

Colorado River Basin Water Supply Briefing

February 7, 2022

Cody Moser - Hydrologist
Colorado Basin River Forecast Center



Today's Presentation

Precipitation Review

Soil Moisture Conditions

Current Snowpack

2022 Water Supply Forecasts

February Forecast Error

Recent/Upcoming Weather

Science Update: 1981-2010 vs. 1991-2020

Seasonal Streamflow Normals Comparison

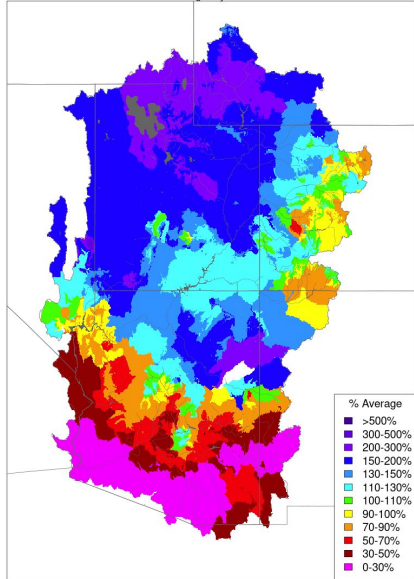
Contacts & Questions

**Webinar recording & slides will be
made available on CBRFC webpage**

Water Year 2022 (Oct - Jan) Monthly Precipitation Summary

Monthly Precipitation - October 2021

Averaged by Basin



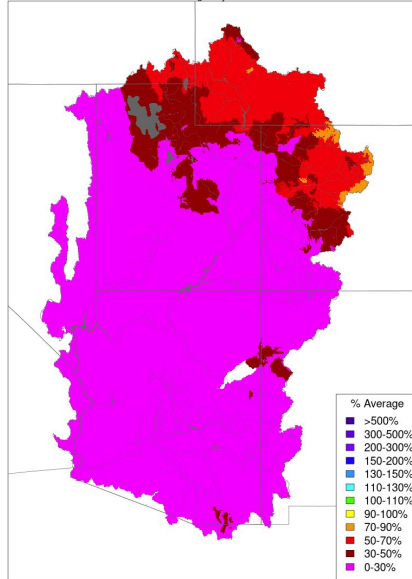
Prepared by NOAA, Colorado Basin River Forecast Center
Salt Lake City, Utah, www.cbrfc.noaa.gov

October precipitation was well above average across much of the region including southwest Wyoming, most of Utah, and northern Arizona.

Western Colorado had near average October precipitation while southern Arizona had below average precipitation during the month.

Monthly Precipitation - November 2021

Averaged by Basin



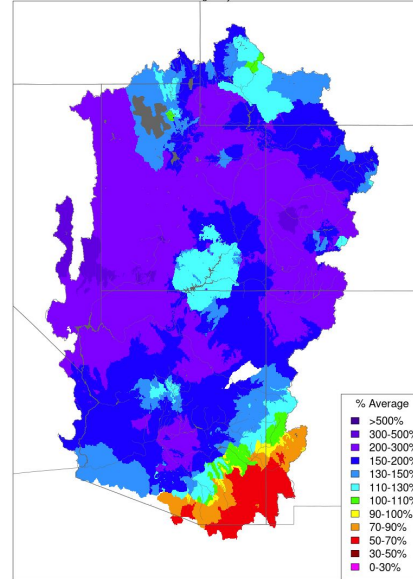
Prepared by NOAA, Colorado Basin River Forecast Center
Salt Lake City, Utah, www.cbrfc.noaa.gov

November's weather pattern was mostly very warm and dry with much below average monthly precipitation across most of the region.

November precipitation fell in the bottom five at numerous SNOTEL stations across Utah, southwest Colorado, and central Arizona.

Monthly Precipitation - December 2021

Averaged by Basin



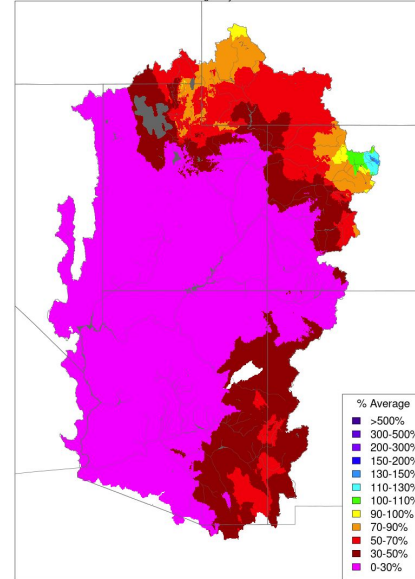
Prepared by NOAA, Colorado Basin River Forecast Center
Salt Lake City, Utah, www.cbrfc.noaa.gov

December was colder and wetter and featured multiple storm systems.

Many SNOTEL sites across Utah and western Colorado reported December precipitation values that ranked in the wettest five on record.

Monthly Precipitation - January 2022

Averaged by Basin



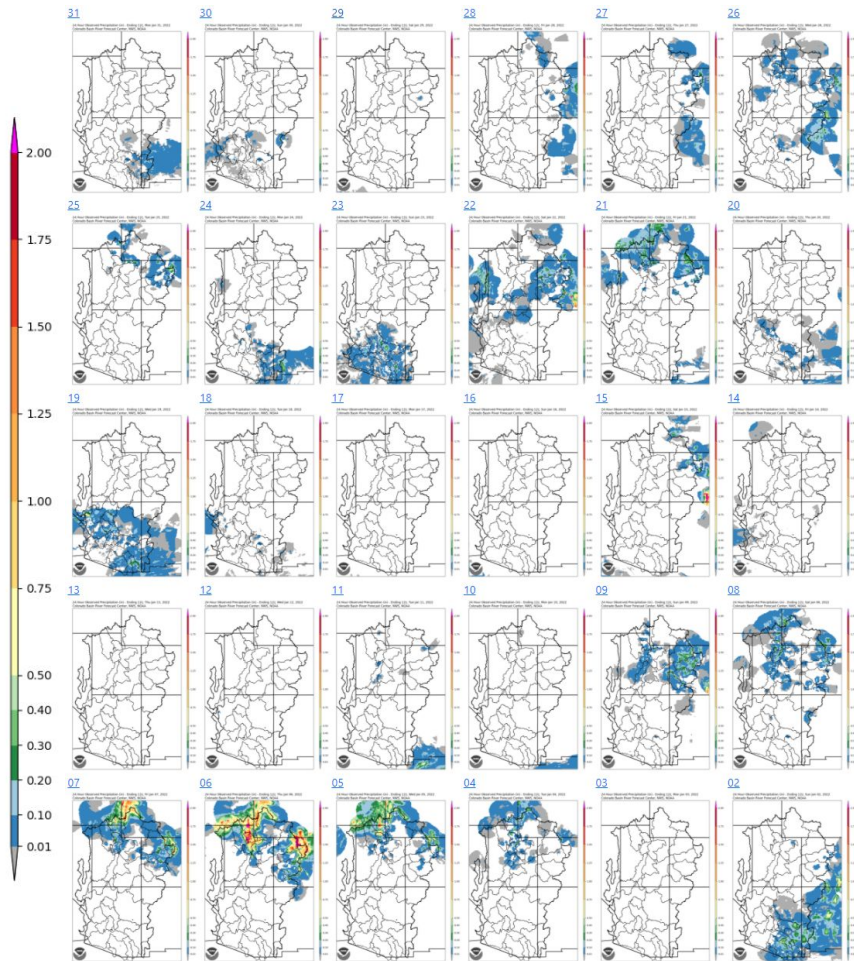
Prepared by NOAA, Colorado Basin River Forecast Center
Salt Lake City, Utah, www.cbrfc.noaa.gov

January started with widespread precipitation across northern basins. High pressure and accompanying very low precipitation dominated the rest of the month.

Many SNOTEL sites across southern Utah and southwest Colorado reported January precipitation values that ranked as the lowest on record.

January 2022 Precipitation

[Link to CBRFC Observed Daily Precip Graphics](#)



The general ridging during the last three weeks of January brought mostly dry weather to the region, although periods of northwesterly flow did bring some precipitation to northern basins.

Arizona/LCRB was mostly dry during January, but did receive some precipitation during the month.

A ridge of high pressure settled over the region during the second week of January and persisted through the end of the month.

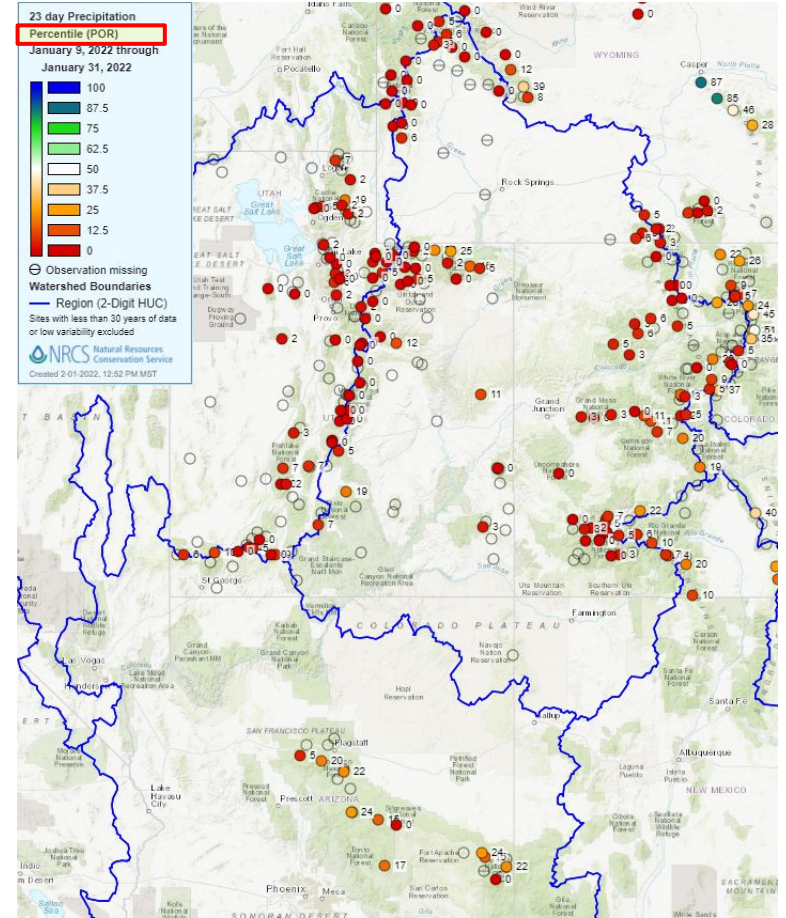
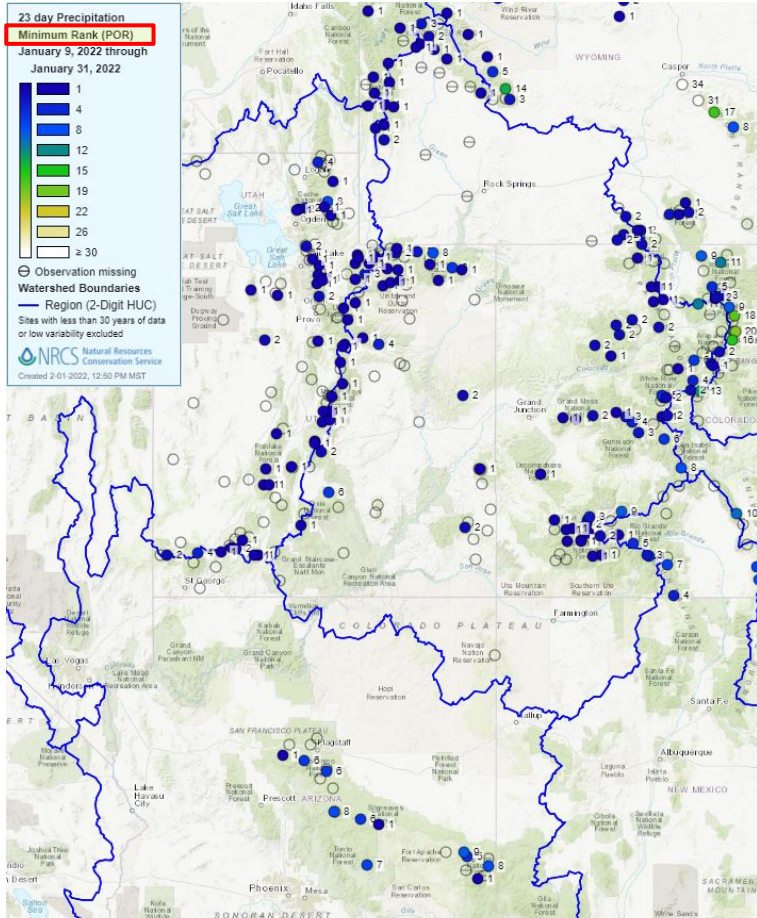
January 3-8

← Widespread 1-3" precipitation amounts across northern basins

Handful of locally higher 4-6" amounts

Last significant event of a very wet period (~December 6 - January 8)

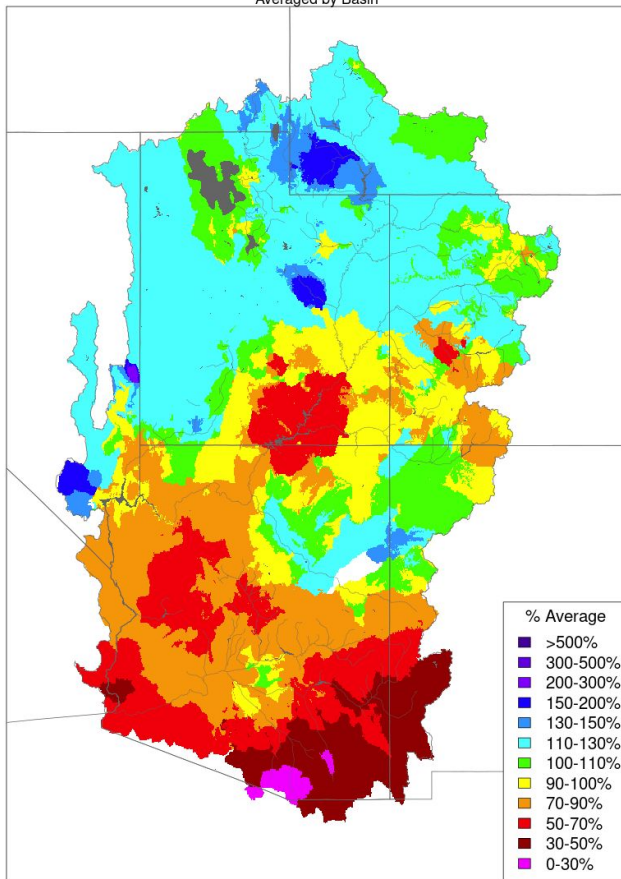
January 9th-31st Precipitation: Record/Near Record Dry



Water Year 2022 (October - January) Precipitation

Water Year Precipitation, October 2021 - January 2022

Averaged by Basin



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

Water year precipitation can be used as a good indicator of early season water supply conditions.

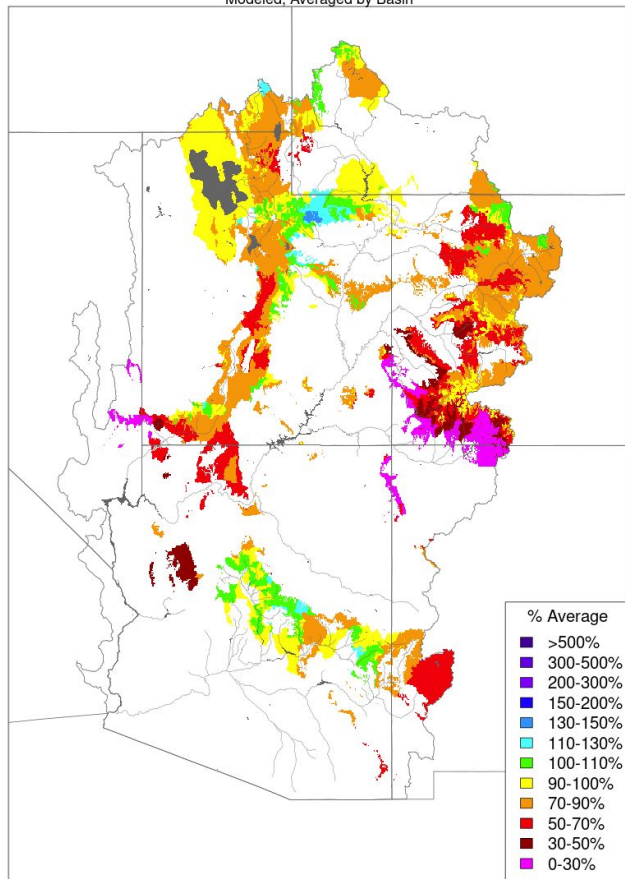
Water Year 2022 Oct-Jan Precip Summary

<u>Basin</u>	<u>Precip (% Avg)</u>
Upper Green	115%
Duchesne	120%
Price/San Rafael	125%
Yampa/White	110%
Upper CO Mainstem	110%
Gunnison	100%
Dolores	100%
San Juan	90%
Lake Powell	105%
Virgin	120%
Verde	75%
Salt	75%
Little Colorado	85%
Upper Gila	50%

Fall Model Soil Moisture Conditions: 2020 vs. 2021

Soil Moisture - Fall - 2021 (November 15)

Modeled, Averaged by Basin

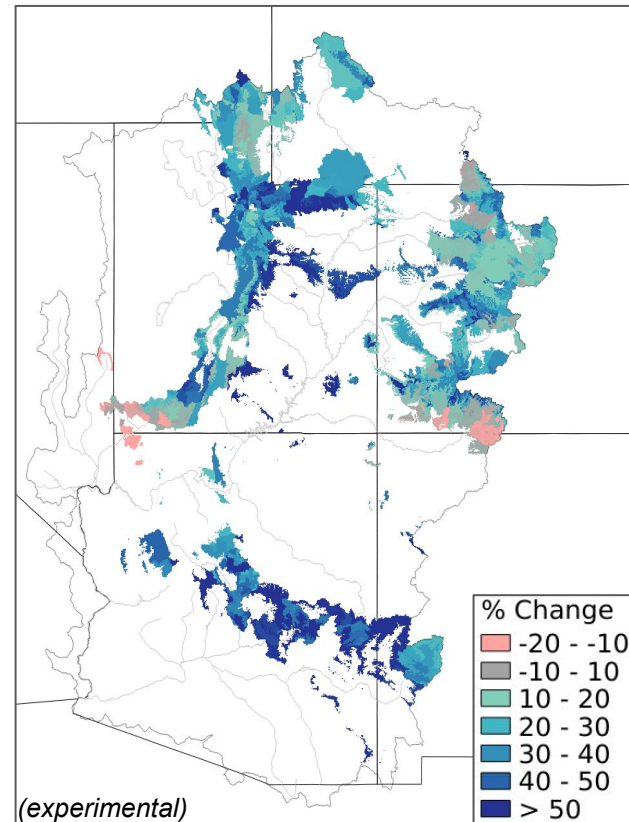


Prepared by NOAA, Colorado Basin River Forecast Center
Salt Lake City, Utah, www.cbrfc.noaa.gov

CBRFC model soil moisture conditions are improved from their record/near record dry levels a year ago but remain below to well below normal across many of the major runoff producing areas, notably western Colorado.

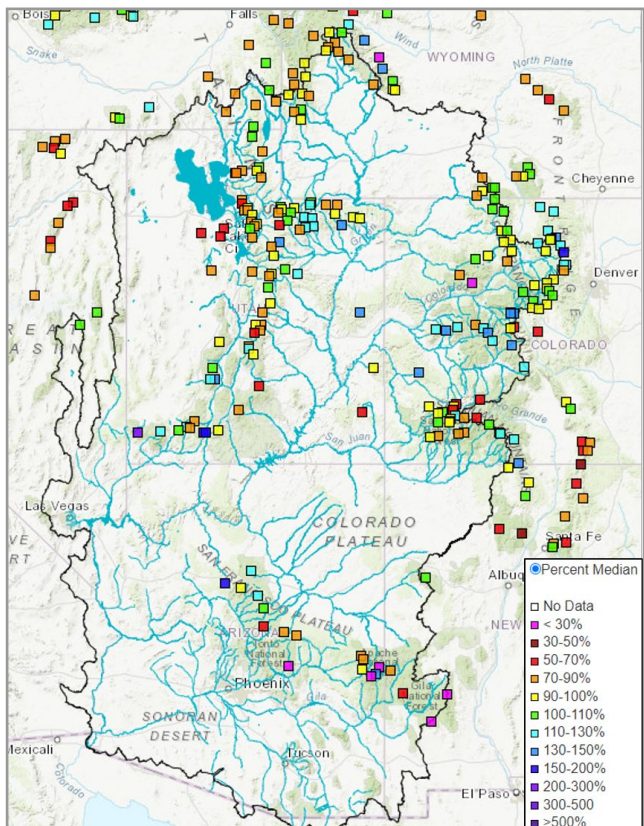
Soil Moisture - Fall (November 15)

Modeled, %Change
(2021-2020)

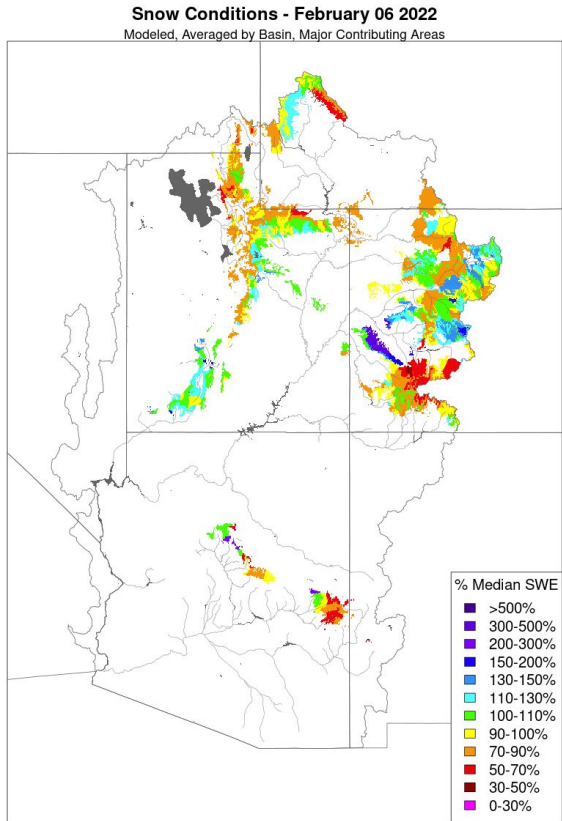


Early February Snow Conditions

SNOTEL (Observed)



CBRFC (Model)

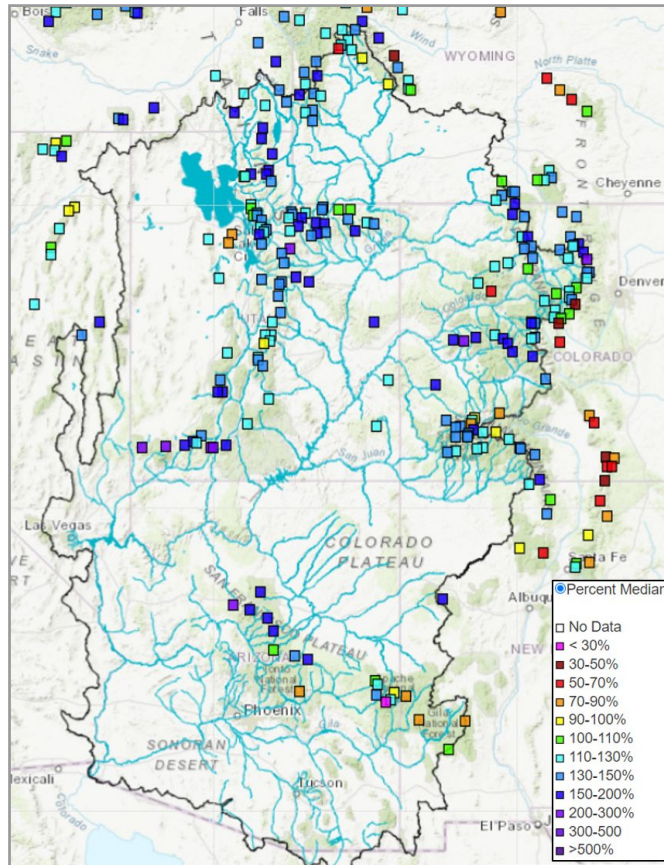


Feb 7 SWE Summary (SNOTEL)

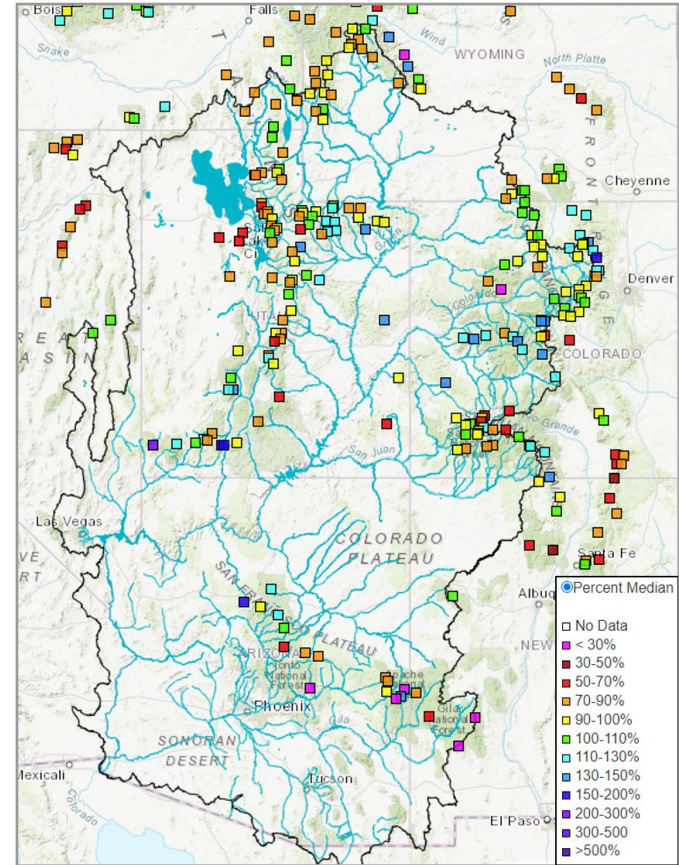
<u>Basin</u>	<u>SWE (% Median)</u>
Upper Green	95%
Duchesne	110%
Price/San Rafael	95%
Yampa/White	95%
Upper CO Mainstem	100%
Gunnison	110%
Dolores	100%
San Juan	100%
Virgin	115%
Verde	95%
Salt	70%
Little Colorado	75%
Upper Gila	40%

Early January vs. Early February SNOTEL SWE Conditions

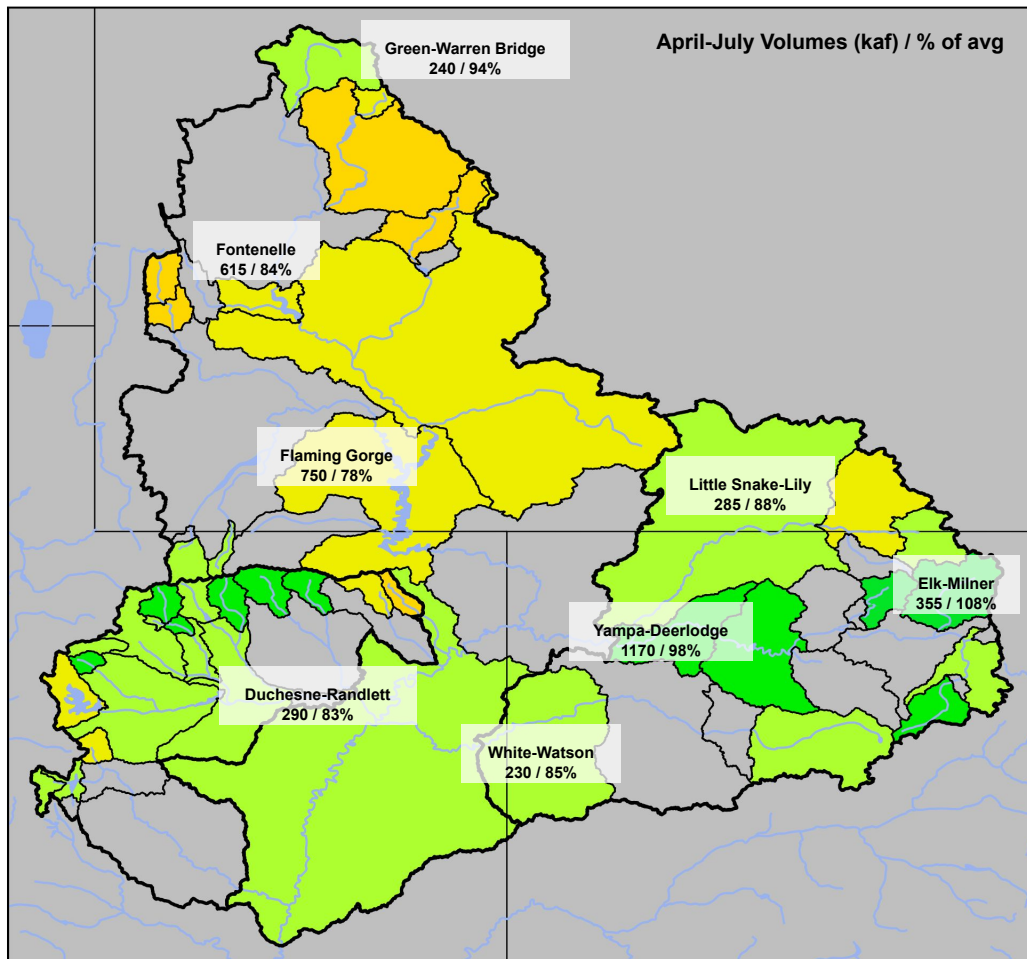
January 7, 2022



February 7, 2022



Feb 1st Water Supply Forecasts: Green, Yampa, White, Duchesne



February 1st 2022 Forecasts

Volume (kaf) / % of 1991-2020 avg

Forecast Ranges & (1-month Trend)

Upper Green: 65 - 95%
(0-15% decrease)

Yampa/White: 85 - 115%
(5-20% decrease)

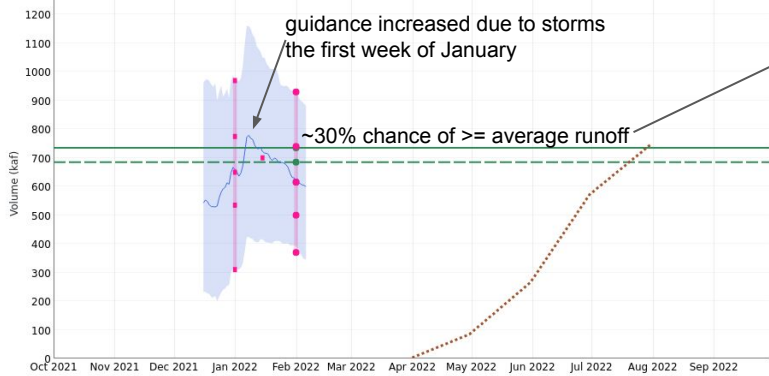
Duchesne: 85 - 140%
(10-35% decrease)

Upper Green Water Supply Forecasts & Snow Conditions

Green - Fontenelle Reservoir, Fontenelle, Nr (GBRW4)

Period: Apr-Jul, Official 50% Forecast (2022-02-01): 615 kaf (84% Average, 90% Median)

ESP is Unregulated and No Precipitation Forecast included



2022/02/01:

Average: 735

Median: 685

ESP: 616

Official 10: 930

Official 30: 740

Official 50: 615

Official 70: 500

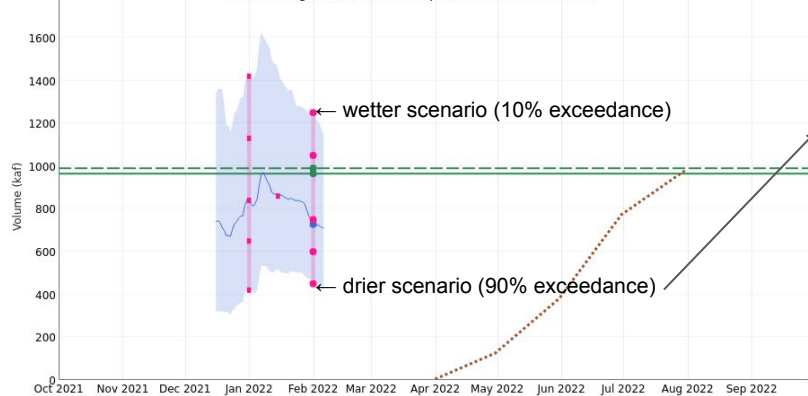
Official 90: 370

Little to no additional snow accumulation the last three weeks of January.

Green - Flaming Gorge Reservoir (GRNU1)

Period: Apr-Jul, Official 50% Forecast (2022-02-01): 750 kaf (78% Average, 76% Median)

ESP is Unregulated and No Precipitation Forecast included



2022/02/01:

Average: 965

Median: 990

ESP: 728

Official 10: 1250

Official 30: 1050

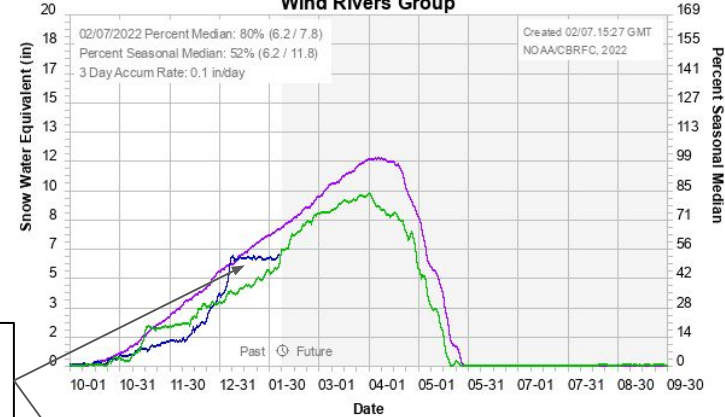
Official 50: 750

Official 70: 600

Official 90: 450

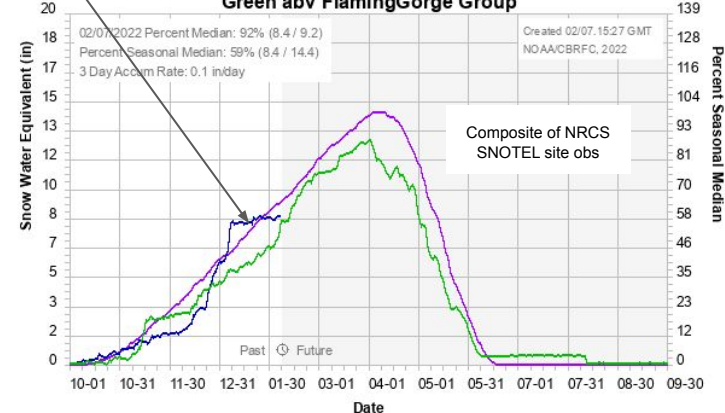
Colorado Basin River Forecast Center

Wind Rivers Group



Colorado Basin River Forecast Center

Green abv FlamingGorge Group

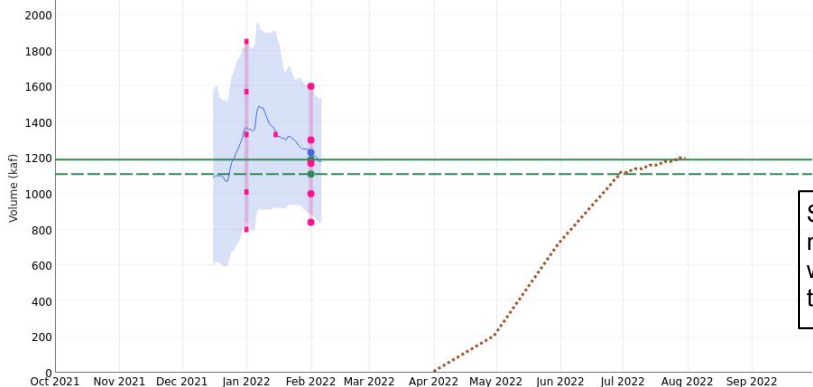


Yampa & Duchesne Water Supply Forecasts & Snow Conditions

Yampa - Deerlodge Park (YDLC2)

Period: Apr-Jul, Official 50% Forecast (2022-02-01): **1170 kaf (98% Average, 105% Median)**

ESP is Unregulated and No Precipitation Forecast Included



2022/02/01:

Average: 1190

Median: 1110

ESP: 1230

Official 10: 1600

Official 30: 1300

Official 50: 1170

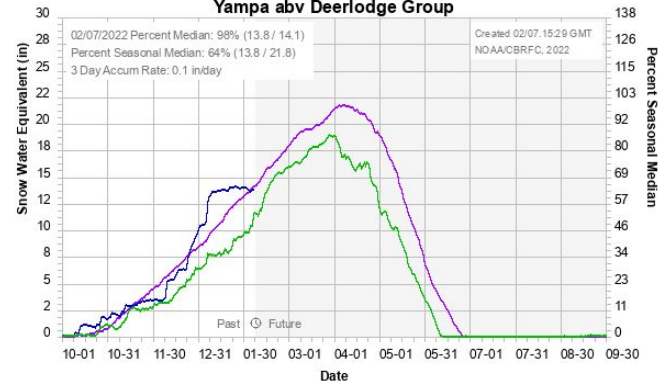
Official 70: 1000

Official 90: 840

Snow conditions are still near normal but will quickly fall below without additional precipitation in the next few weeks.

Colorado Basin River Forecast Center

Yampa abv Deerlodge Group



Median 1991-2020 — 2022 — 2021 —

Rock Ck - Upper Stillwater Reservoir (USTU1)

Period: Apr-Jul, Official 50% Forecast (2022-02-01): **74 kaf (103% Average, 116% Median)**

ESP is Unregulated and No Precipitation Forecast Included



2022/02/01:

Average: 72

Median: 64

ESP: 74.3

Official 10: 112

Official 30: 81

Official 50: 74

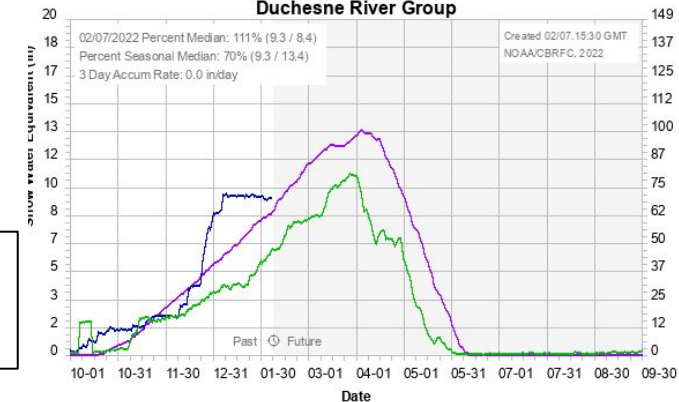
Official 70: 64

Official 90: 55

Still hanging on to above normal snow conditions, but that will not last much longer if current weather pattern persists.

Colorado Basin River Forecast Center

Duchesne River Group

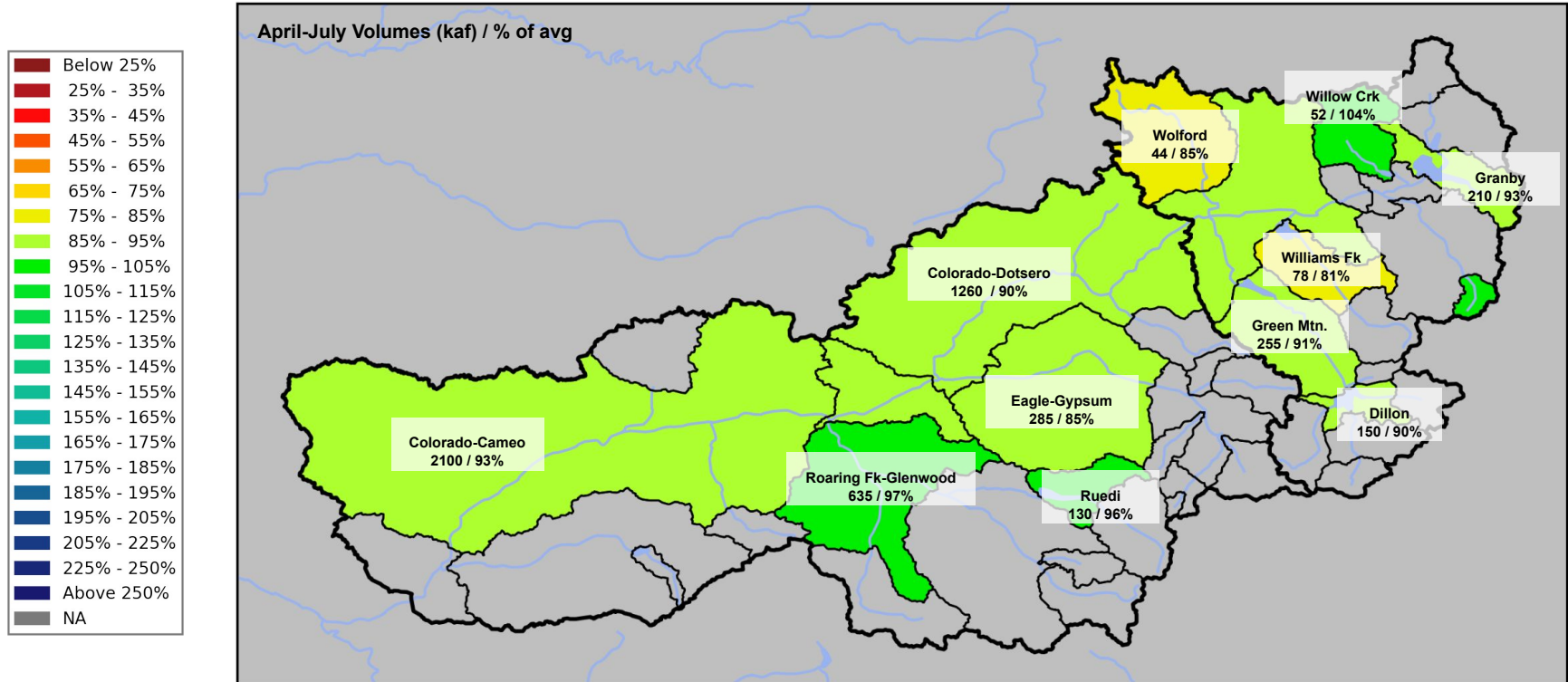


Median 1991-2020 — 2022 — 2021 —

Feb 1st Water Supply Forecasts: Upper Colorado River Mainstem

Forecast Ranges & (1-month Trend):

Granby to Kremmling: 80 - 105% of average (0-5% decrease)
Kremmling to Cameo: 85 - 95% of average (0-10% decrease)



Upper Colorado Mainstem Water Supply Forecasts & Snow Conditions

Blue - Dillon Reservoir (DIRC2)

Period: Apr-Jul, Official 50% Forecast (2022-02-01): 150 kaf (90% Average, 91% Median)
ESP is Unregulated and No Precipitation Forecast Included

2022/02/01:

Average: 167

Median: 164

ESP: 153

Official 10: 200

Official 30: 170

Official 50: 150

Official 70: 130

Official 90: 105

WY22 SWE (%med)

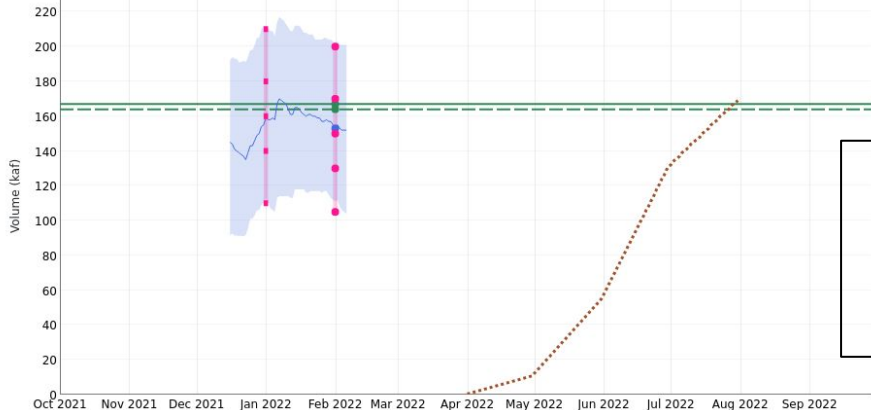
Nov1: 117%

Dec1: 80%

Jan1: 105%

Jan7: 121%

Feb6: 102%



Frying Pan - Ruedi Reservoir, Basalt, Nr (RURC2)

Period: Apr-Jul, Official 50% Forecast (2022-02-01): 130 kaf (96% Average, 101% Median)
ESP is Unregulated and No Precipitation Forecast Included

2022/02/01:

Average: 135

Median: 129

ESP: 135

Official 10: 175

Official 30: 145

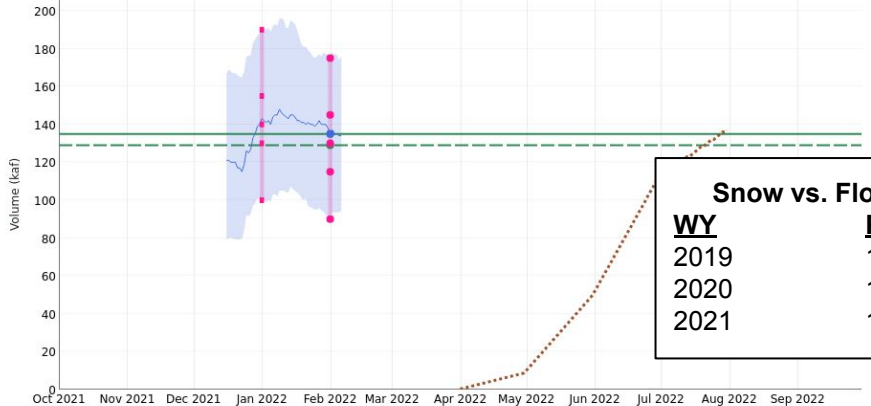
Official 50: 130

Official 70: 115

Official 90: 90

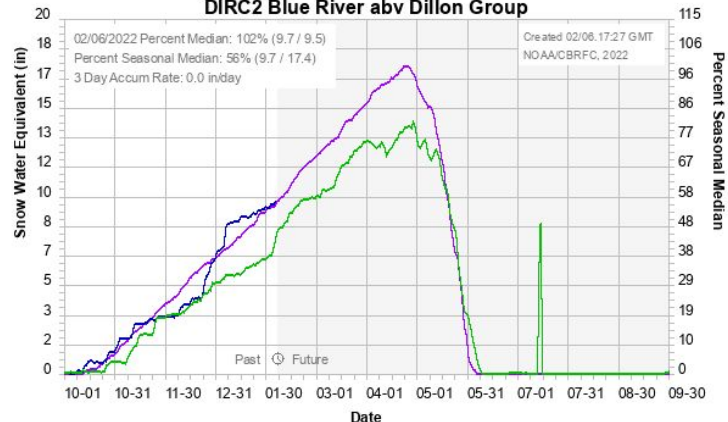
Snow vs. Flow Obs Relationship

WY	PEAK SWE	AMJJ
2019	163%	140%
2020	138%	76%
2021	108%	55%



Colorado Basin River Forecast Center

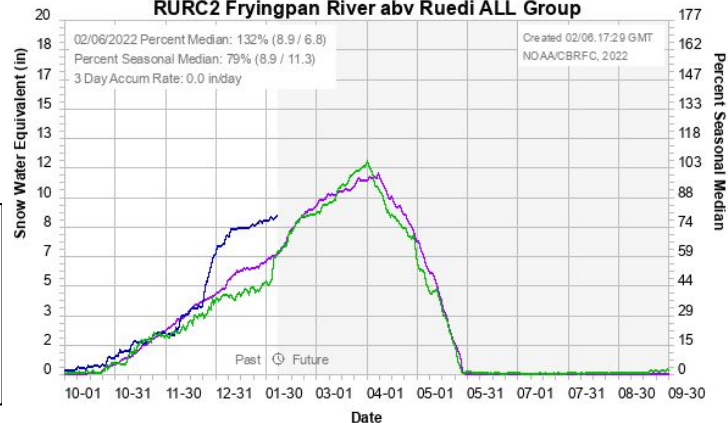
DIRC2 Blue River abv Dillon Group



Median 1991-2020 2022 2021

Colorado Basin River Forecast Center

RURC2 Fryingpan River abv Ruedi ALL Group



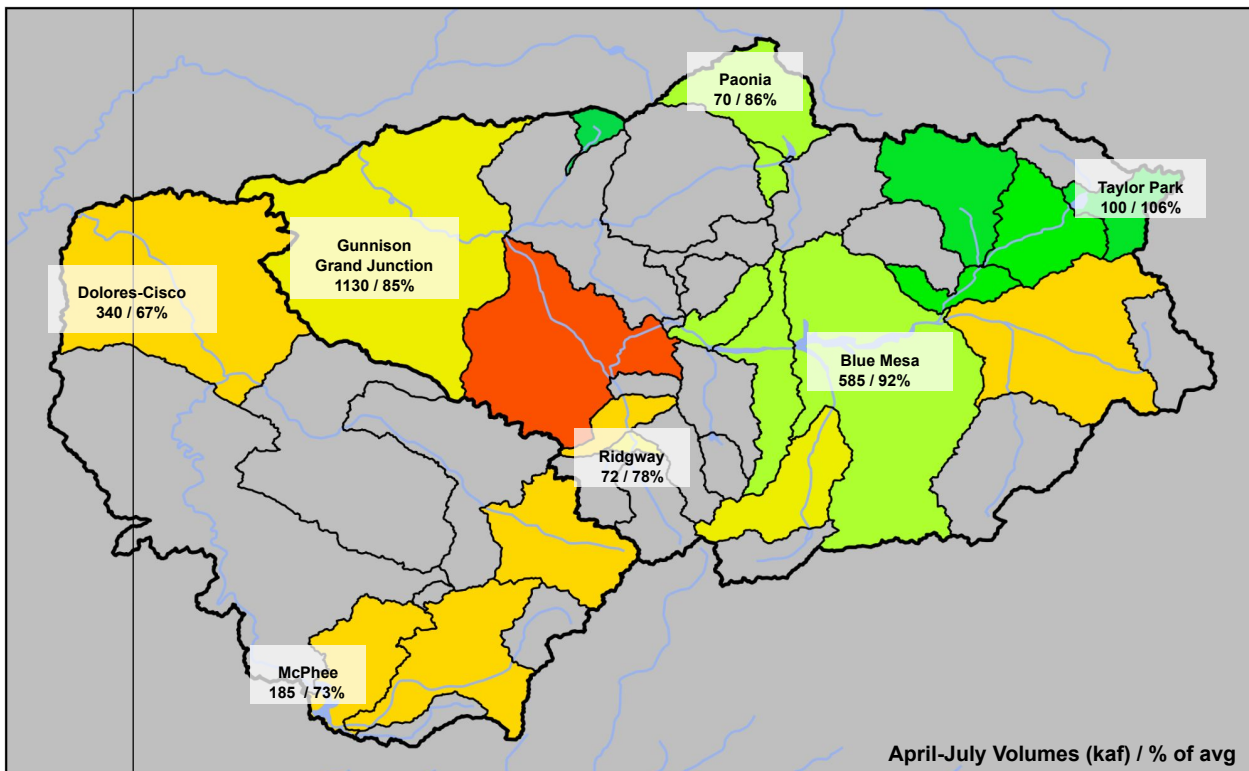
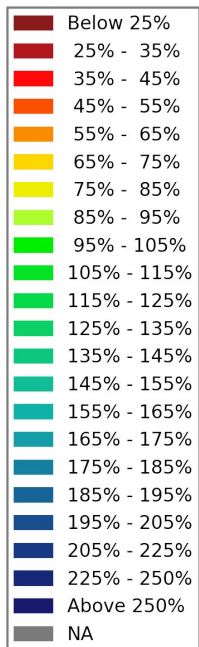
Median 1991-2020 2022 2021

Feb 1st Water Supply Forecasts: Gunnison, Dolores

Forecast Ranges & (1-month Trend):

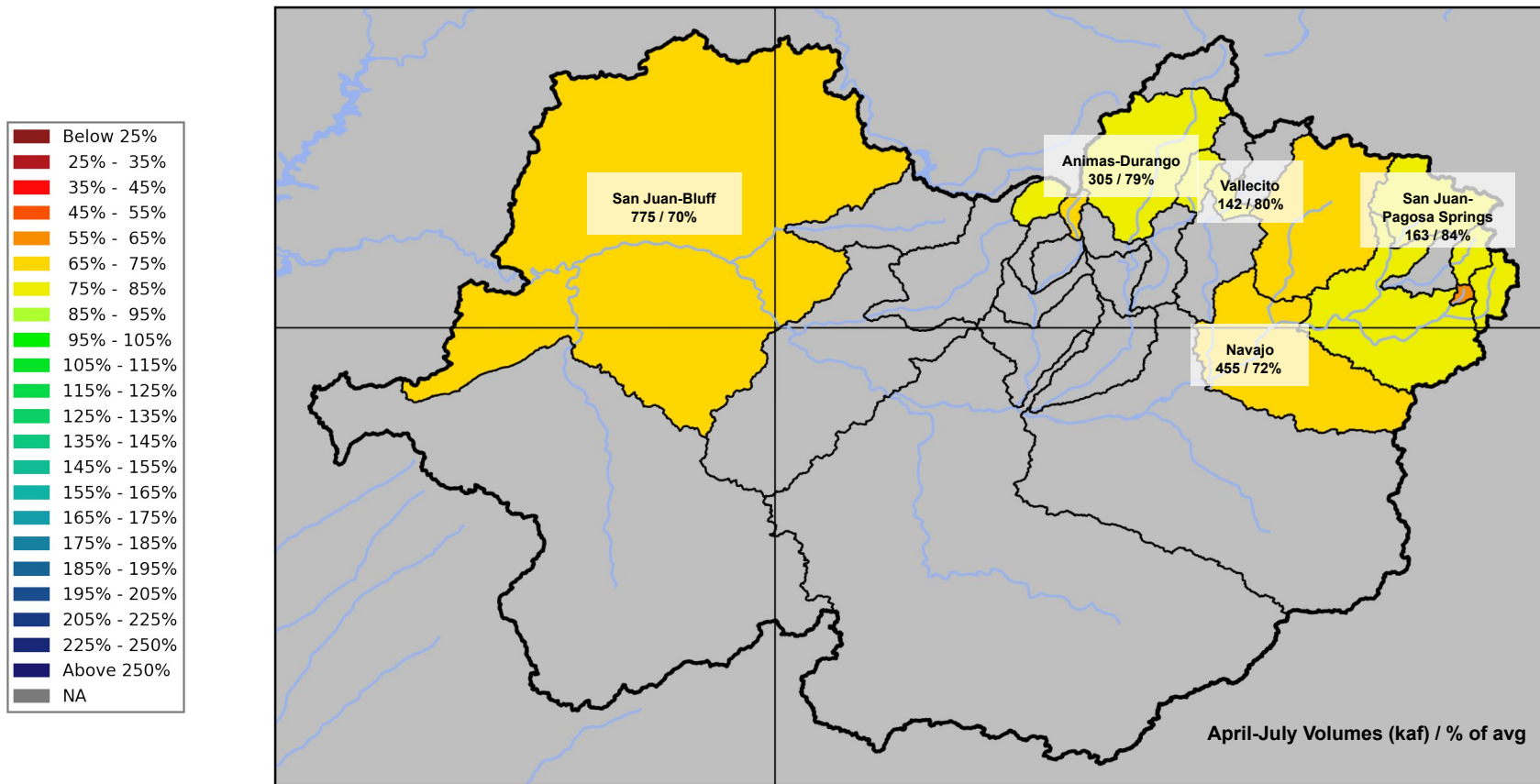
Gunnison: 70 - 115% of average (0-25% decrease)

Dolores: 65 - 75% of average (15-25% decrease)



Feb 1st Water Supply Forecasts: San Juan

Forecast Range & (1-month Trend):
60 - 85% of average (10-20% decrease)



Southwest Colorado Water Supply Forecasts & Snow Conditions

Gunnison - Blue Mesa Reservoir (BMDC2)

Period: Apr-Jul, Official 50% Forecast (2022-02-01): 585 kaf (92% Average, 102% Median)
ESP is Unregulated and No Precipitation Forecast Included



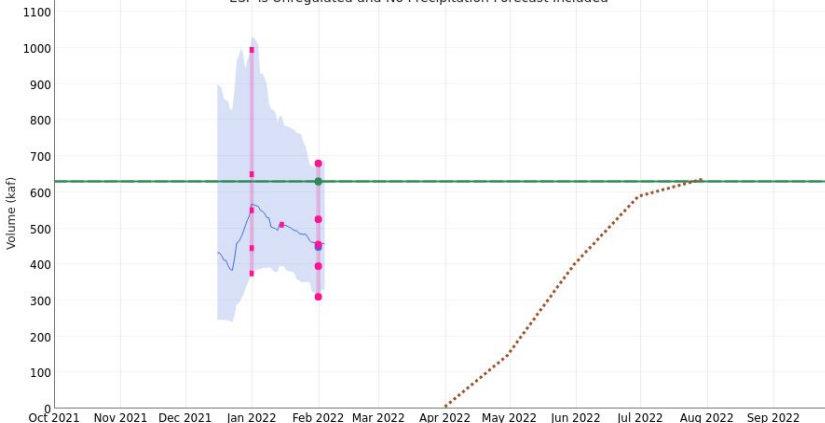
2022/02/01:
Average: 635
Median: 575
ESP: 595
Official 10: 860
Official 30: 650
Official 50: 585
Official 70: 515
Official 90: 435

Blue Mesa Res Inflow
Feb Fcst: 585 kaf / 92%
Decreased by 10%

Forecast guidance expected to decrease through mid February.

San Juan - Navajo Reservoir, Archuleta, Nr (NVRN5)

Period: Apr-Jul, Official 50% Forecast (2022-02-01): 455 kaf (72% Average, 72% Median)
ESP is Unregulated and No Precipitation Forecast Included

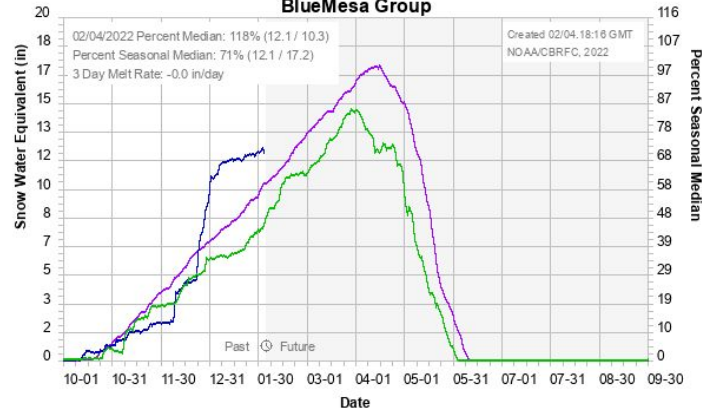


2022/02/01:
Average: 630
Median: 630
ESP: 448
Official 10: 680
Official 30: 525
Official 50: 455
Official 70: 395
Official 90: 310

Navajo Res Inflow
Feb Fcst: 455 kaf / 72%
Decreased by 15%

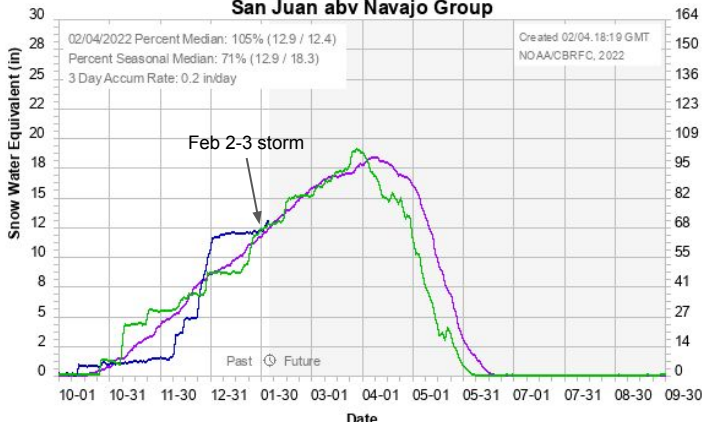
The area above Navajo reservoir benefited from precipitation on Feb 2-3.

Colorado Basin River Forecast Center BlueMesa Group



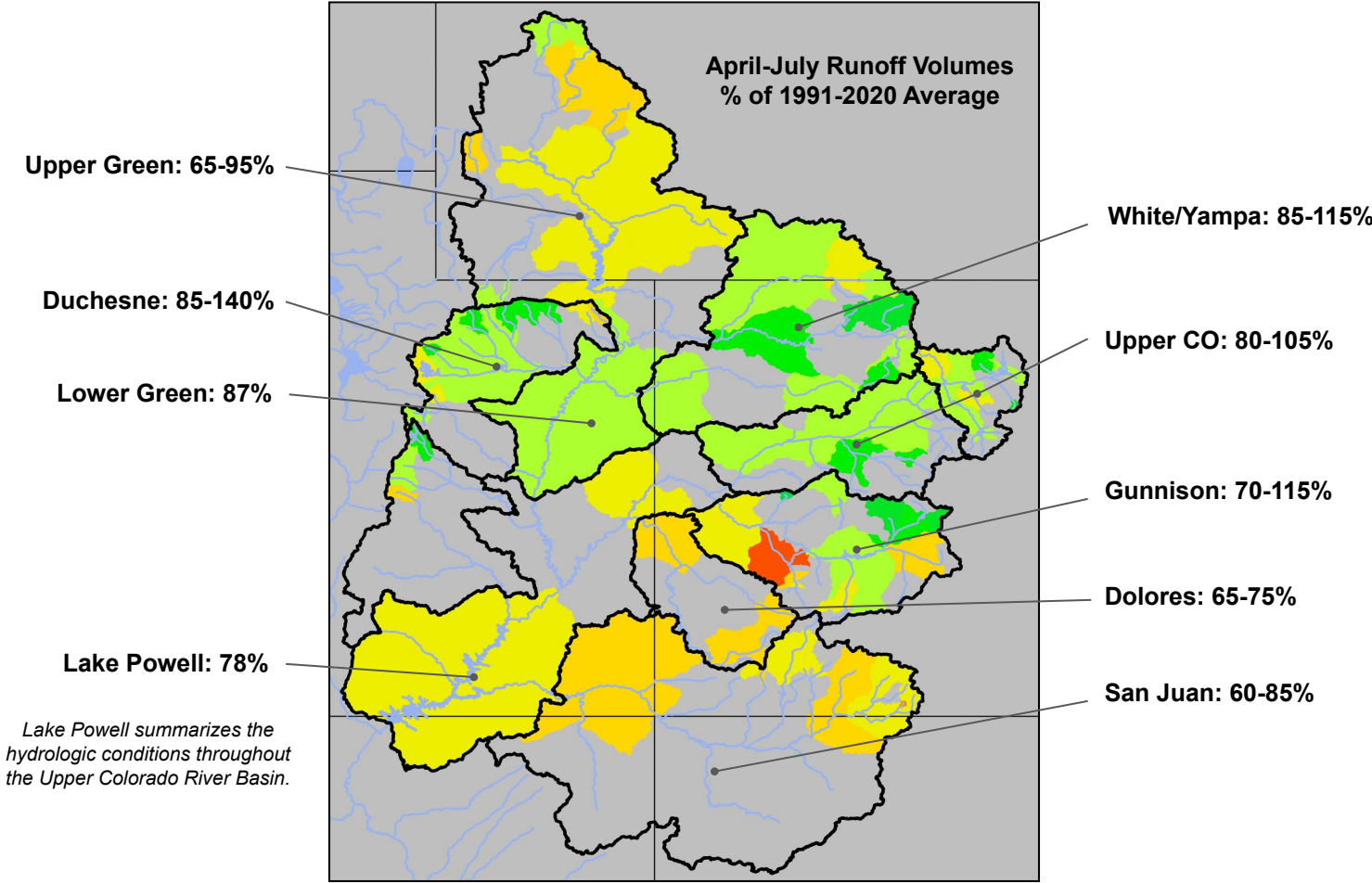
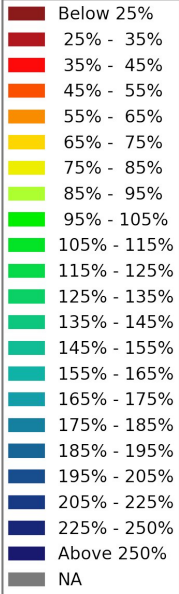
Median 1991-2020 — 2022 — 2021 —

Colorado Basin River Forecast Center San Juan abv Navajo Group

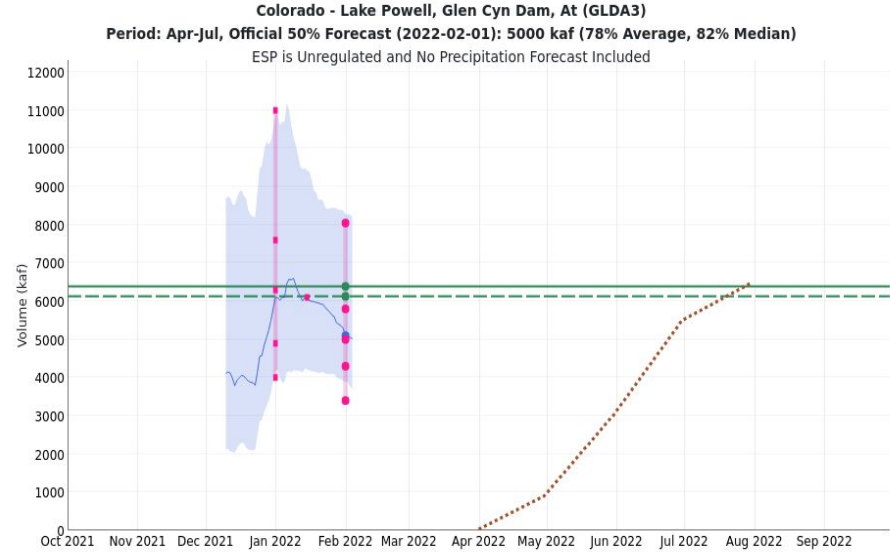
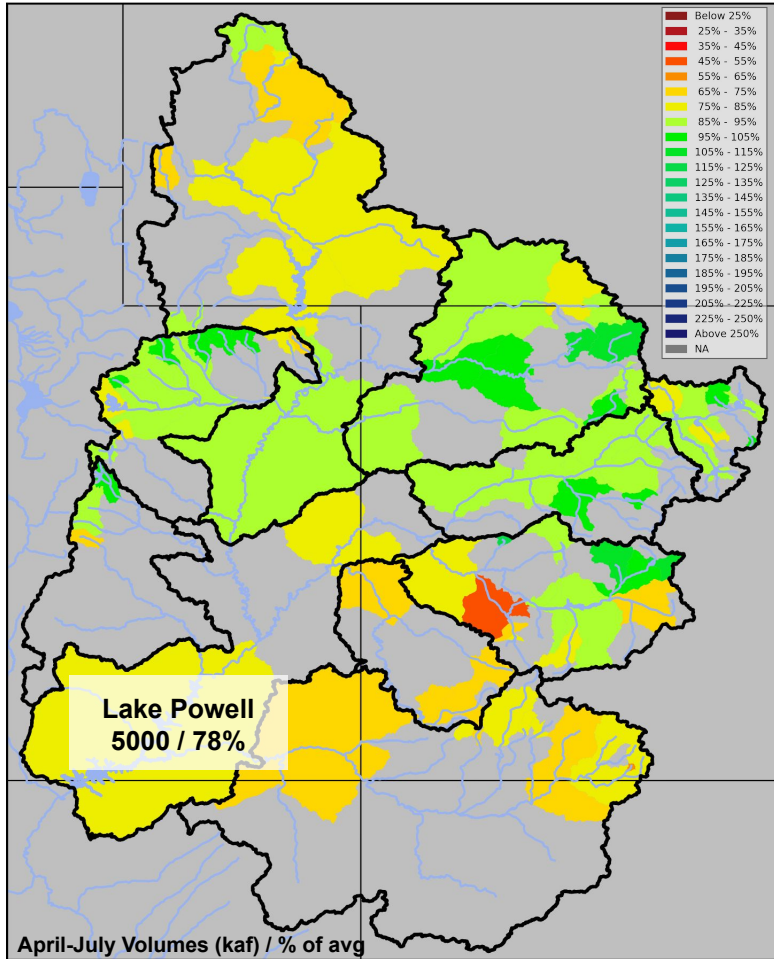


Median 1991-2020 — 2022 — 2021 —

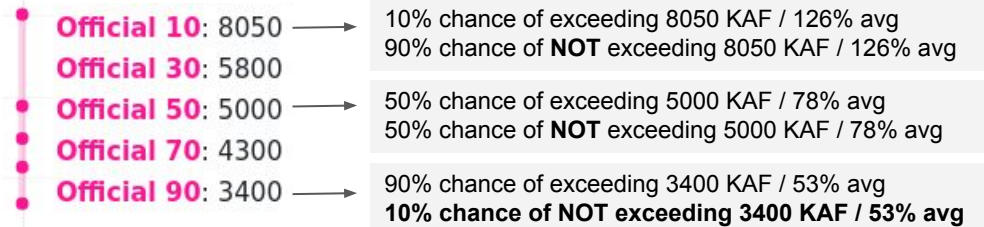
Feb 1st Water Supply Forecasts: Upper Colorado



Feb 1st Water Supply Forecasts: Upper Colorado (Lake Powell)

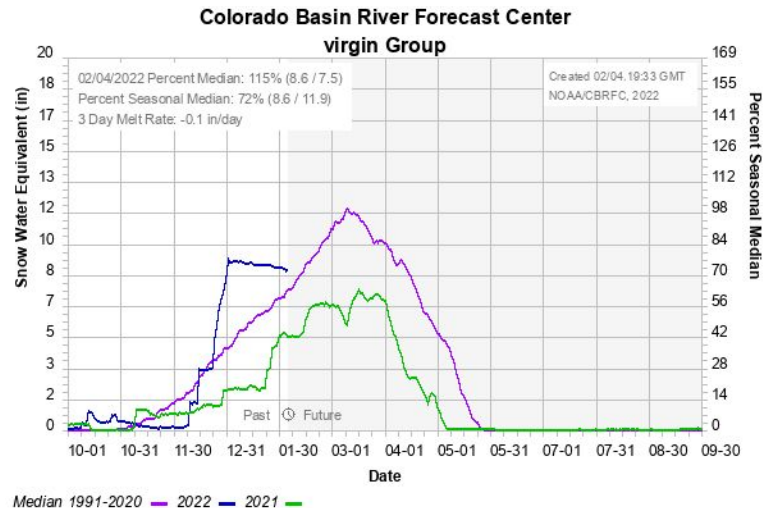
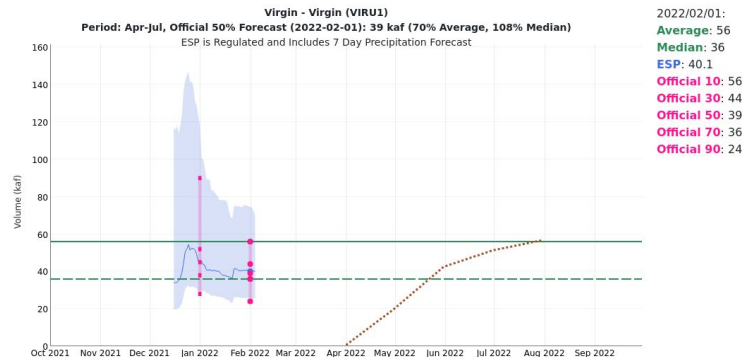
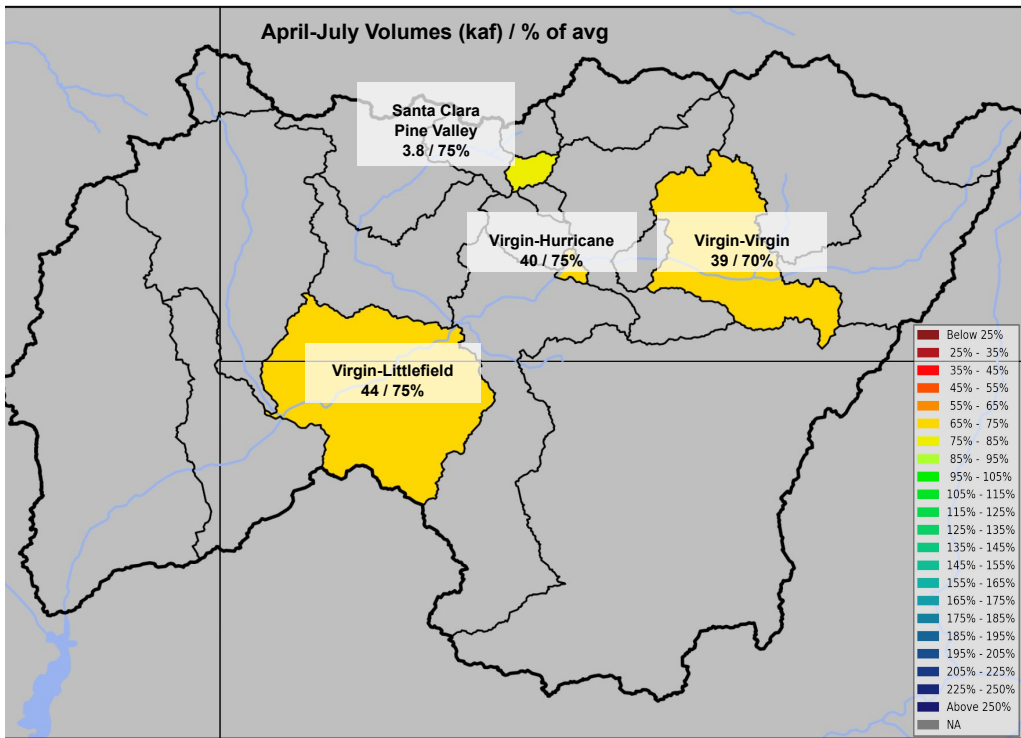


2022/02/01:
Average: 6390
Median: 6130
ESP: 5100
Official 10: 8050
Official 30: 5800
Official 50: 5000
Official 70: 4300
Official 90: 3400

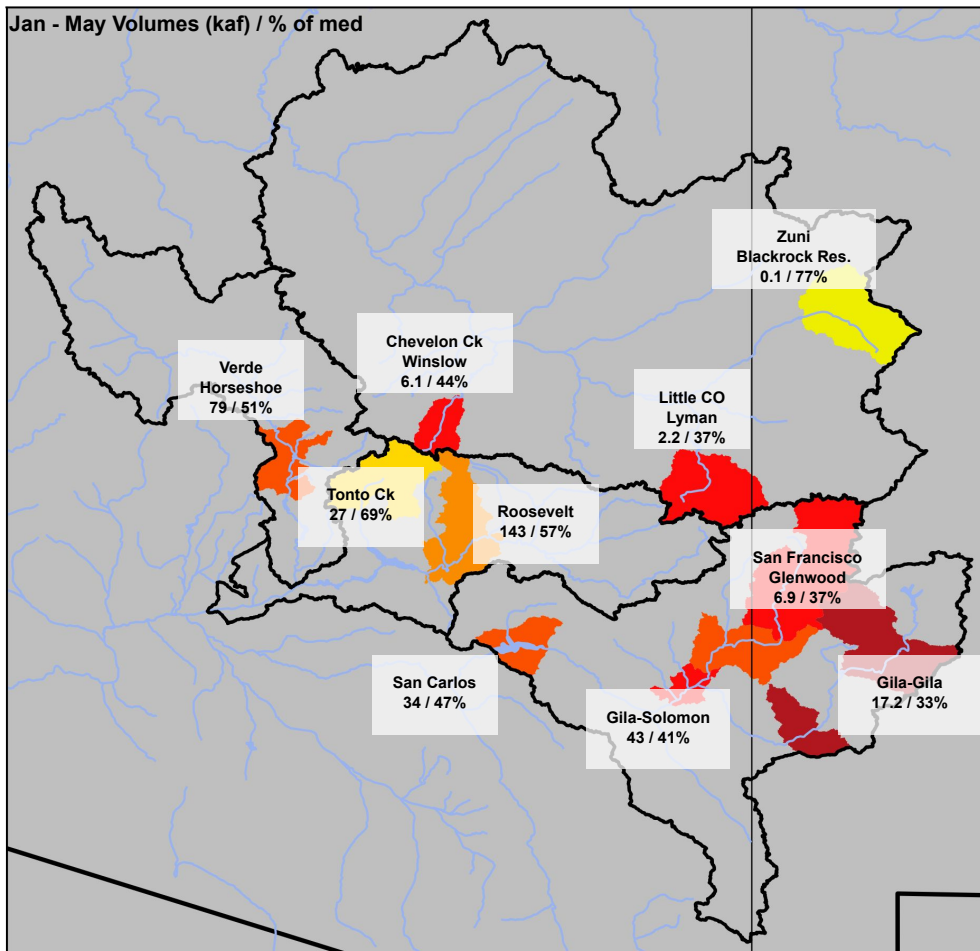


Feb 1st Water Supply Forecasts: Virgin River Basin

Forecast Range & (1-month Trend):
 70 - 75% avg (5-25% decrease)



Feb 1st Water Supply Forecasts: Lower Colorado River Basin



January - May Forecast Period
% of 1991-2020 Median

Forecast Ranges

Little Colorado: 35% - 75%

Upper Gila: 35% - 45%

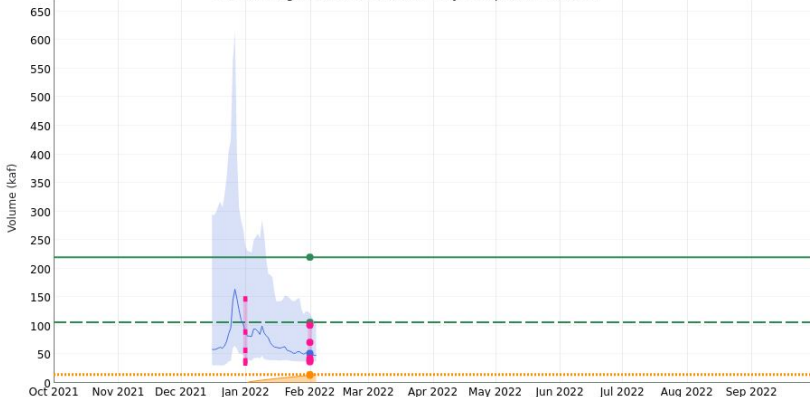
Salt: 55% - 70%

Verde: 50%

Jan Obs Streamflow Summary
 Little Colorado – **Below Normal**
 Upper Gila – **Below Normal**
 Salt – **Above Normal**
 Verde – **Near Normal**

Lower Colorado Water Supply Forecasts & Snow Conditions

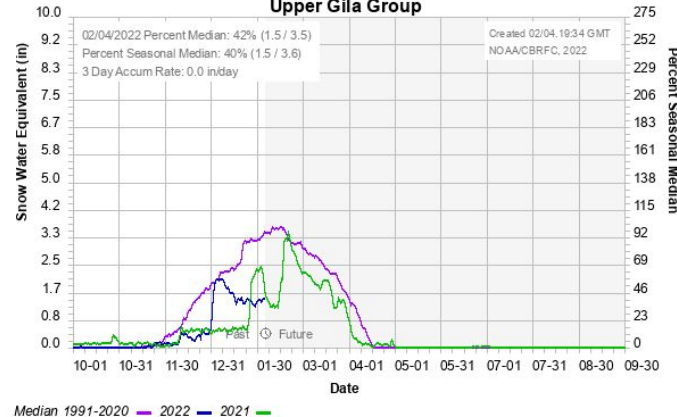
Gila - Solomon, Nr, Head Of Safford Vly (GLHA3)
Period: Jan-May, Official 50% Forecast (2022-02-01): 43 kaf (20% Average, 41% Median)
 ESP is Unregulated and Includes 7 Day Precipitation Forecast



2022/02/01:
Average: 220
Median: 106
Observed Accumulation: 13.4
Observed Total: 14.6
ESP: 51.7
Official 10: 101
Official 30: 71
Official 50: 43
Official 70: 39
Official 90: 37

Mostly dry weather across the Upper Gila this water year.

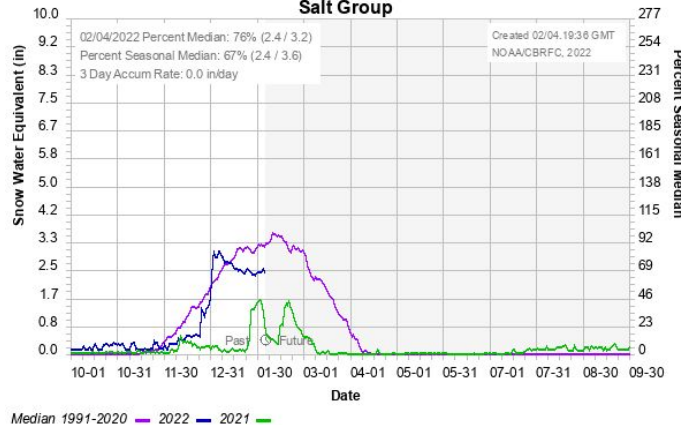
Colorado Basin River Forecast Center
Upper Gila Group



2022/02/01:
Average: 80
Median: 39
Observed Accumulation: 19.9
Observed Total: 20.1
ESP: 37.1
Official 10: 93
Official 30: 47
Official 50: 27
Official 70: 24
Official 90: 23

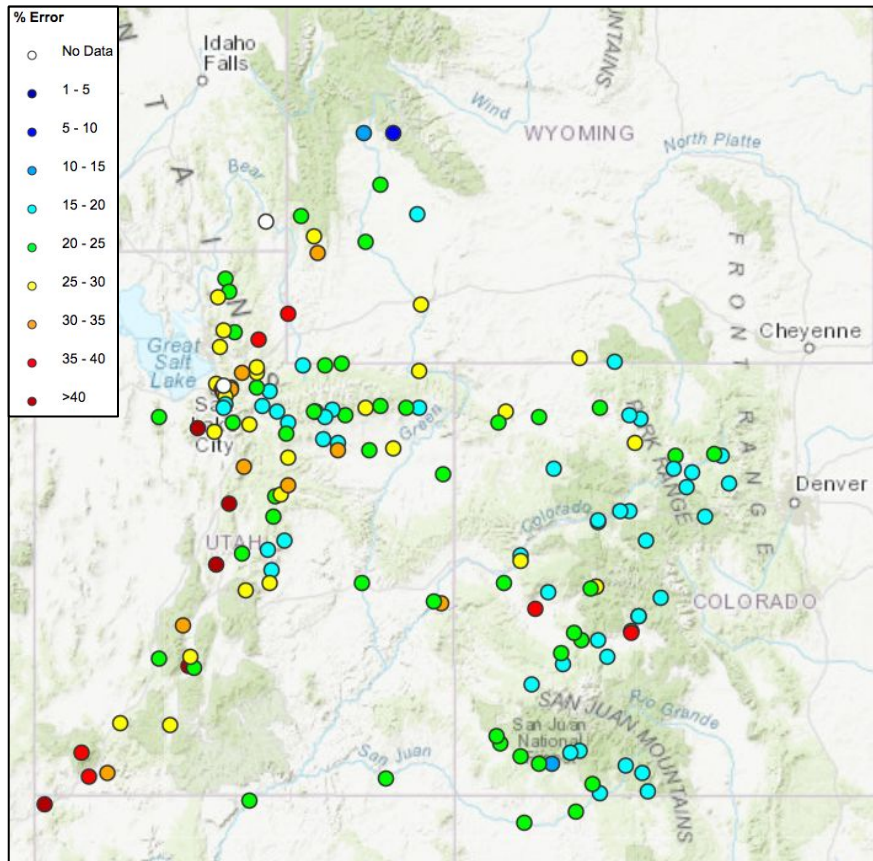
Jan-May forecast period; start showing accumulated volume on Jan 1st.

Colorado Basin River Forecast Center
Salt Group



Historical (1981-2010) Forecast Verification

February Forecast Error: April-July Volume



Location

Green River - Warren Bridge	15%
Fontenelle Reservoir	25%
Yampa River - Deerlodge	25%
Blue River - Dillon Reservoir	17%
Colorado River - Cameo	19%
Blue Mesa Reservoir (Gunnison)	20%
McPhee Reservoir (Dolores)	25%
Navajo Reservoir (San Juan)	22%
Lake Powell	24%
Virgin River at Virgin	34%

Avg Feb Forecast Error

Error tends to decrease each month into the spring

Where Forecasts are Better:

- Headwaters
- Primarily snow melt basins
- Known diversions / demands

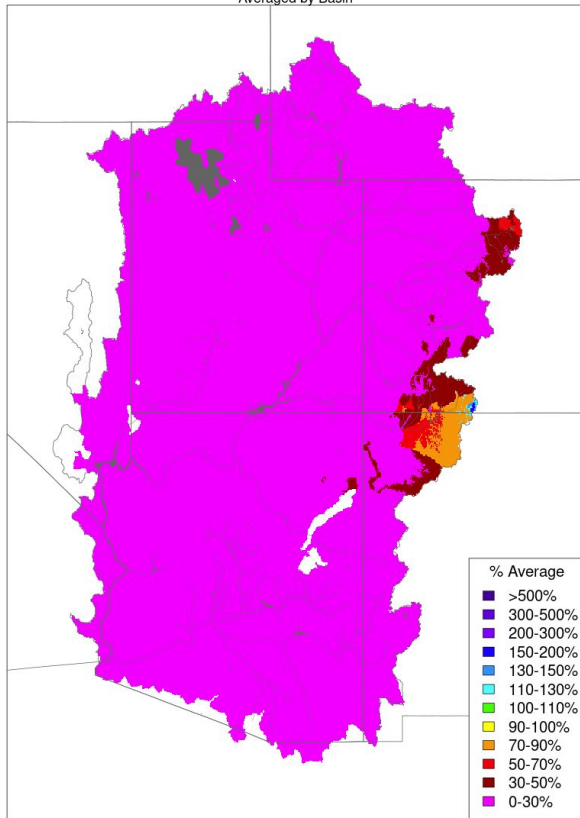
Where Forecasts are Worse:

- Lower elevations (rain or early melt)
- Downstream of diversions / irrigation
- Little is known about diversions / demands

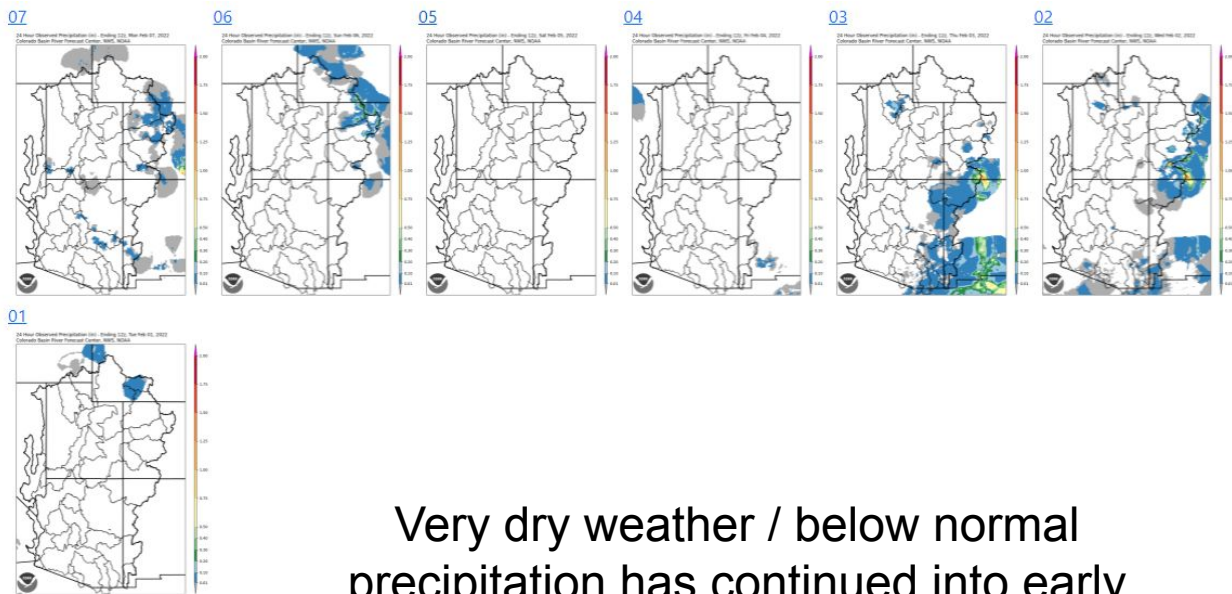
February 2022 Month-To-Date Precipitation

Month to Date Precipitation - February 07 2022

Averaged by Basin

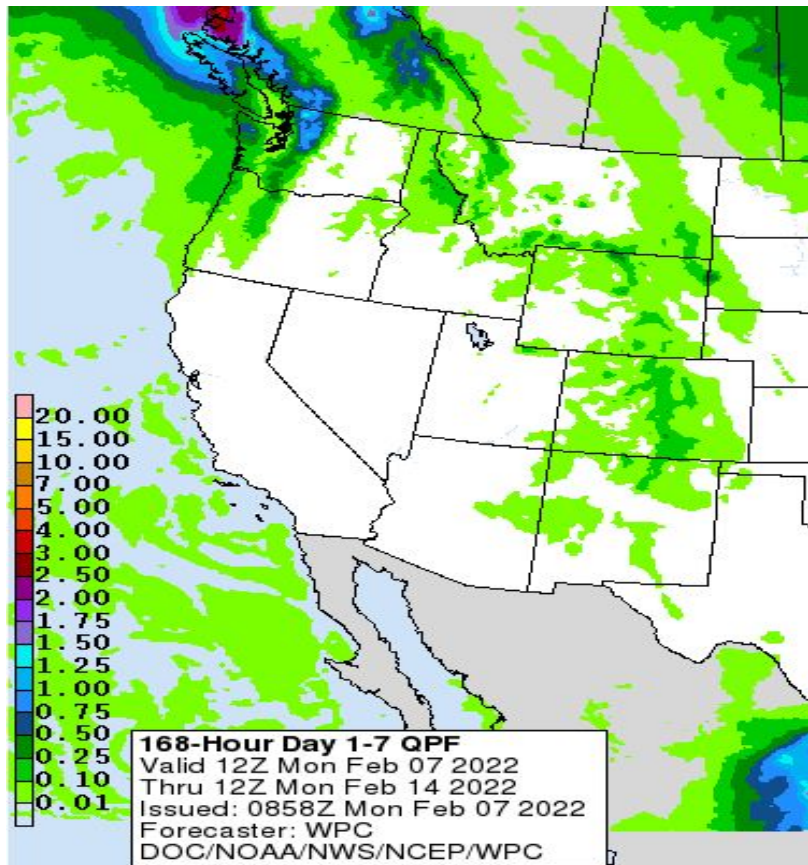


Prepared by NOAA, Colorado Basin River Forecast Center
Salt Lake City, Utah, www.cbrfc.noaa.gov



Very dry weather / below normal precipitation has continued into early February across the region.

Upcoming Weather: WPC February 7-14 Precipitation Outlook



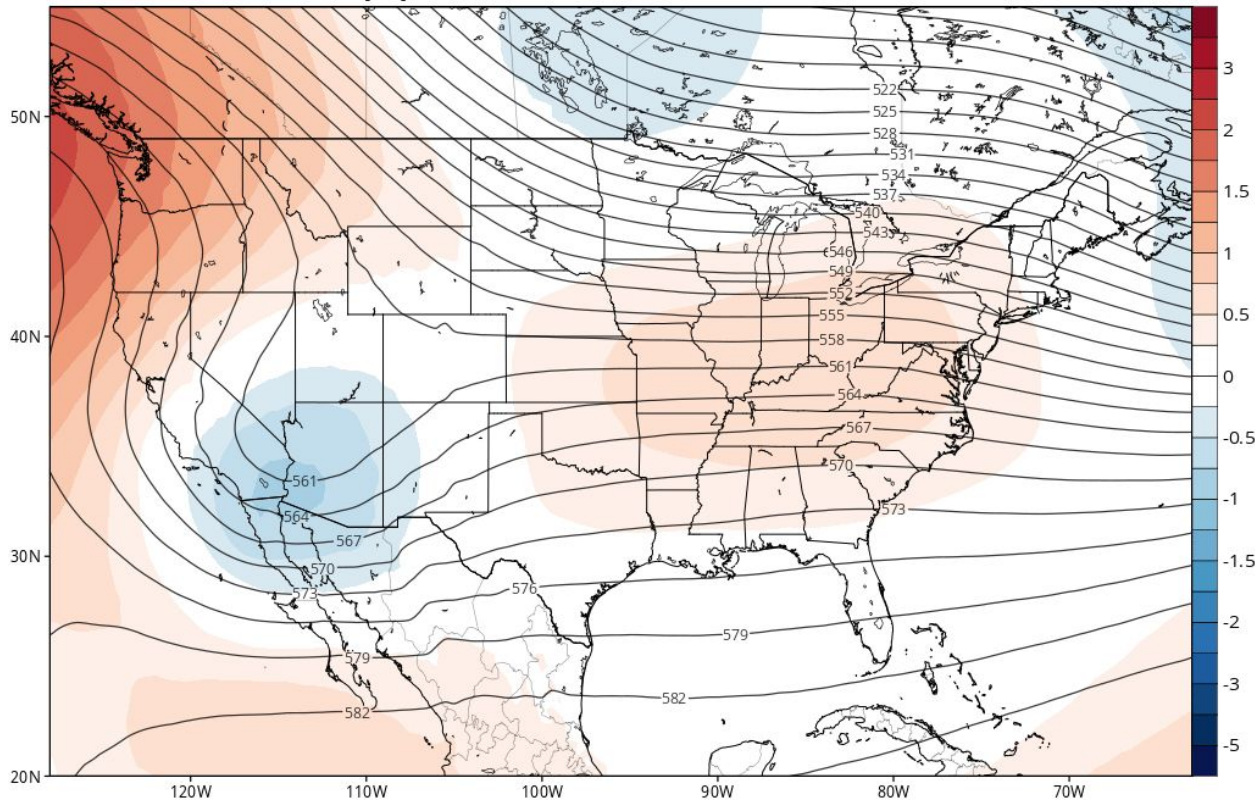
- A ridge over the Eastern Pacific will keep most of the basin dry
- A trough will dig to the east of the basin mid-week, bringing a chance of precipitation to the higher terrain of CO
 - <0.25” of precipitation in the forecast
- The ridge moves over the western US towards the end of the week

Upcoming Weather: February 14-20

GEFS 500mb Geopotential Height & Normalized Anomaly (based on CFSR 1981-2010 Climatology)

Init: 00z Feb 07 2022 Forecast Hour: [228] valid at 12z Wed, Feb 16 2022

TROPICALTIDBITS.COM



- A ridge will build over the eastern Pacific into next week
- A series of troughs will move over the basin next week, bringing chances of precipitation to most of the basin
- High uncertainty in precipitation amounts and placement

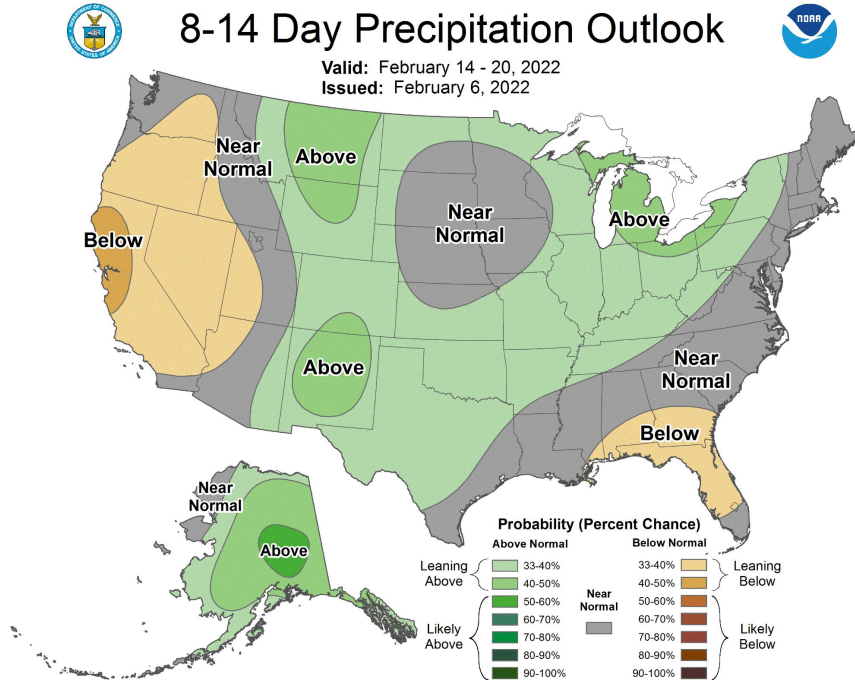
Upcoming Weather: 8-14 Day Outlook (February 14-20)

Slightly elevated odds of above average precipitation across eastern basins.
Slightly elevated odds of above average temperatures across southwestern basins.

Precipitation Outlook

8-14 Day Precipitation Outlook

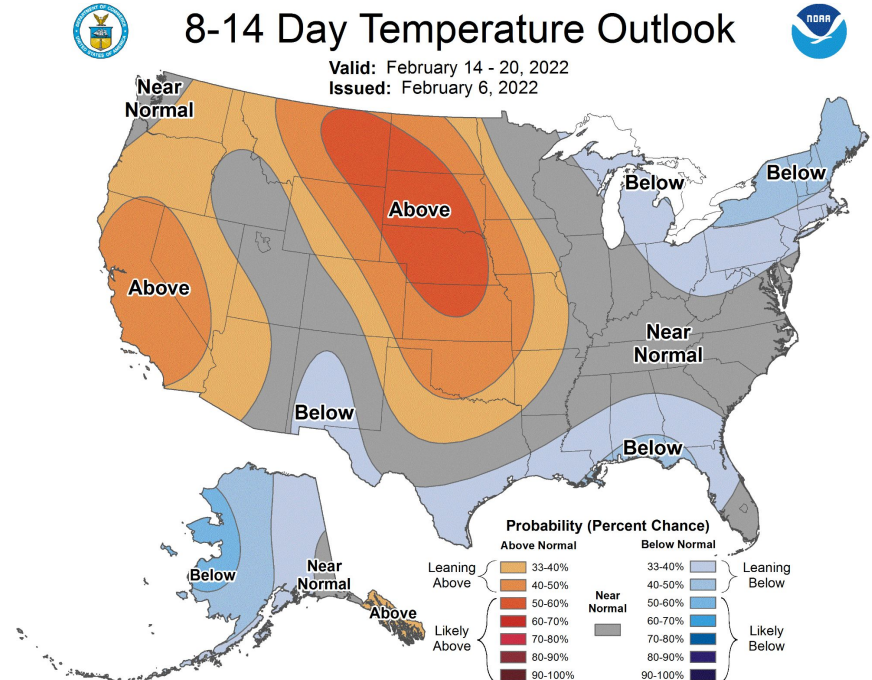
Valid: February 14 - 20, 2022
Issued: February 6, 2022



Temperature Outlook

8-14 Day Temperature Outlook

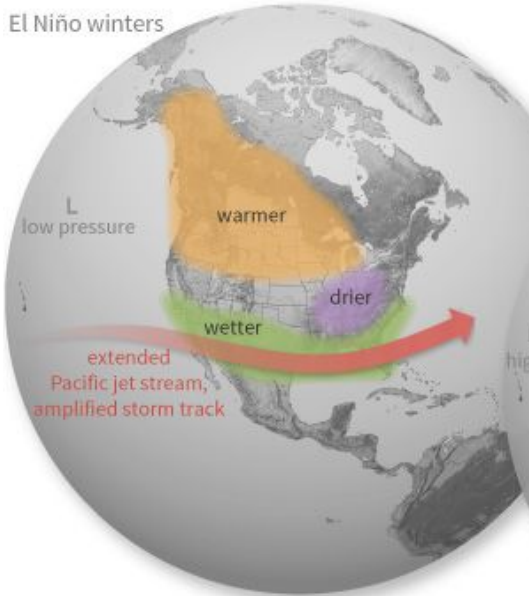
Valid: February 14 - 20, 2022
Issued: February 6, 2022



El Niño Southern Oscillation (ENSO) Status

- La Niña** is likely to continue into the Northern Hemisphere spring (67% chance during March-May 2022) and then transition to ENSO-neutral (51% chance during April-June 2022).
 - Increased chances of drier winter weather in Arizona/LCRB
 - Much weaker correlation/winter weather signal elsewhere in basin

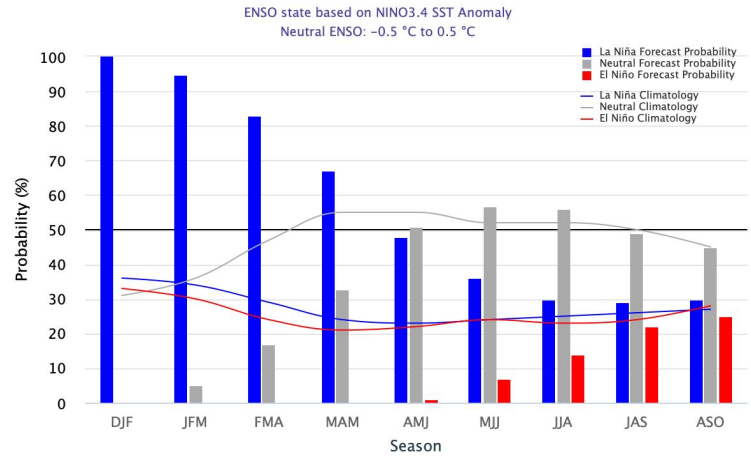
El Niño winters



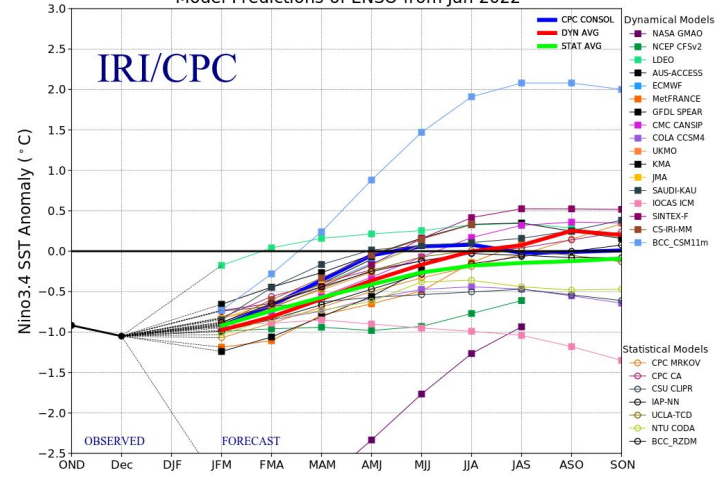
La Niña winters



Early-January 2022 CPC/IRI Official Probabilistic ENSO Forecasts



Model Predictions of ENSO from Jan 2022



Summary

- A wet monsoon season helped soil moisture conditions, which are improved from a year ago but soil moisture deficits are still out there, notably across much of western Colorado
- Very wet & very dry periods of weather in water year 2022:
 - October: wet
 - November -> first week of December: dry (<25th percentile)
 - Last 3 weeks of December -> early January: wet (>85th percentile)
 - Last 3 weeks of January -> current: dry (<10th percentile)
- Current (Feb7) SWE Conditions:
 - Upper Colorado: 95-110%
 - Lower Colorado: 40-115%
- February water supply forecasts (% of normal):
 - Upper Colorado: 60-115%
 - Lower Colorado: 30-75%
- Weather outlook
 - Mostly dry with light precipitation (<0.25") across northern, high elevation basins
 - North slope of Uinta Range; western Colorado along Continental Divide

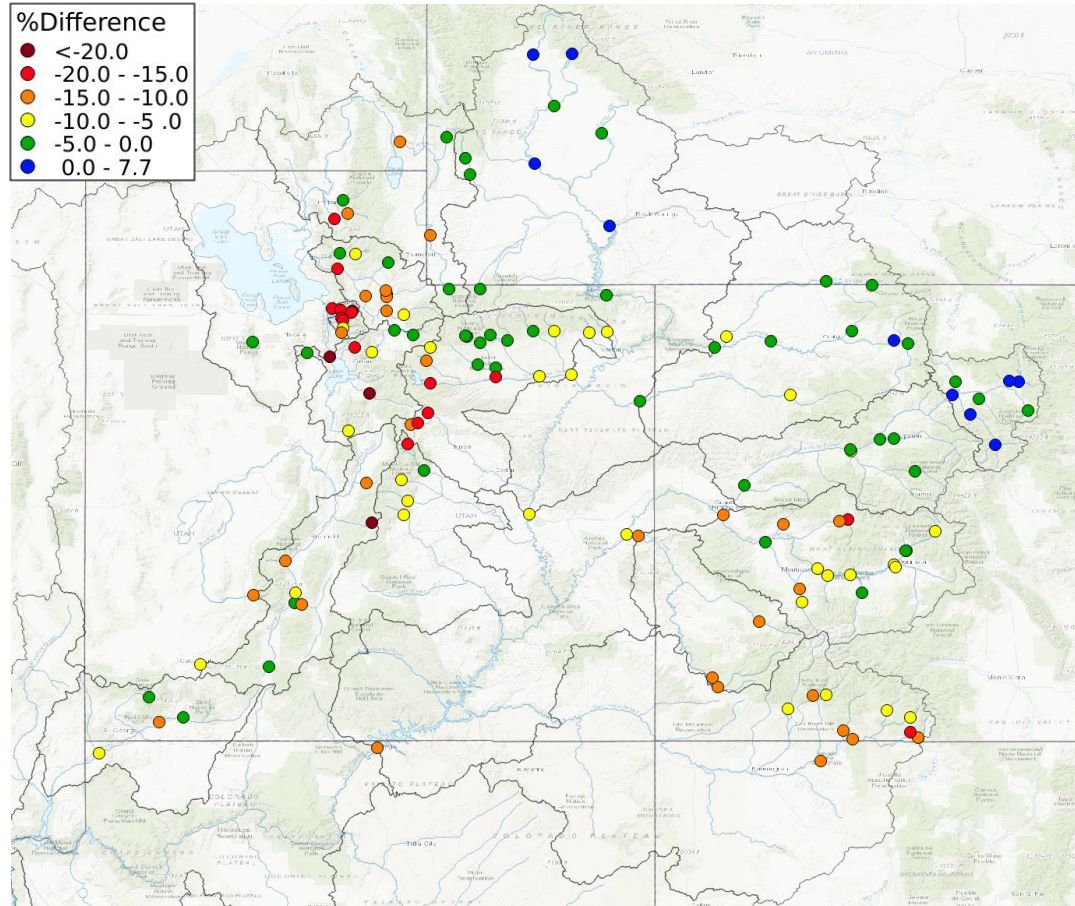
Science Update

- 1981-2010 vs. 1991-2020 Seasonal Unregulated Streamflow Normals Comparison
 - CBRFC unregulated streamflow definition
 - Great Basin & Upper Colorado River Basin
 - April-July Volume
 - Change In Average (%Difference)
 - Lower Colorado River Basin
 - January-May Volume
 - Change in Median (%Difference)
 - $\%Difference = \frac{\text{New Value} - \text{Old Value}}{\text{Old Value}} \times 100$
 - New Value: 1991-2020
 - Old Value: 1981-2010

Unregulated Flow

- Most CBRFC water supply forecasts are unregulated flow forecasts
- CBRFC unregulated flow definition:
 - Unregulated flow accounts for measured diversions and reservoir regulation
 - Diversions that are usually larger in magnitude
 - Data available in near real-time
 - Long historical period of record
 - Unregulated flow does not account for unmeasured depletions or unmeasured return flow
 - Non-real time data
 - Lack of historical data
 - Challenging to measure
- CBRFC Forecast Points and their adjustments:
 - <https://www.cbrfc.noaa.gov/wsup/guide/2022/guidepoints.html>
 - Water Supply Menu -> Documentation

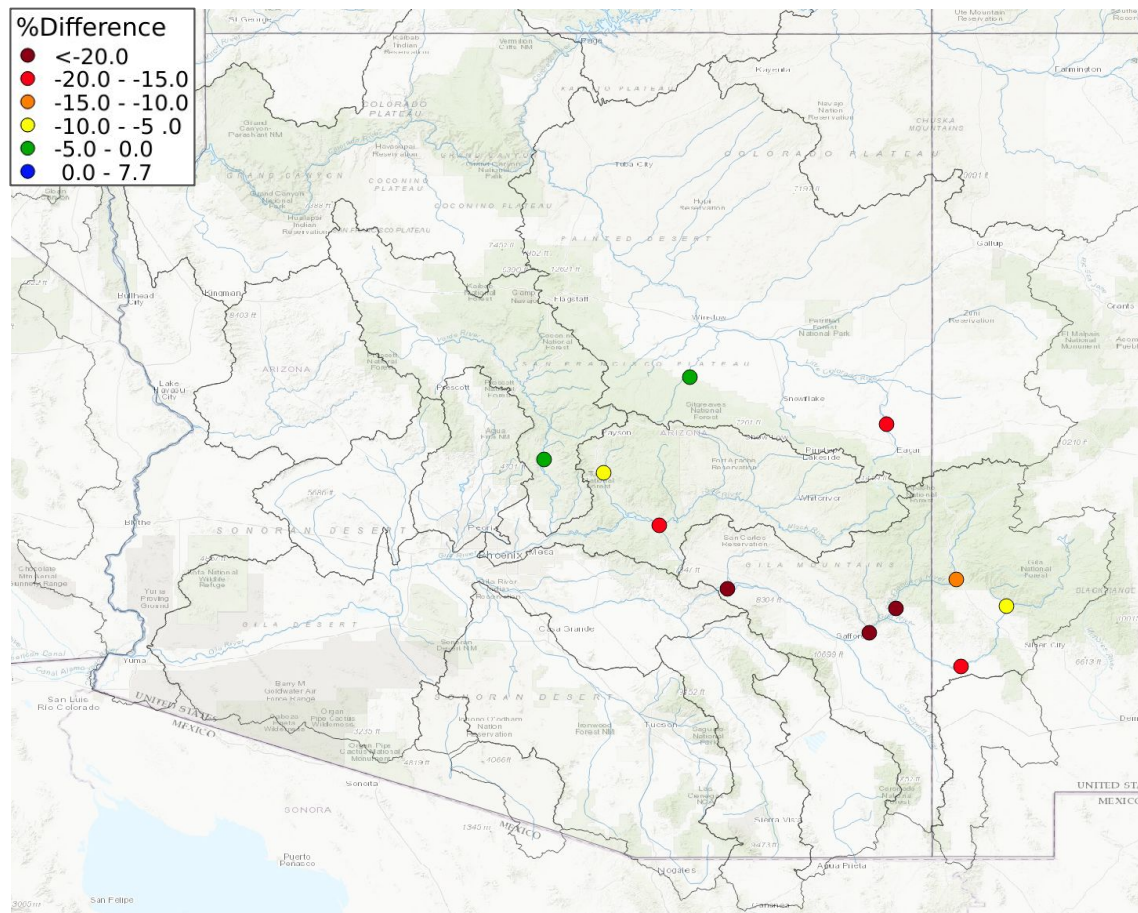
1981-2010 vs. 1991-2020 Comparison: April-July Change in Average (%Difference)



1981-2010 -> 1991-2020 April-July Volume

<u>Basin</u>	<u>%Difference</u>
Upper Green	-4 to +4
Duchesne	-16 to 0
Price/San Rafael	-19 to 0
Yampa/White	-7 to +3
Upper CO-Abv Kremmling	-4 to +6
Upper CO-Krm->Cam	-5 to 0
Gunnison	-16 to -3
Dolores	-14 to -10
San Juan	-20 to -7
Virgin	-14 to 0
Lake Powell	-11
Bear	-17 to -1
Weber	-15 to -4
Six Creeks	-20 to -6
Provo/UT Lake	-34 to -1
Sevier	-22 to 0

1981-2010 vs. 1991-2020 Comparison: January-May Change in Median (%Difference)



1981-2010 -> 1991-2020 January-May Volume

<u>Basin</u>	<u>%Difference</u>
Little Colorado	-17 to 0
Upper Gila	-28 to -7
Salt	-19 to -7
Verde	-1

2022 Water Supply Webinar Schedule

**All Times Mountain Time (MT)*

Colorado River Basin

Friday	Jan 7 th	10 am
Monday	Feb 7 th	10 am
Monday	Mar 7 th	10 am
Thursday	Apr 7 th	10 am
Friday	May 6 th	10 am

Great Basin

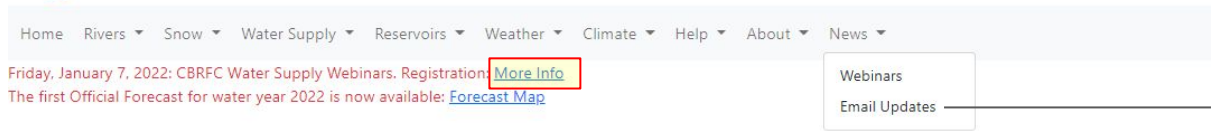
Friday	Jan 7 th	11:30 am
Monday	Feb 7 th	11:30 am
Monday	Mar 7 th	11:30 am
Thursday	Apr 7 th	11:30 am
Friday	May 6 th	11:30 am

Peak flow forecast webinar Thursday, March 17th, 10 am MT

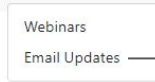
Additional briefings scheduled as needed

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

CBRFC Webinar Registration & Email List



Friday, January 7, 2022: CBRFC Water Supply Webinars. Registration: [More Info](#)
The first Official Forecast for water year 2022 is now available: [Forecast Map](#)



email cbrfc.webmasters@noaa.gov
subject line: **email notification list**

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 Water Supply Forecast Webinar Schedule & Registration - Water Year 2022

The Colorado Basin River Forecast Center (CBRFC) produces water supply forecasts for the Colorado River Basin and the eastern Great Basin. CBRFC conducts December through May webinars explaining the forecasts and current conditions.

Follow the links below to register for a webinar.

Early Season Water Supply Outlook Webinar

Wednesday December 15 @ 10 am MT

Colorado River Basin Water Supply Webinars

- [Friday January 7 @ 10 am MT](#)
- [Monday February 7 @ 10 am MT](#)
- [Monday March 7 @ 10 am MT](#)
- [Thursday April 7 @ 10 am MT](#)
- [Friday May 6 @ 10 am MT](#)

Utah Water Supply Webinars

- [Friday January 7 @ 11:30 am MT](#)
- [Monday February 7 @ 11:30 am MT](#)
- [Monday March 7 @ 11:30 am MT](#)
- [Thursday April 7 @ 11:30 am MT](#)
- [Friday May 6 @ 11:30 am MT](#)

Peak Flow Webinar

- [Thursday March 17 @ 10 am MT](#)

A notification email will be sent if a date or time change occurs. Additional webinars are scheduled as needed.

The webinar slides will be available on the [CBRFC presentations page](#) soon after each briefing.

2022 Presentations

Overview of the 1991-2020 Normal Period and Model Impacts Presentation during Reclamation's October 24-Month Study Rollout
Slides (.pdf)

2022 Early Season Water Supply Outlook
Slides (.pdf)
Recording (.mp4)

CBRFC Contacts & WY22 Basin Focal Points

Basin Focal Points (Forecasters)

Brenda Alcorn - Green, Duchesne, White/Yampa
brenda.alcorn@noaa.gov

Ashley Nielson – Gunnison, San Juan, Dolores, Lake Powell
ashley.nielson@noaa.gov

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

Patrick Kormos – Great Basin/Sevier
patrick.kormos@noaa.gov

Trevor Grout - Virgin, Lower Colorado
trevor.grout@noaa.gov

Brent Bernard – Hydrologist
brent.bernard@noaa.gov

Tracy Cox - Hydrometeorologist
tracy.cox@noaa.gov

Nanette Hosenfeld - Senior Hydrometeorologist
nanette.hosenfeld@noaa.gov

Wolfgang Hanft - Hydrometeorologist
wolfgang.hanft@noaa.gov

Michelle Stokes – Hydrologist In Charge
michelle.stokes@noaa.gov

Paul Miller– Service Coordination Hydrologist
paul.miller@noaa.gov

John Lhotak – Development and Operations Hydrologist
john.lhotak@noaa.gov

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>

