Improving Drought Forecasts: The Next Generation of Seasonal Outlooks

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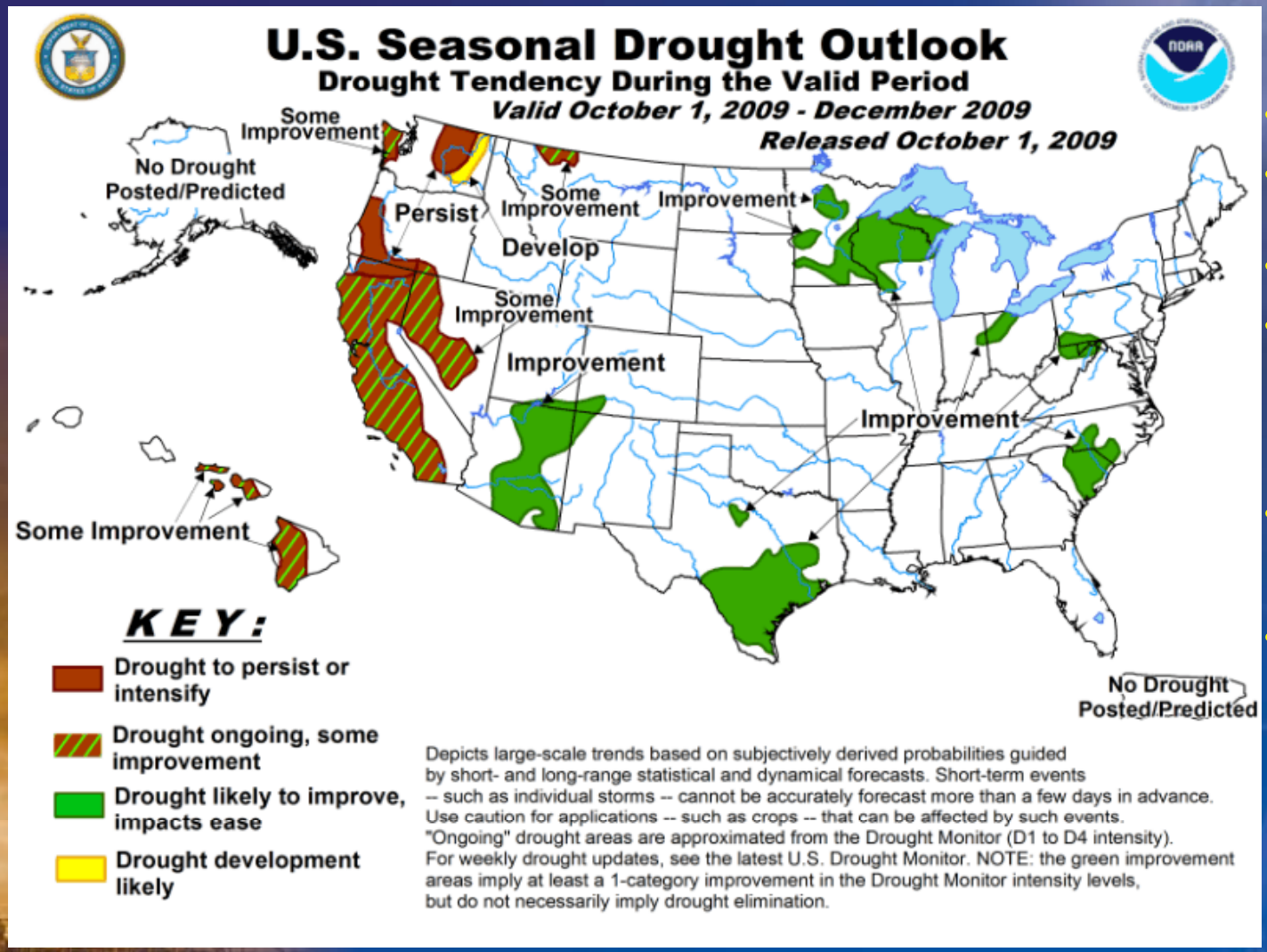
Outline

- Review of how the current Drought Outlooks are made
- Sample experimental products
- Goals of the next-generation drought outlooks
- Partners
- Next steps

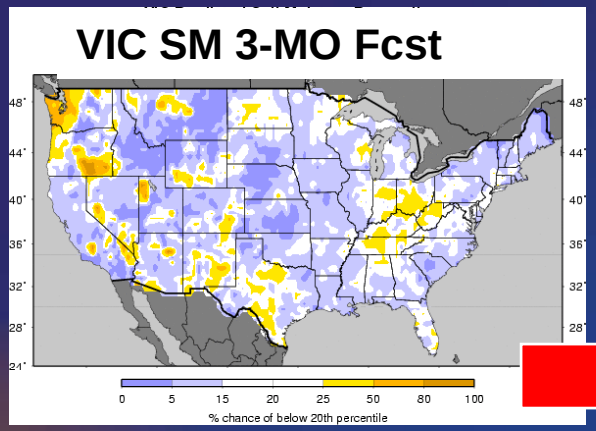
Inside Track on Drought Forecast

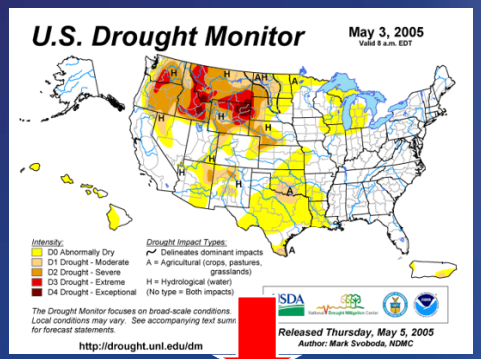
Putting Together the U.S. Seasonal Drought Outlook

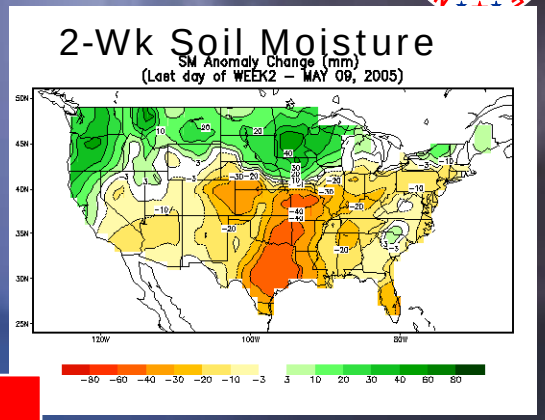


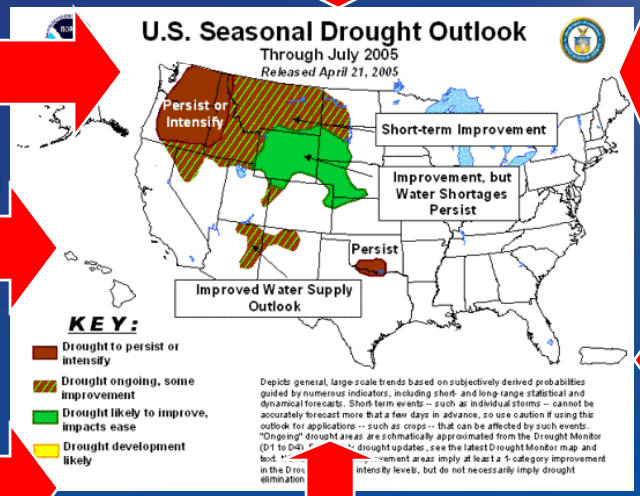
- A CPC product
- Operational since March 2000
- Released 2/month
- Subjectively blends temp/prcp/soil moisture forecasts from short term to seasonal
- Verification based on category changes in the USDM
- Current format O.K . for general trends, but too vague for use by water managers and ag community

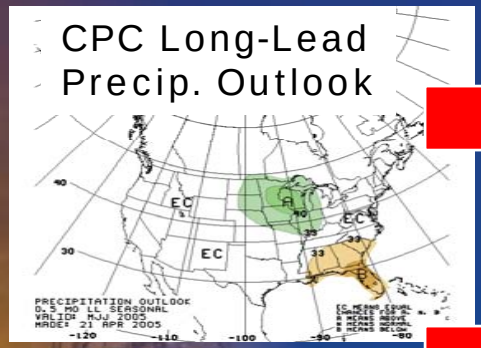
Principal Drought Outlook Inputs

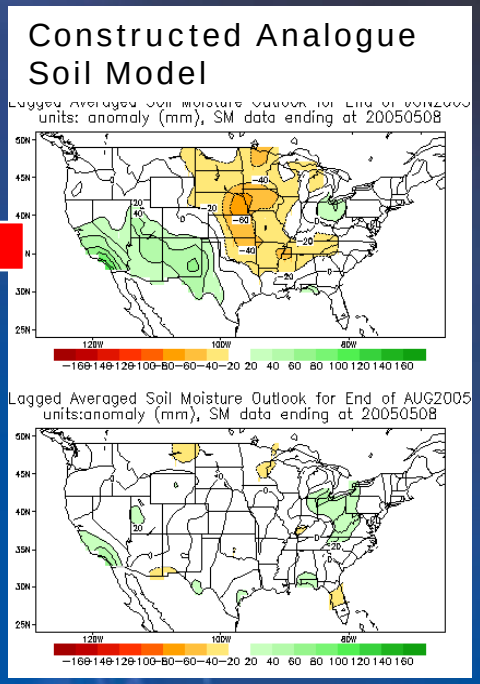


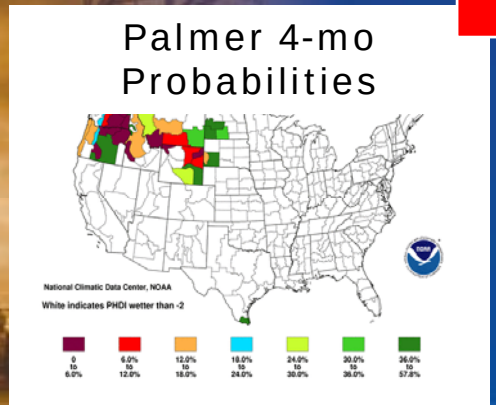


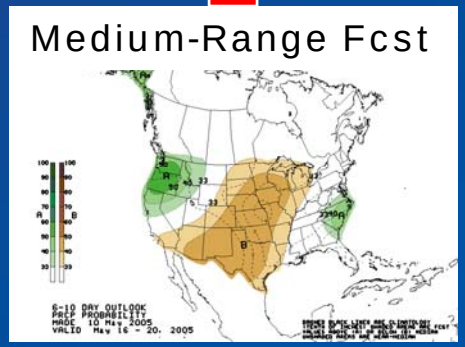




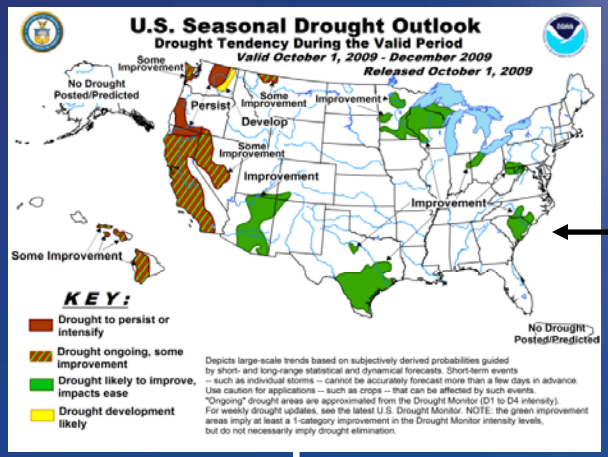








Short and Long-term Forecast Contributions



Climatology

Wet time of the year? Dry season?

Start with latest U.S. Drought Monitor D1 areas

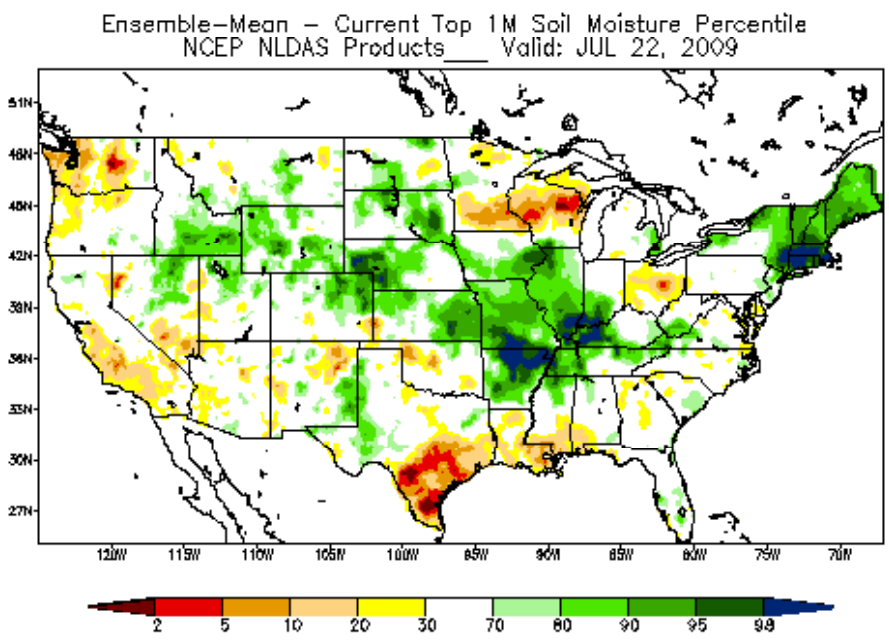
2-week Soil Moisture Forecasts

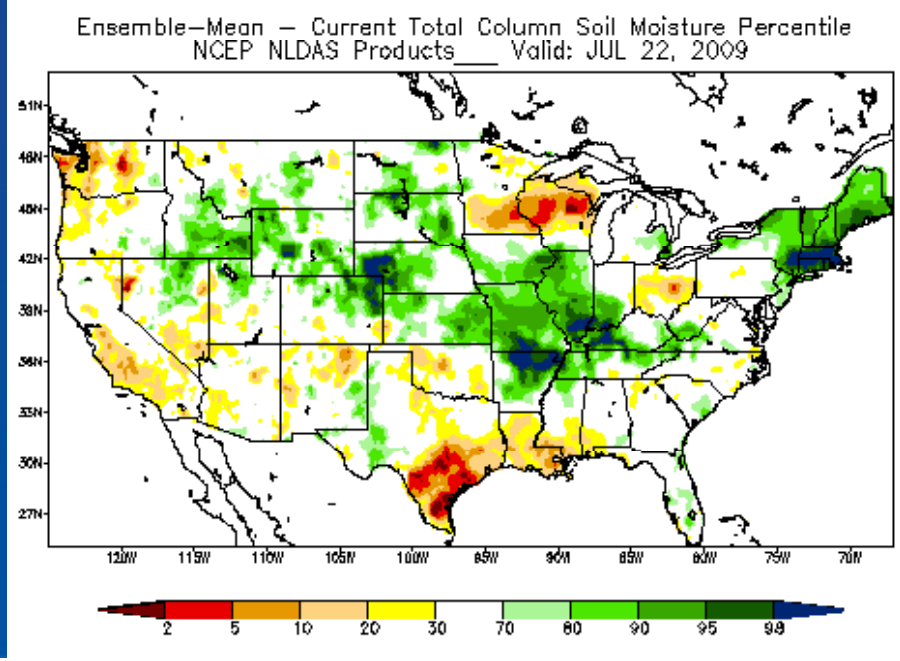
3-month Precipitation and Temperature Outlooks

Multimodel LDAS—A Candidate for Objective Drought Monitor

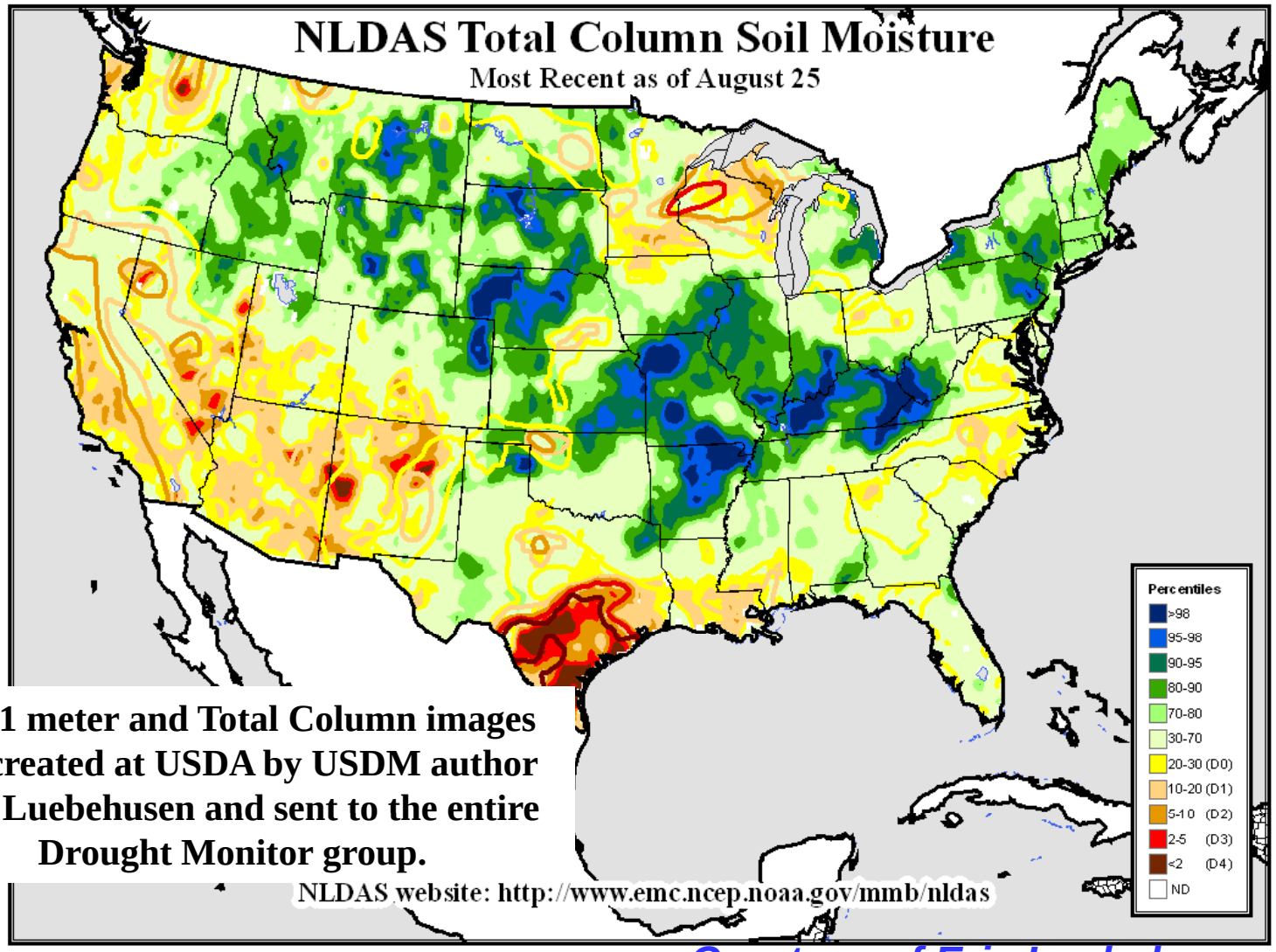
http://www.emc.ncep.noaa.gov/mmb/nldas/drought/

Initial conditions for the forecasts: 1-meter LDAS (left) is a candidate for baseline agricultural drought depiction. Total column (2-meter) is a candidate for general drought. EMC recently began to smooth the depictions to make them less “noisy.”





NLDAS Soil Moisture and GIS = Winning Combo for USDM

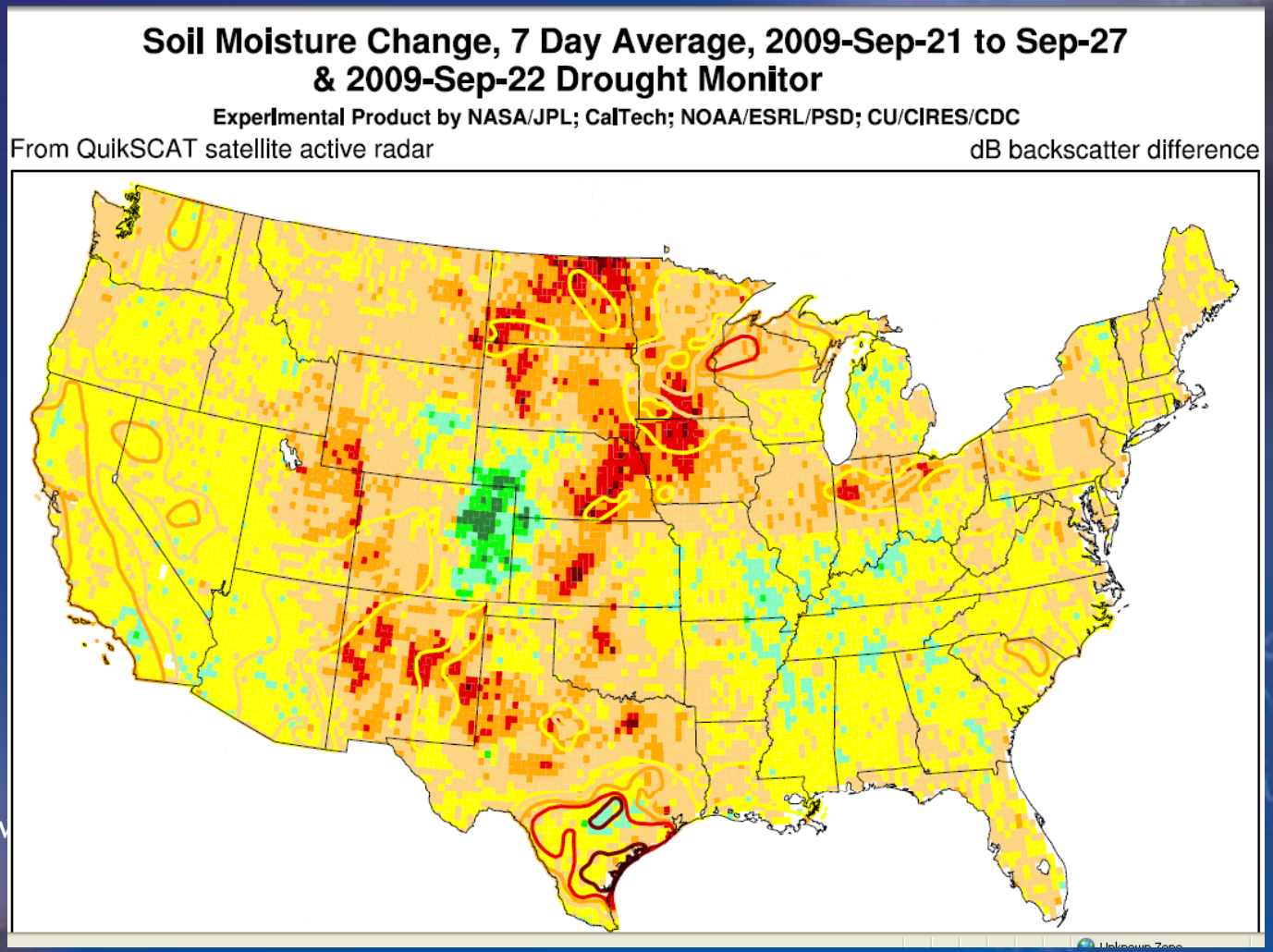


Top 1 meter and Total Column images are created at USDA by USDM author Eric Luebehusen and sent to the entire Drought Monitor group.

Courtesy of Eric Luebehusen

Recent Trends

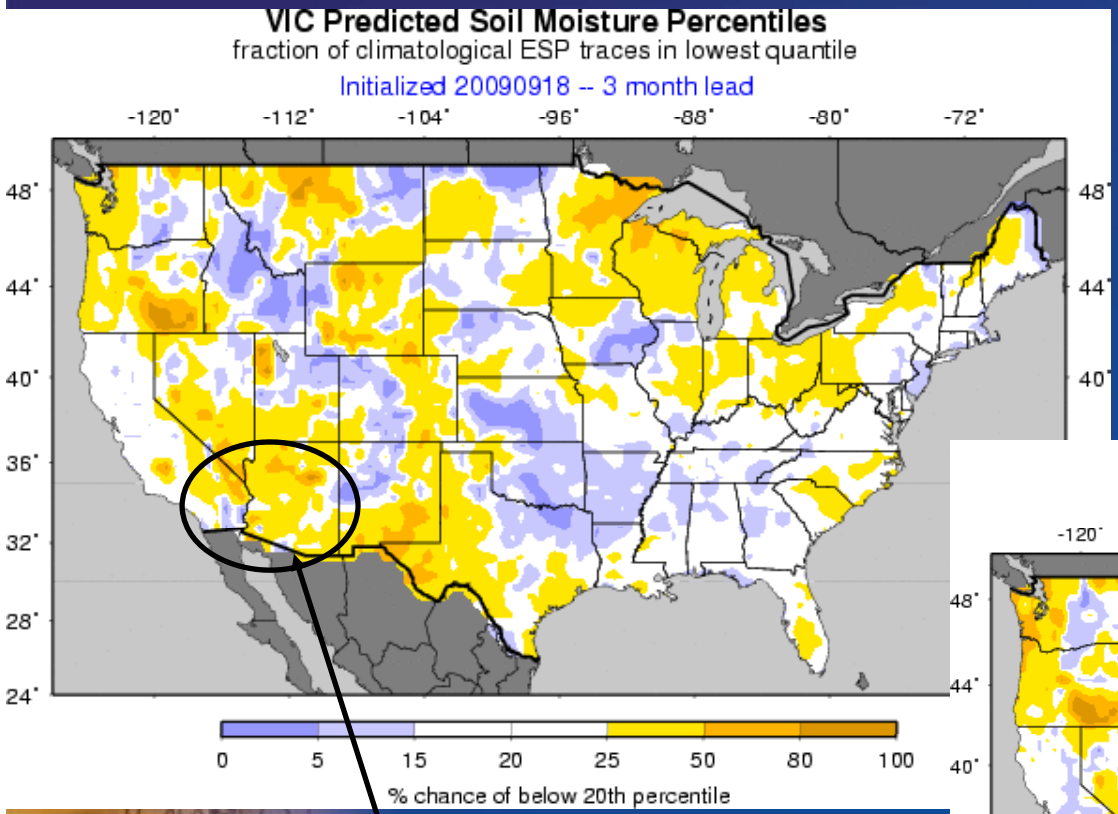
Forecasters need to be aware of recent moisture trends



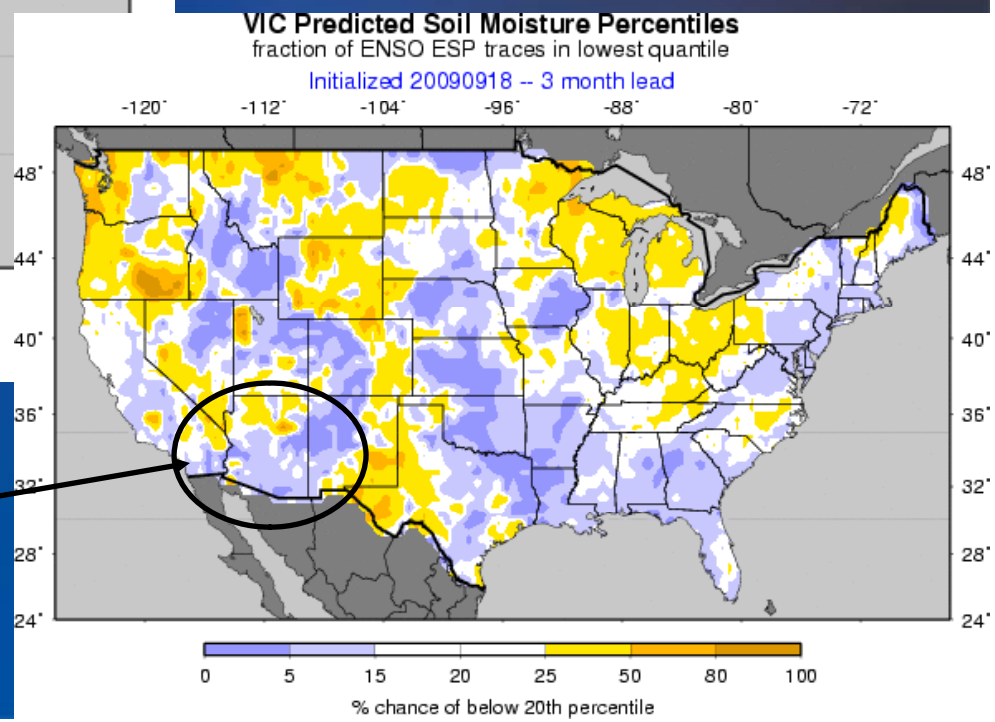
http://ww

University of Washington

3-month Soil Moisture Forecast All Years



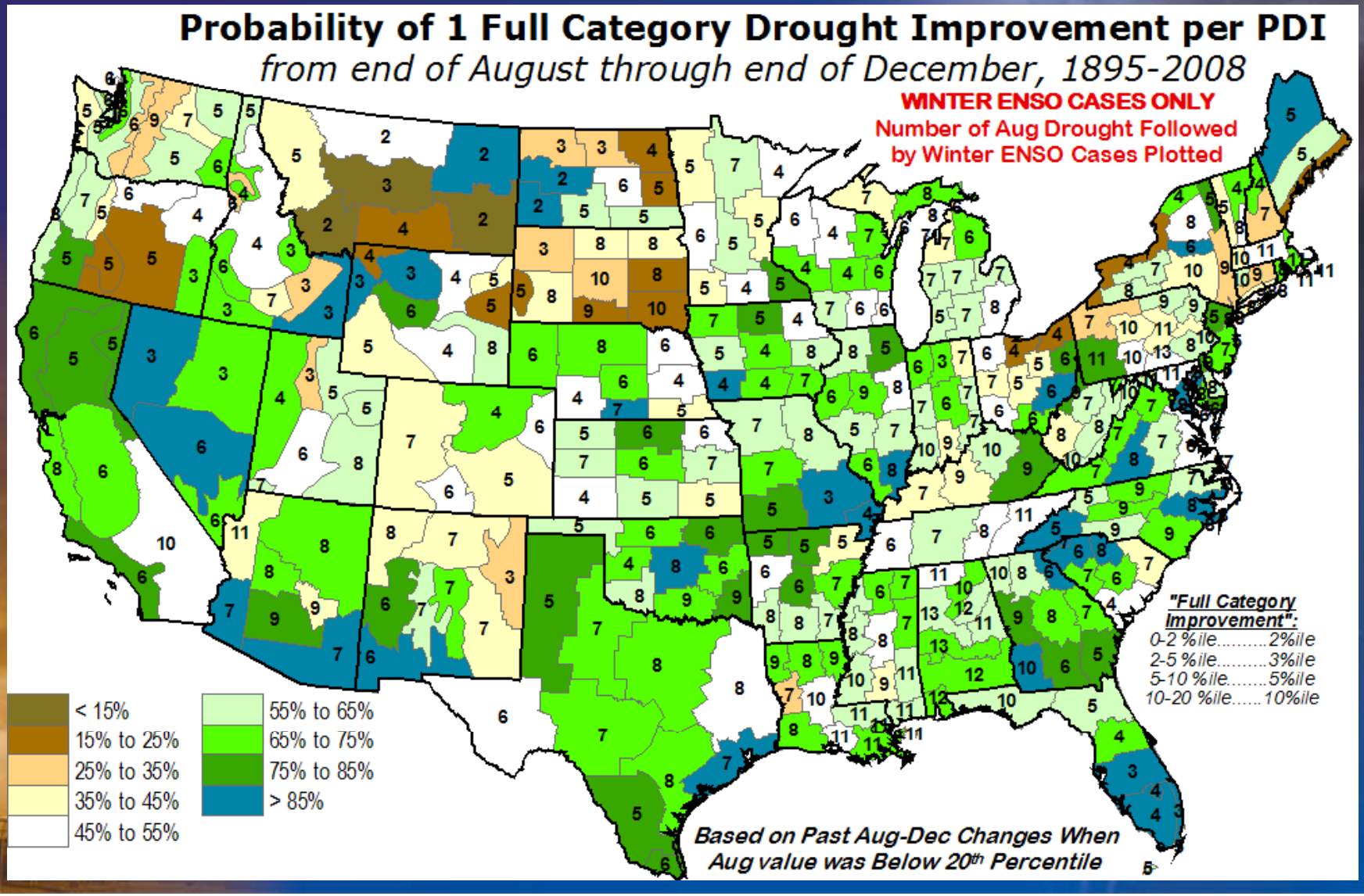
Forecast Soil Moisture El Nino Years



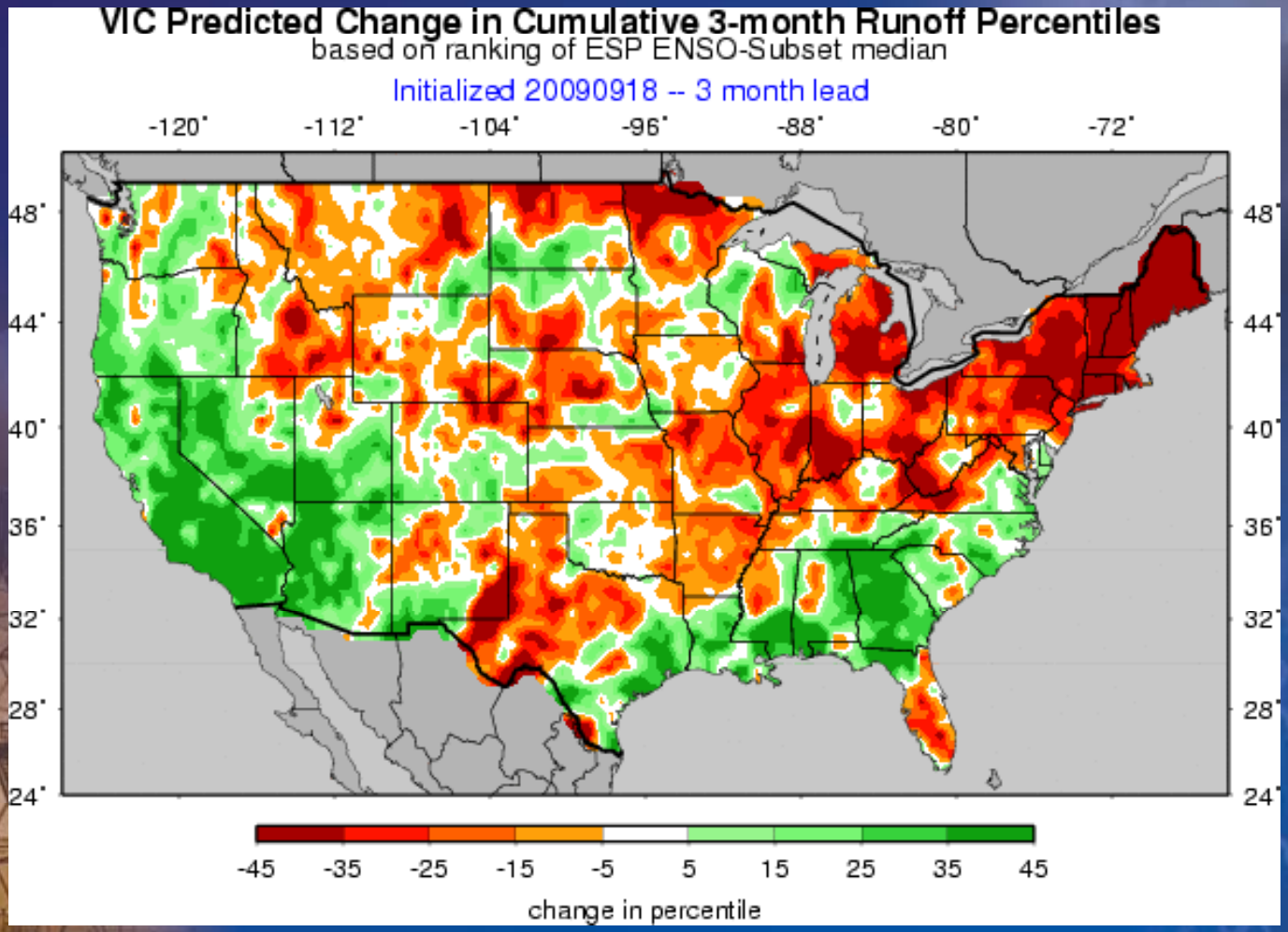
El Nino reduces drought odds

Innovative Use of Historical PDI Data

Created by Rich Tinker, CPC

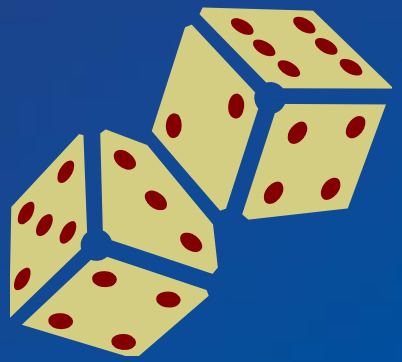


Recent Addition to U of WA Forecast Suite:
Forecast Change Maps



The Next Generation Forecasts

Goal: Forecast drought probabilities to better manage drought risk



What Drought Forecasts Need

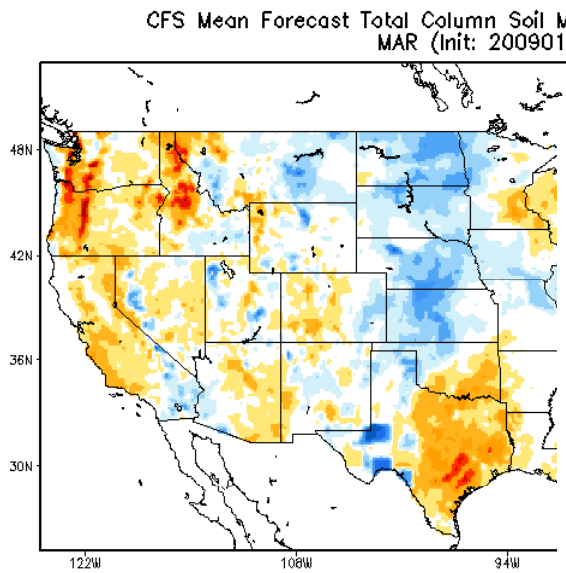
- **Accurate assessment of <u>initial moisture</u> conditions and recent trends**
- **Consideration of <u>agriculture</u> and <u>hydrology</u> (short-term and long-term drought)**
- **Incorporation of a "Seamless Suite of Forecasts" (short term and seasonal temperature/precip)**
- **Confidence levels (probabilities) of where and when drought will occur**
- **Monthly and seasonal forecasts**

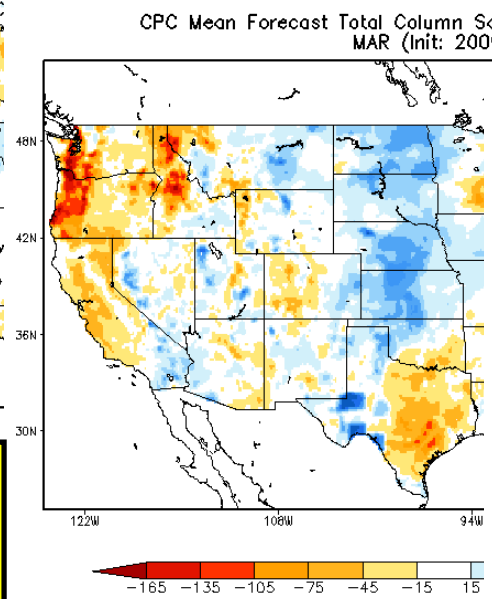
Sample Soil Moisture Anomaly Forecasts

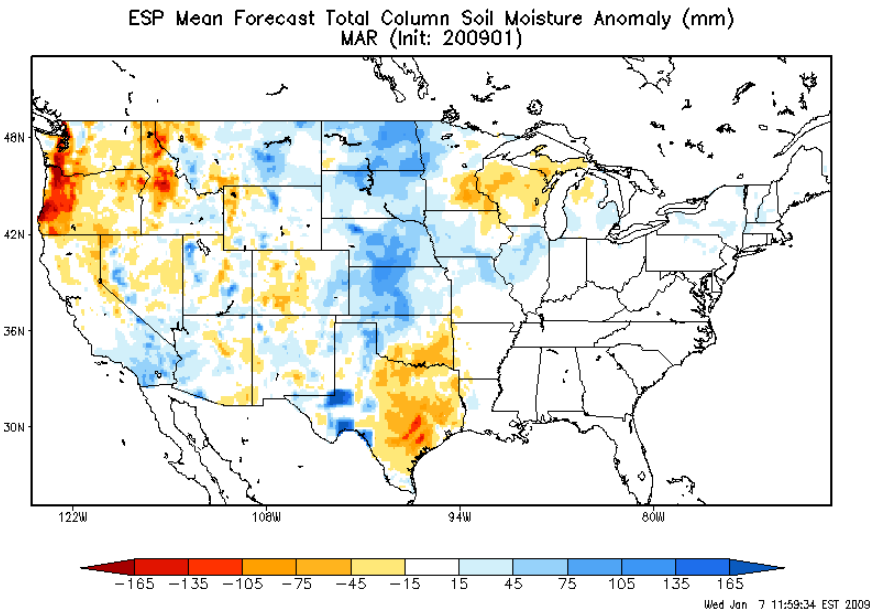
Princeton-EMC Downscaling of the CFS

Downscaling of CPC fcst

Downscaling of ESP







NLDAS forecasts are a good start. The various forecast techniques must be verified.

Next Up:

- Resolve differences in NLDAS models (U of WA vs EMC)
- Incorporate short-term QPF in the seasonal forecasts
- Decide metrics for agriculture and hydrology
- Apply best seasonal forecast methodology
- Create probabilistic change maps
- Adjust dates of NLDAS forecasts to conform with the CPC forecast schedule

Major Players: Development Stage

Climate Test Bed Research

CPC Research (KM, HV, etc)

EMC Land-Hydrology Team (Produce prototype forecasts)

CPC Drought Outlook Team (provides guidance on operational products)

- o Princeton Land Sfc Hydro Grp
- o NWS Office of Hydro Develop.
- o U. of WA Land Sfc Hydro Res.
- o RFCs (contribute methodology)

NCEP/NLDAS Drought

http://www.emc.ncep.noaa.gov/mmb/nldas

Realtime Monitoring

Seasonal Drought Prediction

Drought Products

Agricultural Drought 1
Top 1m soil moisture anomaly and percentile

Agriculture Drought 2
Top 2m soil moisture anomaly and percentile

Hydrology Drought
Total runoff and streamflow anomaly and percentile

NIDIS Drought Portal
http://www.drought.gov/

Public Users

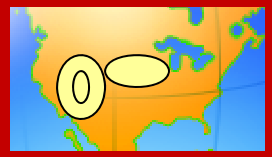
Slide from EMC

NIDIS – National Integrated Drought Information System

Proposed Suite of Probabilistic Seasonal Drought Forecasts

Total Column 2-m Soil Moisture

Probability of Drought



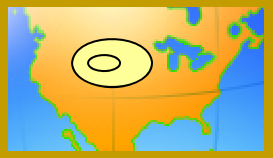
Change in soil moisture percentiles

Change Map

Total Drought

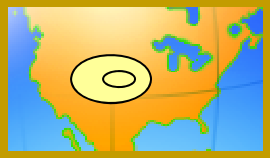
Top 40 cm or root zone soil moisture

Probability of Ag. Drought



Change in soil moisture percentiles

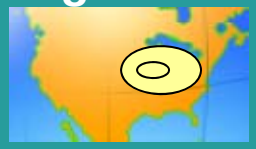
Change Map



Agricultural (Short-term) Drought

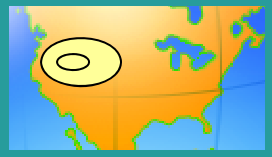
Probability of Runoff or Streamflows

Probability of Hydro Drought



Change in runoff or streamflow percentiles

Change Map



Hydro (Long-term) Drought

One day, a company's future will ride on *your* forecast.