ARIZONA WATER CONSERVATION FACTSHEET

# Rural Industrial Water Conservation and Reuse

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THE UNIVERSITY OF ARIZONA
COOPERATIVE EXTENSION
WATER RESOURCES RESEARCH CENTER
wrrc.arizona.edu/conserve

## Background

### Turf Facilities, Mining, Power Generation, Cattle Feedlots, Dairies, and Data Centers

This fact sheet is intended for existing and new industrial facilities throughout the state of Arizona, including turf facilities, mining, power generation, cattle feedlots, dairies, data centers, and other industrial facilities (such as factories). It also provides information useful to regional, county, and local entities, such as municipalities and utilities, for influencing industrial water use.

The Arizona commercial, industrial, and institutional (CII) sector brings in billions of dollars and employs tens of thousands of Arizonans around the state. Alongside the benefits that these industries bring, there are also resource demands.

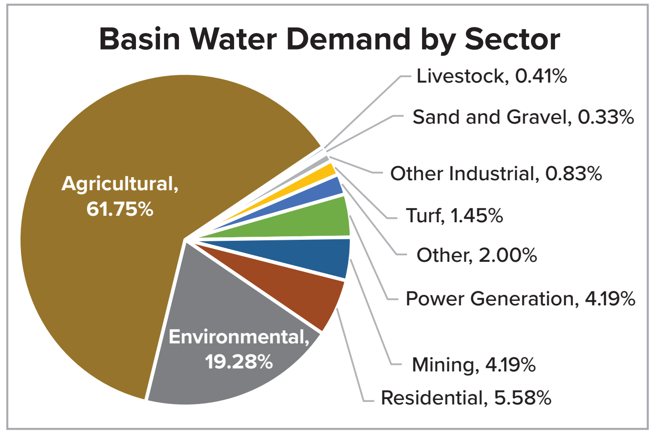


**Figure 1.** Basin water demand by subsector from the ADWR Supply and Demand Reports available through spring 2026 (35 out of 51 basins represented). Completion of the remaining reports is anticipated by the end of 2027.

The industrial sector, defined in this publication as turf facilities (parks, schools and golf courses), mining, power generation, cattle feedlots, dairy operations, and data centers, account for approximately 11% of the state's water demand (Figure 1). Mining and power generation are the largest industrial water users, each accounting for 37% of industrial water use.

Within **Active Management Areas (AMAs)***, the Arizona Department of Water Resources (ADWR) has set industrial conservation requirements to reduce groundwater withdrawals. Outside of AMAs, water conservation remains voluntary and typically follows best management practices. Large industrial water users can play a leading role in water conservation and efficiency by employing water saving strategies and building partnerships with municipalities and other industrial users to reclaim and reuse water.

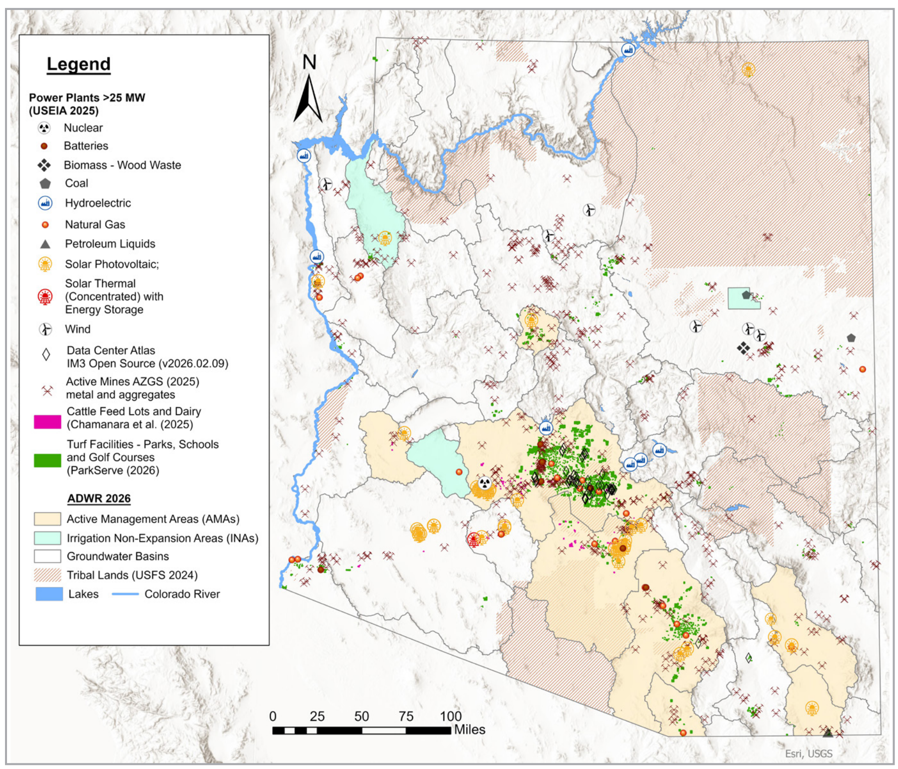


**Figure 2.** Map of AMAs and INAs[1] and industrial facilities throughout the state, including turf facilities,[2,3] feedlots, dairies,[4] power plants,[5] mines,[6] and data centers.[7]

### Where are Arizona's industrial water users?

Turf facilities, mines, power generation facilities, cattle feedlots, dairies, and data centers are located around the state, both inside and outside of AMAs where groundwater use is regulated (Figure 2). Industrial water demand varies across the state, with industrial water demand making up as little as 0% to as much as 67% of total water demand in groundwater basins.

For example, in Big Sandy Basin (Mohave and Yavapai County) and Morenci Basin (Greenlee County), mining makes up more than 50% of the basin-wide water demand. In Tonto Creek Basin (Payson, Gila County), Upper

*__Highlighted__ words are defined in the online resources section for this factsheet.*

Hassayampa Basin (Wickenburg, Yavapai County), and Prescott AMA (Prescott and Chino Valley, Yavapai County), turf facilities account for more than 12% of the basin-wide water demand, and in the Sacramento Valley (Mohave County), power generation accounts for 61% of the basin-wide water demand. Therefore, the opportunities for water conservation by industrial users will vary by basin.

**The tradeoff between water and energy**

**Some "water saving technologies", such as dry cooling for data centers, have the tradeoff of higher energy consumption. Total water use by an industry adopting these technologies may not be reduced if power comes from high-water-use generating facilities. Industry use of low-water-use power can reduce total water use; however, industries typically use power from the local grid and seldom have a choice of power generation sources.**

## Where to Look for Water Savings

Identifying where and how water is used by industrial water users can indicate where water may be saved. Lifetime water use can include both direct water use (i.e., the water that is used on-site for day-to-day operations) and indirect water use (i.e., the water that is used to manufacture materials, obtain fuel, or provide energy). Generally, direct water use has an impact on local water supplies while the impacts of indirect water use are felt elsewhere. Below is an overview of the major direct water uses by industry.

- **Turf Facilities:** Water is used for irrigation of turf and maintaining water features. The average golf course water use within AMAs was 4.1 acre-feet (AF) per acre in 2023.[15]
- **Mining:** Water is used throughout the mining process, including during ore processing, tailings management, dust suppression, and to cool equipment. Historically, producing copper averaged 5.5-62.3 gallons per pound.[16]
- **Power Generation:** Water use during power generation varies depending on the type of power generation (Figure 3). For example, one kilowatt-hour (kWh) of **thermoelectricity** consumes 0-2.1 liters (L) depending on the cooling method. Cooling towers that utilize **steam turbine cooling** average 2.1 L/kWh, whereas **dry cooling** only uses trace amounts of water directly.[10]
- **Cattle Feedlots and Dairy:** Water is used for consumption, dust suppression, and maintaining the facilities. The average annual feedlot and dairy water use per acre and water use per animal within Prescott and Phoenix AMAs in 2023 were 1.4 AF/acre and 0.03 AF/animal, with variations due to age and lactating status of the animal.[15]
- **Data Centers:** Water is primarily used in data centers for cooling. One report that looked at 30 data centers located in the U.S. found that water use by data centers ranged from 0.5-59.2 AF/acre.[15] Facilities in Arizona averaged 6.3 AF/acre.[15] It has been estimated that each 100-word search on large language models uses about half a liter or 0.13 gallons of water.[11]

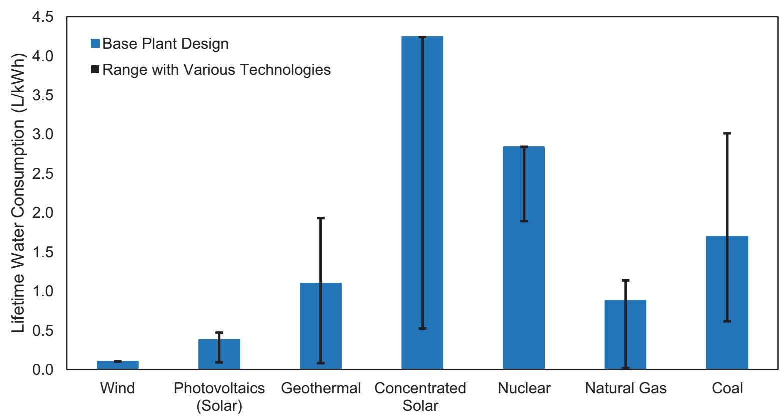


**Figure 3.** Lifetime water consumption of energy production including both the direct water use during operation and the indirect water use for materials and fuel.[12]

# Conservation and Efficiency Strategies

An individual industrial water user can reduce their water use by implementing a variety of water-saving and water reuse practices. Achieving water conservation and efficiency goals at a basin or regional level requires regional planning and cross-sectoral collaboration. Partnerships among entities with a stake in water sustainability can expand the range of available strategies.

Implementing water use and energy efficiency strategies may seem daunting; however, the long-term benefits are numerous. Reducing energy and water consumption can result in cost savings for these inputs that offset upfront investments. In addition, reducing consumption now leaves more resources available for the future.

The following strategies are pulled from case studies and projects around the continental United States.

## Water Saving Practices

Reducing water use is industry specific; however, some strategies may overlap. Performing a water audit can help pinpoint areas for improvement. The American Water Works Association (AWWA) has free water audit software available to help complete a water audit. Technical assistance is available statewide from multiple sources (see Getting Started section).

You can start by integrating water and energy efficient practices into operations and management:

- check regularly for broken water meters or broken water valves
- check for and eliminate leaks where possible
- reduce over-pumping
- avoid single-pass cooling or heating (see Resources link)
- flush nozzles and heads for cleaning
- use low-flow plumbing fixtures
- work on general system performance

Next, move into other water saving measures, such as:

- installing more advanced water efficient fixtures
- sub-metering areas with suspected leaks or malfunctioning equipment
- checking for electrical faults (they may lead to a system failure that increases water consumption)
- increasing cooling tower cycling with minimal chemical additives
- finding ways to re-use water from cooling systems

Water conservation requirements from AMAs can provide good initial goals and strategies for reducing water use.[13]

- **Sector Specific Conservation Requirements within AMAs:**
  - **Turf Facilities (> 10 acres):** Install low water use and drought tolerant plants where feasible and efficient irrigation systems. Minimize high-water use turf. Different categories of turf have specified maximum irrigation volumes. Maximum irrigation volume is calculated based on total acreage, land use category, and the AMA. Generally, allowable annual turf irrigation rates range between 3.37 to 6.034 acre-feet (AF) per acre.
  - **Metal Mining Facilities** (> 500 AF/year): Minimize the amount of water used in **tailings** transport (48-50% or greater solids content in the tailings). Maximize tailings water reuse, minimize evaporation, and minimize water use for dust control.
  - **Large-Scale Power Plants** (> 25 MW): Achieve a specified number of **cycles of concentration**. Pre-1985 steam facilities must achieve 7 or more cycles. Post-1984 steam facilities must achieve 15 or more cycles. For combustion turbine facilities, the required number of cycles of concentration is based on the quality of blowdown water.
  - **Large-Scale Cooling Facilitie**s (> 1,000 tons): Cycle cooling water until it reaches a specified concentration of silica (120 mg/L) or of total hardness (1,200 mg/L) before replacing with fresh water.
  - **New Large Industrial Users** (> 100 AF/year): New large industrial users must submit to ADWR a plan to improve the facility's water use efficiency.

## Reusing and Reclaiming Water On Site

After reducing water use, the next conservation step can be reusing or reclaiming water on-site. On-site reuse entails using the same water for multiple purposes. For example, blowdown water from a cooling tower could be used for other non-potable purposes such as cleaning or irrigation. On-site reclamation includes treating water on-site to meet either a non-potable or potable quality standard. Many mining operations already incorporate on-site water reuse and reclamation throughout their processes. For power generation facilities and data centers, there could be substantial water conservation by incorporating on-site reuse and reclamation. A 2025 white paper from WateReuse Association estimates that power generating facilities could save 10-26% of water by incorporating reduction and reuse actions and up to 80% by adding on-site reclamation.[14] Similarly, it was estimated that data centers could save 10-25% with reduction and reuse actions and up to 49% with on-site reclamation.[14]

## Reusing Water via Partnerships

One of the most exciting frontiers of industrial water conservation is water reuse via partnerships either with other industries or municipal water utilities. Just as on-site water reuse and reclamation allow the same water to be used multiple times, water reuse via partnerships allows water to be used multiple times by different entities.

For some uses, reclaimed water that has received sufficient treatment can be better than groundwater. There are many examples of successful partnerships throughout Arizona.

> Water and energy saving technologies for data centers include the use of liquid immersion cooling, renewable energies to off-set peak loading, and heat tolerant chips.

- **Golf Courses and Municipal Effluent:** Many examples of private-public partnerships exist for turf irrigation using recycled water from cities, such as Phoenix, Tucson, and Prescott. Within AMAs, the use of effluent by turf facilities is incentivized by an effluent use adjustment. Each acre-foot of effluent used is counted as 0.6 or 0.7 AF depending on the AMA.
- **Copper Mining and Local Farming:** Resolution Copper, since 2009, has provided 25,000 AF of treated water from **dewatering** operations to local farmers in the New Magma Irrigation and Drainage District (NMID) for irrigation purposes.[15] Florence Copper provides surplus process water to a local farm. Over time the partnership is expected to save up to 1,466 AF annually.[16]
- **Palo Verde Nuclear Generating Station and Phoenix Municipalities:** The nuclear generating station located west of Phoenix reclaims and uses approximately 75,000 AF per year of effluent from local municipalities for cooling needs.
- **Copper Mining and Power Generation/Data Centers:** Another potential partnership would be between power generation or data centers and copper mining industries. Research has shown that hot water leads to higher rates of copper leaching. This may mean that a low-grade heat producer, such as a data center or power plant, may be able to send hot water to a mine for more efficient copper extraction.

### Incentivizing Industrial Water Conservation

In an ideal world, every industry, entity, and individual would pursue water conservation and efficiency. The influx of data centers adds a new dimension to the challenges faced by areas that are home to large water using industries. There are strategies that municipalities, utilities, and regulators can adopt to incentivize water and energy saving practices and protect existing water users.

An Arizona-focused 2025 study reported that nine public municipal providers and one private water provider (EPCOR) have implemented large-volume water user ordinances, tariffs, or other measures relating to water conservation.[17]

Large-volume water users can be defined with reference to daily, monthly, or annual water consumption. Alternatively, some providers regulate a specific industry or category of use. For example, Marana developed a rule that prohibits data centers from using municipal water. Water efficiency requirements on large-volume water users vary. Examples include the requirement to submit a conservation plan and mandates to bring water with them or use recycled water. Utilities and regulators also have the ability to evaluate and adopt policies that accelerate the adoption of minimal water use energy sources. Policy recommendations from Western Resource Advocates[18] include:

- Clean energy tariffs
- Require water efficiency and water use reporting
- Restructure economic development rates (electricity rates) and follow best practices for ratemaking
- Enable data centers to develop, own, and operate their own clean energy directly
- Require energy efficiency and load shifting away from peak hours
- Establish contract provisions to protect consumers from potential uncertainty related to new large energy uses

## Getting Started

There are water conservation strategies that municipalities, utilities, and regulators can adopt to incentivize water and energy saving practices and protect existing water users. **Please use the QR code below or visit wrrc.arizona.edu/conserve to find additional definitions, resources, references (corresponding to numbers in the text) used for the creation of this factsheet.**

**Additional Definitions, Resources, and References**

wrrc.arizona.edu/conserve

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