

Fontenelle Working Group Meeting: CBRFC Forecast Update

April 21, 2011

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NWS Colorado River Basin Forecast Center



Outline

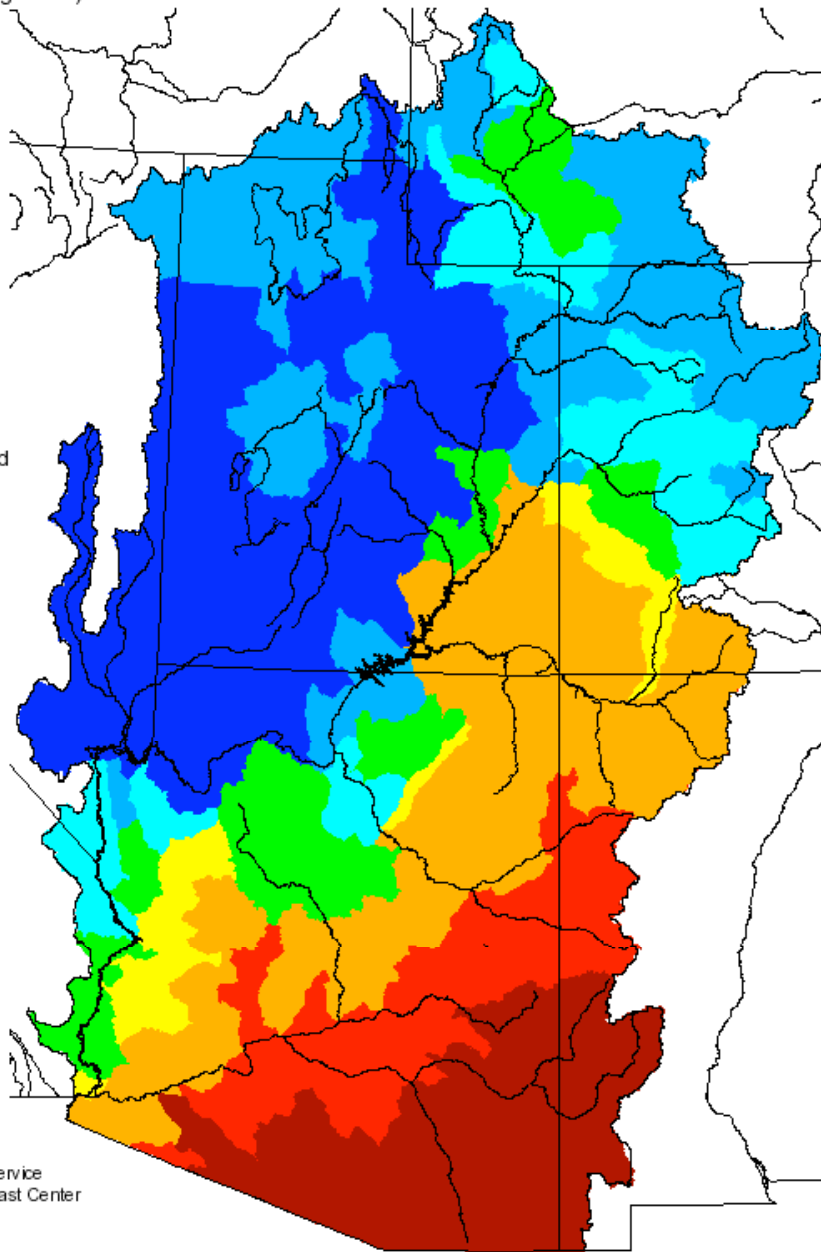
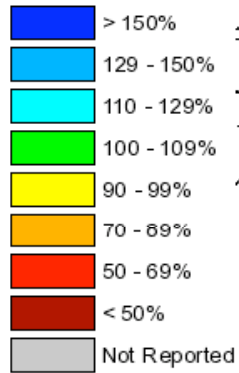
1. Current Conditions
 - Precipitation
 - Snow
2. Water Supply Forecasts
3. 30 year average update



Seasonal Precipitation, October 2010 - March 2011

(Averaged by Hydrologic Unit)

% Average

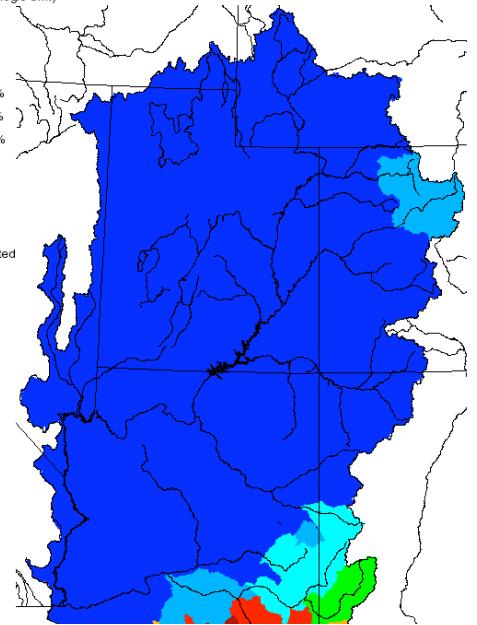
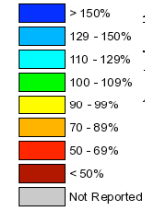


Prepared by
 NOAA, National Weather Service
 Colorado Basin River Forecast Center
 Salt Lake City, Utah
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Monthly Precipitation for December 2010

(Averaged by Hydrologic Unit)

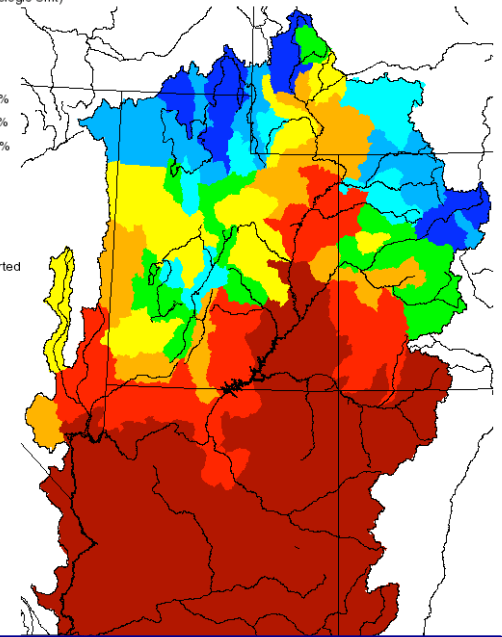
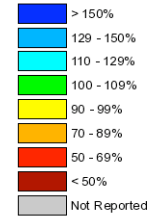
% Average



Monthly Precipitation for March 2011

(Averaged by Hydrologic Unit)

% Average



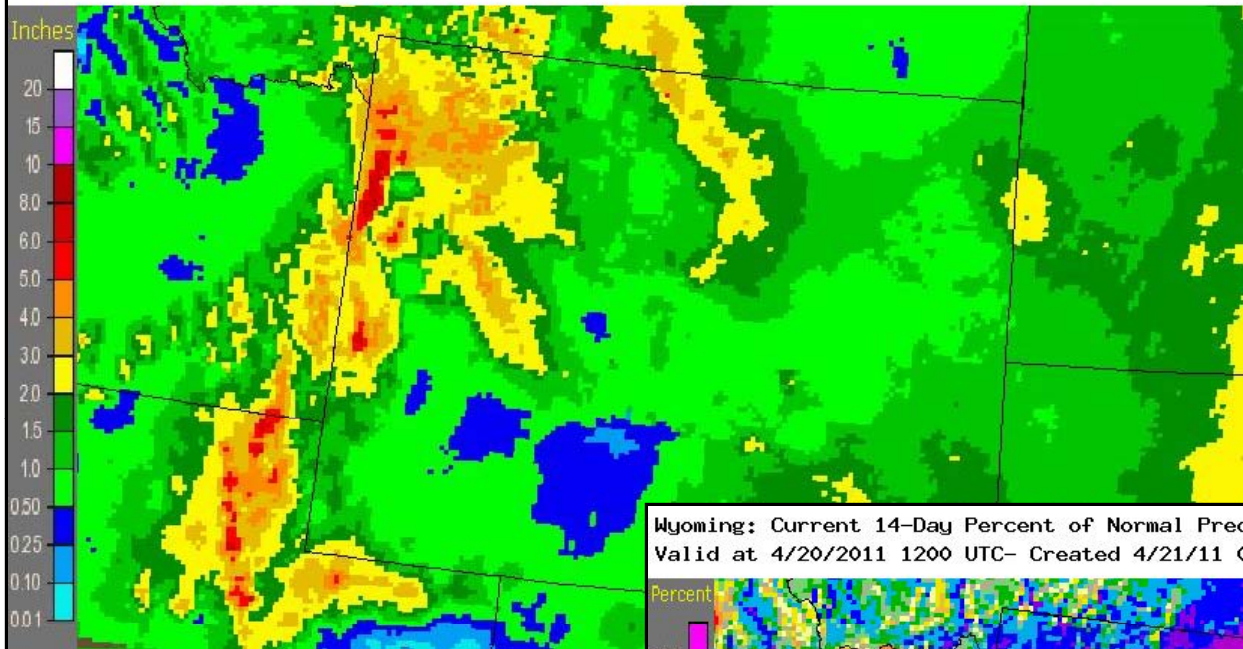
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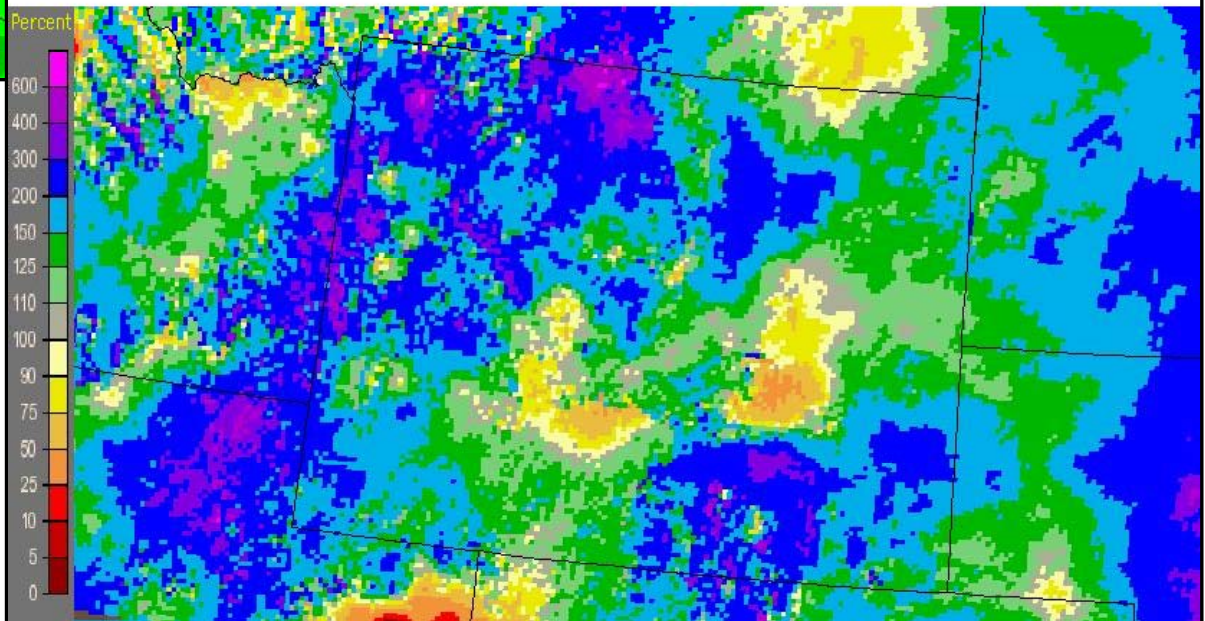
www.cbrfc.noaa.gov

April Precipitation

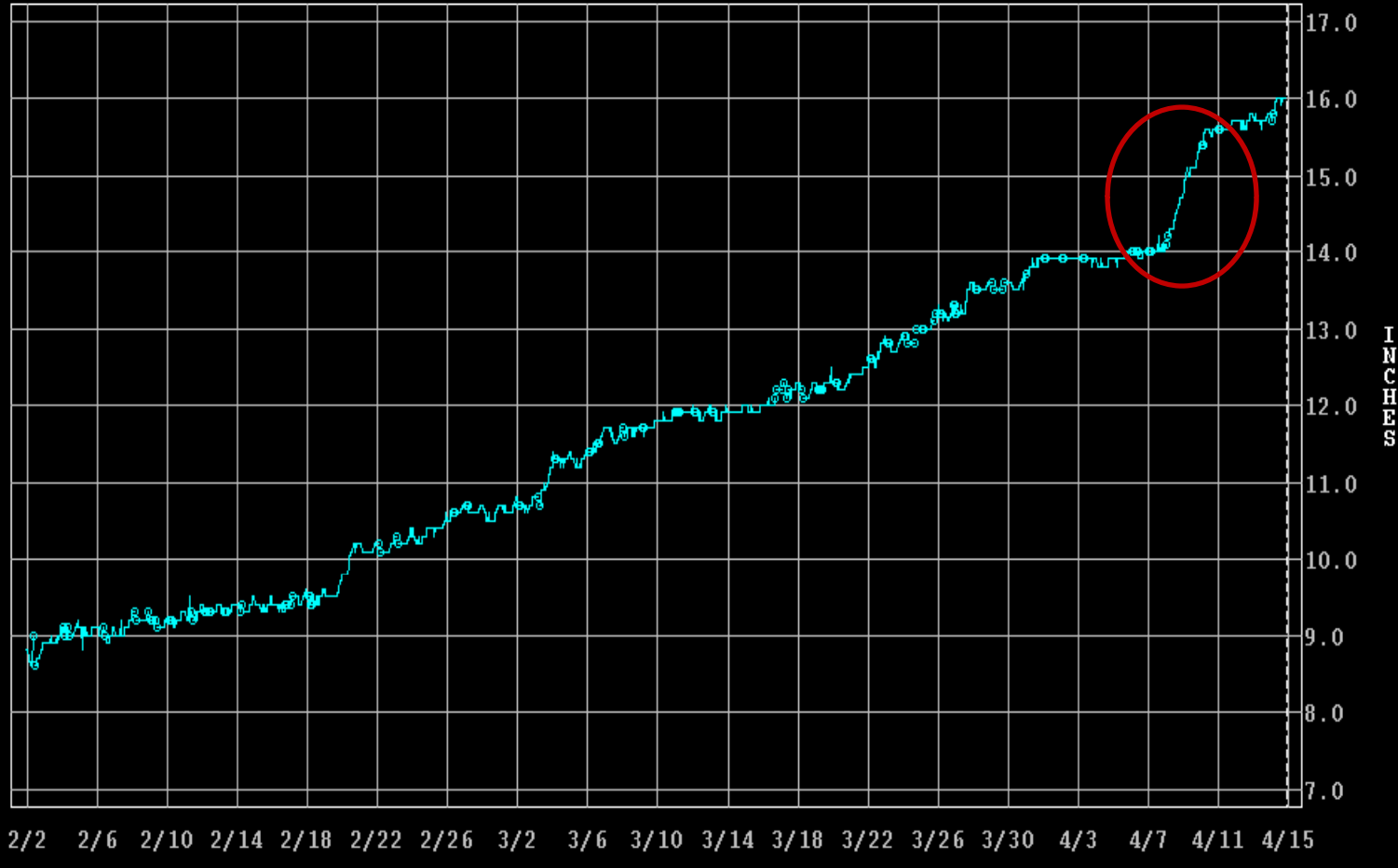
Wyoming: Current 14-Day Observed Precipitation
Valid at 4/20/2011 1200 UTC- Created 4/21/11 0:12 UTC



Wyoming: Current 14-Day Percent of Normal Precipitation
Valid at 4/20/2011 1200 UTC- Created 4/21/11 0:16 UTC

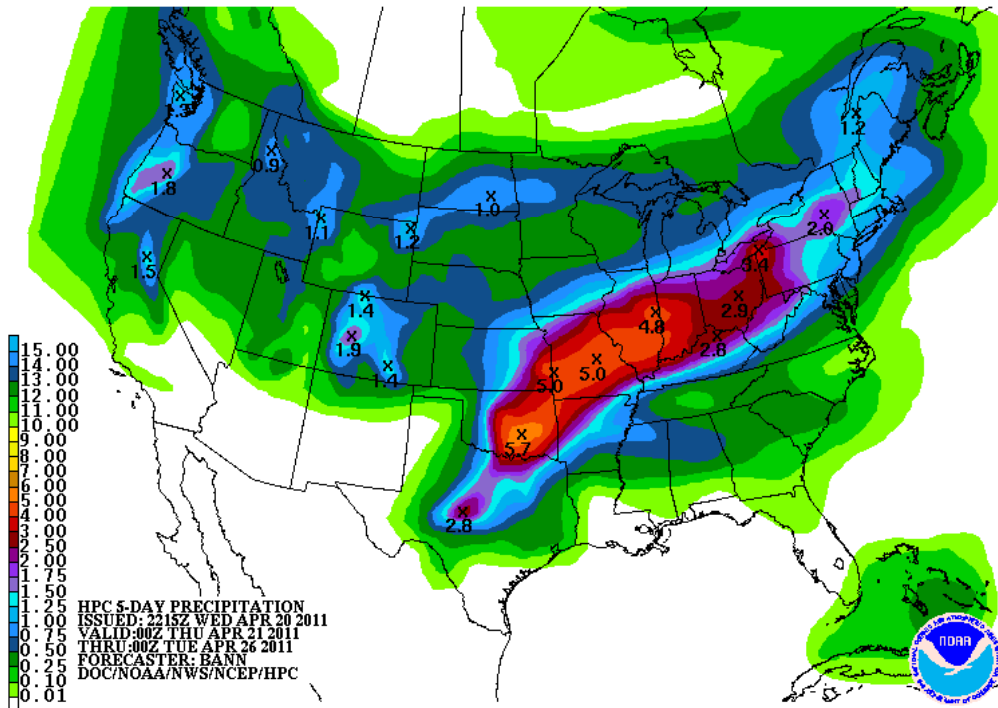


ELKHART PARK G.S.
EKPW4 PCIRMZZ PRECIPITATION ACCUMULATION, INSTANTANEOUS, OBSERVED, METEOR
Max= 16.0 at 04/14/2011 21Z
Min= 8.6 at 02/02/2011 12Z

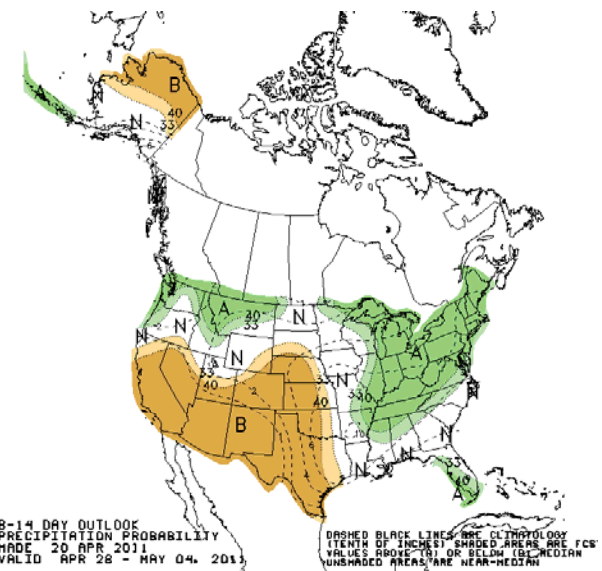
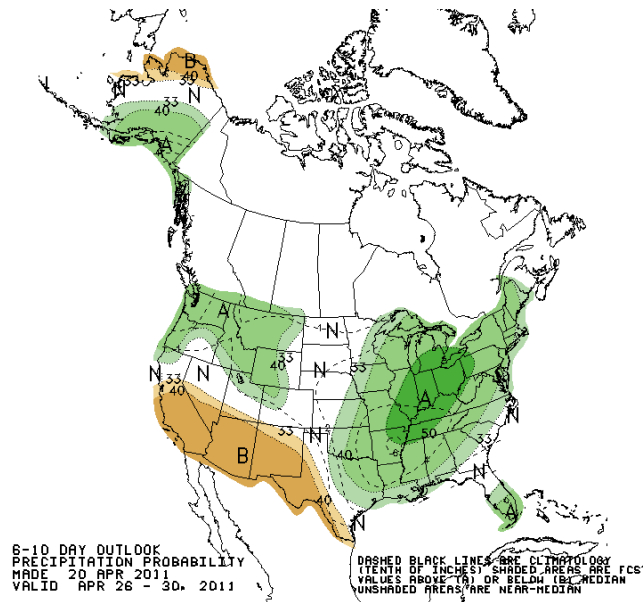


Significant ~ 2.0 inch storm in early April!

Forecast Precipitation

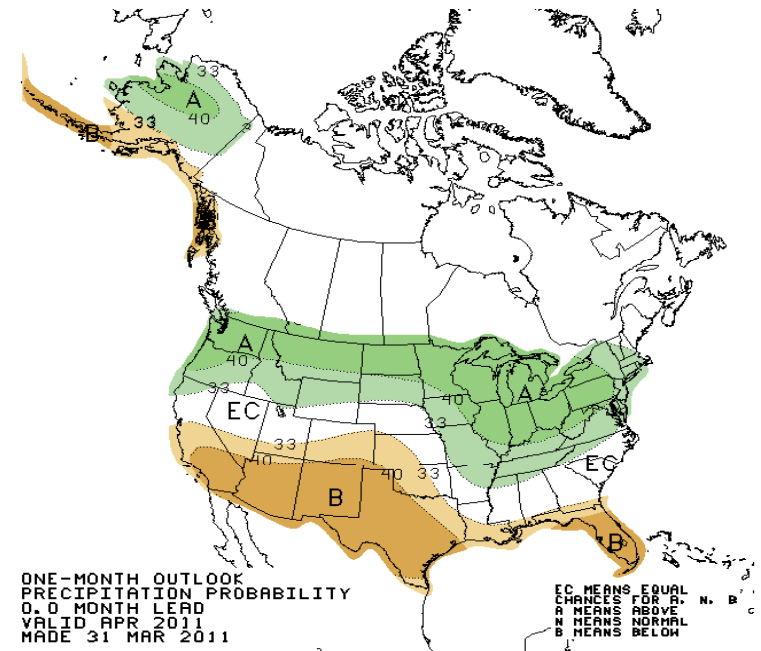
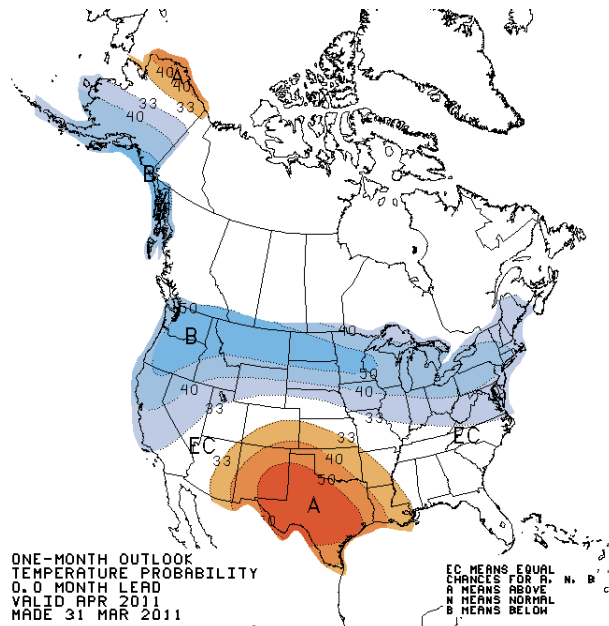


- Cold and wet pattern continues!!
- Storm Thursday into Friday
- Another cold front Sunday followed by moist unstable conditions through Tuesday

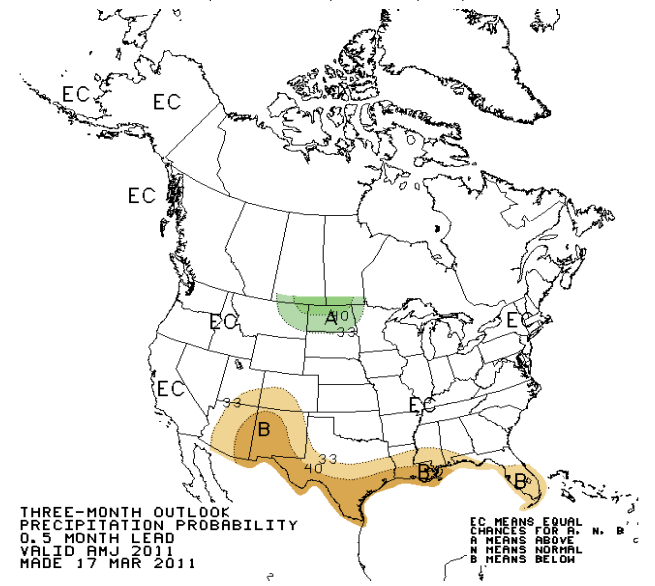
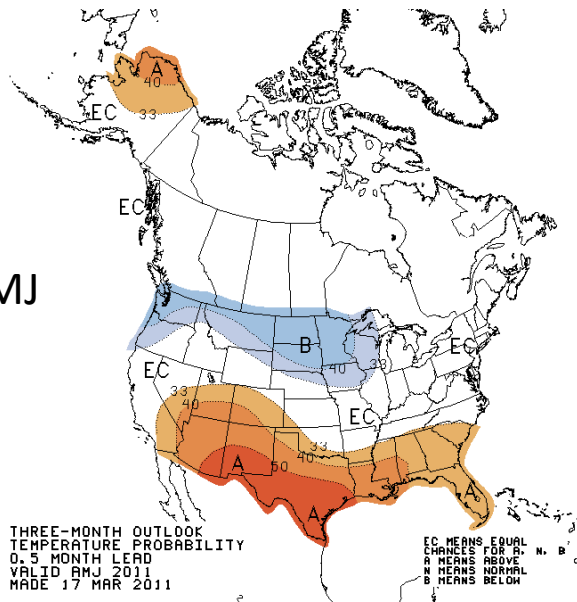


Long Range Climate Forecasts

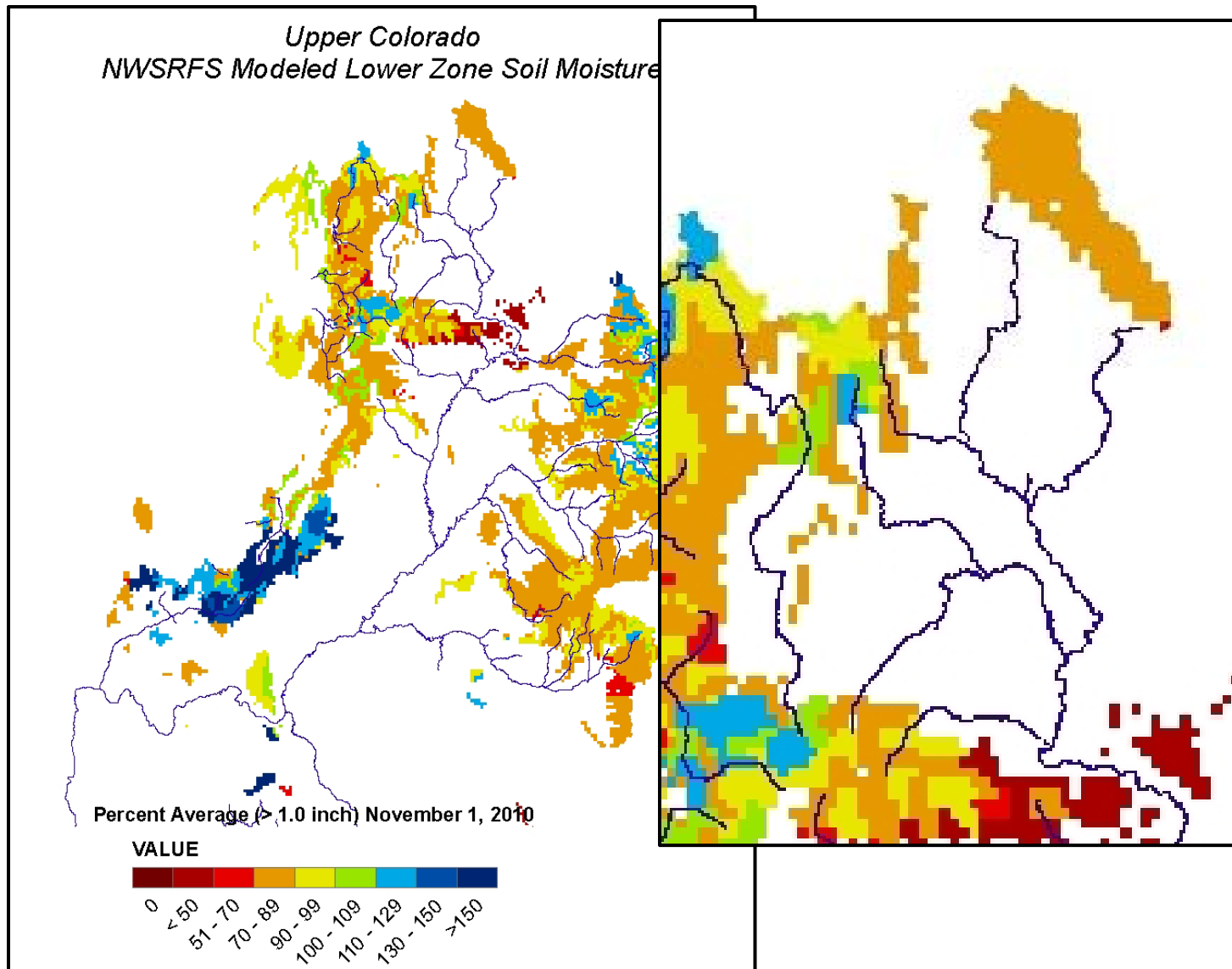
1 MONTH



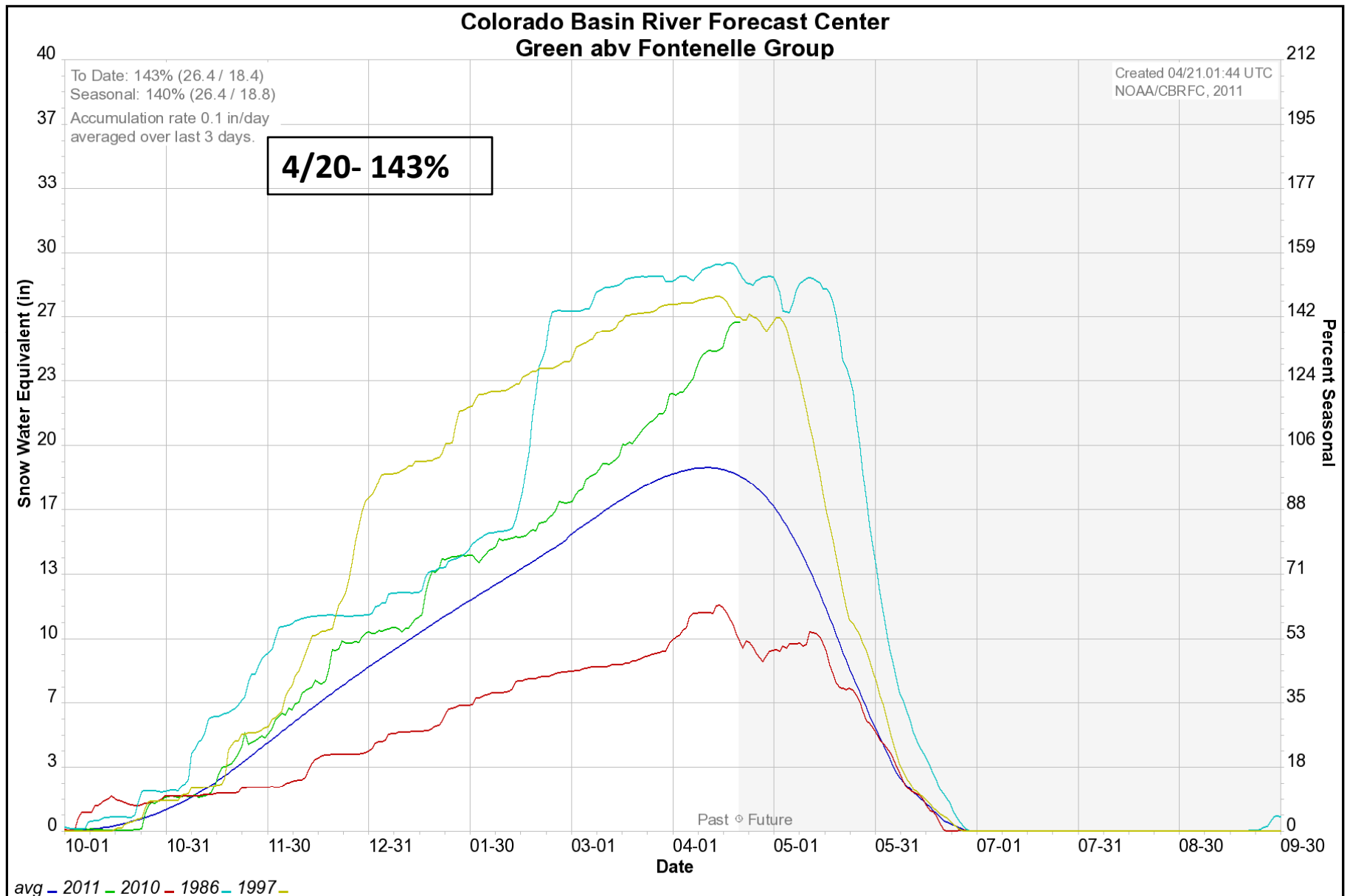
3 MONTH-AMJ



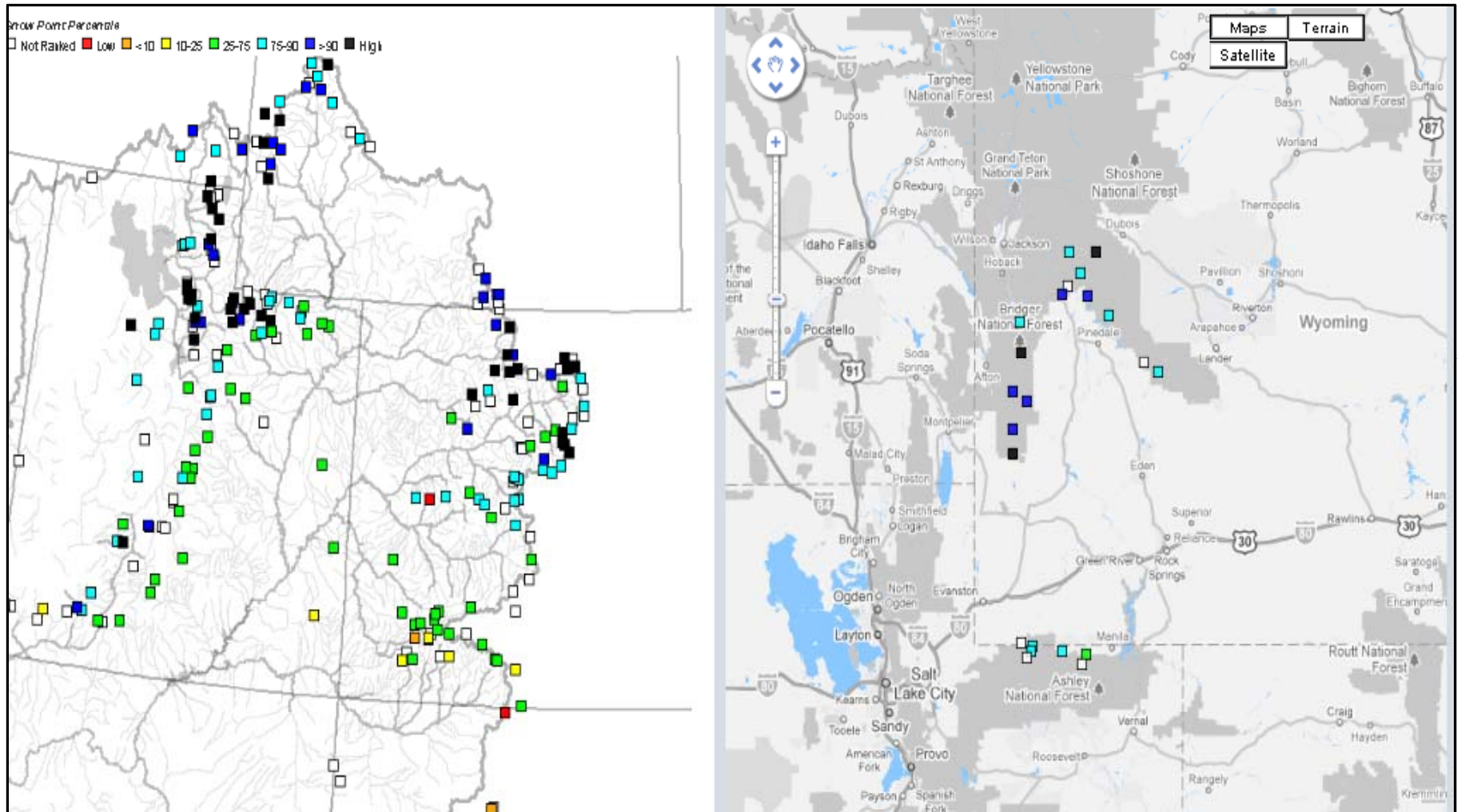
Modeled Fall Soil Moisture



SNOW



SNOW

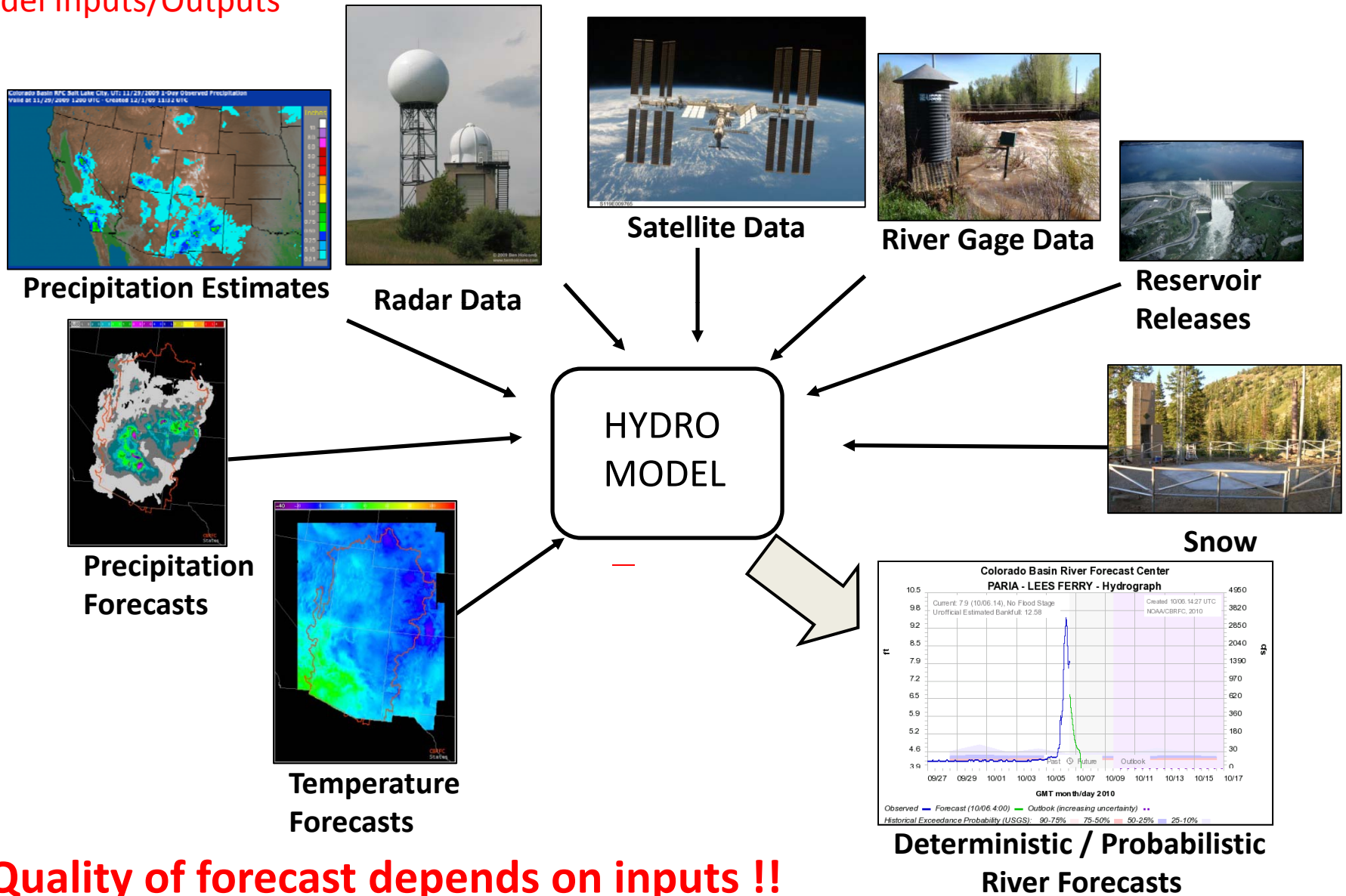


Numerous sites showing highest value ever for today!!

****Important to remember no snotels above 10,000ft for Upper Green****

How do we make forecasts?

Model Inputs/Outputs



Quality of forecast depends on inputs !!

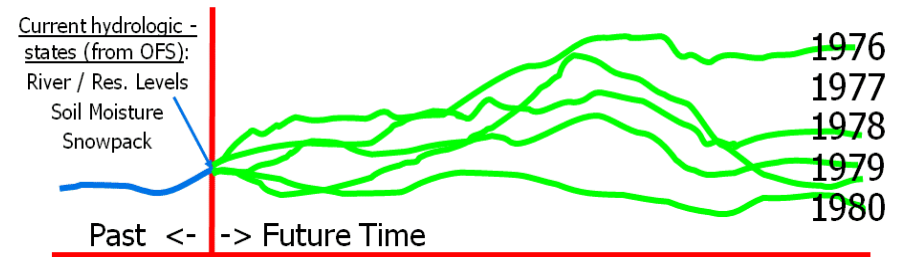
Two Methods

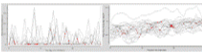
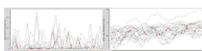



Statistical

- 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)

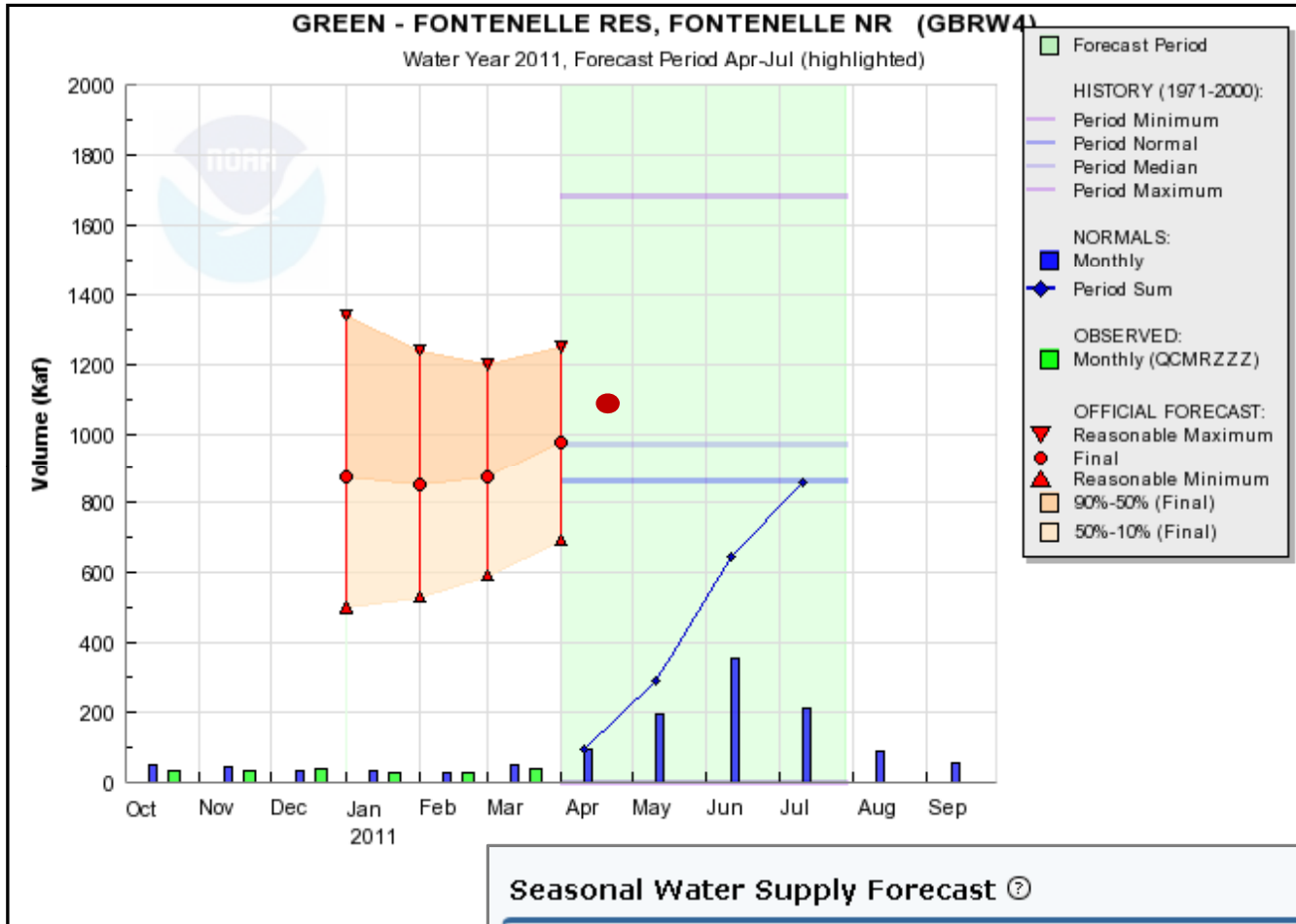
Ensemble Streamflow Prediction

- Continuous, conceptual, hydrologic model



1. Start with current conditions 76 
 2. Apply each year of historical climate 77 
78 
 3. Create several possible future streamflow patterns 79 
80 
- 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

FORECASTS



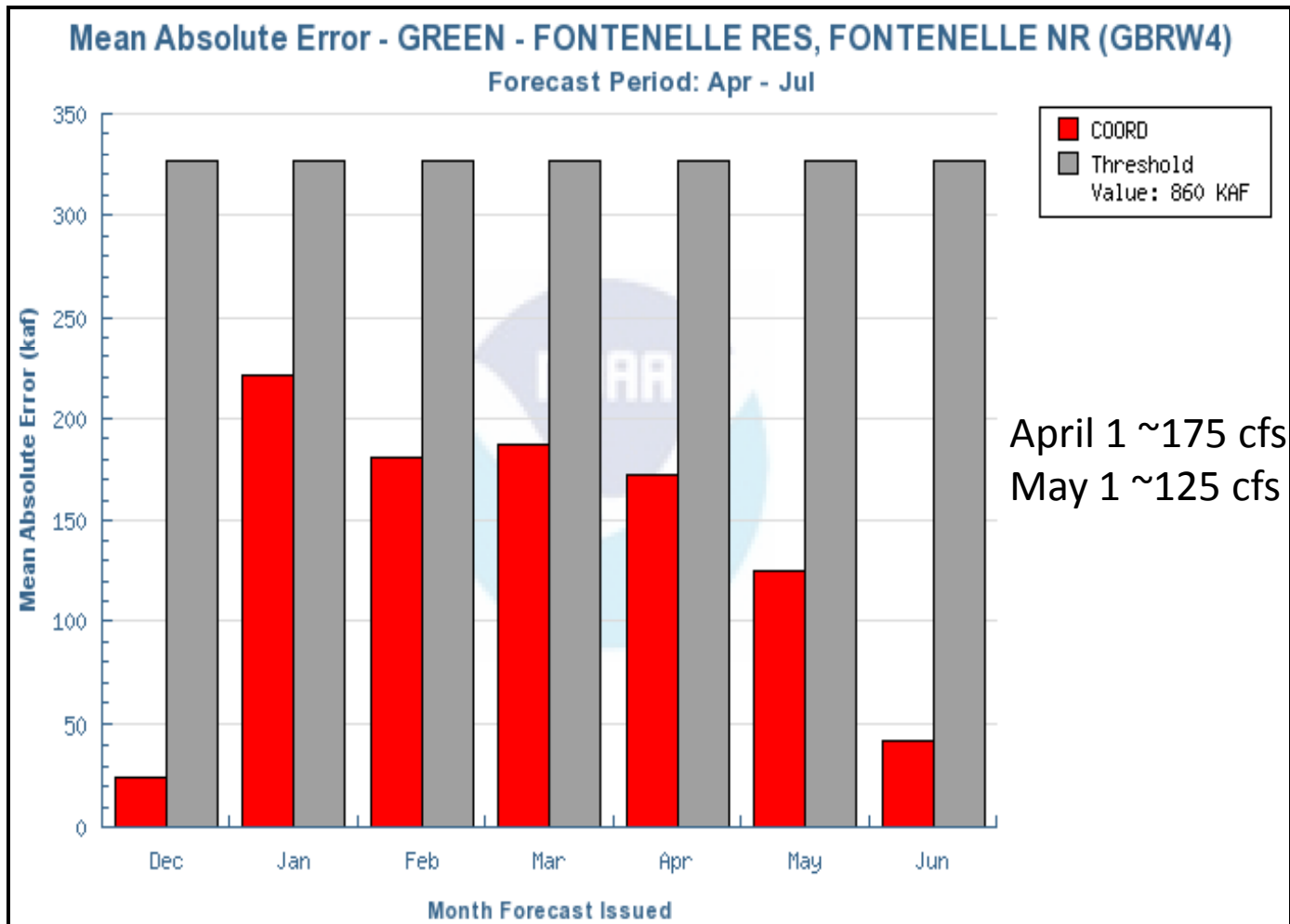
APRIL 15th Forecast:
1100 KAF/128%
 ~11% Increase

- 1986: 1682 KAF
- 1972: 1402 KAF
- 1997: 1289 KAF
- 1983: 1234 KAF
- 1971: 1228 KAF
- 8. 2011: 1100 KAF**

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

980 kaf 50% Exceedence (Official Forecast)		142.5% of Historical Median	114% of Historical Mean
690 kaf 90% Exceedence	1250 kaf 10% Exceedence	16th of 53 Official Historical Flows	

Forecast Issued: Apr 1 2011 [View Water Supply Forecast Plot](#)

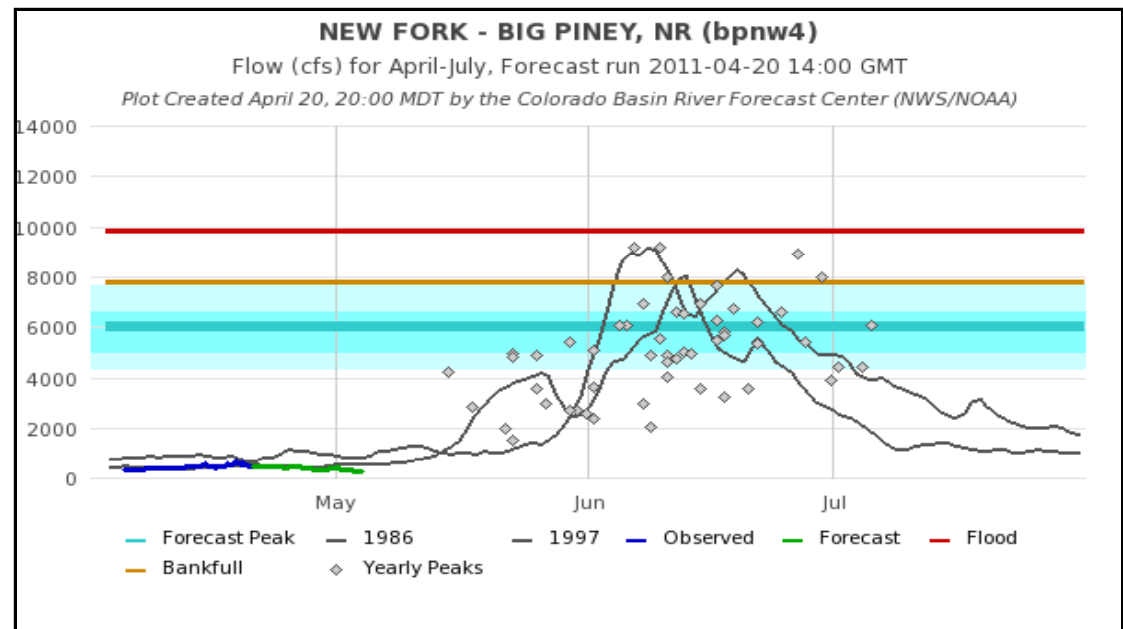
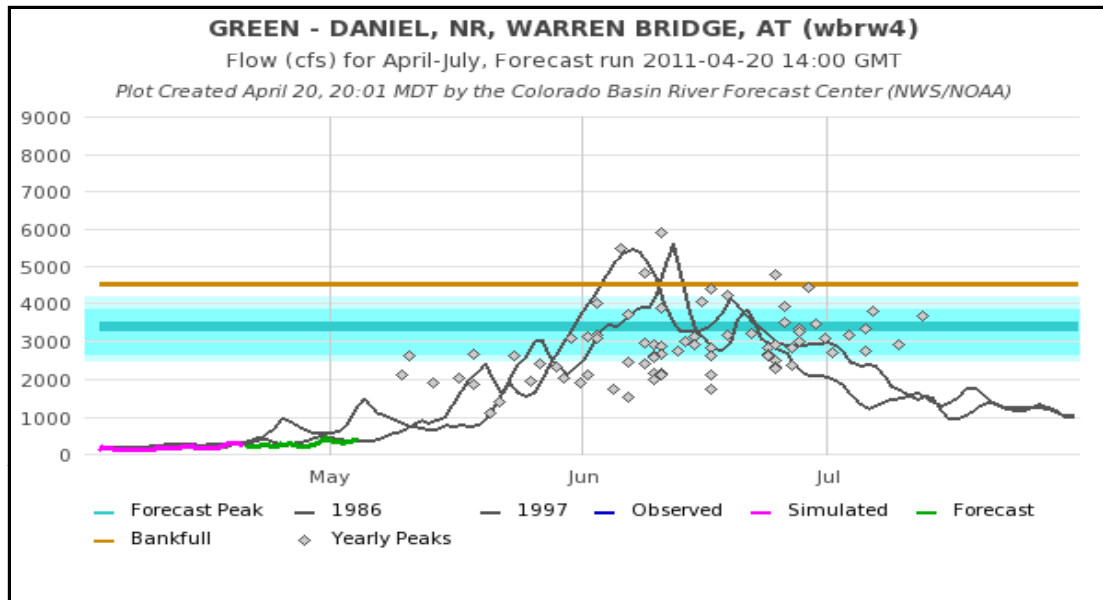


Possible Sources of Error

Input Errors:

- Conditions in river basin (snowpack, soil moisture)
- Future temperature and precipitation
- Upstream regulations and diversions

Peak Flow Forecasts



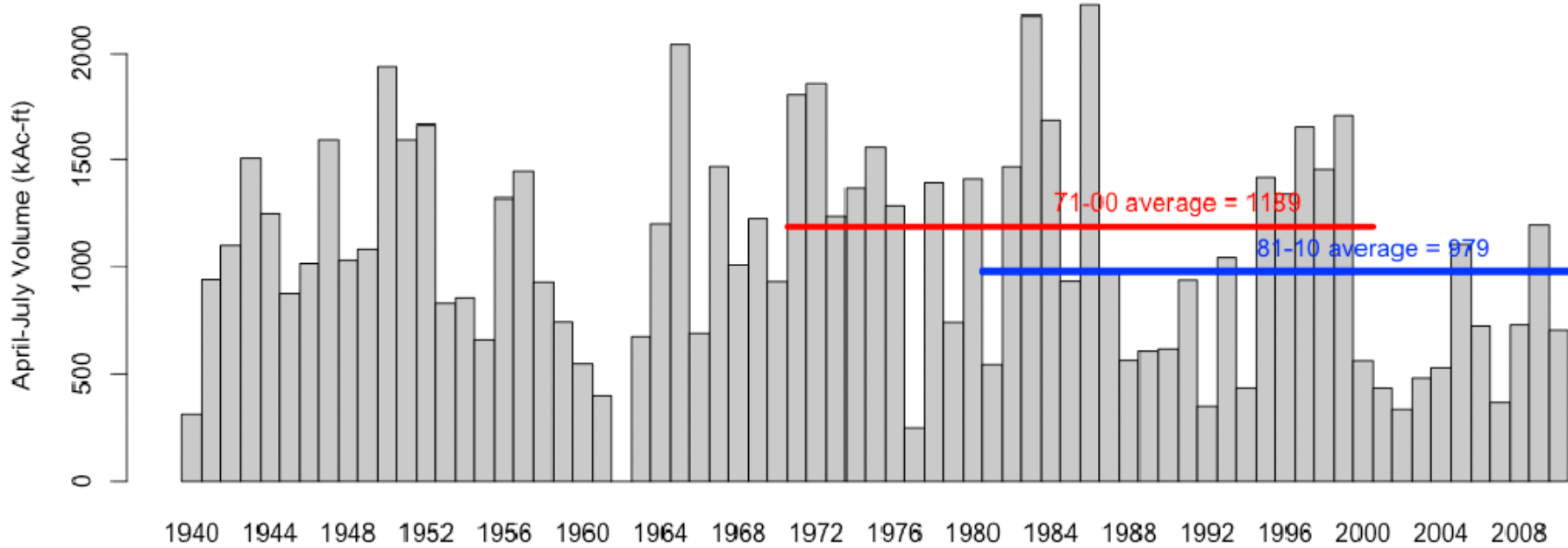
30 year average

- 30 year averages are updated once every 10 years
- Currently using
 - 1971-2000 for averages
 - 1971-2000 for statistical prediction
 - 1976-2005 for ESP
- Update for **WY2012** will be based on 1981-2010 averages
- Trends in monthly precipitation are important for ESP

ESP for Water Supply

- ESP forecasts based on
 - (1) initial conditions (e.g. snow pack, base flow, etc)
 - (2) future scenarios
- Early in the season, future scenarios contribute more to forecast
- As snow accumulates, dry/wet years begin to define themselves in the initial conditions

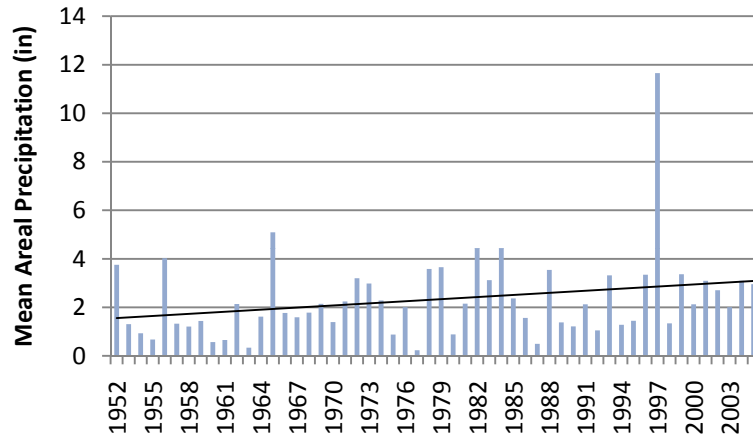
Flaming Gorge Inflow



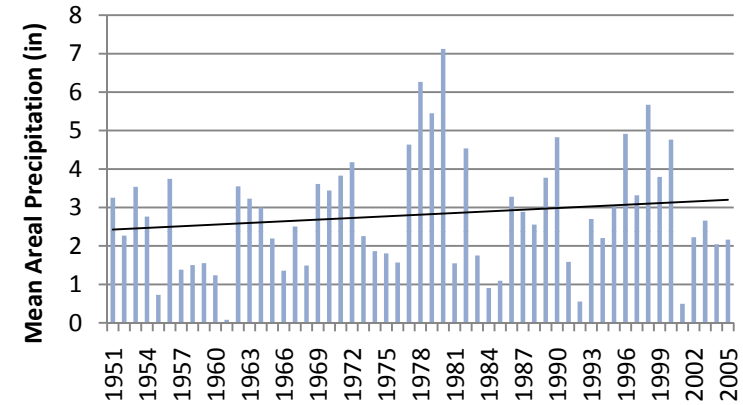
- Preliminary Data
- 18% reduction in mean

Upper Green (at Warren Bridge) Precipitation Trends by Month

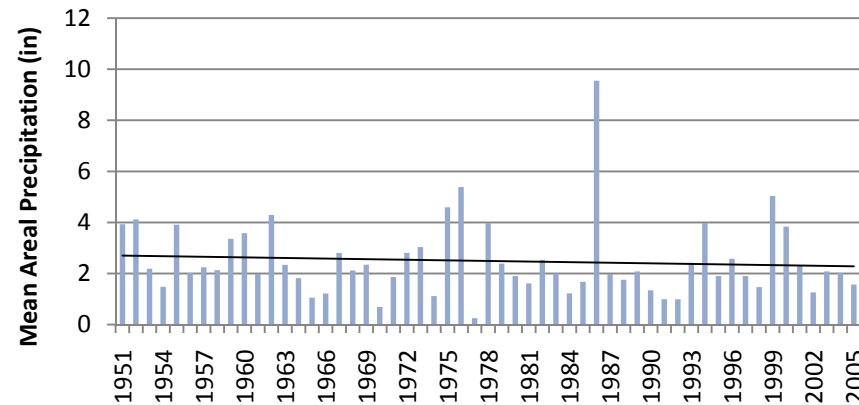
January precipitation



February precipitation

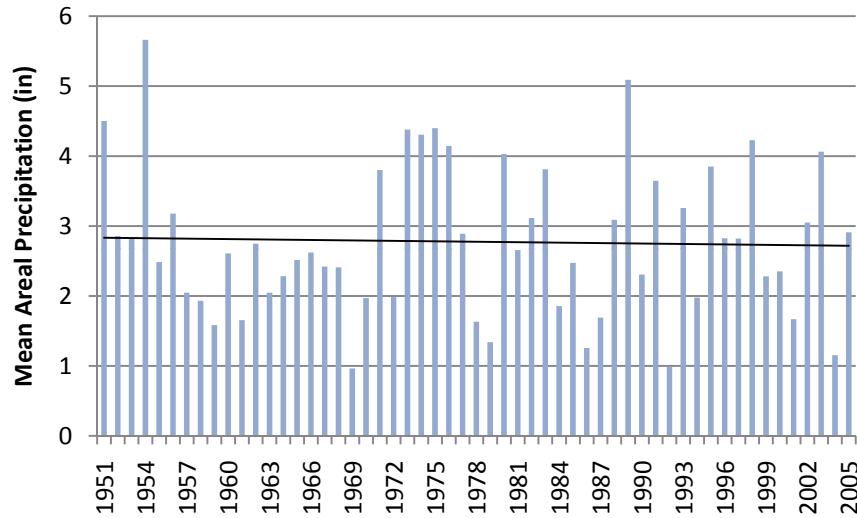


March precipitation

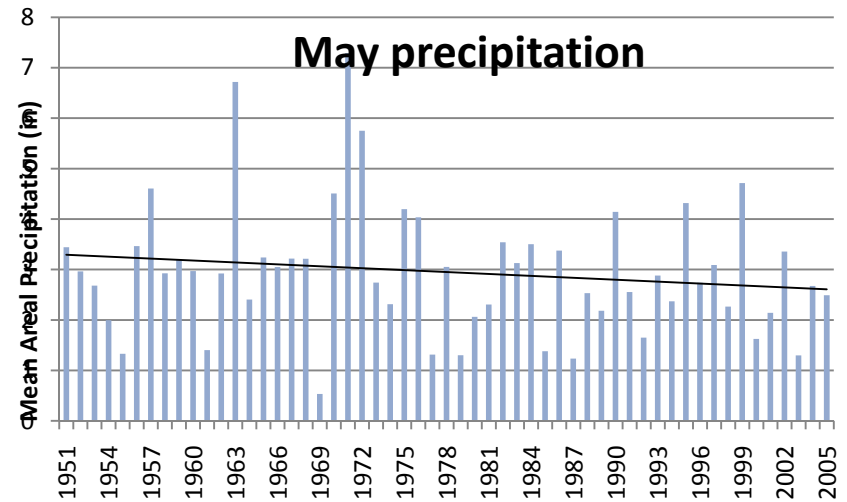


Upper Green (at Warren Bridge) Precipitation Trends by Month

April precipitation



May precipitation



Affect on Forecasts

- WY2011 forecasts continue to use 1971-2000 means:
 - Statistical models (SWS and NRCS) will use 1971-2000
 - Simulation model (ESP) will use 1976-2005
- WY2012 forecasts will be based on 1981-2010 inputs in both forecast models
 - ESP and SWS will both use the same period
- SNOTEL network much stronger for 1981-2010 period than in 1970s. This network is critical for forecast skill.
- All things equal, these forecasts will be lower since input data sets are drier in the 30 year average
 - **Especially true in early season forecasts**
 - Later season forecasts more controlled by observed snowpack
- Percent of normal forecast values should remain largely unchanged (since normals AND forecasts will be lower)

CBRFC Updates

- Anticipating significant spring flooding May-June
- Migration to new CHPS (Community Hydrologic Prediction Services) software complete late summer / early fall
- Updating 30 year averages
- Experimental hydrologic ensemble services running – incorporates ensemble weather and climate forecasts
- Evapotranspiration work – testing application to drought and water demand forecast / analysis
- Analysis of peak flow forecasts (instantaneous vs mean daily)



Questions/Comment?



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