Wringing Water-Thrifty Urban Design from Southwestern Water Plans

by ***Jan C. Bush***

A 2006 water report from the Western Governors' Association notes that 22 percent of the U.S. population now lives in the West, where "decisions about where and how to grow are rarely influenced by the water policy or the availability of water." Of the top six states experiencing rapid growth from 2004 to 2005, five are in arid western regions.

Fortunately, one strategy popular in the West—land development that increases urban population density—addresses both the problem of sprawling land use and the need for water conservation. Higher density development can make urban areas water thrifty.

A review of recent strategic plans from southwestern metropolitan water providers shows differences in how four large water providers analyze and model the effects of increased urban density on water consumption. This article structures a comparison of the plans around three questions: Which regions are serious about managing water demand? How is higher urban density a demand-management tool? What are the social benefits of using higher urban density to manage water demand?

The reviewed plans are from the City of Denver Board of Water (Denver Water), the City of Phoenix, Southern Nevada Water Authority (SNWA), and the City of San Diego. The table at right summarizes service area statistics for each utility.

All four utilities identify single-family housing (SFH) as the major determinant of urban water use. They agree that customer demand patterns are changing, that overall per person consumption is falling, and that SFH demand is controlled by outdoor water use for landscaping and pools. However, there is significant disagreement as to how and why to manage outdoor water demand in the future.

Which regions are serious about managing water demand?

Phoenix's *Water Resources Plan 2005 Update* reveals an unwillingness of the municipality to discourage outdoor water use except as a means to reduce drought-derived financial losses. The plan expresses concern that efforts to curb outdoor water use could negatively impact quality of life for residents. It views nonessential water use as a buffer that gives the utility flexibility in dealing with a drought crisis.

SNWA's *2006 Water Resource Plan* is at the opposite end of the policy spectrum. SNWA actively promotes reductions in consumptive outdoor uses to bring demand into balance with existing supplies. It offers a $2 per-square-foot rebate for the first 1,500 square feet of turf removed, and $1 per square foot thereafter, and estimates the program saves 3.5 billion gallons of water yearly. Other incentive programs work through private-sector partnerships.

SNWA views incentives as one of four interrelated demand management tools that, when used with the others (regulation, education, and water pricing), maximize water conservation at the community level.

How is higher urban density a demand management tool?

SNWA has yet to identify urban design as a demand management tool, but water plans by Denver (*Integrated Water Resource Plan, 2002*) and San Diego (*Long-Range Water Resources Plan 2002-2030*) recognize a nexus between the pattern of urban development and subsequent water use in residential and nonresidential sectors. Both anticipate more compact future development as markets react to limited land availability within their service areas. They predict that rising densities will lower rates of water use and slow growth of the total volume of water consumed.

To generate its forecast, Denver Water assumed increased densities in specified "areas of change" that will absorb the expected regional growth in jobs and housing. Existing regional plans, intergovernmental agreements, zoning and subdivision codes, and market factors will direct growth to these areas and away from functional existing neighborhoods and rural areas. Two market trends also influence compact growth: more single-family units on small lots and a higher proportion of multi-family housing (MFH) units relative to single family housing. The result is less landscape irrigation: the big fish in urban water consumption. Overall urban density is expected to rise 10 percent by 2050, with SFH units averaging 3.55 per acre.

Provider (report year)	Population (millions)	Water sales ($M)	Volume sold (acre-feet/year)	Per capita use (gallons/day)
SNWA (2005)	1.7	100	416,000	>250
Phoenix (2005)	1.4	192	308,400	218
San Diego (2005)	1.3	200	200,500	164
Denver (2002)	1.1	158	238,000	206

Service area statistics by utility

Denver Water expects per-account demand to decrease. By 2050, SFH use is predicted to fall from 450 to 445 gallons per household per day. MFH units, which are combined with commercial and industrial users, are expected to reduce water use from 110 to 103 gallons per capita per day in 2050. Institutional and governmental customers are expected to continue to use water at the current rate of 17 gallons per person per day.

Phoenix also plans higher-density land use in its central business district as land redevelops in response to construction of a regional light rail transportation system. Unlike Denver, it expects this new, more compact growth to actually increase demand for water over that demanded by growth patterns consistent with the city's current general plan. High-density growth in central Phoenix is apparently modeled as population *in addition to* the baseline growth in population. Analysis of water demand projection detail in the plan's appendices shows that Phoenix modeled increasing densities to 2055 for its urban core *without* a corresponding decline in growth rate for surrounding areas.

This is a critical point. U.S. EPA, Denver Water, and San Diego all model increased urban density on a different assumption, namely that there is no net gain in predicted future population when analyzing differences between dispersed and compact development scenarios. Total future population remains the same while the urban form becomes more compact in selected areas. Overall water consumption rises because population rises. But water consumption measured on a per-account or per-capita basis falls as compact growth reduces lot sizes, landscape irrigation, and SFH pools. In this way, higher-density urban design wrings water out of growth, especially residential growth.

What are the social benefits of using higher urban density to manage water demand?

To meet projected water demands, Phoenix plans to use a traditional approach of acquiring new water resources through the least costly structural proposals. It will seek out new, imported groundwater supplies from McMullen Valley in western Arizona to augment increased use of its local aquifer and reclaimed water supplies. Importation will have large capital, environmental, and social costs to overcome.

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Unlike other utilities, Denver Water has committed to finding additional supply from within its existing water rights. It has determined that it needs another 100,000 acre-feet to support the build-out of its service area by 2050. It will look to conservation, system refinements, and wider use of reclaimed water to meet future needs. Encouraging compact regional growth should be an important companion strategy.

Denver Water's policies actively support regional growth while transitioning the local economy to low-profile water resource consumption. This strategy allows the utility to avoid two financial pitfalls. First, it is easy to overbuild water infrastructure before the regional economic and environmental issues that necessarily attend rapid urban growth (such as air pollution, congestion, and very high housing prices) exert a moderating influence on continued population expansion. Second, expansive capital improvement projects make it difficult to accept the short-term revenue declines that result from successful conservation programs.

If Denver Water successfully avoids expensive projects for acquiring new water resources, it will put its regional economy in a very competitive position vis á vis other southwestern areas. It will have turned the changing nexus between water and economy to its regional advantage.

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