

Risks of Depending on the Colorado River for the Lake Powell Pipeline

By Jane Whalen, revised January 2019

The State of Utah (Utah) wants to build the Lake Powell Pipeline to pump water 140 miles from Lake Powell, Arizona to St. George, Utah. Utah estimates it can still develop about 361,000 acre feet of its remaining share of 1.369 million acre feet a year (MAFY) of the Colorado River and a portion of this 86,249 acre feet is allocated for the Lake Powell Pipeline (LPP). But, there are risks depending on this remaining share because it may not be physically in the river system due to: increased use; reduced snow pack and stream flows from rising temperatures; over allocation; junior priority of LPP's water right; and unsettled Federal Reserve Water Rights claims of the Indian Tribes.

The laws that govern the Colorado River have allocated more water annually than the river produces even without considering the impact of a warming climate on reducing the future water supply. This is an economic risk that Utah has ignored and is not addressed in the Lake Powell Pipeline studies.

For instance, Utah is not adequately addressing the following issues in their studies:

1. Whether Utah has any remaining share of its 1.369 million acre foot a year (MAFY) to use for the Lake Powell Pipeline. It may already be using 1.369 MAFY due to its Upper Basin Water Rights are in disarray and significantly over allocated.
2. Whether Utah will have sufficient senior water rights to effectively operate the project as a permanent water project since this water right is a junior water right.
3. Whether the diversion of water from Lake Powell is in accordance with *the Law of the River*. According to the Colorado River Compact, Utah's Upper Basin water rights may not be used in the Lower Basin where the project is located.
4. Utah incorrectly claims it can divert water in dire conditions, and that it does not have a responsibility to address the risk of climate change on water availability for the Lake Powell Pipeline. We address these issues in detail below:

There are Various Compacts that Govern Management of Colorado River, they include:

1922 Colorado River Compact

The Colorado River Compact was created in 1922 and negotiated during a historically wet period at about 17 million acre feet a year (MAFY) at Lee Ferry, Arizona. Lee Ferry is the dividing line between the Upper and Lower Colorado River Basin States. It was decided 15 MAFY would be equally divided with 7.5 MAFY for the Upper Basin States of Utah, Colorado, New Mexico and Wyoming and 7.5 MAFY for the Lower Basin states of Nevada, Arizona and California. A few excerpts from the Compact:

i. In Article III (d) of the Compact requires: “The States of the Upper Division will not cause the flow of the river at Lee Ferry to be depleted below an aggregate of 75,000,000 acre-feet for any period of ten consecutive years reckoned in continuing progressive series ...”, which means 7.5 MAFY a year.

ii. In a shortage Article III (c) of the Compact states that Upper Basin must provide half of deficiency of water for Mexico. Utah is not planning for this in its remaining allocation.

iii. ARTICLE III (c) (*water for Mexico*)

“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 1922 Compact clearly separates the two basins and that 7.5 MAF is for Upper Basin and 7.5 MAF for the Lower Basin State’s use. It is not certain all states agreed to Utah using a Upper Basin water right in the Lower Basin where the project is located. A 2003 Resolution of the Upper Colorado River Commission does not resolve this issue, stating:

“Whereas, the states of Colorado, New Mexico, Utah and Wyoming all support the proposed Lake Powell Pipeline project, but the states are not in agreement as to whether, under the Law of River, Utah may use a part of its Upper Basin apportionment to serve uses in the Lower Basin portion of Utah, without obtaining the consent of the other states. However in the spirit of comity, and without prejudice to the position of any state regarding these unresolved issues, all the states support and to the extent necessary consent to the Lake Powell Pipeline Project in Utah.”¹

¹ Resolution of the Upper Colorado River Commission, 2003, See at: <http://www.riversimulator.org/Resources/LawOfTheRiver/HooverDamDocs/Supplements/2003aUCRCResolutionUseAccountingWaterLakePowellPipeline.pdf>

According to legal scholars Utah cannot use an Upper Basin water right in the Lower Basin as this Project does.²

For instance, where an allocation is measured is important for the Upper Basin and it is counted at Lee Ferry, AZ. However, the Lake Powell Pipeline will draw its water above Lee Ferry. The practical necessity of administering the various water rights, apportionments, etc. of the Colorado River has led to definitions of consumptive use or depletions generally in terms of “how it shall be measured.” The Upper Colorado River Basin Compact provides that the Upper Colorado Commission is to determine the apportionment made to each state by “...the inflow-outflow method in terms of manmade depletions of the virgin flow at Lee Ferry...”³ This water diversion for the Lake Powell Pipeline is diverted before it gets to Lee Ferry and is used in the Lower Basin and this conflicts with the Colorado River Compact. It may take federal legislation and Basin States agreement to allow this scenario.

There is also another issue that may complicate the matter, there is no agreement on water sharing of the Virgin River between the states of Nevada and Arizona. Utah tried to get an agreement from these states years ago but could not. These issues may come up when other states are asked to agree that the water can be moved from the Upper Basin to the Lower Basin.

Further, Utah shows on this chart from an article on page 8, Utah Perspectives Colorado River ⁴<https://water.utah.gov/InterstateStreams/PDF/TheColoradoRiverart.pdf> it has a share in the Lower Basin. However, I could not find that Utah has a share in the Lower Basin. The article doesn't include how Utah's Lower Basin share is accounted for? This amount of water doesn't show in Utah's Upper Basin share of 1,369,000 AFY.

² James S. Lochhead, An Upper Basin Perspective on the California's Claims to Water from the Colorado River Part 1: the Law of the River, pp.322-329, See at: <http://citizensfordixie.org/wp-content/uploads/2015/12/LochheadAn-Upper-Basin-Perspective.pdf>

³ The Upper Colorado River Basin Consumptive Uses and Losses Report 2011-2015, Terminology, page 4

⁴ Utah Perspectives Colorado River, page 8

⁴<https://water.utah.gov/InterstateStreams/PDF/TheColoradoRiverart.pdf>

Utah's Lower Colorado River Basin Projected Depletions

(Units in acre-feet per year)

	2000	2020	2050
Municipal/Industrial	13,000	22,000	39,000
Secondary (lawn and garden)	6,000	10,000	17,800
Agriculture/Stock	50,000	45,000	38,000
Exports (to New Castle area)	2,600	2,600	2,600
Reservoir Evaporation	5,300	10,600	11,700
Shivwits Paiute Indian Band	300	2,000	4,000
Total Depletion	77,200	92,200	113,100

Source: Utah Division of Water Resources

1928 Boulder Canyon Project Act

The Boulder Canyon Project Act of 1928 authorized construction of a dam in Boulder, or Black Canyon, construction of the All-American Canal to connect the Imperial and Coachella Valleys with the Colorado River, and divided the lower basin waters among the lower basin states. The court decided how the Lower Basin States divided 7.5 million acre feet a year (MAFY). Arizona 2.8 MAFY, Nevada 300,000 acre feet and California 4.4 MAFY which, are fixed allocations and draw their water supply from Lake Mead.

1948 Upper Basin Compact

Utah's Water Rights are only 23%

In 1948 the Upper Basin Compact was agreed to by the states of Utah, Colorado, Wyoming and New Mexico. The states realized a state's water right couldn't be a fixed amount like the Lower Basin. Consequently, each state divided the 7.5 MAFY Upper Basin share by a percentage depending on how much the state's watershed contributes to the Colorado River.

This 7.5 MAF was divided, 51.75% to Colorado, 23% to Utah, 14% to Wyoming and 11.25% to New Mexico. In times of shortage/drought, the Upper Basin River Commission will decide the reductions. Utah's 23% remaining share of the Colorado River is particularly vulnerable due to being such a small percentage of the flow. There are additional "upstream" aspect of the Law of the River that might affect the amount of water for the LPP, particularly in times of drought. These Upper Basin rights are more uncertain and variable because they are allocated only a percentage of what is left after obligations to the Lower Basin, and senior water rights are met.

1988 Hydrologic Determination (safe yield)

A 1988 hydrologic determination was made for the Navajo Reservoir in a Bureau of Reclamation contract in connection with Jicarella Apache Nation's water rights settlement. In this process the Department of Interior determined the Upper Basin States share of 7.5 MAFY should be reduced to 6 MAFY. Based on the BOR using its Colorado River Simulation Systems (CRSS) model for the period 1906-2000. They use natural runoff from Upper Basin averaged 15.3 MAF per year at Lee Ferry, AZ. This natural flow is calculated as if there were no diversions in the river system. This over estimates the annual flow that has been reduced to about 12.5 MAFY

The State of Utah portion is 23% of 6 MAFY, or 1.369 MAFY. Over time the 6 MAFY called safe yield will likely be lowered again because of predicted less snow pack feeding the river; or the Department of Interior adopting a lower annual flow for the river. Utah is currently using about 1.008 million acre feet a year (MAFY) of its allocation and estimates it has about 361,000 acre feet left to develop using 15 MAFY. But, if this yield is reduced Utah's remaining share of river will also be reduced. Utah's water right is not a fixed. There is no guarantee what Utah's allocation will be in the future.

According to various agreements, 8.25 million acre-feet per year (MAFY), on average, must pass the "Compact Point" (the gage one mile downstream of Lee Ferry) every year for use by the Lower Basin States of Nevada, Arizona, and California. This includes 7.5 MAFY for Lower Basin States ⁵and 750,000 acre feet for Mexico.

2007 Hydrological Determination Upper Basin Water Availability from Navajo Reservoir, New Mexico

In April 2005 there was a Navajo water rights settlement for 20,800 acre feet from the Navajo Reservoir. But, this 2007 hydrologic determination stated the flow the Upper Basin states could reasonably plan on is lower at 5.76 million acre feet a year, not 6 MAFY. This determination was made as to the availability of water under a long-term BOR service contract.

Therefore, if you use 5.76 MAFY (minus water for Arizona 50,000 AF) times 23%, equals MAFY 1,313,300 AF, not 1,369,000 AF that Utah is using now. This would not leave enough for the LPP and all the other senior water rights, or unsettled Federal Reserved Water Rights for Indian tribes and other Federal reservations.

⁵ The 1922 Compact Article III (d) states: "The States of the Upper Division will not cause the flow of the river at Lee Ferry to be depleted below an aggregate of 75,000,000 acre-feet for any period of ten consecutive years reckoned in continuing progressive series ..."

For example:

6 million acre feet minus- 50,000 AF for AZ equals 5,950,000 acre feet.
23% of 5,950,000 AF= 1,368,000 AF; (Utah is now using this figure)

Utah's Allocation using 6 MAFY

1.369 MAFY using 23% of 6 MAFY

1.008 MAFY used

361,000 AF remaining in Utah's allocation using 15 MAFY

But, if you use less water 5.76 MAF or 5,760,000 AF, minus- 50,000 AF for AZ = 5,710,000 AF, divided by 23%, equals 1,313,300 AF (Less water Utah can use).

It has been eleven years since the last Colorado River Basin 2007 Hydrological Determination on water yield for the Upper Basin was completed. A new determination should be completed before BOR gives a long term service contract to Utah for the Lake Powell Pipeline.

Moreover, due to higher temperatures between 2000 and 2014 the annual Colorado River flows averaged 19% below historic average 1906-1999, the worst 15 year drought on record⁶

For example, to illustrate there would be less water, subtract (19% or 1,140,000 MAF) from 6 MAF minus- 50,000 AF for Arizona equals 1,090,000. Then subtract 1,090,000 from 6 MAF, equals 4,860,000 AF to divide in the Upper Basin. Leaves Utah with 23% of that, or 1,117,800 AF, not 1,369,000 AF.

6,000,000 AF
-50,000 AF State of Arizona
5,950,000 AF
-19 %
1,090,000 AF

5,950,000 AF
-1,090,000 AF 19%
4,860,000 AF to divide between the Upper Basin States

23% of 4,860,000 AF is =1,117,800 AF, not 1,369,000 AF

⁶ *The Twenty-First Century Colorado River hot drought and implications for the future*. See at http://conserveswu.org/wp-content/uploads/Udall_et_al-2017-Water_Resources_Research.pdf.

Thus, this scenario of less water 1,117,800 AF, would leave just 109,800 AF that remains of Utah's allocation, not 361,000 AF and this doesn't leave enough water for LPP, the tribes, or other Federal Reserved Water rights holders, or other senior water rights holders.

December 2007, Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations of Lake Powell and Lake Mead

The Secretary of the Department of the Interior (Secretary), acting through the Bureau of Reclamation, adopted specific interim guidelines for the Colorado River, particularly under drought and low reservoir conditions. The eight-year period from 2000 through 2007 was the driest eight-year period in the 100-year historical record of the Colorado River.⁷ This drought/climate change has reduced Colorado River storage systems. It creates a higher probability of shortage due to depleted storage conditions in these reservoirs. In 2018 the inflow into Lake Powell is projected to be only 3 million acre feet and not the assumed 7 million acre feet. These guidelines do not take into consideration climate change and will expire in 2026. Discussions between the states about new guidelines have already begun.

The Interim Guidelines describe that water in Lake Powell and Lake Mead will be managed jointly and water will be sent to Lake Mead to prevent shortage. The goal is to balance storage in Lake Powell and Lake Mead. Actions will be taken according to the elevations for Powell and Mead set in the Interim Guidelines. The releases from Lake Powell continue to exceed inflows into Lake Powell reducing storage. This agreement called for the Lower Basin States to implement staged reductions in their withdrawals if Lake Mead falls below the series of defined tipping points.

John Fleck mentions in his book what Michael Conner BOR told him about reductions. Excerpts from his book:

“As Lake Mead drops, rules kick in that require water users in Nevada, Arizona, and Mexico to remove less water from the system each year. But those reductions are modest, and Connor told me that the Bureau’s worst-case modeling showed that even with the agreed-upon reductions, Lake Mead could quickly drop past a point of no return, to levels at which the current rules would be no help in determining who was entitled to how much.”

“The solution is, in a sense, straightforward. Everyone in the Colorado River Basin has to use less water. It’s possible to apply a simple arithmetic wave of the arm and say, for example, that we could bring the system into balance if everyone used 20 percent less water than they are consuming today. We know from experience, from Yuma to Las Vegas to Albuquerque, that such reductions are possible, that water-using communities are capable of surviving and even thriving with substantially less water than they use

⁷ <https://www.usbr.gov/lc/region/programs/strategies/RecordofDecision.pdf> BOR Interim Guidelines

today. But no one will voluntarily take such a step without changes in the rules governing basin water use as a whole to ensure that everyone else shares the reductions as well—that any pain is truly shared. We need new rules. Absent that, we simply end up with a tragedy of the commons.”⁸

Eric Millis, Director of Utah Division of Water Resources (DWRe) is concerned about a provision in the Interim Guidelines that requires Lake Powell to be lowered by 20 feet. It is triggered by low elevations of Lake Mead. He recommends this provision be deleted in the future guidelines. This provision reads:

“In Water Years when Lake Powell elevation is projected on January 1 to be at or above the elevation stated in the Lake Powell Equalization Elevation Table, an amount of water will be released from Lake Powell to Lake Mead at a rate greater than 8.23 maf per Water Year to the extent necessary to avoid spills, or equalize storage in the two reservoirs, or otherwise to release 8.23 maf from Lake Powell. The Secretary shall release at least 8.23 maf per Water Year and shall release additional water to the extent that the additional releases will not cause Lake Powell content to be below the elevation stated in the Lake Powell Equalization Elevation Table or cause Lake Mead content to exceed that of Lake Powell; provided, however, if Lake Powell reaches the elevation stated in the Lake Powell Equalization Elevation Table for that Water Year and the September 30 projected Lake Mead elevation is below elevation 1,105 feet, the Secretary shall release additional water from Lake Powell to Lake Mead until the first of the following conditions is projected to occur on September 30: (i) the reservoirs fully equalize; (ii) Lake Mead reaches elevation 1,105 feet; or (iii) Lake Powell reaches 20 feet below the elevation in the Lake Powell Equalization Elevation Table for that year.”⁹

The Lower Basin Structural Deficit

An imbalance in Lake Mead between inflows and outflows is known as the Lower Basin’s *structural deficit*. Eric Millis, director DWRe gave a presentation at the Utah Water Users Workshop in March 2018 on the structural deficit in existing Compact agreements. The problem is there is more water going out of Lake Mead than the amount of water going into Lake Mead.

According to Mr. Millis given basic apportionments in the Lower Basin 7.5 MAFY, the allotment to Mexico 750,000 AF, with normal 8.23 MAFY release from Lake Powell, Lake Mead storage declines about 12 feet each year.

Here are excerpts from his power point presentation.¹⁰

⁸ John Fleck, Water is for Fighting Over: and Other Myths about Water in the West

⁹ see at <https://www.usbr.gov/lc/region/programs/strategies/RecordofDecision.pdf> Page 51

Water Budget at Lake Mead

- Inflow (release from Powell) = 9 MAF
- Outflow, AZ, CA, NV and Mexico = - 9.6 MAF
- Mead evaporation losses = -.06 MAF
- Balance = - 1.2 MAF (annual deficit)

Impacts of the Lower Basin Compact's Structural Deficit

- Results in a decline of 12+ feet in Lake Mead every year when releases from Powell are “normal” (8.23 MAF)
- Results in a decline of 4 feet in Lake Mead every year when releases from Powell are “balancing” (9.0 MAF)
- Drives Lower Basin to take shortages
- May bring Lake Powell down with it if more water is required to be released under the 2007 Guidelines
- This list does not include the 1.5 MAFY needed for the Central Arizona Project (CAP)

Udall's 2017 article further describes how the Central Arizona Project adds to the structural deficit. It also explains how the Central Arizona Project depends on equalization flows from Lake Powell because there was not enough remaining unallocated Lower Basin water. The CAP is delivering about 1.5 MAFY.

An excerpt from this article:

“In the Lower Basin, Arizona could theoretically lose its water allocation for the entire Central Arizona Project canal, a critical \$4.4B, 530 km cross-state 2 bcm/yr water source for 4.7 m people, multiple sovereign Indian nations, and over 120,000 irrigated hectares [Glennon, 1995; Colorado River Basin Stakeholders, 2015]. This canal currently relies on occasional but uncertain “equalization” releases from Lake Powell that only occur with irregular and rare large Powell inflows. The extra water is delivered when Lake Powell reaches levels substantially higher than Lake Mead, a use allowed under the 1922 Colorado River Compact section III (e) and formalized most recently under rules established in a 2007 Record of Decision for coordinated operations of Lakes Powell and Mead and for shortage sharing in the Lower Basin [Department of Interior, 2007]. Under normal operating rules, without these extra inflows, Lake Mead has excess outflows of 1.5 bcm per year, the so-called Lower Basin “structural deficit” [Collum and McCann, 2014]. The structural deficit was created in 1968 when Congress authorized the Central Arizona Project (CAP).....Arizona agreed to rely on this unused, but in the long run unreliable water, because there was not enough remaining unallocated Lower Basin water. The CAP had long been a desire of Arizona and the state was willing to make this bargain despite its flaws [Johnson, 1977]. This same water is first available for use by the Upper Basin under the Colorado River Compact, but

¹⁰ <http://conserveswu.org/wp-content/uploads/Eric-Millis-pp-2018.pdf> Utah Water Users Workshop, March 2018

heretofore has not been developed for Upper Basin use. A plan to augment the Colorado River with flows from outside the basin, discussed during the hearings on the legislation, but not included in the final package due to opposition from potential source areas, was never revisited by Congress. Reclamation in 2011 said that such augmentation was now unlikely. The structural deficit only became a problem when the CAP was fully completed in the mid-1990s combined with the drought that began in 2000. Upper Basin demand growth has also played a small role, although Upper Basin demands are still much less than forecast in 1968 for the year 2000 [Tipton and Kalmbach, Inc., 1965; Johnson, 1977]. The recent Lake Mead declines are strongly influenced by this imbalance, and solutions to this deficit have been a recent focus of the Basin states and federal government [Central Arizona Project, 2016; Davis, 2016].”¹¹

Over Allocation of Utah’s Water Rights

It is well documented there is more water allocated in the Colorado River than the river produces annually even without considering climate change impacts on diminishing future flows. According to the Bureau of Reclamation (BOR) water demand for Colorado River water has already outstripped supply since 2002 (see Figure 3 below). The Bureau of Reclamation indicated in a study the “apportioned water in accordance with the *Law of River* exceeds the approximate 100 year average “natural flow” of river of 15 million acre feet year (MAFY) at Lee Ferry and is 16.4 MAFY.”¹² (The “natural flow” is estimated in modeling as what the unregulated, undiverted streamflow would have been absent human intervention.) “The Basin faces a wide range of plausible future long-term imbalance between supply and demand. This imbalance computed as a 10-year running average, ranges from no imbalance to 6 million acre feet (MAF) with a median of 3.2 MAF in 2060.”¹³ Compounding the problem is river flows at Lee Ferry during last 15 years have only been 12.5 -13 (MAFY). Yet, these diminishing flows are not used in forecasting water availability for the LPP, by Utah, the Upper Basin River Commission, or BOR.

Bradley Udall and Jonathan Overpeak’s 2017 research article explains the risks of lower flows for the Upper Basin States.¹⁴

Some excerpts from this article:

“ 2000 and 2014 annual Colorado River flows averaged 19% below 1906-1999

¹¹ see at: http://conserveswu.org/wp-content/uploads/Udall_et_al-2017-Water_Resources_Research.pdf.

¹² Colorado River Basin Stakeholders *Moving Forward* to address Challenges identified in the Colorado River Basin Water Supply and Demand Study, Phase 1 Report: Executive Summary, Bureau of Reclamation, May 2015.

¹³ Colorado River Basin Stakeholders *Moving Forward* to address Challenges identified in the Colorado River Basin Water Supply and Demand Study, Phase 1 Report: Executive Summary, Bureau of Reclamation, May 2015, page 3.

¹⁴ *The Twenty-First Century Colorado River hot drought and implications for the future*. See at http://conserveswu.org/wp-content/uploads/Udall_et_al-2017-Water_Resources_Research.pdf., pages 2404, 2407

average, the worst 15 year drought on record. One third or more of the decline was likely due to warming.”

“The Upper Basin also has serious issues, one of which ripples into the Lower Basin. Under such low reservoir conditions, there is also a high likelihood that the Upper Basin states would have to curtail existing water deliveries to cities such as Denver, Colorado Springs, Albuquerque and Salt Lake City in order to make required deliveries to Lake Mead. Heretofore, largely because of the structure of the Colorado River Compact, the Upper Basin and Lower Basin have been managed separately. With permanent flow declines of approximately 20%, however, the required deliveries to Lake Mead would become a hardship on the Upper Basin, as well as create Lower Basin delivery shortages [Reclamation, 2007; Barnett and Pierce, 2009; Rajagopalan et al., 2009]. The original compact, signed during one of the wettest periods in the last 450 years [Woodhouse et al., 2006], did not envision how large scale flow declines would be managed between the basins, and such declines could cause an allocation crisis between the Upper and Lower Basins [Adler, 2008].”

Utah has over promised communities in the Colorado River Upper Basin across the state water that is no longer in the system.

In a 2014 Deseret News article Utah’s water managers explain the over allocation of water.

Excerpts from this article: ¹⁵

The Water Question: The staggering problem of determining water rights.

"Your paper water right may look very big and supply everything you are asking, but the wet water, in reality, can be very different," Kent Jones, the state engineer over water rights, said:

The Colorado River, for example, holds 1.4 million acre-feet of water for Utah to put to use. There are applications approved for more than 2 million acre-feet, and about one half of that is currently in use. Jones said the imbalance has yet to be a problem because the water has not been developed — but the struggle will come with time, and those holding "junior" rights will go wanting.

Many of the files are outdated, which means there could be a big difference between what is in the file — paper water — and the actual water that exists or is available — wet water.

¹⁵ See at: <http://www.deseretnews.com/article/865617715/The-water-question-The-staggering-problem-of-determining-water-rights.html>; 2014 by Amy Joi O’Donoghue

“We are growing so much as a state and there is so much demand for water, it is critical we know where these existing uses are and protect them,” said Mike Styler, executive director of the Utah Department of Natural Resources. “And there is really no new water to be had.”

Why should Utahns care? Because the nature of water rights is that there are far more rights than the water that actually exists, so the task is to determine what is real and what is not.

Of the 15 major watershed areas in Utah, just two of them have been researched and adjudicated, which means that the investigation and documentation work was carried out and a judge then issued a decree. ”

Are Utah’s remaining rights of 361,000 acre feet still there?

If you use lower flows than 15 MAFY, it is not.

This chart is from Division Water Resources (DWRe) shows proposed uses for Utah’s remaining share of the river.

Figure 1. (DWRe chart)

Utah’s planned new users Colorado River	Utah’s Total Allocation 1.369 MAFY 1.008 MAFY used
<i>Ute Tribe Reserved Water</i>	105,000 acre feet
<i>Navajo Nation Reserved Water</i>	81,000 acre feet
Lake Powell Pipeline	86,000 acre feet
New Ag uses	40,000 acre feet
New M & I Uses	29,000 acre feet
Total new planned uses	361,000 acre feet

As Figure 1 illustrates Utah assumes it has 361,000 acre feet of water from Colorado River Compact water left to develop. However, if lower flows of below 15 million acre feet a year (MAFY) are used in the analysis Utah’s compact rights are reduced and that eliminates the availability of water for the Lake Powell Pipeline.

An example of over allocation of Utah’s remaining Colorado River share of 361,000 acre feet is illustrated in this DWRe 2005 chart below:

Potential Depletion
Approved Applications (Undeveloped)¹⁶

Applicant	Quantity (AF)
San Juan County WCD	30,000
Central Utah WCD	29,500
Board of W R (et al)	158,000 Flaming Gorge
Wayne County WCD	50,000
Kane County WCD	30,000
Sanpete WCD	5,600
Uintah County WCD	5,000
Others	80,000
Ute Tribe	<u>105,000</u>
TOTAL	493,100 (which is above 361,000 AF)

We could not find how Utah will account for water use on the Virgin River 100,000 AF. In our research it is not included in Colorado River Upper Basin water rights. Utah may have to delete another 100,000 AF for the Virgin River from Utah’s remaining share of river.

While Utah may not be using its remaining share of the Colorado River on paper there is not enough water supply left to develop if you use lower flows. In addition, the waters of Utah’s Upper Basin Colorado River are significantly over appropriated. This situation needs to be resolved before Utah allocates more water for the Lake Powell Pipeline.

Is Utah already using its 1.369 MAFY Allocation?

Utah’s has 1.369 Million Acre Feet Year (MAFY) of depletions from the Colorado River Compact to use and the balance of water has to go downstream to the Lower Basin States. We have heard a lot of talk about that Utah has to hurry and use all its Colorado River rights before other Lower Basin get the water. But, Utah may already be using its share and is over-allocating its remaining share. There should be a validation process to straighten out the Upper Basin Water Rights that are currently in disarray.

The State’s web site of the Upper Basin Water Rights has 2.5 million acre feet of approved depletions. But, Utah is only supposed to deplete 1.4 million acre feet.

¹⁶ Upper Colorado River Basin Current Water Rights Issues Division of Water Rights
April 2005 see at https://www.waterrights.utah.gov/meetinfo/m042005/jdo_2005.ppt

Click here web page: see

<https://www.waterrights.utah.gov/distinfo/colorado/WRPriorityDDview.asp> " with new totals at the bottom of page:

- 6,450,413 acre feet diversion; and
- 2,542,092 acre feet depletions

“Water rights can be quantified through both diversion and depletion volumes of water, in acre feet per year (AFY). A water right is permitted to ‘divert’ a specific amount of water, a portion of which will be returned to the river depending on its use (i.e. through agricultural return flows or municipal wastewater treatment plants). The portion of the right that is consumptively used (largely through plant evapotranspiration) is considered ‘depleted’ from the basin. When water rights are changed from one use to another, only the depletion portion of the right can be transferred.”¹⁷

Consequently there are significantly more approved water right applications, which if developed could potentially exceed Utah’s entitlement.¹⁸

Further, Utah passed a law that allows water agencies 50 years to prove up on their water rights. (Utah Code (73-3-12) 2008) This was supposed to create some security that they would get water in the future. But this is false promise due to Utah over allocating its share of Upper Colorado River Basin. As water supplies decline it is unclear who will be able to use the for the long term..

Staff from the state’s water agencies said you cannot use water rights listed on this web page to determine depletions because they are not accurate. Some of these water rights were never developed. They said the staff of the River Basin Planning Section Manager Utah Division of Water Resources would have a more accurate list of depletions. The depletions have to be reported to BOR. A depletion is defined as the part of water that will not return to the river system. It is evaporated, transpired, incorporated into products or crops, and consumed by humans or livestock.

Staff gave us a depletion list by river reach see at: http://conserveswu.org/wp-content/uploads/Upper-Basin-DEPLETIONS-2014_Colorado_River_Compact.xls.pdf. We asked for a more specific list on what data was used for this chart. Then, we can cross check with the

¹⁷ Native American Tribal Water Rights in the Colorado River Basin Jesse Jankowski Ecogeomorphology Final Paper May 4, 2018 , p.5
https://watershed.ucdavis.edu/education/classes/files/content/page/Ecogeomorphology.PaperFinal.JesseJankowski_0.pdf

¹⁸ Water Right Issues in the Upper Colorado River Basin of Utah
<https://www.waterrights.utah.gov/meetinfo/m042005/summary.htm>

cities' water rights approved applications. It will take some more research to verify that Utah didn't already over allocate its remaining share of the river.

Before the state keeps giving large amounts of money to the Lake Powell Pipeline there should be a determination as to whether, or not water will physically be available for the Lake Powell Pipeline over the long term. We recommend the Governor provide funding to Division of Water Rights to resolve the over allocation of the Colorado River Upper Basin Water Rights so that depletions are recorded accurately. The Governor could ask the Bureau of Reclamation to do a new Hydrological Determination using 12.5 MAFY annual natural flow at Lee Ferry to determine the long term supply for the LPP and safe yield the state can plan on for this project.

Federal Reserved Water Rights

Before Utah allocates a portion of its remaining allocation of the Colorado River to the Lake Powell Pipeline Project it should first settle all of its Federal Reserved Water Rights claims that have priority over the LPP's 1958 junior water right.

When the United States reserved public land for uses such as Indian reservations, military reservations, National Parks, National Forest lands, or Monuments and other public land reservations, it also implicitly reserved sufficient water to satisfy the primary purposes for which the reservation was created. Reservations made by presidential executive order or those made by an act of Congress have implied Federal Reserved Water Rights. The date of priority of a Federal Reserved Water Right is the date the reservation was established. The United States Supreme Court has determined that the measure of a Federal Reserved Water Right is not dependent on beneficial uses to which the water has been historically applied, but should be quantified based on the water needed to accomplish the primary purpose for which the reservation was established.

While some Federal Reserved Water Rights in Utah have been settled many have not.¹⁹ This situation creates the potential for unknown and unquantified Federal Reserve Water Rights to disrupt long established appropriative state water rights if or when the reservation uses are developed even though the rights may have been un-quantified, undeveloped, and unrecorded under state water rights laws for decades. Utah has completed some Federal Reserved Water Rights settlement agreements. But, Bryce Canyon National Park, Capital Reef National Park, Canyonlands National Park and Dinosaur National Monument have pending Federal water rights claims in Utah that are not included in the accounting of Utah's remaining water rights. It is uncertain the amount of National Forest Lands, Bureau of Land Management lands that have Federal Water Rights. All of these unsettled Federal Reserve Water Rights need to be added to Utah's remaining Compact allocation.

Adjudication

¹⁹ Reserved water rights power point, Boyd Clayton DWRe, September 26, 2016. See at: https://westernstateengineers.files.wordpress.com/2016/12/clayton_2016fall.pdf

Blake Bingham Utah Division of Water Rights gave a [presentation](#)²⁰ at the Utah Users Workshop in March 2018 on Utah's Adjudication process to verify water rights and Federal Reserved Water Rights.

The Adjudication process validates water rights in a court proceeding. It is a long, tedious process of verifying water rights and making a formal determination about the volume of water available and whether it is being put to "beneficial" use. Time and resources are necessary to involve all claimants and collect sufficient data to complete the adjudication process. With growing demands for water, it is imperative the adjudication process be expedited to determine current use and what water might yet be available. As the value of water continues to increase, water right files need to be up to date and accurate through use of the adjudication process. Current funding for State Water Engineer's office is insufficient to complete the adjudication process in a timely manner. However, a water official mentioned at this pace it could take a 150 years to complete the process. New steps are now being taken to shorten this process. But, the Adjudication process does not take into account diminishing flows in the future due to a warming climate. This will impact wildlife, fish and recreation as there will be less water supply to divide among water rights users. In Utah, the rivers, streams and aquifers are mostly over allocated. As water supplies diminish legal disputes will become more frequent. The McCarran Amendment 43 U.S.C. § 666 (1952) allows Federal Reserved water rights cases to be held in state court not federal court if there was an adjudication process. It is important to get the adjudication process moving faster than it is.

Tribal Water Rights

The U.S. Supreme Court first recognized tribal reserved water rights in a 1908 decision, *Winters vs. United States*, some 14 years prior to the 1922 Compact. In 1963, the Supreme Court ruled that water consumed under tribal rights be counted as part of the allocation made to the state in which the reservation is located.

In 2014, Dan Cordalis, a tribal water rights expert with the nonprofit environmental law firm Earthjustice in Denver, wrote:

“In addition to the existing over-allocation of the river, another “new,” major demand is likely to come from Indian tribes, some of which have established the right to divert significant quantities of water but have not yet developed the infrastructure to do so, and others whose water rights are promised but have yet to be formally quantified. The latter is the case for 12 of the 28 tribes that reside in the Colorado River Basin.”

“What we do know is that the 16 tribes in the basin that have quantified their rights have established the right to divert nearly 2.9 million acre-feet of water annually from the

²⁰ see at: http://conserveswu.org/wp-content/uploads/BlakeBingham_wuwAdjudicationUpdate-pp-2018.pdf

Colorado River system. It appears, therefore, the remaining tribal claims leave a significant ‘cloud’ over the certainty of existing non-Indian water rights and uses.” It is important to note that these reserved water rights don’t require that the tribes had an actual need at the time of the reservation’s establishment, but are instead based upon future uses of the reserved water. A U.S. Bureau of Reclamation study now underway in cooperation with the Ten Tribes Partnership, a coalition of tribes with Colorado River water rights, is working to determine how much water may be associated with those rights.”²¹ The Ten Tribes Report has been completed. ²²

The Indian Tribes were not at the table in the 1922 Colorado River Compact, nor in any later compacts and the compacts didn’t change or reduce any of their rights. The states have to settle water rights claims with the tribes who have reservations in Utah because Indian rights have to come out of the Utah’s remaining 361,000 acre feet Colorado River water right. As river flows decline this could become problematic for the Lake Powell Pipeline water right because tribal rights have priority over the Lake Powell Pipeline’s junior water right of 1958.

The Utah Navajo Water Rights Settlement Act was introduced in Congress by Senator Hatch in 2017 see at: (<https://www.congress.gov/bill/115th-congress/senate-bill/664>). The agreement is for 81,500 acre of feet of water annually from the San Juan River; \$200 million from U.S. Congress; and \$8 million from Utah. Also, the Bureau of Reclamation shall: (1) plan, design, and construct the water diversion, delivery, and conservation features of the Navajo water development projects. This agreement must be approved by Congress before it can be implemented. As yet, the bill has not been approved by Congress.

The Northern Ute Tribe of the Uintah and Ouray Indian Reservation in Duchesne, Uintah and Grand Counties have Federal Reserved Water Right claims in Utah. Negotiations culminated in a settlement agreement approved by Congress in 1992. But it was never ratified by the tribe. Also, the proposed Ute Indian Water Compact of September 22, 2009 was never ratified either by the tribe.²³ This agreement quantified water rights for the tribe limited to 470,594 acre-feet diversion rights and 258,943 acre-feet of depletion from the Upper Colorado River System of the Uinta and Lake Front Rivers and Duchesne River in Utah. Negotiation with Utah is for 105,000 acre foot of depletion out of Utah’s remaining share of its Compact water rights. The priority date for the Ute Tribal Water Rights when transferred to the Green River was October 3, 1861.

“The Ute Tribe is suing the U. S. Government Bureau of Indian Affairs. The Tribe’s claims against the United States focus, in large part, on the Uintah Indian Irrigation Project

²¹ Managing the Colorado River in the 21st Century: Shared Risks and Collaborative Solutions, see at: <https://www.cobank.com/~media/Files/Searchable%20PDF%20Files/Knowledge%20Exchange/2016/Colorado%20River%20Report%20%20Mar%202016.pdf>

²² [Ten tribes Colorado River water report](https://www.usbr.gov/lc/region/programs/crbstudy/tws/docs/CRB%20TTP%20TWS%20Front%20Matter%2012-13-2018.pdf)
<https://www.usbr.gov/lc/region/programs/crbstudy/tws/docs/CRB%20TTP%20TWS%20Front%20Matter%2012-13-2018.pdf>

²³ Compacts and agreements, See at: <https://www.waterrights.utah.gov/wrinfo/policy/compacts.asp>

(“UIIP”), an Congressionally-authorized Indian irrigation project designed to irrigate nearly 88,000 acres of Reservation land. The UIIP is a trust asset owned and operated by the United States for the benefit of the Tribe. Today, the UIIP is only delivering irrigation water to about 61,000 acres. The Tribe alleges that this disparity is the result of various breaches of the United States’ fiduciary obligations.”²⁴ See more information on: Central Utah Projects, Upalco and Ute Indian (Ultimate Phase) The Uinta unit (UIIP) was partially developed but the Ute units were not. <https://www.usbr.gov/projects/pdf.php?id=3>

Negotiations are also underway with the Utah to resolve claims of the Confederated Tribes of the Goshute Reservation in northwestern Utah. A settlement agreement with the Shivwitts Band of Paiute Indians in southern Utah was completed and passed by Congress.

Resolving Indian water rights and the other Federal Reserved Water Rights before allocating more water projects would remove significant uncertainty to what Utah’s remaining share of Colorado River water will be used for. Federal Reserved Water Rights in the Colorado River have to come out of Utah’s remaining share of its Colorado River Compact rights, which is about 361,000 acre feet. With Colorado River flows declining and Utah’s share being only 23% of what remains after earlier priority water rights are met it is uncertain how Utah will meet its obligations to senior water right holders.

Lake Powell Pipeline’s Junior Water Right

The *Doctrine of Prior Appropriation* is the fundamental way water rights are managed within the western states and Utah. The tenet is not used in allocations in the Colorado River Compact between the states. Utah water law is based on a principal of *First in time, First in right* known as the *Doctrine of Prior Appropriation*. This means those holding a water right with the earliest priority date, and who have continued beneficial use of the water, have the right to water from a certain source before others with water rights having later priority dates. As water supplies decline this principal will decide who get shut off and who can remain using the water. The 1958 Lake Powell Pipeline water right is junior to many senior water right holders and is at high risk of being shut off. Utah is ignoring this risk. As Colorado River flows diminish over time Utah’s junior priority water right of 1958 for the Lake Powell Pipeline will be subordinated to senior water rights holders.

The priority date for Lake Powell Pipeline water right is 1956 when the Flaming Gorge reservoir and Central Utah project were approved. This means that all water rights granted prior to 1958 have priority over the Lake Powell Pipeline. Also, the Lake Powell Pipeline water right is junior to the Bonneville Unit of Central Utah Project, junior to the Lower Basin States water rights, and water for Mexico as well as unsettled Federal Reserve Water Rights and water rights that have an earlier priority date.

²⁴ see at: <http://utepac.com/media-1/2018/3/8/ute-indian-tribe-sues-the-united-states-alleging-mismanagement-of-the-tribes-water-rights>. March 8, 2018

The Bonneville Unit is the largest and most complex unit of the Central Utah Project. It includes 10 reservoirs, more than 200 miles of aqueducts, tunnels, and canals.

The State decided to use a water right from Ultimate phase of Central Utah Project for the LPP. The Ultimate Phase of Central Utah Project was not built because US Government decided to no longer fund the project. The BOR thought the Ultimate Phase of the CUP water right should have lapsed in 2009, but Utah extended the water right anyway.

Concerns about the extension of time in 2009 for this Ultimate Phase CUP water right is explained in BOR's letter of protest.²⁵

Water Right No. 41-3479 is a segregated portion of the Flaming Gorge water right, Application to Appropriate No. A30414. This appropriation originally included both the storage of water in Flaming Gorge Reservoir and the beneficial use thereof for the "Ultimate Phase" of the Central Utah Project. After the "Ultimate Phase" was deauthorized, Reclamation assigned this portion of the appropriation to the Utah Board of Water Resources with the understanding that any portion of this water right not developed within 50 years of the original approval date (October 6, 2009) would lapse.

Reclamation is concerned that further extensions on the undeveloped portions of the Flaming Gorge appropriation could jeopardize the future of the Central Utah Project (CUP). To date, over \$2 billion dollars have been spent to develop the CUP, which supplies agricultural, municipal, and industrial water to millions of Utah residents in the Uintah Basin, Heber Valley, and Wasatch Front corridor. The key right for the CUP, Water Right No. 43-3822, has a priority date of November 11, 1964. If all the senior undeveloped water rights in the Green River and San Juan River Basins are developed, Utah would exceed its portion of the Colorado River Compact and the Central Utah Project water rights would be adversely impacted.

Due to the BOR protesting this extension of time for proof of beneficial use beyond 50 year limit (October 6, 2009) Utah made this Lake Powell Pipeline water right junior to the Central Utah Project. The BOR also mentioned in their protest if all senior undeveloped water rights in Green River and San Juan are developed, Utah would exceed it portion of Colorado River Compact. In 2008 Utah legislature passed a bill that "Public water supplier" can keep extending this water right Utah Code (73-3-12).https://le.utah.gov/xcode/Title73/Chapter3/C73-3-S12_1800010118000101.pdf

This bill is a problem because public water suppliers think they would have 50 years to show proof while water supplies diminish. There planning for future supplies is undermined by all the other public water suppliers that also think they have 50 years to show proof of a future water supply project.

²⁵Letter from BOR to State Engineer Dec 17, 2009https://www.waterrights.utah.gov/asp_apps/DOCDB/DocImageToPDF.asp?file=/docSys/v921/b921/B921002.N.TIF

Problem- LPP water right not in Lake Powell

Recently, Utah disclosed they don't have the water right where they need it in Lake Powell and will have to do water rights exchange with BOR to get the water right into Lake Powell. see at: <http://conserveswu.org/wp-content/uploads/Green-River-Exchange-for-LPP.pdf>.

Utah would trade Green River tributary water rights with the BOR for water out of Flaming Gorge reservoir. We asked for the specific water rights for the Green River that will be traded. DWRe said the records from the Division of Water Rights do not agree with the Division of Water Resources and they will have to sort that out. The BOR has not started the environmental assessment to accomplish this trade. This could turn out to be very controversial if all the states have to agree that the BOR can decide to approve a water right exchange from the Upper Basin to the Lower Basin and draw more water out of Lake Powell.

Other obligations having priority over the Lake Powell Pipeline water right include:

- Water required for Mexico in the 1922 Compact, Article III (c): “If, as a matter of international comity, the United States of America shall hereafter recognize in the United State of Mexico any right to the use of any waters of the Colorado River System.....”²⁶ Requires the Upper Basin to provide one-half the deficiency in the obligation to Mexico when it can't be met through a surplus. The treaty obligation to Mexico is 1.5 MAF. Thus in theory, if there is not surplus the Upper Basin states would have to provide another 750,000 acre feet. Utah does not consider Mexico's water rights in their planning.
- Water required for the Lower Basin is 7.5 million acre feet a year. The 1922 Compact Article III (d) states: “The States of the Upper Division will not cause the flow of the river at Lee Ferry to be depleted below an aggregate of 75,000,000 acre-feet for any period of ten consecutive years reckoned in continuing progressive series ...”²⁷
- The Upper Basin Compact of 1948 Article III. also includes lower basin requirement:²⁸
 - Article IV – “In the event curtailment of use of water by the States of the Upper Division at any time shall become necessary in order that the flow at Lee Ferry shall not be depleted below that required by Article III of the Colorado River Compact, the extent of curtailment by each State of the

²⁶ The Colorado River Compact Article III (c); See at <https://www.usbr.gov/lc/region/pao/pdfiles/crcompct.pdf>

²⁷ Ibid. Article III (d)

²⁸ Upper Basin Compact 1948, See at: <https://www.usbr.gov/lc/region/pao/pdfiles/ucbsnact.pdf> (emphasis added)

consumptive use of water apportioned to it by Article III of this Compact shall be in such quantities and at such times as shall be determined by the Commission.....”

- Utah Indian Tribes and other Federal reservations such as National Parks, and National Forest Service lands
- Senior water rights holders having an earlier date of 1958.

Only using 15 MAFY to Assess Risk?

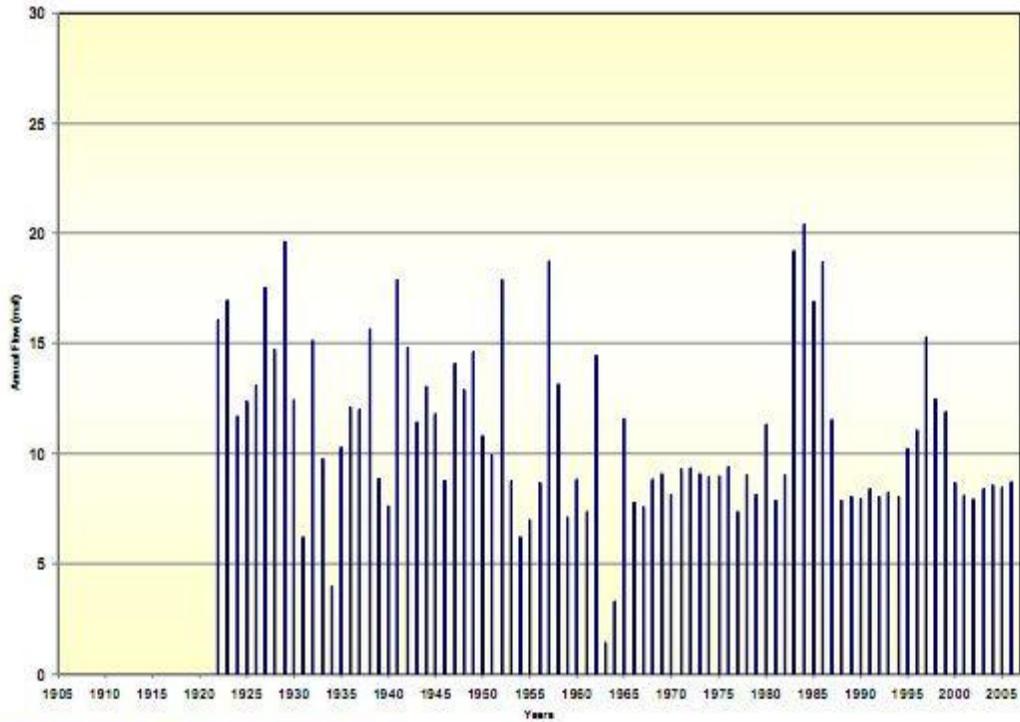
The problem of over allocation continues

Another risk of water availability for the LPP is that the Colorado River Upper Basin States and Bureau of Reclamation are using 15 MAFY at Lee Ferry, to make decisions yet flows have been much less at 12.5-13 MAFY. This overestimates the natural flows. The “natural flow” is estimated in modeling as what the unregulated, un-diverted streamflow would have been absent human intervention.

The Colorado River Simulated System (CRSS) river model used to assess the impact of State water projects are overly optimistic in projecting that river flows will still be as robust in the future as they have been in the past even though the water is no longer in the Colorado River Basin.

This BOR chart (3.3-2) shows flows over a 100 year period could be interpreted to have been declining below 15 MAFY for many years.

Figure 3.3-2
Historic Annual Flow of the Colorado River at Lees Ferry Gaging Station, Arizona
1922 through 2005

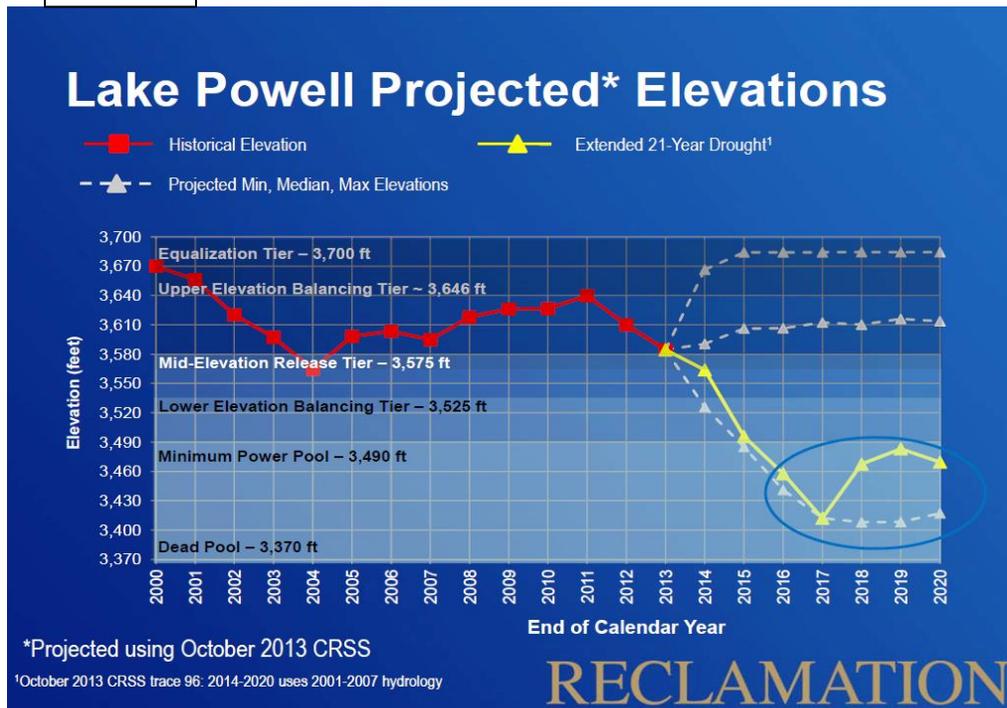


Data from Upper Colorado Hydrologic Database

In addition, historical records indicate that droughts of various severities occurred periodically. In 1878-2002 a tree ring study by Connie Woodhouse showed a 25 year drought with a natural flow of only 12.36 MAFY. Further, tree records also show that from 1584 to 1593 there was a 9 year drought averaging only 9.7 MAFY. The BOR's using natural flow of 15 MAFY creates the false sense that there will be adequate water supply to keep reservoirs supplied with enough for all the demands that includes the Lake Powell Pipeline.

In addition, to this flawed use of narrow piece of river flow history, there has been nothing in this

Figure 2.



view of history that includes the impact Climate Change on the Colorado River’s water availability.

In Figure 2, The BOR estimated what will happen if our 16 year drought turns into a 21 year drought with Lake Powell possibility falling below

the level power can be generated.

Utah not considering Climate Change

It is troubling that Utah in the Federal Energy Regulatory Commission’s studies for the Lake Powell Pipeline will not consider future climate change impacts on diminishing future water availability. These conclusions are made without any evidence given to the public, or decision makers.

Here are some conclusions from Utah’s LPP studies:

- “Though the potential impacts of climate change have been studied in the Colorado River Basin, the data needed to quantitatively evaluate these potential impacts with CRSS was not yet available at the time of study.”²⁹
- “It is unknown at this time what impacts such management strategies might have on the State of Utah or the LPP Project. The LPP Project intake would be designed at an elevation which would be physically capable of receiving water in times of low storage. There are currently no plans to curtail Upper Basin State’s water use beyond what is required by the Colorado River Compact.”³⁰

²⁹ Study Report 18, Reclamation Colorado River Model Report, Appendix 2, p. 2.

³⁰ Chapter 5 Summary and Conclusions:

- “Under most drought scenarios, the most secure water rights are from reservoirs at the downstream end of river system.”³¹

Water Demand already Outstrips Supply

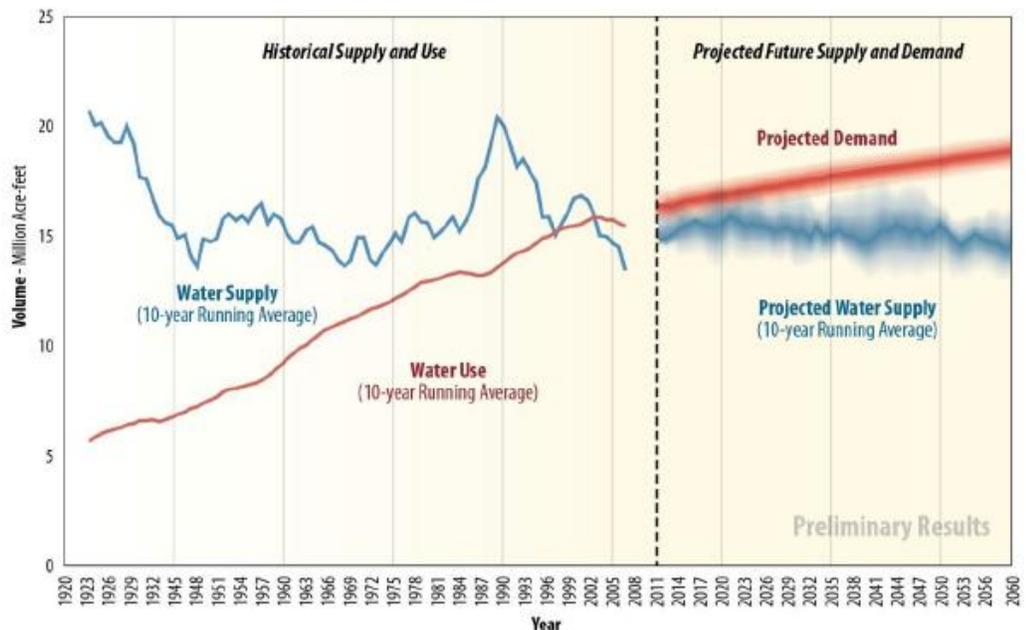
In Figure 3, the Bureau of Reclamation, depicts 10-year average supply and demand totals for the Colorado River basin, and illustrates that since 2002 demands have exceeded supply. This is nowhere more evident than in the declining volume of water in storage throughout the basin. The Lake Powell Pipeline proponents must acknowledge that while new demands for Colorado River water may be supplied out of storage in the short term, the inevitable, long-term result is that a new demand in a system already fully used will either itself be shorted, or will result in a shortage to another water use somewhere else in the system.³²

The red line represents the water supply and the blue line represents water demand. This figure 3 illustrates clearly that a supply and demand imbalance currently exists the Basin. This imbalance will grow in the future if major changes are not made in how we use water.

Rising Temperatures

The main source of water for community water systems is snow pack that will be impacted greatly by the increase in temperature that will result in a drastic decrease in the snow water equivalent. The annual average temperature in the Colorado River Basin has increased 1.4 degrees C and nearly 2°C at Lee’s Ferry, AZ since 1906.³³

Figure 3



Weather Station, Figure 4

³¹ LPP Study Report No. 19. p. 3-1,

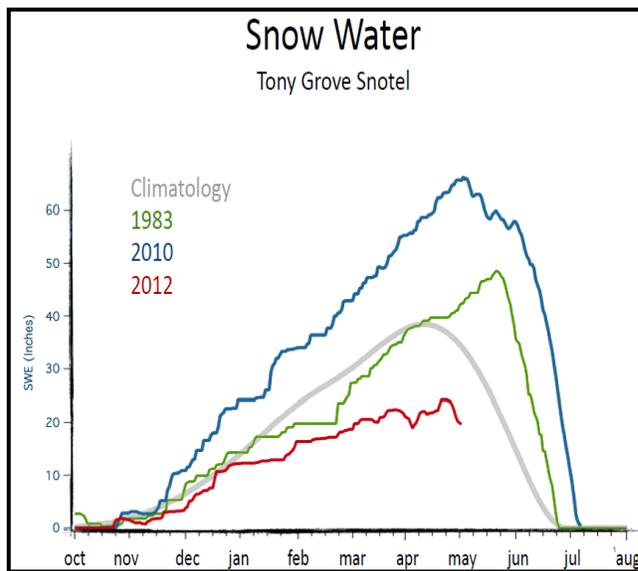
³² Doug Kenney, Rethinking the future of the Colorado River, Colorado River Governance initiative Dec 2010. See at: http://scholar.law.colorado.edu/cgi/viewcontent.cgi?article=1013&context=books_reports_studies

³³ The Colorado River Basin and Climate: Perfect storm for the twenty-first Century? 2012 by Carson McMurray; See at: <https://www.coloradocollege.edu/dotAsset/74e91de4-a1ff-4062-b628-030e997b4e0b.pdf>

Tony Grove Snotel, NRCS, in Cache Valley, Elevation 8474 ft
SWE- left legend- Snow Water Equivalent is how much water is in snow

In Figure 4, Dr. Robert Gilles from Utah Climate Center, at Utah State University in Logan, Utah illustrates that Utah's climate is getting warmer with temperatures of all Utah's cities are going up. Moreover, Utah has had 9% less snow since 1950 and less winter storms. Figure 4, illustrates how much less water is in snow since 2012.

Figure 4



Utah relies heavily on mountain snowpack for its water supply. Traditionally, snowpack accumulates in mountainous regions during the winter months. Water stored in the snowpack is then released to aquifers, streams, lakes, and reservoirs as it melts primarily during spring; this fundamental snowpack hydrology will be impacted by a warming climate.

Our climate is changing because the Earth is warming and Utah is transitioning to a very different hydrological regime. As a result, our water supply will be impacted. Utah's climate has already changed and has

warmed about 2 degrees Fahrenheit, and in many parts of Utah by much more, in the last century³⁴. In general, Utah's climate has warmed at a rate of two to four times that of the global climate^{35,36}; this is evidenced by the long-term trend of observational temperature records throughout Utah.

³⁴ EPA What Climate change means for Utah. See

<https://www.epa.gov/sites/production/files/2016-09/documents/climate-change-ut.pdf>

³⁵ Robert R. Gillies 2017, Director of Utah Climate Center, and state Climatologist for the state of Utah; Observational and synoptic analyses of the winter precipitation regime change over Utah. *Journal of Climate*, GILLIES, R. R., S.-Y. WANG, AND M. R. BOOTH, 2012: 25, 4670-4698; Climate change impact on the roles of temperature and precipitation in western U.S. snowpack variability. *Geophysical Research*, SCALZITTI, JASON, STRONG, COURTENAY, KOCHANSKI, ADAM, 2016: 43, 10

³⁶ National Climate Assessment (Southwest climate assessment) 2013, See <http://www.globalchange.gov/what-we-do/assessment>;

The transition to Utah's new climate regime in terms of increasing temperatures and altering precipitation patterns has a probable effect on watershed health. Increased temperatures will drive more evaporation and evapotranspiration (ET), which is the coupled process by which water is transferred from the land to the atmosphere by evaporation from the soil and other surfaces and by transpiration from plants. Increasing air temperatures result in increasing stream temperatures, which in turn will proliferate water pollutant concentrations and so, reduce water quality; also expected is a potential loss of wetlands that purify our water. In addition, higher temperatures increases evaporation from streams and reservoirs with resultant water quality issues, depletion of soil moisture and so, increased irrigation requirements for crops and plants.

As the climate warms, Utah's precipitation receipt will be more in the form of rain than in snow, especially in low and mid elevation mountain regions. Run-off due to snowmelt will occur earlier in the year with higher intensities and shorter durations. As such, late summer river flows are projected to diminish, impacting water users who rely on natural river flows during this time of year. Furthermore, water rights providing diversions from Utah's waterways may be diminished, or need to be altered, due to these changes in snowpack, timing of run-off, and streamflow hydrology.

Risks and Uncertainty

In conclusion, Utah's Compact water rights are not fixed like the Lower Basin water rights. It is only a percentage of what remains after other senior water holders are met. Therefore, this right could further be reduced in the future and revert to the senior water rights holders. There is danger that litigation, associated with water rights claims and environmental issues, will compound the problem and could cause economic disruption.

Utah should not keep over allocating its Colorado River water rights until they do a new hydrologic study to determine how much water is present and available in the Upper Basin to reasonable use by using a natural flow that is lower 12.5-13 MAFY annual flow for forecasting Utah's future water supply. Balancing the gap between water demands with river's available flows is developing much faster than water managers had previously imagined.

Utah's Lake Powell Pipeline studies do not detail the risks of a diminishing water supply for the project listed above. Utah incorrectly claims it can divert water in dire conditions, and that they don't have a responsibility to address the risk of lower flows in the Colorado River. On the contrary, the studies must require a detailed analysis from Utah that proves their assumption about water availability for a permanent water project the Lake Powell Pipeline is valid. Further, the studies must ensure the environmental information is accurate so that decision makers can understand the consequences of their decision. The current Lake Powell Pipeline studies lack scientific accuracy that is both reasonable and objective that the agencies and the public can rely upon to make a decision on the pipeline and must be revised. We recommend:

- Utah should complete vulnerability analyses that evaluates the risks to the Lake Powell Pipeline listed above.
- The Governor should ask the BOR to complete a Hydrological Determination for the Lake Powell Pipeline long term contract. Using lower flows of 12.5 MAFY rather than 15 MAFY.
- Utah's Upper Basin Colorado River Basin water rights are significantly over appropriated. This situation needs to be dealt with before the LPP is approved. Have an independent third party evaluate if Utah has over allocated its Upper Basin Water Rights of 1.369 MAFY and verify if Utah has a remaining share to develop.
- The Governor should give more funding to Division of Water Rights to update the Utah's Colorado River Upper Basin water rights so they are correct. Funding for this purpose could also be found in Senate Bill 281 and not only use this fund for the Lake Powell Pipeline.

The Utah Division of Water Resources (DWRe) has taken many important steps in improving water use data collection. The next challenge is to develop a standard to account for all water supplies in a region, The Washington County Water Conservancy is only counting potable water as supply. Further, DWRe should focus on straightening out the Colorado River Upper Basin water rights. Water is held in trust for the public and they depend on water rights being correct. DWRe held some public meeting in 2005 alerting the public about the over allocation of the Colorado River Upper Basin water rights and they should do that again. This would alert communities to get serious about using their current water sources more efficiently and to implement conservation measures now.

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