Great Basin Water Supply Briefing:

Primary focus is on the Bear, Weber, Six-Creeks, Provo/UT Lake river basins.

We can add the Sevier River Basin if there is interest.

We have a separate Colorado River Basin water supply briefing.

Feedback on these briefings is welcome and appreciated.
Today’s Presentation – Questions to Answer

- Some forecast increased, others decreased, how beneficial were the March storms?
  - March weather pattern.
  - March and water year precipitation.
  - Where snowpack conditions improved or worsened.

- Trend in the water supply forecasts between last month and this month

- The water supply outlook / forecasts
  - Bear, Weber, Six-Creeks, Provo conditions and forecasts.
  - What are the chances for average runoff conditions.
  - How good are forecasts in early April?

- Brief updated peak flow forecast summary.

- Upcoming weather – It looks Active!

- El Niño and the long range outlook.
March 2016 Weather Pattern

March 6\textsuperscript{th} satellite image

March 5\textsuperscript{th}–8\textsuperscript{th} upper atmosphere pattern

March was active however primary impacts were in the northern areas
March 2016 Weather Pattern

March 29th satellite image

March 25th-31st upper atmosphere pattern

Large slow moving system at the end of March improved snow conditions at several northern locations
March 2016 Precipitation

Bear: 155%
Weber: 110%
Six Creeks: 95%
Provo/UT Lake: 85%
Water-Year (Oct-Mar) 2016 Precipitation

Bear: 100%
Weber: 95%
Six Creeks: 85%
Provo/UT Lake: 85%
March 6th 2016
Significant Runoff Areas

April 6th 2016
Significant Runoff Areas
Model soil moisture conditions entering the winter

Soil Moisture representation from the CBRFC hydrologic model

Soil Moisture - Fall - 2015 (November 15)
(Model, Averaged by Basin)
Bear River Basin: CBRFC Model soil moisture entering winter

Water supply forecast point (% average Forecast)

- < 70%
- 70-90%
- 90-110%
- 110-130%
- >130%
- Regulated
- No Forecast

<table>
<thead>
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<th>% Normal</th>
<th>Color</th>
</tr>
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<td>Deep Red</td>
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<td>Light Red</td>
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Bear River Basin: CBRFC Soil Saturation – April 6th

Water supply forecast point

(% average Forecast)

CBRFC Soil Moisture Model
Inches to Saturation

- < 70%
- 70-90%
- 90-110%
- 110-130%
- > 130%
- Regulated
- No Forecast
April 1st Water Supply Forecasts – Bear River Basin

April-July Forecast Streamflow Volumes (% of 1981-2010 average)

- Below 25%
- 25% - 35%
- 35% - 45%
- 45% - 55%
- 55% - 65%
- 65% - 75%
- 75% - 85%
- 85% - 95%
- 95% - 105%
- 105% - 115%
- 115% - 125%
- 125% - 135%
- 135% - 145%
- 145% - 155%
- 155% - 165%
- 165% - 175%
- Above 175%
- NA

- Bear Stateline
- Logan River
- Blacksmiths Fork
- Smiths Fork
- Little Bear
- Above Woodruff Narrows
- Bear Above Woodruff Narrows
- Stewart Dam
- Bear Above Woodruff Narrows
Weber River Basin: April 6th SNOTEL (percent of median)
Weber River Basin: CBRFC Model Snow – April 6th

Water supply forecast point
(% average Forecast)

- < 70%
- 70-90%
- 90-110%
- 110-130%
- >130%
- Regulated
- No Forecast

CBRFC Model
Snow

% Median SWE
- >500%
- 300-500%
- 200-300%
- 150-200%
- 130-150%
- 110-130%
- 100-110%
- 90-100%
- 70-90%
- 50-70%
- 30-50%
- 0-30%
Weber River Basin: CBRFC Model soil moisture entering winter
Weber River Basin: CBRFC Soil Saturation – April 6th
Six Creeks: April 6th SNOTEL (percent of median)

**Colorado Basin River Forecast Center**

**LOPU1 - LOOKOUT PEAK**
- Percent Median To Date: 93% (26.3 / 28.9)
- Percent Seasonal Median: 94% (25.3 / 26.9)
- Melt rate: 0.1 in/day averaged over last 3 days.

**SBDU1 - SNOWBIRD**
- Percent Median To Date: 85% (33.5 / 39.2)
- Percent Seasonal Median: 78% (33.5 / 43.1)
- Melt rate: 0.0 in/day averaged over last 3 days.
Six Creeks: CBRFC Model Snow – April 6th

Water supply forecast point (% average Forecast)

- < 70%
- 70-90%
- 90-110%
- 110-130%
- >130%
- Regulated
- No Forecast

CBRFC Model Snow

% Median SWE

- >500%
- 300-500%
- 200-300%
- 150-200%
- 130-150%
- 110-130%
- 100-110%
- 90-100%
- 70-90%
- 50-70%
- 30-50%
- 0-30%
Six Creeks: CBRFC Model soil moisture entering winter

Water supply forecast point
(% average Forecast)

- < 70%
- 70-90%
- 90-110%
- 110-130%
- >130%
- Regulated
- No Forecast
Six Creeks: CBRFC Soil Saturation – April 6th

Water supply forecast point
(% average Forecast)

CBRFC Soil Moisture Model
Inches to Saturation

Inches
- >12
- 10-12
- 8-10
- 6-8
- 5-6
- 4-5
- 3-4
- 2-3
- 1-2
- <1

< 70%
70-90%
90-110%
110-130%
>130%
Regulated
No Forecast
April 1st Water Supply Forecasts – Six Creeks

April-July Forecast Streamflow Volumes (% of 1981-2010 average)

- City Creek: 64%
- Little Cottonwood
- Mill Creek: 48%
- Big Cottonwood: 61%
- Red Butte: 42%
- Emigration: 41%
- Little Dell Inflow: 54%
- Parleys Creek: 52%
- Lambs Creek: 52%
- Little Dell Inflow: 54%
- Inflow: 48%
- Parleys Creek: 52%
- Mill Creek: 48%
- City Creek: 64%
- Big Cottonwood: 61%
- Little Cottonwood: 74%

Legend:
- Below 25%
- 25% - 35%
- 35% - 45%
- 45% - 55%
- 55% - 65%
- 65% - 75%
- 75% - 85%
- 85% - 95%
- 95% - 105%
- 105% - 115%
- 115% - 125%
- 125% - 135%
- 135% - 145%
- 145% - 155%
- 155% - 165%
- 165% - 175%
- Above 175%
- NA
Provo River / UT Lake: April 6th SNOTEL (percent of median)
Water supply forecast point

Provo River / UT Lake: CBRFC Model Snow – April 6th
Provo River / UT Lake: CBRFC Model soil moisture entering winter

Water supply forecast point
(% average Forecast)

CBRFC Model
Soil Moisture

% Normal
- >500%
- 300-500%
- 200-300%
- 150-200%
- 130-150%
- 110-130%
- 100-110%
- 90-100%
- 70-90%
- 50-70%
- 30-50%
- 0-30%
- Regulated
- No Forecast
Provo River / UT Lake: CBRFC Soil Saturation – April 6th
April 1st Water Supply Forecasts – Provo River / Utah Lake

April-July Forecast Streamflow Volumes (% of 1981-2010 average)

- Provo: 81%
- Woodland: 80%
- Spanish Fork: 75%
- American Fork: 55%
- Deer Creek Inflow: 53%
- West Canyon Creek: 64%
- Utah Lake Inflow: 36%
- Provo Hailstone: 81%
Weber River near Oakley forecast evolution plot

Model guidance update daily

Official Forecast On April 1st

About a 10% chance for average runoff

Exceedance probabilities

The latest (2016-04-05) 50% ESP forecast is 90 kaf.
Plot Created 2016-04-05 17:10:03, NOAA / NWS / CBRFC
Forecasts in the forecast target period include observed values.
Logan River near Logan forecast evolution plot

Forecast increased from 71% to 87% of average between March and April.

About a 20% chance of receiving average runoff.
Forecast increased from 72% to 82% of average between March and April

27% chance to receive average runoff

The latest (2016-04-05) 50% ESP forecast is 90 kaf.
Plot Created 2016-04-05 17:11:19, NOAA / NWS / CERFC
Forecasts in the forecast target period include observed values.
Forecast increased from 73% to 80% of average between March and April.

About a 7% chance of receiving average runoff.
Forecast increased from 53% to 58% of average between March and April.

About a 2-3% chance of receiving average runoff.
Little Cottonwood Creek forecast evolution plot

Forecast increased from 53% to 58% of average between March and April

About a 2-3% chance of receiving average runoff

Forecast decreased from 79% to 74% of average between March and April

(≈ 2 KAF)

No scenarios in the 1981-2010 climate where average runoff is reached

The latest (2016-03-31) 50% ESP forecast is 29 kaf.

Plot Created 2016-04-05 17:04:10, NOAA / NWS / CBRFC

**Purple ESP forecasts do not include observed and are not total runoff.**
Forecast Accuracy? How good are we in April?

% Model Error for April

April-July Forecast

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

Sources of Uncertainty:
- Current conditions → model snow states
- Future weather
Forecast Accuracy? How good is the model guidance in April?

**April Official Forecast: 1991 - 2015**

**Forecast Period: April - July**

*Forecast is: 93*

*% Model Error for April April-July Forecast*

- Lost Creek Inflow: 30%
- Pineview Inflow: 21%

Lost Creek Inflow: 30%

*Forecast is: 7.8*

*% Error*

- No Data
- 1 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- 30 - 35
- 35 - 40
- >40
No site is currently forecast to exceed flood stage due to snowmelt at this time.

Forecasts and/or flood levels do not exist on every stream.

Spring weather, such as extended periods of much above normal temperatures or heavy rainfall during melt, can cause flooding problems in any year.

From CBRFC homepage (www.cbrfc.noaa.gov)
- “Rivers” drop down menu
- select Peak Flow Map or List

list: http://www.cbrfc.noaa.gov/rmap/peak/peaklist.php
## Peak Flow Forecast Summary (mean daily CFS)

<table>
<thead>
<tr>
<th>River</th>
<th>Location</th>
<th>Flood Flow</th>
<th>Mean Daily 90</th>
<th>Mean Daily 75</th>
<th>Mean Daily 50</th>
<th>Mean Daily 25</th>
<th>Mean Daily 10</th>
<th>Average Peak</th>
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<tbody>
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<td>Bear</td>
<td>Utah</td>
<td>3718</td>
<td>1000</td>
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<td>3245</td>
<td>980</td>
<td>1050</td>
<td>1200</td>
<td>1550</td>
<td>1950</td>
<td>1815</td>
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<tr>
<td>Smiths Fork</td>
<td>Border</td>
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<td>East Canyon Ck</td>
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<td>75</td>
<td>80</td>
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<td>Provo</td>
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<td>3098</td>
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[www.cbrfc.noaa.gov](http://www.cbrfc.noaa.gov) - “Rivers drop down menu” – select peak flow information
Peak Flow Forecast Summary (mean daily CFS)

2016 Mean Daily Peak Flow Forecast
Provo - Woodland- Nr (WOOU1)

These graphics are updated approximately every two weeks between 3/1 and 5/1
Plot Created 2016-04-06 07:34:58
CBRFC / NWS / NOAA
1 - Storm system will weaken and spread moisture / scattered showers into desert southwest through Friday. Warm system with rain at higher elevations.

2 - This will strengthen and follow the same path as storm 1. Scattered showers will increase over the entire area this weekend into Monday. Warm system with rain at higher elevations.
Weather outlook

3 – The third storm system moves through the southwest late Monday into Tuesday with a chance for scattered showers.
4 – A colder system is poised to move into the area toward the end of next week. Confidence in the track and strength of this system remains on the low side.
Precipitation Outlook: Thu Apr 7th – Sun Apr 10th
Precipitation Outlook: Sun Apr 10th – Tue Apr 12th
Precipitation Outlook: 7-Day Total (Apr 7th – Apr 14th)
Weather outlook: April 14<sup>th</sup> – April 20<sup>th</sup>

Climate Prediction Center
8-14 day outlook
El Niño Event

- Still a strong event but has been weakening over the past several weeks.
- The 2015-2016 will go down as one of the strongest on record (82-83, 97-98)
- Impacts the Jet stream strength, location, and storm tracks (favors LC Basin)
- No solid correlation between ENSO and April-July runoff volumes in Great Basin
- La Niña conditions are possible by later this fall (~50% chance)
Conclusions

Today’s summary:

• Dry soil moisture conditions are having a negative impact on forecasts (10-15% of avg)
• March was generally beneficial, particularly in farther north in the Great Basin.
• Water supply forecasts increased in the Bear, parts of the Weber, and Provo headwaters
• Not likely we will see average runoff conditions – we would need an unusual spring.
• Weather pattern looks active and suggests additional precipitation / mountain snow.
• El Niño is still present but weakening and is impacting long range climate outlooks.

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Sevier River Basin water supply focal point: Tracy Cox tracy.cox@noaa.gov

Upcoming Briefings:

5/5  @   1 pm MDT Colorado River Basin Water Supply
5/6  @  10 am MDT Great Basin Water Supply

Today’s slides available online: www.cbrfc.noaa.gov/present/present2016.cgi