Colorado River Basin
Water Supply Briefing

January 8, 2021

Cody Moser - Hydrologist
Colorado Basin River Forecast Center

Please mute your phone until the question period
Today’s Presentation

Precipitation Review

Soil Moisture Conditions

Current Snowpack

2021 Water Supply Forecasts

Early Season Forecast Error

Upcoming Weather

Contacts & Questions

Webinar recording & slides will be made available on CBRFC webpage
April - September 2020: One of the Driest / Drought Intensifies

Precipitation percentiles from April-September 2020. Note the large number of sites below the 10th percentile.

Extensive area in the Extreme to Exceptional Drought heading into new year.
**Water Year 2021 Oct-Dec Precip Summary**

<table>
<thead>
<tr>
<th>Basin</th>
<th>Precip (% Avg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Green</td>
<td>75%</td>
</tr>
<tr>
<td>Duchesne</td>
<td>60%</td>
</tr>
<tr>
<td>Price/San Rafael</td>
<td>60%</td>
</tr>
<tr>
<td>Yampa/White</td>
<td>60%</td>
</tr>
<tr>
<td>Upper CO Mainstem</td>
<td>70%</td>
</tr>
<tr>
<td>Gunnison</td>
<td>70%</td>
</tr>
<tr>
<td>Dolores</td>
<td>60%</td>
</tr>
<tr>
<td>San Juan</td>
<td>70%</td>
</tr>
<tr>
<td>Lake Powell</td>
<td>65%</td>
</tr>
<tr>
<td>Virgin</td>
<td>45%</td>
</tr>
<tr>
<td>Verde</td>
<td>15%</td>
</tr>
<tr>
<td>Salt</td>
<td>40%</td>
</tr>
<tr>
<td>Little Colorado</td>
<td>35%</td>
</tr>
<tr>
<td>Upper Gila</td>
<td>40%</td>
</tr>
</tbody>
</table>
Current soil moisture conditions are worse off than they were a year ago due to near record low April-October 2020 precipitation across the region.

Model soil moisture is generally in the bottom 5 across the Upper Colorado over the 1981-2020 40-year period. The San Juan and Dolores are generally in the bottom 3 with some areas being record dry.
Soil Moisture Conditions - Lower Colorado

After another unfavorable summer monsoon season and then the very dry autumn, early January soil moisture conditions across Arizona are very dry.
# Early January Snow Conditions

## Jan 7 SWE Summary (SNOTEL)

<table>
<thead>
<tr>
<th>Basin</th>
<th>SWE (% Median)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Green</td>
<td>80%</td>
</tr>
<tr>
<td>Duchesne</td>
<td>70%</td>
</tr>
<tr>
<td>Price/San Rafael</td>
<td>60%</td>
</tr>
<tr>
<td>Yampa/White</td>
<td>80%</td>
</tr>
<tr>
<td>Upper CO Mainstem</td>
<td>75%</td>
</tr>
<tr>
<td>Gunnison</td>
<td>70%</td>
</tr>
<tr>
<td>Dolores</td>
<td>70%</td>
</tr>
<tr>
<td>San Juan</td>
<td>80%</td>
</tr>
<tr>
<td>Lake Powell</td>
<td>75%</td>
</tr>
<tr>
<td>Virgin</td>
<td>40%</td>
</tr>
<tr>
<td>Verde</td>
<td>10%</td>
</tr>
<tr>
<td>Salt</td>
<td>15%</td>
</tr>
<tr>
<td>Little Colorado</td>
<td>5%</td>
</tr>
<tr>
<td>Upper Gila</td>
<td>15%</td>
</tr>
</tbody>
</table>
Jan 1st Water Supply Forecasts: Green, Yampa, White, Duchesne

January 1st 2021 Forecasts

Volume (kaf) / % of 1981-2010 avg

Forecast Ranges

Upper Green:  60 - 80%

Yampa/White:  60 - 80%

Duchesne:  40 - 60%
Upper Green Water Supply Forecasts & Snow Conditions

Conditions over the Wind River mountains, a major contributor to streamflow, are dry resulting in low water supply forecasts.

- the 'official' forecast (50%)
- wetter scenario (10%)
- drier scenario (90%)

Composite of NRCS SNOTEL site obs
Based on current conditions there is a 10% chance for average streamflow in the Yampa River Basin.
Jan 1st Water Supply Forecasts: Upper Colorado River Mainstem

Forecast Ranges: Granby to Kremmling: 60 - 80% of average
Kremmling to Cameo: 40 - 70% of average
Upper Colorado Mainstem Water Supply Forecasts & Snow Conditions

Kremmling
- WY21 fcst: 580 kaf
- WY20 obs: 782 kaf
- WY19 obs: 1110 kaf
- WY18 obs: 566 kaf

Cameo
- WY21 fcst: 1600 kaf
- WY20 obs: 1710 kaf
- WY19 obs: 3200 kaf
- WY18 obs: 1300 kaf
Jan 1\textsuperscript{st} Water Supply Forecasts: Gunnison, Dolores

Forecast Ranges:
- Gunnison: 40 - 80% of average
- Dolores: 50 - 60% of average
Jan 1st Water Supply Forecasts: San Juan

Forecast Range: 45 - 80% of average

San Juan-Bluff 580 / 53%
Vallecito 110 / 57%
Animas-Durango 240 / 58%
Navajo 450 / 61%
San Juan Farmington 610 / 55%

April-July Volumes (kaf) / % of avg
Forecast guidance has decreased since January 1 and is expected to continue to decrease through at least the middle of the month due to a dry weather forecast.

Blue Mesa
- WY21 fcst: 470 kaf
- WY20 obs: 387 kaf
- WY19 obs: 1090 kaf
- WY18 obs: 239 kaf
Lake Powell summarizes the hydrologic conditions throughout the Upper Colorado River Basin.

5 Lowest Historical Years: April-July Volume / % avg
- 2002: 946 KAF / 13%
- 1977: 1208 KAF / 17%
- 2012: 2063 KAF / 29%
- 2013: 2558 KAF / 36%
- 2018: 2602 KAF / 36%

*Currently a ~30% chance to be in the bottom five
Jan 1st Water Supply Forecasts: Virgin River Basin

Forecast Range: 30 - 45% of average

April-July Volumes (kaf) / % of avg

- Virgin-Hurricane 21 / 33%
- Virgin-Littlefield 25 / 38%
- Virgin-Virgin 26 / 45%
- Santa Clara Pine Valley 1.66 / 33%

Graph: Virgin - Virgin (VRU1)
- Period: Apr-Jul
- Official 95% Forecast (2021-01-01): 26 kaf (45% of Average, 63% Median)
- ESP is Regulated and No Precipitation Forecast Included

Graph: Colorado Basin River Forecast Center
- virgin Group
- Snow Water Equivalent (in)
- Percent Seasonal Median: 19% (2.2 / 11.8)
- 3 Day Accum Rate: 0.0 in/day
Jan 1st Water Supply Forecasts: Lower Colorado River Basin

January - May Forecast Period
% of 1981-2010 Median

Forecast Ranges

Little Colorado: 10 - 20%
Upper Gila: 25 - 35%
Salt: 15 - 25%
Verde: 40%
Lower Colorado Water Supply Forecasts & Snow Conditions

Jan-May forecast period; start showing accumulated volume on Jan 1st.
Historical (1981-2010) Forecast Verification

Forecasts are better than just going with average
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

### January Forecast Error: April-July Volume

<table>
<thead>
<tr>
<th>Location</th>
<th>Avg January Forecast Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green River - Warren Bridge</td>
<td>19%</td>
</tr>
<tr>
<td>Fontenelle Reservoir</td>
<td>28%</td>
</tr>
<tr>
<td>Yampa River - Deerlodge</td>
<td>27%</td>
</tr>
<tr>
<td>Blue River - Dillon Reservoir</td>
<td>16%</td>
</tr>
<tr>
<td>Colorado River - Cameo</td>
<td>21%</td>
</tr>
<tr>
<td>Blue Mesa Reservoir (Gunnison)</td>
<td>23%</td>
</tr>
<tr>
<td>McPhee Reservoir (Dolores)</td>
<td>25%</td>
</tr>
<tr>
<td>Navajo Reservoir (San Juan)</td>
<td>25%</td>
</tr>
<tr>
<td>Lake Powell</td>
<td>27%</td>
</tr>
<tr>
<td>Virgin River at Virgin</td>
<td>44%</td>
</tr>
</tbody>
</table>

Forecasts are better than just going with average
Error tends to decrease each month into the spring
Recent precipitation during the first week of January has had a positive impact to water supply guidance in parts of the Upper Green, White/Yampa, and Upper Colorado headwaters.
Upcoming Weather: WPC January 8-14 Precipitation Outlook

- Short wave moves through Utah and Colorado Saturday and Sunday
- Less than a half inch is forecast in the uppermost elevations
- Otherwise, ridging will dominate the weather pattern.
Upcoming Weather: January 13-18: Persistent Western Ridge

- Ridge to persist through the third week of January
- Northwest flow could allow weak storm systems to clip the northern areas by late next week.
Upcoming Weather: 8-14 Day Outlook (January 15-21)

Elevated odds of below average precipitation (especially across Utah and Lower Colorado) & above average temperature.

Precipitation Outlook

Temperature Outlook
**El Niño Southern Oscillation (ENSO) Status**

- **La Niña** is likely to continue through the Northern Hemisphere winter 2020-21 (~95% chance during January-March), with a potential transition during the spring 2021 (~50% chance of Neutral during April-June).
  - Increased chances of drier winter weather in Arizona/LCRB
  - Much weaker correlation/winter weather signal elsewhere in basin

---

**Mid-December 2020 IRI/CPC Model-Based Probabilistic ENSO Forecasts**

ENS0 state based on NINO3.4 SST Anomaly
- Neutral ENSO: $-0.5 \degree C$ to $0.5 \degree C$

**Model Predictions of ENSO from Dec 2020**

IRI/CPC
Summary

- Near/record dry April-December 2020 period across the majority of the Colorado River Basin

- Near/record low antecedent soil moisture conditions entering the water year 2021 snow accumulation & runoff season

- Slow start to the snow season
  - Current snowpack (SWE) conditions are below to well below normal across the majority of the region
  - Early January is a little less than halfway (~40-50%) through the snow accumulation season

- January water supply forecasts (% of normal):
  - Upper Colorado: 40-80%
  - Lower Colorado: 10-40%

- Drier than normal conditions expected over the next two weeks
  - Best chance for precipitation will be across northern higher elevation basins
  - Water supply volume guidance expected to decrease in most basins

- Given the dry conditions, an above normal snowpack or a wet spring will be needed to see near average water supply volumes.
# 2021 Water Supply Webinar Schedule

*All Times Mountain Time (MT)*

<table>
<thead>
<tr>
<th></th>
<th><strong>Colorado River Basin</strong></th>
<th></th>
<th><strong>Great Basin</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Friday</td>
<td>Jan 8&lt;sup&gt;th&lt;/sup&gt;</td>
<td>10 am</td>
<td>Friday</td>
</tr>
<tr>
<td>Friday</td>
<td>Feb 5&lt;sup&gt;th&lt;/sup&gt;</td>
<td>10 am</td>
<td>Friday</td>
</tr>
<tr>
<td>Friday</td>
<td>Mar 5&lt;sup&gt;th&lt;/sup&gt;</td>
<td>10 am</td>
<td>Friday</td>
</tr>
<tr>
<td>Wednesday</td>
<td>Apr 7&lt;sup&gt;th&lt;/sup&gt;</td>
<td>10 am</td>
<td>Wednesday</td>
</tr>
<tr>
<td>Friday</td>
<td>May 7&lt;sup&gt;th&lt;/sup&gt;</td>
<td>10 am</td>
<td>Friday</td>
</tr>
</tbody>
</table>

**Peak flow forecast webinar** Thursday, March 18<sup>th</sup>, 10 am MT

Additional briefings scheduled as needed

Webinar schedule & registration information has been posted to the CBRFC web page
This list is used to provide notification when webinars are scheduled, water supply forecasts are updated, and for other news of interest to our stakeholders regarding CBRFC operations.
CBRFC Contacts & WY21 Basin Focal Points

Michelle Stokes
Hydrologist In Charge

John Lhotak
Development and Operations Hydrologist

Paul Miller
Service Coordination Hydrologist

Cass Goodman
Computer Systems Analyst

Valerie Offutt
Administrative Assistant

Ashley Nielson
Upper Green, Yampa
San Juan, Dolores, Powell

Patrick Kormos
Lower Green, Duchesne
Weber, Provo

Cody Moser
Upper CO Mainstem, Gunnison

Brent Bernard
Bear, Sevier, Six Creeks

Zach Finch
Lower Colorado River Basin

Brenda Alcorn
Senior Hydrologist

Craig Peterson
Senior Hydrometeorologist

Tracy Cox
Hydrometeorologist

CBRFC Webpage
https://www.cbrfc.noaa.gov/

CBRFC Operations
cbrfc.operations@noaa.gov
801-524-4004

CBRFC Water Supply Presentations
https://www.cbrfc.noaa.gov/present/present.php

firstname.lastname@noaa.gov