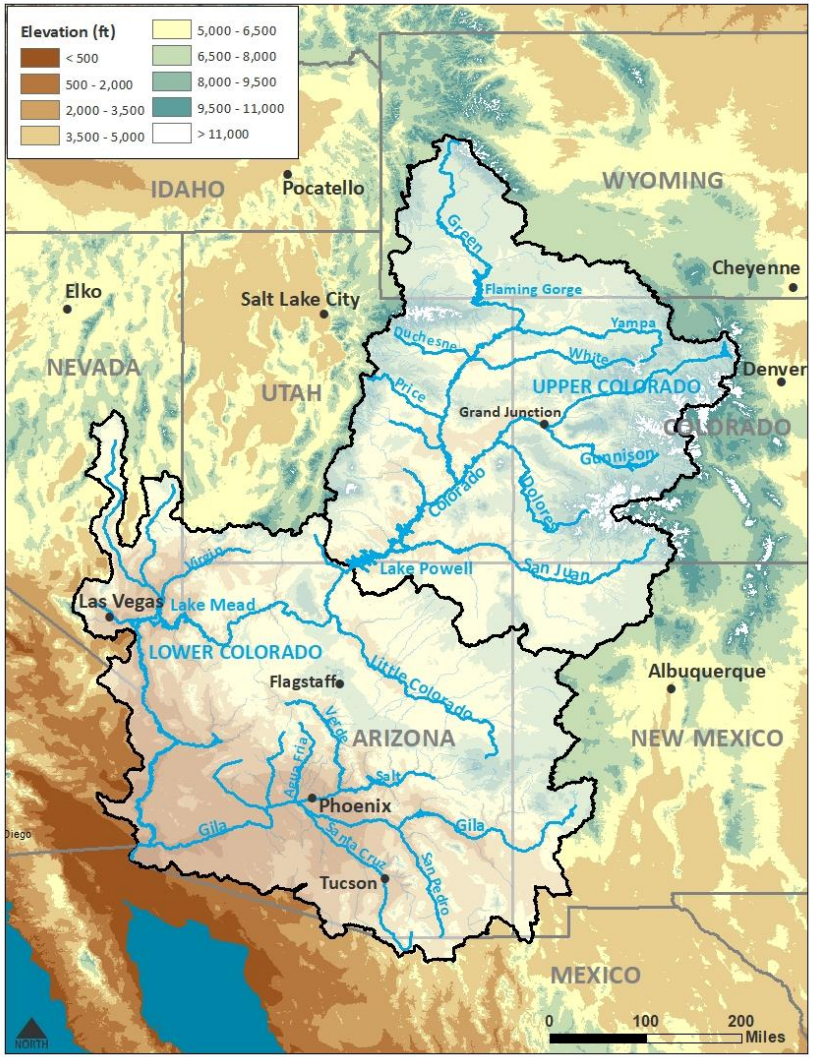
Colorado River Basin Water Supply Briefing

January 9, 2023

Cody Moser - Hydrologist
Colorado Basin River Forecast Center



Presentation Overview

Precipitation Review

Model Soil Moisture Conditions

Current Snowpack Conditions

2023 Water Supply Forecasts

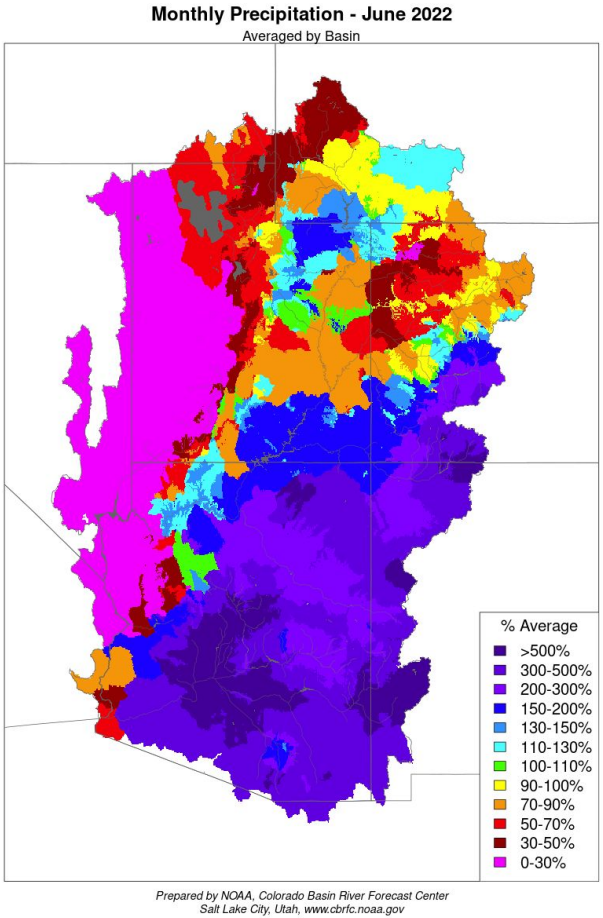
Early Season Forecast Error

Upcoming Weather

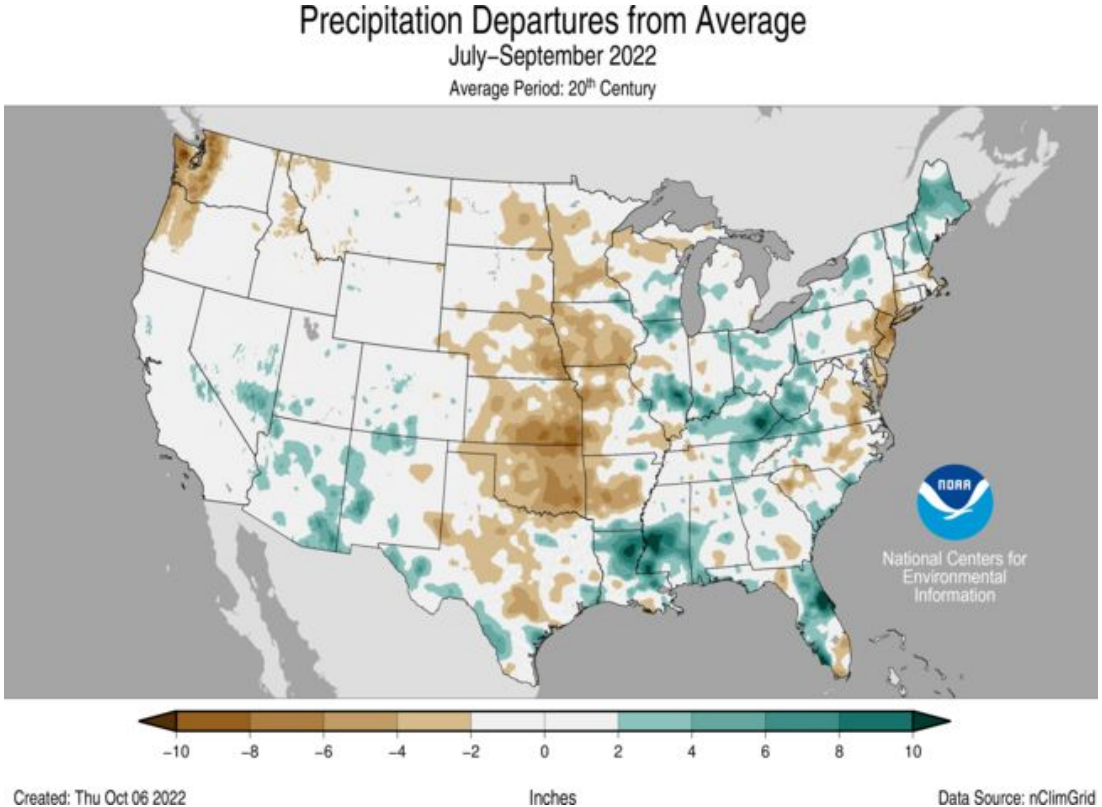
Contacts & Questions

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

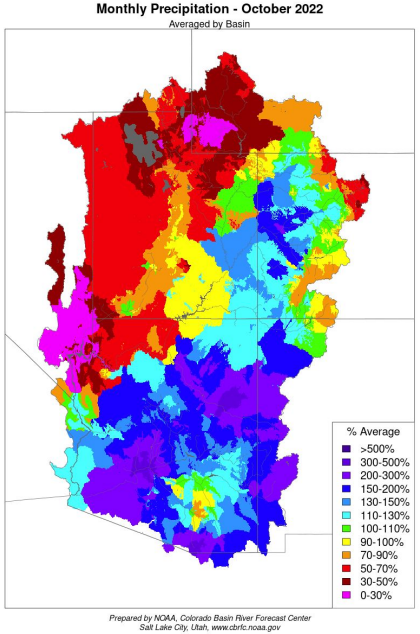
Southwest Monsoon Season Precipitation



Arizona State Climatologist: "9th wettest June-September on record."

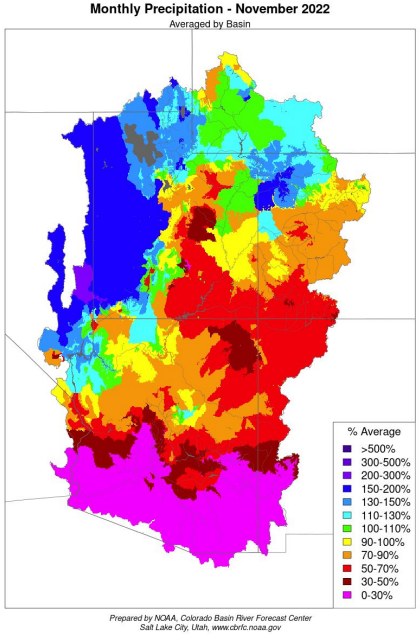


Water Year 2023 (October-December) Monthly Precipitation Summary



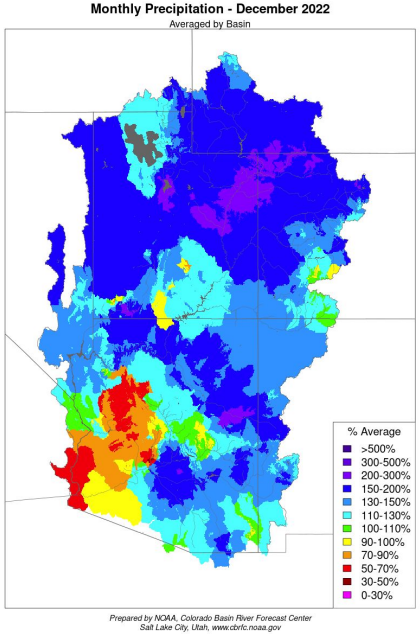
Moisture continued over southern/eastern basins during the first half of October.

An October 22-27 storm system delivered the first snow of water year 2023 across higher elevations of the UCRB and GB.



A few storm systems moved through the region during November, with precipitation primarily targeting western UT, southwest WY, and northwest CO.

Snowpack conditions as a percent of normal generally improved across northern basins and declined across southern basins, with brief periods of low and mid-elevation snowmelt occurring during the month.

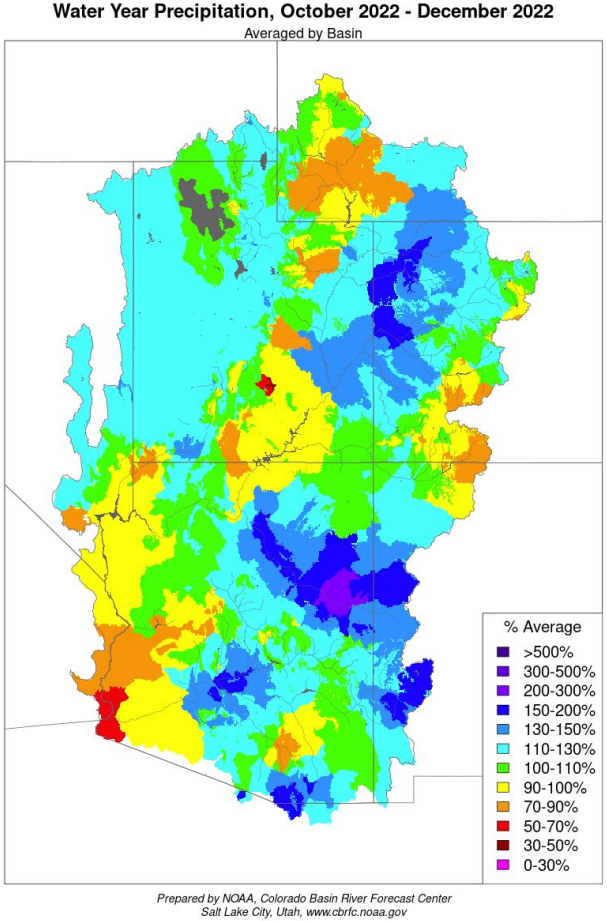


Active weather occurred during much of December across the CRB and GB, with only a handful of days during the month seeing no precipitation.

A number of SNOTEL stations across the Wasatch Range in UT and Sierra Madre/Park Ranges in northwest CO reported December precipitation values above the 90th percentile and ranking in the wettest five on record.

Water Year 2023 (October - December) Precipitation

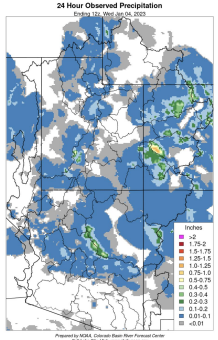
Water year precipitation can be used as a good indicator of early season water supply conditions, and is currently near to above average across most of the region.



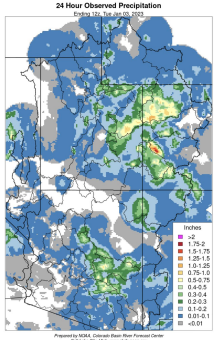
Water Year 2023 CBRFC Precipitation (Significant Runoff Areas) Percent of 1991-2020 Average				
UPPER COLORADO RIVER BASIN				
	Oct	Nov	Dec	Oct-Dec
Above Lake Powell	84	82	152	107
Green River Basin				
Above Fontenelle	48	92	140	98
Above Flaming Gorge	51	101	156	105
Yampa/White	82	102	179	124
Duchesne	49	86	178	103
Price/San Rafael/Dirty Devil	82	83	181	118
Colorado River Headwaters				
Above Kremmling	58	90	150	101
Eagle	101	86	146	111
Roaring Fork	103	81	142	108
Above Cameo	87	86	148	107
Southwest Colorado				
Gunnison	97	74	136	103
Dolores	113	64	152	109
San Juan	97	62	119	92
LOWER COLORADO RIVER BASIN				
Virgin	77	172	113	121
Little Colorado	166	81	121	123
Verde	158	79	114	115
Salt	143	50	126	109
Upper Gila	196	26	140	130
GREAT BASIN				
Bear	58	120	143	114
Weber	58	133	157	121
Six Creeks	77	130	157	125
Provo/Utah Lake	77	108	177	124
Sevier	85	109	149	116

~New Years Event (December 27 - January 3)

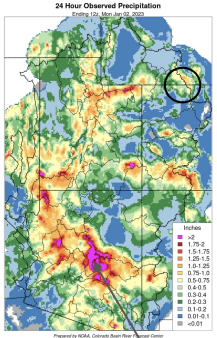
04 January



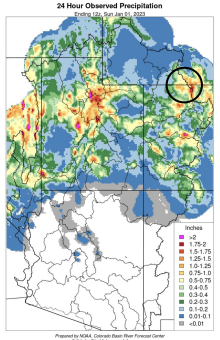
03



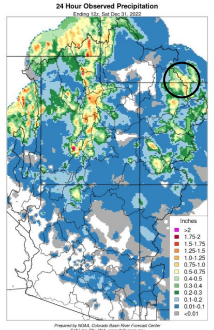
02



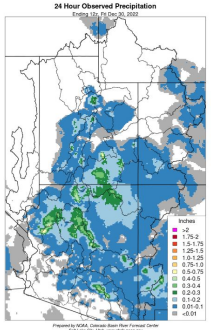
01



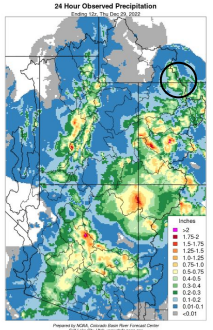
31



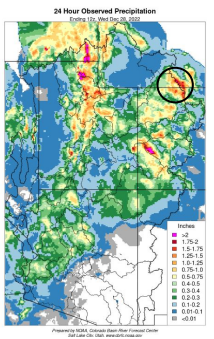
30

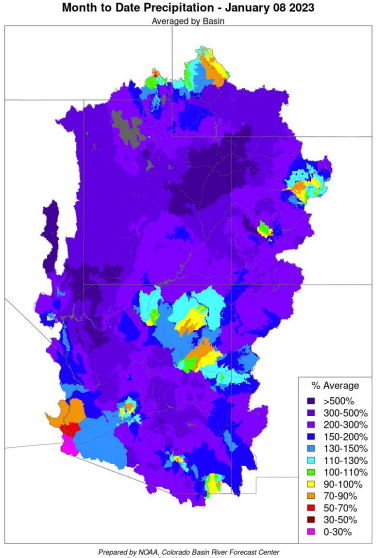


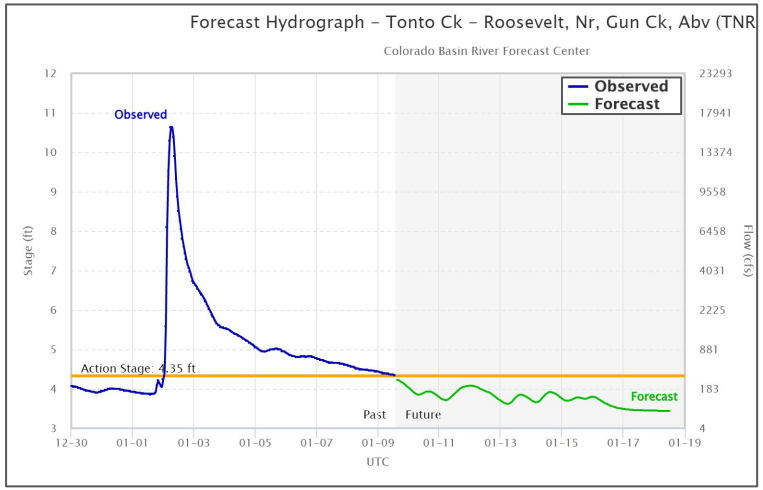
29



28 December



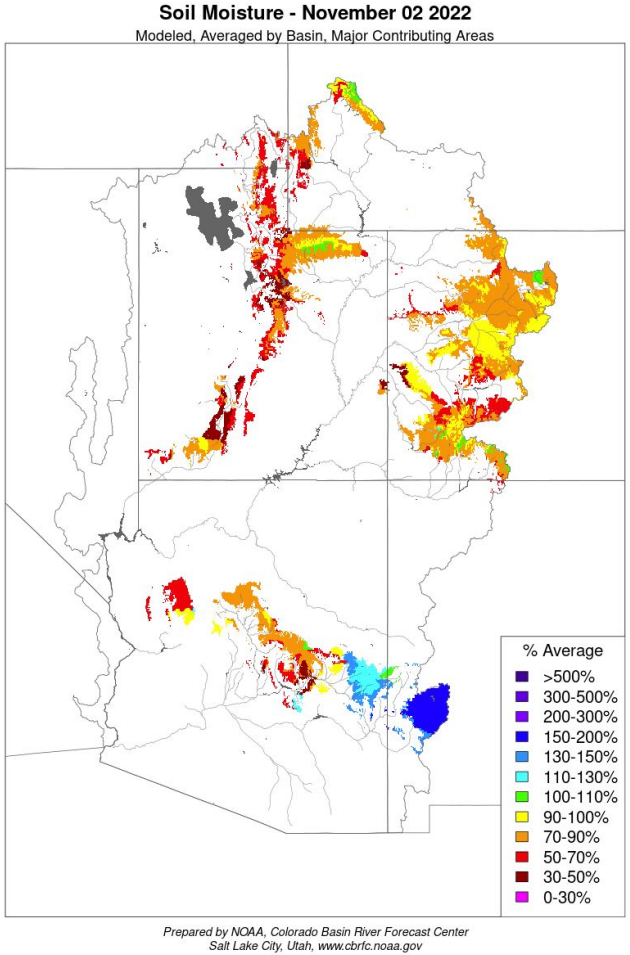




- More beneficial to UT and central AZ vs. CO
  - Exception: Yampa/White basins in NW CO
- Snow across higher elevations
- Rain/snow mix across lower elevations

Link to CBRFC Observed Daily Precip Graphics

Fall 2022 Model Soil Moisture Conditions



The map shows the model soil moisture conditions from the lower soil zone in CBRFC's hydrologic model. Modeled lower zone soil water content is a result of past hydrologic conditions including but not limited to:

- -previous year(s) runoff
- -summer/fall precipitation

Soil moisture content is adjusted every fall during a dry period after irrigation season has ended and before winter. Forecasters use the following data to make adjustments:

- -Early November streamflow observations (baseflow)
- -Reservoir inflows
- -July-October precipitation
- -Past season(s) runoff conditions

CBRFC model soil moisture conditions are near to below normal across many of the major runoff producing areas.

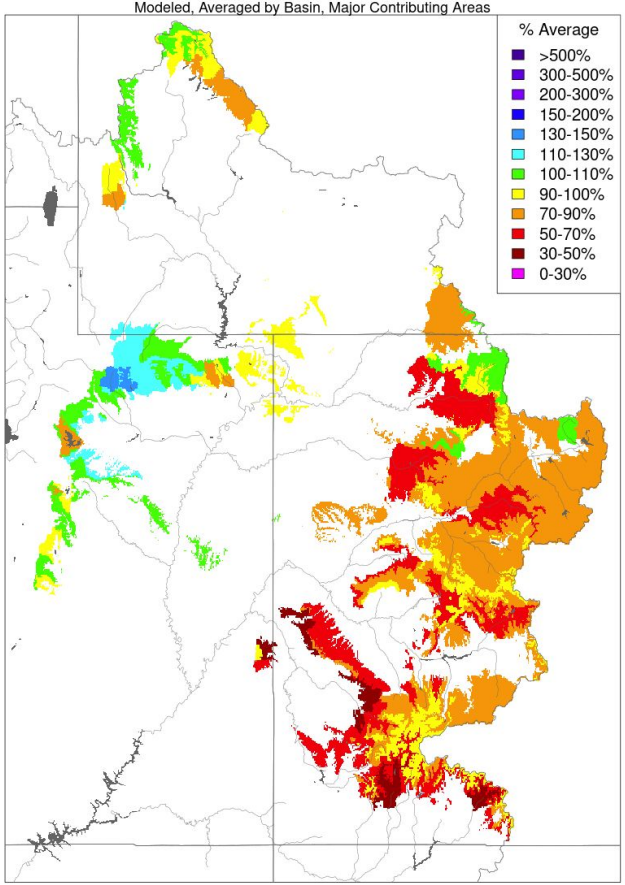
Generally better conditions in the Colorado River Basin compared to the Great Basin.

The timing and magnitude of spring runoff is ultimately a result of SWE conditions, spring weather, and antecedent soil moisture conditions.

UCRB Fall Model Soil Moisture Conditions: 2021 vs. 2022

Soil Moisture - Fall - 2021 (November 15)

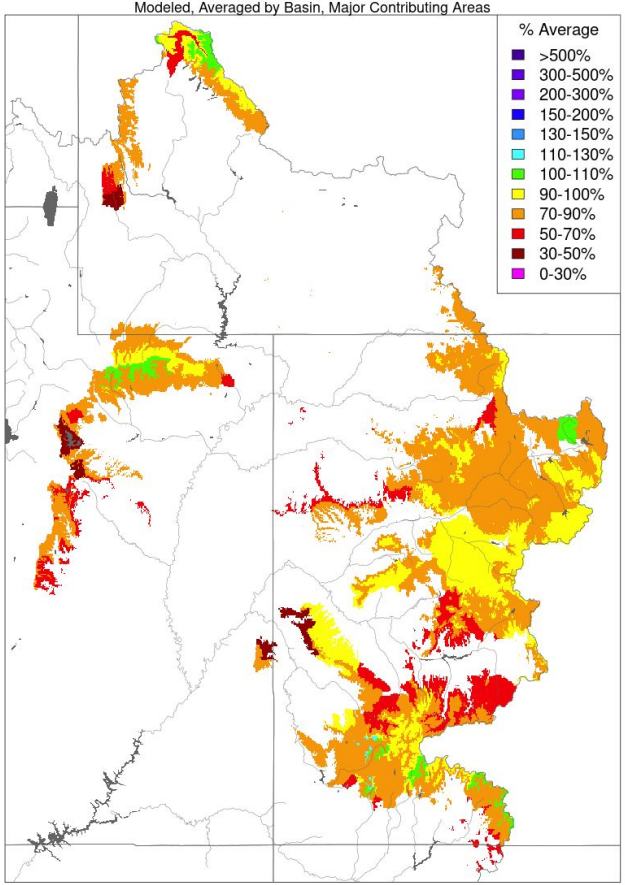
Modeled, Averaged by Basin, Major Contributing Areas



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

Soil Moisture - Fall - 2022 (November 02)

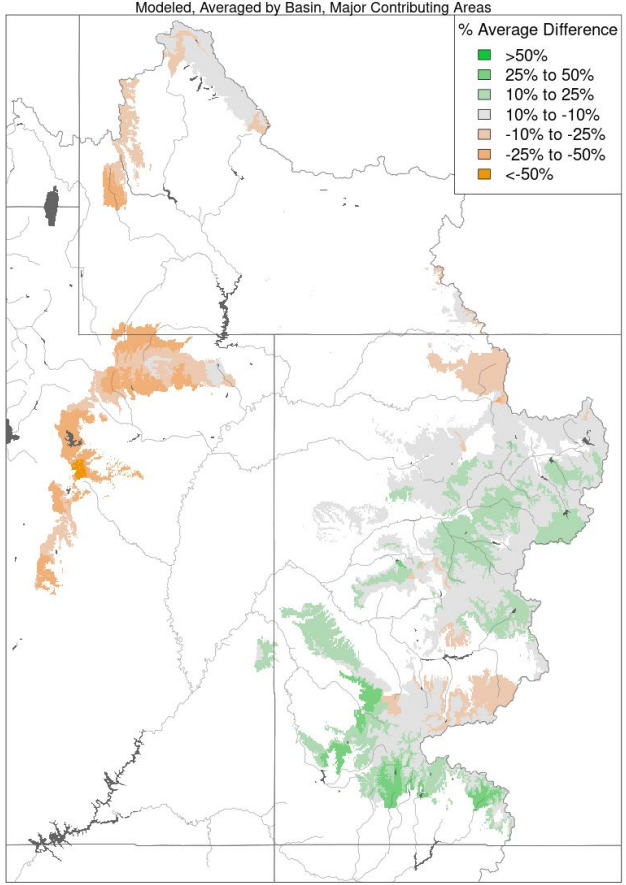
Modeled, Averaged by Basin, Major Contributing Areas



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

Soil Moisture - Fall - 2022 vs 2021

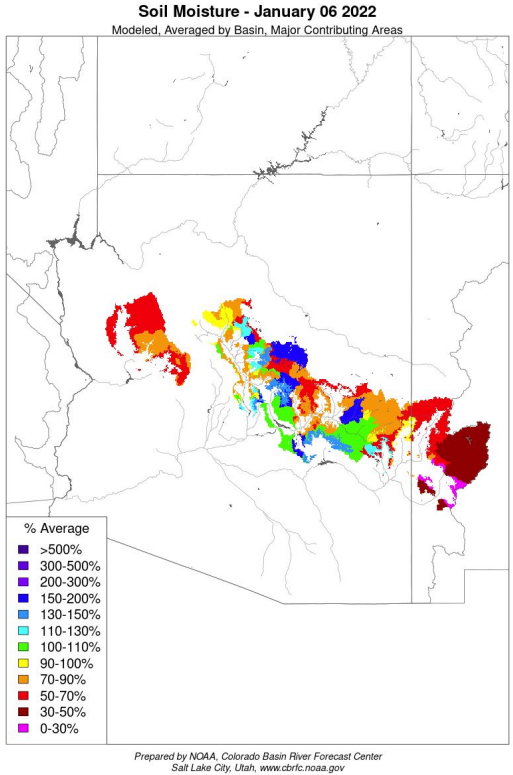
Modeled, Averaged by Basin, Major Contributing Areas

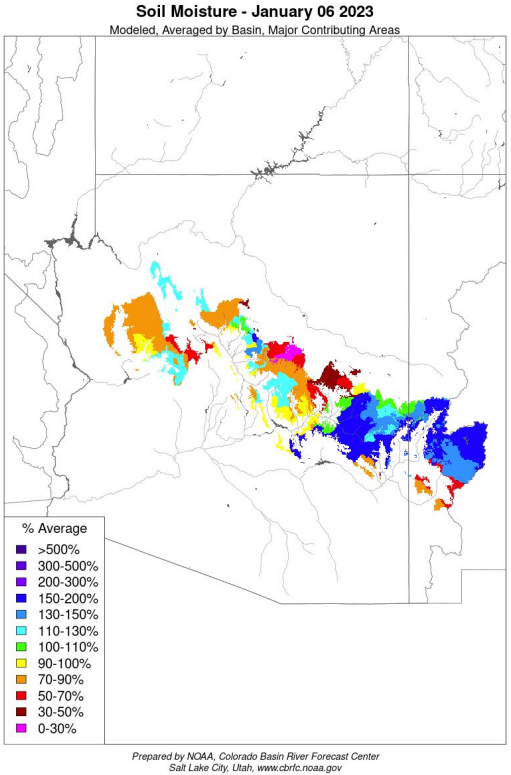


Prepared by NOAA, Colorado Basin River Forecast Center
Salt Lake City, Utah, www.cbrfc.noaa.gov

LCRB Soil Moisture Conditions

Model soil moisture conditions across the Lower Colorado River Basin are variable, with conditions generally improving from west to east across AZ.

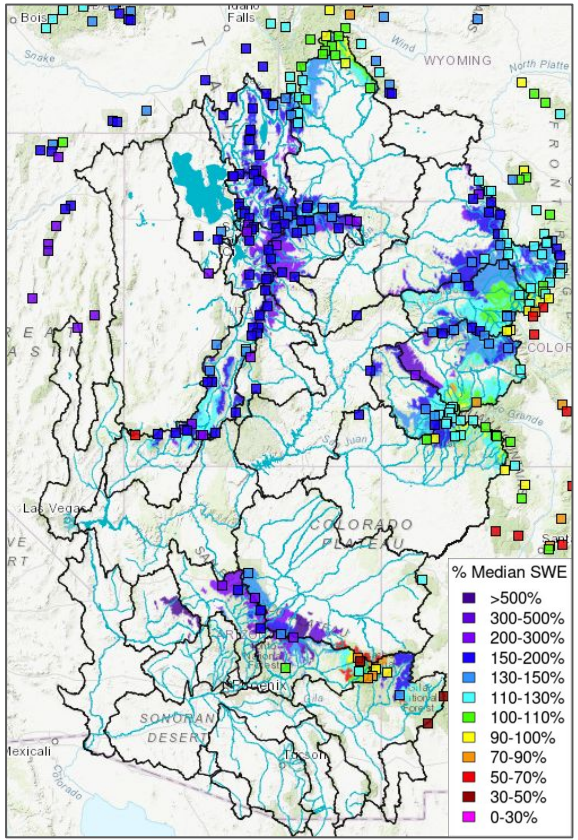




Water Year 2023 Snowpack Conditions

January 8 SWE Conditions

NRCS SNOTEL Observed (Squares)
CBRFC Model (Significant Areas)

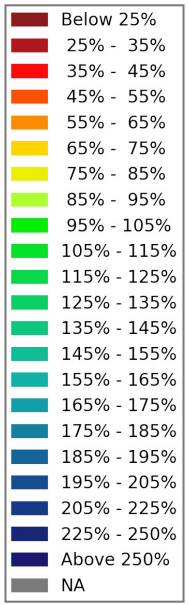


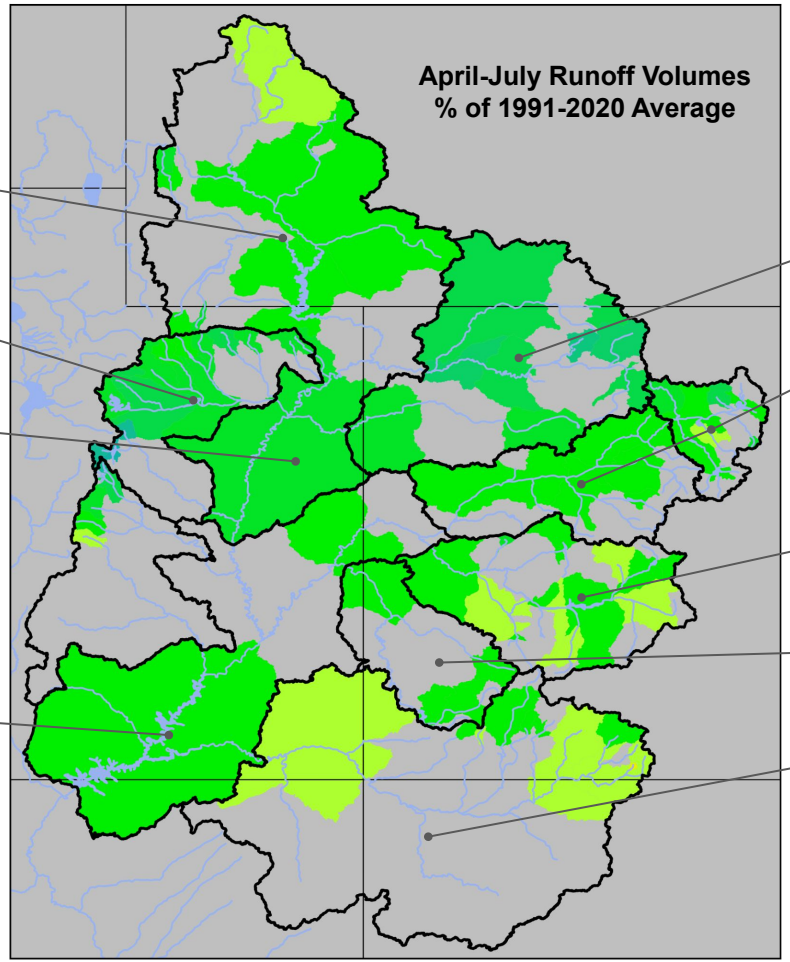
Water Year 2023 CBRFC Model SWE (Significant Runoff Areas) Percent of 1991-2020 Median			
UPPER COLORADO RIVER BASIN			
	Dec1	Jan1	Jan8
Above Lake Powell	91	126	134
Green River Basin			
Above Fontenelle	97	112	113
Above Flaming Gorge	104	127	129
Yampa/White	115	160	160
Duchesne	91	146	165
Price/San Rafael/Dirty Devil	123	164	188
Colorado River Headwaters			
Above Kremmling	84	122	117
Eagle	95	118	110
Roaring Fork	91	114	115
Above Cameo	89	122	119
Southwest Colorado			
Gunnison	85	117	128
Dolores	67	122	141
San Juan	64	87	107
LOWER COLORADO RIVER BASIN			
Virgin	141	121	156
Little Colorado	2	49	140
Verde	0	108	228
Salt	38	52	112
Upper Gila	0	28	92
GREAT BASIN			
Bear	160	165	164
Weber	197	180	181
Six Creeks	210	188	195
Provo/Utah Lake	177	187	209
Sevier	148	159	167

Early January SWE conditions are near to above normal across the Colorado River Basin.

Improvements since Jan 1 in many basins.

Jan 1st Water Supply Forecasts: Upper Colorado





Upper Green: 90-105%

Duchesne: 95-125%

Lower Green: 95-160%

Lake Powell: 105%

Lake Powell summarizes the hydrologic conditions throughout the Upper Colorado River Basin.

White/Yampa: 110-140%

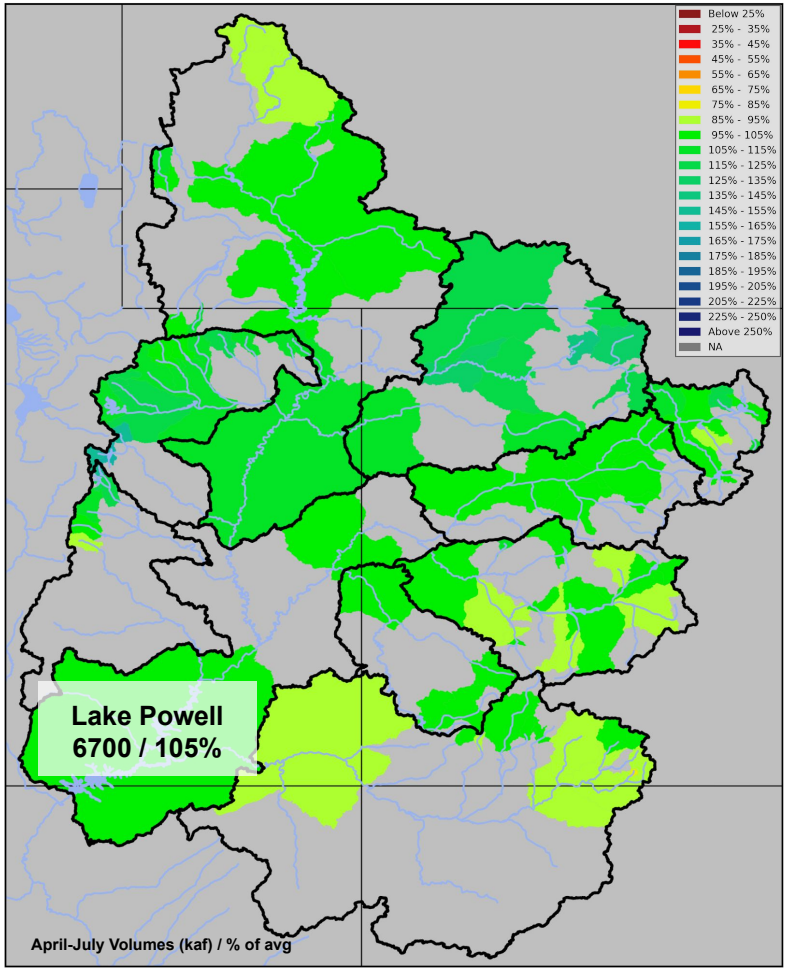
Upper CO: 90-120%

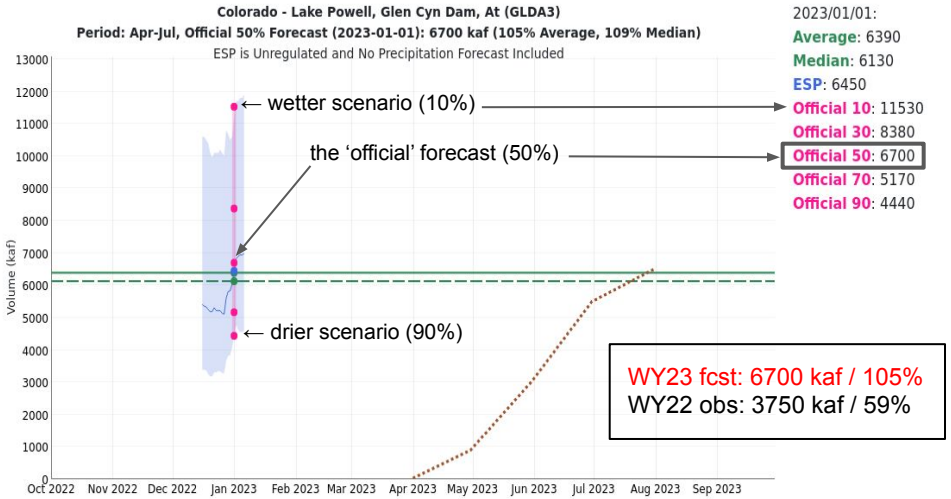
Gunnison: 90-110%

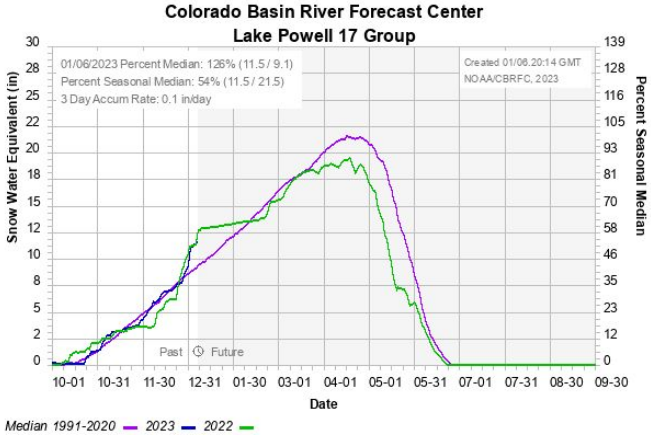
Dolores: 100-105%

San Juan: 85-100%

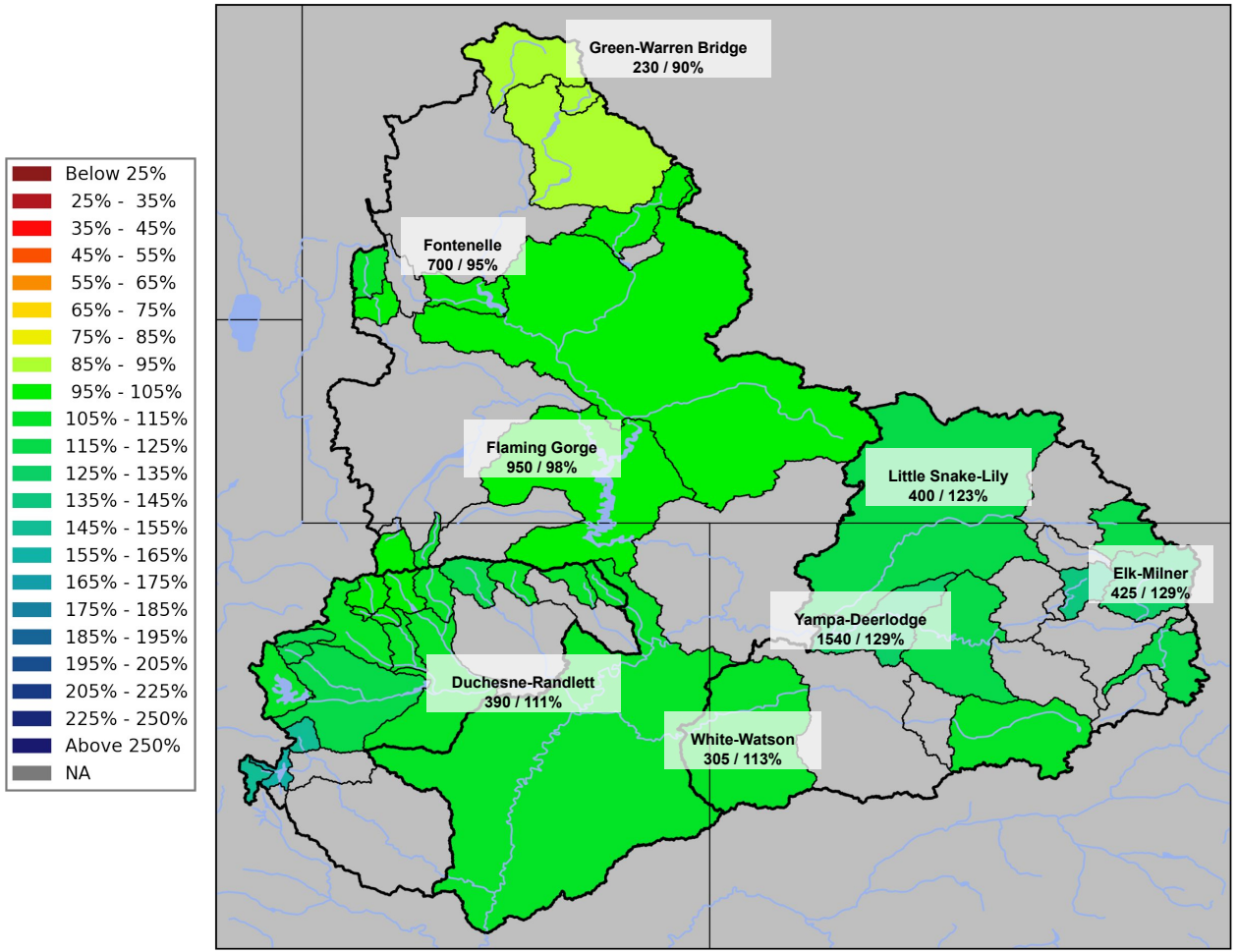
Jan 1st Water Supply Forecasts: Upper Colorado (Lake Powell)







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



January 1st 2023 Forecasts

Volume (kaf) / % of 1991-2020 avg

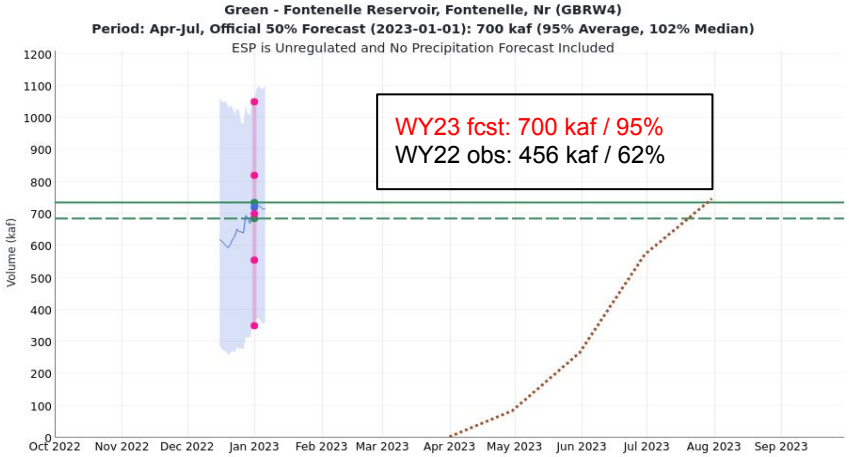
Forecast Ranges

Upper Green: 90 - 105%

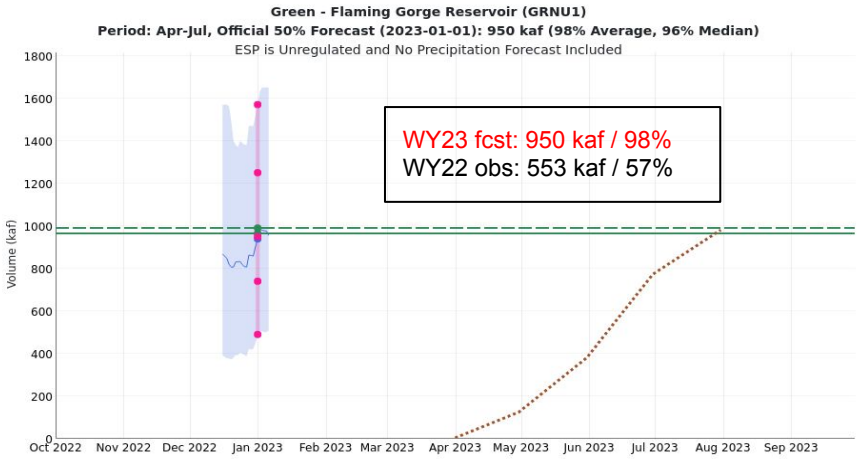
Yampa/White: 110 - 140%

Duchesne: 95 - 125%

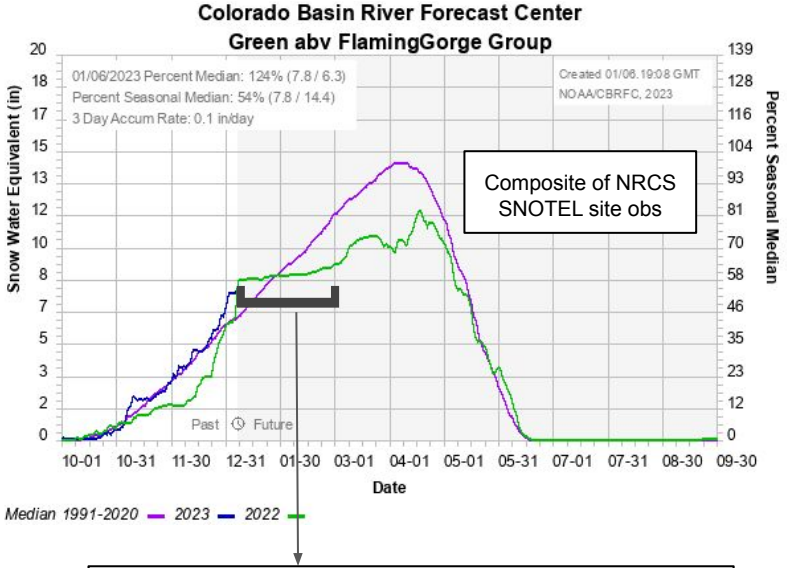
Upper Green Water Supply Forecasts & Snow Conditions



2023/01/01:
Average: 735
Median: 685
ESP: 720
Official 10: 1050
Official 30: 820
Official 50: 700
Official 70: 555
Official 90: 350



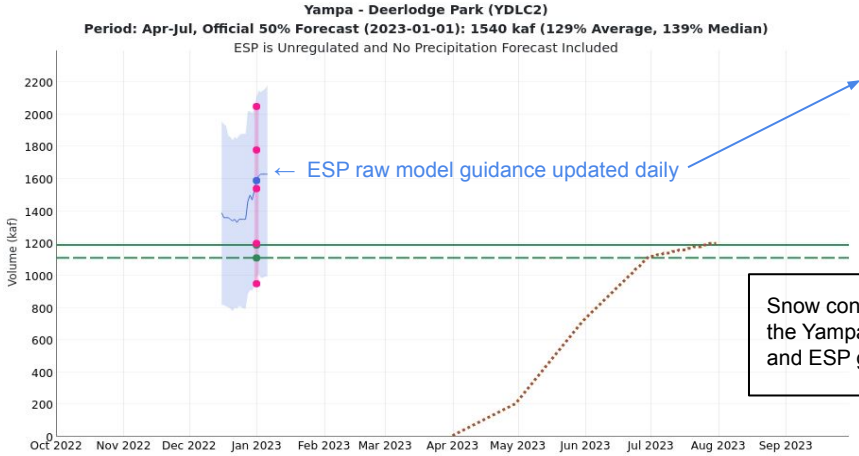
2023/01/01:
Average: 965
Median: 990
ESP: 939
Official 10: 1570
Official 30: 1250
Official 50: 950
Official 70: 740
Official 90: 490



Very dry Jan/Feb 2022 across the region.

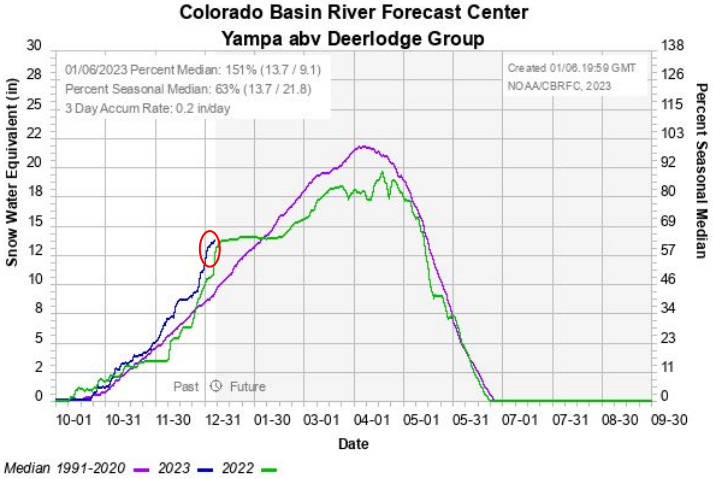
Precipitation ranked in the bottom five at most SNOTEL sites across Utah, southwest Wyoming, and western Colorado during Jan/Feb/Mar.

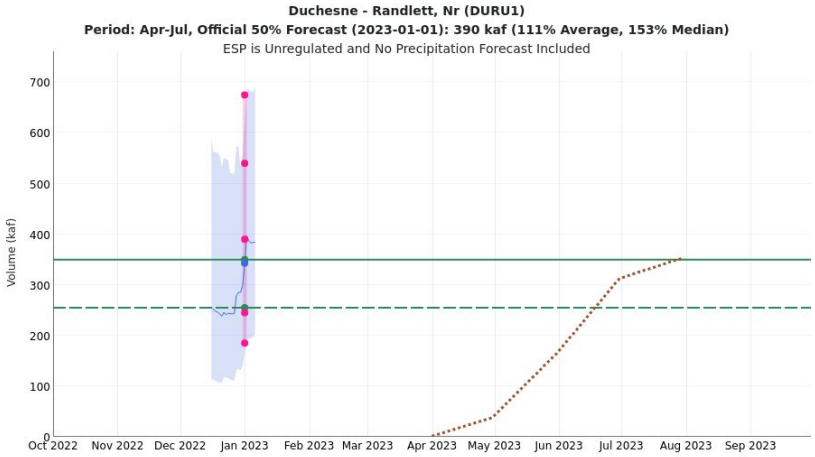
Yampa & Duchesne Water Supply Forecasts & Snow Conditions



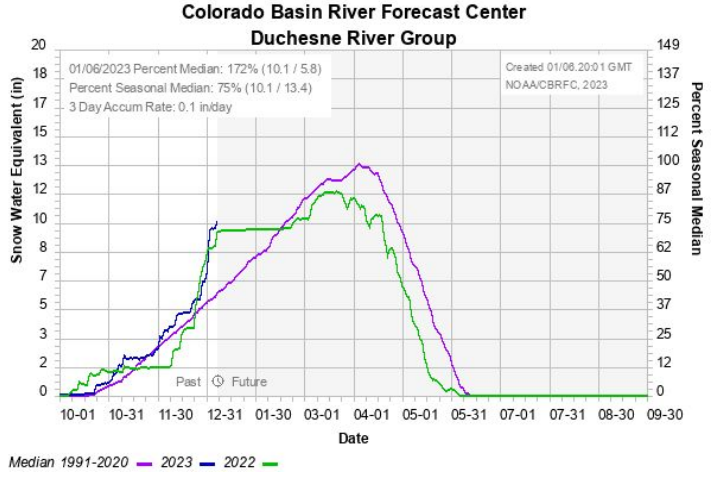
2023/01/01:
Average: 1190
Median: 1110
ESP: 1590
Official 10: 2050
Official 30: 1780
Official 50: 1540
Official 70: 1200
Official 90: 950

Snow conditions have improved in the Yampa River Basin since Jan 1 and ESP guidance has responded.





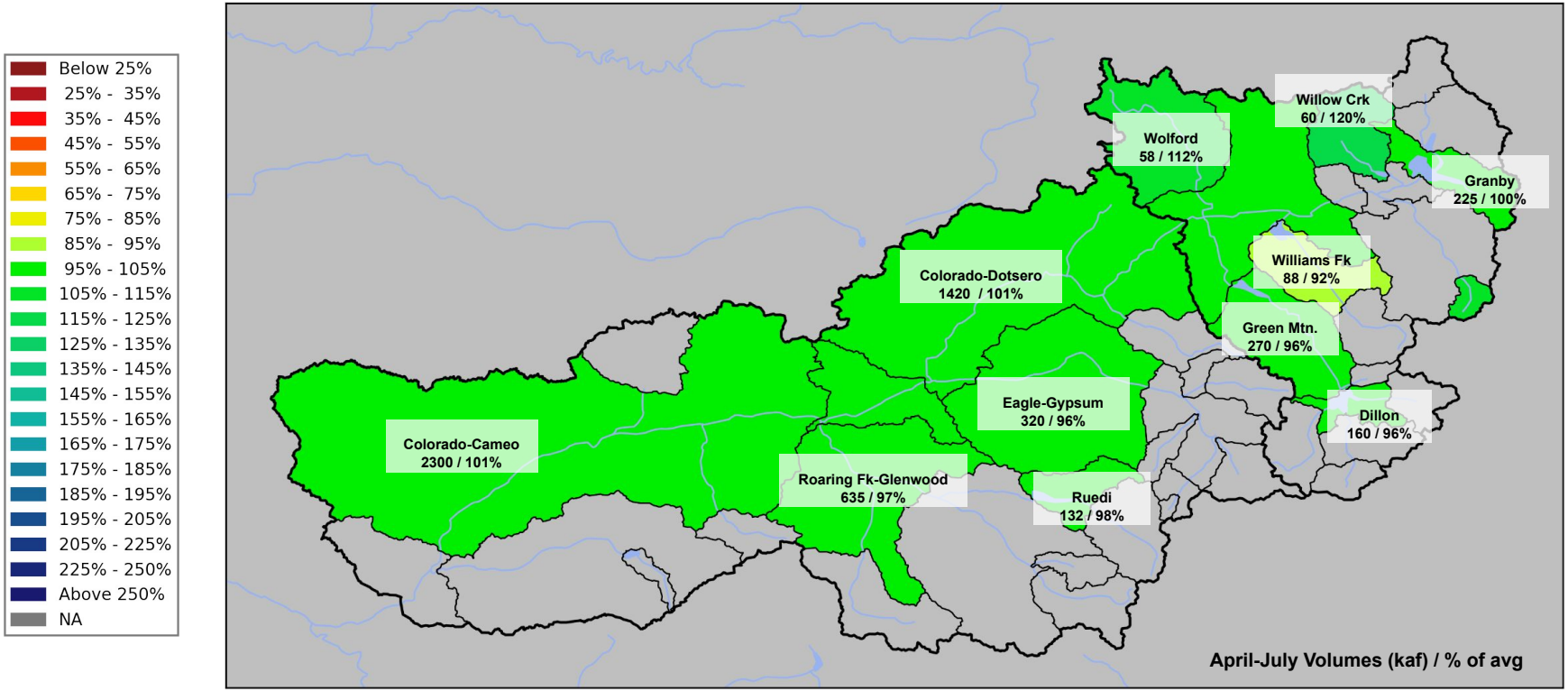
2023/01/01:
Average: 350
Median: 255
ESP: 343
Official 10: 675
Official 30: 540
Official 50: 390
Official 70: 245
Official 90: 185



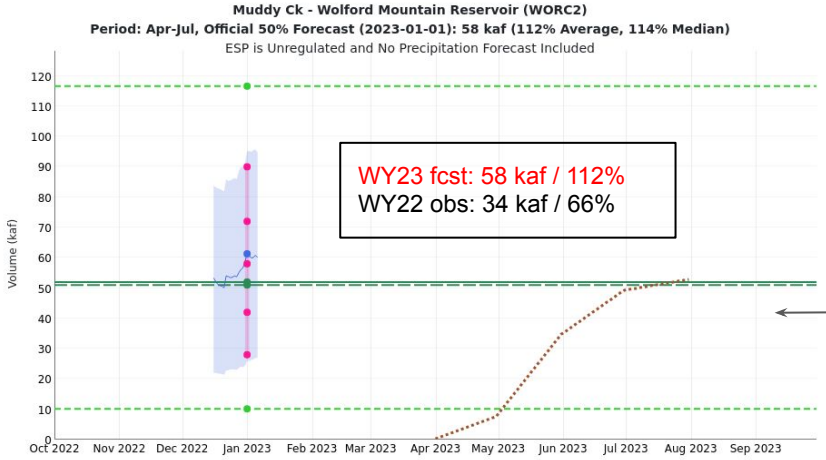
Jan 1st Water Supply Forecasts: Upper Colorado River Mainstem

Forecast Ranges:

Granby to Kremmling: 90 - 120% of average
Kremmling to Cameo: 95 - 100% of average

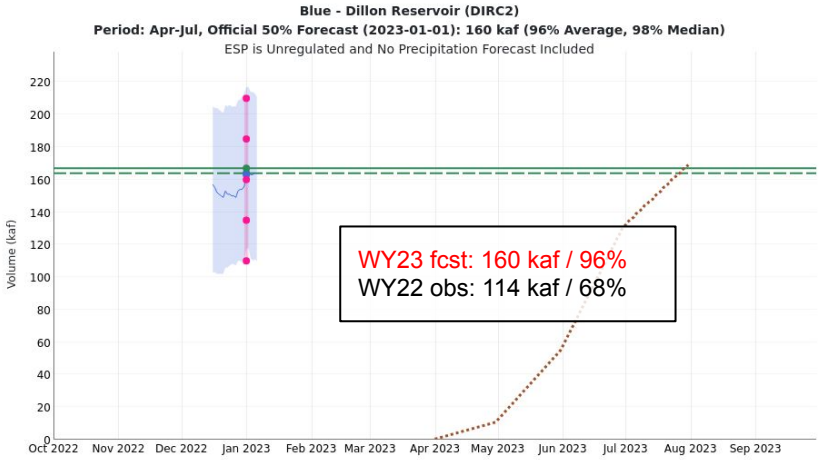


Upper Colorado Mainstem Water Supply Forecasts & Snow Conditions



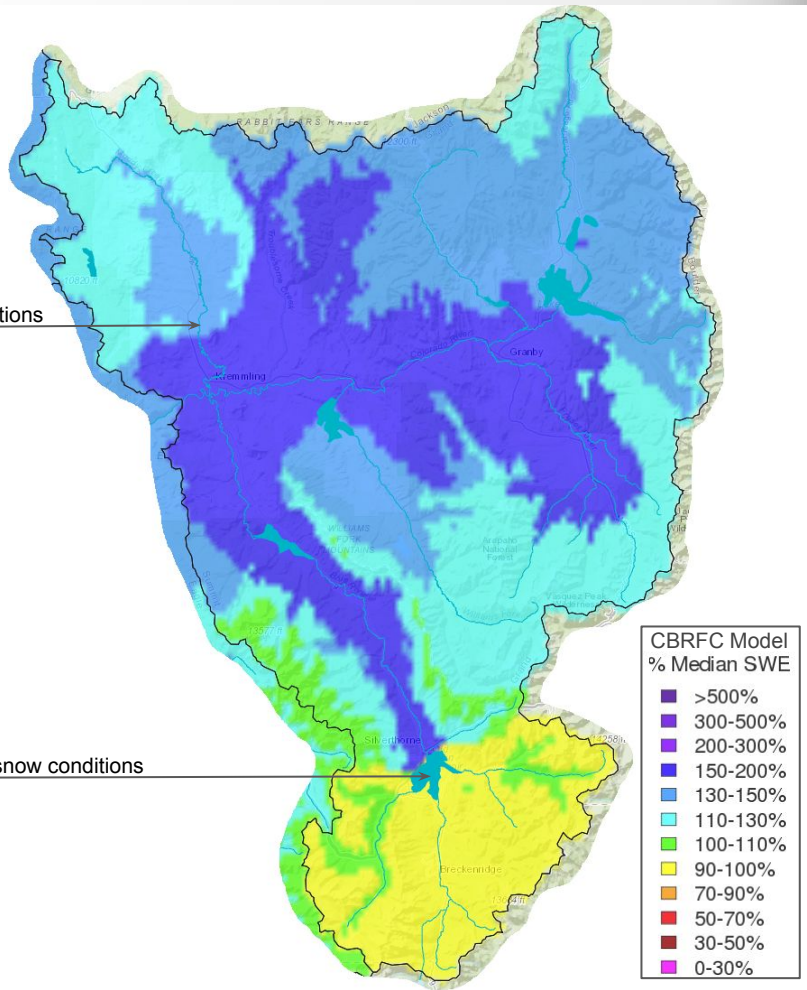
2023/01/01:
Max 2011: 116.6
Min 2002: 10.14
Average: 52
Median: 51
ESP: 61.3
Official 10: 90
Official 30: 72
Official 50: 58
Official 70: 42
Official 90: 28

Above normal snow conditions



2023/01/01:
Average: 167
Median: 164
ESP: 163
Official 10: 210
Official 30: 185
Official 50: 160
Official 70: 135
Official 90: 110

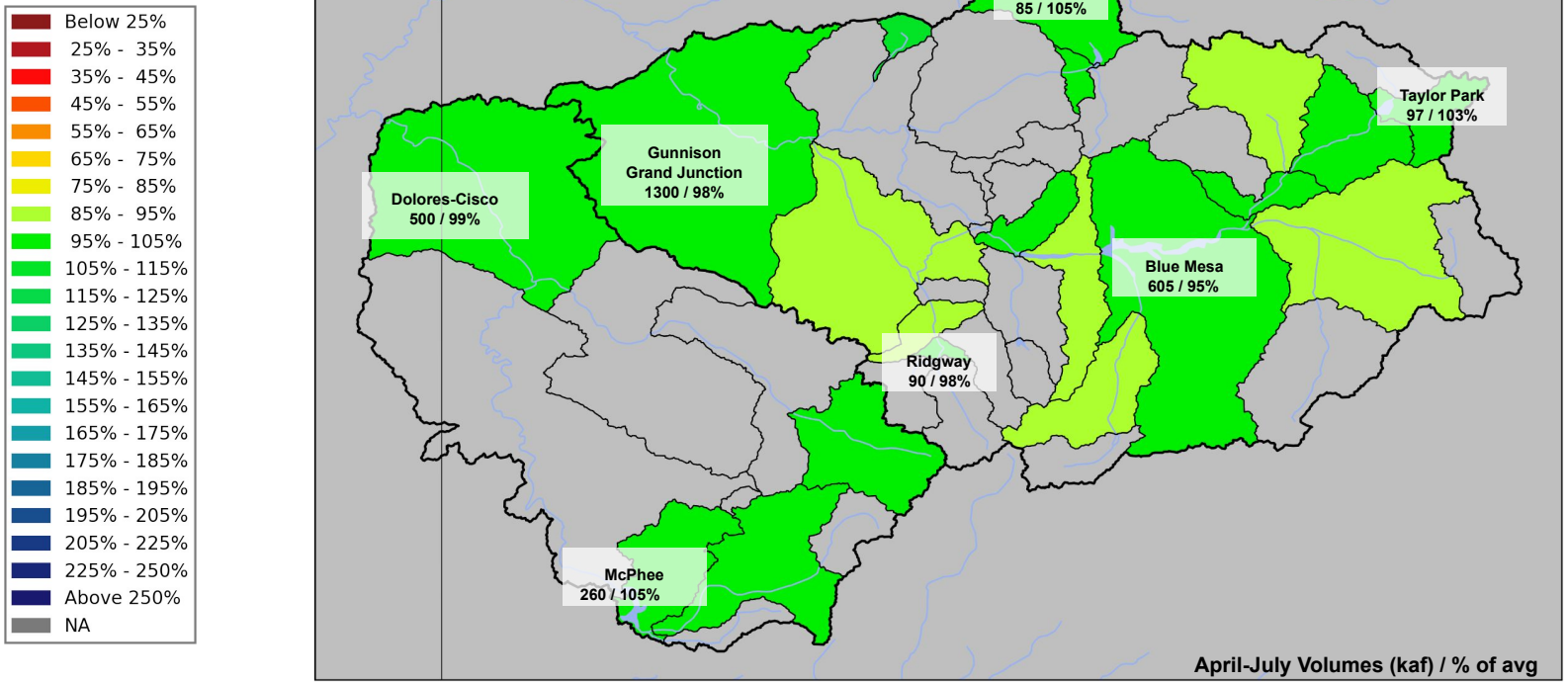
Near normal snow conditions



Jan 1st Water Supply Forecasts: Gunnison, Dolores

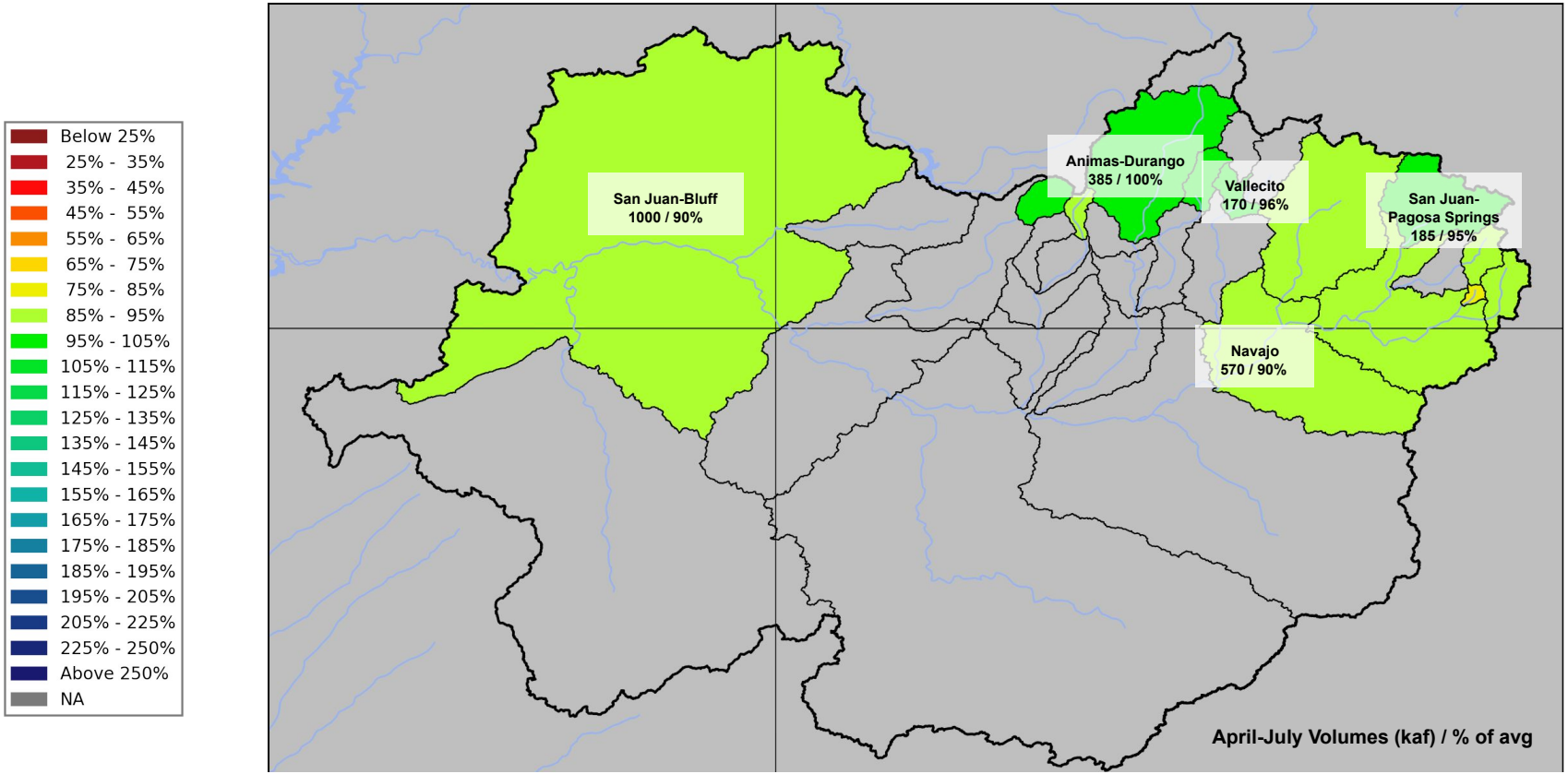
Forecast Ranges:

Gunnison: 90 - 110% of average
Dolores: 100 -105% of average

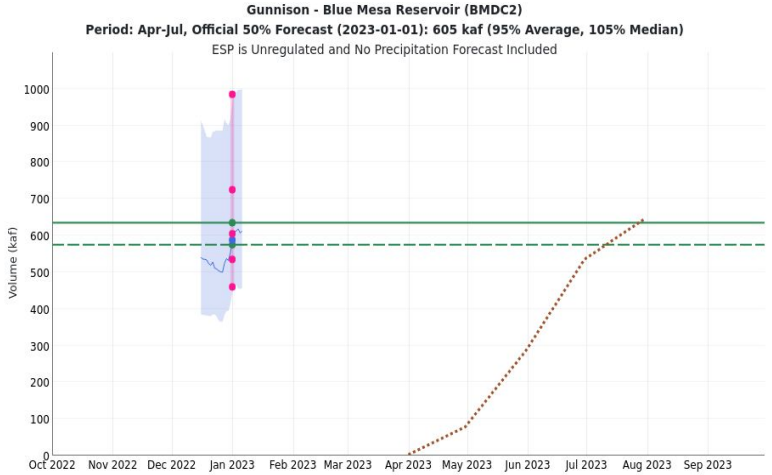


Jan 1st Water Supply Forecasts: San Juan

Forecast Range: 85 - 100% of average

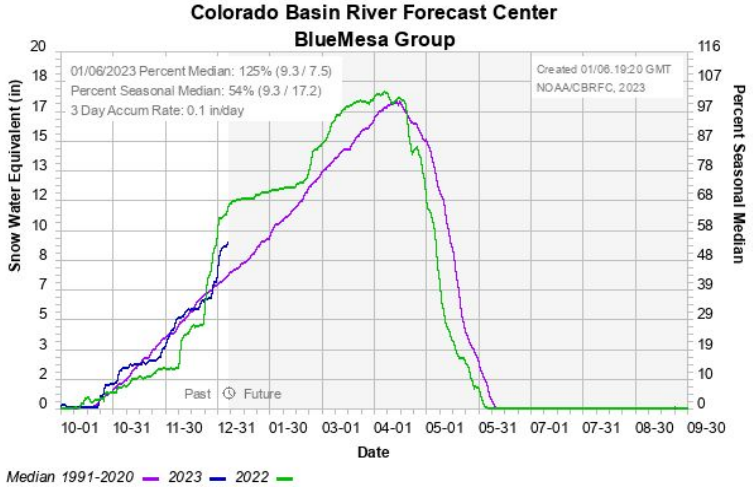


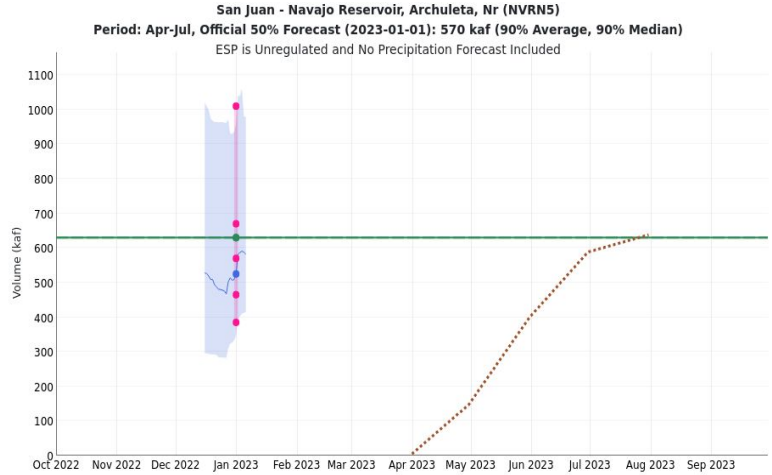
Southwest Colorado Water Supply Forecasts & Snow Conditions



2023/01/01:
Average: 635
Median: 575
ESP: 588
Official 10: 985
Official 30: 725
Official 50: 605
Official 70: 535
Official 90: 460

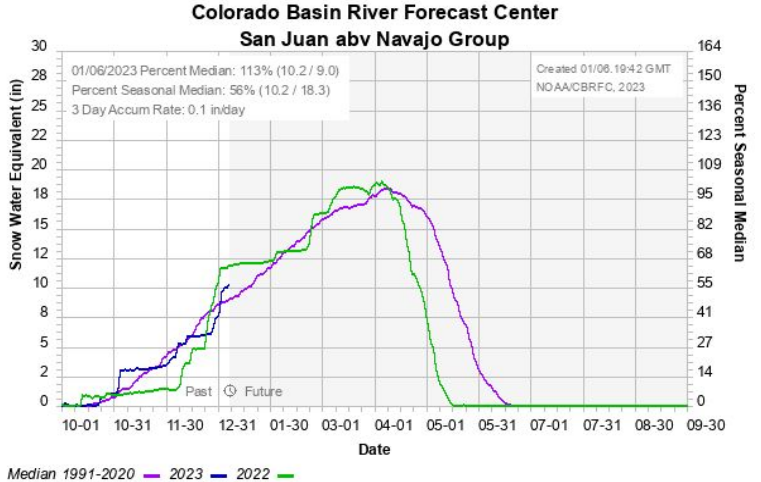
Blue Mesa Res Inflow
WY23 fcst: 605 kaf / 95%
WY22 obs: 431 kaf / 68%
WY21 obs: 316 kaf / 55%
WY20 obs: 387 kaf / 67%





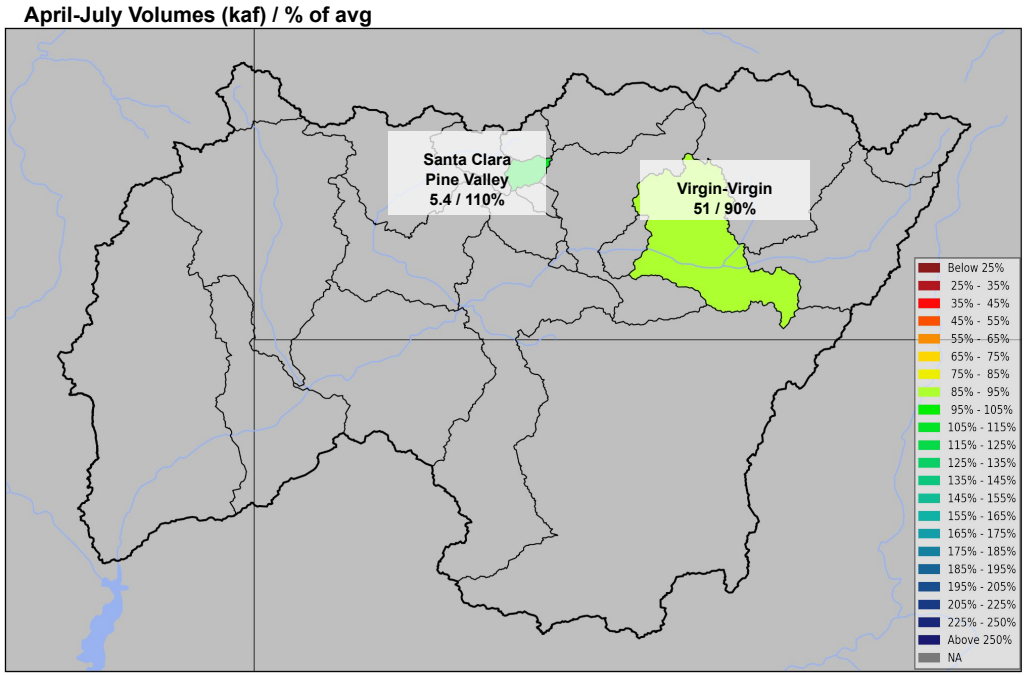
2023/01/01:
Average: 630
Median: 630
ESP: 525
Official 10: 1010
Official 30: 670
Official 50: 570
Official 70: 465
Official 90: 385

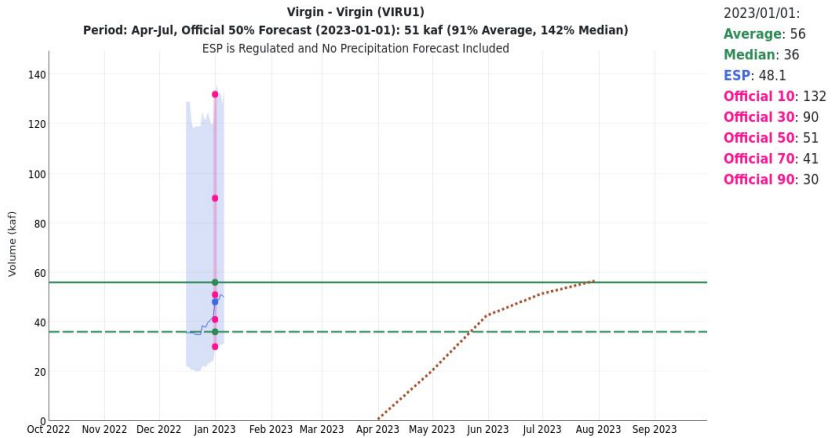
Navajo Res Inflow
WY23 fcst: 570 kaf / 90%
WY22 obs: 382 kaf / 61%
WY21 obs: 378 kaf / 60%
WY20 obs: 348 kaf / 55%

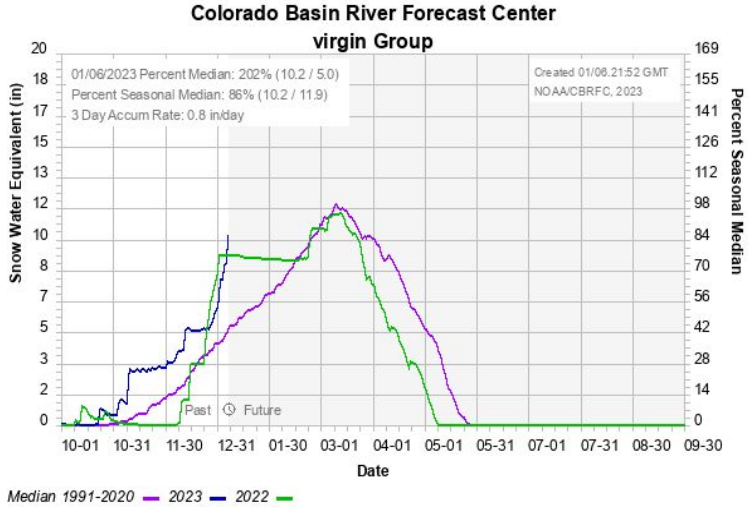


Jan 1st Water Supply Forecasts: Virgin River Basin

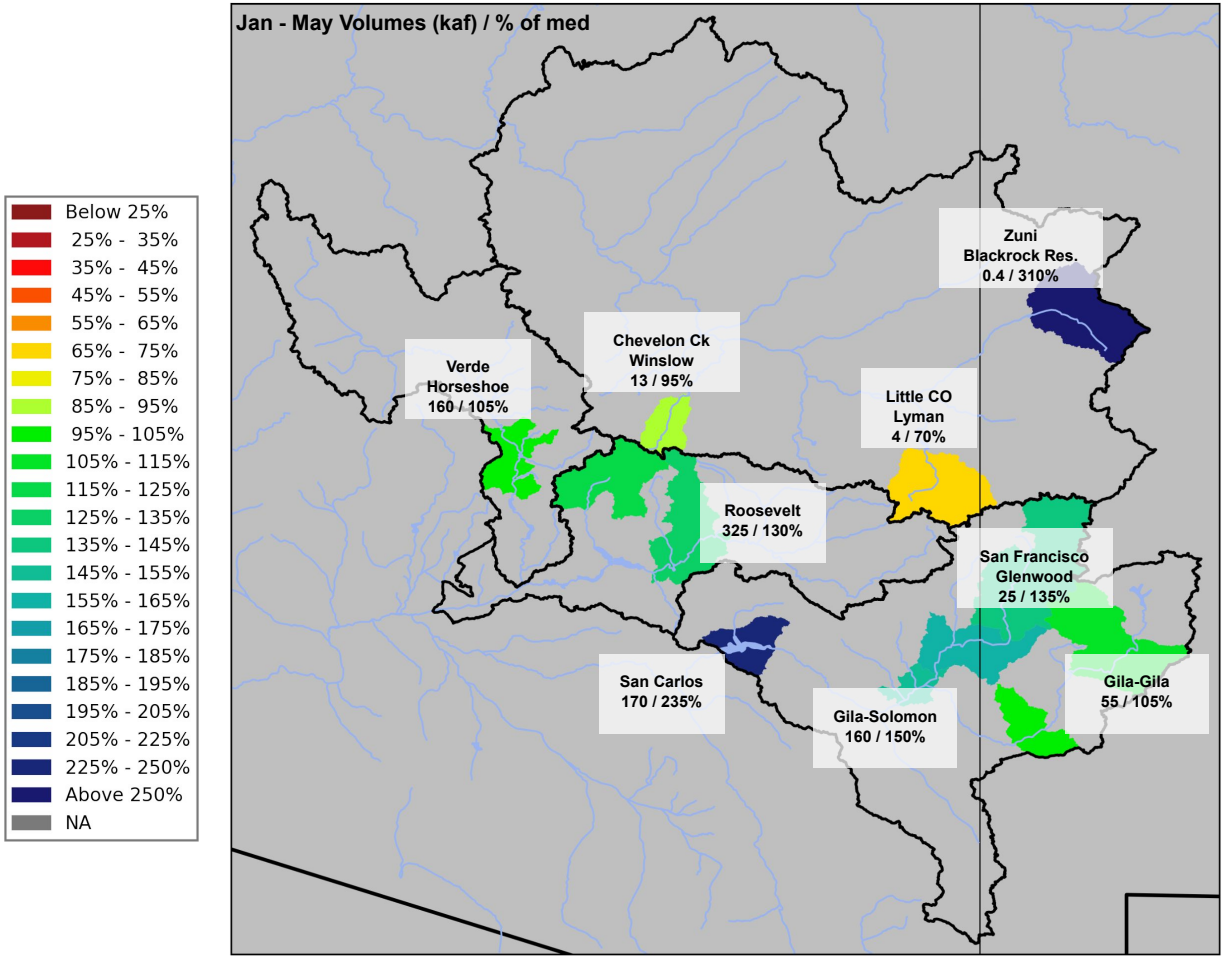
Forecast Range: 90 - 110% of average







Jan 1st Water Supply Forecasts: Lower Colorado River Basin



January - May Forecast Period
% of 1991-2020 Median

Forecast Ranges

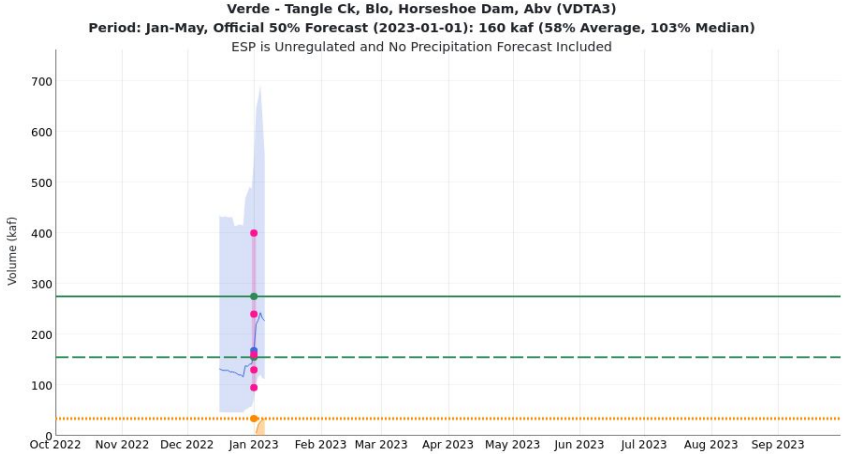
Little Colorado: 70% - 310%

Upper Gila: 100% - 235%

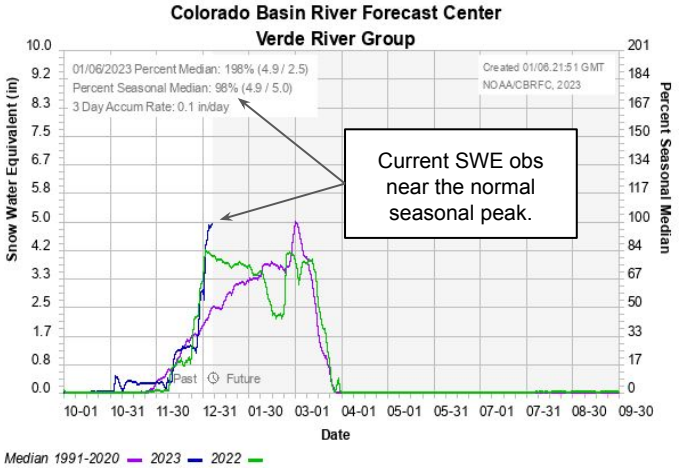
Salt: 120% - 130%

Verde: 105%

Lower Colorado Water Supply Forecasts & Snow Conditions

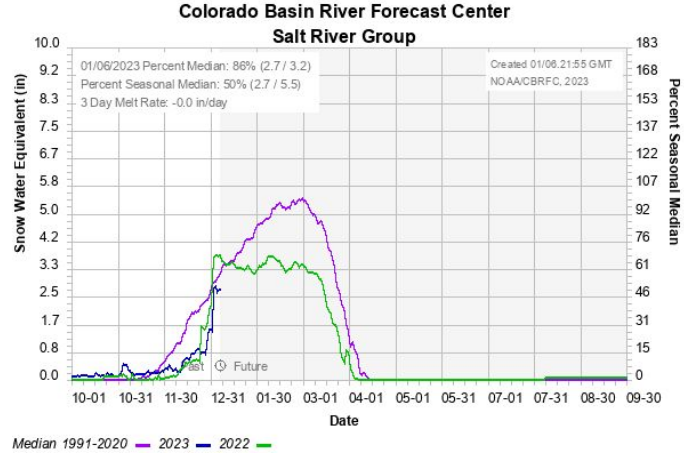


2023/01/01:
Average: 275
Median: 155
Observed Total: 33.9
ESP: 168
Official 10: 400
Official 30: 240
Official 50: 160
Official 70: 130
Official 90: 95



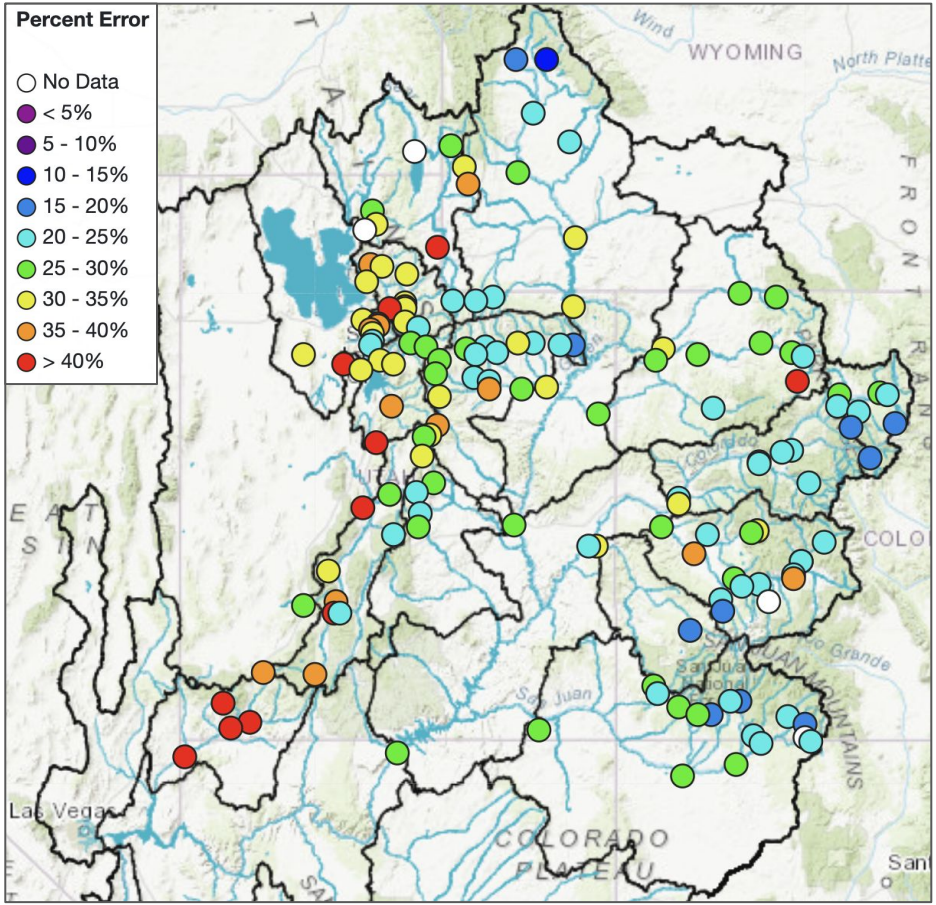
2023/01/01:
Average: 385
Median: 250
Observed Total: 52.7
ESP: 320
Official 10: 650
Official 30: 415
Official 50: 325
Official 70: 250
Official 90: 182

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



Historical Forecast Verification

January Forecast Error: April-July Volume



Location	Avg January Forecast Error
Green River - Warren Bridge	19%
Fontenelle Reservoir	28%
Yampa River - Deerlodge	28%
Blue River - Dillon Reservoir	19%
Colorado River - Cameo	21%
Blue Mesa Reservoir (Gunnison)	23%
McPhee Reservoir (Dolores)	25%
Navajo Reservoir (San Juan)	25%
Lake Powell	27%
Virgin River at Virgin	44%

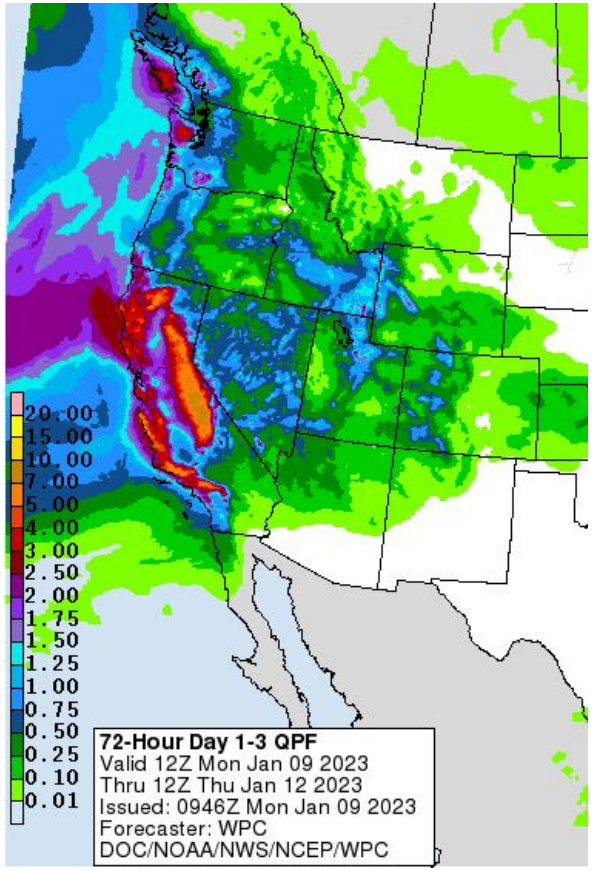
Error tends to decrease each month into the spring

Where Forecasts are Better:
- -Headwaters
- -Primarily snow melt basins
- -Known diversions / demands

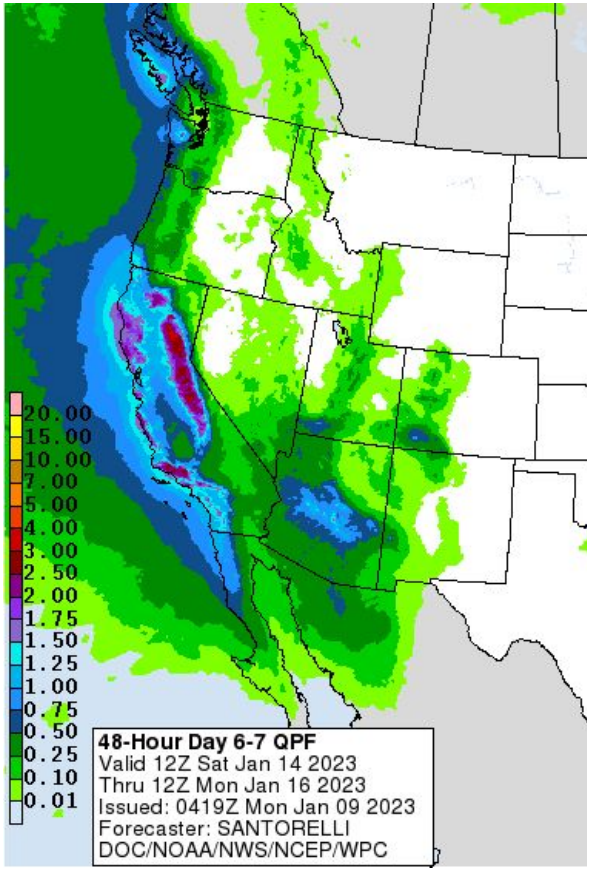
Where Forecasts are Worse:
- -Lower elevations (rain or early melt)
- -Downstream of diversions / irrigation
- -Little is known about diversions / demands

Future weather is the primary source of early season water supply forecast error/uncertainty.

Upcoming Weather: WPC January 9-16 Precipitation Outlook



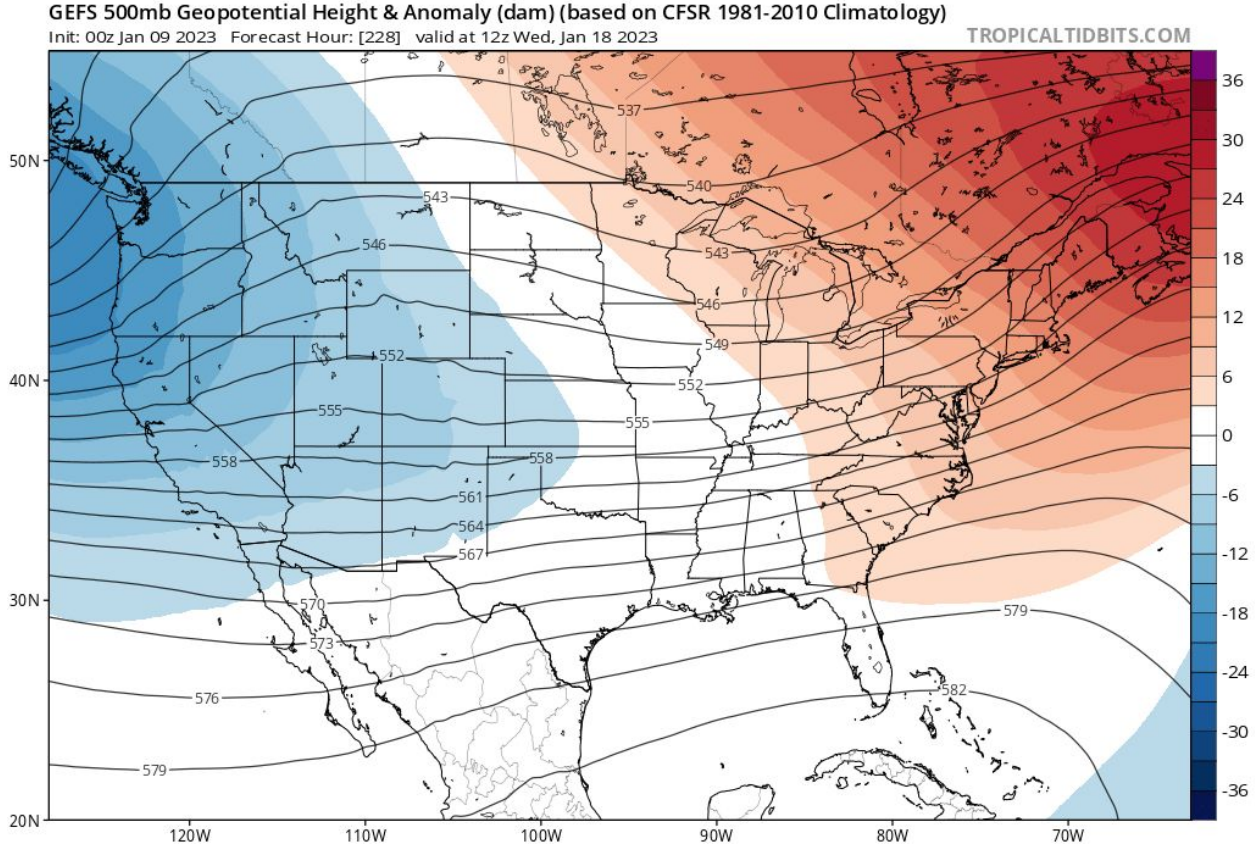
WPC QPF for days 1-3



WPC QPF for days 6-7

- A trough and associated atmospheric river will bring widespread precip to UT, CO, and northern AZ through Wednesday
    - Up to 0.50” for lower elevations, up to 1” or more for higher terrain
- Another system to bring precip to the region towards the end of the weekend
    - Weather model ensembles are split on a track that would favor the heaviest QPF in AZ vs UT/CO

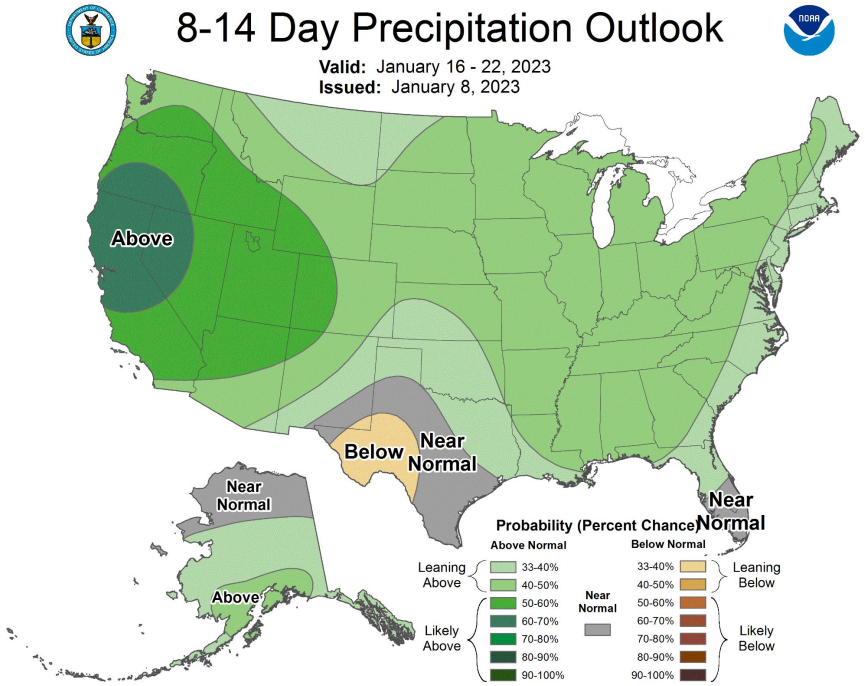
Upcoming Weather: January 16-20: Western Ridge and a Closed Low

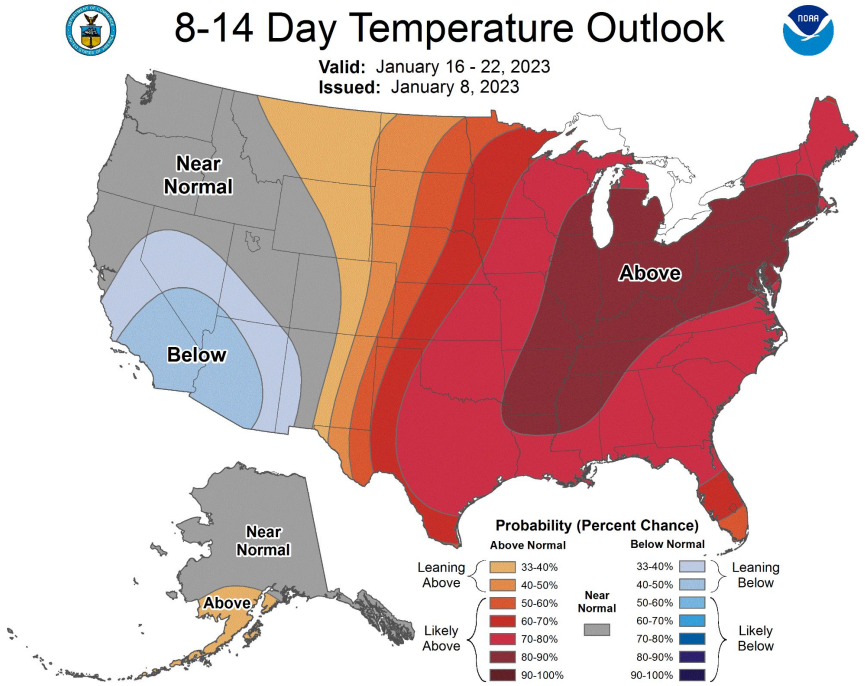


- The combination of eastern Pacific troughing and westerly flow over the US will keep the overall weather pattern active for the Colorado River Basin.
- Can expect wetter than average precipitation, and near average temperatures to continue.

Upcoming Weather: 8-14 Day Outlook (January 16-22)

Elevated odds of above average precipitation & near to below average temperatures.

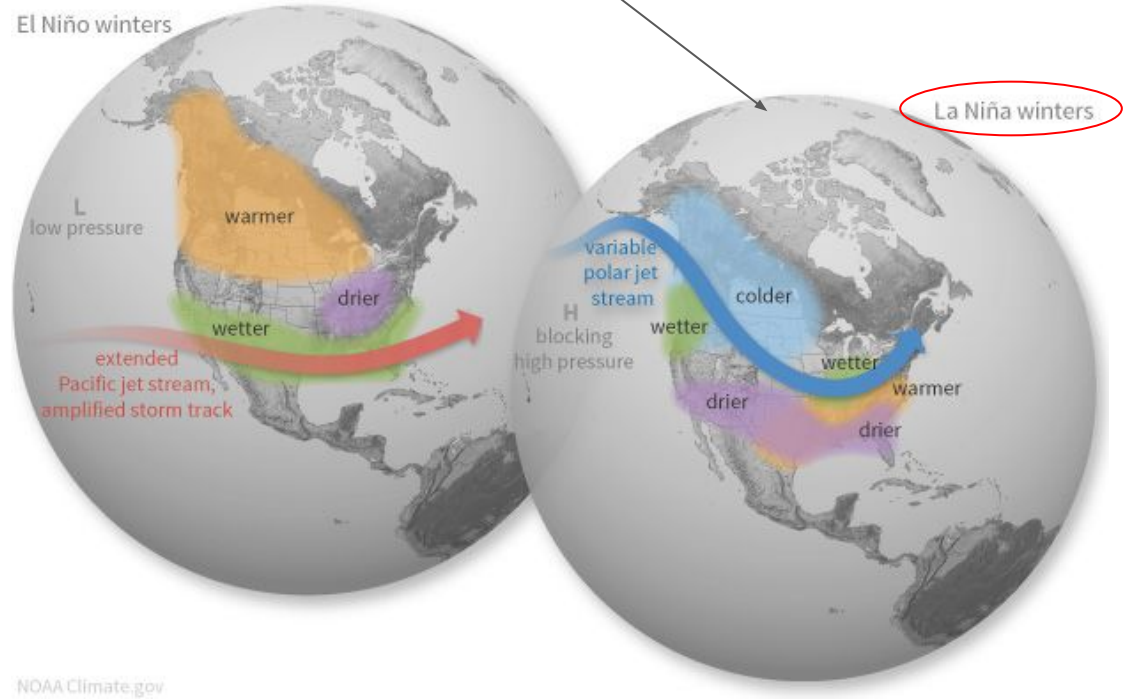


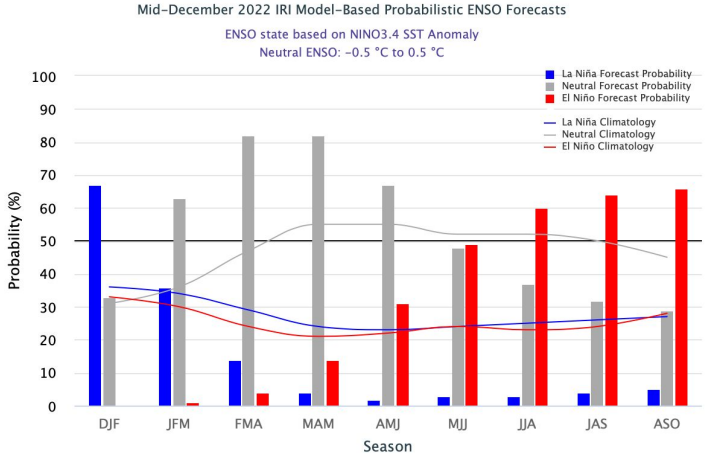


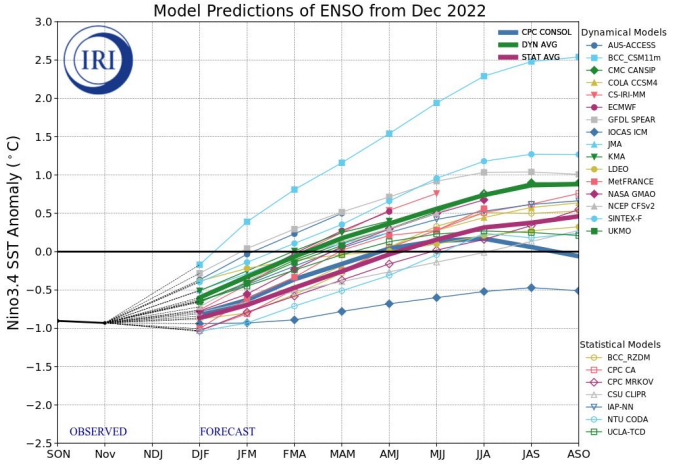
EL NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION
issued by
CLIMATE PREDICTION CENTER/NCEP/NWS
8 December 2022

El Niño Southern Oscillation (ENSO) Status

- **La Niña** is expected to continue into the winter
  - Increased chances of drier winter weather in Arizona/LCRB
  - Much weaker correlation/winter weather signal elsewhere in basin
  - ~60% chance of ENSO-neutral during January-March 2023
  - ~80% chance of ENSO-neutral in February-May 2023





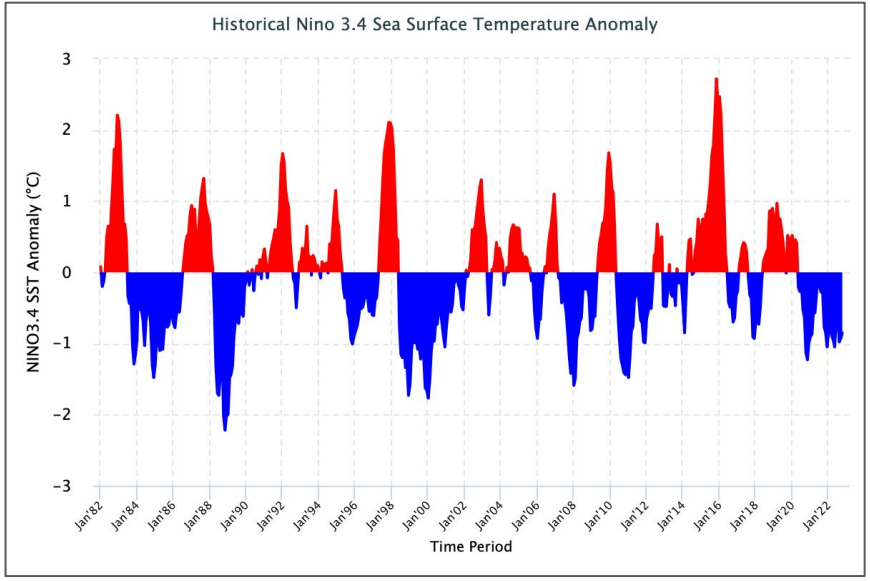


El Niño Southern Oscillation (ENSO) Status

PUBLISHED NOVEMBER 22, 2022

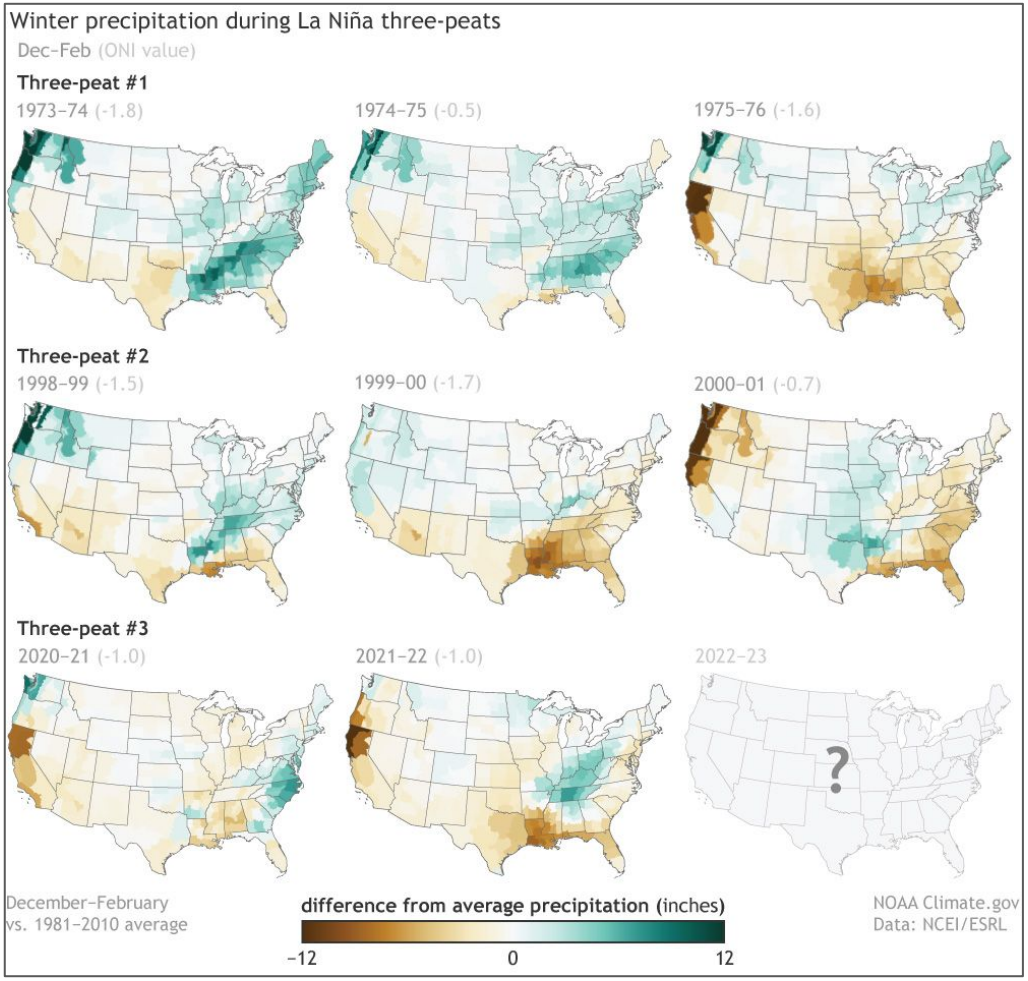
"With a 76% chance of La Niña through this winter, it's likely that we will have **a third La Niña winter in a row**, which would be only the third time since 1950 that this has occurred."

"..there is nothing obviously different about La Niña three-peats relative to all other La Niñas that would lead to markedly different expectations."



Climate.gov SCIENCE & INFORMATION FOR A CLIMATE-SMART NATION

[Data/Source Link]



Summary

- CBRFC model soil moisture conditions are near to below normal across many of the major runoff producing areas across the UCRB, with variable soil moisture conditions across the LCRB.

- Current (Jan 8) CBRFC model SWE conditions are mostly above normal across the Colorado River Basin
  - Upper Colorado: 105-190%
  - Lower Colorado: 90-230%

- January 1 water supply forecasts (% of normal):
  - Upper Colorado: 85-150%
  - Lower Colorado: 95%-175%

- Weather outlook
  - Active weather is expected to continue for the next two weeks.

- Similarities to last year
  - Productive monsoon season, above normal December precip/Jan1 SWE, La Niña

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 7th	10 am
Friday	May 5th	10 am

Utah/Great Basin

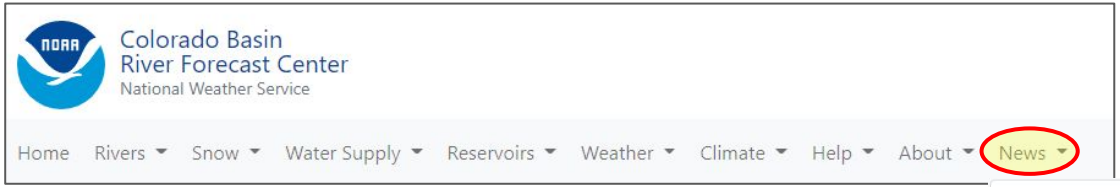
Monday	Jan 9th	11:30 am
Tuesday	Feb 7th	11:30 am
Tuesday	Mar 7th	11:30 am
Friday	Apr 7th	11:30 am
Friday	May 5th	11:30 am

Peak flow forecast webinar Monday, March 20th, 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



cbrfc.noaa.gov

CBRFC Water Supply Forecast Webinar Schedule & Registration - Water Year 2023

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 14 @ 10:00 am MT

Colorado River Basin Water Supply Webinars
Monday January 9 @ 10:00 am MT
Tuesday February 7 @ 10:00 am MT
Tuesday March 7 @ 10:00 am MT
Friday April 7 @ 10:00 am MT
Friday May 5 @ 10:00 am MT

Utah Water Supply Webinars
Monday January 9 @ 11:30 am MT
Tuesday February 7 @ 11:30 am MT
Tuesday March 7 @ 11:30 am MT
Friday April 7 @ 11:30 am MT
Friday May 5 @ 11:30 am MT

Peak Flow Webinar
Monday March 20 @ 10:00 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.

Email Updates

Available Email Lists

- General Stakeholders
- USBR Water Year and MTOM Forecasts
- Lake Mead Local Forecasts
- Green River Basin Forecasts
- Upper Colorado Mainstem Forecast
- San Juan, Gunnison and Dolores River Basins Forecasts
- Weber Basin PAO
- Special forecasts for the Dolores River Basin
- Special forecasts for the San Juan River Basin
- Special forecasts for CUWCD
- Utah reservoir forecasts
- CRFS
- Eastern Great Basin Water Supply
- Upper Basin Reclamation Reservoirs

Addition Requests

- Request to be on one of our lists by emailing cbrfc.webmasters@noaa.gov

CBRFC Contacts & WY23 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

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
cbrfc.noaa.gov

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

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