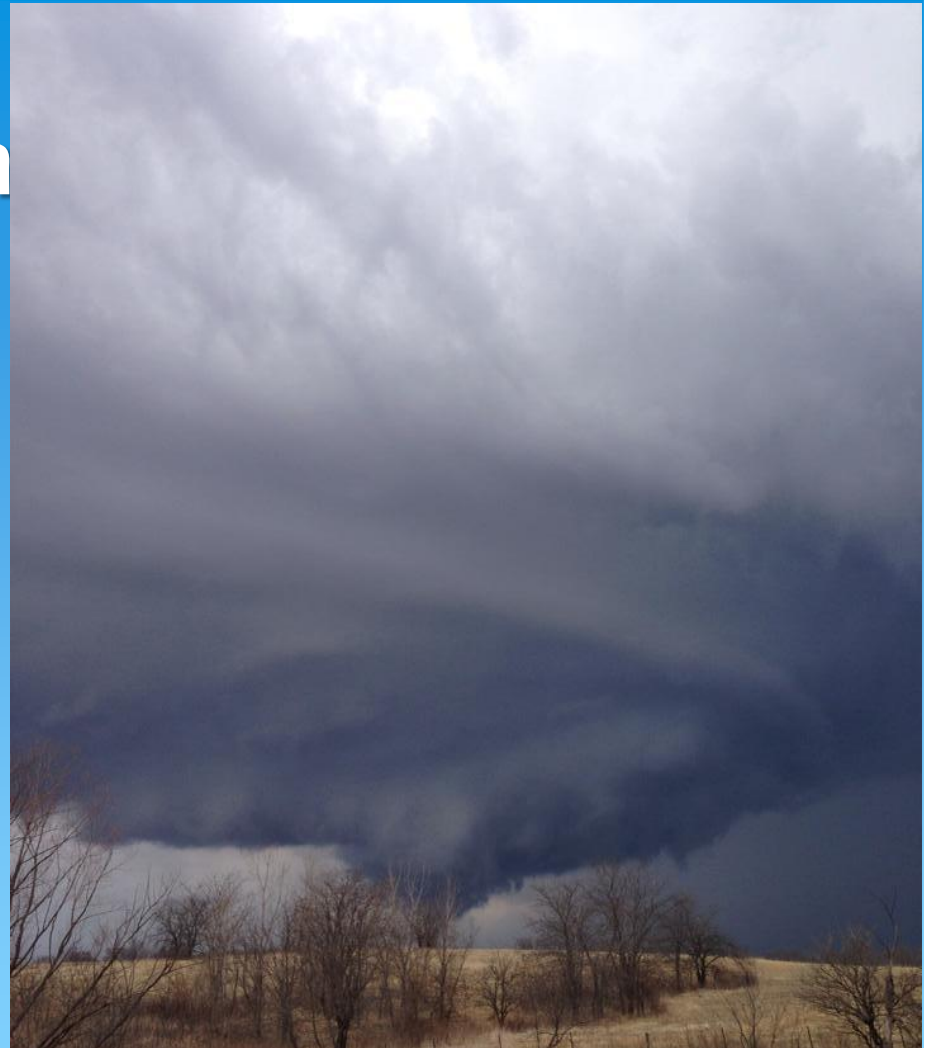


Missouri River Basin Climate Outlook 1 May 2014

Dr. Dennis Todey
State Climatologist
South Dakota State Univ.
dennis.todey@sdstate.edu
605-688-5141



US Army Corps of Engineers

Northwestern Division
Missouri River Basin Water Management Division

BUILDING STRONG.

General Information

- * **Providing climate services to the Central Region**

- * Collaboration Activity Between:

- * State Climatologists
- * Doug Kluck & John Eise (NOAA/NWS)
- * American Association of State Climatologists
- * Midwest and High Plains Regional Climate Centers
- * National Drought Mitigation Center/USDA
- * USACE/BOR/NWS MRBRC

- * **Next Regular Climate/Drought Outlook Webinar**

- * May 15, 2014 (1 PM CDT)
- * May 29, 2014 (1 PM CDT) – Special Missouri River (tentative)

- * **Access to Future Climate Webinars and Information**

- * <http://www.drought.gov/drought/content/regional-programs/regional-drought-webinars>

- * <http://mrcc.isws.illinois.edu/webinars.htm>

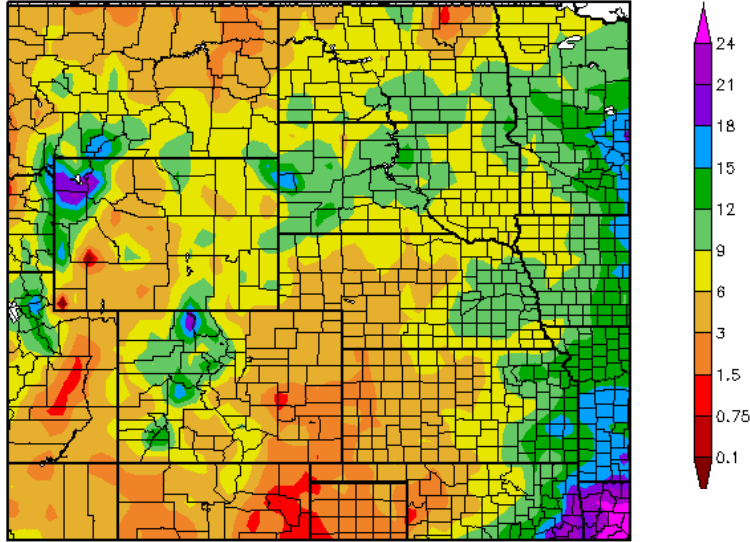
- * <http://www.hprcc.unl.edu/webinars.php>

- * **Questions at the end**

Agenda

- * **Current Conditions - comparisons**
- * **Review River status**
- * **Predictions**
 - * **Drought**
 - * **El Niño**

Precipitation (in)
10/1/2013 - 4/30/2014

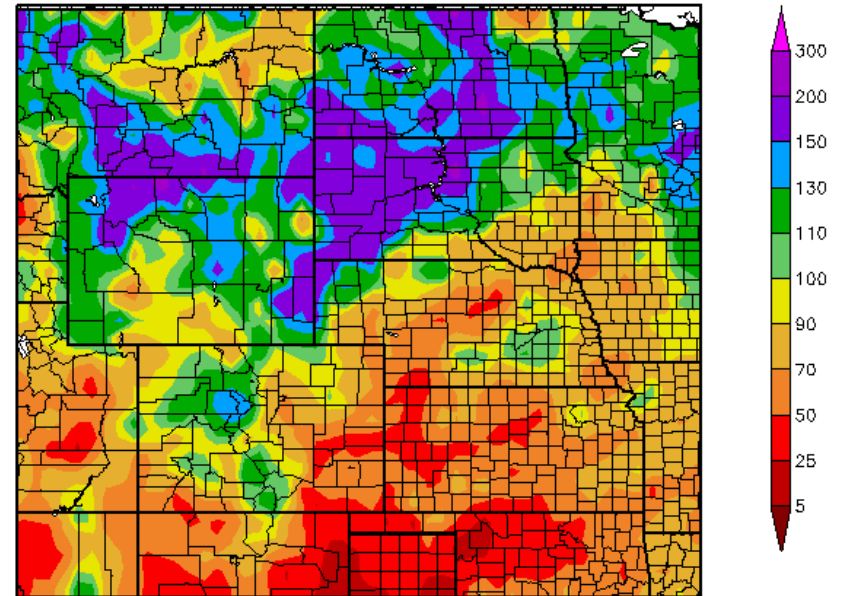


Generated 5/1/2014 at HPRCC using provisional data.

Regional Climat



Percent of Normal Precipitation (%)
10/1/2013 - 4/30/2014

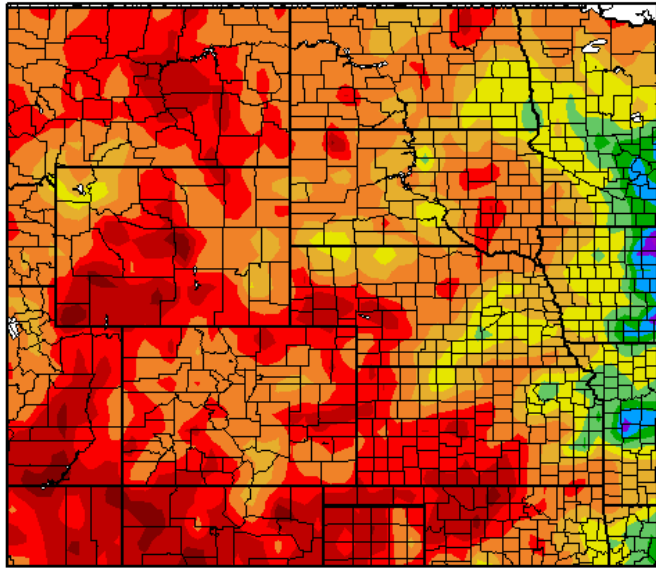


Generated 5/1/2014 at HPRCC using provisional data.

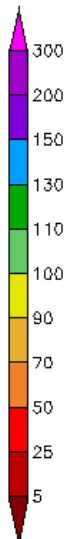
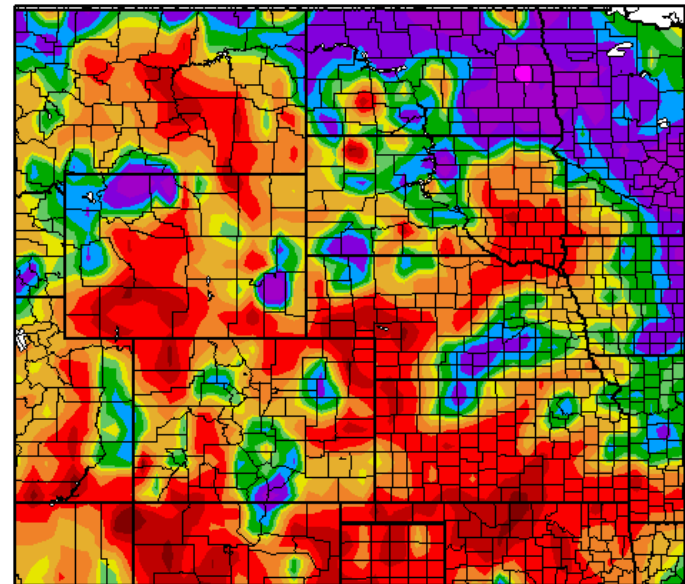
Regional Climate Centers

<http://www.hprcc.unl.edu/maps/current/>

Precipitation (in)
4/1/2014 - 4/30/2014



Percent of Normal Precipitation (%)
4/1/2014 - 4/30/2014



Generated 5/1/2014 at HPRCC using provisional data.

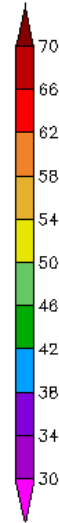
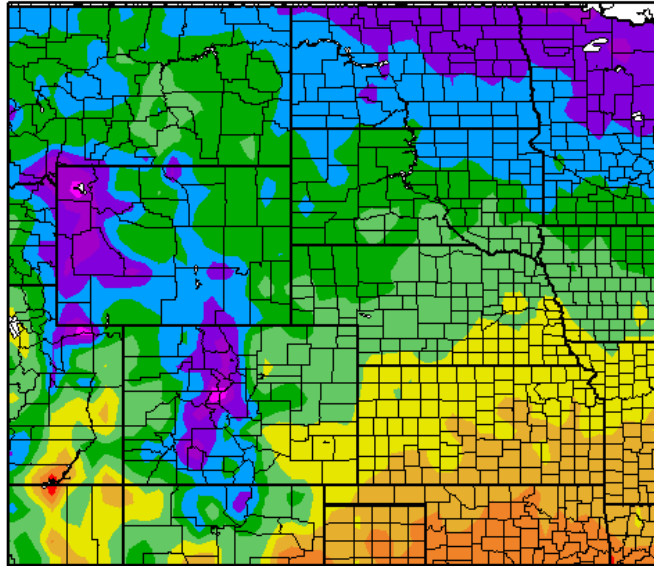
Regional Climate Centers

<http://www.hprcc.unl.edu/maps/current/>

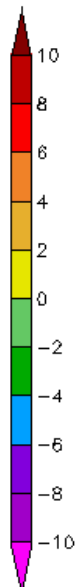
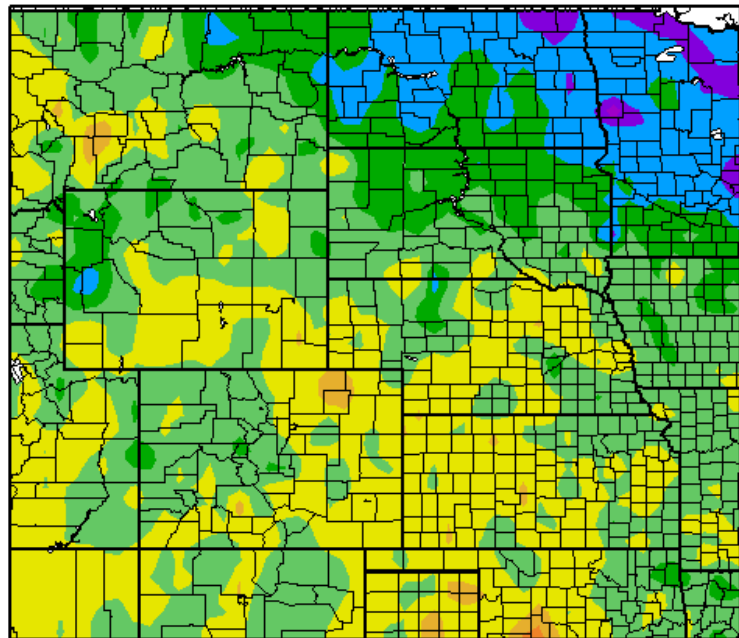
Generated 5/1/2014 at HPRCC using provisional data.

Regional Climate Centers

Temperature (F)
4/1/2014 - 4/30/2014



Departure from Normal Temperature (F)
4/1/2014 - 4/30/2014



Generated 5/1/2014 at HPRCC using provisional data.

Regional Climate Centers

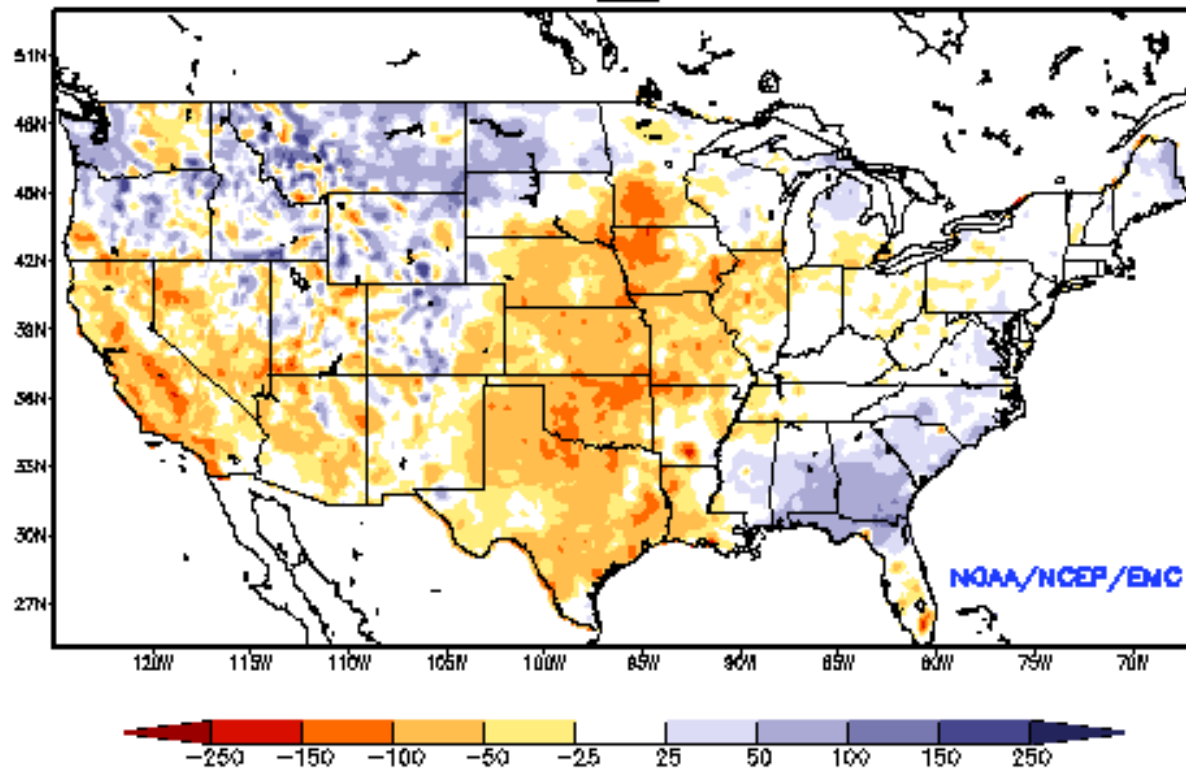
<http://www.hprcc.unl.edu/maps/current/>

Generated 5/1/2014 at HPRCC using provisional data.

Regional Climate Centers

Soil Moisture and Recovery

Ensemble-Mean - Current Total Column Soil Moisture Anomaly (mm)
NCEP NLDAS Products Valid: APR 26, 2014



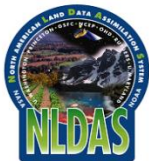
Wet area in the northern Plains continues

Drier further south/east

Recent rains some recovery and frost removal

Soil Moisture Anomaly in millimeters

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



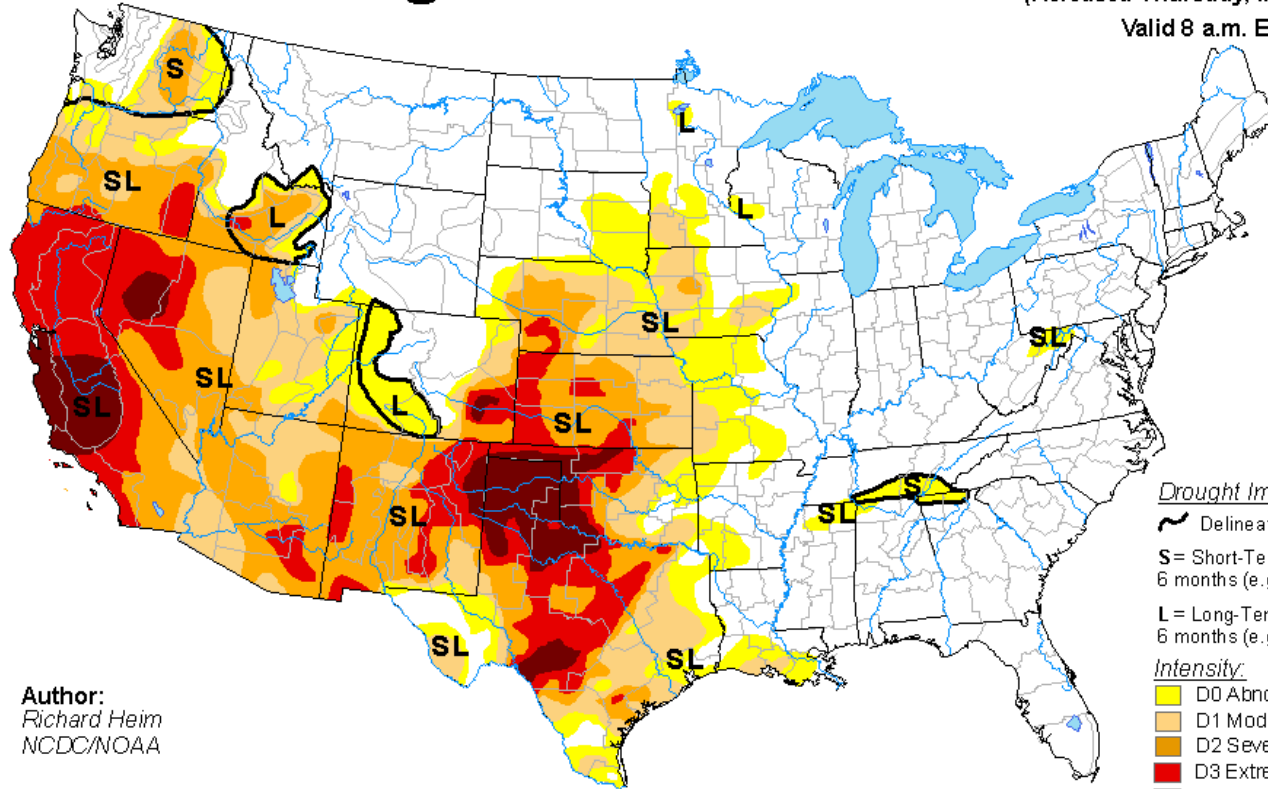
US Drought Monitor

U.S. Drought Monitor

April 29, 2014

(Released Thursday, May 1, 2014)

Valid 8 a.m. EDT



Drought Impact Types:

~ Delineates dominant impacts

S= Short-Term, typically less than 6 months (e.g. agriculture, grasslands)

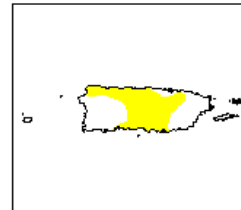
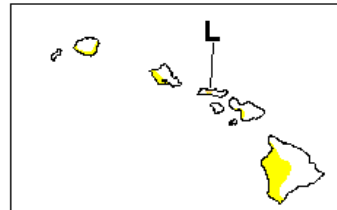
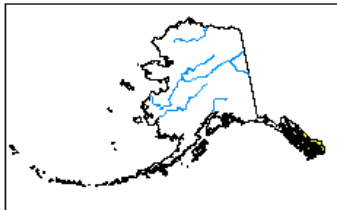
L= Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

Intensity:

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

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

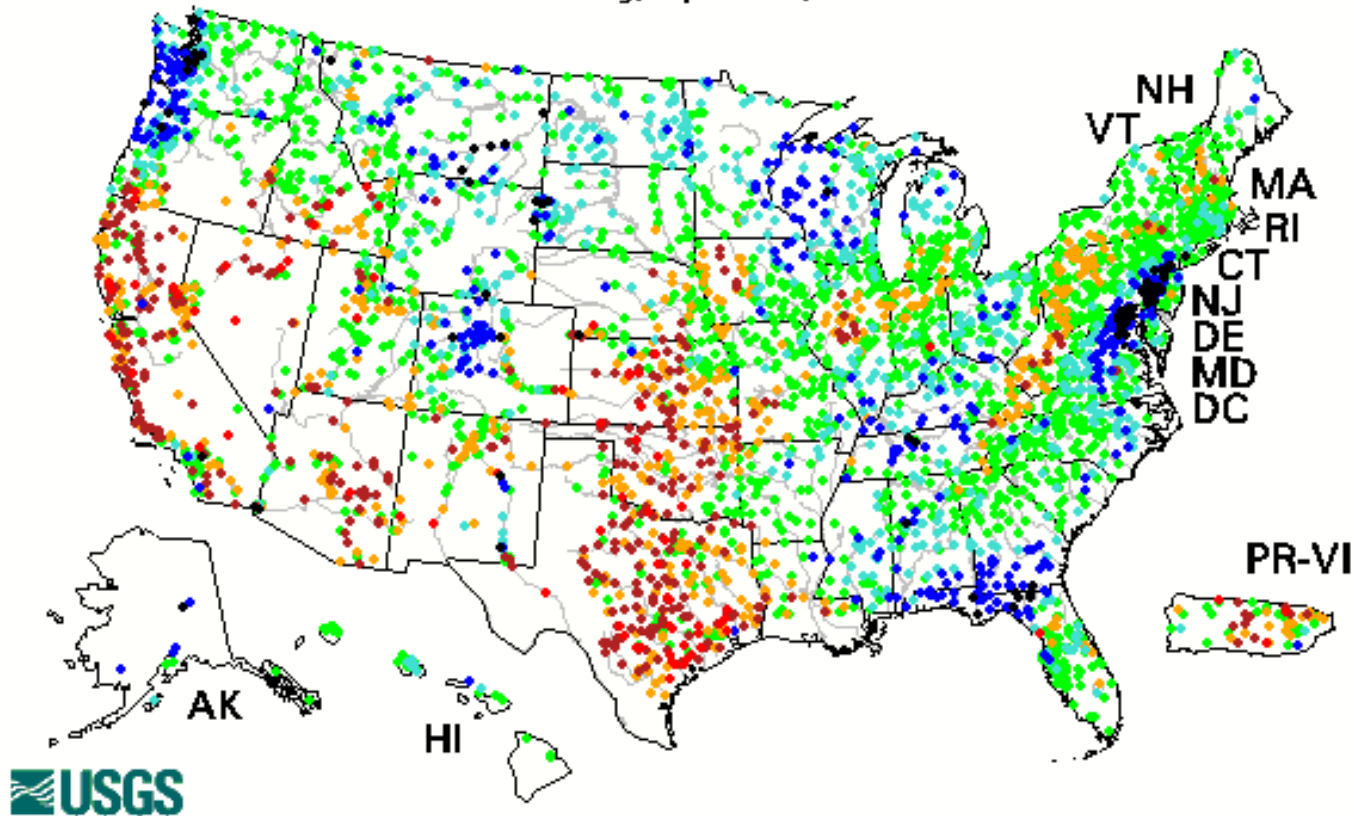
Author:
Richard Heim
NCDC/NOAA



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

7-Day Average Streamflow

Wednesday, April 30, 2014



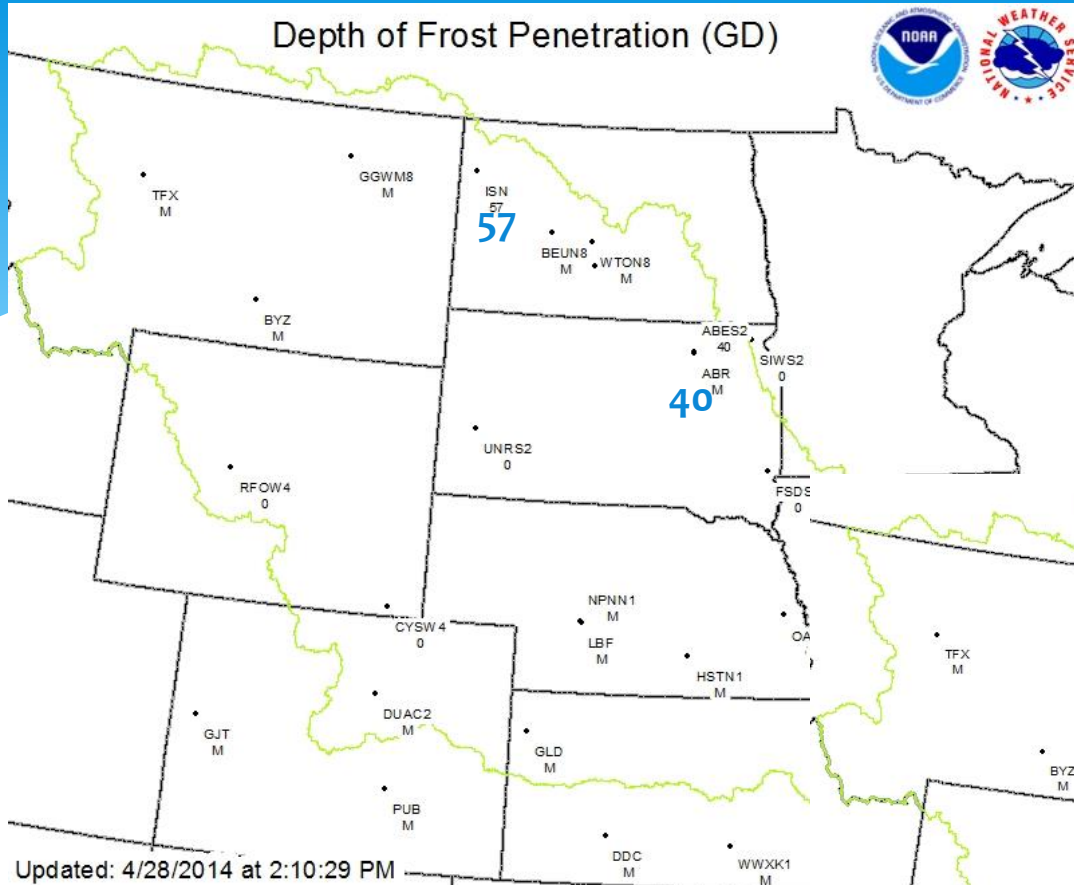
Thursday, 1 May 2014

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

Depth of Frost Penetration (GD)

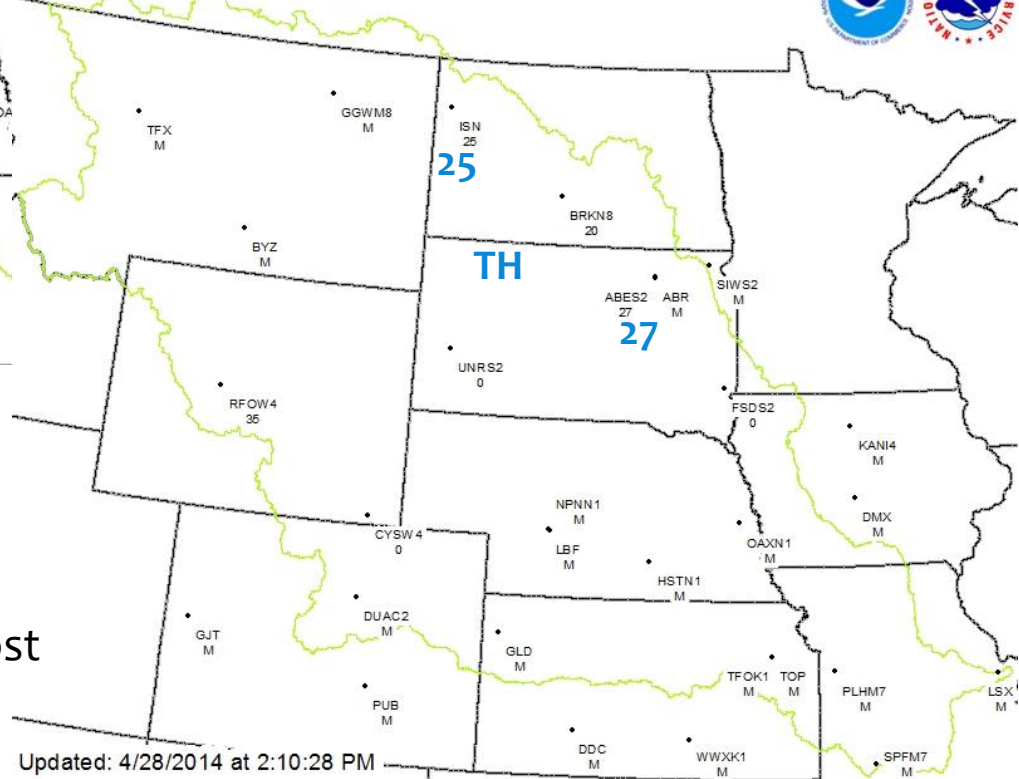


Frost Depths



Updated: 4/28/2014 at 2:10:29 PM

Depth of Frost Thawed (GT)



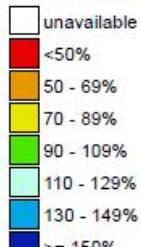
Updated: 4/28/2014 at 2:10:28 PM

<http://www.crh.noaa.gov/mbrfc/?n=frost>

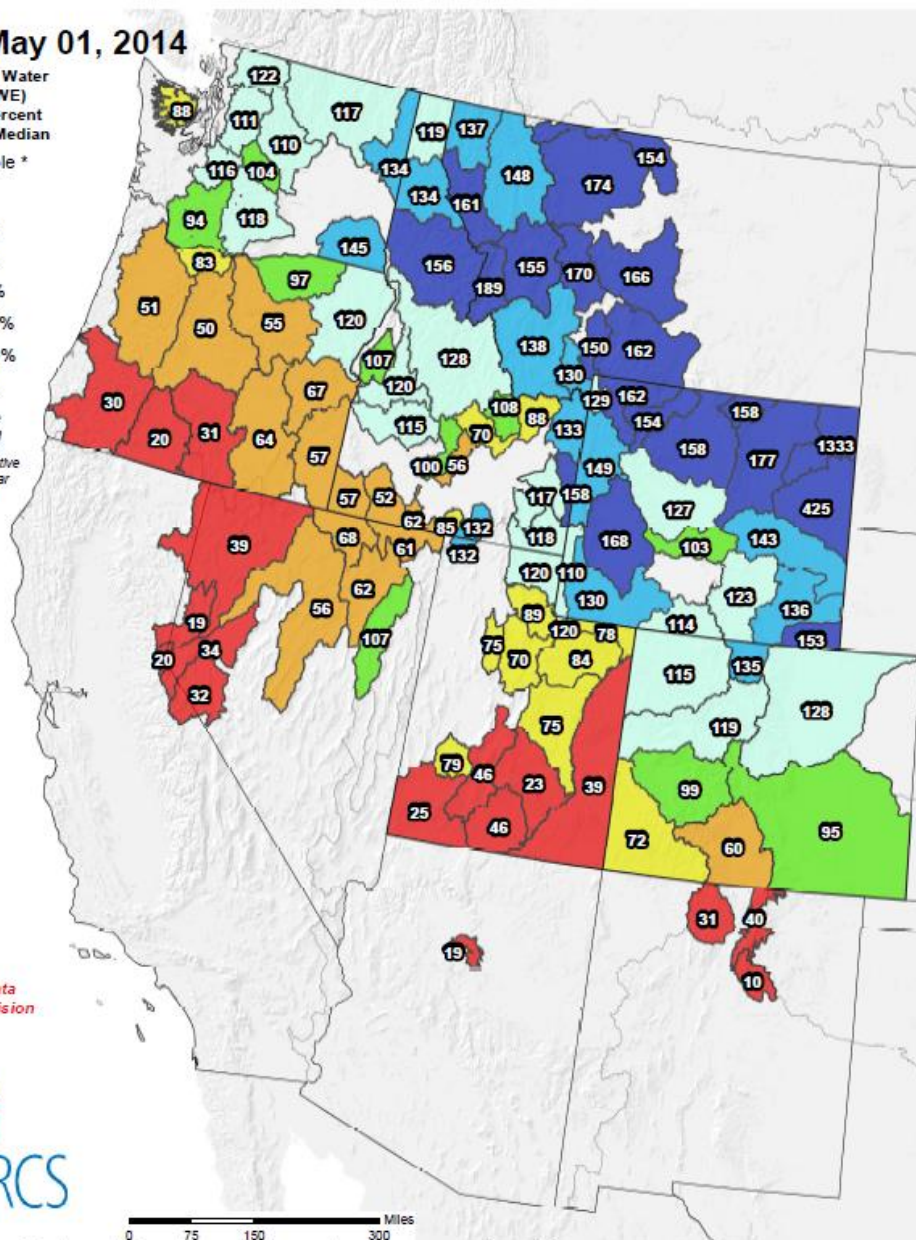
Westwide SNOTEL Current Snow Water Equivalent (SWE) % of Normal

May 01, 2014

Current Snow Water Equivalent (SWE) Basin-wide Percent of 1981-2010 Median



* Data unavailable at time of posting or measurement is not representative at this time of year



Provisional data subject to revision

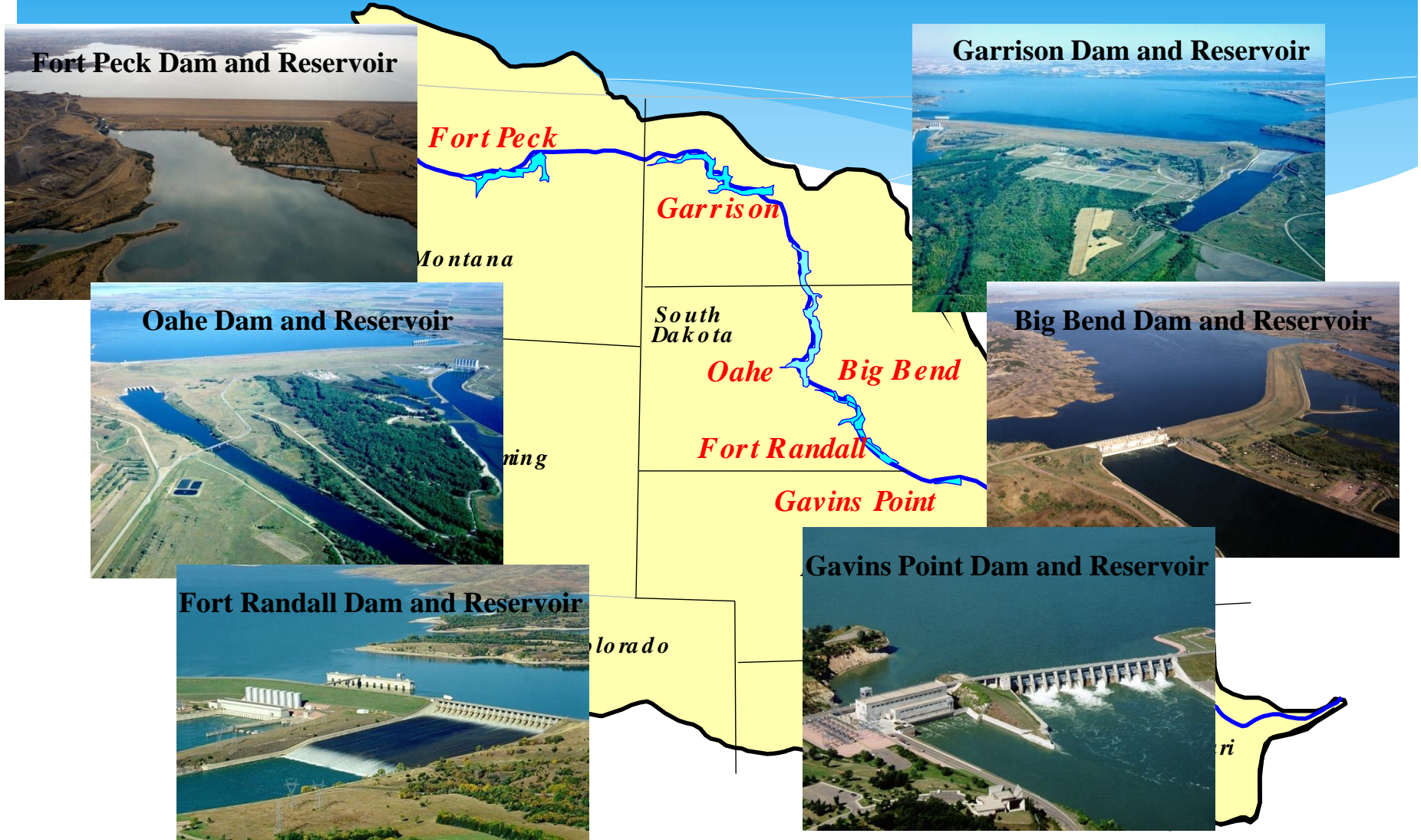


The snow water equivalent percent of normal represents the current snow water equivalent found at selected SNOTEL sites in or near the basin compared to the average value for those sites on this day. Data based on the first reading of the day (typically 00:00).

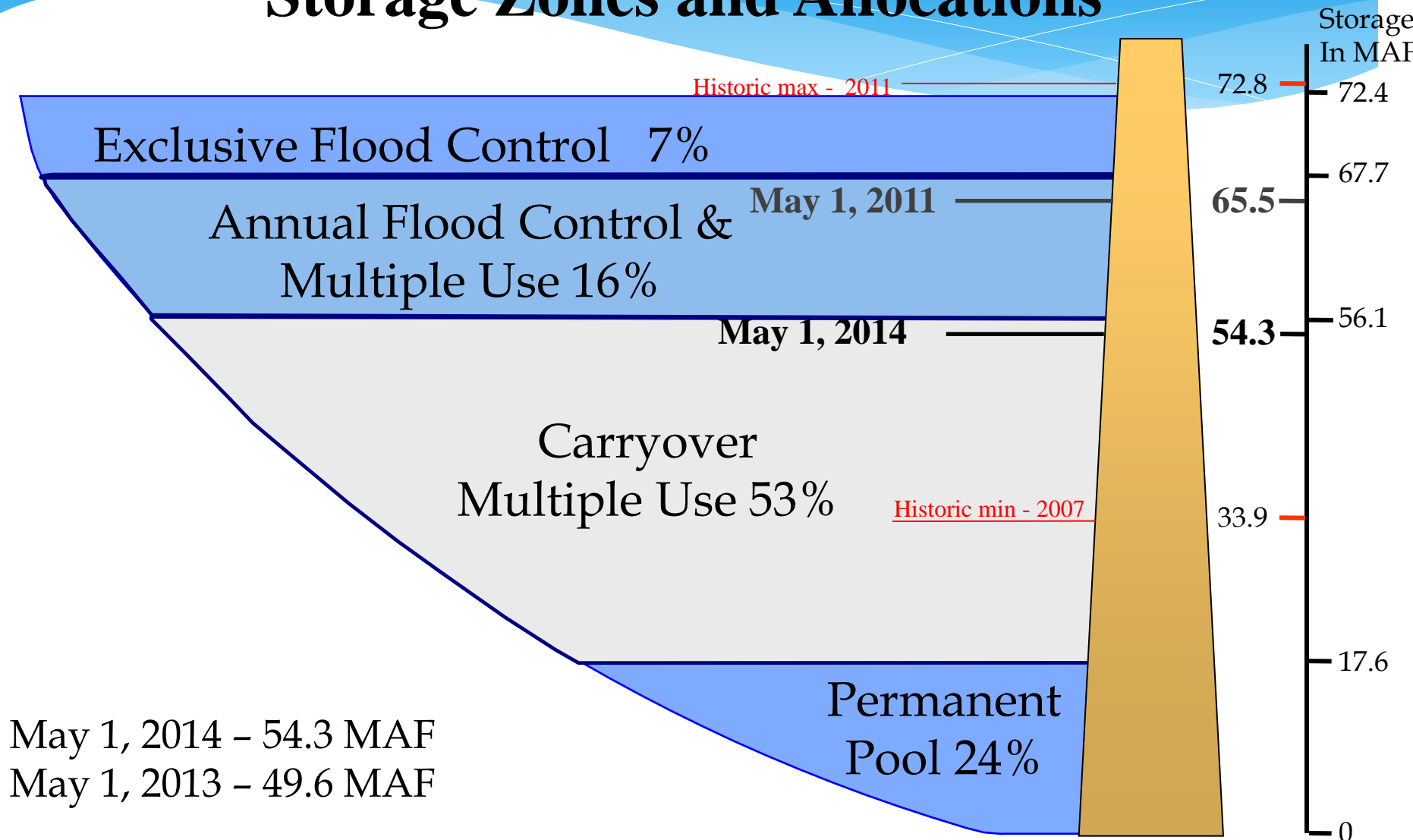
Prepared by:
USDA/NRCS National Water and Climate Center
Portland, Oregon
<http://www.wcc.nrcs.usda.gov>

Current Snow Pack

Missouri River Mainstem Reservoir System



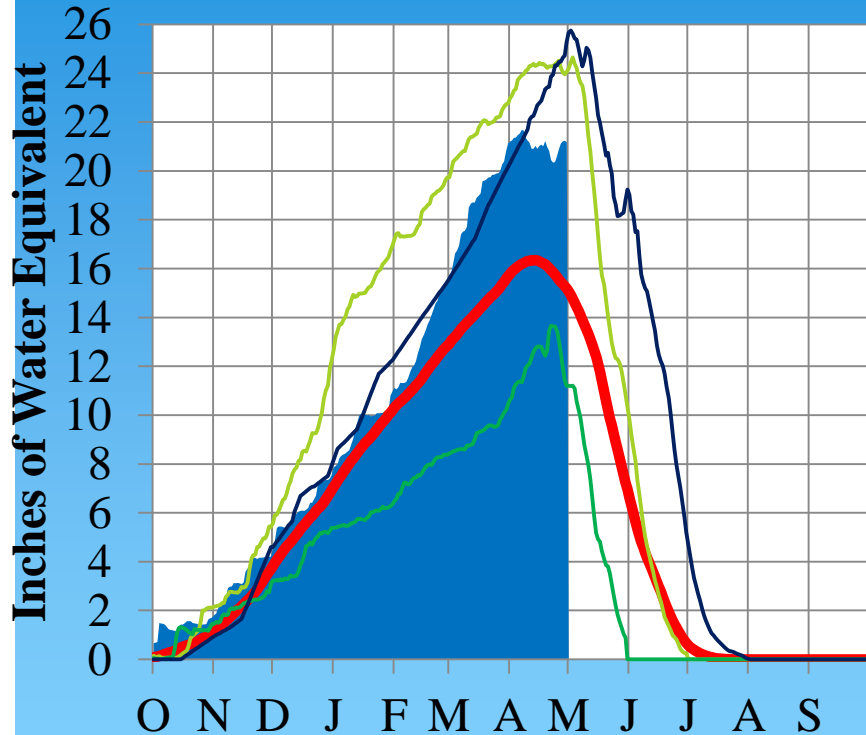
Missouri River Mainstem System Storage Zones and Allocations



Missouri River Basin – Mountain Snowpack Water Content 2013-2014 with comparison plots from 1997*, 2001*, and 2011

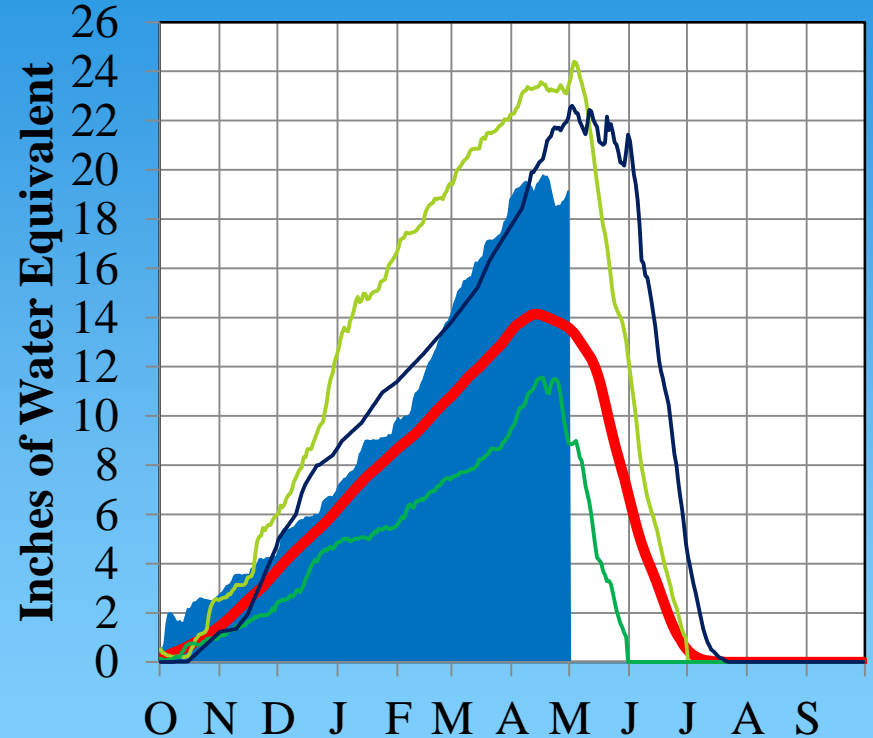
April 30, 2014

Total above Fort Peck



■ 2013-14 ■ 1981-2010 Ave ■ 1997 ■ 2001 ■ 2011

Total Fort Peck to Garrison



■ 2013-14 ■ 1981-2010 Ave ■ 1997 ■ 2001 ■ 2011

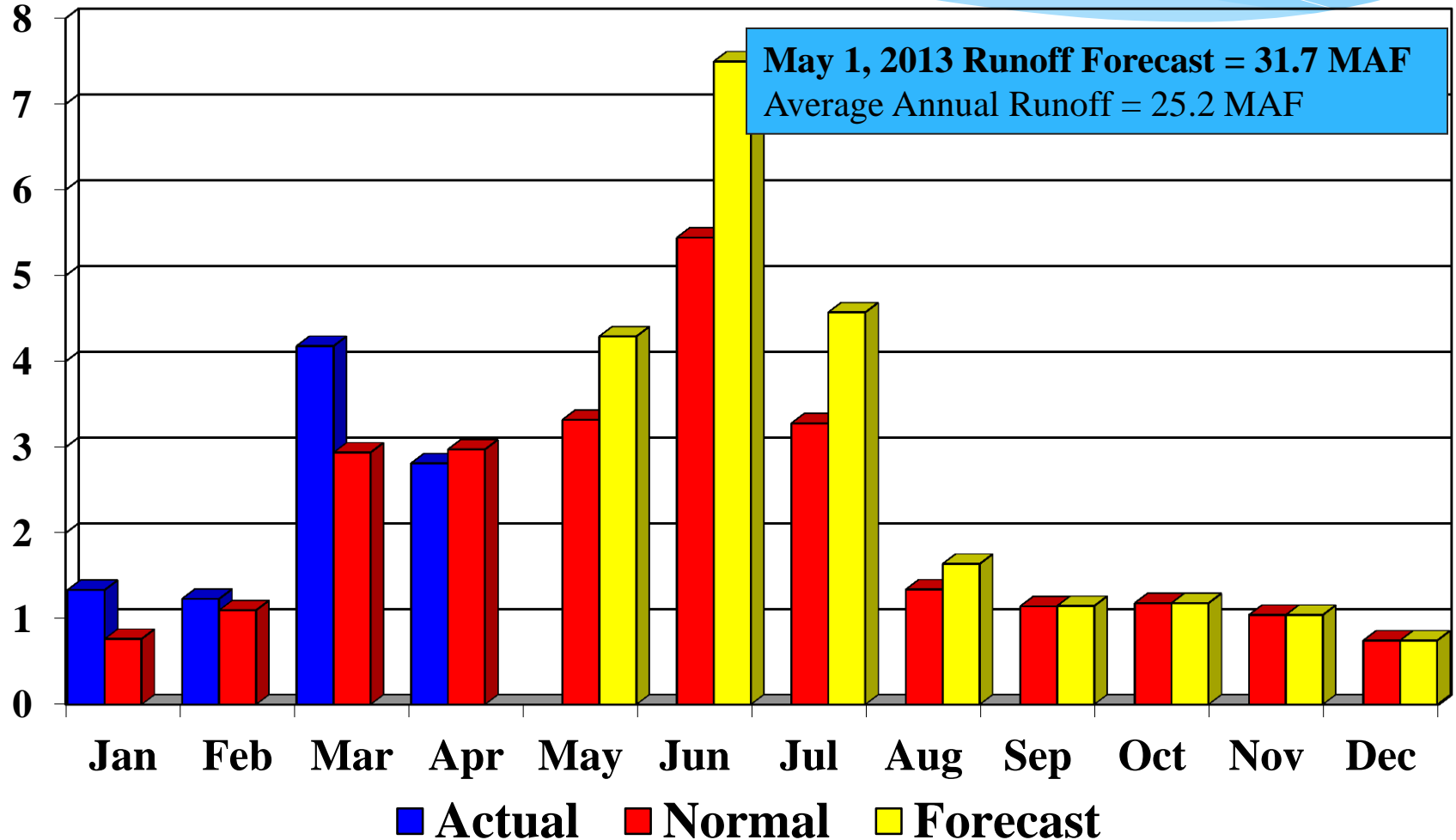
The Missouri River basin mountain snowpack normally peaks near April 15. By May 1, normally 93% of the “Total above Fort Peck” peak remains. On April 30, 2014, the mountain snowpack in the “Total above Fort Peck” reach was 21.2”, 129% of the normal April 15 peak. By May 1, normally 97% of the “Total Fort Peck to Garrison” peak remains. On April 30, 2014, the mountain snowpack in the “Total Fort Peck to Garrison” reach was 19.1”, 135% of the normal April 15 peak.

*Generally considered the high and low year of the last 20-year period.

Provisional data. Subject to revision.

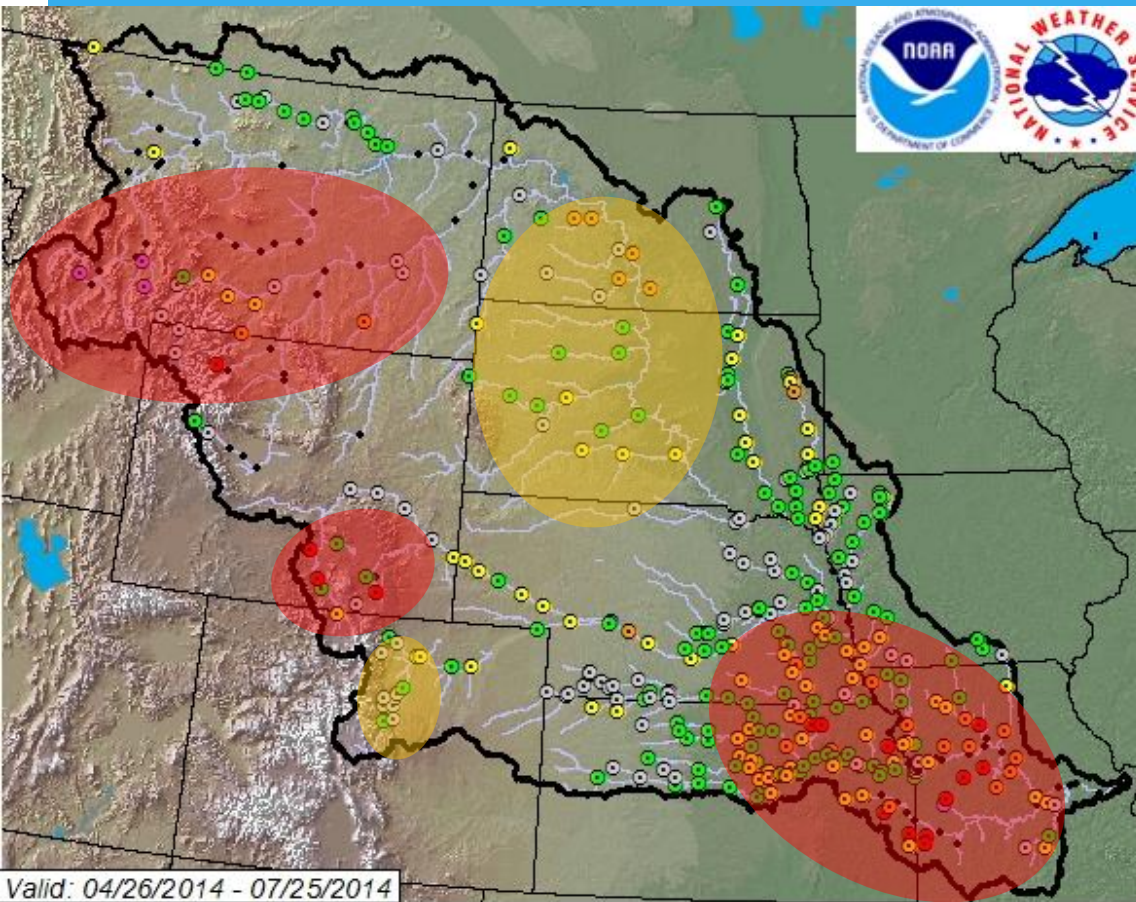
Missouri River Runoff above Sioux City, IA 2014 Actual and Forecasted

Million Acre-Feet (MAF)



<http://www.nwd-mr.usace.army.mil/rcc/>

MISSOURI BASIN RIVER FORECAST CENTER



Percent Chance of Minor Flooding



Rivers likely to experience minor (and maybe **moderate**) flooding

- **Big Hole River, MT**
- **Gallatin River, MT**
- Clarks Fk Yellowstone, MT
- Tongue, MT
- N Fk Shoshone, WY
- North Platte, WY
- Laramie, WY
- Big Blue, KS
- **Marais des Cygnes—Osage River basin, KS & MO**
- **Grand River, MO**
- Chariton River, MO
- Missouri River below Gavins, some reaches
- **Smaller streams in MO & extreme eastern KS**

Areas to watch:

- Smaller streams in Dakotas
- Colorado foothills

MISSOURI BASIN

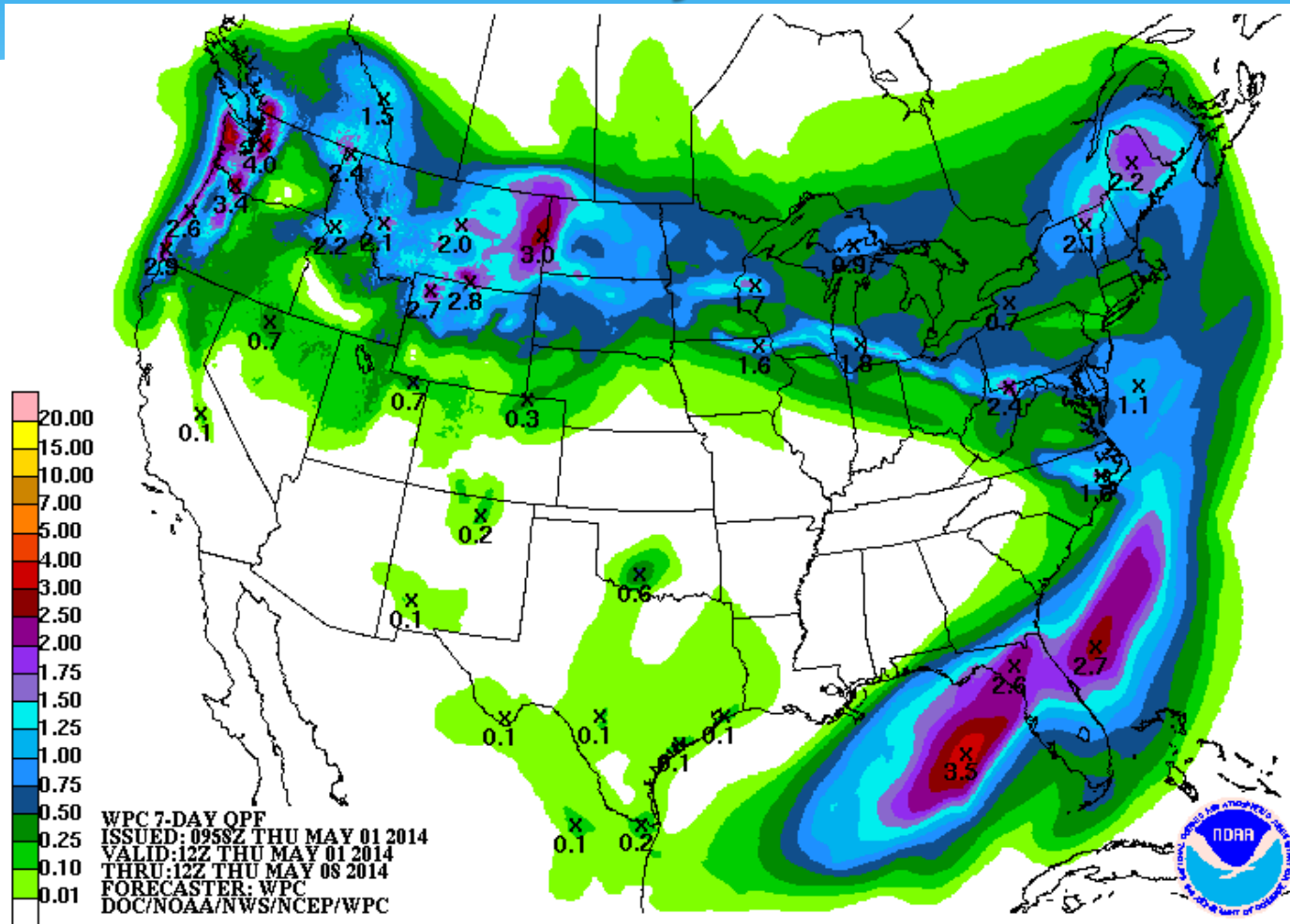
SPRING FLOOD SUMMARY

- **Above average mountain snowpack. Typical accumulation season has ended.**
- **Northern Plains soils very wet, at least top layer.**
- **Some minor-to-moderate flooding is expected due to the mountain snow runoff. **Widespread significant flooding is not expected.** It would most likely take rainfall events to set this in motion.**
- **Have to keep watch on western portions of the Dakotas, as rain events could still lead to localized minor flooding.**
- **Minor-to-moderate flooding due to thunderstorms will continue in eastern Kansas and Missouri for next few months. Not atypical!!!!**

Climate Outlooks

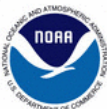
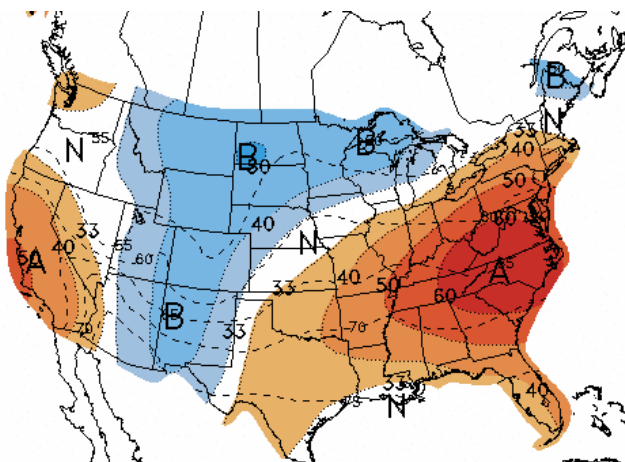
- * **7-day precipitation forecast**
- * **8-14 day outlook**
- * **May**
- * **3 Months (May-July)**
- * **Seasonal Drought Outlooks**
- * **El Nino**

7-day Quantitative Precipitation Forecast Valid: 7 AM Thu 1 May– 7 AM Thu 8 May



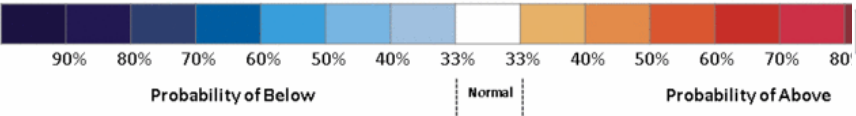
<http://www.wpc.ncep.noaa.gov/qpf/day1-7.shtml>

Temperature and Precipitation Probabilities for 8 May– 14 May 2014



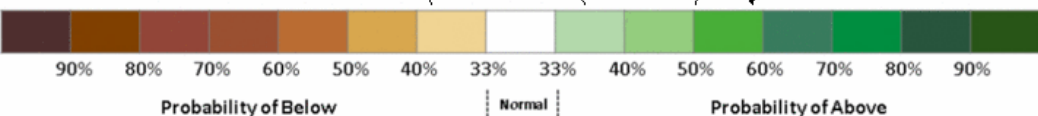
8-14 DAY OUTLOOK
TEMPERATURE PROBABILITY
MADE 30 APR 2014
VALID MAY 08 - 14, 2014

DASHED BLACK LINES ARE CLIMATOLOGY (DEG F) SHADED AREAS ARE FCST VALUES ABOVE (A) OR BELOW (B) MEDIAN UNSHADED AREAS ARE NEAR-NORMAL



8-14 DAY OUTLOOK
PRECIPITATION PROBABILITY
MADE 30 APR 2014
VALID MAY 08 - 14, 2014

DASHED BLACK LINES ARE CLIMATOLOGY (TENTH OF INCHES) SHADED AREAS ARE FCST VALUES ABOVE (A) OR BELOW (B) MEDIAN UNSHADED AREAS ARE NEAR-MEDIAN

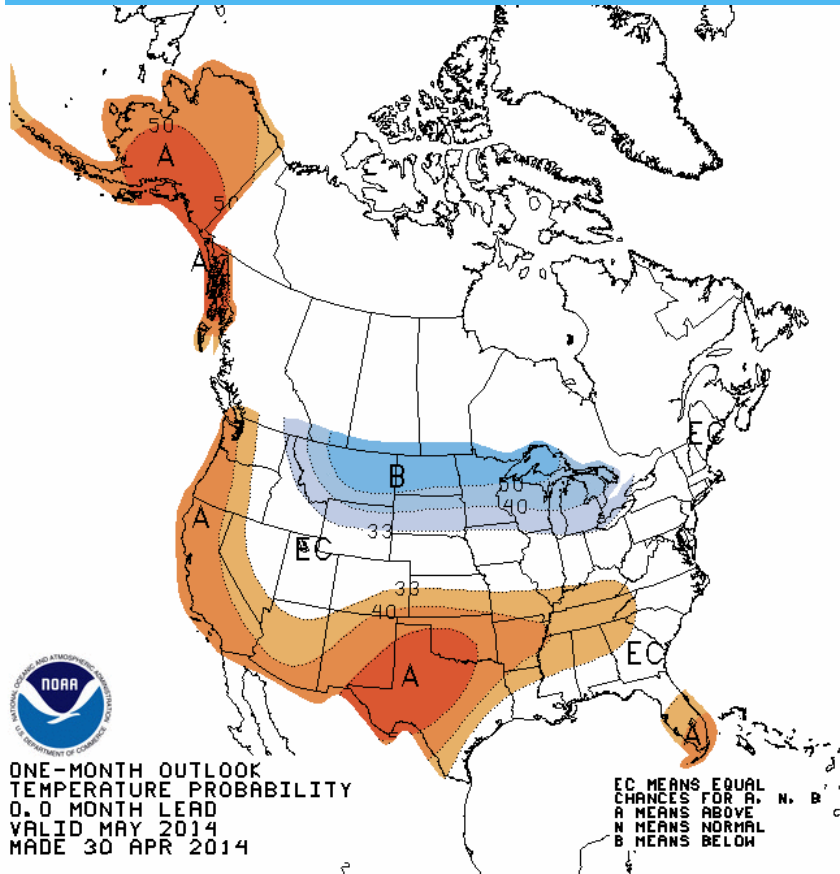


Temperature

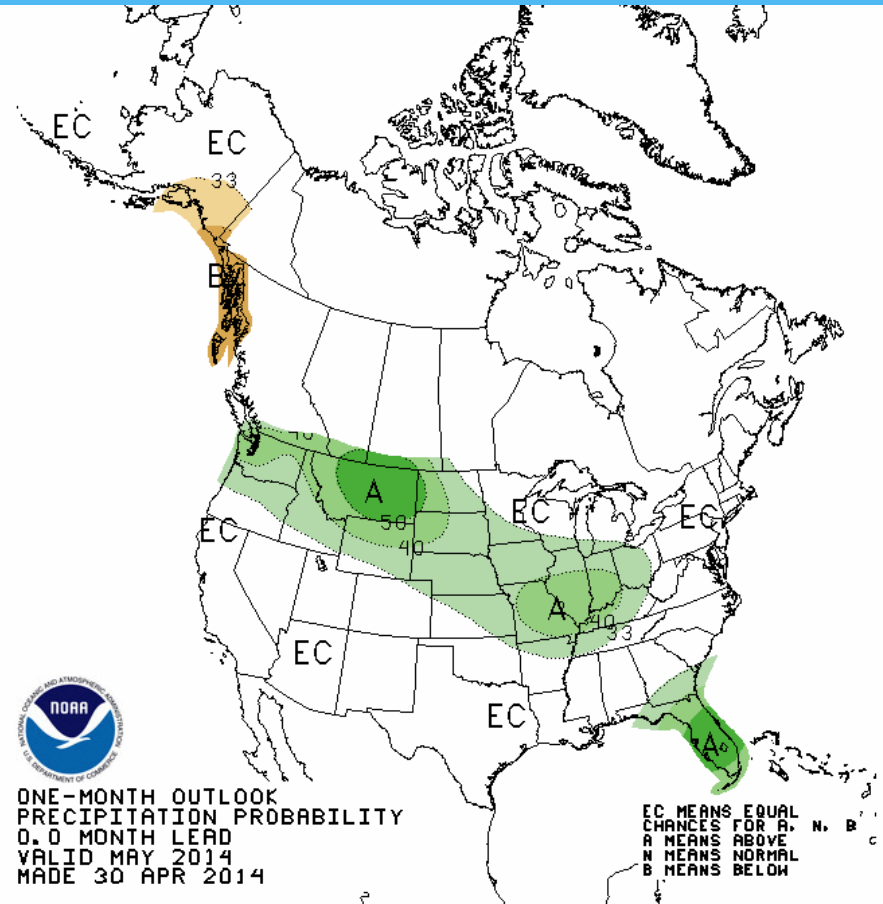
Precipitation

<http://www.cpc.ncep.noaa.gov/products/predictions/814day/index.php>

May Temperature and Precipitation Probabilities



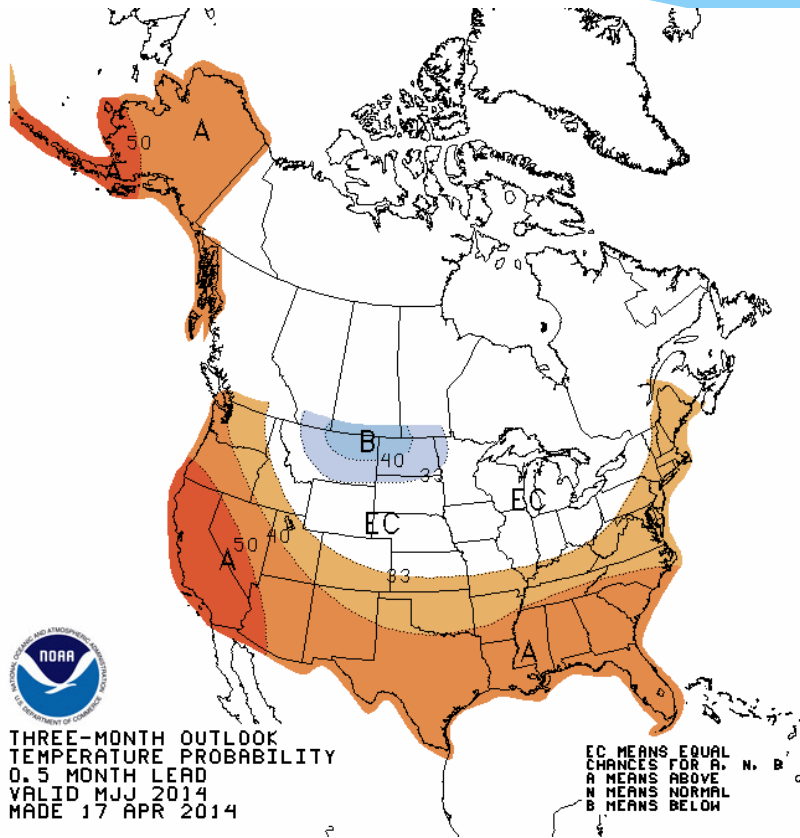
Temperature



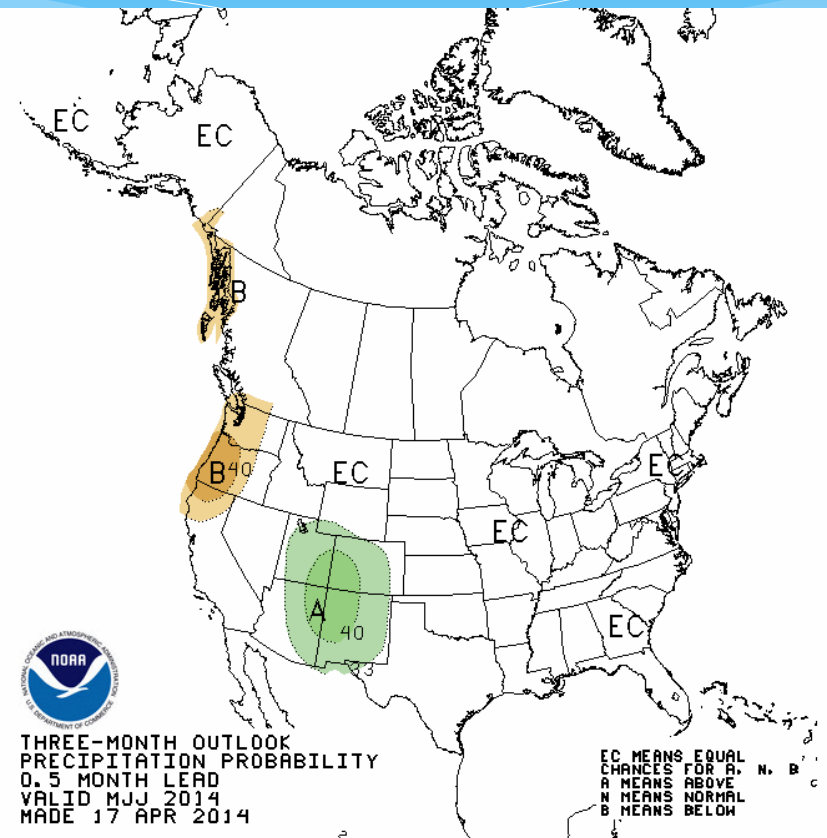
Precipitation

<http://www.cpc.ncep.noaa.gov/products/predictions/30day/>

3 Month Temperature and Precipitation Probabilities (May – July)



Temperature



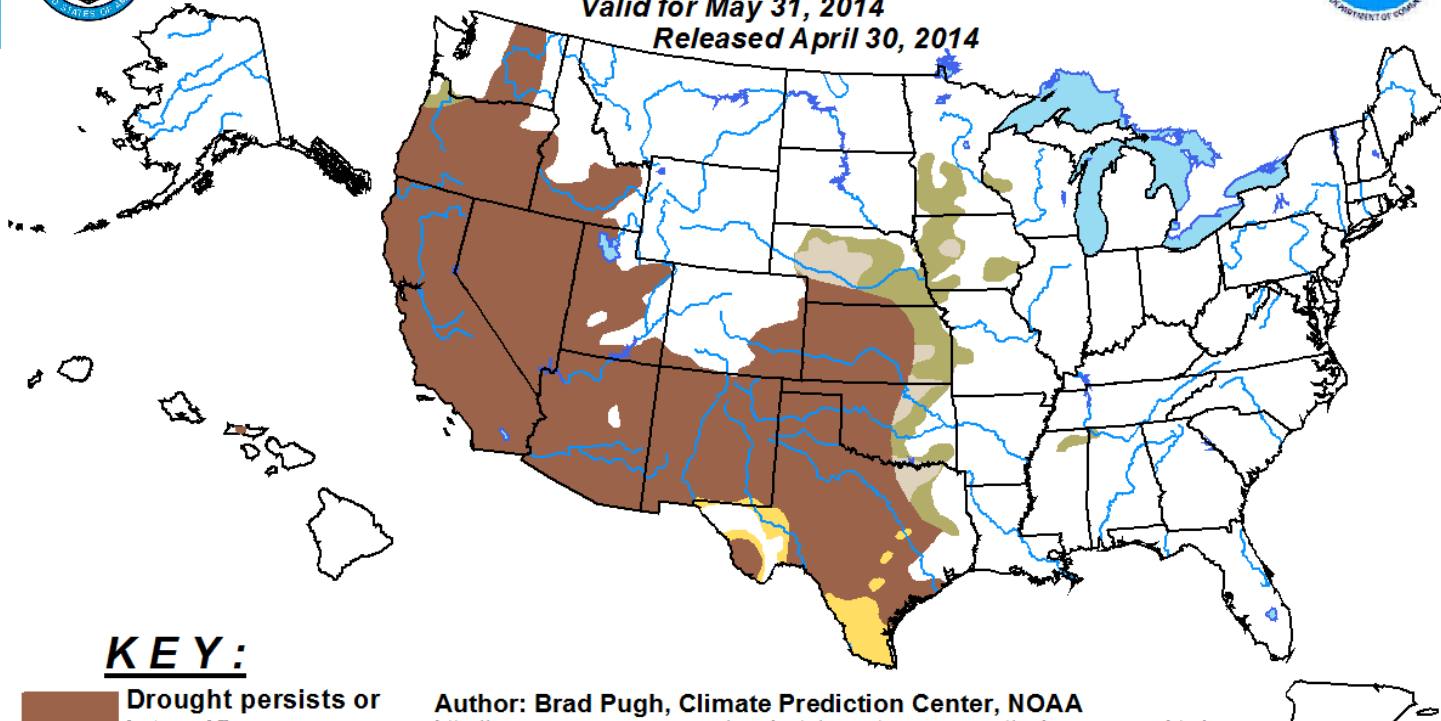
Precipitation

Drought Outlook through 31 May







U.S. Monthly Drought Outlook Drought Tendency During the Valid Period

Valid for May 31, 2014
Released April 30, 2014



KEY:

-  Drought persists or intensifies
-  Drought remains but improves
-  Drought removal likely
-  Drought development likely

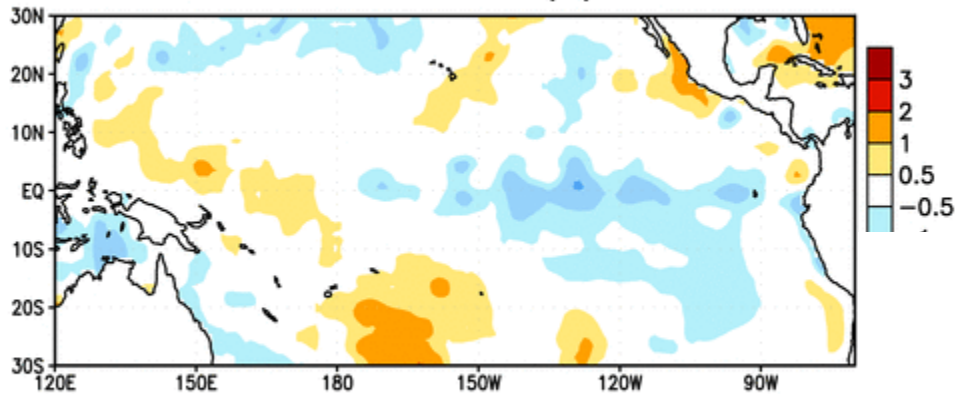
Author: Brad Pugh, Climate Prediction Center, NOAA
http://www.cpc.ncep.noaa.gov/products/expert_assessment/mdo_summary.html

Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Short-term events -- such as individual storms -- cannot be accurately forecast more than a few days in advance. Use caution for applications -- such as crops -- that can be affected by such events. "Ongoing" drought areas are approximated from the Drought Monitor (D1 to D4 intensity). For weekly drought updates, see the latest U.S. Drought Monitor.

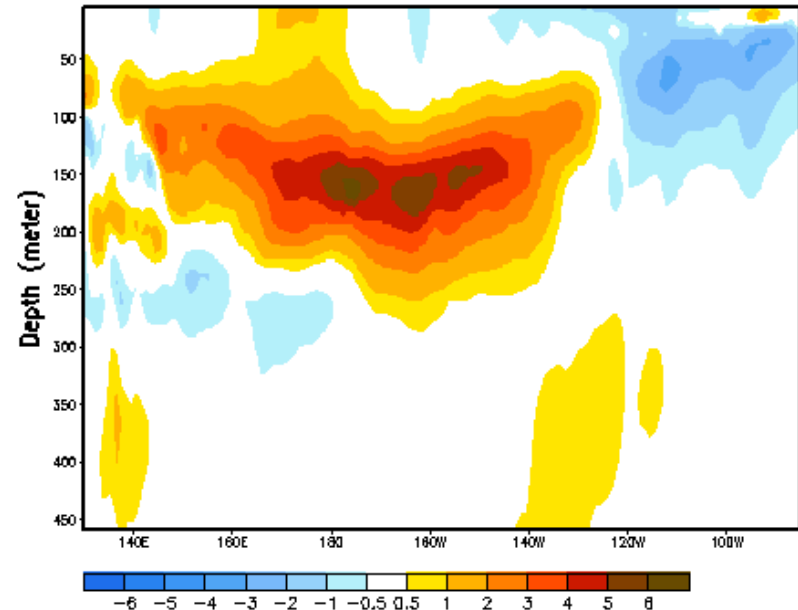
NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period although drought will remain. The green areas imply drought removal by the end of the period (D0 or none)

Warm water progression in Pacific

Week centered on 05 FEB 2014
SST Anomalies (°C)



Equatorial Temperature Anomaly (°C)
Pentad centered on 22 FEB 2014

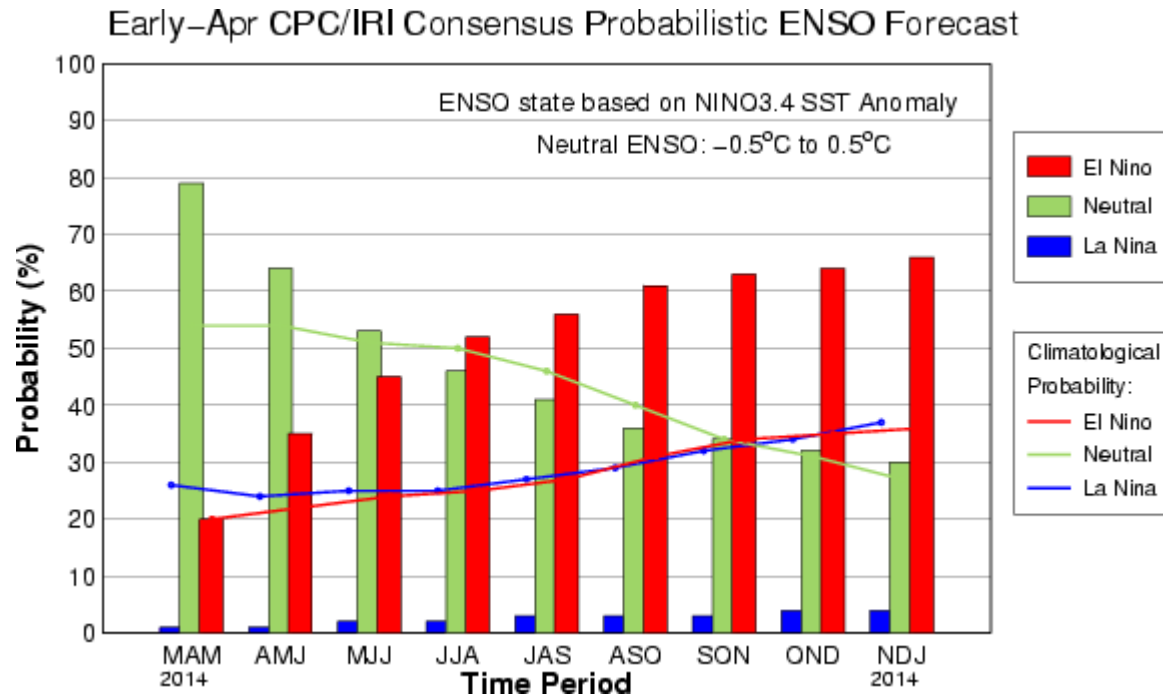


<http://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/enso.shtml>

CPC/IRI Probabilistic ENSO Outlook

Updated: 10 April 2014

ENSO-neutral is favored for the Northern Hemisphere spring 2014, with chances of El Niño increasing during the rest of the year, exceeding 50% by summer.



Summary

- * Recent dry conditions reduced some runoff
- * Snow pack fallen off 2011 track, but still substantial
- * Still moist plains soils and some frost at depth - north

- * More active precipitation pattern likely in May
- * Will increase likelihood of sub-basin flooding
- * Overall Missouri River still no major issue – ample flood control space
- * El Nino likely coming, but unlikely to impact this run-off year

Further Information - Partners

- **Today's and Past Recorded Presentations and :**
- * <http://mrcc.isws.illinois.edu/webinars.htm>
- <http://www.hprcc.unl.edu>
- NOAA's National Climatic Data Center: www.ncdc.noaa.gov
 - Monthly climate reports (U.S. & Global):
www.ncdc.noaa.gov/sotc/
- NOAA's Climate Prediction Center: www.cpc.ncep.noaa.gov
- Climate Portal: www.climate.gov
- U.S. Drought Portal: www.drought.gov
- National Drought Mitigation Center: <http://drought.unl.edu/>
- State climatologists
 - * <http://www.stateclimate.org>
- Regional climate centers
 - * <http://mrcc.isws.illinois.edu>
 - * <http://www.hprcc.unl.edu>

Thank You and Questions?

- * Questions:

- * **Missouri River Partners:**

- * Dennis Todey: dennis.todey@sdstate.edu , 605-688-5678

- * Doug Kluck: doug.kluck@noaa.gov, 816-994-3008

- * John Eise: john.eise@noaa.gov, 816-268-3144

- * Kevin Low: kevin.low@noaa.gov; (816) 540-5151

- * Kevin Stamm: Kevin.D.Stamm@usace.army.mil ; (402) 996-3874