

# Drought and climate seasonal outlook

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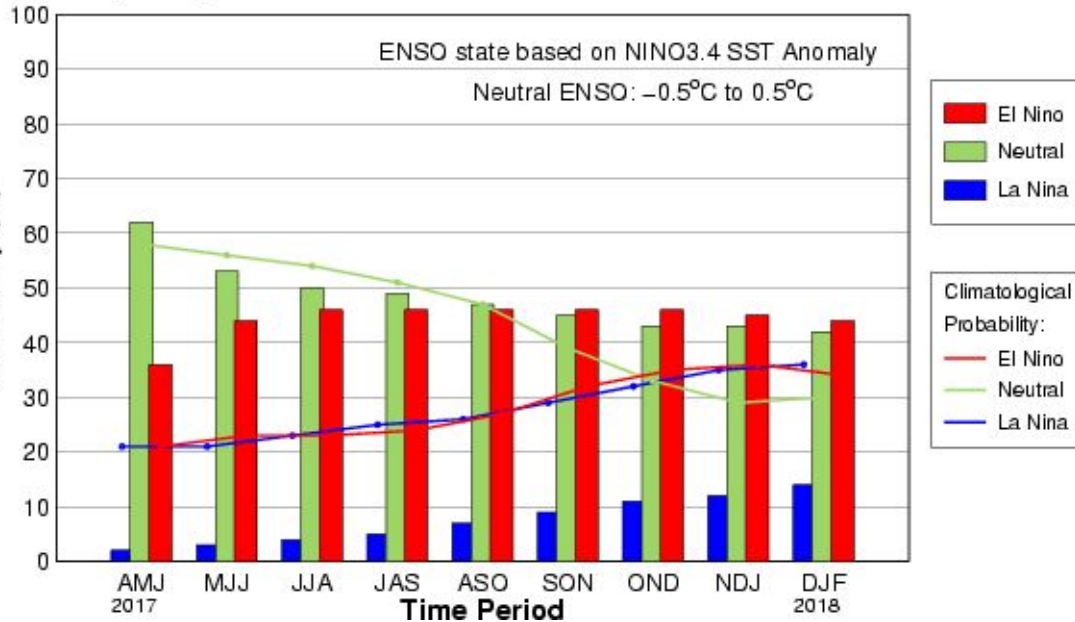
# Outline

- This presentation will include:
  - Current:
    - ENSO forecast
    - Temperature forecast
    - Hydrologic forecast
  - Methods and skill of the above forecasts and where to find them.

# ENSO forecast

# CPC/IRI ENSO forecasts (Early May 2017)

Early–May CPC/IRI Official Probabilistic ENSO Forecast



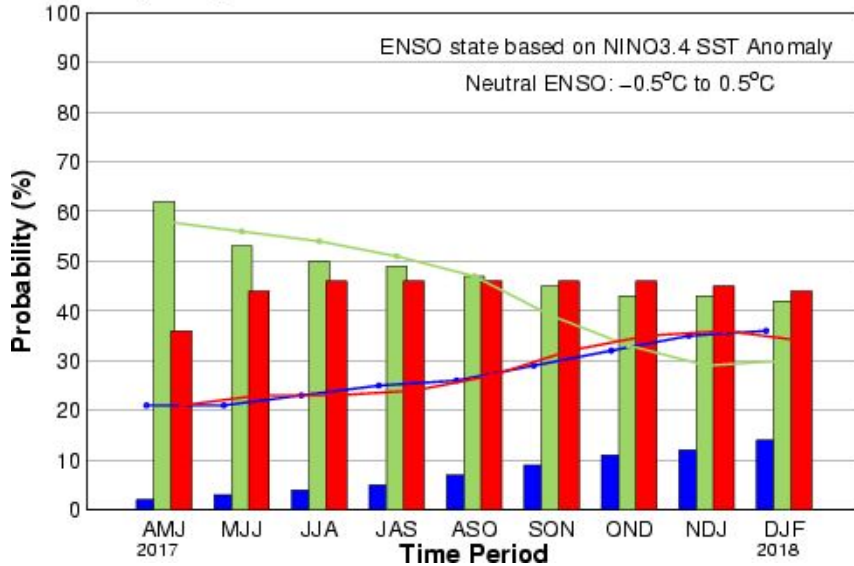
- Official ENSO forecasts.
- Released on the second thursday of the month.
- Uses dynamical and statistical models, and human judgement based on model biases.

Season	La Niña	Neutral	El Niño
<b>OND 2017</b>	11%	43%	46%
<b>NDJ 2017</b>	12%	43%	45%
<b>DJF 2018</b>	14%	42%	44%

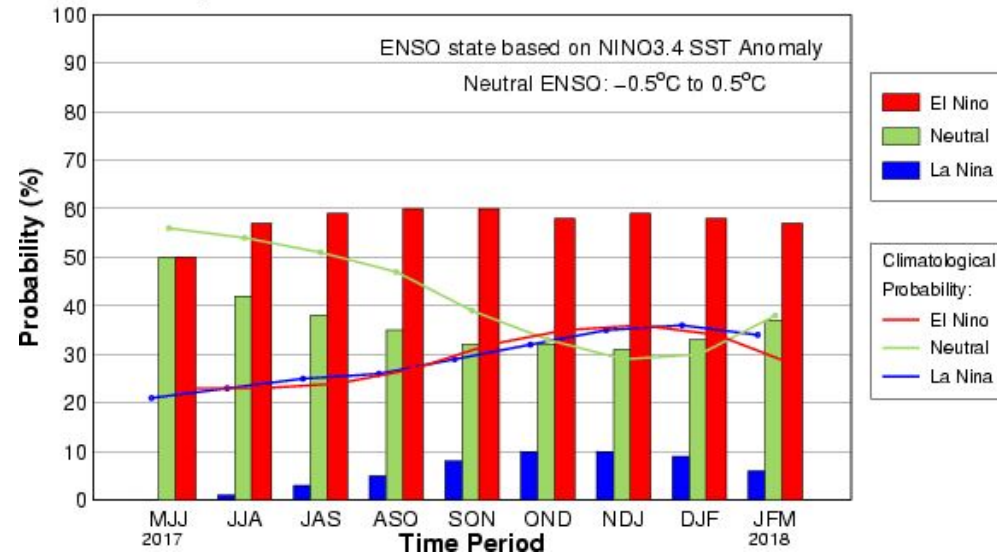
<http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/>

# Comparison of “Official” and objective ENSO forecast

Early–May CPC/IRI Official Probabilistic ENSO Forecast

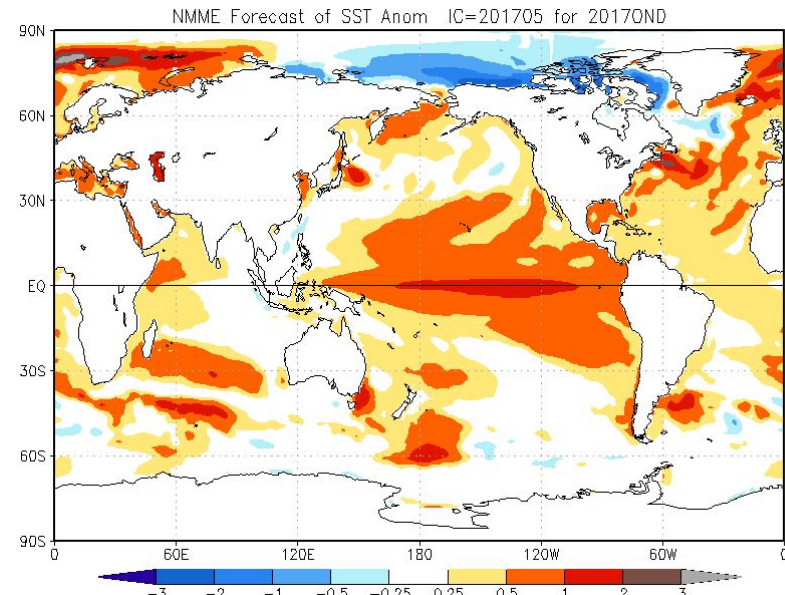
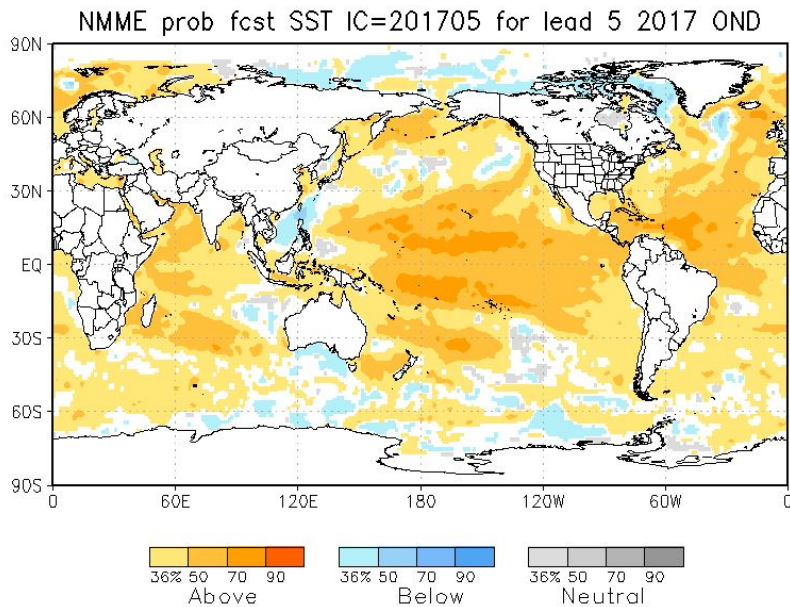


Mid–May IRI/CPC Model–Based Probabilistic ENSO Forecast



- Objective ENSO forecasts based solely on the dynamical and statistical models are released on the third Thursday of the month.
- Currently forecasting ~60% chances of El Niño in fall/winter.

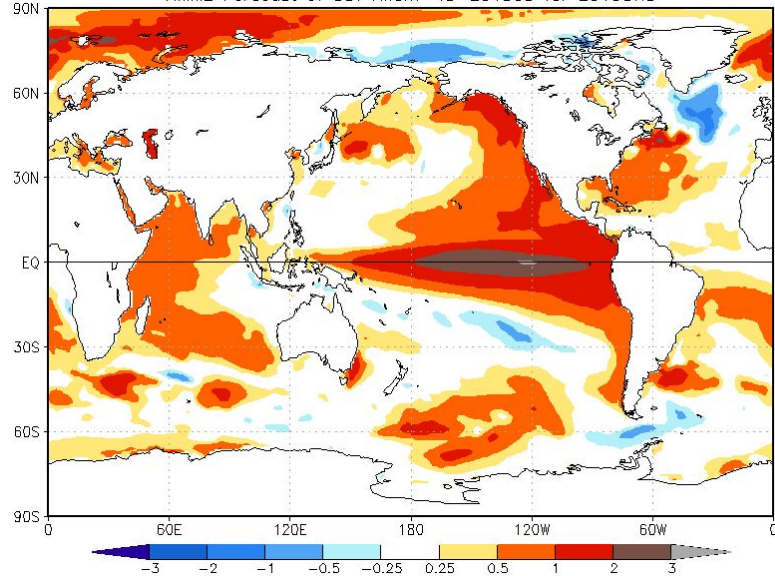
# North American Multimodel Ensemble (NMME) Sea Surface Temperature (SST) forecasts



# Comparison with SST forecasts made in May 2015

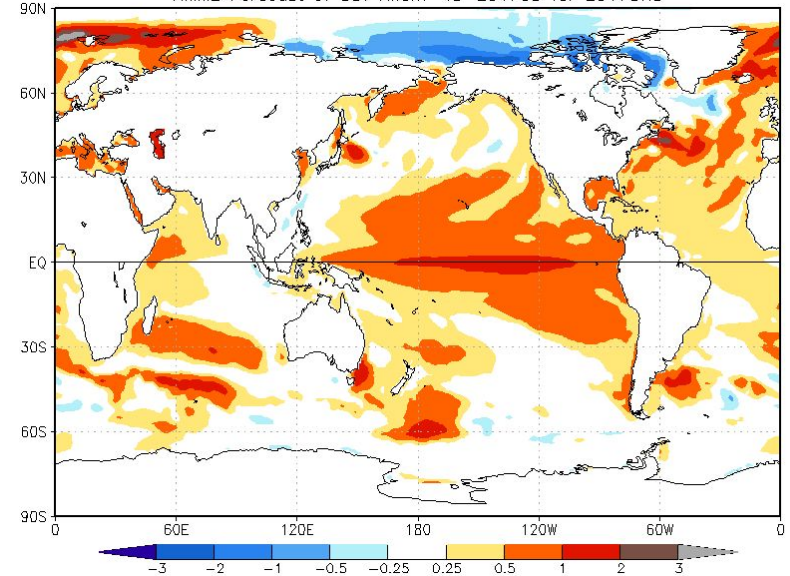
## OND 2015 forecast made in May 2015

NMME Forecast of SST Anom IC=201505 for 2015OND



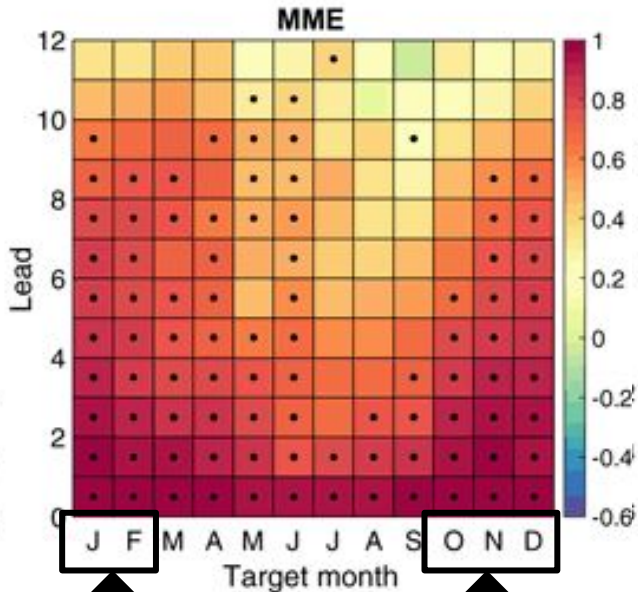
## OND 2017 forecast made in May 2017

NMME Forecast of SST Anom IC=201705 for 2017OND



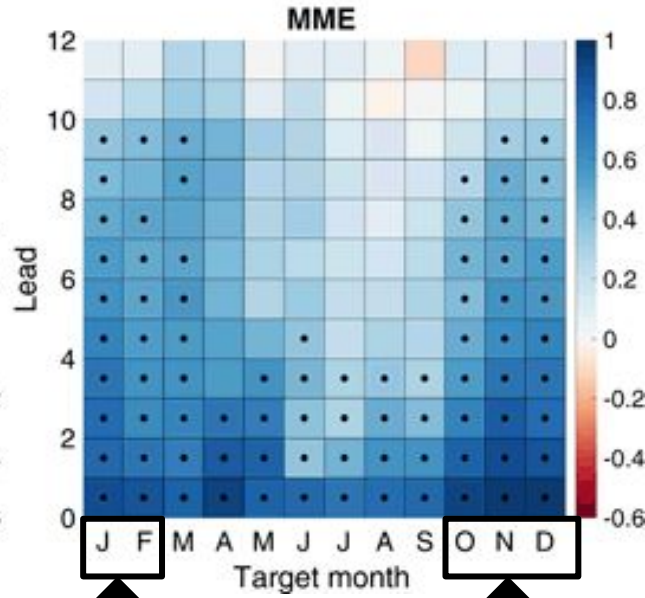
# NMME ENSO forecast skill

## Deterministic Skill



Barnston et al., 2017

## Probabilistic Skill



Tippet et al., 2017

- Skill of the multimodel ensemble (MME, all models taken together) is higher than any of the individual model.
- Both in terms of deterministic and probabilistic skill score ENSO forecast skill for fall/winter months is high and statistically significant for at least 6 months or so in advance.

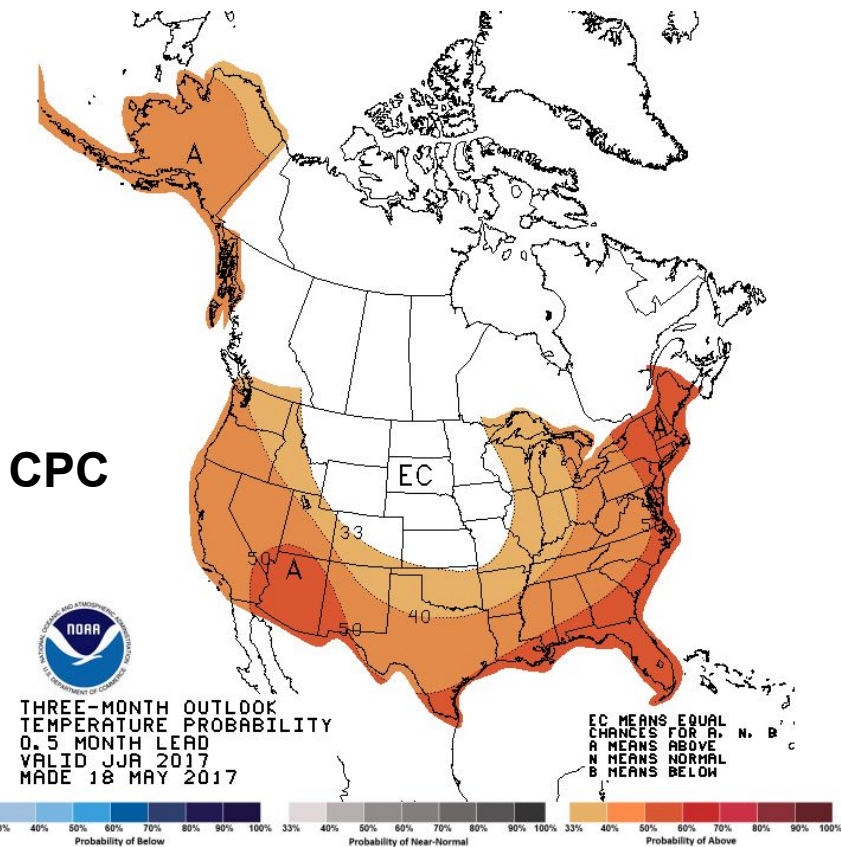


# **Temperature forecasts**

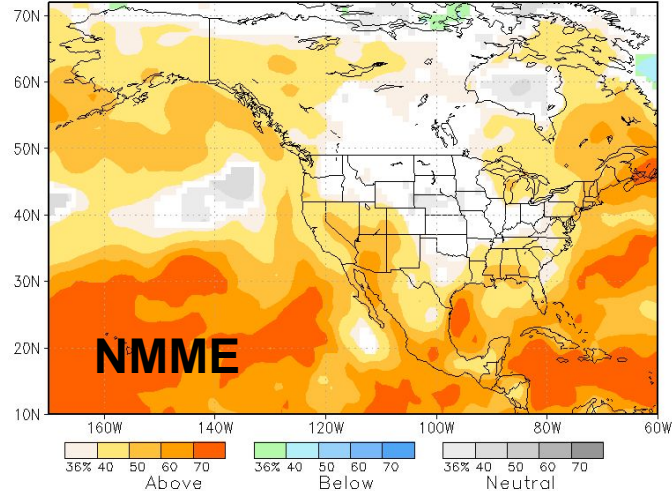
# JJA Temperature forecasts

<http://www.cpc.ncep.noaa.gov/products/predictions/90day/>

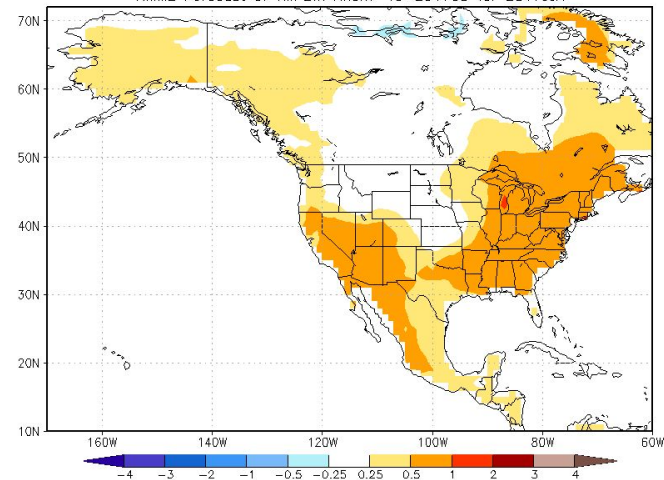
- Probability of above normal temperature in CA-NV is 40 to 50%.
- Expected anomaly of 0.5 to 1 deg.



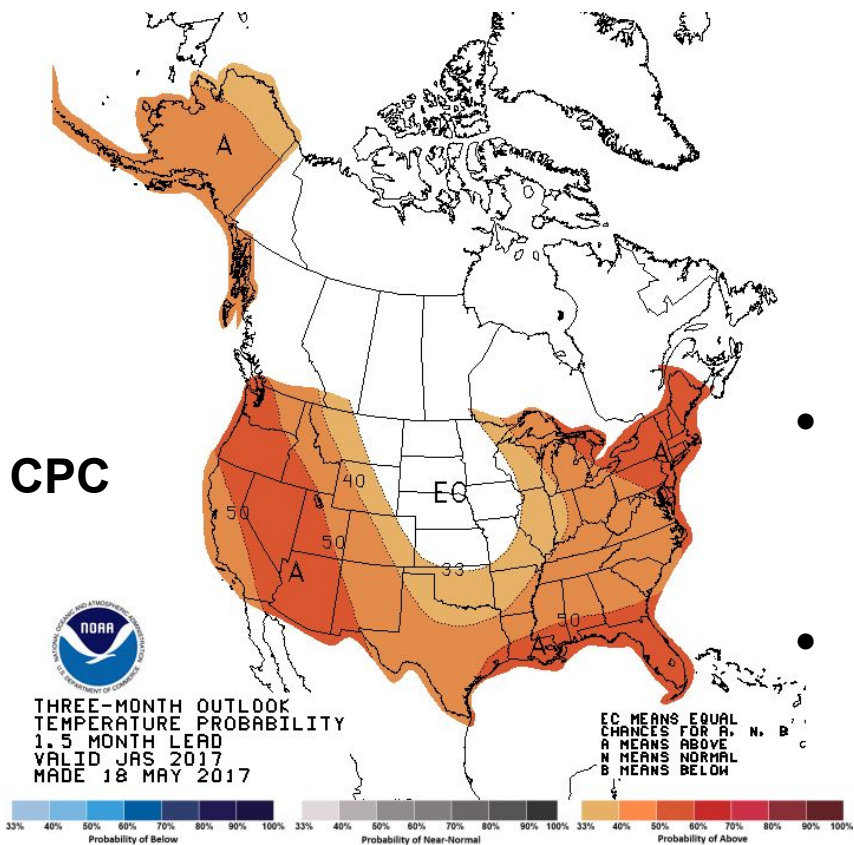
NMME prob fcst TMP2m IC=201705 for lead 1 2017 JJA



NMME Forecast of TMP2m Anom IC=201705 for 2017JJA

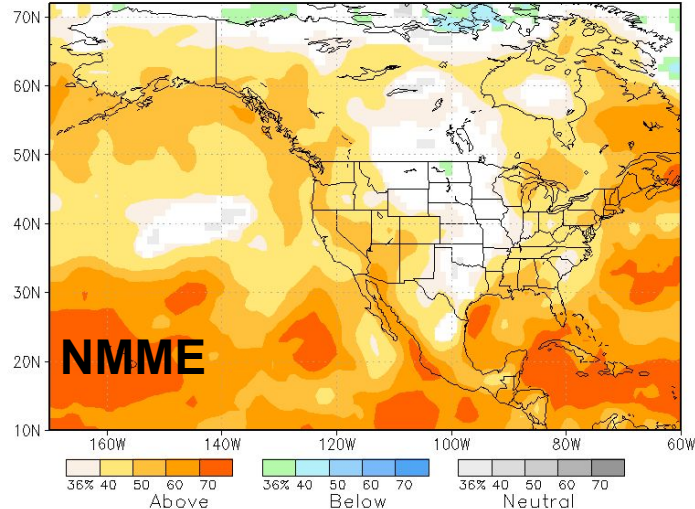


# JAS Temperature forecasts

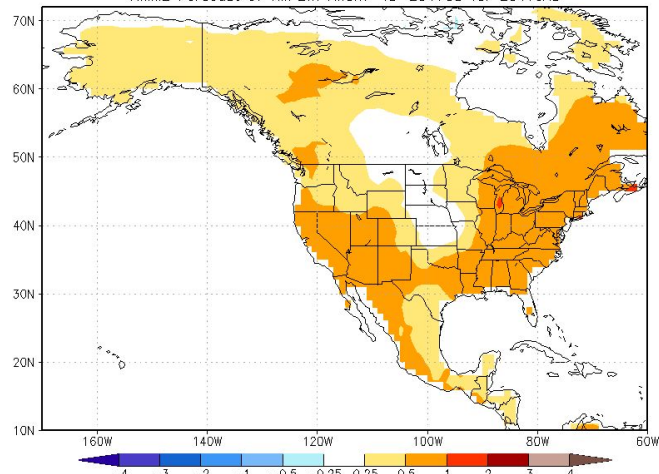


- Probability of above normal temperature in CA-NV is 40 to 60%.
- Expected anomaly of 0.5 to 1 deg.

NMME prob fcst TMP2m IC=201705 for lead 2 2017 JAS



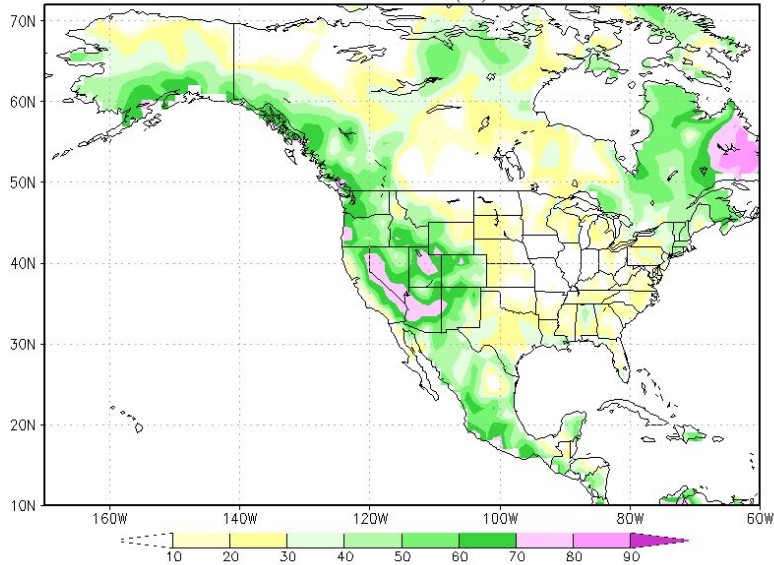
NMME Forecast of TMP2m Anom IC=201705 for 2017JAS



# Temperature forecast Skill

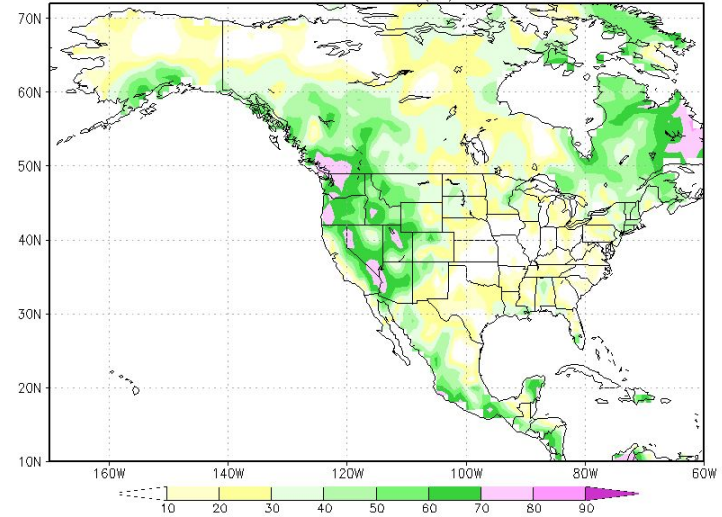
## JJA forecast skill

NMME Forecast of TMP2m Skill (AC) IC=05 for JJA



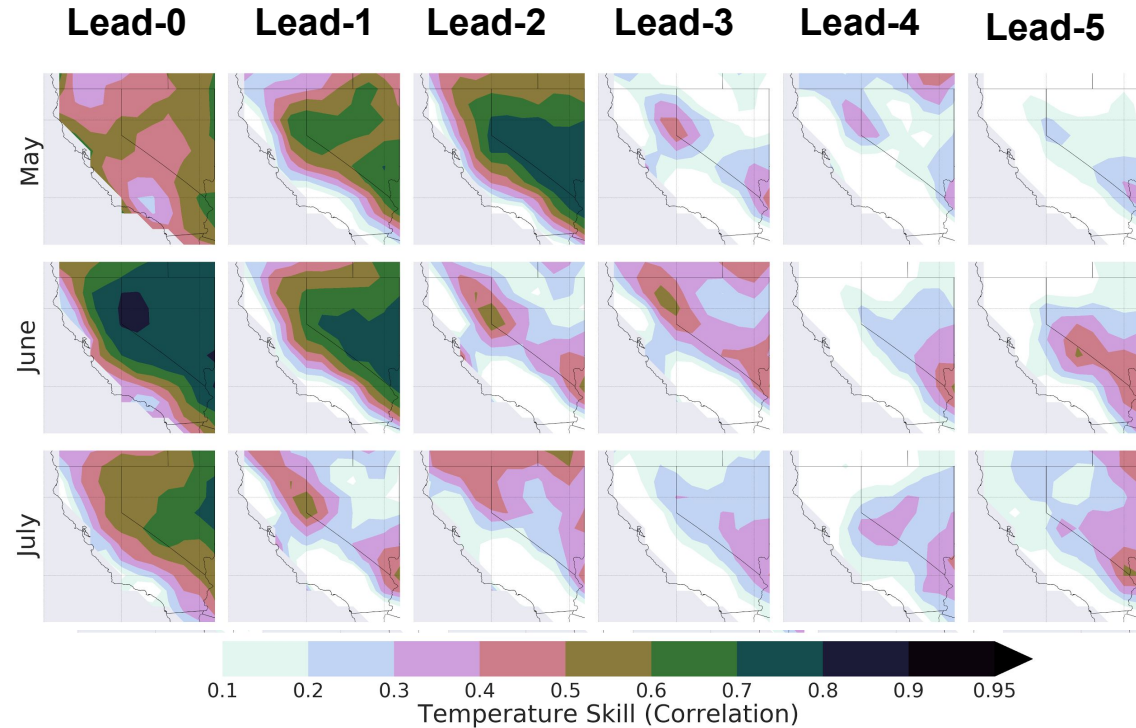
## JAS forecast skill

NMME Forecast of TMP2m Skill (AC) IC=05 for JAS



- Temperature forecasts are skillful for interior part of CA and NV region.

# NMME's Summer Temperature forecast skill



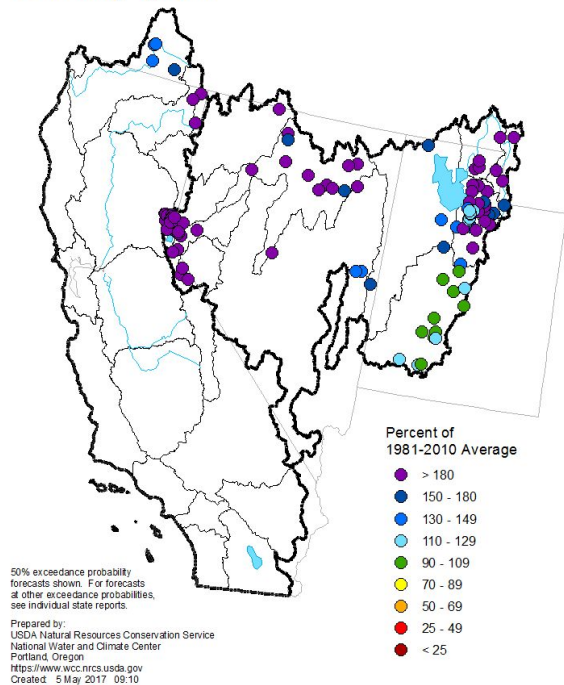
- Higher skill during the first 2 months.
- Temperature forecasts for June and July months seem to be most skillful consistently.

# Hydrologic forecasts

# Water supply outlook

<https://www.wcc.nrcs.usda.gov/gis/watersupply.html>

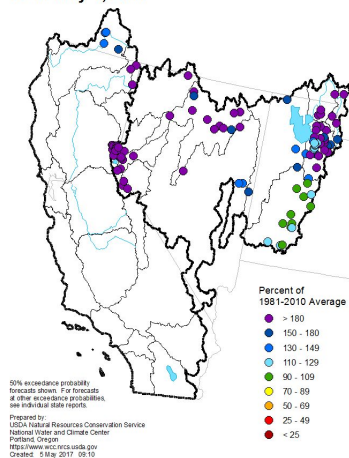
## Great Basin and California Spring and Summer Streamflow Forecasts as of May 1, 2017



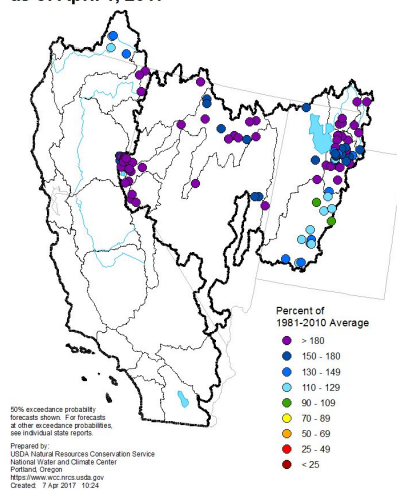
- Streamflow volume that will flow past a point on a stream during spring and summer.
- Based on statistical models using predictor variables such as observed SWE (and precipitation, antecedent streamflow etc.)
- There is a 50% chance that the actual streamflow volume will exceed this forecast value and a 50% chance that it will be less than this forecast value.
- Most of the Great basin and CA streams are expected to have much above normal streamflow volume.

# Change in water supply outlook

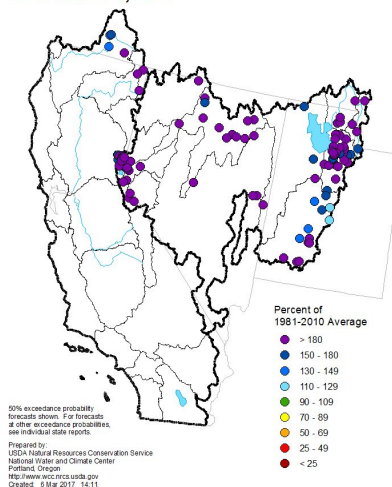
Great Basin and California  
Spring and Summer Streamflow Forecasts  
as of May 1, 2017



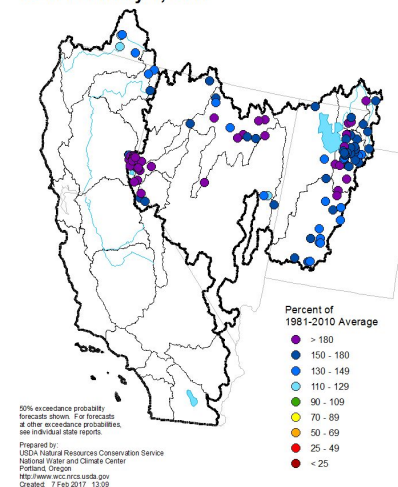
Great Basin and California  
Spring and Summer Streamflow Forecasts  
as of April 1, 2017



Great Basin and California  
Spring and Summer Streamflow Forecasts  
as of March 1, 2017



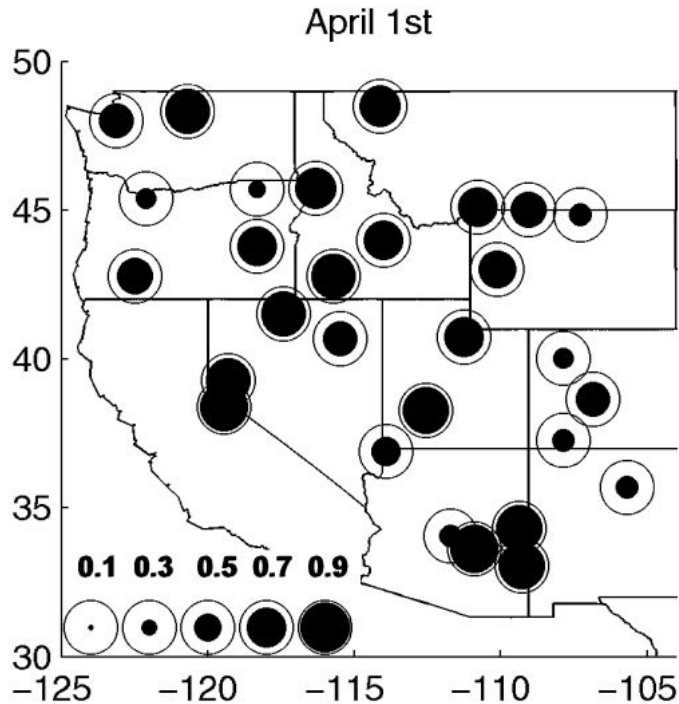
Great Basin and California  
Spring and Summer Streamflow Forecasts  
as of February 1, 2017



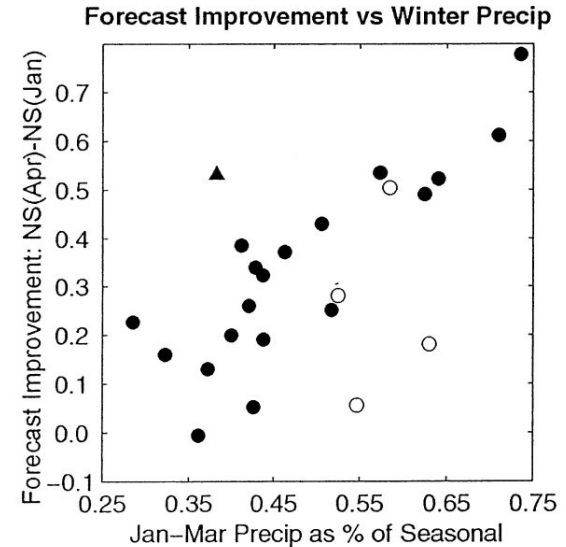
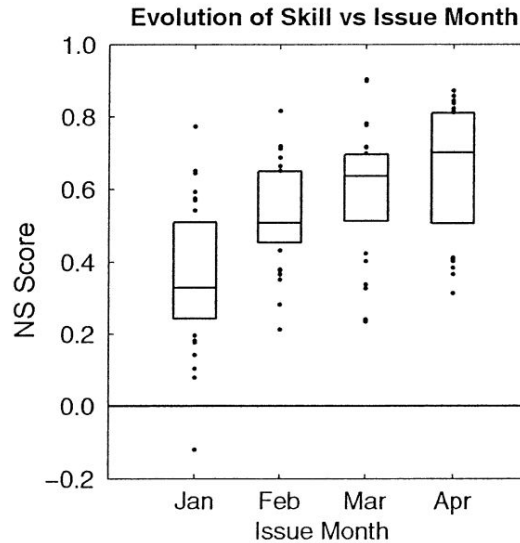
- Forecast for above normal streamflow volume has persisted since February.



# Skill of water supply outlook



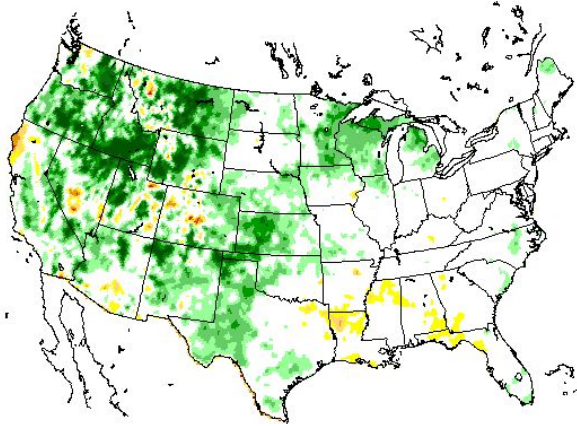
Pagano et al., 2004



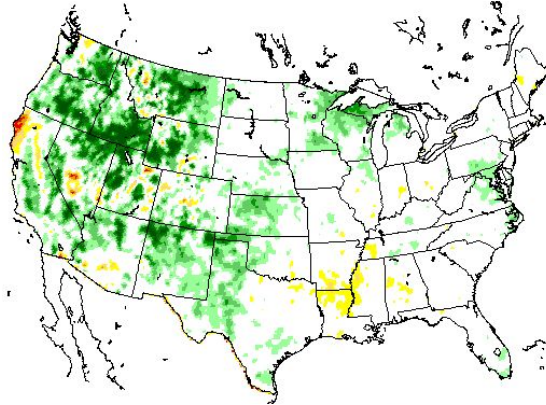
- Skill of water supply outlook is high (correlation  $> 0.7$ ) for snow dominated basins.
- The uncertainty in forecasts is greater for basins that receive monsoon rainfall in summer.

# Soil Moisture forecasts

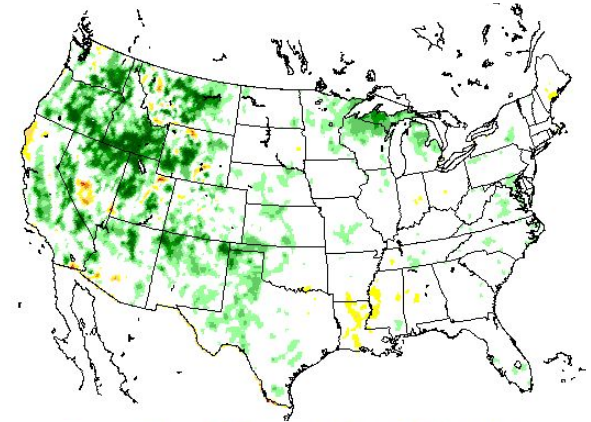
June-2017



July-2017



August-2017



Percentiles of Forecast Total Soil Moisture



Tue May 9 10:44:45 EDT 2017

- Forecast generated in May 2017.
- Forecast is dynamical in nature. Generated by forcing a hydrologic model (VIC) with CFSv2 seasonal climate forecasts followed by post-processing for bias-correction.

# Summary

- Official ENSO forecasts is ENSO neutral state (objective ENSO forecasts indicate higher chances for El Nino development this fall/winter.)
- Historically NMME ENSO forecasts have been most skillful for fall and winter target months upto 6 months in advance.
- Above normal temperature is likely for CA and NV during JJA and JAS. Historically NMME temperature forecasts is skillful for the above season mainly in interior parts of CA-NV region.
- Above normal (>130%) water supply outlook is expected. Historically skillful over CA and GB.

# Forecast sources:

**ENSO Forecast:** <http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/>

**CPC Outlook:** <http://www.cpc.ncep.noaa.gov/products/predictions/90day/>

**NMME Forecast:** <http://www.cpc.ncep.noaa.gov/products/NMME/>

**Water Supply Outlook:** <https://www.wcc.nrcs.usda.gov/gis/watersupply.html>

**Hydrologic forecasts:** <http://www.emc.ncep.noaa.gov/mmb/nldas/forecast/TSM/perc/>