



WHAT LIES BENEATH

An Arizona Groundwater Policy Primer

OVERVIEW

Arizona has long benefitted from its generally favorable climate and beautiful natural setting that over the years have resulted in a strong economy with a growing population. However, the climate and natural features have also required the state to adopt extraordinary water management strategies for both surface and groundwater supplies in order to ensure a secure future.

This paper provides an overview of past and present water management policies, with an emphasis on groundwater. It opens with a description of historic and notable accomplishments, briefly explains surface water and groundwater hydrology, outlines the history of Arizona's groundwater laws, provides a sampling of current water issues, encourages participation to resolve current challenges, and closes with sources for additional information.



GROUNDWATER

HISTORIC AND NOTABLE ACCOMPLISHMENTS

Arizona policymakers have developed several water stewardship strategies, which are outlined in the following timeline. A long record of notable accomplishments demonstrates the tremendous dedication and foresight that have served as the foundation for subsequent water management policies.¹

- 1864** • Territorial Legislature passes Howell Code and doctrine of prior appropriation for surface water in Arizona.
- 1911** • Roosevelt Dam is completed on the Salt River.
- 1919** • Legislature passes the Public Water Code.
- 1922** • The Colorado River Compact divides Colorado River water among Mexico and seven basin states. The Upper Basin states are Colorado, New Mexico, Utah, and Wyoming. The Lower Basin states are Arizona, California, and Nevada.
- 1935** • Hoover Dam is completed, creating Lake Mead. The largest man-made reservoir in the nation provides storage, flood control, and hydroelectric power generation for the Colorado River Basin.
- 1944** • Arizona approves the Colorado River Compact.

United States and Mexico sign a treaty allocating 1.5 million acre-feet of Colorado River water to Mexico.
- 1945** • Legislature requires registration of wells throughout the state.
- 1948** • Legislature passes the 1948 Groundwater Code, which prohibits drilling of new wells in critical groundwater areas.
- 1963** • The U.S. Supreme Court rules in favor of Arizona in a lawsuit relating to disputed claims over the amount of water allocated to the Lower Basin States. *Arizona v. California* (1963) determined the annual apportionment to Arizona would be 2.8 million acre-feet (maf), with California's apportionment set at 4.4 maf and Nevada's apportionment at 300,000 acre-feet. Tributaries were not included in the waters that were divided and remained for the exclusive use of each state.
- 1966** • Glen Canyon Dam is completed, creating Lake Powell, the second largest reservoir in the nation.
- 1968** • President Lyndon Johnson signs the Colorado River Basin Project Act, authorizing construction of the Central Arizona Project (CAP). As part of the negotiations, the Act specified that CAP's share of Colorado River water is junior to California's allocation. During times of shortage on the River, CAP's share will be cut before any reductions are made to California's allocation.
- 1971** • Legislature creates the Central Arizona Water Conservation District (CAWCD) to operate the CAP canal and to repay the federal government for Arizona's share of the cost of construction.

- 1977** • Legislature appoints the 25-member Groundwater Management Study Commission to develop a long-range plan for groundwater management. A report containing recommendations and a draft of statutory amendments was due by December 31, 1979. If the Legislature failed to enact a groundwater management code by the first Monday in September 1981, the draft recommended by the Commission would become law. The measure also prohibited establishment of any new critical groundwater areas until September 1981 and outlined a process for groundwater to be transferred from critical groundwater areas under certain circumstances.
- 1980** • Legislature passes the 1980 Groundwater Code creating the Arizona Department of Water Resources (ADWR) as a new state agency. Among other provisions, the measure creates Active Management Areas (AMA) with specific goals and requirements to address groundwater overdraft. The Department is authorized to administer provisions of the Code, has jurisdiction over surface water, and has the authority to represent the state on Colorado River issues.
- 1993** • Legislature expands the responsibilities of CAWCD to include groundwater replenishment using renewable supplies in Maricopa, Pinal and Pima counties. Membership in the Central Arizona Groundwater Replenishment District (CAGRDR) can be used to demonstrate an assured water supply, which is required prior to constructing new subdivisions in an AMA.
- 1996** • Legislature creates the Arizona Water Banking Authority to store excess CAP water underground.
- 2004** • Congress passes the Arizona Water Settlements Act, resolving water rights claims of the Gila River Indian Community and the Tohono O'odham Nation. The Act also finalizes the agreement between the U.S. and CAWCD for the state's CAP repayment obligation.
- 2007** • The Secretary of Interior signs the Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead. Also known as the 2007 Interim Guidelines, the document outlines reductions in Colorado River water deliveries for Mexico and the Lower Basin states (Arizona, California and Nevada) in the event that water elevations drop to a certain level in Lake Mead, and a shortage is declared on the Colorado River.
- 2019** • In response to an increasing decline in the Colorado River system, Arizona enters into the *Agreement Concerning Colorado River Drought Contingency Management and Operation*. After extensive negotiations, all basin states and Mexico enter the agreement. Also referred to as the Drought Contingency Plan, or DCP, it modifies the 2007 Interim Guidelines and authorizes additional actions to reduce the likelihood the Colorado River system reservoirs will reach critically low elevations.

INTRODUCTION

Arizona laws governing surface water are distinct from those governing groundwater. Surface water is subject to the doctrine of prior appropriation, sometimes described as ‘first in time, first in right.’ Groundwater uses are governed by the 1980 Groundwater Act which establishes area-specific requirements.

Although surface water and groundwater are treated differently under Arizona law, a discussion of one source of water eventually leads to the other. While this paper focuses mainly on groundwater, a brief discussion of both sources and related terminology follows.

Surface water is generally found in streams and rivers and can be diverted into canals for direct use (by farms or city water treatment facilities) or into reservoirs (for storage).

Groundwater occurs in saturated soil and rock below the earth’s surface. Water percolates downward under the force of gravity until it reaches an impermeable layer. The water fills the spaces between the particles of soil and rock, forming a zone of saturation. The top of the zone of saturation is the water table.

Water Sources and Hydrology

Surface water is generally found in streams and rivers and can be diverted into canals for direct use (by farms or city water treatment facilities) or into reservoirs (for storage). Surface water is considered to be a renewable supply. Arizona’s sources of surface water include the Colorado River and in-state rivers and tributaries, including the Salt, Verde, Agua Fria, San Pedro, Santa Cruz, and Gila Rivers.

Groundwater occurs in saturated soil and rock below the earth’s surface. Water percolates downward under the force of gravity until it reaches an impermeable layer. The water fills the spaces between the particles of soil and rock, forming a zone of saturation. The top of the zone of saturation is the water table. A geological formation that stores water is called an aquifer. The amount of water in an aquifer depends on its structure and other factors, including recharge (water that soaks into ground and refills the aquifer). The rate of recharge and the rate at which water moves varies greatly. Some aquifers receive no natural recharge and others recharge so slowly that it takes thousands of years to fill them. For the most part, natural recharge in Arizona is minimal and withdrawal rates far exceed the amount replenished by sparse rainfall.^{2 3}

Access to groundwater requires a well, drilled to a depth necessary to reach the water table. The depth to water varies widely across the state depending on many factors, including the type of aquifer and the amount of recharge. The amount of water a well can produce varies, and is determined by the size of the well, its pumping capacity, and the type of aquifer and its permeability.⁴

Wells

All groundwater wells in the state, regardless of location, must comply with Arizona Department of Water Resources (ADWR) groundwater well regulations. Before drilling a new well or modifying an existing well, a person must file a Notice of Intent to Drill with the Department that identifies the well’s location, the landowner, drilling and construction information, pumping capacity, and the uses to which the groundwater will be applied. A \$150 filing fee is due when the Notice is submitted. A licensed well drilling contractor must perform the work according to well construction standards that are designed to prevent contamination of the well and groundwater. ADWR is authorized to investigate and inspect wells to ensure they are properly constructed and the associated well records are accurate.⁵

Water Rights

SURFACE WATER: In Arizona, a series of laws, court decrees and compacts govern rights and limitations to use surface water. As discussed previously, surface water is subject to the doctrine of prior appropriation, sometimes described as ‘first in time, first in right.’ Priority is determined by the date a person first puts a specific amount of surface water to a beneficial use. The person with the earliest date of use has a senior right, which takes precedence over later users. The senior right holder is entitled to the full amount of their allocation before water is available to junior users. This means that in times of shortage, junior right holders might not receive their allocation.⁶

GROUNDWATER: The laws governing groundwater rights and the requirements related to its use are outlined in the 1980 Groundwater Code, however provisions do not apply uniformly across the state. Regulations vary in certain geographical areas that were designated based on the severity of overdraft in the area. Groundwater overdraft occurs when pumping exceeds the amount replenished by rainfall or artificial recharge. (See section on 1980 Groundwater Code for additional detail.)

The Colorado River is managed by the United States Secretary of the Interior, and Colorado River water is governed by the *Law of the River*, which consists of a series of federal laws, court decrees, compacts and regulatory guidelines. The *Law of the River* apportions water from the Colorado River and regulates its use among seven basin states and Mexico.

HISTORY AND OVERVIEW OF ARIZONA GROUNDWATER LAW

Arizona adopted the State Water Code in 1919 and created the office of the State Water Commissioner. Most of the Commissioner’s duties related to surface water. “The Commissioner shall have general control and supervision of the waters of the State and of the appropriation and the distribution thereof except for distribution reserved ...by the courts under existing decrees.”

The measure gave the Commissioner control over dams and the authority to measure the flow of streams, divide the state into water districts, determine water rights, locate reservoirs, and enforce decrees and findings. The Commissioner was authorized to survey, investigate and compile information on water resources in the state, to enter cooperative arrangements for those purposes with the federal government, and to “establish a permanent, safe and convenient public depository in the State Capitol building for existing and future records of stream flow and all other data relating to the water resources of the state.”⁷

As the state grew and technology advanced, groundwater use increased substantially in certain areas of central Arizona. In the 1930s and 1940s, significant concerns regarding aquifer depletion led to a series of gubernatorial and legislative actions to address the increasing demand on groundwater supplies and overdraft of groundwater basins.

The draft report of the Groundwater Management Study Commission (published in 1979) provides a detailed historical overview of Arizona groundwater law. The report explains the advent of higher prices for cotton and subsequent cotton boom, increased pump efficiency, inexpensive power, and prolonged drought resulted in steadily increasing groundwater overdraft. Several commissions were appointed to study the issues and develop recommendations, however legislative attempts from 1938 to the late 1940s to enact a comprehensive groundwater management plan were generally unproductive. Governor Sidney Osborn called the Legislature into several special sessions to specifically address groundwater in 1946 and 1947 without success.⁸

Meanwhile, the federal government warned that unless the state took action to manage its groundwater supplies, approval of the Central Arizona Project was in jeopardy.⁸ Intent on passing some type of code, the governor called another special session of the Legislature in March 1948 to address the issue. His proclamation explained “...the regulation and control of Arizona’s ground water resources is an imperative necessity, if this State’s rights in the Colorado River are to be realized, the imminent threat to its agricultural

industry averted and the consequent menace to its economy turned aside.” Characterized as having been enacted “more in desperation than in conviction,” the bill passed and was signed into law.⁸

The 1979 Report also explains that although the Groundwater Code of 1948 prohibited new wells and expansion of cultivation of agricultural lands, it was widely criticized for several reasons. It did not limit withdrawals from existing wells, which continued at historic levels; it did not prohibit deepening of existing irrigation wells; nor did it regulate existing or new withdrawals of groundwater for non-agricultural purposes.⁸

In spite of the enactment of the 1948 Groundwater Code, local concerns and pressure from the federal government to enact meaningful groundwater management policies continued. In October 1951, Governor Howard Pyle appointed a commission

The legacy of the Groundwater Code of 1980

The Ford Foundation in 1986 named the Groundwater Code of 1980 as one of the ten most innovative programs in state and local government.

“The 1980 Groundwater Management Act is a historic law that was a national milestone. Agricultural interests, the largest users of groundwater in Arizona, had to accept a law that slapped new rules on them.”

– Jack Pfister, Salt River Project¹³

consisting of leading figures in the agricultural industry to draft a groundwater bill for consideration during the following legislative session. Its recommendations, however, were rejected by the Legislature.

In 1952, the Underground Water Commission was created, consisting of 24 members, all of whom were primarily engaged in agriculture and represented the principal agricultural areas in each county. Commission recommendations again were not enacted and, in 1954, the Legislature abolished the Commission.⁹

The struggle to resolve issues related to groundwater continued for many more years.

Governor Paul Fannin’s supplemental message to the Legislature on January 29, 1963 included an eloquent plea to encourage completion of the Central Arizona Project and to address groundwater overdraft. He explained that “Arizona has a three-way need for the additional water from the Colorado River: 1) To reduce the dangerous overdraft on groundwater; 2) to return 280,000 acres of rich farm lands to production; and 3) to meet the municipal and industrial needs of a growing population.” He concluded his remarks with a call for a high standard of cooperation between members of the Legislature, between members of the House and Senate, between the Legislature and the office of the Governor, between various departments of the state, between both political parties, and between all segments of the economy.¹⁰

Additional measures relating to critical groundwater areas were enacted in 1956, 1959, and 1968, but “no significant legislative action was taken to regulate or manage the groundwater supplies of the state.”

During this period, a series of decisions made by the Arizona Supreme Court in 1969, 1970, and 1976 addressed several disputes relating to the transportation of groundwater. The most controversial decision, *Farmers Investment Company v. Bettwy* (FICO), is generally considered to be the motivation that led to the eventual enactment of the 1980 Groundwater Code.¹¹

In 1977, in response to ongoing groundwater overdraft, continued pressure from the federal government regarding its support for the CAP, and a series of critical court decisions, the 25-member Groundwater Management Study Commission was created. The Commission’s charge was to develop a comprehensive long-range plan for the state’s groundwater resources as soon as possible. A report containing recommendations was due by December 31, 1979. After lengthy negotiations, and eventual agreement among the stakeholders, Governor Bruce Babbitt called a special legislative session in 1980 to adopt the Commission’s recommendations. See State of Arizona Session Laws 1977, Chapter 29.

GROUNDWATER MANAGEMENT ACT OF 1980

Enacted in June 1980, the Groundwater Management Act (Code) established the statutory framework to regulate and control the use of groundwater. It also transferred responsibility to administer Arizona water law from the State Land Commissioner to a new agency, the Arizona Department of Water Resources.

The Code has three primary goals: 1) to control the overdraft of groundwater occurring in areas of substantial depletion; 2) to provide a means to allocate groundwater resources in Active Management Areas (discussed below) to more effectively meet changing needs; and 3) to augment Arizona's groundwater through development of sustainable supplies.¹²

An AMA is a geographic area that has been designated based on a history of significant overdraft.

Safe yield is a management goal that attempts to achieve and maintain a long-term balance between the annual amount of groundwater withdrawn from aquifers in the AMA and the annual amount of natural and artificial recharge.

AMAs

Limitations on how much water can be pumped, by whom and for what purpose apply in specific areas of the state designated as Active Management Areas, or AMAs. An AMA is a geographic area that has been designated based on a history of significant overdraft. The Code identified several AMAs and established specific, comprehensive management goals and requirements for each one. Subsequent AMAs may be designated through local initiative or by the Director of ADWR.¹⁴

The Code contains key provisions applicable within AMAs:

1) a system of groundwater rights and permits; 2) a prohibition on irrigation of new agricultural lands; 3) a series of water management plans for each AMA designed to reduce groundwater withdrawals; 4) a requirement that developers demonstrate a 100-year assured water supply for new residential growth; 5) a requirement to measure water pumped from all large wells; 6) a program for reporting annual water withdrawal and use; and 7) well spacing requirements. These provisions apply only within AMAs; outside AMAs there is far less regulation of groundwater.¹⁵

There are currently five AMAs: Phoenix, Pinal, Prescott, Tucson and Santa Cruz. The 1980 Groundwater Code initially designated four AMAs. The Tucson AMA boundaries were modified in 1994, establishing the Santa Cruz AMA in order to facilitate binational negotiations with Mexico and coordinated management of the Santa Cruz River. See A.R.S. §45-411.04

One of the goals of the Groundwater Code is to reach safe yield in four of the five AMAs by the year 2025. (The Pinal AMA is the exception.) Safe yield is a management goal that attempts to achieve and maintain a long-term balance between the annual amount of groundwater withdrawn from aquifers in the AMA and the annual amount of natural and artificial recharge.

INAs

The Code also authorizes the designation of irrigation non-expansion areas. INAs are geographic areas located outside AMAs that have been identified as having insufficient groundwater to irrigate land under cultivation at the current rate of withdrawal. Irrigation of new agricultural land is limited in an INA, and metering and reporting requirements apply. Other uses of groundwater in an INA for domestic, municipal or industrial purposes are not restricted. As of 2021, there are three INAs: Joseph City INA (in Navajo County), Douglas INA (in Cochise County) and Harquahala INA (in western Maricopa and eastern La Paz counties). See A.R.S. §45-431 et seq.

Outside AMAs/INAs

Few limitations apply to groundwater use in areas that are not within an AMA or an INA. Water must be put to *reasonable and beneficial* use and generally may not be transported to an AMA, although there are certain exceptions to transportation restrictions. Well spacing requirements, conservation requirements, pumping limits, metering of wells and reporting requirements do not apply. Beneficial uses include domestic, municipal, irrigation, stock watering, water power, recreation, and wildlife, including fish. See A.R.S. §45-181 and A.R.S. §45-453.

Wells

As described earlier, all groundwater wells in the state, whether inside or outside an AMA or INA, must follow ADWR regulations. Well spacing and impact rules govern the location of new wells within AMAs to prevent unreasonably increasing damage to surrounding land, neighboring wells, or other water users. The characteristics of an aquifer and the mechanics of groundwater recovery are factors that come into play when determining well interference.³

Outside of AMAs and INAs, well spacing rules and limitations do not apply, which means that in most cases ADWR does not have statutory authority to regulate the impact of one landowner's pumping on their neighbor's well.^{4 18}

MODIFICATIONS TO THE CODE SINCE 1980 AND CURRENT ISSUES

Since the 1980 Groundwater Code was enacted, several water policies to address issues of concern have been developed, including:

1. Establishment of recharge and underground storage projects. (1986, 1993, 1996)
2. Limitations on the use of potable groundwater in artificial lakes. (1987)
3. Prohibiting transfer of groundwater from a non-AMA to an AMA. (1991)
4. Authorizing the ADWR Director to enter into interstate water storage agreements on behalf of the state.
5. Allowing a county outside an AMA to adopt 100-year water supply requirements for new housing subdivisions. A unanimous vote of the county's Board of Supervisors is required. (2007)

Assured and Adequate Water Supply

Developers of new subdivisions must provide information on the development's water supply to ADWR. The Director is required to evaluate the supply based on the development's projected needs, the source of water and the method of delivery. This requirement applies statewide. The Assured Water Supply program applies in AMAs and the Adequate Water Supply program applies outside AMAs. Both programs evaluate the availability of a 100-year water supply based on current and committed demand.

In AMAs, the subdivision will be approved only if the Director determines that an assured water supply exists.

Outside AMAs, if sufficient water exists to support the development, a certificate of adequate water supply is issued. If the Director determines the water supply to be inadequate, the property may still be sold. Information on the water supply and any limitations must be disclosed in the public report provided to potential first purchasers and described in promotional or advertising material.

In 2007, statute was amended to allow the Board of Supervisors in a county outside an AMA to adopt a mandatory adequacy requirement. If adopted, all new subdivisions must have an adequate water supply to be approved by the platting authority. A mandatory adequacy provision must be adopted by unanimous vote. The provisions apply countywide and may not be rescinded. A city outside an AMA may adopt a mandatory adequacy requirement by ordinance. As of 2021, two counties (Cochise and Yuma) and two cities (Clarkdale and Patagonia) have enacted a mandatory adequacy requirement. See A.R.S. §9-463.01, subsection O (cities) and A.R.S. §11-823 (counties).

Current Working Groups, Topics and Issues

A number of working groups, committees and stakeholders continue to wrestle with a variety of water policy issues. Information on some of the working groups and ongoing issues follows.

GOVERNOR'S WATER AUGMENTATION, INNOVATION AND CONSERVATION COUNCIL

The GWAICC was created in January 2019 by Executive Order 2019-02 to address water augmentation, innovation and conservation. Four committees have been formed to focus on specific issues: Desalination; Long Term Water Augmentation; Non-AMA Groundwater; and Post-2025 AMAs. Agendas, summaries, documents and videos are available at new.azwater.gov/gwaicc.

“For several years, the state’s focus and energy has been on the Colorado River system, projected shortages, and the response by Lower Basin and Upper Basin states. However, there are other water issues that also need to be addressed. It’s important to continue to show Arizona is paying attention to all the water issues, including groundwater, while keeping an eye on surface water issues as well.”

– Warren Tenney, Co-chair, Post-2025 AMAs committee, comment September 9, 2021 meeting

POST-2025 AMAS COMMITTEE

One of the goals of the Groundwater Code is to reach safe yield in four of the five AMAs by the year 2025. (The Pinal AMA is the exception.) Safe yield means there is a balance between the amount of groundwater that is withdrawn in the AMA and the amount that is replenished or recharged. To that end, the Code established a series of five management periods. The fifth and final management period ends in 2025. Although some of the AMAs have met or are very close to meeting the goal of safe yield, others have not. The Post-2025 AMAs Committee is charged with reviewing the results achieved in AMAs since 1980, identifying strategies for sound water management after 2025, and considering whether safe yield is the best way to measure progress, or if another objective would be a better gauge.

The first meeting of the Post-2025 AMAs Committee in October 2019 outlined committee objectives to: 1) identify the water management challenges facing the AMAs and; 2) to generate solutions for 2025 and beyond. The committee met again in December 2019, conducted six meetings in 2020 and four in 2021. The committee has identified several issues for discussion, further analysis and prioritization which include:

- unreplenished groundwater pumping;
- impacts of exempt wells;
- enrollment in and supplies for the Central Arizona Groundwater Replenishment District;
- the Assured Water Supply program;
- hydrologic disconnect between recharge/recovery and pumping/replenishment;
- groundwater recharge for streams and wildlife.

Additional meetings are tentatively set for October, November and December 2021. A presentation to the Governor’s Water Augmentation, Innovation and Conservation Council to describe general consensus proposals is scheduled for December 9. The committee plans to continue discussions in 2022 to develop additional strategies and solutions. Meeting information and documents may be found at new.azwater.gov/gwaicc/post-2025-amas-committee.

RURAL COMMUNITIES OUTSIDE ACTIVE MANAGEMENT AREAS

Groundwater management policies are not uniform across the state. Groundwater use in AMAs, located for the most part in populated metropolitan areas, is governed by a series of water rights, conservation measures, obligations and management practices.

Areas of the state that are outside AMAs and INAs are not subject to well spacing requirements and other limitations that apply within AMAs and INAs. In most cases ADWR does not have statutory authority to regulate the impact of one landowner's pumping on their neighbor's well. See A.R.S. § 45-633(A) and new.azwater.gov.

Several rural Arizona communities have identified groundwater problems and are asking the state to address their concerns and allow communities to adopt local solutions. Two study committees were created to conduct hearings and discuss issues of concern in northwestern Arizona.

MOHAVE AND LA PAZ COUNTY GROUNDWATER ANALYSIS (MATRIX REPORT)

Laws 2018, Chapter 280, Section 8 appropriated \$100,000 to ADWR to contract with an independent consultant to: 1) analyze data on groundwater supplies in northwest Arizona and; 2) develop a report that estimates the rate of groundwater depletion in the northwest basins planning area and the number of years of groundwater remaining in certain groundwater basins within the planning area. The report, *Northwest Basins Groundwater Resource Assessment Mohave County, AZ*, prepared by Matrix New World Engineering, was submitted to ADWR in December 2019.

new.azwater.gov/sites/default/files/NWBasins_Report_Final_Combined.pdf

MOHAVE COUNTY WEST BASIN WATER USERS STUDY COMMITTEE AND LA PAZ COUNTY WEST BASIN WATER USERS STUDY COMMITTEE

Two study committees established in 2019 are authorized to analyze all groundwater data developed by ADWR and to recommend programs and policies for specified groundwater basins located in Mohave County and La Paz County. Those basins are: Hualapai Valley, Sacramento Valley, Renegras Plain, McMullen Valley and Butler Valley. The committees will also review and make recommendations based on the 2019 Matrix report on estimates of groundwater depletion and the number of years of groundwater supplies remaining in the northwest basin planning area.

The committees met several times in 2021. Co-chair state Rep. Regina Cobb plans to schedule additional meetings for the committees in October, November and December 2021. A report of recommendations is due by December 31, 2021. See Laws 2019, Chapter 243, azleg.gov/legtext/54leg/1R/laws/0243

PINAL COUNTY

Pinal County has convened a group of local stakeholders to address supply and demand imbalances in the county. ADWR modeling shows there is not enough groundwater in the Pinal AMA to support current uses. In an update by ADWR on June 28, 2021 to the Pinal Stakeholder Group, the ADWR Director stated "the days of utilizing native groundwater for development in Pinal are over." See new.azwater.gov/sites/default/files/ADWRPresentationPinal

The shortage declared on the Colorado River will result in a cut to Arizona's share of Colorado River water in 2022 by 512,000 acre feet. Nearly all the reductions in Arizona will be borne by CAP and will result in less Colorado River water for central Arizona agricultural users. Some agricultural operations will return to groundwater pumping as a result.

IMPACT OF PUMPING ON RIVERS AND STREAMS

Determining the hydrologic connection between surface water and groundwater is often difficult and expensive. In many areas the connection is certain, although the magnitude is not.¹²

The connection between groundwater pumping and surface water flow is the subject of continuing litigation.

The Arizona Water Protection Fund, established in 1994, provides a funding source for coordinated efforts and programs to enhance, restore, protect and conserve water resources of the state including rivers, streams and associated riparian habitats. The Arizona Water Protection Fund Commission administers the Fund, reviews applications, and provides grants to entities that cooperate and work in conjunction with local residents and affected jurisdictions. See A.R.S. §§45-2101 through 45-2114.

ADJUDICATIONS

Two general stream adjudications are underway to determine the nature, extent, and priority of surface water rights in the Gila River and the Little Colorado River systems. Ongoing court proceedings to resolve thousands of water rights claims in the two watersheds, encompassing approximately half the state, continue. ADWR provides technical and administrative support to the adjudication court and the Special Master. See JLBC FY 2022 Appropriations Report, page 407.¹⁹

SUBSIDENCE AND FISSURES

Additional issues of concern include land subsidence and earth fissures in parts of the state where significant groundwater overdraft occurs. Subsidence refers to sinking of the land surface overlying an aquifer. Subsidence occurs when geologic formations collapse irreversibly. Severe subsidence has occurred in areas of the state that also experience severe groundwater overdraft.

Earth fissures are open surface fractures of the land that occur in areas of extensive ground subsidence resulting from groundwater withdrawal. Fissures form as the ground subsides unevenly, and are found in Cochise, La Paz, Maricopa, Pima and Pinal Counties. They can be up to a mile in length, up to 15 feet wide and up to 90 feet deep.²⁰

FY 2022 BUDGET – APPROPRIATIONS

The state budget adopted June 30, 2021 appropriated monies for fiscal year 2022 for several new and ongoing water management programs including:

Drought Mitigation Board (new)	\$160 million
Water Supply Development Revolving Fund (ongoing program-additional funding)	\$46 million
Rural Water Studies (ongoing)	\$1.1 million
Arizona Water Protection Fund (ongoing program-additional funding)	\$1.25 million
General Stream Adjudication Personnel and Support Fund (new)	\$2.0 million
Special Water Master (ongoing)	\$497,000

See JLBC FY 2022 Appropriations Report for additional detail by agency: Drought Mitigation Board; Judiciary-Superior Court; Water Infrastructure Finance Authority; and Department of Water Resources.¹⁹ azleg.gov/jlbc/22AR/apprpttoc.pdf

LEGACY AND CONCLUSION

Arizona has developed several comprehensive water management strategies to respond to its unique environment. For more than 100 years, Arizonans have built a legacy of water management policies that have supported its population and economy. The Groundwater Code was recognized by the Ford Foundation in 1986 as a landmark work and continues to be a national model for managing groundwater supplies. The state maximizes its use of sustainable supplies, including effluent, and had the foresight to store its excess CAP water underground for times of shortage.

Arizona's water management legacy is evident in the list of accomplishments over the past century, most notably the Colorado River Compact among seven western states and Mexico, construction and maintenance of reservoirs, comprehensive groundwater management strategies, conservation programs, and construction and operation of underground recharge and groundwater replenishment facilities. Work continues on a series of tribal water rights settlements.

POLICY BRIEF

Wise water policy requires thoughtful, long-term planning and a commitment to follow through and make it work in practice.¹³ There is more work to be done and several stakeholder and interest groups are tackling the most challenging water policy issues of the day. Once again, Arizona will need to draw upon its long history and tradition of robust discussion, collaborative efforts, stamina and consensus building in order to move forward and meet the current and future needs of the state.

NOTES

- 1 Arizona Department of Water Resources. (n.d.). The Story Behind Arizona Department of Water Resources. Arizona Department of Water Resources. <https://new.azwater.gov/adwr/history>
- 2 U.S. Geological Survey. (n.d.). Aquifers and Groundwater. USGS. https://www.usgs.gov/special-topic/water-science-school/science/aquifers-and-groundwater?qt-science_center_objects=0#qt-science_center_objects
- 3 Sax, J. L., & Adams, R. H. (1986). The Interaction of Hydrology and Law. In *Legal Control of Water Resources: Cases and Materials* (p. 797).
- 4 Arizona Department of Water Resources. (n.d.). Groundwater Permitting and Wells. Arizona Department of Water Resources. <https://new.azwater.gov/permitting-wells>
- 5 A.R.S. § 45-633(A). Inspections, investigations and audits. <https://www.azleg.gov/viewdocument/?docName=https://www.azleg.gov/ars/45/00633.htm>;
- 6 Kyl Center for Water Policy at Morrison Institute. (2018). The Price of Uncertainty. Arizona State University. https://morrisoninstitute.asu.edu/sites/default/files/the_price_of_uncertainty.pdf. (p. 5).
- 7 State of Arizona. (1919). Session laws, State of Arizona, 1919, Fourth Legislature, Regular Session. Arizona Memory Project. <https://azmemory.azlibrary.gov/digital/collection/azsession/id/85/rec/6>
- 8 Arizona Groundwater Management Study Commission. Draft Report of Tentative Recommendations – July 1979. (Chapter I).; State of Arizona. (1948). Laws 1948, 6th Special Session, Chapter 5. Arizona Memory Project. <https://azmemory.azlibrary.gov/digital/collection/azsession/id/33/rec/1>
- 9 Arizona Groundwater Management Study Commission. Draft Report of Tentative Recommendations – July 1979. (p. I-9).; Session Laws Arizona. (Laws 1952, Chapter 49; Laws 1953, Chapter 42; and Laws 1954, Chapter 160).
- 10 State of Arizona. (1963). Session laws, State of Arizona, 1963, Twenty-Sixth Legislature, First Regular Session, First and Second Special Sessions. Arizona Memory Project. <https://azmemory.azlibrary.gov/digital/collection/azsession/id/19/rec/1>. (unnumbered preliminary pages).

- 11 Arizona Groundwater Management Study Commission. Draft Report of Tentative Recommendations – July 1979. (p. I-11).
- 12 Arizona Chamber Foundation. (2018). Water in Arizona: Our Past, Present, and Future. (p. 5).
- 13 Ingley, K. (2015). Water, Power, Persuasion: How Jack Pfister shaped modern Arizona. American Traveler Press.
- 14 Arizona Chamber Foundation. (2018). Water in Arizona: Our Past, Present, and Future.
- 15 Ibid.
- 16 Ibid. (p. 2).
- 17 Arizona Town Hall. (2015). Keeping Arizona’s Water Glass Full. (p. 39).
- 18 A.R.S. § 45-598(A). New wells and replacement wells in new locations in active management areas; rules; permit required; Arizona Administrative Code. R12-15-1301 - R12-15-1307.
- 19 JLBC Budget Updates: FY 2022 Appropriations Report: Budget Units. <https://www.azleg.gov/jlbc/22AR/agencyindex.pdf>. (Drought Mitigation Board; Judiciary-Superior Court; Water Infrastructure Finance Authority; and Department of Water Resources).
- 20 Arizona Geological Survey. (n.d.). Earth Fissures, Subsidence & Karst in Arizona. The University of Arizona College of Science. <https://azgs.arizona.edu/center-natural-hazards/earth-fissures-subsidence-karst-arizona>