



Colorado River Update: Shaping the Future of Arizona Agriculture

Pinal County Cooperative Extension Webinar

Sharon B. Megdal, Ph.D.

Director, Water Resources Research Center

May 12, 2026



THE UNIVERSITY OF ARIZONA
COOPERATIVE EXTENSION

**WATER RESOURCES
RESEARCH CENTER**

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wrrc.arizona.edu

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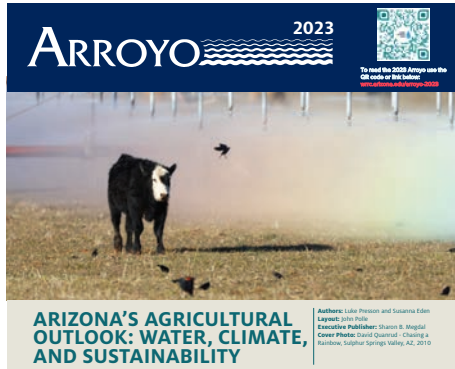
WRRC bridges academia and the real-world of water management

- The University of Arizona Water Resources Research Center (WRRC) tackles key water policy and management issues, empowers informed decision-making, and enriches understanding through engagement, education, and applied research.
- Water Webinars, annual conference, publications, informational resources, etc.
- Partnerships, engagement, and respectful dialogues are essential to our work.



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WRRC's Annual *Arroyo* publication is connected to our Annual Conference



INTRODUCTION

Arizona's development has been dominated by the five C's—cotton, cattle, citrus, and climate—three of which are products of agriculture. However, the cultural and economic contributions of the agricultural industry have declined with the increase of urbanization and economic diversification. Climate conditions and ongoing drought pose additional challenges to farmers. A megadrought has persisted in the western states for more than 20 years, resulting in a dangerous drop in available water storage. As drought forces difficult decisions on water use, food security—assured

access to sufficient safe and nutritious food—is emerging as a key concern. Given these conditions and ever-increasing needs for food and fiber, what is Arizona's agricultural outlook? This *Arroyo* aims to address this question by focusing on how the state can adapt to a new climate reality and sustain the agricultural productivity and culture that has defined the character of the state for so long. With water shortages in the Colorado River, policymakers and stakeholders are looking for every opportunity to increase water efficiency and decrease water use. Urban areas have been implementing successful conservation measures, but continued population growth still raises concerns about

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The Arroyo is published by the Water Resources Research Center
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Introduction

Why is so much of Arizona's water used to irrigate crops in the desert? A partial answer to this question is that Arizona provides at least two of the three prerequisites for producing crops: ample sunshine, high-quality soils, and adequate water. Although the desert lacks sufficient rainfall to grow most crops, Arizona's rivers have supported agriculture for thousands of years, and aquifers in Arizona's desert valleys hold vast quantities of groundwater. Ongoing drought, coupled with the water demands of a growing population, however, threaten those rivers and aquifers. In this context, it is useful to reexamine irrigated agriculture: its benefits, water using practices, constraints, and trends.

This *Arroyo* seeks to provide a comprehensive picture of Arizona's irrigated agriculture, presenting first a brief history of the state's desert agriculture, followed by profiles of agricultural regions in Arizona, their water sources, uses, and crops. Following sections offer background and discussion on the two major sources of water for irrigated agriculture in Arizona: groundwater and the Colorado River. A description of agricultural water use efficiency and conservation, including new crops that may reduce water application follows. Voluntary fallowing of farmland for water conservation and transfer to other uses is discussed. Collaboration opportunities with university and government agencies on conservation and water efficiency improvements are outlined. The reader will come away with a deeper understanding of how Arizona achieves sustainable food and fiber production in a desert climate.

What is Irrigated Agriculture?

Irrigated agriculture involves the controlled application of water to a crop. In semi-arid environments, such as Arizona, irrigation is essential because there

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2023 *Arroyo* includes 8 factsheets

ARROYO 2023 **FACTSHEET**
7 Soils and Conservation Practices

Soil Texture
 Soil texture is a crucial component of a soil's water holding capacity (WHC).
 • Sandy soils have a low WHC and must be irrigated frequently.
 • Clay and silt have high WHC and can be irrigated less frequently.
BUT the amount of water a plant can extract from the soil also depends on texture.
 • Clay soils may be farmed, but clay holds water so tightly it impedes extraction by plants.
 • Silty soils are great for farming as they hold a lot of water available to crops.
AND higher WHC is not always better. Sandy soils have low WHC but great drainage with little risk of waterlogging.

Soil Organic Matter
 • Can hold large volumes of water—much of which is available to crops.
 • High SOM can also improve infiltration rates by providing structure to the soil and protecting against crusting and compaction.

ARROYO 2023 **FACTSHEET**
7 Soils and Conservation Practices

Soil Improvement Practices
 While soil texture is largely out of farmers' control, soil health can be improved.
Crop Rotation—Alternating crops seasonally or annually
 • Balances and cycles nutrients while minimizing risk from pests and disease.
 • Diverse root systems improve soil structure and provide soil microbes with different food sources.
Cover Crops—Planted primarily to support soil health rather than crop production
 • Used on only ~6% of Arizona's farmland because the year-round growing season encourages planting and irrigating more profitable crops.
 • BUT cover crops add nitrogen and improve soil health.
 • AND can control weeds, reducing the need for herbicide.

Conservation tillage—Reducing or eliminating tillage on agricultural fields
 Most of Arizona's farmland is operated under intensive tillage, but between 2012 and 2017, no-till practices increased while intensive tillage decreased by nearly 14%.

Decreased Tillage can:
 • Save time, money, and fuel;
 • Increase SOM, water retention, and drainage;
 • Prevent erosion, soil compaction, and CO₂ release;
 • Improve yields over the long term.

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- Help people understand the context for and complexity of our region's water situation(s)
- Discuss the challenges
- Explore solutions
- Underscore the role of people and process (governance and policy)
- Work at various geographic scales and via varied platforms



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Personal webpage: www.arizona.edu/director

LINK TO PUBLICATIONS
LINK TO PRESENTATIONS



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
- ➔ • Politics of Area
- Public values and socio-cultural factors
- Historical context
- Information
- Etc...

Importance of Context

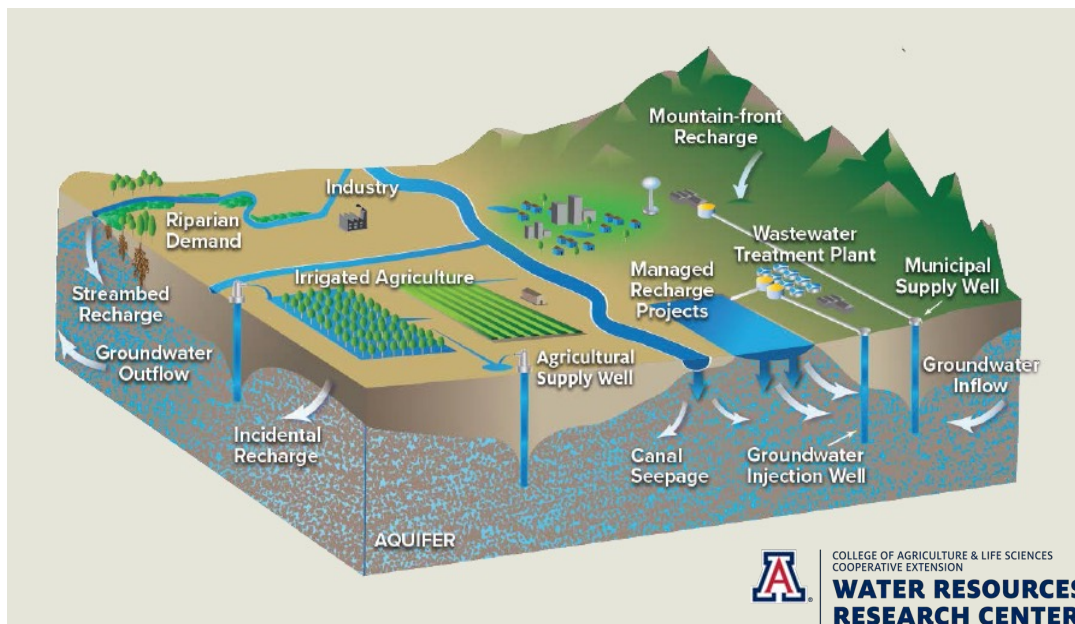


Megdal, Graduate Water Policy class, January 16, 2026

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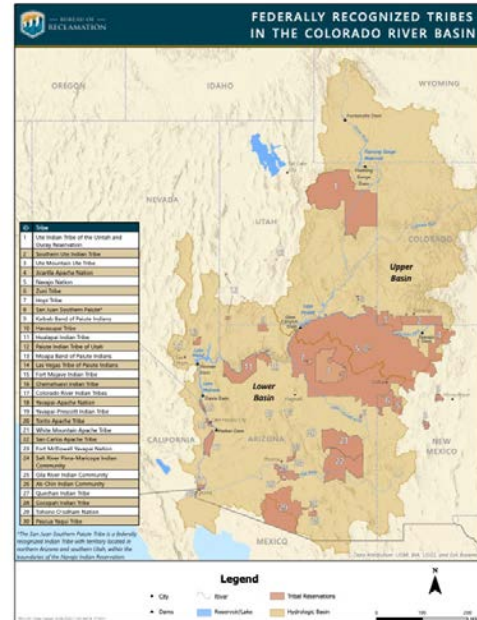
Water Cycle Context



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Geographic and Jurisdictional Context



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Wicked Water Problems Context

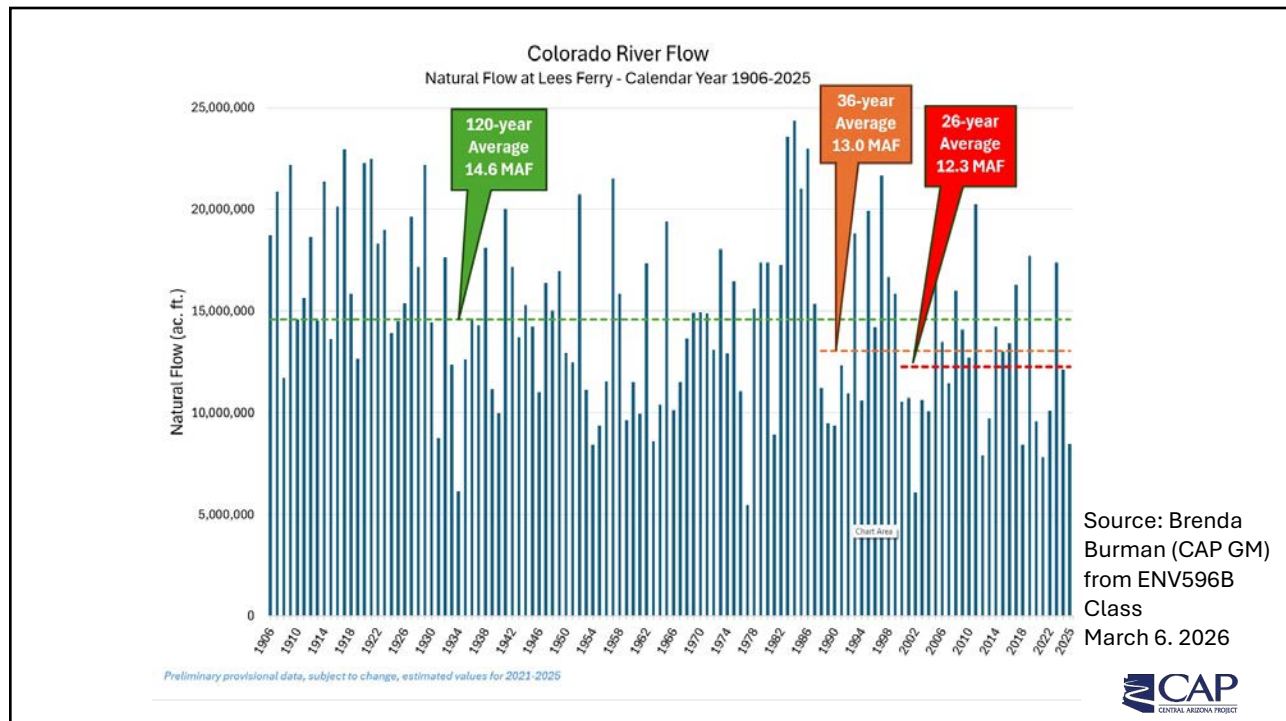
- Wicked Water Problems are big problems that do not have a simple pathway to resolving them.
- Two Wicked Water Problems Arizona faces:
 - Imbalance of Water Supply and Demand (Colorado River in particular)
 - Groundwater invisibility and overdraft
- Innovation and collaboration are necessary for addressing Wicked Water Problems.



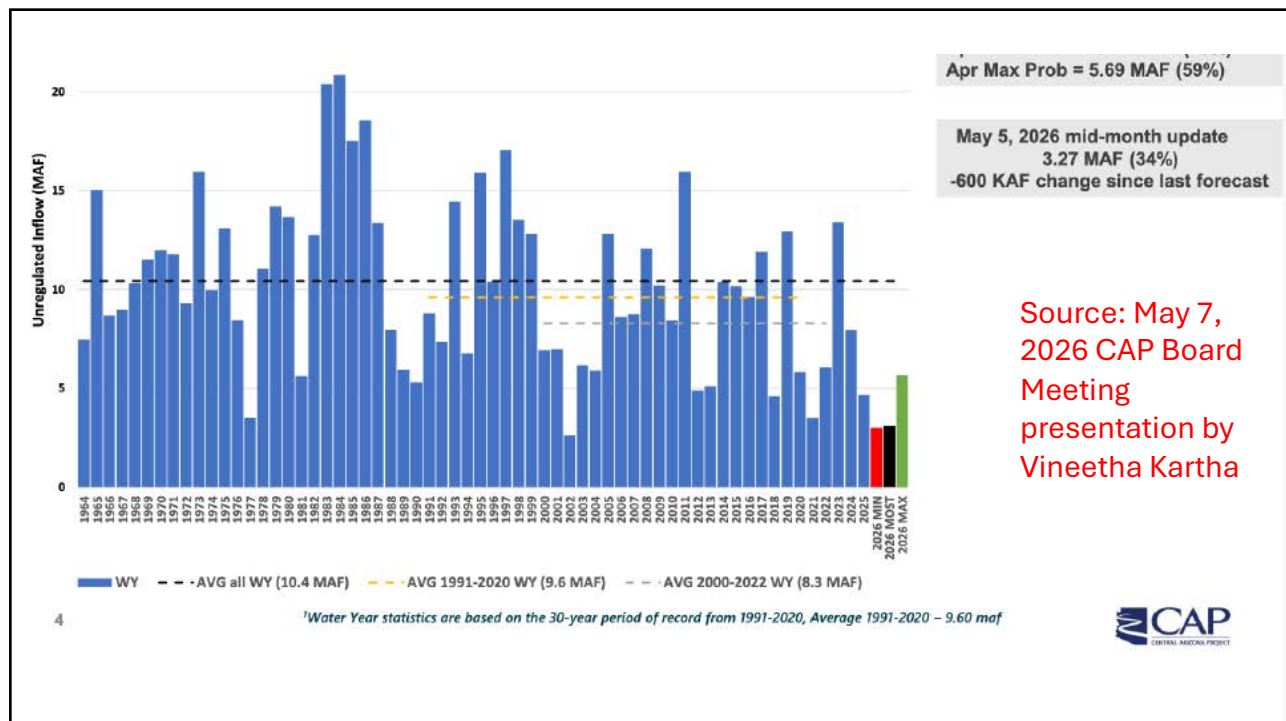
Photos: SB Megdal



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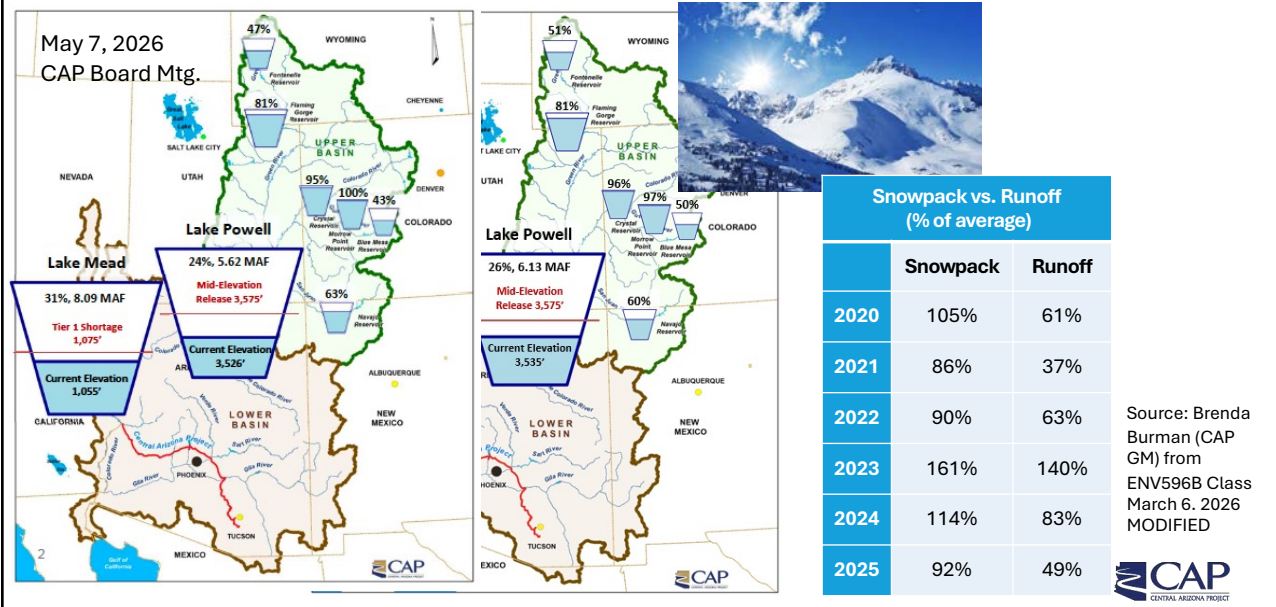


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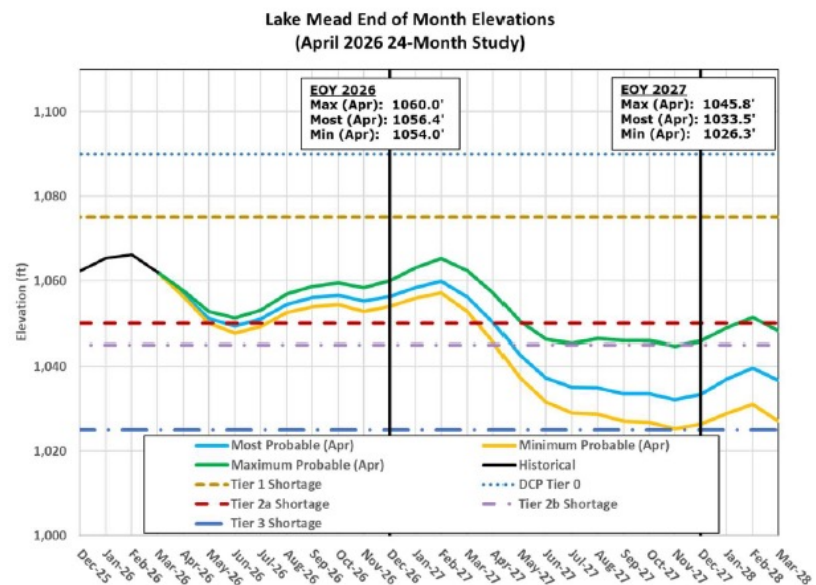
25 years of Colorado River drought



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Lake Mead April 2026 24-Month Study

- Lake Mead is operating in Tier 1 shortage condition in 2026
- Projection for EOY 2026 is above 1050'

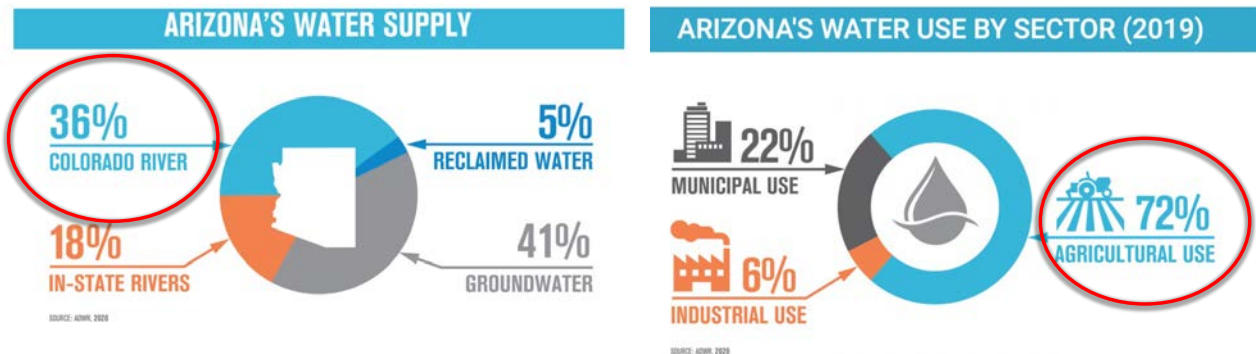


Source: Slide from May 7, 2026
CAP Board Meeting presentation
by Vineetha Kartha

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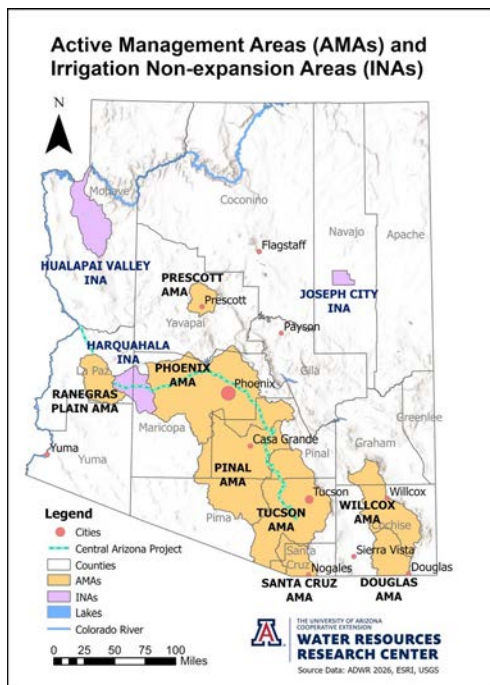
Arizona's water sources and demand

Arizona Department of Water Resources as of 2020



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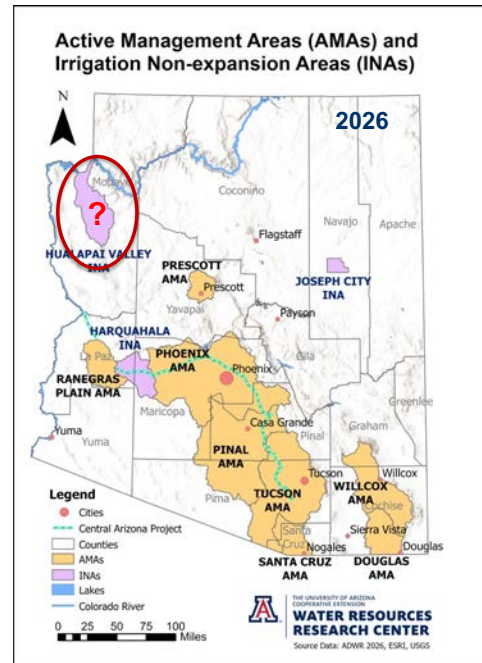
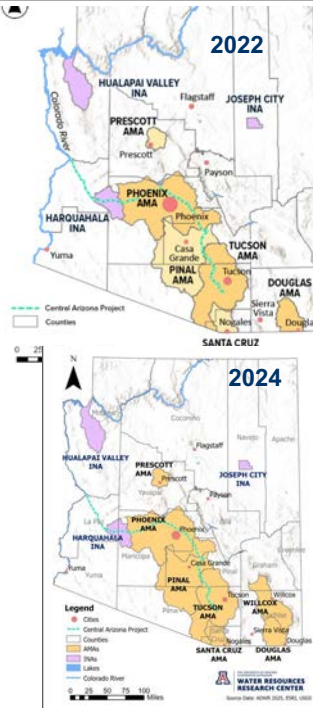
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Groundwater is regulated in Active Management Areas (AMAs)

Agricultural footprint cannot expand in AMAs and in Irrigation Non-expansion Areas (INAs)

Changing landscape of AMAs and INAs

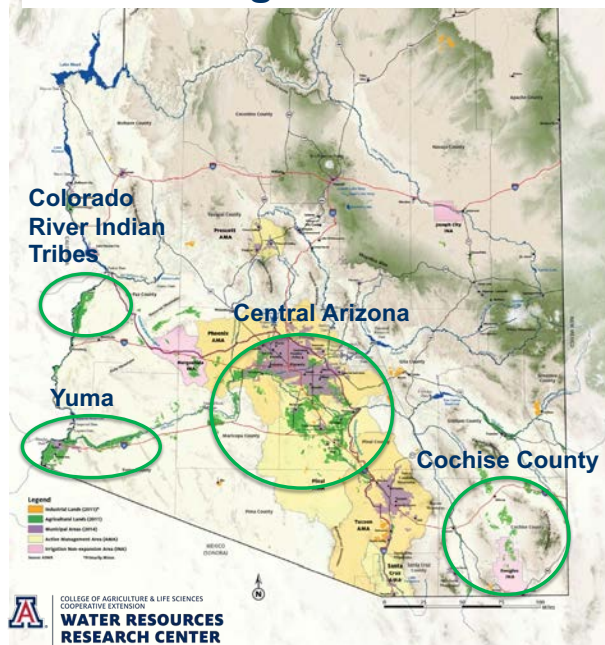
Initial vs Subsequent AMAs



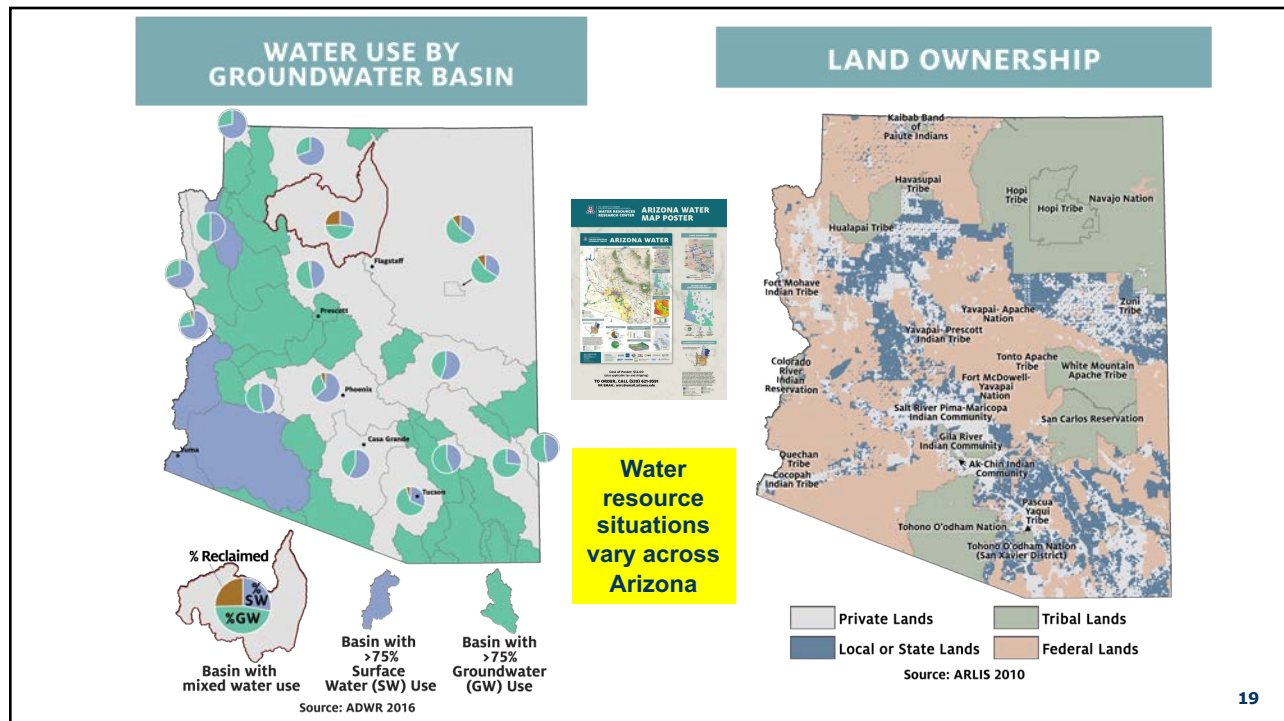
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Selected Agricultural Zones



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Yuma Area

- Borders the Colorado River
- Very close to Mexican border
- Very little rainfall annually
- Senior rights to Colorado River water (surface water)
- Large agri-business enterprises
- In the winter months, they grow high-value vegetables and provide much of the United States and Canada with their leafy green vegetables in the winter



Photo: SB Megdal

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Colorado River Indian Tribes (CRIT)

- Sovereign Tribal Nation
- Their lands span the Colorado River
- Very senior rights to Colorado River water
- Grow alfalfa, cotton, sorghum, and other crops but not leafy green vegetables grown in the Yuma region
- Have been involved in efforts to conserve water to leave in Lake Mead
- Top right photo is cotton grown with drip irrigation



Photos: Josh Moore, CRIT
<https://wrrc.arizona.edu/sites/wrrc.cals.arizona.edu/files/2022-09/Josh-Moore-CRIT-N-Drip-Trial.pdf>

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Cochise County

- Reliant on groundwater, which is in limited supply
- Groundwater use recently regulated in parts of the county; in other parts groundwater use is unregulated.
 - Where it is regulated, agriculture's footprint cannot increase
- A major policy issue for Arizona is what to do to manage groundwater in several rural, agriculturally dominated groundwater basins.

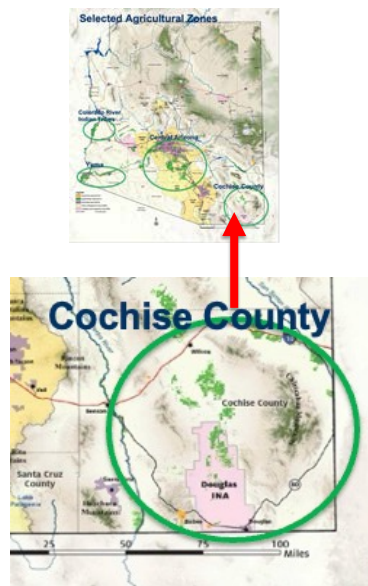


Photo: SB Megdal



Ed Curry and Sharon Megdal



Curry Seed and Chile Co.



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Central Arizona

- Historical reliance on groundwater
- Then Colorado River water became a key water source
- Very little Colorado River water is now available to Central AZ ag due to reduced river flows.
- Returning to groundwater, but groundwater supplies are finite, and much land is owned by those expecting to develop it for housing and other land uses.
- Alfalfa and cotton are primary crops

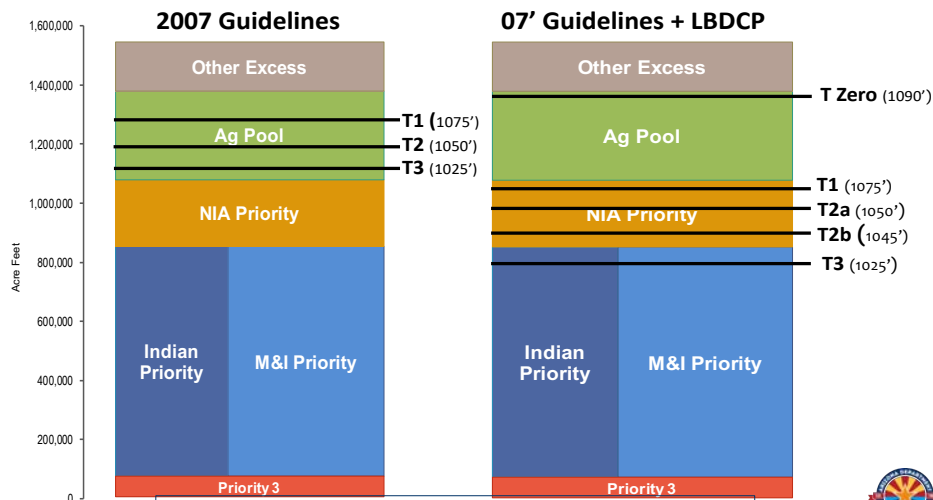


Photos: SB Megdal



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Colorado River Management Issues – CAP Reductions



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Tribal Nation Agriculture within and outside my selected zones

Two largest districts

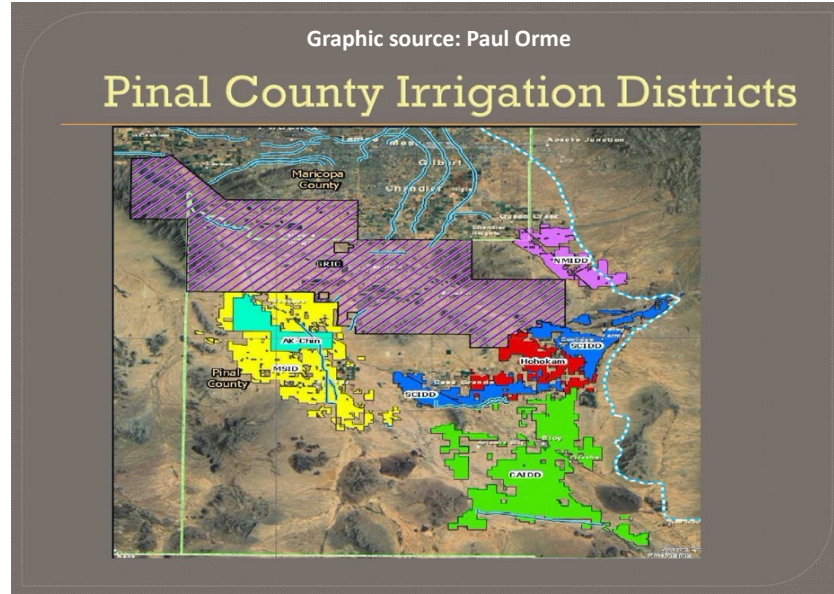
MSIDD =
Maricopa-
Stanfield Irrigation
& Drainage
district is in yellow

CAIDD = Central
Arizona Irrigation
& Drainage
district is in green

Tribal Nation
Boundaries

Gila River Indian
Community

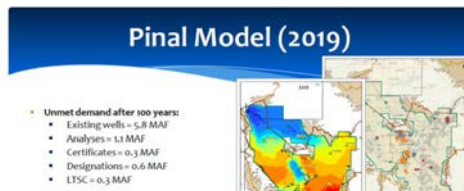
Ak Chin Indian
Community



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Groundwater issues in AMAs and outside AMAs



Arizona Department of Water Resources (.gov)

Ag to Urban: An Arizona Water News Podcast
interview with ADWR's A2U specialist, Ben Bryce

July 2025

**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 Winsett Sanchez and Isaac Stanlev-Buckner
Updated June 1, 2023 at 6:50 a.m. EDT | Published June 1, 2023 at 6:31 a.m. EDT



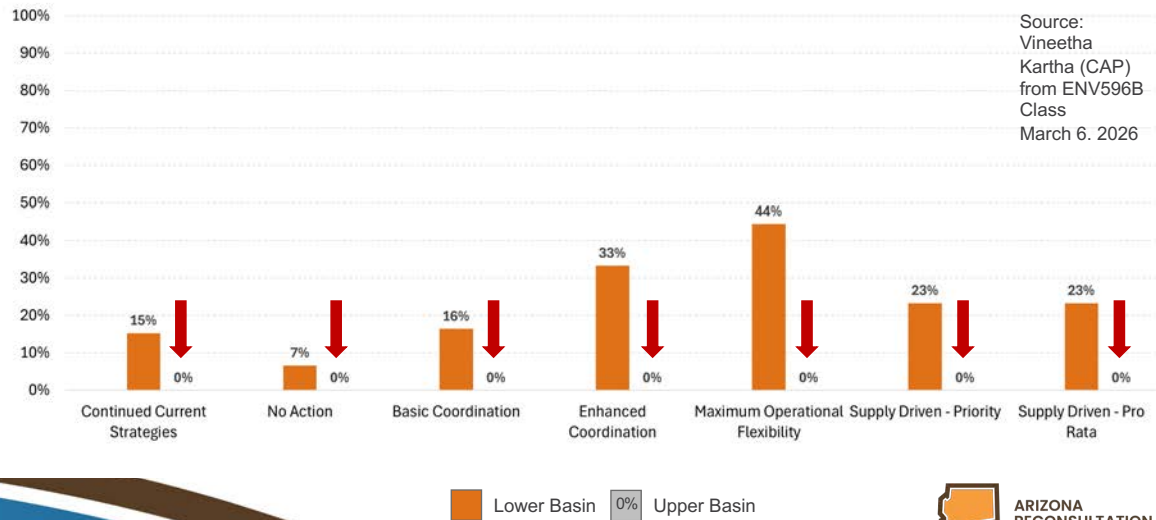
Jan 2026

Framework for rural groundwater
management still being worked on.

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Maximum Policy Shortage in Each Basin for each Alternative



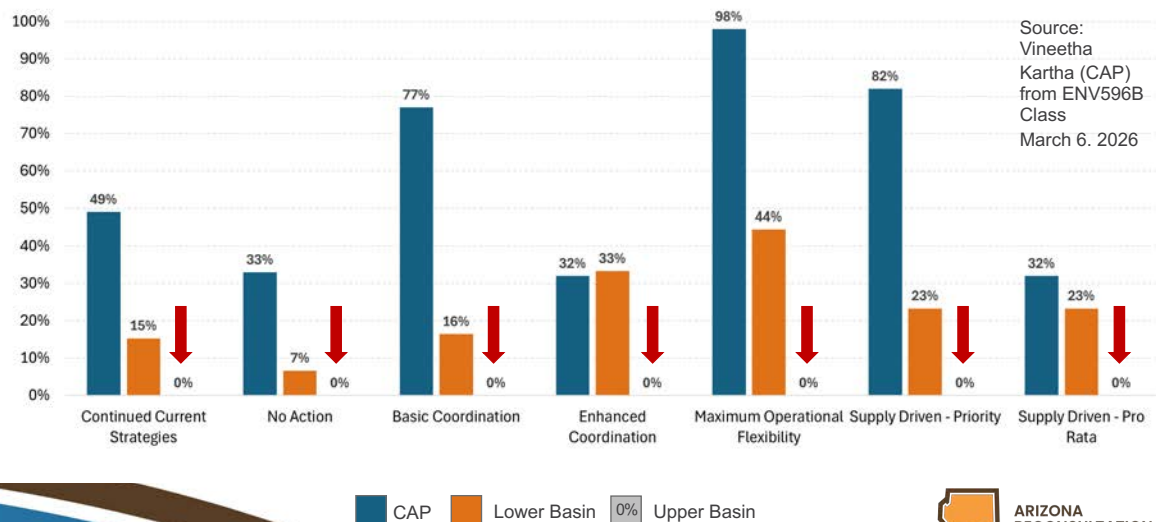
ARC Meeting #12 February 2, 2026

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RECONSULTATION
COMMITTEE

Preliminary analysis; subject to change

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Maximum Policy Shortage in Each Basin for each Alternative

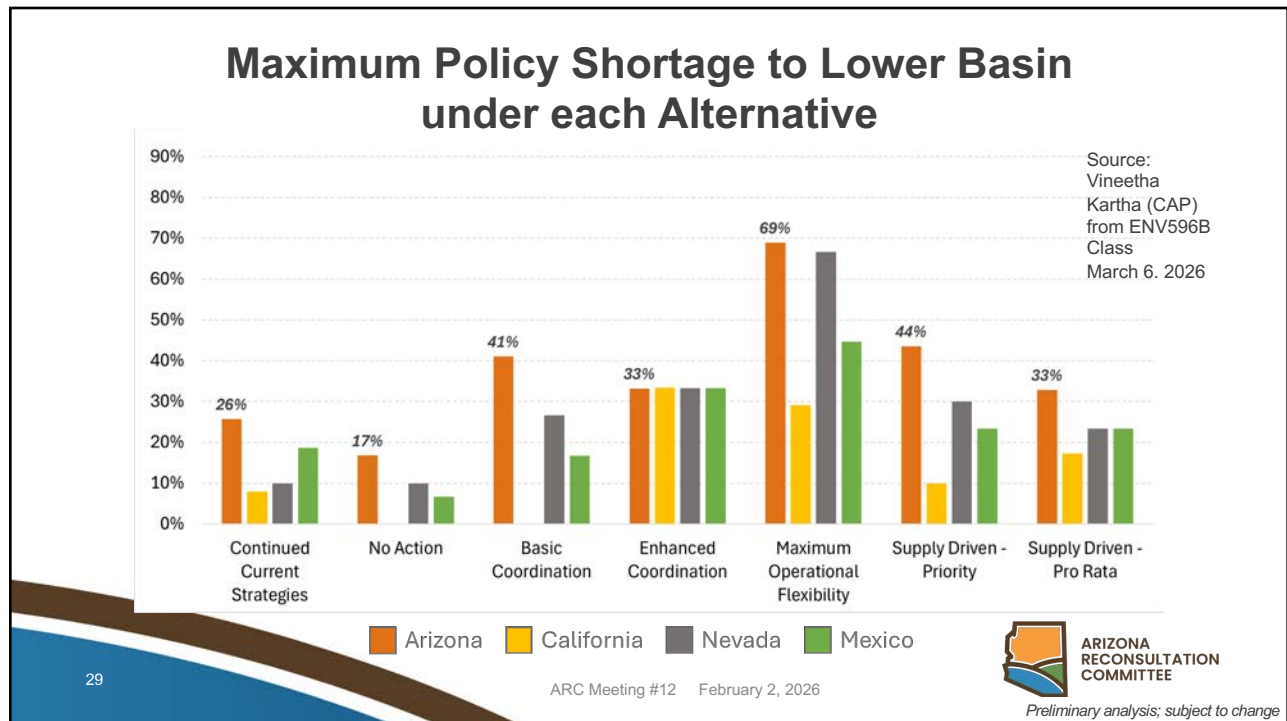


ARC Meeting #12 February 2, 2026

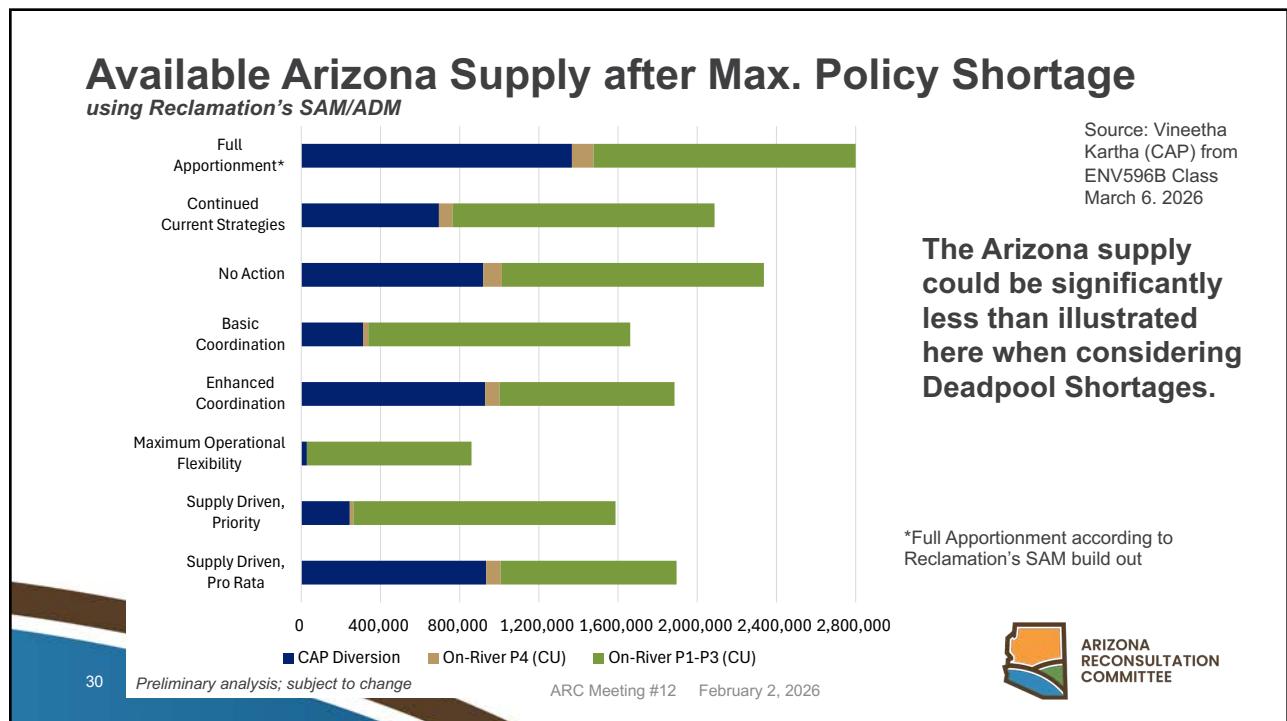
ARIZONA
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Preliminary analysis; subject to change

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Summary of impacts to agriculture from water supply challenges

- Central Arizona farmers are having to adjust to less Colorado River water availability
 - Guayule, a rubber substitute, is being grown by some
 - Land fallowing is occurring
 - Return to groundwater, but some investment is required
 - Interest in farmlands for future urban-suburban development but pace of development is uncertain, even with some recent legislation
 - Interest in farmlands for solar development
- Yuma area agriculture is expected to continue to focus on leafy green vegetables
- Farming is expected to continue on tribal lands
- Groundwater management changes may occur in other parts of Arizona, but there are policy/political disagreements on the details
- Opportunities to implement more efficient irrigation practices

Innovation + Collaboration => Adaptation

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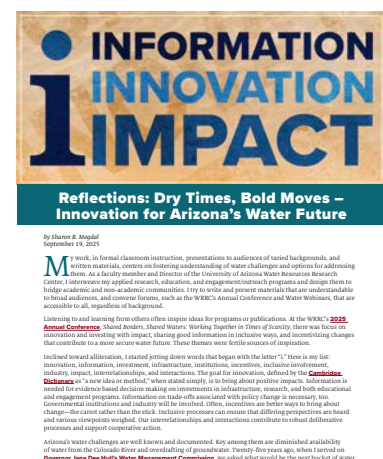
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About Innovation (New Ideas or Methods)

Arizona has been a water innovator.

- Groundwater Management Act, including its Assured Water Supply Program
- Water banking and recharge
- Rules and regulations regarding water re-use, including treatment to drinking water standards
- Indian Water Rights Settlements, but some still outstanding
- And more...

But we can't rest on our laurels.



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Categories of solution options to address imbalance of supply and demand

- Conservation
- Water pricing
- 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

Policy changes and creative partnerships and \$\$ (incentives)

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The need for innovation has never been greater...

- Innovation in the policy arena is front-and-center.
 - **Sharing the burden of reduced Colorado River flows**
 - Rural groundwater management
- Innovation is central to discussions of how to reduce water use by the agricultural sector.
 - Water Irrigation Efficiency Program, carried out by Arizona Cooperative Extension
- Innovation in government institutions.
 - The Water Infrastructure Finance Authority's Long-term Water Augmentation Fund supports "the development of projects intended to supplement Arizona's existing water supplies."
- Innovation in policies related to location of large non-agricultural water users, such as facilities (data centers) that require large amounts of water to provide quick and reliable access to data and information.

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New guidelines for sharing Colorado River shortage must be adopted soon.

The entire Colorado River system is at risk. All Colorado River water users in Arizona are likely to be impacted.

What will be the Federal Government's Decision?

Subject: Lower Division States' Proposal for 2026–2028 Colorado River Operations
Date: Friday, May 1, 2026 at 4:52:35PM Pacific Daylight Time
From: John Entsminger
To: Andrea Travnicek
CC: Scott Cameron, David Palumbo, Carly Jerla, Tom Buschatzke, JB Hamby, Gene Shawcroft, Brandon Gebhart, Estevan Lopez, Rebecca Mitchell

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The Lower Division States' Proposal for 2026–2028 Colorado River Operations is a comprehensive plan that benefits the entire Colorado River Basin and requires the continued leadership of the Department of Interior in partnership with the Lower Basin states to bring its benefits to fruition. We appreciate the Department's encouragement and consultation on this proposal, as well as its rapid consideration.

This proposal is an integrated, non-severable package that addresses:

- Lake Powell Releases;
- Upper Initial Units Operations;
- Lower Basin reductions by state of 1.25 million acre-feet annually;
- Additional Lower Basin Conservation;
- Intentionally Created Surplus (ICS);
- Establishment of a Tribal Pool; and
- Infrastructure Improvements, including to Glen Canyon Dam, as well as development of system projects.

The Lower Division States' Proposal is structured as a unified package. Its components are not independent and should not be evaluated or modified in isolation. The operational elements governing Lake Powell releases and the use of the Upper Initial Units are foundational as the Lower Basin reductions and proposed contributions are directly dependent on these operational parameters. Consistent with the Law of the River, the Department of the Interior does not have the authority to implement these Lower Basin reductions and conservation activities as proposed, nor to require Tribal pool contributions, in the absence of an agreement with the Lower Division States.

The term of this proposal has been intentionally shortened to reflect rapidly changing hydrologic

1 of 3

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The University of Arizona will continue to be engaged!

Water Efficiency Irrigation Program – administered by Cooperative Extension

- Reimbursement grants will be awarded up to \$1,500 per acre to support infrastructure costs of farms transitioning away from flood irrigation to more efficient technologies, expected to provide a 20% or greater water savings.
- University personnel are administering the grant funds and providing analysis of results.



February 2023

Water Efficiency Irrigation Program

Dr. Ethan Orr, Robert Mason, and Stephanie Brown

Agriculture in the American Southwest provides the nation with high quality food, fiber, and fuel. Blessed with hot summers, mild winters, and dry climates Arizona has become a center for growing specialty crops of unparalleled quality. In our current climate, one of the most limiting factors to crop production in Arizona is water availability. During the decade for more conservative use on the farm.

State funding has been allocated to fund commercial growers transitioning to more efficient water use practices. Reimbursement grants will be awarded up to \$1,500 per acre to support infrastructure costs of farms transitioning away from flood irrigation to more efficient technologies, expected to provide a 20% or greater water savings.

The University of Arizona Cooperative Extension group is tasked with administering the reimbursement grants, and will assist growers with understanding available options and development of best use practices.

Program Overview and Requirements

- Applicants must have a signed permit issued by the Arizona Department of Agriculture pursuant to A.R.S. § 9-906.
- Landowners or active landbank investors identify current flood irrigated fields that would benefit from irrigation improved technology.
- A grant request form is emailed to the Extension review committee who will assist with designing and reviewing the irrigation efficiency plan for the field.
- Up to \$1,000,000 in grant funds per farm will be paid directly to approved vendors to install irrigation improved technology that has previously demonstrated the ability to reduce water use by 20%.
- Irrigation water use will be monitored by the review committee for three years after implementation to determine optimal water use and assist with adjustments to sustainability management program.
- Application process is ongoing, and proposals may be submitted until October 2028.
- For more details visit our Arizona Extension webpage, download the application, or email us directly at CFE-Water@u.arizona.edu.



Irrigation Grant Landing Page
<https://extension.arizona.edu/water-efficiency-program>

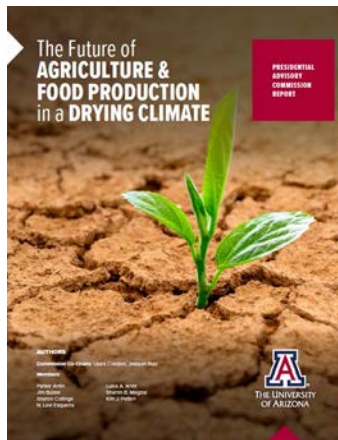


Fill out the online form
<https://arizona.surveymonkey.com/s/123456789>

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2023 University Commission Report



<https://wrrc.arizona.edu/publication/future-agriculture-food-production-drying-climate>

Tasked with recommending concrete steps the University of Arizona can take to position the State of Arizona as a global leader in climate-resilient sustainable agricultural and food production technology and practices.

Threats

- Growing food with less water in a hotter climate
 - Reduced availability and increased competition for water
 - Decline in soil quality, biodiversity, product yield and quality
- Socioeconomic and cultural concerns
 - Loss of the agricultural land, workforce and communities
- Impediments to adaptation
 - Siloed, inflexible policies
 - Lack of systems thinking, R&D investment

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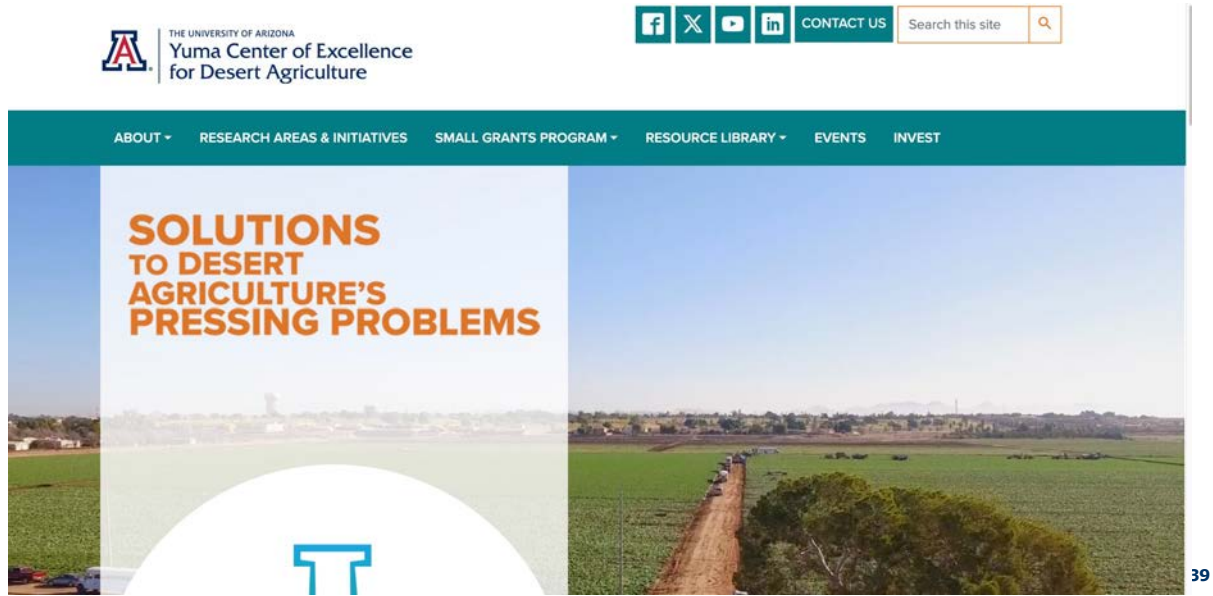
University of Arizona Strategic Initiatives related to water and agriculture in arid lands

- **University of Arizona Strategic Imperatives**
 - Success for Every Student
 - Research that Shapes the Future
 - Engagement with our Communities to Create Opportunity
- Among Five U of A **Strategic Research Initiatives** is ***Environmental Systems, Arid Lands Agriculture and Water***, with three sub-initiatives
 - Water Research
 - Environment and Public Health
 - Arid Lands Agriculture

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YCEDA, a U of A – agricultural industry partnership



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Agrivoltaics



Photo by S. Megdal, Arava Valley

AGRIVOLTAICS



Photo by G. Barron-Gafford, Biosphere 2

Partnerships!

Much Collaboration in all these areas, but will focus on a special one:

the Kasser Joint Institute for Food, Water, and Energy Security (KJI), a partnership of JNF-USA, the Univ of AZ and the Arava Region of Israel

<https://jointinstitute.jnf.org/>



Photo by S. Megdal, Arava Valley

AGRICULTURE IN ARID CONDITIONS



Photo by S. Megdal, Pearce, Arizona

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Process Factors for success, Megdal case study in *Routledge Handbook of Water Diplomacy*

Seven factors contributing to successful outcomes:

1. A functioning mechanism for cooperation, including knowledge co-production
2. Mutual respect contributing to trust
3. Involvement of interested parties (stakeholders)
4. Good communication
5. Persistence and Patience
6. Eating with your partners
7. Leadership



Additional factors:



Transparency
Sharing Lessons Learned (+ and -)

Search Routledge Handbook of Water Diplomacy for link to free PDF.

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Stay connected for information on WRRRC resources and activities!

Thank you!!
smegdal@arizona.edu



<https://wrrc.arizona.edu/>



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

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