

Brandon Ruiz, Graduate Research Assistant<sup>1</sup>; Dr. Ray Quay, Professional Researcher<sup>1</sup>  
<sup>1</sup>The Decision Center for a Desert City at Arizona State University

## Question

How will water shortage conditions within the Colorado River Basin impact Southern California, Central Arizona, Southern Nevada, and Central Colorado?

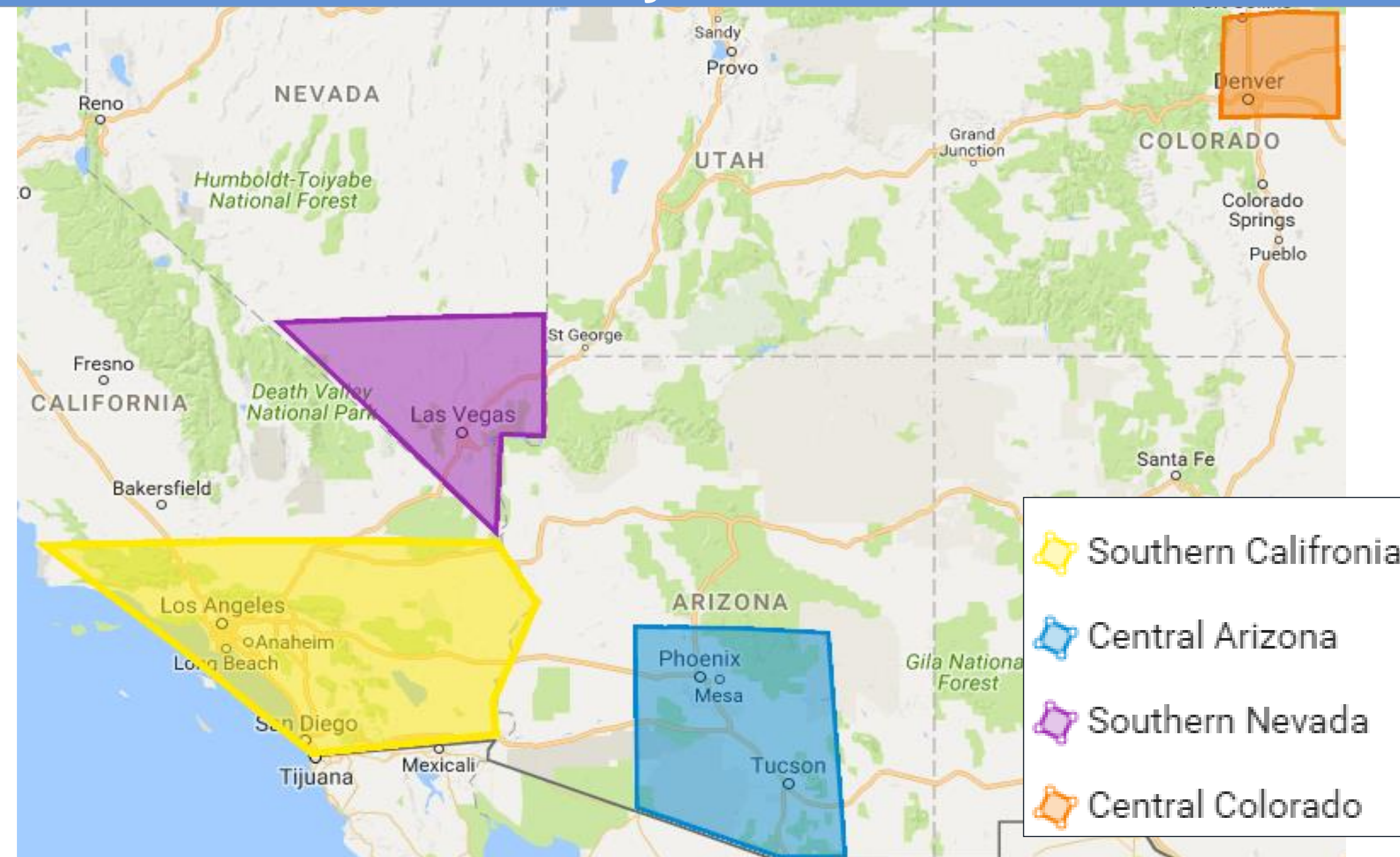
## Background

There is currently not enough stream flow in the Colorado River to meet the 15 million acre-feet per year (AFY) in allocated water.<sup>1</sup> The Colorado River is projected to experience a median imbalance of 3.2 million AFY between supply and demand by 2060 due to climate change and increased demands.<sup>1</sup>

The 4 study regions (shown below) rely on Colorado River water to support **Municipal and Industrial (M&I)** and **Agricultural (Ag)** uses, which harbor a large portion of their regional economies. Factors threatening supply, methods to combat shortage, and subsequent impacts are shown herein.

- **M&I Water Use:** urban water uses including residential, commercial, industrial & institutional.
- **Ag Water Use:** water used for irrigating crops.

## Study Areas



## Methods

### Factors Considered when Assessing Water Supply Risk

- Regional reliance on Colorado River for water supply
- Shortage impacts on Colorado River water supply
- Future regional water demand changes
- Strategies used to mitigate water shortage impacts

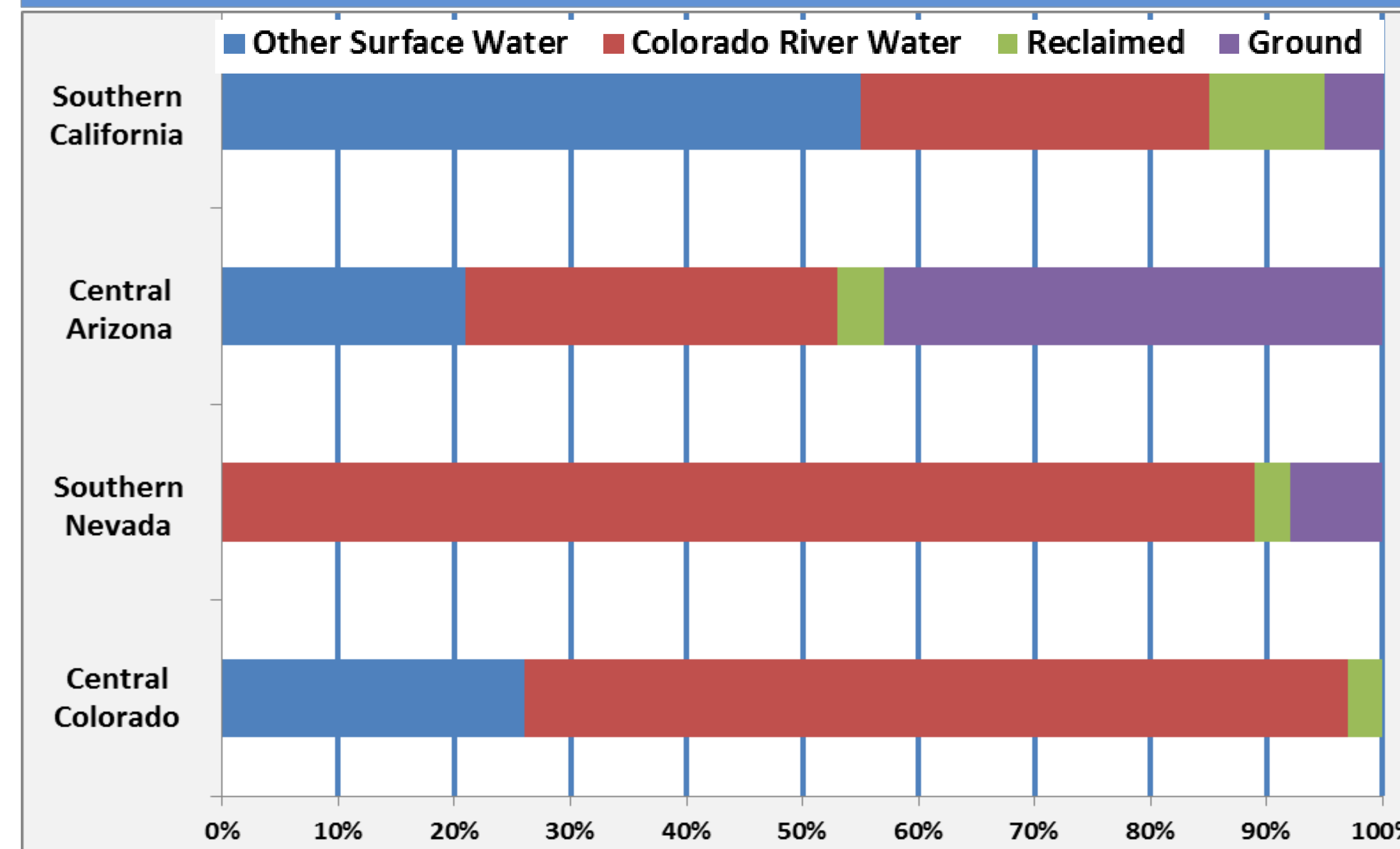
Data was collected from reports and websites of major urban area water providers in the 4 regions, the Bureau of Reclamation website, and other western water focused organizations.



## References

1. U.S. Bureau of Reclamation. 2012. Colorado River Basin Water Supply and Demand Study.
2. <http://www.cap-az.com/documents/shortage/Shortage-Fact-Sheet.pdf>
3. [http://www.denverwater.org/docs/assets/4BEA7503-0237-E833-64A3F4C3447F588C/frwc\\_econ\\_report.pdf](http://www.denverwater.org/docs/assets/4BEA7503-0237-E833-64A3F4C3447F588C/frwc_econ_report.pdf)
4. <https://www.usbr.gov/lc/region/programs/crbstudy/finalreport/techrptC.html>

## Water Portfolios<sup>3</sup>



## Water Portfolio Risks

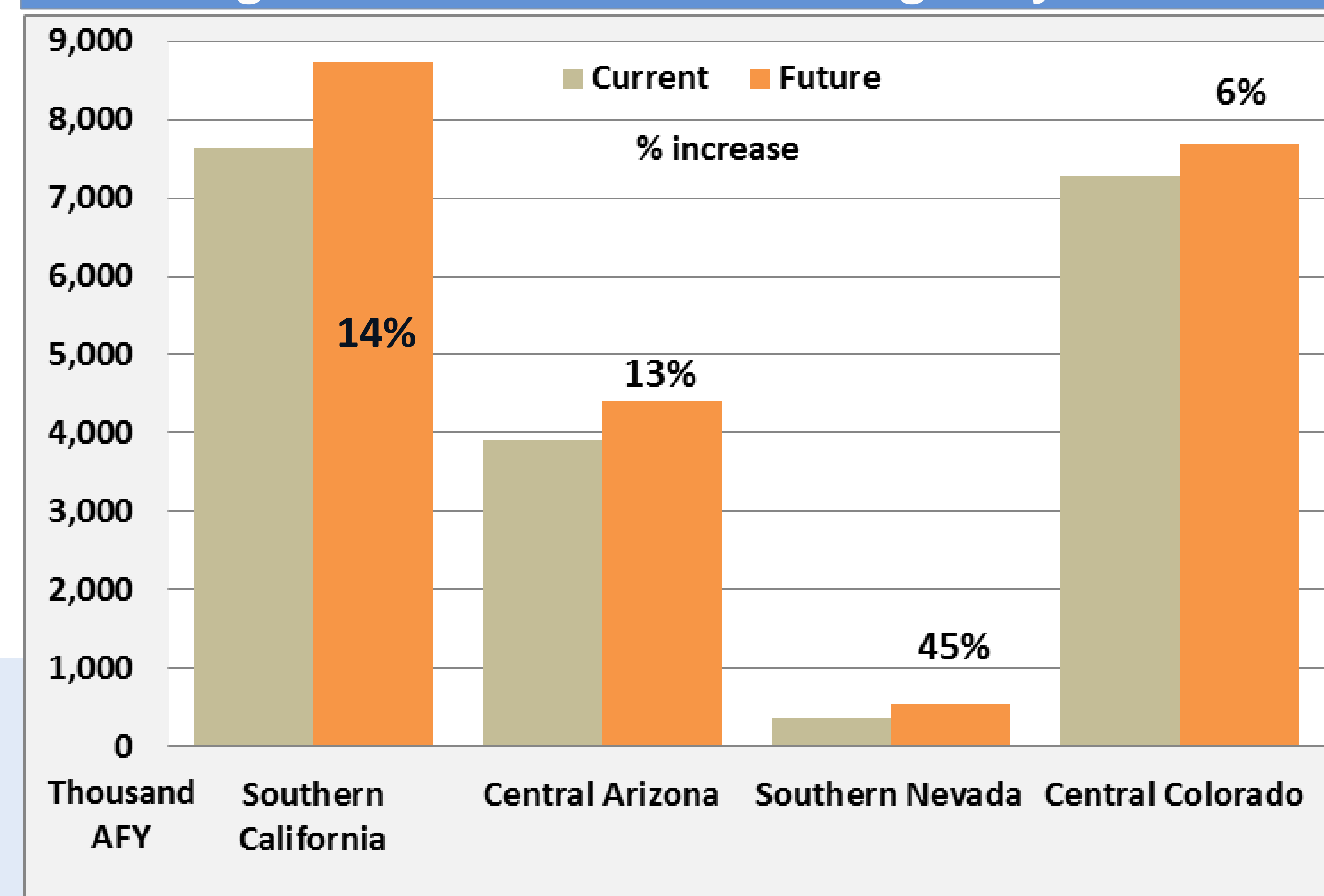
Climate change will reduce Colorado River flows 9% by 2030.

**>50% chance for Colorado River Tier 1 shortage by 2018.**

## Tier 1 Shortage Impacts on Colorado River

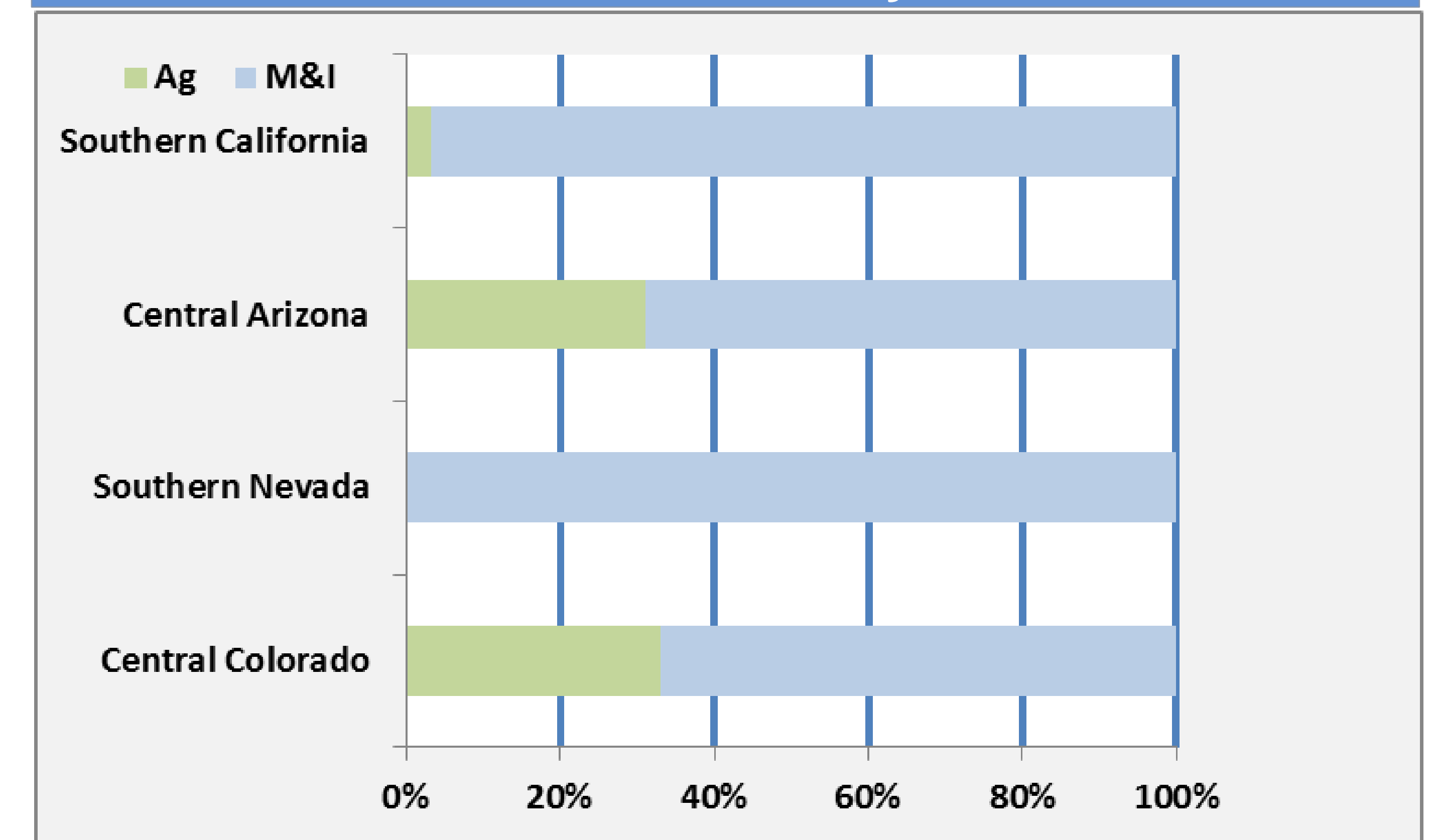
Region	% of CO River Water Supply Affected. <sup>2</sup>	% of Total Water Supply Affected
Southern California	0%	0%
Central Arizona	20%	7%
Southern Nevada	11%	10%
Central Colorado	0%	0%

## Regional Water Demand Changes by 2060<sup>4</sup>



Demand projections are based on U.S. Bureau of Reclamation estimates using long-term trends in continuation of growth, development patterns, and institutional behavior.

## Current Water Use by Sector



## Strategies Used to Mitigate Shortage Impacts

### Central Arizona

Central Arizona will make up to a **50%** cut in **agricultural water** use in the event of a shortage before cuts are made to municipal and industrial users. Current efforts to mitigate shortage impacts include:

Structural efficiency improvements	Water supply augmentation
Weather modification	

### Southern Nevada

Southern Nevada does not anticipate near-term impacts from a shortage. This is because their allotment of Colorado River water is not being fully utilized as a result of reducing per capita water use by:

Less water intensive land-use codes	Summer water-use restrictions
Tiered water pricing	Education
Incentives	

## Conclusion & Next Steps

Of the 4 regions, Southern Nevada relies the most on the Colorado River—which makes up nearly 90% of its total water supply—and will experience a 10% reduction in total supplies if a Tier 1 shortage is declared. The region also expects the highest increase in demand at 45% by 2060. Yet, it will not be adversely affected given the effectiveness of its conservation efforts.

Southern California and Central Colorado will experience no shortages from a Tier 1 shortage declaration due to interstate agreements on water rights seniority and water sharing.

Central Arizona relies on the Colorado River for about 35% of its total water supply and will experience a 7% reduction in total supply from a Tier 1 shortage, along with a 13% increase in demand by 2060. It will make cuts (up to 50%) to agricultural users, negatively impacting farming.

In the **next phases** of this research, we will determine the impacts of Colorado River drought on regional economies and the effectiveness of conservation efforts using cost-benefit analysis.

## Acknowledgements

This material is based upon work supported by the National Science Foundation under Grant No. SES-1462086, DMUU: DCDC III: Transformational Solutions for Urban Water Sustainability Transitions in the Colorado River Basin. Any opinions, findings and conclusions or recommendation expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation (NSF).