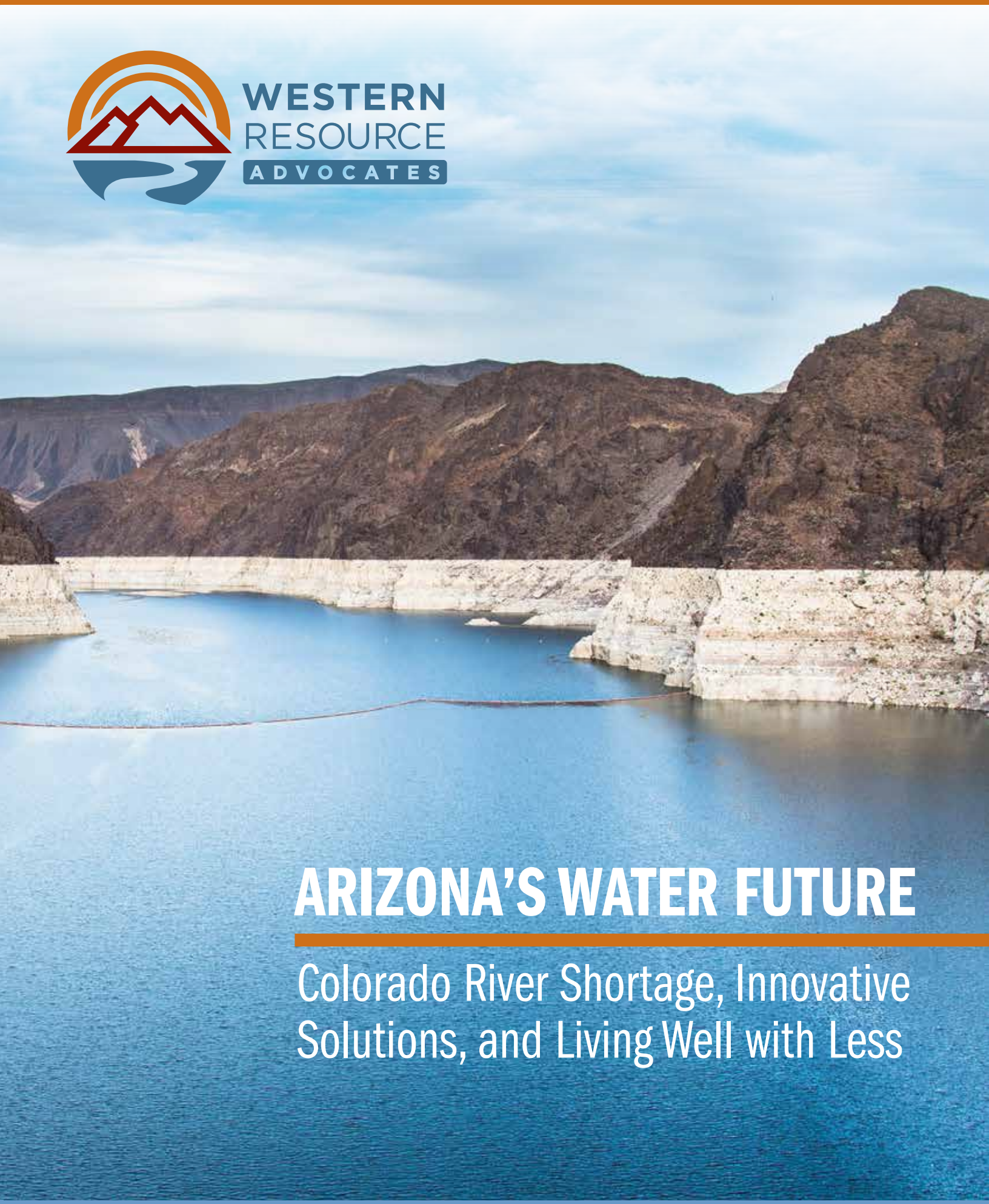

WESTERN RESOURCE ADVOCATES

# ARIZONA'S WATER FUTURE

## Colorado River Shortage, Innovative Solutions, and Living Well with Less

WESTERN RESOURCE ADVOCATES

PROTECTING THE WEST'S LAND, AIR, AND WATER

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## ABOUT WESTERN RESOURCE ADVOCATES

For over 25 years Western Resource Advocates has been one of the West's leading conservation groups protecting the region's air, land and water. We use the law, science and economics to craft innovative solutions to the most pressing conservation issues in the region. We work to transition electricity production away from conventional fossil fuel technologies toward clean, renewable energy and energy efficiency to end the electric industry's contribution to climate change. We protect the health of Western rivers and lakes so they remain vibrant parts of our communities, support robust economies and provide a variety of recreational opportunities. We safeguard threatened landscapes and wildlife to leave a Western legacy for future generations. westernresourceadvocates.org

# Arizona's Water Future: Colorado River Shortage, Innovative Solutions, and Living Well with Less

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## ACRONYMS, ABBREVIATIONS, DEFINITIONS, AND UNITS

**2007 Interim Guidelines** – An agreement between Arizona, California, Nevada and the U.S. Bureau of Reclamation that specifies how Colorado River shortages will be shared.

**Acre-foot** – 325,851 gallons. The amount of water 2-4 families use in 1 year. The term comes from the amount of water needed to flood one acre in one foot of water.

**ADWR** – Arizona Department of Water Resources, state agency responsible for securing long-term dependable water supplies for Arizona's communities.

**AWBA** – Arizona Water Banking Authority - "banks" Central Arizona Project water in underground aquifers for future use.

**CAGRD** – Central Arizona Groundwater Replenishment District - supplies renewable water, primarily Excess Water from CAP, to cities and developers that lack long-term CAP contracts for suburban development – an ADWR requirement.

**CAP** – Central Arizona Project, the reclamation project and works authorized to bring approximately 1.5 million acre-feet of Colorado River water per year to Pima, Pinal and Maricopa counties.

**CAWCD** – Central Arizona Water Conservation District – a multi-county district that manages and operates the CAP.

**DCP** – the three-state Drought Contingency Plan being created by Arizona, California, and Nevada to address falling Lake Mead water levels. The goal of the plan is to withdraw less water now to prevent the Lake from dropping to low enough levels that trigger federal intervention and water shortage declarations.

**DOI** – U.S. Department of Interior, federal department responsible for the management and conservation of most federal land and natural resources.

**Excess Water** – This is a temporary, one-year allotment of CAP water that is under contract but not ordered for use by the contractor. It is available only after long-term contract obligations are fulfilled. Excess Water is composed of two pools, "Other Excess" and Agricultural Settlement. Excess Water is allocated first to the Agricultural Settlement pool and the remaining amount to the Other Excess pool.

**Indian Priority pool** – also referred to as the "Tribal pool", this pool is long-term CAP contract water allocated to Indian tribes. It has second and equal priority to the M&I Priority pool to receive Central Arizona Project water.

**Law of the River** – the laws, decrees, court cases, and international and domestic agreements that manage the water supply of the Upper and Lower Basins of the Colorado River.

**M&I Priority pool** – This pool is composed of long-term CAP contracts allocated to central and southern Arizona municipal and industrial water users. This pool shares second priority with the Indian Priority pool.

**NIA** – Non-Indian Agricultural Priority pool. This is Central Arizona Project water allocated to non-Indian agricultural users, some cities, and Indian tribes through legal settlements. This pool has the lowest priority of CAP long-term contract water.

**Other Excess pool** – The water in the Other Excess pool is stored underground by the Arizona Water Banking Authority to be used in time of shortage, and is used to offset groundwater pumping by suburban water development via the Central Arizona Groundwater Replenishment District. This pool is the lowest priority pool of Central Arizona Project water and is available only on an annual basis based on water availability (see Excess Water).

**Priority 3** – A relatively small volume of water rights that predate the Central Arizona Project but which are currently delivered through the CAP infrastructure – largely held by Indian tribes and cities. Priority 3 water has the highest CAP delivery priority.

**Structural Deficit** – The condition of Lake Mead where less water flows into the lake than is withdrawn and evaporates from the Lake, resulting in declining water levels and threatening the lower basin states with decreased water deliveries.

**USBR** – United States Bureau of Reclamation - manages water and related resources in the Western United States including dams and power plants and is the largest wholesaler of water in the U.S.

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WESTERN RESOURCE ADVOCATES

# Arizona's Water Future: Colorado River Shortage, Innovative Solutions, and Living Well with Less

## EXECUTIVE SUMMARY

Arizona and the Southwestern United States are facing perhaps their greatest challenge since the settlement of the region and development of modern cities, agriculture, and industry. **Arizona's "bank" for 40% of its water – Lake Mead on the Colorado River – is being drained faster than it can be filled.**

Projections show that if no action is taken to address the gap between supply and demand, Lake Mead could reach a critical stage within the next few years, triggering progressively larger mandatory restrictions on Colorado River water use that could have a devastating impact on Arizona's communities, agriculture, environment, and economy. Western Resource Advocates undertook a review of current laws and water use data that is not widely publicly known to clarify which entities would face water cutbacks at different levels of Lake Mead (see Figure ES.1).

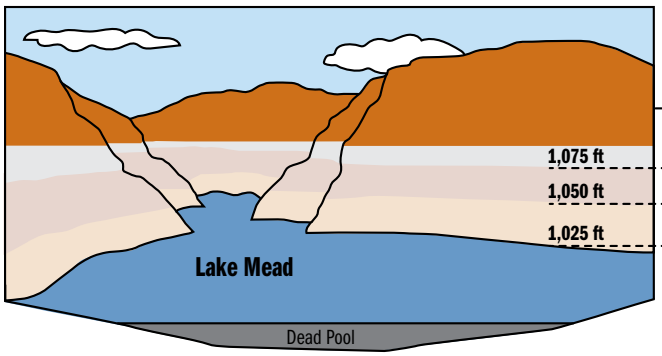
### Suburban Growth and Agriculture Likely First to Face Water Reductions

Measures to meet legal obligations with the federal government, Nevada, and California could result in water used for suburban land development and water banked for future use to be greatly curtailed. Additionally, there is the potential for a number of agricultural irrigation districts in central Arizona to see sharp reductions in the amount of water they receive from the Colorado River. **These cuts are projected to occur if Lake Mead falls to an elevation of 1,075 feet, which has a nearly 50% chance of happening as soon as 2018.**

### Major Cities Could Face Water Reductions within this Decade

If water management actions do not change and water levels in Lake Mead continue to fall, progressively larger reductions will be required that eventually will impact Arizona's cities and towns. As the law is written today, cuts to central Arizona cities could happen before 2020, but proposed additional cutbacks currently being negotiated may impact cities even sooner.

## Figure ES.1 Suburban Growth, Agriculture, and Cities Face Water Shortages as Lake Mead Shrinks




| SHORTAGE TIERS | WATER CUTS TO AZ (Acre-Feet) | IMPACTED USERS |
|---|---|---|
| Tier 1 | 320,000 | Suburban growth, water banking, Central AZ agriculture |
| Tier 2 | 400,000 | More Central AZ agriculture |
| Tier 3 | 480,000 | Potential for cities |

Source: U.S Bureau of Reclamation. Colorado River Interim Guidelines for Lower Basin Storage, 2007

### Arizona Can Avoid Water Cuts with Proactive Actions to Stop the Decline of Lake Mead

Arizona's economy, quality of life, agriculture, and environment are on the line. The time is now for Arizonans to take steps to respond to falling Lake Mead water levels, and enter a new phase of long-term collaboration, innovative water management, water conservation and efficiency, and water reuse. This requires a new look at how water cuts are implemented and how shortages can be avoided.

Arizona has already taken important action by implementing interim measures to keep more water in Lake Mead to help stave off federally mandated cutbacks of Colorado River water. The state has also been working with California, Nevada, and key water users within Arizona on plans to avoid critically low levels in Lake Mead. These actions are a good start, but temporary agreements are not long-term solutions.

Western Resource Advocates and our partners support the state's efforts to collaborate on finding a long-term solution to Colorado River shortages. We have developed a number of policies and actions directed at Arizona's impending Colorado River water shortage over the next decade. These immediate actions and longer term plans will help address Lake Mead's falling water levels in ways that can protect groundwater and still allow Arizona's agriculture, cities, Indian tribes, economy, and environment to thrive in a future with less water.

The solution set we propose abides by seven key tenets:

1. Adopt next-generation water conservation and efficiency
2. Expand system conservation programs to stabilize Lake Mead levels
3. Increase innovative water sharing arrangements
4. Create an Arizona Water Bank Recovery Plan Stakeholder Committee
5. Uphold the integrity of Indian water rights settlements
6. Protect the state's groundwater resources
7. Protect Arizona's wildlife and natural areas

Arizona needs its Governor, elected officials, water users, and other water stakeholders to work together and consider innovative solutions to achieve a new water paradigm for Arizona. The time to act is now. We can address Arizona's water future, so that our communities maintain a high quality of life, our agricultural heritage will continue, and our wildlife, rivers and lakes thrive – but only if we act together to find fair and equitable solutions for all Arizonans. We are confident that Arizona and its residents are up to the challenge and ready to protect and sustain the Colorado River, the heart of the "Grand Canyon State."

# Chapter 1: Introduction

When Civil War veteran Jack Swilling entered the Salt River Valley in the 1860s, he was confronted with a vast expanse of desert covered in mesquite trees and cacti with a cool ribbon of green fed by the then consistently running Salt River. As he investigated the land, he came across ancient canal systems dug by the now departed Hohokam Indians. These sophisticated systems extended miles from the Salt River and were estimated to irrigate about 110,000 acres of farmland supporting a population of 50,000–80,000 residents.

For reasons lost to time, the Hohokam later departed the valley. But for Swilling, the canals were an unforeseen bonanza — as well as a message from the past — that humans could survive and thrive in the arid environment. Swilling, an enterprising sort, went about excavating the old Hohokam canals, bringing water to new crops he sowed to feed the nearby prospecting copper miners. He and others extended the canals and planted more crops; soon settlements arose that slowly consolidated and became known as "Phoenix" — a civilization rising from the ashes of another.

Like Swilling, you don't have to be in Arizona long to recognize the importance of water. Productive farmland and modern cities have sprung up, with non-native grasses and trees of green in contrast to the desert vistas.

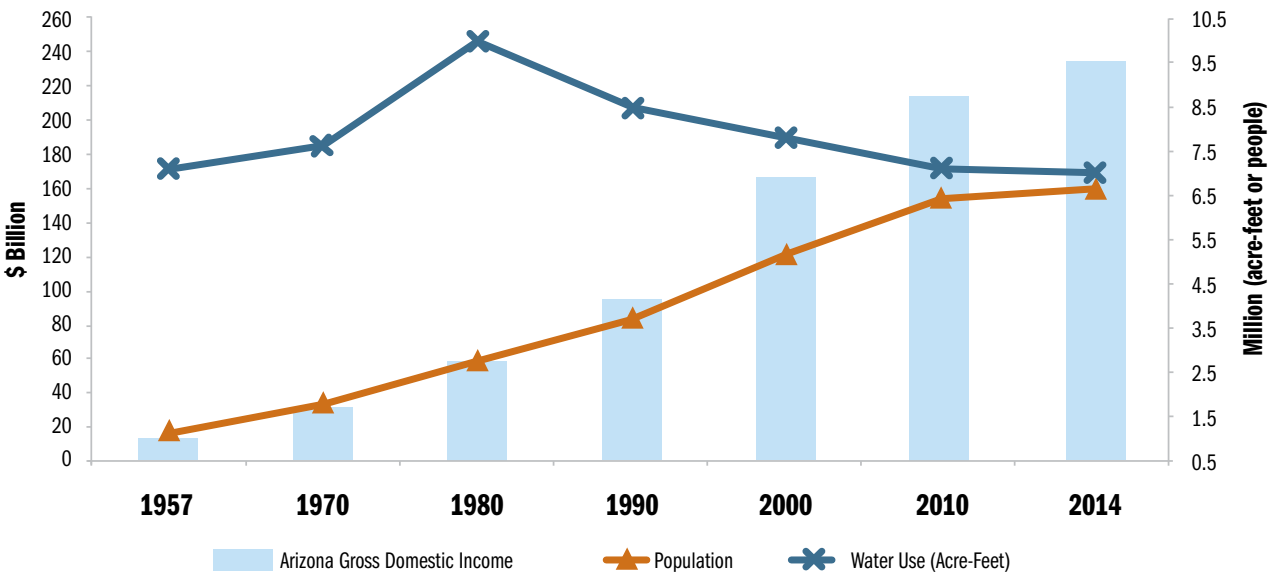
In many ways, Arizona's history, growth, and struggle for its identity are encapsulated in its efforts to acquire and often fight voraciously for enough water to sustain its livelihood.

Arizona and the whole Southwest United States are now facing another chapter of water challenges. Arizona's "bank" for much of its water — Lake Mead on the Colorado River — is being drained faster than it can be filled. It recently fell to levels dangerously close to the point where the state will have to drastically cut back on its water use to meet legal obligations.

The reason: Arizona and other Lower Basin states are taking more water from the Colorado River system than can be replaced. In an average year, the demand for water from Mexico and the Lower Basin states — Nevada, Arizona, and California — exceeds supply by 1.2 million acre-feet, equivalent to the annual water needs of about 3 million families.[1] This consistent overdraft has resulted in a very large and

Arizona's 'bank' for much of its water – Lake Mead on the Colorado River – is being drained faster than it can be filled.

## Figure 1.1 Arizona's Population and Economy Have Grown While Total Water Use Has Not




Source: Arizona Department of Water Resources, 2014

striking "bathtub ring" at Lake Mead — a white, chalky remembrance for where water levels used to be.

Projections show that if no action is taken to address the gap between supply and demand, Lake Mead could reach a critical stage within the next few years, triggering progressively larger mandatory restrictions on water use that could have a devastating impact on Arizona's communities, environment, and economy.

Like the entrepreneurial Swilling and his partners, though, Arizona can continue to find solutions and thrive in the face of this challenge by bringing that same spirit of cooperation, hard work, and vision of its forbearers. In fact, Arizona has already taken many steps through conservation, water sharing, water recharge, reuse, and improving efficiency to reduce demand, all while Arizona's economy continued to expand, as Figure 1.1 illustrates.

Arizonans need to take steps now to respond to the gap between supply and demand, and enter a new phase of collaboration, innovative water management, and incentives for conservation, efficiency, and reuse.

But despite steps to reduce water use in Arizona, Lake Mead continues to fall. Arizonans need to take steps now to respond to the gap between supply and demand, and enter a new phase of collaboration, innovative water management, water conservation and efficiency, and water reuse. At the end of the day, conservation groups, farmers, cities, the business community, government, neighboring states — everyone — are all in this together.

This report will briefly explore how and why Arizona arrived at its current water predicament. It will delve into not widely publicly known data on who actually uses Central Arizona Project water and who could be impacted if expected curtailments are enforced. Finally, it recommends that Arizona stakeholders adopt a set of solutions to ensure Arizonans will have water for current needs and future generations.

# Chapter 2: The Structural Deficit – How and Why We Got Here

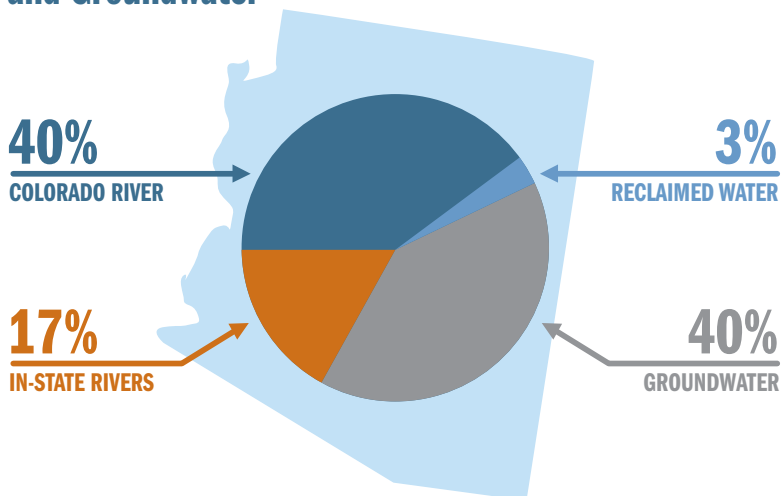
## Arizona's Growing Water Needs Surpass Local River and Groundwater Supplies

After the establishment of Phoenix and Sullivan's success in utilizing the ancient Hohokam canals that brought water to early communities in Arizona, by the 1880s it became readily apparent to the settlers of the valley that the Salt River and its major tributary, the Verde, could not provide a consistent and long-term solution to the growing town's water needs.

The state is blessed with huge reserves of groundwater, but natural recharge for this ancient resource is slow. Widespread groundwater well development and large-scale pumping caused groundwater to be depleted faster than it is replenished.[2] It was soon recognized that over-drafting this "bank" of groundwater could put the state in an even more precarious situation (Figure 2.1).

The state is blessed with huge reserves of groundwater, which are being depleted faster than it is naturally replenished.

Figure 2.1 **Arizona's Water Supply Relies Heavily on the Colorado River and Groundwater**




Source: Arizona Department of Water Resources, Arizona Water Facts, 2016

## Arizona Looks to the Colorado River for Water Supply

The Colorado River supports 16 million jobs and provides drinking water to nearly 40 million people.

Eyes and ambitions soon turned to the "grand river," which acts as a western border for the state — the Colorado River.

The Colorado, with its headwaters high in the Rocky Mountains of Colorado and Wyoming, cuts a 1,450-mile path through the American West before, in current times, drying up well short of its natural finish line at the Gulf of California.[3]

The river and its tributaries directly support 16 million jobs, generate $1.4 trillion in economic benefits, and provide municipal drinking water to nearly 40 million people (both in and outside of the Colorado River Basin, including Mexico). The river also irrigates over 5 million acres of farmland supporting diverse rural communities that grow 15% of all U.S. crops.[4]

## Arizona is Last State to Enter into Complicated Agreement Apportioning Colorado River

Access to Colorado River water supplies is ruled by a complicated series of laws, decrees, and agreements collectively known as the "Law of the River," which dictates how much Colorado River water the seven basin states (Arizona, California, Colorado, New Mexico, Nevada, Utah, and Wyoming), as well as the Republic of Mexico, have a right to use and when. The foundational document for managing the Colorado River's resources is the Colorado River Compact of 1922 (the Compact).

Under the Compact, the waters of the Colorado River were apportioned between the states of the Upper Basin division (Colorado, New Mexico, Utah, and Wyoming) and the Lower Basin division (Arizona, California, and Nevada), with the dividing point between the two basins identified as Lees Ferry in northern Arizona (Figure 2.2). Each of the basins was allocated 7.5 million acre-feet of water use per year.[5]

Hoover Dam, constructed in 1933, and Glen Canyon Dam, built in 1963, act as the lynch pins of the Colorado River system. Glen Canyon Dam, which forms Lake Powell, helps the Upper Basin states guarantee the average delivery of 7.5 million acre-feet of water to the Lower Basin states every year, while Hoover Dam, which forms Lake Mead, provides assurance for the Lower Basin states for division of the water allocated to them and to meet international obligations to Mexico.

Arizona has had a contentious relationship with the Colorado River and its neighboring states.

## Arizona's Navy and the Birth of the Central Arizona Project

Arizona has had a difficult and contentious relationship with the Colorado River and its neighboring states, particularly California. Arizona did not ratify the original Colorado River Compact at first, and in 1934, its governor even deployed National Guard troops and commissioned a Navy to prevent California from finishing Parker Dam on the mainstem of the Colorado River. It was the last occurrence in American history when one state took up arms against another.[6]

But in some ways, Arizona had a good rationale for its position. California was booming and historically took more water from the Colorado than it was entitled to. Arizona's congressional delegation was dwarfed by that of California's, found itself

## Figure 2.2 The Colorado River is Divided into Upper and Lower Basins


Source: U.S. Bureau of Reclamation. Colorado River Basin Water Supply and Demand Study, 2012

bowled over in Washington D.C., and left behind for needed water projects and infrastructure.

By midcentury, Arizona knew it had to find a way to supplement its water supplies. And as Arizona continued to grow, it became apparent that groundwater aquifers were rapidly depleting, largely through antiquated laws that encouraged groundwater over-drafting. This led to immense conflict between farmers, the mining industry, and Arizona cities and towns.

Arizona's water rights are junior to California's, which means during a Colorado River shortage, Arizona will have to cut back on its water supplies first. This presents future challenges.

Eventually, Arizona water policies began to shift. The Colorado River Compact was ratified in 1944, with the hope that it would help clear the way to access Colorado River water for central and southern Arizona. And in 1964, Arizona prevailed when the U.S. Supreme Court restricted California's Colorado River apportionment to 4.4 million acre-feet and affirmed Arizona's right to 2.8 million acre-feet.

In 1968, Arizona finally received the congressional approval to build a water project to deliver water from the Colorado to central and southern Arizona communities, and the Central Arizona Project — or CAP — was born. However, to ensure the project's passage, Arizona had to agree that its water rights were junior to California's. This meant that if there were ever a shortage on the river, California was guaranteed it would receive its allotment and Arizona would have to cut back first — a deal that would present future challenges.

### The Ultimatum: Deal with Your Groundwater or No Federal Funding

By 1973, the CAP was underway, with initial construction of the canal near Lake Havasu City. Meanwhile, the issue of groundwater depletion continued to dog the state, as Arizona had never satisfactorily dealt with managing its groundwater. The ensuing years often saw major water users in Arizona (agriculture, mining, and cities and towns) fighting it out at the legislature and in courts until the late 1970s, when former Governor Bruce Babbitt convinced the U.S. Secretary of the Interior, Cecil Andrus, to lay down the law — unless Arizona enacted strict groundwater laws to stabilize pumping at sustainable levels, Andrus would refuse to approve final funding for completion of the Central Arizona Project.

As a result, in what was called perhaps Arizona's greatest achievement since statehood, the Groundwater Management Act of 1980 was signed to ensure that Arizona would manage and conserve its groundwater supplies in a more sustainable manner.

This agreement cleared the way to finally finish the CAP: a 336-mile-long system of aqueducts, pipelines, and pumping plants that extends from Lake Havasu on the Colorado River to the southwestern edge of Tucson, nearly 2,900 feet higher in elevation (Figure 2.3). The project is designed to deliver nearly 1.5 million acre-feet of Colorado River water per year to Pima, Pinal, and Maricopa counties; it is the largest single source of renewable water supply in Arizona.[7]

### Central Arizona Project Fulfills Dream, But Challenges Are on Horizon

Building out the CAP was viewed as the culmination of Arizona's long-held desire to tap into the Colorado River, bringing needed water supplies to Arizona's rapidly growing central and southern cities.

CAP water not only provides supplies directly to Arizona's agricultural users, cities, and industry, but it is also stored underground in recharge projects to act as a hedge against future drought and shortages. In this way, Arizona fully uses its Colorado River allotment and can fend off arguments from California and other states that there are any "unused" Colorado River water supplies in Arizona.

## Figure 2.3 Central Arizona Project, a 336-Mile-Long Water Distribution System, Supplies Water to Arizona's Central and Southern Cities


Source: Central Arizona Project, 2015

Today, thanks to Colorado River water supplies brought in by CAP, much of central Arizona's groundwater aquifers are recovering from historical overpumping, and Arizona's economy and population continue to grow.

Unfortunately, the reliability of CAP water faces a challenging future. The Law of the River, climate change, population growth across the Lower Basin, and a "structural deficit" in how Lake Mead water levels are managed threaten to upend the ongoing success of the Central Arizona Project.

## Current Challenge: More Water Withdrawn From Colorado River Than It Can Supply

Designers of the Compact used data from one of the wettest periods of time, resulting in overestimating the average flow of the Colorado River.

A now-recognized fundamental flaw in the Law of the River is that it promises more water to the seven basin states and Mexico than is physically available under normal circumstances.

How did this happen? Simply put, the designers of the Compact used what turned out to be one of the wettest periods of time to estimate average flow of the river. From 1905 to 1922, the Colorado River had the highest long-term annual flow volume of the past century, an average approaching 17 million acre-feet flowing past Lees Ferry every year. For most of the past 90 years, however, the average yearly flows have been below 15 million acre-feet, well under the 16.5 million acre-feet that the states and Mexico legally share.[8]

The gap in Colorado River water supplies impacts Arizona first and foremost of all the states. As mentioned earlier, when the CAP was codified in 1968, Arizona had to agree that CAP water deliveries are subservient to California's and those of other more senior water right holders. In times of severe shortage on the river, Arizona would be legally required to fully reduce its CAP deliveries before California has to reduce its Colorado River rights.

In 1968, the possibility of limited water supplies from the Colorado River seemed far-fetched, but in the early 2000s, the region was racked by a sustained drought. The U.S. Bureau of Reclamation (USBR) described it as the worst drought for the Colorado River Basin in over a century of continuous recordkeeping.[9]

Compounding water supply problems, the population boomed across the Colorado River Basin in the last half century, creating more and more demand for the river's shrinking supply.

Arizona is impacted first and foremost when water deliveries are reduced from the Colorado River.

## Agreement Reduces Water Use in Times of Drought

In 2007, an agreement was reached by the basin states and USBR on how to collectively deal with future drought scenarios, officially called the *Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead*, or "2007 Interim Guidelines" for short. These guidelines outlined under what conditions and by how much the Secretary of the Interior would reduce the amount of water available for use from Lake Mead to the Lower Basin states. It also created three tiers of shortages based on the elevation of water in Lake Mead and outlined the reduction in water available to each of the Lower Basin states under each shortage tier. For Arizona, a Tier 1 shortage reduces CAP water availability by up to 320,000 acre-feet, a Tier 2 shortage up to 400,000 acre-feet, and a Tier 3 shortage up to 480,000 acre-feet (Figure ES.1).

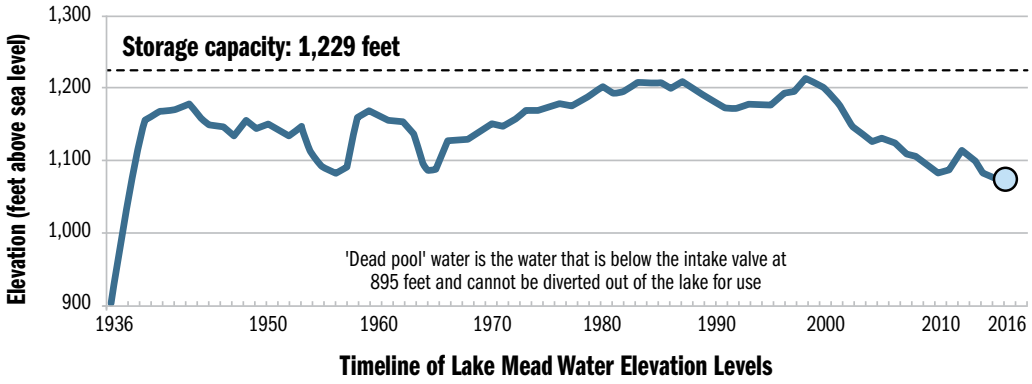
## Lake Mead Continues to Drop and Will Soon Trigger Official Shortage Declarations

Unfortunately, a combination of extended drought and continued water over-use has caused reservoir levels in Lake Mead to continue to fall. After reaching near full capacity — at elevation 1,229 feet above sea level in the 1990s — by the close of

2016, the water elevation at Lake Mead barely avoided the tipping point of 1,075 feet, at which the first level of shortage declaration for the river is required to go into effect (Figure 2.4).

Since 2000, Lake Mead has fallen by more than 100 feet, and the volume of stored water at Lake Mead and Lake Powell is currently at about half-capacity.[10] Putting it another way, in 2000 Lake Mead was at 94% capacity and is at 34% capacity today. A few good "snow years" are not going to correct this situation.

Figure 2.4 **In 2016, Lake Mead Reached its Lowest Water Elevation Since Filling in the 1930's**




Source: Table from Las Vegas Review Journal based on US Bureau of Reclamation date

**The official term for the Lower Basin dilemma of having less water coming from Lake Mead is "Structural Deficit." There is simply not enough water coming into Lake Mead to meet all of the water uses in the Lower Basin states and Mexico.** This overuse occurs even under normal, non-drought conditions, because the allocations of water to the Lower Basin states and Mexico exceed supply, resulting in an ongoing imbalance.

Approximately 9.0 million acre-feet of water flows into Lake Mead each year from Lake Powell and other minor tributary streams. Lower Basin state allocations as well as treaty obligations to Mexico require releasing 9.6 million acre-feet per year from Lake Mead. In addition, each year 0.6 million acre-feet of water simply evaporates from the lake's surface, a loss that is not factored into any of the state's individual allocations (see Figure 2.5). These Lower Basin state water uses, Mexican treaty obligations, and evaporative losses combine for a total outflow, or demand, from Lake Mead of 10.2 million acre-feet per year.

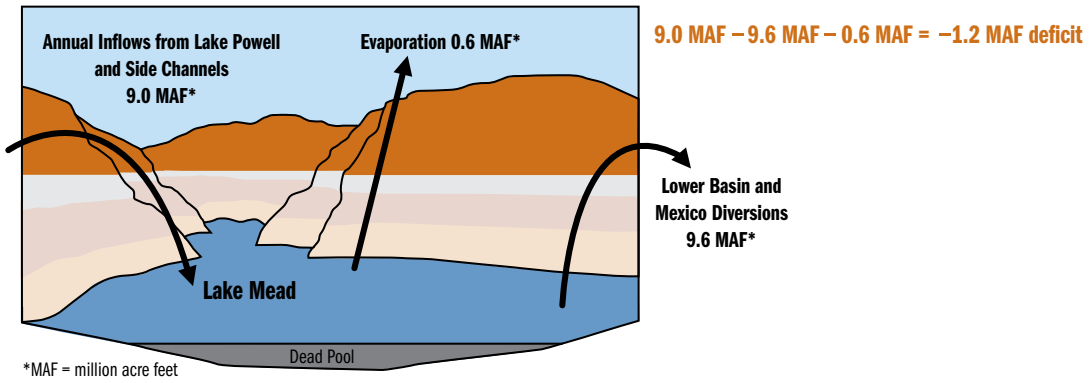
An empty Lake Mead is untenable for cities and farmers.

The result is that Lake Mead loses more water than is replenished in any "normal" year. Under these conditions, Lake Mead loses 1.2 million acre-feet annually, resulting in a lake elevation decline of about 10–12 feet each year.

**The inevitable conclusion is that Lake Mead will continue to fall unless the Lower Basin states can agree how to do more with less.**

Figure 2.5

## Lake Mead's "Structural Deficit" Means Each Year More Water Goes Out than Comes In




Source: U.S Bureau of Reclamation. Colorado River Interim Guidelines for Lower Basin Storage, 2007

### Determining When Shortage Is Declared

Every month, the USBR releases a report, called a 24-month study report that estimates what the water levels in the Colorado River reservoirs will be each month over the next two years. The August report, specifically, projects whether Lake Mead water levels the following January 1 will fall below 1,075. Under the 2007 Interim Guidelines, when the lake is estimated to drop below the 1,075-foot elevation on January 1, a Tier 1 shortage is declared and a series of federally obligated, legally binding steps to reduce water use are put into action by the USBR to forestall continued declines in reservoir elevation.

If lake levels continue to fall, more drastic cuts are made at elevation 1,050 feet (Tier 2 shortage) and again at 1,025 feet (Tier 3 shortage). We will discuss later how these tiers and a newer, more drastic, proposed three-state Drought Contingency Plan may specifically impact water users in Arizona.

**Currently, USBR estimates a nearly 50% chance of a shortage being declared on Lake Mead for 2018, rising to 56% by 2021.**[11]

Unfortunately, modeling performed by CAP and others show that the cuts agreed to in 2007 are not sufficient to keep Lake Mead from emptying completely under a repeat of the drought conditions seen at the beginning of this century. With critical

power production, drinking water supplies for millions of people, and extremely valuable farmland at risk, Lower Basin water leaders have recognized an empty Lake Mead is an untenable outcome.

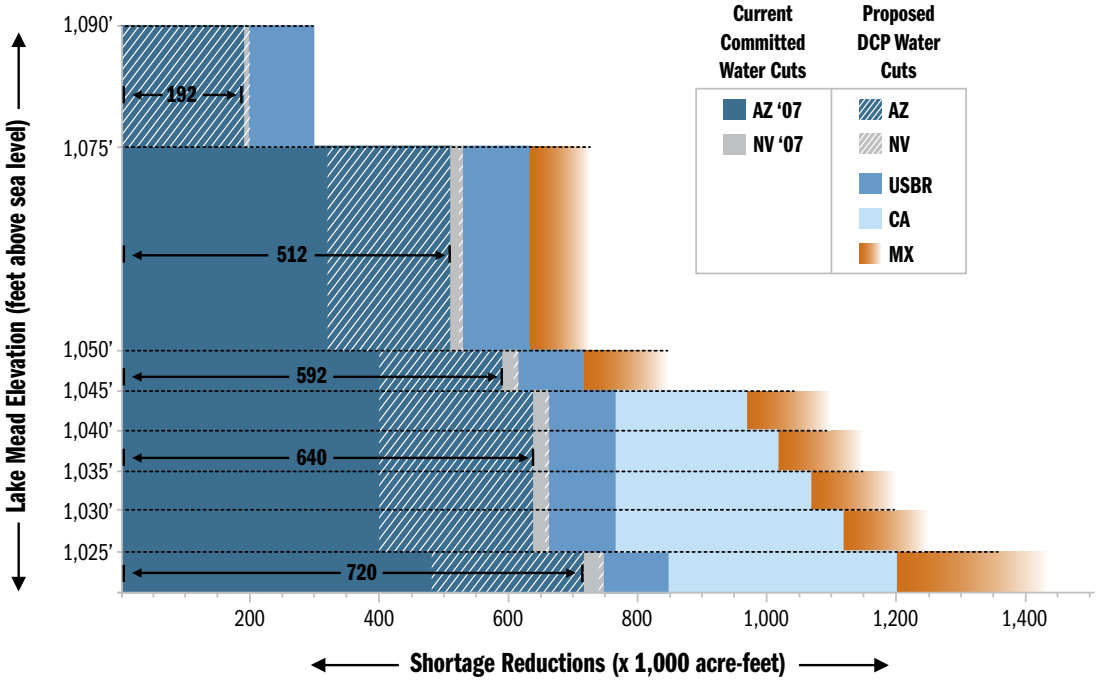
### Three-State Drought Contingency Plan Being Negotiated

Fortunately, Arizona and its leaders are well aware of their ongoing predicament. In May 2016, the Arizona Department of Water Resources (ADWR), CAP, and USBR announced it had begun a series of negotiations with the Lower Basin states (Arizona, Nevada, and California) on a Drought Contingency Plan (three-state DCP) to proactively deal with Lake Mead's chronically falling levels and the threat of a federal shortage declaration and resulting water delivery reductions.

In general, the three-state DCP proposes new reductions (in addition to those of the 2007 Interim Guidelines) by each Lower Basin state, with additional conservation commitments by USBR in order to prevent Lake Mead from falling to dangerously low levels. There are earlier and larger reductions by Arizona and Nevada, reductions by California at lower Lake Mead elevations, and Mexico's participation as well.[12]

As of the writing of this report, Figure 2.6 shows the already agreed upon Colorado River reductions from the 2007 Interim Guidelines, and the proposed additional reductions for each state under the three-state DCP.[13]

Figure 2.6 **Proposed Three-State Drought Contingency Plan Water Cuts are Much Larger than Already Agreed-to Cuts**




Source: Presentation on Lower Basin Drought Contingency Plan at Central Arizona Water Conservation District Board Meeting 2016

## Arizona Intrastate Drought Discussions Started on Whose Water Use Will Be Cut

Within Arizona, negotiation of the three-state DCP also commenced an intrastate discussion on how Arizona can meet its proposed obligations and equitably deal with the inevitable process of deciding who will be impacted by the cutbacks. The proposed DCP cuts for Arizona are significant, reaching up to 720,000 acre-feet when combined with cutbacks under the interim guidelines — nearly half of current CAP water deliveries — though it is not yet decided which water interests in Arizona will be impacted or by how much.

"There are opportunities to lessen those effects and, more importantly, to spread the consequences more equitably among agriculture, municipalities and tribes. To that end, I have begun to reach out to water managers in Arizona to explore a collective and voluntary sharing of the impacts and benefits of this potential new agreement."

—Tom Buschatzke, April 25, 2016

Some of ADWR Director Buschatzke's recent comments indicate that Arizona's implementation of the three-state DCP would share the responsibility of the proposed cuts, as opposed to a strict following of water rights priority. This could include voluntary or compensated reductions by the cities, towns, and tribes who have more senior water rights participating in the first rounds of cutbacks, which effectively softens the blow to farmers in central Arizona who have lower priority rights.

In late fall of 2016, some details of a possible Arizona plan began to take shape. The "DCP Plus" appears to frontload water reductions in Arizona in order to forestall and reduce mandatory cuts from the 2007 Interim Guidelines and proposed three-state DCP. The plan currently proposes a combination of reduced CAP deliveries, compensated reductions by tribes and Pinal County agriculture, and temporary reductions by tribes totaling 1.2 million acre-feet from 2017–2019.

Unfortunately, the structural deficit and declining Lake Mead water levels will extend beyond this upcoming three-year period and likely well into the future. Consequently, there is still much need for ideas and policies to address how to thrive in spite of having less water over the long term. Chapter 4 discusses some of these solutions more in depth.

The next chapter peeks under the hood of CAP water uses and users, discussing which stakeholders might lose if a federal Law of the River shortage declaration is made and which stakeholder is almost guaranteed to keep its water no matter what.

# Chapter 3: Peeking Under the Hood – Who's In Line for Water Cutbacks

Given what we know about how the Colorado River and Lake Mead are managed, current water law, population growth, and impacts from climate change, shortages on the Colorado River are virtually guaranteed. As Arizona continues important conversations within the state on who will share in water supply cutbacks, existing law and agreements and the proposed three-state DCP can provide a guide to understand who will be impacted.

The Colorado River in the Lower Basin, like many Western rivers, has a system of established water right priorities that determines who receives water and in what order — and, in the case of limited water availability, who will suffer cuts first and by how much.

Table 3.1 shows Arizona Colorado River water right entitlements greater than 100,000 acre-feet per year and the priority of those different water users. Priority of water rights indicates the pecking order of who receives water cut backs first. First priority holders are the last to receive cuts and fourth priority holders are first in line to receive reductions. First priority water holders include several Indian tribes, and third priority users include several agricultural interests in Yuma. Central Arizona Project (CAP), which is represented in the figure below by its managing entity the Central Arizona Water Conservation District, is entitled to about 1.5 million acre-feet of water a year and has fourth priority.

Given current water law, population growth, and impacts from climate change, shortages on the Colorado River are virtually guaranteed.

## Table 3.1 Priority of Arizona's Colorado River Water Allocations Greater Than 100,000 Acre-Feet per Year

| Entitlement Holder | Priority | Entitlement (Acre-Feet) |
|---|---|---|
| Colorado River Indian Tribes (CRIT) | 1st Priority | 662,402 |
| Fort Mojave Indian Reservation | 1st Priority | 103,535 |
| Yuma County Water Users' Association | 1st Priority | 254,200 |
| Welton-Mohawk Irrigation and Drainage District | 3rd Priority | 278,000 |
| Yuma Mesa Irrigation and Drainage District | 3rd Priority | 141,519 |
| Yuma County Water Users' Association | 3rd Priority | Unquantified water right certificates |
| Central Arizona Water Conservation District (CAP) | 4th Priority | 1,500,000 (approximate) |

Source: U.S. Bureau of Reclamation, Lower Colorado River Water Entitlements Listing, 2015

In a shortage situation on the lower Colorado, cuts to Arizona are likely to almost exclusively be borne by the users of CAP water in central Arizona because CAP is the lowest priority user of Colorado River water.

Table 3.2 shows the estimated cuts Arizona would have to make to CAP water supplies under the previously agreed upon 2007 Interim Guidelines. If Lake Mead dips below 1,025 feet, the agreements simply say that the U.S. Secretary of the Interior would have to make a determination of what to do next.

## Table 3.2 Arizona Could Lose Nearly 500 Thousand Acre-Feet of Colorado River Water if a Federal Shortage is Declared

| Lake Mead Jan 1 Elevation* | Shortage Tier | Amount of Colorado River Water Delivery Reduced to Arizona |
|---|---|---|
| 1075' | 1 | 320,000 acre-feet |
| 1050' | 2 | 400,000 acre-feet |
| 1025' | 3 | 480,000 acre-feet |

* If Lake Mead dips below 1,025 feet the Secretary of the Interior would have to make a determination of what to do next.

Source: U.S Bureau of Reclamation, Colorado River Interim Guidelines for Lower Basin Storage, 2007

### 1983 Decision Allocated CAP to Three Pools of Users

The Central Arizona Project also has an internal system of priorities, often referred to as "pools" of water. CAP's annual allotment of 1.5 million acre-feet was first prescribed in a 1983 U.S. Department of Interior (DOI) decision signed by DOI Secretary James Watt. The 1983 decision allocated CAP water into three broad pools of water: approximately 310,000 acre-feet per year to "Indian uses" (Indian), 640,000 acre-feet per year to "municipal and industrial uses" (M&I), and any available remaining water to "non-Indian agricultural uses" (NIA), which has totaled approximately 450,000 acre-feet per year. The 1983 decision also established the priority among the three pools of water, giving equal priority to Indian and M&I water and a second, lower priority to NIA.

Colorado River water cuts to Arizona are likely to almost exclusively be borne by the users of CAP water because CAP is the lowest priority user of Colorado River water.

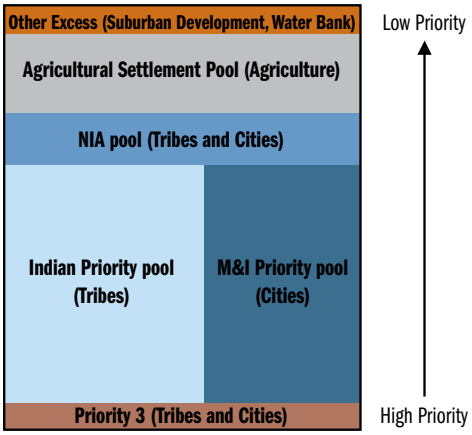
It is important to note that the 1983 allocations to the three broad pools of water does not track with today's water use because of ongoing water settlements and lower-than-expected use of the three broad pool allocations than originally projected. As a result, over time, two additional pools of CAP water have been added that allow for new uses by agricultural and some other entities. However, these two new pools do not come with guaranteed delivery of CAP water. One new pool is called the "Agricultural Settlement Pool" and the second is called "Other Excess Water." Water that feeds these two new pools (sometimes called Excess Water) is created when water is not delivered or taken by the original owner (Indian tribes, M&I, or NIA). As an example, Phoenix creates Excess Water when it doesn't use its full contract entitlement in a particular year.

Other Excess Water and the Agricultural Settlement Pool are further discussed later in this chapter.

## CAP Water Priorities and Order of Cuts

Figure 3.1 shows CAP deliveries in 2014 and their relative priority within the CAP system. At the bottom, the highest priority pool to get water deliveries, referred to as Priority 3, represents a small set of tribal and municipal water rights that predate CAP but are currently delivered through CAP infrastructure. Above Priority 3, Indian Priority pool and M&I Priority pools share the next highest priority, then the NIA Priority pool, then the Agricultural Settlement Pool, and finally, the Other Excess Water pool. This ranking shows that the Other Excess Water pool would be the first to receive reductions in water deliveries under a shortage condition.

### Figure 3.1 Delivery Priority for Central Arizona Project Water Pools




Source: Central Arizona Project, Shortage Impacts to CAP Priority Pools and Customers, 2015

Throughout the rest of the report as we discuss these different pools of water priority, we make the assumption that shortage cutbacks will be made according to current law (i.e., the most junior rights are cut first). While this may not actually come to pass during an actual shortage condition, as Arizona's proposed "DCP Plus" indicates, it is a simple and reasonable assumption — and speculating on the outcome of private negotiations is beyond the scope of this report.

## Who is Cut First? Suburban Growth, Arizona's Water Bank and Groundwater Replenishment

If cuts are made according to priority, the first cuts would be made to Other Excess Water pool users, who currently receive about 132,000 acre-feet of CAP water. Much of this water is used for underground storage through the Arizona Water Banking Authority (AWBA) and Central Arizona Groundwater Replenishment District (CAGRD). The AWBA banks unused CAP water underground to create a "rainy day" storage account for some municipalities and others in central Arizona

First cuts would impact the Arizona Water Banking Authority and Groundwater Replenishment District, seriously threatening residential and commercial development in some suburban areas.

in case of shortages, while the CAGRD allows land developers and water providers to meet requirements under the 1980 Groundwater Management Act to prove they have enough "renewable" water to cover planned development in certain suburban areas of greater Phoenix and Tucson.

A Tier 1 shortage according to the 2007 Interim Guidelines could total up to a 320,000 acre-feet cut to CAP supplies. This Tier 1 shortage would completely eliminate water available to the AWBA and CAGRD.

The potential loss of supply to both of these underground storage entities not only removes important tools in Arizona's water planning toolbox, but also could seriously threaten residential and commercial suburban development in central and southern Arizona that do not have sufficient CAP municipal water supplies.

### Further Cuts Impact Central Arizona Agriculture

Next in line for cuts are central Arizona agricultural water users who currently use water from the Agricultural Settlement Pool. An investigation of CAP contracts and other documents reveal that the top four users of this water are Maricopa Stanfield Irrigation & Drainage District, Central Arizona Irrigation & Drainage District, Harquahala Valley Irrigation District, and Hohokam Irrigation District (Figure 3.2). All are important irrigation districts that support area farmers and Arizona's agricultural economy.

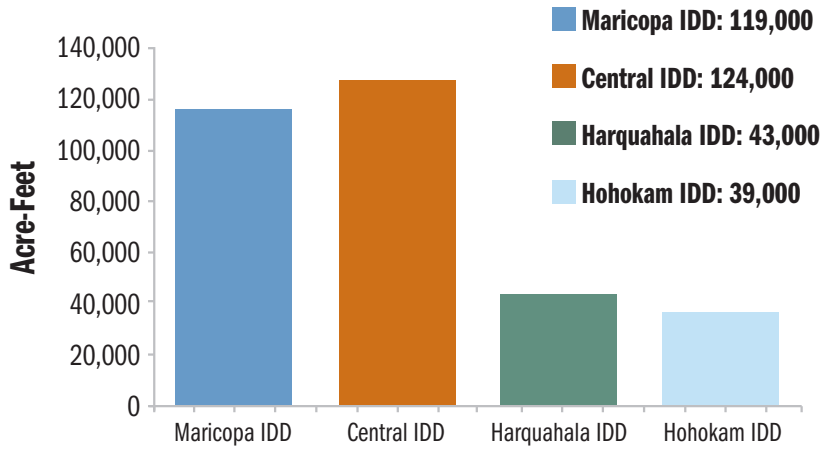
- **Maricopa Stanfield Irrigation & Drainage District** was formed in 1962 for the purpose of providing irrigation water for agricultural use and is composed of approximately 59,000 acres. The district is located in Pinal County, Arizona.[14]

- **Central Arizona Irrigation & Drainage District** was formed in 1996 and is located in and around Eloy, Arizona. CAIDD is composed of 87,586 acres.[15]

- **Harquahala Valley Irrigation District** is a small water supply systems company in Tonopah, Arizona, founded in 1964. It has six full-time employees and generates $39,945 in annual revenue.[16]

- **Hohokam Irrigation & Drainage District** was formed in 1972 and is located northeast of Casa Grande, southwest of Coolidge in Pinal County, Arizona. It is composed of 29,600 acres, though some of its irrigable acres have been reduced due to urban development.[17]

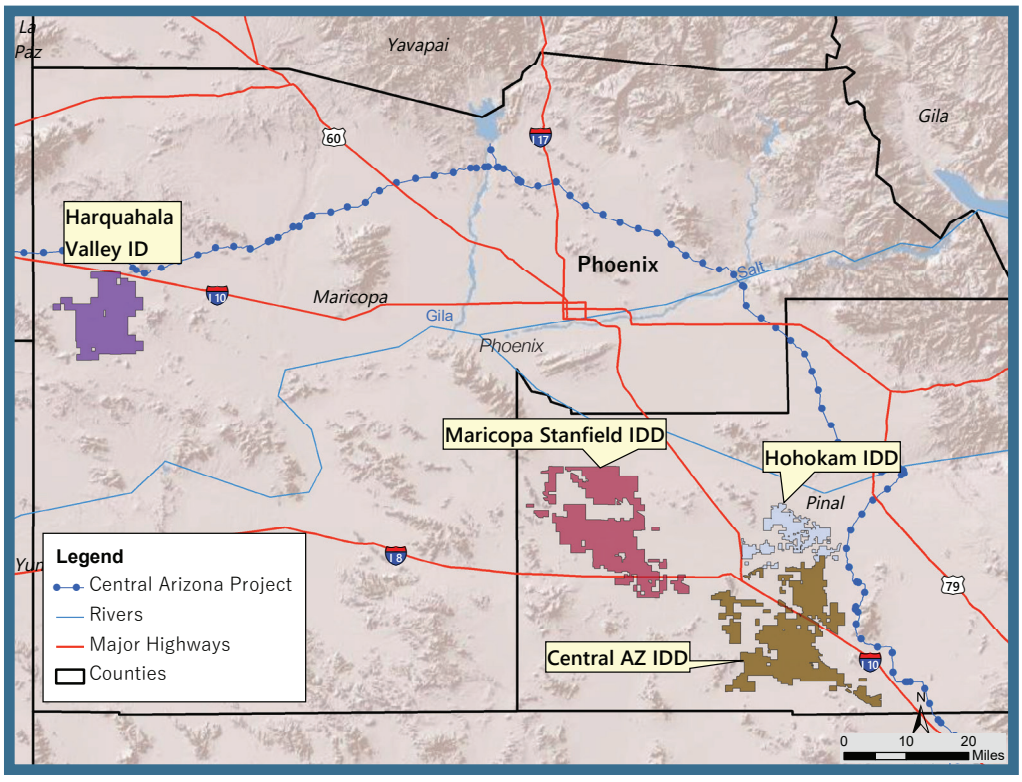
## Figure 3.2 Average Agricultural Settlement Pool "Excess Water" Deliveries (2012-2014)




Source: Central Arizona Project, Water Deliveries, 2016

Figure 3.3 shows where the Agricultural Settlement Pool recipients and other CAP irrigation districts are located.

## Figure 3.3 Large Irrigation Districts Benefitting from CAP "Excess Water"




Source: Produced by Western Resource Advocates using data from Arizona Department of Water Resources, 2000, 2008; ESRI, 2015; US Geological Survey, 2014.

A Tier 1 shortage would begin to impact water availability for central Arizona agriculture, and a Tier 2 shortage (up to 400,000 acre-feet) would eliminate a sizeable amount of water available to central Arizona agriculture. A Tier 3 shortage (up to 480,000 acre-feet) virtually eliminates CAP water available to central Arizona agriculture, in addition to the previously mentioned AWBA and CAGRD, and again, this is without considering even greater reductions proposed under the three-state DCP.

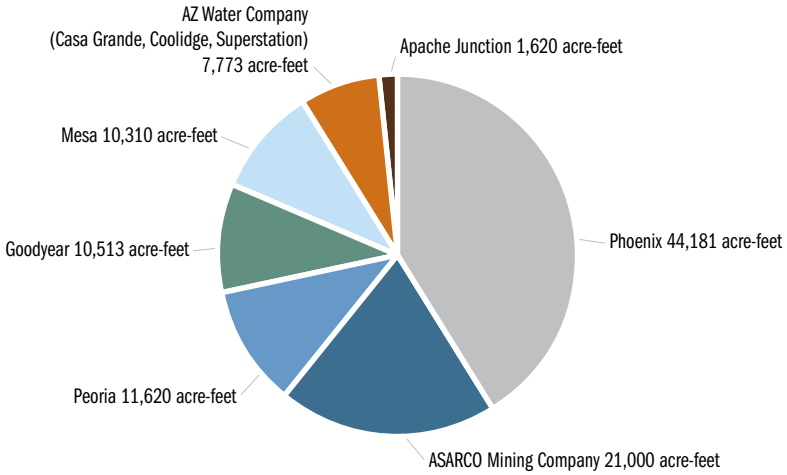
### Excess Water Users and Creators

These top two pools of water, the Other Excess Water pool and the Agricultural Settlement Pool, are often referred to as Excess Water in Arizona water language. Excess Water is a bit of a misnomer because it isn't really additional or an excess amount of water. These pools were initially created largely because cities and towns with higher priority water rights were not able to use their full allotments, and CAP made this water available to other entities until those cities and towns "grew into" their full allotment.

The benefit of the Excess Water program has been two-fold: for CAP it provided additional water to other interests and the funds generated from selling Excess Water has helped pay down the significant costs incurred by CAP to build its infrastructure system. That said, CAP readily admits that Excess Water holds a very junior water right and "should not be relied upon by other interests when they are planning to meet future demands." Excess Water is a temporary allotment and is only available to other interests on a yearly basis.[18]

Figure 3.4 shows the top entities that produced Excess Water in 2015. They include the City of Phoenix at 44,181 acre-feet, ASARCO (a mining company) at 21,000 acre-feet, and a number of smaller communities in, predominantly, the greater Phoenix metropolitan area.

## Figure 3.4 Top Seven Non-Tribal "Excess Water" Producers Include Phoenix and Smaller Communities




Source: Central Arizona Project, Water Deliveries, 2016

### Arizona Cities Firming up Their Water Rights, Leaving Less "Excess Water" for Others

In recognition that water shortages are on the horizon, cities like Phoenix are making plans to use or store elsewhere their full allotments, thus further decreasing water available to the Agricultural Settlement Pool.

In October 2016, the City of Phoenix announced it would take its full CAP allotment for the first time and dedicate 20% of its CAP allotment to underground water storage facilities in the Tucson area.[19] This enables Phoenix to store the water that it does not need to deliver to customers that year and allows Tucson, which has ample underground water storage capabilities, to enhance its groundwater supplies. In return, during a shortage, a portion of Tucson's CAP entitlement will be delivered directly from Lake Mead to Phoenix, and Tucson will recover an equal amount of Phoenix's water previously stored in Tucson's aquifers.

While this development is a good example of the cooperative nature between cities in Arizona that are planning for water shortage (and is discussed more in depth later), it also provides some truth to the statement that perhaps there is not as much Excess Water available in the long run for other users.

Inevitably, in almost any shortage scenario, users of the Agricultural Settlement Pool and Other Excess Water pool will be significantly curtailed, gravely impacting central Arizona agricultural users, affecting new residential development opportunities in some areas, and reducing the ability to utilize such tools as the Arizona Water Bank to store water for future use.

If Lake Mead levels continue to fall, central Arizona cities' water supplies will be impacted

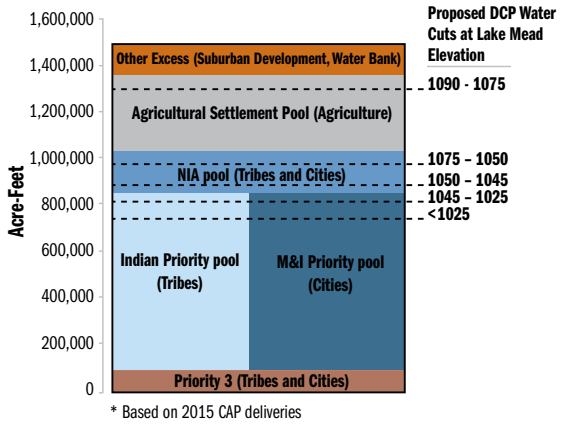
### Major Cities Could Face Water Reductions within this Decade

If water management actions do not change and water levels in Lake Mead continue to fall, progressively larger cuts will be required that eventually will impact Arizona's cities and towns. Under current laws and agreements, cuts to central Arizona cities could happened before 2020, but proposed additional cutbacks may impact cities even sooner.

Under the proposed three-state DCP, if Lake Mead levels fall below 1,025 feet, up to 720,000 acre-feet of water use must be cut by Arizona (Figure 3.5). At this point, water shortages will impact the NIA pool and dip into the M&I and Indian pools, too.

Multiple Arizona communities, including Tucson and Phoenix and its major suburbs, attain their CAP water supplies from a mix of the NIA, M&I, and even Indian pools, due to various leasing, sharing, and contractual agreements (more data on this is available upon request). For example, 31% of Phoenix's CAP water comes from the NIA pool, 65% from the M&I pool, and 16% under contracts from Indian pool water. Under current agreements, Indian pool and M&I pool water should be far from any potential cuts. However, if ADWR does move forward with efforts to "share the responsibility" through its drought contingency plan, tribes and major Arizona cities and towns could certainly feel the pinch.

## Figure 3.5 Severe Three-State Drought Contingency Plan Water Cuts Could Reduce Municipal Water Supplies




* Based on 2015 CAP deliveries

Source: Adapted from presentation of the Lower Basin Drought Contingency Plan at Central Arizona Water Conservation District Board Meeting, 2016

### A Note on Tribal Water Use

Central and southern Arizona Indian tribes have important rights to CAP water made available through federal Indian water rights settlements. This water is composed of both Indian Priority water that is delivered on-reservation for direct use, as well as water used off-reservation via Tribal leases and exchanges to municipalities and agriculture for direct use and for storage.

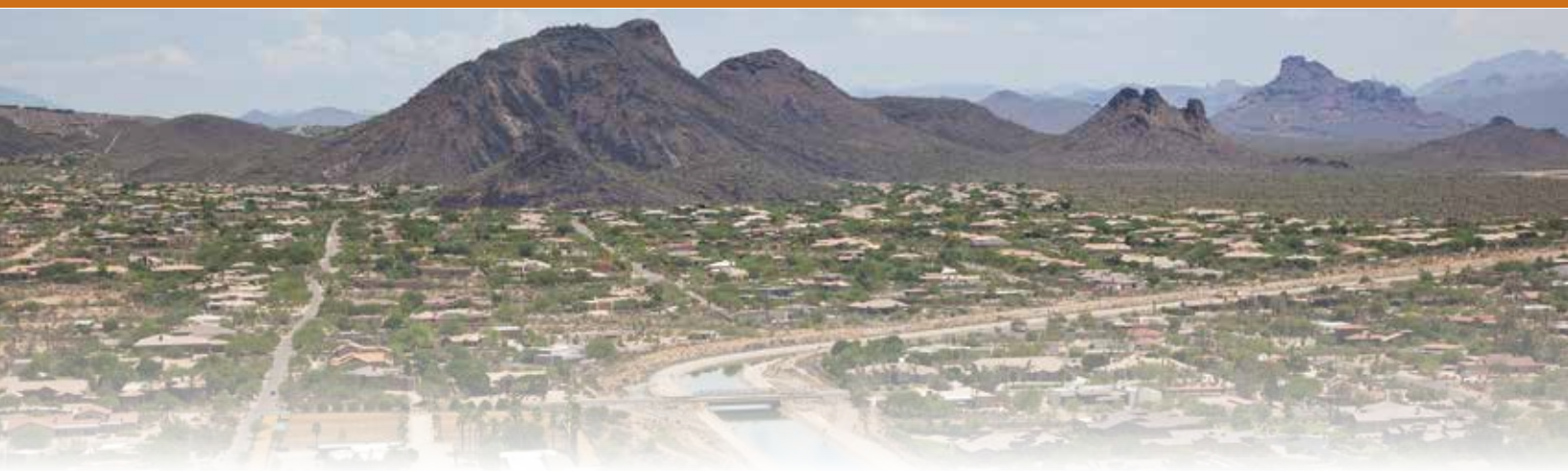
There is much more to Tribal water rights and their relationship with CAP than is discussed in this report. It is essential to honor the range of legal settlements and contracts that allocate and protect Tribal water, even in the midst of shortage actions. We have not done that topic justice in this report, though we affirmatively recognize that tribes are a critical user with an important voice that must be included in ongoing water discussions in Arizona.

### Progressively Larger Cuts Have Significant Impacts

The breakdown of these pools demonstrate the hard work ahead for ADWR and Arizona water users. Existing agreements and the proposed three-state DCP, depending on where Lake Mead levels fall, could result in sharp cuts to Arizona underground water storage mechanisms, wipe out CAP water access for key central Arizona water irrigation districts, and have the potential to impact major Arizona cities, like Phoenix and Tucson.

The descriptions of these pools and who its water users are provides more detail than is widely publicly known about CAP water supplies. Importantly, names can be deceiving (in addition to confusing), as exemplified by cities and towns that use water from the NIA, M&I, and Indian Priority pools.

While cuts are inevitable and Lake Mead is almost certainly poised to reach critical water levels in the next few years, the next chapters outline a number of measures Arizona water users can take now to increase water efficiency and conservation, put more water in Lake Mead to forestall shortage conditions, and still supply water for Arizona farmers, industry, and communities.



# Chapter 4: Policies and Actions – Protecting Groundwater While Ensuring Arizona Communities, Environment, and Economy Thrive

The challenges Arizona faces with its water supply are formidable but not insurmountable. It does seem likely that the three-state DCP and any of Arizona's intrastate implementation will entail some significant water reductions for Arizona water users. But if Arizona can use less water and help maintain levels in Lake Mead at or above 1,075 feet for the long term, there is a lot more flexibility on how or what Arizona can do to address the structural deficit rather than have the U.S. Bureau of Reclamation (USBR) lead and manage the process.

## Arizona Can Avoid Water Cuts with Proactive Actions to Stop the Decline of Lake Mead

Arizona's economy, quality of life, agriculture, and environment are on the line. The time is now for Arizonans to take steps to respond to falling Lake Mead water levels, and enter a new phase of long-term collaboration, innovative water management, water conservation and efficiency, and water reuse. This requires a new look at how water cuts are implemented and how shortage can be avoided.

Arizona has already taken important action by implementing interim measures to keep more water in Lake Mead to help stave off federally mandated cutbacks of Colorado River water. The state has also been working with its neighbors and with key water users within the state on plans to avoid critically low levels in Lake Mead. These actions are a good start, but temporary agreements are not long-term solutions.

Western Resource Advocates and our partners have developed a number of policies and actions directed at Arizona's impending water shortage over the next decade. These immediate actions and longer term plans will help address Lake Mead's falling water levels in ways that can protect groundwater and still allow Arizona's agriculture, cities, Indian tribes, economy, and environment to thrive in a future with less water.

There are a number of policies that will help address the falling Lake Mead water levels in ways that can protect groundwater and still allow Arizona's agriculture, cities, Indian tribes, and environment to thrive in a future with less water.

The solution set we propose abides by seven key tenets:

1. Adopt next-generation water conservation and efficiency
2. Expand system conservation programs to stabilize Lake Mead levels
3. Increase innovative water sharing arrangements
4. Create an Arizona Water Bank Recovery Plan Stakeholder Committee
5. Uphold the integrity of Indian water rights settlements
6. Protect the state's groundwater resources
7. Protect Arizona's wildlife and natural areas

We share the goal that all users are part of a single water system, and the more that each user can contribute water and ideas to stabilizing our system, the better we all are. At the same time, all water users need to be open to a variety of solutions.

### 1 Adopt next-generation water conservation and efficiency

Water conservation is a "no-regrets" strategy to increasing water supplies — one that is often cheaper, faster, and smarter than traditional "concrete and steel" water supply approaches. Water conservation success requires long-term implementation of practices and technologies that produce a permanent reduction in per capita water use. Conserving water allows us to do more with less.[20]

Water conservation is a "no regrets" strategy to increasing water supplies.

Luckily, many communities in Arizona have robust water conservation and efficiency policies, and have built strong community cultures embracing the need to save water in Arizona's arid desert environment. Western Resource Advocates highlighted a number of Arizona communities that have successfully implemented conservation measures in our 2010 *Arizona Water Meter* report. Many Arizona communities have strong public education campaigns to raise community awareness about the need for water conservation. Several communities have also implemented important water conservation programs — like landscape retrofit programs, where customers are paid to remove water-intensive non-native grasses and replace them with landscaping well-suited to minimal or zero watering.

Now Arizona is ready and in need of implementing the "next generation" of water efficiency programs. Below are a number of measures that can help Arizona cities and towns advance to the next water conservation level:

- **Improve water metering, data tracking, and water loss management.** This helps water providers know where water is coming from and where it's going to inform better management. It also helps ensure water utilities get paid for each water drop and ensures all metered customers are billed accurately.

- **Utilize innovative water utility rate-making and billing practices.** There are many new approaches to rate design and billing that encourage water conservation, educate customers for their own informed management, and provide adequate resources for utilities to stay solvent.

- **Integrate land use and water planning.** This entails building new developments to be water-smart from the start, which is much cheaper than retrofitting homes and businesses later to be water efficient.

- **Advance fully efficient outdoor irrigation of Arizona-friendly landscapes.** Ensure new landscapes are designed to give drought-tolerant and desert-appropriate plants the right amount of water when they need it and consider installing recycled water systems for landscaping.

- **Achieve total indoor water use efficiency.** Promote new and existing residences and businesses to use appliances and products that get the job done with a small amount of water.

- **Increase water reuse and recycling.** Many of us already drink water previously used by upstream communities — design systems that reuse water within our own community most efficiently, getting the most from each drop of water by using it over and over again.

- **Make gains in agricultural water efficiency.** Many agricultural users have incorporated water efficiency measures into their operations, including installing drip irrigation, laser-leveling fields to ensure the equal distribution of water, moving away from water-intensive crops, and improving irrigation schedules, but there is still room for improvement.

### ❷ Expand system conservation programs to stabilize Lake Mead levels

In 2014, Colorado River water users and the federal government agreed to develop a new program, the System Conservation Pilot Program, which provides funding to test a wide range of voluntary measures to conserve Colorado River water in Lake Powell and/or Lake Mead. Unlike previous programs where water conservation savings were still "owned" (and could be claimed for future use) by the entity that conserved, this new program recognizes that water conservation savings that improve reservoir levels are ultimately beneficial to all users, that no individual ownership of savings are implied, and that the water stays "in the system."

A number of System Conservation Pilot Program projects have been funded to date from the USBR, including several in Arizona, such as a $2.5 million grant to the Tohono O'odham Nation that will help conserve 10,080 acre-feet of the Indian tribe's CAP water and keep that water in Lake Mead.[21]

This federally funded pilot program should be expanded to allow more communities and other entities to take advantage of this innovative program. There are many pilot projects completed or producing useful findings that could immediately contribute to saving water and boosting water levels at Lake Mead. By increasing the availability of this program to fund more projects, more savings can be achieved on the Colorado River and more innovative projects can come online.

The System Conservation Pilot Program should be expanded to allow more communities to take advantage of this innovative program.

### ❸ Increase innovative water sharing arrangements

The current structure of water rights and allocations in Arizona allows for some movement of water supplies, such as underground water storage that can be recovered for later use when needed, but there is considerable opportunity for more flexibility to allow for more efficient movement of water.

A water sharing agreement enables water to move from one entity that has extra water to a different entity that needs more water. These agreements result in benefits for both entities.

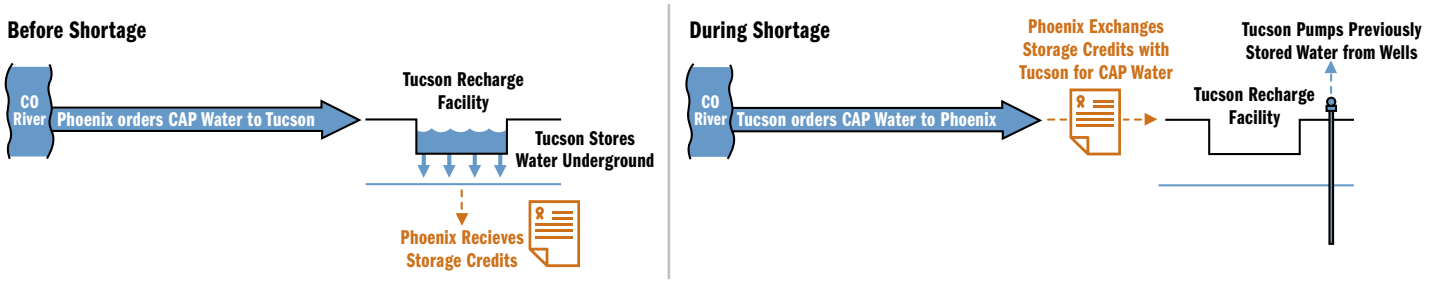
Water sharing is viewed by many as the ultimate fix to water supply challenges in arid places across the world. Creating more exchanges or trading of water between users can ensure water gets to where it is needed most. While caution is certainly needed in the development of this strategy for Arizona, existing agreements that allow for water to move more freely, with flexibility and efficiency, have created tangible benefits for water users in Arizona and beyond.

A water sharing agreement generally enables water to move from one entity that has extra water to a different entity that needs more water. These agreements are often short-term, compensated, and result in benefits for both entities. An example of this water sharing agreement in Arizona is an innovative water exchange between the cities of Phoenix and Tucson.

The Phoenix and Tucson water sharing agreement was announced at a White House water summit in early 2016 and was heralded in the Arizona Daily Star as "an example of the kind of cooperation needed to protect the region against its unyielding drought." The initial agreement called for 4,910 acre-feet of Phoenix's CAP supply from the Colorado River to be stored in recharge basins in the Avra Valley, west of the Tucson Mountains. Phase 2 will involve storing up to 40,000 acre-feet of water a year in the Tucson aquifer.

The agreement benefits Tucson in the short term by raising its water table with recharged water. And when future Colorado River water shortages become severe enough, Phoenix can take some of Tucson's CAP water as it comes down the canal, in exchange for the water it previously stored with Tucson.[22]

## Figure 4.1 Phoenix-Tucson Water Sharing Agreement: Potential Model for Water Savings




Source: Southern Arizona Water Users Association, Water Users and Southern Arizona, 2015

The example from figure 4.1 highlights that increasing the flexibility in when, where, and how water is used in Arizona can create a more efficient and reliable water system. Similar types of leases, storage credit sales, and recovery partnerships that leverage central Arizona's extensive canal, aquifer storage, and well field infrastructure can add even more options into the system, improving water resiliency for an uncertain future.

### 4 Create an Arizona Water Bank Recovery Plan Stakeholder Committee

To enable cities to plan with certainty for the amount, timing, method of delivery, and cost of water that can be expected from the Arizona Water Bank during times of shortage on the Colorado River, creation of a stakeholder committee is needed to complete an Arizona Water Bank Recovery Plan by 2018. Given Arizona's dire relationship to the declining Colorado River, old assumptions about how Arizona's Water Bank will operate are no longer relevant. Many communities do not have a good sense of where and who holds the water in Arizona's Water Bank, let alone an efficient process for retrieving water from the bank in times of need. An enhanced plan is needed that uses up-to-date assumptions utilizing realistic data to encourage real-time solutions in which multiple parties can share and participate.

### 5 Uphold the integrity of Indian water rights settlements

It is critical that we maintain our legal obligations to Arizona's tribes, who, like many across the West, were left out of earlier agreements and often put at the back of the line. Tribes and their water resources should be viewed as an equal partner in bolstering Lake Mead levels, and tribes should be invited to participate in ways that protect their water rights and cultural heritage. All opportunities for inclusion and equal communication should be included for this critical partner in Arizona's water supply conversation.

### 6 Protect the state's groundwater resources

The state's groundwater resources must be protected by investing in strategic aquifer storage and recovery facilities and incentivizing in-channel recharge and riparian enhancement. Arizona has made great strides in replenishing its groundwater supplies by recharging various types of water supplies and investigating groundwater basins where additional storage can take place. These groundwater storage opportunities should be expanded and, if at all possible, strategically developed where water will actually be used. Furthermore, recharging water directly through river and stream channels can have ecological benefits, too.

### 7 Protect Arizona's wildlife and natural areas

All calculations for dealing with a water shortage or any water future should ensure water still runs through Arizona rivers and streams. There is no reason our wildlife and water-dependent natural areas should take additional hits, nor should dry riverbeds become the norm for every river and stream. Arizona residents rely on healthy rivers and streams for respite and recreation, including world-class bird watching in the Verde Valley and along the Salt, San Pedro, and Santa Cruz rivers. It is essential that more be done to increase water flows in our rivers and to maintain our natural areas in order to provide critical wildlife habitat at all key times of year.

All calculations for dealing with a water shortage should ensure water still runs through Arizona's rivers and streams.

# Chapter 5: Conclusion – A Tale of Two Futures

In many ways, Arizona is standing at an important crossroads. After years of litigation, congressional wrangling, and innovative water management, Arizona has made significant inroads in addressing groundwater depletion and moving Colorado River water to central and southern Arizona. However, with extended drought caused by climate change, growing populations throughout Arizona and other Colorado River Basin states, and an over-allocated Colorado River, new solutions for the next decade are needed.

A tale of two futures is unfolding in Arizona with the potential to create two starkly different outcomes, depending on which path is taken.

The current path will trigger large-scale shortages and other grave impacts to Arizona.

## Following the Current Path – Arizona High and Dry

If Arizona does not make significant changes to its current water management system, it is inevitable that Lake Mead will reach dangerously low levels, triggering large-scale shortages and other grave impacts to Arizona, including:

- **Draining our groundwater dry.** Reduced water from the Colorado River under a shortage declaration will create a return to reliance on unsustainable groundwater mining for agriculture and other uses. This is a short-term solution that will lead to land subsidence, lowering well levels, and drying up connected greenways and springs.

- **Reduced hydroelectric power and increased electric rates.** Reduced water in Lake Mead impacts hydropower. The maximum amount of power that Hoover Dam on Lake Mead is capable of producing is down 30% from when Lake Mead was full. For every foot that Lake Mead drops, generating capacity decreases by five to six megawatts. This requires new power coming onto our electric grid to replace this lost generation, increasing costs to utility customers.

- **Impacts to farmers.** A shortage declaration could result in more conflicts between users, with the most probable result being farms switching to pumping groundwater or irrigating less crops, leading to groundwater level declines and potential land subsidence, economic problems, and negative impacts to rural communities reliant on an agricultural economy.

- **Reduced water for cities, halting growth and harming our economy.** Arizona cities and towns could see reduced water supplies leading to moratoriums on new housing development, prohibitions on new industrial growth, economic stagnation, implementation of draconian conservation and efficiency methods for existing residents and businesses, and general uncertainty for once-thriving communities.

- **Less water for the rest of the Colorado River, harming the environment.** If a shortage is declared, there inevitably will be less water throughout the system — this will remove flexibility and harm ongoing innovative environmental efforts, such as bringing more water to the Colorado River Delta or flushing flows below Lake Powell to recreate a more natural river system.

### Creating a New Path – Thriving Communities, Farms, Environment, and Economy

The other fork in Arizona's water road solves the structural deficit in a sustainable manner, maintaining levels in Lake Mead to avoid shortage declaration, providing long-term solutions to Arizona water needs, and keeping more water in our rivers and streams for both recreation and wildlife. This path will necessarily depart from how things were done in the past in Arizona, although much of it builds on Arizona's innovative spirit and commitment to water conservation.

The new path should build on Arizona's innovative spirit to create long-term solutions to Arizona's water needs.

Our seven tenets outlined in more depth in chapter four can greatly assist Arizona in reaching long-term solutions to Arizona's and the Lower Basin's water challenges. Again, those tenets are:

1. Adopt next-generation water conservation and efficiency
2. Expand system conservation programs to stabilize Lake Mead levels
3. Increase innovative water sharing arrangements
4. Create an Arizona Water Bank Recovery Plan Stakeholder Committee
5. Uphold the integrity of Indian water rights settlements
6. Protect the state's groundwater resources
7. Protect Arizona's wildlife and natural areas

The final element for future success is to double down on what the Lower Basin states are already doing: focus on collaboration, negotiation, and arrive at decisions that benefit both current and future generations. In the end, this strategy is what has served Arizona and the Lower Basin states the most.

The Colorado River, Lake Mead, and CAP have been essential to the success story that is Arizona. It is time we now work to shore up what has provided us with security and laid the path for prosperity in Arizona. A declining Lake Mead should be an ominous sign for all in Arizona, and a collective effort is needed to ensure Lake Mead will continue to provide water for current and future businesses, agricultural users, Indian tribes, and the people of Arizona.

Western Resource Advocates and our partners feel that the solutions to Arizona's water challenges must move beyond temporary fixes for the next one to three years

and address a longer time horizon. One cannot put Band-Aids on an ill patient, while failing to address the underlying illness. This is true of our water management systems, too. We need to focus and implement long-term solutions that will help Arizona be resilient with less water.

Arizona needs all stakeholders to work together to achieve a new water paradigm for the state.

For Arizona, this is a time for leadership, to evoke the days and spirit of passing the landmark Groundwater Management Act, which put aside past differences and squabbles and worked toward hard solutions to difficult problems. Arizona needs its governor, the state legislature, federally elected officials, and the differing interests of conservationists, agricultural users, cities, towns, Indian tribes, and those at the Central Arizona Project to work together to achieve a new water paradigm for the state.

We can address Arizona's water future so that our communities will maintain a high quality of life, our agricultural heritage will continue, our wildlife, rivers, lakes and streams will thrive, and future generations will be proud to call Arizona home. But only if we act together to find fair and equitable solutions for all Arizonans. We are confident that Arizona and its residents are up to the challenge and ready to protect and sustain the Colorado River, the heart of the "Grand Canyon State."

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