

Green and Yampa Rivers: Current Conditions and Forecasts

April 20, 2017
Flaming Gorge Working Group Meeting

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Today's Presentation

Seasonal Weather Review: Impacts to water supply conditions

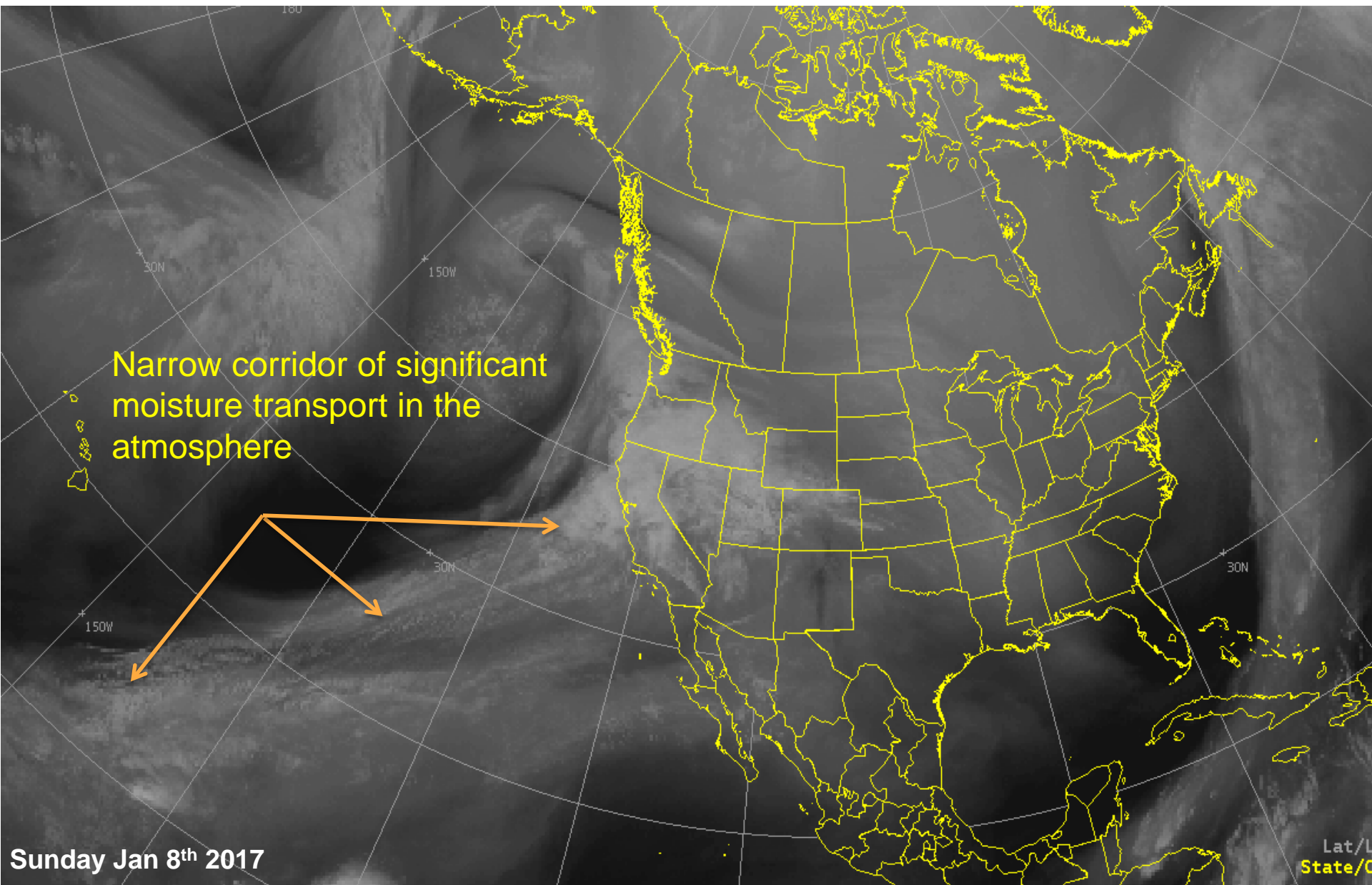
April 2017 Water Supply Forecasts Overview

- April-July Water Supply Volumes
 - Flaming Gorge Reservoir
 - Yampa River
- Peak Flow Forecasts
 - Green River
 - Yampa River

How good are the forecasts?

- Forecast error and uncertainty

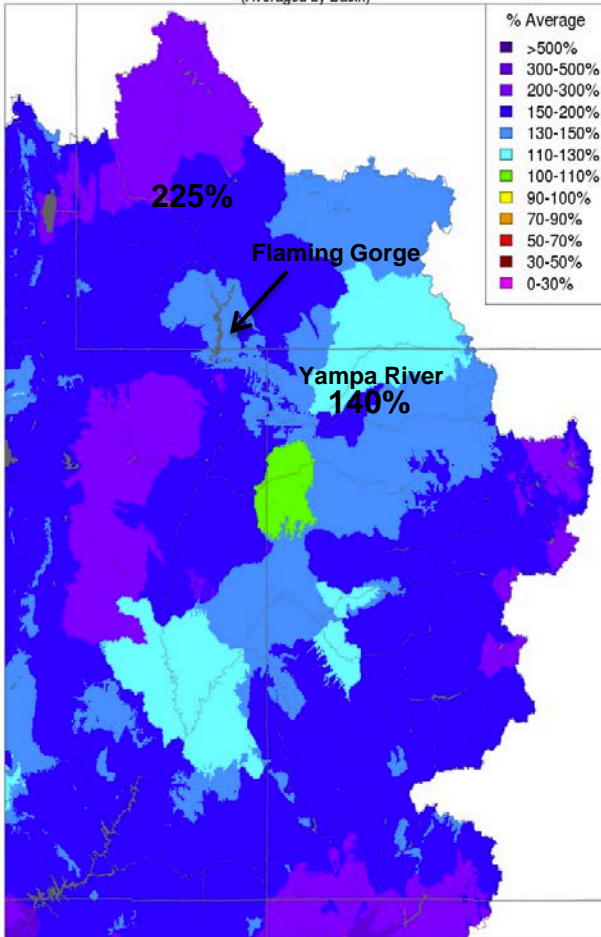
Mid December through February: “Atmospheric Rivers”



Weather Review: Winter Precipitation (Dec-Feb)

Monthly Precipitation - December 2016

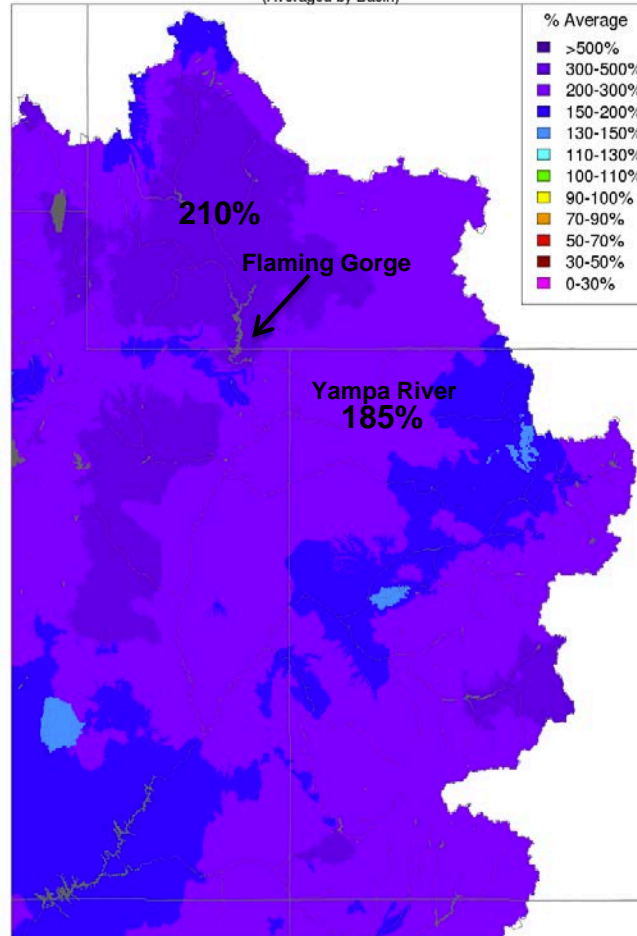
(Averaged by Basin)



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

Monthly Precipitation - January 2017

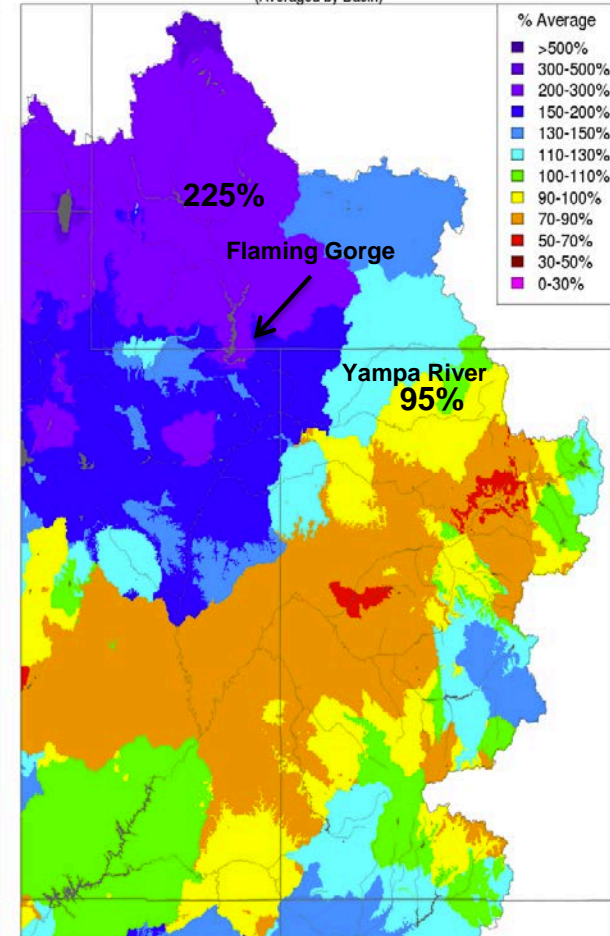
(Averaged by Basin)



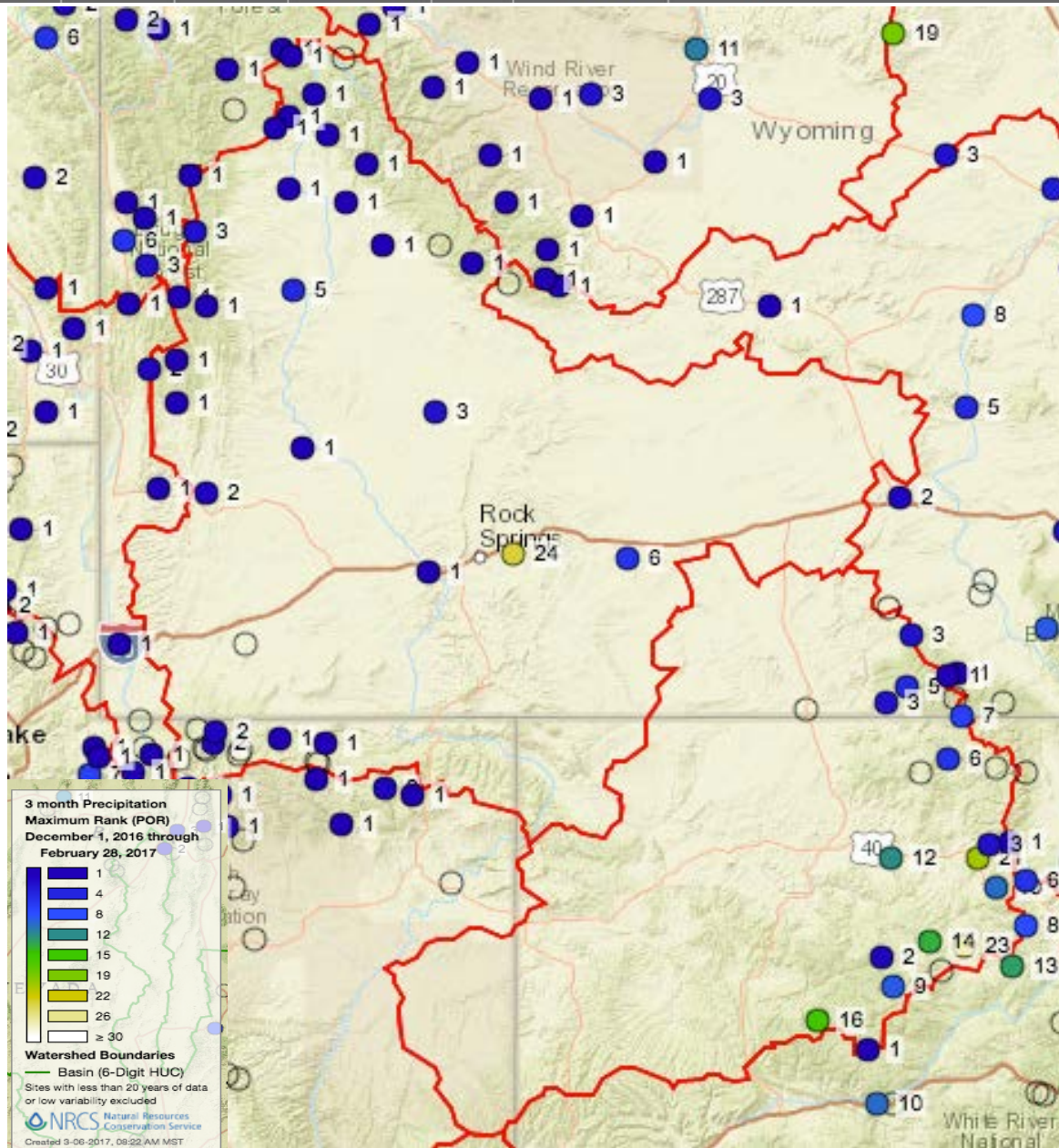
Prepared by NOAA, Colorado Basin River Forecast Center
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Monthly Precipitation - February 2017

(Averaged by Basin)



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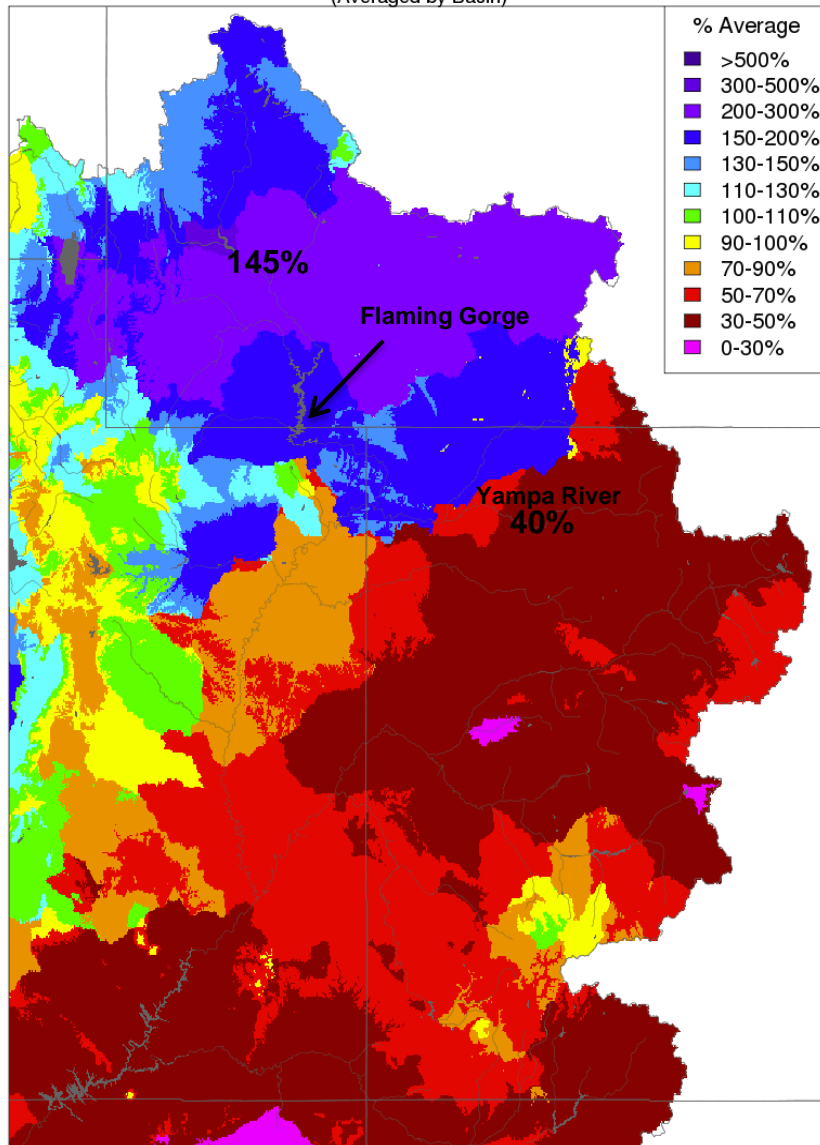


Upper Green had record
 precipitation for the 3
 month period of
 December-February

Weather Review: March Precipitation and Temperature

Monthly Precipitation - March 2017

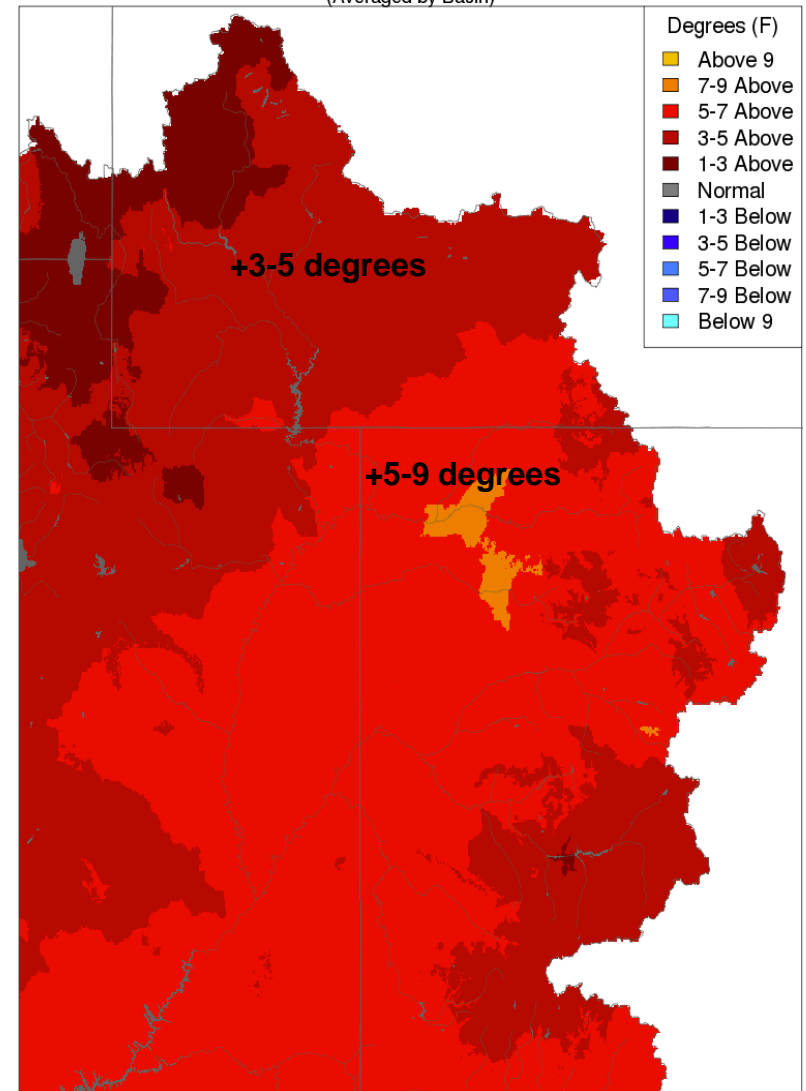
(Averaged by Basin)



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Max Temp - Monthly Deviation - March 2017

(Averaged by Basin)

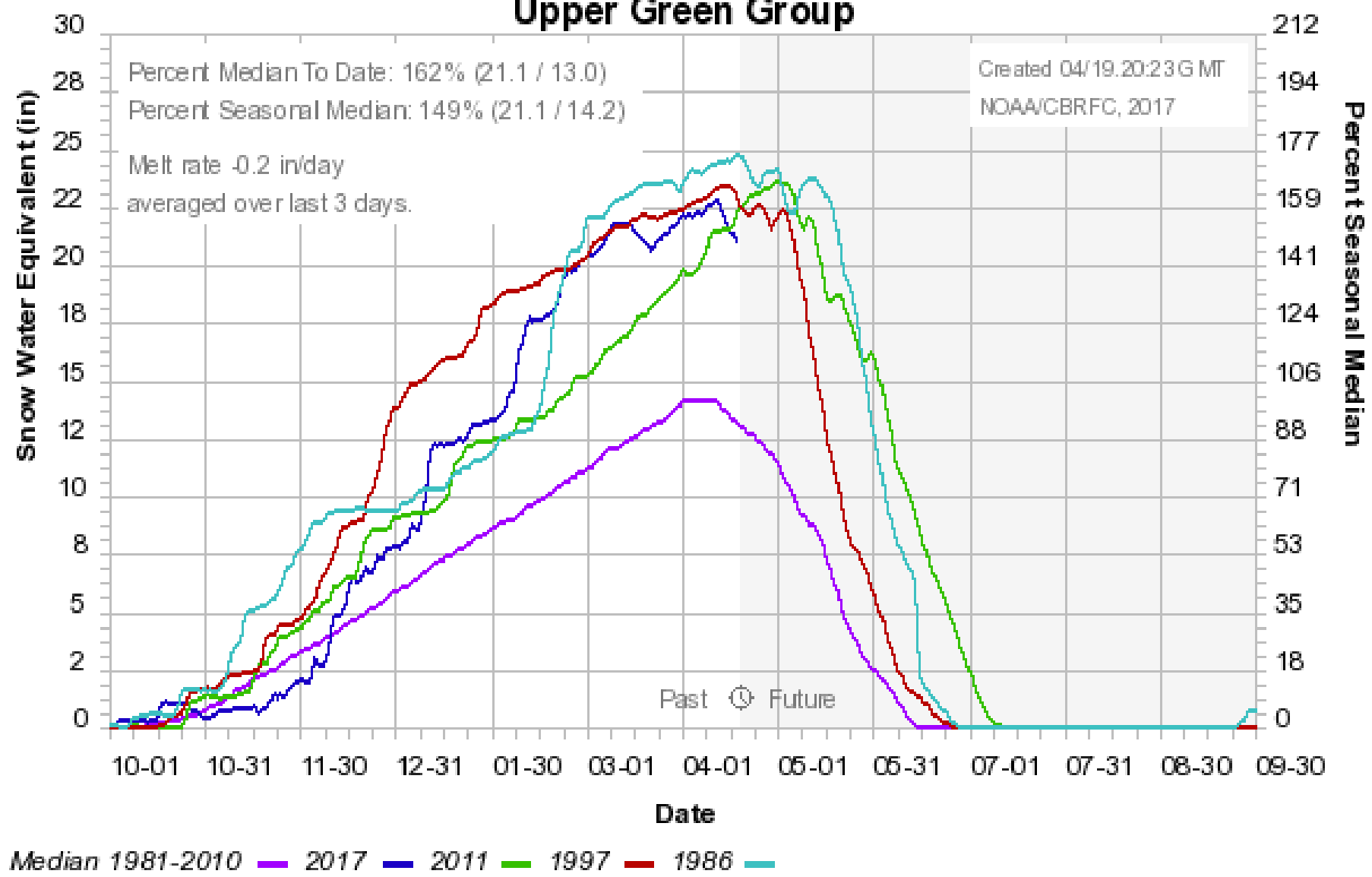


Daily temperatures reached 10-20 degrees above average

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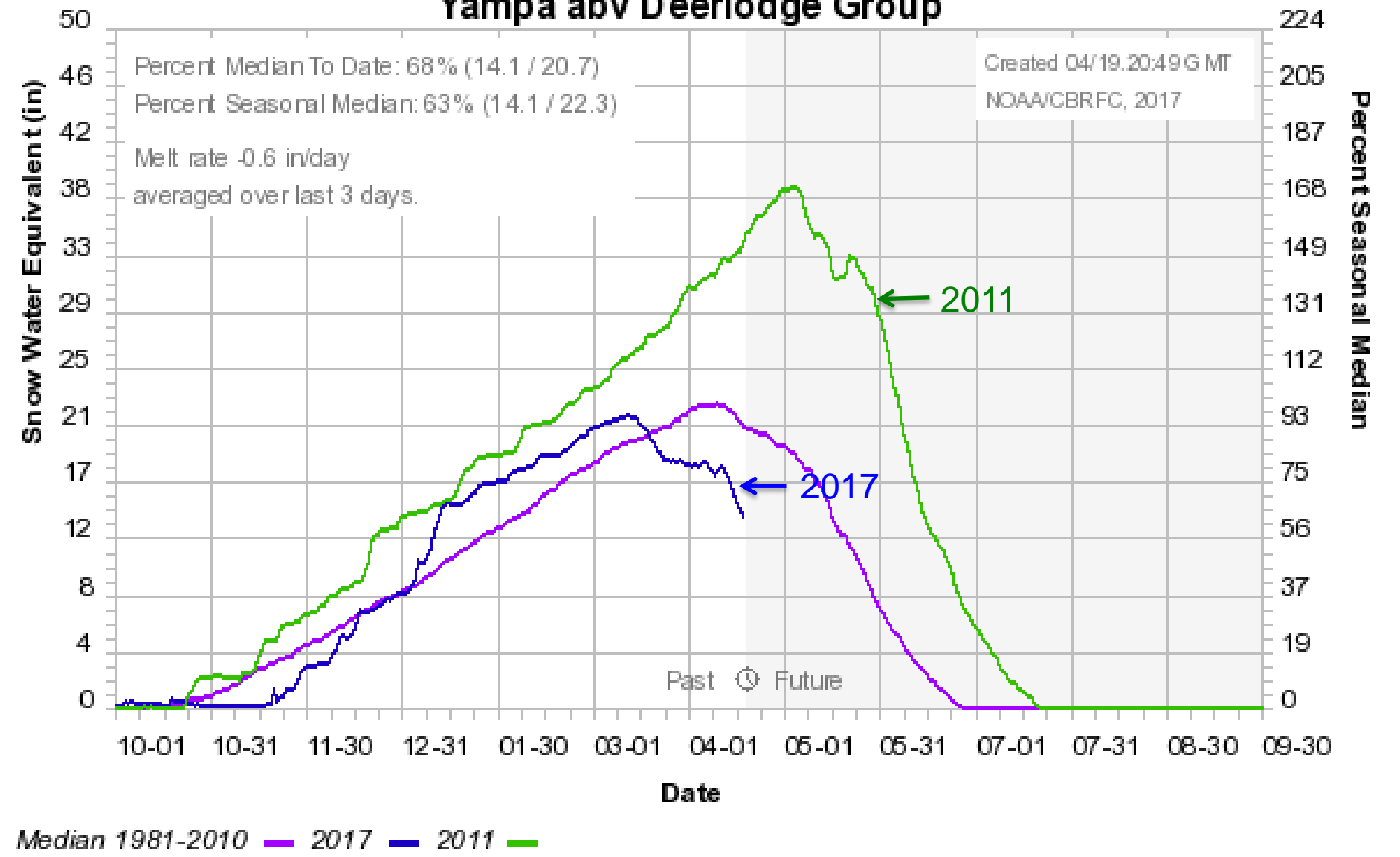
March Weather: Temperature Impacts to Snowpack

Colorado Basin River Forecast Center Upper Green Group



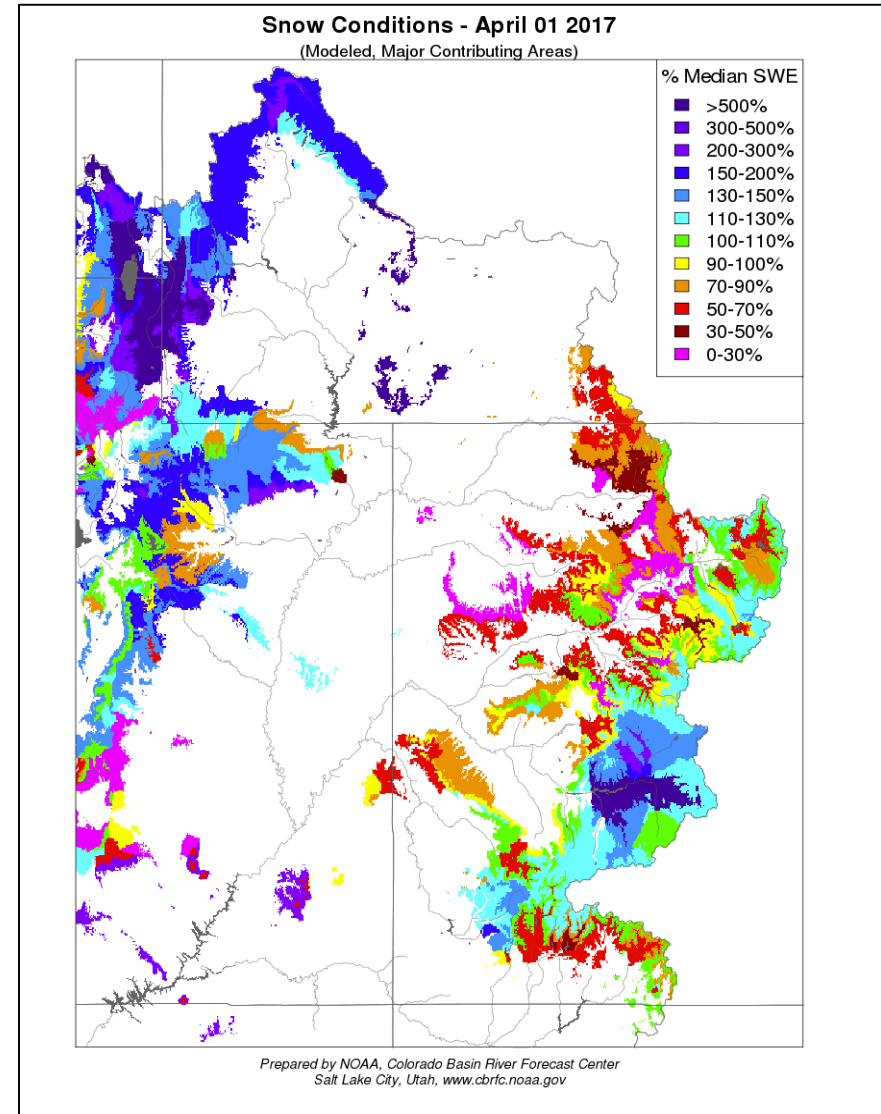
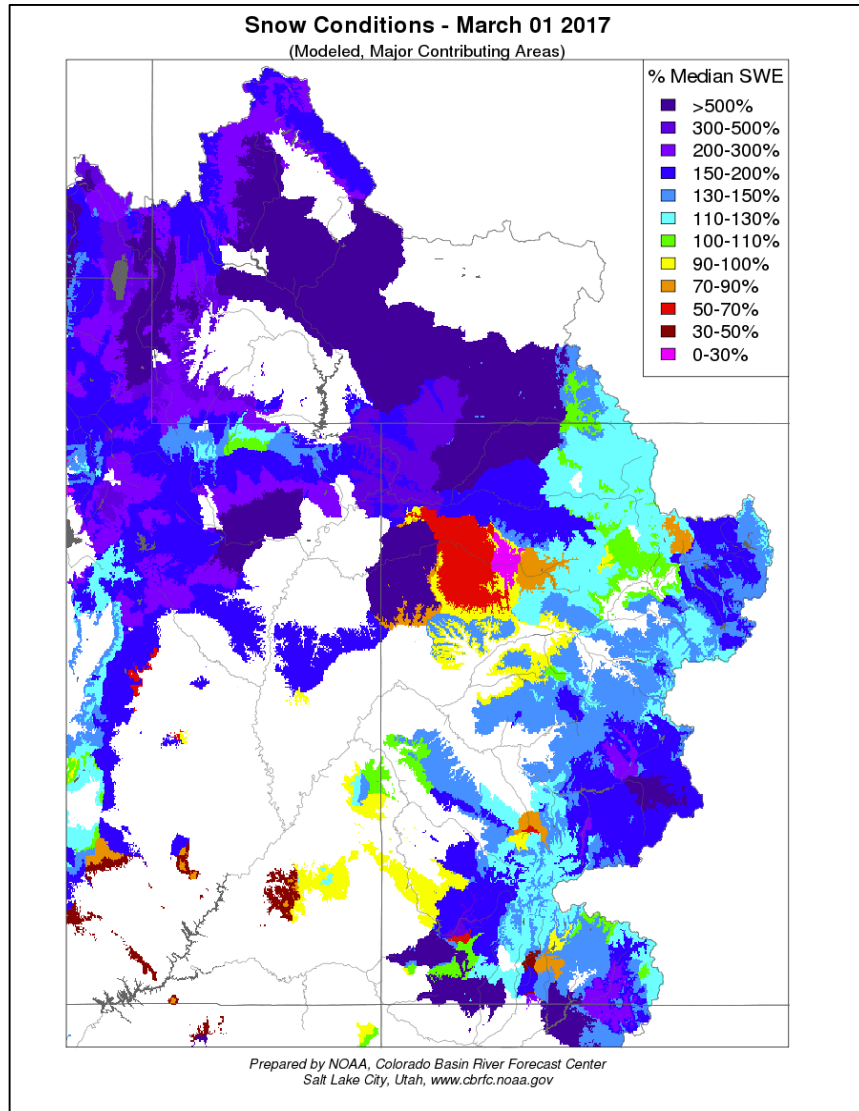
March Weather: Temperature Impacts to Snowpack

Colorado Basin River Forecast Center Yampa abv Deerlodge Group



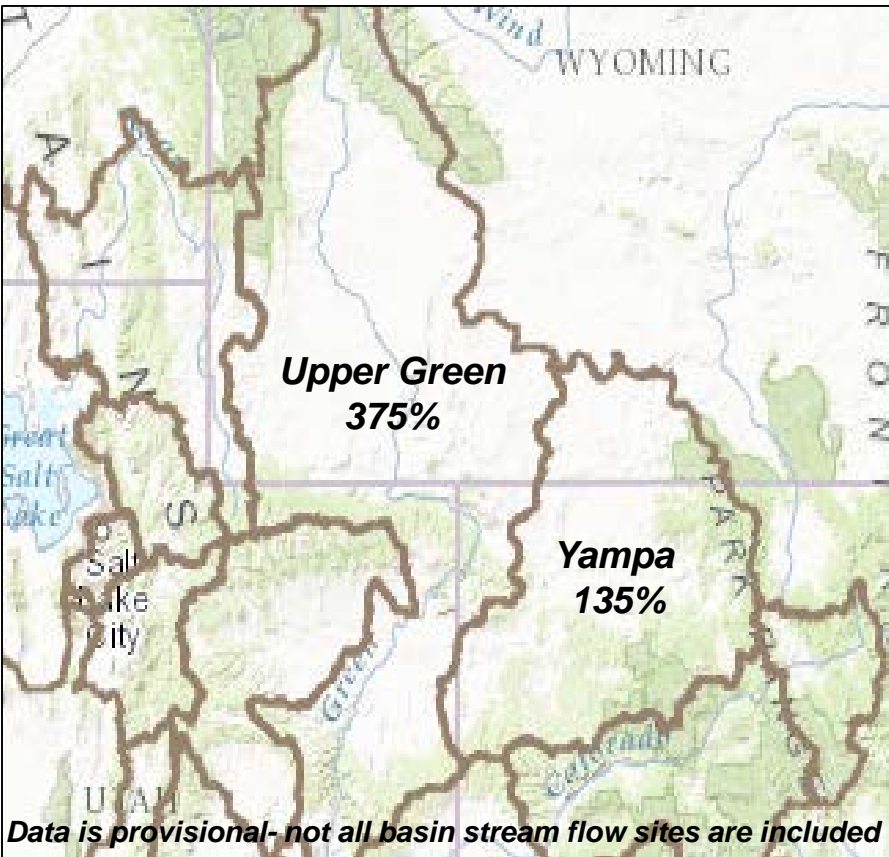
March Weather: Temperature Impacts to Snowpack

Upper Green: reduced low elevation (<8000 ft) snow; **significant snow remains at high elevations**
Yampa River: reduced significant low and mid elevation snow (~8500-10,000ft)



March Weather: Temperature Impacts to Streamflow

River Basin % Average Streamflow for March
(approximate)



Record March Runoff

Site (Rank/POR)	Mar Vol KAF / % Avg – old record (year)
Pine Creek (1/60)	2.5 / 240% 2.2 (1986)
Fontenelle (1/52)	180 / 343% 99 (1986)
Green River-WY (1/66)	237/ 413% 115 (1997)
Hams Fork (1/41)	3.2 / 240% 2.5 (2015)
Flaming Gorge (1/55)	400 / 392% 237 (1997)

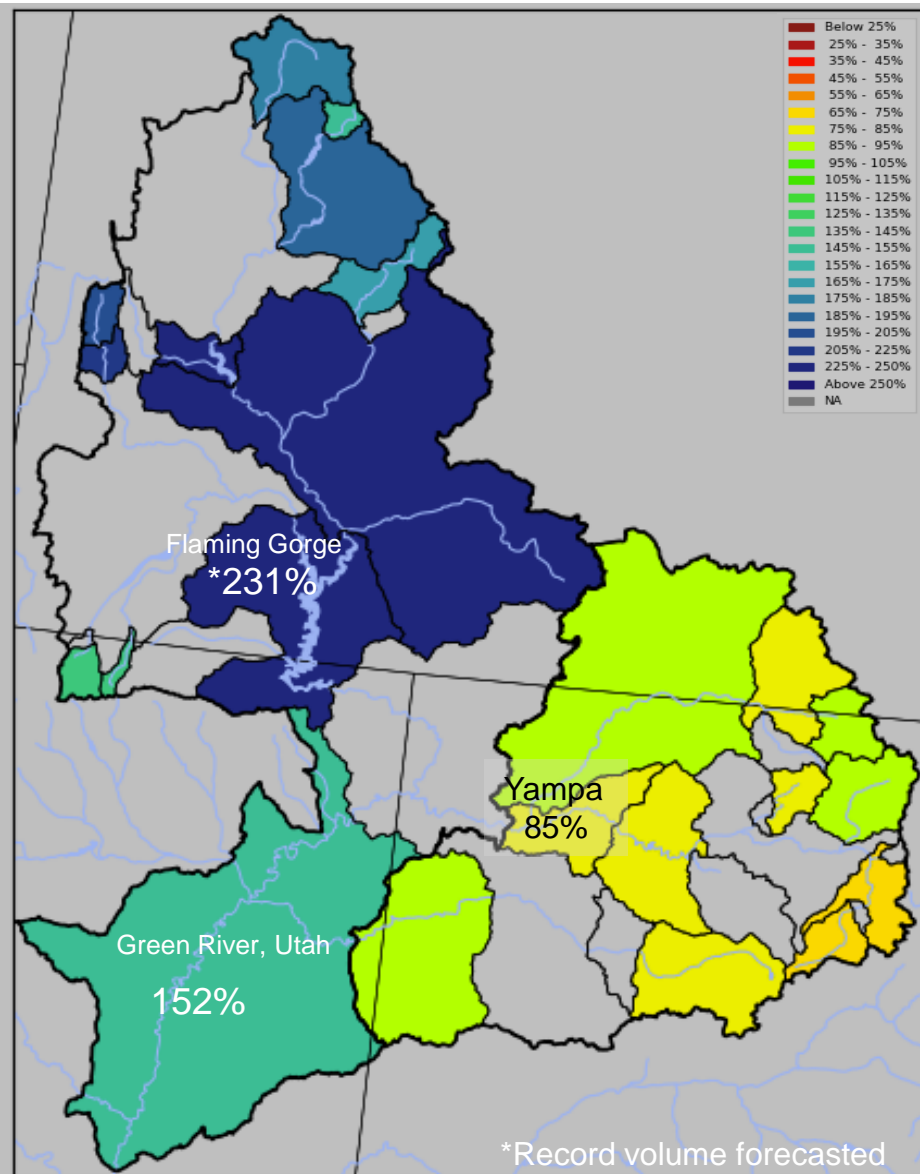
Many other sites in the top 2 or 3 in the Upper Green.

Data is provisional- not all basin stream flow sites are included

April 1st Water Supply Forecasts

Water Supply Forecasts: April – July Volumes

Most Probable Scenario (% of 1981-2010 average)



- CBRFC model makes assumptions about long range future weather
- Official forecasts provide a range of possible outcomes based on “dry”, “average”, and “wet” weather scenarios
- “Average” scenario is most commonly used forecast

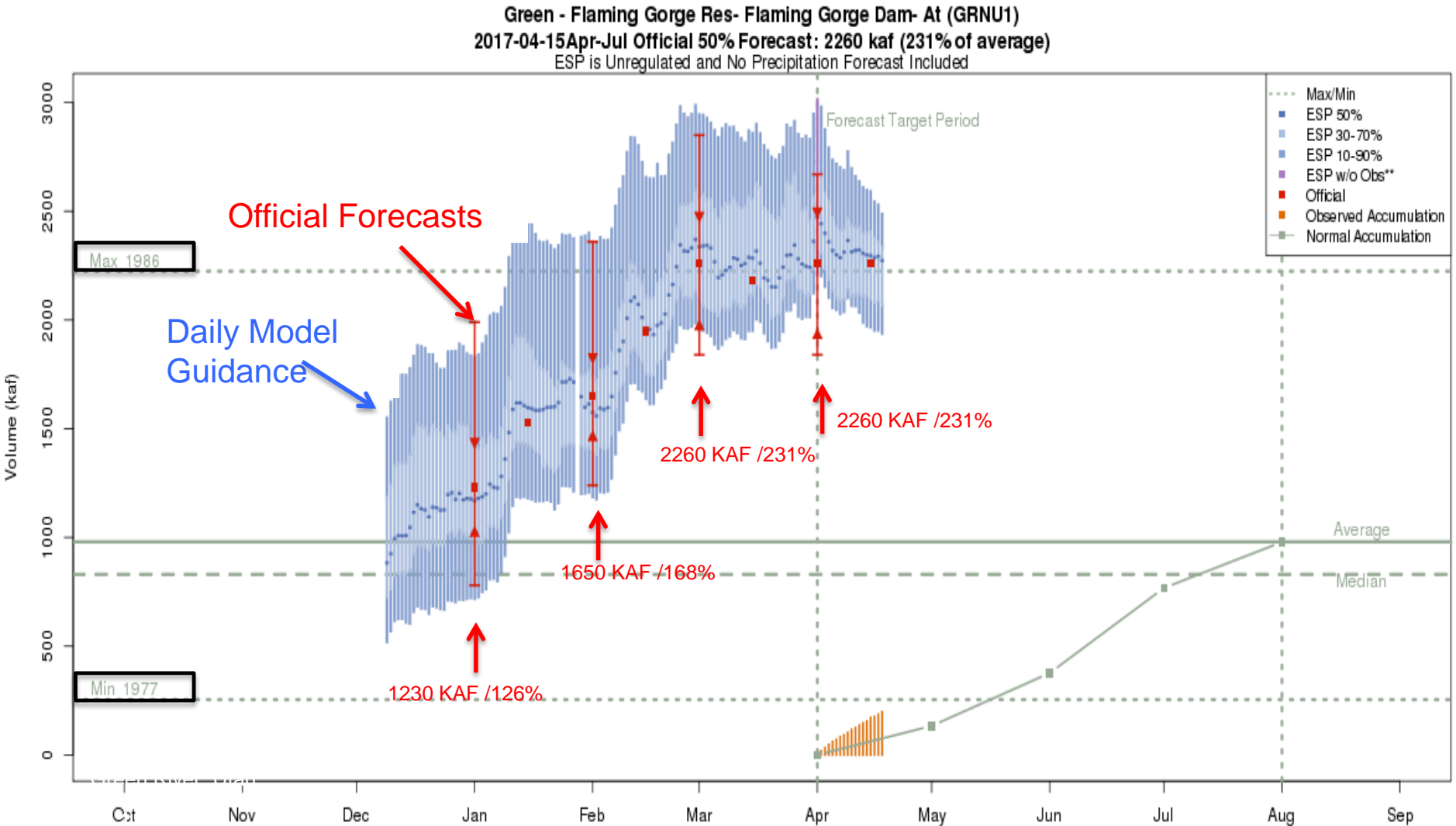
April 1st Flaming Gorge Forecasts:

Dry	→	1840 KAF (187% average)
Average	→	2260 KAF (231% average)
Wet	→	2670 KAF (272% average)

April 1st Yampa River Forecasts:

Dry	→	765 KAF (62% average)
Average	→	1050 KAF (85% average)
Wet	→	1370 KAF (110% average)

Forecast Evolution Plot: Flaming Gorge Inflow

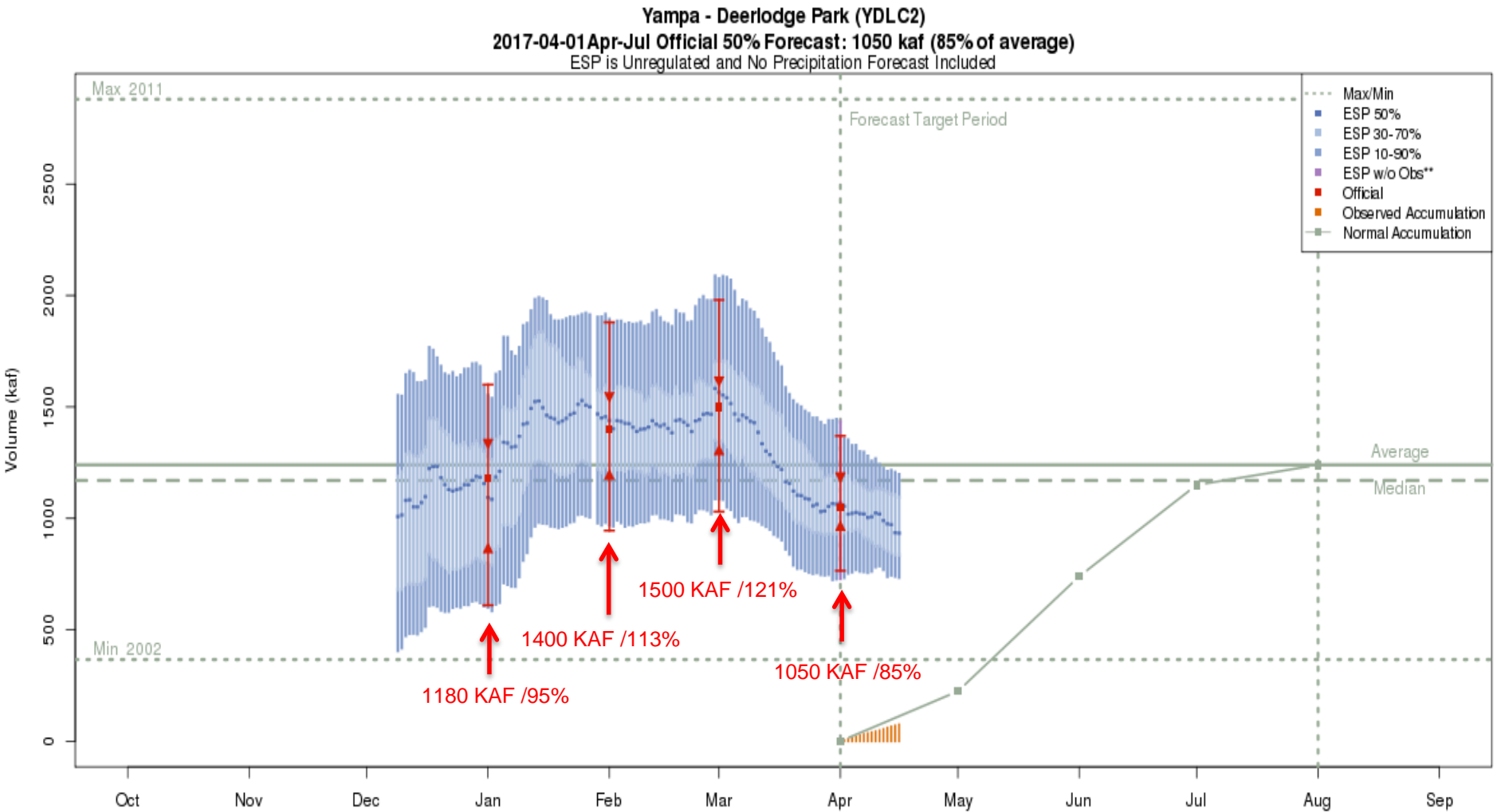


The most recent (2017-04-18) full period 50% ESP forecast is 2273 kaf.

Plot Created 2017-04-18 15:15:34, NOAA / NWS / CBRFC

Forecasts in the forecast target period include observed values.

Forecast Evolution Plot: Yampa River-Deerlodge

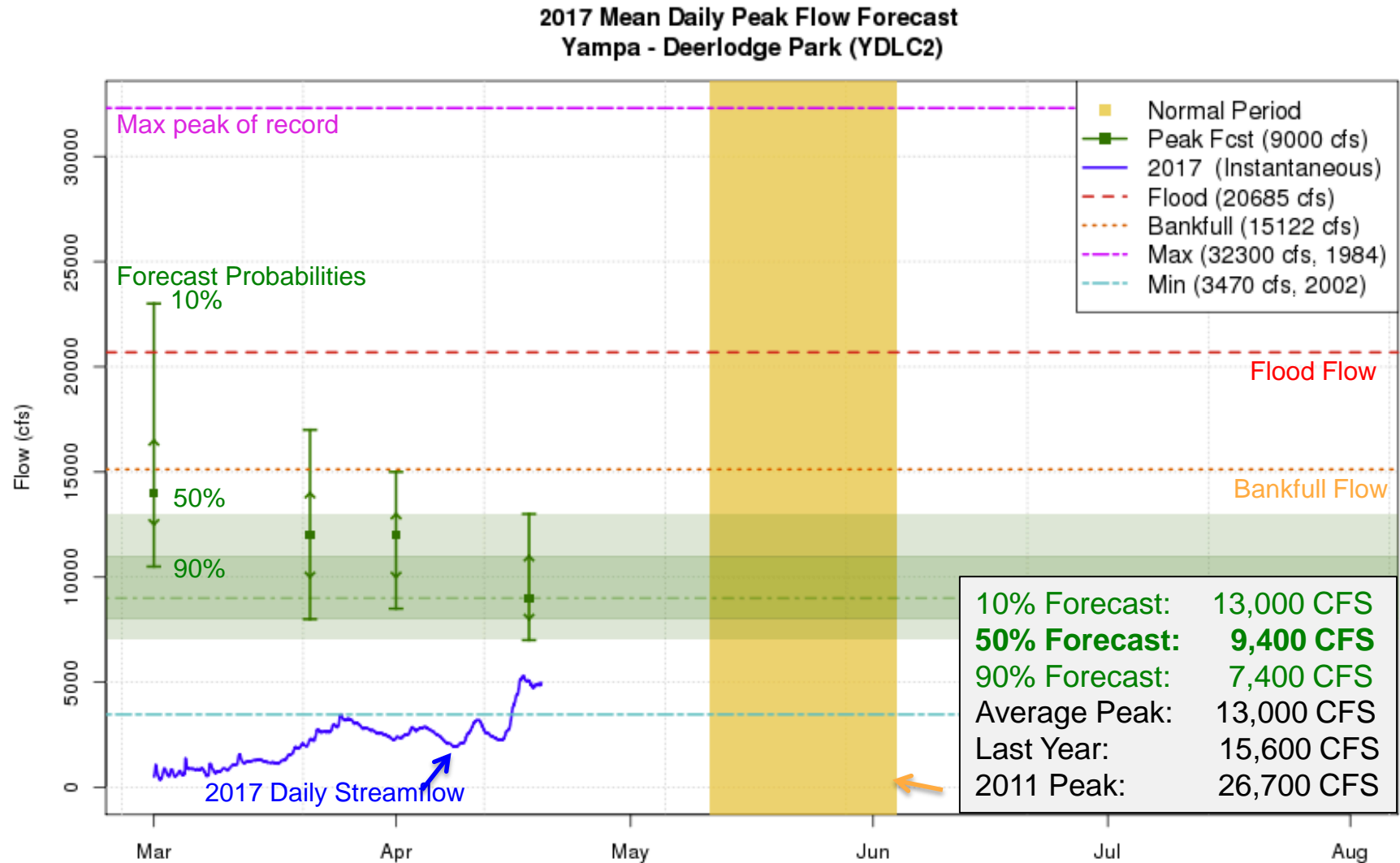


The most recent (2017-04-16) full period 50% ESP forecast is 934 kaf.

Plot Created 2017-04-16 11:48:27, NOAA / NWS / CBRFC

Forecasts in the forecast target period include observed values.

Peak Flow Outlook: Yampa River-Deerlodge

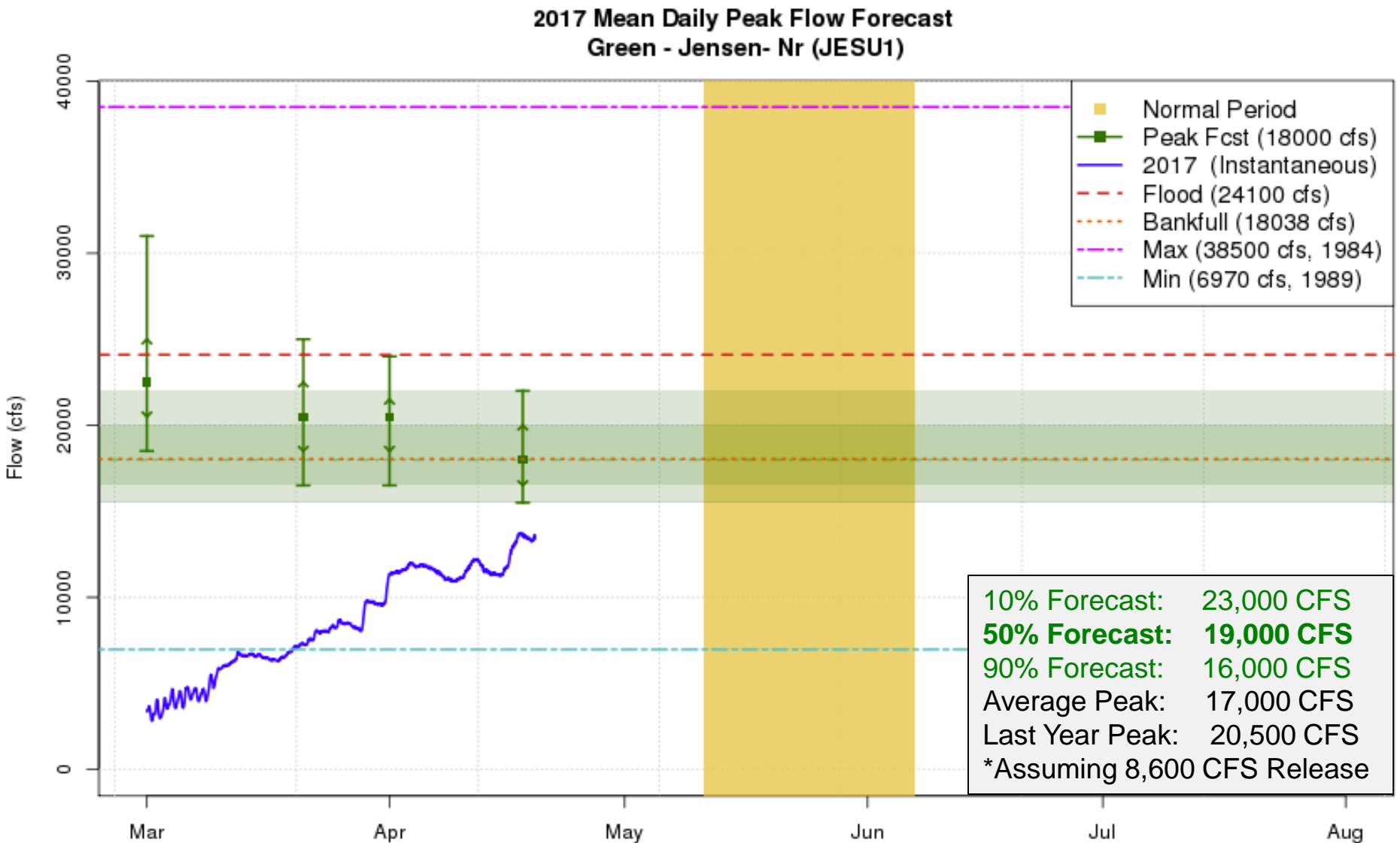


These graphics are updated approximately every two weeks between 3/1 and 5/1

Plot Created 2017-04-19 08:58:32

CBRFC / NWS / NOAA

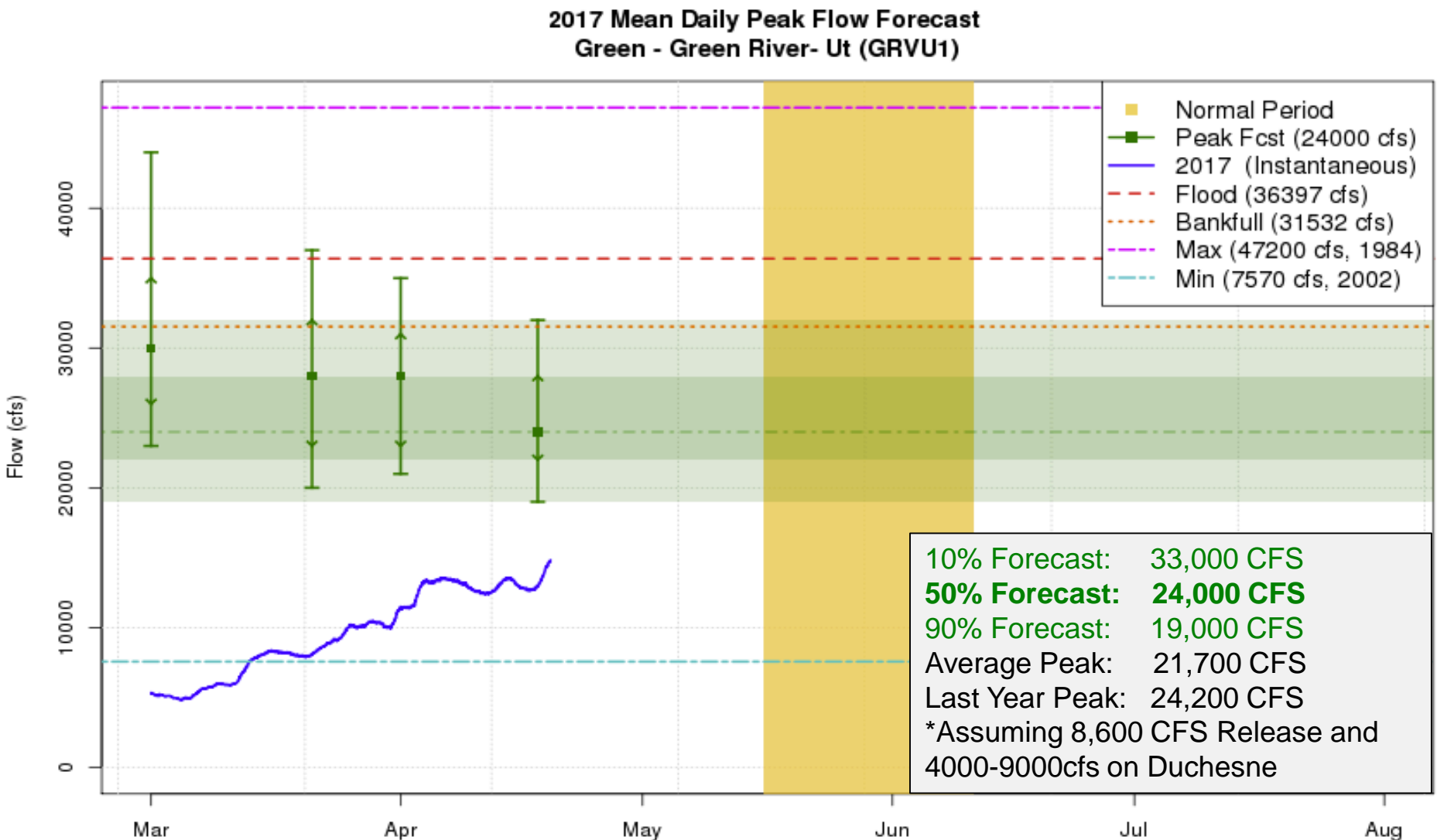
Peak Flow Outlook: Green River- Jensen



These graphics are updated approximately every two weeks between 3/1 and 5/1

Plot Created 2017-04-19 08:57:38
CBRFC / NWS / NOAA

Peak Flow Outlook: Green River, Utah



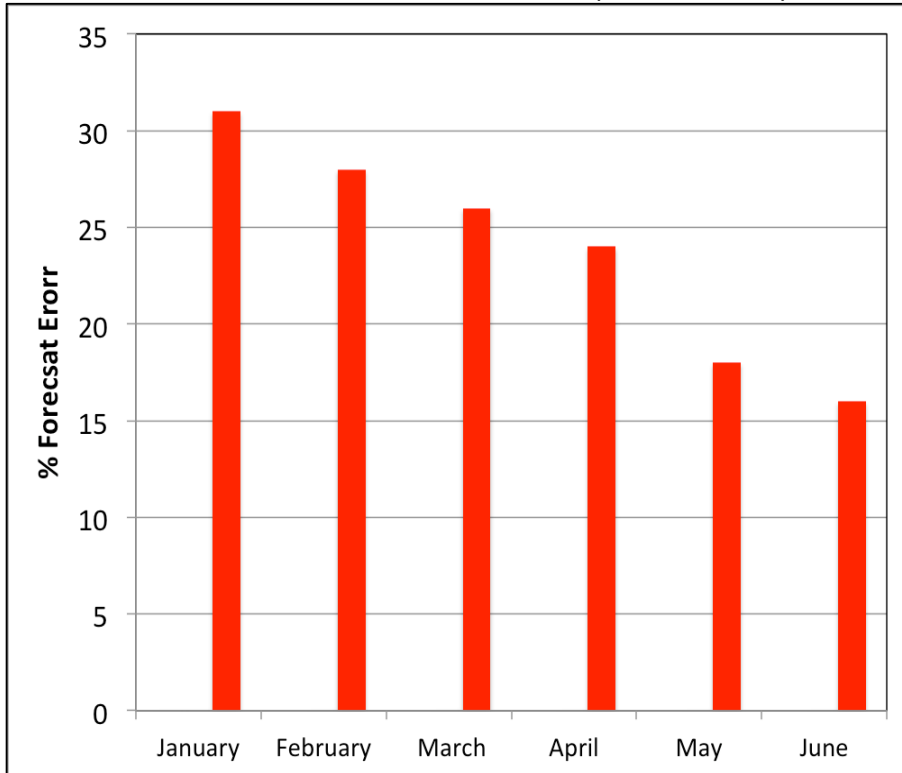
These graphics are updated approximately every two weeks between 3/1 and 5/1

Plot Created 2017-04-19 08:57:42

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How good are the April-July volume forecasts?

Flaming Gorge Average Historical Model Error
50% Exceedance Forecast (1981-2010)



- Higher forecast error early in the season
- Error decreases through out the season
- **Error may be higher in wet years**

January 1st Forecast:

What we know:

- ~40% of snowpack accumulation
- Fall soil moisture conditions

What we **DON'T** know:

- Feb-May weather (4 months)
- ~60% of snowpack accumulation

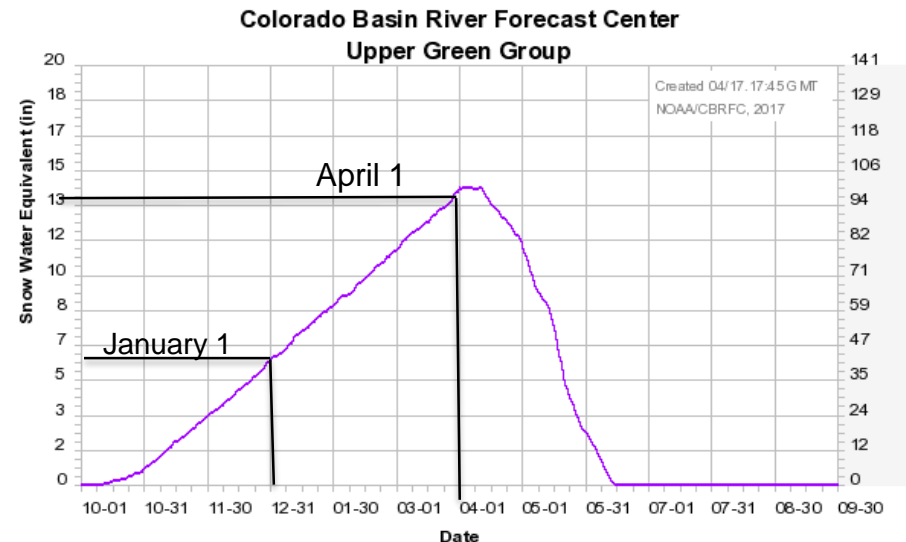
April 1st Forecast:

What we **KNOW**:

- ~98% of snowpack accumulation
- Dec-March weather

What we don't know:

- April-May weather (2 months)
- Snowmelt pattern



What are the sources of uncertainty in the forecasts?

Future Weather

- Uncertainty in temperature and precipitation forecasts
- Extreme events (record wet/record dry) are rarely forecast
- Snowmelt pattern

Model Snow States

- Is the model's representation (amount and extent) of the snowpack correct?
- SNOTELS and satellite images used to verify model snow states
- SNOTELS become less representative during melt

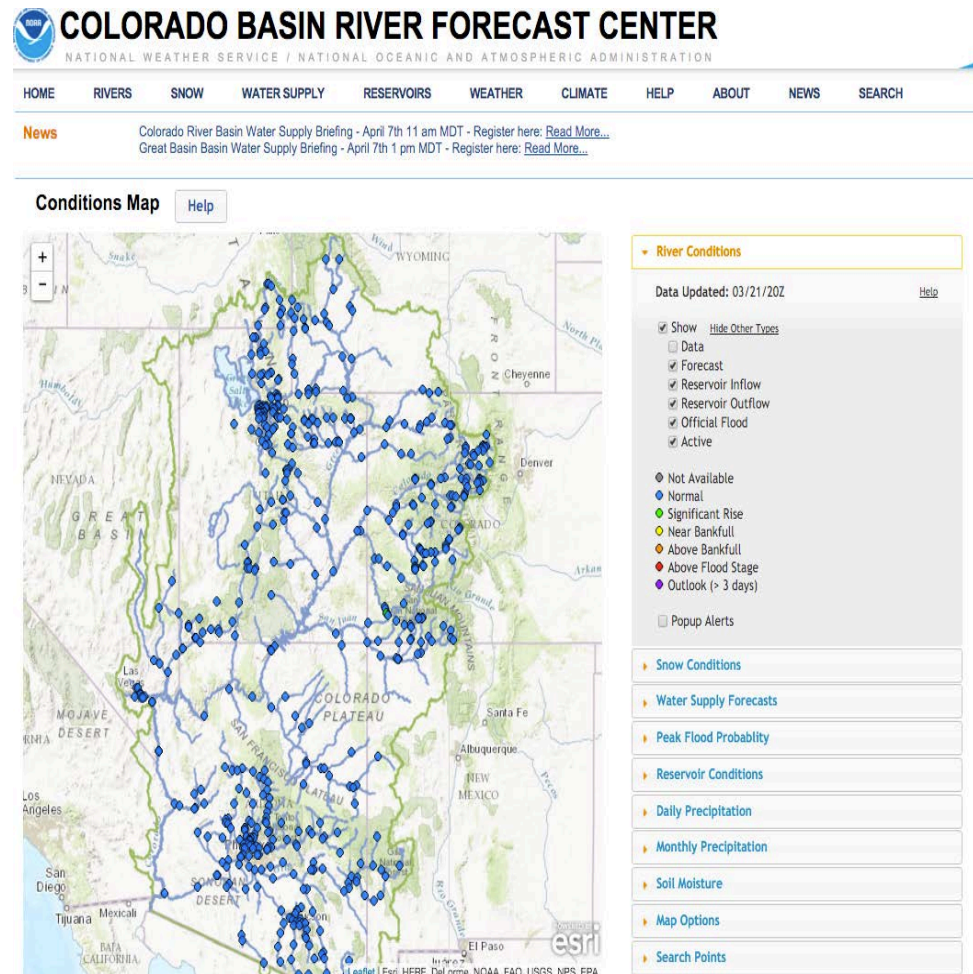
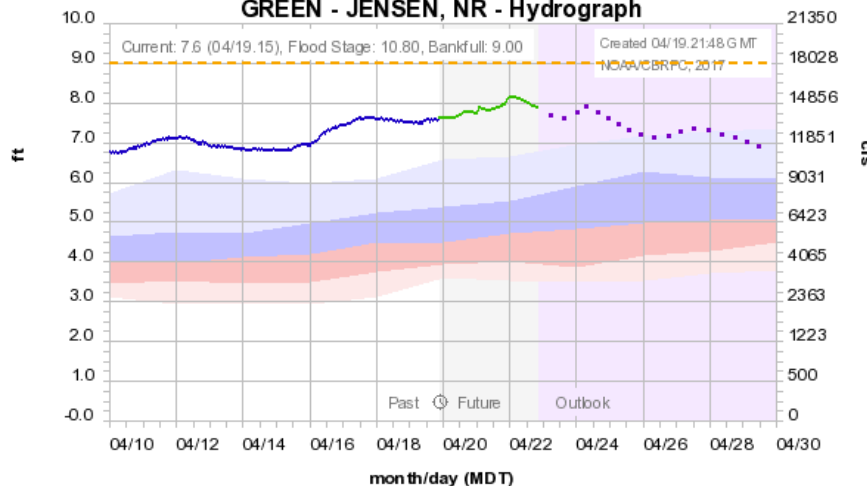
Model Soil Moisture States

- Current conditions are near the model max
- Near the upper end of the model calibration; more uncertainty than an average year

Contact Us!

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Questions?

