April 2017
Colorado River Basin Water Supply Briefing

April 6, 2017

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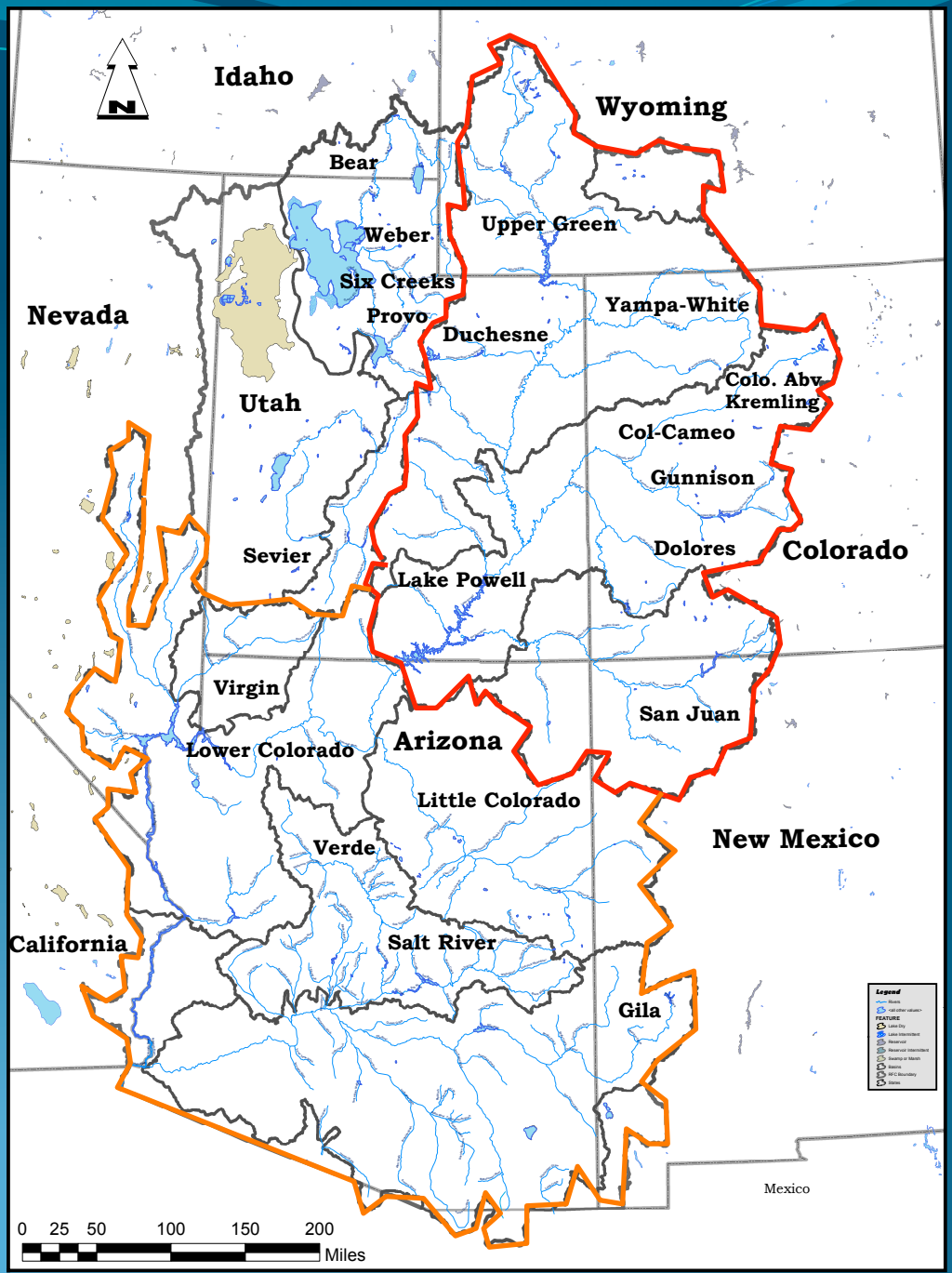
Colorado Basin River Forecast Center
National Weather Service
NOAA

Please mute your phone until ready to ask questions

CBRFC Forecast Areas



Today's Presentation

March weather impacts:
- Warm and dry conditions widespread (but some exceptions)
- Melting snow, record runoff volumes, & saturated soils

Snowpack conditions:
- Low and mid elevation snow reduced in many areas
- Significant snow remains in several higher elevation areas

April 2017 water supply forecasts overview
- Some runoff was pushed into March
- April-July forecast trends over the last month

April forecast error – an improvement over March
- Primary sources of error from this point onward

Upcoming weather – Potential impacts to water supply forecasts

Peak Flow Summary

Contacts & Questions

*** Please mute your phone until ready to ask questions ***

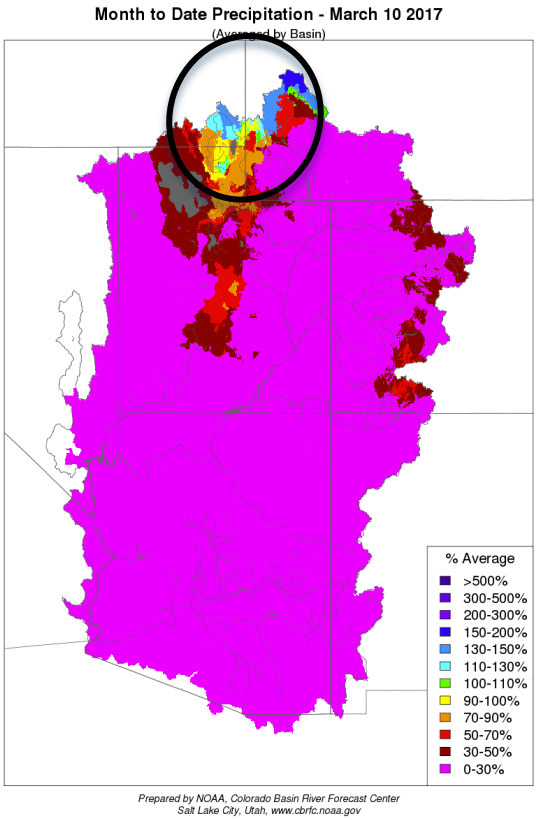
March Weather

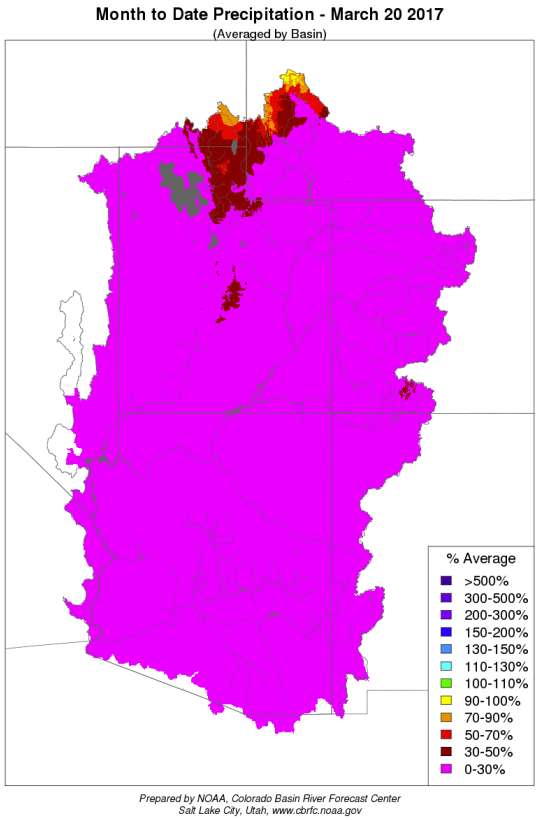
Precipitation distribution over the month of March

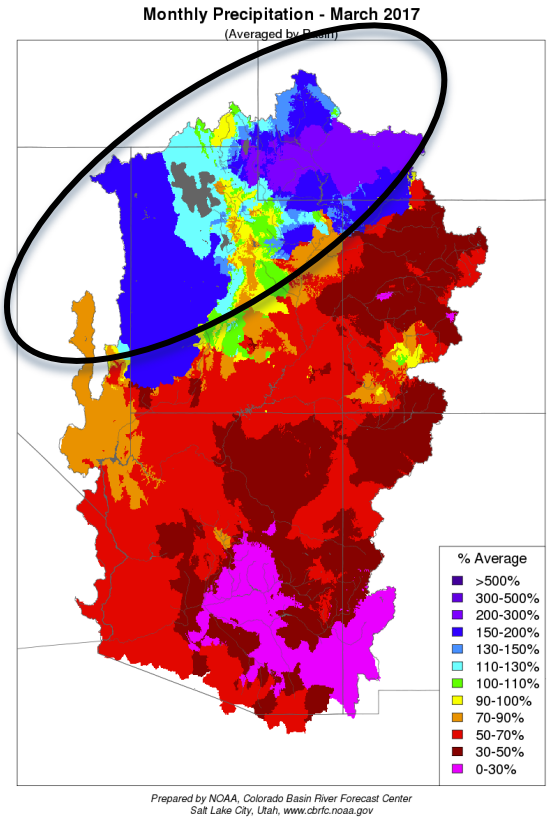
Storms clipped only the extreme northern part of the area during early March (Green River Basin).

Extended period of dry conditions throughout the area during the middle part of the month.

Significant precipitation the final 7-10 days of March. Focused over the Green River and Great Basins.

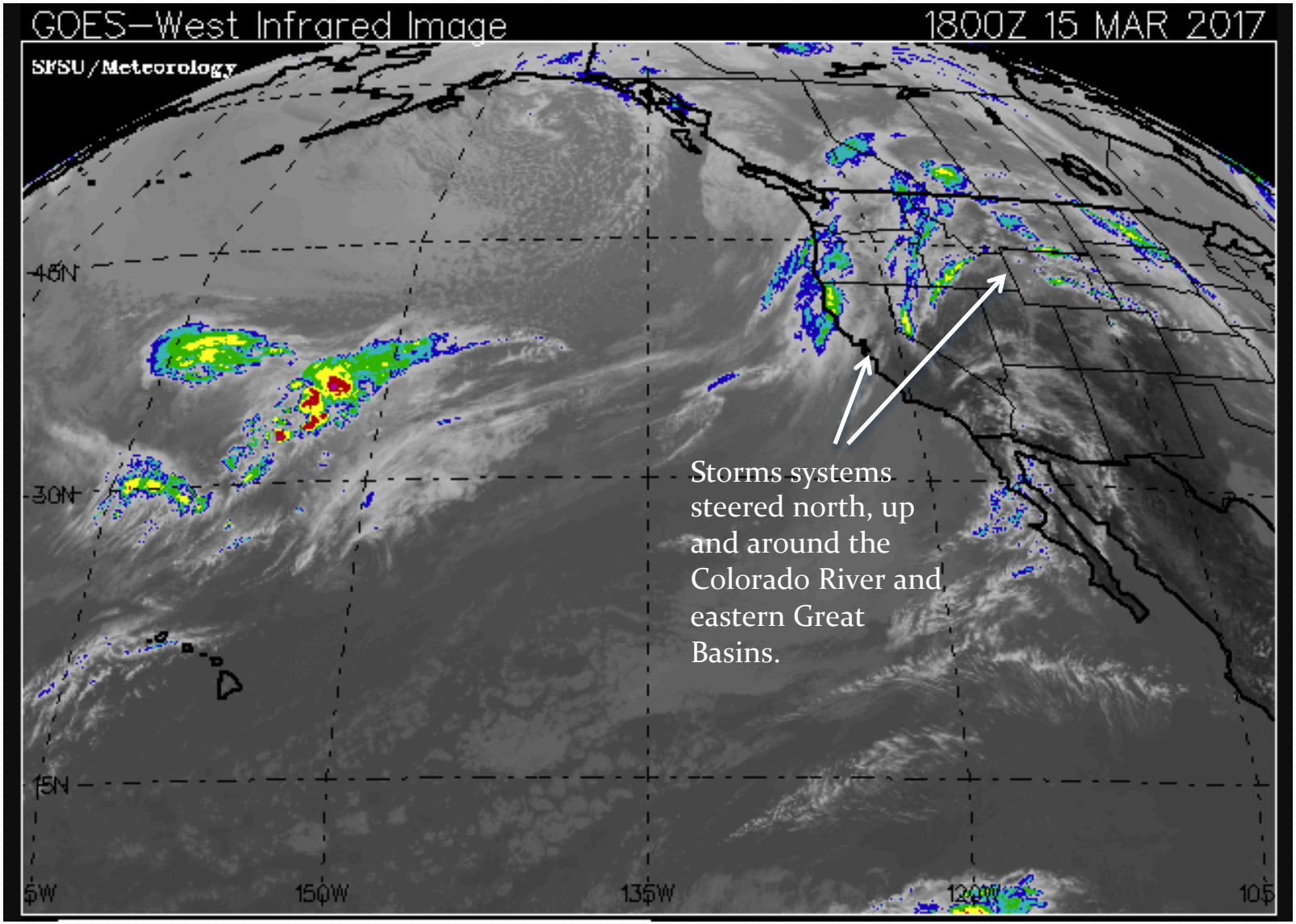






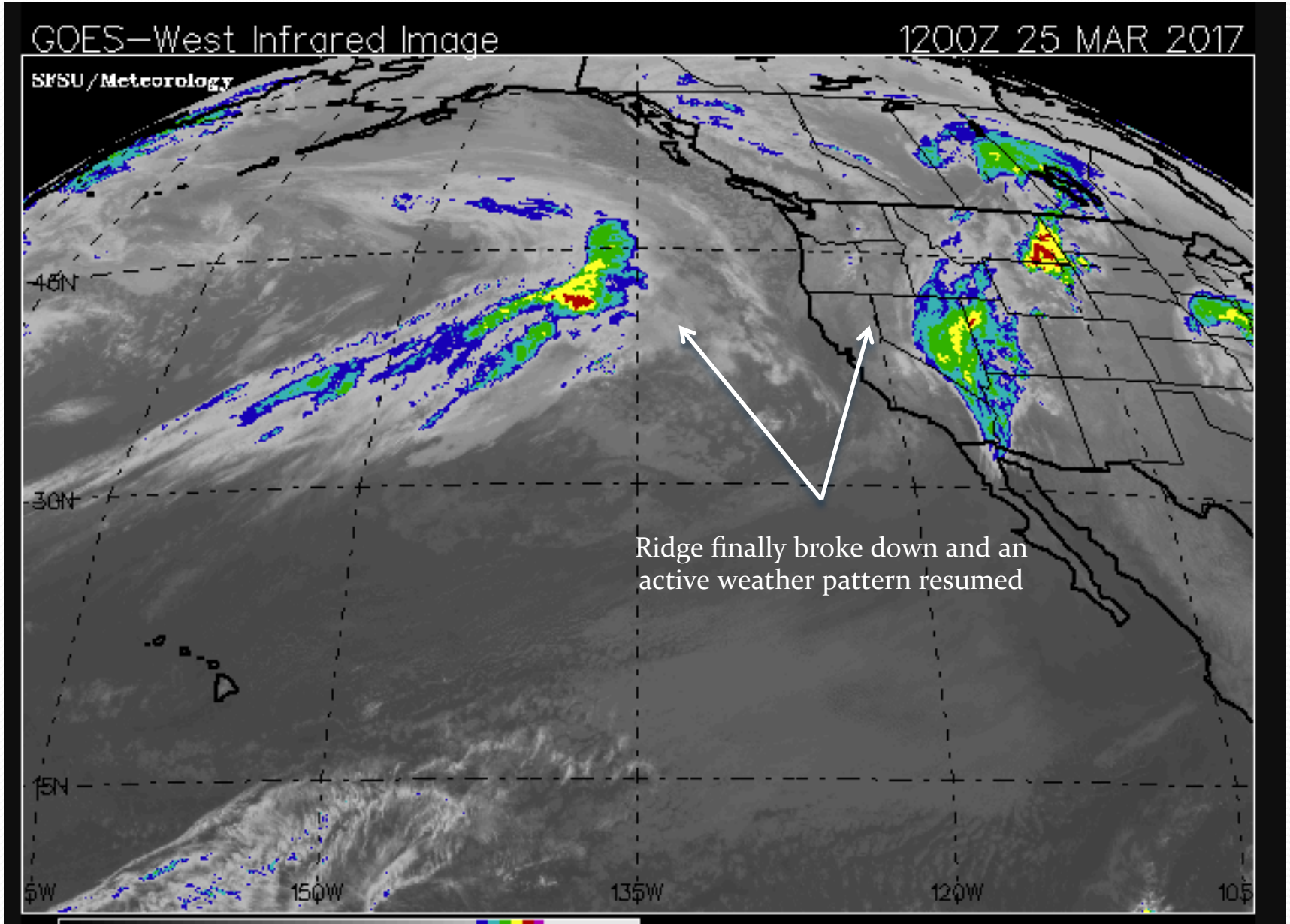
March Weather

Strong ridge of high pressure



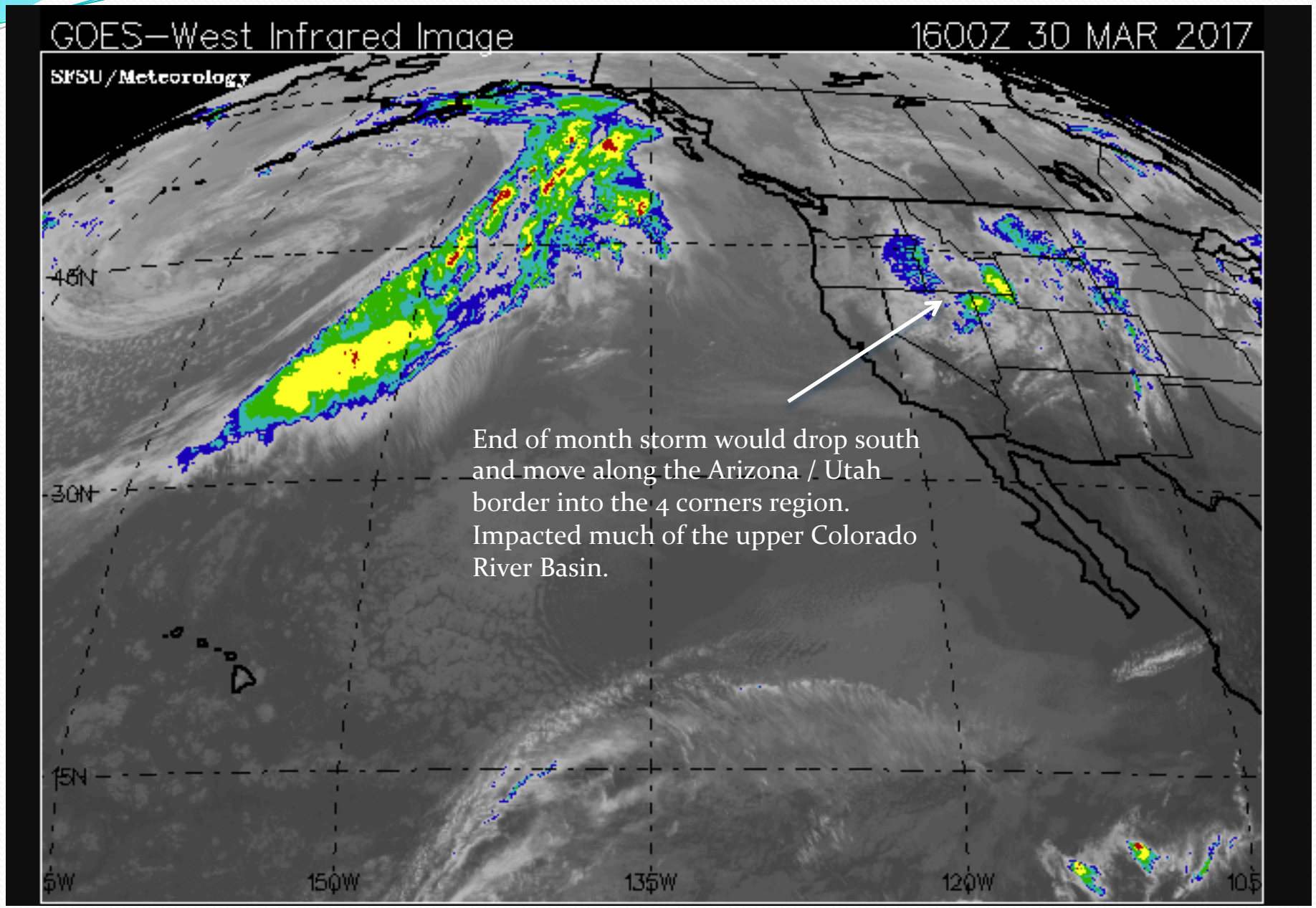
March Weather

Storm systems resumed impacting the area after March 20th



March Weather

End of March / Early April storm impacted most of the forecast area



March Weather

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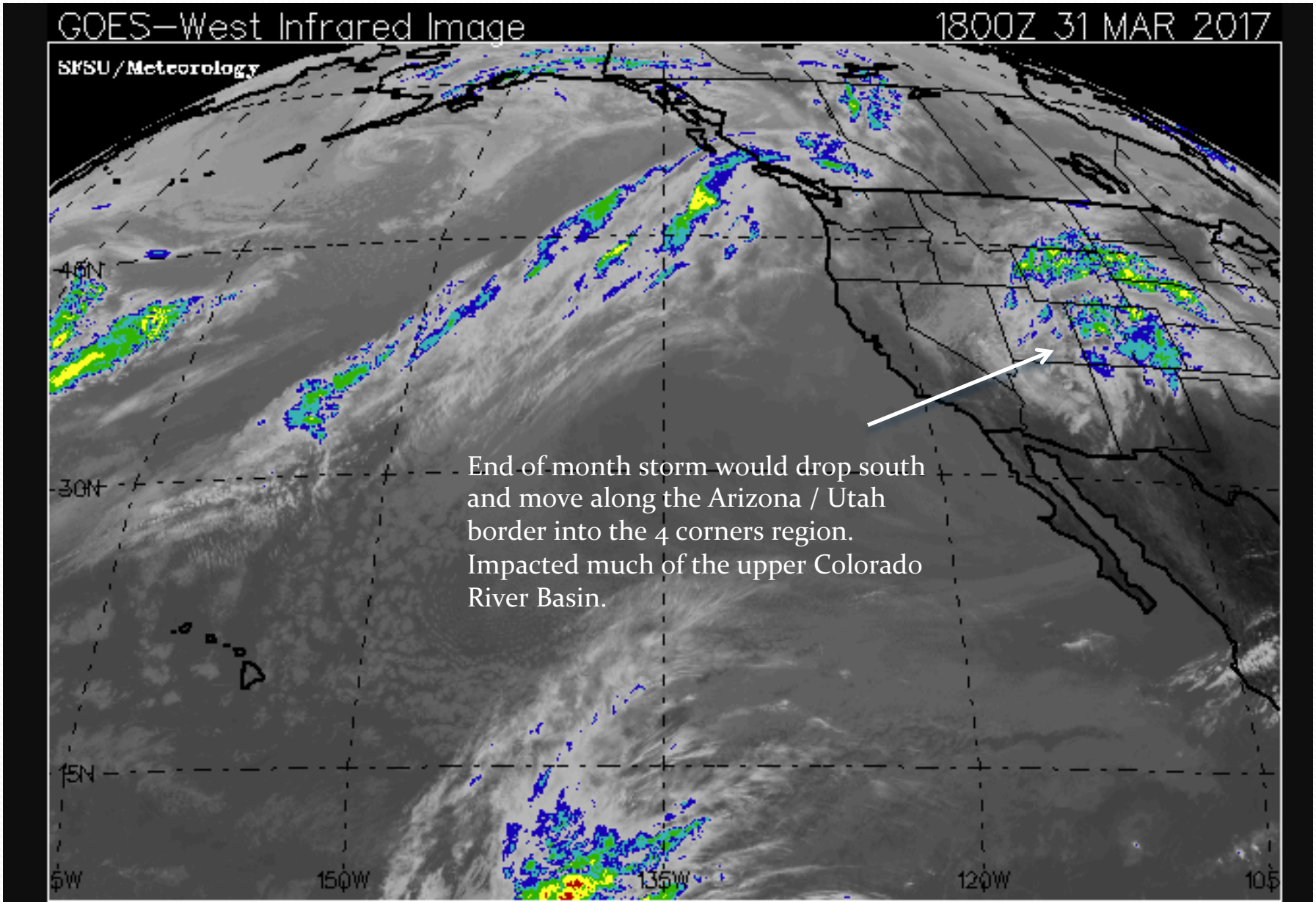
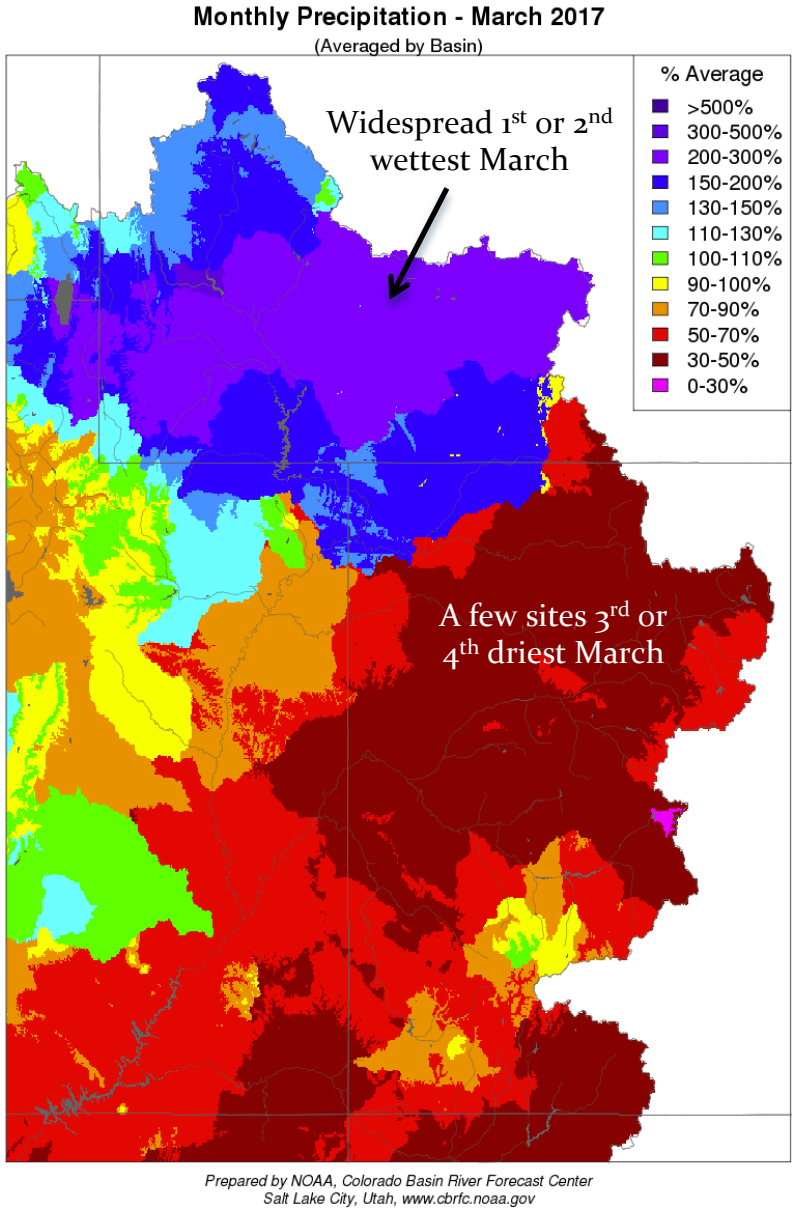


March Weather

Precipitation distribution by major river basins

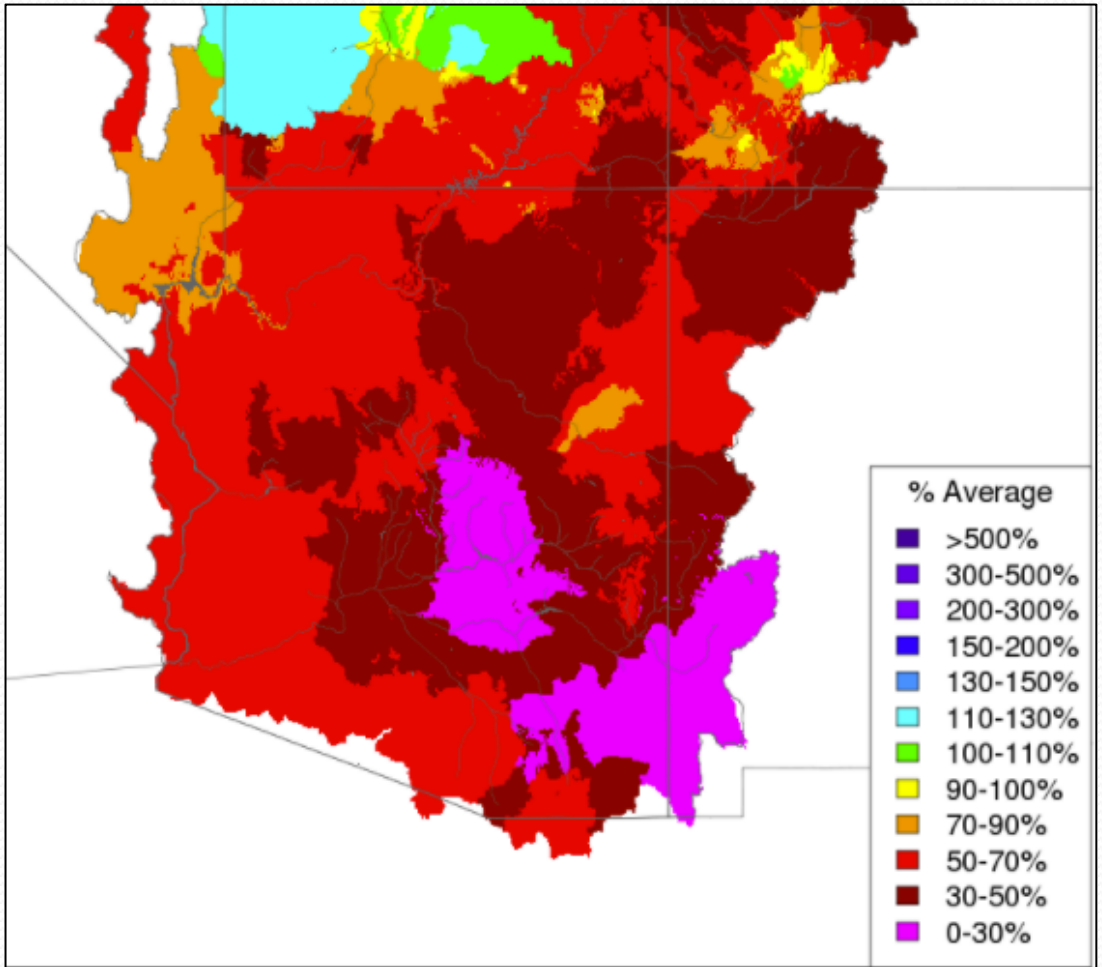


Upper Colorado River Basin
Mar 2017 Precipitation (% average)

Upper Green:	145%
Yampa/White:	45%
Duchesne:	110%
Colorado Mainstem:	50%
Gunnison:	60%
Dolores:	70%
San Juan:	70%

March Weather

Precipitation distribution by major river basins



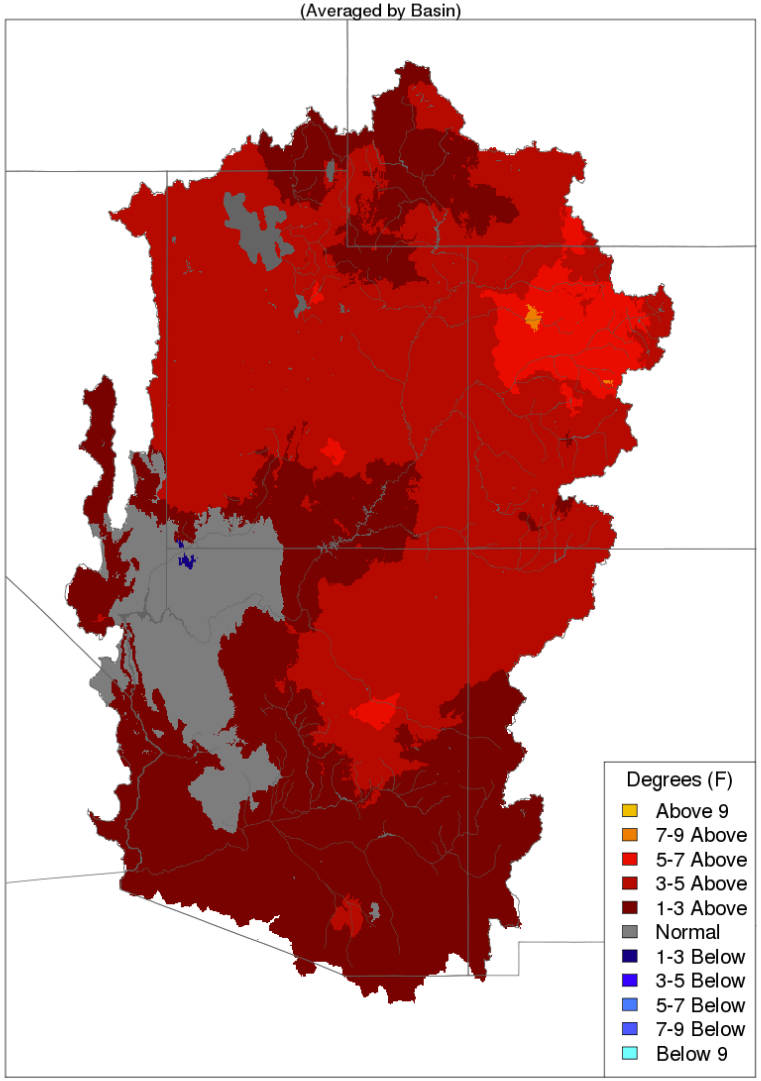
Lower Colorado River Basin
Mar 2017 Precipitation (% average)

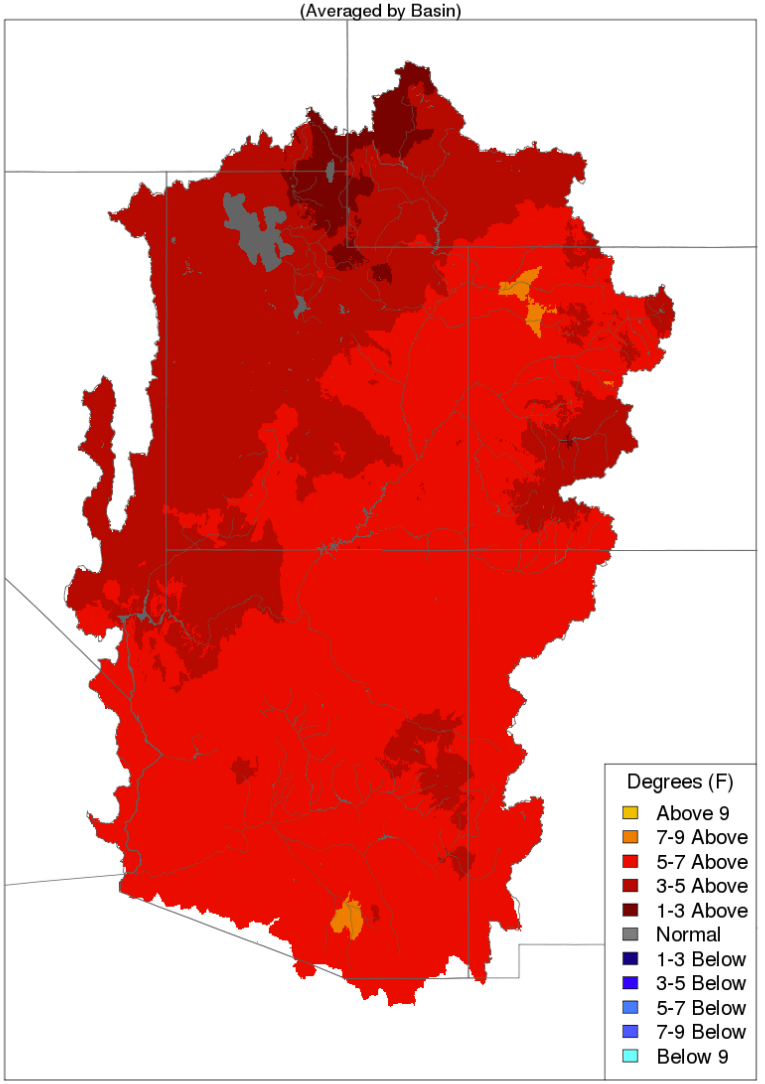
Virgin River:	60%
Little Colorado:	40%
Salt:	40%
Gila:	25%

March Weather

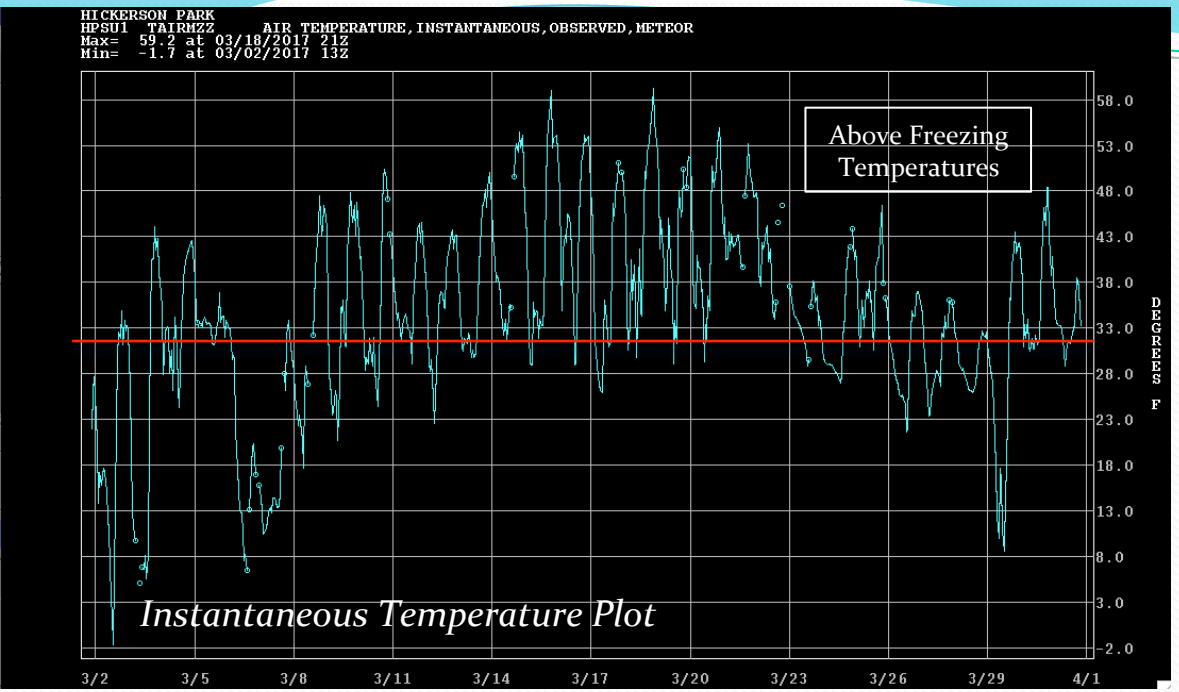
Another Warm Month

Some mean daily temperatures reached 15-25 degrees above average

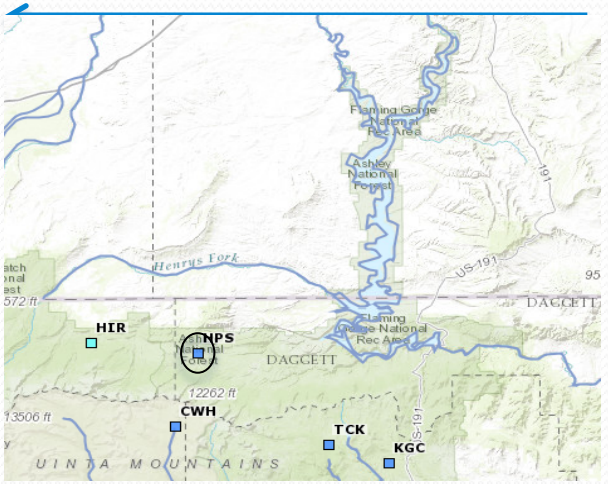


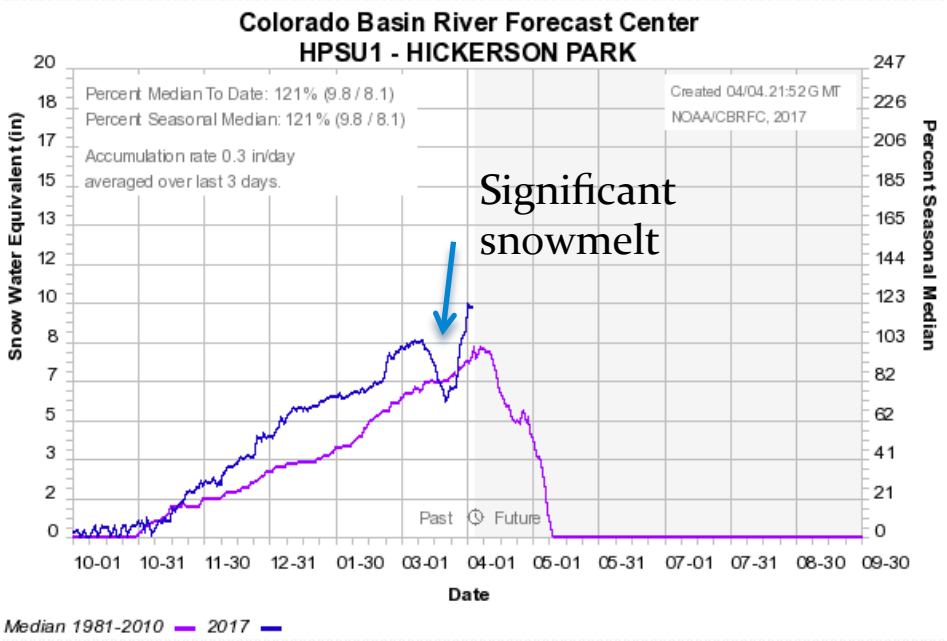


March Weather – Temperature Impacts

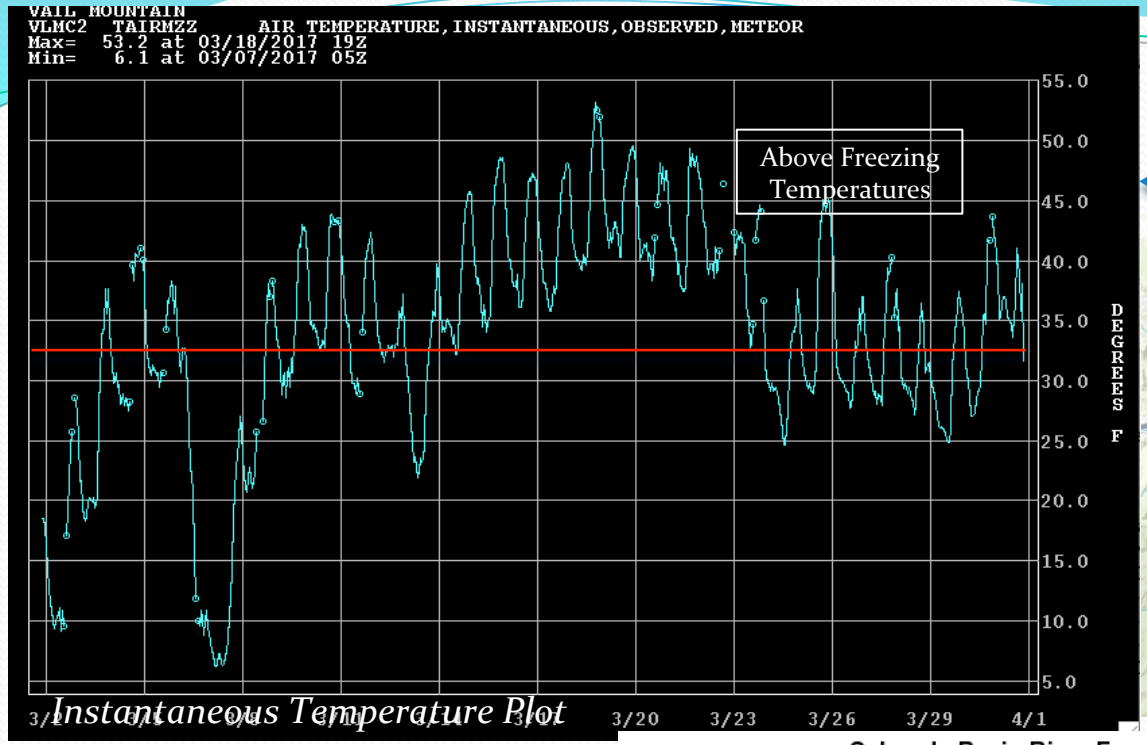


Hickerson Park SNOTEL
Elevation: 9,145 Feet
Upper Green River Basin



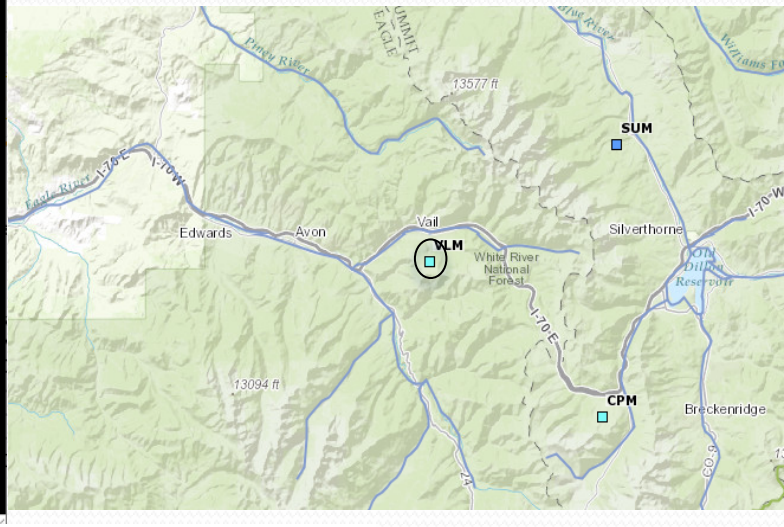


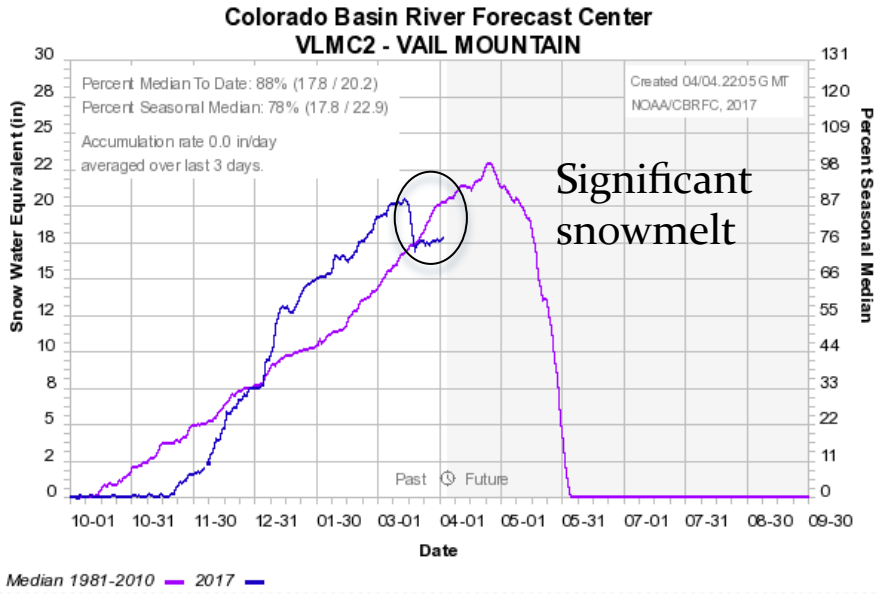
March Weather – Temperature Impacts



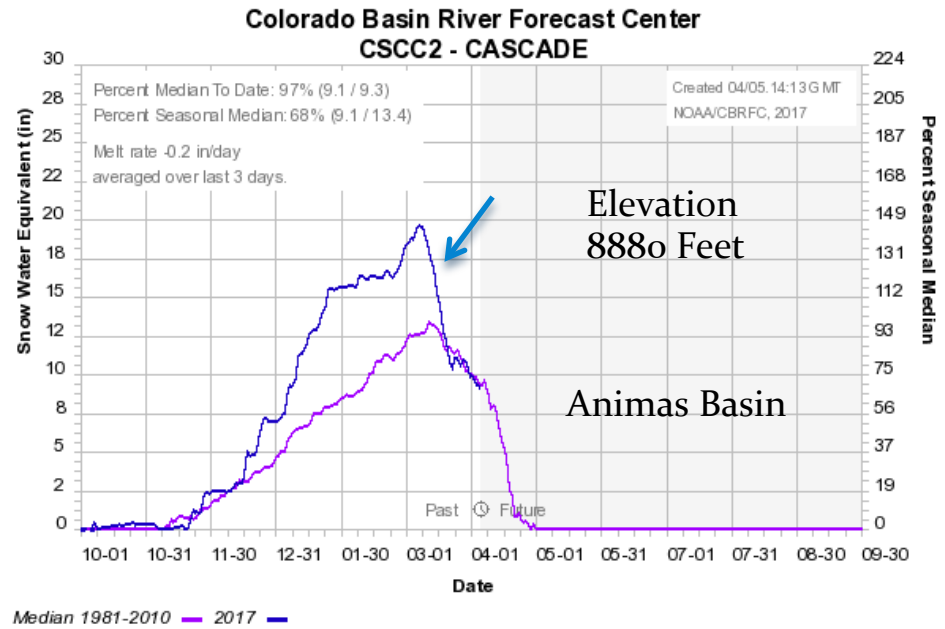
Instantaneous Temperature Plot

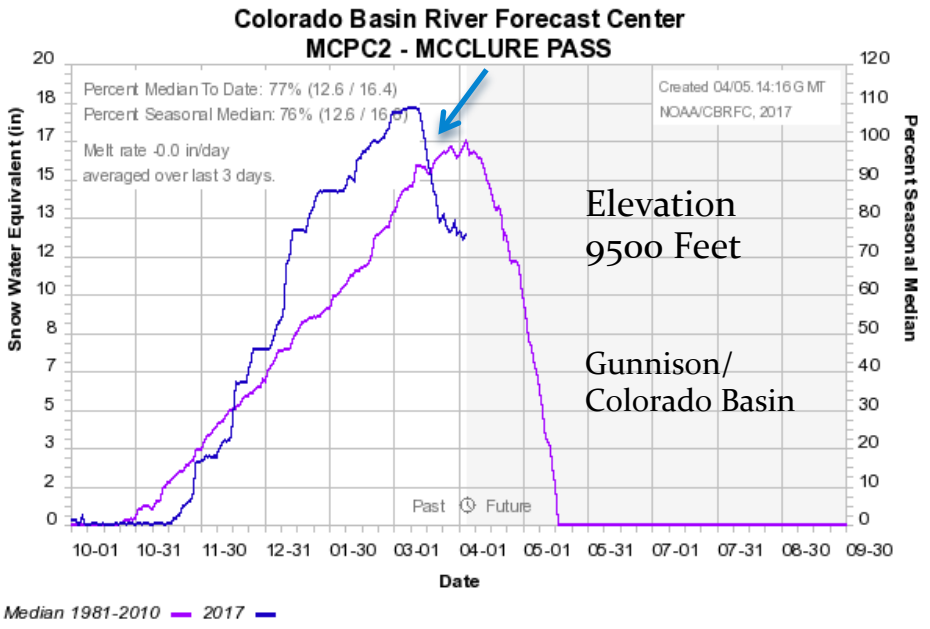
Vail Mountain SNOTEL
Elevation: 10,300 Feet
Colorado River Headwaters

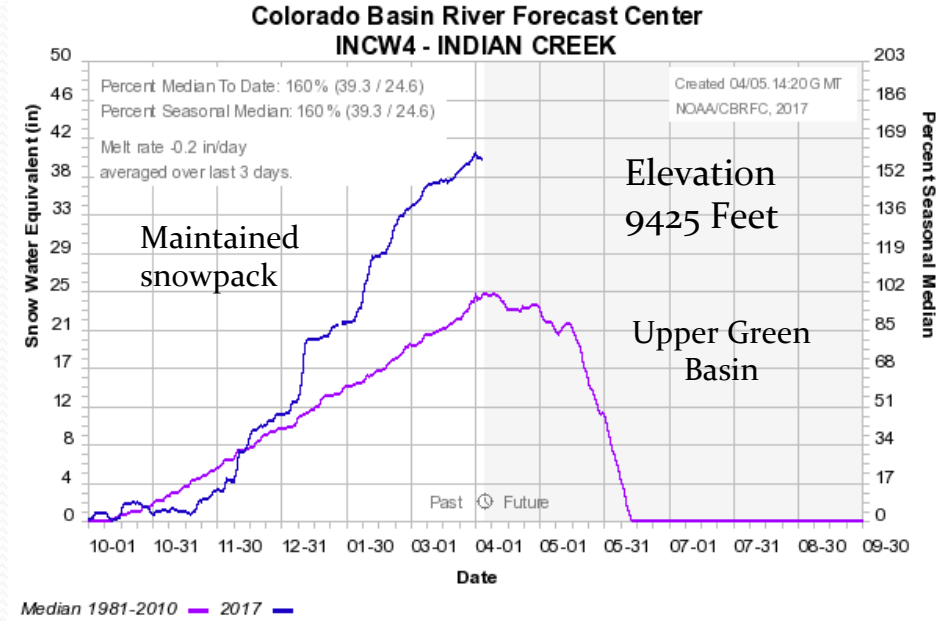


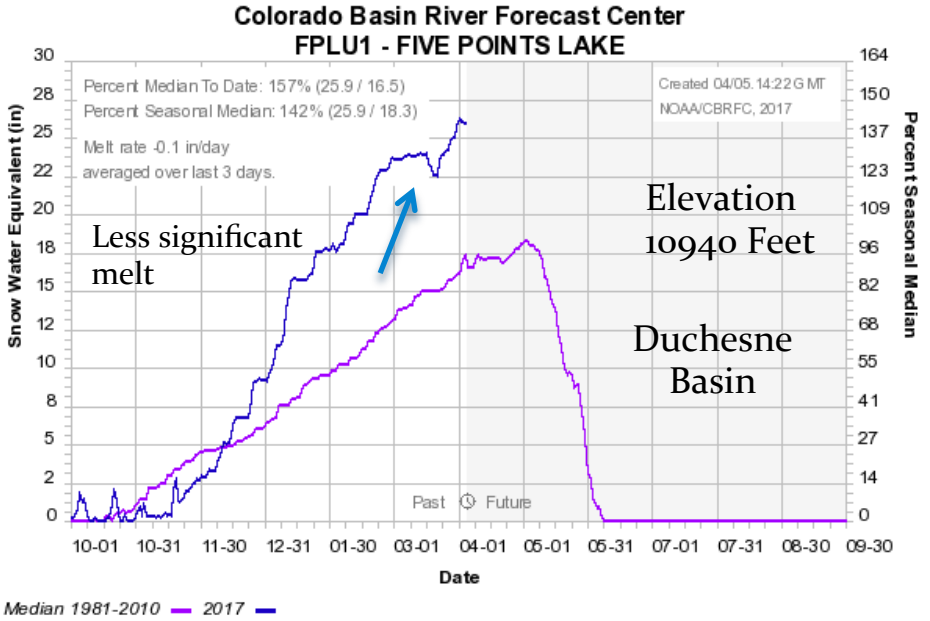


March Weather – Temperature Impacts on Snowpack



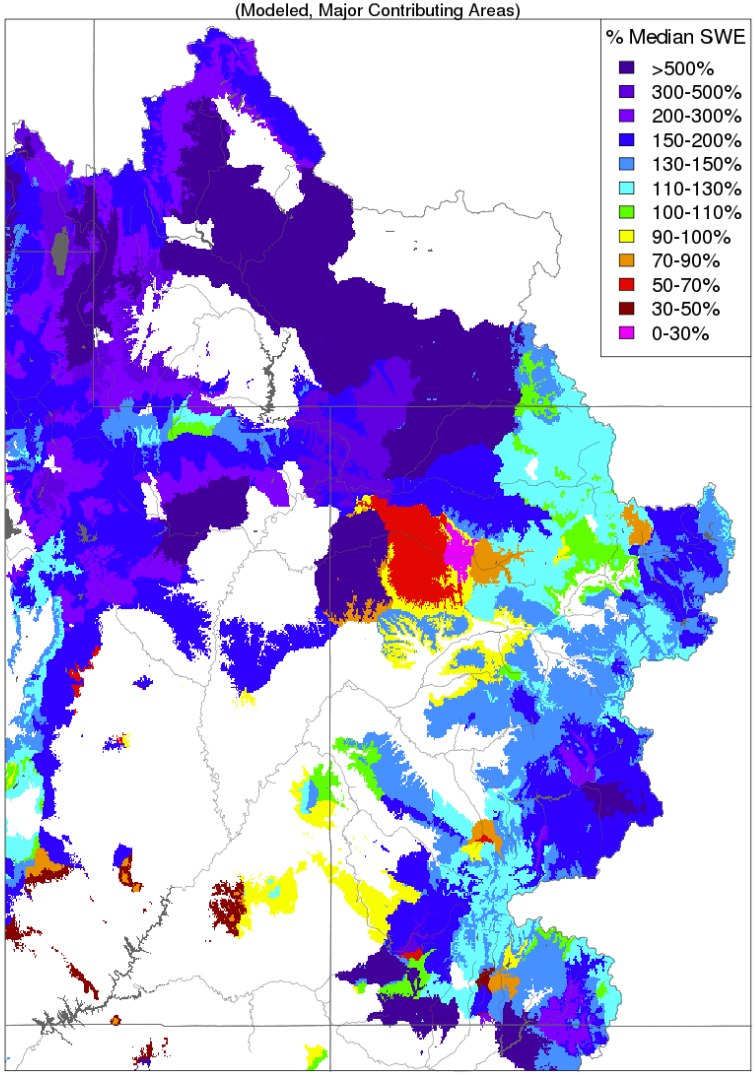


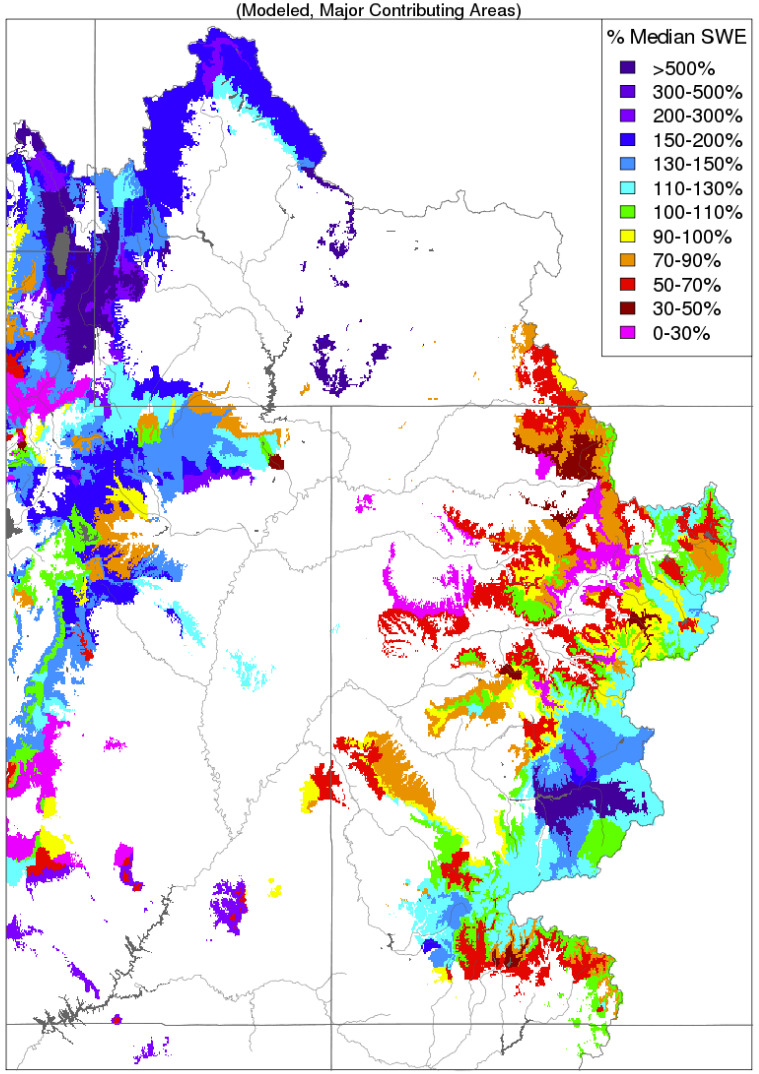




March Weather – Temperature Impacts on Snowpack

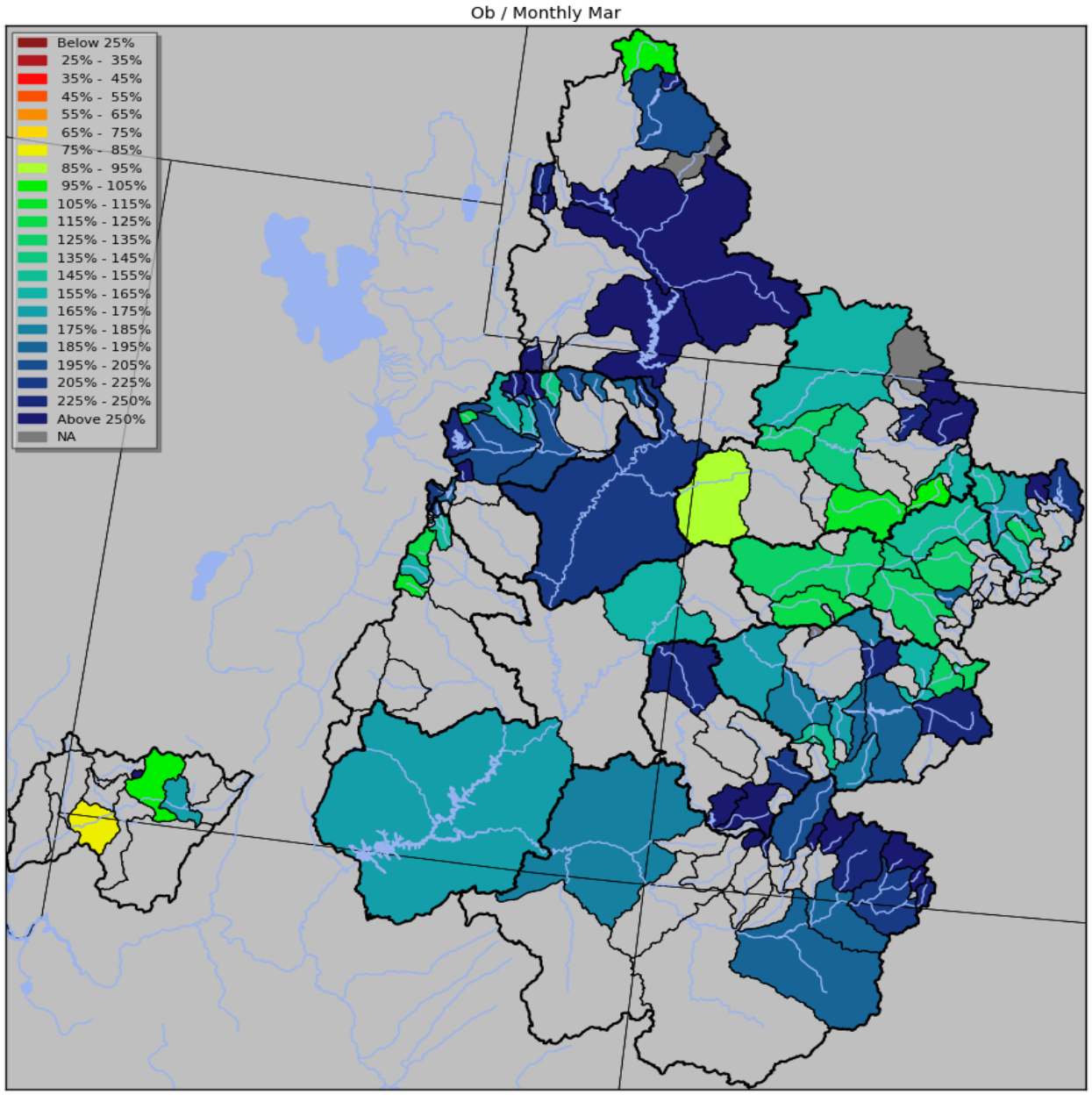
Reduced a lot of low elevation (< 8500) snow as well as some mid elevation (approx 8500-10,000 ft)



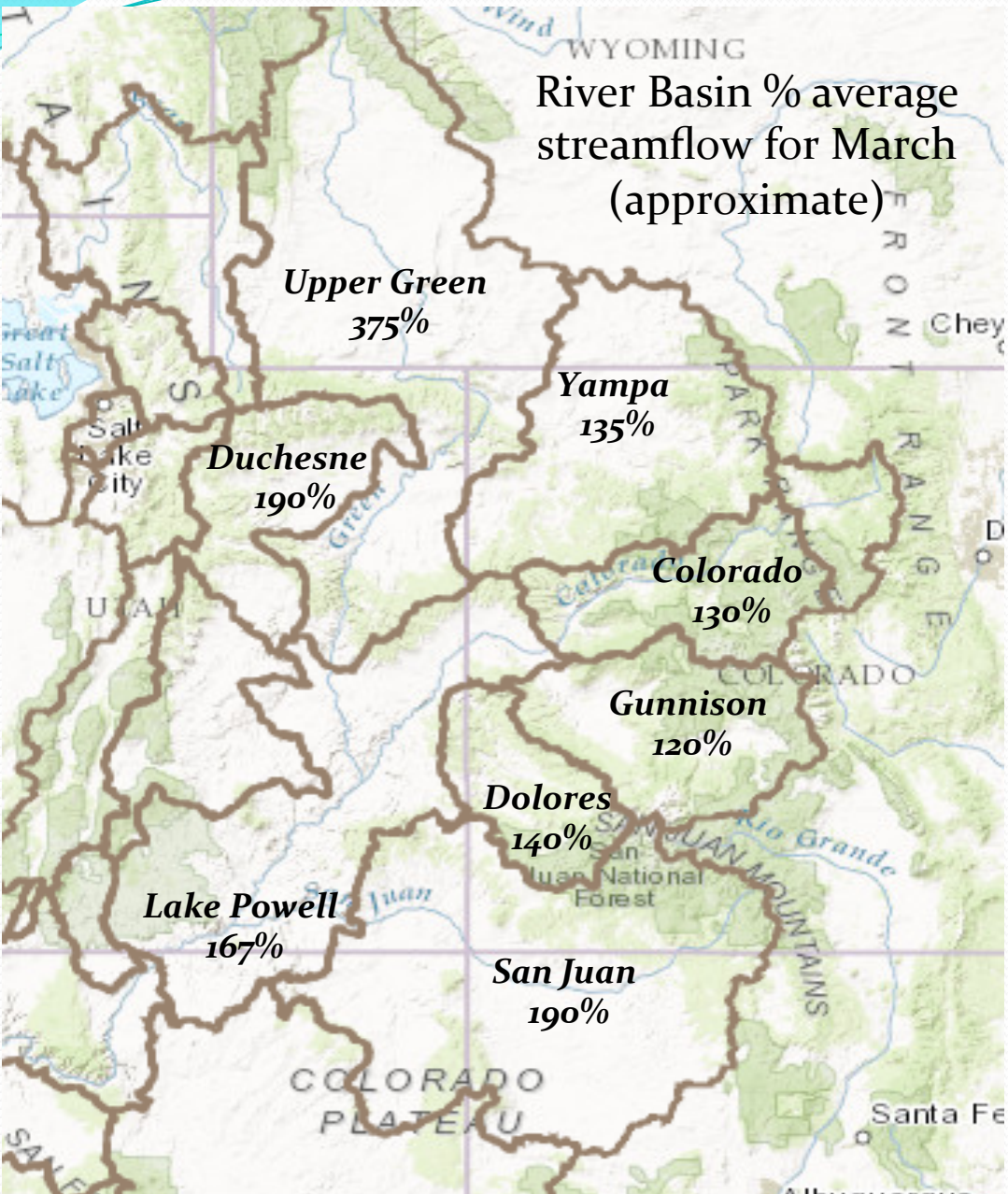


March Weather – Streamflow Impacts

March streamflow volumes (unregulated) as a % of average



March Weather – Temperature Impacts
Record March Runoff



Notable March Volumes

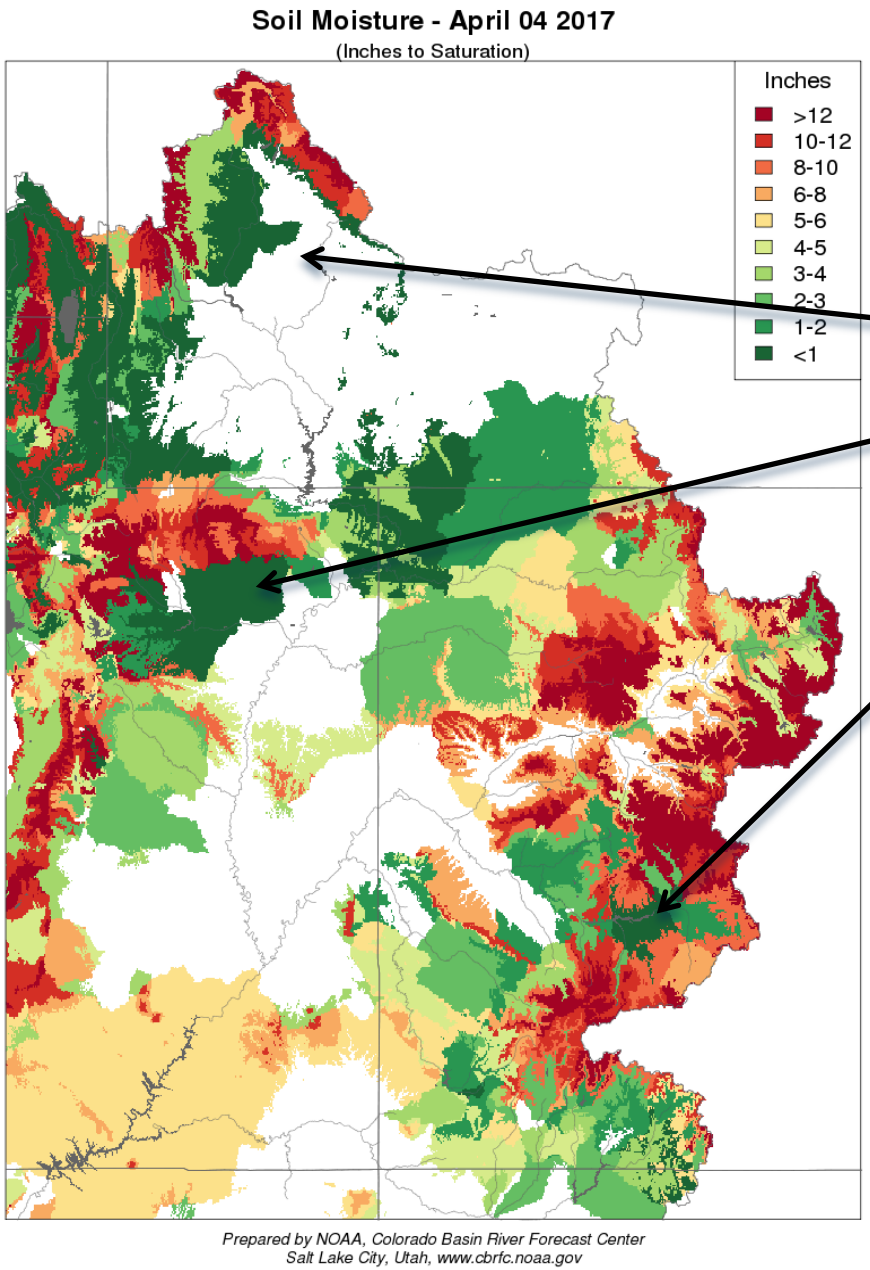
Site (Rank/POR) – Mar Vol KAF / % Avg	– old record	(year)
Fontenelle (1/52)*	180 / 343%	99 (1986)
Flaming Gorge (1/55)*	400 / 392%	237 (1997)
Granby (1/90)*	9.7 / 206%	9.1 (2015)
Willow Creek (1/98)*	3.1 / 254%	2.3 (1920)
Green Mtn (1/80)*	14.9 / 153%	14.4 (2015)
Colo-Kremmling (1/55)*	52 / 167%	52 (2015)
Blue Mesa (1/49)*	70 / 193%	55 (1951)
Mcphee(2/37)	57 / 270%	59 (1997)
Vallecito (1/76)*	24 / 285%	16 (2007)
Navajo (4/47)	177 / 191%	198 (1995)
Lemon Res(1/54)*	4.1 / 259%	3.8 (1989)
Lake Powell(3/54)	1109 / 167%	1141 (1985)

At least 17 sites in Green River Basin records

Many more sites in top 2 or 3 of record

Data is provisional – not all basin stream flow sites included

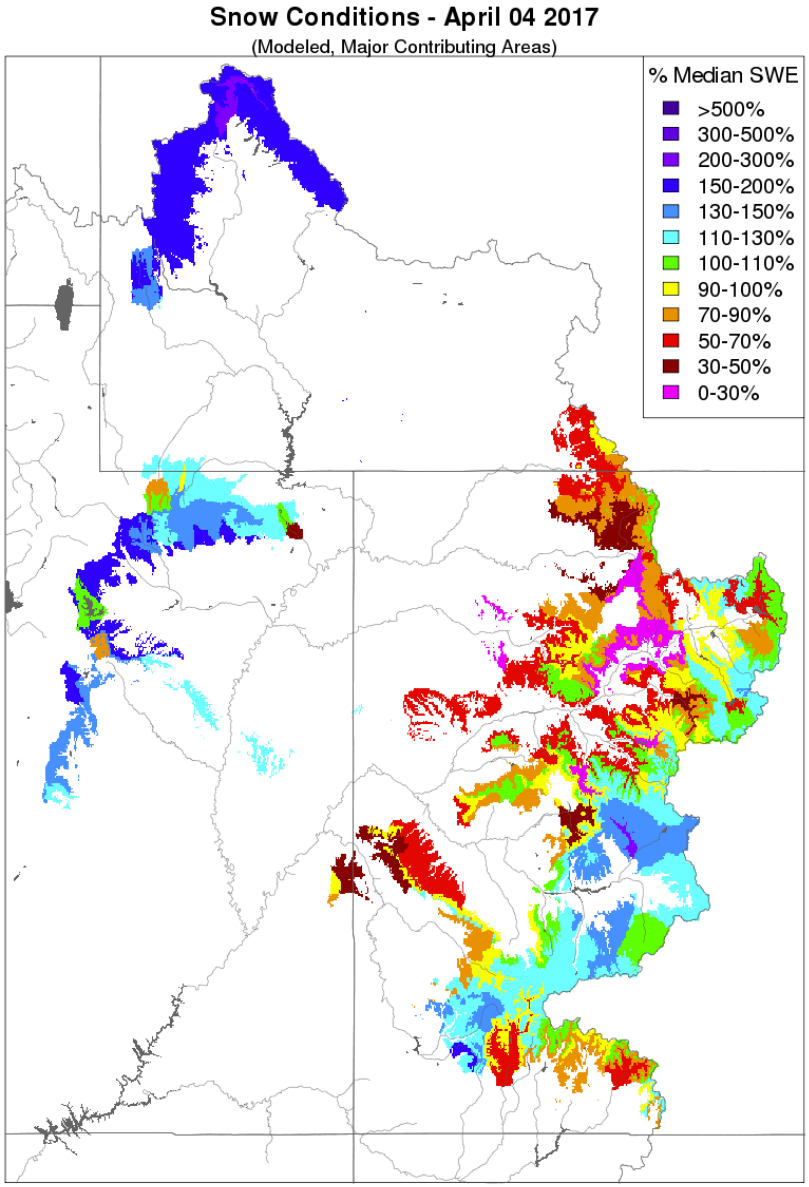
March Weather – Impacts to Soil Moisture



Lower elevation areas with significant snowpack in early March are saturated in the hydrologic model due to recent melt

March Weather Impacts

Current snow conditions (CBRFC model)



Melted significant amount of lower elevation snow
- Benefits to reducing flood threats

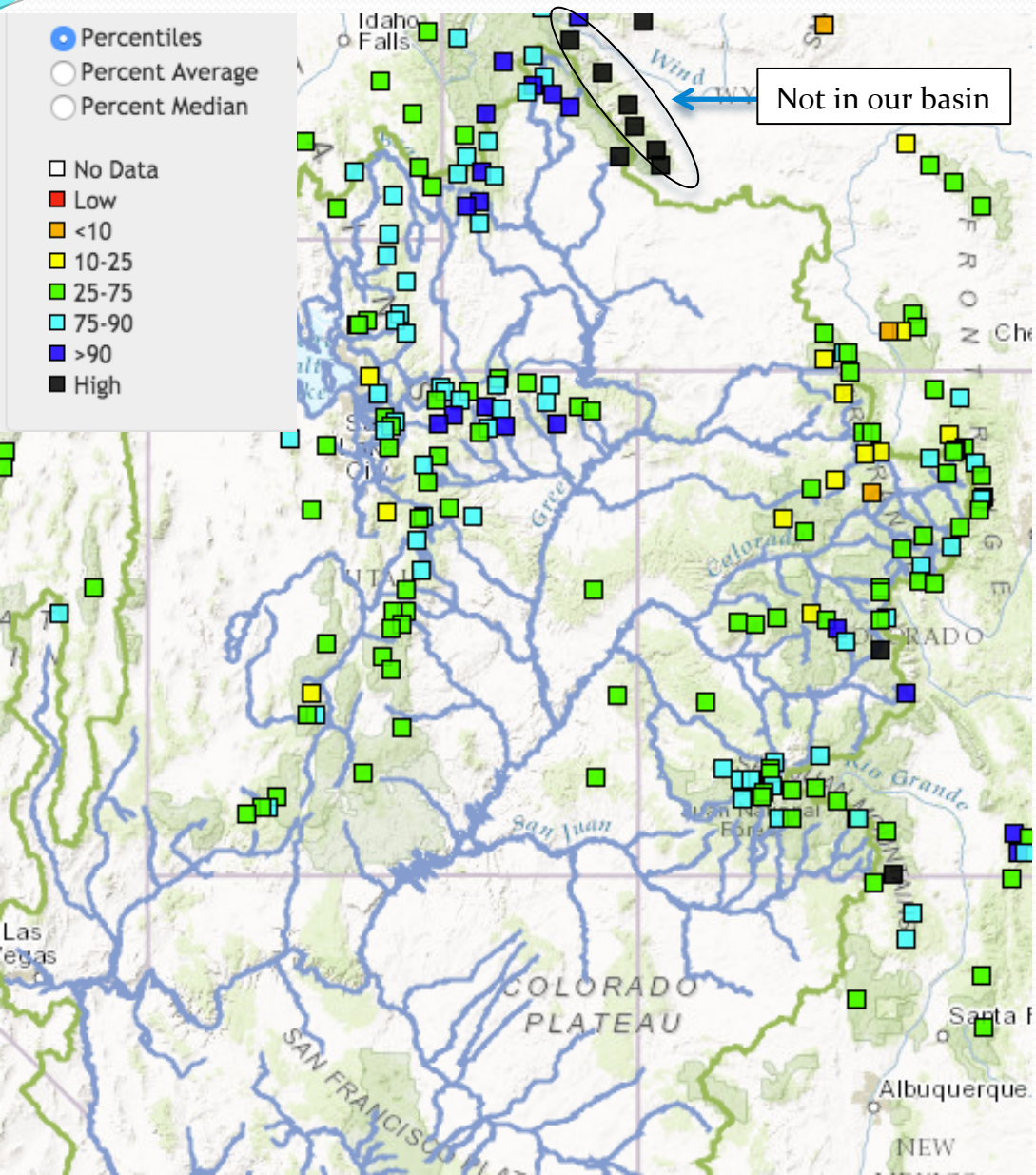
Lower elevation areas saturated (model)
- Could result in efficient runoff response to rain
  - Green River Basin (Wyoming)
  - Duchesne River Basin
  - Gunnison River Basin (abv Blue Mesa)

Previous April-July forecast volumes
- Some of that volume ended up in March
- Some April-July volumes decreased

Significant snow still remains in higher elevations
- Green River Basin (Wyoming)
- Duchesne River Basin
- Gunnison River Basin headwaters
- Dolores River Basin

Current Snow Conditions

SNOTEL historical snow ranking for April 6th 2017



Two sites are the highest on record for this date.
- Gunnison Headwaters
- Big Sandy (upper Green Basin)

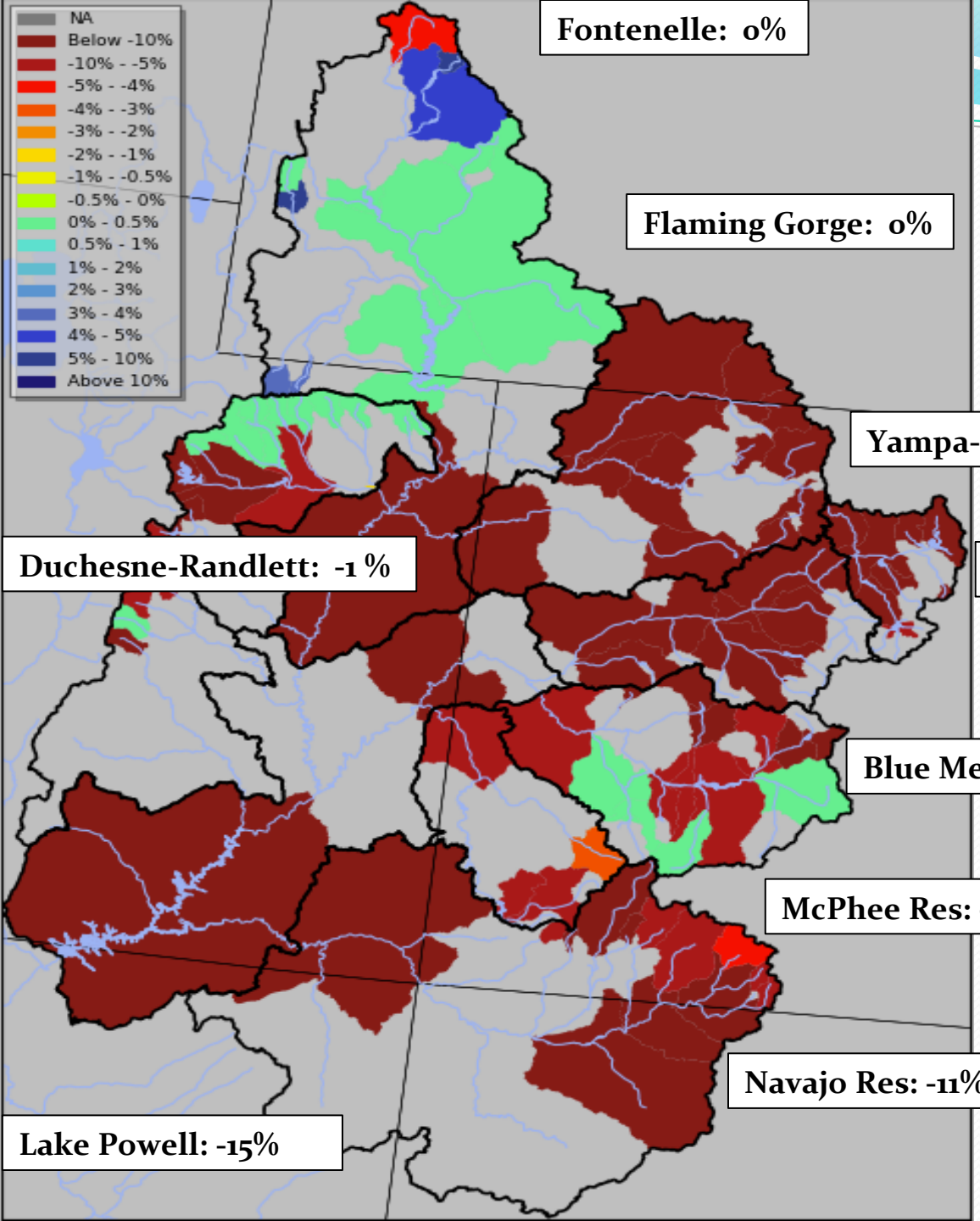
Most sites indicated by dark blue are the 2nd or 3rd highest on record for this date.

Periods of record are generally 34-39 years.

Upper Colorado April-July Streamflow Volume Forecasts

(% of 1981-2010 average)

% of Average Change from March 1st Forecasts

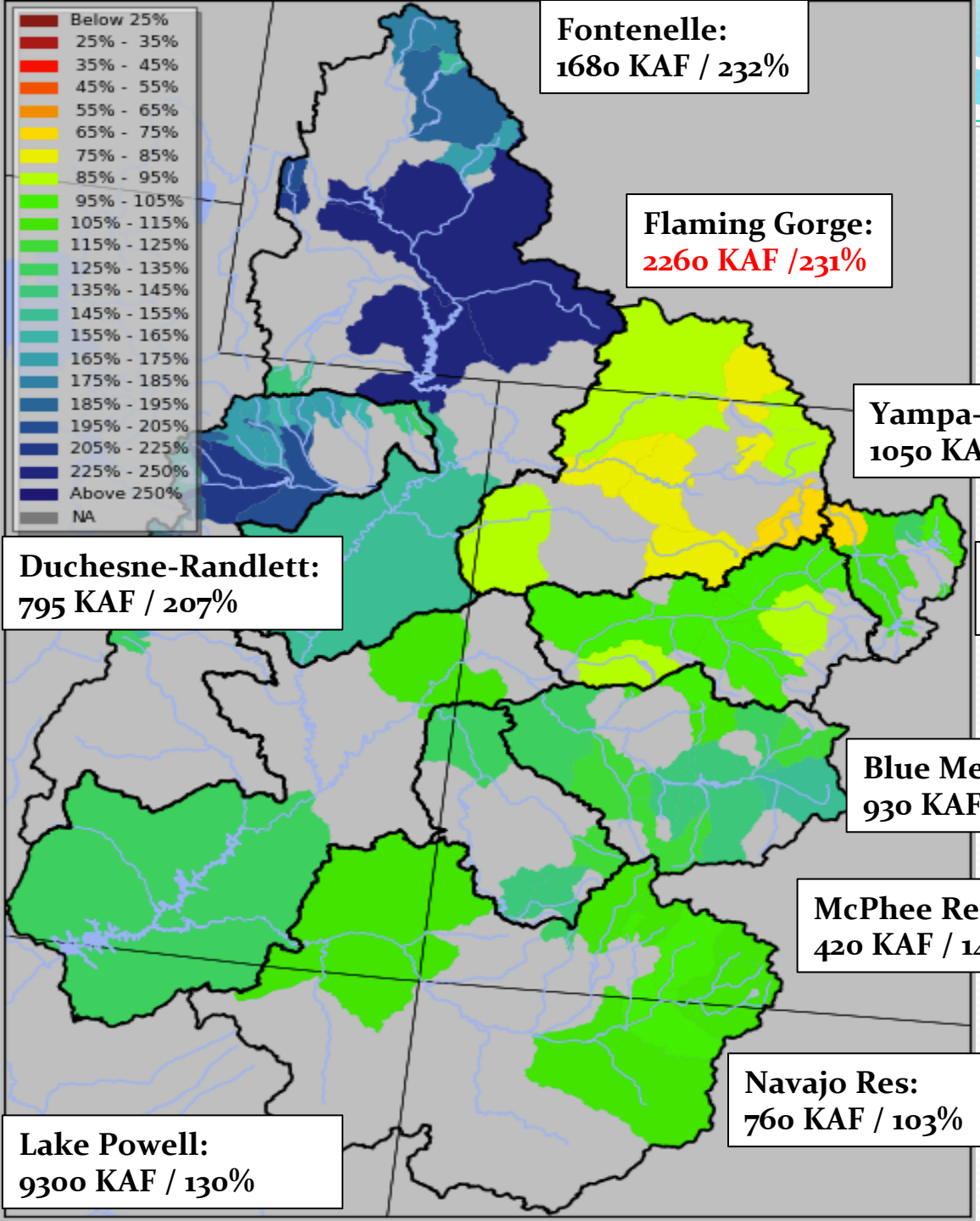


Forecasted percent of average changes from 45% decrease to 5% increase since March 1st

Upper Colorado April-July Streamflow Volume Forecasts

(% of 1981-2010 average)

Forecasts as of Apr 1 2017



Fontenelle:
1680 KAF / 232%

Flaming Gorge:
2260 KAF /231%

Yampa-Deerlodge:
1050 KAF / 85%

Duchesne-Randlett:
795 KAF / 207%

Colorado-Cameo:
2400 KAF / 102%

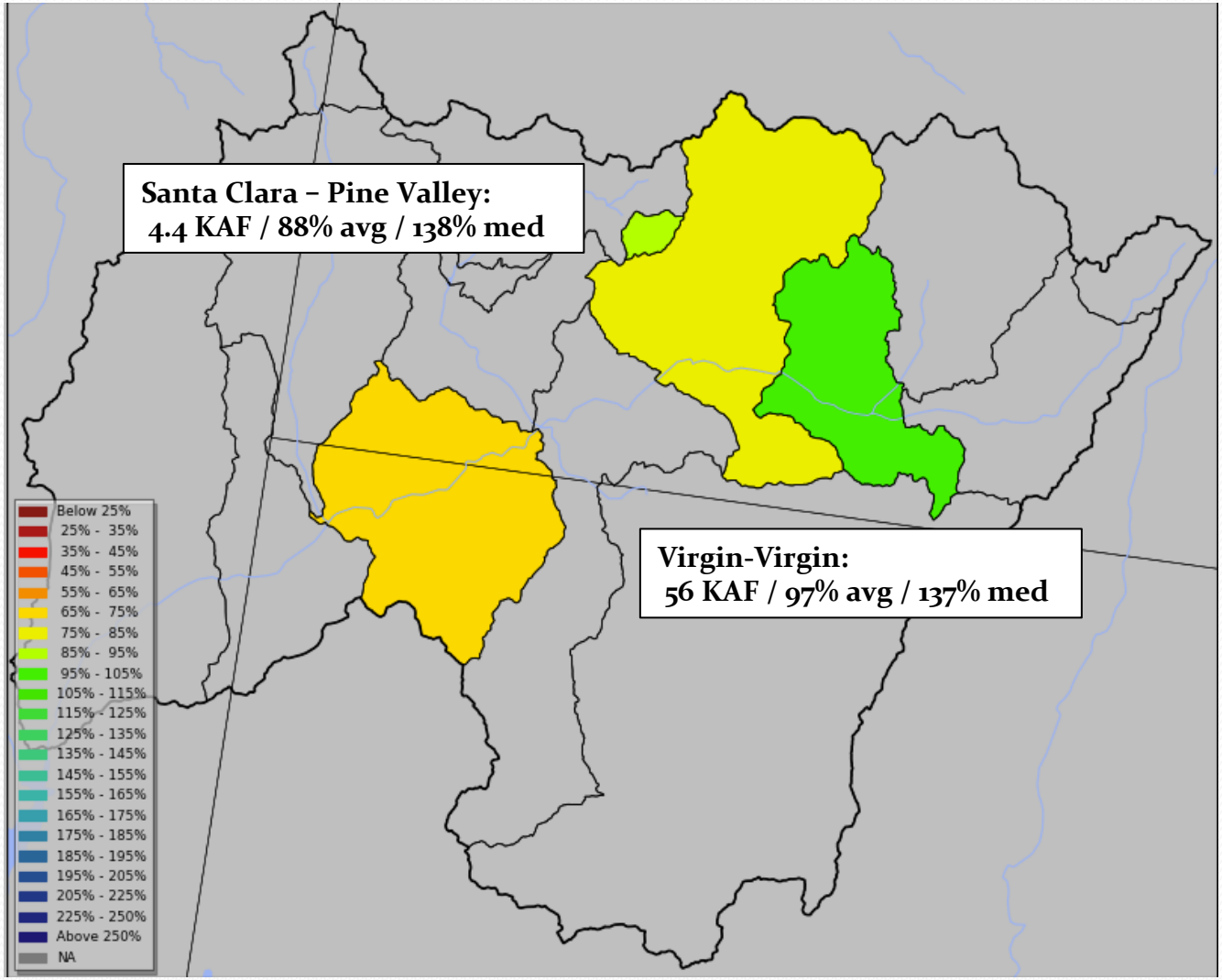
Blue Mesa:
930 KAF / 138%

McPhee Res:
420 KAF / 142%

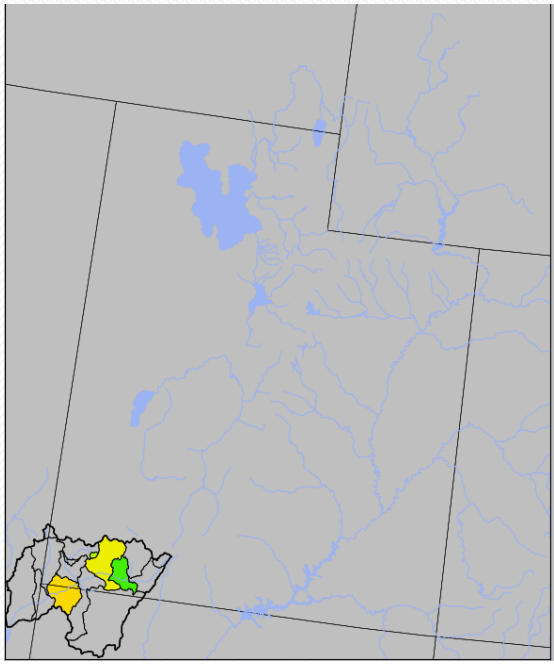
Navajo Res:
760 KAF / 103%

Lake Powell:
9300 KAF / 130%

Lower Colorado (Virgin River)
April-July Streamflow Volume Forecasts
(% of 1981-2010 average / median)

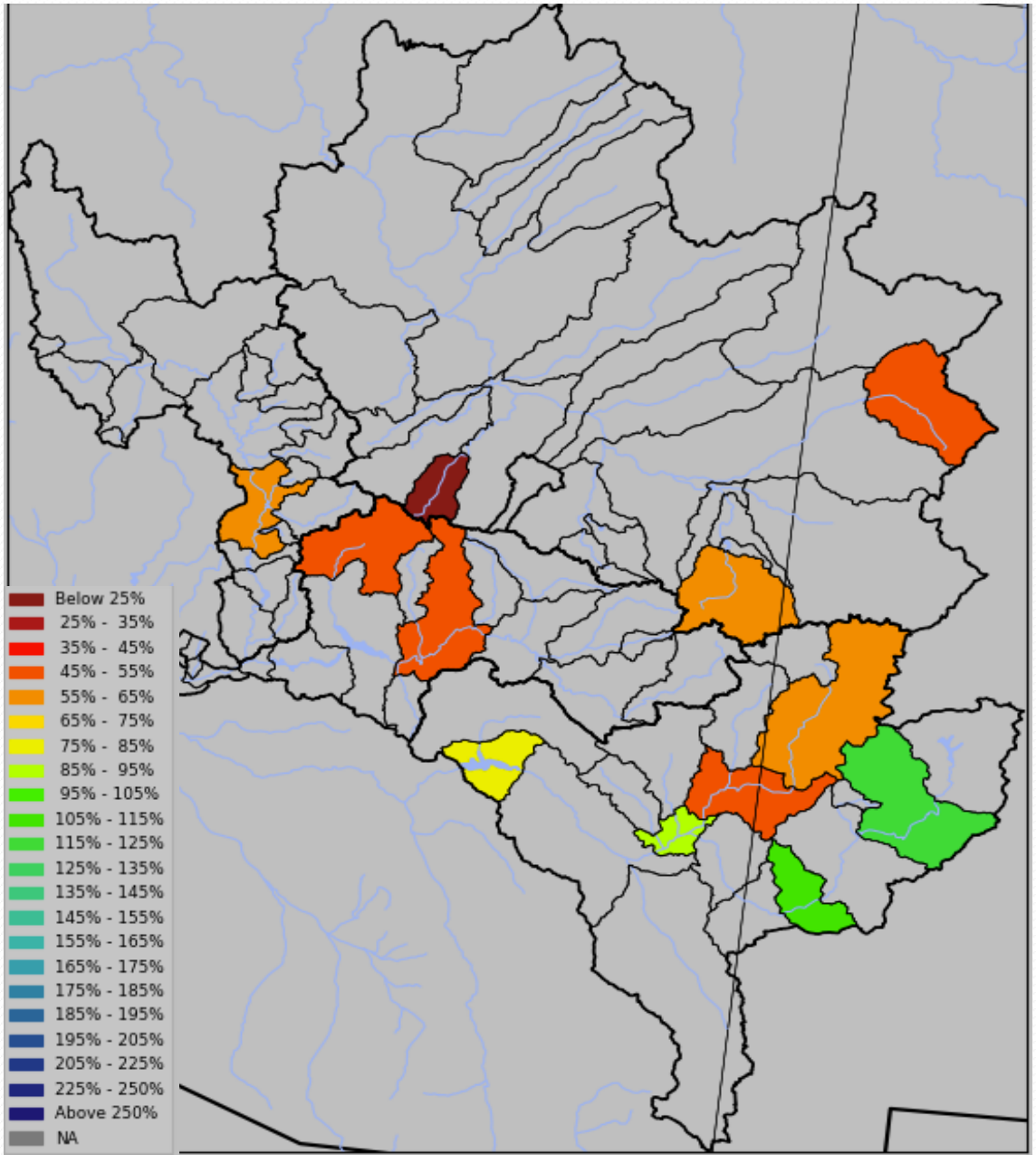


Forecasts as of Apr 1 2017

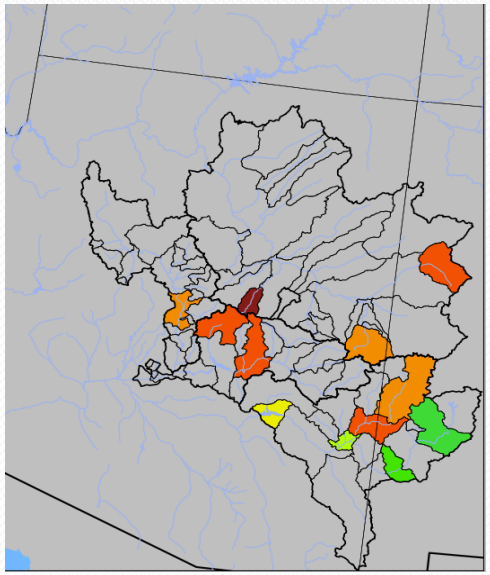


Lower Colorado Apr-May Streamflow Volume Forecasts

(% of 1981-2010 median)



Forecasts as of Apr 1 2017



Little Colorado-Lyman:
2.2 KAF / 63% med

Verde-Horseshoe:
23 KAF / 64% med

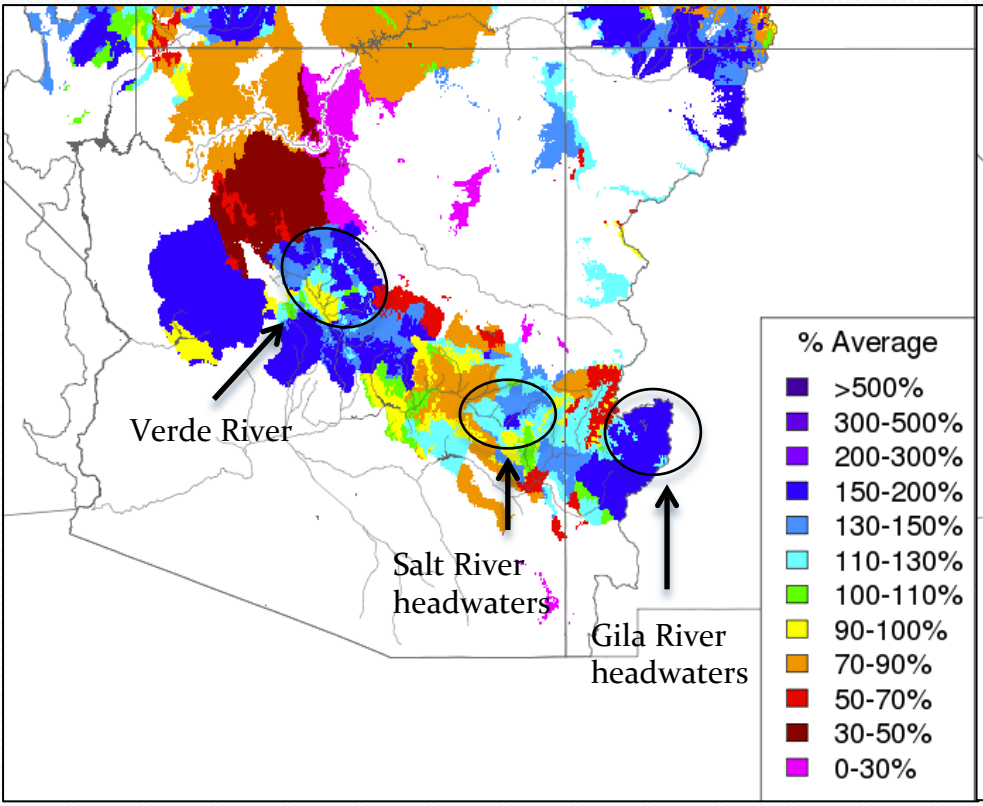
Salt - Roosevelt:
63 KAF / 50% med

Gila-Gila:
19.3 KAF / 117% med

CBRFC Model Soil Moisture

Winter rain and snowmelt impacts to soil moisture in the Lower Colorado River Basin

Mar 6 2017



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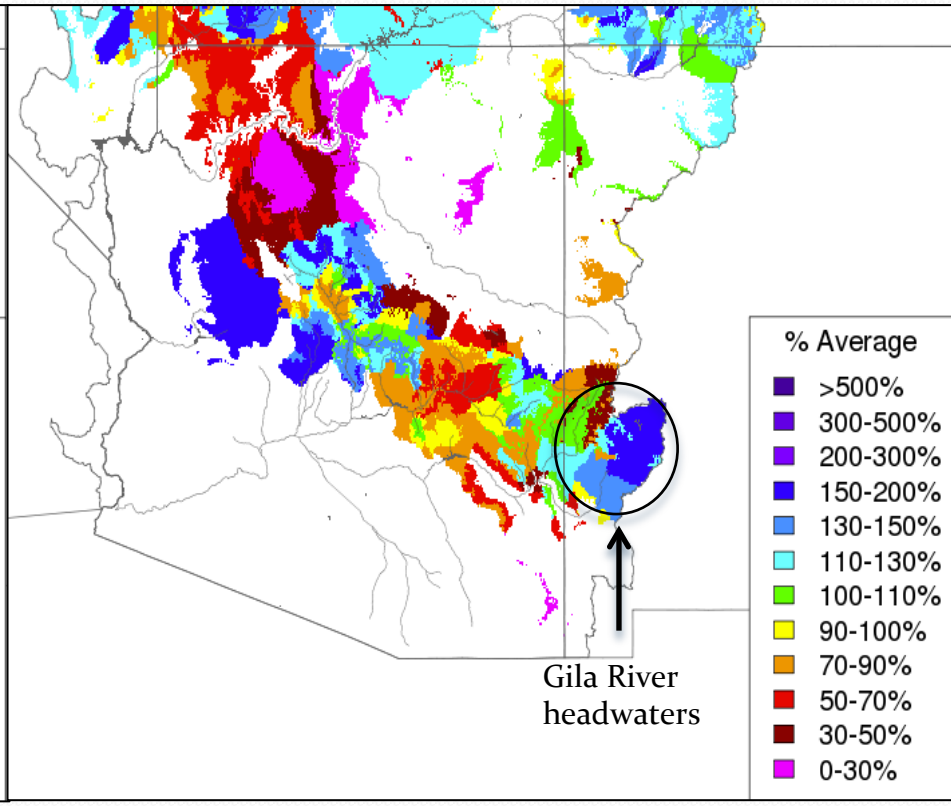
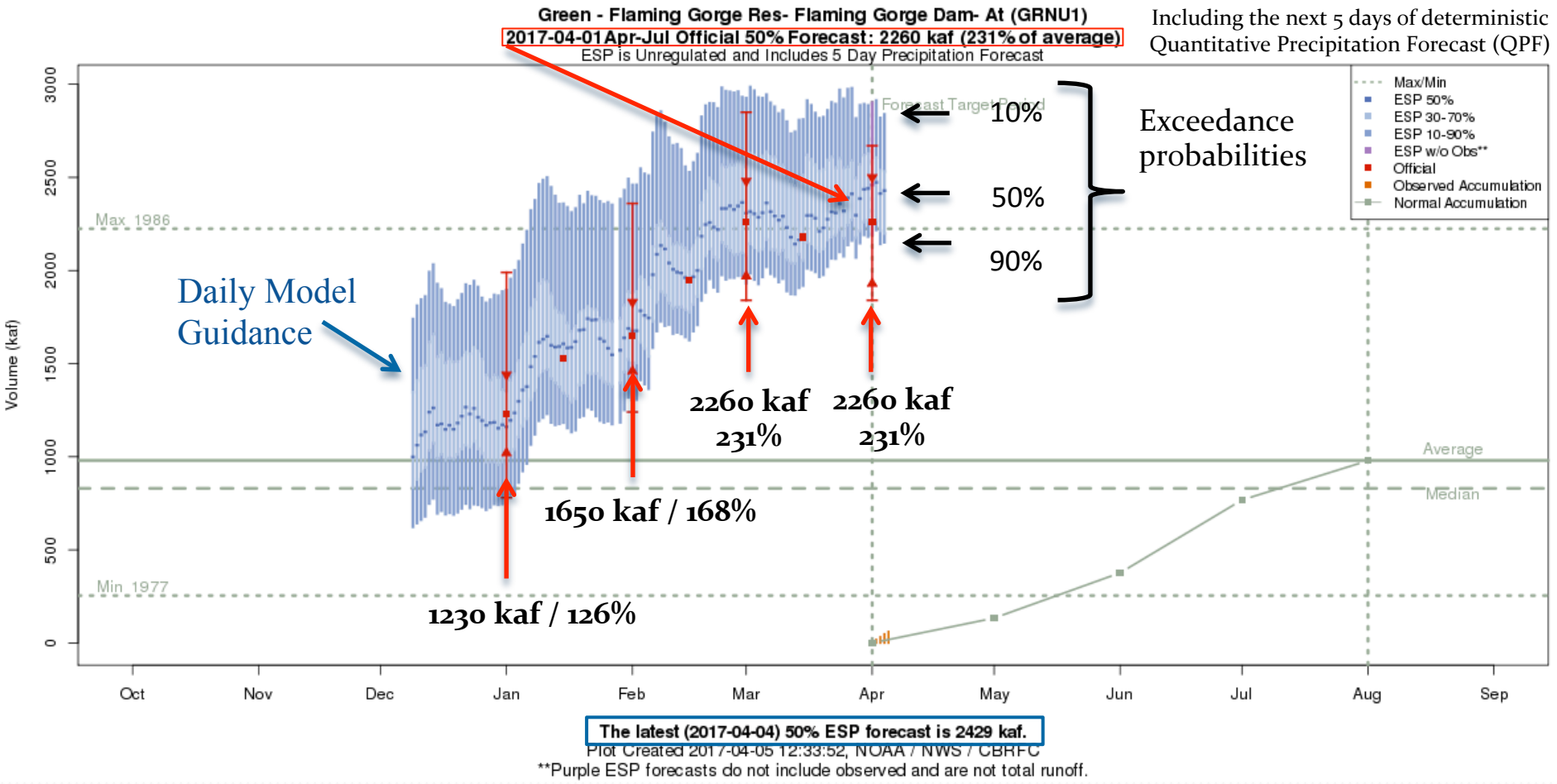


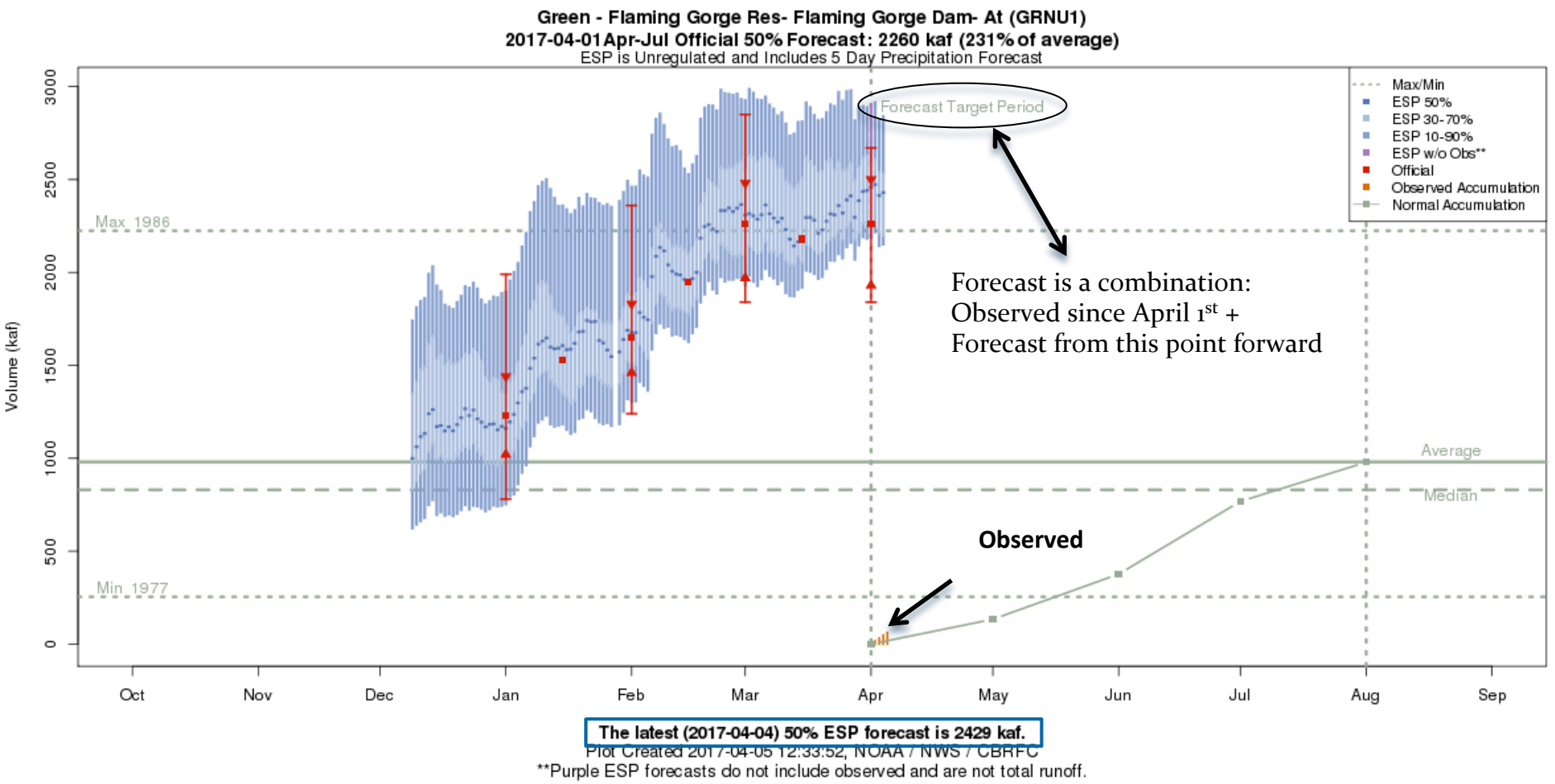
Forecast Evolution Plot: Flaming Gorge Inflow

Daily Ensemble Streamflow Prediction (ESP) Model Run & Official Forecasts

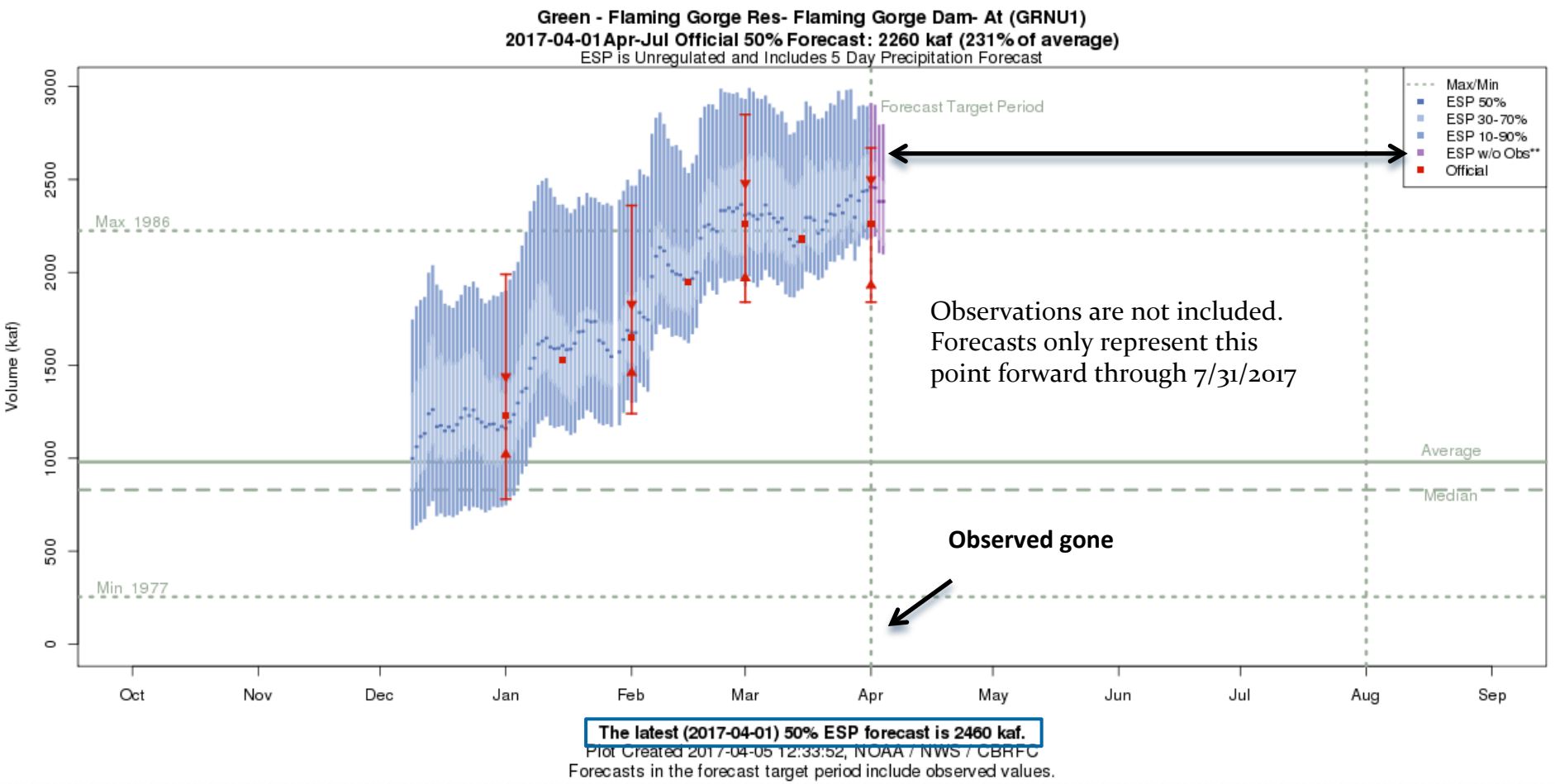


Plots are available at: https://www.cbrfc.noaa.gov
Select WATER SUPPLY from the top menu
Click on desired location for pop-up, click again for full screen

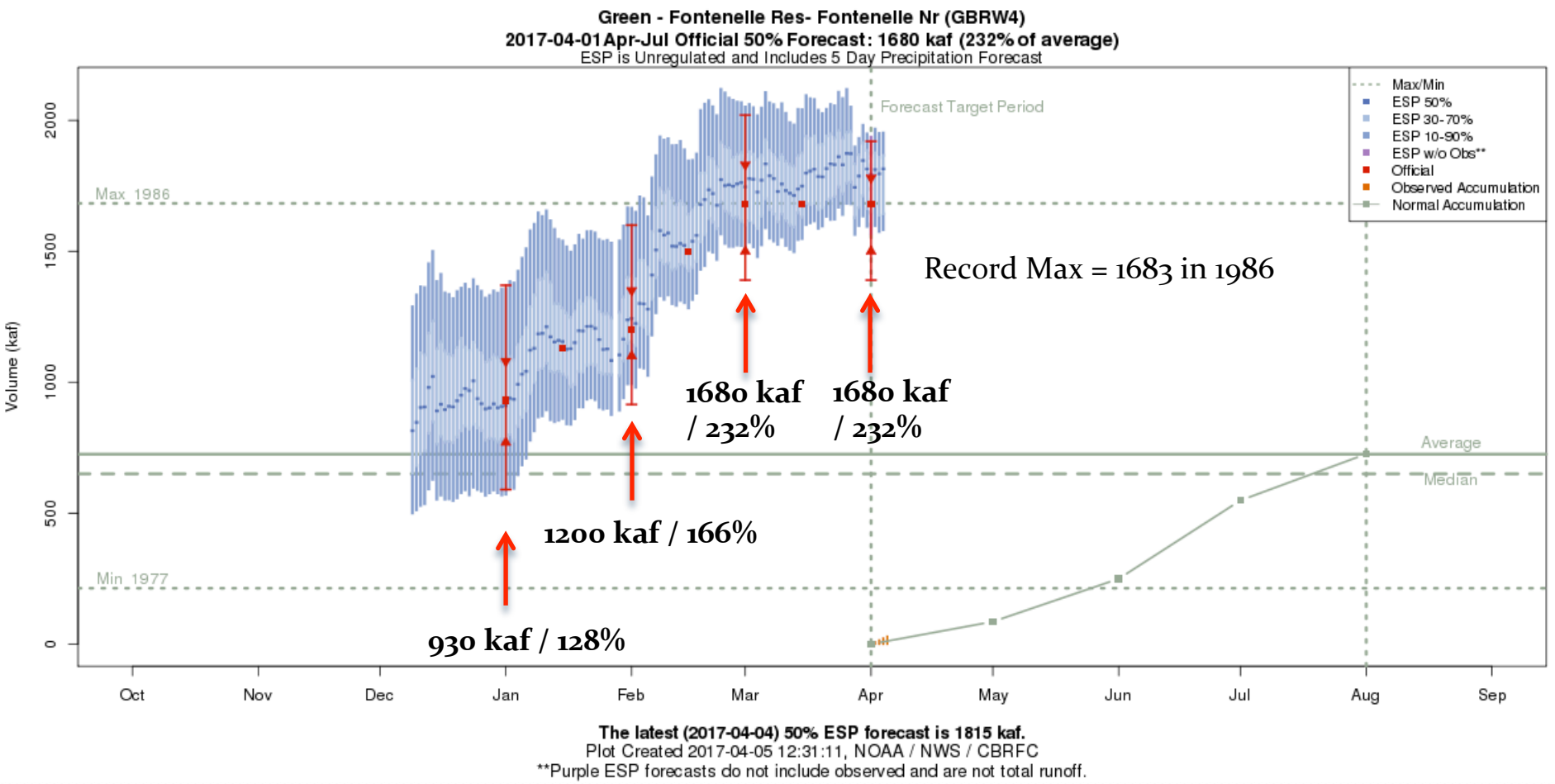
Forecast Evolution Plot: Flaming Gorge Inflow



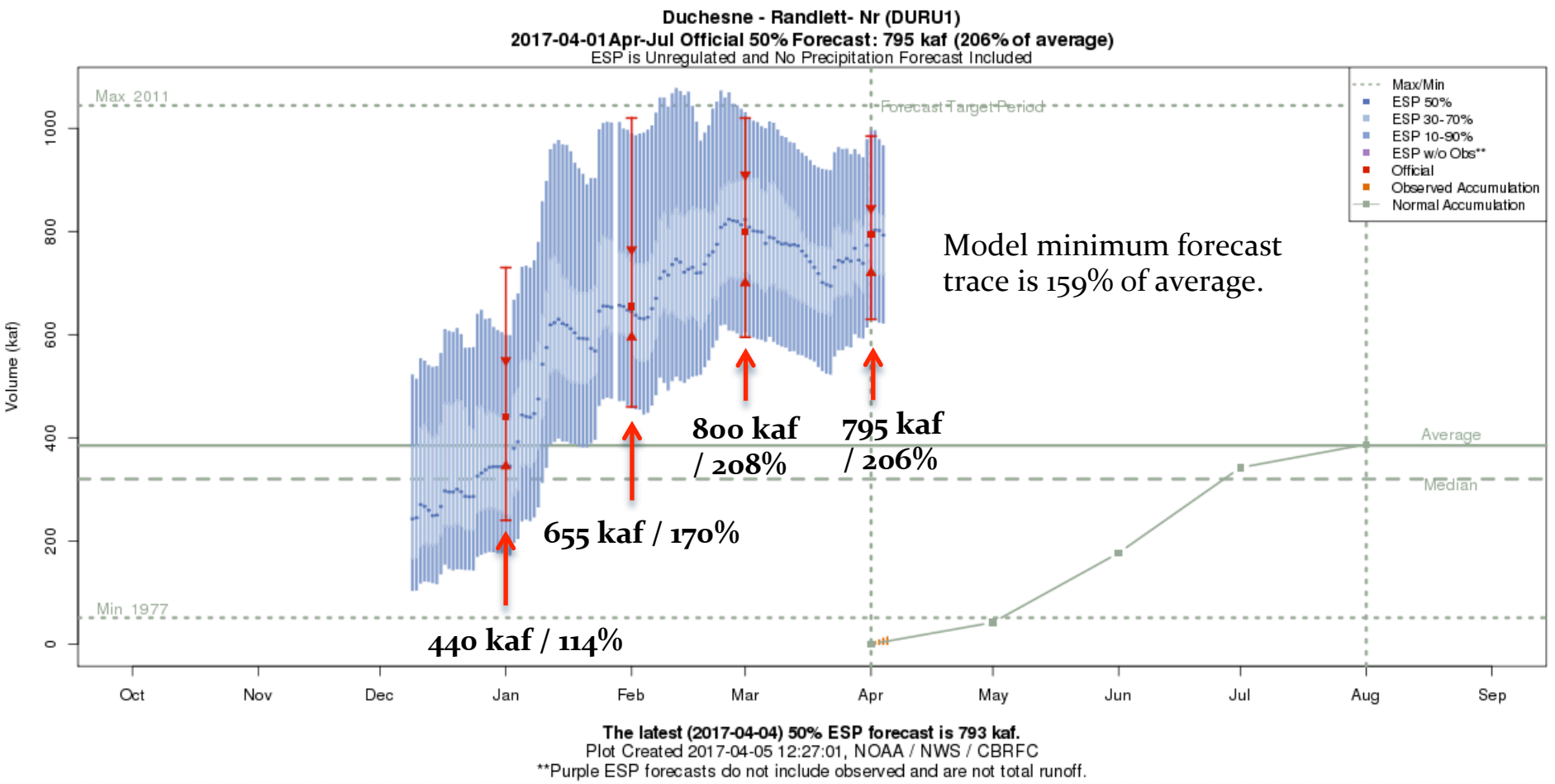
Forecast Evolution Plot: Flaming Gorge Inflow



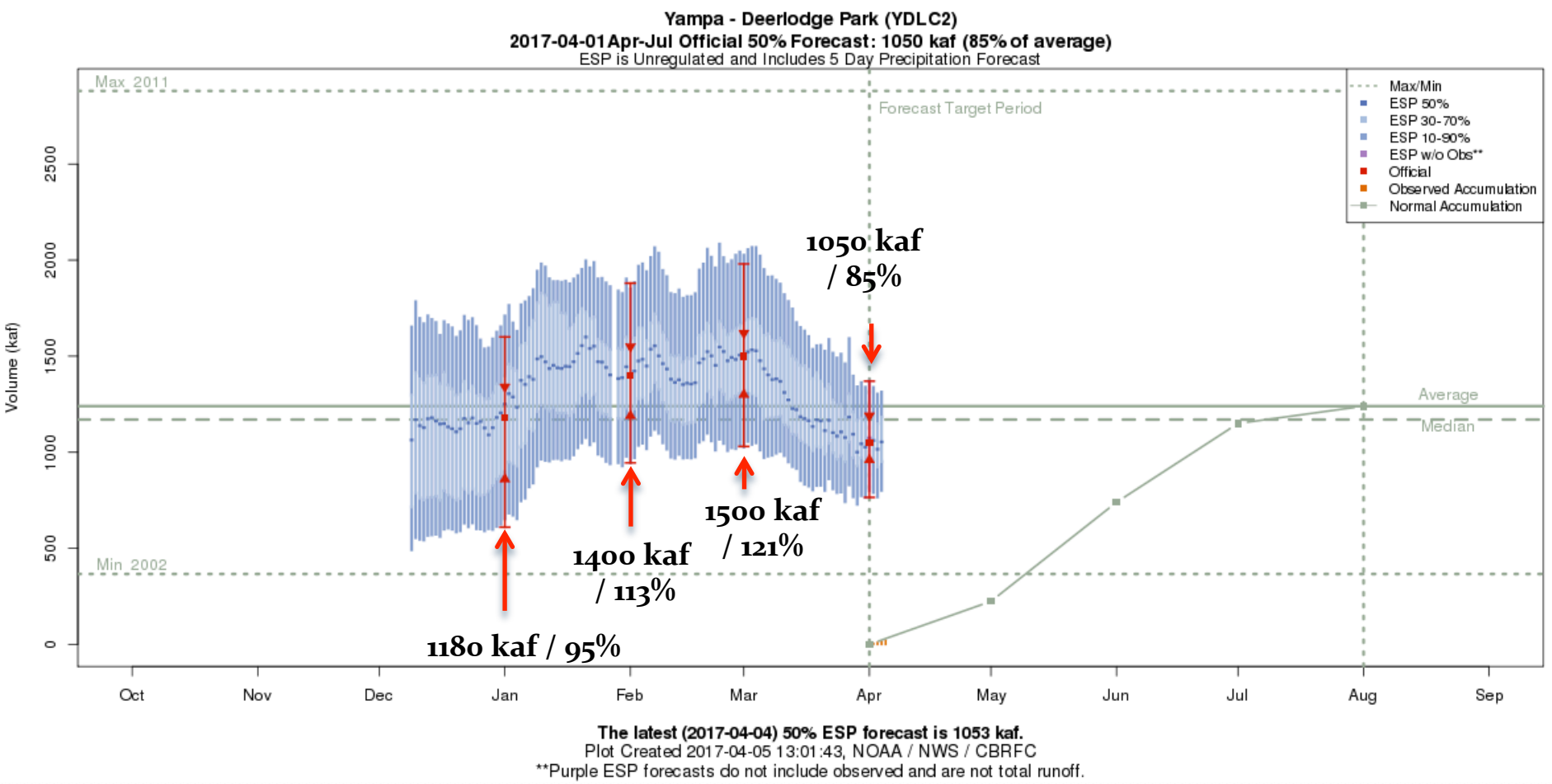
Forecast Evolution Plot: Fontenelle Inflow



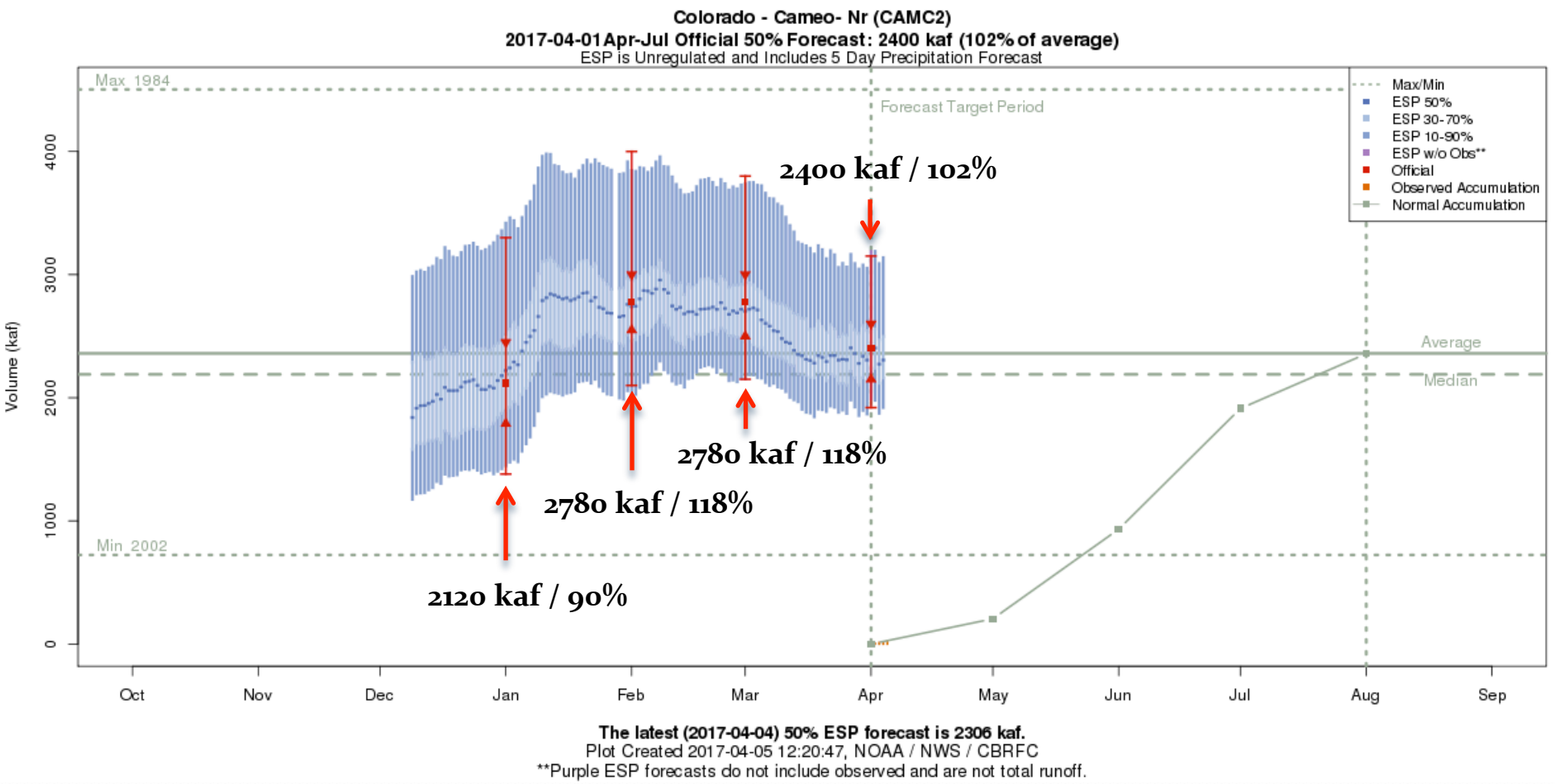
Forecast Evolution Plot: Duchesne-Randlett



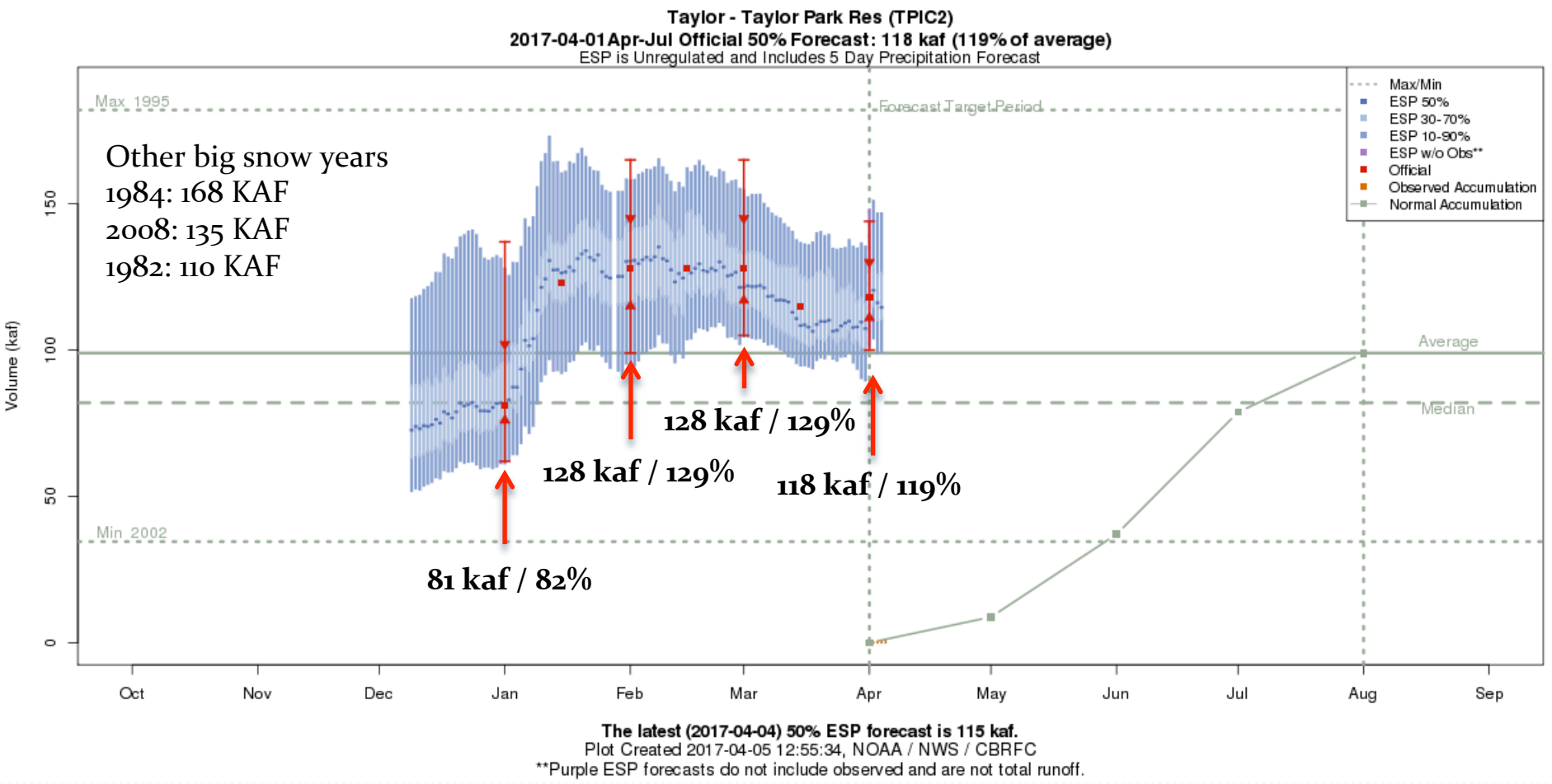
Forecast Evolution Plot: Yampa – Deerlodge Park



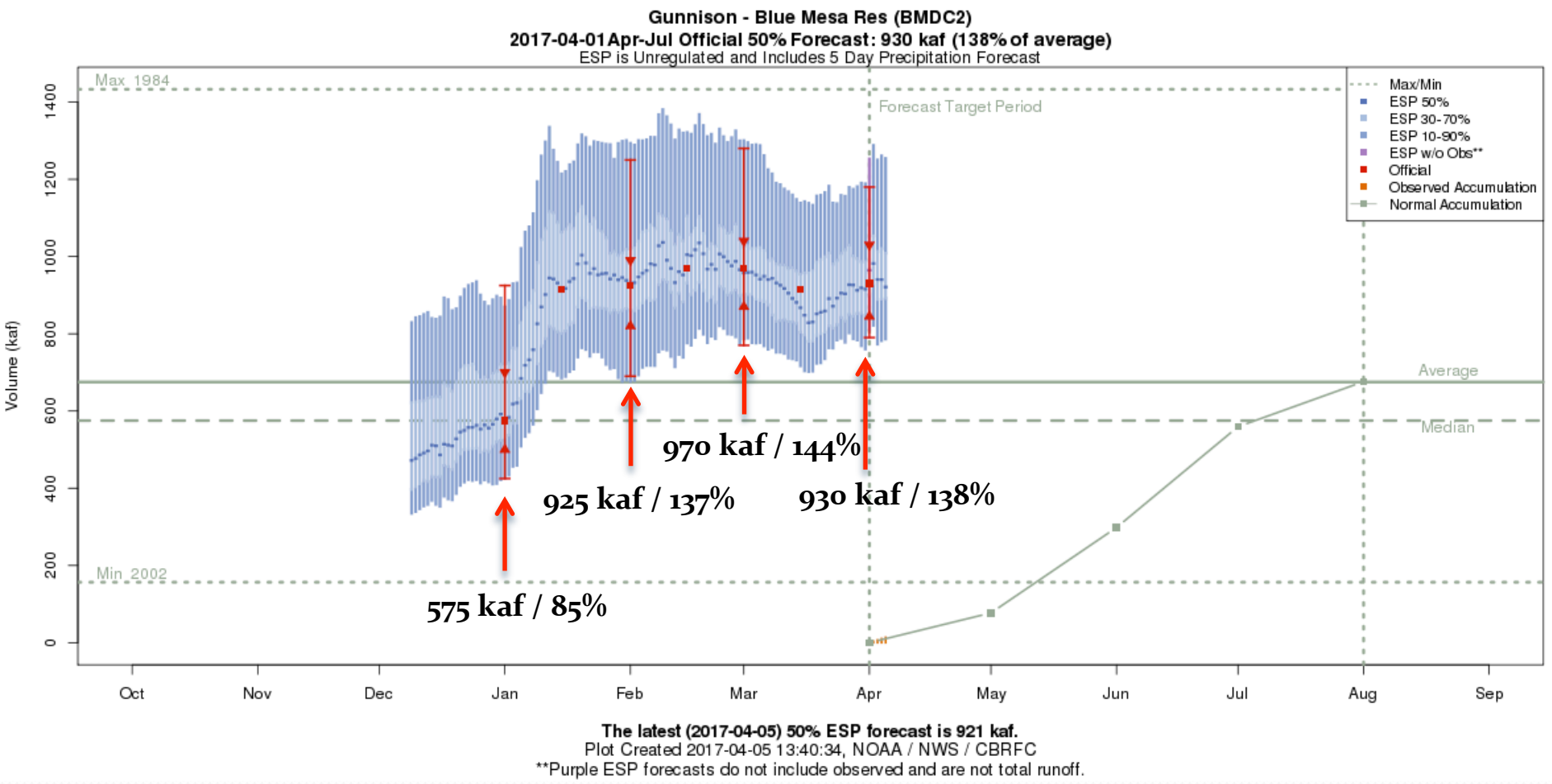
Forecast Evolution Plot: Colorado near Cameo



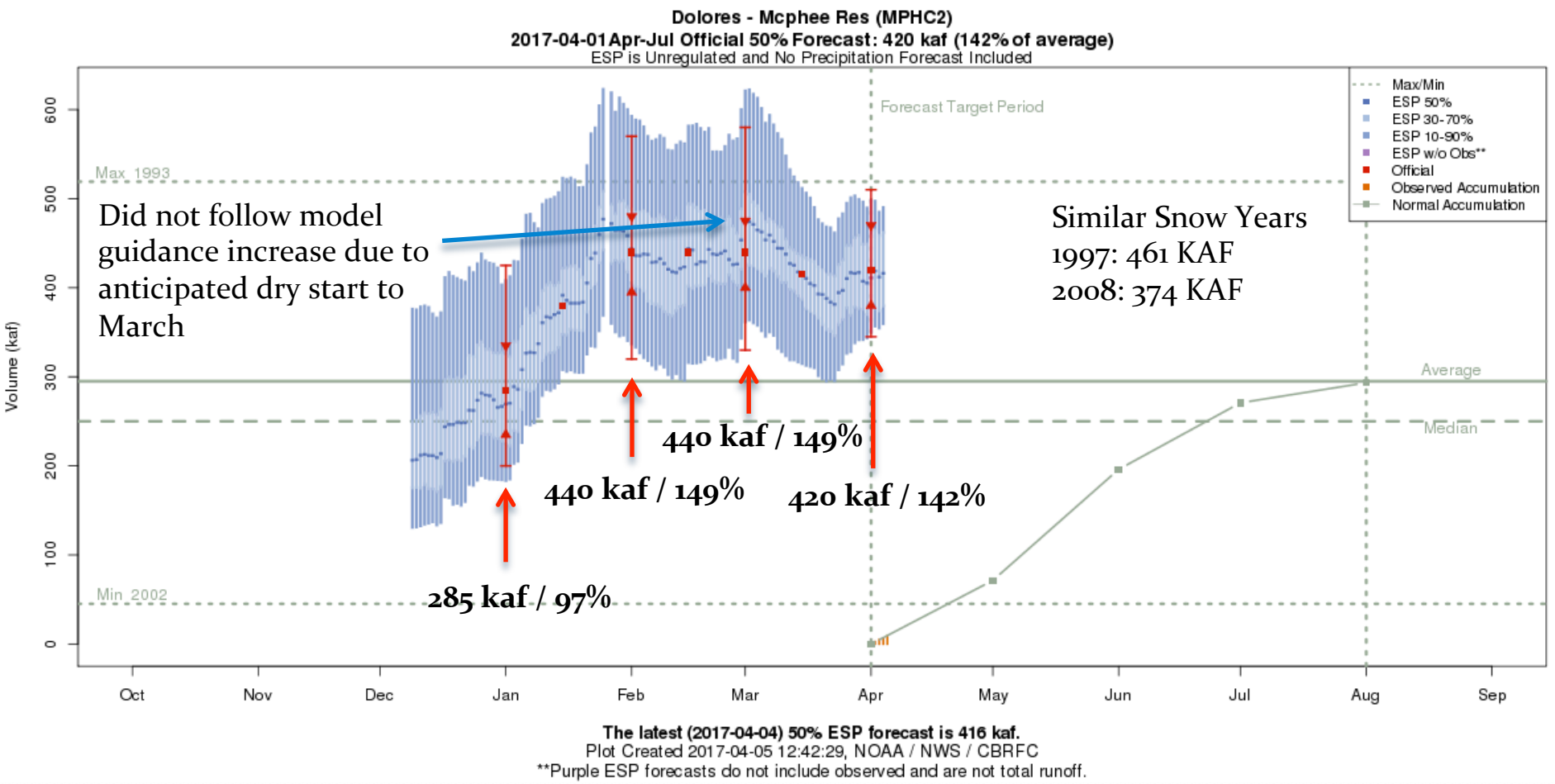
Forecast Evolution Plot: Taylor – Taylor Park Inflow



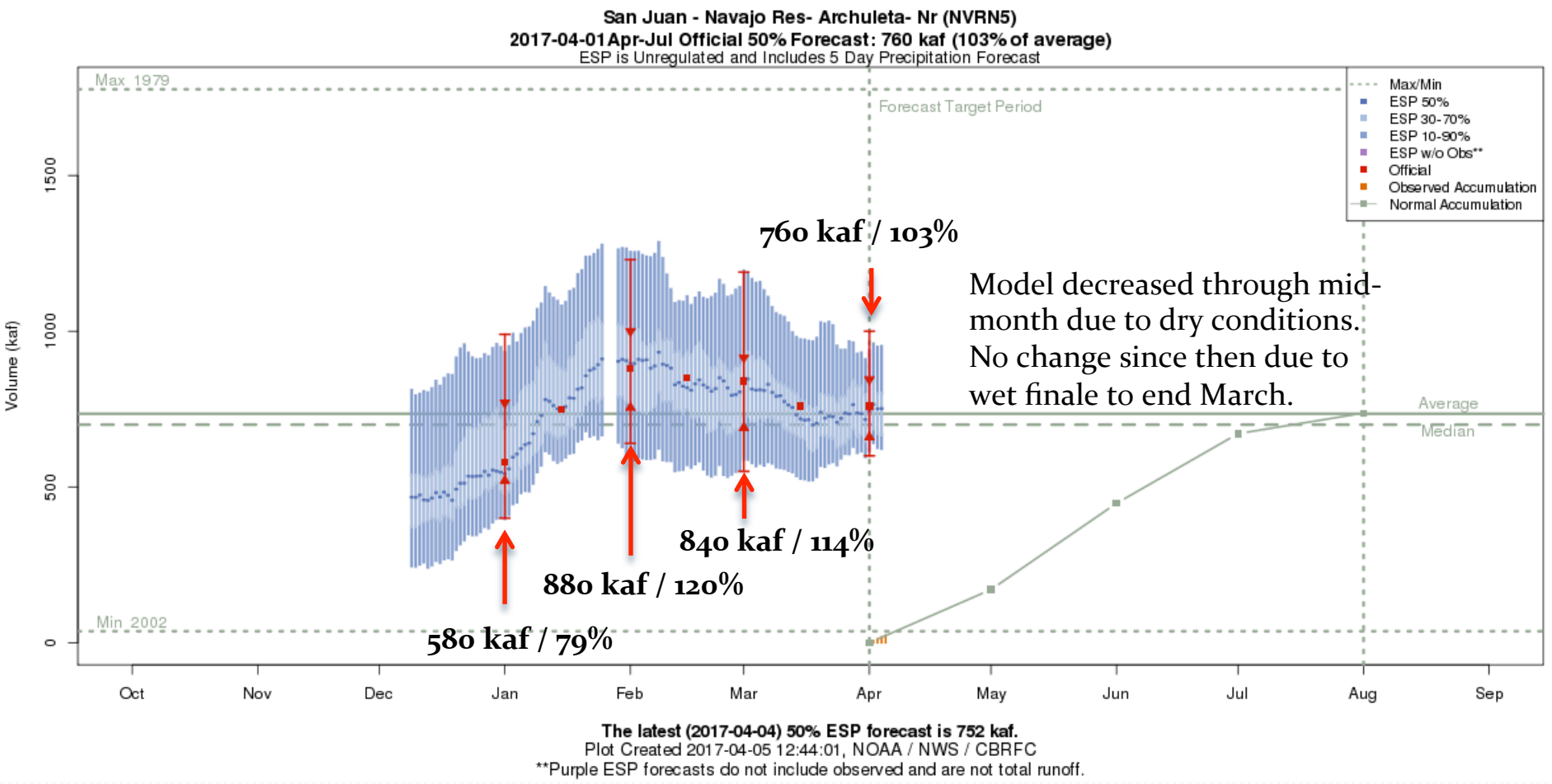
Forecast Evolution Plot: Gunnison – Blue Mesa Inflow



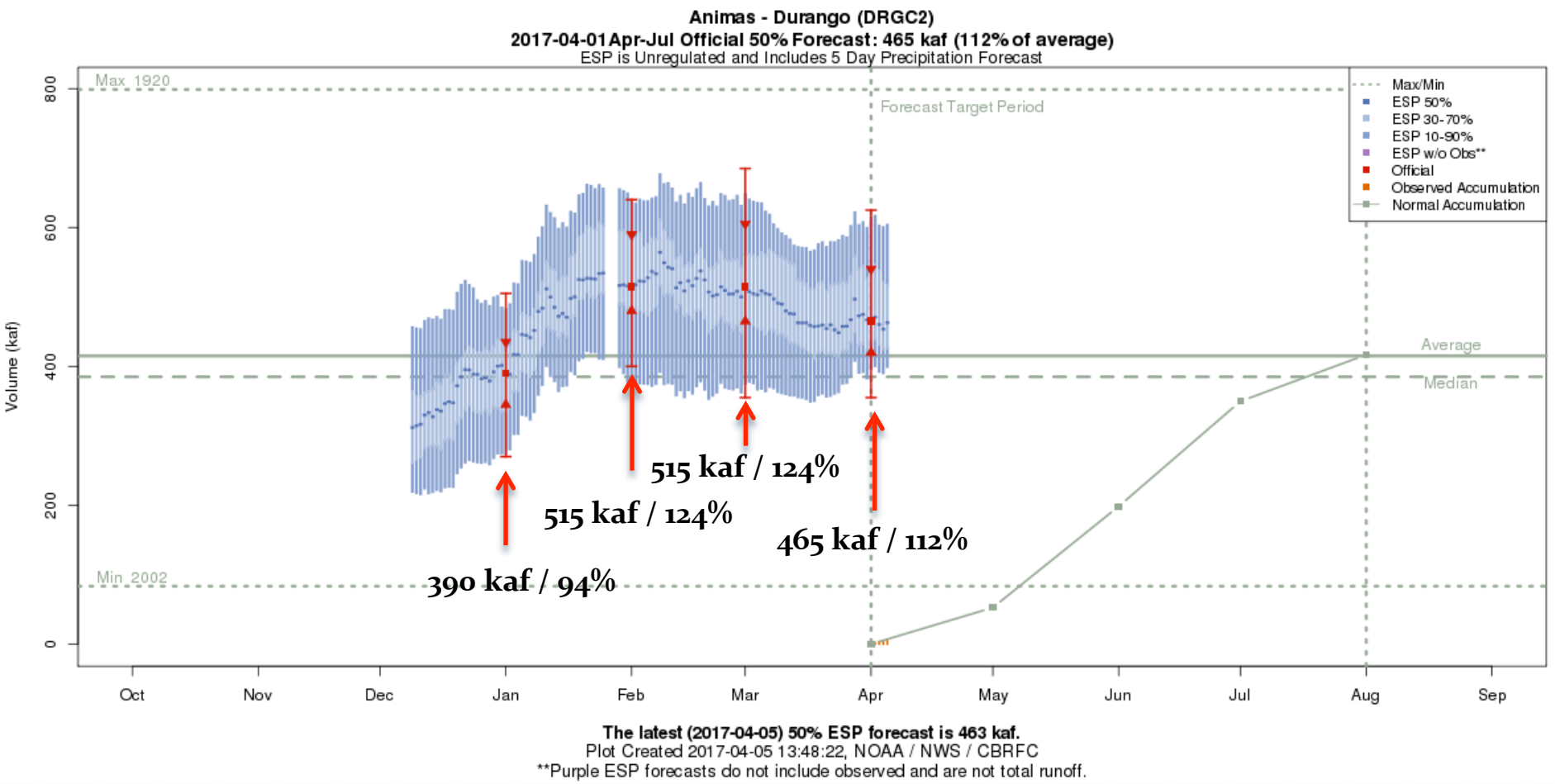
Forecast Evolution Plot: Dolores – McPhee Reservoir Inflow



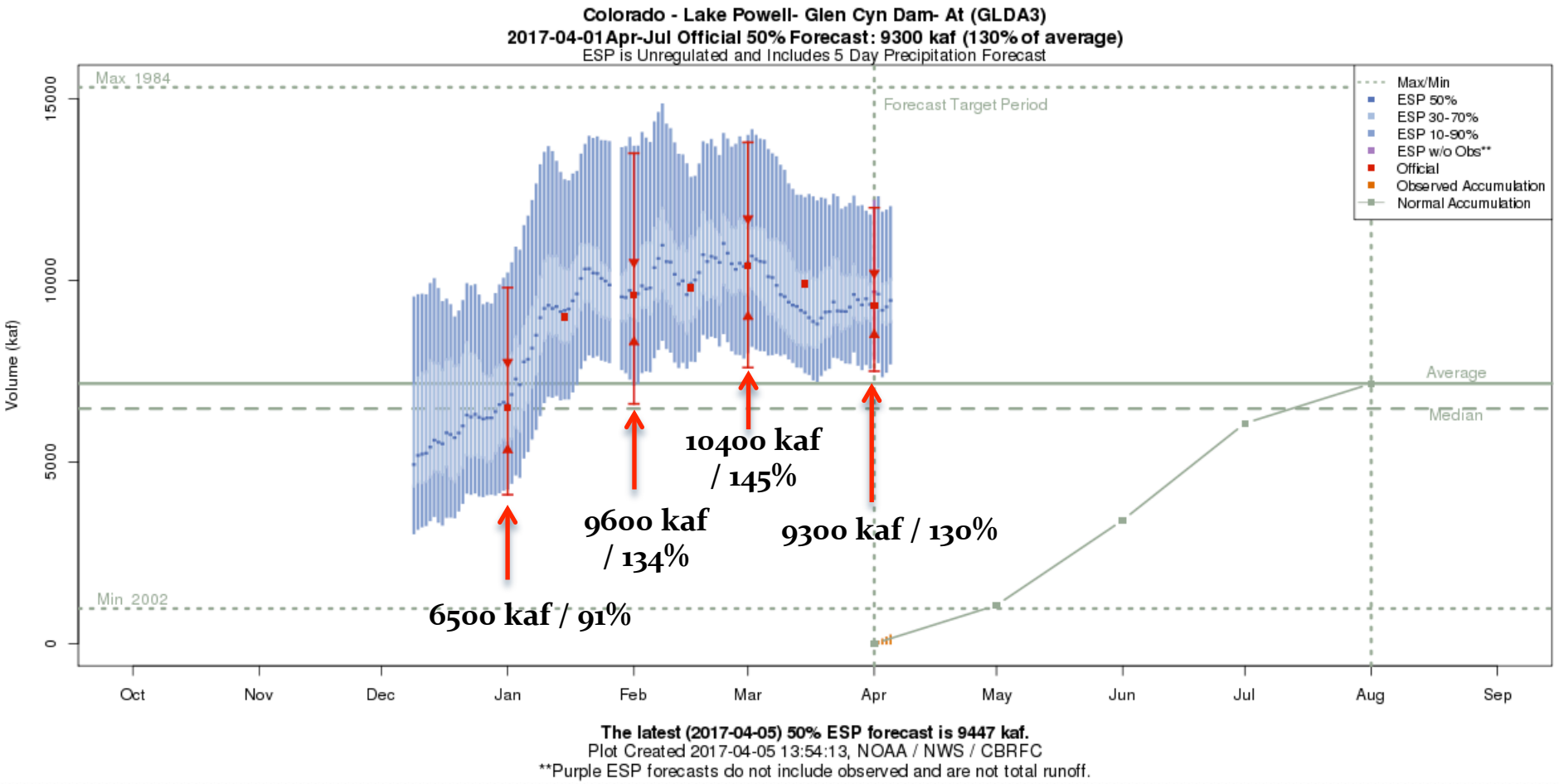
Forecast Evolution Plot: San Juan – Navajo Reservoir Inflow



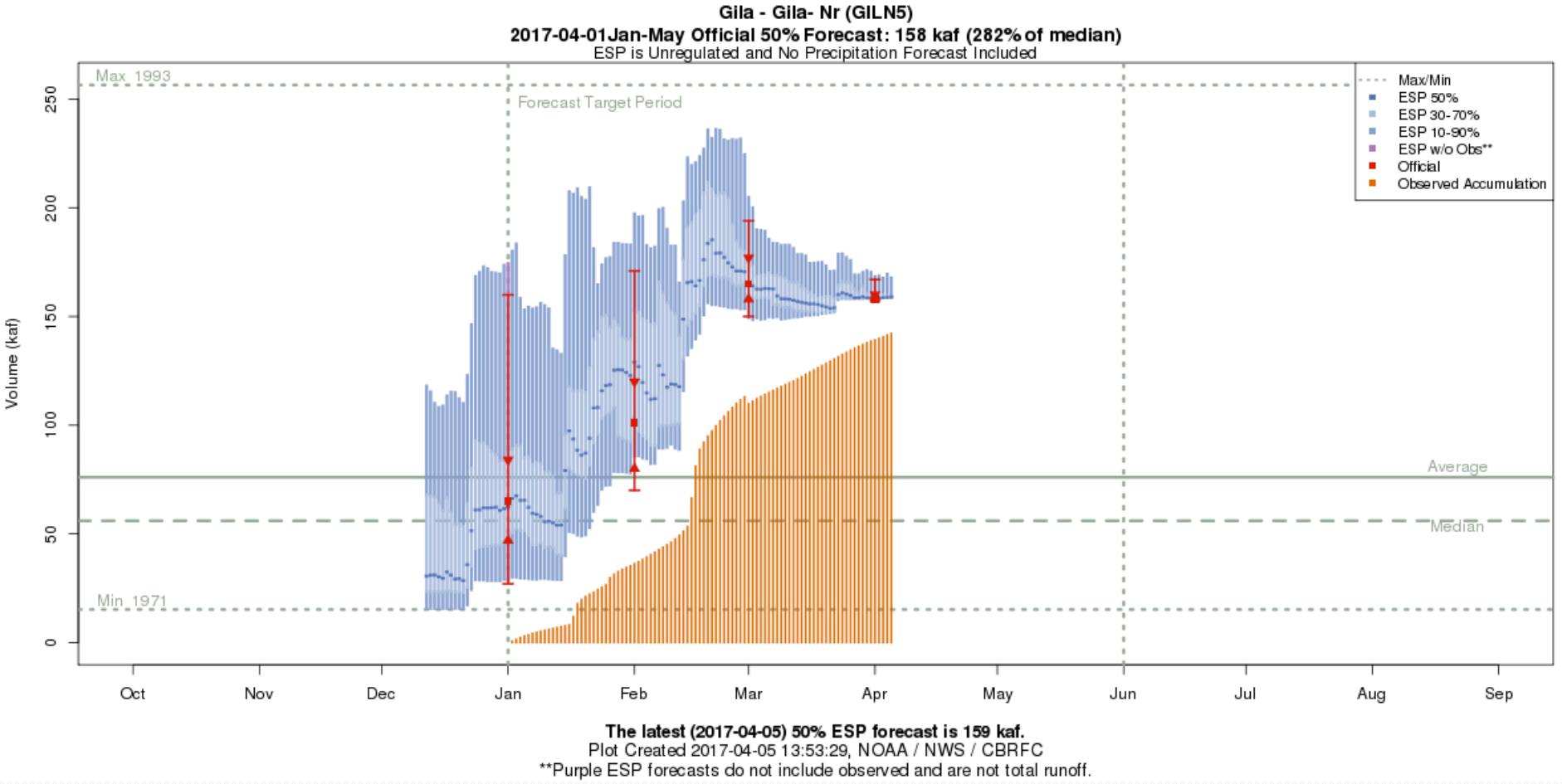
Forecast Evolution Plot: Animas - Durango



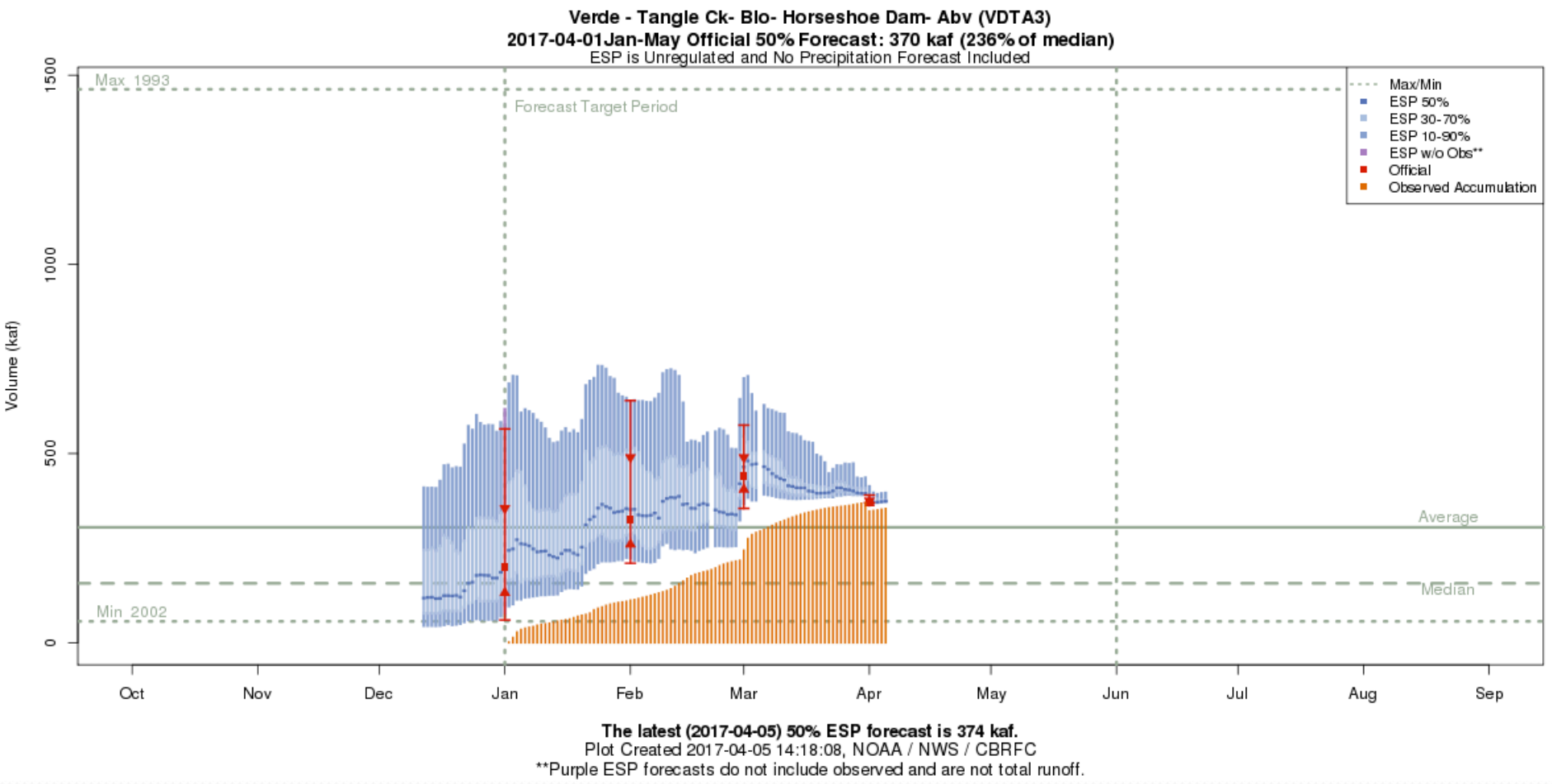
Forecast Evolution Plot: Lake Powell Inflow



Lower Colorado Basin
Forecast Evolution Plot: Gila nr Gila



Lower Colorado Basin
Forecast Evolution Plot: Verde – Tangle Creek abv Horseshoe



Forecast Validation: How good are forecasts in April ?

Historical Model Error 1981-2010

Improvement in forecast error between Mar & Apr

Forecasts are better than just going with average

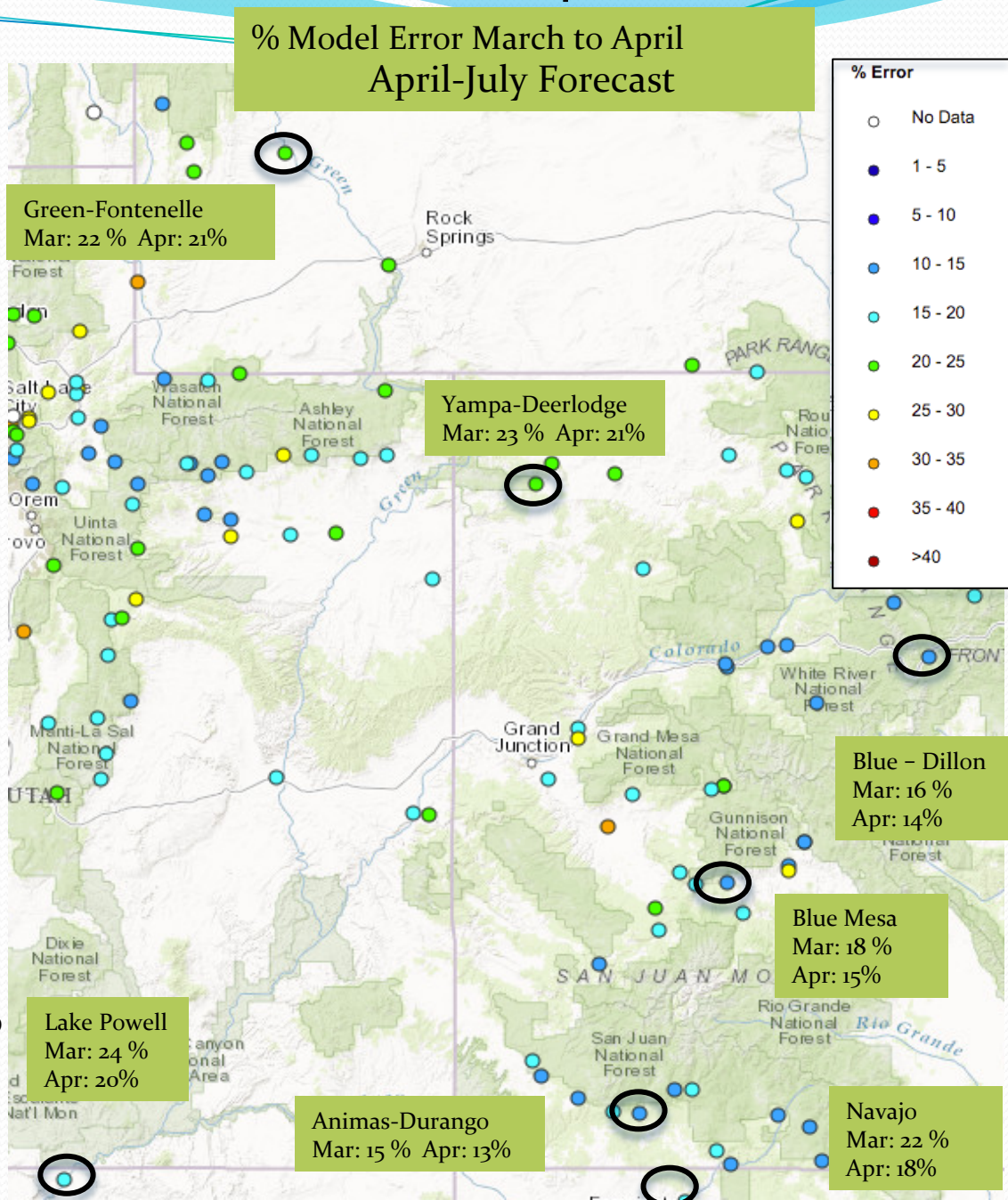
Primary sources of error from this point forward:
- Extreme weather (wet or dry)
- Correct model representation of snowpack
- Saturated lower elevations (near model max)
- Consistency of meteorological model guidance

Where We Do Better:
- Headwaters
- Primarily snow melt basins
- Known diversions / demands

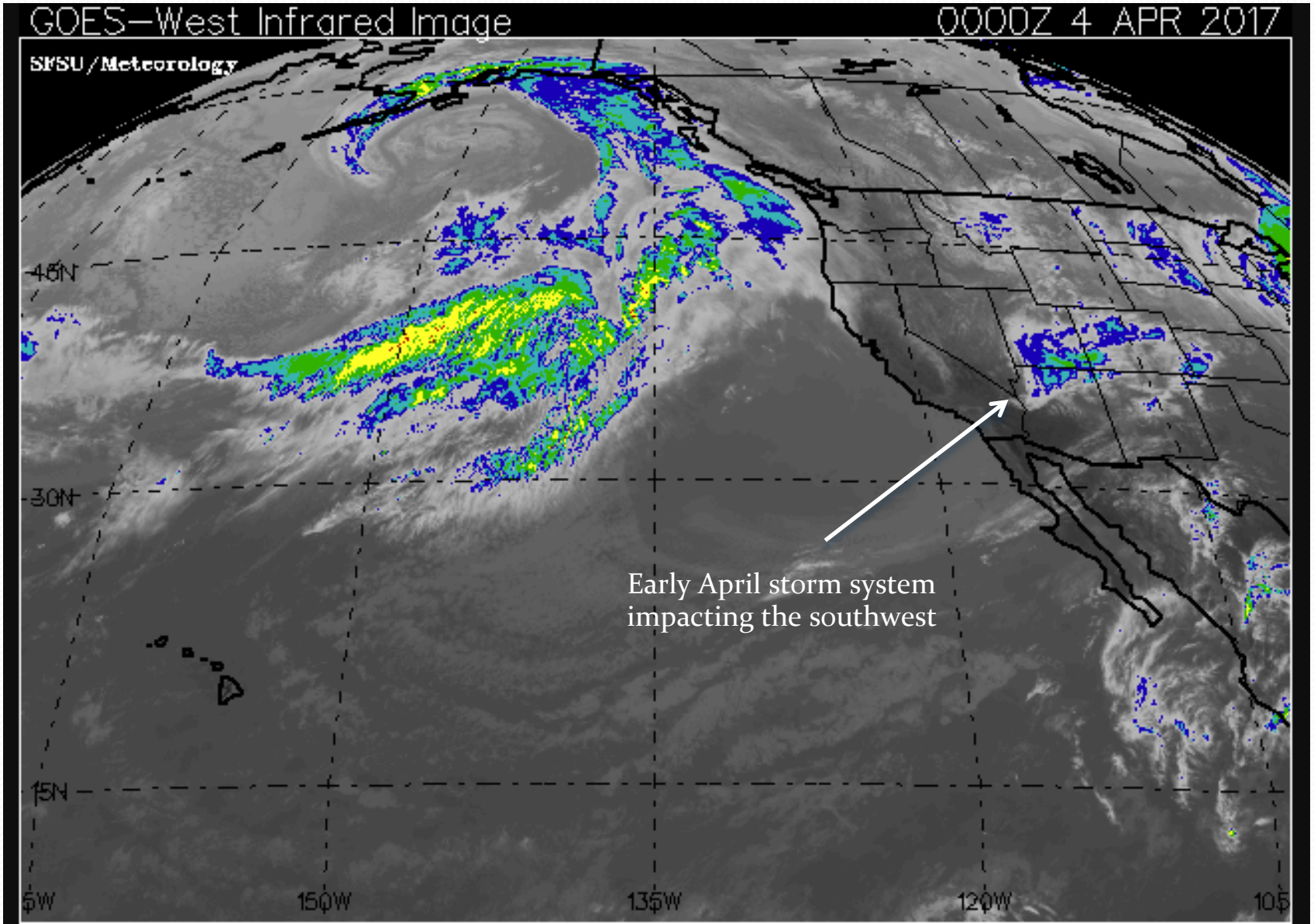
Where We Do Worse:
- Lower elevations (rain or early melt)
- Downstream of diversions / irrigation
- Little is known about diversions / demands

Map is available at:
https://www.cbrfc.noaa.gov/arc/verif/verif.php

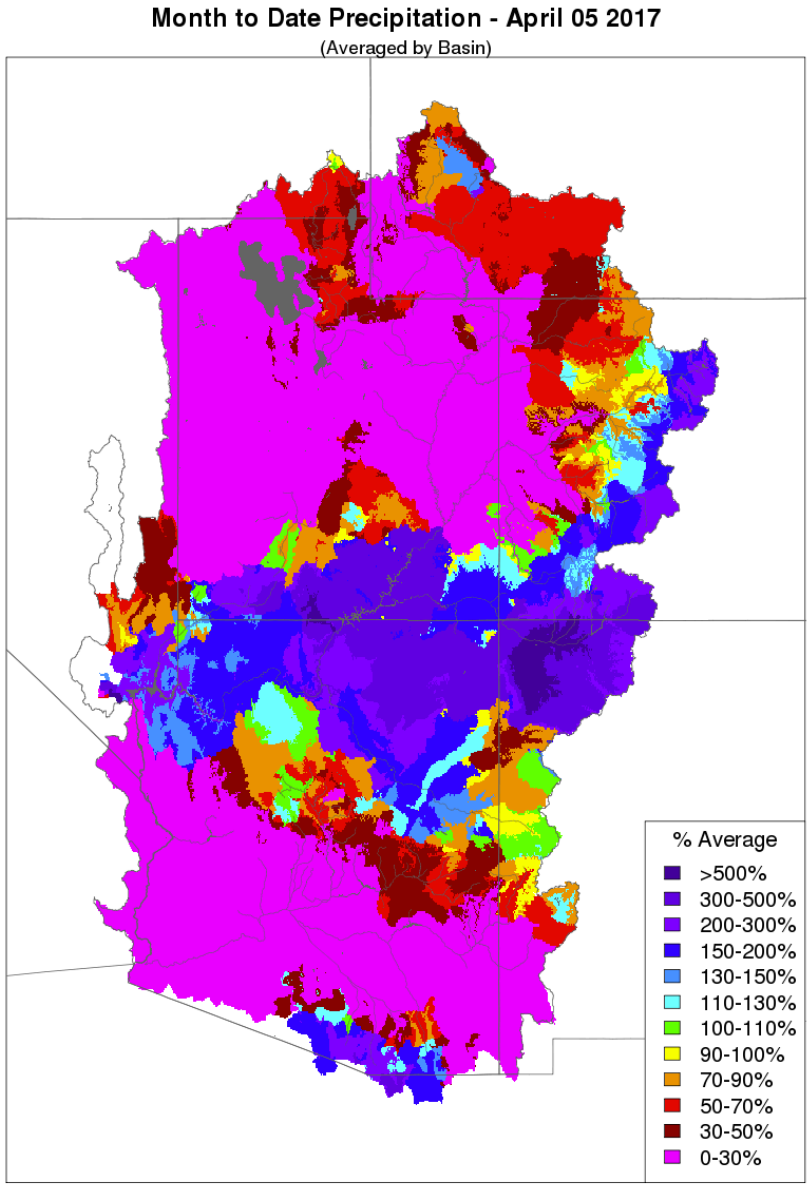
From Water Supply drop down menu
→ select Historical Verification Map

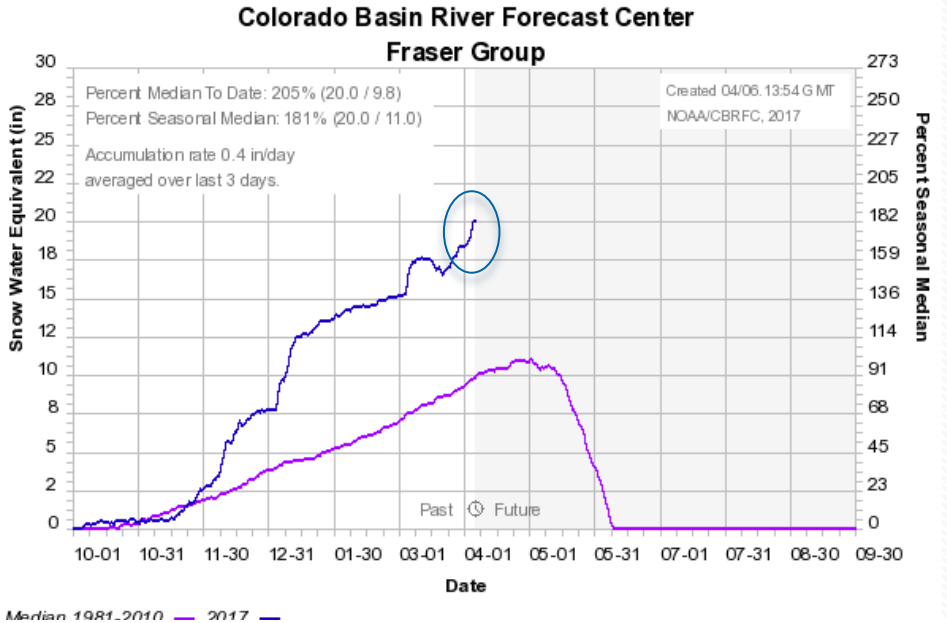


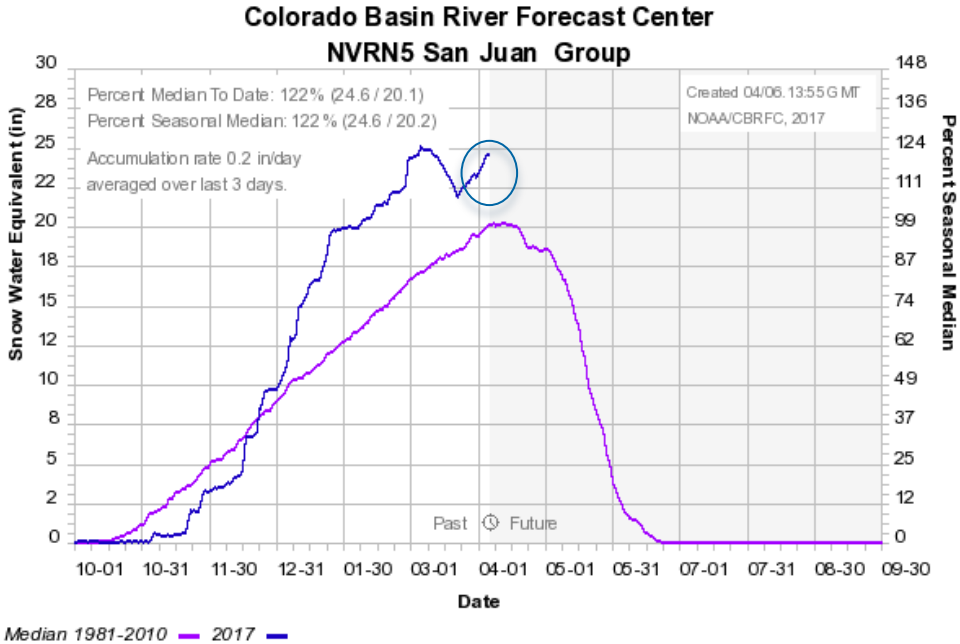
April Weather: Precipitation so far….



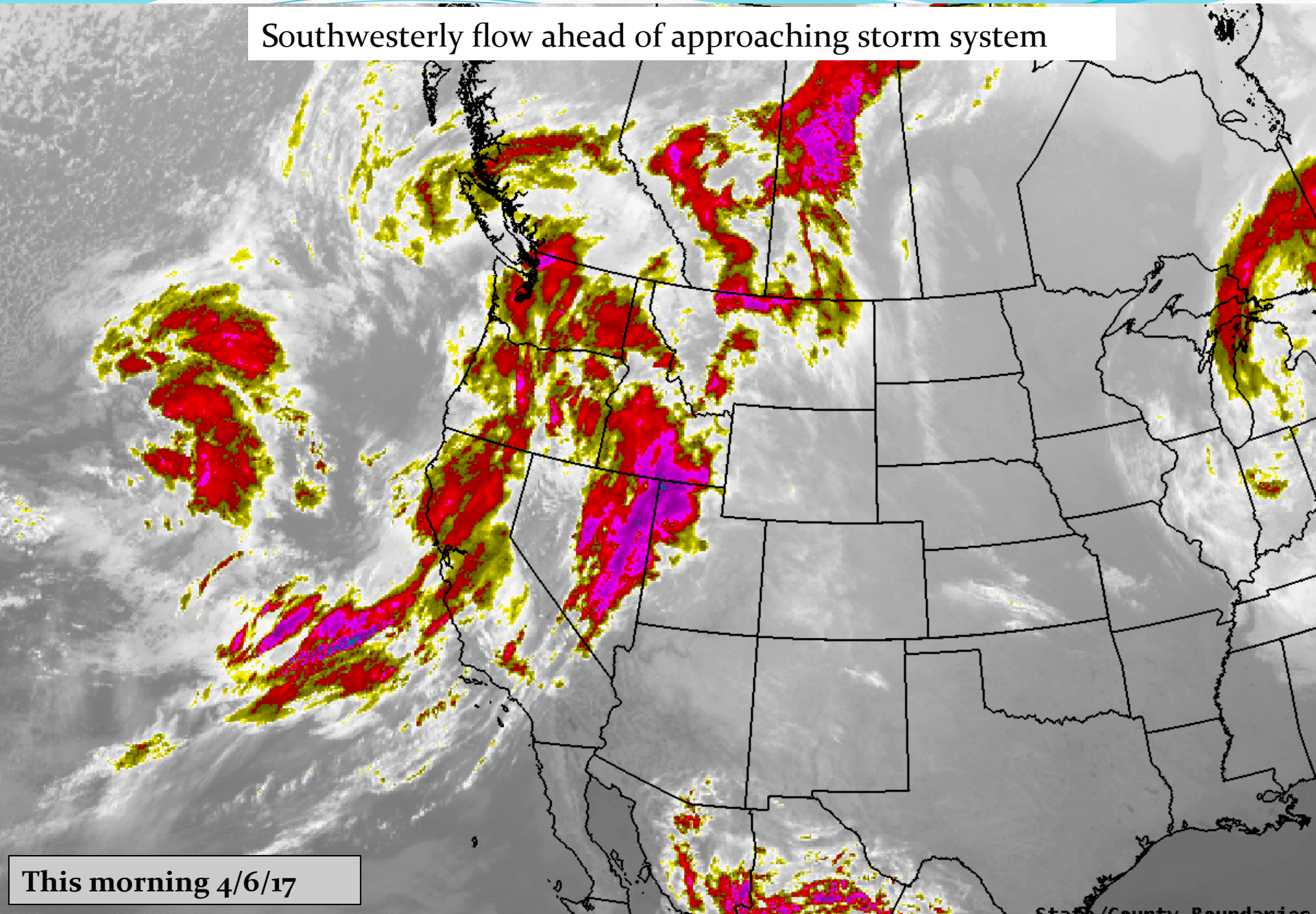
April Weather: Precipitation so far….





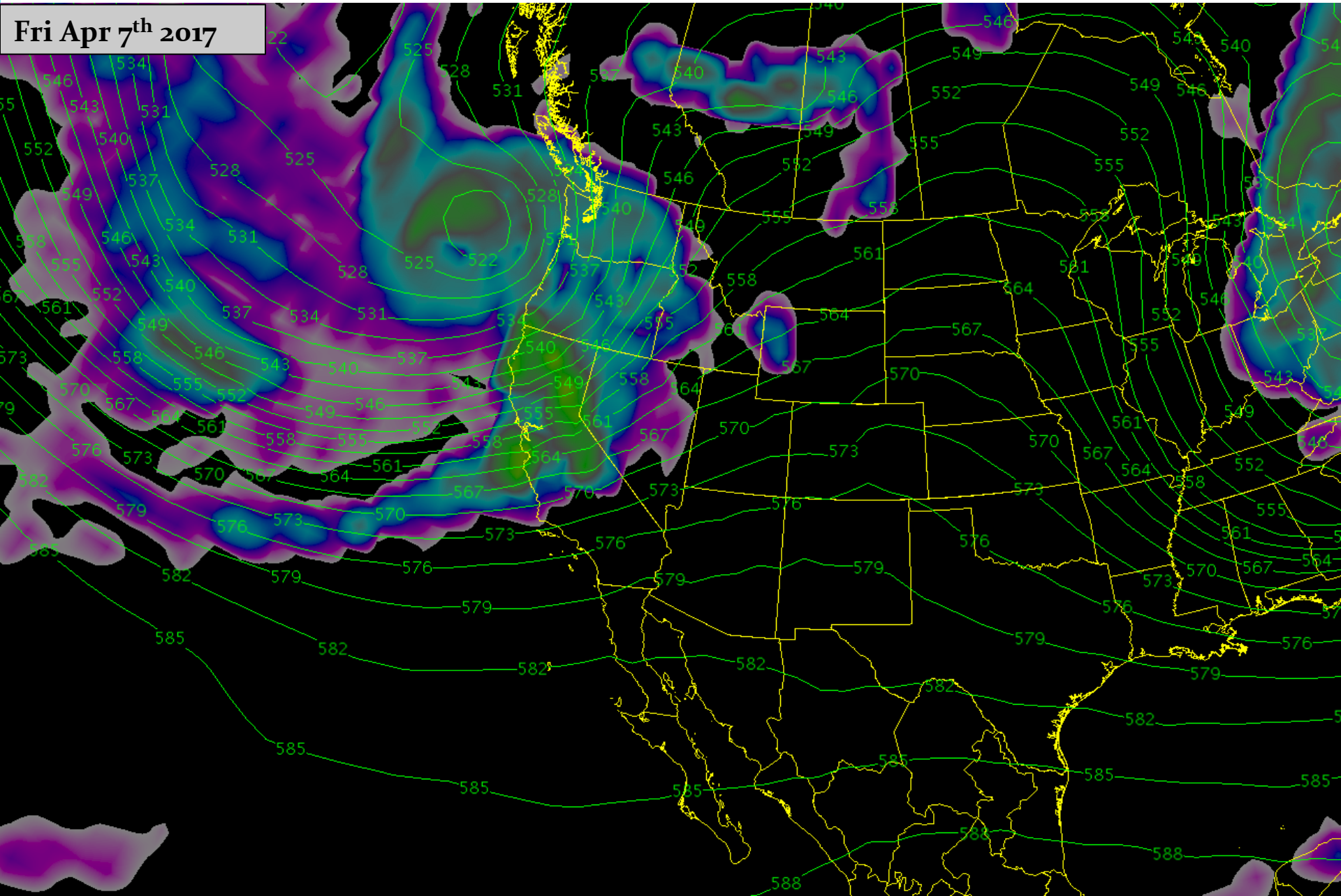


Upcoming Weather and Impacts to Water Supply Forecasts



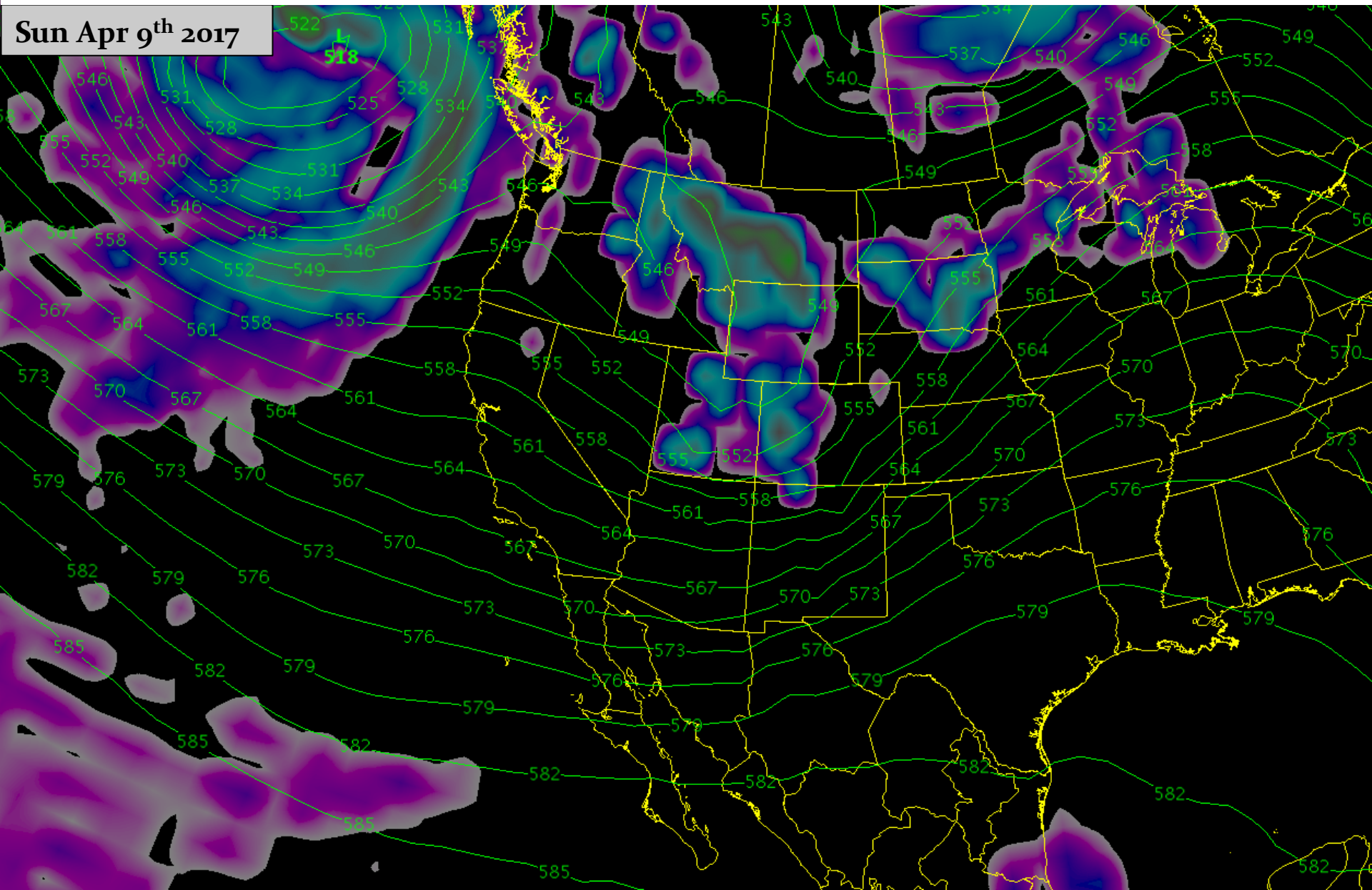
Upcoming Weather and Impacts to Water Supply Forecasts

Mild southwest flow ahead of weekend storm system. Temperatures 8-10 degrees above average.



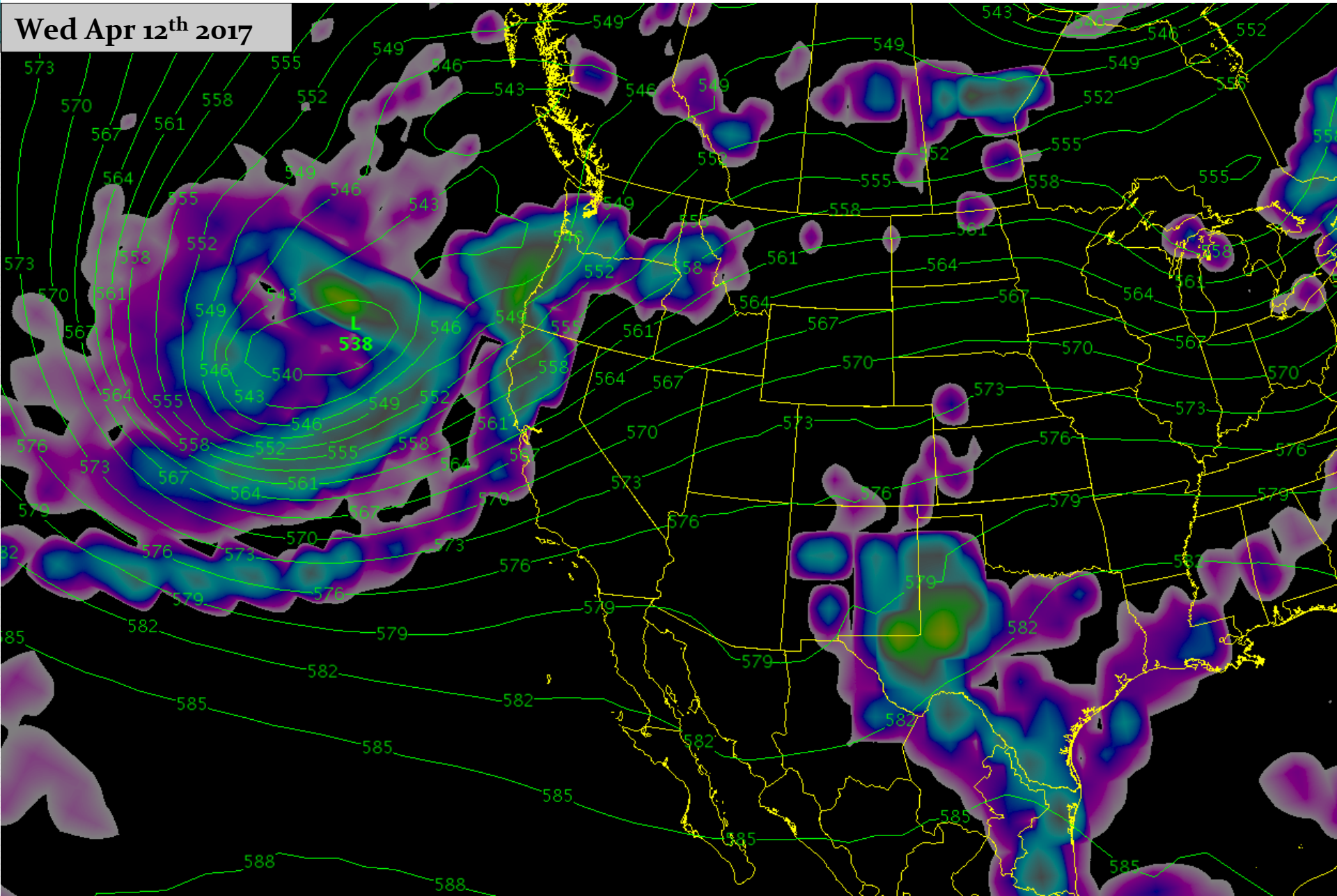
Upcoming Weather and Impacts to Water Supply Forecasts

The first in a series of spring storms moves through the area. Precipitation amounts up to 1 inch in the Colorado River Basin, higher amounts in the 1-3 inch range possible northern Great Basin. Temps 5-15 degrees below avg.



Upcoming Weather and Impacts to Water Supply Forecasts

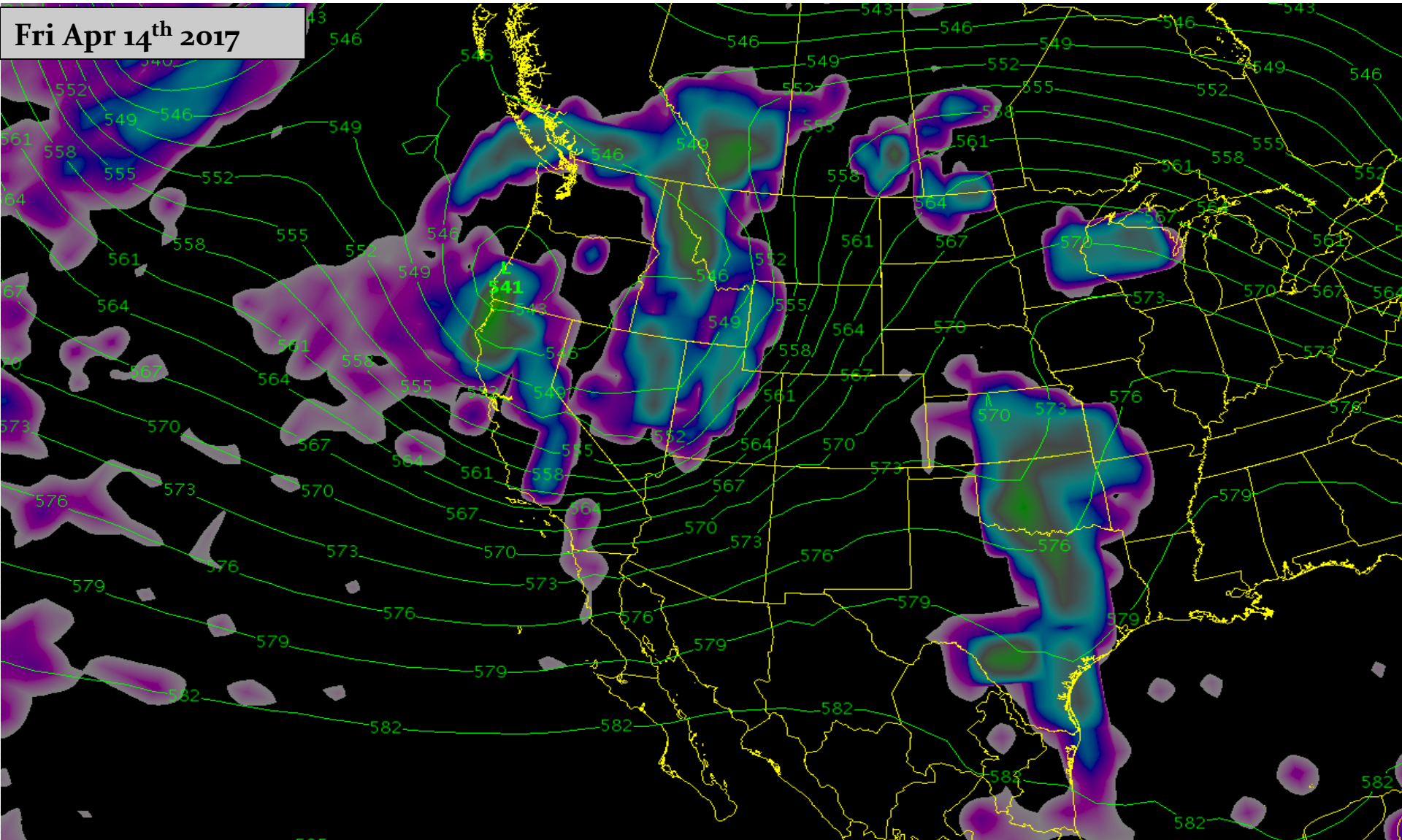
Dry and mild conditions return midweek ahead of the next storm system. Temperatures 8-10 degrees above average



Upcoming Weather and Impacts to Water Supply Forecasts

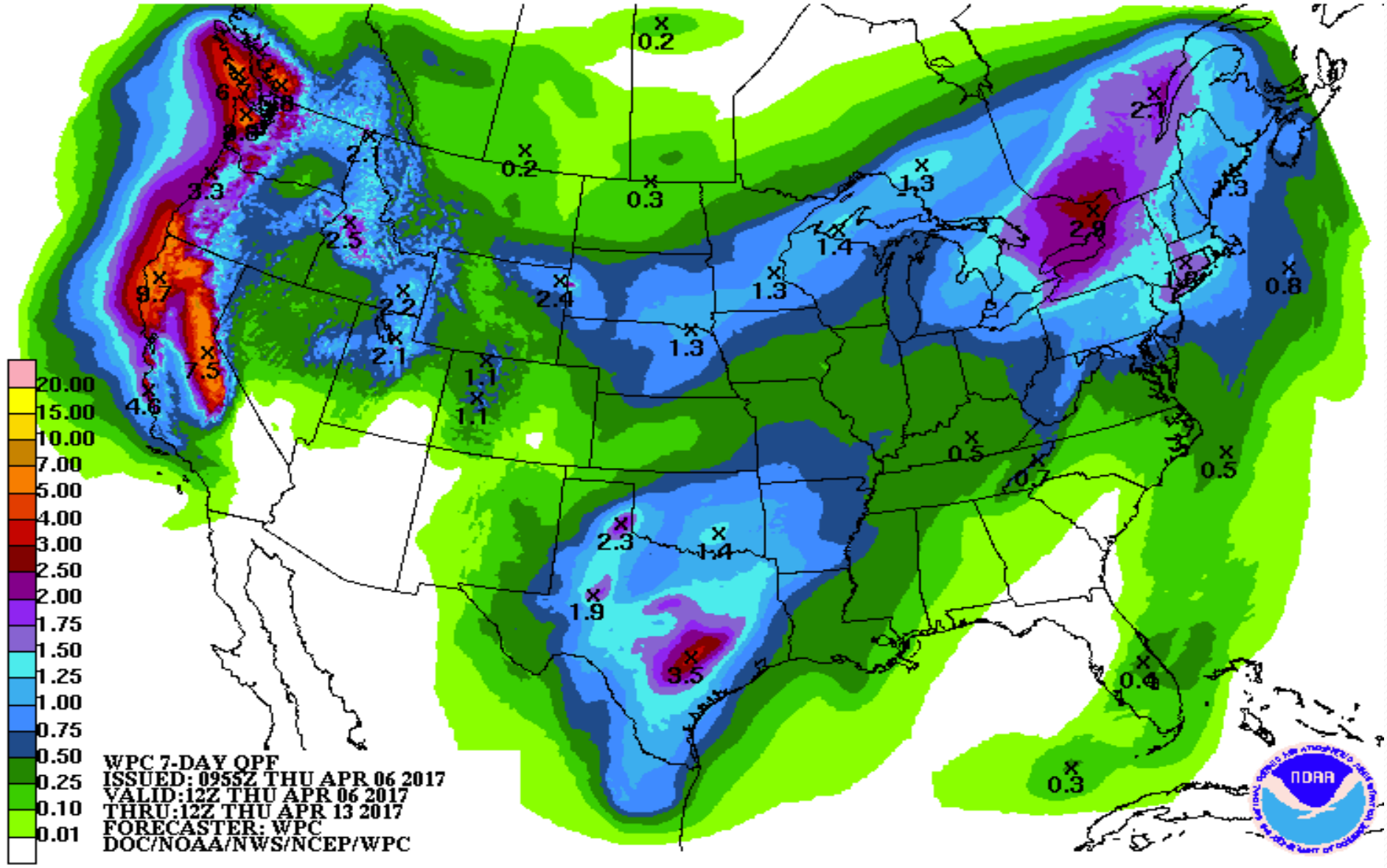
Possibly another ruined weekend as another storm system moves into the area. Models suggest storm center may lift north of us with impacts primarily to the northern Great Basin and Green River Basin (WY).

Long range guidance suggests an active weather pattern & additional storms through at least the 3rd week of April.



Upcoming Weather and Impacts to Water Supply Forecasts

Precipitation Forecast: 7 day total (Apr 6th-Apr 13th), most associated with this weekends storm



Key Points

Significant snowmelt occurred in March leading to record runoff in many areas. Some of the April-July volumes from previous forecasts moved into March. As a result new April-July volumes were reduced in most locations.

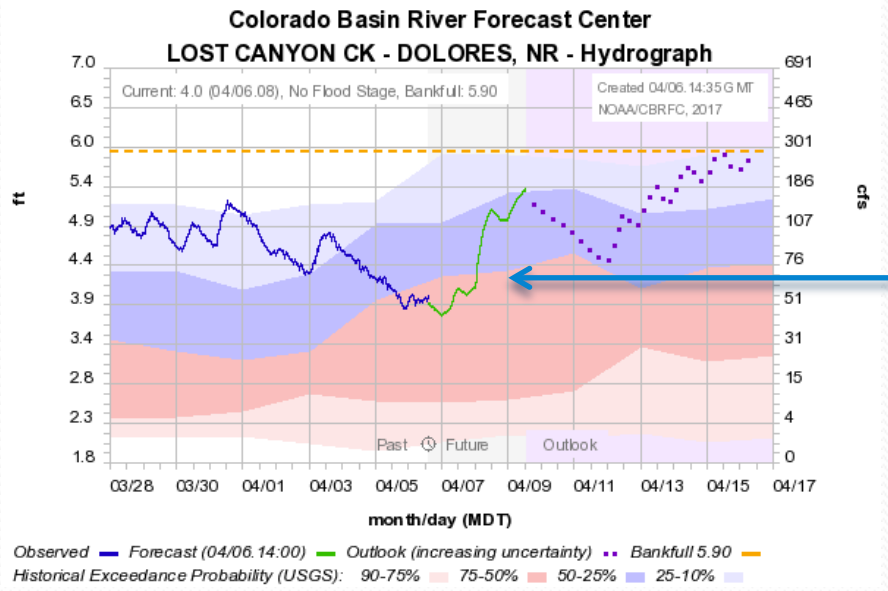
March was beneficial in reducing (not eliminating) flood threats by removing a heavy lower elevation snowpack. However saturated soils exist in some areas and spring rainfall may run off very efficiently.

Significant snowpack remains in the Green River Basin of Wyoming, Duchesne River Basin, Gunnison Basin headwaters and Dolores River Basin. High runoff volumes are anticipated in these areas especially in the Green River Basin and Duchesne.

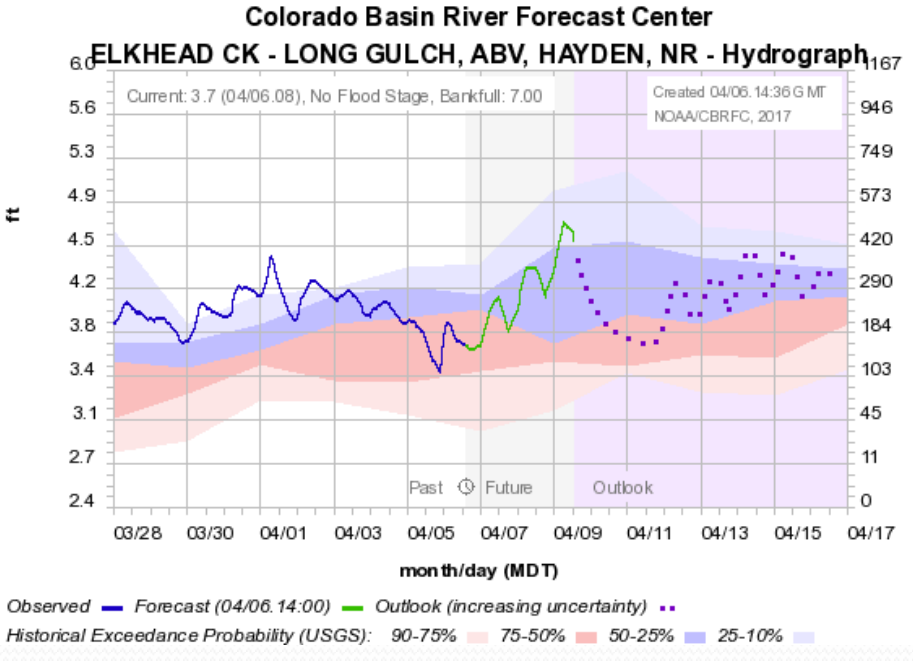
At this time April looks active with a series of storms and dry/warm periods in-between. Short term impacts to existing water supply forecasts will probably be minimal. Rain events may become a concern as streams rise due to snowmelt throughout the month.

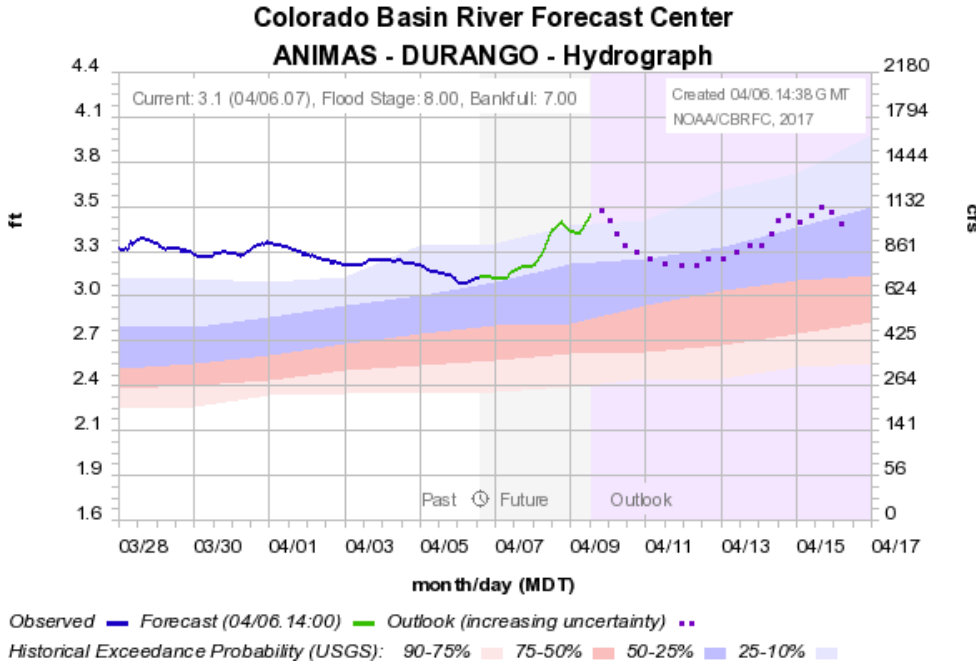
We continue to see active reservoir operation activity in anticipation of the high inflow forecasts. As we receive plans these will be incorporated into our model and reflected in our daily forecasts.

Daily deterministic forecasts available on the CBRFC web page www.cbrfc.noaa.gov

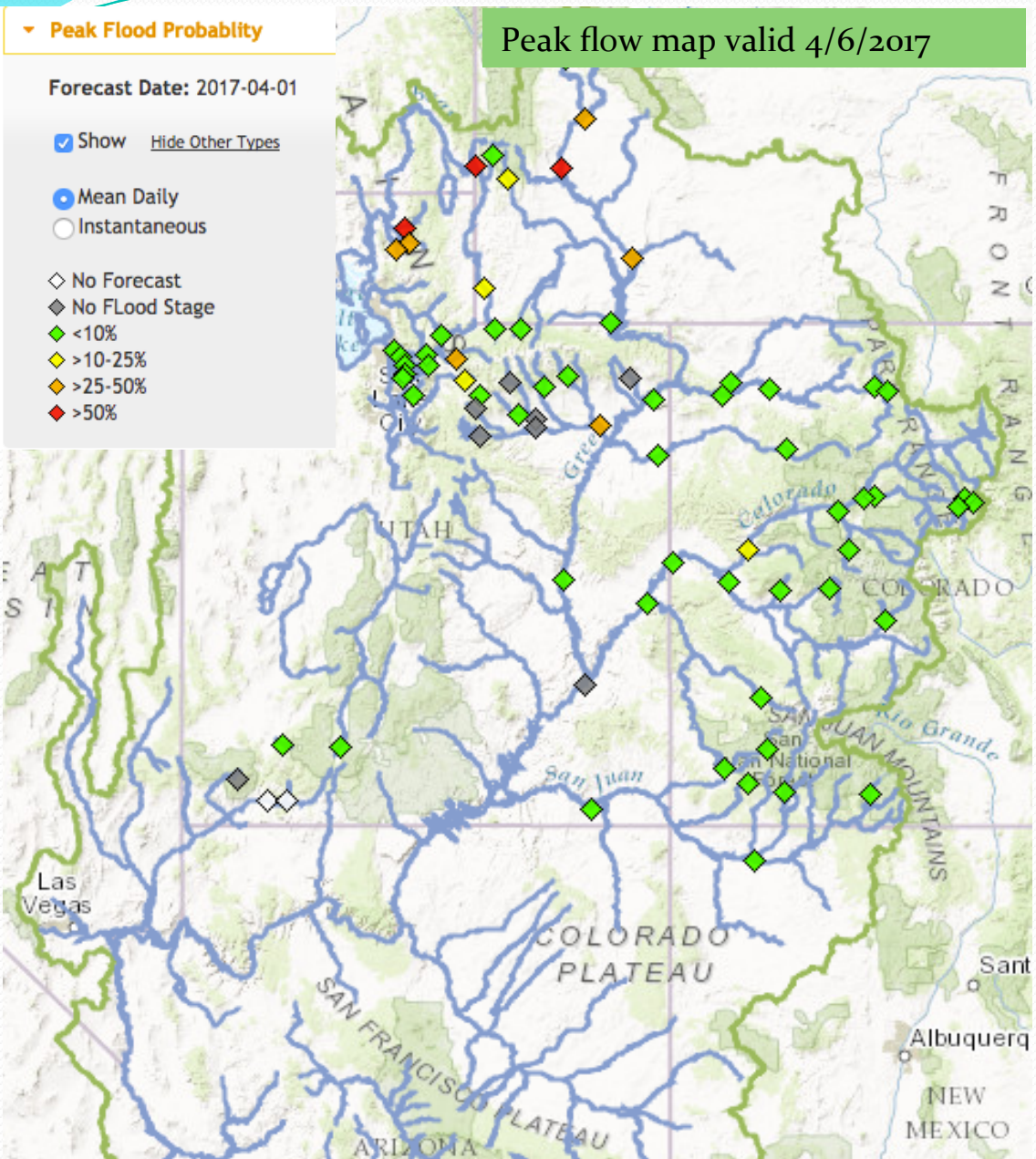


Increases due to warming today / Friday





Spring Runoff Peak Flows



Peak flow forecasts were updated this morning.

Spring runoff peak flow forecasts have decreased or changed little from mid-March forecasts in most areas.

Upper Green (WY) and Duchesne River Basin forecasts remain high with flooding probable on some rivers.

Reservoir release plans and operations impact downstream forecasts

2017 water supply briefing schedule

- 2017 monthly water supply briefings for the Colorado River Basin
  - Friday May 5th @ 11 am MT
  - Great Basin webinars are same dates at 1:30 pm MT
    - ***NEXT UP: Today 1:30 pm***
- Peak flow briefing: *As Needed (nothing currently scheduled)*
- Date/Times are subject to change. All registration information has been posted to the CBRFC web page.

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