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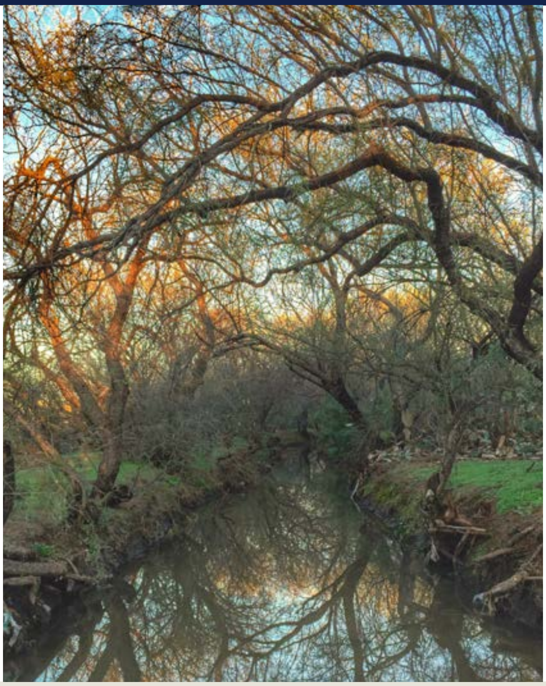

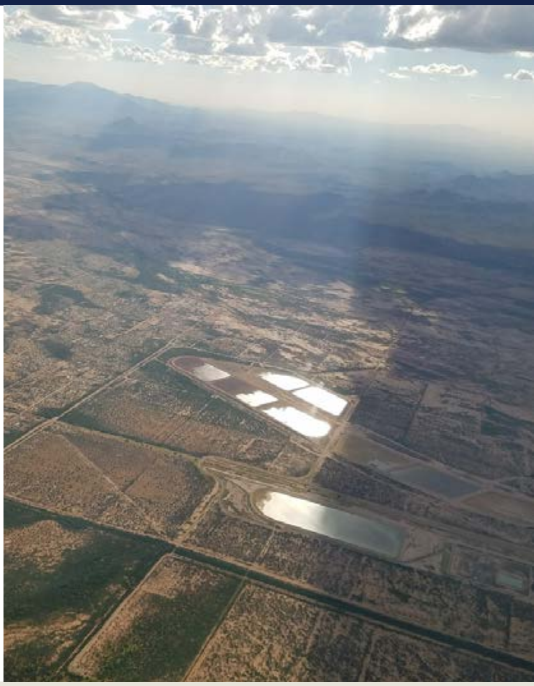

ARIZONA GROUNDWATER MANAGEMENT - PAST, PRESENT AND FUTURE

Authors: Brian McGreal, Susanna Eden
Layout: John Polle
Executive Publisher: Sharon B. Megdal
Cover Photos: See Back Page

INTRODUCTION

The passage of the 1980 Arizona Groundwater Management Act (GMA) represented a major change in Arizona's attitudes toward sustainable groundwater management. Prior to enactment of the GMA, there were essentially no restrictions on groundwater withdrawal, except that its use be "reasonable." Today, groundwater use in most of the populous regions of Arizona is monitored and regulated in the effort to preserve a dependable water supply for generations to come. The GMA made much of this progress possible, but significant challenges remain that must be addressed by Arizona's policy, planning, and management decision makers. Among these are diminishing flows, increasing demands, increased competition for water from the Colorado River, and rapid water level declines in groundwater-dependent rural communities that lack the financial, legal, or natural resources to secure alternative supplies. Groundwater depletion also is affecting rivers and streams, resulting in diminished or absent stream flow. The water rights of many of Arizona's Native Nations have not been legally quantified through adjudication or settlement, an additional impediment to tribal water development. These and other problems are the next set of hurdles Arizonans must clear in the pursuit of a sustainable and equitable water future.

Taking its inspiration from the WRRC's 2020 Annual Conference, "Water at the Crossroads: The Next 40 Years," this *Arroyo* covers the history of the GMA and the mechanisms through which the act made groundwater use in Arizona more sustainable. It examines some of the state's broader water use issues that impact groundwater management and explores innovative solutions policymakers, managers, and stakeholders are developing to address these issues.

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The *Arroyo* is published by the Water Resources Research Center
Cooperative Extension, University of Arizona
350 N. Campbell Ave., Tucson, Arizona 85719; **Phone:** 520-621-9591
Email: wrrc@arizona.edu; **Website:** wrrc.arizona.edu

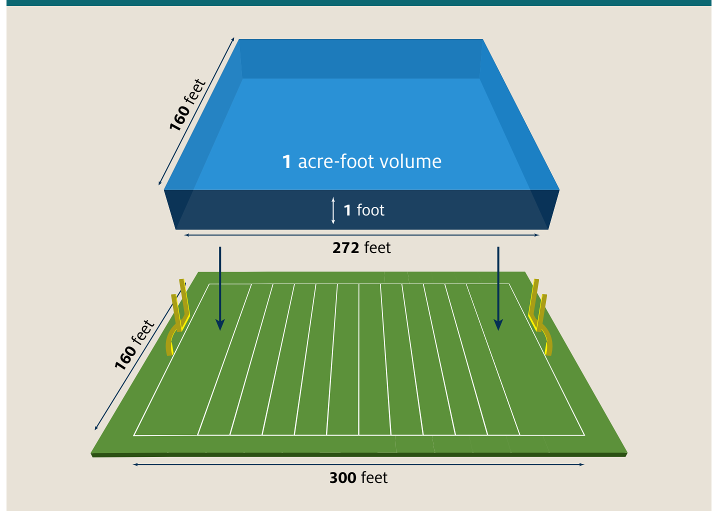
BACKGROUND

Before the 1980 Groundwater Management Act

The 20th century saw Arizona transformed from a federal territory, perhaps best known for the occasional gold, silver, and copper mining booms, into a state known for its vibrant urban centers, diverse economy, and productive agriculture. This transformation was possible due to development of surface water reservoirs, diversions, distribution canals and, following the mid-century adoption of high-speed centrifugal turbine pumps, groundwater extraction from large and seemingly inexhaustible aquifers. Between 1940 and 1953, a major boom in irrigated farming drove a tripling of groundwater extraction rates. As a result, groundwater levels declined and year-round stream flows diminished in many parts of Arizona. In 1968, central Arizona was overdrafting an estimated 2.5 million acre-feet annually, lowering aquifer levels by 300 to 400 feet in some areas, with adverse effects such as land subsidence. Groundwater overdraft, the withdrawal of more water than is recharged, was becoming a serious concern. During the same period, Arizona was experiencing population growth five times higher than the national rate. Much of this growth occurred in central Arizona, which relied increasingly on groundwater to support its cities and farms. Although irrigated agriculture continued to account for most of the water use, total irrigated acreage changed little. Potential problems of groundwater dependence received growing attention throughout the 1950s and 1960s. In 1976, a ruling in a lawsuit among groundwater pumpers put a stop to transporting groundwater away from the overlying land, a stunning blow to some mining operations and municipal water providers. By then it was clear that booming economic and population growth founded on non-renewable groundwater use would be unsustainable.

There was hope, however, in the form of the recently authorized Central Arizona Project (CAP), approved by the US Congress as part of the Colorado River Basin Project Act of 1968. The CAP was intended to allow the physical delivery of Arizona's entitlement to Colorado River water to central Arizona, where it would "rescue" groundwater-dependent agriculture and supply the growing metropolitan areas of Phoenix and Tucson with renewable surface water. In addition, water deliveries via CAP would address Arizona's concerns about the possibility of losing the unused portion of its Colorado River water allotment to California. Work on CAP began in the early 1970s with the construction of the Havasu Pumping Plant, but the system did not begin substantial water deliveries until the 1980s. In the meantime, the problem of serious and uncontrolled groundwater overdraft continued.

What is an acre-foot?



An acre-foot of water can cover most of a football field in 1 foot of water. Source: WRRC

In the late 1970s, the Arizona legislature and then Governor Bruce Babbitt mandated creation of a commission tasked with developing a statewide comprehensive groundwater management plan. Arizona was responding to federal signals that the state must demonstrate that CAP water would replace rather than supplement groundwater mining. A commission was formed, composed of representatives from various major stakeholder groups, including Tribes, irrigated agriculture, municipalities, mining, and industry. The commission would not merely advise lawmakers, but would draft a set of policies and legislation for the legislature to review and put to a vote. Crucially, the legislature had to vote on the package and could not alter the carefully crafted policies that represented a delicate balance of interests. This process resulted in passage of the GMA in 1980.

The 1980 Groundwater Management Act

The GMA won praise from numerous water policy and management experts for many years. The Ford Foundation named it "one of the 10 most innovative programs in state and local government" in 1986. Water policy expert Sharon B. Megdal called it "the most far-reaching groundwater management regulatory framework in the United States." The act demonstrated Arizona's ability to manage its water resources and succeeded in convincing the federal government to fund completion of the CAP.

The GMA addressed three broad areas of concern: the extent of Arizona's groundwater overdraft, transporting groundwater away from overlying lands, and substituting renewable CAP water, at least partially, for groundwater. To address these concerns, the act

Signing ceremony for the 1980 Groundwater Management Act. Source: ADWR

combined the preexisting and new administrative and regulatory authorities relating to water into the Arizona Department of Water Resources (ADWR). It also incorporated a strong water conservation mandate.

The GMA defined two areas for special attention—Irrigation Non-expansion Areas (INAs) and Active Management Areas (AMAs)—where groundwater overdraft had reached critical levels. In INAs, development of new irrigated agricultural land is prohibited, and anyone withdrawing more than 10 acre-feet of groundwater per year is required to report groundwater withdrawals annually to ADWR. The three INAs (Harquahala, Douglas, and Joseph City) are small, agricultural, and rural. Four of the five AMAs (Phoenix, Pinal, Tucson, and Santa Cruz), are located along the north-south I-10/I-19 corridor, where Arizona's population and growth are concentrated. The fifth AMA includes the growing communities in the Prescott area. The AMAs, which contain 80 percent of Arizona's population and approximately half of the state's irrigated agricultural land, are the focus of more management, planning, and regulation than the rest of the state.

Arizona's Active Management Areas and Irrigation Non-Expansion Areas. Source: ADWR

The GMA outlined a sophisticated regulatory framework for water management within the AMAs. Each AMA has a management goal; most include the goal of safe yield by 2025. Safe yield is the attempt to balance groundwater withdrawals with recharge and is measured over the entire AMA. The GMA mandated that the director of ADWR adopt a series of five management plans for each AMA, one every 10 years through 2020 and one for the five years to 2025. These plans were to specify how progress would be made toward reducing groundwater demand and identify problem areas, opportunities, and innovations. The AMA planning requirement was intended to promote the development of approaches suited to the unique needs and challenges of the different regions.

While each AMA has unique challenges, all AMAs have many of the same regulatory mechanisms. Within an AMA, any well capable of pumping more than 35 acre-feet per year—"nonexempt wells"—must measure and report pumping. The GMA specifies that a right or permit must exist for every acre-foot of groundwater withdrawn within AMAs, except from exempt wells. A permit must be obtained to drill a nonexempt well. Conservation requirements further limit groundwater use. In addition, the GMA allows residential growth in the AMAs only if the developer or water provider demonstrates the legal, financial, and physical capability to provide enough good quality water to supply the development for 100 years.

Statewide, regulation of groundwater extraction requires that any person proposing to drill a well register their intention to drill—regardless of the well's size. All community water systems must report their groundwater pumpage annually. Except for lot splits and subdivisions of fewer than six lots, all new real estate development must obtain a determination of "adequate" or "assured" water supply before lots can be sold. Outside AMAs, if ADWR determines that a subdivision does not have an adequate water supply, the developer must inform potential buyers. A local mandatory adequacy ordinance may also prohibit the sale of lots without a determination of water supply adequacy.

Central Arizona Groundwater Replenishment District

An important provision of the GMA was requiring a 100-year Assured Water Supply (AWS) for new growth within AMAs. For some time after the passage of the GMA, this 100-year water supply could be mined groundwater. In 1988, ADWR released its draft AWS Rule package, which proposed severely limiting per acre groundwater withdrawals for AWS purposes. These draft

AWS rules were opposed by a number of stakeholders, including cities and towns without access to renewable supplies, the development community, and agricultural landowners.

Arizona policymakers sought a mechanism that would ease the burden of AWS compliance without undermining the GMA. To this end, the Arizona legislature established the Central Arizona Groundwater Replenishment District (CAGRD) in 1993. By enrolling in the CAGRD, developers and water providers proposing to use groundwater for new developments can comply with the AWS requirement that their groundwater use be consistent with the AMA's management goal. In exchange for membership dues, fees, and assessments, the CAGRD finds, acquires, and recharges renewable water supplies to offset groundwater use by its members. Subdivision developers who choose to join the CAGRD enroll subdivided lots, and the subsequent homeowner becomes financially responsible for charges.

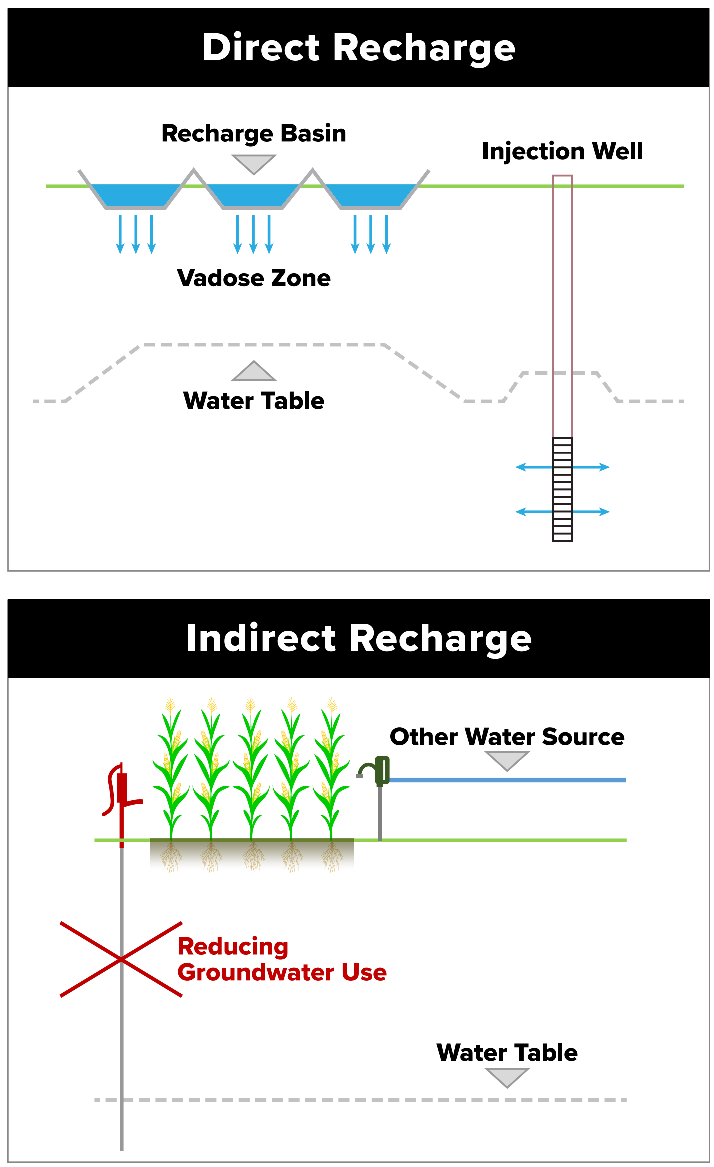
To provide transparency and accountability in its operations, CAGRD is required to submit a Plan of Operation for ADWR approval every 10 years. The plan reports its current and projected enrollment for 100 years along with the associated replenishment obligation. It details what water supplies CAGRD intends to use over the next 20 years to meet its replenishment obligation and identifies the water supplies potentially available to meet the projected obligation in the subsequent 80 years. The most recent plan, published in 2015, reported a replenishment obligation of 38,500 acre-feet annually and projected that its obligation could increase to 86,900 acre-feet per year by 2034. The 2019 Mid-Plan Review noted, however, that the annual replenishment obligation has hovered at or below 35,000 acre-feet since 2009, which will lead to a lag in the growth of the overall replenishment obligation, even as the rate of growth in population and residential construction trends toward pre-2008 levels.

Historically, the main source of supply available to CAGRD was "excess" CAP water, the portion of CAP's Colorado River water allotment that was available after long-term entitlement holders had placed their annual orders. More recently, as municipalities and tribal entitlement holders used more CAP water and drought reduced deliveries, excess CAP water dwindled. Faced with the decreased availability of CAP water and increased possibility of Colorado River shortages, CAGRD began seeking alternative sources, such as treated effluent and groundwater recharge credits, to meet its obligations. The 2015 Plan of Operation listed 36,530 acre-feet of annually renewable supply in their current portfolio. The 2019 Mid-Plan Review, however, revised those numbers to 51,181 acre-feet per year, with additional supplies that more than offset subtractions caused by new circumstances. The estimated supplies potentially available over the next 100 years remained in the range of 500,000 to 988,000 acre-feet per year.

Underground Storage

The decades that followed the GMA's passage saw a series of legislative actions to promote widespread use of aquifer recharge projects for storing water from renewable sources. The Underground Water Storage and Recovery Act in 1986 resolved ownership issues, which had previously acted as disincentives to underground water storage by protecting the right of the storer to recover the water. The ADWR administers a recharge and recovery accounting system that allows parties storing water underground to recover their water in the same calendar year or receive Long Term Storage Credits (LTSCs) to be recovered in the future.

The ability to store water underground was augmented in 1994 by the Underground Water Storage and Replenishment Act, which, among other provisions, established a mechanism for indirect groundwater "recharge." Farms within AMAs and INAs with rights to



Direct aquifer recharge through infiltration or injection and indirect or "in-lieu" recharge through substitution of renewable water for groundwater use. Source: WRRC

groundwater for irrigation could substitute a renewable supply, in lieu of pumped groundwater, thereby saving groundwater. The groundwater savings become LTSCs in the account of the entity that provided the renewable water to the farmer. The recharged water is normally CAP or reclaimed water (wastewater treated to the legal standard for reuse).

LTSCs may be recovered anywhere within the same AMA as the water was stored, with exceptions based on the rate of groundwater level declines in the recovery area. The recovered water retains the same legal status as the water that was stored. Thus, recovered CAP water and reclaimed water are not considered groundwater and do not count against the quantity of groundwater allotted to the pumper under various GMA provisions. This is an important consideration, especially for AWS purposes, because the GMA limits the use of groundwater to meet the demands of planned growth.

The GMA allows LTSCs to be bought, sold, or held indefinitely. The ability to recover LTSCs anywhere within the AMA in which they were created provides water management flexibility and allows water to be "moved" from a convenient storage site to a distant site of use within the same AMA. Although safe yield may be maintained in the AMA, this flexibility can lead to localized declines in groundwater levels where pumping continues without offsetting recharge in the same hydrologic area.

Arizona Water Banking Authority

As the 1990s progressed, Arizona water managers and lawmakers were concerned about the low orders for the newly available CAP water. The CAP's administrative body, the Central Arizona Water Conservation District (CAWCD), was obliged to repay part of the federal investment in the project's construction, and agricultural CAP water use fell short of the amount needed for repayment of the federal loan obligation during this time. Various incentives were devised to boost use by agricultural entities. After 1999, CAGRD utilized some of the unused CAP water, but immediately after it was established in 1996, the Arizona Water Banking Authority (AWBA) used more. Originally a mechanism for putting Arizona's full allotment of Colorado River water to use, the AWBA has become a key component in the "conjunctive" use (connected or interdependent use) of renewable water and groundwater envisioned in the GMA and subsequent underground storage legislation.

Broadly, the AWBA was created to make beneficial use of excess CAP water by storing it underground and as a precaution against future Colorado River water shortages. Specifically, the AWBA operates to accomplish four objectives: 1) ensure against future Colorado River shortages impacting the municipal and industrial sectors (known as "firming"); 2) help AMAs meet their groundwater management goals; 3) help Arizona meet its water firming obligations to Native Tribes; and 4) store water for California and Nevada in Arizona's aquifers. Water stored by the AWBA is earmarked for specific obligations and specific AMAs, based on the funding used to purchase the water. Between 1996 and 2019, the AWBA accrued 4.28 million acre-feet in long-term storage credits. A legislative change in 2017 authorized AWBA to meet its goals not only by storing excess CAP water underground, but also by storing other renewable supplies and purchasing LTSCs from third parties.

Conservation and Water Use Efficiency

The passage of the GMA affected various Arizona economic sectors in different ways. Agricultural operations within AMAs saw their formerly unlimited access to groundwater capped. Within the AMAs and INAs, the prohibition against expanding irrigated acreage meant that the only way for farms to increase production would be to improve efficiency on existing lands. The act also mandated that irrigation system distribution losses must not exceed 10 percent. While this would improve efficiency in the long term, it also represented a significant cost for upgrading irrigation systems. Industries that had been dependent on groundwater, including dairies, power plants, mines, and golf courses, were required to comply with use limits, conservation targets, and reporting requirements. In Arizona's fast-growing population centers, located almost entirely within the AMAs, municipal water providers saw per capita conservation, efficiency standards, and system loss limits mandated. A later Best Management Practices option allowed water providers to substitute practices to increase water conservation and use efficiency for a maximum gallons-per-capita-per-day target.

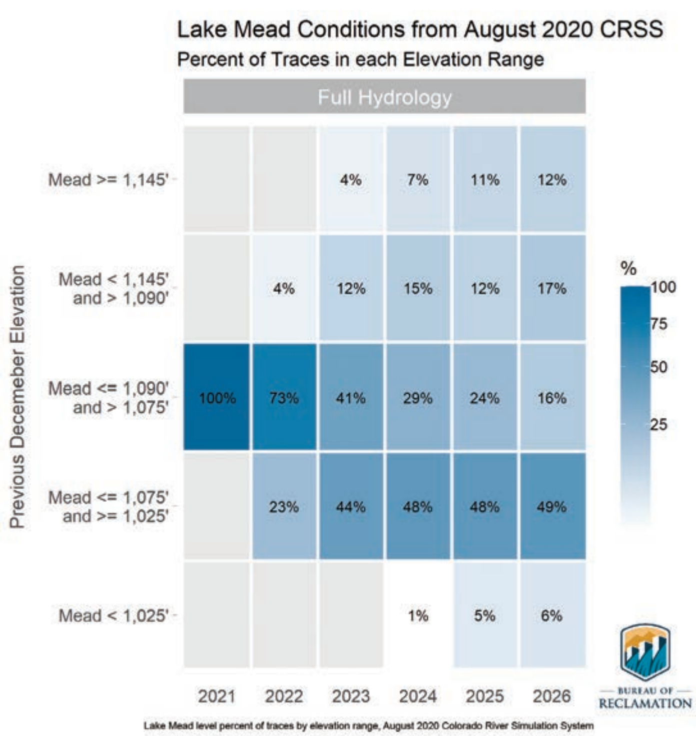
WATER SUPPLY ISSUES AND GROUNDWATER MANAGEMENT

Despite the accomplishments of the 1980 Groundwater Management Act and related legislation, Arizona continues to face a diverse array of challenges related to managing water resources. Pressing concerns include Colorado River water shortages, the future ability of CAGRD to meet replenishment obligations, the physical availability of groundwater within parts of some AMAs, water transfers, unsustainable groundwater pumping in rural communities, a range of issues related to tribal water rights, the need for resilience to climate change in water management systems, and conservation potential, as well as balancing environmental water needs with human water demand. Resolution of these issues is integral to effective groundwater management, which in turn impacts management of other water resources in significant ways. This section explores each of these challenges.

Colorado River Supply Reliability

The threat of Colorado River shortages is arguably the water issue of most immediate concern to Arizona's river communities and to those in the CAP service area, for both its direct impact on Colorado River water users and its indirect impact on groundwater use. As the water level of Lake Mead drops below certain predetermined elevations, shortages would be declared, triggering curtailment of water deliveries to Arizona by specified amounts. A persistent deficit in inflows in relation to water demands on the Lower Colorado River points to ever-increasing declines in the level of Lake Mead. As of September 30, 2020, unregulated inflows into Lake Powell from the upper basin were about 61 percent of the historical September 30 average, and Lake Mead, in the lower basin, was about 47 percent full.

There is good news in the short term, however. Arizona, Nevada, and Mexico are making contributions to Lake Mead in a collaborative effort to maintain water levels and avoid severe shortage conditions. US Bureau of Reclamation (Reclamation) models project Lake Mead levels will remain above triggers for severe curtailments, at least through 2022. The projected likelihood and severity of a shortage increase substantially in 2023, meaning that the time to implement preventive actions is limited.



Projected percent likelihood that Lake Mead will be at or below specified shortage levels on January 1, 2021 to 2025, Colorado River Simulation System (CRSS). Source: Reclamation

Climate Change

The Colorado River Basin already is feeling the negative effects of climate change. In the Upper Basin, snowpack is melting earlier in the year because of rising temperatures. In Arizona, storm systems that once may have brought rain now tend to track northward to higher latitudes. For the Lower Basin states, rising temperatures are causing increased evaporation from storage reservoirs and algae and turbidity in water transportation networks. In addition, extreme heat in summer months is leading to increased water demand by agricultural and municipal water users. Climate science assessments indicate that

Arizona's Drought Contingency Plan

On January 31, 2019, after years of negotiations between the Colorado River Basin states, Arizona enacted implementing legislation covering the state's role in a Drought Contingency Plan (DCP) addressing how to deal collectively with likely

Lower Colorado River Curtailments

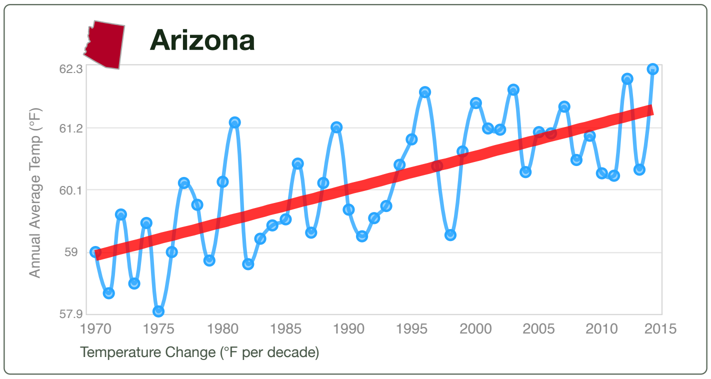
Lake Mead Elevation	AZ	NV	CA	MEX	TOTAL
1090 -> 1075	192	8	0	41	241
1075 -> 1050	512	21	0	80	613
1050 -> 1045	592	25	0	104	721
1045 -> 1040	640	27	200	146	1013
1040 -> 1035	640	27	250	154	1071
1035 -> 1030	640	27	300	162	1129
1030 -> 1025	640	27	350	171	1188
<1025	720	30	350	275	1375

Curtailments = 2007 Interim Guidelines Shortage, DCP Contributions, and Bi-national Water Scarcity Contingency Plan Savings in KAF (1,000 acre-feet) / year

shortages. Subsequently submitted to and approved by Congress, the DCP forestalled action by the US Department of the Interior to impose its own shortage curtailments. The DCP outlines a basin-wide coordinated response to the declining water levels in Lake Mead, Lake Powell, and other reservoirs throughout the Colorado River watershed. As water levels in Lake Mead decline, Arizona faces increasing curtailments of its Colorado River allotment.

In August 2019, mere months after the plan's implementation, a Tier Zero shortage condition was declared when the water level in Lake Mead was predicted to stand below 1,090 feet as of January 1, 2020. This triggered a 192,000 acre-foot reduction in Arizona's Colorado River allotment, which would come from the quantity normally diverted by CAP. Since 2015, however, CAP already had been taking a similar reduction to shore up Lake Mead levels and thus was prepared for this substantial cut. As a result, with the exception of some agricultural entities, most CAP water customers felt minimal impacts.

As of August 2020, Tier Zero conditions continue through 2021. While the Colorado River Drought Contingency Plans represent a major step forward in incentivizing conservation, basin-wide cooperation, and sustainable water use, Colorado River shortages remain an important focus of Arizona's water management efforts.



Increase of approximately 3ºF in Arizona's average annual temperature, 1970 to 2015. Source: https://www.climatecentral.org/

these drier conditions are likely to represent a new normal, as temperatures in the Southwest warm, storm tracks shift northward, and snowpack affected by hotter spring temperatures yields less runoff.

Hydrologic Disconnect

Another water management issue in the AMAs is the hydrologic disconnect between the location of groundwater recharge and withdrawals. Stored water may only be recovered through permitted recovery wells, and ADWR monitors those withdrawals. The recharge and recovery system in the groundwater code allows recovery to occur anywhere in the AMA. If outside the recharge project's area of hydrologic impact, recovery is permitted where the average annual rate of localized groundwater declines does not exceed four feet per year.

Nevertheless, other groundwater pumping may continue without local replenishment. The AWS rules prohibit groundwater pumping beyond 1,000 feet below land surface in the Phoenix and Tucson AMAs, and 1,100 feet in the Pinal AMA. The GMA requires only that extraction and recharge balance on an AMA-wide basis. It should also be noted that grandfathered irrigation rights and industrial permits allow substantial groundwater withdrawals in AMAs without replenishment. Pumping water from far below the surface may be feasible for some municipal water providers and industrial users, but the agricultural sector—where financial returns on water use already are low—acutely feels the increases in the cost of extraction. In addition, disruptive and damaging land subsidence and earth fissuring have occurred and will continue to occur in many places as groundwater levels drop, even before regulatory depth limits are reached.

Potential Colorado River Water Transfers

The pressure of groundwater use limitations and potential curtailment of Arizona's Colorado River allotment on central Arizona water users is alarming on-river water users. Reduced Colorado River supplies will force central Arizona's water users to find another way to reduce their reliance on groundwater and continue groundwater replenishment. Mainstem communities worry about potential purchases of Colorado River water rights for transfer to central Arizona.

Farmers, irrigation districts, and on-river communities, such as Yuma and Parker, are some of the earliest non-tribal users of Colorado River water in Arizona. Their water rights are older and therefore have a higher priority than the rights of CAP water users. If curtailments are triggered, some on-river rights holders will be entitled to use water when lower priority diverters, including the CAP, can no longer take water from the river. If Colorado River water transfers are approved, on-river water users would be well compensated for their water by central Arizona's relatively wealthy cities, but rural agricultural communities fear that they could see their economies irreparably damaged by the reduction in agricultural industry caused by the local loss of water. On-river communities are keenly aware that historical precedent exists for the impoverishment of rural areas when their water rights were bought to slake the thirst of growing cities. Their concerns deserve serious attention in any attempts to negotiate balanced solutions.

Yuma area farms produce more that 90 percent of the lettuce sold in the United States. Source: pexels.com

Water for Rural Communities

Other rural communities throughout the state face a different set of water issues. Although spatially disparate, many rural communities in Arizona are linked by a common set of characteristics. They often are highly dependent on groundwater. As their populations tend to be dispersed, many homes are not connected to a water utility; instead, they draw well water from relatively shallow individual or shared wells. Incomes in rural communities are typically low and economic diversity often is limited. Farming, typically a dominant economic engine in rural communities, is vulnerable to a diminishing groundwater supply.

In areas outside the AMAs and INAs, the lack of regulations on groundwater extraction allows groundwater depletion to go unchecked. For example, in southeastern Arizona, long-time Cochise County residents have reported wells that were dependable for years have run dry. Here, the groundwater level decline largely is due to the expansion of industrial-scale agriculture supplied by deep, high-output wells. The cost of deepening existing wells is high, and many homeowners and small farmers find themselves on essentially valueless property if they are unable to restore their water access. In western Arizona's La Paz County, industrial-scale production of alfalfa and other hay has led to similar groundwater impacts, with faucets running dry in homes dependent on domestic wells. Despite a traditional distrust of government regulation, some 500 La Paz County residents petitioned state lawmakers to exercise some form of groundwater management to protect existing water uses.

CAGRD Replenishment Obligation

As central Arizona's population has continued to grow, CAGRD has enabled groundwater-dependent development in AMAs to continue. Although only about half of all development in central Arizona relies on CAGRD, the district's future ability to meet its replenishment obligation is a significant issue. The impact of a looming reduction in CAP water on water supply availability has raised questions about CAGRD's ability to meet its long-term obligation. Meeting its obligations is largely a function of member enrollment numbers, the availability of renewable water supplies, and the cost of acquiring them, all of which are undetermined. As of December 2020, no statutory cap limits enrollment in CAGRD. Questions exist as to whether CAGRD can continue to support development for all current and future members or if it already has grown larger than it was meant to be. Realistically, limits may exist at the point that groundwater is no longer physically available for new development or CAGRD fails to acquire enough renewable water to meet its additional replenishment obligations. Although the district's 2015 Plan of Operation projected that CAGRD would be obliged to replenish groundwater for 383,000 homes by 2036, these estimates were reduced in its recent 2019 Mid-Plan Review, reflecting a reassessment of trends in new development.

Established with excess CAP water as its chief source supply, CAGRD acknowledged as early as 2005 that this supply would eventually decrease or dry up entirely and began building a diverse water supply portfolio. As of 2020, CAGRD had 25 supply agreements in place with various entities, including the Gila River Indian Community, for treated wastewater, long-term storage credits, leased CAP supply, and more. In its 2019 Mid-Plan Review, CAGRD states that since its 2015 Plan of Operation, new water supply acquisitions reduce reliance on excess CAP water and represent much more water than required for near-term replenishment obligation. In addition, CAGRD has over 800,000 acre-feet of LTSCs for its replenishment

Subdivisions spread out across the Arizona landscape.
Source: shutterstock.com

obligation, plus more than 250,000 acre-feet of LTSCs in a separate reserve account, which can be used in times of shortages to meet its replenishment obligation. CAGRD acknowledges, however, that the risks to its water supply from future shortages means that acquisition of additional supplies must be the primary focus of its operations. Yet, some still ask, what would it mean for the Assured Water Supply program if CAGRD becomes unable to meet its obligations, and what can be done to prevent such an outcome.

Tribal Water

Any meaningful discussion of the water management issues confronting Arizona today must include the state's many tribal communities. Tribal water issues involve quantifying the water rights of individual Native Nations and addressing the lack of infrastructure needed for use of the water to which they are legally entitled. Native Nations also have much to offer as participants in addressing a range of water management problems.

Although most tribal water claims focus on surface water, groundwater is inevitably involved in resolving water issues. While tribes lack final quantification of their water rights, adequate infrastructure, or both, Arizona's non-Native water users continue to rely on unused tribal water for existing uses. This reliance will pose significant challenges as tribes quantify and develop their water rights.

Many Native Nations are involved, along with other water users, in Arizona's General Stream Adjudications of the Gila and Little Colorado rivers, which have been in progress since the 1970s. Difficult legal questions about the extent to which tribal and non-tribal rights to underground water will be affected by these adjudications remain unresolved. The long duration and uncertainty of this legal process impedes the ability of the parties to move forward with plans for resource development and use. Through the end of 2018, these two ongoing adjudications encompassed nearly 99,000 claims.

Only 11 of Arizona's 22 federally recognized tribal entities have fully adjudicated and/or settled their water

2020 Water Rights of Arizona's Native Nations	
QUANTIFIED RIGHTS	**OUTSTANDING CLAIMS***
Adjudicated (Priority Dates)	**Partially Settled (Settlement Dates)**
Cocopah Tribe (1917)	Tohono O'odham Nation (1982/2004)
Colorado River Indian Tribes (1865-1874)	San Carlos Apache Tribe (1992)
Fort Mojave Indian Tribe (1890-1911)	Hualapai Tribe (2014)
Fort Yuma (Quechan) Indian Tribe (1884)	**Outstanding**
Settled (Settlement Dates)	Havasupai Tribe
Ak Chin Indian Community (1984)	Hopi Tribe
Salt River-Pima Maricopa Indian Community (1988)	Kaibab Paiute Tribe
Fort McDowell Yavapai Nation (1990)	Navajo Nation
Yavapai-Prescott Indian Tribe (1994)	Pasqua Yaqui Tribe
Zuni Indian Tribe (2003)	San Juan Southern Paiute Tribe
Gila River Indian Community (2004)	Tonto Apache Tribe
White Mountain Apache Tribe (2010)	Yavapai Apache Nation

*includes partial settlements

Location of Arizona's Native Nations and the status of their water rights claims in 2020. Source: ADWR

claims. The adjudication process has extended through generations, during which time their people suffered serious hardship. Even when water rights are not in dispute, many Native communities are hampered by the lack of water infrastructure and insufficient financial resources for planning construction, operation, and maintenance. Many households on Arizona's tribal lands depend on water hauling and often live on only five to seven gallons per person per day. This issue is especially pernicious, as the lack of access to water blocks tribal economic development and creates serious public health challenges, as evidenced by the spread of COVID-19 on the Navajo Nation. There, approximately 3,500 households are without plumbing for basic hand washing or cleaning.

According to Dennis Patch, former chairman of the Colorado River Indian Tribes (CRIT) Tribal Council, tribal leaders have become accustomed to promises of help and little follow through. Tribes continue to be disadvantaged in terms of funding and infrastructure. Although the

Tribal Perspectives on the History of Water in Arizona

The relationship between Arizona's Native Nations and federal and state governments has historically been fraught. Long before European settlement in the Southwest, Native communities developed particular cultural and practical relationships with their lands and waters. As elsewhere in the United States, Native communities in Arizona that encountered missionaries and settlers experienced expropriation of their resources, including water, and other actions that threatened their existence. Throughout much of the 20th century, they remained marginalized. This situation began to change, albeit slowly, in the latter half of the century. Tribal activists like Rodney ("Rod") B. Lewis, the first tribal member to practice law in Arizona, challenged systemic disregard of tribal water rights. Major negotiated water settlements involving the Ak Chin, Tohono O'odham, and Gila River Indian Community (GRIC), among others, resulted from the determination of Native Nations to reestablish control over their water, but often only after a lengthy series of trials and appeals. While court battles helped secure tribal water rights in some cases, they did little to foster trust or develop a precedent for cooperation between Arizona's tribes and federal and state governments.

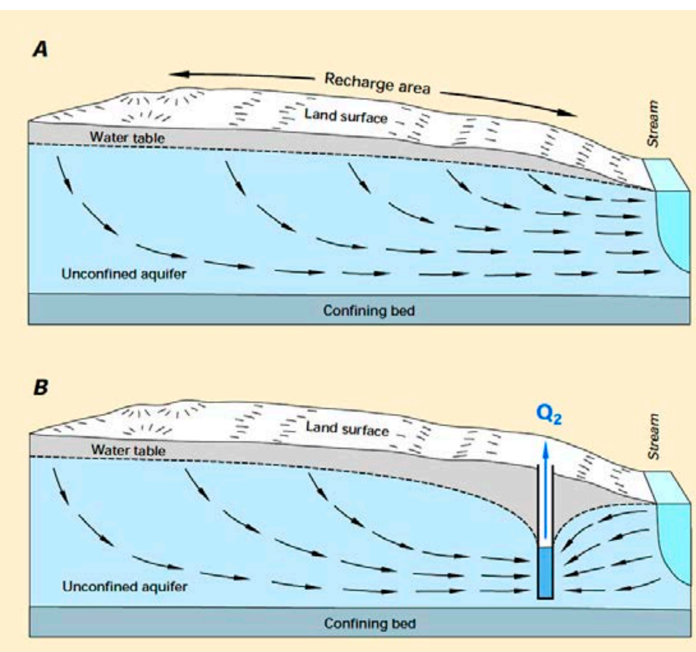
The recent involvement of GRIC and the Colorado River Indian Tribes (CRIT) in negotiations over the Arizona Drought Contingency Plan (DCP) represented a major step toward tribal participation in shaping Arizona water policy. Former CRIT Chairman Dennis Patch is quick to point out, however, that Native Nations have been asked to sit at the bargaining table because they hold quantified rights to water that could benefit other entities. Stephen Roe Lewis, Governor of GRIC and son of Rod Lewis, sees the participation of Native Nations in the DCP negotiations as representing a meaningful change, but also recognizes that this does not mean they are ensured future representation. According to Gov. Lewis, Native communities like GRIC and CRIT must leverage this moment to preserve their places at the table.

Their long history of marginalization by state and federal governments is not easily forgotten and trust is not easily rebuilt. Recent experience demonstrates that the participation of Native Nations in discussions addressing water issues yields better solutions.

federal government has a trust responsibility to federally recognized Native tribes, funds, when provided, are often held up by disagreements about funding requirements or where and how funds should be spent. Improved cooperation between communities in need and funding agencies, through committed institutions and simplified procedures, could go a long way toward resolving this problem.

Environmental Water Needs

As changing environmental conditions widen the gap between water supply and demand in Arizona, there is growing worry over the availability of water for imperiled desert ecosystems. It is evident in the condition of the state's rivers and streams that Arizona water law does not protect instream uses of flowing rivers, except in new, relatively rare instances where an instream flow right has been secured. In addition, the legal distinction between groundwater and surface water in Arizona allows groundwater pumping to drain surface flows even where older, higher-priority surface water rights exist. On a federal level, the 2020 changes to the definition of Waters of the United States under the Clean Water Act have reduced protections for ephemeral and intermittent streams. Preservation of aquatic and riparian ecosystems requires some minimum baseline flow. Water policy in the western United States historically has encouraged growth and development at the expense of natural riparian and aquatic ecosystems and the human activities and lifestyles they support. More recently, growing numbers of policymakers and community leaders are calling for consideration of environmental water needs.



Effect of groundwater pumping on surface water; A - before well pumping, B - after pumping well has operated for some time. Source: USGS (modified)

FINDING SOLUTIONS

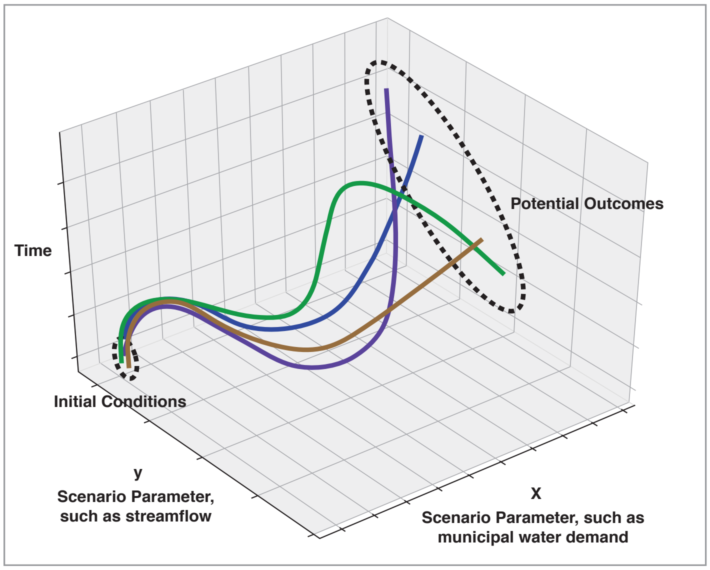
From central Arizona's sprawling population centers to small rural communities, Arizona's policymakers, water managers, and stakeholders face numerous water challenges. In response, a variety of innovative solutions are in various stages of development.

Modeling Arizona's Water Future

In an arid state like Arizona, effective water management starts with effective planning, which is made possible through reliable forecasting of future conditions. ADWR, US Geological Survey (USGS), Reclamation and CAP all are involved in modeling future water resource conditions. CAP is developing forecasts for use in long-term planning for its service area. CAP analysts utilize computer models of supply and demand for water in the CAP service area (Maricopa, Pinal, and Pima counties), with projections running through 2060. Using the current CAP Service Area Model (CAP:SAM), analysts can project a wide range of future supply and demand scenarios by adjusting various parameters. The result therefore is not a single projection, but a set of conditional outcomes that define an envelope of possibilities. Working within this envelope, water managers can assess likely future supply and demand imbalances and plan accordingly. Reclamation employs a similar modeling approach in operational planning for the Colorado River system.

Reclamation publishes a 24-Month Study, updated monthly, from model outputs that forecast water levels in lakes Mead and Powell. The January forecast in the August edition of the 24-month study is used to determine whether a shortage declaration will be triggered for the upcoming calendar year. Reclamation's Mid-term Operations Model projects five years into the future, yielding a range of output values for future time periods. Water managers use this planning tool to identify and manage near-term risks to supply. In addition, the Colorado River Simulation System projects Colorado River conditions 10 to 60 years into the future, again yielding a range of output values. These projections, although not useful for day-to day operations or short-term planning, provide useful insight to those engaged in crafting water policy.

Groundwater models developed over the years by ADWR have multiple applications, including assessing water supply conditions, establishing water budgets, and evaluating AWS applications. They underpin discussions about the impact on aquifers of increased groundwater pumping and recovery of long-term storage credits in the event of a shortage on the Colorado River. Taken together, these tools help water resource managers, planners, and policymakers prepare for the future.



Model projections of alternative futures given different scenarios. Source: WRRC

Recovering Water Banked in the AMAs

Within the AMAs, storing water underground for recovery at a later date has become an important strategy for water supply resilience. While this practice began largely as a way to take and retain Arizona's entire CAP allotment, the stored water is now considered a crucial supply in the event of future shortage-induced drops in CAP deliveries. Long-term drought is adding urgency to questions about recovery of stored water. What conditions will trigger the recovery of stored water? How and where will this recovery take place? How long will Arizona's stored water reserves last once recovery begins? Like any savings account, the banked water is intended to cover temporary shortfalls, not permanent reductions. These questions were the focus of recovery planning by AWBA, which began storing water in 1996 before participating in the development of the first recovery plan in 2014.

AWBA, ADWR, and CAP together developed the Joint Recovery Plan in 2014, a basic framework for stored water recovery. Under this plan, recovery of banked water is triggered when shortage prevents CAP from delivering contracted Colorado River water to entities for whom AWBA has a firming obligation, principally municipal and industrial (M&I) water users and some Native tribes. Recovery will occur in one of two ways: direct delivery by CAP of water recovered through permitted recovery wells, or indirect recovery, which involves exchanges between M&I water users. Because direct recovery likely would require the construction of new recovery wells and conveyance infrastructure, it may be an expensive option. Indirect recovery can involve complex agreements among various entities but is likely to be an attractive option for avoiding infrastructure costs where recovery well infrastructure already exists.

Because AWBA also facilitated interstate water storage in central Arizona aquifers, the state established procedures to facilitate recovery on behalf of California and Nevada. In the 1990s, California took advantage of this interstate storage capacity when it banked and then fully recovered a portion of its Colorado River allotment. Nevada, which does not expect to recover its stored water anytime soon, has agreed to provide a 10-year plan for recovery to give Arizona water managers time to prepare for the withdrawals. When they occur, Nevada's withdrawals will be accomplished indirectly, by taking from Lake Mead an amount equal to the amount they intend to recover, while Arizona refrains from taking the same amount from its allotment.

Overall, scenario modeling for the 2014 Joint Recovery Plan projects a high probability that 75 percent of all banked water will remain underground through 2045. ADWR, AWBA, and CAWCD are updating the 2014 plan and working with stakeholders in the Recovery Planning Advisory Group process. An update to the recovery plan, posted in July 2020, projected that the maximum total recovery by 2045 could be as much as 3.6 million acre-feet. AWBA had accrued nearly 4.3 million acre-feet of water as of December 31, 2019.

Augmenting Arizona's Water Supplies

To address statewide water supply issues, Arizona water managers are seeking ways to augment existing water supplies. Options they are considering include industrial-scale desalination of seawater or brackish groundwater, taking advantage of advanced wastewater treatment technology for potable water reuse, and voluntary water transfers, among others. While many ideas show promise, each comes with significant cost.

To approach the issues broadly and engage stakeholders in considering options, Gov. Doug Ducey created the Governor's Water Augmentation Council in January 2016 for the express purpose of finding additional water supplies and more efficient ways to use current supplies. The council comprised representatives from multiple stakeholder groups, including municipalities, agricultural interests, the mining sector, and rural communities. Yet some, including tribal communities and environmental organizations, did not feel adequately represented. In January 2019, the council was reconstituted as the Governor's Water Augmentation, Innovation and Conservation Council (GWAICC), with a broader mandate but the same overall goal of securing sustainable water supplies for Arizona. A report on long-term water augmentation options for Arizona, prepared by a team of consulting firms for the council's Long-term Water Augmentation Committee and issued in August 2019, contained an evaluation of water augmentation methods that could be applied throughout Arizona, including conservation and efficient water use practices.

One option is desalinating ocean water from the California coast or the Sea of Cortez, and/or desalinating brackish groundwater. For Arizona to be able to make use of desalinated ocean water, California or Mexico would have to participate. One proposal would have Arizona pay for construction and operation of an ocean water desalination plant in Sonora, Mexico. The desalinated water would be used in Mexico, and Mexico in turn would forego delivery of some of its Colorado River allotment, allowing Arizona to take additional water from the river. This method of indirectly importing desalinated ocean water avoids the need to construct facilities for moving the treated water from Sonora to users in Arizona.

Even so, desalination of ocean water is an energy-intensive and therefore expensive process. For this reason, the desalination of less saline brackish groundwater is an attractive option, as lower salinity translates to lower cost. The downsides of this approach include the need for extraction and conveyance infrastructure, the potential for land subsidence, and the need to dispose of the highly saline brine—a desalination waste product. The cost of desalinated water, whether from ocean water or saline groundwater, would likely be too high for use by the agricultural sector.

Another potential source of "new" water for Arizona involves the expanded treatment of wastewater for reuse. Water reuse is widely seen as a more achievable and lower-cost alternative to desalination. Much of Arizona's wastewater already is reclaimed for non-potable use. While Arizona's regulations encourage greater integration of reclaimed water into supply portfolios, some barriers exist to potable reuse, including costs associated with advanced treatment and negative public opinion—the so-called yuck factor. In Arizona, experience with advanced water treatment technology and continuing concerns about water shortages have succeeded in moving public opinion toward acceptance. Recent rule changes allowing direct potable reuse reflect and reinforce this attitude.

Potential ocean water desalination facilities for augmenting Arizona's water supply through cooperation with Sonora, Mexico. Source: https://www.researchgate.net/figure/Desalination-plants-in-the-western-US-Mexico-border_fig1_301277964

Attempts at weather modification or cloud seeding have gone on in Arizona as far back as the 1950s. In the time since, both the Salt River Project (SRP) and CAP have undertaken weather modification initiatives to increase rainfall on the SRP watershed and the larger Colorado River Basin. Some evidence suggests success under certain circumstances, but questions remain as to whether weather modification will produce enough impact on water availability to make it cost effective. Legal questions about potential unintended consequences may also prove a barrier to widespread use of weather modification.

Removing phreatophytes, water guzzling riparian plants, may also augment water supply. In the Upper Colorado River Basin, resource managers have been culling the invasive phreatophyte tamarisk by releasing tamarisk beetles into the environment to feast on the plant's leaves. This approach to removing tamarisk has been effective thus far, although scientists warn that tampering with ecosystems often produces unintended

Scottsdale Water's Direct Potable Reuse

Throughout its history, Scottsdale Water, the municipal water provider for the city of Scottsdale, has relied on technology and innovation to find sustainable ways to meet the water needs of customers. Scottsdale Water established the Gainey Ranch Water Reclamation Facility in 1981 to provide reclaimed water for a neighboring golf course and continued to develop its reclamation capacity in 1988 with construction of the Water Campus, a combination reclamation plant and advanced water treatment facility. Built to produce contaminant-free water for golf course irrigation and indirect potable reuse through aquifer recharge, the Water Campus allowed Scottsdale to balance its groundwater budget by 2006. In 2019, less than two years after the state opened the door to legal direct potable reuse (DPR), Scottsdale's Water Campus became the first facility in Arizona to receive a DPR permit under the new recycled water rules. The project's express purpose was to create a model for cities in Arizona and elsewhere, as well as to help the Arizona Department of Environmental Quality develop a DPR permitting process and demonstrate to the public the safety of strictly regulated and highly treated recycled water. In November 2019, public outreach took the form of the One Water Brewing Showcase, a beer festival exclusively featuring craft beers brewed with recycled water from Scottsdale's Water Campus.

consequences. Phreatophyte removal has damaged important endangered species' habitats and has not demonstrated long-term increases in water supply.

The grandest augmentation ideas involve importing water from great distances, with some proposals calling for the physical transfer of water from as far away as the Columbia or Missouri rivers. These projects are dubious because of scale, cost, legal impediments, and political realities, and they have been ruled out for the foreseeable future by the GWAICC Long-term Water Augmentation Committee.

Established stand of invasive tamarisk. Source: USGS

Transfers from Arizona's On-river Water Users

In the 21st century, Arizona's policy on Colorado River water transfers neither encourages nor prevents transfers between Colorado River water users or from those users to central Arizona. A number of examples exist of transfer attempts that succeeded or failed, yet unanswered questions surround the issue. Should communities have a voice in shaping water transactions between willing sellers and buyers when transfers would affect local economies? Should potential buyers be required to exhaust other possibilities before attempting to transfer water? Should transfers include economic mitigation for communities in regions from which water is transferred? Should transfers include a "cut to the river," allowing a portion of the water to remain in the river for ecological benefit?

Potential transfers of Colorado River water to central Arizona are among the most contentious water policy issues in Arizona today. This divisive issue is so important that Bruce Babbitt advocates formation of a commission similar to the one that drafted the 1980 GMA when he served as Arizona governor. The commission would be designed such that all affected parties would have a place at the table, with special attention paid to diversity and inclusion of voices for the environment.

Water Solutions for Rural Communities

Rural communities lacking legal or physical access to Colorado River mainstem water or the CAP canal are finding that collaborative activities show promise in dealing with water supply issues. An agreement between SRP and Payson, in Gila County, enabled the town to reduce its dependence on groundwater. As part of the 2004 Arizona Water Settlements Act, SRP acquired the 15,000 acre-foot C.C. Cragin Reservoir, 25 miles north of Payson. The reservoir typically has filled to capacity each winter. Despite this nearby source of surface water supply, the town was completely reliant on groundwater. In 2008, SRP and Payson agreed to share the costs of delivering 3,000 acre-feet of water per year from the reservoir to the town. Water deliveries began in 2019 after the construction of a gravity pipeline. Payson's groundwater pumps were shut off throughout that summer and fall, resulting in stable or rising groundwater levels.

Stakeholders are working with ADWR toward a legislative proposal for new water management tools for rural areas outside AMAs. Existing criteria for establishing new AMAs and INAs have discouraged designation of new areas, including in Mohave and Cochise counties, where residents see threats to their groundwater resources. In addition, regulations associated with AMAs and INAs so far have been deemed unsuitable for most of rural Arizona. Past efforts to create new areas with custom-tailored rules have so far fallen short, but discussions continue about the potential for new legal tools.

C.C. Cragin dam and reservoir. Source: ADWR

Tribal Water Access

Like other rural communities, Native communities in many rural parts of Arizona face challenges stemming from the a lack of essential infrastructure for accessing potential water supplies. The situation of each tribal community is unique and there is no one-size-fits-all solution. Effective solutions require tailored approaches; therefore, it is useful to examine cases in which Native

Nations have been able to engage with local stakeholders and governmental agencies to solve water access problems.

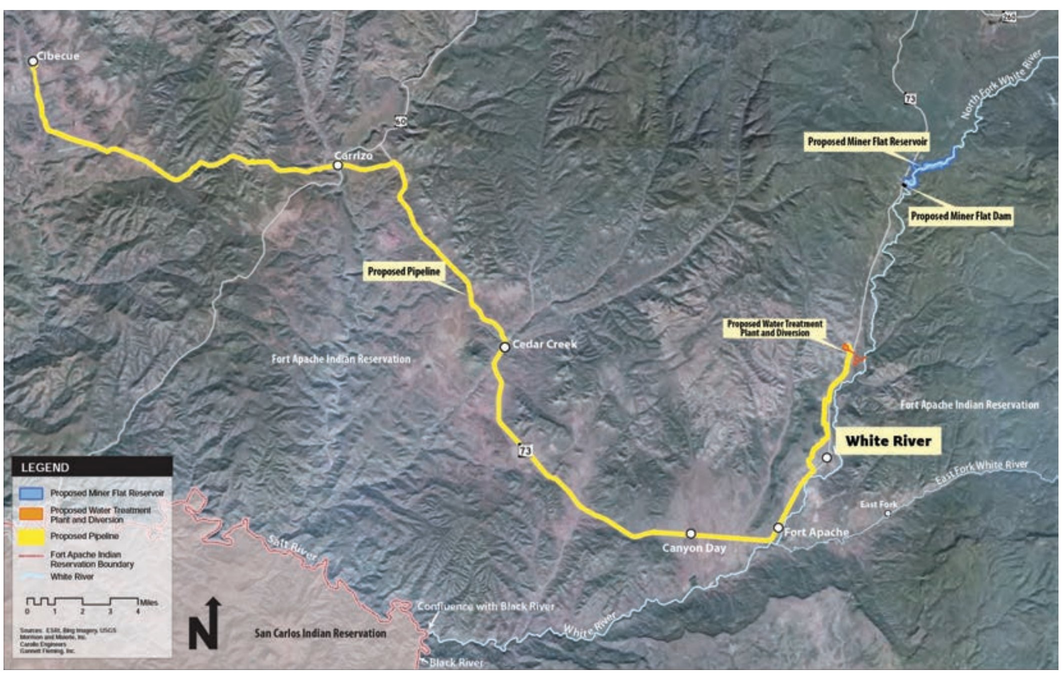
For example, the White Mountain Apache Tribe was able to resolve its water rights claims as part of the White Mountain Apache Tribe Water Rights Quantification Act of 2010. The Tribe is located on the 1.66 million-acre Fort Apache Indian Reservation in the Salt River watershed, upstream of Phoenix area cities. As the greater Phoenix metropolitan area rapidly expanded during the 20th century, much of their water came from the Salt River system. Yet, 78 percent of the water in the largest Salt River reservoir, Roosevelt Lake, derives from streams on the White Mountain Apache's tribal land. The Tribe's senior water rights claims represented a threat to the metro area's water security.

After years of negotiation, the Tribe, the federal government, State of Arizona, and a number non-federal parties resolved the Tribe's water rights claims. The United States previously had filed claims to approximately 180,000 acre-feet of water annually from the Salt River system in the pending Gila River Adjudication on behalf of the White Mountain Apache Tribe and also filed claims on behalf of the Tribe in the Little Colorado River Adjudication. The negotiated settlement and subsequent quantification act allocated approximately 99,000 acre-feet of maximum annual diversion (or 52,000 acre-feet of diversions minus return flows) from the Salt River system to the Tribe. It also authorized approximately $300 million in federal funding, which included $200 million for a rural water system that will bring desperately needed drinking water to the Tribe.

On a smaller scale, the Ganado Irrigation Water Conservation Project delivers a dependable water supply to water-poor lands near the town of Ganado on the Navajo Nation in northeastern Arizona. A coalition of stakeholders, community members, and government agencies worked together to restore flow to Ganado's derelict network of earthen irrigation canals. Ganado's main industry is farming, and without water delivery infrastructure, farmers were unable to irrigate fields during dry periods. The community identified the need to design, fund, and construct a delivery pipeline from Pueblo Colorado Wash into the Ganado irrigation network. Through the collaboration of federal and Navajo agencies with many local groups, including the Ganado Farm Board and the Presbyterian Ministries of the Grand Canyon, the project realized the community's goal of delivering water to more than 640 acres of formerly dry pasture. Although different in scale, both projects demonstrate what can be done to improve lives for tribal residents through cooperation among stakeholders and agencies, when coupled with access to government resources.

A Seat at the Table

A few tribes in Arizona hold substantial high-priority water rights, which provide them with leverage and influence in water planning and policy discussions. As a result, a new paradigm is emerging with a broader and growing understanding of the value of tribal participation in water planning. In 2019, negotiations over Arizona's implementation of the Drought Contingency Plan set an important precedent when tribes became essential partners in the reconciliation of competing positions on how to mitigate inevitable shortages. For example, the Gila River Indian Community (GRIC), whose water rights were defined in the Arizona Water Settlement Act of 2004, was instrumental in achieving agreement among the participants in Arizona's DCP implementation plan. Similarly, CRIT, whose senior diversion rights to 20 percent of Arizona's total Colorado River water allocation were affirmed in a decree issued by the Arizona Supreme Court in 1964, played a significant role in the Lower Basin DCP. GRIC is moving forward in its new, more influential role by developing partnerships with SRP, the City of Phoenix, and other non-tribal entities and by defining best practices for the conjunctive management of groundwater and surface water that they intend to share with water managers in Arizona and the Colorado River Basin.



Location of White Mountain Apache Tribe Settlement White River reservoir, treatment plant, and pipeline project. Source: Reclamation

2021 *Arroyo* Intern

Brian McGreal is working towards his MS in Applied Econometrics and Policy Analysis from the University of Arizona's Department of Agricultural and Resource Economics. His research focuses on the effects of large-scale agribusiness on groundwater use in rural areas. He also is assisting in research that involves hydro-economic modeling in the Four Corners states and is assessing the reliability of various satellite weather measurement systems used as predictors of farm output. When not staring at spreadsheets on his laptop, Brian and his wife can be found hiking southern Arizona's trails with their dog.

Environmental Water Use

As the future of Arizona's water use begins to take shape, an important question remains: what about the natural environment? In the western United States, the water needs of natural systems traditionally have been ignored in the pursuit of growth and economic development. Faced with evidence of environmental degradation, majority attitudes toward environmental stewardship are changing. As Arizona grapples with the need to augment water supply, environmental advocates call for mechanisms to ensure sufficient water for natural systems.

One proposed mechanism is the expansion of the public trust doctrine, which requires governments holding resources in trust for the public to maintain those resources for public benefit. Assuming environmental uses of water are in the public interest, application of the doctrine could protect conserved water dedicated to instream flows from forfeiture—the loss of a water right from disuse. Thus, when environmental advocates pay farmers for conserving water to be left in a stream or river, the water right is preserved.

Another idea gaining traction is mandating minimum flows in streams and rivers. These flows would be defined so as to protect aquatic and riparian habitat, and the law would require curtailed diversions if flows drop below the specified minimum. Because groundwater pumping can diminish surface flows even if direct diversions are curtailed, knowledge of riparian hydrology is necessary for minimum flow prescriptions to be effective. Applying this knowledge may be difficult, given that Arizona manages groundwater and surface water separately. Ideas like these still meet powerful opposition, but as public attitudes change, they may gain more traction. Including environmental advocacy groups in water-related decision-making processes has the potential to effect change and preserve the environmental resources most Arizonans value.

CONCLUSION

Since the passage of the 1980 Groundwater Management Act, Arizona has made tremendous strides toward a sustainable water future. By employing a broad range of strategies, including groundwater storage, AWS rules, water reuse, conservation and use efficiency requirements, tribal water rights settlements, and more, Arizona's water stewardship has done much to assure residents and businesses that water will flow reliably from Arizona's taps for decades to come. However, as the 21st century progresses, new and varied challenges arise. These include mitigating shortages on the Colorado River, preparing for ever greater unpredictability due to climate change, securing water for Arizona's growing economy, resolving ongoing water rights adjudications of the Gila and Little Colorado rivers, and ensuring water for nature. Water managers, policymakers, and others are exploring potential solutions, but there are no simple answers. Arizona has a history of meeting complex water problems with sophisticated and nuanced approaches and will need to continue this tradition to solve future challenges. Future generations demand that Arizona's leaders continue this tradition by addressing these serious challenges now and doing so with transparency. We are all water stakeholders and water stewards with responsibility for understanding what is at stake and pointing leadership in the direction we want to go.

COLLEGE OF AGRICULTURE & LIFE SCIENCES
COOPERATIVE EXTENSION
WATER RESOURCES
RESEARCH CENTER

Water Resources Research Center
College of Agriculture and Life Sciences
The University of Arizona
P.O. Box 210437
Tucson, AZ 85721-0437

Address Service Requested

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