

# Recommendations

A close look at urban water use efficiency in major cities in Arizona, Nevada, Utah, Colorado, New Mexico, and west Texas yields some bad news and some good news.

The bad news: There is plenty of water waste going on in the American desert Southwest. Many cities have large and rising water demands and, on a per capita basis, some are using significantly more water than some of their southwestern neighbors. As a result, many of our rivers are in trouble. With population growth continuing, water providers and citizens face the prospect of spoiling precious water resources that, in their natural form of flowing streams, are a huge part of why people love to live in the West. Collectively, western residents have not yet taken to heart the Incan proverb—“The frog does not drink up the pond in which it lives.”

The good news: some water providers have begun efforts to change water use patterns and to implement supply-side measures that protect the environment, save money over large “traditional” supply projects, actively promote effective conservation programs and policies, and, in many cases, speed their ability to meet the water needs of their customers. Trends in water use over the past decade reveal that, on the whole, urban residents in the Southwest are starting to plan for a more sustainable water future. However, there is much room for improvement. The policy recommendations outlined in this chapter can help.

Throughout the region, education and awareness have been heightened by the recent drought. However, some water providers and citizens either have already gone back to their old, wasteful ways in

the few cases where severe drought conditions have subsided, or, in other areas, have been slow or failed to react at all. It is clear many citizens have not yet made the connection between the water they draw from the tap and the natural river systems taxed to meet municipal needs.

A key tool for improving efficiency—aggressively increasing block rate structures—is under-used. Although many cities throughout the region apply various types of increasing block rate structures, very few of these efforts appear aggressive enough to be effective. As of 2001, only a few cities had significantly trimmed demand by rewarding water-savers and facing high-volume users with higher prices. Few providers directly connect the price of increasing blocks of water to the rising costs associated with providing extra water.

Outdoor use, principally on landscape irrigation, is the single biggest category of potential water savings. But many communities have yet to actively encourage reduced outdoor water use,



Photo by Tom VandenBerg, National Park Service.

“When we save a river, we save a major part of an ecosystem, and we save ourselves as well because of our dependence—physical, economic, spiritual—on the water and its community of life.”

—Tim Palmer

from “The Wild and Scenic Rivers of America”

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either through turf replacement and/or irrigation controller rebate programs, or through reasonable restrictions on turf area, watering times, or sprinkler placement. Equally troubling, even fewer urban communities have fully embraced or accepted the concept of Xeriscape landscaping as a standard practice in our arid climate.

Despite many technological advances, indoor water use efficiency moves forward at a snail's pace. Most cities remain content to let appliance/fixture replacement happen at a natural rate, making little or only sporadic efforts to encourage speedier replacement of inefficient indoor appliances.

For many cities, most supply-side alternatives remain on the drawing board. Though these options offer great potential for water savings (as proven by some of the progressive efforts in the region), many cities have not yet made significant efforts toward: (1) forging new arrangements between the cities, farmers, and ranchers to use irrigation water (or conserved irrigation water) to meet urban and instream flow needs during dry periods; (2) using aquifers to store surface water in wet years so that it may be harvested from the ground in drier years; (3) building facilities to enable reuse of water that has gone through waste treatment plants; and (4) reducing Unaccounted For Water.

### Hurdles to Improving Efficiency

Why have water providers not yet pursued improving water efficiency with much vigor? Economics and common sense suggest that efficiency should be adopted, because it is usually less expensive than the alternative—new dam construction, impoundments, and diversions.

But there are other barriers to water use efficiency, including:

- The law in most western states suggests, if it is not always wholly clear, that conserved water may not always be held for future use by those who conserve it.
- Water providers, like electric utilities of old, sometimes view conservation as a troublesome and unreliable resource to develop: it is decentralized, depends on the actions of many customers, and does not seem as “concrete” as a river or aquifer source.
- Water users are just beginning to learn how to conserve water. How best to motivate them is not yet broadly understood.
- Urban water providers often hold water rights that they have not developed. If water conservation or other efficiency measures postpone or eliminate the need to develop these rights, there is uncertainty whether these providers will lose them under the “use it or lose it” doctrine of western water law.
- The other, supply-side elements of water efficiency are sometimes impeded by legal and other barriers, such as the lack of clarity in western water law surrounding dry-year leases of water from agricultural irrigators.

In many respects, in our region we are at the same stage in water efficiency as we were with energy efficiency two decades ago. Water efficiency is a new frontier for many water providers. We hope we can learn from the energy example, and ride the learning curve to faster change in water efficiency.

## Untapped Potential for Change

There is an enormous untapped potential to turn water use efficiency into a compelling issue at the local, state, and perhaps even federal levels. There are several reasons to be optimistic.

First, during the recent drought, polls revealed that water supply topped the list of citizen concerns. The drought has heightened citizen awareness to unprecedented levels. It has helped many see the connection between urban water use and the impact it has on the world around us. Urban water providers should take advantage of the public's interest in water issues and let their customers know that efficiency matters, and thereby garner support for aggressive programs.

Second, though municipal water efficiency has been primarily a local issue, state government and federal agencies have begun to take keen interest. State legislatures and state agencies have started enacting efficiency-based legislation and programs throughout the region. In May 2003, the Department of Interior released *Water 2025: Preventing Crises and Conflict in the West*, proposing to apply a small amount of federal financial and technical resources toward research and development of water use efficiency in the West.<sup>1</sup> These efforts illustrate the growing institutional support for water efficiency across all levels of government.

Third, urbanites tend to appreciate wilderness and wild rivers for their aesthetic and recreational values, perhaps because they spend most of their time in developed landscapes. Additionally, compared to agricultural regions, there is a

larger tax base in metropolitan areas to support efficiency when citizens make the connection between urban water use and its effects elsewhere.

So, though populations in the Southwest will continue to grow into the foreseeable future, there is hope we may have a future with more sustainable water use, rather than one where free-flowing rivers and streams are a distant memory. To realize this goal, more water providers, with informed citizens both leading and following them, need to make a collective effort towards both demand-side and supply-side water use efficiency.

The choice is ours.



*Photo by Jeff Widen.*

<sup>1</sup> See [www.doi.gov/water2025](http://www.doi.gov/water2025).

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## Faced With a Choice, What Can We Do?

As discussed throughout this report, many opportunities are available to improve water use efficiency in the Southwest. These include demand-side measures, supply-side measures, and legislative and intergovernmental efforts.

### Outdoor Water Efficiency

On the demand-side of the water use equation, among urban uses, outdoor use has the greatest potential for water savings in the Southwest. Outdoor water use (primarily landscape irrigation) not only accounts for the majority of residential urban water use but, for the most part, is “elective” or discretionary.

Current levels of outdoor use in many urban areas in the Southwest expose the divergence between the high-water-use landscape vegetation many have chosen and the arid/semi-arid place in which we live. An appropriate or acceptable “developed urban landscape” is defined differently in many southwestern cities. In addition to landscape design issues, low-density urban sprawl compounds the problem of high outdoor water use as it usually brings

with it substantial landscaped area (i.e., irrigated area), typically covered with non-native vegetation. In sum, water providers and individuals need to focus on reducing discretionary outdoor use.

#### Recommendations for water providers, policymakers, and citizens:

- Establish or expand landscape/Xeriscape rebate programs.
- Provide rain sensor and irrigation controller rebate programs.
- Limit water use on medians, sidewalk parkways, slopes, and other areas close to impermeable surfaces.
- Enact and/or amend landscaping ordinances (via municipal zoning ordinance or development codes) that: (1) require some degree of Xeriscape landscape; (2) regulate the amount/percentage of high-water-use vegetation; and (3) require water-efficient soil preparation best management practices and landscape designs.
- Enact watering regulations that restrict landscape irrigation to early morning and evening to avoid daytime evaporation losses.
- Prohibit new covenants that either require the use of high-water-use vegetation or restrict the use of Xeriscape techniques.
- Provide landscape irrigation audits to identify waste by customers in all sectors.
- Educate the public on Xeriscape, efficient irrigation techniques, design, etc.
- Design water rate structures that charge for excessive outdoor water use on the basis of avoidable costs and reward low outdoor water use (e.g., via rate structures that are based on water budgets, average winter consumption, seasonal usage, etc.).
- Incorporate smart development principles into municipal zoning ordinances, development standards, and comprehensive plans (e.g., emphasize



Xeriscaped yard. Photo by David Winger; Denver Water.

higher-density mixed-use developments, Xeriscape requirements, infill development, and the use of reclaimed water for landscape irrigation, etc.).

## Water Rate Structures and the Price of Water

Strategic water pricing is a key component of demand-side water use efficiency that can induce water conservation by customers. For example, water sold in the region to urban customers for discretionary use is priced much lower than its actual long-term cost. Many water providers in the arid Southwest simply do not use water rate structures that send an effective “conservation message” to their customers. With a finite water supply, this practice results in unsustainable consumption.

Many water providers have begun to apply increasing block rate structures in an attempt to send this conservation message via their water pricing structures. However, in many cases, the block price increases are not steep enough to get the attention of water users. Rate structures that yield inclining marginal price curves *and* average price curves tend to be most effective in promoting water use efficiency. Increasing block rate structures also tend to be fair, if they are designed to charge high-volume users for the provider’s avoidable costs of serving discretionary, outdoor use and reward low-volume users.

### Recommendations for water providers, policymakers, and citizens:

- Re-assess and modify water provider rate structures in a way that sends a clear, consistent conservation message via water pricing. This is most effectively done through an increasing block rate structure. There are many variations to this type of structure. Therefore, each particular water

provider should analyze the potential effectiveness of various pricing options and make appropriate pricing changes. The City of Tucson’s water rate structure offers a prime example of this strategy (see Chapter 3).

- More effectively incorporate long-term infrastructure costs, new supply attainment costs, and environmental costs into municipal water price-setting.
- Set fixed service charges and variable consumption prices in a way that sends a consistent conservation price signal while maintaining revenue stability.
- Utilize aggressive increasing block rate structures in all years (*i.e.*, not just as an emergency drought response tool).

## Indoor Water Efficiency

Although the savings potential for indoor water efficiency may be secondary to the gains from outdoor efficiency, they are still significant. By converting a “typical” American home to a “conserving” American home, we can go from an average of 69 gpcd to approximately 45 gpcd via low-flow fixtures and appliances that are readily available at home improvement stores. Many municipalities are relying on “natural replacement” of outdated, inefficient appliances/fixtures (*i.e.*, replaced over time via EPAct or building codes). To expedite water savings, they can become more aggressive in promoting and/or requiring water-efficient appliances/fixtures.

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### Recommendations for water providers, policymakers, and citizens:

- Offer indoor appliance/fixture rebate programs.
- Enact municipal ordinances that require water-efficient indoor appliances/fixtures in all new residential and commercial development (coinciding with 1992 EPAAct) as well as all building upgrades (executed and inspected via building permit process).
- Require appliance upgrades contemporaneous with property sales, or perhaps require landlords to install them to qualify for a rental license.
- Enact municipal ordinances (building/plumbing codes) that require appliances/fixtures not captured by the EPAAct and that exceed standards established therein.
- Provide indoor water use audit services to all customers in all sectors (including leak detection and repair assistance).
- Educate the public on water-efficient appliances, fixtures, and personal water use behavior.

### Supply-Side Water Use Efficiency

Supply-side water use efficiency holds some of the greatest potential for minimizing or even avoiding the need for developing new supply sources. To send a consistent “conservation message” to their customers, water providers must demonstrate an equal effort in increasing the efficiency of their collection/storage facilities, delivery systems, and treatment facilities, as well as reap the benefits of using innovative supply strategies and technologies.

Water loss reduction is a critical piece in the water efficiency puzzle. Rates of Unaccounted For Water (UFW) vary substantially between water providers in the region. Collectively in our region, hun-

dreds of thousands of acre-feet are unaccounted for in water collection and distribution systems each year. Although some UFW will always exist (due to fire fighting, system flushing, etc.), halting preventable losses (e.g., leaks) will save a great deal of water, and better metering will provide more accurate data on actual use and losses in distribution systems.

Many other innovative supply-side measures are being developed across the Southwest. These measures include: water reuse and recycling systems; aquifer storage and recovery projects; system integration and coordination; and market-based water transfers. Such supply-side strategies are already being used by many water providers in the region (see examples listed in Chapter 2), although they are not yet commonplace. There is growing potential to implement these efforts in many urban water service areas. As technology advances and we gain more operational knowledge, these supply-side efficiency measures should become increasingly cost-effective.

### Recommendations for water providers, policymakers, and citizens:

- Implement aggressive system-wide water loss reduction programs (e.g., leak detection and repair, dam repair, etc.) to minimize UFW and maximize existing storage capacity.
- Seek efficiency savings via cooperative, integrated water supply efforts with other local or regional water providers.
- Pursue market-based water transfers such as water salvage projects with agricultural users, temporary dry-year leases with agricultural users, and water banking transfers with other water providers or regional/state water banking authorities.
- Explore the feasibility and legality of using water reuse and recycling systems. When feasible, use nonpotable reclaimed water for urban landscape irrigation and industrial uses.

- Investigate the feasibility of using aquifer storage and recovery (ASR) systems (e.g., conjunctive use), if at least a portion of a water provider's supply is derived from groundwater sources.

## Program Implementation, System Monitoring, and Staying "Up to Speed"

Through the Smart Water analysis, we have discovered a very large potential for improving urban water efficiency throughout the Southwest. Based on comparisons of per capita single-family residential consumption, outdoor and discretionary consumption, Unaccounted For Water (UFW) and other end-use variables in service areas throughout the region, it appears urban water providers have just begun to improve water use efficiency.

There is at least one "target" water provider in almost every category, setting the benchmark toward which others can strive. Model water providers hint at a vast potential for water savings. We also found a significant variation in conservation programs throughout the region, from very comprehensive programs to much more limited ones.

The Smart Water analysis reveals that several water providers' water consumption accounting and program monitoring were lacking, incomplete, and/or inconsistent, leaving these providers with only a fuzzy picture of actual water use. And, Smart Water exposes the fact that many water providers have not thoroughly assessed the cost-effectiveness of their conservation programs. Although detailed benefit/cost analyses are often conducted to justify traditional structural water supply improvements, this level of analysis for water use efficiency measures is extremely limited, even non-existent for some providers.

### Recommendations for water providers, policymakers, and citizens:

- Enact and implement multi-faceted conservation programs that concurrently use rebate programs, education programs, conservation-aimed water rate structures, and regulations/policies to reach customers with unique response "triggers" or "motivators."
- Keep "up to speed" with the continuously evolving state-of-the-art programs and policies used by other water providers. The significant variation in conservation programs and policies in the Southwest indicates that much more information-sharing and modeling can take place.
- Improve water system accounting practices and metering to reduce water waste and increase revenues.
- Streamline water conservation program monitoring and analysis efforts, including cost effectiveness and/or benefit-cost analyses. In addition to facilitating the promotion and fine-tuning of conservation programs, this information also can provide excellent "model" material to be shared with other water providers.
- Take charge in promoting water use efficiency in dry and wet years.



Photo by the Bureau of Land Management.

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### Education and Awareness

Although many municipal water providers offer water conservation education programs, many consumers do not have a basic knowledge of water sources/issues within their area:

- Where does our current water supply originate?
- Where will the next drop of water supply come from?
- What's at stake if we don't become more efficient?

In addition, many water customers are not sufficiently aware of programs/opportunities offered by their water providers, or aware of how they can improve their water use efficiency. Regardless of the reasons for this limited understanding, water providers and customers must collectively and proactively strive to raise the bar on water efficiency awareness.

#### Recommendations for water providers, policymakers, and citizens:

- Improve the promotion and advertisement of water conservation programs (e.g., for rebate programs, audit programs, the rationale for increasing block rates, etc.).
- Maximize the use of the Internet and water bills to disseminate information.
- Use all available media outlets to spread the message of adapting to our surroundings/climate and the importance of water conservation during wet and dry periods (i.e., not only during drought conditions).
- Educate people on the collision course of population growth and water supply in the Southwest (i.e., that we can prevent a “crisis” by acting now).
- Promote comprehensive water use audit programs to all municipal water customers to provide personalized education and direction on how to become water efficient.
- Take advantage of customer self-monitoring through providing opportunities for customers to monitor their own water use patterns. Examples include distribution programs for direct-use meters (e.g., for self-monitoring of landscape irrigation) and interactive billing websites that provide real-time consumption rates for customers. For some water providers, the transition from bi-monthly billing to monthly billing also will improve customer awareness and reaction.



Photo by Jeff Widen.

Many residents of the Southwest, often transplants from other, less arid, parts of the nation or globe, have only a fledgling awareness of place. Collectively, southwestern residents need to adjust their water use and mindset to be more consistent with the arid climate in which we live, and make clear distinctions between our water “needs” and water “wants.”

## State Legislative Action

State legislatures can help improve urban water efficiency by setting equitable, statewide targets and through crafting law that removes obstacles to improvement and dedicates at least a portion of “saved” water for use in streams and rivers.

### Recommendations for state legislatures:

- **Statewide efficiency targets:**  
Efficiency targets can encourage phased-in reductions in water use (e.g., aiming for 20% reduction in per capita water use over the next 10 years) and define efficiency measures that water providers must at least consider while planning. Statewide guidelines create the equity of holding all to the same standard but leaving the details of efficiency implementation to local providers and citizens.<sup>2</sup>
- **Removing barriers to Xeriscape:**  
Several private housing developments in the region prohibit Xeriscape (and/or require bluegrass lawns). State law can expressly authorize the use of Xeriscape, thus clarifying individual choice to decrease outdoor water use.
- **Securing “saved” urban water:**  
Some urban water providers express concern that they will not be able to hold onto water “saved” through conservation for future use. State legislatures can clarify that savings from conservation programs can be safeguarded by water providers for future urban uses.
- **Dedicating conserved water instream:**  
State and federal laws in parts of the Northwest dedicate savings from agricultural water conservation (sometimes called water “salvage”) to improve instream uses. Similar laws should be considered to allow a portion of “sal-

vaged” irrigation water and/or “conserved” urban water to be kept instream for the benefit of fish, wildlife, and human recreation. Similarly, urban water providers and citizens can establish organizations and legal mechanisms to buy water rights and conservation easements to protect flows and riparian areas in critical rivers.<sup>3</sup>

- **Office of water conservation:**  
Each state in the Southwest should have a state office that aims to:
  - Organize public outreach and education efforts;
  - Develop, evaluate and help implement programs, practices and projects;
  - Provide technical assistance, research and incentive programs;
  - Encourage cooperative conservation efforts; and
  - Monitor progress and set goals.

Funding sources for conservation offices could include membership dues; support from the business community; academic, government and private foundation grants; private funding and gifts; and the U.S. Bureau of Reclamation.

Through dedicated efforts on outdoor and indoor water use, rate structure, program implementation, supply-side alternatives, education, and state law reform, there is the potential for enormous leaps forward in municipal water efficiency over the next decade. Ignoring this potential will place at risk some of the greatest treasures in the southwestern landscape, the region’s magnificent rivers.

It is our hope this Smart Water report, and related efforts by water providers, governments, citizens, and organizations across the region will allow all of us to look back ten years from now and say we made the right choice just in time.

<sup>2</sup> In 2003, the Colorado state legislature considered a bill that proposed targets for reducing per capita water use. SB 87 passed the Senate by a large margin but died in the House. See [http://www.state.co.us/gov\\_dir/stateleg.html](http://www.state.co.us/gov_dir/stateleg.html).

<sup>3</sup> See, e.g., the Oregon Water Trust at [www.owt.org](http://www.owt.org).

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*Photo by Jeff Widen.*