Earth System Research Laboratory
Physical Sciences Division

CIRES
Cooperative Institute for Research in Environmental Sciences

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Colorado WATF,
23 July 2014
Denver

Seasonal Outlook for Colorado

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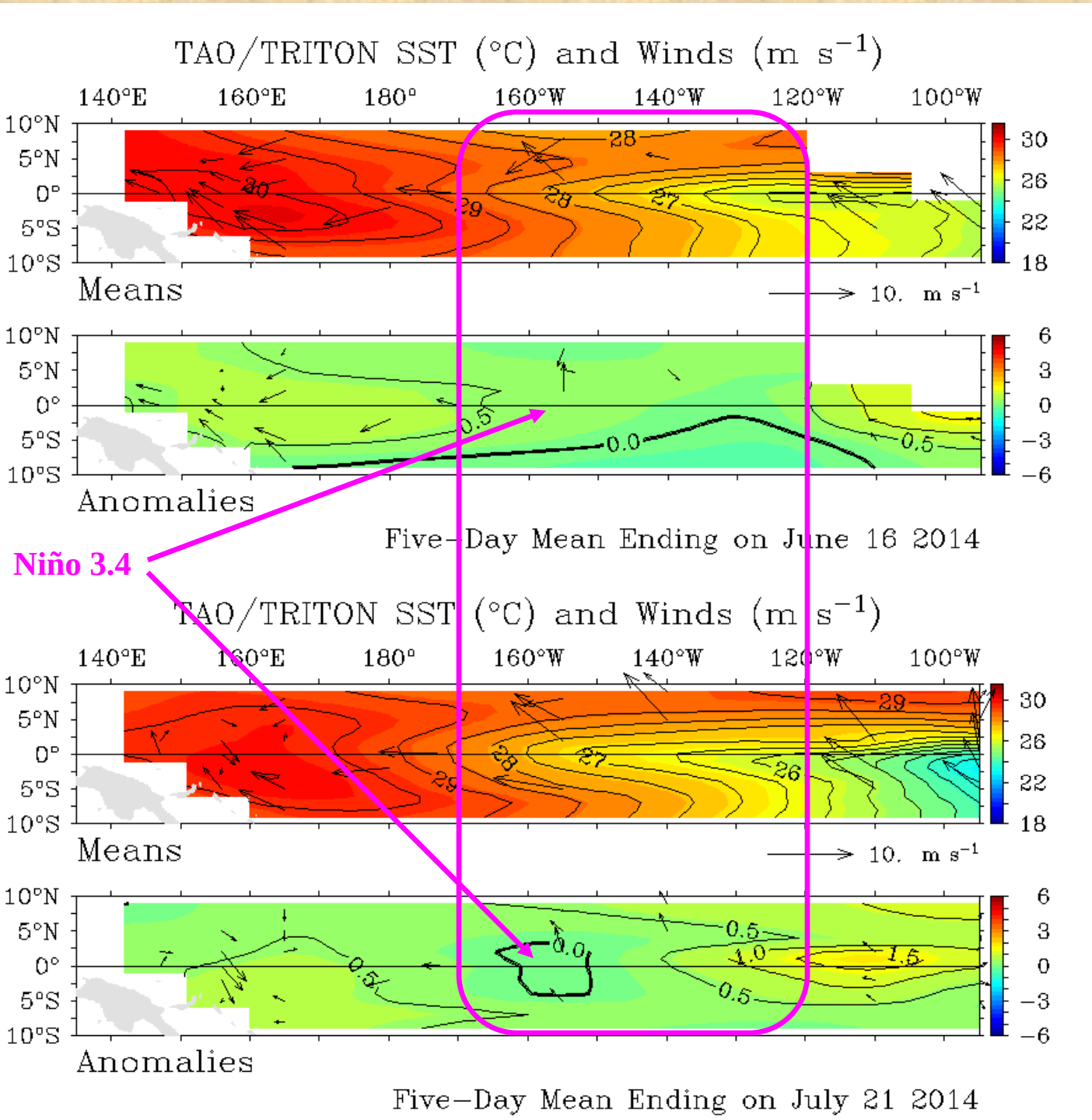
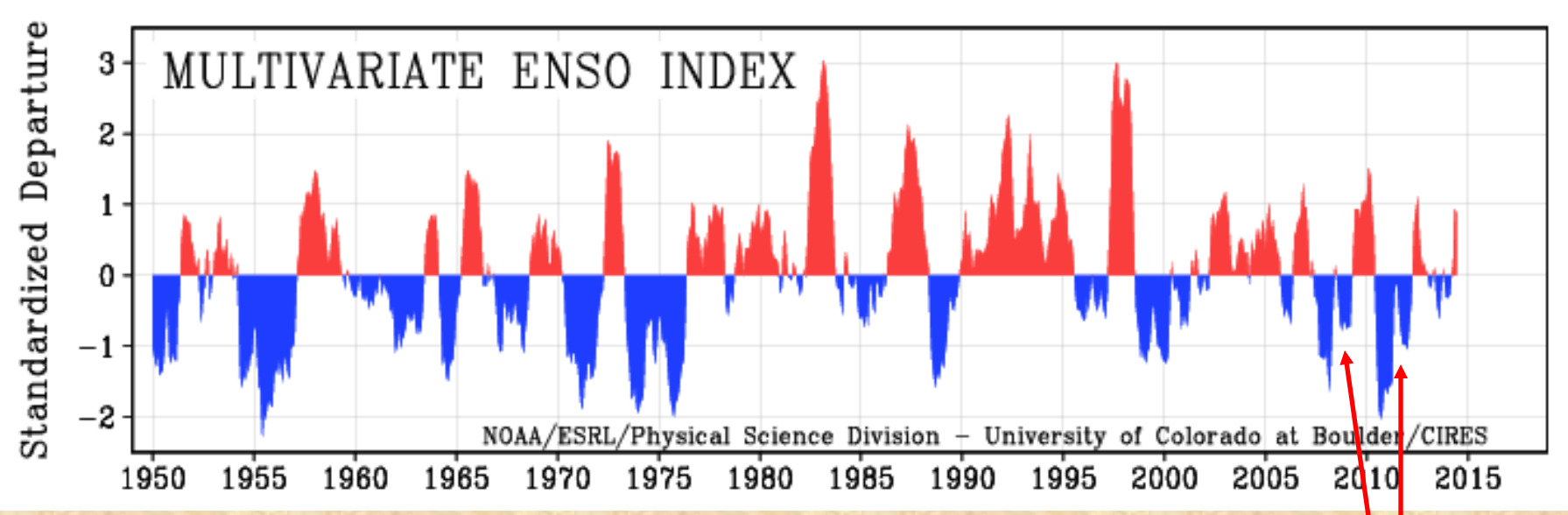
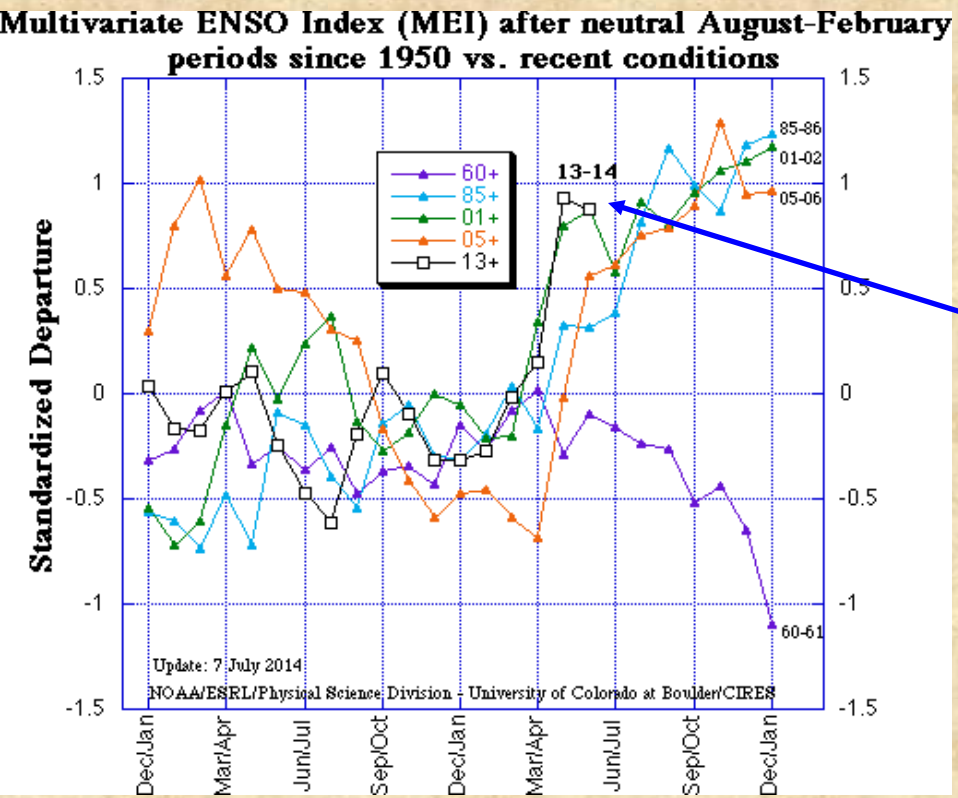
- **What has happened to ENSO(+), what will happen next, and what does that mean for us ?**
- **Expectations for the next two weeks**
- **CPC forecasts for August through December 2014**
- **Seasonal Forecast Guidance for precipitation**
- **Executive Summary**

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 only of the weak variety, *with some westerly wind anomalies west of the dateline that are finally consistent with El Niño.*



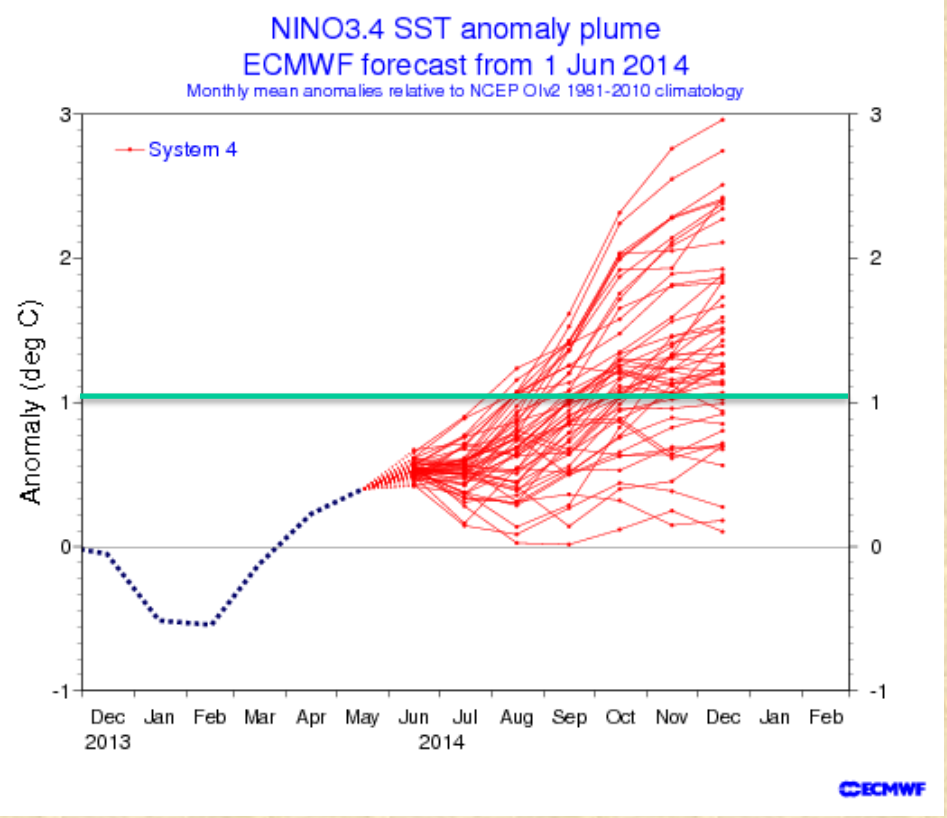




Last seven years have seen two 'double-dip' Las Niñas in a row, followed by a brief excursion to what looked like an El Niño event in 2012, and a return to ENSO-neutral or weak La Niña conditions for much of the last year.

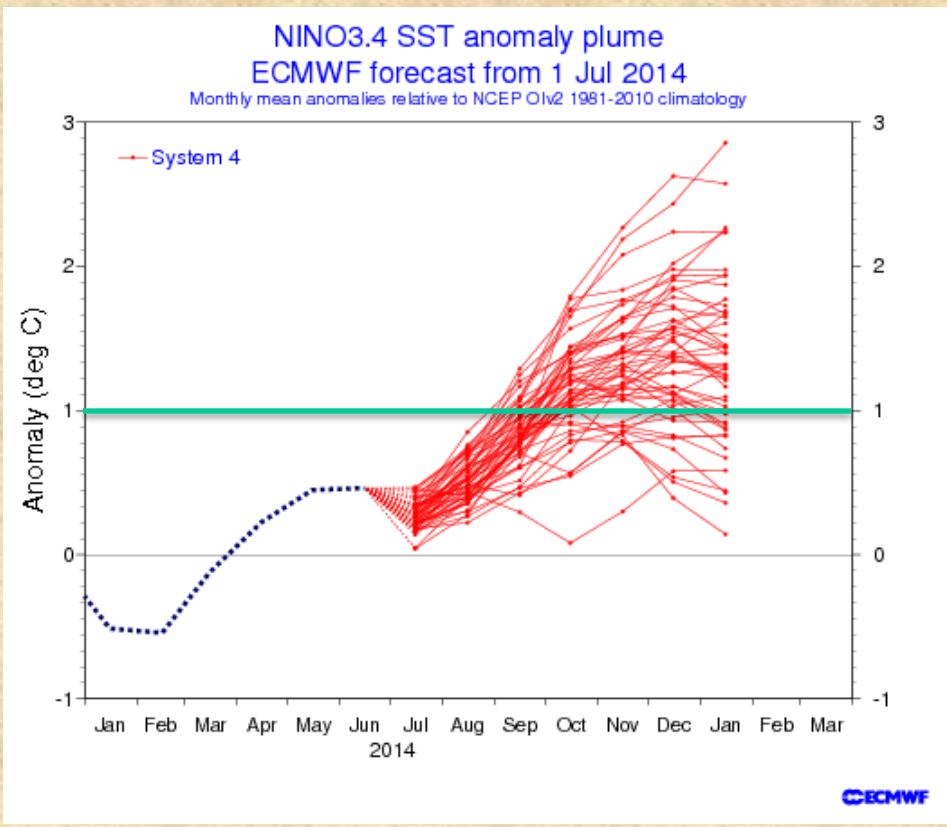
ENSO conditions often change during our spring season. This year towards El Niño indeed, although the latest value has eased off a little from April-May.

http://www.esrl.noaa.gov/psd/enso/mei



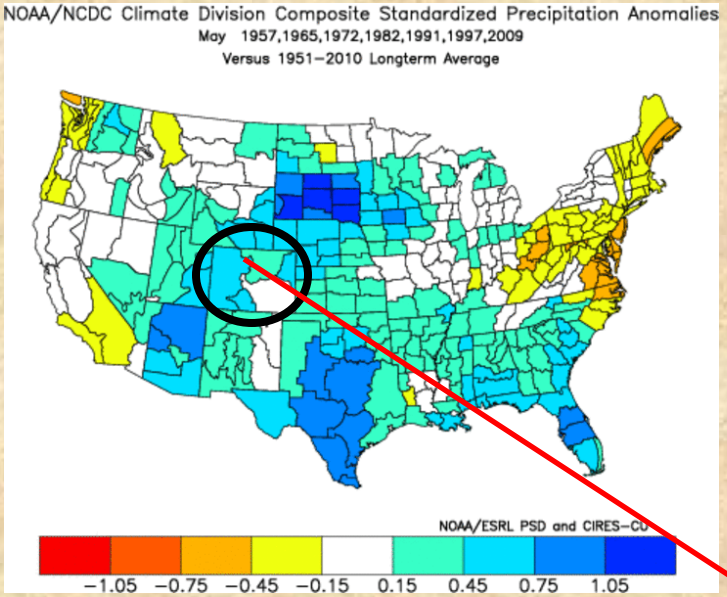
The ECMWF June 2014 forecast (left) was the fourth in a row to virtually guarantee a significant El Niño event, since none of its 50 ensemble members dipped below 0° C through December 2014. However, its median peak value had dropped a little compared to May.

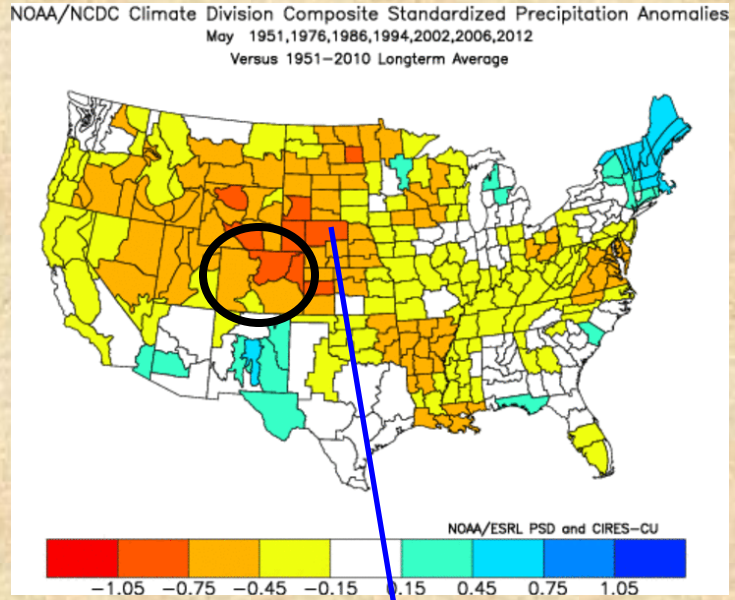
The ECMWF July 2014 forecast (right) is even slower to ramp up through the summer. Peak values around November-December end up between 1-1.5° C, which is actually the 3rd highest within the IRI plume (*not shown*).



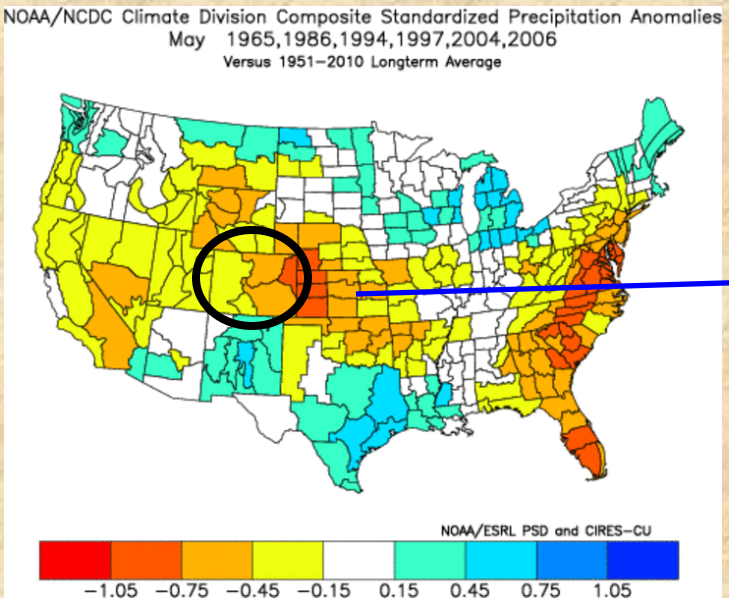
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/

May: Precipitation (when there was still hope for a big El Niño)

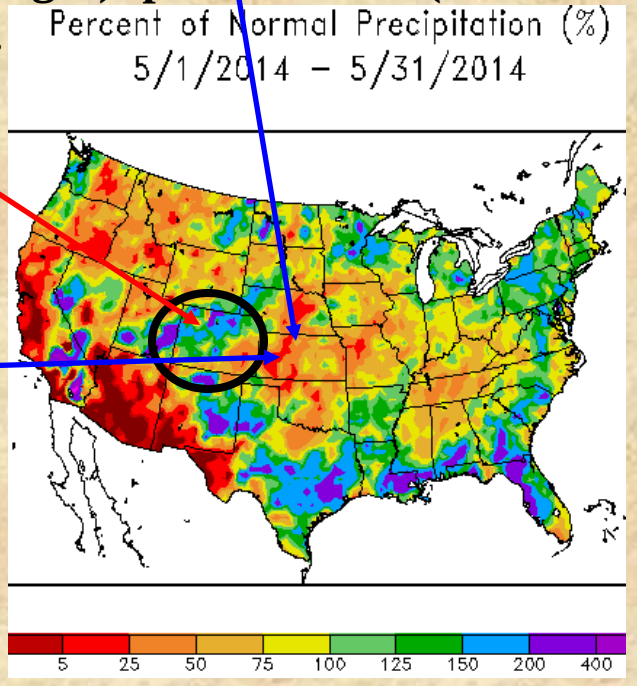




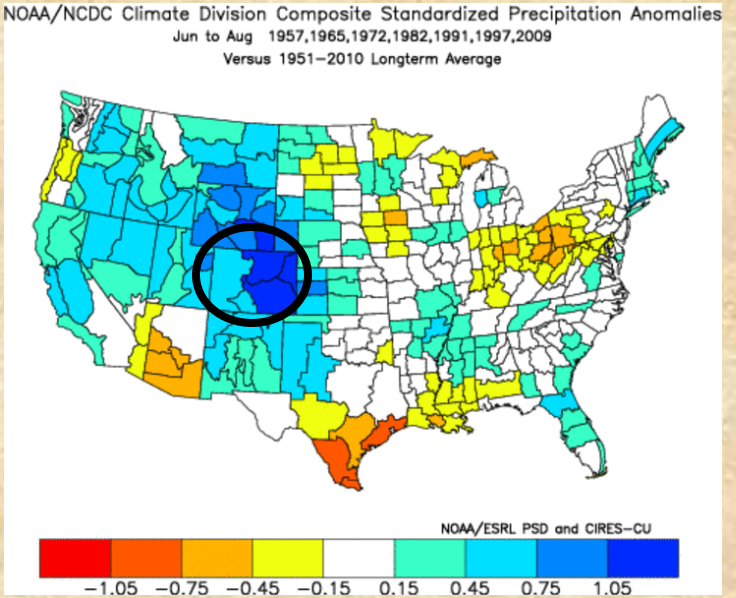
Strong El Niño in JJA (top left); weak El Niño in JJA (top right); positive PDO (bottom left – based on Mar-Apr), and observations (bottom right).

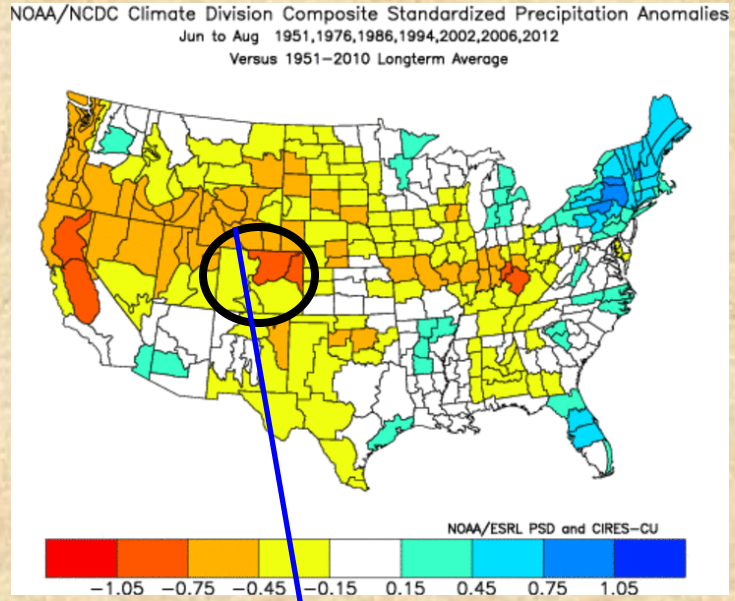


http://www.esrl.noaa.gov/psd/data/usclimdivs/

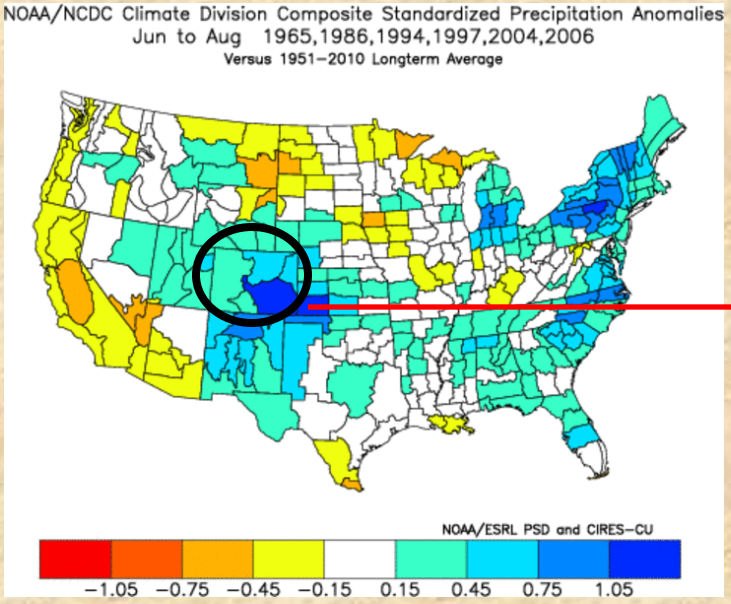


June-August: Precipitation (weak El Niño & positive PDO)





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).



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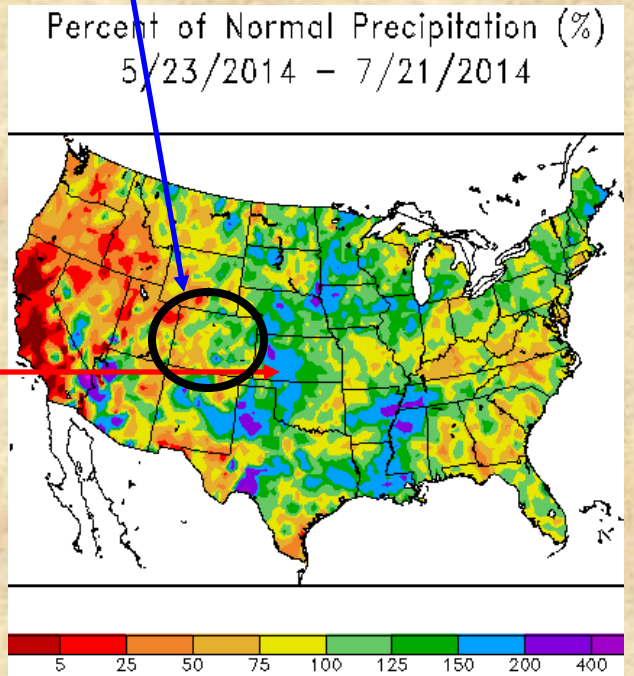
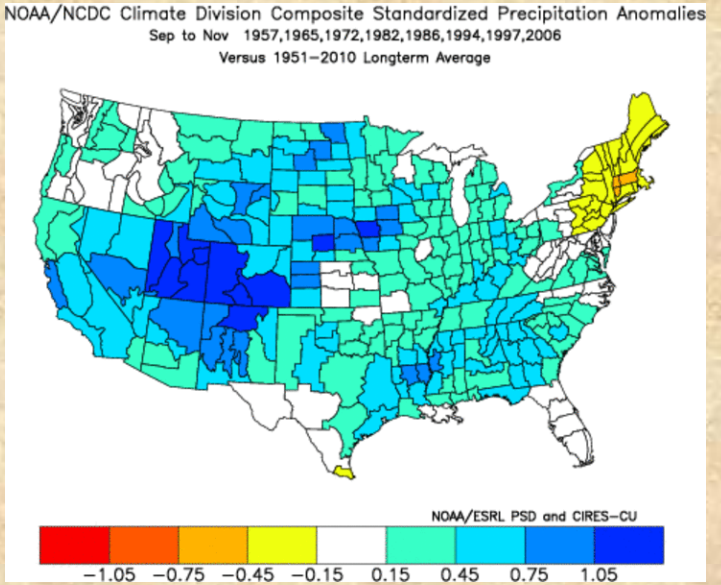
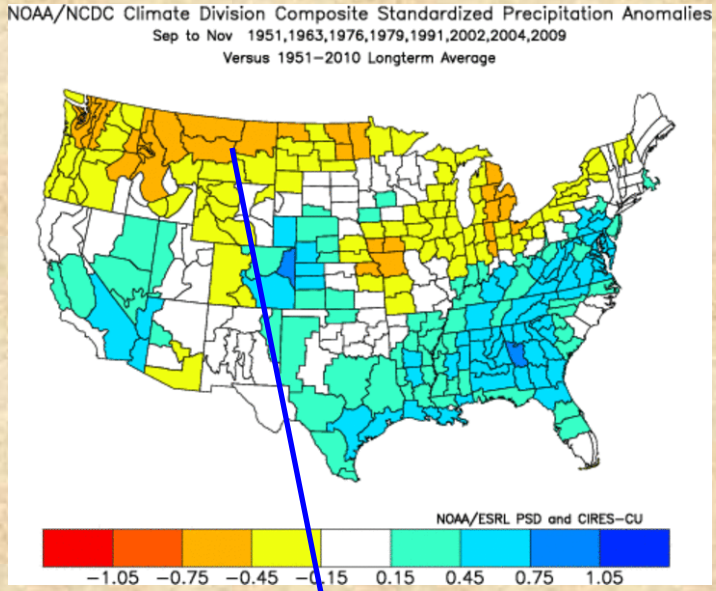
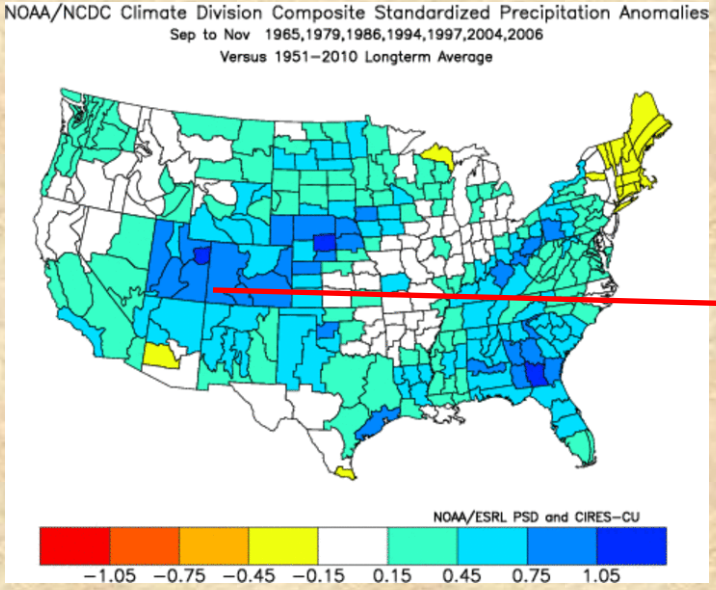


September-November: Precipitation (weak El Niño still dryish)





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



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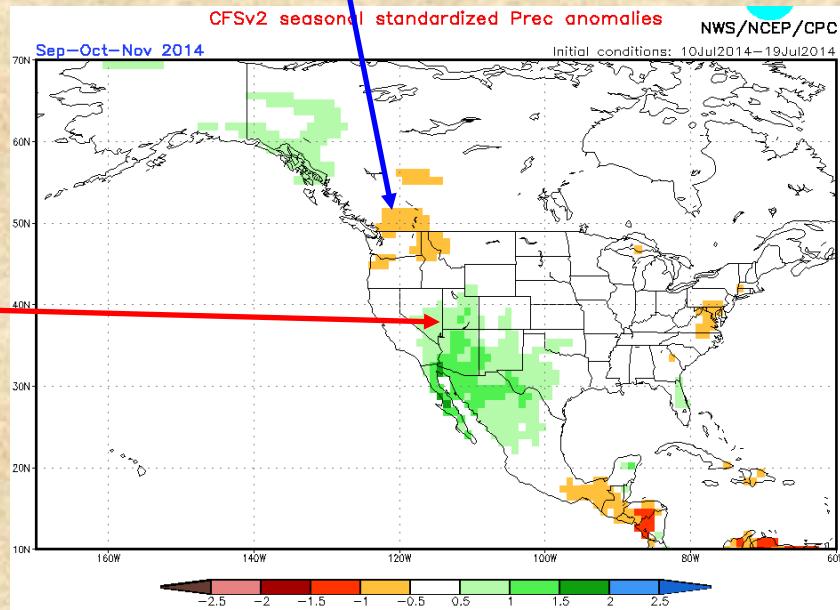
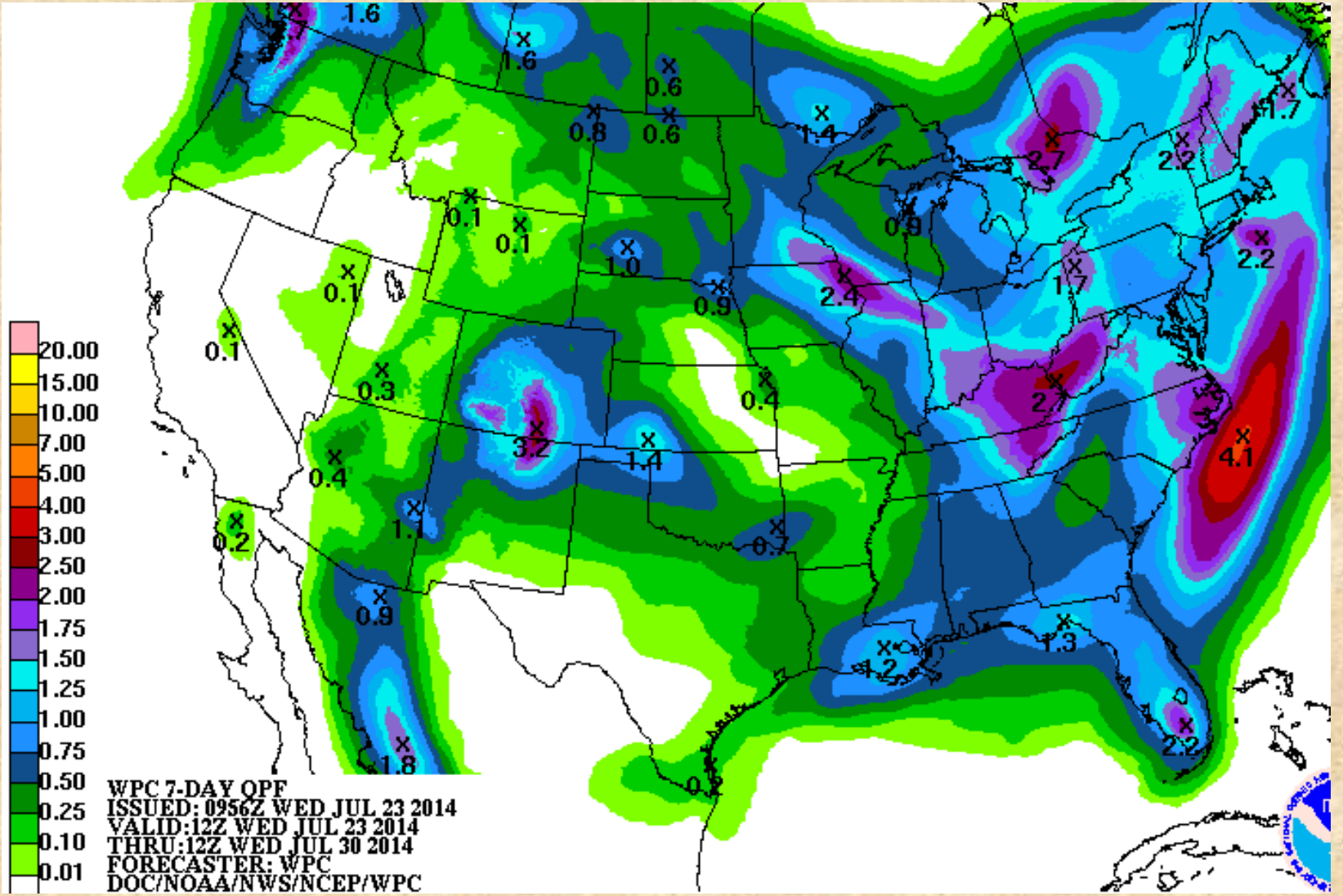
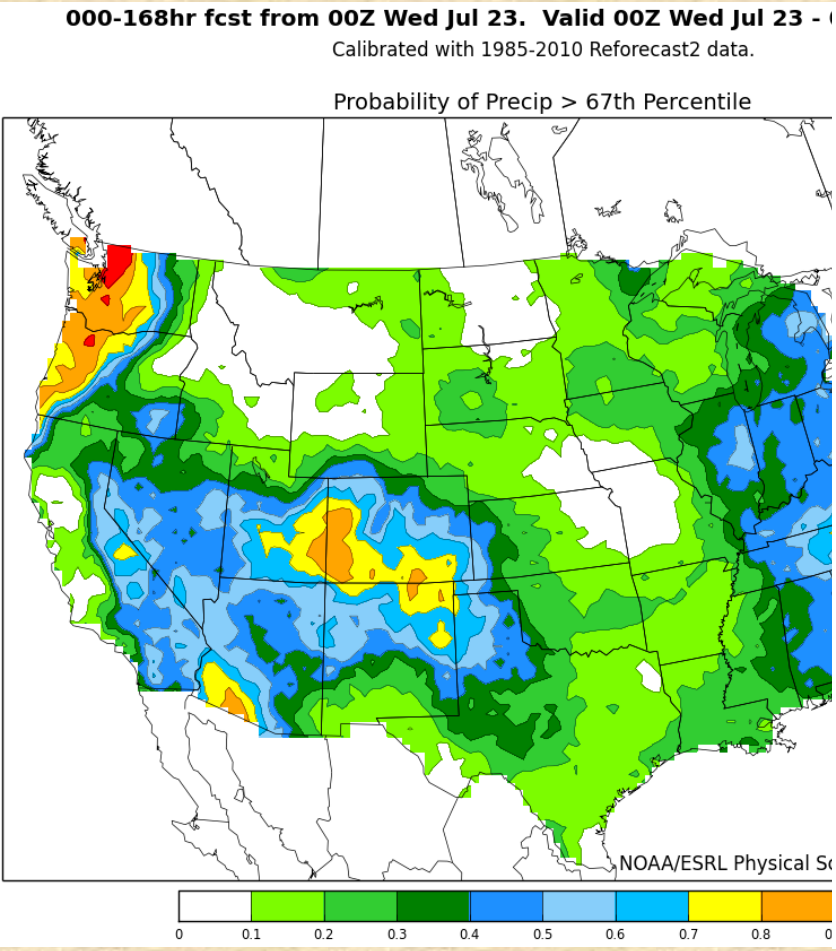


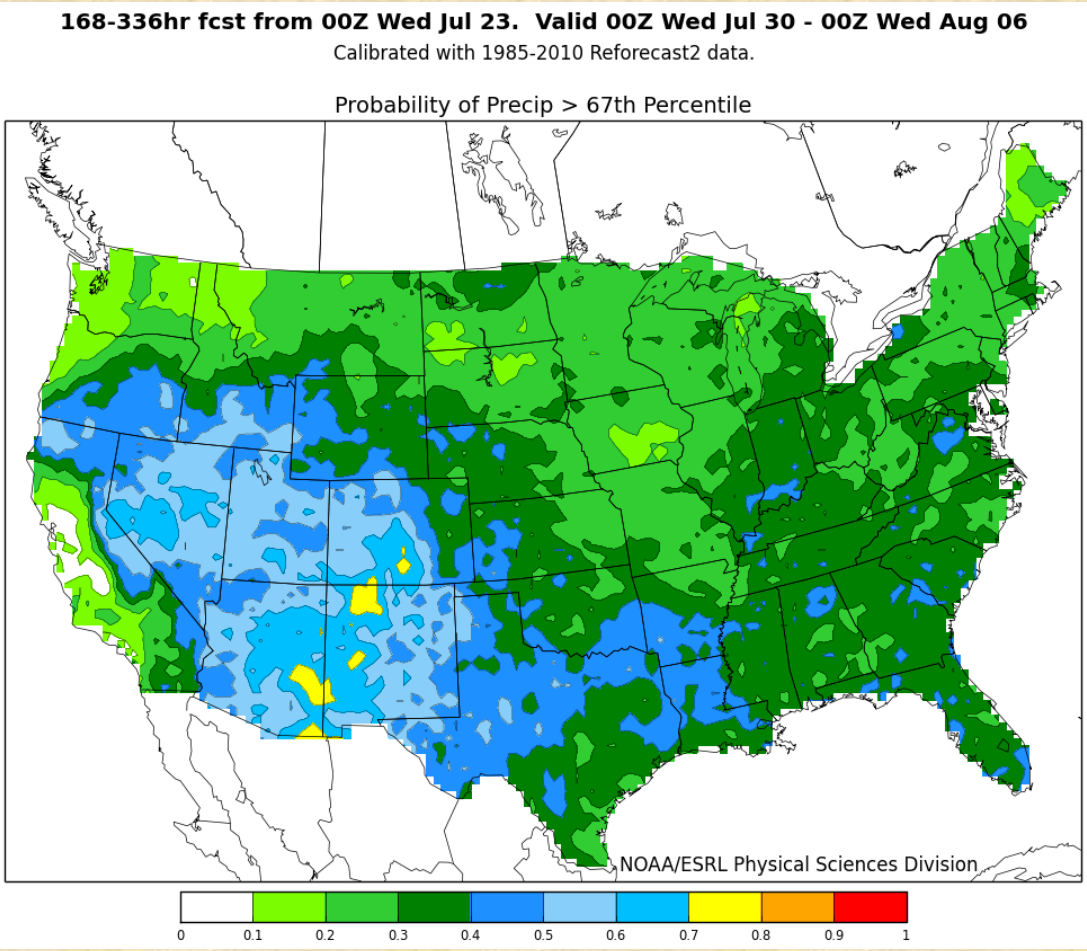
What can we expect in the next seven days?



Expected 7-day total precipitation (Hydrological Prediction Center, NOAA): a wet week coming up for much of CO, although this is 'back-loaded', i.e., towards next week. Note that 0.5-1" of rain in one week is not unusual for this time of year.

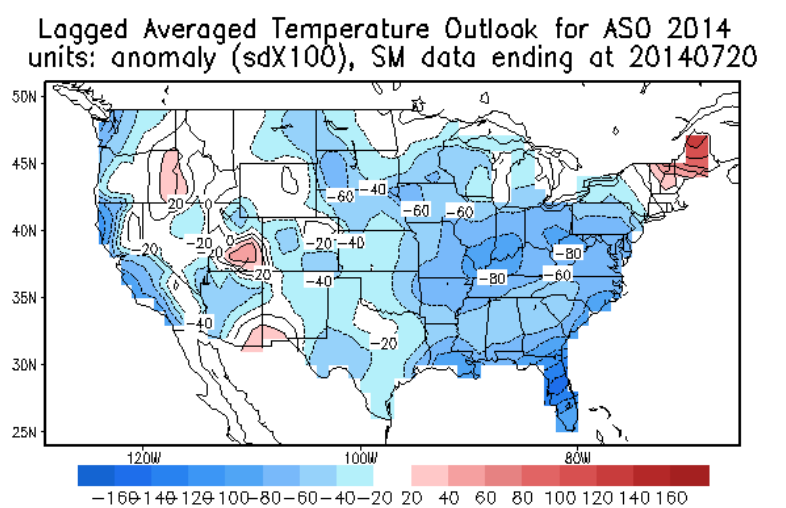
What do the ‘Reforecasts’ say?

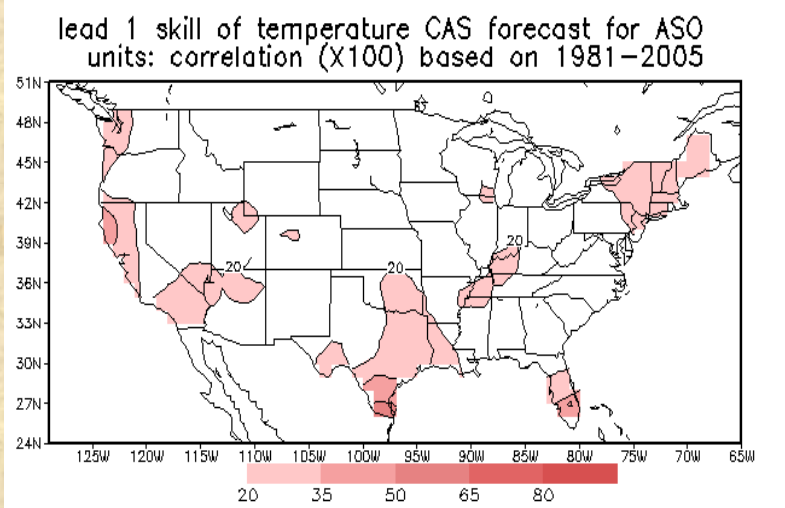


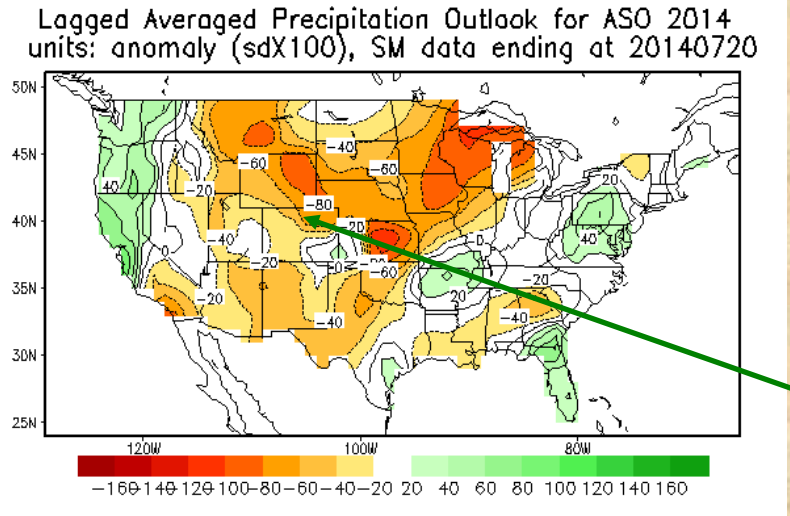


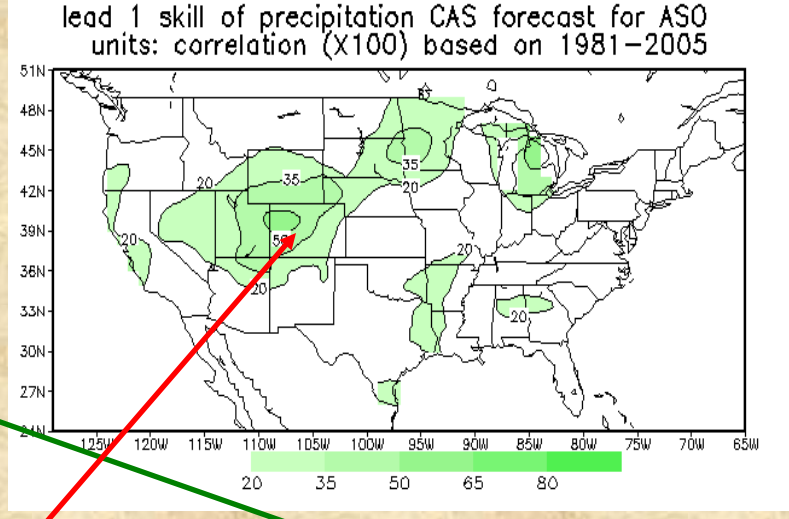
Next week looks moist for western CO, less so for the northeastern plains (left), mostly consistent with HPC, while the following week (right) keeps the monsoon going more over the western 2/3 of the state than to the northeast.

Soil Moisture Analogue Forecasts





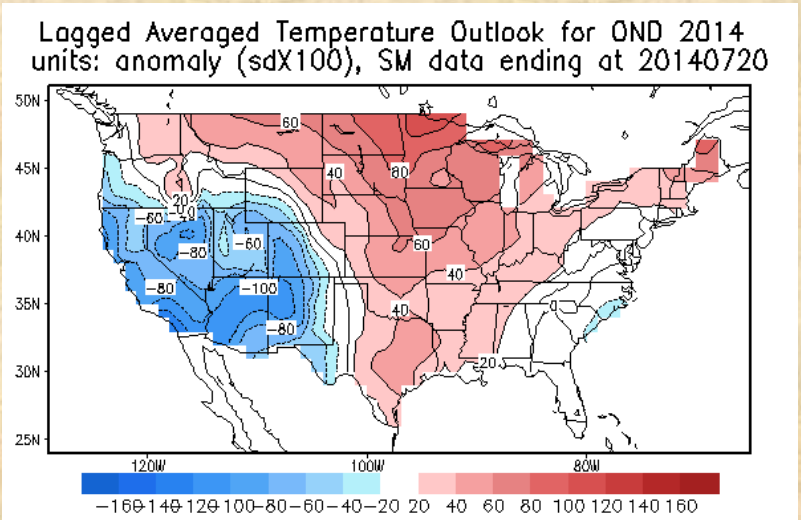


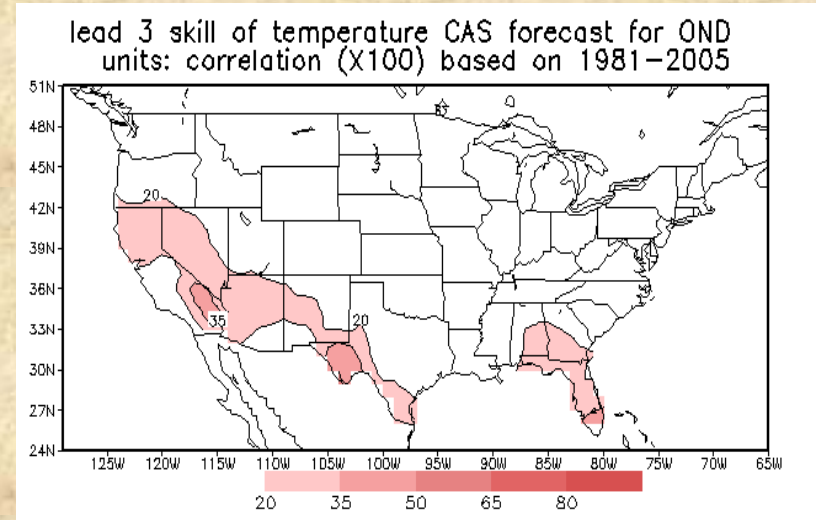


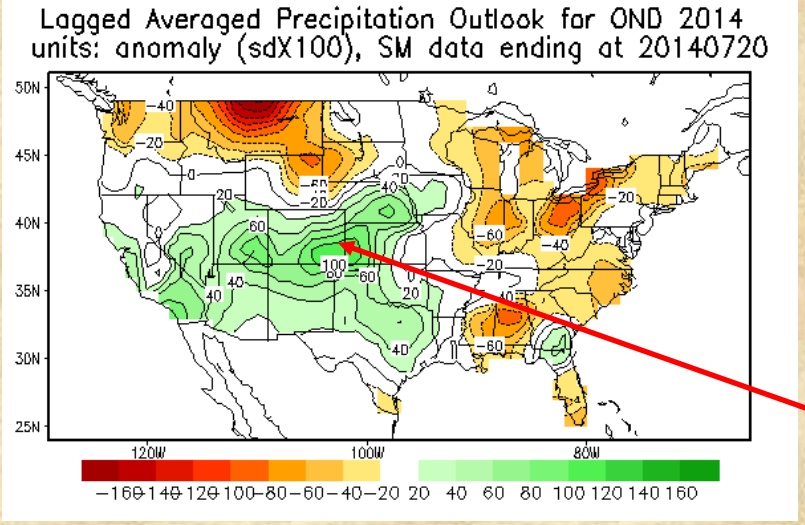
CPC's soil moisture tool anticipates a mostly cool and dry *late summer/early fall* over our state, supported by historical skill in precipitation (*and weak El Niño*).

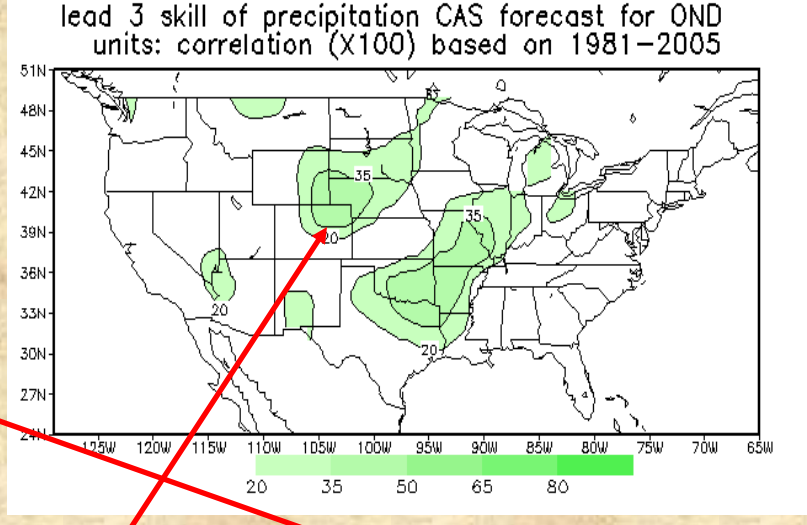
http://www.cpc.ncep.noaa.gov/products/predictions/90day/tools/briefing/

Soil Moisture Analogue Forecasts





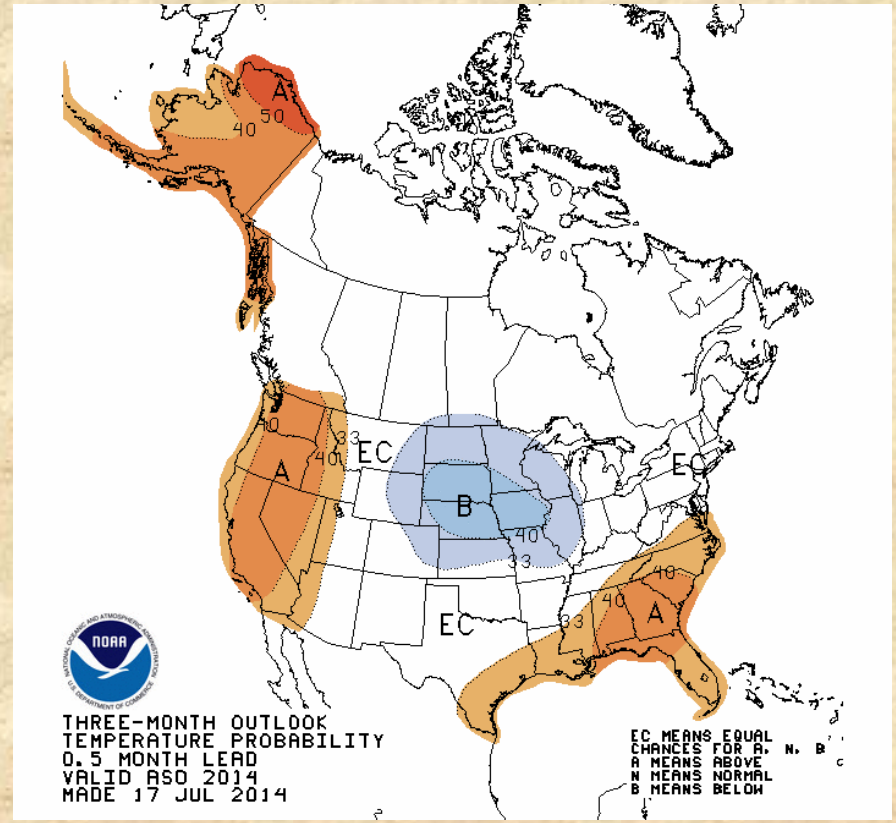


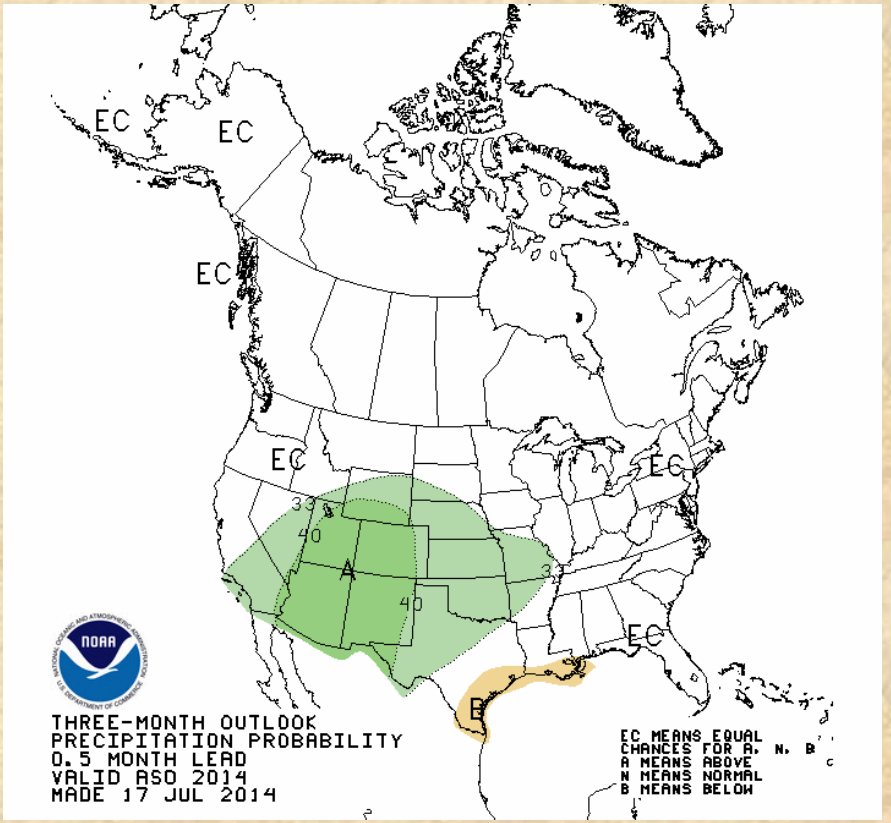


The soil moisture tool anticipates a mostly cool and wet *fall* over our state, supported by some historical skill in precipitation (*and El Niño*).

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

Climate Prediction Center Forecasts

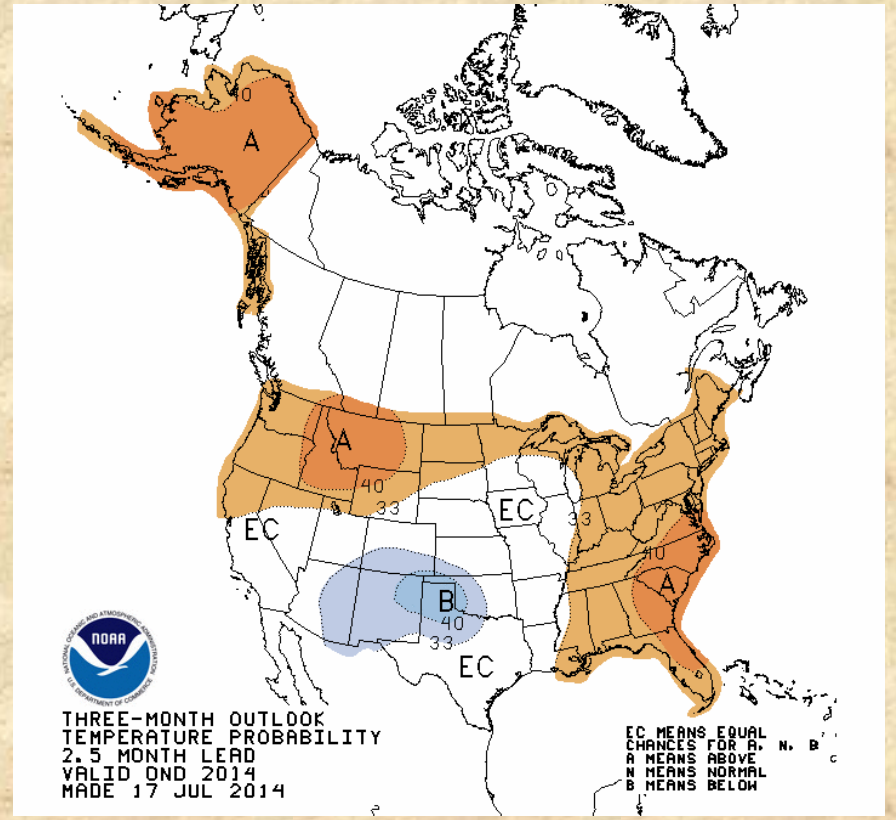


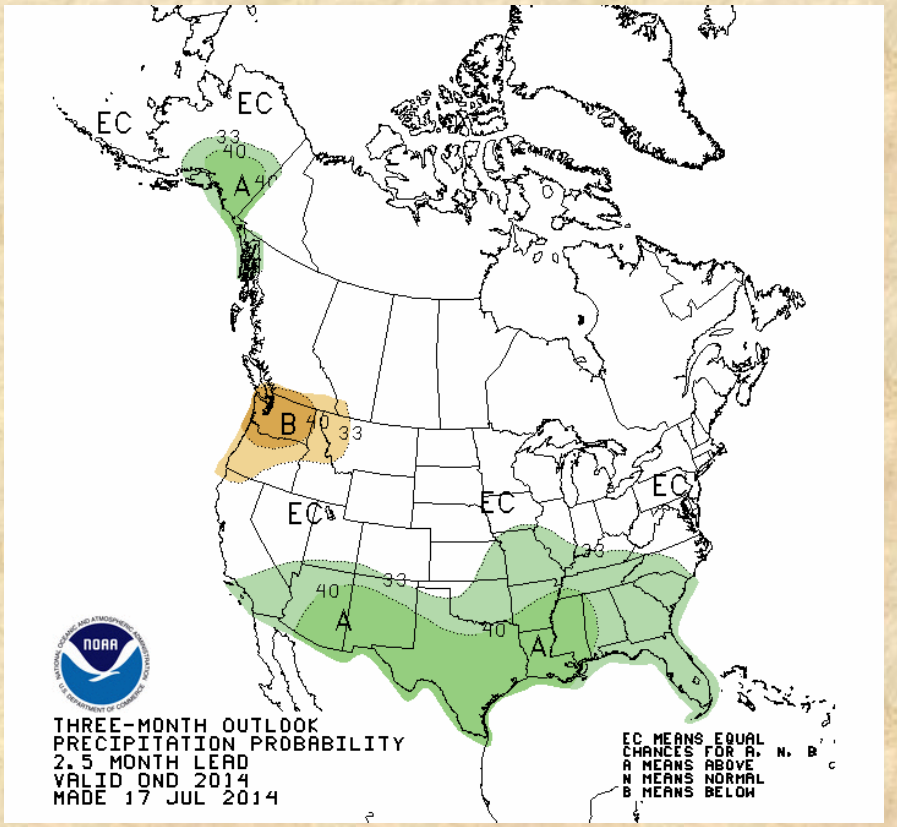


Colorado is not likely to be warmer-than-average in the next three months according to CPC (left). Their moisture forecast is wetter-than-average for much of the interior western U.S. ***This forecast was driven by their coupled forecast model (CFS).***

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

Climate Prediction Center Forecasts



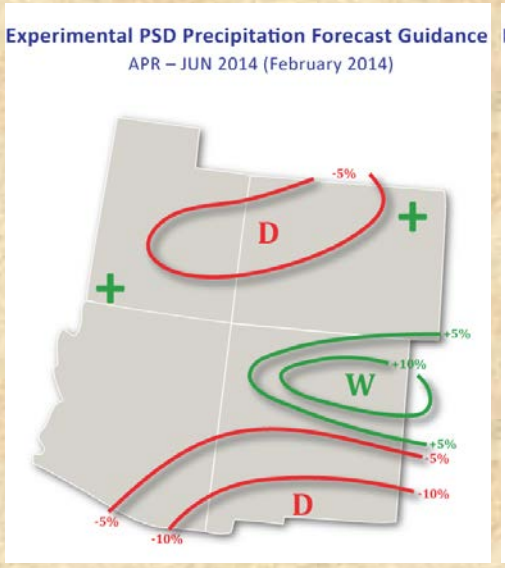


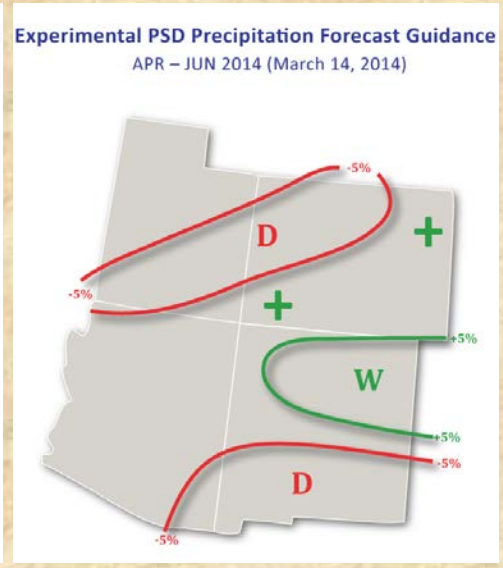
Colorado is not likely to be warmer-than-average this fall according to CPC (left). Their moisture forecast keeps the moisture to our south. This is mostly consistent with CPC's El Niño composites.

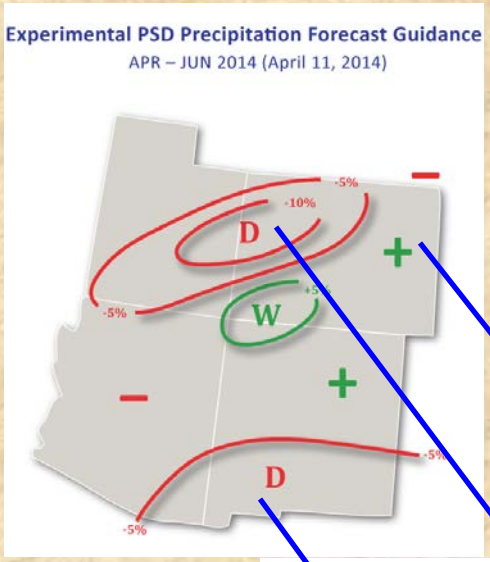
Source: ***http://www.cpc.ncep.noaa.gov/products/predictions/***

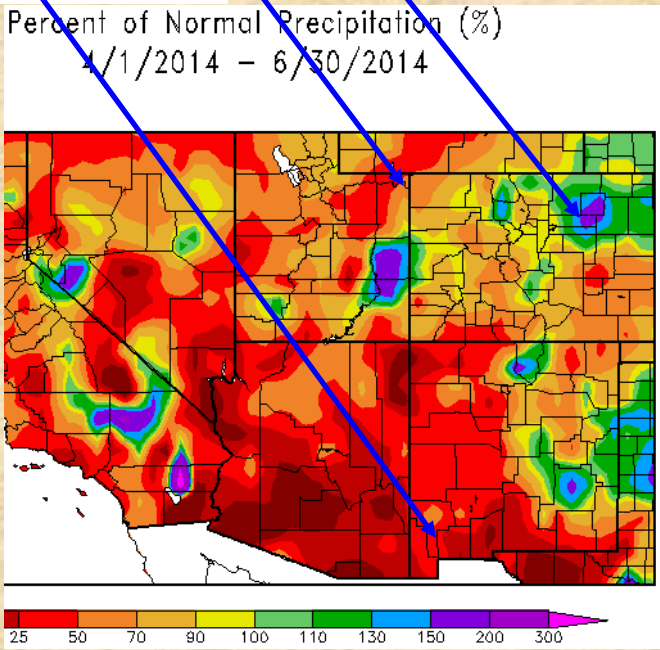
Statistical Forecast for April-June 2014

Postmortem







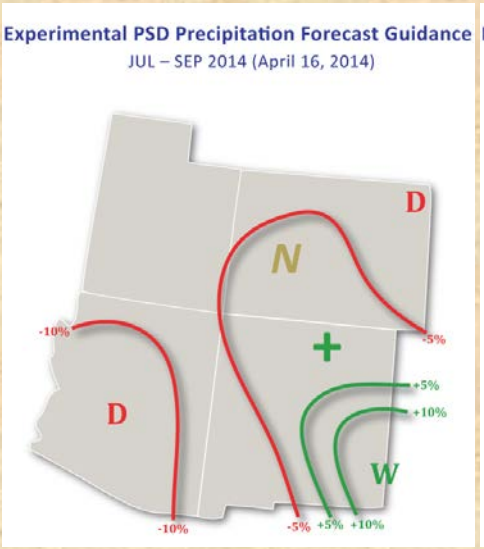


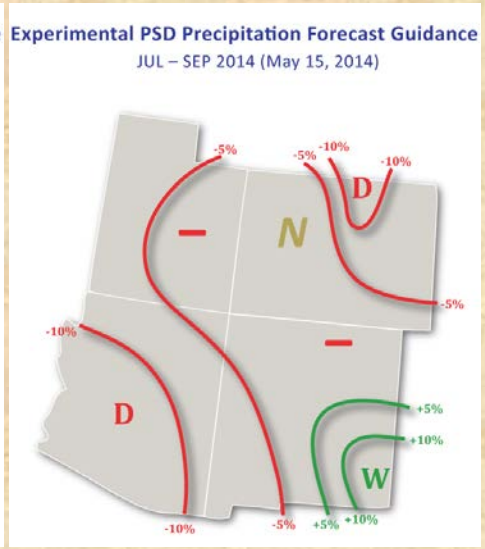
My forecasts for April-June 2014 from Feb' (left), Mar' (middle), and Apr' (top right) showed slightly increased chances for moisture in the southeastern half of CO, and less over much of the Upper Basin, but increasingly better news for the San Juans. ***Operational skill had been best over UT and CO.***

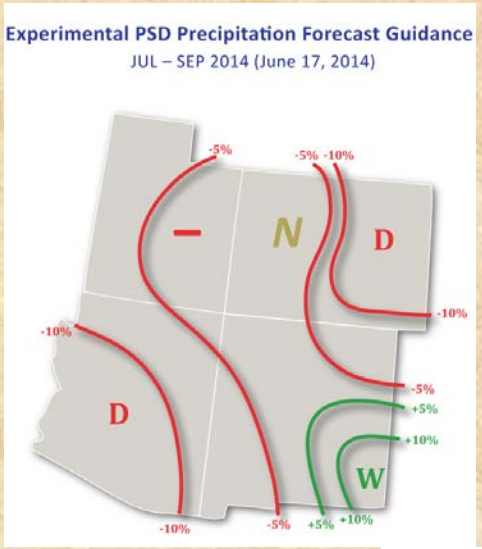
In the end, dry forecast regions verified better than the wetter ones, especially near the San Juans.

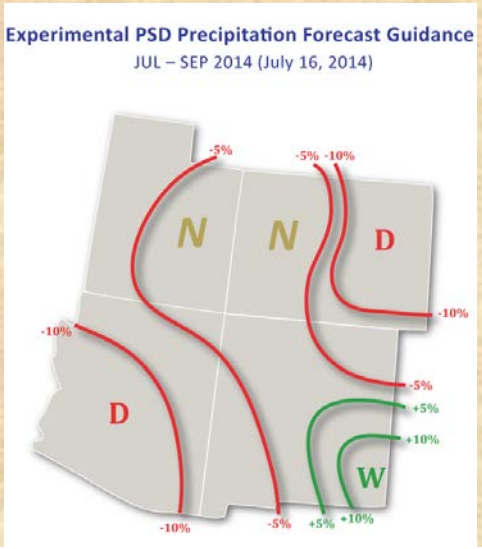
Statistical Forecast for July-September 2014

High month-to-month consistency!

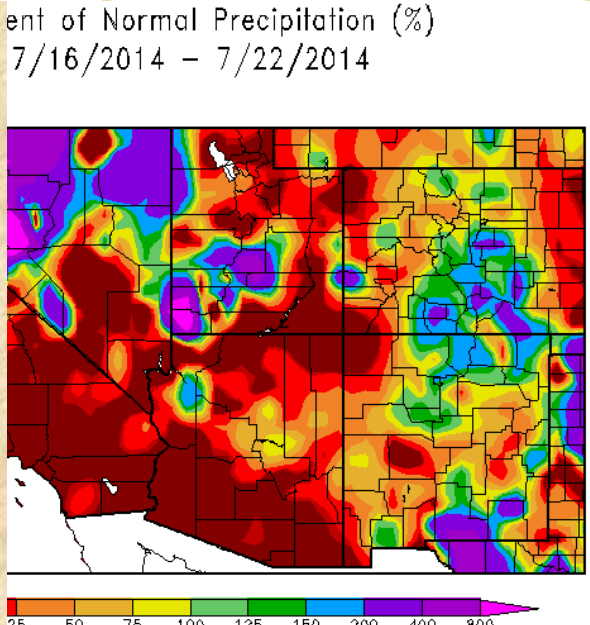








My 1st seasonal forecast for July-September 2014 (left) was dry for much of the interior southwestern U.S., driest over AZ where El Niño often results in dry conditions during the summer. The May update (2nd left) remained dry, including the CO Front Range in particular. The June update (2nd right) reinforced this bleak picture which is consistent with a 'weak El Niño' scenario. The final update (right) contributed only minor changes. ***After a wet start to July, the last week (bottom right) has gotten on track for mostly dry conditions...***



Executive Summary (23 July 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 struggling.** ***While the recent excursion of the Pacific Decadal Oscillation (PDO) into positive territory favors a wetter growing season, this appears to be counteracted by the weakness of the current El Niño.***

- **While the next two weeks look encouraging (seasonally wet), my statistical forecast for late summer (July-September) is on the dry side for eastern CO and near-normal west of the divide.** ***This is consistent with a weak El Niño which can be blamed on the lack of coupling over the equatorial Pacific since May. At this point only the CFS maintains a wet outlook for the rest of the summer.***

- **We have made it through the snowmelt season without major flooding, but the monsoonal peak is still ahead of us in the next 2-3 weeks, so there is still enhanced potential for flash-flooding, even with a weak El Niño. However, the seasonal forecast keeps it fairly dry, so that we might end up drawing down reservoirs at an above-average rate.** ***Looking beyond summer, our odds for above-average moisture should return by fall as the size of the El Niño becomes less important, although additional growth in that phenomenon would be more favorable.***