CBRFC Forecast Update: Upper Green and Yampa

April 18, 2012

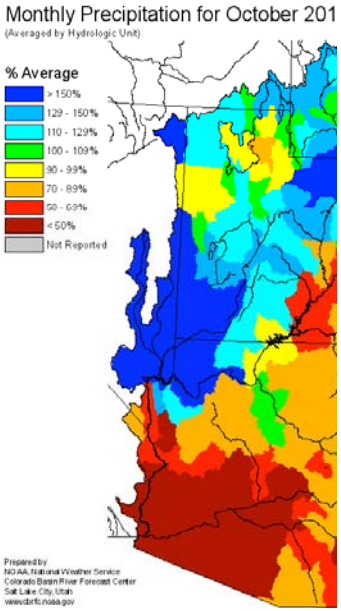
Ashley Nielson
NWS Colorado Basin River Forecast Center

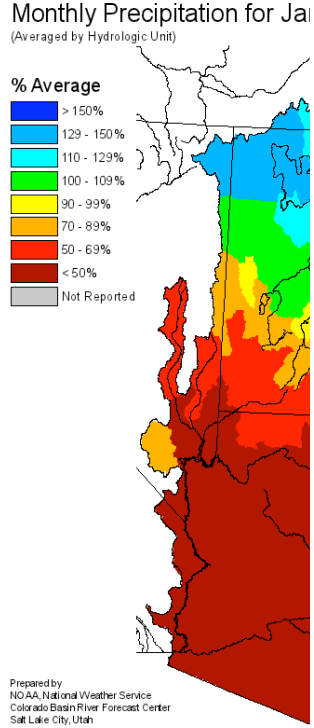
Outline

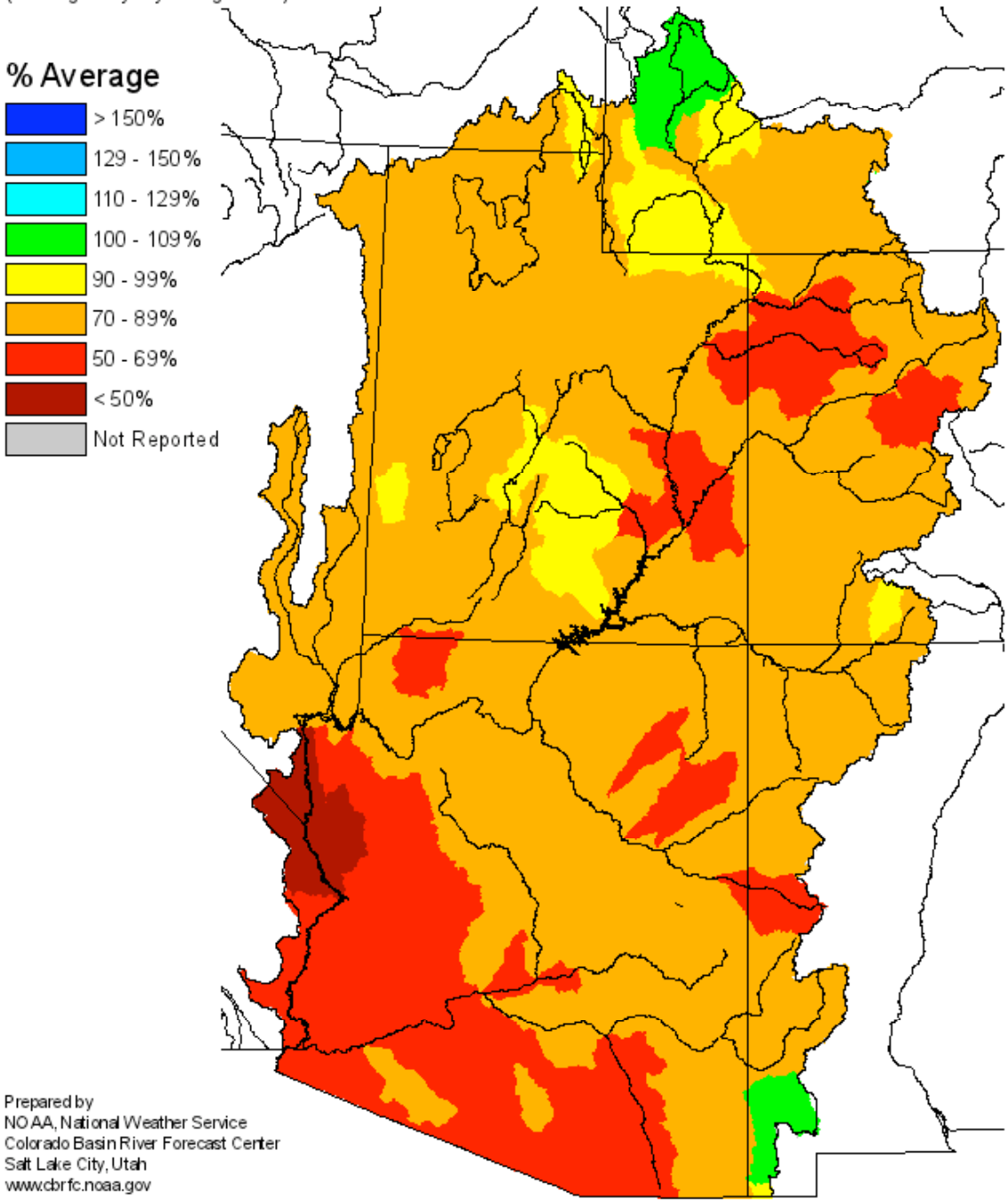
1. Current Conditions
   - Precipitation/Temperature/Snow
   - Weather Forecasts
2. Water Supply
3. Yampa Peak

Seasonal Precipitation, October 2011 - March 2012

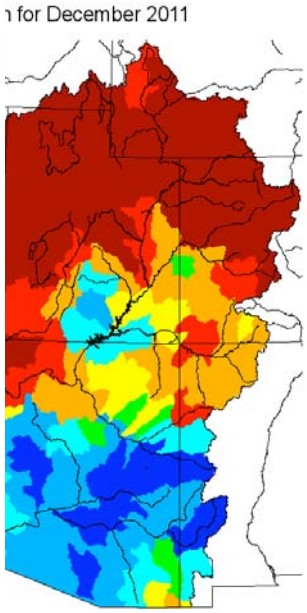
(Averaged by Hydrologic Unit)

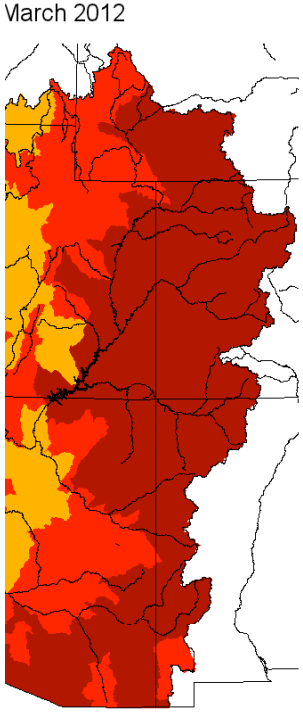






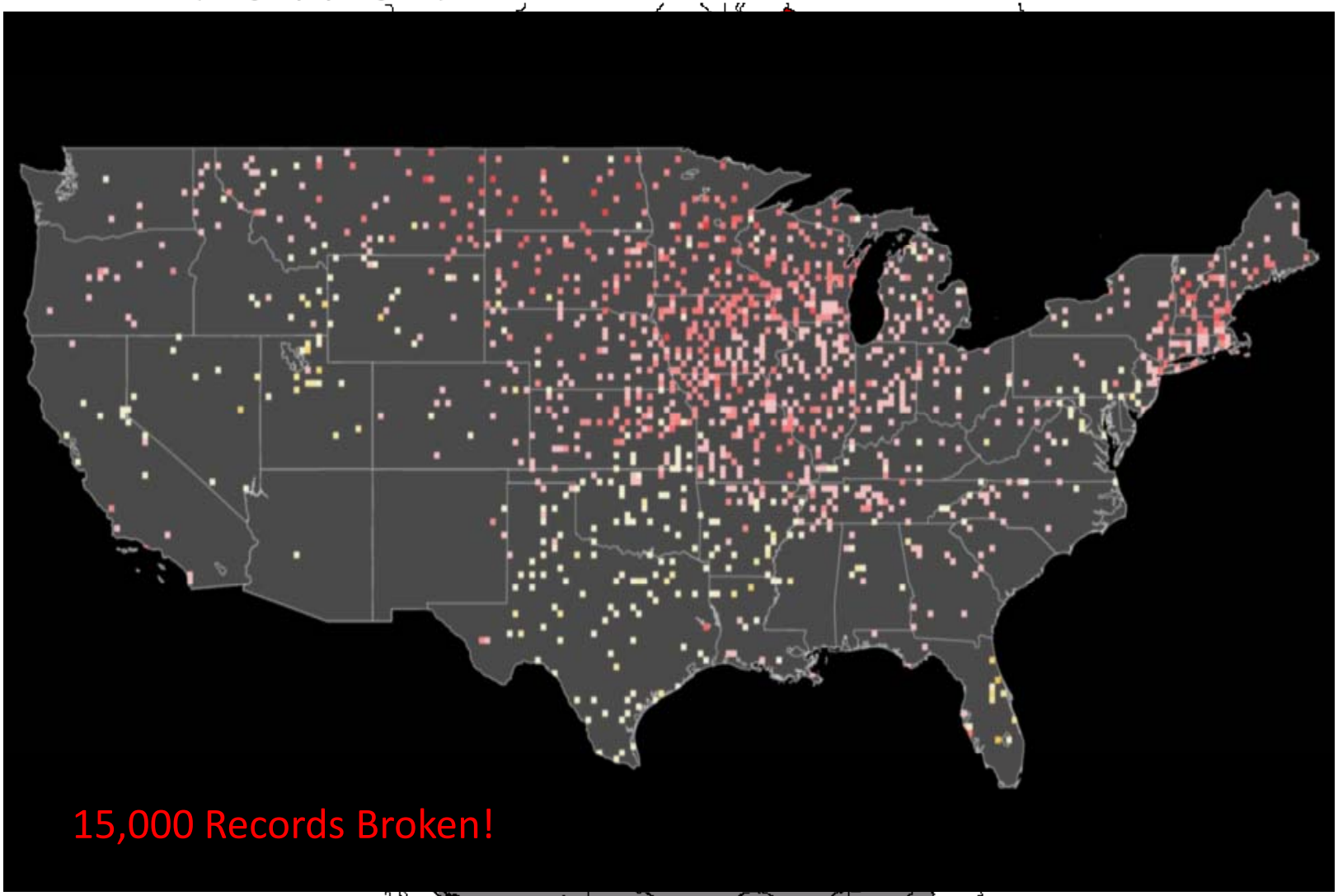
Prepared by
NOAA, National Weather Service
Colorado Basin River Forecast Center
Salt Lake City, Utah
www.cbrfc.noaa.gov

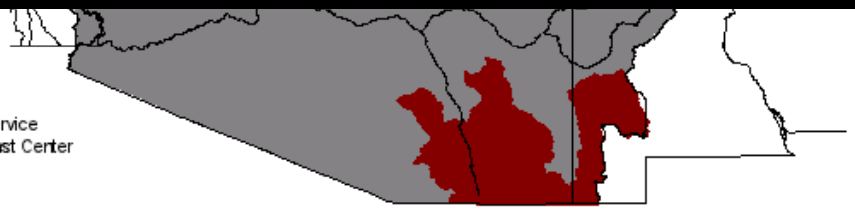




Monthly Max Temp Deviation for March 2012

(Averaged by Hydrologic Unit)





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Salt Lake City, Utah
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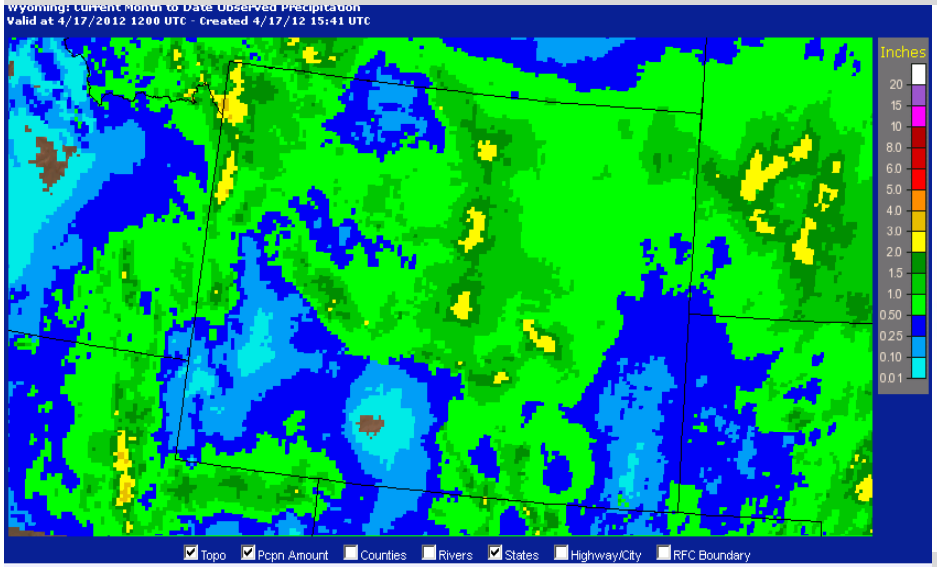
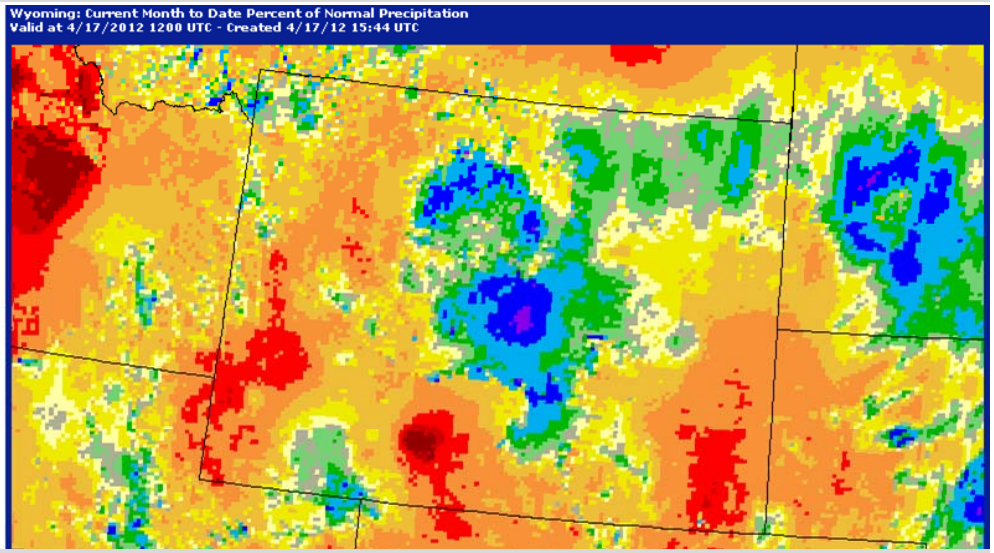
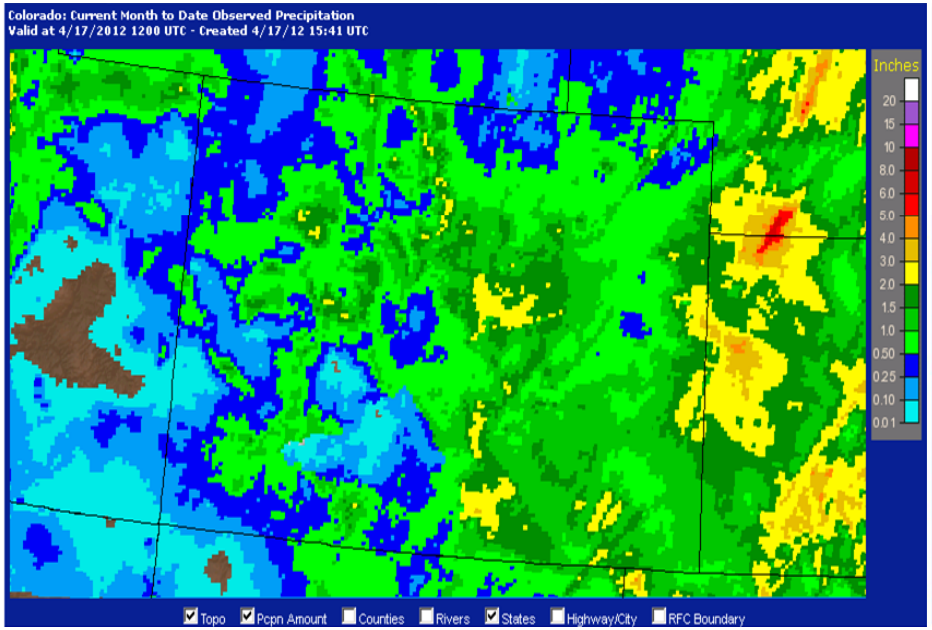
April Precipitation….so far

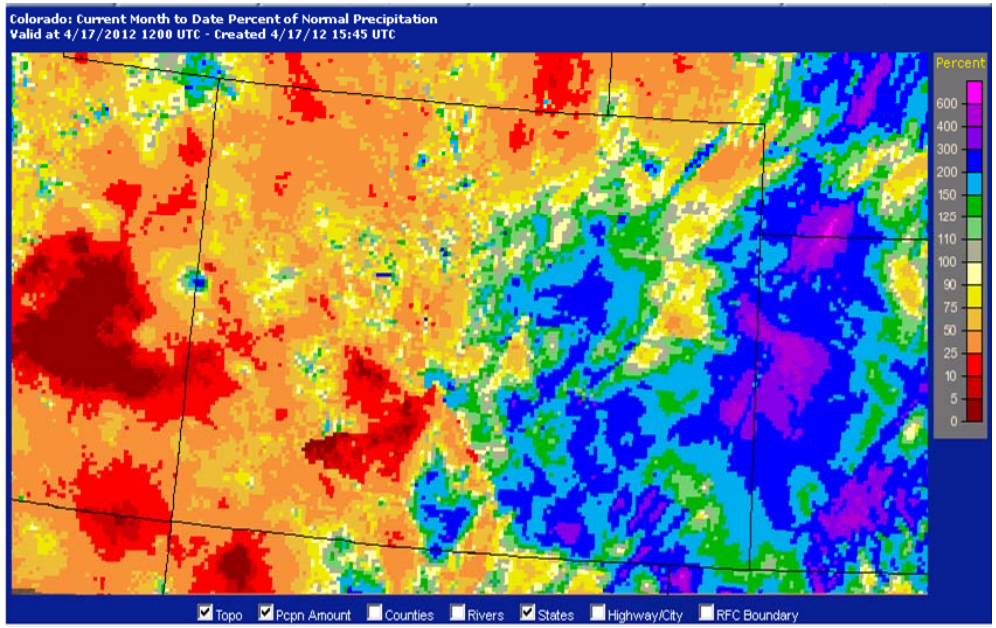
Wyoming



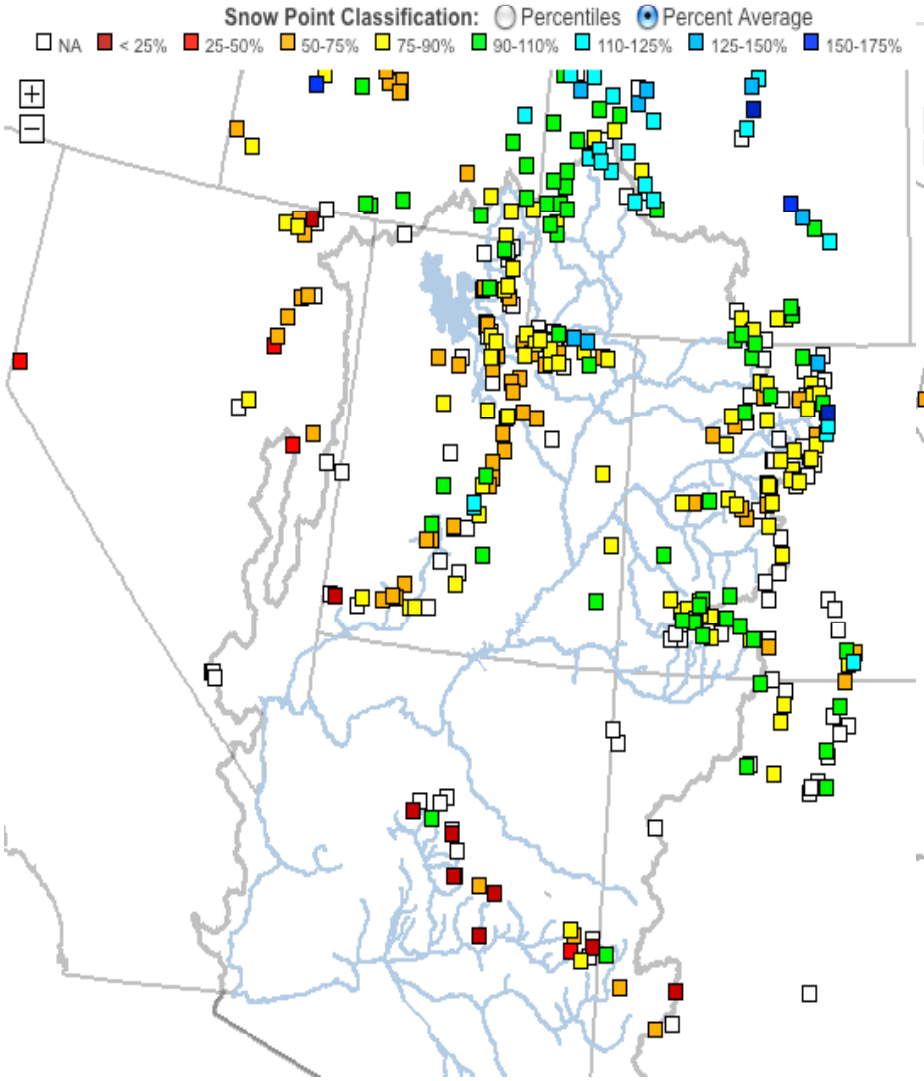


Colorado

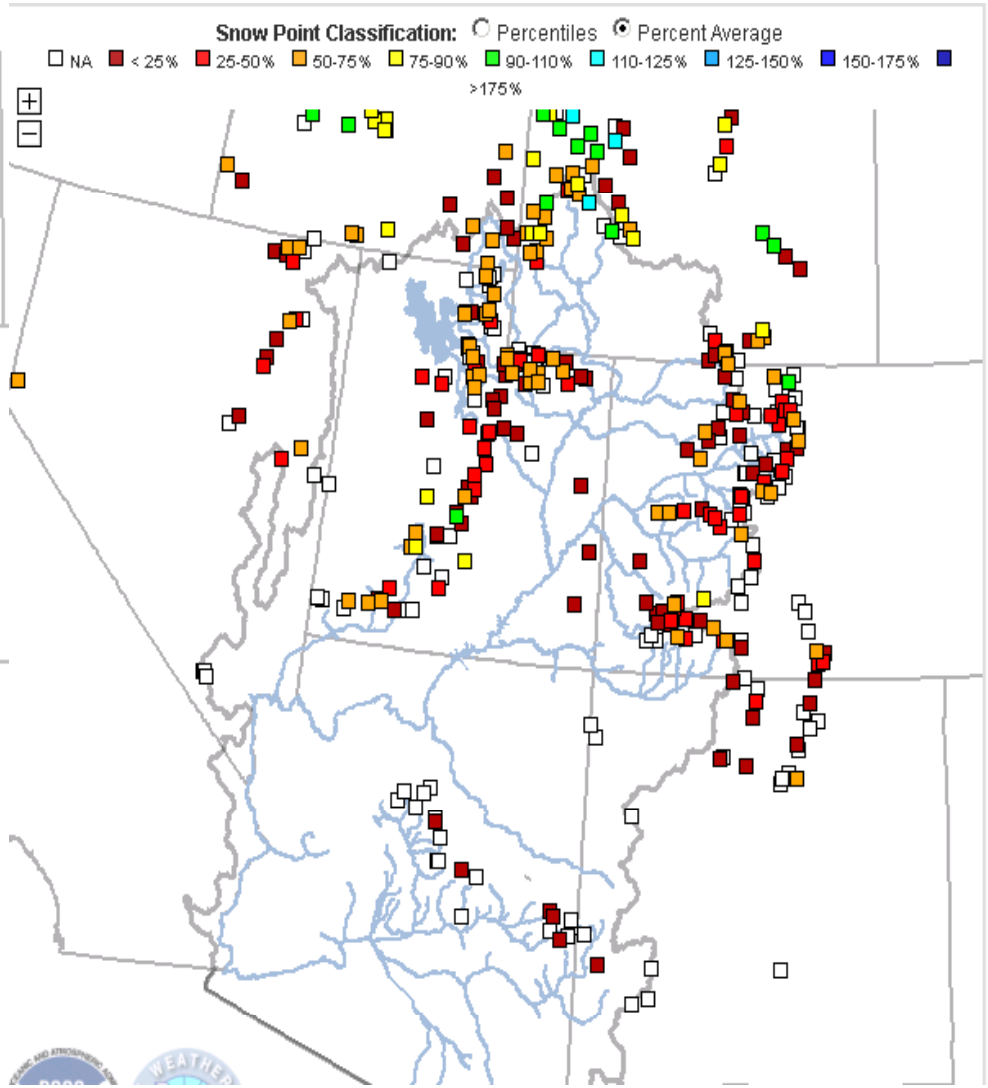




Snow

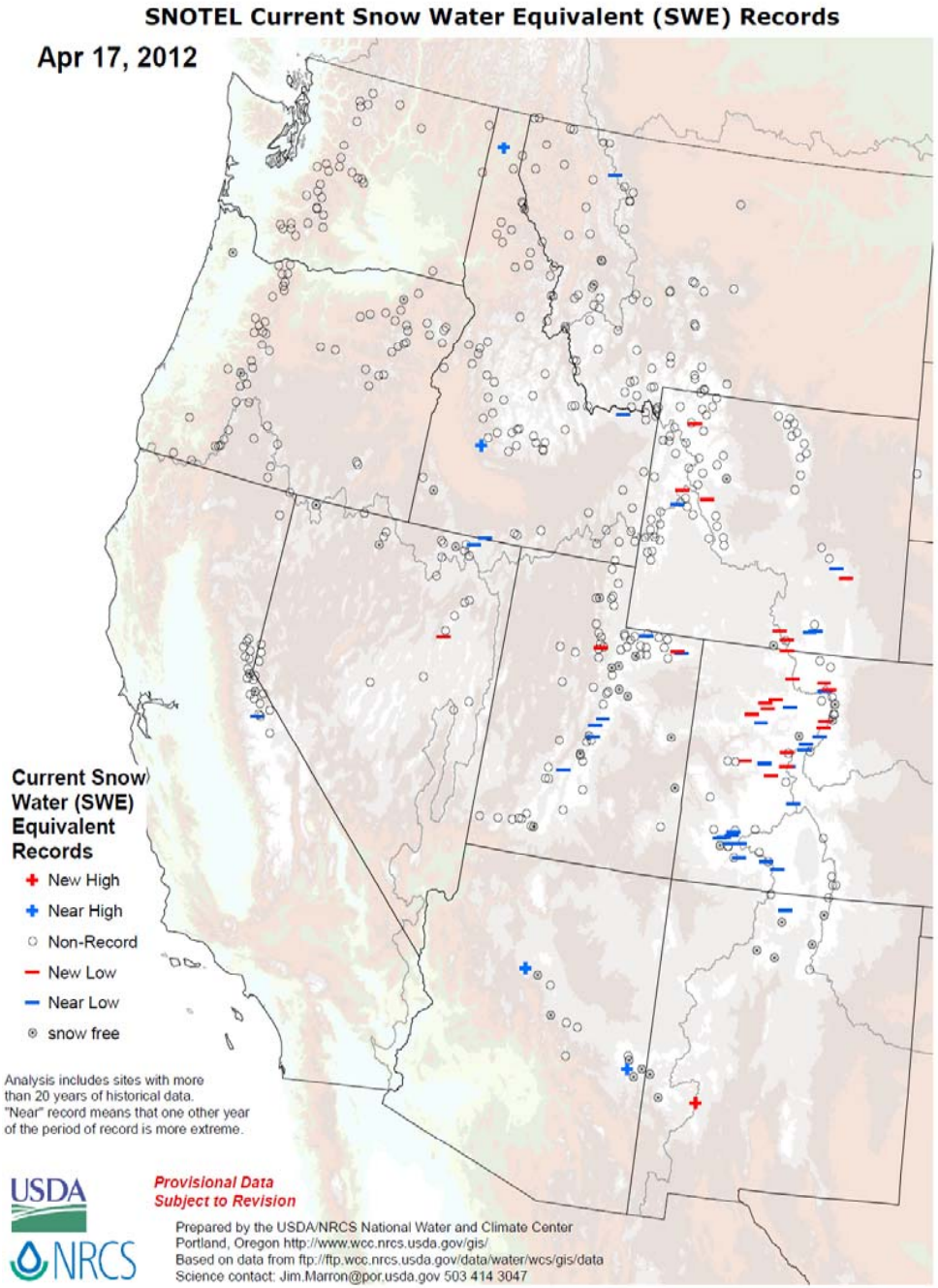


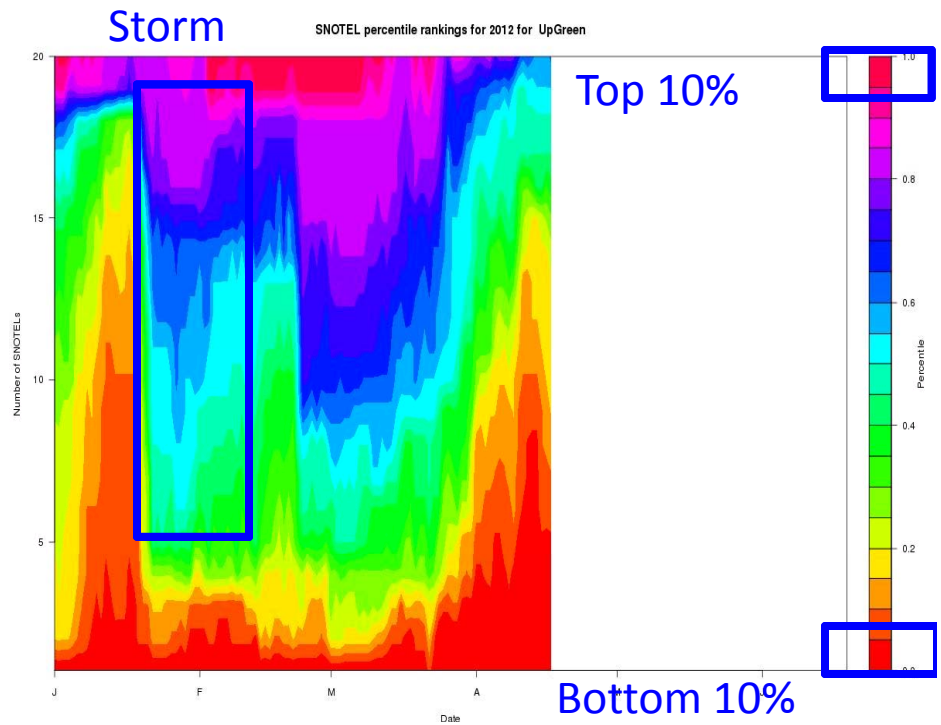
March 6, 2012

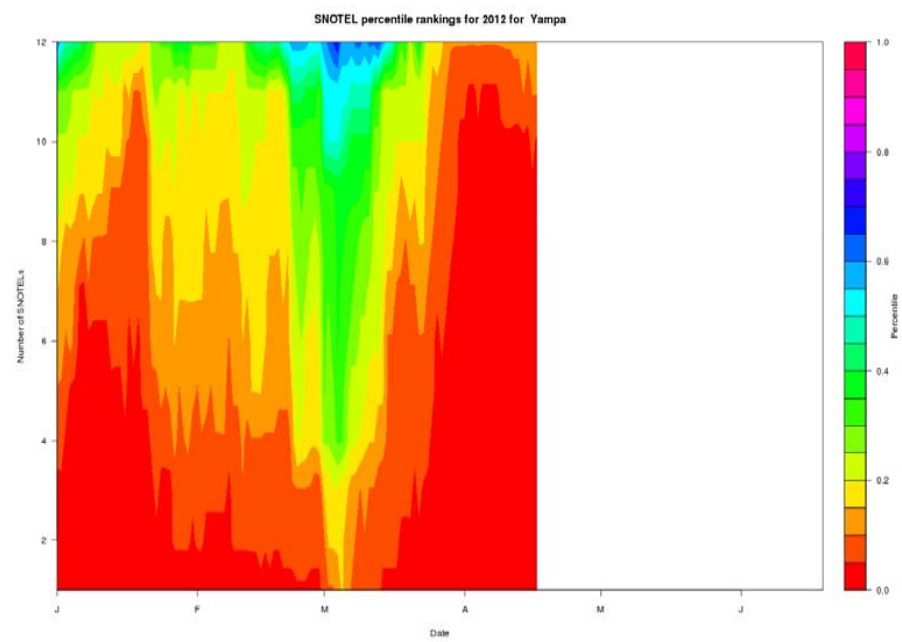


April 17, 2012

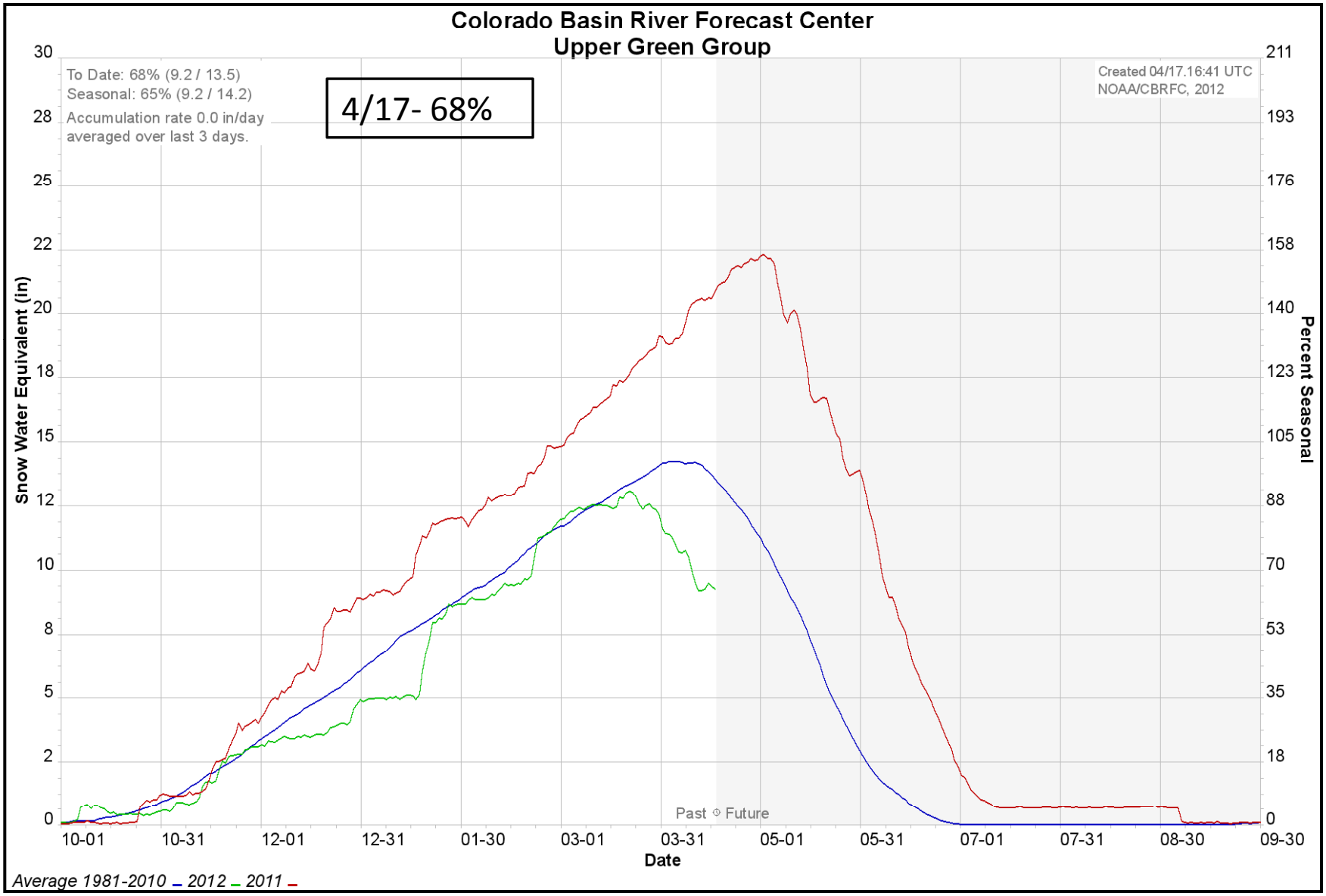
Web Reference: http://www.cbrfc.noaa.gov/gmap/gmapm.php?scon=checked


SNOTEL Current Snow Water Equivalent (SWE) Records
Apr 17, 2012
Current Snow Water (SWE) Equivalent Records
New High
Near High
Non-Record
New Low
Near Low
snow free
Analysis includes sites with more than 20 years of historical data.
"Near" record means that one other year of the period of record is more extreme.
USDA
NRCS
Provisional Data
Subject to Revision
Prepared by the USDA/NRCS National Water and Climate Center
Portland, Oregon http://www.wcc.nrcs.usda.gov/gis/
Based on data from ftp://ftp.wcc.nrcs.usda.gov/data/water/wcs/gis/data
Science contact: Jim.Marron@por.usda.gov 503 414 3047

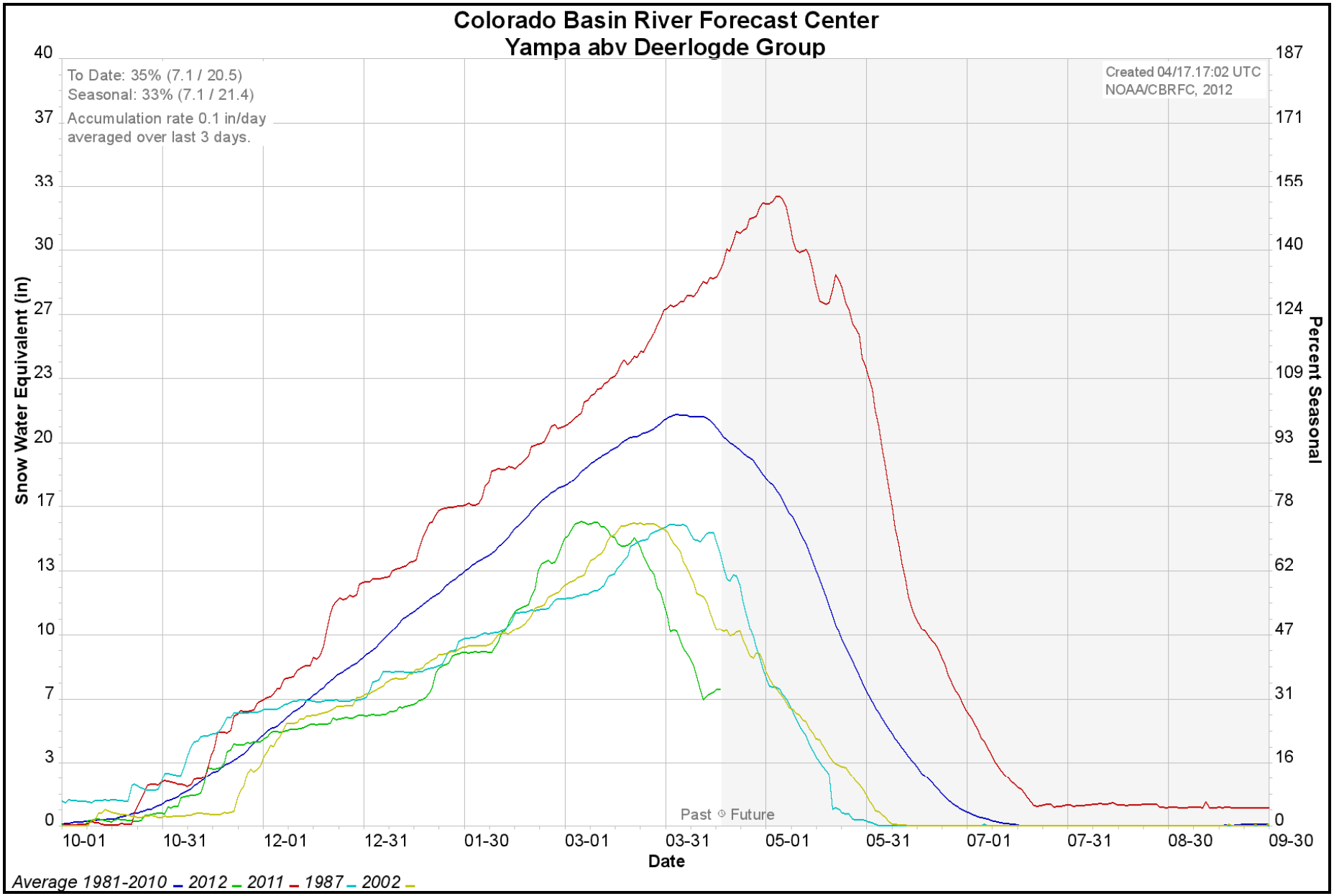

Storm
SNOTEL percentile rankings for 2012 for UpGreen
Top 10%
Bottom 10%
Number of SNOTELs
Date
Percentile
J
F
M
A


SNOTEL percentile rankings for 2012 for Yampa
Number of SNOTELs
Date
Percentile
J
F
M
A
M
J

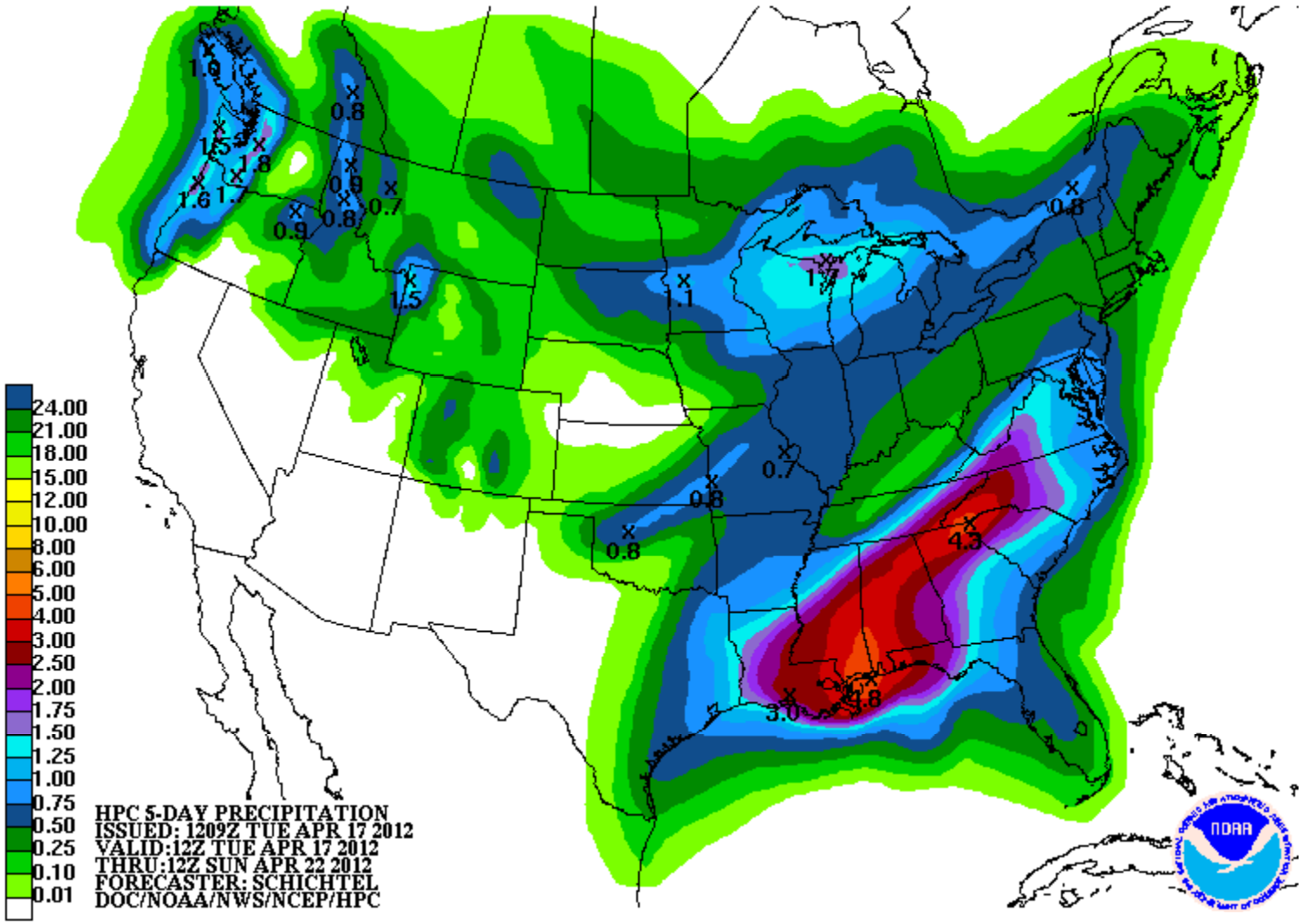
UPPER GREEN:SNOW



YAMPA:SNOW


Colorado Basin River Forecast Center
Yampa abv Deerlogde Group
To Date: 35% (7.1 / 20.5)
Seasonal: 33% (7.1 / 21.4)
Accumulation rate 0.1 in/day
averaged over last 3 days.
Created 04/17.17:02 UTC
NOAA/CBRFC, 2012
Snow Water Equivalent (in)
Percent Seasonal
Date
Past
Future
10-01
10-31
12-01
12-31
01-30
03-01
03-31
05-01
05-31
07-01
07-31
08-30
09-30
Average 1981-2010
2012
2011
1987
2002

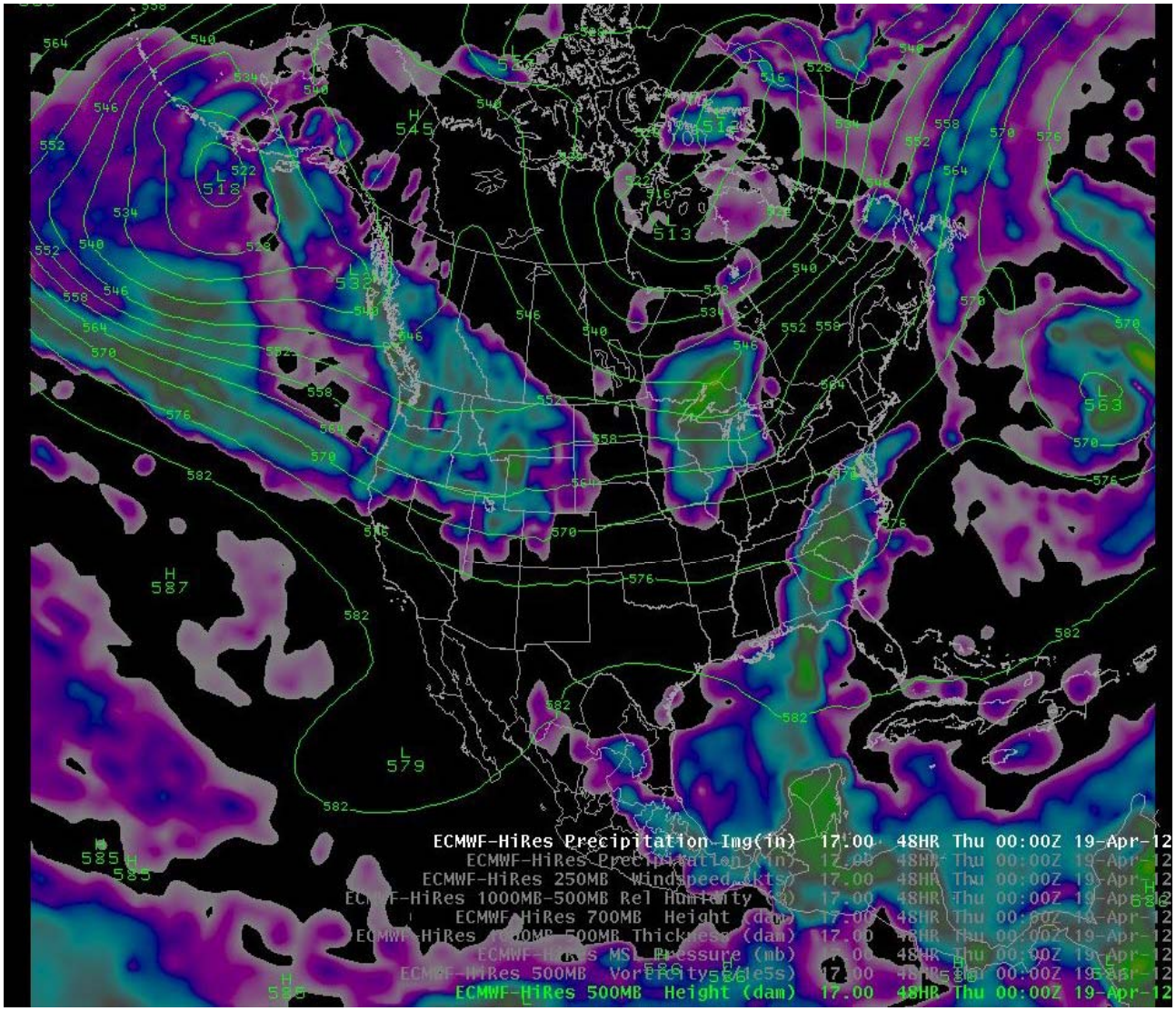
Forecast Precipitation



Web Reference: www.hpc.noaa.gov

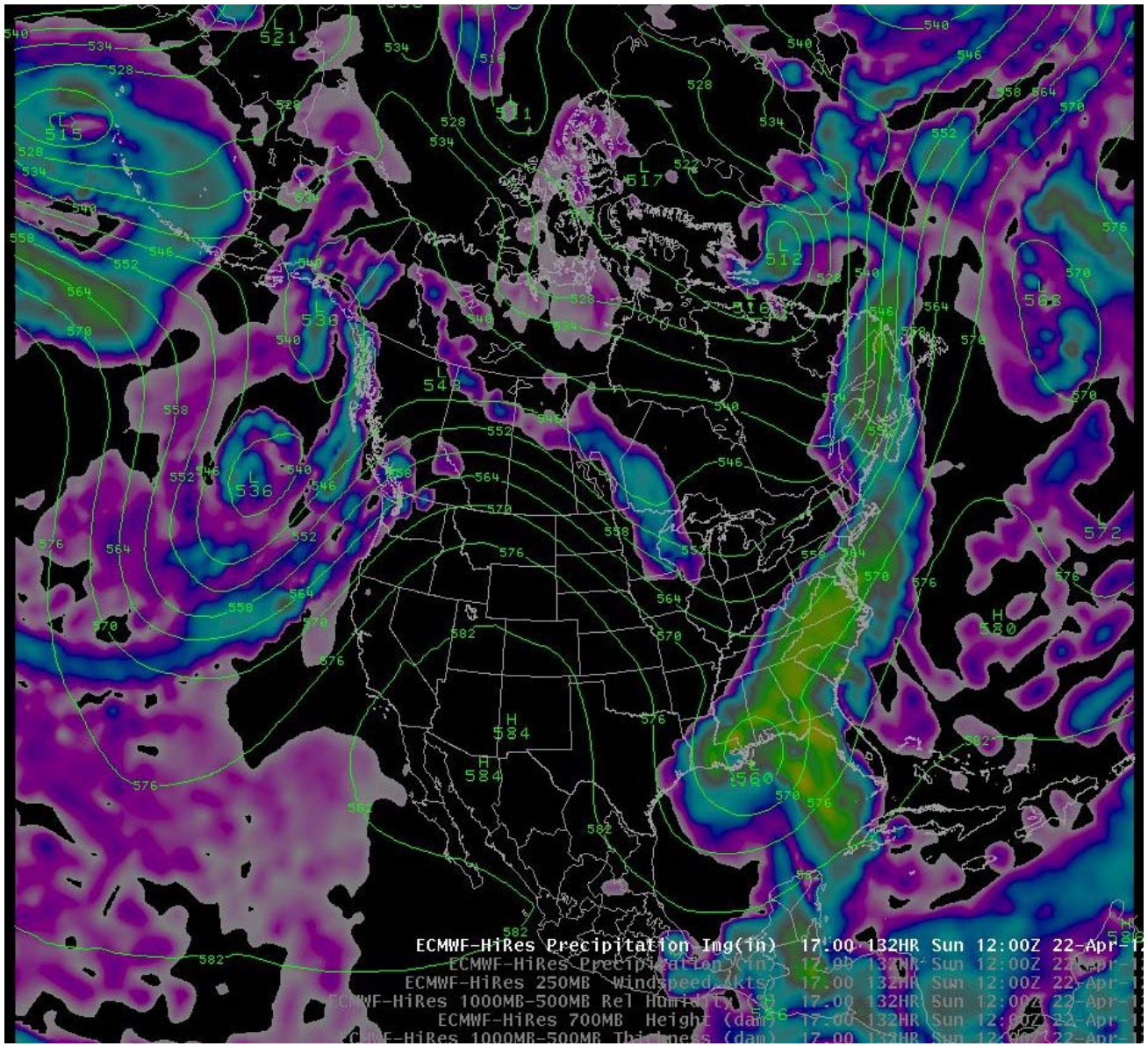
Weather Forecast

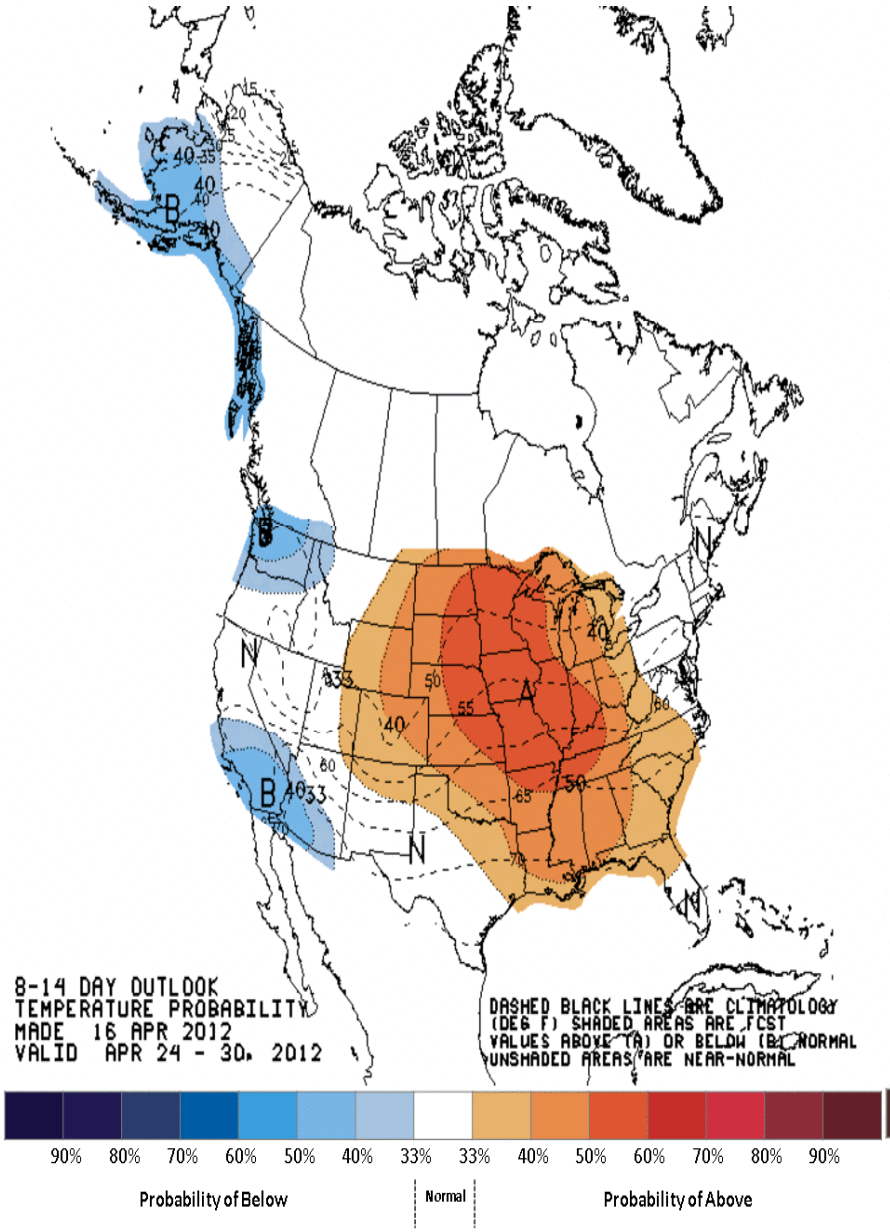
- Series of weak troughs and shortwaves.
- Showers and cooler temperatures through Friday.

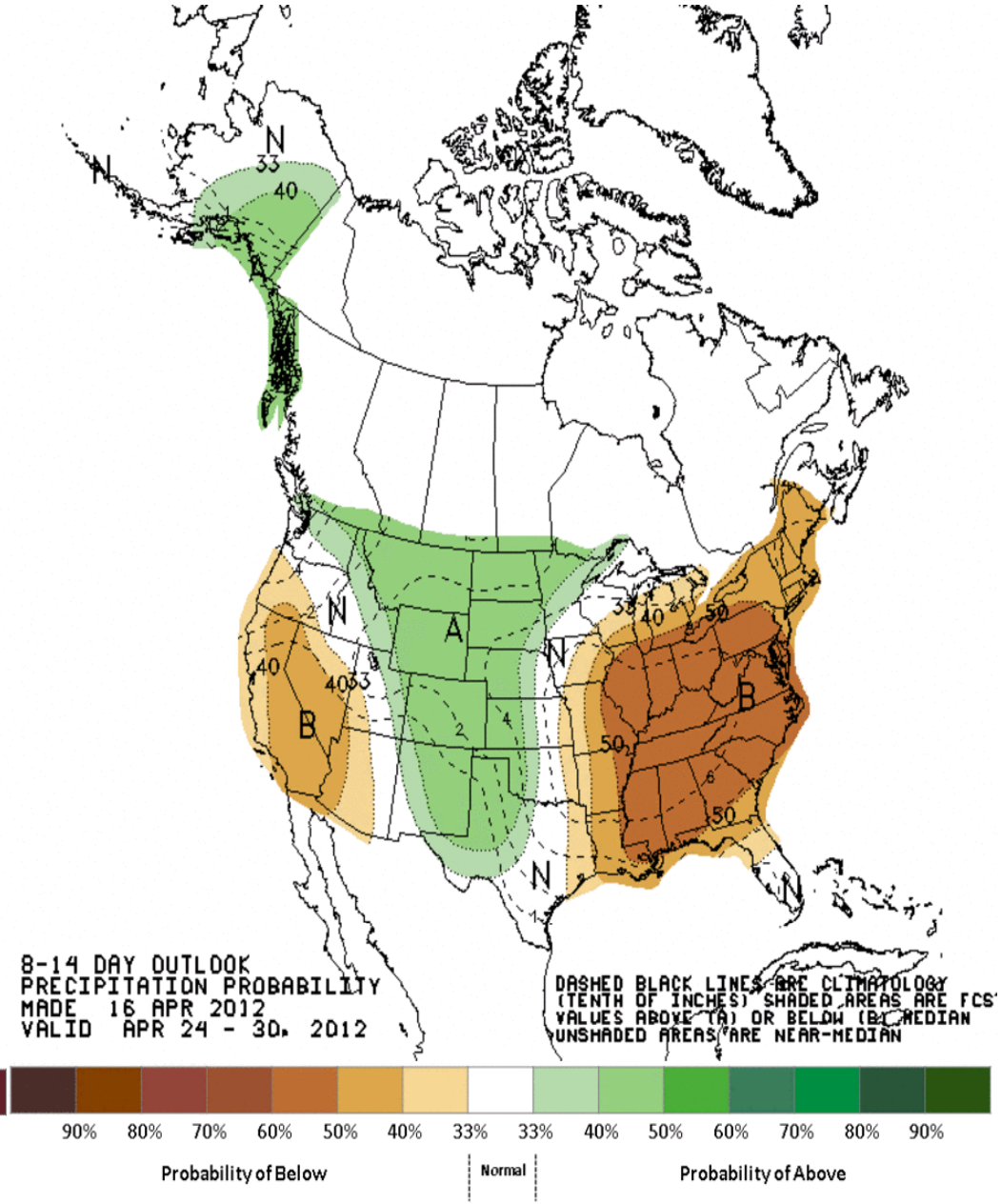


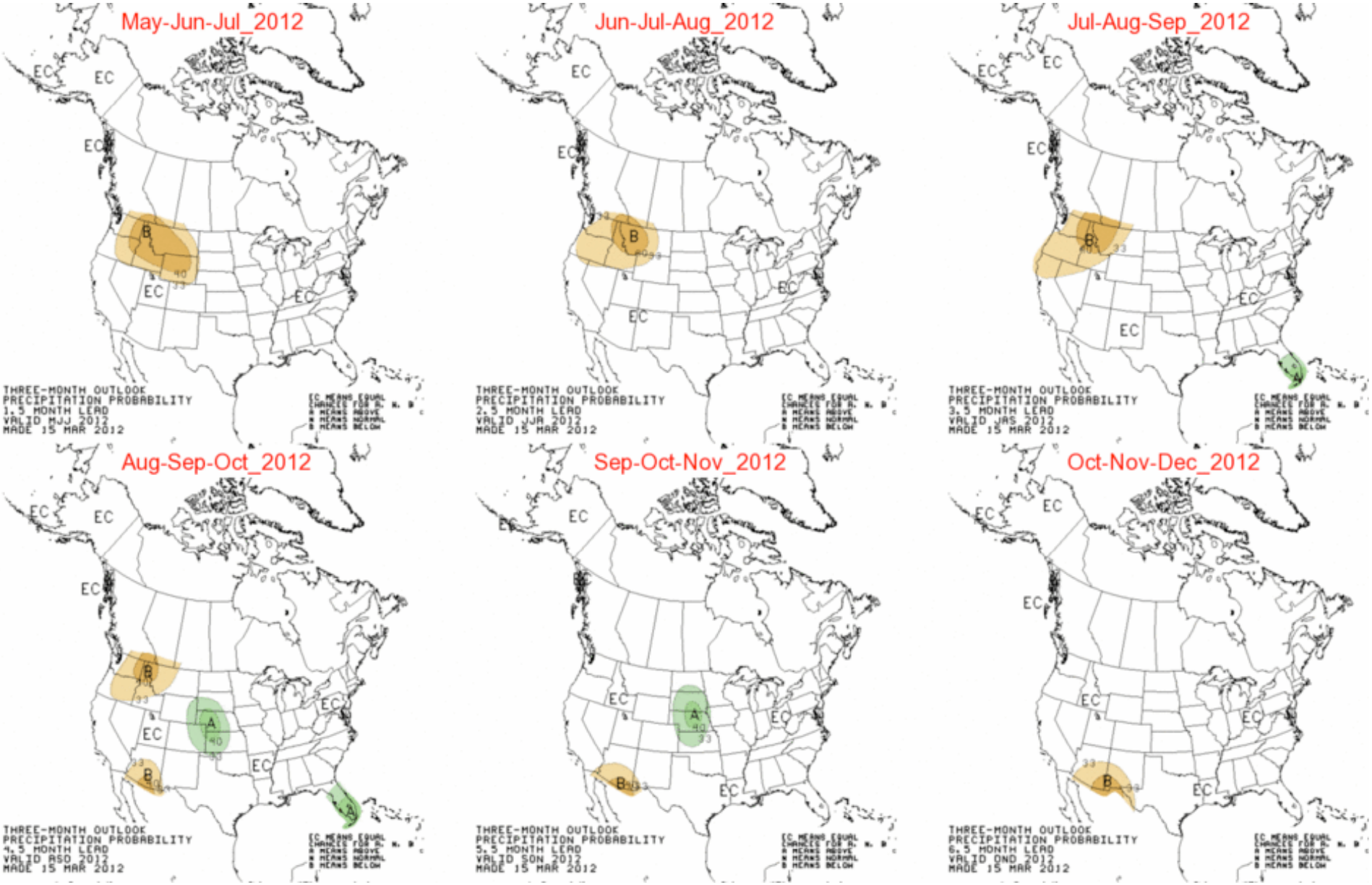
Weather Forecast

- Strong ridge of high pressure builds through the weekend into early next week.
- Above average temperatures through at least Tuesday…maybe longer

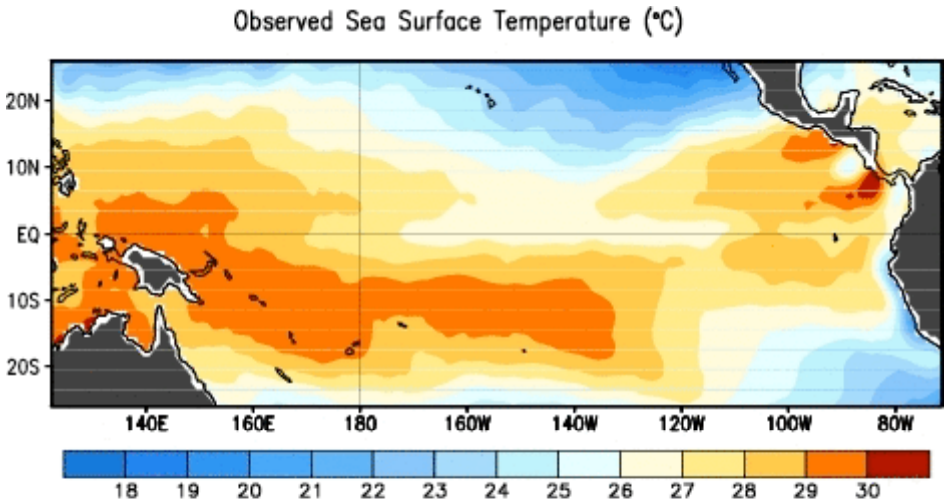


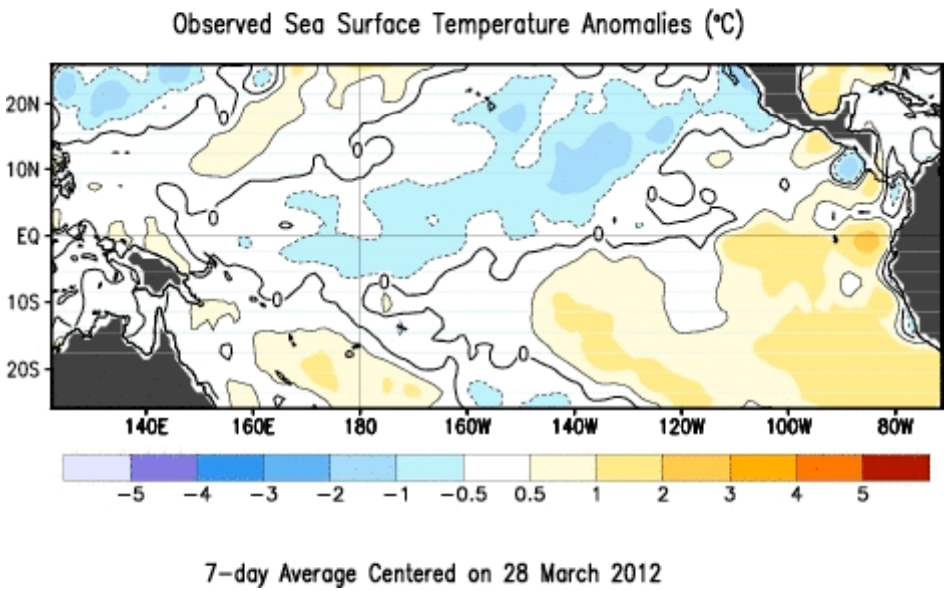

8-14 DAY OUTLOOK
TEMPERATURE PROBABILITY
MADE 16 APR 2012
VALID APR 24 - 30, 2012
DASHED BLACK LINES ARE CLIMATOLOGY
(DEG F) SHADED AREAS ARE FCST
VALUES ABOVE (A) OR BELOW (B) NORMAL
UNSHADED AREAS ARE NEAR-NORMAL
90% 80% 70% 60% 50% 40% 33% 33% 40% 50% 60% 70% 80% 90%
Probability of Below
Normal
Probability of Above

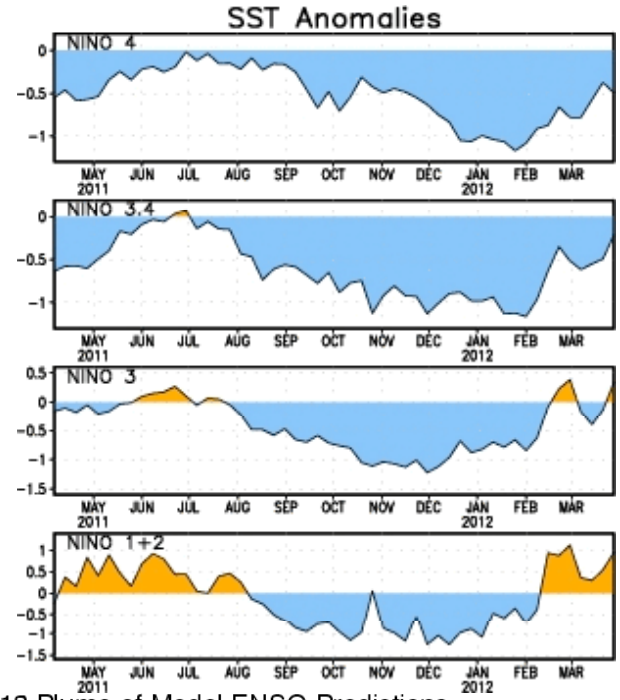

8-14 DAY OUTLOOK
PRECIPITATION PROBABILITY
MADE 16 APR 2012
VALID APR 24 - 30, 2012
DASHED BLACK LINES ARE CLIMATOLOGY
(TENTH OF INCHES) SHADED AREAS ARE FCST
VALUES ABOVE (A) OR BELOW (B) MEDIAN
UNSHADED AREAS ARE NEAR-MEDIAN
90% 80% 70% 60% 50% 40% 33% 33% 40% 50% 60% 70% 80% 90%
Probability of Below
Normal
Probability of Above

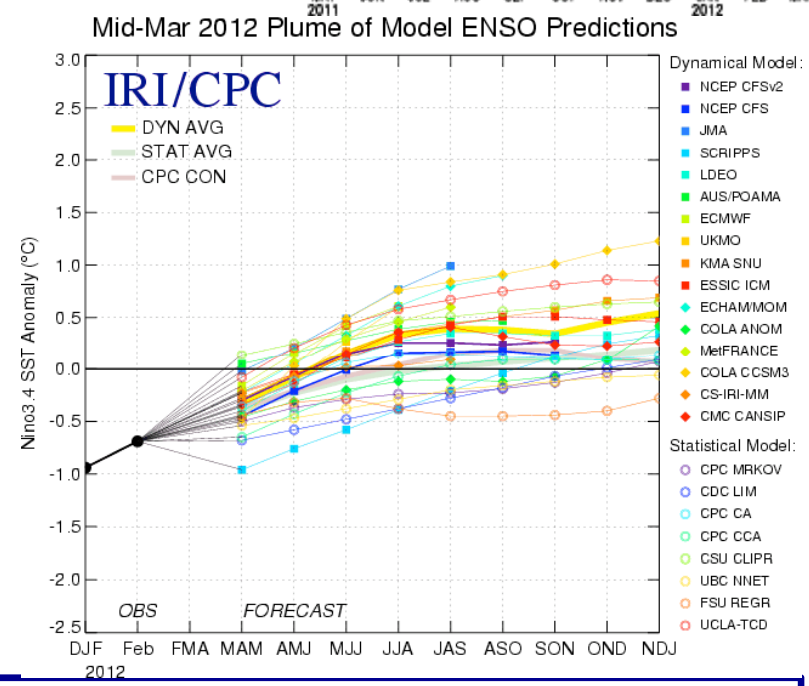

May-Jun-Jul_2012
THREE-MONTH OUTLOOK
PRECIPITATION PROBABILITY
1.5 MONTH LEAD
VALID MJJ 2012
MADE 15 MAR 2012
Jun-Jul-Aug_2012
THREE-MONTH OUTLOOK
PRECIPITATION PROBABILITY
2.5 MONTH LEAD
VALID JJA 2012
MADE 15 MAR 2012
Jul-Aug-Sep_2012
THREE-MONTH OUTLOOK
PRECIPITATION PROBABILITY
3.5 MONTH LEAD
VALID JAS 2012
MADE 15 MAR 2012
Aug-Sep-Oct_2012
THREE-MONTH OUTLOOK
PRECIPITATION PROBABILITY
4.5 MONTH LEAD
VALID ASO 2012
MADE 15 MAR 2012
Sep-Oct-Nov_2012
THREE-MONTH OUTLOOK
PRECIPITATION PROBABILITY
5.5 MONTH LEAD
VALID SON 2012
MADE 15 MAR 2012
Oct-Nov-Dec_2012
THREE-MONTH OUTLOOK
PRECIPITATION PROBABILITY
6.5 MONTH LEAD
VALID OND 2012
MADE 15 MAR 2012

La Nina Update



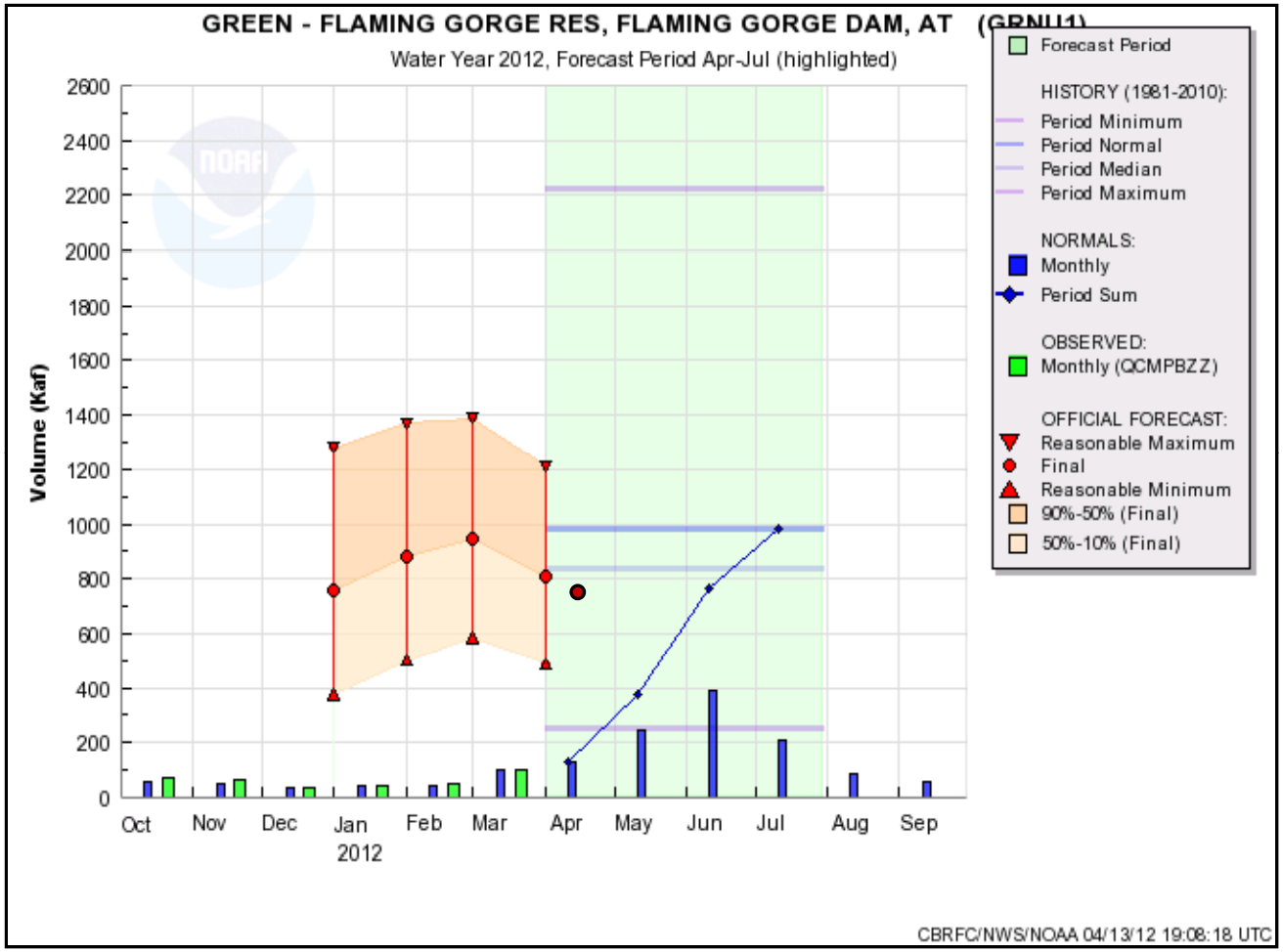






Web Reference: http://www.cpc.noaa.gov and iri.columbia.edu/climate/ENSO

FORECASTS: Upper Green



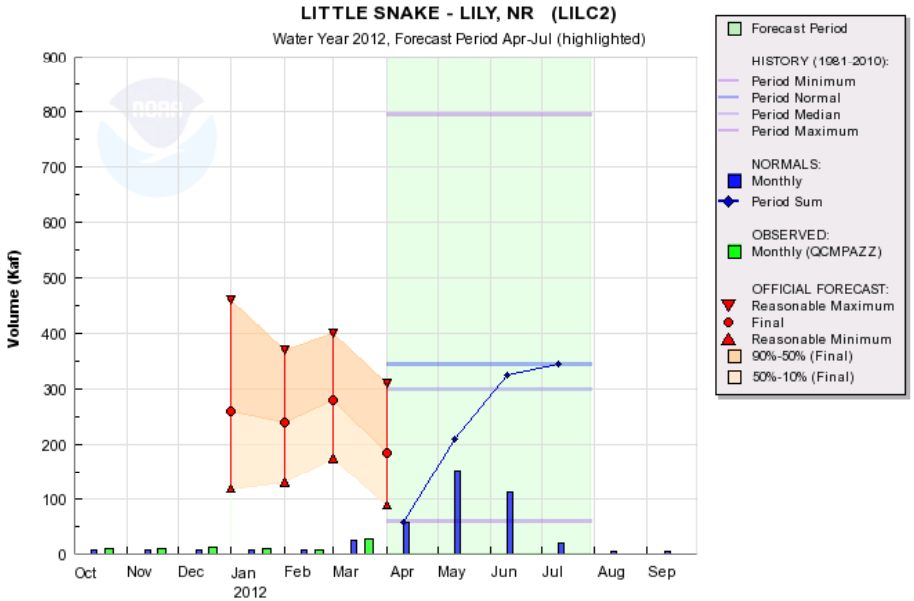
810 kaf 50% Exceedence (Official Forecast)	**97%** of Historical Median	**83%** of Historical Mean
490 kaf 90% Exceedence	**1210 kaf** 10% Exceedence	**51st of 72** Official Historical Flows

Forecast Issued: Apr 1 2012

View Water Supply Forecast Plot

APRIL 16th Forecast:
785 KAF/80%

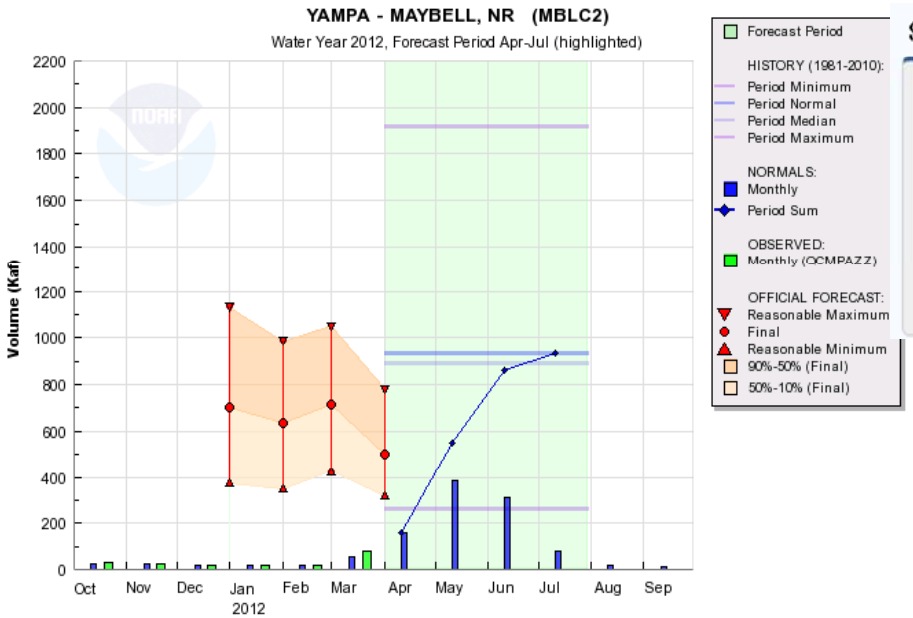
FORECASTS: YAMPA



Seasonal Water Supply Forecast — **Forecast Period: Apr-Jul**

500 kaf 50% Exceedence (Official Forecast)	**56%** of Historical Median	**54%** of Historical Mean
320 kaf 90% Exceedence	**780 kaf** 10% Exceedence	**46th of 53** Official Historical Flows

Forecast Issued: Apr 1 2012 — View Water Supply Forecast Plot



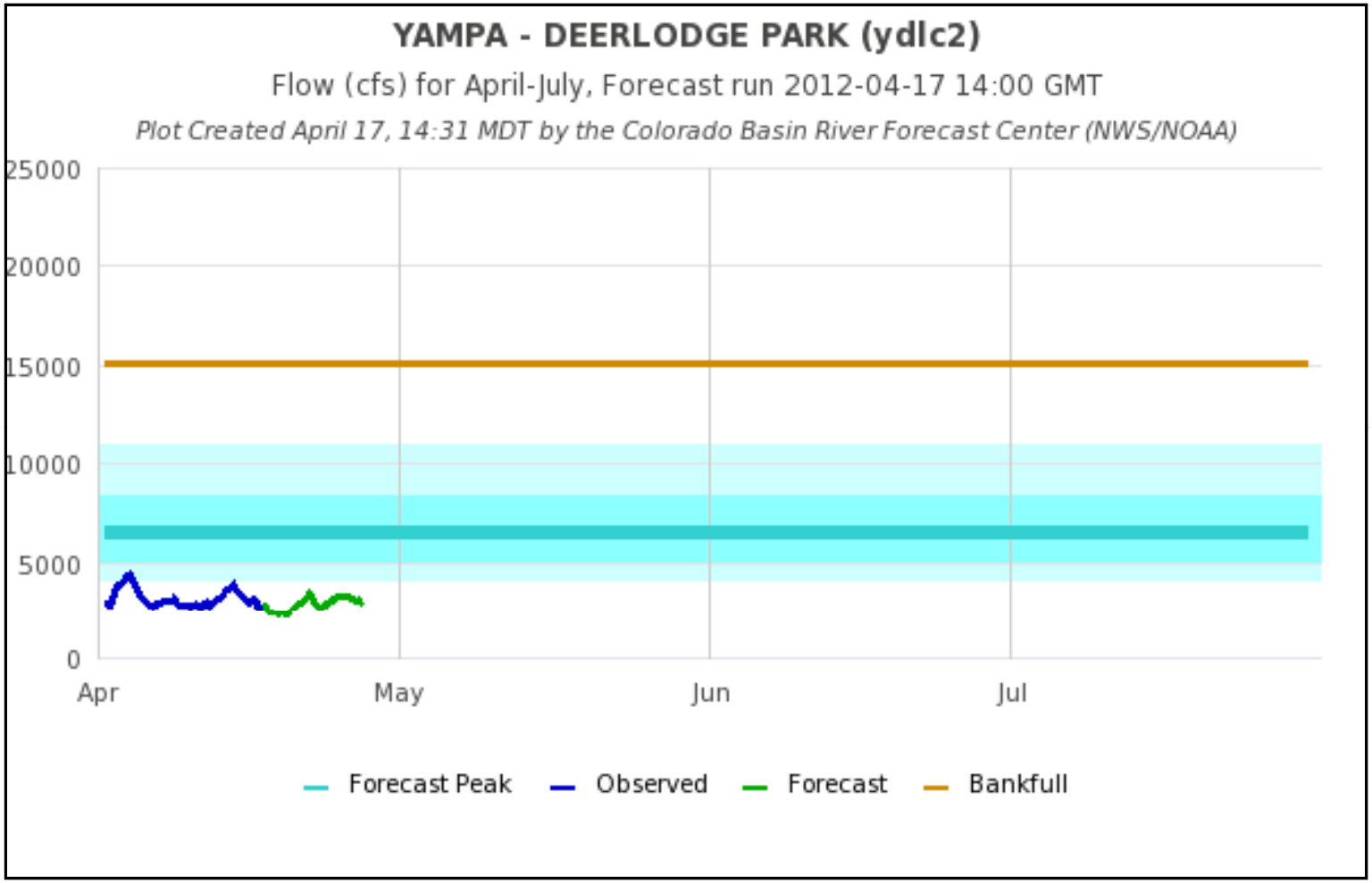
Seasonal Water Supply Forecast — **Forecast Period: Apr-Jul**

185 kaf 50% Exceedence (Official Forecast)	**62%** of Historical Median	**54%** of Historical Mean
88 kaf 90% Exceedence	**310 kaf** 10% Exceedence	**76th of 90** Official Historical Flows

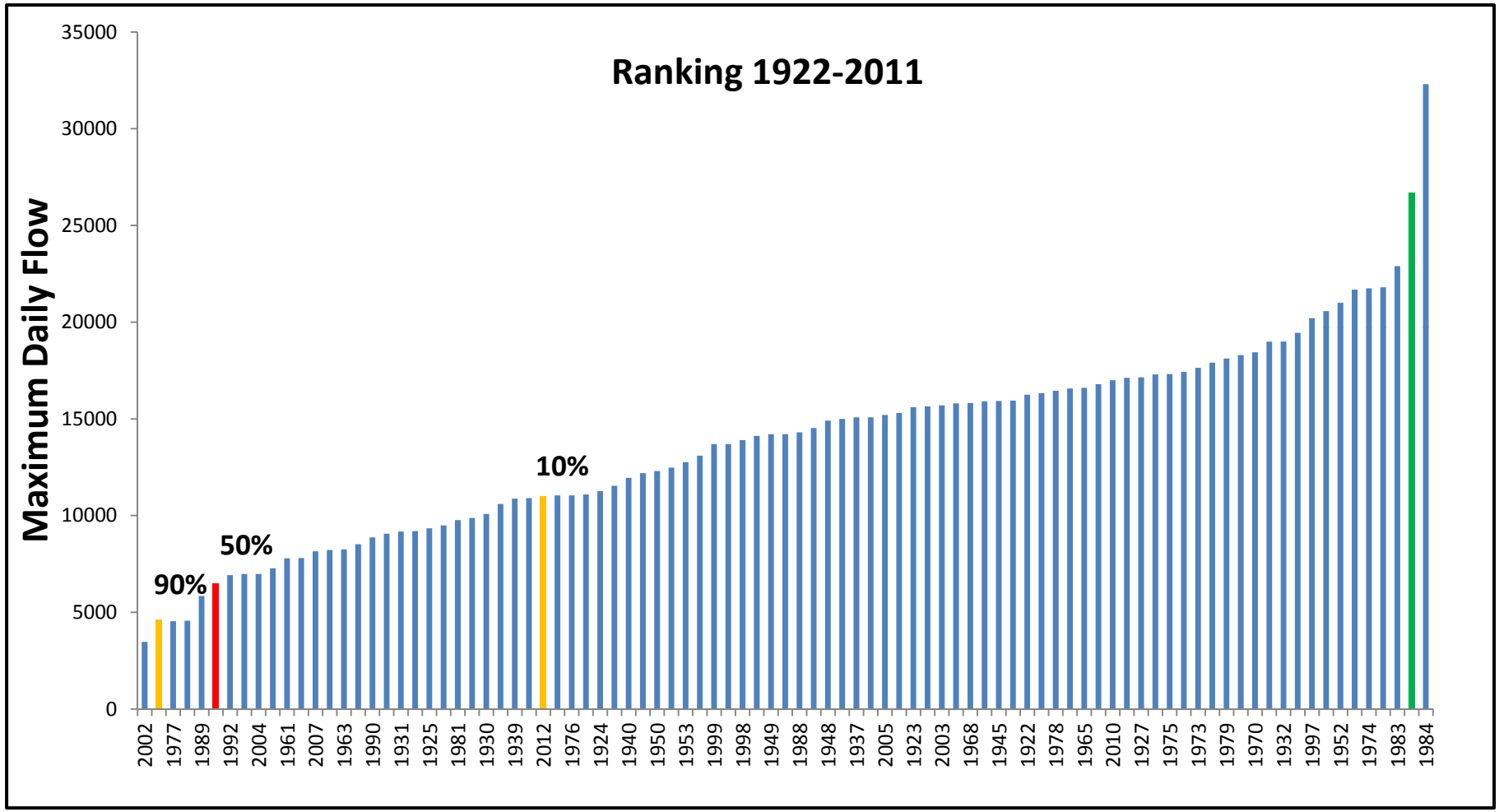
Forecast Issued: Apr 1 2012 — View Water Supply Forecast Plot

CBRFC/NWS/NOAA 04/13/12 19:11:41 UTC

Peakflow Forecasts



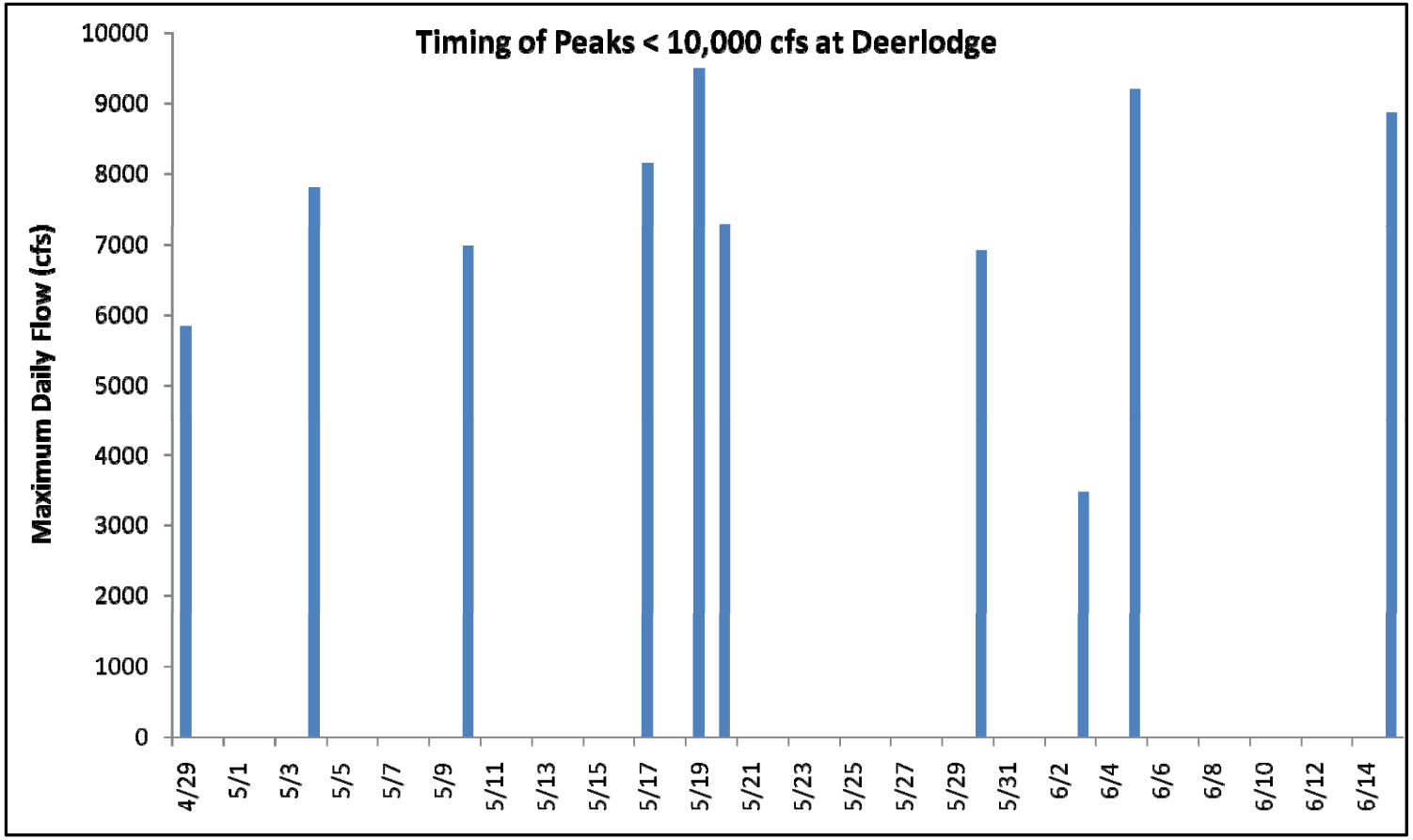
90%	75%	50%	25%	10%
4,200	5,000	**6,500**	8,500	11,000


Ranking 1922-2011
Maximum Daily Flow
35000
30000
25000
20000
15000
10000
5000
0
90%
50%
10%
2002
1977
1989
1992
2004
1961
2007
1963
1990
1931
1925
1981
1930
1939
2012
1976
1924
1940
1950
1953
1999
1998
1949
1988
1948
1937
2005
1923
2003
1968
1945
1922
1978
1965
2010
1927
1975
1973
1979
1970
1932
1997
1952
1974
1983
1984

Spring Weather Really Matters

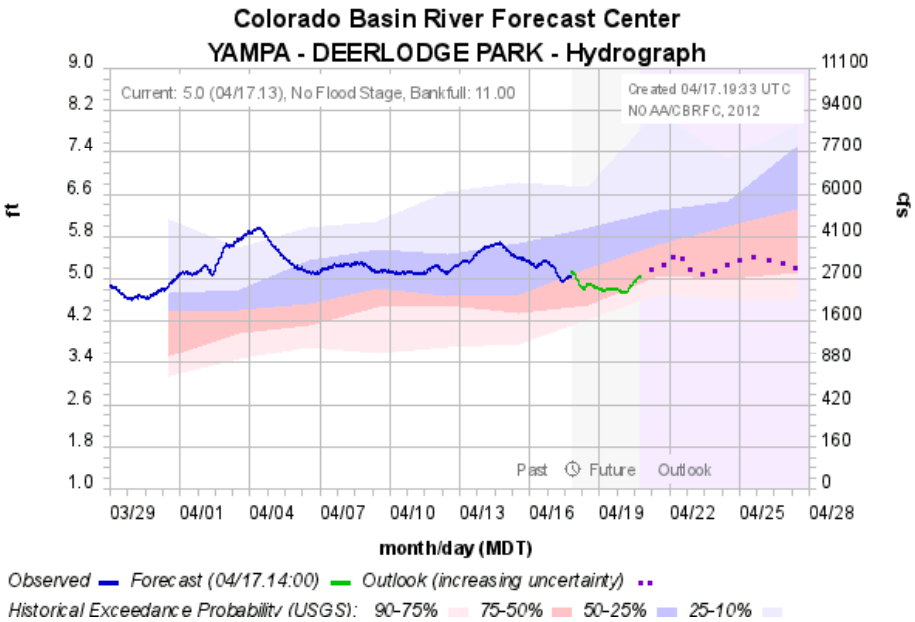
- Runoff characteristics are largely determined by the day-to-day spring weather.
  - While large snow pack years increase chances for flooding, it is not an inevitability
  - Small snow pack years (like 2010) can flood with the right sequence of spring temperatures

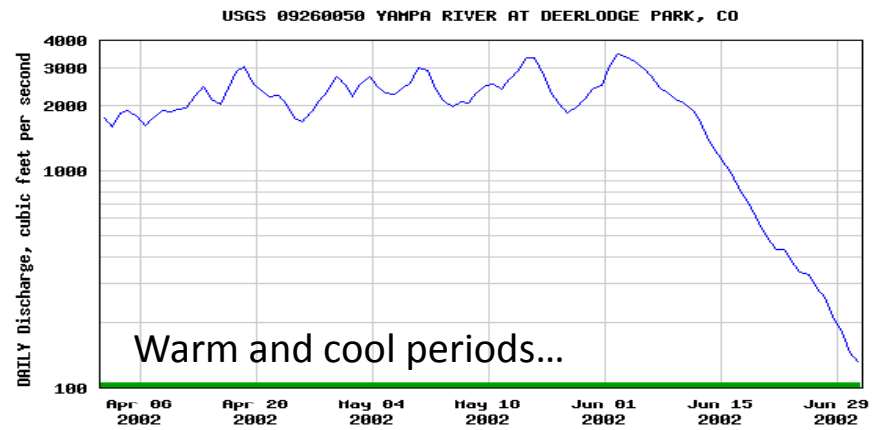
Uncertainty in Deerlodge Peak……

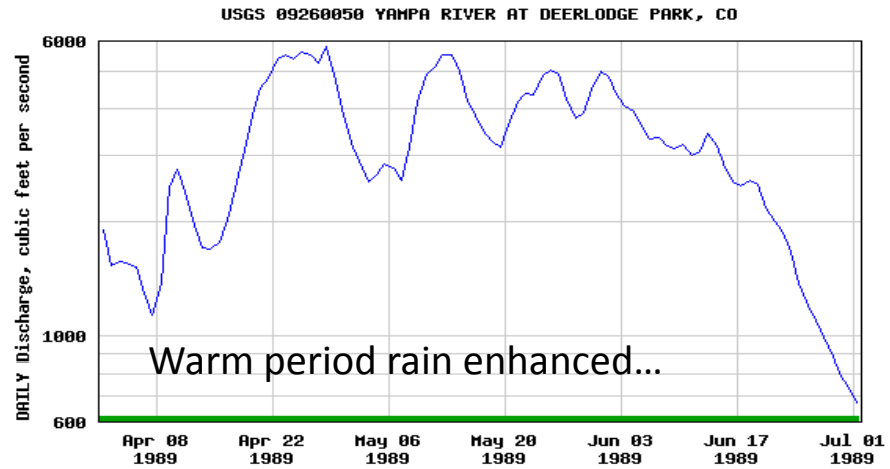


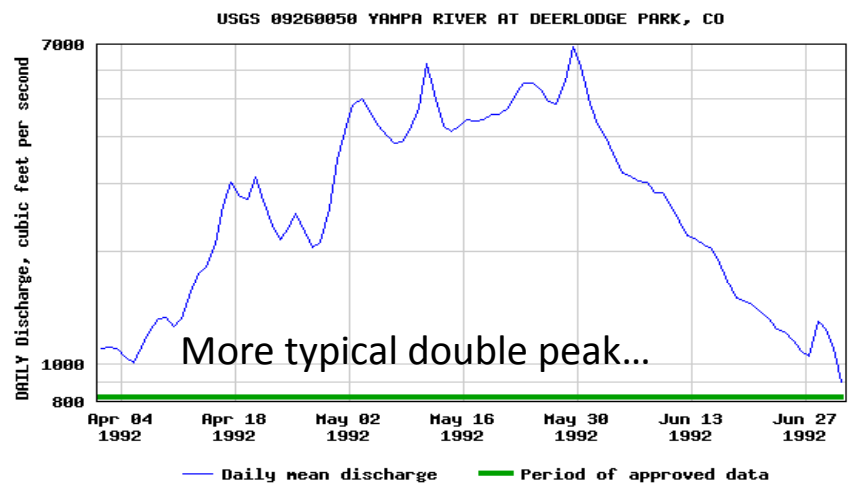
Historical timing ranges from late April to June for observed peaks similar to forecasted peak.

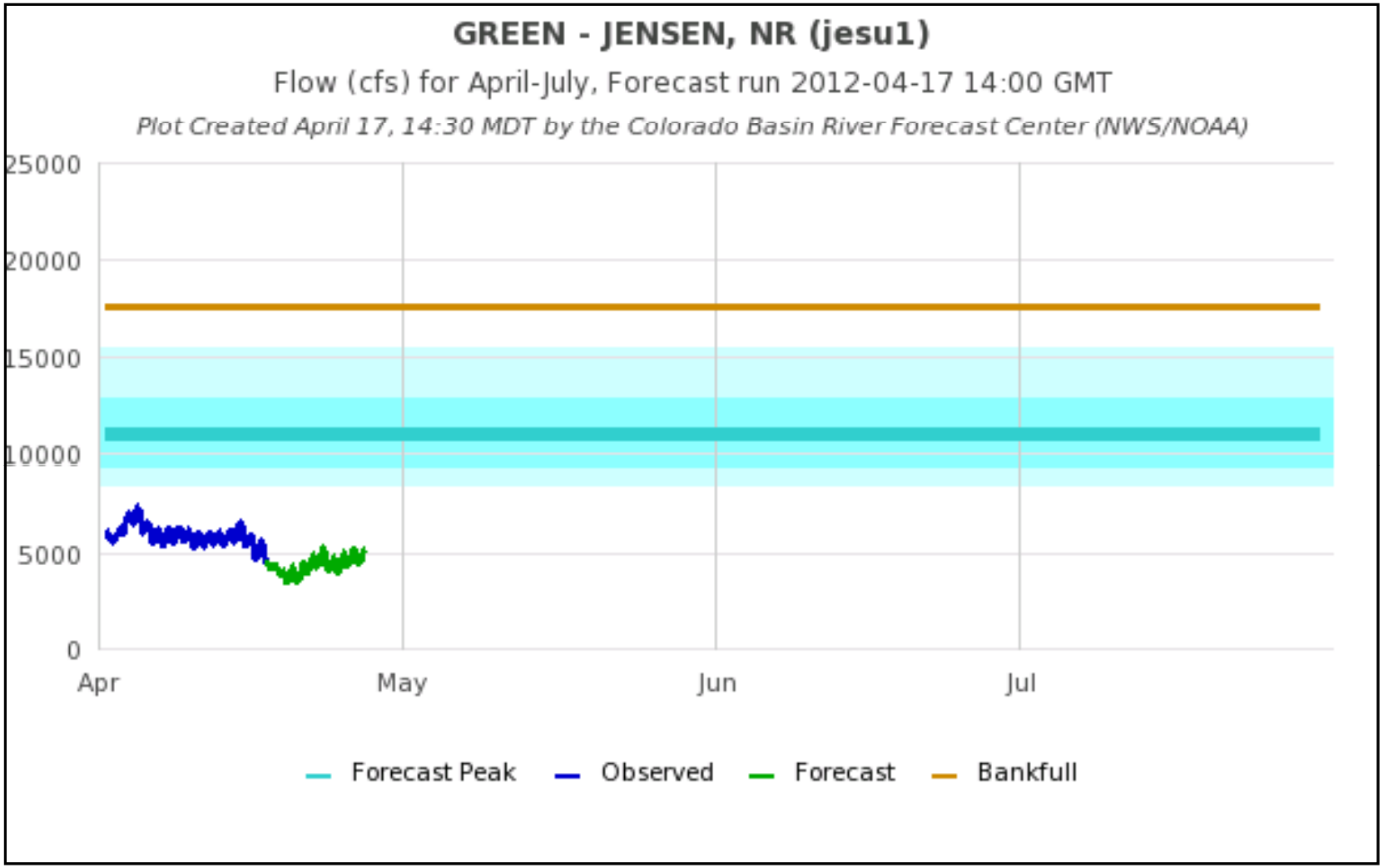
Possible Deerlodge Peak Scenarios











90%	75%	50%	25%	10%
8,500	9,500	**11,000**	13,000	15,500

Assuming 4,600 cfs release from Flaming Gorge

Questions/Comments?

Ashley Nielson

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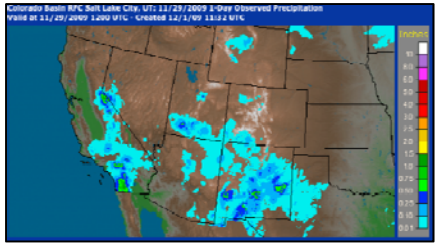
Email: ashley.nielson@noaa.gov

How do we make forecasts?

Model Inputs/Outputs



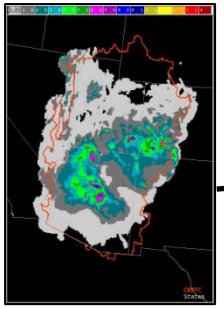
Precipitation Estimates

Radar Data

Satellite Data

River Gage Data

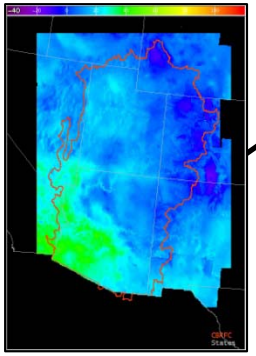
Reservoir Releases



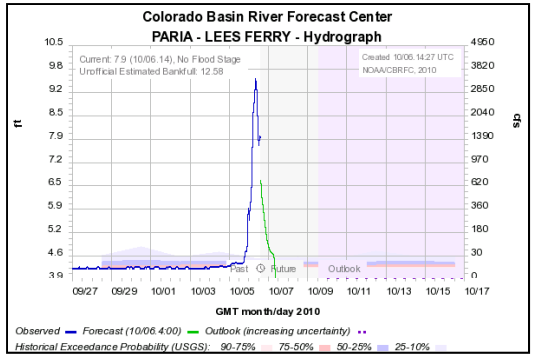
Precipitation Forecasts

HYDRO MODEL

Snow



Temperature Forecasts



Deterministic / Probabilistic River Forecasts

Quality of forecast depends on inputs !!

Water Supply:Two Methods

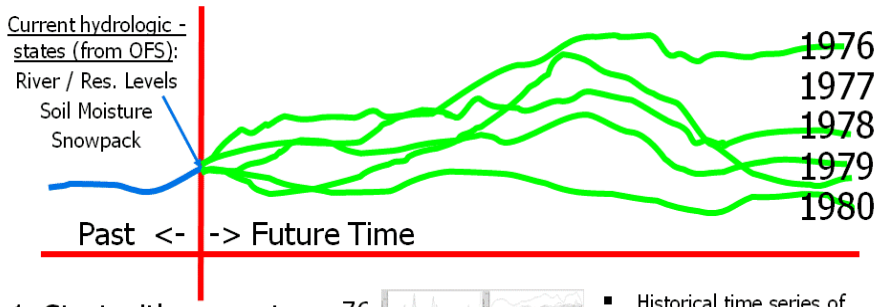
Statistical

- Regression equations, between measurements of observed climate conditions (predictor variables) and streamflow for a specific period.

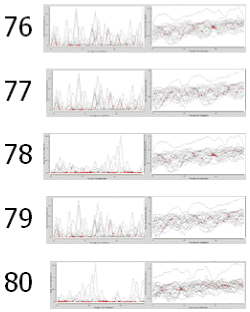
- Predictors used by the CBRFC (Min 30 yrs of record).
  - Total precipitation (for a month or period of months)
  - First of month snow water equivalent (SNOTEL data)
  - Monthly flow volume
  - Climate Signals: El Nino Southern Oscillation Index (SOI)

Ensemble Streamflow Prediction

- Continuous, conceptual, hydrologic model



1. Start with current conditions
2. Apply each year of historical climate
3. Create several possible future streamflow patterns



- Historical time series of precipitation and temperature (from Calibration)
- Currently using water years 1976-2005.
- Use historical data because predicting long term future is difficult