



## Utah's Allocation of Colorado River Water Water Availability for the Lake Powell Pipeline

The following table depicts the simple arithmetic of the Colorado River as compiled and interpreted from scientific/factual sources: its natural flow and the elements impacting that flow, the amount available for human use and the subset available for use by the 7 Colorado River Compact states, the allocations between the states and specifically to Utah, and finally the availability of water for the Lake Powell Pipeline (LPP). The Law of the River - a compilation of agreements and decisions over the past 100 years - addresses the allocations in a much more convoluted manner, but there is no escape from the reality of nature. This data has been well known and refined over many years, with each refinement revealing that the Bureau of Reclamation and the Compact states should be much more conservative in their planning. Corrections with applicable citations are welcome. As shown in the bottom line, there is no water for the LPP without taking it from somewhere else – other states, non-state users (Mexico or Native American tribes) or other users in Utah (farmers and ranchers). There is no evident practical legal or political path for Utah to implement these reallocations, or justification for doing so. Our conclusion: the LPP is not practical or feasible.

The numbers are shown in units of million acre-feet yearly (MAFY) - an acre-foot being the amount of water that would cover an acre with 1 foot of water, or about 326,000 gallons. 1 MAFY is a water flow rate of 1-million acre-feet of water per year going down the river, primarily from snow melt in the headwaters of the Colorado River, in the mountains of Colorado, Utah and Wyoming. Footnotes explain terms, the sources of the data, and issues.

	<b>The Compact<sup>1</sup></b>	<b>The Reality<sup>2</sup></b>
<b>Natural River Flow<sup>3</sup></b>	<b>18-22 MAFY</b>	<b>13.5 MAFY</b>
Climate-Induced Flow <sup>4</sup>		-3.5
Reservoir Evaporation <sup>5</sup>		-1.0
Natural Environment <sup>6</sup>		-0.0
Mega-drought safety reserve <sup>7</sup>		-0.0
<b>Available for Human Use<sup>8</sup></b>	<b>18-22</b>	<b>9.0</b>
Senior Rights (Mexico, Tribes) <sup>8</sup>		-3.0
<b>Available to Compact States<sup>9</sup></b>	<b>15.0</b>	<b>6.0</b>
Lower Basin <sup>10</sup>	7.5	3.0
Upper Basin <sup>11</sup>		
Original <sup>11</sup>	7.5	
Agreed <sup>11</sup>	5.76	
Anticipated <sup>11</sup>		3.0
Utah Allocation <sup>12</sup>	1.32	0.69
Utah Current Use <sup>13</sup>	1.1	1.1
Utah Remaining Share <sup>14</sup>	0.22	-0.32
LPP <sup>15</sup>	0.085	0

## Footnotes

1. Represents the “Law of the River”, a set of agreements and legal settlements/decisions that has evolved since the original signing of the Colorado River Compact, and general understanding of the Compact States.
2. Represents the current science of past and projected future conditions and practical allocations. It’s clearly understood that this reality is unlikely to be directly addressed in near-term revisions to the Law of the River, but any agreements not based in this reality will surely fail, as Mother Nature will not care what the Compact States agree.
3. The original Compact Commissioners ignored scientific inputs at the time that suggested historical flows were well below 18 MAFY, closer to 14, and based decisions on an unrealistically high assumption of 18-22 MAFY. Scientific studies based on over 600 years of tree-ring data (“Colorado River Flow at Lees Ferry, CO”, Stockton and Jacoby, 1997, TreeFlow, <https://www.treflow.info/context/upper-colorado>; see Fig 5, Science Be Dammed, Kuhn and Fleck, 2019, pg. 185) indicate 13.5, with high standard deviation and frequent mega-droughts.
4. Climate change’s impact on river flows is uncertain, but studies indicate ~10% decrease per °C average temperature increase. This could result in a 19-31% decrease by 2050. See “Colorado River Flow Dwindles as Warming-Driven Loss of Reflective Snow Energizes Evaporation”, Mille and Dunne, Science, Feb 2020; Haste of Global Warming Trend Opposed, Philip Shabecoff, 1983, New York Times; Science Be Dammed, Kuhn and Fleck, 2019, pg. 189. Estimating a 25% decrease from historical flows seems conservative.
5. Includes evaporation from the reservoirs and the river itself. Estimates for losses in Lakes Mead and Powell are in the range of .5 - .7 MAFY.

<https://www.colorado.edu/today/2015/12/28/reservoir-evaporation-big-challenge-water-managers-west>

<https://bouldercityreview.com/news/researchers-study-true-scale-of-evaporation-at-lakes-mead-powell-51822/>

<https://www.cpr.org/2019/04/07/researchers-study-reservoir-evaporation-for-better-budgeting-of-colorado-river-water/>

[http://www.swhydro.arizona.edu/archive/V4\\_N2/feature4.pdf](http://www.swhydro.arizona.edu/archive/V4_N2/feature4.pdf)).

Many other smaller reservoirs could lose half that much cumulatively. As climate change drives evaporation up, smaller surface area due to declining volumes will drive evaporation down. An estimate of 1 MAFY seems conservative.

6. Humans have taken as much water from the ecosystem as they can, as evidenced by dry river delta at the Gulf of California. Restoring it could take as little as 0.1 MAFY (see “Where the Water Goes” by Owen, page 225), but there is no plan to do so.
7. There is no reserve for historically periodic mega-droughts lasting 20+ years. There should be some safety reserve built into the system, perhaps 0.5 MAFY, but there is not. The current 2000-2021+ shortage is typically characterized as the result of a megadrought, but in reality, only about 50% of the reduced flow can be attributed to drought. The remainder is characterized as and increasing and very long-term climate-change-induced aridification of the entire Southwest US.
8. Per the 1944 treaty, Mexico’s allocation is 1.5 MAFY. Per a 1963 agreement, Lower Basin tribal allocation is 0.9 MAFY. Upper Basin tribal allocations are in dispute but are 2-5 MAFY. Illogically, the Compact has left it up to the states to address tribal rights within each state. Utah has yet to adjudicate tribal rights. The assumption here is that these sets of rights could be negotiated to 3 MAFY, but that may be wildly optimistic, especially considering Utah’s unsettled rights (see note 11). Lots of unknowns  
<https://www.watereducation.org/aquapedia/mexico-and-colorado-river-water>,  
<https://waterkeeper.org/news/native-american-water-rights/>,

- <https://www.sltrib.com/news/environment/2021/06/13/lake-powell-pipeline/>). Tribes don't have the financing to build a pipeline like the LPP to access their water.
9. It was originally thought that splitting 15 MAFY between the 2 basins (7.5 each), leaving 3-7 for Mexico, the Tribes and other future uses, would be sustainable. That has been proven incorrect.
  10. The Lower Basin is allocated a fixed 75 MAFY/10yrs (7.5 MAFY/yr average). It clearly is not sustainable.
  11. Per the 1948 agreement (<https://public.csusm.edu/taylor134/ucbsnact.pdf>), the Upper Basin does not have a fixed share: it gets whatever is left over after the LB gets its fixed 7.5 MAFY allocation. The share can only be estimated based on hydraulic conditions. The estimate was reduced from 7.5 MAFY to 5.76 MAFY in a 2006 resolution by the Upper Basin Commission (<http://www.riversimulator.org/Resources/LawOfTheRiver/HooverDamDocs/Supplements/2006UCRCResolutionAvailabilityWaterNavajoReservoir.pdf>). The estimate has been rounded-up by Utah to 6 MAFY, and that number has been used in the past by Utah to determine what it assumed to be a safe depletion target. However, the "reality" shows that target is no longer realistic. Considering the new reality of the river's flow, the LB will not be able to get their 7.5 MAFY allocation and the UB would get none. This is not a practical situation. A 50:50 split is assumed here, but may be over-optimistic for the Upper Basin considering the Lower Basin uses more now, would have more impact under reductions, and has more political power. Utah's new Colorado River Authority will be challenged in protecting as much current use as possible, much less adding the LPP. The stated purpose of the Authority seems unrealistic (see the "Utah" paragraph in <https://www.hppr.org/post/colorado-river-showdown-looming-let-posturing-begin>). In a 2005 finding (<https://www.waterrights.utah.gov/meetinfo/m042005/summary.htm>), the Utah Division of Water Rights (DWRi) concluded (1) Utah tribal rights are >600,000 AFY, (2) Utah's rights are far overallocated, (3) anticipated uses of senior water rights could be large, and (4) no new major uses should be granted without resolving these issues.
  12. 23% of the Upper Basin's variable/not guaranteed flow, as agreed by the Upper Basin.
  13. As reported by the Utah DWRe.
  14. A simple subtraction, indicating Utah must reduce its current use by ~30%, not counting the LPP or planned uses by any other senior water rights.
  15. The LPP could legally transport water only if there is a large re-allocation within Utah of senior water rights. There is no concept, process or plan in place to do this, and it is apparently not anticipated.