

# Lean and Green: Water Efficiency in the Las Vegas Golf Industry

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*Las Vegas is home to some of the finest desert golf courses in the nation. A crippling 12-year drought on the Colorado River has challenged water supplies for this fast-growing city, requiring officials to make dramatic changes to water use policy. Since 2003, area golf courses have operated under a water budgeting policy that assures greater efficiency, while sustaining a high quality golf experience. Since the inception of drought, 30 golf courses have converted more than 40 million square feet (918 acres) of non-essential turfgrass to water-efficient landscape designs. Collectively, these conversions are saving more than 2.2 billion gallons of water annually.*

The green industry is a critical stakeholder and should be viewed as an ally for water conservation rather than an adversary. Water purveyors and the green industry must work together to find the common ground toward a goal that conserves water and provides a vibrant green industry. The Southern Nevada Water Authority (SNWA), working with local golf courses, successfully achieved this goal for the Las Vegas, Nevada region.

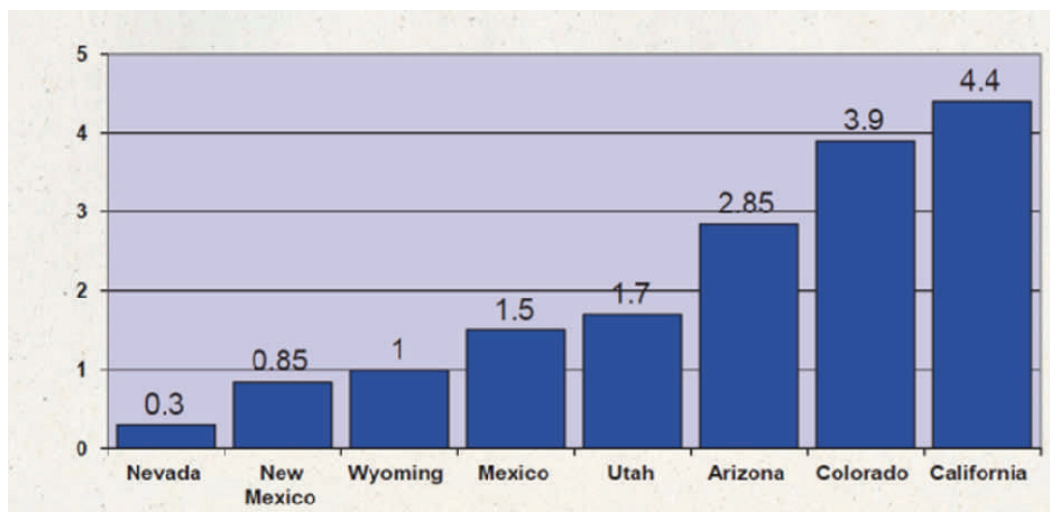
Although Nevada uses less than two percent of the water appropriated on the Colorado River, it relies on the river for 90 percent of its water supply. The Colorado River is the single most critical river system in the Western United States, serving more than 30 million people in seven states and Mexico (See Figure 1).

In addition to meeting the water needs of western cities, more than three million acres of farmland are irrigated with Colorado River water and agriculture comprises more than 70% of the total use. Unfortunately, appropriations of water for each of the seven states and the nation of Mexico, agreed to nearly a century ago, overestimated the reliable flow of the river by about 15 percent. Furthermore, a twelve-year drought on the system has diminished both flows and storage, and a warmer climate is expected to further diminish precipitation in the river basin in the future.

## The Colorado River: Imperiled?

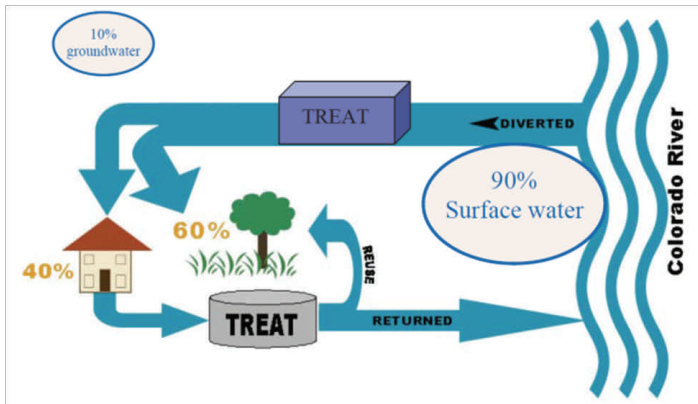
With the Colorado River accounting for 90% of Southern Nevada's water, it is critically important to find ways to conserve water. Lake Mead, located near Las Vegas, is a 256 square mile reservoir from which Las Vegas draws its water. The lake is currently 120 feet below the water level in the year 2000. This drop in the lake level translates to about 4.5 trillion fewer gallons than the lake stored one decade prior. As the drought manifested itself, so too, did aggressive population growth in the Las Vegas region. In the mid-2000's, as many as 30,000 homes were being built annually and 80,000 to 100,000 new residents were streaming in

**Figure 1. The Colorado River is shared by seven states and Mexico. Southern Nevada is allocated 1.8% of the water or 0.3 million acre feet annually.**



every year.

**Figure 2. All water used indoors is already recovered for direct or indirect reuse. Landscape irrigation, or consumptive water use, is the amount that is lost to evaporation and the environment.**



In Southern Nevada, the greatest opportunity for conservation was to find ways to reduce consumptive, or one-time, uses of water. In other words, consumptive water use is water delivered from any source that cannot be reclaimed because it is lost to evaporation and the environment. Examples of consumptive use include landscape irrigation and evaporation from water surfaces and industrial cooling towers.

Currently, about 60% of Southern Nevada’s water use is consumptive, with the vast majority of consumptive use attributable to landscape irrigation (See Figure 2). The 40% of water use that is used inside of buildings is considered non-consumptive, because it can be recovered from the sanitary sewer system, treated and directly or indirectly reused. Currently, southern Nevada reuses 100% of its wastewater, either by directly providing recycled water to parks, golf courses and industrial users, or by returning treated and polished water to Lake Mead for storage and reuse. This “reservoir storage and recovery technique” means indoor use has almost no diminishing effect on upon Southern Nevada’s water resources.

With landscape irrigation as the dominant consumptive use of water, improving water use efficiency for outdoor landscapes is the most effective means of reducing demand and extending the water supply.

It is important to reiterate that Las Vegas already directly or indirectly reuses all of the water taken from the Colorado River System. Too often, recycled water is undervalued, even though the infrastructure and energy required to reuse water is sometimes more costly than potable water. As such, municipalities in Southern Nevada are committed to reuse on a municipal scale, rather than through disaggregated, private systems. It’s also important to note that irrigating with recycled water can actually increase consumptive demand, because more water is required to leach salts through the root zone.

## Outdoor Water Use

Public education efforts concerning water use were needed to address misperceptions about how water was used in the community. Surveys showed that people in Las Vegas commonly believed the majority of the community’s water was used by resorts and golf courses, primarily due to the high visibility of these sectors. In reality, just 15% of the water in Las Vegas is used by resorts (7.2%) and golf courses (6.8%) combined. Residential water comprises more than 60% of the water used in Las Vegas.

To develop effective water efficiency and drought policy, finger-pointing needed to stop -- every sector not only needed to be part of the solution, but they needed to know that the solutions were equitable among different classes of users. With this in mind, the SNWA worked with stakeholders to develop water demand management tools that fell into four categories: Education, Water Pricing, Regulation, and Incentives. Among the most effective measures was the implementation of Landscape Development Codes for new construction which were implemented in 2003:

- Lawns are prohibited in new residential front yards and limited to 50% of the landscape area in new backyards.
- Lawn is prohibited in new non-residential developments.
- A maximum of 50 acres of turf are allowed on a new golf course.
- Day-of-week and time-of-day watering restrictions which varied during the winter, spring/fall, and summer.

**Figure 3. The Southern Nevada Water Authority and its member agencies utilize a variety of tools to pro-**

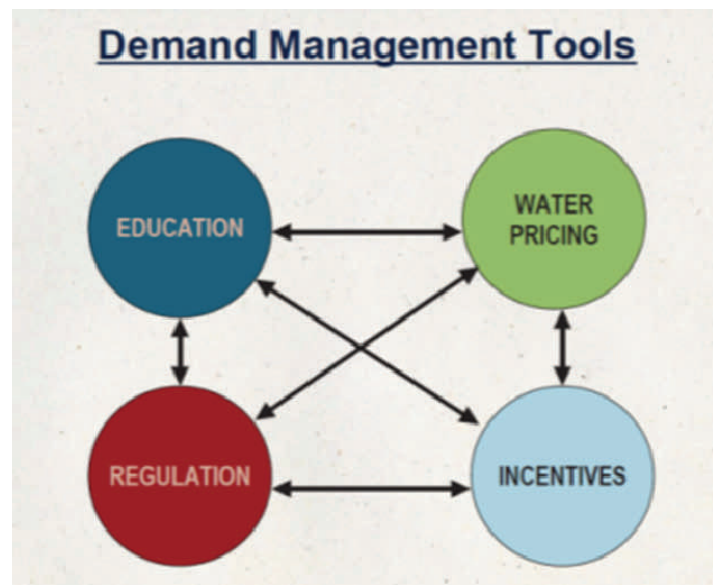
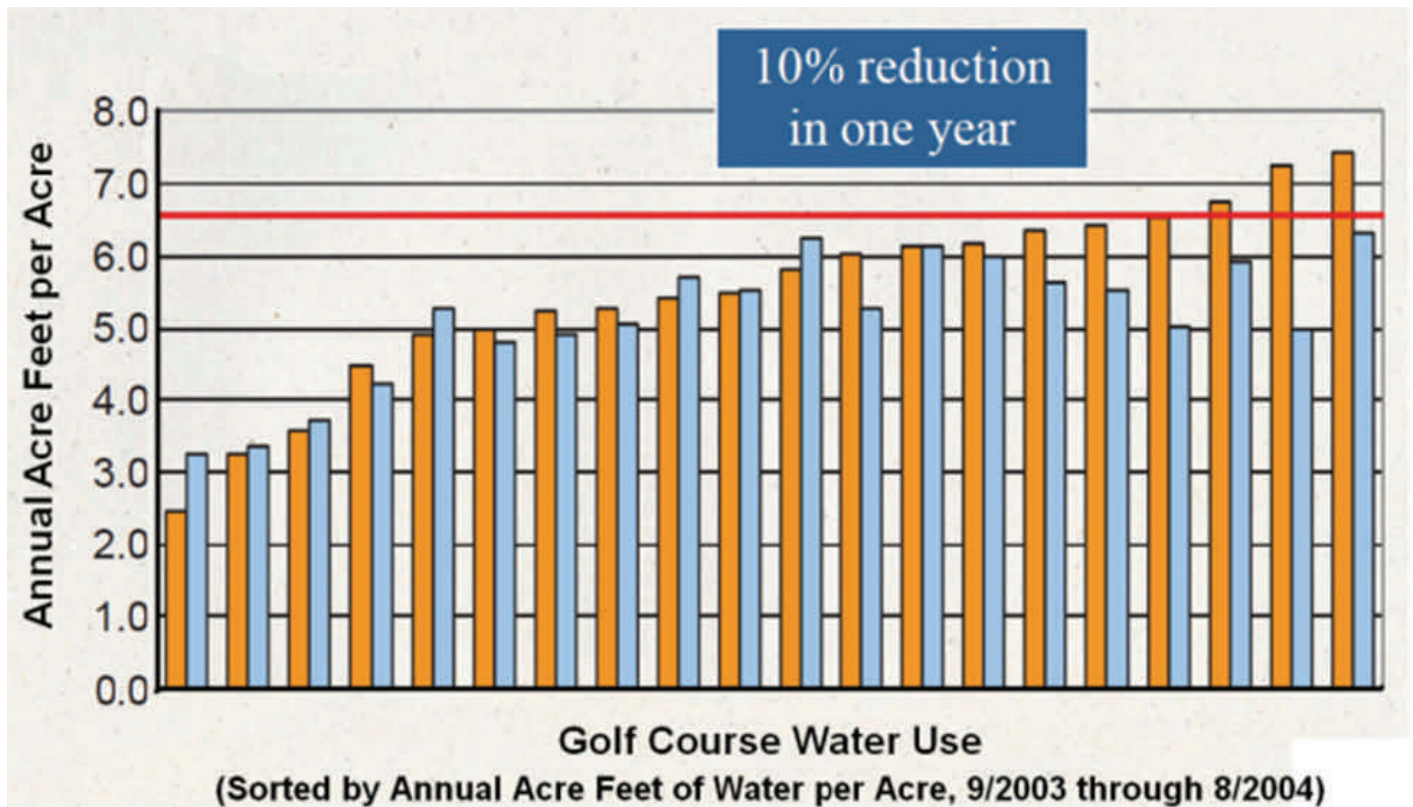


Figure 4. Yellow bars indicate each golf course's per acre water use prior to implementation of water budgets. Blue bars show water use the following year. The agreed upon budget was initially set at 6.5 acre feet per irrigated acre (red line), and subsequently reduced to 6.3 acre feet.



- Golf course water budgets and pricing penalties in lieu of prescribed watering schedules.

### Water Budget for Golf

Golf courses in the region were asked to choose whether they preferred to abide by community watering schedules, or if they would prefer being assigned a water budget based upon irrigated acreage. Overwhelmingly, the industry chose water budgets.

The SNWA presented a graph of the amount of acre feet of water per irrigated acre already being used each year by golf courses in the region to illustrate the existing differences in consumption. (Figure 3). After input from the industry, 6.5 acre feet was determined to be an acceptable amount of water for each irrigated acre of golf course turf and also predicted to produce similar savings as the mandatory watering schedule assigned to other customer classes.

The budget was predicted to affect about 30% of courses, but only those with high water use. While there was objection from some of the affected courses, the vast majority of the sector already operated within the budget and supported the policy. Water budgeting is certainly a more equitable approach than requiring all

courses to effect mandatory percentage reductions, without regard to their current water use.

Water agencies provided both incentives and penalties to support the water budget strategy. Punitive pricing applied to water use in excess of the water budget. If a golf course exceeded the water budget by 1 to 20%, the course would have to pay two times the top tier water rate (currently \$4.88 per 1,000 gallons). Golf courses using more than 21 to 40% of the water budget would pay five times the top tier rate, and courses exceeding the water budget by 40% or more would pay nine times the top tier rate. This punitive pricing applied whether the golf course was using potable or recycled water for irrigation.

In just one year, a 10% reduction in golf course consumptive water use was achieved by establishing an agreed upon water budget. Not surprisingly, most of the reduction was attributable to courses with the highest water use.

A major strategy used by golf courses for coping with water budgets was to remove turf from out-of-play areas, perimeter areas near homes, and driving ranges. A water savings of 34 gallons per square foot was realized for areas converted from turfgrass to desert landscape. A total of 30 golf courses conducted 324 projects which

Figure 5. Examples of golf courses removing turf from out-of-play areas, perimeter areas near homes, and driving ranges. A water savings of 34 gallons per square foot was realized for areas converted from turfgrass to desert landscape.



converted more than 836 acres of out of play turfgrass to water efficient landscape. These conversions were incentivized by SNWA with rebates of up to \$1.00 per square foot of conversion. In total, golf courses received \$37.7 million for conversions completed since 2004.

**Conclusions**

In 1990, Las Vegas’ per capita water use was nearly 350 gallons per day. Moderate conservation efforts

through the 1990’s reduced per capita demand to approximately 324 gallons by 2003. Since implementation of aggressive outdoor water use regulations and programs, per capita water use has dropped to 221 gallons per capita per day (GPCD). The SNWA has an established goal to achieve 199 GPCD by the year 2035. An average reduction of 14.4 % in water use has been realized for golf courses following water budget guidelines. Overall, total golf water demand in Las Vegas has declined by 2.7 billion gallons (21%). While much of the

reduction is due to improved water efficiency, a portion of the reduction has been due to the loss of a handful of courses that could not remain economically viable.

Water budgeting is considered an equitable and effective water conservation mechanism that allows the golf course to manage water the way they want rather

than be given specific days and times when irrigation can occur. Generally, through the combined education efforts of the SNWA and the golf industry, the community is aware that golf courses have responded positively and effectively to the call for greater water efficiency.