



WHITE PAPER

Water Resources in Southern Nevada

By Patricia Mulroy

Introduction

At first glance, North America's most arid region would seem an unlikely location for a major metropolitan city. However, a more thorough analysis reveals that—with innovation, adaptability and a commitment to conservation—a community of more than two million people can thrive in this harsh desert environment. For the first 60-plus years of its existence, Las Vegas was sustained entirely by local groundwater supplies. Only in the late 1960s did the state finally begin to draw upon its Colorado River entitlement as a source of municipal water, which is carefully managed for optimal utilization. Through periods of unprecedented population growth and drought, Southern Nevada has continued to prosper due to prudent long-range water resource plans that extend well into the future.

Challenges

While Southern Nevada faces many challenges related to water—its hot, windy climate produces one of the nation's highest evapotranspiration rates, effectively precluding non-irrigated landscapes, and local renewable groundwater resources are relatively modest and strictly governed by the State—there is no greater challenge to the security of the region's water supply than the Colorado River drought. Since 2001, the West's primary lifeline, the Colorado River, has been mired in a drought of extraordinary severity and duration. During this span, Lake Mead—the primary reservoir serving Nevada, Arizona, California and Mexico—has seen its volume decrease by nearly 4.25 trillion gallons, reducing its water storage from 96 percent to less than 37 percent of capacity. Visible as a 100-vertical-foot calcium ring around the lake, this depletion is an omnipresent reminder of the challenges ahead.

Putting these numbers in the proper context requires retrospect. Among the most highly regulated and litigated water bodies on Earth, the Colorado River flows more than 1,400 miles from the western slopes of the Rocky Mountains to Mexico and is governed by a complex web of laws, treaties and agreements collectively referred to as the "Law of the River." Chief among these documents are the 1922 Colorado River Compact and the 1928 Boulder Canyon Project Act. The former effectively divided the river into two basins, with Colorado, New Mexico, Utah and Wyoming forming the Upper Basin, and California, Arizona and Nevada comprising the Lower Basin states. Each basin was apportioned 7.5 million acre-feet (MAF) per year (one acre-foot is 325,851 gallons) annually. The 1928 legislation further divided the Colorado River's flows; in the Lower Basin, California receives 4.4 MAF annually and Arizona 2.8 MAF, while Nevada was granted only 300,000 acre-feet. The cause of this disparity was the lack of irrigable land within Nevada. It is also worth noting that Las Vegas—the only major city located adjacent to the main stem—at that time had no facilities through which it could draw its allocation. In 1944, a treaty with Mexico provided that nation an annual allocation of 1.5 MAF. This brought total Colorado River allocations to 16.5 million acre-feet, surpassing the historical average of 15 MAF and substantially greater than the approximately 12 MAF average during the current drought. This does not even account for evaporation from lakes Powell and Mead, which itself is five times greater than Nevada's annual allocation.

The continuing decline of Lake Mead poses two key challenges: one operational, the other resource-related. From an infrastructure perspective, the community's drinking water intakes require a continuous "pressure head" to pump water from the lake. In other words, the pumping facilities must be submerged. From a resource perspective, it is understood that as conditions deteriorate and Lake Mead's elevation falls, the states' annual allocations will be curtailed.

Solutions

When the drought began in 2002—a year that saw Colorado River inflows at a staggering 24 percent of normal—the Southern Nevada Water Authority (SNWA), the regional entity tasked with managing the community's water supply, responded by implementing one of the nation's most aggressive and successful water conservation campaigns. The initiative had two major tracks, one aimed at reducing water use among existing residents, the second designed to minimize the water footprint of new development. To achieve the latter, a suite of landscaping-related rules for new residential and commercial properties was enacted. To reduce water use within the existing community, property owners were incentivized to replace turf grass with water-efficient landscaping. Outdoor water use makes up roughly two-thirds of all water used in Las Vegas. Water that is used indoors—for showers, laundry, dishes, etc.—is captured, treated and returned to the Colorado River to be reused. Despite their opulent water displays, Las Vegas' resorts and associated businesses are exceptionally frugal water users, cumulatively consuming only 3 percent of Southern Nevada's water supply because most of their water is used indoors and recovered. As a result of conservation, annual consumption of Colorado River water has decreased by more than a third since the drought began even as the region's population has increased by 500,000. Today, the community uses less than 230,000 acre-feet annually, about 75 percent of its allocation.

When it comes to managing its resources, particularly during droughts, Southern Nevada realizes that its future is inextricably intertwined with that of its neighboring states. Beginning in the mid-1990s, Nevada and the other Basin states have fundamentally reshaped their relationship from one of litigation to one of cooperation and joint planning. The Lower Basin states have entered into joint water banking arrangements (storing water in both groundwater basins and reservoirs for future use) and embarked on joint water efficiency projects. Finally, in a historic agreement with Mexico, the states and their federal partners agreed to a series of changes that allowed Mexico to assume voluntary reductions under the same conditions as the Lower Basin states.

To guarantee that Las Vegas can reach water from Lake Mead even under the worst conditions, the SNWA constructed a new drinking water intake that is, from an engineering perspective, unparalleled in the water industry. Unlike the two existing intakes, which enter Lake Mead from the side, this one emerges from the bottom near the original Colorado River channel. It was a massive undertaking requiring excavation of a three-mile tunnel underneath the lake bed. When coupled with a new pumping station that is presently under construction, this new intake will afford the community access to clean water even if Lake Mead descends into "dead pool," the elevation below which no water can pass through Hoover Dam.

Conclusion

Whether for a day or a generation, survival in the desert requires resilience and ingenuity. Southern Nevada will continue to enjoy a reliable water supply thanks to the willingness of its residents to embrace water efficiency and the risk-mitigating strategic focus of its regional water agency. Through a combination of conservation and resource diversification, a community situated in one of the world's most inhospitable natural environments is able to weather a drought of historic severity. Given that metropolitan Las Vegas houses 70 percent of the state's population, employs more than 940,000 people and generates a Gross Metropolitan Product in excess of \$90 billion annually—which translates into an economic output of nearly \$400,000 per acre-foot of water consumed—the stakes are too high to subject the community's fate to the whims of nature or the ambiguities of expensive litigation.

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