

## The Colorado River is a major source of water for California

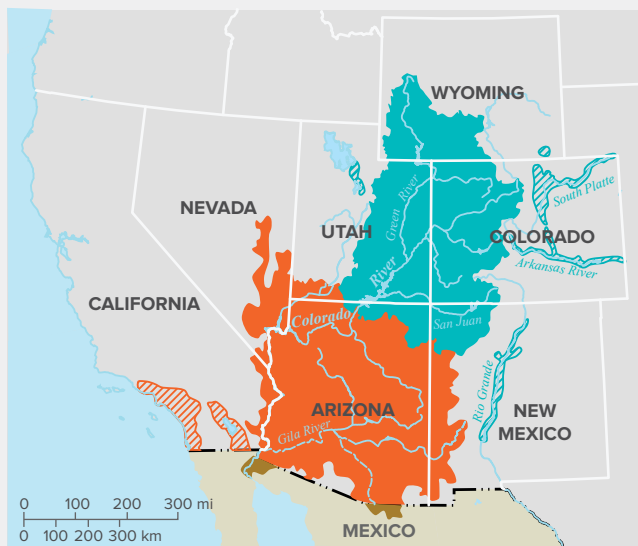
The Colorado River provides roughly a third of all supplies for Southern California cities and suburbs. It also supports a large farming industry in Imperial and Riverside Counties.

California shares this resource with six other states and Mexico, and water allocation is governed by an interstate compact and an international treaty. The US share of the river is divided among four upper basin states (Wyoming, Colorado, Utah, and New Mexico) and three lower basin states (Arizona, Nevada, and California). The federal government has key roles in managing infrastructure and supplies. Under current agreements, 15 million acre-feet (maf) of water per year is allocated to the United States, and 1.5 maf to Mexico. This exceeds average annual supplies, and long-term drought has sharply reduced storage in the major reservoirs. Climate change studies project an overall decline in water in the river, exacerbating the imbalance of supply and demand.

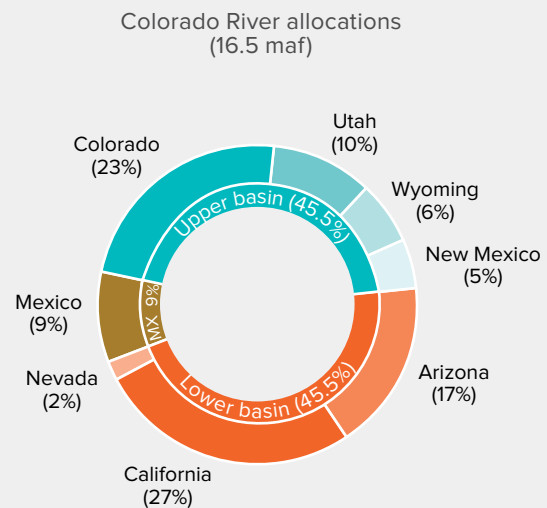
As other states began to use their full allocations in the early 2000s, California was required to reduce its use of the river. Cooperation between urban and agricultural agencies has made this possible. Quantitative Settlement Agreement (QSA) programs save water by lining earthen canals and improving irrigation efficiency, along with some land fallowing. This makes more water available, but some of these programs reduce inflows to the Salton Sea—a vast saline sea in Southern California whose main water source is irrigation runoff from Imperial Valley farms.

Under the QSA, in 2018 the state of California becomes responsible for mitigating the ecological and public health impacts of a shrinking Salton Sea. California also needs to stay engaged in regional efforts to bring the Colorado River Basin into balance.

### CALIFORNIA IS A MAJOR USER OF COLORADO RIVER WATER



- Upper Colorado Basin
- ▨ Upper Colorado export areas
- Lower Colorado Basin
- ▨ Lower Colorado export areas
- Colorado Basin in Mexico



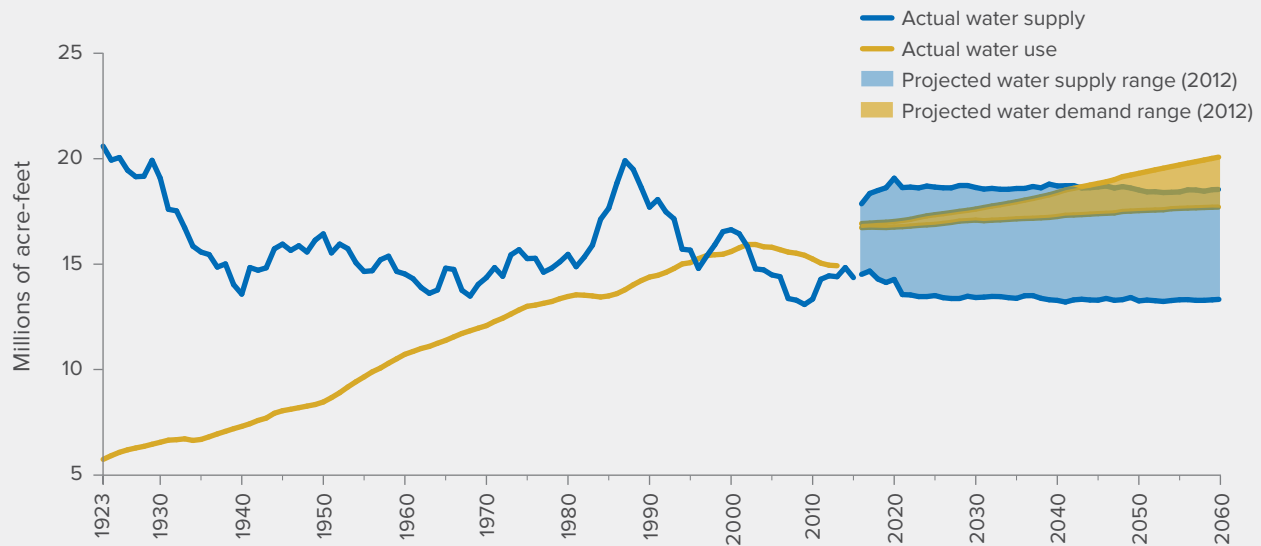
SOURCE: Author illustrations using maps from the US Bureau of Reclamation.

NOTES: The circle graph shows how the 16.5 million acre-feet (maf) are apportioned among the seven basin states and Mexico. Totals do not sum to 100 percent because of rounding. Most of California's allocation is delivered by canals and aqueducts to agricultural and urban export areas outside the river basin. Other export areas in the upper basin include the Denver metropolitan area, Albuquerque, and Salt Lake City. Arizona receives 2.80 maf as a lower basin state and 0.05 maf as an upper basin state.

## The Colorado River Basin has a water budget deficit

A prolonged drought that began in 1999 prompted the seven US states to adopt interim guidelines in 2007 to manage supplies and allow more flexible water management to avoid shortages. A 2012 agreement—known as Minute 319— included similar provisions for Mexico. But a 2012 basin study estimated a persistent deficit of about 1.2 maf per year, due to excess use by the lower basin states. It projected that demand could significantly outstrip supply in the coming decades.

### WATER USE HAS BEEN OUTSTRIPPING SUPPLY IN THE BASIN



SOURCE: Adapted from US Bureau of Reclamation (USBR), *Colorado River Basin Water Supply and Demand Study* (2012), with updated historical supply and use data from USBR.

NOTES: The 2012 basin study provided actual water use data through 2007 and supply through 2011, and presented long-term supply and demand projections identified through scenario development. This figure updates actual water use through 2013 and supply through 2015, and shows that water use has continued to decline in recent years. Historical water use and supply are shown as 10-year running averages.

- **Shortages would affect parties differently.**

The laws that govern water allocation require the upper basin states to allow an average of 7.5 maf to reach the lower basin each year. Within the next few years, storage at Lake Mead—which serves the three lower basin states and Mexico—is expected to fall below the level that triggers usage cuts. Arizona, Nevada, and Mexico would lose supplies first. Although California has senior and relatively secure rights, Californians will benefit from solutions that reduce the costs of shortages for all parties. Arizona, Nevada, and California are negotiating a voluntary agreement to reduce use to slow the decline of Lake Mead and avoid mandatory cuts.

- **Adapting to scarcity requires overcoming inflexible laws governing the river.**

Trading water and “carrying over” supplies for use in later years can reduce the costs of shortages. The laws that govern the river restrict these practices, but parties have begun to find work-arounds. For example, California and Nevada have stored water in Arizona groundwater basins, and some carryover storage is now allowed in Lake Mead. Cities in the upper and lower basins generally have junior rights, which are more likely to be reduced during shortages. They have been funding conservation programs, primarily for upper basin irrigators, to help maintain water levels in Lakes Powell and Mead. Recent declines in overall water use suggest these kinds of innovations are beginning to reduce the imbalance of supply and demand.

## California has been adapting to reduced availability of Colorado River supplies

Within California, irrigators have first rights to 3.85 maf of the total 4.4 maf annual allocation. In the early 2000s, when California had to end a decades-long practice of using more than its share, cities would have borne the brunt of those reductions. The QSA was negotiated then and has helped the state adapt, but not without difficulties.

- **The QSA encouraged regional collaboration and more flexible management.**  
State funding helped line canals, which reduced seepage and increased usable supplies. Urban agencies now also have several major long-term trades with irrigators for more than 500,000 acre-feet annually. The Metropolitan Water District of Southern California is acquiring water from the Palo Verde Irrigation District, the Imperial Irrigation District (IID), and the Bard Water District. The San Diego County Water Authority has a large purchase agreement with IID. These deals make water available from land fallowing and investments in more efficient irrigation techniques.
- **Some QSA actions have involved trade-offs.**  
Lining the All-American Canal—a critical conduit along the Mexican border—saved water for California but reduced groundwater supplies for Mexican farmers. The water trades that involve land fallowing can reduce jobs and tax revenues in farming communities. To address this, urban agencies have established funds to mitigate negative impacts. Irrigation efficiency improvements at IID reduce runoff of excess irrigation water into the Salton Sea, accelerating environmental problems there.
- **Salinity is also a concern for California cities using Colorado River water.**  
By the time the Colorado River water reaches California, it has a higher salt content than most local supplies. During droughts, when other sources are reduced, this raises water treatment costs for urban agencies.

## Water use in the Colorado River Basin poses environmental challenges

The overallocation of supplies to farms and cities has harmed native species along the river. It has also dried up the Colorado River Delta where it enters the Gulf of California, destroying riparian habitat that once served as an important part of the Pacific Flyway. Conditions in and around the Salton Sea pose major ecological and public health challenges. Some of these issues are easier to address than others.

- **A multispecies conservation plan is in place on the lower Colorado River.**  
The first of its kind, this aquatic ecosystem plan was adopted in 2005 and aims to restore habitat and recover species between Lake Mead and the Mexican border.
- **Recent efforts to rewater the Colorado River Delta show promise.**  
In 2014, short “pulses” of water were sent down the dry riverbed in Mexico, briefly reconnecting the river to the ocean. This pilot project—established under the Minute 319 agreement—shows promise for recovering riparian habitat with modest amounts of water.
- **The Salton Sea poses difficult challenges ...**  
In the 19th century the Salton Sea was known as the Salton Sink—a vast salt pan in the Colorado Desert. Levee failures in 1905 caused massive flooding, creating the modern Salton Sea. Since then, the sea has been sustained by irrigation runoff from Imperial Valley farms. A key stopover on the Pacific Flyway and once-popular recreation area, the sea is shrinking and becoming hypersaline. This is destroying bird habitat and worsening air pollution from increased dust along exposed shorelines. By reducing irrigation runoff, the QSA transfers will exacerbate this problem.
- **... and solutions have remained elusive.**  
As part of the QSA, California agreed to mitigate the effects of shrinking the Salton Sea. There have been many engineering proposals to reduce dust pollution and maintain bird habitat. But so far the high price of the solutions (\$9 billion or more)—and the costly alternative of reallocating large volumes of water to the sea from existing uses—have limited actions.

## Looking ahead

California and its partners in the Colorado River Basin must continue to adapt so that the river can continue to provide essential economic, social, and environmental benefits to the region.

**Build on recent efforts to manage demand.** There are no significant opportunities to expand supplies in the Colorado River Basin, and available runoff appears to be in decline. Additional efforts to reduce water use will be needed to achieve balance.

**Foster flexible solutions to stretch scarce supplies.** To reduce the economic costs of scarcity, parties will need to increase water trading and carryover storage. This is especially important for urban supply reliability throughout the basin, since cities generally have lower priority rights to river water.

**Protect local economies.** The large share of water use in relatively low-revenue farming (80–90% of the total within the seven states) creates opportunities for trading, but such deals need to protect local economies. Rotational fallowing—where farmers take turns fallowing some land rather than permanently retiring it—is a promising option, already being used in the Palo Verde Irrigation District. So is seasonal fallowing—where farmers cut back on farming lower revenue crops in the hot summer months—now being piloted in Bard. Mitigation funds for fallowing, like those being offered in the Palo Verde and Imperial Irrigation Districts, are another option worth expanding.

**Improve ecological conditions in the basin.** Solutions should be explored to extend the promising experiment of rewatering the Colorado River Delta. Temporary and longer-term water purchases for the environment can be used for this purpose.

**Address public health and environmental problems at the Salton Sea.** California must take the lead in addressing air and water quality impacts of a shrinking Salton Sea. This includes deciding on a course of action and securing reliable funding to implement it.

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