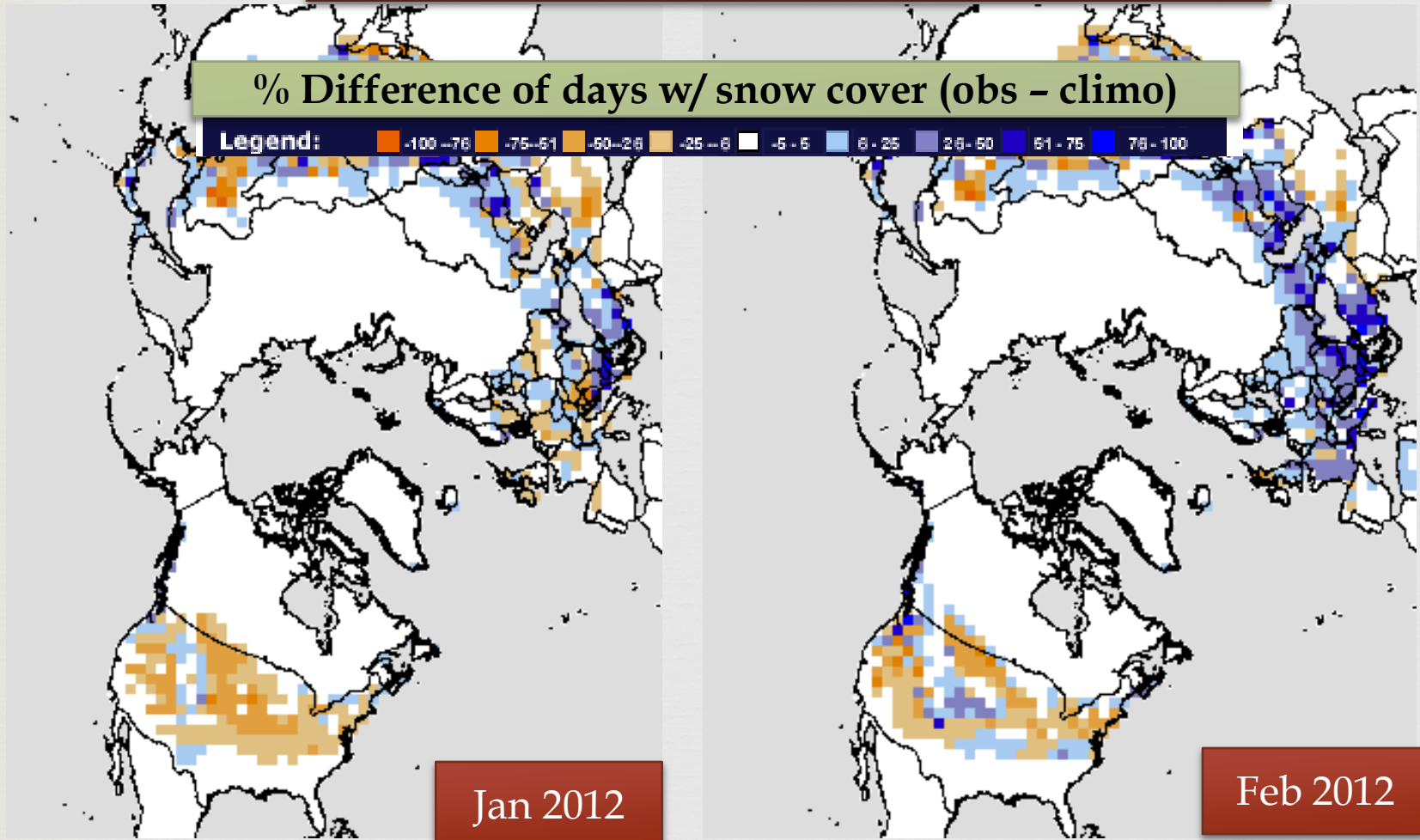
500 mb Height and Anomalies  
3 Month Mean  
Centered: jan2012



CLIMATE PREDICTION CENTER/NCEP

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

# Too little snow...



Images courtesy Rutgers University

3<sup>rd</sup> 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



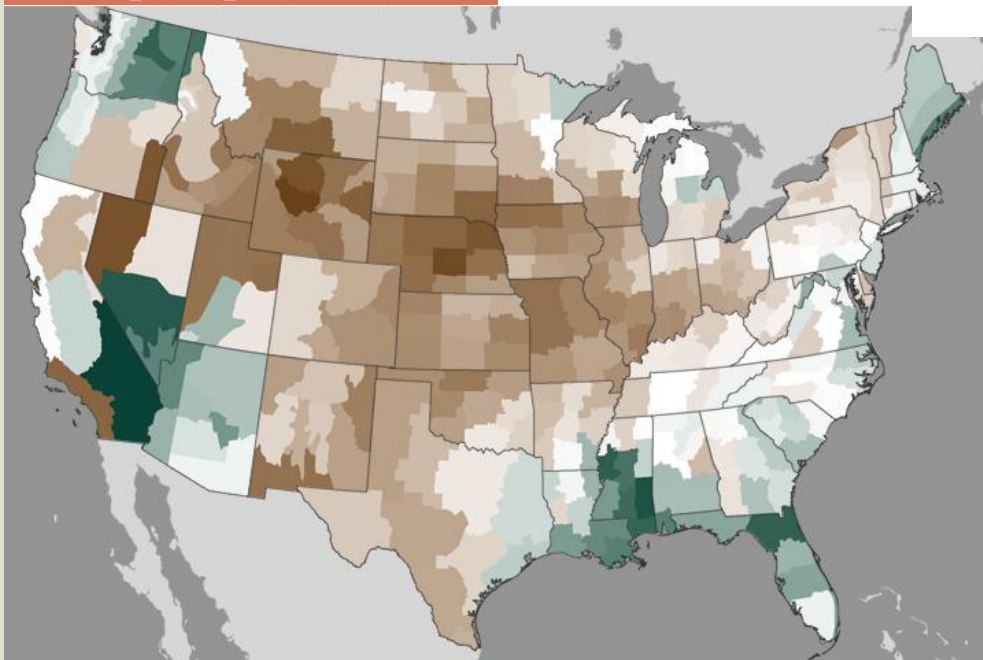
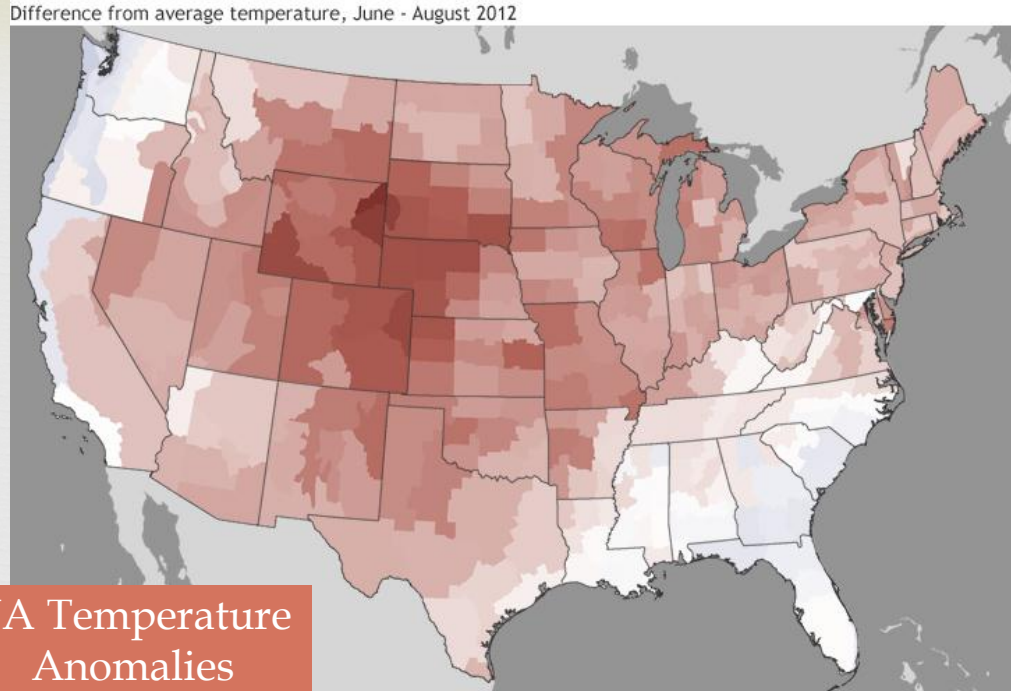
The town lift climbs up the mountainside at Park City Mountain Resort, April 4, 2012, in Park City, Utah. (Tom Smart, Deseret News)

# A hot and dry summer

JJA temperature and precipitation anomalies

JJA % of average precipitation

JJA Temperature Anomalies



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

# Heat wave in June

## U.S. Monthly Highest Max Temperature Records set in June 2012



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

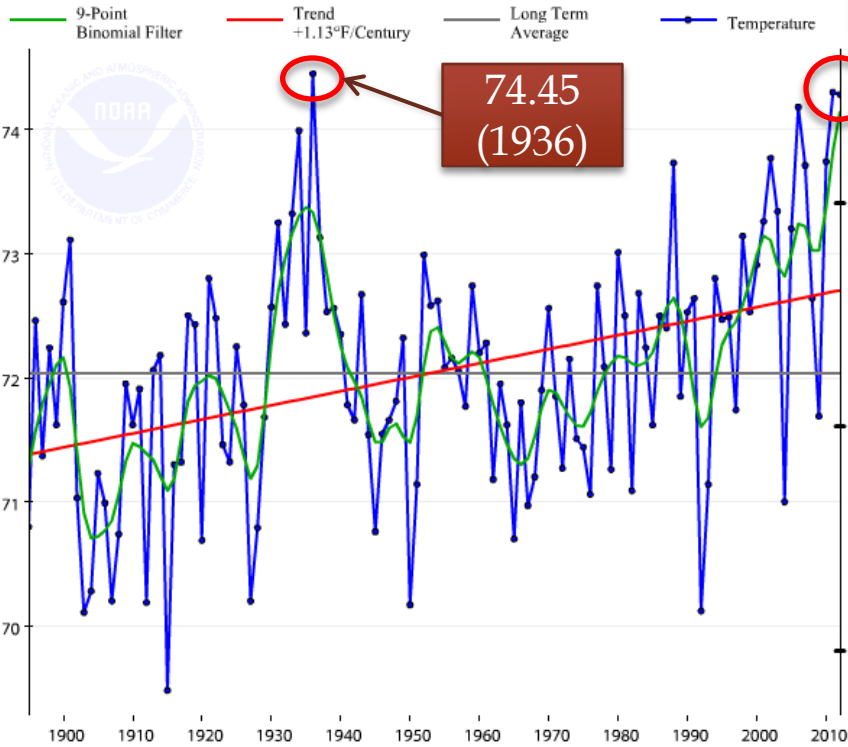
NOTE: These records are based on the historical daily observations archived in NCDC's Cooperative Summary of the Day data set and preliminary reports from Cooperative Observers and First Order National Weather Service stations, and as such are subject to change.

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.

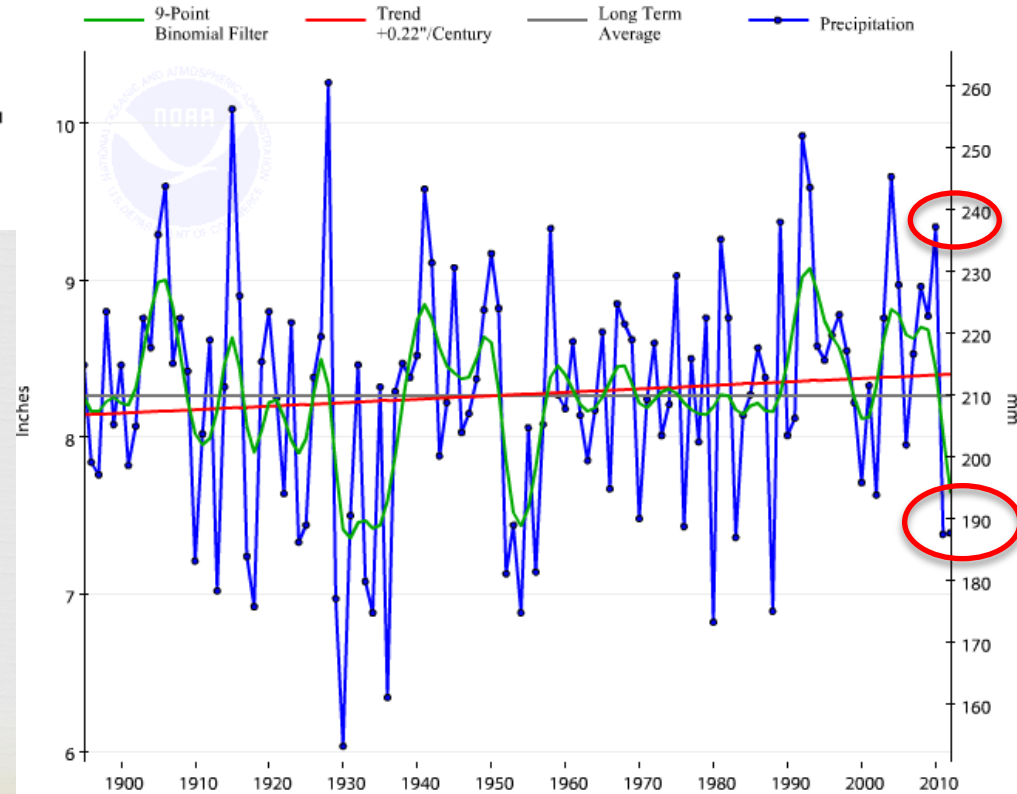


# JJA timeseries

### Contiguous U.S., Temperature, June-August



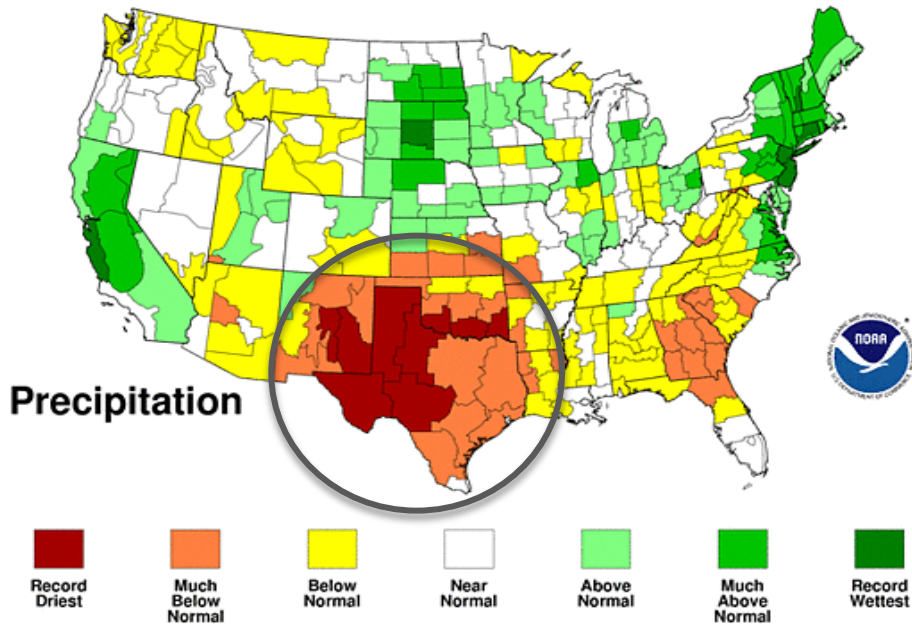
### Contiguous U.S., Precipitation, June-August



# JJA 2012 Precipitation Rankings

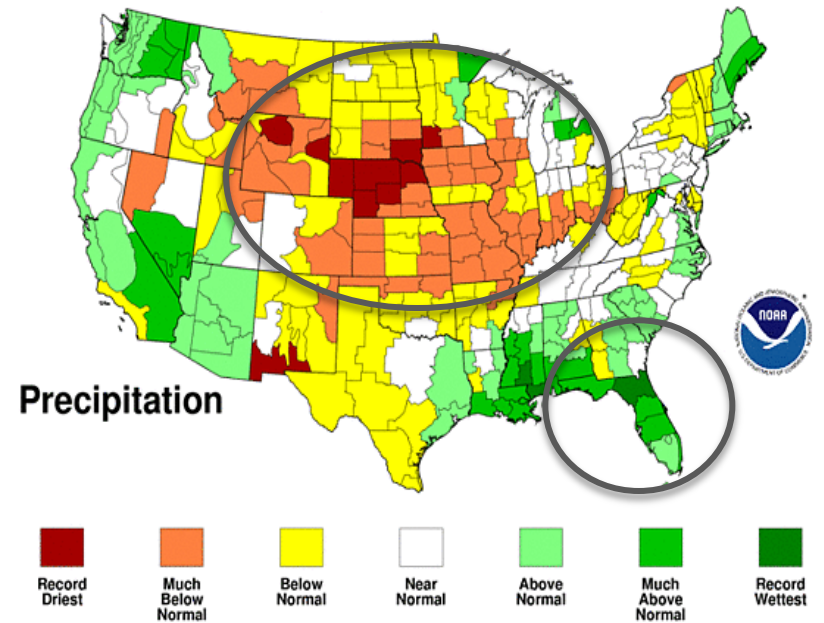
## Jun - Aug 2011

National Climatic Data Center/NESDIS/NOAA



## Jun - Aug 2012

National Climatic Data Center/NESDIS/NOAA



# 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)

## North American Drought Monitor

July 31, 2012

Released: Tuesday, August 14, 2012

<http://www.ncdc.noaa.gov/nadm.html>

Analysts:

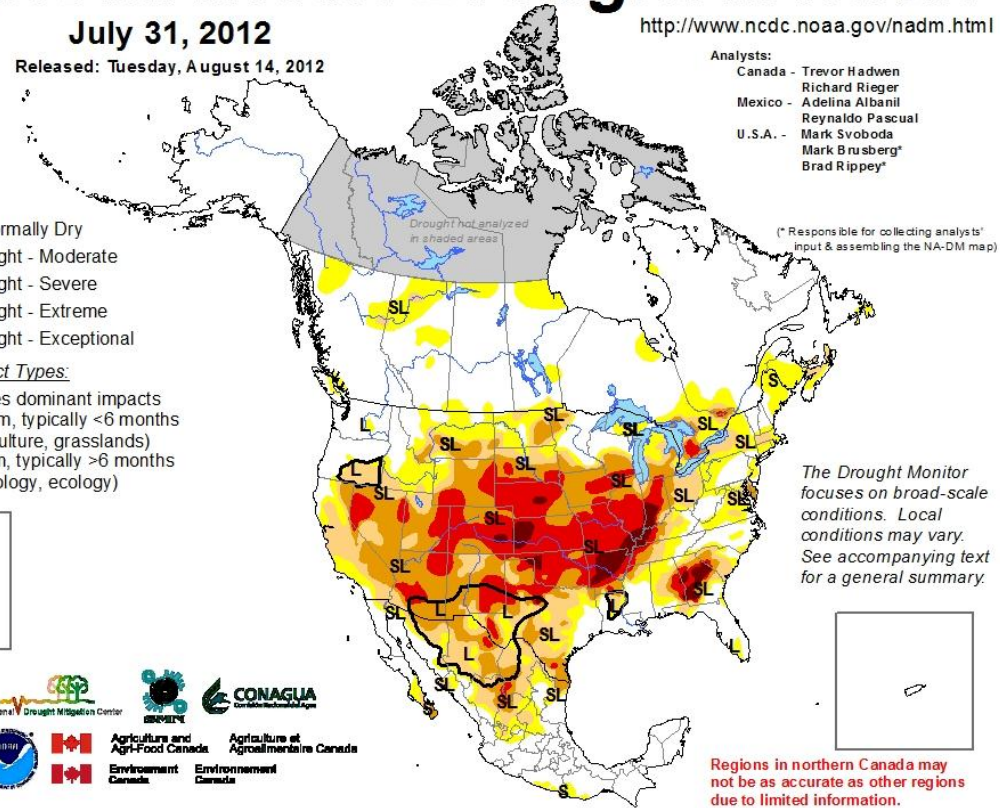
Canada - Trevor Hadwen  
Richard Rieger  
Mexico - Adelina Albanil  
Reynaldo Pascual  
U.S.A. - Mark Svoboda  
Mark Brusberg\*  
Brad Rippey\*

### Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

### Drought Impact Types:

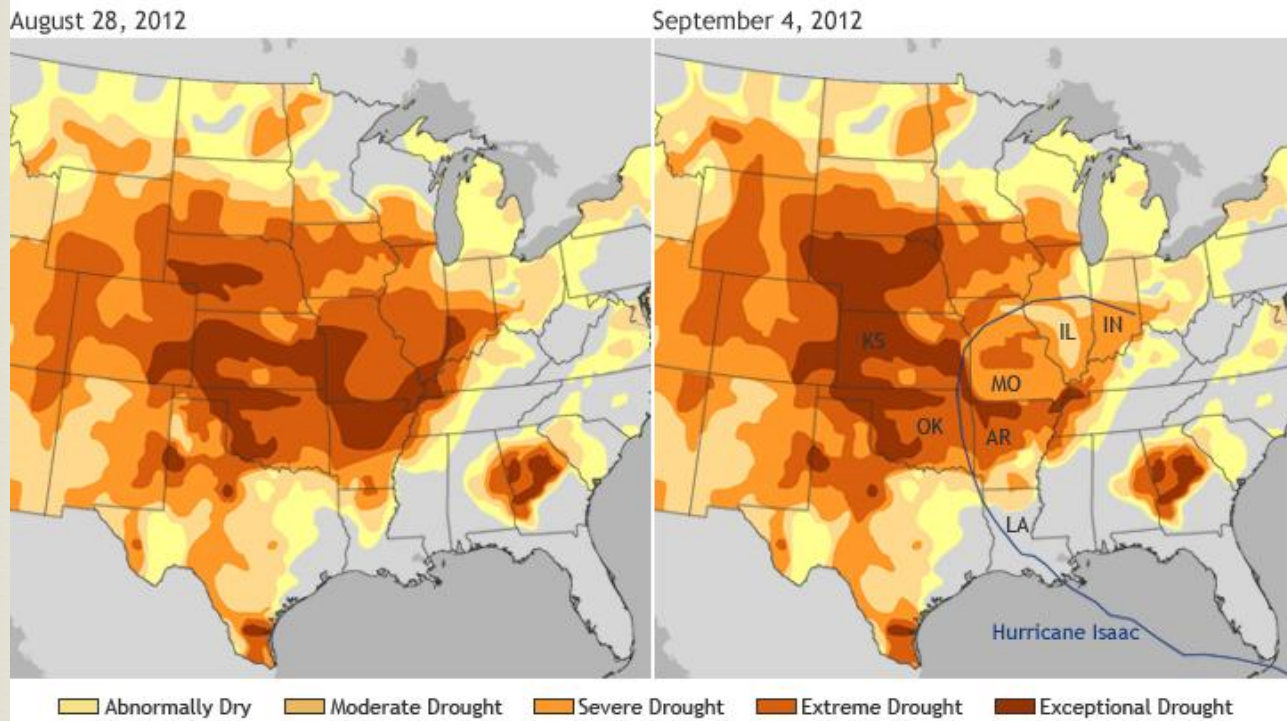
- ~ Delineates dominant impacts
- S = Short-Term, typically <6 months  
(e.g. agriculture, grasslands)
- L = Long-Term, typically >6 months  
(e.g. hydrology, ecology)



The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text for a general summary.

Regions in northern Canada may not be as accurate as other regions due to limited information.

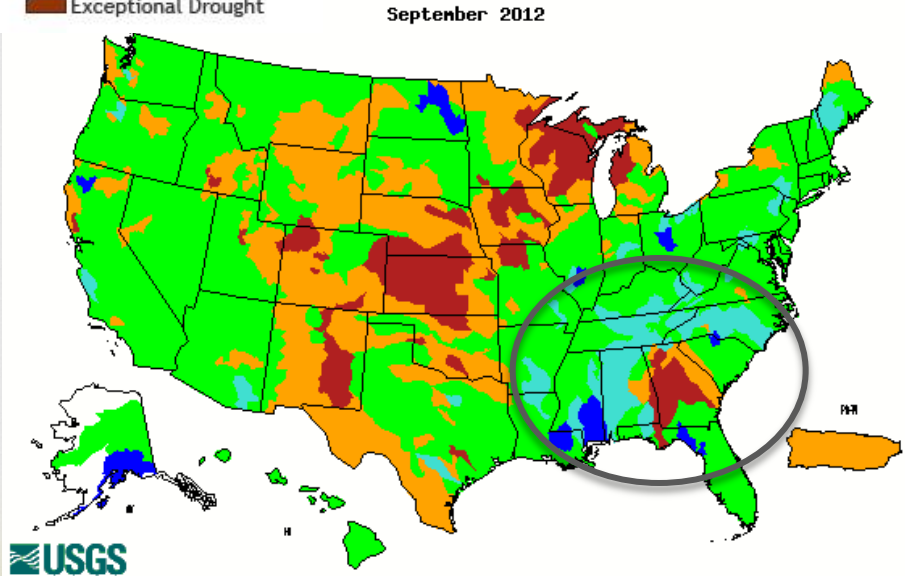
# Hurricanes had little impact on drought



Hurricane Isaac made landfall August 28, 2012

September 2012 average streamflow

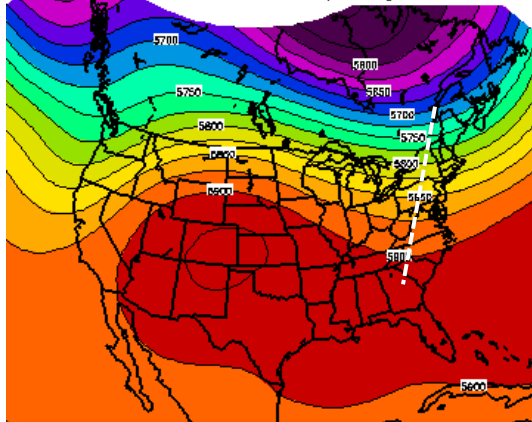
Courtesy of NCDC, Map by climate.gov



Explanation - Percentile classes						
Low	<10	10-24	25-75	76-90	>90	High
	Much below normal	Below normal	Normal	Above normal	Much above normal	

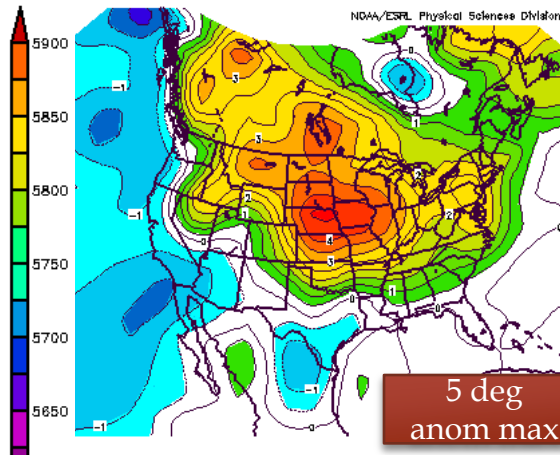
# Drought Index July Analogs – 1954 & 2012

NCEP/NCAR Reanalysis  
500mb Geopotential Height (m) Composite Mean  
NOAA/ESRL Physical Sciences Division



July 2012 500mb heights

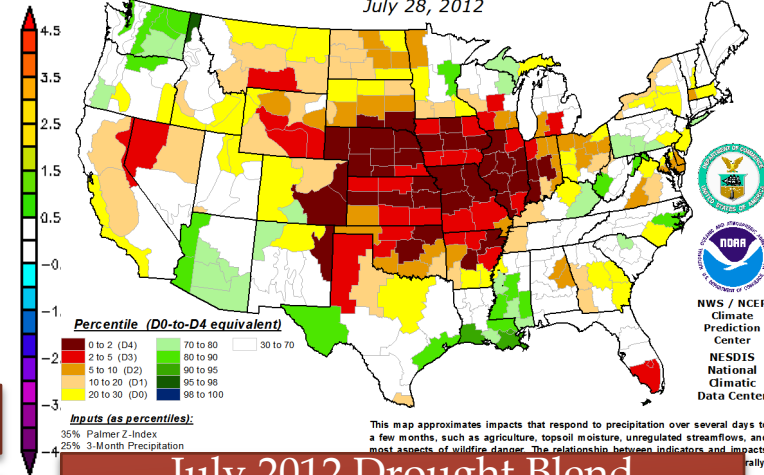
NCEP/NCAR Reanalysis  
Surface air (C) Composite Anomaly 1981–2010 climo  
NOAA/ESRL Physical Sciences Division



5 deg  
anom max

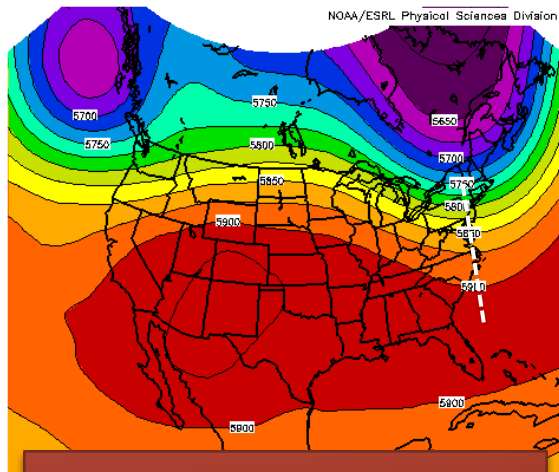
July 2012 surface air temp  
anomalies (deg C)

Objective **Short-Term Drought Indicator Blend Percentiles**  
July 28, 2012



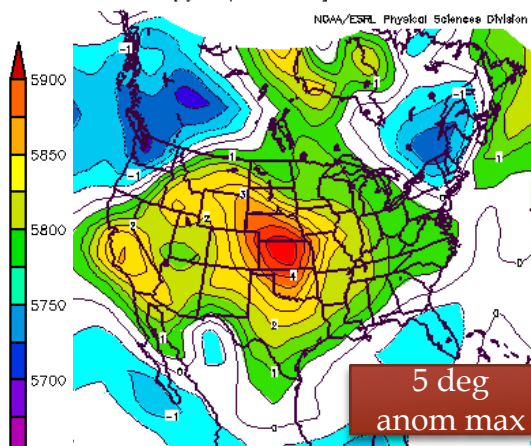
July 2012 Drought Blend  
(40.28% coverage D1+, 10.86%  
D4)

20th Century Reanalysis V2  
500mb Geopotential Height (m) Composite Mean  
NOAA/ESRL Physical Sciences Division



July 1954 500mb heights

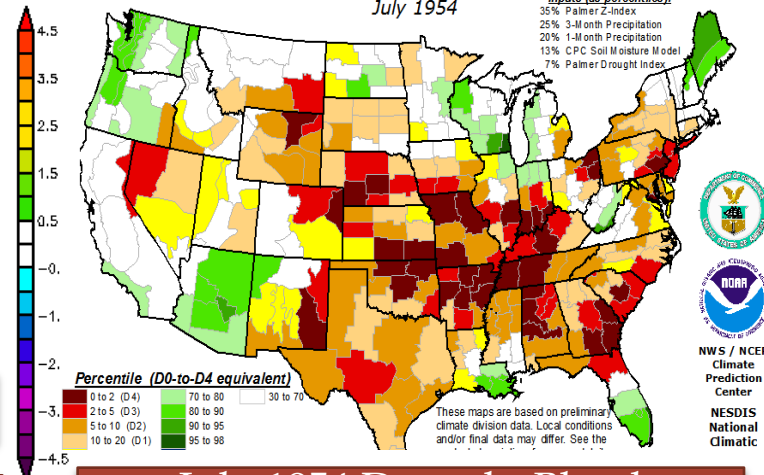
NCEP/NCAR Reanalysis  
Surface air (C) Composite Anomaly 1981–2010 climo  
NOAA/ESRL Physical Sciences Division



5 deg  
anom max

July 1954 surface air temp  
anomalies(deg C)

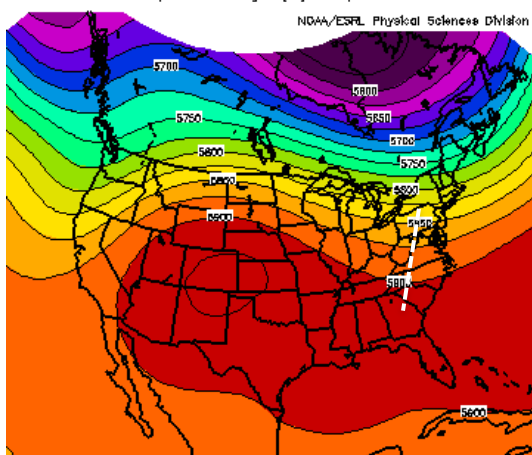
Objective **Short-Term Drought Indicator Blend Percentiles**  
July 1954



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

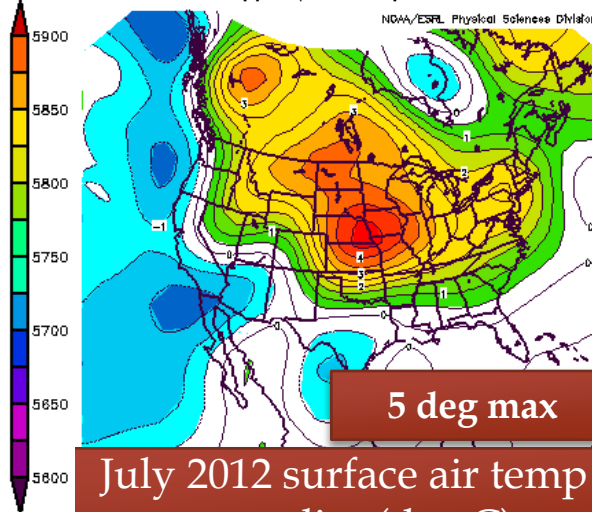
# Precipitation Analogs - 1936 & 2012

NCEP/NCAR Reanalysis  
500mb Geopotential Height (m) Composite Mean

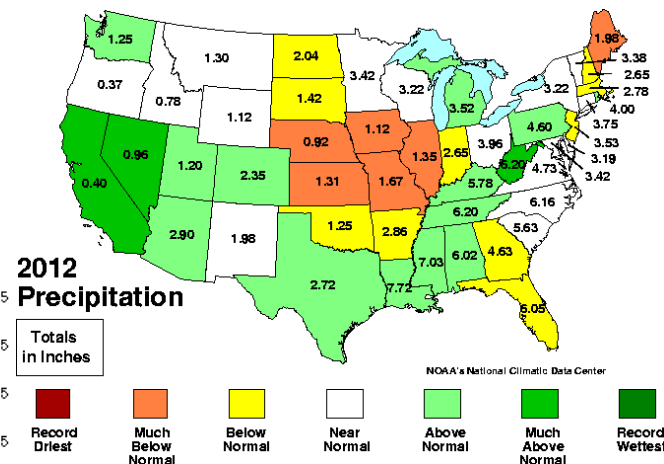


July 2012 500mb heights

NCEP/NCAR Reanalysis  
1000mb air (C) Composite Anomaly 1981-2010 climo

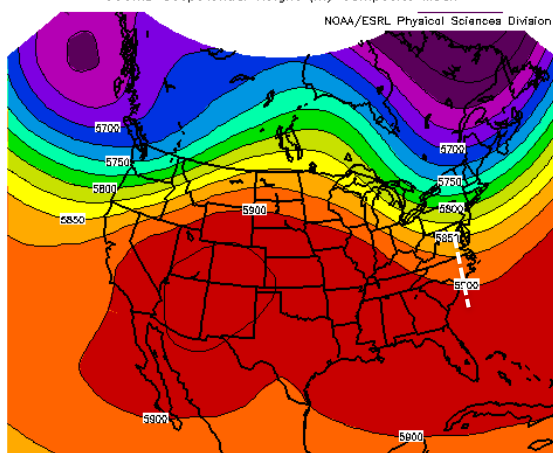


5 deg max  
July 2012 surface air temp anomalies (deg C)



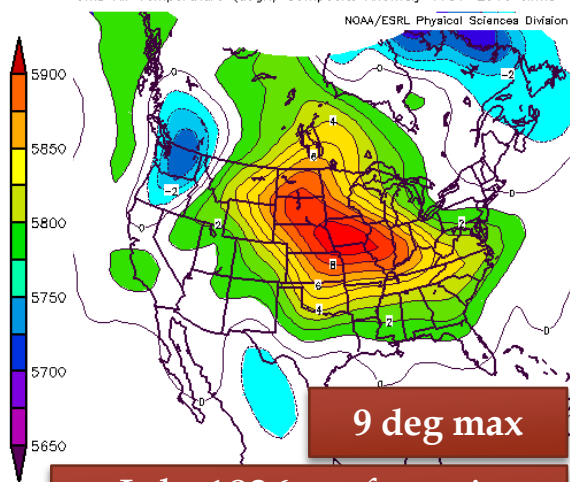
2012 Precipitation  
Totals in Inches  
July 2012 precip (inches)

20th Century Reanalysis V2  
500mb Geopotential Height (m) Composite Mean

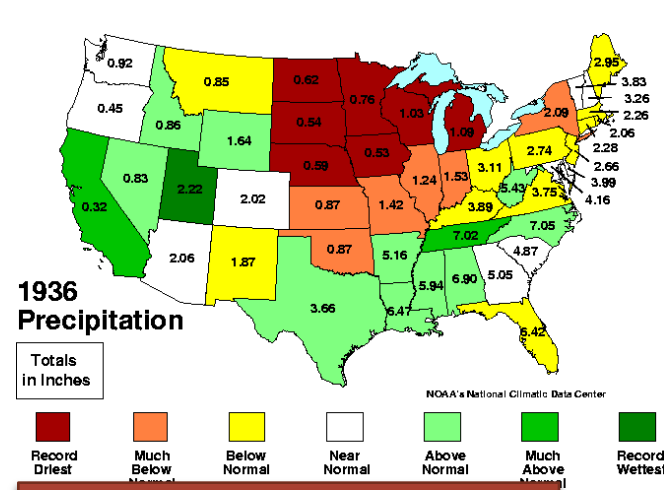


July 1936 500mb heights

20th Century Reanalysis V2  
10mb Air Temperature (degK) Composite Anomaly 1981-2010 climo

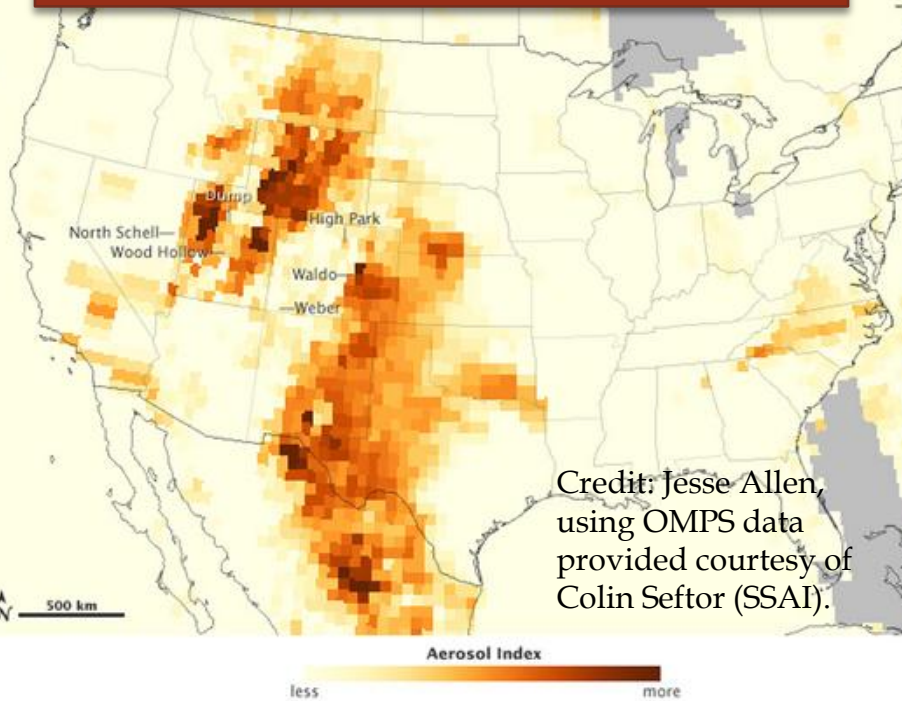


9 deg max  
July 1936 surface air temp anomalies (deg K)



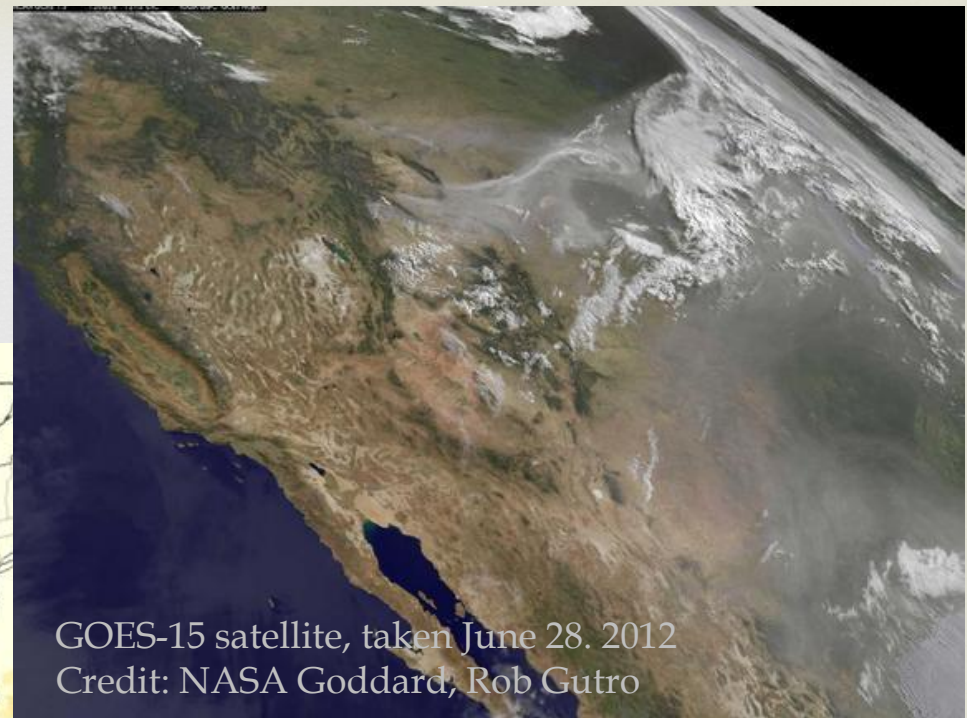
1936 Precipitation  
Totals in Inches  
July 1936 precip (inches)

# Dangerous fire weather conditions in the west in June



## 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

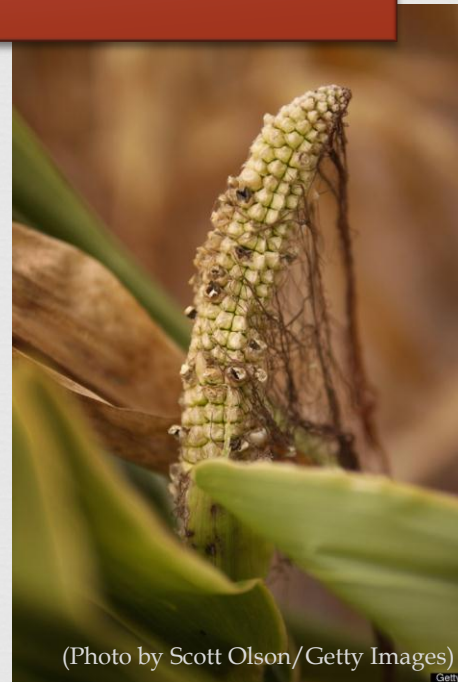


Terra Satellite, taken June 23, 2012

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

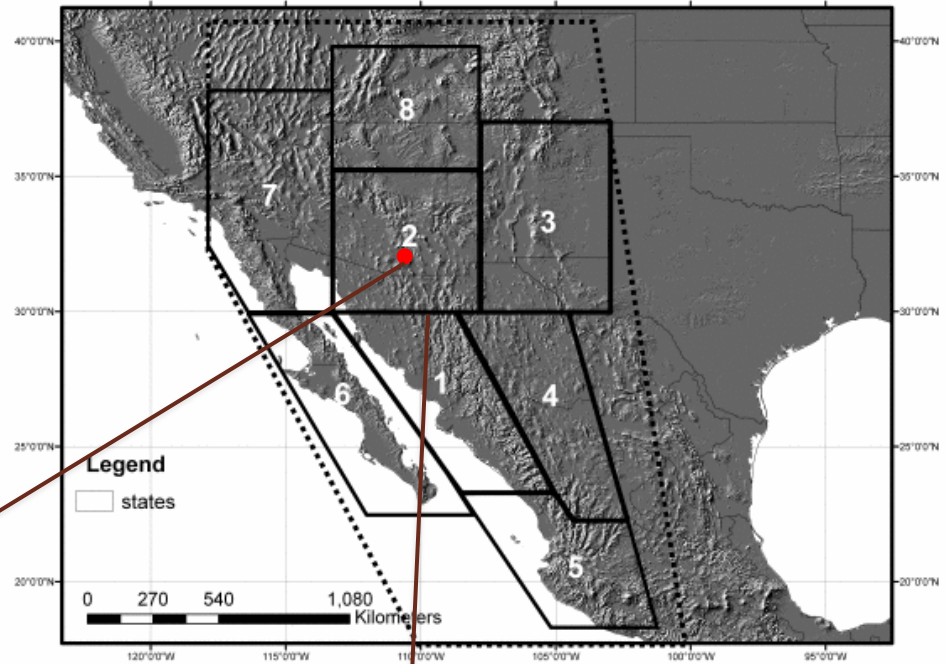




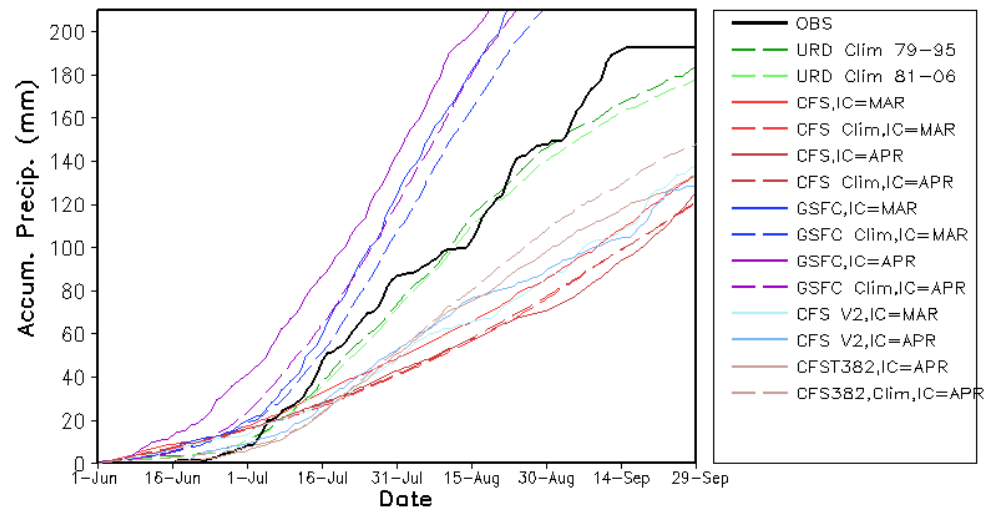
# Southwest monsoon

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

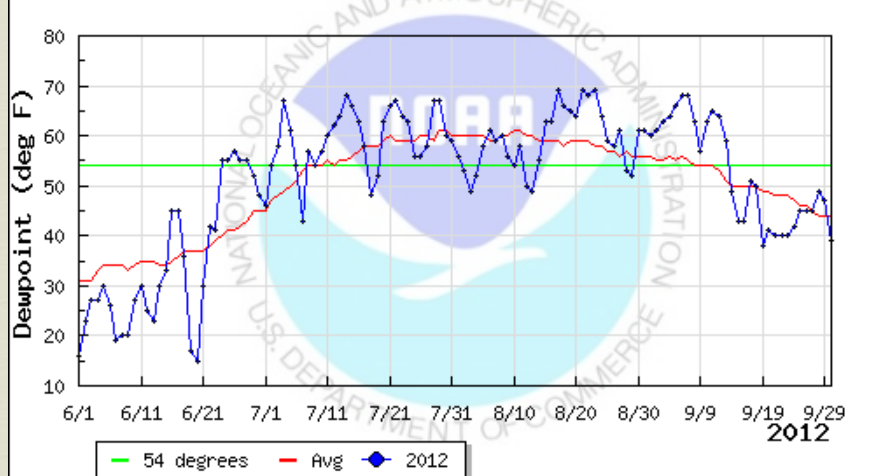
## North American Monsoon sub-regional domains



2012 NAME Forecast Forum Zone 2  
Accumulated Precipitation

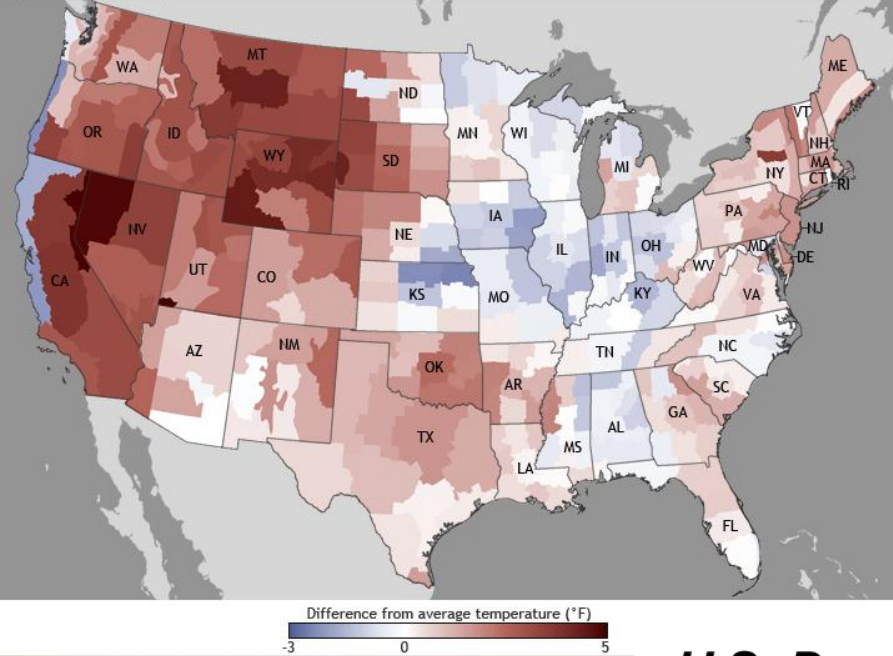


Tucson Airport Avg. Daily Dewpoint Tracker



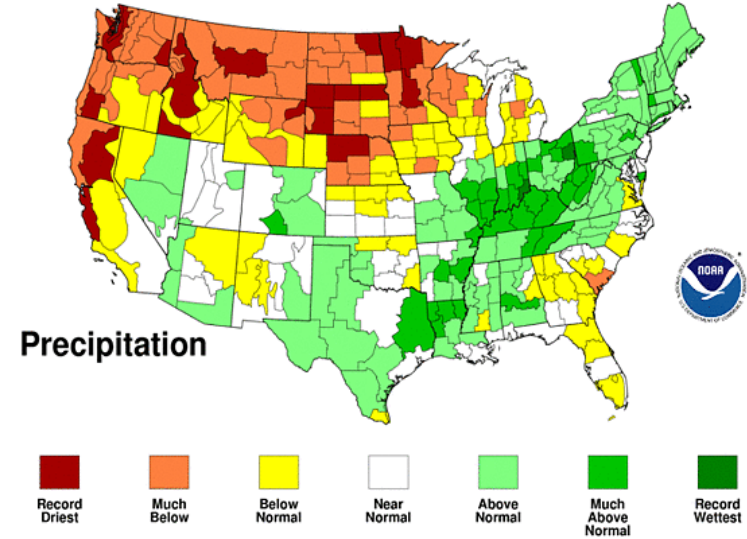
# Recent Conditions

September 2012 Temperature



## Sep 2012 Divisional Ranks

National Climatic Data Center/NESDIS/NOAA

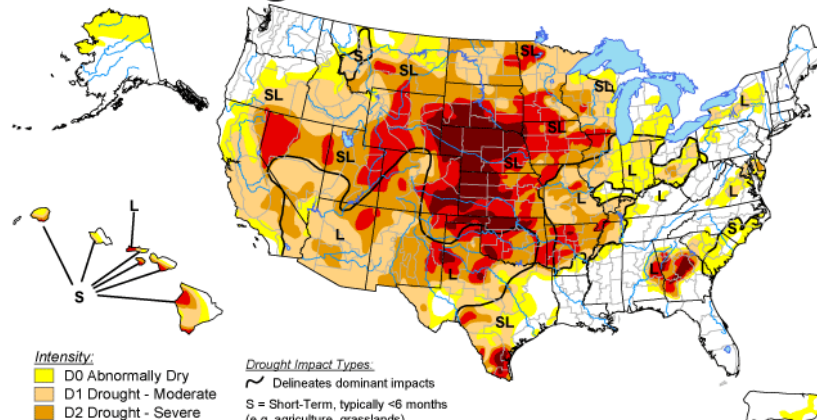


## JJA Temperature Anomalies

## U.S. Drought Monitor

October 16, 2012

Valid 7 a.m. EDT



Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

Drought Impact Types:

- ~ Delineates dominant impacts
- S = Short-Term, typically <6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically >6 months (e.g. hydrology, ecology)

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

<http://droughtmonitor.unl.edu/>



Released Thursday, October 18, 2012

Author: Matthew Rosencrans, NOAA/NWS/NCEP/CPC

# Fires at Rocky Mountain Park Oct 20, 2012

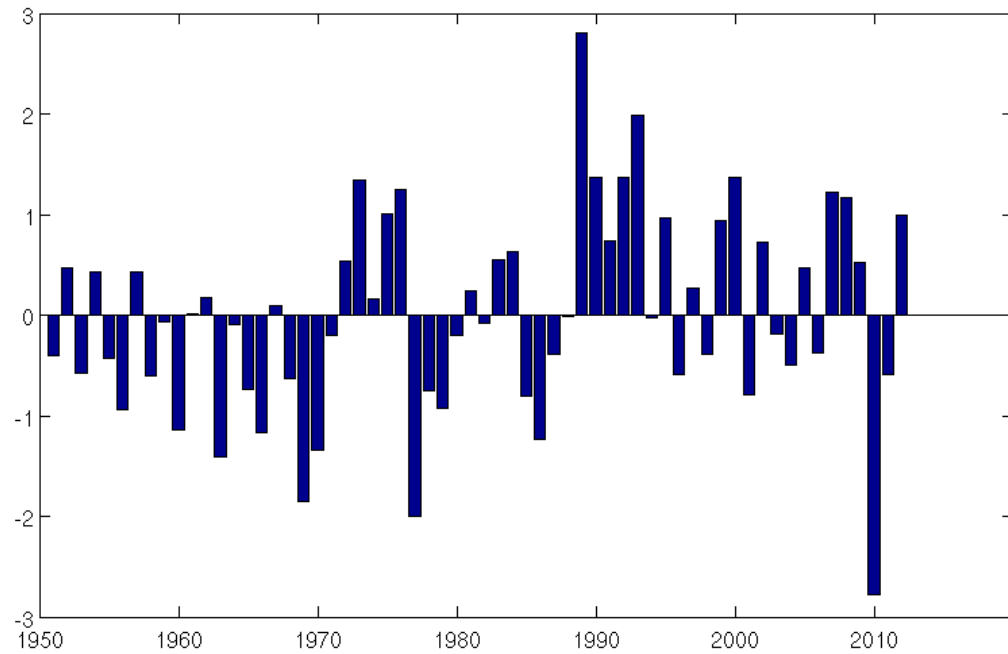


# Summary

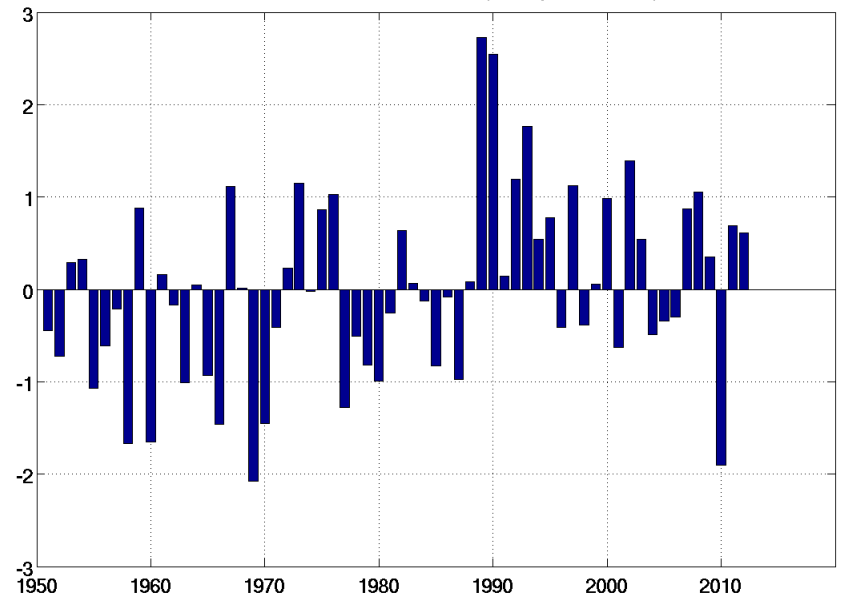
- Record breaking above normal temperatures over the CONUS for most of 2012
- Hot, dry conditions led to widespread severe drought over the US
- Significant impacts from climate on agriculture, livestock, and homes
- Most recent conditions were anomalously warm and dry across the northwest

Thank you!  
Especially NCDC  
and Wei Shi (CPC)

Standardized DJF AO Value



Standardized JFM AO Value (base period 81-10)

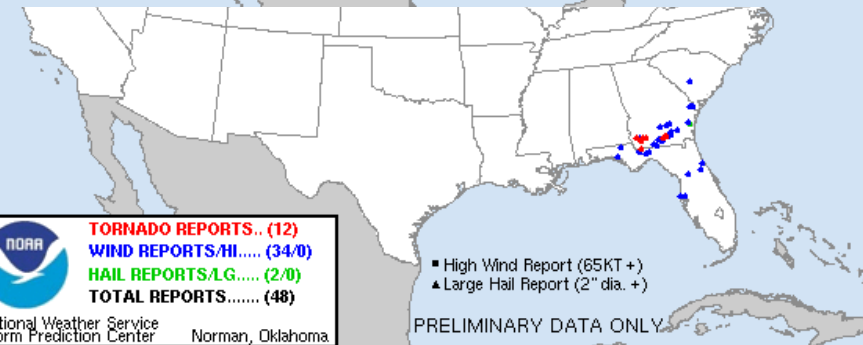
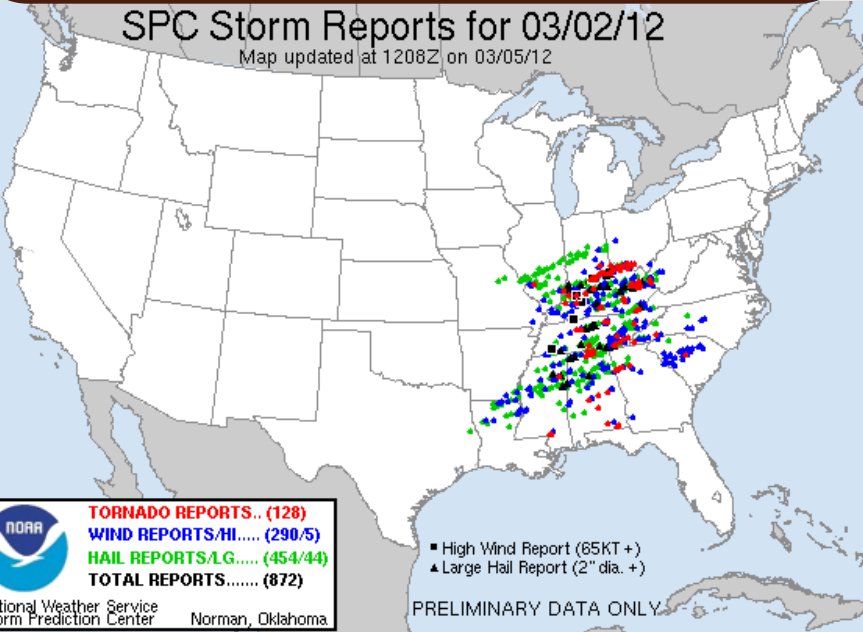


# US Tornado Outbreak

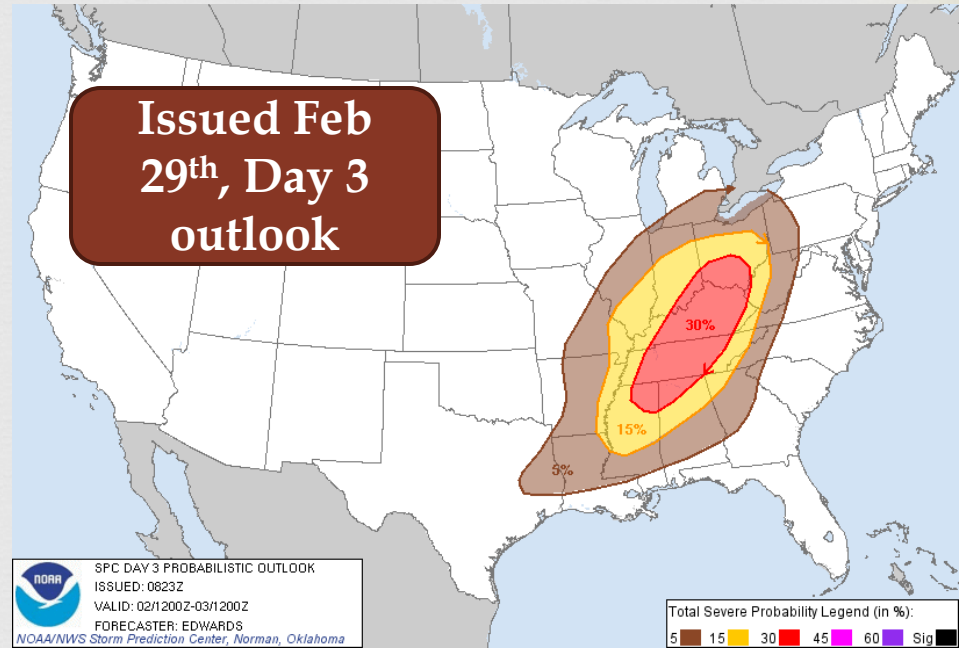
- Feb 28-Mar 3
- 37 fatalities
- ~ 40 tornadoes likely
- F2-F4 tornadoes

## SPC Storm Reports for 03/02/12

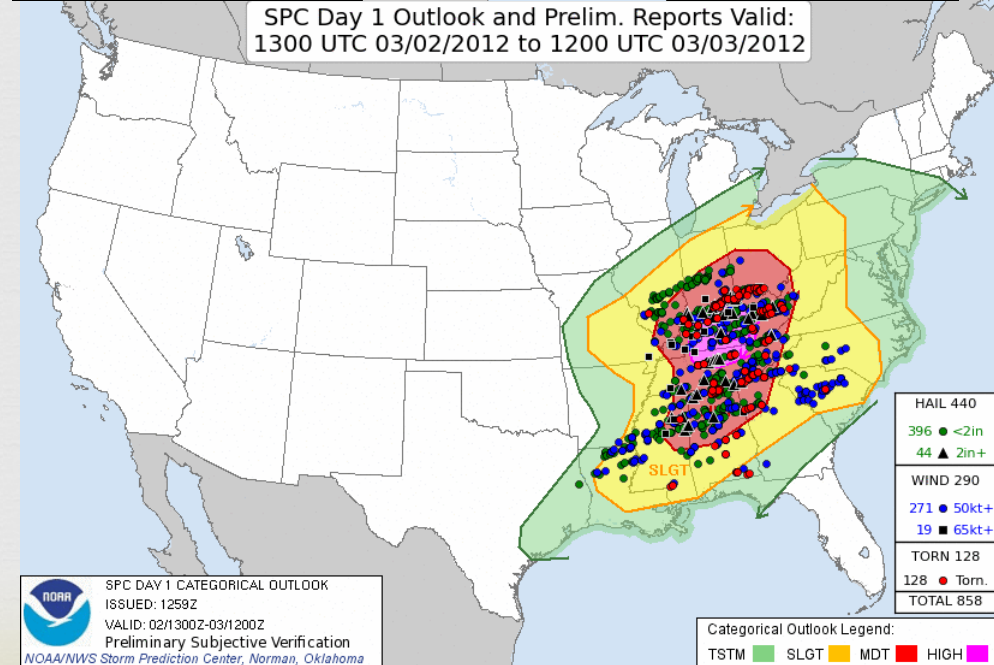
Map updated at 1208Z on 03/05/12



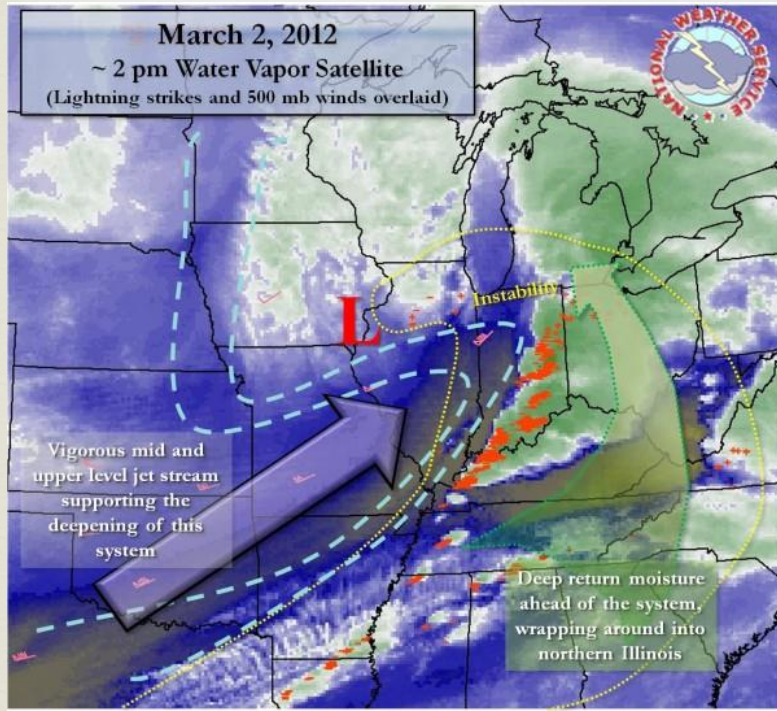
Issued Feb 29<sup>th</sup>, Day 3 outlook



SPC Day 1 Outlook and Prelim. Reports Valid:  
1300 UTC 03/02/2012 to 1200 UTC 03/03/2012



# US Tornado Outbreak



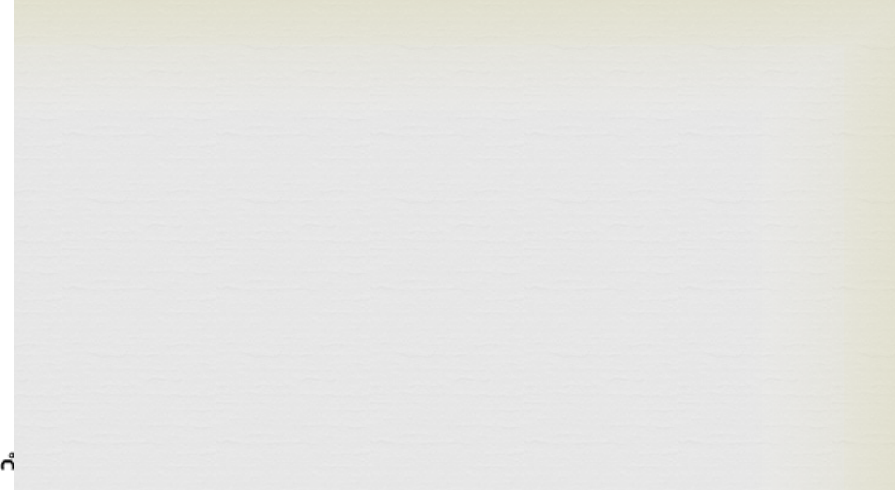
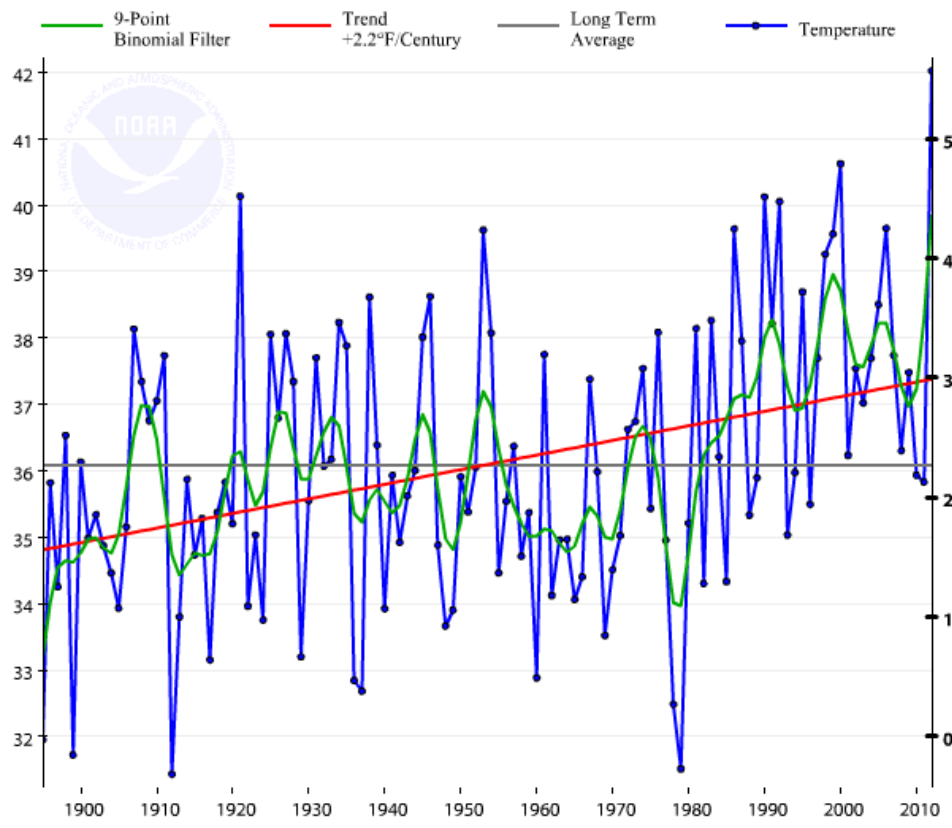
Saturday, March 3, 2012, in Marysville, Indiana (AP Photo/Al Behrman)



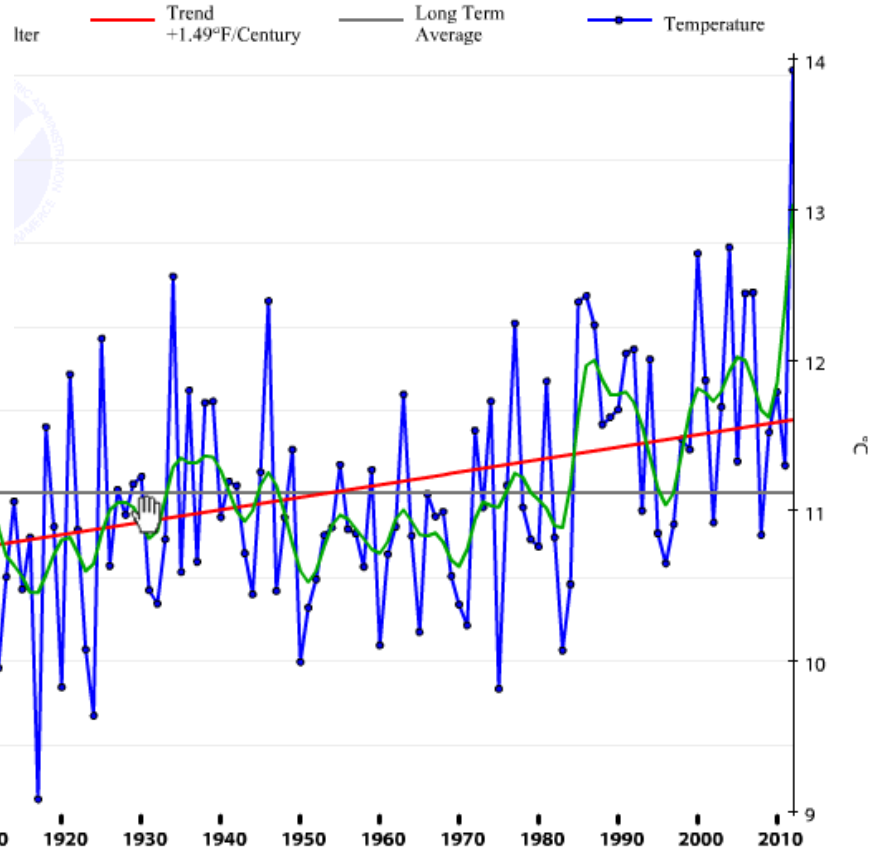
- 2 storm systems over these days
- At least 52 fatalities from combined events
- This was the second deadliest early March tornado outbreak in the U.S. on record (1966 previously)



Contiguous U.S., Temperature, January-March



Contiguous U.S., Temperature, March-May



**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

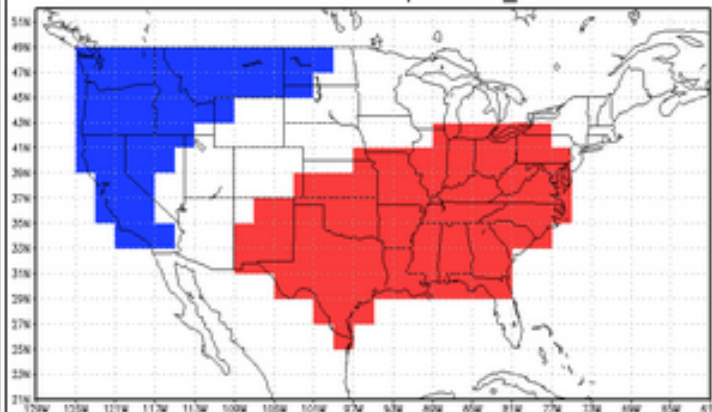
All forecasts: 14.44

% coverage not Equal Chance forecasts : 70.69

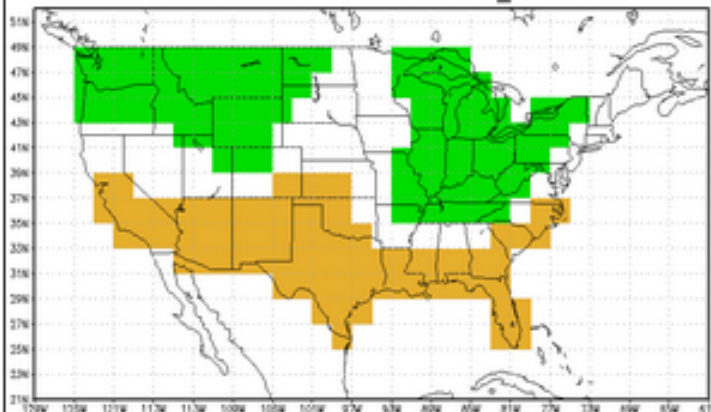
**Temperature (Forecast)**  
Download Forecast Data Archive  
([CAT](#), [PROB ABOVE](#) [PROB BELOW](#))  
[How To Read Temperature Forecasts](#)

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

Jan-Feb-Mar 2012 Temp Official\_Forecast



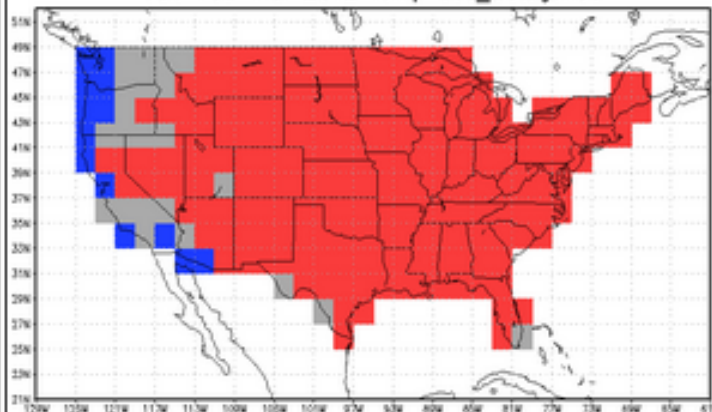
Jan-Feb-Mar 2012 Prec Official\_Forecast



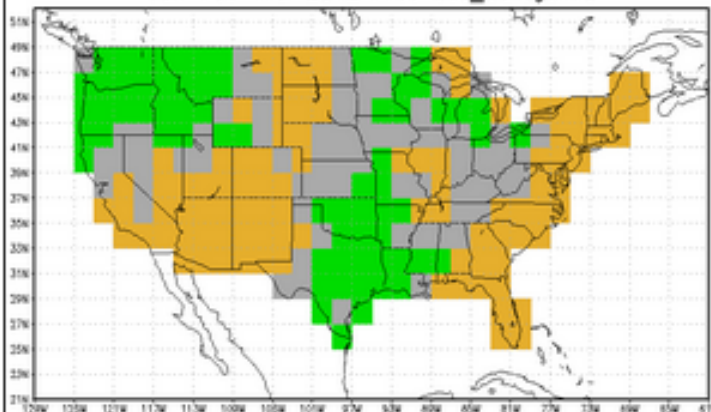
**Temperature (Observations)**  
Download Observational Data Archive  
([Temperature Observations](#))  
[How To Read Observations](#)

**Precipitation (Observations)**  
Download Observational Data Archive  
([Precipitation Observations](#))  
[How To Read Observations](#)

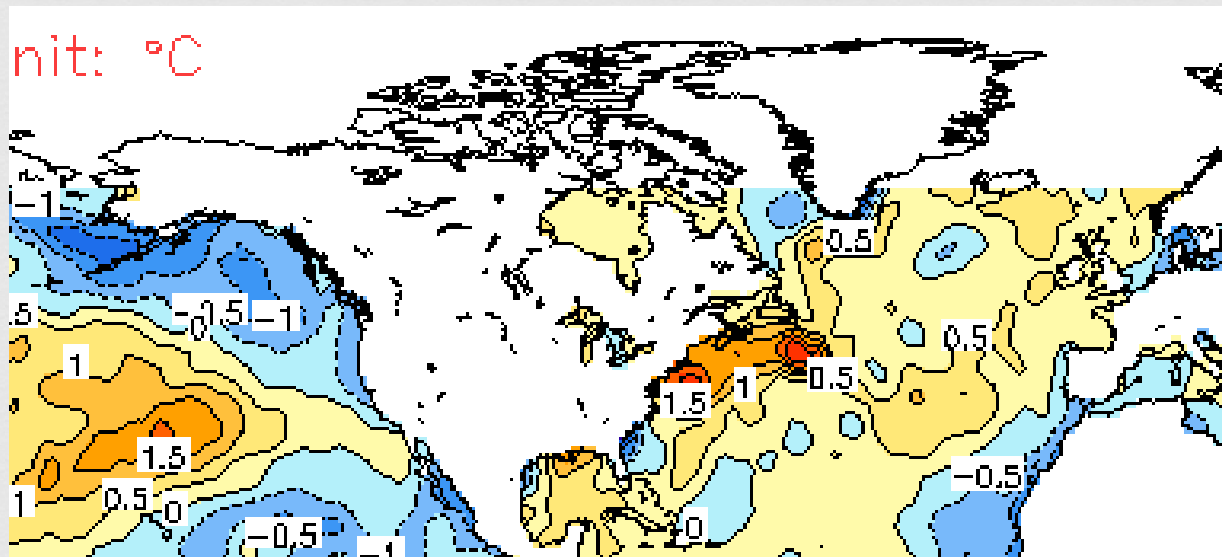
Jan-Feb-Mar 2012 Temp Obs\_Categories



Jan-Feb-Mar 2012 Prec Obs\_Categories



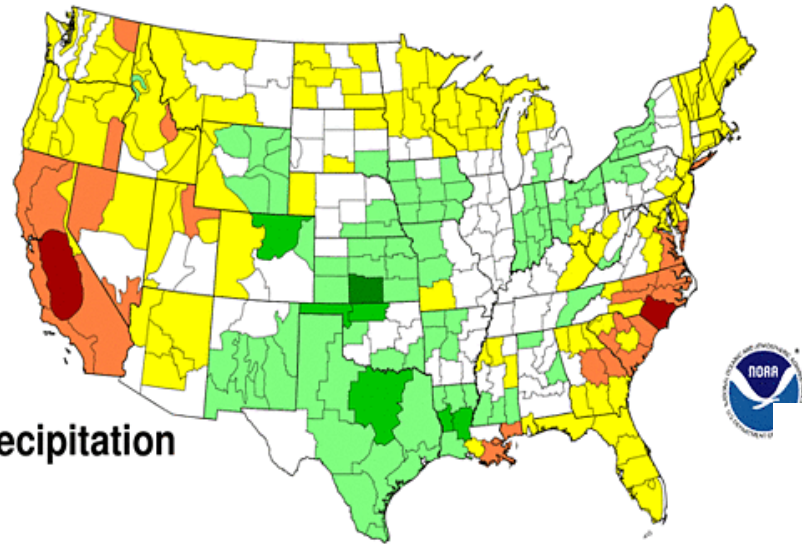
# Winter SSTs



Optimum Interpolation SST  
Anomaly, Feb 2012

# Dec 2011 - Feb 2012 Divisional Ranks

National Climatic Data Center/NESDIS/NOAA



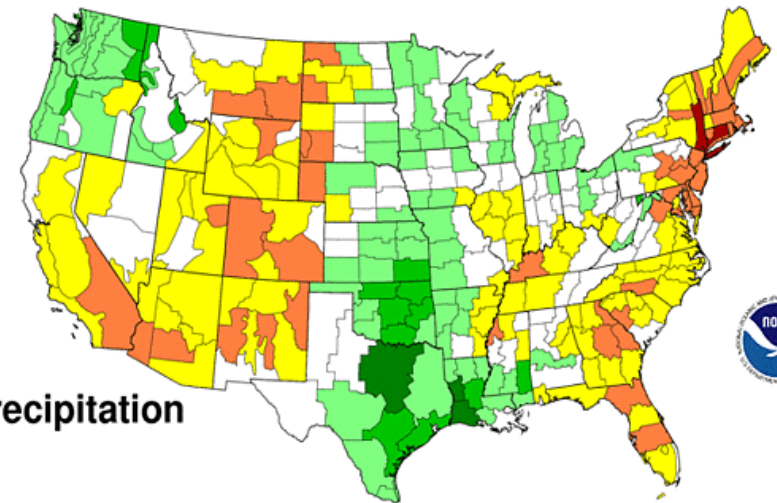
Precipitation



# Winter precip

# Jan - Mar 2012

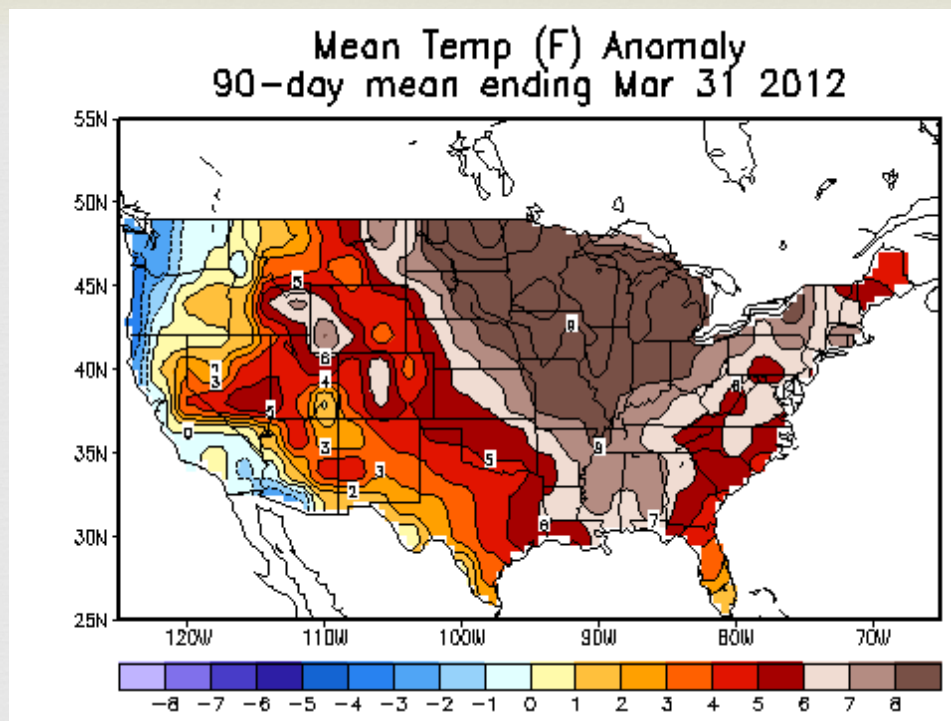
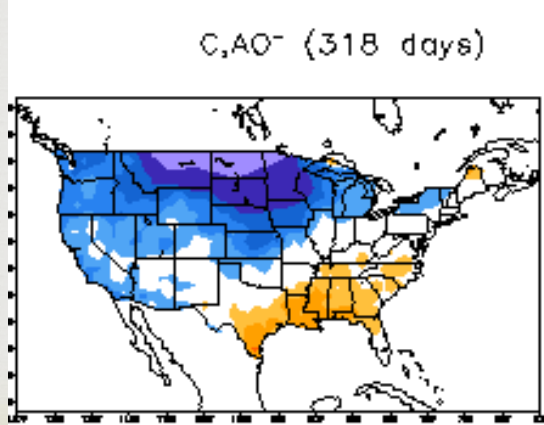
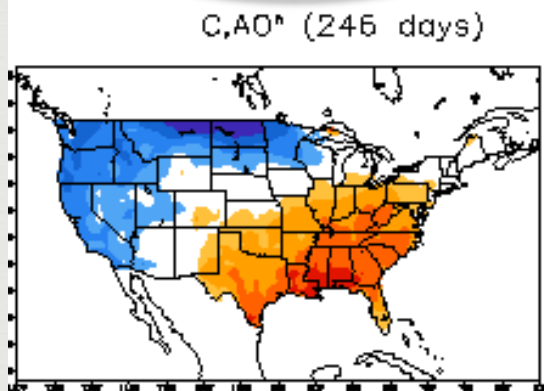
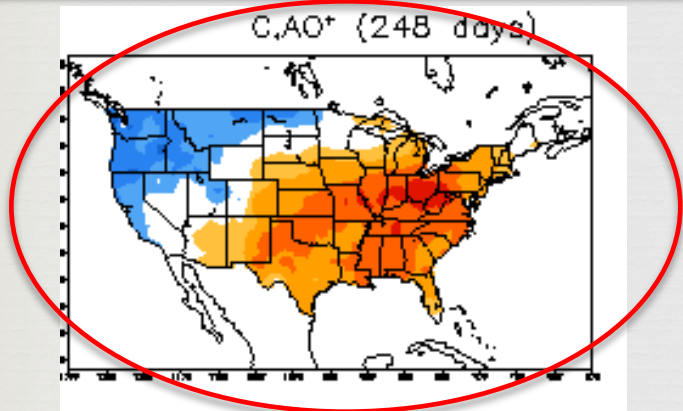
National Climatic Data Center/NESDIS/NOAA



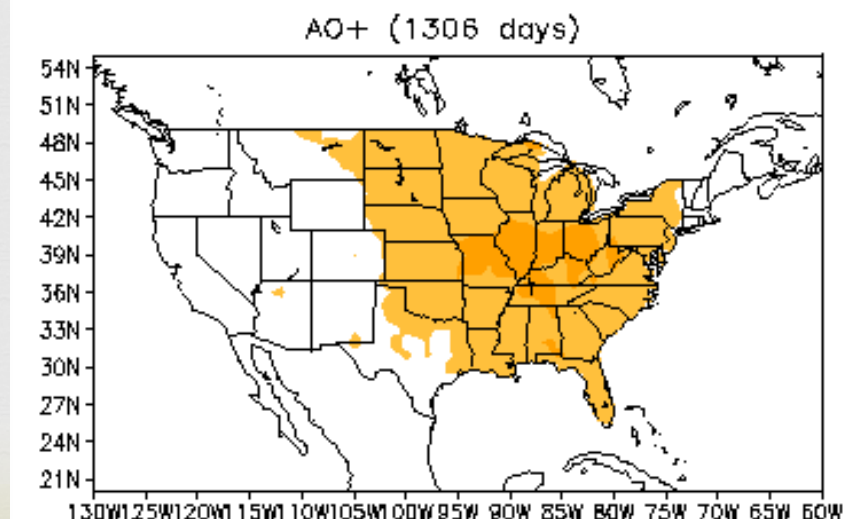
Precipitation



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



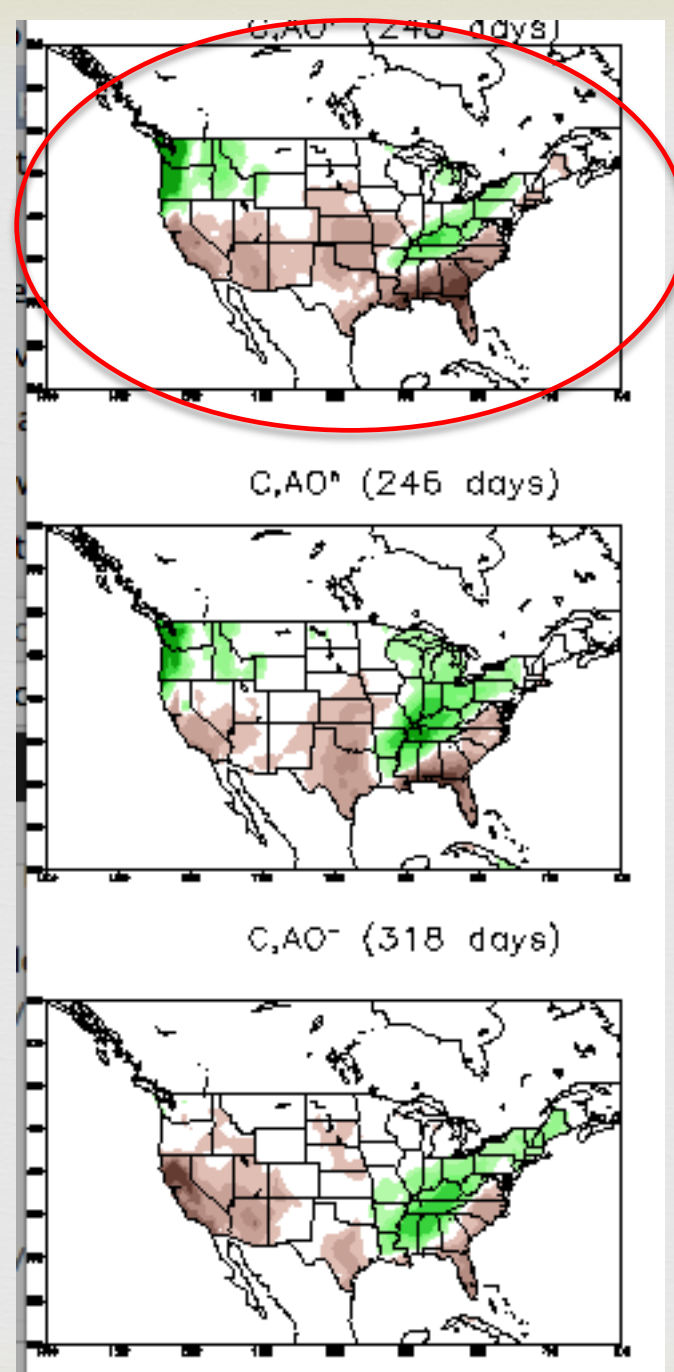
JFM Temperature Anomaly (°C) by AO PHAS



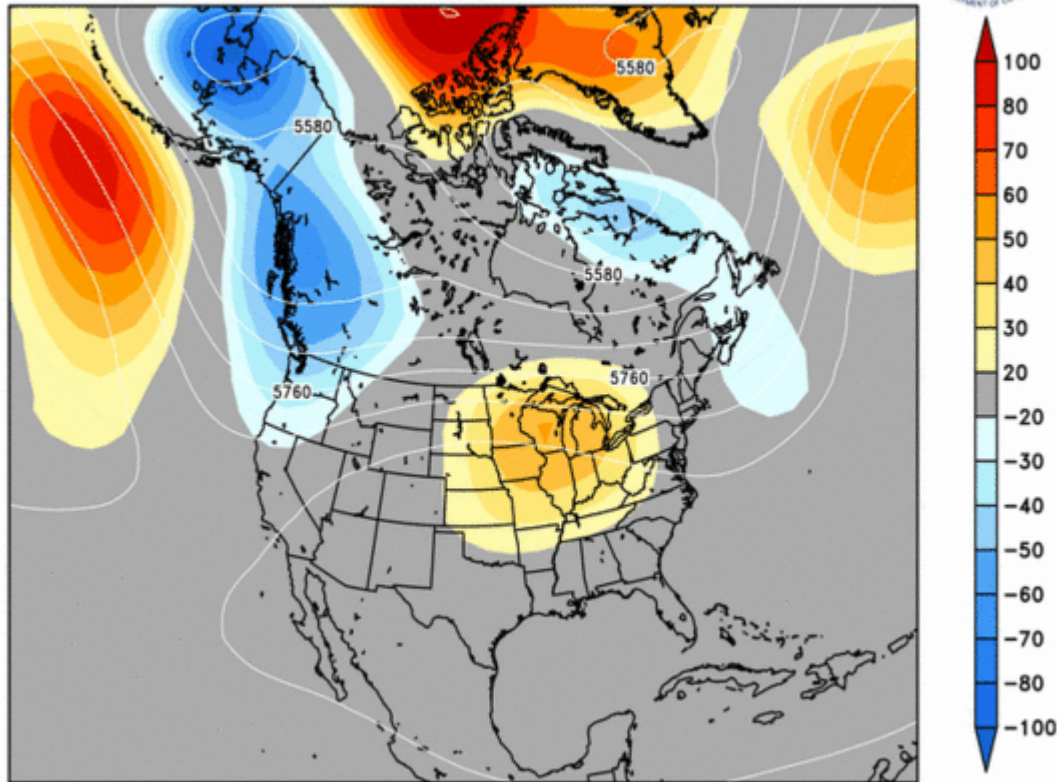
La Nina + pos AO composites of temperature for JFM (1950-2000)

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)



July 2011

# North American Drought Monitor

July 31, 2011

Released: Wednesday, August 10, 2011

<http://www.ncdc.noaa.gov/nadm.html>

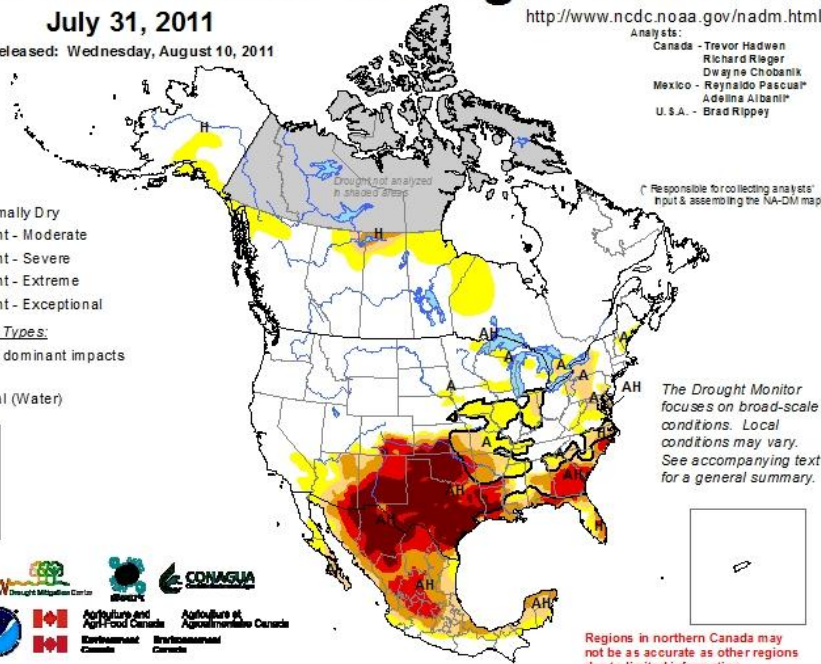
Analysts:  
 Canada - Trevor Hadwen  
 Richard Rieger  
 Dwayne Chobanik  
 Mexico - Reynaldo Pascual  
 Adalme Albeniz  
 U.S.A. - Brad Rippey

## Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

## Drought Impact Types:

- Delineates dominant impacts
- A = Agriculture
- H = Hydrological (Water)



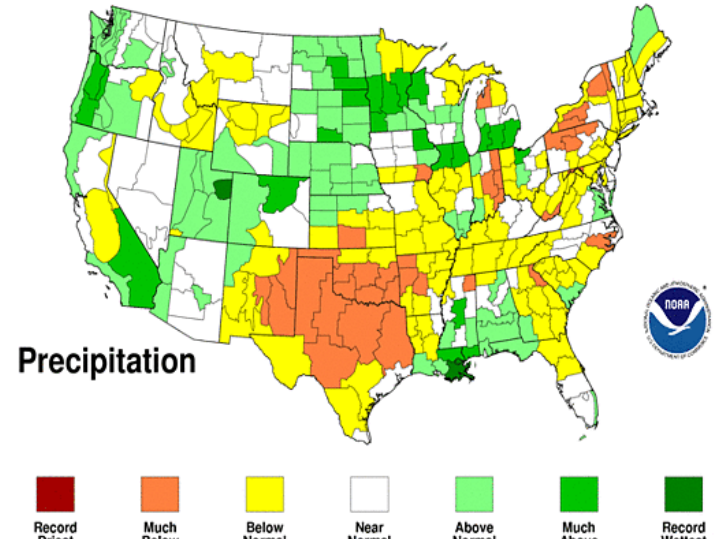
Responsible for collecting analysts' input & assembling the NA-DM map)

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text for a general summary.

Regions in northern Canada may not be as accurate as other regions due to limited information.

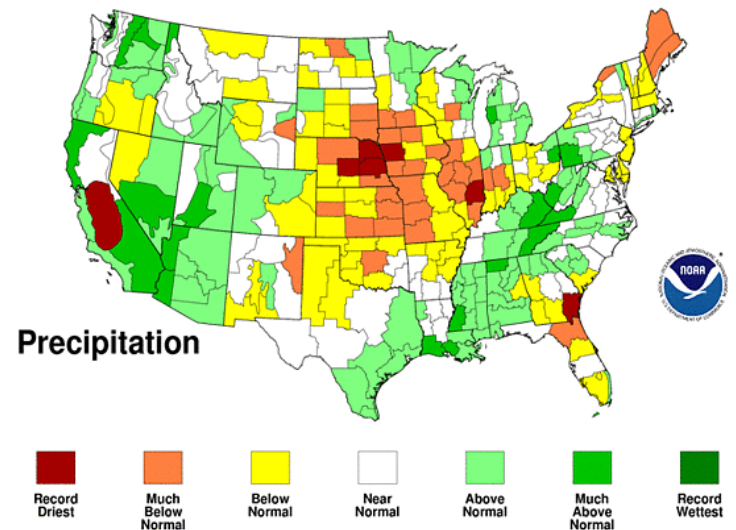
## Jul 2011 Divisional Ranks

National Climatic Data Center/NESDIS/NOAA



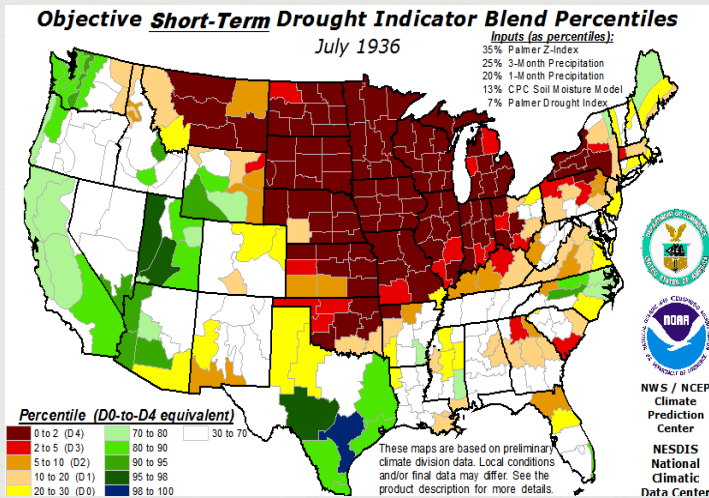
## Jul 2012 Divisional Ranks

National Climatic Data Center/NESDIS/NOAA



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)



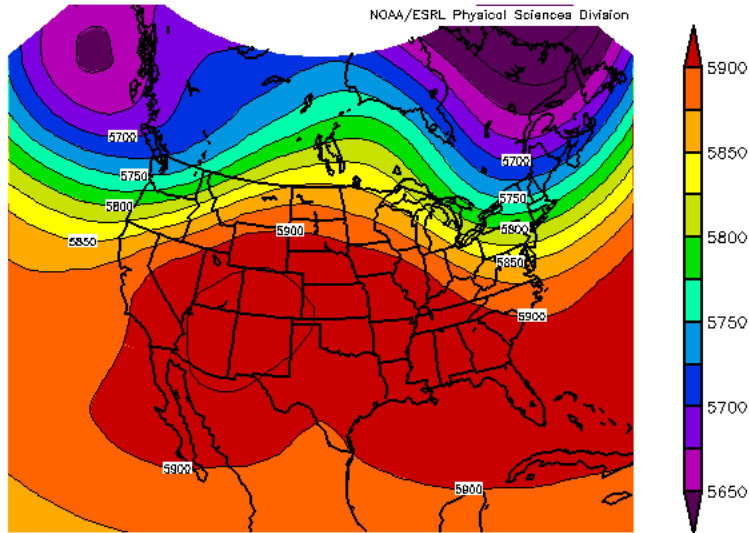


July 1936 Drought Blend  
(43.78% coverage D1+, 26.46% D4)

- 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.

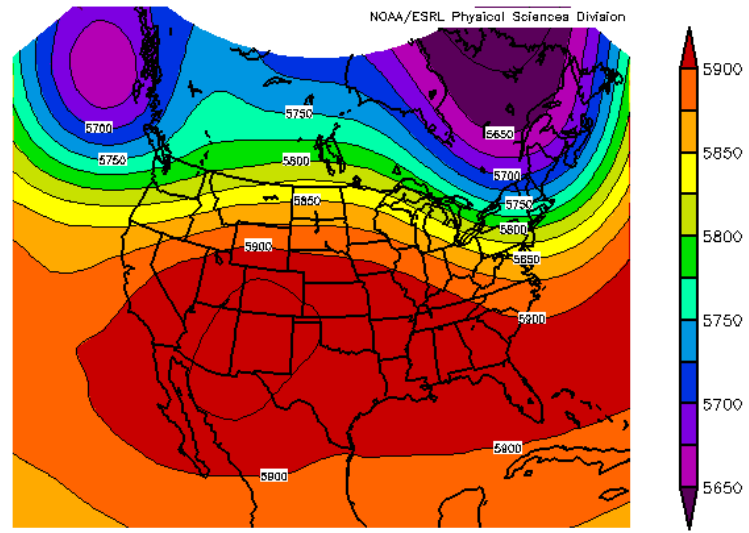
# 500mb Heights from drought year analogs

20th Century Reanalysis V2  
500mb Geopotential Height (m) Composite Mean



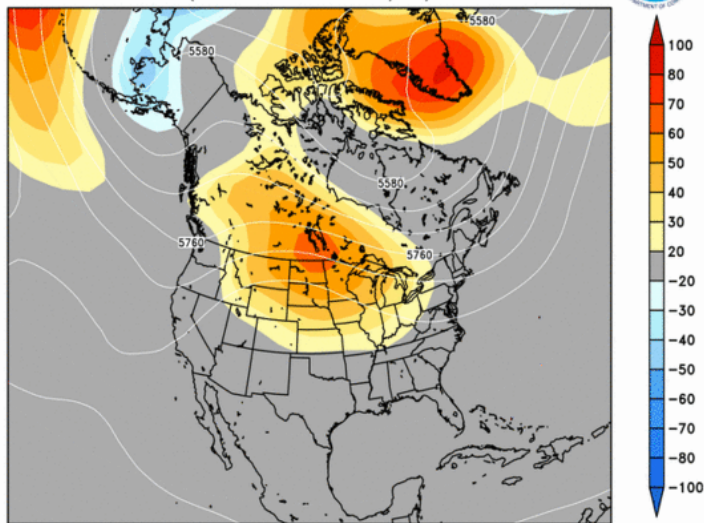
Jul 1936

20th Century Reanalysis V2  
500mb Geopotential Height (m) Composite Mean



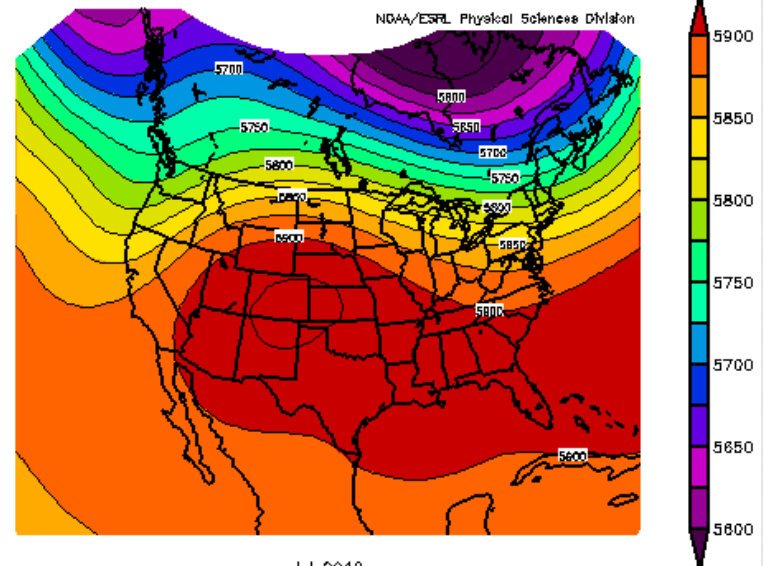
Jul 1954

500 Millibar Heights and Anomalies (in meters)  
(From NCEP Reanalysis)



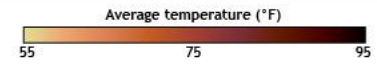
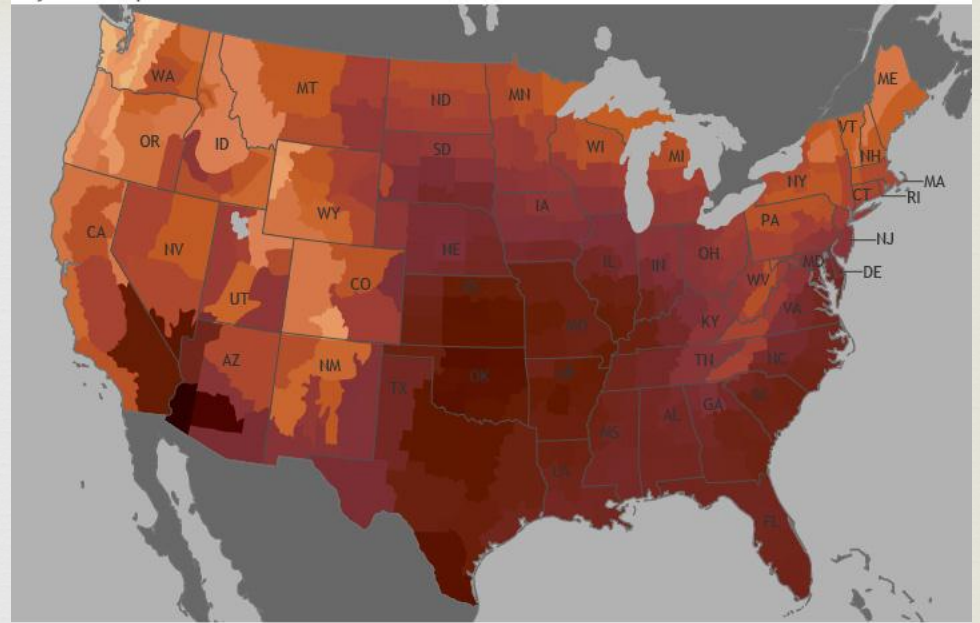
July 2012

NCEP/NCAR Reanalysis  
500mb Geopotential Height (m) Composite Mean

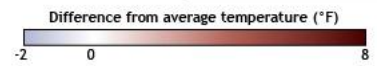
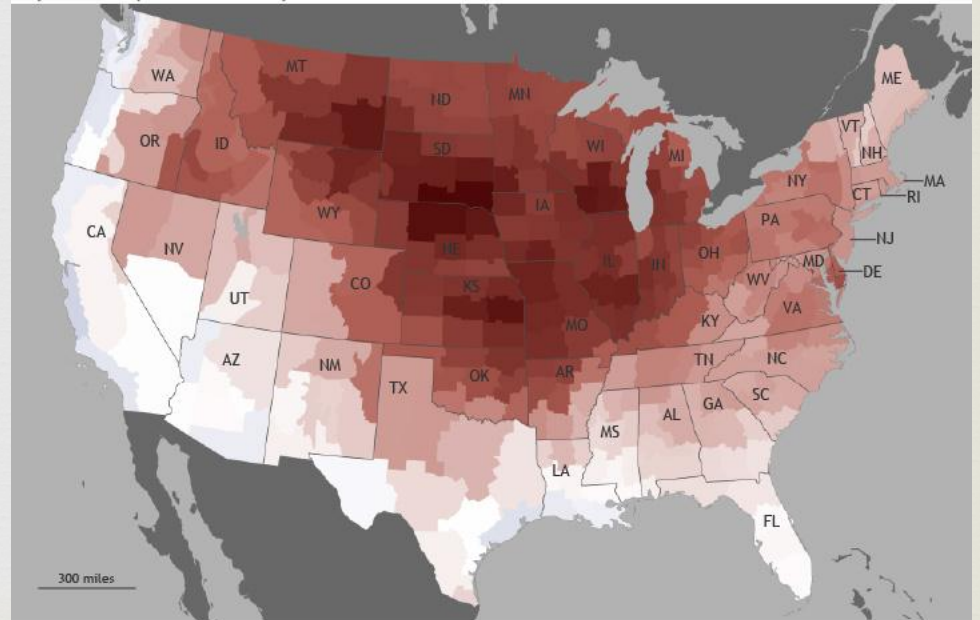


Jul 2012

July 2012 temperature

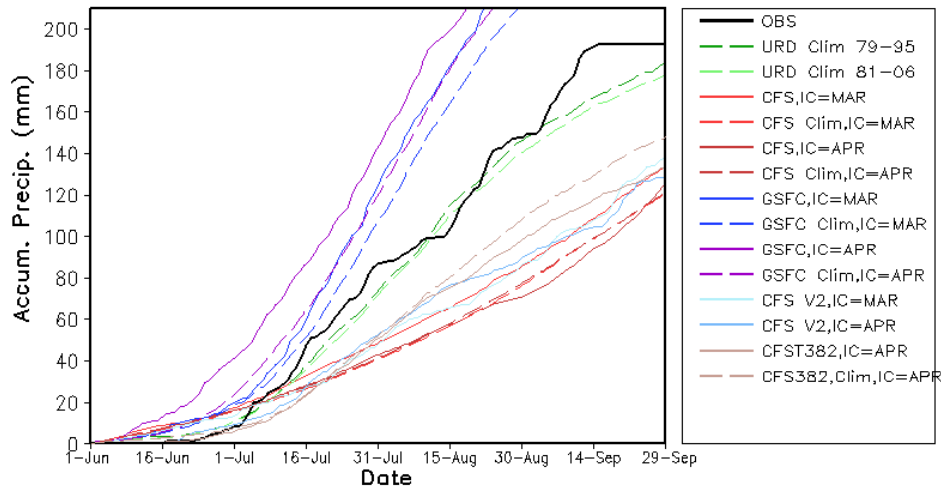


July 2012 temperature anomaly

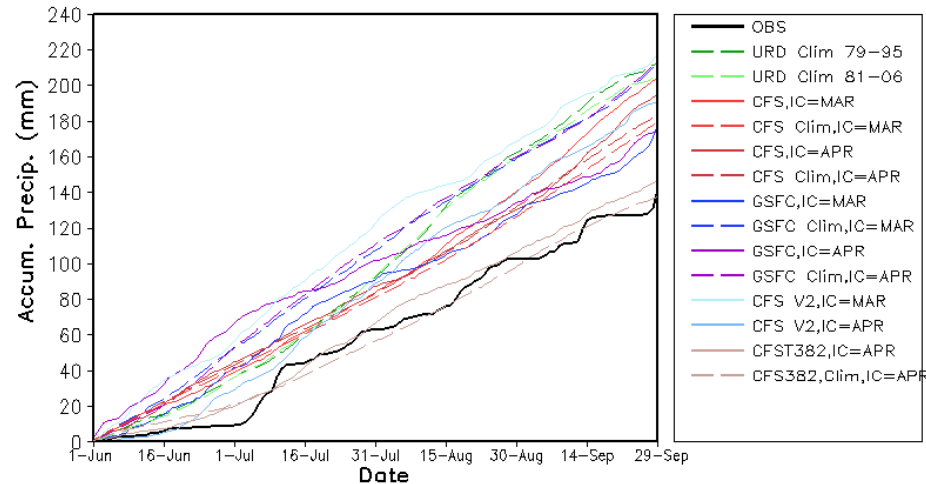


# SW Monsoon

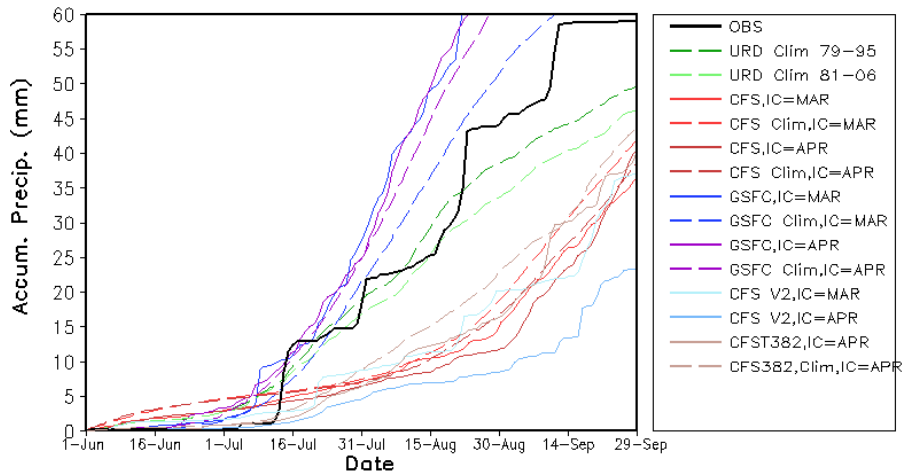
2012 NAME Forecast Forum Zone 2  
Accumulated Precipitation



2012 NAME Forecast Forum Zone 3  
Accumulated Precipitation



2012 NAME Forecast Forum Zone 7  
Accumulated Precipitation



2012 NAME Forecast Forum Zone 8  
Accumulated Precipitation

