

April 2016

Colorado River Basin Water Supply Briefing

April 7, 2016

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Colorado Basin River Forecast Center
National Weather Service
NOAA

Conference Phone #: 877-929-0660
Passcode #: 1706374

Please mute your phone
until ready to ask questions



Today's Presentation

March Weather

Current conditions impacting forecasts

Overview of April water supply forecasts

Peak flow forecasts

Upcoming weather and longer range outlooks

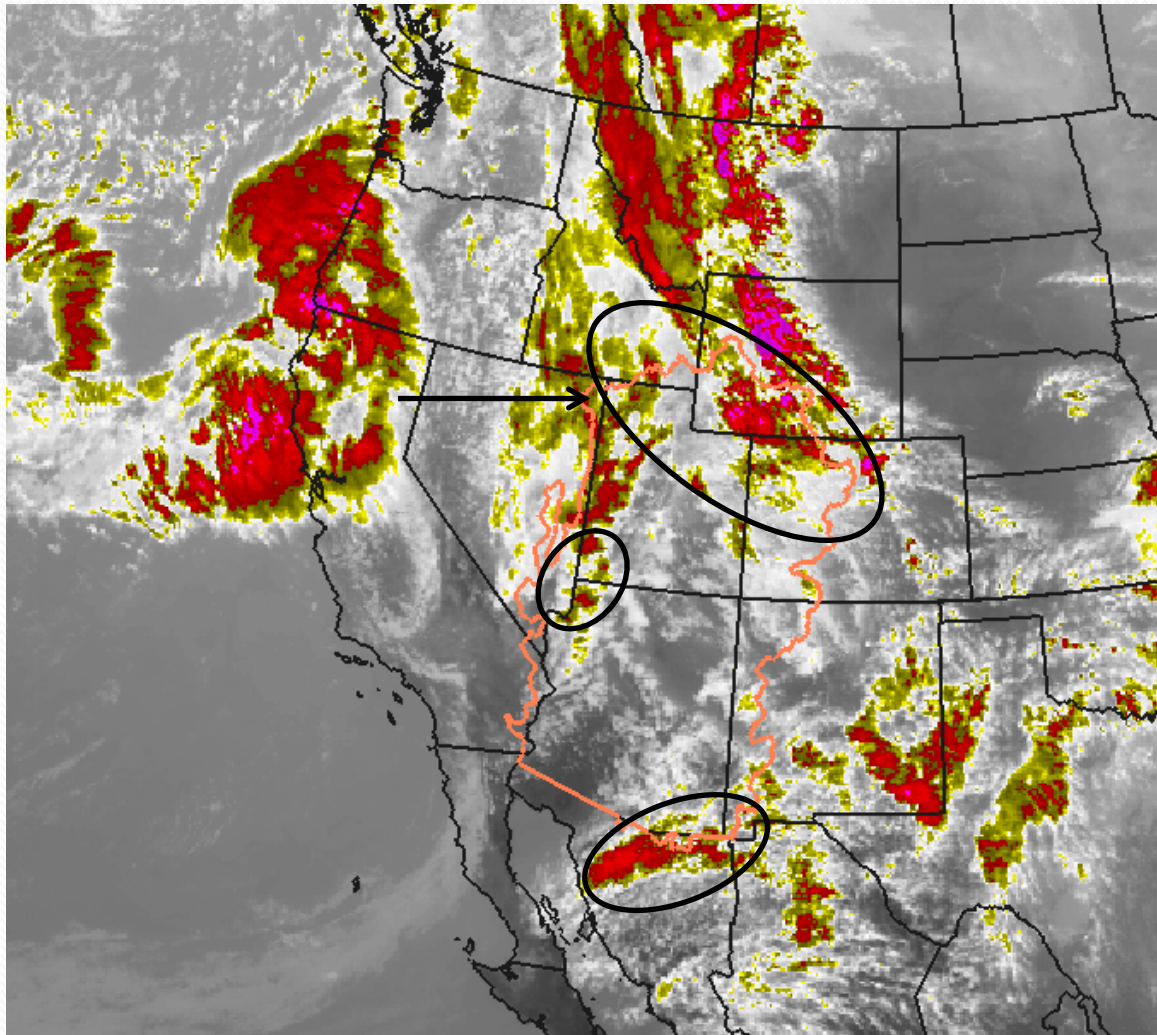
Contacts

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

2016 March Weather

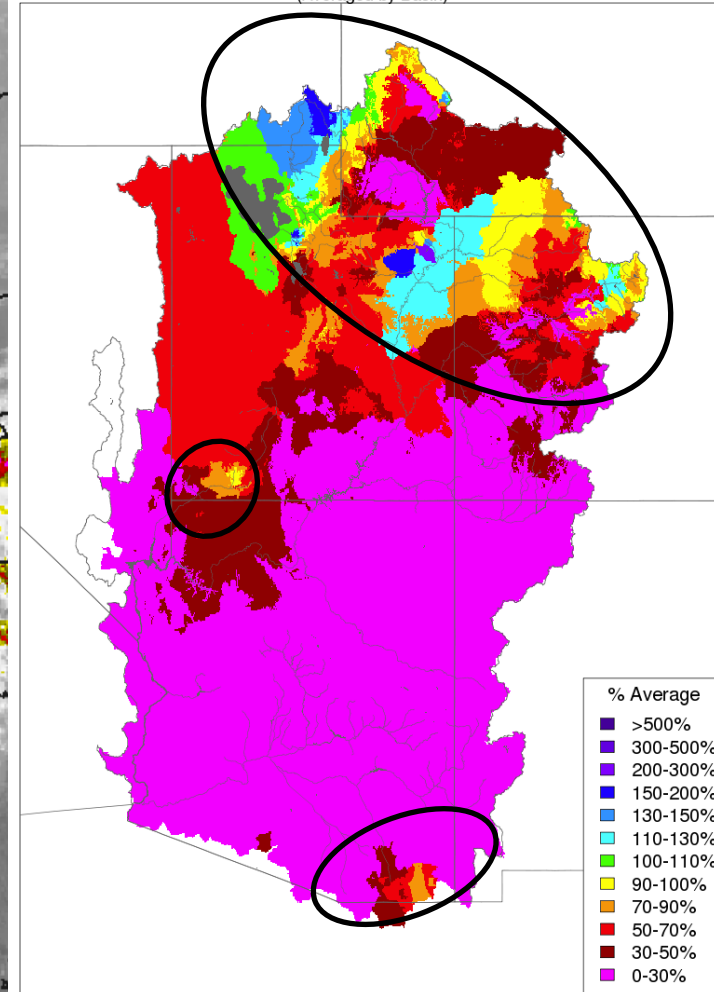
March 6th Satellite Image

Storm system impacting parts of the CBRFC area



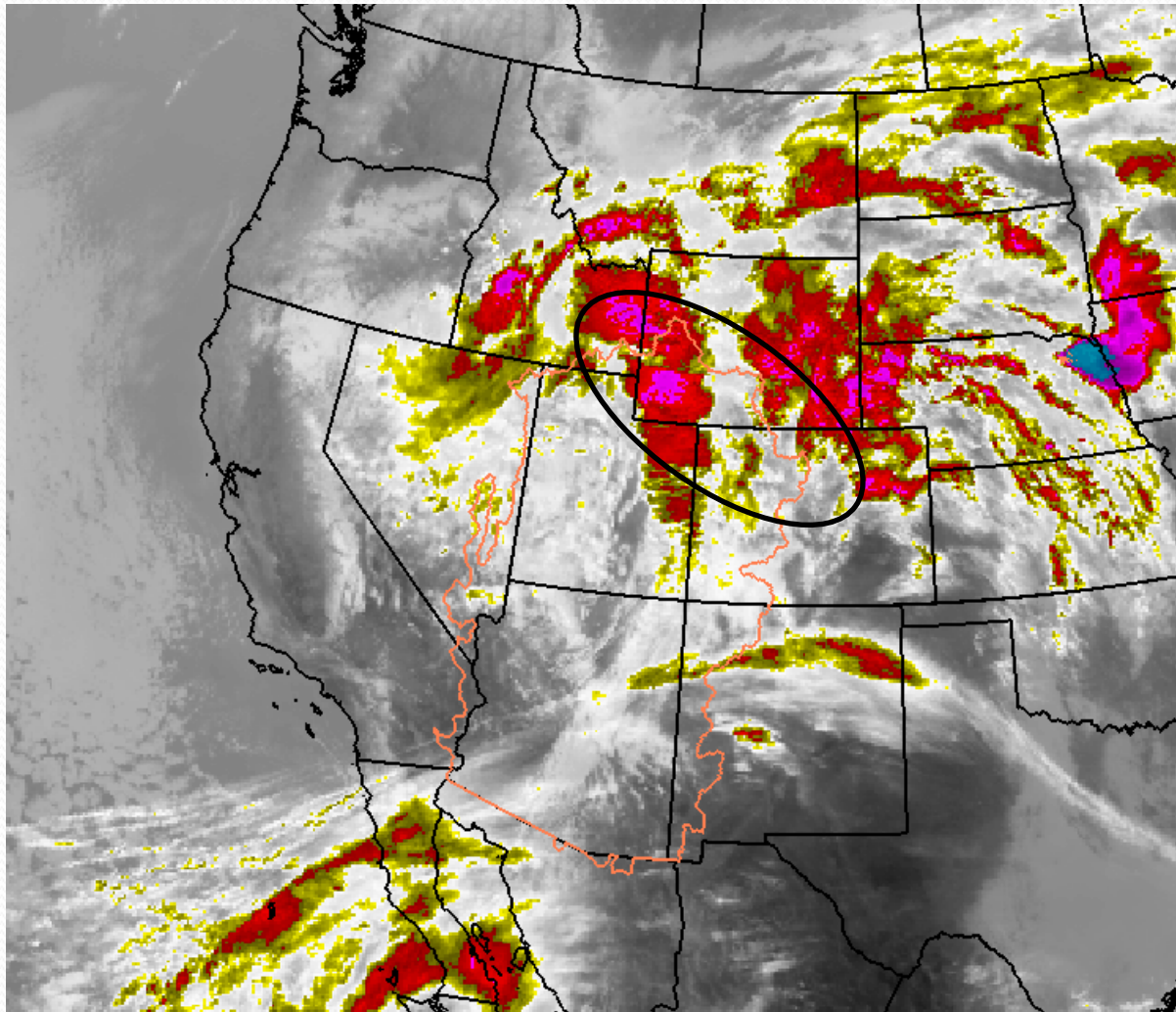
Month to Date Precipitation - March 15 2016

(Averaged by Basin)

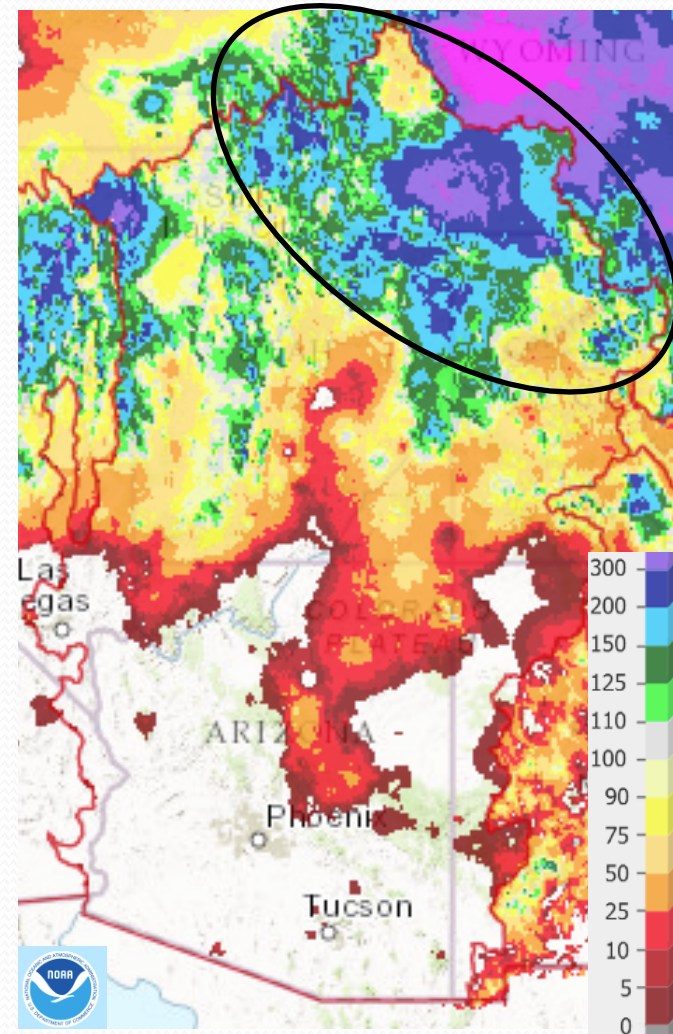


2016 March Weather

March 29th Satellite Image
Storm system impacting northern CBRFC area

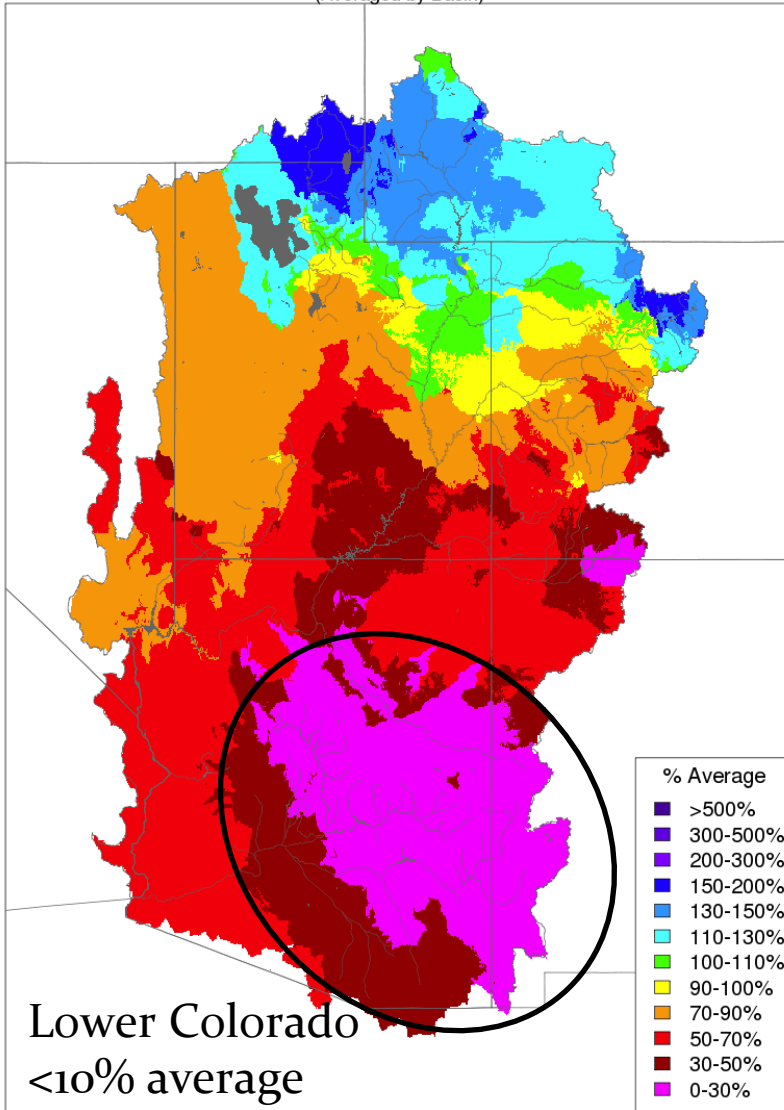


Observed % Average Precipitation
March 20 – April 1

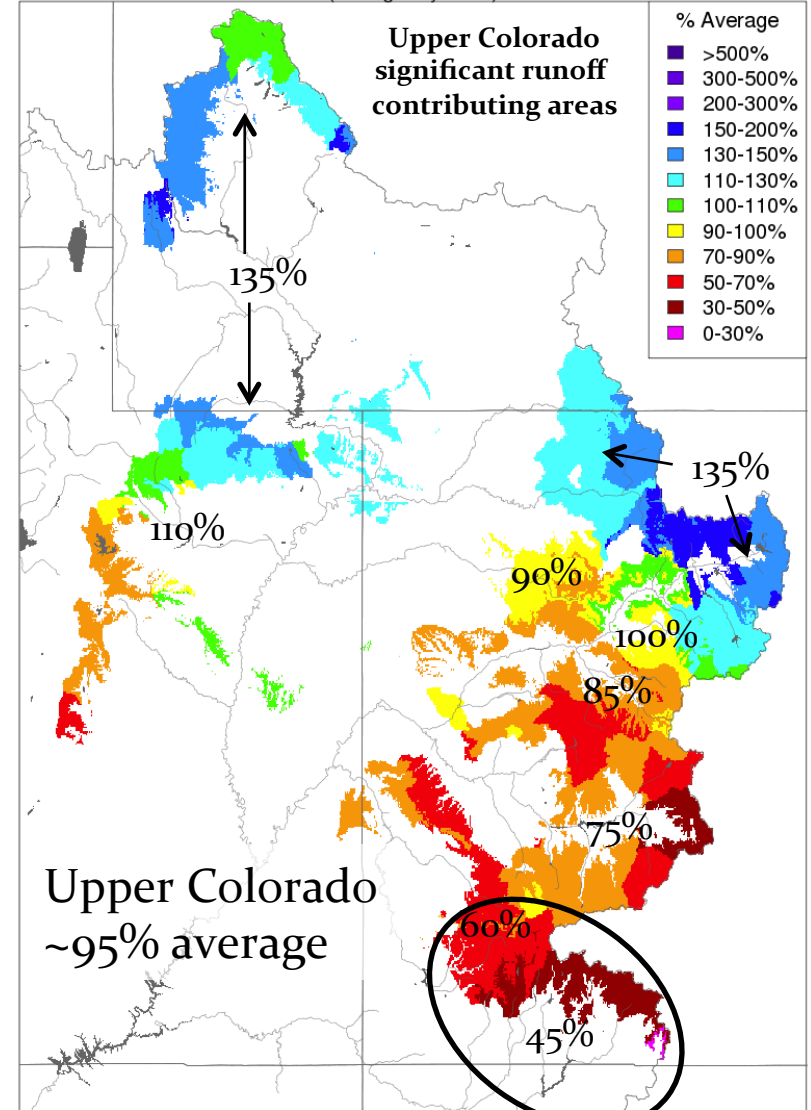


March Precipitation

Monthly Precipitation - March 2016
(Averaged by Basin)

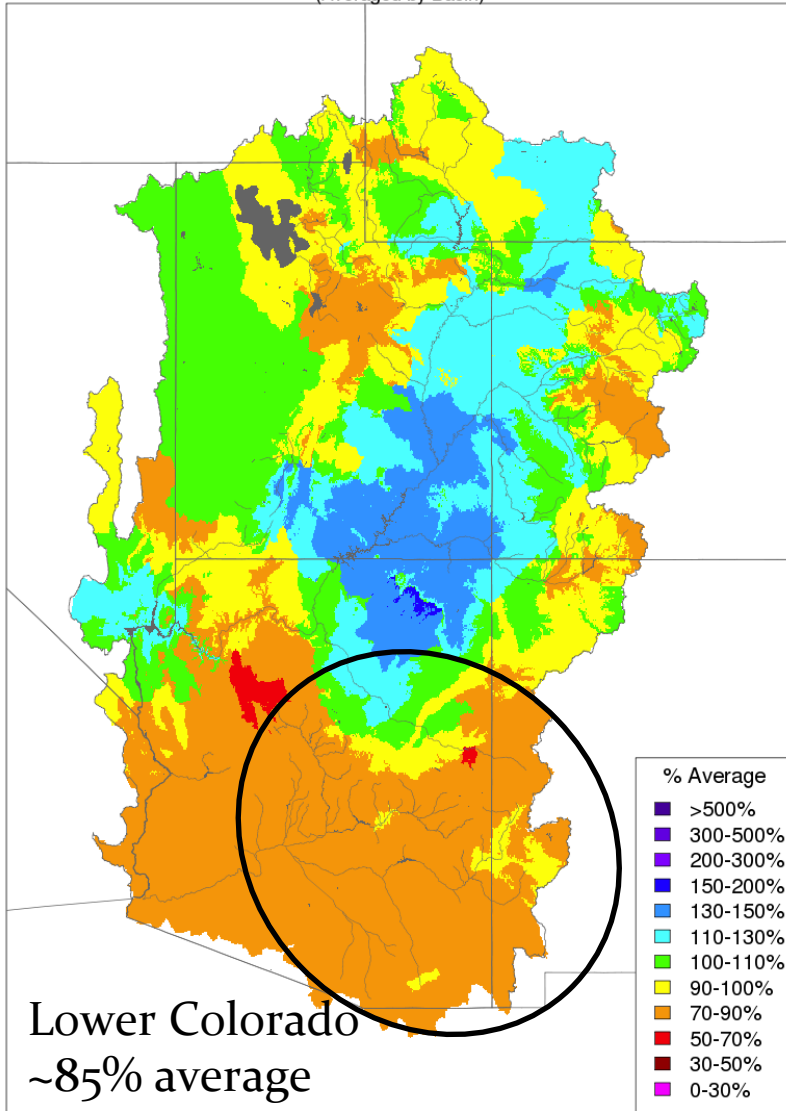


Monthly Precipitation - March 2016
(Averaged by Basin)

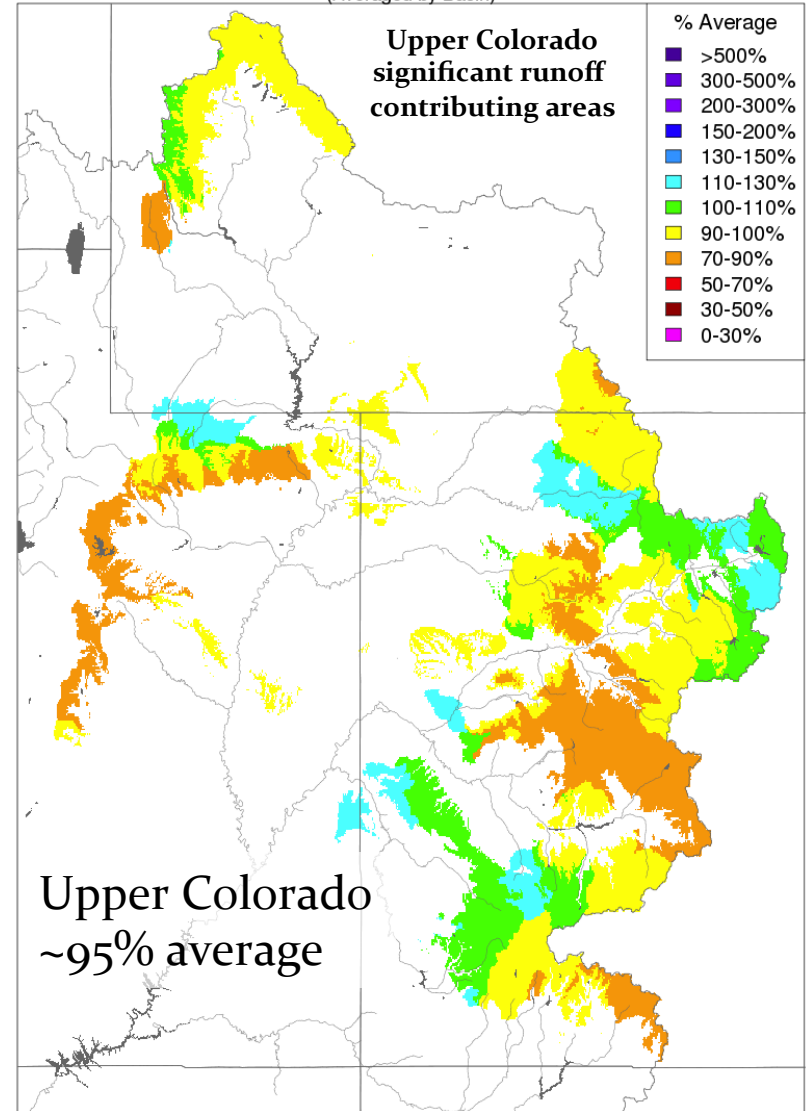


Water Year Precipitation

Water Year Precipitation, October 2015 - March 2016
(Averaged by Basin)

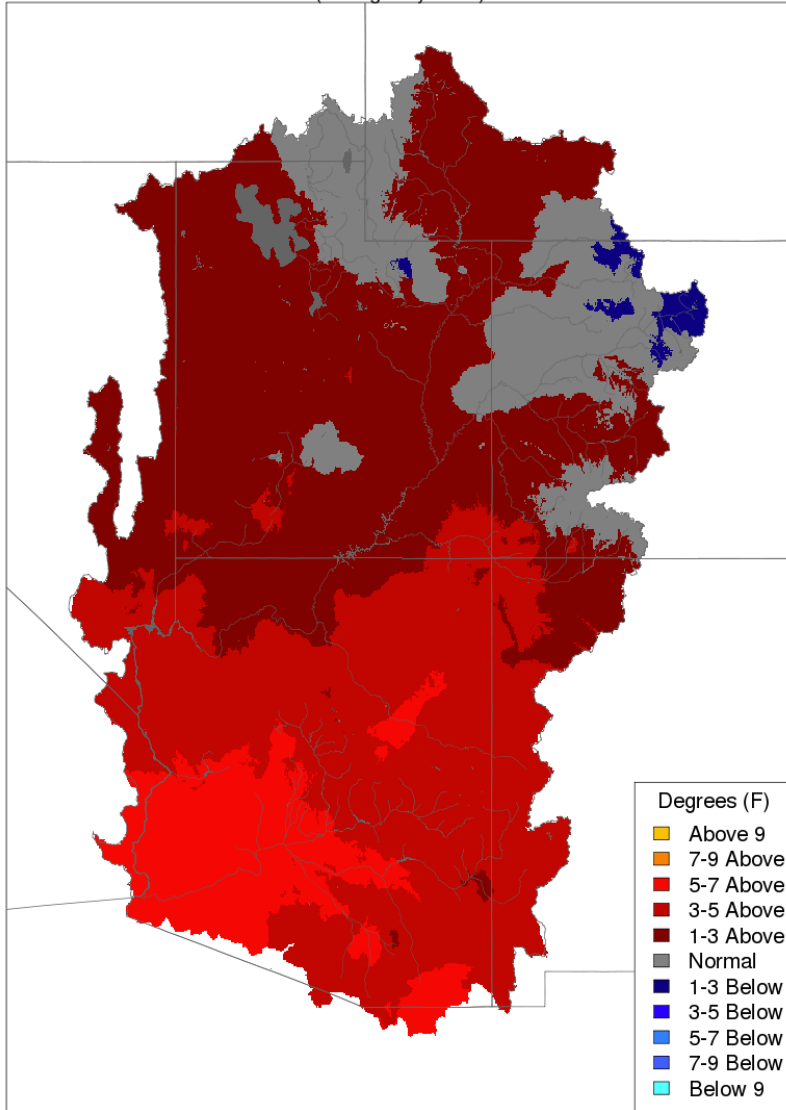


Water Year Precipitation, October 2015 - March 2016
(Averaged by Basin)



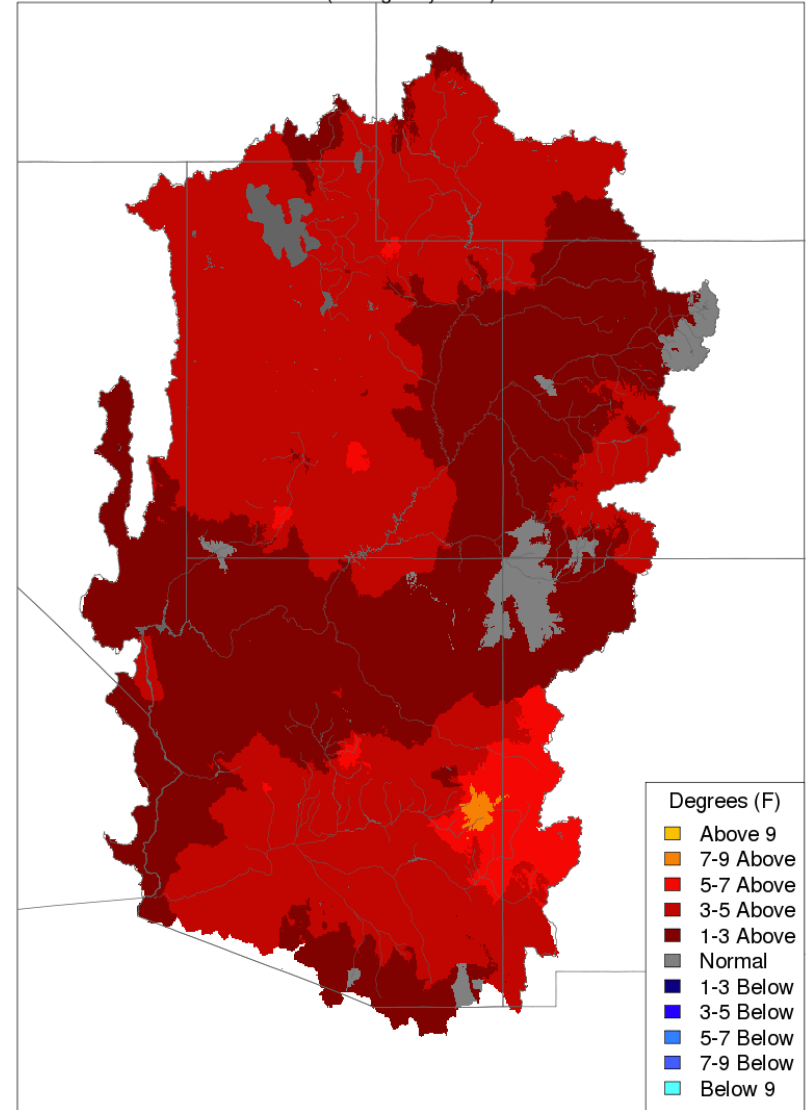
March Temperature

Max Temp - Monthly Deviation - March 2016
(Averaged by Basin)



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

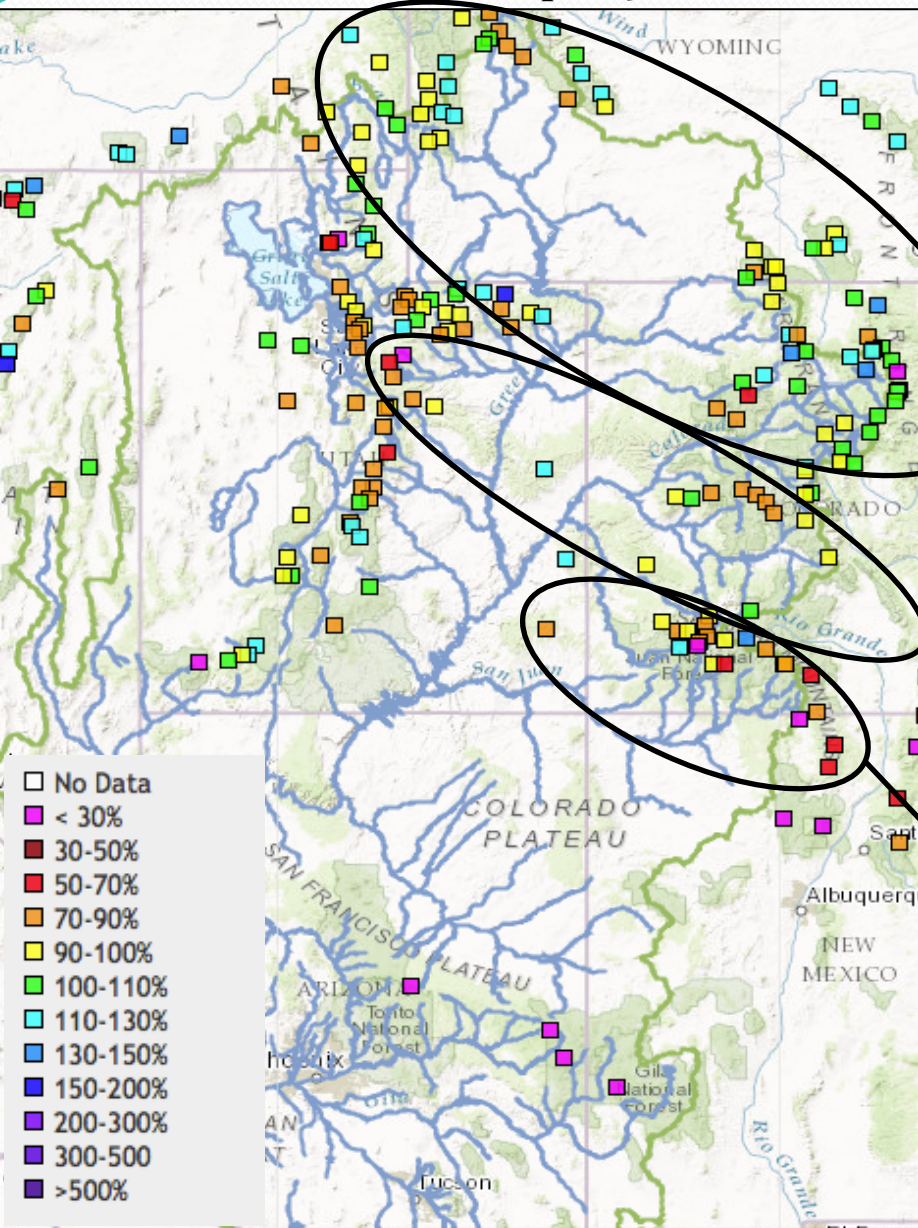
Min Temp - Monthly Deviation - March 2016
(Averaged by Basin)



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

Snow – SNOTEL Network

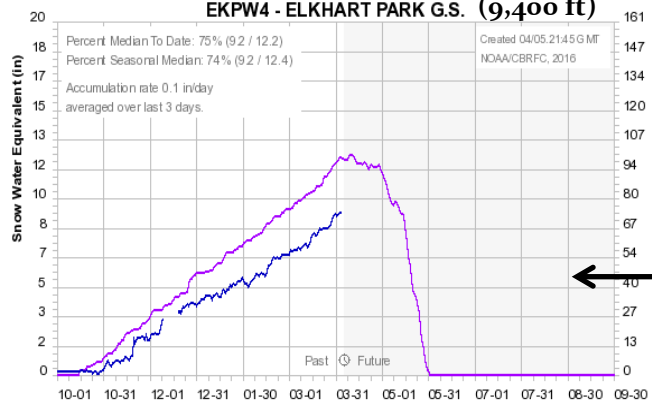
Snow (% median): April 5, 2016



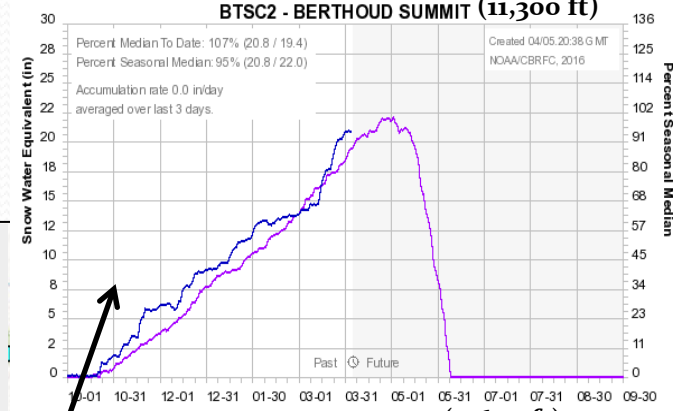
- Percent median snow water equivalent changes since March 1:
- Increased due to precipitation over the northern third of the Upper Colorado River Basin.
 - Decreased mostly due to lack of precipitation in the middle part of the basin.
 - Decreased due to a combination of lack of precipitation and melt at high elevations in the southern part of the basin.

Snow – SNOTEL Network

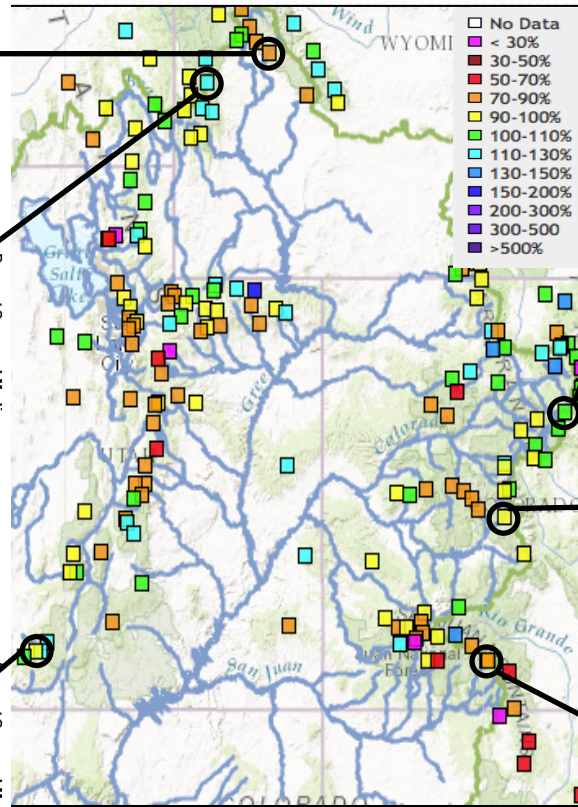
Colorado Basin River Forecast Center
EKPW4 - ELKHART PARK G.S. (9,400 ft)



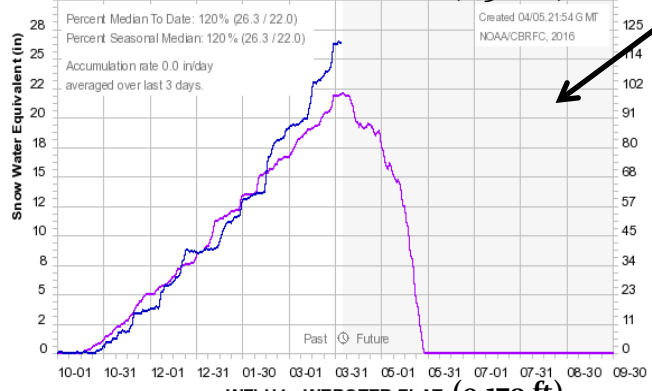
Colorado Basin River Forecast Center
BTSC2 - BERTHOUD SUMMIT (11,300 ft)



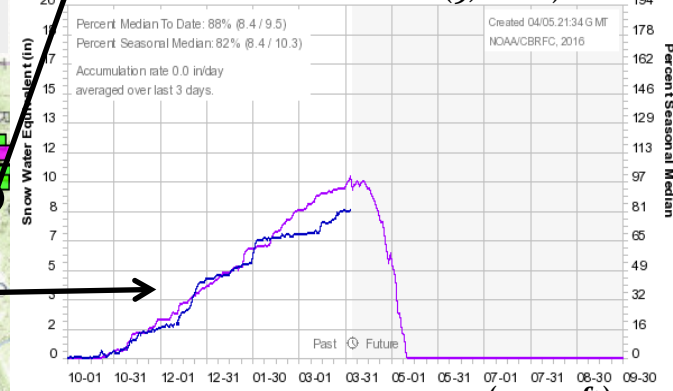
Snow (% median):
April 5, 2016



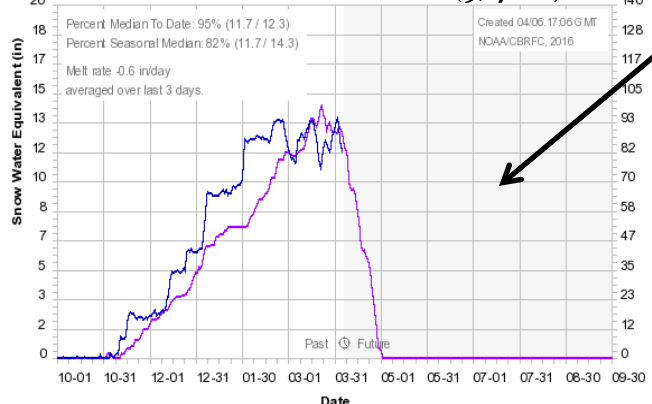
TRPW4 - TRIPLE PEAKS (8,500 ft)



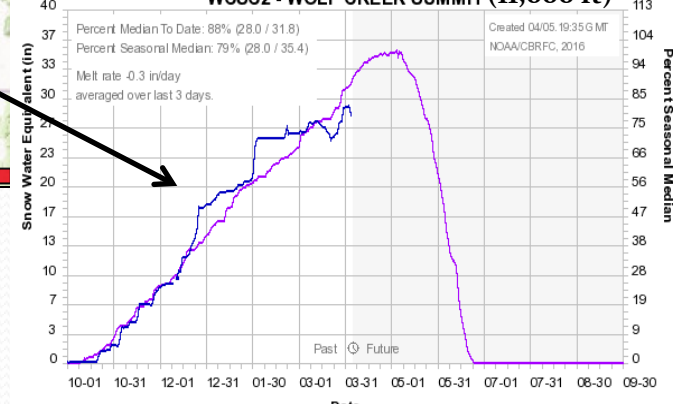
PKCC2 - PARK CONE (9,600 ft)



WFLU1 - WEBSTER FLAT (9,170 ft)

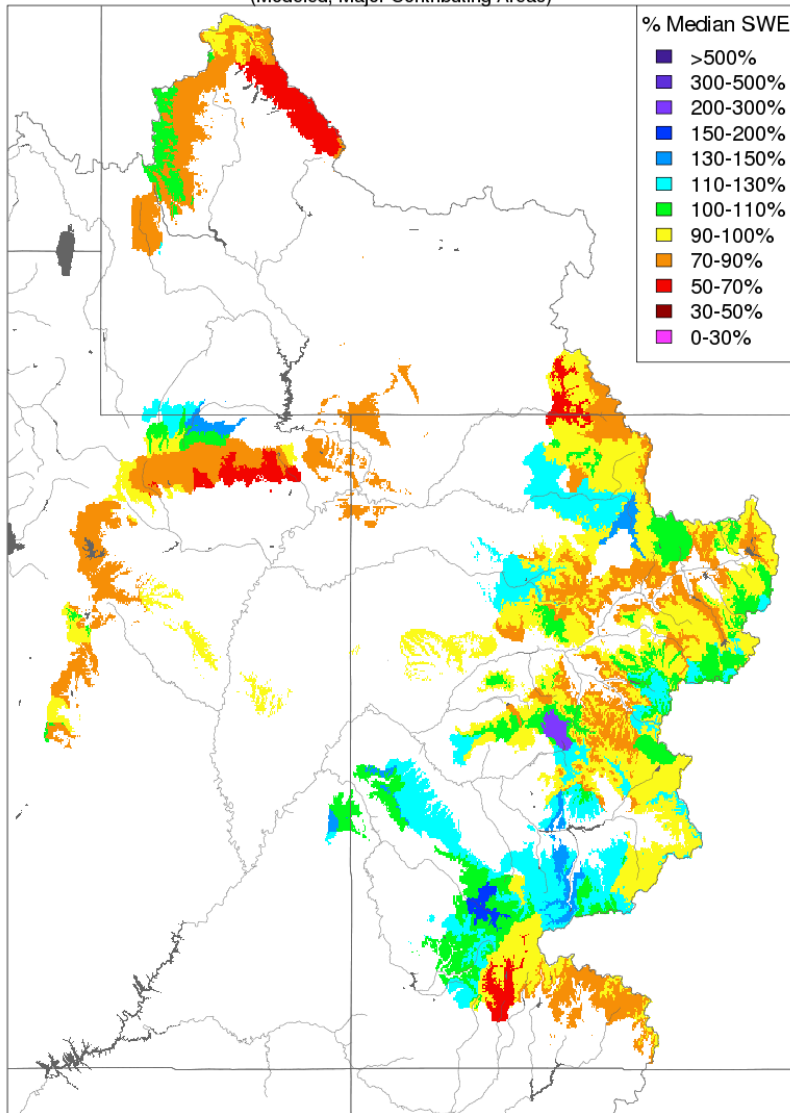


WCCS2 - WOLF CREEK SUMMIT (11,000 ft)



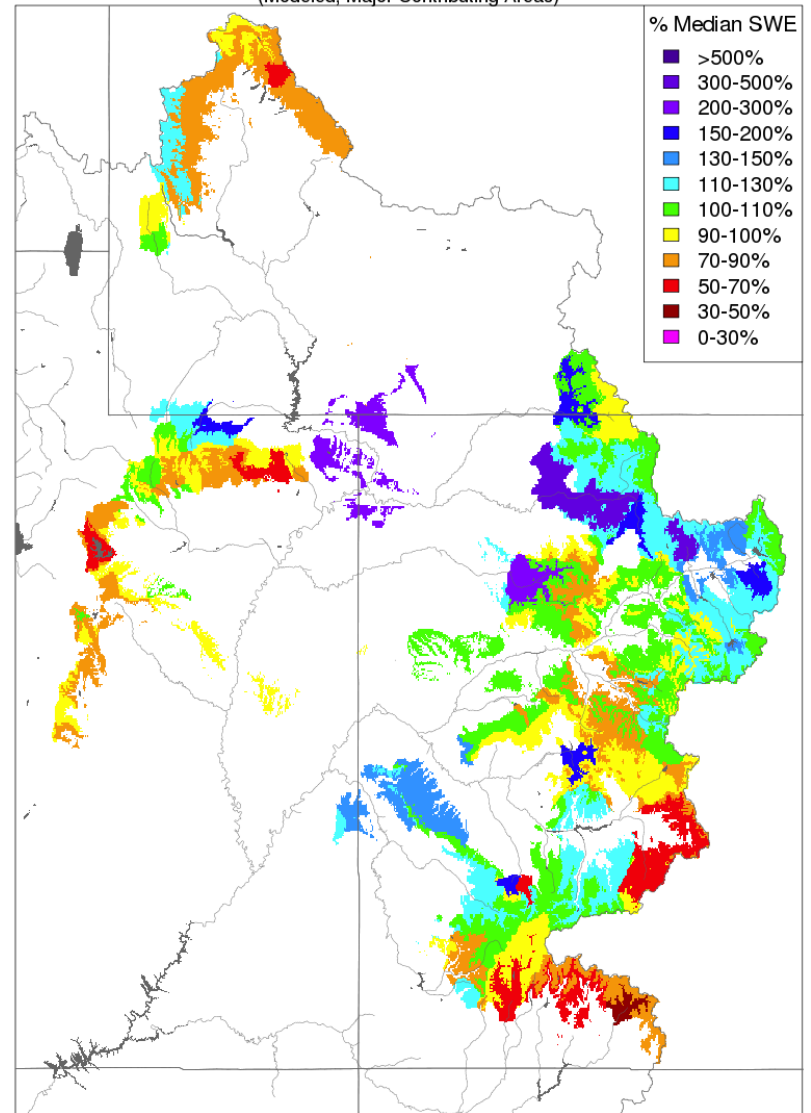
Snow – CBRFC Hydrologic Model

Snow Conditions - March 01 2016
(Modeled, Major Contributing Areas)



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

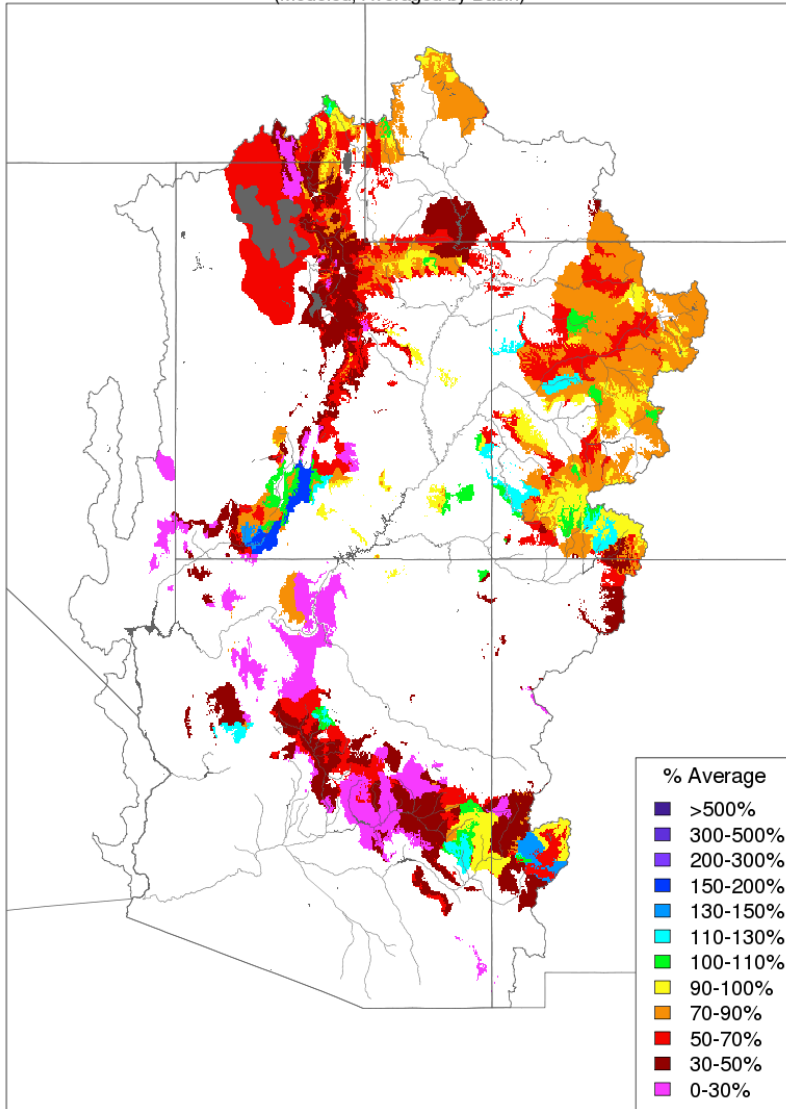
Snow Conditions - April 01 2016
(Modeled, Major Contributing Areas)



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

Model Soil Moisture – Fall % Average

Soil Moisture - Fall - 2015 (November 15)
(Modeled, Averaged by Basin)



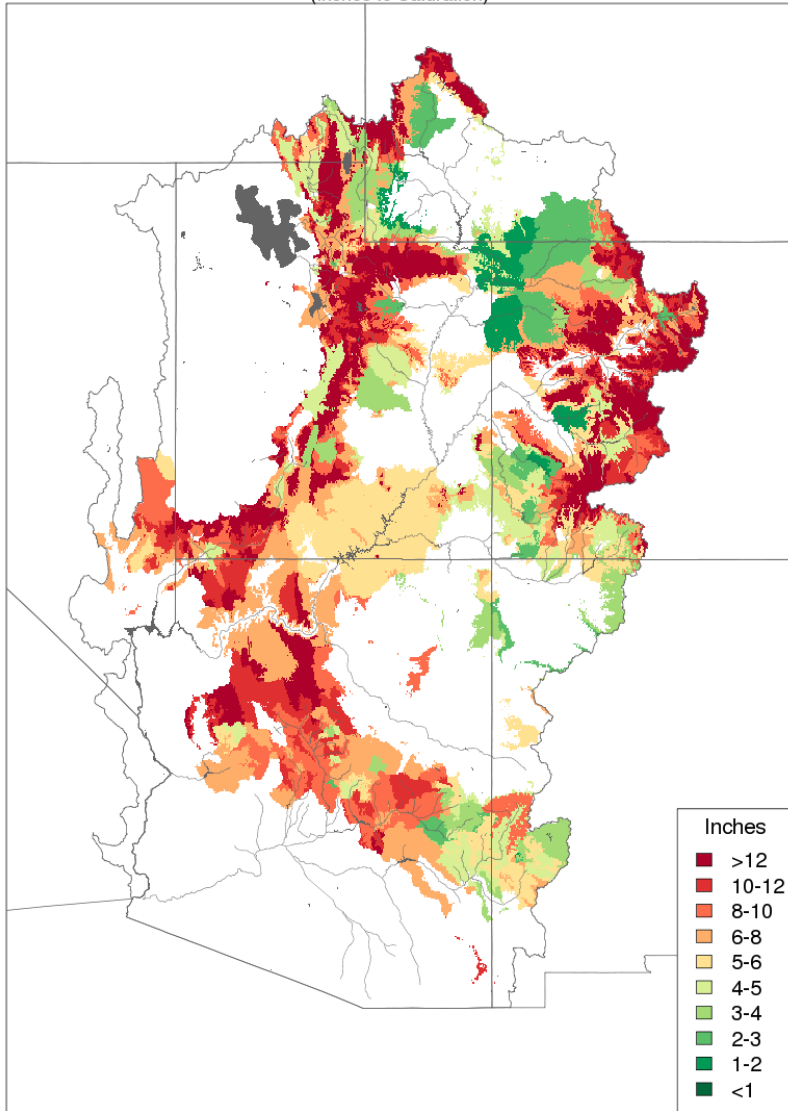
Prepared by NOAA, Colorado Basin River Forecast Center
Salt Lake City, Utah, www.cbrfc.noaa.gov

Dry fall soil moisture conditions over most of the Upper Colorado River Basin (as represented by the CBRFC's hydrologic model) have negatively impacted streamflow forecasts this year.

Lower basin conditions can be more variable, as fall and spring rains and other storm events can impact soil moisture conditions significantly

Model Soil Moisture - Saturation

Soil Moisture - April 01 2016
(Inches to Saturation)



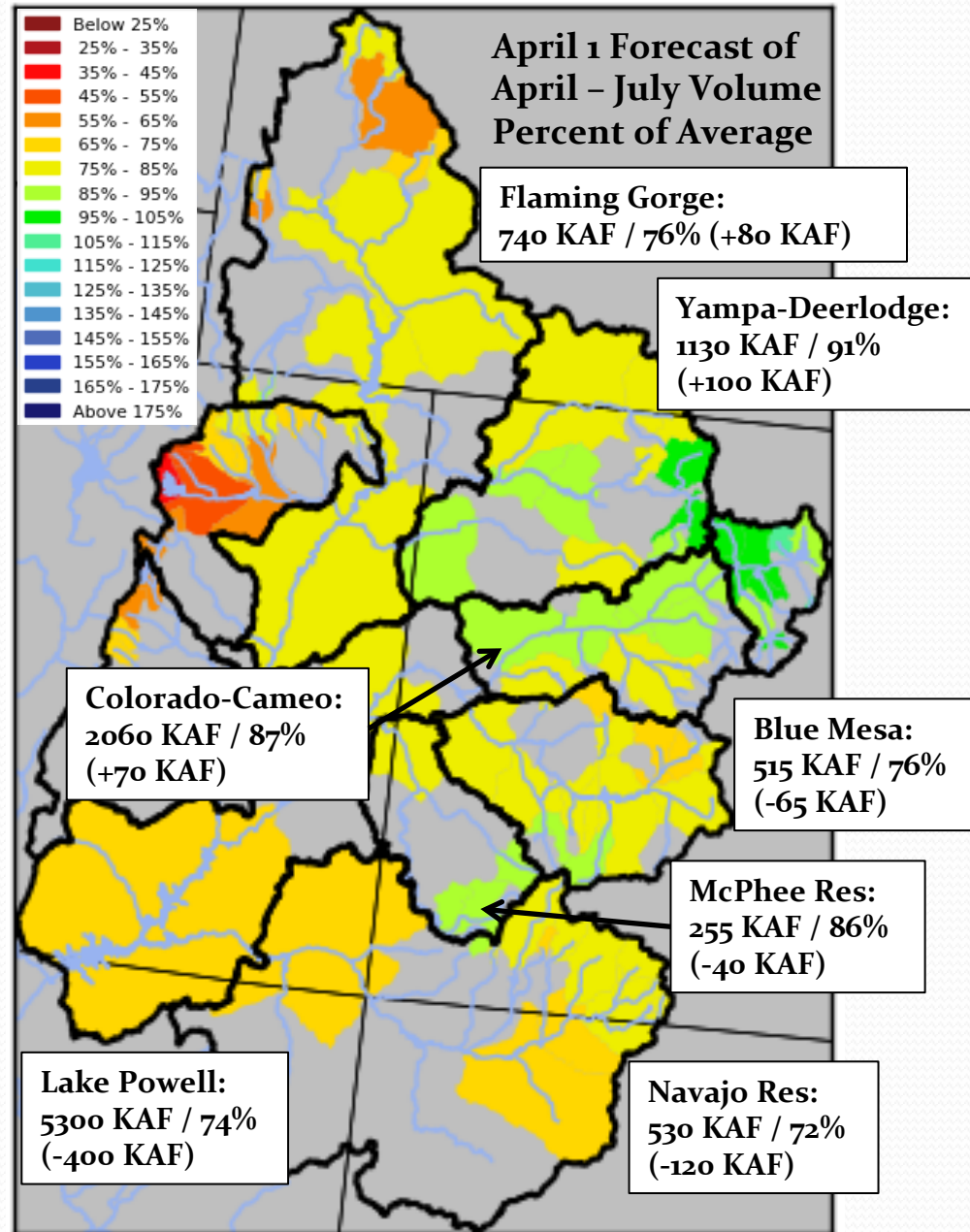
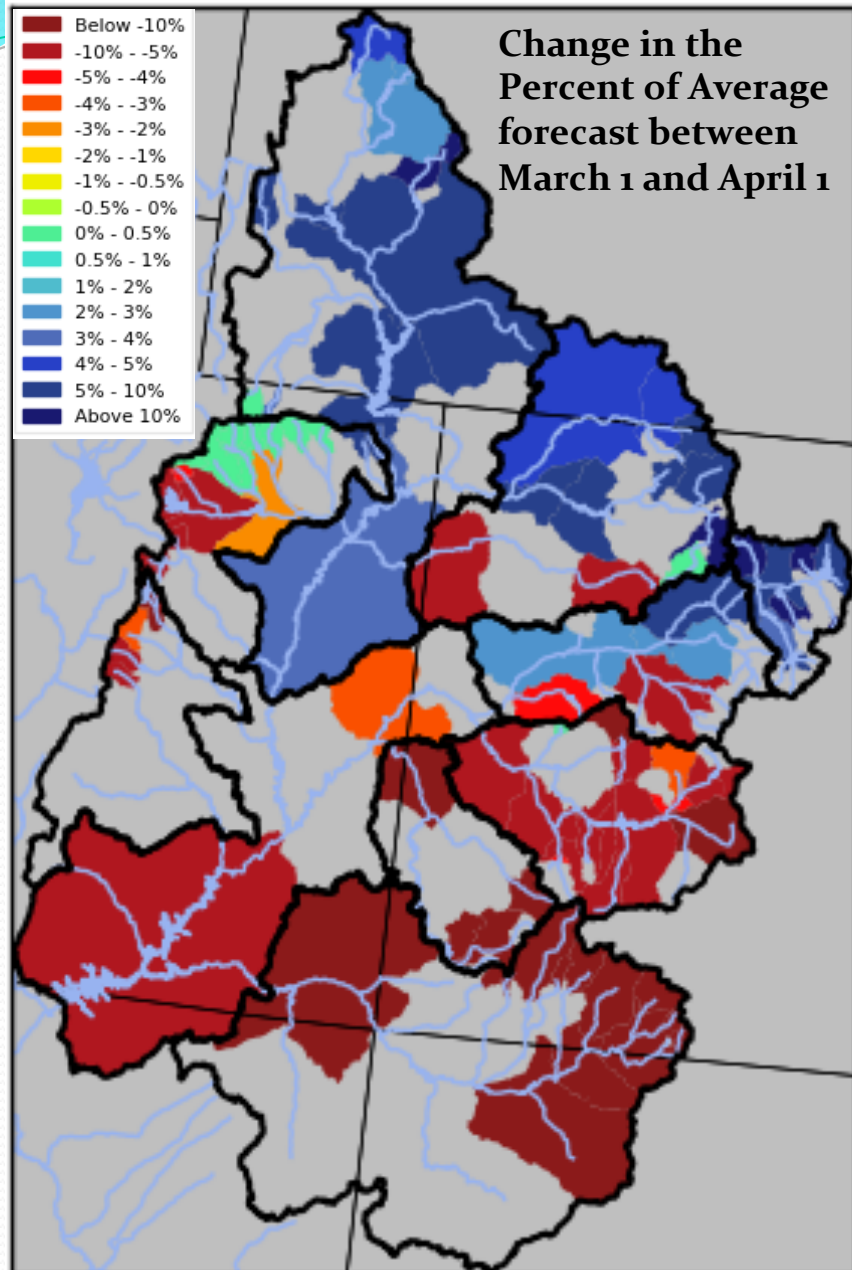
Prepared by NOAA, Colorado Basin River Forecast Center
Salt Lake City, Utah, www.cbrfc.noaa.gov

The 'Inches to Saturation' soil moisture map gives an indication of where soils are becoming saturated in the CBRFC hydrologic model due to snowmelt and/or rainfall. Dark green areas show where the model may begin to produce runoff with additional moisture input.

This map is primarily intended to assess runoff efficiency in the Lower Colorado River Basin during winter rain events.

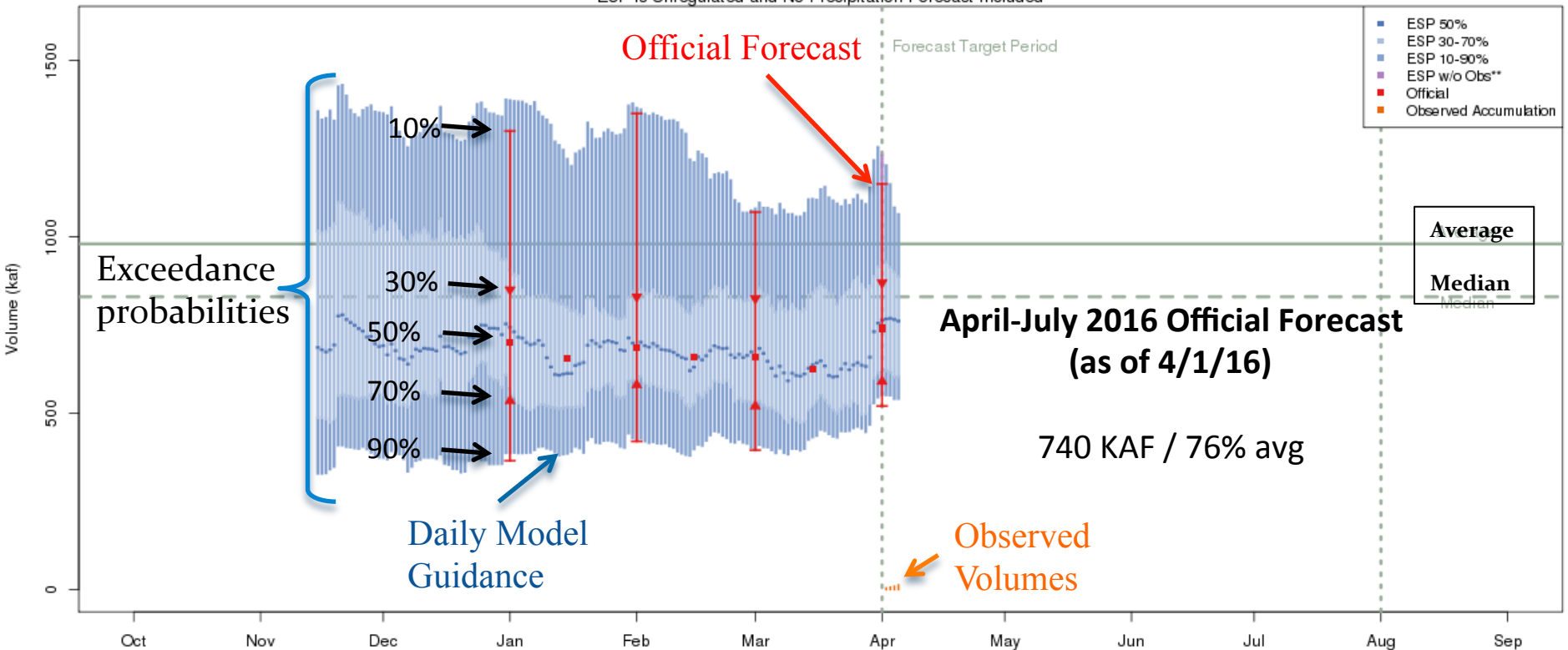
It **does not** affect the water supply volume forecasts in the Upper Colorado River Basin, but can provide some information during the spring snowmelt.

April – July Forecast Streamflow Volumes



Forecast Evolution Plot – Flaming Gorge

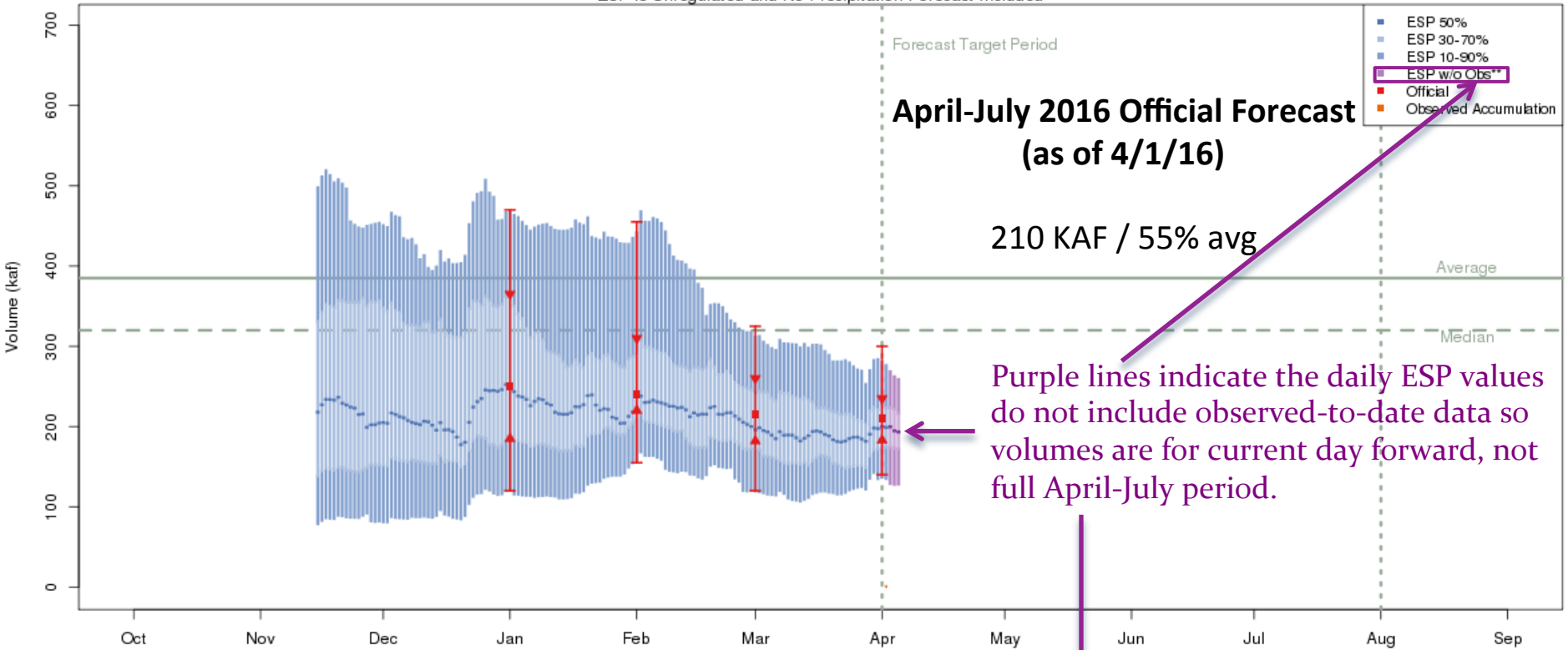
Green - Flaming Gorge Res- Flaming Gorge Dam- At (GRNU1)
 2016-04-01 Apr-Jul Official 50% Forecast: 740 kaf (76% of average)
 ESP is Unregulated and No Precipitation Forecast Included



The latest (2016-04-05) 50% ESP forecast is 761 kaf.
 Plot Created 2016-04-05 16:58:50, NOAA / NWS / CBRFC
 Forecasts in the forecast target period include observed values.

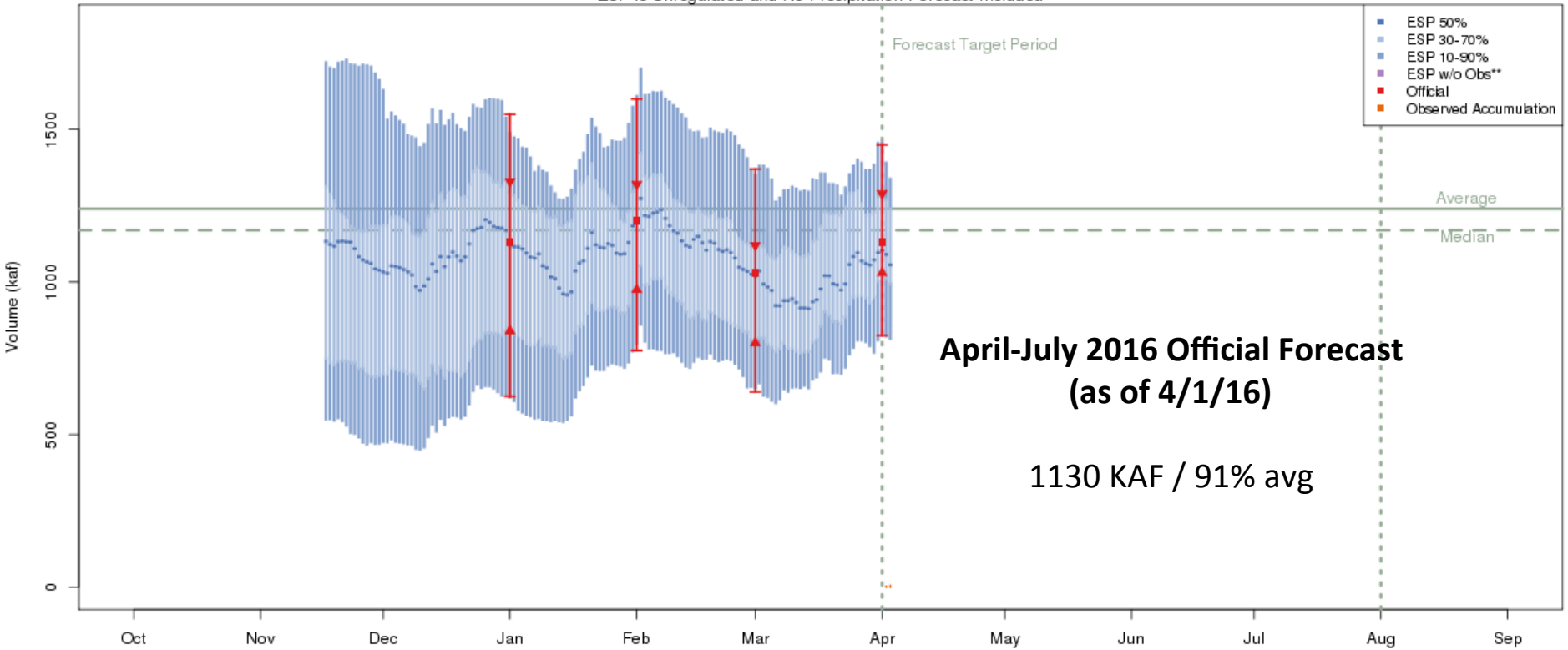
Forecast Evolution Plot – Duchesne-Randlett

Duchesne - Randlett- Nr (DURU1)
2016-04-01 Apr-Jul Official 50% Forecast: 210 kaf (55% of average)
ESP is Unregulated and No Precipitation Forecast Included



Forecast Evolution Plot – Yampa-Deerlodge

Yampa - Deerlodge Park (YDLC2)
2016-04-01 Apr-Jul Official 50% Forecast: 1130 kaf (91% of average)
ESP is Unregulated and No Precipitation Forecast Included

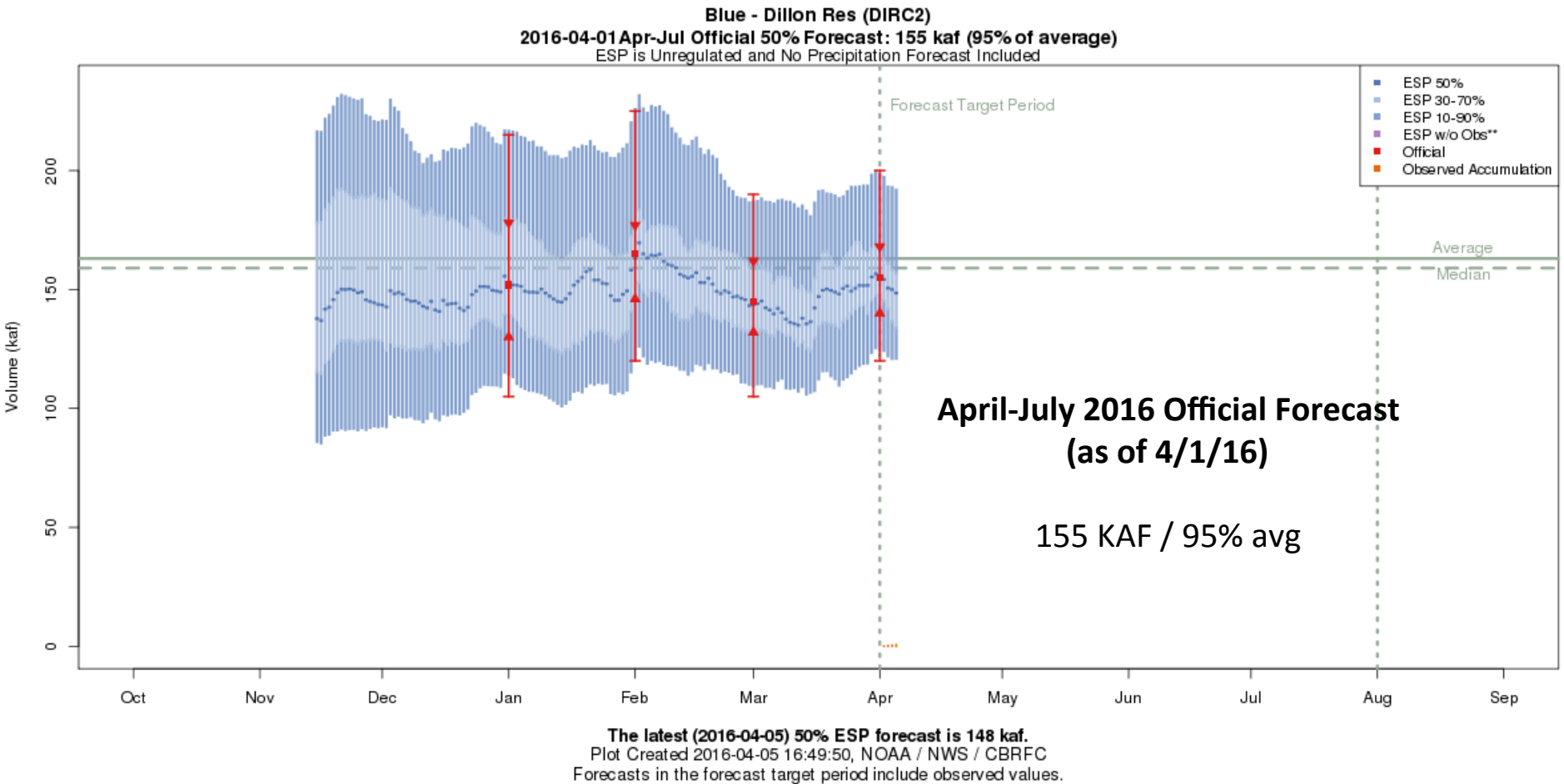


**April-July 2016 Official Forecast
(as of 4/1/16)**

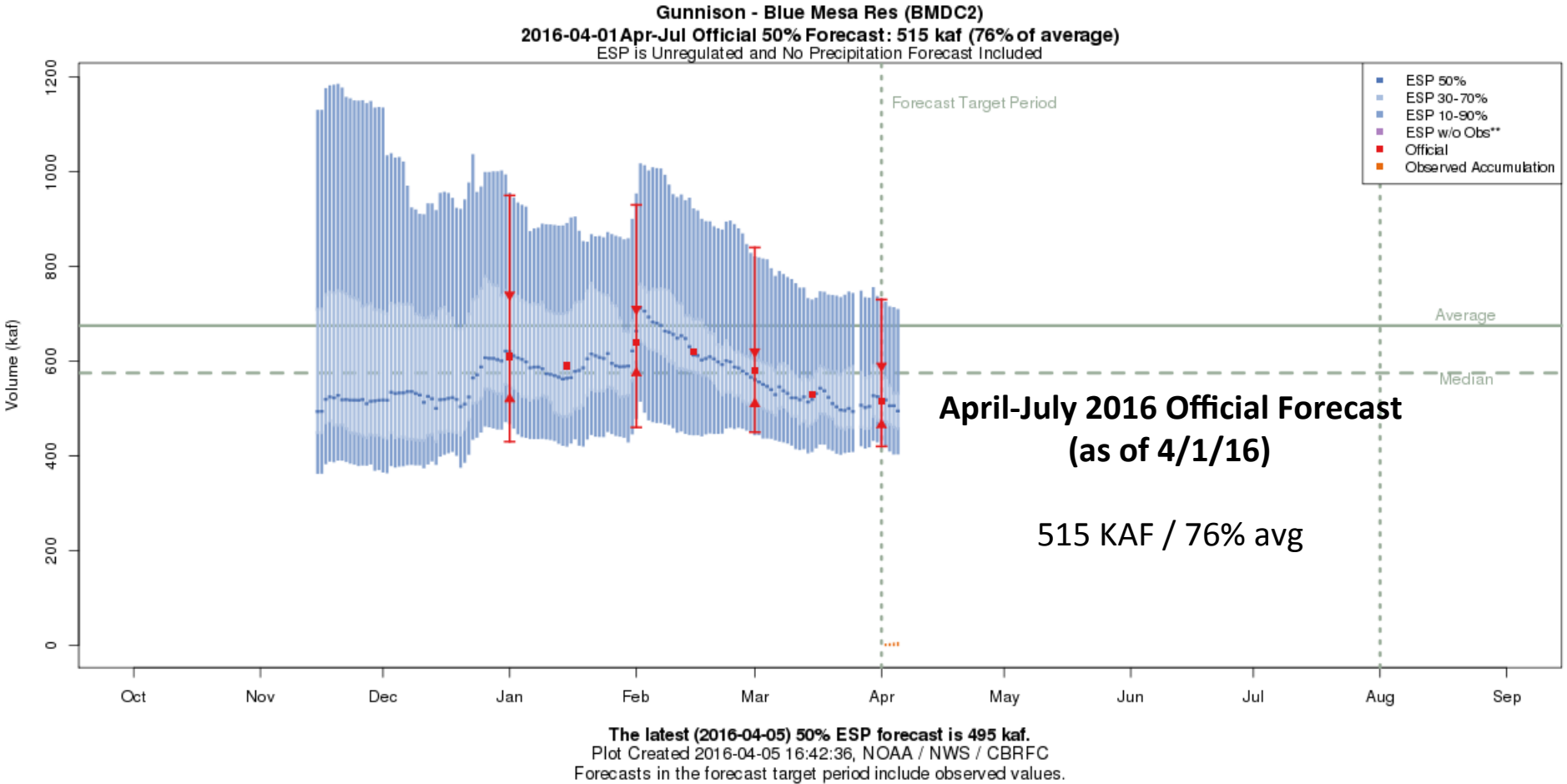
1130 KAF / 91% avg

The latest (2016-04-03) 50% ESP forecast is 1056 kaf.
Plot Created 2016-04-04 14:03:14, NOAA / NWS / CBRFC
Forecasts in the forecast target period include observed values.

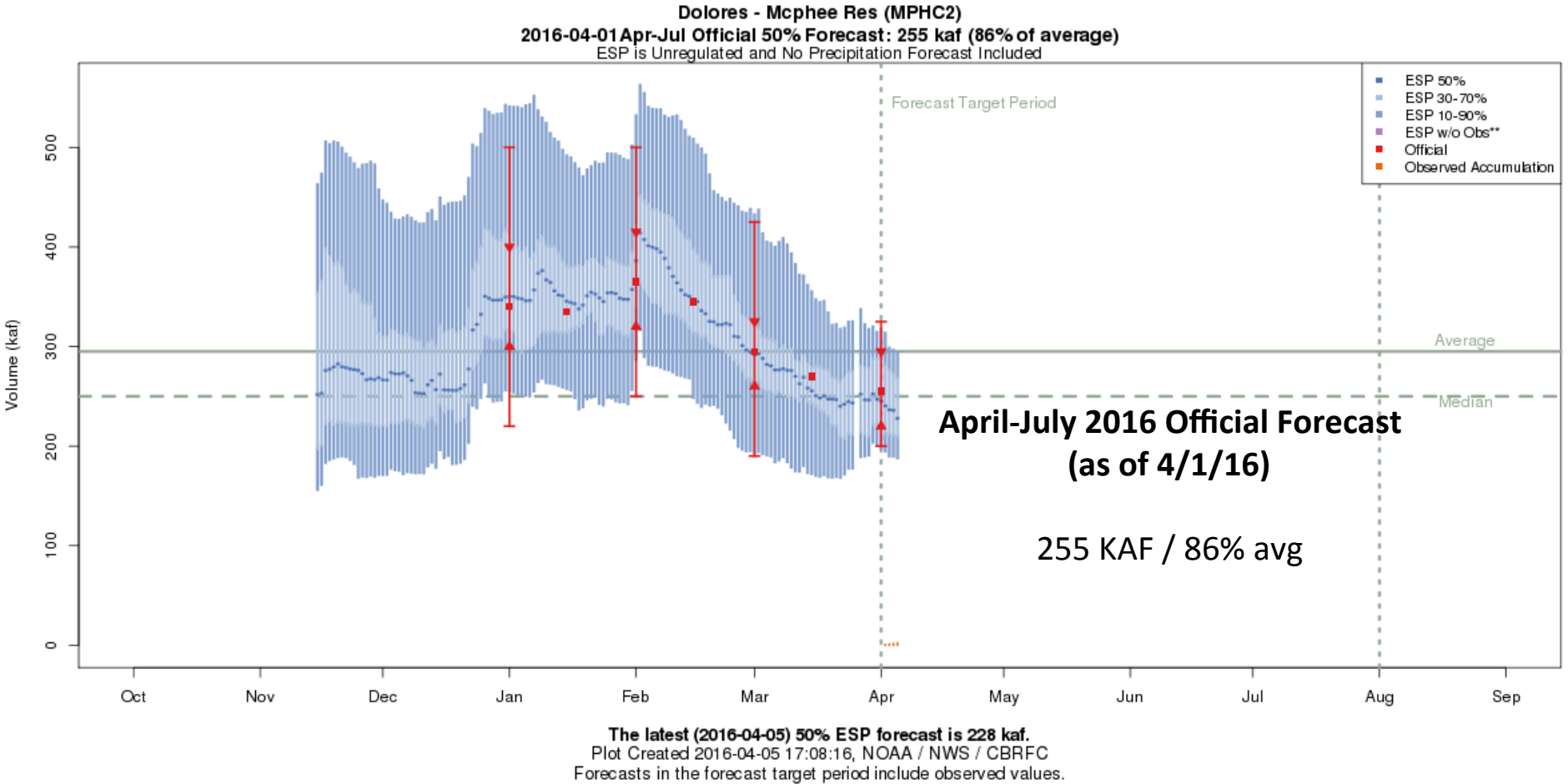
Forecast Evolution Plot – Dillon Reservoir



Forecast Evolution Plot – Blue Mesa Reservoir

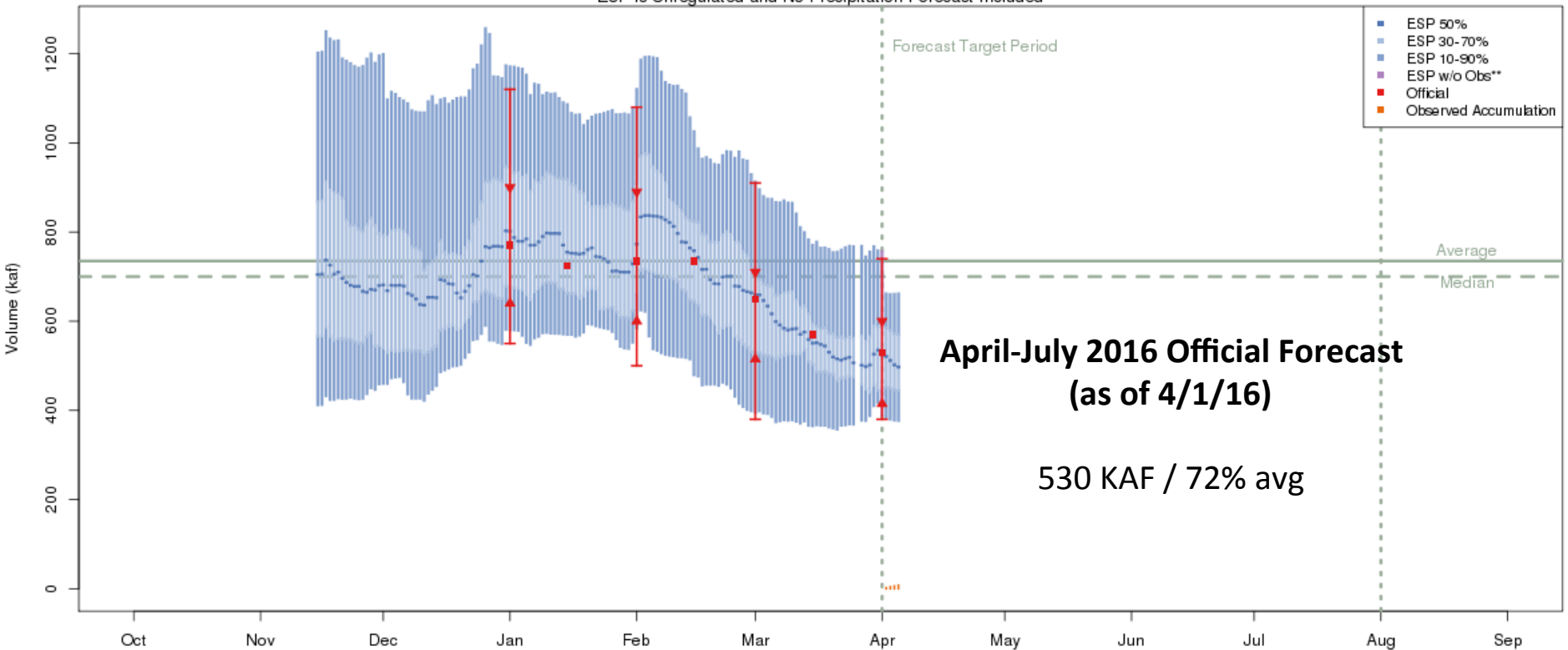


Forecast Evolution Plot – McPhee Reservoir



Forecast Evolution Plot – Navajo Reservoir

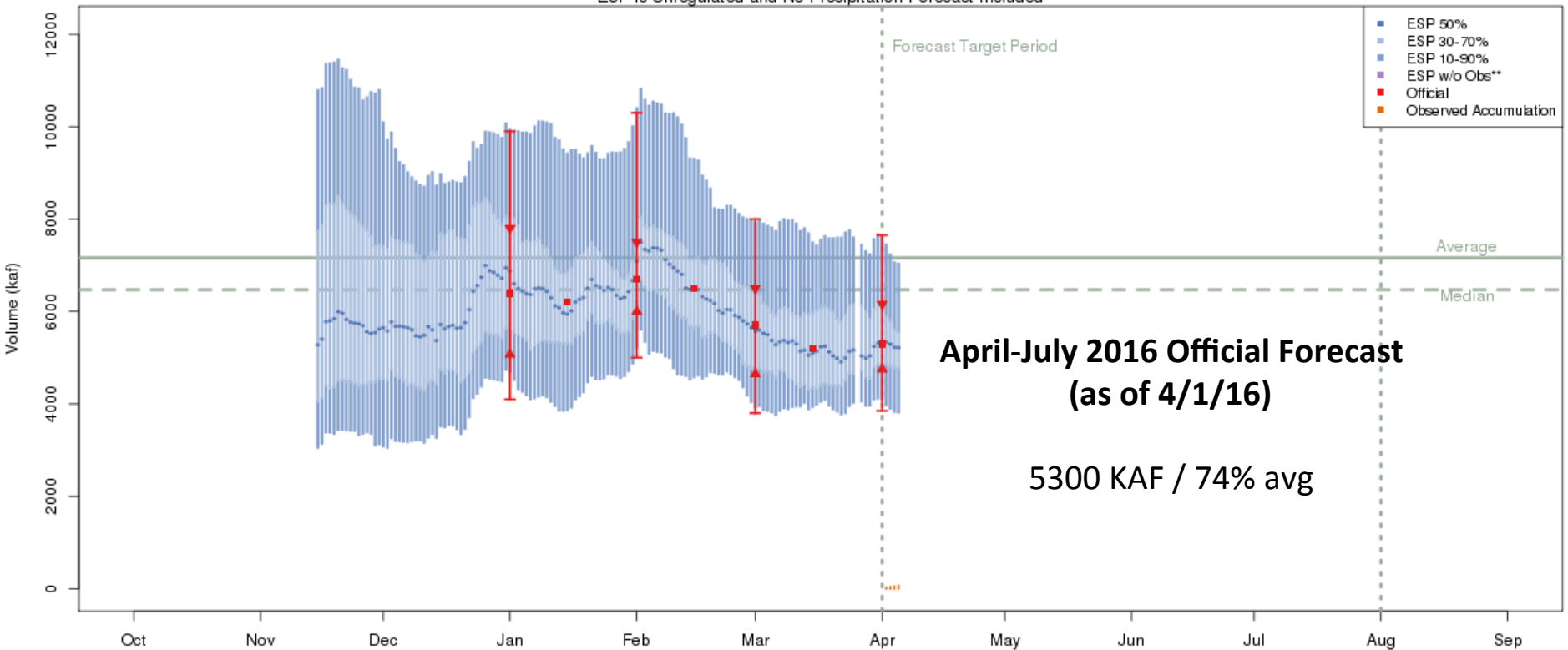
San Juan - Navajo Res- Archuleta- Nr (NVRN5)
2016-04-01 Apr-Jul Official 50% Forecast: 530 kaf (72% of average)
ESP is Unregulated and No Precipitation Forecast Included



The latest (2016-04-05) 50% ESP forecast is 497 kaf.
Plot Created 2016-04-05 17:09:47, NOAA / NWS / CBRFC
Forecasts in the forecast target period include observed values.

Forecast Evolution Plot – Lake Powell

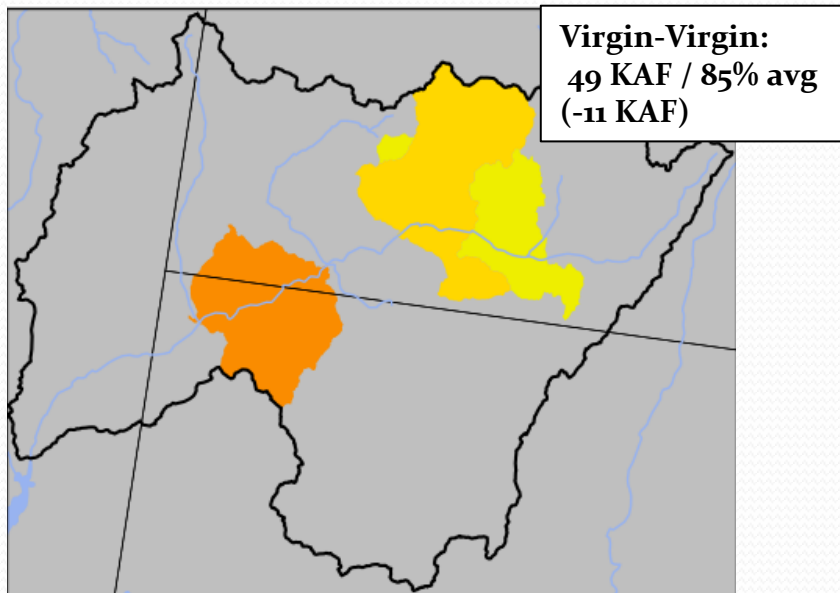
Colorado - Lake Powell- Glen Cyn Dam- At (GLDA3)
2016-04-01 Apr-Jul Official 50% Forecast: 5300 kaf (74% of average)
ESP is Unregulated and No Precipitation Forecast Included



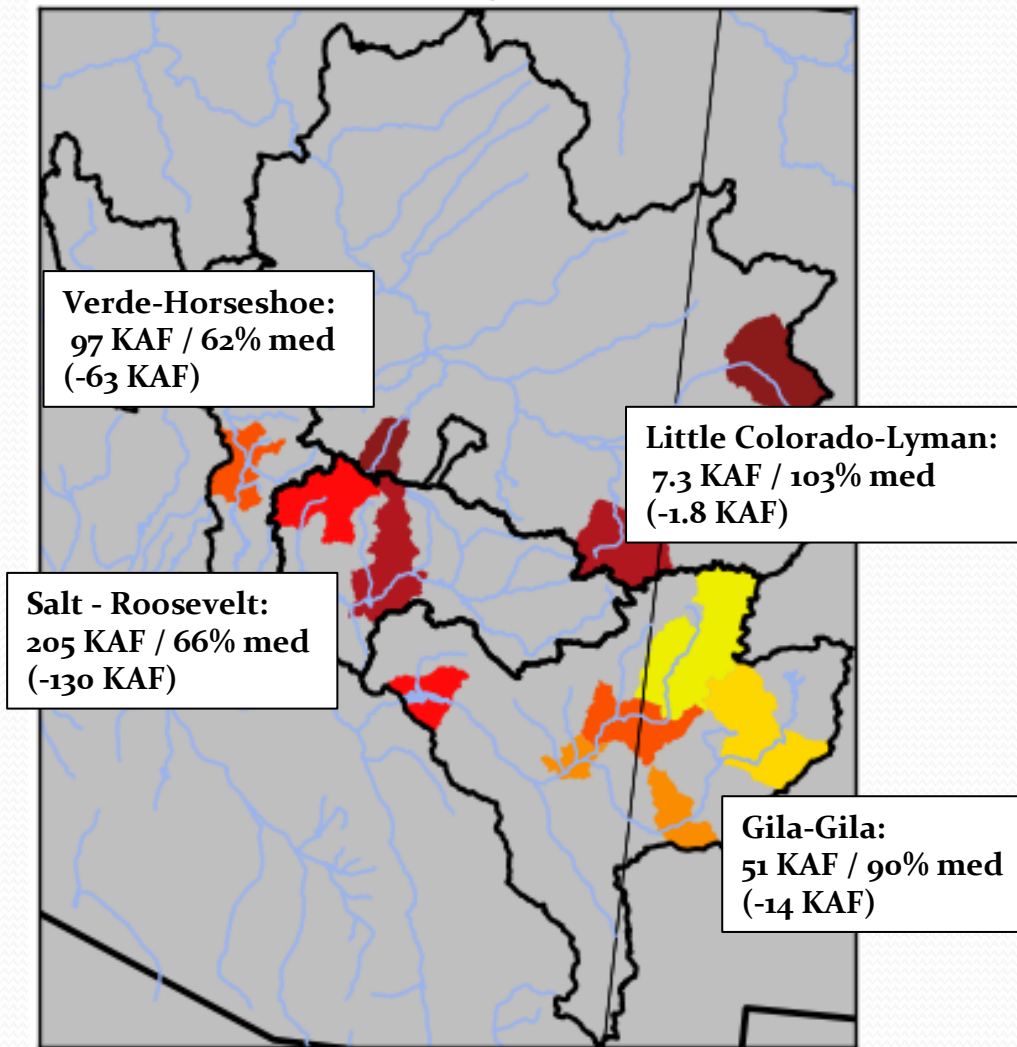
The latest (2016-04-05) 50% ESP forecast is 5220 kaf.
Plot Created 2016-04-05 16:57:32, NOAA / NWS / CBRFC
Forecasts in the forecast target period include observed values.

Lower Colorado Forecast Streamflow Volumes

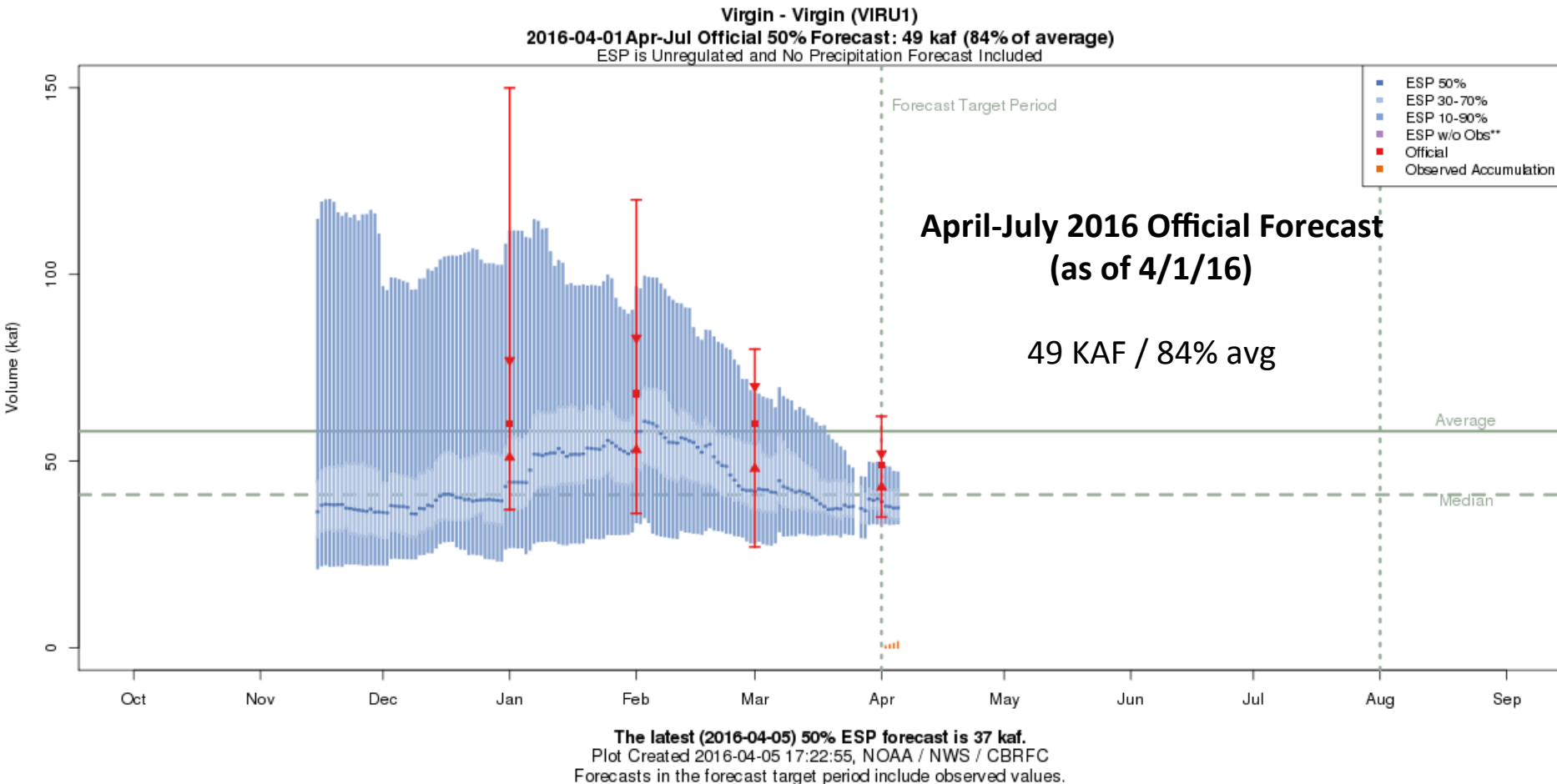
Virgin River Basin
April-July Percent Average



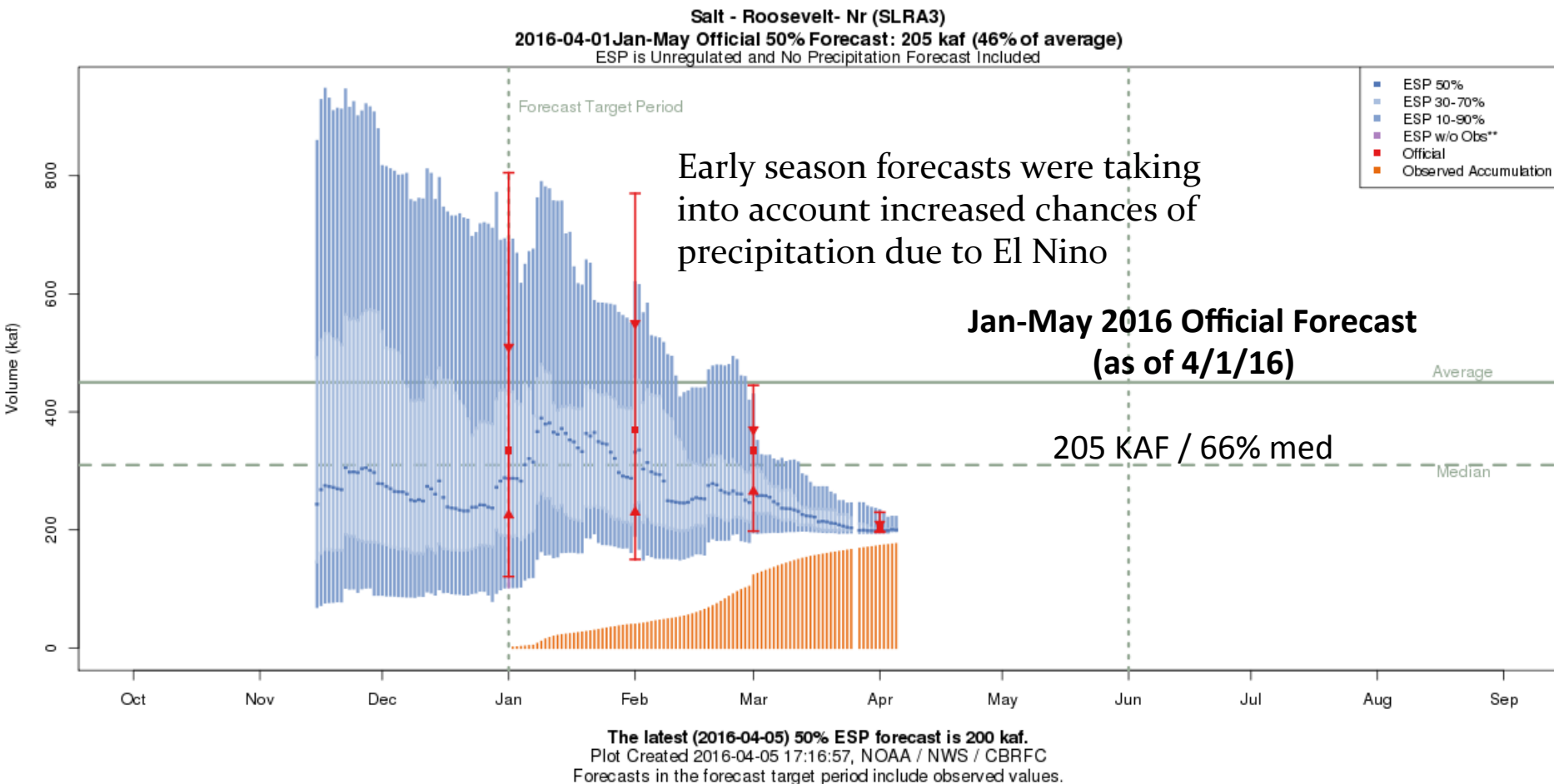
Arizona River Basins
(Little Colorado, Salt, Verde, Gila)
January-May Percent Median



Forecast Evolution Plot – Virgin-Virgin



Forecast Evolution Plot – Salt-Roosevelt



Forecast Impacts Summary

- Large discrepancies in precipitation during March across the Upper Colorado River Basin resulted in mixed results for the April-July forecast runoff volumes.
 - Increases: Upper Green, Yampa, and Upper Colorado headwater basins
 - Decreases: Gunnison, Dolores, and San Juan river basins
 - Some SNOTEL sites had the driest February-March period in ~35 years
 - Snowmelt occurring at high elevations in southern-most basins
- Lower Colorado River Basin forecasts continued to decrease as El Niño failed to produce the expected increase in winter precipitation.
- Snowpack conditions are highly variable across the Upper Colorado River Basin.
 - Upper Green: improved but the areas that produce the most runoff in that basin have near to below average snow
 - Yampa and Upper Colorado headwaters: above average
 - Gunnison and Dolores: near to below average
 - San Juan: below to much below average

Forecast Accuracy in April

Water Supply Verification - April

We Do Better:

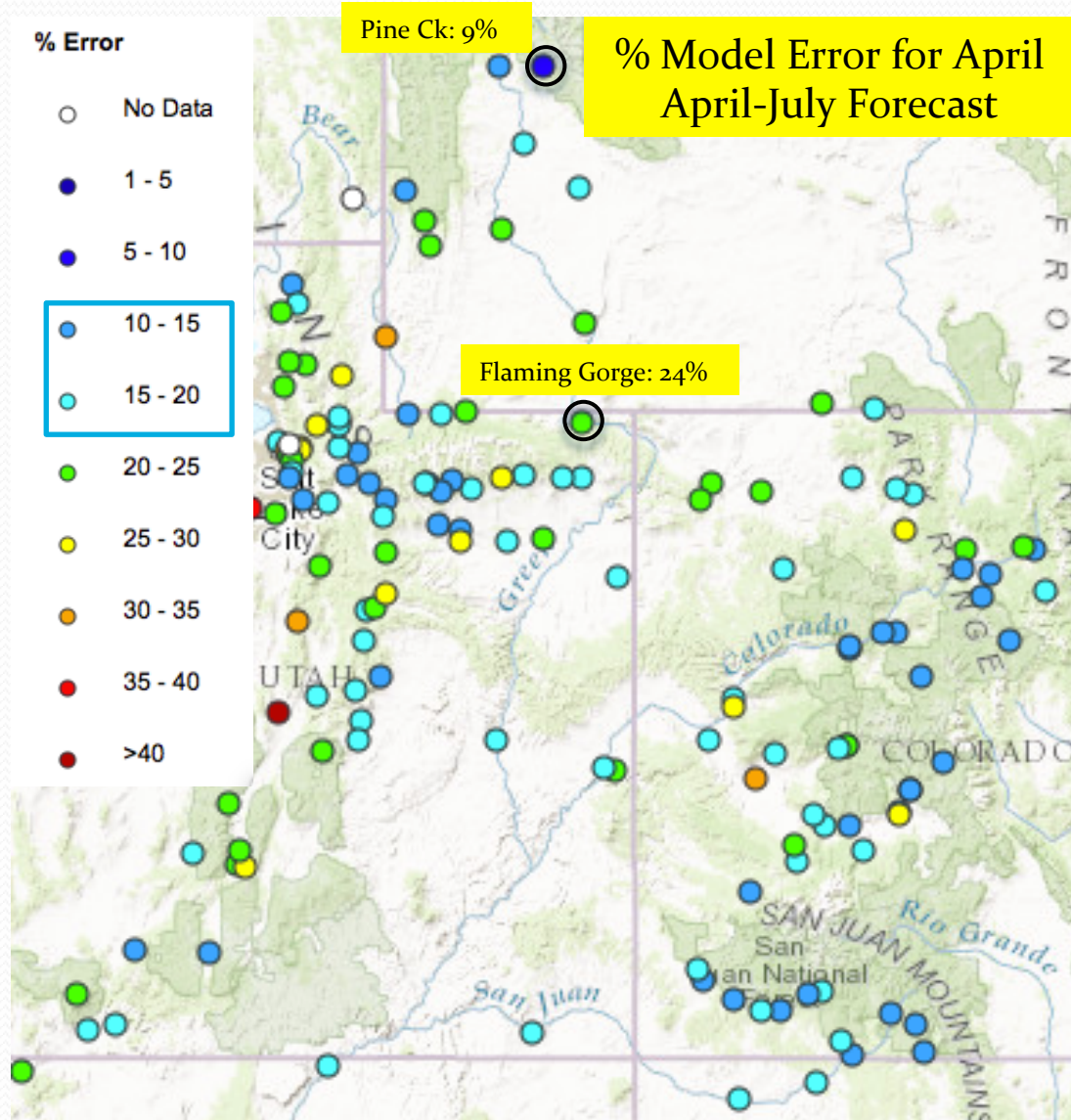
- Headwaters
- Primarily snow melt basins
- Known diversions / demands

We Do Worse:

- Lower elevations (rain or early melt)
- Downstream of diversions / irrigation
- Little is known about diversions / demands

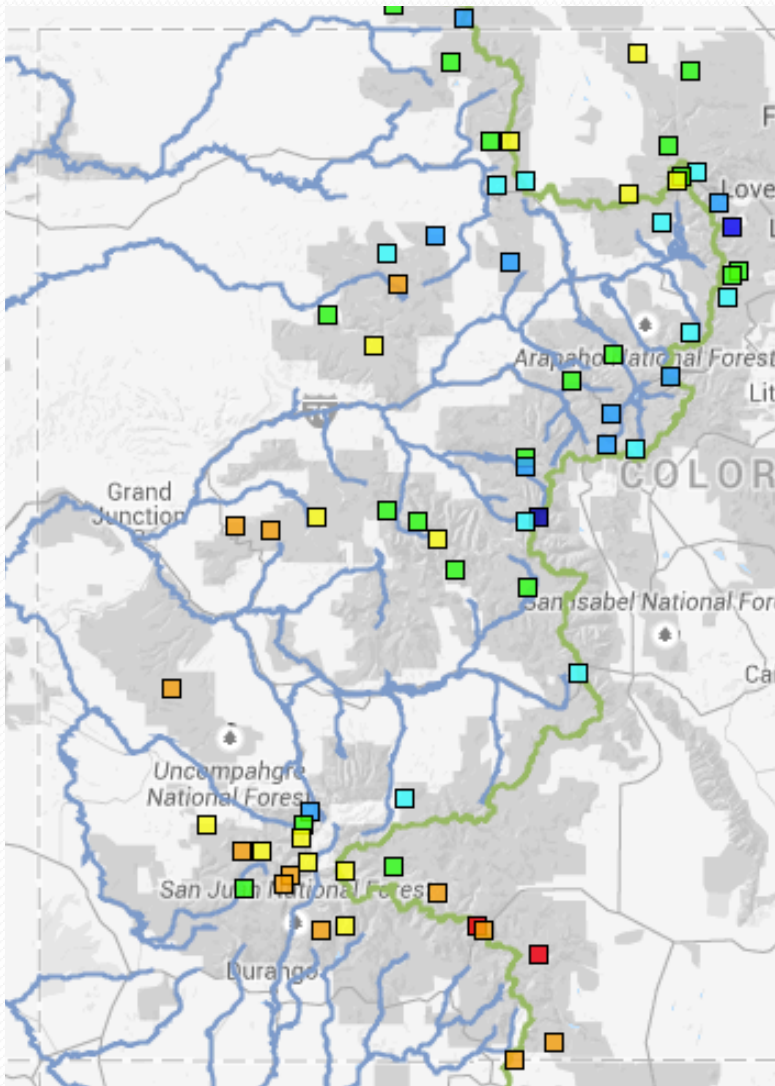
Sources of Uncertainty:

- Current conditions → model snow states
- Future weather



SNOTEL Elevations vs. Flow Contribution

Colorado River Basin SNOTEL Sites within the state of Colorado



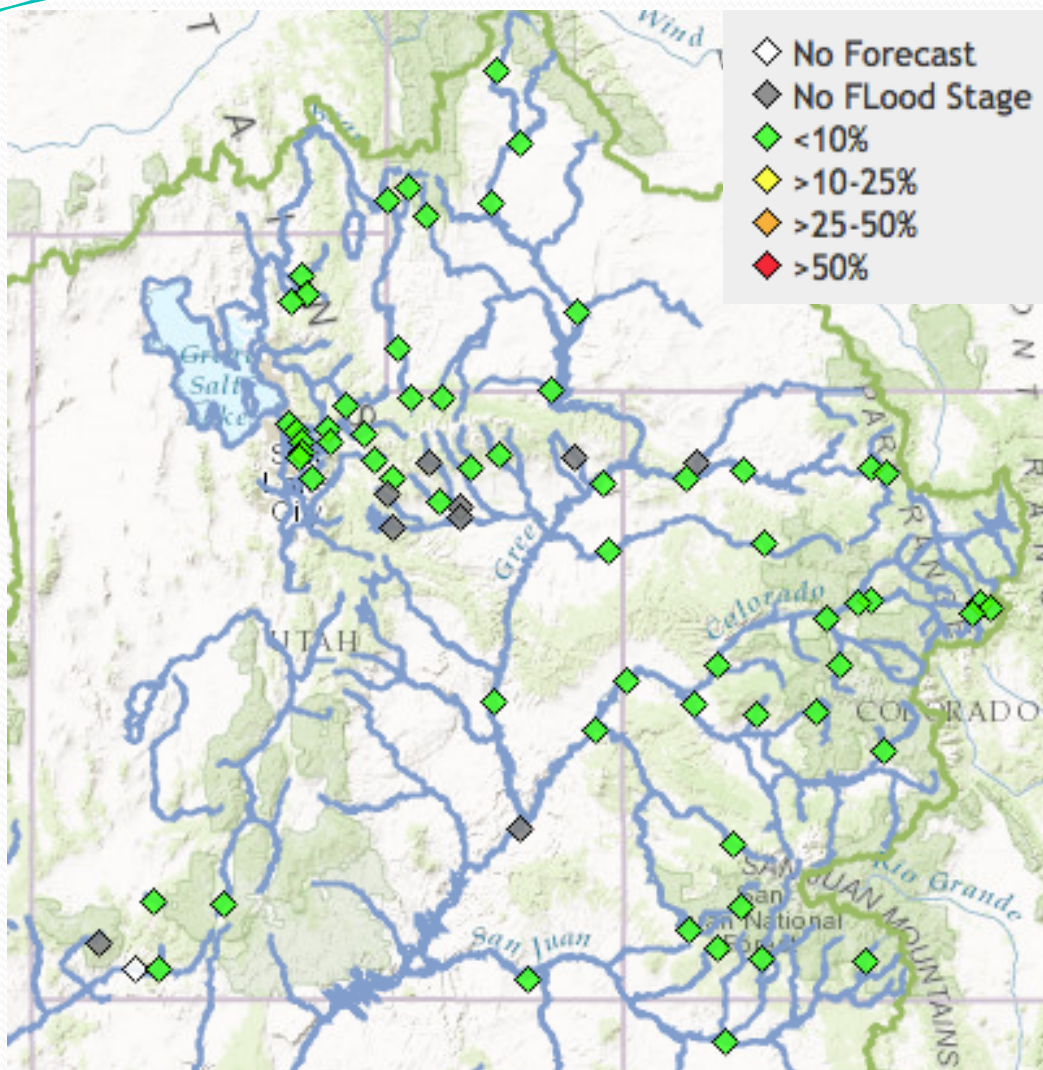
Colorado River Basin within Colorado

Modeled basin breakdown is as follows:

Elevation Band	% Total Area	% Flow Contribution (estimated)	% SNOTEL sites within band
>11,000'	16%	36%	16%
9500' – 11,000'	31%	41%	58%
<9500'	53%	23%	26%

→ There are no SNOTELS above 11,600', so the highest area is poorly represented.

Peak Flow Forecasts



No site is currently forecast to exceed flood stage **due to snowmelt** at this time.

Forecasts and/or flood levels do not exist on every stream.

Spring weather, such as extended periods of much above normal temperatures or heavy rainfall during melt, can cause flooding problems in any year.

From CBRFC homepage (www.cbrfc.noaa.gov):

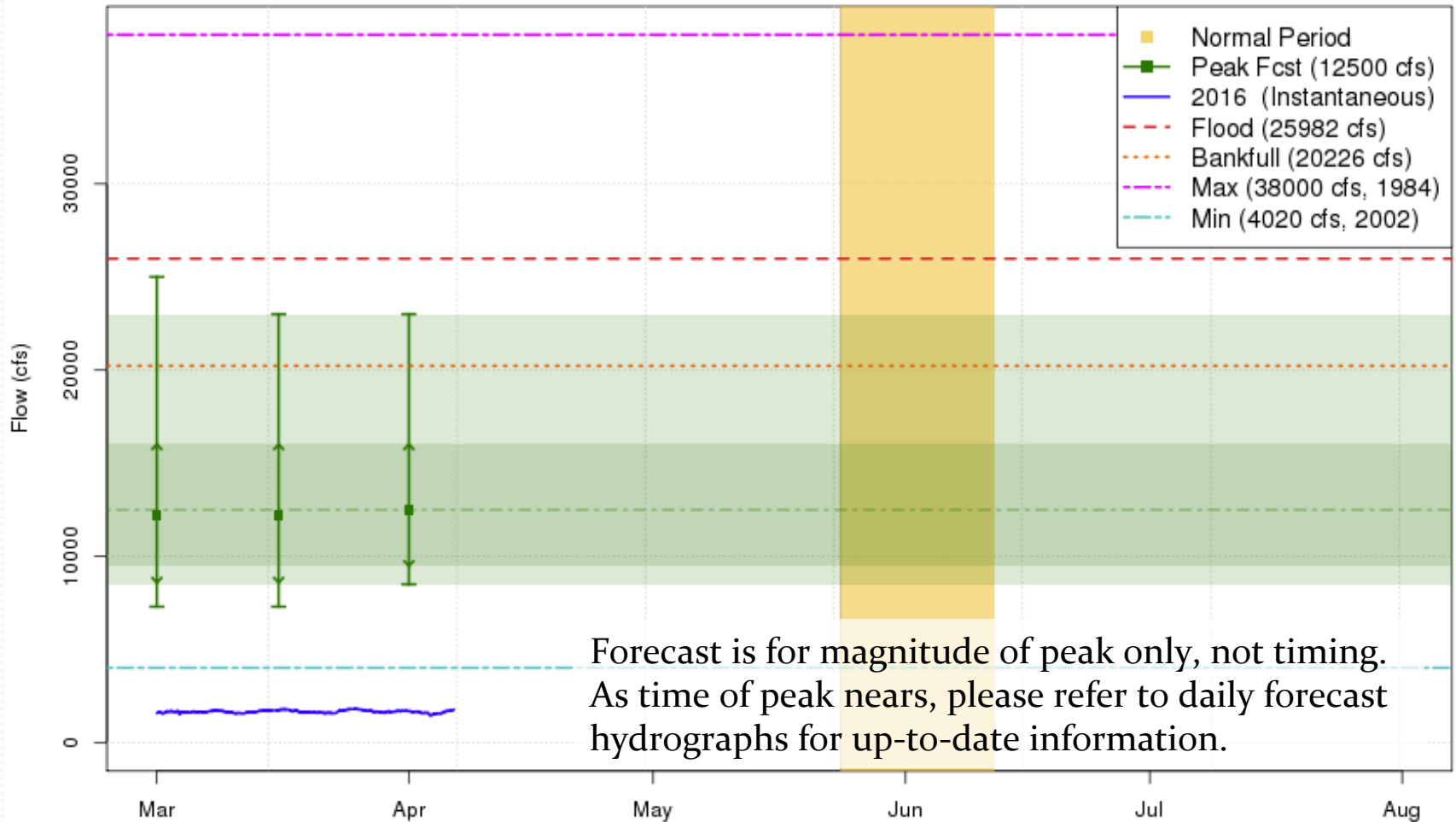
- > “Rivers” drop down menu
- > select Peak Flow Map or List

map: <http://www.cbrfc.noaa.gov/lmap/lmap.php?interface=peak>

list: <http://www.cbrfc.noaa.gov/rmap/peak/peaklist.php>

Peak Flow Forecasts

2016 Mean Daily Peak Flow Forecast
Colorado - Cameo- Nr (CAMC2)

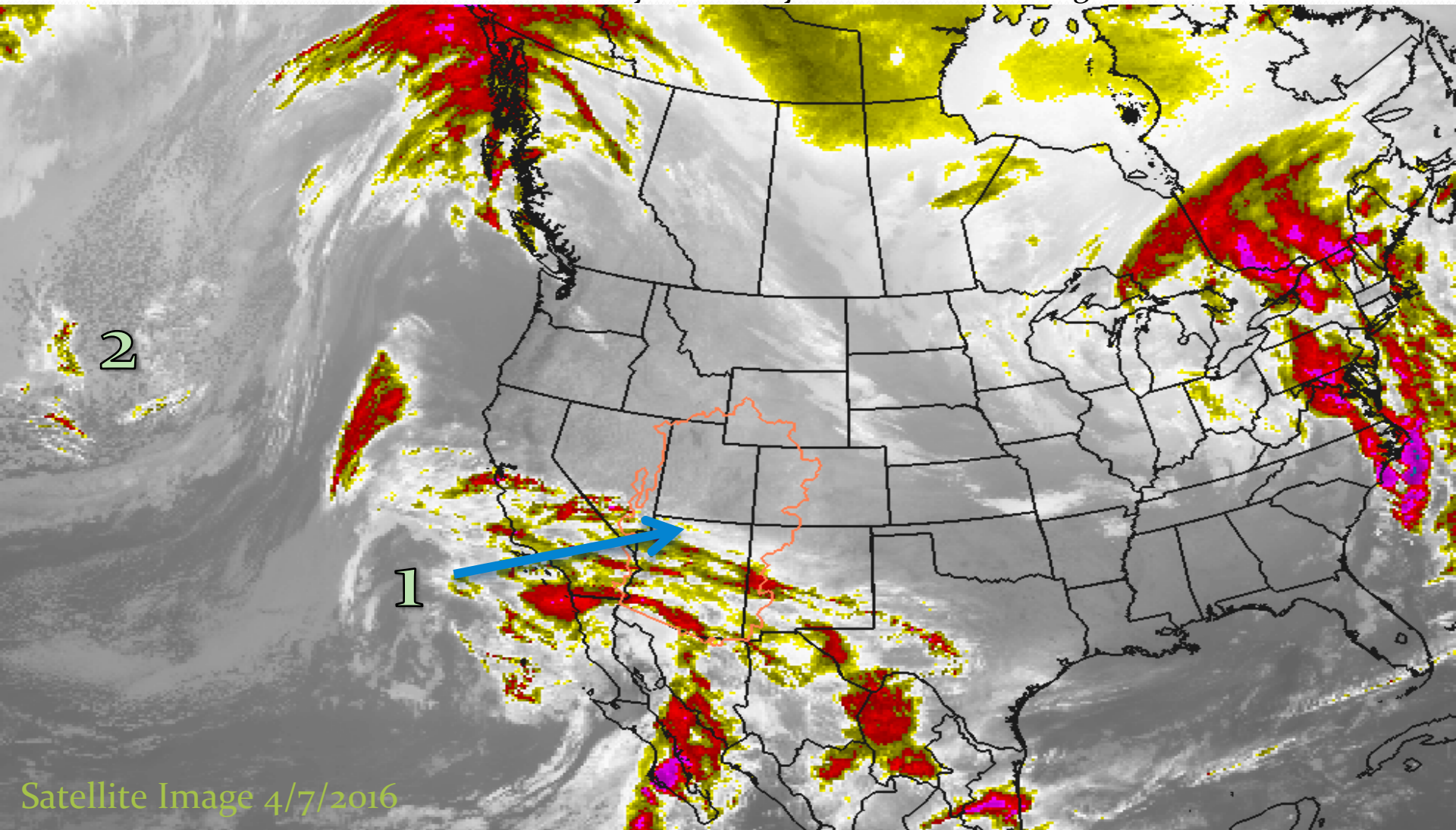


These graphics are updated approximately every two weeks between 3/1 and 5/1

Plot Created 2016-04-06 07:34:06
CBRFC / NWS / NOAA

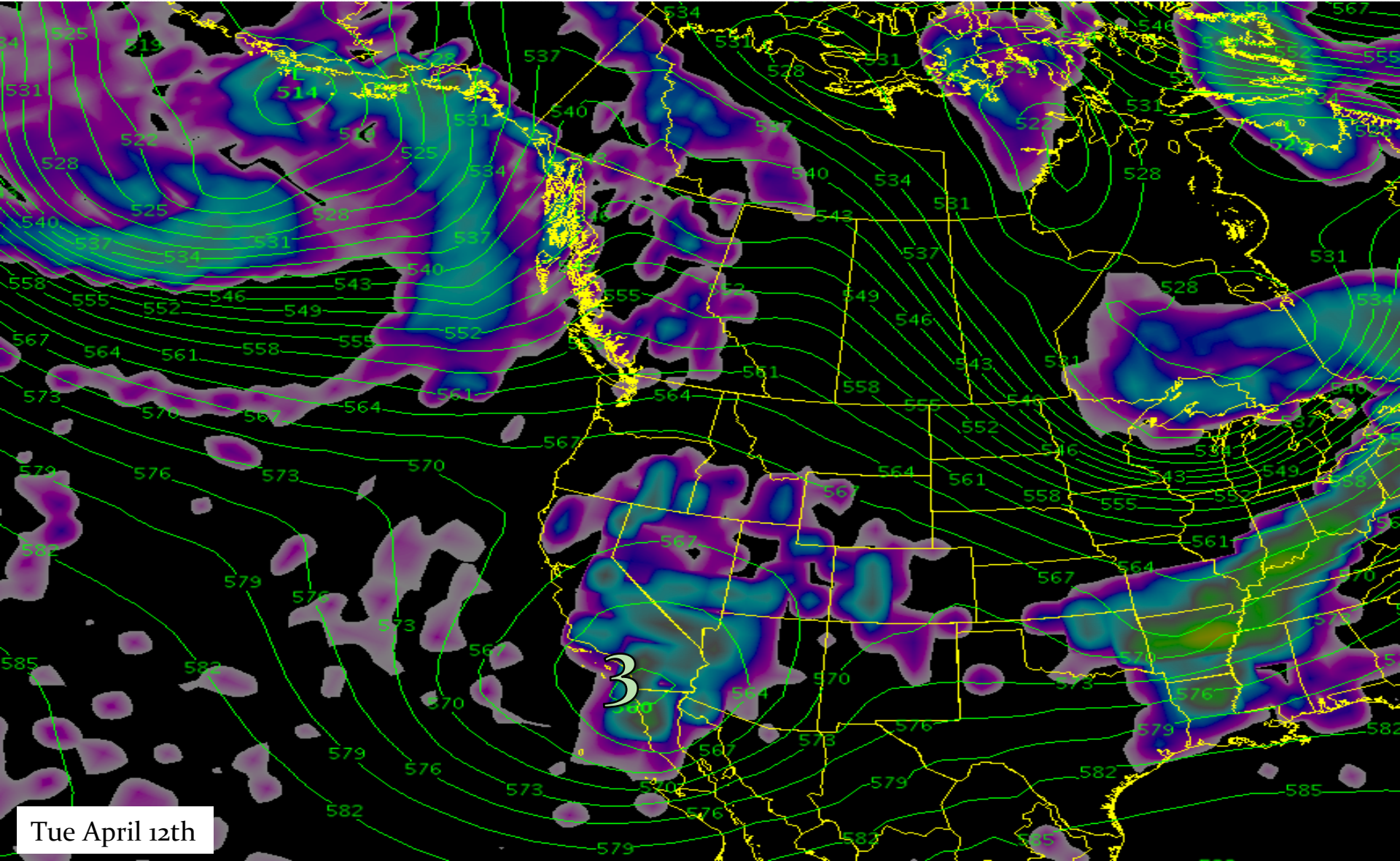
Upcoming Weather – Active pattern but what's in it for us ?

- 1 - Storm system will weaken and spread moisture / scattered showers into desert southwest through Friday. Warm system with rain at higher elevations.
- 2 - This will strengthen and follow the same path as storm 1. Scattered showers will increase over the entire area this weekend into Monday. Warm system with rain at higher elevations.



Weather outlook

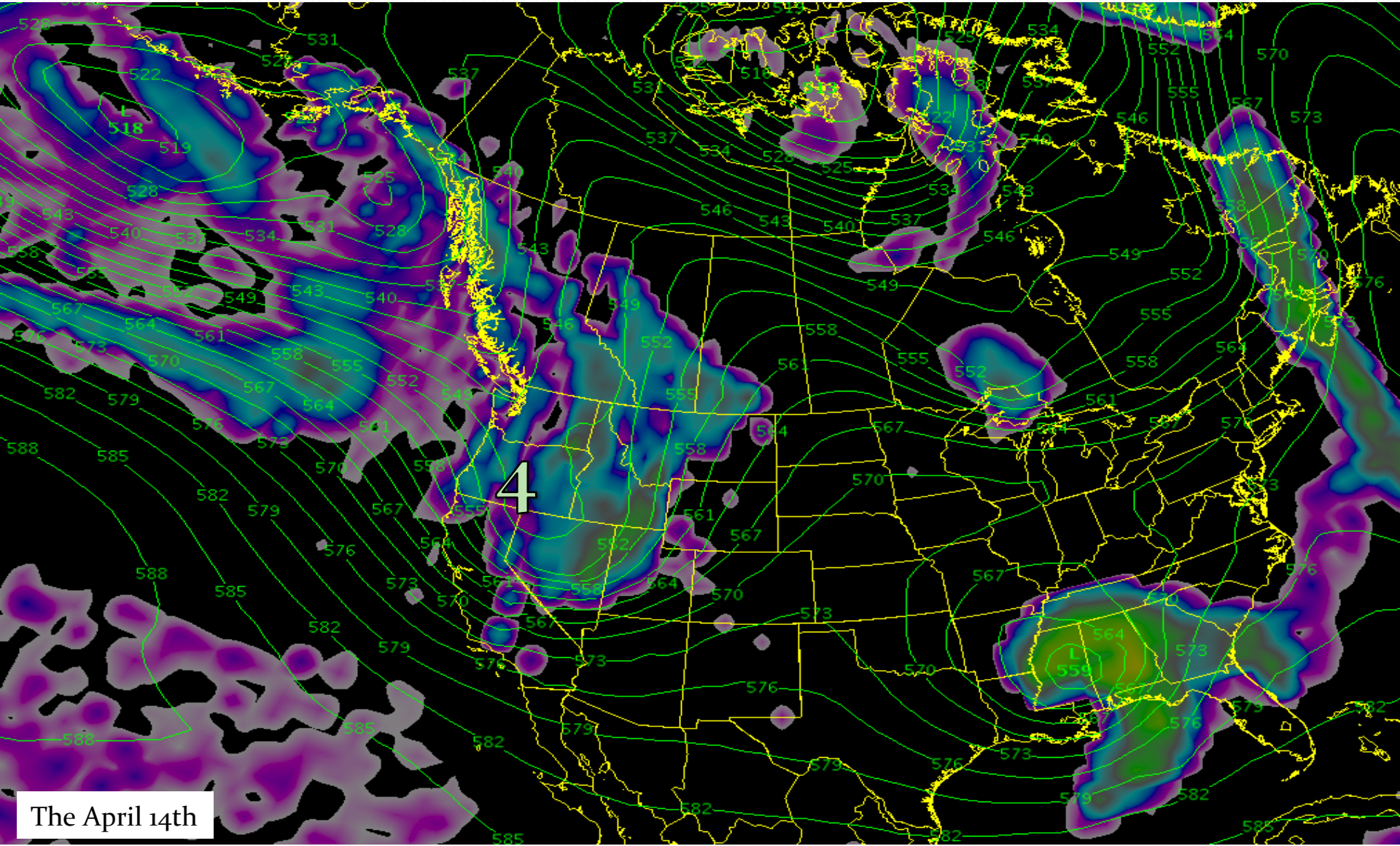
3 - The third storm system moves through the southwest late Monday into Tuesday with a chance for scattered showers.



Tue April 12th

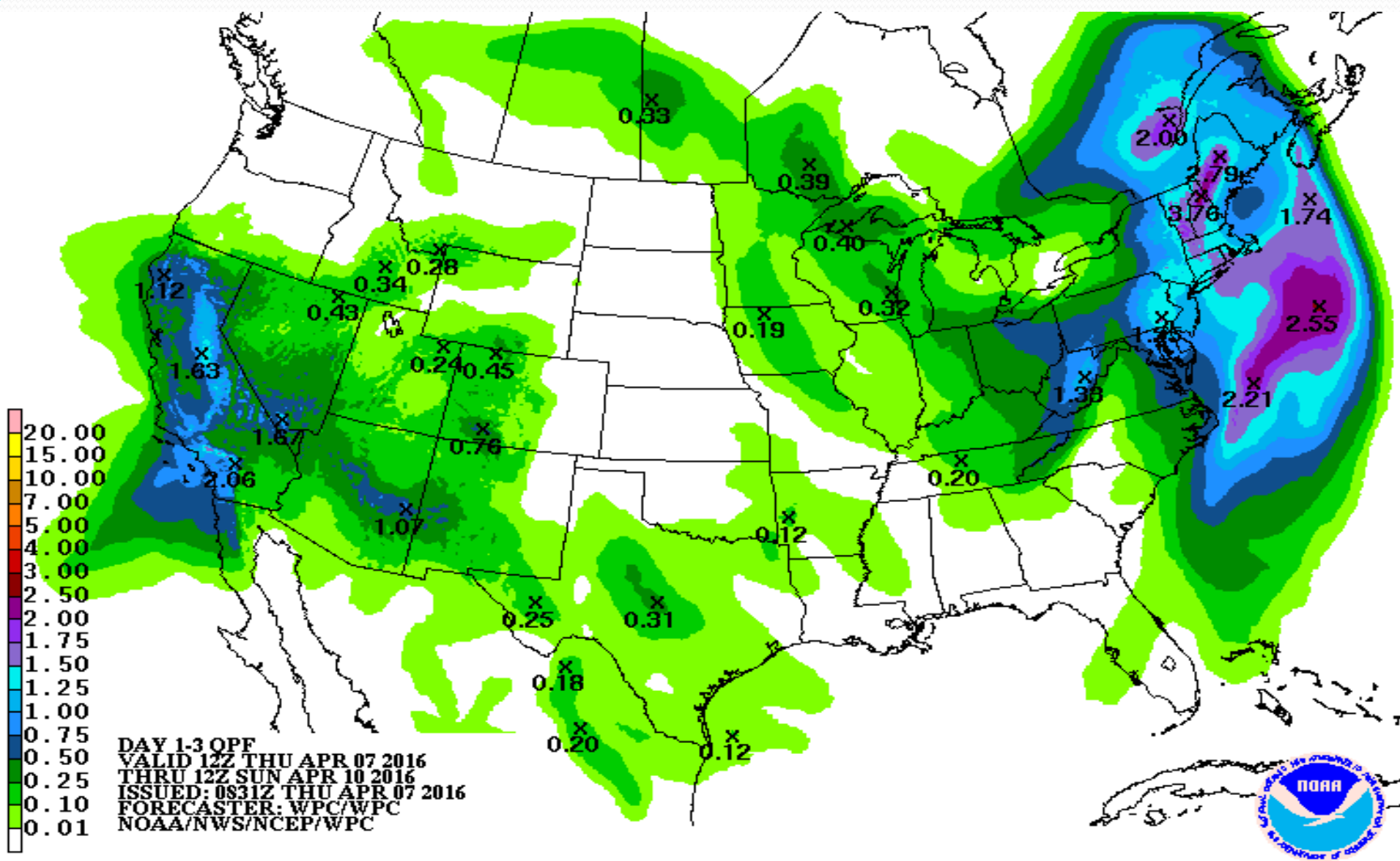
Weather outlook

4 - A colder system is poised to move into the area toward the end of next week. Confidence in the track and strength of this system remains on the low side.

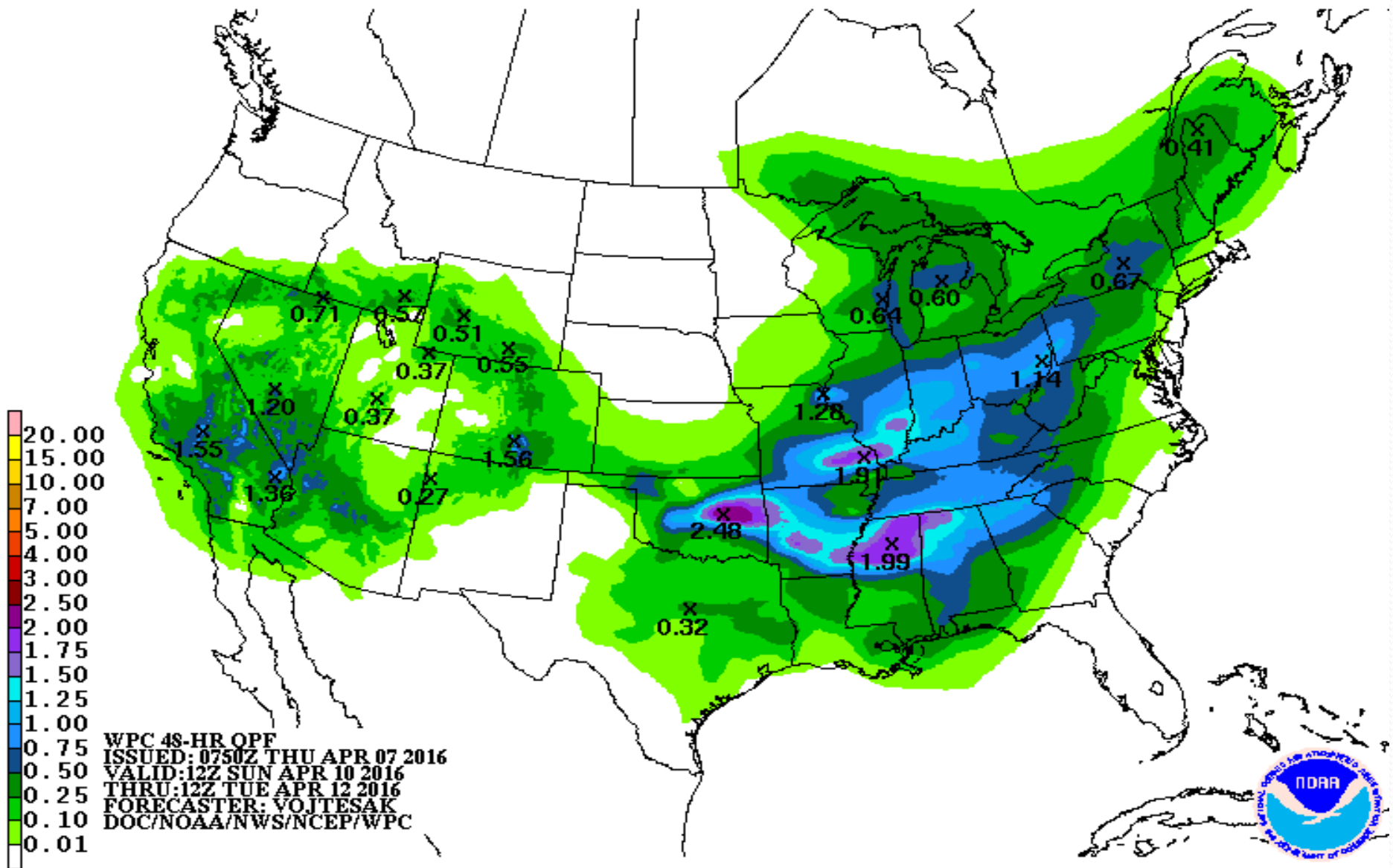


The April 14th

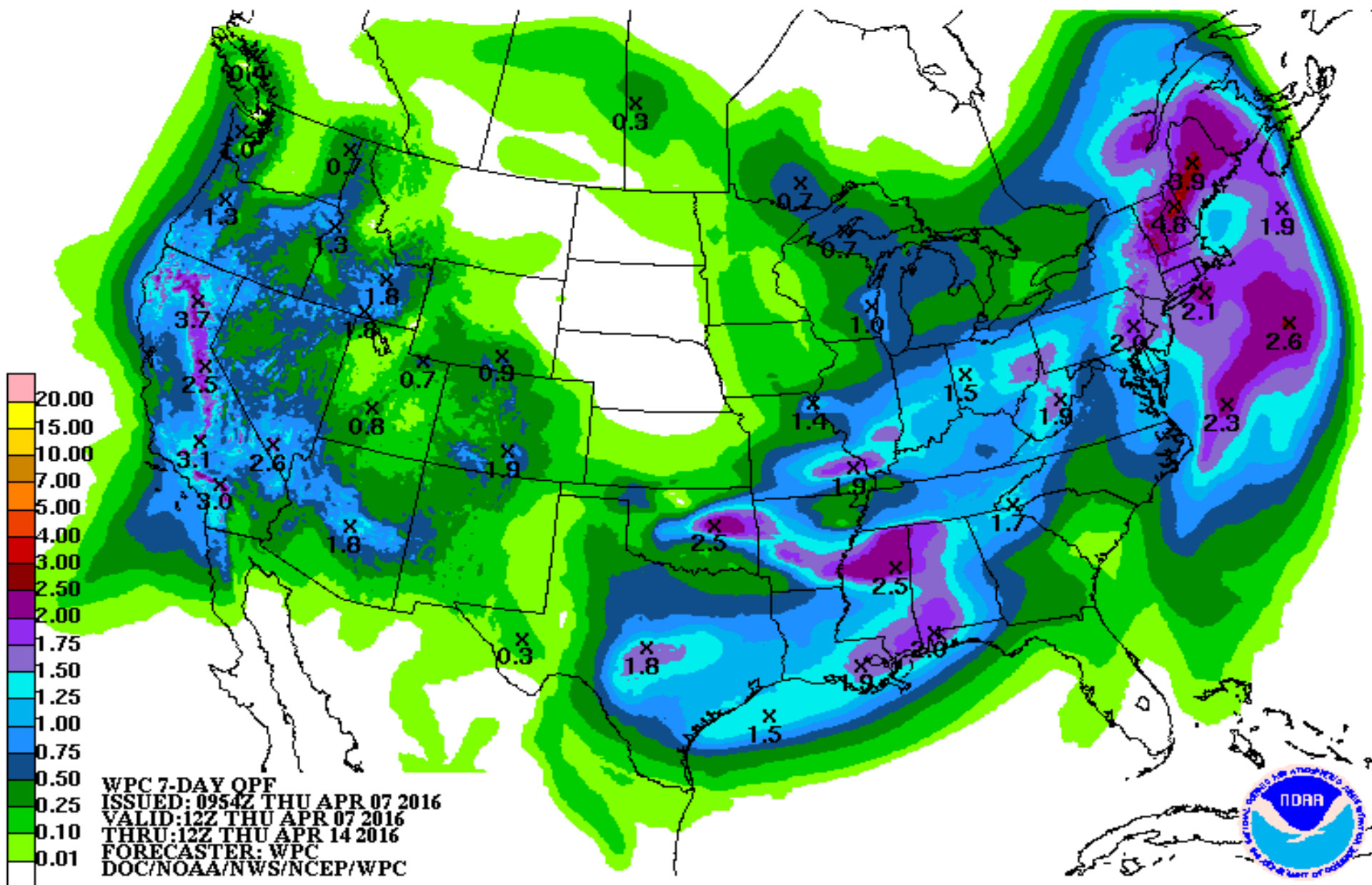
Precipitation Outlook: Thu Apr 7th – Sun Apr 10th



Precipitation Outlook: Sun Apr 10th – Tue Apr 12th

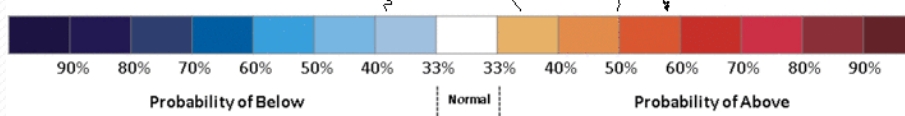
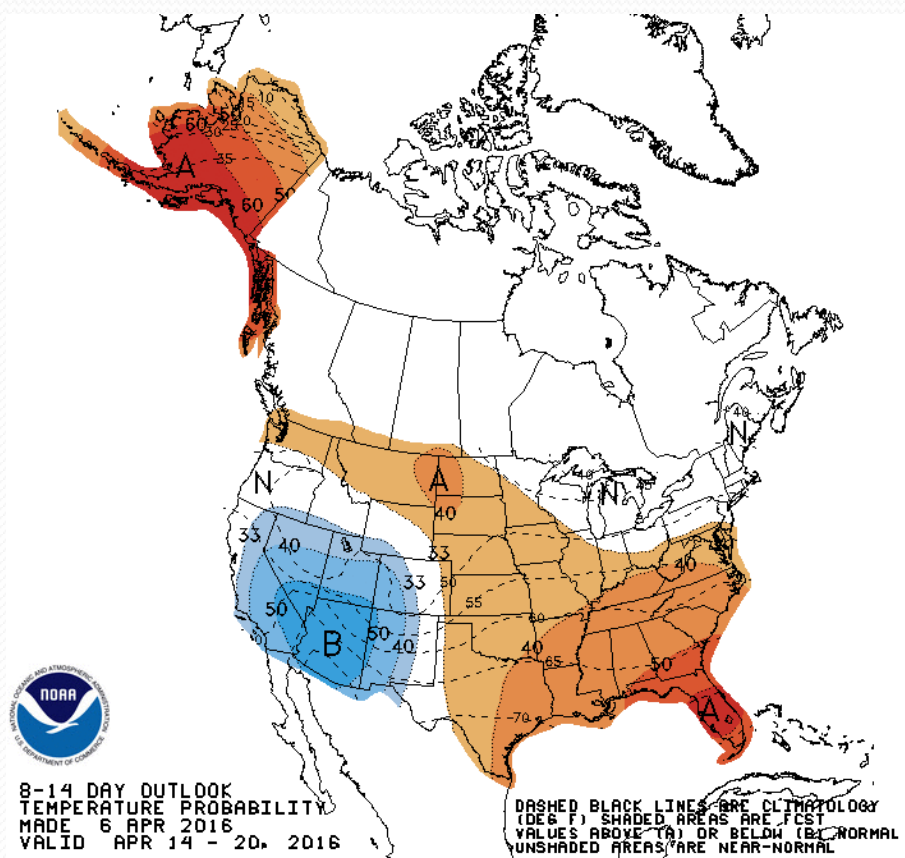
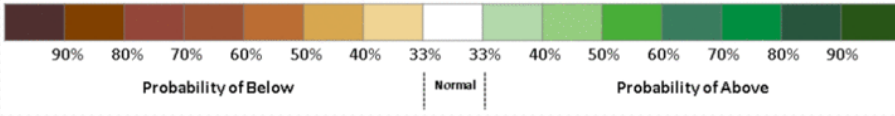
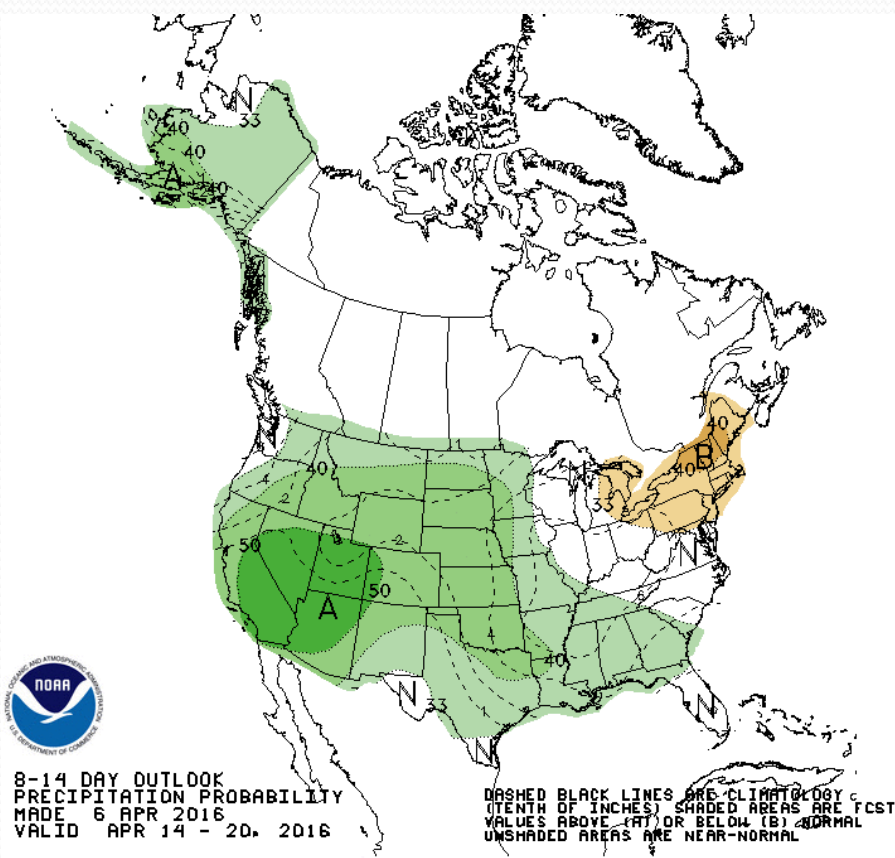


Precipitation Outlook: 7-Day Total (Apr 7th – Apr 14th)



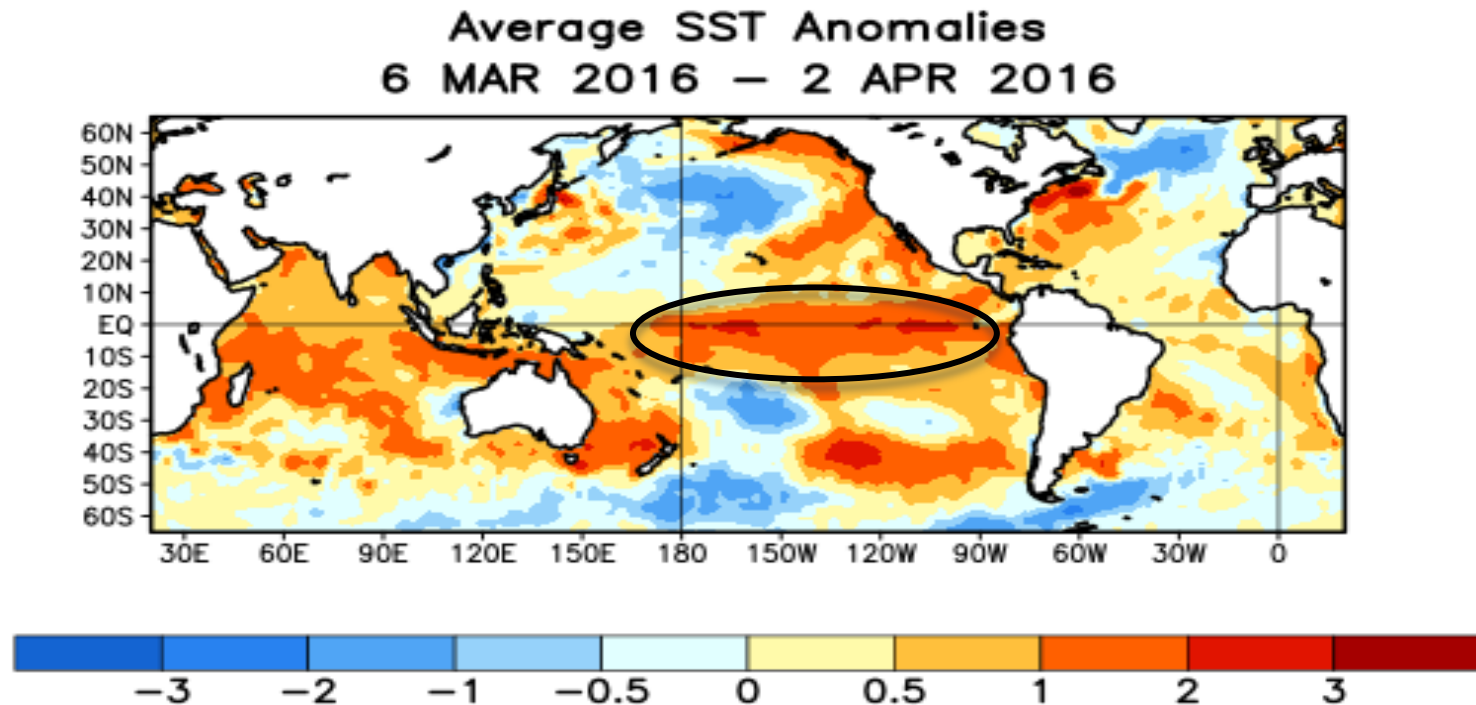
Weather outlook: April 14th – April 20th

Climate Prediction Center 8-14 day outlook



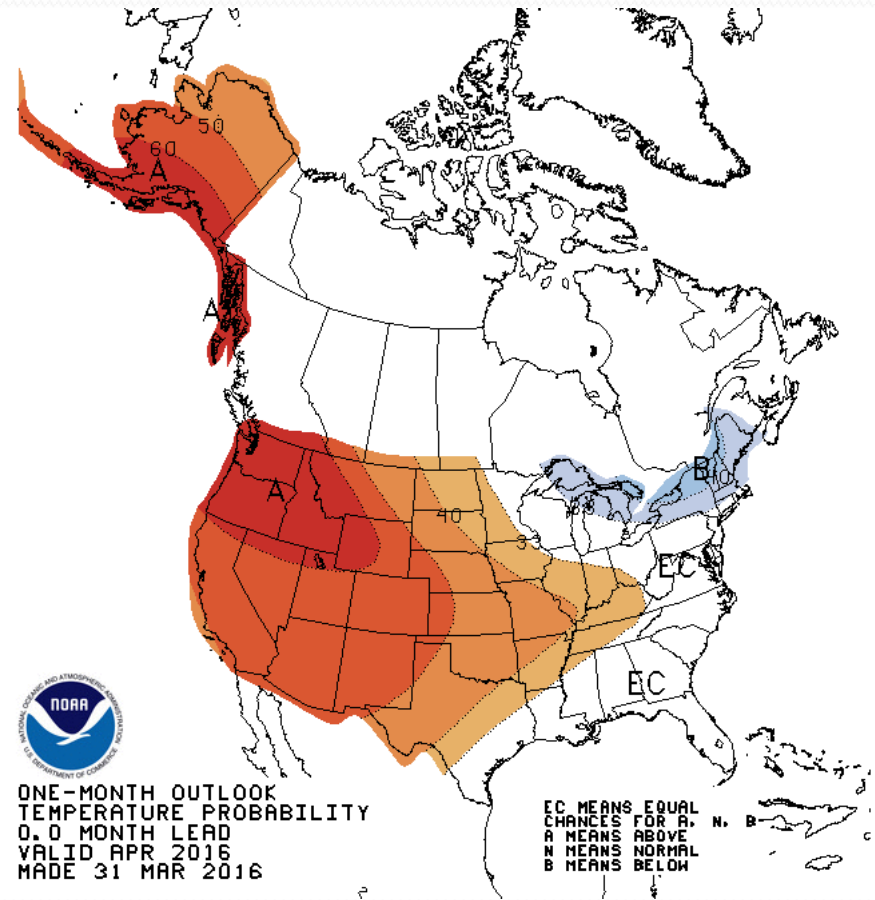
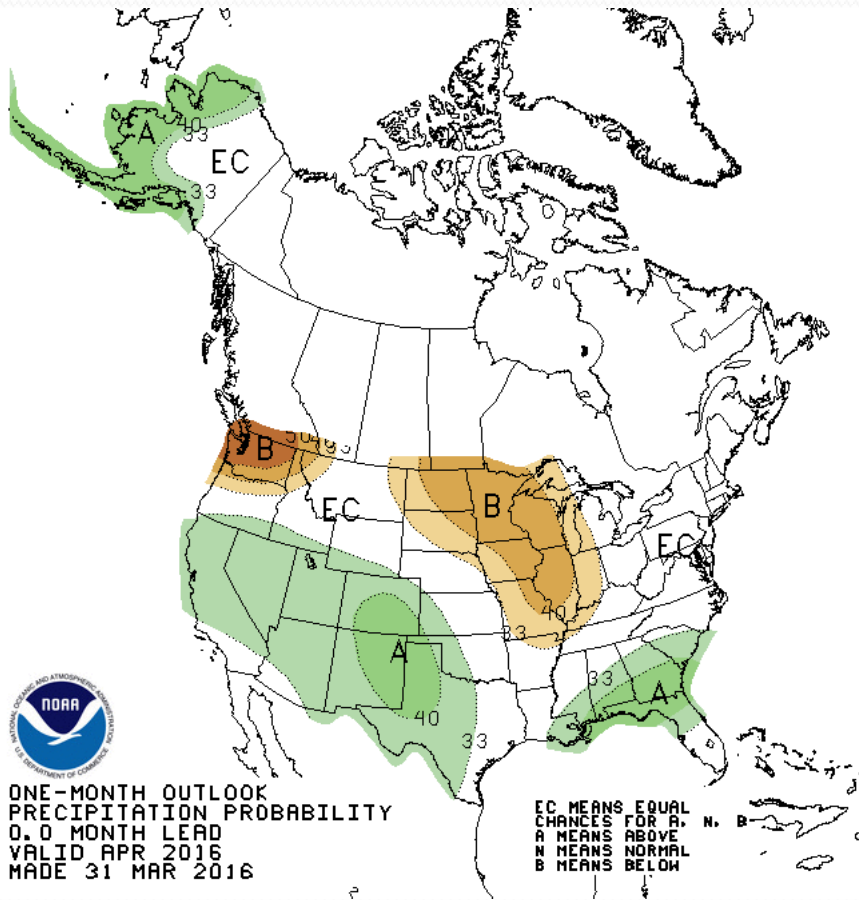
El Niño Event

- Still a strong event but has been weakening.
 - Impacts the Jet stream strength, location, and storm tracks.
 - The 2015-2016 will go down as one of the strongest on record (82-83, 97-98).
- La Niña conditions are possible by later this fall (~50% chance).
- No solid correlation between ENSO and April-July runoff volumes in Upper Colorado River Basin.
- Usually brings above average precipitation to Lower Colorado River Basin.
 - Did not happen this year.



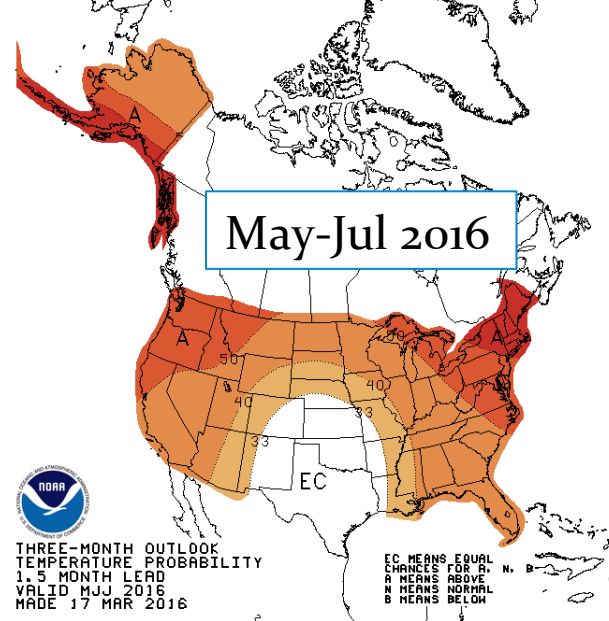
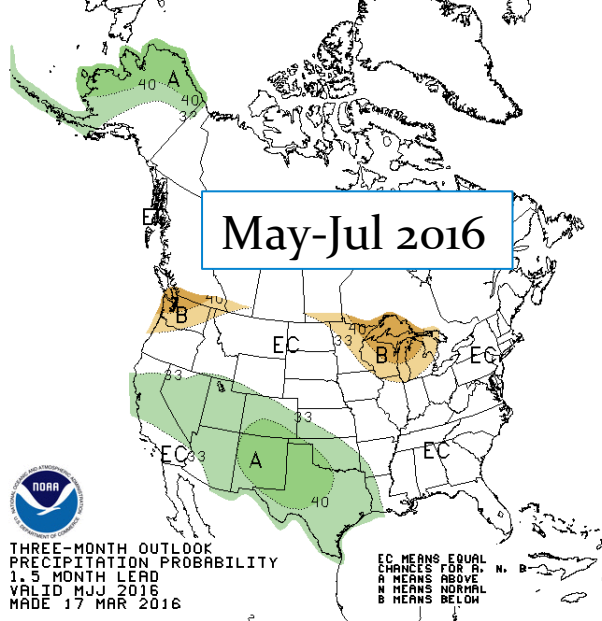
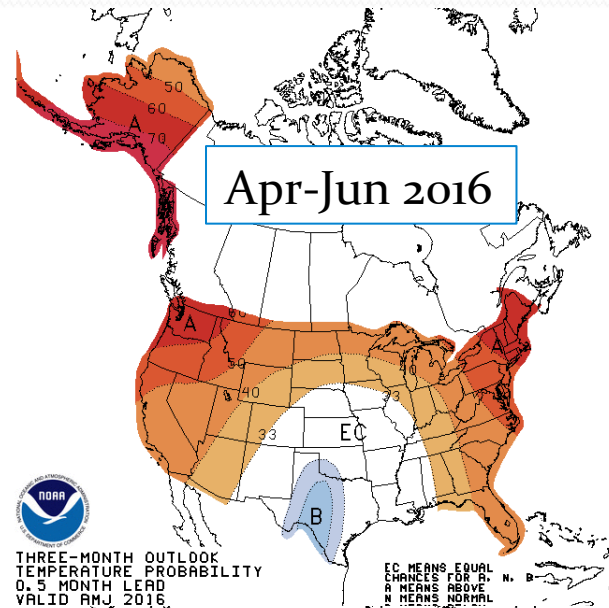
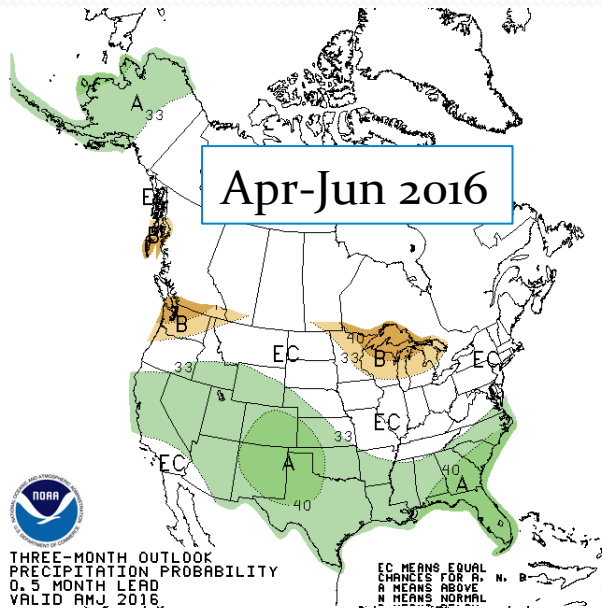
Long Range Outlook

Climate Prediction Center 30 Day Outlook for April 2016



Long Range Outlook

Climate Prediction Center – 3 month outlooks



Upcoming Briefings:

5/5 @ 1 pm MDT Colorado River Basin Water Supply
5/6 @ 10 am MDT Great Basin Water Supply

Contacts:

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Upper Colorado:	Brenda Alcorn	brenda.alcorn@noaa.gov
Lower Colorado:	Tracy Cox	tracy.cox@noaa.gov