"We Have to Judge the Future by the Past": The 1931–40 Drought, the Upper Basin Compact, and the Colorado River Storage Project

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This essay explores the relationship of the 1931–40 drought in the Colorado River Basin to the development of the 1948 Upper Colorado River Basin Compact ("Upper Basin Compact") and the Colorado River Storage Project ("CRSP"), authorized by Congress in 1956. Building on prior historical assessments, it considers the influence of this period of stream flow record on Bureau of Reclamation planning for Upper Basin development in the 1940s; the formulation of the Upper Basin Compact; and the design of CRSP. The purpose of both the Upper Basin Compact and CRSP was to enable the Upper Basin to make full development of its allocation under the Colorado River Compact of 1922 while simultaneously meeting its 75 million acre-feet over 10 years obligation to the Lower Basin at Lee Ferry during a period comparable to 1931–40. The essay argues that the historical significance of the 1931–40 drought for the present day "Law of the River" lies in the way that the collective response to the drought by federal reclamation engineers and the Upper Basin states not only contributed to the operational regime that governs the administration of Colorado River waters, but also laid the groundwork for disputes over the 1922 Compact and use of the Colorado River.

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INTRODUCTION

On December 2, 1947, during the fifth meeting of the Upper Colorado River Basin Compact Commission ("Commission"), federal reclamation engineer and chair of the Commission's Engineering Advisory Committee J.R. Riter made a frank admission to the commissioners from the "Upper Basin" states of Colorado, New Mexico, Utah, and Wyoming who had gathered to work out a compact for the allocation of Colorado River water above Lee Ferry. H. Melvin Rollins, Wyoming's Assistant Interstate Streams Commissioner, questioned Riter as to whether analyses by the United States Bureau of Reclamation ("Reclamation") regarding Upper Basin development made sufficient provision for future drought conditions. "Well, Mr. Rollins," the engineer replied,

> as engineers we have to judge the future by the past. If we hold down our uses of water to the residual over and above the downstream obligations, yes. Now the question always comes up, what is the proper period of study? I recall in 1929 when I first became engaged in the study of the Colorado River, we went back and fabricated records through the drought centering around 1902 and 1904. We thought we had a pretty low period selected. So we went ahead and planned Hoover Dam on that basis. About the time we got it built and started operating, Nature demonstrated to us that there was a lower ten-year period, 1931 to 1940. I don't know what the future is going to hold; whether 1931 to 1940 is a proper basis I don't know.[1]

Riter's uncertainty about the future possibility of a "lower ten-year period" notwithstanding, as this essay argues, the period of recorded Colorado River flows between 1931 and 1940 helped shape the Upper Colorado River Basin Compact of 1948 ("Upper Basin Compact"). The essay also contends that this stream flow period functioned as an essential planning benchmark for the Colorado River Storage Project ("CRSP"), authorized by Congress in 1956, which provided for the construction of physical works that would support Upper Basin Compact goals of meeting the obligation to the Lower Basin and funding consumptive use projects in the Upper Basin.

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1. UPPER COLO. RIVER BASIN COMPACT COMM'N, Official Record of Meeting No. 5 (Dec. 1–4, 1947), *in* 1 RECORD OF PRELIMINARY GOVERNORS' MEETING, AND FOR COMMISSION MEETINGS NO. 1–5, INCLUSIVE 102 (1948) (on file at Water Resources Collections and Archives, University of California, Riverside). The page numbers will reflect the pagination for the individual meeting minutes, not the entire volume.

The Upper Basin Compact negotiation minutes consist of two volumes of minutes and a third volume containing the report of the Engineering Advisory Committee and the first "inflow-outflow manual."

Both the Upper Basin Compact and the Colorado River Storage Project Act ("CRSPA") are elements of what has come to be known as "The Law of the River." This body of agreements, laws, judicial decrees, policies, guidelines, and plans—now more than a century old, having originated with the Colorado River Compact of 1922 ("1922 Compact")—governs the administration of the waters of the Colorado River Basin waters among the Upper Basin states, the "Lower Basin" states of Arizona, California, and Nevada, as well as the Republic of Mexico and Native American tribes within the United States.[2] Figure 1 is a map of the Colorado River Basin, ca. 1946.[3] As many as 40 million people in the United States rely upon the waters of the Colorado River today.[4]

Norris Hundley, Jr. was the first historian to recognize implications of the 1931–40 "dry decade,"[5] and more recent scholarship has further discussed the ramifications of "the drought of the 1930s." Animated by contemporary concerns over the sustainability of the Colorado River, Eric Kuhn and John Fleck observe in their book *Science Be Dammed: How Ignoring Inconvenient Science Drained the Colorado River* that the period reshaped knowledge about the river's hydrology and informed "policy decisions in the late 1940s

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2. A précis of "The Law of the River," inclusive of descriptions of the two compacts, the 1944 Mexican Treaty, and pertinent federal legislation since the 1920s, may be found in KATHERINE OTT VERBURG, U.S. DEP'T OF THE INTERIOR, THE COLORADO RIVER DOCUMENTS 2008, at xxxvii–xli (2010), https://coloradoriverscience.org/The_Colorado_River_Documents_2008 [https://perma.cc/EHQ8-H84D]. This reference work, part of a larger series of document compendiums first issued in the 1930s, also contains contracts, operational/management guidelines and other documentation concerning the Colorado River into the first decade of the 21st century.

Reclamation also has a dedicated "Law of the River" section on its "Colorado River Storage Project" website. *See Colorado River Storage Project*, BUREAU OF RECLAMATION, https://www.usbr.gov/uc/rm/crsp/index.html [https://perma.cc/C8AD-ZSGR] (Aug. 19, 2021).

3. BUREAU OF RECLAMATION, U.S. DEP'T OF THE INTERIOR, THE COLORADO RIVER 8 (1946), https://images.archives.utah.gov/digital/collection/p17010coll70/id/8793/rec/1 [https://perma.cc/8EFQ-3EJQ].

4. Estimate of the number of people relying on the Colorado River may be found at *Colorado River Basin*, BUREAU OF RECLAMATION, https://www.usbr.gov/ColoradoRiverBasin [https://perma.cc/5H2M-NGV6] (Aug. 5, 2025).

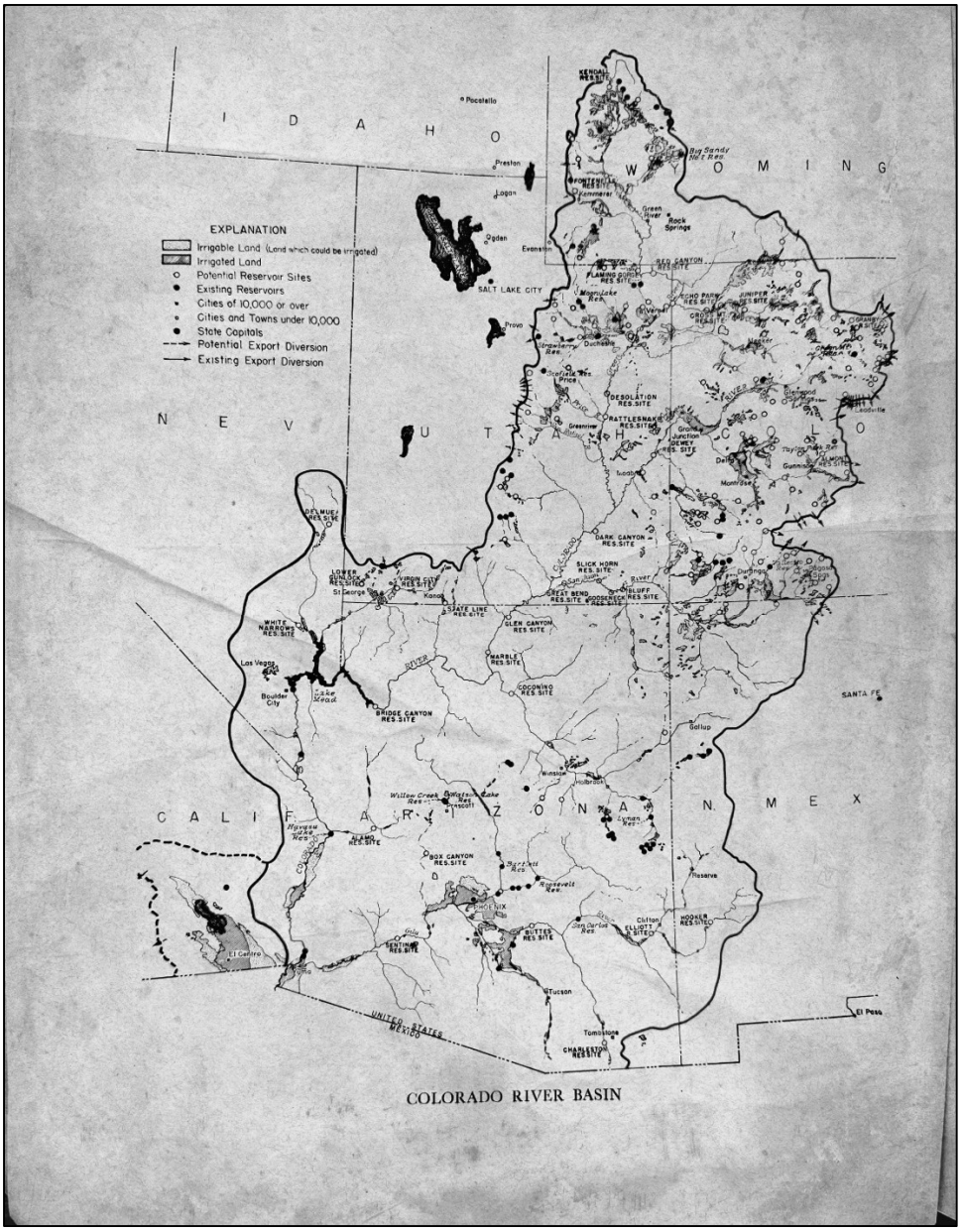
5. NORRIS HUNDLEY, JR., WATER AND THE WEST: THE COLORADO RIVER COMPACT AND THE POLITICS OF WATER IN THE AMERICAN WEST 297 (2d ed. 2009).

The scholarship concerning the Colorado River, historical and otherwise, is vast. Key works that helped frame the subject for discussion are HUNDLEY, JR., *supra*; ERIC KUHN & JOHN FLECK, SCIENCE BE DAMMED: HOW IGNORING INCONVENIENT SCIENCE DRAINED THE COLORADO RIVER (2019); and 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. (2025), http://digital repository.unm.edu/nrj/vol65/iss1/5 [https://perma.cc/HJC9-2BDX]. As appropriate, other works are cited throughout.

through the late 1960s."[6] Yet, Kuhn and Fleck argue this dry cycle did not prevent ill-advised Upper Basin development driven by political and economic considerations. Reclamation and the Upper Basin's failure to heed what the 1930s drought portended about the river's future supply, in their view, is another example of the hydrological myopia that began with the 1922 Compact.[7] In an article published this past year (2025) in the University of New Mexico's *Natural Resources Journal*, Kuhn and Fleck, together with Katherine H. Tara, once more highlighted the role "the 1931–40 drought" in the negotiations leading to the Upper Basin Compact.[8]

6. KUHN & FLECK, *supra* note 5, at 112–113.
7. KUHN & FLECK, *supra* note 5, at 98, 109–10, 151–54.
8. Kuhn, Tara, & Fleck, *supra* note 5, at 87, 89, 90, 100, and 103-104.

Figure 1. Map of the Colorado River Basin



Note: Map is a photograph of the map from the author's copy of THE COLORADO RIVER: A NATURAL MENACE BECOMES A NATIONAL RESOURCE.[9]

9. BUREAU OF RECLAMATION, *supra* note 3, at 8.

Building on this prior scholarship, this essay explores in further detail the consequences of the 1931–40 period of stream flow record for water development, regulation, and use by the Upper Basin states. It seeks to take the past on its own historical (rather than legal) terms, delving not only into published historical documents but also archival records to investigate the influence of the 1931–40 drought on Reclamation's initial planning for the Upper Basin in the early 1940s, the Upper Basin Compact negotiations in the mid-to-late 1940s, and the design and intent of CRSP in the early 1950s. Placing this decadal dry cycle nearer to the center of the story of the Upper Basin Compact and CRSP, it aims to shed greater light on not only the origins and assumptions underlying that compact and the federal undertaking that are central to present-day Colorado River administration but also the tensions between the Upper and Lower Basin states over the river's waters.

Opening with a discussion of the historical context of the 1931–40 "dry decade," the essay proceeds chronologically through the passage of CRSPA, touching on key documents and decisions. It relates how in October 1940 Riter recognized that the 1931–40 streamflow conditions made "holdover storage capacity" in the Upper Basin necessary for the Upper Basin "to meet its [1922] Compact obligation at Lee Ferry [Article III(d)] and to concurrently utilize water allocated to it under the terms of the Compact."[10] Reclamation subsequently adopted the period as a "yardstick" for assessing a plan of development for the Upper Basin.[11] The essay next discusses how this "lower ten-year period, 1931 to 1940" influenced the Upper Basin Compact negotiations, contributing to the development of a method and means by which the Upper Basin could satisfy its 1922 Compact obligation to the Lower Basin and simultaneously make full use of its 7.5 million acre-feet (AF) 1922 Compact allocation (Article III[a]).[12] It goes on to describe how Reclamation, with direct input from the Upper Basin, designed CRSP to accomplish the aim of facilitating increased Upper Basin use through construction of reservoirs and power "units" that would hold water in the Upper Basin for delivery to meet the Lee Ferry obligation during dry periods and generate power revenues to fund the construction of water-consuming "participating projects."[13] In closing, the essay offers an appraisal of the

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10. Letter from J. R. Riter, Chief Dev. Eng'r, Bureau of Reclamation, to Ival V. Goslin, Eng'r-Sec'y, Upper Colorado River Comm'n (November 10, 1959).

11. BUREAU OF RECLAMATION, PROCEEDINGS OF THE COMMITTEES OF FOURTEEN AND SIXTEEN OF THE SEVEN STATES OF THE COLORADO RIVER BASIN AND THE POWER ALLOTTEES 13 (1944).

12. UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 1, at 103.

13. Letter from Fred G. Aandahl, Assistant Sec'y of the Interior, to Joseph W. Martin, Jr., Speaker, House of Representatives (Mar. 31, 1954), H.R. Doc. No. 83-364, at 69 (2d Sess. 1954).

historical significance of the 1931–40 "drought period," its importance to the "Law of the River" and the operational regime by which the Lower Basin receives its 1922 Compact allocation, and the effect that the Upper Basin response to this dry cycle had on relations with the Lower Basin.

I. THE 1931–40 "DRY DECADE" IN CONTEXT

Hundley, in his seminal work on the Colorado River Compact, *Water and the West: The Colorado River Compact and the Politics of Water in the American West*, was the first academic to address the 1931–40 "dry decade."[14] As part of a broader discussion of the aftermath of the 1922 Compact and in the context of Senate consideration of the 1944 Mexican Treaty, *Water and the West* calls attention to the fact that Reclamation analysis of river flows for this 10-year period indicated that the water supply available below Hoover Dam for Arizona, California, and Nevada and Mexico could be insufficient in a comparable drought in later years.[15]

Although neither is a historian, Kuhn and Fleck in *Science Be Dammed* extend the analysis of Colorado River history presented in Hundley's work.[16] They take as their starting point "Hundley's criticism" about the 1922 Compact, that "[t]he drafters of the [1922] compact . . . failed to determine with reasonable accuracy the long-term annual flow of the Colorado River."[17] *Science Be Dammed* acknowledges—referencing Marc Reisner's influential

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14. HUNDLEY, JR., *supra* note 5, at book cover.

15. *See id.* at 297. In discussing the circumstances that prompted negotiations for the Upper Basin Compact, *Water and the West* makes no mention of the 1931–40 period nor the effect that it had on Reclamation plans for the Upper Basin in the 1940s, the Upper Basin Compact, or CRSP. The Upper Basin Compact, also known as the "supplementary agreement of 1948," is only briefly discussed because as the preface to the second edition of Hundley's book states, "it did not involve the heated and prolonged controversy over the meaning of the compact that characterized the lower-basin embroilment [i.e., the *Arizona v. California* litigation]." *See id.* at xv, 300–01. As will become clear in the discussion that follows on the pages below, the possible future deficiency for the Lower Basin states and Mexico during a similar dry cycle would be a consequence of full Upper Basin development.

16. Kuhn is the former general manager of the Colorado River Water Conservation District, while Fleck was previously a journalist, and is now a Professor of Practice at the University of New Mexico and Writer in Residence at the university's Utton Transboundary Resources Center. *See Eric Kuhn*, COMMON SENSE INST. COLO., https://www.commonsenseinstituteus.org/colorado/about/experts/eric---kuhn [https://perma.cc/4ZKZ-PZRW]; *Utton Center Welcomes John Fleck*, UTTON TRANSBOUNDARY RES. CTR. (Jan. 20, 2022), https://uttoncenter.unm.edu/news/2022/01/utton-welcomes-john-fleck.html [https://perma.cc/B58J-AFYH].

17. HUNDLEY, JR., *supra* note 5, at 352; KUHN & FLECK, *supra* note 5, at 3.

Cadillac Desert: The American West and Its Disappearing Water[18]—that the 1922 Compact was predicated on limited knowledge of the Colorado River's hydrology.[19] However, Kuhn and Fleck argue "decision-makers actually had available, had they chosen to use it, a relatively thorough, complete, and almost modern picture of the river's hydrology," and throughout their book they marshal evidence in support of this analysis.[20]

"[T]he drought of the 1930s," *Science Be Dammed* contends, was a crucial hydrological data point that "forced a reckoning with two important implications" but did not dampen the pace of Colorado River development, particularly for the Upper Basin.[21] The first implication was that Lower Basin storage at Lake Mead (Hoover Dam) below Lee Ferry did nothing to help the Upper Basin meet the 1922 Compact's "delivery requirements" under Article III(d). The Upper Basin needed "as much as 28 million acre-feet of carry over storage" above Lee Ferry.[22] The second was that the "drought of the 1930s had intruded on the record the river's managers were using to estimate its flows" and consequently less water existed for Colorado River projects than was previously thought.[23] Although the Colorado River Storage Project aimed to "meet the Upper Basin's obligations under Article III of the 1922 compact" in the face of a comparable drought,[24] an "iron triangle" of "Reclamation engineers and planners . . . boosters and politicians" pushed through an unrealistic and economically dubious plan to develop the water allocated to the Upper Basin by the 1922 Compact under Article III(a).[25]

Kuhn and Fleck are critical that Reclamation and Upper Basin policy makers did not respond to the drought period by scaling down plans for future projects to reflect new hydrological information.[26] They see this as among several "missed opportunities"[27] to make more sustainable choices for the river's future use, and in particular, "to imbue the institutions for allocating and using the Colorado's waters with the flexibility to respond when there is less water than . . . planned."[28]

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18. *See generally* MARC REISNER, CADILLAC DESERT: THE AMERICAN WEST AND ITS DISAPPEARING WATER (1993) (examining the political, economic, and environmental consequences of federal water policy and reclamation projects in the American West).
19. *Id.* at 271.
20. KUHN & FLECK, *supra* note 5, at 5.
21. *Id.* at 109.
22. *Id.* at 109–10.
23. *Id.* at 110.
24. *Id.* at 152.
25. *Id.* at 110, 144–46, 152–154.
26. *Id.* at 110. 144-49, 152–56, 225.
27. *Id.* at 224.
28. *Id.* at 225.

In their article *A Horse Named 'Stream Depletion Theory: The History and Negotiation of the Upper Colorado River Basin Compact*, Kuhn, Tara, and Fleck focus on narrating the events, discussions, and debates leading to the Upper Basin Compact. They nevertheless note the 1931–40 drought as among the contributing factors shaping the compact.[29] The authors insist that "[a] careful and nuanced understanding of the Upper Basin Compact is necessary for interpreting the Law of the River in a way that is both faithful to the intention of the Compact and cognizant of the constraints of subsequent legislation and current hydrology."[30]

Further historicization of the "dry decade" of 1931–40—which this essay seeks to provide—is a step toward that "careful and nuanced understanding." Close attention to the historical record in fact indicates that Reclamation and the Upper Basin pursued development above Lee Ferry in the 1940s and 1950s not despite this 10-year low stream-flow period but because of it.

The concept of "drought," at least in a legal context, has been likened to the proverbial story of the blind men describing the elephant—a recognition that "drought" has a "perceptual nature."[31] It may in fact be "the only natural disaster we experience without initially realizing it," attorney Sarah Klahn has written.[32] Klahn's observations are as instructive to the historian as the lawyer: a reminder that human experiences of climatic conditions vary in time and place and may be best understood after the fact. This is especially true for the Colorado River Basin in the 1930s.

Reduced Colorado River stream flows between 1931 and 1940 were neither the only nor the most reported upon manifestation of dry conditions in the United States in the 1930s.[33] The "Dust Bowl" in the Midwest has been the subject of considerable scholarly attention,[34] but "drought" in some form prevailed throughout the nation during the decade. Writing in 1936, United States Geological Survey ("USGS") hydrologist John C. Hoyt observed that "[t]he humid States were seriously affected in 1930 and to a lesser extent in 1931 and 1934. The semiarid States underwent minor droughts in 1931 and

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29. Kuhn, Tara, & Fleck, *supra* note 5, at 87, 89, 90, 100, 103–104.

30. *Id.* at 121.

31. Sarah Klahn, *The Blind Man and the Elephant: Describing Drought in Colorado*, 6 U. DENV. WATER L. REV. 519, 520 (2003).

32. *Id.*

33. *The Dust Bowl*, NAT'L DROUGHT MITIGATION CTR., https://drought.unl.edu/dustbowl [https://perma.cc/U799-KAJH].

34. A search of JSTOR, an online repository of secondary scholarship (journals and monographs) and primary sources maintained by the non-profit ITHAKA, identified approximately thirty articles in history journals over the past fifty years that address the 1930s drought on the Great Plans either wholly or in part.

1933, which added to the catastrophe of 1934."[35] The year 1934 was in fact "the second driest year in the twentieth century" for the Colorado River Basin.[36]

The effects of the 1930s drought, like many droughts historically, were unevenly distributed. Although California as a whole was among the "arid states" reportedly spared the severity of dry conditions that afflicted other states,[37] its Imperial Valley nevertheless suffered from diminished Colorado River flows in 1934. Imperial Valley relied on a river that did not yet have upstream main stem dams for regulation,[38] and groundwater was little developed in the area at the time.[39] According to the *Los Angeles Times* on July 15, 1934, officials with the Imperial Irrigation District were worried that the "Colorado River will be completely dry within ten days if it continued to drop at its present alarming rate."[40] Domestic water was being trucked in that same month.[41] A subsequent *Times* article in August 1934 noted that irrigation facilities largely off-set the dry conditions in every part of California, except Imperial Valley.[42]

In his analysis of the "Drought of 1934," Hoyt attributed the "extremely low run-off of the Colorado River" that impacted this part of Southern California "to drought conditions in the upper basin States."[43] The Upper Basin states, however, had yet to develop the Colorado River as the Imperial Valley(located in the Lower Basin) had.[44] In fact, both Reclamation and Upper Basin engineers later assessed Upper Basin use of the waters of the Colorado River system as approximately 2 million acre-feet between 1914

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35. JOHN C. HOYT, U.S. DEP'T OF THE INTERIOR, DROUGHTS OF 1930–34, at 1 (1936).

36. KUHN & FLECK, *supra* note 5, at 109.

37. HOYT, *supra* note 35, at 46.

38. Boulder Dam, also known as Hoover Dam, would begin filling in 1935 but would not be completed until 1936. *See* HUNDLEY, JR., *supra* note 5, at 296, 300; KUHN & FLECK, *supra* note 5, at 109–12.

39. *Colorado River Flow for 1934 Set All-Time Low*, L.A. TIMES, January 12, 1935. According to the *Nevada State Journal*, the 1934 Colorado River flow was "4,72,200 acre feet compared to a normal of approximately 16,000,000 – a 75 per cent drop." *See Colorado's Flow Is 75% Below Normal*, NEV. ST. J., January 11, 1935.

40. *Dry Colorado River Looming*, L.A. TIMES, July 15, 1934, at 6.

41. *Water Shipped into Imperial*, L.A. TIMES, July 11, 1934, at 4.

42. *See Irrigation Facilities Offset Lack of Rain*, L.A. TIMES, Aug. 26, 1934, at 5.

43. HOYT, *supra* note 35, at 46; *see also* E.O. Larson, *Regional Director's Report*, *in* BUREAU OF RECLAMATION, U.S. DEP'T OF THE INTERIOR, INTERIM REPORT COLORADO RIVER STORAGE PROJECT AND PARTICIPATING PROJECTS 11 (1949).

44. Joe Gelt, *Sharing Colorado River Water: History, Public Policy, and the Colorado River Compact*, UNIV. ARIZ. WATER RES. RSCH. CTR. (Aug. 1, 1997), https://wrrc.arizona.edu/publication/sharing-colorado-river-water-history-public-policy-and-colorado-river-compact [https://perma.cc/85JP-9MR9].

and 1945.[45] In June 1934, as water supply conditions worsened in the Imperial Valley, the Upper Basin states took their first major step towards additional Colorado River development since ratification of the 1922 Compact. In a meeting with Reclamation officials, representatives from the states agreed to each state pursuing its own projects for the waters of the Colorado River system, subject to an eventual compact amongst themselves. This agreement helped pave the way for congressional authorization of the trans-basin diversion Colorado-Big Thompson Project ("C-BT") for Colorado in 1937.[46] Throughout the 1930s, Colorado also pursued smaller federal and "'nonfederal' projects" on its Taylor, Los Pinos, and Arkansas rivers.[47]

Water supply conditions began improving in 1935 in the Colorado River Basin. River flows rebounded that year, and Boulder (also known as Hoover) Dam began filling, promising more regularity in deliveries to Imperial Valley lands.[48] Parker Dam, a diversion for the Metropolitan Water District of Southern California to bring domestic water to growing communities, was under construction by Reclamation and would be completed in three years.[49]

Any potential long-term impacts to lands and communities in Southern California were ultimately blunted by the fact that the average flows passing Lee Ferry—the 1922 Compact point of measurement between the Upper and Lower basins—exceeded the 7.5 million acre-feet allocated to the Lower Basin by the 1922 Compact (Article III[a]) during most years between 1931

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45. BUREAU OF RECLAMATION, *supra* note 3, at 151; Letter from Engineering Advisory Committee to Upper Colorado River Basin Compact Commission (July 7, 1948) (on file with Colorado State University).

46. This resolution was made along with others recommending terms for a future treaty with Mexico regarding the waters of the Colorado River, urging federal funding for additional studies of Colorado River development, and calling for Arizona to ratify the 1922 Compact before contracting for water from Boulder Dam. *See* BUREAU OF RECLAMATION, U.S. DEP'T OF THE INTERIOR, RESOLUTIONS ADOPTED AT A CONFERENCE OF REPRESENTATIVES OF THE STATES OF COLORADO, NEW MEXICO, UTAH AND WYOMING, AND THE BUREAU OF RECLAMATION, CALLED BY THE SECRETARY OF THE INTERIOR, AT DENVER, COLORADO, ON JUNE 29 AND 30, 1934, at 3–5 (1934); *see also Meeting 4 Upper Basin States Is Harmonious One*, DAILY PRESS, July 2, 1934; *States of Upper Basin Offer Plan*, DAILY PRESS, July 3, 1934; DANIEL TYLER, THE LAST WATER HOLE IN THE WEST 66–96 (1992); STEVEN C. SCHULTE, AS PRECIOUS AS BLOOD: THE WESTERN SLOPE IN COLORADO'S WATER WARS, 1900–1970, at 53–65 (2016); KUHN & FLECK, *supra* note 5, at 141.

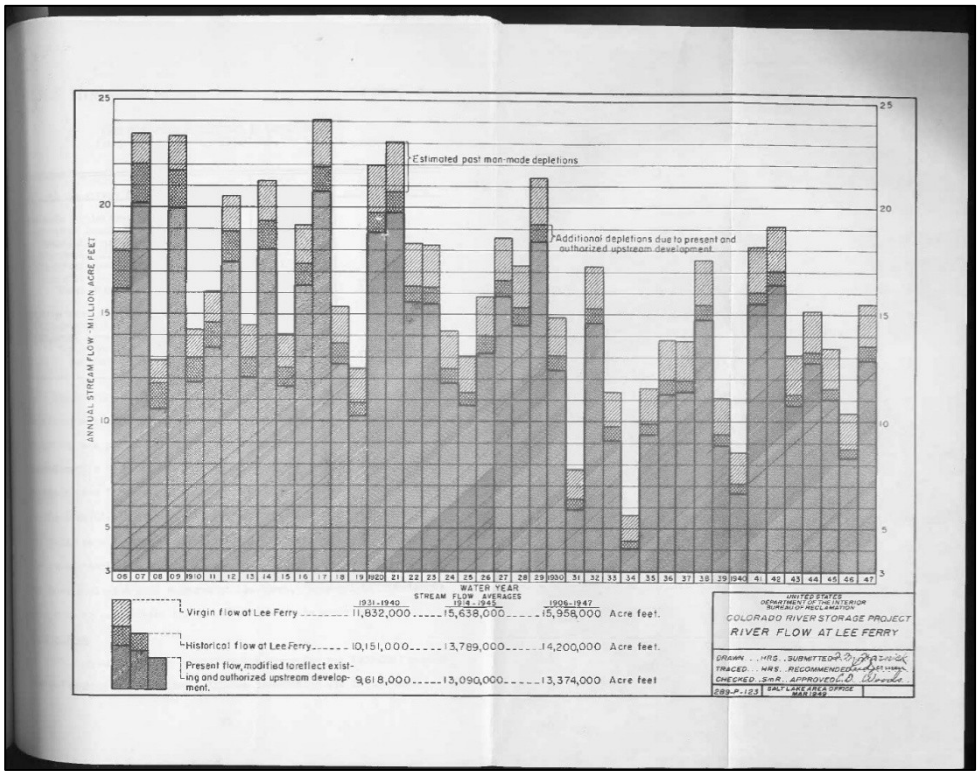
47. *See* HUNDLEY, JR., *supra* note 5, at 76–78, 300; KUHN & FLECK, *supra* note 5, at 109–12.

48. *Boulder Lake Now Reality; Water Stored*, NEV. ST. J., Feb. 5, 1935. Later Reclamation assessment found that approximately 9.5 million acre-feet reached Lee Ferry in 1935. *See* BUREAU OF RECLAMATION, *supra* note 43, at 30–31.

49. *See* 1 JOHN UPTON TERRELL, WAR FOR THE COLORADO RIVER, THE CALIFORNIA-ARIZONA CONTROVERSY 26 (1965); *see also* U.S. DEP'T OF THE INTERIOR, WATER AND POWER RESOURCES SERVICE: PROJECT DATA 770 (1981); HUNDLEY, JR., *supra* note 5, at 294, 300.

and 1940. As depicted in Figure 2, a 1949 Reclamation analysis of the period indicated that an annual average of 10,151,00 acre-feet ("Historical Flow") reached Lee Ferry during this decade—exceeding the 75 million acre-feet over 10 years required by the 1922 Compact under Article III(d).[50]

Figure 2. Reclamation Graph of "River Flow at Lee Ferry," Prepared March 1949



The critical importance of the 1931–40 "drought" in light of subsequent events, addressed below, is that the dry cycle revealed that the Upper Basin's aspirations for future full development of its 1922 Compact-allocated water could be constrained. The Upper Basin would have been unable to increase direct diversions from the uncontrolled Colorado River above Lake Mead (the reservoir created by Boulder Canyon/Hoover Dam) up to its full 7.5 million acre-feet allocation and simultaneously meet the 10-year Lee Ferry obligation to the Lower Basin during a comparable dry decade.

The Upper Basin Compact and CRSP were thus direct responses to the 1931–40 stream-flow period. Operating under the widely held assumption of

50. BUREAU OF RECLAMATION, *supra* note 43, at 14.

this period that western water discharged into the ocean was "wasted," Reclamation and the Upper Basin states developed a plan to capture such waters from the Colorado River in large reservoirs.[51] Through the use of holdover storage, the compact and the federal undertaking promised that despite the prospect of another 10-year "low period" akin to 1931–40, the Lower Basin "obligation" could be met even as the Upper Basin fully developed and used its 1922 Compact allocation.[52] These twin historical responses to the 1930s drought nonetheless laid bare the possibility of further and greater conflict between the two basins over the administration of the Colorado River.

II. 1931–40 AS A "YARDSTICK": RECLAMATION PLANNING FOR THE UPPER BASIN IN THE EARLY 1940S

Development of the Upper Basin Compact can be traced directly back to a March 1946 report prepared jointly by Reclamation's Region III (Lower Colorado River Region) and Region IV (Upper Colorado River Region), which was included in a much larger publication, *The Colorado River: A Natural Menace Becomes a Natural Resource"—A Comprehensive Departmental Report on the Development of Water Resources of the Colorado River Basin for Review Prior to Submission to the Congress."*[53] The "Regional Directors' Report" was the culmination of nearly two decades of study of the Colorado River and planning for its development, and it featured the 1931–40 drought period as a central factor for future Upper Basin projects.

The Boulder Canyon Project Act of 1928, which provided congressional ratification of the 1922 Compact and approved construction of Hoover Dam, and the Boulder Canyon Project Adjustment Act of 1940 authorized investigations for the development of the Colorado River.[54] In the context of these studies, undertaken principally by Reclamation, the effects of the 1931–

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51. *See* DONALD J. PISANI, WATER AND THE AMERICAN GOVERNMENT: THE RECLAMATION BUREAU, NATIONAL WATER POLICY, AND THE WEST, 1902–1935, at xiii–xv (2002).

52. Letter from Michael W. Straus, Comm'r, Bureau of Reclamation, to Oscar L. Chapman, Sec'y of the Interior, at 2 (Dec. 22, 1950) (on file with author).

53. JEAN S. BREITENSTEIN, COLO. WATER CONSERVATION BD., THE UPPER COLORADO RIVER BASIN COMPACT 4–5 (1949). This larger work contains comments by the Colorado River Basin states as well as letters of transmittal to Congress by Interior Department officials. Colloquially, it is known as is "The Blue Book." *See* RUSSELL MARTIN, A STORY THAT STANDS LIKE A DAM: GLEN CANYON & THE STRUGGLE FOR THE SOUL OF THE WEST 48 (1999).

54. 42 Stat. 1065 § 15 (1928); 643 Stat. 774 § 2 (1940); BUREAU OF RECLAMATION, *supra* note 3, at 26.

40 dry period on Colorado River development became apparent, perhaps first to J. R. Riter.

Hundley's *Water and the West*, as noted above, observed that data presented by Reclamation during the Senate hearings on the 1944 Mexican Treaty indicated that Colorado River stream flows for 1931–40 portended deficits in the future water supply to the Lower Basin states as well as Mexico. This data was prepared by Riter in response to questions from Nevada Senator Pat McCarran in 1945.[55]

The engineer's own knowledge of the ramifications of the 10-year dry cycle, however, appears to date back to the fall of 1940 and was focused on the implications of this cycle for the Upper Basin—not the Lower Basin. In an October 1940 internal Reclamation memorandum assessing Colorado River power possibilities and operations of Lake Mead, Riter noted that "generally low run-off . . . has prevailed since 1934."[56] More importantly, as he later acknowledged to Ival Goslin, the Engineer-Secretary for the Upper Colorado River Commission in 1959, his analysis with this data indicated that by 1988 "the minimum 10-year inflow" at Lee Ferry would be less than the 75 million acre-feet obligated to the Lower Basin by the 1922 Compact (Article III[d]).[57] "It was the awareness of that situation," Riter wrote Goslin, "that prompted me to realize the necessity for holdover storage capacity in the Upper Basin to permit the Upper Basin to meet its Compact obligation at Lee Ferry and to concurrently utilize water allocated to it under the terms of the Compact."[58] As addressed in the sections below, yoking holdover storage in the Upper Basin with utilization of water in the Upper Basin was an essential element of the Upper Basin Compact and was reflected in CRSP.

Riter, in his role as the Acting Director of Project Planning for Reclamation, communicated his "awareness of the situation" posed by the 1931–40 period of record to Reclamation Commissioner Harry Bashore (later the federal chair to the Upper Basin Compact Commission) in an April 1944 memorandum. Noting the potential impact to developments downstream of

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55. Letter from Harry W. Bashore, Comm'r of Reclamation, Bureau of Reclamation, to John R. Riter, Dir. of Project Plan., Bureau of Reclamation (Mar. 19, 1945) (on file at the Bureau of Reclamation Library); Letter from John R. Riter, Dir. of Project Plan., Bureau of Reclamation (Mar. 22, 1945) (on file at the Bureau of Reclamation Library); *See* HARRY W. BASHORE, WATER SUPPLY BELOW BOULDER DAM, S. DOC. NO. 89 (1st Sess. 1945).

56. Memorandum from J. R. Riter, Chief Dev. Eng'r, Bureau of Reclamations, to Hydraulic Engineer (Oct. 25, 1940) (on file with author).

57. Letter from J. R. Riter to Ival V. Goslin, *supra* note 10.

58. Letter from J. R. Riter to Ival V. Goslin, *supra* note 10.

Lee Ferry as a consequence of 1931–40 stream flows,[59] the engineer "assumed that holdover storage would be provided above Lees Ferry to permit an ultimate average annual depletion of 7,500,000 acre-feet in the upper basin and also insure an average annual flow of 7,500,000 acre-feet at Lees Ferry in the 10-year critical period 1931 to 1940, inclusive."[60] Put another way, Riter thought that "holdover storage" above Lee Ferry was necessary to ensure that the Lower Basin received its 1922 Compact allocation and thereby permit the Upper Basin to utilize its allocation (both allocations given in Article III[a]) in the event of a "critical period" of streamflow like 1931–40.

By 1944, Reclamation was using the 1931–40 period as a "yardstick in measuring the water supply available for individual projects" throughout the Colorado River Basin.[61] "In other words," as Riter informed Upper and Lower basin representatives during a presentation on Reclamation's progress in investigating further developments in July 1944, "new projects that must be developed would have to live through this drought period in order to be sound."[62]

Reclamation project planning into the fall of 1945 was predicated on "the decade 1931–40, inclusive" as the "critical period for determination of available water supply for present and proposed initial development."[63] This was essential because that decade had exposed the possibility that the yield of the Colorado River, as Riter's 1959 letter to Goslin indicated, was insufficient to enable the Upper Basin to make use of its 1922 Compact allocation and meet its 1922 Compact-required flow obligation at Lee Ferry.[64] "[I]f the Upper Basin is going to realize the use of 7,500,000 acre feet of water," the engineer told the Upper Basin Compact commissioners when they met in 1947, "some schemes have got to be devised so that water will be

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59. Riter specifically referenced the proposed "Bridge Canyon Project," a reservoir facility above Hoover Dam and below Lee Ferry that was never built. Memorandum from John R. Riter, Acting Dir., Branch of Project Planning, Bureau of Reclamation, to Harry W. Bashore, Comm'r, Bureau of Reclamation (Apr. 12, 1944) (on file at the Bureau of Reclamation Library).

60. *Id.* "Lees Ferry" and "Lee Ferry" denote the same division point identified in the 1922 Compact. The terms were often used interchangeably in the early 20th century, particularly during the negotiations of the 1922 Compact, as Hundley has noted. *See* HUNDLEY JR., *supra* note 5, at 192 n.52.

61. BUREAU OF RECLAMATION, *supra* note 11, at 13.

62. *Id.*

63. Memorandum from Dir., Branch of Project Planning, Bureau of Reclamation, to Reg'l Dir., Salt Lake City, Utah, Bureau of Reclamation (Sept. 7, 1945) (on file at the Bureau of Reclamation Library).

64. Letter from J. R. Riter to Ivan V. Goslin, *supra* note 10.

available to us [i.e., the Upper Basin states] and still meet the obligation at Lee Ferry."[65]

Project Planning Report No. 34-8-1, a draft of the Regional Directors' Report presented to Bashore in October 1945, reflected Reclamation's focus on the 1931–40 period as a planning baseline to devise such "schemes." For tributary watersheds in the basin, the streamflow data for this "driest period of record" and "critically dry decade" was presented along with available longer periods of record.[66] The report identified potential reservoir sites in both the Lower Colorado and Upper Colorado regions and signified the potential function of each, many having multiple possible purposes.[67] In the Upper Colorado Region's articulation of the "general plan" for the Upper Basin, a limited number of "main-stem reservoirs"[68] for holdover storage were included, in part, to solve the drought problem by saving water in the Upper Basin for later release to the Lower Basin.[69] The holdover storage reservoirs were to "be operated on a long-time hold-over basis, being filled during a succession of wet years and emptied to provide firm power and to satisfy [1922] Compact requirements for water at Lee Ferry during dry periods, such as the 1931–40 decade."[70] Other reservoirs for irrigation, flood control, silt management, and domestic water would be funded by power revenues generated principally by the holdover reservoirs.[71]

The October 1945 draft of the Regional Directors' Report noted that development of "all of the projects" for the Upper Basin "exceed[ed] the Colorado River Compact allocation to the Upper Basin,"[72] and identified the Colorado River water supply overall as inadequate "for full expansion of

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65. UPPER COLO. RIVER COMPACT COMM'N, Official Record of Meeting No. 3 (Oct. 30, 1946), *in* 1 RECORD OF PRELIMINARY GOVERNORS' MEETING, AND FOR COMMISSION MEETINGS NO. 1–5, INCLUSIVE 32 (1948).

66. BUREAU OF RECLAMATION, U.S. DEP'T. OF THE INTERIOR, THE COLORADO RIVER: "A NATURAL MENACE BECOMES A NATIONAL RESOURCE" 104, 128, 150, 172, 181, 189, 206 (1945), https://www.google.com/books/edition/The_Colorado_River/VgoZAAAAIAAJ?hl=en&gbpv=0 [https://perma.cc/RBH9-CT72]. Some of the tip-out figures, however, were not scanned with accuracy, so these were obtained separately from the National Archives at Denver: Box 4, Entry 93-001, RG 115, NARA D.

67. *Id.* at 8, 42.

68. Proposed Upper Basin storage reservoirs are variously described in the historical record as "main stem," or "main stream." *Id.* at 9.

69. *Id.* at 6.

70. *Id.* at 167.

71. *Id.* at 167–68. The "Elkhorn Unit" of the Sublette Project located on the Green River in Wyoming and the Ouray Project on the Uncompahgre River in Colorado—neither of which were identified for holdover storage for Lee Ferry flows—were also contemplated as generating power.

72. *Id.* at 167.

existing and authorized projects and for all potential projects."[73] "At present," however, "more than sufficient water is available physically . . . for all projects listed in the proposed initial program" in both the Upper and Lower basins.[74] The report consequently called "for a determination of the rights of the respective States in Colorado River water under the Colorado River Compact."[75]

The March 1946 Regional Directors' Report, later released by Congress along with supporting material as House Document 419 in July 1947,[76] elaborated on Reclamation plans for the Upper and Lower basins. In doing so, the report further emphasized "[t]he need for a determination of the rights of the respective States to deplete the flow of the Colorado River consistent with the Colorado River Compact and its associated documents."[77]

Notably, although the March 1946 Regional Directors' Report asserted that "[t]here is not enough water available in the Colorado River system for full expansion of existing and authorized projects and for all potential projects outlined [therein]"—100 for the Upper Basin alone—it observed that there would be sufficient water for "within-basin projects or units of projects if no further exportation of water is made [i.e., from the Colorado River Basin]."[78] The report raised the prospect "that the States may elect to forgo construction of some irrigation projects within the natural drainage basin in order to make water available for exportation," and pointed out that "some States may be unable to use their full amount [of apportioned water] unless part is exported."[79]

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73. *Id.* at 20.

74. *Id.*

75. *Id.* at 20–21.

76. As House Document 419, *The Colorado River: "A Natural Menace Becomes a Natural Resource"* was subtitled, *Interim Report on the Status of the Investigations Authorized to Be Made by the Boulder Canyon Project Act and the Boulder Canyon Project Adjustment Act*. This latter version included not only letters of transmittal to Congress from Reclamation Commissioner Michael Straus and Secretary of Interior J. A. Krug, but also comments by state and federal agencies, as well as by the Colorado River Basin states themselves, appended to the front of the March 1946 version. *See* BUREAU OF RECLAMATION, U.S. DEP'T OF THE INTERIOR, THE COLORADO RIVER: "A NATURAL MENACE BECOMES A NATIONAL RESOURCE," H.R. Doc. No. 80-419, at 1–95 (1947); *see also* MARTIN, *supra* note 53, at 48–50; KUHN & FLECK, *supra* note 5, at 130–31.

77. BUREAU OF RECLAMATION, *supra* note 3, at 21.

78. *Id.* at 7, 13.

79. *Id.* at 13–14. Trans-basins diversions were discussed during the subsequent negotiation of the Upper Basin Compact. Wyoming was especially concerned for the impact of such diversions in formulating a compact. In December 1946, in the midst of Upper Basin Compact negotiations, Wyoming State Engineer and Upper Basin Compact commissioner L. C. Bishop

Given these considerations, two principal recommendations were offer:

> "That the States of the Colorado River Basin acting separately or jointly, recommend for construction . . . a group of projects, the stream-flow depletions of which will assuredly fall within the ultimate allocation of Colorado River water," and
>
> "That the States of the Colorado River Basin determine their respective rights to deplete the flow of the Colorado River consistent with the Colorado River Compact."[80]

While none of the identified projects subsequently constructed were endorsed by all seven Colorado River Basin states, these recommendations galvanized the longstanding effort among the Upper Basin states to formulate a compact—one influenced by the 1931–40 period of record.[81]

III. THE 1931–40 "LOW PERIOD," THE LEE FERRY OBLIGATION, AND THE UPPER BASIN COMPACT

Work toward an Upper Basin interstate agreement dated to the late 1920s. In November 1929, Delph Carpenter, Colorado's commissioner for the 1922

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shared with Bashore that the Wyoming delegate saw "that the practical solution of meeting the obligation at Lee Ferry [i.e., Article III(d) of the 1922 Compact] was to close all transmountain diversions until the obligation is meet." Bishop and his advisors believed that Reclamation should, in turn, "plan our reservoir system so it will never be necessary to close any diversions." *See* Letter from L.C. Bishop, State Eng'r & Interstate Streams Comm'r for Wyo., to Harry W. Bashore, Chairman, Upper Colo. River Compact (Dec. 27, 1946) (on file with author); *see* Letter from Reid Jerman, Planning Engineer, on Progress of Investigations (Mar. 8, 1949) (on file at Wyo. State Archives, RG 0037, Box 1).

Before his fellow commissioners at the fifth meeting, Bishop identified "transmountain diversion[s]" as "the most troublesome item that confronts this Commission." He believed that Upper Basin advocacy for transmountain diversions during the 1922 Compact negotiations led to the Article III(d) requirement "a mistake that can well wreck the entire plan of the development of the Upper Basin unless we face the facts and keep the amount of water to be transported from the Basin within reasonable limits." He expressed Wyoming's willing to take "about 200,000 acre feet of water for transmountain diversion [*sic*] and we will sign on the dotted line to scale ours down to take care of the obligation at Lee Ferry . . . it is our position that it is morally wrong to take water from a basin which is needed within that basin." UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 1, at 27.

No such provision or any provision relating to transmountain or transbasin diversions was adopted in the Upper Basin Compact.

80. BUREAU OF RECLAMATION, *supra* note 3, at 21.

81. By contrast, in the late 1940s, Lower Basin states of Arizona and California were moving toward interstate adjudication that culminated in the landmark decision in *Arizona v. California*, 373 U.S. 546, 579–85 (1963) which has subsequently shaped Lower Basin water administration by the federal government. *See* HUNDLEY, *supra* note 5, at 299–306; KUHN & FLECK, *supra* note 5, at 157–68.

Compact, prepared a "Preliminary Suggestion for an Upper Colorado River Compact" that became the basis of initial negotiations before the Upper Basin states reached an impasse.[82] As noted above, in June 1934, representatives of the Upper Basin states adopted a resolution that endorsed negotiation for an Upper Basin compact. This resolution declared that "each state should go ahead with its development without objection, as contemplated by the Colorado River Compact," provided it did not "approach[] too nearly the equitable share of water that under compact might eventually be apportioned to such state out of the waters involved."[83]

As Colorado attorney and Upper Basin Compact legal advisor Jean Breitenstein later recalled, the Regional Directors' Report spurred the Upper Basin to move forward with formal compact negotiations in July 1946.[84] Talks were initiated at a meeting of the Upper Basin state governors in Cheyenne, Wyoming that month, and the Upper Colorado River Basin Compact Commission would meet eight times before agreeing to an Upper Basin Compact in October 1948.[85] The compact was signed into law in April 1949,[86] but the commission held "Post-Compact Meetings" in December 1948, February 1949, and August 1949 before formally adjourning with the organization of the Upper Colorado River Commission that oversees compact administration today.[87]

"[T]wo primary problems" confronted the Upper Basin Compact commissioners, as articulated by Utah State Engineer and Upper Basin Compact commissioner Edward Watson in December 1947: "(1) to divide the water equitably [among the Upper Basin States], and (2) allocate the

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82. PRELIMINARY SUGGESTION FOR AN UPPER COLORADO RIVER COMPACT (1929); PRELIMINARY SUGGESTION FOR AN UPPER COLORADO RIVER COMPACT (1930); REMARKS IN RE PRELIMINARY DRAFT OF UPPER COLORADO RIVER COMPACT (1930); DANIEL TYLER, SILVER FOX OF THE ROCKIES: DELPHUS E. CARPENTER AND WESTERN WATER COMPACTS 261–63 (2003); *see also* KUHN & FLECK, *supra* note 5, at 141.

83. As also noted above, this resolution facilitated congressional authorization of C-BT. *See* BUREAU OF RECLAMATION, *supra* note 46, at 5–6; *Meeting 4 Upper Basin States Is Harmonious One*, *supra* note 46; *States of Upper Basin Offer Plan*, *supra* note 46; *see also* TYLER, *supra* note 46, at 66–96; SCHULTE, *supra* note 46, at 53–65; KUHN & FLECK, *supra* note 5, at 141.

84. BREITENSTEIN, *supra* note 53, at 3.

85. UPPER COLO. RIVER BASIN COMPACT COMM'N, Foreword, *in* 1 RECORD OF PRELIMINARY GOVERNORS' MEETING, AND FOR COMMISSION MEETINGS NO. 1–5, INCLUSIVE i, i–ii (1948) [hereinafter UPPER COLO. RIVER BASIN COMPACT COMM'N, Foreword]; UPPER COLO. RIVER BASIN COMPACT COMM'N, Explanatory Note, *in* 1 RECORD OF PRELIMINARY GOVERNORS' MEETING, AND FOR COMMISSION MEETINGS NO. 1–5, INCLUSIVE (1948) [hereinafter UPPER COLO. RIVER BASIN COMPACT COMM'N, Explanatory Note].

86. 43 U.S.C. § 620.

87. UPPER COLO. RIVER BASIN COMPACT COMM'N, Foreword, *supra* note 85, at ii; UPPER COLO. RIVER BASIN COMPACT COMM'N, Explanatory Note, *supra* note 85.

obligation at Lee Ferry."[88] In demonstrating that the available supply from the Colorado River could be lower than previously thought, the 1931–40 dry cycle complicated resolution of these "primary problems." Yet, the experience of that period also provided a context for the solutions articulated and embraced by the Upper Basin Compact. During the negotiations, Riter pointed that "during a low ten-year period" like 1931–40, to meet the Lower Basin's "bottom right . . . to 7,500,000 acre feet" and release sufficient water "for the benefit of the Mexican Treaty," the Upper Basin would have "something less than 5,000,000 acre feet for use . . . probably 4,000,000 acre feet."[89] The Upper Basin understood that in order to utilize their 1922 Compact allocation (Article III[a]), an agreement between the Upper Basin states as well as physical storage solutions had to ensure the states could meet their Compact obligation to make future deliveries to Lee Ferry under comparable dry conditions.

Future droughts, moreover, likely could not absolve the Upper Basin of its "obligation" to the Lower Basin, in the view of Judge Clifford Stone. President of the Colorado Water Conservation Board and Colorado's Upper Basin Compact commissioner, Stone doubted that an "unprecedented drought" would be a sufficient excuse for the Upper Basin states individually to fail to deliver water at Lee Ferry.[90] He opined: "I would assume that the defense of drought would not be a complete defense. . . . We can't control Mother Nature. Neither can we go back and revamp the Colorado River Compact. The Colorado River Compact does make it [i.e., the Lee Ferry delivery] a joint and several obligation."[91]

Meeting the "obligation," determining how to ensure reliable deliveries to the Lower Basin under the 1922 Compact, was the Upper Basin Compact

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88. UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 1, at 129. Although the focus of this essay is on the Upper Basin's obligation to the Lower Basin under the 1922 Compact, the Lee Ferry obligation by the late 1940s included not only the 1922 Compact's Article III(d) provision for the Lower Basin but also deliveries to Mexico under Article 10(a) of the 1944 Mexican Treaty. Additionally, under the treaty's Article 10(b), "[i]n the event of extraordinary drought or serious accident to the irrigation system in the United States, thereby making it difficult for the United States to deliver the guaranteed quantity of . . . water allotted to Mexico [would] . . . be reduced in the same proportion as consumptive uses in the United States are reduced." *See* Treaty With Mexico Relating to the Utilization of the Waters of Certain Rivers: Message from the President of the United States, Transmitting A Treaty Between the United States of America and the United Mexican States, Signed at Washington on February 3, 1944, Relating to the Utilization of the Waters of the Colorado and Tijuana Rivers and of the Rio Grande from Fort Quitman, Tex., to the Gulf of Mexico, 78th Cong., 2d sess. 14 (1944).

89. UPPER COLO. RIVER BASIN COMPACT COMM'N, Official Record of Meeting No. 6 (Feb. 17–21, 1948), *in* 2 RECORD OF COMMISSION MEETINGS NO. 6–11, INCLUSIVE 48 (1948).

90. UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 1, at 109.

91. *Id.* at 110.

negotiators' top priority—a prerequisite to apportioning the water remaining in the river after satisfying the Lee Ferry obligation. As Breitenstein observed about the Upper Basin Compact negotiations:

> [W]hile the 1922 Compact by its paragraph III (a) apportions to the Upper Basin the beneficial consumptive use of 7,500,000 acre-feet annually, such use is subject to the availability of water. The States of the Upper Division [i.e., the Upper Basin] . . . are required by the 1922 Compact to maintain certain flows at Lee Ferry. The water available for use [i.e., by the Upper Basin] is that remaining after the Lee Ferry delivery requirements are satisfied.[92]

Acknowledgment that the Upper Basin commissioners were not going "to revamp the [1922] Compact" (in Stone's words) applied both to their recognition of the Lee Ferry "obligation" and to their understanding of their rights to develop fully waters allocated to them by the 1922 Compact.[93]

At the outset of the negotiations, Stone was the first to call attention to "the obligation" imposed on the Upper Basin states "to make deliveries to Lee Ferry."[94] When commissioners began discussing how they might apportion the 7.5 million acre-feet allocated to the Upper Basin by the 1922 Compact's Article III(a), he reminded them: "We are not concerned here solely with the question of dividing the water."[95] "These states [i.e., Colorado, New Mexico, Utah, and Wyoming]," the Colorado commissioner maintained, "have assumed an obligation in the Colorado River Compact to deliver a specified amount at Lee Ferry, and that is going to be a very important phase of these negotiations."[96]

Noting the importance of the Lee Ferry delivery "obligation" in the face of drought periods, the Upper Basin commissioners and their advisors further conceded that Upper Basin use could be curtailed to ensure compliance with the 1922 Compact as well as the recently negotiated treaty with Mexico.[97] For example, Charles L. Patterson, a Colorado engineer who initially served on the Engineering Advisory Committee, observed that the states could very well apportion their 1922 Compact Article III(a) waters, but "when you

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92. BREITENSTEIN, *supra* note 53, at 8.

93. UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 1, at 110.

94. UPPER COLO. RIVER BASIN COMPACT COMM'N, Official Record of Preliminary Governors' Meeting (July 22, 1946), *in* 1 RECORD OF PRELIMINARY GOVERNORS' MEETING, AND FOR COMMISSION MEETINGS NO. 1–5, INCLUSIVE 8 (1948).

95. UPPER COLO. RIVER BASIN COMPACT COMM'N, Official Record of Meeting No. 1 (July 31, 1946), *in* 1 RECORD OF PRELIMINARY GOVERNORS' MEETING, AND FOR COMMISSION MEETINGS NO. 1–5, INCLUSIVE 33 (1948).

96. *Id.*

97. *Id.*

consider the delivery obligation along with it you may finally conclude that it won't be possible for you collectively to reach that amount."[98]

Upper Basin engineers conceptualized holdover storage reservoirs on the main stem of the Colorado River and its major tributaries as the physical solution that would eventually allow for full development of the 7.5 million acre-feet allotted by the 1922 Compact (Article III[a]), even during a period of drought like 1931–40. "In order to beneficially consume as much as possible all of the water allocated to the Upper Basin and still meet the obligation of not depleting the flow at Lee Ferry in a low ten-year period such as from 1931 to 1940 inclusive," Riter told the Commission, "it becomes necessary to consider main stem storage."[99]

Water stored in reservoirs located downstream from most Upper Basin irrigation projects would be released to meet the Lee Ferry obligation during low-water years, preserving inflows of headwaters for use by the Upper Basin's own diversion projects. As Patterson opined, the "purpose" of building reservoirs was "instead of shutting off projects, we are going to rely on these reservoirs to make good on the obligations at Lee Ferry."[100] Operationally, he envisioned releases of holdover storage water from the reservoirs as occurring in a future eleventh hour—at the end of a ninth year of drought to prevent missing the 1922 Compact Article III(d) obligation to deliver 75 million acre-feet to the Lower Basin in a 10-year period.[101]

The "concept of holdover reservoirs" furthermore, as Riter explained when questioned by Rollins as to whether "sufficient water can be stored to take care of our [i.e., the Upper Basin's] obligation" was not limited to meeting a comparable set of flow conditions as 1931–40 "just . . . once."[102] The federal engineer could not be sure "whether 1931 to 1940 [was] a proper basis" or whether there would not be "a lower ten-year period" in the future, but he did believe that sufficient water could be stored to meet the 1931–40 conditions.[103] More to the point, Riter believed that such reservoirs

> must be planned so they can be filled with the ultimate development you plan to make. In other words, I don't envision these holdover reservoirs as just emptying them once. I envision after they are emptied they have got to be refilled again to prepare for another

98. UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 1, at 79.

99. UPPER COLO. RIVER BASIN COMPACT COMM'N, Official Record of Meeting No. 2 (Sept. 17–18, 1946), *in* 1 RECORD OF PRELIMINARY GOVERNORS' MEETING, AND FOR COMMISSION MEETINGS NO. 1–5, INCLUSIVE 9 (1948).

100. UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 1, at 30.

101. *Id.* at 78.

102. *Id.* at 102–03.

103. *Id.* at 102.

> drought cycle. . . . I have in mind a cyclic operation following complete development.[104]

The alternative (as Patterson suggested) was "curtailment" of Upper Basin water use—or at least by individual Upper Basin states' projects—to meet the Lee Ferry obligation. Breitenstein, for his part, believed that curtailment should only come into play in the event of deficient Lee Ferry flows: "[T]here should be no question of curtailment arise [*sic*] unless there is a deficiency at Lee Ferry."[105] He moreover insisted that "no state should be called upon to shut down any of its uses to supply a deficiency unless the main stem reservoirs have failed in the test."[106]

An Engineering Advisory Committee letter, presented at the July 1948 Vernal, Utah meeting, which formed the basis for the final report of the committee in November 1948, recommended "main stem reservoir[s]" as a centerpiece for an Upper Basin Compact.[107] The committee acknowledged that "[t]he flow of the Colorado River is not uniform but varies from year to year."[108] The lowest known year was 1934, during the 1931–40 period, when the flow at Lee Ferry was approximately 4.4 million acre-feet; the greatest year was 21.9 million acre-feet in 1917.[109] For 1931 to 1940, the engineers calculated that the average annual flow at Lee Ferry was 10,151,000 acre-feet.[110] In their analysis, without "replacement reservoirs," the Upper Basin's use of 1922 Compact Article III(a) water would be limited to 4.3 million acre-feet (as Riter had warned).[111] This was an amount that was far more than the basin was annually using in the 1930s (as noted above)[112] but less than the 1922 Compact allocation (Article III[a]). "To permit full use of the Upper Basin allocation of 7,500,000 acre-feet annually during drought cycles," the Engineering Advisory Committee concluded,

> holdover reservoirs must be constructed in the Upper Colorado River Basin to impound water in years of high runoff and to release

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104. *Id.* at 103.

105. UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 1, at 77.

106. UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 1, at 101.

107. Letter from Engineering Advisory Committee to the Upper Colorado River Basin Compact Commission, *supra* note 45, at 8.

108. *Id.*

109. *Id.*

110. *Id.*

111. *Id.*; UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 99, at 9.

112. BUREAU OF RECLAMATION, *supra* note 3, at 151; Letter from Engineering Advisory Committee to Upper Colorado River Basin Compact Commission, *supra* note 45, at 6–7.

> such stored water in critical periods of low runoff, such as 1931-40, to help meet the Upper Basin obligation at Lee Ferry.[113]

"Operation studies . . . assuming that all holdover storage would be provided at the Glen Canyon site on the Colorado River"[114]—identified above Lee Ferry by USGS hydrologist E. C. LaRue in 1916,[115] preliminarily surveyed by him in 1922,[116] and proposed for development in the Regional Directors' Report[117]—indicated that "storage capacity of 34,200,000 acre-feet (live capacity 29,200,000 acre-feet) [to accommodate 'power head and sediment']" would be sufficient.[118] Figure 3 is an excerpt from the 1916 "Map of Colorado River Drainage Basin," prepared by LaRue, depicting Glen Canyon (the "Colorado-San Juan Res. Site").[119]

As suggested above, satisfaction of the Lee Ferry "obligation" went hand-in-hand with divvying up the waters apportioned by the 1922 Compact. Stone expressed his openness to a proposal for a "specific formula" for the utilization of the Upper Basin's 7.5 million acre-feet 1922 allocation (Article III[a]), "together with a formula with respect to the deliveries of water at Lee Ferry."[120] As negotiations advanced, the Colorado commissioner continued to push for "the determination of the respective obligations of the states to make deliveries at Lee Ferry," along with "the apportionment of water."[121]

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113. Letter from Engineering Advisory Committee to Upper Colorado River Basin Compact Commission, *supra* note 45, at 8.

114. *Id.* at 9.

115. E.C. LA RUE, COLORADO RIVER AND ITS UTILIZATION 214–15 (1916).

116. Letter from E.C. La Rue, Hydraulic Eng'r, U.S. Geological Surv., to Clarence C. Stetson, Assistant to Herbert Hoover, Sec'y of Com. (Oct. 6, 1922) (on file with author).

117. BUREAU OF RECLAMATION, *supra* note 3, at 146–47.

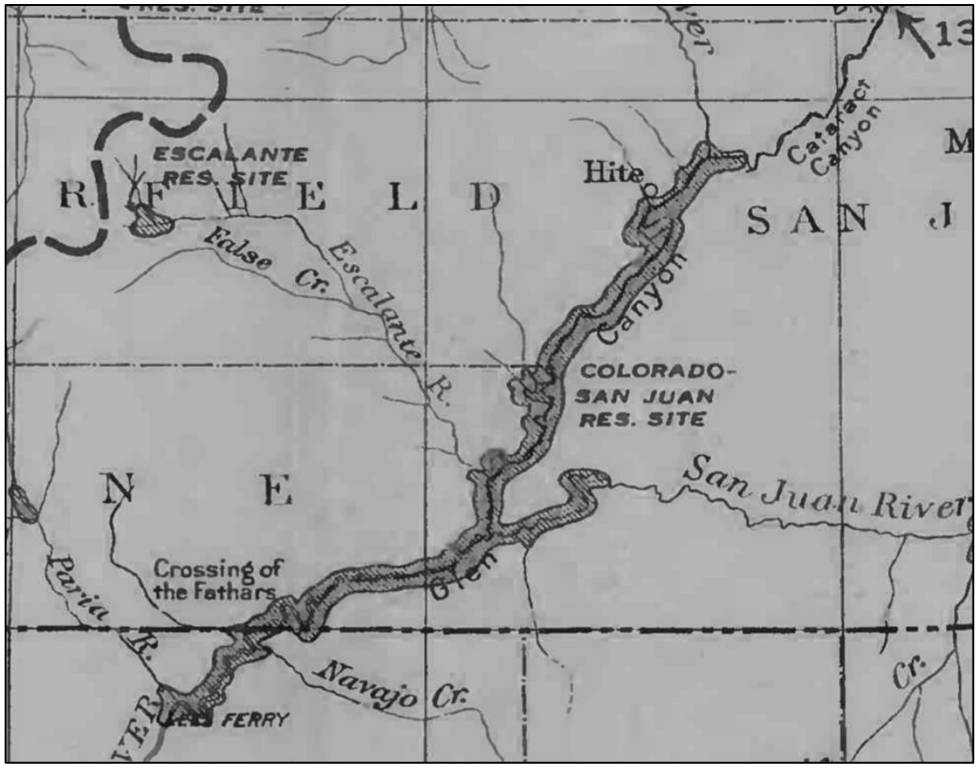
118. Letter from Engineering Advisory Committee to Upper Colorado River Basin Compact Commission, *supra* note 45, at 9. Although the operational studies assumed that Glen Canyon Dam would provide all holdover storage to meet the Lee Ferry obligation during a 1931–40 drought period, as discussed above, the CRSP envisioned multiple reservoirs providing this holdover storage.

119. E.C. LaRue, *supra* note 115, Plate XIII "Map of Colorado River Drainage Basin."

120. UPPER COLO. RIVER BASIN COMPACT COMM'N, Official Record of Meeting No. 4 (Sept. 8, 1947), *in* 1 RECORD OF PRELIMINARY GOVERNORS' MEETING, AND FOR COMMISSION MEETINGS NO. 1–5, INCLUSIVE 6 (1948).

121. UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 89, at 68.

Figure 3. The Glen Canyon Reservoir Site[122]



Note: The Glen Canyon Reservoir Site is identified by E.C. LaRue in this map as the "Colorado-San Juan Res. Site."

This latter issue was largely worked out during the same Vernal meeting at which the engineers endorsed holdover storage.[123] At this "marathon seventh meeting," lasting two weeks in July 1948,[124] Breitenstein later recalled "a tentative compact draft was hammered out."[125] The Upper Basin states not only agreed to a percentage apportionment of the Upper Basin's 1922 Compact Article III(a) allocation but also adopted the "stream depletion theory" and the "'inflow-outflow' method," as presented by Colorado's engineering advisor Royce Tipton.[126] As discussed below, both the stream depletion theory and the inflow-outflow method of measurement would come

122. E.C. LaRue, *supra* note 115, Plate XIII "Map of Colorado River Drainage Basin."
123. KUHN & FLECK, *supra* note 5, at 144–45.
124. *Id.* at 145, 248 n.13.
125. BREITENSTEIN, *supra* note 53, at 6.
126. KUHN & FLECK, *supra* note 5, at 144–46, 148.

under Lower Basin scrutiny during congressional hearings on the Upper Basin Compact.

The Upper Basin Compact Commission, as memorialized by Breitenstein, proceeded on the basis that it was dividing the water remaining after the Lee Ferry obligation was met.[127] The resulting compact emphasized the obligation to the Lower Basin under the 1922 Compact to ensure that 75 million acre-feet passed Lee Ferry in ten years (Article III[d]),[128] an emphasis that the recent 1931–40 dry cycle had underscored.[129] In line with Patterson's conceptualization of using regulatory storage to avoid missing the delivery of 75 million acre-feet during a tenth year of drought, the Upper Basin Compact specifically addressed a scenario whereby curtailments to meet the Lee Ferry obligation would be based on the ten years preceding the shortfall (Upper Basin Compact Article IV[b]).[130]

To maximize their permitted utilization of Colorado River water under the 1922 Compact, the Upper Basin adopted the "stream depletion theory" as the measure of their "consumptive use" of Colorado River flows and the "'inflow-outflow' method" to account for those depletions.[131] Colorado's engineering advisor Royce Tipton laid these ideas out in detail to the commissioners, with reference to data from other watersheds, the Rio Grande and the South Platte River.[132] The "stream depletion theory" defined "consumptive use . . . in terms of man-made depletions of the virgin flow at Lee Ferry."[133] "Virgin flow," according to Tipton, "in 1922 was called 'reconstructed flow.' Both terms mean the flow of the river as it was in the state of nature before man entered the picture."[134] To assess depletion, the engineer in turn proposed, "measur[ing] . . . the change in relation between the runoff at certain key gaging stations location around the rim of the basin

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127. BREITENSTEIN, *supra* note 53, at 3.

128. *Id.*

129. *See* KUHN & FLECK, *supra* note 5, at 108.

130. *See* UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 1, at 81; KUHN & FLECK, *supra* note 5, at 147.

131. BREITENSTEIN, *supra* note 53, at 10–11; *see also* KUHN & FLECK, *supra* note 5, at 144–46.

132. UPPER COLO. RIVER BASIN COMPACT COMM'N, Official Record of Meeting No. 7 (July 7–21, 1948), *in* 2 RECORD OF COMMISSION MEETINGS NO. 6–11, INCLUSIVE 42–63 (1948).

133. BREITENSTEIN, *supra* note 53, at 10.

The origins of the "stream depletion theory" are complex, and while Tipton emerged in the context of the Upper Basin Compact negotiations as the architect of the idea, Arizona employed the idea in advocating for its exclusive use of the Gila River in the 1940s. *See, e.g.*, 2 JOHN UPTON TERRELL, WAR FOR THE COLORADO RIVER, ABOVE LEE'S FERRY—THE UPPER BASIN 11–12 (1965); KUHN & FLECK, *supra* note 5, at 132–37, 144–45.

134. UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 132, at 43.

above the major development and the outflow from the basin as measured at Lee Ferry."[135]

Lower Basin stakeholders—especially California's representatives—questioned the "stream depletion theory," the "inflow-outflow method," and the contemplated use of storage reservoirs, as the Upper Basin Compact moved toward congressional approval in the spring of 1949. During Breitenstein's appearance before the House Subcommittee on Irrigation and Reclamation, in particular, California's Clair Engle expressed his concern that under "the depletion theory, the amount of water passing Lee Ferry [and into the Lower Basin] would be less" than under the theory of "diversions less return to the river" (espoused by California) and that the Upper Basin would gain more water under this theory.[136] Colorado's Upper Basin Compact legal advisor, having already expressed the Upper Basin's "intent to live up to the [1922] Colorado River compact" and the "opinion [that] the depletion theory is a correct interpretation of the Colorado River compact," deferred to Tipton.[137] Tipton's view was that if the "California theory" of "diversion minus return to the stream . . . had been adopted by the upper basin States when it wrote its compact, there would be less water passing Lee Ferry than there will be under the theory that is set forth in the upper basin compact."[138]

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135. *Id.*

136. *The Upper Colorado River Basin Compact: Hearings Before the Subcomm. on Irrigation and Reclamation of the Comm. on Pub. Lands*, 81st Cong. 93–94 (1949) [hereinafter *The Upper Colorado River Basin Compact Hearings*] (statement of Rep. Clair Engle, Member, Comm. on Pub. Lands).

The "California theory," as Tipton pointed out, found expression in the Boulder Canyon Act but "diversions less return" was not mentioned in the 1922 Compact. *See id.* at 94. In its comments on *The Colorado River Report*, California argued that "consumptive use" was "[t]he only proper measure of water requirements on the Colorado River," was "used in the Colorado River compact and related legislation," and "should be measured at actual or potential places of use." H.R. Doc. No. 80-419, at 39 (1947). Kuhn and Fleck point out, that this question of how to measure use was a central argument between California and Arizona in the 1940s, leading into the *Arizona v. California* litigation. KUHN & FLECK, *supra* note 5, at 133–37, 157–60.

Notably, following Tipton's presentation to the Upper Basin Compact commissioners, Wyoming's legal advisor William J. Wehrli expressed the opposite concern of Engle's – that the Upper Basin would have less water relative to the Lower Basin under this theory. UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 132, at 57–60; *see also* KUHN & FLECK, *supra* note 5, at 145.

137. *The Upper Colorado River Basin Compact Hearings*, *supra* note 136, at 93.

138. *Id.* at 94. Kuhn and Fleck point out that under the "stream depletion theory," using the "inflow-outflow" method to assess "the impact of human water use to the natural flow at Lee Ferry . . . the Upper Basin could, at least during wet cycles, collectively consume 600,000 acre-feet more than 7.5 million acre-feet per year and, under its 1922 compact apportionment, a total of 8.1 million acre-feet." KUHN & FLECK, *supra* note 5, at 144.

When Engle pressed further about the potential impact of the Upper Basin Compact on the Lower Basin, stressing the Lower Basin's "interest[]" in the method of "measurement," Breitenstein conceded the issue of "the measurement of water" could require adjudication by the Supreme Court:

> if at times of ultimate development when we [i.e., the Upper Basin] are up to near the maximum of our use, or when the question is whether or not we are meeting our delivery obligations, there is disagreement between the two basins as to how beneficial consumptive use is to be measured and it cannot be settled amicably, I assume that at that time, some uncertain date in the future, there may have to be a decision of the United States Supreme Court determining as between these two basins, which method is discussed here, or perhaps some other method that one of us have thought of yet, is the correct method of measuring beneficial consumptive use.[139]

As for storage reservoirs, in reviewing Article IV of the Upper Basin Compact before the House Subcommittee, Tipton highlighted the need for these facilities "along the main stream of the Colorado River and some of its tributaries . . . in order to enable the upper basin to make use of its apportioned water."[140] The Upper Basin in the 1940s and early 1950s, as noted above and below, was utilizing neither its full 7.5 million acre-feet 1922 Compact allocation (Article III[a]) nor an amount that threatened the Lower Basin's allocation (which speaks to Engle's concern). The engineer acknowledged that the reservoirs would be constructed "long before" they were going to be needed to satisfy the Lee Ferry obligation, so they would be used "for the generation of hydroelectric energy" in the interim.[141] Tipton's rationale was that operating the reservoirs for hydroelectric power generation, an activity that demands a steady supply of water, would regulate the river such that the Upper Basin obligation at Lee Ferry would be "taken care of."[142] He maintained that operating the reservoirs for the purposes of satisfying the obligation and for power generation were compatible.[143]

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139. *The Upper Colorado River Basin Compact Hearings*, *supra* note 136, at 94–95. Breitenstein went on to observe that California had very few diversions from the Colorado River and those were large and simple to measure whereas in Colorado, there were "between four and five thousand of diversions on the west slope," which are onerous to gage and difficult from which to assess return flow. *Id.*

140. *Id.* at 37.

141. *The Upper Colorado River Basin Compact Hearings*, *supra* note 136, at 37.

142. *Id.* at 38.

143. *Id.*

Under questioning from Arizona's representative John R. Murdock as to whether the Upper Basin "will ultimately be able to use its apportionment of 7,500,000 acre-feet of water annually and, at the same time, be able to deliver . . . an average of 7,500,000 acre-feet for the lower basin," Tipton was unsure of the former but confident of the latter. "I am not sure that the upper basin can utilize 7 ½ million acre-feet," the engineer told Murdock, but "[i]n any event, it will always make its required delivery at Lee Ferry." [144] Moreover, Tipton stated,

> The very development of the basin itself by the construction of the substantial hold-over reservoirs for the direct use of the upper basin above the points of use, the effect of that will be to equate to some extent the flow of the river at Lee Ferry. That always happens, but in addition to those reservoirs, and the effect they will have upon the flow at Lee Ferry there will be required additional reservoirs with an aggregate substantial capacity below our points of use to complete the balance of the equation that is necessary to take care of our obligation...[145]

This idea of storage reservoirs below Upper Basin points of use for the purposes of meeting the Lee Ferry obligation and generating power to fund Upper Basin irrigation projects was the blueprint for the CRSP "units" and "participating projects" that followed the Upper Basin Compact's ratification.[146]

IV. "TO PERMIT THE STATES OF THE UPPER DIVISION TO MEET LEE FERRY FLOW OBLIGATIONS AND UTILIZE THE FULL CONSUMPTIVE USE APPORTIONED THEM": THE DESIGN OF THE COLORADO RIVER STORAGE PROJECT

Even before the Upper Basin Compact was signed, Reclamation Region IV, encompassing the Upper Basin states and based in Salt Lake City, was working toward a proposal for Upper Basin development. Investigation of projects above Lee Ferry had been ongoing since 1946,[147] and in March 1949, Region IV released for internal review a preliminary and draft "Interim Report Colorado River Storage Project and Participating Projects, States of

144. *Id.* at 49.

145. *Id.* at 49.

146. KUHN AND FLECK, *supra* note 5, at 152.

147. H.R. Doc. No. 83-364, at 102 (1954); *see, e.g.*, BUREAU OF RECLAMATION, *supra* note 43; *see also* Correspondence from U.S. Dept. of Interior, Bureau of Reclamation, to Upper Colo. River Comm'n 10 (Mar. 8, 1949) (on file with author).

the Upper Division, Upper Colorado River Basin." This was the first iteration of the report that became the basis of the CRSP bill approved by Congress in 1956.[148] Although CRSP drew on elements presented in the Regional Directors' Report, it embodied ideas reflected in the Upper Basin Compact.

Region IV finalized the CRSP report for transmittal to the Reclamation Commissioner and the Secretary of the Interior in December 1950. The agency prepared a supplemental report in 1953 and submitted both the 1950 and 1953 reports to Congress in 1954.[149] Reclamation assumed full authorship of the CRSP reports but acknowledged that both the Upper Basin states and the Upper Colorado River Compact Commission contributed to the report and the substantiating materials.[150] Upper Basin legislators introduced the first versions of the legislation to Congress in 1953.[151]

Upper Basin recognition that its water resources could not be fully developed while meeting the Lee Ferry obligation during a future decade of flow conditions similar to those of 1931–40 framed the problem that CRSP was intended to address. Water development in the Upper Basin had been accomplished primarily through "numerous small private enterprises and 13 projects of various sizes undertaken by the Bureau of Reclamation" at the least expensive and most convenient locations.[152] The Upper Basin's uses in 1950 were estimated to deplete the flow of the Colorado River at Lee Ferry by slightly more than 2.5 million acre-feet annually.[153] "Present flows in the upper basin," were therefore "adequate to meet the 10-year Lee Ferry obligation."[154] In fact, Reclamation concluded that at the 1950 rate of Upper Basin use, no curtailment of water would be required "[u]nless future droughts are much more severe than that of 1931–40."[155] "Within 20 or 25 years, however," Reclamation anticipated that "curtailment of consumptive uses will be necessary in protracted dry periods unless some storage water is available for delivery to the lower basin."[156] In essence, CRSP was intended to address a future problem resulting from a drought like that of 1931–40.

Similarly, as noted above, the Lower Basin was not on the receiving end of multiple shortfalls of 1922 Compact water deliveries between 1931 and 1940. Rather, the decade was marred by one particular year (1934) when the

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148. BUREAU OF RECLAMATION, *supra* note 43, at 10–12.
149. H.R. Doc. No. 83-364, at III (1954).
150. *Id.* at 70.
151. 1 TERRELL, *supra* note 49, at 263.
152. BUREAU OF RECLAMATION, *supra* note 43, at 6.
153. H.R. Doc. No. 83-364 at 47, 86 (1954).
154. *Id.* at 105.
155. *Id.* at 148.
156. *Id.* at 105.

"Virgin Flow" of water passing Lee Ferry was approximately 5.6 million acre-feet.[157] In fact, when the CRSP report was drafted, the Lower Basin was in a comparatively good position on the river. As noted above, Hoover Dam was providing storage, regulation, and flood control below Lee Ferry and water annually passing Lee Ferry typically exceeded the Lower Basin's 1922 Compact allocation (Article III[a]).[158] With no storage reservoirs on the main stem above Lake Mead, the Lower Basin did not have to contend with an upstream release schedule for its supply. Unsurprisingly then, opposition to the CRSP legislation came from the Lower Basin and from outside the Upper Basin–especially with regard to the proposed Echo Park Dam in Dinosaur National Monument.[159] As discussed further below, Lower Basin opponents of the legislation, especially Californians, disputed fundamental components of the Upper Basin's implementation and interpretation of its obligations under the 1922 Compact.[160]

Reclamation, working with the Upper Basin, designed CRSP to meet the theoretical inability of a fully developed Upper Basin to meet its downstream obligations during the 1931–40 conditions.[161] Calculating that the virgin flow of the Colorado River during this decadal dry cycle was approximately 118,320,000 acre-feet, Reclamation concluded that during that time, the Upper Basin "could have depleted the river flow during the 10-year drouth [*sic*] period by only 43,320,000 acre-feet in terms of man-made depletions at Lee Ferry" and still met the obligation.[162] As discussed above, the Upper Basin had not reached a stage of infrastructure development that utilized such a quantity of water. Looking to the future, however, Reclamation and the Upper Basin recognized that without river regulation, new projects in the Upper Basin would be limited to those that did not consume more water than required to meet the 10-year Lee Ferry obligation and the U.S. commitment to Mexico.[163] The aim of the storage project first and foremost was "to permit the States of the upper division to meet Lee Ferry flow obligations and utilize

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157. *See* BUREAU OF RECLAMATION, *supra* note 43, at 32.

158. *Id.*

159. In 1965, Terrell provided a detailed account of this opposition, especially to Echo Park. *See* 2 TERRELL, *supra* note 133, pts. 2–7. For an interpretive history of the origins of this fight and its relationship to the post-World War II conservation movement, see MARK W. T. HARVEY, A SYMBOL OF WILDERNESS: ECHO PARK AND THE AMERICAN CONSERVATION MOVEMENT (Univ. Wash. Press, 2000) (1994).

160. H.R. Doc. No. 83-364, at 52–58 (1954).

161. *See id.* at 2, 105.

162. BUREAU OF RECLAMATION, *supra* note 43, at 38.

163. *Id.* at 38–39.

the full consumptive use apportioned them under the terms of the Colorado River Compact."[164]

The CRSP report proposed congressional authorization for a plan of development that would finance irrigation development (through power revenues) in the Upper Basin and provide for regulatory storage capacity in the Upper Basin to allow it to meet its downstream delivery obligations at Lee Ferry during periods of drought like 1931–40.[165] Despite a name that suggests a Colorado River Basin-wide undertaking, CRSP was an Upper Basin/Region IV project whose works were located exclusively in the Upper Basin.[166] From the geographical perspective of the Lower Basin, the "storage" component of the project was upstream on the Colorado River and its major tributaries. The plan of development within the Upper Basin notably placed most of this storage too far downstream to provide water directly to irrigable lands and industrial centers in the Upper Basin at the time.[167]

The plan provided for two classes of reservoirs that reflected the conceptualization offered by Tipton during the Upper Basin Compact hearings. Ten "units"—mostly downstream from Upper Basin points of use—would each include a dam, reservoir, and hydroelectric power generating facilities.[168] Eight of the units would provide for river regulation.[169] The total storage capacity of the storage units was 48,555,000 acre-feet, with 37,530,000 acre-feet of active storage capacity.[170] These units "constitute[d] the Colorado River storage project."[171] The other class of reservoirs that Reclamation Commissioner Michael Straus identified as an "element[] in the plan" were participating irrigation projects.[172] Participating projects generally consisted of reservoirs, diversion, and distribution works—all intended to facilitate Upper Basin consumption of Colorado River waters.[173]

The 1931–40 period of record figured prominently in both setting the design criteria for CRSP and in developing recommendations for the initial authorization of units. Region IV posited that 23 million acre-feet "of active

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164. *Id.* at 39.

165. *Id.* at 1–11; H.R. Doc. No. 83-364, at 105, 148–49 (1954); Letter from Michael W. Straus, Comm'r, Bureau of Reclamation, to Oscar L. Chapman, Sec'y of the Interior, at 2 (Dec. 22, 1950) (on file with author).

166. *See* H.R. Doc. No. 83-364, at 104–05 (1954).

167. *Id.* at 105.

168. *Id.* at 71.

169. *Id.*

170. *Id.* at 72.

171. *Id.* at 71.

172. *See* Straus, *supra* note 165, at 2.

173. *Id.* at 107.

hold-over storage capacity" would be required for the Upper Basin to meet the Lee Ferry obligation during a future drought event comparable to the drought recorded between 1931 and 1940.[174] Operationally, Reclamation envisioned a system much as suggested by Riter during the Upper Basin Compact negotiations, a system whereby:

> water stored would be released as needed in drought periods to meet the compact obligation at Lee Ferry. The reservoirs would be refilled during years of favorable water supply. In a dry decade such as that of 1931–40, release of the entire 23 million acre-feet would be necessary to meet the Lee Ferry obligation.[175]

To maintain the 23 million acre-feet necessary for hold-over storage—reflecting the need pointed out by the 1931–40 period—additional capacity would be required for sediment encroachment.[176] Reclamation made future projections about sediment encroaching into storage and projected that in 200 years, 18 million acre-feet of sediment would be captured by project reservoirs, 12 million acre-feet of which would be retained in the active storage capacity.[177] Region IV suggested that future generations could ameliorate the problem by "controlling some sediment at its source and by developing remaining upstream sediment storage sites."[178]

In preparing a request for initial authorization of components of CRSP, Reclamation drew a distinction between known and unknown factors. Straus wrote that "[i]t is possible at this time to foresee rather clearly the needs of the Upper Basin in terms of storage requirements for purposes of river regulation, although facilities for utilization of the last drops of water cannot be seen with any clarity."[179]

Between the 1950 CRSP report and the 1956 passage of CRSPA, various combinations of units and participating projects for initial authorization were considered.[180] Every major proposal had one thing in common: the recommendation of the Glen Canyon Dam. The dam site, as noted above, had long been considered a suitable one for the overall development of the Colorado River Basin.[181] Situated just 17 miles upstream from Lee Ferry (and far downstream from Upper Basin points of use), Glen Canyon Dam had the

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174. E.O. Larson, *Regional Director's Report*, *supra* note 43, at 16; H.R. Doc. No. 83-364, at 105 (1954).

175. H.R. Doc. No. 83-364, at 105 (1954).

176. *See id.* at 163.

177. *Id.* at 72; E.O. Larson, *Regional Director's Report*, *supra* note 43, at 17.

178. E.O. Larson, *Regional Director's Report*, *supra* note 43, at 17–18.

179. *See* Straus, *supra* note 165, at 1.

180. 2 TERRELL, *supra* note 133, apps. C & D.

181. *See* discussion *supra* Part III.

potential to create "more initial storage capacity than all others combined."[182] It was the only one of the 10 units identified in the CRSP report that was on the Colorado River; all others were sited on major tributaries.[183] Initial designs for the dam set its capacity at 26 million acre-feet, inclusive of 20 million acre-feet active capacity—less than what the Upper Basin Compact Engineering Advisory Committee had analyzed, but nearly enough to satisfy a future drought scenario like 1931–40, according to that analysis.[184]

Department of Interior officials spoke favorably of the project during the 1953–1955 congressional hearings for the proposed CRSP legislation, highlighting how it provided for a system that served both the Upper and Lower basins. Region IV Director, E.O. Larson likened the project to other mid-century Reclamation projects, describing it as a "replacement practice quite common on western streams where water is diverted upstream in exchange for storage water releases from downstream reservoirs."[185] Both Larson and Ralph Tudor, the Undersecretary of the Interior, promoted the idea of future authorizations of additional storage reservoirs following the initially authorized units.[186]

Regardless of the touted benefits of CRSP to the Colorado River Basin as a whole, detractors such as Northcutt Ely, an attorney for the Colorado River Board of California, raised concerns in Congress about how Reclamation and the Upper Basin were interpreting the 1922 Compact with CRSP.[187] Ely believed that there were "erroneous interpretations of the Colorado River compact built into the planning of the Colorado River storage project."[188]

The two most "intolerable" aspects of the proposed legislation, in Ely's estimation, were how Reclamation intended to measure beneficial consumptive use in the Upper Basin and Reclamation's endorsement of the idea of treating the 7.5 million acre-feet apportionment as an annual average

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182. H.R. Doc. No. 83-364, at 104 (1954).

183. *Id.*

184. *Id.* at 118; Letter from Engineering Advisory Committee to Upper Colorado River Basin Compact Commission, *supra* note 45, at 9.

185. *Colorado River Storage Project: Hearings Before the Subcomm. on Irrigation and Reclamation of the Comm. on Interior and Insular Affs. on S. 500: A Bill to Authorize the Secretary of the Interior to Construct, Operate, and Maintain the Colorado River Storage Project and Participating Projects, and For Other Purposes*, 84th Cong. 47 (1955) [hereinafter *S. 500 Hearings*].

186. *Colorado River Storage Project: Hearings Before the Subcomm. on Irrigation and Reclamation of the Comm. on Interior and Insular Affs. on S. 1555: A Bill to Authorize the Secretary of the Interior to Construct, Operate, and Maintain the Colorado River Storage Project and Participating Projects, and For Other Purposes*, 83d Cong. 41, 43–44 (1954) [hereinafter *S. 1555 Hearings*].

187. *Id.* at 584, 592.

188. *Id.*

rather than an annual maximum.[189] Ely believed that those interpretations would deprive the Lower Basin of access to surplus water and compromise the ability to meet the 1944 Mexican Treaty obligation.[190] Harkening back to Engle's exchange with Breitenstein and Tipton during the Upper Basin Compact hearings, the attorney pointed out that "there is sharp controversy over the meaning of the term 'beneficial consumptive use'" and opposed the depletion theory adopted by the Upper Basin.[191]

Ely further objected to CRSP plans for construction of storage reservoirs on operational grounds, arguing that holdover storage would not be necessary for many years (as Tipton himself had conceded during the Upper Basin Compact hearings) because it would take decades of Upper Basin development before the flow at Lee Ferry was reduced below 75 million acre-feet over 10 years.[192] The attorney maintained that it would be wasteful to begin filling reservoirs before they were needed because of evaporative losses, and alleged that proponents of the holdover storage were seeking to subsize irrigation projects with power revenues.[193]

189. *S. 500 Hearings*, *supra* note 185, at 587.
190. *Id.* at 587–95.
191. *S. 1555 Hearings*, *supra* note 186, at 588.
192. *Id.* at 585–87.
193. *Id.*; *S. 500 Hearings*, *supra* note 185, at 573.

Figure 4. "Colorado River Storage Project Map," from Reclamation's Interior Region 7, Upper Colorado Basin Website[194]

Californians like Ely together with conservationists led by David Brower were the primary objectors to CRSP during the hearings concerning the project in the 1950s, but in the end they stood little chance against the Upper Basin's unified front, supported by the Eisenhower Administration.[195] Engle himself—an early opponent of CRSP—eventually relented and voted in favor of the bill along with 10 of California's 35 representatives.[196] After multiple

194. *Interior Region 7: Upper Colorado Basin*, BUREAU OF RECLAMATION, https://www.usbr.gov/uc/rm/crsp/index.html (Aug. 19, 2021) [https://perma.cc/45Y9-23ZX].

195. KUHN & FLECK, *supra* note 5, at 153–54.

196. Terrell, Kuhn, and Fleck all argue that Engle's support was obtained through a political trade: his vote for CRSP in exchange for Upper Basin support for the long-contemplated Trinity Dam Division of California's Central Valley Project. 2 TERRELL, *supra* note 133, at 25–26; KUHN & FLECK, *supra* note 5, at 154.

hearings, revisions, and amendments, Congress approved a House-Senate conference report on the bill in March 1956 and President Eisenhower signed Public Law 84-485 on April 11, 1956.[197] Just as all iterations of the bill had done, the final bill provided for construction of Glen Canyon Dam as one of four units authorized for initial construction.[198] Eleven participating projects were part of the initial authorization, including the first phase of the large Central Utah project that was operationally linked to the Flaming Gorge unit.[199] The bill further authorized priority planning for another storage reservoir and an additional twenty-four participating projects.[200]

Several of these participating projects were authorized in the 1960s, but most were scaled back or never developed because of the absence of economic feasibility or challenges with bringing more land under irrigation.[201] No new CRSP storage reservoirs, moreover, have been constructed in the Upper Basin since the completion Morrow Point Dam in 1968, an element of the Curecanti Unit, today known as the Aspinall Unit.[202] Figure 4 is a present-day map of the CRSP "units."[203]

V. UNDERSTANDING THE PAST ON ITS OWN TERMS: AN APPRAISAL OF THE HISTORICAL SIGNIFICANCE OF THE 1931–40 DROUGHT

While engineers may have to "judge the future by the past," as Riter asserted to Rollins in December 1947[204], historians seek to understand the past on its own terms. Bringing the 1931–40 drought closer to the center of the historical analysis of the underlying assumptions of the Upper Basin Compact and CRSP allows for a sharper appreciation of how Reclamation and the Upper Basin intended the Upper Basin to deliver the Lower Basin's 1922 Compact allocation during future dry periods without curtailing its own use, as well as the tensions between the Upper and Lower Basins over the waters of the Colorado River.

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197. KUHN & FLECK, *supra* note 5, at 154.

198. *Id.* at 154–55.

199. *See id.* at 155.

200. *See* H.R. Doc. No. 83-364, at 73 (1954). For information related to CRSP and to each of the authorized participating projects, see U.S. DEP'T OF THE INTERIOR, *supra* note 49; see also 2 TERRELL, *supra* note 133, for a detailed presentation of the hearings on various iterations of the CRSPA legislation (70 Stat. 105).

201. KUHN & FLECK, *supra* note 5, at 155.

202. U.S. DEP'T OF THE INTERIOR, *supra* note 49, at 361.

203. *Colorado River Storage Project*, BUREAU OF RECLAMATION, https://www.usbr.gov/uc/rm/crsp/index.html [https://perma.cc/HZ23-RM6G].

204. UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 1, at 102.

Although the 1931–40 drought did not prompt the Upper Basin "to revamp" (to borrow Judge Clifford Stone's language)[205] "The Law of the River" or to join with Reclamation "to imbue the institutions for allocating and using the Colorado's waters" that were being created "with the flexibility to respond when there is less water than . . . planned" (in Kuhn and Fleck's words),[206] the Upper Basin states nevertheless derived lessons from the stream-flow conditions of this decade. Chief among these was that to enable their maximum development under the terms of the 1922 Compact more storage was necessary in the Upper Basin to satisfy the Lower Basin during a future comparable dry cycle.

The 10-year drought impressed upon the Upper Basin and Reclamation the need for additional reservoirs on the Colorado River. The Upper Basin states, heeding Reclamation warnings and recommendations, came to recognize that under streamflow conditions like those prevailing between 1931 and 1940 they would be unable to make full use of their 1922 Compact allocation and comply with the obligation (Article III[d]) to deliver 75 million acre-feet of water over 10 years downstream at Lee Ferry. The Upper Basin thus embraced a general plan of development whereby water would be stored in the Upper Basin to ensure the obligation could be met during a comparable drought while simultaneously making direct diversions, generally above regulatory storage. Upper Basin Compact negotiators sketched out the plan along with the apportionment of the 1922 Compact water allocated to the Upper Basin states; and with direct input from the Upper Basin, Reclamation designed CRSP to implement the plan. A system was fashioned in which 23 million acre-feet of holdover storage to the Lower Basin would conceivably be released during a 10-year period like 1931–40, without compromising the Upper Basin's use of its 1922 Compact allocation—otherwise curtailment by the Upper Basin states would be necessary.[207]

As Engle and Murdock's questions to Breitenstein and Tipton about the Upper Basin Compact and Ely's comments before Congress regarding the CRSP indicate, this solution for future droughts was not altogether satisfying and was even worrisome for the Lower Basin. Those concerns, moreover, were not limited to the potential impact of subsequent dry cycles in the Colorado River Basin.

The historical significance of the 1931–40 drought period is thus two-fold. First and foremost, the decadal dry cycle was a defining event that created the context and informed responses that led to the operational regime by

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205. UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 1, at 110.
206. KUHN & FLECK, *supra* note 5, at 225.
207. BUREAU OF RECLAMATION, *supra* note 11, at 13; H.R. Doc. No. 83-364, at 105 (1954).

which the Lower Basin receives its water under the 1922 Compact today. For that reason alone, for the role the drought played in structuring the "Law of the River," the climatic event is important and demanding of attention. The 1931–40 dry cycle directly contributed to how the Upper Basin conceived of its responsibility to the Lower Basin. The Upper Basin states focused on addressing that obligation first and conceded the possibility of curtailment should the contemplated main stem reservoirs "fail the test" (in Breitenstein's words).[208]

Second, while the Upper Basin's response to the 1931–40 drought period was intended in part to assure the Lower Basin of its 1922 Compact-allocated water in the face of Upper Basin development, it ironically set the stage for conflict with the Lower Basin. The Upper Basin states prior to the Upper Basin Compact and CRSP were not so concerned that they would fail to meet the Lee Ferry obligation during a future comparable drought, but rather that they could not meet the obligation *and* make use of their full 1922 Compact allocation during another such dry period. They developed a means by which they believed both aims could be achieved, in both policy and engineering terms, compliant with the 1922 Compact. That belief was nevertheless predicated upon views of the 1922 Compact and the administration of the Colorado River waters not shared by others in the Lower Basin, who questioned both how the Upper Basin proposed to account for its use and the overall plan for Upper Basin development.

208. UCRBCC *Official Record*, vol. I, "Meeting No. 5," Denver, Colorado, December 2, 1947, Afternoon Session, 101.