

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

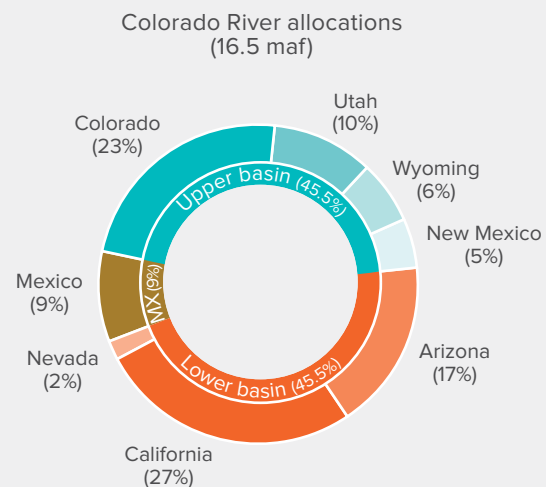
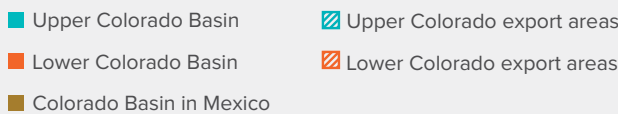
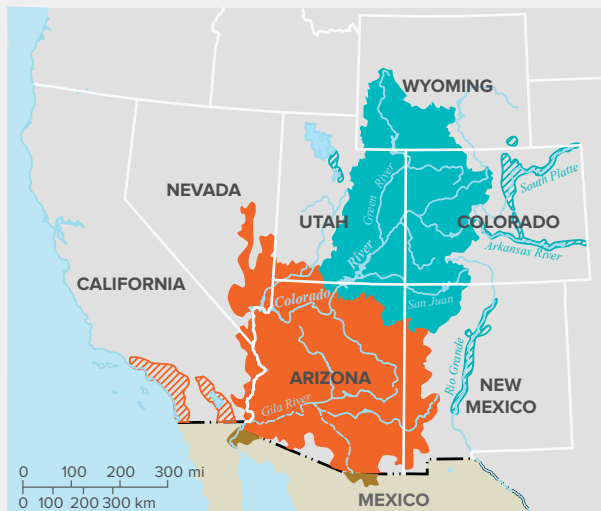
The Colorado River supplies roughly a third of all water for Southern California cities and suburbs. It also supports a large farming industry in Imperial and Riverside Counties.

California shares this resource with six other states and Mexico—an interstate compact and an international treaty govern its water allocation. The US share 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 plays a key role in managing infrastructure and supplies. Current agreements allocate 15 million acre-feet (maf) of water per year to the United States and 1.5 maf to Mexico. These allocations exceed average annual supplies, and long-term drought has sharply reduced storage in the major reservoirs. Climate change studies project an overall decline in the river’s water, which will exacerbate the imbalance of supply and demand.

California was required to reduce its use of the river when other lower basin states began to draw their full allocations in the early 2000s. Cooperation among urban and agricultural agencies and the state—through a program known as the Quantification Settlement Agreement (QSA)—has made this possible. QSA programs make water available for transfers by lining earthen canals and improving irrigation efficiency, along with some land fallowing. 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, the state of California became responsible in 2018 for funding and implementing projects to mitigate the ecological and public health impacts of a shrinking Salton Sea. Californians also need to stay engaged in basin-wide efforts to bring the Colorado River Basin into balance.

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



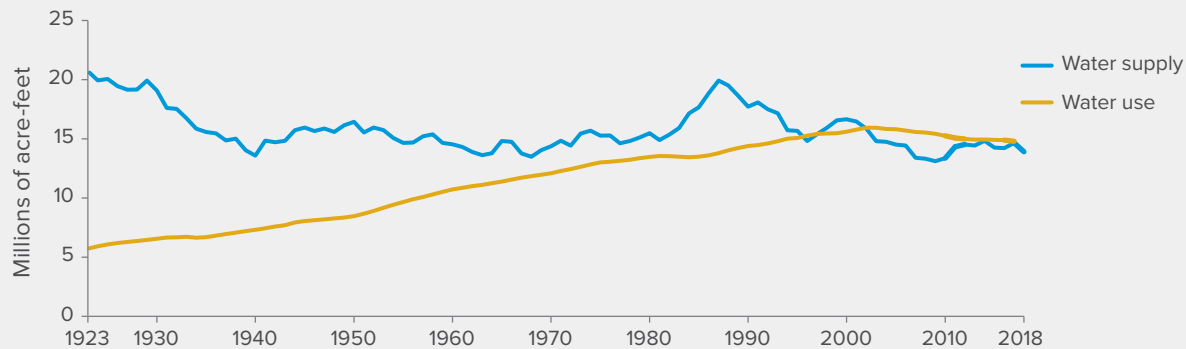
SOURCE: Author illustrations using maps from the US Bureau of Reclamation.

NOTES: The circle graph shows how the 16.5 million acre-feet (maf) are apportioned among the seven basin states and Mexico. These allocations over-estimate available supplies. Totals do not equal 100 percent because of rounding. Arizona’s allocation includes 2.8 maf as a lower basin state and 0.05 maf as an upper basin state. American Indian tribes have rights to a significant share of this water in some states; some tribal rights are still awaiting settlement. Canals and aqueducts deliver most of California’s allocation to agricultural and urban export areas outside the river basin. Export areas in the upper basin include the Denver metropolitan area, Albuquerque, and Salt Lake City.

## The Colorado River Basin has a water budget deficit

A prolonged drought began in 1999. In 2007, all the US basin states adopted interim guidelines to avoid shortages by controlling supplies and allowing more flexible water management. In 2012, they made a similar agreement with Mexico (Minute 319, renewed in 2017 as Minute 323). Although basin-wide water use has declined in recent years, an imbalance between supplies and demands persists, due to reduced runoff and the lower states' excess consumption. The upper basin states use considerably less than their allocation.

### 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 figure shows water use and supply as 10-year running averages. Supply estimates for 2016–18 and use estimates for 2017 are provisional.

- **Lower basin shortages affect parties differently.**

The laws and policies that govern water allocation require the upper basin states to allow an average of 8.25 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 use-reduction agreement to slow Lake Mead's decline and avoid mandatory cuts.

- **Adapting to scarcity requires overcoming inflexible laws that govern 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 funded conservation programs, primarily for upper basin irrigators, to help maintain water levels in Lakes Powell and Mead. American Indian tribes have also participated in these efforts. Recent declines in overall use suggest these kinds of innovations are beginning to reduce the imbalance of supply and demand.

## California has been adapting to reduced 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, the QSA helped cities avoid even deeper cutbacks. Although California is adapting, more challenges remain.

- **The QSA has 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. These deals make water available from land fallowing and investments in more efficient irrigation. 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.

- **Some QSA actions have involved trade-offs.**  
Lining the All-American Canal—a conduit along the Mexican border—saved water for California but reduced groundwater supplies for Mexican farmers. Water trades that involve land fallowing can reduce jobs and tax revenues in farming communities. Urban agencies have established funds to mitigate such negative impacts. Irrigation efficiency improvements at IID reduce irrigation runoff 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. This raises water treatment costs for urban agencies during droughts, when other sources are reduced.

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

Overallocation to farms and cities has harmed native species along the river. It has also dried up the delta where the river enters the Gulf of California, destroying once-important habitat for 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, a pulse flow of water was sent down the dry riverbed in Mexico, briefly reconnecting the river to the ocean. This Minute 319 pilot project benefited riparian vegetation and wildlife. Minute 323 establishes modest annual base flows for delta restoration. The agreement also funds scientific research and project implementation.
- **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, irrigation runoff from Imperial Valley farms has sustained it. A key stopover on the Pacific Flyway and once-popular recreation area, the sea is becoming hypersaline, destroying bird habitat. By reducing irrigation runoff, the QSA transfers exacerbate this problem; they are also causing the sea to shrink, worsening air pollution from increased dust along the exposed shoreline. Conditions could deteriorate rapidly from 2018 onward, when the transferring parties are no longer required to provide inflows to mitigate the reduced runoff.
- **... and the state is now in the driver's seat.**  
Under the QSA, California agreed to mitigate the effects of shrinking the Salton Sea. In 2017, the California Natural Resources Agency unveiled an initial 10-year restoration plan, with projects to reduce dust pollution and maintain bird habitat. State bond funds are available to launch this plan, and local and federal funds can also support mitigation.

## Looking ahead

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

**Build on recent efforts to manage demand.** No significant opportunities exist to expand supplies in the Colorado River Basin, and available runoff appears to be in decline. Achieving balance will require additional efforts to reduce water use.

**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.

**Finalize drought planning efforts.** With Lake Mead storage nearing levels that would trigger usage cuts in the lower basin, it is paramount that states finalize formal drought contingency plans. This is important for how the states share shortages, and it is also required to implement the new agreement with Mexico.

**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 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.

**Address public health and environmental problems at the Salton Sea.** Timely implementation of the state’s initial 10-year plan is essential to begin mitigating air and water quality impacts of a shrinking Salton Sea—a low-income region that already experiences much higher respiratory illness than the state as a whole.

**Improve ecological conditions in the basin.** Minute 323 extends the promising experiment of rewatering the Colorado River delta. Longer-term water and funding for habitat restoration will be needed beyond 2026, when this agreement expires.

**Consider watershed connections.** Because Southern California relies on both the Colorado River and water that flows through the Sacramento–San Joaquin Delta, shortages in the Colorado increase pressure on Delta supplies, and vice versa.

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