



ARIZONA WATER FACTSHEET

Pima County

Get to know water in your county

Extended Version - August 2022



THE UNIVERSITY OF ARIZONA
COOPERATIVE EXTENSION

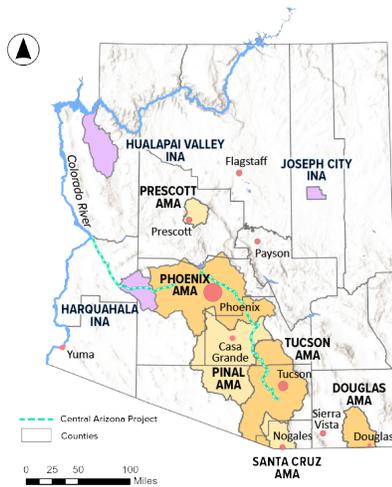
WATER RESOURCES RESEARCH CENTER

wrrc.arizona.edu/arizona-water-factsheets

Water in Arizona

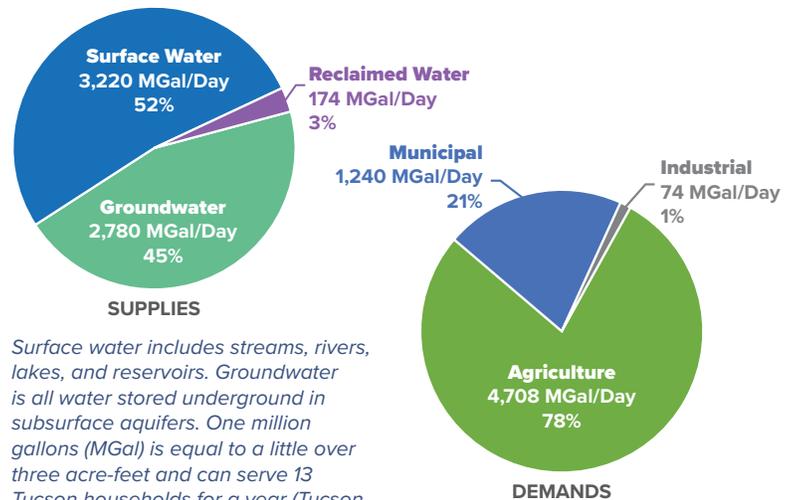
Arizona’s future depends on sustainable water supplies, which in turn depend on vigilant and innovative management of those supplies. From low deserts to high mountains, counties and communities face different water challenges and take different approaches to addressing those challenges, while conforming 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



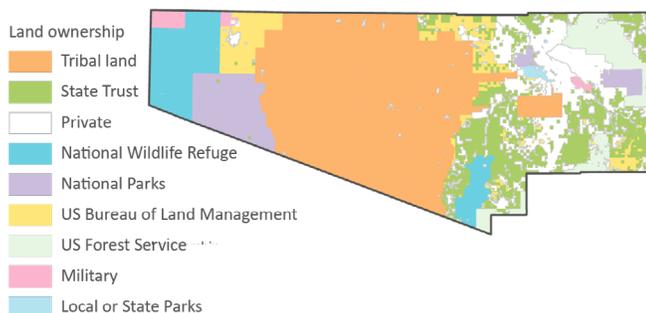
County and AMA boundaries (WRRC 2021).

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 and can serve 13 Tucson households for a year (Tucson Water 2018, USGS 2015).

Water in Pima County



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

Pima County lies at an ecological crossroad where plants and animals from the neo-tropics meet the Sonoran Desert and Rocky Mountains. Covering much of the county, the Sonoran Desert is the wettest, hottest, and most biodiverse desert in North America. On average, Arizona receives 3-40 inches of precipitation per year, with Pima County averaging 13 inches. The summer and winter rainy seasons are vital to this region. Water is life in the desert, and Pima County contains many naturally flowing

Pima County is one of the oldest continuously inhabited areas of the United States, supporting agrarian communities along treasured desert rivers for many millennia.

streams and springs. While most watercourses flow only when it rains, segments of the Santa Cruz and San Pedro Rivers flow year-round. Water use and management are prominent in the more populous eastern side of Pima County, where privately or locally owned lands are concentrated. In central and western Pima County, Tribal and Federal lands predominate (Tribal 42%, Federal 19%, State Trust 15%, private 14%).

Frequently Asked Questions

Where Does Pima County's Water Come From?

Groundwater

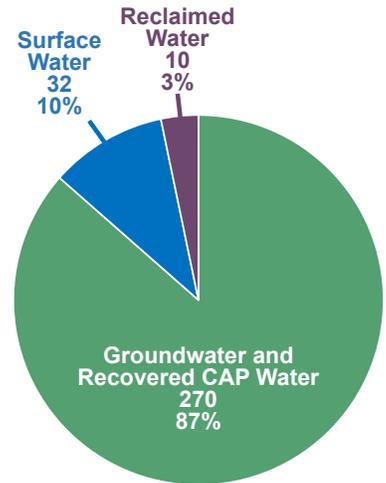
The primary source of water in Pima County is groundwater. Most local groundwater is so-called "fossil water" that percolated into the ground many thousands of years ago and is considered nonrenewable because it is not replenished by nature. The Central Arizona Project (CAP) supplies Colorado River water to Pima County, which is then artificially recharged to the local aquifer.

Pima County's natural watercourses ultimately are linked to the Colorado River. Major watersheds in the county include the Santa Cruz River, Lower San Pedro River, and Lower Gila River Watersheds.

Central Arizona Project (CAP)

Colorado River water delivered via CAP is the primary source of municipal drinking water in Pima County.

- CAP water is transported 336 miles from the Colorado River across central Arizona to supply Maricopa, Pinal, and Pima Counties. CAP is recharged to the aquifer where it blends with native groundwater. The blended water can be pumped out by local wells for delivery to customers.
- Renewable water supplies from CAP are also stored in underground aquifers to prepare for future water demands.



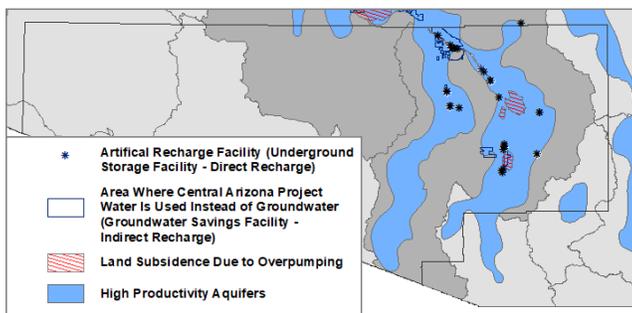
Sources (Million Gallons/Day) for Pima County's water (USGS 2015). **Note:** USGS categorizes stored CAP water as groundwater, because it is withdrawn for use from the aquifers after storage.

Active Management Areas (AMAs)

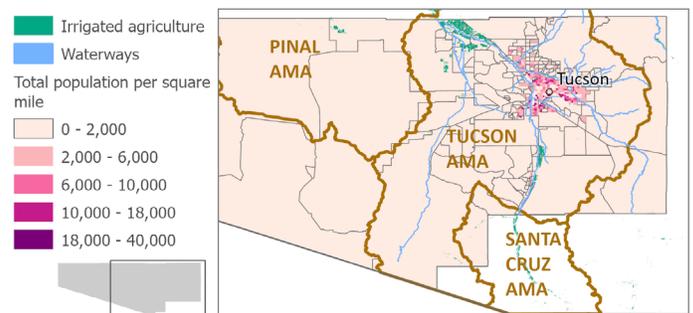
Pima County includes parts of the Tucson, Pinal, and Santa Cruz AMAs.

- ADWR regulates groundwater use within Active Management Areas (AMAs). Most water users in Pima County live within the Tucson AMA, so AMA rules often also serve as a substitute for broader management in the county.
- The **Tucson AMA's** management goal is safe yield by 2025. To achieve safe yield, groundwater recharge should balance groundwater pumping within the AMA.
- The **Pinal AMA's** goal is to maintain the agricultural economy while working to preserve groundwater for future non-irrigation uses. The **Santa Cruz AMA's** goal is to maintain safe yield and prevent water tables from experiencing long-term declines.
- Within the AMAs, the Assured Water Supply program requires new subdivisions to demonstrate in advance of development that a 100-year supply of good quality water is continuously and legally available.

After years of groundwater dependence and overdraft, local groundwater levels started rising in 1999 following the introduction of CAP water. In some areas, groundwater levels have risen between 60-200 feet due to the recharge and use of CAP water.



Recharge and subsidence in Pima County (ADWR 2022).

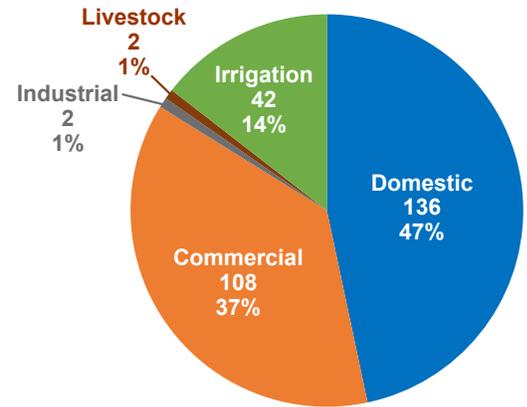


Population density and agricultural lands in Pima County and Tucson AMA (US Census Bureau 2020, USDA 2011).

How Is Water Used in Pima County?

Despite nearly doubling in population, Tucson, the largest city in the Pima County, uses the same amount of water that it did in the 1990s.

- In the mid-1980s, agriculture and municipalities in the Tucson AMA used roughly equal amounts of water. In Pima County as a whole, the ratio has changed over time. By 2015, irrigation accounted for only 14% of water use, while domestic and commercial use accounted for 84%.
- Land and energy use decisions such as the water efficiency of industrial users and growth patterns impact regional water conditions.
- Artificial recharge of groundwater is vital to the region and occurs in two ways in Pima County: 1) in natural streams and 2) in constructed basins. In-stream recharge provides additional benefits for plants, animals, and humans.
- Tucson Water and Pima County recharge reclaimed water in the Santa Cruz River at three locations, restoring flow to the river. The San Xavier District's Arroyos Project, implemented with federal support in 2008, accomplishes the District's CAP water use goals in an environmentally friendly way while restoring the aquifer.
- Water management in Pima County includes providing, protecting, and restoring water to natural areas and the environment to boost tourism, property values, economic vitality, and quality-of-life benefits for residents.



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

What Water Challenges Does Pima County Face?

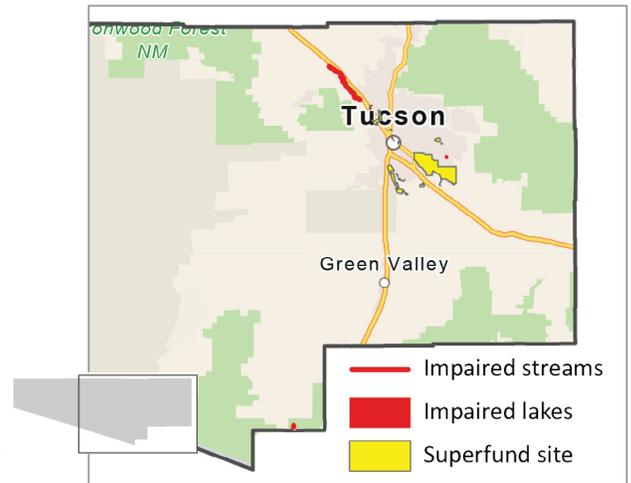
Water Quantity Challenges

- The Tucson AMA has been at or around safe-yield since 2010. However, some areas are still seeing groundwater levels fall. Outside of major metro areas where the largest water providers are located, much of the county is groundwater dependent. Rural areas rely primarily on private wells.
- Historic overdraft (pumping more water from an aquifer than is recharged) has caused some areas of land subsidence, where sinking ground level can cause damage to infrastructure.
- The location of groundwater water pumping may be different from where it is being recharged. This 'hydrologic disconnect' affects where groundwater is actually available.
- Many private wells are tapping shallow groundwater that also support riparian habitat. With climate change and increased water use, this water will likely be depleted, impacting both human and environmental water uses.
- For decades, the Colorado River has been over-allocated (users were promised more water than flows in the river) and persistent drought is reducing flow. Although a Colorado River shortage was declared in 2022, the cuts to CAP primarily impact the agricultural sector. Water providers in Pima County have prepared for future CAP water reductions by storing CAP water in regional aquifers.

Up to 31% of water used in Tucson homes can be reused as graywater to irrigate plants and trees. Washing machines are usually the easiest source of gray water. The City of Tucson offers rebates for gray water systems.

Water Quality Challenges

- **Superfund Sites.** The Tucson International Airport is the only Superfund site in Pima County, containing seven project areas. A Superfund site is a federally designated area contaminated by toxic materials. The current contaminants of concern in groundwater at this site include trichloroethene (TCE), dichloroethane (DCE), chloroform, chromium, 1,4 dioxane, PFOS, and PFOA compounds.
- **Groundwater Contamination.** Pima County contains eight Water Quality Assurance Revolving Fund (WQARF) Registry sites undergoing or scheduled for groundwater remediation. These sites are associated with landfills or industry, and often involve **chlorinated solvents**, substances used in degreasers, paint strippers, and dry cleaning. The cleanup is governed by ADEQ.
- **Surface Water Pollution.** Impaired waters are rivers, streams, and lakes that do not attain federal Clean Water Act or Arizona water quality standards. Some portions of the Santa Cruz River in Pima County are considered impaired because they do not meet the standards for their designated water uses, such as for wildlife, recreation, and public water supply. ADEQ monitors surface water impairment.
- **Emerging Contaminants.** Contaminants of emerging concern (CECs), such as per- and polyfluoroalkyl substances (PFAS), have been found in several wells in Pima County and throughout Arizona. CECs include ingredients found in pharmaceuticals, household items, and personal care products, and may cause human and environmental harm. Among CECs are PFAS, a group of man-made chemicals that have anti-stick properties and have been used since the 1940s. When these chemicals migrate into the soil, they do not break down but persist and can impact water supplies. Most CECs have not yet been federally defined or regulated.
- **Watershed Health.** Arizona's native fish have managed to survive drought and flash floods while inhabiting all forms of waterways, including streams, springs, ponds, and lakes. However, native fish species have been in sharp decline since 1940 due to introduction of non-native fish, alteration of aquatic habitat, and loss of water.



Impaired streams, lakes, and Superfund sites (ADEQ 2020).

By the early 1900s, the Santa Cruz River had lost all native fish species. Due to efforts to improve water quality and increase streamflow, two native fish species have been reintroduced to the river!

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

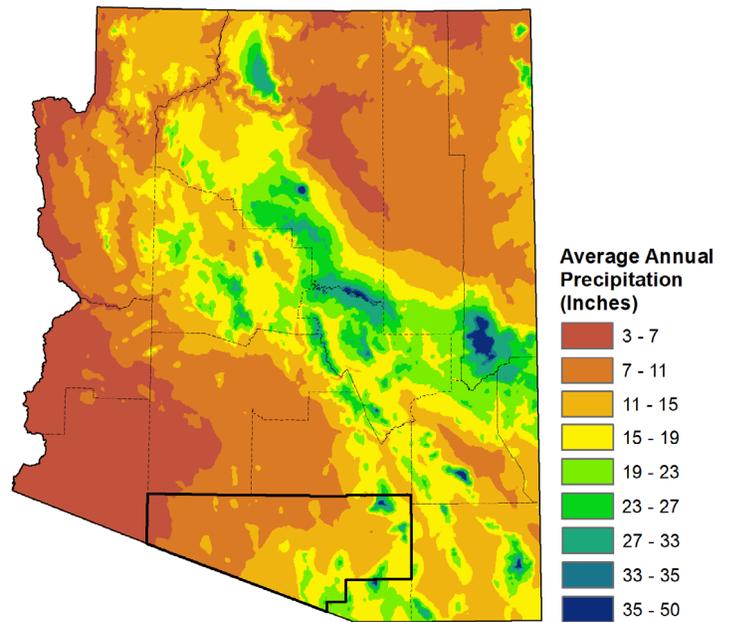
Because the region expected to be disproportionately impacted by climate change, Pima County's water supplies, communities, and ecosystems are likely to be hit harder and faster than elsewhere around the country.

- As temperatures rise and cities expand, Pima County will see more extreme heat days (which increase water demand), and a stronger urban heat island effect, raising heat stress unless countermeasures are taken.
- With the increased heat from climate change, evapotranspiration (water vaporized from soil and plants) is expected to rise. After 20-plus years of drought, the accumulated soil moisture deficit prolongs drought conditions, putting the county's water resources at risk.
- Local drought impacts have been recorded since 1998 in Pima County, adversely affecting the natural environment, creeks, and well owners in shallow groundwater areas. Severe drought and heat will also affect springs and upland groundwater-dependent streamflow. These impacts will likely increase

groundwater pumping where access to surface water supplies is diminished.

- The growing number, size, and intensity of wildfires can lead to increased sediment discharge, flooding, and water quality challenges.
- Using highly treated effluent to support multiple benefits, such as wildlife habitat, while recharging the aquifer is an example of successful water management in the present that will continue in the future.

The **Drought Contingency Plan (DCP)** is a multi-state agreement on actions to forestall catastrophic shortages on the Colorado River. Under the DCP, low water levels in Lake Mead have triggered reduced CAP deliveries to agricultural users in Pinal, Maricopa, and Pima Counties.



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

How Is Pima County Moving Toward Sustainable Water Management?

Living in a desert city has not only prompted water conservation but innovation. Tucson's groundwater recharge and recovery is essential for providing reliable water supplies using renewable CAP supplies.

CAP Recharge. CAP water has been replacing groundwater use since the 1990s. CAP and recycled water has been stored in aquifers for future use.

Water Reuse. Reclaimed water use has increased four-fold in the Tucson AMA since 1985. Reclaimed water uses include recharge, landscape irrigation, and restoring aquatic and riparian habitat. Using reclaimed water for landscape irrigation is common, from large turf areas on school grounds to parks and golf courses.

Rainwater Harvesting. Urban landscaping with harvested rainwater (rain that is collected and directed to specific uses) can increase shade and reduce urban heat island effects while reducing the use of potable water. Stormwater management through green infrastructure projects creates natural irrigation, flood attenuation, improved stormwater quality, and other benefits.

Integrated Land and Water Planning. Communities can affect long-term water conservation through building codes, landscaping ordinances, and other strategies, such as the City of Tucson's rainwater rebate program and green stormwater infrastructure program.

Regional Coordination. Governments and NGOs throughout the region share water knowledge to ensure comprehensive and efficient land and water use management that sustains healthy urban watersheds with flowing rivers and streams.

Community Health and Environmental Values. Pima County jurisdictions have adopted public health goals that include equitable access to clean and reliable sources of water.

Efficiency. The agricultural industry continues to increase irrigation efficiency. The residential sector has also reduced indoor and outdoor water use through efficiency gains, bolstered in part by City of Tucson's rebate program to install high-efficiency toilets and appliances as well as rainwater harvesting systems.

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.
- **ADEQ Superfund Sites:** An overview of Superfund sites and descriptions of the sites located in Arizona.
- **ADWR Community Water System Map:** A map of water providers and their service areas.
- **AZ State Maps:** A state population density map with county boundaries, used for the population density map of Maricopa County.
- **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

- **Active Management Areas:** Information about groundwater regulation in Arizona and the management of AMAs.
- **CAP:** Background information on the Central Arizona Project.
- **Drought Contingency Plan (DCP):** An overview of the Drought Contingency Plan and its implications for Arizona water users.
- **Altar Valley Conservation Alliance:** A non-profit working to conserve, promote, and sustain healthy working landscapes through water conservation efforts among other initiatives.

County Specific Water Resources

- **Nonpoint Education for Municipal Officials:** Watershed based plan for water quality improvement.
- **PAG Resources:** Various data resources and interactive maps from Pima Association of Governments.
- **PAG Areawide Water Quality Management Plan:** Water quality inventories and wastewater facility interactive map.
- **Pima County Comprehensive Plan:** Pima Prospers is the update to the long-range county plan.
- **Pima County Drought Response Plan:** Information about Pima County's drought response planning.
- **Pima County Living River Report:** The 2020 report on Santa Cruz River conditions.
- **Sonoran Desert Conservation Plan:** Pima County's plan to conserve natural resources.
- **Santa Cruz Watershed Collaborative:** Watershed stakeholders partnering on collective goals and priorities for healthy waterways and people in Tucson.
- **SAWUA:** Legislative briefings, water priorities, and bulletins from the Southern Arizona Water Users Association.

TRIF Initiative

Preparation of this Factsheet was funded in part by the **Technology Research Initiative Fund/Water, Environmental and Energy Solutions Initiative** administered by the University of Arizona Office for Research, Innovation and Impact, funded under Proposition 301, the Arizona Sales Tax for Education Act, in 2000.



THE UNIVERSITY OF ARIZONA
COOPERATIVE EXTENSION

**WATER RESOURCES
RESEARCH CENTER**

wrrc.arizona.edu

GREATER DEPTH, BROADER PERSPECTIVE FOR A CLEAR WATER FUTURE

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