CBRFC Forecast Areas

Colorado Basin
Water Supply Briefing

March 7 2019

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Phone: 1-877-929-0660

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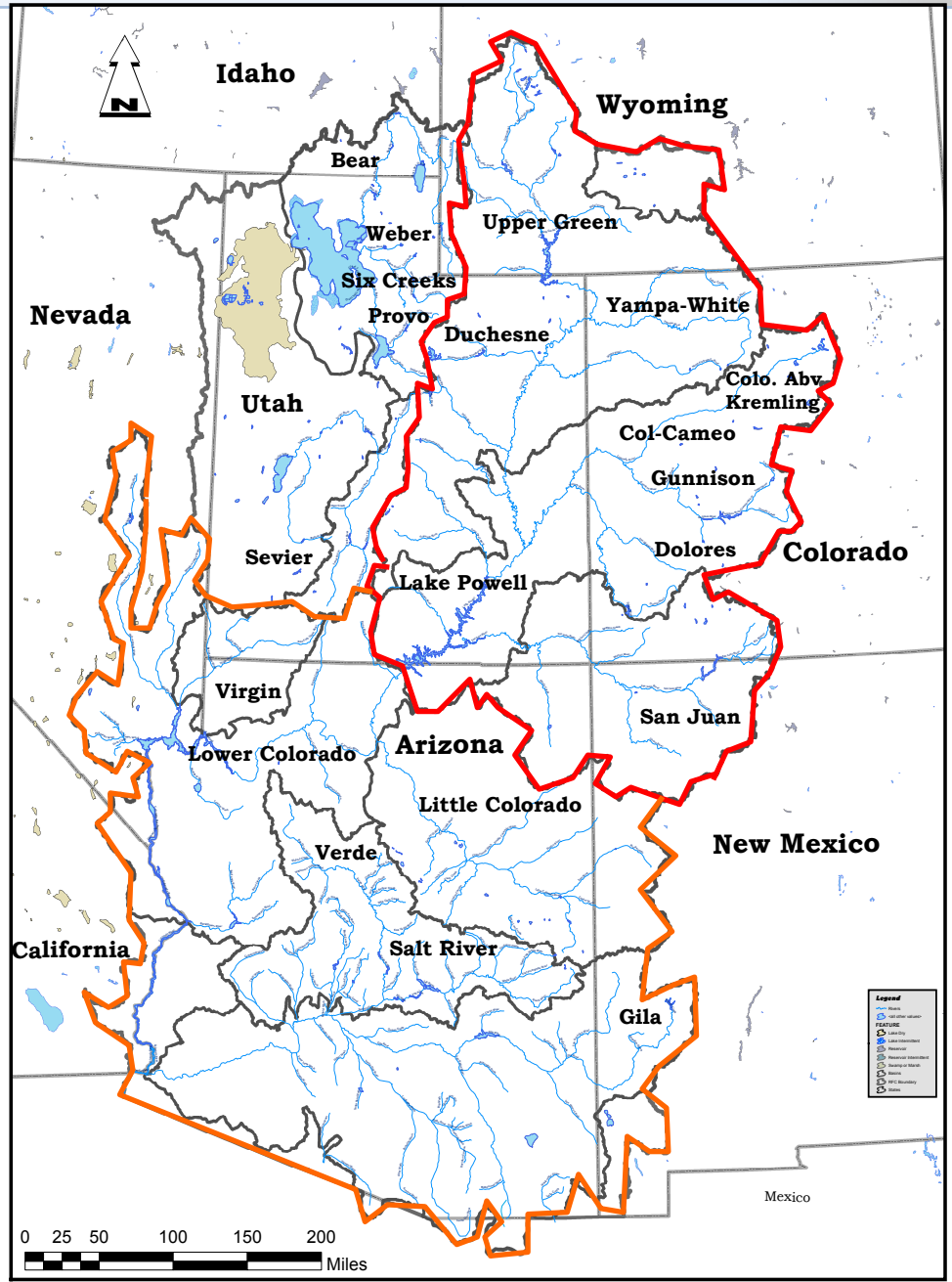
Please mute your phone until the question period



Today's Presentation

Fabulous February
- Widespread significant precipitation in February and early March

Big Increase In Snowpack (and where it was needed most)
- Update on current snowpack conditions

2019 Water Supply Forecasts – Some large increases
- Select forecast site review

Model Snow – How can you look at it ?
- When SNOTELs melt out but snow is still present in the Basin

Upcoming Weather
- Likely impacts to the forecasts going forward

Contacts & Questions

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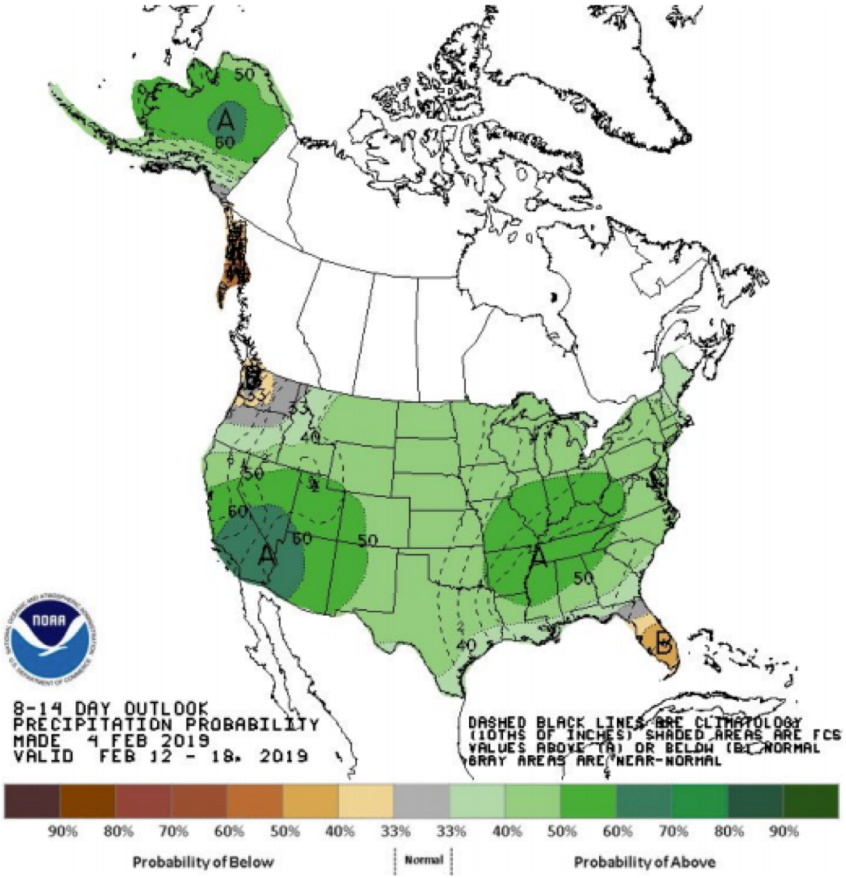
*** Please mute your phone until the question period ***

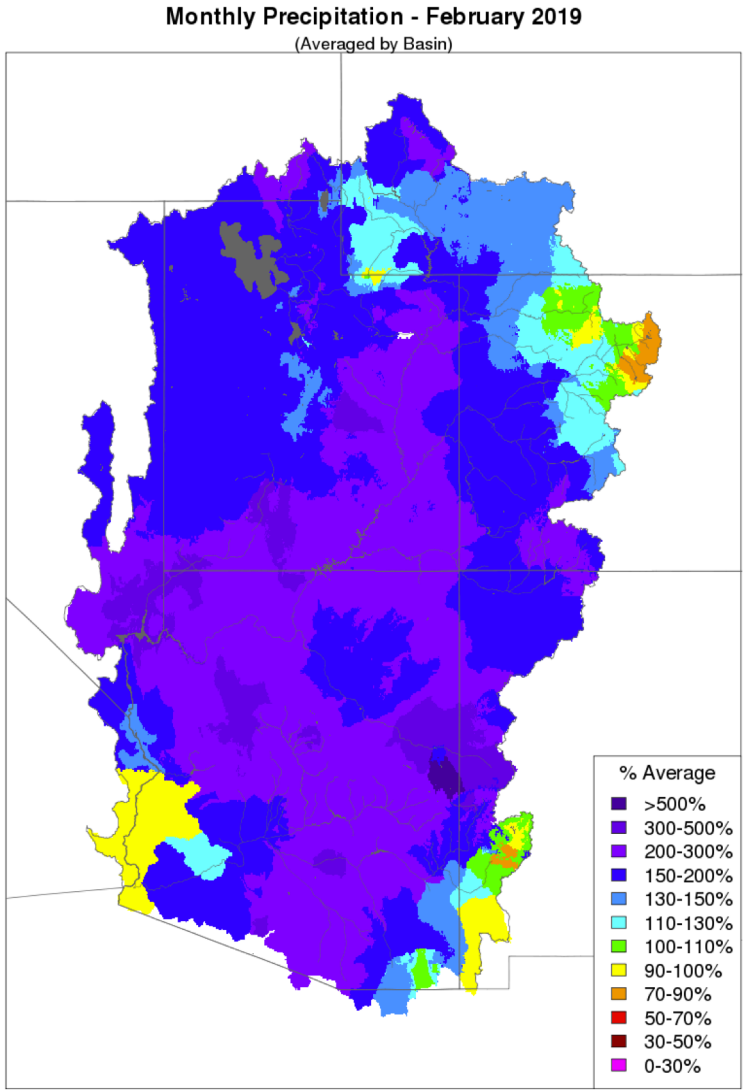
A slide from last months briefing: A wet month was anticipated, just not this wet!

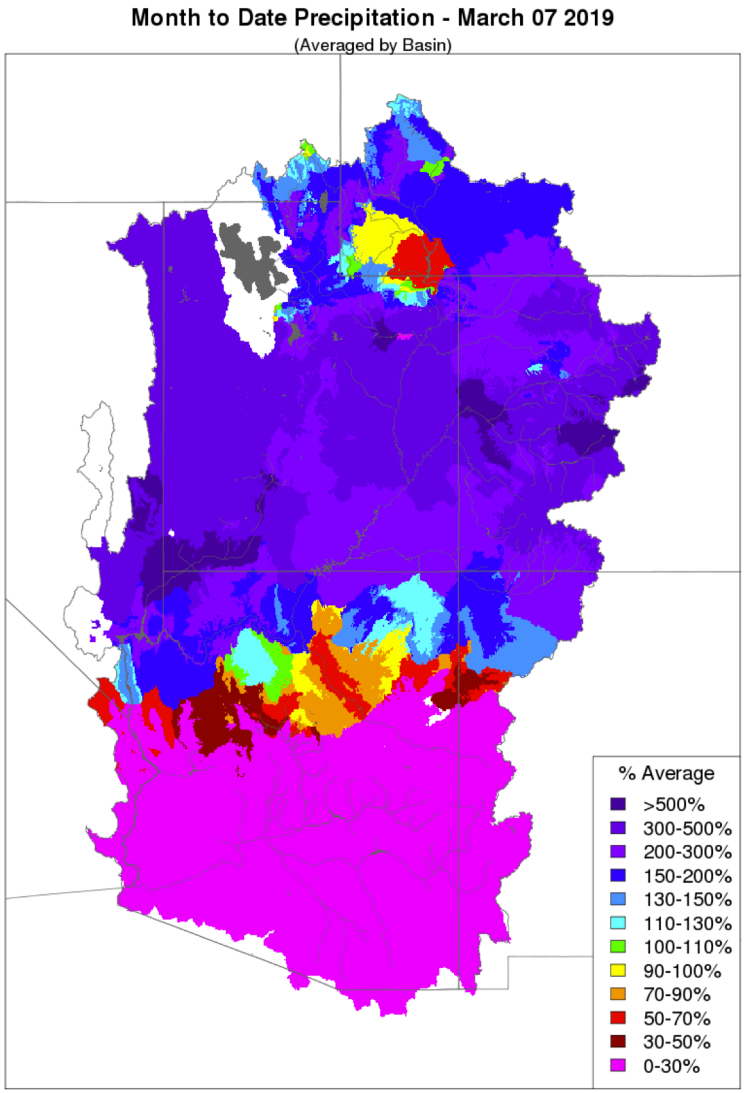
- ✓ Potentially a more significant storm impacting the entire area late next week (Feb 15-16)
- ✓ Models suggest active weather possibly beyond that (less confidence in the details)
- ✓ An increase in snowpack over most areas between now and mid/late February stands a good chance.
- ✓ Above average precipitation for the month of February appears likely.



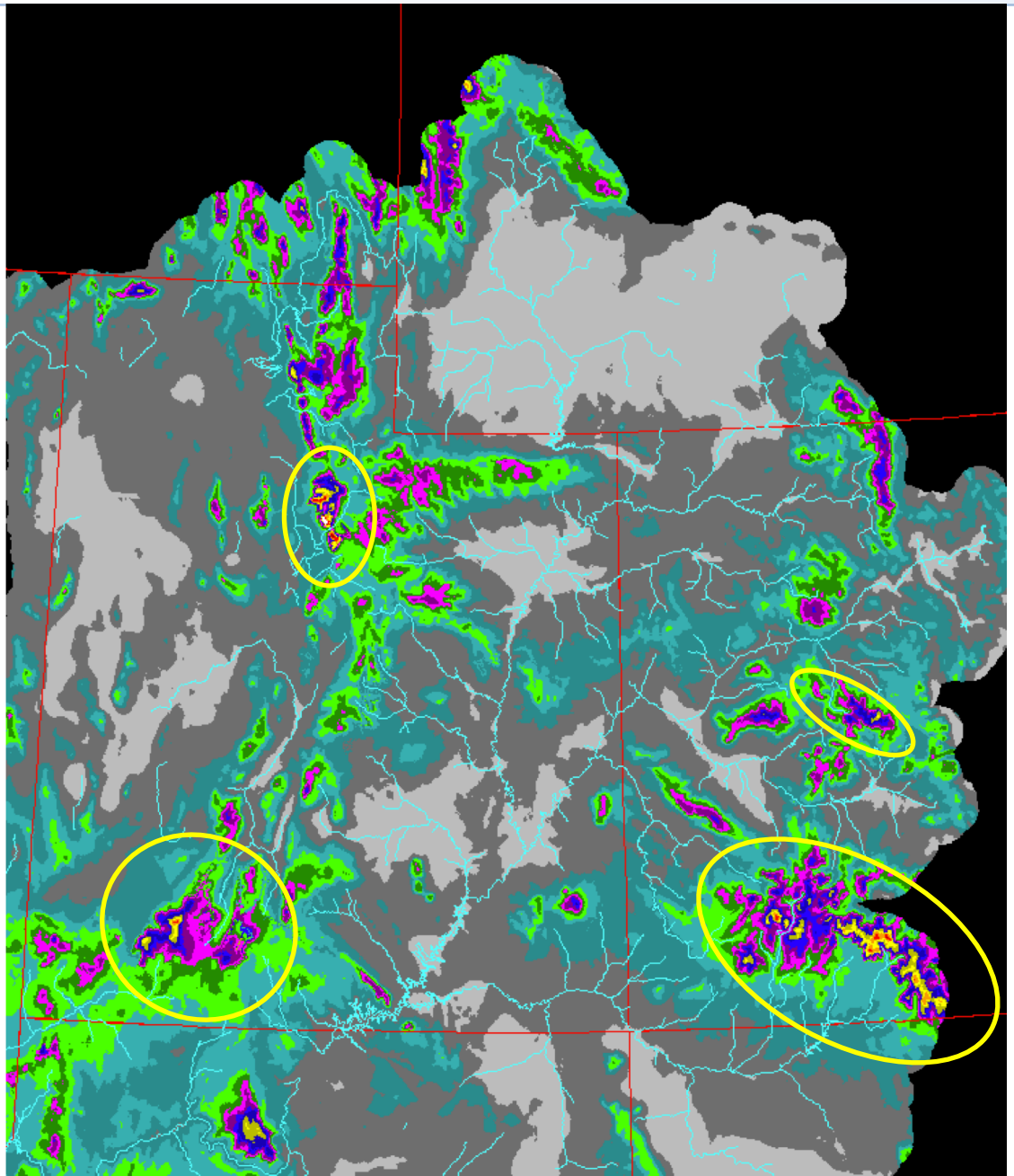
February - Early March Precipitation

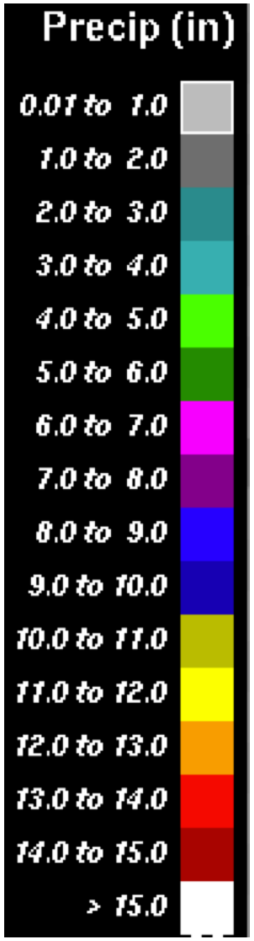
Percent of Average Precipitation





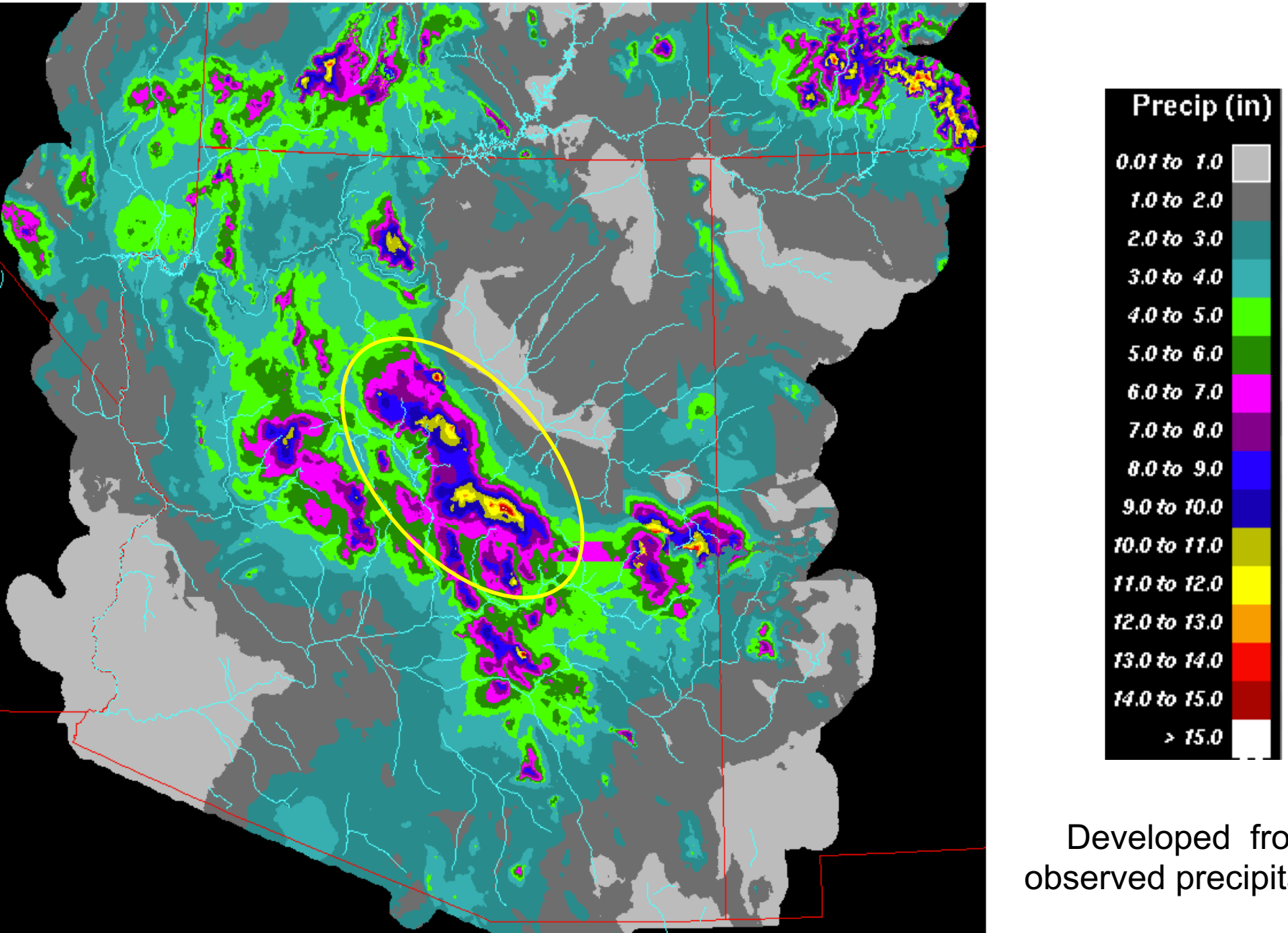
Gridded Precipitation Field for February 2019 (Upper Colorado / Great Basin





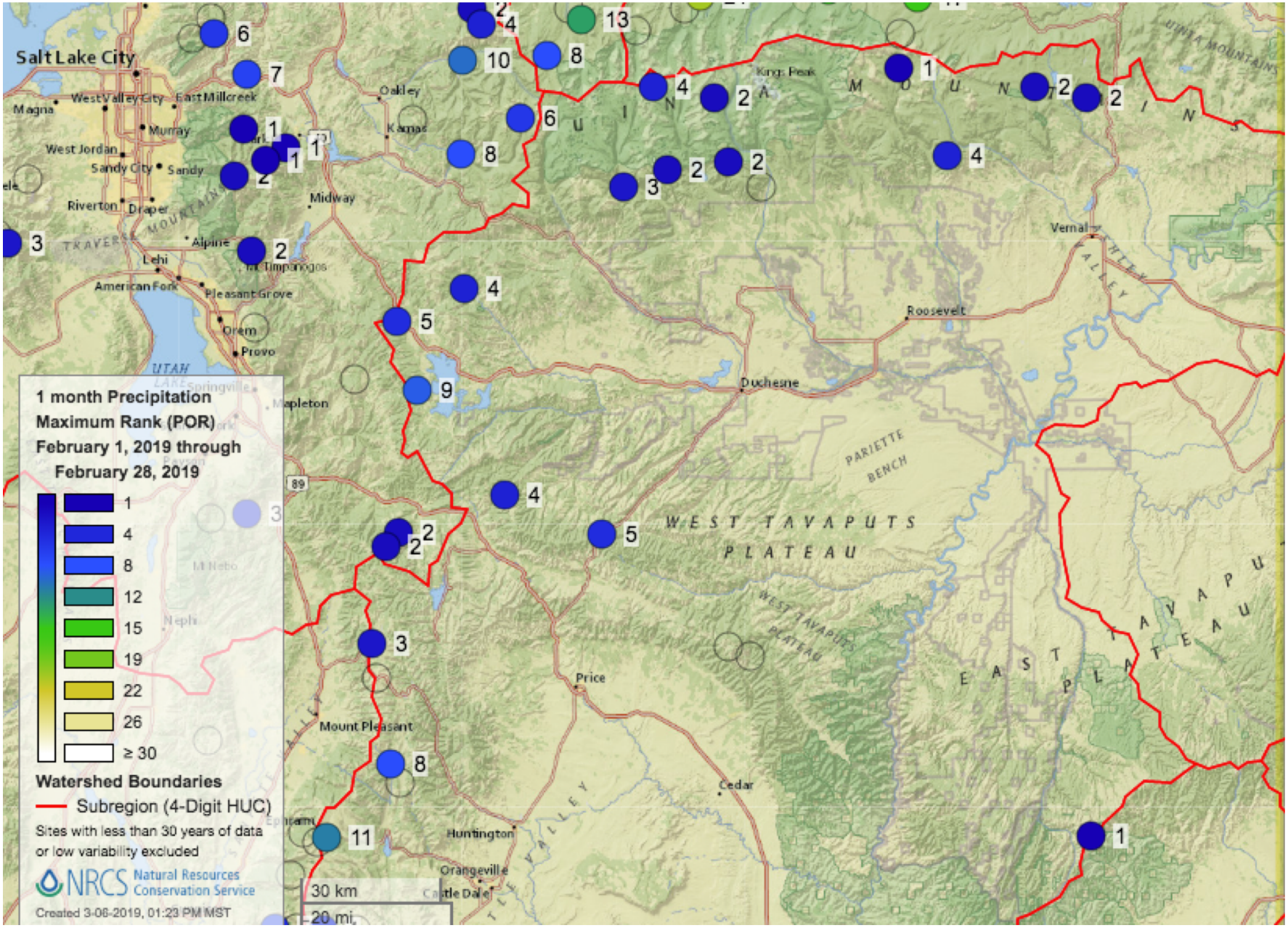
Developed from observed precipitation

Gridded Precipitation Field for February 2019 (Lower Colorado River Basin)

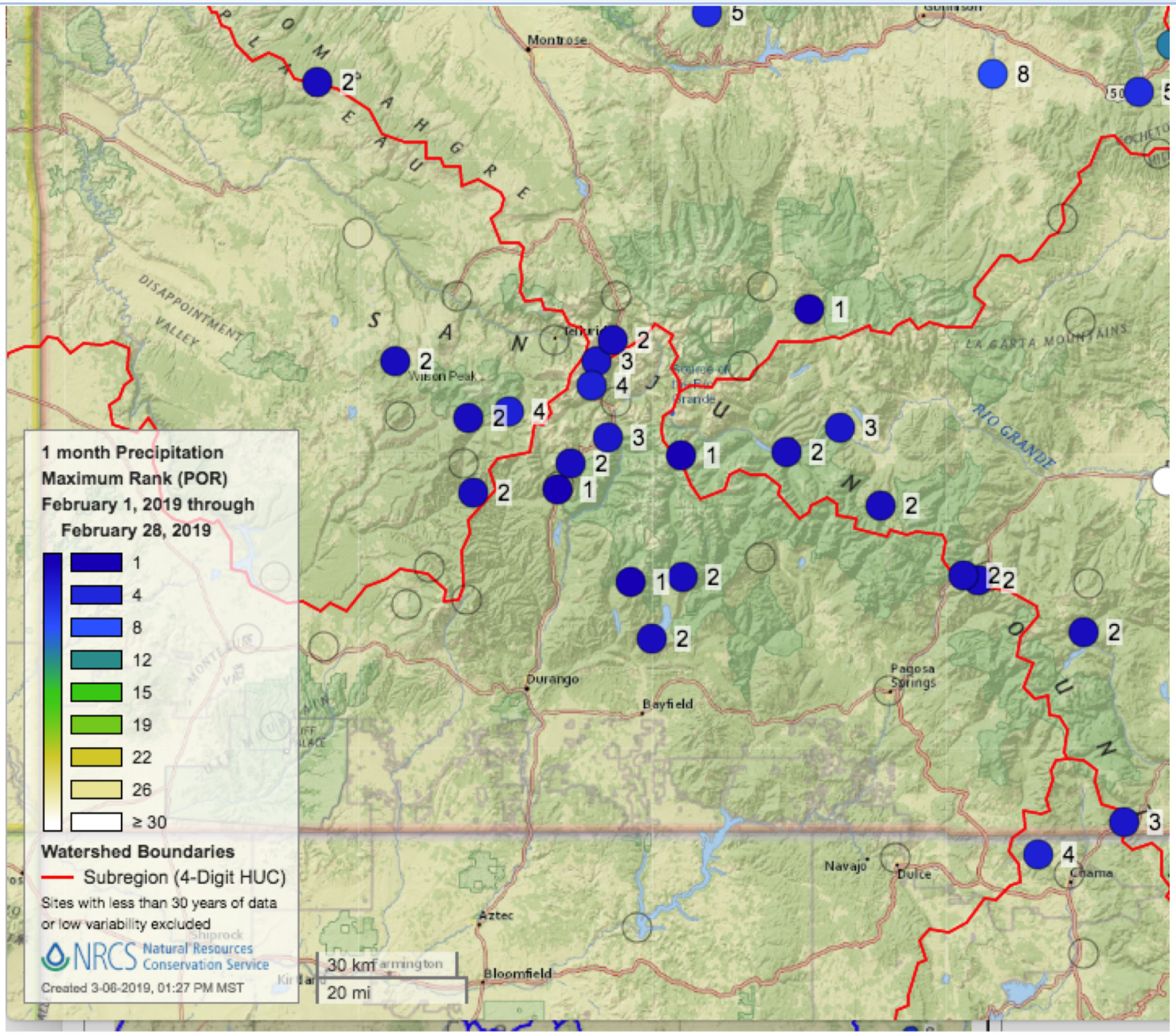


Developed from observed precipitation

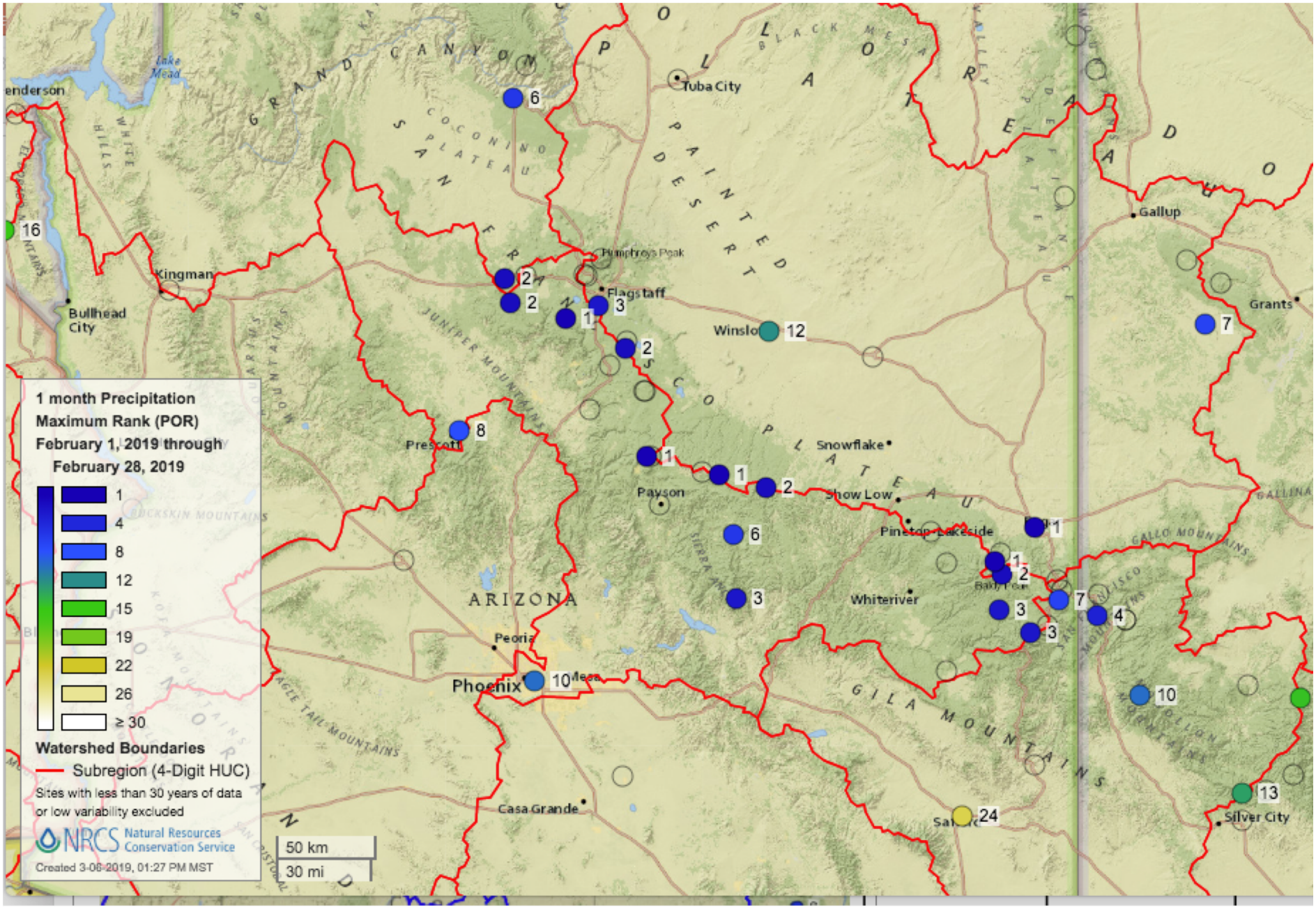
February 2019 Precipitation Ranking for February (minimum 30 years of record)
Duchesne River Basin (Northeast Utah)



February 2019 Precipitation Ranking for February (minimum 30 years of record)
Dolores and San Juan River Basins (Southwest Colorado)



February 2019 Precipitation Ranking for February (minimum 30 years of record)
Lower Colorado River Basin (Verde & Salt) - Arizona



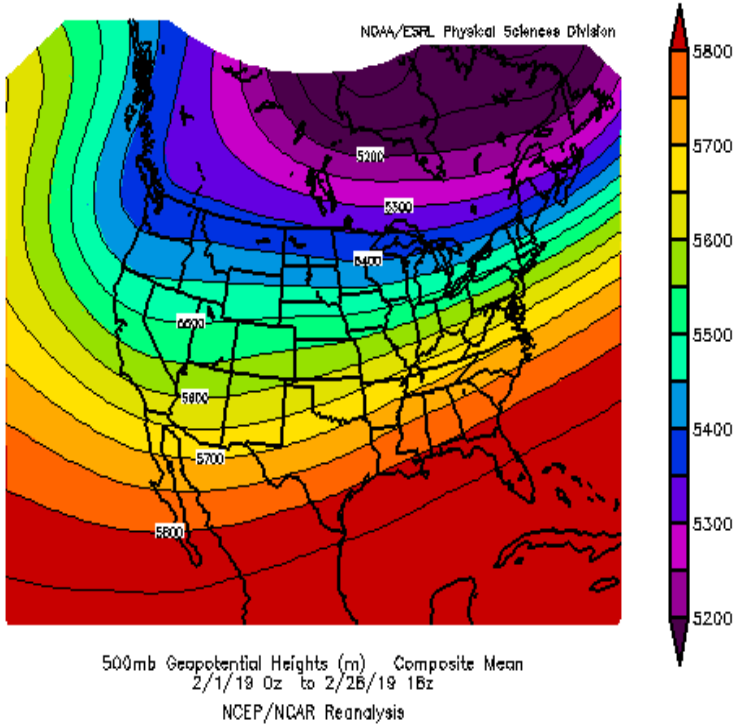
February 2019 Weather Pattern – Why So Wet ?!

Persistent trough of low pressure was located over the western U.S.

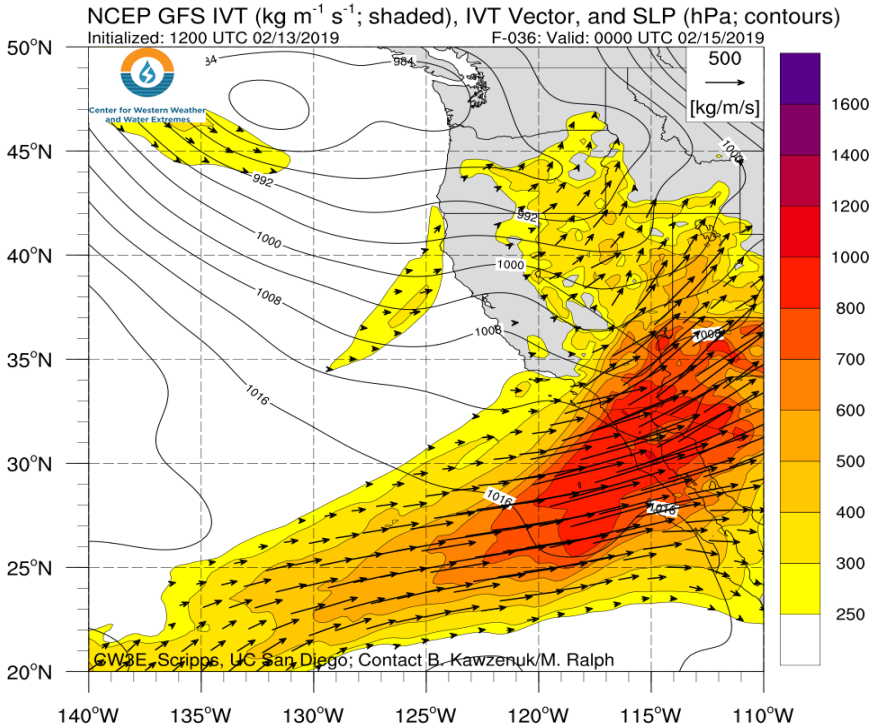
Multiple storm systems moved eastward through the Colorado River Basin.

Storms were of a Pacific origin tapping sub tropical moisture resulting in significant precipitation.

Mean upper atmospheric pattern for February shows the strong trough over the Colorado and Great Basins.

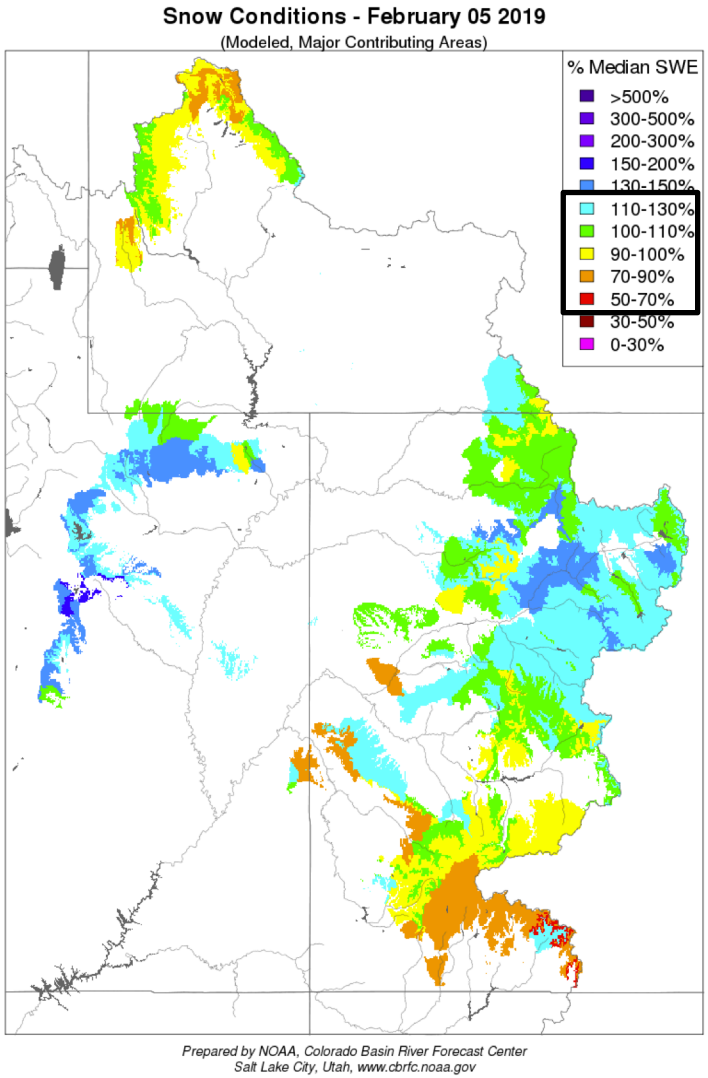


Subtropical moisture plume (red/oranges) moved across the western U.S around Valentines Day. Arizona took the brunt but heavy precipitation also fell in the Dolores and San Juan Basins.



Widespread increase in snowpack conditions February to March

February & March Snow Conditions
(CBRFC hydrologic model)



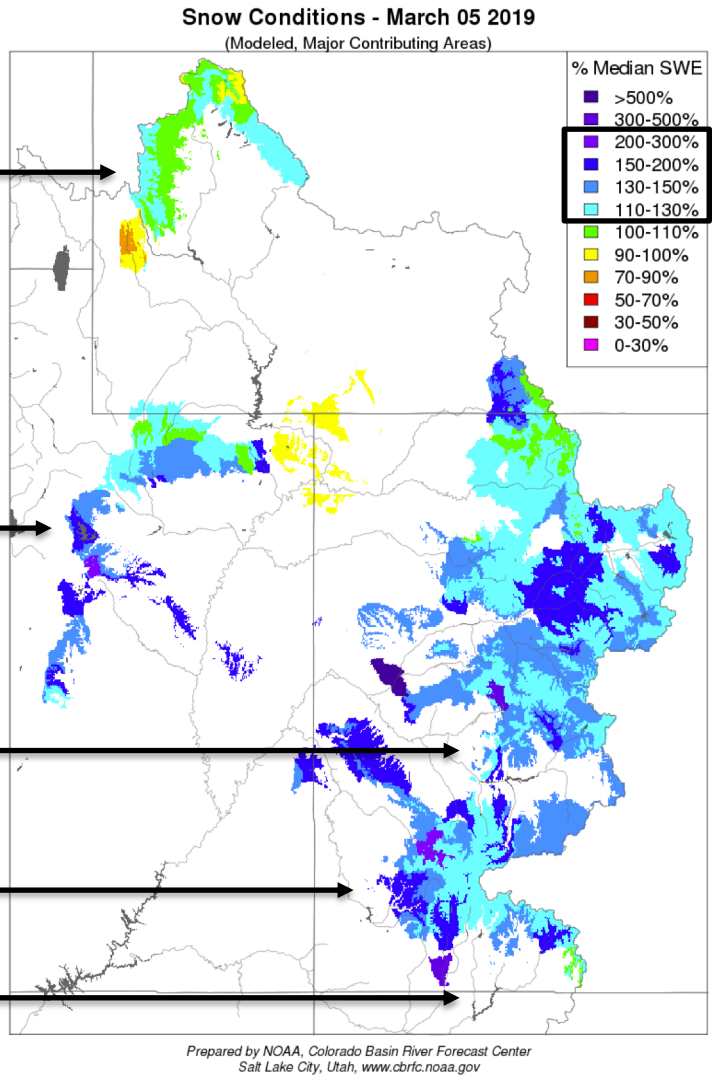
Upper Green
85% to 105 %

San Rafael
105% to 130 %

Gunnison
100% to 130%

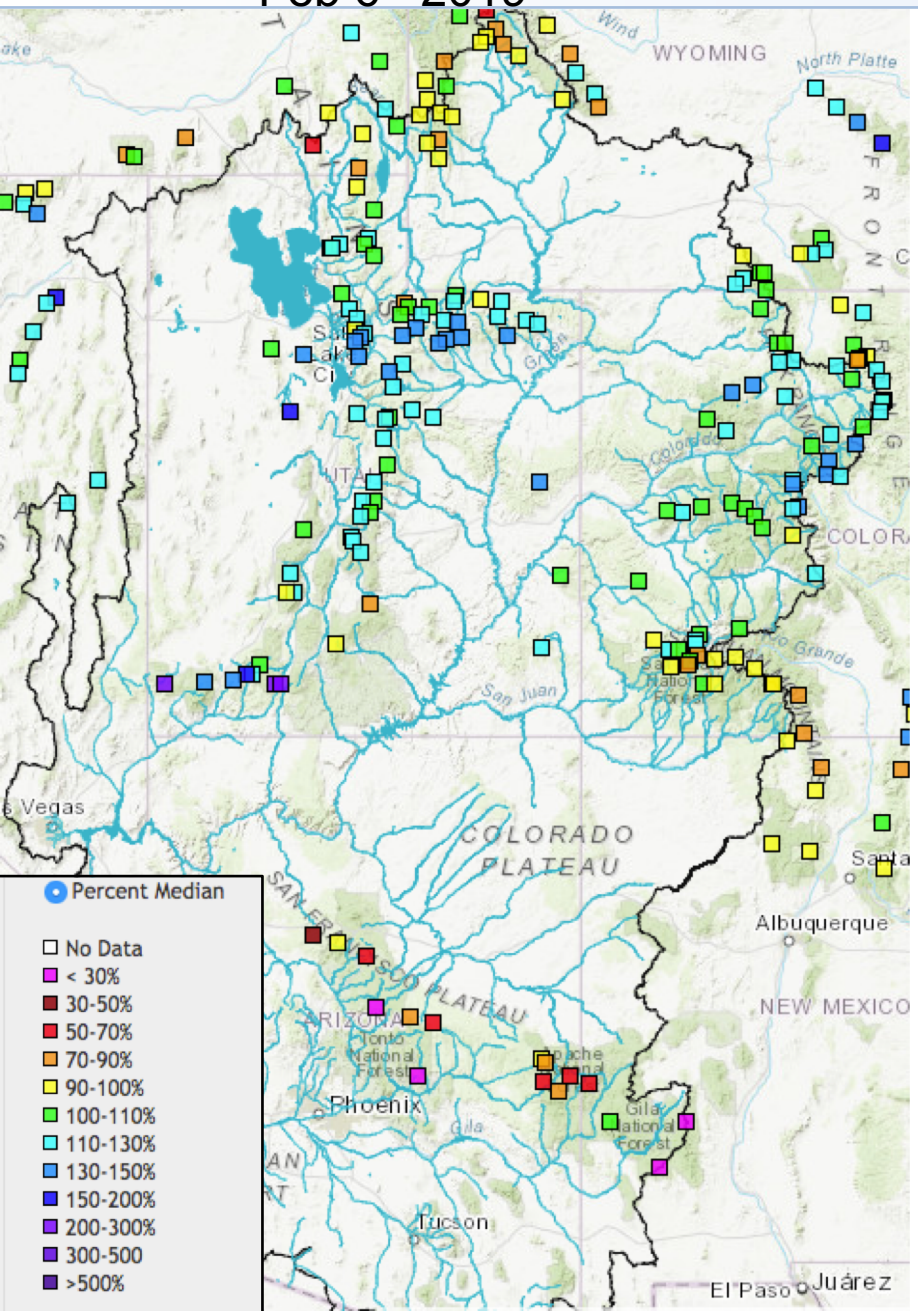
Dolores
105% to 135%

San Juan
85% to 130%

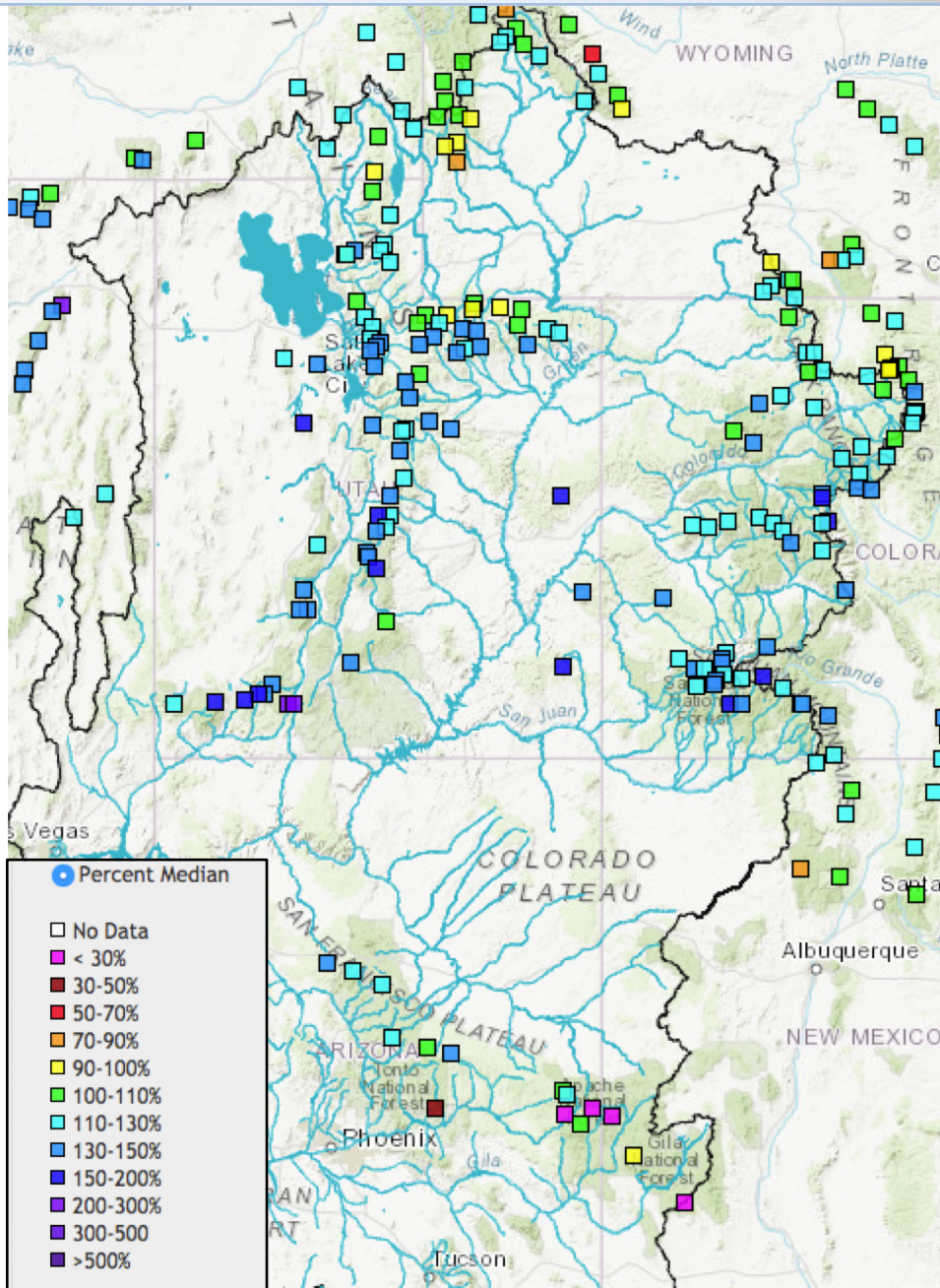


Current Snow Conditions –SNOTEL

Feb 6th 2019



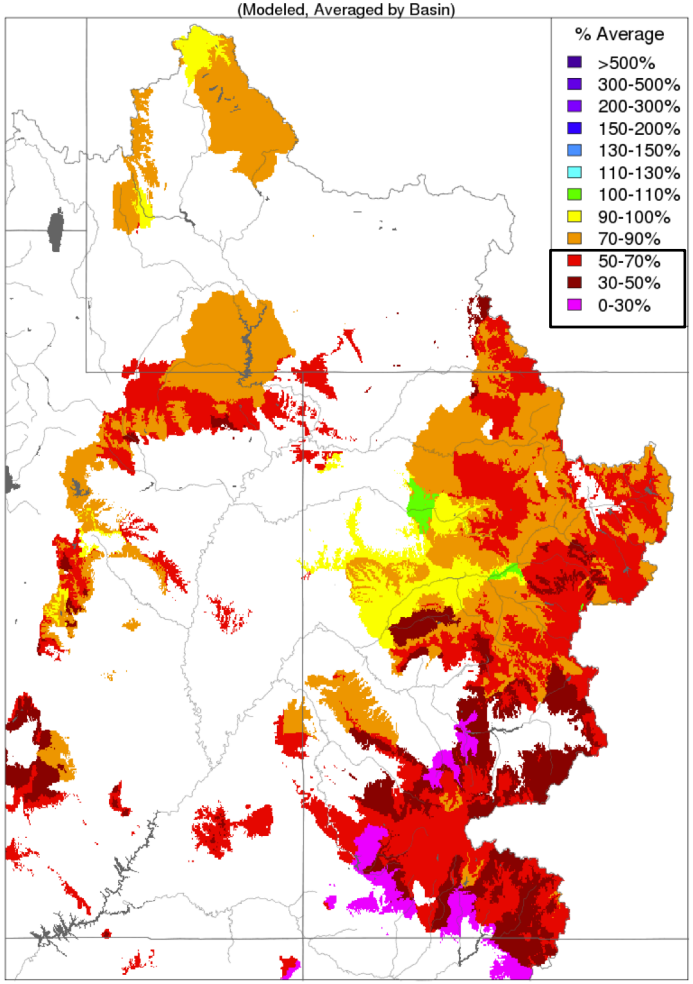
Mar 6th 2019



Soil Moisture Impacts

Upper Colorado Basin: We still anticipate losing some runoff to dry soils (5-15% of average). May become less of an impact with deeper snowpack if there is a later melt.

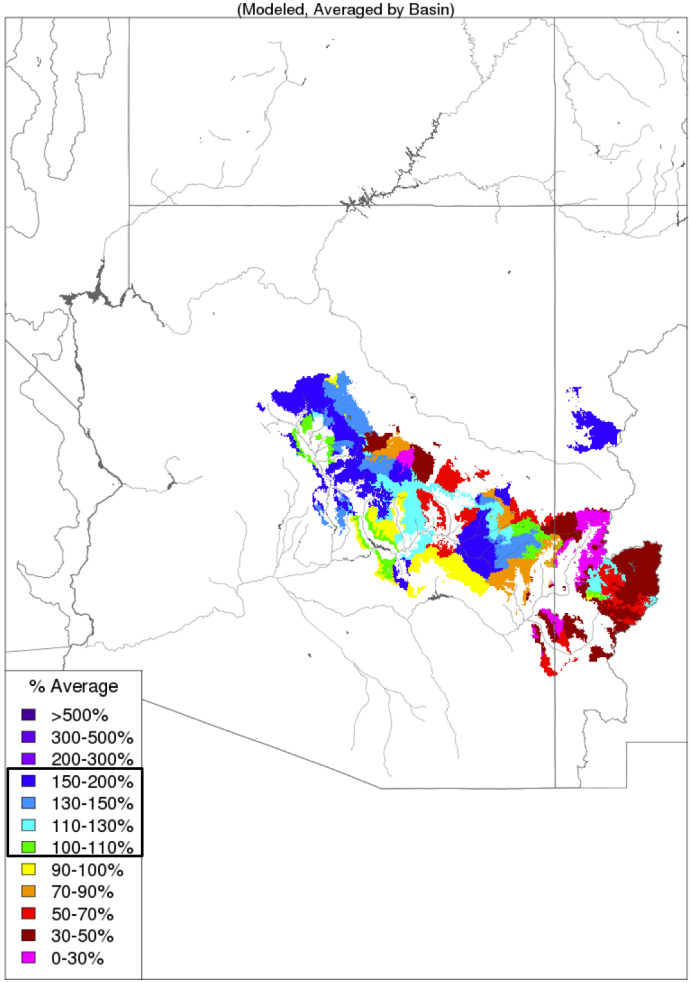
Soil Moisture - Fall - 2018 (November 15)
(Modeled, Averaged by Basin)



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

Lower Colorado Basin: Recent heavy rainfall, snowmelt, and flooding has resulted in saturated soils in some areas (Verde, Salt, Tonto Basins). High efficiency runoff is likely with future precipitation events in the near future.

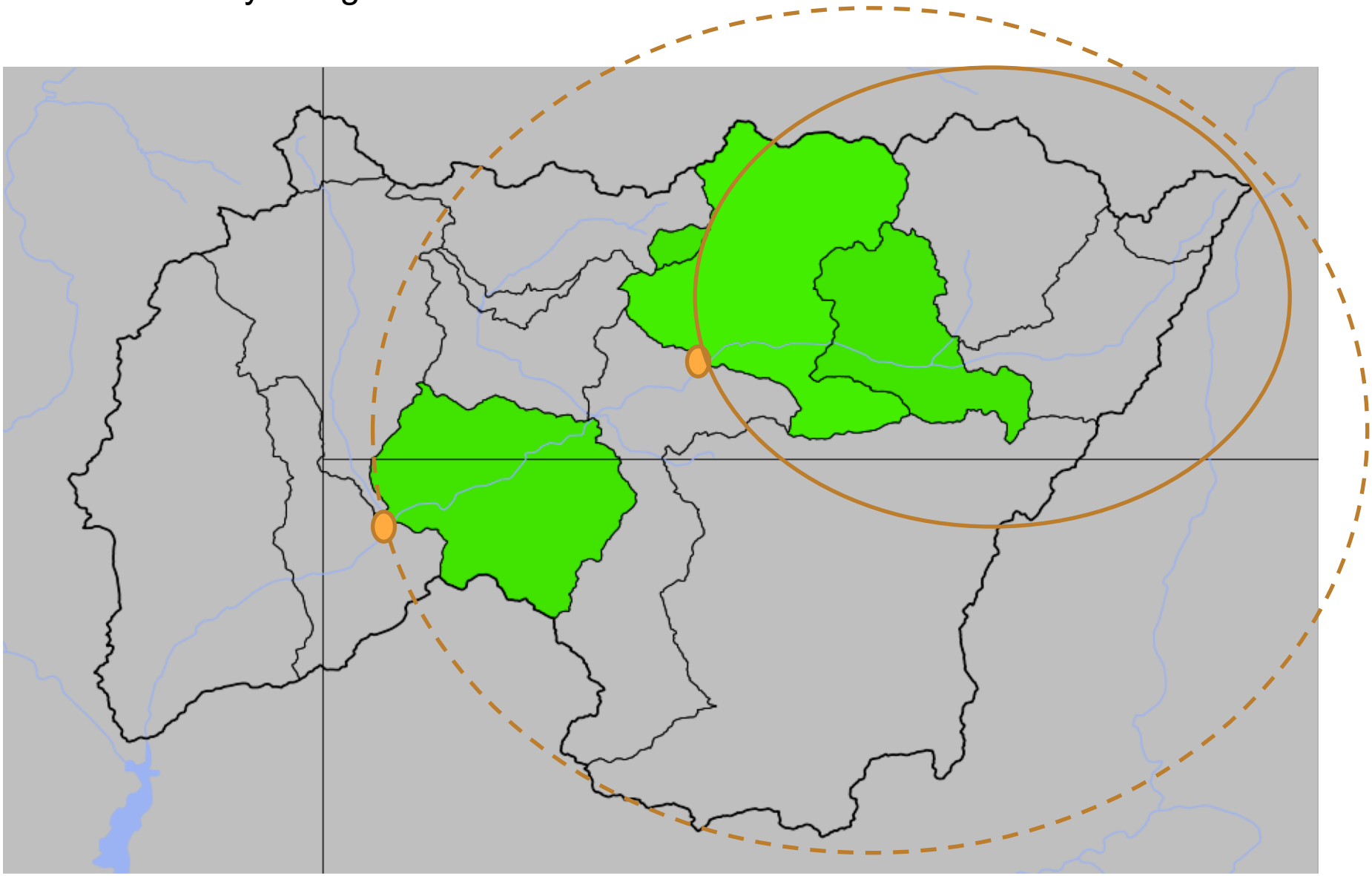
Soil Moisture - March 05 2019
(Modeled, Averaged by Basin)



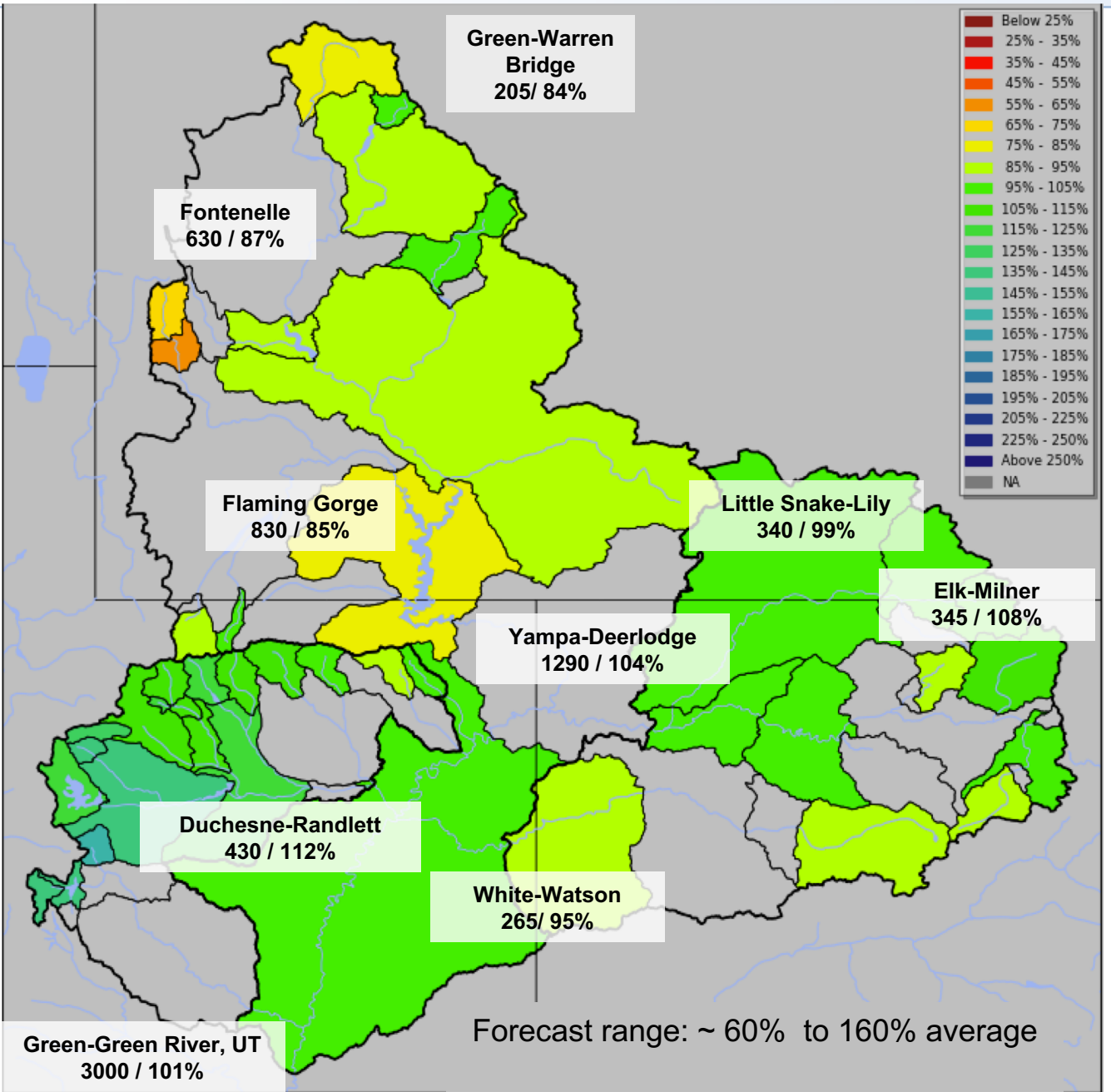
Prepared by NOAA, Colorado Basin River Forecast Center
Salt Lake City, Utah, www.cbrfc.noaa.gov

Clarification: River Basin Slides

Forecasts at a point represent the entire area upstream. The entire area upstream is included in the hydrologic model.



Upper Colorado: Green-Yampa-White-Duchesne



Forecasts as of Mar 1 2019

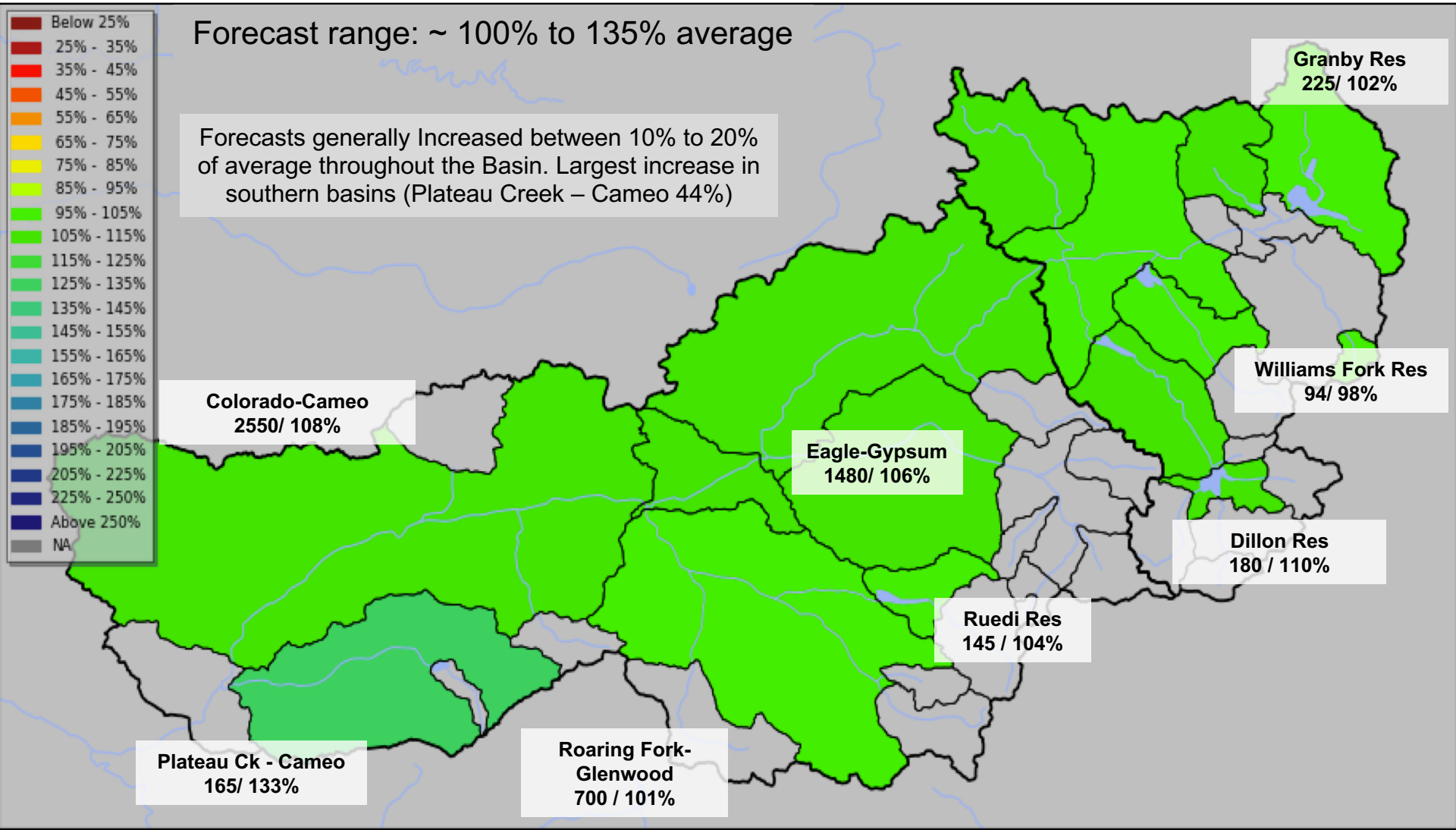
Volume 1000's acre feet / % of 1981-2010 average

Largest increases western Duchesne headwaters & Price / San Rafael (not shown) (~25% to 50% of average increase)

Most forecast points increased 10% to 20% of average

Upper Colorado: Colorado River Mainstem

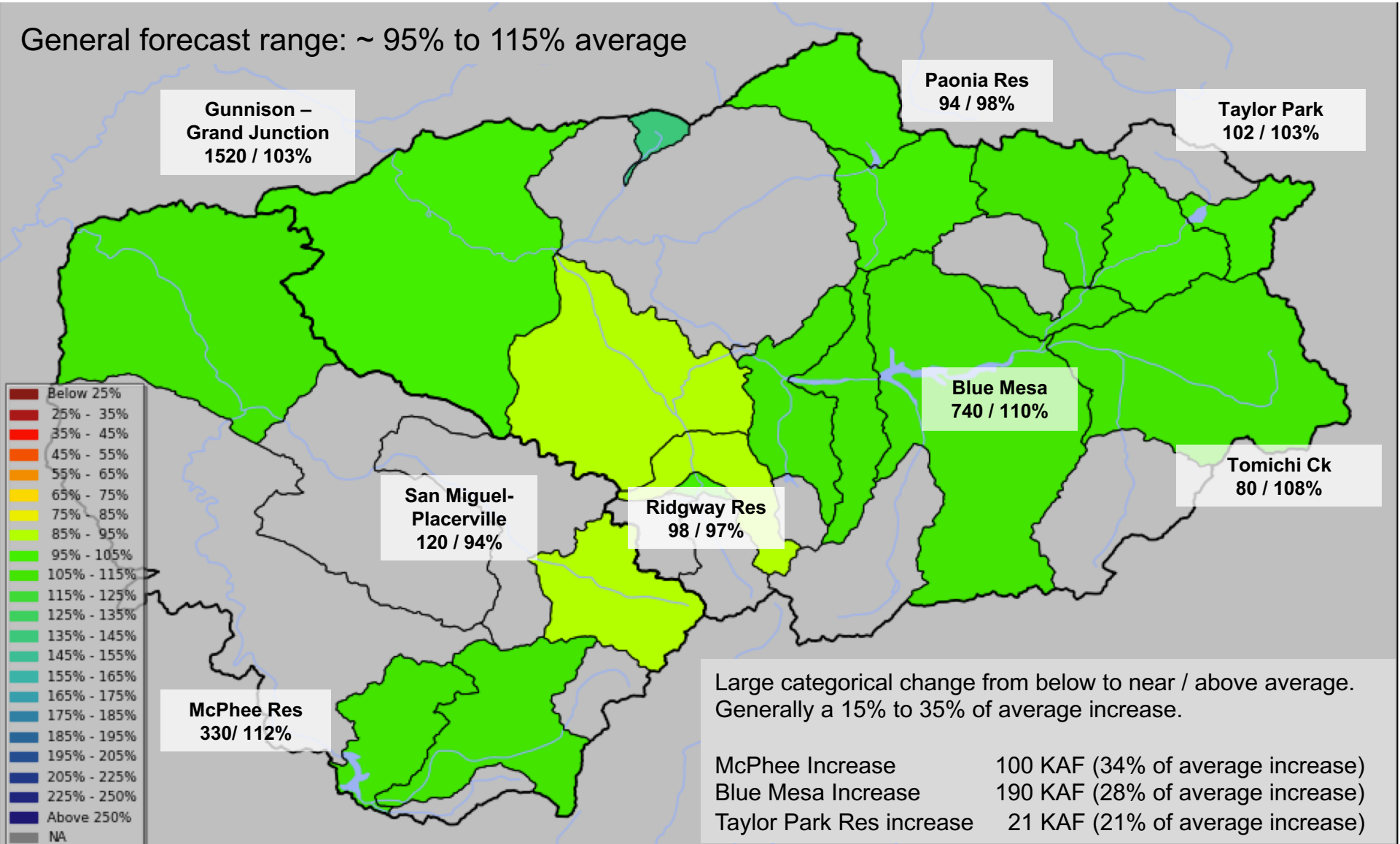
Forecasts as of Mar 1 2019
Volume in 1000's acre-feet / % of 1981-2010 average



Upper Colorado: Gunnison and Dolores Basins

Forecasts as of Mar 1 2019

Volume in 1000's acre-feet / % of 1981-2010 average



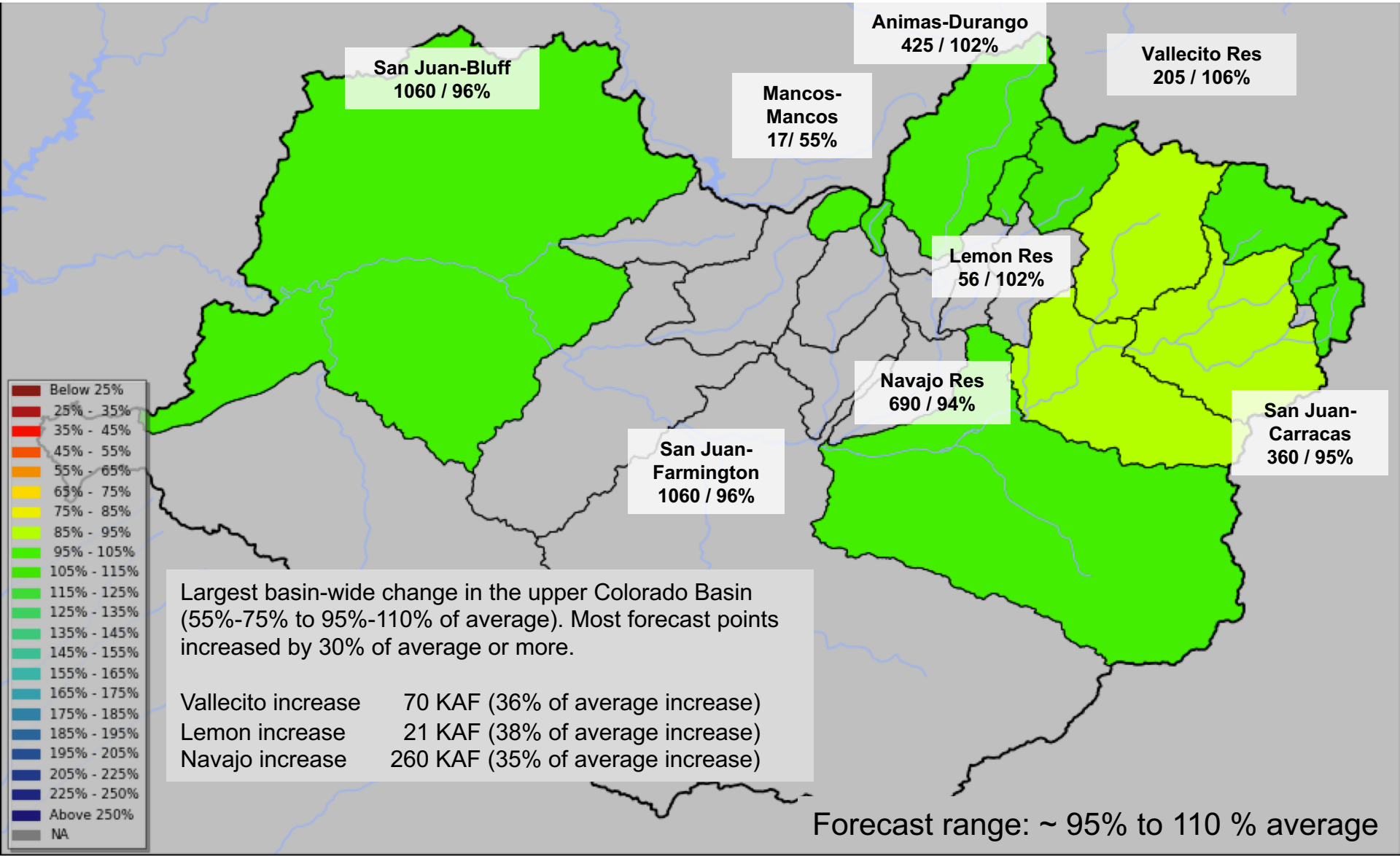
Large categorical change from below to near / above average.
Generally a 15% to 35% of average increase.

McPhee Increase	100 KAF (34% of average increase)
Blue Mesa Increase	190 KAF (28% of average increase)
Taylor Park Res increase	21 KAF (21% of average increase)

Upper Colorado: San Juan Basin

Forecasts as of Mar 1 2019

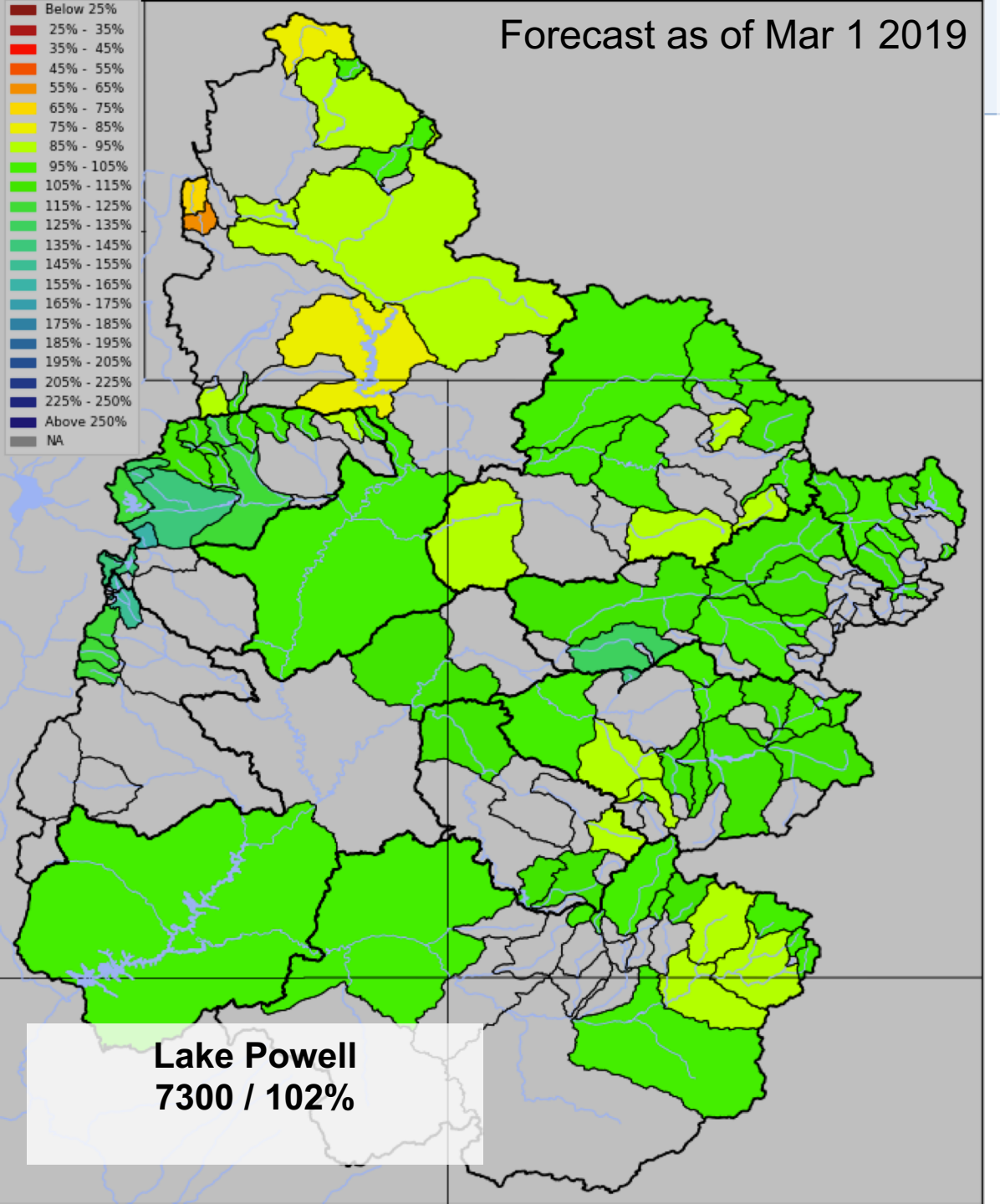
Volume in 1000's acre-feet / % of 1981-2010 average



Largest basin-wide change in the upper Colorado Basin (55%-75% to 95%-110% of average). Most forecast points increased by 30% of average or more.

Vallecito increase	70 KAF (36% of average increase)
Lemon increase	21 KAF (38% of average increase)
Navajo increase	260 KAF (35% of average increase)

Forecast range: ~ 95% to 110 % average



Upper Colorado April-July Streamflow Volume Forecasts

(% of 1981-2010 average)

Lake Powell:
7300 KAF / 102 % average

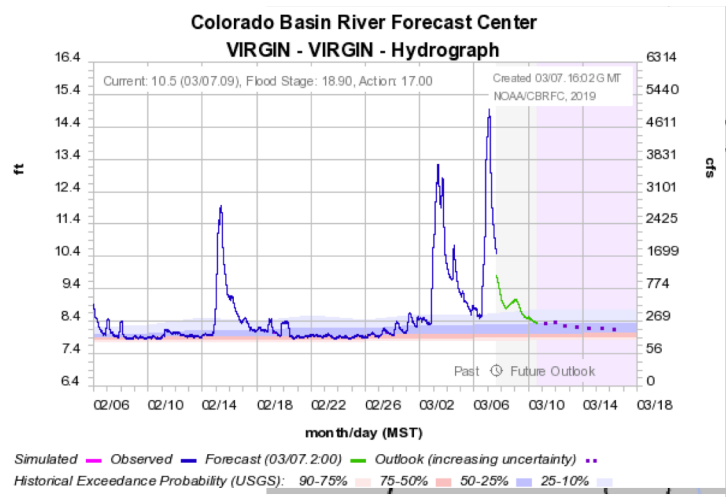
Lake Powell summarizes the impacts of the February through early March weather in the upper Colorado River Basin.

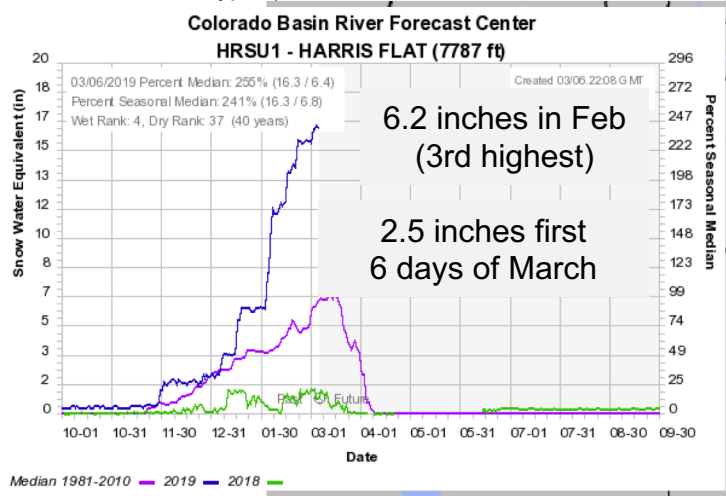
The Lake Powell inflow forecast increased 2 million acre-feet from early February (28% of average increase)

Lower Colorado (Virgin River) April-July Streamflow Volume Forecasts

Forecasts as of Mar 1 2019

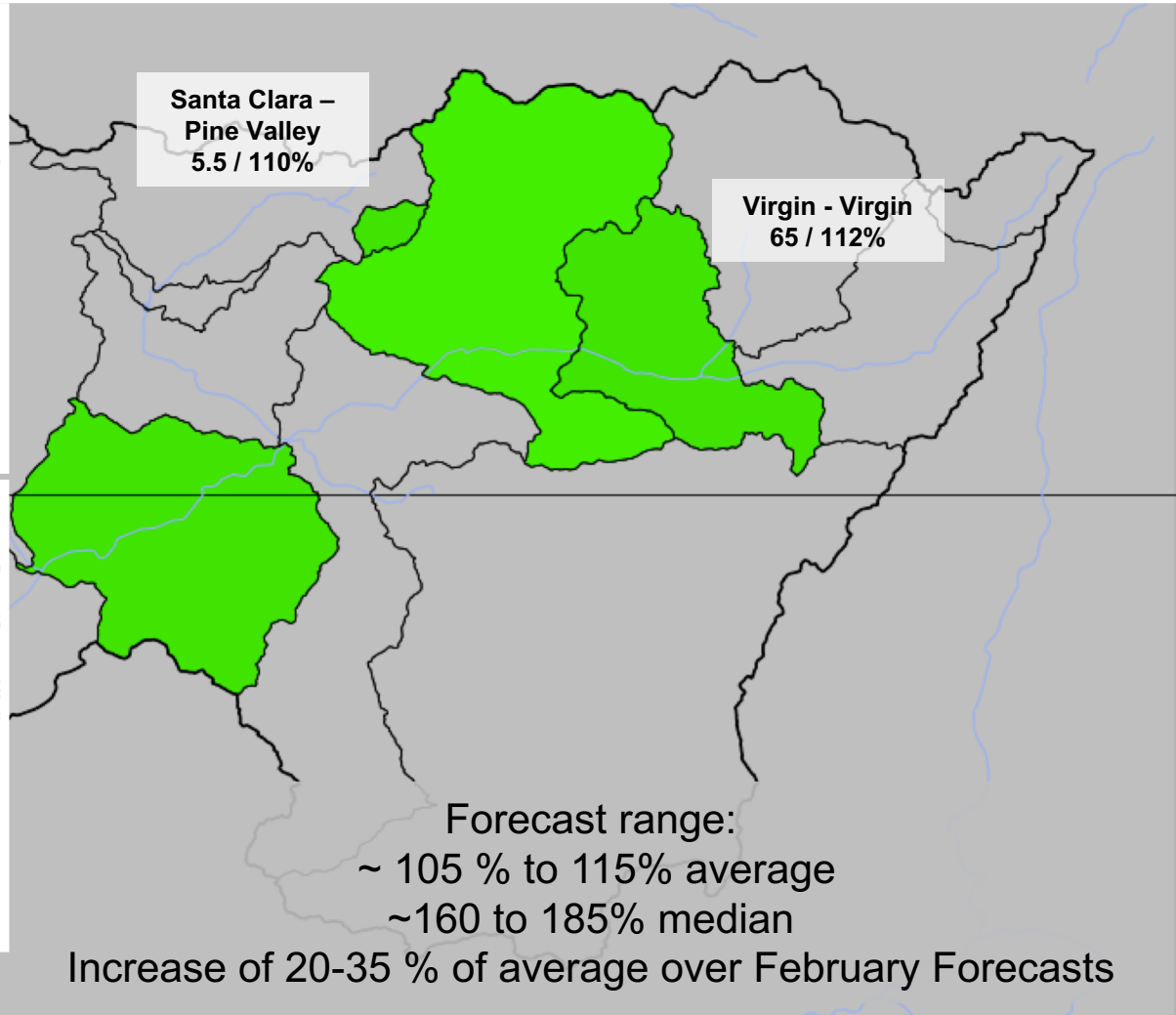
Above average flow occurred in February due to potent storm systems that brought rain and lower elevation snowmelt. Virgin River observed February volume was 142% of average





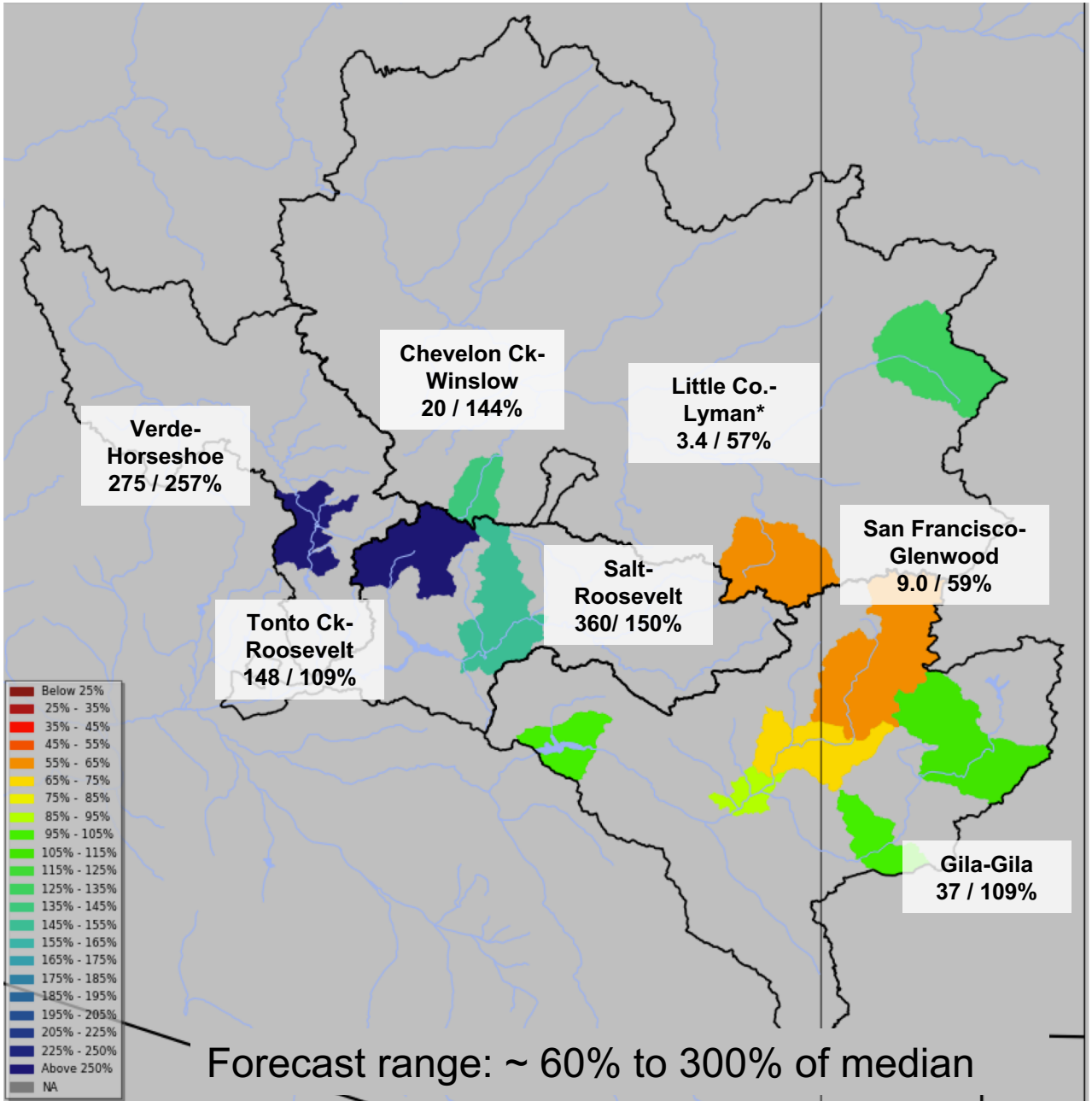
6.2 inches in Feb
(3rd highest)

2.5 inches first
6 days of March



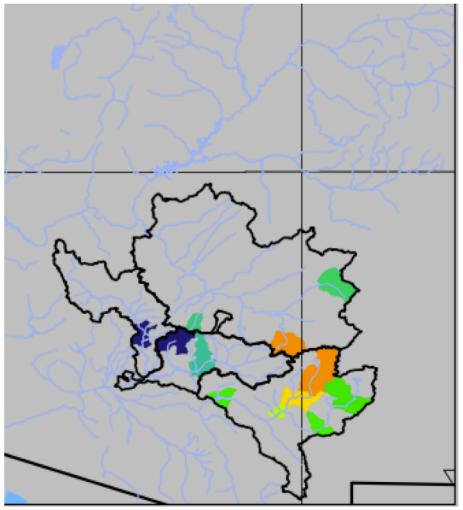
Forecast range:
~ 105 % to 115% average
~160 to 185% median
Increase of 20-35 % of average over February Forecasts

Lower Colorado Mar-May forecast streamflow volumes
(1000's acre-feet / % of 1981-2010 median)



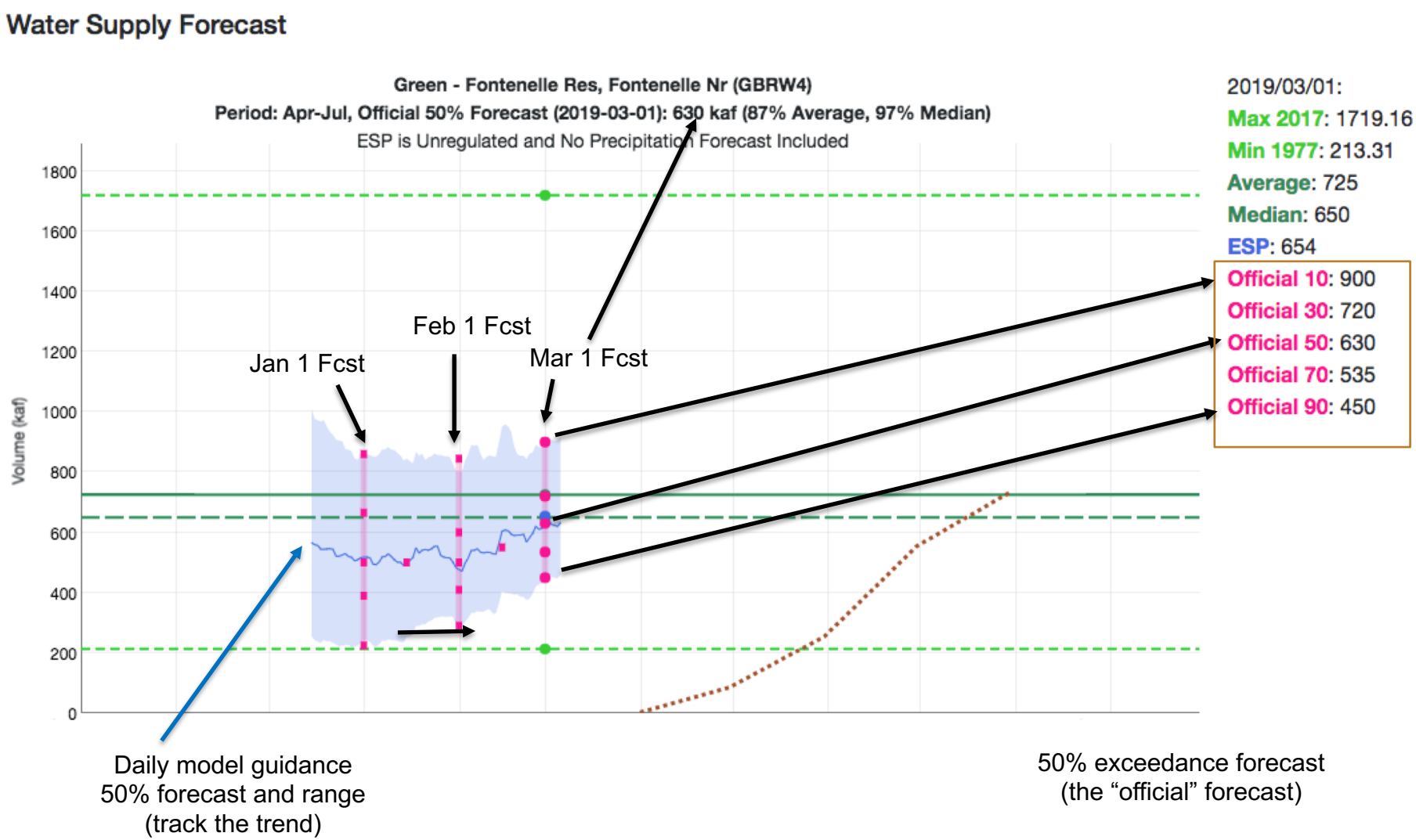
Forecast range: ~ 60% to 300% of median

Forecasts as of
Mar 1 2019



* Mar-June forecast period

Forecast Evolution Plot: Fontenelle Reservoir (Upper Green Basin - Wyoming)



ESP – Ensemble Streamflow Prediction

www.cbrfc.noaa.gov select "Water Supply" from dropdown menu

Forecast Evolution Plot: Dillon Reservoir Inflow (Colorado Headwaters)

Water Supply Forecast

Blue - Dillon Res (DIRC2)

Period: Apr-Jul, Official 50% Forecast (2019-03-01): 180 kaf (110% Average, 113% Median)

ESP is Unregulated and No Precipitation Forecast Included

Volume (kaf)

300 250 200 150 100 50 0

Oct 2018 Nov 2018 Dec 2018 Jan 2019 Feb 2019 Mar 2019 Apr 2019 May 2019

Early March Storm

2019/03/01:

Max 1984: 275.99

Min 2002: 54.07

Average: 163

Median: 159

ESP: 163

Official 10: 220

Official 30: 200

Official 50: 180

Official 70: 160

Official 90: 135

Colorado Basin River Forecast Center

DIRC2 Blue River abv Dillon Group

03/05/2019 Percent Median: 134% (16.1 / 12.0)

Percent Seasonal Median: 100% (16.1 / 16.1)

Created 03/06 17:43 G MT

NOAA/CBRFC, 2019

Snow Water Equivalent (in)

20 18 17 15 13 12 10 8 7 5 3 2 0

Percent Seasonal Median

124 114 104 93 83 72 62 52 41 31 21 10 0

Past Future

10-01 10-31 11-30 12-31 01-30 03-01 04-01 05-01 05-31 07-01 07-31 08-30 09-30

Date

Median 1981-2010 — *2019* — *2018* —

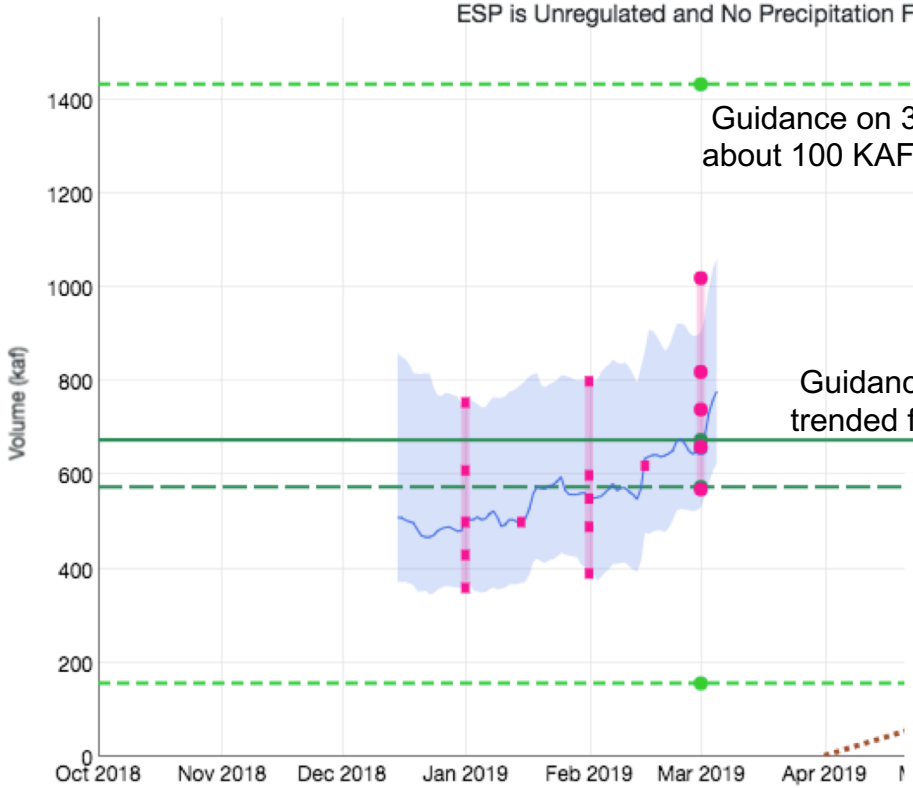
Forecast Evolution Plot: Blue Mesa Inflow (Gunnison Basin)

Water Supply Forecast

Gunnison - Blue Mesa Res (BMDC2)

Period: Apr-Jul, Official 50% Forecast (2019-03-01): 740 kaf (110% Average, 129% Median)

ESP is Unregulated and No Precipitation Forecast Included



Guidance on 3/1 was below average but increased by about 100 KAF due to the Mar 1-4 weekend storm.

Guidance / Forecasts have trended further above average

Average

2019/03/01:

Max 1984: 1433.01

Min 2002: 156.55

Average: 675

Median: 575

ESP: 658

Official 10: 1020

Official 30: 820

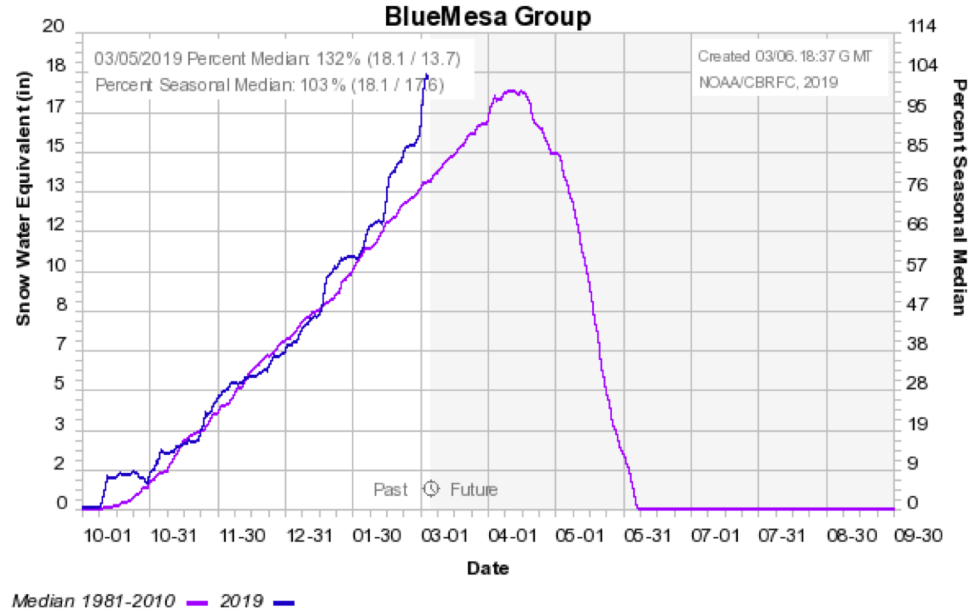
Official 50: 740

Official 70: 660

Official 90: 570

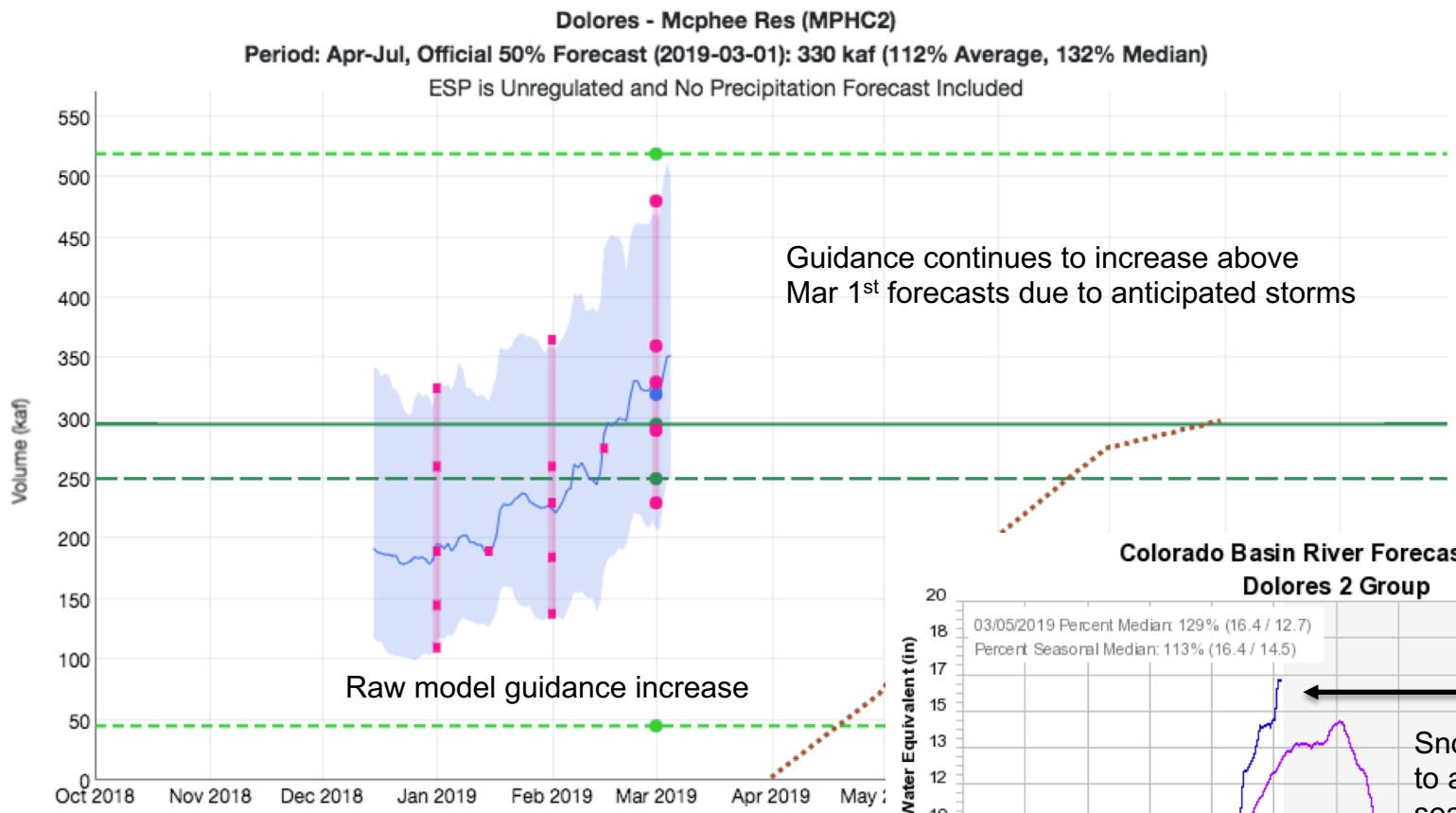
Colorado Basin River Forecast Center

BlueMesa Group



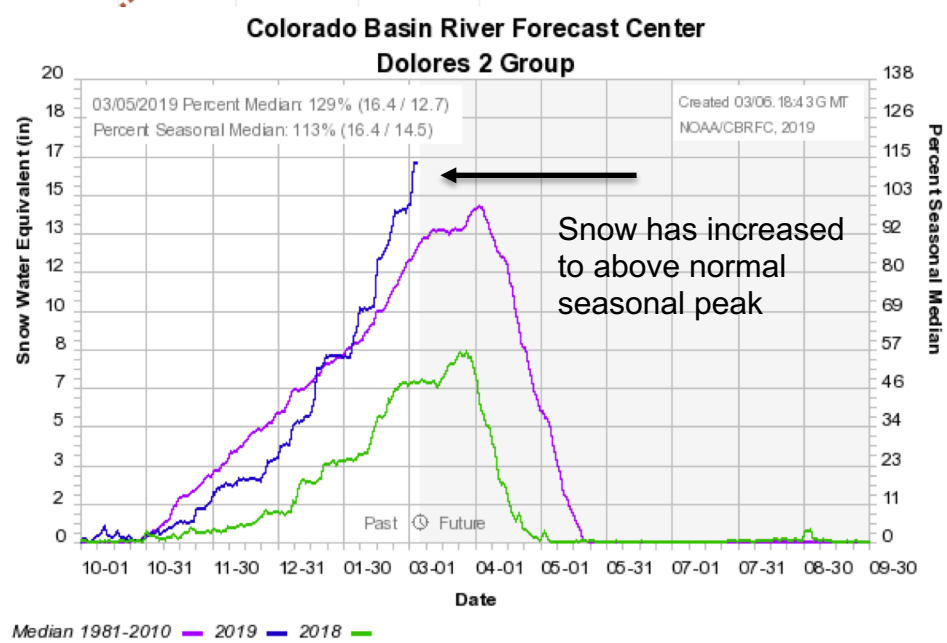
Forecast Evolution Plot: McPhee Inflow (Dolores Basin)

Water Supply Forecast



Guidance continues to increase above Mar 1st forecasts due to anticipated storms

2019/03/01:
Max 1993: 519.12
Min 2002: 45.16
Average: 295
Median: 250
ESP: 320
Official 10: 480
Official 30: 360
Official 50: 330
Official 70: 290
Official 90: 230

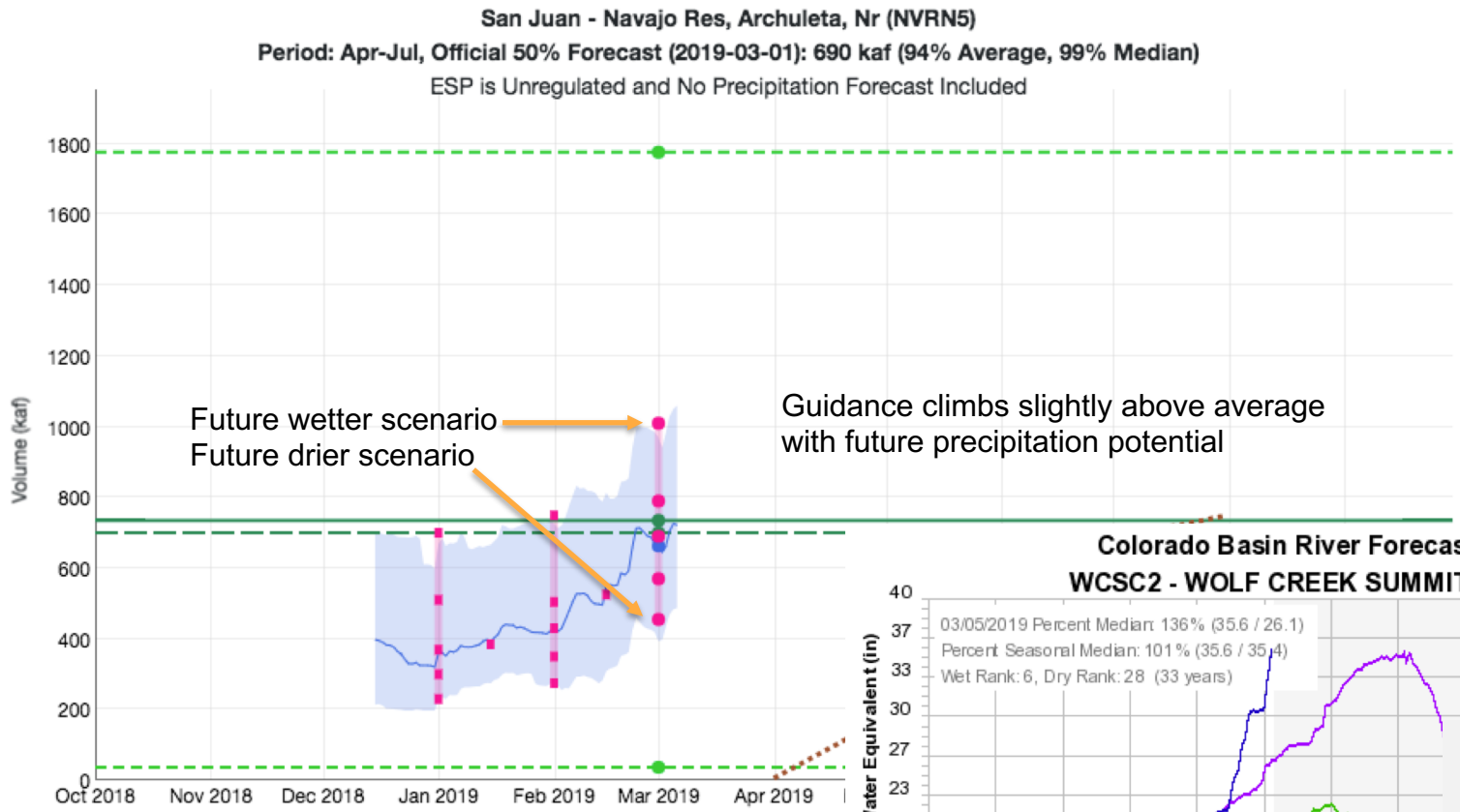


Snow has increased to above normal seasonal peak

El Diente Peak SNOTEL has gained over 9 inches of water since February 1st.

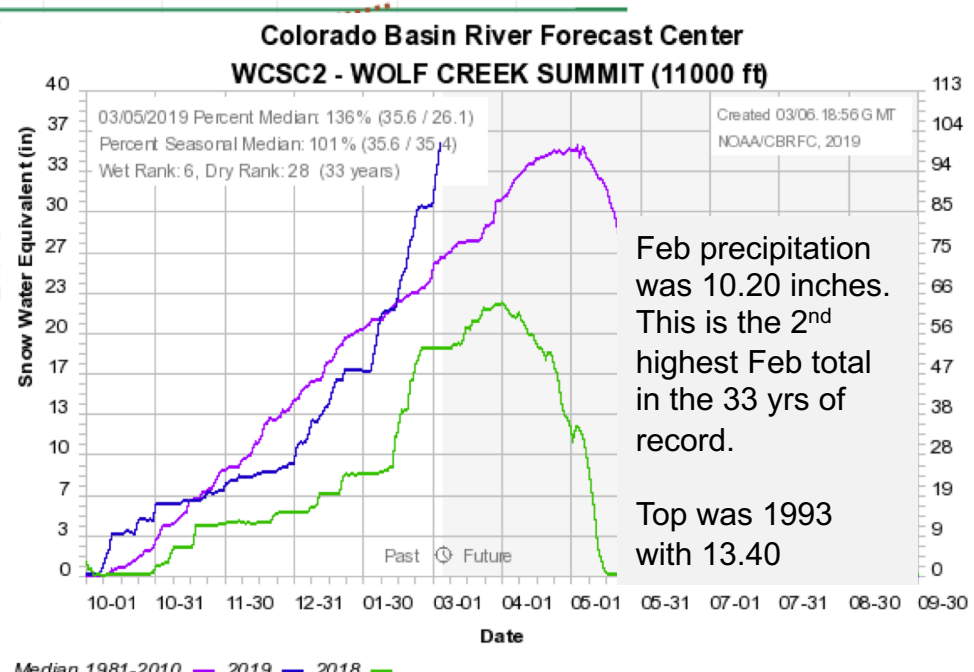
Forecast Evolution Plot: Navajo Inflow (San Juan Basin)

Water Supply Forecast



Guidance climbs slightly above average with future precipitation potential

2019/03/01:
Max 1979: 1776.84
Min 2002: 36.74
Average: 735
Median: 700
ESP: 663
Official 10: 1010
Official 30: 790
Official 50: 690
Official 70: 570
Official 90: 455



Feb precipitation was 10.20 inches. This is the 2nd highest Feb total in the 33 yrs of record.

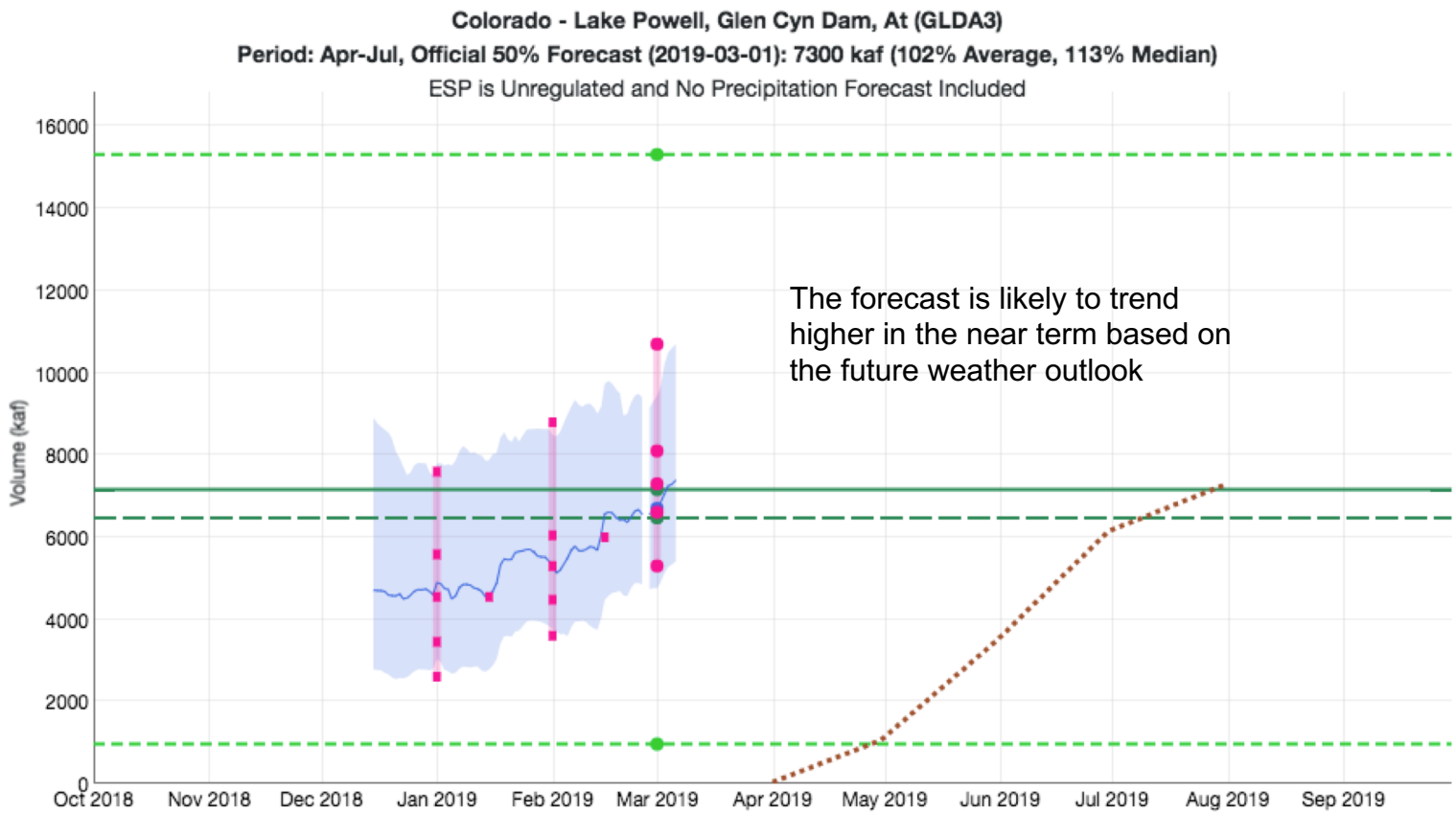
Top was 1993 with 13.40

Wolf Creek Summit SNOTEL SWE gained nearly 19 inches of water between Feb 1st and March 6th.

Upper San Juan SNOTEL gained around 17.5 inches.

Forecast Evolution Plot: Lake Powell Inflow (Upper Colorado Basin)

Water Supply Forecast



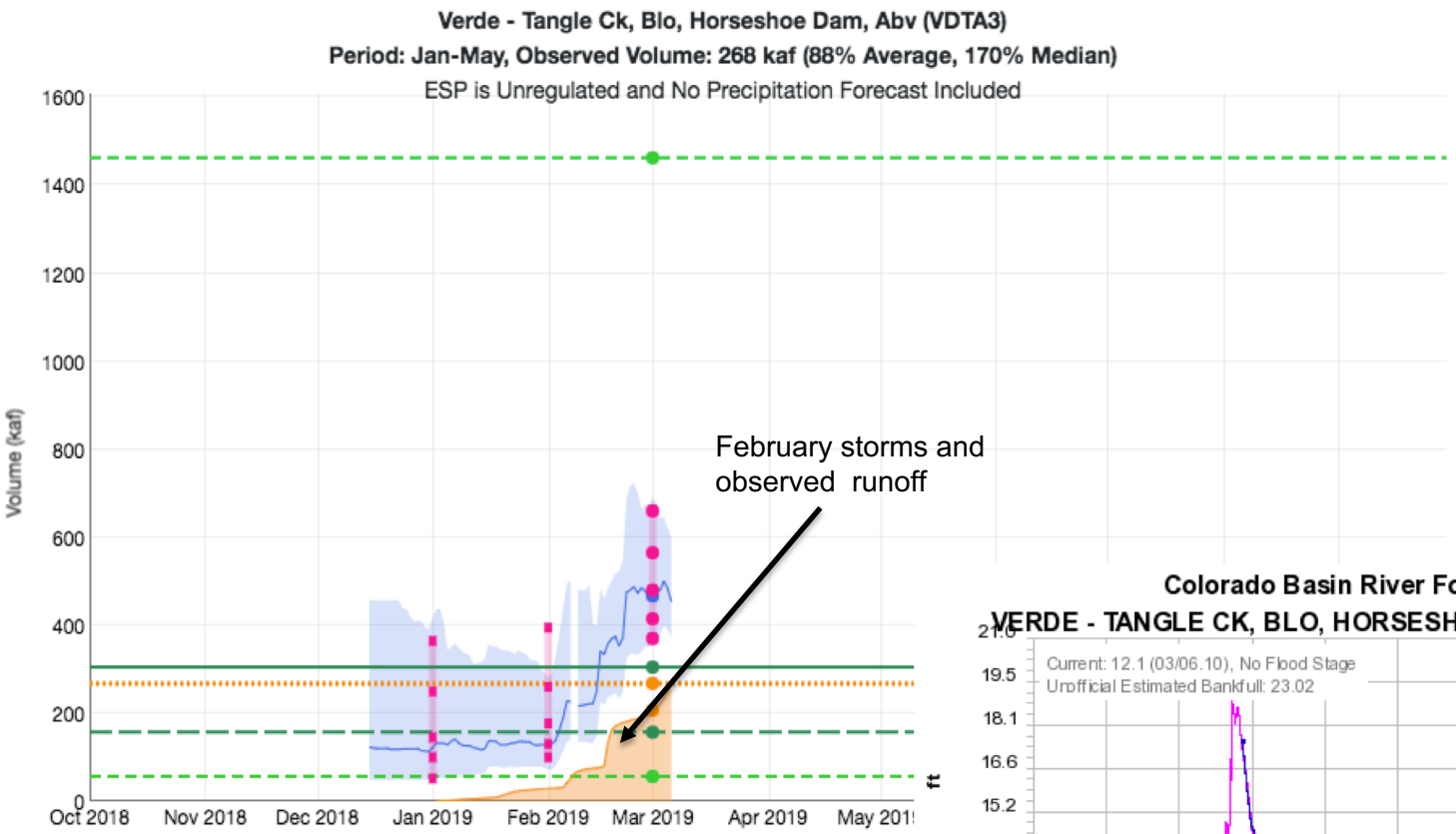
2019/03/01:
Max 1984: 15316.11
Min 2002: 963.96
Average: 7160
Median: 6470
ESP: 6700
Official 10: 10700
Official 30: 8100
Official 50: 7300
Official 70: 6610
Official 90: 5300

Since early January Lake Powell inflow forecast increased 2 million acre-feet (about a 28% of average increase)

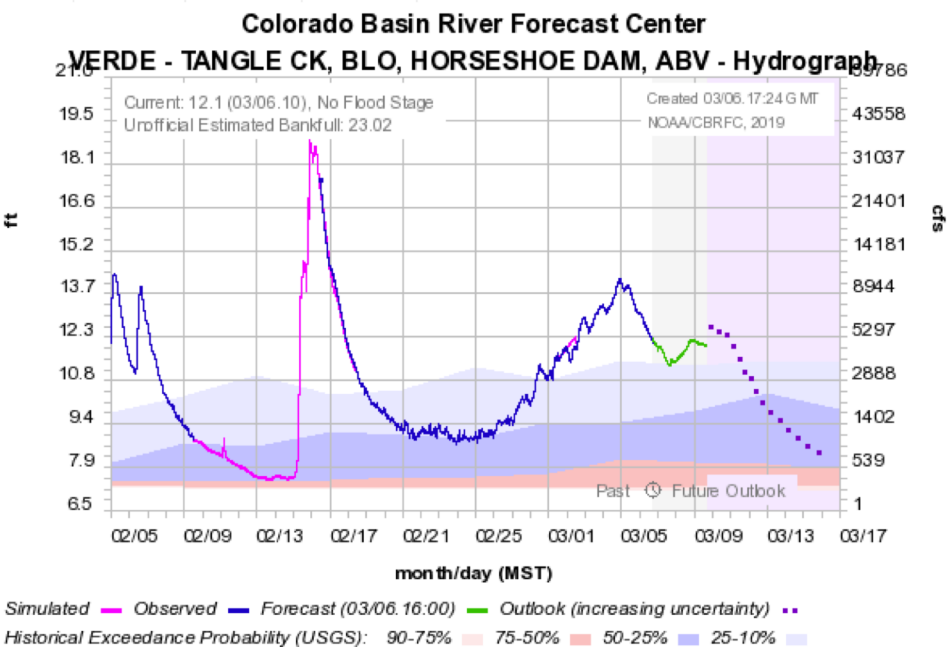
2nd highest Feb to Mar forecast increase (2.2 MAF 1993)
3rd highest month to month forecast increase (3.1 MAF Jan-Feb 2017)

Forecast Evolution Plot: Verde River (Lower Colorado Basin)

Water Supply Forecast



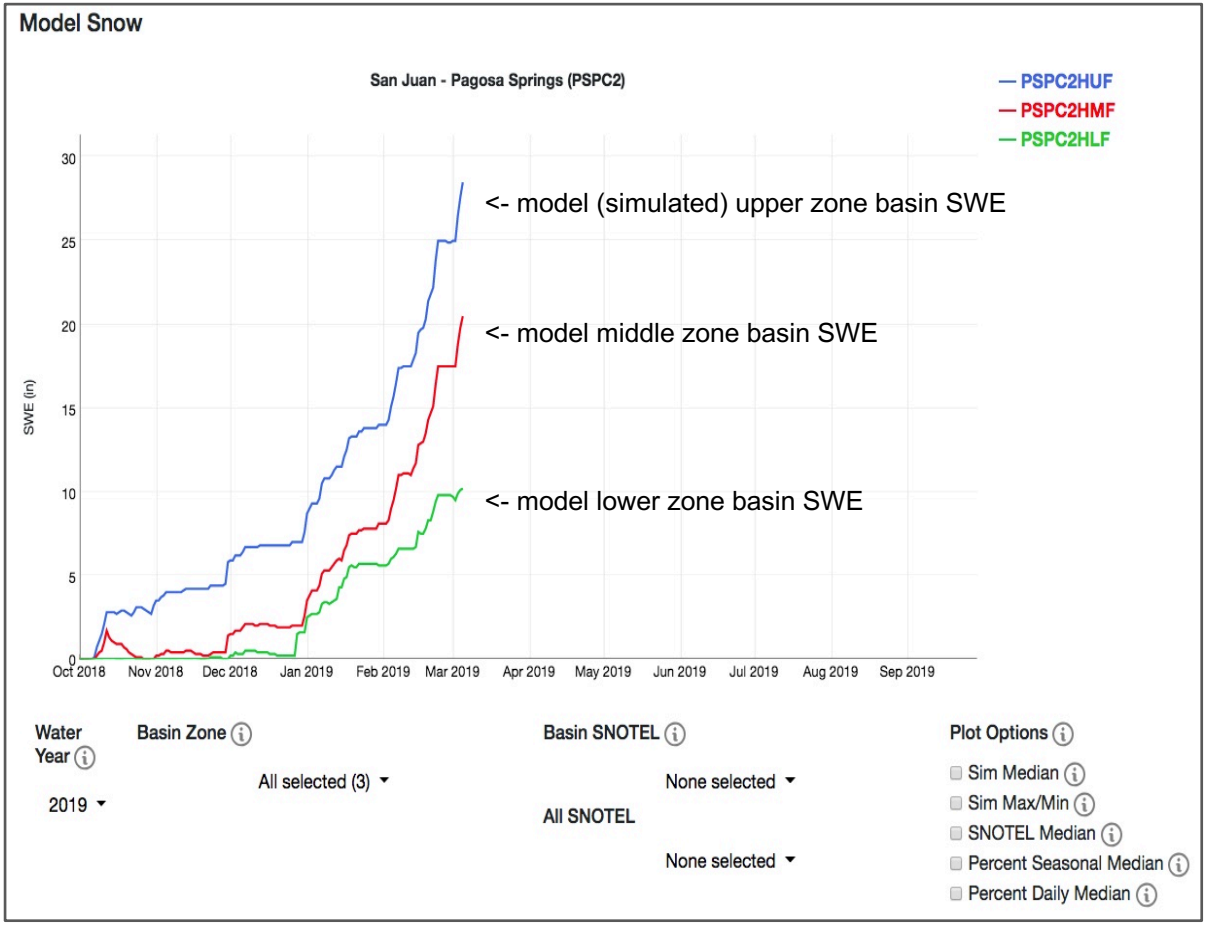
2019/03/01:
Max 1993: 1462.85
Min 2002: 56.33
Average: 305
Median: 157
Observed Accumulation: 207
Observed Total: 268
ESP: 467
Official 10: 660
Official 30: 565
Official 50: 480
Official 70: 415
Official 90: 370



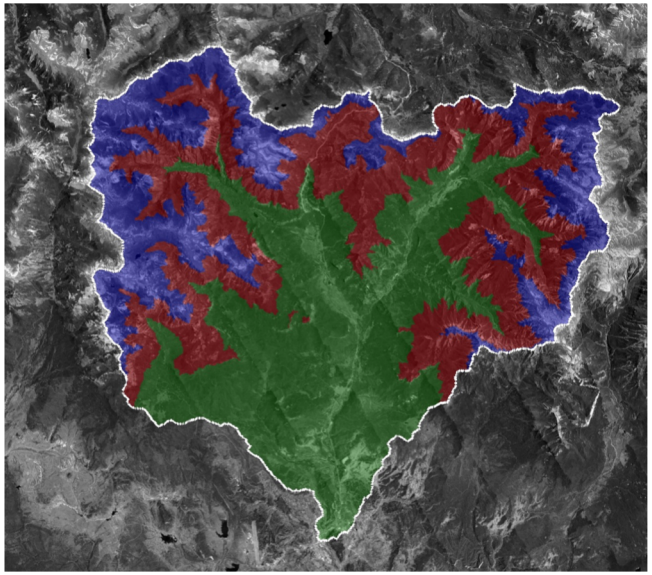
Jan-May forecast period
(Forecast 170 percent of median)

CBRFC Model Snow

Primary Goal: supplement/add transparency to streamflow forecast products



PSPC2 Basin Zone Map



<u>Basin Zone Elevation Ranges (ft)</u>

PSPC2HUF: 11,000 – 12,644

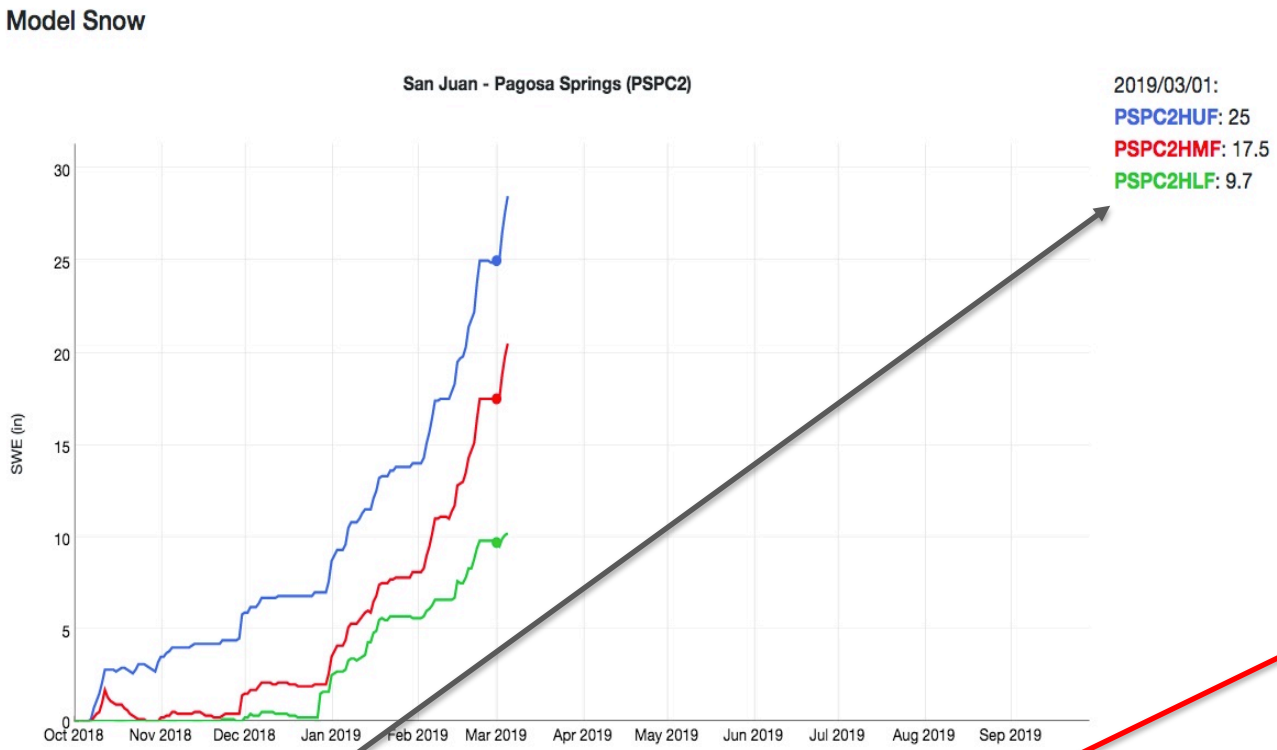
PSPC2HMF: 9,500 – 11,000

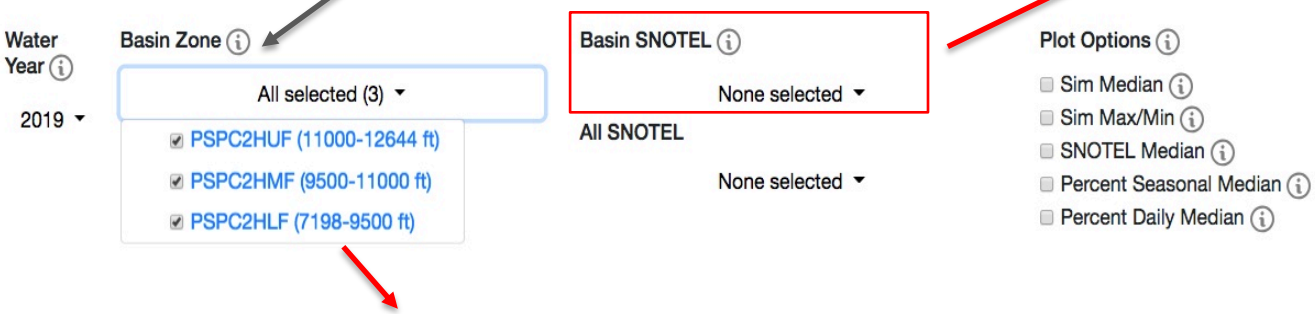
PSPC2HLF: 7,198 – 9,500

CBRFC Model Snow

PSPC2HUF:

PSPC2 = NWS ID
H = headwater basin; L = local basin
U = basin upper elevation zone; L / M / O
F = 6-hr model timestep; H = 1-hr (lower basin)



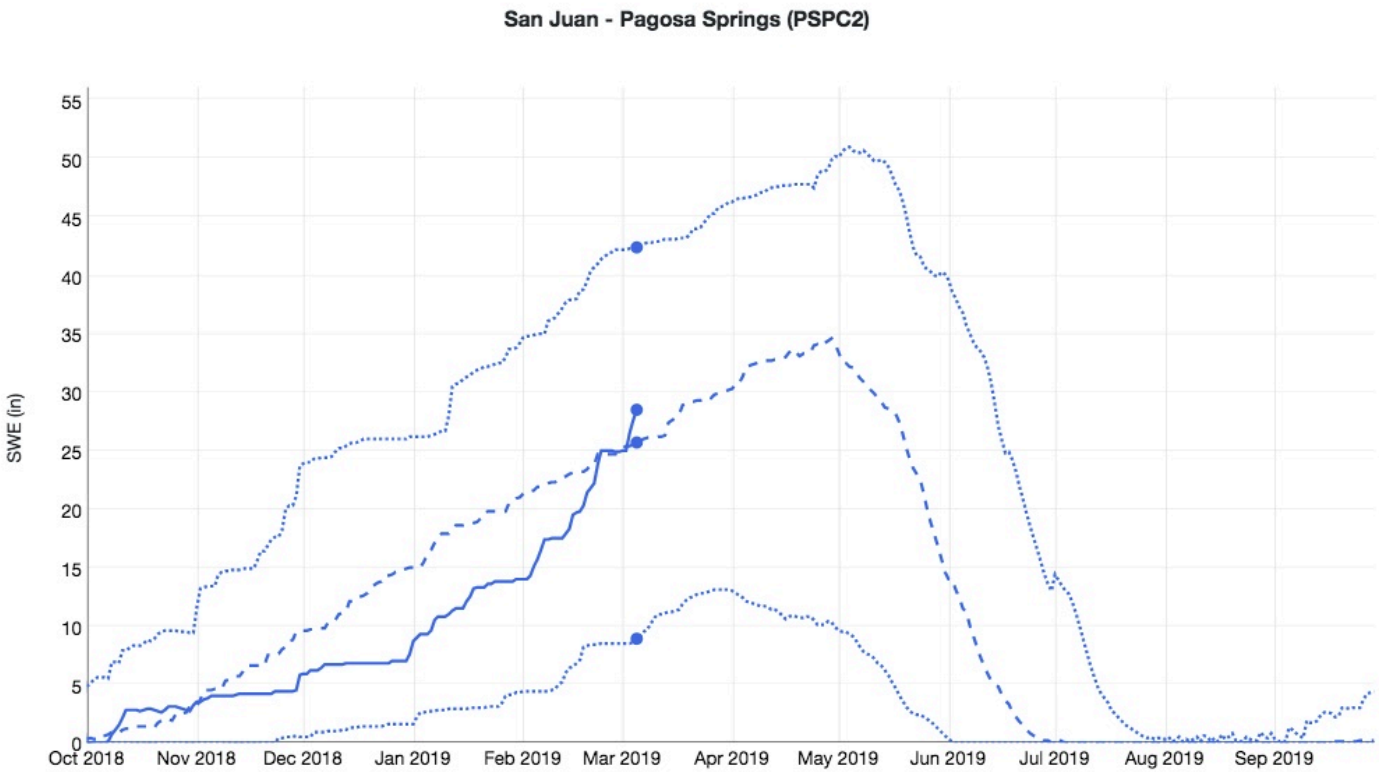


NRCS SNOTEL stations that best represent basin; determined/weighted during hydrologic model calibration process

basin zone elevation ranges

CBRFC Model Snow

Model Snow



2019/03/05:
PSPC2HUF: 28.5
PSPC2HUF Median: 25.7
PSPC2HUF Max: 42.4
PSPC2HUF Min: 8.9

Water Year
2019

Basin Zone
PSPC2HUF (11000-12644 ft)

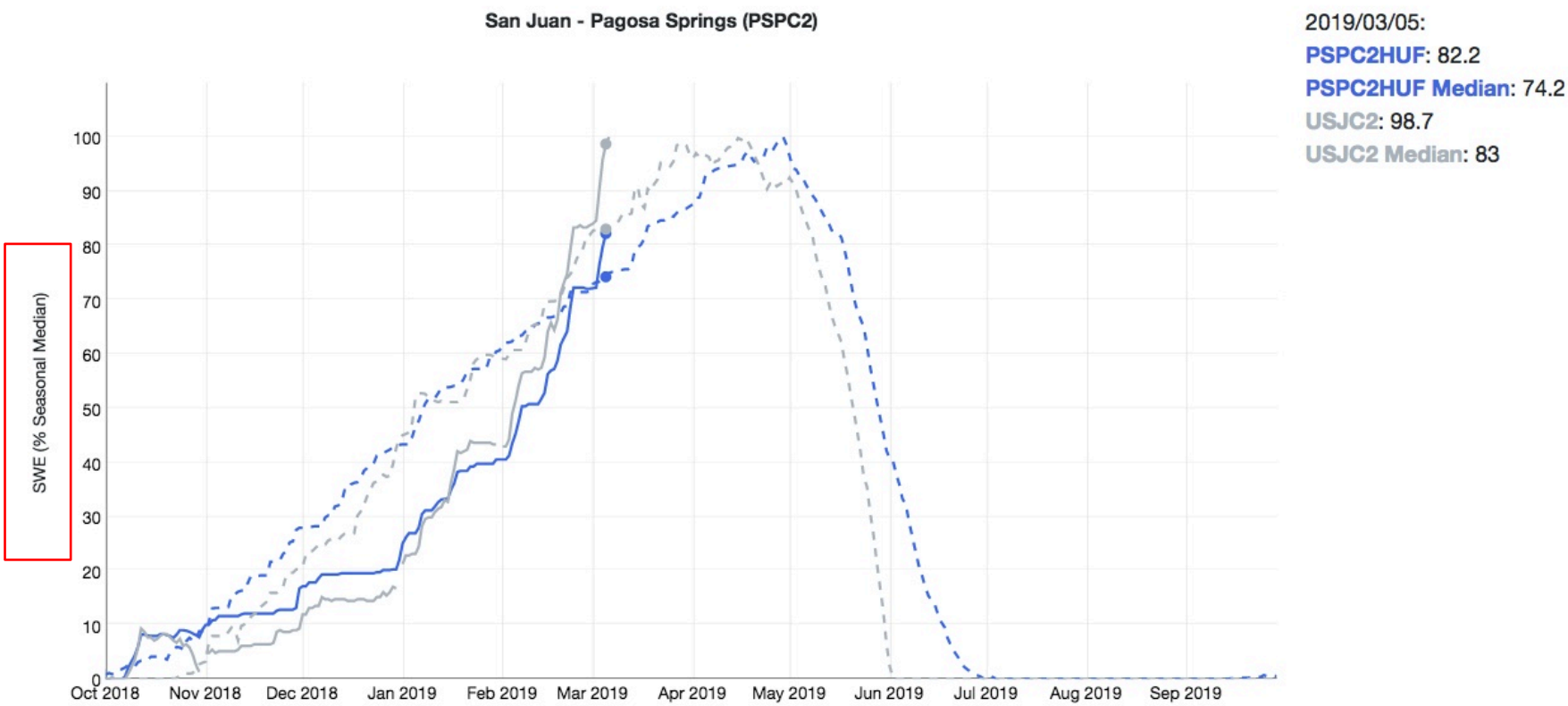
Basin SNOTEL
None selected

All SNOTEL
None selected

Plot Options
- [x] Sim Median
- [x] Sim Max/Min
- [ ] SNOTEL Median
- [ ] Percent Seasonal Median
- [ ] Percent Daily Median

CBRFC Model Snow

Model Snow



Water Year

2019

Basin Zone

PSPC2HUF (11000-12644 ft)

Basin SNOTEL

USJC2 Upper San Juan (10200 ft)

All SNOTEL

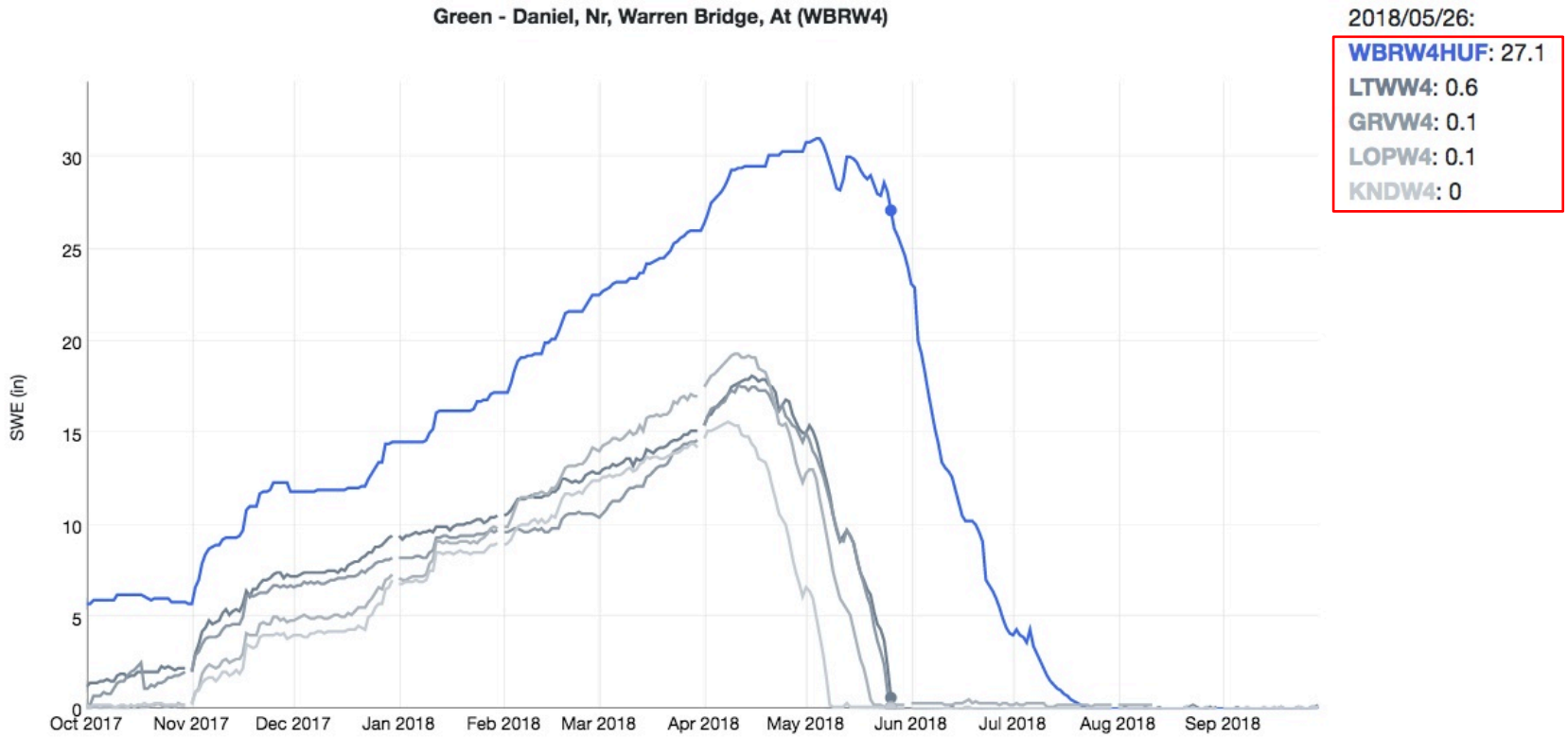
None selected

Plot Options

- [x] Sim Median
- [ ] Sim Max/Min
- [x] SNOTEL Median
- [x] Percent Seasonal Median
- [ ] Percent Daily Median

CBRFC Model Snow

Model Snow



Water Year

2018

Basin Zone

WBRW4HUF (10000-12962 ft)

Basin SNOTEL

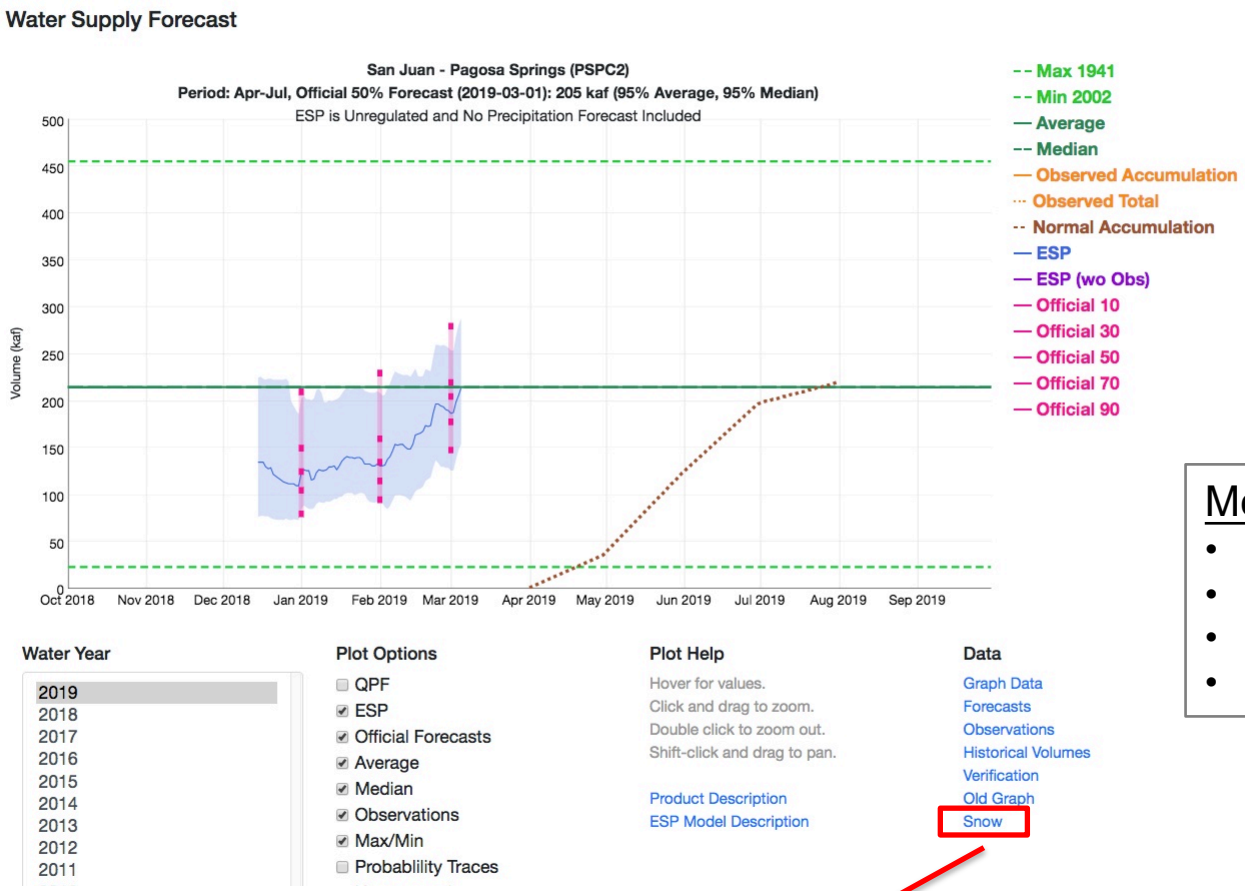
All selected (4)

- LTWW4 Little Warm (9370 ft)
- GRVW4 Gros Ventre Summit (8750 ft)
- LOPW4 Loomis Park (8240 ft)
- KNDW4 Kendall Rs (7740 ft)

Plot Options

- Sim Median
- Sim Max/Min
- SNOTEL Median
- Percent Seasonal Median
- Percent Daily Median

CBRFC Model Snow



Link to model SWE

Model Snow Future Development

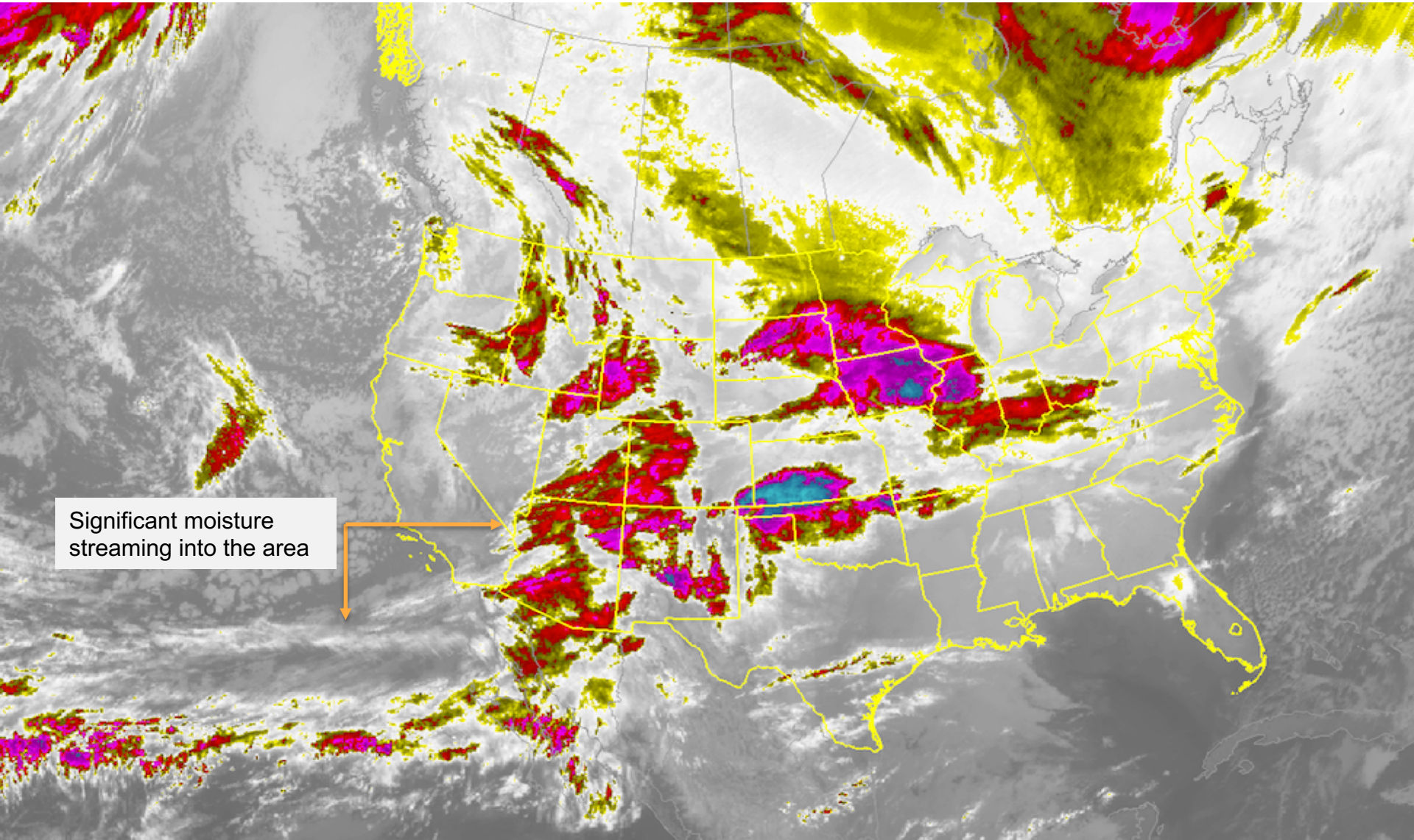
- + Plot capabilities
- Tabular component
- Spatial component
- Stakeholder/user recommendations

https://www.cbrfc.noaa.gov/dbdata/station/snowmodel/snowmodel_dg.html?id=PSPC2

*Model SWE available for all CBRFC hydrologic model basins

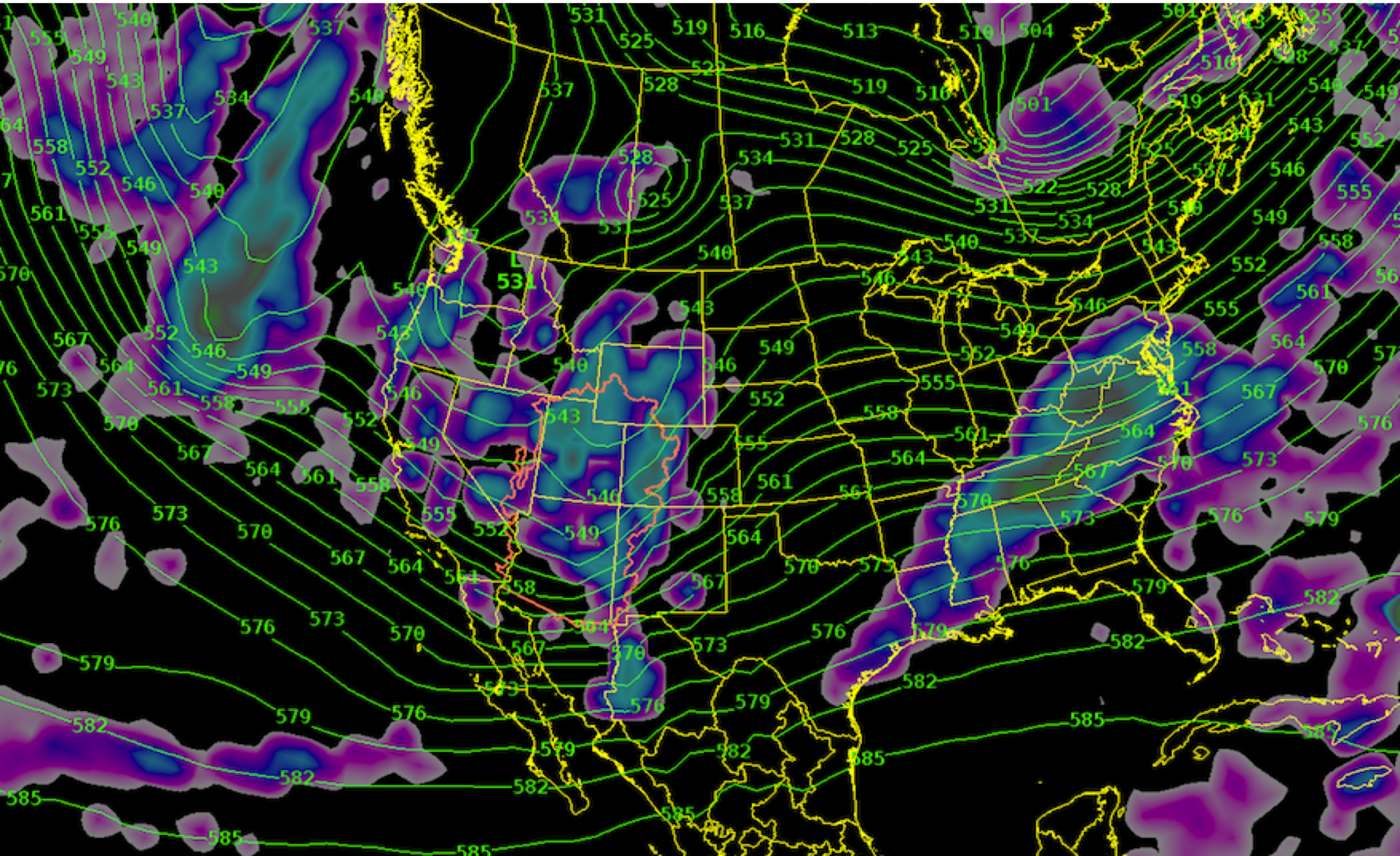
This morning – Satellite Image

The first in a series of storms is moving through the area today. This storm is another with a Pacific sub-tropical moisture source. Upwards of 2 inches of precipitation has already been observed in the last 24 hours.



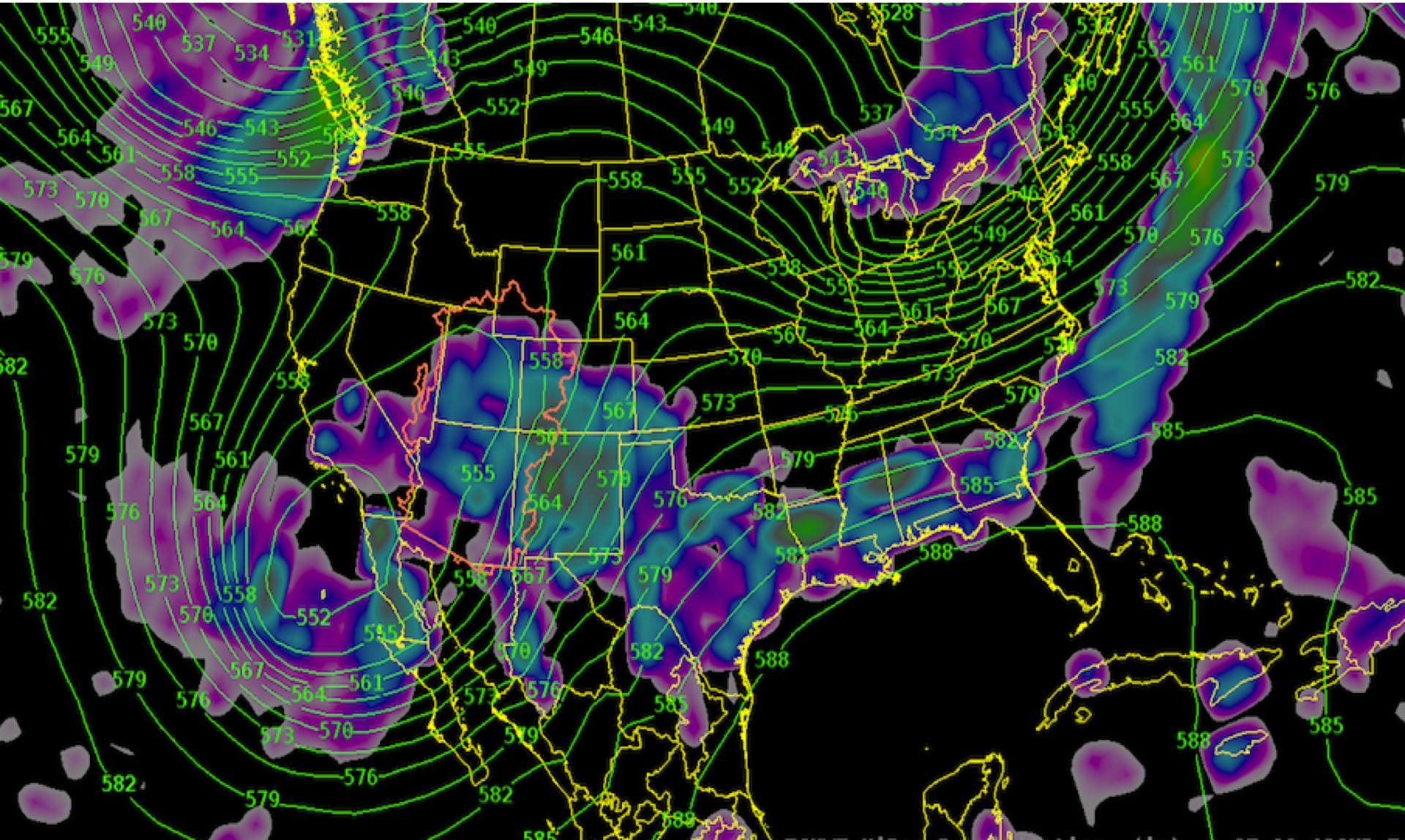
Upcoming Weather – Friday/Saturday

Another system on the heels of the first. Another system with good moisture but cooler temperatures. Snow levels will be lower with this one. Precipitation estimates .50 to 2.00 inches.



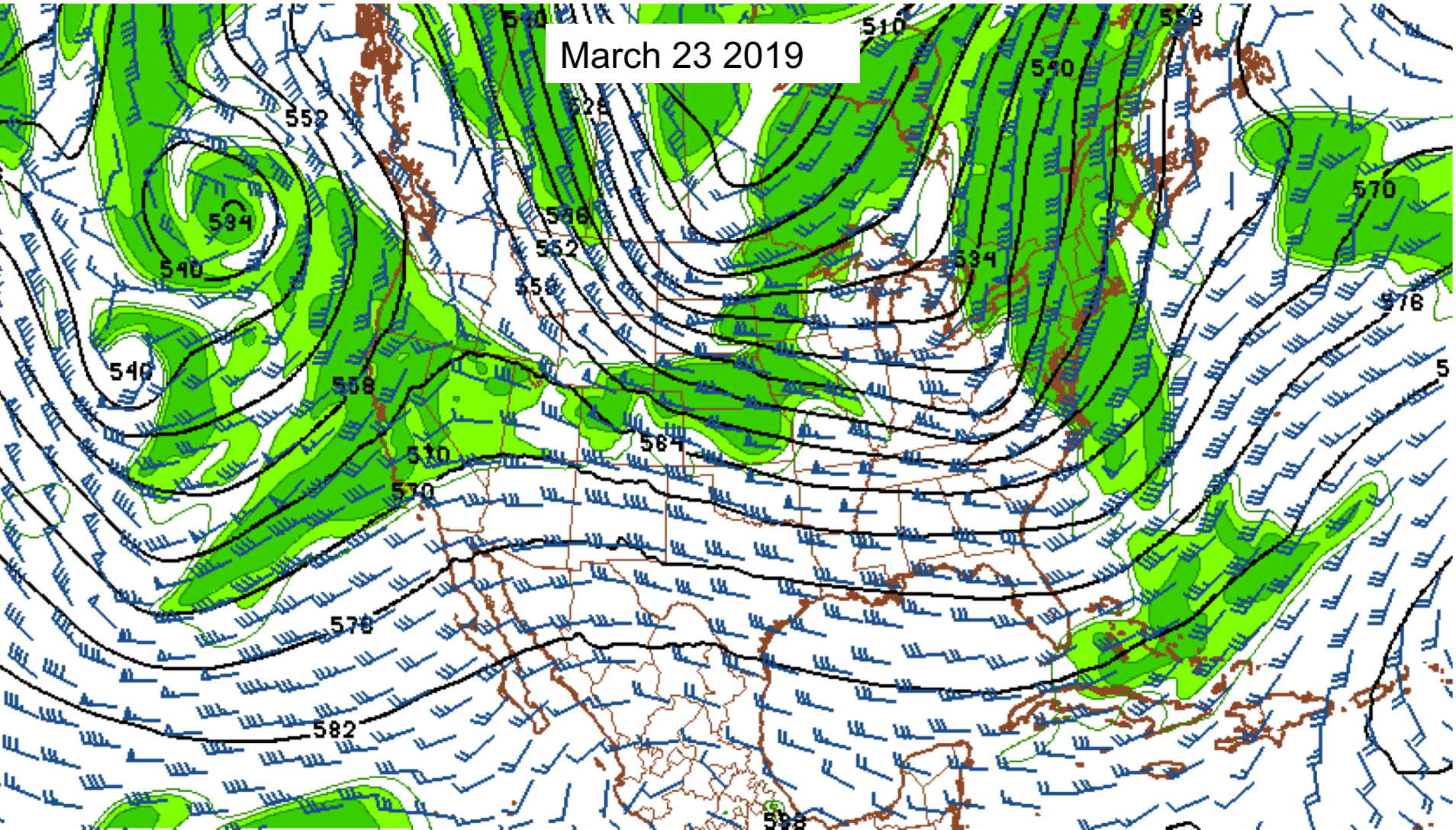
Upcoming Weather – Early next week (Mon-Tue)

A large low pressure system drops southward along the west coast. Good moisture is ejected northward prior to the system moving inland. This could be a good precipitation producer for the Lower Colorado Basin & SW Colorado depending how far south the system ends up.



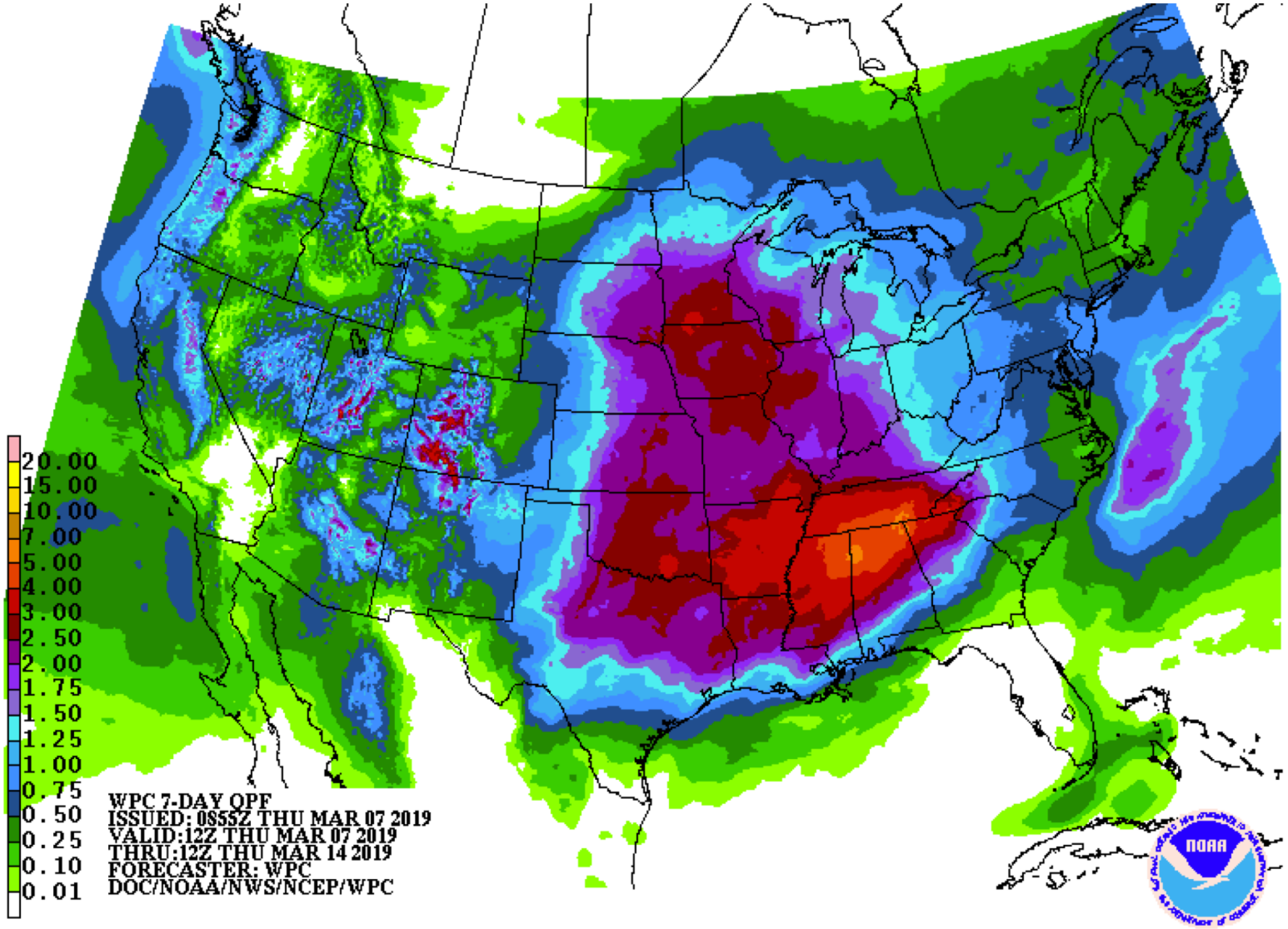
Upcoming Weather – Longer Range Possibilities - Lower Confidence

Models suggest a break in the action may occur around the March 17-22 period but they do not established a persistent ridge. The pattern remains progressive toward the end of the month with additional precipitation moving into the area. Climate models hint at near or above average April precipitation in the northern Basins (Upper Colorado and Great Basins).



Precipitation Outlook – Next 7 Days

Weather Prediction Center
Precipitation March 7th – March 14th



Future Temperatures - Below average the next couple of weeks

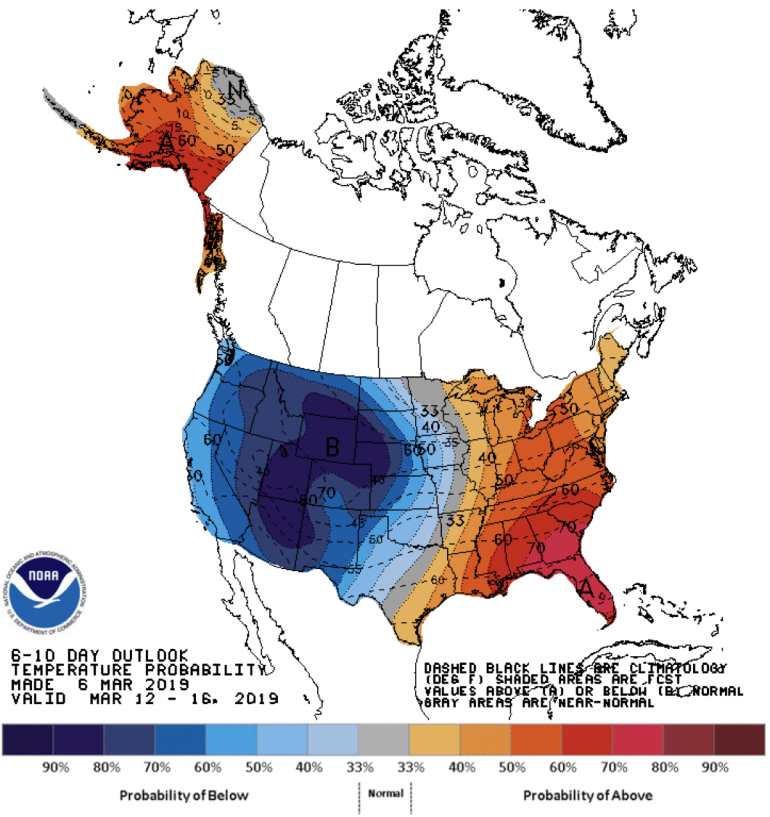
Additional precipitation likely through mid March – Storms have good Pacific moisture.

March is likely to be above average in most areas (exception may be far northern parts of the basin).

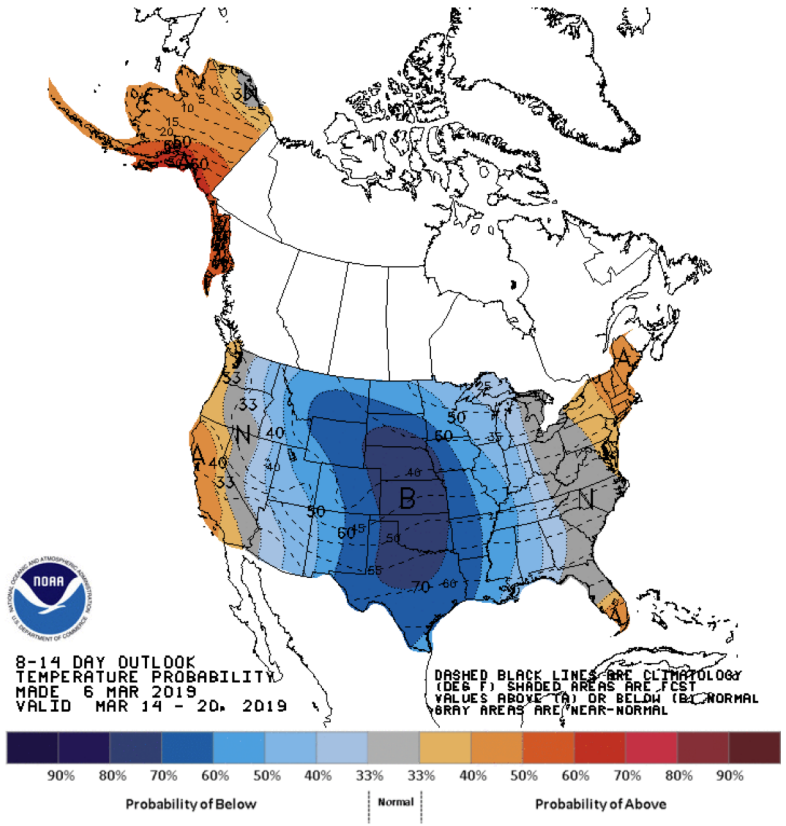
A cooler than average March should retain snowpack into April, not looking at an early melt.

Impacts to Water Supply Volume Forecasts – Increases are good bet between now and April for many upper Colorado River Basin forecast points – Yampa, San Juan, Dolores, upper Gunnison, Duchesne.

March 12-16



March 14-20



2019 water supply briefing schedule

2019 monthly water supply briefings for the Colorado Basin

Thursday April 4th @ 11 am MT

Tuesday May 7th @ 11 am MT

Great Basin webinars are same dates at 1:30 pm MT (there is one today)

Spring Runoff Peak Flow briefing for the Colorado and Great Basins

Thursday March 14th @ 1:30 pm MT

Date/Times are subject to change. All registration information has been posted to the CBRFC web page.

CBRFC Water Supply Contacts

Please contact us with any questions

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