

TOPAZ LODGE WATER COMPANY CONSERVATION PLAN

February 2008



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INTRODUCTION

Topaz Lake, NV is located in the southern most part of Douglas County along US Highway 395, approximately 20 miles south of the Minden/Gardnerville area. It is a small rural community consisting of a large percentage of retirees. The Topaz Lake Recreation Area provides many recreational and scenic opportunities to residents and visitors alike. The Topaz Lodge Resort is a small resort adjacent to Topaz Lake that has lodging, gaming, restaurants, and an RV park. The Topaz Lodge Water Company provides water to the Topaz Lodge Resort and also serves a few residential homes adjacent to the property. The water system was purchased in the 1980's and most of the older lines were replaced at that time. The Topaz Lodge Water Company's water system consists of one storage tank, three wells, and distribution pipes.

The Topaz Lodge Water Company's water system is very small. The total number of active connections to the water system as of November 2007 is 15 (13 residential, 1 commercial, and the Topaz Lodge Resort). Due to the small size of the system, the connections are not metered and a flat monthly rate is assessed which includes unlimited water usage. Residential connections are charged \$15.00 per month, the commercial connection is charged \$60.00 per month, and the Topaz Lodge Resort pays for the remainder of the expenses. The current rate schedule was adopted sometime between years 2001 to 2002 and there are currently no plans to change the rates or the structure.

Despite the use of un-metered connections, the comparison of pumping data from the months of November 2004 – October 2005 to the same months in 2005-2006 and 2006-2007 shows that, on average, there was a decrease in the total water pumped from the three wells to supply water to the Topaz Lodge Water Company's customers. Between the three study years the water pumping was reduced by an annual average of 13%.

This conservation plan has been created with the above mentioned in mind, and includes the following:

- Conservation Goals
- Existing and planned conservation measures and incentives
- Topaz Lodge Water Company's water system use profile
- Educational Materials

This plan is compliant with Nevada Revised Statutes (NRS) Sections 540.121 through 540.151 and is available for public inspection during office hours at the following location:

**Topaz Lodge Resort
1979 Highway 395 South
Gardnerville, NV 89410
(775) 266-3338 ext.232**

Public Comments about this plan are encouraged. Written comments may be sent to the address above.

SECTION 1 – CONSERVATION GOALS

The following goals have been selected to begin building a conservation conscious community within the Topaz Lodge Water Company's customers. As the residents become more conservation minded and adopt conservation practices, these goals will be increased in scope, and new ones will be added through periodic revision of the Conservation Plan.

1.1 Reduce Water Usage

The primary objective of the conservation plan is to help the Topaz Lodge Water Company and its customers meet and possibly exceed the conservation goals stated in this section. The primary goal of this plan is to continue to reduce the consumption of water which is extracted from the various water sources 10% by the year 2012.

The Topaz Lodge Water Company will continue to maintain accurate monthly pumping records from each of the three source wells and perform yearly audits and comparisons to the previous years' pumping rates. Results from the initial audit will be compared with those of subsequent audits in order to determine the effectiveness of measures and/or incentives (see Appendix A for examples on conservation measures). If there is a decrease in usage as a result of a particular measure or incentive, that incentive or measure can be expanded, if possible, to maximize efficiency. If it is discovered that a particular measure or incentive is ineffective, it will be discontinued and a new one will then be implemented to take its place.

1.2 Establishment of a Conservation Budget

Currently the Topaz Lodge Water Company does not have money set aside for conservation purposes. Funding will be needed to implement conservation incentives and/or measures. Budget money will be set aside to pay for the purchase and distribution of conservation education materials and to pay for the administrative costs associated with the creation of programs and procedures. Since the Topaz Lodge Water Company's revenue is extremely limited (with monthly revenues approximately \$255), the budget set aside will not be substantial.

1.3 Creation of a Conservation Education Program

The creation of an education program will be done in stages. The first stage will be to provide links to water conservation sites on the Topaz Lodge Resort's website (see Appendix B for examples). The second stage will be to distribute educational materials (see Appendix C for examples). Conservation materials may be made available at the Topaz Lodge Resort, distributed by mail, and/or hand delivered. After evaluating the success of these initial stages, the program will be fine tuned in order to maximize efforts and expense.

1.4 Increase Community Participation in Conservation

A key objective of this plan is to increase public awareness of the limited supply of water in Nevada and the need to conserve water. A successful educational program provides information to the public that motivates and helps water users in their efforts to conserve. Educational

materials and resources can include home & landscape guides and mailers. Regardless of the type of educational resources that are used, the most important consideration is their content and if the information is disseminated successfully.

1.5 Creation/Expansion of Water Watcher Procedures

The Topaz Lodge Water Company does not currently have full time personnel assigned to solely monitor water waste; however, the Topaz Lodge Resort currently has procedures and techniques in place for employees to report water waste to maintenance for repair. Residential customers are not monitored full-time for water waste; however, the majority of the residential customers currently do not have significant sized lawns. Water problems are reported to the Topaz Lodge Water Company by its users and due to the small number of residential connections, full-time monitoring is not necessary at this time. There is value in continuing to train personnel in conservation management practices and techniques so that waste can be prevented and managed. The Topaz Lodge Resort (being the biggest single water user from the system) will expand upon and continue with procedures already in place for employees to watch out for and report any equipment waste such as leaky faucets/dishwashers/equipment, sprinkler over-spray/problems, constantly running toilets, etc. to maintenance for repair.

1.6 Encourage the Topaz Lodge Resort's Guests to Conserve Water

The Topaz Lodge Resort is the main water user in the system. Techniques currently in place to reduce water within the everyday operating procedures will be evaluated for effectiveness. All areas throughout the resort (hotel, restaurants, and casino floor) can be evaluated for water usage, and the current plan to encourage guests to conserve water can be evaluated for effectiveness. Currently, the Topaz Lodge Resort has implemented a plan including the following: informing guests that are staying more than one day to request sheets and blankets to be laundered, putting towels in the tub when they need to be changed, only serving water upon request in the restaurants, etc. An evaluation of the effectiveness of the plan will be performed and a determination to continue, expand upon, or discontinue the plan can be made based on the results.

1.7 Encourage Voluntary Watering Time Restrictions

The climate of Douglas County is continental. The summers are short (and often hot) and the winters are moderately cold (and often wet). The Sierra Nevada effectively reduces the moisture content of storms that sweep inland from the Pacific Ocean. The Western Regional Climate Center reports maximum average temperatures for the months of July and August as 90.4°F and 88.9°F, respectively for the Topaz Lake area. A plan to discourage customers of the Topaz Lodge Water Company from landscape watering during the hottest parts of the day (typically 12pm to 5pm) during the July and August months will be drafted and implemented. Due to the small nature of the Topaz Lodge Water Company, the plan will focus on educating users about water evaporation and effective root growth for their lawns. The current landscape watering schedule (during the summer) at the Topaz Lodge Resort is between midnight and 6:00 a.m. Topaz Lodge Resort's maintenance crew will verify that the Lodge's current landscape watering schedule does not occur during the hottest times of the day. The intent of the watering time

restrictions is not to limit landscape options, but to help customers optimize the efficiency of water use. In addition to a voluntary watering time restriction, the Topaz Lodge Water Company will encourage landscaping with a reduction in lawn size and adding native plants that thrive in Northern Nevada requiring minimal water consumption. Appendix D shows a list of these native plants.

1.8 Identify and Reduce Water Loss

The Topaz Lodge Water Company will strive to reduce the amount of water extracted from the various sources vs. the water actually delivered to customers through a system of identifying and reducing leaks in the water distribution system, servicing the system valves and connections, and considering the installation of meters on all connections. Due to the small nature of the Topaz Lodge Water Company and the limited revenues received from the customers, meter installation will be considered as a potential future option. Any future new or repaired connections onto the system will be considered for metering. Appendix E gives informative directions for consumers on the how-to's of reading a meter.

1.9 Conservation Plan Implementation Schedule

The conservation measures and incentives in this plan will be implemented according to the following schedule (see section 6 for detailed descriptions of incentives and measures included in the schedule):

Table 1.1
Plan Implementation Schedule

	2008	2009	2010
<i>Incentives</i>			
Annual Pumping Audit	Implement		
Conservation Education Program	Implement		
Encourage Conservation	Implement		
<i>Measures</i>			
Establish a Conservation Budget	Implement		
Voluntary Watering Time Restrictions	Implement		
Creation of Water Watchers Procedures	Draft	Implement	
Identify and Reduce System Leaks	Draft	Implement	

The annual pumping audit will help determine if the schedule needs to be adjusted to accommodate the implementation of new measures or incentives or the discontinuation of old ones.

1.10 Conservation Plan Review

This plan will be reviewed and revised every five (5) years. Plan adoption and revision will conform to NRS 540.131 (2) and (4). Per these sections any interested person shall have the opportunity, “including, but not limited to, any private or public entity that supplies water for municipal, industrial or domestic purposes, to submit written views and recommendations in the plan.” Every revision will be made available for inspection by these persons or entities.

SECTION 2 – WATER USE PROFILE AND FORECAST

This section details the production and usage rates of the Topaz Lodge Water Company Water System, including:

- Water Rights
- Existing Supply Sources
- Water use profile
- Water use forecast using projected population growth

2.1 Water Rights

Topaz Lodge Water Company holds title to several underground water rights in the Carson Valley Basin, with a combined duty not to exceed 23.46 million gallons annually or 72 acre-feet annually. Table 2.1 is a summary of the current water rights permits and certificates held by the Topaz Lodge Water Company.

**Table 2.1
Summary of Water Rights**

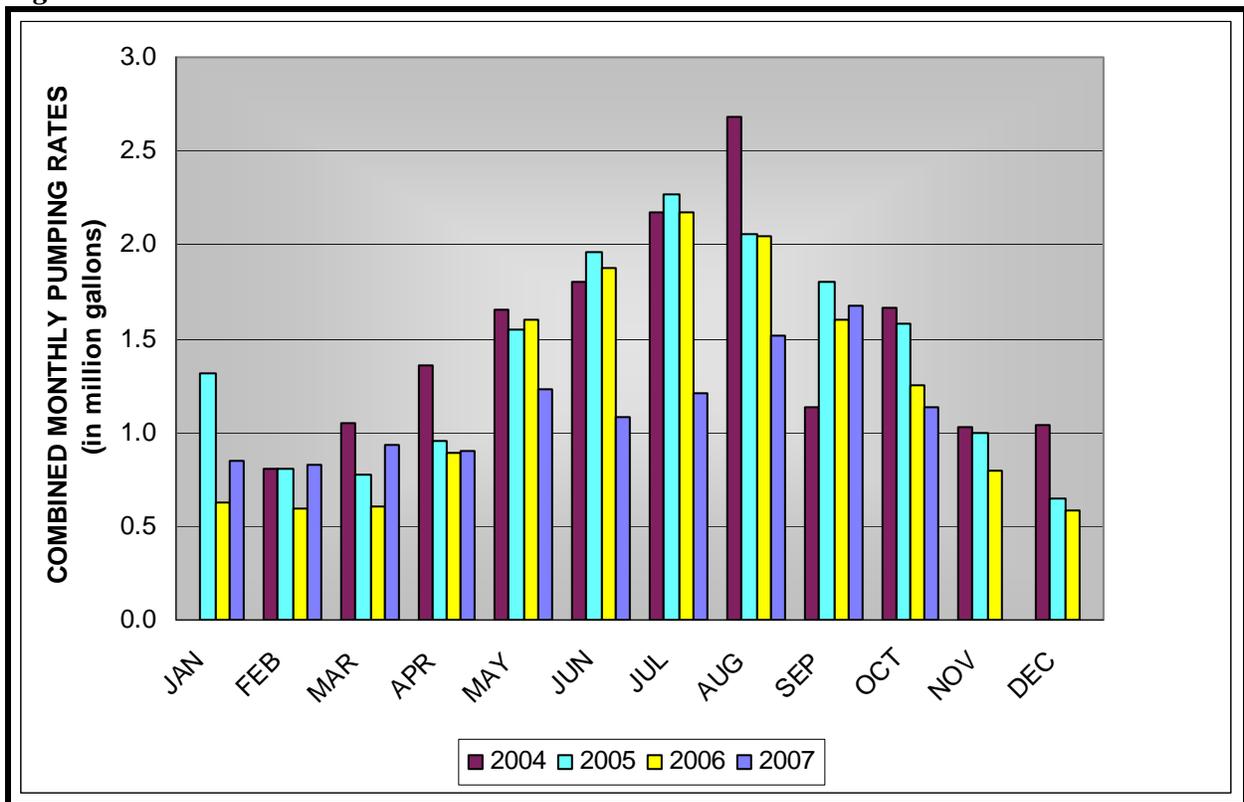
<u>Source</u>	<u>Owner</u>	<u>Permit Numbers</u>	<u>Max Rate of Diversion (CFS)</u>	<u>Max Annual Use (AFA)</u>	<u>Max Annual Use (MGA)</u>
Wells #1 & #2	Topaz Lodge Water Company	48040	0.50	34.05	11.094
		48041	0.50	31.46	10.25
		48299	0.04325	5.14	1.676
		48300	0.12365	7.73	2.52
		67426*	0.10	21.28	6.935
		Total Duty	1.2669	99.66	32.47
		Not to Exceed		55.874	18.2
Well #3	Topaz Lodge Water Company	53073**	0.30	16.4	5.26
		16245	0.30	6.45	2.10
		Total Duty	.6	22.85	7.36
		Not to Exceed		16.148	5.26
TOTAL SYSTEM NOT TO EXCEED				72.022	23.46
Notes:					
* Permit 67426 : The total combined duty of water under Permits 48040, Certificate 14943; 48041, Certificate 14944; 48299, Certificate 14945; 48300, Certificate 14946; and Permit 67426 shall not exceed 18,200,000 gallons annually or 55.85 acre-feet annually.					
** Permit 53073 : The total combined duty of water under Permits 53073, 16425, Certificate 5398 shall not exceed 5,260,000 gallons annually or 16.15 acre-feet annually.					

2.2 Supply Sources and Production

Production

The Topaz Lodge Water Company has three production wells (Well #1, Well #2, and Well #3), which can produce 60 gpm, 35 gpm, and 58 gpm, respectively. Well #1 was recently upgraded with a new pump, motor, and a section of piping increasing its capacity from 35 gpm to 60 gpm. Monthly records of groundwater pumping are recorded and kept when the operator visits the well sites on the first day of each month. Monthly pumping records were obtained from February 1, 2004 through November 1, 2007 for all three of the wells. Average groundwater pumping over this timeframe was 1,300,000 gallons per month. Peak monthly usage was recorded in August of 2004 at 2,680,802 gallons. Average daily pumping is approximately 44,000 gallons, while peak daily pumping (August 2004) was approximately 86,500 gallons. Figure 2.1 details the well production for 2004, 2005, 2006, and 2007. The wells have not been pulled for inspection for over 14 years; however, the on-site operator felt that they were in good working conditions.

Figure 2.1: Well Production



Storage

There is one 300,000 gallon capacity storage tank located northwest of the Lodge, approximately ½ mile off of US395 on BLM land, just north of the Topaz Lodge Resort. The tank has not recently been inspected; however, the on-site operator felt that all the facilities are currently in good working condition.

Effluent

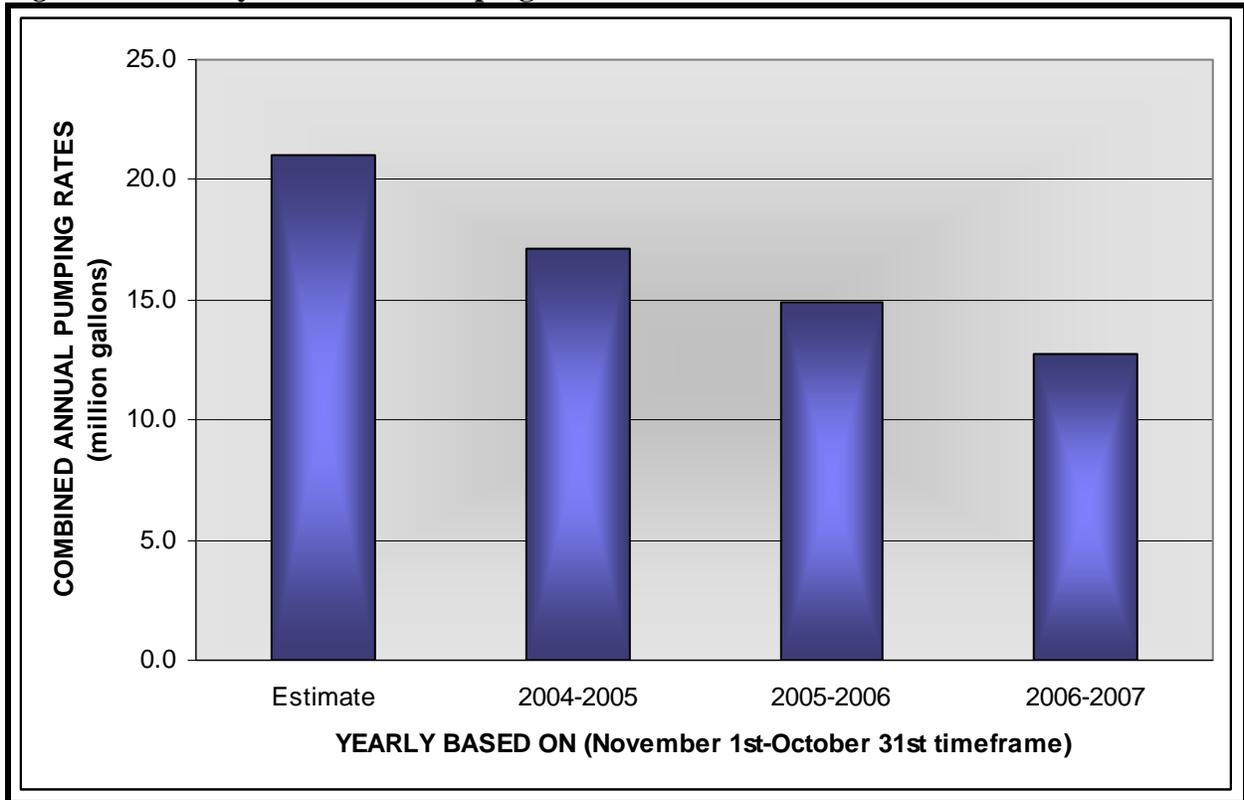
The Topaz Lodge Resort customers currently have individual septic systems installed to handle their wastewater. Due to the small nature of the system, there is no current wastewater treatment for the system. Reclaimed water for irrigation purposes is not available to the water system. Currently, only a few of the homes have small landscaped yards and the Topaz Lodge Resort has a minimal lawn. Effluent reuse would not significantly benefit the water system (at the current time). If the system were to increase significantly in size, needing a wastewater treatment plant, effluent pipes will be considered as an option for irrigation.

2.3 Water Use Profile

The Topaz Lodge Water Company's users consist of 13 residential customers, one commercial customer, and the Topaz Lodge Resort. Customers are billed monthly on a flat rate of \$15.00/residential, \$60.00/commercial, and the Topaz Lodge pays for the remainder of the cost to run the system. Because there are no meters currently installed on any of the system's connections, water use estimations were performed. Residential usage was based on the average within Douglas County of 230 gallons per capita per day and 2.5 persons per household (575 gallons per residential connection per day). Based on these estimations the 13 residential connections use an estimated total combined average of 7,475 gallons per day (2.75 million gallons annually). The Topaz Lodge Resort and the commercial usage were based on the projected water demand (Exhibit "A" from Permit No. 67426 dated April 12, 2002). The estimated demand for the Topaz Lodge Resort (including the RV Park, motel, store, gas station, casino expansion, restaurant, and landscaping) was 18.2 million gallons annually. The total estimated amount of water for the Topaz Lodge Water Company is approximately 21 million gallons annually.

Yearly combined pumping records for the Topaz Lodge Water Company's three wells were obtained for the timeframe between February 2004 and October 2007. Full year records (January to December) were not available for the 2004 and 2007 years. Full years were taken from November 1 to October 31 for three consecutive timeframes between 2004 through 2007 and are shown in Figure 2.2.

Figure 2.2: Yearly Combined Pumping:



The amount of gallons used per year in the Topaz Lodge Water Company’s service area in the 2004-2005, 2005-2006, and 2006-2007 timeframes were 17.1 million gallons annually, 14.9 million gallons annually, and 12.7 million gallons annually, respectively. The total annual average usage was estimated at 21 million gallons annually based on regional estimations and permitting estimations. The past 3 years pumping records indicate a trend towards a water reduction of approximately 2.2 million gallons annually. This corresponds with a decrease of between 12% and 15% annually and is below the estimated annual water usage. The decrease in water consumption can be reflective of the fire that took place at the Topaz Lodge Resort and the slower business during the reconstruction.

2.4 Water Demand Forecast

The total number of customers in the Topaz Lodge Water Company’s service area has stayed fairly constant. With the exception of possible expansions to the Topaz Lodge Resort there are no immediate plans to allow future growth the capability to utilize the water system. The Topaz Lake area has experienced below average amounts of growth as compared to other areas in Douglas County. With the current customer base and population trends, it would take a significant amount of time for the water demand for the Topaz Lodge Water Company to increase significantly, so a water demand forecast is unnecessary at this time.

2.5 Estimated Amount of Water Conserved Due to Measures and Incentives

Currently the Topaz Lodge Water Company's connections are not on meters so the amount of conservation due to measures and incentives was based on the recorded well productions. Typically smaller systems lose between 5%-10% of the actual water pumped to losses that are unaccounted for and/or wasted. This conservation plan applies 10% of the total water pumped as being wasted. Table 2.2 shows the estimated amount of water lost over the same three year timeframe as the production previously indicated in Section 2.3 (November 1 through October 31 from 2004 to 2007).

Table 2.2
Topaz Lodge Water Company's
Estimated Unaccounted Water Waste

November 1 through October 31 (Million Gallons Annually)		
2004-2005	2005-2006	2006-2007
1.71	1.49	1.27

The main goal of the conservation plan is to conserve the Topaz Lodge Water Company's water due to consumption waste and losses by 10% by the year 2012. A 10% reduction in the use of water by the year 2012 amounts to a reduction to the annual pumping rate from the current 12.7 million gallons annually to 11.4 million gallons annually by the year 2012. The water system's main consumer is the Topaz Lodge Resort and the majority of the planned water consumption will come from conservation incentives and measures within the Resort itself. According to a study by the American Hotel and Lodging Association, the average occupied hotel room consumes about 209 gallons of water per day, just short of the average 243 gallons of water per household per day. The resort has approximately 100 available rooms, casino, restaurant, RV park, gas station, and general store.

Through measures and incentives the Topaz Lodge Resort is expected to conserve the most substantial portion of the 10% goal reduction, however through education (see Section 3.2) residential applications can conserve a portion of this 10% goal as well. The average residential water consumption in Douglas County is 575 gallons per household per day (based on 230 gallons per day and 2.5 persons per household). In order to estimate the amount of annual water saved by the thirteen residential connections, the EPA's data for the range of residential use per person per day was utilized. The EPA gives a range of residential water consumption use based on a national average. Table 2.3 (see also Appendix F) shows the range of residential use per person per day.

TABLE 2.3
Range of Residential Water Use in Gallons per Day (EPA Estimates)

Use	Per Person (Low)	Per Person (High)
Toilets	6.4	48.00
Showers	7.50	75.00
Baths	6.00	10.00
Washing Machine	9.00	25.00
Dish Washer	1.00	4.50
Kitchen Faucet	1.00	15.00
Bathroom Faucet	1.00	9.00
Landscape	13.97	186.3
Total	45.9	372.8

The population estimation for the thirteen residential connections is 33 persons (Douglas County 2.5 persons per household on average). Based on this population and the EPA ranges of water consumption per day, the water supply to the combined residential connections is expected to be between 1,515 gallons per day (low) to 12,300 gallons per day (high). The low value of 1,515 gallons per day may be unrealistic due to the nature of Nevada being such a dry state. The use for the Topaz Lodge Water Company’s residential connections is estimated based on Douglas County’s average of 230 gallons per person per day. The application of residential conservation measures and incentives encouraged through education (see Section 3.2) could reduce the 230 gallons per person per day average. Table 2.4 shows new averages that can be achieved based on a percentage of the population learning more efficient ways to conserve water and reducing water consumption by 20% to 185 gallons per person per day.

TABLE 2.4
Residential Conservation Resulting from Education

% of Population Consuming 185 gallons/day	New Average (Gallons Per Capita Per Day)	Amount Conserved Annually (in Million Gallons)
25	219.1	.13
50	206.8	.28
75	195.9	.41

*Table assumes constant population numbers. Current total system residential water consumption estimated at 2.77 million gallons per day.

The amounts in Table 2.4 (previous) are what amounts would be expected from the residential portion of the Topaz Lodge Water Company’s residential connections as a result of conservation education. A range is provided because it is difficult to determine the exact response to educational efforts. Table 2.5 shows the remainder that the Topaz Lodge Resort and the commercial connection would need to conserve in order to meet the 10% reduction by the year 2012.

TABLE 2.5
Conservation Estimations Based on Source

Conservation Source	Amount Conserved Annually (in Million Gallons)		
	% Residential Contribution		
	25%	50%	75%
Residential Conservation	.13	.28	.41
Total 10% Goal Conservation	1.27	1.27	1.27
Required Topaz Lodge/Commercial Conservation	1.14	.99	.86

2.6 Impact of Prior Conservation Efforts Requirements

Currently the Topaz Lodge Water System already actively conducts some forms of water conservation. The Topaz Lodge Resort only launders towels, sheets, bedding when requested, only offers water in the restaurant upon request, waters the landscaping between the hours of midnight and 6:00 a.m., has procedures and policies in place for employees to report water waste/equipment failure, and monitors if there is excessive pumping that is not normal. There has been no recorded impact from these prior water conservation efforts; however, the water pumping trends over the 2004-2007 timeframe indicates that the Topaz Lodge Water System is continuing to reduce its water usage (from 18 million gallons to 14 million gallons annual pumping). The most recent 2006-2007 timeframe shows a significant decrease in the amount of water usage; however, that could be attributed to the fire that destroyed portions of the Topaz Lodge Resort and the corresponding decrease in customers to the Lodge while remodeling was taking place.

SECTION 3 – CONSERVATION INCENTIVES

3.1 Financial Conservation Incentives

Water Rates

Due to the small size of the system and un-metered connections, the Topaz Lodge Water Company currently uses a flat rate for its customers. Residential connections are charged \$15.00 per month and the commercial connection is charged \$60.00 per month for an unlimited amount of water usage. The Topaz Lodge Resort pays the remainder of the costs to run the system. The current rate schedule was adopted sometime between years 2001 to 2002 and there are currently no plans to change the rates or the structure. Table 3.1 (below) summarizes the system’s water rate schedule.

**Table 3.1
Topaz Lodge Water Company’s Water Rate Schedule**

	Flat Rate	
Billing	Residential Connection	Commercial Connection
Monthly	\$15.00	\$60.00
Note: Remainder of expenses paid by the Topaz Lodge Resort		

Introducing and implementing an inclining block rate structure to a water system is an additional way a water system can encourage conservation. The purpose of an inclining block schedule is to encourage the reduction in water that each individual consumer uses by charging for the actual amount used, thereby rewarding those who do not use as much water. Water rates would increase based on the actual consumption. An example of an inclining block rate schedule is shown in Table 3.2 below. An inclining block rate schedule can only be implemented if all of the water connections are on meters. Due to the Topaz Lodge Water Company’s limited revenue, metering all connections is not currently feasible. If revenues become available to meter all of the connections, an inclining block rate structure will be considered for implementation.

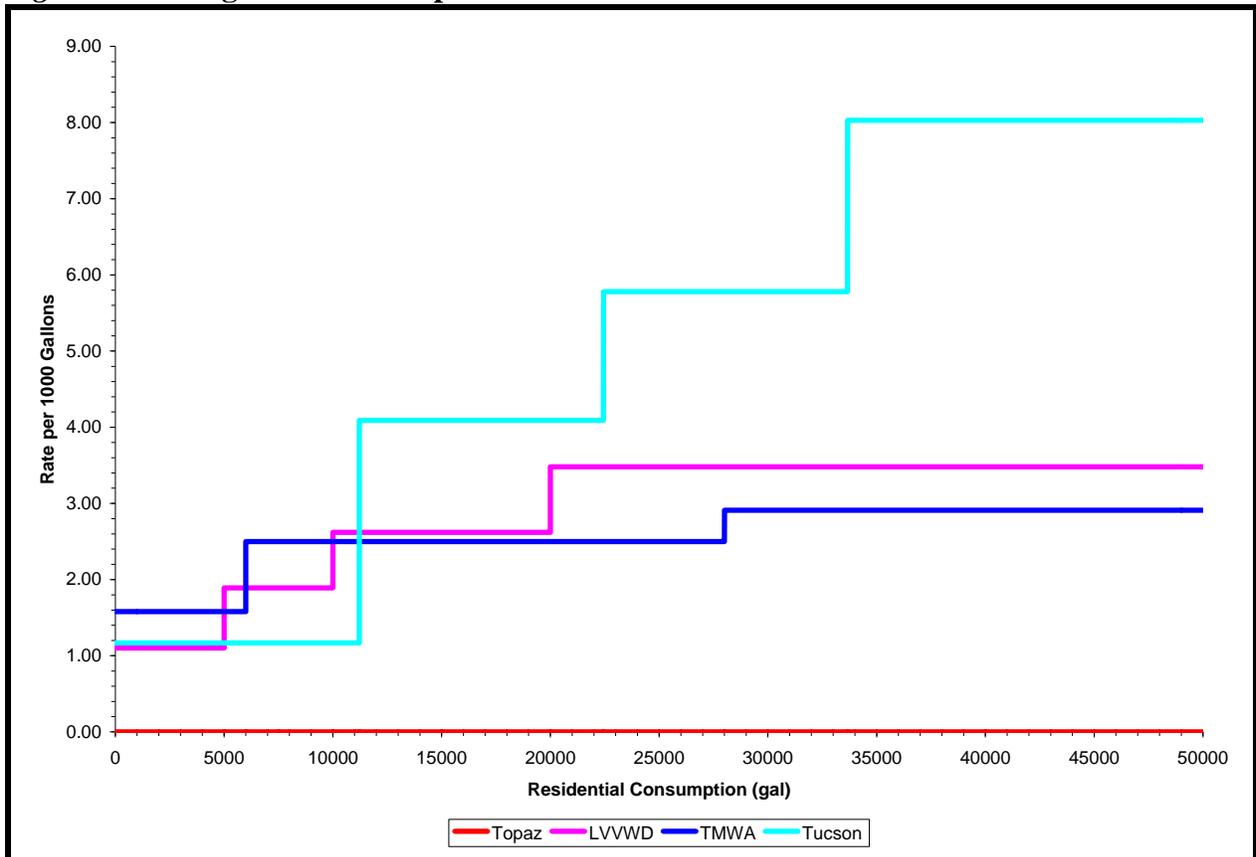
**Table 3.2
Example Water Rate Schedule**

Billing Tier	Base Rate	Rate for Each 1000 Gallons Used	Gallons of usage included in each billing tier
Base Rate	\$27.50	-	0-10,000
Tier 2	-	\$3.25	10,001-20,000
Tier 3	-	\$3.60	20,001-30,000
Tier 4	-	\$4.00	30,001-40,000
Tier 5	-	\$4.00	40,001-50,000

Marginal Rate Comparison

Water companies that have an inclining block as its rate structure have “tiers” for each level of water usage and the rate increases (per 1,000 gallons) as a consumer enters into the next tier. The marginal rate is the rate that a consumer is charged per 1,000 gallons of water within each tier. Figure 3.1 shows the marginal price comparison curves for Las Vegas Valley Water District (LVVWD), Truckee Meadows Water Authority (TMWA), Tucson Water (Tucson), and the Topaz Lodge Water Company. The curves are shown together to illustrate the different approaches to rate-related conservation. Note that the Tucson curve starts lower than the others but increases substantially in the second tier and remains higher than the others from that point forward. Also note that the rate structure for the Topaz Lodge Water Company is a straight line at \$0.00 because it currently does not have meters on any of its connections and could not feasibly charge customers based on the amount of water used. If, in the future, it were to become financially feasible for the Topaz Lodge Water Company to meter its connections, a marginal rate that promotes water conservation will be considered.

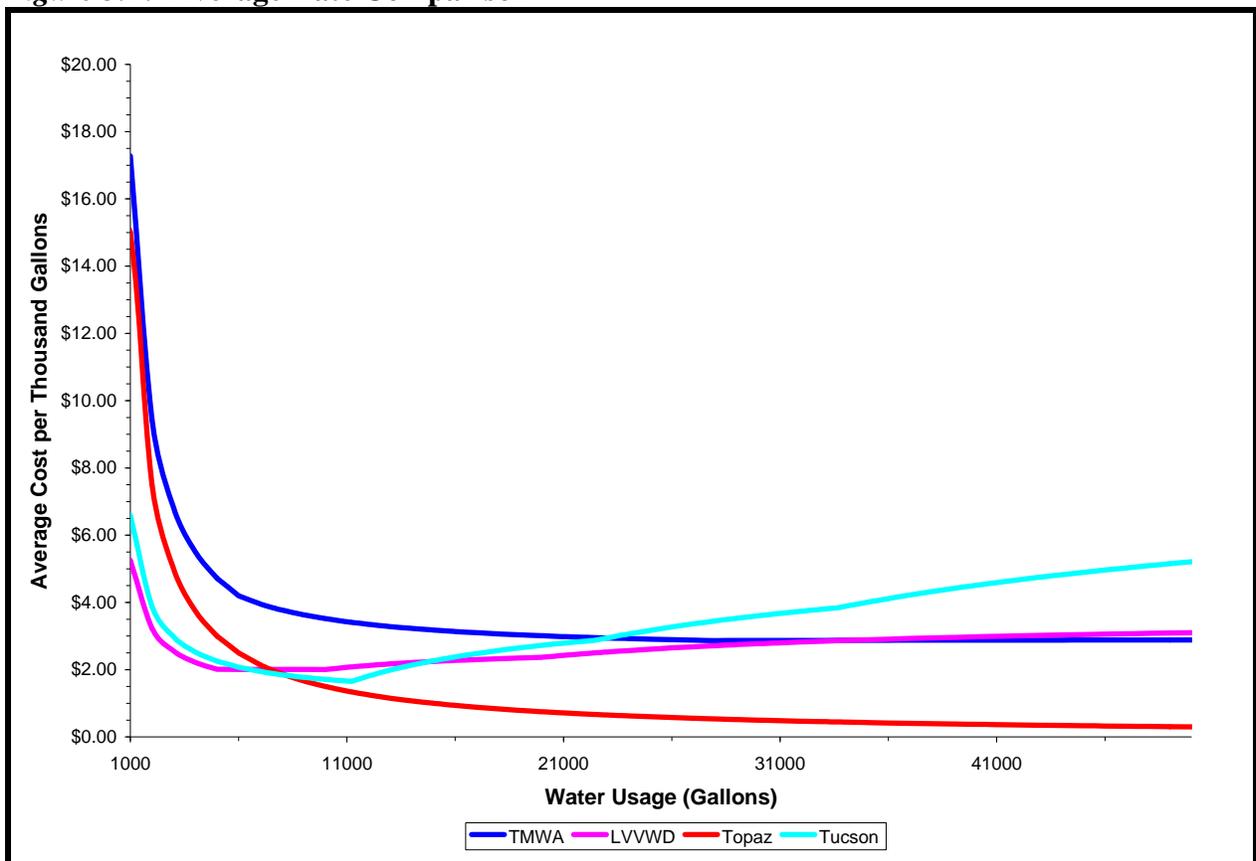
Figure 3.1: Marginal Rate Comparison



Average Rate Comparison

Although the marginal rates in Figure 3.1 show the price of water increasing with use, it is actually the average price per unit that has the greatest impact on conservation. Figure 3.2 shows the average price per thousand gallons for each system. Tucson's average price per thousand gallons increases sharply at high consumption levels (going from under \$2.00 to over \$5.00 per thousand gallons of water usage when water usage is increased from 10,000 gallons to 40,000 gallons per month). Topaz Lodge Water Company starts out high because it is a flat rate of \$15.00 per month (if the customer only uses 1,000 gallons of water in a month they will pay the same amount as a consumer using 40,000 gallons per month so the price per 1,000 gallons starts out high then decreases with an increase in water usage). This type of rate structure does not promote the conservation of water; however, it is currently not financially feasible to install meters on the small number of Topaz Lodge Water Company's connections. Rates used for both figures were taken from the websites of the included systems. If, in the future, it were to become financially feasible for the Topaz Lodge Water Company to meter its connections, an average rate per thousand gallons that would promote water conservation will be considered.

Figure 3.2: Average Rate Comparison



3.2 Educational Conservation Incentives

3.2.1 Literature

The American Water Works Association (AWWA) and the University of Nevada Reno Cooperative Extension Service publish a number of water conservation related pamphlets that will be distributed by the water system. Some of these pamphlets will be selected by the water system to be distributed to customers and made available at the water system office.

A guide like the one in Figure 3.1 can be distributed by Topaz Lodge Water Company to existing and new customers when they start their water service and contains suggestions for indoor and outdoor residential water conservation. The guide also provides instructions on basic leak repair and encourages the installation of water saving devices. Table signs can be used in restaurants to inform patrons that if they want water they must request it. These signs can be obtained from the AWWA. Figure 3.2 is an example of such a sign.

The educational literature included in this conservation plan is for reference purposes only. Additional included literature is included in Appendix C and is intended to be a resource for ideas that can be implemented if more conservation incentives become necessary and if the Topaz Lodge Water Company budget can support such incentives.

Figure 3.1: Pershing County Water Conservation Guide and Sample Page

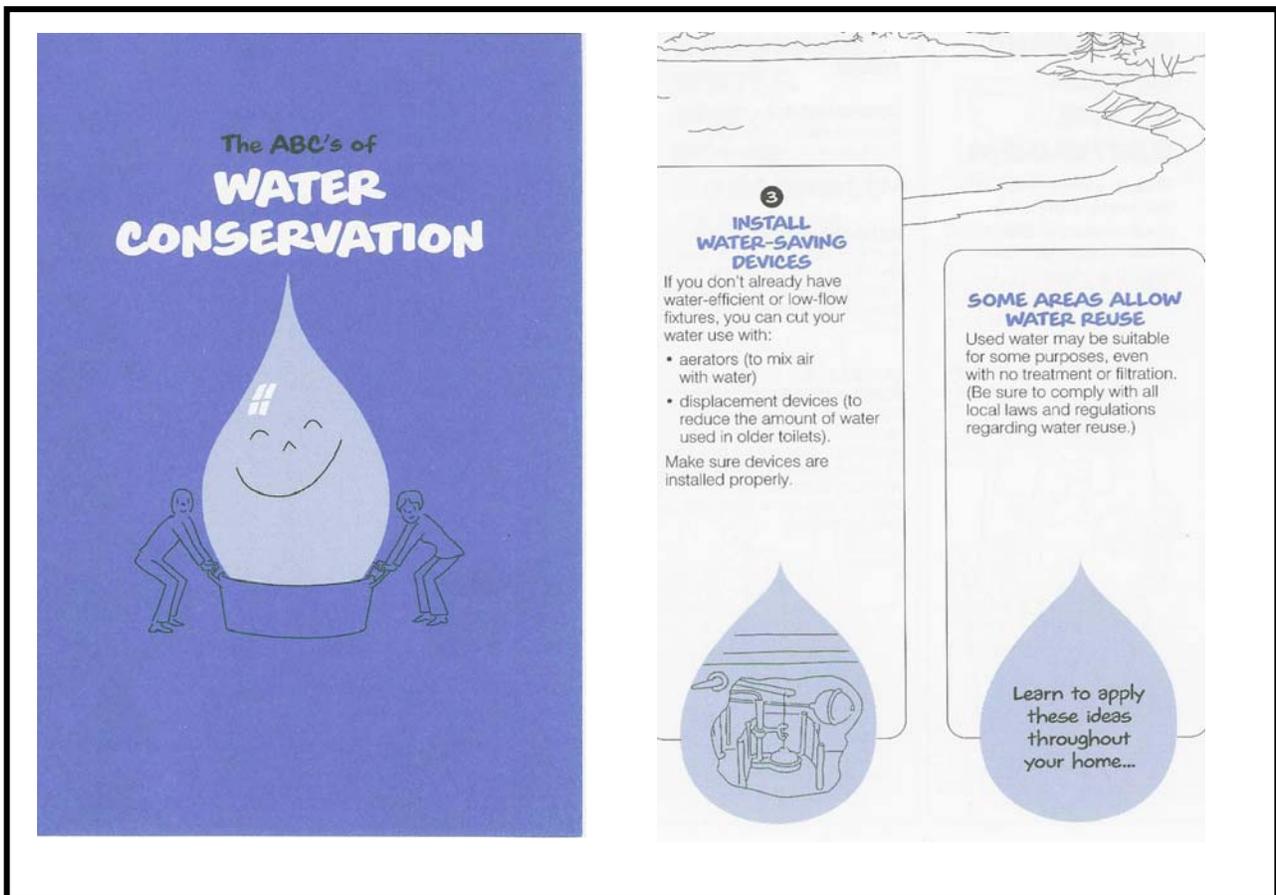


Figure 3.2: Table Tents for Use in Restaurants



3.2.2 Conservation Websites

Internet websites are also a good way to distribute water conservation information and can be less expensive than published materials. Many existing websites contain instructional information on the following subjects:

- Xeriscaping
- Irrigation
- Rebates
- Watering Schedules
- Water Rates
- Lawn Care
- Water Saving Appliances
- Meter Reading Instructions
- Leak Detection Tips
- Water Conservation Tips
- Water Audit Forms
- Water Waste Report Forms
- Water Use Exemptions
- Water Conservation Plan

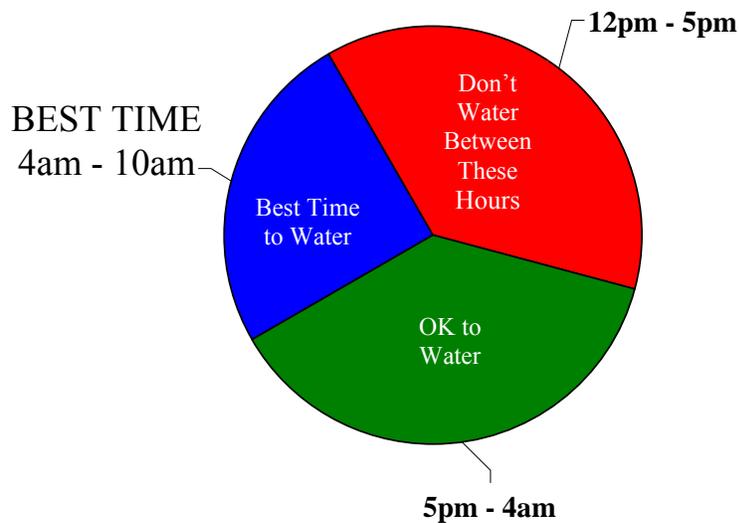
Appendix B contains a list of websites that contain water conservation information.

3.3 Regulatory Conservation Incentives

3.3.1 Watering Schedule Regulations: A popular conservation practice is to implement a watering schedule for customers to follow. Effective plans typically restrict the number of days during the week and the time of day a customer is allowed to water their landscaping. This method is usually based on addresses, with even numbered addresses watering on certain days, such as Sunday and Thursday, and odd numbered addresses watering on other days, such as Wednesday and Saturday. A watering schedule typically prohibits watering between the hours of 1:00 and 5:00 p.m. when the temperatures are hotter, and evaporation is more of an issue.

The Topaz Lodge Water Company’s consumers will be encouraged to water only on certain days of the week and a voluntary watering time restriction will be implemented in order to prevent waste of water to evaporation. The Topaz Lodge Water Company does not currently have the authority to institute codes and restrictions; however, a voluntary watering time restriction can be implemented and encouraged amongst its residential users and the Topaz Lodge Resort. Since one of the goals of this plan is to draft such a voluntary time restriction, some basic guidelines are included here to be used its creation. Watering is allowed at any time except between 12:00 p.m. and 5:00 p.m. which is the time of highest daytime temperatures. Figure 3.3 shows the ideal watering times.

Figure 3.3: Ideal Watering Times in Topaz Lodge Water Company Service Area



Purpose

The purpose of the voluntary landscape watering time restrictions will include education materials describing the area’s temperatures and amounts of evaporation related to these temperatures, the amount of water that can be saved from not watering during the day’s hottest times, efficient lawn root growth requirements, as well as additional ways to conserve landscaping water. All of these elements will be considered and included in the plan.

Definitions

All terms in the voluntary plan must be specifically defined and examples will be given. For example, a watering restriction time will be established and the Topaz Lodge Resort will be the first to set the example.

Applications

The voluntary landscape watering time restriction will include reminders within the customers bills that explain which months (i.e. June, July, and August, etc.) and which timeframes (12pm – 5pm, etc.) that need to be avoided to prevent water waste. These reminders should go out into the customer’s bill at the beginning of the season (April/May etc) and continue throughout the months when the restriction should be followed.

SECTION 4 – CONSERVATION MEASURES

4.1 Topaz Lodge Water Company Conservation Measures

Conservation measures implemented by the Topaz Lodge Water Company will consist of management measures only, due to the size of the utility and small population growth. Measures such as water reuse or automation are not economically feasible at this time.

4.1.1 Establishment of a Conservation Budget: All materials and labor associated with conservation will require funding. Because of the small size of the system, funding will be limited, so the budget will be conservative. Cost estimates will be made prior to the start of any program and nothing will be implemented prior to the completion of the budget.

4.1.2 Water Watcher Procedures: Large water utilities employ full-time personnel who specialize in water waste detection and enforcement. Their duties include patrolling neighborhoods searching for water waste problems, levying fines, and providing educational materials to customers. The Topaz Lodge Water Company does not have the authority to create codes or regulations that are enforceable to its service area and it is not feasible for Topaz Lodge Water Company to hire personnel for this purpose; however, existing field personnel will be trained in waste recognition and procedures for reporting them. These procedures include the following:

- Definitions of voluntary watering time restrictions.
- Instructions on how to turn off a valve in the event of a broken pipe.
- Hydrant use.
- Distribution of educational materials.
- Customer service/relations.
- Waste notifications.
- Maintenance repair forms for the Topaz Lodge Resort.
- Waste complaint system, (Appendix G has an example waste complaint form).

Warning notices designed to hang on doorknobs will be considered as part of the procedures. The intent of these procedures is to increase the education on water conservation.

4.2 Plumbing Standards

The most recent federal plumbing standards are included in Table 4.1. These standards are applicable to all water utility service areas. California's standards are included for reference since California's standards are more stringent in many cases. These standards also show that there are plumbing fixtures available that exceed the federal standards, and offer consumers alternatives that maximize conservation efforts.

**Table 4.1
Federal and California Plumbing Standards**

Device	FEDERAL ENERGY POLICY ACT (FEPA)		CALIFORNIA	
	Manufacture	Effective Date	Sale and Installation	Effective Date
Shower Heads	2.5 gpm*	1/1/1994	2.5 gpm	3/20/1992
Lavatory Faucets	2.5gpm	1/1/1994	2.2 gpm	3/20/1992
Sink Faucets	2.5gpm	1/1/1994	2.2 gpm	3/20/1992
Metering Faucets	**	1/1/1994	†	7/1/1992
Tub Spout Diverters	Not Included in FEPA		0.1 to 0.3‡	3/20/1992
Residential Toilets	1.6 gpf	1/1/1994	1.6 gpf	3/20/1992
Flushometer Valves	1.6 gpf	1/1/1997	1.6 gpf	1/1/1992
Commercial Toilets	1.6gpf	1/1/1997	1.6 gpf	1/1/1994
Urinals	1.0 gpf	1/1/1994	1.0 gpf	1/1/1992

* Gallons per minute

** 0.25 gal/cycle (pertains to maximum water delivery per cycle)

† Hot water maximum flow rate range from 0.25 to 0.75 gal/cycle and/or from 0.5 gpm to 2.5 gpm, depending on controls and hot water system

‡ 0.1 (new) to 0.3 gpm (After 15,000 cycles of diverting)

4.3 Drought Measures

4.3.1 Drought Descriptions

All water supplied by the Topaz Lodge Water Company comes from groundwater sources. Because of this it is difficult to determine the effect of a drought year on the groundwater system and the consequences of a drought may not be detected in the water table until several years after the drought. For this reason, an annual review of water supplies will be done to determine the availability of water for the current year and the following year. This analysis will be done in the spring before the high use season.

In order to determine when it is necessary to impose special drought conservation measures, parameters or limits must be established for groundwater levels and groundwater levels should relate to measures. For instance, if groundwater drops to a certain level, a corresponding stage of drought measures are then required. Topaz Lodge Water System will draft a contingency plan that will be effective in the event of an unforeseen circumstance that reduces the amount of water that can be supplied to its customers. In the event that either of the groundwater wells were to fail, options will include restricting water usage, deepening the current wells, developing new wells, finding a new water site, etc. There are specific measures associated with each stage of drought that apply to water customers.

This plan uses a drought assessment system similar to the one used by the Southern Nevada Water Authority (SNWA) that includes the following levels of drought observation:

- Stage 1: No Drought
- Stage 2: Drought Watch
- Stage 3: Drought Alert
- Stage 4: Drought Emergency

TABLE 4.2
Topaz Lodge Water Company Drought Conservation Measures

Stage	Reduction Goal	Information Measures	Measures
STAGE 1: No Drought	10%	Encourage conservation through educational efforts	Institute intensive leak reduction program, Reduce % of unaccounted for water. Increase enforcement.
STAGE 2: Drought Watch	15-18%	Use meetings/media to communicate drought information, warn of potential for more stringent measures associated with succeeding stages. 1 st stage measures.	Reduce water use for flushing and public facility landscape irrigation. 1 st stage measures.
STAGE 3: Drought Alert	25-30%	Water officials appeal for water use reductions. Explain details of emergency. 1 st and 2 nd stage measures.	Prohibit all public water uses not required for health or safety. 1 st and 2 nd stage measures.
STAGE 4: Drought Emergency	50% or more	1 st , 2 nd , and 3 rd stage measures.	Prohibit all outdoor water use and selected commercial use. 1 st , 2 nd , and 3 rd stage measures.

Drought conservation measures implemented by customers can save more water than those measures applied by the Topaz Lodge Water Company (Table 4.2). For this reason water customers must also be expected to employ special conservation measures during times of drought. Special drought conservation measures for water users have been divided into the following categories:

1. General Water User Measures
2. Landscape Irrigation
3. Parks and Recreation Use Areas
4. Turf Installation
5. Vehicle Washing
6. Surface Equipment and Building Washing
7. Mist Systems
8. Fountains and Water Features

General Water User Measures

Drought measures are summarized in table 4.11.

TABLE 4.11
General Drought Measures

Stage	General Water User Measures
STAGE 2: Watch	Mandatory restrictions on all outside uses by residential users, except landscape irrigation. Unnecessary outdoor uses by any commercial users prohibited.
STAGE 3: Alert	All outdoor water use severely restricted. Serve water in restaurants only upon request.
STAGE 4: Emergency	All outdoor water use and selected commercial and industrial use prohibited.

Landscape Irrigation

Drought measures are summarized in table 4.3.

TABLE 4.3
Drought Measures for Landscape Watering

Stage	Winter (Oct – Mar)	Spring, Summer, Fall (Apr – Sept)
STAGE 2: Watch	No Watering	2 assigned days per week
STAGE 3: Alert	No Watering	2 assigned days per week
STAGE 4: Emergency	No Watering	To be determined

Parks and Recreation Use Areas

Drought measures are summarized in table 4.5.

TABLE 4.5
Drought Measures for Parks and Recreation Use Areas

Stage	Parks and Recreation Use Areas
STAGE 2: Watch	To be determined by TOPAZ LODGE WATER COMPANY after parks/recreation needs have been established.
STAGE 3: Alert	
STAGE 4: Emergency	

Turf Installation

Drought measures are summarized in table 4.10.

TABLE 4.10
Drought Measures for New Turf Installation

Stage	Residential Single and Multi-family	Non-Residential
STAGE 2: Watch	Allowed	Allowed within limits.
STAGE 3: Alert	Allowed	Allowed within limits.
STAGE 4: Emergency	Not allowed	Not allowed

Vehicle Washing

Drought measures are summarized in table 4.8.

TABLE 4.8
Drought Measures for Vehicle Washing

Stage	Personal Vehicle Washing	Commercial Vehicle Washing
STAGE 2: Watch	Once a week per vehicle using a hose with an automatic shut-off nozzle.	Only at a facility where water is discharged into the sanitary sewer through approve methods. Also with high-pressure, low-volume sprayer using less than 10 gallons per vehicle.
STAGE 3: Alert		
STAGE 4: Emergency	Not allowed	Not allowed

Surface Equipment and Building Washing

Drought measures are summarized in table 4.6.

TABLE 4.6
Drought Measures for Surface Equipment and Building Washing

Stage	Surface Equipment and Building Washing
STAGE 2: Watch	Prohibited unless water is contained onsite.
STAGE 3: Alert	
STAGE 4: Emergency	

Mist Systems

Drought measures are summarized in table 4.4.

TABLE 4.4
Drought Measures for Misting Systems

Stage	Residential	Commercial
STAGE 2: Watch	Allowed, No restrictions	Use only for human comfort in June, July, and August and only between the hours of noon to 6 pm
STAGE 3: Alert	Allowed, No restrictions	Use only for human comfort in June, July, and August and only between the hours of noon to 6 pm
STAGE 4: Emergency	Not allowed	Not allowed

Fountains and Water Features

Drought measures are summarized in table 4.7.

TABLE 4.7
Drought Measures for Fountains and Features

Stage	Residential	Common Areas	Commercial
STAGE 2: Watch	Fountains and features with a surface area of 200 ft ² or less allowed.	Same as residential but feature cannot be incorporated into an entry way of streetscape, as defined by local government and only one fountain or water feature may be operated.	May maintain a re-circulating water pool to sustain pumps, pond liners, surface coatings and ancillary equipment. The feature of fountain may run only between 1 a.m. and 4 a.m. or whenever freezing conditions require system preservation.
STAGE 3: Alert	Fountains and features with a surface area of 25 ft ² or less allowed.	Same as Watch	Same as Watch
STAGE 4: Emergency	Fountains and features not allowed.	Fountains and features not allowed.	Fountains and features not allowed.

Appendix A contains a list of conservation measures that can be implemented by water consumers. The list includes measures for residential, commercial, industrial and institutional applications.

APPENDIX A – CONSERVATION MEASURES

Conservation measures are divided into two types: (1) Hardware/Equipment and (2) Behavioral/Managerial. Each of these is subdivided into five categories of application: (1) Residential, (2) Landscape, (3) Industrial, Commercial, and Institutional (ICLI), (4) Agricultural, and (5) Purveyor. The following conservation measures will be classified first by application then by type.

A.1 RESIDENTIAL CONSERVATION MEASURES

A.1.1 Behavioral Measures

A.1.1.1 Residential Water Audits: Water Audits could target high use customers first and then be offered to all customers. The following elements should be part of an effective audit:

- Purpose of the audit
- Estimation of use for all fixtures and appliances
- Check for repairs and leaks
- Evaluation of landscape (See “Landscape Conservation Measures”)
- Evaluation of outdoor water use
- Evaluate efficiency measures
- Educate customers using available fliers

A residential water audit should take no more than 30 to 45 minutes.

A.1.1.2 Additional Measures: The sample pamphlets in Appendix C include additional behavioral conservation measures

A.1.2 Hardware/Equipment Measures

The following is a list of devices/practices that will reduce water consumption in the home.

Measure	Description
Bathroom/Kitchen Fixtures	
Low-flow toilets	1.6 gallons per flush
Toilet retrofit devices	Bladders (bags), dams, early close flappers, other hardware and adjustments
Toilet Leak repairs	Includes detection (dye tabs) and replacement of worn parts
Low-volume shower heads	2.5 gallons per minute at 80 psi
Showerhead retrofit devices	Includes temporary cutoff valves and restrictors
Low-volume faucets	2.5 gallons per minute at 80 psi
Faucet retrofit devices	Includes aerators, activation sensors, self-closing meter valves
Faucet maintenance	Includes washer replacement, repacking, tightening and cleaning aerators
Water pressure reduction	Only needed if house pressure exceeds what's required
High Efficiency Appliances	
Clothes washers	27 gallons per load
Dish washer	4.5 gallons per load

A.2 LANDSCAPE CONSERVATION MEASURES

A.2.1 Behavioral Measures

A.2.1.1 Landscape Water Audits

Landscape water audits will be conducted on high-volume irrigation users. A residential landscape audit should take no more than an hour. Larger (high-volume) users could take substantially longer. The following elements should be part of an effective audit:

- Purpose of the audit
- Estimation of outdoor use based on meter records
- Check for repairs and leaks
- Evaluation of landscape (size, soil, amount of turf, types of plants)
- Evaluation of irrigation system (Timers, Use of drip, Precipitation amounts)
- Efficiency recommendations
- Educate customers using available fliers

A.2.1.2 Xeriscape™

Xeriscape is a method of landscaping that employs low-water use plants, turf, ground covers, shrubs and trees. It includes careful planning, soil analysis, and irrigation system design. A list of native plants can be found in Appendix D.

A.2.1.3 Hardware/Equipment Measures

Landscape hardware measures consist of two basic groups (1) Landscape materials and (2) irrigation equipment. The following is a list of landscape materials and irrigation equipment and how they should be used to support water conservation principles.

Measure	Description
Landscape Materials	
Trees, plants and grass	Should be well suited to climate and altitude and be drought tolerant
Organic Mulch	Grass clippings, leaves, wood chips, bark, pine needles. Organic Mulches help to retain soil moisture and keep ground cool around plants
Inorganic Mulch	Boulders, gravel, pavers, decomposed granite, and stepping stones. Inorganic mulches are generally more for decorative purposes but they reduce the amount of trees, plants and turf, thereby conserving water
Compost	Made of manure or biosolids and wood, straw, grass and leaves. Helps plants stay healthy and retains moisture in the soil
Irrigation Equipment	
Valves	Should be sized to meet requirements and checked periodically for leaks
Sprinkler heads	Should match water volume requirements of area being irrigated
Sprinkler nozzles	Should have proper arc of coverage and proper trajectory
Irrigation controllers	Should have required number of stations, programs and starts. Also rain delays and sensor terminals
Drip irrigation	Insures Water is directs to where it is needed

A.3 General Residential Behavioral Measures

This list of conservation measures is divided into four parts: Home, Landscaping, Community, and Miscellaneous.

A.3.1.1 Home Behaviors

1. When washing dishes by hand, don't let the water run while rising. Fill one sink with wash water and the other with rinse water.
2. Evaporative coolers require a seasonal maintenance checkup. For more efficient cooling, check your evaporative cooler annually.
3. Run your washing machine and dishwasher only when they are full and you could save 1000 gallons a month.
4. Use the garbage disposal sparingly. Compost instead and save gallons every time.
5. Keep a pitcher of water in the refrigerator instead of running the tap for cold drink so no water goes down the drain.
6. Check your water meter and bill to track water usage.
7. Wash produce in the sink or a pan that is partially filled with water instead of using the tap.
8. Use a broom instead of a hose to clean your driveway or sidewalk to save 80 gallons of water each time.
9. If your shower can fill a one gallon bucket in less than 20 seconds, replace it with a more efficient showerhead.
10. Collect the water you use for rinsing produce and reuse it to water houseplants.
11. Check outdoor faucets and fixtures for leaks.
12. When purchasing a new appliance, look for one with adjustable cycle and load sizes.
13. Keep showers to less than 5 minutes to save up to 1000 gallons a month.
14. Install low-volume toilets.
15. Reuse water from a fish tank to water plants, as the water is rich in nitrogen and phosphorous, making it a free and effective fertilizer.
16. Put food coloring in your toilet tank and if it seeps into the toilet bowl there is a leak. It is easy to fix and can save up to 600 gallons a month.
17. Plug the bathtub before turning the water on, and adjust the temperature as the tub fills.
18. Only use one glass for drinking each day to reduce the need for washing dishes.
19. Don't use running water to thaw food.
20. Fix a leaky faucet to save 140 gallons of water a week.
21. Match the water level to the size of the load when doing laundry.
22. Turn faucets off tightly after use.
23. Soak pots and pans instead of running water over them.
24. Locate your master water shutoff valve to save water and prevent water damage in case of a broken pipe.
25. Turn off water while brushing your teeth.
26. Make sure your toilet flapper doesn't stick open after flushing.
27. Make sure there are aerators on all your faucets.
28. Install an instant water heat on your kitchen sink so you don't have to run the water until it gets hot.

29. Cut back on rinsing if you have a new dishwasher as they clean more efficiently than older models.
30. Bathe your young children together.
31. Winterize outdoor spigots to prevent pipes from bursting or freezing.
32. Insulate hot water pipes to reduce the amount of water you have to run to reach the desired temperature.
33. Drop tissues in the trash instead of flushing them.
34. Place a toilet dam or bottle of water in the toilet tank on toilets made prior to 1980 to reduce the amount of water required for each flush.
35. Install water softening systems only when necessary.
36. Wait until you have a full load to do laundry.
37. Cook food in the minimum amount of water required.
38. Turn off water while you shampoo and condition to save more than 50 gallons a week.

A.3.1.2 Landscape Behaviors

1. Adjust your sprinkler system to keep water on your landscaping and off of the driveway, sidewalk, house, and the street.
2. Avoid planting turf on inclines, and in isolated areas that are difficult to water.
3. Plant during the spring or fall when the watering requirements are lower.
4. Water early in the morning or late in the evening when temperatures are lower to minimize evaporation.
5. Use a layer of organic mulch around plants to reduce evaporation and save hundreds of gallons of water a year.
6. Use more frequent, shorter watering intervals to reduce runoff and allow for better absorption every time you water.
7. Only water your lawn when needed. If you walk across the grass and leave footprints, it is time to water.
8. Leave grass longer when you mow, as longer grass shades root systems and holds soil moisture better than a closely clipped lawn.
9. Use a sprinkler for large areas of grass and water by hand elsewhere to eliminate unnecessary watering.
10. Install a rain shut-off device on your automatic sprinklers to eliminate unnecessary watering.
11. Periodically check your sprinkler system for leaks and keep the heads in good shape.
12. Don't water your lawn on windy days.
13. Group plants by watering needs to maximize the benefits of your watering time.
14. Regularly weed your lawn and garden, as weed compete with desirable plants for nutrients, light and water.
15. Apply the minimum amount of fertilizer as it increases water consumption requirements.
16. Aerate your lawn so water will reach the roots instead of running off the surface.

A.3.1.3 Community Behaviors

1. Encourage your school system and local government to develop and promote a water conservation ethic among children and adults.

2. Make suggestions to your employer to save water at work.
3. Support projects that use reclaimed wastewater for irrigation and other uses.
4. Encourage your friends and neighbors to be part of a water-conscious community.
5. Report broken pipes, open hydrants and errant sprinklers to property owners or your water management district.

A.3.1.4 Miscellaneous Behaviors

1. Install covers on pools and spas and check for leaks around pumps.
2. Check your pool for leaks if you have an automatic refilling device.
3. Use a commercial car wash that recycles water.
4. Don't buy recreational water toys that require a constant flow of water.
5. Bathe pets outdoors in areas in need of water.
6. Reuse towels to reduce laundering requirements.
7. Reuse water from backwashing your pool on your landscaping.

WATER

- www.amsa-cleanwater.org
- www.energystar.gov
- www.awwa.org

DROUGHT

- DroughtMonitor@ndmc.unlv.edu

LANDSCAPE

- www.usda.gov/news/garden.htm
- www.tmwlandscapeguide.com/landscape_guide/interactive/index.php

EDUCATION

- www.wateruseitwisely.com
- www.washoeet.dri.edu

INSTITUTIONAL

- www.lvvwd.com
- www.snwa.com
- www.co.washoe.nv.us/water_dept/rwpc/regionalplm
- www.tmh20.com
- www.cabq.gov
- www.ci.phoenix.az.us/WATER/wtrteach.html
- www.owue.water.ca.gov/leak/faq/faq.cfm

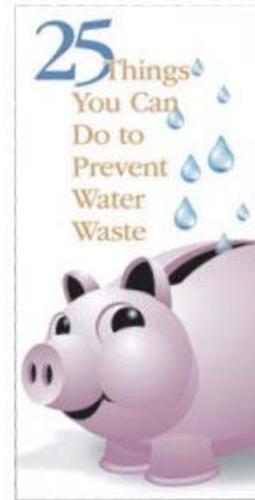
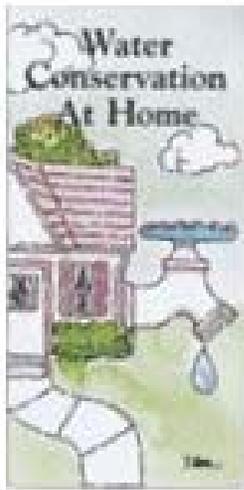
LEAK DETECTION

- www.who.int/docstore/water_sanitation_health/leakage/begin.html

APPENDIX C – AWWA CONSERVATION PAMPHLETS

The following pamphlets are available on the AWWA website at: www.awwa.org/bookstore

Figures 1.1, 1.2, 1.3

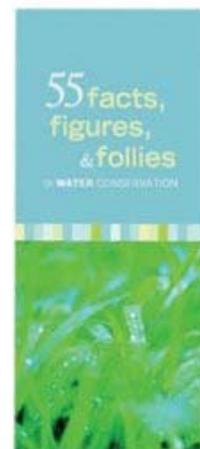
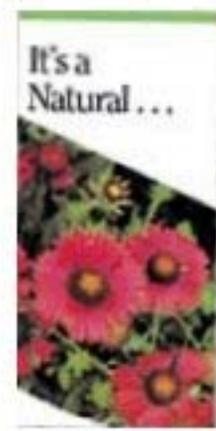


Water Conservation at Home discusses in-home conservation practices for bathroom, kitchen and outdoor water use (see Figure 1.1).

Landscaping to Save Water explains the seven principles in the Xeriscape(tm) concept that promotes attractive landscapes, conserves water, and protects the environment (see Figure 1.2).

25 Things You Can Do to Prevent Water Waste has 25 easy things people can do to conserve water inside and outside their homes (see Figure 1.3).

Figures 1.4, 1.5, 1.6

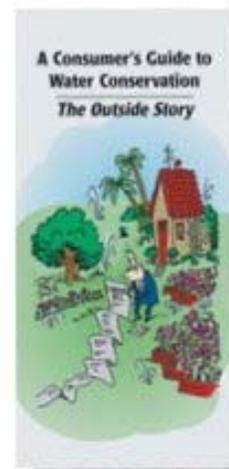
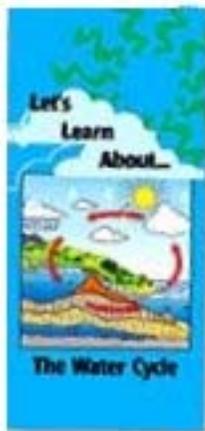


5 Basic Ways to Conserve Water provides 5 things people can do to cut water use by 25% (see Figure 1.4)

It's a Natural is an introduction to planning a water-conserving home landscape (see Figure 1.5)

55 Facts, Figure and Follies of Water Conservation is a list of 55 items that promote water conservation (see Figure 1.6).

Figures 1.7, 1.8, 1.9



Let's Learn About...The Water Cycle diagrams the seven stages of the water cycle (see Figure 1.7)

A Consumer's Guide to Water Conservation the Inside Story gives eight ways to reduce water waste inside the home (see Figure 1.8).

A Consumer's Guide to Water Conservation the Outside Story gives eight ways to reduce water waste in landscaping (see Figure 1.9).

APPENDIX D – PLANTS FOR THE TOPAZ LODGE WATER COMPANY AREA

The following list of plants is from the Truckee Meadows Water Authority (TMWA) Website. These plants thrive in Northern Nevada, and more information can be found at www.tmwandscapeguide.com

PERENNIAL FLOWERS

Eriogonum umbellatum/Sulfur Flowered Buckwheat (Perennial)--water use: Very Low

Achillea species/Yarrow (Perennial)--water use: Low

Agastache cana/Bubblegum Mint (Perennial)--water use: Low

Aurinia saxatilis/Basket-of-Gold (Perennial)--water use: Low

Coreopsis species/Tickseed (Perennial)--water use: Low

Crocus species/Spring Crocus (Perennial)--water use: Low

Dianthus species/Pinks (Perennial)--water use: Low

Eschscholzia californica/California poppy (Perennial)--water use: Low

Gaillardia grandiflora/Blanket Flower (Perennial)--water use: Low

Iris germanica/Iris germanica (Perennial)--water use: Low

Linum species/Flax (Perennial)--water use: Low

Narcissus species/Daffodil or Narcissus (Perennial)--water use: Low

Nepeta racemosa/Catmint (Perennial)--water use: Low

Oenothera species/Evening Primrose (Perennial)--water use: Low

Perovskia atriplicifolia/Russian Sage (Perennial)--water use: Low

Sedum species/Stonecrop (Perennial)--water use: Low

Senecio Cineraria/Dusty Miller (Perennial)--water use: Low

Stachys byzantina/Lamb's Ears (Perennial)--water use: Low

Thermopsis montana/No Lupine (Perennial)--water use: Low

Tulbaghia violacea/Society Garlic (Perennial)--water use: Low

Alcea rosea/Hollyhock (Perennial)--water use: Moderate

Antirrhinum majus/Snapdragon (Perennial)--water use: Moderate

Armeria maritima/Sea Pinks (Perennial)--water use: Moderate

Aster species/Aster (Perennial)--water use: Moderate

Echinacea purpurea/Coneflower (Perennial)--water use: Moderate

Gaura lindheimeri/Gaura (Perennial)--water use: Moderate -- Add to

Geranium species/Handy Geranium (Perennial)--water use: Moderate

Gypsophila species/Baby's Breath (Perennial)--water use: Moderate

Hemerocallis hybrids/Daylily (Perennial)--water use: Moderate

Heuchera sanguinea/Coral Bells (Perennial)--water use: Moderate

Iberis sempervirens/Candytuft (Perennial)--water use: Moderate

Kniphofia uvaria/Red Hot Poker (Perennial)--water use: Moderate

Lavandula angustifolia/Lavender (Perennial)--water use: Moderate

Lilium species/Lily (Perennial)--water use: Moderate

N/A/Pussy toes (Perennial)--water use: moderate

Papaver species/Poppy (Perennial)--water use: Moderate

Penstemon species/Beard Tongue (Perennial)--water use: Moderate

Platycodon grandiflorus/Balloon Flower (Perennial)--water use: Moderate

Rudbeckia fulgida/Black-Eyed Susan (Perennial)--water use: Moderate

Salvia Species/Sage or Salvia (Perennial)--water use: Moderate

Saponaria species/Soapwort (Perennial)--water use: Moderate

Tanacetum species/Painted or Michaelmas Daisy (Perennial)--water use: Moderate

Tulipa species/Tulip (Perennial)--water use: Moderate

Veronica spicata/Spike Speedwell (Perennial)--water use: Moderate

Viola species/Violet or Pansy (Perennial)--water use: Moderate

GROUNDCOVERS, VINES, AND GRASSES

Opuntia polyacantha/Prickly Pear Cactus (Groundcovers)--water use: Very Low
Clematis species/*Clematis* (Groundcovers)--water use: Low

Euphorbia species/*Spurge* (Groundcovers)--water use: Low

Helictorichon sempervirens/Blue Oat Grass (Groundcovers)--water use: Low

Hypericum calycinum/Jacob's Ladder or Aaron's Beard (Groundcovers)--water use: Low

Juniperus horizontalis/Groundcover Junipers (Groundcovers)--water use: Low

Lathyrus latifolius/Perennial Sweet Pea (Groundcovers)--water use: Low

Lonicera species/*Honeysuckle* (Groundcovers)--water use: Low

Panicum virgatum/Switch Grass (Groundcovers)--water use: Low

Polygonum species/*Polygonum* (Groundcovers)--water use: Low

Santolina species/*Lavender Cotton* (Groundcovers)--water use: Low

Vinca minor/Dwarf Periwinkle (Groundcovers)--water use: Low

Wisteria sinensis/Chinese Wisteria (Groundcovers)--water use: Low

Zauschneria californica/California Fuschia (Groundcovers)--water use: Low

Calmagrostis x acutiflora/Feather Reed Grass (Groundcovers)--water use: Moderate

Campsis radicans/Red Trumpet Creeper (Groundcovers)--water use: Moderate

Cerastium tomentosum/Snow in Summer (Groundcovers)--water use: Moderate

Delosperma cooperi/Hardy Purple Ice Plant (Groundcovers)--water use: Moderate

Hedera helix/Ivy (Groundcovers)--water use: Moderate

Helianthemum nummularium/Sunrose (Groundcovers)--water use: Moderate

Mahonia repens/Creeping Mahonia (Groundcovers)--water use: Moderate

N/A/Northern seacats (Groundcovers)--water use: moderate

Phlox subulata/Moss Pink (Groundcovers)--water use: Moderate

Potentilla neumanniana/Cinquefoil (Groundcovers)--water use: Moderate

Sedum species/*Stonecrop* (Groundcovers)--water use: Moderate

Thymus species/*Thyme* (Groundcovers)--water use: Moderate

SHRUBS

Artemisia tridentata var. *tridentata*/Big Sagebrush (Shrubs)--water use: Very Low

Atriplex canescens/Four Wing Saltbrush (Shrubs)--water use: Very Low

Chrysothamnus nauseosus/Rubber Rabbitbrush (Shrubs)--water use: Very Low

Amelanchier species/Serviceberry or Juneberry (Shrubs)--water use: Low

Aronia species/Chokeberry (Shrubs)--water use: Low

Berberis species/Barberry (Shrubs)--water use: Low

Caragana species/Peashrub (Shrubs)--water use: Low

Caryopteris x clandonensis/Blue Mist Spiraea (Shrubs)--water use: Low

Chaenomeles speciosa/Flowering Quince (Shrubs)--water use: Low

Cytisus species/Broom (Shrubs)--water use: Low

Elaeagnus commutata/Silverberry (Shrubs)--water use: Low

Euonymus species/*Euonymus* (Shrubs)--water use: Low

Forestiera neomexicana/New Mexico Privet (Shrubs)--water use: Low

Genista species/Dwarf Broom (Shrubs)--water use: Low

Hibiscus syriacus/Rose of Sharon (Shrubs)--water use: Low

Ligustrum species/Privet (Shrubs)--water use: Low

Lonicera tatarica/Tatarian Honeysuckle (Shrubs)--water use: Low

Mahonia aquifolium/Oregon Grape (Shrubs)--water use: Low

Pinus mugo/Mugo Pine (Shrubs)--water use: Low

Prunus species/Bush Cherry (Shrubs)--water use: Low

Pyracantha coccinea/Firethorn or *Pyracantha* (Shrubs)--water use: Low

Rhus species/Sumac (Shrubs)--water use: Low

Ribes aureum/Golden Currant (Shrubs)--water use: Low

Shepherdia argentea/Silver Buffaloberry (Shrubs)--water use: Low

Symphoricarpos albus/Snowberry (Shrubs)--water use: Low

Syringa vulgaris/Common Lilac (Shrubs)--water use: Low

Yucca species/Yucca (Shrubs)--water use: Low

Acer circinatum/Vine Maple (Shrubs)--water use: moderate

Amorpha canescens/Leadplant (Shrubs)--water use: moderate

Buddleia species/Butterfly Bush (Shrubs)--water use: Moderate

Catalpa x Chilopsis/Chitalpa (Shrubs)--water use: moderate

Ceratoides lanata/Winterfat (Shrubs)--water use: moderate

Cercocarpus ledifolius/Mt. Mahogany (Shrubs)--water use: moderate

Chamaebatiaria millifolium/Fernbush (Shrubs)--water use: moderate

Chilopsis linearis/Desert or Flowering Willow (Shrubs)--water use: moderate

Cotoneaster species/Cotoneaster (Shrubs)--water use: Moderate

Cowania mexicana/Cliffrose (Shrubs)--water use: moderate

Fallugia paradoxa/Apache Plume (Shrubs)--water use: moderate

Forsythia species/Forsythia (Shrubs)--water use: Moderate

Hamamelis x intermedia/Witch Hazel (Shrubs)--water use: Moderate

Hesperaloe parviflora/Red Yucca (Shrubs)--water use: moderate

Juniperus chinensis/Sea Green Juniper (Shrubs)--water use: Moderate

Kerria japonica/Kerria (Shrubs)--water use: Moderate

Kolkwitzia amabilis/Beautybush (Shrubs)--water use: moderate

Philadelphus virginialis/Mock Orange (Shrubs)--water use: Moderate

Picea glauca var. albertiana 'Conica'/Dwarf Alberta Spruce (Shrubs)--water use: Moderate

Pinus contorta 'Latifolia'/Lodgepole Pine (Shrubs)--water use: moderate

Potentilla fruticosa/Shrubby Potentilla (Shrubs)--water use: Moderate

Purshia tridentata/Bitterbrush (Shrubs)--water use: moderate

R. frangula 'Asplenifolia'/Fernleafed buckthorn (Shrubs)--water use: Moderate

R. frangula 'Columnaris'/Tall Hedge Buckthorn (Shrubs)--water use: Moderate

Rhamnus frangulia/Sea buckthorn (Shrubs)--water use: Moderate

Rosa species/Hardy Shrub Roses (Shrubs)--water use: Moderate

Spiraea species/Spiraea (Shrubs)--water use: Moderate

Symphoricarpa x chenaultii/Coralberry 'Hancock' (Shrubs)--water use: Moderate

Thuja occidentalis/American Arborvitae (Shrubs)--water use: Moderate

Viburnum species/Viburnum (Shrubs)--water use: Moderate

TREES

Acer ginnala/Amur Maple (Trees)--water use: Deep Water 10-14 days

Ailanthus altissima/Tree of Heaven (Trees)--water use: Deep Water 10-14 days

Calocedrus decurrens/Incense Cedar (Trees)--water use: Deep Water 10-14 days

Catalpa species/Catalpa (Trees)--water use: Deep Water 10-14 days

Cedrus atlantica glauca/Blue Atlas Cedar (Trees)--water use:Deep Water 10-14 days

Celtis occidentalis/Hackberry (Trees)--water use:Deep Water 10-14 days

Crataegus species/Hawthorn (Trees)--water use:Deep Water 10-14 days

Elaeagnus angustifolia/Russian Olive (Trees)--water use:Deep Water 10-14 days

Gleditsia triacanthos inermis/Honeylocust (Trees)--water use:Deep Water 10-14 days

Juniperus species/Tree Juniper (Trees)--water use:Deep Water 10-14 days

Maackia amurensis/Maackia (Trees)--water use:Deep Water 10-14 days

Maclura pomifera/Osage Orange (Trees)--water use:Deep Water 10-14 days

Malus hybrids/Crabapple (Trees)--water use:Deep Water 10-14 days

Pinus species/Pine (Trees)--water use:Deep Water 10-14 days

Platanus acerifolia/Sycamore (Trees)--water use:Deep Water 10-14 days

Quercus species/Oak (Trees)--water use:Deep Water 10-14 days

Robinia species/Locust (Trees)--water use:Deep Water 10-14 days

Sequoiadendron giganteum/Giant Redwood (Trees)--water use:Deep Water 10-14 days

Ulmus parvifolia/Chinese elm (Trees)--water use:Deep Water 10-14 days

Zelkova serrata/Zelkova (Trees)--water use:Deep Water 10-14 days

Aesculus hippocastanum/Common Horsechestnut (Trees)--water use:Deep Water 7-10 days

Carpinus betulus/Hornbeam (Trees)--water use:Deep Water 7-10 days

Cotinus coggygria/Smoke Tree (Trees)--water use:Deep Water 7-10 days

Cupressus glabra/Arizona Cypress (Trees)--water use:Deep Water 7-10 days

Fraxinus species/Ash (Trees)--water use:Deep Water 7-10 days

Ginkgo biloba/Maidenhair Tree (Trees)--water use:Deep Water 7-10 days

Koelreuteria paniculata/Golden Rain Tree (Trees)--water use:Deep Water 7-10 days

Laburnum watereri/Golden Chain Tree (Trees)--water use:Deep Water 7-10 days

Liquidambar styraciflua/Sweetgum (Trees)--water use:Deep Water 7-10 days

Liriodendron tulipifera/Tulip Tree (Trees)--water use:Deep Water 7-10 days

Malus domestica/Fruiting Apple Tree (Trees)--water use:Deep Water 7-10 days

Morus alba/Mulberry (Trees)--water use:Deep Water 7-10 days

Phellodendron amurense/Amur Cork Tree (Trees)--water use:Deep Water 7-10 days

Picea species/Spruce (Trees)--water use:Deep Water 7-10 days

Pistacia chinensis/Chinese Pistache (Trees)--water use:Deep Water 7-10 days

Prunus species/Plum or Cherry (Trees)--water use:Deep Water 7-10 days

Pyrus Species/Pear (Trees)--water use:Deep Water 7-10 days

Sophora japonica/Japanese Pagoda Tree (Trees)--water use:Deep Water 7-10 days

Sorbus species/Mountain Ash (Trees)--water use:Deep Water 7-10 days

Thuja occidentalis/Arborvitae (Trees)--water use:Deep Water 7-10 days

Tilia species/Linden (Trees)--water use:Deep Water 7-10 days

Gymnocladus dioica/Kentucky Coffee Tree (Trees)--water use: Moderate

Juniperus monosperma/Singleseed Juniper (Trees)--water use: moderate

Pinus edulis/Pinon Pine (Trees)--water use: moderate

APPENDIX E – METER READING INSTRUCTIONS

Since the Topaz Lodge Water Company does not currently have any of its connections metered, these reading instructions are included for reference only.

Locate your Meter

Most water meters will be located outside in front of your house next to the curb on the street under a steel or concrete lid.

Reading your meter

There are two basic types of meters: a dial with a needle that measures in tenths of a cubic foot and a digital meter that measures from 100,000 down to 1 cubic foot. Most meters also have a small triangle on the face called a flow indicator. It will move when there is water passing through it. Read your meter from left to right.

Measuring Water Activities

It is possible to measure the water use of certain activities. These activities include, but are not limited to the following:

- Shower or bath use
- Watering the lawn
- Washing clothes or dishes
- Flushing a toilet
- Washing a car

To measure the water use of an activity, do the following (in order):

1. Make sure all water is turned off. This includes all faucets (indoor and outdoor), appliances, swamp coolers and icemakers.
2. Write down the meter reading to two decimal places.
3. Perform the activity. Be sure to measure the amount of time in minutes that the activity required.
4. At the end of the activity, read the meter again. Subtract the first meter reading from the second to determine the amount of water used for the activity in cubic feet. Multiply the resulting amount by 7.48 to determine the amount of gallons of water used. Divide this number by the time elapsed during the activity to obtain the activities water requirements in gallons per minute.

Detecting Leaks

1. Make sure all water is turned off. This includes all faucets (indoor and outdoor), appliances, swamp coolers and icemakers.
2. Write down the meter reading to two decimal places and the time of day to the minute.

3. Wait at least an hour before reading the meter a second time. Make sure no water is used during the test. Read the meter at the end of the test and record the time to the minute. If the flow indicator is moving during the test you have a leak or a meter malfunction.
4. At the end of the activity, read the meter again. Subtract the first meter reading from the second to determine the amount of water used for the activity in cubic feet. Multiply the resulting amount by 7.48 to determine the amount of gallons of water passed through the meter during the test period.
5. Divide the amount of water by the time elapsed during the test to obtain the amount of water that went through the meter in gallons per minute.
6. To measure the amount lost over time, multiply the gallons per minute by the following:
 - 1,440 for gallons per day
 - 43,920 for gallons per month
 - 527,040 for gallons per year
7. Locating a leak is a process of elimination. Shut off one toilet at a time at the wall. Go to the meter to check to see if the flow indicator is still moving. If the triangle has stopped moving, you have discovered the leak. If not, go on the next one and repeat Step 7.
8. Check your sprinkler system. Shut off the siphon valve and check the meter.
9. Check your main service line. You will need to shut off the valve between your house and the meter. If the meter stops, the leak is between the meter and the valve.
10. These steps can be repeated for every fixture and fitting in your home. In the event you cannot locate the leak, you should call a professional plumber to find and fix it.

APPENDIX F –EPA RESIDENTIAL BENCHMARKS

Type of Use	Likely Range of Values
<i>INDOOR USES</i>	
Average household size	2.0 – 3.0 persons
Frequency of toilet flushing	4.0 – 6.0 flushes per person per day
Flushing volumes	1.6 – 8.0 gallons per flush
Fraction of leaking toilets	0 – 30 percent
Showering frequency	0 – 1.0 showers per person per day
Duration of average shower	5 – 15 minutes
Shower flow rates	1.5 – 5.0 gallons per minute
Bathing frequency	0 – 0.2 baths per person per day
Volume of water	30 – 50 gallons per cycle
Washing machine use	0.2 – 0.5 loads per person per day
Volume of water	45 – 50 Gallons per cycle
Dishwasher use	0.1 – 0.3 Loads per person per day
Volume of water	10 – 15 gallons per cycle
Kitchen faucet use	0.5 – 5.0 Minutes per person per day
Faucet flow rates	2.0 – 3.0 gallons per minute
<i>OUTDOOR USES</i>	
Average lot size	5000 – 8000 square feet
Average house size	1200 – 2500 square feet
Landscape area	4000 – 5000 square feet
Fraction of lot size in turf	30 – 50 percent
Water application rates	1 – 5 feet per year
Homes with pools	10 – 25 percent
Pools evaporation losses	3 – 7 feet per year
Frequency of refilling pool	1 – 2 times per year

TOPAZ LODGE WATER COMPANY WATER WASTE REPORT FORM

Please use this form to report water waste. Our investigators must witness the waste in progress to issue a violation form. Please provide as much information as possible to help us identify the problem.

TIME OBSERVED:

DATE OBSERVED (M/D/Y):

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ADDRESS OR LOCATION OF WASTE:

Street:	City:
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MAJOR CROSS STREETS:

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- | | |
|---|---|
| <input type="checkbox"/> Over-Watering | <input type="checkbox"/> Fountain/Water Feature Violation |
| <input type="checkbox"/> Broken Sprinkler | <input type="checkbox"/> Broken Pipe/Onsite Leak |
| <input type="checkbox"/> Time-of-Day Violation | <input type="checkbox"/> Misting System Violation |
| <input type="checkbox"/> Assigned Day Violation | <input type="checkbox"/> Other |

DESCRIPTION:

TOPAZ LODGE RESORT WATER WASTE REPORT FORM

Please use this form to report maintenance problems relating to water waste. Please provide as much information as possible to help us identify the problem.

TIME OBSERVED:

DATE OBSERVED (M/D/Y):

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DEPARTMENT:

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- | | |
|--|---------------------------------------|
| <input type="checkbox"/> Over-Watering | <input type="checkbox"/> Leaky faucet |
| <input type="checkbox"/> Broken Sprinkler | <input type="checkbox"/> Toilet |
| <input type="checkbox"/> Broken Pipe/Onsite Leak | <input type="checkbox"/> Equipment |
| <input type="checkbox"/> Broken Drip System | <input type="checkbox"/> Other |

DESCRIPTION:
