WESTERN RESOURCE
ADVOCATES

SMART Water

A Comparative Study
of Urban Water Use
Efficiency Across
the Southwest

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A Comparative Study of Urban Water Use Across the Southwest

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WESTERN RESOURCE ADVOCATES

Western Resource Advocates uses law, economics, and policy analysis to protect land and water resources and assure that energy demands are met in environmentally sound and sustainable ways. It collaborates with environmental and community groups to protect the natural environment of the Interior West, taking into account the economic and cultural framework of the region.

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Executive Summary

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Municipal water use is on the rise in the southwestern U.S., tracking with rapid population growth.

In the past decade, millions have flocked to cities like Albuquerque, Denver, Las Vegas, Phoenix, and Salt Lake City. These burgeoning metropolitan areas are expected to draw millions more over the next several decades. Unfortunately, this growth threatens the very quality of life that draws people in the first place.

In addition to other social and environmental stresses caused by rapid population growth, increased water demand by these new residents endangers one of the region's most precious resources—natural river systems. The rapid influx of new residents often encourages municipal water providers to divert and store what is left of already-stressed rivers to meet increasing urban water demands. The current regional drought has added urgency to the issue. Cities and states seem more inclined than ever to consider large water development projects that are, on the whole, very slow to construct, highly contentious, extremely costly, and environmentally damaging.

Fortunately, improving urban water use efficiency can meet much of this growth in demand. We can stretch already-developed water supplies to meet a higher portion of our needs through indoor and outdoor conservation as well as through creative supply-side options. Efficiency alternatives can postpone or alleviate entirely the need to divert and store the last water left in our rivers, water that is crucial to continued enjoyment by anglers, rafters, local communities, and the preservation of the plants, fish, and other wildlife that rivers support.

Thus far, western water policy has not encouraged efficiency alternatives, both because of legal impediments and a lack of sustained public pressure to invest in efficiency. Some water utilities have made efforts, but progress has been isolated and sporadic. Although agricultural efficiency also must be addressed, this report focuses on urban water use, an area where demand for water is growing most quickly, where there is a receptive audience to an efficiency message, and financial resources to implement efficiency alternatives.

Lack of comparative data on water use and efficiency options has been a significant hurdle to maximizing urban water efficiency. Many cities simply are in the dark as to how they compare to others in the region. Nor are they necessarily aware of cutting-edge approaches being explored elsewhere. Isolation hampers innovation. Such comparative information could inspire cities and citizens alike.

"Rivers run through our history and folklore, and link us as a people. They nourish and refresh us and provide a home for dazzling varieties of fish and wildlife and trees and plants of every sort. We are a nation rich in rivers."

-Charles Kuralt

from "The Magic of Rivers"

Photo by Jeff Widen.

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Smart Water provides, for the first time, a detailed snapshot of current water use in major cities across the region as well as recent trends in water uses, conservation and efficiency programs, water system leaks, water rate structures, and unmet potential in over a dozen cities. The report highlights a large disparity in water use efficiency across the region and offers specific recommendations to make increased efficiency a reality.

Equipped with the data in this Smart Water report, citizens, water utilities, and state and local governments can focus heightened interest in urban water planning on the role of efficiency as a faster, safer, and relatively inexpensive way to stretch existing water supplies farther.

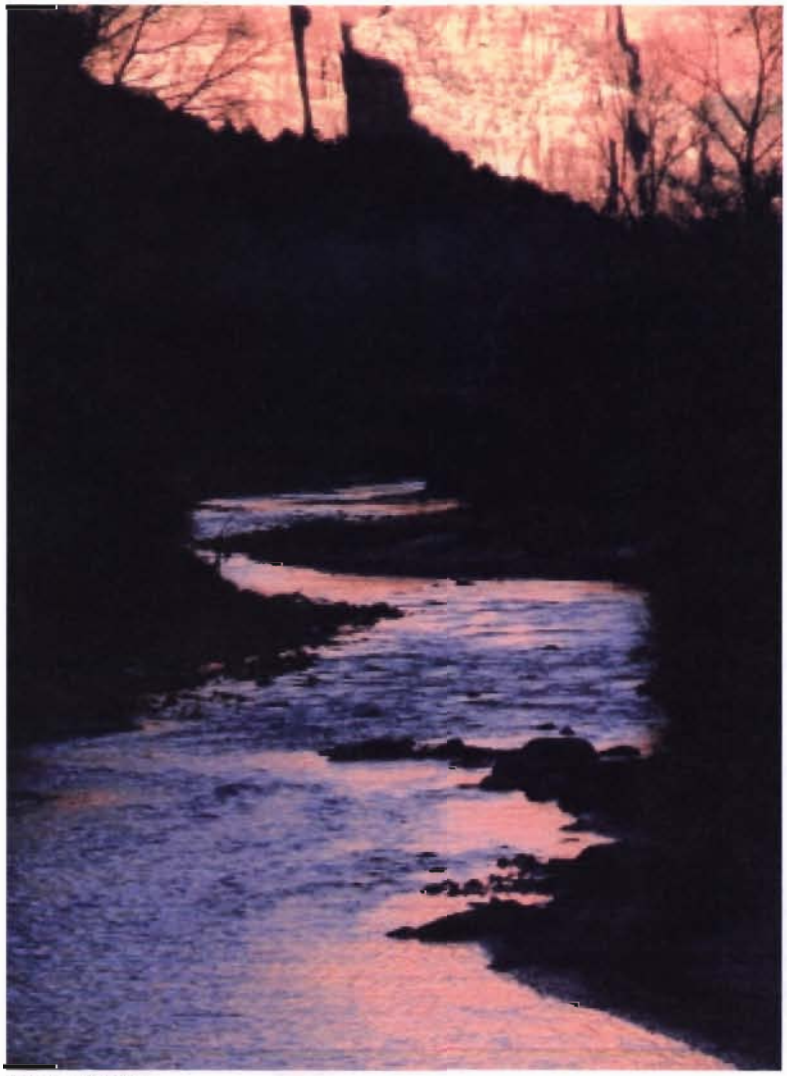

Photo by Jeff Widen.

The pages that follow include a wealth of information, collected into 5 chapters.

Chapter 1 introduces what's at stake if we fail to develop efficiency alternatives. It brings to light the enormity of recent population growth in the Southwest. Nevada, Arizona, Colorado, and Utah are the four fastest-growing states in the country. Together, they added 4 million new residents between 1990 and 2000. The Census Bureau projects that they will add another 7 million people by 2025. Texas and New Mexico are on a similar path.

These new residents have led water utilities to consider a round of new, conventional water diversion and storage projects to meet the demand. If history is any guide, these projects will greatly alter, and can even cause the collapse of, the natural river systems that already face significant strain. Chapter 1 provides a quick guide to rivers—including the Bear, Colorado, Gunnison, and Rio Grande—that are threatened by recent and future urban water demands. The chapter reveals the direct link between growing urban demand and threats to some of our most treasured river resources.

Chapter 2 provides some light at the end of the tunnel, canvassing the "state-of-the-art" in municipal water efficiency. Through strategy descriptions, case studies, and other examples from around the country and other parts of the world, it details successful programs that improve efficiency, sometimes dramatically. These examples, applied in appropriate situations, can serve as benchmarks and models for urban residents and water providers in our region.

Chapter 2 highlights the enormous potential for improving efficiency both on the demand-side (i.e., through water conservation) and supply-side (e.g., collection and delivery systems), a potential that possibly can eliminate the need for enduring the social, monetary, and environmental

costs associated with traditional supply-side projects. It includes details on:

Supply Side Measures

- Water Loss Management
- System Integration, Transfers, and Salvage
- Aquifer Storage and Recovery
- Re-Use

Demand Side Measures

- Landscape Design
- Landscape Watering
- Development Standards
- Indoor Efficiency

Regulations & Education

Incentives

- Rate Structures
- Rebates and Retro-fits

Chapter 3 provides a detailed analysis of where many western cities stand today in both water consumption and water conservation efforts. Through dozens of figures and tables, it provides comparative data on per capita water use, water system losses, conservation programs, rate structures, and more. Related appendices include city-by-city data and descriptions of existing efficiency programs, water systems, and alternative sources of supply.

Based on the comparative analysis reported in Chapter 3, it is clear that across the Southwest:

- Outdoor water consumption accounts for a large proportion of total water sold and offers the biggest target for future water savings.
- Indoor efficiencies could be greatly improved.
- Unaccounted For Water (including system leaks) is high in many districts.
- Pricing water with increasing block rates provides a strong conservation incentive.
- Conservation programs and budgets vary considerably in the region.
- Accounting practices and monitoring program effectiveness need additional focus.
- Many providers have only begun to seriously investigate many supply-side options.

Chapter 4 takes a close look at the connection between urban sprawl and water use. It tells a simple but compelling story of how sustainable patterns of urban growth—"smart development"—can distribute growth over the landscape in ways that increase water efficiency. A case study from several decades of development in Las Vegas provides empirical data for the common-sense concept that water use varies with housing lot size. And, a close look at a recent development in Tucson shows tremendous results from water-efficient design strategies (e.g., higher-density, mixed-use development) as well as other efficiency measures (e.g., Xeriscape standards, reclaimed water distribution systems, etc.).

Chapter 5 highlights the overall conclusions of the Smart Water study and proposes recommended actions for water providers, policy-makers, and citizens, including:

- Policies to help reduce discretionary outdoor water use;
- Attributes of effective water rate (pricing) structures;
- Rebates and other measures to improve indoor use;
- Reasons to remedy leaks and other Unaccounted for Water;
- Consideration of several supply-side alternatives;
- Better monitoring of programs and water accounting;
- Improving customer education and awareness; and
- State legislative initiatives that would improve efficiency.

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We hope the Smart Water report will serve as a helpful decision-making tool for water district managers, policy makers, interested organizations, and the citizens across the Southwest and beyond. The report is intended for all who appreciate the value of our natural river systems and, more importantly, all who rely on the water that these rivers provide.

We expect water use efficiency will be as important to water management in the 21st Century as the Hoover Dam and other engineering marvels were to the 20th Century. Relatively wasteful urban water use today provides a challenge and an opportunity. Though it threatens our natural river systems, curbing waste and improving efficiency can ensure that these rivers thrive, long after we are gone. We need to adopt a permanent and growing efficiency ethic to meet our urban water demands. This report discusses how we might get there.

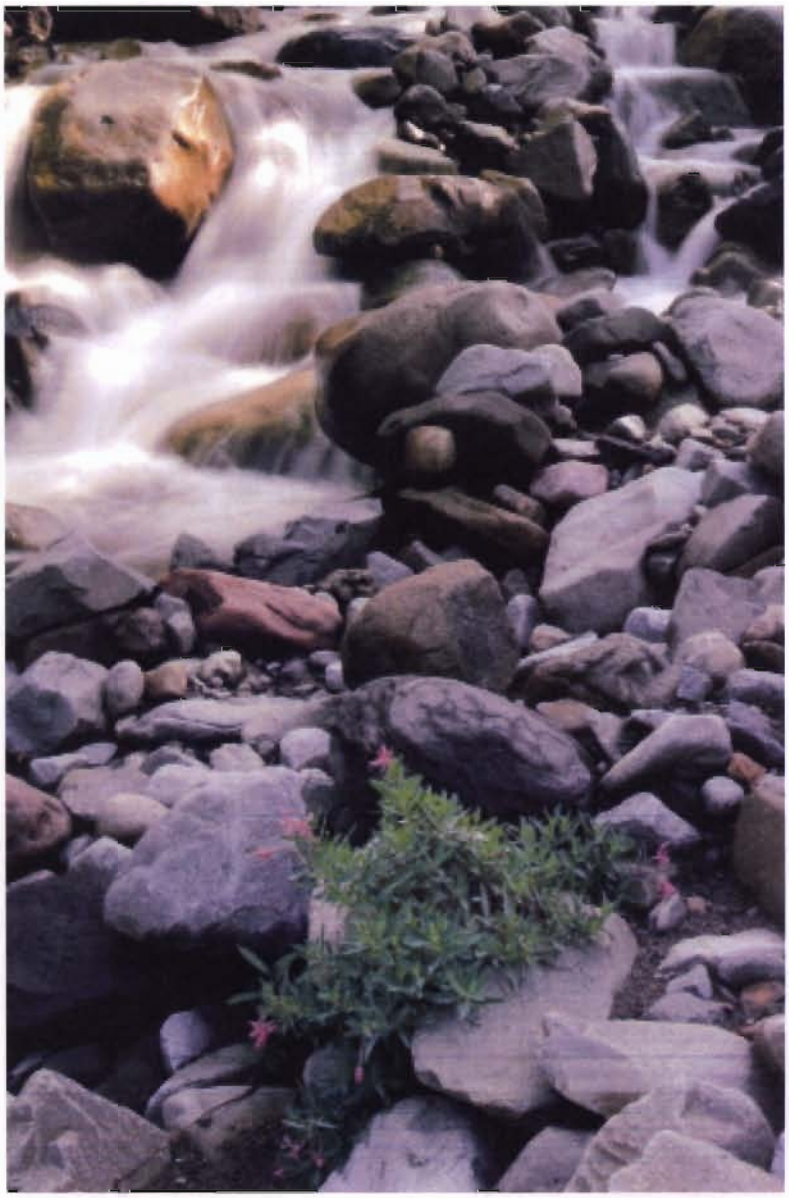


Photo by Jeff Widen.

Chapter 3

System-wide per capita Water Consumption

System-wide daily per capita consumption is a commonly used standard in the water supply industry.[13] This indicator is intended to represent the overall per capita demand across all consumer sectors. Figure 3.9 displays the 2001 system-wide daily per capita consumption rates for the participating water providers. Per capita distribution losses (UFW) are included in these system-wide figures. The mean system-wide daily per capita consumption rate for this sampling of water providers is 229 gpcd. The rates range from 170 gpcd in Tucson to 366 gpcd in Scottsdale[14].

Although the water supply industry commonly uses this demand variable as a system demand indicator, the probability for comparison error in the system-wide per capita variable is relatively high, resulting in an "apples-to-oranges" comparison. Therefore, the displayed values in Figure 3.9 should be considered individually, instead of comparatively, to avoid erroneous conclusions on water consumption.

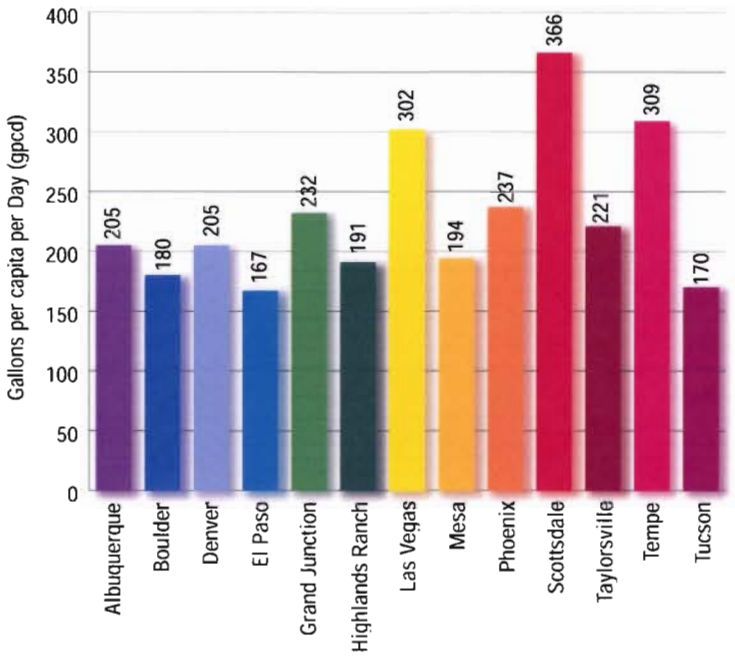
As discussed in Appendix A, data analysis bias in the system-wide consumption indicator can originate in municipal water service areas that:

1. function as employment centers and receive significant amounts of inflow commuting;
2. possess a relatively large industrial, commercial, or institutional (ICI) consumption sector;[15]
3. serve large airports; or
4. distribute large quantities of wholesale water.

Varying definitions of Unaccounted For Water (UFW) across water providers also contribute to the bias in the system-wide consumption variable. As a result, Chapter 3 de-emphasizes the system-wide indicator, focusing instead on Single-Family Residential per capita consumption.

Figure 3.9

2001 System-Wide Daily per capita Water Consumption



13 The industry-standard definition of system-wide per capita consumption is the total raw water extracted from supply sources divided by the water provider's service area population:

$$\text{System-wide per capita consumption} = \frac{\text{Total Raw Water Extracted from Supply Sources}}{\text{Service Area Population}}$$

14 The City of Mesa Utilities Department alluded to a possible raw water master meter discrepancy between the City and the Central Arizona Project (CAP). Apparently, the actual CAP raw water deliveries may be higher than the recorded/billed volume. CAP raw water deliveries constitute roughly 30 percent of Mesa's supply. Since the system-wide per capita figures are directly based on the volume of total raw water drawn from supply sources, Mesa's system-wide consumption rate in Figure 3.9 may be slightly lower than the actual value.

15 As an example, Tempe's system-wide consumption rate is notably higher than nearby Mesa or Phoenix. However, Tempe's non-residential consumption accounts for 45 percent of its retail water sold, compared to 30 percent and 33 percent in Mesa and Phoenix, respectively. The higher proportion of commercial, industrial, and institutional water use will yield a higher system-wide per capita figure in Tempe.