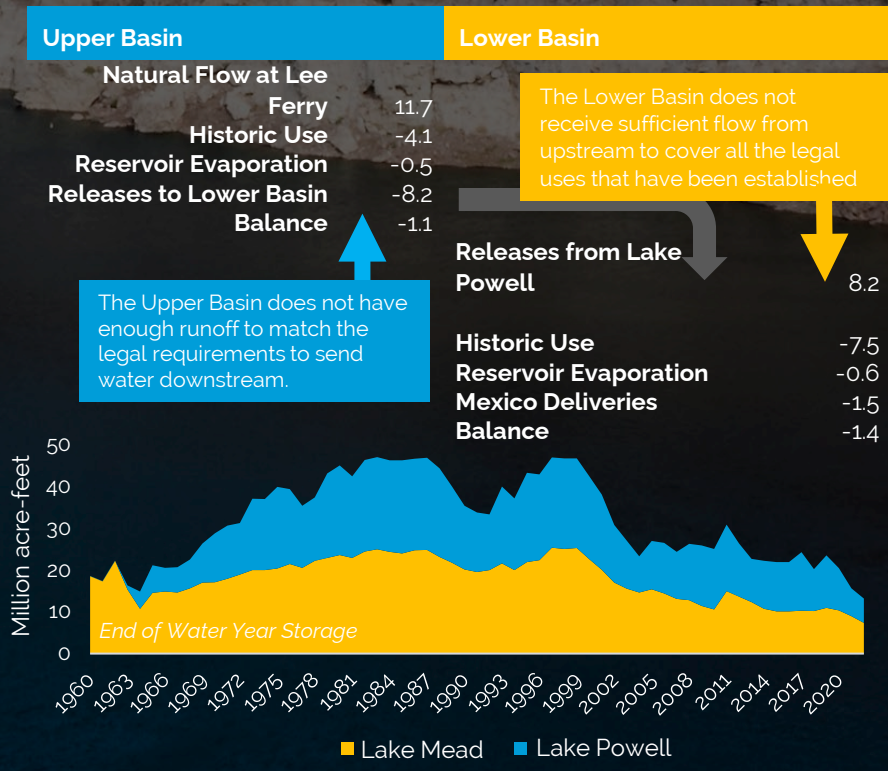


# WATER MARKET INSIDER

Q4, 2022

## A DOWN PAYMENT ON STABILITY FOR THE COLORADO RIVER BASIN

The Colorado River Basin has garnered necessary media attention over this past year as water storage levels in Lakes Powell and Mead decline to record lows. As unprecedented drought conditions persist (and are predicted to stay), the basin's insurance pools, in the form of reservoir storage, are disappearing. The river basin has been stuck in a seemingly unwavering imbalance between water supplies and demands. Simply put, the seven basin states have become reliant on a diminishing water supply and it has proven very difficult to reduce the magnitude of this reliance.



Hoover Dam Towers, Lake Mead

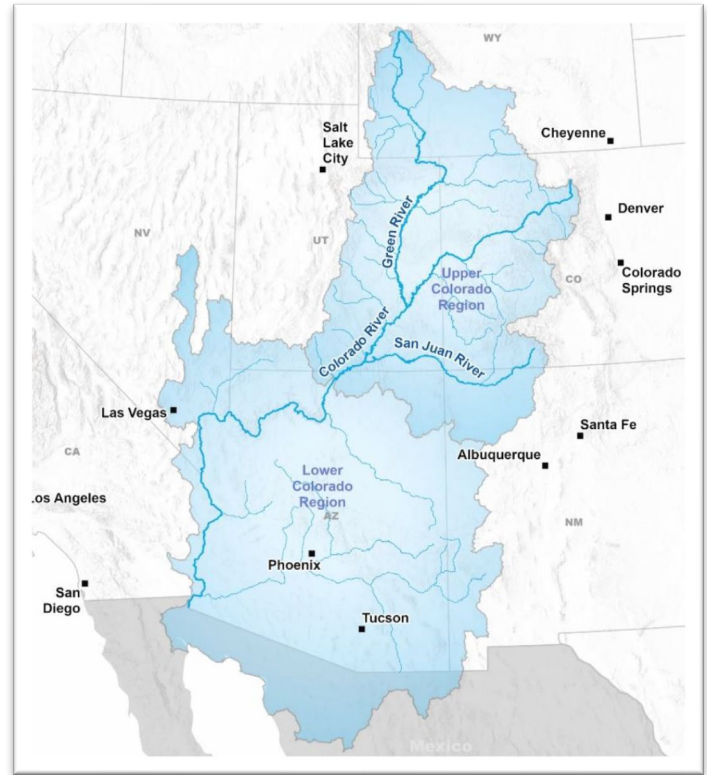


**A DOWN PAYMENT ON STABILITY FOR THE COLORADO RIVER BASIN**

**\$4 Billion Secured for Market-Based Demand Reduction**

To rectify the supply/demand imbalance, action is needed, and most experts agree that an “all of the above” mindset is required to see real and meaningful progress. Demand reduction can take several forms, including market and regulatory approaches. As part of the Inflation Reduction Act of 2022 (IRA), Congress secured \$4 billion in funding for market-based demand reduction in the Colorado River Basin and other stressed river basins. Approaches to reduce demand through incentivized conservation are important and a critical component of future management actions. This Water Market Insider provides context on market-based approaches providing for incentivized conservation in the Colorado River Basin.

*Colorado River Basin*



*Options for water demand reduction in the basin include both market and regulatory approaches. Provided below are some example actions under each approach.*

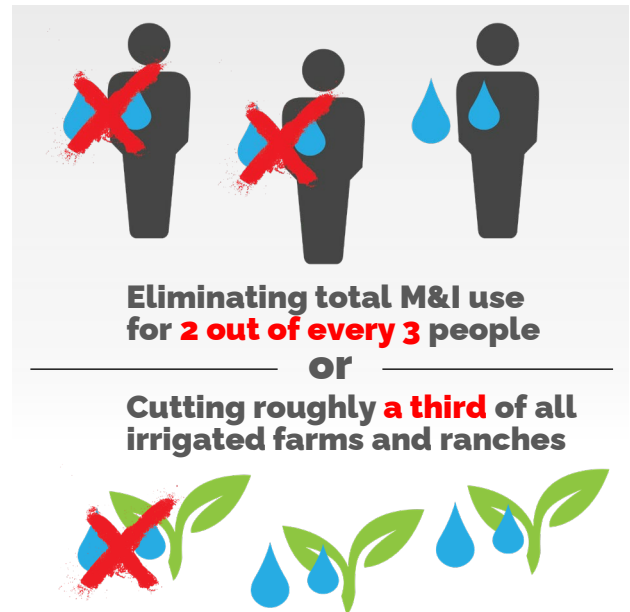
	<b>Agricultural Sector</b>	<b>M&amp;I Sector</b>
<b>Market:</b> <b>Incentivized Conservation</b>	<b>Fallowing in Various Forms. Also: Crop Switching, Deficit Irrigation</b>	<b>Rebates for Conservation Actions. Payments for Turf Removal. Incentives for Low Water Use Housing</b>
<b>Regulatory:</b> <b>Penalized Overuse</b>	<b>Relatively unprecedented. Penalty fees for use over local policy limits.</b>	<b>Tiered Rates. Drought Response Actions. Building and Development Codes.</b>

## A DOWN PAYMENT ON STABILITY FOR THE COLORADO RIVER BASIN

### What Large Scale Conservation Looks Like

The Colorado River Basin has been out of balance for the past two decades. In the Upper Basin, the snowpack has not been able to keep up with requirements to pass water down to the Lower Basin states. In the Lower Basin, the river flows received from the Upper Basin have not been sufficient to meet all established uses, a situation often referred to as the "structural deficit". Estimates vary, but its easy to see how the basin collectively needs to reduce demand by 2.5 million acre-feet (MAF) in order to achieve long-term stability and balance. In recent testimony to the U.S. Senate Committee on Energy and Natural Resources, the Commissioner of Reclamation called for basin cuts of 2 to 4 MAF.

Quantifying what a 20% cut in water use looks like across the basin

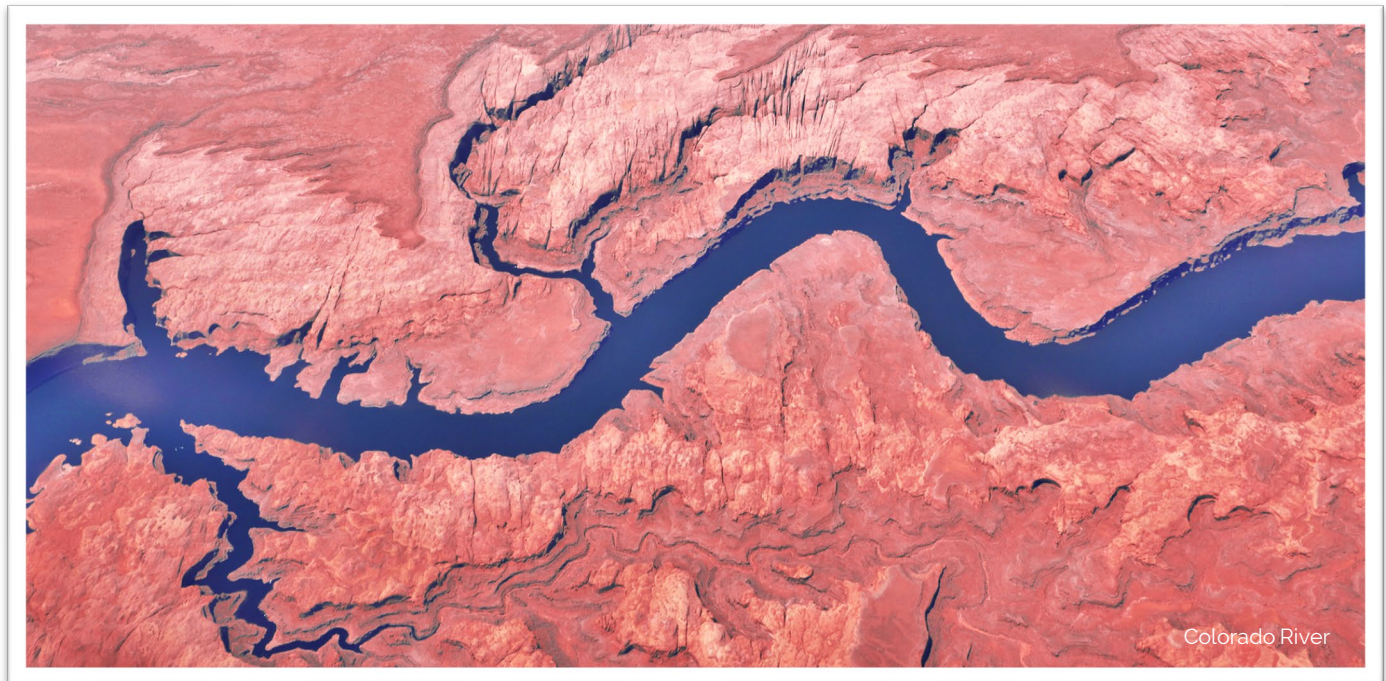


Current consumptive uses in the basin total about 11 MAF. This figure reflects the impact of reductions at different scales by sector, including basin-wide water use by agriculture and municipal and industrial (M&I). This figure already accounts for system conservation efforts in recent years. The rough math tells us that conservation efforts need to reduce basin-wide water use by at least 20% and perhaps up to 40% relative to current use. That is a humbling estimate. To put 20% reduction in perspective, it means eliminating the total M&I use for 2 out of every 3 people in the basin, or alternatively cutting out roughly a third of all irrigated farms and ranches across the basin. While a combination of efforts to reduce demand across all sectors will be required, these estimates represent a scale of conservation and demand reduction never before attempted.

Ag Reduction as % of Total Reduction	100%	80%	50%	20%	0%
Ag Reduction (MAF)	2.5	2	1.25	0.5	0
Reduction as % of Current Use	35%	28%	17%	7%	0%
Remaining Use (MAF)	4.7	5.2	5.95	6.7	7.2
M&I Reduction as % of Total Reduction	0%	20%	50%	80%	100%
M&I Reduction (MAF)	0	0.5	1.25	2	2.5
Reduction as % of Current Use	0%	13%	33%	53%	66%
Remaining Use (MAF)	3.8	3.3	2.55	1.8	1.3



## A DOWN PAYMENT ON STABILITY FOR THE COLORADO RIVER BASIN



### The Cost to Cut Water Use


The cost to incentivize the necessary scale of demand using market-based approaches is significant. Achieving a 20% reduction in water use comes at an estimated annual cost of at least \$1.3 billion. Any cost estimate for demand reduction is very uncertain, but data points on the cost of agricultural conservation pilot programs employed from 2015 to 2018. While we have some data points on the cost of agricultural conservation from pilot programs that were run from 2015 to 2018, the scale of these programs was about 1% of the necessary scale of conservation in the basin and therefore price discovery will likely continue. In the M&I sector, cost data are primarily based upon the costs of specific conservation actions, but the historic record of municipal conservation program costs and the demand hardening that has occurred following past conservation initiative indicate a likelihood of higher costs to achieve M&I water use reductions. This evidence suggests the conservation costs presented in the table may be conservatively low.

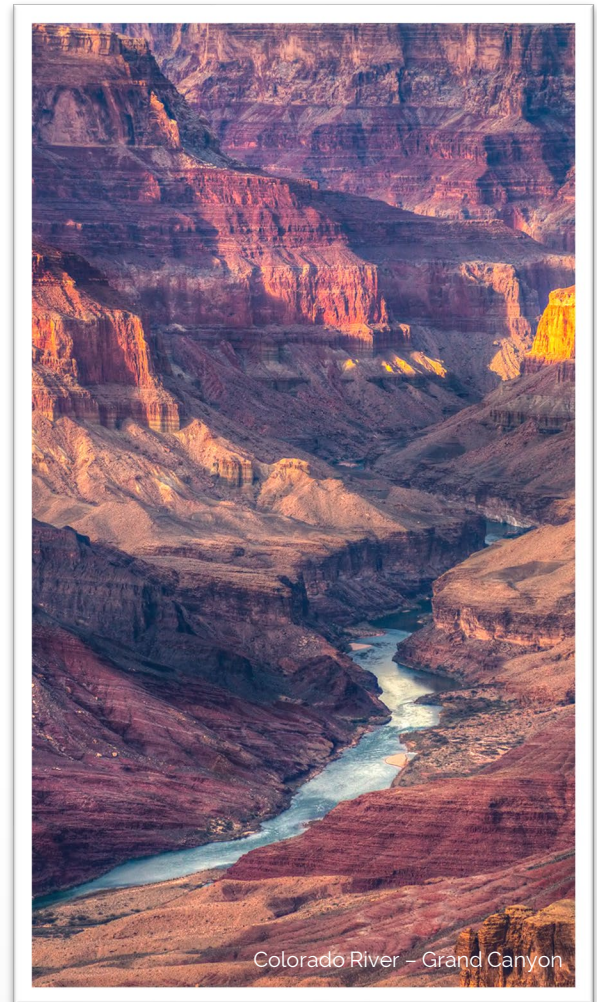
	Conservation Volume (MAF)	Unit Cost (\$/AF)	Annual Cost
Agriculture	2	\$400	\$800,000,000
M&I	0.5	\$1,000	\$500,000,000
<b>Total</b>	<b>2.5</b>		<b>\$1,300,000,000</b>

## A DOWN PAYMENT ON STABILITY FOR THE COLORADO RIVER BASIN

### Colorado River Basin Stability Requires Permanent Demand Reduction

It's important to understand that the conservation required in the Colorado River Basin is not just a series of annual cutbacks to get through a drought. The science is clear that the basin requires permanent demand reduction to achieve sustainability. The present value of \$1.3 billion in future annual conservation costs is roughly \$81 billion based on U.S. Treasury bond real interest rates. The \$4 billion in funding from the IRA buys just three years of needed conservation - it is only a down payment.

Water users and managers face a long process of permanently revising water use across the Colorado River Basin and reimagining what the Colorado River system can support. Significant and long-term funding is needed to achieve sustainability in the Colorado River Basin. The scale of needed investment for market-based solutions may increase the risk of mandatory conservation through regulatory actions. Most often, regulatory actions seek to penalize overuse. Such mandatory restrictions or cutbacks imply risk to water asset owners in the basin and should be factored into risk profiles. Such risks can be reduced over time with significant and sustained investment to reduce water demand in the river basin. 



Colorado River – Grand Canyon

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We work across the country with five regional offices to provide market intelligence, valuation, transaction advisory, strategic planning, and asset management services relating to water rights and water resources. We are known for our rigorous analysis, and information-driven water rights investment strategy formulation and execution

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