Chapter 8 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;
- 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") has been implemented which provides for greater flexibility of surface water resources during drought. (See Section 2.2.3.4 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 prolonged periods of drought 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").
- Enhanced conservation actions during droughts will be required when Floriston rates cannot be sustained during the irrigation season.
- In order to increase water use efficiency of all customers, in 2015, Truckee Meadows Water Authority ("TMWA") successfully converted the remainder of its flat-rate-residential services to metered rates thereby allowing those customers detailed information on monthly water use.

Based on the discussion of current and future possible conservation measures in discussed in Sections 8.5 and 8.6, a list of actions for future consideration are summarized in Table 8-1, in addition to the base case and other conservation measures already underway. While future actions may be implemented, it is important to continue successful existing conservation programs in the Planning Area while implementing new ones.

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

BASE CASE
Retrofit Water Meters on all Municipal Water Services (to the extent practicable)
Toilet Retrofit
Increase Block Rates Region-wide
Watering Restrictions
Water Use Review / Water Audits
Landscape Efficiency Conversion
New Building Codes
Showerhead Retrofit
Good Earth keeping
ONGOING MEASURES
Water Usage Review / Water Audits
Public Education
New Irrigation Technology
Non-Potable and Reclaimed Water Service
FUTURE MEASURES
Education: Soil Preparation, Irrigation Efficiency
Best Management Practices (“BMPs”)
Grade to Retain 50% of runoff on New Lots (Low Impact Development [“LID”] Practices)
Commercial Faucet Retrofits
Enhanced Enforcement of Landscape and Runoff Ordinances
Landscape Water Budgets
Sprinkler System Devices
Customer Leak-Repair Assistance
Promotion of New Ideas
Research Studies
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 Earth keeping

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 2008, following the implementation of the Western Regional Water Commission Act, ("Act") the RWPC was succeeded by the Northern Nevada Water Planning Commission ("NNWPC"), which assumed the task of developing the RWMP's conservation chapter. 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*. References to the RWPC in this chapter indicate conservation elements developed prior to the implementation of the Act. The reference is intended to provide chronologic continuity of water conservation efforts for the region relative to the RWMP's conservation chapter development.

Since its formation in 1995, the RWPC set water conservation goals for the Planning Area; and, at the same time, 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 was 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 were 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 base case, ongoing future and drought water conservation measures originally developed by the RWPC's Advisory Committee on Conservation were adopted by NNWPC. Based on these measures the following water conservation policy is intended to aid in evaluating past, current and future conservation measures:

Policy 1.1.b: Water Conservation

Water conservation measures that promote smart and efficient use of the Planning Area's water resources will be implemented for the benefit of the community. Additionally, the community will be expected to reduce water use during low precipitation years when upstream reserve releases are needed prior to September 1.

8.1 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 dedicated to the local purveyor, within their service area, as a condition for receiving a building permit. The resulting will-serve from the purveyor becomes permanently affixed to that particular property..

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 must 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:

8.1.1 Extending drought 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. Since TROA has been implemented, TMWA now has an increased ability to store more water in upstream reservoirs for use during drought, as well as for water quality purposes. The Cities and County, as parties to TROA, also have the ability to store water in upstream reservoirs for water quality purposes during a drought or anytime higher river flows are desired to meet water quality objectives. To the extent that conserving water supply helps the community to minimize the impact of a drought, conservation is a very valuable tool.

8.1.2 Delaying construction of new water treatment and wastewater treatment facilities.

A major benefit of conservation to residents within the Planning Area has been delaying the need for expanding or constructing new water and wastewater facilities. Since 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.

8.1.3 **Lowering cost of wastewater treatment operations.** Lower water use means lower operational costs for wastewater treatment for 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 concentrations at TMWRF are anticipated to increase as a result of conservation. Careful reuse management and enhanced operations are expected to avoid a violation of discharge limitations.

8.1.4 Reducing energy costs.

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

8.1.5 Minimizing pollution in the watershed.

Water conservation results in less yard and agricultural runoff and sediments that contribute to pollution in the watershed, affecting both surface and groundwater. The United States Geological Survey studied the quality of shallow groundwater in the Truckee Meadows and identified a problem likely 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.

8.1.6 **Improving fisheries and habitat.** Under TROA, less surface water used during a drought for municipal purposes allows more water to be stored in upstream reservoirs. This stored water can continue to accrue until it is either needed to meet demand during periods of extreme drought or when a non-drought year occurs, and the water is released for fishery purposes in the lower Truckee River.

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

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

8.2 Overview of Progress

All major water purveyors in the Planning Area have implemented water conservation plans as required by Nevada Revised Statutes (“NRS”) 540.121-151. Aside from those purveyors that 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. Progress on these and other Base Case Conservation measures are summarized in Table 8-2.

This conservation effort will continue to reduce peak demand on the system, reducing the quantity of water that must be treated for residential use and delaying construction of new and expensive treatment facilities. The scope of the conservation program is Planning Area-wide.

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

Water Meters on all Municipal Water Services	Purveyors strongly encouraged flat rate customers to convert to metered rates. As a result, Sun Valley General Improvement District ("SVGID") and TMWA connections are essentially 100 percent metered.
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	TMWA, customers are on increasing block rate structures.
Watering Restrictions	Since 2010, TMWA has instituted a three-times-per-week, Assigned-Day Watering schedule, with a no-watering restriction on Monday to allow for treatment-operations recovery. Along with Assigned-Day Watering, TMWA discourages watering during the hottest, and typically the windiest, part of the day. Thus, there is a restriction on time-of-day watering between Memorial Day and Labor Day; there is no watering allowed from 12:00 P.M. to 6:00 P.M. during this time of year. During drought years, these no-watering times are expanded by two hours: 11:00 A.M. to 7:00 P.M.
Water Use Review/Water Audits	TMWA offers residential and commercial customers on-site water use reviews and water audits. Since the program's inception in 2003, to-date approximately 31,000 audits have been performed.
Landscape Efficiency Conversion	TMWA's Landscape Retrofit Program 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	Work with local hotels/motels to promote reduced laundry requirements.

The results of water conservation measures are only quantifiable with a fully 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) gallons per capita per day (GPCD).

8.3 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.

Overall, per-connection water use has been trending downward over time due, in part, to conservation efforts. For example, during the drought period of the late 1980s to the mid-1990s, use per-connection decreased by approximately two percent from the previous years' average usage. Figure 8-1 shows that from 2003 to 2019 TMWA per-capita water usage and total population served. While TMWA's customer base has grown from about 300,000 people to approximately 425,000 residents, per-capita water usage has declined by 30% over the last fifteen years.

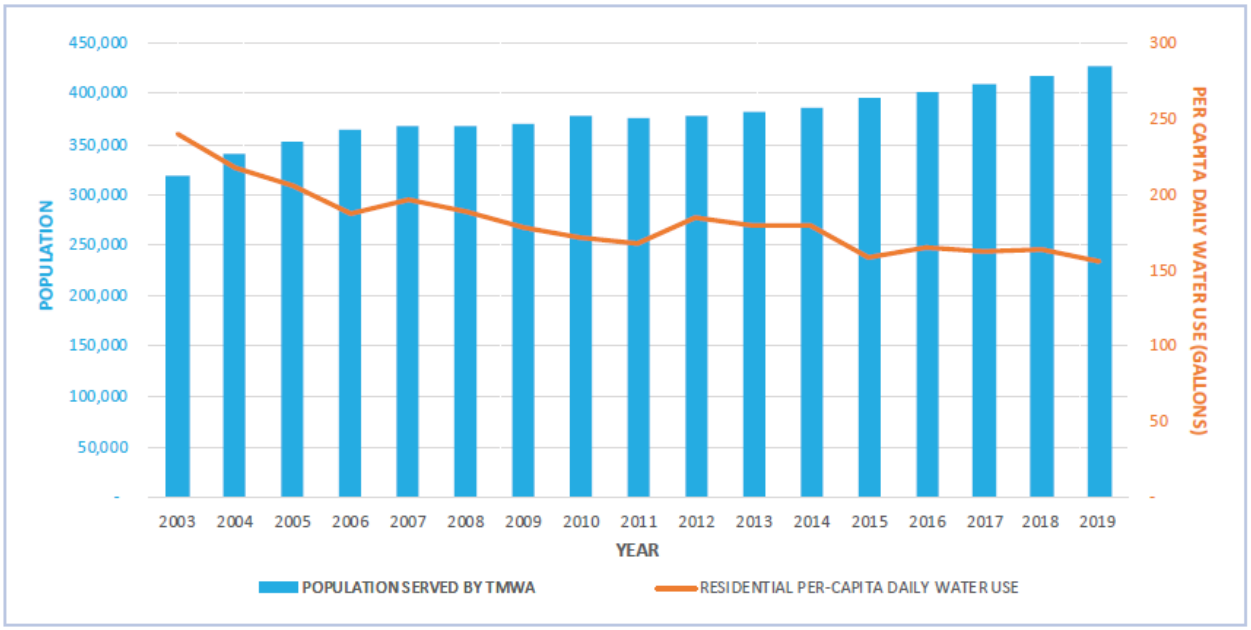


Figure 8-1 POPULATION SERVED BY TMWA AND RESIDENTIAL PER-CAPITA DAILY WATER USE (2003 to 2019)

Part of the reason for the declining per-capita water use is the gradual shift from non-metered to metered water use by residential customers. TMWA also has a robust water conservation plan in place to help control water demand over time.

Many factors influence water usage in homes: age of the home, number of occupants, age and lifestyle of the occupants, pipe size, 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 technology. As an example Table 8-3 shows that, from 1990 through 2009, the percentage of lot sizes less than 6,000 square feet has increased, making up nearly 15 percent of the total number of lots. In 1990, lot sizes less than 6,000 square feet made up only 12 percent of the total. This would suggest an overall decrease in water use

due to less irrigation demand. However, lot sizes greater than 8,000 square feet increased by 5.5 percent over the same period, suggesting an overall gain in water efficiency over time.

Table 8-3 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 2016-2035 WRP

8.4 Laws, Ordinances, Agreements and Plans Facilitating Conservation

8.4.1 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 United States 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 WCA fulfills the Preliminary Settlement Agreement requirement section 29(c) and The NNWPC supports TROA and the WCA, as reflected by the following policy.

Policy 1.1.c: Management of Conserved Truckee River Water

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

8.4.2 Local Government Ordinances and Water Purveyor Rules

Developed by water planners, local governments, and the Nevada Landscape Association ("NLA"), local ordinances have been enacted that encourage the use of water efficient

landscaping for new developments and set grading standards to avoid excessive runoff and water pooling. In addition, Reno, Sparks and Washoe County have supported the 1996 WCA by enacting local ordinances prohibiting water waste. Enforcement of the codes has been minimal. All purveyors are active in enforcing water wasting ordinances within their respective service areas through education, progressive fines, service shut-off and other means to reduce waste.

The RWPC 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 G). 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. In 2015, the NNWPC collaborated with TMWA, and city and county planners to once again review the current landscaping codes and provide recommendations to municipal officials (see Appendix 5-4; 2016-2035 WRP).

8.4.3 State of Nevada Conservation Objectives

In order to meet the requirements of NRS 540.131 through NRS 540.151, all purveyors of water for municipal, industrial, or domestic purposes, with the exception of certain smaller purveyors, filed water conservation plans, most in 1992, with the Nevada Department of Conservation and Natural Resources for approval and adoption by the state. Amendments in 2005 to NRS 540.131 require conservation plans to be updated every five years. The following Washoe County water purveyors' conservation plans are on file with the Nevada Division of Water Resources ("NDWR"): TMWA, SVGID, Sky Ranch Water Service, Utilities Incorporated of Nevada, Silver Knolls Mutual Water Company, Rosemount Water Company, Verdi Mutual Water Company, and a number of other very small systems. Refer to the following website for a full list of plans currently available for viewing: http://water.nv.gov/programs/planning/plans.cfm.

Water purveyors subject to the regulation of the Nevada Public Utilities Commission ("PUCN") are required to gain approval of their water conservation plan from the PUCN that meets the requirements of NRS 704.662 to 704.6624. Per NRS 540.121 (3) the investor-owned water purveyors are not required to gain approval through the NDWR.

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 WCA discussed in the previous section. Because TMWA's plan affects the largest number of people, it is summarized first under each element, followed by SVGID, and the remaining purveyors.

SECTION 1: Elements of Water Conservation

Purveyors' programs are discussed in detail in Section 8.5, 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 is deeply committed to conservation and efficient use of water and helps its customers conserve water through education about water usage. They provide education and information about watering rules through various forms of communication including in-person training, public workshops and events. The majority of this education comes via the Water Watcher Program and the Water Usage Review Program. Additionally, TMWA provides presentations to various organizations and sets up booths at various public events throughout the year. Furthermore, they provide up-to-date information about conservation and the state of its water supply via multimedia messaging and online resources (see tmwa.com/conservation). TMWA also provides its customers detailed information about their water usage and conservation efforts on monthly billing statements allowing them to monitor usage and individual conservation efforts. Additionally, TMWA has a Landscape Retrofit Program that provides financial assistance to other municipal agencies engaging in landscape efficiency programs. TMWA also distributes low-flow water devices to its customers via the programs discussed above. For a full discussion of TMWA's conservation efforts refer to TMWA's Drought Contingency Plan.

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. Additionally, an ET study was initiated in 2003 to better understand potential water use reductions gained through using automated ET Controllers. The study found 22.9 million gallons were saved over three years by one 10-property study group alone. Moreover, 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's Water Watcher Program as well as its Water Audit Program ensures staff constantly engages with the public every year. They provide conservation measures tailored to the customer's unique situation. These programs also ensure customers adhere to all water regulations. In order to comply with state law, TMWA monitors the effectiveness of many of its conservation programs to the extent practical. These measures of effectiveness can be found in TMWA's Drought Contingency Plan (tmwa.com/dcp). At the local level, TMWA periodically works with agency planners to review landscape codes to see if they make sense in the Planning Area's arid, high desert environment.

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.

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.

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 an adequate supply of potable water is available at all times. Discussion of drought and drought planning is presented in Section 8.7.

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 a "price signal" to high volume water users to conserve.

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
The benefits of retrofitting existing plumbing fixtures are publicized through TMWA's Water Watcher Program, publications, bill inserts and its website. At the request of the customer, TMWA staff will provide low-flow shower heads to customers.

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
TMWA works with horticulturists, the NLA and University of Nevada Cooperative Extension ("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 non-functional turf areas and implement non-potable irrigation where appropriate.

TMWA's Landscape Retrofit Fund encompasses promotion of water efficient landscaping in the Truckee Meadows primarily through education. They provided a guide to water-efficient landscaping with ideas for yard designs, irrigation layout, plant selection, and maintenance. TMWA launched an interactive guide which is one of the most visited pages on the website. It also provides local government's financial assistance to reduce turf areas and replace vegetation with drought-tolerant landscaping.

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.

8.5 Ongoing Measures to Conserve Water

In the terminology of water conservation, a *measure* is usually a device that conserves water, such as low-flow showerheads or low-flow toilets. The primary objective in conservation planning is to identify and develop water conservation measures that are likely to be widely adopted by customers in order to produce 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.

8.5.1 Assigned-Day Watering

Since its inception, TMWA has implemented Assigned-Day Watering rules during the irrigation season (approximately April to October). 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 demands for landscape irrigation.

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.

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	No	Yes	No	Yes	No
All "ODD" addressed services	No	No	Yes	No	Yes	No	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.

8.5.2 Water Meters

Over time, TMWA has gradually retrofitted unmetered services with meters. The formal program to retrofit all of TMWA's remaining flat-rate residential services began in earnest in June 1995 and to date has achieved metering of essentially all its service connections. In 2015, TMWA's Board

voted to convert all remaining unmetered services to metered services. Since then, TMWA has maintained a completely metered system.

Being fully metered, SVGID can pinpoint water waste by comparing purchased water values 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.

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.

8.5.3 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.

8.5.4 Use of Other Water-Conserving Fixtures

The RWPC believed that the mandated installation of ULFTs, 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.

8.5.5 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 and pressure monitoring can help detect major leaks in the system. Water purveyors repair 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. TMWA also provides customers with a Water Usage Review Program (described below) which can detect smaller leaks on the customer's side of the meter.

8.5.6 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 enforcement of water waste and watering restrictions.

In 2010, the Cities of Reno and Sparks, and Washoe County adopted ordinances to reflect the three-day-a-week watering program described previously in Section 8.5.1.

8.5.7 Water Usage Review Program (Water Audits)

In 2002, TMWA received funding from the Regional Water Management Fund ("RWMF") to implement a pilot residential water audit program during the summer of 2003. The purpose of the pilot program was to help further regional 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 water usage review consists of checking the meter for low-flow movement or usage history for irregular usage patterns. If detected, the auditor can work with the customer to pinpoint the source of the leak. They can also supply the customer with water-saving devices such as showerheads and faucet aerators and provide other 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 RWMF funding was renewed 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.

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 2019 are detailed in Table 8-4.

Table 8-4 TMWA Customer Water Audits 2003 - 2019

Year	Annual Total	Overall Total
2019	2,079	31,018
2018	2,496	28,939
2017	1,978	26,443
2016	2,108	24,465
2015	2,027	22,357
2014	1,541	20,330
2013	1,523	18,789
2012	1,729	17,266
2011	2,077	15,537
2010	3,415	13,460
2009	2,800	10,045
2008	2,569	7,245
2007	2,110	4,676
2006	731	2,566
2005	894	1,835
2004	497	941
2003	444	444

Customer response to the Water Usage Review program 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; and
- In 2016, analysis conducted on TMWA's Water Usage Review Program indicates that on average, customers reduce their monthly consumption by 9.6 percent after a review has been performed.

8.5.8 Rate Design

Every so often, TMWA conducts an in-depth cost of service study, from which, it develops a customer class-specific rate design. Its water rates are such that customers are charged, to the extent practical, the cost of service incurred by their customer class. This is done by using different

base rates for each customer class (i.e., a customer charge) and various price-tier structures (i.e., a commodity charge). In general, each purveyor employs a multi-tiered, increasing block-rate structure.

8.5.9 Public Education

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

Outdoor Watering

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

TMWA offers ongoing water conservation workshops which are free to the public. Workshops include classes on designing water efficient landscapes as well as starting up and winterizing irrigation systems. TMWA utilizes every opportunity to promote smart 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.tmwa.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 ET Project also can be accessed from the Desert Research Institute.

TMWA published an edition of "*Water-Efficient Landscape Guide*" with ideas for yard designs, irrigation layout, plant selection and maintenance. In 2003, TMWA launched an interactive landscaping webpage that enables customers to obtain individualized information easily. Visit tmwa.com/landscape for more information. TMWA also provides the guide in a printable version at tmwa.com/landscape-guide-print.

TMWA 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 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.

In 2018, TMWA partnered with UNCE and the NLA to provide the Qualified Water-Efficient Landscaper (QWEL) Program. This 4-day, EPA-approved program teaches landscape professionals the skills and best practices for designing, maintaining and auditing a water-conscious landscape within the Truckee Meadows. This class is taught by UNCE and TMWA staff as well as industry experts and is offered twice each year. For more information visit qwel.net.

Non-Functional Turf Conversion

TMWA has in place the Landscape Retrofit Fund. This program provides financial assistance to municipal agencies looking to implement water conservation projects and programs. Since its implementation TMWA has sponsored projects by WCSD, cities' parks departments and UNR.

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 H 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 indicate a healthy lawn, 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.

8.5.10 New Irrigation Technology

Washoe Evapotranspiration Project

Evapotranspiration (ET) is a combination of the word's evaporation and transpiration. Evaporation is the amount of surface water lost directly to the atmosphere while transpiration is the amount of water lost by way of plant uptake that is expelled by plant foliage. ET rates are used for irrigation scheduling and budgeting, and to determine the potential water needs of plants.

The Washoe ET Project was initiated in 1999 with the installation of three weather stations. Additional weather stations were made available through Washoe County and the program has expanded to a total of eight locations. The stations cover a wide geographic area and are located at Wilson Commons Park, Wolf Run Golf Course, UNR Campus at Valley Road, UNR Farms, Mogul Mountain Park, Lazy 5 Regional Park, North Valleys Regional Park and Cold Springs Park. In addition to enhancing the Project, the data collected by the proposed enhancements will serve to provide the following benefits:

- The stations will become part of the Western Regional Climate Center monitoring network and will provided climate specific data for several hydrographic basins that will better define the microclimate conditions which are known to exist in our area.

- The identification, characterization and variability of microclimates can be used as a basis for creating better regulatory policies regarding landscaping requirements throughout the area.

- The data gathered can further be used to help calibrate downscaled global or regional climate and precipitation models to better help simulate observed local conditions.

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 ET 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 situated in a grassy area, as suggested by CIMIS. A data logger, using the modified Penman equation, as suggested by CIMIS, performs data interrogations.

ET Controllers

An ET irrigation controller adjusts the duration and timing of the outdoor watering schedule using ET rates computed from weather data which are 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*).

ET controllers for individual residences, while available, are expensive and not currently in widespread use; however, it is likely that they will become more affordable in the near future. In anticipation of this, the Washoe ET project data will be made available through AgriMet, the Pacific Northwest Cooperative Agricultural Weather Network. At present, most ET controllers access data by way of Satellite or local radio broadcast, which require a fee-based subscription service. AgriMet data is available directly through the internet at no charge to the user. This will allow ET controller manufactures the option to developing internet-based systems which can use home-based local area networks making the units more attractive (cost effective) to residential users.

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.

8.5.11 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.

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: 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 include nutrients that are 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 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.

8.6 Future Water Conservation Initiatives

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

The 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 and QWEL certifications. 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 LID 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 BMPs include design and implementation of:

- Bioretention Areas;
- Swales and Buffer Strips;
- Porous Paving Systems;
- Porous Concrete and Asphalt; and
- 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; and
- 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; and
- 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.

Enforcement of the various entities' landscaping ordinances will 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. It is important for local entities and water purveyors to work together 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 cannot 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.

Sponsored Public Education Program

The NNWPC recommends 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 8-2 is an example illustrating 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/).

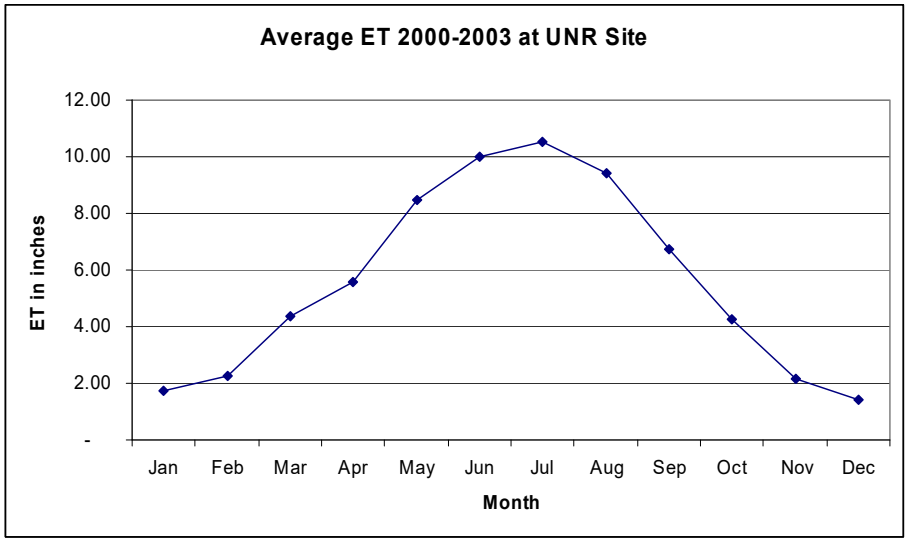


Figure 8-2 Monthly ET Rates

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.

Landscape Award Programs - NLA offers landscape awards for efficient commercial and residential landscape designs.

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 costs of expanding the reclaimed water distribution system to serve individual residential lots, and regulatory oversight, would exceed the benefits. 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, only a few systems have been permitted in Washoe County. Much of this is due to cost of engineering, design, permitting, and construction of these systems which do not produce enough water to be impactful or cost effective. 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 according to American Water Works Association. Sources of unaccounted for water use include unmetered use (e.g., fire hydrant use, main flushing) and unauthorized uses (water theft). 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.

Commercial Faucet Retrofit in Restaurants

The California Urban Water Conservation Council received a $2.2 million grant from the California Public Utilities Commission to replace 16,900 pre-rinse spray valves in restaurants and other food service businesses. The pre-rinse spray valves are used to remove the majority of food waste from dishes and utensils prior to placing them in the dishwasher. Called "Rinse and Save", the program will market free spray valves directly to food service facilities and provide free installation of the valves upon request. The project 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

This program was included as an action item in the 1995 Base Case for conservation, and currently, the practice seems to be more prevalent with the local hotel and motel industry. There is reason to anticipate 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. Additionally, regulatory constraints related to water rights limit water harvesting opportunities.

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. The use of rain-water collection/retention systems may not be allowed in areas where it is deemed to infringe on water rights holders. Health departments responsible for 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; and
- 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 the planning area.

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.

8.7 Drought

Impact to Surface Water Supplies

Some of the water stored in upstream reservoirs is used to maintain a uniform rate of flow in the river at the California/Nevada state line near the town of Floriston, CA. These court-ordered rates of flow in the Truckee River, called Floriston Rates, are sufficient enough to satisfy all of the needs of the downstream water right holders for hydro power production, M&I needs, and agricultural, and fish and wildlife purposes. If adequate reservoir storage is not available to augment the river during low flow conditions, then downstream users must curtail their water use. The summer low-flow runoff 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 the Floriston rates. TMWA has privately owned stored water held in Donner and Independence Lakes, separate from Floriston rate water, 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 high customer demand months that low flow on the Truckee River will have the most impact, and surface water supplies will have to be augmented with groundwater and privately-owned stored water released from TMWA's upstream reserves. In a severe drought, low flows may occur during the early summer months.

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.

Groundwater supplies are an important drinking water source for the region. With the consolidated water systems, TMWA's wells typically supply between 15 and 20 percent of annual, net water production. These wells are critical to providing water to enable TMWA to meet summer peak demands. During extremely dry years when Truckee River water is not plentiful between the months of June and October, TMWA relies more heavily on its wells to me those 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 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).

8.7.1 Drought Contingency Plan

TMWA maintains a detailed Drought Contingency Plan for dealing with drought within the Truckee River Basin. During droughts, TMWA customers will be required to adhere to additional watering restrictions and potentially asked to reduce water use. As a general rule, TMWA uses demand-side management programs ("DMPs") designed to conserve water supplies by limiting water waste, inefficient use, and overuse. Depending on the severity of the drought i TMWA may require enhanced demand-side management programs ("*e*DMPs") 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 use practices in response to a Drought Situation may vary during the year. For more information visit tmwa.com/dcp.

Pursuant to the operating criteria outlined in TROA, the determination of a Drought Situation takes place in April. That determination is based on the forecasted amount of Truckee River water available to provide for Floriston Rates through the end of the year and/or the projected elevation of Lake Tahoe. The Drought Contingency Plan, along with the Planning Area's current water plans, link conservation actions during droughts to the timing of the loss of Floriston Rates during the irrigation season

TMWA developed a Drought Situation Severity Classification system based on past experience gained while operating the system in order to meet customer demand through a number of droughts over the past 25 years. Under a drought situation, according to TROA, when normal Truckee River flows (i.e. Floriston Rates) are projected to still be maintained through Labor Day, no reserves are projected to be used, thus no *e*DMPs are necessary since demands typically begin declining after Labor Day. During a Drought Situation under TROA, where upstream reservoir storage is projected to not be sufficient enough to maintain Floriston Rates in any month before Labor Day, then one of three levels of *e*DMP is identified and actions outlined to ensure customer demands are reduced in the current year. Such actions will help to reduce the amount of drought reserves used to meet demand in the event a successive Drought Situation occurs the following year.

Each level of *e*DMPs depends upon when Floriston Rates are anticipated to be lost. The first *e*DMP TMWA will employ is a comprehensive communication campaign which provides the public with additional information on current water supply conditions and what TMWA will be expecting

from its customers in the coming months. TMWA's Drought severity level is presented in Table 8-5 along with recommended timing for changes in existing conservation measures to occur over the course of a Drought Situation.

Table 8-5 DROUGHT SEVERITY LEVEL RESPONSE TIMELINE CHART

	Outdoor Watering Months					
Level of Severity	May	June	July	August	September	October
	Drought reserves are not needed before Labor Day					
Level 1	Standard Conservation					
	Drought reserves are needed before Labor Day					
Level 2				Drought Reserves Needed		
	Standard Conservation		Enhanced Conservation			Standard Conservation
Level 3			Drought Reserves Needed			
	Standard Conservation	Enhanced Conservation				Standard Conservation
Level 4		Drought Reserves Needed				
	Enhanced Conservation					Standard Conservation

TMWA's conservation actions by severity level is presented in Table 8-6.

Table 8-6 CONSERVATION ACTIONS AND DROUGHT SITUATION SEVERITY

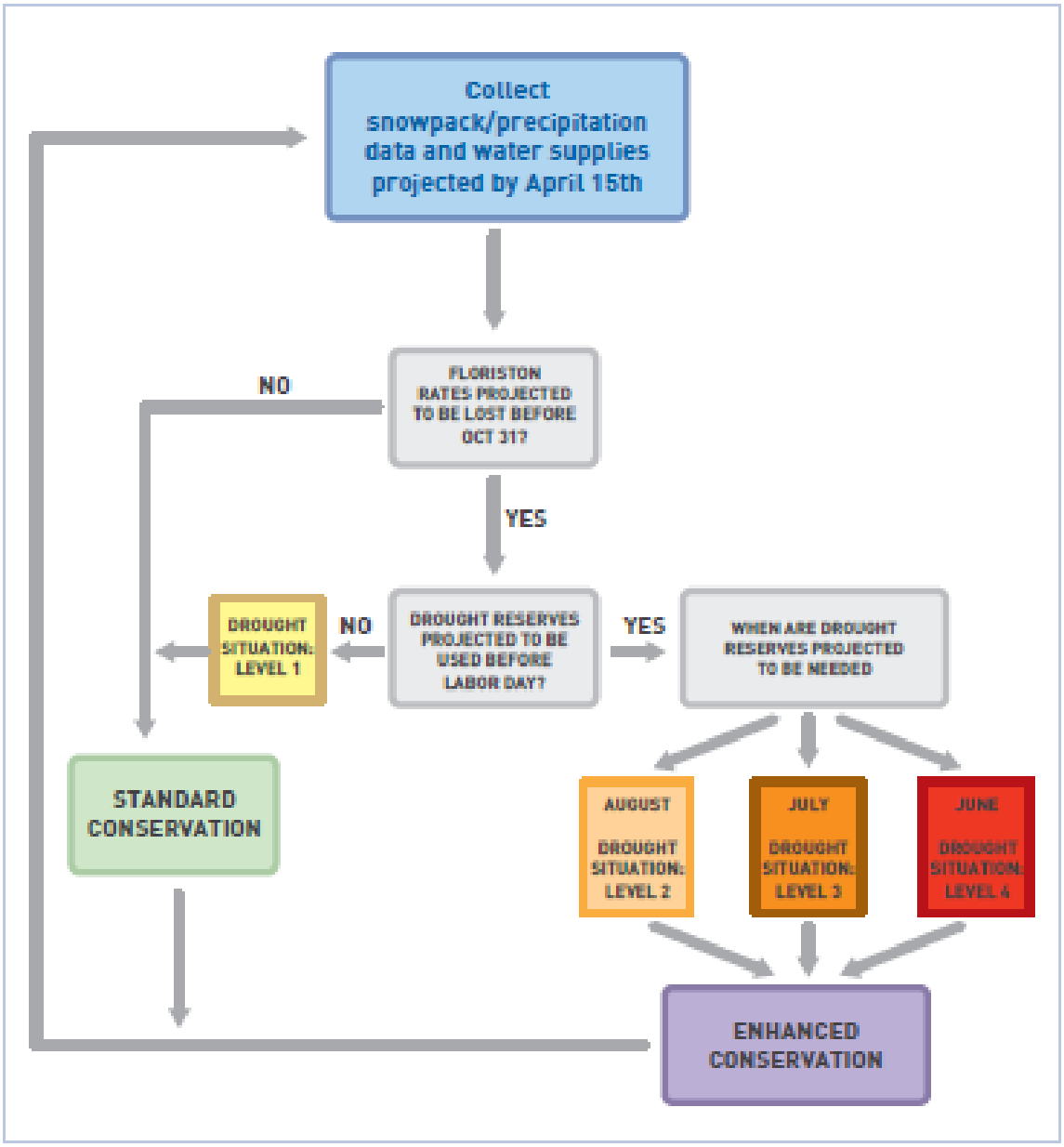
CONSERVATION INITIATIVE	DROUGHT SITUATION LEVEL OF SEVERITY	
	LEVEL 1	LEVEL 2 - 4
Communication and Outreach Campaign	Standard campaign	Enhanced campaign
Water Efficiency Codes	Time-of-day watering: 12a.m. to 6p.m.	Time-of-day watering: 11a.m. to 7p.m.
Water Watcher Programs	Standard staffing level	Increase staffing level
Water Usage Review Program	Standard staffing level	Standard staffing level
Landscape Retrofit Fund	Standard funding level	Standard funding level
Temporary Cutback*	No cutback request	Temporary cutbacks may be requested
Water Pricing Structure**	Standard pricing structure	Drought rates or increased fines may be implemented

* The exact amount of curtailment requested is determined based on projected demand levels, drought storage availability and estimated surface and groundwater available.

** While historically this measure has never been used in the Truckee Meadows, increasing the price of water during a drought has been an effective measure used by other water purveyors.

Figure 8-3 illustrates the process, pursuant to TROA, to determine if a Drought Situation exists and then assesses the level of severity that the Drought Situation may have on TMWA's drought reserves in order to develop an action timeline to deploy *e*DMPs along with an accompanying communication plan to meet the targeted reduction in annual water demands.

Figure 8-3 Drought Severity Level Flowchart



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.

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