UPDATE: Colorado River Basin Storage Continues Slide Toward System Crash

June 1, 2026

Anne Castle,[1] Jack Schmidt,[2] Eric Kuhn,[3] Kathryn Sorensen,[4] Katherine Tara[5]

IN BRIEF

If the Colorado River Basin (Basin) experiences another dry year, similar to Water Year 2025, it is likely that reasonably accessible storage in Lake Powell and Lake Mead would be mostly depleted, even if consumptive uses and losses are at or near historic lows. Run-of-the-river operations would shortly ensue. This would be an outcome with devastating consequences.

In contrast, if next year is very wet, similar to Water Year 2023, the Basin's largest federal reservoirs would recover somewhat, but would provide only about two years of cushion before we find ourselves again in the same position we are in today, unless consumptive use decreases further. This recovery would be welcome but would provide only a brief reprieve from crisis.

Both scenarios demonstrate the need to adopt significant additional measures to permanently decrease consumptive uses across the entire Basin.

[1] Getches-Wilkinson Center, Univ. of Colorado Law School, former US Commissioner, Upper Colorado River Commission, former Assistant Secretary for Water and Science, US Dept. of the Interior.

[2] Director, Center for Colorado River Studies, Utah State University, former Chief, Grand Canyon Monitoring and Research Center.

[3] Retired General Manager, Colorado River Water Conservation District.

[4] Kyl Center for Water Policy, Arizona State University, former Director, Phoenix Water Services.

[5] Staff Attorney, Utton Transboundary Resources Center, University of New Mexico.

INTRODUCTION AND BACKGROUND

Our September 2025 paper described how the dwindling reserves of water stored in Lake Powell and Lake Mead reservoirs might be depleted to paltry amounts if runoff from the 2025/2026 winter snowpack was low. Unfortunately, that scenario came to pass. As we recommended then, and now re-emphasize with greater urgency, immediate steps must be taken to significantly reduce consumptive uses in the Upper and Lower Basins and in Mexico. This paper updates last year's analysis, takes stock of where we are today, and again urges prompt action.

We previously described how the Colorado River reservoir system was almost full in fall 1999.[6] Lake Powell and Lake Mead lost 52% of their combined active capacity in the first five years of the 21st century between fall 1999 and January 1, 2005. Thereafter, although reservoir storage gained in some wet years, the depletions in subsequent dry and average years were approximately of the same magnitude. Consequently, Lake Powell and Lake Mead were in the same precarious condition at the beginning of 2020 as they had been in 2005. The return of dry conditions between 2020 and 2022 further drew down the combined contents of Lake Powell and Lake Mead, and the active storage in those reservoirs in March 2023 was only 27% of what it had been in fall 1999, propelling the Basin into the water supply crisis that has existed ever since. The combination of very dry years, periodic wet years, continued over-allocation of the river, and more recent attempts to slow reservoir declines through conservation efforts has resulted in the "ratchet effect" easily recognized by a graph of water levels in Lake Powell and Lake Mead over this century (Figure 1).

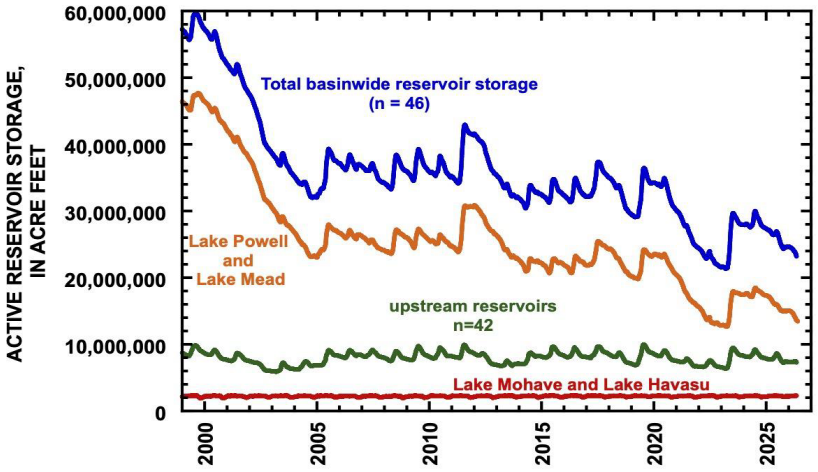

Figure 1. Graph showing active storage in 46 Colorado River Basin reservoirs between January 1, 1999, and late May 2026. We refer to the progressive decline in Basin reservoir storage despite replenishment during occasional wet years as the ratchet effect. Data for these reservoirs is available at https://www.usbr.gov/uc/water/hydrodata/reservoir_data/site_map.html.

[6] John C. Schmidt et al., *The Colorado River water crisis: its origin and the future*, 10 WIREs WATER e1672 (2023).

The Bureau of Reclamation's most recent forecasts for reservoir storage indicate that Basinwide annual consumptive use continues to exceed annual natural supply. The inevitable result is continued drawdown of the Basin's reservoirs. Water Year 2026 is shaping up to be one of the lowest runoff years on record, most likely with an even greater gap between natural supply and consumptive use and loss. While Reclamation is taking extraordinary steps to operate the federal reservoir system in a manner that prevents major risks to operations at Glen Canyon Dam, the fundamental problem of Basinwide imbalance between supply and use has not been solved.

In this paper, we again calculate a mass balance for a short period into the future. Our calculation is for Water Year 2027 (hereafter, WY2027) that extends between October 1, 2026 and September 30, 2027. We assume the initial conditions of our calculation to be the reservoir contents as projected by Reclamation in the recently released May 2026 24-Month Study. We consider natural flows at Lees Ferry and inflows to Lake Mead under two scenarios and subtract consumptive uses and losses. The difference between supply and use is reservoir storage at the end of WY2027. The two hydrologic scenarios bracket the spectrum between a dry year comparable to WY2025 and a wet year comparable to WY2023. These straightforward supply and demand calculations provide a simple picture of how much water we might have in the reservoir storage "savings account" going into WY2028.

This analysis demonstrates that, in the event of another dry winter and with low projections of consumptive use, we would experience a gap of **2.59 million acre feet** (MAF) between natural supply and Basin use.[7] In such a situation, we risk a crash of the Basin's water storage system. We define a system crash as a situation in which the major reservoirs drop to elevations that risk damage to the dam infrastructure and are operated as "run-of-the-river" facilities.[8] While a system crash eviscerates the value of the extensive Colorado River storage system, and would negatively impact rural and urban communities alike, it does not mean that municipal taps will run dry. Many cities have developed diverse water portfolios and can fall back on replacement water supplies such as ground water, local rivers, and reclaimed water. A system crash would, however, have a significant impact on agricultural use of water.

---

[7] Although some of the data that we use in our mass balance analysis are reported to a high degree of precision, we recognize that other critical data such as reservoir evaporation, evapotranspiration, and consumptive use associated with irrigated agriculture have significant uncertainty and are imprecisely known. Here we report all components of our mass balance analysis only to the nearest 10,000 acre-feet in an effort to represent the uncertainty in measuring some of these physical processes.

[8] The term "run-of-the-river" is most frequently used in connection with hydropower facilities, referring to a power plant where the releases from the reservoir are approximately the same as the inflow. *See* Bureau of Reclamation, Glossary, "run-of-the-river plants." We use the term here to describe a reservoir that has little to no usable storage capacity and thus primarily releases downstream only the inflow it receives.

Even a repeat of the bountiful snow year of WY2023 will not significantly improve the precarious condition of low reservoir storage that presently exists. We project that if snowmelt runoff in the coming year is similar to WY2023, the Basin's reservoirs will recover only enough to create a buffer for a couple of years. This increase in storage would not be large enough to fundamentally disrupt the ratchet effect described above.

The mass balance calculations discussed in this paper are shown in the Appendix, with accompanying data sources.

OVERVIEW OF ANALYSIS

We examine two scenarios, a dry year and a wet year as described above. A key purpose of this effort is to determine whether the laudable conservation measures achieved in recent years are sufficient to stabilize the system. Unfortunately, they are not. The initial condition for each scenario is Reclamation's estimate of storage volumes in Lake Powell, Lake Mead, and Flaming Gorge Reservoir on October 1, 2026, as reported in the May 2026 Most Probable 24-Month Study.[9] The two scenarios encompass a range of possible future hydrologic conditions, ranging from relatively dry to relatively wet.

- In one scenario, we assume that natural flow in WY2027 will be similar to WY2025, a relatively dry year but not as severe as WY2026.[10] Because this scenario reflects relatively dry conditions and because reservoir storage is presently low, we assume that consumptive uses and losses throughout the Basin would be low, reflecting both voluntary and imposed reductions across both Basins and priority administration in the Upper Basin. To simulate low water usage for which there is precedent, we assume the lowest consumptive use reported in recent years in the Upper Basin (CY2013) and Lower Basin (WY2024).

- In the second scenario, we assume that natural flow in WY2027 will be similar to WY2023, the third wettest year of the 21st century. We assume that uses of water will be the same as they were in CY2023 in the Upper Basin and WY2023 in the Lower Basin. Thus, we assume a small increase in use that would result from the welcome reprieve from dryness, and that some refilling of upstream reservoirs would occur.

[9] U.S. BUREAU OF RECLAMATION, *May 2026 Most Probable 24-Month Study* (May 15, 2026).

[10] Natural flow at Lees Ferry in WY2025 is estimated at 8.502 MAF, the fifth smallest natural runoff of the 21st century, 2000-2026. Personal communication between J. Schmidt and J. Prairie, Bureau of Reclamation, May 26, 2026.

WHY DO THIS ANALYSIS?

Reclamation's May 2026 24-Month Study provides objective and transparent forecasts for operations and conditions of the major federal reservoirs in the Colorado River system for the next two years. The 24-Month Studies are widely read and relied upon for planning purposes.[11] Our goal is to shed additional light on the implications of the most recent 24-Month Study by highlighting the amount of active storage that is realistically accessible and projecting inflows and consumptive uses and losses that mirror recent relevant experience. We also consider the consequences to the overall system.

Realistically Accessible Storage v. Active Capacity

Our focus in this update, and in our previous papers, is on "realistically accessible storage" (hereafter, "RAS") in the major reservoirs. RAS is the water available above protected elevations determined by Reclamation. These levels are 3500 feet in Lake Powell,[12] and 975 feet in Lake Mead.[13] "Active storage" is a term widely used in water resource engineering and refers to all the stored water that is above "dead pool" that could theoretically be released. This is the metric of storage reported by Reclamation in the 24-Month Study. Forecasts of active storage may not be fully

---

[11] The Bureau of Reclamation publishes a 24-Month Studies on a monthly basis. Each study includes minimum probable (90% exceedance), most probable (50% exceedance), and maximum probable (10% exceedance) projections. As of May 2026, there is little difference between the most probable and minimum probable projections for WY2026 in the 24-Month Study. Each projection covers 36 months; the 12 previous months, which show actual data, plus 24 future months, which are projections. 24-Month studies back to 2010 can be accessed at U.S. BUREAU OF RECLAMATION, *24 Month Study Index*, https://www.usbr.gov/lc/region/g4000/24mo/index.html, last visited May 31, 2026.

[12] U.S. BUREAU OF RECLAMATION, SUPPLEMENT TO 2007 COLORADO RIVER INTERIM GUIDELINES FOR LOWER BASIN SHORTAGES AND THE COORDINATED OPERATIONS OF LAKE POWELL AND LAKE MEAD, RECORD OF DECISION (SEIS), XI. G. Sec. 6.E, (2024). Note that the recent Department of the Interior response to the operational proposal from the Lower Division States has indicated that Reclamation intends to protect a minimum elevation of 3510 feet in Lake Powell. Department Response to Lower Division States' Proposal for 2027-2028 Colorado River Operations, May 28, 2026. We have not utilized elevation 3510 feet to determine RAS in Lake Powell. We do not currently know whether this protection level will be included in the Secretary of the Interior's anticipated Record of Decision for post-2026 operations. In addition, the May 2026 24-Month Study shows Lake Powell dropping below 3510 feet beginning in October 2026 and remaining below that level for the next seven months. Additional measures would need to be taken to protect elevation 3510 feet, most likely extra releases from Flaming Gorge Reservoir, over and above the 1.00 MAF already planned or smaller than anticipated releases from Lake Powell. This addition of multiple unknown factors is speculative and unnecessary to our analysis. If the protection elevation at Lake Powell is 3510 feet, RAS in the reservoir would decrease by 0.51 MAF, exacerbating the already very small quantity of available storage.

[13] BUREAU OF RECLAMATION, DRAFT ENVIRONMENTAL IMPACT STATEMENT, POST-2026 OPERATIONAL GUIDELINES AND STRATEGIES FOR LAKE POWELL AND LAKE MEAD, TECHNICAL APPENDIX 3, HYDROLOGIC RESOURCES (2026). Note that our Sept. 2025 paper utilized 1000 feet of elevation behind Hoover Dam as the bottom level of RAS in Lake Mead based on information from the SEIS. Subsequent analyses by Reclamation have indicated that 975 feet is a more appropriate protection level, and that is the level utilized here. Total RAS in Lake Mead is increased by 0.87 MAF to reflect this lower protection level.

illuminating, however, because Reclamation currently intends to protect higher levels in the reservoirs.[14] In contrast to our previous paper in which we only focused on the total RAS in Lake Powell and Lake Mead, we now also consider the RAS in Flaming Gorge Reservoir because some of the water in Flaming Gorge is now being released to prop up the elevation of Lake Powell. We do not project future distribution of RAS among the three reservoirs.

Reclamation's 24-Month Minimum Probable Inflow Projection Is Too Optimistic for Prudent Planning

Our scenario that assumes a dry WY2027 is based on the actual experience of WY2025, and this scenario is considerably drier than Reclamation's May 2026 minimum probable forecast for the coming year. Reclamation's minimum probable scenario for WY2027 in the May 2025 24-Month Study is based on the work of the Colorado Basin River Forecast Center (CBRFC), which uses a 30-year reference period (1991 to 2020) to forecast future flows, The CBRFC approach does not fully reflect the increasing aridity of the past decade.[15] WY2025 was the fifth driest of the 21st century and the third driest in the last ten years.[16] In contrast, Reclamation's minimum probable forecast in the May 24-Month Study would be only the sixth driest in the last ten years, meaning that this forecast represents a wetter year than the median for the most recent decade. We suggest that a drier projection of inflows than that released by Reclamation is more informative for planning purposes.

The 24-Month Study Assumes Large Lower Basin Water Uses

In our dry year scenario, we assume that Lower Basin uses would be decreased in the event of another dry year. We believe this to be a reasonable assumption, particularly given Reclamation's likely efforts to decrease Lower Basin consumptive use in its anticipated Record of Decision and the recently proffered Lower Basin plan.[17] In contrast, the 24-Month study projects increased deliveries from Lake Mead of 8.69 MAF in WY2027 under the most probable projection, as compared to a projected 7.51 MAF in WY2026.[18] We believe it is informative to analyze the impact on reservoir storage assuming that Lower Basin water users reduce their consumption as much as has occurred in the past. We seek to evaluate whether

[14] Protecting elevations in Lake Powell and Lake Mead also potentially impacts compliance with the Endangered Species Act and Glen Canyon Dam Adaptive Management Program operations, compliance with the 1922 Colorado River Compact, and hydropower generation, not to mention the obvious reduction of deliveries to Lower Basin water users.

[15] Jian Wang et al., Evaluating the Accuracy of Reclamation's 24-Month Study Lake Powell Projections (Center for Colorado River Studies, The Future of the Colorado River Project, 2022).

[16] Personal communication between J. Schmidt and J. Prairie, Bureau of Reclamation, May 26, 2026.

[17] Lower Division States, Proposal for Short-Term Operations of the Colorado River, May 1, 2026.

[18] U.S. BUREAU OF RECLAMATION, LOWER COLORADO BASIN REGION OFFICIAL WATER USE FORECAST, 2026.

reductions implemented in recent history will be sufficient to protect the system in the event of another dry year.

For these reasons, we provide this analysis as supplemental to the May 2026 24-Month Study to assist Basin water managers and state and federal decision-makers in planning for future possible runoff outcomes. We also seek to inform interested members of the public about the situation at hand.

INITIAL CONDITIONS

Reclamation's May 2026 24-Month Study projecting reservoir storage and reservoir releases for the next two years was published May 15, 2026.[19] We utilize the most probable projections in this 24-Month Study for the beginning of WY2027 as the initial condition for our computations.

Our September 2025 paper analyzing mass balance considered only water in storage in Lake Powell and Lake Mead. Now, however, Reclamation is releasing water from Flaming Gorge Reservoir to augment storage in Lake Powell. This additional water is intended to ensure that water can be released through the Lake Powell turbine outlets and avoid "operational issues, uncertainty for users, downstream impacts, instability in regional power and water supplies, and a reduction in power generation."[20] Flaming Gorge is the largest reservoir upstream from Lake Powell, and the supplemental releases from Flaming Gorge, together with reduced releases from Lake Powell, are being implemented to ensure that Lake Powell does not drop below elevation 3500 feet.[21] Accordingly, we have added Flaming Gorge Reservoir in this mass balance analysis.

As discussed above, we focus on "realistically accessible storage" - the amount of water stored above 975 feet of elevation in Lake Mead and 3500 feet in Lake Powell. To date, Reclamation has not identified a protection level above dead pool for Flaming Gorge Reservoir. For our analysis, we assume that it is unlikely that Reclamation and the Upper Basin States would allow Flaming Gorge Reservoir to be drawn down to hold less than 0.50 MAF of active storage.

The May 2026 Most Probable 24-Month Study projected the following conditions as of September 30, 2026:

---

[19] U.S. BUREAU OF RECLAMATION, *supra* note 9.

[20] U.S. BUREAU OF RECLAMATION, *Reclamation Acts to Protect Colorado River System During Historic Drought*, April 17, 2026.

[21] U.S. BUREAU OF RECLAMATION, *supra* note 12. It must be kept in mind that a release from any of the upstream reservoirs is only a one-time solution. Such releases do not solve the fundamental problem of the gap between supply and use/losses. The water provided from upstream reservoirs will not be available again unless wet years allow refill of those reservoirs. Such refilling will reduce the inflows to Lake Powell. Unless overall system water use is brought down to a sustainable level, using Flaming Gorge Reservoir releases to supplement Lake Powell simply exacerbates future shortages.

- Lake Powell is predicted to be at elevation 3510.85 feet, with 4.77 MAF of active storage, of which 0.54 MAF is RAS. The May 2026 24-Month Study assumes that 1.0 MAF will be released from Flaming Gorge under the Drought Response Operations protocol by April 2027. The May 24-Month Study also reflects reduced releases from Lake Powell for WY2026, namely, a release of 6.00 MAF instead of 7.48 MAF as originally projected.

- Lake Mead is predicted to be at elevation 1037.22 feet, with 6.79 MAF of active storage, of which 3.63 MAF is RAS, and reflects reduced inflows from Lake Powell.

- Flaming Gorge Reservoir is predicted to be at elevation 6008.74 feet, with 2.55 MAF of active storage. Active storage in excess of 0.5 MAF is 2.05 MAF, which we define as RAS.

- As of Sept. 30, 2026, these three reservoirs together are projected to hold **6.22 MAF of RAS** (33% of which will be in Flaming Gorge).

PROJECTED CONDITIONS AT END OF WATER YEAR 2027

We estimate the inflows and outflows and calculate the net difference between the two. Inflows consist of the natural flow of the Colorado River at Lees Ferry plus the actual inflows that occur in the Grand Canyon and from the Virgin River.[22] Outflows are the consumptive uses and losses associated with uses by agriculture, municipalities, industry, transbasin diversions, and reservoir evaporation. The difference between the two is the net effect on reservoir storage.

[22] Grand Canyon inflows were calculated as the difference between the mean annual flow of the Colorado River above Diamond Creek near Peach Springs (USGS gage 09404200) and the Colorado River at Lees Ferry (USGS gage 09380000). Virgin River inflows were the measured flow at USGS gage 09415250 (Virgin River below confluence of Muddy River near Overton). This analysis does not include contributions from either the Gila River or the Bill Williams River. The Bill Williams River drains the desert country in West-Central Arizona and flows into Lake Havasu. The river has an annual mean flow of about 100,000 acre-feet per year but is highly variable. However, much water reaches Lake Havasu reduces the annual release from Lake Mead. The Gila River has a large drainage area, 58,200 square miles. In most years, its waters are fully consumed. It is only rarely that Gila River flows to its confluence with the Colorado River,

Scenario 1

This scenario is intended to be a conservative assessment of potential future conditions. We assume a relatively dry year and that consumptive uses and losses are reduced to the lowest annual amount that each Basin has achieved in the 21st century. Thus, there is historical precedent for the reductions in use that we assume here.

Inflows

We assume that the natural flow in WY2027 will be the same as in WY2025, a relatively dry year. Natural flows in WY2025 were the third lowest of the most recent ten years and the fifth lowest of the 21st century. We assume that the supply available consists of the natural flow of the Colorado River at Lees Ferry in WY2025 (8.50 MAF)[23] and measured inflows in the Grand Canyon and from the Virgin River in WY2025 (0.70 MAF),[24] for a total of **9.20 MAF**.

Consumptive Use

With respect to uses in the Upper Basin, we are cognizant that in the Upper Basin states, priority administration of water rights within each state will curtail use by junior water users during dry years. Therefore, we assume in our dry year scenario that consumptive water use in the Upper Basin will be the same as it was in Calendar Year (CY) 2013,[25] the year of lowest reported consumptive use in the Upper Basin in the 21st century, when intrastate curtailment of junior rights was pervasive.[26] Total Upper Basin use in CY2013 including estimated reservoir evaporation was 3.56 MAF.[27]

In the Lower Basin, usage of water has significantly decreased in recent years, due to implementation of the 2007 Guidelines, the Drought Contingency Plan, and

---

[23] Personal communication between J. Schmidt and J. Prairie, Bureau of Reclamation, May 26, 2026.

[24] Measured inflow between the Lees Ferry gage and the Colorado River Diamond Creek gage was 0.627 MAF in WY2025. Measured inflow of Diamond Creek was 0.003 MAF. Measured inflow of the Virgin River downstream from Muddy Creek was 0.067 in WY2025. These inflows total 0.697 MAF. *See supra* note 22.

[25] Consumptive use data for the Upper Basin are only available as annual totals for each calendar year. We assume that the Calendar Year data for the Upper Basin and Water Year data for the Lower Basin are comparable.

[26] U.S. BUREAU OF RECLAMATION, UPPER BASIN CONSUMPTIVE USES AND LOSSES 1971-2024, (2025). Interestingly, reported CU&L including evaporation in the Upper Basin is lower for 2013 (3,563,178 acre feet) than for 2002 (3,991,405 acre feet), the driest hydrologic year on record in the 21st century prior to 2026.

[27] *Id.* Total evaporation was 0.42 MAF, over 80% of which was from Lake Powell. Written communication between J. Schmidt and J. Prairie, Bureau of Reclamation, May 2026.

voluntary compensated conservation. Therefore, we assume that Lower Basin usage including evaporation will be the lowest of any year in recent history. That occurred in WY2024. In that year, consumptive uses by Arizona, California, and Nevada, plus deliveries to Mexico totaled 7.30 MAF.[28] We estimated channel conveyance losses downstream from Hoover Dam, including reservoir evaporation, as the difference between actual Hoover Dam releases in WY2025 and consumptive use by Arizona and California plus deliveries to Mexico. The difference was 0.52 MAF. We recognize that this estimate is imprecise and varies from year to year. We assume that evaporation from Lake Mead in WY2027 will be that estimated by Reclamation (0.41 MAF).[29] The total amount of Lower Basin use (including the conveyance and evaporation losses described above) and deliveries to Mexico was 8.23 MAF.

The sum of assumed Upper and Lower Basin uses and losses for Scenario 1 is **11.79 MAF** (3.56 + 8.23).

Gap and resulting reservoir drawdown

With the assumptions described above, we estimate that consumptive uses and losses would exceed the available supply in the Colorado River Basin by at least **2.59 MAF** (11.79 - 9.20).

Thus, to meet the consumptive uses and losses that we assume, the gap would necessitate significant additional reservoir drawdown, bringing Lake Mead, Lake Powell, and Flaming Gorge to levels not experienced since those reservoirs initially filled.[30] There are no good choices in this scenario about how to distribute the drawdown from these reservoirs. Regardless of where the drawdown would occur, there would be only **3.63 MAF** in total RAS in these three major reservoirs. **This is likely to mean that Lake Powell would continue to be operated as a run-of-the-river facility and Lake Mead might be very close to a similar situation.**

With only 3.63 MAF of RAS remaining, there will inevitably be conflicting political pressure from all directions to: recover storage levels in Flaming Gorge Reservoir, maintain safe operating levels at Lake Powell; provide a typical release from Lake

[28] U.S. BUREAU OF RECLAMATION, COLORADO RIVER ACCOUNTING AND WATER USE REPORT: ARIZONA, CALIFORNIA, AND NEVADA, CALENDAR YEAR 2024 (2025).

[29] U.S. BUREAU OF RECLAMATION, *supra* note 9. Note, because total reservoir evaporation is lower at reduced elevations, we are using the 24-Month study projection for Lake Mead evaporation for WY2027.

[30] We assume that 100% of the drawdown caused by uses in excess of supplies would be felt in these three major reservoirs. They are the three largest reservoirs in the system and the only ones currently being operated to meet overall system demands.

Powell to Lake Mead;[31] and avoid large drawdown of Lake Mead. Obviously, not all of these outcomes can be achieved simultaneously.

The challenge of managing this very small amount of remaining RAS would be even more difficult, because approximately six additional months of reservoir drawdown would be necessary to maintain Lower Basin uses in the first half of WY2028 before snowmelt begins. Additionally, management of recreation and ecosystems downstream from these reservoirs would be significantly challenged.

Avoiding the possibility of this significant drawdown and associated conflict requires **immediate and substantial** additional reductions in consumptive use across the Basin, because a dry coming winter is possible. The cuts needed to avoid this scenario, were it to come to pass, would be unprecedented and far larger than any accomplished thus far. Basin water users must focus on solutions to this fundamental, wet-water math problem, rather than legal arguments over paper water.

It is also worth noting that as of the end of CY2025, there was approximately 3.60 MAF of assigned water in Lake Mead.[32] In an earlier paper, we described how the large amount of assigned water in Lake Mead may lead to conflict if there is insufficient supply to support ICS deliveries in addition to regular contract deliveries.[33]

---

[31] The Lower Basin states and water users have encouraged Reclamation to examine engineering solutions that could reduce the minimum safe release level at Lake Powell. *See, e.g.*, State of Arizona Comments on Draft Environmental Impact Statement (March 2, 2026). The co-authors of this report have also previously urged exploration of modifications to the release structures at Hoover and Glen Canyon Dams. *See* Castle, et al., Essential Pillars for the Post-2026 Guidelines, (April 2025). Note, however, that an engineering solution to access previously unavailable stored water would likely take many years to design and construct and is, like releases from upstream reservoirs, only a one-time fix.

[32] BUREAU OF RECLAMATION, COLORADO RIVER ACCOUNTING AND WATER USE ACCOUNTING REPORT: ARIZONA, CALIFORNIA, AND NEVADA, CALENDAR YEAR 2025 (2026).

[33] Kathryn Sorensen et al., Considerations for Assigned Water after the Expiration of the 2007 Guidelines (2026).

Scenario 2

This scenario assumes significant inflow to the system, comparable to WY2023. We evaluated this scenario with the intention of examining the degree to which the Colorado River water crisis might be averted if the coming winter is wet.[34]

Inflows

In this scenario, we assume that inflow will be the same as the natural flow at Lees Ferry in WY2023 and that there would be larger than average inflows in the Grand Canyon and from the Virgin River. Natural flows at Lees Ferry in WY2023 were the third largest of the 21st century, 17.41 MAF.[35] Measured inflows of springs and tributaries of the Grand Canyon added 0.85 MAF, 12% greater than the 21st century average.[36] Inflows from the Virgin River were 0.29 MAF, the largest measured since the gage near Overton was established in 2020.[37] Total available flow in WY2023 was **18.55 MAF**, more than twice the available flow of Scenario 1.

Consumptive Use and Reservoir Refill

We assume that consumptive uses and losses in this scenario would be the same as in WY2023. Upper Basin consumptive uses including CRSP evaporation were 4.71 MAF in CY2023.[38] In the Lower Basin, these consumptive uses were 5.98 MAF, and 1.48 MAF was delivered to Mexico.[39] We assume the same evaporation losses from Lake Mead and the same losses downstream from Hoover Dam as in Scenario 1. Thus, we assume that total consumptive uses and losses in the Basin would be **13.10 MAF** (4.71+5.98+1.48+0.41+0.52).

Surplus and Recovery

With the assumptions described above, we estimate that inflow would exceed consumptive uses and losses by at least **4.83 MAF** (18.55 - 13.10 - 0.62). In such a circumstance, active storage at the end of WY2026 would be 18.94 MAF, of which **11.05 MAF** would be RAS. This amount of storage would only support less than two years of the same continued imbalance between inflow and consumptive uses

---

[34] The National Weather Service's seasonal forecast projects a "Super El Nino" beginning in fall 2026 and continuing into winter 2027, raising hopes for a big water year. We caution, however, that there is not a significant correlation between an El Nino ENSO and natural flows at Lees Ferry. Personal communication. Written communication between E. Kuhn and M. Hoerling, April 26, 2026.

[35] U.S. BUREAU OF RECLAMATION, *Provisional Natural Flow Data, 1906-2024, based on Aug. 2024 24MS* (last visited May 31, 2026).

[36] U.S.G.S. gages at Lees Ferry and Diamond Creek, *supra* note 24.

[37] U.S.G.S. gage at Overton, *supra* note 22.

[38] U.S. BUREAU OF RECLAMATION, *supra* note 26.

[39] U.S. BUREAU OF RECLAMATION, *Colorado River Accounting and Water Use Report: Arizona, California, and Nevada*, Calendar Years 2022 and 2023, last visited May 31, 2026.

before the system would again be in the same position as it is now. The lesson is that even a relatively wet year provides merely a short reprieve from crisis if the pattern seen in the 21st century of multiple, consecutive dry years following individual wet years continues. In other words, the ratchet effect would likely endure.

POLICY IMPLICATIONS AND CONCLUSIONS

These analyses cover a range of potential hydrologic scenarios for Water Year 2027. While a substantial snowpack dividend next year is possible, prudent water supply management demands that we plan for the worst even as we hope for the best. The persistence of the 21st century water crisis demonstrates that the significant conservation efforts to date have not achieved the necessary balance between water use and natural supply. The snowpack in winter 2026 was much worse than predicted, making the task of balancing demand and supply even more difficult. This, however, is the task at hand, and the consistently low runoff experienced in the Basin during the past few years is the hydrology we must plan for.

While inflows and outflows during the next year cannot be predicted with certainty, our dry water year scenario suggests the necessity for prudent, conservative planning. We predict that, in such a scenario, there would be only about **3.63 MAF** in reasonably accessible storage in Lake Powell, Lake Mead. and Flaming Gorge Reservoir at the beginning of WY2028, with an additional six months of depletion likely before the onset of snowmelt runoff in 2028. The Colorado River reservoir system would likely crash – at least two of the three major reservoirs would likely be operating as run-of-the-river facilities. We reiterate that Reclamation's minimum probable 24-Month Study is overly optimistic with respect to projected inflows and may not be the best source of information for conservative planning.

Moreover, one wet year with current levels of consumptive use will not increase reservoir storage to provide sufficient cushion for more than a year or two, meaning it will not reverse the ratchet effect. The ongoing water supply crisis would remain. In either case, **the reservoir system no longer has supply available to sustain current levels of Colorado River system consumption.**

If the three major Colorado River Basin storage reservoirs have little to no RAS, water users will no longer derive any water supply benefit from this extensive and expensively-constructed system, intended to bring reliable water supplies and associated prosperity to the southwestern United States and Mexico. We need to take additional steps now to permanently decrease consumptive uses across the Basin and in Mexico, in light of the very real possibility of Scenario 1. Actions taken thus far do not sufficiently slow the decline in reservoir storage. Previous conservation measures, although commendable, have been inadequate to reduce uses sufficiently to respond to the low runoff predicted in Scenario 1.

Given that agriculture is responsible for more than half of the consumptive use of water in the Colorado Basin while municipal, commercial and industrial uses comprise only 18%,[40] strategies for substantially reducing agricultural water use should be a major focus of the discussion. Increased conservation actions today can immediately slow the rate of reservoir decline and create more opportunity for creative Colorado River management solutions. We urge significant reductions in consumptive uses across the entire Basin, beyond what has been accomplished to date. The political incentives to fight for the most favorable outcomes for individual states and water users must be overcome by the necessity of preventing a Colorado River system crash, the consequences of which would be devastating for those same water users. This cannot be allowed to happen.

[40] Brian Richter et al., *New water accounting reveals why the Colorado River no longer reaches the sea*, 5 COMMUNICATIONS EARTH & ENVIRONMENT 134, (2024).

Appendix - Mass Balance for Colorado River Basin Under Two Scenarios of Annual Inflow and Annual Consumptive Uses and Losses

all numbers are million acre feet (MAF)

	Active Storage	RAS
Initial Condition - Reservoir Storage		
Predicted condition: October 1, 2026 [1]		
Flaming Gorge	2.55	2.05 [2]
Lake Powell	4.77	0.54 [3]
Lake Mead	6.79	3.63 [4]
Total	**14.11**	**6.22**

Scenario 1 (inflows of WY2025; lowest historical uses in each Basin; projected Lake Mead evaporation)

Inflow (gains to system)		
Natural flow @ Lees Ferry	8.50 [5]	
inflow - Grand Canyon	0.63 [6]	
inflow - Virgin River	0.07 [7]	
Total		**9.20**
Uses and losses (outflows from system)		
Upper Basin uses and losses	3.56 [8]	
Lower Basin uses	5.85 [9]	
Lake Mead evaporation	0.41 [10]	
net conveyance losses and reservoir evaporation downstream from Hoover Dam	0.52 [11]	
deliveries to Mexico	1.45 [12]	
Total		**11.79**
Difference between inflows and outflows [i.e., Gap (-) or Surplus (+)]		**-2.59**
Reservoir storage		
Predicted final condition: October 1, 2027		
Total	**11.52**	**3.63**

Scenario 2 (inflows of WY2023; historical uses in each Basin comparable to 2023; projected Lake Mead evaporation)

Inflow (gains to system)		
Natural flow @ Lees Ferry	17.41 [13]	
inflow - Grand Canyon	0.85 [14]	
inflow - Virgin River	0.29 [15]	
Total		**18.55**
Uses and losses (outflows from system)		
Upper Basin uses and losses	4.71 [16]	
Lower Basin uses	5.98 [17]	
Lake Mead evaporation	0.41 [10]	
net conveyance losses and reservoir evaporation downstream from Hoover Dam	0.52 [11]	
deliveries to Mexico	1.48 [17]	
Total		**13.10**
Refilling of Upper Basin Reservoirs		**0.62** [18]

Difference between inflows and outflows [i.e., Gap (-) or Surplus (+)]

Total	**4.83**

Reservoir Storage

Final condition: October 1, 2027

Total	**18.94**	**11.05**

Notes

[1] Bureau of Reclamation, May 2026 Most Probable 24-Month Study <https://www.usbr.gov/uc/water/crsp/studies/24Month_05.pdf>

[2] assumes 0.50 MAF is smallest active storage acceptable to Reclamation and Upper Divisoin States, see text

[3] assumes RAS threshold is 3500 ft (4.23 MAF); Schmidt et al, September 11, 2025, Analysis of Colorado River Basin storage suggests need for immediate action. If Reclamation changes the threshhold to elevation 3510 ft (4.74 MAF), the initial Powell RAS is 0.03 MAF. <https://www.colorado.edu/center/gwc/media/670>

[4] assumes RAS threshold is 975 ft (3.16 MAF)

[5] estimate for WY2025 (J. Prairie, Chief, Upper Colorado Basin Research and Modeling Group, Bureau of Reclamation, pers. commun.)

[6] WY2025; difference between annual flow at USGS gage 09380000 and USGS gage 09404200 plus annual flow at USGS gage 09404208

[7] WY2025: annual flow at USGS gage 09419530

[8] CY2013, the lowest UB consumptive use and loss since 2000, including CRSP reservoir evaporation; USBR Provisional Consumptive Uses and Losses Reports <20251201-UpperColoradoCUL1971-2025_v24.5_MajorTribSummary-DataSummariesFigures>

[9] WY2024; calculated from monthly data Oct 2022-Sep2023, Colorado River Accounting and Water Use Report, Calendar Years 2023 and 2024

[10] predicted WY2027 evaporation, Bureau of Reclamation, May 2026 Most Probable 24-Month Study <https://www.usbr.gov/uc/water/crsp/studies/24Month_05.pdf>

[11] estimated as the difference between Hoover Dam releases in WY2024 minus total WY2024 consumptive uses of Arizona and California and total deliveries to Mexico (see footnote 12)

[12] WY2024; "total deliveries in satiisfaction of treaty requirements" plus "in excess of treaty"; calculated from monthly data Oct 2023-Sep2024, Colorado River Accounting and Water Use Report, Calendar Years 2023 and 2024

[13] WY2023; Bureau of Reclamation, Colorado River Basin Natural Flow and Salt Data, provisional, based on August 24 MS <https://www.usbr.gov/lc/region/g4000/NaturalFlow/provisional.html>

[14] WY2023; difference between annual flow at USGS gage 09380000 and USGS gage 09404200 plus annual flow at USGS gage 09404208

[15] WY2023: annual flow at USGS gage 09419530

[16] CY2023; USBR Provisional Consumptive Uses and Losses Reports <20251201-UpperColoradoCUL1971-2025_v24.5_MajorTribSummary-DataSummariesFigures>

[17] WY2023; "total deliveries in satiisfaction of treaty requirements" plus "in excess of treaty"; calculated from monthly data Oct 2022-Sep2023, Colorado River Accounting and Water Use Report, Calendar Years 2022 and 2023

[18] Change in annual storage in WY2023 at Navajo, Blue Mesa, and Fontanelle, Bureau of Reclamation, October 2023 24-Month Study