

# Introduction and Background

## **XERISCAPE AND WHAT IT MAY MEAN FOR WATER CONSERVATION**

In the Mojave Desert of the southwestern United States, typically 60 to 90% of potable water drawn by single-family residences in municipalities is used for outdoor irrigation. Thus, in this region, and indeed most of the entire Southwest, the most effective conservation measures are oriented towards reducing outdoor water consumption. A commonly considered method for accomplishing water conservation is to use xeriscape (low-water-use landscaping) in place of traditional turf. Xeriscape is based on seven principles:

- Sound Landscape Planning and Design
- Limitation of Turf to Appropriate Areas
- Use of Water-efficient Plants
- Efficient Irrigation
- Soil Amendments
- Use of Mulches
- Appropriate Landscape Maintenance

The term “xeriscape” was invented by Nancy Leavitt, of Denver Water (a public utility) in the early 1980s as a fusion of the Greek word “xeros” (meaning dry or arid) and landscape. Denver Water trademarked the term shortly thereafter though it has entered the English vernacular over the last 20 years as the concept has spread globally.

So promising was xeriscape, that water purveyors and others interested in conservation began actively promoting xeriscape in place of traditional landscape as early as the mid-80s as part of water conservation strategies. The need to better understand its true effectiveness as a conservation tool led to a host of studies being conducted in the 1990s, which have generally pegged savings associated with xeriscape at between 25% and 42% for the residential sector (Bent<sup>1</sup> 1992, Testa and Newton<sup>2</sup> 1993, Nelson<sup>3</sup> 1994, Gregg<sup>4</sup> et al. 1994). The variation in savings estimates is due to a large number of factors ranging from the different climates of each study locality, different local definitions of xeriscape, and different study methodologies employed.

The work done to this point has greatly advanced the water conservation community’s ability to evaluate, modify, and justify programs to encourage the use of xeriscaping as an integral component of water conservation plans. Utilities, water districts, cities, counties, and states are beginning to promote xeriscape as a cost-effective, mutually beneficial alternative to traditional turfgrass-dominated landscapes. Recently, this interest has increased at the national level, and this study is part of that evolution. Interest is further enhanced at the time of publication of this report due to a significant drought impacting the Colorado River Basin and much of the western United States.

## **NEVADA’S COLORADO RIVER RESOURCES AND THE SPECIAL IMPORTANCE OF OUTDOOR WATER CONSERVATION**

The Colorado River serves as the lifeblood for many of the communities of the southwestern United States, permitting society to flourish, despite the harsh, arid conditions that often define it. It serves the needs of millions within the region and its yearly volume is entirely divided up by the Colorado River Compact<sup>5</sup> and subsequent legislation and legal decisions, known as the “Law of the River” that specify allocations for each of the states (and Mexico) through which it flows. Among other things, the Bureau of Reclamation – Lower Colorado Region (BOR-LCR) is charged with maintaining an adequate and established allocation of water for each of the states in the arid Lower Basin. Since water demand management is ultimately accomplished at local levels, BOR-LCR actively partners with entities that divert Colorado River water to encourage conservation. In southern Nevada, the major regional organization meeting this criterion is the Southern Nevada Water Authority (SNWA).

In 1991 the SNWA was established to address water on a cooperative local basis, rather than an individual water purveyor basis. The SNWA is committed to managing the region’s water resources and developing solutions that ensure adequate future water supplies for southern Nevada. The member agencies are the cities of Boulder City, Henderson, Las Vegas, North Las Vegas, the Big Bend Water District, the Clark County Water Reclamation District, and the Las Vegas Valley Water District. As southern Nevada has grown into a metropolitan area and a world-famous vacation destination, so too have its water needs. The SNWA was created to plan and provide for the present and future water needs of the area.

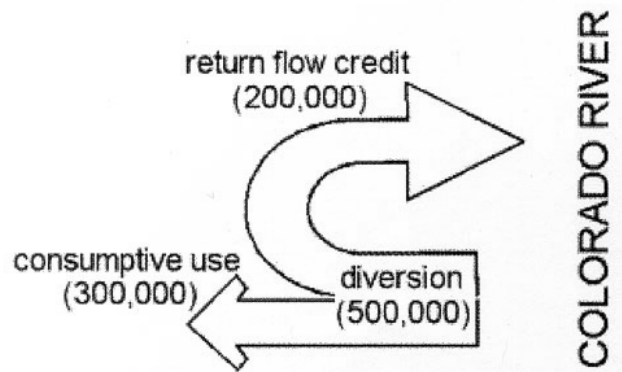
Five different water purveyors provide potable water to most of Clark County. Big Bend Water District provides water to the community of Laughlin; the cities of Boulder City and Henderson provide water to their respective communities. The Las Vegas Valley Water District provides water to the City of Las Vegas and portions of unincorporated Clark County; the City of North Las Vegas provides water within its boundaries and to adjacent portions of unincorporated Clark County and the City of Las Vegas. The SNWA member agencies serve approximately 96% of the County’s population.

Southern Nevada’s climate is harsh. The Las Vegas Valley receives only 4.5 inches of precipitation annually on average, has a yearly evapotranspirational (ET) water requirement of nearly 90 inches, and it is one of the fastest growing metropolitan areas in the United States. Clark County, the southernmost county in Nevada, has a population in excess of 1.6 million people and has been experiencing extremely strong economic growth in recent years with correspondent annual population growth averaging in excess of 5% percent. The primary economic driver of Clark County’s economy is the tourism and gaming industry, with an annual visitor volume in excess of 30 million people per year. Today more than 7 out of every 10 Nevadans call Clark County home.

Consumptive use (use where Colorado River water does not return to the Colorado River) is of paramount interest to SNWA (specifically, consumptive use is defined by SNWA as

the summation of yearly diversions minus the sum of return flows to the River). A 1964 Supreme Court Decree in *Arizona v. California* verified the Lower Basin apportionment of 7.5 million acre feet (MAF) among Arizona, California, and Nevada, including Nevada’s consumptive use apportionment of 300,000 acre feet per year (AFY) of Colorado River water as specified initially in the Colorado River Compact<sup>5</sup> and Boulder Canyon Project Act<sup>6</sup>. Return flows in Nevada consist mainly of highly treated Colorado River wastewater that is returned to Lake Mead and to the Colorado River at Laughlin, Nevada. With return flow credits, Nevada can actually divert more than 300,000 AFY, as long as the consumptive use is no more than 300,000 AFY (see diagram below). Since Colorado River water makes up roughly 90% of SNWA’s current water-delivering resource portfolio, it means that in terms of demand management, reduction of water used outdoors (i.e., water unavailable for accounting as return flow) is much more important in terms of extending water resources than reduction of indoor consumption at this point in time.

**Diagram Showing Dynamic of Diversions, Return Flow Credits (from indoor uses) and Consumptive Use**



Since most of the SNWA (Authority) service area contains relatively scarce local reserves (there are little surface or groundwater resources) and since, as explained above, its Colorado River apportionment is limited, the organization has an aggressive conservation program that began in the 1990s. The Authority has been committed to achieving a 25% level of conservation (versus what consumption would have been without conservation) by the year 2010 (note though that soon this goal will be revised to probably be even more aggressive in the immediate future due to the drought). In 1995, the SNWA member agencies entered into a Memorandum of Understanding (MOU) regarding a regional water conservation plan. The MOU, updated in 1999, identifies specific management practices, timeline, and criteria the member agencies agree to follow in order to implement water conservation and efficiency measures.

The programs or Best Management Practices (BMPs) listed in the MOU include water measurement and accounting systems; incentive pricing and billing; water conservation coordinators; information and education programs; distribution system audit programs; customer audit and incentive programs; commercial and industrial audit and incentive programs; landscape audit programs; landscape ordinances; landscape retrofit incentive programs; waste-water management and recycling programs; fixture replacement programs; plumbing regulations, and water shortage contingency plans. The BMPs provide the framework for implementing the water conservation plan and guidance as to the methods to be employed to achieve the desired savings.

## **THE RESEARCH STUDY**

The potentially large water savings attainable with the broad-scale use of xeriscaping and the fact that associated reductions are in consumptive-use water makes xeriscape of paramount interest for both BOR and SNWA. For this reason, a partnership between BOR and SNWA was formed to investigate the savings that could be obtained with a program to encourage converting traditional turfgrass landscape to xeriscape. This was formally implemented as a Cooperative Agreement<sup>7</sup> in 1995. With its signing, a multi-year study of xeriscape was born, which has come to be known as the SNWA Xeriscape Conversion Study (XCS). As delineated in the most recent version of the Scope (Appendix 1) for this agreement, the objectives of the Study are to:

- Objective 1: Identify candidates for participation in the Study and monitor their water use.
- Objective 2: Measure the average reduction in water use among Study participants.
- Objective 3: Measure the variability of water savings over time and across seasons.
- Objective 4: Assess the variability of water use among participants and to identify what factors contribute to that variability.
- Objective 5: Measure the capital costs and maintenance costs of landscaping among participants.
- Objective 6: Estimate incentive levels necessary to induce a desired change in landscaping.

SNWA assembled a team to support the XCS, and field data was collected through 2001 with the draft final report finished in 2004 (intermediate reports outlined some of the major conclusions). By agreement, the SNWA agreed to provide the raw data collected for possible use in national research efforts by BOR (data was included with the final version of this manuscript submitted to BOR).