

CBRFC May 2017 CUWCD Briefing

1pm May 11, 2017

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Senior Hydrologist

Today's Presentation

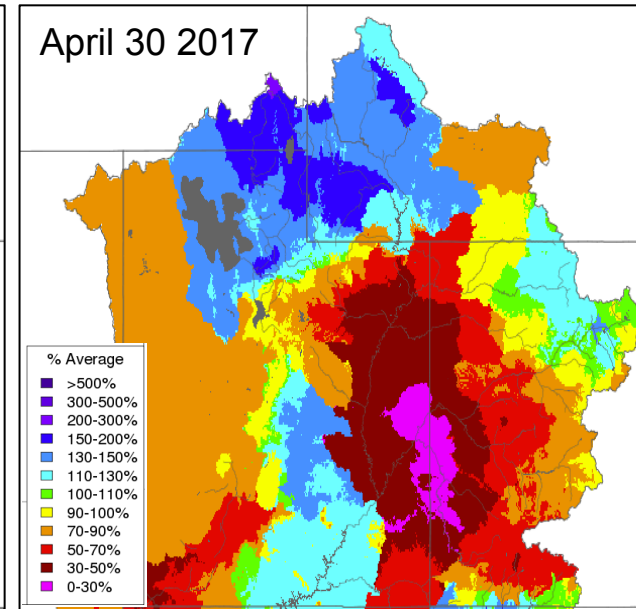
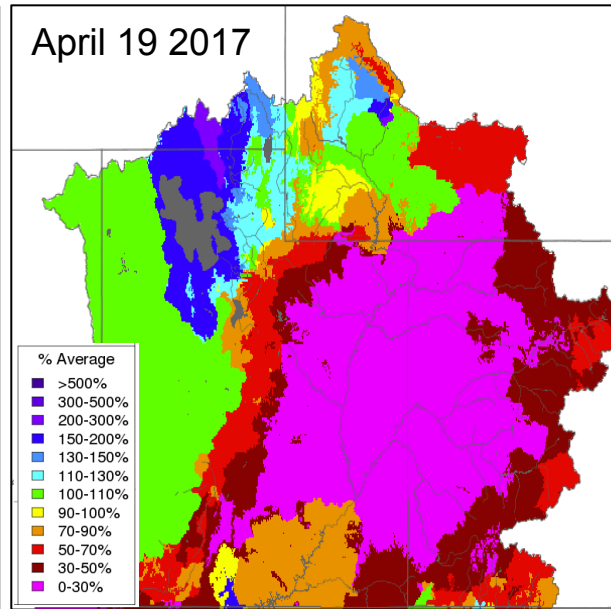
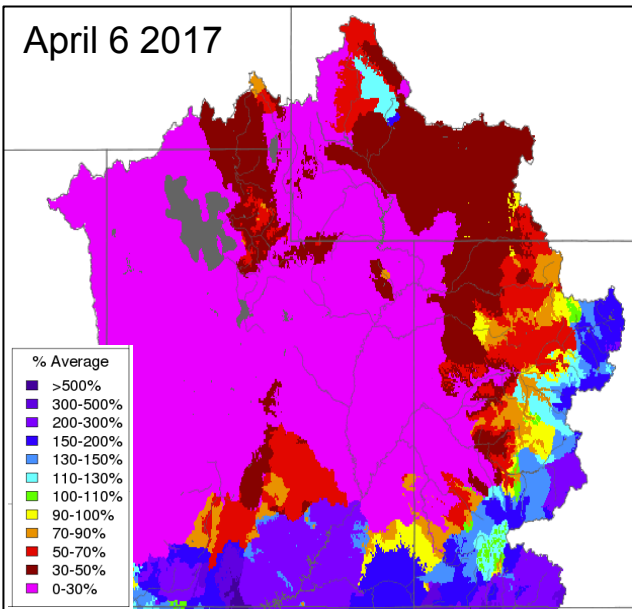
- **April Weather**
 - Below normal precipitation
 - Below normal mean monthly temperatures
- **Snowpack conditions**
 - Melt continued < 9000 ft in April
 - No melt and some accumulation > 9000 ft in April
 - Significant snow remains at high elevations
 - Melt at all elevations with warm first 10 days of May
- **April 2017 Water Supply Forecast Overview**
 - Minor decreases to little change in forecasts
- **Upcoming Weather**
- **Current Conditions**
 - 10-Day Streamflow Forecasts

April Weather: Precipitation distribution over the month

Storms tracked through the middle of the CBRFC area early in the month mostly benefitting basins in Colorado

A couple of systems brushed by the very northern part of the area during the second two weeks of the month.

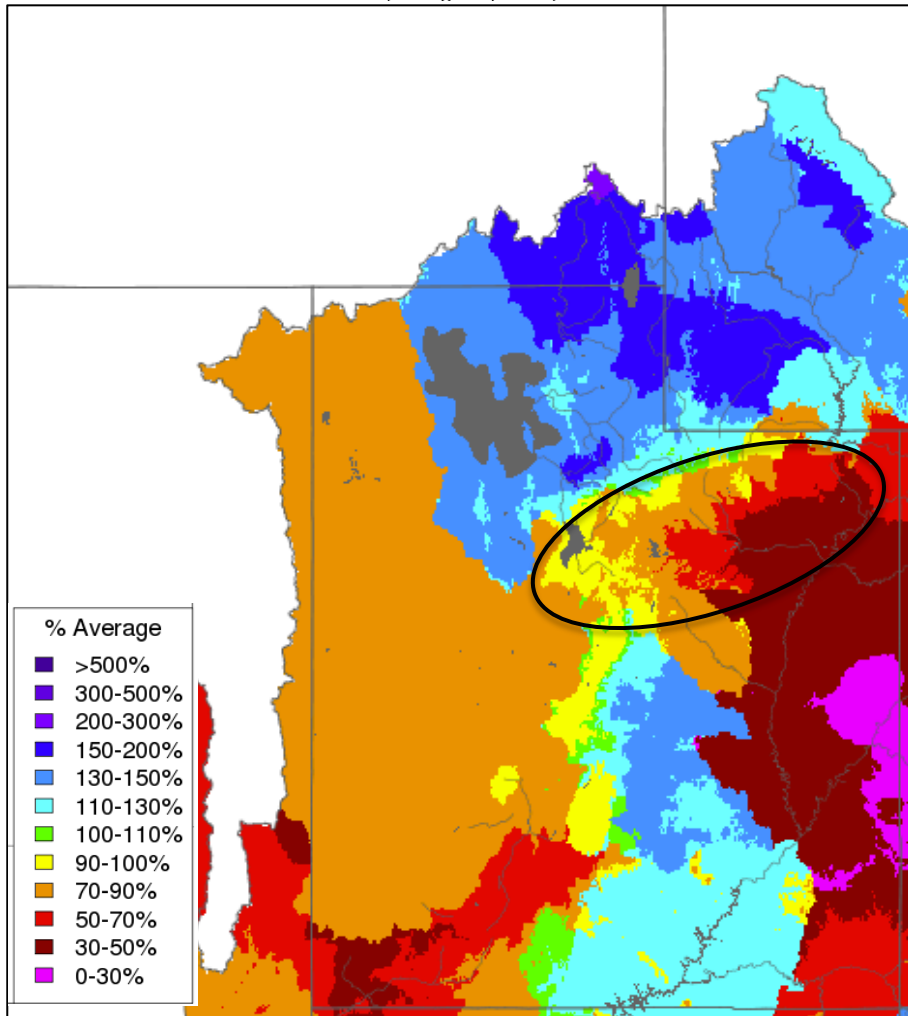
Widespread precipitation the final week of April



April Weather: Precipitation

Monthly Precipitation - April 2017

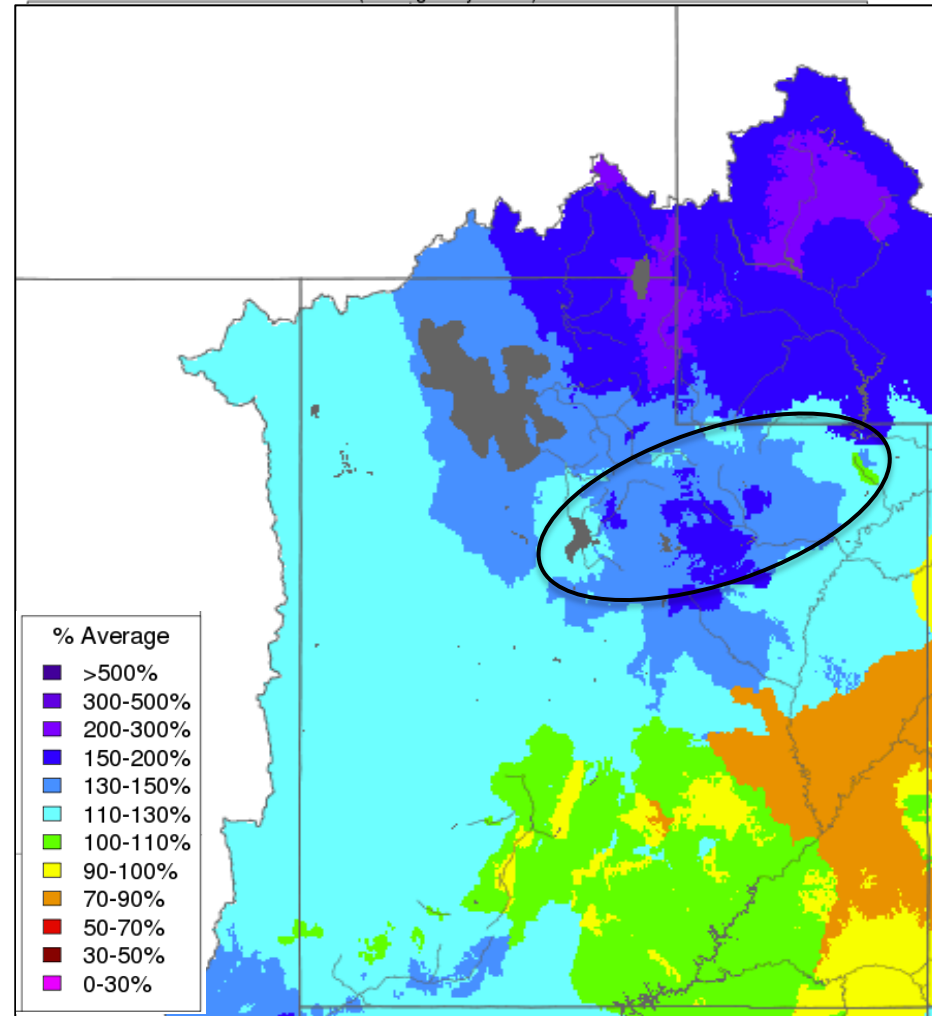
(Averaged by Basin)



Duchesne: 75%
Provo: 90%

Water Year Precipitation, October 2016 - April 2017

(Averaged by Basin)



Duchesne: 140%
Provo: 145%

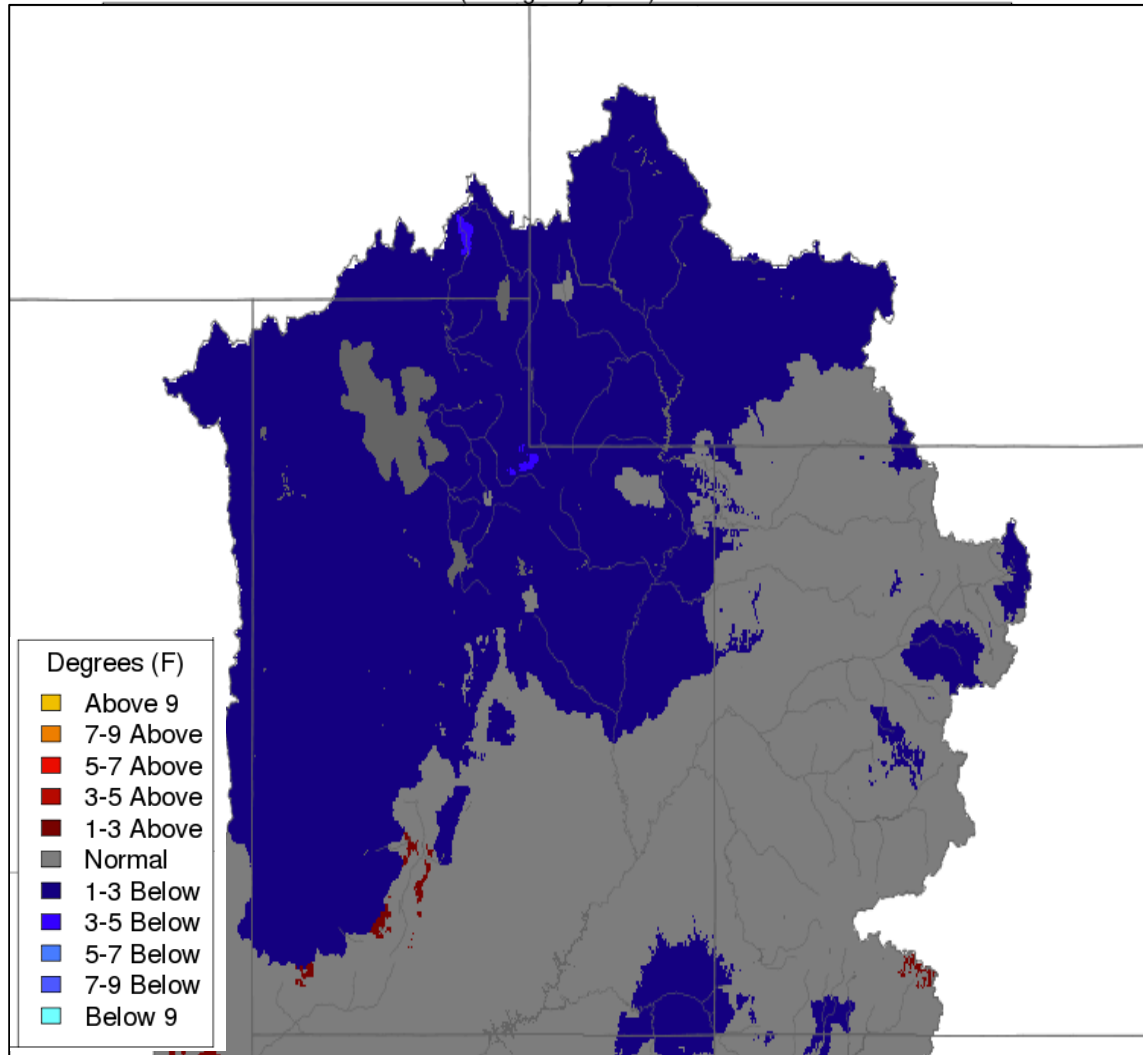
April Weather: Temperature

Below normal mean monthly temperatures

Periods of both unsettled weather and above average temperatures

Max Temp - Monthly Deviation - April 2017

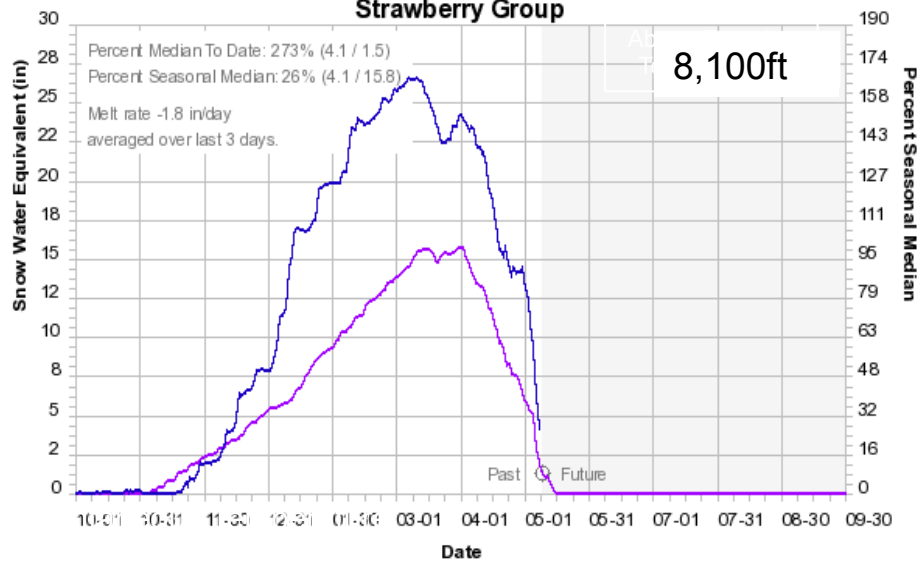
(Averaged by Basin)



Snowpack Conditions: SNOTEL

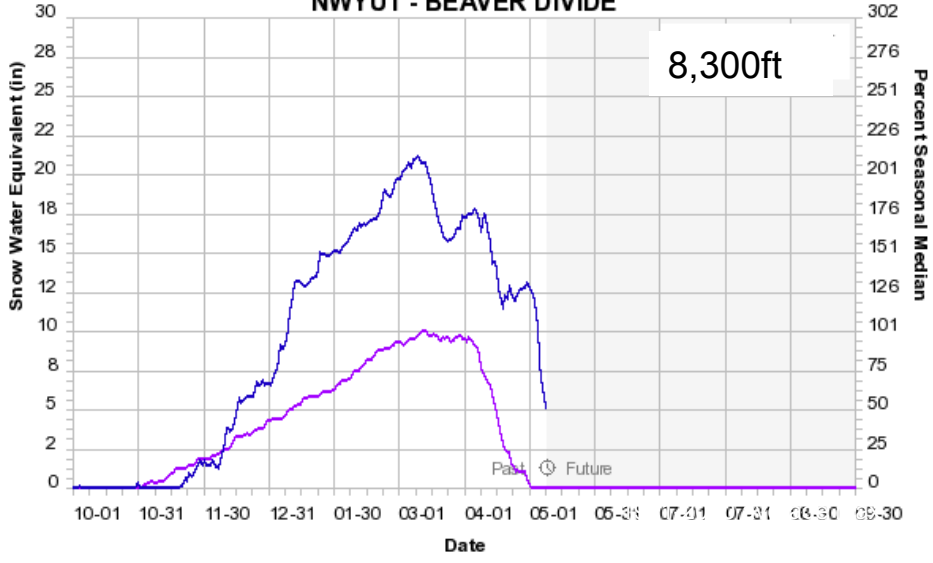
Colorado Basin River Forecast Center

Strawberry Group



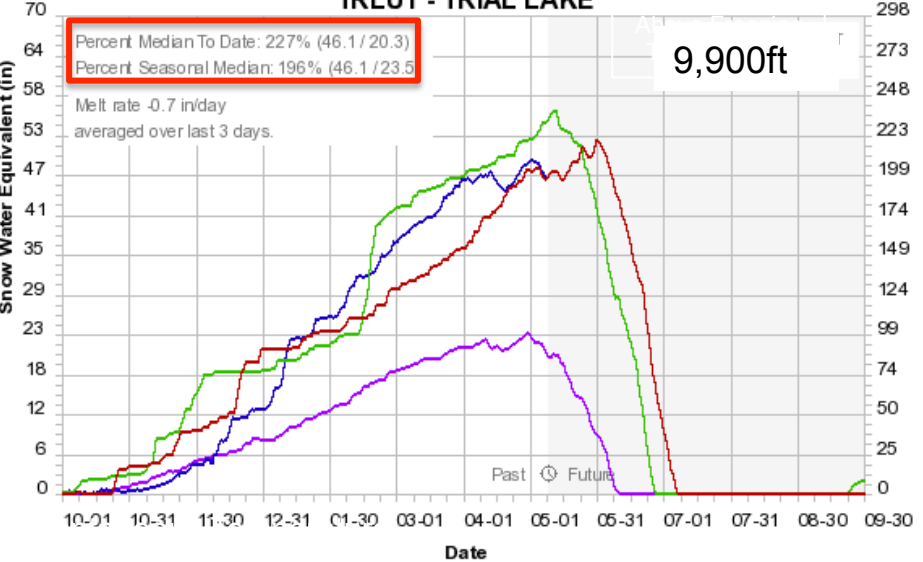
Colorado Basin River Forecast Center

NWYU1 - BEAVER DIVIDE



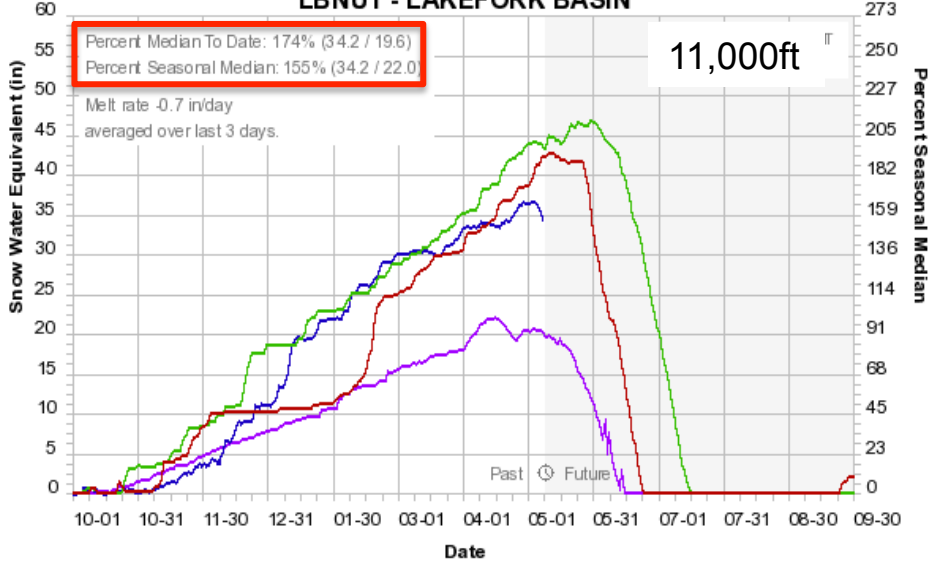
Colorado Basin River Forecast Center

TRLU1 - TRIAL LAKE



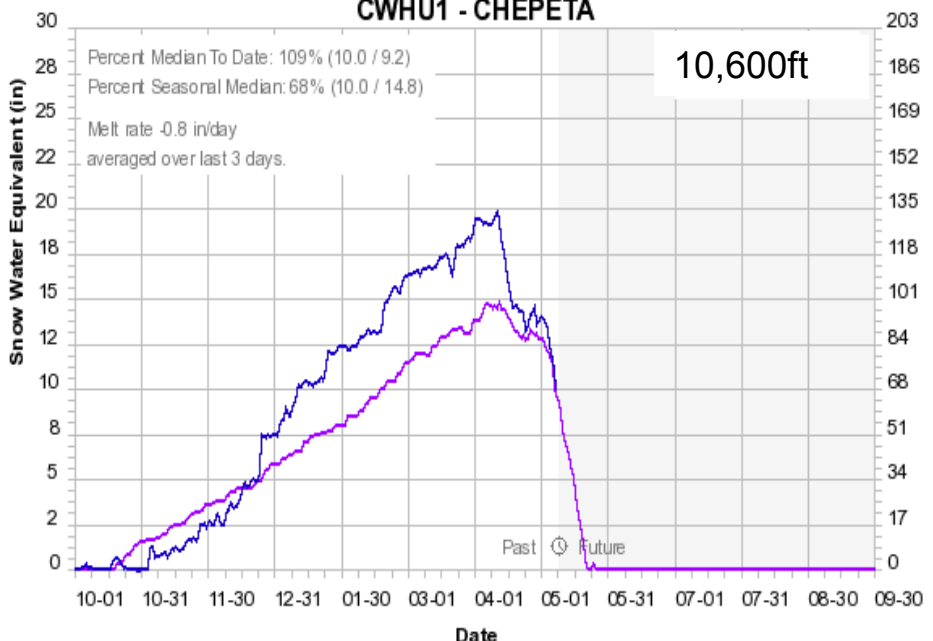
Colorado Basin River Forecast Center

LBNU1 - LAKEFORK BASIN



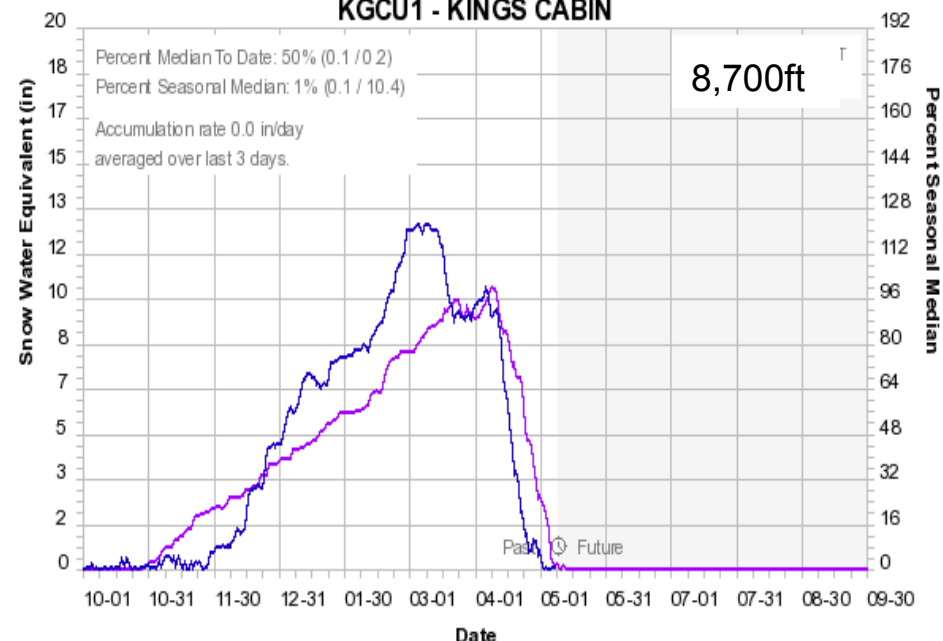
Snowpack Conditions: SNOTEL

Colorado Basin River Forecast Center
CWHU1 - CHEPETA



Median 1981-2010 — 2017 —

Colorado Basin River Forecast Center
KGPU1 - KINGS CABIN

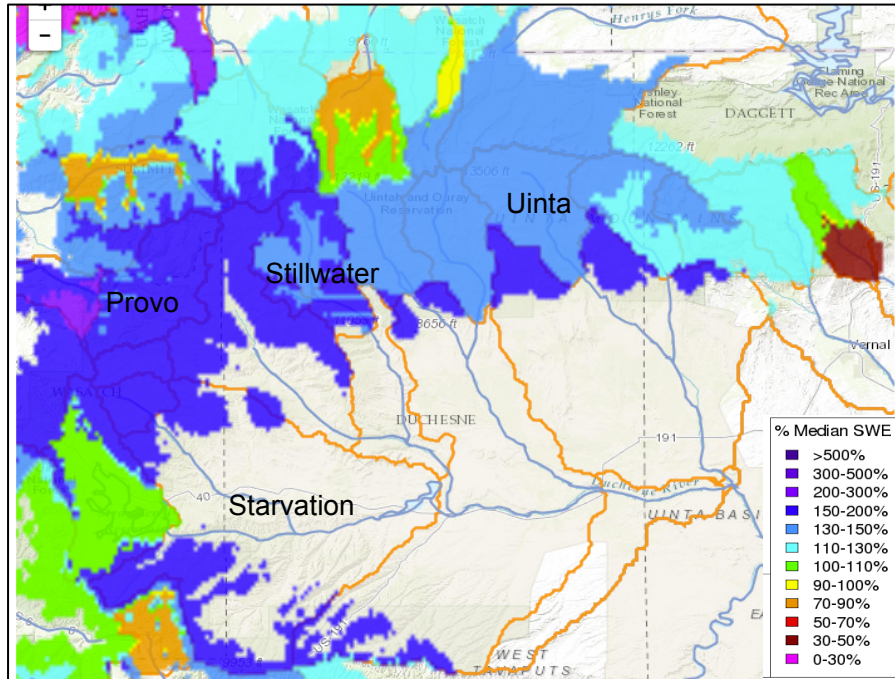


Median 1981-2010 — 2017 —

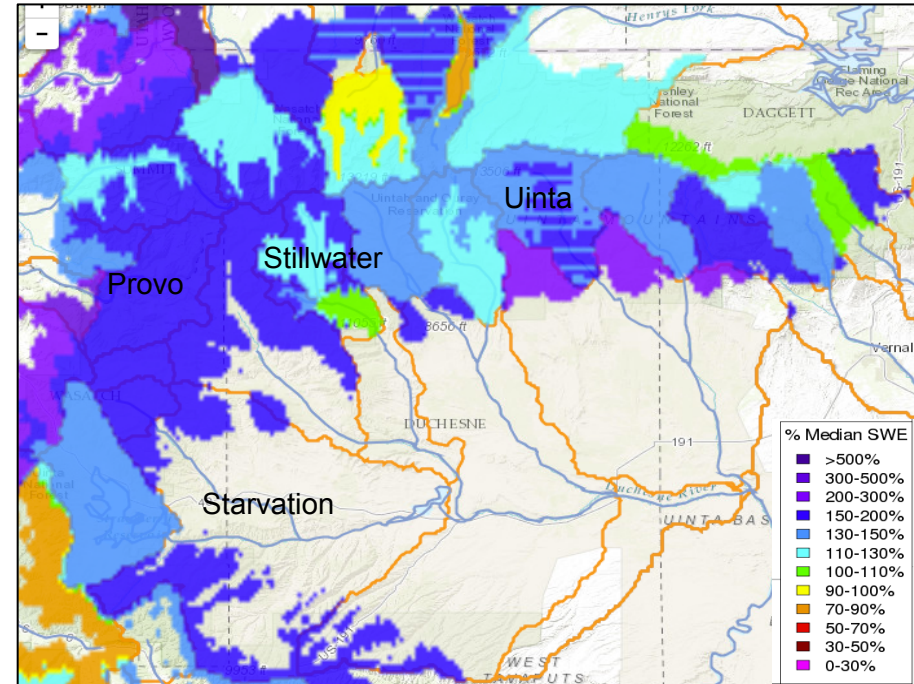
Snowpack Conditions: CBRFC MODEL

CBRFC MODEL SNOW (% median):

April 1 2017



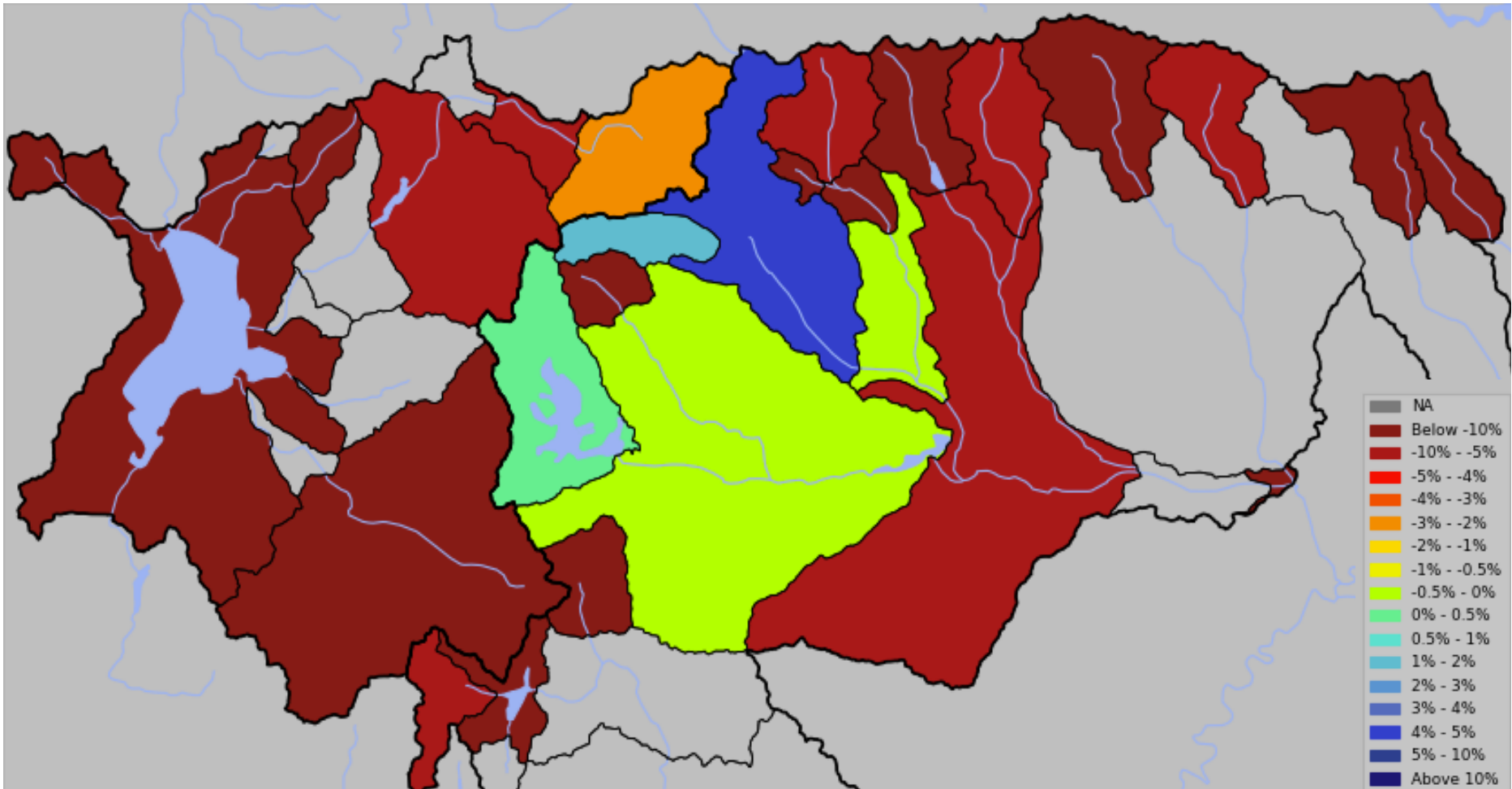
May 1 2017



Similar snow conditions between April and May in the areas that contribute significantly to runoff

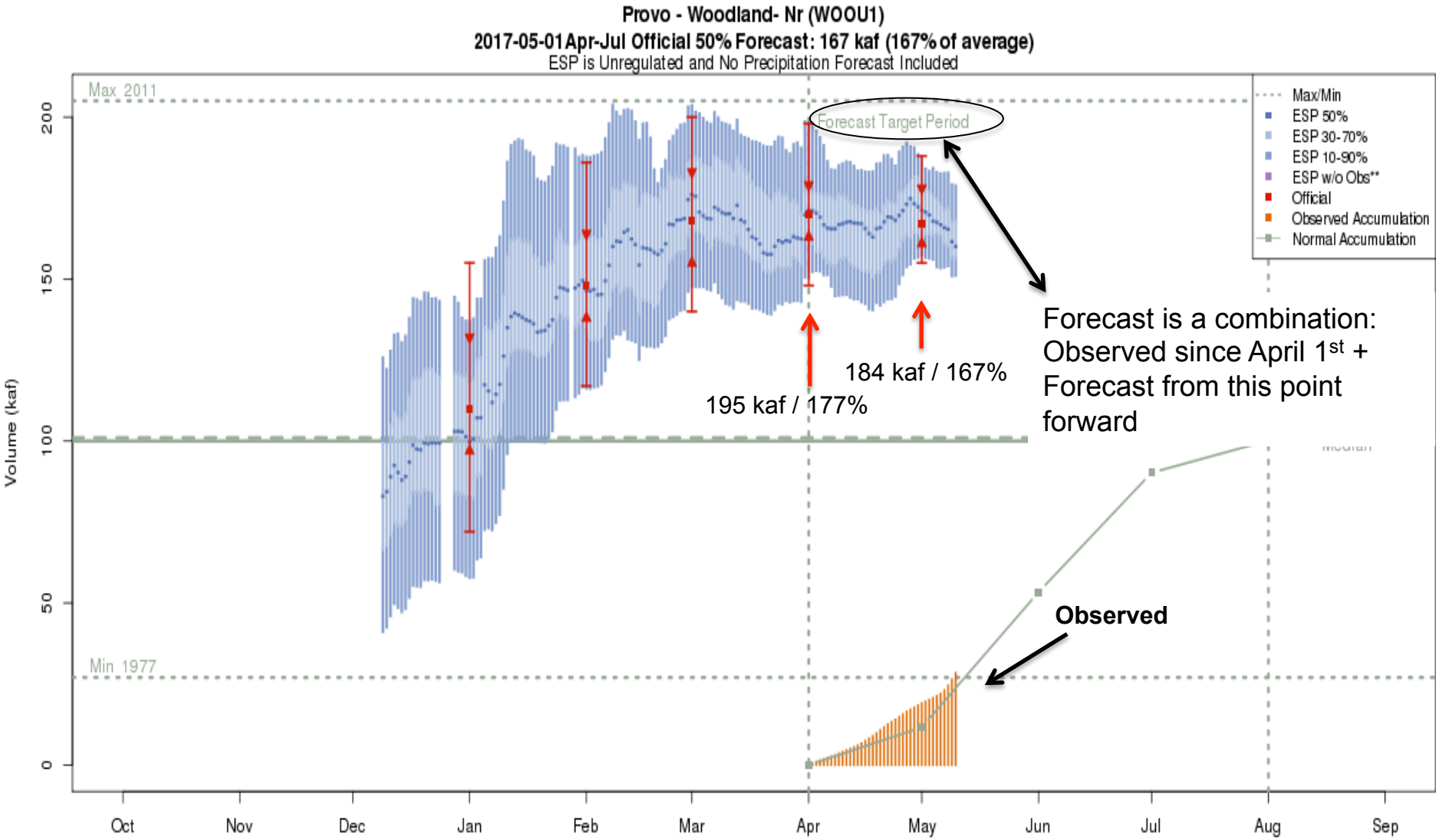
May 1st Water Supply Forecasts

April-July Forecast Streamflow Volumes
(% of Average Change from April 1st Forecasts)



~10-20% decrease or little to no change to forecasts since April 1st

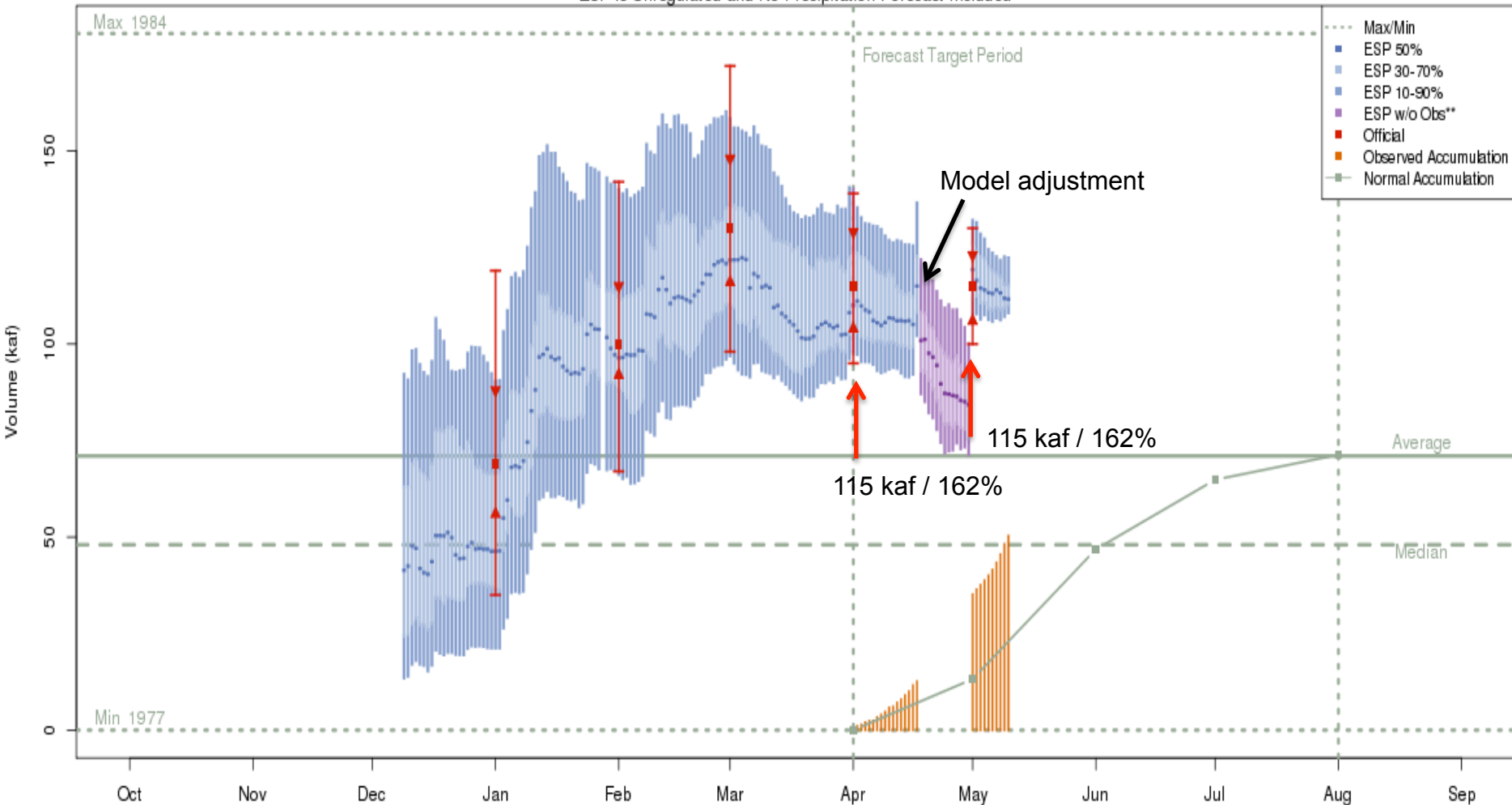
Forecasts: Provo nr Hailstone



The most recent (2017-05-10) full period 50% ESP forecast is 160 kaf.
 Plot Created 2017-05-10 17:00:43, NOAA / NWS / CBRFC
 Forecasts in the forecast target period include observed values.

Forecasts: Strawberry nr Solider Springs

Strawberry - Solider Springs-nr - Strawberry Res (STIU1)
 2017-05-01 Apr-Jul Official 50% Forecast: 115 kaf (162% of average)
 ESP is Unregulated and No Precipitation Forecast Included



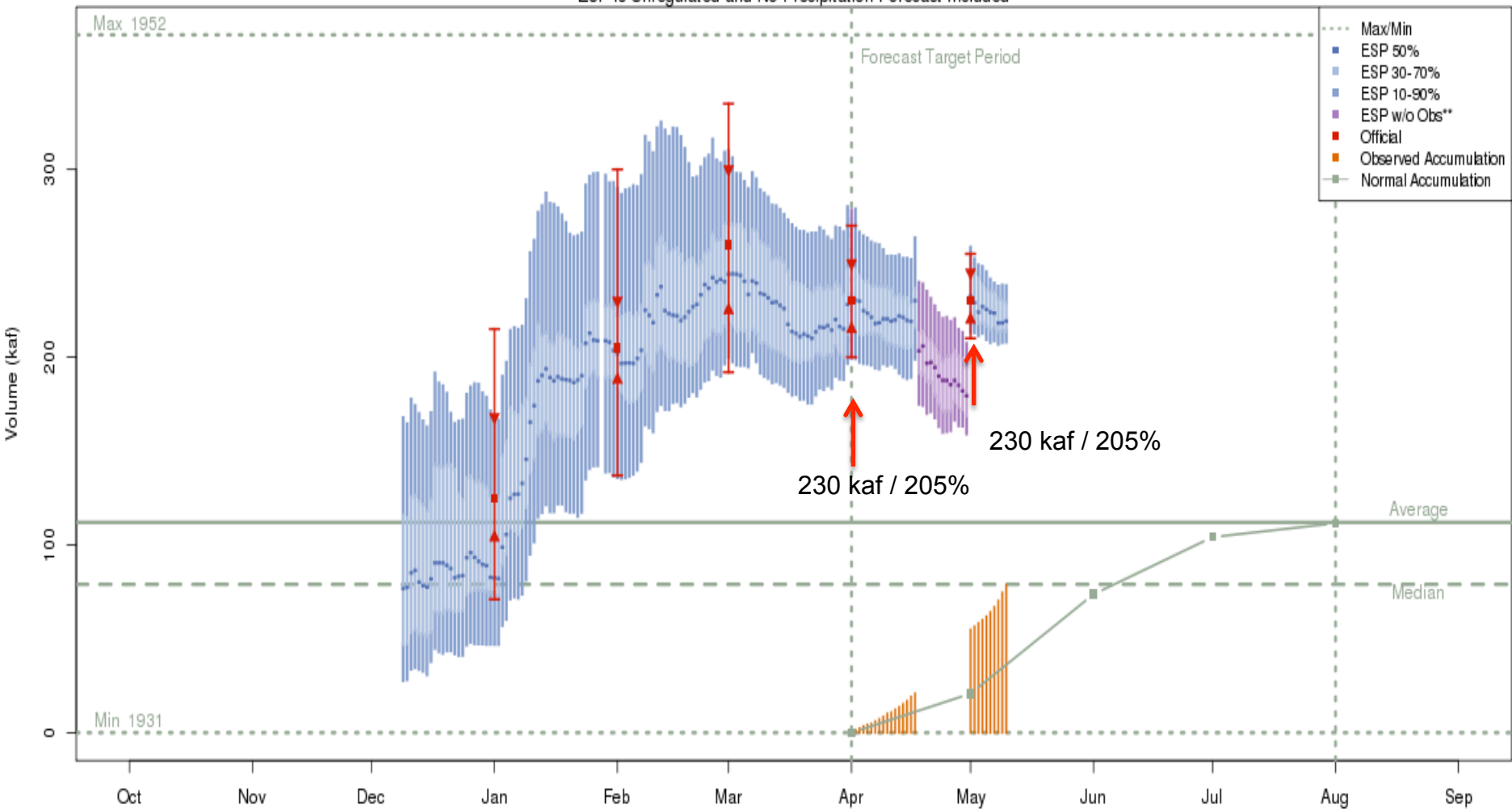
The most recent (2017-05-10) full period 50% ESP forecast is 112 kaf.

Plot Created 2017-05-10 16:53:21, NOAA / NWS / CBRFC

**Purple ESP forecasts do not include observed and are not total runoff.

Forecasts: Starvation Reservoir

Strawberry - Starvation Res- Duchesne- Nr (STAU1)
 2017-05-01 Apr-Jul Official 50% Forecast: 230 kaf (205% of average)
 ESP is Unregulated and No Precipitation Forecast Included



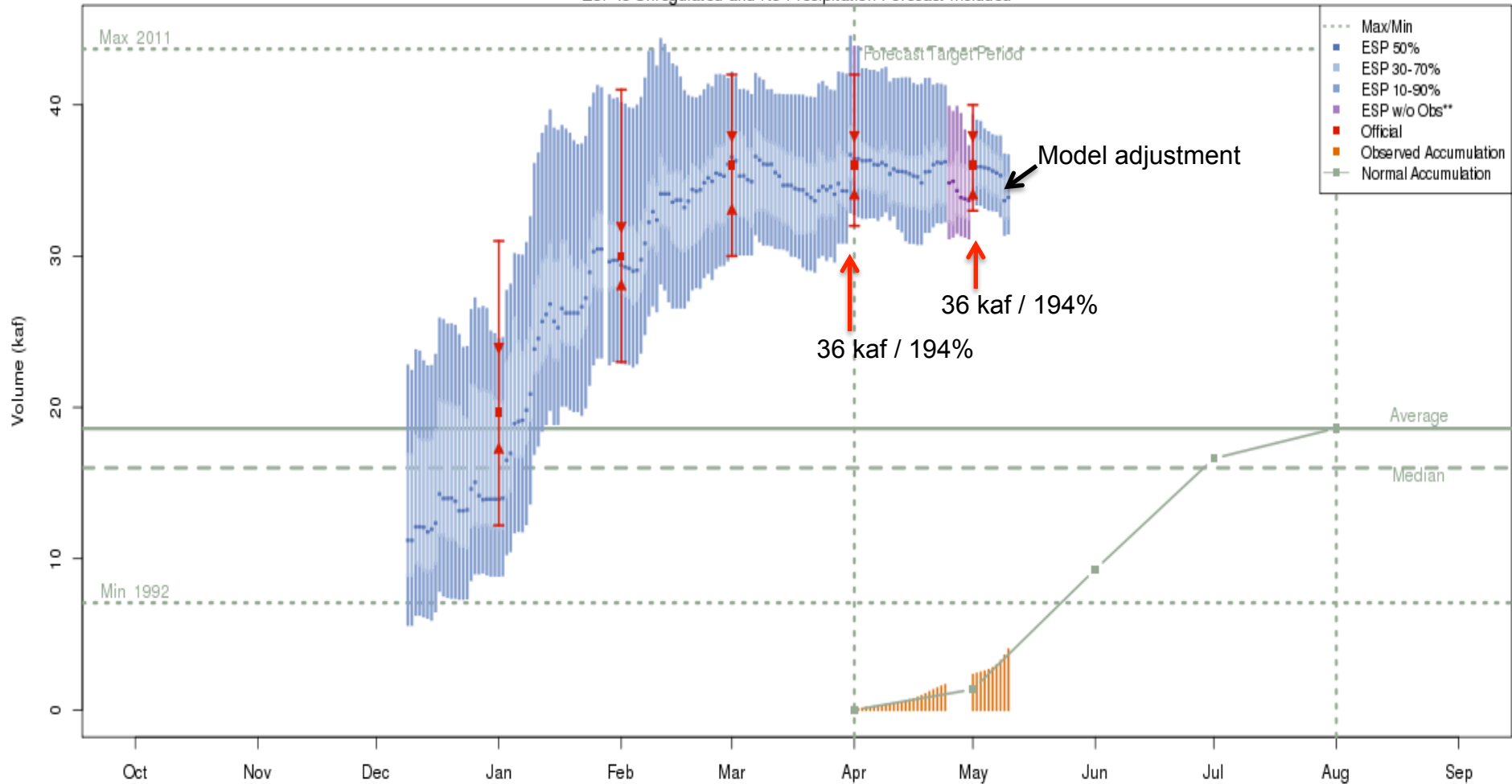
The most recent (2017-05-10) full period 50% ESP forecast is 219 kaf.

Plot Created 2017-05-10 16:52:06, NOAA / NWS / CBRFC

**Purple ESP forecasts do not include observed and are not total runoff.

Forecasts: West Fork below Vat

West Fork Duchesne - Vat Diversion- Blo (WFDU1)
 2017-05-01 Apr-Jul Official 50% Forecast: 36 kaf (194% of average)
 ESP is Unregulated and No Precipitation Forecast Included

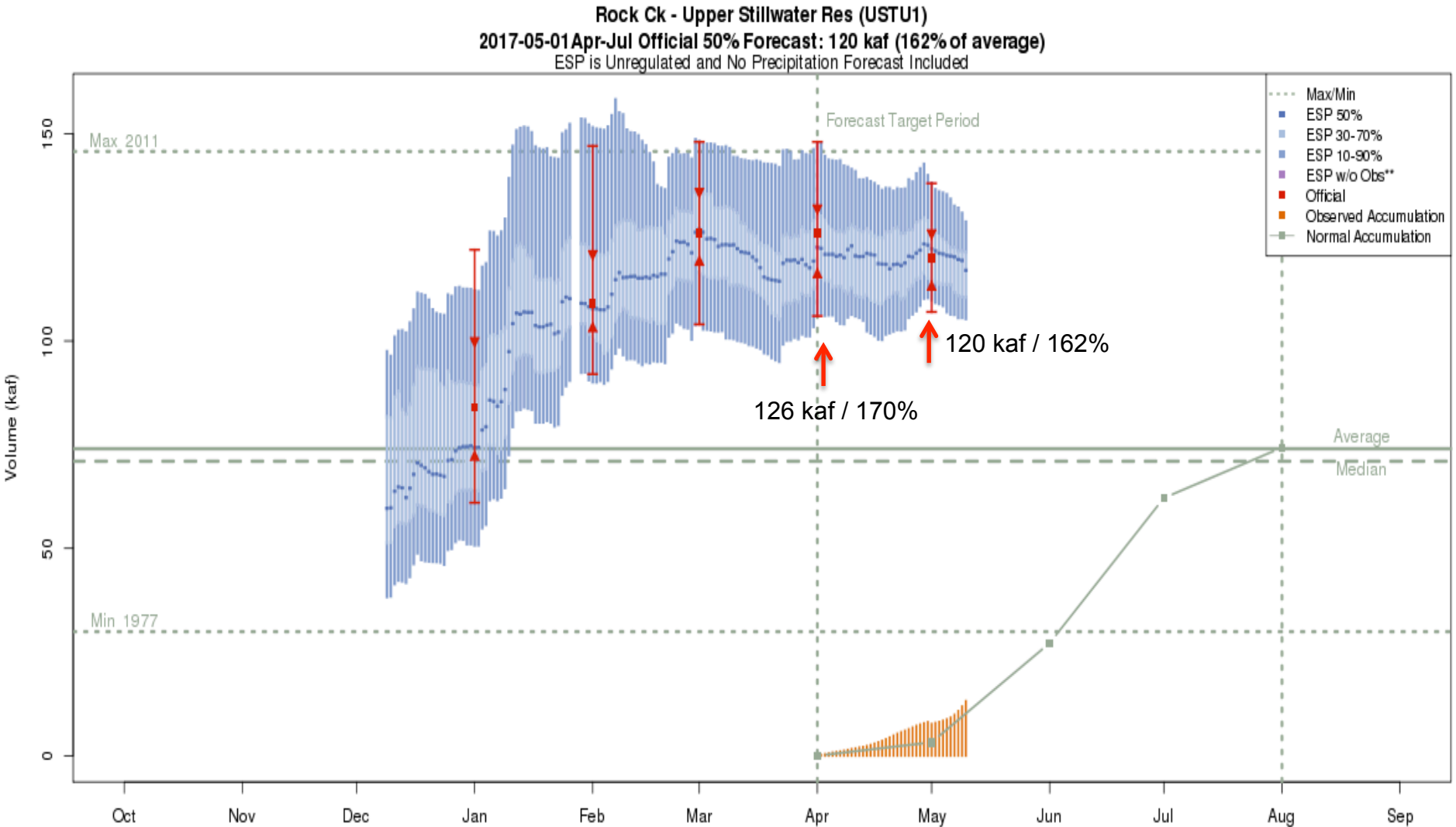


The most recent (2017-05-10) full period 50% ESP forecast is 34 kaf.

Plot Created 2017-05-10 17:00:21, NOAA / NWS / CBRFC

**Purple ESP forecasts do not include observed and are not total runoff.

Forecasts: Upper Stillwater Reservoir

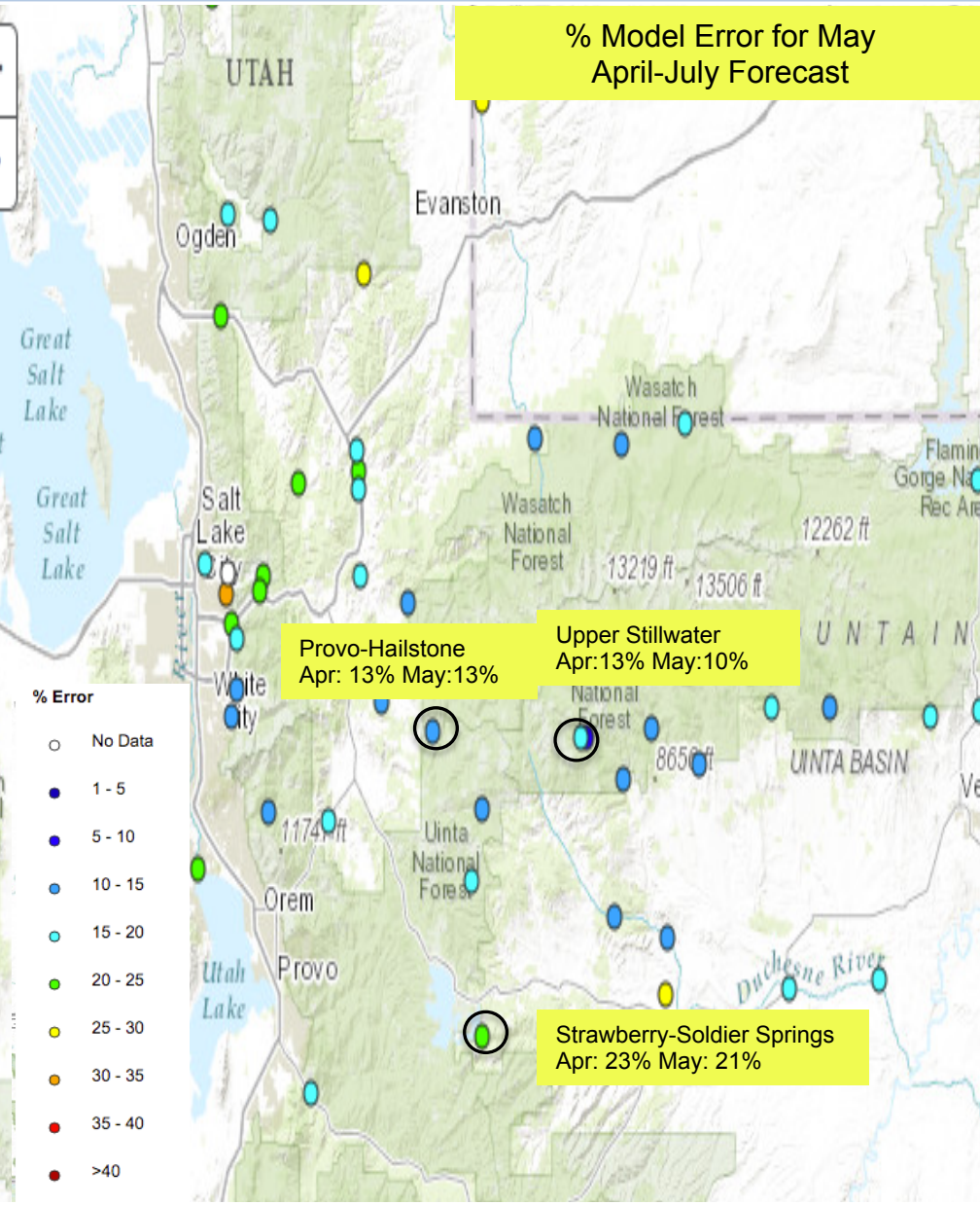


The most recent (2017-05-10) full period 50% ESP forecast is 117 kaf.

Plot Created 2017-05-10 16:55:46, NOAA / NWS / CBRFC

Forecasts in the forecast target period include observed values.

Forecast Accuracy? How good are the forecasts in May?



Historical Model Error 1981-2010

Improvement in forecast error between April & May
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
Consistency of meteorological model guidance

Long Lead Peak Flow Outlooks

MEAN DAILY PEAK FLOW FORECASTS IN CFS

May 4, 2017

LOCATION	FLOOD FLOW	FCST DATE	FORECAST FLOWS					TYPE
			90%	75%	50%	25%	10%	
BIG BRUSH CK - VERNAL, NR, RED FLEET RES, ADV	-999	2017-05-01	Peaking in the next 10 Days					UNREG
STRAWBERRY - SOLIDER SPRINGS, NR - STRAWBERRY	-999	2017-05-01				1300	1400	UNREG
CURRENT CK - CURRENT CK RES	-999	2017-05-01	450	500	550	600	650	UNREG
STRAWBERRY - STARVATION RES, DUCHESNE, NR	-999	2017-05-01	700	800	900	1000	1100	REG
STRAWBERRY - STARVATION RES, DUCHESNE, NR	-999	2017-05-01	1900	2200	2400	2600	3000	UNREG
WEST FORK DUCHESNE - VAT DIVERSION, BLO	721	2017-05-01	200	250	300	350	450	REG
WEST FORK DUCHESNE - VAT DIVERSION, BLO	721	2017-05-01	350	400	450	500	600	UNREG
DUCHESNE - TABIONA, NR	2730	2017-05-01	1000	1200	1400	1700	1900	REG
DUCHESNE - TABIONA, NR	2730	2017-05-01	1500	1700	1900	2000	2300	UNREG
ROCK CK - UPPER STILLWATER RES	-999	2017-05-01	1200	1400	1600	1800	2300	UNREG
DUCHESNE - DUCHESNE, NR, KNIGHT DIV, ABV	-999	2017-05-01	1800	2200	2500	2700	3000	REG
DUCHESNE - DUCHESNE, NR, KNIGHT DIV, ABV	-999	2017-05-01	2500	3000	3500	4000	4500	UNREG
PROVO - WOODLAND, NR	3114	2017-05-01	1850	2150	2450	2650	2900	REG
PROVO - WOODLAND, NR	3114	2017-05-01	1650	1850	2100	2200	2400	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/regulations.

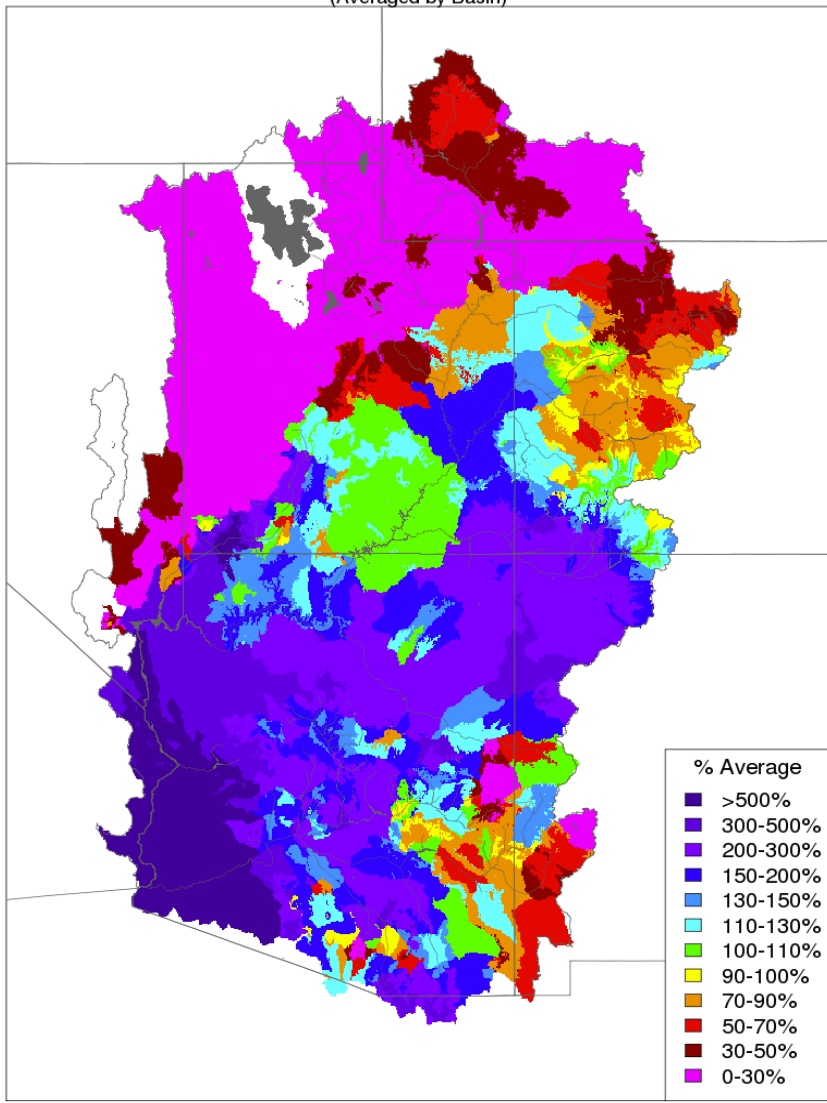
FLOOD= Flood flow. -9999 = no flood flow

Regulated flow at Provo-Woodland includes diversions from the Duchesne Tunnel whereas unregulated flows do not.

May Weather: Precipitation and temperature so far....

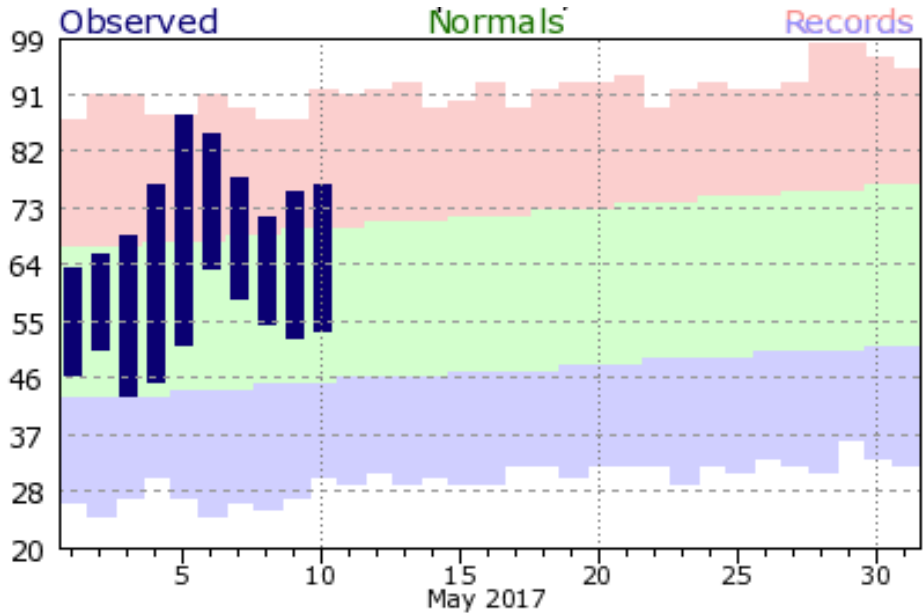
Month to Date Precipitation - May 11 2017

(Averaged by Basin)



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

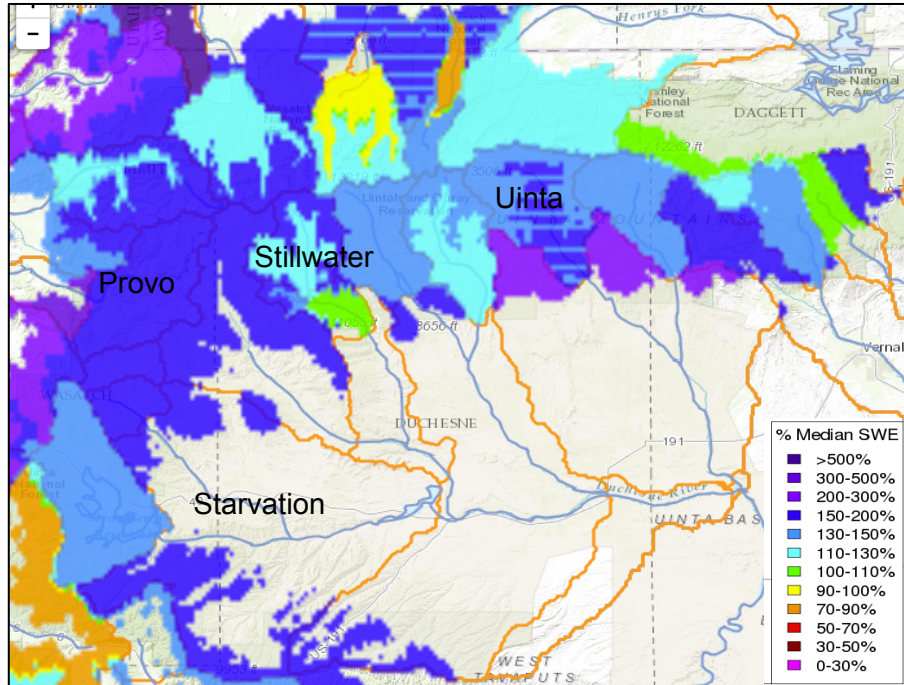
Salt Lake City Temperature: May 2017



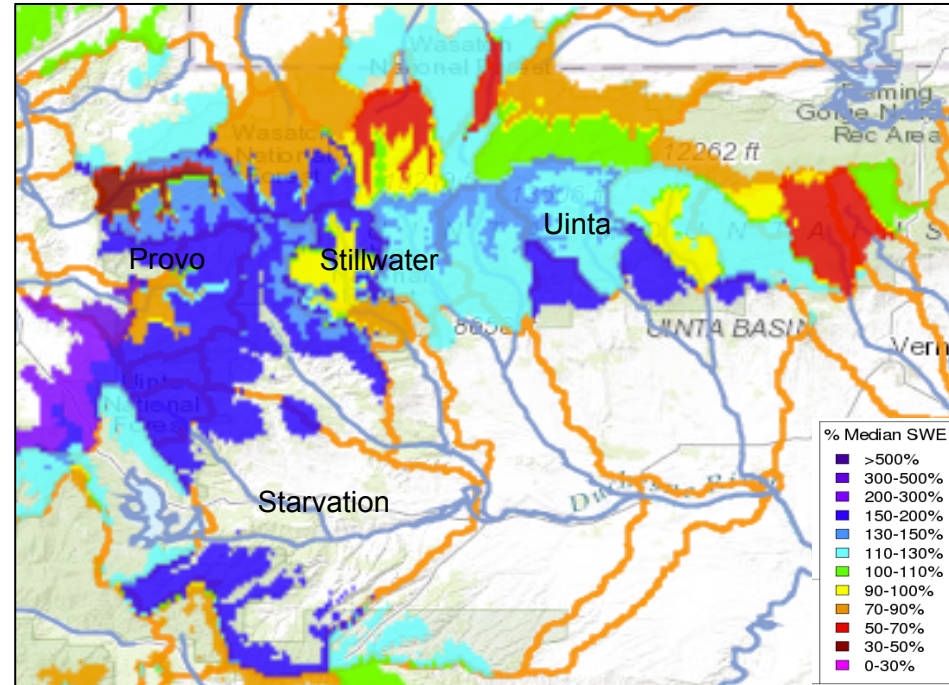
Current snow conditions

CBRFC MODEL SNOW (% median):

May 1 2017



May 10 2017

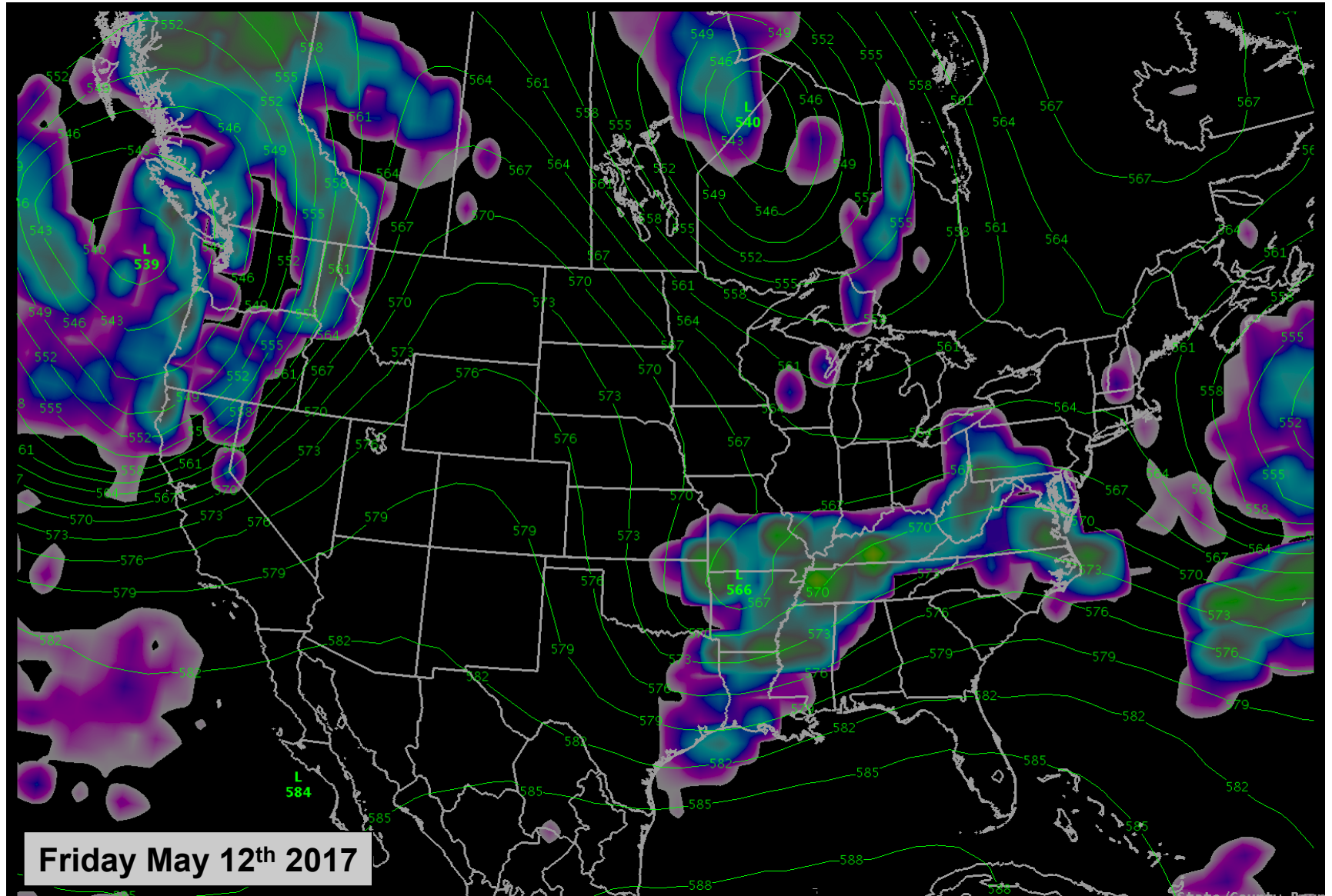


Snow has decreased as a % of median since the first of the month due to warm temperatures and melt.

There is uncertainty in model snowpack especially during the melt period. We verify model snow with observed streamflow, SNOTEL (if not melted out), and satellite images (if not cloudy).

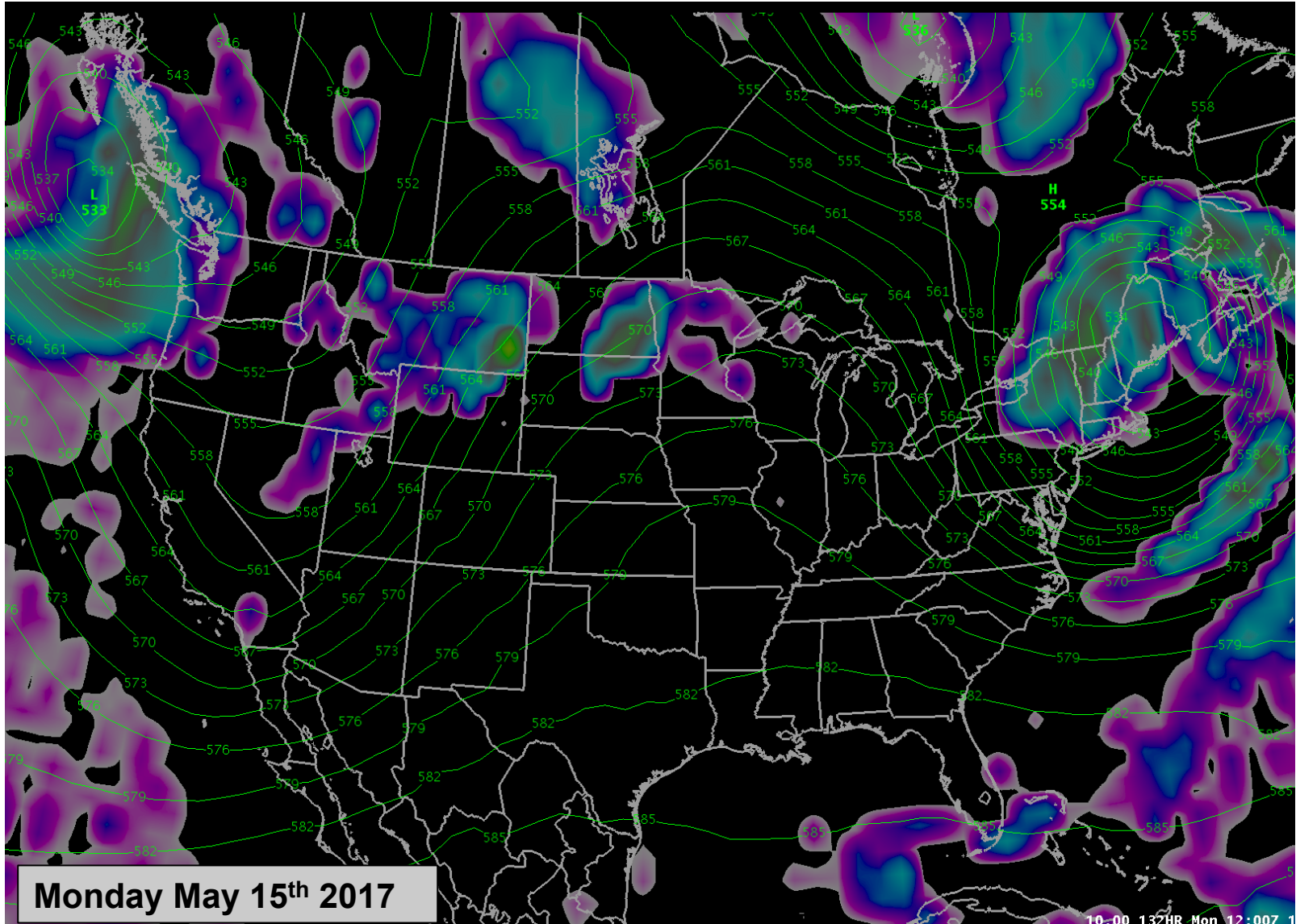
Upcoming Weather

Ridge of high pressure over the area before the next weather system. Above average temperatures and continued snowmelt expected through Sunday.



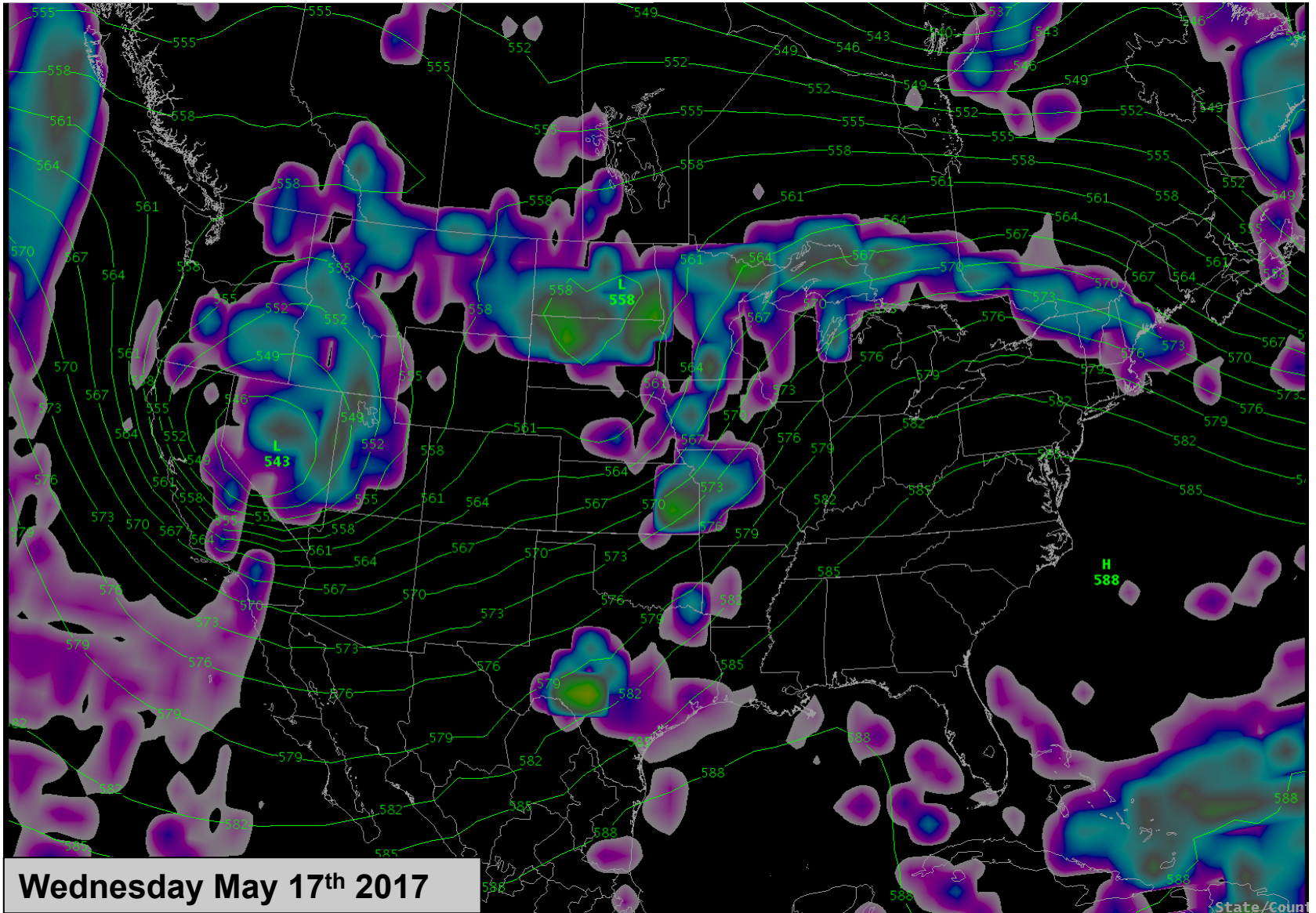
Upcoming Weather

Models show storm system splitting. Expecting cooler temperatures and increasing chances for precipitation. Should result in decreasing streamflows.



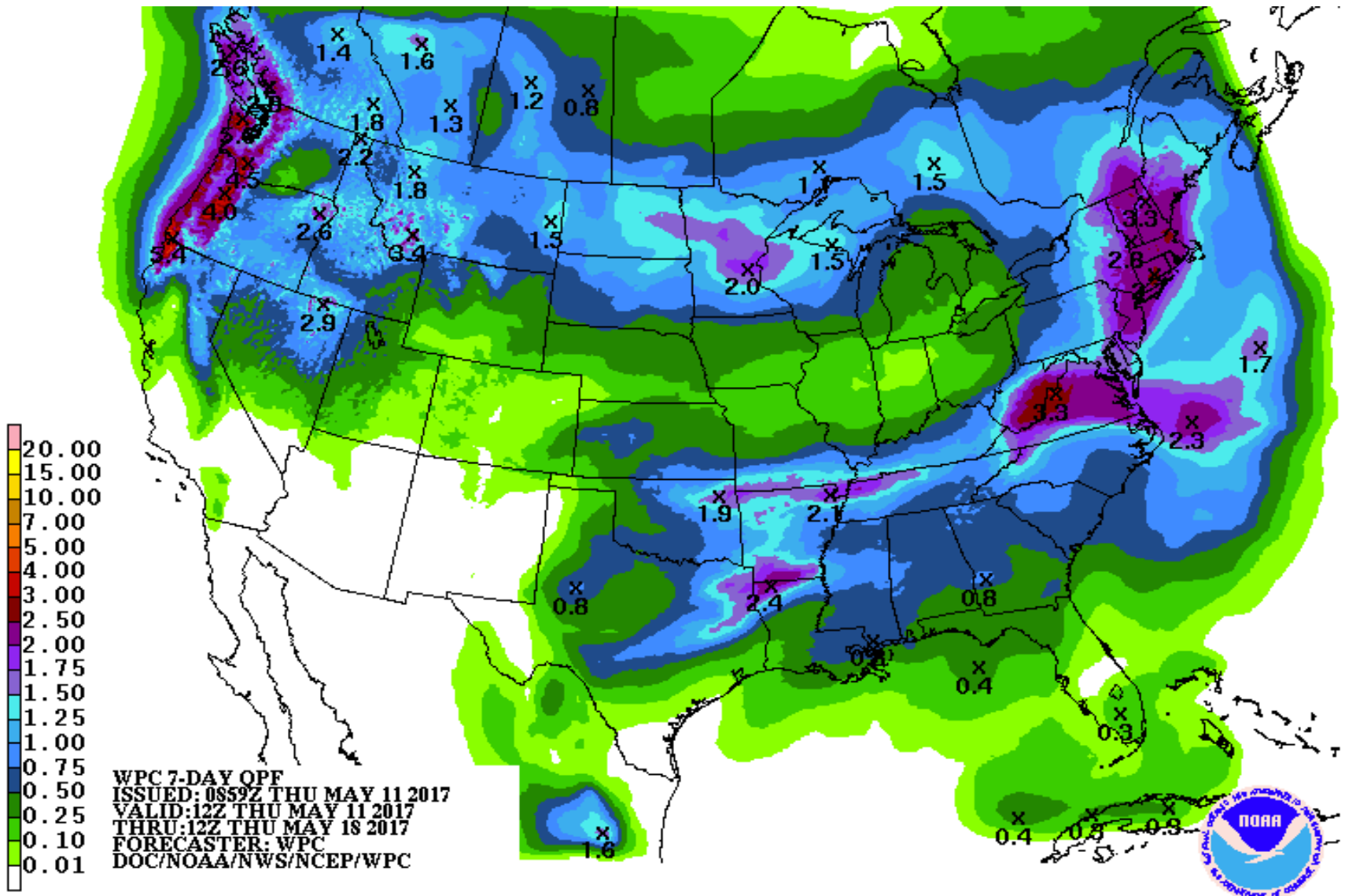
Upcoming Weather

Models show another storm system impacting the region next week. Below normal temperatures and chances of precipitation depending on track of system. Models are inconsistent at this point.



Upcoming Weather

Precipitation Forecast: 7 day total (May 10th – May 17th)



10-Day Deterministic Streamflow Forecasts



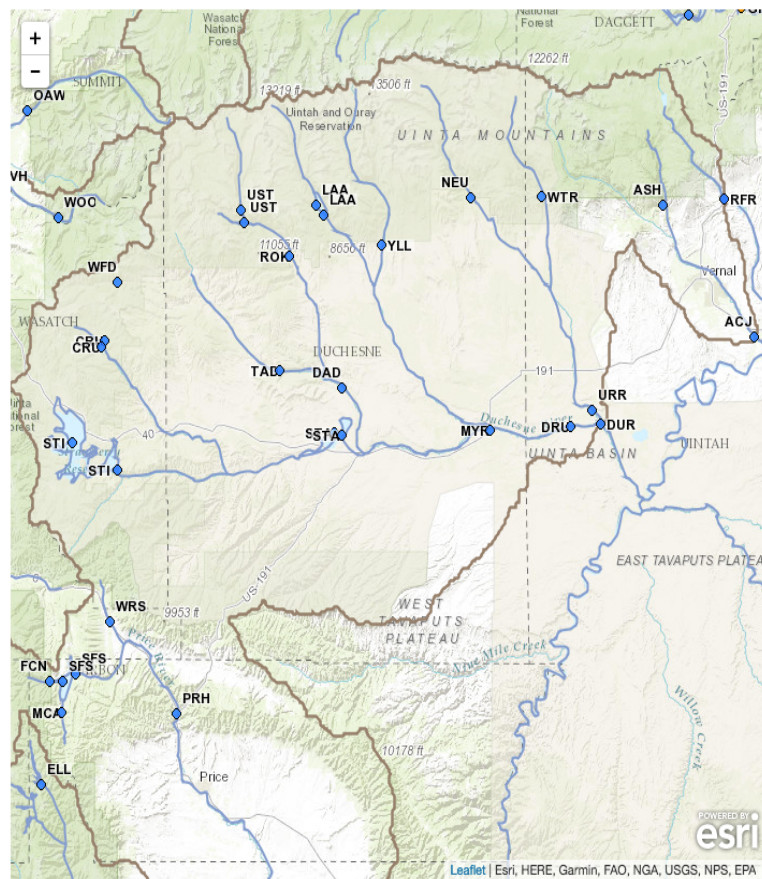
COLORADO BASIN RIVER FORECAST CENTER

NATIONAL WEATHER SERVICE / NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

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Conditions Map [Help](#)



- River Conditions
- Snow Conditions
- Water Supply Forecasts
- Peak Flood Probability
- Reservoir Conditions
- Daily Precipitation
- Monthly Precipitation
- Soil Moisture
- ▾ Map Options

Base Map Boundaries Zoom Areas [Help](#)

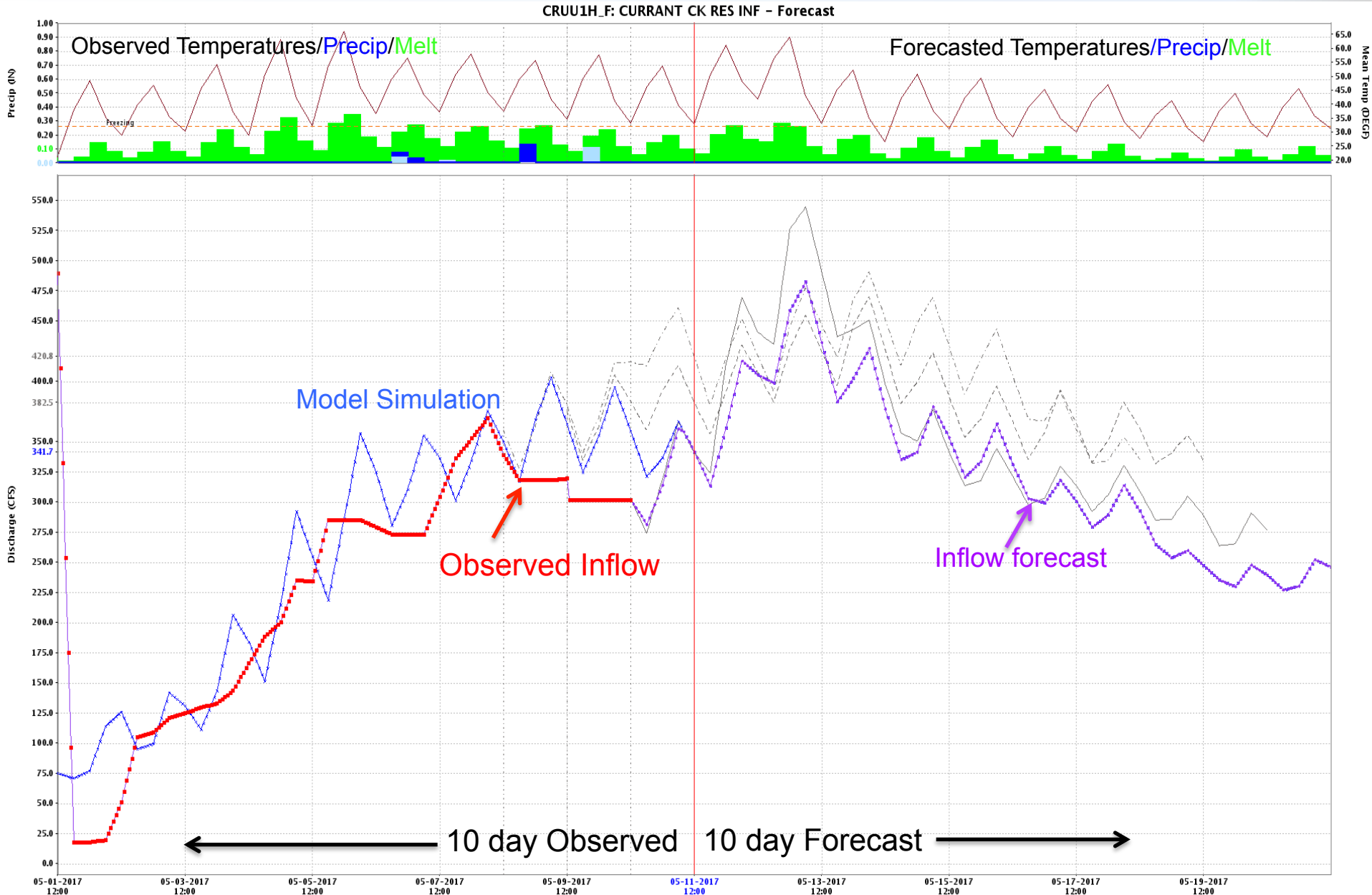
- Entire CBRFC
- Upper Colorado**
 - Col abv Kremmling
 - Eagle-Roaring Fork
 - Gunnison
 - Dolores
 - Lake Powell
- Green**
 - Upper Green
 - White-Yampa
 - Duchesne-Price
 - San Rafael-Dirty Devil
- San Juan**
 - San Juan
- Great**
 - Bear
 - Weber
 - Six Creeks-Jordan
 - Provo-Utah Lake
 - Salt Lake
- Sevier**

Best forecast to used when melt begins. Regulated flow. Flow you would expect to see in the river. Updated every morning by 10 am.

Forecasts include:
 5 days of forecasted precip
 10 days of forecasted temperatures

Sources of Errors/Inconsistency:
 Model snow states
 Consistency of meteorological models
 Future weather
 Assumptions about regulation/ diversions

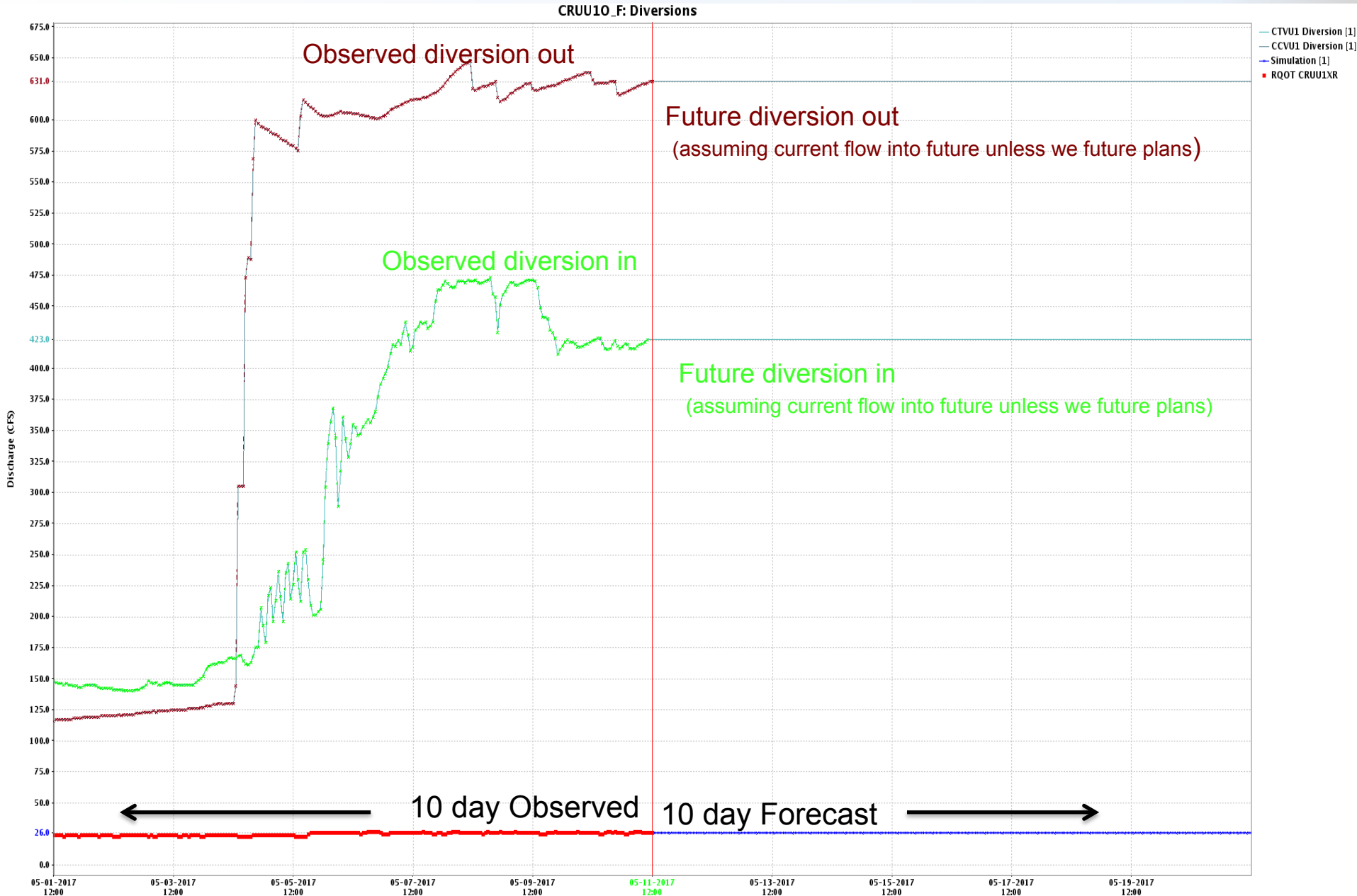
Example from the model.....



External: [1] 05-10-2017 12:00:00 GMT [2] 05-09-2017 12:00:00 GMT [3] 05-08-2017 12:00:00 GMT DUCHPR_Approved_Forecast: [4] Duchesne-Price 05-11-2017 12:00:00 GMT Current MergeScalars_Forecast: [5] pi_service_run 05-11-2017 12:00:00 GMT Current

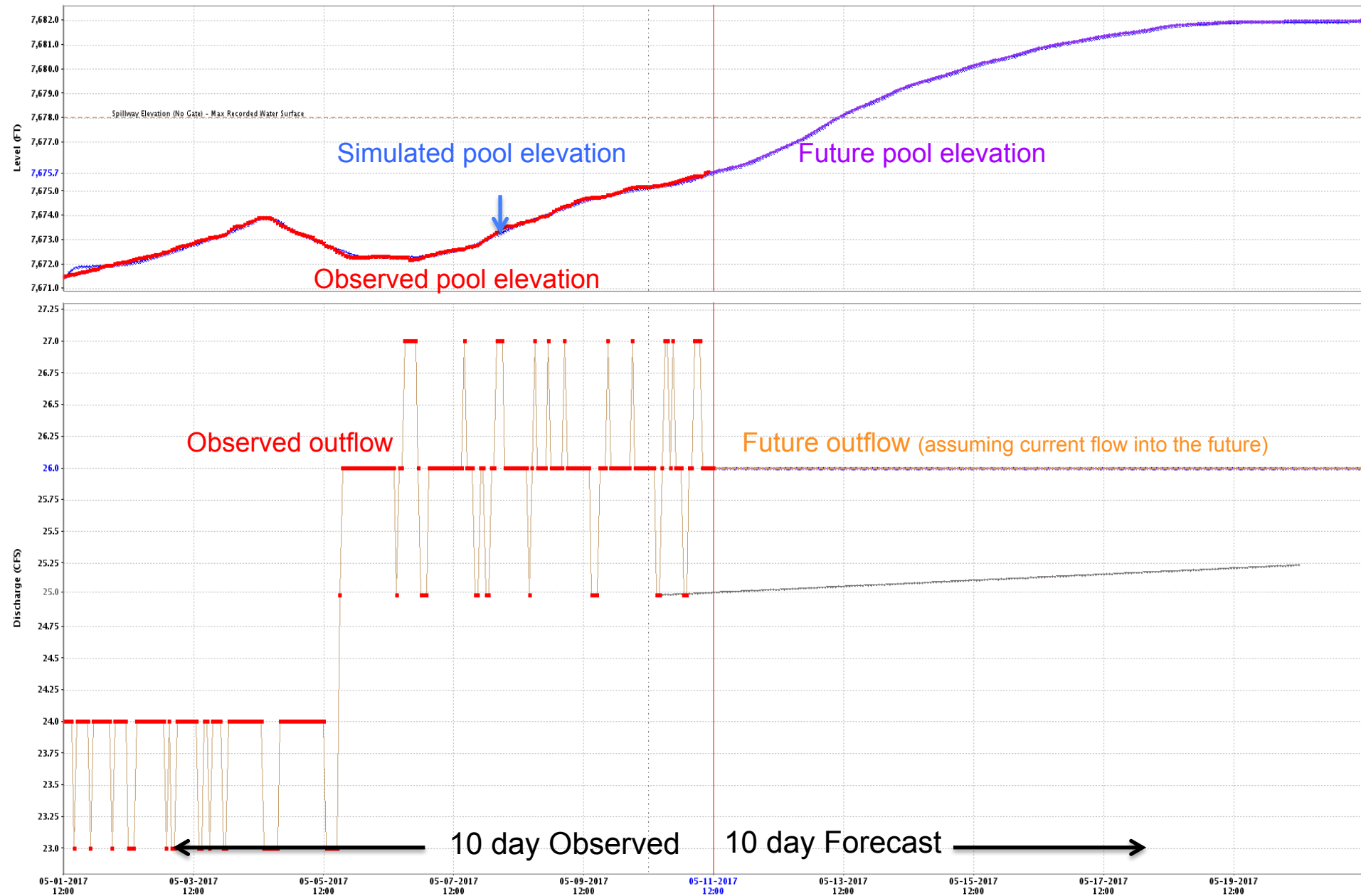
Current MergeScalars_Forecast: [5] pi_service_run 05-11-2017 12:00:00 GMT Current

Example from the model.....



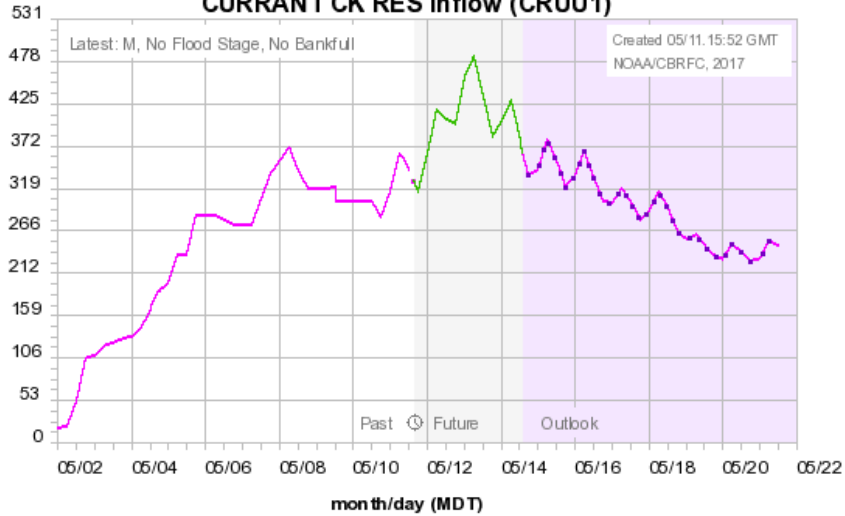
Example from the model.....

CRUU10_F: CURRANT C RES OPERAT - Pool & Outflow

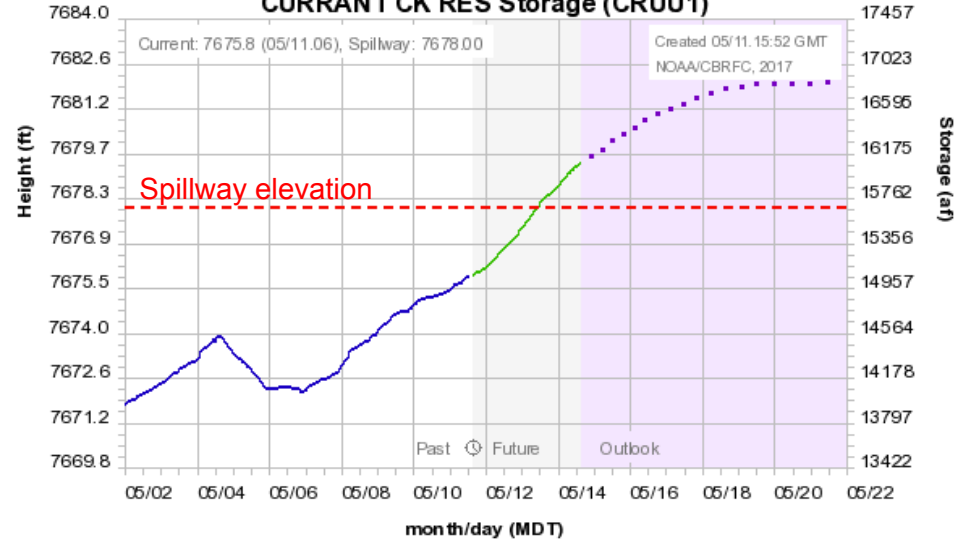


Resulting 10 day Streamflow Forecasts

Colorado Basin River Forecast Center
CURRENT CK RES Inflow (CRUU1)



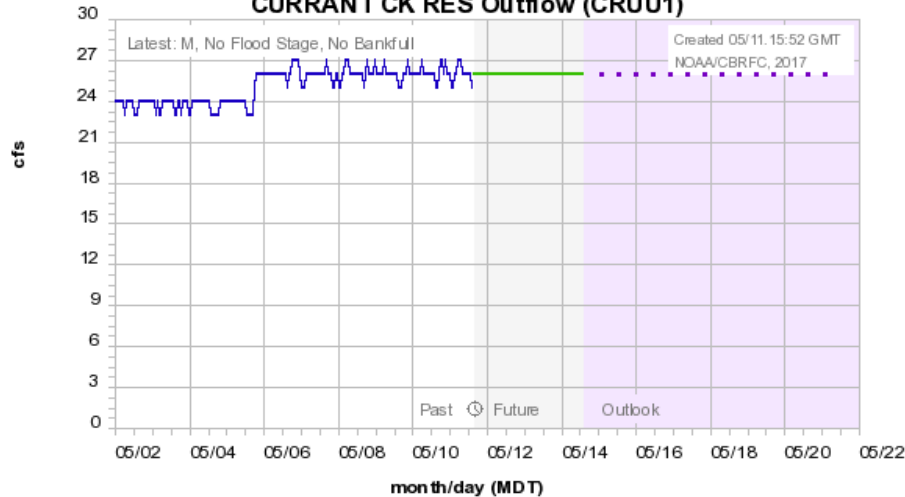
Colorado Basin River Forecast Center
CURRENT CK RES Storage (CRUU1)



Observed — Simulated — Forecast (05/11. 16:00) — Outlook (increasing uncertainty) - - -
 Historical Exceedance Probability (USGS): 90-75% 75-50% 50-25% 25-10%

Observed — Forecast (05/11. 16:00) — Outlook (increasing uncertainty) - - - Spill 7678.0 — Average - - -

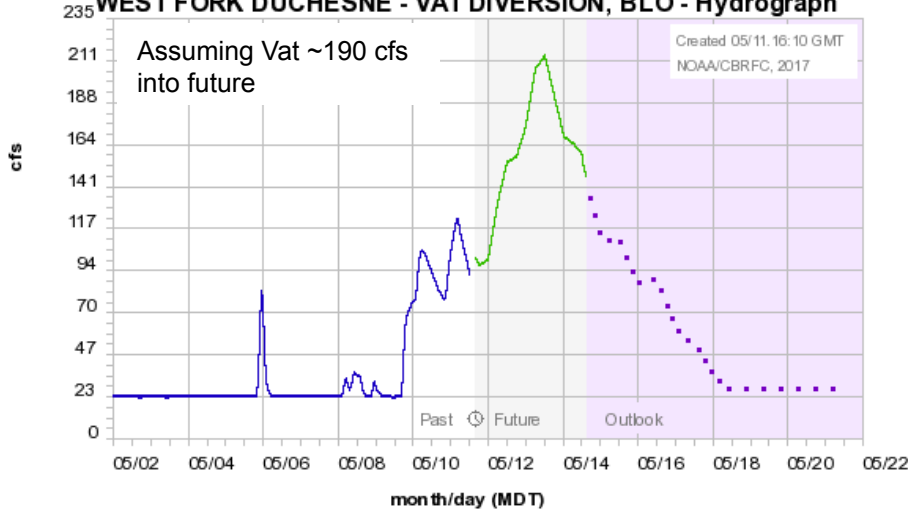
Colorado Basin River Forecast Center
CURRENT CK RES Outflow (CRUU1)



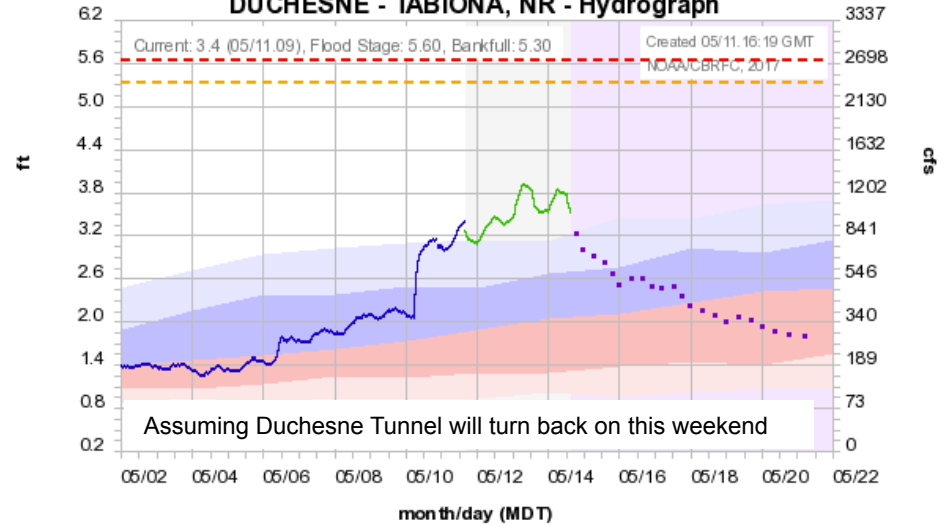
Observed — Forecast (05/11. 16:00) — Outlook (increasing uncertainty) - - -
 Historical Exceedance Probability (USGS): 90-75% 75-50% 50-25% 25-10%

10 day Streamflow Forecasts

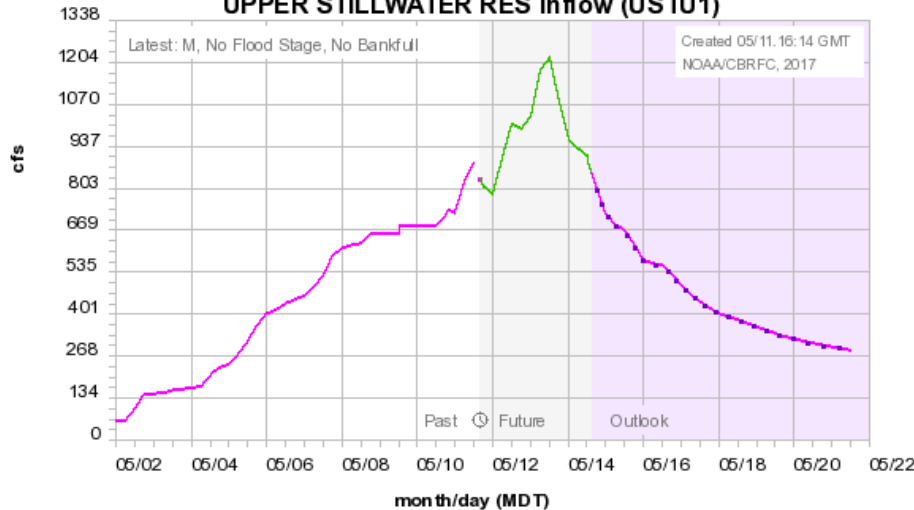
Colorado Basin River Forecast Center
WEST FORK DUCHESNE - VAT DIVERSION, BLO - Hydrograph



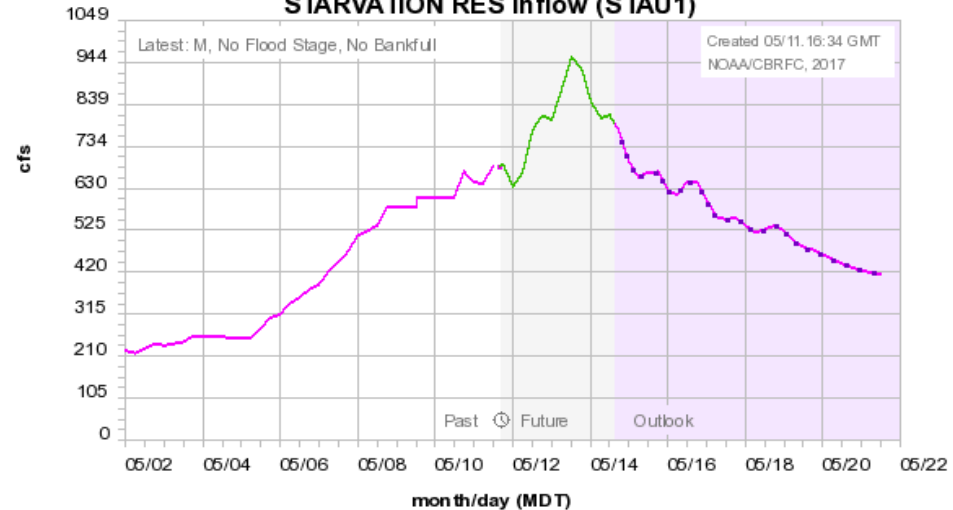
Colorado Basin River Forecast Center
DUCHESNE - TABIONA, NR - Hydrograph



Colorado Basin River Forecast Center
UPPER STILLWATER RES Inflow (USTU1)



Colorado Basin River Forecast Center
STARVATION RES Inflow (STAU1)



Discussion

Forecast Discussion

- New West Fork-Duchesne inflow product
- Anything else?

Operations Discussion?

Thanks for the updates!