CBRFC
March 2016
CUWCD Briefing

1 pm March 23, 2016

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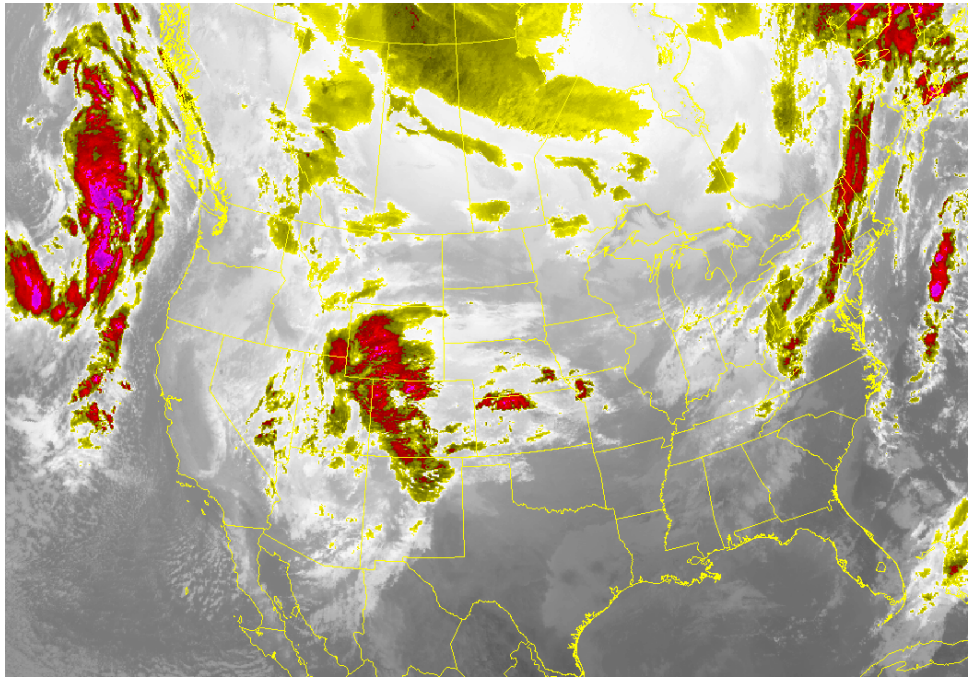
Colorado Basin River Forecast Center
National Weather Service/NOAA

Today's Presentation

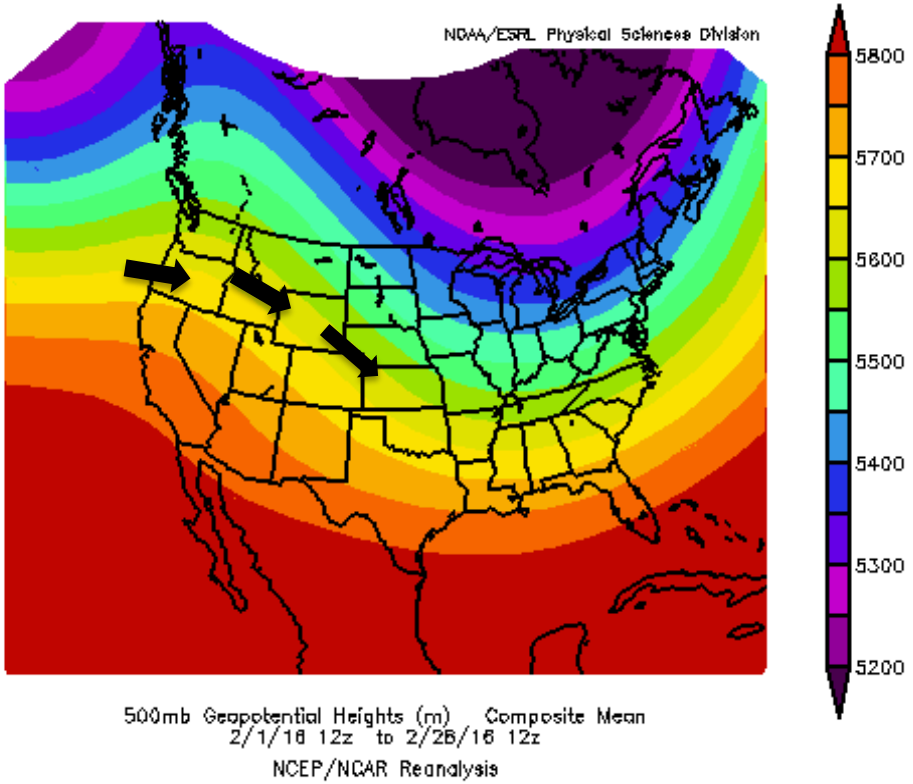
- Weather Review
  - February
  - March to date
- Current Conditions Impacting Forecasts
  - Soil Moisture (modeled)
  - Snow
- March 2016 Forecasts
  - Water Supply
  - Peak Flow
- Weather Outlooks

February 2016 Weather Pattern

February 1st Satellite Image



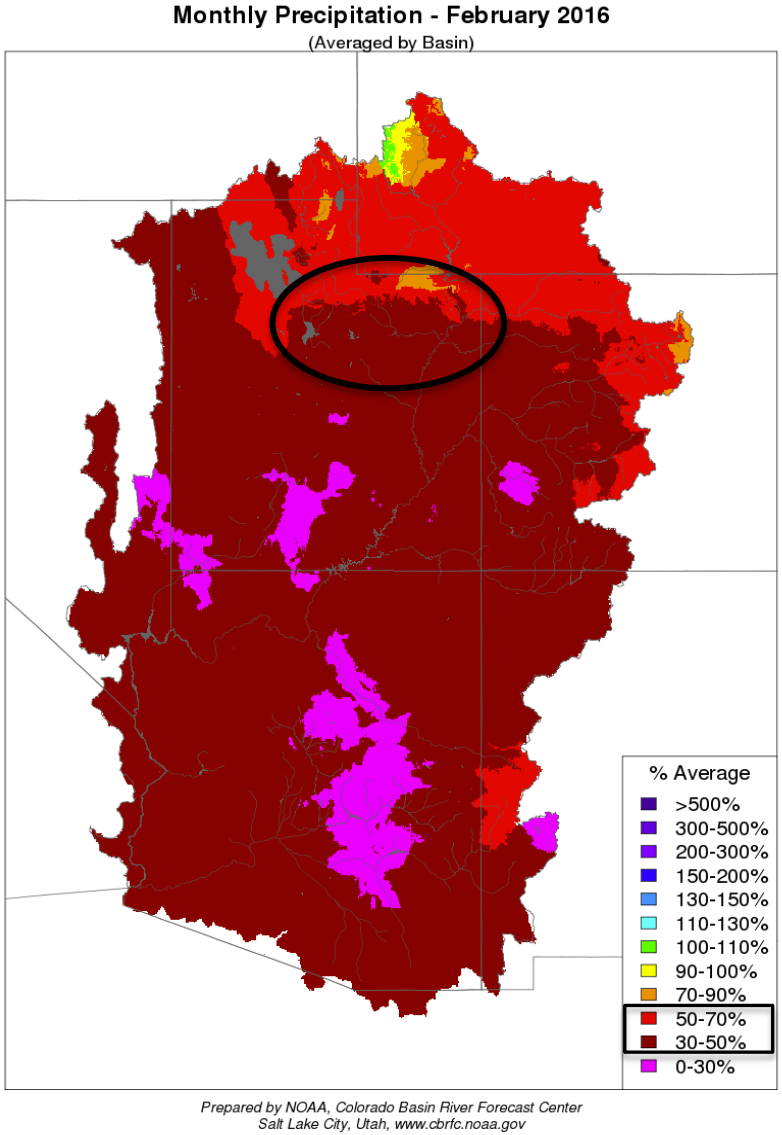
February Upper Atmosphere Pattern



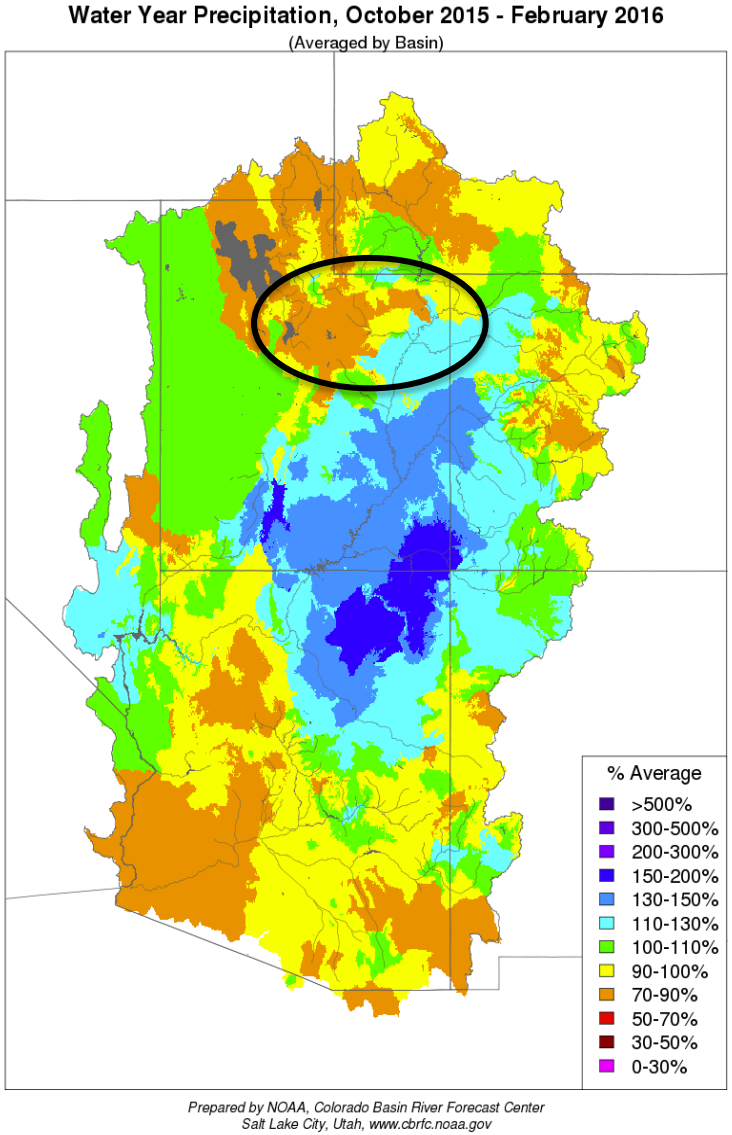
Most Feb precipitation came from just a couple of storm systems

Storms encountered a ridge of high pressure; weakened, split, produced minimal precipitation

February and Water Year 2016 Precipitation



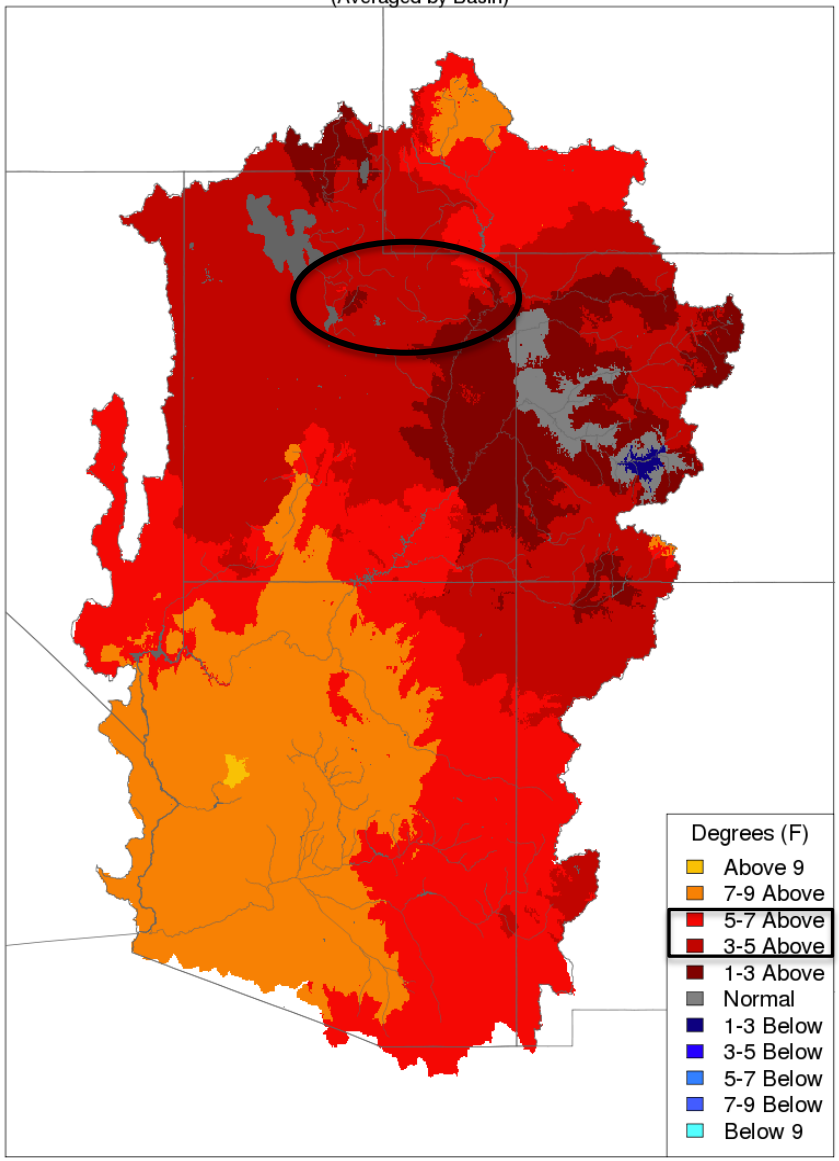
Duchesne: 50%
Provo: 45%



Duchesne: 85%
Provo: 85%

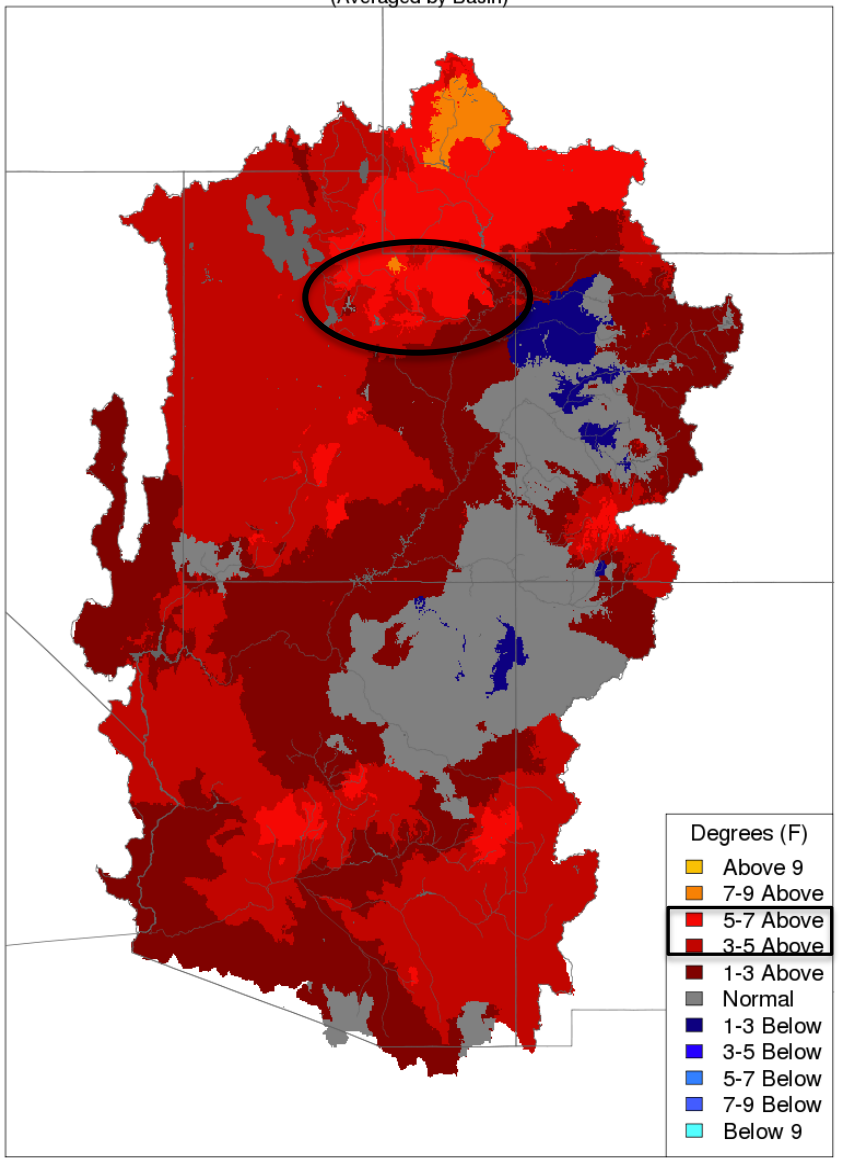
February 2016 Temperatures

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



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

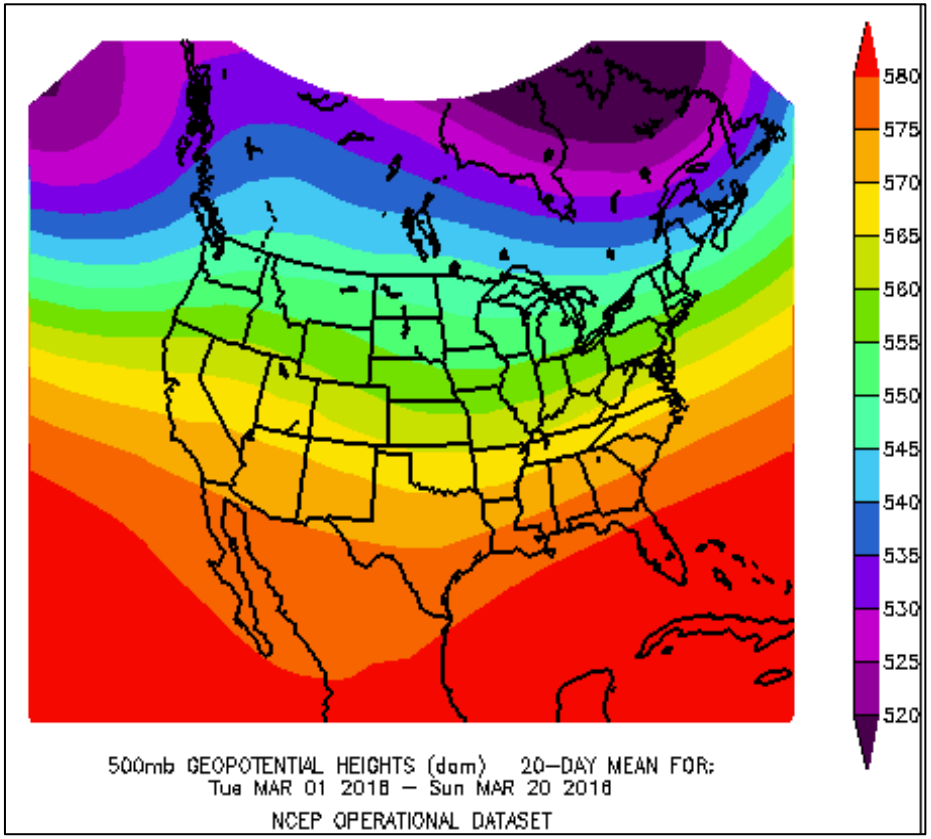
Min Temp - Monthly Deviation - February 2016
(Averaged by Basin)



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

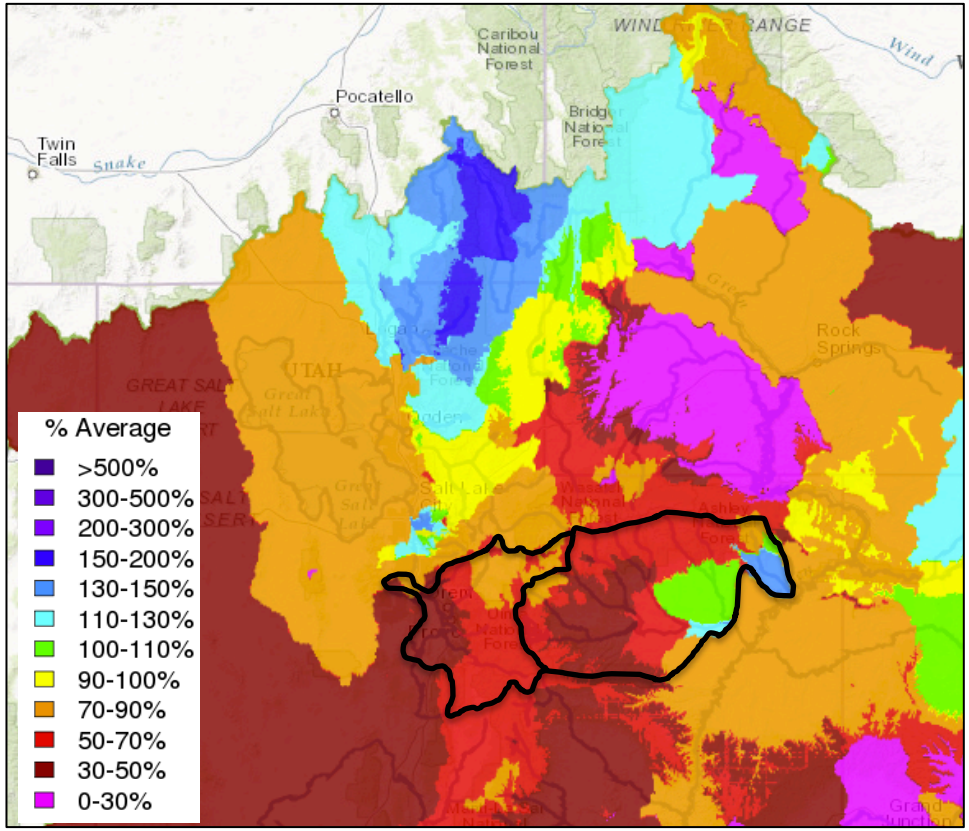
Early March 2016 Weather

Mean Upper Air Pattern



Active spring weather pattern has continued through the month.

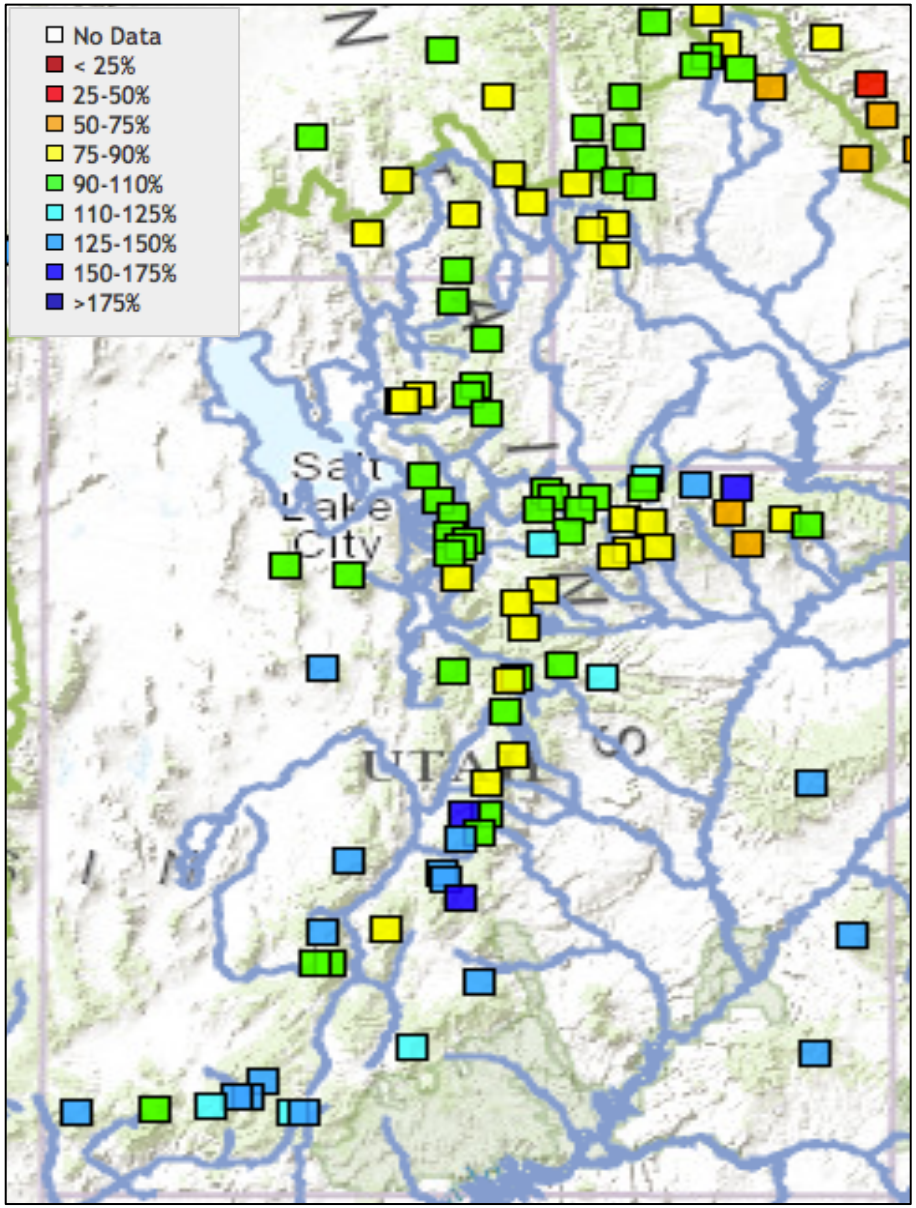
March 1-23 Precipitation



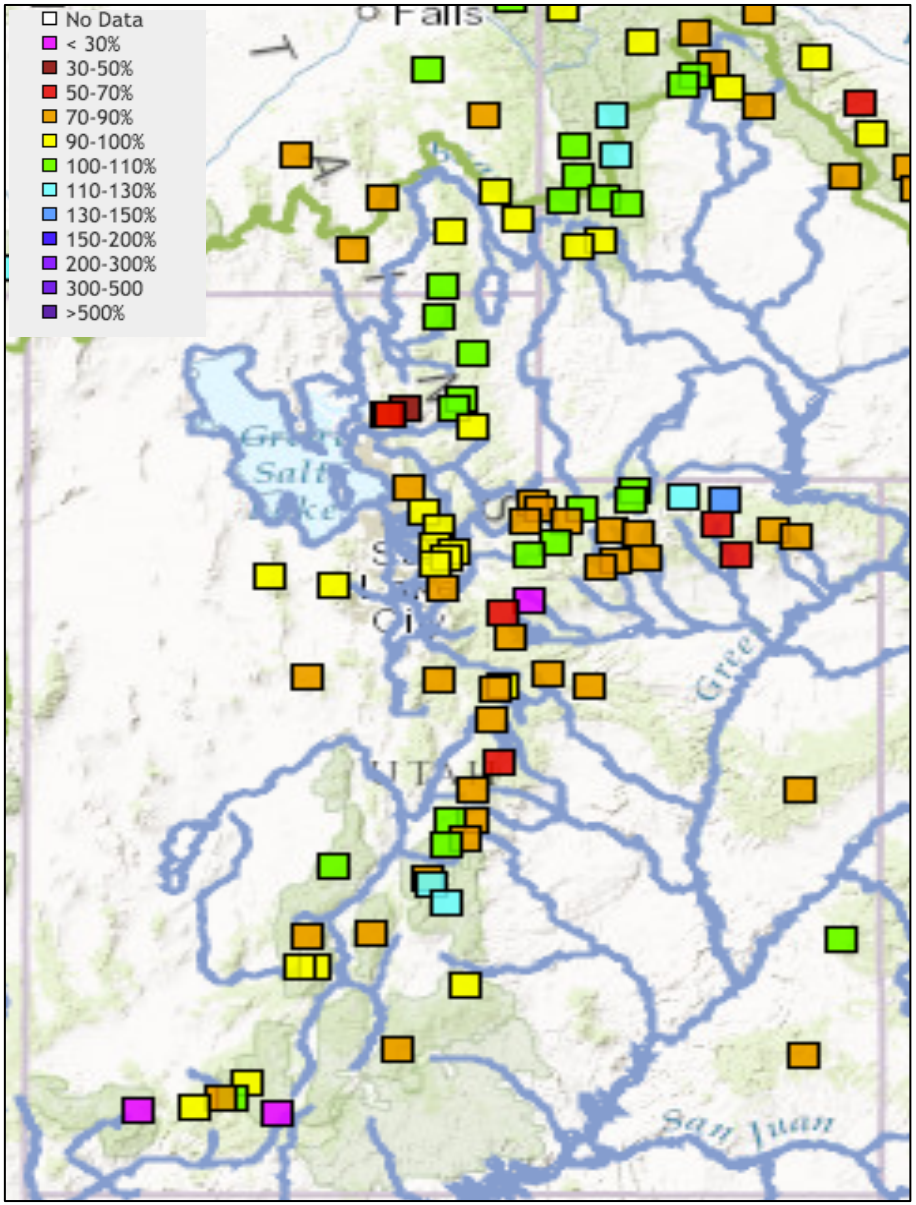
However, month to date precipitation is below average.

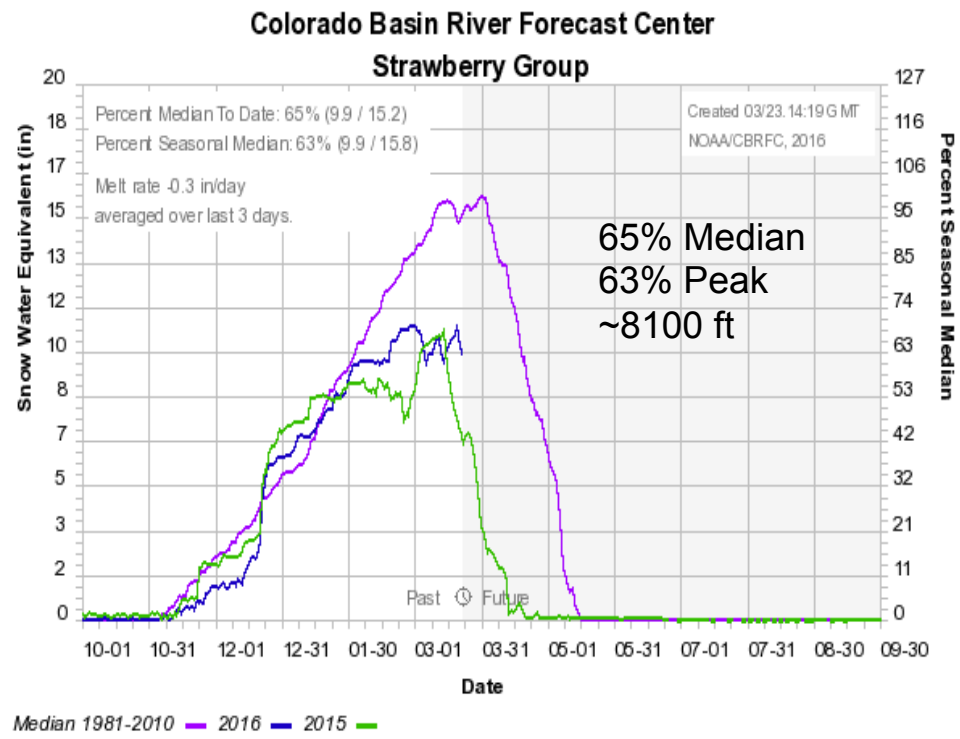
Forecast Drivers: Snow Conditions (SNOTELS)

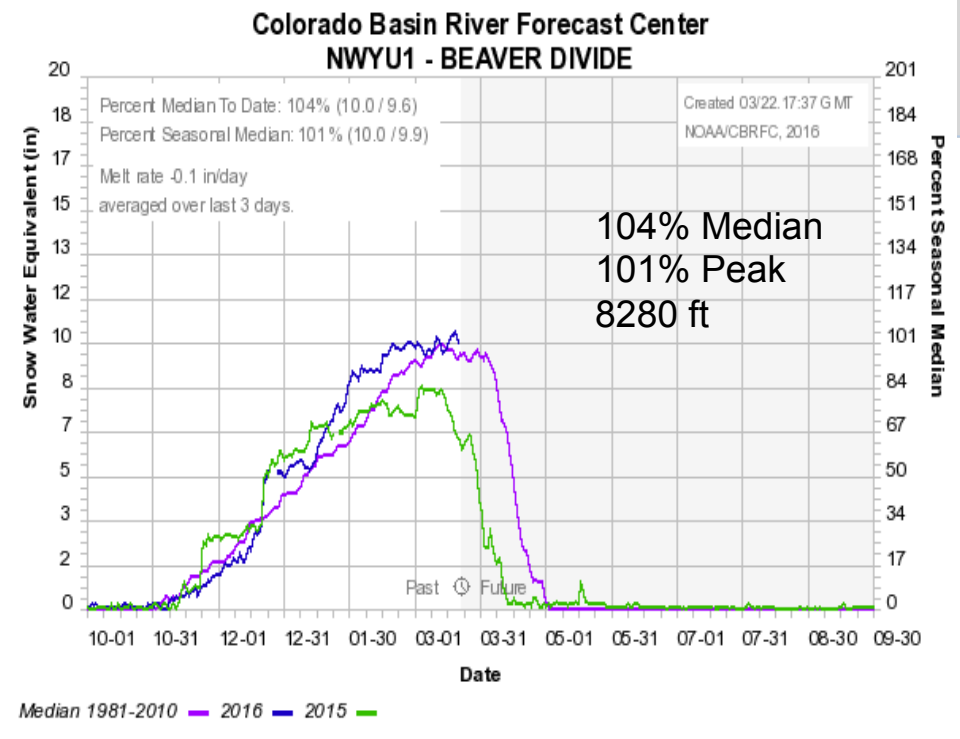
SNOW (% median): February 17 2016

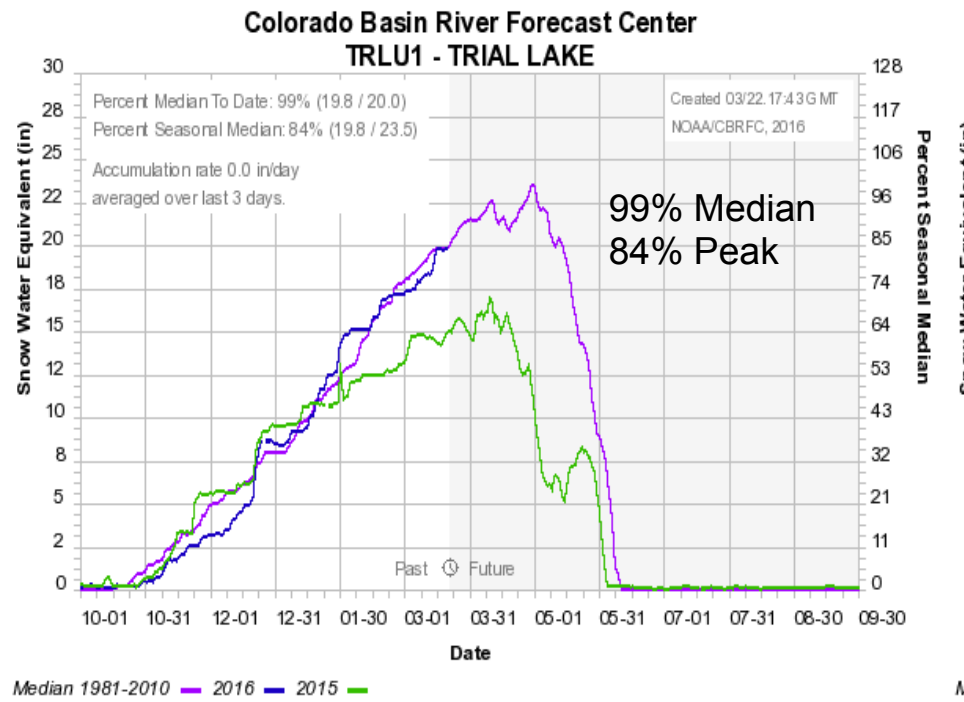


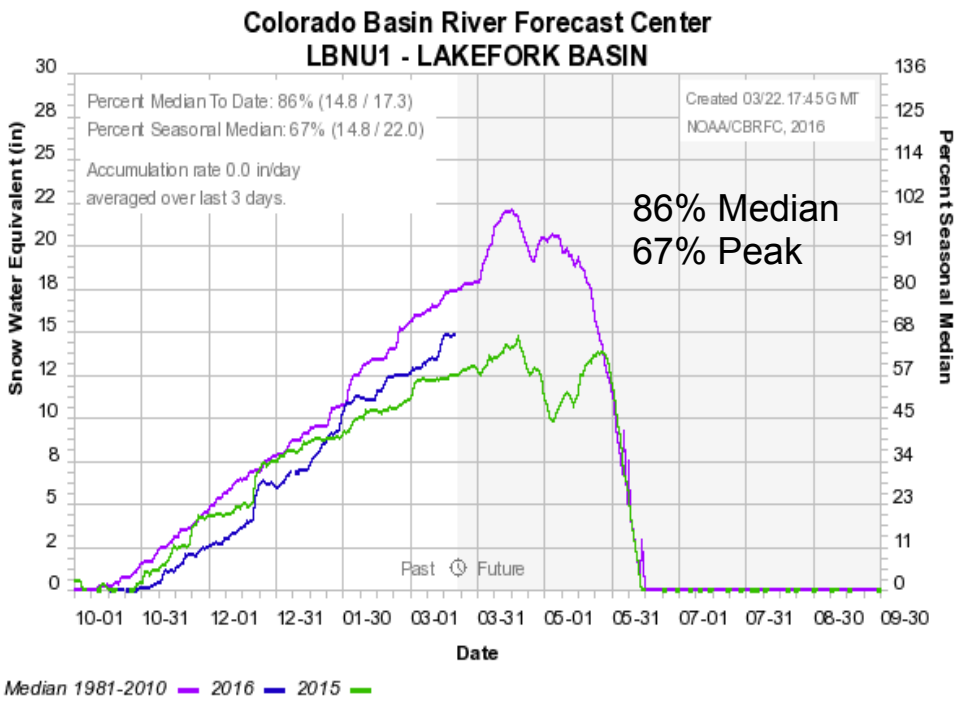
SNOW (% median): March 23 2016

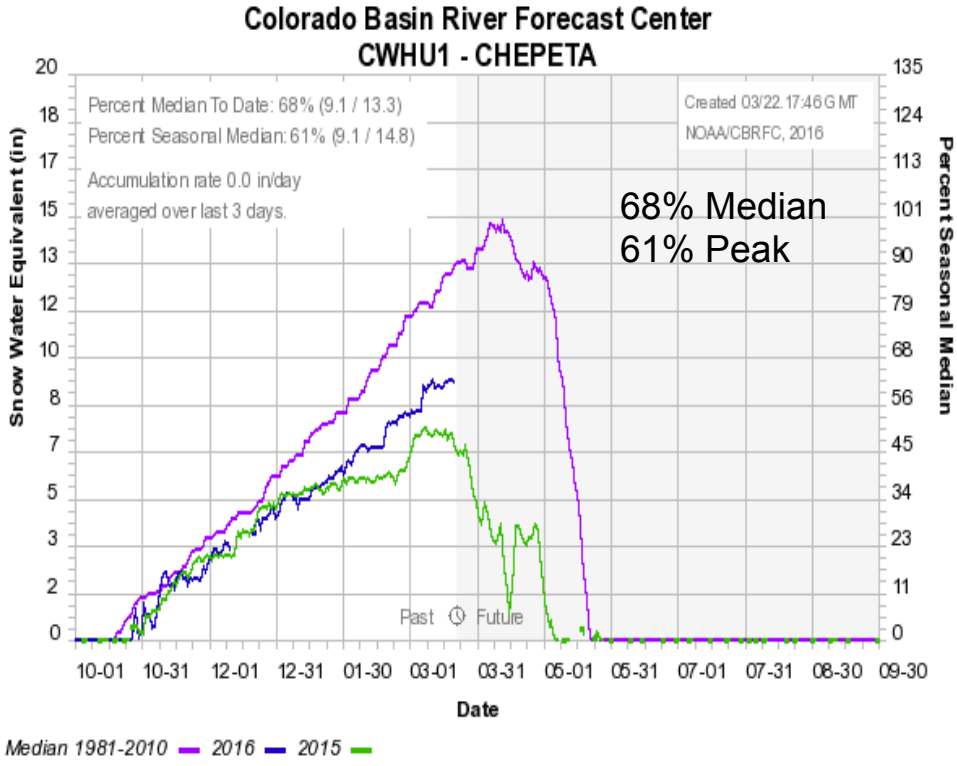


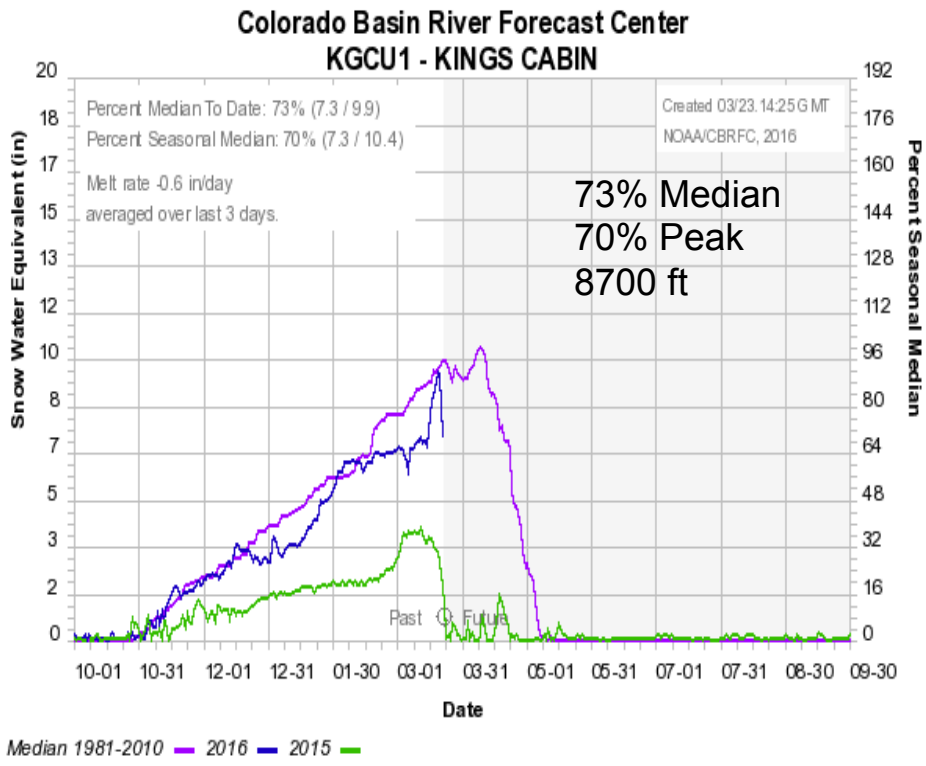

Colorado Basin River Forecast Center
Strawberry Group
Percent Median To Date: 65% (9.9 / 15.2)
Percent Seasonal Median: 63% (9.9 / 15.8)
Melt rate -0.3 in/day
averaged over last 3 days.
Created 03/23.14:19 G MT
NOAA/CBRFC, 2016
65% Median
63% Peak
~8100 ft
Past
Future
Snow Water Equivalent (in)
Percent Seasonal Median
Date
Median 1981-2010
2016
2015


Colorado Basin River Forecast Center
NWYU1 - BEAVER DIVIDE
Percent Median To Date: 104% (10.0 / 9.6)
Percent Seasonal Median: 101% (10.0 / 9.9)
Melt rate -0.1 in/day
averaged over last 3 days.
Created 03/22.17:37 G MT
NOAA/CBRFC, 2016
104% Median
101% Peak
8280 ft
Past
Future
Snow Water Equivalent (in)
Percent Seasonal Median
Date
Median 1981-2010
2016
2015


Colorado Basin River Forecast Center
TRLU1 - TRIAL LAKE
Percent Median To Date: 99% (19.8 / 20.0)
Percent Seasonal Median: 84% (19.8 / 23.5)
Accumulation rate 0.0 in/day
averaged over last 3 days.
Created 03/22.17:43 G MT
NOAA/CBRFC, 2016
99% Median
84% Peak
Past
Future
Snow Water Equivalent (in)
Percent Seasonal Median
Date
Median 1981-2010
2016
2015

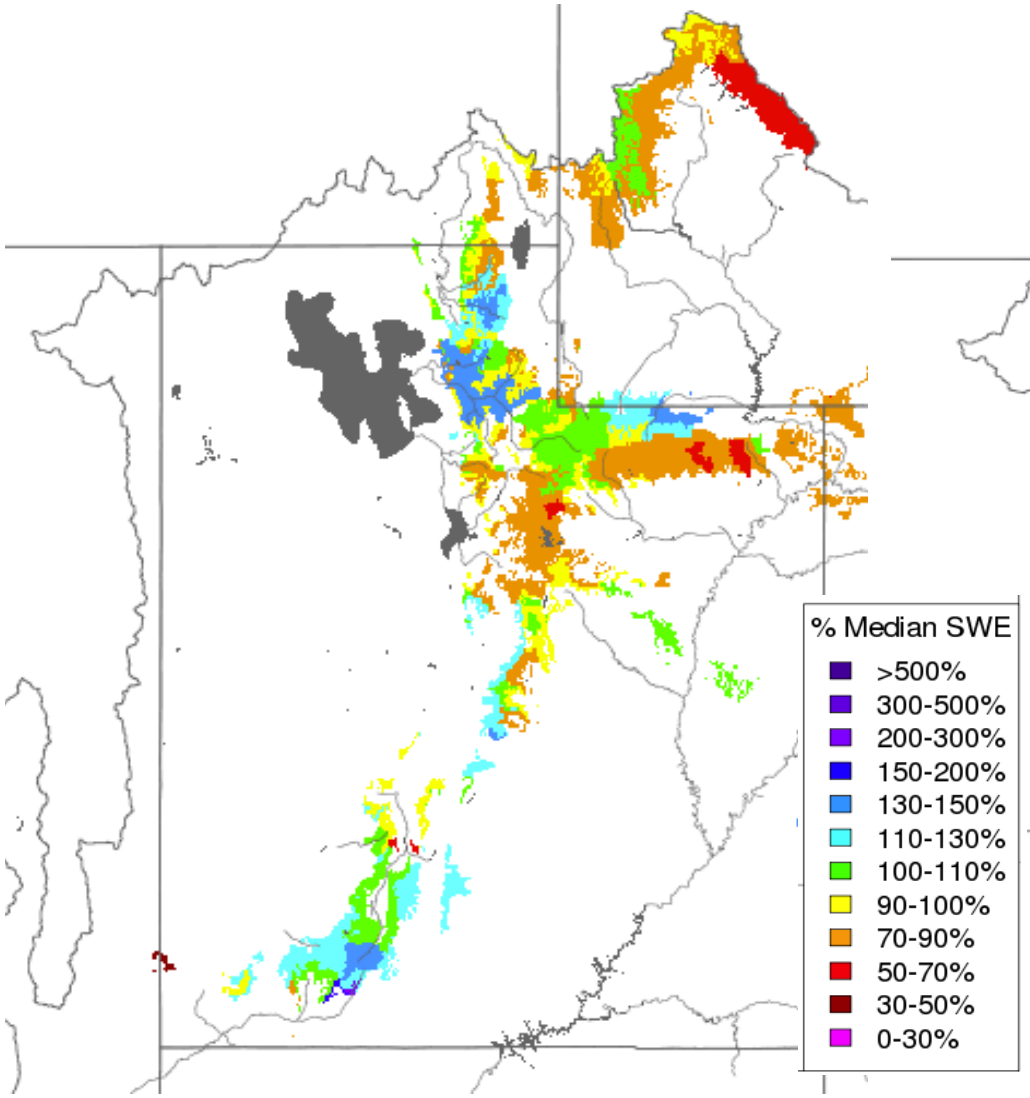

Colorado Basin River Forecast Center
LBNU1 - LAKEFORK BASIN
Percent Median To Date: 86% (14.8 / 17.3)
Percent Seasonal Median: 67% (14.8 / 22.0)
Accumulation rate 0.0 in/day
averaged over last 3 days.
Created 03/22.17:45 G MT
NOAA/CBRFC, 2016
86% Median
67% Peak
Past
Future
Snow Water Equivalent (in)
Percent Seasonal Median
Date
Median 1981-2010
2016
2015


Colorado Basin River Forecast Center
CWHU1 - CHEPETA
Percent Median To Date: 68% (9.1 / 13.3)
Percent Seasonal Median: 61% (9.1 / 14.8)
Accumulation rate 0.0 in/day
averaged over last 3 days.
Created 03/22.17:46 G MT
NOAA/CBRFC, 2016
68% Median
61% Peak
Past
Future
Snow Water Equivalent (in)
Percent Seasonal Median
Date
10-01 10-31 12-01 12-31 01-30 03-01 03-31 05-01 05-31 07-01 07-31 08-30 09-30
Median 1981-2010
2016
2015

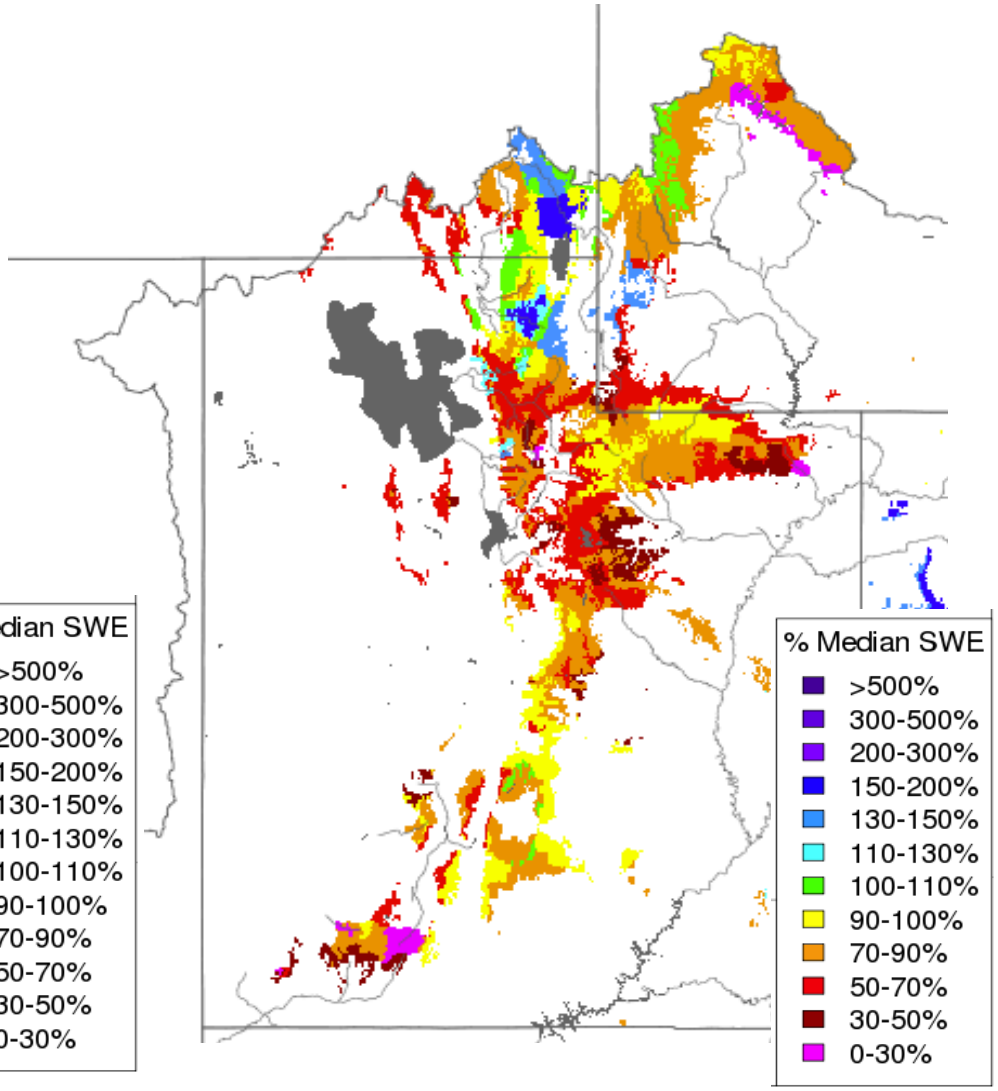

Colorado Basin River Forecast Center
KGCU1 - KINGS CABIN
Percent Median To Date: 73% (7.3 / 9.9)
Percent Seasonal Median: 70% (7.3 / 10.4)
Melt rate -0.6 in/day
averaged over last 3 days.
Created 03/23.14:25 G MT
NOAA/CBRFC, 2016
73% Median
70% Peak
8700 ft
Past
Future
Snow Water Equivalent (in)
Percent Seasonal Median
Date
10-01 10-31 12-01 12-31 01-30 03-01 03-31 05-01 05-31 07-01 07-31 08-30 09-30
Median 1981-2010
2016
2015

Forecast Drivers: Snow - CBRFC Hydro Model

Feb 17th 2016
Significant Runoff Areas

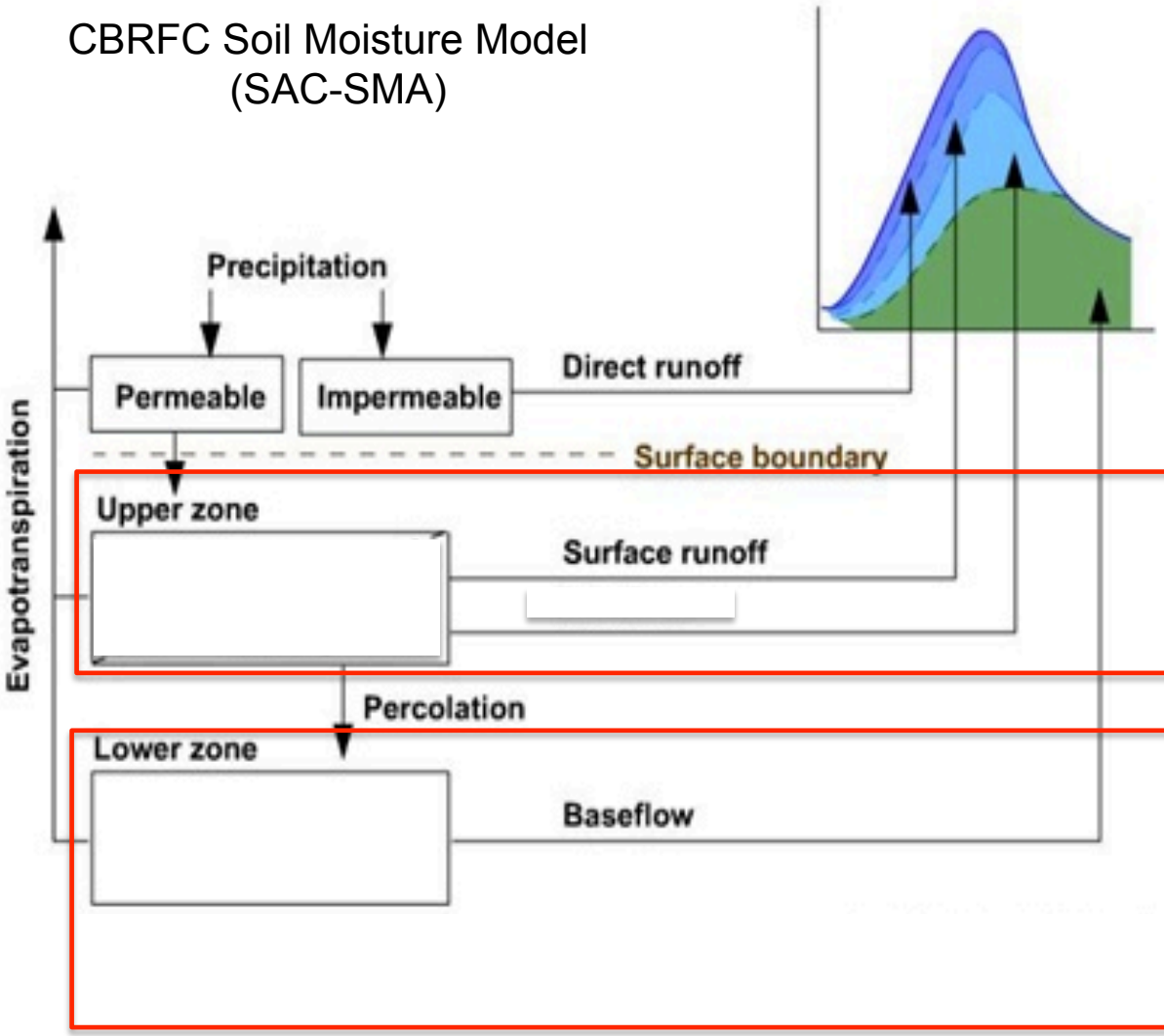


Mar 22th 2016
Significant Runoff Areas



Forecast Drivers: Soil Moisture

CBRFC Soil Moisture Model
(SAC-SMA)



SAC-SMA Model

- 20 Model Parameters
- Parameters determined in calibration
- Hydrograph analysis
- Historical observed data

Upper Zone

-Active, permeable layer near surface
-Source of most storm runoff
-Time Delay=Days

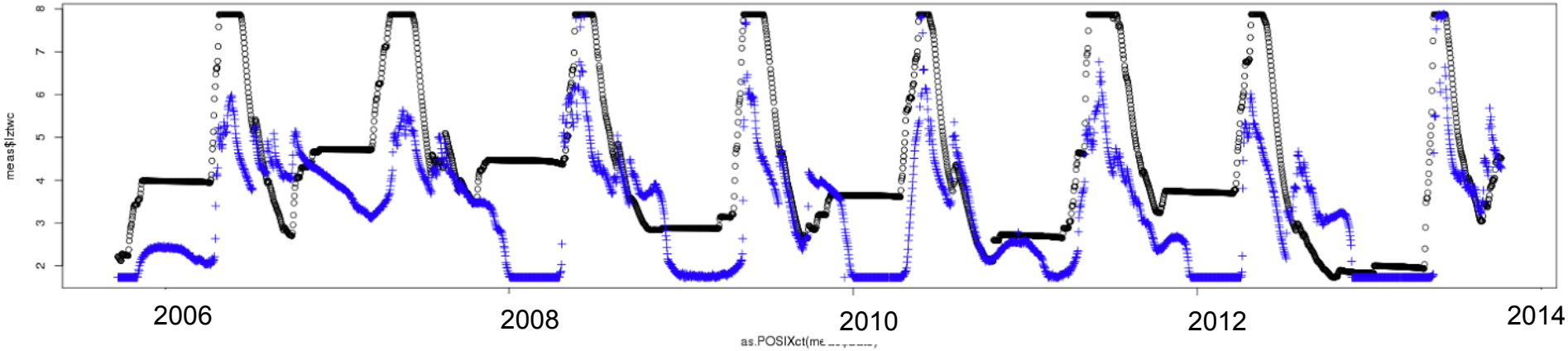
Lower Zone

-Deep soil layer
-Source of baseflow
  -Supplemental (weeks)
  -Primary (months/years)
-IMPACTS SPRING RUNOFF

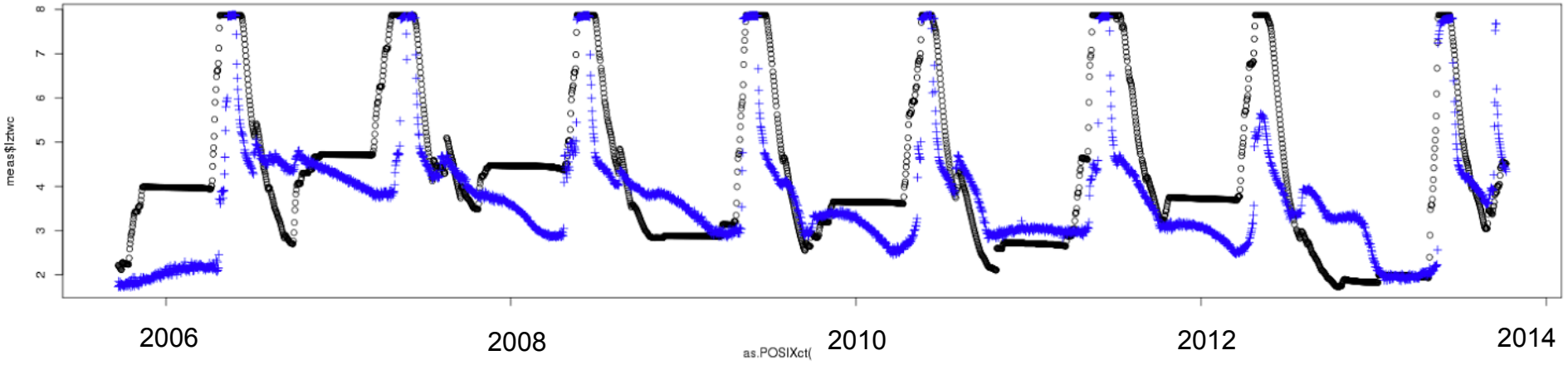
NRCS Soil moisture sensors?

NRCS vs CBRFC Soil Moisture

HOOSIER PASS 20 inch (blue): NRCS
BLUE RIVER AT BLUE RIVER LOWER ZONE (black): CBRFC



HOOSIER PASS 40 inch (blue): NRCS
BLUE RIVER AT BLUE RIVER LOWER ZONE (black): CBRFC

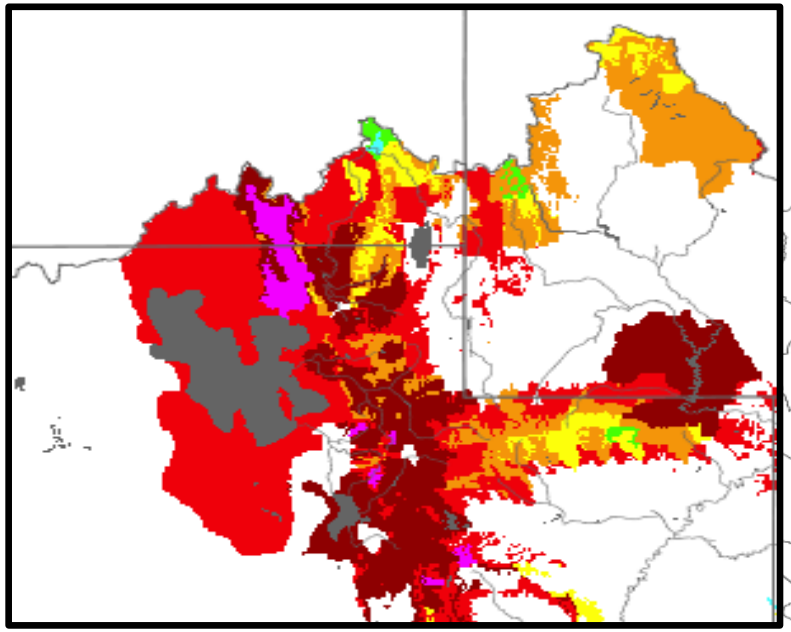


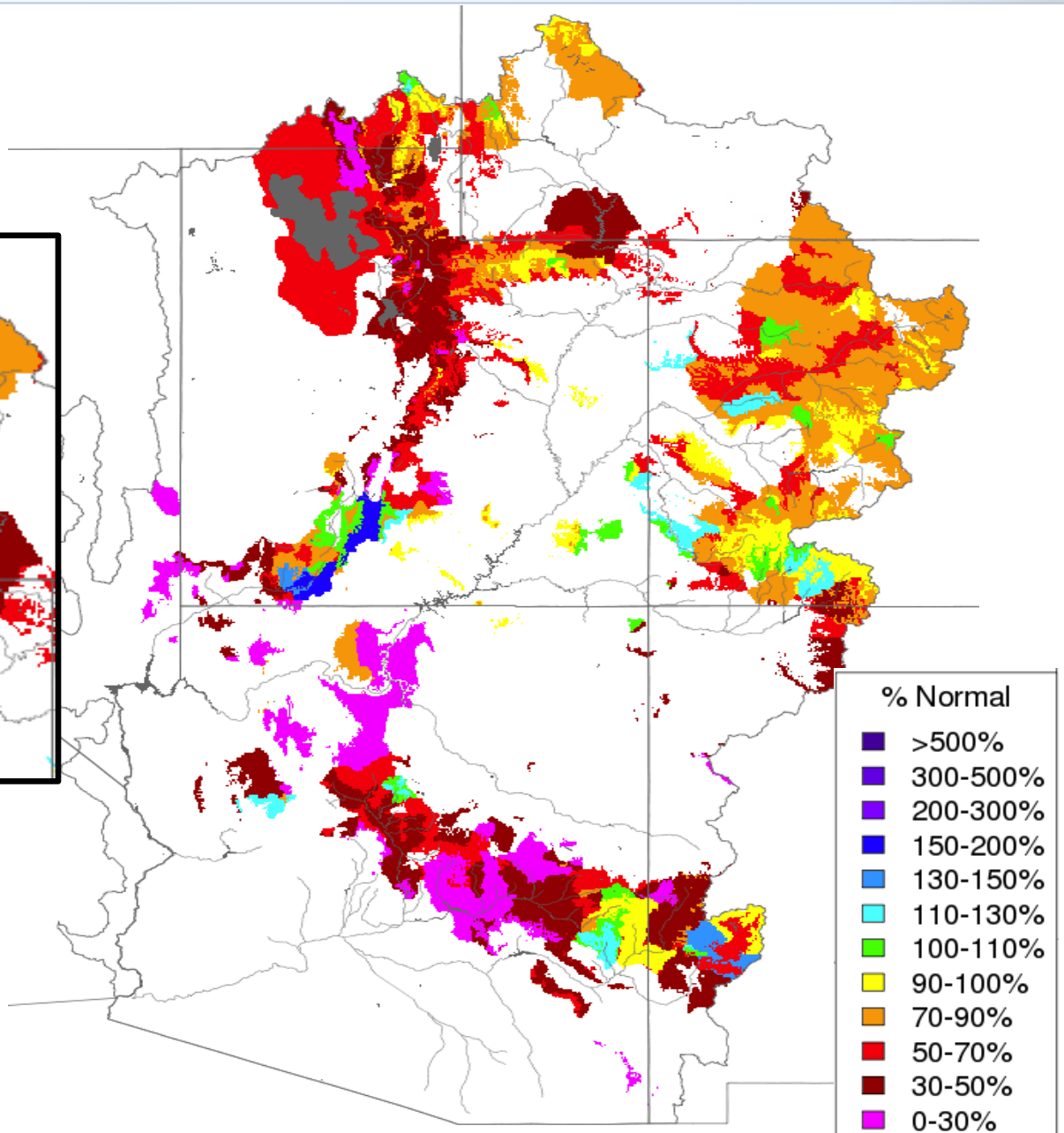
1. 40 inch NRCS sensors better correlated with CBRFC modeled soil moisture than 20 inch sensor
2. Limited amount of 40 inch sensors, none in the Duchesne

Forecast Drivers: Fall Soil Moisture

Soil Moisture (Lower Zone)

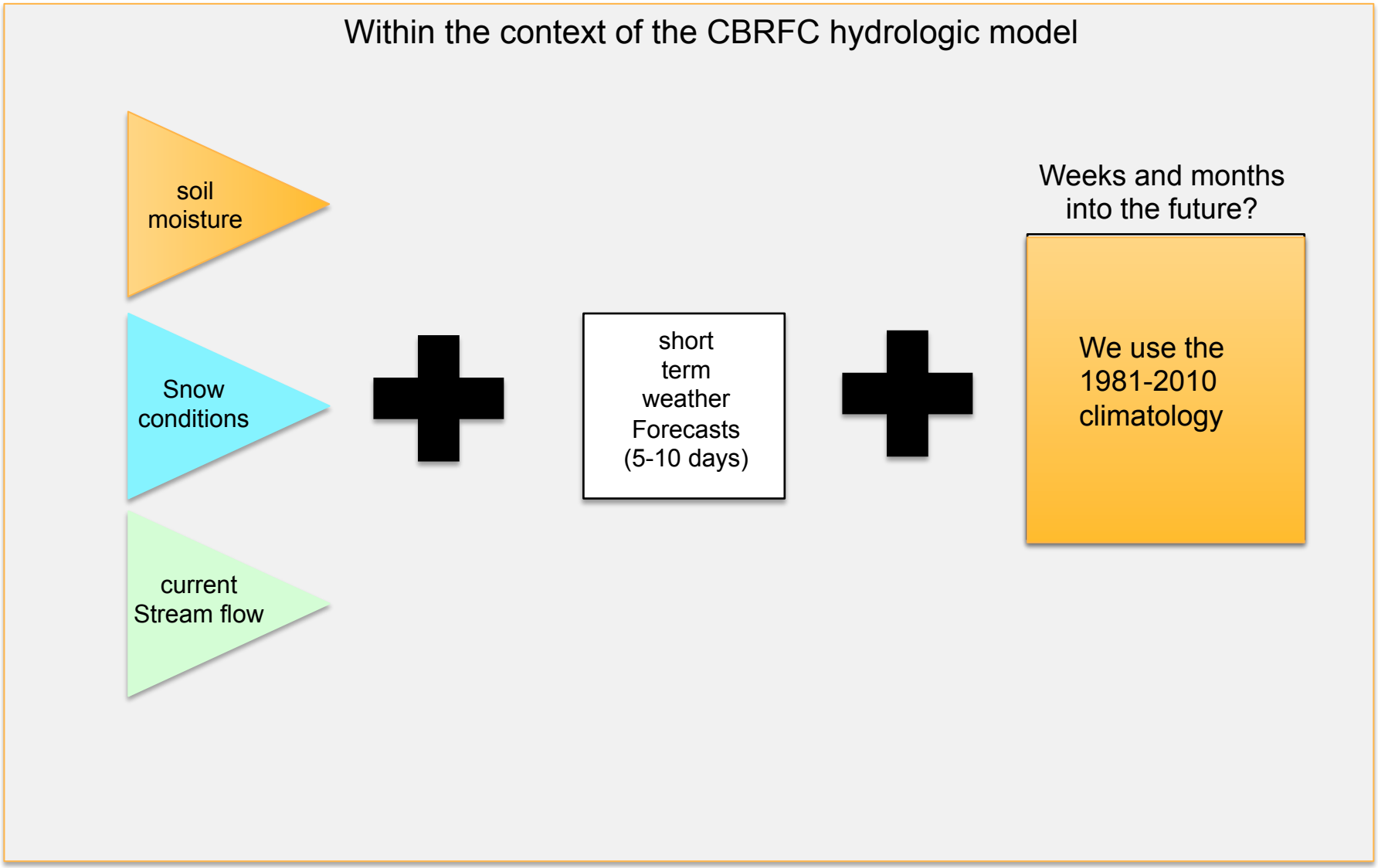
November 15, 2015





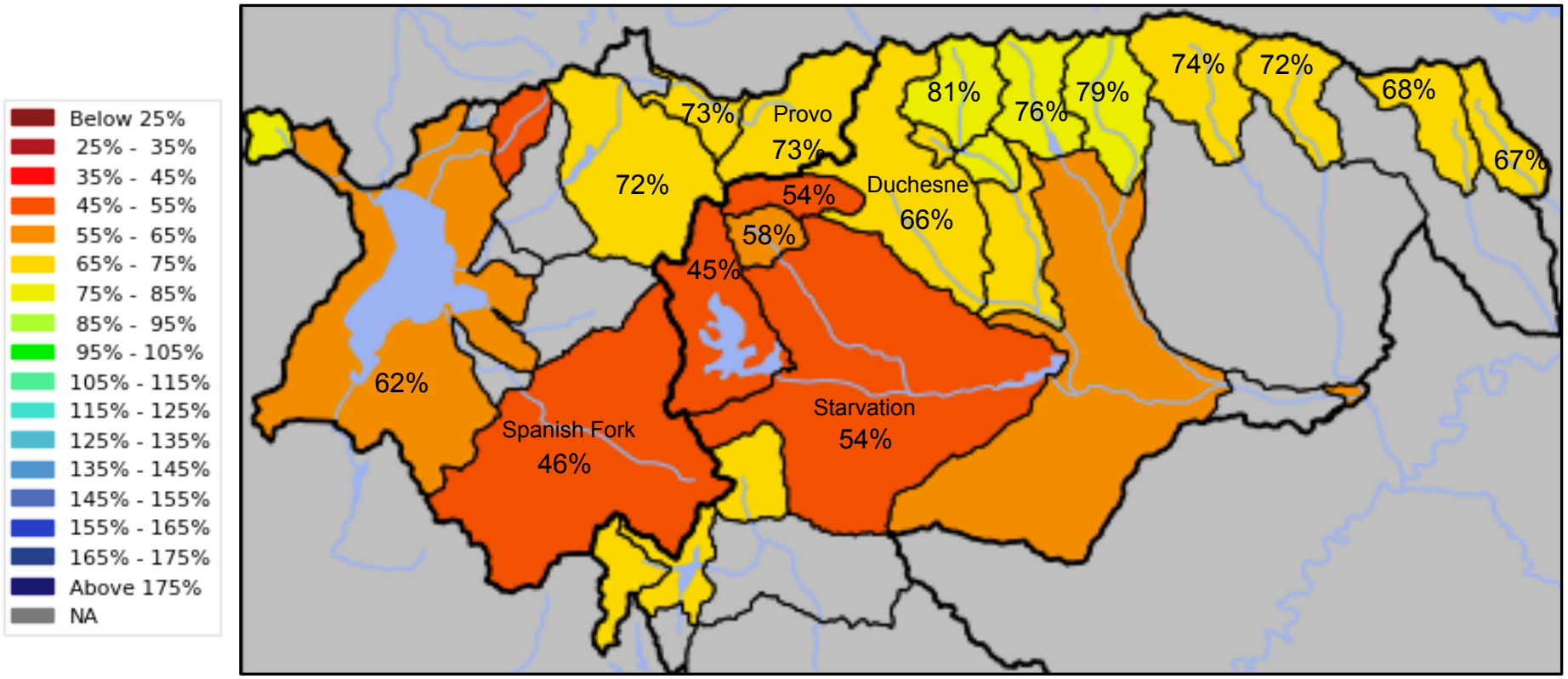
Soil Moisture representation from the CBRFC hydrologic model

Primary Drivers of the Forecast



March 1st Water Supply Forecasts

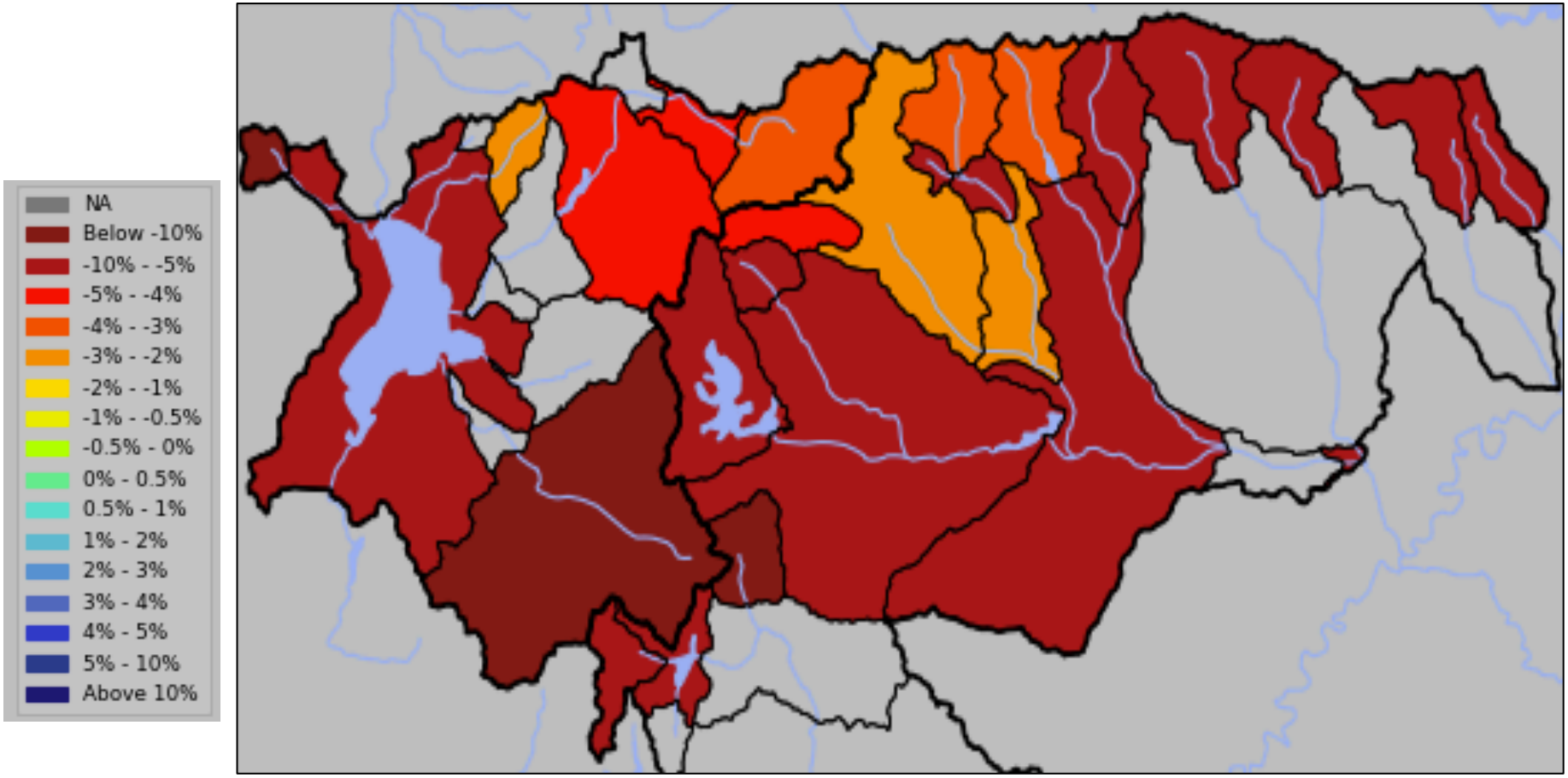
Duchesne and Provo River Basins
April-July Forecast Streamflow Volumes
(% of 1981-2010 average)



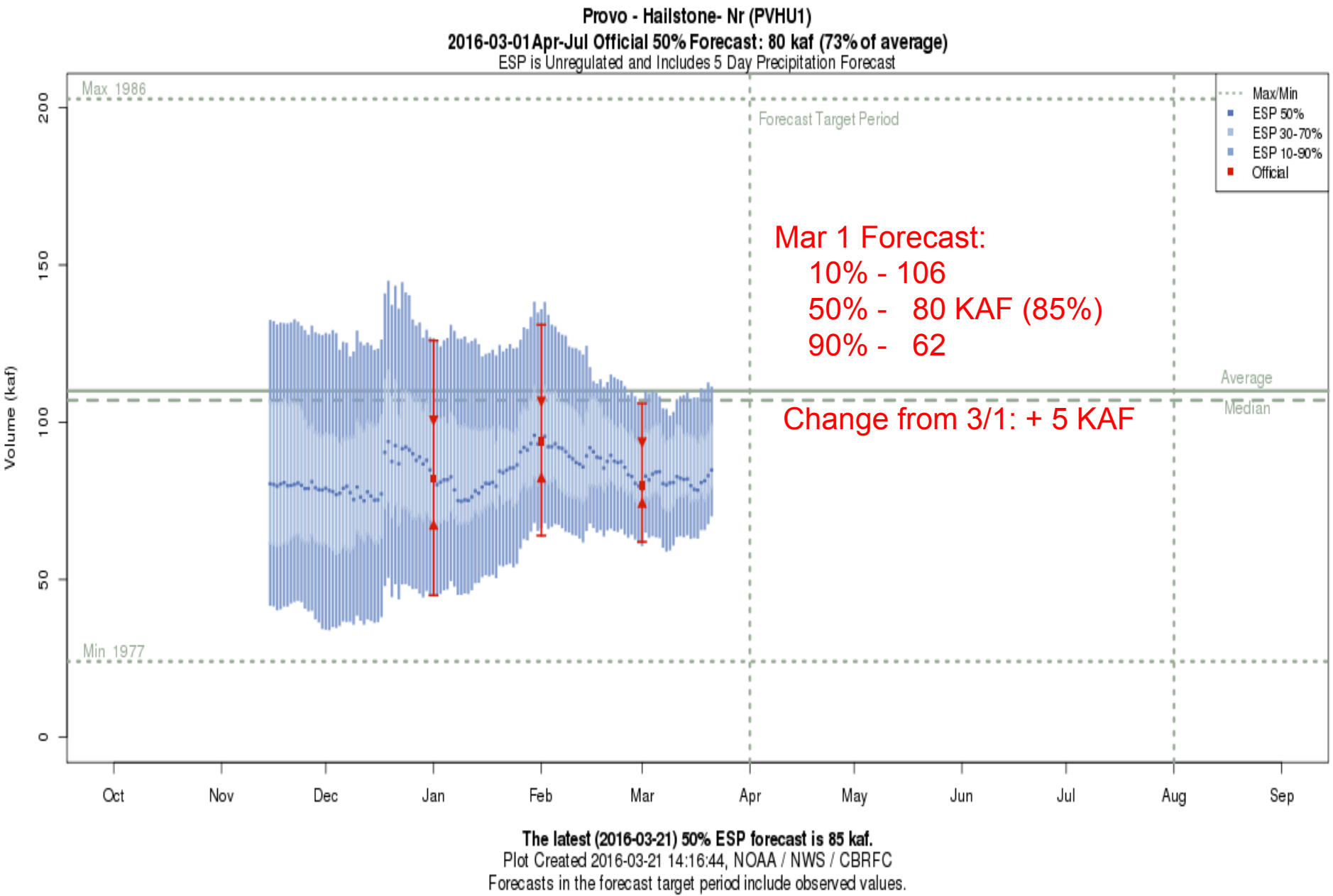
March 1st Forecasts Decreased ~by 10-20% from February 1st

Daily Model % Average Change 3/1-3/22

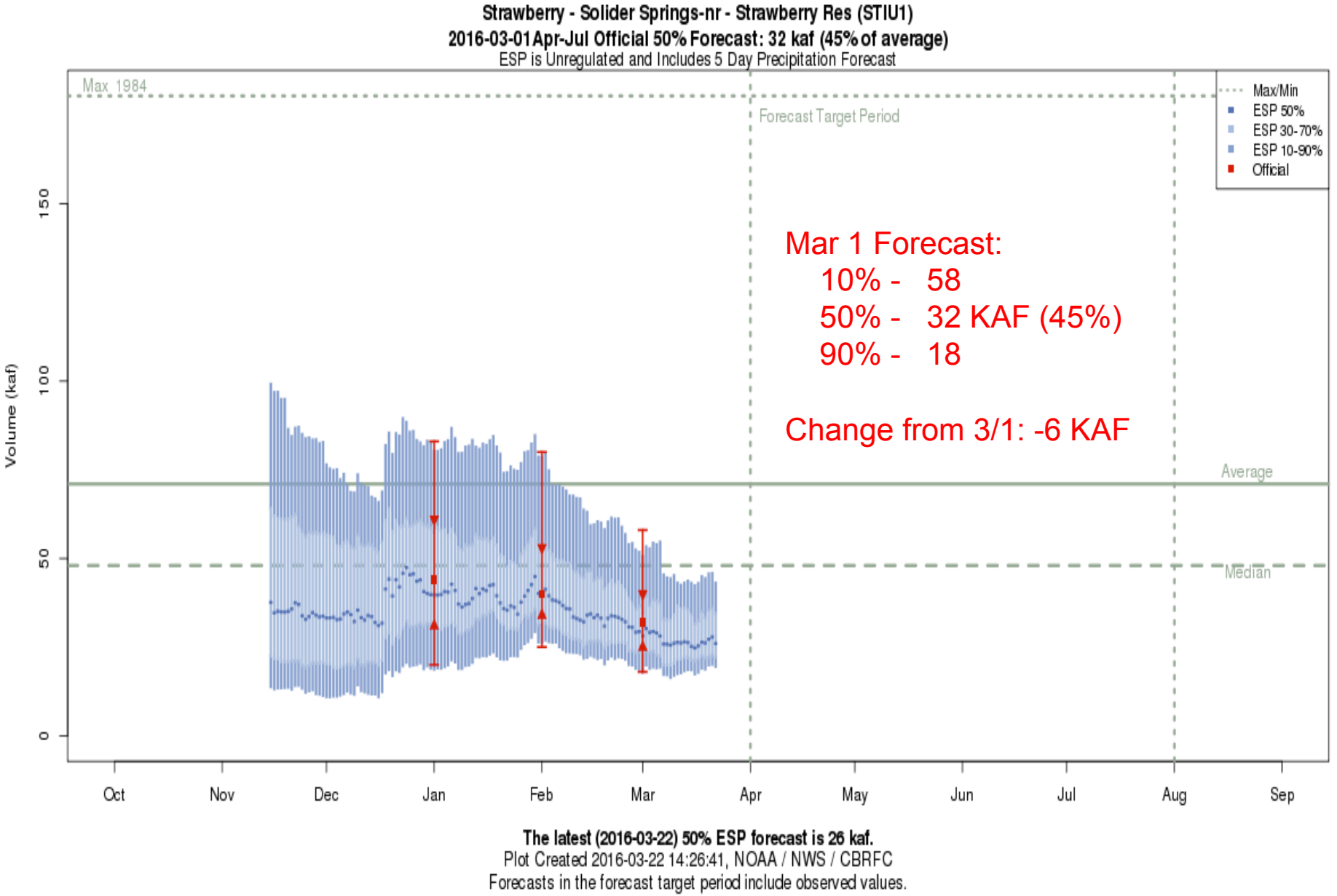
Duchesne and Provo River Basins
(% Change of 1981-2010 average)



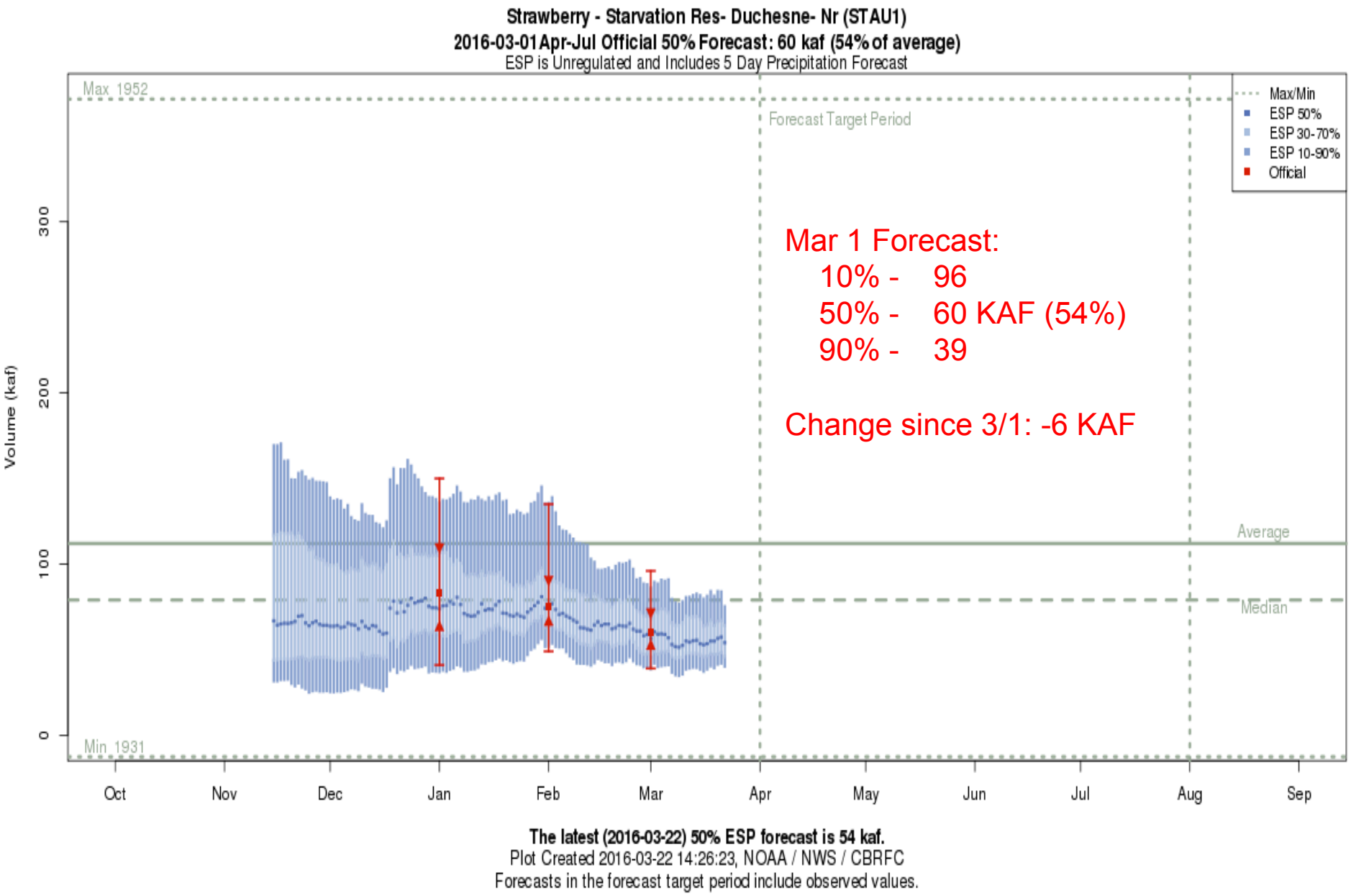
Forecasts: Provo nr Hailstone



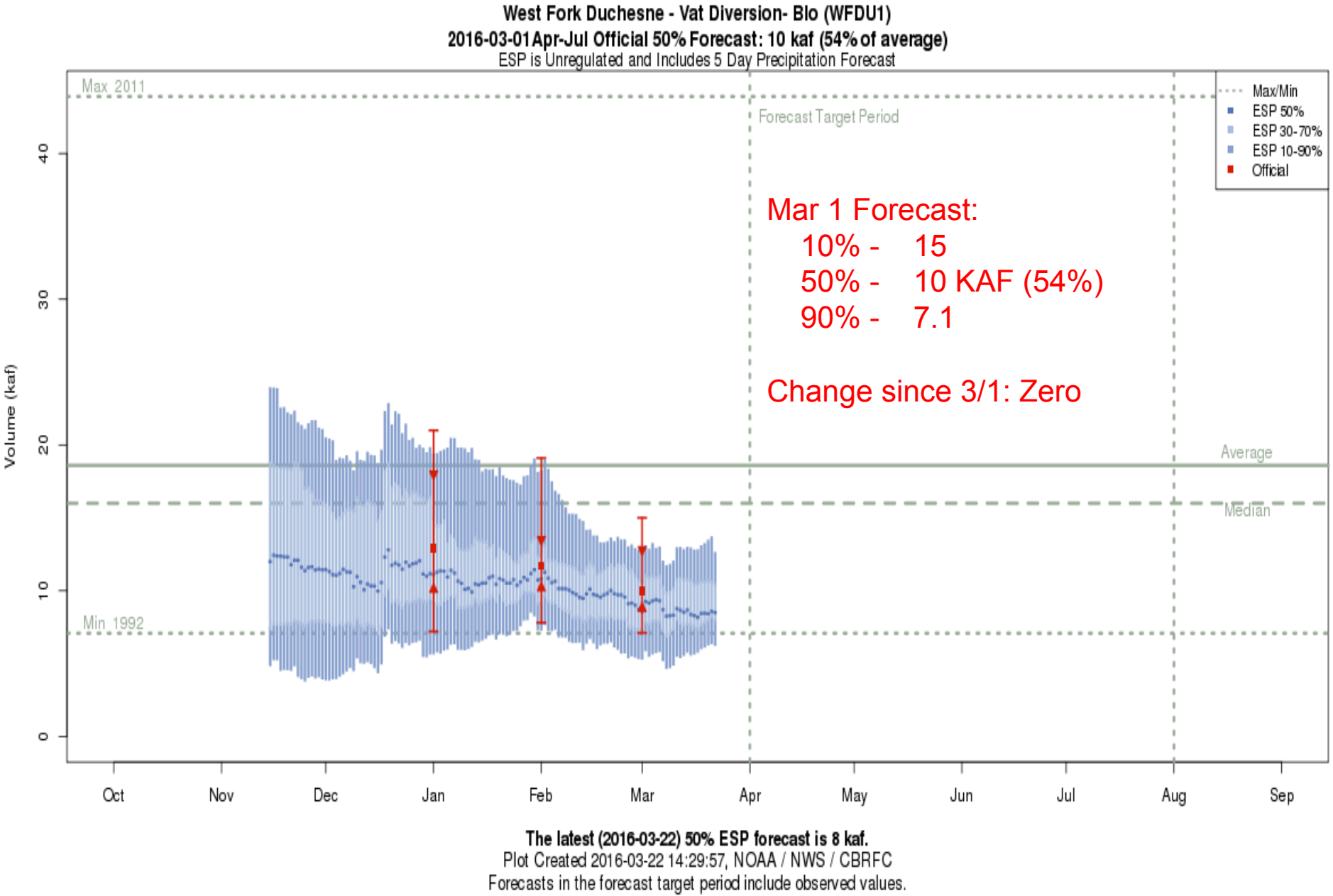
Forecasts: Strawberry nr Solider Springs



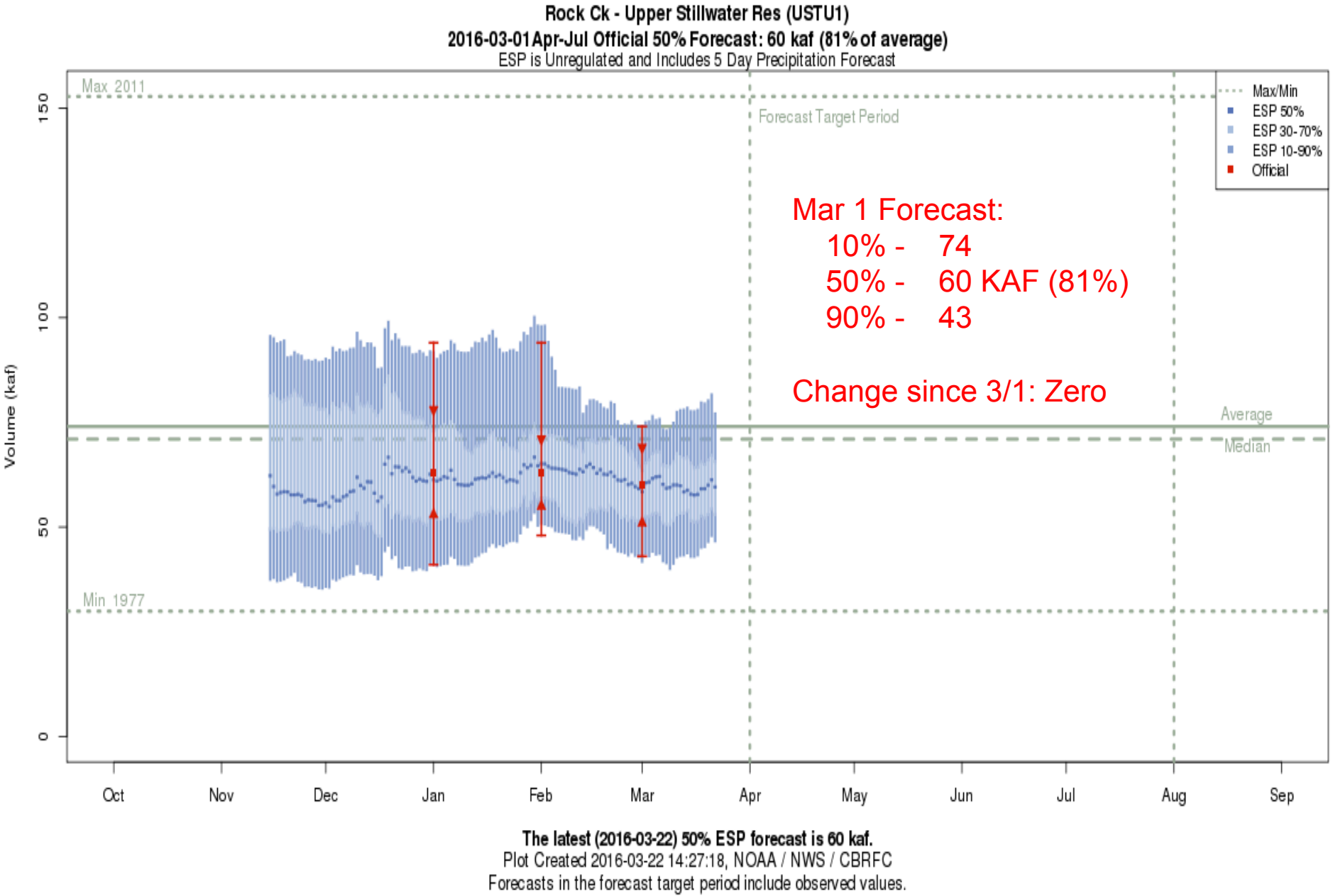
Forecasts: Starvation Reservoir



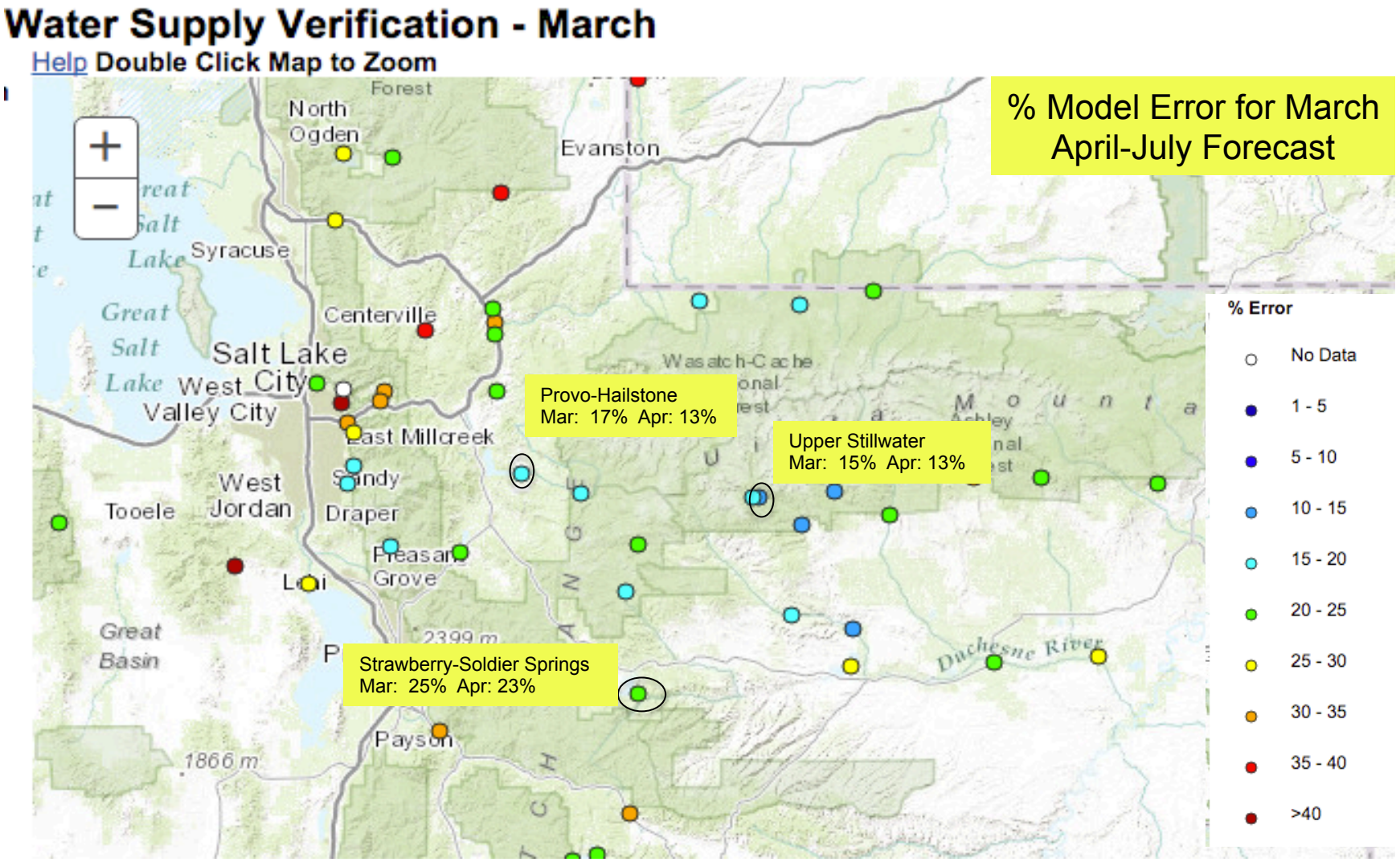
Forecasts: West Fork below Vat



Forecasts: Upper Stillwater Reservoir



Forecast Accuracy? How good are the forecasts in March?



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

Peak Flow Forecast Special Product

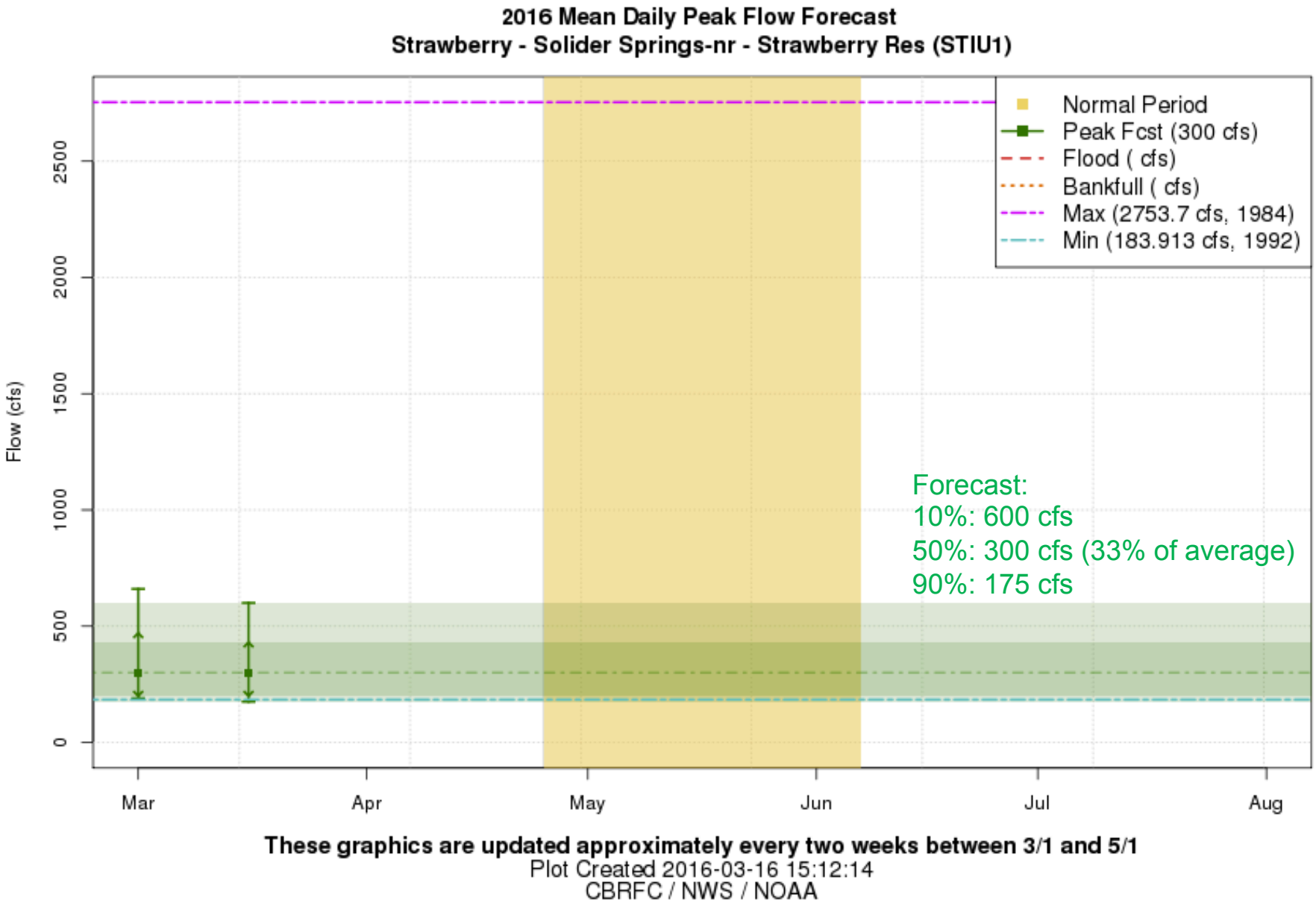
MEAN DAILY PEAK FLOW FORECASTS IN CFS
March 3, 2016

LOCATION	FLOOD FLOW	FCST DATE	FORECAST FLOWS 90%	75%	50%	25%	10%	TYPE
BIG BRUSH CK - VERNAL, NR	-999	2016-03-01	100	130	170	220	300	UNREG
STRAWBERRY - SOLIDER SPRI	-999	2016-03-01	190	200	300	470	660	UNREG
CURRANT CK - CURRANT CK R	-999	2016-03-01	60	100	150	200	300	UNREG
STRAWBERRY - STARVATION R	-999	2016-03-01	110	150	200	300	450	REG
STRAWBERRY - STARVATION R	-999	2016-03-01	350	450	550	850	1100	UNREG
WEST FORK DUCHESNE - VAT	721	2016-03-01	25	50	60	110	150	REG
WEST FORK DUCHESNE - VAT	721	2016-03-01	65	95	130	170	200	UNREG
DUCHESNE - TABIONA, NR	2730	2016-03-01	150	220	300	450	700	REG
DUCHESNE - TABIONA, NR	2730	2016-03-01	500	600	800	1000	1200	UNREG
ROCK CK - UPPER STILLWATE	-999	2016-03-01	550	650	750	1000	1100	UNREG
DUCHESNE - DUCHESNE, NR,	-999	2016-03-01	150	300	600	1000	1200	REG
DUCHESNE - DUCHESNE, NR,	-999	2016-03-01	1100	1300	1600	2100	2400	UNREG
PROVO - WOODLAND, NR	3098	2016-03-01	1100	1100	1350	1650	1900	REG
PROVO - WOODLAND, NR	3098	2016-03-01	800	900	1100	1200	1500	UNREG

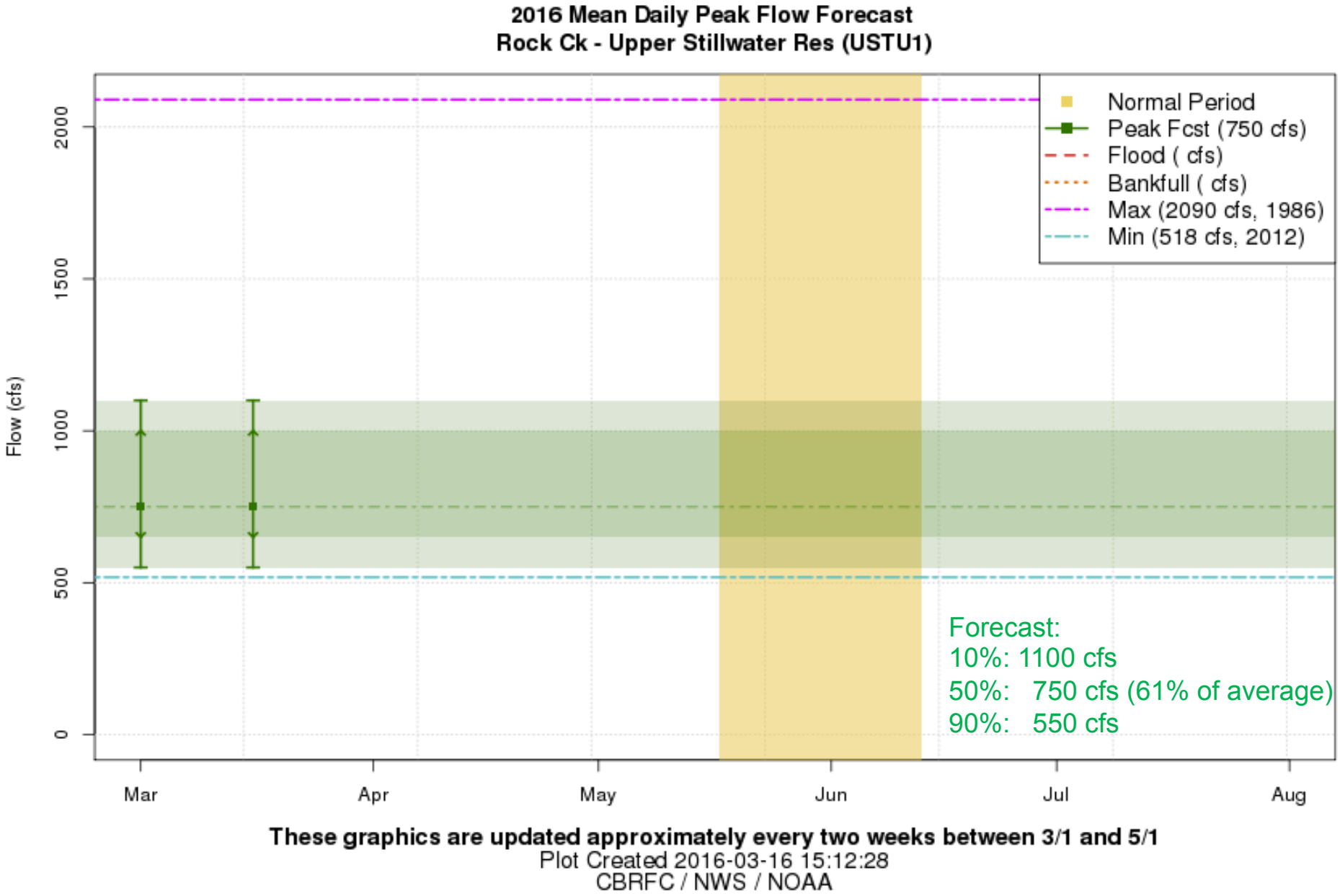
UNREG=Peak flow forecasts are unregulated and do not account for upstream diversions/regulation.
REG=Peak flow forecasts are regulated based on assumptions of upstream diversions/regulation.
FLOOD= Flood flow. -9999 = no flood flow
Regulated flow at Provo - Woodland, NR include diversions from the Duchesne Tunnel whereas unregulated flows do not.

- Do not provide a specific date of the peak forecast
  - May only have a 5-10 day lead time for timing the peak
  - Prior to that we provide the average time period of the peak

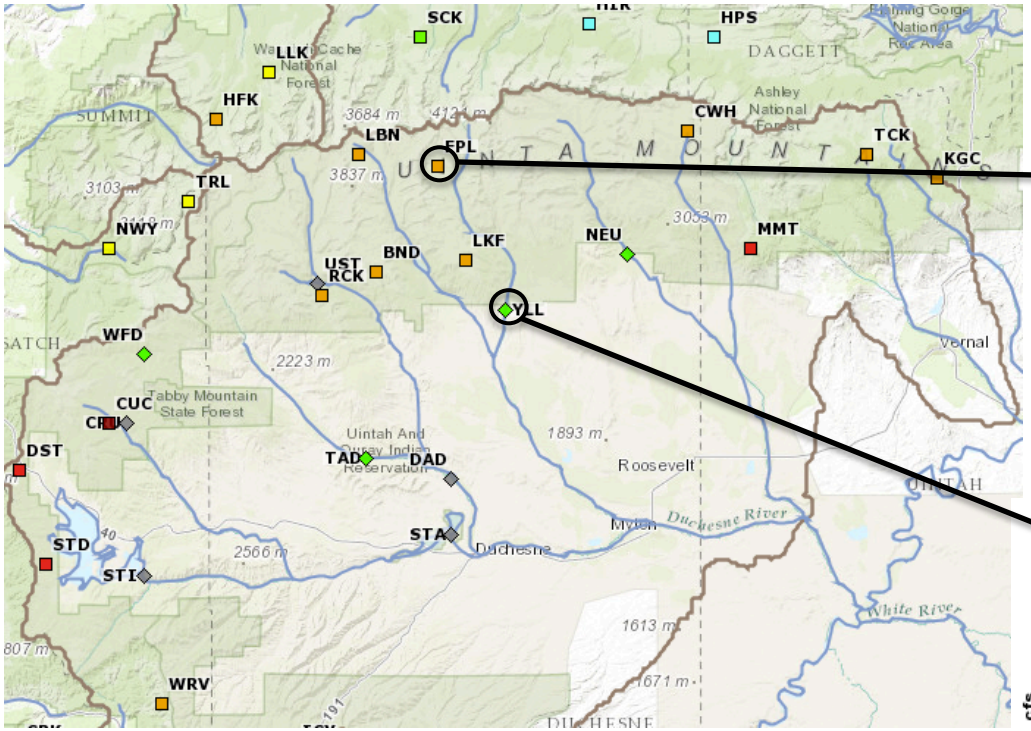
Peak Flow Forecast: Strawberry nr Solider Springs

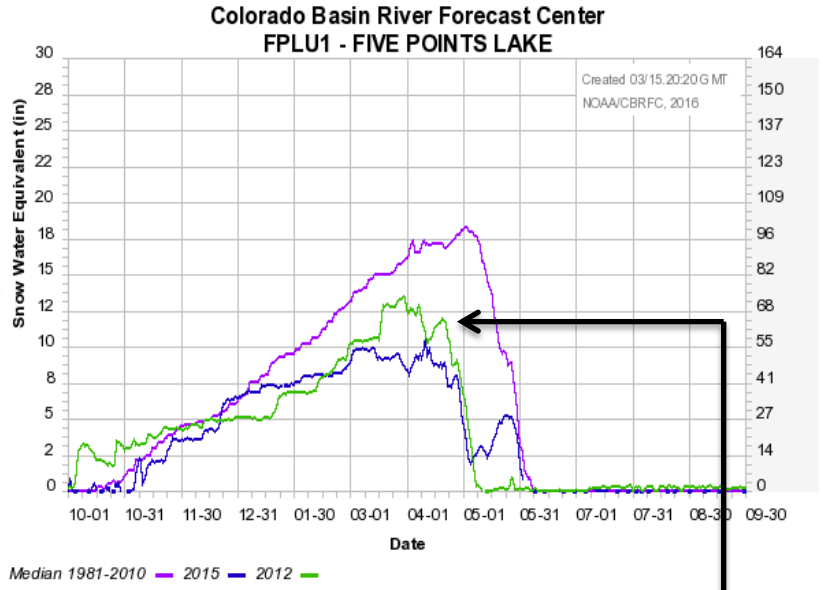


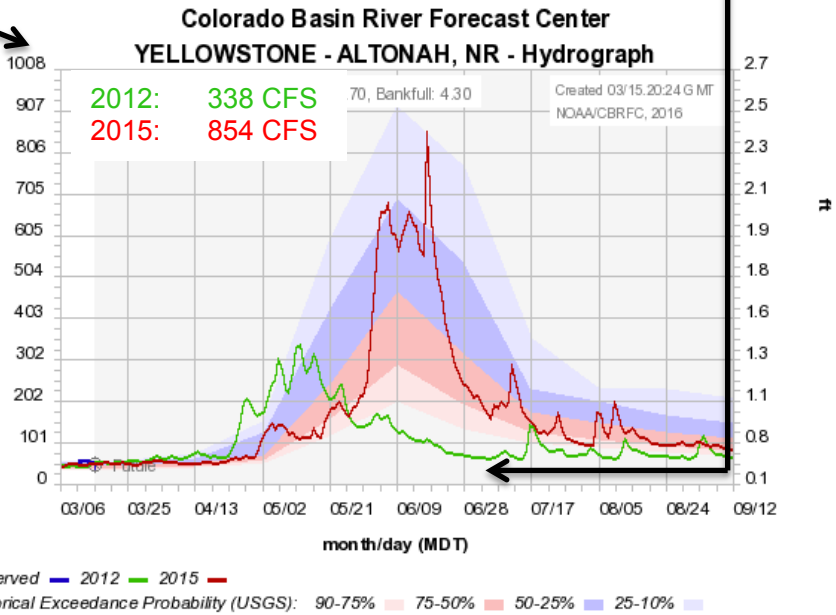
Peak Flow Forecast: Upper Stillwater



Peak Flow Forecasts: Spring Weather Impacts



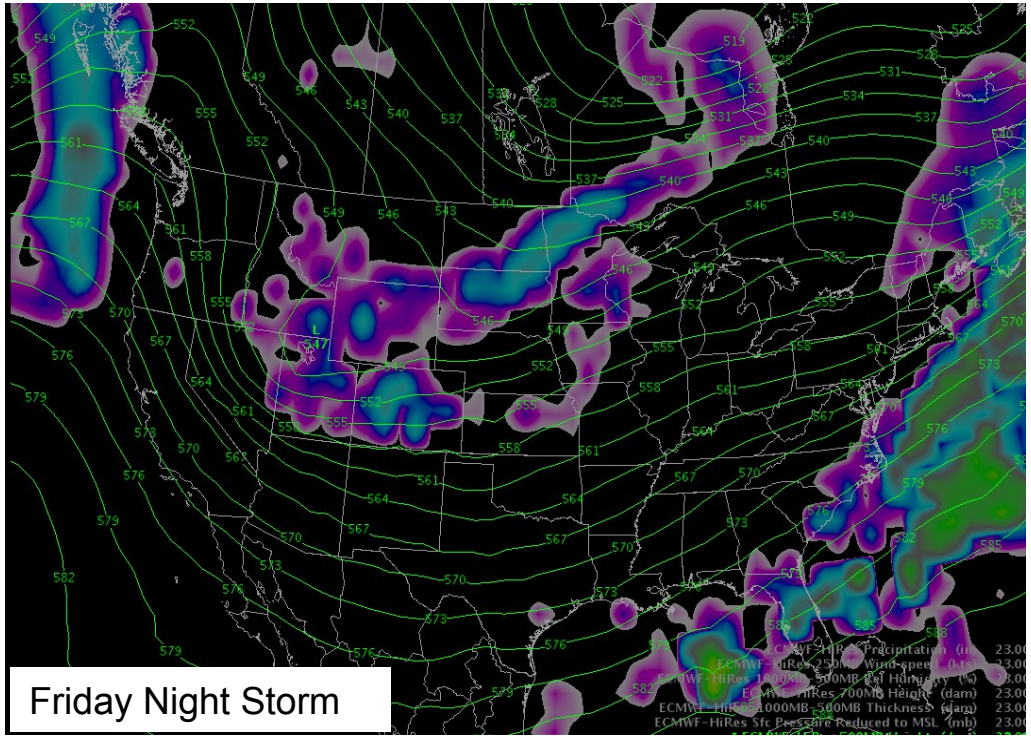


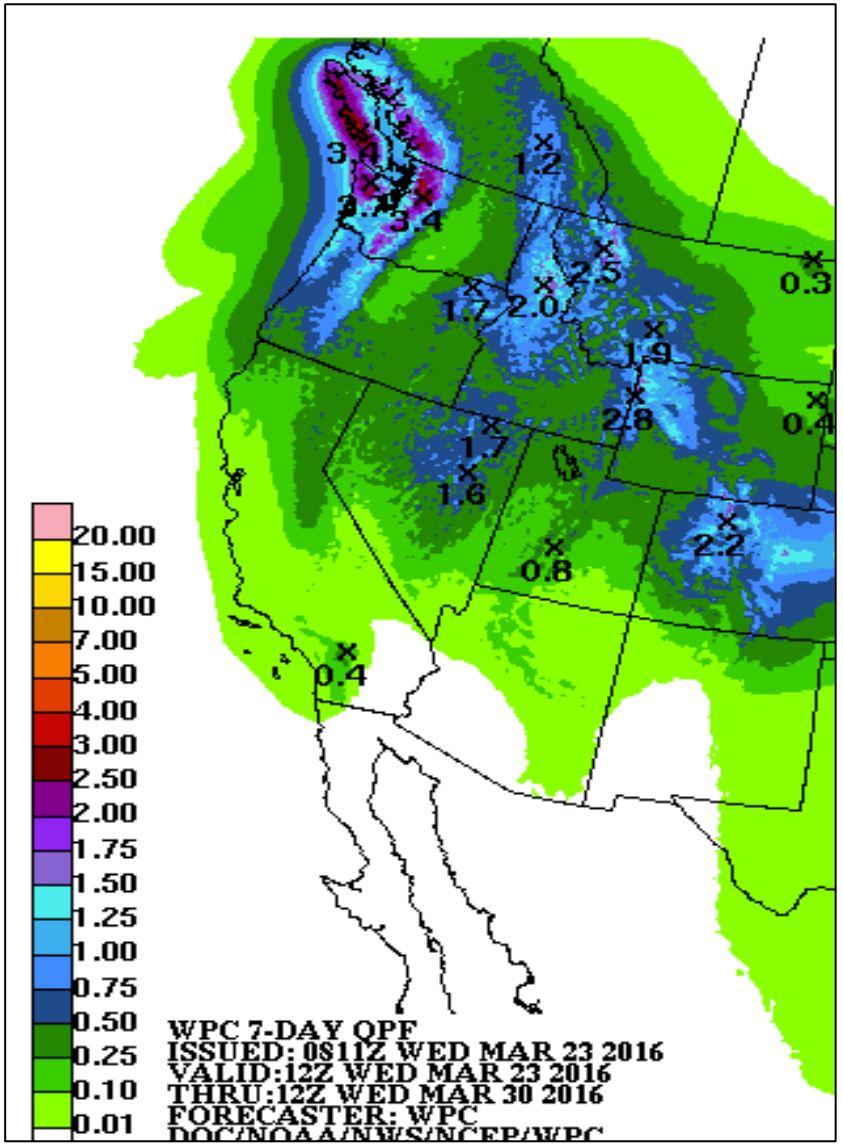


- Long lead peak flow forecast try to capture the range of possibilities but will not capture all spring scenarios
- Use daily forecast hydrographs as peak nears
  - Include forecasted precipitation and temperature

Weather Outlook

- Storm system moving out of the area today
- Next storm Friday night into Saturday
- Another storm early next week-closed low

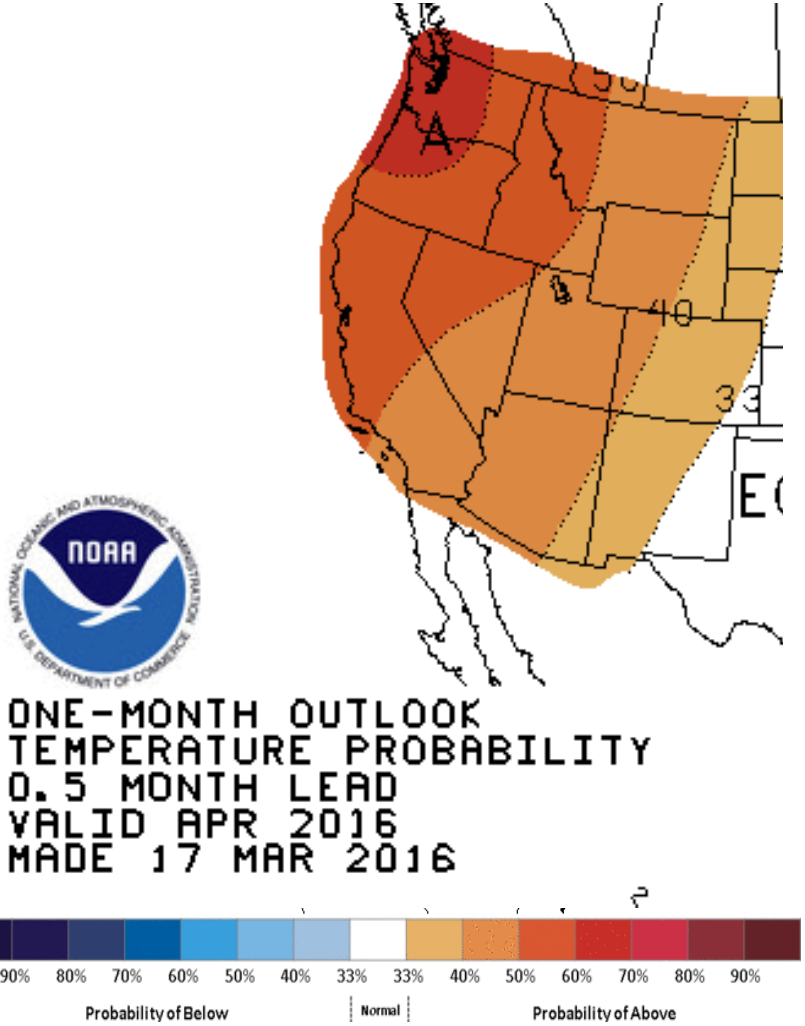




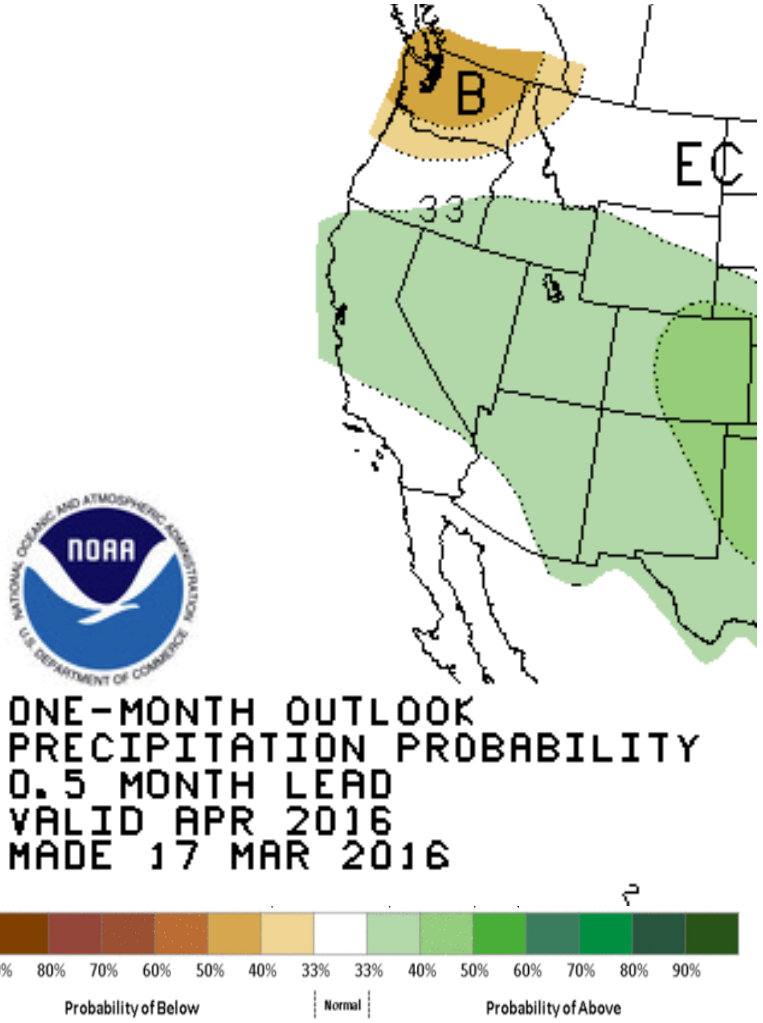
7 Day Forecasted Precipitation

Weather Outlook: April

Temperature



Precipitation



Questions/Discussion

Today's summary:

- Dry fall soil moisture conditions are reducing forecasts
- Melt has started in some areas – increases prospect for earlier runoff
- It is possible to still get average runoff but not likely (we need a REALLY wet spring)
- Active weather pattern will continue through the end of the month

- Forecast Discussion
- Operations Discussion
- Next briefing date?
  - Week of April 11th?

Other webinars:

-4/7 @11am Colorado River Basin Webinar

-4/7 @ 1pm Great Basin Webinar