COLORADO
Colorado Water Conservation Board
Department of Natural Resources

1313 Sherman Street, Room 718
Denver, CO 80203

P (303) 866-3441
F (303) 866-4474

Jared Polis, Governor

Dan Gibbs, DNR Executive Director

Lauren Ris, CWCB Director

TO: Colorado Water Conservation Board Members

FROM: Amy Ostdiek, Michelle Garrison and Brian Macpherson

DATE: Sep. 18, 2024

SUBJECT: Agenda Item 9: Colorado River Updates

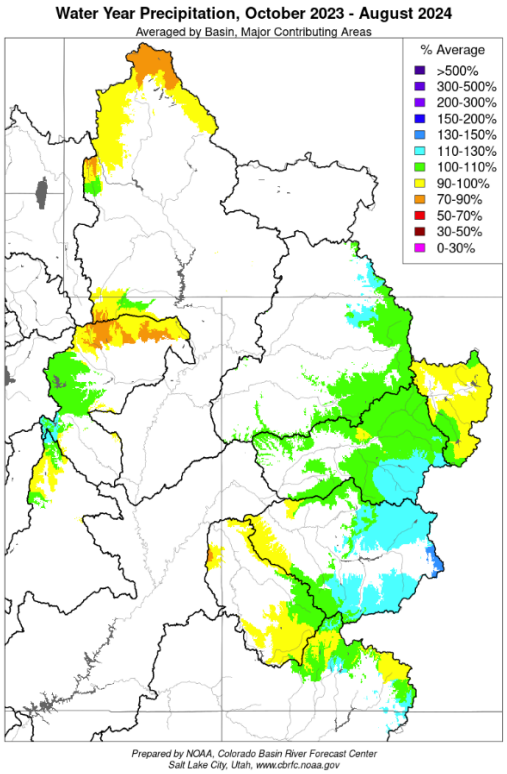
This is an informational item with no board action requested.

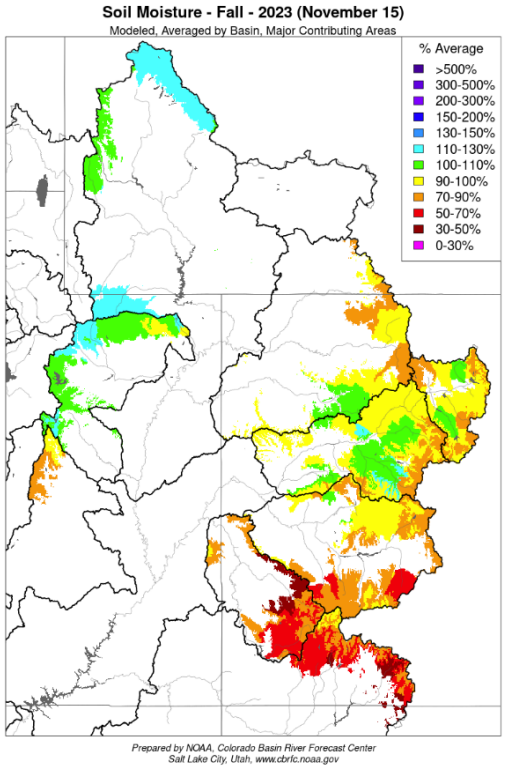
1. Hydrology and operations update

Hydrology

Extremely dry conditions in Water Years 2021 and 2022 placed significant strain on basin storage and on water users in the Upper Basin. WY 2023 precipitation and streamflow were slightly above average, with well above average snowpack and high spring runoff followed by warm and dry summer conditions. WY 2024 precipitation has been average. Snowpack peaked near to above average in April, with below average conditions in the southern subbasins in Colorado. Late spring and summer conditions were warm and dry until recent monsoonal moisture patterns brought increased precipitation to parts of the basin. Inflow into Lake Powell has been approximately 83% of normal, reflecting recent snowpack and soil moisture conditions. Climate forecasts indicate increased likelihood of warmer and dryer than average conditions for the fall and winter.

Drought and reservoir storage conditions have improved; however, long-term impacts from depleted storage are expected to continue, as indicated in current forecasts for reservoir operations.


Water Year Precipitation, October 2023 - August 2024
Averaged by Basin, Major Contributing Areas
% Average
>500%
300-500%
200-300%
150-200%
130-150%
110-130%
100-110%
90-100%
70-90%
50-70%
30-50%
0-30%
Prepared by NOAA, Colorado Basin River Forecast Center
Salt Lake City, Utah, www.cbrfc.noaa.gov


Soil Moisture - Fall - 2023 (November 15)
Modeled, Averaged by Basin, Major Contributing Areas
% Average
>500%
300-500%
200-300%
150-200%
130-150%
110-130%
100-110%
90-100%
70-90%
50-70%
30-50%
0-30%
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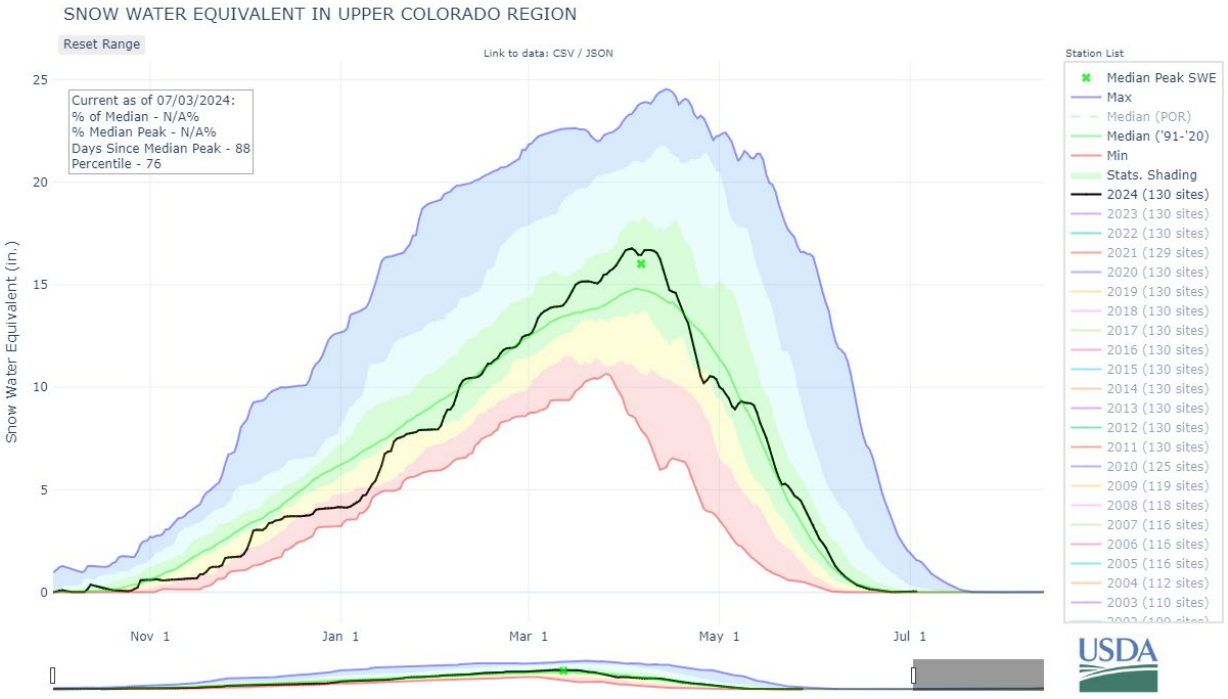
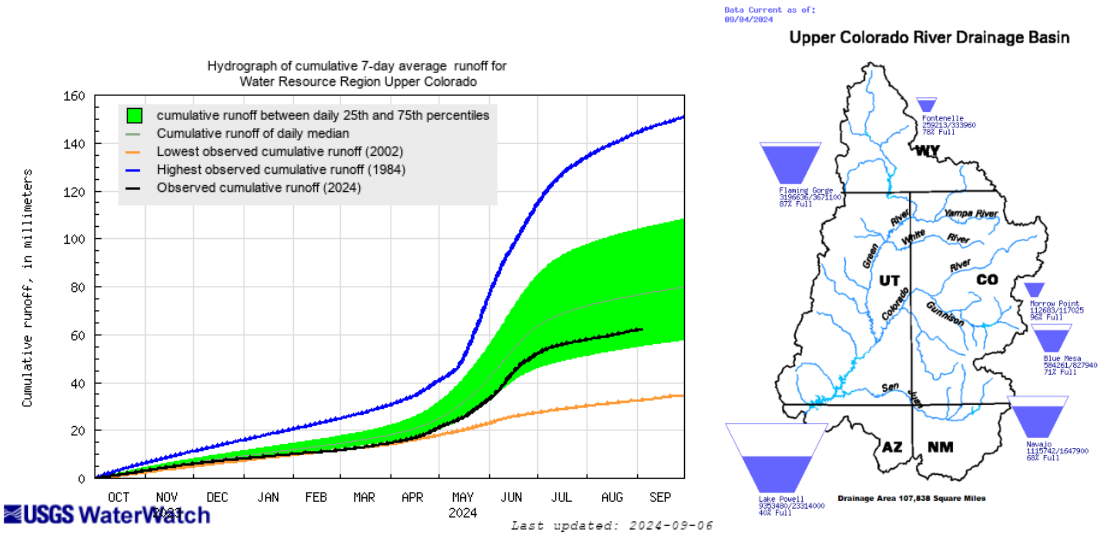
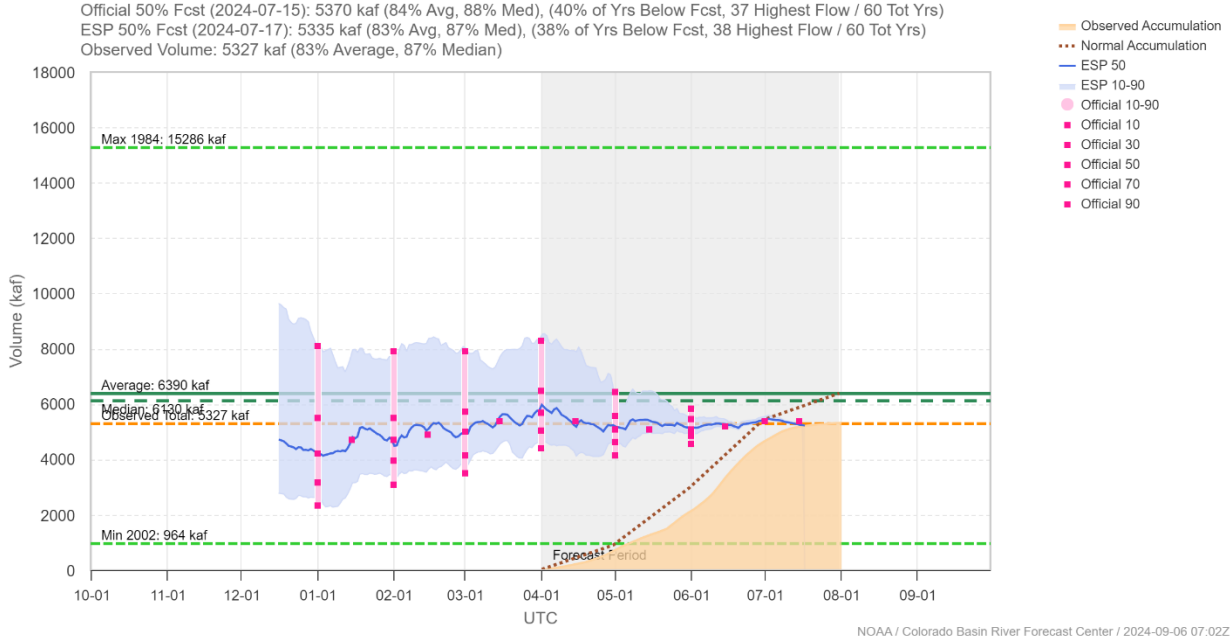

SNOW WATER EQUIVALENT IN UPPER COLORADO REGION
Reset Range
Link to data: CSV / JSON
Current as of 07/03/2024:
% of Median - N/A%
% Median Peak - N/A%
Days Since Median Peak - 88
Percentile - 76
Snow Water Equivalent (in.)
25
20
15
10
5
0
Nov 1
Jan 1
Mar 1
May 1
Jul 1
Station List
Median Peak SWE
Max
Median (POR)
Median ('91-'20)
Min
Stats. Shading
2024 (130 sites)
2023 (130 sites)
2022 (130 sites)
2021 (129 sites)
2020 (130 sites)
2019 (130 sites)
2018 (130 sites)
2017 (130 sites)
2016 (130 sites)
2015 (130 sites)
2014 (130 sites)
2013 (130 sites)
2012 (130 sites)
2011 (130 sites)
2010 (125 sites)
2009 (119 sites)
2008 (118 sites)
2007 (116 sites)
2006 (116 sites)
2005 (116 sites)
2004 (112 sites)
2003 (110 sites)
USDA



2024 Water Supply Forecast - Colorado - Lake Powell, Glen Cyn Dam, At (GLDA3)

ESP is Unregulated and No Precipitation Forecast Included
Official 50% Fcst (2024-07-15): 5370 kaf (84% Avg, 88% Med), (40% of Yrs Below Fcst, 37 Highest Flow / 60 Tot Yrs)
ESP 50% Fcst (2024-07-17): 5335 kaf (83% Avg, 87% Med), (38% of Yrs Below Fcst, 38 Highest Flow / 60 Tot Yrs)
Observed Volume: 5327 kaf (83% Average, 87% Median)



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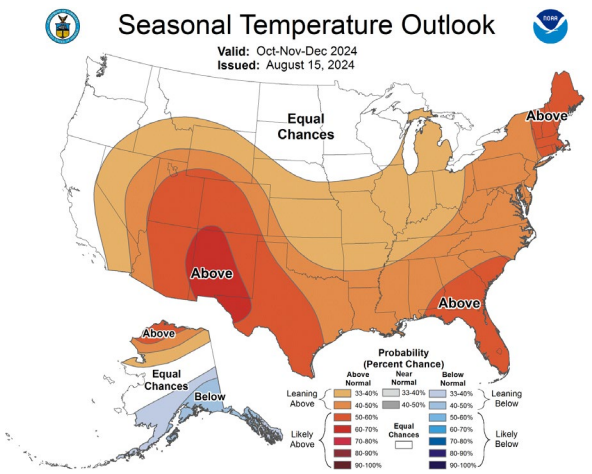
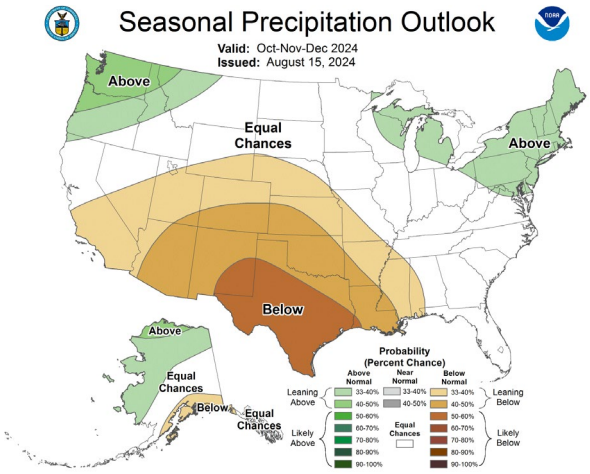
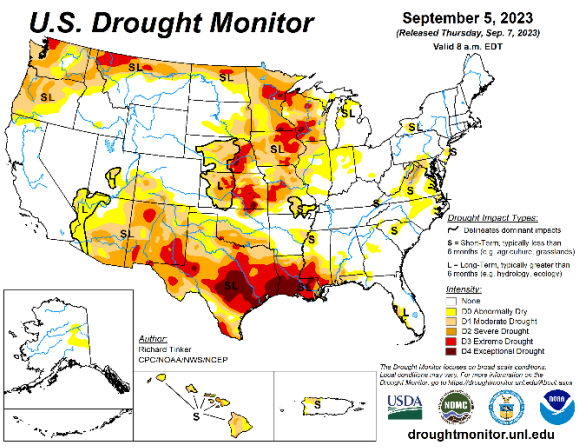
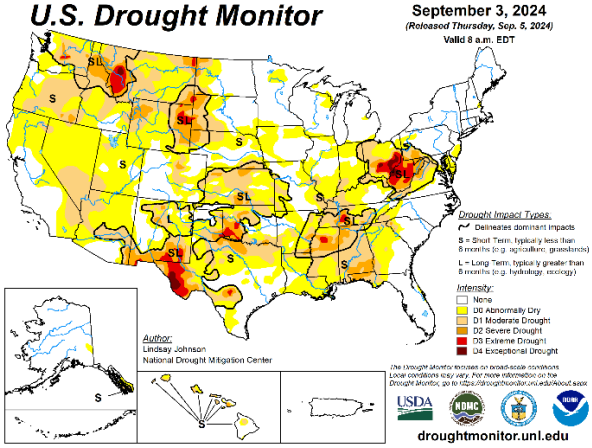








Operations

Upper Basin

Low inflows and reservoir storage prompted multiple reservoir operation changes and Upper Basin Drought Contingency Plan (DCP) activities in WY 2022 and 2023. To protect critical infrastructure in Lake Powell, Reclamation decreased WY 2022 Lake Powell releases. May 2022 – April 2023 Flaming Gorge reservoir releases were increased as part of the Drought Response Operations Plan. Lake Powell rose above elevation 3525' in May 2022 and fell below that threshold elevation in December 2022. Due to improved hydrologic conditions in WY 2023, Lake Powell elevations rose significantly in April 2023 and remain above the 3525' threshold.

High spring runoff and increasing reservoir elevations prompted the cessation of Drought Response Operations Agreement (DROA) releases in March 2023, changing focus to recovery of previously released DROA water for the May 2023 – April 2024 plan, and a substantial increase in WY 2023 releases from Lake Powell. WY 2023 was the first year in which Lake Powell operated in the Lower Elevation Balancing Tier. In that tier, releases from Lake Powell are

initially set to 7.0 MAF but can be adjusted up to a maximum of 9.5 MAF based on inflow and reservoir storage forecasts. Releases were adjusted monthly from April through September based on updated inflow and reservoir storage forecasts. Lake Powell releases totaled 8.58 MAF for WY 2023, including the release of the 480,000 acre-feet withheld in Lake Powell in WY 2022. As the inflow forecasts declined quickly due to the warm and dry conditions and Lake Mead storage projections increased due to precipitation and decreasing demand, Reclamation decreased Lake Powell releases, but still inadvertently released 40,000 acre-feet more from Powell than was required under balancing. They claim to have no authority to correct this inadvertent release.

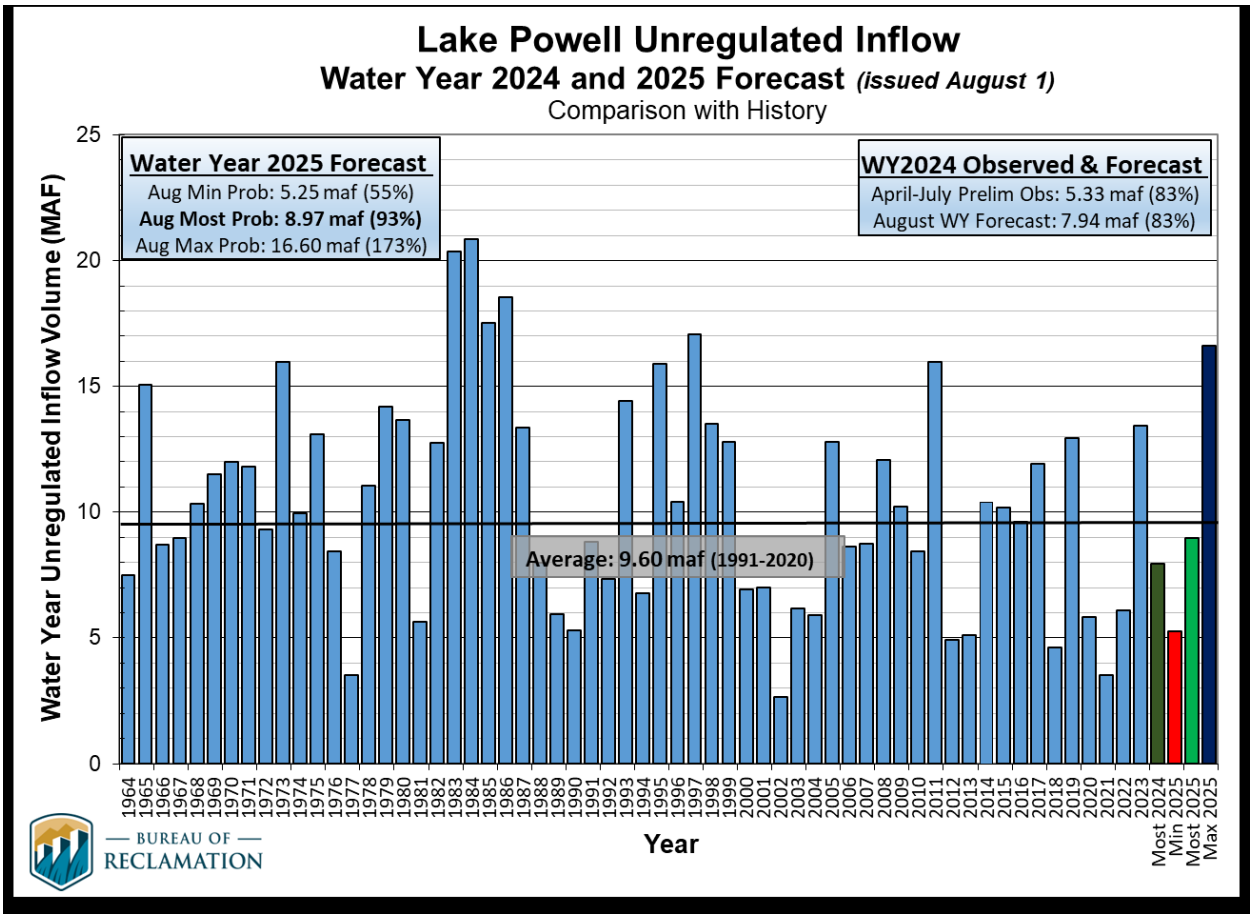
In spring 2023 as Lake Powell elevation was very low but inflow and elevation were rising, Reclamation increased releases significantly for several days to mobilize sediment remaining in the system from tributary inflows below Glen Canyon Dam and deposit it onto eroding sandbars within the Grand Canyon. Reclamation increased powerplant releases and made releases through the bypass tubes similar to a High Flow Experiment (HFE), but this high release was conducted outside the LTEMP protocol for such experiments. This was the first time releases of that magnitude were made through the bypass tubes with Lake Powell at such a low elevation, and the altered hydraulic conditions damaged one of the bypass tubes. Reclamation is evaluating potential short-term limitations to Glen Canyon Dam operations and long-term actions to prevent additional damage to the bypass tubes and has issued temporary guidance limiting bypass tube releases at low elevation while it analyzes potential solutions.

As determined by Reclamation's August 2023 24-Month Study, Lake Powell is operating in the Mid-Elevation Release Tier in WY 2024 with a fixed annual release of 7.48 MAF. Streamflow at the Lees Ferry gage includes Lake Powell releases, flow of water around the Glen Canyon dam through bank storage and leakage, and inflows from the Paria River. The 10-year cumulative streamflow at Lees Ferry through WY 2023 was approximately 86 million acre-feet.

Blue Mesa reservoir achieved recovery of its previously released DROA water in late December 2023. Flaming Gorge reservoir achieved recovery of previously released DROA water in late February 2024. No DROA operations are expected during the May 2024 – April 2025 DROA planning period.

DROA actions helped protect critical infrastructure in Lake Powell from late 2021 through April 2023. However, half of the DROA water in Lake Powell was released in WY 2023 as part of the balancing releases. Lake Powell elevations are now lower than they would have been without DROA releases, leaving Lake Powell at increased risk of dropping below critical elevations in the future. The lack of long-term effectiveness of the 2021 – 2023 DROA releases does not match the goals and objectives of the DROA and may factor into future Upper Basin DCP decisions.

As determined by Reclamation's August 2024 24-Month Study, Lake Powell will operate in the Mid-Elevation Release Tier in WY 2025 with a fixed annual release of 7.48 MAF.



Lower Basin

The table below describes the Interim Guideline Lower Basin shortage tiers, reduction of deliveries to Mexico pursuant to Minute 323, Lower Basin DCP contributions and Binational Water Scarcity Contingency Plan contributions as determined by projected elevations at Lake Mead. In Calendar Year 2023 Lake Mead operated in a Tier 2a shortage condition. In CY 2024 Lake Mead is operating in a Tier 1 shortage condition. As determined by the August 2024 24-Month Study, Lake Mead will also operate in a Tier 1 shortage condition in CY 2025.

2007 Interim Guidelines, Minute 323, Lower Basin Drought Contingency Plan, and Binational Water Scarcity Contingency Plan

Total Volumes (kaf)

Lake Mead Elevation (feet msl)	2007 Interim Guidelines Shortages		Minute 323 Delivery Reductions	Total Combined Reductions	DCP Water Savings Contributions			Binational Water Scarcity Contingency Plan Savings	Combined Volumes by Country *US: (2007 Interim Guidelines Shortages + DCP Contributions)* *Mexico: (Minute 323 Delivery Reductions + Binational Water Scarcity Contingency Plan Savings)*					Total Combined Volumes
	AZ	NV	Mexico	***Lower Basin States + Mexico***	AZ	NV	CA	Mexico	*AZ Total*	*NV Total*	*CA Total*	*Lower Basin States Total*	*Mexico Total*	***Lower Basin States + Mexico***
1,090 - 1,075	0	0	0	***0***	192	8	0	41	192	8	0	*200*	*41*	***241***
1,075 - 1050	320	13	50	***383***	192	8	0	30	512	21	0	*533*	*80*	***613***
1,050 - 1,045	400	17	70	***487***	192	8	0	34	592	25	0	*617*	*104*	***721***
1,045 - 1,040	400	17	70	***487***	240	10	200	76	640	27	200	*867*	*146*	***1,013***
1,040 - 1,035	400	17	70	***487***	240	10	250	84	640	27	250	*917*	*154*	***1,071***
1,035 - 1,030	400	17	70	***487***	240	10	300	92	640	27	300	*967*	*162*	***1,129***
1,030 - 1,025	400	17	70	***487***	240	10	350	101	640	27	350	*1,017*	*171*	***1,188***
<1,025	480	20	125	***625***	240	10	350	150	720	30	350	*1,100*	*275*	***1,375***

2022 Operations → (Lower Elevations)

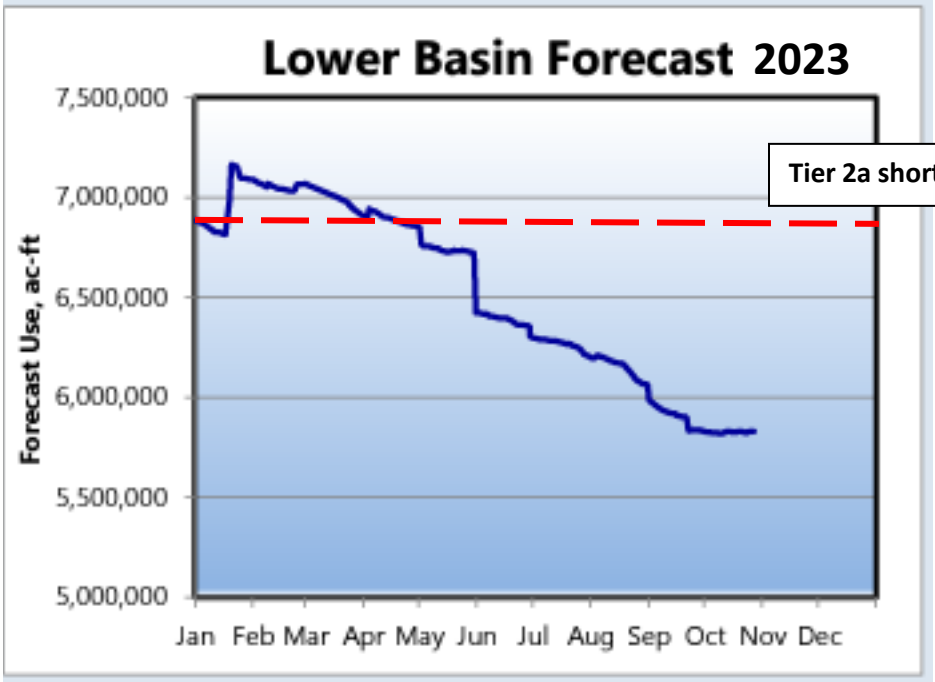
2023 Operations → (Lower Elevations)

← 2022 Operations

← 2023 Operations

The Secretary of the Interior will take affirmative actions to implement programs designed to create or conserve 100,000 acre-ft per annum or more of Colorado River System water to contribute to conservation of water supplies in Lake Mead and other Colorado River reservoirs in the lower basin. All actions taken by the United States shall be subject to applicable law, including availability of appropriations.

Early in CY 2023, the Lower Basin was projecting to consumptively use up to 7.2 MAF – about 320,000 AF more than their allocation under Tier 2a shortage. This would have involved the withdrawal of banked ICS. However, as the spring came, historic precipitation flooded the Arizona tributaries, and the California State Water Project issued a 100% allocation for the first time since the year 2006 (due to high snow in the Sierras; Lake Oroville spilled by May 2023). Hurricane Hilary in August 2023 further reduced Lower Basin demands due to heavy local precipitation. The large decrease in demands allowed for creation of ICS instead of the projected withdrawal. This "historically low consumptive use" in the Lower Basin was due to local hydrology – it was not caused by significant actions by the Lower Basin contractors.



California State Water Project Allocation

YEAR	DATE	ALLOCATION
2020	12/2/2019	10%
	1/24/2020	15%
	5/22/2020	20%
2021	12/1/2020	10%
	3/23/2021	5%
2022	12/1/2021	0% [3]
	1/20/2022	15%
	3/18/2022	5% [4]
2023	12/1/2022	5% [5]
	1/26/2023	30%
	2/22/2023	35%
	3/24/2023	75%
	4/20/2023	100%

In addition to the shortages agreed to pursuant to the 2007 Guidelines and 2019 Drought Contingency Plans, in December 2021 the Lower Division States also committed to creating an additional 500,000 acre-feet of water per year in 2021-2022, and 2023, of conserved water to remain in Lake Mead on a voluntary basis. The amount of water modeled for each year pursuant to the "500+ Plan" is included in the tables below. Planned conservation in late 2022 and 2023 increased significantly from 2022 projections, reflecting the improved hydrology in the Lower Basin. Similar to shortage conditions, the amount of water conserved in Lake Mead under the "500+ Plan" may be partially offset by other withdrawals.

Additional Water Modeled Under 500 Plus Plan

(as anticipated to be modeled in the April 2023 Most Probable 24-Month Study)

Conservation Activity (volumes in AF)	2021	2022 (Provisional)	2023 (Projected)
CAP ICS delivery offset	6,147	15,876	-10,900
GRIC System Conservation	40,000	58,837	125,000
GRIC ICS creation	0	78,565	0
CRIT System Conservation	4,685	4,685	0
CAWCD System Conservation	0	87,794	0
YMIDD System Conservation	0	8,523	13,670
MVIDD System Conservation	0	9,531	12,819
FMYN System Conservation	0	0	13,933
MWD ICS delivery offset and/or creation	58,134	58,211	107,347
PVID System Conservation	12,305	52,789	58,400
CVWD System Conservation	0	9,083	0
SNWA ICS creation	12,832	28,330	44,000
Annual Total (Non-Shortage/DCP)	**134,103**	**412,224**	**364,269**
Cumulative Total	**134,103**	**546,327**	**910,596**

- 2023 volumes reflect executed agreements under the 500+ Plan and LC Conservation Program and current operational projections and are subject to change.
- Additional conservation activities are being considered. After new agreements are finalized and executed, these additional activities will be included in Reclamation's operational planning and modeling.

26

The Lower Basin proposed up to 3 million acre-feet of compensated conservation and other activities through 2025 to address drought conditions as part of Reclamation's Supplemental Environmental Impact Statement (SEIS) process to contemplate additional changes to Lake Powell and Lake Mead reservoir operations through the end of the Interim Guidelines ("near-term operations"). Reclamation released its final Interim Guidelines SEIS in March 2024 and issued its Record of Decision (ROD) in May 2024. The final SEIS analyzed only two alternatives, a No Action alternative and the Lower Basin alternative, removing the previously proposed action alternatives from final consideration. Reclamation is adding the expected conservation volumes to its models as conservation agreements with participating entities are signed, which is increasing projected Lake Mead elevations. The contracted conservation volumes as of July 2024 are summarized in the tables below. The hydrology-driven increase in ICS creation in 2023 is also reflected.

Status of SEIS ROD Lower Basin Conservation[1]

As of July 2024 (all volumes in acre-feet)

State	LCB Water Entitlement Holder/Tribe	*2023*	2024	2025	2026
Arizona	Fort McDowell Yavapai Nation SCW	*13,933*	13,933	13,933	
Arizona	Gila River Indian Community SCW	*91,319*	125,000	125,000	
Arizona	Hopi Tribe SCW	*2,679*	3,059	3,059	
Arizona	San Carlos Apache Tribe SCW	*23,804*			
Arizona	Central Arizona Project (CAP) Subcontractors SCW	*141,400*	129,400	128,800	2,400
Arizona	Mohave Valley Irrigation and Drainage District SCW	*12,819*	13,441	13,441	
Arizona	Yuma Mesa Irrigation and Drainage District SCW	*21,556*	21,795	21,795	
Arizona	Cibola Valley Irrigation and Drainage District SCW	*1,682*	2,328	2,328	
Arizona	Cathcart Farms SCW	*57*	61	61	
Arizona	GM Gabrych Family Limited Partnership SCW	*3,240*	3,240	3,240	
Arizona	CAP ICS Preservation Program	*41,776*			
California	Coachella Valley Water District SCW	*35,000*	35,000	45,000	10,000
California	Quechan Tribe-Metropolitan Water District (MWD) SCW	*13,000*	13,000	13,000	
California	Palo Verde Irrigation District-MWD SCW	*71,507*	117,021	117,021	79,830
California	Imperial Irrigation District SCW	*106,111*			
California	MWD Extraordinatary Conservation ICS	*450,000*			
California	MWD Extraordinary Conservation Left in Lake Mead (non-ICS)	*25,066*			
Nevada	SNWA Tributary Conservation ICS	*36,075*			
Nevada	SNWA Extraordinary Conservation Left in Mead (non-ICS)	*88,156*			
	Annual Volumes	*1,179,180*	477,278	486,678	92,230
	Cumulative Volumes	*1,179,180*	1,656,458	2,143,136	2,235,366

[1] Volumes reflect final accounting in the 2023 Water Accounting Report and executed system conservation agreements based on current projections. Any projected or provisional volumes are subject to change. Additional conservation activities are being considered including system conservation, ICS, and other conserved water in 2024, 2025, and 2026. These additional activities will be included in Reclamation's operational modeling.

25

Projected Modeled Conservation Activities

As anticipated to be modeled in the August 2024 Most Probable 24-Month Study[1,2]

Conservation Activity (ac-ft)	2024	2025	2026	Total
242 Wellfield Additional Pumping Agreement	25,000	25,000	25,000	**75,000**
CAP ICS Preservation Program	0	0	0	**0**
CAP System Conservation Agreements	129,400	128,800	2,400	**260,600**
Cathcart Farms System Conservation	61	61	0	**121**
Cibola Valley IDD System Conservation	2,328	2,328	0	**4,656**
Fort McDowell Yavapai Nation System Conservation	13,933	13,933	0	**27,866**
GM Gabrych System Conservation	3,240	3,240	0	**6,480**
GRIC System Conservation	125,000	125,000	0	**250,000**
Hopi Tribe System Conservation	3,059	3,059	0	**6,118**
MVIDD System Conservation	13,441	13,441	0	**26,882**
San Carlos Apache Tribe System Conservation	0	0	0	**0**
YMIDD System Conservation	21,795	21,795	0	**43,590**
Coachella Groundwater System Conservation	35,000	35,000	0	**70,000**
Coachella Ag System Conservation	1,063	10,000	10,000	**21,063**
CA Other Conserved Water Left in Lake Mead	41,928	0	0	**41,928**
PVID-MWD System Conservation	117,021	117,021	79,830	**313,872**
Quechan Indian Tribe-MWD System Conservation	13,000	13,000	0	**26,000**
SNWA Other Conserved Water Left in Lake Mead	90,000	40,000	35,000	**165,000**
SNWA Tributary ICS/System Water	36,000	30,000	30,000	**96,000**
Pilot System Conservation Program	545	545	545	**1,635**
Annual Total	**671,814**	**582,223**	**182,775**	**1,436,811**

[1] Volumes reflect executed agreements and/or current operational projections and are subject to change. Additional conservation activities are being considered. After new agreements are finalized and executed, these additional activities will be included in Reclamation's operational modeling.
[2] New agreements under the LC Conservation Program are being developed.

21

LTEMP

Reclamation recently released its Final SEIS and ROD for the Glen Canyon Dam Long-Term Experimental and Management Plan (LTEMP) that explores options for changing monthly and daily releases and release temperatures to help prevent establishment of smallmouth bass

and other non-native fish in the Grand Canyon and to alter sediment accounting and implementation windows for high flow experiments to distribute sand higher on sandbars. The options include releases through the bypass tubes, limited by the new interim operating guidance. LTEMP does not alter annual releases, which are determined according to the Interim Guidelines. Bypass releases to reduce water temperatures from Glen Canyon Dam to disadvantage smallmouth bass reproduction began July 9 and are expected to continue through the fall. Monitoring is being conducted to assess the effectiveness of the colder release temperature operations. Bypass releases decrease hydropower production from Glen Canyon Dam and increase costs to hydropower customers to obtain alternate power supplies.

2. Colorado River Accounting Update

Pursuant to the 1922 Colorado River Compact, the Upper Division States have a legal apportionment for the beneficial consumptive use of 7.5 million acre-feet per year. The Lower Basin States also have an annual apportionment of 7.5 million acre-feet per year. The Lower Basin receives an additional one million acre-feet pursuant to Article IIIb. The Colorado River Compact states that apportionments to the respective Basins include mainstem and tributary uses alike. The Colorado River Compact remains the foundational component of the Law of the River, and all subsequent agreements are subject to it.

However, several other components of the Law of the River also address quantification of consumptive use, for various accounting purposes. Issues such as the technology used to estimate agricultural consumptive use, inclusion of evaporation and transit losses, and inclusion of tributary uses differ amongst different accountings. Staff will present details regarding the different accounting protocols as well as some of the misconceptions about consumptive use accounting in the Colorado River Basin.