Earth System Research Laboratory
Physical Sciences Division

CIRES
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Colorado WATF,
18 June 2014
Denver

Seasonal Outlook for the next three months

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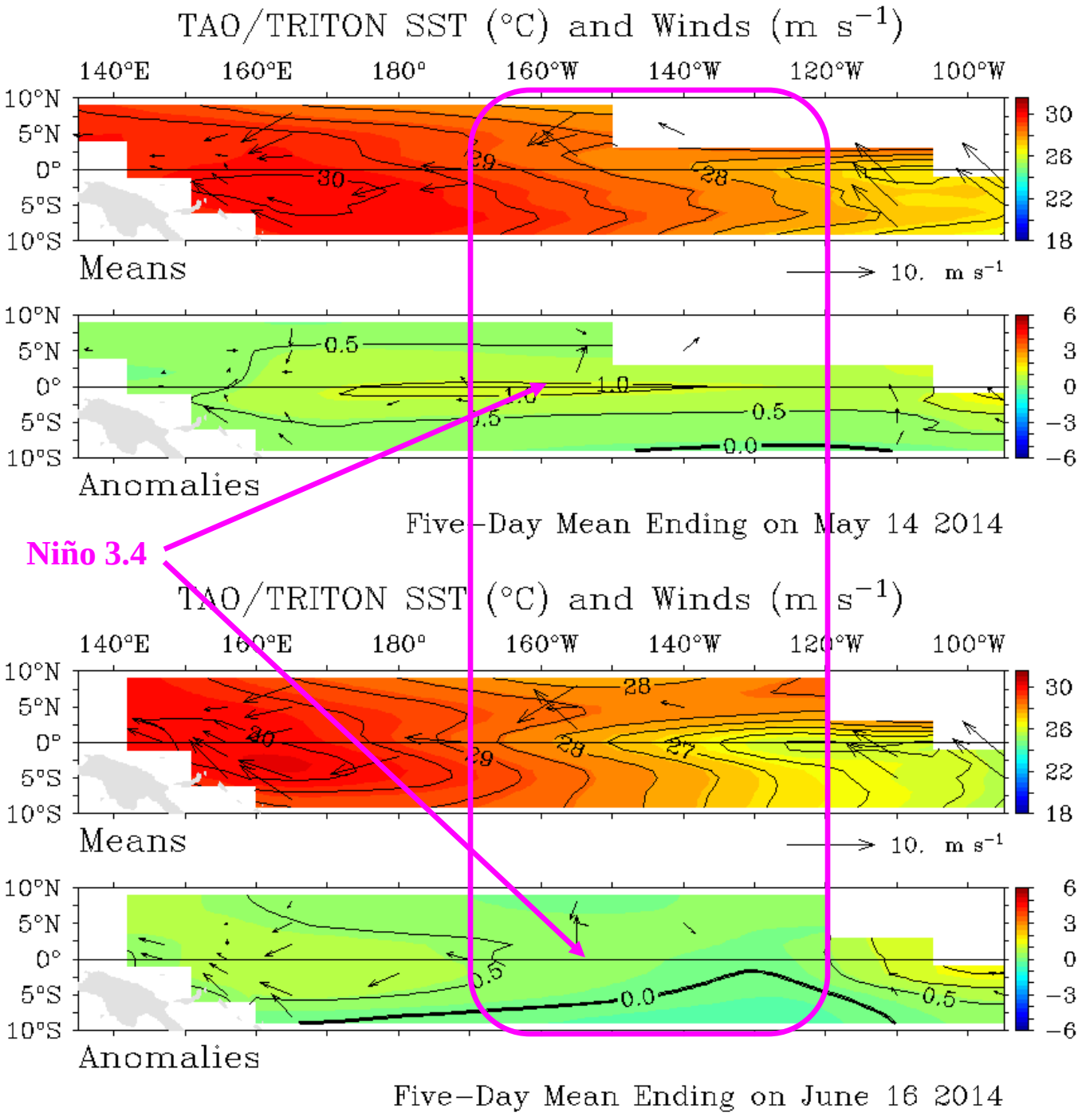
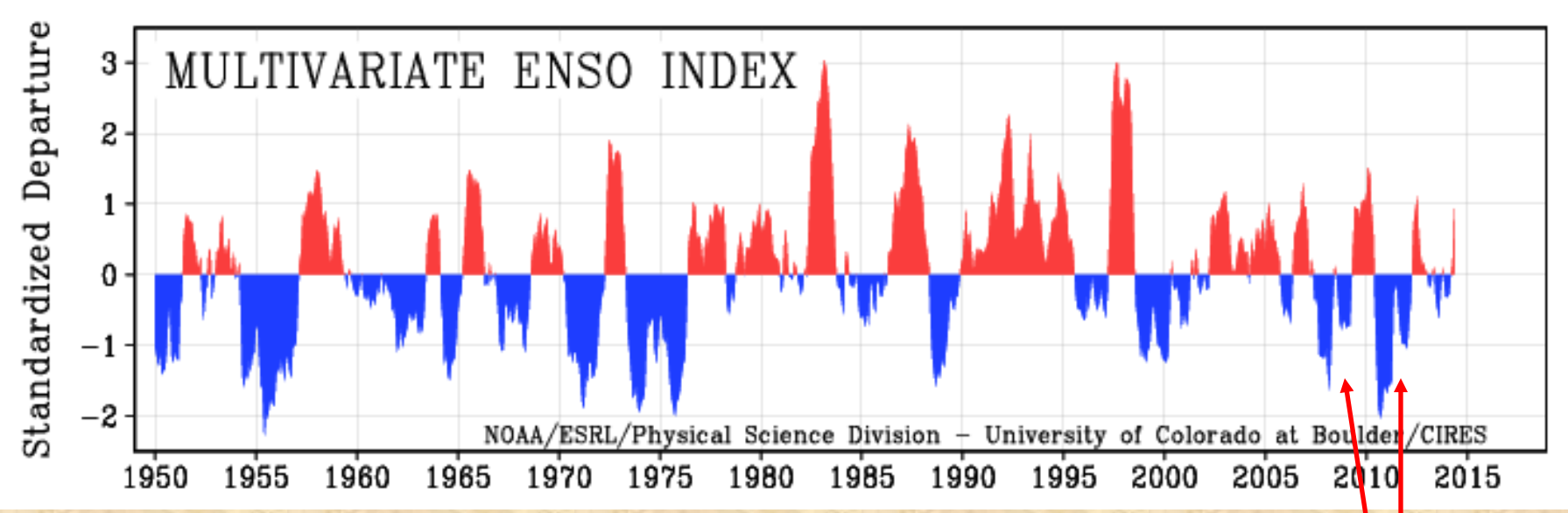
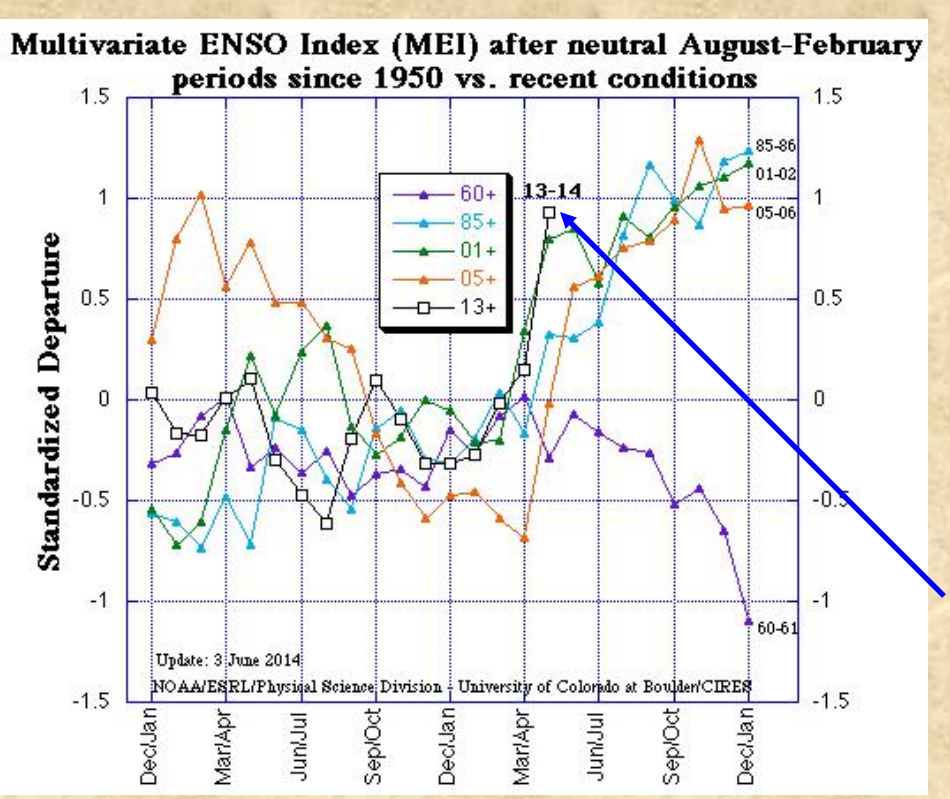
- **What has happened to ENSO(+), what will happen next, and what does that mean for us ?**
- **Expectations for the next two weeks**
- **CPC forecasts for July through September 2014**
- **Seasonal Forecast Guidance for precipitation**
- **Executive Summary**

Current state of El Niño/Southern Oscillation (ENSO) phenomenon (bottom), compared to last month (top): Current SST anomalies are still consistent with developing El Niño conditions, but weaker than last month, *and still not in the right sense for the wind department*

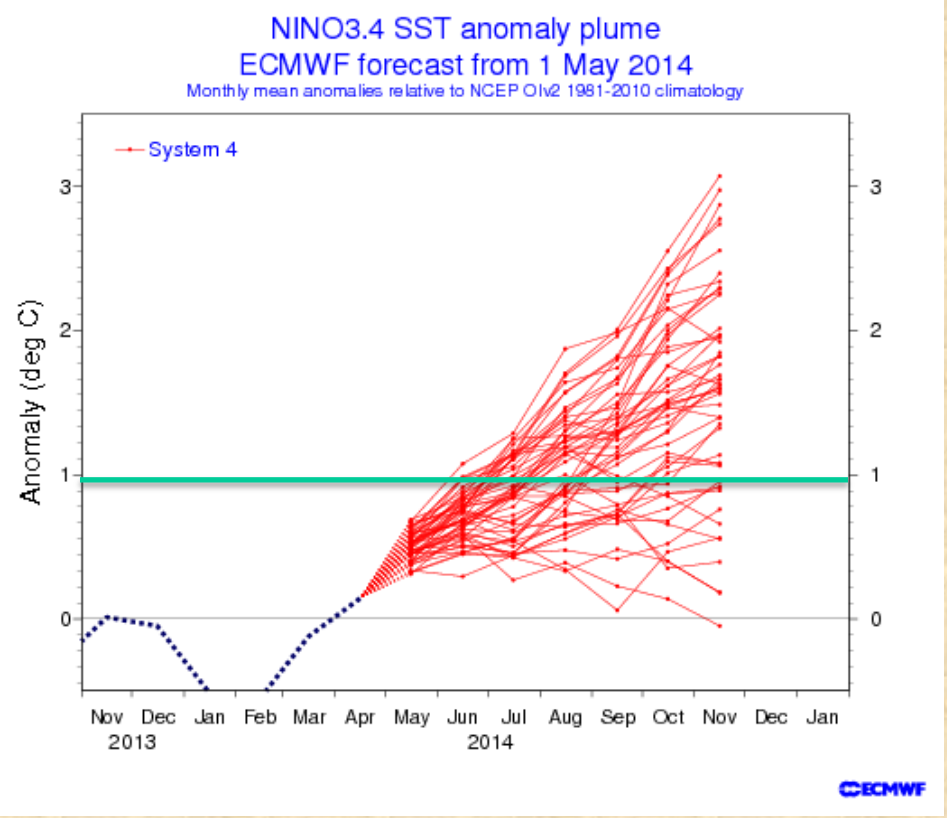






Last seven years have seen two 'double-dip' Las Niñas in a row, followed by a brief excursion to what looked like an El Niño event in 2012, and a return to ENSO-neutral or weak La Niña conditions for much of the last year.

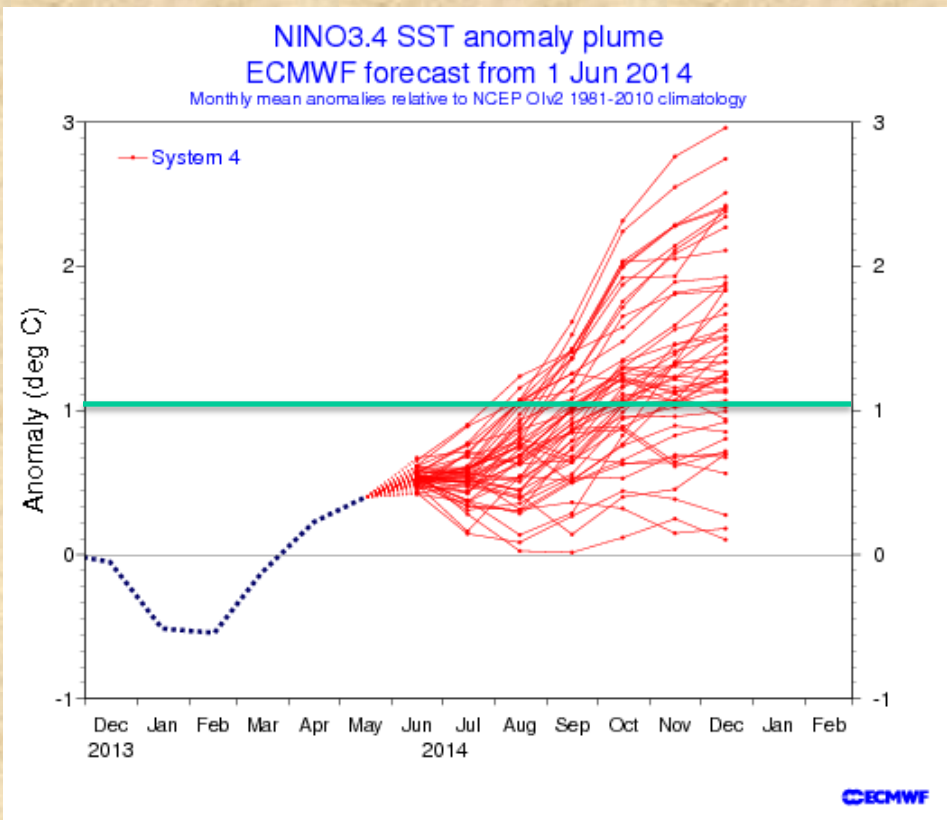
ENSO conditions often change during our spring season. This year towards El Niño indeed, in fact, this is one of the biggest one-month increases of the MEI on record. ***http://www.esrl.noaa.gov/psd/enso/mei***



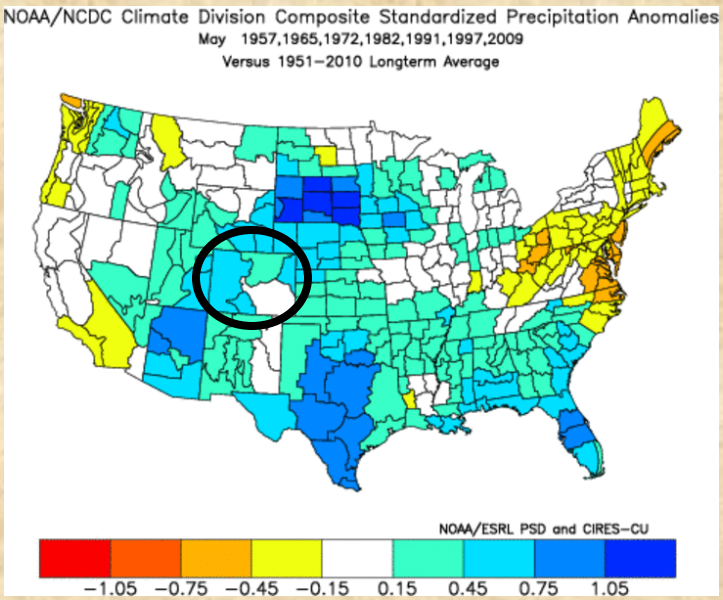
The ECMWF May 2014 forecast (left) was the third one in a row to virtually guarantee a significant El Niño event, since only one of its 50 ensemble members dipped below 0° C through November 2014. In fact, the median value of +1.5° C in boreal fall was the highest of any model.

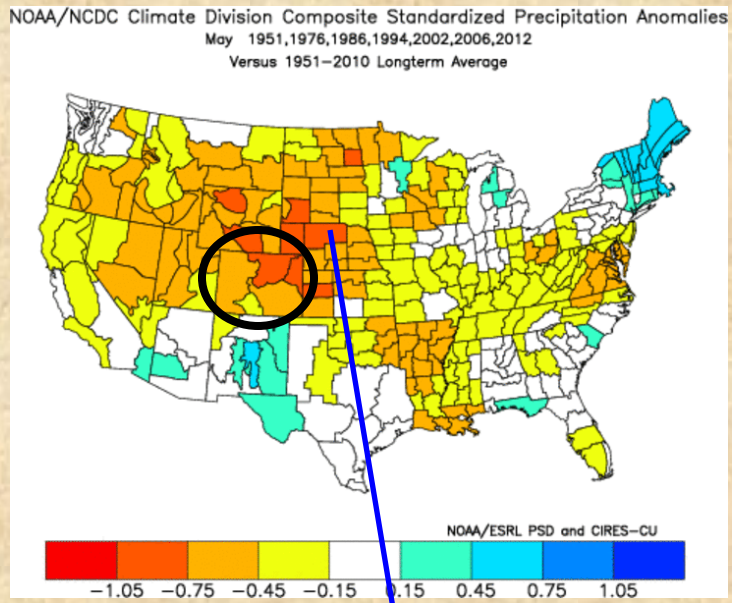
The ECMWF June 2014 forecast (right) is a bit slower to ramp up through the summer. The median peak value has dropped a little below +1.5° C, but it remains one of the most bullish ones within the IRI plume (*not shown, since not officially out yet*).

http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/

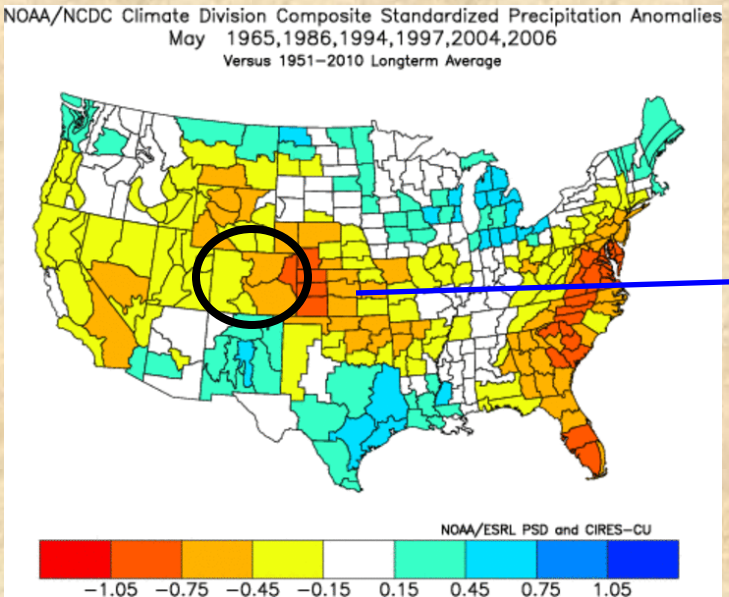


May: Precipitation (sanity check)

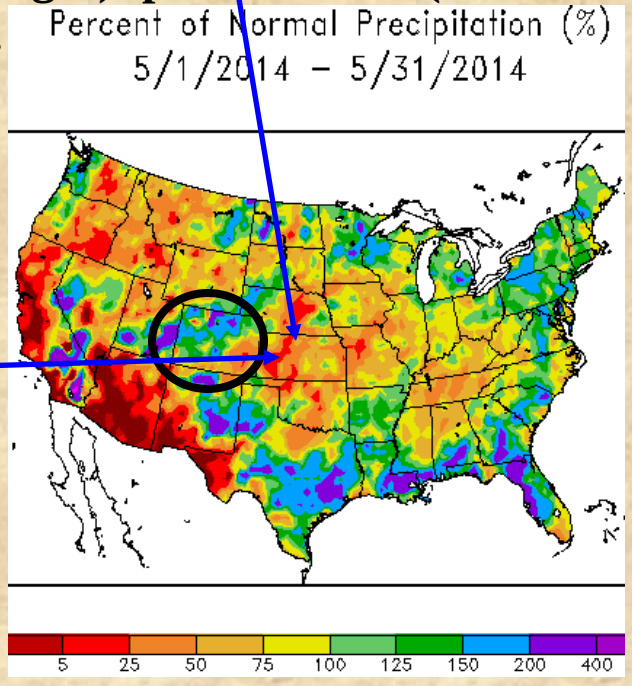




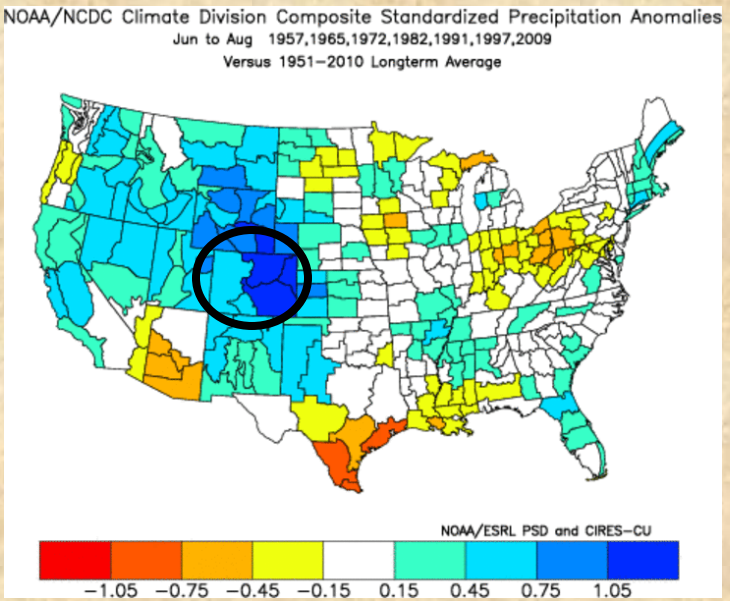
Strong El Niño in JJA (top left); weak El Niño in JJA (top right); positive PDO (bottom left – based on Mar-Apr), and observations (bottom right).

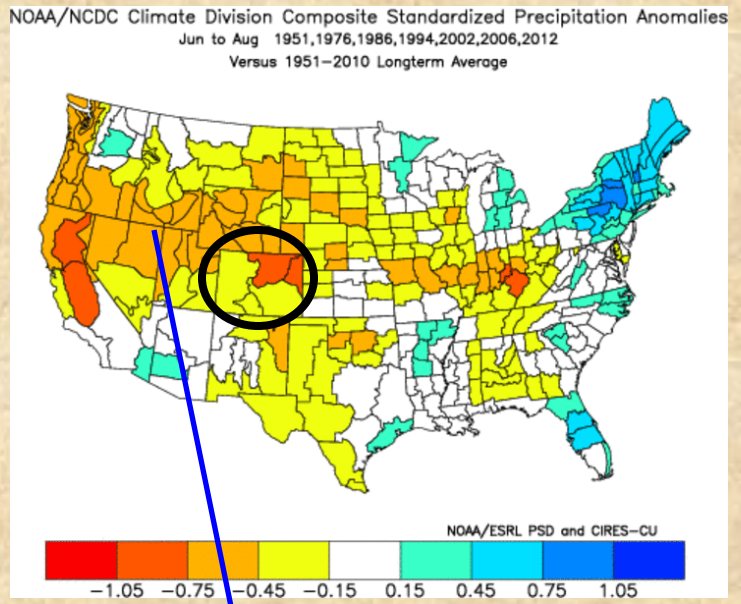


http://www.esrl.noaa.gov/psd/data/usclimdivs/

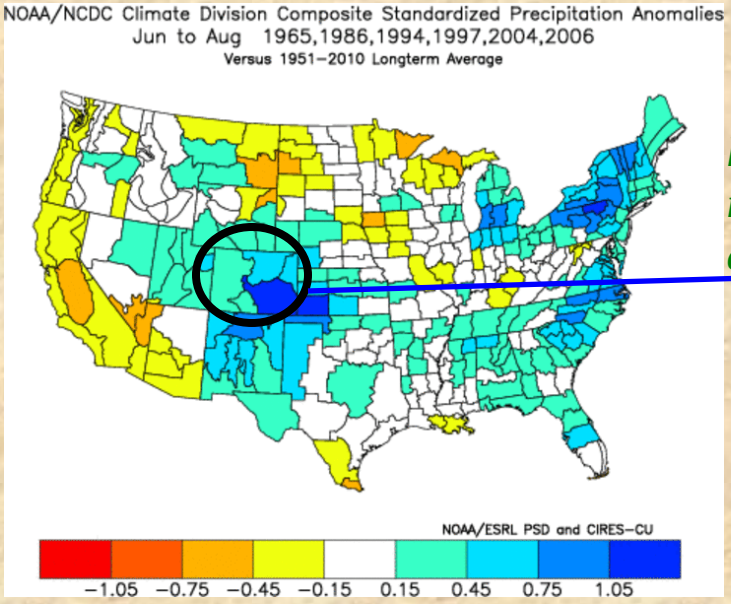


June-August: Precipitation (updated normals)

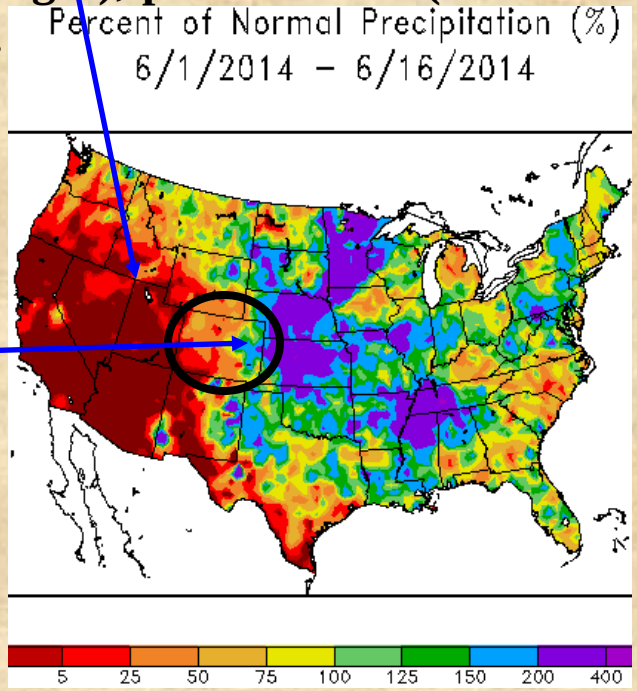




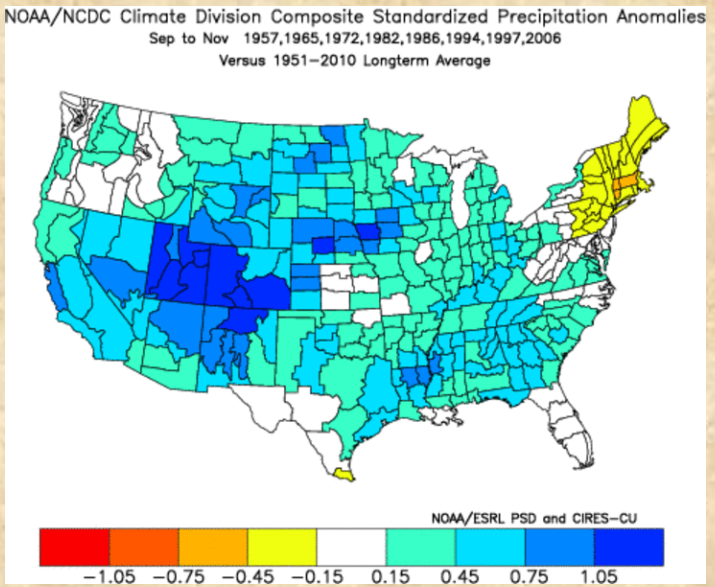
Strong El Niño in JJA (top left); weak El Niño in JJA (top right); positive PDO (bottom left – based on Mar-Apr), and observations (bottom right).

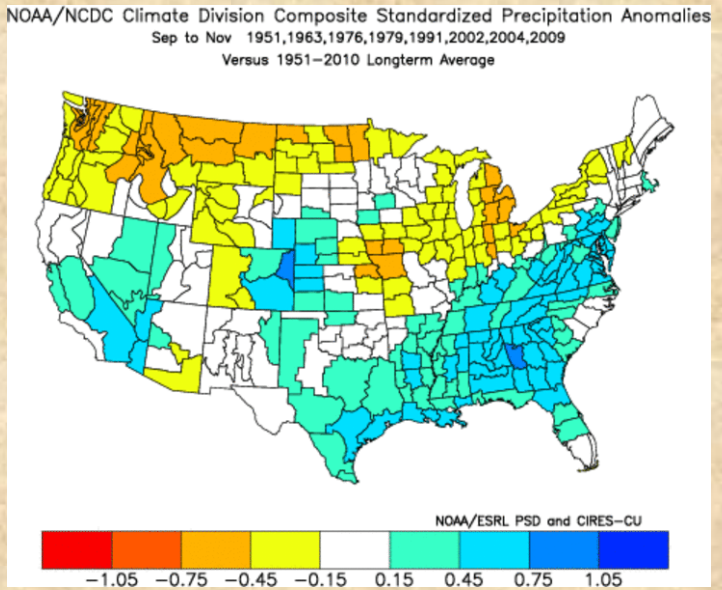


http://www.esrl.noaa.gov/psd/data/usclimdivs/

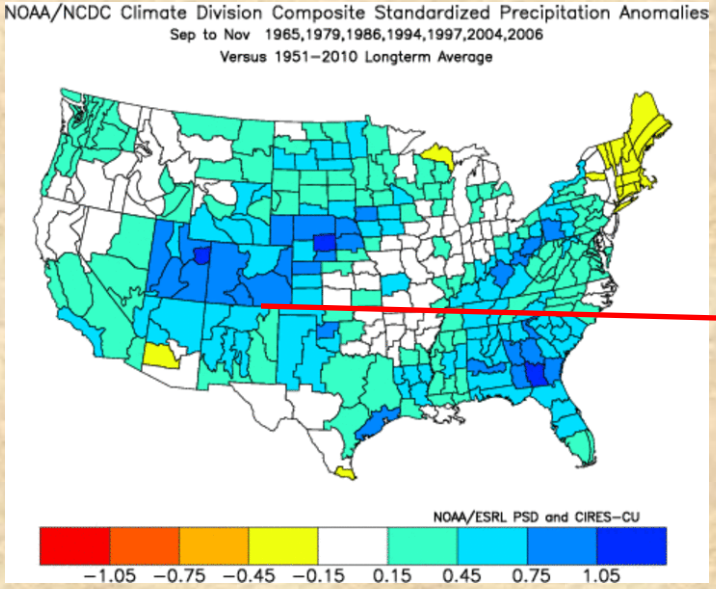


September-November: Precipitation (updated normals)

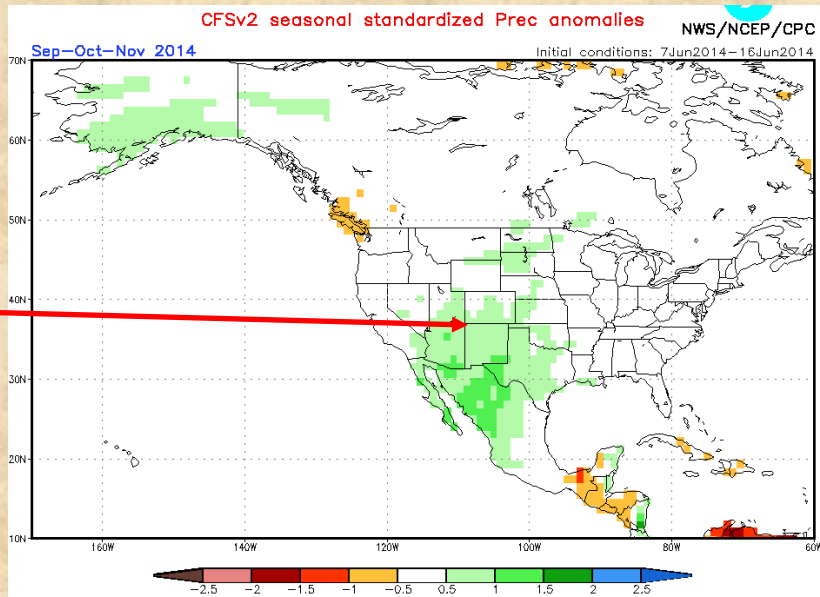




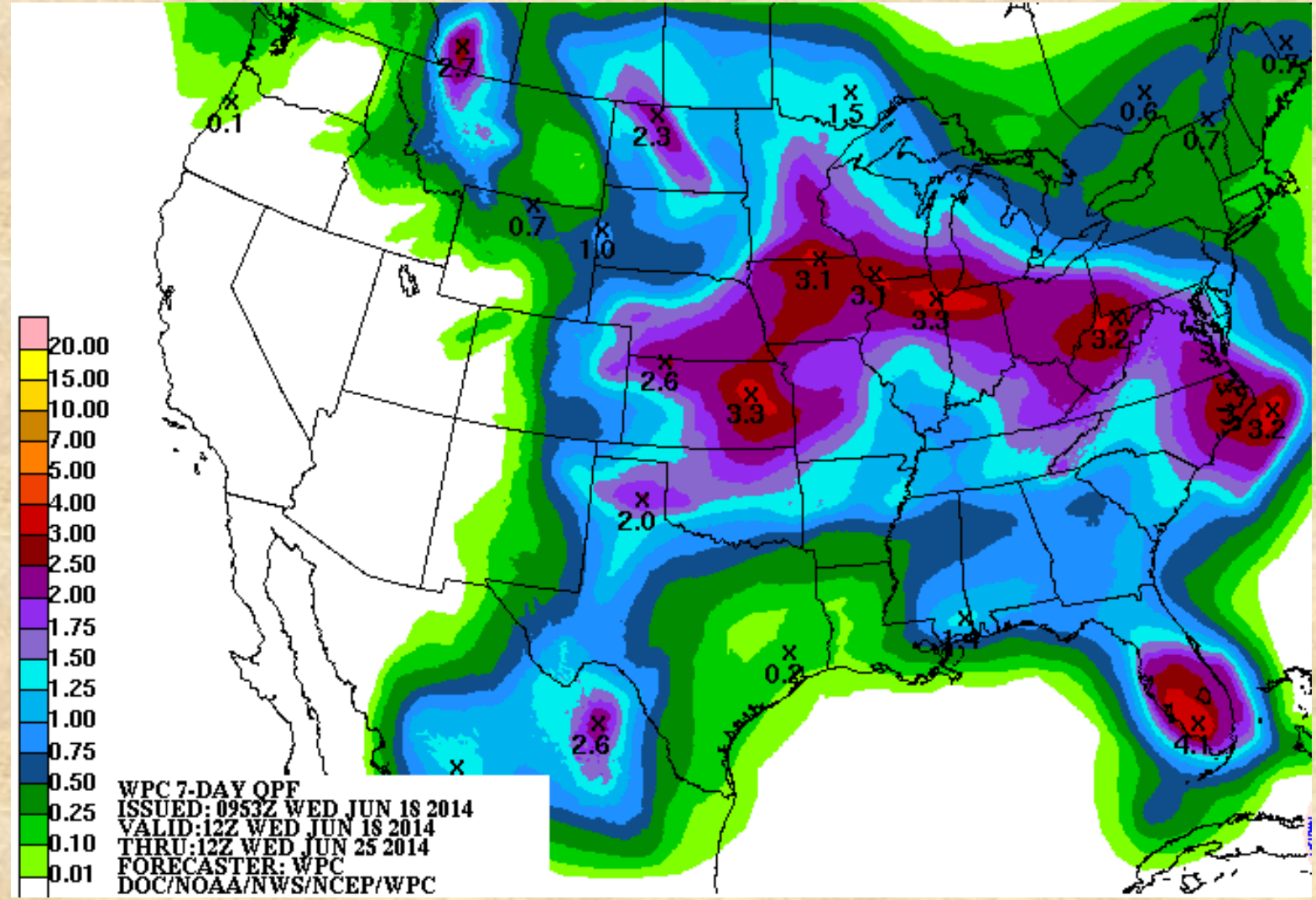
Strong El Niño in SON (top left); weak El Niño in SON (top right); positive PDO (bottom left – based on Mar-Apr), and CFS forecast (bottom right).



http://www.esrl.noaa.gov/psd/data/usclimdivs/

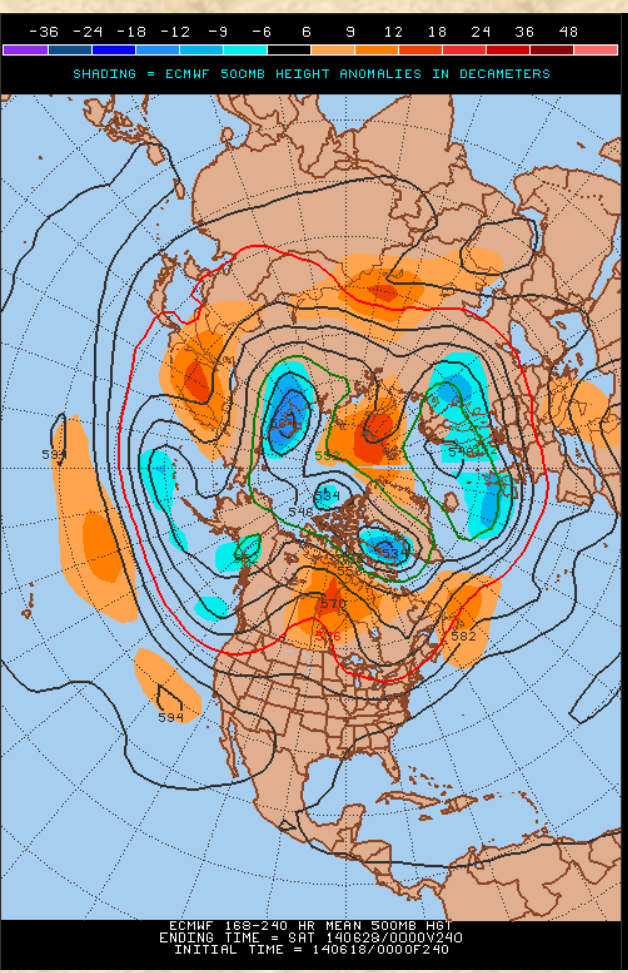


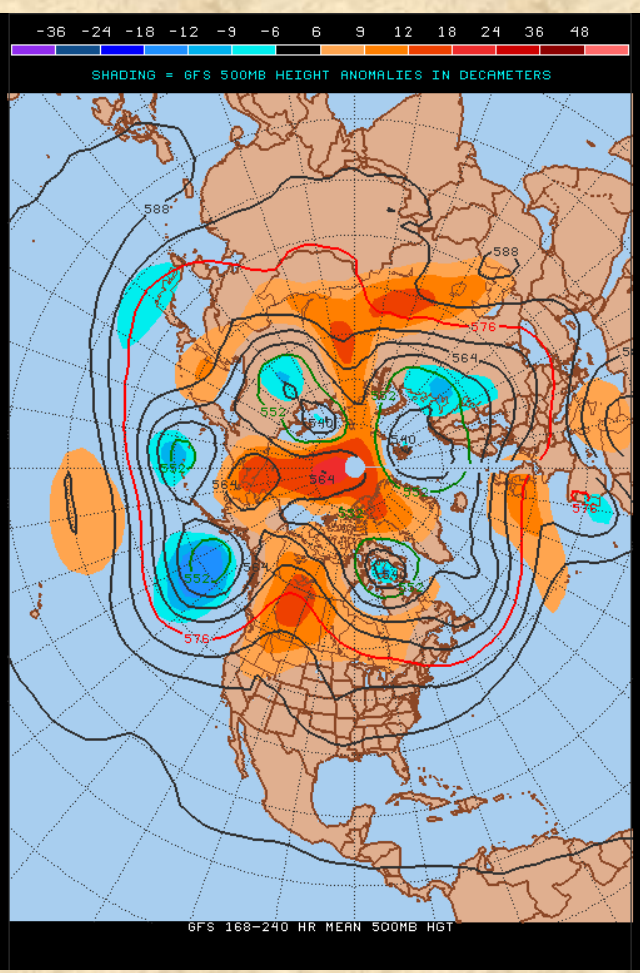
What can we expect in the next seven days?

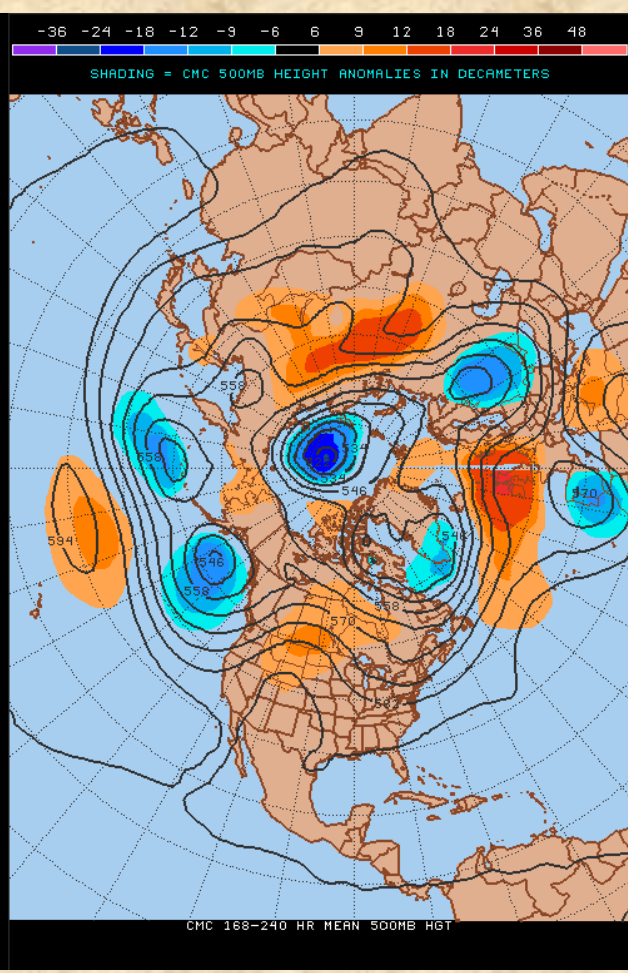


Expected total precipitation (Hydrological Prediction Center, NOAA): a clear east-west gradient, consistent with climatology for this time of year, perhaps bringing some much needed moisture to SE CO, although the track record has been 'spotty'.

What can we expect later next week?

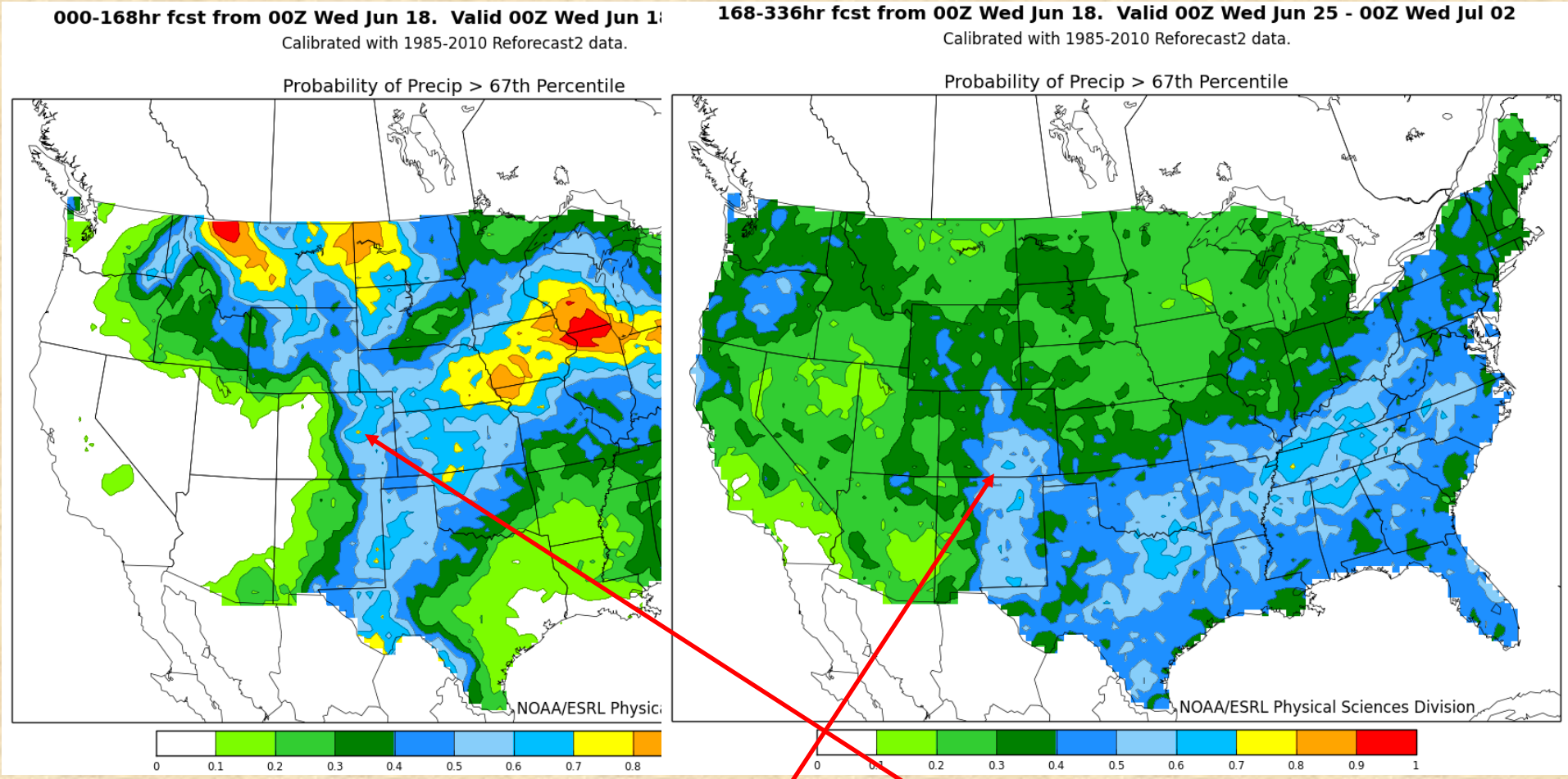






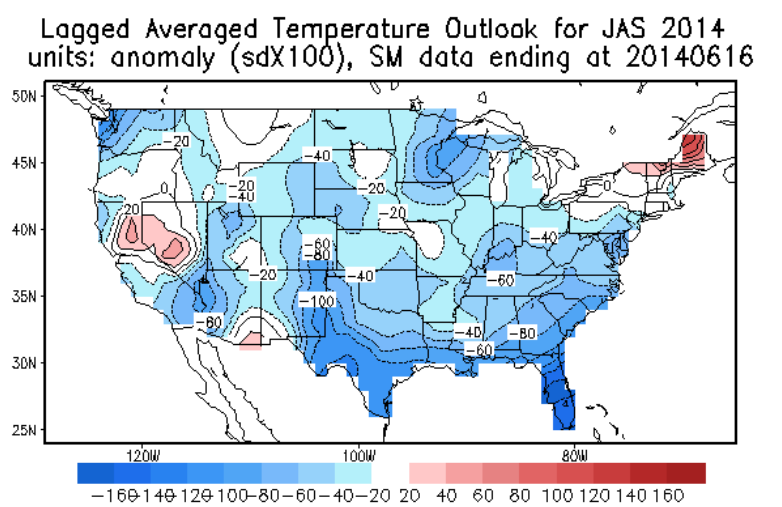
No major anomalies for us 7-10 days from now, with the overall pattern slowly drifting towards an early monsoon situation. At this time of year that should be associated with rising temperatures.

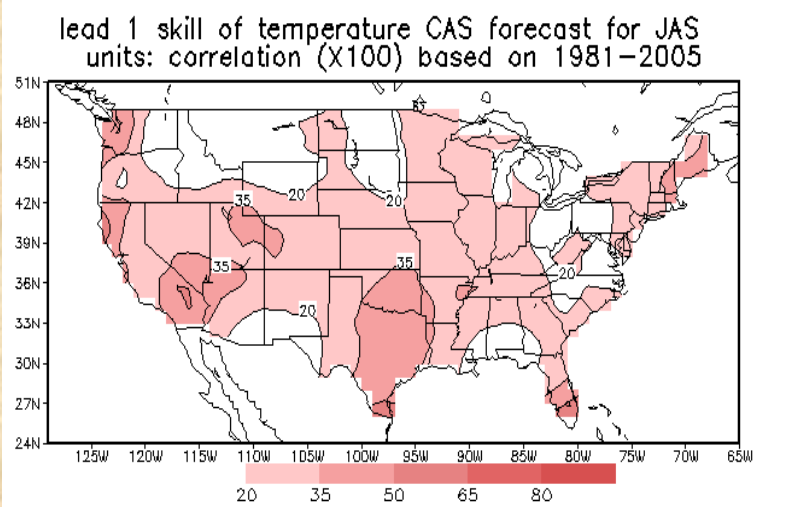
What do the ‘Reforecasts’ say?

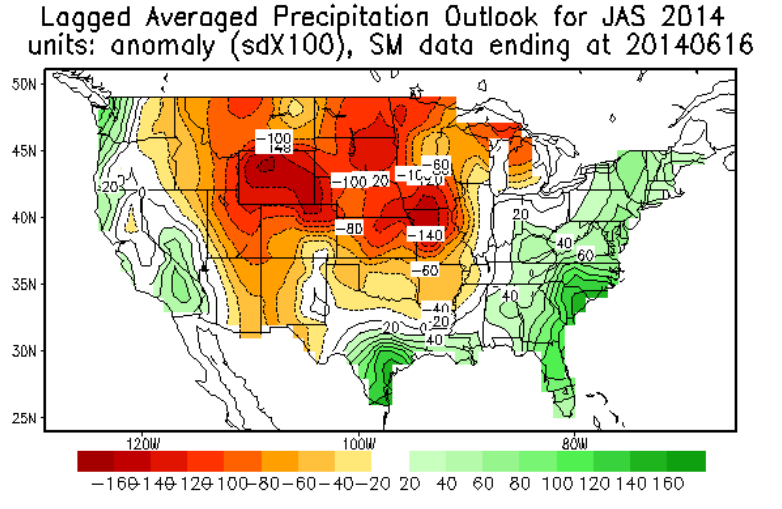


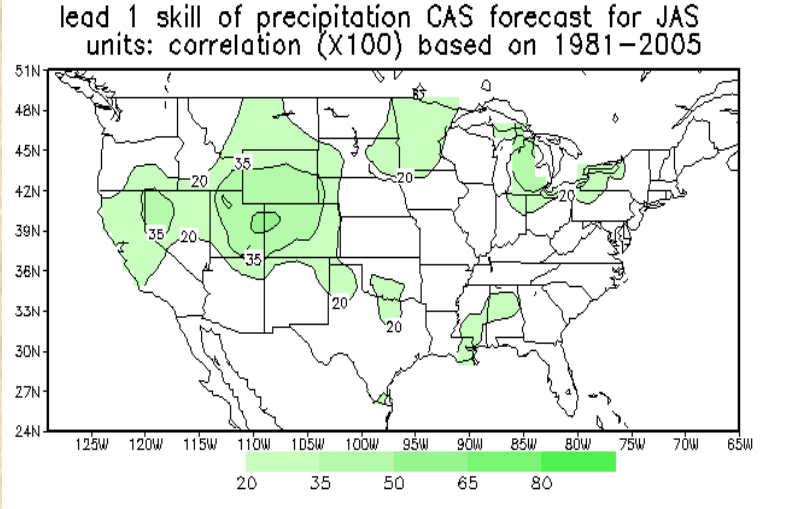
Next week looks dry for western CO and wet for the eastern plains (left), consistent with HPC, while the following week (right) broadens this to look more like an early (eastward shifted) monsoon pattern that <u>could</u> end up favoring SE CO in particular.

Soil Moisture Analogue Forecasts





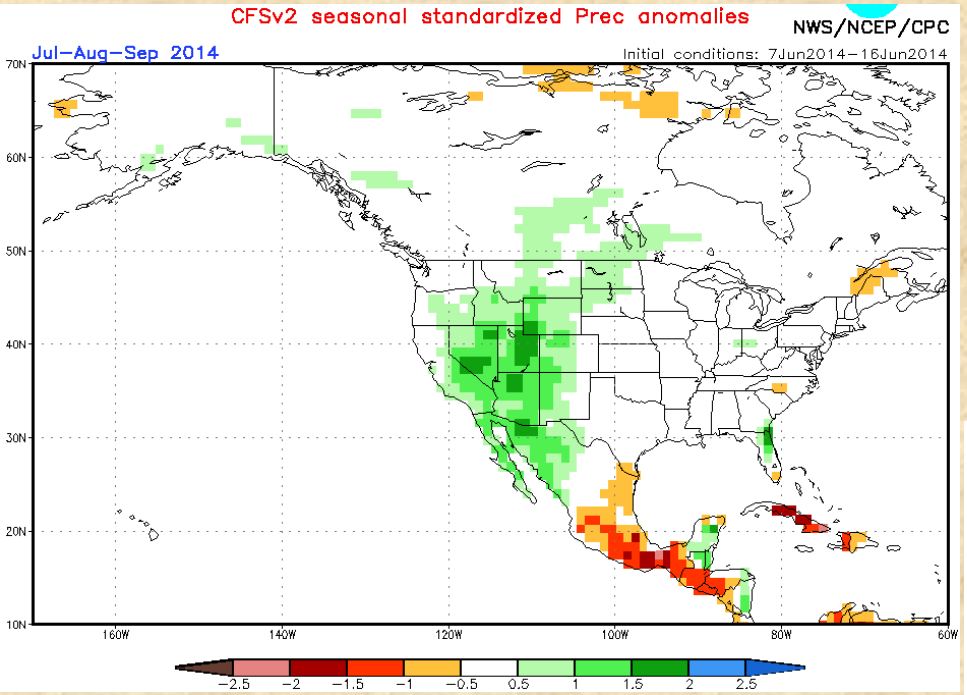




The soil moisture tool anticipates a mostly cool and <u>dry</u> *monsoon season* over our state, supported by historical skill (*and weak El Niño*).

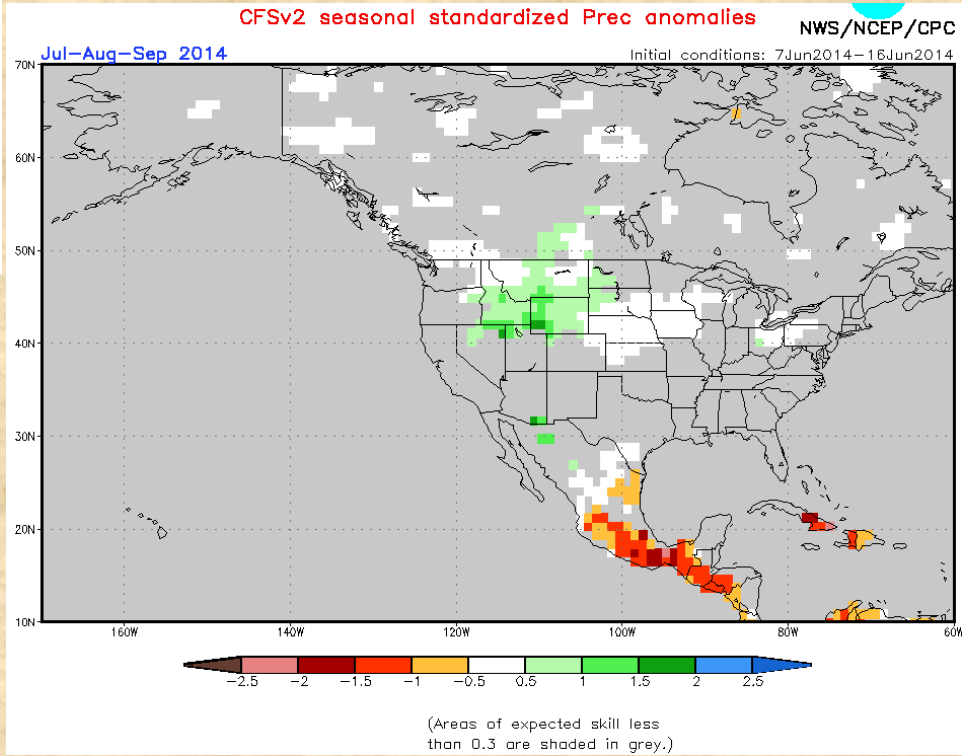
http://www.cpc.ncep.noaa.gov/products/predictions/90day/tools/briefing/

Coupled Forecast System V.2 forecasts

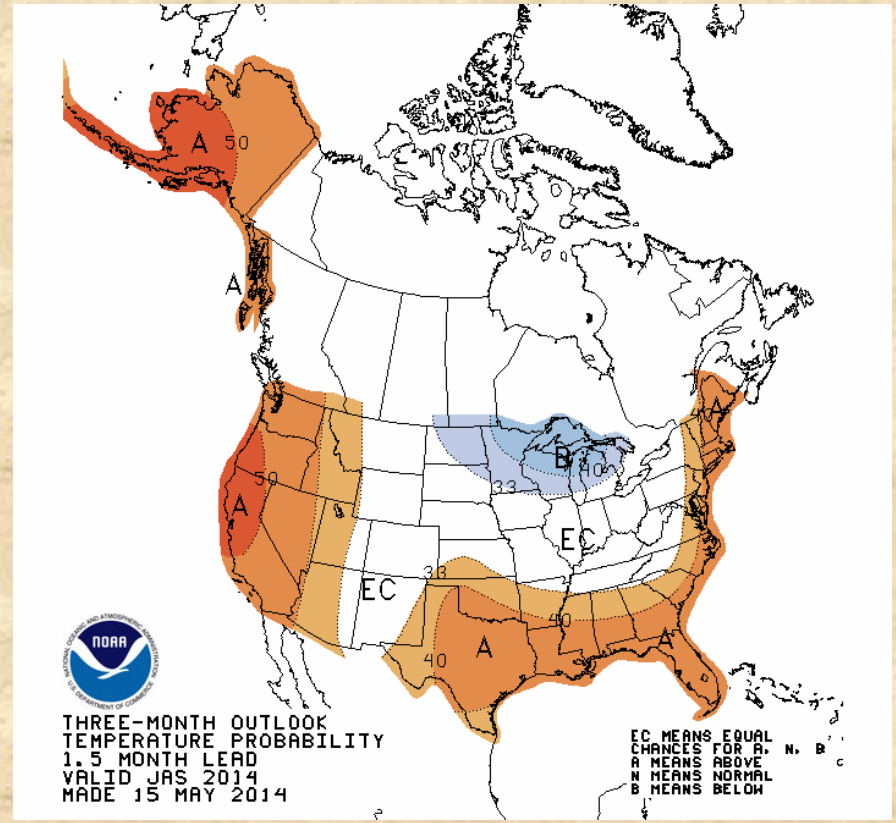


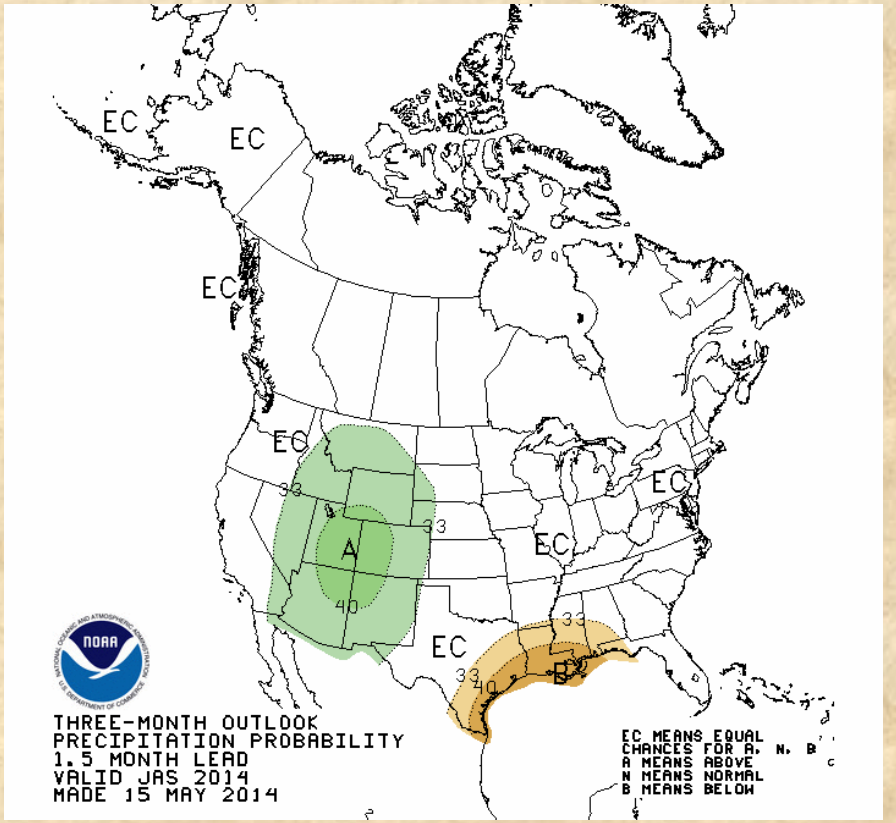
http://www.cpc.ncep.noaa.gov/products/predictions/90day/tools/briefing/

Anticipates enhanced monsoon right thru AZ and UT (top), handicapped by poor skill (right) if all cases are thrown together *(need to get conditional skill according to ENSO condition – not available yet!*).



Climate Prediction Center Forecasts

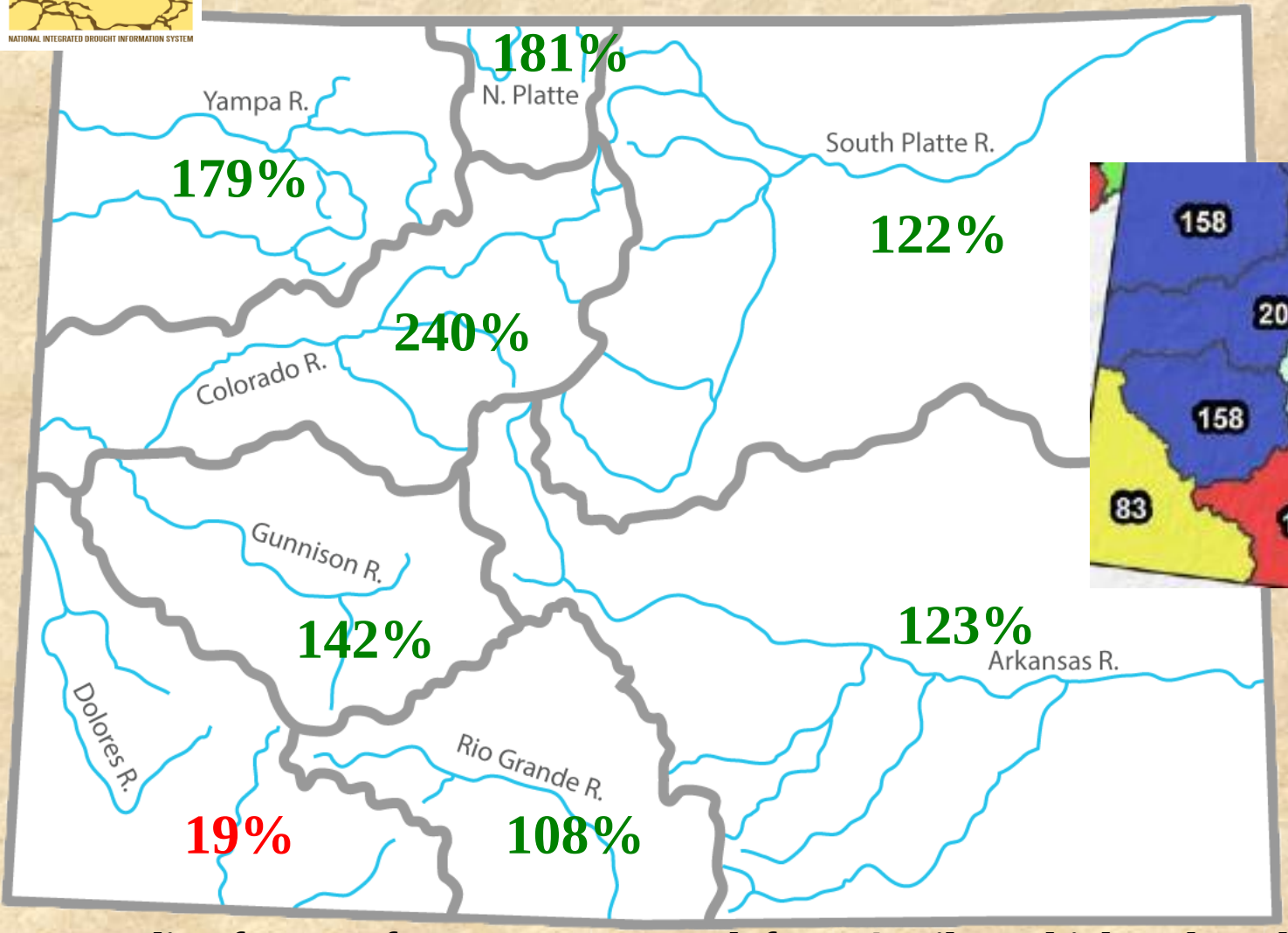


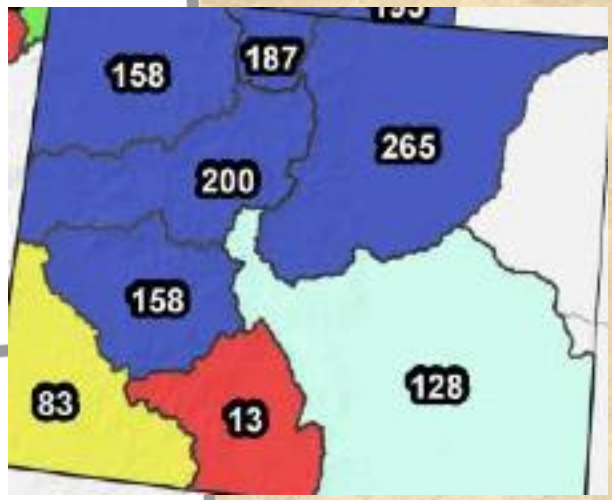


Colorado is not likely to be warmer-than-average this summer according to CPC (left). Their moisture forecast is wetter-than-average for much of the interior western U.S. *This was driven by their coupled forecast model (CFS).*

Source: ***http://www.cpc.ncep.noaa.gov/products/predictions/***

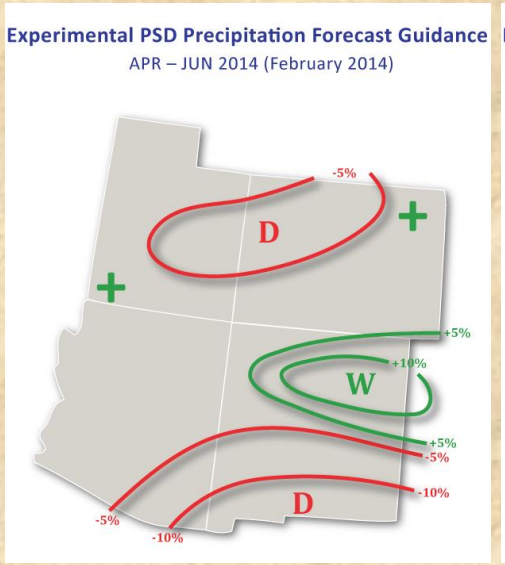
SWE forecast for 1 June 2014 (50%ile)

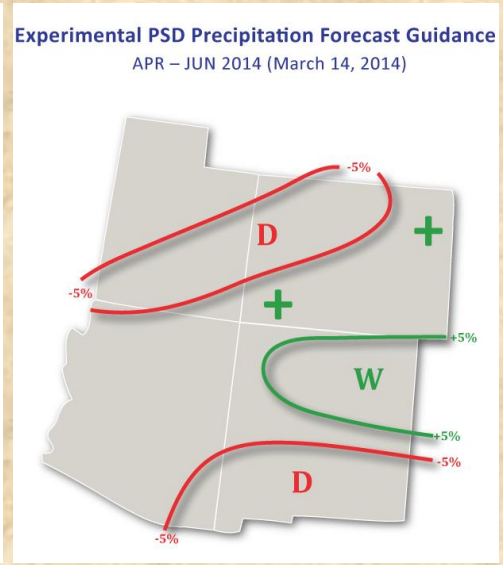


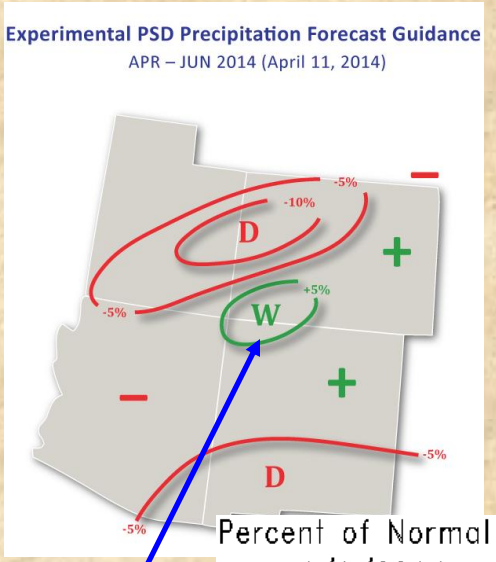


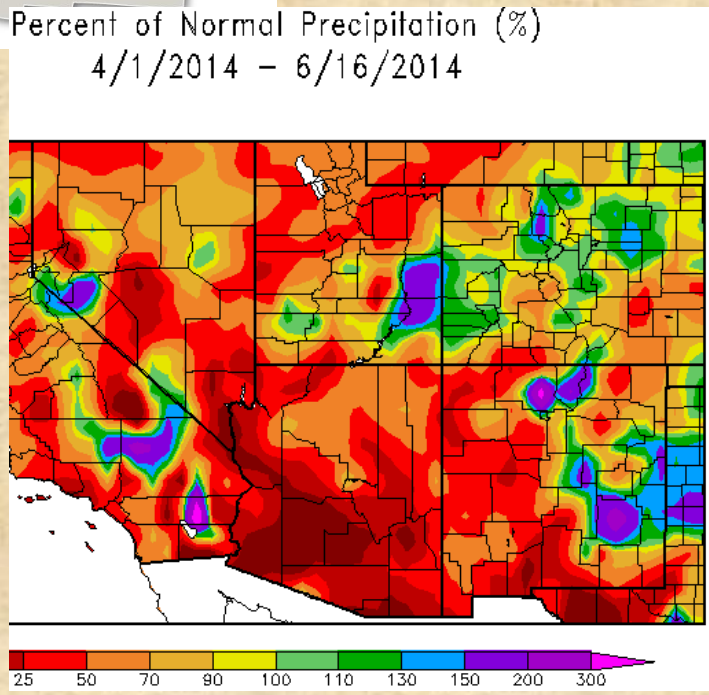
My median forecast for 1 June snowpack from April was higher than the long-term median for most of the state. Perhaps 'beginner's luck', but the above 'normal' verified by May 29th (right insert), with the Rio Grande basin being the only basin really 'off'.

Statistical Forecast for April-June 2014





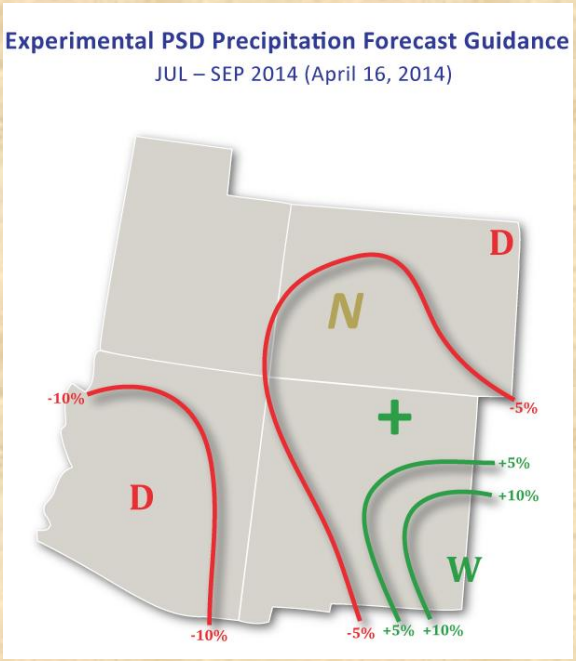


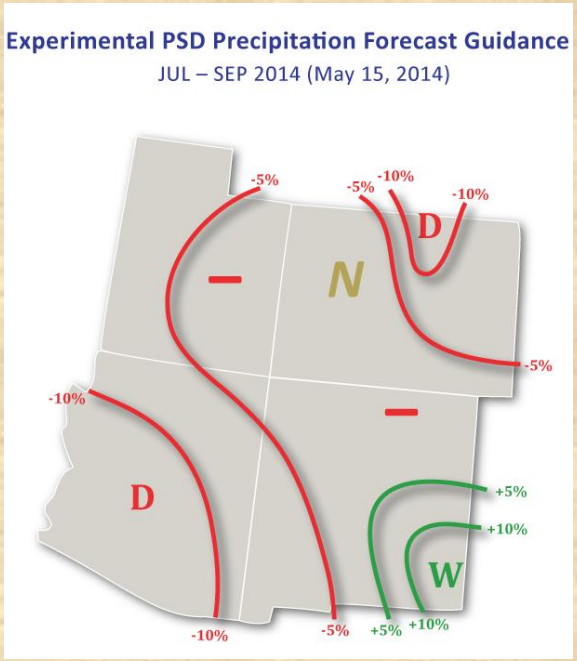


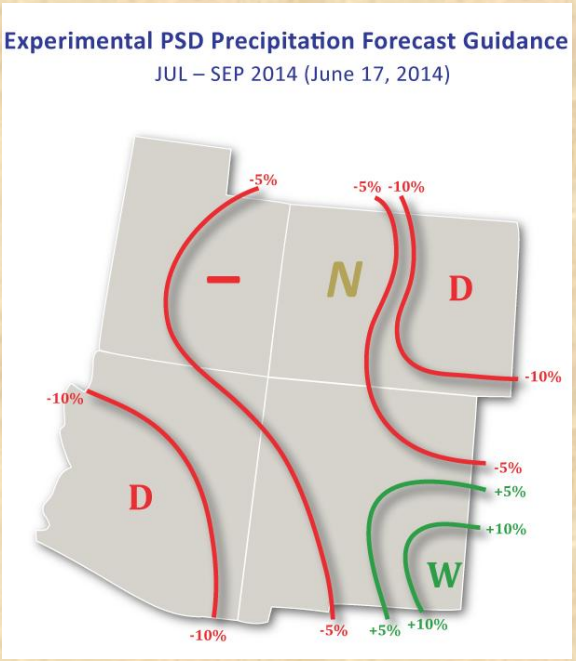
My forecasts for April-June 2014 from Feb' (left), Mar' (middle), and Apr' (top right) showed slightly increased chances for moisture in the southeastern half of CO, and less over much of the Upper Basin, but increasingly better news for the San Juans. ***Operational skill has been best over UT and CO.***

So far, moisture has been spotty, with the dry forecast regions verifying better than the wetter ones.

Statistical Forecast for July-September 2014







My first seasonal forecast for July-September 2014 (left) was dry for much of the interior southwestern U.S., driest over AZ where El Niño often results in dry conditions during the summer. The May update (middle) remained surprisingly dry for much of the region, including the CO Front Range in particular. *My final update (right) reinforces this bleak picture which is consistent with a 'weak El Niño' scenario, sorry to say.*

Executive Summary (18 June 2014)

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- **While El Niño/La Niña can provide decent guidance for climate outlooks around here, this was not very helpful in two years of ENSO-neutral conditions. El Niño has started, but is not firmly established yet.** ***The stronger this event gets, the more likely we will see a wetter growing season. In a similar vein, the recent switch in the Pacific Decadal Oscillation (PDO) – even if only temporary - appears to favor a wetter growing season as well.***

- **My statistical forecast for late spring (April-June) showed a slight tilt towards wetness covering the eastern plains which has verified except for SE CO. The northwestern half of the state has not been as dry as expected. The monsoon season is forecast to end up dry for eastern CO and near-normal west of the divide.** ***This would be consistent with a weak El Niño which has indeed become more likely after the lack of coupling over the equatorial Pacific since May.***

- **Given the rains of last September, an above-normal snowpack in the northern mountains, and a transition to El Niño, the stage was set for increased flood risk during the snow-melt season, and late May brought indeed some flooding, but all in all cool and drying weather at higher elevations ended up reducing that threat in June.** ***But we are not out of the woods yet, the peak of the monsoon season in late July in particular could still pose a flashflood threat, even if the season overall ends up dry.***