

A New Era of Cooperation

Colorado River Compact EIS Comments

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Living Document, Work in Progress, Don't Sue Me, Join Me

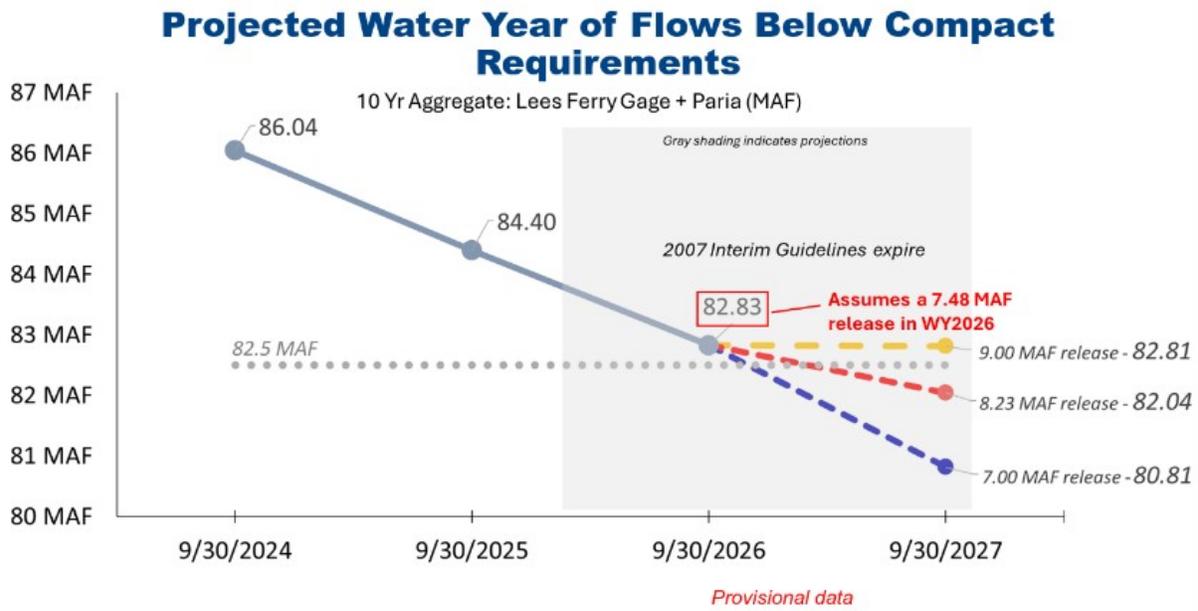


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Executive Summary

- We ask the Bureau choose No Alternative or Basic Coordination to operate the River
- In light of the LaFond 2024 memo it appear imperative the Bureau be prepared to switch to Run of the River with annualized flow matching to protect power head and infrastructure at which point releases from Powell would be based on what the River provides
- We offer a novel interpretation of how III(c) surplus/deficit is calculated that fundamentally improves and corrects the current flawed Arizona interpretation in the 2007 Interim guidelines and maybe even in Section 602 and LROC
- We propose a new Compact Compliance and Infrastructure Protection Pool(CCIPP), pronounced sip. This pool could hold stranded Upper Basin water rights like Ute Animas La Plata water and shuttered power plant water like Nucla and San Juan. This is not a lot of water but over time could be and would help protect infrastructure
- The Lower Basin seems to have hoarded 9-14 MAF of Colorado River water in aquifers which seems to run counter to III(e) since the water isn't being put to beneficial consumptive use. By taking this water from reservoirs it appears they may have contributed to the demise of Lake Powell and are pushing the Upper Basin toward compact non-compliance which seems to invoke Section 603. We ask the Bureau and Lower Basin to develop a plan to tap this water immediately to bridge the River through the looming crisis when Lake Powell goes on Run of the River.
- We proposed a number of vital accounting and forecasting improvements to help us get through the looming crisis. For the river to work the Math has to work.
- Its imperative the wall in Article III(a) between the basins be protected and that no inter basin marketing or transfers occur.
- We propose some solutions to the looming crisis for further discussion.

Colorado River Foundational Principles, What do we fight for. V0.5

- **The Colorado River system has to work.** It needs to be in balance and sustainable, **For the river to work the math has to work.** There may be difficult choices ahead to achieve that end.
- **Water is life, so is food. Without agriculture, no cities, no civilization.**
- **Valuable ecosystems are precious.** They must get enough water to thrive. Once they are lost they are hard to recover. Conversely, marginal ecosystems shouldn't use NEPA to drag down the entire system.
- **Cities must have adequate clean water** for health and safety, drinking, cooking, bathing and fire suppression. Cities need green space, parks, swimming pools and even golf courses to be livable. Conversely, finding the balance between enough outdoor water use and too much is the challenge.
- **Rural communities have value too.** Not everyone wants to live in a city. The adverse consequences of following need to be avoided.
- **The United States must retain the ability to feed itself.** In a tumultuous world, if we lose that ability, and the rest of the world chooses not to, we starve.
- **Good farm land is priceless.** The best, most productive farmland, which is at the nexus of an ideal Ag economy is **invaluable**. It must be protected and improved, not fallowed and lost. Once good farm land is lost its hard to recover.
- **Good farmers and ranchers are invaluable, especially young ones.** They must be encouraged, assisted and protected, not driven out of the life they love by an unappreciative world.
- **Water speculation must be discouraged** without compromising free markets.
- **Litigation is the last resort of the desperate.** Article VI, the non litigious, cooperative path must come first. The Upper Basin can no longer succumb to litigation threats. School yard bully rules apply. We may lose but we will fight.
- **The Upper Basin must not be sacrificed** because it can't compete with the ideal conditions in the Lower Basin. The price the Lower Basin paid to get the high dam that creates those ideal conditions was the Colorado River Compact and the obscure wall between the two basins in Article III(a):

*(a) There is hereby apportioned from the Colorado River System in perpetuity to the Upper Basin and to the Lower Basin, respectively, the **exclusive beneficial consumptive use** of 7,500,000 acre-feet of water...*

Before the high dam the Lower Colorado flooded in the spring and went dry in the Winter, the Winter agriculture which now makes the Lower Basin special wasn't there. The high dam provided the power and water that made its cities thrive. To reiterate, "The Wall" in Article iii(a) was the price and it must stand. No inter basin markets.

Disclaimer

Disclaimer: I, Ed Millard, am a knowledgeable citizen but I do not speak for Colorado or the UCRC. I do not work for the State of Colorado. I am an informal water policy advisor to Colorado Representative Larry Don Suckla who represents counties in Southwestern Colorado and have been for more than a decade. I am not a lawyer. I am not a Professional Engineer. I am concerned the current doom loop in the Colorado River will not end well for anyone. There are many legal arguments in this paper, they should in no way be treated as actual legal threats or basis for actual litigation even if they sound that way. They are provided purely to spark conversation about and better understanding of these complex issues among people who are not lawyers.

Operations, Accounting and NEPA

Colorado River System Accounting

For the river to work the math has to work.

Gila River Accounting Transparency

It is imperative USBR establish uniform transparency in water accounting under the Article II definition of the Colorado River System which includes the Gila River and its tributaries:

(a) The term "Colorado River System" means that portion of the Colorado River and its tributaries within the United States of America

With the possibility of future litigation and alteration of how the Compact works this unfortunate black hole in system accounting needs to be remedied. The Gila and its tributaries should have the same consumptive use, loss and natural flow accounting as the rest of the system. This data is essential for litigation and to understand the math.

The Math Dataset

Below is Table 1 which is a first attempt to collect all of the essential Colorado River System data, in one place to understand the math, as far back as is available. This a Foundational Principle. The table is not verified, it is a daunting task to verify it, make it easier to understand and finish. Ideally USBR can take over this role so there is a trusted standard dataset where we can all go to get this data in an easily accessible

way without having to write all this code or collect it ourselves. We all need to understand the math, this is a way to do that.

Table 1 - The Math

The data below is not validated. Treat it as a straw man for an essential data set we all need to understand the math of this system. This data comes from multiple disparate sources. It was very hard to assemble and will be hard to validate. Do not trust it or use it in anything important, at least yet.

This data is a work in progress. It is a living document. Always use the latest version of the spreadsheet found here:

https://www.varuna.io/LOTR/Colorado_River_Math.xlsx

Some data, USBR RISE and USGS, are still on Water Year, Oct 1. Everything has to migrate to Calendar year to match the Compact accounting standard

The Bureau doesn't provide up to date provisional data for Natural Flow at the border which is needed for III(c) calculations below. This goes only to 2020, we have to use the Lee's Ferry provisional natural flow after that which is inherently low.

Year	Natural Lees	Natural Border	NV	AZ	CA	Lower Basin	Mexico	Mead Evaporat	Hoover Release	Hv-Mx	Diff 7.5	Hoover USGS	Diamond Creek	Mead	Powell	Powell Evaporat	Glen Canyon	Lees Ferry	Inflow	Inflow Unregul	Upper Basin	CO	UT	WY	NM	AZ_
1964	10.41	10.70	0.03	1.13	5.06	6.22				0.00	-7.50	8.23		11.62	4.10	0.07	2.41	2.41	6.65	7.49						
1965	19.42	20.84	0.02	1.01	4.90	5.93	1.50			-1.50	-9.00	7.92		14.71	6.26	0.17	10.82	10.82	13.70	15.05						
1966	10.16	11.23	0.03	1.07	5.10	6.20	1.50		7.78	6.28	-1.22	7.77		15.00	6.22	0.22	7.85	7.85	8.55	8.69						
1967	11.51	12.29	0.03	1.04	4.89	5.96	1.50		7.93	6.43	-1.07	7.83		14.38	6.16	0.19	7.80	7.80	8.25	8.98						
1968	13.65	14.39	0.03	1.10	5.07	6.20	1.50		7.84	6.34	-1.16	7.83		15.02	7.27	0.21	8.33	8.33	9.93	10.32						
1969	14.92	15.89	0.04	1.14	4.90	6.07	1.50		7.89	6.39	-1.11	7.99		16.13	9.39	0.27	8.82	8.82	11.51	11.52						
1970	14.95	15.63	0.04	1.20	5.02	6.25	1.50		8.02	6.52	-0.98	7.89		16.77	11.65	0.32	8.67	8.67	11.76	11.99						
1971	14.90	15.35	0.05	1.30	5.17	6.52	1.50		8.16	6.66	-0.84	8.22		16.89	13.17	0.38	8.59	8.59	11.04	11.80	3.66	1.85	0.77	0.37	0.19	0.01
1972	13.11	13.59	0.08	1.20	5.23	6.51	1.50		8.10	6.60	-0.90	8.27		17.45	12.09	0.39	9.31	9.31	8.80	9.33	3.74	1.91	0.79	0.36	0.20	0.01
1973	18.04	19.18	0.09	1.27	5.32	6.68	1.50		8.30	6.80	-0.70	7.94		20.18	16.74	0.42	10.11	10.11	15.40	15.97	3.64	1.66	0.77	0.35	0.31	0.01
1974	12.91	13.22	0.09	1.33	5.41	6.83	1.50		8.73	7.23	-0.27	8.85		19.36	17.44	0.52	8.27	8.27	9.99	9.97	4.06	2.00	0.81	0.42	0.20	0.02
1975	16.49	16.79	0.07	1.36	4.98	6.41	1.50		8.37	6.87	-0.63	8.37		20.15	19.58	0.54	9.26	9.26	12.37	13.10	3.89	1.93	0.67	0.33	0.29	0.02
1976	11.07	11.60	0.07	1.25	4.71	6.03	1.50		7.93	6.43	-1.07	8.32		20.06	19.03	0.56	8.48	8.48	8.71	8.43	3.75	1.79	0.66	0.32	0.29	0.03
1977	5.46	5.94	0.07	1.23	5.10	6.40	1.50		7.87	6.37	-1.13	7.56		20.20	15.62	0.51	8.26	8.26	5.48	3.53	3.12	1.67	0.41	0.23	0.22	0.03
1978	15.12	16.32	0.07	1.23	4.50	5.81	1.50		7.48	5.98	-1.52	7.68		20.87	16.03	0.47	8.35	8.35	9.45	11.06	4.00	2.04	0.70	0.36	0.32	0.03
1979	17.38	18.92	0.06	1.15	4.79	6.00	1.70		7.72	6.02	-1.48	7.39		22.24	20.99	0.54	8.30	8.30	14.20	14.19	4.07	1.87	0.75	0.36	0.42	0.03
1980	17.40	19.15	0.09	1.22	4.73	6.04	1.70		11.09	9.39	1.89	9.96		23.64	22.42	0.63	10.91	10.91	12.85	13.68	4.10	1.85	0.71	0.36	0.42	0.04
1981	8.96	9.64	0.11	1.42	4.80	6.32	1.70		8.28	6.58	-0.92	9.83		21.87	20.12	0.61	8.30	8.30	6.41	5.64	4.12	2.12	0.65	0.35	0.28	0.04
1982	17.27	18.12	0.10	1.24	4.30	5.64	1.50		7.45	5.95	-1.55	7.39		22.77	22.34	0.60	8.30	8.30	11.31	12.77	4.16	2.06	0.62	0.34	0.41	0.04
1983	23.57	24.84	0.09	1.06	4.25	5.39	1.70		19.07	17.37	9.87	14.75		25.66	24.14	0.67	17.49	17.49	20.11	20.37	4.09	1.92	0.59	0.35	0.41	0.04
1984	24.35	25.46	0.10	1.12	4.68	5.89	1.70		21.41	19.71	12.21	22.21		24.41	23.67	0.66	20.50	20.50	20.65	20.85	3.99	1.87	0.63	0.32	0.38	0.04
1985	21.04	21.98	0.10	1.19	4.78	6.07	1.70	0.91	17.21	15.51	8.01	18.63		24.88	22.10	0.65	19.09	19.09	18.04	17.52	4.26	2.00	0.75	0.35	0.38	0.05
1986	22.98	23.36	0.11	1.36	4.80	6.27	1.70	0.88	17.55	15.85	8.35	17.21		24.22	22.70	0.65	16.85	16.85	18.14	18.55	4.23	1.81	0.73	0.47	0.44	0.04
1987	15.34	16.37	0.11	1.73	4.89	6.73	1.70	0.85	11.33	9.63	2.13	13.14		24.36	22.44	0.65	13.43	13.43	13.80	13.38	4.29	1.89	0.77	0.47	0.38	0.04
1988	11.21	12.16	0.13	1.92	5.04	7.09	1.70	0.87	9.42	7.72	0.22	9.69		22.80	22.09	0.64	8.14	8.14	8.40	7.99	4.70	2.28	0.75	0.56	0.35	0.04
1989	9.51	10.20	0.16	2.23	5.14	7.53	1.50	0.85	9.23	7.73	0.23	9.03		21.53	19.18	0.59	8.01	7.98	5.47	5.94	4.71	2.40	0.76	0.47	0.38	0.04
1990	9.37	9.97	0.18	2.26	5.22	7.66	1.50	0.78	9.20	7.70	0.20	9.26		20.14	15.72	0.51	8.14	8.14	4.91	5.31	4.41	2.10	0.80	0.52	0.39	0.04
1991	12.33	13.09	0.18	1.86	5.01	7.05	1.50	0.74	8.95	7.45	-0.05	8.96		19.23	14.70	0.45	8.12	8.12	7.47	8.80	4.17	1.87	0.86	0.55	0.33	0.03
1992	10.96	12.23	0.18	1.91	4.55	6.63	1.50	0.69	7.83	6.33	-1.17	8.01		19.42	14.08	0.43	8.00	8.00	7.77	7.35	3.86	1.66	0.82	0.54	0.29	0.04
1993	18.82	21.36	0.20	2.25	4.74	7.19	1.50	0.78	7.44	5.94	-1.56	7.01		21.38	18.82	0.49	8.10	8.10	13.71	14.44	4.12	1.79	0.86	0.50	0.33	0.04
1994	10.62	11.06	0.23	2.15	5.17	7.55	1.50	0.79	9.35	7.85	0.35	9.41		19.93	17.77	0.53	8.29	8.29	7.69	6.79	4.45	2.00	0.87	0.61	0.31	0.04
1995	19.92	21.33	0.22	2.22	4.93	7.36	1.50	0.78	8.54	7.04	-0.46	8.75		20.71	22.31	0.57	9.22	9.22	14.70	15.91	3.96	1.65	0.84	0.43	0.33	0.04
1996	14.23	14.55	0.25	2.71	5.32	8.29	1.50	0.84	9.97	8.47	0.97	10.08		21.61	21.15	0.62	11.52	11.52	10.89	10.40	4.48	1.87	0.92	0.65	0.31	0.03
1997	21.66	22.04	0.24	2.85	5.25	8.35	1.70	0.87	11.67	9.97	2.47	11.16		23.77	22.80	0.62	13.82	13.85	16.22	17.05	4.05	1.60	0.78	0.55	0.37	0.03
1998	16.69	17.41	0.25	2.57	5.05	7.86	1.70	0.86	12.77	11.07	3.57	11.97		25.13	22.40	0.64	13.51	13.42	13.72	13.52	4.21	1.77	0.82	0.50	0.36	0.04
1999	15.87	16.38	0.29	2.73	5.19	8.21	1.70	0.89	11.03	9.33	1.83	11.40		24.59	23.00	0.64	11.20	11.41	12.48	12.80	4.49	1.79	0.93	0.65	0.36	0.04
2000	10.55	10.81	0.32	2.80	5.16	8.29	1.70	0.88	10.69	8.99	1.49	10.98		22.44	20.94	0.62	9.38	9.52	7.77	6.94	4.78	2.18	0.97	0.60	0.30	0.04
2001	10.74	11.17	0.32	2.84	5.25	8.41	1.50	0.84	10.21	8.71	1.21	10.49		19.87	19.13	0.57	8.24	8.34	6.86	6.99	4.94	2.21	1.04	0.65	0.37	0.04
2002	6.09	6.21	0.33	2.97	5.37	8.66	1.50	0.74	10.45	8.95	1.45	10.57		17.09	14.47	0.48	8.23	8.34	3.67	2.64	3.99	1.82	0.80	0.52	0.28	0.04
2003	10.63	10.90	0.30	2.83	4.41	7.54	1.50	0.68	9.38	7.88	0.38	9.45		15.62	12.11	0.39	8.23	8.36	6.07	6.16	4.27	1.97	0.89	0.57	0.35	0.04
2004	10.07	10.63	0.28	2.78	4.32	7.38	1.50	0.64	9.34	7.84	0.34	9.64		13.94	9.17	0.32	8.23	8.34	5.38	5.91	3.94	1.81	0.85	0.49	0.37	0.04
2005	16.89	18.82	0.29	2.43	4.34	7.06	1.50	0.66	8.27	6.77	-0.73	7.94		15.22	11.94	0.32	8.23	8.36	11.55	12.79	4.34	1.82	1.00	0.61	0.44	0.04
2006	13.50	13.72	0.29	2.78	4.34	7.41	1.50	0.64	9.26	7.76	0.26	9.39		13.89	11.92	0.36	8.23	8.49	8.57	8.63	4.23	1.94	0.84	0.60	0.37	0.04
2007	11.45	11.72	0.30	2.78	4.37	7.45	1.50	0.60	9.36	7.86	0.36	9.45	9.20	12.50	11.93	0.37	8.23	8.40	8.62	8.75	4.47	2.03	0.95	0.60	0.40	0.04
2008	16.00	16.51	0.27	2.75	4.50	7.52	1.50	0.58	9.55	8.05	0.55	9.53	10.06	12.01	14.51	0.40	8.98	9.16	12.16	12.09	4.49	2.09	0.85	0.59	0.43	0.03
2009	14.09	14.29	0.25	2.83	4.36	7.44	1.50	0.55	9.48	7.98	0.48	9.21	9.30	10.93	15.46	0.44	8.24	8.40	9.70	10.22	4.47	2.06	0.89	0.53	0.42	0.04
2010	12.71	13.53	0.24	2.78	4.35	7.37	1.50	0.54	9.45	7.95	0.45	9.26	9.48	10.09	15.27	0.44	8.23	8.42	8.47	8.43	4.40	1.83	0.95	0.68	0.37	0.03
2011	20.26	20.85	0.22	2.78	4.31	7.32	1.45	0.58	9.21	7.76	0.26	9.80	13.47	12.98	17.59	0.47	12.52	12.73	15.50	15.97	4.44	2.03	0.85	0.56	0.39	0.03
2012	7.89	8.34	0.24	2.79	4.42	7.44	1.37	0.61	9.39	8.02	0.52	9.42	10.30	13.13	13.93	0.45	9.47	9.53	5.96	4.91	4.62	2.16	0.92	0.61	0.39	0.03
2013	9.73	10.30	0.22	2.78	4.48	7.48	1.37	0.58	9.38	8.00	0.50	9.04	9.20	12.36	10.93	0.36	8.23	8.26	5.36	5.12	3.56	1.51	0.77			

Lower Basin Annual Report Accessibility

Ideally the Bureau should make all of its Lower Basin Annual Report data back to 1964 available in a similar machine accessible way, spreadsheets or CSV files. We've made a first attempt at this. Its pretty good but needs more verification and hasn't been updated since 2022. It would be better if the USBR provide this data as a standard, trusted service, not necessarily in this format, maybe you already have it, couldn't find it. Volunteers are welcome. I've been busy :)

[Riverwar Lower Basin Annual Report CSV data](#)

You need a special Python function to read these somewhat non standard CSV files, we need to fix this. The code is on github, it needs a lot of work to be usable by others. A user interface either by web or a cross platform app is needed to visualize and make this data more accessible to non programmers. There is some cross platform desktop code here used on another project.

CRBFC Lake Powell Inflow Forecasts

With the increasingly dire state of Lake Powell infrastructure described below its imperative that Inflow forecasts be the best they can be. The margins are very thin protecting power head and maintaining Run of the River. Excessively optimistic forecasts could lead to releasing water that would be critical to infrastructure protection.

To this end we ask the Bureau establish a small, independent panel, to evaluate the performance of all relevant models at the end of runoff each year and rate them so we have a guide to which model to trust the most the following year. There may be different models which excel at drought years vs normal years so it may not be simple. Some models may only be available or excel in some sub-basins.

At the recent ASO seminar we were alarmed to hear that CRBFC was abandoning any effort to use ASO snow pack data in their model. We are aware there have been structural problems making this difficult. In basins where this data is available it would seem essential to better informing these critical forecasts.

We ask this panel to determine a way to either successfully integrate this data in the CRBFC model or to integrate ASO WRF-Hydro, or any other successful model, in the Powell inflow forecast. It might worth considering having a defined API under which any very successful model be integrated in this forecast, but this has to be done very carefully to preserves the forecasts integrity and avoid chaos.

The Bureau needs to identify, reward, use and promote models which excel and incentivize everyone to step up their game in these increasingly desperate times. Best

performing models need to be integrated into the critical forecast. Consideration should be given to creating financial incentives for the best Modelers to compete for and win this coveted role.

Run-of-the-River Operations at Glen Canyon Dam

Objective 1: Lake Powell had real value to the Upper Basin in the 80's and 90's when there were surplus inflows stored there. Those days are over. Rather than appreciating and cherishing that precious reserve Arizona took it for granted. They used litigation threats and gaming to abuse it. Since 2007 it's become a liability to the Upper Basin as the Lower Basin drained it to mitigate a problem, the structural deficit, entirely of their making. Since Lake Powell is now being used to squeeze the Upper Basin for water instead of protect us it may be time to let it go.

Objective 2: The 2007 Interim Guidelines are "Interim" for a reason. When they were signed the Upper Basin knew they would fail, they wouldn't fix anything. They agreed to them only because threatened litigation was worse. Despite the Bureau's claims to the contrary, and in absence of a seven states compromise, we are relatively certain the only path forward is to revert to the Long Range Operating Criteria backed by Run of the River to protect the power head and turbines in Lake Powell, and this is OK. The Bureau has no authority to impose an arbitrary new alternative on the seven states though they do have the authority to protect their infrastructure and endangered fish.

Objective 3: We hope to counter inflammatory rhetoric, terms like "crashed river", "dancing with dead pool" and "turbines will stop turning" being used to pressure and rush stakeholders, like those of us in Colorado, into accepting deep cuts in our Compact water use. With Run of the River the river will instead be OK, not great, risky yes, but OK if managed carefully, very carefully.

As outlined in this 2024 Technical Memo the Bureau can not risk using bypass tubes to operate the Colorado River below Glen Canyon if they lose the power head at 3490'.

[Establishment of Interim Operating Guidance for Glen Canyon Dam](#)

Richard LaFond

Date: 2024.03.27

Director, Technical Service Center

The following page has the essential conclusions.

If water levels in Glen Canyon Dam drop below elevation 3,490 ft, releases can only pass through the river outlet works. Operation of the river outlet works at or below elevation 3,490 ft must consider the following risks and consequences:

- Safe operation of the river outlet works is controlled by submergence and discharge velocity. The original rating curves indicate that this is only possible down to elevation 3,394 ft (20 ft above the river outlet intake centerline elevation).
- If any portion of the river outlet works were to fail, releases would be limited or unavailable through that individual conduit until repairs are complete. Potential points of failure include:
 - Hollow-jet valve failure, which could include the physical valve, or any equipment required for operation of the valves.
 - Ring follower gate failure, which could include the physical gate, or any equipment required for operation of the gates.
 - Lining or conduit damage so severe the structural integrity of the conduit becomes a concern, and it is decided to close the ring follower gate to prevent further damage.
 - Intake trashrack blockage.
- Long term operation of the river outlet works will result in accelerating regular operation and maintenance tasks. This is perhaps accelerated even more so if the interim maximum flows shown in Table 1 are exceeded. These tasks include lining repairs and hollow-jet valve maintenance. During these times, discharge capacity will be reduced to only the available conduits.
- Operation of the river outlet works without powerplant releases will redistribute existing tailrace sediment, gravel and cobbles causing the size of an existing sediment-deposit to grow and potentially impound the powerplant draft tubes.
 - To prevent sediment from entering the draft tubes, bulkheads should be installed prior to releases through only the river outlet works.
 - Sediment that deposits against the draft tube bulkheads will need to be removed prior to lifting the bulkheads back into their storage positions.

In summary, at reservoir levels below the minimum power pool (elevation 3,490 ft), there are concerns with relying on the river outlet works as the sole means of sustained water releases from Glen Canyon Dam. If the situation were to occur, additional operational limits would be determined based on water needs at that time relative to the need to protect the conduits against cavitation damage and minimize stress placed on the hollow jet valves. Given the current uncertainty associated with long-term performance of the river outlet conduits and components, and tailrace scour and sedimentation deposit, it is recommended that Reclamation not rely on the river outlet works as the sole means for releasing water from Glen Canyon Dam as would be required at reservoir levels below the minimum power pool, elevation 3,490 ft.

The Bureau already has authority, in fact an obligation, to protect their infrastructure and endangered fish. Therefore, before Lake Powell loses its power head the Bureau needs to set a power head elevation they are going to defend, possibly 3510', 3500' is risky.

Reservoir coordination with Lake Mead and releases called for in whatever guidelines are in force will end and the Bureau will switch to Run of the River (ROTR), flow matching on an annualized basis:

$$\text{Outflow} = \text{Inflow} - \text{Losses}$$

Glen Canyon will be generating power and revenue though output will be limited by the low power head. This is better than the alternative, no power.

Fish have flows so their bellies aren't on the bottom of the river :) Fish experts like Jack Schmidt will need to weigh in on this flow regime. If bypass tubes are used and they fail after loss of power head flows could be lost in the Grand Canyon imperiling endangered fish. This is bad.

In Glen Canyon, at low head, I think one turbine needs 1,600–2,300 cfs (per Reclamation estimates). This equates to roughly 1.2–1.7 MAF. Another common figure used is a conservative 2.3 MAF for one year's operation. As spring runoff winds down the Bureau must insure there will be enough water in the lake to reach the start of the next Spring runoff. The great people at the Bureau can work out these details.

They would hopefully be running 2 or 3 turbines, they can turn a turbine off and on to fine tune the target

The river can run like this indefinitely if Bureau ops people are careful. Hopefully there will be no catastrophic crisis which is key here.

When Powell is in ROTR coordination will be significantly restricted and the two basins will be somewhat decoupled. As long as the Lower Basin can't use Lake Mead elevations to draw down Lake Powell, there is nothing to draw, what the Bureau and the Lower Basin do regarding shortages and assigned water becomes irrelevant to the Upper Basin.

If snow pack improves you can easily revert to guideline releases. Then the basins would recouple and coordination would matter again.

ROTR is included in one DEIS alternative, Maximum Flexibility submitted by the NGO's. It predictably performs much better protecting critical elevation than the others. In extreme traces like the one we are in this year critical elevation can still be breached if the next year's spring runoff is less than the minimum to operate one turbine.

It is highly desirable that initial units like Flaming Gorge retain as much usable water as possible so that, in event of a catastrophic inflow year like the current one, power head can be maintained in Lake Powell. This can be justified by protection of infrastructure under coordinated operations.

Compact Compliance Infrastructure Protection Pool (CCIPP)

Three circumstances require establishment of a new pool in Lake Powell immediately, with or without Seven States agreement. This is a kind of gap water but actually real. Its pronounced “sip”:

Compact Compliance Pool Infrastructure Protection Pool

- It is imperative power head be protected at elevation 3510’ in light of the USBR LaFond 2024 memo. Bypass tubes can not safely run the river. A pool buffering this elevation is required. A safety margin is needed if extended Run of The River operations are required. USBR should really like this pool right now.
- The Upper Basin has significant established water rights that must be used “exclusively” in the Upper Basin as defined in Article III(a). These include Winters tribal water rights, in particular the two Ute Tribes in Colorado in Animas La Plata totaling about 32,000 AF/year, and water rights for power plants that have been or will be retired. This water is going to the Lower Basin for free which is inappropriate under III(a) for an established Upper Basin water right,
- Its imperative the Upper Basin have more control over the timing of releases of water under established Upper Basin water rights from Lake Powell to better balance infrastructure protection and compact compliance under Article III(d) and the 10 year 7.5 MAF moving average. Examples of problematic Arizona behavior in this area were litigation threats to increase releases from Lake Powell to 9 MAF, and documented manipulation of releases of Lake Powell by the Lower Basin under those terms which are pushing the Upper Basin toward compact noncompliance right now contrary to Section 603 in the [1968 Colorado River Basin Project Act](#).

A brief summary of this stranded gap water:

32,000 AFY Animas La Plata Settled Tribal Winters water rights
5,000 AFY Nucla
8,000 AFY San Juan
45,000 AFY Subtotal
30,000 AFY Navajo
75,000 AFY Subtotal
31,000 AFY Pending, don’t count on it
106,000 AFY Total, don’t count on the last 31,000

It should be made clear we are not proposing to withhold this water from the Lower Basin so it is not an Article III(e) problem. As John Entsminger famously said at CRWUA, "[Gravity Works](#)". Once this water is in Lake Powell its going to them, all we are asking is to control when because its an Upper Basin water right and its our prerogative.

Creation of this pool has many perils which must be prevented:

- The consumptive use required under III(a) is Powell evaporation, IANAL.
- Under no circumstances can water from this pool be sold to the Lower Basin or to USBR acting in its role as Lower Basin Water Master. This would be an Article III(a) violation and compromise The Wall. The Wall can not be compromised by this pool
- Under no circumstances can this pool support or encourage speculation, its a Foundational Principal.
- Water rights which can participate in this pool must be carefully restricted to Ute ALP water and stranded power plant water for now. It cant become a destination for buy and dried Ag water
- Constraints must be developed on when this water is released from Lake Powell. Presumably it would ONLY be when there is a legally recognized compact compliance call. UCRC would be first entity to proposed this, probably in consultation with the involved state and the water rights holder
- Careful consideration has to be given to how this water right can be monetized by the rights holder. Most probably this would involve sale of the water release to an entity seeking compact compliance protection, like a city with junior water rights... BUT ONLY IN THE UPPER BASIN. The water would be released to offset their curtailment obligation. Again this can not be allowed to be a buy and dry mechanism for Ag so the water rights eligible have to be closely controlled.

Power Water Stranded and Potentially Stranded

This needs verification before use in decision making:

The cumulative water associated with the shuttered and scheduled-to-shut-down coal-fired power plants in the Upper Colorado River Basin states (Colorado, New Mexico, Utah, and Wyoming) that use Colorado River Basin sources totals approximately 55,000–65,000 acre-feet per year (AF/yr) in consumptive use (primarily evaporative losses for cooling) when all retirements are completed. This estimate aggregates the primary operational water rights or average annual consumptive volumes directly tied to these facilities, based on U.S. Bureau of Reclamation Consumptive Uses and Losses

reports, U.S. Energy Information Administration data, utility filings, and analyses from sources such as the Energy and Policy Institute and Western Resource Advocates (historical averages 1991–2018 place Upper Basin thermal power consumptive use at ~144,000–162,000 AF/yr overall, with coal plants dominating).

These savings represent a potential “water dividend” for the basin upon full retirement, though actual reallocation depends on state water law (prior appropriation), utility retention of rights (e.g., for future uses like hydrogen production or to avoid abandonment), and any transfers, leases, or instream flow protections. Volumes reflect average annual consumptive use or decreed entitlements attributable to plant operations; diversion may be higher with return flows.

Shuttered Plants (Already Ceased Using Water):

- **Nucla Station** (Colorado, San Miguel River tributary): Shuttered 2019; **~4,000–5,000 AF/yr**.
- **San Juan Generating Station** (New Mexico, San Juan River): Fully shuttered 2022; **~8,000 AF/yr** (with portions for associated uses).

Subtotal for shuttered plants: **~12,000–13,000 AF/yr** (already realized savings).

Navajo Generating Station, now shuttered in Arizona had 34,100 acre-feet under long-term contractual consumptive use allocation approved in 1968 by the Navajo Tribal Council, it used about 20,000-28,000 af in practice. Its not clear if Arizona would put this water in the CCIPP though.

Scheduled Shutdowns (Water Use to Cease Upon Retirement):

- **Craig Generating Station** (Colorado, Yampa River tributary): Units 1 (delayed potentially to post-March 2026), 2 (2028), and 3 (2029); full by late 2028–2029; **~16,000–16,400 AF/yr** (e.g., ~7,394–8,400 AF in recent filings; collective Craig/Hayden rights ~19,000–21,000 AF/yr).
- **Hayden Generating Station** (Colorado, Yampa River tributary): Unit 2 (2027), Unit 1 (2028); **~4,400–5,000 AF/yr**.
- **Four Corners Generating Station** (New Mexico, San Juan River): Full retirement no later than 2038 (potentially extended); **~17,000–24,000 AF/yr** (2020 average ~17,000 AF consumptive; up to ~27,000 AF diversion makeup).
- **Bonanza Power Plant** (Utah, Green River): ~2030; ~6,700–7,600 AF/yr (average ~6,672 AF consumptive; primary right ~7,600 AF/yr).

Subtotal for scheduled plants: **~44,000–53,000 AF/yr** (phased realization, with most by

2030–2038; subject to delays from reliability needs or federal orders).

Grand Total Upon Full Shutdown of Listed Plants

Approximately **55,000–65,000 AF/yr** in aggregate consumptive use freed up (shuttered + scheduled).

This excludes plants like Jim Bridger (Wyoming, Green River; **~25,000–33,000 AF/yr** when coal-active) where coal retirements have been canceled or converted to gas (reducing but not eliminating water needs) and no firm full-shutdown date exists.

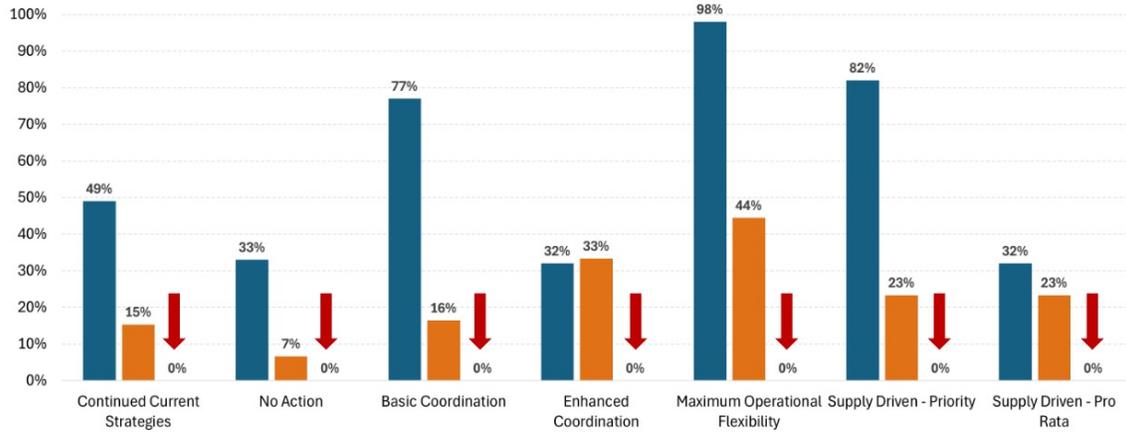
Key considerations:

- Historical Upper Basin coal/thermal averages (**~162,000 AF/yr peak**) suggest broader retirements could yield more, but not all plants use Colorado River Basin sources, and some rights may persist.
- Post-closure, water often remains available for reallocation (e.g., discussions for Yampa River instream flows or green hydrogen), but no widespread permanent abandonment has occurred.
- Closure Schedules face uncertainty from demand growth (AI data centers), federal interventions, and economics. Volumes are estimates from operational data, not fixed decrees in all cases.

Our Alternatives

We are concerned USBR might be using this process to make choices illustrated below for the states they shouldn't be making. Please stick to LROC with ROTR and the new Infrastructure Protection Pool. The seven states have to get back to work under Article VI, non litigious cooperation. We ask any operating plan operate only on a year to year basis, until Seven States cooperation is reestablished in a new era.

Maximum Policy Shortage in Each Basin for each Alternative



27

■ CAP ■ Lower Basin ■ Upper Basin

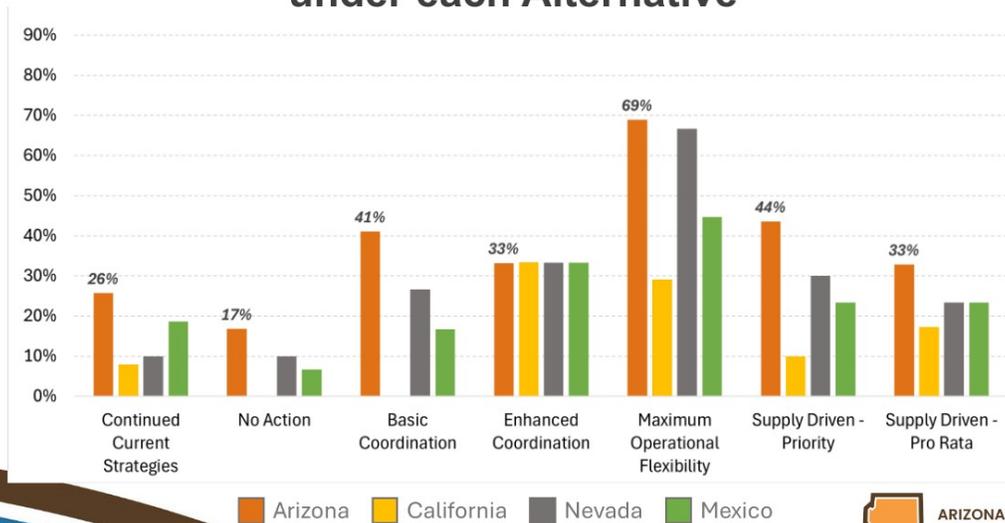
ARC Meeting #12 February 2, 2026



ARIZONA
RECONSULTATION
COMMITTEE

Preliminary analysis; subject to change

Maximum Policy Shortage to Lower Basin under each Alternative



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ARC Meeting #12 February 2, 2026



Preliminary analysis; subject to change

A New Era of Cooperation

The Salton Sea Problem

In 1904 the Salton trough was a dry lake more than 200 ft below sea level. In spring 1905, an engineering mishap led to a major breach of the River's bank that wasn't closed until February 1907. The breach filled the Salton Sea with 15 MAF of water.

The Sea may now be evaporating 1.3 MAF of Colorado River water a year, we are working to find this data. That's as much as Lake Mead and Lake Powell combined, this is not sustainable with today's Colorado River. It's math.

Waste water, mostly from Imperial Irrigation District and Coachella sustained the sea until recently. Its an IV in the arm of a sick patient. The 2018 DCP and Demand Management have broken this equilibrium . Now about 1 MAF of waste water from IID, Coachella and Mexico enter the sea so there is a 300,000 AF deficit every year. It is shrinking and as it shrinks salinity increases.

Irrigation waste water may put 5 unit trains of salt into the sea each week. The sea has no outlet so it will never leave.

We think the Sea is a dead man walking. It will inevitably go hyper saline and die on the current trajectory. Jenny Ross is a top scientist on the Sea. These are her EIS

comments in first round. She seems to affirm the Sea is dying and wants to save it, we wish here well.

Bur, we all face a difficult choice that must be made immediately:

- California and the U.S. must embark on a very expensive and extremely difficult project to save the Sea in an artificial way by importing ocean water into the sea, most probably with additional expensive measures to balance salinity. A Sea to Sea pipeline from the Gulf of California is the leading but not only possibility. This must be done quickly and affordably which is a near impossibility with Mexico and California.
- We let the Sea follow its natural cycle and die. The sea needs to return to either a dry lake bed or a much smaller sea where inflows and evaporation are in balance. Salinity would still be a continuing problem in the latter. Dust will be a major problem and must be mitigated. A dry lake bed is natural so it must be possible, but out of scope here. If Jenny and others can design a smaller, sustainable ecosystem, a new Garden of Eden, that would be ideal under Foundational Principles.

It is not our place to influence this choice. But... to bring the River back into balance the math has to work, a Foundational Principal. To make the math work the River can no longer waste water into the Sea. There is an old saying, "You rob banks because that's where the money is". In this case we look to Imperial Valley only because that is where the water is. In much of the rest of the basin, not all, return flows return to the River for reuse. In Imperial 1 MAF of return flows are being lost because it is a trans basin diversion.

We do not want to "rob" this bank. Imperial agriculture is a precious national resource. We not only want to preserve it but make it better, its a Foundational Principal.

The objective is to recover this:

- Tail water is water flowing off the surface of the fields, it is nearly the same as Colorado River water
- Tile water is very saline which flows through the soil and comes out underneath

These are some ways to recover this tail water through improved farming practices which have been done in Mexico and Yuma:

- Irrigation tape, which requires money and pressure which can be challenging

- Pressure requires pumps with an extensive electrical system, or piping water if there is sufficient drop. Pumps are a continuing expense, pressurized pipe are a big up front expense
- Laser leveling of fields requires money and skilled irrigators or someone needs to devise an automated way to time flood irrigation.

I'm told, but have not verified, that efficiency improvements like this are being blocked by NEPA because they would further reduce flows into the Sea accelerating its demise. If so, I'm not sure it is, it is contrary to a Foundational Principal.

A key goal, a Foundational Principle, is to use efficiency improvements to decrease the need to fallow IID, and waste money on this flawed practice. Hopefully these difficult tasks can better equip IID for the new, challenging, shortage dominated world.

Environmentalists will obviously and rightly be devastated by the loss of habitat from letting the Sea die. It is a foundational principal to preserve viable ecosystems but not use NEPA to save marginal or dying ones.

To offset their loss, and align with Foundational Principal, We propose redirecting 100,000 AF or more of the saved tile water to the now dry Colorado River Delta. The Delta **could bloom like Cienega is blooming, home for birds and fish**. It is a worthy goal to finally fix the righteous demands for more water from Audubon. **Abandon a doomed ecosystem and save a viable one.**

The Delta has an outlet to dispose of IID's salt which is key here, it is sustainable where the Sea is not.

This would require at least 80 miles of HDPE pipe and a 200' lift of the water so substantial pumps and electricity. Expensive, and not easy but possible. IID generates a lot of power so would be ideal for this. Funding pumping costs is an issue.

Lower Basin Aquifer Utilization

Lower Basin States have at least 9 MAF of Colorado River water in underground aquifers for long storage rather than beneficial consumptive use as required by Article iii(e), drawing down reservoirs and pushing us into this crisis. Kathryn Sorenson in a recent talk at UWI said its as much as 14 MAF. The accounting is so complex we aren't sure of the number, but maybe a full year of Lower Basin supply. We request the Lower Basin and USBR immediately develop a plan to rapidly draw down these reserves in the coming year to bridge the system through this crisis. If this water was banked for a

rainy day, or a drought, it would seem this would be it. Putting this water back in the system, protecting power head in both Lake Mead and Lake Powell, and waiving compact noncompliance action on the Upper Basin would seem like the only appropriate way to make amends for this dubious practice.

There are legitimate concerns that this hoarding of system water rather than putting it to prompt beneficial use runs counter to Article III(e) and when it pushes the Upper Basin towards compact non compliance, which it has, it may be contrary to Section 603 in the CRBPA.

Fire Deficit In Our Forests

This is primarily and Upper Basin initiative but funding could come from any where. This proposal is not ready for discussion at this time. It is well known that aggressive historical USFS fire suppression in our forest and reduced forest harvesting have created imbalances in our forests are almost certainly adversely affecting runoff and contributing to this crisis.

Upper Basin Irrigation Efficiency

This is primarily and Upper Basin initiative but funding could come from any where. This is intended to match Lower Basin initiatives but is much more difficult. This proposal is not ready for discussion at this time

Desalination

Many have died on this hill but it remains in consideration.

Litigation Issues Which Directly Impact Current Operations

These issues may be a matter of litigation but they in fact have to be resolved to have an even a minimally functional operating plan for this system which complies with the actual terms of the Compact and the 1968 CRBPA, so is relevant to this EIS process.

Section 603

Objective: Based on Arizona's misinterpretation of Article III(c) and the Eric Kuhn et al "Tripwire" paper there is a plausible case for Colorado to invoke Section 603, Federal law in the 1968 CRBPA that authorized CAP

A credible legal argument can be made that this sequence:

- the 2007 Interim Guidelines' treatment of Compact Article III(c)
- CAP's exploitation of the operational "sweet spot,"
- the resulting 9 MAF Powell releases in 2015–2019
- the subsequent drop to ~7.5–8.23 MAF releases today

has prejudiced Upper Basin rights in violation of Section 603(a) of the 1968 Colorado River Basin Project Act (CRBPA), especially if it forces Upper Basin curtailment.

[Section 603\(a\), CRBPA \(Pub. L. 90-537, 82 Stat. 885, 901\):](#)

"Rights of the upper basin to the consumptive use of water available to that basin from the Colorado River system under the Colorado River Compact shall not be reduced or prejudiced by any use of such water in the lower basin."

This provision was a key Upper Basin protection inserted in 1968 to safeguard against Lower Basin development (especially the then-new CAP) impairing Upper Basin Compact rights.

On the last page of the Tripwire Paper (Eric Kuhn & John Fleck, 2025-ish draft):

[The 1922 Compact is Now the Obvious Elephant in the Negotiating Room](#)

It concludes that the system is on track to breach the "tripwire" (10-year Lee Ferry flow < 82.5 MAF) soon unless unusually wet years occur. High releases (9 MAF 2015–2019)

created a temporary bubble in the moving average, but as those years roll off and are replaced by lower releases (e.g., 8.23 MAF or the current ~7.48 MAF under most-probable scenarios), the 10-year total drops below 82.5 MAF. The paper argues there is “no painless strategy” that protects both Powell (>3,500 ft) and the tripwire; the only real solution is a basin-wide enforceable agreement with Compact claim waivers.

The “Tripwire” and Article III(c) Connection

The 82.5 MAF figure is not just Article III(d)’s 75 MAF/10-year non-depletion obligation. It incorporates an interpretation of Article III(c) of the 1922 Compact: if there is no surplus above the 16 MAF apportioned to both basins (7.5 each), the Upper Basin must deliver its half-share of Mexico’s 1.5 MAF treaty obligation (0.75 MAF/year = 7.5 MAF/10 years) at Lee Ferry, for a total delivery obligation of 82.5 MAF. • Upper Basin view: III(c) creates an additional delivery requirement once “surplus” is exhausted. • Lower Basin view (historically): Surplus (including Lower Basin overuse above 8.5 MAF) covers Mexico first; Upper’s extra obligation is minimal or conditional.

The 2007 Interim Guidelines (Record of Decision) embedded operational assumptions that leaned toward the Lower Basin interpretation by coordinating Powell releases to protect Mead elevations. This produced the 9 MAF releases when Mead was in the ~1,075–1,100 ft range (the “sweet spot” that avoided Lower Basin shortages while triggering higher Powell releases under equalization/balancing rules):

[The Lower Basin Drought Contingency Plan: Development and Delays](#)

William Tintor

Water Policy in Arizona and the Semi-arid West – Research Paper

CAP’s “Sweet Spot” Strategy In 2017–2018, CAP (and Arizona) openly discussed managing demands to keep Mead in the elevation band that triggered higher Powell releases (~9 MAF) while avoiding formal shortage declarations.

Upper Basin states (via UCRC) accused Arizona/CAP of “gaming” or “manipulating” the guidelines to extract extra water from Powell storage at Upper Basin expense. This was widely reported as a flash point (e.g., Upper Basin representatives called it undermining the purpose of coordinated operations). These high releases temporarily kept the 10-year Lee Ferry average high but depleted Powell storage and inflated the moving average. As those 9 MAF years fall out (starting ~2025–2027) and are replaced by lower releases, the average is projected to cross below 82.5 MAF.

How This Ties to a Section 603 Breach Argument If the 10-year flow drops below 82.5 MAF:

- Lower Basin states could argue a Compact violation (“Compact call”).
- This would pressure Upper Basin states to curtail uses (post-Compact rights first) to restore deliveries.
- That curtailment would be a direct reduction/prejudice to Upper Basin consumptive uses—precisely what Section 603(a) forbids if caused by Lower Basin uses/operations.

The chain of causation runs through:

1. The 2007 Guidelines’ interpretation/operation of III(c) and coordinated releases.
2. CAP’s demand management to stay in the high-release “sweet spot.”
3. The resulting excessive Powell drawdown.
4. The current low-release regime that exposes the tripwire risk.

Upper Basin interests could argue this was foreseeable, that the guidelines were administered in a way that favored Lower Basin deliveries over Upper Basin storage protection, and that Section 603 (a federal statute) overrides or constrains such prejudice.

Counterpoints and Realities

- The guidelines were negotiated with Upper Basin participation (though many Upper Basin voices later felt the “sweet spot” dynamics were not fully anticipated). However Upper Basin negotiators were under duress from litigation threats.
- Reclamation administers the dams under the CRBPA and prior acts; courts give deference to federal operational discretion.
- No court has ever ruled on the exact III(c) delivery obligation or enforced the 82.5 MAF tripwire.
- The Tripwire paper itself essentially concedes that litigation is a dead end (“will not create an additional drop of water”) and that the only viable path is negotiation + waiver of Compact claims.

In short: Yes, a strong policy/legal case exists that the described actions have prejudiced Upper Basin rights in violation of Section 603(a)’s plain language, especially if curtailment results. Whether a court would agree is another matter—the politics and federal authority make litigation risky for everyone. The paper’s conclusion is probably right: the only realistic escape is a comprehensive, enforceable basin-wide deal.

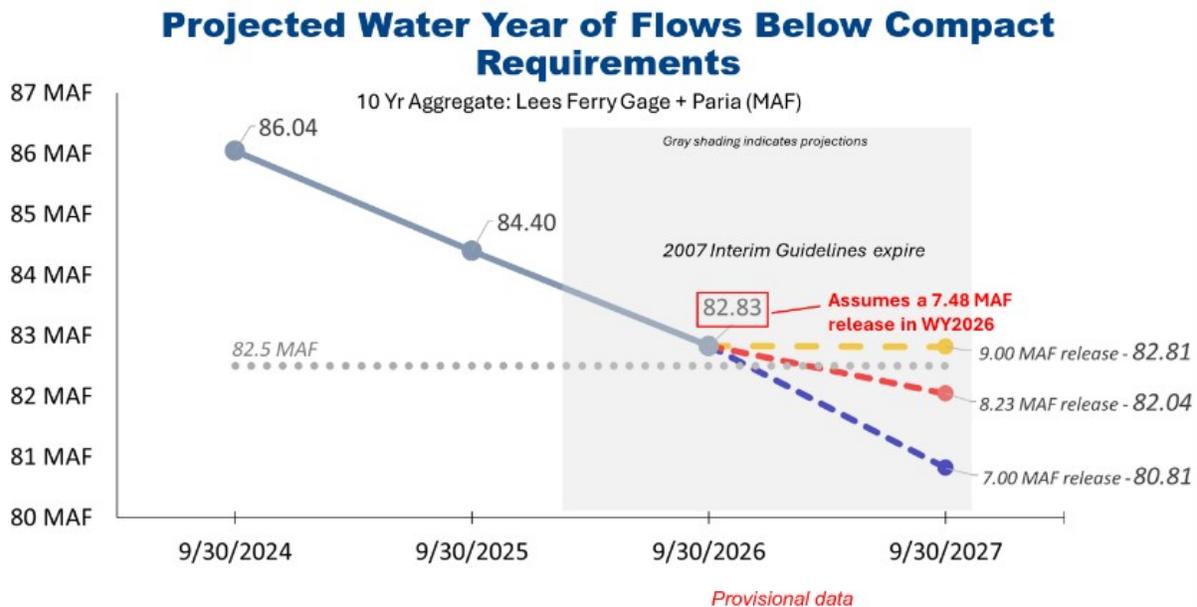
Article III(c) Interpretation

Objective: Counter Arizona's expansive interpretation of Article III(c) to restore balance

"We may breach the compact in 2026, and almost certainly it will be breached in 2027... sobering news, it's something that hasn't happened before, our Upper Basin neighbors have always met that obligation in the past"

Brenda Burman, General Manager, Central Arizona Project

Burman is talking about breaching Arizona's interpretation of the compact which includes half of the Article III(c) Mexico obligation on top of Articles III(d)'s 7.5 MAF so 8.25 MAF over a 10 year moving average. Colorado doesn't recognize this interpretation.



Background - This is Complicated, Sorry

There is problematic language in the [1922 Colorado River Compact](#)

*(c) If, as a matter of international comity, the United States of America shall hereafter recognize in the United States of Mexico any right to the use of any waters of the Colorado River System, such waters shall be supplied first from the waters which are **surplus over and above the aggregate of the quantities specified in paragraphs (a) and (b)**; and if such surplus shall prove insufficient for this purpose, then, **the burden of such deficiency shall be equally borne***

by the Upper Basin and the Lower Basin, and whenever necessary the States of the Upper Division shall deliver at Lee Ferry water to supply one-half of the deficiency so recognized in addition to that provided in paragraph (d).

The first problem is how do you determine whether the Colorado is in surplus or deficit.

This is the ridiculously literal interpretation Arizona used in litigation threats 2005-2007:

$$16 \text{ MAF} = 7.5 \text{ Lower Basin(A)} + 1.0 \text{ Lower Basin(B)} + 7.5 \text{ Upper Basin(A)}$$

The obvious flaw in this is the Upper Basin has never used its full entitlement so this interpretation is inevitably 3 MAF high. If this interpretation is correct we are ALWAYS in a deficit because this only works on a fully utilized river much bigger than it actually is. Its a little nuts.

The only interpretation that makes any sense is the one the river would've actually used in 1922 to decide this if there had been a Mexico treaty. The river did the math. It was the natural flow of the river minus Upper Basin consumptive use and Lower Basin Consumptive Use which gives you how much water actually crossed the border into Mexico. If it was above 1.5 MAF we were in surplus, if it was below we were in deficit.

$$\text{Mexico} = \text{Natural Flow at Border} - (\text{Upper Basin CU} + \text{Lower Basin CU})$$

If Mexico \geq 1.5 MAF there is no deficiency or 8.25 mandate

In a recent typical year CU might be:

$$12 \text{ MAF} = 7.5 \text{ Lower Basin(A)} + 4.5 \text{ Upper Basin(A)}$$

If the Natural Flow is $>$ 13.5 we are not in a deficit.

Two problems:

- Natural Flow and CU are hard to calculate and lag the calendar year accounting to determine deficiency
- Two reservoirs in the middle really complicates this

Table 2

The following spreadsheet should be treated as a straw man for the calculation we are looking for and are looking to build on to actually correctly compute the iii(c) deficit and obligation, This is not validated data, much work is needed.

Year	iii(c)	=	Natural Border	-(	LOWER CU	+	UPPER CU	)	MX TREAT	Hoover Release
1964	4.48	=	10.70	-(	6.22	+	0.00	)	0.00	0.00
1965	14.91	=	20.84	-(	5.93	+	0.00	)	1.50	0.00
1966	5.04	=	11.23	-(	6.20	+	0.00	)	1.50	7.78
1967	6.33	=	12.29	-(	5.96	+	0.00	)	1.50	7.93
1968	8.19	=	14.39	-(	6.20	+	0.00	)	1.50	7.84
1969	9.82	=	15.89	-(	6.07	+	0.00	)	1.50	7.89
1970	9.37	=	15.63	-(	6.25	+	0.00	)	1.50	8.02
1971	5.17	=	15.35	-(	6.52	+	3.66	)	1.50	8.16
1972	3.34	=	13.59	-(	6.51	+	3.74	)	1.50	8.10
1973	8.86	=	19.18	-(	6.68	+	3.64	)	1.50	8.30
1974	2.32	=	13.22	-(	6.83	+	4.06	)	1.50	8.73
1975	6.49	=	16.79	-(	6.41	+	3.89	)	1.50	8.37
1976	1.82	=	11.60	-(	6.03	+	3.75	)	1.50	7.93
1977	-3.58	=	5.94	-(	6.40	+	3.12	)	1.50	7.87
1978	6.51	=	16.32	-(	5.81	+	4.00	)	1.50	7.48
1979	8.85	=	18.92	-(	6.00	+	4.07	)	1.70	7.72
1980	9.01	=	19.15	-(	6.04	+	4.10	)	1.70	11.09
1981	-0.79	=	9.64	-(	6.32	+	4.12	)	1.70	8.28
1982	8.31	=	18.12	-(	5.64	+	4.16	)	1.50	7.45
1983	15.36	=	24.84	-(	5.39	+	4.09	)	1.70	19.07
1984	15.58	=	25.46	-(	5.89	+	3.99	)	1.70	21.41
1985	10.73	=	21.98	-(	6.98	+	4.26	)	1.70	17.21
1986	11.97	=	23.36	-(	7.16	+	4.23	)	1.70	17.55
1987	4.49	=	16.37	-(	7.59	+	4.29	)	1.70	11.33
1988	-0.49	=	12.16	-(	7.96	+	4.70	)	1.70	9.42
1989	-2.89	=	10.20	-(	8.38	+	4.71	)	1.50	9.23
1990	-2.87	=	9.97	-(	8.43	+	4.41	)	1.50	9.20
1991	1.13	=	13.09	-(	7.79	+	4.17	)	1.50	8.95
1992	1.04	=	12.23	-(	7.32	+	3.86	)	1.50	7.83
1993	9.26	=	21.36	-(	7.98	+	4.12	)	1.50	7.44
1994	-1.73	=	11.06	-(	8.34	+	4.45	)	1.50	9.35
1995	9.22	=	21.33	-(	8.15	+	3.96	)	1.50	8.54
1996	0.95	=	14.55	-(	9.13	+	4.48	)	1.50	9.97
1997	8.78	=	22.04	-(	9.21	+	4.05	)	1.70	11.67
1998	4.48	=	17.41	-(	8.72	+	4.21	)	1.70	12.77
1999	2.78	=	16.38	-(	9.11	+	4.49	)	1.70	11.03
2000	-3.13	=	10.81	-(	9.16	+	4.78	)	1.70	10.69
2001	-3.03	=	11.17	-(	9.25	+	4.94	)	1.50	10.21
2002	-7.19	=	6.21	-(	9.41	+	3.99	)	1.50	10.45
2003	-1.58	=	10.90	-(	8.22	+	4.27	)	1.50	9.38
2004	-1.33	=	10.63	-(	8.02	+	3.94	)	1.50	9.34
2005	6.76	=	18.82	-(	7.73	+	4.34	)	1.50	8.27
2006	1.44	=	13.72	-(	8.05	+	4.23	)	1.50	9.26
2007	-0.80	=	11.72	-(	8.05	+	4.47	)	1.50	9.36
2008	3.92	=	16.51	-(	8.10	+	4.49	)	1.50	9.55
2009	1.83	=	14.29	-(	7.99	+	4.47	)	1.50	9.48
2010	1.22	=	13.53	-(	7.90	+	4.40	)	1.50	9.45
2011	8.51	=	20.85	-(	7.89	+	4.44	)	1.45	9.21
2012	-4.34	=	8.34	-(	8.05	+	4.62	)	1.37	9.39
2013	-1.32	=	10.30	-(	8.06	+	3.56	)	1.37	9.38
2014	2.37	=	14.56	-(	8.18	+	4.01	)	1.44	9.61
2015	1.48	=	13.42	-(	7.96	+	3.98	)	1.50	9.41
2016	1.79	=	13.84	-(	7.74	+	4.31	)	1.50	9.28
2017	4.76	=	16.77	-(	7.30	+	4.71	)	1.50	8.73
2018	-3.55	=	8.65	-(	7.66	+	4.54	)	1.49	9.12
2019	6.67	=	18.39	-(	7.09	+	4.62	)	1.50	8.51
2020	-2.48	=	9.69	-(	7.32	+	4.85	)	1.43	8.78
2021	-3.68	=	7.82	-(	7.57	+	3.93	)	1.46	9.14
2022	-1.10	=	10.11	-(	7.16	+	4.05	)	1.45	8.74
2023	6.43	=	17.39	-(	6.25	+	4.71	)	0.00	7.44
2024	1.12	=	12.13	-(	6.54	+	4.47	)	1.45	7.85
2025	-0.43	=		-(	0.43	+	0.00	)	0.00	0.00
2026	0.00	=		-(	0.00	+	0.00	)	0.00	0.00

If we are in deficit then:

the burden of such deficiency shall be equally borne by the Upper Basin and the Lower Basin

and:

the Upper Division shall deliver at Lee Ferry water to supply one-half of the deficiency so recognized in addition to that provided in paragraph (d).

If the river is in a deficit the next key question is where does the Lower Basin's half of the obligation come from:

- highly variable Grand Canyon tributaries which offsets Lake Mead evaporation
- stored water in Lake Mead that came from unused 602 releases, equalization or balancing
- conserved water from the Lower Basin's 7.5 MAF entitlement(aka shortages)
- Wellton-Mohawk toxic return flows which would have to be taken from Ciénega de Santa Clara and be desalinated. Audubon and Mexico would oppose this. This water was actually promised by Royce Tipton's 1944 testimony. He said Gila return flows will supply various percentages of the obligation, like half or more. Yuma desalination tried and failed to deliver a little.

Its key that this does not say the Upper Basin must deliver one-half of the deficiency each year, if there is a big equalization or balancing release from Lake Powell then can that water in Lake Mead be used to cover multiple years of the Upper Basin III(c) obligation?

Scenario 1 - Status Quo, 2007 Interim Guidelines

Arizona documented their position, the basis for litigation threats in 2007 in this paper and kind of what we got in the 2007 guidelines so its the status quo:

[From a Colorado River Compact Challenge to the Next Era of Cooperation Among Seven Basin States](#)

49 Ariz. L. Rev. 217 (2007)

W. Patrick Schiffer, Herbert R. Guenther & Thomas G. Carr

The Schiffer and Guenther paper (co-authored with Carr) argues that Article III(c) of the Colorado River Compact defines "surplus" as annual system-wide supply exceeding the 16 MAF aggregate apportionments in Articles III(a) and (b) (7.5 MAF each to Upper and Lower Basins). Any surplus over 16 MAF must first satisfy the 1.5 MAF Mexican Treaty obligation; if supply is deficient, the Upper and Lower Basins share the burden equally,

with the Upper Basin delivering its half (0.75 MAF) at Lee Ferry plus evaporative/transit losses (totaling ~0.9 MAF Upper share). The authors reject the Upper Division States' view that Lower Basin usage exceeding 8.5 MAF constitutes "surplus" to be applied solely by the Lower Basin to Mexico, insisting instead on system-wide assessment to protect Arizona from undue shortages.

On releases, the paper critiques the 8.23 MAF minimum objective release from Lake Powell as inadequate, excluding full losses and risking Lake Mead depletion that fails to meet ~9 MAF mainstream Lower Division needs (Lower apportionment plus Mexico). It proposes ~8.38 MAF in deficiency years (0.9 MAF Mexican share + 7.48 MAF Article III(d)) and up to 9.28 MAF in surplus years, prioritizing the Upper's Mexican share first under the Basin Project Act and LROC. An interim solution suggests variable 7-9 MAF releases to equalize reservoirs and avert crises, bridging toward long-term augmentation.

Scenario 2 - Beneficial Consumptive Use Based

Core Upper Basin Argument: The Compact Apportions Beneficial Consumptive Use, Not Raw Flow — So “Surplus” Is Defined Relative to Actual Apportioned Uses, Not a Hypothetical 16 MAF System Supply Number

1. The Compact is about beneficial consumptive use, not total virgin flow or system supply. Article III(a)–(b) apportion “beneficial consumptive use” (the key phrase repeated throughout the Compact). Article III(c) expressly ties the surplus calculation to “the aggregate of the quantities specified in paragraphs (a) and (b)” — i.e., the apportioned beneficial consumptive uses (Upper 7.5 + Lower 8.5 = 16 MAF). If the Lower Basin is already consuming >8.5 MAF (mainstem + tributaries + evaporation/ losses charged to it), then any water it is using beyond its apportionment is, by definition, surplus that Article III(c) says must first go to Mexico. There is no “deficiency” until the Lower Basin has reduced its use to its apportioned 8.5 MAF. → This directly refutes the paper’s claim that Lower Basin use is “irrelevant.” The Compact itself makes actual use relevant.
2. Lower Basin has been using 10–11+ MAF for decades (including tributaries). In the years the paper was written (and still today), Lower Basin consumptive use (Arizona, California, Nevada mainstem + Gila, Virgin, etc. tributaries + reservoir evaporation charged to Lower) routinely exceeds 10 MAF. That excess (≥1.5 MAF) is precisely the “surplus” III(c) requires to be applied to Mexico first. No deficiency exists; Upper Basin has no III(c) obligation beyond the III(d) non-depletion floor. The paper’s insistence on a pure “system supply >16 MAF” test

would mean the Lower Basin can overuse its apportionment indefinitely while still forcing the Upper Basin to deliver extra water for Mexico — an outcome the Compact negotiators never intended and that would violate the equitable division premise.

3. The extra 1 MAF in III(b) was always understood as coming from surplus. Article III(b) gives the Lower Basin the right to increase its use by 1 MAF “in addition to” the base apportionment. Negotiators (and later Upper Basin witnesses in 1948 Upper Compact hearings and 1960s CAP debates) treated that extra 1 MAF as the Lower Basin’s share of expected long-term surplus. If the Lower Basin is already taking that (and more), it cannot simultaneously claim there is no surplus for Mexico.
4. Tributaries and losses reinforce the point. Lower Basin tributaries (especially the Gila) are part of the “Colorado River System” (Art. II(a)) and count toward Lower Basin use for purposes of determining surplus/deficiency. Upper Basin deliveries at Lee Ferry do not have to compensate for Lower Basin channel losses/evaporation — those are borne by the Lower Basin from its own apportionment (the Lee Ferry delivery point was chosen for exactly this reason).
5. Historical practice and the 8.23 MAF minimum objective release. Since the 1970s, Reclamation has operated Glen Canyon Dam to a minimum objective release of ~8.23 MAF (≈ 7.5 III(d) + a small buffer, but not the full 0.75–0.9 MAF III(c) share the paper demands). Upper Basin states have never accepted the Lower Basin’s 8.25 MAF (or higher) figure as legally required under III(c), and they have never been forced to litigate it because their position has effectively prevailed in operations. The paper’s interpretation would retroactively declare decades of operations illegal.

In short, the Upper Basin’s best refutation is that the Schiffer-Guenther paper reads Article III(c) in isolation and ignores the Compact’s overarching framework of beneficial consumptive use apportionments. Once you measure “surplus” against actual basin uses (as the Compact requires), the Lower Basin’s longstanding overuse of its own apportionment supplies all the “surplus” needed for Mexico. There is no deficiency, and the Upper Basin has no additional delivery obligation under III(c).

This is why the issue has never been conclusively litigated — both sides have strong textual and historical arguments, but the Upper Basin view protects its ability to develop while holding the Lower Basin accountable for its own overuse. The 2007 Interim Guidelines and subsequent agreements deliberately punted the legal question in favor of operational compromise, but the underlying interpretive disagreement remains exactly as it was in 2004–2007.

Scenario 3 - Supply Based

Core Upper Basin Argument: **The “surplus” water to satisfy Mexico’s allocation under Article III(c) of the 1922 Colorado River Compact does not have to come through Lee’s Ferry each and every year. It can (and in practice does) draw from stored surplus in Lake Mead, including water delivered in big-release years like the 2011 equalization. So as long as there is extra water in Mead for III(c) does that mean there is no deficiency? If so 8.25 isn’t the basis for a call.**

- The classic compact equation is paragraphs (a) + (b) = 16 MAF of apportioned consumptive use (7.5 MAF Upper + 7.5 MAF Lower + 1 MAF extra to Lower). It makes no sense today, Neither Upper basin use or entitlement are 7.5 MAF, III(b) water does not exist.
- Today’s apportioned consumptive use equation is either this:

7.5 MAF Lower + 1 MAF extra to Lower = 8.5 MAF

or

7.5 MAF Lower

- Mexico’s 1.5 MAF (per the 1944 Treaty) comes first from any system-wide surplus above that 7.5 MAF or 8.5 MAF.
- Only if that surplus is insufficient does a “deficiency” arise — and only then does the Compact explicitly require the Upper Division to deliver extra water at Lee’s Ferry (half the shortfall, on top of the 75 MAF/10-year minimum in III(d)).
- 1.5 MAF is the default Mexico obligation. It is currently a little lower thanks to shortages Mexico is taking to help the system

The Compact never says the surplus portion itself must pass Lee’s Ferry in the same year it is used for Mexico. Surplus is a system-wide concept — water in the Colorado River System not consumed by the apportioned uses in the two basins. Once water reaches the Lower Basin (whether via Lee’s Ferry that year, Lower Basin tributaries, or releases from storage), it can be part of the “surplus” pool.

In wet years or equalization operations (like 2011 when the two reservoirs were deliberately rebalanced), extra water is released from Powell → through Lee’s Ferry → into Lake Mead. That water becomes stored surplus in Mead.

In a later year, when natural inflows are lower and Lee’s Ferry releases are at or near the minimum objective (currently ~8.23 MAF/year under the Long-Range Operating Criteria, which already bakes in 0.75 MAF as the Upper Basin’s presumed share of

Mexico), operators can still release water from Mead's storage to meet Mexico's full 1.5 MAF (and Lower Basin demands) without triggering a Compact "deficiency." That stored water originated as surplus and was carried forward.

This is exactly how the system has functioned for decades: reservoirs (Powell + Mead) act as a multi-year buffer. The Compact's surplus/deficiency test is not a strict annual accounting that ignores storage; it's a broader recognition that the river is regulated by large reservoirs. If the basins could only use "this year's" surplus through Lee's Ferry, the entire storage-and-carryover regime that has kept Mexico whole since 1944 would be illegal — which it obviously isn't.

Bottom line

- Surplus water for Mexico → can be (and is) supplied from Lake Mead storage that accumulated in big years.
- Deficiency share → triggers Lee's Ferry delivery obligation from the Upper Basin.
- The Compact draws a clear distinction between the two. The surplus clause does not contain a Lee's Ferry requirement; only the deficiency clause does.

So yes — surplus stored in Mead from years like 2011 can satisfy Mexico without creating a deficiency that forces extra Upper Basin deliveries at Lee's Ferry in a subsequent dry year. That's how the "Law of the River" has always worked in practice.

Article III(e) Interpretation

Objective: Counter Arizona's expansive interpretation of Article III(e) to restore balance

“The States of the Upper Division shall not withhold water, and the States of the Lower Division shall not require the delivery of water, which cannot reasonably be applied to domestic and agricultural uses.”

This provision is deliberately symmetrical and conditional. The qualifying clause —“which cannot reasonably be applied to domestic and agricultural uses”—applies equally to both prohibitions. It does not create an unqualified duty for the Upper Basin to release water on demand, nor does it grant the Lower Basin an unrestricted right to call for deliveries. Instead, it imposes reciprocal restraints to prevent waste or unreasonable interference during the basins’ respective development phases.

During the 1922 negotiations (led by Herbert Hoover as federal representative), Upper Basin delegates (from Colorado, New Mexico, Utah, and Wyoming) expressed significant concern that Lower Basin states—particularly California, with its rapid development and access to storage at Hoover Dam (authorized later)—might use prior appropriation principles or storage infrastructure to make premature “calls” on water before Upper Basin states could fully develop their apportioned uses. The Upper Basin, where most runoff originates but infrastructure lagged, feared that such calls would impair their future consumptive uses.

Article III(e) emerged as a compromise to address this asymmetry:

- It protected the Upper Basin by prohibiting Lower Basin demands for water that the Upper Basin could reasonably apply to its own domestic and agricultural needs (e.g., storing water in future reservoirs like Powell for later use).
- Simultaneously, it restrained the Upper Basin from indefinitely hoarding water that served no beneficial purpose and could be used downstream.
- The clause was not intended as a broad delivery obligation or equity-forcing mechanism but as a pragmatic “safety valve” to promote interstate comity, avoid waste, and facilitate development without one basin unduly hindering the other.

This intent is reflected in the Compact’s preamble, which emphasizes equitable division, protection from floods, and expeditious agricultural/industrial development. The provision’s narrow focus—limited to “domestic and agricultural uses” (excluding power generation or other purposes)—further underscores its restraint-oriented design rather than an expansive release requirement.

Subsequent legislation and operations reinforce this interpretation:

- The Colorado River Basin Project Act of 1968 (Section 602(a)) explicitly conditions releases from Lake Powell for Lower Basin beneficial use under III(e) on specific criteria, such as Powell storage exceeding Mead storage and no impairment of Upper Basin consumptive uses. This subordinates III(e) to the Compact's core apportionments (III(a), (b), (d)) and protects Upper Basin development.
- Long-Range Operating Criteria and post-2007 guidelines incorporate III(e) in a limited, conditional manner, consistent with its reciprocal nature.
- Upper Basin analyses (e.g., from the Upper Colorado River Commission, experts like Eric Kuhn, and historical reviews) consistently frame III(e) as a safeguard for Upper Basin growth, not a tool to compel releases that could shift disproportionate burdens (e.g., for the Mexican Treaty under III(c)).

In Upper Basin rebuttals, attempts to expand III(e) beyond this narrow, mutual framework—such as using it to mandate releases for Mexican Treaty deficiencies or to prioritize Lower Basin access to stored water—are viewed as contrary to the negotiated balance. The provision was crafted to preserve each basin's exclusive beneficial consumptive use (per III(a)) while preventing abuse, not to override volumetric obligations or create new priorities.

The Schiffer-Guenther paper's emphasis on Upper Basin non-withholding as a broad duty to release usable water is seen as reading the clause one-sidedly, ignoring its symmetry and the Compact's overall grant of "exclusive beneficial consumptive use" to each basin under Article III(a).

The Schiffer paper links III(e) to mandatory Upper Basin releases to meet half the Mexican obligation in deficiency years, arguing that withholding would cause unjustified Lower Basin shortages. Upper Basin rebuttal:

- Article III(c) already contains the precise sharing rule (first from surplus; then equal burden; Upper delivers half-deficiency at Lee Ferry "whenever necessary" in addition to III(d)). III(e) adds no extra obligation.
- Upper Basin's preferred reading of "surplus" in III(c) is basin-specific: if the Lower Basin is already using >8.5 maf (its III(a)+(b) apportionment, including tributaries per Upper Basin view), that excess is the surplus first applied to Mexico, relieving Upper Basin of deficiency sharing.
- Forcing additional releases under III(e) to cover Mexico would impair Upper Basin's own future uses, violating the "without impairment of annual consumptive uses in the upper basin" language in CRBPA §602(a)(3).

This is the exact position the Upper Division Governors' Representatives took in their [2004 letter](#) (the trigger for the Schiffer paper) and that Upper Basin entities have reiterated in post-2007 Guidelines, Drought Contingency Plan, and post-2026 negotiations.

It is a near certainty that Loer Basin, especially Arizona's, taking delivery of water from reservoirs in the 90's, and probably continuing today, for long term storage in its aquifers and contributing to the current crisis in Lake Powell is a direct and unambiguous violation of Article III(e).

This data needs verification before use in decision making

The documented transfers of Colorado River water into aquifers by Lower Basin states for long-term storage remain as previously outlined, with the primary mechanisms being

- Arizona's Arizona Water Banking Authority (AWBA) program (intrastate and interstate for Nevada),
- Nevada's local and interstate banking (primarily in Arizona and California aquifers), and
- California's more limited conjunctive use/replenishment (primarily via Coachella Valley Water District [CVWD] and Metropolitan Water District [MWD] interstate for Nevada).

Comprehensive year-by-year volumes of new physical transfers (recharge or in-lieu substitution leading to long-term storage credits [LTSCs] or equivalent) are not uniformly published in a single aggregated table across all programs, as recent years have seen minimal new direct storage due to drought, shortage declarations, and a shift toward purchases of existing credits, Intentionally Created Surplus (ICS) firming, and in-reservoir conservation. Cumulative totals are well-documented through USBR accounting reports and state sources, with interstate banking stable at approximately

- 944,071 AF for Nevada's benefit (613,846 AF in Arizona via AWBA; 330,225 AF in California via MWD) as of the end of calendar years 2023 and 2024 (no net change reported in recent USBR reports due to lack of new storage or recoveries offsetting additions).

Arizona (AWBA LTSCs from Colorado River/CAP Water)

The AWBA is the dominant program for dedicated long-term aquifer storage of Colorado

River water. New accrual has been limited since around 2014–2015 due to reduced excess CAP water availability; recent activity focuses on LTSC purchases or ICS-related firming rather than direct recharge of new volumes.

- Cumulative LTSCs through 2019: Approximately **4.28 million AF** (3.67 million AF intrastate for Arizona; ~614,000 AF interstate for Nevada).
- Cumulative through ~2023: **~4.39 million AF** (intrastate ~3.78 million AF; interstate 613,846 AF).
- Cumulative through 2024: **4.41 million AF** (intrastate ~3.80 million AF; interstate 613,846 AF unchanged).

Annual new accruals (from direct storage) were significant in earlier years (e.g., tens to hundreds of thousands AF in the 2000s–early 2010s) but have been near zero in recent years without purchases. For example:

- 2016: ~65,708 AF delivered for storage (example year with activity).
- Post-2019: Minimal to no new direct recharge reported; reliance on purchases (e.g., 1,327 AF LTSCs purchased in Tucson AMA in 2023). No detailed annual series of new accruals is aggregated publicly beyond cumulatives in AWBA annual reports and USBR Decree Reports.
Nevada (SNWA Banking)
- Local Southern Nevada Water Bank (Las Vegas Valley aquifer): Cumulative ~342,000 AF through 2024 (via direct injection or in-lieu; no significant annual breakdown reported recently).
- Interstate (stored in other states' aquifers): Cumulative ~944,071 AF through 2024 (unchanged from prior years; 613,846 AF in Arizona, 330,225 AF in California; no new additions reported in 2023–2024 USBR reports).
Annual new interstate storage was active in earlier periods (e.g., additions through 2018–2019) but has been negligible recently.
California
- MWD interstate for SNWA: Cumulative 330,225 AF stored in California aquifers through 2024 (no new storage in recent years; stable balance).
- CVWD conjunctive use/replenishment (Coachella Valley aquifers, including Colorado River sources via CRA exchanges): Cumulative over ~4.37 million AF from 1973–2023 across facilities (mix of SWP and Colorado River; ~4.14 million AF to

Whitewater River facility alone). Recent annual replenishment (including Colorado River portions):

- 2023: ~320,962 AF total artificial replenishment (significant portion Colorado River-related).
- 2023–2024 water year: ~296,726 AF imported/local surface water recharged in Indio Subbasin (with managed recharge reduced in some facilities due to voluntary Colorado River conservation).
- Earlier periods: Over 2 million AF in first 35 years (1973–~2008); ongoing but variable with availability. These are not structured as formal LTSCs but support long-term aquifer storage offsetting pumping.

Lower Basin Aquifer Storage Summary

- Grand cumulative aquifer storage of Colorado River water (all programs, approximate end-2024): **>9 million AF (AWBA ~4.41 million AF + CVWD >4 million AF + SNWA local ~0.34 million AF + other minor; with overlaps in interstate credits not double-counted as new transfers).**
- Interstate for Nevada benefit (stable benchmark): **944,071 AF.**
- Due to the shift from new physical storage to credit purchases, conservation, and ICS, no comprehensive annual additions table exists for recent years.

Canonical Legal Arguments Related to Operational Questions

Hopefully you didn't make it this far. We are hoping the Seven States don't either. The following are fairly canonical Upper Basin arguments you may see in event of a Lower Basin Compact Call or litigation. We don't want to go here, but we will if we have to. School yard bully rule applies. In that event we will apply additional resources to develop these and apply some of our unconventional wisdom to strengthen them.

These will obviously have direct impact on USBR operation of the system if these events occur so are relevant to the EIS process.

Article III(d)

The canonical Upper Basin position on the core dispute in the Colorado River Compact of 1922 (particularly Article III(d)) centers on interpreting the Upper Division states' (Colorado, New Mexico, Utah, Wyoming) obligation as a "non-depletion" duty rather than a strict delivery guarantee to the Lower Basin (Arizona, California, Nevada). Article III(d) states: the Upper Division states "will not cause the flow of the river at Lee Ferry to

be depleted below an aggregate of 75,000,000 acre-feet for any period of ten consecutive years." The Upper Basin interprets this literally as a prohibition on their own actions causing depletion—meaning they must not consume (deplete) more than their share in a way that drops the 10-year rolling flow at Lee Ferry (just below Glen Canyon Dam) below 75 million acre-feet (MAF), averaging 7.5 MAF/year. Key elements of the Upper Basin view:

- No absolute delivery obligation — They are not required to guarantee or "deliver" 7.5 MAF annually (or 75 MAF/10 years) to the Lower Basin regardless of natural conditions. If low runoff from climate change, drought, or aridity reduces natural flows, the Upper Basin is not at fault and should not face forced cuts solely to meet a fixed delivery target.
- Consumptive use cap — Their primary limit is their own beneficial consumptive use (up to 7.5 MAF/year basin-wide under Article III(a)), plus their share of U.S. treaty water to Mexico if no surplus exists (Article III(c)). They argue they have never fully used their 7.5 MAF allocation (often ~4–5 MAF in recent decades), so any shortfall at Lee Ferry stems from reduced supply, not overuse.
- Climate change as force majeure — Depletion caused by natural variability or long-term aridification (not human depletions in the Upper Basin) does not trigger a Compact violation or "call" requiring Upper Basin curtailments. This protects upstream development rights, as the Compact was designed to allow Upper Basin growth without being penalized by prior Lower Basin claims.
- Contrast with Lower Basin view — Lower Basin states read III(d) as imposing a firm delivery requirement (strict liability for 75 MAF/10 years at Lee Ferry, potentially including half of Mexico's share under operating criteria), enforceable via litigation if flows fall short.

This interpretation aligns with the Compact's 1922 context: Upper Basin delegates feared Lower Basin storage projects (like Hoover Dam) could establish prior rights before upstream states developed, so they insisted on "non-depletion" language to safeguard future use. The Upper Basin Compact (1948) reinforces this by allocating percentages of available water after meeting Compact obligations, without mandating fixed deliveries. In modern negotiations (post-2026 guidelines), this stance emphasizes shared basin-wide responsibility for shortages driven by climate, not unilateral Upper Basin cuts, while rejecting litigation threats of a "Compact call."

Article III(b)

In 1922, Arizona's compact commissioner W.S. Norviel asked that 1 MAF be set aside in Article III(b) to cover the natural flow of the Gila River at the confluence with the Colorado. The Gila is a wasting river so that is inherently much less than their actual Consumptive Use, they've used it to extinction since the 1870's. His rationale was even if Arizona wasn't use the Gila's water only 1 MAF would reach the confluence. The rest would disappear into aquifers and evaporation.

After his ask the minutes stop and don't cover what did happen, it wasn't Norviel's ask. It ended up being just an additional 1 MAF split between Arizona and California when there was surplus water. California took it all before CAP came on line, exceeding their 4.4 MAF limitation and diverting 5 to 5.5 MAF.

Eric Kuhn's assertion is that in 1922 everyone knew the Upper Basin wouldn't be able to develop more than 6.1-6.5MAF so they had a bubble in their entitlement at 7.5 MAF that was of concern to the Lower Basin. The solution was to give the Lower Basin an extra 1 MAF to offset it, which is how III(b) worked until the 2003 QSA when there was no more surplus and California was forced back under their 4.4 limitation,.

With 20/20 hindsight it would've been better to cut the Upper Basin entitlement to 6.5 MAF but they thought they had a big river then. If the Compact is reopened for amendments in the coming tumult, amendment is a hard process, consideration should be given to removing III(b) and cutting the Upper Basin entitlement to 6.5 MAF. It removes any chance of future Lower Basin use of the surplus water and doesn't really matter to the Upper Basin. They will never develop 7.5 MAF. It would eliminate a constant source of confusion and friction. The compact would be simpler.

Another possible amendment is to do Norviel's ask and use III(b) to cover the Gila natural flow at the confluence. The Gila is a problem. Article III(d)

The canonical Upper Basin position on the core dispute in the Colorado River Compact of 1922 (particularly Article III(d)) centers on interpreting the Upper Division states' (Colorado, New Mexico, Utah, Wyoming) obligation as a "non-depletion" duty rather than a strict delivery guarantee to the Lower Basin (Arizona, California, Nevada). Article III(d) states: the Upper Division states "will not cause the flow of the river at Lee Ferry to be depleted below an aggregate of 75,000,000 acre-feet for any period of ten consecutive years." The Upper Basin interprets this literally as a prohibition on their own actions causing depletion—meaning they must not consume (deplete) more than their share in a way that drops the 10-year rolling flow at Lee Ferry (just below Glen Canyon

Dam) below 75 million acre-feet (MAF), averaging 7.5 MAF/year. Key elements of the Upper Basin view:

- No absolute delivery obligation — They are not required to guarantee or "deliver" 7.5 MAF annually (or 75 MAF/10 years) to the Lower Basin regardless of natural conditions. If low runoff from climate change, drought, or aridity reduces natural flows, the Upper Basin is not at fault and should not face forced cuts solely to meet a fixed delivery target.
- Consumptive use cap — Their primary limit is their own beneficial consumptive use (up to 7.5 MAF/year basin-wide under Article III(a)), plus their share of U.S. treaty water to Mexico if no surplus exists (Article III(c)). They argue they have never fully used their 7.5 MAF allocation (often ~4–5 MAF in recent decades), so any shortfall at Lee Ferry stems from reduced supply, not overuse.
- Climate change as force majeure — Depletion caused by natural variability or long-term aridification (not human depletions in the Upper Basin) does not trigger a Compact violation or "call" requiring Upper Basin curtailments. This protects upstream development rights, as the Compact was designed to allow Upper Basin growth without being penalized by prior Lower Basin claims.
- Contrast with Lower Basin view — Lower Basin states read III(d) as imposing a firm delivery requirement (strict liability for 75 MAF/10 years at Lee Ferry, potentially including half of Mexico's share under operating criteria), enforceable via litigation if flows fall short.

This interpretation aligns with the Compact's 1922 context: Upper Basin delegates feared Lower Basin storage projects (like Hoover Dam) could establish prior rights before upstream states developed, so they insisted on "non-depletion" language to safeguard future use. The Upper Basin Compact (1948) reinforces this by allocating percentages of available water after meeting Compact obligations, without mandating fixed deliveries. In modern negotiations (post-2026 guidelines), this stance emphasizes shared basin-wide responsibility for shortages driven by climate, not unilateral Upper Basin cuts, while rejecting litigation threats of a "Compact call."

Gila River

The canonical Upper Basin position on the exclusion ("removal") of the Gila River from Colorado River Compact accounting, as affirmed in the 1963 *Arizona v. California* Supreme Court decision, is that the ruling's scope is limited to interpreting the Boulder Canyon Project Act (BCPA) and mainstream apportionments among Lower Basin states (Arizona: 2.8 MAF, California: 4.4 MAF, Nevada: 0.3 MAF from the 7.5 MAF

mainstream allocation). This is the Statutory construction case Mark Wilmer used to win *Arizona v. California*. Colorado and Wyoming were not party to this case, they refused California to join. It was a Lower Basin case so it is doubtful it applies to them.

It does not alter the Compact's broader inclusion of all Lower Basin tributaries—like the Gila—in the definition of the "Colorado River System" (Article II(a)), which encompasses the river and its tributaries within the U.S. for basin-wide apportionment purposes. Upper Basin states argue that the Compact's text (e.g., Articles III(a)–(c)) apportions 7.5 MAF + 1 MAF to the Lower Basin from the entire system, including tributaries, to determine total available water, surpluses, and shared obligations such as deliveries to Mexico under Article III(c).

Excluding the Gila allows Arizona unrestricted use (estimated 1–3.5 MAF annually, depending on hydrology) beyond its mainstream share, effectively enabling the Lower Basin to exceed its 8.5 MAF system-wide entitlement. This, they contend, imbalances the basin, increases pressure on Upper Basin deliveries at Lee Ferry (to meet the non-depletion obligation of 75 MAF over 10 years under Article III(d)), and shifts a disproportionate burden for shortages or Mexico deliveries onto the Upper Basin amid climate-driven reductions in natural flows.

Historically, during *Arizona v. California* litigation, Upper Basin intervenors supported tributary exclusion from BCPA mainstream accounting to protect against precedents that might encroach on Upper tributaries or allow California to claim more mainstream water, potentially affecting inter-basin equity.

However, in modern interpretations (e.g., post-2000 negotiations and analyses like the Upper Colorado River Commission's stances), the position has solidified around Compact inclusion for system accounting, rejecting the *Arizona v. California* exclusion as inapplicable to Compact obligations and emphasizing shared basin-wide responsibility without unilateral Upper cuts. This view is substantiated by Compact negotiation records (e.g., 1922 minutes showing intent for inclusive apportionment) and critiques that the extra 1 MAF in Article III(b) was meant to accommodate Gila uses within—not beyond—the Lower Basin's total share.

There are stronger, more persuasive arguments in the canonical Upper Basin position on the Gila River's exclusion from Colorado River Compact accounting (as established by *Arizona v. California* in 1963). The initial textual argument—that the Compact's definition of the "Colorado River System" in Article II(a) explicitly includes all tributaries—is solid but often seen as somewhat literalist and countered by the Supreme Court's narrow reading of the Boulder Canyon Project Act (BCPA). Better arguments focus on equity, intent, basin-wide balance, and practical consequences amid declining flows.

Upper Basin Arguments

1. The Extra 1 MAF in Article III(b) Was Intended as Compensation for Gila Inclusion

During 1922 negotiations, Arizona strongly opposed including the Gila (its dominant tributary) because its waters enter far downstream and cannot be reused in the U.S. after mixing with the mainstream. Upper Basin delegates agreed to the additional 1 MAF allocation to the Lower Basin (beyond the base 7.5 MAF in III(a)) specifically to offset Arizona's Gila uses—meaning the Gila was factored into the overall Lower Basin entitlement. Excluding it now lets Arizona enjoy unrestricted Gila consumption (often 2–3+ MAF in wet years) plus its full 2.8 MAF mainstream share, effectively giving the Lower Basin more than its intended 8.5 MAF system total. This violates the Compact's equitable intent and forces the Upper Basin to subsidize Lower Basin "over-allocation" through higher Lee Ferry releases.

2. Basin-Wide Equity and Shared Burden for Shortages/Mexico Obligations

The Compact apportions the entire system (mainstream + tributaries) to ensure balanced development. By excluding the Gila (24% of the basin's drainage area), Arizona's effective Lower Basin consumptive use often exceeds the 7.5 MAF mainstream + 1 MAF extra, increasing pressure on Upper Basin flows to meet Article III(c) Mexico treaty obligations (shared equally unless surplus exists). Upper Basin states argue this creates asymmetry: they face climate-driven shortages without "credit" for their own undeveloped allocations, while Arizona benefits from tributary exclusion without bearing proportional responsibility. This undermines the Compact's goal of preventing one basin from disproportionately burdening the other.

3. Historical Negotiation Context and Arizona's Own Position

Arizona refused to ratify the Compact for decades partly because it feared Gila inclusion without safeguards—yet *Arizona v. California* gave Arizona the exclusion it wanted for mainstream accounting while ignoring Compact-wide implications. Upper Basin views this as selective application: the decision resolved Lower Basin internal disputes under the BCPA but did not rewrite the 1922 Compact's inclusive system definition. Negotiation records (e.g., 1922 minutes) show delegates understood tributaries would count toward basin totals to avoid upstream development being penalized by downstream claims.

4. Modern Practical and Hydrologic Reality

With climate change reducing natural flows, excluding major tributaries like the Gila artificially inflates perceived Lower Basin "compliance" while the Upper Basin (which generates most runoff) absorbs disproportionate risk. Upper Basin

advocates (e.g., via Upper Colorado River Commission analyses) emphasize that formal water budgets and accounting should reflect actual system contributions for fair post-2026 operations—excluding the Gila distorts this and incentivizes inefficient Lower Basin use.

These arguments are more compelling because they shift from pure textualism to equitable apportionment principles (embedded in Compact negotiations), original intent, and current hydrologic equity—key in ongoing post-2026 negotiations where Upper Basin states resist mandatory cuts without basin-wide accounting reforms. The position avoids over-relying on the Supreme Court's BCPA specific ruling, instead framing exclusion as an unintended loophole that imbalances the 1922 framework.