CBRFC Forecast Areas

Colorado Basin Water Supply Briefing

April 6 2018

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Please mute your phone until the question period



Today's Presentation

March Weather – Dry early, active late, preserved higher elevation snow.

Current Snowpack Conditions – Overall little change since last month

2018 Water Supply Forecasts – April update

Select Forecast Site Review – Is there any chance to rebound?

Model Forecast Error – General improvement through the spring

Brief Peak Flow Summary – Below average peaks in general

Upcoming Weather – Active pattern but what areas likely to be impacted?

Takeaways – Very low runoff likely most areas.

Contacts & Questions

Phone: 1-877-929-0660 Passcode: 1706374* Please mute your phone until the question period *

High pressure ridge with dry conditions and warm temperatures in early March



March Weather

Mean Atmospheric Pattern March 2018

First half of March



500mb Geopotential Heights (m) Composite Mean 3/1/18 12z to 3/15/18 12z NCEP/NCAR Reanalysis

High pressure ridge – mostly dry conditions

Second half of March



Increase in storm activity / precipitation (primary impacts to northern basins)

March Weather: First half precipitation





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March Weather: Second half precipitation





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March Weather: Water Year Precipitation



Water Year Breakdown (Basin mean precipitation as a % of average)

Above Fontenelle

<u>Oct</u>	Nov	<u>Dec</u>	<u>Jan</u>	<u>Feb</u>	Mar	<u>TOT</u>
35	155	105	80	115	110	105

	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>тот</u>
Upper Green	35	80	90	85	90	110	90
Yampa-White	85	65	55	75	100	85	80
CO Mainstem	100	55	65	85	105	65	80
Duchesne	20	80	50	70	50	120	65
Gunnison	50	45	35	75	100	50	60
Dolores	30	25	20	75	100	55	50
San Juan	20	30	20	60	115	45	45
Virgin	*	15	20	90	75	90	55
Little Colorado	*	*	*	50	85	40	30
Salt-Verde	*	*	*	50	80	35	35
Gila	5	5	20	25	160	40	40

* Less than 5% of average

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March Weather: Water Year Precipitation Historical Ranking



March Weather: March & October-March Precipitation (Primary contributing areas to April-July water supply runoff)



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Water Year Precipitation, October 2017 - March 2018

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

March Weather: Temperatures – Mean Monthly Maximum Deviation



Prepared by NOAA, National Weather Service Colonado Bastin River Forecast Center Sab Lake City, Utah www.chr.cnoas.cov Snow Conditions: SNOTEL Snow Water Equivalent (1981-2010 % of median)

March 6th 2018

April 4th 2018



Snow Conditions: Basin SNOTEL Plots







Mediar



Snow Conditions: SWE Historical Rankings Fewer sites at lowest on record – Preserved snow in March



Snow Conditions: CBRFC hydrologic model



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Soil Moisture Impacts (entering winter, prior to the onset of snow)

Greatest impacts are where snowpack conditions and soil moisture show the same signal Impact forecast volumes +/- 5 -10 % of average



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Soil Moisture Impacts: Lower Colorado River Basin

Below average precipitation dates back to August 2017 Any precipitation events are unlikely to product significant runoff initially

We are in a climatologically drier period prior to the onset of the monsoon pattern (typically July)





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Upper Colorado: Green-Yampa-White-Duchesne



Forecasts as of Apr 1 2018

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

Duchesne: Increase of 0-10% of average

Upper Green: Change of -5 to +8% of average

White/Yampa Most a 0-5 % decrease

Upper Colorado: Colorado River Mainstem

Forecasts as of Apr 1 2018 Volume in 1000's acre-feet / % of 1981-2010 average



Upper Colorado: Gunnison and Dolores Basins

Forecasts as of Apr 1 2018 Volume in 1000's acre-feet / % of 1981-2010 average



Upper Colorado: San Juan Basin

Forecasts as of Apr 1 2018 Volume in 1000's acre-feet / % of 1981-2010 average





Upper Colorado April-July Streamflow Volume Forecasts (% of 1981-2010 average)

Lake Powell: 3100 KAF / 43 % average



Lake Powell – Forecast Inflow Distribution Comparison – 2018 vs Historical Average

This chart available at: <u>www.cbrfc.noaa.gov</u> - water supply drop down menu - select: Upper Colorado Situational Awareness



Averages are over the 1981 - 2010 period

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



Lower Colorado Apr-May forecast streamflow volumes Volume in 1000's acre-feet / % of 1981-2010 median





Forecasts as of

How are forecasts trending ?? April Precipitation (first 6 days)



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Forecast Evolution Plot: Fontenelle Inflow

April-July Forecast: 124% of average



Forecast Evolution Plot: Fontenelle Inflow

April-July Forecast: 124% of average



Forecast Evolution Plot: Flaming Gorge Inflow

April-July Forecast: 102% of average



Forecast Evolution Plot: Yampa River @ Deerlodge

April-July Forecast 60% of average



Forecast Evolution Plot: Taylor Park Inflow

April-July Forecast 63% of average



Forecast Evolution Plot: Taylor Park Inflow

April-July Forecast 63% of average

Water Supply Forecast



What this means is starting with current conditions (Streamflow, Snow, Soil Moisture) in the Taylor Park Basin, but having 1995 weather from this point forward – the model output results in a April-July volume of 109 KAF (110% of average).

The model is calibrated on the 1981-2015 period. Assuming all years are equally weighted this 1995 climate scenario would have a 1/35 (~3%) chance of occurring.

What happened in 1995 after April 1st



Significant snow accumulation and a late melt

What happened in 1995 after April 1st: June 1995 was also very wet



What happened in 1995 after April 1st: Wettest April-June on record



Forecast Evolution Plot: Blue Mesa Reservoir Inflow

April-July Forecast 51% of average



Forecast Evolution Plot: McPhee Reservoir Inflow

April-July Forecast 30% of average



Forecast Evolution Plot: Navajo Reservoir Inflow

April-July Forecast 39% of average



Forecast Evolution Plot: Lake Powell Inflow

April-July Forecast 43% of average

Forecast Evolution Plot: Lake Powell Inflow

April-July Forecast 43% of average

1995 was wettest April-June on record throughout most of the Colorado River Basin

Forecast Validation: Historical model error improves March to May

Historical Model Error 1981-2010

General improvement through the spring as more information is known and most of the snow accumulation season is behind us.

Forecasts are better than just going with average

Error tends to decrease each month into the spring

Not much improvement in June. Lack of information about high elevation snow that remains.

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

Peak Flow Map on CBRFC website – A quick look at flood potential (<u>www.cbrfc.noaa.gov</u> – select "RIVERS" drop down menu.

Peak Flow List

Peak Flow Forecast List Help | Download Data | Requery | Rebuild Plots

Peak Flood Probability Legend

♦ No Forecast ♦ No Flood Stage ♦ <10 ♦ >10 ♦ >25 ♦ >50

Options (on/off): Mean Daily Forecasts Instantaneous Forecasts Plot

Select by Area: CBRFC Green Colorado San Juan Great Sevier Virgin Low Col

Columns (on/off): ID River Location Flood Flow PI Issue Date Observed Peak to Date Observed Date Historic Peak Hist Peak Date Average Peak Normal Earliest Date Normal Latest Date Last Year Peak Last Year Date Notes Area Sub Area DS

Click column	heading to so	ort by that data	a. Click ID to	o view po	pint info.															
ID	River	Location	Flood PI Flow	Issue Date	Mean Daily 90	Mean Daily 75	Mean Daily 50	Mean Daily 25	Mean Daily 10	Inst 90	Inst 75	Inst 50	Inst 25	Inst 10	Historic Peak	Average Peak	Normal Earliest Date	Normal Latest Date	Last Year Peak	Last Year Date
1 WBRW4	Green	Daniel	6100 🔷	2018- 03-01	2500	2700	3200	3500	4000	2600	2800	3300	3600	4100	5620	2695	05-27	06-28	5310	2017-06- 20
2 <u>BPNW4</u>	New Fork	Big Piney	8850 🔷	2018- 03-01	3000	3500	4500	5000	5500	3100	3600	4600	5200	5700	9110	4730	05-26	06-23	9010	2017-06- 20
3 <u>LABW4</u>	Green	La Barge	10900 🔷	2018- 03-01	6500	7000	9000	10000	11500	6700	7200	9200	10000	12000	18800	8000	05-26	06-21	15900	2017-06- 12
4 <u>GRRW4</u>	Green	Green River	11000 🔷	2018- 03-01	5000	6000	8000	9500	10000	5100	6100	8100	9700	10000	15400	5790	05-05	07-08	10500	2017-06- 26
5 HMFW4	Hams Fork	Frontier	1790 🔷	2018- 03-01	250	350	400	550	700	260	370	430	590	750	2000	710	05-09	06-06	1240	2017-05- 14
6 <u>BNRU1</u>	Blacks Fork	Robertson	2580 🔷	2018- 03-01	500	700	800	1000	1300	620	860	980	1200	1600	2860	1380	05-23	06-17	1380	2017-06- 06
7 HFMW4	Henrys Fork	Manila	2960 🔷	2018- 03-01	150	200	250	450	650	NA	NA	NA	NA	NA	3780	750	05-10	06-26	627	2017-06- 07
8 STMC2	Yampa	Steamboat Springs	5930 🔷	2018- 03-01	1300	1700	2100	2700	3600	1600	2000	2400	3000	3900	5870	3070	05-19	06-10	2640	2017-06- 08
9 <u>ENMC2</u>	Elk	Milner	6220 🔷	2018- 03-01	1500	2000	2500	3000	4500	1700	2300	2800	3400	5100	7000	3865	05-17	06-03	3960	2017-06- 12
10 <u>MBLC2</u>	Yampa	Maybell	21200 🔷	2018- 03-01	4000	5000	6500	8000	10500	4200	5200	6800	8300	11000	24400	10300	05-12	06-05	7930	2017-05- 16
11 <u>LILC2</u>	Little Snake	Lily	14700 🔷	2018- 03-01	1300	2000	2500	3000	4500	1500	2300	2800	3400	5100	13400	4320	05-03	06-04	2870	2017-05- 16
12 <u>YDLC2</u>	Yampa	Deerlodge Park	20600 🔷	2018- 03-01	5500	7000	8500	10500	13500	5900	7400	8900	11000	14000	32300	13470	05-11	06-04	10700	2017-05- 16
13 WRMC2	White	Meeker	8570 🔷	2018- 03-01	1100	1300	1600	1900	2500	1200	1400	1700	2100	2700	6320	3040	05-17	06-09	2300	2017-06- 12

Peak Flow List

Peak Flow Forecast List Help | Download Data | Requery | Rebuild Plots

Peak Flood Probability Legend

♦ No Forecast ♦ No Flood Stage ♦ <10 ♦ >10 ♦ >25 ♦ >50

Options (on/off): Mean Daily Forecasts Instantaneous Forecasts Plot

Select by Area: CBRFC Green Colorado San Juan Great Sevier Virgin Low Col

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Click column heading to sort by that data. Click ID to view point info.

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1 LABW	4 Green	La Barge	10900 🔷	2018- 03-01	6500	7000	9000	10000	11500	6700	7200	9200	10000 (12000	18800	8000	05-26	06-21	15900	2017-06- 12
2 TADU	1 Duchesne	Tabiona	700 🔷	2018- 03-01	120	150	200	250	350	210	240	290	350	460	2810	925	05-14	06-12	1450	2017-06- 09
3 YLLU	1 Yellowstone	Altonah	2100 🔷	2018- 03-01	300	350	500	650	800	340	410	610	810	1000	1980	950	05-22	06-16	1070	2017-06- 07
4 <u>NEUU</u>	1 Uinta	flc	od level)18- 3-01	250	400	550	750	950	540	690	9 0	1100	1300	3000	1245	05-15	06-11	1030	2017-06- 07
5 JESU	1 Green	Jensen	24100 🔷	2018- 03-01	9500	11000	12500	16000	10% forec	or g ast	reat exce	er n eeds	near s floo	n dai od le	ly vel	16990	05-11	06-07	17900	2017-06- 10
6 <u>GRVU</u>	1 Green	Green River	36400 🔷	2018- 03-01	10000	11500	13000	17000	22000	10000	12000	10000	11000	22000	71200	21700	05-16	06-11	21800	2017-06-11
7 WBRW4	4 Green	Daniel	6100 🔷	2018- 03-01	2500	2700	3200	3500	4000	2600	2800	3300	3600	4100	5620	2695	05-27	06-28	5310	2017-06- 20
8 BPNW	1 New Fork	Big Piney	8850 🔷	2018- 03-01	3000	3500	4500	5000	5500	3100	3600	4600	5200	5700	9110	4730	05-26	06-23	9010	2017-06- 20
9 <u>GRRW</u>	4 Green	Green River	11000 🔷	2018- 03-01	5000	6000	8000	9500	10000	5100	6100	8100	9700	10000	15400	5790	05-05	07-08	10500	2017-06- 26
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11 <u>BNRU</u>	Blacks Fork	Robertson	2580 🔷	2018- 03-01	500	700	800	1000	1300	620	860	980	1200	1600	2860	1380	05-23	06-17	1380	2017-06- 06
12 <u>HFMW</u>	4 Henrys Fork	Manila	2960 🔷	2018- 03-01	150	200	250	450	650	NA	NA	NA	NA	NA	3780	750	05-10	06-26	627	2017-06- 07
13 STMC	2 Yampa	Steamboat Springs	5930 🔷	2018- 03-01	1300	1700	2100	2700	3600	1600	2000	2400	3000	3900	5870	3070	05-19	06-10	2640	2017-06- 08
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Peak Flow Graphic

MBLC2 Peak Flow Forecasts

Mean Daily Plot Instantaneous Plot Forecasts Observations Help

Plot Options (on/off): Record Year Data Yearly Peaks Flood Flow

CBRFC / NWS / NOAA

Current and Future weather – Storm system moving in for the weekend. Sub-tropical source means mild air, high freezing levels, rain possible up to 10K feet or higher.

This morning- Apr 6th 2018

Storm system has a sub-tropical moisture tap. Heaviest precipitation will impact the U.S. West Coast but some moisture will move into our forecast area.

Current and Future weather – Storm system moving in for the weekend. NWS radar image from this morning.

This morning- Apr 6th 2018

Significant moisture moving into the West Coast. Some of that moisture (lesser amounts) will translate into the Great and Colorado River Basins.

Upcoming Weather: Heaviest precipitation overnight Saturday. Northern basins will be impacted the greatest.

Upcoming Weather: Drying with a ridge of high pressure. Temperatures above normal midweek (5-10 degrees above normal). Pattern remains progressive.

Upcoming Weather: Models suggest a large trough over the forecast area. This would be a beneficial system impacting much of the area if it verifies. Confidence is low.

Fri April 13th Colder system indicated for next weekend. This is not associated with subtropical moisture but it would bring snow back down to lower elevation areas

Upcoming Weather: Model suggests another cold trough to start the week of the 16th. While confidence is low these could boost mid month precipitation to above average.

Mon April 16th Models keep an active weather pattern through mid month. While these would not bring a full recovery these systems - if they verify – could benefit the water supply situation and trend forecasts slightly higher in some areas

Upcoming Weather

NWS Weather Prediction Center: Precipitation Forecast Apr 6 – Apr 13

Long Range Weather Outlook: This model suggests a period of dry and warmer weather to start the 4th week of April. Pattern may still remain progressive.

Key Points

Near to above average March precipitation was limited to the Green River Basin in Wyoming and the Duchesne River Basin. Elsewhere precipitation was much below average, especially farther south.

Overall there was little change to snowpack conditions, which remain quite poor with the exception of the Green River Basin headwaters in Wyoming. Seasonal temperatures helped to maintain high elevation snowpack.

Forecasts increased slightly from those issued March 1 in the Green River Basin headwaters in Wyoming and the Duchesne River Basin. Elsewhere forecasts decreased with largest decreases occurring in the Dolores and San Juan River Basins. Lake Powell decreased to 3.1 MAF or 43% of average.

On average the snow accumulation season runs into mid to late April in the higher elevations. This means significant snow accumulation from this point forward, while possible, becomes less likely, especially in the southern basins.

Current models suggest an active weather pattern over the next two weeks. If this verifies, mid-month precipitation totals could be near to above average and have a positive impact on water supply forecasts, especially in the northern basins. Forecast confidence is low at this time.

2018 water supply briefing schedule

2018 monthly water supply briefings for the Colorado Basin

Monday May 7th @ 11 am MT

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

No peak flow briefings are scheduled at this time. If conditions change and a need arises we will re-evaluate.

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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Ashley Nielson – Green River Basin, Lake Powell Focal Point <u>ashley.nielson@noaa.gov</u>

Cody Moser – Upper Colorado Mainstem Focal Point cody.moser@noaa.gov

Tracy Cox and Zach Finch – Lower Colorado Basin, Virgin Focal Point tracy.cox@noaa.gov zach.finch@noaa.gov

Brent Bernard – Six Creeks, Provo, Sevier Focal Point brent.bernard@noaa.gov

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