Utah Water Supply Briefing

April 7th, 2023

Colorado Basin River Forecast Center

Presenter: - Brenda Alcorn

Utah Forecasters: Trevor Grout Brenda Alcorn Patrick Kormos

Questions: Type questions into the 'Questions' Box or Raise Hand

Webinar recording & slides will be made available on CBRFC webpage



Utah Water Supply Briefing

- 1. Weather and Snowpack
- 2. Water Supply Forecasts
- 3. Upcoming Weather
- 4. Peak Flow Forecast Information
- 5. Contacts & Questions



Utah Weather Review - March Daily Precipitation

March 31



March started wet and ended wet, with very few statewide dry days in between. Big precipitation events ~weekly with some precipitation most days.

Utah Weather Review - March and Water Year Precipitation Totals

- >200% average March precipitation in all basins except Sevier (195%)
- All forecast groups have seen much above normal WY precipitation



Utah Weather Review - March Precipitation and Temperature Maps





Not only was March extremely wet, but temperatures were also much below normal statewide.

This allowed the area to hold onto most of the low elevation snowpack through the month.

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

Utah March Streamflow

Due to the cold temperatures, minimal snowmelt occurred during March, especially in northern Utah. As a result, March streamflow was below to much below normal across most of the state.

The exception was the Virgin River Basin in southwest Utah which experienced a few lower elevation rain events during the month. The March 15-16 storm caused flooding in some parts of the basin.



	Expl	anation	- Perce	ntile cla	asses		_
Low	<10	10-24	25-75	76-90	>90	High	
LOW	Much below normal	Below normal	Normal	Above normal	Much above normal	nign	No Data

≥USGS

Utah Weather Review - April Precipitation to Date



April 1-6 CBRFC Precipitation Percent of 1991-2020 Average						
Duchesne	170					
Virgin	90					
Bear	325					
Weber	290					
Six Creeks	310					
Provo/Utah Lake	280					
Sevier	95					

The first week of April continued the cold, wet pattern of March. Areas of northern Utah received >300% of the normal totals for the period.

The April 1 water supply forecasts were being made in the midst of this significant precipitation event. Use of forecast precipitation helped forecasters take it into account but some areas outperformed the projections.

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

Utah Current Snowpack: CBRFC April 6th



Utah Current Snowpack: NRCS April 6th

Most SNOTEL stations in the Bear, Weber, Six Creeks, and Provo river basins are now reporting SWE values that are the highest on record.

Elsewhere across the state most stations rank in the top 3 of record.



Utah Water Supply Forecasts - Percentile Map **NEW**



Water Supply Forecasts

First of Month Forecast Date: 2023-04-01 Latest Model Run Date: 2023-04-06

Show Hide Other Types

First of Month Forecast Percent Average
First of Month Forecast Percent Median
First of Month Forecast Percentile
Latest Model Guidance Percent Average
Latest Model Guidance Percent Median
Latest Model Guidance Percentile

△ No Forecast
△ No Data
△ Low
△ <10
△ 10-25
△ 25-75
△ 75-90
△ >90
△ High

Latest model guidance after the storm indicates record volumes at some sites along the Wasatch Front.

BCT

BCT: Big Cottonwood Ck - Salt Lake City Nr **Percentile:** 100% of Years below forecast (1st Highest Flow / 93 Total Years)

West Jordan



Utah Water Supply Forecasts



- April 1 forecast for April-July volume
- April-July forecast streamflow volumes are in percent of <u>1991-2020 average</u>.

Median forecasts by forecast group.

Bear	160
Weber	215
Six Creeks	235
Provo / Utah Lake	260
Sevier	245
Duchesne	165
Virgin	305

Utah Water Supply Forecasts - Bear



<u>April 1 Forecast</u>

- >10% increases across the basin
- median forecast 160% of avg.
- forecasts range 114-239% of avg.
- No official 50% forecasts over record
- 1 Latest Model Guidance 50% over record
 - Little Bear

Utah Water Supply Forecasts - Bear



Utah Water Supply Forecasts - Weber



Utah Water Supply Forecasts - Weber



Now that we are within the runoff window (April-July), observed volumes must be added to the model forecast which is only for the current day forward.

If observed data is unavailable, the Model Guidance will be plotted as purple instead of blue.

Utah Water Supply Forecasts - Six Creeks



Utah Water Supply Forecasts - Six Creeks



After a great start to the season, there was a dry period during February and forecast volumes dipped as a result.

However, forecast volumes have been steadily increasing since the end of February thanks to the continual cold, wet weather during that time.

The current forecast indicates a 70% chance of exceeding the historical volume.

Utah Water Supply Forecasts - Provo - Utah Lake Basin



Utah Water Supply Forecasts - Duchesne, Price, and San Rafael



Utah Water Supply Forecasts - Duchesne, Price, and San Rafael



The current model snow in the Duchesne River Basin as a whole is at the same level as the 2011 maximum.

However, the 2011 maximum snow occurred about a month later than the current time with some additional storms in May that caused some forecast points in the basin to experience record runoff volumes that year.

Model guidance is indicating chances for exceeding record volumes at some places if the spring is wetter than normal.

Utah Water Supply Forecasts - Sevier and Virgin





Historical Forecast Verification

April 1 Forecast Error: April-July Volume



Location	Apr 1 Forecast Error
BEAR - UTAH-WYOMING STATE	15%
BEAR - WOODRUFF NARROWS	31%
LOGAN - LOGAN- NR	14%
WEBER - OAKLEY- NR	14%
WEBER - ROCKPORT RES	19%
BIG COTTONWOOD CK	16%
PROVO - WOODLAND- NR	13%
PROVO - DEER CK RES	19%
VIRGIN - VIRGIN	17%

Error tends to decrease each month into the spring

Where Forecasts are Better:

-Headwaters

-Primarily snow melt basins

-Known diversions / demands

Where Forecasts are Worse:

-Lower elevations (rain or early melt) -Downstream of diversions / irrigation

-Little is known about diversions / demands

Future weather is still a large portion of the April 1 water supply forecast error/uncertainty.

CBRFC Peak Flow Forecast Background Information

- Mean daily peak flow forecast points are a subset of our daily river forecast points.
 - Peak flow forecasts represent a long range outlook of peak flows due to **snowmelt**
- Many of these sites have established flood stages and therefore provide some flood threat information.
- Peak flow forecasts have a high level of uncertainty and are highly dependent on Spring weather.
- Do not forecast a specific date of peak
 - Typically only have a 5-10 day forecast lead time for timing the peak
 - Normal peak flow timing (window) information is provided
- Instantaneous Peak Flow Forecasts
 - Relationship between observed mean daily peak and instantaneous peak in each year
 - Only available for locations with strong correlations and long historical record
 - Sites with frequent heavy rain have poor relationships
- Peak flow forecast points alone are not a comprehensive summary of any flood threat.

Peak Flow Forecast Information - Map View





Peak Flow Forecast - Percentile

Percentile: the percent of historical annual mean daily peak flow values that are below the current peak flow forecast.

Legend: Percentile Categories

Peak flow forecasts with a higher percentile correspond to locations with better snowpack conditions.

Peak flow forecasts highest on record: East Canyon near Jeremy Ranch McLeod Creek near Park City Mud Creek at Scofield



Peak Flow Forecast - Percent of Average

Percent of Average: the peak flow forecast percent of the 1991-2020 average mean daily peak flow.

Legend: Percent of Average

Peak flow forecasts with a higher percent of average correspond to locations with better snowpack conditions.

Most peak flow forecasts in the Great Basin are >200% of the average mean daily peak.



Peak Flow Forecast - Flood Stage Exceedance Probability

NWS Flood Stage Exceedance Probability: the probability of the mean daily peak flow forecast exceeding flood stage.

Legend: Exceedance Probability

Peak flow forecasts with a higher exceedance probability correspond to locations with increased flood potential.

Peak flow forecasts >50% chance of exceeding defined flood stage: Bear at Border City Creek **Big Cottonwood Creek**

*Note: flood stage not established at all peak flow forecast locations.

Clicking on a point takes you to the site's peak flow dashboard page.



Hide Other Types

Peak Flow Forecast Information - Peak Flow Dashboard Pages

Daily Peak Flow Forecast - LGNU1 - Logan - Logan Nr State Dam Abv

Model Run Date	2023-04-06 (Incl 7 Day Precip Forecast)
Flood Flow	1552 cfs
50% Forecast	1497 cfs
Rank of 50% Forecast	7th Highest Flow / 69 Total Years
Percentile	91% of Years Below Forecast
Peak to Date	
Average Peak	879 cfs
Percent Average	170%
Normal Time of Peak	05-13 - 06-08
Last Year's Peak	471 cfs, on 2022-05-30



• As the time of peak nears, transition from using probabilistic peak flow guidance to using the daily 10-day deterministic streamflow forecasts.



- 10-day streamflow forecasts use:
 - 7-day precipitation forecast
 - 10-day temperature forecast

Date	Time	Flow
4/8/2023	12Z	87
4/9/2023	12Z	87
4/10/2023	12Z	87
4/11/2023	12Z	96
4/12/2023	12Z	121
4/13/2023	12Z	147
4/14/2023	12Z	155
4/15/2023	12Z	161
4/16/2023	12Z	179
4/17/2023	12Z	217

Latest 10 Day Streamflow Forecast Plot

LGNU1: Logan - Logan, Nr, State Dam, Abv - Created: 2023-04-07 15:50Z NOAA/CBRFC Current: 2.42 ft, 90 cfs (04/07/15Z) Flood: 5.2 ft, 1552 cfs - Action: 5.0 ft, 1374 cfs



Peak Flow Forecast Information - Peak Flow Dashboard Pages

Daily Peak Flow Forecast Tables

- Probability of peak magnitude
- Probability of peak date
 - Likelihood for date of peak whatever the magnitude Ο
 - Long lead forecasts will generally indicate the 'Normal Time of Ο Peak'
 - Given the current conditions (much above average snow and Ο minimal melt to date), the model is indicating the possibility of a later peak date this year

Normal Time of Peak 05-13 - 06-08

Apr-Jul Historical Peaks								
Rank	Year	Peak	Date					
1	1986	1870	6/7					
2	1984	1830	6/2					
3	2011	1630	6/26					
4	1971	1590	6/12					
5	1997	1560	5/23					
6	2006	1530	5/22					
7	1999	1430	5/31					
8	1983	1400	5/31					
9	2017	1390	6/8					
10	1996	1330	5/19					
11	1972	1280	6/5					

Snow conditions driving peak flow forecasts

Daily Peak Flo	ow Forecast Magnitude	Daily Peak Flow Forecast Timing				
Exceedance Probability	Mean Daily Flow (cfs)	Exceedance Probability	Date of Peak			
Maximum	2410	Latest	2023-06-30			
10%	1868	10%	2023-06-22			
25%	1712	25%	2023-06-13			
50%	1497	50%	2023-06-08			
75%	1376	75%	2023-06-01			
90%	1334	90%	2023-05-22			
Minimum	1209	Earliest	2023-05-17			



Magnitude and Timing are independent forecasts.

Peak Flow Forecast Information - List View





- Virgin
- Lower Colorado

Lower C	olorado																Observed							
Sub Area	NWS ID	River	Location	ESP Date	ESP 50	ESP 25	ESP 10	Percentile Cond	Percentile	Rank	Total Years	Percent Average Cond	Percent Average	Average Peak	Flood Cond	Flood Flow	Peak to Date	Observed Date	Historic Peak	Hist Peak Date	Normal Earliest Date	Normal Latest Date	Last Year Peak	Last Year Date
Bear	BERU1	Bear	Utah	2023-04-06	2065	2345	2769	•	86	12	81	•	133	1551	•	4394			3030	2011-07-01	05-16	06-12	1180	2022-05-20
Bear	EVAW4	Bear	Evanston	2023-04-06	2516	2864	3616		89	5	39	•	143	1752	\$	3485			3360	2010-06-09	05-13	06- 1 0	1430	2022-05-20
Bear	BORW4	Smiths Fork	Border; Nr	2023-04-06	1179	1241	1415	•	80	17	81	•	141	832	٠	3632			2000	1986-06-05	05-18	06-09	663	2022-06-13
Bear	BRBW4	Bear	Border	2023-04-06	3039	3405	4053	٠	81	12	61	•	208	1455	•	2239			4840	1983-06-09	<mark>05-</mark> 01	06-24	652	2022-06-14
Bear	LGNU1	Logan	Logan; Nr; State Dam; Abv	2023-04-06	1497	1712	1868	•	91	7	69	•	170	879		1552			1870	1986-06-07	05-13	06-08	471	2022-05-30
Bear	HRMU1	Blacksmith Fork	Hyrum; Nr; Upnl Dam; Abv	2023-04-06	936	979	1095	•	91	10	105	•	273	342	٠	1198			1530	1984-05-16	04-10	05-13	128	2022-04-23
Weber	OAWU1	Weber	Oakley; Nr	2023-04-06	2445	2750	3151	•	90	12	118		157	1553	\$	2822			4170	1921-06-14	05-20	06-14	1250	2022-05-29
Weber	<u>CIVU1</u>	Chalk Ck	Coalville	2023-04-06	1079	1263	1955	•	93	7	96	•	236	456		1349			1420	1993-05-23	05-08	06-02	315	2022-05-18
Weber	MCLU1	Mcleod Ck	Park City; Nr	2023-04-06	120	142	176	•	100	1	26	•	214	56.0	\$	155			117	1995-06-16	05-09	06-02	28.0	2022-05-21
Weber	ECAU1	East Canyon Ck	Jeremy Ranch; Nr	2023-04-06	424	470	526	•	100	1	21	•	277	153	٠	716			371	2011-04-19	04-03	05-20	79.0	2022-05-31
Six Creeks	LCTU1	Little Cottonwood Ck	Salt Lake City; Nr	2023-04-06	775	872	955	•	96	5	119	•	182	425		799			762	1984-05-31	05-21	06-16	357	2022-06-14
Six Creeks	BCTU1	Big Cottonwood Ck	Salt Lake City; Nr	2023-04-06	867	962	1011	*	99	2	122	*	221	392	•	798			925	1984-06-01	05-15	06-07	232	2022-05-20

CBRFC Peak Flow Forecast Information - Special Forecasts





Upcoming Weather: April 7-14 Precipitation Outlook



- A ridge of high pressure over the Western US will bring a period of dry and warming conditions to the region.
 - Temperatures will approach seasonal normals by this weekend, and should be 5-10 degrees above normal for the start of next week.
 - Little to no precipitation is expected through the middle of next week.
- During the second half of next week, the ridge will begin to break down as a trough moves into the Western US.
 - High forecast uncertainty in the depth and timing of the trough
 - Current weather model ensemble guidance favors precipitation moving into Utah on the last day of this period.
- Ensemble models favor another ridge building in after the passage of the trough

WPC 7 day QPF

Upcoming Weather: 8-14 Day Outlook (April 14-20)

Near normal precipitation and temperatures are expected overall for Utah for the week 2 outlook. This likely means there will be some days of above normal and some below.



Summary

- Water year precipitation is much above average across Utah.
- Current snowpack is much above normal across Utah.
- Water supply forecasts are much above average across Utah.
 - Multiple points across the area have forecasts above the historical record volume at some exceedance level.
- Mean daily peak flows from snowmelt are expected to be much above average across the state.
 - Multiple points across the area have forecasts above the defined flood level at some exceedance level.









2023 Water Supply Webinar Schedule

*All Times Mountain Time (MT)

Colorado River Basin

Monday	Jan 9th	10 am
Tuesday	Feb 7th	10 am
Tuesday	Mar 7th	10 am
Friday	Apr 7 th	10 am
Friday	May 5 th	10 am

Utah/Great Basin

Monday	Jan 9th	11:30 am
Tuesday	Feb 7th	11:30 am
Tuesday	Mar 7 th	11:30 am
Friday	Apr 7 th	11:30 am
Friday	May 5 th	11:30 am

Additional briefings scheduled as needed

Webinar schedule & registration information has been posted to the CBRFC web page

cbrfc.noaa.gov

CBRFC Webinar Registration / Presentations / Email List



CBRFC Contacts & WY23 Basin Focal Points

Basin Focal Points (Forecasters)

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CBRFC Operations