Arizona Water Meter

A Comparison of Water Conservation Programs in 15 Arizona Communities

October 2010

WESTERN RESOURCE ADVOCATES

Aerial view of Phoenix

WESTERN RESOURCE ADVOCATES

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Western Resource Advocates' mission is to protect the West's land, air, and water.

Our lawyers, scientists and economists:

1) advance clean energy to reduce pollution and global climate change;

2) promote urban water conservation and river restoration; and

3) defend special public lands from energy development.

We collaborate with other conservation groups, hunters and fishermen, ranchers, American Indians, and others to ensure a sustainable future for the West.

This report was prepared by Drew Beckwith, WRA's Water Policy Analyst; and Jorge Figueroa, Water Program Researcher; with assistance from Bart Miller, Nicole Theerasatiankul, and Anita Schwartz (Western Resource Advocates). It was funded through a grant from the Walton Family Foundation.

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Design by Jeremy Carlson

Arizona Water Meter

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photo: iStock

Dry riverbed in Arizona

Acronyms and Abbreviations

ACC	Arizona Corporate Commission
ACP	Alternative Conservation Program
ADWR	Arizona Department of Water Resources
AF	acre-foot (325,851 gallons); also acre-feet
AMA	Active Management Area
AMR	automatic meter reading
AMWUA	Arizona Municipal Water Users Association
AWC	Arizona Water Company
AWWA	American Water Works Association
BIC	Buckeye Irrigation Company
BMP	best management practice
BoR	U.S. Bureau of Reclamation
CAGRD	Central Arizona Groundwater Replenishment District
CAP	Central Arizona Project
Ccf	centum (100) cubic feet (volume); one Ccf is equivalent to 748 gallons of water
CWS	Community Water System
EPA	Environmental Protection Agency
ET	evapotranspiration (controllers)
°F	degree Fahrenheit (temperature)
FY	fiscal year
HET	high-efficiency toilet
IWA	International Water Association
GIS	geographic information system
GMA	Groundwater Management Act, also known as the Arizona Groundwater Code
GPCD	gallons per capita per day (volumetric rate)
GPF	gallons per flush (volumetric flow rate)
GPM	gallons per minute (volumetric flow rate)
MGD	million gallons per day (volumetric rate)
MNPCCP	Modified Non-Per Capita Conservation Program
NPCCP	Non-Per Capita Conservation Program
PV	photovoltaic (solar electricity system)
PVC	polyvinyl chloride (plumbing)
RID	Roosevelt Irrigation District
SCADA	supervisory control and data acquisition system
SFR	single-family residential
sq. ft.	square feet
SROG	Sub-Regional Operating Group
SRP	Salt River Project
UPC	Uniform Plumbing Code
UVRWPC	Upper Verde River Watershed Protection Coalition
WOT	Water Outreach Team (Yuma)
WRA	Western Resource Advocates
WWTP	wastewater treatment plant

Executive Summary

Water supplies in Arizona are already a precious resource. Given estimates that the state will almost double in population over the next 45 years, water supply challenges are only going to become more difficult. Western Resource Advocates (WRA) supports urban water conservation as a no-regrets strategy to increasing water supplies—one that is often cheaper, faster, and smarter than "traditional" water supply approaches. Maximizing water conservation efforts and programs across the state will allow Arizona to do more with less.

This report highlights the water conservation programs of 15 Arizona communities and evaluates their programs by seven important water conservation criteria. The communities are Buckeye, Casa Grande, Chandler, Clarkdale, Lake Havasu City, Mesa, Payson, Peoria, Phoenix, Prescott, Safford, Scottsdale, Sierra Vista, Tucson, and Yuma. These communities represent a diverse cross-section of municipal water providers, and are varied with respect to size, budget, geographic location, ownership structure, and regulatory program. By presenting a broad sample of current conservation practices, utilities, researchers, policy makers, and local communities can make informed decisions about the possibilities that exist for improvement in their own programs. Everyone benefits when we learn from one another.

Per Capita Water Use

One of the most common measures of a utility's water use is how much water is used by each person in the service area each day often described in gallons per capita per day (GPCD). Several communities in Arizona are currently using less than 100 GPCD in the single-family residential (SFR) sector, including Buckeye, Payson, Clarkdale, Prescott, and Casa Grande. Extensive turf landscaping is not the norm in these communities, and several are predominantly composed of newer homes that were built with more water-efficient appliances and fixtures than what was available even 10 years ago.

photo: iStock

Urban development in Chandler

Land use planning policies that limit the amount of high-water-use landscaping or ensure that plantings come from a desert-appropriate list are a few of the ways these communities are achieving low water use in the SFR sector. In Arizona, the vast majority of SFR water use goes to outdoor irrigation, so methods and practices that target and reduce outdoor use can be very effective at improving water use efficiency.

Trends in system-wide water use are also important because they show how cities are becoming more water-efficient overall. The majority of communities evaluated in this report reduced system-wide water use by more than 10% between 2003 and 2008 (Figure ES-1)—a notable achievement. Interestingly, communities with the lowest SFR rates in 2008 are not necessarily the same ones that achieved the greatest reductions in system-wide use, pointing to the variable effectiveness of different water conservation approaches.

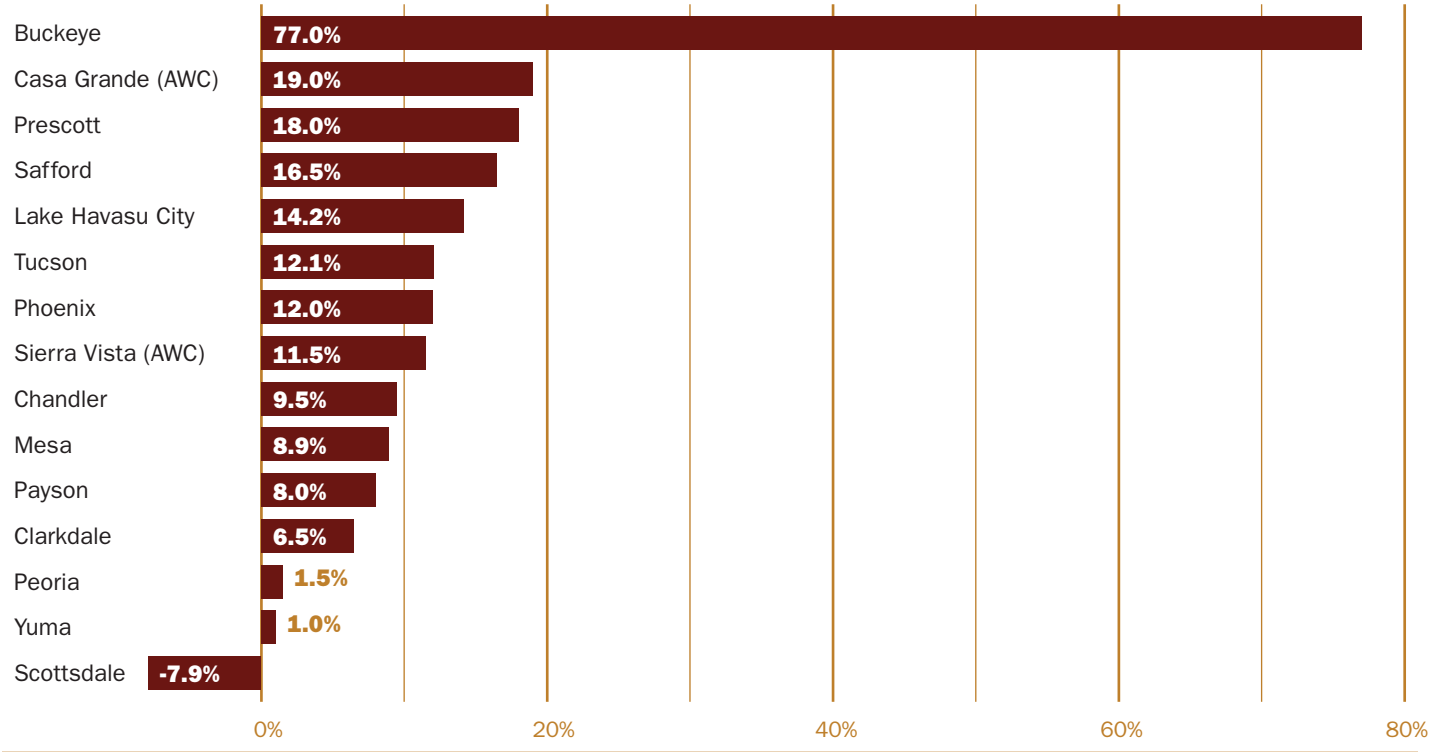
Water Rate Structures

Water rate structures play an essential role in communicating the value of water to utility customers. They are also one of the most powerful conservation tools. There are a number of ways to structure water rate consumption charges, including uniform (flat), seasonal, and inclining block rates—all of which are used in Arizona.

Inclining block rates are generally the most effective at communicating the value of water, but they are not the only factor affecting the price paid by consumers. A customer's bill includes volumetric consumption charges, fixed service fees, and, sometimes, additional service charges. All of these charges are reflected in the average price of water, the total bill divided by the total gallons used. Conservation-oriented rate structures have an average price curve that slopes upwards, communicating that the more water a customer uses, the more expensive each gallon of water becomes.

There is tremendous variation in the design of water rate structures for communities in this report, and

FIGURE ES-1. REDUCTION IN SYSTEM-WIDE PER CAPITA WATER USE (2003-2008)



a commensurate variation in their effectiveness at communicating the value of water. In general, water consumption charges across Arizona are cheap, with some utilities charging as little as $1.00 per thousand gallons. Tucson, Prescott, and Buckeye have exemplary water rate structures for incentivizing conservation, which all could serve as a model for how to price water in Arizona.

Conservation Measures

Conservation measures raise community awareness and motivate residents to use water more efficiently. These measures are often the most publicly recognized form of water conservation implemented by a utility and are an integral part of the community's water management strategy.

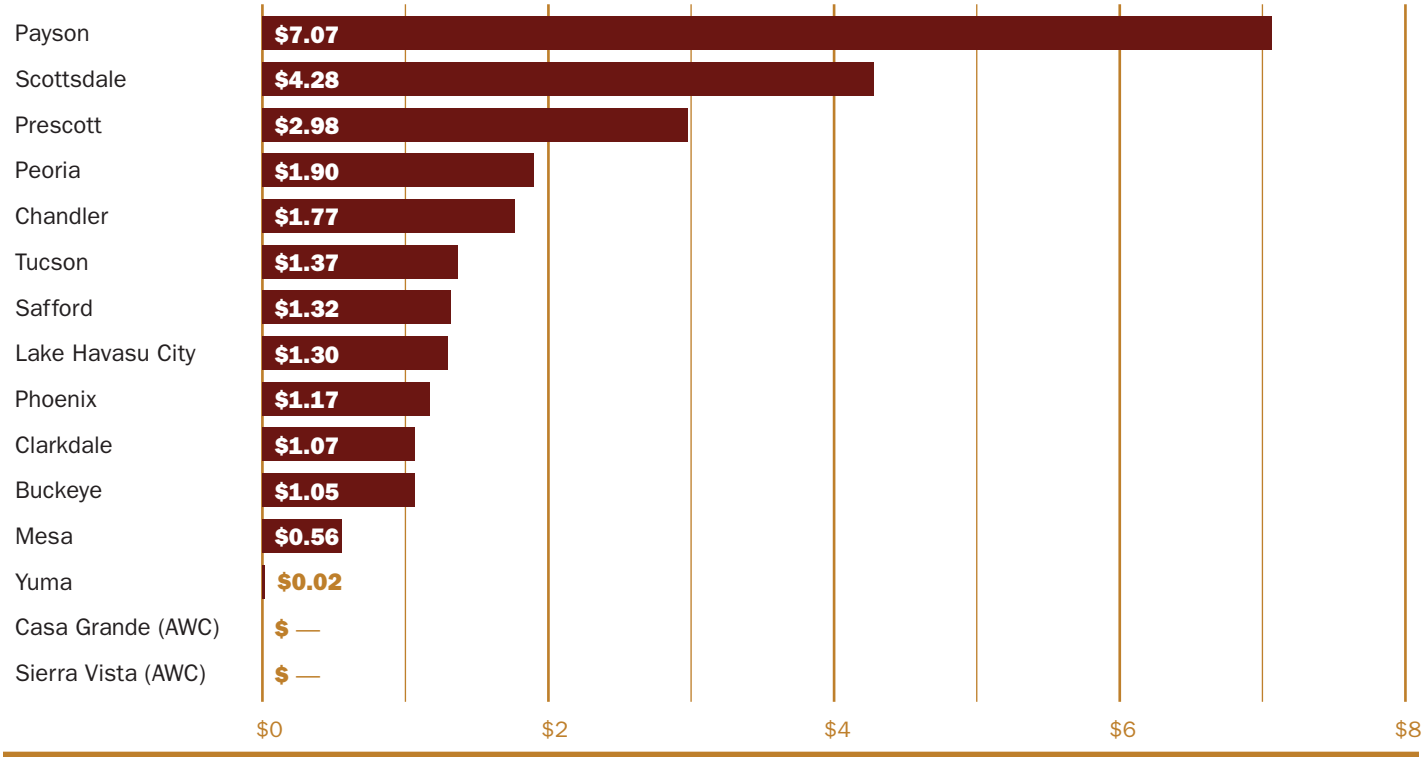
The most popular water conservation measures used by communities in this report are messaging and youth education programs. Special events, adult education and training programs, and residential audit programs are also widely employed. Outdoor-specific conservation measures, such as a Xeriscape demonstration garden, landscape consultations, and smart irrigation, are appropriate for Arizona, given the large quantity of water used for outdoor watering; however, less than a third of the communities in this report sponsor this type of conservation measure. Large landscape programs and commercial and industrial conservation measures also appear to be suitable for, and underutilized by, Arizona water providers.

Conservation Ordinances

Well-designed and properly enforced ordinances can impact 100% of a utility's customer base and thus play a unique role in establishing water use rules and appropriate behavior. In Arizona, state and local statutes and regulations have been critical in promoting wise water use, protecting utility infrastructure, and assuring that municipalities have adequate water supply to support population growth.

The most enacted type of ordinance for communities in this report prohibits water waste, which generally bars people from allowing excess water to escape from their

FIGURE ES-2. PER CAPITA FUNDING FOR WATER CONSERVATION IN 2008



property and create a hazardous condition. Ordinances restricting water features or water-intensive landscapes and those that describe the proper time to irrigate are also popular, with more than two-thirds of municipalities implementing some type of ordinance in these categories. These measures are appropriate for Arizona.

Payson, Sierra Vista, and Clarkdale use ordinances to establish appropriate water use more than any of the other communities. Yuma and Safford rely the least on ordinances.

Funding

To operate a successful water conservation program, it is essential to adequately fund and staff the program. Without money and time, conservation efforts cannot decrease per capita water use.

The town of Payson spends $7.07 on conservation programming for each person in its service area—nearly $3.00 more than the next big spender (Figure ES-2). Payson, coincidentally or not, also has the second-lowest rate of single-family residential water use out of all the utilities examined in this report. The majority of providers examined spend in the range of $1.00 to $2.00 on water conservation for each person in their service area. Major exceptions include the cities of Casa Grande and Sierra Vista, which are supplied water by the private utility, Arizona Water Company (AWC).

photo: iStock

Building construction in Prescott

Water Loss

While much of this report is focused on conservation programs that encourage efficient use by customers, studies have shown that the amount of water providers can save by improving supply efficiency, such as reducing leaks, can eclipse the quantity of water saved by individual customers.

Water providers are implementing a number of different measures to reduce water loss, as shown in the "Supply-Side Efficiency Measures" section of the utility summaries (Appendix B). In turn, these measures influence the percentage of water loss recorded by each utility, which realistically ranges between 2.5% and 12% for the providers studied.

An active leak detection and repair program is a crucial conservation measure for any utility. Casa Grande, Chandler, Lake Havasu City, Mesa, Peoria, Phoenix, and Sierra Vista have implemented this type of program. Meter replacement programs are another important method for reducing system losses because meters wear out over time and then under-report water use. For example, Scottsdale has replaced 27,300 meters over the past four years, recovering as much as $5.6 million in revenues from what would have been lost using leaky meters.

Effluent Use

In an arid state such as Arizona, it is vital to maximize the use of water supplies. Highly treated wastewater (known as effluent, reclaimed water, or recycled water) is appropriate to use for many non-potable purposes. Every gallon of effluent that is used displaces the need for a gallon of scarce and valuable drinking water.

Every provider studied is utilizing its effluent for some purpose, and the majority are putting all of their effluent to beneficial use. The two most common uses for effluent are to recharge groundwater supplies and irrigate high-water-use landscapes, such as golf courses.

Scoring

Based on WRA's decade-long experience in evaluating water conservation practices, we developed a rating for each water utility's conservation program. Our 100-point scoring system uses the seven criteria described above: per capita water use, water rate structures, conservation measures, conservation ordinances, funding, water loss, and effluent use.

Although comparative analysis of multiple water providers can be difficult because providers track and report information differently, we made every effort possible to ensure that the data presented compares equivalent information from each of the 15 utilities. Furthermore, this report represents a true "snapshot" of water conservation activities and data from a select group of years. Conservation programs and results are constantly evolving over time, and we make no assumption that scoring results in this report would be the same if it were redone next year.

According to our scoring methodology, Prescott maintains the most comprehensive water conservation program out of the water providers in this report, with Tucson, Phoenix, and Payson rounding out the top four (Table ES-1). Several of the conservation measures these providers are implementing can be useful models for how to improve programs in lower-scoring communities.

WRA's scoring system substantively compares water conservation programs; it is systematic and transparent. However, our rankings should not be used to penalize any water provider. Instead, we hope that water providers will learn from each other. It is WRA's intent to present a sample of conservation practices, regulations, and programs that can be used by researchers, policy makers, and local communities in enhancing their water conservations programs. We will use the information in this report as a stepping-stone that leads towards the improvement of water conservation efforts across Arizona. We hope others will do the same.

TABLE ES-1. ARIZONA WATER METER SCORING

	Maximum Points	Prescott	Tucson	Phoenix	Payson	Clarkdale	Sierra Vista (AWC)	Lake Havasu City	Chandler	Scottsdale	Mesa	Peoria	Buckeye	Safford	Casa Grande (AWC)	Yuma
Per Capita Water Use	*[25]*															
SFR GPCD	*10*	8	8	6	10	10	8	6	4	0	6	4	0	4	6	6
System-Wide Trend	*15*	12	12	9	9	9	9	12	6	3	12	3	3	15	3	9
Rate Structure	*[25]*															
Slope	*20*	20	20	15	10	10	0	10	5	5	5	5	15	0	0	0
Thresholds	*5*	3	2	0	3	0	0	2	2	2	0	0	2	0	3	0
Conservation Measures	*[15]*															
Number of Measures	*8*	5	6	5	5	1	5	3	5	7	3	5	2	1	1	1
Assessment of Measures	*7*	6	5	7	2	1	0	1	7	6	3	5	3	0	3	1
Conservation Ordinances	*15*	10	6	7	13	12	15	6	8	8	8	5	7	4	5	2
Funding for Conservation	*5*	5	3	3	5	3	0	3	4	5	2	4	3	3	0	1
Water Loss	*10*	2	0	8	1	10	7	0	1	5	4	9	6	0	3	1
Effluent Use	*5*	5	3	5	3	4	5	5	5	5	2	4	2	5	2	5
Total Points	***100***	**76**	**65**	**65**	**61**	**60**	**49**	**48**	**47**	**46**	**45**	**44**	**43**	**32**	**26**	**26**

photo: iStock

Cottonwood tree, Watson Lake, near Prescott

Introduction

The Case for Conservation

Water supplies in the arid southwest are a precious resource—and they will be even more so in the face of rapid population growth and climate change. Arizona has been one of the fastest growing states over the past several decades, and the Arizona Department of Commerce now estimates that the state will add an additional 6.3 million people over the next 45 years—almost doubling the population to 13.3 million residents by 2055.* At the same time, renewable water supplies available to Arizona, like those from the Colorado River, are already over-appropriated by other users.† Moreover, groundwater resources within the state are rapidly declining, and management programs initiated to stabilize groundwater levels are achieving mixed success.

Western Resource Advocates supports urban water conservation as 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 is a result of the long-term implementation of practices and technologies that produce a permanent reduction in per capita water use. This is synonymous with improving water use efficiency because, at the most basic level, conserving water allows us to do more with less.

While conservation does not increase the amount of water a provider can utilize, water that is saved through conservation can be used for other purposes, stretching existing supplies. Conserved water can be used by a utility to fulfill new customer demands, increase supply reliability, or provide additional flows to the environment.

Water conservation also creates ancillary benefits for a water utility. Reductions in per capita water demand allow utilities to delay and/or downsize new water projects, treatment plants, and expansion projects—accruing large financial benefits for a utility. Furthermore, water conservation demonstrates leadership to customers, addresses community values, can decrease operating costs for the water provider (especially through decreased energy use), and often results in benefits to other water sectors.

No regrets: urban water conservation is often cheaper, faster, and smarter than traditional "concrete and steel" water supply approaches; conserving water allows us to do more with less.

Water conservation and efficiency can be achieved through a variety of practices and technologies—as shown by the range of programs used by the 15 different utilities highlighted in this report. Conservation efforts can be price-based, like adjusting water rates, or non-price-based, like educating consumers about the value of water. Conservation can be focused at the utility level, such as leak detection and repair, or at the customer level, such as clothes washer rebates. Conservation can also be focused on indoor or outdoor measures, aimed towards commercial or industrial customers, and approached through regulatory or voluntary measures. In short, there is a multitude of reliable ways to use limited water resources more efficiently.

* Arizona Department of Commerce. 2006. *Arizona population projections 2006 – 2055. Available at:* http://www.azcommerce.com/econinfo/demographics/Population%20Projections.html.

† For example, see the Bureau of Reclamation's long-term graph of water supply and water use in the Colorado Basin. Since 2004, the 10-year running average for water use has been greater than the 10-year average for water supply.

Framing the Process

This study is a sister publication to WRA's *Front Range Water Meter* report, which evaluated the water conservation programs of 13 Colorado water utilities. There are many similarities between the two reports, but this study is unique to Arizona. A significant amount of effort was made to gather data from a broad spectrum of water providers in the state, such that there would be a representative variability with respect to size, location, demographics, ownership, and regulatory program — 22 water providers were approached for participation in this study.

Data was collected through a lengthy process that entailed multiple review points with each water utility. The resulting information found in each utility summary — provided in Appendix B — form the database for this report. Although these summaries were the most accurate WRA could attain, there are likely to be errors due to the constant evolution and improvement of municipal conservation programs. Errors of omission are also a possibility, but every effort was made to capture the full essence of each provider's water conservation program. Regardless, this report offers a significant quantity of valuable information that describes a holistic snapshot of the conservation programs in 15 Arizona municipalities.

Water Management in Arizona

Water management in Arizona is complex. Arizona's historical dependence on groundwater, and its bifurcated water rights system in which groundwater and surface water rights are acquired and regulated under separate doctrines, have created significant challenges for managing the state's water resources. As a result, novel water conservation strategies have been developed in Arizona in order to manage the state's resources efficiently.

As early as the mid-1940s, increasing water demands from agriculture, mining, and urban growth were removing more water from Arizona's underground aquifers than was being replaced — a condition known as "overdraft."* Continued growth in the 1950s and 1960s caused increasing overdraft and led to land subsidence, infrastructural damage, and surface fissures over wide areas, from Phoenix to Tucson, by the 1970s.† Since then, finding a balance between groundwater withdrawal and natural and artificial groundwater recharge — known as achieving "safe yield" — has been the Holy Grail of water conservation and management efforts in Arizona.

In 1980, the Arizona state legislature enacted the Groundwater Management Act (GMA) in response to this overdrafting challenge, and to assure that the state could supply enough water for a vigorously growing economy and population.‡ The GMA (also known as the Arizona Groundwater Code) is the foundation of the current innovative and inter-connected water

* Gelt, Joe. *Managing the interconnecting waters: The groundwater-surface water dilemma. University of Arizona Water Resources Research Center.* http://ag.arizona.edu/azwater/arroyo/081con.html (accessed on July 27, 2010).

† Bolin, Bob, et al. 2010. Water resources, climate change, and urban vulnerability: A case study of Phoenix, Arizona. *Local Environment 15 (3): 261-279.*

‡ Ariz. Rev. Stat. §§ 45-401 to 704 (2010).

management programs in Arizona, which includes the Arizona Department of Water Resources (ADWR), Active Management Areas (AMA), the Total Gallons Per Capita Per Day Program, the Modified Non-Per Capita Conservation Program, and the Community Water System Program.

Finding a balance between groundwater withdrawal and recharge—known as achieving "safe yield"—has been the Holy Grail of water conservation and management efforts in Arizona.

http://azgs.az.gov/images/Earth%20Fissure%20Photos/ef4b.jpg

Surface crack from over-pumping groundwater

The GMA recognizes the need to aggressively manage groundwater resources. The code designates five AMAs, which have historically relied heavily on groundwater, and mandates separate management goals for these areas. For example, the management goal of the Tucson, Phoenix, and Prescott AMAs is to reach safe yield by January 1, 2025,* while the management goal of the Pinal AMA is to allow development of non-irrigation uses and to preserve existing agricultural economies.† Of the communities highlighted in this report, Buckeye, Chandler, Mesa, Peoria, Phoenix, and Scottsdale are located in the Phoenix AMA; Tucson is in the Tucson AMA; Prescott is in the Prescott AMA; and Casa Grande is located in the Pinal AMA.

Each AMA must develop and implement a management plan for five consecutive management periods from 1980 through 2025. The plans adopted thus far have included one or more constantly evolving, mandatory water conservation programs designed to achieve reductions in groundwater withdrawals.‡ The municipal conservation program established during the first management plan was the Total GPCD Program, which requires utilities to achieve reasonable reductions in per capita use. In subsequent management plans, additional programs were added to provide more flexibility for achieving groundwater reductions, such as the Alternative Conservation Program and the Non-Per Capita Conservation Program (NPCCP). The most recent development is the Modified Non-Per Capita Conservation Program (MNPCCP), where providers are required to implement a public education program and one or more best management practices (BMPs), depending on the utility's size. For the communities in this report, Mesa, Peoria, Phoenix, and Tucson are currently regulated under the Total GPCD Program; Chandler and Scottsdale are in the NPCCP; and Buckeye, Casa Grande, and Prescott are in the MNPCCP.

Another important component of Arizona's water conservation regulations is the Community Water System (CWS) Program. The focus of this program is on water providers that serve at least 15 connections or 25 year-round residents, and are located outside of the state's AMAs. Arizona law requires each CWS (both those inside and outside AMAs) to submit a system water plan that contains a water conservation plan designed to increase the efficiency of the water system, reduce waste, and encourage consumer water conservation efforts.§ Clarkdale, Lake Havasu City, Payson, Safford, Sierra Vista (AWC), and Yuma are located outside the state's AMAs.

Through these varying programs and regulations, most of the water providers in Arizona are required to implement some type of water conservation program. The following sections compare the programs of 15 different communities in Arizona.

* *Id. § 45-562(A).*

† *Id. § 45-562(B).*

‡ *Id. § 45-563.*

§ *Id. § 45-342 to 343.*

Comparative Analysis by Conservation Criteria

While there is no "one-size fits all" conservation program, Arizona water providers can learn a lot from examining current conservation programs used throughout the state. This report presents a range of conservation practices so that utilities, researchers, policy makers, and local communities can make informed decisions about the possibilities for improvement in their own programs. Everyone benefits when we learn from one another.

Seven criteria are examined as indicators of a community's water conservation program:

- Per Capita Water Use
- Water Rate Structures
- Conservation Measures
- Conservation Ordinances
- Funding for Conservation
- Water Loss
- Effluent Use

These seven criteria demonstrate a utility's level of water conservation, and are used to score each utility's conservation program later in the report. This section presents the raw data WRA accumulated in developing the Arizona Water Meter report.

Per Capita Water Use

One of the most common measures of a utility's water use is how much water is used per person in the service area per day—often described in gallons per capita per day (GPCD). When using this metric, it is important to qualify the GPCD figure by describing which specific water use is being measured. For example, a single-family residential (SFR) GPCD figure would only include the water used by single-family homes, whereas a system-wide GPCD figure would include the water used by households, commercial developments, and industrial users. While GPCD is not a perfect metric because of the difficulty in calculating population and controlling for differences in weather, lot size, and persons per household among communities, it is the most widely used measure of water use across the United States, and it is firmly embedded in the water management policies of Arizona.

Water Use in the Single-Family Residential Sector

Several communities in Arizona are currently using less than 100 GPCD in the SFR sector, including Buckeye, Payson, Clarkdale, Prescott, and Casa Grande (Figure 1). Extensive turf landscaping is not the norm in these communities, and several are predominantly composed of newer homes that were built with more water-efficient appliances and fixtures than what was available even 10 years ago.

In Arizona, the vast majority of SFR water use goes to outdoor irrigation,* so methods and practices that target and reduce outdoor use can be very effective at improving water use efficiency. Land use planning policies that restrict high-water-use landscapes or ensure that plants come from a desert-appropriate list are a few of the ways these communities are achieving low-water-use in the SFR sector.

The majority of communities evaluated in this report are using between 100 and 150 GPCD, which is comparable to water use rates across the Southwest.† Notably, Scottsdale uses almost 250 GPCD in the SFR sector, more than four times the GPCD in Buckeye. High-water-use rates in Scottsdale are attributable to

* Western Resource Advocates. 2009. *New house new paradigm: A model for how to plan, build, and live water-smart. Boulder, CO.*

† Western Resource Advocates. 2003. *Smart Water: A comparative study of urban water use across the Southwest. Boulder, CO.*

larger lot sizes, a more affluent customer base, and a high percentage of residences with pools.

Many of the mid-range cities have older homes and abundant landscaping. These communities can increase their efficiency by targeting education and rebates at older homes, which are more likely to have high-water-use fixtures and appliances, and selecting appropriate measures to reduce outdoor water use. A Xeriscape replacement program—sometimes known as "cash for grass"—is one type of program that can reduce outdoor water use. These financial incentive programs have been shown to be highly effective in Arizona and across the Southwest (see examples from several providers in the "Implementation of Conservation Measures" section for each utility in Appendix B).

Water Use System-Wide

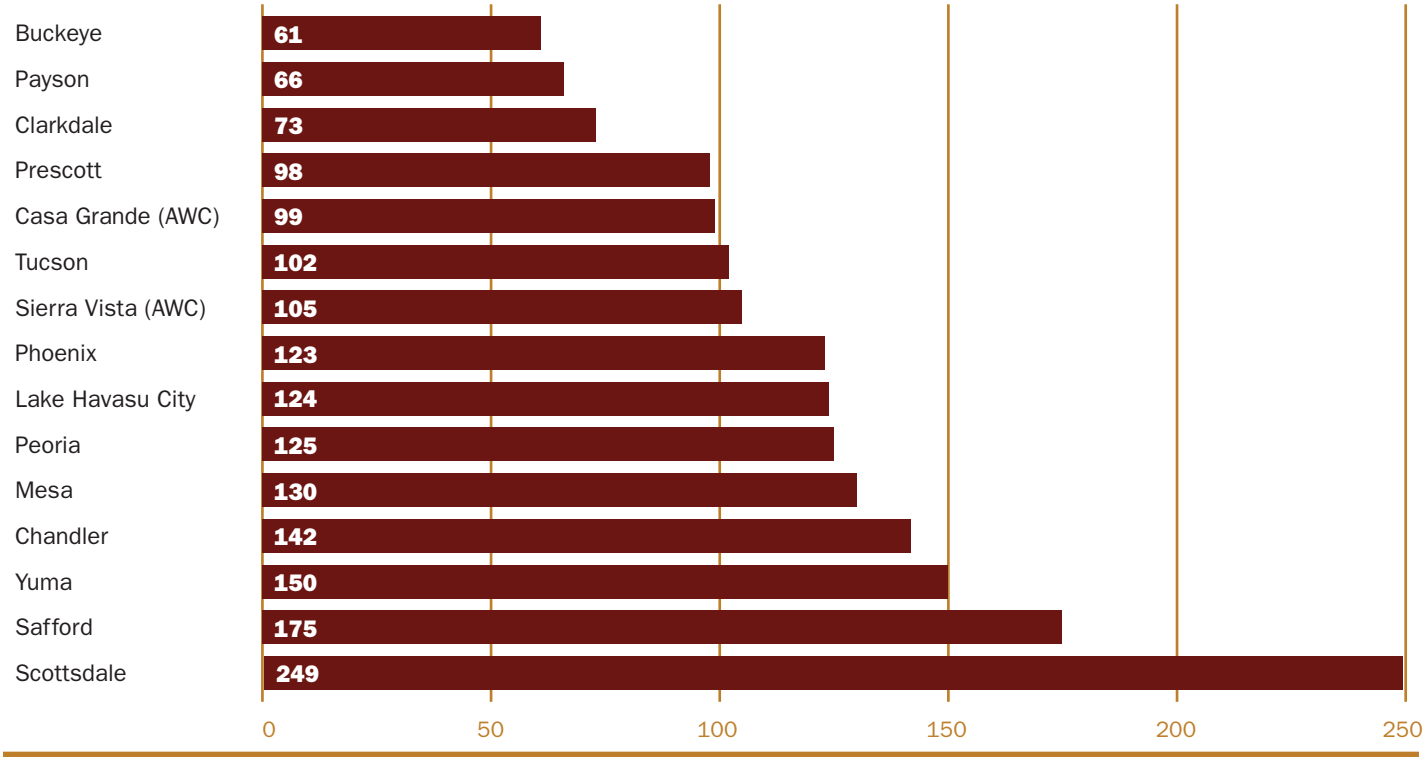
System-wide water use varies greatly amongst communities, depending on the amount of residential, commercial, and industrial water use—as shown in the pie charts provided for each community in Appendix B. For example, Mesa provides 47.5% of its water to SFR use and 23.1% to commercial use; while Peoria (a suburb on the other side of Phoenix from Mesa) provides 55.2% of its water to SFR use and only 8% to commercial use.

Because of these differences, the percentage reduction in water use between 2003 and 2008 is used as a data point, rather than the absolute value of system-wide GPCD. Furthermore, only potable water delivered to customers is used to calculate this measure of system-wide water use, which does not include effluent use or water loss. Due to the heavy reliance of many of Arizona's towns and cities on potable groundwater, tracking the reduction in this metric is a good measure of how communities are becoming more water-efficient over time.

The majority of communities in this report have reduced system-wide water use by more than 10% between 2003 and 2008 (Figure 2)—a notable achievement. Buckeye stands out at the top of this list, with a 73% reduction in use, primarily because system-wide water use was very high in Buckeye in 2003, at 609 GPCD.

The remaining communities reduced system-wide water use between 1% and 10%, except for Scottsdale, which

FIGURE 1. 2008 SINGLE-FAMILY RESIDENTIAL WATER USE (GPCD)



saw an increase in use of almost 8%. Water use in a city generally declines over time, as older, high-water-use fixtures gradually wear out and are replaced with newer ones that use less water. This is true when replacing an old, 3.5-gallon-per-flush (GPF) toilet with a new 1.28-GPF model, just as it is for replacing a 3-gallon-per-minute (GPM) pre-rinse spray valve (used at restaurants) with a new 1.3-GPM model. Sometimes this decline in water use is referred to as "passive conservation" because it requires no effort on behalf of water providers.

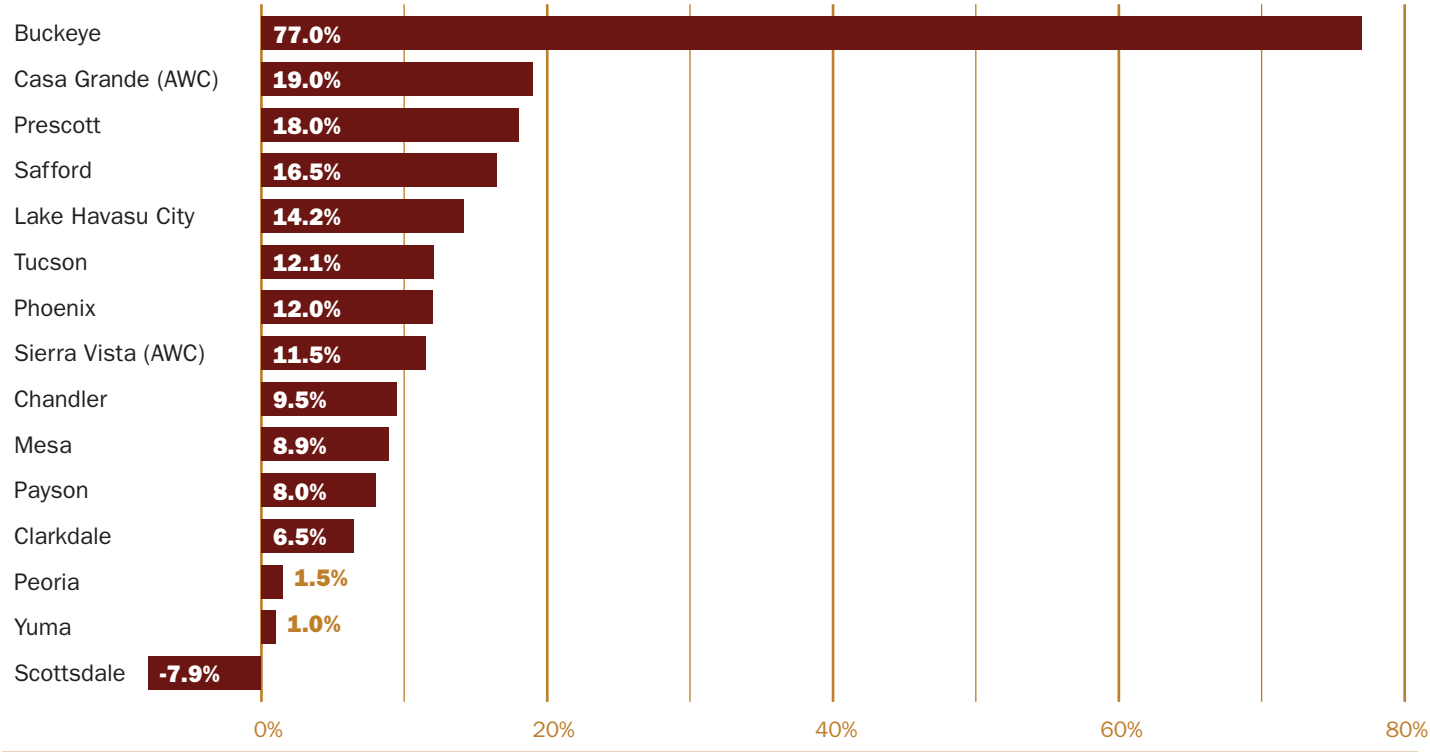
Interestingly, communities with the lowest SFR rates in 2008 are not necessarily the same ones that achieved the greatest reductions in system-wide use. As an example, both Payson and Clarkdale have some of the lowest SFR GPCD rates, but only reduced system-wide use by 8.0% and 6.2%, respectively, which puts them near the bottom of the list. On the other hand, Buckeye and Prescott have achieved both low SFR rates and significant reductions in system-wide use.

Water Rate Structures

Water rate structures play an essential role in communicating the value of water to customers. They are also one of the most powerful water conservation tools.

Water utilities must ensure that revenues from water sales are sufficient to recover supply costs, which generally include debt service, facility operations, system maintenance, development of new supplies, and implementation of conservation programs. Typically, providers recover these costs through their water rate structure, tap fees, and other charges, and some utilities receive property tax revenues as well.

FIGURE 2. REDUCTION IN SYSTEM-WIDE PER CAPITA WATER USE (2003-2008)



Effective water rate structures ensure the efficient use of valuable water. In addition to the costs listed above, the "value" of water also includes the social and environmental opportunity costs of losing other benefits of water in its natural state and location, including the loss of ecological and recreational values; furthermore, the natural ability for rivers to dilute pollutants is another real opportunity cost of diverting water from the natural environment.

Integrating all of these costs into a water rate structure is challenging. Properly designed rate structures:

- Provide water at low prices for basic and essential needs, so all customers can afford it.
- Reward conserving customers with lower unit rates.
- Encourage efficient use by sending a strong conservation price signal.
- Assign supply and development costs proportionally to the customers who place the highest burden on the supply system and the natural supply sources.
- Maintain a stable flow of revenue to the water provider.

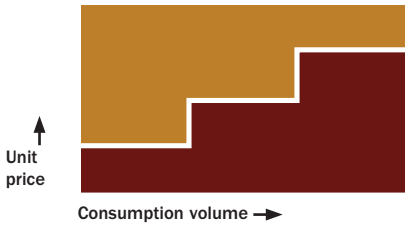
Rate Structures That Promote Efficiency

There are a number of ways to structure water rates, including uniform (flat), seasonal, and inclining block rates—all of which are used in Arizona.

Inclining block rates are generally the most effective at communicating the value of water to customers. With inclining block rate designs, the unit price for water increases as the volume of water consumed increases, with higher prices being set for each higher water use block (Figure 3). Customers using low volumes of water are charged a modest unit price and are rewarded for conservation, while those using higher volumes of water pay higher prices. This approach provides an incentive to conserve and ensures that lower income consumers are able to meet their basic water needs at an affordable cost.

While consumption charges are an important component of an effective water rate structure, they are not the only factor affecting the price paid by consumers. The customer's water bill also includes a fixed service fee and additional service charges in some communities. The customer then "sees" the average price of water—the total water bill divided by the volume of water used.

FIGURE 3. STYLIZED REPRESENTATION OF AN INCLINING BLOCK RATE



Because the average price reflects the entire bill, this is primarily to what customers respond.

There are several key elements that must be properly addressed in order to achieve a truly conservation-oriented block rate structure:

- **Right-Size the Blocks –** For residential customers, the size of block 1 should be based on an efficient level of monthly indoor use. Block 2 should be based on the landscape needs of a moderately landscaped property. Additional blocks should capture inefficient or wasteful water use.
- **Make Block Price Differentials Meaningful –** The change in price between blocks should be large enough to be noticed by customers when their usage bumps them into a higher rate block.
- **Avoid High Fixed Service Charges –** A high fixed service charge may provide more stable revenues, but it directly offsets the conservation incentives provided by increasing block rates.

The overall effectiveness of a conservation-oriented rate structure can be evaluated by looking at the slope of the average price curve. Effective rate structures have an average price curve that slopes upwards, communicating that the more water a customer uses the more expensive each additional gallon of water becomes. Of course, customers' overall water bill will increase as they use more water. But customers have a real financial incentive to use water in the most efficient manner possible as each individual gallon becomes increasingly expensive.

TABLE 1. 2010 WATER RATES FOR SINGLE-FAMILY RESIDENTIAL ACCOUNTS

Community (Water Provider)	Type of Rate Structure	Monthly Service Charge	Consumption Charge (Price per 1,000 Gallons)
Buckeye	Increasing block rate (5 blocks)	$12.70	$2.20 – 0 to 6,000 gallons $3.10 – 6,001 to 10,000 $5.30 – 10,001 to 15,000 $7.95 – 15,001 to 30,000 $8.18 – over 30,000
Casa Grande (Arizona Water Company)	Increasing block rate (3 blocks)	$10.48	$1.00 – 0 to 3,000 $1.49 – 3,001 to 10,000 $1.65 – over 10,000
Chandler	Increasing block rate, summer season (4 blocks)	$8.21	$1.48 – 0 to 10,000 $1.99 – 10,001 to 20,000 $2.49 – 20,001 to 60,000 $3.11 – over 60,000
Clarkdale	Increasing block rate (3 blocks)	$23.50	$4.00 – 1,001 to 10,000 $5.60 – 10,001 to 20,000 $7.84 – over 20,000
Lake Havasu City	Increasing block rate (4 blocks)	$5.16	$1.35 – 0 to 9,724 $1.76 – 9,725 to 18,700 $2.16 – 18,701 to 37,400 $2.70 – over 37,400
Mesa	Increasing block rate (3 blocks)	$11.48	$2.30 – 0 to 12,000 $3.45 – 12,001 to 24,000 $3.86 – over 24,000
Payson	Increasing block rate (4 blocks)	$19.65	$2.93 – 2,001 to 5,000 $3.87 – 5,001 to 10,000 $4.42 – 10,001 to 20,000 $6.00 – over 20,000

*Some providers include a quantity of water with the monthly service fee. In these cases, the block prices do not start at 0 gallons.

photo: iStock

TABLE 1. 2010 WATER RATES FOR SINGLE-FAMILY RESIDENTIAL ACCOUNTS

Community (Water Provider)	Type of Rate Structure	Monthly Service Charge	Consumption Charge (Price per 1,000 Gallons)
Peoria	Increasing block rate (4 blocks)	$14.16	$1.49 – 2,000 to 5,000 $2.69 – 6,000 to 10,000 $3.24 – 11,000 to 25,000 $3.85 – over 26,000
Phoenix	Flat rate, high month season	$4.64	$3.51 – all use over 7,480
Prescott	Increasing block rate (4 blocks)	$6.60	$2.86 – 0 to 3,000 $4.30 – 3,001 to 10,000 $6.45 – 10,001 to 20,000 $12.90 – over 20,000
Safford	Increasing block rate (3 blocks)	$11.25	$1.24 – 0 to 10,000 $1.55 – 10,001 to 20,000 $1.94 – over 20,000
Scottsdale	Increasing block rate (3 blocks)	$11.25	$1.80 – 0 to 7,500 $3.35 – 7,501 to 39,000 $4.60 – over 39,000
Sierra Vista (Arizona Water Company)	Increasing block rate (3 blocks)	$15.14	$1.61 – 0 to 10,000 $2.02 – 10,001 to 25,000 $2.42 – over 25,000
Tucson	Increasing block rate (4 blocks)	$5.62	$1.39 – 0 to 11,220 $5.13 – 11,221 to 22,440 $7.25 – 22,441 to 33,660 $9.90 – over 33,660
Yuma	Increasing block rate (3 blocks)	$15.68	$1.42 – 0 to 7,480 $1.52 – 7,481 to 22,440 $1.75 – over 22,440

*Some providers include a quantity of water with the monthly service fee. In these cases, the block prices do not start at 0 gallons.

Water Rate Structures in Arizona

Water rate data collected for the 15 communities in this report are current as of 2010. As shown in the following tables and figures, there is a tremendous amount of variation in the design of water rate structures. However, because each utility has different water supply and community situations, variations in pricing should be the norm. The rate structure for each utility in this study is reported in Table 1, but only a selection of communities is presented in Figure 4 and Figure 5 to provide a representative sample of the rate structures.*

Water consumption charges across Arizona are quite inexpensive. All providers studied charge less than $4.00 per thousand gallons for the first block of water, and some charge as little as $1.00 per thousand gallons. In addition, the communities of Clarkdale, Payson, Peoria, and Phoenix include some amount of water in the monthly service fee, which ensures that people of all economic situations can receive water at an affordable rate.

The utilities profiled show high variability in setting the cost for different blocks of water. At one end, water rates in Tucson jump by 270% between blocks 1 and 2—from $1.39 to $5.13 per thousand gallons—while at the other end, rates in Yuma increase only 10 cents between blocks

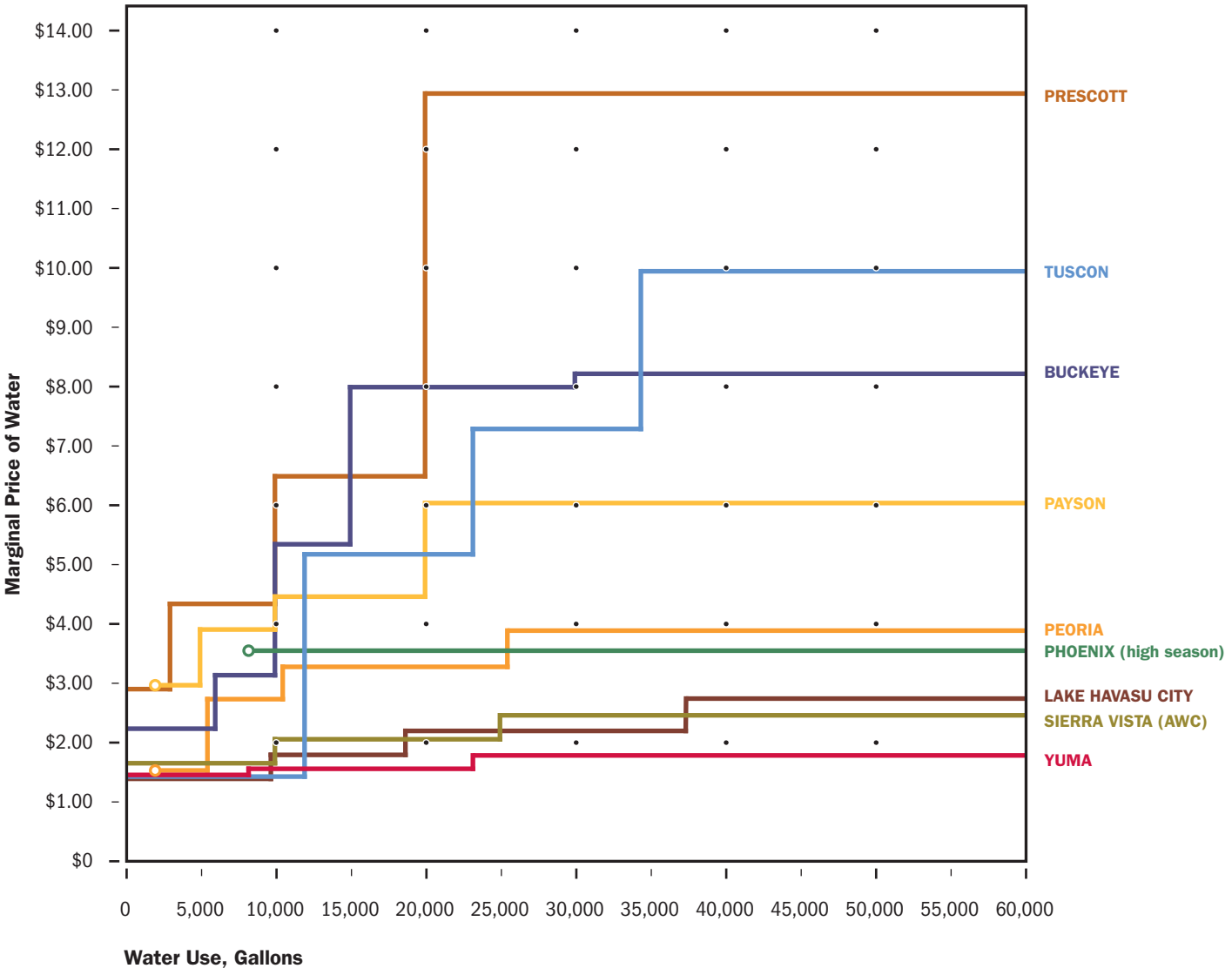
* The communities of Casa Grande, Chandler, Clarkdale, Mesa, Safford, and Scottsdale are included in the table, but are not in either of the figures.

1 and 2 — from $1.42 to $1.52. Customers in Tucson will clearly notice an increase in their water bill if their use bumps them up into the next higher block, while customers in Yuma may not.

The utilities also show different preferences for targeting customers through their rate structures. Prescott, Payson, and Casa Grande have block changes at or before 5,000 gallons that target low-volume water users and encourage efficient indoor use. Buckeye, Chandler, Lake Havasu City, Scottsdale, and Tucson target high-volume users and penalize excessive outdoor water use by including a block at or above 30,000 gallons.

In addition to the high variability in consumption charges, there are also major differences between the providers' average price curves — the true indicator of a conservation-oriented rate structure. Tucson has the greatest positive slope of any average price curve, primarily due to Tucson's low monthly service charge (one of the lowest) and the large increases between blocks in its rate structure. Prescott and Buckeye achieve

FIGURE 4. MARGINAL PRICE OF SELECT WATER RATE STRUCTURES (CONSUMPTION CHARGES ONLY)

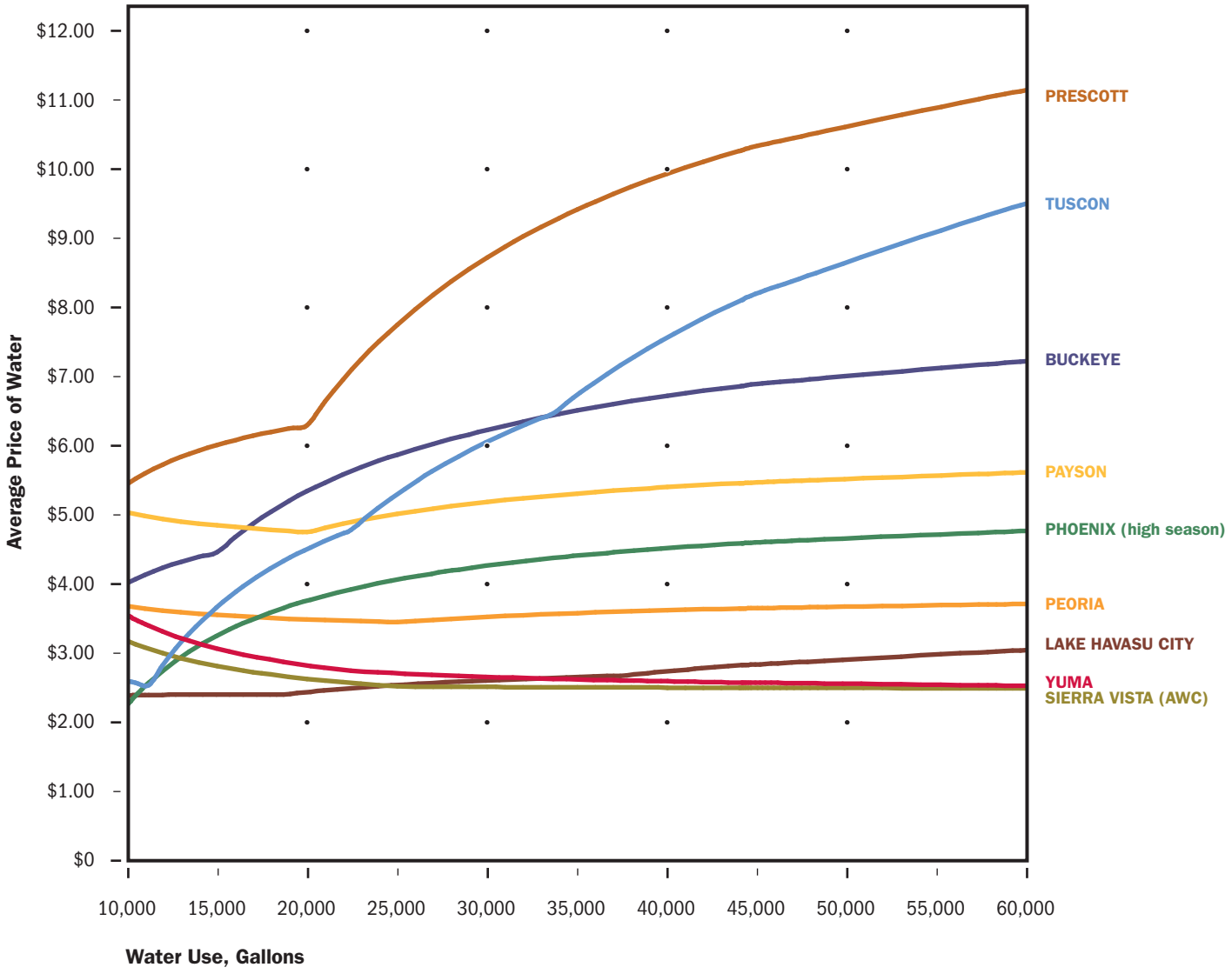


similarly large positive slopes, but monthly fees are greater in these two cities, so the conservation price signal is not as strong. Regardless, customers in these communities are getting the message that the more water they use, the more expensive each gallon becomes.

In Peoria, despite the city's increasing block structure, the average price of water remains relatively constant no matter how much customers use. This is because the city's above-average $14.15 monthly service charge virtually negates the influence of the increasing consumption charges.

For customers in Yuma and Sierra Vista, each gallon of water used becomes cheaper in spite of the cities' increasing block rate structures because the block price differentials are so small and monthly service charges are comparatively high. Unfortunately, these rate structures send a contradictory message if these cities are trying to promote water conservation through increasing block rates.

FIGURE 5. AVERAGE PRICE OF SELECT WATER RATE STRUCTURES (CONSUMPTION CHARGES AND MONTHLY FEES)



Interestingly, despite Phoenix's flat rate structure, customers still see a positive slope in the average price curve. Phoenix's low monthly service charge of $4.64 (the lowest of those studied), combined with a uniform consumption cost and environmental charge, still creates a financial incentive for customers to use water efficiently. Phoenix exemplifies the fact that different types of rate structures can promote water conservation.

Conservation Measures

Conservation measures raise community awareness and motivate residents to use water more efficiently. These measures are often the most publicly recognized form of water conservation and are an integral part of the community's water management strategy. Other highly recognized conservation measures include branded public messaging campaigns (such as "Water — Use it Wisely") and landscape retrofit programs, where a utility pays customers to replace turf with lower-water-use vegetation.

Because there is a wide range of conservation measures used in Arizona, we utilize 29 measures recognized by ADWR's Modified Non-Per Capita Conservation Program (MNPCCP) to provide some order and consistency when comparing conservation programs. These are the same best management practices (BMPs) identified in MNPCCP Categories 1, 2, 3, 6, and 7.* These conservation measures were chosen because they were developed through an extensive, Arizona-specific stakeholder process.

The most popular water conservation measures implemented by utilities in this report are messaging and youth education programs, with 14 of 15 utilities using at least one of these measures (the highest "City Count" total in Figure 6 through Figure 9). Special events, adult education and training programs, and residential audit programs are also popular, with two-thirds or more of

* See: Arizona Department of Water Resources. 2010. *Modified Non-Per Capita Conservation Program. Available at:* http://www.azwater.gov/AzDWR/WaterManagement/AMAs/ModifiedNon-PerCapita.htm (accessed July 26, 2010).

FIGURE 6. NUMBER OF PUBLIC AWARENESS MEASURES IMPLEMENTED BY COMMUNITY

BMPs	Buckeye	Casa Grande (AWC)	Chandler	Clarkdale	Lake Havasu City	Mesa	Payson	Peoria	Phoenix	Prescott	Safford	Scottsdale	Sierra Vista (AWC)	Tucson	Yuma	*Measure Count*	*City Count*
1.1. Local and/or regional messaging program	1		1	1	2	2	5	4	4	2	1	3	4	1	2	***33***	***14***
1.2. Special events/programs and community presentations	1		2	1		1	3	2	3	2		2	4	1		***22***	***11***
1.3. Market surveys to identify information needs/assess success of messages			1			1		1	1			1				***5***	***5***

FIGURE 7. NUMBER OF EDUCATION AND TRAINING MEASURES IMPLEMENTED BY COMMUNITY

BMPs	Buckeye	Casa Grande (AWC)	Chandler	Clarkdale	Lake Havasu City	Mesa	Payson	Peoria	Phoenix	Prescott	Safford	Scottsdale	Sierra Vista (AWC)	Tucson	Yuma	*Measure Count*	*City Count*
2.1. Adult education and training programs			1		1	1	1	2	1		1	2	2	4		**16**	**10**
2.2. Youth education program	1	1	2	1	1	2	1	2	3	2	1	3	2	9		**31**	**14**
2.3. New homeowner landscape information							1					2				**3**	**2**
2.4. Xeriscape demonstration garden			3			1	1	1				1				**7**	**5**
2.5. Distribution plan for water conservation materials						1						1				**2**	**2**

FIGURE 8. NUMBER OF OUTREACH SERVICE MEASURES IMPLEMENTED BY COMMUNITY

BMPs	Buckeye	Casa Grande (AWC)	Chandler	Clarkdale	Lake Havasu City	Mesa	Payson	Peoria	Phoenix	Prescott	Safford	Scottsdale	Sierra Vista (AWC)	Tucson	Yuma	*Measure Count*	*City Count*
3.1. Residential audit program		1	1		1	1	1	1		1		3	3	1		***14***	***10***
3.2. Landscape consultations			1		1			1	1			1		1		***6***	***6***
3.3. Water budgeting program (non-residential)		1	1			1		1				1	1	1		***7***	***7***
3.4. Residential interior retrofit programs			1						1				1			***3***	***3***
3.5. Non-residential interior retrofit programs																***0***	***0***
3.6. Customer high water use inquidy resolution		1							1			1				***3***	***3***
3.7. Customer high water use notification			1		1		1									***3***	***3***
3.8. Water waste investigations and information		1					1					1				***3***	***3***

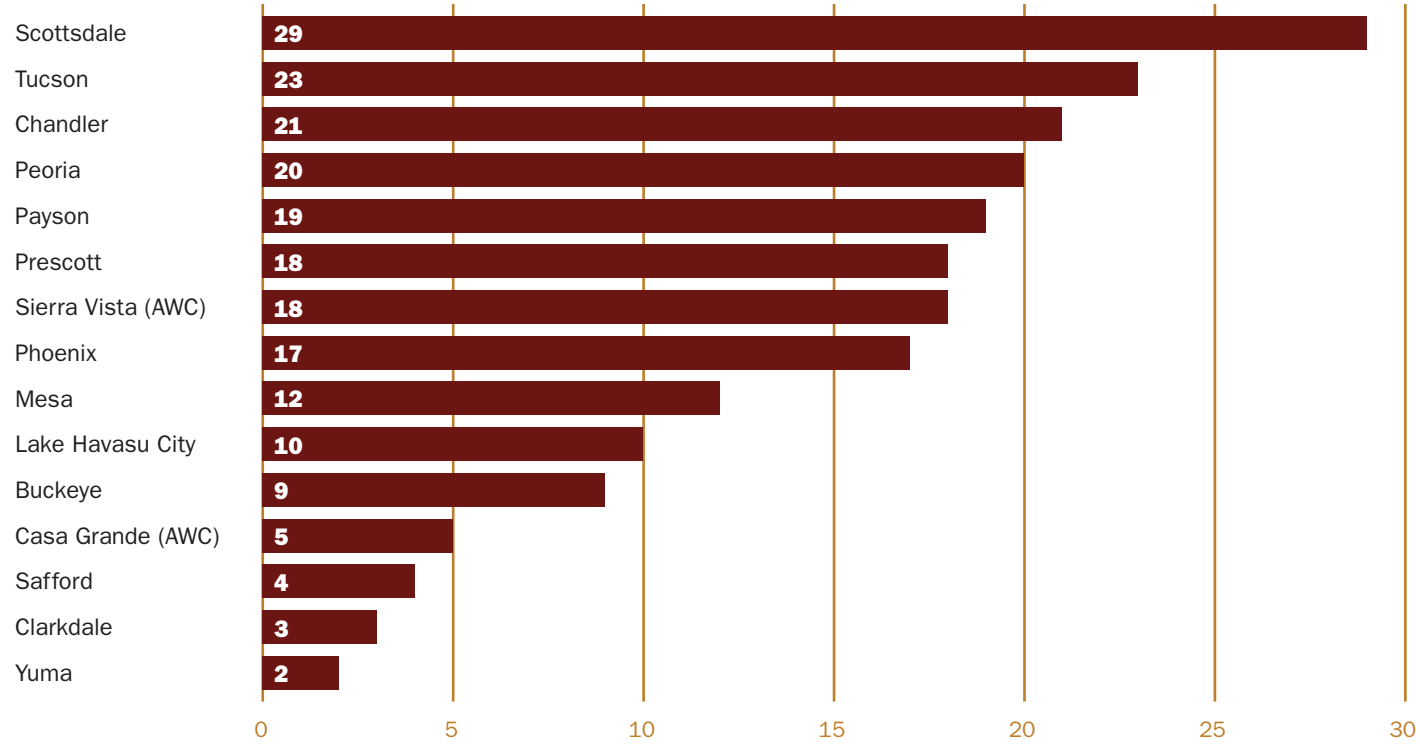
FIGURE 9. NUMBER OF REBATE/INCENTIVE MEASURES IMPLEMENTED BY COMMUNITY

BMPs	Buckeye	Casa Grande (AWC)	Chandler	Clarkdale	Lake Havasu City	Mesa	Payson	Peoria	Phoenix	Prescott	Safford	Scottsdale	Sierra Vista (AWC)	Tucson	Yuma	*Measure Count*	*City Count*
6.1. Toilet rebate										4		1	1			***6***	***3***
6.2. High efficiency flush toilet rebate	1				1		1	1		1				2		***7***	***6***
6.3. Toilet replaceent																***0***	***0***
6.4. Indoor water fixture replacement/ rebate/incentive			1				2		1	2		2				***8***	***5***
6.5. Hot water recirculating system or instant hot water system rebate	1				1			1				1				***4***	***4***
6.6. Water efficient appliances rebate/ incentive	1		1							1						***3***	***3***
6.7. Gray water retrofit/rebate/ incentive					1											***1***	***1***
6.8. Water harvesting retrofit/rebate/ incentive										1						***1***	***1***
6.9. Landscape conversion rebate/ incentive	1		2			1		1		1		2				***8***	***6***
6.10. Xeriscape installation rebate in new landscapes			1					1			1					***3***	***3***
6.11. Commercial/Industrial program							1		1					2		***4***	***3***
6.12. Large landscape conservation program			1													***1***	***1***
6.13. No/low interest loans for implementation of water conservation measures																***0***	***0***
7.5. Smart irrigation	2							1		1		1		1		***6***	***5***

photo: iStock

Midtown Phoenix

FIGURE 10. TOTAL NUMBER OF CONSERVATION MEASURES IMPLEMENTED BY COMMUNITY



the communities implementing at least one of these measures. Although these efforts focus on educating customers, which is vital for any successful water conservation program, it is very difficult to show that education alone leads to improved water efficiency.

On the other hand, such conservation measures as high-efficiency toilet (HET) rebates and landscape conversion incentives provide a direct link between implementing the measure and saving water. Unfortunately, while these measures are the second-most popular, they are chosen less frequently than education measures by the utilities in this study.

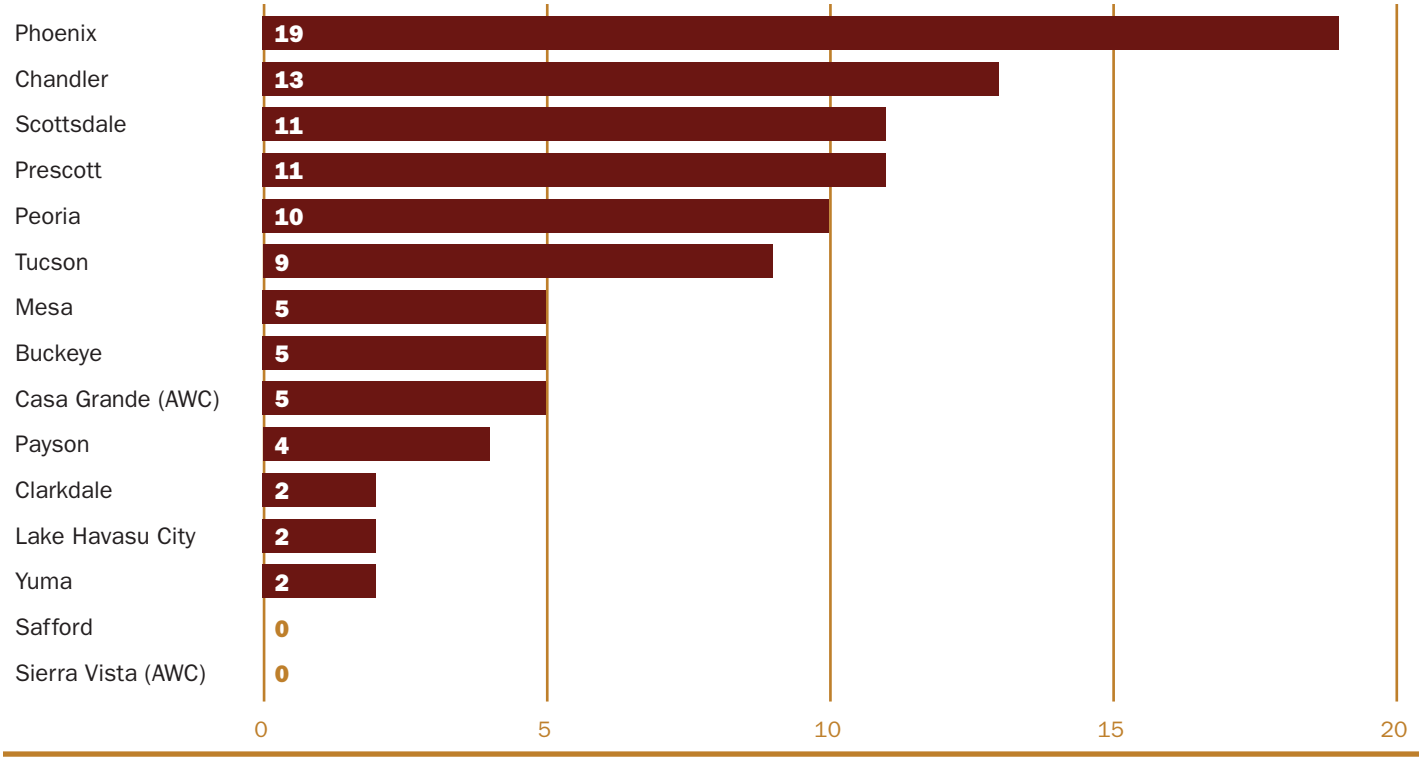
Outdoor-specific conservation measures, such as a Xeriscape demonstration garden, landscape consultations, and smart irrigation, are also appropriate for Arizona, given the large amount of water used for outdoor watering. However, less than a third of the communities in this report sponsor some type of conservation measure in these categories.

Other conservation measures that are suitable for Arizona, but are underutilized, include large landscape programs, new homeowner landscape information, water-efficient appliance rebates, and commercial and industrial programs. Considering the amount of water used in the commercial and industrial sectors, there is great potential for reducing water use through the implementation of conservation measures targeted to these sectors, such as cooling tower improvements, pre-rinse spray valves, or commercial laundry enhancements.

Out of all the communities evaluated, the city of Scottsdale implements the greatest number of water conservation measures—29 separate measures, with Tucson, Chandler, and Peoria rounding out the top four (Figure 10). It seems like no coincidence, then, that these communities also spend a lot per capita on conservation programs (see the section, "Funding for Conservation," later in the report).

Safford, Clarkdale, and Yuma implement the fewest number of conservation measures. However, Safford and Clarkdale are also the smallest utilities evaluated in this report, which may limit the number of measures that are appropriate in their service area.

FIGURE 11. NUMBER OF ASSESSMENTS OF CONSERVATION MEASURES BY COMMUNITY



Conservation Measure Examples

As described above, virtually every provider participates in a water conservation messaging campaign that educates customers about wise water use. These programs range from Yuma's Water Outreach Team, to Clarkdale's website, to the participation of Chandler, Mesa, Peoria, Phoenix, and Scottsdale in the "Water—Use it Wisely" campaign. Most utilities also provide some sort of youth education campaign, often tied to Arizona Project WET.

Financial incentives range in value between communities. Rebates for replacing toilets with HET models range from $75 in Peoria to $150 in Prescott, and rebates for replacing turf with xeric or more drought-tolerant plants range from $500 in Mesa to $1,500 in Scottsdale.

There are several interesting conservation measures worthy of highlighting. The town of Payson sponsors an annual "Leadership Academy" for political candidates to learn about water resources, the water system, and the town's conservation programs within the context of municipal government. Mesa provides a Landscape Watering Reminder email service that advises subscribers on watering frequencies based on current weather conditions. And Tucson sponsors a two-week paid internship for high school teachers to develop classroom materials.

Implementation of Conservation Measures

While the number of conservation measures is an important metric for assessing a water conservation program, it is also important to track and understand how successfully each conservation measure is received and implemented at the customer level. This kind of data is crucial for establishing the efficacy of conservation measures and provides important information when justifying water conservation programs during the budgeting process. Assessing programs allows utilities to make informed, cost-effective decisions by adapting their conservation programs to local circumstances and changing demands.

Phoenix excels at documenting and reporting the effectiveness of its 19 different water conservation programs (Figure 11). Generally speaking, providers who implement more conservation measures have more data to share and report, which explains why many providers

are listed at the top of both Figure 10 and Figure 11. However, it is also possible that because these providers have done a better job at justifying and reporting successes from their programs, they were able to add more conservation measures over time.

Conservation Ordinances

Well-designed and properly enforced ordinances can impact a utility's entire customer base, and thus play a unique role in establishing water use rules and appropriate behavior. In Arizona, state and local statutes and regulations have been critical in promoting wise water use, protecting utility infrastructure, and assuring that municipalities have adequate water supply to support population growth.

To provide order to the variety of ordinances enacted by municipalities in this report, we have grouped the ordinances into a list recognized by ADWR's MNPCCP (Category 5: Ordinances, Conditions of Service, and Tariffs). These conservation ordinances were chosen because they were developed through an extensive, Arizona-specific stakeholder process. This list includes:

- Low Water Use Landscaping Requirements
- Water Tampering/Water Waste Restrictions
- Plumbing Code Requirements (more restrictive than the 1990 Uniform Plumbing Code)
- Water Features/Water Intensive Landscaping Limitations
- Model Home Landscape Requirements (for new residential developments)
- On-site Graywater/Water Harvesting Requirements
- Car Wash Recycling Requirements
- Landscape Watering Restrictions
- Hot Water Recirculation Device Requirements
- Non-Residential Landscape Water-Use Efficiency Standards
- Water Use Plans for New Large Non-Residential Users

The most frequently selected ordinance is Water Tampering/Water Waste Restrictions, with 14 of the 15 municipalities having at least one ordinance in this group (the highest "City Count" total in Figure 12). The groups of Water Features/Water-Intensive Landscaping Limitations, Landscape Watering Restrictions, and Low Water Use Landscaping Requirements are also popular, with 10 of the municipalities implementing some type of ordinance in these three categories. These ordinances are highly relevant for Arizona given the quantity of water used for outdoor irrigation.

Well-designed and properly enforced ordinances can impact a utility's entire customer base.

The least popular ordinance categories are Model Home Landscapes and Non-Residential Landscape Water-Use Efficiency Standards. Chandler and Scottsdale are the only two communities implementing model home landscape ordinances, and Casa Grande and Payson are the only two implementing mandatory non-residential landscape requirements.

Payson, Sierra Vista, and Clarkdale use ordinances to promote water conservation more than any of the other communities (see the "Total Categories" column in Figure 12). Each of these municipalities has ordinances that cover 75% of the categories, often with multiple ordinances, rules, and/or standards within each category. Yuma and Safford rely the least on ordinances. Grouped according to the categories in this report, Yuma has only a water waste ordinance, while Safford has a water waste ordinance and two ordinances covering outdoor water use.

Conservation Ordinance and Regulation Examples

Exemplifying the water waste ordinance of many communities in this study, Yuma's ordinance states that it is unlawful for any person to willfully or negligently

FIGURE 12. NUMBER OF MANDATORY ORDINANCES ENACTED BY MUNICIPALITIES

Municipality	Buckeye	Casa Grande	Chandler	Clarkdale	Lake Havasu City	Mesa	Payson	Peoria	Phoenix	Prescott	Safford	Scottsdale	Sierra Vista	Tucson	Yuma	*Ordinance Count*	*City Count*
5.1. Low Water Use Landscaping Requirements	2	1	1	1	-	2	1	-	1	1	-	-	6	1	-	***17***	***10***
5.2. Water Tampering/Water Waste	-	1	2	2	2	1	2	5	2	5	1	2	2	1	4	***32***	***14***
5.3. Plumbing Code Requirements	2	-	-	-	5	-	7	-	-	5	-	1	8	2	-	***30***	***7***
5.4. Water Features/ Water Intensive Landscaping Limitations	-	-	2	1	1	2	3	-	2	2	1	3	3	-	-	***20***	***10***
5.5. Model Home Landscapes	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	***2***	***2***
5.6. Grey Water/Water Harvesting	-	-	1	2	-	2	-	1	1	1	-	-	2	2	-	***12***	***8***
5.7. Car Wash Recycling/ Other Non-Landscape Watering Restrictions	2	-	-	4	-	-	2	-	-	-	-	-	3	-	-	***11***	***4***
5.8. Landscape Watering Restrictions	1	1	-	2	-	1	3	-	3	2	1	1	3	-	-	***18***	***10***
5.9. Hot Water Recirculation/ Energy-Water Efficiency	-	-	-	2		1	2	-	-	-	-	-	6	-	-	***11***	***4***
5.11. Non-Residential Landscape Water-Use Efficiency Standards	-	1	-	-	1	-	1	-	-	-	-	-	-	-	-	***3***	***3***
5.13. Water Use Plans New Large Non-Residential	1	-	1	1	-	-	-	1	-	-	-	1	-	-	-	***5***	***5***
TOTAL ORDINANCES	**8**	**4**	**8**	**15**	**9**	**9**	**21**	**7**	**9**	**16**	**3**	**9**	**33**	**6**	**4**		
TOTAL CATEGORIES	**5**	**4**	**6**	**8**	**4**	**6**	**8**	**3**	**5**	**6**	**3**	**6**	**8**	**4**	**1**		

permit or cause the escape or flow of water in such quantity as to cause flooding, impede traffic, create a hazardous condition, cause damage to public streets, or cause conditions that amount to a threat to public health and safety.*

The city of Mesa provides one example of restrictions on water features, stating that water features (pools, ponds, fountains, streams, waterfalls, etc.), unless serviced with reclaimed water or part of a publicly oriented outdoor recreation facility, shall be sited only within small-scale, pedestrian-oriented places.†

Scottsdale has very specific water-intensive landscaping limitations,‡ stating that no water-intensive landscape/ turf shall be permitted in the public right-of-way, and turf areas are limited to the following percentages:

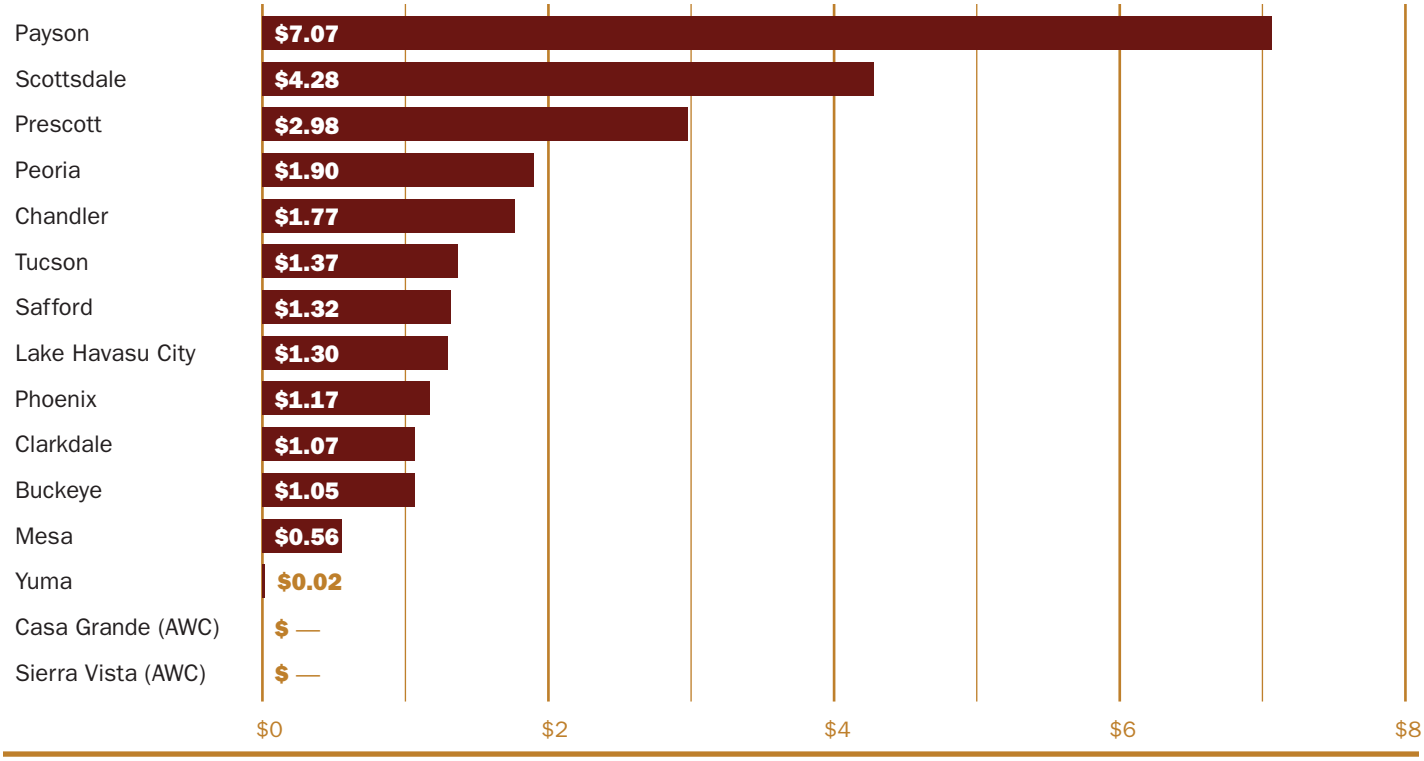
- Schools – 15% of total lot with all of the remaining area consisting of plants listed on the ADWR low-water-use plant list.
- Churches – 25% of total lot with all remaining areas regulated the same as schools.
- Resorts – 10% of the first 9,000 square feet and 8.5% of the remainder of the total lot, with at least 95% of the remaining area consisting of plants listed on the ADWR list.
- Cemeteries – 75% of their total operating facility area, excluding parking lots.
- New commercial and industrial users, and residential common areas – 10% of total lot for lots less than 9,000 square feet, with decreasing allotments for increasing lot size.

* Yuma, Ariz., Code, § 193-02 (2010).

† City of Mesa Water Feature Policy (approved in 2000 by the City Manager's Office).

‡ Scottsdale, Ariz., Code §§ 49-245 to -246 (2010).

FIGURE 13. PER CAPITA FUNDING FOR WATER CONSERVATION IN 2008



Prescott has enacted a typically structured landscape watering restriction, stating that outdoor spray irrigation and airborne watering shall only be permitted during the hours between 8:00 p.m. and 8:00 a.m. daily from April 15 through November 1 of each year.*

Chandler and Phoenix both have low-water-use landscaping requirements. In Chandler, landscapes for new developments must be designed, installed, and maintained in accordance with the seven detailed basic principles of Xeriscape.† In Phoenix, water supplied by the city to a customer shall not be used for the purpose of watering landscaping plants in any publicly owned right-of-ways or areas located between the right-of-ways, unless the landscaping plants are low-water-use plants. Single-family or duplex dwellings are exempt from both Chandler and Phoenix's ordinances.‡

There are also several unique ordinances worthy of highlighting:

- In Payson, the planting or establishment of new turf areas and the expansion of existing turf areas is prohibited.§
- In Safford, the installation of water-efficient landscapes by developers is encouraged by providing a partial refund of the water development fee.¶
- In Clarkdale, residential golf course developments must be able to generate a sufficient amount of effluent to meet the entire irrigation needs of the golf course.**
- In Sierra Vista, the use of misters is prohibited in commercial and industrial developments.††
- In Tucson, 50% of new commercial construction landscape water demand must be met through the use of water harvesting practices and technologies.‡‡

* Prescott, Ariz., Code, § 3-10-14 (2010).
† Chandler, Ariz., Code § 35-1903 (2010).
‡ Phoenix, Ariz., Code § 37-111 (2010).
§ Payson, Ariz., Code § 50.83 (2010).
¶ Safford, Ariz., Code § 13.24.070 (2009).
** Clarkdale, Ariz., Code § 12-8-01 (2010).
†† Sierra Vista, Ariz., Code § 151.16.004(D) (2010).
‡‡ Tucson, Ariz., Ordinance 10597 (2008).

FIGURE 14. AWWA/IWA WATER BALANCE — AUDITING SUPPLY VS. DELIVERIES

<table>
<tr><td rowspan="10">System Input Volume</td><td rowspan="4">Authorized Consumption</td><td rowspan="2">Billed Authorized Consumption</td><td>Billed Metered Consumption</td><td rowspan="2">Revenue Water</td></tr>
<tr><td>Billed Unmetered Consumption</td></tr>
<tr><td rowspan="2">Unbilled Authorized Consumption</td><td>Unbilled Metered Consumption</td><td rowspan="6">Non-Revenue Water</td></tr>
<tr><td>Unbilled Unmetered Consumption</td></tr>
<tr><td rowspan="6">Water Losses</td><td rowspan="3">Apparent Losses</td><td>Unauthorized Consumption</td></tr>
<tr><td>Customer Metering Inaccuracies</td></tr>
<tr><td>Systematic Data Handling Errors</td></tr>
<tr><td rowspan="3">Real Losses</td><td>Leakage on Mains</td></tr>
<tr><td>Leakage and Overflows at Storage Tanks</td></tr>
<tr><td>Leakage on Service Connections</td></tr>
</table>

Funding for Conservation

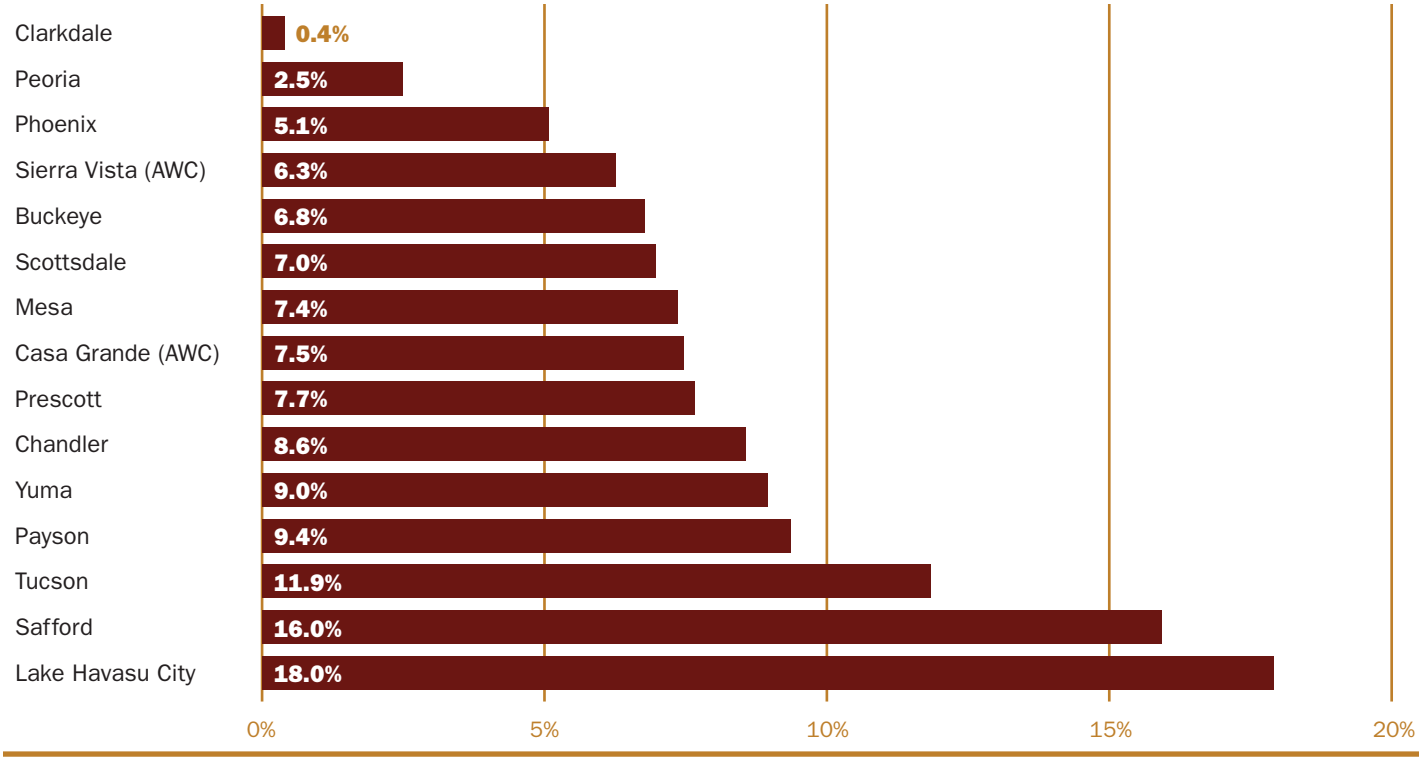
To operate a successful water conservation program, it is essential to adequately fund and staff the program. Without money and time, conservation efforts will be shallow at best and not produce the expected results of decreasing per capita water use.

The town of Payson spends $7.07 on conservation programming per person in its service area — nearly $3.00 more than the next big spender (Figure 13) — and has dedicated about 3.3% of the total water utility's budget to conservation. Payson, coincidentally or not, also has the second-lowest rate of single-family residential water use out of all the utilities in this report.

Scottsdale spends $4.28 per capita on conservation, representing about 1.6% of the total water utility's budget, and employs four full-time staff members in the conservation department. Prescott only spends 0.5% of its budget on water conservation, but due to its small service area population, the utility spends $2.98 per person on its conservation programs.

The majority of providers examined spend in the range of $1.00 to $2.00 on water conservation per person in their service area. Major exceptions include the cities of Casa Grande and Sierra Vista, which are supplied water by the private utility, Arizona Water Company (AWC). AWC does not track conservation funding or spending as a separate line item in its budget primarily because the Arizona Corporate Commission (ACC) has not allowed cost recovery for conservation spending in the past. However, the ACC is beginning to recognize the importance of water conservation, and may allow cost-recovery for expenditures in the near future.

FIGURE 15. WATER LOSS PERCENTAGES FOR 2008



Water Loss

Much of this report is focused on conservation programs that encourage efficient use by customers, but the water utility itself can lose volumes of water through leaks and pipeline failures. Studies have shown that the amount of water that providers can save by improving supply efficiency, such as preventing system losses, can eclipse the amount of water that can be saved by individual customer efforts.*

Water loss can occur due to malfunctioning meters, data handling errors, small leaks, water main breaks, and unauthorized uses (Figure 14). All systems are expected to have some water loss—10% or less is the benchmark established by ADWR. The American Water Works Association (AWWA) and the International Water Association (IWA) jointly developed a water audit methodology, and have made free auditing software available on their website to aid in the process of identifying where water loss control measures will be most effective.†

As shown in the "Supply-Side Efficiency Measures" sections of the utility summaries (Appendix B), providers are implementing a number of different measures to reduce water loss. In turn, these measures influence the percentage of water loss recorded by each utility, which also varies tremendously between the utilities studied—from 0.4% to 18% (Figure 15). The end points of this range represent abnormalities in the data for 2008,

* Kunkel, G. 2001. As we see it: Cutting our losses. *Journal AWWA 93 (1): 40.*

† AWWA Water Loss Control Committee. Free water audit software. Available at: http://www.awwa.org/Resources/WaterLossControl.cfm?ItemNumber=48511&navItemNumber=48158 (accessed July 21, 2010).

so it is likely that water loss for the communities in this report is more realistically between 2.5% and 12%.*

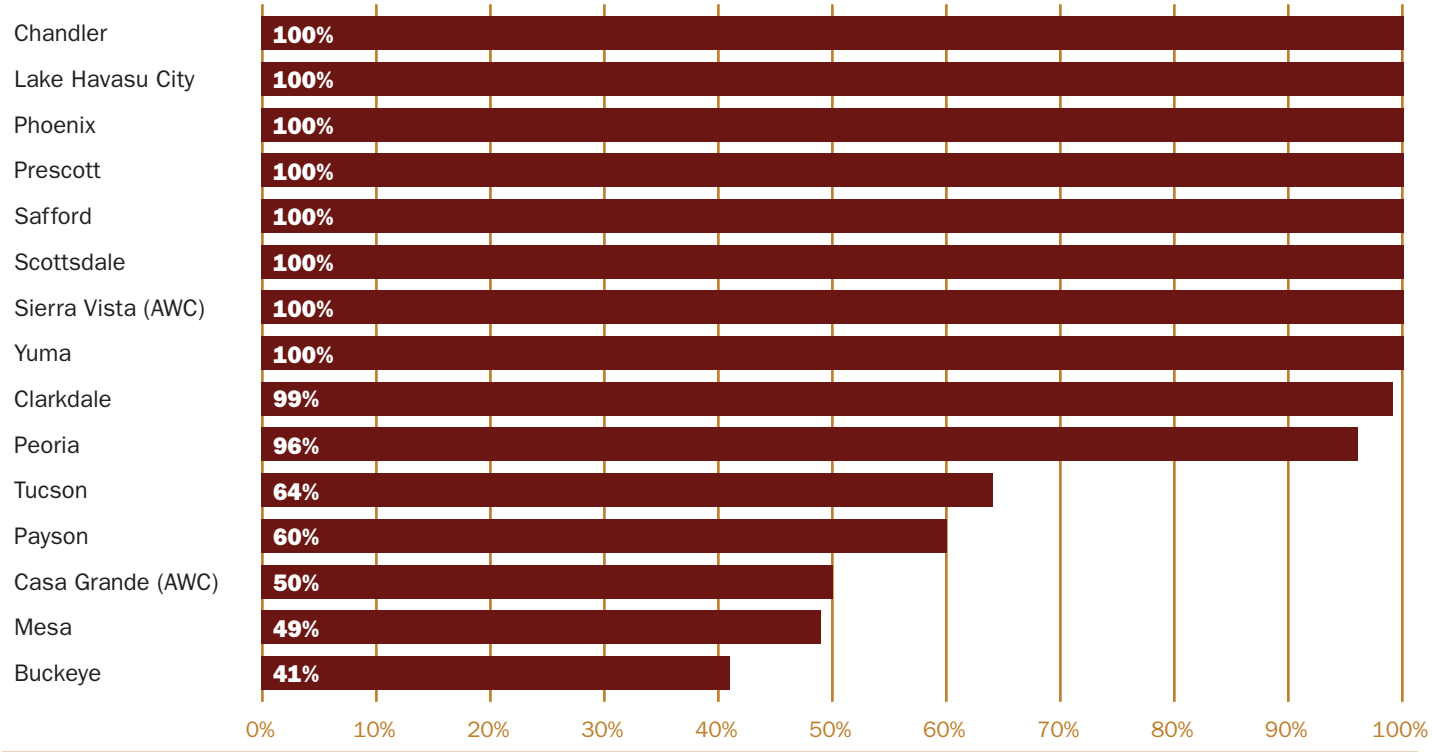
At the most basic level, water utilities rely on customers and field service personnel to identify leaks when the surface becomes wet, i.e., when enough water has leaked out underground that the soil becomes saturated and water rises to the surface. Payson and Buckeye rely on this type of system to detect leaks.

More active leak detection is used by several utilities, including Casa Grande, Chandler, Lake Havasu City, Mesa, Peoria, Phoenix, and Sierra Vista. Both Casa Grande and Sierra Vista (Arizona Water Company utilities) use a leak detection logger and correlator to survey the distribution system and locate leaks. Chandler has surveyed over 400 miles of its distribution system in the past six years, and estimates that leak repairs have saved the city 8.8 million gallons of water. Mesa uses over 400 permanent noise loggers to listen for leaks in water mains.

Meter replacement programs are another popular method for reducing system losses because meters wear out over time and generally under-report water use. Buckeye, Casa Grande, Chandler, Mesa, Payson, Peoria, Scottsdale, Sierra Vista, Tucson, and Yuma all have some sort of meter repair or replacement program. For example, Chandler replaces more than 200 non-residential meters each year. Mesa has replaced more than 35,000 meters in the past few years, and Tucson has replaced 46,500 in the past four years. Scottsdale has replaced 27,300 meters over the past four years, averting as much as $5.6 million in lost revenues from leaky meters.

* See Clarkdale, Safford, and Lake Havasu City summaries in Appendix B for further explanation of why their water loss numbers for 2008 are abnormal.

FIGURE 16. 2008 EFFLUENT USE — RECHARGED, DIRECTLY USED, OR PUT TO OTHER USES



Effluent Use

In an arid state such as Arizona, it is essential to maximize the use of water supplies. Highly treated wastewater, also known as effluent, reclaimed water, or recycled water, is appropriate to use for recharging groundwater aquifers, irrigation of landscapes, environmental restoration, process water for industrial facilities, return flow credits, cooling tower water, and many other purposes. For many of these uses, potable drinking water is not required—e.g., grass does not need chlorinated and fluorinated drinking water to survive, and may actually benefit from nutrients found in some reclaimed water. Every gallon of effluent that is used displaces the need for a gallon of scarce and valuable potable water.

It is no surprise that every provider studied is utilizing its effluent for some purpose—and a majority of providers are putting all of their effluent to beneficial use (Figure 16). The two most common uses for effluent are groundwater recharge and irrigation of high-water use landscapes, such as golf courses.

Every community, except Phoenix and Casa Grande, recharges some portion of effluent to its local groundwater aquifer. Several communities recharge 100% of effluent, such as Sierra Vista, but a mix of effluent use is more common.

Direct use of effluent, generally for irrigation, occurs in most of the communities in this report. Scottsdale, for instance, uses 72% of its effluent for watering golf courses. Utilities also use effluent for industrial processes (Casa Grande), and wetlands restoration and maintenance (Phoenix and Yuma).

Effluent use can get complicated, depending on who "owns" the water, who treats the water, and a number of other factors. One example is the Sub-Regional Operating Group (SROG), which operates the 91st Avenue wastewater treatment plant, collecting wastewater from Glendale, Mesa, Phoenix, Scottsdale, and Tempe. Approximately 60,000 acre-feet (AF) of effluent from this plant is used for cooling water at the Palo Verde nuclear power plant and 28,200 AF is delivered to the Buckeye Irrigation District. Some utilities are also involved in exchanging their effluent to farmers for surface water supplies (Phoenix) or potable groundwater supplies (Buckeye).

photo: iStock

Water flowing into irrigation canal

Scoring

Based on WRA's decade-long experience in evaluating water conservation programs and practices, we identified several criteria critical for sustainable water management in Arizona and created a 100-point scoring system to rate each water utility. Because the ultimate goal of conservation programs is to reduce per capita demand, per capita water use — both single-family residential use (generally the largest sector of water use at a utility) and trends in system-wide use — represents 25% of the total possible points. Since water bills are a utility's most direct contact with customers and one of the single most powerful tools to promote water conservation, an additional 25% of total possible points are allocated to three components of a utility's rate structure. As a result, performing well in these two criteria (GPCD and water rate structure) is crucial for receiving a high all-around score.

Water conservation programs and conservation-oriented ordinances each account for 15% of possible points. Well-designed and properly enforced ordinances can impact a utility's entire customer base, and thus play a unique role in establishing appropriate water use limits and behaviors. Conservation programs can then be used to target efficiency measures at select sub-groups of customers. The basis for scoring these two criteria is grounded in ADWR's Modified Non-Per Capita

TABLE 2. ARIZONA WATER METER SCORING

	Maximum Points	Prescott	Tucson	Phoenix	Payson	Clarkdale	Sierra Vista (AWC)	Lake Havasu City	Chandler	Scottsdale	Mesa	Peoria	Buckeye	Safford	Casa Grande (AWC)	Yuma
Per Capita Water Use	*[25]*															
SFR GPCD	*10*	8	8	6	10	10	8	6	4	0	6	4	0	4	6	6
System-Wide Trend	*15*	12	12	9	9	9	9	12	6	3	12	3	3	15	3	9
Rate Structure	*[25]*															
Slope	*20*	20	20	15	10	10	0	10	5	5	5	5	15	0	0	0
Thresholds	*5*	3	2	0	3	0	0	2	2	2	0	0	2	0	3	0
Conservation Measures	*[15]*															
Number of Measures	*8*	5	6	5	5	1	5	3	5	7	3	5	2	1	1	1
Assessment of Measures	*7*	6	5	7	2	1	0	1	7	6	3	5	3	0	3	1
Conservation Ordinances	*15*	10	6	7	13	12	15	6	8	8	8	5	7	4	5	2
Funding for Conservation	*5*	5	3	3	5	3	0	3	4	5	2	4	3	3	0	1
Water Loss	*10*	2	0	8	1	10	7	0	1	5	4	9	6	0	3	1
Effluent Use	*5*	5	3	5	3	4	5	5	5	5	2	4	2	5	2	5
Total Points	***100***	**76**	**65**	**65**	**61**	**60**	**49**	**48**	**47**	**46**	**45**	**44**	**43**	**32**	**26**	**26**

Conservation Program because it was developed through an extensive, Arizona-specific stakeholder process.

Minimizing water loss accounts for 10% of possible points, in recognition that the potential amount of water saved through improving supply-side efficiency can dwarf the potential for demand-side improvements. Funding for conservation accounts for 5% of possible points, because no water conservation program can be effective without proper investments of time and money. Finally, effluent use is allotted the last 5% of possible points to underscore the importance of maximizing the use (and reuse) of water supplies in a water-limited state such as Arizona.

A complete description of the scoring criteria and the methodology used for calculating each metric is described in Appendix A.

Comparative analysis of multiple water providers can be difficult because providers track and report information differently. Therefore, every effort was made to ensure that the data presented compare equivalent information from each of the 15 utilities. Furthermore, this report represents a true "snapshot" of water conservation activities and data from a select group of years. Conservation programs and results are constantly evolving and we make no assumption that scoring results in this report would be the same if it were redone next year.

According to our scoring methodology, Prescott maintains the most comprehensive water conservation program out of the water providers in this report, with Tucson, Phoenix, and Payson rounding out the top four (Table 2). Several of the conservation measures these providers are implementing can be used as a model to improve programs in lower-scoring communities.

Scope and Assumptions

It is worthwhile to discuss some of the assumptions imposed by WRA's scoring methodology, addressed in three broad topics: GPCD, supply-side issues, and disconnect.

GPCD

Per capita water use is affected by many factors, including the age of housing, land use planning policies, local climate, population estimates, and conservation programs, among others. This report does not account for the effect conservation programs have had on GPCD prior to 2003, the first year of data collection. It is certainly possible that a community achieved significant savings during the 1990s after implementing a new rate structure (for example), and incremental savings post-2003 have been harder to achieve. This is in contrast to a community that is "new" to conservation, which may be still reaping significant savings.

This report also does not directly account for ongoing land use change and the impact it can have on per capita water use. For example, in a built-out community such as Phoenix, a portion of new growth is occurring as new multifamily housing replaces older single-family housing. Due to economic drivers, multifamily housing generally replaces comparably less valuable SFR real estate. This has the perverse effect of increasing SFR GPCD because the housing that remains in the SFR sector is generally more affluent due to higher incomes, larger lots, and abundant landscaping.

WRA's scoring accounts for the effect population growth has on per capita water use, albeit in a basic manner. People living in homes built after the year 2000 generally use much less water than those who live in older homes. In high-growth communities, the large influx of new efficient homes has the effect of decreasing per capita use. We do not see sprawl as a viable conservation tool; thus, GPCD is adjusted by population growth, as described in Appendix A. Communities that score low in the GPCD category either use a significant amount of water per capita, grew substantially and achieved conservation savings with limited efforts, or did not reduce per capita use to a significant degree between 2003 and 2008.

Supply-Side Issues

This study is first and foremost about water conservation. It is not a holistic look at a water provider's larger water resources strategies, limitations, and opportunities. Although effective conservation must be tailored to the individual circumstances of each community, the scope of this report precluded an all-encompassing analysis of each specific service area. The data in this report can be used as an introduction to the greater water supply challenges that face Arizona water providers, for instance, by examining the bar charts of supply sources in the following "Utility Snapshots" section.

One example of a supply-side issue not addressed is the trend in groundwater use—although this type of metric would be applicable only to communities within AMAs that have a goal to reduce groundwater use. Tucson, Phoenix, Prescott, and Scottsdale have reduced groundwater use by 15 percentage points or more between 2003 and 2008 by increasing renewable water supplies. However, comparing these cities to communities that do not have access to CAP or SRP water (e.g., Payson) is not worthwhile with respect to their water conservation programs. Regardless of source, desert communities need to conserve water.

This report does not account for the sustainability of each provider's supply. Several utilities in Arizona are concerned about the operations of Central Arizona Groundwater Replenishment District and a system that allows new developments based on "paper water" that has no physical connection to supply. Communities and utilities that have attained a Designation of Assured Water Supply based mainly on "non-paper water" are at least assuming control of the future of their water supply. Furthermore, there are serious questions surrounding the assumed future of surface water supplies and whether they are truly sustainable.

Finally, we do not address how supply constraints may be impacting water conservation programs—"necessity is the mother of all invention," so they say. For growing communities with no access to renewable water, aggressive conservation may be their only option for additional supply.

Disconnect

One interesting limitation of the scoring methodology is that is does not comprehensively equate effort to results. The effectiveness of any conservation program, especially education-based programs, can be difficult to determine. This topic is the subject of much research at the state, provider, and university level, and one that WRA is keenly interested in advancing. We have included a score for the implementation of conservation measures to address part of this concern, recognizing that it is crucial to track the progress and report results from conservation programs instead of just having a measure "on the books."

Scottsdale, for example, ranks second in the money spent per person on conservation programming, yet its system-wide water use increased between 2003 and 2008. However, it is possible that Scottsdale's use could have increased more were it not for the city's conservation efforts. Further research will be necessary to select the most appropriate and effective water conservation programs for each community, a task that WRA plans to be more involved with in the future.

Despite the issues discussed above, WRA's scoring system substantively compares the water conservation programs of several Arizona municipalities. Our scoring is systematic and transparent, and presents a true snapshot of water conservation at one point in time. However, this data should not be used to penalize any water provider. Instead, we hope that water providers will learn from each other. It is WRA's intent to present a sample of conservation practices, regulations, and programs that can be used by researchers, policy makers, and local communities to enhance their water conservation programs. We will use the information in this report as a stepping-stone that leads towards the improvement of water conservation efforts across Arizona; we hope others do the same.

photo: iStock

Local color, Tucson

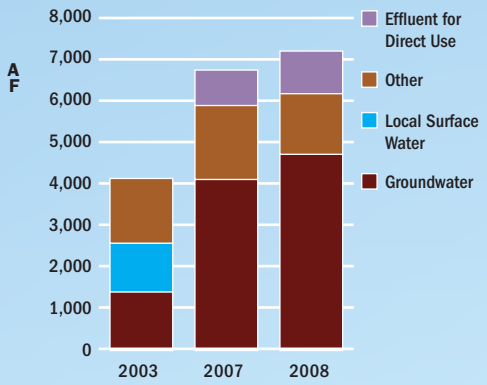
Utility Snapshots

Snapshot: **Town of Buckeye**

43

Service Area Population	38,064
Total Budget	$ 2,900,000

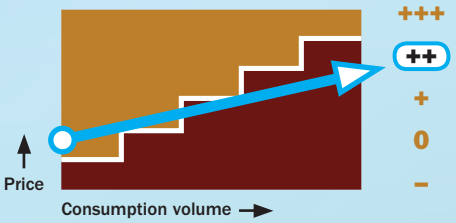
Water Sources



Rate Structure

Structure: 5-Tier Increasing Block

Average Price Curve: ++



Per Capita Water Use Gallons per Person per Day (GPCD)

SINGLE-FAMILY RESIDENTIAL USE

2003: **140** GPCD

2008: **61** GPCD

SYSTEM-WIDE POTABLE USE

2003: **609** GPCD

2008: **136** GPCD

Scoring

Per Capita Water Use	
SFR GPCD	0
SW Trend	3
Rate Structure	
Slope	15
Thresholds	2
Conservation Measures	
Number	2
Assessment	3
Ordinances	7
Funding	3
Water Loss	6
Effluent Use	2
Total Points	**43**

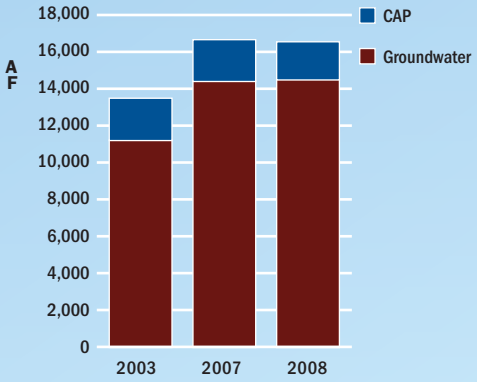
Recommendations

- ✓ Follow through with Water Resources Master Plan to increase effluent use.
- ✓ Implement active leak detection program.
- ✓ Enact ordinances that set water-efficient standards for new development.

Snapshot: **City of Casa Grande – Arizona Water Company**

Service Area Population	67,622
Total Budget	no data

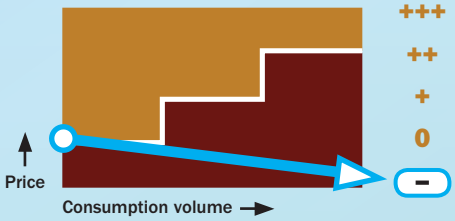
Water Sources



Rate Structure

Structure:
3-Tier Increasing Block

Average Price Curve: –



Per Capita Water Use Gallons per Person per Day (GPCD)

SINGLE-FAMILY RESIDENTIAL USE

2003: **140** GPCD

2008: **99** GPCD

SYSTEM-WIDE POTABLE USE

2003: **251** GPCD

2008: **203** GPCD

Scoring

Per Capita Water Use	
SFR GPCD	6
SW Trend	3
Rate Structure	
Slope	0
Thresholds	3
Conservation Measures	
Number	1
Assessment	3
Ordinances	5
Funding	0
Water Loss	3
Effluent Use	2
Total Points	26

Recommendations

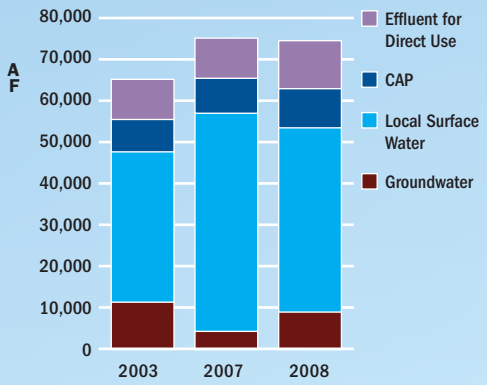
- ✓ Adopt rate structure that encourages conservation.
- ✓ Explore opportunities for residential indoor/outdoor and commercial rebates.
- ✓ Encourage Arizona Corporate Commission to include conservation costs in rate recovery.
- ✓ Work with city of Casa Grande to enact outdoor water use ordinances, such as time-of-day irrigation requirements.

Snapshot: **City of Chandler**

47

Service Area Population	255,581
Total Budget	$ 163,686,000

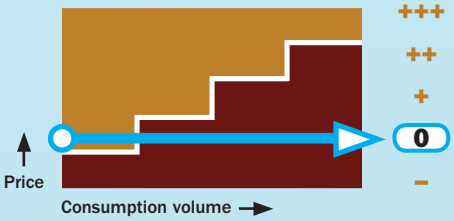
Water Sources



Rate Structure

Structure:
4-Tier Increasing Block, Seasonal

Average Price Curve: **0**



Per Capita Water Use Gallons per Person per Day (GPCD)

SINGLE-FAMILY RESIDENTIAL USE

2003: **148** GPCD

2008: **142** GPCD

SYSTEM-WIDE POTABLE USE

2003: **222** GPCD

2008: **201** GPCD

Scoring

Per Capita Water Use	
SFR GPCD	4
SW Trend	6
Rate Structure	
Slope	5
Thresholds	2
Conservation Measures	
Number	5
Assessment	7
Ordinances	8
Funding	4
Water Loss	1
Effluent Use	5
Total Points	47

Recommendations

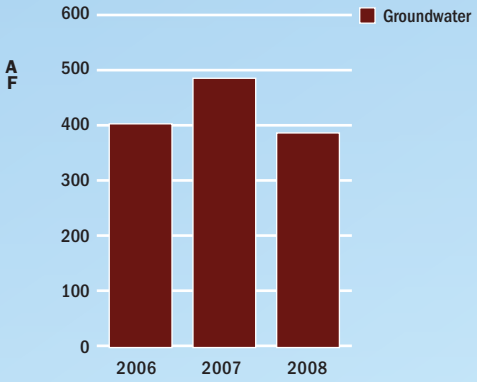
- ✓ Improve conservation price signal by increasing difference between blocks and increasing price changes between summer and winter structures.
- ✓ Reduce per capita water use by increasing penetration of already comprehensive rebate program to target high water users.

Snapshot: **Town of Clarkdale**

60

Service Area Population	4,030
Total Budget	$ 1,606,000

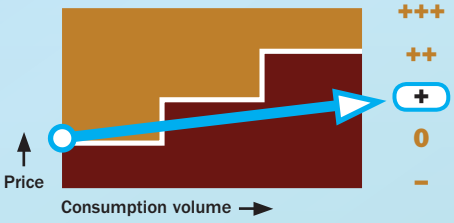
Water Sources



Rate Structure

Structure:
3-Tier Increasing Block

Average Price Curve: +



Per Capita Water Use Gallons per Person per Day (GPCD)

RESIDENTIAL USE

2006: **82** GPCD

2008: **73** GPCD

SYSTEM-WIDE POTABLE USE

2006: **92** GPCD

2008: **86** GPCD

Scoring

Per Capita Water Use	
SFR GPCD	10
SW Trend	9
Rate Structure	
Slope	10
Thresholds	0
Conservation Measures	
Number	1
Assessment	1
Ordinances	12
Funding	3
Water Loss	10
Effluent Use	4
Total Points	**60**

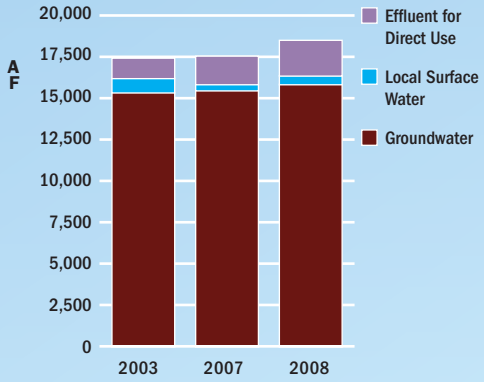
Recommendations

- ✓ Improve conservation price signal by decreasing monthly fee.
- ✓ Initiate indoor/outdoor residential rebate program and track progress.
- ✓ Increase funding for conservation programs.

Snapshot: **Lake Havasu City**

Service Area Population	54,000
Total Budget	$ 5,000,000

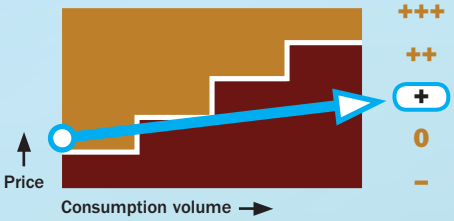
Water Sources



Rate Structure

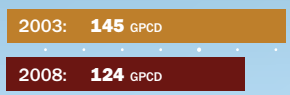
Structure:
4-Tier Increasing Block

Average Price Curve: +

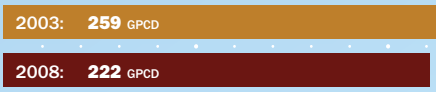


Per Capita Water Use Gallons per Person per Day (GPCD)

SINGLE-FAMILY RESIDENTIAL USE



SYSTEM-WIDE POTABLE USE



Scoring

Per Capita Water Use	
SFR GPCD	6
SW Trend	12
Rate Structure	
Slope	10
Thresholds	2
Conservation Measures	
Number	3
Assessment	1
Ordinances	6
Funding	3
Water Loss	0
Effluent Use	5
Total Points	48

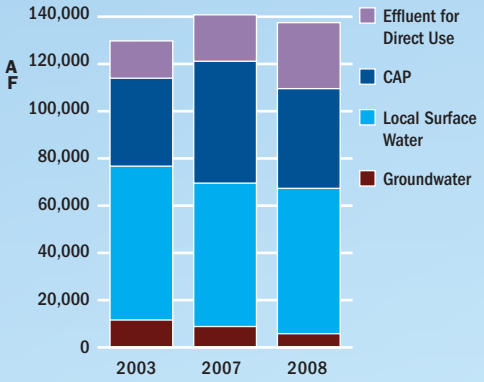
Recommendations

- ✓ Improve conservation price signal by decreasing monthly fee.
- ✓ Initiate indoor/outdoor residential rebate program and track progress.
- ✓ Increase funding for conservation programs.

Snapshot: **City of Mesa**

Service Area Population	46,988
Total Budget	$ 60,245,000

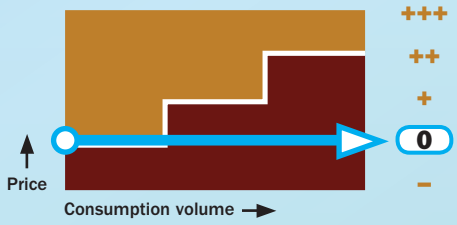
Water Sources



Rate Structure

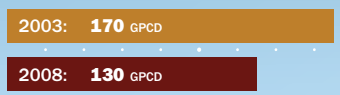
Structure:
3-Tier Increasing Block

Average Price Curve: **0**

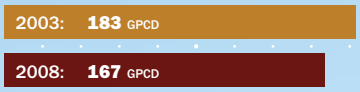


Per Capita Water Use Gallons per Person per Day (GPCD)

SINGLE-FAMILY RESIDENTIAL USE



SYSTEM-WIDE POTABLE USE



Scoring

Per Capita Water Use	
SFR GPCD	6
SW Trend	12
Rate Structure	
Slope	5
Thresholds	0
Conservation Measures	
Number	3
Assessment	3
Ordinances	8
Funding	2
Water Loss	4
Effluent Use	2
Total Points	45

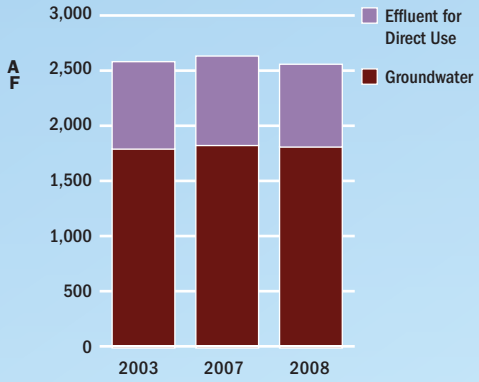
Recommendations

- ✓ Expand rebate program to industrial, commercial, and institutional sector.
- ✓ Improve conservation price signal by increasing price difference between blocks.
- ✓ Explore opportunities for indoor retrofits, e.g., direct install.
- ✓ Solidify Water Rights Settlement Act Program to further maximize effluent use.

Snapshot: **Town of Payson**

Service Area Population	17,682
Total Budget	$ 3,829,000

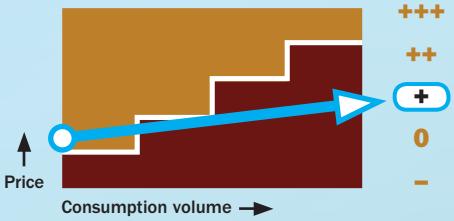
Water Sources



Rate Structure

Structure:
4-Tier Increasing Block

Average Price Curve: +



Per Capita Water Use Gallons per Person per Day (GPCD)

RESIDENTIAL USE

2003:	68 GPCD
2008:	66 GPCD

SYSTEM-WIDE POTABLE USE

2003:	91 GPCD
2008:	83 GPCD

Scoring

Per Capita Water Use	
SFR GPCD	10
SW Trend	9
Rate Structure	
Slope	10
Thresholds	3
Conservation Measures	
Number	5
Assessment	2
Ordinances	13
Funding	5
Water Loss	1
Effluent Use	3
Total Points	61

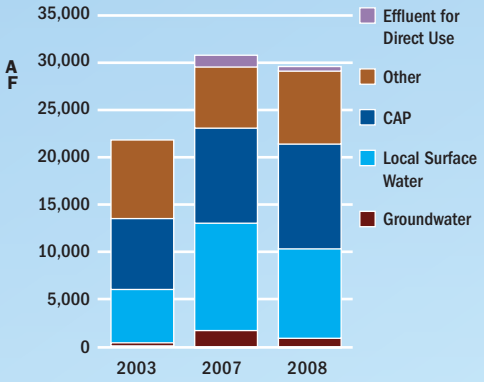
Recommendations

- ✓ Start outdoor rebate program to balance strong outdoor ordinances.
- ✓ Improve conservation price signal by decreasing monthly fee and increasing consumption charges.
- ✓ Establish new conservation goals — the old one has been met.
- ✓ Explore new opportunities for tracking and reducing water loss.

Snapshot: **City of Peoria**

Service Area Population	158,081
Total Budget	$ 23,780,000

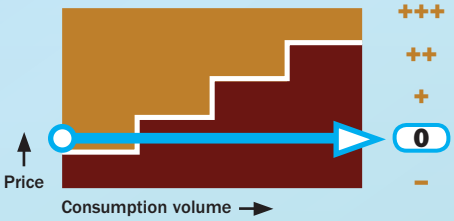
Water Sources



Rate Structure

Structure:
4-Tier Increasing Block

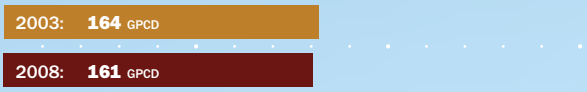
Average Price Curve: **0**



Per Capita Water Use Gallons per Person per Day (GPCD)

SINGLE-FAMILY RESIDENTIAL USE

SYSTEM-WIDE POTABLE USE



Scoring

Per Capita Water Use	
SFR GPCD	4
SW Trend	3
Rate Structure	
Slope	5
Thresholds	0
Conservation Measures	
Number	5
Assessment	5
Ordinances	5
Funding	4
Water Loss	9
Effluent Use	4
Total Points	44

Recommendations

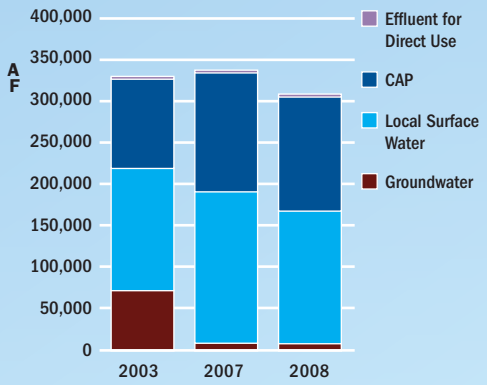
- ✓ Enact ordinances covering outdoor water use and efficient water use in new developments.
- ✓ Increase conservation price signal by decreasing monthly fee.
- ✓ Initiate industrial, commercial, and institutional conservation rebates.

Snapshot: **City of Phoenix**

65

Service Area Population	1,512,214
Total Budget	$ 253,169,000

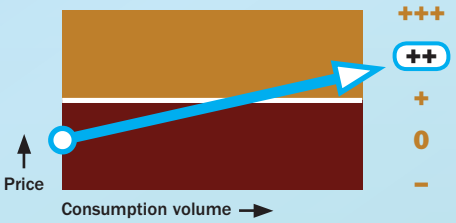
Water Sources



Rate Structure

Structure:
Flat, Seasonal

Average Price Curve: ++



Per Capita Water Use Gallons per Person per Day (GPCD)

SINGLE-FAMILY RESIDENTIAL USE

2003: **143** GPCD

2008: **123** GPCD

SYSTEM-WIDE POTABLE USE

2003: **197** GPCD

2008: **173** GPCD

Scoring

Per Capita Water Use	
SFR GPCD	6
SW Trend	9
Rate Structure	
Slope	15
Thresholds	0
Conservation Measures	
Number	5
Assessment	7
Ordinances	7
Funding	3
Water Loss	8
Effluent Use	5
Total Points	65

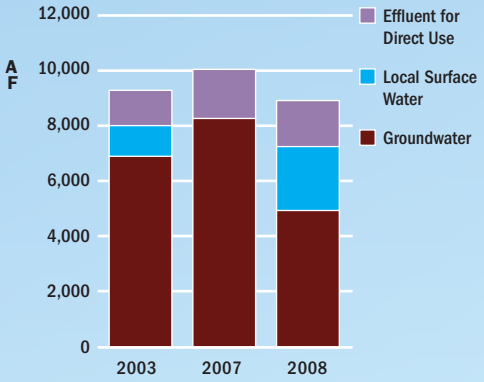
Recommendations

- ✓ Decrease quantity of water included with monthly fee.
- ✓ Explore opportunities for residential indoor/outdoor, and industrial, commercial, and institutional rebate programs.

Snapshot: **City of Prescott**

Service Area Population	47,959
Total Budget	$ 30,800,000

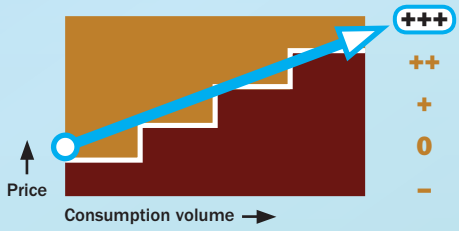
Water Sources



Rate Structure

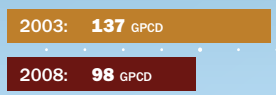
Structure:
4-Tier Increasing Block

Average Price Curve: +++



Per Capita Water Use Gallons per Person per Day (GPCD)

SINGLE-FAMILY RESIDENTIAL USE



SYSTEM-WIDE POTABLE USE

Scoring

Per Capita Water Use	
SFR GPCD	8
SW Trend	12
Rate Structure	
Slope	20
Thresholds	3
Conservation Measures	
Number	5
Assessment	6
Ordinances	10
Funding	5
Water Loss	2
Effluent Use	5
Total Points	76

Recommendations

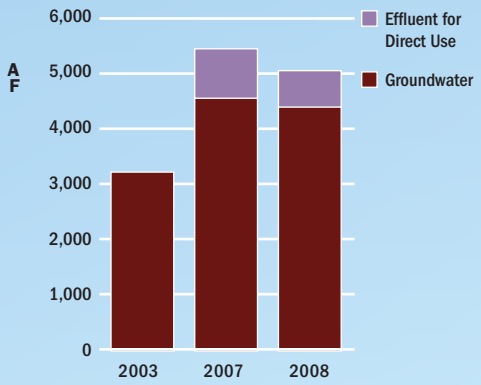
- ✓ Enact ordinances covering outdoor water use in new development.
- ✓ Initiate commercial rebate program.

Snapshot: **City of Safford**

32

Service Area Population	18,900
Total Budget	$ 3,187,000

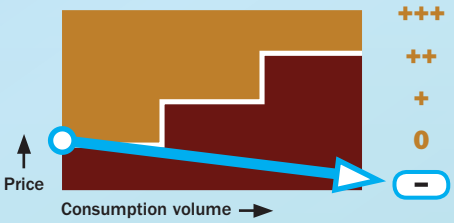
Water Sources



Rate Structure

Structure:
3-Tier Increasing Block

Average Price Curve: –



Per Capita Water Use Gallons per Person per Day (GPCD)

RESIDENTIAL USE

2007: **185** GPCD

2008: **175** GPCD

SYSTEM-WIDE POTABLE USE

2007: **210** GPCD

2008: **175** GPCD

Scoring

Per Capita Water Use	
SFR GPCD	4
SW Trend	15
Rate Structure	
Slope	0
Thresholds	0
Conservation Measures	
Number	1
Assessment	0
Ordinances	4
Funding	3
Water Loss	0
Effluent Use	5
Total Points	32

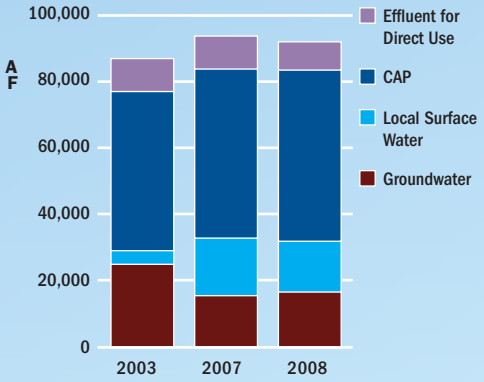
Recommendations

- ✓ Improve conservation price signal by increasing cost difference between blocks.
- ✓ Account for water loss in a systematic way, e.g., AWWA/IWA water loss methodology.
- ✓ Implement time-of-day irrigation restrictions.
- ✓ Explore opportunities for rebate programs.

Snapshot: **City of Scottsdale**

Service Area Population	230,664
Total Budget	$ 60,103,000

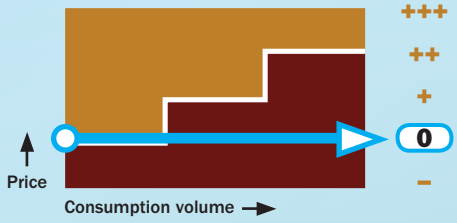
Water Sources



Rate Structure

Structure:
3-Tier Increasing Block

Average Price Curve: **0**



Per Capita Water Use Gallons per Person per Day (GPCD)

SINGLE-FAMILY RESIDENTIAL USE

2003: **240** GPCD

2008: **249** GPCD

SYSTEM-WIDE POTABLE USE

2003: **280** GPCD

2008: **302** GPCD

Scoring

Per Capita Water Use	
SFR GPCD	0
SW Trend	3
Rate Structure	
Slope	5
Thresholds	2
Conservation Measures	
Number	7
Assessment	6
Ordinances	8
Funding	5
Water Loss	5
Effluent Use	5
Total Points	46

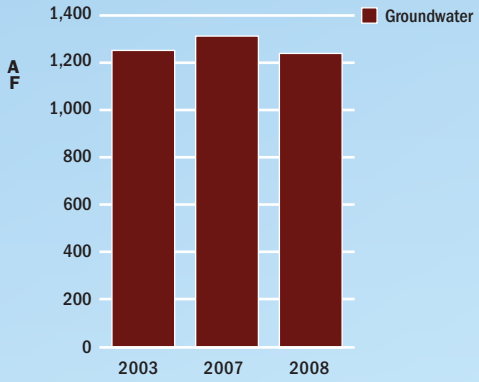
Recommendations

- ✓ Improve conservation price signal by decreasing monthly fee and increasing price differentials between blocks.
- ✓ Decrease per capita use by increasing penetration rates of already comprehensive programs and targeting high water users in each customer class.

Snapshot: **City of Sierra Vista – Arizona Water Company**

Service Area Population	7,909
Total Budget	no data

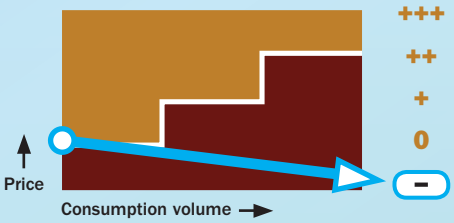
Water Sources



Rate Structure

Structure:
3-Tier Increasing Block

Average Price Curve: –



Per Capita Water Use Gallons per Person per Day (GPCD)

RESIDENTIAL USE

2003: **116** GPCD

2008: **105** GPCD

SYSTEM-WIDE POTABLE USE

2003: **148** GPCD

2008: **131** GPCD

Scoring

Per Capita Water Use	
SFR GPCD	8
SW Trend	9
Rate Structure	
Slope	0
Thresholds	0
Conservation Measures	
Number	5
Assessment	0
Ordinances	15
Funding	0
Water Loss	7
Effluent Use	5
Total Points	49

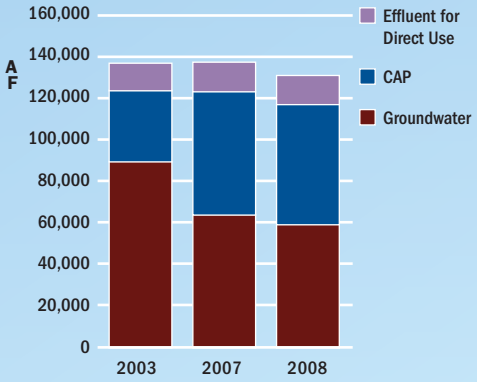
Recommendations

- ✓ Adopt rate structure that encourages conservation.
- ✓ Partner with the City of Sierra Vista on rebates for the residential sector.
- ✓ Encourage Arizona Corporate Commission to include conservation costs in rate recovery.

Snapshot: **City of Tucson**

Service Area Population	730,831
Total Budget	$ 109,300,000

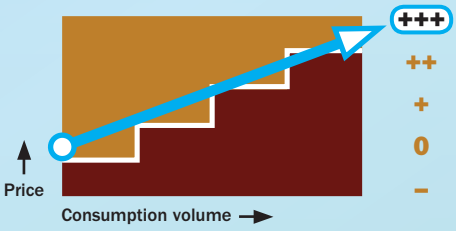
Water Sources



Rate Structure

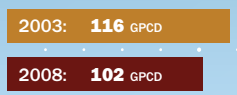
Structure:
4-Tier Increasing Block

Average Price Curve: +++



Per Capita Water Use Gallons per Person per Day (GPCD)

SINGLE-FAMILY RESIDENTIAL USE



SYSTEM-WIDE POTABLE USE

Scoring

Per Capita Water Use	
SFR GPCD	8
SW Trend	12
Rate Structure	
Slope	20
Thresholds	2
Conservation Measures	
Number	6
Assessment	5
Ordinances	6
Funding	3
Water Loss	0
Effluent Use	3
Total Points	65

Recommendations

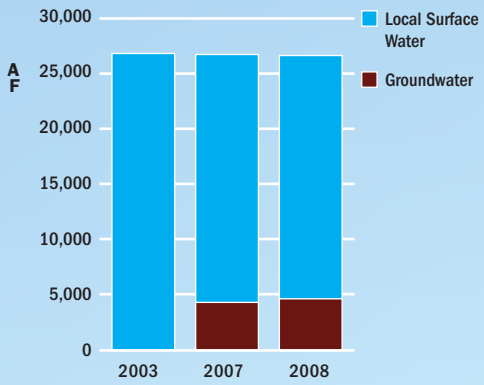
- ✓ Decrease allocation of first price block to target efficient indoor water use.
- ✓ Improve water loss tracking to prioritize next steps for water loss reduction.
- ✓ Explore opportunities for additional rebate programs as recommended by Water Community Conservation Task Force.

Snapshot: **City of Yuma**

26

Service Area Population	103,264
Total Budget	$ 28,593,000

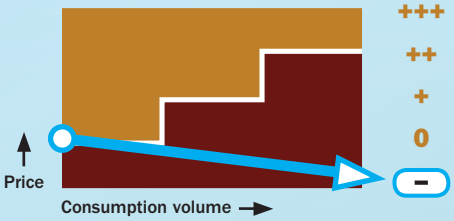
Water Sources



Rate Structure

Structure:
3-Tier Increasing Block

Average Price Curve: –



Per Capita Water Use Gallons per Person per Day (GPCD)

RESIDENTIAL USE

2003: **152** GPCD

2008: **150** GPCD

SYSTEM-WIDE POTABLE USE

2003: **234** GPCD

2008: **231** GPCD

Scoring

Per Capita Water Use	
SFR GPCD	6
SW Trend	9
Rate Structure	
Slope	0
Thresholds	0
Conservation Measures	
Number	1
Assessment	1
Ordinances	2
Funding	1
Water Loss	1
Effluent Use	5
Total Points	26

Recommendations

- ✓ Revamp rate structure to encourage water conservation.
- ✓ Increase funding for water conservation programs.
- ✓ Implement ongoing water loss tracking, e.g., AWWA/IWA water loss methodology.
- ✓ Enact ordinances to promote efficient water use inside and outdoors.
- ✓ Follow through with recommendations from Water Conservation Plan.

Appendix A—Scoring Criteria

To develop a score to rate the conservation programs of the 15 water utilities we studied, we weighted the seven criteria we consider to be critical for sustainable water management and created a 100-point scoring system.

Per Capita Water Use (25 points)

Per capita water use is the volume of water that each person uses on a daily basis averaged over a full year—often described in gallons per capita per day (GPCD). There are several different measures of per capita use; we evaluate single-family residential use and system-wide potable use. SFR per capita use is relatively consistent across the United States because most people perform the same activities inside and outside of their homes (e.g., bathing, cooking, watering the yard)—with some fluctuation for local climate and its influence on outdoor water use. Because of this consistency, we are able to compare SFR use across communities to assess their level of water efficiency. By contrast, system-wide potable use per capita is not a relevant comparison from one community to the next because cities have very different residential, commercial, and industrial uses of water. In this case, we compare the trend in system-wide use at each utility to evaluate if individual cities are becoming more efficient in their water use over time.

Calculating Per Capita Water Use

Per capita use numbers were determined according to our methodology, which is materially different from the way ADWR determines GPCD. ADWR's methodology is complex and requires data inputs that several utilities in this study do not track. Consequently, our methodology is more simplified than ADWR's, but the basic metric of calculating water use per person is retained.

Single-family residential use is the total volume of water sold to the SFR sector, divided by the SFR population, divided by 365 (days in a year). Single-family residential population in each community was determined by multiplying the number of SFR accounts and the number of persons per household (taken from the U.S. Census).

For providers that do not separately track SFR use from other residential water uses, total residential water sales were used instead.

System-wide potable use is the total potable water provided to all accounts, divided by the service area population, divided by 365. This does not include water loss or treated effluent delivered for direct uses. In some communities not all metered consumption is potable water, but because system-wide per capita use is being compared intra-community, this bias remains constant through time.

Time Period for Comparison

Weather variability plays a role in levels of consumption, with overall water consumption changing between years that are warmer or drier than average. The years examined were not chosen to reflect "normal" weather patterns, but rather to give a snapshot of current levels of water use. The year 2003 was chosen as a baseline because this is the first year information for water providers in the Active Management Areas (AMA) is widely available. The years 2007 and 2008 were chosen because they represent the most recent water use information available for water providers within the state.

Impact of Population Growth on GPCD

Many Arizona communities have grown rapidly over the past decade, which has happened in parallel with significant improvements in water conservation technology and the implementation of more desert-appropriate landscape choices for new developments. As a result, people that reside in homes built after 2000 generally use much less water that those who live in older homes. Purely comparing one municipality's 2008 per capita water use to that of others has the potential to mask the true effectiveness of a city's water conservation plan because a large influx of new, efficient homes could artificially skew per capita values downward.

To compensate for growth's affect on GPCD, we adjust both 2008 SRF and system-wide water use rates by

multiplying the GPCD by one plus the population growth rate from 2003-2008. For example, if community A uses 150 GPCD in the SFR sector and grew at 10% over this time period, its "adjusted" GPCD is 165. Adjusted values of water use—which, when compared to a non-adjusted value, do not affect scoring for the vast majority of providers—are presented in Appendix C. Although this is a simplified measure of the impact that growth can have on water use, applied across all communities, it permits a more level comparison.

SFR Per Capita Use

+10 points if adjusted 2008 SFR per capita use is more than 40% below the median (137 GPCD)

+8 points if use is 11% to 30% below the median

+6 points if use is between 10% below and 10% above the median

+4 points if use is 11% to 30% above the median

+0 points if use is greater than 30% above the median

System-wide Potable Per Capita Trend

+15 points if adjusted 2008 system-wide potable use decreased 10% or more since 2003

+12 points if use decreased 5% to 10%

+9 points if use decreased 0% to 4%

+6 points if use increased 0% to 15%

+3 points if use increased more than 15%

Water Rate Structure (25 points)

Water rate structures play an essential role in communicating the value of water to customers and are one of the most powerful water conservation tools. Increasing block rate structures can be designed to provide stable and sufficient funding, while effectively communicating to consumers that the more water they use, the more expensive their water becomes. While increasing block rate structures can provide a strong conservation "price signal" to customers, there are several key elements that must be properly addressed in order to maximize the benefits associated with this type of rate structure, including:

- Make blocks the right size.
- Make block price differentials meaningful.
- Avoid high fixed service charges.

The effectiveness of a conservation-oriented rate structure can be evaluated by looking at the slope of the average price curve. Customers generally "see" the average price of water when looking at their bill—i.e., how much they paid divided by how much they used—which combines the volumetric cost of water plus any fixed service charges. Effective rate structures have an average price curve that slopes upwards, communicating that the more water a customer uses, the more expensive each additional gallon of water becomes.

Slope of the Average Price Curve

+20 points if the slope of the average price curve is greater than 0.1, as measured between 10,000 gallons and 70,000 gallons

+15 points if the slope is between 0.031 and 0.1

+10 points if the slope is between 0.011 and 0.03

+5 points if the slope is between 0 and 0.01

+0 points if the slope is negative

Block Thresholds

+3 points if there is a threshold at or before 5,000 gallons in the utility's 2010 rate structure to target efficient indoor use

+2 points if there is a threshold at or above 30,000 gallons to target excessive outdoor use

Conservation Measures (15 points)

Conservation measures raise community awareness and motivate residents to use water more efficiently — they are an integral part of any community's water management strategy. Because of cultural, historical, and regional differences, there is no one-size-fits-all set of conservation measures, and what works in one community may not be well received in another.

The scoring for conservation measures is guided by 29 best management practices established in ADWR's Modified Non-Per Capita Conservation Program, because 1) these BMPs were identified and developed in Arizona through an extensive stakeholder process; and 2) the Arizona Corporation Commission (ACC) uses this list of BMPs in its regulatory practices. The BMPs are designed to reduce water use within the service area, and are grouped into categories commensurate with MNPCCP Categories 1, 2, 3, 6, and 7.*

Water consumption depends on both the number of measures implemented and how well they are implemented. It is critical that utilities examine how effectively their conservation programs are working. Penetration and implementation assessments allow utilities to make more informed, cost-effective decisions by adapting their respective conservation programs to local circumstances and changing demands.

Like the MNPCCP, each conservation measure is given equal value in recognition that providers should use measures that are appropriate for their service area. In our scoring system, utilities are awarded points for both the number of measures and the assessment of those measures. Total points in each sub-section are rounded to the nearest whole number.

Number of Measures (8 points maximum)

+0.25 points for each specific conservation measure.

Assessment of Measures (7 points maximum)

+0.50 points for each assessment of a conservation measure.

* Smart Irrigation is the only additional BMP that we score that is not explicitly included in the MNPCCP's BMPs.

Conservation Ordinances (15 points)

Municipal ordinances or regulations are passed by local governments and establish rules that must be complied with, or prohibit certain actions or conduct. In Arizona, state and local statutes and regulations have been critical in promoting wise water use, protecting utility infrastructure, and assuring that municipalities have adequate water supply to support population growth. Ordinances affect every customer in a provider's service area. They can be more powerful at influencing city-wide water use than rebate programs, which are only utilized by a small percentage of the population.

We use the ordinance list established in ADWR's MNPCCP Category 5 to guide the scoring of this section as well, with slight variations in some categories to capture additional information. Ordinances that cover the list of MNPCCP BMPs (described in the "Conservation Ordinances" section of the main report) are designed to increase water use efficiency by limiting or reducing water used for specific purposes.

Like the MNPCCP, each ordinance is given equal value in recognition that providers should use ordinances that are most appropriate for their service area. In our scoring system, utilities are awarded points according to the following scale. Total points are rounded to the nearest whole number, and 15 points is the maximum points awarded for this section.

+1 point for having an ordinance in a particular BMP category

+0.25 extra points for each distinct regulation or standard within the same category

Funding for Conservation (5 points)

It is nearly impossible to run an effective conservation program if no financial and staffing resources are set aside for that purpose. The amount of resources a water provider dedicates to efficiency and conservation efforts reflects upon how they value conservation. Funding for conservation is calculated by dividing the total water conservation budget by the service area population.

+5 points if the utility spends more than $2.00 per customer on conservation (for 2008)

+4 points if spending is between $1.51 and $2.00

+3 points if spending is between $1.01 and $1.50

+2 points if spending is between $0.50 and $1.00

+1 point if spending is less than $0.50

+0 points if spending is not tracked separately from other utility expenditures

Water Loss (10 points)

Reducing system-wide losses increases the efficiency of the overall system, allowing more water to make it to the end user. System-wide water loss can occur due to malfunctioning meters, small leaks, water main breaks, data handling errors, and unauthorized uses. Water loss is the difference between total water deliveries and total water supplies (not including direct use of effluent), expressed as a percentage of total water supplies. All systems are expected to have some water loss—10% or less is the benchmark established by the ADWR—yet many communities in Arizona keep water loss at much lower rates than 10%. Our scoring system awards:

+10 points for the city with the lowest water loss in 2008; each subsequent city receives one less point. For example, the utility with the second-lowest water loss receives 9 points; the third-lowest receives 8 points; etc.

+1 point guaranteed if water loss is less than 10%

+0 points if water loss is greater than 10%

Effluent Use (5 points)

In an arid state such as Arizona, it is vital to maximize the use of water supplies. Highly treated wastewater, known as effluent, reclaimed water, or recycled water, is appropriate to use for recharging groundwater aquifers, irrigation of high-water-use landscapes, environmental restoration, process water for industrial facilities, return flow credits, cooling tower water, and many other purposes. Scoring for effluent is calculated by dividing the quantity of effluent used for recharge, direct, and other uses by the total amount effluent generated.

+5 points if the city utilized 100% of the effluent it generated in 2008

+4 points if reuse is between 81% and 100%

+3 points if reuse is between 61% and 80%

+2 points if reuse is between 40% and 60%

+0 points if reuse is less than 40%

Appendix B—Detailed Individual Utility Summaries

Town of Buckeye

Background

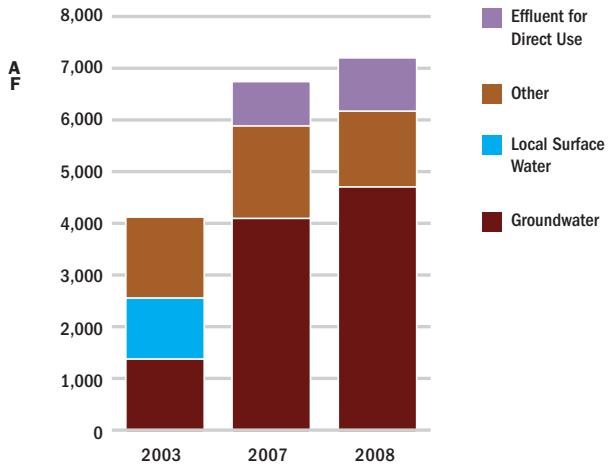
The town of Buckeye—called the biggest "small town" of Arizona—is located within the Hassayampa River Basin, 35 miles west of Phoenix. With an estimated population of 52,764* and 315,000 approved dwelling units,† Buckeye is one of the top high-growth areas in the U.S.

The average precipitation in the Buckeye Valley is 7.9 inches, with rainfall evenly distributed across the year. Average high temperatures in the summer are approximately 100 degrees (ºF), and the lowest average temperature in winter is 35.8 degrees (ºF).‡

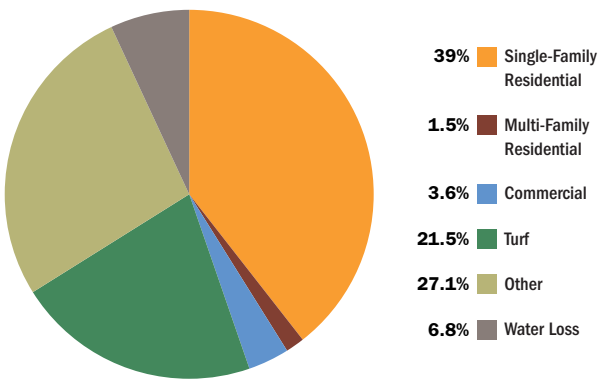
Water Supply and Deliveries

Over the period of 2003-2008, Buckeye increased supply sources by 74%, indicative of a rapidly growing population. Although the town has access to significant amounts of groundwater (very close to the surface), most of it is high in total dissolved solids and cannot be used for potable or landscape use. The majority of water deliveries in 2008 were supplied to single-family residential (39.6%) and turf (21.5%) customers. In both figures below, "Other" includes non-potable water delivered by the Buckeye Irrigation Company (BIC) and Roosevelt Irrigation District (RID) for flood irrigation of single-family residential lots, cemeteries, local parks, and other turf customers. BIC and RID water is a combination of groundwater, local surface water, and effluent from major upstream wastewater treatment plants (e.g., Phoenix's 91st Avenue WWTP).

SOURCES OF WATER FOR BUCKEYE



2008 WATER USE IN BUCKEYE



* Arizona Department of Commerce. 2009. *Arizona population estimates, 2009. Available at:* http://www.azcommerce.com/econinfo/demographics/ Population+Estimates.html (accessed May 5, 2010).

† Town of Buckeye, Arizona. Economic development: Buckeye at a glance. http://az- buckeye2.civicplus.com/index.aspx?NID=87 (accessed April 12, 2010).

‡ IDcide Local Information Data Server. Buckeye, AZ weather. http://www.idcide.com/weather/az/buckeye.htm (accessed April 12, 2010).

Per Capita

The town of Buckeye has dramatically curtailed its per capita water use since 2003. From 2003 to 2008, the town reduced single-family residential gallons per capita per day (GPCD) water use by 50%, its system-wide potable use by 78%, and total water use by 73%.

Buckeye GPCD

Per Capita Water Use	2003	2007	2008
Single-Family Residential [a]	123	73	61
System-Wide Potable [b]	609	176	136
System-Wide Total [c]	637	203	169

a Treated water deliveries to single-family accounts ÷ single-family residential population

b Total treated water delivered ÷ service area population

c Total raw water from all supply sources + direct effluent use ÷ service area population

Rate Structure

The town currently uses a five-tier inclining block rate for residential water accounts.

Usage Per Dwelling Unit	Cost
0–6,000 gallons	$2.20 per 1,000 gallons
6,001–10,000 gallons	$3.10 per 1,000 gallons
10,001–15,000 gallons	$5.30 per 1,000 gallons
15,001–30,000 gallons	$7.95 per 1,000 gallons
Over 30,000 gallons	$8.18 per 1,000 gallons

The town will raise its top rate tier to $8.42 on 07/01/2011, and subsequently to $8.67 on July 1, 2012. Residential accounts have a base service fee of $13.97, which represents 35% of an average customer's monthly bill for 10,000 gallons. The slope of Buckeye's average price curve is 0.0657, indicating that the average price of water increases slightly as consumption volume increases.

Conservation Measures

The town of Buckeye is regulated in the Phoenix Active Management Area as a large municipal provider under the Modified Non Per Capita Conservation Program. As a Tier II municipal provider, it is required to implement a public education program and has selected the following five additional, state-approved water conservation best management practices. Buckeye started implementation of these measures in January, 2010:*

- 5.2 – Water Tampering/Water Waste Ordinances
- 5.8 – Landscape Watering Restrictions
- 6.2 – Toilet Rebate Program
- 6.6 – Water-Efficient Appliance Rebate Program
- 7.5 – Implementation of Smart Irrigation Technology

Customer Rebates

The town of Buckeye offers several financial rebates to incentivize wise water use, including:†

- *High-efficiency toilets* – $75 per toilet for replacing pre-1994 models, $50 for replacing post-1994 models.
- *Clothes washers* – $100 for an efficient front-load model.
- *Hot water recirculator* – $75 and must include timer. An additional $50 is available for insulating pipes, and the $33 building permit fee is waived.
- *Smart irrigation controller* – $100 and must use daily weather data to adjust run times.
- *Turf replacement* – $50-$100 per year for replacing high-water-use landscaping with Xeriscape or artificial turf.
- *Automatic water shut-off device* – $75 and must stop flow from water main in case of major water leak.

Ordinances/Rules

On June 2, 2009, the mayor and town council of the town of Buckeye adopted a water conservation ordinance amending the town code with the following water conservation provisions (this list is not comprehensive):‡

Water-Efficient Landscaping§ **–** Prohibitions of water-efficient landscaping are not allowed and are not

* Arizona Department of Water Resources. July 29, 2009. Official notice of provider profile approval, 56-002006.0000, Town of Buckeye.

† Town of Buckeye, Arizona. Rebates for water-saving devices and turf replacement. http://www.buckeyeaz.gov/index.aspx?NID=551 (accessed May 26, 2010). See also: Town of Buckeye, Arizona. 2010. Table 1: Town of Buckeye water bill credits, water conservation rebate table. http://www.buckeyeaz.gov/DocumentView.aspx?DID=1090 (accessed May 26, 2010).

‡ Buckeye, Ariz., Ordinance 14-09 (June 2, 2009).

§ Buckeye, Ariz., Code § 17-17-18 (2009).

enforceable if included in private covenants, conditions, restrictions, deed clauses or other agreements between parties. This includes the use of artificial/synthetic turf.

Turf Placement[*] **–** No new natural turf is allowed in public right-of-ways or medians.

High-Efficiency Urinals[†] **–** High-efficiency urinals (< 0.5 gallons per flush) must be installed in all town owned buildings constructed after January 1, 2010.

Metered Faucets[‡] **–** Self-closing faucets delivering no more than 0.25 gallons of water per use installed in lavatories intended to serve the transient public must be installed in lavatories of public and private facilities built after January 1, 2010.

Outdoor Irrigation Restrictions[§] **–** Outdoor spray irrigation is not allowed from 9 a.m. to 6 p.m. from March 15 to November 14; and between 11 a.m. to 6 p.m. from November 15 to March 14.

Automatic Shutoff Nozzles for Hoses[¶] **–** Required for all hoses used in hand-irrigation watering, car washing (including charity car washes), and other outdoor uses.

Voluntary Certification Program for Water-Efficient/ Recycling Carwash[**] **–** Car washes that receive town's certification may advertise their certified status.

Charity Car Washes[††] **–** Must use automatic shutoff nozzles in all hoses.

Washing of Sidewalks and Driveways[‡‡] **–** The use of potable water to wash driveways and sidewalks is prohibited.

Construction Water Plan[§§] **–** Developers and contractors must submit a detailed construction water plan when using groundwater for construction or dust control within the town's service area.

Water Leaks and Waste[¶¶] **–** Leaks or overwatering of private property that causes water to flow onto a public right-of-way, sidewalk, driveway, or adjacent property shall be promptly repaired or corrected by the owner within seven days of notification from the town.

Education

Water Conservation Website – The town of Buckeye hosts a Water Conservation webpage with links to its Water Conservation Plan, rebate programs, desert-appropriate landscaping information, and several water saving tips.

Public Relations and Awareness – Buckeye promotes public awareness via water bills, water bill inserts, brochures, messages on the town's webpage, newsletters, articles or messages in local newspapers, participation in EPA's WaterSense program, and various public service announcements.

School Education – The town provides Project WET K-12 teacher education materials designed to help introduce water conservation education into the classroom. The activities and instructional materials are also appropriate for town-sponsored water conservation education events. Approximately 130 school children attend the town's annual Public Works Week educational program.

Implementation of Conservation Measures

Buckeye just began offering rebate programs, but the town has seen good participation in its programs thus far. From January 1 through June 30, 2010, rebates were awarded for six clothes washers, three landscape conversions, and three toilet replacements. The town disbursed $1,100 for these rebates, not including labor for pre- and post-inspections, and estimates these replacements will save 232,200 gallons in 2010.

The town participated in an EPA WaterSense-inspired "Fix a Leak Week" event where conservation staff distributed water conservation promotional material and drip gauges at the local Lowe's and True Value Hardware stores—and True Value offered a 10% discount off leak repair supplies during the event. Staff also hosted a water conservation public event and distributed drip gauges, drip kits, dye tablets, toilet dams, and other informational materials; approximately 200 people attended the event.

[*] *Id. § 17-17-17(A).*
[†] *Id. § 17-17-19.*
[‡] *Id. § 17-17-20.*
[§] *Id. § 17-17-10(A).*
[¶] *Id. § 17-17-11(A).*
[**] *Id. § 17-17-12.*
[††] *Id. § 17-17-13.*
[‡‡] *Id. § 17-17-14.*
[§§] *Id. § 17-17-21.*
[¶¶] *Id. § 17-17-15.*

Funding for Conservation

In 2008, the town of Buckeye had a conservation budget of $39,800, approximately 1.4% of the total water utility's budget. The town utilizes two employees working part-time (25%) for its water conservation program. Each year the town spends about $1.05 per customer on conservation programs.

Goals for Conservation Savings

The town of Buckeye has set a conservation savings goal to reduce GPCD to 125 gallons per person, including residential and nonresidential water use. (There is no specific date by which to achieve this goal).

Water Loss

In 2008, Buckeye recorded 423 AF (137.9 million gallons) of water loss, representing 6.8% of total supplies. This is the highest rate of water loss compared to 2003 and 2007. Buckeye attributes some of this water loss to construction water thefts through fire hydrants, and notes that these thefts have declined in 2009 and 2010 due to the housing market slump.

Supply-Side Efficiency Measures

Buckeye is beginning to formulate an active leak detection program, but currently just repairs leaks when they surface.

The town generally replaces meters on a five-year cycle, which was determined to be the optimum time based on previous experience of meter wear. Buckeye has replaced approximately 50 meters each year for the past several years, but anticipates gradually increasing that amount to about 500 per year in 2012, as the general age of the town's meters become older and approach 2 million gallons in usage.

Effluent Use

The town generated 2,496 AF of effluent in 2008, delivering 41% of this total for direct use. Buckeye's Tartesso recharge facility currently uses two recharge basins that percolate about 135 AF per year. This facility is permitted up to a 20,000-AF capacity and will expand as population and effluent generation increase. In some areas around Buckeye, recharge is not allowed due to high groundwater levels. In these areas, Buckeye is planning to increase direct reuse of effluent.

Buckeye is in the process of updating its Water Resource Master Plan, which will set a minimum recharge goal of 35%. For every 100 gallons of groundwater pumped by the town, a minimum of 35 gallons of effluent must be recharged.

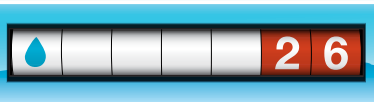
Buckeye also is involved in a groundwater savings facility relationship with agricultural interests near by. In this partnership, the town delivers effluent to the farmers, and in exchange, pumps groundwater that would have been used by the farmers.

Additional Information

Several homeowner associations in Buckeye are involved in an irrigation efficiency pilot program sponsored by the Central Arizona Groundwater Replenishment District (CAGRD). Twelve smart irrigation controllers have been installed for large landscapes at the HOAs, and data collection is proceeding.

The town will also be formulating a policy for solar power plants that encourages photovoltaic or dry-cooled solar compared to wet-cooled technologies because of the vastly different impacts these types of electricity generation have on water resources.

City of Casa Grande—Arizona Water Company



Background

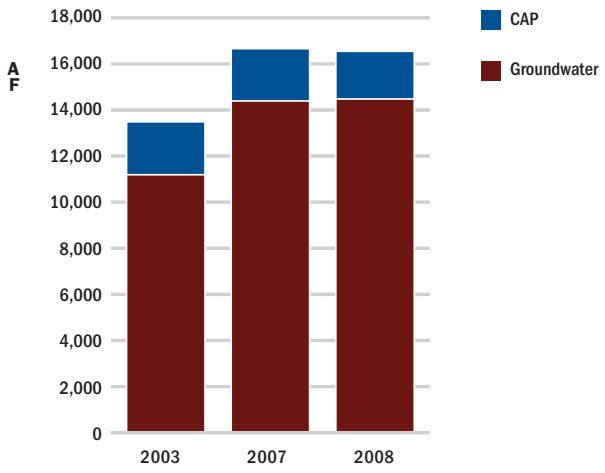
The city of Casa Grande is the largest community in western Pinal County, with a population of approximately 45,993 residents.* Water is provided to city residents by a private water utility, Arizona Water Company. Situated half-way between Tucson and Phoenix, the city has a land area of 109 square miles and lies in a valley with the Sacaton Mountains to the north and the Casa Grande Mountains to the south.

Located in the Sonoran Desert and within the Basin and Range physiographic province, average precipitation in Casa Grande is 9.22 inches per year. Average high temperatures in the summer are close to 100 degrees (ºF), and the lowest average temperature in the winter is 37 degrees (ºF).†

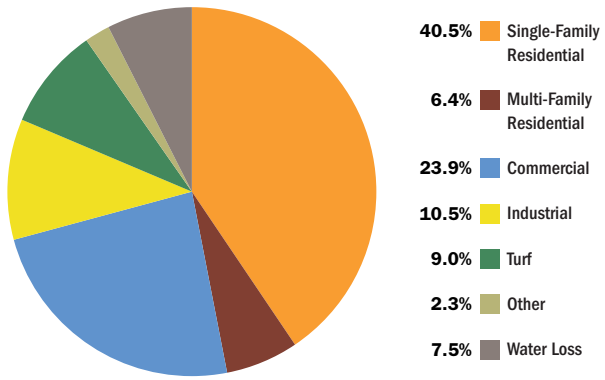
Water Supply and Deliveries

The Arizona Water Company (AWC) provides potable water service to citizens in Casa Grande, relying predominantly on groundwater to meet customer needs. Casa Grande is AWC's largest water system in the state, with over 20,000 single-family residential connections. In 2008, 88% of the water supplied to Casa Grande was sourced from 14 wells, with the remaining 12% coming from the Colorado River via the Central Arizona Project. Direct effluent use is not part of the water resource portfolio of AWC-Casa Grande because wastewater is handled by the city of Casa Grande. The majority of water delivered by AWC is used by single-family residential customers (40.5%), with commercial, industrial, and turf consumption making up most of the remaining demand.

SOURCES OF WATER FOR AWC–CASA GRANDE



2008 WATER USE IN AWC–CASA GRANDE



* Arizona Department of Commerce. 2009. *Arizona population estimates, 2009. Available at:* http://www.azcommerce.com/econinfo/demographics/Population+Estimates.html (accessed May 5, 2010).

† IDcide Local Information Data Server. Casa Grande, AZ weather. http://www.idcide.com/weather/az/casa-grande.htm (accessed April 12, 2010).

Per Capita

AWC-Casa Grande has significantly reduced gallons per capita per day (GPCD) water use from 2003 to 2008. Water consumption was reduced by an average of 41 gallons per person per day in the single-family residential sector (-30% change), and by 50 gallons per person per day system-wide (-19% change).

AWC–Casa Grande GPCD

Per Capita Water Use	2003	2007	2008
Single-Family Residential [a]	140	101	99
System-Wide Potable [b]	251	216	203
System-Wide Total [c]	269	226	219

a Treated water deliveries to single-family accounts ÷ single-family residential population

b Total treated water delivered ÷ service area population

c Total raw water from all supply sources + direct effluent use ÷ service area population

Rate Structure

AWC-Casa Grande uses a three-tier inclining block rate for residential water accounts.

Usage Per Dwelling Unit	Cost
0–3,000 gallons	$1.00 per 1,000 gallons
3,001–10,000 gallons	$1.49 per 1,000 gallons
Over 10,000 gallons	$1.65 per 1,000 gallons

Residential accounts have a base service fee of $10.48, which represents 36% of an average customer's monthly bill for 10,000 gallons, as well as an arsenic fee of $2.72 plus $0.2147 per thousand gallons of use. The slope of AWC-Casa Grande's average price curve is -0.0138, indicating that the average price of water declines as consumption volume increases.

Conservation Measures

AWC-Casa Grande is regulated in the Pinal Active Management Area as a large municipal provider under the Modified Non Per Capita Conservation Program (NPCCP). As a Tier-II municipal provider, it is required to implement a public education program and has selected the following five additional, state-approved water conservation best management practices:*

- 3.1 – Residential Audit Program
- 3.6 – Customer High Water Use Inquiry Resolution
- 3.8 – Water Waste Investigations and Information
- 4.1 – Leak Detection Program
- 4.2 – Meter Repair/Replacement Program

Customer Rebates

No rebates are currently offered to customers, either by AWC–Casa Grande or the city of Casa Grande.

Ordinances/Rules

International Plumbing Code Adopted† **–** The city of Casa Grande adopted the International Plumbing Code, which sets standards for high-efficiency plumbing fixtures and appliances to be used within a home.

Low-Water-Use Plants and Landscaping‡ **–** In order to conserve water, all plant materials installed shall be listed on the city's low-water-use plant list. Any plants located in public right-of-ways must be listed on the plant list.

Irrigation Standards§ **–** All landscaped areas shall be supported by an automatic irrigation system, which may be a spray, bubbler, or drip-type system. All irrigation systems and landscaped areas shall be designed, constructed, and maintained so as to promote water conservation and prevent water overflow or seepage into the street, sidewalk, or parking areas.

Excessive Water Flow¶ **–** Causing or permitting to cause excessive water flow onto public streets is unlawful.

Education

Water Audit Program – An AWC Water Conservation Auditor will conduct a free internal water audit for any single-family residential, multifamily residential, or nonresidential customer to address water conservation opportunities. A written conservation recommendation

* ADWR List of Best Management Practices (adapted from the 2nd Modification to the Third Management Plan Chapter 5, May 2008).

† Casa Grande, Ariz., Code § 15.16 (2010).

‡ *Id § 17.52.410.*

§ *Id § 17.52.440.*

¶ *Id § 9.12.090.*

will be furnished to the customer along with selected conservation pamphlets upon completion of the audit.

Water Conservation Webpage – AWC maintains a water conservation webpage that includes a description of its water conservation programs, provides links to more than 20 water conservation brochures and activity books, and lists several free "giveaways" for customers.

Helpful Hints to Reduce Water Use – A water conservation informational leaflet is included in mailed notices and other public notices of curtailment during temporary water shortages.

For Kids – AWC's website provides educational material targeted specifically to children, including several brochures, activity books, and links to outside websites.

Implementation of Conservation Measures

As a participant in the Modified NPCCP, AWC-Casa Grande is required to submit a conservation efforts report each year that details the success of its programs. In 2009:

- 32 scheduled water audits were conducted.
- Over 200 high-water-use inquiries were investigated and resolved, the majority resulting from leaky irrigation systems and toilets.
- More than 5,000 pieces of written water conservation information and giveaways were distributed.
- AWC attended a home and garden show and an Arizona Project WET water festival to increase customer contact opportunities.

Funding for Conservation

AWC-Casa Grande does not track conservation funding or spending as a separate line item in its budget—it is lumped in with other costs. This is primarily because the Arizona Corporate Commission (ACC) has not allowed cost recovery for conservation spending in the past; thus, AWC did not have a need to track this type of information. The ACC may allow cost-recovery in the near future, so AWC may begin collecting and tracking conservation expenditures in the next few years.

Goals for Conservation

AWC-Casa Grande's goals are to maintain compliance with the Modified NPCCP, keep lost and unaccounted for water below 10%, resolve customer concerns in a timely manner, and provide customers with beneficial conservation information whenever possible.

Water Loss

In 2008, AWC-Casa Grande recorded 1,238 AF (403 million gallons) of water loss, representing 7.5% of total water supplies. AWC-Casa Grande tracks 11 categories of water use other than sales, including such uses as construction water and fire flows. Data indicates that AWC-Casa Grande consistently maintains system losses below 10%.

Supply-Side Efficiency Measures

AWC-Casa Grande utilizes an active leak detection program to minimize physical line losses. A leak detection logger is used to survey large areas of the distribution system to locate potential leaks. Then a leak correlator is used to pinpoint the location of leaks identified by the detection logger. Identified leaks are repaired in a timely manner.

AWC's meter shop has established specific replacement criteria based on total gallons and length of time in service for meters in the Casa Grande system. These criteria differ for each of AWC's water systems, based on water quality, temperature, and other factors that affect meter wear. The meter shop also periodically tests Casa Grande meters to provide an ongoing assessment of the replacement criteria. The current replacement schedule for residential-size meters in Casa Grande is:

- 5/8" meters – 1 million gallons/10 years
- 1" meters – 3 million gallons/10 years

In 2009, 1,205 meters were repaired or replaced in the Casa Grande system. There were also three visits from other water companies to the meter shop to discuss adoption of AWC's meter repair and replacement program.

Effluent Use

AWC-Casa Grande does not deliver effluent for reuse because wastewater services are handled by the city of Casa Grande. However, the city and AWC recently participated in a joint planning effort to produce a Reclaimed Water Use Conceptual Master Plan. The plan:

- Provides a high-level analysis of the reclaimed water use alternatives available for implementation within the planning area.
- Evaluates the potential costs, benefits, technical challenges, regulatory issues, and financing alternatives for effluent reuse options.
- Provides a recommended implementation action plan, including system funding alternatives.
- Discusses and provides a potential framework for a memorandum of understanding between Casa Grande and Arizona Water Company designed to facilitate reclaimed water use within the service area.
- Identifies additional engineering, hydrologic, and financial analyses required.

Due to the economic recession, plans for integrating reclaimed water between AWC and the city have slowed substantially.

The city of Casa Grande produces approximately 6,700 AF of wastewater per year and delivers about half of this total to industrial customers.* The other half of treated effluent is discharged to the local wash. Currently, the city does not receive recharge credits for this water, but it will after implementation of the Reclaimed Water Use Master Plan.

Additional Information

AWC is working with Arizona Project WET to develop activities and educational materials for middle-school-aged children in Casa Grande. AWC addresses energy use by primarily relying on its most efficient wells—when demands increase, production is ramped up at wells with lower efficiency.

* Personal communication between Jon Parrish, Wastewater Division, Casa Grande Public Works, and Drew Beckwith, July 15, 2010.

City of Chandler

Background

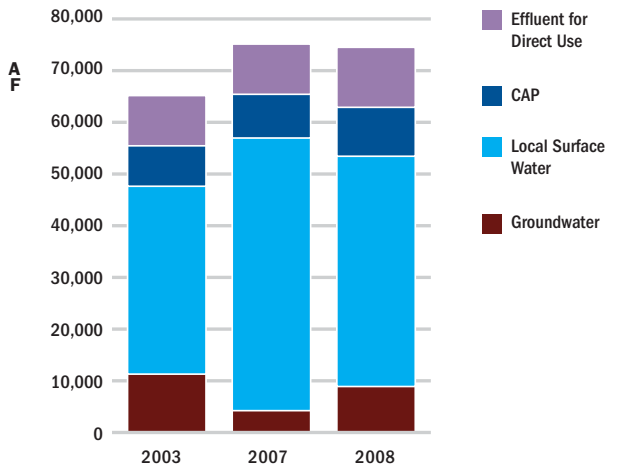
The city of Chandler has an estimated population of 245,087 living within an incorporated area of 70 square miles.* The city is located in Maricopa County, less than five miles south of the Salt River, nestled in an open valley between the San Tan Mountain Regional Park (to the south), the Phoenix South Mountain Park (to the west), and the Tonto National Forest mountains (to the east).

Chandler is located in the Basin and Range physiographical province. The city has an average annual precipitation of 9.2 inches, and average high and low temperatures of 100 and 40.5 degrees (ºF), respectively.†

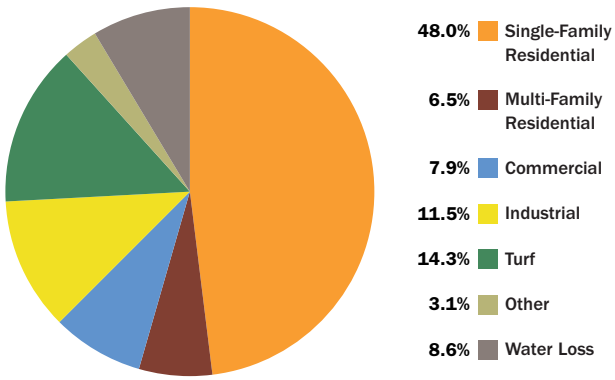
Water Supply and Deliveries

The city of Chandler relies heavily on local surface water supplies, with water delivered via the Salt River Project originating from the Salt and Verde Rivers comprising the vast majority of total water supply. Notably, the city supplied more effluent for direct use (20,956 AF) in 2008 than it did in Central Arizona Project water (9,448 AF) and groundwater water (9,081 AF), combined. The single-family residential sector received almost half (48%) of the total water deliveries in 2008 and turf (at 14.3%) is the second-highest water consumer in the city.

SOURCES OF WATER FOR CHANDLER



2008 WATER USE IN CHANDLER



* Arizona Department of Commerce. 2009. *Arizona population estimates, 2009. Available at:* http://www.azcommerce.com/econinfo/demographics/ Population+Estimates.html (accessed May 5, 2010).

† IDcide Local Information Data Server. Chandler, AZ weather. http://www.idcide.com/weather/az/chandler.htm (accessed April 12, 2010).

Per Capita

The city of Chandler has reduced its gallons per capita per day (GPCD) water use from 2003-2008 across all metrics: single-family residential (-4.3% change), system-wide potable (-9.5% change), and system-wide total (-7.1% change). From 2003-2008, system-wide water consumption was reduced by an average of 20 gallons per person per day.

Chandler GPCD

Per Capita Water Use	2003	2007	2008
Single-Family Residential [a]	148	153	142
System-Wide Potable [b]	222	213	201
System-Wide Total [c]	281	266	261

a Treated water deliveries to single-family accounts ÷ single-family residential population

b Total treated water delivered ÷ service area population

c Total raw water from all supply sources + direct effluent use ÷ service area population

Rate Structure

The city of Chandler uses two four-tier inclining block rates for individual residential water accounts inside the city (one for the summer season, one for the winter).

Summer

Usage Per Dwelling Unit	Cost
0–10,000 gallons	$1.48 per 1,000 gallons
10,001–20,000 gallons	$1.99 per 1,000 gallons
20,001–60,000 gallons	$2.49 per 1,000 gallons
Over 60,000 gallons	$3.11 per 1,000 gallons

Winter

Usage Per Dwelling Unit	Cost
0–10,000 gallons	$1.48 per 1,000 gallons
10,001–20,000 gallons	$1.83 per 1,000 gallons
20,001–60,000 gallons	$2.29 per 1,000 gallons
Over 60,000 gallons	$2.86 per 1,000 gallons

Residential accounts have a base service fee of $8.21 for both the high and low seasons, which represents 36% of an average customer's monthly bill for 10,000 gallons. For the low season (winter), the slope of the city's average price curve is 0.0015, indicating that the average price of water remains relatively constant as consumption increases. The slope for the high season (summer) is 0.0044, indicating that the average price of water during the high season also remains relatively constant.

Conservation Measures

The city of Chandler is currently regulated in the Phoenix Active Management Area as a large municipal provider under the Non-Per Capita Conservation Program (NPCCP). As part of this program, Chandler reports on 12 Reasonable Conservation Measures to ADWR. The city recently applied for the MNPCCP and has selected the following best management practices* — based on an evaluation of gallons saved per dollar spent — which have been approved by the city council.

- 1.1 – Local and/or Regional Messaging Program
- 2.1 – Adult Education and Training Programs
- 2.2 – Youth Conservation Education Programs
- 3.1 – Residential Audit Program
- 3.2 – Landscape Consultations (Residential and/or Non-Residential)
- 3.7 – Customer High-Water-Use Notification
- 4.1 – Leak Detection Program
- 6.9 – Landscape Conversion Rebate/Incentive
- 6.10 – Xeriscape Installation Rebate in New Landscapes
- 7.5 – Implementation of Smart Irrigation Technology

Customer Rebates

The city of Chandler offers several financial incentive programs to its customers, which focus primarily on outdoor water use:†

- *Faucet aerators and low-flow showerheads* – Free to homes built prior to 1992.
- *Clothes washer* – $100 for a qualifying machine with a water factor of 6 or less.
- *Irrigation controller* – $50 for the timer, plus a $22 reimbursement of the permit fee.
- *Landscape conversion* – $600 for removing turf and replacing with low-water-use plants.

* ADWR List of Best Management Practices (adapted from the 2nd Modification to the Third Management Plan Chapter 5, May 2008).

† City of Chandler, Arizona. Rebate programs. http://www.chandleraz.gov/default.aspx?pageid=746 (accessed June 1, 2010).

- *New landscapes* – $200 for installing front and back yard landscaping with a minimum of 50% of the area with non-grass elements.
- *HOA irrigation controllers* – $200 for each evapotranspiration-based irrigation controller for use on turf areas greater than 5,000 sq. ft.
- *HOA landscape conversion* – $200 per 1,000 sq. ft. (maximum $3,000) to remove turf and replace with low-water-use landscaping.

Ordinances/Rules

International Code Adoption[*,†] – Chandler has adopted the International Plumbing Code and International Energy Conservation Code. These codes set standards for water- and energy-efficient appliances, fixtures, and building techniques.

Waste of Water[‡] – It is unlawful to willfully or negligently permit or cause the escape or flow of water in such quantity as to cause flooding, impede vehicular or pedestrian traffic, create a hazardous condition, or cause damage to the public streets.

Tampering Forbidden[§] – It is unlawful for any person to start or stop the pumping plants, operate control switches on water storage facilities, open or close any fire hydrant, remove the covers of gate valves, or in any fashion otherwise tamper with the city water system without the permission of the city.

Requirements for New Nonresidential Water Users[¶] – New users of 9,000 gallons or more per day must submit a "water use plan" sealed by an Arizona registered architect or engineer that should contain, at a minimum, a description of any available water conservation training programs offered to employees; whether alternative water sources will be used; whether the user will use the best available conservation technologies in accordance with existing process uses; any plans for the reuse of wastewater or process water at the facility; and the type of landscaping and irrigation system planned.

Xeriscape Landscapes for New Developments[**] – Landscapes must be designed, installed and maintained in accordance with the seven detailed basic principles of Xeriscape: water conservation design, limited turf areas, utilization of the most efficient irrigation system, soil improvements, mulching, use of only approved lower-water-demand plants, and appropriate maintenance. Single- and two-family dwellings are exempt.

Landscape Standards[††] – Additional landscape standards include:

- Turf areas greater than five acres must be watered with reclaimed water if available.
- Unless watered with reclaimed water, turf must be limited to 20% of landscaped area in model homes; 10% in nonresidential, commercial/institutional, and industrial land uses; and 40% in multifamily housing and open space/retention basins.
- Decorative water features should use reclaimed water when possible and shall be allowed only within small-scale, pedestrian-oriented places.
- Model homes shall use plants contained on the city-approved low-water-use plant list and shall have a literature package describing water-conserving landscaping on display within all model sales offices.

Education

Efficiency Program for Targeted Neighborhoods – Neighborhoods identified to have higher-than-average water use receive retrofit kits, water audits, irrigation system improvements, and efficient fixtures at no charge.

Landscape Information Packets – These packets are delivered to all owners of newly constructed houses, and information about available programs is mailed to all new owners of existing homes.

On-Site Consultations on Low-Water-Use Landscaping and Efficient Watering Practices – The city offers irrigation advice and a landscape assistance program to either establish Xeriscapes or convert high-water landscapes into ones with low water usage.

* Chandler, Ariz., Code § 29-4 (2010).
† *Id. § 29-8.*
‡ *Id. § 30-5(A)(12).*
§ *Id. § 52-9.*
¶ *Id. § 35-1902(9).*

** *Id. § 35-1903.*
†† *Id. § 35-1903.*

High-Water-Use Notification – Chandler initiated a proactive high-water-use notification program in 2001.

Demonstration Gardens – Chandler maintains three demonstration gardens—Hummingbird Habitat, Arrowhead Xeriscape Garden, and the Main Library—which provide visitors with a visual representation of low-water-use landscape techniques, plus interpretive signs and displays featuring low-water-use plants and desert landscape techniques.

Free Indoor and Outdoor Water Audits – Chandler provides free residential water audits that include site inspection and information on efficient water use, both in the landscape and in the home. In addition, the city provides a free self-water-audit guide and kit to homeowners.

Customized Landscape Water Budget – A customized water budget based on landscaped area and plant material is provided on request to help HOAs and multifamily customers manage their water application.

AMWUA Membership – As a member of Arizona Municipal Water Users Association, Chandler participates in the "Water—Use It Wisely" messaging campaign, SmartScape Training Program, outreach at tradeshows and conferences, and distribution of AMWUA brochures, such as "Landscape Plants for the Arizona Desert" and "Watering by the Numbers."

Public Outreach – The city is involved in several general education campaigns, including media outreach through television and radio commercials, webpages, brochures, and magnets; educational/promotional events staffed by conservation staff; and landscaping and water conservation workshops, conferences, and lectures.

EPA WaterSense Program – Chandler is a WaterSense promotional partner and promotes WaterSense through its website and via special campaigns, such as "Fix a Leak Week."

Annual Art and Calendar Contest – The utility partners with Chandler public schools to sponsor the Environmental Art Contest. Winners have artwork displayed in a calendar that is distributed to 15,000 Chandler residents. The utility typically receives 800-1,200 entries each year from Chandler fourth-grade students.

Classroom Education – Chandler uses Project WET curriculum materials to provide customized conservation activities to classrooms on request and provides free water conservation assemblies and workbooks for more than 10,000 elementary school students each year.

Implementation of Conservation Measures

Chandler reports the following successes with its ongoing water conservation programs:

- 1,172 water audits have resulted in 43.8 million gallons of water savings.
- 8 HOA customized landscape budgets were implemented, saving 2.13 million gallons.
- 4,428 adults were reached through education classes.

Rebate Program	No. of Rebates 2003–2009	Funds Distributed 2003–2009	Water Savings (gallons)	Notes
Residential irrigation controller	1,430	102,960	na	
Residential Xeriscape installation at new homes	2,308	461,600	na	
Residential turf removal	599	220,855	12,302,000	1,119,454 sq. ft. of turf removed
Clothes washer	3,537	353,700	37,654,902	Started April 2008
Smart irrigation timers for HOAs	12	2,400	7,976,000	Started April 2008
HOA landscape conversion	11	23,300	3,322,648	Started April 2008
Retrofit kits	616	na	1,862,000	2003-2008, free for customers
	Total Funds	**$1,164,815**		

- 154 teachers have been trained in Project WET conservation activities.
- 79,351 K-12 students have been reached in classroom education programs.

In addition to these measures, Chandler has achieved significant additional savings through its rebate program, as shown below:

Surveys – In a 2007 report prepared by BBC Research, Chandler consistently ranks first or second in conservation awareness programs, compared to other AMWUA cities.

Monitoring of Weather-Based Irrigation Controllers – Chandler has installed 41 new controllers since 2008, saving approximately 1.25 million gallons per year at a rate of 30,500 gallons per year per controller.

Monitoring Use of ET Controllers – Chandler has been monitoring the use of ET controllers in several of its HOA common-area landscapes. Results show significant water savings, on the order of eight million gallons per year for controllers installed during 2008 and 2009.

Funding for Conservation

Water conservation is housed within Chandler's Environmental Resources section of the Municipal Utilities Department. In FY 08/09, Environmental Resources had a budget of $1,964,000, 7.1% of the total water utility's budget. Two and a half full-time-equivalent employees work in water conservation, and each year the city spends about $1.77 per customer on water conservation programs.

Water Loss

In 2008, the city recorded 5,437 AF (1.77 million gallons) of water loss, representing 8.6% of total supplies. Water loss in Chandler appears to remain relatively constant over the years of data collection, between 7% and 8%.

Supply-Side Efficiency Measures

As part of Chandler's water loss program, it has checked over 400 miles of pipe in the last six years, saving an estimated 8,825,700 gallons of water.

Each year the water conservation office funds the replacement of over 200 meters sized 2" or larger. Over the past three years, Chandler has also replaced over 27,000 residential meters, and will continue replacing about 3,000 per year going forward.

The city uses leak detection and meter maintenance to ensure accuracy of its meters. An asset management program is in place that monitors the age and life cycle of all water distribution components. Over 27,000 AMR meters with data-logging capability have been installed that can track water use down to one-hour increments.

Effluent Use

The city reused all of the 20,956 AF of effluent it generated in 2008. Approximately 55% (11,542 AF) of the effluent was for direct use, and the remainder evenly split between recharge and an exchange program.

Additional Information

The water resources department considers energy costs when determining which wells are used to supply groundwater. Energy use and efficiency is calculated for each well, and operations are coordinated to ensure the least amount of energy is used during pumping.

Town of Clarkdale

Background

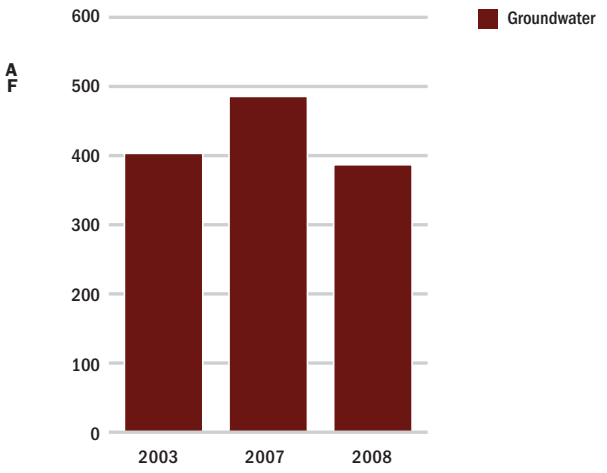
The town of Clarkdale—population 4,030—is part of Yavapai County in north-central Arizona.* The town is located on the banks of the Verde River, as it cuts through red rock canyon country and the northeastern part of the Mingus Mountain Range.

Clarkdale lies within the northern edge of the Central Highlands Transition Zone, just south of the Colorado Plateau. The average precipitation is 12.7 inches, with rainfall evenly distributed throughout the year. Average high temperatures in the summer are approximately 99.6 degrees (ºF), and the lowest average temperature in winter is 30.6 degrees (ºF).†

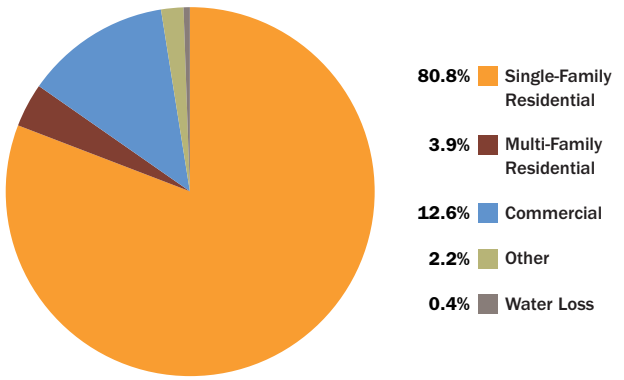
Water Supply and Deliveries

The town of Clarkdale purchased a private water utility in 2006 and consequently assumed all operations and maintenance of the town's water supply system. Water supply in Clarkdale is sourced entirely from groundwater, and the overwhelming majority of treated water is delivered for single-family residential use (81%).

SOURCES OF WATER FOR CLARKDALE



2008 WATER USE IN CLARKDALE



* Arizona Department of Commerce. 2009. *Arizona population estimates, 2009. Available at:* http://www.azcommerce.com/econinfo/demographics/ Population+Estimates.html (accessed May 5, 2010).

† IDcide Local Information Data Server. Clarkdale, AZ weather. http://www.idcide.com/weather/az/clarkdale.htm (accessed July 5, 2010).

Per Capita

The town of Clarkdale has achieved a reduction in gallons per capita per day (GPCD) water use since assuming control of the water supply system. From 2006-2008, the town reduced residential use by 11%, system-wide potable use by 6.5%, and system-wide total use by 10%.

Clarkdale GPCD

Per Capita Water Use	2006	2007	2008
Residential [a]	82	81	73
System-Wide Potable [b]	92	97	86
System-Wide Total [c]	97	109	86

a Treated water deliveries to residential accounts ÷ service area population

b Total treated water delivered ÷ service area population

c Total raw water from all supply sources + direct effluent use ÷ service area population

Rate Structure

The town currently uses a three-tier inclining block rate for residential water accounts, and includes the first 1,000 gallons of water within the base service fee.

Usage Per Dwelling Unit	Cost
1,001–10,000 gallons	$4.00 per 1,000 gallons
10,001–20,000 gallons	$5.60 per 1,000 gallons
Over 20,000 gallons	$7.84 per 1,000 gallons

Residential accounts have a base service fee of $23.50, which represents 36% of an average customer's monthly bill for 10,000 gallons. Customers are also charged several additional fees each month, including $4.00 for Water Resource Development, $0.32 for Yavapai County Water Advisory Committee, $0.41 for Gila River Adjudication, and $0.25 for Water Conservation Program. The slope of Clarkdale's average price curve is 0.0247, indicating that the average price of water increases as consumption volume increases.

Conservation Measures

As a Community Water System in the Verde River Basin, Clarkdale has prepared a water conservation plan as part of its system water plan.

Customer Rebates

The town of Clarkdale does not currently offer any financial rebate programs.

Ordinances/Rules

Landscape Design Standards* – The plant materials used for landscaping shall be primarily native or drought-tolerant and conform to the city's official plant list. The majority of each design plan must utilize Xeriscape concepts and incorporate energy and water conservation practices. Use of gray water is encouraged.

Standards for Golf Course Developments† – Applicant must submit a water management and monitoring plan demonstrating a project meets ADWR's standards for golf courses within AMAs. The development must be able to generate a sufficient amount of effluent to meet the entire irrigation needs of the golf course. Golf course water use is limited to no more than five irrigated acres per hole.

Demand Reduction Strategies‡ – Strategy Level I ("Water Alert") is automatically in effect from May 1 through September 30, and is strongly encouraged on a daily basis at all other times of the year. Some mandatory measures include:

- Residential landscaping shall be accomplished with plant materials that require little or no supplemental irrigation water.
- Outdoor water use is prohibited between the hours of 9:00 a.m. and 5:00 p.m., and watering days are coordinated with a resident's address.
- Cooling of outdoor areas with water or misting devices is prohibited.
- Restaurants shall serve water to customers upon request only.
- Hotels shall wash a customer's linens if a stay is in excess of one night on request only.
- Automobile washing shall only be undertaken with a bucket and hose with shut-off nozzle, using other water-saving devices, such as a pressure washer, or at carwashes that recycle or recirculate water.

* Clarkdale, Ariz., Code § 9-1 to -9 (2010).

† *Id. § 12-8-01.*

‡ *Id. § 19-11-4 to -6.*

- Construction projects are required to use reclaimed water or effluent for construction and dust control purposes.

Water Conservation Code* – Article 19-12 has been reserved for the town's Water Conservation Code, which is currently under development.

Evaporative Coolers† – Evaporative coolers shall not be installed in new buildings or additions. Evaporative coolers are permitted only as a replacement for coolers and must have a water recirculating device.

Water Heating Systems‡ – All water heating systems shall be equipped with a recirculating pump, manifold, or similar approved device, unless the farthest fixture using hot water is 10 feet or less from the water heater. All hot water piping shall be insulated.

Permitted Lawn Irrigation Systems§ – Low-water-use drip systems are permitted for new and replacement lawn irrigation systems. Sprinkler systems may be repaired only and not expanded or installed except for permitted new or expanded turf.

Water System Damage¶ – No person shall maliciously, willfully, or negligently, break, damage, uncover, deface, or tamper with any structure or equipment that is a part of the municipal water system.

Water Waste** – It is unlawful for any person to willfully or negligently permit or cause the escape or flow of water or irrigation water in such quantity as to cause flooding, impede traffic, create a hazardous condition, or cause damage to the public streets of the town.

Education

Website – The Water Division of the town of Clarkdale hosts a webpage that provides educational information and materials to customers. The webpage details water quality and conservation information, including a link to the town's Drought and Water Shortage Preparedness Plan, and Conservation Tips. It also offers information on the town's watering schedule and historical water use.

Outreach – The town provides water conservation methods and tips in monthly billing statements. Conservation information and articles are also featured in the town-wide newsletter.

School Programs – Water conservation staff provides education to the local elementary school.

Implementation of Conservation Measures

Clarkdale has not levied any fines due to ordinance violations; rather, warnings and additional water conservation literature is provided to first-time violators. The town provides water conservation education to approximately 80 elementary students each year.

Funding for Conservation

In 2008, the town of Clarkdale had a conservation budget of $4,305, approximately 0.3% of the total water utility's budget. All seven of the water utility's employees participate in conservation programming and efforts at some level. Each year the town spends about $1.07 per customer on conservation programs.

Goals for Conservation Savings

Clarkdale's goal is to reduce GPCD water use across its system. The town started tracking GPCD in 2007 and has a goal to reduce use 6% between 2007 and 2009, from 82 GPCD to 77 GPCD, respectively.

Water Loss

In 2008, Clarkdale recorded 2 AF (652,000 gallons) of water loss, representing 0.4% of total supplies. This is substantially lower than water loss reported for 2007 at 52 AF (11%). For the period of data collection, Clarkdale and Cottonwood (a neighboring community) had an unmetered inter-municipal connection that made determining exchange water difficult, which may play into the low-water-loss number for 2008.

Supply-Side Efficiency Measures

Clarkdale recently contracted a study to determine leaks in the town's infrastructure. In response to the study,

* *Id. § 19-12.*

† *Id. § 7-2-1(AB) (amending Residential Code for One and Two Family Dwellings of the Town of Clarkdale).*

‡ *Id. §§ 7-3-1(L),(M) (amending Plumbing Code of the Town of Clarkdale). See also Id. § 7-2-1(AI) (amending Residential Code for One and Two Family Dwellings of the Town of Clarkdale).*

§ *Id. § 7-3-1(N) (amending Plumbing Code of the Town of Clarkdale).*

¶ *Id. § 19-7-2(H).*

** *Id. § 10-1-20.*

Clarkdale anticipates it will change out 135 water meters within the next year.

Effluent Use

Clarkdale captures and reuses all the effluent it generates. In 2008, the town generated 126 AF, and delivered 125 AF for recharge. The town is working on upgrading the quality of its effluent, so more reuse options will be available in the future.

Additional Information

The town has submitted grant applications to generate solar electricity for operating the water system.

Lake Havasu City

Background

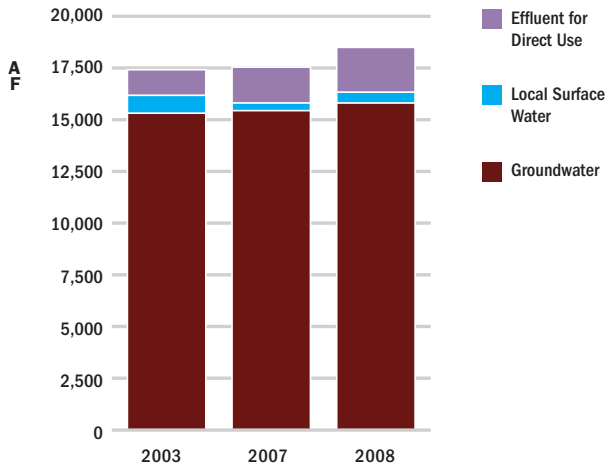
Lake Havasu City is located along the Colorado River on the eastern shore of Lake Havasu. The city is the largest municipality in Mohave County, with an estimated population of 55,502 residents.*

Lying in the Basin and Range physiographic province, Lake Havasu City has a low-elevation, desert climate, with average maximum and minimum temperatures of 86.6 and 63.9 degrees (ºF), respectively. Average annual precipitation is 4.2 inches.†

Water Supply and Deliveries

In 2008, 86% of the water supplied to Lake Havasu City was sourced from groundwater wells, with a small amount directly diverted from Lake Havasu. Legally, most groundwater within the Lake Havasu service area is considered Colorado River water and is tracked according to Lower Colorado River decree accounting. Over the time period of 2003-2008, the city's system-wide potable treated deliveries remained relatively flat, even while population increased 10%. The city attributes this response to a progressive sewer rate structure based on water consumption (enacted to fund the transition of Lake Havasu City from a septic to a sewered system) and the general economic downturn of the past several years. Approximately half of all deliveries in 2008 went to single-family residential accounts and 10% was delivered for turf management.

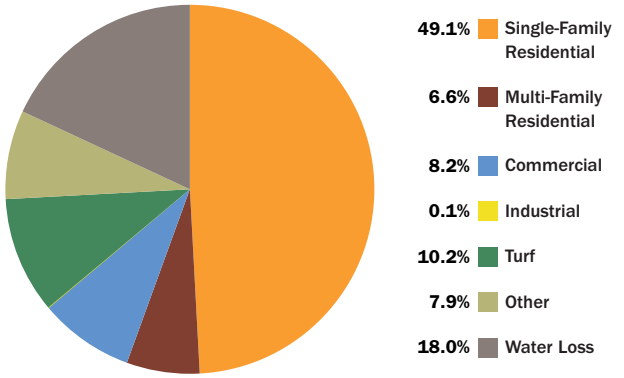
SOURCES OF WATER FOR LAKE HAVASU CITY



* Arizona Department of Commerce. 2009. *Arizona population estimates, 2009. Available at:* http://www.azcommerce.com/econinfo/demographics/Population+Estimates.html (accessed May 5, 2010).

† Personal communication between Doyle Wilson, Water Resource Coordinator, Lake Havasu City Public Works, and Drew Beckwith, July 20, 2010.

2008 WATER USE IN LAKE HAVASU CITY



Per Capita

Lake Havasu City notably reduced its gallons per capita per day (GPCD) water use from 2003 through 2008 across all metrics: single-family residential (-14.9% change), system-wide potable (-14.2% change), and system-wide total (-4.2% change).

Lake Havasu City GPCD

Per Capita Water Use	2003	2007	2008
Single-Family Residential [a]	145	133	124
System-Wide Potable [b]	259	240	222
System-Wide Total [c]	319	290	306

a Treated water deliveries to single-family accounts ÷ single-family residential population

b Total treated water delivered ÷ service area population

c Total raw water from all supply sources + direct effluent use ÷ service area population

Rate Structure

Lake Havasu City uses a four-tier inclining block rate for single-family water accounts, measured in Ccf.

Usage Per Dwelling Unit	Cost
0–9,724 gallons (0–13 Ccf)	$1.35 per 748 gallons (per Ccf)
9,725–18,700 gallons (13.01–25 Ccf)	$1.76 per 748 gallons (per Ccf)
18,701–37,400 gallons (25.01–50 Ccf)	$2.16 per 748 gallons (per Ccf)
Over 37,400 gallons (over 50 Ccf)	$2.70 per 748 gallons (per Ccf)

Residential accounts have a base service fee of $5.16, which comprises approximately 28% of an average customer's monthly bill for 10,000 gallons. The slope of the Lake Havasu City's average price curve is 0.0135, indicating that the average price of water increases as consumption volume increases.

Conservation Measures

As a Community Water System in the Lake Havasu Basin, Lake Havasu City has prepared a water conservation plan as part of its system water plan. In addition, the city is also in the process of updating its conservation plan, as required by the Bureau of Reclamation (BoR), which will be completed by the end of 2010.

Customer Rebates

Lake Havasu City offered a rebate program in 2008 for replacing high-volume toilets with new low-flow models and a partial rebate on swimming pool covers. BoR grant funds were not available in 2009, but a new grant will initiate another rebate program covering toilets, pool covers, and hot water recirculation pumps in 2010-2011.

Ordinances/Rules

Commercial and Industrial Water Conservation and Sustainability* – Water conservation measures shall be addressed through landscape and irrigation design. Sustainable landscapes are encouraged through actions

* *Id. § 14.32.030(G).*

that conserve, recycle, and reuse the resources that are invested in landscapes. The use of drought-tolerant landscape materials and low-water-flow irrigation systems is encouraged.

Water Conservation* – Bodies of water (e.g., fountains, streams, ponds, lakes, and displays using water) shall be discouraged in single and two-family residential properties. Xeriscape landscaping materials and methods shall be encouraged. All landscaping materials and irrigation practices shall be in compliance with the city's water conservation plan and water conservation plant material list.

Specific Low-Flow Fixtures and Devices Required† – Specific low-flow plumbing fixtures and devices shall be installed in every new building and when a replacement fixture or device is required in any building.

Bodies of Water‡ – Outdoor bodies of water (e.g., fountains, streams, lakes, and displays using water) shall not be used in multifamily, commercial, or industrial developments, and are discouraged on single- and two-family residential properties.

Waste of Water Prohibited§ – Wasting water is prohibited during federally declared Colorado River shortages that result in a direct reduction to the city's annual allocation.

Water Flow Upon Streets¶ – It is unlawful for any person to willfully or negligently permit or cause the escape or flow of water in such quantity as to cause flooding, impede vehicular or pedestrian traffic, create a hazardous condition to such traffic or to the public in any manner, or cause damage to public streets and other public facilities of the city.

Education

More than 50% of the city's water is used for landscape irrigation in the residential sector. Consequently, Lake Havasu City has focused its education efforts on reducing outdoor water use for the past several years.

Education and Outreach, "Slow the Flow Campaign" – The city promotes this educational campaign during summer months by utilizing all forms of media advertising. The city also has proposed a Water Conservation Community Campaign.

Brochure Program – This program is targeted to different user types, with different methods of education being developed for each class to target the most effective conservation methods for residential, commercial, and school customers.

Customer Audit Program – The city offers free water audits that include water pressure checks, high-water-use complaints, and interior and exterior evaluations, supplemented with the city's landscape ordinance materials. Lake Havasu City proactively assesses high water users in each customer category and targets these accounts for audits and education.

Landscape Audits – These audits are provided to supplement city landscape ordinance materials.

Water Conservation Webpage – Lake Havasu City has a water conservation webpage with links to its Low-Water Tree and Plant Guide and its Recommended Landscape Plant List for Reduced Water Demand.

Water Conservation Workshops – The city will begin offering water conservation workshops to the general public on a quarterly basis staffed by the city's water conservation officer. Workshops will cover how to read a water meter and how to properly use irrigation systems, especially during the winter.

Water Conservation Classes – The water conservation officer provides education to second- and fourth-grade public school students.

Implementation of Conservation Measures

The city maintains a measurement and accounting system to provide quantitative and qualitative tracking and assessment of its conservation plan programs. Each year, Lake Havasu City completes about 1,000 water audits and reaches 1,200 students through its programs.

Funding for Conservation

In 2008, Lake Havasu City had a conservation budget of $70,000, approximately 1.4% of the total water utility's budget. The city has two employees in the water conservation department and each year spends about $1.30 per customer.

* *Id. § 13.16.090.*
† *Id. §§ 12.08.100(A)-(E).*
‡ *Id. §§ 14.32.020(E),(D).*
§ *Id. § 7.20.020.*
¶ *Id. § 9.16.140.*

Goals for Conservation Savings

In 2005, Lake Havasu adopted goals to reduce water use by 10-30 GPCD over a five-year period. New goals are still being formalized in the 2010 water conservation plan, but generally include plans to:

- Convert as many potable nonresidential irrigators to effluent as possible.
- Better educate residential customers about landscape irrigation practices and maintenance.
- Develop an effluent injection program that will allow the city to retrieve the water without it counting against its Colorado River allocation.

Water Loss

In 2008, the city recorded 2,952 AF (961 million gallons) of water loss, representing 18% of total supplies. In 2007, the city reported 8.6% water loss. Lake Havasu City has experienced several challenges with metering inflows to its potable water treatment plant—replacing the meter on the 48" intake pipe four times in the past decade. The city recognizes that losses occur between the treatment plant and utility customers, estimating these losses to be between 8% and 10%. Through the summer of 2010, the utility will recalibrate its meters and be able to more accurately report water loss.

Supply-Side Efficiency Measures

The city has an active water distribution system audit program and uses leak detection equipment to identify and repair leaks. Program elements include water main replacements, replacing plastic pipes with more durable copper pipe, and line leak detection—where over 200 miles of line has been checked in the last five years.

The city has constructed a flexible effluent system that allows transport of treated and untreated wastewater to or from any of the three wastewater facilities. This promotes the use of effluent for golf courses, highway landscaping, and future non-potable customers.

Effluent Use

The city reused all of the effluent it generated in 2008 (3,327 AF). Turf irrigation directly received 64% of the effluent, and the remainder was recharged. Lake Havasu City increased effluent deliveries for turf by 192% between 2002 and 2009.

The city is also developing a vadose zone recharge program that will allow maximum utilization of effluent. In the Lake Havasu area, water that percolates below the level of the lake (projected underground to the mountains) is considered Colorado River water. The program will recharge effluent above this "accounting surface" so it can be reused by the city without counting against its Colorado River allocation.

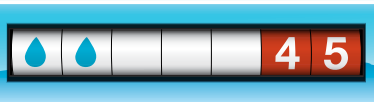
Additional Information

Water quality for Lake Havasu City is high in manganese and arsenic. The build-up of corrosive byproducts in water mains necessitated extensive hydrant flushing to keep water acceptable for drinking and clothes washing. The city recently upgraded to a French-designed, bacteria-based, water treatment plant that removes excess manganese from the water. With the improved water quality, water main flushing is no longer required.

From 2006-2008, park irrigation systems were renovated to replace outdated electrical material and install flow meters that would allow the system to shut down automatically when a break or a high flow occurs. Some of the parks will also be converted to effluent use. This program was funded through a 50-50 water conservation fund with the BoR.

Lake Havasu City is also organizing a citizens group to help develop various water conservation education products, including citizen workshops, teacher workshops, and brochures.

City of Mesa



Background

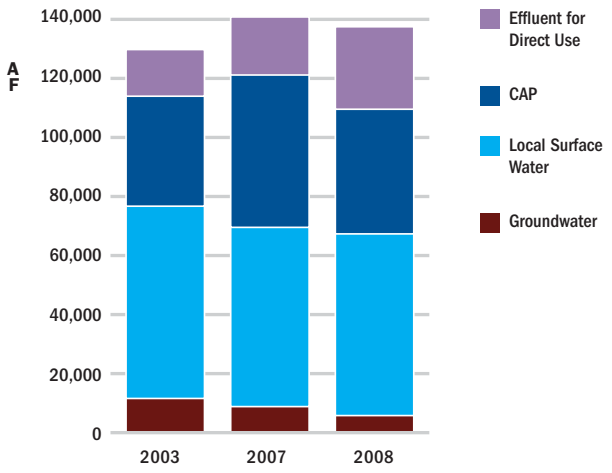
The city of Mesa is the third-largest city in the state of Arizona, with a population of approximately 461,100 residents.* The Salt River—flowing west towards Phoenix—traces the city's northern corporate limits, placing Mesa in the middle of the Gila River Watershed.

Mesa has an annual average precipitation of 9.2 inches, an average summer high temperature of 100 degrees (ºF), and an average winter low temperature of 40.5 degrees (ºF).†

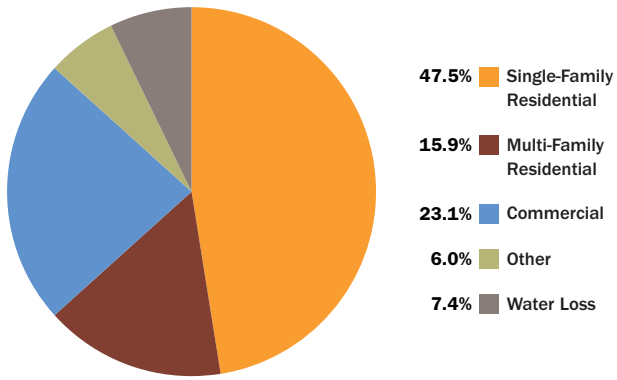
Water Supply and Deliveries

The city of Mesa maintains a diverse supply portfolio, with surface water from the Salt and Verde Rivers constituting 53% of the total water supplies for the city in 2008. A large portion of water is provided from the Colorado River, via the Central Arizona Project (CAP), and only 5% of Mesa's water supply is sourced from groundwater. In 2008, single-family residential accounts received about 48% of the total treated deliveries, but commercial accounts represent a significant water user in the city as well, consuming 23% of all deliveries. It is important to note that turf and industrial users are included within the commercial water use sector.

SOURCES OF WATER FOR MESA



2008 WATER USE IN MESA



* Arizona Department of Commerce. 2009. *Arizona population estimates, 2009. Available at:* http://www.azcommerce.com/econinfo/demographics/Population+Estimates.html (accessed May 5, 2010).

† IDcide Local Information Data Server. Mesa, AZ weather. http://www.idcide.com/weather/az/mesa.htm (accessed April 12, 2010).

Per Capita

The city of Mesa reduced its gallons per capita per day (GPCD) water use from 2003-2008 across all metrics: single-family residential (-23.7% change), system-wide potable (-8.9% change), and system-wide total (-2.9% change). The reduction in single-family residential GPCD water use from 2003-2008 is significant.

Mesa GPCD

Per Capita Water Use	2003	2007	2008
Single-Family Residential [a]	170	140	130
System-Wide Potable [b]	183	180	167
System-Wide Total [c]	198	212	192

a Treated water deliveries to single-family accounts ÷ single-family residential population

b Total treated water delivered ÷ service area population

c Total raw water from all supply sources + direct effluent use ÷ service area population

Rate Structure

The city of Mesa uses a three-tier inclining block rate for individual residential water accounts inside and outside the city limits.

Usage Per Dwelling Unit	Cost
0–12,000 gallons	$2.30 per 1,000 gallons
12,001–24,000 gallons	$3.45 per 1,000 gallons
Over 24,000 gallons	$3.86 per 1,000 gallons

Residential accounts have a base service fee of $11.48, comprising 33% of the average customer's monthly bill for 10,000 gallons. The slope of Mesa's average price curve is 0.0081, indicating that as consumption increases, the unit price of water remains relatively constant.

Conservation Measures

The city of Mesa is regulated in the Phoenix Active Management Area as a large municipal provider under the Total GPCD Program. According to the Arizona Department of Water Resources, Mesa is currently in compliance with the requirements of the Total GPCD Program.

Customer Rebates

Mesa offers a grass-to-Xeriscape rebate in which residential property owners who replace at least 500 square feet of grass with desert landscaping can qualify for a $500 rebate.*

Ordinances/Rules

Water Conservation Design Guidelines† – The following water conservation design guidelines apply to all proposed developments, all buildings, and uses of land, with the exception of single residences:

- Drought-resistant shrubs and trees are to be the predominant plants used in the landscape design.‡
- Plant materials for right-of-way landscaping must be compatible with low-water-use plant limitations.§
- Required irrigation systems shall be underground automatic watering systems, unless the lot is served by functioning flood irrigation.¶

Water Feature Policy** – Water features (pools, ponds, fountains, streams, waterfalls, etc.), unless serviced with reclaimed water or part of a publicly oriented outdoor recreation facility, shall be sited only within small-scale, pedestrian-oriented places.

Potable Water Use Restrictions†† – Further filling of artificial lakes and watering turf-related facilities with potable water within the water service area of the city is contrary to the city's water conservation policy. A permit is required to fill an artificial lake‡‡ or apply water for landscaping watering purposes on a turf-related facility that applies water to 10 or more acres of landscaping.

* City of Mesa, Arizona. Grass-to-Xeriscape landscape rebate. http://www.mesaaz.gov/conservation/grass-to-xeriscape-rebate.aspx (accessed June 9, 2010).

† Mesa, Ariz., Code § 11-14-2(A) (2010).

‡ *Id. § 11-14-3(C)(4).*

§ *Id. § 11-14-3(C)(6).*

¶ *Id. § 11-15-3(F)(6).*

** City of Mesa Water Feature Policy (approved by the City Manager's Office, 2000).

†† Mesa, Ariz., Code § 4-5-2 (2010).

‡‡ An artificial lake is defined by the city code as a "man-made lake, pond, lagoon, or other body of water that has a surface area greater than twelve thousand three hundred twenty (12,320) square feet and that is used wholly or partly for landscape, scenic, or recreational purposes." See *Id. § 4-5-2(B).*

Native Plant Preservation* – For subdivisions within the Desert Uplands Area, a minimum of 50% of the plant material used for common-area, parkway, and median landscaping shall be selected from the Preferred Desert Uplands Plant List, and the remainder selected from the Acceptable Desert Uplands Plant List. Subdividers are encouraged to select at least 90% of the plant material used for common-area, parkway, and median landscaping from the Preferred Desert Uplands Plant List.

Water Waste Nuisance† – It is unlawful for any person to permit or cause the escape or flow of water into or upon a public street from any source in such quantity as to cause flooding, impede traffic, create a hazardous condition, cause damage to streets, or cause a condition that constitutes a public nuisance or a threat to the public health and safety.

Water Conservation Receptacle‡ – At least one receptacle outlet shall be installed under-counter at the sink or lavatory most remote from the water heater for the purposes of installing a hot-water recirculation system.

Education

Email Subscriptions – A Landscape Watering Reminder email service is available through the city that advises subscribers on watering frequencies based on current weather conditions. There are currently over 1,200 subscribers.

Inventory of Water Conservation Materials – Mesa maintains an inventory of its water conservation materials to track distribution to nurseries and landscape companies, garden clubs, workshops, libraries and customer service centers, local and regional events, and general public requests.

Residential Audit Program – Mesa provides free self-audit kits for homeowners upon request, in addition to information that helps residents understand how to read their water bill, water meter, and determine where water might be wasted.

Water Budgeting Program – Mesa provides outreach to businesses and multifamily communities to show how saving water can help reduce costs. Staff works with managers and/or owners to review on-site water use, identify water saving options, and construct a month-by-month outdoor water budget. City departments and the Arizona Department of Transportation also participate in this program.

Water Conservation Website – The city of Mesa hosts a robust water conservation website, with multiple categories of information and several additional links to outside resources.

Landscaping Workshops and Presentations – Mesa offers free water conservation and landscape classes for homeowners (12 per year) as part of its "Living Green Workshop Series: Earth Friendly Advice for Home and Garden." Classes are advertised in the utility bill newsletter, in The Arizona Republic, and press releases.

AMWUA Membership – As a member of Arizona Municipal Water Users Association, Mesa participates in the "Water — Use It Wisely" messaging campaign, SmartScape training program, outreach at tradeshows and conferences, and distribution of AMWUA brochures, such as "Landscape Plants for the Arizona Desert" and "Watering by the Numbers."

Water Curriculum – Staff has worked with Mesa public schools to develop a water curriculum helping students establish good water use habits and creating stewards of the future. The first-grade curriculum focuses on plants and animals and how they have adapted to the desert. The fourth-grade curriculum focuses on where water comes from, the treatment process, and water use decisions. These programs each reach approximately 4,000 students per year. The seventh-grade curriculum focuses on the science of water — the importance of keeping drinking water clean and the economics of water.

Xeriscape Demonstration Garden – The city partners with Mesa Community College's main campus and Red Mountain campus to maintain a demonstration garden that includes interpretive signs and displays featuring low-water-use plants and desert landscape techniques.

Implementation of Conservation Measures

The city of Mesa provided 107 Xeriscape rebates between 2007 and 2009. Preliminary data from the homes suggest an average savings of approximately 19,000 gallons per home per year, a 13% reduction in household water use. Extrapolating to all homes in the program and the

* *Id. § 9-6-5(A), (G).*

† *Id. § 8-6-3(P).*

‡ *Id. § 4-3-1(PP).*

113,420 square feet of turf removed, Mesa estimates this program saves 2,039,000 gallons of water annually.

The city's Code Compliance Division opened 10 cases of water waste violations this year; however no fines have been issued thus far.

Mesa's water conservation staff provides 5-10 homeowner association water audits each year. In one example, an HOA with 19 acres of turf reduced consumption post-audit by 21 million gallons, generating a savings of $100,000 in water costs for the association. During the audits, HOAs are also encouraged to not over-seed their common areas during the winter. Using conservative assumptions, the city estimates this specific measure to save more than 30,000,000 gallons annually, and has cumulatively saved more than 242,000,000 gallons since program inception.

Funding for Conservation

In 2008, Mesa had a conservation budget of $265,081, approximately 0.4% of the total water utility's budget. This does not take into account capital conservation projects, such as replacing water lines, installing permaloggers, and upgrading treatment plant processes, which, if included, would boost funding to about 10% of the water utility's budget. The city has four full-time equivalent employees working in water conservation, and spends about $0.56 per customer on water conservation programs—again, not including capital projects.

Goals for Conservation Savings

The city of Mesa has a conservation savings goal to reduce GPCD and maintain compliance with state requirements.

Water Loss

In 2008, the city recorded 6,981 AF (2.27 billion gallons) of water loss, representing 7.4% of total supplies. This is lower than system losses in 2007 (at 10.3%), but slightly higher than 2003 (at 6.6%).

Supply-Side Efficiency Measures

Mesa uses over 400 noise loggers deployed throughout the system to provide continuous leak detection monitoring of the system. When a potential leak is detected, the logger goes into leak mode and transmits a radio signal for the patrol unit to pick up. The alert is investigated and leak is repaired, if necessary.

Using a carefully designed statistical sample of water meters, Mesa gained enhanced understanding of manufacturer performance, changes in meter performance over time, and unmetered water losses. This information was used to understand the typical meter functional and economic life, which has allowed optimization of the meter management program. Meters are removed from service when the lifecycle cost of the meter management program is minimized. Over the last 18 months, Mesa replaced nearly 35,000 underperforming meters through the program, and distribution system losses have fallen to less than 3%.

Mesa maintains an aggressive program for replacing old service lines by identifying neighborhoods that have old pipes with a history of breaks and leaks, and targeting them for wholesale replacement. Mesa projects that it will spend on the order of $12 million a year over the next five years to replace old waterlines.

Effluent Use

The city generated 23,807 AF of effluent in 2008, and delivered 26% of this total (6,243 AF) for direct use and 23% (5,456 AF) for recharge. Mesa sends a significant portion of its wastewater to the 91st Avenue regional wastewater treatment plant, which is subsequently used for wildlife habitat mitigation, agricultural purposes, and cooling at the Palo Verde nuclear power plant. This additional amount of reuse is not accounted for in Mesa's figures above, but it would have the effect of increasing Mesa's direct effluent use on the order of 20,000-25,000 AF per year. Despite not including these amounts, Mesa reported a 700% increase in effluent delivered for direct use between 2003 and 2008.

Mesa has also entered into a reclaimed water management program through the comprehensive Arizona Water Rights Settlement Act of 2005. Ultimately, Mesa will deliver 29,400 AF per year of reclaimed water to the Gila River Indian Community for agricultural use. In exchange, Mesa will receive 23,530 AF per year of Central Arizona Project water that can be used for potable purposes.

Additional Information

As one of the first cities to displace reliance on fossil aquifers for Colorado River water, Mesa is an outspoken critic of the region's current paradigm of aquifer use that allows groundwater pumping to occur as much as 100 miles away from recharge or replenishment of that pumping. Through regional efforts such as the East Valley Water Forum, Mesa pushes for more sustainable management of regional aquifers so that water supplies can be saved as a contingency for surface water drought rather than being depleted as a base supply.

The city of Mesa understands that the use of power, chemicals, and raw water supplies are all interrelated. Efforts are made to optimize operations between these three factors by scheduling supplies based on minimization of raw water costs, treatment costs, and power costs. Mesa is also undertaking a comprehensive audit to refine where savings in these three areas can be achieved, and all capital projects are analyzed to include power and chemical costs as a factor in design decisions.

For example, at Mesa's Northwest Water Reclamation Plant, the city has installed generators that run off of the biogas produced by the digestion of solids at the plant (cogeneration). The city also uses goats for weed control purposes at the plant.

Town of Payson

Background

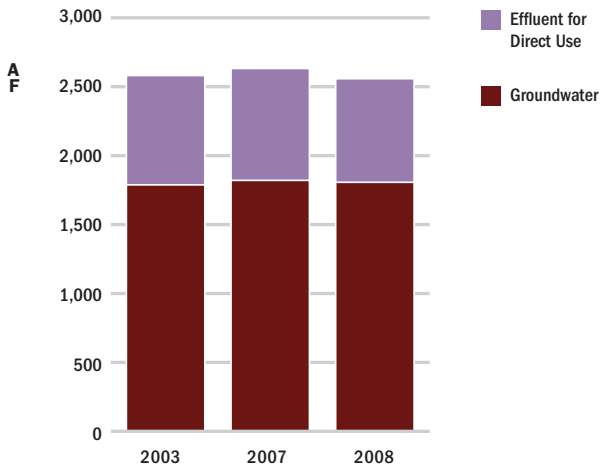
The town of Payson sits along the Mogollon Rim in the middle of the Tonto National Forest. It is located in Gila County, close to the geographic center of the state of Arizona, and has an estimated population of 17,242.*

Payson is within the mid-northern edge of the Central Highlands Transition Zone physiographic province, just below the southern border of the Colorado Plateau. Average annual precipitation in Payson is about 22.1 inches, with average summer maximum temperatures near 93 degrees (ºF), and average winter minimums near 25 degrees (ºF).†

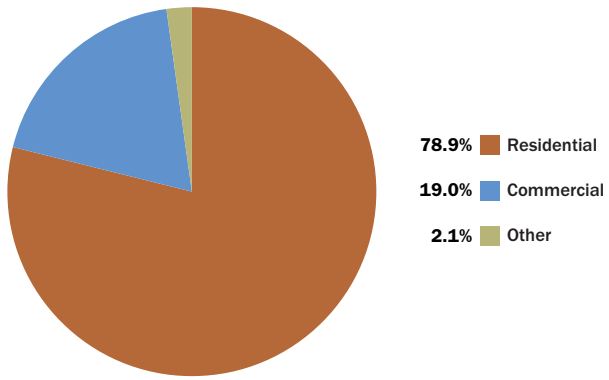
Water Supply and Deliveries

All of the water supply for Payson is originally sourced from groundwater, but a large percentage of effluent is delivered for direct uses. In 2008, residential accounts utilized approximately 80% of the total potable water supplies.

SOURCES OF WATER FOR PAYSON



2008 WATER USE IN PAYSON



* Arizona Department of Commerce. 2009. *Arizona population estimates, 2009.* Available at: http://www.azcommerce.com/econinfo/demographics/Population+Estimates.html (accessed May 5, 2010).

† IDcide Local Information Data Server. Payson, AZ weather. http://www.idcide.com/weather/az/payson.htm (accessed April 12, 2010).

Per Capita

The town of Payson has reduced its gallons per capita per day (GPCD) water use from 2003 through 2008 across all metrics: residential (-3.8% change), system-wide potable (-8.0% change), and system-wide total (-6.9% change). Payson's low residential GPCD is partially explained by the town's retirement community character, in which half of the homes may be empty during the winter months.

Payson GPCD

Per Capita Water Use	2003	2007	2008
Residential [a]	68	69	66
System-Wide Potable [b]	91	87	83
System-Wide Total [c]	139	134	130

a Treated water deliveries to residential accounts ÷ service area population

b Total treated water delivered ÷ service area population

c Total raw water from all supply sources + direct effluent use ÷ service area population

Rate Structure

The town of Payson uses a four-tier inclining block rate for individual residential water accounts.

Usage Per Dwelling Unit	Cost
2,001–5,000 gallons	$2.93 per 1,000 gallons
5,001–10,000 gallons	$3.87 per 1,000 gallons
10,001–20,000 gallons	$4.42 per 1,000 gallons
Over 20,000 gallons	$6.00 per 1,000 gallons

Residential accounts have a base minimum fee of $21.71 that covers the first 2,000 gallons of use. This base fee represents approximately 44% of the average customer's monthly bill for 10,000 gallons. The slope of Payson's average price curve is 0.018, indicating that the average price of water increases as consumption increases.

Conservation Measures

The town of Payson is a Community Water System in the Verde River Basin. It has published a water conservation plan as part of its system water plan, which details the conservation measures being implemented by the town.

Customer Rebates

The town of Payson offers the following financial rebates:*

- *Toilets* – $100 for one low-flow toilet.
- *Showerheads* – free.
- *Faucet aerators* – free.
- *Small business restrooms* – incentives are offered to bring toilets, urinals, and faucets up to code.

Ordinances/Rules

Indoor Water Conservation†

- Water system leaks from private water lines creating waste shall be repaired by the owner within 15 days of a repair notification by the water department. Proof of repair shall be provided to the water department upon completion of the repair.
- High-efficiency washers must be installed in all new multifamily and commercial laundry facilities.

Water Conservation Plumbing Standards‡ – All new construction shall follow the standards below and all existing water users shall retrofit their facilities to the standards by January 1, 2005. Single- and multifamily-residential water users are exempt from the retrofit requirement.

- *Water closets* – Average consumption of not more than 1.6 gallons per flush.
- *Urinals* – Waterless urinals shall be installed in all new public, commercial, multifamily-residential common-use buildings, and in all commercial and industrial restroom remodels.

* Town of Payson, Arizona. Payson Water Department – Water Conservation Program: Water conservation related links. http://www.paysonaz.gov/Departments/water/conservation.html (accessed June 22, 2010).

† Payson, Ariz., Code § 50.81 (2010).

‡ *Id. § 50.82.*

- *Non-metered faucets* – Lavatory and kitchen faucets shall be equipped with aerators and not exceed a water flow rate of 2.5 gallons per minute.
- *Metered faucets* – Self-closing faucets shall be installed on lavatories intended to serve the transient public and deliver not more than 0.25 gallons of water per use.
- *Showerheads* – Not to exceed a flow rate of 2.5 gallons per minute.
- *Recirculating systems* – Evaporative cooling systems, decorative water fountains, car washes, and commercial and industrial clothes washers must be equipped with recirculation systems.
- *Hot water heaters* – Shall not be installed more than 40 feet from the hot-water-using fixture.

Outdoor Water Conservation[*]

- Outdoor irrigation is prohibited between 9:00 a.m. and 6:00 p.m.
- Watering native plants is prohibited.
- The construction of new outdoor swimming pools is prohibited.
- The use of misters is prohibited.
- The use of plants not listed on the town of Payson's "Native and Low-Water-Use Plant List" for industrial, commercial, and multifamily residential landscaping is prohibited.
- Spray irrigation is prohibited except for existing turf or plants that have been spray-irrigated prior to March 1, 2003. Flood irrigation is prohibited.
- Drip irrigation systems with smart controllers must be installed on all new commercial landscape irrigation projects.
- Artificial water features larger than 50 gallons are prohibited, and water features of less than 50-gallons capacity must be equipped with a recirculating pump.

Conservation Signage and Literature Distribution[†]

- Public, semi-public, and governmental restroom and shower facilities shall post a water conservation sign in each restroom and shower facility.
- Hotels, motels, and other lodging facilities shall provide a water conservation informational card or brochure in a visible location in each guest room. Lodging facilities shall not provide daily linen and towel changing for those guests staying multiple nights unless a guest specifically requests each day that the linen and towels be changed.
- Retail plant nurseries shall provide customers with town-provided, low-water-use landscape literature and water-efficient irrigation guidelines at the time of sale of any outdoor perennial plants.
- Title companies shall provide town-authored indoor and outdoor conservation literature at the time of closing.
- Town departments shall provide indoor and outdoor conservation literature to all persons applying for a building permit and customers initiating new water service.

Water Waste[‡] **–** The planting or establishment of new turf areas and the expansion of existing turf areas is prohibited and at odds with the town's water conservation plan. No entity shall cause or permit to occur any water waste.

Education

Conservation Signage and Literature Distribution – Payson has a comprehensive water conservation signage program that covers public restrooms, lodging facilities, commercial nurseries, title companies, and town departments.

Public Relations and Awareness – The town of Payson hosts a water conservation webpage and provides water conservation tips via brochures, slides on the public television station, and at the local movie theatre.

Brochures – The town of Payson offers numerous brochures free to the public. The town has a "wall of brochures" always available in the water utility's office

* *Id. § 50.83.*

† *Id. § 50.80.*

‡ *Id. § 50.84.*

that includes information on leak repair, reading your meter, town plant list, rainwater harvesting, gray water use, and other water conservation issues.

Leadership Training – The town annually sponsors a "Leadership Academy" for the public and potentially interested political candidates to learn about water resources, water systems, and conservation programs within the context of municipal government.

New Homeowner/Commercial Customer – Information on native and low-water-use plants is provided to all residential/commercial builders and owners through the town's building division. A "Welcome to Payson" brochure that outlines the town's water conservation requirements is also available at the water department website, the chamber of commerce, and most real estate offices.

High-Water-Use Notification – Customer service notifies customers of unusually high readings as a result of the monthly meter reads during the billing cycle.

Seminars – Water department staff participates in the High Country Xeriscape Council WaterWise Seminar and sponsors the Arizona Project Wet Water Festival for the fourth-graders in the local school district.

Community Presentations – Water department staff provides outreach and presentations to Scout meetings and church youth summer programs.

Xeriscape Demonstration Garden – Payson and the High Country Xeriscape Council maintain a Xeriscape garden at the local college.

Home Water Audit – Home water audit information is available on the Water Conservation page of the town's website.

Water Waste Investigations – Water conservation staff responds to reports of water waste, and issues notice of violations, where appropriate.

Implementation of Conservation Measures

The town of Payson tracks its rebate programs for both the residential and small business sectors. Residential low-flow toilet rebates totaled 17 in FY 08-09 and 19 in FY 09-10. In both time frames, additional funding was available for rebates. Payson reports the following successes in its small business restroom rebate program:

Fixture	Rebates (FY 08–09)	Rebates (FY 09–10)
Faucets	4	34
Toilets	30	46
Urinals	59	3
Total Expenditures	**$18,705**	**$9,600**

Payson's billing and meter reading systems report unusually high readings during each billing cycle, which are then provided to field representatives for investigation. During 2009, 584 unusually high readings resulted in the discovery of 219 customer-side leaks.

Funding for Conservation

In 2008, Payson had a conservation budget of $125,000, approximately 3.3% of the total water utility's budget. The town has two employees in its water conservation department, and spends approximately $7.07 per customer each year on conservation programs.

Goals for Conservation Savings

The water conservation goal for the town of Payson is to maintain water usage at or below 89 GPCD system-wide.

Water Loss

In 2008, the town recorded 171 AF (55.7 million gallons) of water loss, representing 9.4% of total water supplies. In 2007, the town reported a water loss of 5.7%. These data points corroborate town water managers' thoughts that water loss is likely between 5% and 10%.

Supply-Side Efficiency Measures

The town of Payson purchased active leak detection equipment about five years ago and performed several tests of water mains. Unfortunately, the equipment failed to work as well as hoped—it didn't work at all on PVC pipe—and the town has discontinued its active leak detection program. Currently, Payson repairs leaks when they are perceptible on the surface.

The town implemented a meter change-out program for larger meters (1 ½" to 4") in 2003 that utilizes a master meter device to "double-check" water use at the meter. Since testing began, Payson has replaced or resized 58 of the 117 tested meters. High-use residential meters are periodically checked for performance, but there is no active meter replacement program for the residential sector.

Effluent Use

Payson generated 1,612 AF of effluent in 2008, delivering 747 AF for direct uses and 213 AF for recharge. The town's main recharge facility, Green Valley Park, is a cooperative water reclamation project between the Northern Gila County Sanitary District and the town. The lakes at Green Valley Park have the capacity to recharge approximately 325 AF per year and serve as an effluent storage facility for landscape irrigation.

Additional Information

Payson has received complaints about its ordinance requiring waterless urinals in commercial buildings—predominantly regarding smell and maintenance issues. In response, the town is re-evaluating the ordinance and exploring the use of new Zurn urinals that can be manually flushed only by maintenance personnel. Payson is also implementing a pilot program at the local Safeway grocery store to test out one-quart-flush urinals, which use about half the water of high-efficiency models.

Payson is currently pursuing a partnership with the Salt River Project to develop surface water supplies out of the C.C. Cragin (formerly Blue Ridge) Reservoir. In this project, the town plans to construct a 14.5-mile pipeline that will maximize the vertical drop between the reservoir and town by adding a hydroelectric facility that will offset any pumping power demands along the route.

The town is also evaluating the electrical needs and efficiencies of its groundwater well system in order to optimize pumping performance at the lowest possible energy demand. An output from this study will include another decision level in the system that selects which wells should be pumped, based on the rate of water level depletion in storage tanks.

City of Peoria

Background

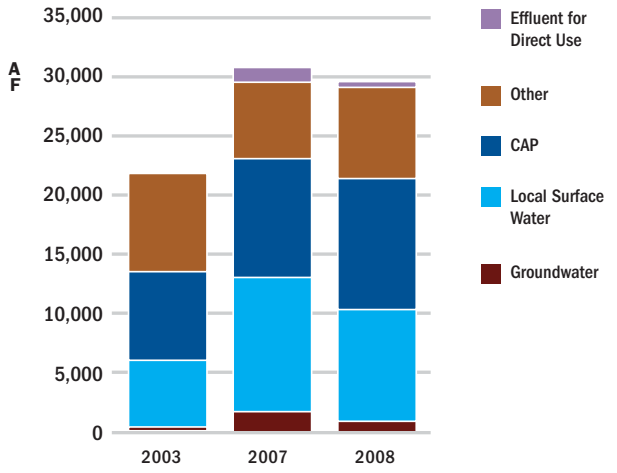
The city of Peoria lies within the Salt River Valley, covering approximately 181 square miles—including Lake Pleasant. An estimated 158,712 people live in the city,* which forms the northwestern corner of the Phoenix metropolitan area.

Peoria is located in the Basin and Range physiographical province at the foot of the Central Mountain Region (the transition zone between the Basin and Range and the Colorado Plateau province). The city receives an average of 9.0 inches of precipitation per year, with average summer highs and winter lows of 100 and 40.9 degrees (ºF), respectively.†

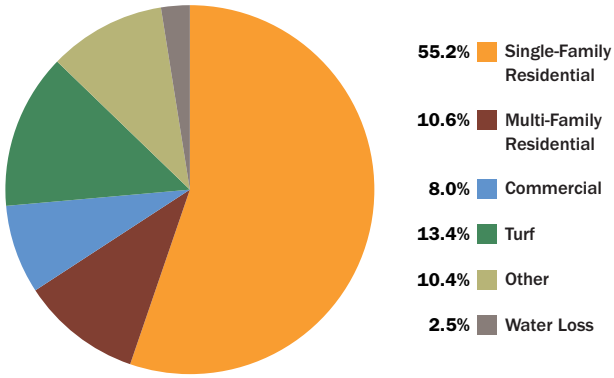
Water Supply and Deliveries

The city of Peoria relies upon a diversified water supply portfolio, including local surface water from the Salt River Project (SRP; Salt and Verde Rivers), imported water from the Colorado River via the Central Arizona Project (CAP), and recovered water (recharged surface water and effluent) labeled as "Other" in the figure below. More than half of Peoria's water supply was delivered to single-family residential accounts in 2008, with turf irrigation as the second-largest water user.

SOURCES OF WATER FOR PEORIA



2008 WATER USE IN PEORIA



* Arizona Department of Commerce. 2009. *Arizona population estimates, 2009. Available at:* http://www.azcommerce.com/econinfo/demographics/Population+Estimates.html (accessed May 5, 2010.)

† IDcide Local Information Data Server. Peoria, AZ weather. http://www.idcide.com/weather/az/peoria.htm (accessed April 13, 2010).

Per Capita

The city of Peoria reduced its gallons per capita per day (GPCD) water use from 2003-2008 across all metrics: single-family residential (-4.1% change), system-wide potable (-1.5% change), and system-wide total (-2.7% change).

Peoria GPCD

Per Capita Water Use	2003	2007	2008
Single-Family Residential [a]	130	129	125
System-Wide Potable [b]	164	176	161
System-Wide Total [c]	173	194	168

a Treated water deliveries to single-family accounts ÷ single-family residential population

b Total treated water delivered ÷ service area population

c Total raw water from all supply sources + direct effluent use ÷ service area population

Rate Structure

The city of Peoria uses a four-tier inclining block rate for single-family residential water accounts.

Usage Per Dwelling Unit	Cost
2,000–5,000 gallons	$1.49 per 1,000 gallons
6,000–10,000 gallons	$2.69 per 1,000 gallons
11,000–25,000 gallons	$3.24 per 1,000 gallons
Over 26,000 gallons	$3.85 per 1,000 gallons

Residential accounts have a base service fee of $16.84 (1" meter), which includes the first 1,000 gallons of water used. The base fee represents approximately 46% of an average customer's monthly bill for 10,000 gallons. The slope of the city's average price curve is 0.0031, indicating that the price of water remains relatively constant as consumption increases.

Conservation Measures

The city of Peoria is regulated in the Phoenix Active Management Area as a large municipal provider under the Total GPCD Program. According to the Arizona Department of Water Resources, Peoria is currently in compliance with the requirements of the Total GPCD Program. The city has no current plans to transition to a different regulatory program.

Customer Rebates

The intent of the rebate program is to encourage permanent water reduction inside and outside of the home. Qualifying customers who install specific water-saving features may receive a credit on their utility bill.* Certain requirements are required for each type of rebate:

- *High-efficiency toilet* – $75 for replacing a 3.5-GPF or higher toilet with an EPA WaterSense-labeled toilet (1.28-GPF).
- *Xeriscape conversion* – $715 maximum for replacing turf with low-water-use landscaping.
- *New home Xeriscape* – $150 for customers who choose Xeriscape landscaping for a new home.
- *Hot water recirculator* – $100 for installing a recirculation system.
- *Irrigation timer* – $30, must have certain features.
- *Indoor retrofit kits* – Free for homes built prior to 1990.

Ordinances/Rules

Principles of Sound Water Management – In 2007, the city adopted the "Principles of Sound Water Management," with a mission to implement collaborative, innovative water policies to ensure long-term sustainability, economic vitality, and quality of life in Peoria. The principles emphasize the importance of water conservation, fiscal responsibility, and maintaining a redundant water supply. Peoria was the first city in Arizona to develop and implement such an integrated set of principles governing water management.

Unnecessary Waste and Leaks† **–** Customers shall prevent unnecessary waste of water and keep all water outlets closed when not in actual use. The city may immediately terminate the water supply where any such waste occurs. Water running off a landscaped area to another area where the water is not beneficially used is prohibited.

International Plumbing Code – Peoria adopted the International Plumbing Code in 2006, which sets specific requirements for plumbing practices, fixtures, and appliances.

* City of Peoria, Arizona. Water conservation: Rebate program. http://www.peoriaaz.gov/content2.aspx?ID=1273 (accessed June 15, 2010).

† Peoria, Ariz., Code § 25-53 (1992).

Reclaimed Water Service Required* – New turf facilities of 10 acres or more that are located within a half mile of a reclaimed water service line, including right-of-way landscaping, parks, retention and detention basins, designated open space, and golf course developments, shall use reclaimed water for irrigation purposes.

Minimum Supply Requirements† – All new large-scale developments must provide a water plan that provides a sufficient redundant (back-up) water supply source that is hydrologically separate and distinct from the primary supply of water.

Unauthorized Shutdown of Water Mains‡ – Only authorized city personnel shall operate water valves or perform other work for the shutdown of the city water mains.

Water Meters§ – Any obstruction, alteration, or tampering with city-owned meters by an individual other than authorized city personnel shall be subject to a civil sanction not to exceed $1,000.

Water Customer Negligence¶ – The cost of any damage to the city water system that requires any repairs or replacements shall be added to that customer's bill, together with a 20% administrative fee. If such charges are not paid, water service may be discontinued.

Testing Water Meter Accuracy** – Any customer may have his meter tested for accuracy by the city. If the meter registers a divergence from accuracy greater than 3%, the customer's deposit shall be refunded and an adjustment will be made in the water service bill.

Education

Monthly Water Conservation Column – The city writes a monthly homeowner association water conservation column that highlights certain aspects of water conservation and provides general information on Peoria's programs to readers.

Landscaping Workshops and Presentations – Peoria offers 10-12 free water conservation and landscape classes per year, with an emphasis on low-water-use landscaping, plant selection, and proper irrigation. Classes are advertised in newspapers, utility bill inserts, and websites for the city, Arizona Municipal Water Users Association, and "Water — Use it Wisely." Water conservation staff also provides information and presentations on water conservation to local organizations upon request.

Peoria's Desert Fusion Garden – Approximately a quarter acre of land outside city hall has been converted from grass to low-water-use landscape. The garden illustrates the principles of Xeriscape, with a focus on showing creative plant combinations that can be translated into residential settings.

Think About Xeriscape Video Series – A 30-minute film and four five-minute segments airing on Peoria Channel 11 inform viewers about Xeriscape principles, converting to Xeriscape, and the city's rebate program.

On-site Landscaping and Water Use Conservation Consultations – Peoria provides on-site consultations regarding low-water-use landscaping and efficient watering practices with Xeriscape conversion inspections.

Homeowner Associations Meetings – City staff attends 5-10 meetings annually to discuss the rebate program, Xeriscape conversion, landscape watering, and all additional water conservation information.

AMWUA Membership – As a member of Arizona Municipal Water Users Association, Peoria participates in the "Water — Use It Wisely" messaging campaign, SmartScape Training Program, outreach at tradeshows and conferences, and the distribution of AMWUA brochures, such as "Landscape Plants for the Arizona Desert" and "Watering by the Numbers."

EPA WaterSense Program – Peoria is a WaterSense promotional partner and promotes the WaterSense program through its website and via special campaigns, such as "Fix a Leak Week."

Home Water Audit Kits for Homeowners – The city offers free how-to-do water audit kits that are distributed in water conservation packets upon request.

School Programs – The city provides free water conservation school assemblies on water resources and conservation, and free workbooks for elementary school students at the completion of the show.

* *Id. § 25-63.*
† *Id. § 25-20.*
‡ *Id. § 25-10.*
§ *Id. § 25-25.*
¶ *Id. § 25-7.*
** *Id. § 25-27.*

Implementation of Conservation Measures

Peoria tracks the number of rebates and funding it has distributed through its financial incentive program. Since program inception, the following results have been tallied:

Program	Rebates	Funding
High-efficiency toilet	169	$ 18,450
Xeriscape conversion	352	$ 66,385
New home Xeriscape	3	$ 450
Hot water recirculator	1,677	$ 167,700
Irrigation timer	128	$ 3,473
Total	2,329	$ 256,458

The city has also provided, free to its customers, 97 indoor retrofit kits, 994 home water audit kits, and 800 on-site landscaping and water use consultations.

Funding for Conservation

In 2009 (FY 2010), Peoria had a conservation budget of $300,000, approximately 1.3% of the total water utility's budget. The city has 1.5 full-time-equivalent employees in the water conservation program, and spends about $1.90 per customer per year on water conservation programs.

Goals for Conservation Savings

The Water Conservation Division goal is to reduce overall water consumption in the city of Peoria. Water conservation is an important complement to the city's water resource portfolio. The city has determined that there is a need to look for future opportunities to save water, and is actively pursuing revisions to city code to incent further conservation.

Water Loss

In 2008, the city recorded 721 AF (234.9 million gallons) of water loss, an exceptionally low 2.5% system loss. Over the period of data collection, Peoria consistently maintained water loss at or below 5%.

Supply-Side Efficiency Measures

The quantity of water ordered and delivered to the city by CAP and SRP, as well as the water pumped from wells, is frequently compared to the amount of water treated, distributed, and sold, allowing for rapid identification of potential monitoring, metering, and usage concerns. Tracking is assisted through the use of geographic information systems (GIS) and supervisory control and data acquisition (SCADA) systems.

The water conservation department interacts with other city departments to take an active part in monitoring their use, equipment, and data. For example, the fire department meters usage when flushing fire hydrants.

Peoria aggressively maintains its 897 miles of water distribution system to mitigate and prevent leaks through a detailed maintenance program. The city also engages in an active meter replacement program.

Effluent Use

The city generated 7,929 AF effluent in 2008, and recharged 7,625 AF (96%) of this total through several different recharge facilities, including the Beardsley Road Water Reclamation Facility (WRF) and Agua Fria Recharge Site. A small percentage of effluent is delivered for direct use in Peoria, predominantly at one large-scale residential development, where it is used for landscape irrigation of golf courses and parks.

Peoria is in the process of installing the backbone for its A+ reclaimed water distribution system from the city's Butler Drive WRF to service the city hall campus area and proposed community park 2, to be located adjacent to the Butler Drive WRF, supported in part by an ARRA grant from the Bureau of Reclamation. The reclaimed water will be used at the municipal car wash, for cooling towers, and for outdoor irrigation.

The city's goal is to increase the direct reuse of reclaimed water wherever possible, particularly in new, master-planned communities.

Additional Information

Peoria has been monitoring the energy usage within its water distribution system and taking steps to improve efficiency over the past few years. Water treatment plants have been retrofitted with more efficient motors, a photovoltaic solar system was installed at one reclamation facility, and the groundwater well system is operated using the more cost-efficient wells, when possible.

City of Phoenix

Background

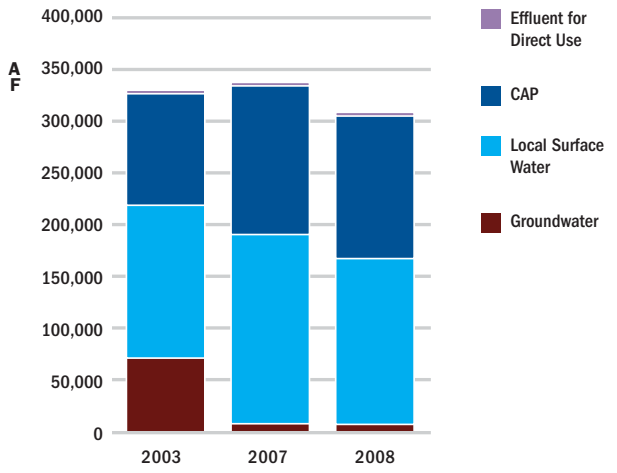
The city of Phoenix is the county seat of Maricopa County and has an estimated population of 1,575,423 residents.* Phoenix provides water service across a 546-square-mile area within the Salt River Valley and Gila River Watershed and is the largest water provider in the state.

Phoenix is located in the Basin and Range physiographical province. It has an annual average precipitation of 7.66 inches, with average summer highs near 106 degrees (ºF)and winter lows around 44 degrees (ºF).†

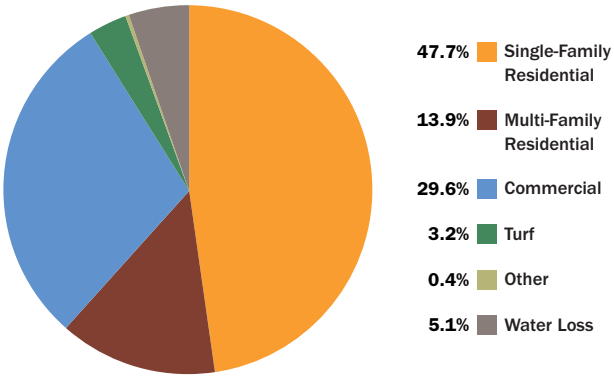
Water Supply and Deliveries

The city of Phoenix maintains a diversified water source portfolio and has significantly reduced its reliance on groundwater in order to comply with the Phoenix Active Management Area's goal of achieving safe yield by 2025. In 2008, local surface water from the Salt River Project (SRP) and imported water from Central Arizona Project (CAP) made up the vast majority of Phoenix's supplies. Almost half of all water in the city was delivered to single-family residential accounts in 2008, a substantial amount was provided to commercial customers, and approximately 5% of the water supply was lost or unaccounted-for.

SOURCES OF WATER FOR PHOENIX



2008 WATER USE IN PHOENIX



* Arizona Department of Commerce. 2009. *Arizona population estimates, 2009. Available at:* http://www.azcommerce.com/econinfo/demographics/Population+Estimates.html (accessed May 5, 2010).

† Cerveny, R.S. 1996. Climate of Phoenix, Arizona. http://www.public.asu.edu/~aunjs/ClimateofPhoenix/phxwx.htm (accessed June 23, 2010).

Per Capita

The city of Phoenix significantly and consistently reduced its gallons per capita per day (GPCD) water use from 2003 through 2008 across all metrics: single-family residential (-14.0% change), system-wide potable (-12.0% change), and system-wide total (-15.3% change).

Phoenix GPCD

Per Capita Water Use	2003	2007	2008
Single-Family Residential [a]	143	134	123
System-Wide Potable [b]	197	189	173
System-Wide Total [c]	217	204	184

a Treated water deliveries to single-family accounts ÷ single-family residential population

b Total treated water delivered ÷ service area population

c Total raw water from all supply sources + direct effluent use ÷ service area population

Rate Structure

The city of Phoenix uses a flat fee for individual residential water accounts inside the city that includes 6 Ccf of water from October to May, and 10 Ccf of water from June to September. Water use in excess of the amount included with the flat fee is charged according to a fixed rate, which varies depending on whether water use occurs during a "high," "medium," or "low" month (medium months are not shown below).

Low Months (Dec, Jan, Feb, Mar)

Usage Per Dwelling Unit	Cost
Over 4,488 gallons (> 6 Ccf)	$2.18 per 748 gallons (per Ccf)

High Months (Jun, Jul, Aug, Sep)

Usage Per Dwelling Unit	Cost
Over 7,480 gallons (> 10 Ccf)	$3.51 per 748 gallons (per Ccf)

Residential accounts have a base service fee of $4.64 (for a 5/8" meter) and an environmental charge of $0.40 per 748 gallons (per Ccf). The base fee represents 18% of the average customer's monthly bill for 10,000 gallons during the low season, and 21% for the high season. For low months, the slope of Phoenix's average price curve is 0.0123, indicating that the average price of water increases as consumption increases. For high months, the slope of the average price curve is 0.0444, indicating a more substantial increase in the price of water as consumption increases.

Conservation Measures

The city of Phoenix is regulated as a large municipal provider under the Total GPCD Program in the Phoenix Active Management Area. The city does not have plans to transition to a different regulatory program and is currently in compliance with Total GPCD requirements set forth in the third management plan.

Customer Rebates

Residential Interior Retrofit Program – Low-income homes are retrofitted with high-efficiency fixtures and the irrigation system is evaluated for leaks.

Water Resource Acquisition Fee Credits* **–** Credits toward water resource acquisition fees are available to new residential and commercial developments when it is demonstrated that conservation savings exceed current standards and conservation savings are long-term. (Implementation of this program has been delayed due to state law establishing a moratorium on changes to impact fee programs.)

Ordinances/Rules

Permit Required for New Turf-Related Facilities† **–** Further use of potable water for landscape irrigation at new turf-related facilities is contrary to the city's policies of water conservation. A permit is required for landscape irrigation at a new turf-related facility.

Limitations on Water Use for Turf-Related Facilities‡ **–** Beginning on January 1, 1992, when applying water from any source to its water-intensive landscaped area, a turf-related facility shall not use an amount greater than its applicable maximum annual water allotment, as determined in accordance with the Phoenix Municipal Code.

* Phoenix, Ariz., Code § 30-5 (2010).

† *Id. § 37-113.*

‡ *Id. § 37-110.*

Limitations on Water Use* – Beginning in 1992, water supplied by the city of Phoenix to a customer shall not be used for the purpose of watering landscaping plants within the following areas unless the landscaping plants are low-water-use plants: (1) any publicly owned right-of-ways; and (2) areas located between the right-of-ways. Single-family or duplex dwellings are exempted.

Landscape Architecture† – Low-water-use plants that reflect and enhance the image of the Sonoran Desert should be used. No more than 50% of the landscaped area at maturity or 10% of the net lot area, whichever is less, should be planted in turf or high-water-use plants. Functional turf areas (parks, schools, single-family common areas, etc.) are exempt.

Site Design/Development, Desert Preservation‡ – Development should minimize the removal of existing healthy Sonoran Desert vegetation in accordance with city's Native Plant Preservation Standards. If removal is necessary, mature trees and cacti should be salvaged and utilized on site.

Escape of Water Prohibited§ – It is unlawful for any person to willfully or negligently permit or cause the escape or flow of water from any source in such quantity as to cause flooding, impede traffic, create a hazardous condition, create a threat to public health and safety, or cause damage to public streets.

Waste of Water; Failure of Consumer to Make Repairs to Pipes, Valves, and Fixtures¶ – Owners of property served by city water are responsible for all leaks, or damages on account of leaks, from the service pipes leading from the consumer's side of the meter to the premises served. Every consumer shall at all times maintain in good repair all his water pipes, faucets, valves, plumbing fixtures, or any other water appliances, to prevent waste of water.

Education

Customer Messaging – The city distributes bilingual conservation information through its water conservation website, the city's Channel 11 WaterWorks program TV station, nurseries, customer pay stations, and water bill messages sent to the more than 350,000 residential accounts. Approximately 10% of the city's literature is distributed in Spanish.

Free Bilingual Water Conservation and Drought Brochures – Homeowners are provided landscape and irrigation materials in English and/or Spanish.

AMWUA Membership – As a member of Arizona Municipal Water Users Association, Phoenix participates in the "Water — Use It Wisely" messaging campaign, SmartScape Training Program, outreach at tradeshows and conferences, and the distribution of AMWUA brochures, such as "Landscape Plants for the Arizona Desert" and "Watering by the Numbers."

EPA WaterSense Program – Phoenix is a WaterSense promotional partner and promotes the WaterSense program through its website and via special campaigns, such as "Fix a Leak Week."

Community Outreach – Phoenix sponsors community and public/private events, such as "Keep Phoenix Beautiful Earth Day" and the Statewide Water Conservation Information Sharing Group. The city also participates in sponsoring, planning, staffing, and providing speakers for local landscape professional conferences, like the Arizona Nursery Association Southwestern Horticulture Annual Day of Education for landscape professionals.

High-Water-Use Complaints – Customers with larger than expected water bills can receive assistance from a city team that performs a site inspection, diagnoses the issue, and provides water conservation materials.

Classroom Programs – Phoenix provides Project WET training for classroom teachers in grades preschool through 12. Four curriculum guides are offered, including two with foci on the Colorado Watershed, which covers most of Arizona, and Arizona water conservation. The city also provides assembly programs and classroom materials about water conservation, water quality, natural resources, and the environment.

* *Id. § 37-111.*

† *Id. § II(A)(3).*

‡ Phoenix, Ariz., Zoning Ordinance § 507 TAB A(II)(A)(1).

§ *Id. § 23-33 (2009).*

¶ *Id. § 37-27.*

Implementation of Conservation Measures

Approximately 300 low-income homes in the "Weed and Seed" neighborhoods are retrofitted with water-efficient fixtures each year. On average in 2008, 1.13 toilets, 0.37 faucets, 1.37 aerators, and 0.71 showerheads were replaced per home. In addition, 89% of homes received irrigation system advice.

Phoenix's AMWUA membership has produced several quantifiable results, including the training of 60 landscape professionals through the SmartScapes program, and the following statistics for the "Water — Use it Wisely" campaign:

- 120 TV spots creating almost 6,000,000 TV impressions
- 24 billboards in weather reports
- Three live segments on Arizona Midday
- More than 3,250,000 print impressions
- Nearly 1,500,000 online impressions

Phoenix was also active in classroom education over the past year, training 178 teachers in four different courses, who then utilized the program with more than 15,000 students. Assembly programs reached an additional:

- 18,109 students through 84 H_2O Magic performances
- 6,261 students through 100 Great Arizona Puppet Theater performances
- 16,371 students through 51 Childsplay performances
- 480 students through four school-based water festivals

Furthermore, Phoenix is conducting an ongoing study of in-home water use, focusing on the age of a home compared to upgrades in technologies, such as replacement of toilets and showerheads, use of smart irrigation techniques, and other water use areas, in order to asses conservation potential. Preliminary results show high penetration rates for low-flow toilets and low-flow showerheads (74% and 89%, respectively) for all homes in Phoenix. Much lower penetration rates have been measured for high-efficiency clothes washers and high-efficiency dishwashers (23% each). The study also suggests that turf landscaping has decreased over the past few decades, with 70% of homes built before 1994 using turf and about 50% of homes post-1994. Overall, technology upgrades have the lowest penetration for homes built between 1955 and 1984 and the highest rate for homes built after 2004.

Funding for Conservation

Phoenix's water conservation division is housed within the Water Resources and Development Planning Department. In 2008, this department had a budget of $1,750,136, approximately 0.7% of the total water utility's budget. Five employees worked in the department, with six positions left vacant. Each year, the city spends about $1.17 per customer on conservation efforts.

Water Loss

In 2008, Phoenix recorded 15,923 AF (5.2 billion gallons) of water loss, representing 5.1% of total supplies. This is the lowest water loss reported for the years of data collection ('03, '07, '08).

Supply-Side Efficiency Measures

The city practices an active leak detection program, tailoring the approach to the size and type of pipe being assessed. For large mains, a noise sensor attached to a small parachute is drawn through the pipeline in the direction of the flow of water. The sensor detects noise created by a leak, the location of which is then correlated to a position on the surface where to dig down and make the repair. In most cases, crews locate leaks through traditional acoustic methods, e.g., placing specially designed microphones on valves, water meters, and other appurtenances and listening for the distinctive sound a leak makes.

Initial results from the leak detection program show that the most common leak sources are fire hydrants. As this program ramps up and gains additional data, more quantitative analysis will be performed.

Effluent Use

The city of Phoenix generated 200,453 AF of effluent in 2008. This total includes all effluent from the 91st Avenue wastewater treatment plant, which receives wastewater from the Sub-Regional Operating Group (SROG) cities: Glendale, Mesa, Phoenix, Scottsdale, and Tempe. Almost 60,000 AF of this effluent is delivered directly to the Palo Verde nuclear power plant and 28,200 AF is delivered to the Buckeye Irrigation District, but these deliveries are made by the SROG cities as a whole, not just Phoenix. The city of Phoenix delivers approximately 1,600-1,700 AF of effluent for direct uses, which primarily is used by turf facilities located throughout the city.

Phoenix also participates in a three-way exchange with 30,000 AF of effluent. In the exchange, the city delivers effluent to the Roosevelt Irrigation District (RID) instead of RID locally pumping groundwater with even higher salinity than the effluent. Salt River Project then pumps RID's groundwater for its deliveries, which include up to 20,000 AF to Phoenix and 10,000 AF to the Salt River Pima Maricopa Indian Community (which Phoenix may use if that Indian community does not).

The remaining effluent (approximately 80,000 AF) is mostly consumed by the Tres Rios Wetlands and other agricultural uses downstream from the 91st Avenue plant.

Additional Information

Phoenix continuously supports efforts, and may begin playing a larger role at the national level, to develop and improve efficiency standards for plumbing, fixtures, and irrigation systems, and to improve education and marketing in the water conservation sector. As one example, the city is conducting an efficient technology integration study to evaluate the natural rate that efficient technology is integrated and the impact new technology is having on water demand and wastewater generation.

City of Prescott

Background

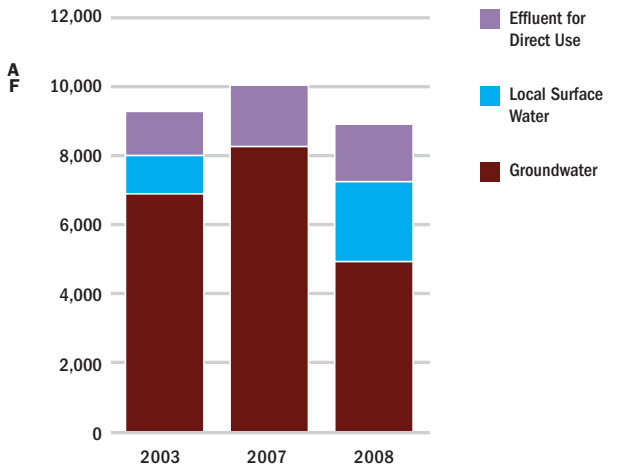
The city of Prescott is the county seat of Yavapai County, and has an estimated population of 43,573 residents.* The city is located about 100 miles southwest of Flagstaff, between the Sierra Prieta Mountains to the west and Black Hills to the east.

At an elevation of 5,368 feet, Prescott is in the Central Highlands Transition Zone physiographic province. The city has an annual average precipitation of 11.8 inches, average high temperatures in the summer of 90.4 degrees (ºF), and average low temperatures in the winter of 24.9 degrees (ºF).†

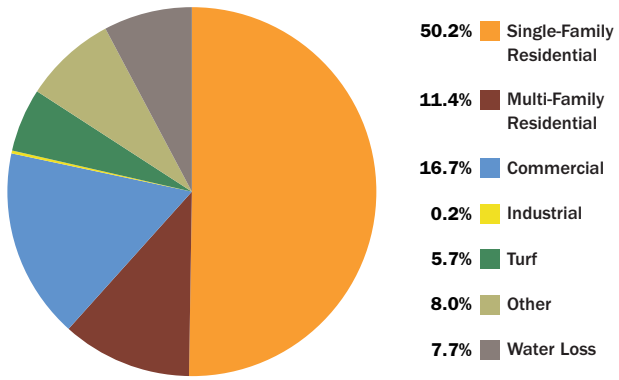
Water Supply and Deliveries

Prescott's water supply is pumped from groundwater wells in the Chino Valley and Prescott area; however, a portion of this groundwater was originally sourced from local lakes and then recharged to the aquifer. In 2008, 50% of the total water deliveries in Prescott were used by single-family residential accounts. The commercial sector, the second-highest water user in the city, used more than the government, construction, turf, and industrial sectors combined.

SOURCES OF WATER FOR PRESCOTT



2008 WATER USE IN PRESCOTT



* Arizona Department of Commerce. 2009. *Arizona population estimates, 2009. Available at:* http://www.azcommerce.com/econinfo/demographics/Population+Estimates.html (accessed May 5, 2010.)

† Western Regional Climate Center. 2009. Climatological summary: Prescott-Ernest A. Love Field Airport. http://www.wrcc.dri.edu/summary/prc.az.html (accessed July 13, 2010).

Per Capita

The city of Prescott reduced its system-wide total gallons per capita per day (GPCD) water use from 2003-2008 (-13.6% change), and significantly reduced its single-family residential (-29% change) and system-wide potable (-18% change) GPCD over the same time period.

Prescott GPCD

Per Capita Water Use	2003	2007	2008
Single-Family Residential [a]	137	114	98
System-Wide Potable [b]	154	144	126
System-Wide Total [c]	193	189	167

a Treated water deliveries to single-family accounts ÷ single-family residential population

b Total treated water delivered ÷ service area population

c Total raw water from all supply sources + direct effluent use ÷ service area population

Rate Structure

Prescott uses a four-tier inclining block rate for single-family residential water accounts.

Usage Per Dwelling Unit	Cost
0–3,000 gallons	$2.86 per 1,000 gallons
3,001–10,000 gallons	$4.30 per 1,000 gallons
10,001–20,000 gallons	$6.45 per 1,000 gallons
Over 20,000 gallons	$12.90 per 1,000 gallons

Single-family residential accounts have a base service fee of $6.60 and an additional alternate water resource fee of $0.65 per 1,000 gallons. The base fee comprises 12% of the average customer's monthly bill for 10,000 gallons. The slope of the city's average price curve is 0.1284, indicating that the average price of water increases significantly as consumption volume increases.

Conservation Measures

The city of Prescott is regulated in the Prescott Active Management Area as a large municipal provider under the Modified Non Per Capita Conservation Program (NPCCP). As a Tier 2 municipal provider, Prescott is required to implement a public education program and five additional water conservation best management practices (BMPs). The city has implemented 23 additional BMPs, but will be evaluated for compliance with the Modified NPCCP on the following five:*

- 1.1 – Local and/or Regional Messaging Program
- 2.2 – Youth Conservation Education Program
- 3.4 – Residential Interior Retrofit Program
- 5.8 – Landscape Watering Restrictions
- 6.9 – Landscape Conversion Incentives

Customer Rebates

The city offers several popular water conservation credits. For the 2010 fiscal year, $85,900 of allocated funding has already been exhausted by the following credits:†

- *Turf removal* – $0.50 per square foot, up to $800 for residential accounts and $2,000 for nonresidential accounts.
- *Automatic drip systems* – $150 credit.
- *Rainwater catchment* – $0.10 per gallon for catch capacity, minimum of a 500-gallon system, maximum credit of $500.
- *Low-flow toilet* – $100 credit for 1.6-GPF toilet.
- *High-efficiency toilet* – $150 credit for 1.28-GPF toilet.
- *Dual-flush toilet* – $150 credit for toilet that is 0.8-GPF/1.6-GPF or less.
- *Low-flow urinals* – $100 credit for urinal that is 1.0-GPF or less.
- *Waterless urinals* – $125 credit.
- *Low-flow showerhead* – $10 credit.
- *Leak repair* – $20 per leak, maximum $50.
- *Certified irrigation audit – $100 credit.*

Ordinances/Rules

Water Conservation Code Regulations‡ **–** The code establishes maximum flow rates for plumbing fixtures and other devices, and applies to all new construction and the replacement of fixtures in all existing structures. Covered

* ADWR List of Best Management Practices (adapted from the 2nd Modification to the Third Management Plan Chapter 5, May 2008).

† Prescott, Ariz., Ordinance 4691-0934 (April 10, 2009).

‡ Prescott, Ariz., Code, § 3-10-3(A) (2010).

fixtures include toilets, urinals, showerheads, faucets, and public restrooms.

Time-of-Day Watering Restrictions[*] – Outdoor spray irrigation and airborne watering shall only be permitted during the hours between 8:00 p.m. and 8:00 a.m. during the period April 15 through November 1.

Low-Water-Use, Drought-Tolerant Plant List[†] – All plants within any publicly owned right-of-way may be irrigated with groundwater only if the plants are listed on the ADWR Low-Water-Use Plant List.

Artificial Lakes and Fountains[‡,§] – The use of treated, metered, potable water from the municipal water supply system for the purpose of filling or refilling private artificial lakes is prohibited. Spray-type fountains are also prohibited.

Water Meter Tests[¶] – Should any consumer doubt the correctness of his water meter or water bill, the consumer may have his meter retested and/or reread by submitting a written application to the city and paying a fee of $35. If, during a meter test, an error is found exceeding 4%, allowance shall be made covering a period not to exceed the prior billing and the current consumption to date of removal of the meter. Should an error be found exceeding 4%, all of the expenses incurred in the meter removal and replacement shall be borne by the city, and the $35 deposit refunded to the consumer.

Tampering with the Water System[**] – It shall be unlawful for any person to break, deface, alter, tamper with, or damage any hydrant, pipe, or other water system appliance or fixture, or in any other manner interfere with the operation of any part of the water system of the city.

Water Consumers Not to Supply Water to Others[††] – Consumers (other than a private line system) shall not supply water or allow water to be carried or run through a hose or pipe to any premises other than that described in the application, agreement, or contract without first having received written permission from the city.

Failure of Consumer to Comply with Regulations[‡‡] – The city may refuse to furnish water or sewer services to the premises of any applicant who fails to meet all the applicable conditions and terms of the regulations or requirements set forth in the city code relating to water or sewer service.

Water Flowing Upon Streets[§§] – It shall be unlawful for any person, firm, or entity to allow potable water used for irrigation to flow into or upon a public street, alley, public right-of-way, or adjoining property.

Education

Educational Materials – The city of Prescott has developed and branded a WaterSmart logo that is used on all conservation program communications. WaterSmart cards with different water conservation topics (ranging from leak detection to rainwater harvesting to Xeriscape principles) are included in each month's utility bills and are also distributed regionally. The city of Prescott also maintains a website containing water conservation information and applications for water conservation incentive programs.

Regional Messaging Program – Prescott is a member of the Upper Verde River Watershed Protection Coalition (UVRWPC). The UVRWPC supports the creation of regional water conservation best management practices, which they disseminate over regional radio spots that cover a wide range of water conservation issues. The UVRWPC provides links to the audio files of these BMP radio spots on its website.

School-Based Education – The city of Prescott supports Project WET. The water conservation coordinator is a certified Project WET facilitator and participates in Project WET events and training in Prescott. The city has also sponsored many teacher trainings and water festivals, along with funding conservation education grants for Project WET teachers.

* *Id. § 3-10-14.*

† Prescott Active Management Area. 2006. Low water use draught tolerant plant list: Official regulatory list for the Arizona Department of Water Resources Prescott Active Management Area. Available at: http://www.cityofprescott.net/documents/ (accessed June 29, 2010).

‡ Prescott, Ariz., Code, § 3-10-5 (2010).

§ *Id. § 3-10-9.*

¶ *Id. § 2-1-25.*

** *Id. § 2-1-36.*

†† *Id. § 2-1-27.*

‡‡ *Id. § 2-1-35.*

§§ *Id. § 3-10-10.*

Implementation of Conservation Measures

Prescott tracks its conservation programs in a systematic way and provides this information to customers on the city's website.* The credits implemented between July 2006 and June 2010 are listed below, along with an estimate of the annual water savings these measures are achieving:

Incentive	Number of Products/ Activities	Projected Savings (Gallons per Year)
Turf grass removal	216	9,918,772
Leaks repaired	354	1,178,550
High-efficiency clothes washers	538	2,325,236
Hot water recirculation pumps	146	319,740
Low-flow toilets	1,502	10,964,600
Low-flow showerheads	547	3,744,900
Waterless urinals	20	41,600
Irrigation audits	11	220,000
Rainwater harvesting systems	10	71,734
Automatic drip irrigation	66	1,782,660

Prescott estimates that these incentives have saved approximately 236 AF of water since inception, at an average cost of $1,509 per AF of water saved. The average customer who participates in the incentive program receives about $172 worth of credits to his water bill and saves approximately 102 gallons of water per household per day or 37,310 gallons per year.

Prescott's watering restriction ordinance has also produced measureable results. In 2006, there were 13 days above 12 MGD. The time-of-day watering ordinance went into effect in 2006, and for 2007 only four days were above 12 MGD. The year 2008 had no days above 12 MGD, and four days above 10 MGD, with the highest day of 10.8 MGD. The year 2009 had only two days above 10 MGD, with the highest day of 10.5 MGD.†

Funding for Conservation

In 2008, Prescott had a conservation budget of $143,000, approximately 0.5% of the total water utility's budget. The city has one full-time employee in the water conservation department, and each year spends about $2.98 per customer on water conservation programs.

Goals for Conservation Savings

Through the safe yield committee, the city of Prescott adopted a goal to promote water conservation by all users and providers in the city of Prescott water service area. The goal seeks to reduce total annual water consumption, with an emphasis on reducing water demand during the summer peak use period, and uses the following strategies:

- Extensive water conservation education and publicity (awareness)
- Water conservation incentive programs (utility bill credit)
- Revised and improved conservation regulations and enforcement
- Research of structured water rates (tiered rate structure)

Water Loss

In 2008, the city of Prescott recorded 564 AF (183 million gallons) of water loss, representing 7.7% of total supplies. Data collected for additional years indicate that Prescott consistently maintains water loss in the 7% to 8% range.

Supply-Side Efficiency Measures

The city of Prescott includes a line item in its yearly budget for system leak detection. The program focuses on large sections of infrastructure throughout the system. Approximately five years ago, the city started a project to replace all meters sized 2" and smaller, which includes all residential meters. This program should be complete by the end of 2010.

* City of Prescott, Arizona. 2010. Water conservation. http://www.cityofprescott.net/services/water/conservation.php (accessed June 25, 2010).

† Arizona Department of Water Resources. September 18, 2009. Official notice of provider profile approval, Modified Non-Per Capita Conservation Program, 56-003017.0000, City of Prescott.

Effluent Use

The city recognizes the importance of recovering as much of the water used by customers as possible.* As such, the city's water management policy prohibits new golf courses to develop on the city's municipal water or effluent system. In 2008, the city utilized all of the effluent it produced, providing 1,653 AF (37%) to direct uses and recharging the remainder (2,862 AF). The city also maximized effluent use in 2003 and 2007.

Additional Information

The water conservation department is currently working with the parks department on improving water use efficiency at local open spaces. The program, named "Conserve to Enhance," seeks to reduce water use through the use of below-ground irrigation systems, removing select areas of turf grass, and exploring other grass cultivars that use less water and may be better suited for Prescott's climate.

Prescott's water conservation staff contributed substantially to a regional Yavapai County water conservation awareness handbook. The handbook is a resource designed to guide and assist citizens in their efforts to conserve water, with an emphasis on the reduction of outdoor water use. It contains detailed information about water and the water cycle, Yavapai County environs, the energy/water connection, and several examples of low-water-using landscape plants and plans.

* City of Prescott, Arizona. 2008. Drought management plan, see section III(C).

City of Safford

32

Background

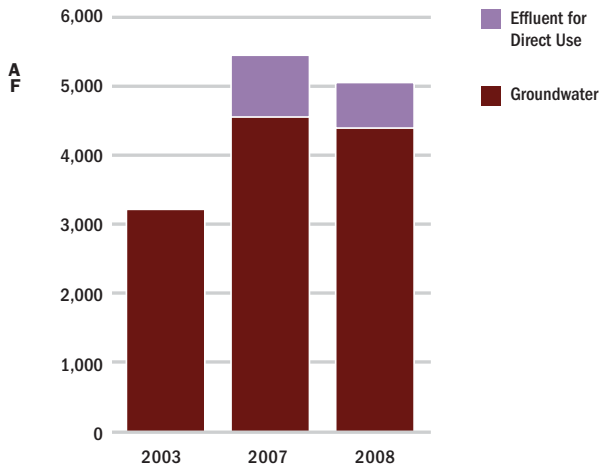
Safford — population 10,094 — is the county seat of Graham County in southeastern Arizona.* The city's public water utility provides service to residents within the city of Safford, Thatcher, Graham, and surrounding unincorporated areas of the county. The city lies in the Safford Valley, which is carved by the Gila River as it flows westward between the Gila Mountains to the north and the Pinaleño Mountains to the south.

The city of Safford is located in the Basin and Range physiographic province, with average summer high and winter low temperatures of 98.4 and 28.6 degrees (°F), respectively. The city's average annual precipitation is 9.8 inches.†

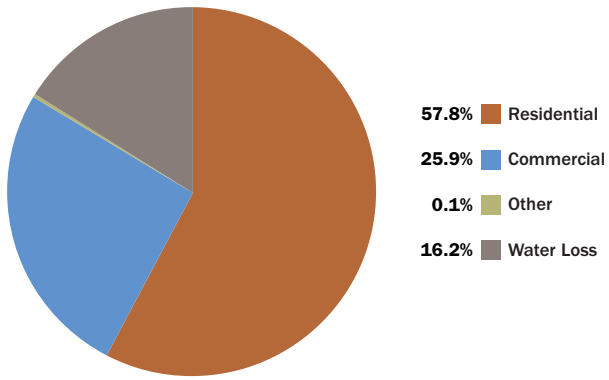
Water Supply and Deliveries

All of Safford's water supply is sourced from groundwater, with approximately 75% of supply coming from Bonita Springs. A subsurface collection gallery captures water from the springs, which are considered groundwater and "not under the influence of surface water." Reclaimed water has been identified as an important water source needed to reduce reliance on additional fresh water sources for future growth, and approximately 14.5% of the total water supplied by the city in 2008 was sourced through reclaimed water. The residential sector receives the majority of water deliveries in Safford, 57.8% of the total in 2008. About one-sixth of total water supplied during this same year was lost.

SOURCES OF WATER FOR SAFFORD



2008 WATER USE IN SAFFORD



* Arizona Department of Commerce. 2009. *Arizona population estimates, 2009. Available at:* http://www.azcommerce.com/econinfo/demographics/Population+Estimates.html (accessed May 5, 2010).

† IDcide Local Information Data Server. Safford, AZ weather. http://www.idcide.com/weather/az/safford.htm (accessed April 13, 2010).

Per Capita

The city of Safford reduced its gallons per capita per day (GPCD) water use from 2007 to 2008 across all metrics: residential (-5.4% change); system-wide potable (-16.5%); and system-wide total (-7.3%).

Safford GPCD

Per Capita Water Use	2003	2007	2008
Residential [a]	No data	185	175
System-Wide Potable [b]	No data	210	175
System-Wide Total [c]	No data	258	240

a Treated water deliveries to residential accounts ÷ service area population

b Total treated water delivered ÷ service area population

c Total raw water from all supply sources + direct effluent use ÷ service area population

Rate Structure

The city of Safford uses a three-tier inclining block rate for individual residential water accounts.

Usage Per Dwelling Unit	Cost
0–10,000 gallons	$1.24 per 1,000 gallons
10,001–20,000 gallons	$1.55 per 1,000 gallons
Over 20,000 gallons	$1.94 per 1,000 gallons

Single-family residential accounts have a base service fee of $19.18, which represents 61% of the average customer's monthly bill for 10,000 gallons. The slope of Safford's average price curve is -0.0158, indicating that the average price of water decreases as consumption volume increases.

Conservation Measures

The city of Safford is a Community Water System in the Safford Basin. It produced a water conservation plan as part of its 2006 System Water Plan.

Customer Rebates

Water Conservation Refunds – A portion of the water development fee (not >20%) can be refunded to developers who install landscapes that contain less lawn area and more water-conserving plant material.

Ordinances/Rules

Regulation and Limitations on Use of Water* **–** The director of the water system may prescribe the hours and days during which water may be used for sprinkling of lawns and grounds.

Uniform Plumbing Code Adoption† **–** Safford started adopting the Uniform Plumbing Code in 1994, and has continued updating it to every succeeding edition.

Refund for Water Conservation‡ **–** In order to encourage voluntary limits on the construction of water features and to encourage the installation of landscapes that contain less lawn area and more water-conserving plant material, all developers are eligible for a refund of a portion of the water development fee, as determined by the city, if their landscaping meets certain requirements established by the city. Such refund will not exceed 20% of the amount of the water development fee that was paid.

Water Flow Prohibition§ **–** It is unlawful for any person to willfully or negligently permit or cause the escape or flow of water or irrigation water in such quantity as to cause flooding, impede traffic, create a hazardous condition, or cause damage to the public streets.

* Safford, Ariz., Code § 13.20.070 (2009).

† *Id. § 15.16.010*

‡ *Id. § 13.24.070.*

§ *Id. § 9.08.090.*

Education

Educational Materials – Safford promotes water conservation annually through the use of bill stuffers and city newsletters.

Tradeshows, Conferences, and Events – The city teaches water conservation every year at the Graham County Fair.

Project WET – Safford sponsors and hosts the annual Project WET, a water education and conservation program in collaboration with the University of Arizona. This program teaches all fourth-graders of Graham County principles of water stewardship and conservation.

Funding for Conservation

In 2008, the city had a conservation budget of about $25,000, approximately 0.8% of the total water utility's budget. Safford utilizes one half-time employee for water conservation, and spends about $1.32 per person on conservation programs.

Water Loss

In 2008, the city recorded 716 AF (233.3 million gallons) of water loss, representing 16% of total supplies. In 2007, Safford reported 3.0% water loss. The high loss in 2008 is attributable to system flushing and flow testing of fire hydrants, which does not occur on a regular basis.

Supply-Side Efficiency Measures

The city tracks all production and consumption volumes to determine and control water loss. Production well meters are calibrated every five years and whenever production reports are in doubt. Reports of volume of water lost during daily operations and maintenance is included in the service orders of the crews repairing damaged lines.

Effluent Use

In 2008 Safford utilized all of the 1,123 AF of effluent it generated. Approximately 57% (643 AF) was delivered for direct use, and the remaining 43% (480 AF) was delivered for recharge. As the city continues to produce more effluent, it will rethink beneficial reuse options.

City of Scottsdale

Background

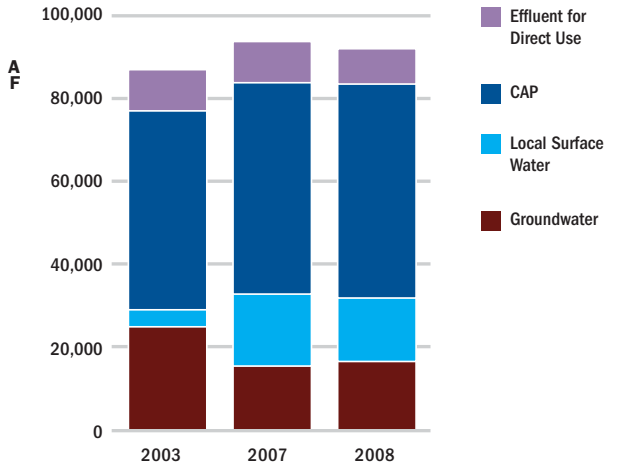
The city of Scottsdale is located within Maricopa County and covers almost 185 square miles. It has an estimated population of 243,501 residents.* The city lies in the Salt River Valley, with the McDowell Mountains on the northeast and east, and Phoenix to the west.

Scottsdale is located in the middle of the Gila River Watershed and in the Basin and Range physiographical province. The annual average precipitation in the city is 9.4 inches. Average high temperatures are about 100 degrees (ºF) in the summer, and the average low temperature is 39.5 degrees (ºF) in the winter.†

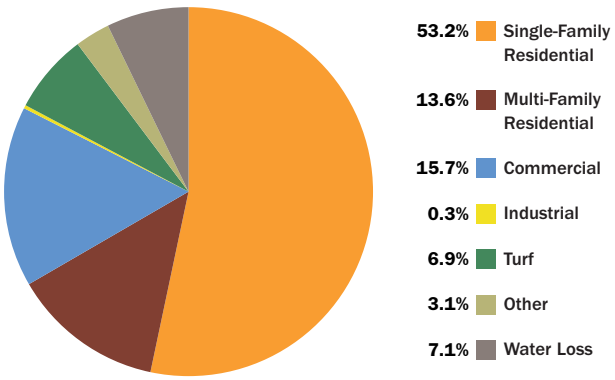
Water Supply and Deliveries

Consistent with the Phoenix Active Management Area's goal, Scottsdale has made significant progress in reducing groundwater withdrawals since 2003—curbing groundwater use from 30% of total water deliveries in 2003 to 19% of total water deliveries in 2008.‡ Colorado River water delivered via the Central Arizona Project (CAP) is Scottsdale's major source of water supply. Most water delivered by the city is used by single-family residential customers (53%), with commercial, multifamily residential, and turf consumption making up most of the remaining demand. The water used for turf irrigation is non-potable and a mix of effluent reuse and raw CAP water.

SOURCES OF WATER FOR SCOTTSDALE



2008 WATER USE IN SCOTTSDALE



* Arizona Department of Commerce. 2009. *Arizona population estimates, 2009. Available at:* http://www.azcommerce.com/econinfo/demographics/Population+Estimates.html (accessed May 5, 2010).

† IDcide Local Information Data Server. Scottsdale, AZ weather. http://www.idcide.com/weather/az/scottsdale.htm (accessed April 14, 2010).

‡ The Phoenix AMA's statutorily mandated goal under the Arizona Ground Management Code is to achieve safe yield (to withdraw no more groundwater than is being annually replaced) by 2025. See: Ariz. Rev. Stat. Ann. § 45-562(A) (2010). To achieve this, Scottsdale substantially relies on SRP and CAP water.

Per Capita

Between 2003 and 2008, the city of Scottsdale increased single-family residential and system-wide potable use — measured in gallons per capita per day (GPCD) — by 3.6% and 7.9%, respectively. Over the same time period, system-wide total use decreased by 1.5%. High water use rates in Scottsdale are generally attributed to larger lot sizes, an affluent customer base, and the high percentage of residences with pools.

Scottsdale GPCD

Per Capita Water Use	2003	2007	2008
Single-Family Residential [a]	240	260	249
System-Wide Potable [b]	280	308	302
System-Wide Total [c]	363	368	358

a Treated water deliveries to single-family accounts ÷ single-family residential population

b Total treated water delivered ÷ service area population

c Total raw water from all supply sources + direct effluent use ÷ service area population

Rate Structure

The city of Scottsdale uses a three-tier inclining block rate for residential water accounts with a 5/8" meter.

Usage Per Dwelling Unit	Cost
0 - 7,500 gallons	$1.80 per 1,000 gallons
7,501 - 39,000 gallons	$3.35 per 1,000 gallons
Over 39,000 gallons	$4.60 per 1,000 gallons

Single-family residential accounts have a base service fee of $11.25 and an environmental quality charge of 3.677% applied to the sum of the base fee and volume charges. The base fee comprises approximately 34% of the average customer's monthly bill for 10,000 gallons. The slope of Scottsdale's average price curve is 0.0075, indicating that the average price of water remains relatively constant as consumption increases.

Conservation Measures

The city of Scottsdale is regulated in the Phoenix Active Management Area as a large municipal provider under the Non-Per Capita Conservation Program. To meet the program's requirements, the city has implemented the following reasonable conservation measures:

- Public information and education
- Distribution plan for water conservation materials
- Submittal of a water use plan by new large facilities
- Low-flow plumbing rebate for existing customers and facilities
- Limitation on turf and other water-intensive landscaping in common areas of new single-family and multifamily developments
- Rebate program for low-water-use landscaping and irrigation system improvements for existing or new facilities
- Exterior audit program for existing residential customers
- Landscape watering advice program for existing and new residential customers
- System-related water audit program
- Ordinance for water-efficient plumbing fixtures in new nonresidential facilities
- Ordinance for model homes in new residential developments
- Landscape ordinance for new nonresidential facilities

Customer Rebates

The city of Scottsdale currently offers several financial rebates to incentivize wise water use and has adequate funds to meet demand for its rebate programs.*

- *Showerhead* – $5 for a 2.75-GPM (or less) fixture. Funding may increase for WaterSense-certified showerheads that use 2.0 GPM or less.
- *Toilet* – $75 for a 1.6-GPF toilet. Funding may increase for WaterSense-certified toilets that use 1.28 GPF or less.
- *Hot water recirculation system* – $150 for installation in an existing structure.
- *Single-family residential turf removal* – $0.25 per square foot for turf removal, $0.50 per square foot for turf removal and installation of low-water-use plants (maximum $1,500).
- *Common area turf removal* – 25% of total cost for removing turf and replacing with low-water-use landscaping (maximum $3,000).

* Scottsdale, Ariz., Code § 49-243 (2010).

- *Irrigation controller* – $250 for a new multiprogram, permanently hardwired, electronically activated controller.
- *Faucet aerators* – Free.

Ordinances/Rules

Water Features* – Large water features are prohibited to either spray water in a fine mist or spray or drop water in excess of six feet in vertical height. Water features must include catch basins, recirculating pumps, and wind shut-off valves, and shall only operate during normal business hours.

Limitation on Water-Intensive Landscapes†,‡ – No water-intensive landscape/turf shall be permitted in the public right-of-way. Turf areas are limited to the following percentages:

- *Schools* – 15% of total lot, with all of the remaining area consisting of plants listed on the ADWR low-water use plant list.
- *Churches* – 25% of total lot, with all remaining areas same as schools.
- *Resorts* – 10% of the first 9,000 square feet and 8.5% of the remainder of the total lot, with at least 95% of the remaining area consisting of plants listed on the ADWR list.
- *Cemeteries* – 75% of their total operating facility area, excluding parking lots.
- *New commercial and industrial users, and residential common areas* – 10% of total lot for lots less than 9,000 square feet, with decreasing allotments for increasing lot size.

Limitations on Model Home Landscaping§ – Water-intensive landscape/turf shall be located only in rear yards and play areas. All new single-family model homes are subject to landscape/turf restrictions similar in nature to commercial accounts.

Conservation Plans for New Nonresidential Customers¶ – All new nonresidential customers with an estimated or billed annual water demand of ≥ 10 AF shall submit a conservation plan identifying the anticipated types of water uses and demonstrating the use of the latest commercially available conservation technologies for both interior and exterior water uses consistent with reasonable economic return (emphasis added).

International Plumbing Code** – Scottsdale adopted the 2006 International Plumbing Code, which sets standards for high-efficiency plumbing fixtures and appliances to be used within a home.

Plumbing Code and Water Conservation†† – The maximum water flow rates and flush volume for plumbing fixtures and fixture fittings shall comply with Section 604.4 (maximum flow and water consumption) of the International Plumbing Code. This includes the addition or alteration or replacement of any regulated plumbing fixture in any occupancy type.

Water Application Systems‡‡ – No person shall irrigate any area of land with water received from the city through a water application system installed after February 1, 1991, unless the system is designed and installed to retain all water on the property.

Leakage, Escape of Water Prohibited§§ – No person shall permit the excess use, loss, or escape of water through breaks, leaks, or other malfunctions in the water user's plumbing or irrigation distribution system for any period of time after such escape of water should have reasonably been discovered and corrected.

Education

Landscape Assistance Program¶¶ – The Water Resources Department, together with the citizen and neighborhood resources department, shall establish a landscape assistance program to assist qualified residential homeowners within the city of Scottsdale in converting their high-water-usage and high-maintenance front yard landscaping into low-water-usage and low-maintenance landscaping.

* *Id. § 49-242.*
† *Id. § 49-245.*
‡ *Id. § 49-246.*
§ *Id. § 49-247.*
¶ *Id. § 49-248 (emphasis added).*
** *Id. § 31-166.*
†† *Id. § 31-167 (amending Chapter 4, "Fixtures, faucets and fixture fittings," of the 2006 edition of the International Plumbing Code, adopted by § 31-166).*
‡‡ *Id. § 49-244.*
§§ *Id. § 49-249.*
¶¶ *Id. § 49-265.*

Audits – Scottsdale provides a free, self-audit water guide and kit to homeowners. A companion irrigation water audit (exterior only) is also available to single-family residential homes. The city contracts with a consultant to provide exterior audits on multifamily properties.

Water Budgeting for Nonresidential Customers – Water conservation information is distributed to new and existing high-water-use customers. A customized water budget based on landscaped area and plant material is also available upon request.

High-Water-Use Complaints – Scottsdale provides on-site inspections to diagnose the cause of increased water bills.

Water Waste Investigations – Water conservation staff responds to reports of water wasting and provide educational assistance and information, when necessary.

Information Packets – Conservation program information is mailed to all new owners of existing homes. Water-efficient landscape information is mailed to all new owners of newly constructed homes.

Water Conservation Presentations – How-to information is presented to residential customers, with an emphasis on water-efficient outdoor landscaping. Presentations are also given, upon request, to civic groups, youth programs, and homeowner association boards.

EPA WaterSense Program – Scottsdale is a WaterSense promotional partner and promotes the WaterSense program through its website and via special campaigns, such as "Fix a Leak Week."

AMWUA Membership – As a member of Arizona Municipal Water Users Association, Scottsdale participates in the "Water—Use It Wisely" messaging campaign, SmartScape Training Program, outreach at tradeshows and conferences, and distribution of AMWUA brochures, such as "Landscape Plants for the Arizona Desert" and "Watering by the Numbers."

Distribution Plan – The city maintains a distribution plan for determining which educational materials are available at each of the different distribution outlets.

Xeriscape Garden – The city maintains a Xeriscape demonstration garden with outdoor classrooms and interpretive signage at Chaparral Park.

School Programs – The city offers free Project WET booklets and on-site educational, interactive water activities at elementary and middle schools, water conservation puppet shows and workbooks for elementary school classes, and resource materials for teachers.

Implementation of Conservation Measures

The city of Scottsdale tracks its rebate program and has recorded the following achievements since September 2005:

Rebate Program	No. of Rebates	Funds Distributed ($)	Notes
Residential irrigation controller	806	107,873	
Commercial irrigation controller	12	2,361	
Residential turf removal	430	220,855	586,817 sq. ft. of turf removed
Commercial turf removal	21	51,662	646,733 sq. ft. of turf removed
Aerators	2,341		free for customers
Showerheads	1,096	5,480	
Toilets	4,582	331,053	
Hot water recirculators	1,995	409,532	
Total Funds		**$ 1,128,816**	

Scottsdale has also performed more than 1,524 single-family residential landscape audits, and a five-year study suggests that audited accounts reduced use by over 30,000 gallons the year following the audit. In addition, the city reports 1,983 water waste complaint investigations and 3,872 landscape water conservation workshop attendees since January, 2005.

Funding for Conservation

In 2008, Scottsdale's conservation budget was $986,523, approximately 1.6% of the total water utility's budget. The city currently employs four people in its Water Conservation Department, and each year spends about $4.28 per customer on water conservation.

Goals for Conservation Savings

Scottsdale aims to achieve the goals set forth in its Recommended Conservation Measures.

Water Loss

In 2008, the city recorded 5,977 AF (1.9 billion gallons) of water loss, representing 7.0% of total water supplies. This represents a significant reduction from the city's 13.4% system loss reported during 2003.

Supply-Side Efficiency Measures

The city employs a meter accuracy program to improve maintenance of its distribution system. From 2005 through 2009, the city replaced 27,267 meters at a cost of $1.1 million, and estimates the program has saved nearly 2.6 billion gallons of water and recovered $5.6 million in potentially lost revenue. This program is one of the main causes behind the city's reduction in water loss between 2003 and 2008.

Effluent Use

In 2008, Scottsdale reused all of the 11,808 AF of effluent it produced, with 72% of the effluent delivered for direct use, and the remaining 28% delivered for recharge. Scottsdale is also a member of the Sub-Regional Operating Group (SROG), which operates the 91st Avenue wastewater treatment plant. A portion of the city's effluent is delivered to this facility (not included above), which is then reused for wildlife habitat mitigation, agricultural use, and use at the Palo Verde nuclear power plant.

Additional Information

From January 2002 to December 2009, the Scottsdale Parks Department has saved an estimated 1.3 billion gallons of water through setting aggressive water budgets and implementing water-savings techniques. Entitled "Parks are Green and Water Lean," implemented practices include:*

- Replacing 271,000 sq. ft. of grass (approximately five football fields) with Xeriscape
- Performing regular preventive maintenance on irrigation equipment
- Discontinuing overseeding for winter grass
- Performing detailed water audits when water usage issues occur

Scottsdale's Water Resources Department is striving to optimize its systems and reduce energy consumption. Existing systems, including aeration blowers and diffusers, are being installed with energy-efficient equipment to drastically reduce long-term energy requirements. Likewise, the department has enrolled in a power peak shaving program with the local electric utility to voluntarily shut down non-critical equipment, upon request.

* City of Scottsdale, Arizona. 2010. Parks are green and water lean. http://www.scottsdaleaz.gov/Water/Conservation/CityWide.asp (accessed June 21, 2010).

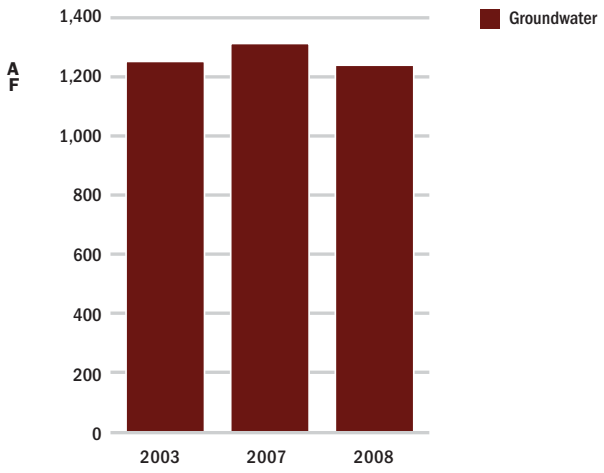
City of Sierra Vista—Arizona Water Company

Background

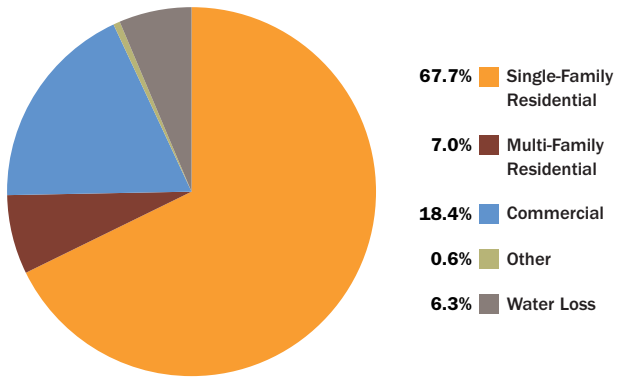
The city of Sierra Vista is located in southeastern corner of Arizona in Cochise County. At an elevation of 4,635 feet, Sierra Vista covers 142.4 square miles and has an estimated population of 46,597.* Water is provided to city residents by several private water utilities, the largest three being Liberty Water (Bella Vista), servicing 23,100 customers; Arizona Water Company (AWC) with 7,909 customers; and Pueblo del Sol with 12,804 customers. The city is bordered on the east by the San Pedro River and the Mule Mountains, on the southeast by the Huachuca Mountain Range, and on the north and northeast by the Whetstone and Dragoon Mountains, respectively.

Sierra Vista is in the Basin and Range physiographical province. It has an average summer high temperature of 93.3 degrees (ºF), and an average winter low of 33.7 degrees (ºF). The average annual precipitation is 14.0 inches.†

SOURCES OF WATER FOR AWC–SIERRA VISTA



2008 WATER USE IN AWC–SIERRA VISTA



* Arizona Department of Commerce. 2009. *Arizona population estimates, 2009. Available at:* http://www.azcommerce.com/econinfo/demographics/Population+Estimates.html (accessed May 5, 2010).

† IDcide Local Information Data Server. Sierra Vista, AZ weather. http://www.idcide.com/weather/az/sierra-vista.htm (accessed April 14, 2010).

Per Capita

AWC-Sierra Vista customers have reduced their gallons per capita per day (GPCD) water use from 2003-2008 across all metrics: residential (-10.0% change), system-wide potable (-11.5% change), and system-wide total (-9.6% change). In 2008, residential customers used 11 gallons per day less, on average, than they did in 2003.

AWC–Sierra Vista GPCD

Per Capita Water Use	2003	2007	2008
Residential [a]	116	113	105
System-Wide Potable [b]	148	140	131
System-Wide Total [c]	155	148	140

a Treated water deliveries to residential accounts ÷ service area population

b Total treated water delivered ÷ service area population

c Total raw water from all supply sources + direct effluent use ÷ service area population

Rate Structure

AWC-Sierra Vista uses a three-tier inclining block rate for individual residential water accounts.

Usage Per Dwelling Unit	Cost
0–10,000 gallons	$1.612 per 1,000 gallons
10,001–25,000 gallons	$2.015 per 1,000 gallons
Over 25,000 gallons	$2.418 per 1,000 gallons

Residential accounts have a base service fee of $15.40, which represents 48% of the average customer's monthly bill for 10,000 gallons. The slope of AWC-Sierra Vista's average price curve is -0.0097, indicating that the average price of water decreases slightly as consumption volume increases.

Conservation Measures

AWC-Sierra Vista is a Community Water System in the Upper San Pedro Basin. It has published a water conservation plan as part of its system water plan, which details the conservation measures being implemented by the company.*

Customer Rebates

AWC-Sierra Vista does not offer financial rebates to customers.

Education

Water Audit Program – An AWC water conservation auditor will conduct a free internal water audit for any single-family residential, multifamily residential, or nonresidential customer to address water conservation opportunities. Written conservation recommendations are provided to the customer along with selected conservation pamphlets, upon completion of the audit.

Water Conservation Webpage – AWC maintains a water conservation webpage that includes a description of its water conservation programs, provides links to more than 20 water conservation brochures and activity books, and lists several free "giveaways" for customers.

Helpful Hints to Reduce Water Use – A water conservation informational leaflet is included in mailed notices and other public notices of curtailment during temporary water shortages.

For Kids – AWC's website provides educational material targeted specifically to children, including several brochures, activity books, and links to outside websites.

Implementation of Conservation Measures

Annual water audit numbers are not kept by AWC for the Sierra Vista water system. Sierra Vista is not located within an Active Management Area and the Arizona Corporate Commission (ACC) does not require this type of information.

Funding for Conservation

AWC-Sierra Vista does not track conservation funding or spending as a separate line item in its budget—it is lumped in with other costs. This is primarily because the ACC has not allowed cost recovery for conservation spending in the past; thus, AWC did not have a need to track this type of information. The ACC may allow cost recovery in the near future, so AWC may begin collecting and tracking conservation expenditures in the next few years.

* Arizona Water Company. 2007. *Sierra Vista System Water Plan.*

Goals for Conservation Savings

AWC-Sierra Vista's goals are to keep lost and unaccounted-for water below 10%, resolve customer concerns in a timely manner, and provide customers with beneficial conservation information, whenever possible.

Water Loss

In 2008, AWC-Sierra Vista recorded 78 AF (25.4 million gallons) of water loss, representing 6.3% of total water supplies. AWC-Sierra Vista tracks 11 categories of water use other than sales, including such uses as construction water and fire flows. Data indicates that AWC-Sierra Vista consistently maintains system losses close to 5%.

Supply-Side Efficiency Measures

AWC-Sierra Vista utilizes an active leak detection program to minimize physical line losses. A leak detection logger is used to survey large areas of the distribution system to locate potential leaks. Then a leak correlator is used to pinpoint the location of leaks identified by the detection logger. Identified leaks are repaired in a timely manner.

AWC's meter shop has established specific replacement criteria based on total gallons and length of time in service for meters in the Sierra Vista system. These criteria differ for each of AWC's water systems, based on water quality, temperature, and other factors that affect meter wear. The meter shop also periodically tests Sierra Vista meters to provide an ongoing assessment of the replacement criteria. The current replacement schedule for residential-sized meters in Sierra Vista is:

- 5/8" – 1 million gallons/12 years
- 1" – 5 million gallons/14 years

Effluent Use

AWC-Sierra Vista does not utilize effluent because wastewater services are handled by the city of Sierra Vista. There are no current plans to partner with the city of Sierra Vista for direct effluent use.

The city of Sierra Vista operates a treatment facility that collects wastewater from Liberty, Pueblo del Sol, and AWC customers. All of the treated effluent is recharged to the groundwater aquifer at several recharge basins. Approximately 2,000 AF is recharged each year.*

* Personal communication between Jerry Whelan, City of Sierra Vista Water/Sewer Services Section Supervisor, and Drew Beckwith, July 20, 2010.

City of Sierra Vista

Conservation Measures

The city of Sierra Vista provides many conservation measures in addition to those offered by the Arizona Water Company.

Customer Rebates

The city's WATERtight Rebate Program provides up to $100 per toilet for converting from a high-use toilet to a low-flow model.†

† City of Sierra Vista, Arizona. WATERtight toilet rebate. http://www.sierravistaaz.gov/egov/apps/services/index.egov?path=details&action=i&id=139 (accessed June 5, 2010).

Ordinances/Rules

Water Saving Plumbing Fixtures‡ – New homes are required to have evaporative cooling systems and decorative fountains equipped with water recycling or reuse systems; all new hot and cold water pipes insulated during construction; and a hot water recirculating system. All new multifamily developments exceeding four units must be sub-metered, and equipped with an ENERGY STAR clothes washer rated with a water factor of 8 or less (if provided by the builder).

For commercial, industrial and public developments:§

- Lavatory faucets shall be equipped with a mechanism that causes the faucets to close

‡ Sierra Vista, Ariz., Code § 151.16.002 (2010).

§ *Id § 151.16.002(A).*

automatically after delivering no more than an average of one quart of water.

- Waterless urinals shall be installed in all new public, commercial, multifamily residential common-use areas, and industrial buildings where urinals are utilized.
- All new commercial car wash facilities shall utilize water recycling systems that recycle a minimum of 75% of the water utilized.
- Commercial clothes washers and dishwashers must be products rated by ENERGY STAR.

Native Plant Salvage* – Prior to site clearing or grading, developers of any residential subdivision, multifamily residential, commercial, or industrial developments that are one acre or larger in size shall be required to salvage native plants.

Landscaping Regulations†

- Turf in single-family residential developments is limited to rear yard areas only, with the exception that up to 200 square feet of turf may be allowed in front and side yard areas.
- Use of turf in multifamily residential developments is limited to 10% of the landscaped area.
- The use of turf is prohibited in governmental, commercial, and industrial developments, except for specific circumstances, as allowed by the city.
- Plant material composition shall be as per a city-provided plant list.

Existing Buildings‡ – In existing buildings or premises in which plumbing installations are to be replaced, such replacement shall comply with all code requirements for water-saving devices.

Water Conservation Guidelines§

- To the extent feasible, spray irrigation on city-owned property during the months of April through October must occur between the hours of 4 a.m. and 9 a.m., and all city-owned properties other than parks and golf courses shall water no more than every other day.
- Outdoor swimming pools should be covered when not in use for a period greater than five days.
- The potential for using harvested water should be evaluated and, when practical, incorporated into the landscape design.

Regulations for Water for Parks and Golf Courses¶

- All parks shall use medium- and low-water-use plants. High-water-use turf or other restricted plants shall be allowed only in those areas with heavy usage, such as athletic fields and playgrounds.
- All golf courses shall use medium- and low-water-use plants.
- The water source utilized for irrigation shall consist of reclaimed wastewater, harvested rainwater, or an alternative water supply other than groundwater, to the extent feasible.
- All new golf course developments shall irrigate the turf only with reclaimed water and shall limit turf areas to the extent feasible consistent with state-of-the-art "target-type" golf course design standards. Turf area shall be limited to five acres per hole.
- New ponds, lakes, artificial watercourses, and other types of water hazard areas shall be prohibited, except for holding ponds utilized for treated effluent being used for permitted irrigation purposes.

Design Regulations for All New Developments and Expansions or Major Renovations**

- Plants that require spray irrigation or a mowing frequency of more than three times per year shall not be used in street medians.
- Spray irrigation shall not be used to apply water to any area within eight feet of a street curb or storm sewer inlet.

* *Id § 151.15.003.*
† *Id § 151.15.004.*
‡ *Id § 151.16.002(C).*
§ *Id § 151.16.003.*
¶ *Id § 151.16.004(A).*
** *Id § 151.16.004(B).*

- No spray irrigation shall be used in areas less than 10 feet in any dimension, with some exceptions. Within parking lots, no spray irrigation shall be used on any area less than 15 feet in any dimension.

Use of Misters is Prohibited* – Use of misters is prohibited in commercial and industrial developments.

Public Nuisance† – It is a public nuisance and unlawful to let escape or flow water into the public right-of-way in such quantity as to cause flooding, impede vehicular or pedestrian traffic, create a hazardous condition for such traffic, or cause damage to the public.

Wasting Water‡ – Wasting water is prohibited in the city of Sierra Vista.

Education

City Water Conservation Webpage – The city maintains a water conservation webpage that includes information for new and current property owners, home builders, and developers to learn how to incorporate water-saving features into home construction, remodeling, landscaping, and storm water management. The webpage also lists several car washing tips and provides a phone line for additional information.

Sierra Vista Water Resource Center§ – This group maintains a webpage that provides informational resources about water sustainability in the Sierra Vista sub-basin, a schedule of upcoming water conservation classes, several brochures and publications, kid-focused content, and an opportunity for visitors to submit questions to the Sierra Vista Water Resource Center. The center ensures that city efforts are focused on water mitigation in the Sierra Vista sub-watershed and that those efforts are measurable, add value to the local community, and are consistent with Fort Huachuca's Biological Opinion.

City Water Management Team – Sierra Vista's water management team was formed in September, 2000 to develop water conservation programs, implement municipal water mitigation actions, and involve the community in water management issues. Among other accomplishments, the inter-departmental staff team has:

- Surveyed residents to establish priorities.
- Developed a toilet rebate program.
- Facilitated free in-home retrofits of high-water-use fixtures.
- Launched a leak detection program.
- Established an internal "Water Watch" program to monitor municipal water use.
- Developed a partnership with the local chamber of commerce to fully engage the business community.
- Implemented an extensive marketing and public relations campaign, including video and printed materials, to educate and inform area citizens.

The city estimates that these programs are expected to mitigate several hundred acre-feet of water use over the next 10 years. During FY 01-02, the toilet rebate program replaced 195 residential toilets and saved six acre-feet of water. The home retrofit program reached 110 residences and saved 10 acre-feet.

City Community Champions Stewardship Program – This program recognizes city businesses and not-for-profit organizations for significant resource conservation programs, or for initiating special projects to preserve, protect, or restore the environment. The program has awarded five organizations to date.

* *Id § 151.16.004(D).*

† *Id § 91.10.*

‡ *Id § 151.16.004(E).*

§ City of Sierra Vista, Arizona. All about water. http://www.sierravistaaz.gov/water (accessed June 7, 2010).

City of Tucson

Background

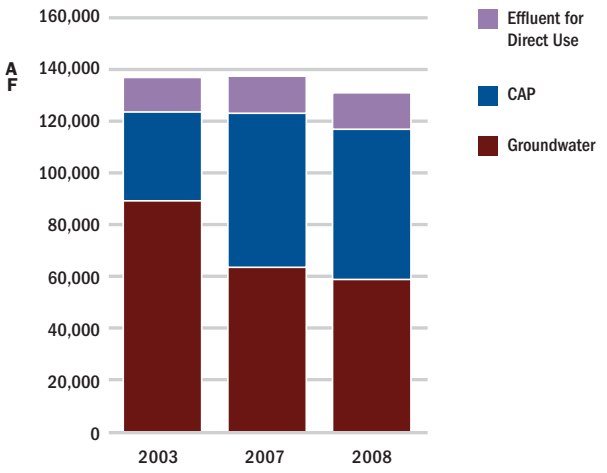
The city of Tucson is located in Pima County in the southeastern portion of Arizona. The city lies in the Tucson Basin, and has an estimated population of 543,566 residents.* Tucson Water served approximately 744,000 people in 2008, and is expected to serve a population of 990,000 by 2030.

Average annual precipitation in the valley is 12 inches, ranging up to 25 inches of rainfall at higher elevations. The average low temperature in January is 41.9 degrees (ºF) and the average high temperature for July is 100 degrees (ºF).†

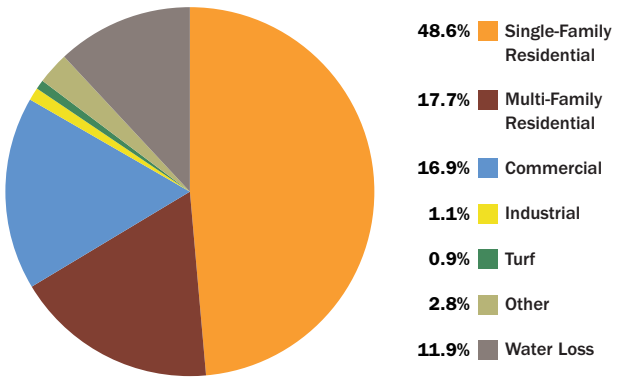
Water Supply and Deliveries

Tucson has significantly curtailed groundwater use over the past several years in accordance with goals of the Tucson Active Management Area. From 2003-2008, groundwater use declined from 72% of total water supplies in 2003 to 50% in 2008. Tucson Water also has the largest municipal allocation of Colorado River water in the state of Arizona, delivered via the Central Arizona Project (CAP). Some 49% of the water provided by Tucson Water in 2008 was delivered to single-family residential accounts, about 17% to both commercial customers and multifamily customers, and approximately 12% was lost or unaccounted for.

SOURCES OF WATER FOR TUCSON



2008 WATER USE IN TUCSON



* Arizona Department of Commerce. 2009. *Arizona population estimates, 2009. Available at:* http://www.azcommerce.com/econinfo/demographics/Population+Estimates.html (accessed May 5, 2010).

† IDcide Local Information Data Server. Tucson, AZ weather. http://www.idcide.com/weather/az/tucson.htm (accessed May 5, 2010).

Per Capita

Tucson notably reduced its gallons per capita per day (GPCD) water use from 2003 to 2008 across all metrics: single-family residential (-12.1% change); system-wide potable (-12.1%); and system-wide total (-11.0%).

Tucson GPCD			
Per Capita Water Use	**2003**	**2007**	**2008**
Single-Family Residential [a]	116	107	102
System-Wide Potable [b]	144	133	127
System-Wide Total [c]	181	169	161

a Treated water deliveries to single-family accounts ÷ single-family residential population

b Total treated water delivered ÷ service area population

c Total raw water from all supply sources + direct effluent use ÷ service area population

Rate Structure

Tucson Water uses a four-tier inclining block rate for individual residential water accounts and bills for consumption in Ccf.

Usage Per Dwelling Unit	Cost
0–11,220 gallons (1–15 Ccf)	$1.39 per 748 gallons (per Ccf)
11,221–22,440 gallons (15.01–30 Ccf)	$5.13 per 748 gallons (per Ccf)
22,441–33,660 gallons (30.01–45 Ccf)	$7.25 per 748 gallons (per Ccf)
Over 33,660 gallons (over 45 Ccf)	$9.90 per 748 gallons (per Ccf)

Tucson Water residential accounts have a base service fee of $5.62 a month, a CAP charge of $0.05 per Ccf, and a conservation charge of $0.04 per Ccf. The base fee comprises 21% of a customer's monthly bill for 10,000 gallons. The slope of Tucson's average price curve is 0.1430, indicating that the average price of water increases significantly as consumption volume increases.

Conservation Measures

The city of Tucson is regulated under the Total GPCD Program within the Tucson Active Management Area. According to the Arizona Department of Water Resources, Tucson is in compliance with requirements of the Total GPCD Program.

Customer Rebates

Tucson Water offers several incentive-based conservation measures, including:*

- *Toilets* – $120 or 50% of the purchase price for high-efficiency toilets (1.28 gallons per flush) for residential customers; $100 or 50% of the purchase price for multifamily, commercial, and industrial customers.
- *Irrigation systems* – $5,000 or up to one-third the cost for irrigation audits for commercial irrigation customers, sub-metering, and weather-based or soil sensor-based controllers.
- *RinseSmart Program* – Free high-pressure, pre-rinse spray nozzles for restaurants and commercial kitchens.

The Tucson Water Community Conservation Task Force has also recommended a number of additional incentive-based conservation measures, including:†

- Multifamily irrigation system upgrade rebate
- Commercial/industrial waterless urinal rebate
- Commercial/industrial sub-metering
- Single-family residence gray water incentive

Ordinances

Ultra-Low-Flush Toilets in Low-Income, Owner-Occupied Housing‡ – Mandates the director of the water department to establish and administer a program to purchase and install ultra-low-flush toilets in low-income, owner-occupied customer dwellings, and for the purchase of ultra-low-flush toilets in city-owned, low-income housing units.

* City of Tucson, Arizona. Tucson Water: Rebate programs. http://www.ci.tucson.az.us/water/rebate.htm (accessed June 21, 2010).

† City of Tucson Water Department Community Conservation Task Force. 2006. Water Efficiency: Water Conservation Program Recommendations for Tucson Water's Future. Available at: http://www.ci.tucson.az.us/water/docs/cctf-finalreport.pdf (accessed September 28, 2010).

‡ Tucson, Ariz., Ordinance 8598 (1995).

Water-Efficient Plumbing Fixtures* – Requires the use of water-efficient plumbing fixtures, including 1.6-GPF toilets and 2.5-GPM showerheads and faucets.

Xeriscape Landscaping Regulations† – Affects all commercial and multifamily construction projects and requires adherence to Xeriscape principles, including limitations on high-water-use plantings/features, requirements for low-water-use plantings, and appropriate irrigation system design.

Rainwater Collection‡ – As of July, 2010, 50% of water demand for new commercial construction landscaping must be met through the use of water harvesting practices and technologies.

Residential Gray Water§ – As of July, 2010, all new residential construction must include the installation of stub-outs for gray water systems at a later date.

Water Waste¶ – A minimum fine of $250, increasing to $500 for subsequent violations, can be levied for any of the following: (1) allowing water to escape property; (2) allowing water to pond greater than one-quarter inch, or greater than 150 square feet on any street or parking lot; (3) washing hardscapes with an open hose under normal system pressure; (4) operating misting systems in unoccupied nonresidential areas; (5) operating an irrigation system with a broken head or emitter; or (6) failing to repair a controllable leak. (This ordinance was initially enacted in 1912 at a fine of $50, which is equivalent to approximately $1,000 in today's dollars).

Education

General Public Information – Tucson Water regularly distributes water conservation information in the form of pamphlets, brochures, and public service announcements through customer mailings and at community events. "Beat the Peak" is one of Tucson's longest running public education campaigns.

Zanjero Program – Tucson offers a residential water-auditing program designed to maximize water conservation potential around the home. The service includes leak detection, replacement of showerheads and aerators, and adjustments of toilets. Landscaping is assessed, and appropriate irrigation requirements are determined. Customers are provided a report showing water and dollar savings potentials for the conservation measures.

Workshops – Tucson Water has developed the following programs to educate and train participants in a structured classroom setting:

- *WaterSmart landscapes* – Two-hour workshops targeting residential customers about (1) drip irrigation design, installation, and maintenance; (2) plant selection and design; (3) irrigation timer use and irrigation scheduling; and (4) water harvesting.
- *SmartScape landscaper* – A series of workshops designed to teach landscape professionals, property managers, and homeowner associations about water conservation practices in landscape management.
- *SmartScape Program (previously "LOW 4")* – Landscape water conservation programs offered to commercial users, school districts, and the general public.
- Landscape water audit training.
- Turf maintenance workshops.

Youth Education Program – Includes classroom materials for specific grade levels, designed to teach about water supply, conservation, and quality issues:

- *'Da Drops (grade 3)* – Student activity book and supplemental teacher guide for classroom use designed to teach about the water cycle, groundwater, and water distribution.
- *Our Water, Our Future (grade 5)* – Classroom curriculum packet designed to teach students about the water cycle, water supply, and water quality.
- *Tucson Toolkit (grades 7-8)* – Student activity book and supplemental teacher guide designed to teach about the water cycle, water quality, and water conservation.
- *High school program* – The program is designed to bring water studies into broader curricular areas by building capacity among teachers and encouraging students to develop water-related projects.

* Tucson, Ariz., Ordinance 7178 (1989; concurrent with Pima County).

† Tucson, Ariz., Ordinance 7522 (1991).

‡ Tucson, Ariz., Ordinance 10597 (2008).

§ Tucson, Ariz., Ordinance 10579 (2008).

¶ Tucson, Ariz., Ordinance 6096 (2000).

Teacher Internship Program – Two-week paid internship offered to high school teachers in order to develop classroom materials.

WaterSmart Business Program – Tucson recently launched a program to encourage businesses to improve their water efficiency and awards participating entities. Facility audits targeting commercial and industrial customers are conducted to identify all uses of water and establish conservation potential.

Implementation of Conservation Measures

Tucson Water tracks several different aspects of its conservation programs, reporting the following results from several of its rebate programs:

- High-efficiency toilets
  - *Single-family residential* – 1,029 toilets, $91,686 of expenditures
  - *Multifamily residential* – 33 toilets, $2,509 of expenditures
  - *Commercial* – 4 toilets, $343 of expenditures
- Irrigation upgrades
  - 1 application approved for $763.70
- Pre-rinse spray valve replacement (RinseSmart)
  - 53 spray valves and $3,084 of expenditures

Tucson has also performed a number of education-based conservation programs over the past several years:

Program	FY 06–07	FY 07–08	FY 08–09
Water waste investigations	218	375	243
Commercial water audits	10	0	18
Workshops	15 (average of 15 persons per event)	13 (average of 16 persons per event)	3 (average of 12 persons per event)

Furthermore, Tucson Water performed 1,605 residential Zanjero water audits in calendar year 2008, and sponsored one paid summer internship with 15 middle and high school teachers in FY 2007-2008.

Funding for Conservation

In 2008, Tucson Water had a conservation budget of approximately $1 million dollars, corresponding to 1.4% of the total water utility's budget. Tucson has 7-10 employees who work in the water conservation department, and each year spends about $1.37 per customer.

Goals for Conservation Savings

Tucson Water has no specific water conservation goals, other than to achieve a general long-term decline in per capita water usage.

Water Loss

In 2008, Tucson recorded 14,058 AF (4.58 billion gallons) of water loss, 11.9% of total supplies. System losses have remained relatively constant from 2003-2008. Tucson Water is aiming to reduce water loss by replacing over-reporting supply meters, reducing average reservoir levels to decrease system pressure, and implementing a customer-side meter replacement program. Through the implementation of improved tracking, Tucson is working to determine the quantity of water attributable to physical line losses compared to malfunctioning meters and other accounting-based causes.

Supply-Side Efficiency Measures

In 2006, Tucson Water initiated a water loss control program that aims to:

- Reduce water loss to 7% of total annual potable deliveries within the next five years and to 4% in the longer term.
- Establish the Infrastructure Leak Index to measure how efficiently the utility manages and controls leaks on an annual basis.
- Quantify discharge volumes from pipeline breaks, leaks, and planned or unplanned distribution system releases by using standardized water discharge.
- Recover lost water revenue from stuck water meters by implementing back-billing.
- Implement the Large Reclaimed Meter Inspection and Replacement Program.

- Implement the Potable Meter Inspection and Replacement Program.
- Calculate and record water loss by updating well purging procedures.
- Ensure production well meter accuracy by implementing a meter testing, calibration, and replacement program.

From September, 2004 to December, 2008, Tucson has replaced 46,532 meters as part of this water loss control program.

Effluent Use

The city operates under a very complicated effluent allocation structure, with most of the effluent being owned or committed to other entities around the Tucson area. In 2008, Tucson Water reused 46,300 AF of the 72,000 AF of effluent it generated, with 13,800 AF (30%) delivered for direct use and 32,500 AF delivered for recharge. Values for 2003 and 2007 are comparable to 2008 effluent uses. A portion of effluent that is discharged to the Santa Cruz River flows out of the Tucson Active Management Area.

Additional Information

Having recently passed an ordinance requiring the installation of gray water stub-outs in new residential construction, Tucson is exploring ways to incentivize customers to build and operate a gray water system in their home. Financial rebates are one option being considered at this point in time.

Tucson Water is keenly aware of the energy/water nexus—located at the end of the Central Arizona Project—and has incorporated avoided power costs when performing cost/benefit analyses of water conservation programs. Tucson is also exploring ways to formally incorporate carbon into a triple-bottom line approach for upcoming water resource planning documents.

City of Yuma

26

Background

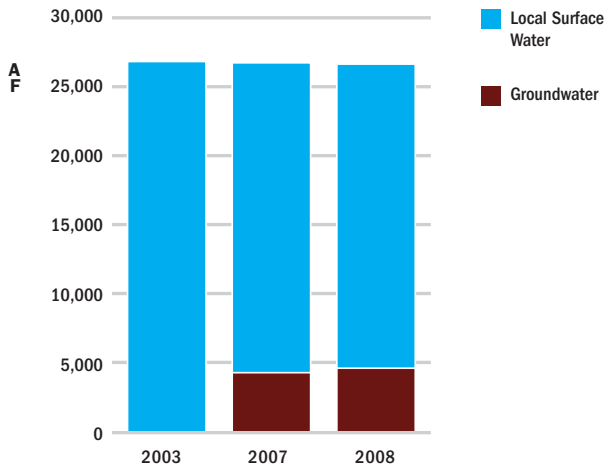
Yuma is the county seat of Yuma County and has an estimated population of 94,361 residents.* The city is located in the southeastern corner of Arizona, at the confluence of the Gila and Colorado Rivers.

Yuma lies within the Sonoran Desert and the Basin and Range physiographic province. Annual precipitation is 3.01 inches, with average summer maximum temperatures and winter minimum temperatures of 100 and 45.8 degrees (ºF), respectively.†

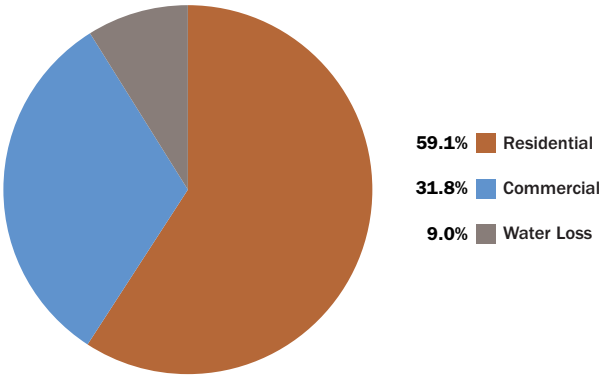
Water Supply and Deliveries

The main source of water for the city of Yuma is the Colorado River. In 2006, however, growth prompted the drilling of new groundwater wells to balance treatment plant capacity and provide additional water supplies. In 2008, the residential sector received almost 60% of total water supplied in Yuma.

SOURCES OF WATER FOR YUMA



2008 WATER USE IN YUMA



* Arizona Department of Commerce. 2009. *Arizona population estimates, 2009.* Available at: http://www.azcommerce.com/econinfo/demographics/Population+Estimates.html (accessed May 5, 2010).

† IDcide Local Information Data Server. Yuma, AZ weather. http://www.idcide.com/weather/az/yuma.htm (accessed May 5, 2010).

Per Capita

The city of Yuma has maintained gallons per capita per day (GPCD) water use at close to the same levels from 2003 to 2008 across all metrics: residential (-1% change); system-wide potable (-1%); and system-wide total (-1%).

Yuma GPCD

Per Capita Water Use	2003	2007	2008
Residential [a]	152	151	150
System-Wide Potable [b]	234	233	231
System-Wide Total [c]	234	233	231

a Treated water deliveries to residential accounts ÷ service area population

b Total treated water delivered ÷ service area population

c Total raw water from all supply sources + direct effluent use ÷ service area population

Rate Structure

The city of Yuma uses a three-tier inclining block rate for individual residential water accounts inside the city. Yuma's billing system is based on meter size, and does not split residential units with a 1" meter from commercial accounts with a 5/8" meter.*

Usage Per Dwelling Unit	Cost
0–7,480 gallons (0–10 Ccf)	$1.42 per 748 gallons (per Ccf)
7,481–22,440 gallons (10.01–30 Ccf)	$1.52 per 748 gallons (per Ccf)
Over 22,441 gallons (over 30 Ccf)	$1.75 per 748 gallons (per Ccf)

Single-family residential accounts have a base service fee of $15.68, which represents approximately 45% of the average customer's monthly bill for 10,000 gallons. The slope of the city's average price curve slope is -0.0166, indicating that the average price of water decreases as consumption volume increases.

* Personal communication between S. Hitchcock, Water Quality Assurance Supervisor, City of Yuma, and Drew Beckwith, April 26, 2010.

Conservation Measures

The city of Yuma produced a water conservation plan in 2001 and submitted it as part of the city's system water plan in 2007.†

Customer Rebates

The city of Yuma does not currently offer financial incentives for customers to reduce water use, and relies predominantly on volunteer-based water conservation measures at this time. Yuma's water conservation plan recommends implementing a program to provide complimentary plumbing retrofits or fixtures, and to offer incentive programs for customers to replace their existing toilets with ultra-low flush toilets. The city is exploring this option for WaterSense toilets.

Ordinances/Rules

International Plumbing Code‡ **–** Yuma adopted the International Plumbing Code in 2006, which sets standards for water-efficient plumbing practices, fixtures, and appliances.

Escape of Water Prohibited§ **–** It is unlawful for any person to willfully or negligently permit or cause the escape or flow of water in such quantity as to cause flooding, impede traffic, create a hazardous condition, cause damage to the public streets, or cause conditions that amount to a threat to public health and safety.

Escape of Irrigation Water Prohibited¶ **–** It is unlawful for people to irrigate their property in a manner that results in the overflow of such irrigation waters.

Water Usage Restricted and Prohibited** **–** The use and withdrawal of water by any person for the following purposes is considered wasting city water in an emergency situation and is hereby restricted or strictly prohibited: 1) watering yards and other vegetation; 2) cleaning outdoor surfaces or buildings; 3) operating ornamental fountains; 4) swimming and wading pools not employing a filter and recirculating system; and 5) escape of water through defective systems.

† Black and Veatch. 2001. City of Yuma water conservation plan, section 4.

‡ Yuma, Ariz., Code, § 150-060 (2010).

§ *Id. at § 193-02.*

¶ *Id. at § 193-03.*

** *Id. at § 193-49.*

Education

Water Outreach Team (WOT) – The WOT provides information to the public concerning the city's water utility through the use of public service announcements and "Water Conservation Facts" brochures that include information about Xeriscape and low-flow plumbing fixtures. The city also distributes the "Landscape Plants for the Arizona Desert" booklet.

Webpage – The city hosts a water conservation webpage that includes water savings tips for customers.

Implementation of Conservation Measures

Since 2007, the city of Yuma has organized a Water Festival for 500 fourth-grade students in cooperation with Arizona Project WET and the University of Arizona's Water Resources Research Center. Prior to the festival, teachers attend curriculum training, and all students receive a "Discover the Waters of Arizona" booklet.

Funding for Conservation

The city of Yuma does not currently employ a full-time staff person dedicated to water conservation. In 2008, Yuma had a conservation budget of $2,500, approximately .01% of the total water utility's budget. The city spends about $0.02 per customer on water conservation programs.

Goals for Conservation Savings

The city has the following conservation goals:*

- Implement a new water rate structure to encourage water conservation, especially during the summer when large water savings can occur.
- Reduce the potential need to acquire additional Colorado River water allotment.
- Reduce or delay the capital expenditures required for additional water production facilities, pumping stations, storage tanks, and distribution system improvements to meet projected demands.
- Increase return flows to the river to receive more credits.

Water Loss

The city performed a major water audit several years ago, but does not track water loss on a regular basis at this time. For 2008, city staff estimates water loss to be somewhere close to, but less than, 10%—this equates to about 2,650 AF or 860 million gallons.†

Supply-Side Efficiency Measures

Yuma uses sonic detection equipment, water system crews, and water customers to identify and locate water system leaks. The city is also beginning to implement automatic meter reading across its system, which will allow more frequent water loss auditing.

Since a comprehensive water audit identified considerable water loss from under-reporting meters, the city has initiated a seven-year water meter replacement program. Yuma is targeting larger industrial meters (>2") at this time and plans to expand the program into residential meters soon. In FY 09/10, Yuma replaced 312 meters and repaired an additional 75 through the program.

Effluent Use

Yuma reuses all of the effluent it produces, primarily in the form of return flow credits to the Colorado River (9,238 AF in 2008). The city also recharged approximately 1,300 AF in 2008, and provided an additional 290 AF to support wetlands habitat along the river.

* Black and Veatch. 2007. City of Yuma water conservation plan, Section 4, City of Yuma system water plan, p.3-3.

† Personal communication between K. Carroll, City of Yuma, and Drew Beckwith, July 15, 2010.

Appendix C—GPCD Adjustments

SINGLE-FAMILY RESIDENTIAL GPCD

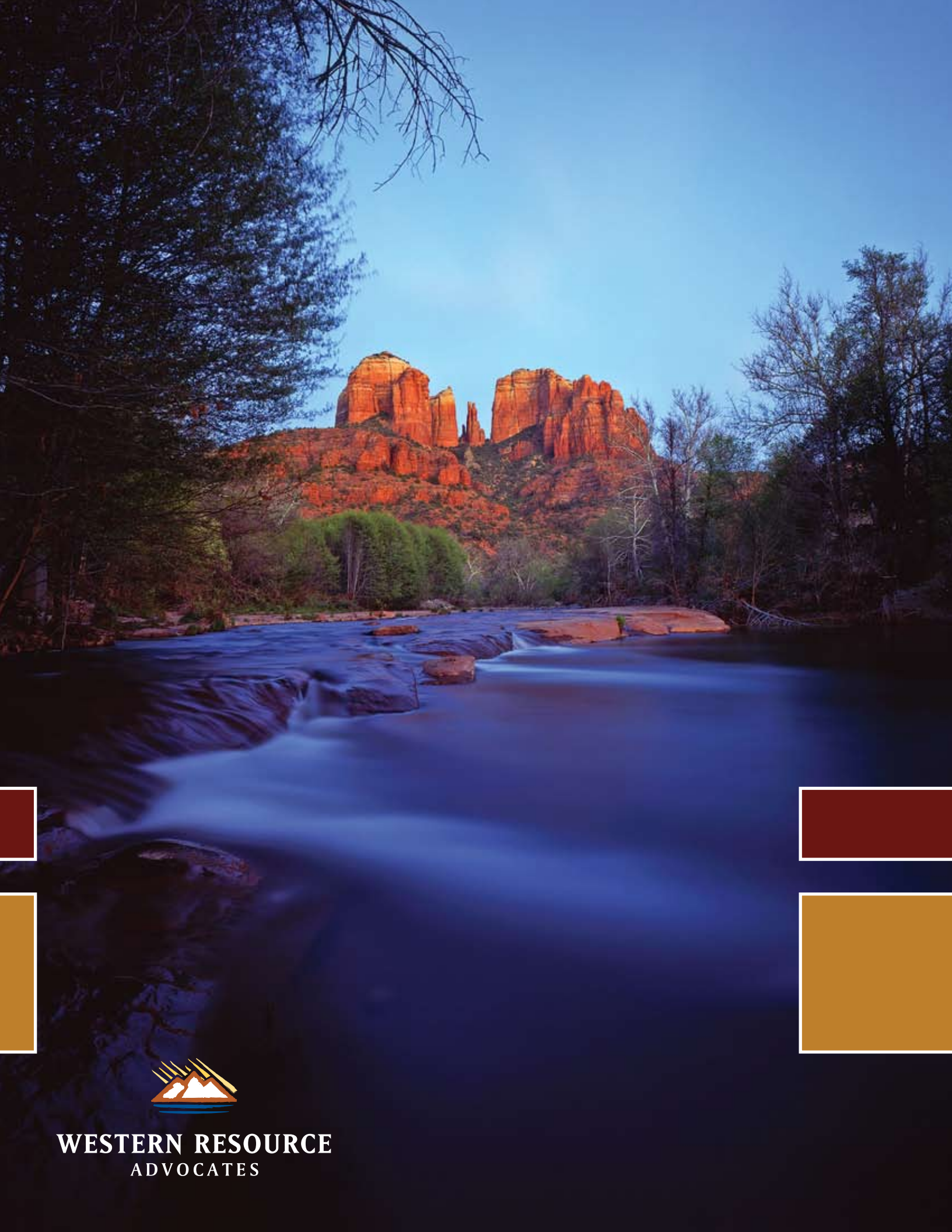
	2008 SFR GPCD	Population Change*	Adjusted GPCD	Straight Rank (1 = lowest use)	Adjusted Rank (1 = lowest use)	Change in Rank
Buckeye	61	555.0%	400	1	15	(14)
Casa Grande (AWC)	99	50.2%	149	5	9	(4)
Chandler	142	23.1%	175	12	12	-
Clarkdale	73	2.2%	75	3	2	1
Lake Havasu City	124	10.8%	137	9	8	1
Mesa	130	4.8%	136	11	7	4
Payson	66	6.5%	70	2	1	1
Peoria	125	39.2%	174	10	11	(1)
Phoenix	123	10.7%	136	8	6	2
Prescott	98	11.4%	109	4	3	1
Safford	175	0.0%	175	14	13	1
Scottsdale	249	7.5%	268	15	14	1
Sierra Vista (AWC)	105	9.4%	115	7	5	2
Tucson	102	7.5%	110	6	4	2
Yuma	150	0.3%	150	13	10	3

* Based on data submitted to ADWR

SYSTEM-WIDE GPCD

	System Wide GPCD (2003)	System Wide GPCD (2008)	Population Change*	Adjusted 2008 GPCD	Straight Rank (1 = most reduction)	Adjusted Rank (1 = most reduction)	Change in Rank
Buckeye	609	136	555.0%	889	1	15	(14)
Casa Grande (AWC)	251	203	50.2%	305	2	13	(11)
Chandler	222	201	23.1%	248	9	11	(2)
Clarkdale	92	86	2.2%	88	12	6	6
Lake Havasu City	259	222	10.8%	246	5	4	1
Mesa	183	167	4.8%	175	10	5	5
Payson	91	83	6.5%	88	11	8	3
Peoria	164	161	39.2%	224	13	14	(1)
Phoenix	197	173	10.7%	192	6	9	(3)
Prescott	154	126	11.4%	140	3	2	1
Safford	210	175	0.0%	175	4	1	3
Scottsdale	280	302	7.5%	325	15	12	3
Sierra Vista (AWC)	148	131	9.4%	143	8	7	1
Tucson	144	127	7.5%	137	7	3	4
Yuma	234	231	0.3%	232	14	10	4

* Based on data submitted to ADWR



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