

ARIZONA WATER FACTSHEET Mohave County

Get to know water in your county
April 2023



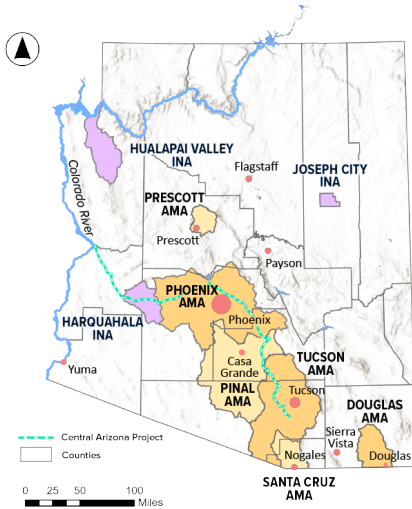
THE UNIVERSITY OF ARIZONA
COOPERATIVE EXTENSION
**WATER RESOURCES
RESEARCH CENTER**

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Water in Arizona

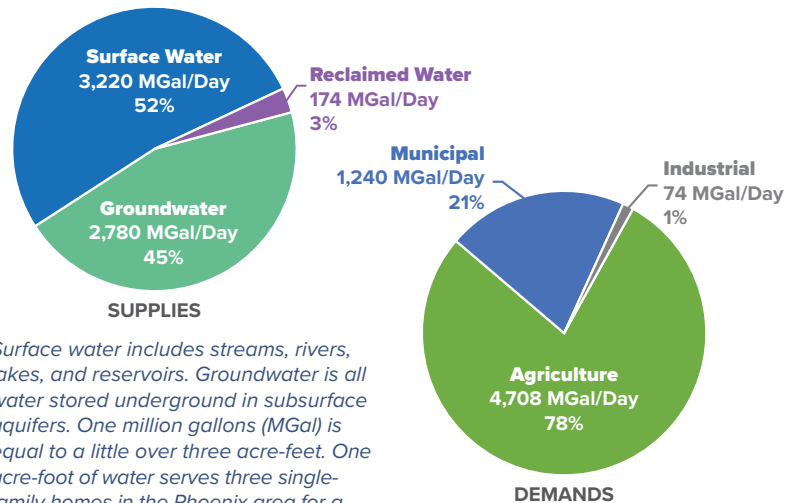
Arizona's future depends on sustainable water supplies, which in turn depend on vigilant and innovative management of those supplies. From low deserts to high mountains, counties and communities face different water challenges and take different approaches to addressing those challenges, while conforming with regional, state, and federal requirements. The Arizona Department of Environmental Quality (ADEQ) is responsible for water quality and tasked with enforcing federal environmental standards. The Arizona Department of Water Resources (ADWR) oversees the use of surface water and groundwater, which are legally distinct though physically interconnected. In general, ADWR regulates groundwater more strictly in Active Management Areas (AMAs) than in the rest of the state.

Statewide Context



County and AMA boundaries (WRRC 2021).

Arizona Water Supply and Demand



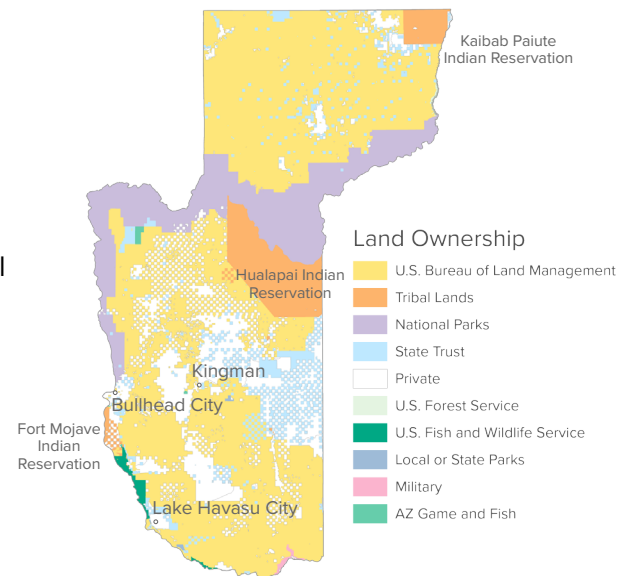
Surface water includes streams, rivers, lakes, and reservoirs. Groundwater is all water stored underground in subsurface aquifers. One million gallons (MGal) is equal to a little over three acre-feet. One acre-foot of water serves three single-family homes in the Phoenix area for a year (ADWR 2021, USGS 2015).

Water in Mohave County

Bordering over 500 miles of the Colorado River, Mohave County provides unique public access to three major reservoirs of the lower Colorado River: Lake Mohave, Lake Havasu, and Lake Mead. As the second largest county in the state, the valleys and scattered mountain ranges of the Sonoran and Mojave Deserts meet the grasslands and woodlands of the Colorado Plateau.

Mohave County land use is as diverse as its geography and includes agriculture, ranching, recreation, and riparian and wildlife habitat. Annual precipitation, which ranges from 4-23 inches depending on elevation, supports the perennial flows of the Virgin River, Francis Creek, and Kanab Creek. Major population centers include Lake Havasu City, Kingman, and Bullhead City, with about 23% of the county's population residing in rural areas and largely dependent on private wells.

Water management within the county is influenced by land ownership (70% federal, 17% private, 6.5% Tribal, and 6.5% state) and the actions of various water using entities, including the autonomous systems of land and water management of the Kaibab Paiute, Hualapai, and Fort Mojave Tribal communities.



Land ownership in Mohave County (Arizona State Land Department 2020).

Frequently Asked Questions

Where Does Mohave County's Water Come From?

Water supplies in Mohave County are mostly sourced from groundwater (61%) and surface water (about 38%), with reuse water accounting for the remaining supply (about 2%).

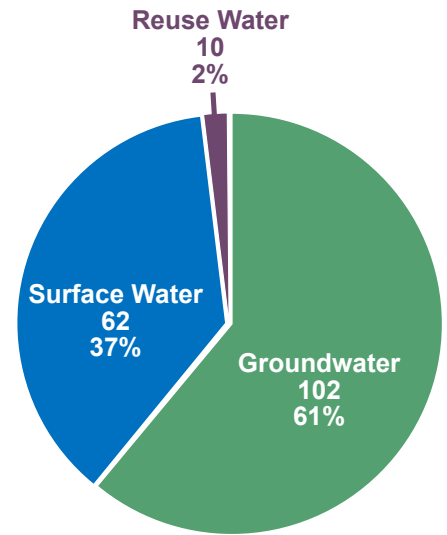
Groundwater

Groundwater is withdrawn come from 13 different groundwater basins. Withdrawals are largely unregulated.

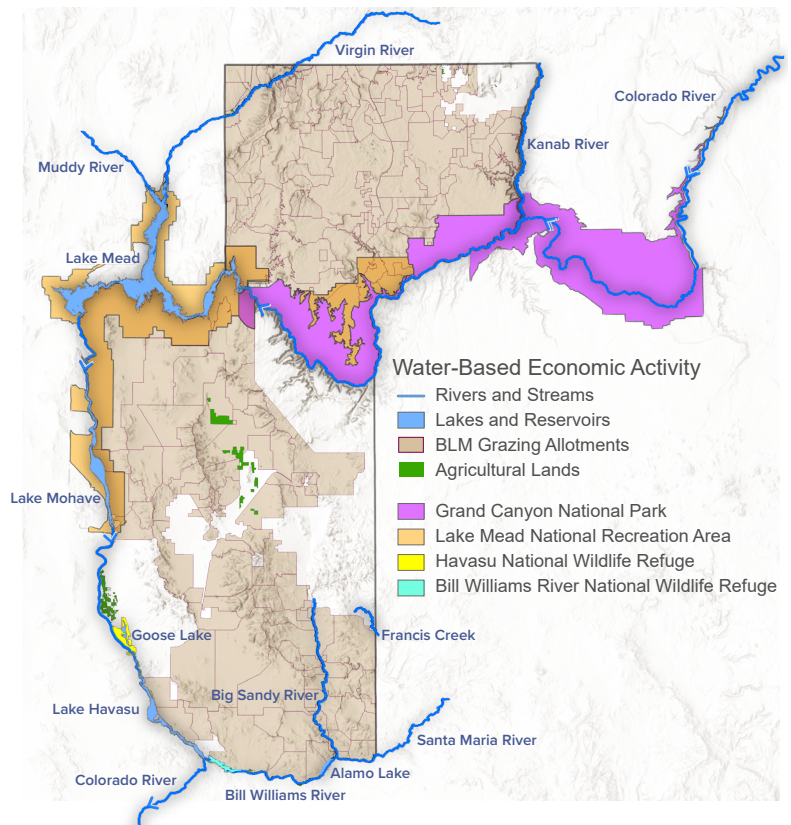
- Groundwater use in Arizona is governed by a doctrine of beneficial use as defined by the Arizona Supreme Court.
- The **1980 Arizona Groundwater Management Act (GMA)** introduced regulation and conservation measures through the creation of **Active Management Areas (AMAs)** and **Irrigation Non-expansion Areas (INAs)**, in parts of the state with a history of heavy reliance on mined groundwater. **There are no AMAs in Mohave County.**

- In December of 2022 the **Hualapai Valley Irrigation Non-Expansion Area (INA)** was created by ADWR, the first new INA in 40 years. The INA was established to address steep declines in available groundwater due to rapid expansion of irrigated agricultural lands and corresponding groundwater pumping. The INA is meant to protect current farms and existing communities by prohibiting new irrigated acreage within the established boundaries and requiring irrigators who pump groundwater at a rate greater than 35 gallons per minute to report their water use
- The **Adequate Water Supply (AWS) Program**, introduced with the passage of the GMA, requires a determination that enough water, of acceptable quality, will be legally and continuously available for 100 years. A disclosure of the water adequacy determination must be provided before land may be subdivided into more than five lots, and potential buyers of subdivided lots must be informed of the result.

In Mohave County, 11 water companies, districts, and cities have a Designation of Adequate Water Supplies, including City of Kingman, Lake Havasu City, Bullhead City, Joshua Valley Utility Company, and Havasu Heights Domestic Water Improvement District.



Sources (Million Gallons/Day) for Mohave County's water (USGS 2015).



Water-based economic activity in Mohave County (NHD 2022, BLM 2022, NLCD 2011, LILP 2022)

Surface Water

Most surface water in Mohave County comes from the Colorado River, which is the only source of water for communities located adjacent to the river.

- Colorado River water is managed by the Bureau of Reclamation and ADWR through Colorado River entitlements. Entitlement holders maintain their own conservation plans, ordinances, and resolutions to govern their Colorado River water use.
- Entitlement holders in Mohave County include: the Fort Mojave Indian Tribe, Bullhead City, Lake Havasu City, Mohave Valley Irrigation and Drainage District, Golden Shores Water Conservation District, Mohave County Water Authority, and EPCOR Water.

Reuse Water

Also known as reclaimed or recycled water, reuse water is a valuable resource that is being put to beneficial use in many communities within Mohave County. Reuse water can help to replace Colorado River water for purposes such as irrigation for public parks, golf courses, and residential areas, which lessens the county's reliance on Colorado River water.

Reuse water is also used for groundwater recharge, which can help boost municipal water supplies for longterm sustainability.

Replenishing groundwater with reuse water through direct injection wells could supplement the City of Kingman's municipal supplies by approximately 22% (1.6 MGal/day) based on current water demand.

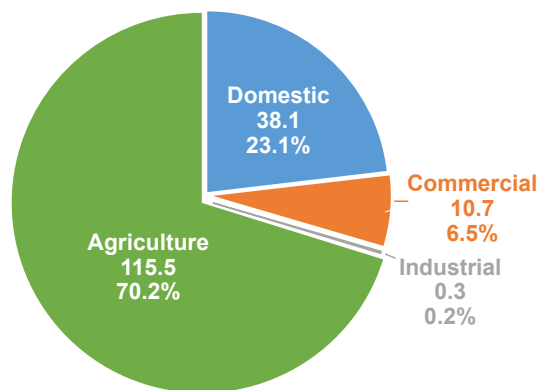
How Is Water Used in Mohave County?

About 70% of water use in Mohave County is directed to agricultural uses, with municipal use – including domestic and commercial uses – accounting for about 30%. Water used for industrial processes, including mining and power generation, makes up the remaining portion.

Both groundwater and surface water are used for agricultural irrigation within Mohave County.

- From 2010-2015, agricultural irrigation increased surface water use in the county by 14% and groundwater use by 178%, mainly within the Hualapai Valley Basin. During that same period, there was an increase of 80% in irrigated agricultural acreage.
- Mohave County is a significant producer of alfalfa hay, ranking in the top 5% of counties nationally in terms of its production. Other top agricultural commodities produced within the county include cotton, cattle and livestock, along with fruit and nut trees. Overall, approximately 9% of county land is farmed, and agriculture accounts for less than 1% of the County's GDP.

Outdoor water recreation and associated services are the top economic industries. Mohave County provides public access to several large reservoirs along the Colorado River, including Lake Mead, Lake Mohave, and Lake Havasu. Lake Mead National Recreation Area was the 5th most visited national park in the country in 2021, with 7.6 million visitors.



Water use (Million Gallons/Day) in Mohave County (USGS 2015).

Water drives tourism in Mohave County. An estimated \$710 million dollars is generated annually from recreation on or along rivers, lakes, and streams.

What Water Challenges Does Mohave County Face?

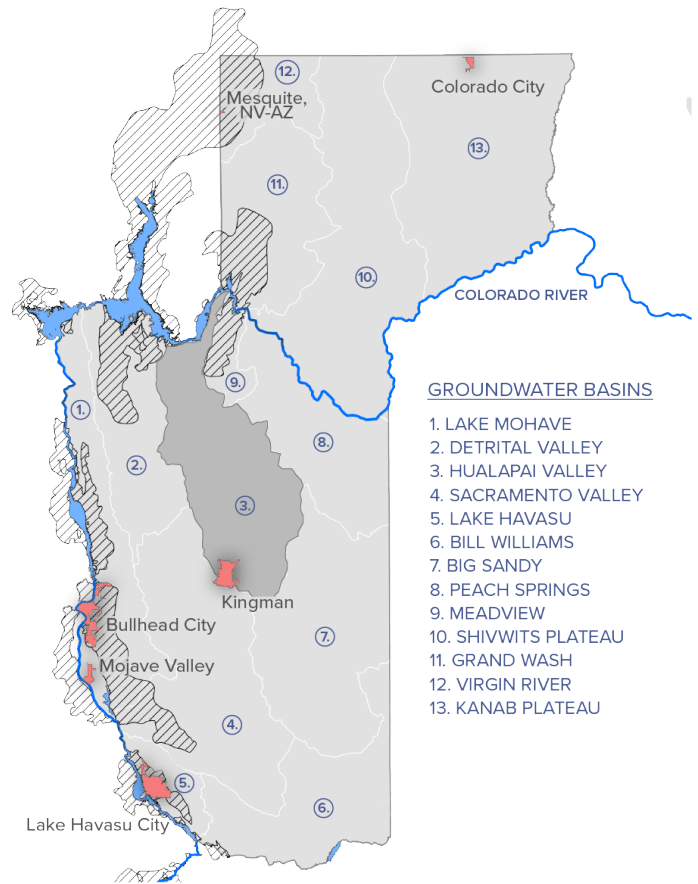
Water Quantity Challenges

Most local groundwater is so-called “fossil water” because it percolated into the ground many thousands of years ago. It is considered nonrenewable since it is not replenished by nature; once that water is pumped and used, it is essentially gone forever.

- The Hualapai Valley groundwater basin in Mohave County stores vast quantities of fossil groundwater, which may be used strategically for the long-term sustainability of the region.
- However, a recent U.S. Geological Survey (USGS) study indicated the City of Kingman has about 100 years of available groundwater left at current consumption rates. If consumption increases, that period could dwindle to 50 years.

Communities located adjacent to the Colorado River are reliant on the river as their only source of water. Decision-making and shortages on the over-allocated Colorado River, as well as the water demand of central Arizona, directly impact Mohave County in multiple ways:

- Arizona's **Drought Contingency Plan (DCP)** came together in 2019 to forestall catastrophic shortages of Colorado River water and mitigate impacts to use.
- In the 1990s, the U.S. Bureau of Reclamation and the USGS developed an **accounting surface method** that defines boundaries of a River Aquifer that directly supports the flow of the lower Colorado River. Wells within these boundaries are considered to be pumping from the Colorado River and thus require an entitlement for diversion of water from the river. The Aquifer boundaries are underground and extend outward from any free-flowing portion of the Colorado River or Reservoir until encountering a geologic barrier.
- Because of their location, within the accounting surface boundaries of the Colorado River, entitlement holders like Lake Havasu City and Bullhead City are unable to store unused Colorado River water or growing supplies of reuse water. This limitation greatly impairs the county's ability to plan for its long-term sustainability and growth based on vital water resources.



Groundwater Basins, Urban Areas, and Colorado River Aquifer/Accounting Surface Boundaries

- Lakes and Reservoirs
- Urban Areas
- Groundwater Basin
- Hualapai Valley Irrigation Non-Expansion Area (INA)
- *Area of River Aquifer around Colorado River + Reservoirs

*Accounting Service boundary where no reuse water may be stored nor groundwater pumped

Groundwater basins, urban areas, and Colorado River Aquifer Boundaries (ADWR 2022, US Census Bureau 2020, USGS 2008).

Federal legislation signed in 2023 will grant the Colorado River Indian Tribes (CRIT) full leasing authority over their Colorado River water entitlements. CRIT will now be able to realize the full value of their entitlements while continuing to support Tribal agriculture and riparian habitat.

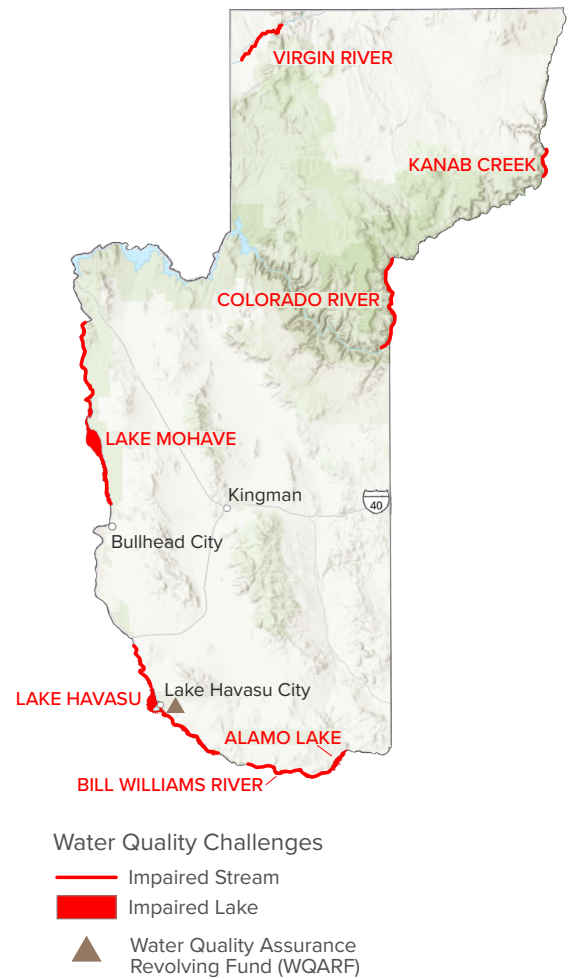
Water Quality Challenges

Groundwater Contamination. There are currently two Water Quality Assurance Revolving Fund (WQARF) registry sites in Lake Havasu City. These sites are associated with industrial facilities and currently pose public and environmental health risks due to hazardous substances found in nearby groundwater. One site was found to have groundwater contamination from volatile industrial solvents (PCE and TCE). The second site was also found to exceed allowable levels of PCE and TCE, as well as with nitrate and chromium. These sites have current or planned investigation and cleanup governed by ADEQ.

Surface Water Pollution. The ADEQ monitors surface water impairment. Impaired waters are rivers, streams, and lakes that fail to meet standards for the waterbody's designated use. Designated uses, as defined by the U.S. Environmental Protection Agency (EPA) and adopted by the ADEQ, establish safety thresholds for contaminants. Within Mohave County, the Virgin River, Kanab Creek, and Colorado River are classified as impaired. Selenium and E. coli, along with high suspended sediment concentrations, have been found. Additionally, Lake Mohave and Lake Havasu are considered impaired by selenium and Alamo Lake by mercury and ammonia-nitrogen.

Colorado River. The Colorado River is a large, highly regulated, water system that supports communities through the delivery of water entitlements and provides water and habitat for riparian networks throughout its river system. Designated uses for the Colorado River include: agriculture (irrigation and livestock watering), full- and partial-body-contact recreation, domestic water supply, fish consumption, and aquatic life and wildlife. Several tributaries contribute to water quality impairments on the river due to pollution runoff, invasive species, and land development. Over the last 20-30 years, water quality impairments of the Colorado River have included: elevated levels of heavy metals, Koi virus outbreaks, invasive aquatic organism development - including algae blooms - and surfactant foaming events.

Emerging Contaminants. Emerging contaminants, such as per- and polyfluoroalkyl substances (PFAS), are found throughout Arizona and may adversely affect human health and/or the environment. They include ingredients in everyday products like packaged foods, clothing and carpet cleaners, personal care products, pharmaceuticals, along with other automotive, construction, and electronics products. U.S. EPA has set legally enforceable limits on some PFAS and customers must now be informed if they are detected in their water supply. Water systems are responsible for monitoring and finding ways to limit or eliminate exposure.



For 30 years, the Pacific Gas and Electric Company (PG&E) used hexavalent chromium in its waste management processes near Topock, which resulted in contamination to both soil and groundwater.

Remediation began in 2018 and is expected to take 30 years to complete. No immediate threat to human health has been identified in Arizona, but ADEQ continues to assess potential threats to the Colorado River and groundwater.

The remediation process has been a model for effective collaboration with the participation of 12 federal, state, and Tribal agencies.

How Is Mohave County Moving Toward Sustainable Water Management?

As water resources in the state become more strained, people continue to study ways to stretch or increase supplies.

Water Reuse: Reuse water is being put to beneficial use within Mohave County. Groundwater recharge projects are in place in Kingman using constructed recharge basins and direct groundwater injection wells. In Bullhead City, reuse water from its wastewater treatment plant is pumped into the Colorado River's groundwater zone (subflow) through two injection wells. Lake Havasu City recharges reuse water to basins near Lake Havasu and also mounds reuse water in underground wells that can be extracted independent of the City's federal allocation of Colorado River water.

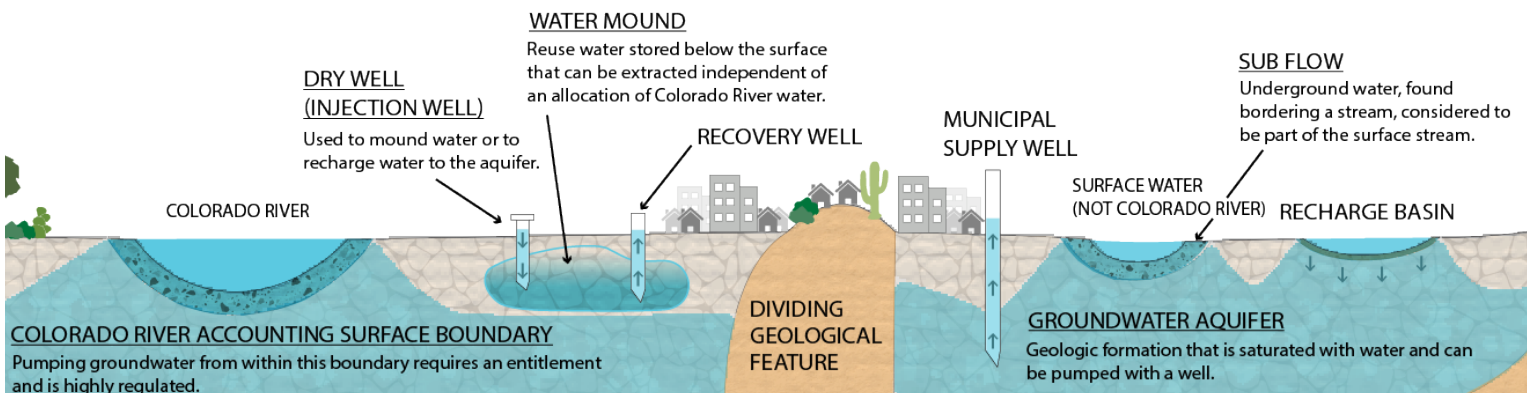
Water Conservation: Mohave County is a leader in expanding the use of reuse water to replace the use of potable water for irrigation.

In Arizona, the biggest use of municipal water is for outdoor irrigation. Communities in Mohave County encourage limiting or removing turf in favor of artificial turf or xeriscape, even offering turf removal rebates. Other efforts include home water audits and irrigation efficiency tips.

Additionally, both Lake Havasu City and Bullhead City have recently updated their water conservation plans to improve public awareness.

Lake Havasu City has used constructed basins for groundwater recharge since 1967. It is estimated that 20-25% of the city's total water allocation (650,000-700,000 acre feet) has been recharged in the last 56 years!

Science-based Decision Making: In 2011, a report completed by USGS, ADWR, and others, provided Mohave County with the information to support a broader understanding of their **groundwater budget** and began considering options to prolong their groundwater supplies. A second report, released in 2020 by USGS, aimed to better understand **properties of the Hualapai Basin** including water flows and depths. These reports contain critical data used to support the establishment of the Hualapai Valley INA, including the data-supported conclusion that four times more water was being pumped out of the aquifer than was going back in each year (44,000-acre feet pumped vs. 10,000-acre-feet recharged). Rapidly declining groundwater poses a threat to public health and a safe supply of groundwater for over 70,000 rural Arizonans.

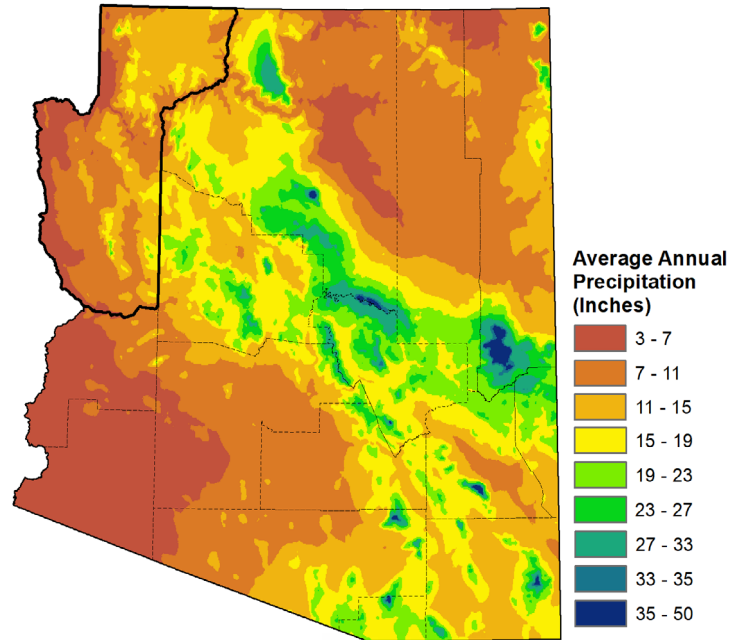


Representation of regulatory limitations for communities seeking to manage groundwater supplies near the Colorado River (WRRC 2023).

What Does Mohave County's Future Water Situation Look Like?

The state of Arizona has been experiencing drought conditions for over 20 years. The hotter and drier future predicted by climate models means increased pressure on county water resources. Drought and climate change pose significant risks to Mohave County, including:

- Unpredictable weather patterns, warmer overnight lows in both summer and winter, a longer monsoon, periods of extremely dry air, and more severe storms and flooding.
- Little forage available for local wildlife and livestock, stressed vegetation and brown hillsides, increased fire risk, and nearly dry stock ponds and creeks.
- Significant declines in the water levels of both Lakes Powell and Mead, with critical implications for Mohave County and the water related recreation that plays an important role in the local and state economy.
- Lowered water tables and long-term effects on groundwater supplies and water flow between surface waterbodies such as streams, lakes, and rivers.



Mean Precipitation 1981-2010 (PRISM Climate Group 2016).

The Lower Colorado River Multi-Species Conservation Program is a cooperative effort among public, private, and Tribal partners that works to restore endangered species along the Lower Colorado River. Their habitat-based approach has created or restored over 4,400 acres of habitat within Arizona for endangered species.

Drought Planning. Despite uncertainty about future rainfall, runoff and snow pack further upstream in the headwaters of the Colorado River, local **drought plans** can define responses to these changing conditions. While drought planning and comprehensive planning throughout the county is critical, proximity to the highly regulated Colorado River limits the ability of local government to employ some innovative water management and planning mechanisms.

Public Education and Awareness. Projected annual population growth within Mohave County (1.4% each year until 2030) is expected to outpace growth within

the state (1.2%) as a whole. As Arizona continues to attract residents relocating from wetter parts of the country, generating public awareness of regional water issues and shaping expectations of desert landscapes is important to ensure continued and improved conservation of municipal water resources.

New Management Areas. Along with the establishment of the Hualapai Valley INA in 2022, a proposal for "Local Groundwater Stewardship Areas" has also gained support. This new type of management area would be created through a petition by 10% of residents in a groundwater basin or through a local county board of supervisors. A local advisory council would develop the area's management goal and develop a plan to meet the goal that would be to be approved by ADWR. This concept represents an opportunity for locally managed and state supported groundwater regulation in areas outside of AMAs.

Additional Resources

The WRRC has compiled and periodically updates a list of additional resources related to water in Arizona. These resources range from statewide information from ADWR to information available from local watershed groups and non-profits. Visit the **WRRC website** to see the complete list. The resources used for this factsheet are provided below.

WRRC Water Map

A reliable and concise visual representation of Arizona's water resources. This map includes information on land ownership, water use by groundwater basin, annual precipitation by planning area, subsidence and groundwater storage, annual water use by region, supply and demand, Colorado River apportionment, and more.

Map Info

Statewide Water Resources

- **ADEQ Emerging Contaminants Report:** An assessment of the emerging contaminants in Arizona's water supplies.
- **ADEQ Impaired Water Information:** Maps and information about the impaired surface waters in the state.
- **ADEQ WQARF Registry:** A list of WQARF sites across the state with descriptions of the individual sites.
- **ADWR Community Water System Map:** A map of water providers and their service areas.
- **Adequate Water Supply Program:** Information on AWS program as part of the 1980 Groundwater Management Act.
- **AZ State Maps:** A state population density map with county boundaries.
- **Cooperative Extension Save Water:** Information on water saving techniques for Arizona relating to irrigation, gray water, and rainwater harvesting.
- **Desert Water Harvesting Initiative:** A website with resources for local water harvesting and Green Infrastructure
- **PRISM Database:** Data on historic and current climate patterns, used for the precipitation map of Arizona.
- **USGS Ground Water Atlas of the United States:** Groundwater and aquifer basics and in-depth publications about aquifers throughout the US.
- **Tribal Water Rights:** Information Tribal water usage in the Colorado River basin and the barriers to that usage.

Regional Management and Planning

- **Accounting Surface Along the Lower Colorado River:** USGS report that defines the Accounting Surface boundaries and Colorado River Aquifer.
- **Audubon Arizona:** Economic Impact of Arizona's rivers, lakes, and streams on statewide and local economies.
- **Colorado River Management:** Information on regulations and allocations of Colorado River Water from ADWR.
- **Colorado River StoryMap:** Lincoln Institute of Land Policy resources and data on the Colorado River.
- **Drought Contingency Plan (DCP):** Collaborative agreement designed to protect the Colorado River system.
- **Irrigation Non-Expansion Areas (INAs):** Information on groundwater regulation and management of INAs.
- **Lower Colorado River Multi-Species Conservation Program:** U.S. Bureau of Reclamation led effort to balance use of Colorado River water resources with the conservation of native species and their habitat.
- **Lower Colorado Watershed Management Plan:** Collaborative plan to improve and protect water quality in the Lower Colorado River from various pollutant sources
- **Water for Arizona:** A multi-stakeholder coalition focused on securing sustainable water supplies for the state.

County Specific Water Resources

- **Arizona County Agricultural Economy Profiles:** County profiles highlighting agricultural production, water use, and regional economic data from UA Cooperative Extension.
- **Bullhead City Water Conservation Plan:** Summary of water conservation goals and strategies in Bullhead City.
- **Groundwater-Level Declines in the Hualapai Valley, Northwestern Arizona:** 2020 USGS report modeling groundwater level decline in the Hualapai basin.
- **Hualapai Valley INA:** Details and boundaries of the newly established Hualapai Valley INA from ADWR.
- **Lake Havasu City Water Conservation Plan:** Outline of water sources, uses, and activities related to water reuse and conservation within Lake Havasu City.

TRIF Initiative

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**GREATER DEPTH, BROADER PERSPECTIVE
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We tackle key water policy and management issues, empower informed decision-making, and enrich understanding through engagement, education, and applied research.