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The Basin has Finessed the Disputed Issue of the Upper Basin's Compact Obligation to Mexico for at Least 50 Years. Is it now Finally Time for a Resolution?

As the Basin stakeholders begin renegotiating Colorado River management rules, it is inevitable that we will run headlong into compact disputes that have been left unresolved for decades. From the Upper Basin's perspective, the most important of these is the simple question:

How much water must the Upper Basin contribute to meet the U.S. obligation to Mexico?

The conventional wisdom, enshrined in current river operating rules, is that the Upper Basin must each year contribute half of the 1.5 million acre-feet/year (maf/year) annual delivery to Mexico under the 1944 Mexican Treaty – 750,000 af/year released from Glen Canyon Dam each year, on top of the Upper Basin's 7.5 maf/year average annual Colorado River Compact obligation at Lee Ferry.

But there is a strong argument to be made that the better answer is “none” – that the Upper Basin's compact obligation is really 7.5 maf/year per year, not 8.25maf.

Sorting out this question is critical to resolving the deep challenges facing the basin as climate change diminishes the natural flow of the river – questions of fairness and equity between the two basins and the sharing of the burdens of the impact of climate change. This is a question left lingering by ambiguity in the language of Article III(c) of the 1922 Colorado River Compact (1922 Compact).¹ Article III(c) provides that water delivered to Mexico is to first come out of the surplus. If there is not sufficient surplus water, the deficiency is to be split evenly between the two basins and the four States of the Upper Division must add this water to their obligation to not deplete the flow at Lee Ferry below 75 maf every ten years.

The Upper Basin has two basic tactical approaches, one active and one passive. Under the active approach, the Upper Division States would seek to convince the Secretary and Lower Division States to adopt operating rules based on a normal year release of 7.5 maf/year using the argument that the Lower Basin's overuse is surplus system water. If that fails, which is possible, the next step would be to significantly escalate the dispute by taking legal action, possibly in the Supreme Court. Given that the burden of this approach would on the Upper Division, a passive approach may be more attractive. Under the Upper Colorado River Basin Compact (1948 Compact), the decision to curtail Upper Basin uses is made by the Upper Colorado River Commission (UCRC).

¹ The exact language is “If, as a matter of international comity, the United States of America shall hereafter recognize in the United States of Mexico any right to the use of any waters of the Colorado River System, such waters shall be supplied first from the waters which are surplus over and above the aggregate of the quantities specified in paragraphs (a) and (b); and if such surplus shall prove insufficient for this purpose, then, the burden of such deficiency shall be equally borne by the Upper Basin and the Lower Basin, and whenever necessary the States of the Upper Division shall deliver at Lee Ferry water to supply one-half of the deficiency so recognized in addition to that provided in paragraph (d).”

The Lower Division States do not have a vote. If the UCRC decides the Upper Basin is not out of compliance with the 1922 Compact until 10-year flows at Lee Ferry drop below 75 maf, ignoring the Mexican Treaty, the Lower Division States would be forced to challenge the UCRC decision. This approach is not without significant risks, but the burden would be on the Lower Basin.

Since the authorization of Glen Canyon Dam in 1956, one of the most divisive issues between the basins has been setting the annual releases from the dam. The reason is obvious, Glen Canyon Dam is located only about 20 miles upriver from Lee Ferry, the compact point. Except for about 150,000 af/year (or so) of water from the Paria River and groundwater inflows downstream of the dam, the flow at Lee Ferry is controlled by releases from the dam. The issue was one of the highlights of the Congressional debate over the Central Arizona Project (CAP) in the 1960s. A 1965 study by UCRC consultant Royce Tipton showed that if the Upper Basin's deliveries at Lee Ferry averaged 8.25 maf/year (7.5 maf/year for the Lower Basin plus .75 maf/year for Mexico), the Lower Basin's structural deficit would be about 1.2 maf/year. If the deliveries averaged 7.5 maf/year (no delivery to Mexico), the structural deficit would be closer to 2 maf/year.² Tipton's message was simple, if the annual flows at Lee Ferry averaged 7.5 maf/year, the yield available to the CAP would be zero. Tipton shocked the Upper Basin as well. He concluded that during an extended dry period like 1931-1964, with an average delivery of 8.25 maf/year, the water available to the Upper Basin would only be about 4.6 maf/year (not counting evaporation on Lake Powell). With an average delivery of 7.5 maf/year, the available yield increased to 5.3 maf/year. The situation Tipton described in his 1965 study is similar to the existing conditions on the river today, except his extended dry period (31-64) was about one maf/year wetter than what we've seen since 2000 (13.4 maf/year vs 12.4 maf/year).

Under the 8.25 maf/year delivery scenario and the assumption that future flows will be similar to or lower than the post-2000 period, the Upper Basin has no water left for future development and will have to implement a large-scale and expensive demand management program and/or curtail its existing uses to meet its Lee Ferry obligations. Under the 7.5 maf/year delivery scenario and the same future hydrology assumption, the Upper Basin has more breathing room. To meet its obligations, it may still require demand management and/or curtailment, but on a much less frequent and smaller basis (this is one of the important messages from the "Alternative Management Paradigms" paper by Wheeler, et. al. 2021).³ Arguably, during consecutive wet years, like 2009-11, there could even be additional water for development.⁴ Thus, unlike past

² Upper Colorado River Commission, *Water Supplies of the Colorado River. Available for Use by the States of the Upper Division and for Use from the Mainstem by the States of Arizona, California, and Nevada in the Lower Basin*, Denver, Colorado. Tipton and Kalmbach. 1965. Tipton looked at the amount of water available to the Upper Basin under several different hydrologic periods, 1896-1964, 1922-1964, & 1931-1964. Removing the pluvial period significantly reduces the water available to the Upper Basin.

³ Wheeler, Kevin, Eric Kuhn, Lindsey Bruckerhoff, Brad Udall, Jian Wang, Lael Gilbert, Sara Goeking, Alan Kasprak, Bryce Mihalevich, Bethany Neilson, Homa Salehabadi and John C. Schmidt (2021). "Alternative Management Paradigms for the Future of the Colorado and Green Rivers." White Paper 6, Future of the Colorado River Project, Utah State University, 2021.

⁴ This statement is backed by the fact that in 2011, over five million acre-feet of extra or surplus water was delivered to the Lower Basin via the equalization provisions of the 2007 Interim Guidelines. Note: a portion of the Water Year 2011 equalization water was delivered in Water Year 2012 due to power plant limitations at Glen

Secretarial decisions like the promulgation of the 1970 long-range operating criteria which set a minimum objective release of 8.23 maf/year and the 2007 Interim Guidelines which provides for a range of annual releases with 8.23 maf/year as the fulcrum, the Upper Basin States may now believe that they must vigorously challenge the adoption of operating rules that continue to deliver .75 maf/year for Mexico from Glen Canyon Dam.

Two other factors will influence the decisions by the Upper Division States: the politics of equity between the two basins and climate science. Article III(a) apportions 7.5 maf/year of beneficial consumptive use to each basin, giving the impression that the compact negotiators intended that the use of the Colorado River's waters be evenly split between each basin (if the Lower Basin's additional one maf in III(b) is included, the split is still close to 50/50). A century after the compact was signed, however, the Lower Basin is using far more water than the Upper Basin. Based on the USBR's latest Consumptive Uses and Losses Reports,⁵ if reservoir evaporation is included, the Upper Basin is consuming about 4.3±.5 maf/year while the Lower Basin is most recently consuming about 8 maf/year on the mainstem and perhaps another 2 maf/year on its tributaries for a total of about 10 maf/year, over twice the Upper Basin's use. The climate science factor is more complicated. Within the four Upper Division States, the politics of using climate science to inform decision-making are very different. Those Upper Basin water officials that accept the conclusion that climate change driven aridification will continue to reduce mean natural flows at Lee Ferry⁶ should easily recognize that delaying the decision to resolve their Mexican Treaty obligation to a future when there will be less water in the river is a losing strategy.

From my perspective as a student of the Colorado River's development history, both the active and passive approaches have serious problems, but the passive option appears less risky. To show that there is surplus system water at a time of unprecedented dry hydrology and empty system reservoirs may seem like an impossibly heavy lift, but the Upper Division States may still have a case based on the 1922 Compact. The argument is that if uses on the Lower Basin tributaries are included, as they should be under Article II(a),⁷ Lower Basin consumptive uses now exceeds its total apportionment of 8.5 maf/year, perhaps by more than 1.5 maf/year. The Upper Division States can argue that water use exceeding the Lower Basin's compact apportionment is surplus, and therefore, should be delivered to Mexico before the Upper Basin has any obligation to deliver water. James Lochhead presented this argument in 2001⁸ as did Larry MacDonnell in 2013 and 2021. In his recent paper Professor MacDonnell states "uses

Canyon Dam. It's a reminder that even during extended dry periods, there will be wetter periods. From 2008-2011, the unregulated inflow to Lake Powell averaged about 40% more than the 2000-2021 average.

⁵ USDO, USBR, Colorado River Basin Consumptive Uses and Losses Reports. 2001-2005, 2006-2010, 2011-2015 (provisional), 2016-2019 (provisional), see [Plans & Reports | Upper Colorado Region | Bureau of Reclamation \(usbr.gov\)](#)

⁶ Brad Udall and Dr. Jonathan Overpeck, "How is Climate Change Impacting the Colorado River Flow." Colorado State University, *Colorado Water*, June 2021.

⁷ Article II(a) "The term "Colorado River System" means that portion of the Colorado River and its tributaries within the United States of America."

⁸ James S. Lochhead, An Upper Basin Perspective on California's Claims to Water from the Colorado River, Part I: The Law of the River," *University of Denver Water Law Review*, Volume 4/Issue 2/Spring 2001. Pages 320-21.

exceeding 8.5 maf/year may constitute a violation of the Law of the River under certain circumstances such as if their existence causes a failure to meet treaty obligations with Mexico.”⁹ Their arguments have support in the historical record from the compact reports by Colorado’s Delph Carpenter and Arizona’s compact legal advisor Richard Sloan as well as the compact analysis made by Arizona v. California Special Master Simon Rifkind.

In his March 20, 1923, Supplemental Report to the Colorado General Assembly, Carpenter writes “(the Compact) does not prevent the diversion and use of water in either basin in excess of the apportionment, but all such excess diversions will be made at the peril of the users” and “such excess uses will be by sufferance and without legal foundation.”¹⁰ Sloan writes “the legal effect of this apportionment is that the lower basin may not complain of the diversion and use of water in the upper basin for agricultures and domestic uses provided the annual limit of 7,500,000 acre-feet is not exceeded but may complain if that limitation is exceeded so as to prevent full use of its 8,500,000 acre-feet annually in the lower basin.”¹¹ By implication, the reverse is true. If the Lower Basin is using more than 8.5 maf/year so as to prevent the Upper Basin from using its full 7.5 maf/year, the Upper Basin has a valid compact complaint. In his December 1960 Special Master’s Report, Rifkind included a non-binding background section on the 1922 Compact. He concluded that Articles III(a) & (b) were not supplies of water, rather they were limits on appropriations that could affect the other basin.¹² A conclusion that I believe is consistent with the views of Carpenter, Slone, and other compact commissioners and advisors.

At least from the historical perspective of the 1922 Compact, the Upper Division States have a good argument. The compact negotiators intended that Lower Basin water use in excess of 8.5 maf/year should not impact the Upper Basin’s use of its apportionment. Now because of the combined effects of climate change and the 750,000 af/year delivery to Mexico, Lower Basin overuse is causing an impact on the Upper Basin. Whether or not the Upper Division States could successfully use arguments based on the history of the 1922 Compact or the need for development equity to reduce future releases from Glen Canyon Dam is a much more difficult and challenging question. There are many complex technical and legal issues and questions that would to be addressed. For example, just answering the basic question how much apportionment the Lower Basin is currently using, a critical question, is not simple or straight forward. A century after the signing of the compact, there is no basin-wide agreement on the fundamental question of how 1922 Compact apportionments are measured.

⁹ MacDonnell, Lawrence J., “Sources of Controversy in the Law of the Colorado River: An Upper Basin View” 6/25/2021 working paper post on SSRN, for a copy contact lmacdonnell206@gmail.com, the quote is from page 1. Also see “*Arizona v. California: Its Meaning and Significance for the Colorado River Basin and Beyond after Fifty Years.*” *Arizona Journal of Law and Environmental Policy* 4 (2013); 88-129.

¹⁰ Carpenter, Delph E., “Supplemental Report of Delph E. Carpenter, Commissioner for Colorado, Colorado River Commission, March 20, 1923, Denver, Colorado. Both Carpenter and Sloan’s reports (as well as the reports by the other commissioners) are included as appendixes to the Hoover Dam Documents, USDOI, Edited by Ryman Wilbur and Northcut Ely, November 1948. It can be found on the 2008 Colorado River Documents CD by USBR>

¹¹ Sloan, Richard E., “The Colorado River Compact: Statement by Richard E. Sloan, Legal Advisor to the Colorado River Commission for Arizona” *Arizona Mining Journal*, January 15, 1923.

¹² Report from Special Masters Simon H. Rifkind (1/15/61), *Arizona v. California* 373 U.S. (1963) Rifkind repeats his conclusion several times in his report, see pages 140 and 149.

In the 1940s as Arizona and California squared off over the authorization of the CAP, two competing theories were proposed. California pushed the “diversions less return flows” method. A basin’s apportionment would be measured as the sum of all individual diversions within a basin as measured by diversion less return flow. Arizona advocated for the “stream depletion theory” where a basin’s apportionment would be measured as the net impact of the basin’s man-made depletions on the natural (aka virgin) flow of the mainstream of the Colorado River at Lee Ferry for the Upper Basin and below the confluence of the Gila River for the Lower Basin. The reasons Arizona advocated for this definition are directly related to the Gila River. Because the Gila River system naturally loses about a million acre-feet per year as it flows through the desert from Phoenix to Yuma, Arizona reasoned that it could consume two maf/year of water (the natural flow of the Gila River system near Phoenix), but only be charged for one maf of apportionment. For a detailed discussion of this confusing topic, see Chapter 12 of *Science Be Dammed*.

For reasons that are hard to understand today, the Upper Division States actively supported Arizona’s stream depletion theory and formally adopted it in the 1948 Compact. Article VI states:¹³

“The Commission shall determine the quantity of the consumptive use of water, which use is apportioned by Article III hereof, for the Upper Basin and for each State of the Upper Basin by the inflow outflow method in terms of man-made depletions of the virgin flow at Lee Ferry, unless the Commission, by unanimous action, shall adopt a different method of determination.”

The decision was not easy. Colorado proposed and strongly pushed the commission to adopt the article as written. Engineering advisor Royce Tipton made the case that, like Arizona, the definition would allow the Upper Basin to take advantage of salvaged water and consume more than its 7.5 maf/year apportionment. As an example, he told the commission that because of salvage by use a 500,000 diversion out of the headwaters to the Colorado Front Range might only deplete the virgin flow of the river at Lee Ferry by 450,000 af. Wyoming initially opposed the definition. Its legal advisor, W. J. Wehrli, specifically warned the other states that this definition would reduce the available surplus and increase the amount of water the Upper Division States would ultimately have to deliver to Mexico under Article III(c).¹⁴ Ultimately

¹³ Colorado engineering advisor Royce Tipton, with the full support of Stone and Breitenstein, was the primary advocate of this position. He believed that like Arizona, the Upper Division States could benefit from not counting salvaged water against their compact apportionment. He estimated that the Upper Division States could collectively benefit by 400,000 – 600,000 af/year. His conclusion was controversial among the hydrology and engineering community. The situations on the Gila River below Phoenix and the lower portions of the Upper Colorado River are very different. Except for very wet years the Gila River below Phoenix is dry. There is no surface water to evaporate and irrigate riverbank vegetation. The lower portions of the Upper Colorado River and its main tributaries are never totally dry. When depleted by upstream uses, the river surface area will be slightly smaller, but the vegetation is still present. This issue is clouded by the fact that at the time Tipton was working for both Arizona and Colorado (not to mention the U.S. State Department). If it was a conflict, no one seemed to care. I was only half joking when I suggested to Chuck Collum that one of the major pumping plants on the CAP main canal should be named after Royce Tipton.

¹⁴ Upper Colorado River Compact Commission. *Official Record*, Volume II, Minutes of the 7th Meeting, page 43-63, Vernal, Utah, 1948.

Colorado prevailed. That same year, Colorado Commissioner and CWCB Director Clifford Stone testified to Congressional Committees that Colorado fully supported Arizona's position that the consumptive use in the Gila River drainage should be measured as the net impact to the virgin flow of the Colorado River below its confluence with the Gila.¹⁵ Water officials from Utah and New Mexico endorsed Stone's testimony.

Applying the 1948 Compact definition of consumptive use (the stream depletion theory) to determine the Lower Basin's consumptive use could have the effect of reducing its use to an amount close to or less than 8.5 maf/year. For example, let's assume the consumptive uses from Lake Mead contract deliveries are 6.9 maf/year, gross evaporation from Mead, Havasu, and Mojave is 900 kaf/year, and Lower Basin tributary use is 2.0 maf/year for a total of about 9.8 maf –all reasonable numbers based on the most recent data.¹⁶ Under the stream depletion theory, let's assume the 6.9 maf/year Hoover Dam use doesn't change. However, the 0.9 maf of gross reservoir evaporation and the 2 maf of tributary use will change. Using net evaporation, the difference between the surface evaporation from the reservoirs and the natural losses that would have occurred had the reservoirs not been built and how the USBR currently reports evaporation from Powell,¹⁷ the net evaporation is now 600 kaf/year. Because of the natural losses, the 2.0 maf/year of tributary uses upstream might only impact the mainstream by 1.0 maf/year. Thus, the new total is 8.5 maf/year. Under the diversions less return flows theory, there is surplus water – 1.3 maf. Under the stream depletion theory, there is none.

The above discussion is conceptual, making an accurate determination of the Lower Basin's consumptive use under the stream depletion theory with any confidence would be an extremely difficult, if not impossible, engineering task. The relationship between surface water flow and use and tributary groundwater use in the Gila River system is exceedingly complex. For these reasons and politics, the Gila River system is not included in either the USBR's natural flow data base or its CRSS model. In its original 1952 filing, one of Arizona's claims for relief was that the Supreme Court find its stream depletion theory to be the proper method apportionment accounting.¹⁸ The technical complexities associated with this definition may have been one of the (many) reasons that in 1957 Mark Wilmer amended Arizona's case dropping this and other compact related claims. It was a smart move, although in non-binding comments, in his report Rifkind essentially dismissed the stream depletion theory as nonsense.¹⁹

¹⁵ Colorado River Water Rights. Hearings..., Eightieth Congress, Second Session ...By United States. Congress. House. Committee on the Judiciary, pages 422-23. Stones testified before both Judiciary and Natural Resources Subcommittees.

¹⁶ 6.9 maf/year is the approximate average use for 2018-2021 (Colorado River Accounting and Use Reports). According to the 24-month studies, evaporation was 890 kaf in 2020 and 866 kaf in 2021. The 2.0 maf/year estimate for Lower Basin tributary use is based on the 2001 -2005 average of 2.18 maf/year from the 2001-2005 C. U. & L. Report (the last one that reported LB tributary use). AWDR uses 1.6 maf/year as the use on its "in states rivers."

¹⁷ Wang, Jian and Schmidt, John C., "Streamflow and Losses of the Colorado River in the southern Colorado Plateau," Center for Colorado River Studies, Utah State University, 2020. [WhitePaper5.pdf \(usu.edu\)](#)

¹⁸ Motion for Leave to File Bill of Complaint, *Arizona v. California*, Original 1952 Term, see claim #5, pages 30-31.

¹⁹ Rifkind, Special Masters Report, pages 147-149.

Even though the Upper Basin States may have reasonable equity and historical arguments that Glen Canyon Dam releases should not normally include 750 kaf/year for Mexico, because of the definition they adopted in the 1948 Compact, the technical complexities associated with determining the Lower basin's current consumptive use, and other reasons not explored by this paper such as the plain language of Article III(c)²⁰ and the language dealing with the Gila River in the 1928 Boulder Canyon Project Act,²¹ mounting an active challenge appears to be an overwhelming and risky task. Thus, a more passive approach may be more attractive, but also not without risk.

As previously mentioned, under the 1948 Compact, the five member UCRC (one commissioner from each Upper Division State and one representing the United States) makes the decision that a curtailment of Upper Basin uses is necessary to comply with the 1922 Compact. Arizona, California, and Nevada do not vote. If the commission decides that the Upper Basin has no Article III(c) obligation to Mexico, therefore it will not require a curtailment until the ten-year cumulative flow at Lee Ferry is not depleted below 75 maf as opposed to 82.5 maf, it would be up to the Lower Division States to challenge the UCRC action. As a practical matter, the burden of showing that the Upper Basin is not in compliance with the 1922 Compact would be on Arizona. California has no Lower Basin tributary use and compared with Arizona; Nevada's tributary uses are trivial. Under some scenarios, it's conceivable that California would be an ally of the Upper Division States. A complicating factor is that both Utah and New Mexico have Lower Basin tributary consumptive uses on the Virgin and Gila Rivers.²²

There are problems and risks with this approach as well. If the post-2026 reservoir operating guidelines are based on an implied or explicit assumption that the Upper Basin has a 750 kaf delivery obligation to Mexico and annual release tiers are so structured, but the Upper Division States take no action until Lee Ferry 10-year flows drop below 75 maf, the new guidelines could be dysfunctional. Under a continuation of the post-2000 hydrology, Lake Powell would experience extended periods where the storage levels are below minimum power and approaching dead pool levels. At which point hydraulic limitations of the outlet would control downstream flows potentially creating major impacts to the Grand Canyon ecosystem. Power

²⁰ See Footnote #1, there is clearly an argument that the plain language means that the surplus water that would be used for a treaty with Mexico is the amount of system water over and above 16 maf/year. The Upper Basin will try to argue that since its only now using about 4.5 maf ±, the current total of III(a) & (b) is about 13 maf. Since 1930, it is highly unlikely that there is 16 maf/year available, but there is a chance there is more than 13 maf/year if Lower Basin tributaries are included.

²¹ Arizona has argued in the past that the language in Section 4 (a)(3) of the Boulder Canyon Act giving Arizona exclusive use of the Gila River amounted to an amendment to the 1922 Compact removing the Gila from its jurisdiction. Rifkind was not impressed with this argument.

²² The Virgin River is a Lower Basin tributary. It provides water for the St. George and vicinity, a high growth area. Meeting the water needs of future growth are why Utah and the Washington County Water District are seeking to build the controversial Lake Powell Pipeline (which moves Upper Basin water into the Lower Basin). Currently the St. George area relies exclusively on the Virgin River, a Lower Basin water. If a future court were to rule that the Lower Basin is exceeding its compact apportionment and the basin had to reduce its total use, the St. George area might have to cut back on its current use.

generation at the dam would be sporadic and unreliable significantly reducing important power revenues.²³

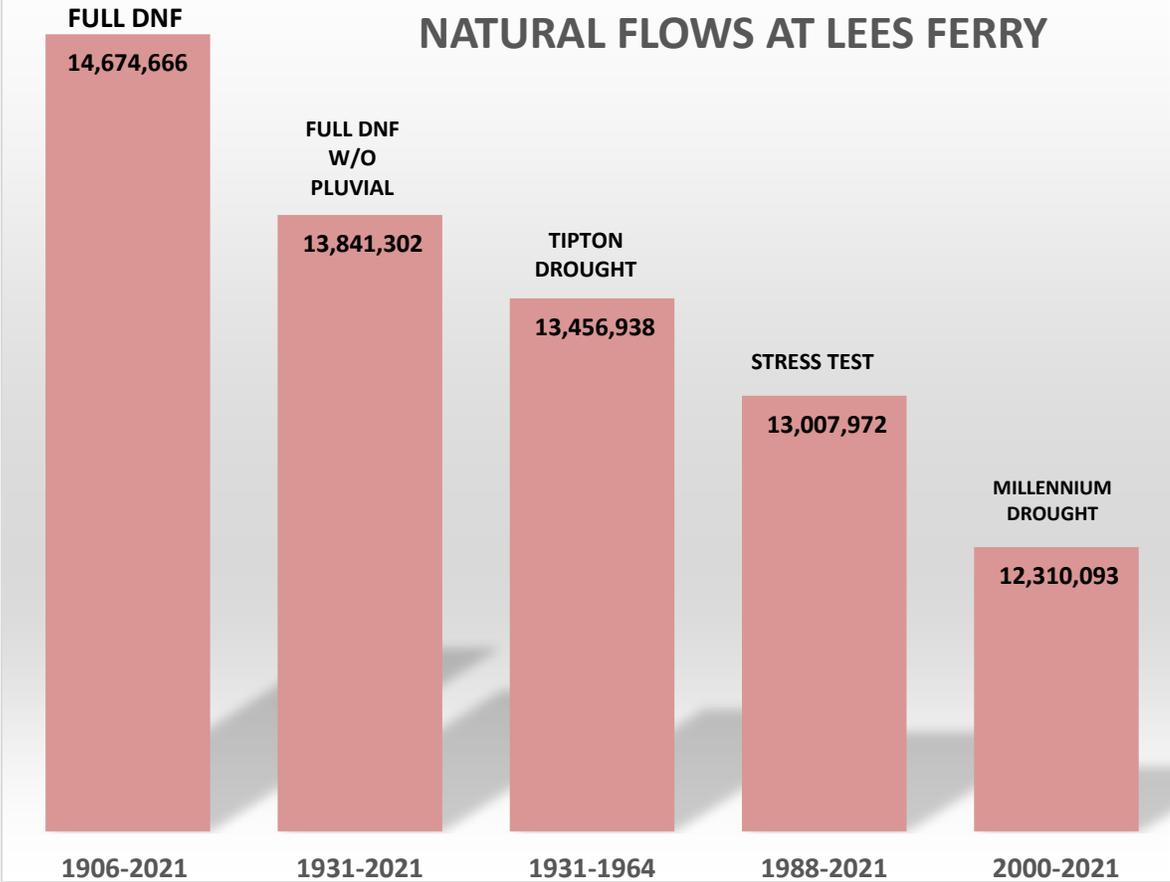
A second risk was recently raised by River District Manager Andy Mueller. Andy asked; “is the Upper Basin prepared to live with consequences if the Supreme Court ultimately decides the Upper Basin has an obligation to Mexico and requires it to make up any accrued deficit?” After ten or more years of litigation, the deficit could be large enough that all post-compact rights in the Upper Basin would have to be curtailed for several years. Is the Upper Basin prepared to live without the Colorado – Big Thompson Project, San Juan – Chama Project, Central Utah Project, Dillon Reservoir/Roberts Tunnel, Dolores Project, and many others? It is not just a problem for the larger post-compact municipal supply projects, many irrigators with pre-compact water rights rely on post-compact reservoirs like Green Mountain, Taylor Park, and Starvation to make it through the irrigation season. The answer is the Upper Basin is not prepared. Further, the economic and environmental impacts of an extended curtailment would be very significant.

The potential downsides to the passive approach are indeed very significant, but I still favor it for both political and scientific reasons. The Upper Division States need to ask a basic question; “does reducing our delivery obligation to Mexico solve our problem or only delay the day when aridification will again reduce our water supply?” The Upper Division States have a strong equity argument that the Upper Basin, alone, should not bear the risk of climate change. The Upper Basin’s treaty obligation to Mexico is not the only disputed compact or Law of the River issue.²⁴ There are other serious problems that need resolution as well such as providing the CAP with a more reliable water supply, the status of unperfected and unused tribal rights, and continuing degradation of the Grand Canyon and Colorado River Delta ecosystems. Rather than trying to address the river basin's problems caused by climate change on a piecemeal, issue by issue basis, is it now time to accept the reality the 1922 Compact and other major planks of the law of the river are based on many hydrologic, economic, and political assumptions that are no longer valid today? What the basin needs is an allocation system that recognizes the non-stationarity and deep uncertainty of the river nature, via climate change, has given us today, not the one we thought we had for the last 100 years and that many of the basin’s decision makers still wish they had today. Making fundamental changes to a Law of the River embedded with “fixed” apportionments and “fixed” delivery obligations will be technically challenging and politically difficult. Under normal circumstances, it would take patience, creativity, and considerable time. We should consider starting now, based the pace that climate change is impacting the river, we may not have the luxury of a lot of time.

²³ Glen Canyon Dams produces about 75% of total CRSP power revenues. These power revenues fund operations of CRSP projects, the CRSP office of WAPA, the repayment of Congressional appropriations, and critical environmental programs.

²⁴ MacDonnell, “Sources of Controversy in the Colorado River: An Upper Basin View”

COMPARISON OF DIFFERENT PERIODS OF RECORD NATURAL FLOWS AT LEES FERRY



NATURAL FLOWS AT LEES FERRY COMPARING DIFFERENT PERIODS

