Chapter 8

Water Conservation

List of Tables

List of Figures

Purpose and Scope

NRS 540A.130 requires the Regional Water Plan to describe programs to achieve conservation of water. The goal of this updated water conservation plan, written by the Regional Water Planning Commission's (RWPC's) Advisory Committee on Conservation (ACC), is to assist the County, Cities, residents, businesses, and other entities in using only the water that is needed to achieve a desirable and sustainable quality of life. The conservation plan describes:

- Water conservation programs and ordinances presently in effect in the region
- Programs that have been implemented since adoption of the 1995–2015 Regional Water Plan
- Pending proposals for water conservation

Recommended water conservation actions that may be implemented or considered for implementation in the future are also presented.

Introduction

Water conservation is a vital part of an integrated water resource plan. Water conservation can positively affect customer utility bills, the need for future facilities or timing of their construction, drought protection for the community, and the rate at which new water resources are needed. The region has a limited supply of water resources, and it should be used as efficiently as possible.

Since its formation in 1995, the RWPC has set water conservation goals for the Region, and developed and implemented programs and plans to reach those goals. The 1995-2015 Regional Water Plan presented three sets of potable water demand projections through 2015 based on differing conservation assumptions. The mid-range projection was termed the Base Case demand and was determined to be achievable if certain conservation measures were implemented. Seven of the eleven conservation measures analyzed in 1995 were selected for implementation during the five years following adoption of the Regional Water Plan. Those seven conservation measures have come to be known informally as Base Case Conservation. Although potable water demand projections have been revised using recent data and no longer consist of low-, mid- and high-range projections, the RWPC finds that the pursuit of Base Case Conservation is desirable and beneficial to the Region.

In addition to monitoring the progress of water conservation, the RWPC will continue to look ahead to determine whether existing conservation programs are effective and practicable, and whether programs should be added or deleted. During drought or emergencies additional conservation measures may be needed to achieve a greater reduction in water use.

The ACC recommends the following water conservation policy for the RWPC in evaluating current and future conservation measures:

> ***Policy 1.1.b: Water Conservation:***
>
> *Water conservation measures that promote smart management of the region's water resources will be implemented for the benefit of the community. Additionally, the community will be expected to conserve more water during drought.*

Summary of Findings

General conclusions drawn from this chapter include:

- TROA will become effective in the future, although this may be beyond the three-year period of this Plan.
- Water conservation ordinances in each of the jurisdictions will remain in the Region.
- All purveyors in the Region will be fully metered by 2009, as estimated in TMWA's *2005-2025 Water Resource Plan.*
- There will be sufficient water for essential public health and safety needs, even during the worst drought years or during an emergency event.
- Increased use of treated wastewater effluent and other non-potable water sources may be implemented subject to federal, state, local and health department regulations, and to the extent supplies are available from TMWRF, RSWRF and STMWRF.
- Additional conservation actions during droughts will be required when Floriston rates cannot be met during the irrigation season.
- The drought plan of the 1990s is no longer applicable under today's operating conditions since "twice-a-week" watering is required by ordinance until TMWA's system is fully metered.

Based on the discussion of future possible conservation measures given in Section 8.5, the ACC has listed actions for future consideration summarized in Table 8-1, in addition to the Base Case and other conservation measures already underway. While these future actions may be implemented, the ACC believes it is important to continue successful existing conservation programs in the region while implementing new ones.

Table 8-1
Base Case, Ongoing, Future and Drought Conservation Measures

BASE CASE

Retrofit Water Meters on all Municipal Water Services
Toilet Retrofit
Increase Block Rates Region-wide
Landscape Efficiency Conversion
New Building Codes
Showerhead Retrofit
Good Earthkeeping

ONGOING MEASURES

Water Audits
Public Education
New Irrigation Technology
Non-Potable and Effluent Water

FUTURE MEASURES

RWPC Sponsored Education: Soil Preparation, Irrigation Efficiency
Best Management Practices (BMPs)
Grade to Retain 50% on New Lots
Commercial Faucet Retrofits
Enforce Landscape and Runoff Ordinances
Landscape Water Budgets
Sprinkler System Devices
Dual Water Delivery Systems
Customer Leak-Repair Assistance
Promotion of New Ideas
Research Studies
Good Earthkeeping

DROUGHT MEASURES

Increased public education
Increased enforcement of water waste rules
Once a week lawn watering
Implementation of landscape water budgets for irrigation customers
Prohibit planting new lawns
Restaurants implement mandatory no-water-served-unless-asked policy
Hotels and motels implement mandatory Good Earthkeeping

8.1 Regional Benefits of Conservation

Under State Engineer and local governmental rules, water conserved by existing customers is not allocated to future growth. Instead, water not diverted as a result of conservation is: (1) left in the river, (2) stored in upstream reservoirs for use during droughts or for fish/wildlife purposes, or (3) treated and stored as part of the groundwater recharge program during the winter. Local government ordinances require that water rights be deeded to Washoe County or TMWA as a condition for receiving a building permit. The resulting will-serve letter becomes permanently affixed to that particular subdivision or property. If the subdivision uses less water than the dedicated water rights, the unused water cannot be transferred to another property unless two or more properties are owned by the same person or entity.

In evaluating the cost and benefit of water conservation efforts, it is necessary to understand and appreciate the integrated nature of the issue. Given the many benefits of water conservation, the fact that water conserved may not be equivalent to a new water supply does not negate its value. If water conservation is evaluated only for the savings it generates in reducing the cost of supplying potable water, cost-benefit ratios and payback periods might look unattractive. Other benefits have to be taken into consideration such as energy savings, environmental impacts, and postponement or avoidance of building new infrastructure. The major benefits of water conservation in the region are summarized below:

1. **Extending drought or emergency water supplies.** Periodic droughts are a fact of life in Washoe County's high-desert environment. Because timing of droughts cannot be predicted and their duration only estimated, it is prudent to maintain reserves to provide for demands during droughts. After the Negotiated Settlement has been implemented, the Cities and County will be able to store more water in upstream reservoirs for use during drought as well as to provide dilution of discharges at the sewage treatment plant consistent with the Water Quality Settlement Agreement. To the extent that conserving water supply helps the community to minimize the impact of a drought, conservation is a very valuable tool.

2. **Delaying construction of new water treatment and wastewater treatment facilities.** A major benefit of conservation has been delaying the need for expanding or constructing new water and wastewater facilities. Because the treatment facilities must have the capacity to handle peak demand, lowering the peak is helpful in postponing expansion. The twice-a-week watering restriction reduces peak demands caused by many customers watering during crucial high-demand periods. Recent studies conducted in Colorado and reported by the AWWA suggest that up to a 30% decrease in consumption is realized by twice-a-week watering. While expansions may be delayed as a direct result of water conservation, future expansions of the water and wastewater treatment facilities will still be necessary to meet the needs of growth.

3. **Lowering cost of water and wastewater treatment operations.** Lower water use means lower supply and operational costs for both water and wastewater treatment in cost components such as chemicals and power. Water conservation benefits, however, may be constrained by TMWRF discharge limitations. As conservation does not reduce the total pounds of pollutants in the waste stream, the influent and effluent TDS concentrations at TMWRF are anticipated to increase as a result of conservation. Careful reuse management and a possible discharge permit revision are expected to avoid a violation of discharge limitations.

4. **Reducing energy costs.** For the consumer, lower water use in facilities and appliances that heat or pump water equates to lower utility costs. For the utilities, lower demands result in less pumping to distribute water through its system, and less energy required at the treatment plants.

5. **Minimizing pollution in the watershed.** Water conservation results in less yard and agricultural runoff and sediments that contribute to pollution in the watershed, affecting both surface and groundwater. The USGS studied the quality of shallow groundwater in the Truckee Meadows and identified an infiltration problem probably caused by landscape application of pesticides. Another conclusion was that there are a greater variety of pollutants in urban-area groundwater compared to agricultural areas (USGS, 1998). Water conservation practices, careful control of pollution sources and storm water BMPs can help minimize run-off and percolation of polluted water and prevent pollutants from entering surface water and groundwater.

6. **Improving fisheries and habitat.** Under TROA, less water used for municipal purposes allows more water to be stored in upstream reservoirs. This water builds a credit of drought reserves that in non-drought years is released for fishery purposes.

7. **Improving water quality.** Future management of river resources will provide enhanced opportunities to increase the amount of water available for fish recovery and wildlife needs, particularly in the lower portion of the Truckee River.

8. **Protection of public health.** Minimizing standing water that accumulates in both rural and urban settings may be a health-related aspect of conservation that guards against breeding and reproduction of mosquitoes and other vectors. These activities include landscaping runoff, emptying swimming pools and spas, storm water containment, and car washing.

8.2 Overview of Progress

All major water purveyors in the region have implemented water conservation plans as required by NRS 540.121-151. Aside from those purveyors who have updated their conservation plans, most of the plans have been in effect since 1992, when they were required to be submitted to the Nevada Department of Conservation and Natural Resources for approval. (See Section 8.3 for detailed discussion of conservation plans.)

Since the 1987-1994 drought, the RWPC has endorsed, and Reno, Sparks, and Washoe County have adopted, national plumbing codes and local ordinances designed to minimize water waste. These include twice-a-week outdoor watering restrictions, installation of water-efficient plumbing fixtures in new construction, use of water-saving landscape design, the installation of water meters, and retrofit of existing toilets and other devices, i.e., showerheads with low-flow models. Success in bringing about adoption of additional water-saving measures, such as further amendments to the plumbing code, has been limited by institutional and political constraints. Progress on these and other Base Case Conservation measures are summarized in Table 8-2.

This conservation effort will continue to reduce peak demand on the system, reducing the quantity of water that must be treated for residential use and delaying construction of new and

expensive treatment facilities. The scope of the conservation program is region-wide, except for water meter retrofits, which is a TMWA sponsored project within its service area.

Table 8-2
Base Case Progress since the 1995–2015 Regional Water Plan

Retrofit Water Meters on all Municipal Water Services	TMWA (previously SPPCo) has been implementing a meter retrofit program since 1995. In March 2002 TMWA began installing meters whenever a single-family residence changes tenants. TMWA estimates having a fully metered system by 2009. WCDWR (including STMGID) connections are fully metered as of January 1, 2003. Both purveyors encourage flat rate customers to convert to metered rates.
Toilet Retrofit	The RWPC hired Volt VIEWtech to administer the Pilot ULFT rebate program, in effect from September 2001 through March 2003. 5,761 ULFTs were installed. A subsequent effort, the Toilet Installation Program, was initiated in July 2003 and is planned to expand throughout the region within a year.
Increasing Block Rates for Municipal Water Services Region-wide	Both TMWA and WCDWR currently use inverted block rate structures. WCDWR adjusts its rates annually. In October 2003 TMWA implemented its first rate adjustment since adopting SPPCo's water rate structure that was set in 1998, including a third tier for metered customers.
Twice-a-Week Watering (Yard Fitness)	TMWA continues it's "Yard Fitness" Program, an advertising campaign promoting twice-a-week lawn watering with annual advertising and its Water Watcher program.
Landscape Efficiency Conversion	TMWA's Landscape Retrofit Program, part of the Water Conservation Agreement, seeks to promote conversion to water efficient landscaping, primarily through education. TMWA has hired professional landscape services to remove non-functional turf areas at select school district sites. Over 77,000 square-feet of turf have been replaced with low water use plants, materials and hardscapes. In 2003 TMWA initiated a pilot ET controller program for its large commercial irrigation services.
New Building Codes	An initial engineering feasibility analysis for hot water pipe size reduction, insulation and pressure regulators was completed in 1998. A draft County ordinance was drafted by the District Attorney's Office. ACC is currently pursuing the code change with Reno, Sparks and County building departments. TMWA is also encouraging landscape designs that make sense in the region's high desert environment.
Showerhead Retrofit	TMWA continues distribution of low-flow showerheads in free kits available on request and at special events. Low-flow showerheads were also distributed free to homes inspected for verification of ULFT installation during the toilet rebate program.
Good Earthkeeping	Concept is to work with local hotels/motels to promote reduced laundry requirements.

Note: There is no priority in the order these actions are listed with the exception of water meter retrofit.

The results of water conservation measures are only quantifiable with a metered system. In the absence of precise data, the level of conservation achieved historically may be shown by the following measures of usage: (1) per connection, (2) by land-use category in relationship to growth in number of service connections within each category, and (3) per capita per day.

8.3 Measuring Progress

Total M&I water use including irrigation in the region is influenced by the number of customers on municipal water supply systems, number of users with private wells, types of industries moving into the region, demographics of the region, and weather. As a result, water use varies from year to year and declines significantly during droughts. One method that can be used to compare water use between years is to represent water use on a per-connection basis and use a base period of time with which to compare current usage.

Figure 8-1 shows that over the past five years TMWA customers have reduced consumption per connection to approximately 85 percent of their 1985-1987 average water use. During the drought period of the late 1980s to the mid-1990s, use per connection decreased by almost 25% from the previous years' average usage, demonstrating significant consumer response to drought measures. Since the end of the last drought, use per connection has stabilized while total connections to the TMWA system have increased. Approximately 80% of the total regional population is served by TMWA.

Figure 8-1
TMWA Service Territory Use per Connection 1985-2002

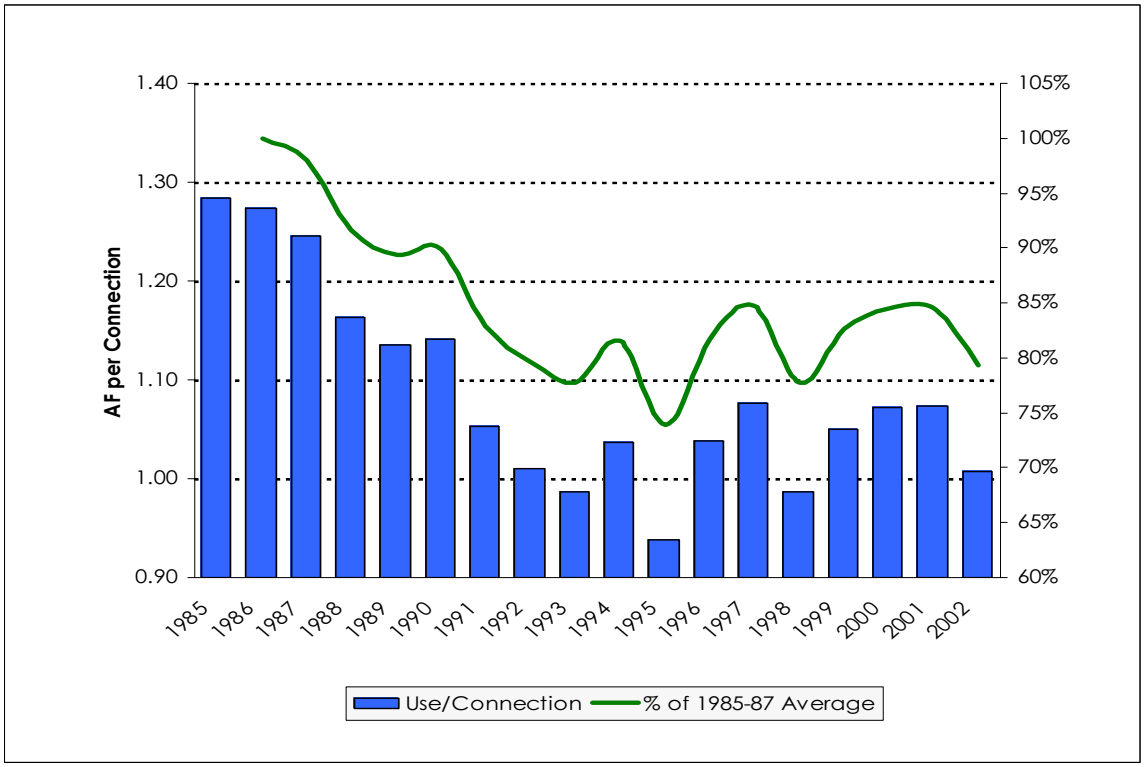
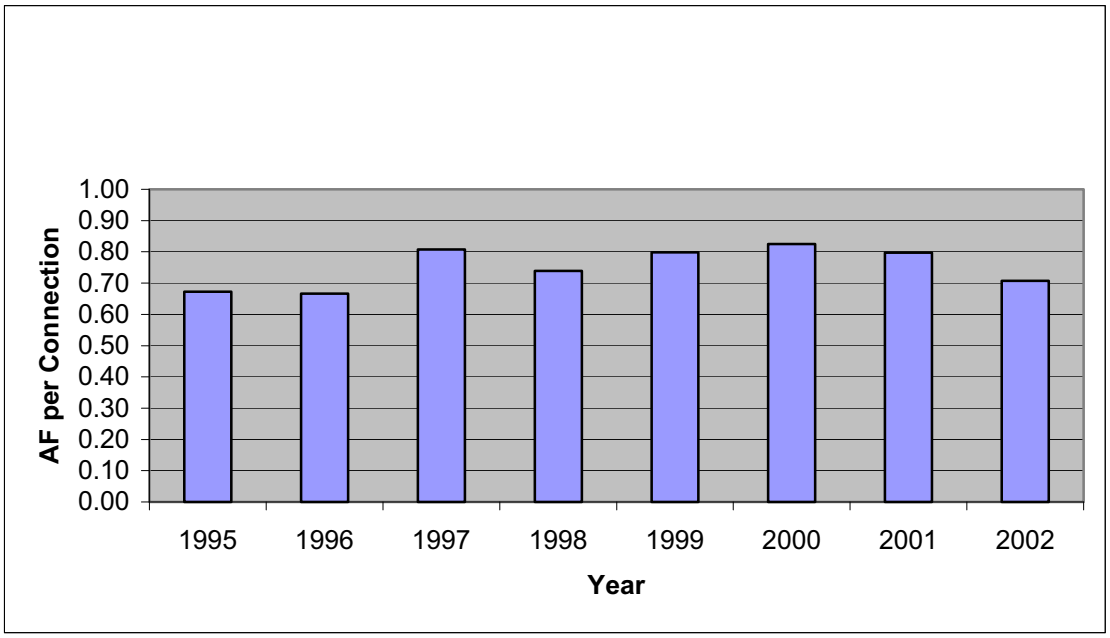


Figure 8-2 shows a similarly stable use-per-connection trend for WCDWR customers over the last 8 years. A comparison of pre-drought and post-drought use is not available for this update.

Figure 8-2
Washoe County Dept. of Water Resources Use per Connection 1995-2002



Part of the reason for the declining use per connection is that during the past ten years there has been a gradual shift from non-metered to metered water use by residential customers. All homes built since 1988 have water meters, and the resulting difference in water use is dramatic. For example, an average flat-rate home in the most common lot size range (5,000-10,000 square feet) uses approximately 0.68 af/yr, whereas a metered home of the same lot size uses approximately 0.44 af/yr.

Many factors influence water usage in homes: age of the home, number of occupants, age and lifestyle of the occupants, pipe size and appliance leaks, and efficiency of appliances and irrigation systems. New homes are much more water-efficient than old homes due to the plumbing code requirements and use of newer, more efficient water using devices. In addition, over the past ten years there has been a shift in the region toward use of smaller lots for new home construction, particularly in the 5,000 to 7,000 square foot lot size, causing less irrigation demand at the new home. Table 8-3 shows that, in 1990, lots ranging in size from 5,000 to 7,000 square feet made up 18% of the total lots developed that year, whereas in 2000, 5,000 to 7,000 square foot lots made up 36% of the total, an 18% increase.

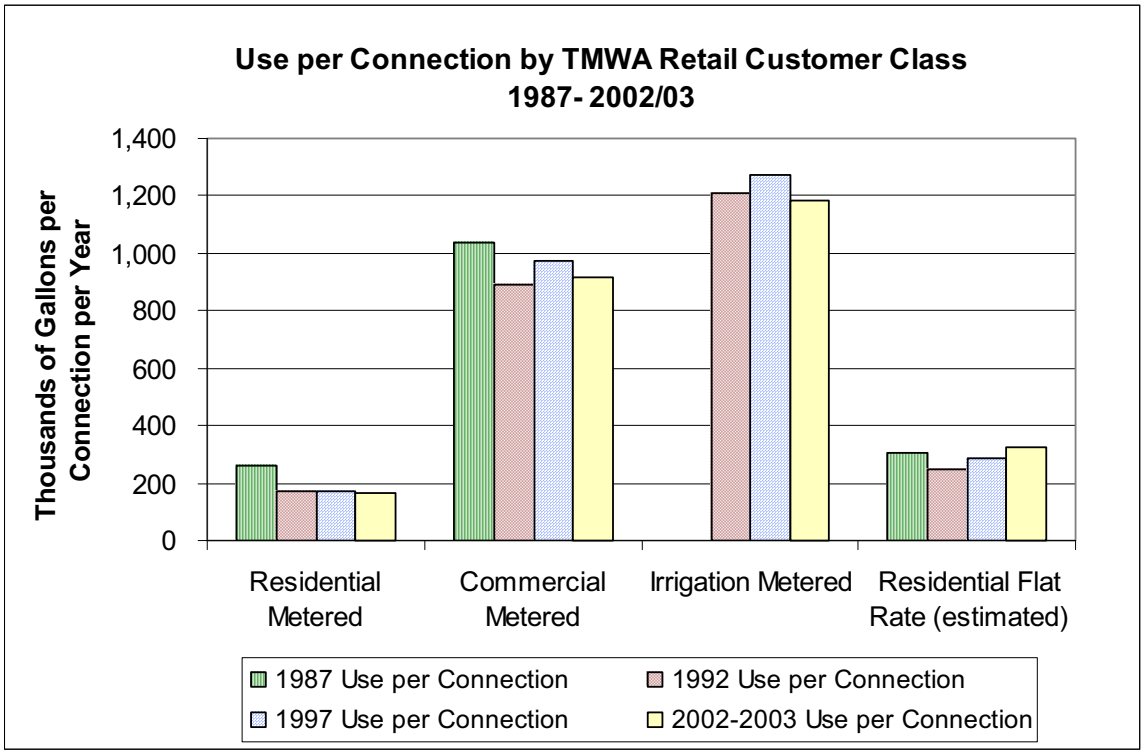
Table 8-3
Shift in Lot Sizes of New Homes

Lot Size (square feet)	1990 Share of Total Lots	2000 Share of Total Lots	Difference 1990-2000
<1,000	20%	1%	-19%
1,000 to 3,999	8%	7%	0%
4,000 to 4,999	6%	6%	0%
5,000 to 5,999	7%	10%	4%
6,000 to 6,999	11%	26%	14%
7,000 to 7,999	9%	11%	3%
8,000 to 8,999	6%	7%	1%
9,000 to 9,999	3%	6%	2%
10,000 to 11,999	5%	8%	3%
12,000 to 15,999	7%	7%	1%
16,000 to 20,000	4%	3%	0%
> 20,000	16%	7%	-9%
Total	100%	100%	0%

Source: TMWA

As a second measure of water conservation achievement, water use can be compared by customer class over time. Figure 8-3 shows how water use per connection has changed by customer class in TMWA's retail service territory since 1987. Residential metered water use has reduced slightly per connection (there were very few metered residential customers in 1987). Commercial metered water use per connection has declined since 1987 and remained fairly stable since the last drought. Irrigation use per connection has also remained stable since the last drought. The flat-rate residential customer water use per connection has increased because lower water use services have converted first, leaving the larger water use services in the sample data. Use per connection in 1997 was greater than in 1992 due to the water-conserving efforts of customers during the 1987-1994 drought period.

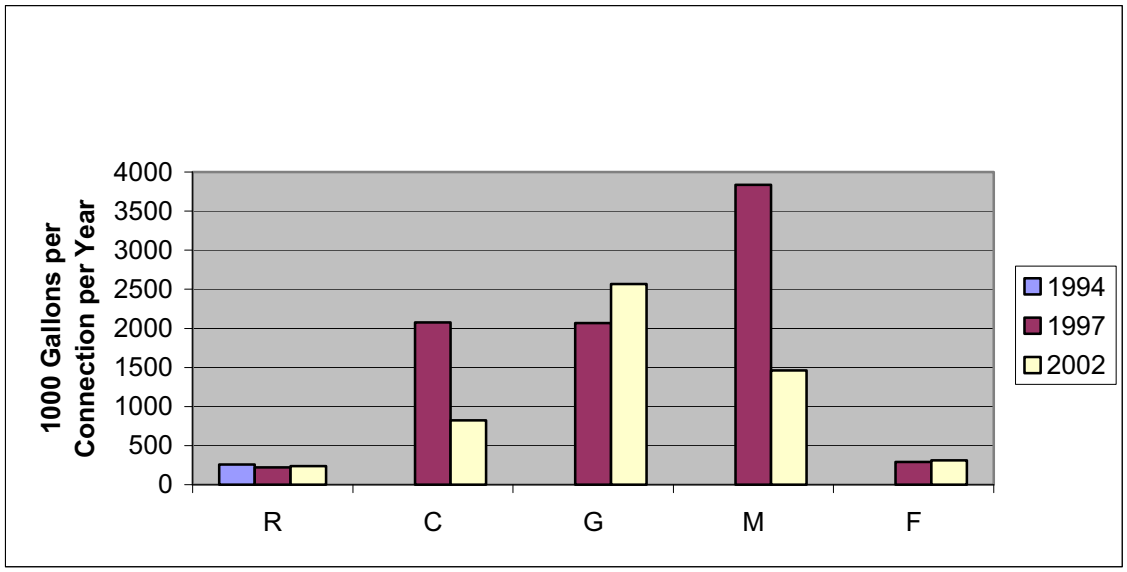
Figure 8-3
Use over Time by Customer Class



Notes: Commercial metered customers are businesses including casinos, small offices, warehouses, and manufacturers. Irrigation customers include public parks, homeowner association maintained areas, and other irrigated commercial sites. Irrigation customer data is not available for 1987 as meters were installed on irrigation accounts between 1990 and 1992. The 2002-2003 period reflects the fiscal year July 02 through June 03.

Figure 8-4 shows that water use by WCDWR residential customer class has remained stable from 1994 to the present.

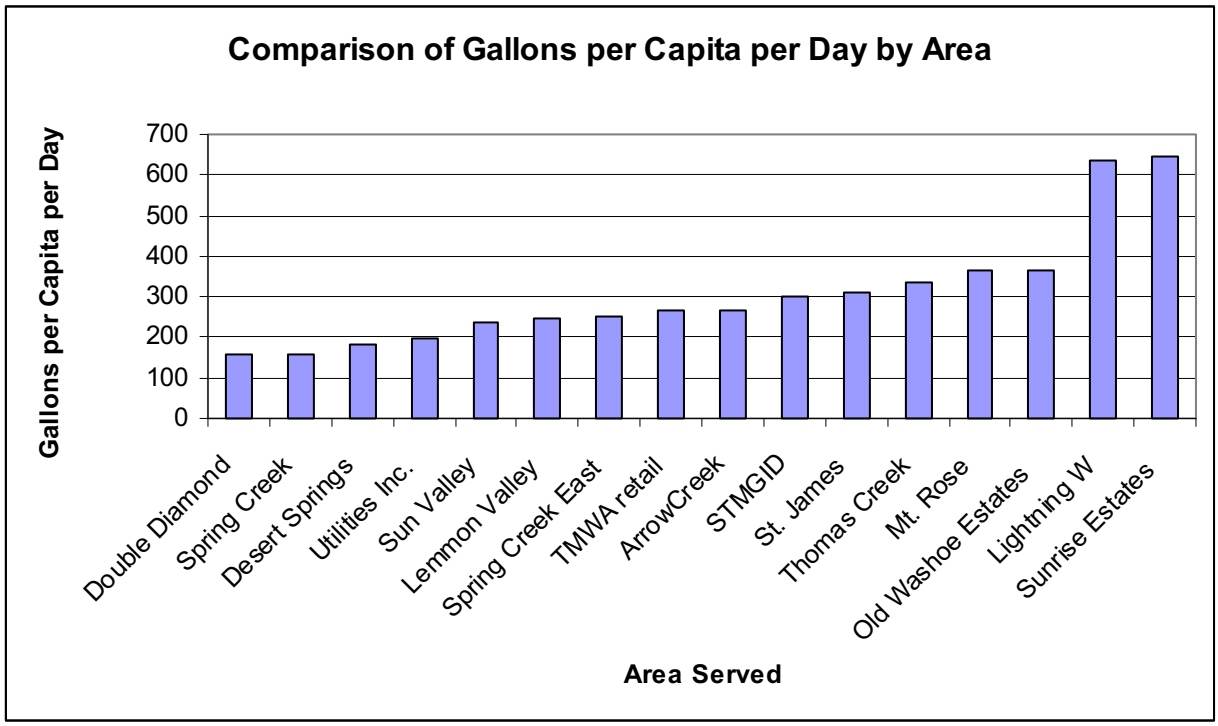
Figure 8-4
Washoe County Dept. of Water Resources Use per Connection by Customer Class



Notes: R-metered residential, C-commercial, G-governmental (parks, schools, community centers), M-multi-family (apartments, trailer parks), F-flat-rate residential

Another common measurement of water consumption in a region is use per capita. It is not necessarily meaningful to compare use per capita in this region with other areas in the Western United States because each area has a unique combination of attributes that constitute the area's need for water and the computation is not always conducted the same way. Seasonal weather patterns differ, demographics differ, and some utilities report for retail areas only, while others combine retail and wholesale areas. Use per capita in 2002 is shown in Figure 8-5 for different communities in the region. Per capita usage figures for areas shown to the far right side of the graph, Sunrise Estates and Lightning W, are not representative of the region. These areas have a small number of high-volume irrigation customers for which special arrangements have been made, including dedication of the appropriate water rights.

Figure 8-5
Gallons per Capita per Day by Area - 2002



Source: ECO:LOGIC, 2003 and TMWA. Data represents year 2002 consumption only.

To provide some gauge of progress since the last Regional Water Plan, Figure 8-6 depicts a comparison of use per capita in TMWA's retail area in 1988 with TMWA's retail area in 2002. For this area, which comprises approximately 80% of the county's population, per capita water consumption has decreased slightly. Note that 2001 residential gallons per capita per day is unavailable. Figure 8-7 shows residential use per capita per day for WCDWR customers.

Figure 8-6
Gallons per Capita per Day for the TMWA Retail Area 1990-2002

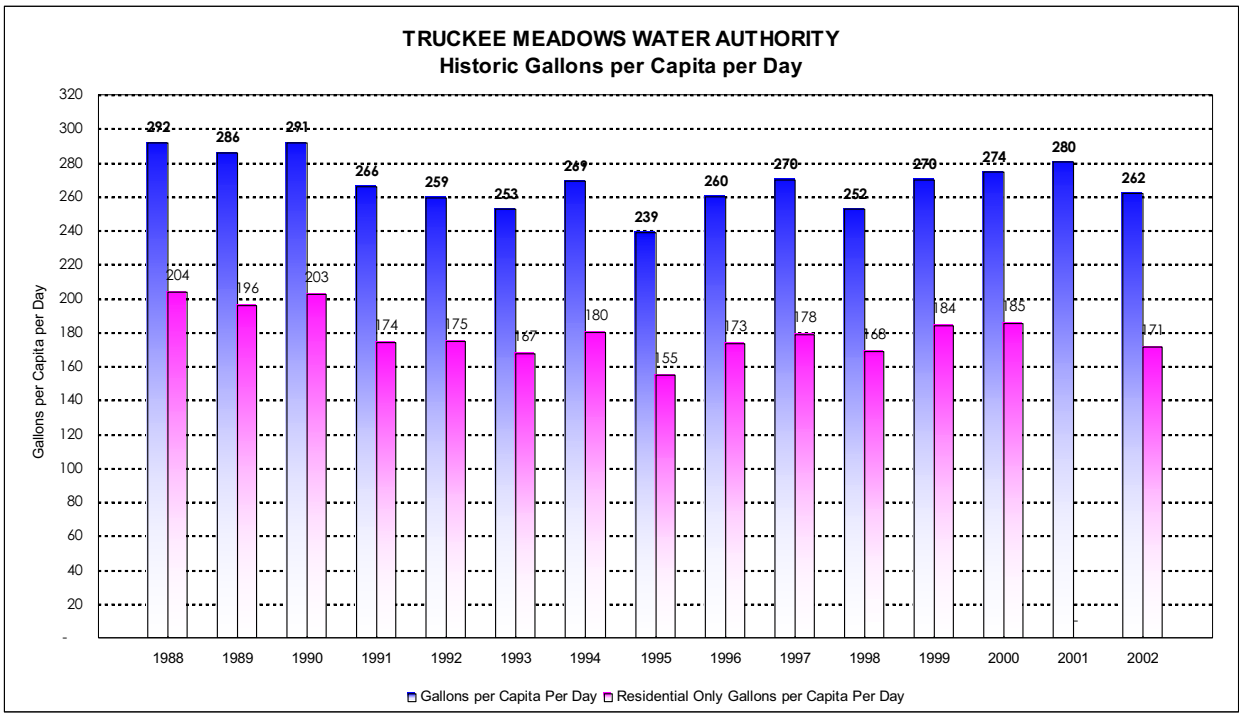
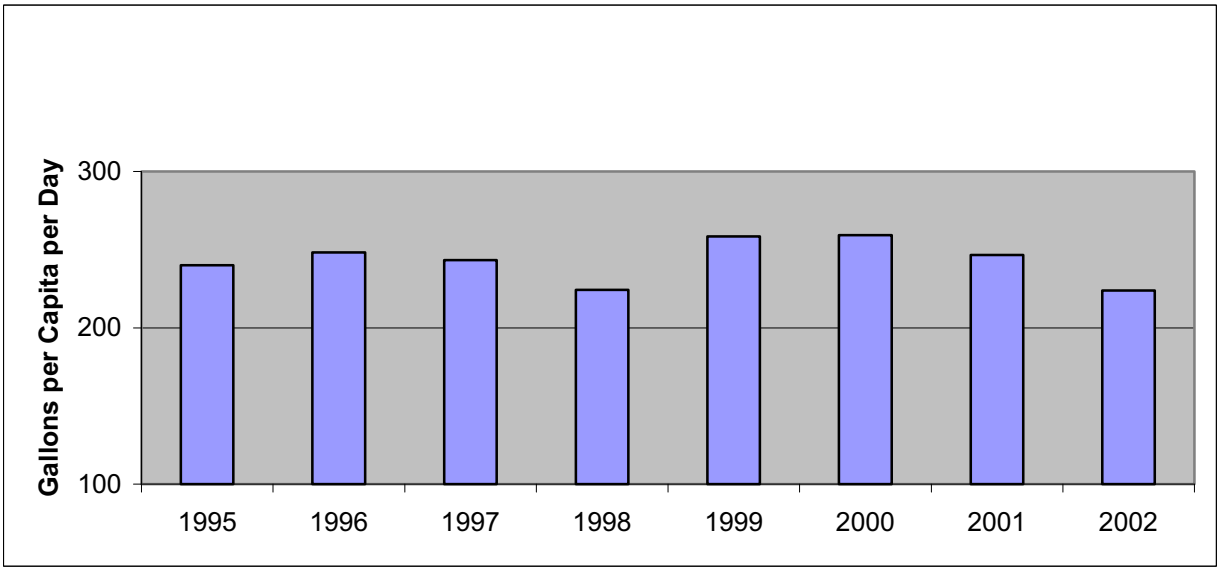


Figure 8-7
Washoe County Dept. of Water Resources Residential Gallons per Capita per Day



8.4 Laws, Ordinances, Agreements and Plans Facilitating Conservation

8.4.1 Federal Laws: TROA Conservation Objectives

TMWA has assumed responsibilities along with Reno, Sparks and Washoe County to implement the water conservation element of TROA. The TROA Water Conservation Agreement (WCA) fulfills the PSA requirement Section 29(c) and stipulates that as a result of the Agreement, the signatories will not make further determination whether such design criteria (10%) is met in ensuing drought years. The Agreement requires TMWA to spend $50,000 per year for public education and $100,000 per year escalated at 3.5% per year (currently $125,000) for implementation of landscape efficiency programs, and $100,000 per year for the "Water Watcher Program" with distribution of water saving devices and materials regarding water saving measures. The latter two measures are required until such time as TMWA's system is 90 percent metered. The RWPC has in the past and continues to support TROA and the WCA as reflected by the following policy.

Policy 1.1.c: Management of Conserved Truckee River Water

Conserved water originating from the Truckee River shall be managed consistent with agreements among local entities and parties of interest to the Truckee River.

8.4.2 Local Government Ordinances and Water Purveyor Rules

Developed by water planners, local governments, and the Nevada Landscape Association (NLA), local ordinances have been enacted that encourage the use of water efficient landscaping for new developments and set grading standards to avoid excessive runoff and water pooling. In addition, Reno, Sparks and Washoe County have supported the 1996 Water Conservation Agreement by enacting local ordinances prohibiting water waste. Enforcement of the codes has been minimal. During 2002 TMWA was granted the authority to enforce the water waste ordinances in their service area with limited success. Purveyors with systems that are at least 90% metered do not have to adhere to all of the watering restrictions within the ordinances; however, almost all the purveyors are subject to the same emergency water situation restrictions. At the March 2003 Board of Directors meeting, the TMWA Board approved changes to Rule 2, giving TMWA authority to place water waste penalty charges on a customer's water bill. For a customer with successive violations within a calendar year, the following penalty charges apply:

1st Violation	2nd Violation	3rd Violation or more
$0.00	$25.00	$75.00

Failure to pay the penalty may result in the termination of water delivery to the customer. A meter will also be installed for billing purposes on any flat-rate service that reaches a third violation.

8.4.3 State of Nevada Conservation Objectives

In order to meet the requirements of NRS 540.131 through NRS 540.151, all purveyors of water for municipal, industrial, or domestic purposes, with the exception of certain smaller purveyors, filed water conservation plans, most in 1992, with the Nevada Department of Conservation and Natural Resources for approval and adoption by the State.

In 1993, the State Department of Conservation and Natural Resources imposed minimum standards for plumbing fixtures in new construction and expansions in residential, industrial, commercial and public buildings, mobile homes, and manufactured homes and buildings. These standards include maximum acceptable water use by toilets, urinals, and showers; banning timing devices that cause fixtures to flush periodically, irrespective of demand; limiting the flow rate of faucets in kitchens and lavatories; and prohibiting multiple faucets activated from a single point. These standards supersede the conservation plans described below. Portions of the conservation plans outlined below were also superseded by local ordinances adopted by Reno, Sparks and Washoe County in support of the Water Conservation Agreement discussed in the previous section.

The following water purveyors' conservation plans are on file with the State Department of Conservation and Natural Resources: TMWA, WCDWR, Sun Valley GID, STMGID, Lemmon Valley Mobile Village, Oasis Mobile Estates, Panther Valley Water Users Association, Sierra Spring Water Company, Silver Knolls Mutual Water Company, and Verdi Mutual Water Company.

The material provided by TMWA reflects their current policies and procedures adopted by the TMWA Board of Directors March 19, 2003, in their 2005-2025 Water Resource Plan, while the conservation plans submitted by most of the other purveyors have been unchanged since their 1992 approval by the State and are still in effect. Because TMWA's plan impacts the largest number of people, it is summarized first under each element, followed by WCDWR, Sun Valley GID, and the remaining purveyors.

SECTION 1: Elements of Water Conservation

Purveyors' programs are discussed in detail in Section 8.4, Ongoing Measures to Conserve Water.

Element 1.A: Public Education. To increase public awareness of the limited supply of water in this state and general strategies for conserving it:

TMWA

One component of TMWA's public education element is comprised of the following conservation measures: Multi-media approach to educating the public, distribution of water-saving kits, Water Watchers, distribution of teacher materials, and the residential water audit program. In addition, TMWA hosts landscaping workshops, tends booths at events, sponsors TV and radio advertisements, produces a video set that is aired on public television, and distributes literature via its Water Watchers. The second part is the annual advertising effort to promote "Yard Fitness" of the twice-a-week watering program.

WCDWR
Promotes water conservation through newsletters, public access television and its website, www.co.washoe.nv.us/water_dept. The Department also works with the University of Nevada, Reno Cooperative Extension (UNRCE) in promoting water efficient landscaping and distributing various water conservation literature. In addition, the WCDWR cooperates with the RWPC in conservation projects and programs.

Sun Valley GID
Provides brochures and videos on water conservation and leak detection for customers.

Other Purveyors
The remaining water purveyors outlined various plans for distributing informational brochures at least yearly; encouraging the use of water efficient landscaping; suggesting ways to conserve water both in the house and outside; and recommending retrofit of toilets, showerheads, and other appliances.

Element 1.B: Other Means of Conservation. To educate the public about specific measures required to meet the needs of the service area, including, but not limited to, conservation measures required by law.

TMWA
In 2002 TMWA prepared a Water Management Program for the Washoe County School District (WCSD), one of TMWA's largest municipal customers, to reduce water use on its numerous sites, thereby lowering WCSD's water bills and reducing peak-day demand for TMWA. Similar programs will be explored with other local agencies.

WCDWR
WCDWR's 1992 Conservation Plan has been augmented with a tiered rate structure, which is now in place.

Sun Valley GID
Customers are encouraged to water lawns according to a voluntary twice-a-week schedule. Where negligent or wasteful use of water exists on or from a customer's premises, the GID may discontinue water service if such practices are not remedied within 48 hours after notice of violation is given to customer.

STMGID
The metering policy of STMGID requires that a warning letter be sent to any flat-rate customer who uses more than 75,000 gallons per month. If the 75,000-gallon limit is exceeded a second time, the connection is switched permanently to the metered billing rate.

Other Purveyors
The smaller water purveyors listed enforcing outdoor watering restrictions, specifically banning watering during windy conditions, requiring the owner to install water meters on all new connections, and fining or billing tariff surcharges, including a possible tiered-rate formula, due to over-watering.

Element 1.C: System Management. To identify and reduce leakage in water supplies, inaccuracies in water meters, excessively high water pressure, and increase the reuse of effluent.

TMWA
System management programs include the water-meter retrofit program, replacement of large and non-functioning water meters, coordination of effluent water service with local agencies, identifying increased use of non-potable water sources, leaks and system repairs, maintaining system pressure standards, and monitoring and stopping unauthorized use of treated water.

WCDWR
Performs system improvements, leakage audits of systems, computer modeling of system demands and pressures, weekly pressure testing and calibration tests on wells, well-head meter testing, effluent reuse, and encourages flat-rate customers to convert to metered rate by showing probable cost savings.

Sun Valley GID
Monitors and repairs water supply leakage and meter inaccuracy, and requires customers or developers to remedy high-pressure situations.

Other Purveyors
The remaining purveyors mentioned a mix of quarterly monitoring of the static water level in their wells to establish a continuous data log on the aquifer, having an on-site manager available to help repair fixture and leak problems within dwellings, maintaining and monitoring water systems daily to ensure integrity of the supply lines, and asking customers to report leaks.

Element 1.D: Drought Plan. All purveyors were required to submit a drought plan that ensures a supply of potable water. Discussion of drought and drought planning is presented in Section 8.6.

Element 1.E: Implementation Schedule. Conservation measures are in effect for all purveyors. TMWA updates its plan every three to five years with its Resource Plan.

Element 1.F: Plan Monitoring. Plans are monitored for effectiveness by the individual purveyors.

SECTION 2: Analysis of Feasibility of Charging Variable Rates to Encourage Water Conservation

TMWA
All metered customers pay according to an increasing tiered structure. Rate structure is continually examined for reasonableness, equity among customer classes, ease of implementation, and encouragement of efficient use of water.

WCDWR
Customers pay a tiered rate structure according to customer class.

STMGID
Customers pay a tiered rate structure according to customer class.

Other Purveyors
Several other purveyors mentioned they would study the feasibility of designing rate structures and other charges, such as a penalty for excessive use, to encourage conservation.

SECTION 3: Retrofit Existing Structures with Plumbing Fixtures Designed to Conserve Water

TMWA
Publicizes the benefits of retrofitting existing plumbing fixtures by means of publications and bill inserts as well as its website.

WCDWR
Participates in regional water-conserving plumbing fixture retrofit programs and implements the metered rate upon request.

Sun Valley GID
In addition to the toilet installation program, promotes retrofit of other fixtures and appliances that waste water.

Other Purveyors
Several other purveyors mentioned encouraging retrofit of toilets and other water-efficient plumbing fixtures as consistent with Washoe County Building Code.

SECTION 4: Encourage Installation of Landscaping that Uses Minimal Water

TMWA
Worked with horticulturists, the NLA and the UNRCE on public education regarding water efficient landscaping, proper watering techniques, and other landscape practices that can reduce water consumption. TMWA participates with the Washoe County School District, Reno and Sparks to explore opportunities to reduce or eliminate ineffective turf areas and implement non-potable irrigation where appropriate.

WCDWR
Worked with the NLA and Sedway Cooke Associates in the early 1990s to prepare a landscaping ordinance, a version of which was adopted by Washoe County. WCDWR also works closely with the UNRCE, which provides pamphlets about lawn watering, water efficient landscaping, and other landscape water reduction methods.

Sun Valley GID
Encourages installation of smaller lawns, irrigated landscapes, and low water-use plants.

Other Purveyors
Several of the remaining purveyors mentioned they also encourage the use of water efficient plants and small turf areas in landscaping, avoiding small, narrow strips of turf that are difficult to water, and watering landscaping properly.

8.5 Ongoing Measures to Conserve Water

In the terminology of water conservation, a *measure* is usually a device that conserves water, such as low-flow showerheads or low-flow toilets. The primary objective in conservation planning is to identify and develop water conservation measures that are likely to be accepted by customers while producing significant system benefits. Over the years, the measures offered by many local purveyors have included water-saving kits, toilet tank displacement bags, automatic hose timers, and leak-detection tablets.

In addition to twice-a-week watering, the following ongoing programs have proved effective in encouraging water conservation in this area. Where applicable, modification and expansion of these programs to meet new objectives are included in this section.

8.5.1 Water Meters

The RWPC confirms the priority it has placed on metering by adopting the following policy:

> ***Policy 1.1.e: Water Meters***
>
> *Water purveyors within the region shall meter to the extent practicable, all uses or sales of water within their respective service areas.*

WCDWR provides water service to approximately 16,300 accounts in 21 service areas. Customer classes include residential, commercial, government connections, fire protection, standby, irrigation or Golden Valley recharge connections. As of January 1, 2003, all the County's connections are metered. Many metered customers in the Lemmon Valley and STMGID service areas; however, pay a flat rate. The flat rate is calculated by dividing the actual cost of service among the number of flat rate customers in the service area, ensuring that the utility's costs are covered.

Once a year WCDWR calculates a summary of each flat-rate customer's yearly charges compared to the amount they would have paid on a metered rate. Those customers who would have paid less on the metered rate are mailed a letter explaining the comparison and encouraging them to switch. As customers convert to metered rates, the flat rate is recalculated (increased), forcing a smaller pool of customers to pay the allocated costs.

STMGID has a metering policy that requires a warning letter to be sent to any flat-rate customer who uses more than 75,000 gallons per month. If the 75,000-gallon limit is exceeded a second time, the connection is switched permanently to the metered rate.

Being fully metered, Sun Valley GID can pinpoint water waste by comparing pumping numbers versus usage numbers. It decreases such waste by reducing water supply leakage, correcting meter inaccuracy, and adjusting high-pressure situations. SVGID customers are exempt from the twice-a-week watering restriction because all customers are metered.

TMWA assumed the meter financing plan responsibilities and the program that SPPCo initiated in 1995 as part of TROA implementation. In March 2002, as a result of a November 28, 2001 Board action, TMWA began installing meters and billing on the metered rate whenever a single-family residence changed tenants. Meter retrofit funds will finance these installations, but that will result in fewer systematic installations over the coming years. It will take another five to

seven years to completely meter the system based on current financing made available through meter retrofit fees of approximately $2 million annually.

The Retrofit Program will continue to:

- Cluster random retrofits, both from tenant change-outs and voluntary requests, to achieve associated efficiencies
- Retrofit in a systematic fashion, recognizing that the program is moving into older areas of Reno and Sparks that will require more extensive groundwork and/or service line repair to install the metering facilities
- Collect money from new development to fund the program
- Install facilities and meters, as funds are available
- Continue until all flat-rate services are retrofitted and ready to convert to metered billing

The following table summarizes total setters and meters installed as of February 2004.

Table 8-4
Summary of TMWA Meter Retrofit Progress

	Number of Services
Starting Flat-Rate Services	44,651
Converted Flat-Rates Services	15,455
Current Flat Rate Services	29,196
Current Non-Billing Meters	11,288
Services Requiring Meter	17,908
Pre-'95 Services with Setter	2,602
Post '95 Retrofitted Setters w/out Meter	1,319
Services Requiring Setter	13,987

Note: Meter facilities include a box, which is the concrete housing, and setter, which is the facility that holds the meter. The meter is the water-use recording device. Setters installed prior to 1995 included customer connection where metering facilities had been previously installed and were awaiting the "drop-in" of a water meter.

8.5.2 ULF Toilet Installation and Retrofit

The Board, on November 21, 2000, approved the expenditure of 1.5 million dollars from the Regional Water Management Fund to implement the Pilot Toilet Retrofit Rebate Program. The Cities of Reno and Sparks, through TMWRF, subsequently agreed to contribute an additional $170,000 per year. The program goal was to replace 10,000 high-flush toilets (3.5 gallons or greater per flush) with ultra low-flow (ULF) toilets (1.6 gallons per flush) by offering cash rebates to owners of qualifying dwelling units. Original program estimates from 2000 or before include a possible 114,000 pre-1995 homes in the region that have high-flow toilets: 60,600 single-family homes and 53,400 multi-family dwellings. It was assumed that if 75% of high-flow toilet owners

participated, 85,000 dwelling units would be retrofitted, saving approximately 4,339 af/yr. A contract to administer the Pilot Toilet Retrofit Rebate Program was awarded to Volt VIEWtech, a consulting firm experienced with similar programs in other states. The contractor initiated the program in July 2001 and ran it until March 2003, exercising a contract termination provision because the level of public participation did not generate sufficient revenue to justify continuation.

Summary of the Pilot Ultra Low-Flow Toilet Rebate Program:

- 5,761 toilets replaced in 21 months
- $752,664 total expenditures
- $595,800 in rebates
- $156,864 to consultant
- Approximate unit cost = $130 per toilet
- Installation was customer's responsibility
- Estimated annual water savings as a result of the toilet rebate program is 35 af per 1,000 toilets or approximately 202 af/yr.

Lessons learned:

- Public participation was overestimated. The program projected more than 800 replacements per month but averaged only 300 per month. Activity peaked in July 2002 with 909 toilets installed that month.
- Distribution of marketing materials as inserts in TMWA water bills was by far the most effective method of publicity.
- A certain (unmeasured) portion of the public is resistant to water conservation in general. They perceive that water conservation will encourage growth.

As a result of the toilet rebate program, the ACC determined that a toilet installation program using existing avenues of distribution, with supply and installation by a local wholesale toilet supplier, was the preferred alternative to another rebate program. Staff and members of the ACC, including the SVGID, TMWA and the County, collaborated on a proposal for a one-year pilot program, summarized below. The results of this collaboration include the installation of more than 4,300 toilets since program initiation in July 2003.

- The program will run for one year, starting in Sun Valley, and offer direct installation of low-flow toilets in qualifying single-family and multi-family dwellings.
- The program will expand to TMWA and WCDWR customers during the pilot year period, and be offered to smaller water purveyors within RWPC's jurisdiction.
- SVGID will contract with a person to administer the program, and a local wholesale distributor will provide toilets and (sub-contracted) installation services.
- One model of toilet will be offered with replacement of either round, elongated or ADA bases.
- A toilet installation coupon will be distributed as a post card to pre-qualified customers.
- TMWA's marketing consultant is providing coupon design, printing and mailing services.
- Customers who receive coupons will call the plumbing contractor and make an appointment for installation.
- Installations will be done by zone or route to maximize efficiency and minimize cost.
- The plumbing contractor will collect the coupon when the toilet is installed.

- The customer will release the installation contractor of liability regarding flooring, tile, and other installation details.
- Variations from the standard toilet or installation, i.e. toilet color or repairs, will be between the customer and the installation contractor.
- The program budget is $755,750 ($157 per toilet installed).
- The program is funded by the Regional Water Management Fund and the TMWRF toilet retrofit funding agreement.

Water saved under this measure will be credit stored under TROA for release to increase flows in the river to improve water quality.

8.5.3 Use of Other Water-Conserving Fixtures

Low-flow showerheads and similar devices also facilitate water conservation by the homeowner. Low-flow (2.5 gallons per minute) showerheads have been available for more than 15 years; and due to natural replacement of worn fixtures, the average flow rate of existing showerheads in homes and hotels has been steadily declining. Installation of low-flow devices is required in new homes and remodels in the region. TMWA distributes low-flow devices such as showerheads, hose timers, and self-closing nozzles on a limited basis each year.

8.5.4 Leaks and System Repairs

Maintaining the integrity of water systems is an important water conservation measure because even the smallest drip from a worn washer can waste 50 gallons of water or more per day. Water metering can help detect major leaks, and the water audit program (see later in this chapter) will pinpoint smaller leaks as well. TMWA and other purveyors repair detected and reported water breaks and leaks as soon as is practicable. In the case of a leaking poly-butylene pipe, TMWA's crews will usually replace the entire service, as this type of pipe has proven particularly prone to leaks.

8.5.5 Local Ordinances and Water Purveyor Rules

The ACC believes that the mandated installation of ULF toilets, showerheads, and similar devices in all new and remodeled residences since 1993 has resulted in the most water conservation, second only to installation of water meters in the region, and will continue to do so for indoor water consumption. Toilets account for more than 26 percent of all indoor water usage. TROA assumptions, used to evaluate the program, estimated annual water savings of 35 af per thousand toilets retrofitted.

The RWPC is working with local government entities in an effort to change the residential plumbing code to reduce hot water pipe size where applicable. For example, building codes would specify smaller-diameter pipes for distribution of hot water in homes, thereby reducing the amount of water wasted waiting for hot water to reach the tap. The estimated savings from such a measure is approximately 28.6 gallons per household per day for single-family homes and 4.1 gallons per household per day for apartments and town homes (CES, 1998).

The Uniform Plumbing Code requires pressure reducer devices to keep water pressure no higher than 80 psi. The proposed changes by the ACC to the local residential plumbing codes include reducing the Uniform Plumbing Code requirement of 80 psi to 65 psi. Higher water pressure may increase the possibility of main breaks or accelerate the development of leaks on both the water purveyor and customer facilities. Excessive pressure results in more water delivered through the tap than necessary since flow rate is proportional to pressure. This can

result in such forms of water waste as sprinkler overspray, faucet splashing, and higher leakage flow rates.

The Cities of Reno and Sparks, and Washoe County (April 2002, July 2002, and March 2002 respectively) have enhanced ordinances that support TMWA's conservation efforts and allow enforcement of penalties to water wasters. The ordinances also give TMWA Board of Directors authority to recommend to the local governments that a water emergency be declared with associated watering restrictions. TMWA's Rule 2 allows for penalty charges for water waste to be put on the water bill and a water meter to be installed on flat-rate repeat offenders.

8.5.6 Water Audits

In 2002 the ACC, through its water conservation consultant, developed a draft scope of work for a pilot residential water audit program. A residential audit consists of complete indoor and outdoor water surveys, retrofit of simple water saving devices such as showerheads and faucet aerators, and complete recommendations for water saving measures. The ACC determined that prior to developing a request for proposals for the pilot program, TMWA would be invited to comment on the draft scope of work and, if interested, make a proposal. TMWA submitted a draft proposal and budget to the ACC in June 2002 to run the pilot program out of their existing water conservation office during the spring and summer of 2003.

On November 7, 2002, the ACC forwarded the proposal and a recommendation for approval to the RWPC. The RWPC at its regular meeting held November 20, 2002, recommended that the County, through its Board of Commissioners, approve funding from the Regional Water Management Fund and execute an agreement with TMWA for completion of the recommended work.

The purpose of a water audit is to analyze the amount of water used by a customer both indoors and outdoors, and to educate customers about interior and exterior water conservation practices. The auditor visits a customer's home upon request, upon a warning or citation being issued, or to newly metered customers. The auditor performs the audit, provides a kit of water saving retrofit devices, and recommends additional conservation measures, such as toilet retrofit.

At the November 20, 2002 meeting, the RWPC approved a funding request from the ACC for TMWA to run a pilot residential audit program during summer 2003. The purpose of the pilot program was to:

- Help the RWPC further its water conservation goals
- Measure the viability of such a program by establishing appropriate levels of staffing, cost recovery, attainable audit goals, and quantify water savings

A full residential water audit consists of:

- Analysis of both indoor and outdoor water use
- Distribution of retrofit devices (such as showerheads, toilet bags, flappers, faucet aerators, etc.) for customer or plumber installation
- Education of customers on benefits of conserving water and giving them recommendations to reduce their water needs
- Total approved budget for the pilot program in the interlocal agreement is $85,360.

- Software application development commenced in March 2003 with a program developer and student intern under TMWA's direction. Two auditors, who were required to attend the irrigation training seminar in April 2003 were hired by TMWA mid-April. The remainder of April was spent practicing audits and obtaining all the necessary equipment.

The auditors utilize the application that was developed for this project in conjunction with the irrigation auditing software supplied during the irrigation training seminar in order to make water saving recommendations to the customer. A recommendation report is printed and given to the customer by the auditor at conclusion of the audit. The software, developed solely for this program, allows the auditors to record mileage to each of the homes visited, schedule appointments, obtain reminders on when to call customers back for a follow-up, and record actions taken by the customer since the audit was completed.

To promote the program, customer service representatives offer audits to metered residential customers in their conversations. The July 2003, "Fresh from the Tap", TMWA's production which airs on public television (SNCAT), featured the two auditors performing an audit and invited customers to call in to schedule an appointment.

Considering that this is a voluntary assistance program, customer response to the service has been extremely positive. In general, the participants are eager to receive the education and implement the auditor's recommendations. All customers are contacted after an audit and the majority of customers are changing their irrigation clocks to the recommended run times.

Of those audits conducted to date, very few improvements have been suggested indoors. Almost all homes visited had faucet aerators and no leaky toilets were found. Customers with older model dishwashers and clothes washers said they would look for Energy Star models when they replace their machines. The RWPC has recommended that the program be continued into its second year.

8.5.7 Rate Design

TMWA, WCDWR and STMGID rely on water rates so that customers are charged, to the extent practical, the cost of service for their customer class. This is done by using different base rates for each customer class and various price-tier structures. Each above purveyor employs a multi-tiered block-rate structure in which the price per 1,000 gallons increases as more water is used.

8.5.8 Public Education

There are many ways water conservation is promoted in the region.

Outdoor Watering

UNRCE, the NLA and others have cooperated extensively with the RWPC in developing research, statistical data, and implementation of programs regarding outdoor watering. (See Appendix G for discussion of regional landscaping problems and suggested solutions by ACC member and NLA Past President, Harry Fahnestock.)

TMWA and Washoe County's Department of Parks and Recreation jointly offer a "CommonSense Gardening Series" at Rancho San Rafael Regional Park. The park has an

extensive arboretum containing water efficient and native plants. Workshops have included guided tours of the arboretum, seminars on designing and winterizing irrigation systems, presentations on alternatives to turf, and panel discussions by landscape professionals. TMWA utilizes every opportunity to promote wise water use, attending public events and distributing information. Organizations can request that TMWA present conservation advice to a specific audience. A residential indoor and outdoor guide provides water savings tips for households, as well as some general usage information about TMWA customers and how to read your meter.

Water Efficient Landscaping

Landscaping with water efficient plants only conserves water if watered correctly. The plants will use more water than needed if over-watered. Educating those in charge of setting the watering schedule as to the proper amount needed by each type of plant is crucial.

The UNRCE is a major resource in helping define irrigation technology of water efficient landscaping. At their website, www.washoeet.dri.edu, UNRCE offers comprehensive information about water conservation measures appropriate for this area. The Final Report of the Washoe Evapotranspiration Project also can be accessed from UNRCE.

TMWA published a new edition of "Water-Efficient Landscaping in the Truckee Meadows," with ideas for yard designs, irrigation layout, plant selection and maintenance. In 2003 TMWA launched an interactive landscaping guide on its website that enables customers to obtain individualized information easily.

Landscape Irrigation Training and Management

In February 2002, TMWA, in cooperation with the NLA, initiated a two-day training and certification program for local landscape industry professionals leading to certification as a Landscape Irrigation Auditor. A one-day class in Spanish was also held, and Landscape Irrigation Auditor certificates were awarded in English and Spanish. Due to the success of the classes, the RWPC funded the class in April 2003, with TMWA hosting the event.

Non-Functional Turf Conversion

Older homes, schools, and parks that have inefficient watering systems might be candidates for such a program. However, the conversion from turf to hardscape as a water conservation measure is a potential program that is very costly. Homeowners are seldom willing to convert 1,000 square feet of turf to an alternative landscape/hardscape design unless there are other motivating factors, such as a cash incentive. Another problem with landscape conversions is there is no guarantee the area will remain hardscaped if the property is sold. In addition, the major problem with turf conversion is that, although a portion of the lawn is removed; owners seldom make regular seasonal watering adjustments to meet only the plant's requirements. Therefore, the conversion seldom produces the maximum water potential savings.

During 2002, TMWA hired professional landscape services to remove large non-functional turf areas at select school district sites. In 2002, a total of 77,000 square-feet of turf was removed and replaced with low water use plants, materials, and hardscapes. During 2003, two more schools are undergoing conversion of non-functional turf. Similar services may be offered to

other local agencies in the future. TMWA is working with the Washoe County School District and city parks departments to conserve water.

Teacher Materials

TMWA currently provides an assortment of teaching materials for elementary schools via the Internet site www.tmh2o.com. TMWA has developed a series of modules that meet the Nevada standards for science curriculum, and released the first set of materials in August 2003. Work to be completed includes tailoring the modules to the region's climate and water use for the various grades. Teachers are able to either download the materials directly from the Internet, or order the materials from TMWA.

8.5.9 New Irrigation Technology

Evapotranspiration Weather Station Network

In 1999 three weather stations were installed at different locations in the region to record local evapotranspiration rates (Eto). They are used for irrigation scheduling and budgeting and to determine the potential water needs of plants. Weather stations record daily weather data using sensors and data loggers to record the following: solar radiation, wind speed, precipitation, vapor pressure, relative humidity, minimum and maximum temperatures and soil temperatures. The stations are located at Wolf Run Golf Course, UNR Valley Road Experiment Station and Sierra Sage Golf Course. Water managers who use Eto can reduce their water use during an irrigation season by up to 40%. Others that may benefit from the stations include: flood control managers, fire protection agencies, weather service, District Health, golf courses, commercial users, local landscape management companies, homeowners and water purveyors. Irrigation runtimes are posted during the irrigation season on the web at www.washoeet.dri.edu.

The stations comply with California Irrigation Management Information System (CIMIS) network criteria. The freestanding stations consist of Campbell sensors and are placed in a grassy area, as suggested by CIMIS. A data logger, using the Penman Monteith equation, as suggested by CIMIS, performs data interrogations. This program is funded by the WCDWR, maintained by DRI and is monitored daily by UNR Cooperative Extension.

ET Controllers

ET is an acronym for *evapotranspiration*, a combination of the words evaporation and transpiration. Evaporation is the amount of water lost from the soil and transpiration is the amount of water lost through the leaves of a plant in a 24-hour period. Based on weather data, ET is computed and programmed into an ET controller, which controls the duration and timing of the outdoor watering schedule, perhaps for short periods four or five days a week. The user of an ET controller must get a variance from the twice-a-week watering ordinance, and the community must be educated about why owners of ET controllers are not bound by the twice-a-week watering restriction. There are several ET Controller pilot projects being conducted in the region.

During 2001 and 2002 the RWPC co-funded a project with UNRCE. The purpose of the study was to determine the efficiency of the new satellite ET controller (Weather TRAK) on residential and commercial landscapes. The ET controller was compared to three other irrigation treatments; a control (intuitive irrigation), a trained UNRCE technician, and trained landscape

professionals. Results indicate the Weather TRAK controller applied approximately 50% less water when compared to landscapes that were irrigated by other irrigation treatments. In addition, the data also suggests that although the ET controller irrigated six days a week and applied the same or less water to the landscape than the other treatments. The use of the ET controller resulted in very little or no stress to the turf when compared to the other treatments.

The RWPC has approved funding of another ET controller pilot project to commence in 2005 at residences.

In 2003 TMWA launched an ET controller project on commercial properties in cooperation with landscape professionals. The objective of the study is to measure the water saving potential from using the ET Controller technology versus historical water applications. A total of 46 controllers were programmed, installed, and locked onsite to prevent tampering. Each of the controllers use 10 years of historical data and a temperature sensor to schedule watering according to local climatic variables. The meters are read weekly and run times of each of the stations recorded. Data collected during these program years will be compared with historical water use data at these meters to compare water use in each year of the project's duration.

8.5.10 Use of Non-Potable and Effluent Water

TMWA provides Non-Potable Service (NPS) to sites that can use partially treated or untreated Truckee River water, or poor quality groundwater. The water is generally for use on construction and large-scale irrigation sites. NPS is available at a lower rate than treated water, providing incentive for qualified customers to switch to this service. Effluent water for construction is available from STMWRF at a limited number of truck-fill sites in the south Truckee Meadows, from TMWRF in Spanish Springs Valley, and from RSWRF in Stead. Permanent south Truckee Meadows sites are planned at Fieldcreek and in the Damonte Ranch – Double Diamond Ranch area. WCDWR also provides non-potable water for construction from a well at the Mira Loma truck-fill site in the southeast Truckee Meadows. Customers pay a charge to set up a card-lock account and also pay a metered rate for the water. Both sources are charged at rates lower than potable water service.

Reno, Sparks and Washoe County provide effluent water (treated wastewater discharged from sewage treatment plants) from TMWRF, RSWRF and STMWRF to irrigation sites and industry where feasible, again reducing the demand for potable water. Supplying irrigation sites and industry with effluent water or other non-potable sources leaves capacity for new municipal demand that requires potable water, enabling the water resources to go further. Another advantage of effluent water use is to alleviate demand on aquifers to produce water in areas that rely solely on groundwater pumping.

There are limitations on the use of effluent water. The following factors must be considered in applying effluent water to any site: health factors, seasonal and annual variations in quantity and quality, soil related factors, irrigation factors, water conservation, cost, plant factors, risk of cross-connection, nutrient content and the chemical properties of the water. For sites determined to be suitable for application of effluent water, effluent can be high in nutrients and used efficiently by turf grass and other plants. This is usually quite beneficial in turf grass management programs (UNRCE, 1988).

The benefits of using effluent water are limited in other ways. A portion of Truckee River water used for municipal purposes is returned to the river through TMWRF. As downstream water

rights rely on these return flows, water rights must be dedicated to make up the amount of effluent water used for irrigation or industry and therefore not returned to the river. The entities have agreed to replace treated effluent that originates from Truckee River water when that effluent water is reused and not discharged back to the river. The potential result is a reduced availability of water rights for other future uses.

Gray water is wastewater generated and distributed on-site; such as from bathroom sinks, bathtubs, washing machines, etc. A properly designed and maintained gray water system can achieve significant water savings but a poorly designed and maintained gray water system can cause health concerns. The Washoe County District Health Department strictly regulates the use of gray and effluent water.

8.6 Future Water Conservation Initiatives

In addition to future savings from continuation of the ongoing programs described in the previous section, the following water conservation initiatives are discussed for consideration and possible implementation in the future.

Soil Preparation

The ACC recommends that prior to planting a new lawn, the soil should be prepared by tilling in at least two inches, preferably four inches, of organic material to the top six to eight inches of soil (Beard, 1973). Organic material includes well-rotted manure, mushroom compost, bark humus and any other organic by-product. Soil modification will improve the water-holding capacity of the soil, promote deeper roots and reduce or prevent runoff.

Irrigation Efficiency

Efficiency refers to the uniformity of sprinkler coverage, which can be measured and corrected when an area is over-watered or under-watered. The higher the efficiency, the more uniform the sprinkler coverage reducing over-application on areas of landscape to compensate for lower application rate on other areas of the landscape. The ACC's goal for the area is to achieve at least 65% efficiency. Consumers can learn more about irrigation efficiency by visiting www.washoeet.dri.edu/.

Best Management Practices (BMPs)

BMPs are guidelines for the landscape industry, which include proper application of hardware, plants, turf, and maintenance based on conditions specific to the site. The use of BMPs could be promoted within the landscape industry through NLA certification. For BMPs to be useful tools for the RWPC, they must be developed and agreed upon by the stakeholders, including water agencies, landscape professionals, and the RWPC. Irrigation efficiency is an example of a BMP that the RWPC can pursue with water purveyor support. Similar to landscape ordinances, BMPs must be enforceable to be successful. As discussed previously in this chapter, until this issue is addressed, BMPs are unlikely to be successful in this region.

In 2003 the NLA developed landscape performance standards that could be useful in this campaign and which will be evaluated by the ACC.

Grade Slopes on New Lots to Retain Water

Limiting the steep slopes of landscaped areas to 50% would help the soil to retain water from rainfall and reduce runoff. Because different soils absorb water at different rates, proper grading of lots is site-specific. Thus, enforcement of such a grading requirement may be difficult for the local building code departments. This proposal would be expected to improve water quality to the river by reducing urban runoff as well as reducing peak flood flows by retaining water on-site in urbanized areas. Grade also affects irrigation system design; steeper grades often result in greater run-off due to poor system design and are more difficult to maintain.

Grading requirements may best be enforced through the Storm Water Quality Management Program, currently being developed for this Region. See Chapter 5 for more detail on Storm Water Best Management Practices.

Enforce Landscape and Run-off Ordinances

Each of the three entities has landscape ordinances that are intended to only allow responsible development and water management of modified landscapes. For example, the City of Sparks municipal code Chapter 20.32 describes all landscaping requirements in the context of "Resource-efficient" landscaping. Washoe County municipal code Division 4, Article 412 has specifications that plants should be grouped in compatible water-use zones, and that turf areas should minimize runoff and inadvertent watering of non-turf areas. The City of Reno municipal code Title 18, Chapter 18.06.700 general provisions promote the use of xeriscape design principals utilizing drought-tolerant or native plants and the efficient use of water. Despite good intentions, the benefits of the landscaping ordinances are limited without adequate enforcement and follow-through in the field.

The ACC considers enforcement of the entities' landscaping ordinances to be a major objective in the future. In addition it would be worthwhile to consider the feasibility of applying landscaping ordinances to individual residential properties, incorporating the water efficiency and environmental merits of different placement of sidewalks, addition of bio-retention areas, and other design features. The ACC wants to encourage and work with the local entities and water purveyors on updating their landscaping ordinances.

Landscape Water Budgets

A landscape water budget is the amount of water required to irrigate a landscape to maintain the health of the plants without wasting water. It is calculated according to commonly accepted principles of horticulture and irrigation design. Several California water utilities have incorporated landscape water budgets in their conservation programs to fulfill a commitment to BMPs. Most utilities apply the water budgets only to separately metered irrigation accounts, on either a voluntary or mandatory basis. The concept of an irrigation efficiency rebate is sometimes rolled into the program, such as that employed by the City of Santa Rosa. If the irrigation account meets, or is less than, the target water application for a billing period, a rebate is applied to that account.

Implementing landscape water budgets requires investment in technology, possibly services of outside firms to provide satellite imagery, and requires changes to the billing system so that bills can show the water budget information and associated rebates and/or penalties. The cost of

setting up such a service may prove more costly than the benefit of the water saved, particularly in a region where outdoor watering is applied for only half the year. Nevertheless, this idea warrants exploration for large irrigated sites.

Sprinkler System Devices

There are various devices to help minimize water waste caused by rain, wind and frost. These include flow and moisture sensors. These sensors turn off the power to the valves, not the controller, so the controller settings are not affected. Use of the sensors will be more successful in some areas of the region than others and their full potential may be hampered by the twice-a-week watering schedule. For example, in extremely windy areas, use of wind sensors in addition to the restriction of watering only on certain days, may limit the opportunities for watering to the point that the plants' watering requirements can't be met. Following is a short description of each type of sensor and how they work.

Rain Sensors – A small device can be attached to the sprinkler system that will stop the sprinklers during periods of rain, automatically compensating for the amount of rainfall that occurred. The sensor interrupts the circuit from the controller to the solenoid valves shutting off the water. Once dry, the power is resumed.

Wind Sensors - While most sprinklers can still perform at close to peak efficiency with some type of breeze, when the air movement starts to get stronger, water coverage can be challenging. It can even become a liability issue when windblown sprinklers soak pedestrian paths or passing cars on roads. A wind sensor shuts off irrigation systems during periods of high wind, and then automatically resets the system when conditions are more favorable. Wind sensors are currently being tested in Somersett, a new development in Northwest Reno. If successful, wind sensors will be required as part of the Conditions, Covenants, and Restrictions (CC&R's) of the new subdivisions.

Freeze Sensors – These sensors prevent irrigation systems from activating by automatically stopping the flow of water when the outdoor temperature drops to a near freezing level. When the temperature rises above the freezing point, the system is reset to its regular cycle. A freeze sensor can save the life of plants and reduce falling or slipping hazards on hard surfaces.

Flow Sensors – When a ruptured pipe or broken sprinkler is left undetected it can result in a substantial amount of water waste and damage. Plants and groundcover can be flooded, a slope can be eroded and solid surfaces, such as sidewalks or driveways, can be undercut. The flow sensor is set to activate at a specified level of flow. Once that level is exceeded, the electrical circuit is broken and the valves are shut off. As a result, water lost in the event of high external leakage would be substantially reduced.

Moisture Sensors – These sensors conserve water by automatically disabling the sprinkler system operation when the soil moisture content is high. When the soil probes detect soil saturation, the sensor will automatically bypass watering cycles to ensure that landscaping is never over-watered due to rain or excessive irrigation cycles. Once the moisture level drops below the user adjustable setting, the watering cycles automatically resume.

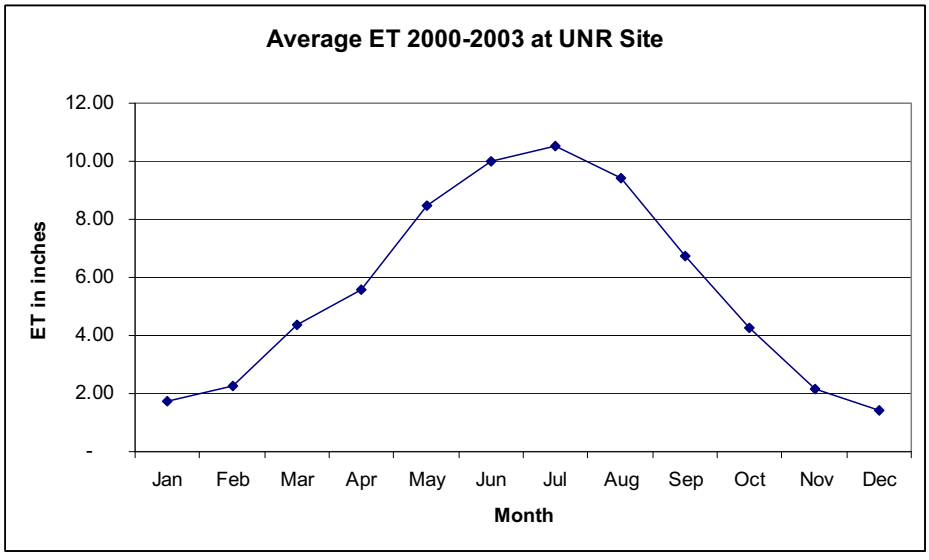
RWPC Sponsored Public Education Program

The ACC recommends implementation of a year-round Public Education Program (PEP) with the assistance of the NLA, to educate newcomers and reinforce what seasoned consumers have already learned about outdoor watering. In addition, the program should publicize the proper way to deal with brown spots in the lawn, the most common complaint of water consumers in this area. Most brown spots are the result of poor irrigation system efficiency. Efficiency refers to the uniformity of sprinkler coverage, as mentioned above. The most common response to brown spots is to increase watering times, which will over-water most of the lawn area. The proper approach is to hand-water the brown spots until system efficiency can be tested and corrected.

Use of Local ET Rates – Figure 8-8 shows that the amount of water that should be applied varies according to the season. Educating the public about this should be a major component of a PEP. There are three weather stations in the Washoe County ET Project. Using data from the UNR ET Weather Station, the graph below shows that consumers need to water the same amount in April and October, more in May and September, even more in June and August, and the most in July. (ET rates are available at www.washoeet.dri.edu/)

Partnerships with Local Organizations - With the Master Plan for expansion of Rancho San Rafael Regional Park there is opportunity for the RWPC to work with the County and water purveyors to provide demonstration gardens and displays of water-saving devices and new technologies. There are continually more opportunities to partner with other local organizations, such as the UNRCE on brochures describing new water saving techniques, and the NLA on training programs.

Figure 8-8
Monthly ET Rates



Use of Media - A spring campaign could be launched in February to remind water users to make sure their watering devices are in proper working condition before the watering season begins. Making sure the water system is working properly prevents under- or over-watering. The

campaign should educate owners that they do not have to turn their sprinklers on during the first warm days of spring. Simply announcing in September that everyone should reduce watering to half of their summer schedule amount might be the most effective fall campaign. TMWA stresses the same concept with irrigators who tend to over-water in the fall. A good website illustrating ways in which to conserve water for homeowners can be found at www.h2ouse.org.

Education on Water-Saving Appliances - This strategy can be effective in both the existing and new-housing market. Such a program would require cooperation and joint funding between TMWA, electricity and gas purveyors, and Washoe County. Many energy-saving appliances are also water-saving appliances, such as washing machines and dishwashers. One idea to explore is the development of a label showing the water-efficiency rating of the appliance to accompany the energy star label. Along with sufficient education, a water-saving appliance rebate may also prove effective in promoting water-efficient appliances.

Dual Water Delivery Systems

Dual water delivery systems, one providing potable water for indoor use and another for non-potable water used outdoors, could help achieve more efficient water use. Delivery of effluent water for irrigation of parks, golf courses and common areas, as described above, is a variation of this concept in use today. It is generally thought that the cost of expanding the delivery system to serve individual residential lots would exceed the benefits. Gray water systems are another variation; however, health concerns such as gray water flowing back into the drinking water system, must be addressed first and extensive public education undertaken. TMWA and SVGID distribute brochures promoting cross-connection safety.

Customer Leak-Repair Assistance

Water purveyors routinely audit their systems for leaky pipes and facilities to minimize waste of municipal supplies and reduce costs of treated water. Unaccounted for water typically averages about 10 percent of total production in urban areas (AWWA). Sources of unaccounted for water use include fire hydrant use, main flushing, and unauthorized uses. The remaining unaccounted for water is lost through leaks in the distribution system, evaporation, poor meter calibration, and unknown sources.

System-wide audits can only be conducted in metered systems and can only measure water waste to the customer's connection. Leaks of customer's facilities can also constitute considerable water waste. Many customers are unaware of leaks until they pay a metered rate. For some customers the cost of repairing the leak may be large. A leak-repair program that can help those customers needing to repair leaky pipes, particularly customers on low or fixed incomes, may be a cost-effective way to reduce water waste. The ACC has discussed the possibility of assisting customers on low or fixed incomes as one way to help the meter retrofit program, and may continue to pursue this type of program in coordination with the water purveyors if it proves financially feasible and socially desirable.

Commercial Faucet Retrofit in Restaurants

The California Urban Water Conservation Council recently received a $2.2 million grant from the California Public Utilities Commission to replace 16,900 pre-rinse spray valves in restaurants and other food service businesses. The pre-rinse spray valves are used to remove the majority

of food waste from dishes and utensils prior to placing them in the dishwasher. Called "Rinse and Save", the program will market free spray valves directly to food service facilities, and provide free installation of the valves upon request. The project will run through December 2003. The Council estimates that each replaced spray valve will save an average of 200 gallons per day. More information on this project is available at www.cuwcc.org.

Given that the entertainment sector is prominent in Washoe County, with an associated large number of dining establishments, a similar project should be explored in this area.

Good Earthkeeping

Though this program was included as an action item in the 1995 Base Case for conservation, it has not yet been vigorously pursued with the local hotel and motel industry. The ACC agrees that there are potential water savings to be gained from this program and the feasibility of implementation needs to be explored. Good Earthkeeping reduces hotel/motel laundry requirements by educating guests regarding the need to conserve water and asking them to indicate whether linens and towels may be changed every other day, rather than daily.

Promotion of New, Creative Ideas

There are several ideas for water conservation that are being tested and implemented across the country. This section discusses some of these ideas and their applicability to our region.

Waterless Urinals - There are a few companies supplying waterless urinals that claim to save approximately 40,000 gallons of water per urinal per year. The urinals work by using a filter system and liquid sealant, which helps block odors. The urinals cut sewer and water costs and are generally less expensive to maintain than flushing urinals. Water utilities that are working with these urinals include East Bay Municipal Utility District and Los Angeles Department of Water and Power in California. Typical customers include large theaters, sports complexes, school districts, arenas and stadiums.

Water Harvesting Techniques - While the idea of harvesting rain for water conservation purposes makes sense, and is gaining momentum across the United State, it may have limited applications in an area of the country that only receives an average of seven inches of rain each year. Effectiveness of rainwater harvesting is dependent on soil type and reinforcing the need for good soil preparation to effectively hold and utilize water. Additionally, health officials have expressed concerns regarding the creation of breeding habitat for mosquitoes and other vectors.

Storm Water Run-off Collection Under Parking Areas - It is possible to collect storm water runoff from hard surfaces, in particular parking areas, by installing technologies such as infiltration basins that allow polluted runoff to percolate into the ground rather than flow into the street, and trenches that trap oil, grease and hydrocarbons leaving filtered water to flow into the storm drain system. Even more advanced systems can process the storm water back to potable water. These potential but costly programs realistically could only occur during new construction, and may be regulated through BMPs.

Rain Barrels, Cisterns and Rain Gardens - Rain barrels and/or cisterns can be placed outside homes to catch rainfall from the roof, which is stored for use in the garden or the home.

Advantages of using rain barrels and/or cisterns include lower water costs over time and possible reduction of surface and groundwater use. Cisterns are greatly utilized in arid states such as Arizona, New Mexico and Texas and in countries such as Yemen and Mexico.

Rain gardens were initially designed to reduce storm water runoff, but also have implications for water conservation. Rain gardens are pond-like recesses shaped like a saucer that collect rainwater from driveways, walkways, decks, and roofs. Pollutants from storm water are filtered in the rain garden rather than making their way directly to rivers and lakes, and the water is used by trees, shrubs, and other landscape plants.

Alternatives to Typical Water-using Devices

In addition, there are small-scale home water-saving opportunities such as:

- Obtaining hot water from a composting greenhouse
- Composting toilets
- Constructed wetlands for wastewater treatment

These measures are unlikely to be adopted widely but are relatively inexpensive alternatives that may be more appealing in rural areas of Washoe County.

Research Studies

The RWPC should continue to support local research studies on new landscape industry technologies and watering practices. It may also prove beneficial to hire consultants to provide updates on emerging trends and policies of other water utilities in the Western United States.

8.7 Drought

Impact to Surface Water Supplies

Water stored in upstream reservoirs is used to maintain Floriston rates and to carry over water supplies from plentiful water producing years for use in years when precipitation is low. Floriston rates (the court-ordered flow rates of the Truckee River at the California-Nevada border) dictate minimum stream flow at which traditional users (irrigators, power producers, and municipal and industrial purveyors), meet their water requirements. If adequate storage is not available to augment low-flows, downstream users must curtail their water use. The summer low-flow period, which coincides with the peak-use period, requires water stored in Boca Reservoir and Lake Tahoe to be released into the Truckee River in order to maintain Floriston rates. TMWA has privately owned water reserves held in Donner and Independence Lakes, and not accountable to Floriston rates, for use during drought periods.

The most critical period for water supply in the region is summer and early autumn. If a drought exists, it is during these months that the Truckee River will have low flows, and water supplies will have to be augmented with groundwater and privately owned stored water. In a severe drought, low flows may occur during the early summer.

Impact to Groundwater Supplies

Unlike surface water, groundwater moves very slowly. Years may pass before a particular year's snowmelt recharges an aquifer and reaches a water well on the valley floor. Consequently, a drought-related decline in the water table may have been caused by a drought many years earlier. The impacts on the groundwater system from a drought are difficult to determine accurately and are even more difficult to predict; however, long-term monitoring of precipitation, stream flow and water table elevations has shown that drought-related impacts are measurable and significant. For example, in 2003 the State Engineer found that in the Mt. Rose Fan aquifer, drought conditions resulted in 10 feet of water table decline over the prior 3 years (State Engineer, 2003, written communication to Washoe County Department of Water Resources).

Every resident of the region using water for domestic purposes relies on groundwater supplies to some degree. TMWA wells typically supply between 15 and 20 percent of annual, net water production. Those wells provide water to meet summer peak demands. During extremely dry years when Truckee River water is not plentiful, TMWA relies even more heavily on its wells to meet summer and fall peak demands. In addition to its retail customers, TMWA provides wholesale water to WCDWR, which relies primarily on groundwater to meet demands, and to SVGID, whose only source of water is TMWA. Other water purveyors in the region rely exclusively on groundwater to meet customer demands. In addition, almost all domestic well owners are solely dependent on groundwater to meet their water needs. While a drought may not affect groundwater levels immediately, common sense says that conservation is necessary at all times in order to help lessen the effects from the reduced recharge during drought years.

With this in mind, every water user in the region should place equal importance on using their water wisely and eliminating waste, not only during times of drought, but every day. Prolonged periods of drought may call for more stringent conservation measures. During these relatively rare occurrences, increased conservation will help stretch surface water supplies and maximize our storage underground.

Drought Issues Facing Private Domestic Well Owners

Domestic well owners are encouraged to conserve even though they aren't metered. Although domestic well owners are limited to no more than 1,800 gpd by state statute, without meters this limitation cannot be enforced. State law currently does not require domestic wells to be metered.

Some domestic wells are particularly vulnerable to the effects of drought, especially shallow wells, those located in marginal portions of aquifers and those influenced significantly by municipal supply wells or a large number of other domestic wells. The Washoe County Groundwater Task Force found in 2003 that existing domestic wells are failing in certain portions of the region because of declining water table elevations. The task force further found that there are many causes for water table declines, which are not easily separable and with continued development water table declines are expected to continue.

8.7.1 Drought Response Plan

During a drought affecting the Truckee River watersheds the community is expected to reduce potable water use. During drought periods with successive drought years it becomes critical to further reduce potable water use. The Drought Response Plan (DRP) primarily applies to those purveyors relying on the Truckee River and its tributaries as sources of supply. Those purveyors affected include TMWA and its wholesale purveyors. A cooperative effort is critical to reduce potable water use by those that rely on the Truckee River. The conservation effort includes a collaborative approach with the RWPC, TMWA, the Cities of Reno and Sparks, and Washoe County. Depending upon the severity of the drought, a conservation plan will be mandated. As a result of conservation, there exists a potential for substantial water savings, potentially 15% to 20% as demonstrated during the 1987 to 1994 drought years. Such water savings is necessary since the number of services relying on the management of Truckee River reserves continues to grow.

TMWA's drought frequency analysis (TMWA, 2003) briefly discussed in Chapter 2, established that an appropriate drought design criterion should reflect conditions that impact TMWA's ability to divert water from the Truckee River. Inability to divert sufficient quantities of water from the Truckee River only happens during consecutive dry summer months in a low-precipitation year. It follows that water conservation efforts in response to drought should be triggered region-wide by the same conditions, that is, when Truckee River flows are inadequate to meet Floriston rates for one or more consecutive summer months between June through September, the prime months of the irrigation season. Under these conditions, TMWA is required to use privately owned stored water (POSW) or other available drought reserves. When surface flows are inadequate, groundwater reserves are also put under additional stress.

The activation of the DRP differs from the previous Regional Water Plan drought plan, which relied on identification of four stages of drought conditions. The four stages were:

Stage 1. Includes voluntary twice-a-week watering and is called for when it is predicted that Floriston rates may not be met all year.

Stage 2. Mandatory twice-a-week watering and is called when Floriston rates are not met.

Stage 3. When more than 3,000 af from Independence Lake will be used.

Stage 4. Emergency conditions. Measures to be determined as needed when customer demands cannot be met.

Currently, with the Water Conservation Agreement (WCA), twice-a-week watering is enforced until TMWA's system is fully metered. As twice-a-week watering occurs whether or not Floriston rates are being met, in essence the region is always in Stage 2, therefore the 4-Stage system is no longer applicable. The DRP proposed for this planning process reflects current operating practices and conditions for water supply and purveyors in the region. The recommended level of response under this DRP, which measures are to be implemented regionally, will be phased according to the flows and the number of drought months during the irrigation season, between June and October, when Floriston rates will not be met as predicted by the Federal Water Master.

Additionally, drought response measures should be those proven to reduce summer demands. The RWPC recommends revising the stages and responses that are codified by local governments. Based on current predictive capabilities and water/river forecasts, the RWPC proposes phasing certain measures earlier in the year to potentially extend water availability and thereby limiting the need for severe water conservation activities. This Plan uses a drought rating similar to that of Southern Nevada Water Authority (SNWA) that includes the following levels of drought declaration:

- No Drought
- Drought Watch
- Drought Alert
- Drought Emergency

During years in which the Federal Water Master predicts one or more months' loss of Floriston rates, a Drought Watch, Drought Alert, or Drought Emergency may be declared. The water purveyors dependent on Truckee River water as the main source of supply begin planning for the irrigation season prior to the April snowpack findings, with a communication plan for each of the following drought-ratings in the event that such a declaration is made. The drought rating for a season may be stepped up or down depending on actual river flows during the summer with the appropriate conservation measures enacted.

The condition defining each of these ratings and some of the conservation measures that may be undertaken with each rating or condition is described below.

No Drought

Condition: Floriston rates are predicted to be maintained from June through September.

Response:
Twice-a-week watering and other conservation measures typically implemented by local water purveyors are in effect.

Drought Watch

Condition: Predicted loss of Floriston rates for the month of September.

Response:

- Twice-a-week watering; no watering between 1:00 p.m. and 5:00 p.m.
- Increased public education
- Increased enforcement of water waste rules
- Implementation of landscape water budgets for irrigation customers. Assumes an amount of water use associated with various lot sizes. Exceedance of average water use by lot size would result in recommended audits
- Voluntary restaurant implementation of "no-water-served-unless-asked" policy
- Voluntary hotel/motel implementation of Good Earthkeeping activities

Drought Alert

Condition: Predicted loss of Floriston rates for the months of August and September.

Response:

- In addition to those actions listed under Drought Watch, these actions may be implemented:
  - Expand no watering time from 1:00 p.m. to 5:00 p.m. to 10:00 a.m. to 7:00 p.m.
  - Public education encouraging Spring or Fall plantings of new lawns
  - Exceedance of water/irrigation budgets results in mandatory audits
  - Mandatory "no-water-served-unless-asked" policy
  - Mandatory hotel/motel implementation of Good Earthkeeping activities

Drought Emergency

Condition: Predicted loss of Floriston rates any month(s) prior to the month of August .

Response:

- In addition to those actions listed under Drought Watch and Drought Alert, any of these actions may be taken:
  - New lawn plantings prohibited during the months of lost Floriston rates
  - Once-a-week watering possibly beginning during first month of lost Floriston rates
  - Outdoor watering is limited to non-turf landscaping such as trees, shrubs and flower and vegetable gardens for the duration of the drought emergency. Consideration will be given to public irrigated recreation areas such as parks and schools as the water supply condition permits.

8.8 Recommendations for Future Action

This chapter summarizes progress made since 1995, describes conservation programs currently in place, including base case programs, and programs to consider for future implementation. Action items for future consideration are listed below in Table 8-5. (Appendix H shows action items listed by category (base case, indoor, outdoor, infrastructure and general) and relative priority based on ACC consensus.

Table 8-5 Existing Measures and Actions for Future Consideration	
Base Case Measures (see Section 8.2)	
Water Meter Retrofit	Accelerate meter retrofit program. Explore potential for financial assistance to low or fixed income customers for repairs of broken or leaky water lines in conjunction with meter retrofit program
Toilet retrofit	Continue, extend or accelerate ULF toilet retrofit
New Building Codes	Continue working with building departments to draft and implement building code changes related to pressure reduction valves, reduction of hot water pipe size, hot water pipe insulation
Increase Block Rates Region-wide	Continue support of block rates
Landscape Efficiency Conversion	Continue outdoor water education programs on landscape efficiencies, soil preparation, plant selection, irrigation design and ET equipment. Develop a summary of BMPs for home use related to landscaping and outdoor irrigation and the education program to promote it. Develop and educate public about outdoor water budgets to promote efficient landscape design, irrigation retrofit and ET watering practices
Showerhead Retrofit	Continue low flow showerhead retrofits where needed
Good Earthkeeping	Hotel/motel implementation of Good Earthkeeping voluntary under Drought Watch and mandatory under Drought Alert.

Table 8-5 - Continued Existing Measures and Actions for Future Consideration	
Ongoing Measures in Addition to Base Case (see Section 8.4)	
Leak/System Repair	Encourage water purveyors to correct system water losses by upgrading system integrity. Explore potential for financial assistance to low or fixed income for repairs of broken or leaky water lines in conjunction with water purveyors—possible use of water waste fines.
Water Audits	Pilot Residential Water Audit Program was started in April 2003 and was considered to be successful in its first year. Continue this indoor and outdoor audit program into its second and subsequent years. In future years, consider using a web-based self-administering indoor audit.
Public Education	Continue to encourage water purveyors and other agencies to promote wise water use. Continue irrigation training for landscape maintenance professionals. Determine frequency of program and consider combining with NLA "certification" program. Continue outdoor water education programs for landscape efficiencies, soil preparation, plant selection, irrigation design and ET equipment. Develop a summary of BMPs for home use related to landscaping and outdoor irrigation and the education program to promote it. Develop and educate public about outdoor water budgets to promote efficient landscape design, irrigation retrofit and ET watering practices.
New Irrigation Technology	Continue with pilot studies to evaluate potential water savings from new irrigation technologies
Non-Potable and Effluent Water	Expand use of non-potable and effluent water within limits of TROA and treatment facilities

Table 8-5 - Continued Existing Measures and Actions for Future Consideration	
Measures for Future Consideration (see Section 8.5)	
Soil Preparation	Addition of organic material to soil prior to planting a new lawn
Irrigation Efficiency	Pursue goal to achieve at least 65% irrigation efficiency (uniformity of sprinkler coverage)
RWPC Sponsored Education	Coordinate a long-term educational campaign in partnership with water purveyors. Use media effectively. In particular, promote use of ET rates, soil preparation techniques and irrigation efficiency. Provide information on water-saving appliances.
Best Management Practices (BMPs)	Develop water conservation BMPs for the region Develop a summary of BMPs for home use related to landscaping and outdoor irrigation and the education program to promote it.
Grade to Retain 50% on New Lots	Require grading to increase irrigation efficiency and reduce runoff. May be more effectively enforced by Storm Water BMPs. See the Watershed Management chapter of this Plan.
Commercial Faucet Retrofits	Investigate and develop a commercial faucet retrofit program for replacement of restaurant pre-rinse spray valves with more water-efficient models
Enforce Landscape and Runoff Ordinances	Encourage stricter enforcement of existing ordinances and efficiencies. Require review of landscape plans. Require review and oversight on installations of large public/commercial irrigation projects. Assist local governments in updating landscape ordinances for water conservation. Provide slope and runoff education. Parks and public agencies to set good watering practices. Provide general public education and training for landscape designers and maintenance people.
Landscape Water Budgets	Develop water budgets for irrigation accounts to promote efficient irrigation design, retrofit, and ET watering practices
Sprinkler System Devices	Research / possible promotion of water-saving devices attached to sprinkler system clocks, i.e. rain sensors, wind sensors, flow sensors
Dual Water Delivery Systems	Promote use of treated water source for potable and other health needs, and effluent or untreated water source for non-potable needs Explore concepts related to dual water delivery systems in new commercial/public, non-residential construction
Customer Leak-Repair Assistance	Financial assistance to low-income and fixed-income customers for repair of their water lines in conjunction with water purveyors
Promotion of New Ideas	Provide information on new or innovative ideas, such as water harvesting and treatment, and non-water-using devices Explore opportunities for waterless urinals
Alternatives to Typical Water Using Devices	Hot water from a composting greenhouse, composting toilets, constructed wetlands for wastewater treatment
Research Studies	Support local research studies on new landscape industry technologies and watering practices. Hire consultants to keep ACC updated on emerging trends and policies of other water utilities in the Western U.S.
Good Earthkeeping	Conduct further research on its feasibility in the region. Review successes of Good Earthkeeping in other communities (San Francisco, Santa Fe) to determine if such a program would work in this region.

References Cited

Washoe County Department of Water Resources, 1997, 1995–2015 Washoe County Comprehensive Regional Water Management Plan.

Truckee Meadows Water Authority, 2003, 2005–2025 Water Resource Plan.

Volt VIEWtech, 2003, Ultra Low Flush Toilet Rebate Program Final Report, prepared for Regional Water Planning Commission.

Cooperative Extension, California Turfgrass Culture, Vol. 38, 1988, “Irrigation Water Quality and Turfgrass Management”, Ali Harivandi.

Beard B.J., 1973, Turfgrass science and culture. Prentice Hall. Englewood Cliffs, New Jersey.

American Water Works Association Water Resources Planning Manual M50.

USGS, 1998, Water Quality in the Las Vegas Valley Area and the Carson and Truckee River Basins, Nevada and California, 1992-96, USGS Circular 1170, Denver, CO.

Consulting Engineers Service (CES), 1998, Feasibility Analysis of Water Conservation Measures, prepared for Regional Water Planning Commission.