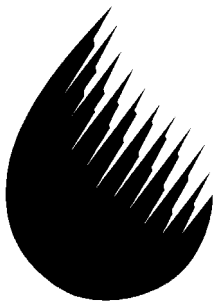

SOUTHERN NEVADA
WATER AUTHORITY

Five-year Conservation Plan 2004-2009

August 2004

Submitted to the US Bureau of Reclamation in fulfillment of the requirements for Section 210(b) of the Reclamation Reform Act of 1982

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I. Overview of the Southern Nevada Water Authority

The Southern Nevada Water Authority (SNWA or "Water Authority") was formed in 1991 by a cooperative agreement among the following seven water and wastewater agencies in Southern Nevada:

- Big Bend Water District
- City of Boulder City
- City of Henderson
- City of Las Vegas
- City of North Las Vegas
- Clark County Water Reclamation District
- Las Vegas Valley Water District

Collectively, these seven agencies provide water and wastewater services to approximately 1.6 million citizens in Las Vegas, North Las Vegas, Henderson, Boulder City, Laughlin and portions of unincorporated Clark County.

The Water Authority is the wholesale water provider to the municipal water agencies in Southern Nevada. In addition to its wholesale treatment and delivery responsibilities, the Water Authority acquires and manages long-term water resources for Southern Nevada.

The Water Authority's mission is to manage the region's water resources and develop solutions that will ensure adequate future water supplies for Southern Nevada. The mission encompasses the following major responsibilities:

- Managing all water supplies available to Southern Nevada through an approved water budget.
- Addressing regional water resource management and conservation programs.
- Ensuring regional water quality as determined by EPA standards.
- Presenting a unified position on water issues facing Southern Nevada.
- Operating regional facilities to provide a reliable drinking water delivery system to all member agencies.

The Water Authority plays a critical role in managing water, but does not have the power to regulate water use by end users or to establish customer rates. Such policies, codes and regulations can only be implemented through the Water Authority's member jurisdictions. The role of the Water Authority on regulatory issues is to facilitate information sharing and collaboration among member agencies. Interagency collaboration has been extremely successful in developing community-wide water efficiency policies. Education, outreach and incentive programs are largely handled by the Water Authority.

Interagency collaboration and public participation have been critical to the past successes of the Water Authority. The Water Authority is committed to a philosophy of involving community stakeholders and the public in developing future programs.

II. The Role of Conservation in Resource Planning and Management

In 1996, the Water Authority adopted its first comprehensive Water Resource Plan to identify and prioritize future water resource options for Southern Nevada. The 1996 plan projected demands to 2050 and identified a portfolio of existing and planned water supply options to meet demand. Demand projections were largely based on projected populations, but also anticipated that demand would be suppressed through significant conservation efforts. The Water Resource Plan is reviewed annually and updated as needed to assure it reflects current water resource policies and the ongoing initiatives of the Water Authority.

In 2002 the Water Resource Plan was updated to reflect current demand and water conditions. The 2002 plan included the prospect of surplus water that was projected to be available under the Department of Interior's Interim Surplus Guidelines. This policy allowed urban users to take water from the Colorado in excess of their apportionment when the river system was deemed capable of accommodating additional withdrawals. At the time of the policy's adoption, the Bureau of Reclamation was predicting high potential that surplus water would be available.

The 2002 plan also included a discussion of the critical role conservation plays in the Water Authority's demand forecasts and in efforts to meet future water demands. Conservation effectively provides an additional resource by freeing up water that was previously consumed inefficiently or wasted. In this sense, it is the most cost-effective source of water available to the community. It is also a resource over which the local community has a great deal of autonomy to implement, since it depends on our own efforts and less on influences outside the community.

The Water Resource Plan was updated again in 2004, largely to reflect the Water Authority's strategies for addressing the severe drought in the Colorado River basin. The Bureau of Reclamation's revised forecasts projected a low likelihood that surplus water would be a reliable supply in the near future. As a result, the 2004 plan strongly emphasizes conservation as a tool to maximize the use of currently available resources,

with special attention to responding to drought conditions on the Colorado River. Banked water in Southern Nevada's aquifers and in Arizona are emphasized as contingency resources that can be called upon if needed.

The severe drought has reduced the probability of surplus water has highlighted the need to accelerate development of the additional water rights within the state of Nevada. In addition to expanding the available water supply, the diversity of supplies will afford the Water Authority greater flexibility to develop strategies to adapt to changing conditions.

The Water Authority has identified three distinct projects to develop these water resources, including projects for Three Lakes Valley Groundwater Development, Virgin and Muddy Rivers Surface Water Development and Clark, Lincoln and White Pine County Groundwater Development. To optimize the development, treatment and delivery of Southern Nevada's existing and potential water resources in a manner that promotes responsible resource management, environmental protection and operational efficiency, the Water Authority has initiated a stakeholder process to assist in developing an Integrated Water Plan (IWP). The IWP process will assess the availability of each resource and the combined capacity needs of water treatment and transmission facilities with the input of affected stakeholders. Conservation will play an integral role in the IWP to assure that the Water Authority is using its current and future resources efficiently and responsibly.

Despite the potential to call upon banked water to meet demands, conservation continues to be Southern Nevada's most vital demand management tool. Since the mid-1990's, the Water Authority has developed and deployed one of the most progressive and comprehensive conservation programs in the United States. As a result of the drought, the Water Authority and its member agencies have redoubled their efforts to strengthen community conservation efforts. The SNWA drought plan, which identifies special measures to be taken to reduce water demands under various levels of drought, was developed in 2002 with the participation of all member agencies and input from community stakeholders. The drought plan was formally adopted as an amendment to the Water Resource Plan in January 2003 and updated in February 2004.

III. Conservation Goals, Strategies and Measures

A. Background

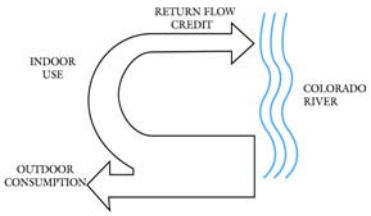
The Water Authority's conservation efforts during the 5-year planning period will be heavily influenced by drought. The strategy for reducing demand under drought is somewhat unique in that the majority of the strategies and tactics are expected to produce long-term demand reductions, even after drought conditions have abated. Furthermore, the SNWA Drought Plan made a concerted effort to sustain quality of life and vitality of the economy. This balanced approach has resulted in drought management tactics that the community has overwhelmingly

accepted. As a result of this acceptance, many of the lessons learned from drought can be carried into longer-term demand management strategies.

Although the Water Authority supports and promotes water conservation both indoors and outdoors, the preponderance of effort goes into promoting more efficient use of water outdoors. Approximately 60 percent of the water delivered to customers is used consumptively, meaning it can be used just once and is evaporated to the atmosphere. Urban landscape irrigation is the single largest consumptive use of water.

All indoor water use is reclaimed to be either returned to the Colorado River, or delivered to other urban uses, such as irrigation or cooling.

In addition to water reclaimed for return to the Colorado River, the Water Authority's member agencies reclaimed almost 22,000 acre feet of water that was reused within the community in 2003.

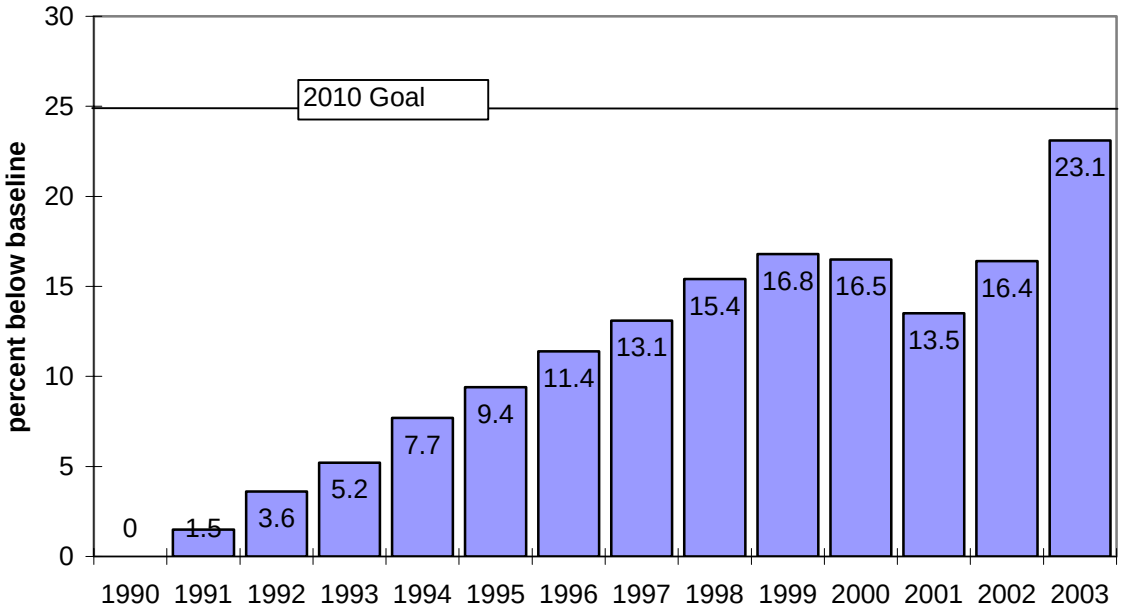


In accordance with Bureau of Reclamation policy, the Water Authority receives credit to withdraw one acre-foot of water from the Colorado for every acre-foot of Colorado River water that was treated and returned. As a result, additional local reuse does not currently enlarge the Water Authority's resource portfolio. It is, however, environmentally responsible by reducing the infrastructure and energy required to move water and wastewater in the valley.

B. Conservation Goals and Strategies

The Water Authority's conservation goal is to achieve 25 percent conservation by 2010. Conservation progress is measured by annually comparing the community's actual water use to the expected water use without conservation measures in effect. Figure 1 shows annual incremental goals and the Water Authority's historic achievement.

Figure 1 - Conservation Goal and Achievement



To measure conservation, the Water Authority uses an explanatory regression model to determine which variables influenced the valley's water use during the preceding year. Although the model has identified a substantial number of relevant variables, the most significant are related to population, weather and economic indicators. These data are obtained from other agencies on an annual basis.

To meet the 25 percent goal, Southern Nevada was expected to gradually increase conservation each year. Starting in 1991, the community met its annual goals for nine consecutive years. In the three year period 2000 through 2002, however, conservation efforts failed to meet the goal.

The trend of sub-goal performance was halted and dramatically reversed in 2003, when the community achieved 110 percent of the incremental annual goal. The 23.1 percent achievement in 2003 approaches the incremental goal originally set for 2006. This dramatic rebound is thought to be attributable largely to the efforts of the Water Authority and its member agencies to aggressively stimulate conservation through implementation of drought-driven demand management tools.

By applying the conservation achievement to the Water Authority's actual water use, the estimated volume of conserved water may be calculated. Table 1 shows the estimated 493,800 acre feet of water use estimated to have been averted by conservation during the previous five-year planning period.

Table 1 - SNWA Member Water Use and Conservation Estimates 1999 to 2003

Year	SNWA Water Use (acre-feet)[1]	Annual Conservation Estimate	Estimated SNWA Potable Water Use without Conservation (acre-feet)	Estimated volume of conserved water (acre-feet)
1999	429,300	16.8%	516,000	86,700
2000	459,100	16.5%	549,600	90,500
2001	479,600	13.5%	554,700	75,100
2002	500,000	16.4%	598,100	98,100
2003	477,500	23.1%	620,900	143,400

Conservation Strategies - While the list of the Water Authority's individual conservation programs, products and services is diverse and lengthy, each is a tactical measure in support of one of three major strategies:

Education – The Water Authority conducts extensive public outreach efforts to assure that water users understand issues of resource availability and wise use.

Incentives – The Water Authority operates the nation's largest known incentive programs to encourage existing customers to make long-term efficiency improvements.

Regulation and Policy – Although the Water Authority itself has no regulatory oversight, collaborative efforts among the member agencies have resulted in the implementation of highly-effective conservation policies, including landscape and plumbing standards, water waste enforcement and tiered water pricing.

[1] Water use includes deliveries of water from the Colorado River and local groundwater. Does not include reuse water.

C. Conservation Measures

Base Water Management Programs

The Water Authority's conservation success is partly dependent upon the water management and business practices of the individual member agencies. There are three key areas related to demand management that are within the purview of the member agencies: metering, managing unaccounted for water and establishing conservation rate structures.

Metering - Metering is the foundation of sound demand management programs. Water Authority member agencies meter all customer connections for all classes of water (raw, potable, recycled/reclaimed) in accordance with AWWA standards.

All purveyors operate on-going meter maintenance and replacement programs. Meters in all jurisdictions are read monthly and data is classified and retrievable on the basis of customer class, meter size, land use, and other relevant variables. All purveyors have the ability to identify unusual water use patterns, such as spikes in consumption, and to notify customers of unusual account activity.

The three largest purveyors, LVVWD, City of Henderson and City of North Las Vegas, are proceeding to expand their automated meter reading (AMR) programs. City of Henderson and LVVWD are both currently implementing a new AMR technology that has additional water management and conservation potential. An AMR system with datalogging capabilities will be installed on all Henderson and LVVWD accounts by 2007. The system includes a data logging function capable of tracking daily and hourly water use for the previous 72 days. This function is being explored by the agencies for it's potential in conservation education with their customers. These AMR sytems also include a function to alert the utility of accounts that have continuous flow activity. This "leak detection" function can be used by the utility to assist customers in proactively identifying leaks.

Managing Unaccounted For Water - All water delivery systems experience losses. In the water industry, these losses are known as unaccounted for water (UFW). UFW is the difference between the agency's total water production and the sum of all metered uses. Such losses are predominantly attributable to leaks, variations in meter accuracy and theft. Among similar communities, the Water Authority and it's member agencies have one of the lowest rates of UFW in the United States. Losses in the regional water treatment and transmission system average less than 1.5 percent per year. Although UFW in the member agencies' distribution systems can vary from year to year, the combined UFW for all members was 3.5 percent in 2002; well below the 10 percent threshold commonly used as an indicator of efficient management.

The Water Authority and its member agencies have a variety of active programs to maximize accounting for the total production. While the strategies among purveyors may vary, the following programs are conducted throughout the region:

- Among the most vital preventive programs is assuring that new facilities are built to meet stringent quality standards. Working together, the Water Authority's member agencies have created and adopted the Uniform Design and Construction Standards. These detailed construction standards assure that delivery systems will meet stringent quality measures that typically exceed industry standards.

- Efforts are ongoing in all service areas to identify older infrastructure that has been deemed to be susceptible to leaks. For example, most cast iron mains are being systematically replaced, as are polyethylene service connections that do not appear to be meeting longevity expectations.

- Prior to installing facilities, soil testing identifies potential threats to the distribution system's integrity. For example, where testing indicates that soil chemistry will be destructive to copper piping, plastic sleeves are installed over the service line to prevent corrosion.

- Reservoirs are thoroughly inspected at regular intervals to assure their integrity and special monitoring devices beneath each reservoir detect leakage.

- Production meters are regularly maintained and calibrated.

- All customer meters are monitored for consumption anomalies. Small customer meters are subject to a planned replacement program based upon life expectancy and large meters are regularly maintained and calibrated.

- A substantial portion of purveyor distribution lines have permanent listening devices installed that can signal patrolling employees of leaks that fail to surface and assist in accurately determining the leak location for excavation.

- Interagency collaboration speeds repair of leaks through fast-tracking line location ("call-before-you-dig") and prompt repair. Records are kept of the estimated system loss for each leak repaired.

Water Rate Setting - All potable water purveyors utilize multi-tier increasing block rate structures. These pricing structures provide financial incentive for the heaviest water users to implement conservation measures.

All purveyors implemented major rate restructuring specifically for the purpose of effecting accelerated conservation in 2003 as a drought response measure. This restructuring involved significant price increases in the higher tiers and a compression of tier thresholds. In addition to strengthening their conservation rate in 2003, the City of North Las Vegas adopted a a policy that includes incremental cost increases over a two-year period.

Figures 2 through 4 compare the pre-drought rates to the recently-adopted aggressive conservation rates for the three largest purveyors: LVVWD, City of Henderson and City of North Las Vegas.

Figure 2 - Water Rate Structure Comparison
Las Vegas Valley Water District
Typical 3/4 inch Residential Home Service

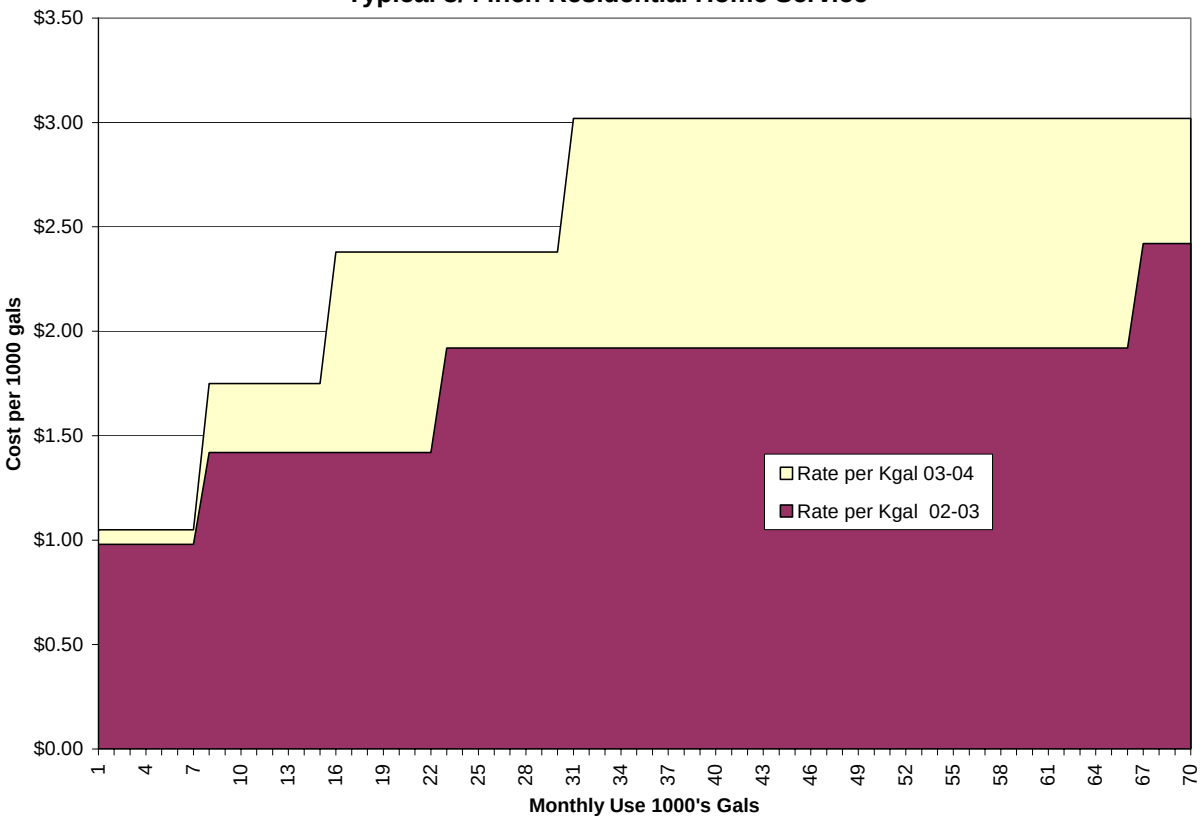


Figure 3 - Water Rate Structure Comparison
City of Henderson
Typical 3/4 inch Residential Home Service

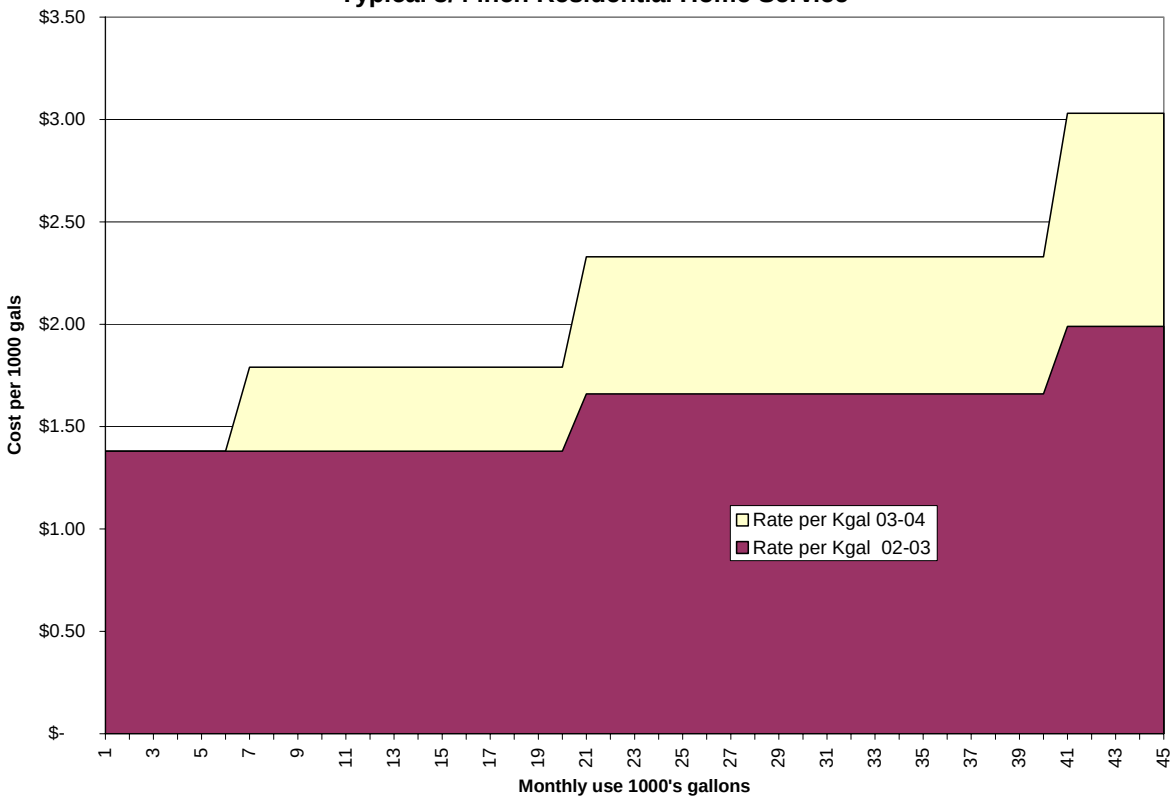
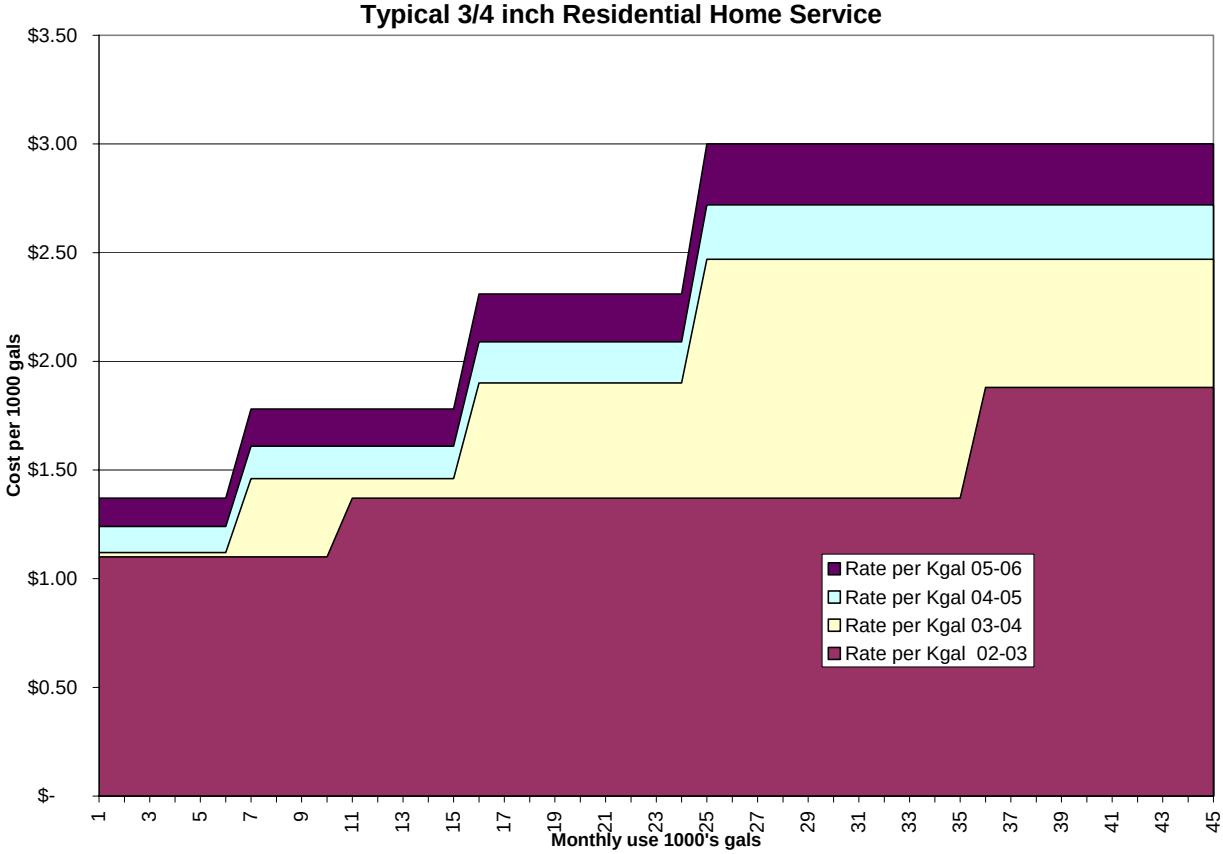


Figure 4 - Water Rate Structure Comparison
City of North Las Vegas
Typical 3/4 inch Residential Home Service



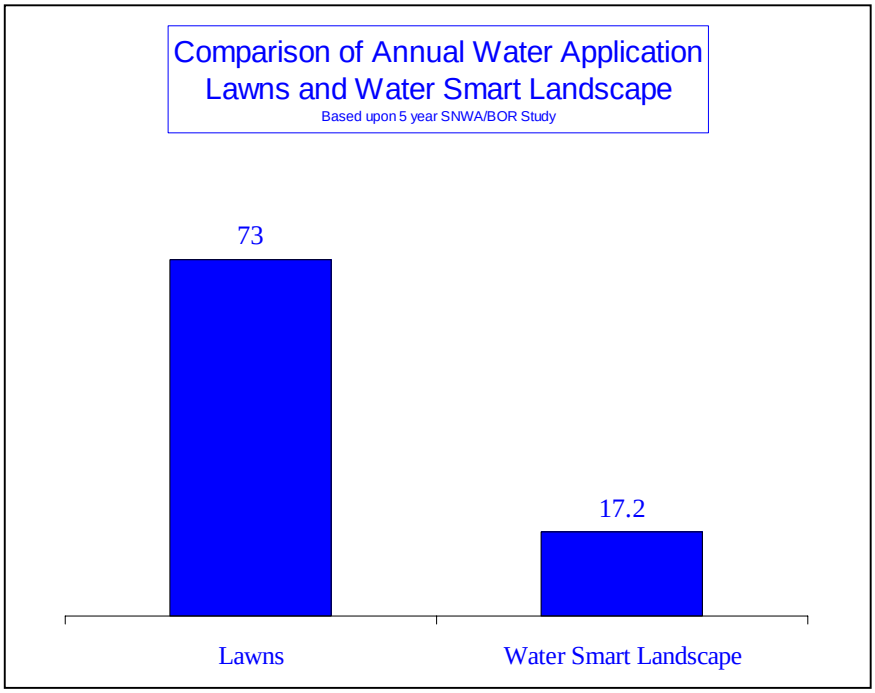
Incentives and Services

The Water Authority recognizes that long-range demand management requires not only implementing the most progressive conservation strategies for new customers, but also creating incentive for existing customers to improve their efficiency.

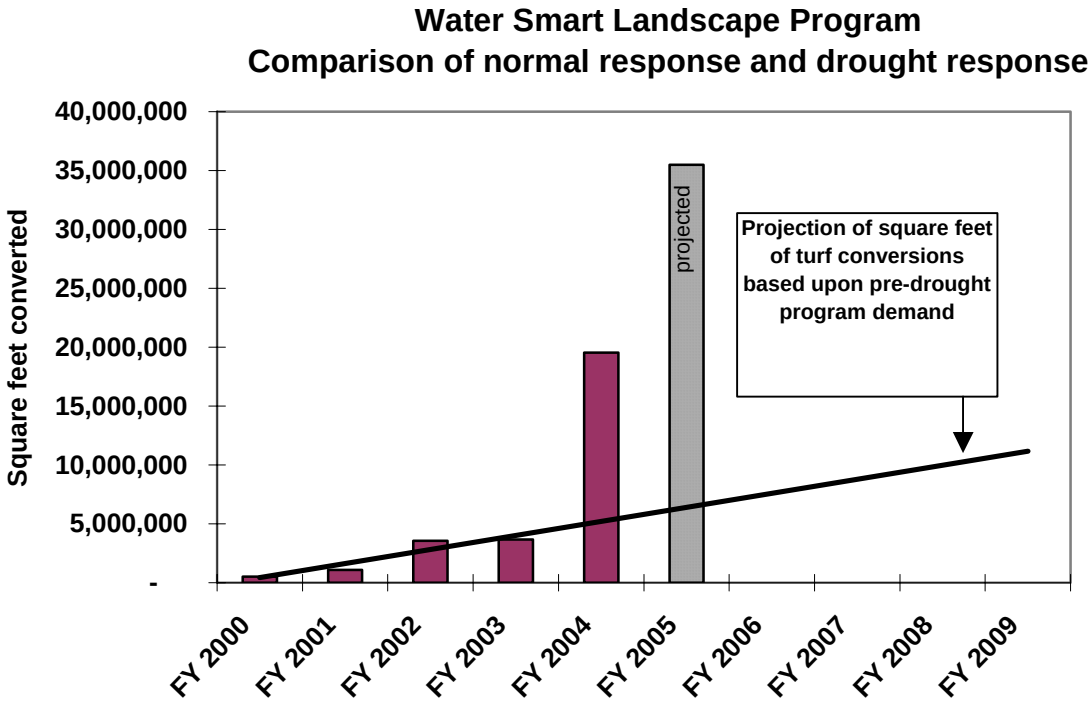
The Water Authority is nationally-renowned for customer incentive programs. Three incentive programs will play a significant role over the next five years in assisting southern Nevada to meet water resource demands:

- Water Smart Landscapes Program (WSL)
- Irrigation Clock Rebate Program (ICR)
- Water Efficient Technologies Program (WET)

Water Smart Landscapes - The Water Smart Landscapes Rebate Program is based upon the Water Authority's five-year study that documented substantial water use reductions by converting turf grass to xeric and/or drought-tolerant plant material. The study found that residents in Southern Nevada annually applied an average of 73 gallons of water per square foot to turf, but just 17.2 gallons annually per square foot after converting turf areas to "water smart" landscape plantings. Based upon the 55.8 gallons per square foot per year water savings, the Water Authority implemented a landscape conversion incentive program.



In January 2003, concurrent with adoption of the SNWA drought plan, the Water Authority increased the incentive rate from $0.40 per square foot to $1.00 per square foot. The Water Authority further modified the program to increase appeal by offering a cash incentive rather than a credit to the client's water bill.



In anticipation of increased participation, the Water Authority board initially appropriated $12.8 million dollars in FY 2004 – more than fourteen times the amount appropriated the previous year. Additionally, the Water Authority dramatically increased public outreach efforts to increase drought awareness and the availability of the Water Smart Landscapes Rebate Program. As a result, participation soared, with as many as 3,000 applicants in a single month. When it appeared that demand might outstrip the program finances, the Water Authority Board authorized an additional $8 million, bringing the total investment to $21 million.

The Water Authority has committed to undertaking extraordinary efforts to meet drought conservation objectives. The FY 2005 appropriation of $31.93 million dollars is anticipated to assure that the Water Smart Landscapes Rebate Program is funded to assure no applicants will be turned away. This exceptional level of funding is approximately five times greater than the pre-drought projected demand trend. The Water Authority intends to promote conversion of up to 35 million square feet, reducing water use by 2.2 billion gallons per year (6,750 acre feet). Combined with previous year's conversions, the Water Smart Landscapes Rebate Program is projected to reduce outdoor water demand by 3.8 billion gallons (11,600 acre feet) annually by June 2005.

Irrigation Clock Rebate Program

The Irrigation Clock Rebate Program (ICR) provides financial assistance for customers to upgrade landscape irrigation controllers to models that can increase water efficiency. At its inception in 1999, the program's original purpose was to replace electromechanical controllers with multi-program digital controllers. Since 1999, the program has facilitated replacement of over 1,500 controllers for residential and commercial properties.

Electromechanical controllers typically only provide a single scheduling program, requiring the property owner to water the entire landscape on the same schedule as their least drought tolerant plants. Furthermore, electromechanical controllers have a lower level of accuracy, with many models demonstrating up to a 20 percent variation between the scheduled watering duration and the actual watering duration.

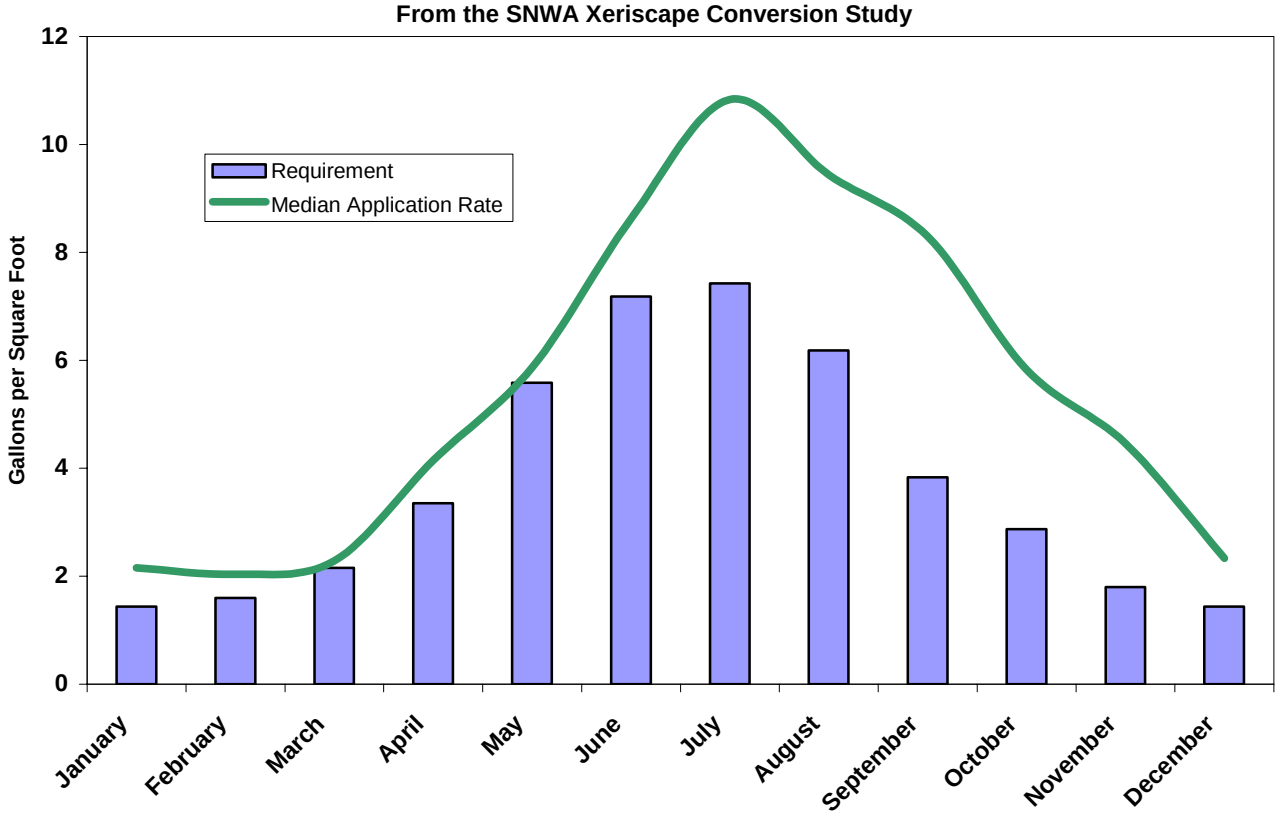
Almost all southern Nevada properties have landscaping with different plant types and irrigation systems that are separately valved to serve different plant groupings. The elimination of controllers with limited scheduling versatility helps assure property owners have the tools to develop and use the efficient watering techniques recommended by the Water Authority.

In March 2004, the ICR Program was modified to encourage adoption of the newest technology: Smart Water Application Technologies (SWAT). These "smart" controllers have the ability to automatically adjust the frequency of watering based upon the projected plant need. Various studies have indicated that these types of technologies have the potential to reduce water use by 10 to 20 percent through more efficient scheduling.

Figure 5 shows the typical water requirement for a lawn in southern Nevada compared to the water application rate of homeowners. Of particular note is that many landscapes are being grossly overwatered during the fall months largely as a result of customers who fail to reschedule their controllers for shorter days and cooler weather. Over the course of a year, typical residential lawns are receiving 40 percent more water than is estimated to be needed to maintain their health and appearance.

Automated irrigation scheduling has the potential to improve the scheduling efficiency with minimal user intervention or oversight.

Figure 5
Residential Lawn Watering vs. Lawn Water Requirement
From the SNWA Xeriscape Conversion Study



In addition to being one of a few agencies offering incentives for smart controllers, the Water Authority has taken a leadership role to create a nationwide collaborative to further promote development and adoption of SWAT technologies. In 2002, the Water Authority arranged a summit on irrigation control technologies, which was hosted at by the Irrigation Association at their international conference. This kick-off event has since stimulated a national-scale research and marketplace transformation effort that includes water agencies, irrigation equipment manufacturers, universities and professional associations. The Water Authority anticipates continued, active involvement in this process throughout the duration of this five-year plan.

The Irrigation Clock Rebate Program is expected to continue over the next five years, with an emphasis on adoption of automated scheduling controllers.

Water Efficient Technologies

The Water Efficient Technologies Program was initiated in early 2001. This program pays incentives to partially fund capital improvements that permanently increase water efficiency. Although the program is available to any customer sector, for reasons of cost-efficiency, the Water Authority has established a minimum one million gallon annual water use reduction requirement. This typically limits the program to industrial, commercial, institutional and multi-family projects.

This performance-based incentive program can be used for projects that reduce consumptive (outdoor) and non-consumptive (indoor) water use. To emphasize the Water Authority's focus on reducing consumptive water use, the incentive rate for such projects is double the amount paid for non-consumptive water use reductions. Since inception, the program has awarded $258,000 in incentives for projects estimated to be conserving 130 million gallons (399 acre feet) annually.

Some noteworthy and representative projects:

- 42 million gallons conserved annually by replacing living turf with artificial turf at two institutional sporting facilities.
- 6.3 million gallons conserved annually by a drift elimination system on a mega-resort cooling tower.
- 20 million gallons conserved annually by installation of commercial laundry equipment that recycles clear rinse water from previous loads into the initial wash cycle.

Regulatory programs

The Water Authority works collaboratively with the member agencies to adopt regulations that conserve water. These efforts may include land use regulation or water use regulation.

Water Waste - Policies that prohibit the waste of water have been used by various agencies prior to the formation of the Water Authority. Currently, all member agencies have ordinances or service rules that prohibit allowing water to runoff into streets and/or into adjoining property. It is also considered water waste to violate policies that limit the time of day or assigned days of the week when watering may occur. As part of the drought restrictions, agencies may also use water waste policies to enforce limitations on the use of outdoor misting systems and ornamental fountains.

All agencies have the ability to assess violation fees directly to a customer's water bill. As part of the efforts to strengthen conservation under drought conditions, all of the agencies adopted a water waste fee structure that contains escalated fees when the community is in a declared drought condition. For customers with small meters, fees start at $25, but double with each subsequent violation, eventually reaching $400 for a fifth or greater violation. Customers with large meters have incurred fees of up to $1,600 per violation. In 2003, well over 1,000 fee violations were assessed by member agencies, including multiple fees at the maximum level.

In 2003, codes were revised to reflect assigned watering days required by the SNWA Drought Plan. The policy called for each customer to be assigned a lettered group, A through F. Each group was assigned watering days for their lawns depending upon the projected seasonal demand to maintain their lawn. During the winter months, each group was allowed one watering day per week. During the spring and fall, groups were assigned three watering days per week. Although water users can select their own watering days from May through September, sprinkler watering is prohibited from 11 a.m. until 7 p.m. Violations for watering outside of the prescribed days or times are enforced using water waste fee policies.

DROUGHT WATERING RESTRICTIONS

My assigned group: _____

All water users have been assigned a watering group. **Mandatory** restrictions mean you may only run sprinklers on your group's allowed watering day(s). To locate your group, check your bill, visit **snwa.com** or call your water provider.

Watering Group	Winter November - February	Spring / Fall March - April / September - October	Summer May - August
A	Monday	Monday, Wednesday, Friday	**Any** day
B	Tuesday	Tuesday, Thursday, Saturday	**Any** day
C	Wednesday	Monday, Wednesday, Friday	**Any** day
D	Thursday	Tuesday, Thursday, Saturday	**Any** day
E	Friday	Monday, Wednesday, Friday	**Any** day
F	Saturday	Tuesday, Thursday, Saturday	**Any** day

For watering instructions, see inside panel.

Water Budgeting – in lieu of assigned watering days, certain large customers have been given landscape water budgets. Due to the need to be able to accurately measure the amount of water applied per unit of landscape, only golf courses are currently subject to the policy. Golf courses are currently budgeted to 6.5 acre feet per irrigated acre. Analysis shows that this threshold will promote conservation of approximately 10 percent of the total golf industry's water use. Water budgets are subject to modification based upon water supply conditions.

Water used in excess of the budget is subject to rates that are 300 to 900 percent of the highest cost of water used within the budget, depending upon the amount of water used in excess of the budget.

Development Codes and Policies

Member agencies adopted landscape codes in the mid-1990's to limit landscape water demand. These policies limited the amount of turf allowed in all types of development including residential homes and golf courses. Under the 2003 drought plan, all agencies adopted more stringent policies. Ornamental turfgrass is no longer allowed in any new commercial, institutional or industrial landscape or homeowner association common areas. New residential homes built under certain drought conditions are subject to strict provisions on the maximum size and placement of turf.

Multi-family housing and golf courses have long been subject to policies that limit the amount of turf that may be planted, but under drought conditions the allowable amount has been aggressively restricted.

As part of the implementation of the Drought Plan, member agencies also adopted ordinances that prohibit homeowner's associations from enforcing covenants that obstruct or prohibit the conversion of landscape to more water-efficient plantings.

Resorts are the largest economic industry and account for about six percent of the community's total water use. Clark County, which has jurisdiction over the Las Vegas Boulevard resort corridor, requires that all new resorts submit a Resort Water Efficiency Plan for approval by their water purveyor. These detailed plans include the projected amount, source and function for all water to be used by the resort. Based upon the data from these plans, the Water Authority has determined that approximately twenty percent of the water delivered to the major resorts is used consumptively, while the remaining eighty percent is returned for reclamation. As a result, the net impact of resorts upon the Water Authority's Colorado River consumptive use apportionment is estimated at less than two percent. Water Efficiency Plans are reviewed to assure that resorts are using the best water management practices that are reasonably available.

Drought Policies

The adoption of the drought plan highlighted the effectiveness of the interagency collaboration and public process that exemplifies the Water Authority's success. The plan was uniformly developed and adopted by eight separate agencies that control water and land use policy in the valley.

Highlights of the drought policy have been interspersed throughout this document in the appropriate sections. Additional information may be obtained from the appendices.

To date, the community's response to the drought measures has been positive and shown to be effective in dramatically reducing water use.

Education and Public Outreach

In addition to extensive conservation and incentive programs, the Water Authority has an education and public outreach campaign to assist residents and businesses with conservation efforts. The campaign utilizes a variety of media to educate customers on the need for conservation, to provide practical tips on how to conserve, and to put customers in touch with SNWA experts who can help them reduce water use at their properties. The efforts include advertising,

community events, publications, an interactive web site, public-private partnerships, and demonstration gardens to inspire water-efficient landscape designs.

Demonstration Garden Programs - One of the best ways to encourage the use of water-smart landscaping is to lead by example. The Water Authority's demonstration garden program has partly funded six demonstration gardens across the valley. Like the Water Smart Landscapes rebate program, the Water Authority's demonstration gardens program offers a rebate for properties that upgrade turf areas to water-efficient demonstration gardens. The properties show visitors the variety, color, texture and shade that water-smart landscaping can provide. The gardens are located across the valley at local schools, parks, and government buildings.

In addition to these demonstration gardens, there are other demonstration gardens offered by member agencies. The Gardens at the Springs Preserve is the oldest and most established garden of its kind in Southern Nevada. The Gardens (formerly the Desert Demonstration Gardens) features more than 1,000 species of plants. Two new facilities are also planned. The City of Henderson's Acacia Park and the Las Vegas Springs Preserve will provide residents the opportunity to learn more about water-smart landscaping through demonstration gardens.

Public Outreach Efforts and Events – The Water Authority employs a variety of community outreach efforts to educate customers on the need for conservation and on the programs and services that are available. Customers can easily access this information through the Conservation Helpline, a phone center that connects customers to rebate and conservation program information, free landscape publications, drought watering schedules, and a place to report water waste. The same information is available online at snwa.com. The Water Authority's web site includes interactive features that allow customers to enter their address and receive a customized drought watering schedule based on their assigned watering days, online rebate program applications, landscape sample designs, and landscape care tips. In addition, the Water Authority produces a variety of collateral materials to educate consumers. These include:

- Drought Watering Restrictions Schedule: This publication explains the Water Authority's drought watering restrictions, illustrates which day(s) of the week each watering group may water, and offers practical tips for irrigating efficiently. The schedule has been included with customer water bills, published in the Drought Handbook listed below, and is available at several retail locations valley-wide.

- Water Wise: This quarterly publication is mailed to more than 645,000 residents in Southern Nevada. It includes drought updates, conservation programs and incentives, and tips on caring for landscapes and using water more efficiently outdoors.

- Drought Handbook: Versions of this publication were created for both Drought Watch and Drought Alert stages. This publication helps residents understand the issues and policies of the drought and provides practical information for coping with drought. The handbooks were inserted into the *Las Vegas Review-Journal* and provided information on drought restrictions, rebate and incentive programs, landscape care tips, and profiles of homeowners and businesses that have undertaken conservation upgrades.

- Sample Designs: The Water Authority teamed with the American Society of Landscape Architects to produce five sample landscape designs. The designs include a variety of water-efficient plants to help homeowners convert their existing landscape or to install the right landscape from the start. The designs are available in printed formats or online at snwa.com.

- Water Smart Calendar: This publication enables the Water Authority to provide information on water-smart plants and conservation tips and keep that information in front of customers year-round. The twelve-month calendar is sent to single-family homeowners. It includes drought watering restrictions, conservation tips, and colorful photos of water-smart plants that are hardy enough to survive in Southern Nevada's arid climate and use just a fraction of the water that turf requires.

- Lean & Green: This publication, published three times per year, educates landscapers on drought restrictions and rebate programs. The publication is printed in both English and Spanish.

- Water Ways: This monthly television program airs on local government cable channels. The program includes monthly segments focusing on water conservation efforts. The program airs daily.

- Videos: The Water Authority produced several videos that are available free of charge to customers. These include "Detecting and Silencing Leaks," a video to help customers determine if they have a water leak and tracking the source of the leak. Additionally, the Water Authority produced a "Lawn to Lush" video to walk customers through the steps of converting from a grass landscape to water-smart landscaping.

The Water Authority also uses a variety of community events to educate customers on conservation issues. Through the Landscape Awards competition, the Water Authority honors landscapers and property owners who have created beautiful water-smart landscapes. The award-winning properties are featured in a variety of Water Authority publications throughout the year.

Water Authority and member agency staff members provide valuable landscape and irrigation expertise through classes taught at several venues in Southern Nevada. Water Authority staff members teach courses at the Gardens at the Springs Preserve, at facilities in the City of Henderson, and at community events. One of the largest landscaping events in the community is SNWA's annual Day with the Experts event, which features dozens of landscape design, irrigation, and gardening classes all offered free of charge. The event draws several thousand people each year. Additionally, staff members visit local nurseries and home stores to teach customers how to operate their irrigation clocks.

Advertising Campaign - A long-term commitment to water conservation includes an aggressive advertising campaign that utilizes television, radio and print advertisements to reach target audiences. The campaign currently running focuses on the need for customers to follow the drought watering schedule.

The Hispanic community is growing rapidly in Southern Nevada. To reach out to this audience, the Water Authority created a bicultural campaign, which includes television, radio, and print ads designed specifically for the Spanish-speaking audience. This allows the Water Authority to more effectively communicate the need for conservation during the drought as well as inform residents of the rebate programs available to them.

Youth Education Programs and School Grants - Youth play an important part in Water Authority outreach efforts. The Water Authority has ongoing programs to educate elementary and secondary teachers and their students. The program qualifies for university credits.

For elementary school students, the Water Authority offers a presentation from water-drop mascot, Deputy Drip. The presentation is designed to teach young children how to conserve water at home. For high school students, Water Authority offers the Youth Advisory Council, now in its sixth year. Each year, one student from each area high school is chosen to participate in the council. The students spend a year studying water issues and choose a community project to focus on during their tenure on the council. Previous projects have included creating conservation television ads, planting a xeric garden at McDoniel Elementary school, helping to restore the wetlands in the Las Vegas Wash, and creating a water-smart home with a local homebuilder.

In addition, the Water Authority offers the Water Education Institute, a continuing education program for teachers. Elementary and secondary teachers attend a two-day workshop and take with them lesson plans and activities they can use in the classroom.

To assist schools with teaching water conservation, the Water Authority offers a school grant program. To receive funds, schools must create a program that gives students a living lab experience at the school. Six local schools have completed the projects using the funds.

Public-Private Partnerships – The Water Authority partners with the private sector to promote conservation efforts. These include partnering with local retailers, landscapers, homebuilders, and the business community. Partnerships include:

- **Water Conservation Coalition (WCC)**: For more than a decade, local business and community leaders have been part of the Water Conservation Coalition. This group has taken on the challenge of communicating the need for conservation to other members of the business community. The group names Water Hero Award winners each year, honoring local businesses and residents who have implemented water conservation programs.

- **Water Upon Request**: The WCC and Water Authority partner with local restaurants, which agree to serve water only when patrons request it. This not only saves the water being served, but unnecessary water used to wash glasses when the glass is not used. Participating restaurants receive menu "snipes" to advertise their commitment to helping the community serve water. There are currently 155 restaurants participating in the program.

- **Water Smart Contractor**: The key to preventing many water waste problems in landscaping is the right design. The Water Authority provides a course in water-efficient landscape and irrigation design and installation for licensed landscape contractors. Contractors who complete the course and pass an exam are certified as Water Smart Contractors. Classes are offered in both English and Spanish. To date, 67 companies have completed the program.

- **Water Smart Home**: This program is currently in development. Similar to Energy Star, it will create guidelines for water-efficient homes that exceed current code requirements. Homebuilders that build Water Smart Homes will be able to assure new homebuyers that the home exceeds water efficiency standards and will help the community conserve water. The program is expected to launch in 2004.

Potential partnerships include a Water Smart Car Wash program, which will encourage the use of facilities that allow water used for washing vehicles to be recycled, and expanding the partnerships with home stores and nurseries that carry Southern Nevada Water Authority publications.

IV. Research

The Water Authority recognizes the value and necessity for research and innovation in water conservation. The drought further illustrates the need to find creative solutions to help reduce consumption. Research is key to filling this need. To this end, the Water Authority has a number of research initiatives to develop cutting edge techniques and technologies to further water conservation efforts.

Xeriscape Conversion Study (XCS) - With the great majority of outdoor use water going to irrigation of turf, much of it ornamental turf, the potential to convert turf-dominated landscapes to xeriscape had been recognized for some time, but until this study, no good estimates existed for how much water could truly be saved. The objectives of the XCS were as follows:

- Identify candidates for participation in the study and monitor their water use. The Water Authority is one of the only known entities to have actually *submetered* xeriscape and turf irrigation usage separately for residents for the purpose of comparison of water application to both landscape types.
- Measure the average reduction in water use among Study participants.
- Measure the variability of water savings over time and across seasons.
- Assess the variability of water use among participants and to identify what factors contribute to that variability.
- Measure the capital costs and maintenance costs of landscaping among participants.
- Estimate incentive levels necessary to induce desired changes in landscaping.

The XCS has already produced a wealth of information about the water savings obtainable by xeriscape conversion projects as a result of this study, funded in part by the Bureau of Reclamation. Beyond this though, estimates of indoor usage via data loggers, measures of the cost effectiveness of xeriscape from the utility perspective, the extent to which people overwater (and in what seasons), and a greater understanding of how people manage their irrigation have all been yielded by this research. While the study will be concluding in 2004 with deliverables to USBR-LCRA, information and further post-hoc analyses will continue to help shape the Water Authority's current rebate program.

Construction Water Use Study - Construction activities can utilize significant volumes of water for excavation and dust control. Whereas construction will continue to be a high-profile topic in water conservation, the Water Authority, with funding from the Bureau of Reclamation, is helping to quantify the water used for construction in Southern Nevada and determine how modified construction activities might save water without compromising other objectives. This is being accomplished by the Water Authority's support of a construction water use study being implemented by UNLV's Department of Civil and Environmental Engineering. The objectives of this research are to:

- Benchmark existing practices and efficiencies.
- Determine opportunities to improve water efficiency for construction water users.
- Create practical recommendations and/or tools for construction professionals to improve water efficiency without compromising quality of work, regulatory compliance needs or cost efficiency.
- Provide credible information to allow the Water Authority to evaluate opportunities for incentive and educational programs for construction water users.

Tentatively, completion is anticipated by the end of 2004. The results will then be available for consideration in terms of public policy and conservation efforts.

National Multiple Family Submetering and Allocation Billing Study - In multi-family housing units, such as apartment complexes, billing of water by utilities has traditionally been done with one or just a few meters on site. In turn, the management of the complex recaptures the cost by folding such overhead charges into the tenants' rent. This approach means that individual apartment dwellers typically do not receive a price signal corresponding to their respective levels of consumption and thus have little or no financial incentive to conserve.

There are several approaches apartment managers have tried in recent years to recoup incurred water charges. One such method, called Ratio

Utility Billing (sometimes referred to as “RUBbing”), involves billing residents based on some criteria that may be considered more equitable than in-rent billing. The other (more expensive) option is to submeter each apartment and bill commensurate with usage. One or both of these options may offer water conservation potential as an associated benefit.

The Las Vegas Valley Water District and the Water Authority agreed to participate in the National Multiple Family Submetering and Allocation Billing Study. The objectives of the research are to:

- Determine the water savings potential in the multi-family sector resulting from both direct metering and allocation programs.
- Understand the current regulatory framework governing billing conversion programs across the United States.
- Assess the current business practices in the sub-billing industry.
- Draw conclusions from these findings.
- Make recommendations that offer consumer protection, provide ethical business practices for the industry, and capture cost-effective water savings.

This research is slated for completion in 2004.

Automated Irrigation Controllers - As mentioned earlier, the Water Authority is helping to facilitate adoption of automated landscape irrigation controllers via its Irrigation Clock Rebate program. The adoption of this technology by the light-commercial and residential sectors has the potential to save large volumes of water assuming introduction is successful. Because this could be one of *the* Water Authority’s next major initiatives in facilitating outdoor water conservation, two major research efforts are underway in support of the topic.

First, the Water Authority has a vested interest in quantifying to a greater extent the savings that can actually be anticipated from these controllers locally. With support from the Bureau of Reclamation, the Water Authority has commissioned a study to evaluate these controllers in a practical residential setting with real customers. The research is being conducted by the University of Nevada Las Vegas. The objectives of this study are to:

- Recruit and select appropriate sites for evaluation of the controller with appropriate controls.
- Install controllers at treatment sites.
- Monitor study sites. This entails including recording of detailed consumption data, responding to customers’ inquiries, etc.
- Perform analyses to determine the potential water savings achievable from the technology.

- Complete a report detailing the findings of the research.

A comparison study is also planned along with the field effort to further evaluate the technology's ability. The first phase of the research is tentatively expected to complete in 2005.

The other research initiative is national in scope and relates to evaluation of the variety of automated control technologies available, and those coming to the market in the future. Specifically, testing protocols are being developed to evaluate the capability of these automated technologies to irrigate landscapes to an adequate level while minimizing the potential for run-off to occur. Protocols specific to the class of product are under development, though these generally can be considered to do all of the following:

- Specify creation of a "virtual landscape" subjected to simulated realistic climatic conditions.
- Help researchers evaluate the ability of the controllers to efficiently irrigate this modeled condition.
- Permit comparison of irrigation management by the controller to reference soil moisture balance equations and estimate plant stress resulting from irrigation scheduling.
- Specify tracking of accumulated irrigation. Researchers will assume water application beyond the soil's ability to hold water will result in runoff, negatively impacting irrigation efficiency.
- Provide for standardized reporting of performance data on each controller. This could in turn be used to determine the suitability of controllers for selection criteria and/or water efficiency labeling.

Additional Research - There are a host of additional directions the SNWA expects to go in beyond the aforementioned areas. Specific objectives and timelines are to be developed in the future, but some of the probable future research areas and initiatives may include:

- *Further evaluating impacts of conservation-oriented regulatory practices on consumption (these include water waste and drought-related restrictions).*
- *Further exploration of consumption characteristics and drought response among various customer sectors*.
- *Evaluating the impact of water budgeting policies on consumption reduction for large customers.*
- *Evaluating the conservation potential of cooling tower improvements* and *other assorted technologies primarily to streamline the delivery of the Water Efficient Technologies Program*.

- *Continued evaluation of turf removal strategies for achieving water conservation*.
- *Broad-scale analyses in support of strategic and integrated water planning.*

V. Conclusion

The Southern Nevada Water Authority has one of the most dynamic and comprehensive water conservation programs in the nation. While the general strategies employed will continue to yield results, the Water Authority constantly pursues refinement and innovation.

The previous planning period, 1999 through 2004, was a period of tremendous change in the western water industry. As a result, this document demonstrates that the Water Authority implemented numerous new conservation efforts that were not foreseeable when the 1999 plan was submitted. It is anticipated that the next five years are likely to reveal even greater challenges and opportunities.

The Southern Nevada Water Authority supports continual cycles of program planning, implementation and evaluation. This on-going process allows the agency to succeed in meeting community needs under a diverse set of circumstances. These efforts are expected to yield new opportunities that may result in the further improvement of this five-year plan.

Appendix I

Description of initiative	**Comments**	*Implementation Timeline*										
		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Incentive Programs												
Water Smart Landscapes*	Long-term efficiency for pre-existing properties	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Irrigation controller	Long-term efficiency for pre-existing properties	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Water Efficient Technologies	Long-term efficiency for pre-existing properties			♦	♦	♦	♦	♦	♦	♦	♦	♦
Educational and Promotional Programs												
Water Smart Contractor	Improved landscape water efficiency on new installations and retrofits.					♦	♦	♦	♦	♦	♦	♦
Water Smart Home	Improved indoor/outdoor efficiency for newly-constructed homes						♦	♦	♦	♦	♦	♦
Water Smart Car Wash	Proposed promotional program to increase public awareness of beneficial reuse of wastewater							♦	♦	♦	♦	♦
School Programming	Teacher training, Youth Advisory Council and classroom materials	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Demonstration Gardens		♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Water Upon Request	Builds awareness through collaboration with the restaurant industry.				♦	♦	♦	♦	♦	♦	♦	♦
Water Conservation Coalition	Awareness and action via business community	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Publications, Video and Web	Unified regional messaging	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Helpline	Direct customer support 6-days per week	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Advertising	Unified regional messaging	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Community Events	Unified regional messaging	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Regulatory Programs												
Water Waste Enforcement*	Conducted by all purveyor agencies	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Landscape efficiency codes*	In place in all jurisdictions for all land use types	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Tiered Water Rate Structures*	Used by all purveyor members	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Golf Course Water Budgets*	Adopted by all purveyors in 2003					♦	♦	♦	♦	♦	♦	♦
Seasonal Watering Schedule*	Uniformly used in all jurisdictions					♦	♦	♦	♦	♦	♦	♦
Time of Day Restriction*	Uniformly used in all jurisdictions	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦

* indicates items that were implemented or strengthened for drought.