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Chapter 7 – Water Conservation Plan - Efficient Use of Water

Purpose and Scope

Chapter 531, Statutes of Nevada 2007, the Western Regional Water Commission ("WRWC") Act (the "Act") requires this Plan to describe programs to achieve conservation of water. The goal of this chapter is to present a water conservation plan that assists 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. This water conservation plan describes:

- Water conservation programs and ordinances presently in effect in the Planning Area
- Programs that have been implemented since the 1997 adoption of the *1995-2015 Regional Water Plan*
- Pending proposals for water conservation, both indoor and outdoor

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

Summary and Findings

General conclusions drawn from this chapter include:

- *Truckee River Operating Agreement* ("*TROA*") will be implemented in the near future. (See Section 2.2.3.1 for more on *TROA*).
- Water conservation ordinances will be retained by each of the jurisdictions in the Planning Area.
- All public purveyors in the Planning Area are essentially fully metered.
- 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 reclaimed water and other non-potable water sources may be implemented subject to federal, state, local and Washoe County District Health Department ("WCDHD") regulations, and to the extent supplies are available from the Truckee Meadows Water Reclamation Facility ("TMWRF"), Reno-Stead Water Reclamation Facility ("RSWRF") and South Truckee Meadows Water Reclamation Facility ("STMWRF").
- Additional conservation actions during droughts will be required when Floriston rates cannot be met during the irrigation season.
- Truckee Meadows Water Authority ("TMWA") has succeeded in retrofitting its flat-rate-residential services to meters thereby enabling TMWA's Board of Directors to modify the current watering schedule from two-day-a-week to three-day-a-week watering. Detailed studies indicated that: (1) more than one-half of all customers currently water more than twice a week; (2) a change from two-day-a-week to three-day-a-week watering would not be expected to increase peak day water demand, and in fact it may result in a decrease in peak day water use; and (3), total water use during the peak week would not be expected to change. The studies concluded that revising the Assigned-Day Watering schedule would not impact existing facilities or their operation.

Based on the discussion of future possible conservation measures in Section 7.5, a list of actions for future consideration are summarized in Table 7-1, in addition to the base case and other conservation measures already underway. While these future actions may be implemented, it is important to continue successful existing conservation programs in the Planning Area while implementing new ones.

Introduction

Water conservation is a vital part of an integrated water management plan. Efficient water use 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 Planning Area has a limited supply of water resources, and those resources should be used as efficiently as possible.

The development of this water conservation plan began with the Regional Water Planning Commission ("RWPC"), created in 1995 by the Nevada Legislature, and the RWPC's Advisory Committee on Conservation. In January 2010, the WRWC approved a prior version of this water conservation plan as part of an amendment to the *2004-2025 Regional Water Plan*.

Since its formation in 1995, the RWPC has set water conservation goals for the Planning Area, 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 *1995-2015 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 found that the pursuit of base case conservation is desirable and beneficial to the Planning Area.

In addition to monitoring the progress of water conservation, the RWPC continued to evaluate whether existing conservation programs are effective and practicable, and whether programs should be added or deleted. The RWPC recognized that during drought or emergencies additional conservation measures may be needed to achieve a greater reduction in water use.

The following water conservation policy is intended to aid in evaluating current and future conservation measures:

Policy 1.1.b: Water Conservation:

> *Water conservation measures that promote smart management of the Planning Area's water resources will be implemented for the benefit of the community. Additionally, the community will be expected to conserve more water during drought.*

Table 7-1 Base Case, Ongoing, Future and Drought Conservation Measures

BASE CASE
Retrofit Water Meters on all Municipal Water Services (to the extent practicable)
Toilet Retrofit
Increase Block Rates Region-wide
Landscape Efficiency Conversion
New Building Codes
Showerhead Retrofit
Good Earthkeeping
ONGOING MEASURES
Water Usage Review / Water Audits
Public Education
New Irrigation Technology
Non-Potable and Reclaimed Water Service
FUTURE MEASURES
RWPC Sponsored Education: Soil Preparation, Irrigation Efficiency
Best Management Practices (“BMPs”)
Grade to Retain 50% on New Lots (Low Impact Development Practices)
Commercial Faucet Retrofits
Enhanced Enforcement of 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
More restrictions on landscape irrigation and/or lawn installation
Implementation of landscape water budgets for irrigation customers
Restaurants implement mandatory no-water-served-unless-asked policy
Hotels and motels implement mandatory Good Earthkeeping

7.1 Regional Benefits of Conservation

Currently, 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 Planning Area are summarized below:

Extending drought or emergency water supplies. Periodic droughts are a fact of life in Washoe County's high-desert environment. Because the 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 for water quality purposes. To the extent that conserving water supply helps the community to minimize the impact of a drought, conservation is a very valuable tool.

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 assigned day watering restriction reduces peak demands caused by many customers watering during crucial high-demand periods. 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.

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 reclaimed water total dissolved solids ("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.

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.

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 United States Geological Survey ("USGS") studied the quality of shallow groundwater in the Truckee Meadows and identified a problem probably caused by excessive application of pesticides on landscapes. 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 pollutant sources including fertilizers and storm water BMPs, can help minimize run-off and infiltration of polluted water and prevent pollutants from entering surface water and groundwater.

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.

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.

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.

7.2 Overview of Progress

All major water purveyors in the Planning Area have implemented water conservation plans as required by Nevada Revised Statutes ("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. Amendments in 2005 to NRS 540.131 require conservation plans to be updated every five years. (See Section 8.3 for detailed discussion of conservation plans.)

Since the 1987-1994 drought, Reno, Sparks, and Washoe County have adopted national plumbing codes and local ordinances designed to minimize water waste. These include assigned day 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 7-2.

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 Planning Area-wide.

Table 7-2 Base Case Progress since the *1995–2015 Regional Water Plan*

Water Meters on all Municipal Water Services	SVGID, STMGID, WCDWR connections are fully metered. TMWA connections are over 96 percent metered. Purveyors encourage flat rate customers to convert to metered rates.
Toilet Retrofit	The RWPC sponsored an Ultra Low Flush Toilet ("ULFT") retrofit program from September 2001 through December 2004, and replaced more than 15,000 toilets. SVGID continued the program until 2009.
Increasing Block Rates for Municipal Water Services Region-wide	Both TMWA and WCDWR currently use inverted block rate structures.
Assigned Day Watering	In 2010, TMWA revised its assigned day watering program, a promotional campaign targeting lawn watering by customers, to provide for 3 day a week watering.
Water Use Review/Water Audits	TMWA offers residential and commercial customers on-site water use reviews and water audits. In 2009, 2,675 audits were performed.
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 288,000 square-feet of turf have been replaced with low water use plants, materials and hardscapes. In 2006, TMWA concluded a pilot Evapotranspiration ("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. The RWPC made recommendations to local building departments. As a result, Washoe County adopted plumbing code amendments consistent with the recommendations. TMWA is also encouraging landscape designs that make sense in the Planning Area'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.

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.

7.3 Measuring Progress

Total municipal and industrial ("M&I") water use including irrigation in the Planning Area is influenced by the number of users on municipal water supply systems, number of users with private wells, types of industries moving into the Planning Area, demographics of the Planning

Area, 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 7-1 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 two percent from the previous years' average usage, demonstrating significant consumer response to drought measures. The Planning Area has experienced two droughts since 1985: an eight-year drought from 1987 to 1994 and five-year drought from 2000 to 2005. During and subsequent to these droughts, use per connection has stabilized while total connections to the TMWA system have increased. Approximately 80 percent of the total regional population is served by TMWA.

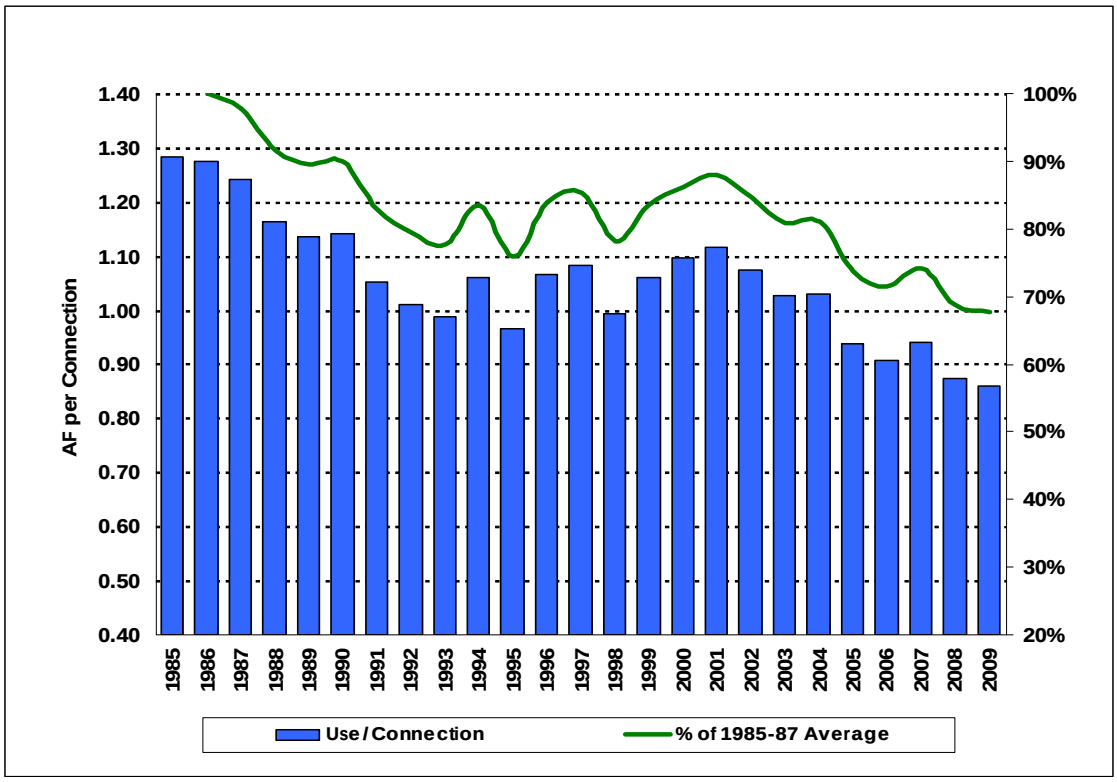

Figure 7-1 TMWA Service Territory Use per Connection 1985-2009

Figure 7-1 shows a similarly stable use-per-connection trend for Washoe County Department of Water Resources ("WCDWR") customers over the last eight years. A comparison of pre-drought and post-drought use is not available for this Plan.

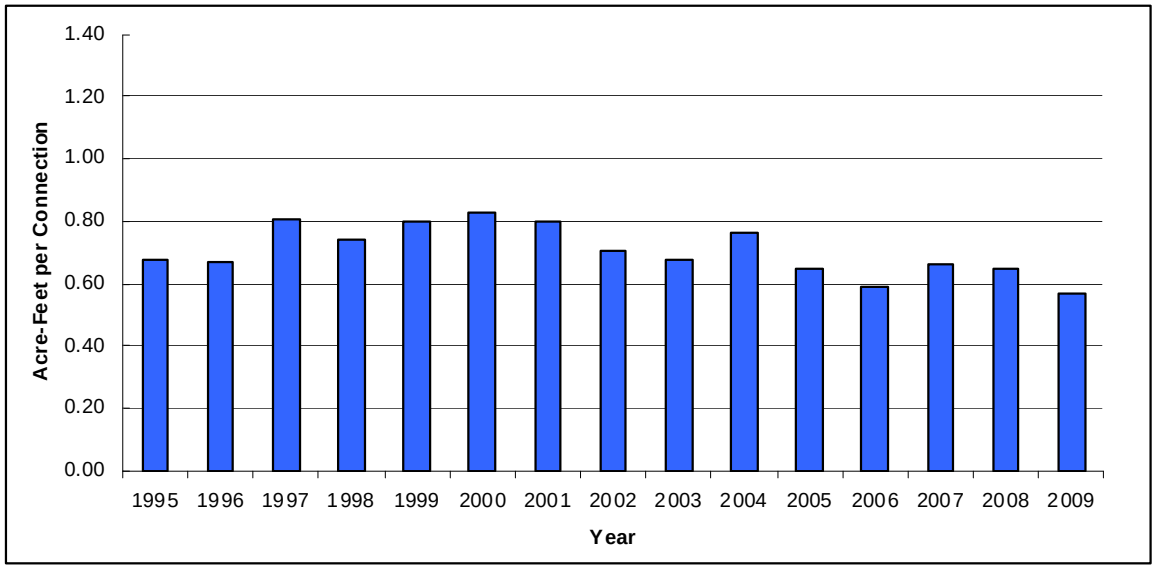

Figure 7-2 WCDWR Use per Connection 1995-2009

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 acre feet annually ("afa"), whereas a metered home of the same lot size uses approximately 0.44 afa.

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 19 years there has been a slow shift in the Planning Area toward use of smaller lots for new home construction, particularly in the lot size classes that are less than 6,000 square feet, causing less irrigation demand at the new home. Table 7-3 shows that, since 1990, there has been an increase in the share of lots with sizes less than 6,000 square feet, which made up 12 percent of the total number of lots, whereas in 2009, lots less than 6,000 square feet made up 14.6 percent of the total.

Table 7-3 Shift in Lot Sizes

Lot Size (square feet)	1990 Share of Total Lots	1995 Share of Total Lots	2000 Share of Total Lots	2005 Share of Total Lots	2009 Share of Total Lots
< 4,000	1.70%	1.90%	2.30%	2.70%	2.90%
4,000 to 4,999	3.80%	3.80%	3.60%	4.30%	4.30%
5,000 to 5,999	6.50%	6.50%	6.50%	7.30%	7.40%
6,000 to 6,999	29.70%	27.50%	24.90%	22.90%	22.50%
7,000 to 7,999	16.20%	16.10%	15.80%	15.30%	15.20%
8,000 to 8,999	7.60%	7.90%	8.70%	8.80%	8.70%
9,000 to 9,999	5.60%	5.90%	6.40%	6.40%	6.50%
10,000 to 11,999	5.10%	5.50%	6.50%	6.90%	7.20%
12,000 to 15,999	8.60%	8.70%	9.50%	10.70%	10.90%
16,000 to 19,999	4.70%	5.00%	5.00%	5.00%	4.90%
>20,000	10.50%	11.30%	10.70%	9.70%	9.40%
Total	100.00%	100.00%	100.00%	100.00%	100.00%

Source: TMWA

As a second measure of water conservation achievement, water use can be compared by customer class over time. Figure 7-3 shows how water use per connection has changed by customer class in TMWA's retail service territory since 1990. Residential metered water use has reduced slightly per connection. Commercial metered water use per connection has declined for the years 1990 to 2000. However, for 2005 to 2009 there was a significant reduction in use. While some of this reduction is related to conservation efforts, a portion is also related to the economic recession that started in 2006. Metered irrigation use per connection shows no clear pattern. This is expected as irrigation demands are determined by the weather, type of landscape and size of the area being served by a single service.

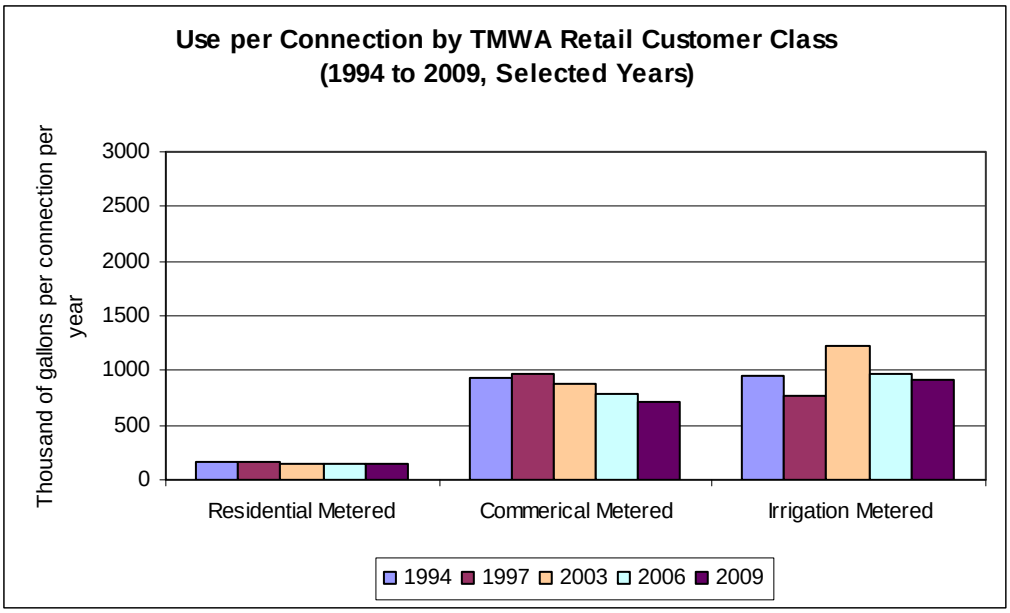

Figure 7-3 Use over Time by Customer Class

Notes: Commercial metered connections customers are businesses including casinos, small offices, warehouses, and manufacturers. Commercial irrigation connections include public parks, homeowner association maintained areas, and other irrigated commercial sites.

Figure 7-4 shows that water use by WCDWR residential customer class has remained relatively stable from 1994 to 2006.

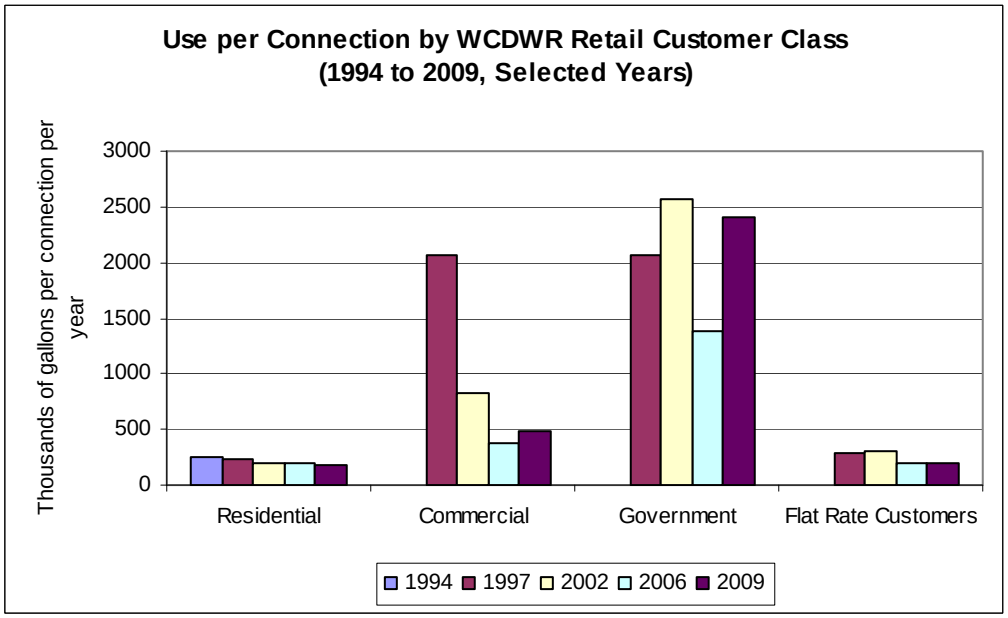

Figure 7-4 Washoe County Department of Water Resources Use per Connection by Customer Class

7.4 Laws, Ordinances, Agreements and Plans Facilitating Conservation

7.4.1 Federal Laws

National Energy Policy Act

The Federal Energy Policy Act ("EPACT") includes three basic water conservation components: maximum-water-use standards for plumbing fixtures, product marking and labeling requirements, and recommendations for state and local incentive programs to accelerate voluntary fixture replacement. These requirements are administered and regulated by the US Department of Energy. EPACT sets forth uniform national water efficiency standards for nearly all toilets, urinals, showerheads, and faucets manufactured after January 1994.

Truckee River Operating Agreement 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 Preliminary Settlement Agreement ("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 percent) 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 percent per year (currently $150,000) 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 RWPC supported *TROA* and the WCA, and the Northern Nevada Water Planning Commission ("NNWPC") continues its support 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.

7.4.2 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. All purveyors are active in enforcing water waste ordinances within their respective service areas through education, progressive fines, service shut-off and other means to reduce waste.

The RWPC has worked with local government entities in an effort to change the residential plumbing code to reduce hot water pipe sizes where applicable. For example, smaller-diameter pipes for distribution of hot water in homes would reduce 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 proposed plumbing code changes also included reducing to 65 pounds per square inch ("psi"), the Uniform Plumbing Code requirement for pressure reducing devices to keep water pressure no higher than 80 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. Plumbing code amendments adopted by Reno, Sparks and Washoe County are generally consistent with the proposed changes.

In 2004, TMWA's Technical Advisory Committee ("TAC") formed a Landscape Subcommittee to address an increase in customer complaints about landscape standards approved by the local governments and the lack of consistent enforcement of the water conservation elements of the ordinances. The subcommittee, comprised of three voting members representing Reno, Sparks and Washoe County, developed findings and recommendations regarding landscape ordinances (see Appendix H). The RWPC participated in the development of the recommendations. After reporting to the TAC and the TMWA Board, staff presented the final report to the Reno City Council, Sparks City Council and Washoe County Board of Commissioners at a joint meeting in 2005. At that meeting, the governing boards directed their respective staffs to prepare code amendments to address the findings and recommendations.

7.4.3 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. Amendments in 2005 to NRS 540.131 require conservation plans to be updated every five years.

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 General Improvement District ("SVGID"), South Truckee Meadows General Improvement District ("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.

Because TMWA's plan affects the largest number of people, it is summarized first under each element, followed by WCDWR, SVGID, STMGID 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

TMWA's public education element is comprised of a multi-media approach including distribution of water-saving kits, seasonal water conservation consultants, distribution of teacher materials, the landscape retrofit program and the residential water audit program. In addition, TMWA hosts landscaping workshops and certification programs, 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 conservation consultants. TMWA also implements an annual advertising effort to promote the assigned-day watering program. Advertisements promoting assigned-day watering are placed on TV, radio, and in local newspapers. Additionally, printed material with tips on how to keep a healthy landscape are provided in monthly bill stuffers, direct advertising, and web postings at www.tmh2o.com.

WCDWR

Promotes water conservation through newsletters, public access television and its website, www.washoecounty.us/water/. The Department also works with the University of Nevada Cooperative Extension ("UNCE") in promoting water efficient landscaping and distributing various water conservation literature. In addition, the WCDWR cooperated with the RWPC in conservation projects and programs.

SVGID

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. Additionally, a three-year ET Controller study was initiated in 2003 to better understand potential water use reductions gained through using ET Controllers. In addition to documenting significant water savings, for example 22.9 million gallons over three years for one 10-property study group, the study confirmed that all the individual commercial sites that used the ET Controllers as intended benefited from water savings during the study period. TMWA also works with local agencies to require landscape designs that make sense in the Planning Area's high desert environment.

WCDWR

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

SVGID

Customers are encouraged to water lawns according to a voluntary assigned day schedule. Where negligent or wasteful use of water exists on or from a customer's premises, SVGID 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 use of reclaimed water.

TMWA

System management programs include replacement of large and non-functioning water meters, annual meter replacement based on meter life-cycle, coordination of reclaimed 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, reclaimed water use, and encourages flat-rate customers to convert to metered rates by showing probable cost savings.

SVGID

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 7.7.

Element 1.E: Implementation Schedule. Conservation measures are in effect for all purveyors. NRS 540.131 requires conservation plans to be updated every five years.

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. TMWA will continue to use a tiered rate structure for metered customers. Not only are tiered water rates a part of the Negotiated Settlement but increasing tiered rates provide greater incentive to high volume water users to conserve.

WCDWR

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

STMGID

Customers pay according to a tiered rate structure by 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 its water conservation consultants, publications, bill inserts and its website.

WCDWR

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

SVGID

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

TMWA's landscape retrofit program encompasses promotion of water efficient landscaping in the Truckee Meadows primarily through education. TMWA provides a guide to water-efficient landscaping with ideas for yard designs, irrigation layout, plant selection, and maintenance. TMWA launched an interactive guide on its website hosting this guide, and it is one of the most visited pages on the website.

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 UNCE, which provides pamphlets about lawn watering, water efficient landscaping, and other landscape water reduction methods.

SVGID

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.

7.5 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.

The following ongoing and revised programs are intended to effectively achieve water conservation in the Planning Area. Where applicable, modification and expansion of these programs to meet new objectives are included in this section.

7.5.1 Assigned-Day Watering

Since 1987, TMWA has sponsored an Assigned-Day Watering advertising campaign during the summer months, including a cool-down period during the autumn months. It began as a voluntary program to spread the use of water more evenly throughout the week and reduce total weekly and daily water production used for landscape irrigation. The program calls for watering deeper and less often, and assigns days of the week during which customers may water.

The program became mandatory twice-per-week watering per the terms of the 1996 Conservation Agreement as part of the Preliminary Settlement Agreement, until such time at least 90 percent of its flat-rate-residential services were metered. TMWA has succeeded in retrofitting its flat-rate-residential services to meters thereby enabling TMWA's Board of Directors to modify the current watering schedule if appropriate.

Prior to considering changes to the current Assigned-Day watering program, TMWA staff assessed the impact of potential changes on TMWA's system and pressure zones. As a first step to gaining better understanding of system-wide, average daily summer usage and assigned day water usage, TMWA, in 2004, began testing alternate day watering schemes in three different neighborhoods. This was followed by a daily water demand study conducted between June 2, 2006 and August 15, 2006. Follow-up studies during the summers of 2007 and 2008 tracked peak day usage system-wide and focused on targeted specific pressure zones and neighborhoods. This micro-level data, when combined with system-wide water demand data, enabled TMWA to thoroughly assess the impacts of a modified watering schedule on all parts of its system and in particular, measure the impact on water service to customers, if any, during peak times. The studies indicated that (1) more than one-half of all customers currently water more than twice-week; (2) a change from two-day-a-week to three-day-a-week watering would not be expected to increase peak day water demand, and in fact it may result in a decrease in peak day water use; and (3), total water use during the peak week would not be expected to change. The studies concluded that revising the Assigned-Day Watering schedule would not impact existing facilities or their operation.

In the spring of 2010, TMWA transitioned from mandatory twice-per-week watering to a program of three-times-per-week watering. No watering on Monday is retained to ensure time and flexibility for system recovery. The revised watering day schedule and restrictions on time-of-day watering permitted under Assigned-Day Watering is summarized as follows:

	MON	TUE	WED	THR	FRI	SAT	SUN
All "EVEN" addressed services	No	Yes		Yes		Yes	
All "ODD" addressed services	No		Yes		Yes		Yes

Along with revisions to Assigned-Day watering and to discourage watering during the hottest, and typically the windiest part of the day, the restriction on time-of-day watering is now 12:00 P.M. to 6:00 P.M. for the days between Memorial Day and Labor Day.

7.5.2 Truckee Meadows Community Forestry Coalition

In 2008, TMWA, in conjunction with other agencies and professionals engaged in urban forestry and landscape improvement programs, created the Truckee Meadows Community Forestry Coalition ("Community Forestry Coalition"). The purpose of the Community Forestry Coalition is to promote a sustainable community forest in and around the Truckee Meadows, recognizing the benefits of both public and private trees. Trees provide substantial environmental, economic and aesthetic benefits to the community; however, tree care needs, especially watering requirements, are not obvious to the average resident. Local arborists are concerned that growth in the area and the conversion to a fully-metered water system has resulted in tree losses throughout the community.

TMWA's involvement in the Community Forestry Coalition reflects its interest in implementing Best Landscape Practices ("BLPs") that achieve water-efficient landscapes. In 2009, the Community Forestry Coalition developed an educational Web site for tree care geared toward residents of the Truckee Meadows (www.communityforestry.org). The site articulates the values and benefits of the Planning Area's trees and serves as an educational resource for urban-forestry related programs and regulations. It also provides easy-to-follow tree care practices for homeowners. By year's end TMWA will update its landscape guide to include an updated list of climate-compatible trees as well as tree care practices with particular emphasis on practices that improve the water efficiency of trees in the landscape.

7.5.3 Water Meters

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

Policy 1.1.e: Water Meters

> *Water purveyors within the Planning Area shall meter to the extent practicable, all uses or sales of water within their respective service areas.*

WCDWR provides water service to approximately 18,400 accounts in 16 service areas. Customer classes include residential, commercial, government connections, fire protection, standby, irrigation or Golden Valley recharge connections. All of 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, SVGID can pinpoint water waste by comparing pumping numbers versus usage numbers. SVGID decreases such waste by reducing water supply leakage, correcting meter inaccuracy, and adjusting high-pressure situations. SVGID customers are exempt from the assigned day watering restriction because all customers are metered.

Since 1979, TMWA has evolved toward a metered water system by first metering all commercial and irrigation services. A formal program to retrofit all of TMWA's remaining flat-rate residential services began in earnest in June 1995 and has achieved metering of over 96 percent of its service connections.

In addition to the progress made by local purveyors to meter the use of water, the 2007 Nevada Legislature took steps to require the owner of a domestic well to install a water meter if an accessory dwelling unit of a single family dwelling unit is to be served by the domestic well. Senate Bill 275 made these and other additions affecting domestic wells to NRS 534.

7.5.4 Ultra Low Flow Toilet Installation and Retrofit

In 2001, the RWPC initiated a Pilot Toilet Retrofit Rebate Program financed by the Regional Water Management Fund and contributions from the Cities of Reno and Sparks, through TMWRF. Toilets account for more than 26 percent of all indoor water usage. The program goal was to replace 10,000 high-flush toilets (3.5 gallons or greater per flush) with ULFTs (1.6 gallons per flush) by offering cash rebates to owners of qualifying dwelling units. Original program estimates included a possible 114,000 pre-1995 homes in the Planning Area that have high-flow toilets: 60,600 single-family homes and 53,400 multi-family dwellings. It was assumed that if 75 percent of high-flow toilet owners participated, 85,000 dwelling units would be retrofitted, saving approximately 4,339 afa. A contract to administer the Pilot Toilet Retrofit Rebate Program was awarded to a consulting firm experienced with similar programs in other states. The program was active from July 2001 until March 2003. A follow up effort, a toilet installation program administered by SVGID, was started in July 2003 and ended in December 2004, although SVGID continued the program for its customers until 2009. The two programs replaced a total of 15,097 toilets, providing for an estimated annual savings of 528 acre feet ("af") of water. *TROA* assumptions, used to evaluate the program, estimated annual water savings of 35 af per thousand toilets retrofitted. Water saved by this measure will be credit stored under *TROA* for release to increase flows in the river to improve water quality.

7.5.5 Use of Other Water-Conserving Fixtures

The RWPC believed that the mandated installation of ULF toilets, showerheads, and similar devices in all new and remodeled residences since 1993 resulted in water conservation, second only to the installation of water meters in the Planning Area. 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 Planning Area. TMWA distributes low-flow devices such as showerheads, hose timers, and self-closing nozzles on a limited basis each year.

7.5.6 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 Usage Review Program (described below) can pinpoint smaller leaks. Water 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.

7.5.7 Local Ordinances and Water Purveyor Rules

In 2002, the Cities of Reno and Sparks, and Washoe County adopted 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.

In 2010, the Cities of Reno and Sparks, and Washoe County adopted ordinances to reflect the three-day-a-week watering program described in section 7.5.1, above.

7.5.8 Water Usage Review Program (Water Audits)

In 2002, the RWPC approved a funding recommendation for TMWA to implement a pilot residential water audit program during summer 2003. The purpose of the pilot program was to help the RWPC further its water conservation goals and measure the viability of such a program by establishing appropriate levels of staffing, cost recovery, attainable audit goals, and quantify water savings. A residential water 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. Auditors used laptop computers and specialized software to make water saving recommendations and provide the customer a printed report at conclusion of the audit.

The 2003 pilot program was met with extremely positive customer response and had considerable success in expanding water conservation awareness through personal customer education and retrofitting of simple water saving devices. The RWPC renewed funding for the program in subsequent years and the scope of the program was broadened in 2005 to add commercial water audits. Expanding the program to commercial properties proved successful and the program was made available to residential and commercial customers through 2009.

The program title was changed from Water Audit to Water Usage Review in 2007. The 2007 program made use of new meter technology installed by TMWA in the Wingfield Springs area of northeast Sparks. The newly installed meters include a data logger that allows for a more detailed analysis of daily water use. TMWA is targeting high volume residential water users in this area to participate in the water usage review program. Upon reviewing the daily data log from the participant's meter and speaking with the resident, staff can better assess when water usage is occurring and recommend appropriate changes based on the type of use. The

information on the data log can also help pinpoint if a leak is occurring. Additionally, the data loggers allow staff to review water usage after the audit to assess whether the resident made changes in their water use. Results for the audit program for calendar years 2003 through 2009 are shown below.

	Total	Commercial	Residential	Reno	Sparks	Washoe County
2003	444	42	402	275	149	20
2004	497	66	431	324	135	38
2005	894	123	771	538	281	75
2006	731	70	661	469	238	24
2007	1,853	208	1,645	1,175	593	85
2008	2,461	265	2,196	1,601	769	91
2009	2,675	300	2,375	1,766	787	122

Customer response to the service continues to be extremely positive. In general, participating customers are more conscientious than the average customer and are receptive to the education and auditor's recommendations. General findings from the program include:

- A main source of inefficiency is inappropriate settings on irrigation clocks
- Water auditors generally recommend reduced watering times for lawns and landscaping
- Commercial properties have different issues; mostly leaks within their irrigation systems
- The majority of recommendations for water conservation are for outdoors
- Customers with older model dishwashers and clothes washers said they would look for Energy Star models when they replace their machines
- The program continues to be very popular with senior citizens

7.5.9 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, increasing block-rate structure.

7.5.10 Public Education

There are many ways water conservation is promoted in the Planning Area.

Outdoor Watering

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

TMWA and Washoe County's Department of Regional Parks and Open Space jointly offer ongoing water conservation workshops at Rancho San Rafael Regional Park, where the May Arboretum has an extensive display of water efficient and native plants. Workshops have included guided tours of the Arboretum, seminars on designing water efficient landscapes and

winterizing irrigation systems. 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. An on-line 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 a water meter (www.tmh2o.com/conservation).

Water Efficient Landscaping

Landscaping with water efficient plants only conserves water if the landscape is irrigated 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 UNCE is a resource in helping define irrigation technology for water efficient landscaping. At the Washoe ET Project website, http://www.washoeet.dri.edu/, UNCE offers comprehensive information about water conservation measures appropriate for this area. The Final Report of the Washoe Evapotranspiration Project also can be accessed from the Desert Research Institute.

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, www.tmwalandscapeguide.com/landscape_guide/interactive/index.php.

The RWPC identified landscape irrigation efficiency as one of its primary areas of focus. Landscape irrigation systems installed and maintained by certified technicians is one way to increase irrigation efficiency.

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.

The NLA brought the Certified Landscape Technician ("CLT") exam to the Planning Area in 2003, through its association with the Professional Landscape Network (formerly Associated Landscape Contractors of America), as a way to raise the standard of the local landscape industry. The multi-module, practical exam is administered internationally and in a number of states and is widely accepted by the local industry.

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

that 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 potential water savings.

TMWA is working with the WCSD and city parks departments to conserve water. Beginning in 2002, TMWA has hired professional landscape services to remove large non-functional turf areas at select school district sites. So far, a total of 288,000 square-feet of turf has been removed and replaced with low water use plants, materials, and hardscapes. Similar services may be offered to other local agencies in the future.

Managing Turf Quality

Turf grass is often a central component in landscape designs because of its attractiveness, versatility, durability and ability to adapt to extremes. Although turf grass is often perceived as a high water user, recent studies show that many trees and shrubs used in landscapes can require higher amounts of water. Additionally, local professional turf growers are using lower water use turf varieties in their products. Turf use and management in the Planning Area is dependent on species selection, type of use, cultural and maintenance practices and, most importantly, soil conditions and irrigation. In fact, recent research indicates that 80 percent of all plant problems are associated with poor soil preparation.

Appendix I discusses soil preparation in more detail. Turf quality and turf maintenance may mean different things to different people. Low maintenance turf does not mean no maintenance, but it may mean less water, less frequent mowing, and lower levels of fertilization and pest control. Improper turf management can result in poor density, lack of color, increased susceptibility to heat and cold stress, disease and pests, and difficulty repairing wear. Conversely, a deep green, lush lawn in the middle of summer may not be a healthy lawn either, and may indicate improper management practices such as over watering and excessive fertilization. National Gardening Association research indicates that the average homeowner over-irrigates their landscape. In times of drought or severe watering restrictions, a brown lawn should be acceptable. Cool season grasses such as Kentucky bluegrass will go dormant during such times and recover with irrigation. BMPs available from the NLA, UNCE and TMWA promote appropriate horticultural management practices, including irrigation management, planting, soil preparation, fertilization and pest control.

Teacher Materials – TMWA Academy for Teachers

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 Planning Area'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.

7.5.11 New Irrigation Technology

Washoe Evapotranspiration Project

Evapotranspiration ("ET") is a combination of the words evaporation and transpiration. Evaporation is the amount of water lost from the soil while transpiration is the amount of water lost through the plant leaves.

The Washoe Evapotranspiration Project was initiated in 1999 with the installation of three weather stations at different locations in the Planning Area to record local Evapotranspiration rates ("Eto"). ET rates are used for irrigation scheduling and budgeting, and to determine the potential water needs of plants. The stations were installed at Wolf Run Golf Course, UNR Valley Road Experiment Station and Sierra Sage Golf Course. Weather stations collect daily weather data using sensors and data loggers to record solar radiation, wind speed, precipitation, vapor pressure, relative humidity, minimum and maximum temperatures and soil temperatures. Water managers who use Eto can reduce their water use during an irrigation season by up to 40 percent. Conventional irrigation controllers can be scheduled using irrigation runtimes posted during the irrigation season on the project website at www.washoeet.dri.edu. Others that may benefit from the project include flood control managers, fire protection agencies, weather service agencies, health departments, golf courses, commercial water users, local landscape management companies, homeowners and water purveyors.

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 modified Penman equation, as suggested by CIMIS, performs data interrogations. This program was supported by the RWPC, and continues with NNWPC/WRWC support. It is maintained by Desert Research Institute ("DRI") and monitored daily by UNCE.

ET Controllers

An ET irrigation controller adjusts the duration and timing of the outdoor watering schedule using ET rates computed from weather data and programmed into the controller. The ET controller may not generate schedules consistent with local watering rules, therefore a user of an ET controller may need a variance from the assigned day watering ordinance. If purveyors decide to issue variances, the community would need to be educated about why owners of ET controllers are not bound by the assigned day watering restrictions. Several ET Controller pilot projects have been conducted in the Planning Area.

During 2001 and 2002, the RWPC co-funded an ET controller project with UNCE. 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 UNCE technician, and trained landscape professionals. Results indicate the Weather TRAK controller applied up to approximately 50 percent 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, it applied the same or less water to the landscape than the other treatments. The use of the ET controller also resulted in very little or no stress to the turf when compared to the other treatments.

In 2003, TMWA launched an ET controller project on commercial properties in cooperation with landscape professionals. The objective of the study was 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. The project was concluded in 2006.

Results indicate that ET controllers can be an effective tool to reduce application of water on commercial property landscapes. Critical to the performance of ET controllers is the condition of the irrigation system. It is recommended that irrigation system audits be conducted prior to installation of such a new device. ET controllers only work properly when the entire system is functioning optimally. The system audit should check for leaks, malfunctioning equipment, water pressure, site coverage and other related issues that can impact the efficiency of the entire system, allowing the ET controller to maximize its effectiveness. Problems with irrigation systems were frequently documented during the program, in some instances causing removal of the meter information from the study, since large leak problems invalidate the water use recordings for purposes of the study.

The challenge with increased use of ET controllers in Washoe County is allowing their use with the assigned day watering schedule. To comply with local law, only ET controllers that can be programmed to account for local watering restrictions could be permitted, causing an enforcement issue; alternatively all sites using ET controllers could be exempted (receive a variance) to water off-schedule (TMWA, 2007, *2003 – 2006 Pilot Evapotranspiration Controller Study*).

In summary, ET controllers in combination with efficient sprinkler-head technology and installation, proper soil preparation and good management practices can provide significant irrigation water savings for homeowners and commercial property owners.

7.5.12 Use of Non-Potable and Reclaimed 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 used 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. Reclaimed 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 well water for construction 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 reclaimed water (highly treated wastewater effluent) 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 reclaimed 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 reclaimed 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 reclaimed water. The following factors must be considered in applying reclaimed 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 reclaimed water, reclaimed water can be high in

nutrients and used efficiently by turf grass and other plants. This is usually quite beneficial in turf grass management programs (UNCE, 1988).

The benefits of using reclaimed 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 reclaimed water used for irrigation or industry and therefore not returned to the river. The entities have agreed to replace reclaimed water that originates from Truckee River water when that reclaimed water is 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 WCDHD strictly regulates the use of gray water. Gray water systems in the Planning Area are discussed in the following section.

7.6 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 through dynamic and evolving initiatives.

Soil Preparation

It is recommended 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. Appendix I also discusses soil preparation.

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 is in reducing over-application on areas of landscape to compensate for lower application rates on other areas of the landscape. The goal for the area is to achieve at least 65 percent efficiency. Consumers can learn more about irrigation efficiency by visiting www.washoeet.dri.edu/.

Best Management Practices

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, they must be developed and agreed upon by the stakeholders, including water agencies, and landscape professionals. Irrigation efficiency is an example of a BMP that can be pursued with water purveyor support. Similar to landscape ordinances, BMPs must be enforceable to be successful. As discussed above in this chapter, until this issue is addressed, BMPs are unlikely to be successful in this Planning Area.

In 2003, the NLA developed landscape performance standards that could be useful in this campaign.

Low Impact Development

The Planning Area's Storm Water Quality Management Program is developing a Low Impact Development ("LID") Program that incorporates numerous water conserving practices. LID is an innovative storm water management approach that promotes the management of runoff from rainfall and urban water use at or near the source using uniformly distributed, decentralized micro-scale controls. LID's goal is to mimic a site's predevelopment hydrology by using design practices and techniques that effectively capture, filter, store, evaporate, detain and infiltrate runoff close to its source. This can be accomplished by creating site design features that direct runoff to vegetated areas with engineered soils, protecting native vegetation and open space, and reducing the amount of hard surfaces and compaction of soil. LID practices are based on the premise that storm water management should not be seen as merely storm water disposal. Instead of conveying the majority of runoff in underground pipes and managing and treating storm water in large, costly end-of-pipe facilities located at the bottom of drainage areas, LID addresses storm water through small, cost-effective landscape features located at the lot level.

Almost all components of the urban environment have the potential to serve as LID practices. This includes open space, rooftops, streetscapes, parking lots, sidewalks, and medians. LID is a versatile approach that can be applied equally well to new development, urban retrofits, redevelopment, and revitalization projects. Examples of LID best management practices include design and implementation of:

- Bioretention Areas
- Swales and Buffer Strips
- Porous Paving Systems
- Porous Concrete and Asphalt
- Permeable Pavers

LID practices may be incorporated into:

- Parking Lot Design
- Street and Road Design
- Driveway Design
- Sidewalks and Bike Paths
- Impervious Surface Reduction and Disconnection
- Soil Amendments
- Roof Rainwater Collection Systems
- Roof Leader Disconnection

Additional areas for consideration of LID practices include:

- Pollution Prevention and Good Housekeeping

- Storm water Education
- Related Structural Controls
- Extended Detention Basins
- Infiltration Trenches and Basins
- Storm water Ponds and Wetlands

Enforce Landscape and Run-off Ordinances

Each of the three local government entities has landscape ordinances that are intended to allow only 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 RWPC considered 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 RWPC encouraged working 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 improved sprinkler nozzles, flow sensors and moisture sensors. Manufacturers offer

various sprinkler nozzle designs that deliver water in improved stream patterns and trajectories that are more efficient and less susceptible to wind drift.

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 Planning Area than others and their full potential may be hampered by the assigned day 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 plant's watering requirements can not 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 - A wind sensor shuts off irrigation systems during periods of high wind, and then automatically resets the system when conditions are more favorable.

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.

WPC Sponsored Public Education Program

The RWPC recommended implementation of a year-round Public Education Program ("PEP") with the assistance of the UNCE and 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 7-5 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. The graph below shows that consumers generally 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 - Opportunities exist for local government entities 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 UNCE on brochures describing new water saving techniques, and the NLA on training programs.

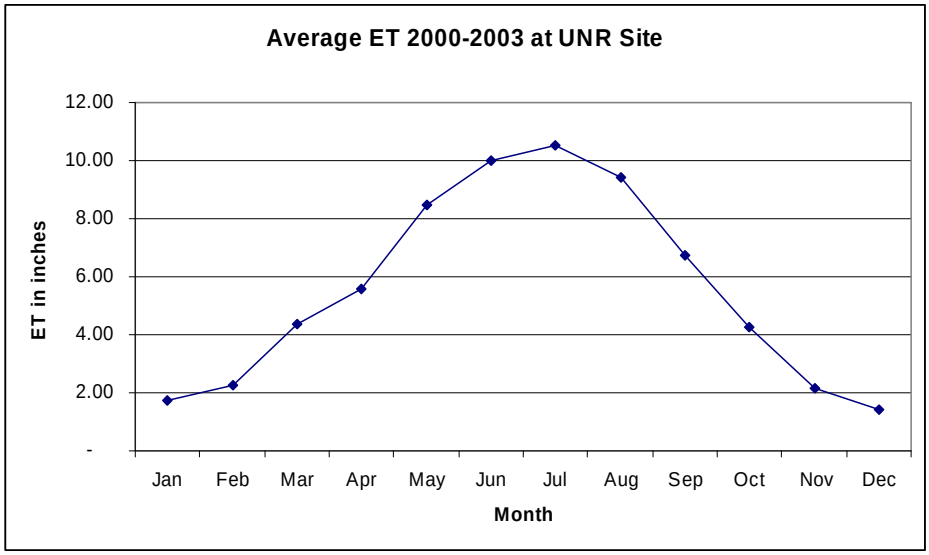

Figure 7-5 Monthly ET Rates

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.

Landscape Award Programs - NLA and TMWA offer landscape awards for efficient commercial and residential landscape designs. TMWA also conducts an annual water conservation poster competition.

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 distribution 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 reclaimed water for irrigation of parks, golf courses and common areas, as described above, is a variation of this concept in use today. Gray water systems are another variation. It has been generally thought, however, that the cost of expanding the reclaimed water distribution system to serve individual residential lots would exceed the benefits. This assumption was tested in 2009 by the City of Sparks by way of an independent evaluation conducted by Optimatics, Inc., who evaluated the differences between a conventional water distribution system, and a dual water system designed to provide for residential irrigation demands with reclaimed water. The evaluation generally concluded that a dual water system costs about twice as much as a conventional system. See Section 4.3.1 for a more detailed discussion of the evaluation results. Health concerns exist wherever potable water and non-potable water, such as reclaimed or gray water, are used on the same parcel or lot. Prevention of cross connections and backflow must be addressed first and extensive public education undertaken. TMWA and SVGID distribute brochures promoting cross-connection safety.

Gray Water Systems

Gray water is wastewater from domestic activities such as laundry, dishwashing, and bathing, and differs from sewage (or black water) in that it does not contain human waste. Gray water systems are typically installed for one of two primary reasons: 1) to minimize the load on septic systems by diverting gray water to an alternative leach field; and/or 2) to recycle wastewater on-site for uses such as landscape irrigation and gardening.

Gray water systems are typically managed either by direct discharge or capture and storage using an underground reservoir. Direct discharge methods use gravity to disseminate gray water as it is generated to subsurface leach lines usually associated with irrigation of landscapes or gardens. Systems that store gray water typically rely on a storage tank and pumping system to discharge gray water to a leach-line network. Gray water can generally be applied without treatment, however, some systems use some form of bio-filtration, such as constructed wetlands, to help remove pollutants.

Gray water systems within the Planning Area are permitted by the WCDHD according to Section 130 of the WCDHD Sewage, Wastewater and Sanitation regulations. According to WCDHD, approximately 12 systems have been permitted in Washoe County. Key permitting requirements include:

- Gray water systems are permitted for supplemental discharge and cannot be used to reduce the design standard requirement of a septic system.
- All gray water systems require a construction permit.
- No gray water may be discharged above ground. Disposal must be through a subsurface leach system with plants to absorb discharge.
- Subsurface leach lines must be at least six inches deep.
- Gray water systems must be built in accordance with the uniform plumbing code with a by-pass valve that allows for gray water to be diverted to the septic/sewer system to protect from freezing.

- Leach lines must be five feet from water service lines and 25 feet from wells and watercourses.

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 American Water Works Association ("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 RWPC 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 ("CUWCC") recently received a $2.2 million grant from the California Public Utilities Commission ("PUC") 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 ran 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 RWPC agreed 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 Planning Area.

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 States, 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. Health departments keep a close watch on maintaining vector control in areas utilizing these outside rainfall collection devices.

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

Support should continue for 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.

7.7 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 Planning Area 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 three years (State Engineer, 2003, written communication to WCDWR).

Every resident of the Planning Area 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 between June and October, 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 Planning Area rely exclusively on groundwater to meet customer demands. All domestic well owners are solely dependent on groundwater to meet their domestic 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 Planning Area 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 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 two acre feet ("af") per year 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 reported in its 2003 final report that existing domestic wells are failing in certain portions of the Planning Area 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 localized water table declines are expected to continue (RWPC, 2003).

7.7.1 Drought Response Plan

During droughts affecting the Truckee River watersheds TMWA customers are expected to reduce water use. Depending on the severity of the drought and the amount of TMWA's drought reserve (i.e., Independence Lake, Donner Lake, and groundwater reserves) that may be drawn upon during a Drought Situation, the aforementioned conservation measures may be modified to achieve targeted and/or necessary water reductions to preserve TMWA's drought reserve water supplies. Similar to past drought responses in previous water plans, the need to change customer uses in response to a Drought Situation may vary during the year.

Currently and under *TROA*, the determination of a Drought Situation takes place in April. That determination indicates the amount of water available for the Truckee River system and provides an early indication as to when river flows will no longer support Floriston Rates (which is always associated with Lake Tahoe elevations at or near the rim). TMWA's Water Resource Plan ("WRP"), along with the Planning Area's current water plans, link conservation actions during droughts to the loss of Floriston Rates. When Lake Tahoe's elevation is projected in April to be greater than 6,225.50 feet, Lake Tahoe datum, by November 15, it means that minimum, normal Truckee River flows are expected to be available for the rest of the year and into the following year. No shortages or interruptions in Truckee River flows will be anticipated over the course of the year.

When Lake Tahoe's elevation is projected to be between 6,225.50 and 6,223.50 feet by November 15, it means that the Planning Area has experienced one or more consecutive, below average snowpacks and corresponding below-normal-streamflow runoff seasons, and that the elevation of the lake has been declining year after year. This situation indicates that carry-over storage will be used to meet Floriston Rates thus depleting upstream storage. Normal Truckee River flows are expected to be maintained through the summer and fall months and TMWA's reserve water supplies are not expected to be used and water production operations will not be negatively impacted. TMWA will monitor the Truckee River water supplies with respect to

reservoir storage since historical data suggests that shortages or interruptions in Truckee River flow could occur sometime within the current year and the next year, particularly with a below average snowpack season.

Finally, when the projected amount of Floriston Rate water stored in Lake Tahoe (including Floriston Rate water stored in other reservoirs as if it were in Lake Tahoe) on or before the following November 15, will be equivalent to an elevation less than 6,223.50 feet, it means that carry-over storage used to make Floriston Rates is likely to be exhausted by the end of the year. It also means that the elevation of the lake is expected to be at or below its natural rim, Truckee River flows are expected to fall off before the end of the year, and TMWA operations, either from a hydro power generation perspective and/or community water availability will be impacted. The elevation of Lake Tahoe and subsequent Truckee River flows could fall off significantly earlier than normal creating operational challenges for TMWA; forcing TMWA to use its additional groundwater pumping and/or back-up drought supplies privately-owned storage water ("POSW") (stored in upstream reservoirs) in order to meet the demands of its water customers prior to November.

During droughts it is important to explain to customers that: (1) climatological conditions have led to reduced precipitation, reduced snowpack accumulations, and resulting lower Truckee River supplies; (2) the need to use water more efficiently; and (3) the degree to which TMWA water supplies will be affected. It is difficult for customers to understand why "less-than-normal" river flow conditions may or may not have an effect on TMWA water supplies. TMWA's conjunctive management of all its available water supplies (which include diversion of natural river flows, groundwater, artificial recharge, and POSW in upstream reservoirs) in a dry year usually avoids or minimizes any impacts on customers' uses.

The current response plan is based on declaring one of four Drought Stages:

(1) No Drought
(2) Drought Watch
(3) Drought Alert
(4) Drought Emergency

The current process is a climatologically based declaration of a drought year and does not clearly link the drought level to available water supplies (both natural river flows and TMWA's drought reserve water supplies). This is very problematic from a public education perspective since under the current system the Planning Area is always in a "drought" stage with little connection between the drought stage and available water supplies, and leaves little room to reduce water use when severe actions may be needed. To improve customer understanding between climatologically induced droughts and water supply, TMWA has developed and will implement as part of this *2030 Water Resource Plan* a simpler way to explain the impact of Drought Situations on available water supplies. The new classification system is presented in Table 7-4 along with changes in existing conservation measures that take place through the course of a Drought Situation year. This revision replaces the four-stage drought classification with a three-stage supply classification.

Table 7-4 Demand-Side Program Management in Response to Drought Situations

	Non-Drought Situation	|---------*Drought Situation*	---------|
	Supplies are Normal	Supplies are Adequate [River Flows Drop-Off After Labor Day]	Supplies are Impacted [River Flows Drop-Off Before Labor Day]
--------a--------	--------b--------	--------c--------	--------d--------
A *Assigned Day Watering*			
Monday	No water day	No water day	No water day
Even addresses:	Tuesday, Thursday and Saturday	Tuesday, Thursday and Saturday	Tuesday, Thursday and Saturday
Odd addresses:	Wednesday, Friday, and Sunday	Wednesday, Friday, and Sunday	Wednesday, Friday, and Sunday
B *Water Day Time Restrictions*			
Between Memorial Day and Labor Day	12 to 6 PM	12 to 6 PM	11 AM to 7 PM
C *Public Education & Advertising*	Standard programs	Standard programs	Increased programs
D *Water Waste Prevention*	Standard enforcement	Standard enforcement	Increased enforcement
E *Other Actions*			
Though not inclusive, these enhancements could be deployed depending on the severity of the circumstances and the potential impact to supplies			Expand water day time restrictions Reduce the number of watering days Set daily watering allotments Drought rates

NOTE: The term "supplies" refers to (1) Truckee River water available from natural flows plus releases from Federally operated reservoirs to support Floriston Rates and (2) TMWA's Privately Owned Stored Water held in Independence and Donner Lakes and Federal reservoirs.

The winter of 2009/2010 provides an example that demonstrates how this revised system would work. The April 1, 2010 snowpack was 89 percent of average for the Truckee River basin. Projections on April 15, 2009 indicated that a Drought Situation exists since Tahoe would be at its rim on or before November 15, 2009 and projected Floriston Rates would be expected to drop-off in late August or September. Late April and early May snowstorms changed the water forecast such that, although Tahoe would still be at its rim on or before November 15, 2009, Floriston Rates would be available possibly through October. This condition is almost identical to 2009 conditions. For 2010, like 2009, the condition "Supplies are Adequate" exists because normal river flows were available past Labor Day, the loss of Floriston Rates will not occur until October 2010, and therefore there is no need to pump additional groundwater or release any POSW. Thus water supplies through the summer are adequate as were the implementation of TMWA's demand-side management programs.

This revised classification system will improve the region's ability to create more meaningful, easier to understand information campaigns that relate needed reductions in customer use to available water supplies. It will also provide a more cohesive management scheme for the region's purveyors who already had an alternate 3-day watering program.

7.8 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 7-5.

Table 7-5 Existing Measures and Actions for Future Consideration

Base Case Measures	
Toilet retrofit	Continue, extend or accelerate ULF toilet retrofit as funding allows. Develop cost estimate to retrofit remaining toilets. Use meter data to verify actual water savings.
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. RWPC responsible for financial obligation
Increase Block Rates Region-wide	Continue support of block rates. Utility responsible for financial obligation.
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. Utility responsible for financial obligation.
Showerhead Retrofit	Continue low flow showerhead retrofits where needed. Utility responsible for financial obligation.
Good Earthkeeping	Hotel/motel implementation of Good Earthkeeping voluntary under Drought Watch and mandatory under Drought Alert. Hotel/motel responsible for financial obligation.

Table 7-5 Existing Measures and Actions for Future Consideration - Continued

Ongoing Measures in Addition to Base Case	
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. Utility responsible for financial obligation.
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 subsequent years. In future years, consider using a web-based self-administering indoor audit. TMWA and RWPC share cost of program. RWPC responsible for financial obligation of approximately $65,000 per year for ongoing water audit program.
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 "landscape technician 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. RWPC responsible for financial obligation, approximately $3,000 per year for ongoing Washoe ET Project maintenance.
New Irrigation Technology	Continue with pilot studies to evaluate potential water savings from new irrigation technologies. RWPC responsible for financial obligation.
Non-Potable and Reclaimed Water	Expand use of non-potable and reclaimed water within limits of *TROA* and treatment facilities. Utility responsible for financial obligation.
Measures for Future Consideration	
Soil Preparation	Addition of organic material to soil prior to planting a new lawn. Work with community development departments to prepare code amendments requiring soil preparation. RWPC responsible for financial obligation.
Irrigation Efficiency	Pursue goal to achieve at least 65 percent 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 Planning Area. Develop a summary of BMPs for home use related to landscaping and outdoor irrigation and the education program to promote it.
Low Impact Development Practices	Support and promote LID, especially landscape practices that retain water on-site and prevent runoff. May be more effectively enforced by Storm Water BMPs. See the Watershed Management chapter of this Plan.

Table 7-5 Existing Measures and Actions for Future Consideration – Continued

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 reclaimed water or untreated water source for non-potable needs. Explore concepts related to dual water delivery systems in new commercial/public, and 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 RWPC 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 Planning Area. Review successes of Good Earthkeeping in other communities (San Francisco, Santa Fe) to determine if such a program would work in this region.

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