



The Colorado River Upper Initial Units Take Center Stage

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SUMMARY OF KEY POINTS

- In 1956, Congress authorized the Upper Initial Units—Flaming Gorge Reservoir, Navajo Reservoir, and the Aspinall Unit (UIUs)—for a variety of water use purposes in the Upper Colorado River Basin, including compliance with the 1922 Colorado River Compact (1922 Compact). The historical record is clear that the primary reason these reservoirs exist is to satisfy the math of the 1922 Compact and the obligations it imposed on the Upper Division States regarding flows at Lee Ferry.
- The size and operation of the UIUs was based on the math of the river as we understood it from the 1930s through the mid-1950s (natural flows, projected uses, and the drought of record). This math no longer works. Total water use in the Colorado River Basin has consistently exceeded the available supply since 2000. Until this fundamental problem is solved, releasing water from the UIUs only delays necessary permanent reductions in water use and provides some degree of temporary management flexibility.
- The 1948 Upper Basin Compact contemplates delivery of a required quantity of water at Lee Ferry. Article V gives the Upper Colorado River Commission (UCRC) the authority to allocate the capacity of the UIUs between providing water for use within the Upper Division States and providing water for common benefit purposes (delivering water to Lee Ferry). The policy has always been that 100% of the capacity of Navajo Reservoir is allocated for water use in New Mexico and 100% of the capacities of Blue Mesa and Flaming Gorge Reservoirs is allocated for common benefit purposes.
- There is no doubt that Flaming Gorge and Blue Mesa Reservoirs exist to meet a portion of the obligation of the Upper Division States under Article III of the 1922 Compact. As of October 1, 2026, the ten-year Lee Ferry flow will be about 81.2 million acre-feet (MAF), and under the Lower Division States' interpretation of the 1922 Compact, the Upper Division States may be in a compact deficit by 800,000 acre-feet (or more).¹
- Yet over 2.0 MAF of water remains in active storage in Flaming George Reservoir; more than enough water to erase the deficit and put the Upper

¹ The position of the Lower Division States is that the Upper Division States must not deplete the ten-year flow at Lee Ferry below 75 MAF PLUS deliver half of the annual treaty delivery to Mexico. The normal treaty delivery is 1.5 MAF, so the total ten-year delivery obligation could be 82.5 MAF. In recent years, under Minutes 323 and 330, the annual delivery has been less, but because these Minutes also create water that Mexico can store – calculating how much delivery the Upper Division States must share is not a simple matter. In any event, however, it appears that 81.2 MAF is less than the required 10-year flow pursuant to the Lower Division States' legal position.

Division states back in compact compliance as interpreted by the Lower Basin, if only for the short term.

- The Upper Division States assert that they are in full compliance with the 1922 Compact.¹ Thus, in their view, delivering additional UIU water to Lee Ferry now would be a waste of stored water that they may need in the future. They question why yet another reservoir should be further drawn down when the Basin has not solved the fundamental problem of demand exceeding supply.
- The stored water available in Flaming Gorge Reservoir has increased in importance to the entire basin. The Lower Division states view it as a source of water that can be delivered at Lee Ferry to supplement the releases from Lake Powell and thereby fulfill the obligations of the Upper Division States under the 1922 Compact. The Bureau of Reclamation is using Flaming Gorge as a source of water to protect critical infrastructure at Glen Canyon Dam, including hydropower generation. The Upper Division States view Flaming Gorge as a source of water for their current and future benefit; the water stored there could be used to comply with an adverse decision by a court or Special Master.
- There remain unresolved issues concerning the use of water stored in the UIUs, with seemingly conflicting provisions in the 1948 Upper Basin Compact and the 1970 Long-Range Operating Criteria that currently govern the operation of these reservoirs. These issues could govern future releases from the UIUs but have not been explicitly addressed in the Post-2026 Record of Decision or the 2027-2028 Operating Rules.
- The math of the 1922 Compact and its Lee Ferry flow provision, together with the directives of the Long-Range Operating Criteria, can no longer be reconciled with today's hydrology and long-term average basin-wide consumptive use. The Basin States can argue about compliance with various conflicting provisions, but the fundamental problem is that the rules were designed for a different river. We need new operating rules that reflect the river we have today. The choice in finding these new rules is likely to be between a compromise that is painful to all parties or a zero-sum Supreme Court decision that determines who gets what little water there is and who does not.

¹ The Upper Division States do not agree that their obligation to Mexico under Article III(c) of the 1922 Compact is half of the annual delivery to Mexico under the 1944 Treaty every year. For more information, see Eric Kuhn, et. al, The 1922 Compact is Now the Obvious Elephant in the Negotiating Room, Oct. 6, 2025, <https://www.colorado.edu/center/gwc/media/707>.

INTRODUCTION²

The 1956 Colorado River Storage Project Act (1956 CRSPA)³ authorized construction of Glen Canyon Dam, which created Lake Powell, and three additional major upstream storage projects; Flaming Gorge Dam and Reservoir, Navajo Dam and Reservoir, and the Curecanti Unit (Blue Mesa, Morrow Point, and Crystal Dams and Reservoirs, now called the Aspinall Unit). The 1956 CRSPA was designed as a broad authorization for Upper Basin water development within the bounds of the 1922 Compact. The legislation authorized construction of storage dams, powerplants,⁴ numerous irrigation projects, and trans-basin diversions. Among the purposes of 1956 CRSPA were “regulating the flow of the Colorado River, storing water for beneficial consumptive use, making it possible for the States of the Upper Basin to utilize, consistently with provisions of the Colorado River Compact, the apportionments made to and among them in the Colorado River Compact and the Upper Colorado River Basin Compact, respectively . . .”⁵ Flaming Gorge, Navajo, and the Aspinall Unit⁶ are collectively referred to as the “Upper Initial Units” (hereafter, UIUs). The three UIUs’ total live storage capacity is 6.15 million acre-feet (MAF), of

² This paper describes the authorization of the UIUs, the events leading up to that authorization, and some of the debate that resulted in the compromises in the 1956 Colorado River Storage Project Act (1956 CRSPA). The authors recognize that there are several detailed histories of CRSPA that address different aspects of its origins and come from a different perspective. Among these are: MARC REISNER, *CADILLAC DESERT: THE AMERICAN WEST AND ITS DISAPPEARING WATER* (1986, Viking Press); M. HARVEY, *A SYMBOL OF WILDERNESS: ECHO PARK AND THE AMERICAN CONSERVATION MOVEMENT* (Univ. N.M. Press 1994, 2nd Ed. Univ. of W.A. Press, 2000). Recognizing the value and insights of these previous works, this paper seeks to place the UIUs and their origins within the context of today’s hydrology and disputes.

³ P.L. 84-485, 70 Statute 105, 43 U.S.C. § 620 et seq.

⁴ The provision of hydroelectric power and resulting revenues prompted the label “cash register dam” to refer to projects in which the hydropower receipts finance other project construction. Long-Term Drought and Glen Canyon Dam: Potential Effects on Water Deliveries and Hydropower, Congressional Rsch. Serv., Apr. 4, 2023, at 4.

⁵ 1956 CRSPA Preamble.

⁶ The three reservoirs in the Aspinall Unit are Blue Mesa, Morrow Point, and Crystal. Only Blue Mesa is operated for river regulation and storage. Future references to storage in the UIUs include Blue Mesa, Flaming Gorge and Navajo Reservoirs, but not Morrow Point and Crystal Reservoirs. A number of additional reservoirs were authorized by the 1956 CRSPA (and subsequent federal legislation) as components of participating projects. All of these reservoirs have specific project functions. Several of these reservoirs store a significant amount of water. Strawberry Reservoir, a component of the Central Utah Project, McPhee Reservoir, a component of the Dolores Project, and Fontanelle Reservoir, a component of the Seedskaadee Project are three prominent examples.

which 5.10 MAF is “active” storage.⁷ On October 1, 2026, the total live storage in the three reservoir systems was 3.47 MAF. The Appendix contains a detailed description of each of the UIUs, with information on capacity, operations, and contract obligations.

For over 60 years, the three UIUs have been storing system water and producing hydroelectric power. These reservoirs, however, previously played a relatively small role in the operation of federal reservoirs of the Colorado River Basin (Basin) as a whole. The focus of the Basin's competing interests has primarily been on operation of Glen Canyon Dam and Hoover Dam that form Lake Powell and Lake Mead, respectively. These two reservoirs are the largest in the United States and presently store approximately 66% of all the water in the 12 federal reservoirs reported in Reclamation's 24-Month Studies. During the debate and development of major policy actions for the Colorado River, such as the 1970 Coordinated Long-Range Operating Criteria,⁸ 2001 Interim Surplus Guidelines,⁹ and the 2007 Interim Guidelines,¹⁰ the operations of the UIUs were barely mentioned. However, as storage in Lake Powell and Lake Mead has declined, the importance of the UIUs has increased.

The Bureau of Reclamation (Reclamation) operates each of the three UIUs under separate Records of Decision (ROD). Each is operated in a manner that balances many competing interests such as: storage for 1922 Compact compliance, the delivery of stored water for Upper Basin consumptive uses, the delivery of water in fulfillment of Tribal water right settlement obligations, flood control, hydropower generation, on-reservoir recreation, downstream river recreation, sport fisheries in the reservoir and in the stream below the reservoir, and the flow needs of threatened

⁷ The data sources for this paper are primarily the Hydrologic Database (HDB) and the 24-Month Studies, both maintained or prepared by the U.S. Bureau of Reclamation. We use “live storage” to mean the amount of storage reported in the HDB or alternately, the 24-Month studies. The standard terminology for reservoirs is that live storage is the amount that can be physically withdrawn or released downstream. Active storage is the amount above the power plant penstocks (or primary outlet works for Navajo Reservoir). Inactive storage is the amount between the power plant inlets, and the low-level outlet works. Below the low-level outlet is the “dead pool.” In theory, live storage = active plus inactive storage. In practice, however, each reservoir has a different design and different management issues. It is possible that some live storage may not be accessible for downstream delivery and use. The figures provided for live and active storage in the UIUs do not include Crystal and Morrow Point reservoirs.

⁸ For more information on the 1970 Long Range Operating Criteria, see <https://www.usbr.gov/lc/region/pao/pdfiles/opcriter2005FRN.pdf>.

⁹ The Colorado River Interim Surplus Criteria were adopted in 2001, but were superseded by the 2007 Interim Guidelines, see https://www.usbr.gov/lc/region/g4000/surplus/pdf/Attachments/Attachment_1.pdf.

¹⁰ U.S. Bureau of Reclamation, Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead, December 2007, <https://www.usbr.gov/lc/region/programs/strategies/RecordofDecision.pdf>.

and endangered fishes. Reclamation operates the UIUs in a transparent manner, and each has a local constituency that is closely involved in how their project is operated.

The UIU obscurity honeymoon ended in 2019 when the Upper Division States proposed what became the Drought Response Operations Agreement (DROA) as a component of their 2019 Drought Contingency Plan.¹¹ Arguably, under federal law, the Secretary of the Interior (Secretary) has broad authority to unilaterally move water from the UIUs downstream to Lake Powell. However, Reclamation took a more collaborative approach in the DROA: it was an inter-governmental agreement among the US (through Reclamation) and the states of Colorado, New Mexico, Utah, and Wyoming. DROA authorized releases from the UIUs to the extent necessary to achieve the stated operational objective of minimizing the risk of Lake Powell falling below a target elevation of 3525 ft, and thereby:

- helping to ensure the Upper Division States will continue fulfilling their interstate water compact obligations while exercising their rights to develop and utilize the Upper Basin's Compact apportionment,
- maintaining the ability to generate hydropower at Glen Canyon Dam, and
- minimizing adverse effects on resources and infrastructure in the Upper Basin.¹²

DROA is subject to numerous constraints, including:

- Water available in the UIU reservoirs,
- Protection of authorized purposes of each CRSP unit (water supply, endangered species, recreation, hydropower, etc.),
- Consultation with the Upper Division States and the Upper Colorado River Commission, and
- Operating criteria established in the agreement and the associated Records of Decision.

In 2021, a total of 181,000 acre-feet of DROA releases were planned pursuant to the Secretary's emergency authority: 125,000 acre-feet from Flaming Gorge, 36,000 acre-feet from Blue Mesa, and 20,000 acre-feet from Navajo. Due to dry conditions, the 20,000 acre-feet release from Navajo Reservoir was cancelled, resulting in a total release of 161,000 acre-feet.¹³ DROA was implemented again in 2022 pursuant

¹¹ U.S. Bureau of Reclamation, 2019 Drought Response Operations Agreement, <https://www.usbr.gov/ColoradoRiverBasin/dcp/droa.html>.

¹² DROA, Sec. I.A.

¹³ Upper Colorado River Commission (UCRC) Seventy-Third Annual Report (2022), pages 16-17.

to consultation and agreement with the Upper Division States—approximately 463,000 acre-feet of water from Flaming Gorge Reservoir were released. Both releases were intended to help maintain an operational target elevation of 3525 ft in Lake Powell.¹⁴ The DROA water released from Flaming Gorge Reservoir and Blue Mesa Reservoir in 2021 and 2022 was completely recovered after the moderately wet winter of 2023.¹⁵ DROA includes specific provisions addressing storage recovery after a DROA release is made. DROA expires contemporaneously with the 2007 Guidelines, but operations to recover storage releases made before Oct. 1, 2026, continue for as long as necessary.¹⁶

In response to the near-record low 2026 runoff and the unprecedented low reservoir levels in Lake Mead and Lake Powell, DROA releases were again implemented to supplement Lake Powell levels, and this time with even greater urgency and impact. To help maintain the elevation of Lake Powell above 3500 ft, on April 23, 2026, Reclamation began making additional DROA releases from Flaming Gorge Reservoir.¹⁷ According to the September 2026 24-Month Study, the planned release from Flaming Gorge will total one million acre-feet between April 2026 and April 2027, but Reclamation retains the flexibility to adjust the timing and amount based on actual hydrologic conditions. Citing contractual obligations and unusually low storage, there are no planned DROA releases scheduled for 2026 from either Blue Mesa Reservoir or Navajo Reservoir.¹⁸

As annual Colorado River Basin runoff in the 21st century is consistently lower than in the 20th century and the “Ratchet Effect” is evident in reservoir storage basin-wide, disputes over the operation of the UIUs between the Upper Division States and Lower Division States have increased and indeed now are nearly as critical and

¹⁴ UCRC Seventy-Fourth Annual Report (2023), page 15. With the DROA releases, Lake Powell reached a low of 3519.92 ft. (MSL), in early April 2023.

¹⁵ UCRC Seventy-Fifth Annual Report (2024), page 15. With an estimated natural flow of 17.3 MAF, 2023 was the third wettest year since 2000. We refer to it as a moderately wet year based on comparisons with the 20th Century record. With a natural flow of 17.3 MAF, it is about the same as the ten-year average from 1980-1989 – 17.2 MAF. USBR natural flow database, <https://www.usbr.gov/lc/region/g4000/NaturalFlow/index.html>.

¹⁶ DROA, Sec. II.A.6.

¹⁷ U.S. Bureau of Reclamation, 2026 Drought Response Operations Plan, <https://www.usbr.gov/ColoradoRiverBasin/documents/dcp/DROA/2026/uc-2026droughtresponseoperationsplan-attachments-a-h-508-20260423.pdf>. Two measures were put in place to maintain the elevation of Lake Powell above 3500 ft. The 1.0 MAF of DROA releases and a reduction of the Water Year 2026 annual release from Glen Canyon Dam from 7.5 MAF to 6.0 MAF.

¹⁸ *Id.*

strident as the disputes over water deliveries from Lake Powell to Lake Mead.¹⁹ The Lower Division States' May 1, 2026, Proposal for Short-Term Operations of the Colorado River included proposed operating criteria for the UIUs that would expand their role in maintaining Lake Powell elevations and effectively subordinate the refilling of the UIUs until there is sufficient water in Lake Powell to support the delivery of 8.23 MAF per year.²⁰ The stated intent is "to share the benefit of improved hydrology between both basins."²¹ On May 13th, 2026, the director of the Arizona Department of Water Resources told the Arizona Re-Consultation Committee that under Arizona's interpretation of the Law of the River, the 1956 CRSPA specifically subordinates the delivery of contract water from the UIUs and the refilling of those reservoirs to water deliveries to the Lower Basin and Mexico under the 1922 Compact.²²

The Upper Division States believe the operation of the UIUs proposed by the Lower Division States is outside the scope of the Post-2026 NEPA process and cannot be incorporated into the Record of Decision as part of the 2027–2028 operations plan.²³ Further, some UCRC commissioners pointed out that under the 1956 CRSPA, there are multiple purposes of the UIUs including supporting consumptive uses within the Upper Basin.²⁴ At the 2026 Getches-Wilkinson Center Conference on the Colorado River, then-Acting Reclamation Commissioner Scott Cameron noted that Reclamation would aggressively operate the UIUs under their RODs to help manage Lake Powell levels, but added that the Secretary has, and will use, if necessary, emergency authorities to operate the UIUs outside the bounds of their RODs.²⁵

The Record of Decision (ROD) released on August 21, 2026, for the "Decision Framework for Colorado River Guidelines: Coordinated Operations of Lake Powell

¹⁹ For an explanation of the Ratchet Effect, see Schmidt et al., The Colorado River Water Supply Crisis in a Few Graphs: Part 1 at 8 (June 2026), <https://www.colorado.edu/center/gwc/2026/06/18/colorado-river-water-supply-crisis-few-graphs-part-1>.

²⁰ Lower Division States' Proposal for Short-Term Operations of the Colorado River, May 1, 2026, <https://www.azwater.gov/sites/default/files/2026-05/2026.05.01%20LB2YearPlanFINAL.pdf>.

²¹ Memo from John Entsminger to Andrea Travnicek, Subject: Lower Division States' Proposal for 2026–2028 Colorado River Operations, Dated May 1, 2026.

²² AWDR presentation at the ARC Meeting May13, 2026, slide #9, https://www.azwater.gov/sites/default/files/2026-05/2026.05.13%20ARC%20Meeting%20%2313%20FINAL_0.pdf.

²³ Letter from UCRC Executive Director Cullom to Acting Commissioner Cullom, dated June 1, 2026, <http://www.ucrccommission.com/wp-content/uploads/2026/06/UDS-response-to-BOR-response-to-LB-concept-June-1-2026.pdf>.

²⁴ Comments of the individual UCRC commissioners at the April 26, 2026, special meeting of the UCRC where it reluctantly approved the DROA plan.

²⁵ Scott Cameron, Bureau of Reclamation presentation, 2026 GWC Conference, <https://www.colorado.edu/center/gwc/2026/06/04/june-4-5-2026-conference-colorado-river>.

and Lake Mead (2027–2036)" addressed the operation of the UIUs in a general manner. The ROD states:

"In carrying out the Decision Framework, the Department will continue to coordinate the operation of Lake Powell, Lake Mead, and the Colorado River Storage Project (CRSP) Upper Initial Units – specific reservoirs above Lake Powell – pursuant to Section 602 of the Colorado River Basin Project Act of 1968 (CRBPA). Consistent with each facility's existing ROD, the CRSP Upper Initial Units remain an operational tool available to the Secretary, when necessary, to release additional water to increase the elevation at Lake Powell to protect critical Federal infrastructure."²⁶

While the Decision Framework Operational Sideboards of the ROD include the *"Potential for maximum use of CRSP Upper Initial Units within their respective RODs to release additional water if needed to protect critical infrastructure,"* they also allow for greater releases than described in their respective RODs:

The Decision Framework establishes consultation thresholds associated with critical reservoir elevations. When projected reservoir conditions approach or fall below the consultation thresholds identified in the operational sideboards, the Secretary will coordinate and consult with the Basin States, Basin Tribes and other affected parties, as appropriate, regarding additional operational actions that may be appropriate to reduce risks to critical Federal infrastructure and maintain system reliability.²⁷

Further, "Such consultations may include consideration of additional reductions in water use, adjustments to coordinated reservoir operations of Lake Powell and Lake Mead, use of the CRSP Upper Initial Units, or other operational actions."²⁸

Notably, the Decision Framework does not mention using the UIUs for making deliveries of water to Lee Ferry when there is insufficient water in Lake Powell for compliance with the 1922 Colorado River Compact (1922 Compact).

²⁶ U.S. Bureau of Reclamation, Record of Decision, Framework for Colorado River Guidelines: Coordinated Operations of Lake Powell and Lake Mead (2027-2036) August 2026, https://www.usbr.gov/ColoradoRiverBasin/post2026/decision-doc/P26_RecordofDecision_Final.pdf.

²⁷ ROD at 30.

²⁸ ROD at 27, 30.

UIU storage recovery timing and amounts are not specified in the 2027-2028 Operating Guidelines,²⁹ but Interior's response to the Lower Basin's May 1st proposal stated that it:

intends to refill the UIUs as soon as practicable to ensure water remains available for any additional infrastructure protection releases, while avoiding further risk to critical infrastructure during recovery operations. Based on prior operational experience, recovery operations were initiated once Lake Powell was no longer projected to continue declining. Reclamation would apply a similar approach for future UIU recovery operations and would consider actual hydrology and Basin-wide conditions before initiating recovery actions.³⁰

What is clear is that the water stored in the UIUs is an increasingly important resource coveted by the Upper Division States, the Lower Division States, Basin Tribes,³¹ and Reclamation. It is also clear that each of these entities has a different perspective on the priorities under which the UIUs will be operated in the future. But it is important to recognize that while the water released by the UIUs in 2021, 2022, and 2026 provided critical benefits, especially for maintaining Lake Powell above target thresholds, DROA-like releases are not a solution to the Basin's fundamental problem – systematic use of more than the available water supply. The operation of the UIUs may buy time and provide additional flexibility for reservoir system management, but it does not create any new water.

The debate over the future use of the UIUs has also exposed and amplified several long-standing disputes over the interpretation of the key provisions of the Law of the River,³² and ambiguities in the major federal legislation that authorized the construction and operation of the river's major federal reservoirs. A primary disputed issue facing the Colorado River Basin today is how much water must flow at Lee Ferry to satisfy the Upper Division States' 1922 Compact obligations. As stated above, delivering water to Lee Ferry was a core purpose for both Lake Powell and the three UIUs.³³

²⁹ U.S. Bureau of Reclamation, 2027-2028 Operating Guidelines, https://www.usbr.gov/ColoradoRiverBasin/post2026/decision-doc/2027-2028OperatingGuidelines_Final.pdf.

³⁰ Department Response to Lower Division States' Proposal for 2027-2028 Colorado River Operations, May 28, 2026.

³¹ The Ute Mountain Ute Tribe, Southern Ute Indian Tribe, Jicarilla Apache Nation, and Navajo Nation each have significant and unique interests in the operation of Navajo Reservoir. The Ute Indian Tribe of the Uintah and Ouray Reservation has asserted claims to water stored in Flaming Gorge Reservoir.

³² The Law of the River is a complex set of agreements, treaties, court decisions, and regulations that govern the allocation and use of water resources in the Colorado River Basin. A Colorado River Overview: Education, Facts & Statistics, <https://coloradoriver.com/statistics-facts/>.

³³ 1956 CRSPA, *supra* note 3.

On August 24, 2026, the state of Nevada, the Colorado River Commission of Nevada, and the Southern Nevada Water Authority filed a complaint for declaratory action and injunctive relief requesting a declaration that the ROD, Final Environmental Impact Statement, and 2027-2028 Guidelines are in violation of the Administrative Procedure Act, the National Environmental Policy Act (NEPA), and the Law of the River.³⁴ The complaint requests an injunction halting the implementation of the ROD and Operating Guidelines. Among other arguments, the plaintiffs claim that the Secretary failed to consider the exercise of authority to operate the UIUs in compliance with the Law of the River and NEPA.

The ROD states that the UIUs will be the subject of a new DROA agreement (referred to as a “framework”) that is currently being negotiated among Reclamation and the Upper Division States. This proposed agreement, drafts of which have not been released to the public, has already received criticism from the State of Arizona. If finalized, it could also be the subject of future litigation.³⁵ In the remainder of the paper, we explore the history of the UIUs from their conception to the present day to provide context and rationale for future operations.

³⁴ *Nevada v. Burgum*, et al, U.S. District Court, District of Nevada, Case 2:26-cv-02665, filed 08/24/2026. See also, <https://mavensnotebook.com/2026/08/25/courthouse-news-nevada-files-suit-over-colorado-river-plan/>; <https://www.gov.nv.gov/press-releases/nevada-files-lawsuit-against-department-of-the-interior-over-colorado-river-operations-record-of-decision>.

³⁵ The term “framework” to describe the new DROA was used by the UCRC at its Sept. 15, 2026, Special Meeting. The comments by Tom Buschatzke were made at the August 24, 2026, meeting of the Arizona Reconsultation Committee.



Fig. 1, Map of projects built under 1956 CRSPA, U.S. Bureau of Reclamation.

THE 1922 COLORADO RIVER COMPACT AND THE 1948 UPPER COLORADO RIVER BASIN COMPACT

The math of Article III of the 1922 Compact preordained the need for a significant amount of carry-over storage in the Upper Basin. Under Article III(d), the States of the Upper Division have an obligation not to cause the 10-year cumulative flow at Lee Ferry to be depleted below 75 MAF.³⁶ Further, under Article III(c), the States of the Upper Division must provide additional deliveries at Lee Ferry equal to one-half of any treaty obligation to Mexico not met from the available surplus over the aggregate of amounts apportioned to each basin under Articles III(a) and III(b).³⁷

In 1922 when the Compact was signed, it was not clear how much storage, if any, the Upper Basin would need to meet these obligations. Many of the commissioners believed that the flexibility of the Upper Division States' Lee Ferry flow obligation over a period of ten years was sufficient to deal with the expected hydrologic variability. In his March 15, 1923, Supplemental Compact report to the Colorado General Assembly, Delph Carpenter concluded that the Upper Division States could "safely guarantee" the 75 MAF commitment.³⁸

The 1930s drought crystallized the need for storage in the Upper Basin to enable 1922 Compact compliance. For most of the engineers and water managers that were engaged in the early planning of the development of the Colorado River Basin, the 1930s drought was a rude awakening.³⁹ Prior to the 1930s, the "drought of record" was a reconstructed three-year period in the early 1900s (1902-1904).⁴⁰ Also, prior to the 1930s, Reclamation's water engineers and planners believed that the estimated

³⁶ 1922 Compact Article III (d), "The States of the Upper Division 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 reckoned in continuing progressive series beginning with the first day of October next succeeding the ratification of this compact."

³⁷ Colorado River Compact Article III (c), "If, as a 'matter of international comity, the United States of America shall hereinafter 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 interpretation of this provision is a matter of dispute between the Upper and Lower Division States.

³⁸ DELPHUS E. CARPENTER, SUPPLEMENTAL REPORT FOR COLORADO, COLORADO RIVER COMMISSION, MAR. 15, 1923. The report is available as Appendix 210 to the Hoover Dam Documents, 1948 Edition. Carpenter's exact language is, "It is evident that the States of the upper basin may safely guarantee 75,000,000 acre-feet aggregate delivery at Lees Ferry during each 10-year period."

³⁹ See generally, Scott Miltenberger, *We Have to Judge the Future by the Past: The 1931-40 Drought, the Upper Basin Compact, and the Colorado River Storage Project*, 57 A.S.U. L. JOURNAL, 1443 (2025).

⁴⁰ *Id.*, page 1443.

long-term natural flow at Lee Ferry was more than 17 MAF per year.⁴¹ From 1931-1940, the annual natural flow at Lee Ferry averaged only 12.57 MAF per year,⁴² low enough so that both Upper Division States and Reclamation water planners recognized that without major storage upstream of Lee Ferry, the Upper Division States would not be able to both develop their Compact entitlement and meet their Lee Ferry flow obligations.⁴³ To put this concern in perspective with today's hydrologic conditions, the 27-year average natural flow at Lee Ferry since 2000 is approximately 12.0 MAF per year, both drier and of longer duration than the 1930s drought.⁴⁴

The Upper Basin States (including Arizona) met in 1946 to begin negotiations of an Upper Colorado River Basin Compact (Upper Basin Compact). One of the early actions of the Upper Colorado River Basin Compact Commission (Commission) was to assign to its Engineering Advisory Committee the task of determining how much carry-over storage would be needed to both allow development of the Upper Basin's Compact apportionment and meet the Upper Basin's Compact obligations.⁴⁵ Since in 1945 the United States Senate had ratified the International Water Treaty with Mexico,⁴⁶ the commissioners and their advisors now understood that the obligations of the Upper Division States included both Article III(d) and Article III(c).⁴⁷

At the Commission's 7th meeting in July 1948, the Engineering Advisory Committee provided its answer: the Upper Basin would have needed to have about 30.0 MAF of water available in storage at the end of Water Year 1930 to both meet its 1922 Compact obligations and consume 7.5 MAF per year through the 1930s drought.⁴⁸ Under the Engineering Advisory Committee's assumptions, this amount of storage would be depleted at the end of Water Year 1940 – when, luckily, the 1941 “super” El

⁴¹ ERIC KUHN & AND JOHN FLECK, *SCIENCE BE DAMMED: HOW IGNORING INCONVENIENT SCIENCE DRAINED THE COLORADO RIVER* Ch. 5 (Univ. of A.Z. Press, 2019).

⁴² This is a current estimate. The data are available from the provisional USBR Natural Flow Database <https://www.usbr.gov/lc/region/g4000/NaturalFlow/provisional.html>. The estimated 10-year flow in the 1940s was slightly less, about 12.21 MAF per year, see “Reclamation, “The Colorado River: A Natural Menace becomes a National Resource” (also known as House Document 419, Eightieth Congress, First Session), “Hydrology Appendix, 1947.

⁴³ Miltenberger, *supra* note 39. See the discussion on pages 1454-1458. Also, Kuhn and Fleck, *supra* note 41, Chapter 9.

⁴⁴ This is an estimate. USBR Natural Flow Database, *supra* note 42. The estimates for Water Years 2025 and 2026 are not in the provisional data; preliminary estimates were provided to the authors by Dr. James Prairie, U.S. Bureau of Reclamation.

⁴⁵ Eric Kuhn, Katherine H. Tara & John Fleck, *A Horse Named “Stream Depletion Theory”: The History and Negotiation of the Upper Colorado River Basin Compact*, 65 NAT. RES. J. 69 (2025), at 87, <https://digitalrepository.unm.edu/nrj/vol65/iss1/5>.

⁴⁶ Utilization of the Waters of the Colorado and the Tijuana Rivers and of the Rio Grande, Treaty Between the United States of American and Mexico, effective Nov. 8., 1945.

⁴⁷ Kuhn, Tara, & Fleck, *supra* note 45, page 95.

⁴⁸ Official Record of the Upper Colorado River Basin Compact Commission, Volume III, Report of the Engineering Advisory Committee, pages 62-65.

Niño pulled the Basin out of its 10-year drought.⁴⁹ An independent hydrologic study by Reclamation's Region 4 (now the Upper Colorado Region) confirmed the Engineering Advisory Committee's results.⁵⁰

The Commission's deliberations went beyond just the question of how much carry-over storage would be needed to meet the Upper Division States' 1922 Compact obligations. The Commission understood that the future operation of what they referred to as "common benefit" storage required that they address questions relating to the distribution of evaporation from these reservoirs among the states. The commissioners also realized it was likely that some of the proposed reservoirs would inundate land in multiple states, raising jurisdictional issues. The Commission further understood that these reservoirs could be used to support both consumptive uses within a state and meet the joint Compact obligations of the four Upper Division States.⁵¹ Thus, they needed to address the question of priority: in-basin consumptive use versus common benefit deliveries to Lee Ferry.⁵² This remains a core disagreement among the Basin States today.

The Commission addressed these questions in a long and detailed article in the Upper Basin Compact. It is noteworthy that one of the stated purposes of the Upper Basin Compact is to "establish the obligations of each state of the upper division with respect to the deliveries of water required to be made at Lee Ferry by the Colorado River Compact." Article V, paragraphs (b) and (c) are directly relevant to DROA-type operations of the UIUs and appear to give the UCRC significant authority over the allocation of water and capacity in the UIUs. The most relevant provisions are as follows:

(b) All losses of water occurring from or as the result of the storage of water in reservoirs constructed after the signing of this Compact shall be charged as follows:

(1) If the Commission finds that the reservoir is used, in whole or in part, to assist the States of the Upper Division in meeting their obligations to deliver water at Lee Ferry imposed by Article III of the Colorado River Compact, the Commission shall make findings, which in no event shall be contrary to the laws of the United States of America under which any

⁴⁹ Seth Mberego, Ritsumeika Asia Pacific University, *The 1940-1941 El Niño Event: Insights from Literature* (2020).

⁵⁰ Official Record, *supra* note 48, Volume II, Meeting VIII, page 66.

⁵¹ Kuhn, Tara, and Fleck, *supra* note 45, at 95.

⁵² *Id.*, at 94-96.

reservoir is constructed, as to the reservoir capacity allocated for that purpose.⁵³

The whole or that portion, as the case may be, of reservoir losses as found by the Commission to be reasonably and properly chargeable to the reservoir or reservoir capacity utilized to assure deliveries at Lee Ferry shall be charged to the States of the Upper Division in the proportion which the consumptive use of water in each State of the Upper Division during the water year in which the charge is made bears to the total consumptive use of water in all States of the Upper Division during the same water year. Water stored in reservoirs or in reservoir capacity covered by this subparagraph (b) (1) shall be for the common benefit of all of the States of the Upper Division.

(2) If the Commission finds that the reservoir is used, in whole or in part, to supply water for use in a State of the Upper Division, the Commission shall make findings,⁵⁴ which in no event shall be contrary to the laws of the United States of America under which any reservoir is constructed, as to the reservoir or reservoir capacity utilized to supply water for use and the State in which such water will be used. The whole or that proportion, as the case may be, of reservoir losses as found by the Commission to be reasonably and properly chargeable to the State in which such water will be used shall be borne by that State. As determined by the Commission, water stored in reservoirs covered by this subparagraph (b) (2) shall be earmarked for and charged to the State in which the water will be used.

(c) In the event the Commission finds that a reservoir site is available both to assure deliveries at Lee Ferry and to store water for consumptive use in a State of the Upper Division, **the storage of water for consumptive use shall be given preference** (emphasis added). Any reservoir or reservoir capacity hereafter used to assure deliveries at Lee Ferry shall by order of the Commission be used to store water for consumptive use in a State, provided the Commission finds that such storage is reasonably necessary to permit such State to make use of the water apportioned to it by this compact.

⁵³ The phrase "which in no event shall be contrary to the laws of the United States of America under which any reservoir is constructed" is not further defined. The Upper Division States and Lower Division States will likely disagree over the interpretation of this provision.

⁵⁴ The "findings" referenced here must be supported by publicly accessible data and independently verifiable.

These provisions are illuminating because they emphasize the fact that neither the UCRC nor any individual Upper Basin state has physical control over the operation of the UIUs. The projects are operated by employees under the direction of the Secretary of the Interior pursuant to 1956 CRSPA and federal Reclamation law.

The commissioners signed the Upper Basin Compact on October 11, 1948. It was then quickly ratified by the five signatory states and approved by Congress. The Upper Basin Compact became effective on April 6, 1949.⁵⁵ After the approval, the Upper Division States turned their efforts toward Congressional approval of a comprehensive Upper Basin water development statute.

1956 COLORADO RIVER STORAGE PROJECT ACT

Reclamation had already completed much of the planning work for comprehensive development legislation long before the Upper Basin Compact was finalized.⁵⁶ Edward Larson, Reclamation Regional Director for Region 4 (now the Upper Colorado Region), issued a planning report in December 1950.⁵⁷ The Larson Report became the basis for what would become the 1956 CRSPA.

In the introduction, the report describes the Colorado River Storage project (CRSP) as follows:

The Colorado River storage project would consist of a combination of dams, reservoirs, power plants, and other appurtenant structures on the upper Colorado River and its principal tributaries.... The project reservoirs would regulate the flow of the river, assure the delivery of water to the lower basin as required by the Colorado River compact, and further the use in the upper basin of water apportioned by the compact. Part of the capacity of some of the reservoirs would store water for direct use in the upper basin. Revenues from the sale of project-generated power would be sufficient to pay all reimbursable Colorado River storage project costs and assist irrigators in the payment of other projects that would utilize water of the upper Colorado River system. Projects that would be so assisted are referred to as "participating projects." All projects authorized subsequent to the approval of the upper Colorado River basin compact that would consume water of the upper

⁵⁵ Official Record, *supra* note 50, Volume I, Foreword.

⁵⁶ Kuhn and Fleck, *supra* note 41, Chapter 12. This chapter covers the comprehensive report on the development of the Colorado River prepared by Reclamation, published as a draft in 1946, then submitted to Congress in 1947. The draft of this report was titled "The Colorado River: A Natural Menace becomes a National Resource" (also House Document 419, Eightieth Congress, First Session). It was referred to as the "Blue Book."

⁵⁷ Department of the Interior, Bureau of Reclamation, Region 4, Interim report on the Colorado River storage project and Participating projects, Colorado River Basin, December 15, 1950 (Larson Report).

Colorado River system are considered to be dependent upon the storage project for an assured water supply, such projects therefore are designated 'dependent projects'.⁵⁸

The concept of designating the water uses from all post-Upper Basin Compact projects as "dependent" because they rely on CRSP reservoir releases made to meet the 1922 Compact obligations of the Upper Division States was an essential part of the economic analysis of the CRSP. It was necessary to showing a benefit-to-cost ratio of greater than 1.0 for the UIUs.⁵⁹

The Larson Report recommended the construction of ten storage units; eight of the dams and reservoirs would provide river regulation, and two would be for power purposes only. The eight regulatory dams were anchored by Glen Canyon Dam with a proposed capacity of 27.0 MAF. The remaining seven were: Whitewater Dam and Blue Mesa Dam on the Gunnison River; Flaming Gorge Dam, Echo Park Dam, and Cross Mountain Dam on the Green and Yampa Rivers; and Navaho Dam (originally spelled with an "h") on the San Juan River. The two power-only dams were the Split Mountain Dam on the Green River below Echo Park Dam and Crystal Dam on the Gunnison River below Blue Mesa Dam. The ten reservoirs would have a total live capacity of 48.55 MAF, of which 37.53 MAF would be considered active storage.⁶⁰

The report estimated that at full development of the Upper Basin's Compact apportionment (which was expected to vary year-to-year based on hydrology), 23 MAF of carry-over storage in reservoirs was needed to meet the 10-year running compact delivery needs of the Upper Division States.⁶¹ One of the reasons the report suggested such a large storage amount was the assumption that after 200 years, because of sedimentation, only 25.94 MAF of active storage would remain.⁶² Because a portion of the power revenues would be used to subsidize the participating projects, hydroelectric power generation was critical to the overall project. The ten

⁵⁸ *Id.*, paragraph 2.

⁵⁹ In general, a Benefit-Cost Ratio is an economic indicator used by the Bureau of Reclamation to evaluate whether the projected economic, environmental, and social gains of a water or power infrastructure project outweigh its construction and operational costs. For more detail see Elser B. Staats, Comptroller General, An Overview of Benefit-Cost Analysis for Water Resources Projects: August 7, 1978, <https://www.gao.gov/assets/ced-78-127.pdf>.

⁶⁰ Larson Report, *supra* note 57, paragraphs 12-16.

⁶¹ *Id.* The authors have not been able to find a document prepared by Reclamation that provides the details of the calculation of the 23 MAF figure and why it is less than previous estimates of about 30 MAF. There are two possible reasons: 1. The estimated natural flows from 1931-1940 were revised upward by a small amount (~370 kaf per year), but over a ten-year period it amounts to 3.7 MAF; 2. Based on the Leeds, Hill, and Jewett Report prepared for Colorado, *infra* note 100, there are years when the physical supply of water available at the individual diversion points in the Upper Basin limited the water available for consumptive use.

⁶² Larson Report, *supra* note 57, paragraph 12.

proposed dams were projected to initially produce a total of about 9 billion kilowatt-hours of energy annually, dropping to 6 billion at ultimate development.⁶³ In contrast, in 2023 (the most recent wet year), the CRSP dams produced a total of 4.2 billion kilowatt hours.⁶⁴

The Larson Report also made an initial recommendation for 12 participating projects; two existing projects that would be reclassified as participating projects and 10 new projects.⁶⁵

With opposition from California, the legislation to authorize the CRSP languished until early 1954 when the Eisenhower Administration finally decided to support authorization, but with important changes.⁶⁶ On March 18, 1954, the White House approved transmitting an October 1953 Supplemental Report to Congress recommending authorization of the CRSPA.⁶⁷ The Supplemental Report recommended that in the initial phase, only two storage projects should be built, Glen Canyon Dam and Echo Park Dam (thus, the term “initial units”). Navaho Reservoir was changed from a storage unit to a component of the Shiprock and Southern San Juan projects. Those two projects were early versions of what would become the Navajo Indian Irrigation Project.⁶⁸ The remaining seven storage units were deferred to a later unspecified date, if they were ever needed.⁶⁹

The Eisenhower Administration's reasons for the changes were: ⁷⁰

- The combined capacity of the Glen Canyon and Echo Park Units of 32.4 MAF (25.5 MAF of active storage) was sufficient to meet the 1922 Compact delivery needs of the Upper Division States. If more storage were to be needed in the future, additional storage units could be built.

⁶³ *Id.*

⁶⁴ Reclamation, October 2023, 24-Month Study. This includes power generated at Fontenelle Reservoir, which is not an Initial Unit, but its power operation is included in the total 1956 CRSPA generation, see <https://www.usbr.gov/lc/region/g4000/24mo/index.html>.

⁶⁵ Larson Report, *supra* note 57.

⁶⁶ See generally, John Upton Terrell, *War for the Colorado River Vol 2: the Upper Basin*, Arthur H. Clark Publishing, 1965.

⁶⁷ Joseph M. Dodge, Director of the Bureau of the Budget to the Secretary of the Interior, dated March 18, 1954. See also, White House, Statement by the President (Eisenhower), Colorado River Storage Project and Participating Projects, press release of March 20, 1954.

⁶⁸ For information on the Navajo Indian Irrigation Project, see <https://www.usbr.gov/projects/index.php?id=360>.

⁶⁹ Supplemental Report on Colorado River Storage Project and Participating Projects, Upper Colorado River Basin, October 1953. The supplement report along with comments from the federal agencies and states was transmitted to Congress by Assistant Secretary of the Interior Fred Aandahl on April 6, 1954 (Secretary's Transmittal), at 40.

⁷⁰ *Id.* at 33 and 40.

- The Glen Canyon and Echo Park Dam projects were the most cost-effective power producers and the most strategically located to serve the expected load centers where the power would be marketed.
- Delaying the remaining storage units until they were needed would save 100,000 to 200,000 acre-feet per year of unnecessary evaporative losses.
- The capacity of Navaho Reservoir (still spelled with an "h") was needed to meet the needs of proposed projects within New Mexico, thus it was not suitable as a common-benefit (or Compact delivery) storage unit.

The response by the Upper Division States was tempered. They all understood that President Eisenhower's continued support for CRSPA was essential. The basic concept of using power revenues to subsidize portions of irrigation projects beyond the ability of the irrigators to pay was untouched. Utah made suggestions concerning eligible participating projects. New Mexico agreed with the change in status of Navaho Reservoir. Wyoming was supportive. Colorado made the most critical comments, suggesting that there needed to be an additional 3 MAF of storage constructed on the mainstem and Gunnison Rivers above Grand Junction and commenting that the proposed list of participating projects provided very little benefit for Colorado.⁷¹

Arizona supported the CRSPA Supplemental Report, suggesting that the state should be included in the service area for CRSPA power. California remained steadfastly opposed.⁷² In 1954, Arizona and California were in the early stages of litigation in the U.S. Supreme Court in *Arizona v. California*. California had filed a joinder motion to bring the Upper Division States into the case on the grounds that Arizona's interpretations of the 1922 Compact impacted all seven Basin States. Fearing that their participation in the case would delay Congressional approval of CRSPA, the Upper Division States allied with Arizona in opposing this motion.⁷³ Thus, the political tensions over water development between California and the other Basin States were very high.

California's stated opposition to CRSPA was publicly based on economic grounds; many of California's Congressional delegations considered the proposed CRSPA

⁷¹ *Id.* Comments from the states are included in the Secretary's Transmittal, pages 27-35.

⁷² *Id.*

⁷³ Kuhn and Fleck, *supra* note 41, Chapter 15.

subsidies to be “creeping” socialism.⁷⁴ California also raised 1922 Compact issues, including how Article III(e) would impact the filling and operation of the storage units. Article III(e) prohibits the Upper Basin from withholding and the Lower Basin from requesting water that cannot reasonably be applied to domestic and irrigation uses. The creation of new storage arguably constituted the withholding of water not immediately required for use. California asked who would interpret and enforce this paragraph.⁷⁵

Because the dam and reservoir would be located within Dinosaur National Monument, the designation of Echo Park as an initial unit attracted national opposition from conservation and preservation groups and from members of the public. Some historians mark the Congressional debate over the Echo Park Dam as one of the founding moments of the nation's environmental movement.⁷⁶ The opposition to the Echo Park Dam gave Congressional Committees reason to reconfigure the Administration's recommendations. In June 1955, the Senate passed its version of CRSPA (S.500, sponsored by Senator Anderson of New Mexico). It included six initial units: Glen Canyon, Echo Park, Flaming Gorge, Juniper, Navajo (now spelled with a “j”), and Curecanti (now Aspinall).⁷⁷ In the House version of the bill (H.R.3383, sponsored by Representative Aspinall of Colorado), Echo Park was removed during markup and the legislation did not include Navajo and Juniper.⁷⁸ After the House and Senate worked out their differences in conference, four initial units were included in the final markup- Glen Canyon, Flaming Gorge, Curecanti and Navajo. Navajo Reservoir was included because of the political influence of New Mexico's Senator Clinton Anderson.⁷⁹ The legislation passed and was signed into law by President Eisenhower on April 11, 1956.

⁷⁴ *Id.* at Chapter 14. See comments by CA Representative Craig Hosmer (R) page 150, “The Bureau's policies have been called creeping socialism. I submit the Bureau's economics wouldn't be tolerated by the most ardent Socialist. And they are most certainly not creeping policies. They are advancing with the speed of a jet plane.” The authors note that while California's public opposition to CRSPA was primarily economic, blocking Upper Basin projects had the additional benefit of preserving its access to Colorado River surplus water. In the 1930s, it signed contracts for 5.362 MAF of Lake Mead water, yet its normal year entitlement under the Boulder Canyon Project Act was only 4.4 MAF.

⁷⁵ Secretary's Transmittal, *supra* note 69, pages 12 and 13.

⁷⁶ George Mumford, Northern Arizona University, “Echo Park Dam and the Early Environmental Movement,” <https://www.intermountainhistories.org/items/show/56>, last accessed Oct. 2, 2026.

⁷⁷ Legislative history of the 1956 CRSPA, <https://www.congress.gov/bill/84th-congress/senate-bill/500>.

⁷⁸ *Id.*

⁷⁹ Comment by former Colorado Water Conservation Board Executive Director and UCRC member Felix Sparks at a meeting of the Upper Division States (convened by the UCRC) in Santa Fe, New Mexico on May 22, 1984, at which co-author Kuhn was present and has a transcript of the meeting. For more information on this legislative history, see M. HARVEY, *supra* note 2.

In addition to the four initial units, the 1956 CRSPA authorized 11 participating projects and directed the Secretary to study an additional 24 projects for potential future authorization by Congress. Because it had a benefit to cost ratio of less than 1.0 (0.86),⁸⁰ before construction of the Curecanti Unit could begin, the legislation required the Secretary of the Interior to prepare and transmit to and Congress and the President an economic justification report.⁸¹

In addition to the stated purposes of the CRSPA units as detailed above, the legislation provides operating guidance in Section 14 as follows:

The Secretary of the Interior is directed to comply with the applicable provisions of the Colorado River Compact, the Upper Colorado River Basin Compact, the Boulder Canyon Project Act, the Boulder Canyon Project Adjustment Act, and the Treaty with the United Mexican States, in the storage and release of water from reservoirs in the Colorado River Basin. In the event of the failure of the Secretary of the Interior to so comply, any State of the Colorado River Basin may maintain an action in the Supreme Court of the United States to enforce the provisions of this section, and consent is given to the joinder of the United States as a party in such suit or suits, as a defendant or otherwise.⁸²

CONSTRUCTION AND FILLING OF THE INITIAL UNITS

By the time CRSPA was signed, Reclamation was already primed to begin final designs and pre-construction activities on all but the Curecanti Unit. Construction of Glen Canyon Dam began in 1957 and of Flaming Gorge and Navajo Dams in 1958.⁸³ Navajo Dam was the first to be completed in December 1962, followed by Flaming Gorge Dam in 1963.⁸⁴ Both reservoirs were filled relatively slowly: The Flaming Gorge

⁸⁰ Secretary's Transmittal, *supra* note 69, the table of benefit-to-cost ratios for the storage units is on page 51.

⁸¹ The enacting clause of the 1956 CRSPA, *supra* note 3, includes the following language: "construction thereof (Curecanti) shall not be undertaken until the Secretary has on the basis of further engineering and economic investigations, reexamined the economic justification of such unit and, accompanied by appropriate documentation in the form of a supplemental report, has certified to the Congress and to the President that, in his judgment, the benefits of such unit will exceed its costs;" The legislation did not require similar economic justification for Flaming Gorge because, pursuant to the October 1953 Supplemental Report, Flaming Gorge had a benefit to cost ratio greater than 1.0 (1.16). Looking at the details, however, the concept of dependency was used. 43% of the benefits of Flaming Gorge Reservoir were assigned to agriculture, even though no actual deliveries of Flaming Gorge water were planned to be made. The agricultural benefits resulted from the Compact deliveries from the reservoir.

⁸² 1956 CRSPA, *supra* note 3.

⁸³ The Bureau of Reclamation Upper Colorado Region website includes detailed information on the history, construction, and initial filling of each CRSPA Initial Units: <https://www.usbr.gov/uc/rm/crsp/>.

⁸⁴ *Id.*

Reservoir initial filling was completed in 1972, Navajo Reservoir in 1973.⁸⁵ Glen Canyon Dam construction was technically completed in 1966, but the dam had been sufficiently completed to begin its long 18-year fill in 1963.⁸⁶ The initial filling of Lake Powell was completed in June 1981.⁸⁷

Construction of the Curecanti Unit (Blue Mesa Dam) was delayed until the Secretary had completed the required economic justification report. The report on the economic feasibility of Blue Mesa and Morrow Point Reservoirs was submitted to Congress in 1959.⁸⁸

To obtain a benefit to cost ratio of greater than 1.0, Reclamation both refined the power benefits and assigned a value to the water the Curecanti Unit would deliver to Lee Ferry. Using the concept of dependence, Reclamation calculated that Blue Mesa could deliver 298,000 acre-feet of water in a future drought when the Upper Division states needed to rely on releases from the initial units to meet their 1922 Compact obligations at Lee Ferry.⁸⁹ Assigning an economic benefit to the basin-wide continued consumptive use made possible by the delivery of the Blue Mesa water to Lee Ferry, together with the power refinements, made the 50-year benefit to cost ratio greater than 1.0.⁹⁰

Construction of Blue Mesa Dam started in 1962 and was completed in 1966, followed by Morrow Point Dam in 1968 and Crystal Dam in 1976. The initial filling of Blue Mesa Reservoir was completed in 1969.

The large inactive storage capacity of Navajo Reservoir, 673,000 acre-feet, is required to deliver water by gravity to the Navajo Indian Irrigation Project supply canal. This is what is known as a “water bridge.” Although Reclamation made plans for a federal power plant at Navajo Dam, Congress never approved it. The City of Farmington obtained a Federal Energy Regulatory Commission (FERC) license for a non-federal power plant in 1986. Power was first generated in 1989.⁹¹

⁸⁵ *Id.*

⁸⁶ *Id.*

⁸⁷ *Id.*

⁸⁸ Department of the Interior, Bureau of Reclamation, Curecanti Unit, Blue Mesa Reservoir and Morrow Point Reservoir, Economic Justification Report, submitted to Congress, July 1959. The authors have been unable to find a copy of the report online. A copy is available from the Colorado River Water Conservation District library, Glenwood Springs, CO.

⁸⁹ *Id.* Pages 18 and 19. The report concludes that the Curecanti Unit Reservoirs would contribute 4% of the releases made from Glen Canyon, Flaming Gorge, and the Curecanti Units for 1922 Compact compliance purposes. The assumption was that there would be no releases from the Navajo Unit.

⁹⁰ *Id.*, table on page 33.

⁹¹ TONI RAE LINENBERGER, BUREAU OF RECLAMATION HISTORY PROGRAM, NAVAJO UNIT, CRSP 26, 1998.

These as-built capacities have been reduced due to sedimentation and refined by updated surveys. The impact of sedimentation on Flaming Gorge, Navajo, and Blue Mesa has been relatively small,⁹² but not so for Lake Powell. Based on a USGS study released in 2022, in 2018 the total storage was estimated to be 25.16 MAF, a loss of 1.84 MAF, and active storage of 23.4 MAF, a loss of 1.4 MAF or about 6.8%.⁹³

STATISTICAL DATA FOR PRINCIPAL RESERVOIRS IN COLORADO RIVER BASIN								
(Units: Elevation — feet; capacity — 1,000 acre-feet)								
UPPER BASIN								
Colorado River Storage Project (Total Surface Capacity)								
	Flaming Gorge		Navajo		Lake Powell		Blue Mesa	
	Elev.	Cap.	Elev.	Cap.	Elev.	Cap.	Elev.	Cap.
River elevation at dam (average tailwater)	5,603	0	5,720	0	3,138	0	7,160	0
Dead Storage	5,740	40	5,882.5	175	3,370	1,998	7,358	111
Inactive Storage (minimum power pool)	5,871	273	5,990	673	3,490	6,124	7,393	192
Rated Head	5,946	1,102	—	—	3,570	11,426	7,438	361
Maximum Storage (without surcharge)	6,040	3,789	6,085	1,709	3,700	27,000	7,519	941
'Required for Navajo Indian Irrigation Project								

Fig. 2, As-built capacities of Lake Powell and the UIUs from the 1966 UCRC Annual Report.⁹⁴ Note footnote 1, regarding Navajo Reservoir.

⁹² A 2019 study by Reclamation determined that Flaming Gorge had lost 80,400 acre-feet of total storage since filling. Most of the loss occurred at the upper end of the reservoir. The loss of live capacity is about 2.2%. See: https://data.usbr.gov/rise/content-rise-public/rise/catalog-item/binary/FlamingGorgeReservoir_FlamingGorgeDam_UT10121_2019_Report.pdf. By contrast, the loss of live capacity at Lake Powell since filling is about 6.8%. See footnote 93.

⁹³ J.C. ROOT, & D.K. JONES 2022, ELEVATION-AREA-CAPACITY RELATIONSHIPS OF LAKE POWELL IN 2018 AND ESTIMATED LOSS OF STORAGE CAPACITY SINCE 1963, 21 (2022, U.S. Geological Survey Scientific Investigations Report 2022–5017), <https://doi.org/10.3133/sir20225017>. See also <https://www.usgs.gov/news/national-news-release/lake-powells-storage-capacity-updated-first-time-1986>.

⁹⁴ Eighteenth Annual Report of the Upper Colorado River Commission, Sept. 30, 1966, page 24.

1968 COLORADO RIVER BASIN PROJECT ACT

While Lake Powell and the UIUs were filling, Congress was debating the last major Colorado River Basin development act, the 1968 Colorado River Basin Project Act (1968 CRBPA).⁹⁵ The primary question facing Congress was the authorization of the Central Arizona Project (CAP). Since the U.S. Supreme Court had ruled in favor of Arizona in its 1963 decision affirming Arizona's apportionment of 2.8 MAF and finding that use of water from the Gila River was not part of that apportionment,⁹⁶ there was little doubt that Congress would approve the project.⁹⁷ The question was what else would be included in the legislation. The Upper Division States had a list.

Near the top of the list was a resolution of the disputed compact issues related to Article III(e) of the 1922 Compact—how much water the Upper Basin could keep in storage above Lee Ferry. Since Reclamation operated Glen Canyon Dam and UIUs, the Upper Division States' strategy was to obtain legislative direction to the Secretary from Congress.⁹⁸

In the decade since CRSPA became law, Colorado River flows remained generally below average. There was now a new "critical drought" period, drier than the 1930s. The period of 1953-1964 was as dry and two years longer than the 1931-1940-year drought that was used to calculate how much carry-over storage was needed for the Upper Division States to meet their compact obligations at Lee Ferry.⁹⁹ Further, there was also now general recognition that consumptive use of water in the Upper Division States would be limited by their compact obligations at Lee Ferry. A study commissioned by the Colorado Water Conservation Board (CWCB) in 1953 concluded that due to water supply limitations, Upper Basin development would be

⁹⁵ Pub. L. 90-537, 82 Stat. 885, codified at 43 U.S.C. §§ 1501 et seq.

⁹⁶ 373 U.S. 546 (1963).

⁹⁷ Kuhn and Fleck, *supra* note 41, Chapter 15. Also, during the meeting described in the following footnote, Felix Sparks made the statement that because Arizona supported the 1956 CRSPA, we (the Upper Division States) owed Arizona our support for the CAP.

⁹⁸ Statement by Felix Sparks at a meeting of the Upper Division States sponsored by the UCRC on May 22, 1984, in Albuquerque, New Mexico, *supra* note 79. Sparks was the Executive Director of the Colorado Water Conservation Board and Colorado's lead negotiator during the negotiations that preceded the Congressional approval of the 1968 CRBPA. See also, Synopsis of Major Documents and Events Relating to the Colorado River, 3 U. *Denv. Water L. Rev.* 339 (2000) (article update), pages 355-56.

⁹⁹ Natural Flow Database, *supra* note 42. The average annual natural flow at Lee Ferry for 1931-1940 was 12.57 MAF; for 1953-1964 it was 12.17 MAF.

limited to about 6.2 MAF per year.¹⁰⁰ In a 1965 study commissioned by the UCRC and submitted to Congress during the debate over the CAP, long-time Colorado water engineer Royce Tipton suggested that if the Upper Division States had to deliver an average of 8.25 MAF per year over the 1930-1964 period, Upper Basin would be limited to using as little as 4.8 MAF per year (Tipton referred to 8.25 as "arbitrary").¹⁰¹ It should be noted that the Upper Division States currently assert that the 1922 Compact does not create a "delivery obligation" at Lee Ferry. This position is contradicted by the historical discussions concerning the amount of storage needed to ensure that Upper Basin development of water could continue while meeting the 1922 Compact obligation at Lee Ferry.¹⁰²

The Lower Division States were equally engaged in the negotiations of the 1968 CRBPA. During the filling of Lake Powell and the UIUs, there were no water shortages on the lower river (basin-wide uses were far less than they are today), but there were concerns with power generation and water quality.¹⁰³ The filling of the CRSP reservoirs reduced flows on the lower Colorado River, which decreased hydropower generation at Hoover Dam and generated spikes in salinity that impacted both users in Mexico and in the Lower Division States. The Lower Division States also fully understood that once CAP was operational, there would inevitably be conflicts between the divisions over the interpretation of the 1922 Compact.¹⁰⁴

The compact and operations-related provisions that the Basin States and Congress agreed to were included in Section 6 (Title VI) of the 1968 CRBPA. Section 601(c) requires all Federal Officers and Agencies to comply with the legislation and other provisions of Law of the River. Similarly to Section 14 of the 1956 CRSPA, it provides:

¹⁰⁰ Leeds, Hill, and Jewett Consulting Engineers, "Report on Depletion of Surface Water Supplies of Colorado West of Continental Divide, Bulletin Number 1, Surface Water Series, Colorado Water Conservation Board, October 31, 1953. In the transmittal letter, page ii, the Leeds Report concludes: "All of the 7,500,000 acre-feet of water per annum apportioned to the Upper Basin by the Colorado River Compact may not actually be available for use because of the requirement that 75,000,000 acre-feet be delivered at Lee Ferry during each consecutive ten-year period."

¹⁰¹ Tipton and Kalmbach, Inc., "Water Supplies of the Colorado River: Available for use by the States of the Upper Division and for use from the Main Stem by the States of Arizona, California and Nevada in the Lower Basin," Denver, CO, 1965. In the Conclusion section, Tipton states that with a delivery of 8.25 MAF per year, the Upper Basin would be limited to 4.8 MAF per year, exclusive of reservoir evaporation. The 8.25 MAF annual release assumes 7.5 MAF per year to satisfy Article III (d) and 750,000 acre-feet per year as the Upper Division State's 50% share of the normal annual treaty delivery to Mexico of 1.5 MAF per year. Tipton refers to the 8.25 MAF delivery as "arbitrary" on page 6 of the report.

¹⁰² See e.g., 1948 Upper Colorado River Basin Compact, Art. I.

¹⁰³ See generally, Dept. of the Interior, USBR, *Updating the Hoover Dam Documents, 1978 Edition*, summary of the legislative debate over the 1968 CRBPA, beginning on page 195.

¹⁰⁴ *Id.*, page 207-08.

In the event of failure of any such officer or agency to so comply, any affected State may maintain an action to enforce the provisions of this section in the Supreme Court of the United States and consent is given to the joinder of the United States as a party in such suit or suits, as defendant or otherwise.¹⁰⁵

Section 602(a) directly addresses the operation of both Glen Canyon Dam and the UIUs. The salient provisions are as follows:

In order to comply with and carry out the provisions of the Colorado River Compact, the Upper Colorado River Basin Compact, and the Mexican Water Treaty, the Secretary shall propose criteria for the coordinated long-range operation of the reservoirs constructed and operated under the authority of the Colorado River Storage Project Act, the Boulder Canyon Project Act, and the Boulder Canyon Project Adjustment Act. To effect in part the purposes expressed in this paragraph, the criteria shall make provision for the storage of water in storage units of the Colorado River storage project and releases of water from Lake Powell in the following listed order of priority:

(1) releases to supply one-half the deficiency described in article III (c) of the Colorado River Compact, if any such deficiency exists and is chargeable to the States of the Upper Division....

(2) releases to comply with article III (d) of the Colorado River Compact, less such quantities of water delivered into the Colorado River below Lee Ferry to the credit of the States of the Upper Division from other sources.¹⁰⁶

Under the legislative language, the Coordinated Long-Range Operating Criteria, or "LROC," must cover storage in both Lake Powell and the UIUs, but the priorities listed under sub-paragraphs (1) and (2) only apply to releases from Glen Canyon Dam. Priority (1) covers the obligation of the Upper Division States under the 1944 Treaty with Mexico, but the obligation is not quantified. Thus, the LROC does not resolve the long-standing dispute between the divisions over the interpretation of Article III(c) of the 1922 Compact. Priority (2) is straightforward – water is to be released to ensure that the obligation of the Upper Division States at Lee Ferry is satisfied. The phrase "less such quantities of water delivered to the Colorado River below Lee Ferry..." was added to account for potential future projects to import water from another basin, such as the Columbia River. In theory, however, it could also be used if the Upper Division States were to ever decide to financially participate in a Lower Basin recycling or desalinization project.

¹⁰⁵ 1968 CRBPA, *supra* note 95, Sec. 601.

¹⁰⁶ *Id.*, Sec. 602.

Section 602(a) goes on to address the quantity of water that can be withheld from releases in the Upper Basin:

(3) storage of water not required for the releases specified in clauses (1) and (2) of this subsection to the extent that the Secretary, after consultation with the Upper Colorado River Commission and representatives of the three Lower Division States and taking into consideration all relevant factors (including, but not limited to, historic stream-flows, the most critical period of record, and probabilities of water supply), shall find this to be reasonably necessary to assure deliveries under clauses (1) and (2) without impairment of annual consumptive uses in the upper basin pursuant to the Colorado River Compact: Provided, That water not so required to be stored shall be released from Lake Powell: (i) to the extent it can be reasonably applied in the States of the Lower Division to the uses specified in Article III(e) of the Colorado River Compact, but no such releases shall be made when the active storage in Lake Powell is less than the active storage in Lake Mead, (ii) to maintain, as nearly as practicable, active storage in Lake Mead equal to the active storage in Lake Powell,¹⁰⁷ and (iii) to avoid anticipated spills from Lake Powell.

Priority (3) is the most complicated and the one that, arguably, addresses storage in the UIUs. It was included in the legislation to specifically address Article III(e) of the 1922 Compact. In simple terms, the paragraph sets out the amount of water that Reclamation can keep in storage so the Upper Division States can avoid a "compact call." It is commonly referred to as "602(a) storage." This provision is important to the Lower Basin because, IF the amount of water in storage in the Initial Units (common-benefits storage) is greater than 602(a), and IF the active storage in Lake Powell is greater than the active storage in Lake Mead and, IF the Lower Division States need the water, the surplus water (or a portion of the surplus water) is delivered from Lake Powell to Lake Mead in a process referred to as "equalization."

Section 6 of the 1968 CRBPA creates potential conflicts with the 1948 Compact. The 1968 CRBPA both requires the Secretary to comply with the Upper Basin Compact, which gives the UCRC certain authority over the allocation of the water and capacity of the UIUs, and directs the Secretary to prepare long-range operating criteria that cover the use of all the storage units without limitations. It is unclear whether the

¹⁰⁷ Based on the hydrologic modelling conducted for Reclamation by the Committee on Probabilities and Test Studies, see footnote 110 *infra*, which began in 1969 – immediately after the 1968 CRBPA became law, we conclude that the intent of this language was to use the classic definition of active storage – the amount of water in the reservoir above minimum power.

1968 CRBPA supersedes the 1948 Upper Basin Compact by clarifying that the first two priorities for releases from Glen Canyon Dam are for the delivery of water to Lee Ferry for compliance with the 1922 Compact, not for consumptive uses within the Upper Division States. The CRBPA raises the question of whether the Secretary can allow storage of state-controlled water allocations in any of the CRSP Initial Units if the Upper Division States are in violation of their Lee Ferry obligation.

In 1968, it was widely recognized that most of the yield of the CAP would come from the “equalization” water that was to be delivered to Lake Mead under Section 602(a)(3).¹⁰⁸ Furthermore, it was understood that, ultimately, Upper Basin development would reduce the yield of the CAP. The authors suggest, however, that reductions in natural flows resulting from aridification, in addition to Upper Basin depletions, have reduced inflows to the Lake Powell and the UIUs to a level that, unless future flows are significantly higher than the last 27 years, there may be no future equalization releases from Lake Powell.¹⁰⁹

After the 1968 CRBPA passed, the Secretary immediately began to prepare the LROC with the active involvement of all seven Basin States. The major disputes between the divisions were: 1) the amount of the annual release from Glen Canyon Dam and 2) the determination of 602(a) storage. A Reclamation task force that modeled different operating criteria proposals assumed that 602(a) was based on total active storage in Lake Powell and the UIUs.¹¹⁰ While there is a dispute among the Upper and Lower Division States over the role of the UIUs in the post-2026 operating rules, there is little dispute that the LROC is intended to cover storage in both Lake Powell and the UIUs.

The LROC were approved by Interior Secretary Walter Hickel on June 8, 1970. The criteria included a minimum objective annual release from Glen Canyon Dam of 8.23 MAF.¹¹¹ The storage level necessary to comply with 602(a)(3) is determined annually.¹¹² The LROC does not specifically mention or provide any guidance on the annual release requirements for any of the individual UIUs. Nor does it attempt to

¹⁰⁸ Tipton, *supra* note 101, Foreword, page 2.

¹⁰⁹ During the Congressional debate over the 1968 CRBPA, the assumptions were that the long-term mean natural flow at Lee Ferry was about 15 MAF per year and that the Upper Basin would consume about 6 MAF per year, Tipton, *supra* note 101, Figure 3. Since 2000, the mean natural flow has averaged about 12 MAF per year, and Upper Basin uses about 4.3 MAF per year.

¹¹⁰ USBR, Report of the Committee on Test Studies and Probabilities, 1969.

¹¹¹ Long Range Operating Criteria, <https://www.federalregister.gov/documents/2005/03/29/05-6160/review-of-existing-coordinated-long-range-operating-criteria-for-colorado-river-reservoirs-operating>. The reason the target release is 8.23 MAF, not 8.25 MAF, is the assumption that the Paria River, which is an Upper Basin stream that enters the Colorado River above Lee Ferry but below Glen Canyon Dam, will contribute an average of 20,000 acre-feet per year.

¹¹² *Id.* Section II.

address any coordinated operations of Lake Powell and the UIUs. It does, however, include the following: "If in the plan of operation, the *Upper Basin Storage Reservoirs active storage* (emphasis added) forecast for September 30 of the current water year is greater than the quantity of 602(a) storage determination for that date, water shall be released annually from Lake Powell at a rate greater than 8.23 million acre-feet per year. . . ."¹¹³ This provision makes it clear that Reclamation considers active storage in the UIUs for the determination of 602(a) releases.

Although the Upper Division States, through the UCRC, vigorously opposed the 8.23 MAF minimum objective release and the annual determination of 602(a) storage (in New Mexico State Engineer Steve Reynolds words; "they crammed it down our throats"),¹¹⁴ there is no evidence in the record that they contested or qualified the manner in which the UIUs were addressed in the LROC.

THE CONTINUING DEBATE AND CONFUSION OVER 602(A) STORAGE

The debate over the calculation of 602(a) storage resurfaced during the negotiations among the Basin States and Reclamation over the 2001 Interim Surplus Guidelines. There were two major disputed issues: the definition of "active storage" and the calculation of storage under 602(a). Firstly, there was an argument about whether the 602(a) storage level should include only storage above minimum power levels or whether it should include all live storage. The Upper Division States believed that under LROC, 602(a) storage only included the water stored above the minimum power pool (this is the classic definition of active storage). The Lower Division States held that excluding inactive storage violated Article IV(b) of the 1922 Compact (stating that power generation and the corresponding impoundments are subservient to consumptive uses for agricultural and domestic purposes).¹¹⁵ The second issue hinged on whether to include UIU storage in the 602(a) calculation, and if so, how much. The Lower Division States contended that the 1956 CRSPA and the plain language of the LROC include all the CRSP storage reservoirs. The Upper Division States pointed to Article V(c) of the 1948 Upper Basin Compact which they believed gives a preference to storage capacity for consumptive uses within the Upper Basin.

¹¹³ *Id.* Paragraph II (3), paragraph II (2) contains the same language but addresses the situation when the Upper Basin Storage Reservoirs active storage forecast is less than the 602(a) storage determination.

¹¹⁴ Sparks, *supra* note 79.

¹¹⁵ 1922 Compact, Article IV (b): "Subject to the provisions of this compact, water of the Colorado River System may be impounded and used for the generation of electrical power, but such impounding and use shall be subservient to the use and consumption of such water for agricultural and domestic purposes and shall not interfere with or prevent use for such dominant purposes."

The disputed issues were never resolved.¹¹⁶ Instead, the two divisions reached a temporary compromise—only Lake Powell (not the UIU) storage would be considered in the 602(a) storage determination, but the inactive storage in Lake Powell (the amount below the minimum power level but above the outlet tubes) would also be included. In 2004 Reclamation completed an Environmental Assessment and ROD on the adoption of the Interim 602(a) Guidelines. The 602(a) storage amount was set at 14.85 MAF or the amount as determined by the 602(a) algorithm, whichever was more.¹¹⁷

When the 2001 Interim Surplus Guidelines were superseded by the 2007 Interim Guidelines, the Basin States and Reclamation agreed to continue with the 2001 compromise on 602(a). The 2007 Interim Guidelines include an equalization table. When the storage elevation in Lake Powell was projected to be above the level shown in the Guidelines' table of elevations at the end of the water year, additional water would be delivered to Lake Mead.¹¹⁸ This table was intended to implement the directive given in Section 602(a). This happened twice; in 2008 and 2011.¹¹⁹ For the last year covered by the 2007 Interim Guidelines (WY 2026), the Lake Powell equalization level is elevation 3666 ft (19.3 MAF), well above the current storage level.

Issues related to 602(a) storage are analyzed in Appendices J and T of the Post-2026 FEIS.¹²⁰ Appendix J, "Sensitivity Analysis – Effects of Assumed Parameter Values on 602(a) Storage," shows the sensitivity of the 602(a) calculation to changes in several of the parameters included in the algorithm. However, the appendix does not specifically identify and address the disputed issues related to 602(a).

Appendix T, "Modeling Assumptions for Anticipated Operating Guidelines for 2027-2028," states that using the same parameters that were used to compute the 602(a)

¹¹⁶ Co-author Kuhn was a participant in the discussions that led to the "equalization" compromise.

¹¹⁷ U.S. Bureau of Reclamation, Adoption of an Interim 602(a) Storage Guidelines, Final Environmental Assessment, March 2004 (2004 EA), https://www.varuna.io/LOTR/2004/EA602aMarch_2004.pdf. Short summary: 14.85 MAF is the approximate amount of 602(a) storage needed based on the 602(a) algorithm (described in detail in the EA). It is based on the Upper Basin demand schedule as of 2001 and the assumption that the critical drought period is 1953-1964. The equalization table in the 2007 Interim Guidelines increases every year under the assumption that Upper Basin consumptive uses would continue to increase annually. Note that as of October 1, 2026, storage in Lake Powell is approximately 5.15 MAF.

¹¹⁸ Record of Decision, Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead, December 2007, Sec. XI.G.6, <https://www.usbr.gov/lc/region/programs/strategies/RecordofDecision.pdf>.

¹¹⁹ U.S. Bureau of Reclamation, Review of the Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations of Lake Powell and Lake Mead, December 2020, <https://www.usbr.gov/ColoradoRiverBasin/interimguidelines/7dreport/index.html>.

¹²⁰ FEIS and appendices, <https://www.usbr.gov/ColoradoRiverBasin/post2026/final-eis/index.html>.

storage volume for the 2007 Interim Guidelines Equalization line, the 602(a) storage volume for 2027 would be 25.082 MAF. If Navajo Reservoir is excluded because it is not a common-benefit reservoir, the total available live storage capacity of Lake Powell, Flaming Gorge, and Blue Mesa is about 27.934 MAF, but if 602(a) storage is limited to active storage, the total capacity is reduced to 23.763 MAF. The large value for 602(a) storage should not be a surprise. The 2004 EA concluded that at some point in the future, 602(a) storage would require all the available storage capacity in the Initial Units.¹²¹

There are operational consequences of 602(a) being “all the available capacity.” As a practical matter, it means that except when storage in lake Powell is high enough that Reclamation is operating the reservoir to avoid unanticipated spills, as happened in the 1980s and again in the late 1990s,¹²² the 8.23 MAF minimum objective annual release under the LROC becomes a cap on annual deliveries by the Upper Division State to Lee Ferry. This discussion highlights the incompatibility of the calculations required by Section 602(a) with the current hydrology and reservoir storage and pinpoints the current math problem on the Colorado River. As of October 1, 2026, live storage in Lake Powell is 5.15 MAF and the combined live storage in Lake Powell and the UIUs is 8.51 MAF.¹²³ When only the realistically accessible storage in Lake Powell is considered (the amount stored above elevation 3500 ft.), Lake Powell can provide only about 920,000 acre-feet.¹²⁴ Whether the UIUs are included or not, the amount of storage available in the 1956 CRSPA units is far below what is nominally required by Sec. 602(a).

¹²¹ 2004 EA, *supra* note 117.

¹²² The annual reports (AOPs) for these years are available. At <https://www.usbr.gov/lc/region/g4000/aop/index.html>.

¹²³ Reclamation Hydro Data Base, available at https://www.usbr.gov/uc/water/hydrodata/reservoir_data/site_map.html.

¹²⁴ For an explanation of “realistically accessible storage,” see Castle, et al., UPDATE: Colorado River Basin Storage Continues Slide Toward System Crash, June 1, 2026, <https://www.colorado.edu/center/gwc/2026/06/01/update-colorado-river-basin-storage-continues-slide-toward-system-crash>.

CURRENT STORAGE LEVELS IN THE UIUs

Figure 3 shows the storage levels in the UIUs from 2023 to the present, with Lake Powell and Flaming Gorge shown separately.

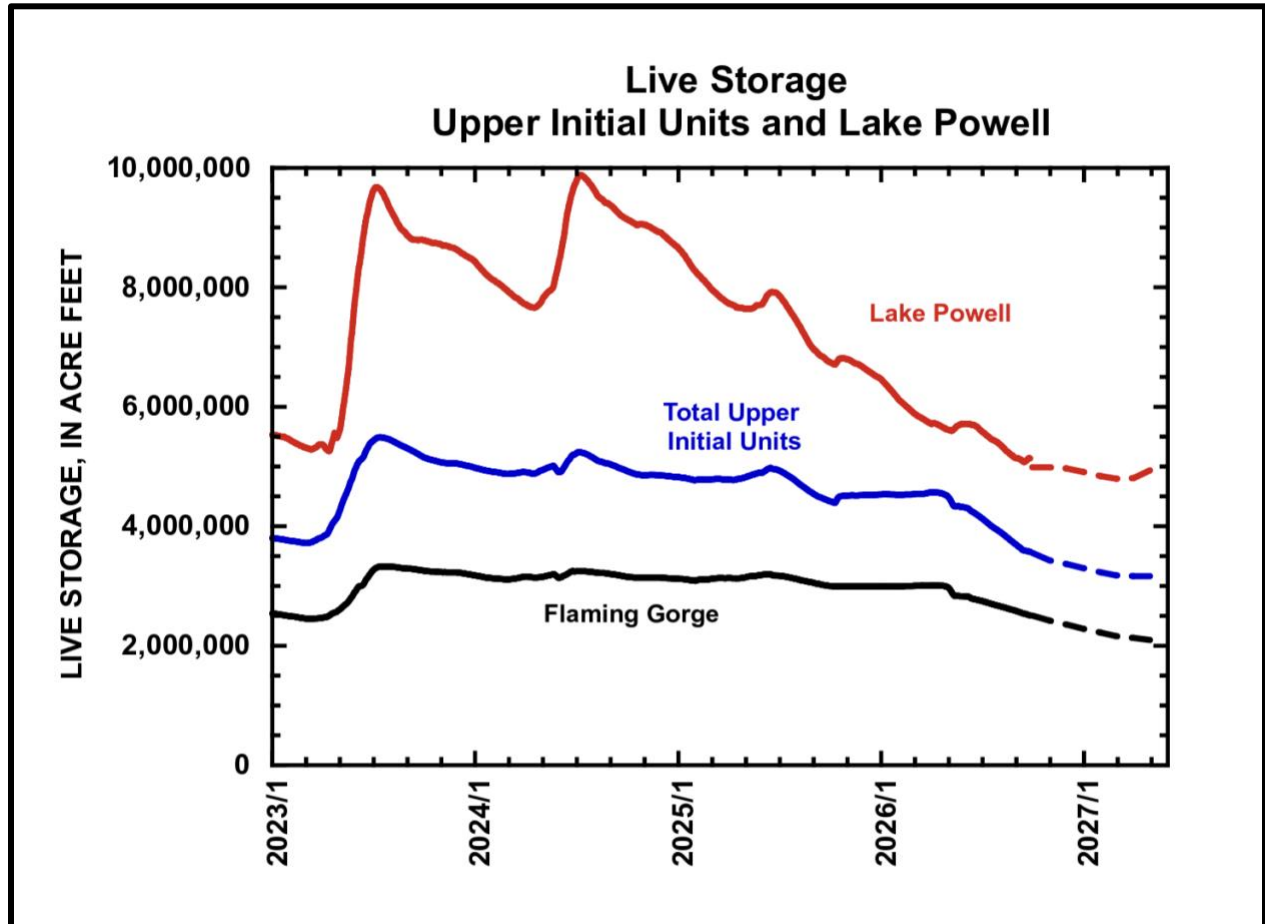


Fig. 3. Storage levels in the UIUs from 2023 to the present. The dashed lines are based on projections through April 2027 from Reclamation's Sept. 15, 2026 Most Probable forecast.

CONCLUSION

The UIUs exist because the flow obligations of the 1922 Compact coupled with the variability and unpredictability of the Colorado River created a need for storage in the Upper Basin. They are now in the spotlight because on October 1, 2026, the ten-year Lee Ferry flow will drop to about 81.2 MAF, a level that, under the Lower Division States' interpretation of 1922 Compact math, may mean that the Upper Division States owe additional water to Lee Ferry. The math of the 1922 Compact and its Lee Ferry flow provision, together with the directives of the LROC, can no longer be reconciled with today's hydrology and basin-wide consumptive use.

The UIUs and Lake Powell were conceived, designed, and built based on a relatively simple view of the mathematics of the 1922 Compact and the then assumed hydrology of the Colorado River. The Upper Division States have a 1922 Compact obligation not to cause the depletion at Lee Ferry below 75 MAF every 10 years and a further obligation to deliver half of the annual treaty delivery to Mexico not met by surplus water. Because Colorado River flows are highly variable at both annual and decadal timescales, to meet these obligations, the Upper Division States needed to store the water available in the wetter years and decades for delivery to Lee Ferry during drier years and decades. Lake Powell is the primary storage bucket, but its capacity alone was insufficient to meet the needs of the Upper Division States during the longest and driest drought of concern when it was authorized, 1931-1940. Thus, additional storage upstream of Lake Powell was needed. Therefore, Congress, via the 1956 CRSPA, authorized the UIUs.

In the 1950s, when the designers put this elegantly simple plan together, the math worked. With sufficient storage, the long-term flow of the Colorado River was enough for the Upper Division States to both meet their 1922 Compact obligations and develop a lot of water, over 6.0 MAF of consumptive use annually. The Lower Division States were also beneficiaries of this simple math. They could rely on a minimum delivery of water from the Upper Division States.

By the mid-1960s when Congress was considering the future of the CAP, the simple 1950s math was facing challenges. With an estimated long-term flow at Lee Ferry of about 15 MAF per year, there was not enough water in the river to meet the consumptive use needs of the Upper Division and Lower Division States, the losses in and below Lake Mead, and treaty deliveries to Mexico. With the CAP online, the Lower Basin was facing a structural deficit of 1.2 to 2.0 MAF per year. The threat was not immediate however; the CAP diversion demands could be met for many decades with the Upper Basin's undeveloped apportionment. After that, the Basin's needs could theoretically be met by importing water from another river basin.

During the 1970s, 1980s, and 1990s, the river math worked. There was enough water in the system to finish the filling of Lake Powell and the UIUs and allow significant increase in basin-wide water consumption. There were a few very dry years, like 1977 and 1981, but many more wet years, such as in the mid-1980s and late 1990s. Despite the increase in basin-wide water consumption and the reality that there would be no imported water from another river basin, there was ample water to meet all needs. At the beginning of the new millennium, Lake Powell and the UIUs were all operationally at full capacity.¹²⁵

Basin water managers were, however, fully aware that there could be math trouble ahead. They reduced California's annual demands from over 5 MAF to 4.4 MAF (its normal-year apportionment). The Upper Division States believed that with this adjustment, the math still worked; the water available in Lake Powell and the UIUs was sufficient to meet their 1922 Compact obligations and still leave them with about 6 MAF for their use.¹²⁶

What few would predict was that post-2000, average annual natural flow of the Colorado River at Lee Ferry would drop to a bit more than 12 MAF, about 1.5 MAF less than the total annual basin-wide consumptive uses. The period from 2000-2004 was especially dry; storage levels in both Lake Mead and Lake Powell plummeted. This drought period triggered the need for the 2007 Interim Guidelines. The guidelines focused on the coordinated operation of Lake Powell and Lake Mead during what many perceived as a temporary drought period.

When dry conditions continued into the second and third decades of the new millennium and the 2007 Interim Guidelines proved insufficient to stop the draining of Lake Mead and Lake Powell, the two divisions prepared Drought Contingency Plans (DCPs). Under the DROA component of the Upper Division States' DCP, the UIUs became a source of water to address management and infrastructure problems at Glen Canyon Dam. However, the Basin states have yet to fully address the basic problem – coupled with the aridification of the Basin, there is not enough water to meet the current levels of consumptive use and the flow obligations of the 1922 Compact. This is a core reason that the two divisions could not reach a consensus agreement and may be headed for the U.S. Supreme Court.

The 2007 Interim Guidelines have now been formally replaced by new post-2026 operating guidelines. These guidelines were not a consensus solution; they are a set of stop-gap measures imposed on the Basin by the federal government. They are

¹²⁵ Reclamation Hydro Data Base, *supra* note 123.

¹²⁶ Tipton, *supra* note 101.

now the subject of litigation. The new operating guidelines were not designed to address or solve the long-term 1922 Compact math problem.

As for the future of the UIUs, the Basin is at an inflection point. The 1950s math, the baseline for the 1956 CRSPA, no longer applies. The Colorado River simply does not provide enough water to satisfy current consumptive uses in the Upper Basin and allow for Lake Powell and the UIUs to deliver sufficient water at Lee Ferry to meet the Upper Division States' 1922 Compact obligations at least under the most prevalent historical interpretation.¹²⁷ The Upper Division States are faced with difficult choices: (1) curtail existing uses - politically a third rail; (2) a negotiated agreement with the Lower Division States under which they make a firm commitment to reduce their uses - not all four states are willing to do this; or (3) interpret the 1922 Compact in a manner that reduces or eliminates their flow obligations at Lee Ferry - the current strategy for at least some of the Upper Division States. The impact of the third strategy, of course, reduces the water supply available to existing uses in the Lower Basin to unacceptable levels, forcing one or more of these states to go to court; Nevada is already there.

Until the Basin's math problem is solved either through litigation or negotiations, different strategies for operating both the UIUs and Lake Powell may buy some time and provide some operational flexibility, but ultimately, they are nothing more than rearranging the deck chairs on a sinking ship. The Colorado River system needs to be managed based on the river math we have today.

¹²⁷ See generally John U. Carlson and Alan E. Bowles, *Contrary Views of the Law of the Colorado River: An Examination of Rivalries between the Upper and Lower Basins*, Rocky Mountain Mineral Law Institute, 1986.

<http://www.riversimulator.org/2025Guidelines/LegalReview/ContraryViewsLawOfColoradoRiver2011CarlsonBoles.pdf> Also see Clifford H. Stone "Report and Submission of the Upper Colorado River Basin Compact to the Governor and General Assembly, State of Colorado, December 1948. On page 17, Stone writes "While the 1922 Compact, by its paragraph III (a) apportions to the Upper Basin the beneficial consumptive use of 7,500,000 acre-feet of water annually, such use is subject to the availability of water. The States of the Upper Division are required by the 1922 Compact to maintain certain flows at Lee Ferry. The water available for use in the Upper Basin is the remaining after the Lee Ferry delivery requirements are satisfied. See also, Eric Kuhn, "On the Colorado River, there are no Simple Disputes" INKSTAIN.NET, <https://www.inkstain.net/2024/02/on-the-colorado-river-there-are-no-simple-disputes/>.

Appendix

COMPREHENSIVE DESCRIPTION OF THE UIUs

Flaming Gorge Reservoir is located on the mainstem of the Green River. The dam is about 30 miles south of the border between Utah and Wyoming. The reservoir footprint extends into Wyoming. It is by far the largest of the UIUs and therefore the most valuable for releases that bolster water levels in Lake Powell. Under the 2026 DROA Operations Plan, Reclamation will release 1.0 MAF from Flaming Gorge to Lake Powell between April 2026 and April 2027.

According to the latest survey,¹²⁸ Flaming Gorge Reservoir has a live capacity of 3,671,000 (at elevation 6040 ft. MSL). The active capacity (above minimum power) is 3,334,000 acre-feet. The inactive capacity is 237,000 acre-feet.¹²⁹ Based on the September 2026 24-Month Study Most Probable projection, the live storage at the end of May 2027 will be 2.052 MAF, or 55.2% of live capacity. This projection incorporates the 1.0 MAF DROA release.

Flaming Gorge is operated pursuant to a 2005 Biological Opinion and 2006 Record of Decision.¹³⁰ Reclamation has issued one water supply contract for Flaming Gorge Reservoir water: Dagget County (Utah) for 1,000 acre-feet per year.¹³¹ Evaporation from Flaming Gorge, approximately 70,000 – 80,000 acre-feet per year, is reported in the Consumptive Uses and Losses Reports by Reclamation as undistributed.¹³² Under Article V of the Upper Basin Compact, the UCRC has the responsibility to distribute evaporation losses from the UIUs to the individual Upper Division States. Under current UCRC policy, evaporation from Flaming Gorge Reservoir, as well as Lake Powell and the Aspinall Unit Reservoirs, is shared among the Upper Division States in proportion to their consumptive use during the water year because these

¹²⁸ Reclamation, Technical Memorandum ENV-2021-112, Flaming Gorge Reservoir 2019 Area and Capacity Tables, available at https://www.usbr.gov/tsc/techreferences/reservoir/FlamingGorgeRes2019AreaCapacityTables_final_508.pdf.

¹²⁹ The total capacity, including the deadpool is 3,711 MAF.

¹³⁰ For more details on the operation of Flaming Gorge Reservoir, see Attachment C to the 2026 Drought Response Operations Plan. Attachments to the 2026 DROA Plan are available at: <https://www.usbr.gov/ColoradoRiverBasin/documents/dcp/DROA/2026/uc-2026droughtresponseoperationsplan-attachments-a-h-508-20260423.pdf>.

¹³¹ *Id.*

¹³² Reclamation, Upper Colorado Consumptive Uses and Losses Report 1971-2025, available at: <https://www.usbr.gov/uc/envdocs/plans.html>.

reservoirs are operated to regulate the flow of the Colorado River at Lee Ferry for meeting the Upper Basin's obligations under Article III of the 1922 Compact.¹³³

Blue Mesa Reservoir is located on the Gunnison River about 25 miles west of the town of Gunnison. It is the primary storage component of the three reservoir Aspinall Unit. Under the 2026 DROA Operations plan, no DROA releases are currently scheduled from Blue Mesa Reservoir.

According to the latest survey, Blue Mesa Reservoir has a total live capacity of 828,100 acre-feet (elevation 7519.4 ft MSL), of which 747,900 acre-feet is active and 80,200 acre-feet inactive.¹³⁴ Based on the September 2026 24-Month Study Most Probable projection, the live storage at the end of October 2026 (the month with the least storage) will be 103,000 acre-feet, or 12.4% of live capacity. Note, this is only about 23,000 acre-feet above minimum power.

Blue Mesa Reservoir (and the Aspinall Unit) are operated pursuant to a 2012 ROD. The Aspinall Unit is unique among the initial units; it is entirely located within the State of Colorado. The United States holds a Colorado water right for Aspinall Unit, including the power plants, and, as stated in the 2026 DROA Operations Plan, "at all times, Aspinall must meet Colorado water administration requirements as determined by the Division 4 Engineer, including the required amount of flow-through necessary to meet downstream water rights senior to Aspinall."

A total of 1400 acre-feet of Blue Mesa Reservoir water is under contract for downstream deliveries or upstream uses by exchange. Additionally, under the Taylor Park Reservoir Exchange agreement, if space is available, up to 106,100 acre-feet of Taylor Park Reservoir water can be temporarily stored in Blue Mesa Reservoir.¹³⁵

Taylor Park Reservoir is located on the Taylor River, upstream of the town of Gunnison. Its purpose is to provide late-season irrigation water for the federal Uncompahgre Project.¹³⁶ Neither the water needed for contract deliveries, nor the

¹³³ New Mexico Office of the State Engineer, Summary of the 2007 Hydrologic Determination Relating to the Navajo Settlement, November 5, 2007, available at: <https://www.ose.nm.gov/Legal/settlements/NNWRS/InitialDisclosures/Settlement%20Documents/>. The May 23, 2007, Hydrologic Determination prepared by Reclamation includes a similar statement: "The CRSP reservoir evaporation that is used in the mass balance analyses includes evaporation from Lake Powell, Flaming Gorge Reservoir, and the Aspinall Unit that is shared among the Upper Division States, but excludes evaporation from Navajo Reservoir which is chargeable to the states based on uses."

¹³⁴ Reclamation, Blue Mesa Reservoir 2019 Area and Capacity Tables Colorado River Storage Project, Colorado, available at: [HYPERLINK https://www.usbr.gov/tsc/techreferences/reservoir/BlueMesaReservoir2019AreaAndCapacityTables_Final508.pdf](https://www.usbr.gov/tsc/techreferences/reservoir/BlueMesaReservoir2019AreaAndCapacityTables_Final508.pdf). The total storage capacity of Blue Mesa including the dead pool is 938,400 acre-feet.

¹³⁵ Reclamation, 2026 DROA plan, *supra* note 130.

¹³⁶ For more information on Taylor Park, see: <https://www.usbr.gov/projects/index.php?id=236>.

Taylor Park Exchange water is available for DROA purposes. Like Flaming Gorge Reservoir, the evaporation from Blue Mesa and the other two Aspinall Unit Reservoirs is reported as undistributed and under a UCRC policy is shared among the four Upper Division States.

It bears mentioning that even though there are no formal DROA releases from Blue Mesa Reservoir scheduled in 2026, Blue Mesa Reservoir releases still provide water for delivery to Lake Powell. Under the 2012 ROD, Reclamation makes releases to support instream flow targets in the Black Canyon of the Gunnison National Park and at Whitewater (near Grand Junction). The likely destination for most of these releases, less conveyance losses, is Lake Powell.¹³⁷

Navajo Reservoir is located on the mainstem of San Juan River in Northwest New Mexico, Navajo Dam is about 40 miles east of the city of Farmington, New Mexico. The reservoir backs water 35 miles up the San Juan River into the State of Colorado. Navajo Reservoir operations are fundamentally different from the other UIUs. Navajo Dam has no federal power plant. The reservoir is primarily operated as water supply source for consumptive uses within the State of New Mexico. Under the 2026 DROA Operations Plan, no DROA releases are currently scheduled to be made from Navajo Reservoir.

According to Reclamation data, Navajo Reservoir has a total live capacity of 1,648,000 acre-feet, with an active capacity of 1,022,000 acre-feet and an inactive capacity of 626,000 acre-feet.¹³⁸

Compared with the other UIUs, Navajo Reservoir, by design, has a very large inactive pool, 38.0% of the total live capacity. The reason for the large inactive pool is that the reservoir was designed to deliver water by gravity to the Navajo Indian Irrigation Project supply canal at an elevation of 5990 ft. MSL. Below this level, the 2026 DROA Operations Plan states that Reclamation cannot meet its water contract obligations.

Under the September 2026 24-Month study, Most Probable projection, at the end of February 2027, live storage in Navajo Reservoir will fall to 763,000 acre-feet, or 140,000 acre-feet of active storage. Under the Minimum Probable projection, live storage drops to 626,000 acre-feet – or zero active storage, by the end of August 2027. If this were to occur, Reclamation would operate the reservoir on a run-of-the-

¹³⁷ This is the view of co-author Kuhn based on his experience working for the Colorado River Water Conservation District. Because of low storage, releases for these flow targets in 2026 have been reduced. Personal communication between Alex Walker, Reclamation, and co-author Kuhn.

¹³⁸ 2026 DROA Plan, *supra* note 130.

river basis; releases would be limited to inflows and Reclamation's ability to make contract deliveries to NIIP would be substantially impaired.

Under the current UCRC policy, the evaporation from Navajo Reservoir, about 25,000 –30,000 acre-feet per year is charged to the State of New Mexico because the UCRC has determined that the entire capacity of Navajo Reservoir is necessary to support consumptive uses within New Mexico.¹³⁹ The 2026 DROA Operations Plan lists four contracts for Navajo Reservoir: Williams Gas Processing, Navajo Nation Settlement Contract, Jicarilla Apache Nation Settlement Contract, and Hammond Conservancy District Contract. Additionally, when the water is available, Navajo Reservoir releases are made to support stream flows in endangered fish critical habitat reach from Farmington to Lake Powell. Most of the water released for this purpose reaches Lake Powell.¹⁴⁰

¹³⁹ Office of the New Mexico State Engineer, *supra* note 136. The policy is to charge the evaporation to the states where Navajo Reservoir water is used. In theory, this could include the States of Colorado, Utah, and Arizona by virtue of the benefits to Tribal nations in those states.

¹⁴⁰ 2026 DROA Plan, Attachment E, *supra* note 130.