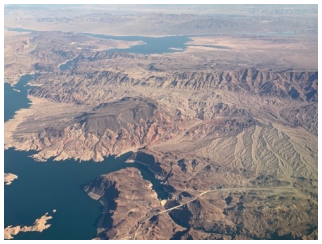


Arizona's Framework for Water Regulation (and Agricultural Sustainability)

Sharon B. Megdal, Ph.D.
Director, University of Arizona Water Resources Research Center
19 March 2025

THE UNIVERSITY OF ARIZONA COOPERATIVE EXTENSION
WATER RESOURCES RESEARCH CENTER

smegdal@arizona.edu

wrrc.arizona.edu

1

WRRC bridges the academic and non-academic communities

- Applied research, Outreach and Engagement, and Educational programs
- Work at geographic scales from local to international
- Webinars, Annual Conference, Publications and more

WRRC WEEKLY WAVE

THE UNIVERSITY OF ARIZONA COOPERATIVE EXTENSION
WATER RESOURCES RESEARCH CENTER
60 YEARS 1964 — 2024

2

2

Water policy and management reflect many determining factors

- Resource Availability
- Location of water demands and supplies
- Economics
- Historic and Current Legal/Institutional Framework
- The nature of involvement of multiple governmental and non-governmental entities, including the extent of centralized versus decentralized decision making
- Public values and socio-cultural factors
- Politics of Area
- Historical context
- Information
- Etc…

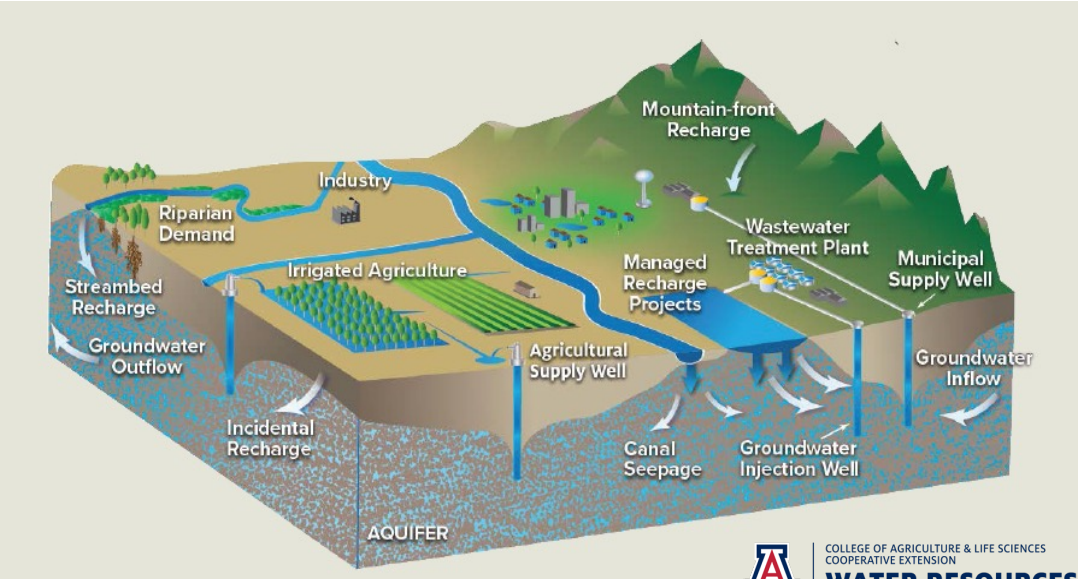
Importance of Context
Water Cycle
Geographical and Jurisdictional
Wicked Water Problems
Regulatory Context

Megdal, Graduate Water Policy class, January 17, 2025 (revised)

3

3

Water Cycle Context



COLLEGE OF AGRICULTURE & LIFE SCIENCES
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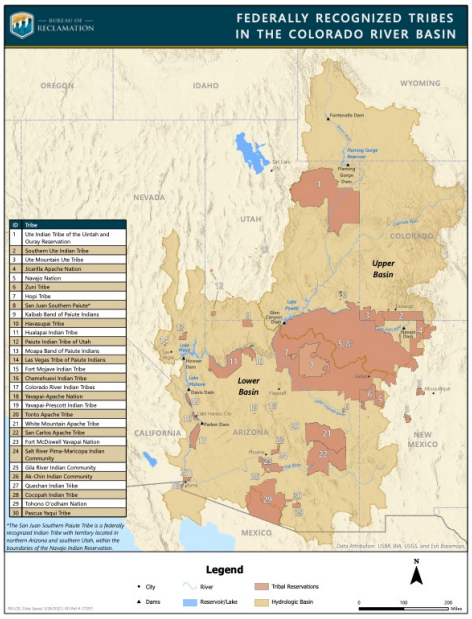
Geographic and Jurisdictional Context

Colorado River Basin (CRB)



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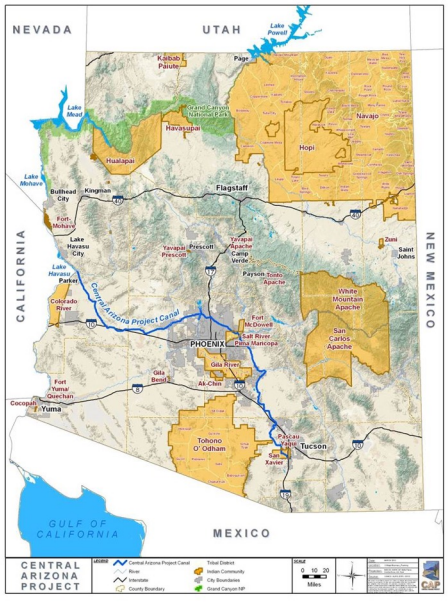
Arizona



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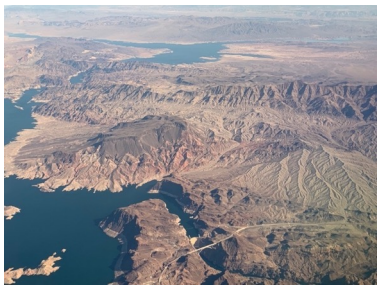
Wicked Water Problems Context

- Wicked Water Problems are big problems that do not have a simple pathway to resolving them.
- Two Wicked Water Problems Arizona is faced with (there are others):
  - Imbalance of Water Supply and Demand (Colorado River in particular)
  - Groundwater invisibility and overdraft
- Collaboration and interdisciplinary work are necessary for addressing Wicked Water Problems.



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Wicked problem: Colorado River Basin supply-demand imbalance

Photo: SB Megdal-Dec.2022
Taken from Hoover Dam

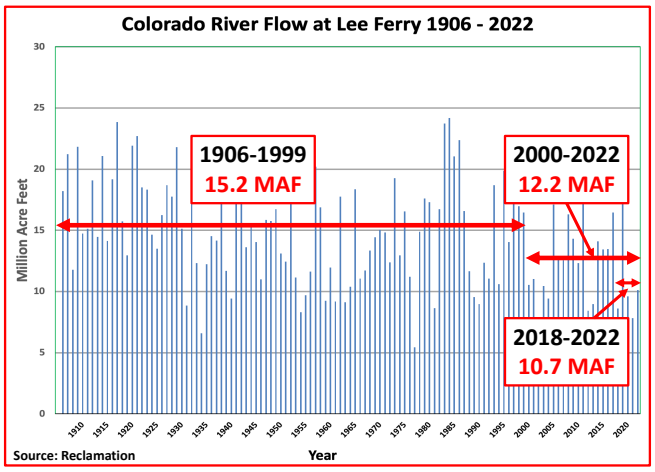
Lake Mead behind Hoover Dam

Photo: SB Megdal-Dec.2022

8

8

Central Arizona Project customers are particularly vulnerable to cutbacks in Colorado River water deliveries



Colorado River (CR) Basin (outlined below)

About 250,000 square miles (647,000 km^2)

7 states in the USA; 2 states in Mexico

30 Native Nations

40 million people rely on CR water

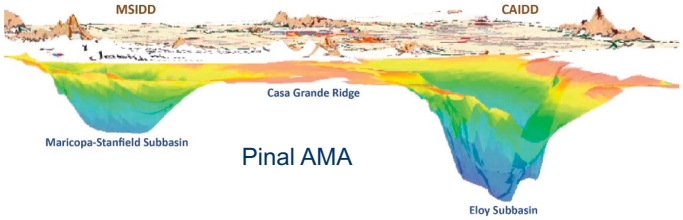
9

9

Wicked problem: Groundwater depletion

Groundwater invisibility

Figure from Arizona Department of Water Resources Model



5x vertical exaggeration of aquifer extending below land surface

(vertical scale of aquifer is exaggerated 5x greater than the horizontal scale)

Figure 8. 3-D Representation of the Pinal AMA Aquifer from 2019 ADWR model, extended to 3000 feet below land surface, based on ADWR's 2014 geology update (Seasholes 2020) - Note: the aquifer bottom is modeled to 3000 feet and is deeper in certain areas

The Washington Post

Democracy Dies in Darkness

Phoenix area can't meet groundwater demands over next century, threatening growth

A state report released Thursday amounts to a chilling warning for a region that has been a development hotspot for new residents and high-tech businesses

By Joshua Partlow, Yvonne Wingett Sanchez and Isaac Stanley-Becker

Updated June 1, 2023 at 6:50 p.m. EDT | Published June 1, 2023 at 4:31 p.m. EDT

The Washington Post

Democracy Dies in Darkness

Politics Biden administration The 202s Polling Democracy in America Election 2024

How a Saudi firm tapped a gusher of water in drought-stricken Arizona

Lax rules let the foreign-owned company pump water from state land to grow alfalfa for the kingdom's cattle. After almost a decade, the deal is in jeopardy.

By Isaac Stanley-Becker, Joshua Partlow and Yvonne Wingett Sanchez

July 16, 2023 at 5:00 a.m. EDT

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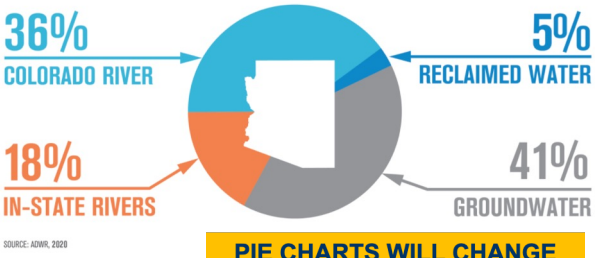
ARIZONA'S WATER SUPPLY



PIE CHARTS WILL CHANGE AS WATER USE CHANGES (BOTH DEMAND AND SOURCE)

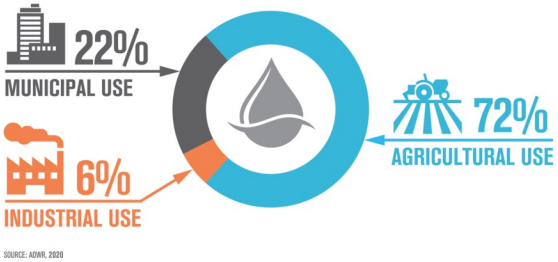
Regulation of water varies across the state, but there are rights to use the water that are difficult to change.

Surface water and groundwater are not regulated in an integrated way.

Environmental water not measured – natural systems are not a recognized water using sector.

Most municipal water provision is by publicly operated water systems, though 15-18% of residents are supplied water by privately operated companies.

ARIZONA'S WATER USE BY SECTOR (2019)



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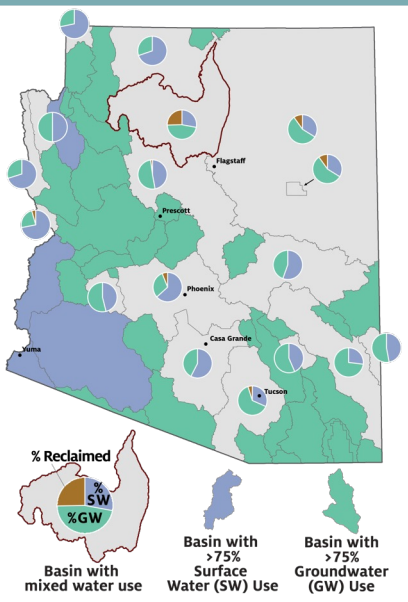
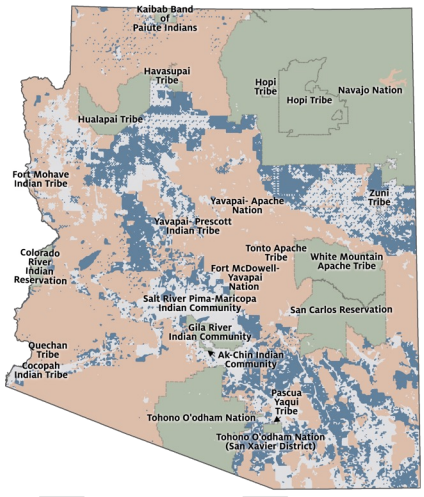
WATER USE BY GROUNDWATER BASIN



Source: ADWR 2016

Water resource situations vary across Arizona

LAND OWNERSHIP



Source: ARLIS 2010

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Within the agricultural sector, circumstances vary.

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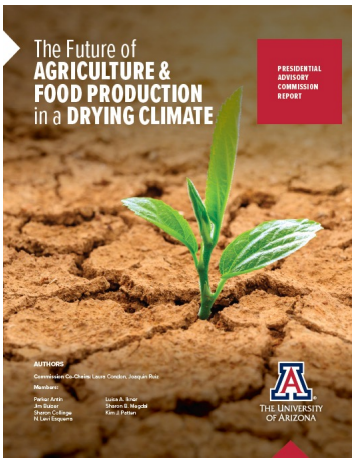
Agricultural water use and food production connected to both surface water and groundwater issues – and not just an Arizona or Colorado River Basin issue



https://research.arizona.edu/impact/future-of-food

https://irrigationleadermagazine.com/volume-14-issue-9-october-az/

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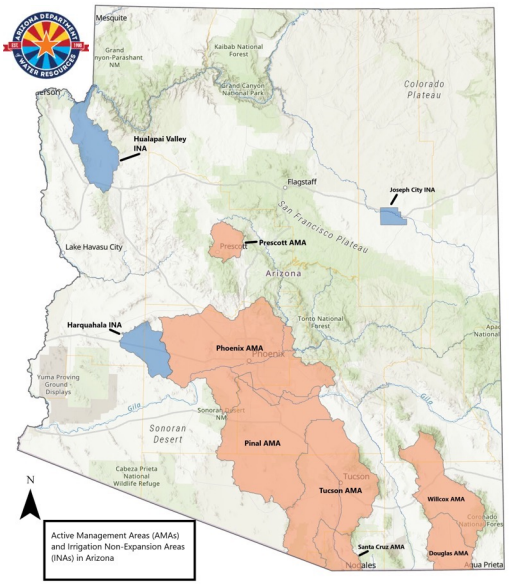
AZ Regulatory Context: 1980 Groundwater Management Act

- Created Active Management Areas (AMAs) with Management Goals and Irrigation Non-Expansion Areas (INAs)
- Management goal for initial AMAs established
- Quantified rights for existing groundwater users
- Some rights transferable
- Management Plans with Conservation Programs
- Restricted new groundwater uses but grandfathered in most uses.
- Footprint of agriculture could not expand.
- Placed burden of using renewable supplies on new residential uses through requiring an assured water supply program (AWS)
- Later legislation authorized recharge and recovery program



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Assured Water Supply (AWS) Requirements

- Applicants (water companies or developers) Must Meet Five Criteria to Prove AWS:
  - Sufficient Quantity of Water for 100 Years (legally, physically and continuously available)
    - How is physical availability shown?
  - Water Source Meets Quality Standards
  - Water Use Consistent with Conservation Standards
  - Water Use Consistent with AMA Goals
  - Renewable water supply use can be direct or indirect
  - Applicant is Financially Capable

- Designations vs certifications of Assured Water Supply
- Adequate water supply determinations outside of the AMAs

- There are no AWS requirements for agricultural and many industrial water uses

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Groundwater issues remain in the Active Management Areas and exist outside the AMAs

https://www.azwater.gov/gwpc
Issued January 2024

ASSURED WATER SUPPLY COMMITTEE

OBJECTIVE

The Assured Water Supply Committee was established to review and make recommendations for changes to Assured Water Supply policies - legislatively, administratively, or by executive action - to address the challenges revealed by Assured Water Supply modeling projections, while continuing to:

- Strengthen the integrity of the Assured Water Supply program
- Protect consumers and aquifers
- Ensure future growth is not reliant on mined groundwater

RURAL GROUNDWATER MANAGEMENT COMMITTEE

GOAL

The Rural Groundwater Management Committee was established to develop policy, legislative, or other actionable recommendations for a water management framework to assist rural Arizona communities to manage their local groundwater resources, protect water users, and sustainably manage aquifers.

OBJECTIVES

- These recommendations will assist rural communities outside the state's Active Management Areas (AMAs) and Irrigation Non-Expansion Areas (INAs) in managing local groundwater resources and mitigating further aquifer depletion.
- These recommendations should be broad enough to apply to any groundwater basin's management needs and customizable to be tailored to a basin's unique characteristics.

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Recharge

- The process of adding water to an aquifer
  - Natural Recharge results from natural process such as precipitation and streamflow
  - Incidental recharge is water entering the aquifer after various human uses, such as irrigation uses or leaks in water lines
  - Artificial recharge facilities or projects that are developed for the purpose of adding water to an aquifer
  - Innovative policy used to:
    - Manage groundwater supply
    - Assure full use of Colorado River water allocation
    - Protect against shortages during drought
    - Enable affordable use of CAP water

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Arizona has a robust regulatory framework for recharge and recovery

https://wrrc.arizona.edu/publications/reports/managed-aquifer-recharge

The Water Report™
Water Rights, Water Quality & Water Solutions in the West

In This Issue:

Upcoming Stories:

Municipal Water: Sources & Storage
Watershed Restoration
Watershed Projects Prioritizing
& More!

MANAGED AQUIFER RECHARGE

MAR AS A MECHANISM TO ADVANCE WATER POLICY GOALS: A PERSPECTIVE

by Sharon B. Megdal, Ph.D.
Director, University of Arizona Water Resources Research Center (Tucson, AZ)

Introduction

The imbalance between water supply and demand is of growing concern globally. Rarely a day goes by without news about the dwindling surface water supplies, with the Colorado River as the poster child. Coverage of approaches to addressing the supply/demand imbalance is broad, with strategies including augmentation, reuse, market mechanisms, and conservation. The dialogue involves not only diminishing surface water supplies but also the increasing role of, and threats to, groundwater — which accounts for 99% of Earth's liquid freshwater (UNESCO World Water Assessment Programme 2022, *see* References, below). Not coincidentally, heightened dialogue on groundwater has coincided with World Water Day's 2022 theme: "Groundwater — Making the Invisible Visible" and the annual *United Nations World Water Development Report* with the same moniker. Next August, the annual Stockholm World Water Week has the theme of "Seeing the Unseen: The Value of Water." Next December, the 2022 UN-Water Summit on Groundwater will continue 2022's global focus on groundwater.

A key component of discussions regarding groundwater, including conjunctive management of groundwater and surface water, is managed aquifer recharge ("MAR" — sometimes referred to as artificial recharge). MAR is increasingly being recognized as an important mechanism for addressing water quantity and/or water quality concerns. The 2021 compendium *Managing Aquifer Recharge - A Showcase for Resilience and Sustainability* (2021 Compendium) defines MAR as "intentionally replenishing aquifers to stabilize water storage and improve water quality" (Zheng, Ross et al. 2021, 16). Alternatively, Australia's National Guidelines for Managed Aquifer Recharge define MAR as "the purposeful recharge of water to aquifers for subsequent recovery or environmental benefit. It is not a method for waste disposal" (Natural Resources Management Ministerial Council, et al. 2009, 1). MAR "…can be done in a myriad of ways that respect other uses of water or harness otherwise wasted water. The enthusiasm for MAR schemes and their popularity and success are enhanced by significant auxiliary benefits such as in protecting against seawater intrusion, improving environmental flows, banking water for drought relief and purifying water through natural processes" (Zheng, Ross et al. 2021, 16). As noted by Dillon et al. in the editorial paper for the volume, *Managed Aquifer Recharge for Water Resilience*: "Managed aquifer recharge…is part of the palette of solutions to water shortage, water security, water quality decline, falling water tables, and endangered groundwater-dependent ecosystems. It can be the most economic, most benign, most resilient, and most socially acceptable solution, but frequently has not been implemented due to lack of awareness, inadequate knowledge of aquifers, immature perception of risk, and incomplete policies for integrated water management, including linking MAR with demand management. MAR can achieve much towards solving the myriad local water problems that have collectively been termed 'the global water crisis'" (Dillon, Fernández Escalante et al. 2020, 12).

Issue #220 June 15, 2022

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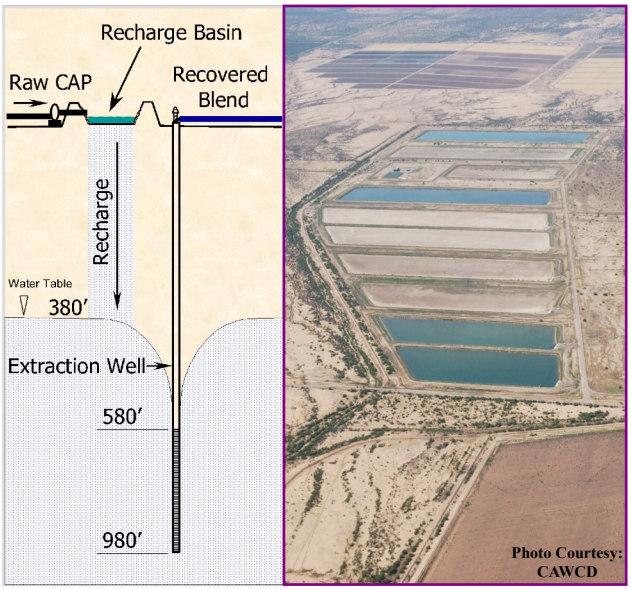
Tucson's storage of Colorado River Water delivered through the Central Arizona Project



SHARON B. MEGDAL AND ALAN FORREST

How a Drought-Resilient Water Delivery System Rose Out of the Desert: The Case of Tucson Water

TUCSON (ARIZ.) WATER'S COMPLEX JURISDICTIONAL EXPERIENCES HAVE DEMONSTRATED THE IMPORTANCE OF AN OPEN AND CONSULTATIVE DECISION-MAKING PROCESS—AND DEMONSTRATED THE BENEFITS OF COLLABORATION WITH OTHER UTILITIES AND JURISDICTIONS AND THE VALUE OF SHARING LESSONS LEARNED.

The City of Tucson (Ariz.) operates Tucson Water as a city department. Tucson is the largest city in southern Arizona, with a population of 524,000 people as of 2012. It is located within Pima County, which had a 2012 population of 990,000. The boundaries of Tucson Water's service area are not coterminous with the city borders; most but not all Tucson residents are served by Tucson Water, and about one-third of Tucson Water's customers live outside the city limits. Tucson has an incorporated area of 587 km², with Tucson Water having a service area of 906.3 km². The number of people served by Tucson Water in 2012 was estimated at 709,000. Approximately 56% of Tucson Water's deliveries are to single-family homes and 19% to multifamily homes, with the remaining 25% going to commercial and industrial water users. Figure 1 depicts the city's boundaries and the service area of Tucson Water.

TUCSON'S INTRICATE WATER AUTHORITIES

There is a complex jurisdictional interweaving of water responsibilities in Tucson. Other water providers, both publicly and privately owned and operated, serve parts of the Tucson metropolitan region. Tucson Water does not collect and treat wastewater from its customers; instead, Pima County provides wastewater collection and treatment services to most Tucson Water customers. Through an intergovernmental agreement, in 2012 Tucson Water had control over about 41% of the 76 × 10⁶ m³ of treated wastewater produced by

46 SEPTEMBER 2015 | JOURNAL AWWA • Vol 9 | MEGDAL & FORREST

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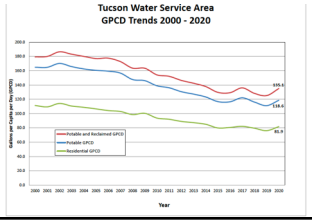
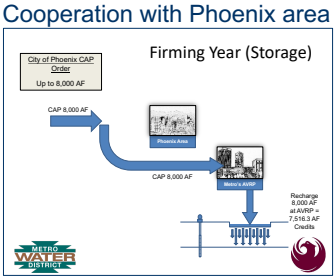
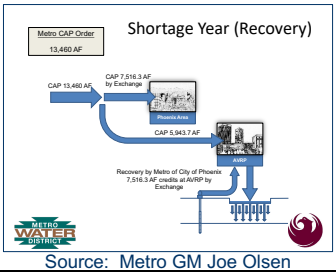
The Tucson region has adapted to changing water conditions through innovation, partnerships, and other actions

One Water 2100 Plan Announcement
https://www.youtube.com/watch?v=UnWqUbrS5Tg



Cooperation with Phoenix area





Source: Metro GM Joe Olsen

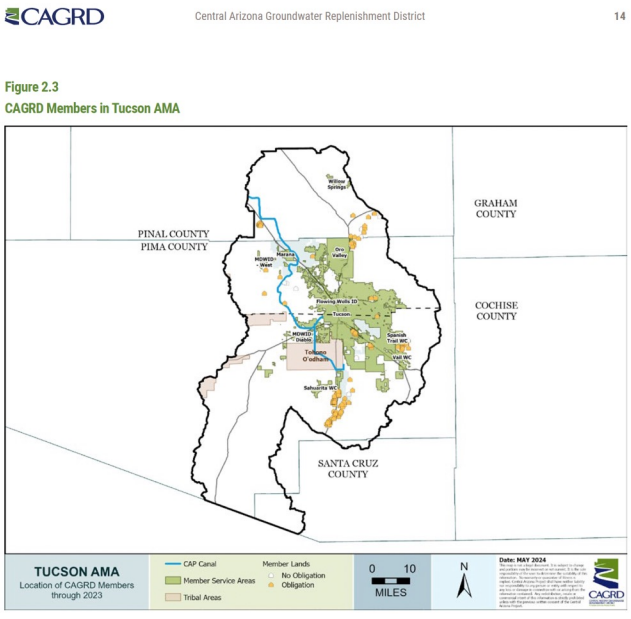
Noon – 1:15 p.m., April 11, 2025
WRRC Water Webinar: Advanced Water Purification in Arizona – Save the Date!

WRRC WATER WEBINARS

21

SaddleBrooke

- In the Tucson AMA, where management goal is safe-yield
- Served by a privately owned water company
- Assured Water Certificate based on groundwater availability and membership in the Central Arizona Groundwater Replenishment District
- No direct access to renewable water supplies



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Categories of solution options to address imbalance of supply and demand

- Conservation
- Greater efficiency
- Water reuse
- Water storage/banking/managed aquifer recharge (MAR)
- Desalination (augmentation example)
- Moving water
- Marketing and other mutually agreed-upon transactions
- Rainwater and stormwater capture
- How we design our buildings, communities, and landscapes

Sweetwater Wetlands

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Work continues…

https://www.azwater.gov/gwpc
Issued January 2024

Dialogue, collaboration matter most to Arizona's water future

An annual conference, presented by the university's Water Resources Research Center, brought together a wide-ranging constituency to discuss solutions to the state's water-related problems.

By Brad Poole, University of Arizona Cooperative Extension
March 13, 2024

Share Tweet Share Email Print

Photo from WRRC 2024 Annual Conference

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Arizona faces both surface water and groundwater challenges! What we can expect depends on all of us.

- Be informed
  - Know where your water comes from
  - Don't take water for granted
  - Understand the trade-offs associated with different policy options and actions in terms of cost, timing, scale, sustainability, etc.
- Be good water stewards in your personal and professional lives
- Be ready to discuss water matters with decision makers and state, regional, and local agencies and utilities, including the Arizona Dept. of Water Resource, the Arizona Dept of Environmental Quality, Central Arizona Project, and the Water Infrastructure Financing Authority (WIFA).
- ENGAGE WITH WRRC PROGRAMMING!

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WRRC Water Webinars and Special Events

Event Calendar

To look at past events, it is recommended to use the calendar widget, otherwise checkout our full list of **past events**.

JAN 30

WRRC Water Webinar: Women and Water – Networking and Leading Across the Globe

12:00 to 1:15 pm MST, January 30, 2025

FEB 07

WRRC Special Event: Damming the Gila: The Gila River Indian Community and the San Carlos Irrigation Project, 1900–1942

12:15 to 1:15 pm MST, February 7, 2025

FEB 13

WRRC 21st Annual Chocolate Fest

4:00 to 5:00 pm MST, February 13, 2025

Event Calendar

To look at past events, it is recommended to use the calendar widget, otherwise checkout our full list of **past events**.

MAR 19

WRRC Co-sponsored Event: Native Voices in STEM

12:00 to 1:00 pm MST, March 19, 2025

MAR 28

WRRC Water Webinar: Prioritizing Transboundary Aquifers in the Arizona-Sonora Region

12:00 to 1:15 pm MST, March 28, 2025

APR 11

WRRC Water Webinar: Advanced Water Purification in Arizona – Save the Date!

12:00 to 1:15 pm MST, April 11, 2025

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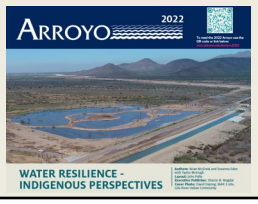
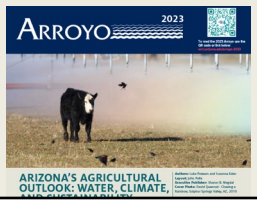
ARROYO

Water Issues Critical to Arizona

The WRRC's *Arroyo* is a unique publication produced each spring to look in depth at a single topic of timely importance to Arizona. Published regularly since 2007, topics have ranged widely. In recent years, the *Arroyo* has been linked with the WRRC Annual Conference topic to capture and expand on the themes and lessons of the conference. The *Arroyo* is available online: **https://wrrc.arizona.edu/arroyo**





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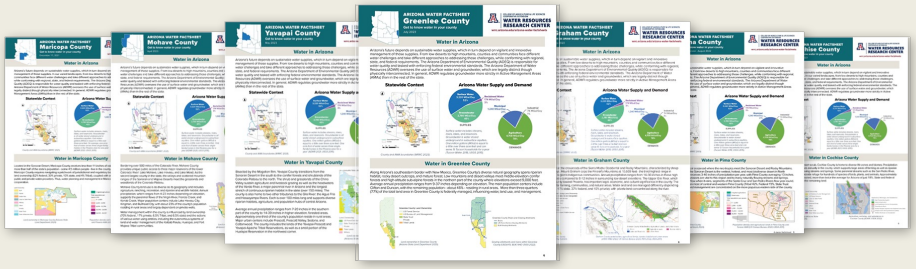
County-level Factsheets

ARIZONA WATER FACTSHEETS



Get to Know Water in Your County

These county-level factsheets are designed to answer common questions about water resources, tailored to every county in Arizona to foster understanding of the local nature of Arizona water resource challenges and solutions.

wrrc.arizona.edu/az-water-factsheets

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Thank you!!

Sharon B. Megdal, Ph.D.
smegdal@arizona.edu

WRRC HOME PAGE

https://wrrc.arizona.edu/

WRRC WEEKLY WAVE

https://wrrc.arizona.edu/publications/weekly-wave

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