

**Canyon General Improvement District  
Water Conservation Plan  
August 2018**

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STATE ENGINEER'S OFFICE



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## INTRODUCTION

This Water Conservation Plan (Plan) has been prepared for the Canyon General Improvement District Public Water System (Canyon GID). The purpose of the Water Conservation Plan is to continue to encourage more efficient use of water within the Canyon GID service area and comply with Nevada Revised Statutes (NRS) Sections 540.121 through 540.151.

Canyon GID's service area includes the small (predominately residential) community of Lockwood located within Storey County, just east of Sparks, Nevada. Canyon GID supplies residents of this community with their water, wastewater, trash removal, television, and streets (only within the Rainbow Bend Community) & storm drains services. New construction in the service area has slowed dramatically and the district is almost at build-out.

The district is approaching a build-out status within its own service area boundaries, and new developments are not anticipated at the present time. Although population growth, in the near future, is not anticipated to unduly burden the water capabilities of the Canyon GID water system, it will result in increased water demand over time. As the demand for water increases, existing facilities will require maintenance or new facilities will need to be constructed and new sources of water developed. Financial savings is possible through water conservation if upgrades or new infrastructure can be deferred.

This Plan includes information to help water customers in the Canyon GID service area continue to conserve water. The Plan can be used as a resource to implement and measure the effectiveness of conservation efforts and can provide a planning guide for future conservation.

As required by NRS Sec. 540.131, Canyon GID's current Water Conservation Plan was submitted in 2001. This Water Conservation Plan is an update to that Plan. The previous update was filed in 2014. The next update to the Plan will be approved by the State and completed by 2023. NRS Sec. 540.131.4(c) This update includes a contingency plan for drought conditions that ensures a supply of potable water, and identifies goals and requirements met since the last plan update was submitted. This Water Conservation Plan is intended solely for use within the Canyon GID service area boundaries and does not include a joint effort with any additional water suppliers.

The Canyon GID Water System is fully metered. Meters are installed at system distribution points. Annual pumpage reports are submitted to Nevada Division of Water Resources (NDWR). NRS Sec. 540.141.1(f) Canyon GID currently uses a tiered rate schedule.

The following is included in this Water Conservation Plan Update prepared for Canyon GID:

- Conservation Goals
- Canyon GID Water System Use Profile
- Existing and Planned Conservation Measures and Incentives
- Educational Materials/Examples

This Plan complies with Nevada Revised Statutes (NRS) Sections 540.121 through 540.151 and is available for public inspection at the following location:

**Canyon General Improvement District  
800 Peri Ranch Road Ste. 103  
Sparks, Nevada 89434  
(775) 342-2850**

Canyon GID will keep this Water Conservation Plan in its office during regular business hours for public viewing. NRS Sec. 540.151.4(a) Members of the public are encouraged to make written views and recommendations on the Water Conservation Plan. These written views should be sent to the Canyon GID office. Canyon GID will periodically review and evaluate water conservation measures and incentives for effectiveness and determine if revisions or continuations to the programs will be made. Canyon GID will update the water conservation plan every five years. NRS Sec. 540.131.4(c) Canyon GID will revise this water conservation plan (as needed) to keep up with any changing needs and conditions of its service area. NRS Sec. 540.121-151.

## **1.0 CONSERVATION GOALS**

The primary water conservation goals for Canyon GID are listed below. Some of these goals involve ongoing efforts and others are one-time projects that will improve the abilities of Canyon GID to manage available water and reduce the amount of water waste.

### **1.1 INCREASE PUBLIC AWARENESS**

Canyon GID will increase public awareness of the limited supply of water in Nevada and the need to conserve water and implement landscaping practices compatible with the arid conditions in Nevada. Canyon GID will continue to train management and existing key personnel in water conservation measures, management practices, and techniques.

### **1.2 ENCOURAGE USE OF COMPATIBLE LANDSCAPING**

Canyon GID will encourage the reduction in lawn sizes and the use of native plants, drought tolerant plants, and plants adapted to arid and semi-arid climates. To prevent water waste from irrigation overspray, Canyon GID will educate users in practical locations and sizes for turf to avoid areas that are difficult to water (narrow, strip, or odd shaped turf.) Educational information for residences and businesses will be in the form of mailers, guides and websites.

### **1.3 REDUCE WATER USE**

A primary goal of this conservation plans is to help Canyon GID and its customers meet or exceed conservation goals stated in this section. Canyon GID will provide conservation education to water users, adopt beneficial conservation practices and improve water use efficiency. Canyon GID will continue to strive to reduce water waste and reduce consumption by 5% by the year 2023 (savings of 2,500,000 gallons per year.) Adding time of day requirements to watering restrictions may also contribute to reducing water use. This plan will be reviewed by the GID Board and, when approved, included within the Canyon GID Tariffs (Tariffs).

Canyon GID made great strides toward the goal of by 5% water use reduction by the year 2013 through existing conservation programs, incentives and measures. Average water use and waste has decreased by over 2,100,000 gallons since 2013. This is a 4% reduction in average water use.

### **1.4 IDENTIFY AND REDUCE WATER LOSS**

Canyon GID will continue to maintain accurate water pumping and usage records to identify and reduce water leakages and inaccuracies in the water system (distribution lines, water meters, etc.) The GID will strive to reduce unaccounted-for water through identification and reduction of leaks in the water distribution system.

### **1.5 IMPLEMENT A STAGED CONTINGENCY PLAN FOR DROUGHT CONDITIONS**

To maintain an adequate supply of potable water for users and meet the requirements of NRS, Canyon GID will implement the staged contingency plan for drought conditions included in this Plan update (See Section 3.3) This Plan will be reviewed by the GID Board and, when approved, included within the Canyon GID Tariffs (Tariffs). The primary goal of this plan is to ensure sufficient water for essential public health and safety needs at all times.

### **1.6 COMPLETE WATER SYSTEM AUDITS AND PLAN EVALUATION MEASURES**

Since the previous plan update was submitted, Canyon GID has completed annual SCADA system audits of the water system's components. Water system billing software was updated in July 2018. These measures have improved water use tracking and meter reading accuracy. Improved water use measurement accuracy will provide better evaluation of conservation measures and incentives into the future.

Canyon GID will continue efforts to perform annual SCADA system audits and improve water use measurement accuracy to evaluate conservation measures and Plan goals.

The annual production versus water usage 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.

Average annual water use by the Canyon GID has decreased by over 2,000,000 gallons since the last plan update was submitted. Implementation of the Plan and several years of data collection to evaluate its effectiveness will continue to be collected and analyzed. However, Canyon GID is currently under the State of Nevada's average of 190-200 gpcpd by 80-90 gpcpd. The average amount of savings per year from the State's average ranges between 38.2 - 43 million gallons. Water conservation efforts already in effect are indicative of this lower water use.

## **1.7 ESTABLISH STANDARDS FOR WATER EFFICIENCY FOR NEW DEVELOPMENT**

Canyon GID's service area includes the small (predominately residential) community of Lockwood located within Storey County, just east of Sparks, Nevada. New construction in the service area has slowed dramatically. The district is approaching a build-out status within its own service area boundaries, and new developments are not anticipated at the present time. The Storey County Master Plan includes recommendations for addressing water and natural resources and implications for future development. See Appendix A. Storey County Master Plan identifies three parameters making potable groundwater scarce in the area: low precipitation, low recharge and soil composition. Canyon GID can refer to these established Storey County policies if future development occurs. NRS Sec. 540.141.1(g)

## 1.8 PLAN IMPLEMENTATION SCHEDULE

Table 1. Plan Implementation Schedule

Conservation Measures and Incentives	2019	2020	2021
<b><i>Measures</i></b>			
Shower Head Retrofit Program	Evaluate	Evaluate	Evaluate
Leak Detection Program	Monitor/Evaluate	Monitor/Evaluate	Monitor/Evaluate
Implementation of Drought Contingency Plan	Evaluate	Ongoing	Ongoing
<b><i>Incentives</i></b>			
Annual Production Audit	Ongoing	Ongoing	Ongoing
Monthly Consumption Audits	Ongoing	Ongoing	Ongoing
Revision to Tariffs (Rules & Regulations Landscaping Schedule, Fines/Penalties, etc.)	Ongoing	Ongoing	Ongoing
Conservation Educational Bill Inserts	Ongoing	Ongoing	Ongoing
Monthly Newsletter Conservation Tip Section	Ongoing	Ongoing	Ongoing
Staged Drought Contingency Plan	Evaluate	Implement	Ongoing
Conservation Training for Key Personnel	Ongoing	Ongoing	Ongoing

Since 2013, Canyon GID has achieved several of the goals included in the previous update of this Water Conservation Plan. Goals achieved since that time include effluent reuse, maintaining residential irrigation restrictions and penalties and fines for water wasting violations, utilizing an increasing block rate water structure to promote conservation, and providing public education and outreach regarding water conservation practices. Canyon GID has also made great strides toward the goal of by 5% by the year 2013 (savings of 3,000,000 gallons per year.) Average water use and waste has decreased by over 2,100,000 gallons since 2013. This is average reduction in water use by 4%.

**END OF SECTION**



## 2.0 WATER USE PROFILE AND FORECAST

This Section details the production and usage rates of the Canyon GID water system, including:

- Water Rights
- Existing Distribution and Supply Sources
- Water Use Profile
- Water Demand Forecast

### 2.1 WATER RIGHTS

Table 2.1 is a summary of the current water right permits and certificates held by Canyon GID. Permits held by Canyon GID are in Hydrographic Basin 083, Tracey Segment. See Appendix B for NDWR Basin Summary. Canyon GID water rights include underground water right permits for quasi-municipal use, and secondary effluent permits for irrigation purposes for parks and common areas and industrial use that supports Lockwood landfill operations. Two additional rights are owned by Storey County and maintained by Canyon GID. In total, these water right permits allow Canyon GID to utilize, but not exceed, a total of 118.43 million gallons annually (363.471 acre feet annually).

**Table 2.1 Summary of Canyon GID Water Rights**

Basin	App. No.	Status	Priority Date	Source	MOU	Owner
83	36918	CER	2/20/1987	UG	QM	Canyon GID
83	50533	CER	11/16/1977	UG	QM	Owned by Storey County: maintained by Canyon GID
83	50534	CER	1/9/1980	UG	QM	Canyon GID
83	50535	CER	2/8/1980	UG	QM	Canyon GID
83	50538	CER	11/16/1977	UG	QM	Canyon GID
83	51172	PER	1/3/1978	UG	QM	Canyon GID
83	51173	PER	1/3/1978	UG	QM	Canyon GID
83	69184	PER	4/9/1987	UG	QM	Canyon GID
83	80870	PER	11/16/1977	UG	QM	Owned by Storey County: maintained by Canyon GID
83	85267	PER	6/26/2015	EFF	STO	Canyon GID
83	85267-S01	PER	6/26/2015	EFF	IRR	Canyon GID
83	85267-S02	PER	6/26/2015	EFF	IND	Canyon GID

### 2.2 EXISTING DISTRIBUTION AND SUPPLY SOURCES

Water is supplied to Canyon GID's water system via three drilled underground wells, two water treatment facilities, storage tanks, and distribution pipelines. Wastewater collected from the area is currently managed through a treatment facility and leech fields. Canyon GID sells treated effluent to the nearby landfill which is able to use all but five percent of the effluent generated by the plant.

### **2.2.1 Service Area**

Canyon GID serves the town of Lockwood and the Rainbow Bend Development.

### **2.2.2 Storage**

Nevada Administrative Code (NAC) recommends a water system have enough storage for maximum day demand (referred to as operational storage), fire suppression and emergency reserves. Historical water use data shows peak month water use is approximately 7.1 million gallons (August 2016). Therefore, maximum day demand (or operational storage) is 229,032 gallons. Fire suppression for a community with commercial customers should not be less than 1,500 gpm for two hours or 180,000 gallons. Reserve storage, although not required for existing public water systems, is recommended by NAC to be 75% of the operating storage; in this case 171,775 gallons. Total storage requirements equal 580,807 gallons. The Canyon GID water system current storage capacity is a minimum of 850,000 gallons.

### **2.2.3 Metering**

The Canyon GID water system is fully metered. Meters are installed at system distribution points. Annual pumpage reports are submitted to Nevada Division of Water Resources (NDWR). NRS Sec. 540.141.1(f)

## **2.3 WATER USE PROFILE**

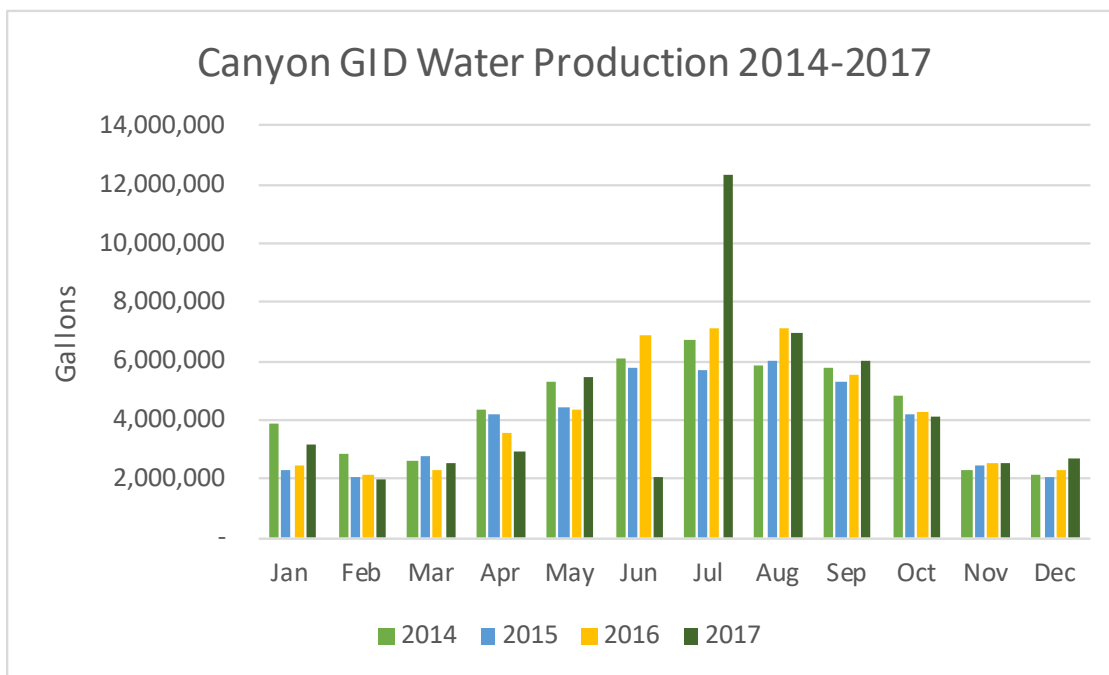
Canyon GID currently has 502 residential connections and 23 commercial connections. There are a total of 13 commercial customers, one of which has multiple irrigation meters. The Canyon GID serves approximately 1,310 persons.

Based on the historical pumping records and a population estimate of 1,310 persons, Canyon GID uses approximately 107 gallons per capita per day (gpcpd). The community is predominantly residential houses with landscapes that are on automatic sprinkler systems. The automatic sprinklers are on timed schedules that make it easy for users to irrigate their lawns without running a water hose on the ground (wasting water from runoff) etc.

Canyon GID currently reclaims 85% of its backwash water for the filters in both water treatment plants. Canyon GID currently sells 95 % of the effluent from the Canyon GID wastewater treatment facility to the nearby Lockwood landfill. The landfill uses the effluent for dust control and compaction. NRS Sec. 540.141.1(c)(2)

### **2.3.1 Canyon GID Personnel**

Due to the small size of the system, Canyon GID does not currently have personnel, procedures, or finances in place to monitor water waste full time; however, existing employees and individual members within the community report visible water wasting to the district's Manager. In addition to this, Canyon GID employs a 24-hour patrol service that keeps an eye on the area and (if there is a problem) can report back to Canyon GID key personnel. Canyon GID does not have the financial capability of hiring employees for the sole purpose of water conservation; however, there is value in training existing personnel in conservation management practices and techniques so that waste can be prevented, and conservation related ordinances/rules can be enforced. Without this training the conservation and drought sections will be ineffective. Canyon GID has sent key personnel to a water conservation class and will continue to actively train existing personnel in conservation management practices and techniques. The Canyon GID Manager compiles a monthly audit (when bills are produced) to determine if any excessive or "out-of-the-ordinary" usages are occurring with a customer. The GID Manager then contacts the customer with questions and/or suggestions. NRS Sec. 540.131. 6(c)



**Figure 1. Canyon GID Water Production 2014-2017**

**\*July 2017 experienced unusually high water use due to filter replacement and system flushing**

**Table 2.2 Canyon GID Water use and Unaccounted-for Water**

<b>Year</b>	<b>Total Production (gal)</b>	<b>Total Billed (gal)</b>	<b>Total Unbilled Metered (gal)</b>	<b>Unaccounted-For (gal)</b>	<b>Unaccounted-For (%)</b>
2017	52,864,000	45,514,258	69,600	5,004,134	9.5
2016	50,586,000	44,204,830	42,300	6,663,262	13.1
2015	47,337,000	42,612,480	52,000	3,471,512	7.3
2014	52,583,000	45,752,171	67,000	5,587,821	10.6
2013	52,816,000	48,353,099	63,000	3,238,893	8.3
<b>Average</b>	<b>51,237,200</b>	<b>45,287,368</b>	<b>58,780</b>	<b>4,793,124</b>	<b>9.8</b>

## **2.4 WATER DEMAND FORECAST**

The total number of customers in the Canyon GID remains fairly constant. New construction in the service area has slowed dramatically and the district is almost at build-out. No new demand forecast is needed at this time.

## **2.5 UNACCOUNTED FOR WATER**

Based on historical records for pumping and water usage from 2013-2017, the amount of unaccounted-for water for Canyon GID is indicated in Table 2.2 above.

Currently, Canyon GID does not have a distribution leak detection program. Leaks in the system are detected through meter readings, monthly audits, and customer reports. As indicated in Table 2.2, Canyon GID has an average 9.8% unaccounted-for water. Causes for water being unaccounted-for are numerous. Leaking mains, dead meters, under-registering meters, record keeping practices, un-metered uses, and multiple users on meters all contribute to the problem. All water systems lose some amount of water and, on average, an efficient system would have 10% or less of unaccounted-for water. Calculations for Canyon GID indicate that its system is efficient with respect to unaccounted-for water percentages.

The amount of annual unaccounted-for water for Canyon GID ranges between 3,000,000 to 6,600,000 gallons. Due to the low percentage of water lost within the Canyon GID system, a leak detection program is not expected to save much additional water; however, there is value in maintaining accurate pumping and usage records in order to estimate unaccounted-for water within the system. Canyon GID will continue to detect leaks by comparing pumping and usage records to evaluate how much water is unaccounted-for annually, meter readings, monthly audits, and customer reports. If the percentages increase significantly, Canyon GID will consider the feasibility of implementing a leak detection program.

In July 2018 Canyon GID completed a billing system software update and identified discrepancies in meter reading data. These discrepancies caused an estimated error in water use accounting of up to 500,000 gallons per month. Identification and correction of this error has resulted in more accurate calculation of unaccounted for water and system water use. Canyon GID will continue efforts to accurately measure water use and reduce unaccounted-for water in the system.

**END OF SECTION**

### **3.0 WATER CONSERVATION INCENTIVES AND MEASURES**

#### **3.1 CONSERVATION INCENTIVES**

Water conservation incentives are defined as methods that motivate water users to implement conservation measures and improve water use efficiency. Conservation incentives increase customer awareness about the value of reducing water use. Increasing public awareness about the value of reducing water use will lead to users making behavioral changes resulting in the increase implementation of conservation measures that directly save a quantifiable amount of water. Conservation incentives are classified into three categories: educational, regulatory and financial. Examples of water conservation incentives are listed below:

Educational: Direct-mail literature, water bill inserts, adding historical water consumption on users bills, television and radio advertisements, media coverage, school curriculum, local workshops/training programs/” Water Fairs”, etc.

Regulatory: Water efficiency policies/ordinances/laws/plumbing codes, landscape design standards, irrigation scheduling (allowable days of week/times of day to irrigate), penalties for outdoor water waste, pollution prevention requirements, etc.

Financial: Bill credits, rebates, conservation designed water rate structures, incentives or surcharge fees, developer rebates/compensations for water savings achieved, etc.

##### **3.1.1 Canyon GID Public Education Programs**

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. Canyon GID will continue to implement public education programs to increase awareness of the limited supply of water in the State of Nevada and the need to conserve water, encourage reduction in lawn size and the use of plants adapted to arid and semiarid climates. NRS Sec. 540.141.1(a) (1-2)

A successful educational program provides information to the public that helps to motivate water users in their efforts to conserve water. The Canyon GID will continue to provide its customers with educational materials and resources including home & landscape guides, mailers (on at a minimum quarterly basis), and links to conservation websites. Example water conservation brochures and pamphlets are included in Appendix C. Regardless of the type of educational resources that are used, the most important considerations are content, and successful dissemination of information. The following are specific conservation incentive methods that are used or will be utilized by Canyon GID to increase public awareness on water conservation within its service area

Canyon GID mails a newsletter with the monthly bill to inform Canyon GID users of waer issues including the importance of conserving water. Canyon GID will continue to include conservation information (at least on a quarterly basis) in the monthly bills of its customers. These mailings should be timed with water conservation issues for the upcoming months. For instance, landscaping conservation tips should go out in the May/June months and continue throughout the summer; whereas, indoor conservation tips should go out during the months of September/October, and extreme cold weather conservation tips (contact information for frozen pipes, etc.) should go out during December/January. Included in Appendix D are websites that Canyon GID can utilize to obtain valuable information on water conservation tips to pass on to its users. Included in Appendix E is a description and examples on how to read a water meter and can be included in the monthly bill to inform users on how to detect a leak on their side.

Canyon GID sponsors a water conservation booth during the “National Night Out” where the community is invited to actively participate in demonstrations. Management at Canyon GID understands the need for community involvement and education regarding water conservation and will strive to obtain funding to implement more community involvement activities.

Canyon GID will continue to include water conservation tips that will encourage/educate its users about the needs to conserve water in its monthly newsletter. This can include various water conservation topics/tips that are deemed pertinent to Canyon GID users.

The information in this water conservation plan will be used for educational purposes. This Plan contains conservation information that can be shared with all water users.

### 3.1.1.1 Plumbing Standards

Canyon GID will provide educational materials that will inform its users on the importance of water savings through the retrofitting of old plumbing fixtures. The most recent Federal and California plumbing standards are shown in Table 3.1. It is valuable to include California's standards for reference since in most cases California's requirements are more stringent. The comparison infers that there are plumbing fixtures available that exceed federal efficiency requirements and offer consumers alternatives that further improve conservation efforts. Appendix F lists EPA water usage benchmarks for typical residential uses. Canyon GID management encourages shower head replacement by retrofitting old shower heads that use more water for new ones that use less water.

**Table 3.1 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*	1/1/94	2.5 gpm	3/20/92
Lavatory Faucets	2.5 gpm	1/1/94	2.2 gpm	3/20/92
Sink Faucets	2.5 gpm	1/1/94	2.2 gpm	3/20/92
Metering Faucets	*	1/1/94	†	7/1/92
Tub Spout Diverters	Not included in FEPA		0.1 to 0.3‡	3/20/92
Residential Toilets	1.6 gpf	1/1/94	1.6gpf	3/20/92
Flushometer Valves	1.6 gpf§	1/1/97	1.6 gpf	1/1/92
Commercial Toilets	1.6 gpf	1/1/97	1.6 gpf	1/1/94
Urinals	1.0 gpf	1/1/94	1.0 gpf	1/1/92

\* Gallons per minute.

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

† Hot water maximum flow rate ranges 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).

§ Gallons per flush.

### **3.1.2 Canyon GID Regulatory Incentives**

Regulatory conservation incentives Canyon GID has implemented include rules and regulations on outdoor water irrigation scheduling and water wasting. Canyon GID has included as a provision in its Tariffs that allowing water to run-off landscaping onto concrete, asphalt or non-vegetated areas is considered a waste of water and this action will result in warnings, penalties and/or fines. An odd/even address watering schedule is included in the Tariffs, with penalties attached to users that water on the wrong days. Additionally, Canyon GID will provide brochures on Xeriscaping™ methods, types of plants that grow well in the area, and the difficulty in watering small strips/odd shaped turf, etc. to encourage its users to become more conscious about the types of plants to purchase and locations to place them.

#### **3.1.2.1 Canyon GID landscaping practices**

Canyon GID will continue to encourage reduction in the size of lawns and encourage the use of plants that are adapted to arid and semiarid climates. Water usage is much higher in the summer than the winter due to the watering needs of landscaping. For this reason, a landscaping code can be a fundamental part of an effective water conservation plan. Landscape codes regulate new landscapes and the replacement of existing landscapes. Canyon GID does not have the authority to institute a landscaping code. For reference, example landscape codes from nearby areas are included in Appendix G.

Canyon GID does not have the authority to institute a landscaping code; it is the responsibility of the Homeowner's Association (HOA) for the two residential areas in Lockwood. Canyon GID, however, will encourage the reduction of the size of lawns and encourage the use of Xeriscaping™ methods and drought tolerant/native plants by providing education to its users through brochures in the monthly bills and conservation tips in its monthly newsletter. Appendix H gives a list of compatible shrubs, trees, and plants for the Canyon GID service area. Education will encourage Canyon GID customers to become more conscious about the types of plants that can be purchased that require the least amount of water and the locations where the plants are most suited for planting.

Canyon GID will continue to encourage the reduction of lawn sizes within its service area through education, incentives, a watering schedule of even/odd addresses, and instituting times during the day when watering is not allowed. In addition to including these rules in its Tariffs, Canyon GID has implemented a schedule of fines to enforce the violation of any water wasting within its service area.

#### **3.1.2.2 Water use restrictions**

Canyon GID has established a watering schedule including day and time watering restrictions. See Appendix I. Three primary restrictions are based on scheduled watering days based on even and odd addresses, hours restricted from watering and prohibiting overwatering. In addition to including these rules in its Tariffs, Canyon GID has implemented a schedule of fines to enforce the violation of any water wasting within its service area. Canyon GID watering schedule prohibits watering between the hours of 12:00 and 4:00 p.m. when the temperatures are hotter, and evaporation rates are generally greater.

**Table 3.2 Canyon GID Water Irrigation Restrictions**

Location	Watering days
Odd Numbered houses	Tuesday, Thursday, Saturday
Even numbered houses	Wednesday, Friday, Sunday
Common Areas	Monday

### 3.1.3 Canyon GID Financial Incentives

#### 3.1.3.1 Canyon GID tiered rate structure NRS Sec. 540.141.1(h)

Canyon GID currently uses a tiered rate schedule. Current water rates include a monthly base rate of \$43.00 (includes 15,000 gallons of water usage) and an additional \$2.00 per 1,000 gallons (from 15,001 to 20,000 gallons) and an additional \$3.50 per 1,000 gallons (above 20,000 gallons). All customers are charged the same water rate regardless of meter size or customer classification (residential, commercial, etc).

The continued use of this tiered rate structure is estimated to impact the consumptive use of water by encouraging users to become more conscious of the water being used, and discouraging water use by increasing the cost to use larger volumes of water.

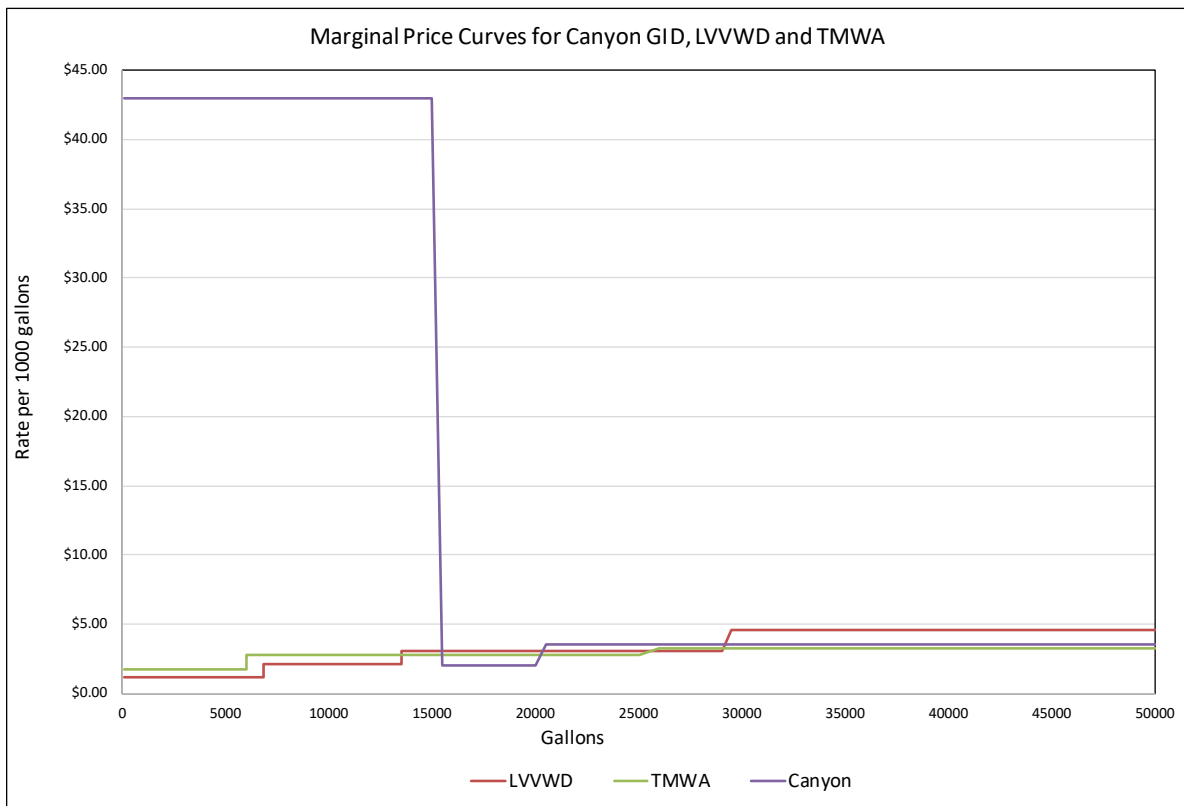
Water rates, as a conservation incentive, work to increase awareness about the value of reducing water use and can motivate users to implement water conservation measures. The multiple increasing blocks/tiered rate structure (currently utilized by Canyon GID) helps to encourage its users to become more conscious of the water that is being used by increasing the cost to use higher volumes of water. The existing Canyon GID water rates have been designed to charge users for water they actually use and to encourage conservation.

Figure 3.1 shows the marginal price curve for the Canyon GID. Figure 3.2 shows the average price per 1,000 gallons of water. For comparison, the figures include curves for the Las Vegas Valley Water District (LVVWD) and Truckee Meadows Water Authority (TMWA). This analysis provides a comparison for Canyon GID against larger water providers with more comprehensive tiered rate structures.

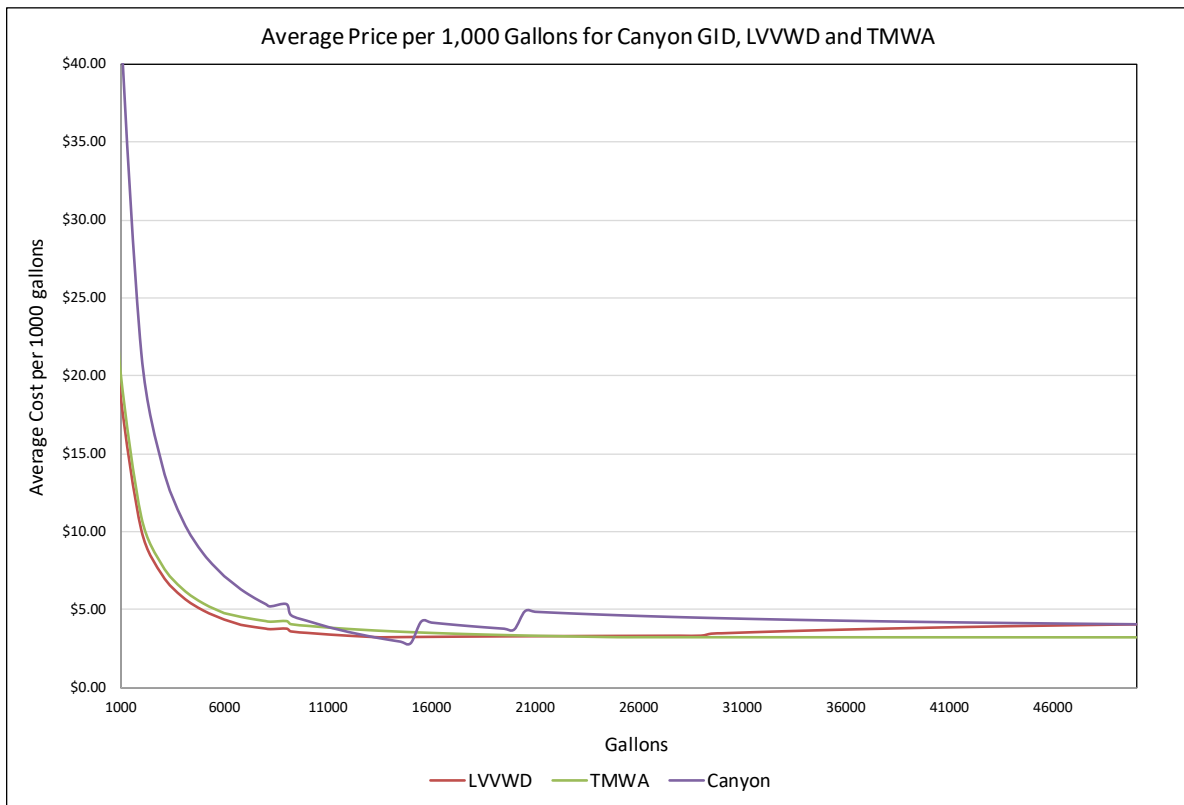
**Table 3.3 Canyon GID Tiered Rate Structure**

Water Use	Rate Schedule
0-15,000 gallons	Flat fee 43.00
15,001-20,000 gallons	Additional \$2.00 per 1,000 gallons
Above 20,000 gallons	Additional \$3.50 per 1,000 gallons





**Figure 3.1 Marginal Price Curves for Canyon GID, LVVWD and TMWA**



**Figure 3.2 Average Price Per 1,000 Gallons for Canyon GID, LVVWD and TMWA**

### 3.1.3.2 Canyon GID Schedule of Fines NRS Sec. 540.131.6(b)

Canyon GID is responsible for enacting rules and regulations regarding water usage within its service area. The intent of water rules and regulations is to limit water use during water shortages and drought conditions, or to restrict use if it is found that water is being wasted. Canyon GID has a schedule of rules and regulations that define “waste of water” and include sections on enforcement by citations, fines, and discontinuation of service.

Canyon GID has revised the Tariffs to include a section on penalties/fines for water wasting violations. The Schedule of Fines was agreed upon and approved by the Canyon GID Board. Including these fines in the Tariffs will allow Canyon GID to enforce the Rules and Regulations and will encourage its users against wasting water. Included in Appendix I are the rules and regulations for leak repair and landscape irrigation that were established in 2009.

## 3.2 CONSERVATION MEASURES

Water conservation measures are defined as a device or behavioral practice implemented by a water system or water users that will result in a quantifiable or measurable amount of water savings or more efficient use of water. There are two types of conservation measures; (1) “hardware” devices or equipment and (2) behavior or management practices that will directly save water. Conservation measures can be mandated by state or federal laws or voluntarily implemented by local water purveyors and/or customers. Some Examples of water conservation measures are listed below and are included in Appendix J:

### Residential (Indoor)

Hardware devices/equipment- installing low flow toilets, waterless and composting toilets and urinals, low-flow shower heads and faucets, water-efficient clothes washers and dishwashers, etc.

Behavioral/management practices- not using toilets for trash disposal, shutting off faucets when brushing teeth or performing other duties, washing only full loads of clothes, dishes, etc.

### Landscaping

Hardware devices/equipment- installing native/drought tolerant plants/landscaping (including Xeriscape™ techniques), drip irrigation, automatic shut-off hoses, rain sensors, etc.

Behavioral/management practices- watering less frequently, utilizing water efficient landscape maintenance practices, etc.

### Commercial/Industrial/Institutional

Hardware devices/equipment- using cooling towers with recycled water, reusing process water, leak repair within facility, etc.

Behavioral/management practices- shutting off unused valves, sweeping a sidewalk rather than washing with a hose, use water-efficient equipment, not serving water automatically in restaurants, etc.

### Water utilities

Hardware devices/equipment- leak detection and repair, hydrant capping, utilizing reused effluent, implementing water rate structures that promotes conservation, etc.

Behavioral/management practices-regularly service and adjust system valves and connections, reduce high pressure locations, etc.

### 3.2.1 Canyon GID Residential Hardware/Device Conservation Measures

Canyon GID is a small water system that has limited regulatory authority and finances. Conservation measures involving retrofitting equipment/devices are expensive; therefore, a cost-benefit analysis would need to be performed before implementation of any such program to evaluate its effectiveness. Currently the GID encourages all residents to install low flow and water conserving shower heads. (retrofitting old shower heads that use more water for new ones). A formal retrofitting program has not been implemented due to costs and is still under consideration. Dedicated funding would need to be identified for a formal retro fitting program sponsored by the Canyon GID.

Water use by shower heads is typically the third largest source of indoor residential demand, averaging 11.6 gallons per capita per day (gpcpd) which represents approximately 17% of all indoor water use for a single-family home. The amount of water that can be saved is dependent on several variables that is specific to Canyon GID users and will need to be evaluated prior to implementation. The number of older homes with connections on the system will be one of the biggest indicators on how much water can be saved within the Canyon GID service area. Shower heads installed before the early 1980's have actual flow rates at approximately 4.3 gallons per minute (gpm) and shower heads installed between 1980 and 1994 have actual flow rates of between 1.8 to 2.7 gpm (depending on regular or low flow design.) In 1994 Environmental Protection Agency (EPA) required that shower heads sold, installed, or imported in the United States be low-volume fixtures that use no more than 2.5 gpm at 80 psi (rated flow rate). Actual flow rates of post 1994 shower heads indicate a water use rate of approximately 1.7 gpm. If the average shower lasts 5.3 minutes, then the savings per capita for the installation of low flow shower heads are indicated in Table 3.4.

**TABLE 3.4 ESTIMATED WATER USE AND SAVINGS FOR LOW-VOLUME SHOWER HEADS**

<b>Shower Head Installation Timeframe</b>	<b>Actual Flow Rates (gpm)</b>	<b>Typical water usage (gallons per 5.3 minute shower)</b>	<b>Water Savings (gpcpd)</b>	<b>Canyon GID Water Savings (gallons per year)</b>
Pre-1980's	4.3	22.8	13.8	6,598,470
1980-1994	1.8-2.7	9.5 - 14.3	.5 - 5.3	239,075-2,534,195
After 1994	1.7	9.0	0	0

The water savings per household per year was estimated based on 2.5 persons per household. Canyon GID will need to evaluate the number of homes built before 1994 to estimate the amount of water that can be saved from implementing a shower head retrofit conservation program. Depending on the existing residential shower heads, Canyon GID can expect to save between 239,000 to 6,598,000 gallons per year through a successful shower head retrofit program. Canyon GID will continue to consider the feasibility of implementing a shower head retrofitting program within its system when funding is available. The GID will continue to encourage all residents to install more water efficient hardware.

### 3.2.2 Canyon GID Residential Behavioral Conservation Measures

Canyon GID will use informational measures to educate its users of individual behavioral changes that can be made to save water. A small section in the monthly newsletter will be allocated to "Water Conservation Tips" and can include amounts of water saved each year by implementing behavioral conservation measures such as turning off the water when brushing your teeth, using other methods

besides allowing the water to run to cool/heat the water that comes out of the faucet, taking shorter showers, only washing clothes/dishes when the machine is full, etc. A successful educational program on behavioral changes can result in long term water savings and a financial savings to the water user.

### **3.2.3 Canyon GID Commercial/Industrial Hardware & Behavioral Conservation Measures**

There are only 13 commercial/industrial connections (one with multiple meters) on the Canyon GID water system. Water conservation to these establishments can come from a variety of different methods. Canyon GID will continue to provide educational materials to these establishments on the importance of fixing leaking toilets/sinks. Education can result in both hardware and behavioral changes that will directly save water.

### **3.2.4 Canyon GID Water Utility Hardware & Behavioral Conservation Measures**

Canyon GID will save water through the process of detecting and repairing leaks within its system. Detecting leaks within the system can be a time-consuming and costly process that may or may not result in the actual savings of a significant amount of water. Leaks within the system can contribute to high percentages of unaccounted-for water within the system.

Canyon GID strives to reduce the amount of water extracted from the various sources versus the water actually delivered (billed) to customers through a system of identifying and reducing leaks in the water distribution system, instituting a meter maintenance/replacement program, connecting un-metered and multiple users, monitoring water usages that are not billed for, and servicing the system valves and connections.

Annual audits comparing water production with metered amounts will be performed prior to implementing incentives or measures. Additional audits will then be done every year thereafter. Results from the initial audit will be compared with those of subsequent audits to determine the effectiveness of measures and/or incentives.

Canyon GID will continue to detect leaks by comparing pumping and usage records to evaluate how much water is unaccounted-for annually, meter readings, monthly audits, and customer reports. If the percentages increase significantly, Canyon GID will consider implementing a leak detection program.

NRS Sec. 540.141.2(c)(1)

### **3.3 DROUGHT CONTINGENCY PLAN TO ENSURE POTABLE WATER SUPPLY**

The primary goal of water conservation is to insure sufficient water for essential public health and safety needs at all times. The climate in Northern Nevada is arid and subject to periodic droughts that can vary in duration. It is important, therefore, to have a reserve on hand for such events. Conserving water during times of surplus will help to ensure that reserves are available for drought and emergency conditions. Maintaining an adequate supply of water is a vital component of providing water for a community.

Canyon GID will maintain an adequate supply of potable water. This includes the implementation of a detailed staged contingency plan for drought conditions. This plan will be reviewed by the Board and, if approved, included in the Tariffs.

All water supplied by Canyon GID comes from groundwater sources. Therefore, it is difficult to determine the effect of a drought year on the groundwater system. The consequences of a drought may not be detected in the water table until several years after the drought. For this reason, it is important that Canyon GID monitor precipitation, surface water levels, water table levels, and pumping records over the long term. 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 need to be done in the spring before the high use season. In extreme instances, where a well can no longer provide the needed water, Canyon GID will consider options such as restricting water usage until the problem can be solved, increasing the depth of the existing wells, developing a new well site, and/or aggressively finding a new water source, etc. For instance, if groundwater drops to a certain level, a corresponding stage of drought measures are then required. Canyon GID will determine how groundwater levels relate to the different stages of drought.

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:

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

There are specific measures associated with each stage of drought that apply to Canyon GID water customers, and the Canyon GID Board.

**TABLE 3.5 Canyon GID Board Drought Conservation Measures**

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

Drought conservation measures implemented by customers can save more water than those measures applied by Canyon GID Board (Table 3.5). 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. Fountains and Water Features
2. Government Facilities
3. Landscape Irrigation
4. Mist Systems
5. Surface, Equipment, and Building Washing
6. Turf Installation
7. Vehicle Washing

### Fountains and Water Features

Drought measures are summarized in Table 3.6.

**TABLE 3.6 Drought Measures for Fountains and Features**

Stage	Residential	Common Areas	Commercial
Watch	Fountains and features with a surface area of 200 ft <sup>2</sup> 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 not run only between 1 a.m. and 4 a.m. or whenever freezing conditions require system preservation.
Alert	Fountains and features with a surface area of 25 ft or less allowed.	Same as Watch	Same as Watch
Emergency	Fountains and features not allowed.	Fountains and features not allowed.	Fountains and features not allowed

### Government Facilities

Drought measures are summarized in Table 3.7.

**TABLE 3.7 Drought Measures for Government Facilities**

Stage	Government Facilities
Watch	To be determined by STOREY COUNTY COMMISSIONERS after government facility needs have been established.
Alert	
Emergency	

### Landscape Watering

Drought measures are summarized in Table 3.8.

**TABLE 3.8 Drought Measures for Landscape Watering**

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

### Mist Systems

Drought measures are summarized in Table 3.9.

**TABLE 3.9 Drought Measures for Misting Systems**

Stage	Residential	Commercial
Watch	Allowed, No Restrictions	Use only for human comfort in June, July and August and only between the hours of noon and 6 p.m.
Alert	Allowed, No Restrictions	Use only for human comfort in June, July and August and only between the hours of noon

### Parks and Community Use Areas

Drought measures are summarized in Table 3.10.

**TABLE 3.10 Drought Measures for Parks and Community Use Areas**

Stage	Parks and Community Use Areas
Watch	To be determined by STOREY COUNTY COMMISSIONERS after parks needs have been established.
Alert	
Emergency	

### Surface Equipment and Building Washing

Drought measures are summarized in Table 3.11.

**TABLE 3.11 Drought Measures for Surface Equipment and Building Washing**

Stage	Surface Equipment and Building Washing
Watch	Prohibited unless water is discharged into the sanitary sewer through approved methods or contained onsite.
Alert	
Emergency	

### Vehicle Washing

Drought measures are summarized in Table 3.12.

**TABLE 3.12 Drought Measures for Vehicle Washing**

Stage	Personal Vehicle Washing	Commercial Vehicle Washing
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 approved methods. Also, with high-pressure, low-volume sprayer using less than 10 gallons per vehicle.
Alert		
Emergency	Not allowed	Not allowed



### Turf Installation

Drought measures are summarized in Table 3.13.

**TABLE 3.13 Drought Measures for New Turf Installation**

<b>Stage</b>	<b>Residential Single and Multi-family</b>	<b>Non-Residential</b>
Watch	Allowed	Allowed within limits of Landscape Code.
Alert	Allowed	Allowed within limits of Landscape Code.
Emergency	Not allowed	Not allowed

### General Water User Measures

Drought measures are summarized in Table 3.14.

**TABLE 3.14 General Drought Measures**

<b>Stage</b>	<b>General Water User Measures</b>
Watch	Mandatory restrictions on all outside uses by residential users, except landscape irrigation. Unnecessary outdoor uses by any commercial users prohibited.
Alert	All outdoor water use severely restricted. Serve water in restaurants only upon

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

**END OF SECTION**

#### 4.0 ESTIMATED WATER SAVINGS

For each conservation measure and incentive, the amount of water savings that is estimated to be conserved each year as a result of adoption of the plan is shown in Table 4.1. The conservation incentives for Canyon GID are described in the Section 3.1 of this plan. Table 4.1 includes a water savings for the conservation incentives based on the combination of incentives indicated in this plan.

**TABLE 4.1 ESTIMATED ANNUAL WATER SAVINGS FROM CONSERVATION MEASURES and INCENTIVES**

	<b>Annual Water Savings (gallons per year)</b>
<b>Conservation Measures</b>	
Shower Head Retrofit Encouragement	239,000 to 6,598,000
Leak Detections (Unaccounted-For Water)	0 to 3,000,000
Drought Contingency Plan	5,123,720 to 25,618,600
<b>Conservation Incentives</b>	
Combined Conservation Incentive Efforts (public education, landscape practices, tiered rate structure, fines for violations)	0 to 2,500,000
Total Estimated Future Water Savings	230,000 to 25,618,000
Total Existing Conservation Measures/Incentives	38,200,000
Annual Conservation Goal (5% consumption reduction)	<b>2,500,000</b>

It is difficult to determine the actual amount of water savings that can be achieved through conservation incentives, so a range is indicated based on the amount of participation within the community. Canyon GID water usage of 107 gpcpd is lower than the State of Nevada's average; however, conservation can still be obtained through an increase in the residential customers becoming further educated and continually reminded on the value of conserving water. The potential water savings based on different customer participation levels (assuming a population of 1,310 within the Canyon GID service area) are shown in Table 4.2 below. A range is provided for an additional savings of 10 gpcpd because it is difficult to determine the additional level of individual participation in educational conservation programs.

**TABLE 4.2 RANGE OF WATER SAVINGS FROM RESIDENTIAL CONSERVATION**

<b>% of Users Consuming 120 gallons/day</b>	<b>New gpcpd Average</b>	<b>Amount Conserved Annually (million gallons)</b>
0	130	0
25	127	1.2
50	125	2.4
75	122	3.6
<b>AMOUNT OF WATER ALREADY SAVED THROUGH CONSERVATION EFFORTS</b>		
190-200 gpcpd	107 gpcpd	38.2 – 43.0

**END OF SECTION**

## **APPENDICES**

### **APPENDIX A. STOREY COUNTY MASTER PLAN, CHAPTER 10 WATER AND NATURAL RESOURCES**

# CHAPTER 10

## Water & Natural Resources



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## 10.1 Introduction

Storey County contains many wonderful natural features and resources. Above Virginia City, Mount Davidson stands 7,868 feet and is the highest point in Storey County. Below Virginia City, was the famous Comstock Lode. This natural resource of Storey County produced over 6.9 million tons of ore and many technological advancements. This mining bonanza helped Nevada become a state, and gave Nevada the “Silver State” name.

There are 167,680 total acres in Storey County, 39,146 acres are in the Carson basin with the remaining 128,534 acres of land in the Truckee River Basin. The Tahoe-Reno Industrial Center encompasses roughly 107,000 acres, well over half of the land area in the county. The Highlands encompasses roughly 24,000 acres. Other larger and undeveloped areas of the county include Lagomarsino, Mark Twain, Lockwood Mustang, Painted Rock and the Northeast part of the county. See Chapter 3 Land Use for more details.



As these larger and mostly undeveloped areas of the county become developed, the protection of the county’s environmental and natural resources should be of importance. Storey County has a history of open space and a population that enjoys the recreational use of that open space.

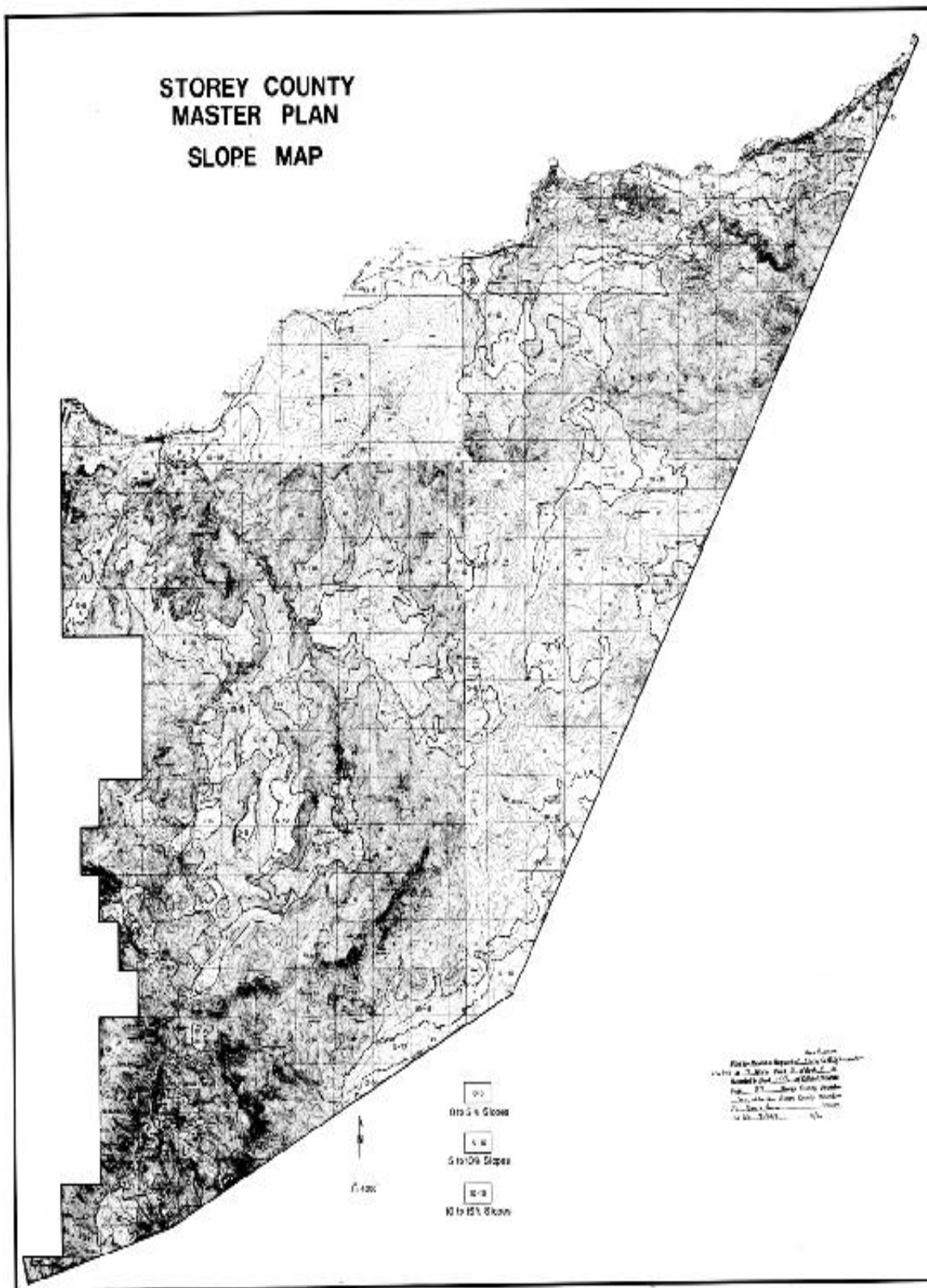
## 10.2 Topography

Storey County is mostly comprised of mountainous terrain with some flat land existing in the Mark Twain area, the south banks of the River District, and within the interior of the county’s northeast within the currently developing Tahoe-Reno Industrial Center area and some in the Highlands area. Although Virginia City itself was built on steep slopes, the fragility of the land makes it undesirable to follow this precedent. Only slopes of less than 10 percent should be developed unless engineered properly.

### 10.2.1 Slope Analysis

A slope analysis has been made and a map prepared to determine topography and terrain suitable for various types of industrial development (such as manufacturing and warehousing). This information is charted on the Slope Analysis Map recorded #74667, Book 102, Page 37, which is available for reference at the Storey County Recorder's Office (see below). Terrain with 0 to 5 percent, and 5 to 15 percent were initially considered as most probable development areas. This analysis reveals that development of much of the county is prohibitive.







## 10.3 Climate

Virginia City and the nearby Virginia Highlands are located at an elevation of over 6,000 feet. This is considerably higher than the rest of the county's populated areas. The Mark Twain and River Districts are more representative of the temperatures experienced in the Reno and Carson City areas.

The county's high mountainous location is also conducive to higher precipitation amounts which average slightly over 12 inches a year. Much of this precipitation comes in as snow during the winter. Total snow fall averages 56 inches a year but over three feet can fall in one month.

Summer daytime average temperatures are in the 70s and low 80s. The nighttime temperatures drop down to the mid-50s. During the winter, daytime high temperatures average 40 to 50 degrees and nighttime temperatures range from 25 to 30 degrees F.

Despite the high elevation of Virginia City, Gold Hill, and the Highlands, the growing season is relatively long, averaging 107 days per year. Relative humidity is slightly higher than the regional average. Humidity averages 30 to 50 percent over the year, but varies from about 70 percent during the winter to approximately 20 percent during mid-summer. Thunderstorms average about 10 to 15 storms per year and are usually accompanied by lightening.

Wind information is relatively sparse. The higher exposed location of Virginia City leads to higher wind velocities. The Virginia Range also has an effect on the prevailing winds, which generally are from north to south and west to east. However, upslope and downslope valley winds are dominate throughout the day. Occasionally wind speed has been known to reach over 100 miles per hour.

Figure 10.3-1 Virginia City Weather (degree F)							
	<i>Ave Hi</i>	<i>Ave Low</i>	<i>Ave Precip Inch/Yr</i>	<i>Record Hi</i>	<i>Year</i>	<i>Record Low</i>	<i>Year</i>
January	42	25	1.7	63	1971	-1	1997
February	44	26	2.1	70	1986	-9	1989
March	50	31	1.5	74	1966	4	1971
April	56	35	0.7	79	1989	10	1970
May	65	43	0.5	109	1984	0	2011
June	75	52	0.5	95	1966	0	2011
July	84	60	0.3	99	2002	36	1983
August	83	59	0.3	100	1970	31	1951
September	74	51	0.6	93	1960	21	1970
October	62	41	0.8	84	2001	11	1971
November	49	31	1.6	72	1976	6	2010
December	41	24	1.8	69	1958	-11	1972

Source: [www.Weather.com](http://www.Weather.com)

### 10.3.1 Air quality

Air quality in Storey County is generally very good. Air movement through the county normally helps to maintain the quality. Generally, Virginia City and the Virginia Highlands do not experience the stagnating air which normally occurs, particularly during winter, on many valley floors of Nevada. Wild fires can have a significant negative impact on air quality. High winds pick up dust and pollen from time to time.

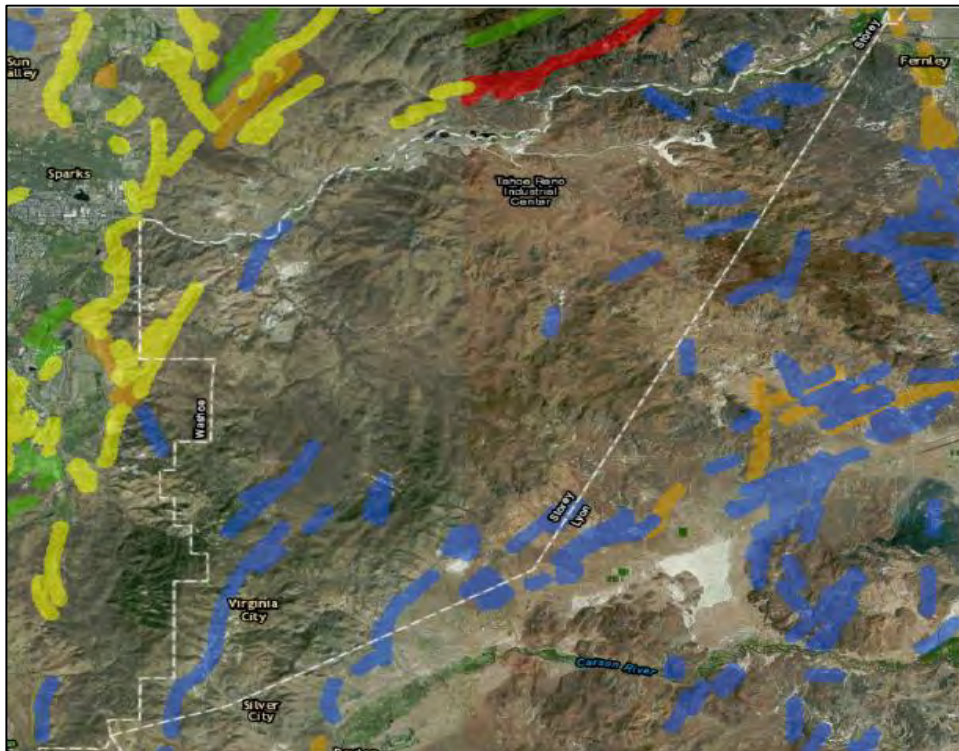
## 10.4 Geology

The geology of the county has greatly dictated its development. Among the most notable geological contributions has been a wealth of minerals and fragmented ground water resources. The mineral deposits shaped the county's early development, while poor quality ground water throughout the county has restricted some development activities.

Much of the county is underlain by relatively stable volcanic bedrock, blanketed by a very shallow surface cover. However, deposits of unstable conglomerates, sandstones, shales and diatomaceous sediments also exist. Gravel and sand deposits also occur in the alluvial planes. Soil Survey of Storey County Area, Nevada; May, 1990.

## 10.5 Seismology

Storey County is located in seismic zone 4. Seismic zones are rated 1 through 4, with seismic zone 1 having the minimum number of seismic events and zone 4 being the most active. This becomes a major consideration for land use planning and particular construction requirements are necessary. As compared to neighboring counties, Storey County has fewer faults. The lines on the map to the right show faults. The blue means that it is an older fault as compared to the green, yellow, orange or red lines.



**Figure 10.5-1:**  
Representation of  
Seismological  
activity in Storey  
County. *Source:*  
*U.S. Geological  
Survey, 2015*

## 10.6 Soils

A comprehensive soil survey for Storey County has been generated by the U.S. Soil Conservation Services and is used to describe soil characteristics which affect the county's potential.

Of concern to the county is its marginal ability to capture and hold what little precipitation it receives. All but a small portion of the county has been classified by the U.S. Soil Conservation Services as exhibiting poor infiltration capability. Soil interpretations for both profile permeability and soil hydrologic grouping lead to this conclusion. Because of this condition, most of the county's runoff occurs as surface flow. Only a small portion occurs as ground water yield.

Runoff leaves the county immediately, which does take its toll in terms of erosion. Most of the county's soils exhibit a moderate to severe erosion hazard. Any disturbance to natural conditions will greatly increase the hazard.

Efforts should be made to slow the water runoff to encourage greater infiltration. Recommendations should be developed for home and property owners to slow the flow and decrease erosion at the same time. The county might consider infrastructure projects to slow the flow of larger drainage canyons as well. Development considerations should continue to be made for water availability, water permeability for septic, and drainage issues.

Wind erosion is also a factor to consider. Most of the county exhibits a moderate to severe hazard. Likewise, any disturbance to natural conditions, such as blading to create roads, will greatly increase wind erosion problems.

## 10.7 Flora

Vegetation within the county is mainly restricted to three communities: the Pinion-Juniper, the Big Sagebrush-Grass, and the Low Sagebrush-Grass. The Pinion-Juniper, located in the upper elevations of Storey County, is accompanied with an understory of big sagebrush and antelope bitterbrush. Frequently lying above the Pinion-Juniper is the Low Sagebrush-Grass community. Associated with low sage are grasses and forbs such as needlegrass and balsamroot. Below the Pinion-Juniper lie the Big Sagebrush-Grass community. Big sagebrush is accompanied by a host of grasses, forbs and shrubs.

These vegetal communities are typical of the region, and exist in a very harsh climate. Recovery from disturbance is slow. Disturbance to vegetation leads to a host of environmental problems such as dislocation of native fauna (permanent or seasonal), increased erosional hazards and a deterioration of the local watershed. Either maintaining native vegetation, or other plant growth should be encouraged to maintain the top soil of the county. See Exhibit A in this chapter for a comprehensive list.

## 10.8 Fauna

Within the interior of Storey County exist the usual array of wildlife found in Western Nevada. The Truckee river is important to the region's fishery and once again provides spawning grounds for the Lahontan Cutthroat Trout and the cui-ui.

Further inland, game birds such as the mountain and California valley quail, dove, and chucker partridge are around the county's springs and seeps. Sage grouse might be in the county, although none have been identified. Cottontail rabbits dwell close to these natural water supplies.

In terms of larger animals, the County hosts one of Nevada's larger herds of wild horses. The U.S. Bureau of Land Management estimates the Nevada population of wild horses at over 27,000 animals. Several hundred of those live throughout the County. The wild horse is the primary grazing animal in some areas, notably the Highlands area and Tahoe-Reno Industrial Center. These herds keep the fine fuel (dry grasses) from adding to the high fire danger. However, the competition for available forage and water is high, and the herd could exceed the natural carrying capacity of the range.

Storey County provides a habitat for both a resident population of deer as well as a wintering ground for a portion of those deer that summer around and about the Tahoe Basin. The Flowery Range-Upper Long Valley Creek area is a key deer wintering site, as is the western face of the Virginia Mountains in Washoe County. Regular seasonal migration routes include the Five Mile Flat area as well as the canyons between Gold Hill and Silver City. Other notable large animals in the county include black bears, cougars, and bobcats.

Associated with the game are the usual assortment of non-game species, ranging from chipmunks to eagles to coyotes and western diamondback rattle snake. All of the county's fauna survive within a delicate framework of available water and food. Thus the fauna are intimately associated with the county's fragile environment and are therefore equally fragile. See Exhibit A in this chapter for a comprehensive list of fauna.

## 10.9 Water

Like most of Western Nevada, Storey County lies in the rain shadow created by the Sierra Nevada mountain Range and most of the county lies in another rain shadow created by a portion of the Virginia Range.

Average annual precipitation in Virginia City is 9.94 inches per year. Higher elevations of the county receive 12 to 15 inches of precipitation annually while the area's lower elevations receive about five inches of precipitation annually. The county has areas of snow accumulation especially at higher elevations.

Annual recharge is challenging in the county for a variety of reasons. Because the topography is generally steep, the soil permeability low, and vegetation sparse, it is difficult to retain water within the county, except for the alluvial fans located at the base of various drainage networks. Storey County is subject to climatic conditions characteristic of a high-mountain desert. During the

summertime, sporadic convection storms deliver about 25 percent of the region's annual precipitation in large amounts over small areas. Winter storms are the primary source of upslope recharge.

### **10.9.1 Implications for Future Development**

As water is essential to any land use, availability of water should be the primary consideration in determining if development is appropriate for any given area. The responsibility of such considerations falls upon Storey County.

Three parameters make potable ground water scarce. They are low precipitation, low recharge and a soil mantle high in sulfates, iron, and numerous other elements which become dissolved in what little ground water that does exist.

Because of past ground water development successes and failures in Storey County, future development should be treated very carefully. A cautious approach would actually benefit the county because it would help ensure the success of new developments thereby avoiding possible county burdens in the future. Such a cautious approach would also protect the general public from what might prove to be unwise investments.

With the exception of the Truckee River flood plain, most of the county can be developed only at exceedingly low densities. The Mark Twain area should be included in the concept of low density uses, as it appears the water table is falling.

Development density should be based on that amount of land necessary to provide recharge equal to the needs of the proposed use. A criterion for density zoning then becomes a situation of defining recharge rates for areas in question. The Nevada State Engineer does this through water rights. While there is some debate on the accuracy of wet water (physical water that can be pumped from the ground) versus paper water (a water right), the water rights system in Nevada is the best available information and the best water rights system in the country. Any further subdivision and development outside of any of the water systems in the county must own water rights to accompany the subdivision application.

### **10.9.2 Water Systems in the County**

Presently, the only source of domestic water for the Virginia City - Gold Hill area comes from the State owned Marlette-Hobart water system. The Virginia City - Gold Hill water system has a contract with the Marlette-Hobart State system. While the contract defines rates to pay for the system, the Virginia City area and Carson City have rights to 10 cubic feet of water per second from the Franktown Decree. This is about 7,200 acre-feet of water. Not only is this more water than the Virginia City water system can handle, it is more than the Virginia City Area can use for now, and more than the Marlette-Hobart system can produce.

In summary, the limiting resource in the system is the transmission capability, rather than the peaking or total annual water availability at the source. Development serviced by the Virginia City water system should be allowed, and could more than accommodate the population growth expectations from the Population Chapter of this Master Plan.



Tahoe Reno Industrial Center and Rainbow Bent are serviced by their own water systems within their general improvement districts. The TRI General Improvement District has capacity for much more growth, and their grey water system adds to their conservation efforts. The Lockwood General Improvement District has a smaller defined community that it supports. Growth prospects for the this general improvement district are limited.

### **10.9.3 Water Quality**

Analysis of ground water as a source for domestic water requires evaluation of both quality and quantity. Findings, from a study for the 1994 Master Plan, of water quality from twenty Storey County wells and three mine shafts, shows twelve sites not meeting acceptable water drinking standards. Only two sites in the Mustang area, one at the Orchard Exit, two at Painted Rock and three in the Mark Twain area met or exceeded water drinking standards.

In summary, 60 percent of the 20 samples submitted for quality analysis of Storey County well water were found to be below standards for domestic consumption. This figure has been determined to be three times that of the five county western Nevada regional average. The implication is that water is not only scarce in Storey County but the quality of available ground water quality is also poor.

## **10.10 Summary**

Future land use densities should be based on water availability from basin-wide inventories. The planning will be based on basin conditions as a whole, an approach which may not be accurate for any specific location. This should result in land not being developed at densities that will lead to the mining of water. Population densities should not be allowed to exceed the point where more water is taken out of the ground than is naturally recharged.

Precipitation at the Virginia City rain gauge is ten inches per year. This gauge is the only one in the county has provided data over a sufficient length of time for analysis. Although located below Mt. Davidson in the rain shadow of the western boundary of the Virginia Range, it is observed that most of Storey County lies in the same rain shadow. Based on these facts it is reasonable to use the 10 inches per year as an average precipitation figure for the county until more accurate precipitation data become available.

It is obvious that sufficient water of potable quality should be produced for residential developments. The generally accepted standard is one acre-foot available for each single family dwelling. This is a reasonable standard, as it encompasses not only the actual water use of the residents but also the numerous demands created by subdivision development (firefighting, recreational use, water loss, etc.).

It is recommended that county aquifers be monitored through well logs, a ground water monitoring system, or a joint study/effort to monitor sensitive areas where well water is the primary source.

## **10.10.1 Goals and objectives**

### **Goal 1 Retain existing water resources which exist for the benefits of Mark Twain residents**

- Objective 1 Request the legislation, both at county and state level, to allow restriction or to prevent water or water rights exportation to areas outside Mark Twain
- Objective 2 Request Nevada State Engineer to commence hydraulic study of water basin in Mark Twain to determine quantity and quality of aquifers to assure aquifers are not being depleted beyond their recharging capabilities
- Policy 1 Discourage exporting or selling off water rights form Story County
- Objective 3 Cooperate with and encourage area mining operations, residences and other land uses to implement water conservation practices.

### **Goal 2 Retain existing water resources for the River District**

- Objective 1 Require new development to obtain water rights before land use permits are approved
- Objective 2 With local residents and development firms, investigate the feasibility of developing a unified water and sewer district for the River District
- Policy 1 Discourage exporting or selling off water rights form Story County

### **Goal 3 Preserve existing agricultural areas**

- Objective 1 Direct non-agricultural development to non-agricultural areas through zoning regulations
- Policy 1 Discourage exporting or selling off water rights form Story County
- Objective 2 Encourage conservation farming such as low water use crops and techniques to minimize evaporation

### **Goal 4 Maintain an environment which is healthy, safe, and desirable for residents throughout the county**

- Policy 1 Preserve open space within the county
- Objective 1 Work with conservation groups to minimize invasive weeds

### **Goal 5 Ensure that present and future county residents have an adequate water supply meeting safe drinking standards**

- Objective 1      Require all proposed planned unit developments to furnish proof of owned rights to adequate water meeting safe drinking standards before necessary land use or building permit applications are considered
- Objective 2      Actively participate on regional governmental water agencies to ensure the water rights of all owners and residents are protected. In addition, actively protest the granting of water rights or land development proposals which will have a negative impact on the quantity and/or quality of Storey County residents' water supply
- Objective 3      Continue to encourage and require, when feasible, the use of recycled, treated effluent water for agrarian and recreational uses. Establish the county's priority of right to the use of this water
- Policy 1          Encourage landscaping to minimize erosion, and increase infiltration
- Objective 4      Request the Nevada State Engineer to undertake a hydrologic study of water resources in the undeveloped northerly and easterly portion of the county and the stability of the water aquifer in the Highlands
- Objective 5      Continue to maintain, replace, and upgrade segments of the Marlette Water System pipeline, as necessary.
- Objective 6      Maintain the primacy of the Virginia City/Gold Hill water allotment allocated in the Franktown Water Decree
- Objective 7      Enhance local water conservation awareness and investigate ordinance changes to require conservation
- Objective 8      Redefine by County Ordinance the geographic boundaries of the town site of Gold Hill as originally written
- Objective 9      Discourage landscaping which requires large amounts of water. Encourage xeriscaping techniques on landscaped public right-of-way areas, around public building and other public areas and other landscaping to slow run off from county.

**Goal 6          Protect the quality of present and future water resources**

- Objective 1      Refuse special use permitting of industries which cannot guarantee the quality of effluent produced by their activity. Require users of toxic or hazardous materials to provide monitoring capabilities to assure protection from surface and groundwater contamination
- Objective 2      Engage in collaborative efforts with surrounding water quality and land conservation entities to implement watershed improvement programs within Long Valley Creek, and Six Mile and Seven Mile Canyons



- Objective 3      Actively protest the granting of water rights or land development proposals which will have a negative impact on the quantity and/or quality of Storey County residents' water supply
- Objective 4      Slow the runoff of precipitation to limit erosion damage, minimize flooding impacts, and encourage greater recharge of county aquifers
- Objective 5      Encourage new developments to design with native animal and plant interests in mind to encourage their growth, and leverage their benefits
- Goal 7          Regulate use of open-range and watershed areas to minimize fire danger and prevent degradation**
- Objective 1      Assist property owners and interested groups in controlling grazing and public use of critical watershed and riparian areas
- Objective 2      Cooperate with ranchers, property owners and interested groups in the county in managing wild horses and other grazing animals, in numbers which will not exceed capacity of the land

**Exhibit A: List of Flora and Fauna in Storey County****FLORA AND FAUNA**

## FLORA

**RIPARIAN**Trees:

Fremont cottonwood Populus fremontii  
French tamarisk Tamarix gallica  
Willow Salix spp.  
Silver buffalo berry Shepherdia argentea

Shrubs:

Rubber rabbitbrush Chrysothamnus nauseosus  
Quail brush or Big salt bush Atriplex lentiformis  
Wild rose Rosa spp.  
Big sagebrush Artemisia tridentata

Grasses:

Saltgrass Distichlis stricta  
Beardless wild rye or creeping wild rye Elymus triticoides  
Blue wild rye Elymus glaucus  
Alkali sacaton Sporobolus airoides

Grass-like:

Sedge Carex spp.

Forbs:

Dock Rumex spp.  
Alkali seepweed or Bush seepweed Suaeda moguinii

**SALT DESERT SHRUB****Big Greasewood**Shrubs:

Big greasewood Sarcobatus vermiculatus  
Inkwood Suaeda Torreyana ramosissima  
Kochia Kochia americana  
Shadscale Atriplex confertifolia  
Red sage Kochia vestita  
Quailbrush or Big salt bush Atriplex lentiformis  
Dalea Psorothamnus polydenius

Forbs:Halogeton Halogeton glomerataGlobe mallow Sphaeralcea spp.Russian thistle Salsola tragus**NORTHERN DESERT SHRUB****Big Sagebrush**Trees:Pinyon pine Pinus monophyllaShrubs:Big sagebrush Artemisia tridentataHop sage Grayia spinosaBitterbrush Purshia tridentataBud sagebrush Artemisia spinescensSpineless horsebrush Tetradymia canescensRubber rabbitbrush Chrysothamnus nauseosusSticky-leaf rabbitbrush or yellow or green rabbitbrush Chrysothamnus viscidiflorusDryland greasewood Sarcobatus baileyiLittle-leaf horsebrush Tetradymia glabrataLow sagebrush Artemisia arbusculaWinterfat Ceratoides lanataShort-spine horsebrush Tetradymia spinoseShadscale Atriplex confertifoliaSquaw tea Ephedra viridisDesert peach Prunus andersoniiCurrant, gooseberry Ribes sppRose Rosa sppGrasses:Nevada bluegrass Poa nevadensisSandberg bluegrass Poa secundaSquirrel tail Sitanion hystrixDesert needlegrass Stipa speciosaThurber's needlegrass Stipa thurberianaCheatgrass Bromus tectorumIndian ricegrass Oryzopsis hymenoidesGalleta Hilaria jamesiiGreat Basin wild rye Elymus cinereus**Low Sagebrush**Trees:Pinyon pine Pinus monophyllaShrubs:Low sagebrush Artemisia arbuscula

Sticky-leaf rabbitbrush or yellow or green rabbitbrush Chrysothamnus viscidiflorus  
Prickly phlox Leptodactylon pungens  
Big sagebrush Artemisia tridentata  
Mormon tea Ephedra virides  
Snowberry Symphoricarpos spp  
Bitterbrush Purshia tridentata  
Serviceberry Amelanchier alnifolia  
Ocean spray Holodiscus discolor  
Buckwheat or Shrubby eriogonum Eriogonum spp.  
Currant, gooseberry Ribes spp  
Bud sage Artemisia spinescens

Forbs:

Indian paint brush Castilleja spp  
Lupine Lupinus spp  
Phlox Phlox spp  
Mules ears Wyethia amplexicaulis

Grasses:

Sandberg bluegrass Poa secunda  
Cheatgrass Bromus tectorum  
Squirrel tail Sitanion hystrix  
Great Basin wild rye Elymus cinereus  
Thurber needlegrass Stipa thurberiana

**PINION - JUNIPER**

Trees:

Pinyon pine Pinus monophylla  
Utah juniper Juniperus osteosperma  
Quaking aspen Populus tremuloides  
Fremont cottonwood Populus fremontii

Shrubs:

Big sagebrush Artemisia tridentata  
Low sagebrush Artemisia arbuscula  
Rubber rabbitbrush Chrysothamnus nauseosus  
Sticky-leaf rabbitbrush or yellow or green rabbitbrush Chrysothamnus viscidiflorus  
Prickly phlox Leptodactylon pungens  
Squaw tea Ephedra viridis  
Buckwheat Eriogonum spp  
Hop sage Grayia spinosa  
Spiny horsebrush Tetradymia glabrata  
Bitterbrush Purshia tridentata  
Mountain mahogany Cercocarpus ledifolius  
Serviceberry Amelanchier alnifolia  
Ocean spray Holodiscus discolor  
Currant, gooseberry Ribes spp.

Skeleton plant Stephanomeria

Forbs:

Lupine Lupinus spp.

Indian paint brush Castilleja spp.

Buckwheat Eriogonum spp.

Locoweed Astragalus spp.

Phlox Phlox spp.

Grasses:

Sandberg bluegrass Poa secunda

Nevada bluegrass Poa nevadensis

Cheatgrass Bromus tectorum

**GRASSLAND**

Shrubs:

Dryland greasewood Sarcobatus vermiculatus var. baileyi

Sticky-leaf rabbitbrush or yellow or green rabbitbrush Chrysothamnus viscidiflorus

Mormon tea Ephedra nevadensis

Short-spine horsebrush Tetradymia spinosa

Fourwing saltbush Atriplex canescens

Winterfat Ceratoides lanata

Forbs:

Russian thistle Salsola tragus

Halogeton Halogeton glomeratus

Pickleweed Salicornia ambigua

Grasses:

Cheatgrass Bromus tectorum

Indian ricegrass Oryzopsis hymenoides

Squirrel tail Sitanion hystrix

Saltgrass Distichlis stricta

Alkali sacaton Sporobolus airoides

**CONIFER**

Trees:

Western white pine Pinus monticola

Limber pine Pinus flexilis

Jeffrey pine Pinus jeffreyi

White fir Abies concolor

Shrubs:

Big sagebrush Artemisia tridentata

Mountain mahogany Cercocarpus ledifolius

Sticky-leaf Rabbitbrush or yellow or green rabbitbrush Chrysothamnus viscidiflorus  
 Currant, gooseberry Ribes spp.  
 Bitterbrush Purshia tridentata  
 Prickly phlox Leptodactylon pungens

Grasses:

Sandberg bluegrass Poa secunda  
 Needlegrass Stipa spp.  
 June grass Koeleria nitida

Grass-like:

Sedge Carex spp.

Forbs:

Indian paint brush Castilleja spp.  
 Lupine Lupinus spp.

## **MOUNTAIN BRUSH**

Shrubs:

Ocean spray Holodiscus discolor  
 Currant, gooseberry Ribes spp  
 Chokecherry Prunus virginiana  
 Curlleaf mountain mahogany Cercoparpus ledifolius  
 Bitterbrush Purshia tridentata  
 Elderberry Sambucus caerulea  
 Serviceberry Amelanchier alnifolia  
 Snowbrush Ceanothus velutinus  
 Squaw tea Ephedra viridis  
 Snowberry Symphoricarpos albus  
 Rose Rosa spp.  
 Big sagebrush Artemisia tridentata  
 Rubber rabbitbrush Chrysothamnus nauseosus  
 Sticky-leaf rabbitbrush or yellow or green rabbitbrush Chrysothamnus viscidiflorus

Forbs:

Mule ears Wyethia amplexicaulis  
 Indian paint bush Castilleja spp.  
 Phlox Phlox spp.  
 Lupine Lupinus spp.  
 Buckwheat Eriogonum spp.  
 Sunflower Helianthus spp.  
 Balsamroot Balsamorhiza sagittata  
 Sneezeweed Helenium hoopesii  
 Beardtongue Penstemon spp.  
 Desert parsley Lomatium spp.  
 Horsemint Agastache urticifolia

Goldenbush Haplopappus spp.

Grasses:

Needle and threadgrass Stipa comata

Columbia needlegrass Stipa columbiana

Western needlegrass Stipa occidentalis

Sandberg bluegrass Poa secunda

Nevada blue grass Poa nevadensis

Mutton grass Poa fendleriana

Mountain brome Bromus marginatus

Smooth brome Bromus inermis

Cheatgrass Bromus tectorum

Creeping or beardless wildrye Elymus triticoides

Great basin wildrye Elymus cinereus

Squirrel tail Sitanion hystrix

June grass Koeleria nitida

Hesperchloa Hesperochloa kingii

Idaho fescue Festuca idahoensis

Bluebunch wheatgrass Agropyron spicatum

Wheatgrass Agropyron spp.

Trees:

White fir Abies concolor

Jeffrey pine Pinus jeffreyi

Pinyon pine Pinus monophylla

Ponderosa pine Pinus ponderosa

Quaking aspen Populus tremuloides

## FAUNA

### MAMMALS

#### Cat Family

Mountain Lion (*Felis concolor*)

Bobcat (*Lynx rufus*)

#### Dog Family

Coyote (*Canis latrans*)

Red Fox (*Vulpes Fulva*)

Gray Fox (*Urocyon cinereoargenteus*)

Kit Fox (*Vulpes macrotis*)

#### Herbivores

Mule Deer (*Odocoileus hemionus*)

#### Rabbit Family

Black-tailed Jackrabbit (*Lepus californicus*)

Nuttall Cottontail (*Sylvilagus nuttali*)

Weasel Family

- Short-tailed Weasel (*Mustela erminea*)
- Long-tailed Weasel (*Mustela frenata*)

Rodent Family

- Porcupine (*Erithizon dorsatum*)
- Muskrat (*Ondatria zibethica*)
- Belding Ground Squirrel (*Citellus beldingi*)
- Least Chipmunk (*Eutamias minimus*)
- Cliff Chipmunk (*Eutamias dorsalis*)
- Great Basin Pocket Mouse (*Perognathus parvus*)
- Canyon Mouse (*Peromyscus crinitus*)
- Pinion Mouse (*Peromyscus truei*)
- Bushy Tailed Woodrat (*Neotoma cinerea*)
- Panamint Kangaroo Rat (*Microdipodops*)
- Chisel-toothed Kangaroo Rat (*Dipodomys*)
- Valley Pocket Gopher (*Thomomys bottae*)

BIRDSEagles and Hawks (Accipitridae)

- Golden Eagle
- Red-tail Hawk
- Cooper's Hawk
- Goshawk
- Sharp-shinned Hawk

Falcons (Falconidae)

- Prairie Falcon
- American Kestrel
- Sparrow Hawk

Owls

- Great Horned
- Long-eared
- Burrowing

Vultures (Falconiformes cathartidae)

- Turkey Vulture

Quails, Pheasants, Partridges (Phasianidae)

- California Quail
- Chukkar (introduced)

Goatsuckers (Caprimulgiformes caprimulgidae)

- Poor-will
- Common Nighthawk



Woodpeckers (Piciformes picidae)

Downy Woodpecker  
Hairy Woodpecker  
Common Flicker  
Yellow-bellied Sapsucker

Flycatchers (Passeriformes Picidae)

Say's Phoebe

Jays, Magpies (Corvidae)

Stellar's Jay  
Scrub Jay  
Pinyon Jay  
Magpie

Chickadees, Titmice, etc. (Paridae/Sittidae)

Mountain Chickadee  
Plain Titmouse  
Common Bushtit  
Red-breasted Nuthatch

Tanager (Thraupidae)

Western Tanager

Hummingbirds (Trochilidae)

Black-chinned  
Broad-tailed  
Calliope

Finches, Grosbeaks, Sparrows (Fringillidae)

Evening Grosbeak  
Cassin's Finch  
Lesser Goldfinch  
American Goldfinch  
Green-tailed Towhee  
Rufous-sided Towhee  
House Finch  
Pine Siskin  
Savannah Sparrow  
Black-throated Sparrow  
Sage Sparrow  
Dark-eyed Junco  
Tree Sparrow  
Chipping Sparrow  
White Crowned Sparrow  
Fox Sparrow

Song Sparrow

Wrens (Troglodytidae)

House

Bewick's

Canyon

Rock

Thrushes, Bluebirds, Solitaires (Turdidae)

Mountain Bluebird

Robin

Townsend's Solitaire

Meadowlarks, Blackbirds (Icteridae)

Western Meadowlark

Yellow-headed Blackbird

Red-winged Blackbird

Brewer's Blackbird

Brown-headed Cowbird

Warblers (Parulidae)

Blue-Gray Gnatcatcher

Ruby-Crowned Kinglet

Golden-Crowned Kinglet

Larks (Alaudidae)

Horned Lark

Swallows (Hirundinidae)

Barn Swallow

Cliff Swallow

Waxwings (Bombycillidae)

Cedar Waxwing

Doves (Columbidae)

Mourning Dove

Gulls (Laridae)

California Gull

Plovers (Charadriiformes Charadiidae)

Killdeer

Coots (Rallidae)

American Coot

Geese, Ducks (Anseriformes Anatidae)

Canada Goose  
Mallard  
Pintail  
Cinnamon Teal

### REPTILES

#### Spadefoot Toad Family (Pelobatidae)

Great Basin Spadefoot (*Scaphiopus Intermontanus*)

#### True Frog Family (Ranidae)

Bullfrog (*Rana Catesheiana*)  
Northern Leopard Frog (*Rana Pipiens*)

#### Toad Family (Bufonidae)

Western Toad (*Bufo Boreas*)  
Woodhouses Toad (*Bufo Woodhousei*)

#### Treefrog Family (Hylidae)

Pacific Treefrog (*Hyla Regilla*)

#### Iguanid Family (Iguanidae)

Zebra Tailed Lizard (*Callisaurus Dracondides*)  
Desert Collared Lizard (*Crotaphytus Insularis*)  
Leopard Lizard (*Gambelia Wislizenii*)  
Desert Horned Lizard (*Pheynoaoma Platyrrhinus Aalidiarum*)  
Sagebrush Lizard (*Sceloporus Graciosus*)  
Desert Spiney Lizard (*Sceloporus Magister*)  
Western Fence Lizard (*Sceloporus Occidentailis*)  
Sideblotched Lizard (*Uta Stansburiana*)

#### Whiptail and Racerunner Family (Teiidae)

Western Whiptail (*Cnemipophorus Tigris*)

#### Snakes (Squamata Sub Serpentes)

#### Boa and Python Family (Boidae)

Rubber Boa (*Charina Bottae*)



#### Colubrid Snake Family (Colubridae)

Races (*Coluber Constrictor*)  
Ringneck Snake (*Diadophis Punctatus*)  
Night Snake (*Hypsiglena Turquata*)  
Coachwhip Snake (*Masticophis Taeniatus*)  
Striped Whipsnake (*Masticophis Taeniatus*)  
Pine-Gopher Snake (*Pituophis Melanoleocus*)  
Western Patch Nosed Snake (*Salvador Hextepia*)  
Ground Snake (*Sonora Semiannulata*)

Western Aquatic (*Thamnophis Couchi*)  
Westen Rattlesnake (*Crotalus Viridis*)

**APPENDIX B. NEVADA DIVISION OF WATER RESOURCES, TRACEY SEGMENT  
BASIN 83 HYDROGRAPHIC AREA SUMMARY**

# Hydrographic Area Summary

Hydrographic Area No.	083	Hydrographic Area Name	TRACY SEGMENT	
Subarea Name				
Hydrographic Region No.	06	Hydrographic Region Name	TRUCKEE RIVER BASIN	
Area (sq. mi.)	285			
Counties within the hydrographic area	Storey, Washoe, Lyon			
Nearest Communities to Hydrographic Area	Sparks, Fernley			
Designated (Y/N, Order No.)	Y, O-705	For All or Portion of Basin	All	
Preferred Use	None	For All or Portion of Basin	All	
State Engineer's Orders:		For All or Portion of Basin	All	
State Engineer's Rulings:				
Pumpage Inventory Status	None	Crop Inventory Status	None	
Water Level Measurement?	None			
Yield Values				
Perennial Yield (AFY)	11500			
System Yield (AFY)	490000			
Yield Reference(s)	State Engineer Ruling 5747			
Yield Remarks				
Source of Committed Data:	NDWR Database	Supplementally Adjusted?	Y	
Manner of Use	Underground	Geothermal	Other Ground Water	
Commercial	405.06	0.00	0.00	
Construction	0.00	0.00	0.00	
Domestic	3.92	0.00	0.00	
Environmental	0.00	0.00	0.00	
Industrial	1,927.70	0.00	0.00	
Irrigation (Carey Act)	0.00	0.00	0.00	
Irrigation (DLE)	0.00	0.00	0.00	
Irrigation	641.80	0.00	0.00	
Mining and Milling	656.05	0.00	0.00	
Municipal	2,954.23	0.00	0.00	
Power	0.00	0.00	0.00	
Quasi-Municipal	4,861.81	0.00	0.00	
Recreation	0.00	0.00	0.00	
Stockwater	25.10	0.00	0.00	
Storage	0.00	0.00	0.00	
Wildlife	0.00	0.00	0.00	
Other	0.00	0.00	0.00	
Totals	11,475.66	0.00	0.00	
Related Reports				
USGS Reconnaissance	57	USGS Bulletin	None	
Other References				
Comments				

## **APPENDIX C. CONSERVATION PAMPHLETS**

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**Read any good meters lately?** Guide provides instruction for reading and interpreting meter information. It also teaches water customers how to measure the amount of water they use in different applications (see figure 3.1).

**Yes, you can...fix a leaky faucet by yourself** pamphlet gives step-by-step instructions on how to fix a leaking faucet. It includes a list of tools necessary to perform the repairs (see figure 3.2).

***FIGURES 3.1, 3.2, and 3.3***

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AWWA Conservation Pamphlets



**Preventing Floods and Leaks in Your Home** emphasizes the importance of locating a master valve and discusses where it might be. It also deals with faucet, toilet, and hose leaks (see figure 3.3).

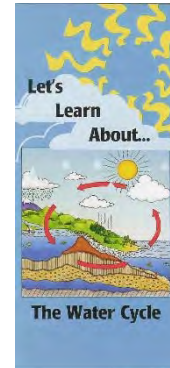
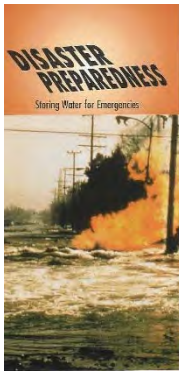
**Disaster Preparedness, Storing Water for Emergencies** addresses four important emergency questions; How much water should be stored, How long can tap water be stored safely, What is a boil water order, and How will I know when the water is safe again (see figure 3.4).



### **FIGURES 3.4, 3.5 and 3.6**

#### **AWWA Conservation Pamphlets**

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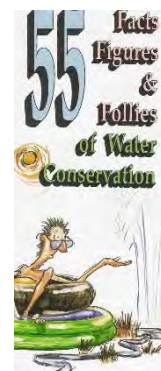
**25 Facts About Water** is a list of 25 water facts that encourage conservation (see figure 3.5).

**Lets Learn About the Water Cycle** diagrams the seven stages of the water cycle (see figure 3.6).

### **FIGURES 3.7, 3.8, and 3.9**

#### **AWWA Conservation Pamphlets**

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**It's a Natural** makes suggestions regarding landscape including planning, design, soils, and irrigation (see figure 3.7).

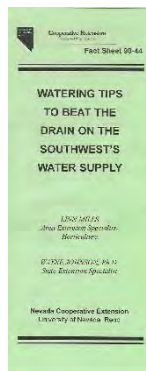
**Water Conservation at Home** discusses in-home conservation practices for bathroom, kitchen, and outdoor water use (see figure 3.8).

**55 Facts Figures & Follies of Water Conservation** is similar to “25 Facts about Water” but it provides a bit more information (see figure 3.9).

In addition to the AWWA publications, The University of Nevada Cooperative Extension publishes Fact Sheets that encourage conservation. Fact Sheet 90-09 “Making a Little Water Go a Long Way in Your Home” contains residential conservation tips (see figure 3.10), Fact Sheet 90-40 “Watering Tips to Beat the Drain on the Southwest’s Water Supply” provides tips to make landscapes more water efficient (see figure 3.11) and Fact Sheet 91-32 is a list of low water-use plants for southern Nevada (see figure 3.12).

### ***FIGURES 3.10, 3.11, and 3.12***

University of Nevada Cooperative Extension Fact Sheets



## **APPENDIX D. CONSERVATION WEBSITES**

## **APPENDIX D – CONSERVATION WEBSITES**

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### **WATER**

- [www.energystar.gov](http://www.energystar.gov)

### **DROUGHT**

- <http://droughtmonitor.unl.edu/>

### **LANDSCAPE**

- [www.tmwandscapeguide.com/landscape\\_guide/interactive/index.php](http://www.tmwandscapeguide.com/landscape_guide/interactive/index.php)

### **EDUCATION**

- [www.wateruseitwisely.com](http://www.wateruseitwisely.com)
- [www.washoeet.dri.edu/](http://www.washoeet.dri.edu/)

### **INSTITUTIONAL**

- [www.lvwd.com](http://www.lvwd.com)
- [www.snwa.com](http://www.snwa.com)
- [www.tmh20.com](http://www.tmh20.com)
- [www.cabq.gov](http://www.cabq.gov)

### **LEAK DETECTION**

- [www.who.int/docstore/water\\_sanitation\\_health/leakage/begin.html](http://www.who.int/docstore/water_sanitation_health/leakage/begin.html)

## APPENDIX E. METER READING INSTRUCTIONS

### HOW TO READ YOUR WATER METER

#### 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 Use 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 off. This includes all faucets (inside and out), appliances, swamp coolers, or 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 one. The result is the amount of water used for the activity in cubic feet. To convert to gallons multiply the result by 7.48. To determine how many gallons per minute were used divide the gallon amount by the number of minutes the activity required. You should now have the water used amount in *gallons per minute*.

#### Detecting Leaks

1. Make sure all water off. This includes all faucets (inside and out), appliances, swamp coolers, or ice makers.
2. Write down the meter reading and 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 may have a leak.
4. Subtract the first meter reading from the second. Multiply the remainder by 7.48. The result is the amount of water in gallons that passed through the meter during the test period. Also record the time duration of the test.
5. Divide the amount of water by the number of minutes in the test. The result is the amount of water that went through the meter in *gallons per minute*.
6. To measure 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 and check to see if the flow indicator (triangle) is still moving. If the triangle has stopped you have discovered the leak. If not go on to the next one and repeat the above steps.
8. Check your sprinkler system. Shut off the system at the anti 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.

## BENCHMARKS USED IN CONSERVATION PLANNING

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**Table B-1: Recent Estimates of Indoor Water Use With and Without Conservation**

Type of Use	Without conservation		With conservation		Savings
	Amount (gpcd)	Percent of total	Amount (gpcd)	Percent of total	
Toilets	18.3	28.4%	10.4	23.2%	44%
Clothes washers	14.9	23.1%	10.5	23.4%	30%
Showers	12.2	18.8%	10.0	22.4%	18%
Faucets	10.3	16.0%	10.0	22.5%	2%
Leaks	6.6	10.2%	1.5	3.4%	77%
Baths	1.2	1.9%	1.2	2.7%	0%
Dish washers	1.1	1.6%	1.1	2.4%	0%
<b>Total indoor water use</b>	<b>64.6</b>	<b>100%</b>	<b>44.7</b>	<b>100%</b>	<b>31%</b>

Source: AWWA WaterWiser, "Household End Use of Water Without and With Conservation," 1997 *Residential Water Use Summary - Typical Single Family Home* (<http://www.waterwiser.org/wateruse/tables.html>).

gpcd = gallons per capita per day

Note: These data are provided for illustrative purposes only and may not be applicable to a given situation. To the extent practical, planners use system-specific assumptions and estimates.

**Table B-2: Benchmarks for Estimating Residential End Uses of Water**

Type of use	Units	Likely range of average values
<b>INDOOR USES</b>		
Average household size	Persons	2.0-3.0
Frequency of toilet flushing	Flushes/person/day	4.0-6.0
Flushing volumes	Gallons/flush	1.6-8.0
Fraction of leaking toilets	Percent	0-30
Showering frequency	Showers/person/day	0-1.0
Duration of average shower	Minutes	5-15
Shower flow rates	Gallons/minute	1.5-5.0
Bathing frequency	Baths/person/day	0-0.2
Volume of water	Gallons/cycle	30-50
Washing machine use	Loads/person/day	0.2-0.5
Volume of water	Gallons/cycle	45-50
Dishwasher use	Loads/person/day	0.1-0.3
Volume of water	Gallons/cycle	10-15
Kitchen faucet use	Minutes/person/day	0.5-5.0
Faucet flow rates	Gallons/minute	2.0-3.0
Bathroom faucet use	Minutes/person/day	0.5-3.0
Faucet flow rates	Gallons/minute	2.0-3.0
<b>OUTDOOR USES</b>		
Average lot size[a]	Square feet	5000-8000
Average house size[a]	Square feet	1200-2500
Landscape area[a]	Square feet	4000-5000
Fraction of lot size in turf[a]	Percent	30-50
Water application rates[a]	Feet/year	1-5
Percent of homes with pools	Percent	10-25
Pool evaporation losses	Feet/year	3-7
Frequency of refilling pools	Times per year	1-2
Frequency of car washing	Times/month	1-2

Source: Duane D. Baumann, John J. Boland, and W. Michael Hanemann, *Urban Water Demand Management and Planning* (New York: McGraw Hill, 1998), 254.

[a] Reflects single-family averages.

Note: These data are provided for illustrative purposes only and may not be current or applicable. To the extent practical, planners should regionally appropriate or system-specific assumptions and estimates.



## APPENDIX G. LANDSCAPE CODE EXAMPLES

City of Yerington Code: available at <http://www.yerington.net>

### Chapter 6 LANDSCAPING

9-6-1: PURPOSE, SCOPE AND AUTHORITY:

9-6-2: DEFINITIONS:

9-6-3: APPLICABILITY AND EXCEPTIONS:

9-6-4: SPECIAL LANDSCAPING REQUIREMENTS:

9-6-5: LANDSCAPE PLAN:

9-6-6: SPECIFIC STANDARDS:

9-6-7: BONDING REQUIREMENTS:

9-6-8: MAINTENANCE:

9-6-9: DISCRETIONARY AUTHORITY:

#### 9-6-1: PURPOSE, SCOPE AND AUTHORITY:

The purpose of this chapter is to promote the public health, safety and general welfare of the people of the city by establishing regulations for the installation and maintenance of landscaping according to recognized resource efficient principles, and to provide for the protection of existing vegetation, where appropriate. The regulations are intended to accomplish the following:

- A. Enhance the aesthetics of the community;
- B. Conserve water and other natural and energy resources by requiring the use of resource efficient guidelines and principles;
- C. Provide environmental controls such as, but not limited to, the reduction of noise, dust and erosion;
- D. Reduce air pollution by encouraging the use of vegetation for air filtration, absorption of carbon dioxide and production of oxygen;
- E. Assist in ground water recharge;
- F. Reduce visual pollution which might otherwise occur within a developed area;
- G. Establish a greater sense of privacy from visual and physical intrusion; and
- H. Encourage a balanced landscape approach with a variety of landscape materials.  
(Ord. 06-01, 1-25-2006)

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## **9-6-2: DEFINITIONS:**

As used in this chapter, unless the context requires otherwise, the words and terms defined in this chapter shall have the meanings ascribed to them herein:

**DEVELOPMENT PROJECT:** The use of land, buildings and structures on any property in the city subject to this title, except single-family dwellings and two-family dwellings, and shall include new developments, planned developments, and the expansion of existing developments, where the site is not in conformance with landscaping and irrigation requirements of this chapter.

**EVERGREEN:** Any plant with foliage that persists and remains year round.

**HYDROSEEDING:** The application of seed within a suspended liquid medium that is sprayed onto a prepared surface.

**LANDSCAPED AREA:** Shall consist of a given percentage of the "site area" of a "development project", as designated in section [9-6-6](#) of this chapter, and shall be composed of a combination of turf grasses, trees, shrubs, hedges, vines, ground covers, and other living plant materials; inert materials such as decorative rock, bark, and wood chips; concrete curbing (or railroad ties or landscape timbers), permeable walkways, decks, patios, and other amenities.

**MAINTENANCE:** Shall consist of any management required for the wellbeing of the plant and appearance of the landscaped area.

**MULCH:** A covering over the soil used for water retention, soil erosion and dust control, as well as for aesthetic purposes. Examples include rock products, wood products, and vegetative byproducts.

**PARKING AREA:** Those portions of a site area designated for motor vehicle use, including, but not limited to, parking stalls, parking spaces, driveways and access driveways.

**PERMEABLE SURFACE:** A hard, porous material that allows water penetration into the soil.

**RESOURCE EFFICIENT IRRIGATION:** The application of water to a specific area based on plant requirements.

**RESOURCE EFFICIENT LANDSCAPING:** A method of landscaping intended to conserve water and other natural resources by encouraging the following principles:

- A. Practical turf areas.
- B. The use of water conserving plant material.
- C. The grouping of plants with similar water requirements.
- D. An irrigation system designed to meet plant needs.
- E. The installation of permeable hard surfaces to encourage ground water recharge and reuse, and to discourage runoff.

F. The use of water harvesting techniques.

G. The use of mulches.

H. The use of soil amendments.

I. Soil analysis.

RESOURCE EFFICIENT LANDSCAPING MATERIAL: Any of the following material:

A. Living material, including, but not limited to, turf grass, ground covers, shrubs, vines, hedges, or trees which have been identified as those which are drought tolerant or low water use varieties, indigenous to or adaptable to this climate, and which can survive, once established, on minimal irrigation or natural rainfall; and

B. Nonliving material including, but not limited to, rocks, gravel, sand, tile, bricks, bark, decorative concrete, and wood.

SEEDING: The application of seed onto a prepared surface.

SHADE TREE: A large deciduous plant with a mature crown diameter of at least fifteen feet (15') and having a trunk that, at maturity, is kept clear of leaves and branches at least six feet (6') above grade.

SITE AREA: The site area consists of the surface area of a development project including public right of way areas between property lines and paved sidewalks or streets.

TURF GRASS: Any species of grass that grows together and can be mowed, planted and maintained in areas of pedestrian, aesthetic or recreational activity.

WATER HARVESTING SYSTEM: Any combination of techniques that results in storm or flood waters captured on site, for later plant use or return to the water table.

XERISCAPE: Landscapes are defined as balanced quality landscaping that conserves water and protects the environment. Also known as "hardscape". (Ord. 06-01, 1-25-2006)

### 9-6-3: APPLICABILITY AND EXCEPTIONS:

A. Applicability: The provisions of this chapter shall apply to the following:

1. All new development projects, including model homes for subdivisions.
2. An expansion to any existing building on any site, when the site is not in conformance with this chapter, according to the percentage of site area required to be landscaped and irrigated, and/or the number of trees required. Landscaping shall be required in accordance with section [9-6-6](#) of this chapter in an amount which is proportionate to such expansion as demonstrated in the following example:

Existing building = 10,000 square feet  
Expansion = 1,000 square feet or 10 percent increase  
Zoning = C2; 15 percent required

$0.10 \times 0.15 = 0.015$  or 1.5 percent of the site is to be landscaped

3. If a proposed building expansion exceeds seventy five percent (75%) of the present size of the building, the site must be brought into compliance with the current landscape ordinance.

B. Exceptions: The provisions of this chapter (except for section [9-6-8](#) of this chapter) do not apply to the following:

1. Single-family dwelling units or duplexes on separate lots, except commonly owned areas in planned developments.
2. Building permits for interior remodel except in change of use from residential to nonresidential or single-family to multi-family.
3. Permits such as, but not limited to, reroofing, siding, temporary power, change of electrical service, change of furnace, mobile home setup, addition of interior plumbing, addition of interior electrical, fencing, on and off premises signs, and encroachment.
4. Development projects where the existing vegetation to be retained meets or exceeds the requirements of this section. (Ord. 06-01, 1-25-2006)

#### **9-6-4: SPECIAL LANDSCAPING REQUIREMENTS:**

Special landscaping requirements, which may be greater or lesser than those required in this chapter, may be imposed by the city council on projects which are proposed for areas of specific city interest, such as, but not limited to, redevelopment districts. These special requirements may include the use of specific types of landscaping materials and/or design features to coordinate with adopted design guidelines for the area in question. (Ord. 06-01, 1-25-2006)

#### **9-6-5: LANDSCAPE PLAN:**

- A. Except as otherwise provided in this chapter, an approved landscape plan shall be on file with the public works director prior to site plan approval or the issuance of a building permit.
- B. The landscape plan shall be prepared by a landscape architect registered in the state of Nevada, or other person permitted to prepare landscaping plans pursuant to chapter 623A of the Nevada Revised Statutes.
- C. The landscape and irrigation plan shall be neatly drawn at a convenient commonly used engineering or architectural scale. Two (2) blue line or black line prints of the plan shall be furnished to the public works director. The plan shall include the following information:
  1. Scale, north arrow, location of adjacent streets, property lines, easements, sidewalks, drives, paved areas, utilities, buildings, existing trees (including street trees), and any other natural or manmade site features influencing the use of the site.
  2. Construction details pertinent to installation of the landscape in accordance with city standards.

3. A note or calculation sheet with all landscape calculations relevant to the application of this section.
4. A plant list giving the common and botanical names of plants to be used. This plant list shall be arranged in legend form with a key number assigned to each plant. On the plan, each plant shall be identified by a key number. The size of the plant, its spacing and the quantity to be used shall follow the legend, as the following example illustrates:

EXAMPLE PLANT LIST			
<u>Botanical Name</u>	<u>Common Name</u>	<u>Size</u>	<u>Quantity</u>
Coreopsis grandiflora	Coreopsis	Flat	144
Celtis occidentalis	Common hackberry	1" cal.	9
Cytissus craecox	Warminster broom	1 gal.	27
Buddleia davidii	Butterfly bush	5 gal.	5
Hedera Helix 'Baltica'	Baltic ivy	Flat	72
Robinia idahoensis	Idaho locust	2" cal.	10
Cedrus deodara	Deodar cedar	5' height	12
Artemisia tridentate	Big sagebrush	1 gal.	20

5. Irrigation plans (at the same scale as the landscape plans), and specifications which comply with the uniform plumbing code, ensure the correct irrigation coverage and include the following:
  - a. Scale, north arrow, locations of adjacent streets, property lines, easements, sidewalks, drives, paved areas, buildings, including street trees, and any other natural or manmade site features influencing the use of the site.
  - b. Identification and description of automatic irrigation components to ensure that vegetation is adequately serviced through water conserving features.
  - c. Indication of the system point of connection and size, water pressure available and maximum demand of the system in gallons per minute.
  - d. Irrigation equipment specified must be identified by manufacturer's name and equipment identification number.
  - e. Cross connection devices installed as follows:
    - (1) Single-family or duplex residential model homes shall have a pressure vacuum breaker installed on the main line of the irrigation system upstream of the control valves.
    - (2) All other development shall have reduced pressure backflow preventer (r.p. device).

- f. All locations of irrigation valves, controllers, hose bibs, quick coupler valves, sprinkler heads, and backflow preventers. Sprinkler location on plans shall also include pattern of sprays (i.e., full circle, half circle), psi, radius of throw and gallons per minute.

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- g. Irrigation details must be used to clarify particular situations. Typical details should include backflow prevention devices, valves, irrigation heads, and irrigation controllers.
  - h. Schedule 40 PVC is required for all pressure lines and under all paved areas. Piping must be installed a minimum of twelve inches (12") underground for non-pressure irrigation lines and eighteen inches (18") underground for constant pressure irrigation lines. Adequate freeze protection shall be provided. Schedule 40 PVC or equivalent sleeving under sidewalks or driveways is recommended.
  - i. Landscape irrigation shall be separately metered.
  - j. A recommended irrigation system operation schedule that includes four (4) seasonal changes shall be required.
6. Other relevant information such as, but not limited to, elevations, sections and construction details, necessary to provide an accurate description of the work to be performed may be required by the building department.
7. When the landscape has been installed, the preparer of the plans or his similarly licensed successor, shall certify, as soon as practicable, on a form provided by the public works department, that the landscaping as required under this chapter has been substantially provided on the project. When the building department receives such certification, the city may issue a certificate of occupancy for the project.
- D. A copy of the approved landscape plan shall be kept on the job site until the project is inspected and accepted by the city. (Ord. 06-01, 1-25-2006)

**9-6-6: SPECIFIC STANDARDS:**

- A. All landscaping materials shall aesthetically enhance and be environmentally compatible with the site area. The landscaping shall be installed to enhance the view of the property from the public streets(s) adjoining the property. Insofar as is practical, the trees used shall represent a mixture of deciduous and coniferous varieties. Existing trees and shrubs may be incorporated into a landscaped area as long as they are healthy and in good condition and do not conflict with plant location requirements of this chapter (such as in parking areas).
- B. The minimum portion of the site area to be landscaped, as defined in this section, shall be as follows:
  - 1. Residential districts (R-1 through R-7 inclusive): Twenty percent (20%) of the site area for all permitted uses with or without a special use permit, except single-family and two-family dwellings;

2. Public facilities district: As determined by the planning commission;
3. Limited commercial district (C-1): Twenty percent (20%);
4. General commercial district (C-2): Fifteen percent (15%);

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5. Industrial district: Six percent (6%) which shall include landscaping strips along major street frontages. These landscaping strips shall be no less than ten feet (10') in width regardless of the percentage of the site area involved;
6. Street medians: One hundred percent (100%). Xeriscape is encouraged for medians.

C. The minimum number of trees to be planted in the required landscape area shall be one tree per three hundred (300) square feet in residential zoning districts and one tree per five hundred (500) square feet in other zoning districts. Parking lot trees per subsection H of this section are in addition to this requirement.

D. Evergreen trees shall be a minimum of six feet (6') in height at time of planting. Fifty percent (50%) of deciduous trees shall be a minimum caliper of one inch (1") at time of planting and fifty percent (50%) shall be a minimum caliper of two inches (2") at time of planting.

E. Sixty percent (60%) of container grown shrubs and plants(excluding trees), and excluding those plants grown in flats, shall be minimum five (5) gallon size at time of planting, and the remainder shall be minimum one gallon size at time of planting.

F. The latest edition of the "American Standard For Nursery Stock" by the American Association of Nurserymen shall be the criterion for sizes and grades of plant materials.

G. Use of turf:

1. The minimum dimension of each lawn or turf area shall be eight feet (8').
2. The maximum slope of lawn or turf area shall be four to one (4:1).
3. Turf may not constitute more than fifty percent (50%) of the required landscape area.

H. Parking area landscaping is in addition to other required landscaping. The parking area shall be subject to the following minimum standards:

1. Each planter island containing a tree shall have a minimum area of three hundred (300) square feet for double loaded parking and one hundred fifty (150) square feet for single loaded parking, with a nine foot (9') minimum interior width.
2. At least one shade tree shall be planted for each seven (7) parking spaces for parking lots under one hundred twenty five (125) spaces in size; for those over one hundred twenty five (125) spaces, at least one shade tree shall be planted for each ten (10) parking spaces.

3. Shade trees shall be planted in such a manner as to provide the maximum amount of shading in the parking area. A maximum of fifty percent (50%) of the trees shall be allowed in the perimeter of the parking area.
4. All areas utilized for landscaping shall be surrounded by curbing at least six inches (6") in height and four inches (4") in width, and shall be constructed of reinforced concrete, masonry, treated railroad ties, or other material acceptable to the public works director.

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5. Landscaping strips, a minimum of ten feet (10') in width (except as otherwise specified in this title) shall be provided along public street frontages and of the total required trees, one tree shall be planted in the landscaping strips for each twenty five feet (25') of street frontage. This requirement is not in addition to the number of trees required in the parking area.

I. Ground covering shall be provided over the entire landscape area to prevent erosion, inhibit weed growth, and to present an esthetically pleasing appearance. Ground covering may include:

1. Living plants, such as shrubs, turf grasses, vines, meadow grasses and wildflowers, or other living ground covers.
2. Wood chips, bark, decorative rock, or other nonliving materials may also be used.
3. Nonliving materials may not be used for more than ten percent (10%) of the total landscaped area and excludes the areas of temporary coverage allowed for all plant and ground cover maturity. Plastic, steel, or other appropriate edging material shall be provided around ground cover beds to retain loose ground cover material.
4. If approved by the city council, Xeriscape may be used for up to ninety percent (90%) of the total landscaped area.

J. Soil in planted areas shall be loosened to a minimum depth of eight inches (8") and improved by incorporating a minimum of two inches (2") of organic soil amendment into the top six inches (6") of soil prior to planting.

K. Planted areas shall be mulched. The mulch shall be a minimum four inches (4") in depth to decrease water evaporation. Nonporous material, such as plastic sheets, shall not be placed under the mulch.

L. The following types of trees shall not be used in landscaping as required by this chapter because of undesirable characteristics: Populus genus (poplars and cottonwoods), Salix genus (willows), Ulmus genus and Zelkova genus (zelkova) (elms), and Elaeagnus angustifolia (Russian olive).

M. If specimens of these trees exist on a site to be landscaped, they may be retained and counted towards the required number of trees. However, the property owner, or the individual responsible for landscape maintenance, must ensure that the trees are maintained in a manner to minimize the noxious characteristics of the trees.



N. All new landscaped areas shall be watered by a water conserving irrigation system including drip, low arching and/or low gallonage heads, as appropriate, controlled by an automatic timer.

1. Manual control of the irrigation system or hand watering may be permitted for landscape installations in preexisting paved areas which could not otherwise be trenched, or in isolated planters.
2. Drip irrigation is encouraged, where appropriate, to conserve water and inhibit weed growth.

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3. Storm water and runoff harvesting to supplement drip irrigation are encouraged where possible for both new plantings and preserved vegetation. (Ord. 06-01, 1-25-2006)

#### **9-6-7: BONDING REQUIREMENTS:**

- A. All landscaping material for a development project shall be installed in accordance with the landscape plan. The city council will ordinarily require a good and sufficient surety bond, written by a surety company authorized to do business in this state, to be filed with the city clerk prior to issuance of a certificate of occupancy if the landscaping is not satisfactorily installed at the time a certificate of occupancy or business license is requested.
- B. In lieu of filing a surety bond, cash, a cashier's check, or a letter of credit issued by a bank licensed in this state may be filed with the city clerk.
- C. The bond, cash deposit, cashier's check, or letter of credit shall be in an amount equal to three dollars (\$3.00) per square foot of total landscape area.
- D. The landscaping shall be inspected by the public works director to ensure proper installation according to the approved landscape plan. The bond, or equivalent surety, will not be released until final approval of the landscaping.
- E. If the landscaping material is not installed in accordance with the landscape plan, the city council may cause the bond, cash deposit, or letter of credit to be forfeited in an amount necessary to complete the installation. (Ord. 06-01, 1-25-2006)

#### **9-6-8: MAINTENANCE:**

- A. Each owner, operator or other person in control of a development project, shall be required at all times to keep all landscaping materials in good health, repair and maintenance. The city may require the immediate replacement of any and all dead or damaged plant materials.
- B. If any portion of the landscaping material or irrigation equipment is damaged, destroyed or otherwise injured, the owner, operator or other person in control of the development project shall replace or repair the damage or injury within thirty (30) days following notification from the public works director of the damage. If the season of the year makes this repair or replacement infeasible within the thirty (30) day period, the person

responsible for the landscaping shall schedule an appropriate time for the accomplishment of this work with the public works director.

- C. If the repair or replacement is not accomplished in a timely fashion as described in subsection B of this section, the public works director may initiate proceedings to revoke the special use permit or business license for the subject use. (Ord. 06-01,1-25-2006)

**9-6-9: DISCRETIONARY AUTHORITY:**

- A. The planning commission may vary the requirements of this chapter by twenty percent (20%). This administrative discretion may be applied to the required site area, the number of trees, or any other numerically quantifiable provision such as, but not limited to, the amount of turf or nonliving materials allowed within the required landscape area.

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- B. The city council may vary the requirements of this chapter if it finds that the strict application of this chapter would work an undue hardship on the property owner or would be contrary to the public interest. (Ord. 06-01, 1-25-2006)

## **County Codes**

### **Title 20 Consolidated Development Code**

#### **20.694 Landscape Standards**

20.694.010 Purpose

20.694.020 Applicability

20.694.030 Exemptions

20.694.040 General

20.694.050 Maintenance

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20.694.100 Landscape design standards

20.694.110 Screening

20.694.120 Site distance for landscaping adjacent to public rights-of-way and points of access

20.694.130 Final inspection

#### **20.694.010 Purpose**

The purpose of this chapter is to establish minimum standards for the placement, amount, and type of landscape materials to be installed in order to enhance the aesthetics of the community, including the visual appearance of streets, to reduce noise, dust, and erosion, conserve water resources, provide groundwater recharge, preserve open space and wetlands, provide privacy from visual and physical intrusion, and to insulate from the effects of weather conditions. (Ord. 763, 1996)

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#### **20.694.020 Applicability**

A. Landscaping requirements shall apply to construction of the following projects unless specifically listed as an exemption or otherwise noted in this chapter:

1. Single-family subdivisions creating parcels of one-half acre or less (for street trees only).
2. Duplex or multi-family residential;
3. Industrial;
4. Commercial;
5. Institutional uses; and
6. Public uses. (Ord. 763, 1996)

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### **20.694.030 Exemptions**

- A. The following types of development are exempt from the landscape requirements in this chapter:
1. Development of a single-family detached dwelling not a part of a subdivision tentatively approved after adoption of this title, and accessory structures;
  2. Previously approved development which conforms to all conditions of approval;
  3. Additions to existing structures or accessory structures that are under ten percent of the total gross floor area or 5,000 square feet, whichever is less. (Ord. 763, 1996)

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### **20.694.040 General**

- A. All landscape materials shall be natural or living materials. Plastic, simulated or synthetic materials are not permitted except for the use as weed block and as irrigation materials.
- B. All landscape areas must be irrigated with an underground irrigation system, adequate to service the landscape areas.
- C. Final landscape and irrigation plans must be submitted at the time of building permit application.
- D. Landscape materials shall follow the approved tree, shrub, and groundcover species list contained within the county design criteria and improvement standards manual to the extent possible. Exceptions to the list are at the sole discretion of the director.
- E. Installation of landscaping and irrigation systems must follow the approved plans. Any plant substitutes can only be authorized by the person who develops the plan, with the director's approval. Approval must be obtained prior to plant installation. (Ord.763, 1996)

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### **20.694.050 Maintenance**

The owner, or his agent, is responsible for the maintenance of all landscaping and irrigation systems, which shall be maintained in good condition, to present a healthy, neat, and orderly appearance and must be kept free from weeds, refuse, and debris. Maintenance includes the immediate replacement of all dead and diseased plant material. (Ord. 763, 1996)

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### **20.694.060 Landscape plans, required**

- A. A landscape plan must be filed with the department for the following:
1. Applications for a building permit or improvement plans which requires design review approval;
  2. Any tentative map which includes common, improved open space areas, or required street trees.
- B. The plan shall, at a minimum, identify all areas to be landscaped and include area and tree calculations and general types of landscaping proposed for the area.
- C. A landscape plan must be approved by the director, prior to the issuance of a building permit or the approval of a final map including common area. The landscape plan must be approved for remodel permits for a change of use from residential to non-residential or from single-family to multi-family.
- D. The landscape plan must be prepared by one of the following:
1. A licensed landscape architect;
  2. A licensed landscape contractor;

3. A licensed architect; or
4. A registered civil engineer. (Ord. 801, 1997, Ord. 763, 1996)

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### **20.694.070 Landscape plans, submittal requirements**

A. Landscape and irrigation plans must be in the format as prescribed in this section and contain the following for the development and installation of all landscape areas.

B. The final landscape plan shall include the following:

1. Scale (one inch equals 20 feet (1"=20') or one inch equals 30 feet(1"=30')), north arrow, location of adjacent streets, property lines, easements, sidewalks, drives, paved areas, lighting, signs, buildings, all utilities and mechanical equipment within the landscape areas, existing trees and other natural or man-made site features influencing the use of the site, and surrounding types of landscaping;

2. Construction details for installation of the landscape in accordance with county standards, including topographical features and grading plans, soil type, method of soil preparation, fertilization added at time of planting, area to be excavated before planting and manner of root exposure, tree staking and guying;

3. A note or calculation sheet with all landscape calculations relevant to the application of this chapter, including site area, areas of required number of parking spaces, number of trees and shrubs, type and amount of living and non-living ground cover, type and amount, if any, of decorative paving material, and percentage of each to be used on the property;

4. A plant list utilizing a wide variety of native and drought tolerant trees, shrubs and plants, based upon the recommended list of species provided in this chapter. The plant list shall include the common and botanical names of plants to be used. This plant list must be arranged in legend form with a key number assigned to each plant. On the plan, each plant shall be identified by a key number. The size of the plant, its spacing and the quantity to be used shall follow in the legend, as the following example illustrates: (Ord. 763, 1996)

Typical Plant List

No.	Botanical Name	Common Name	Size	Space	Quantity
1	Acer genially	Amur Maple	2-inch caliper	30 feet o.c.*	10
2	Pyrus Coleraine	Flowering Pear	2-inch caliper	20 feet o.c.	12
3	Forsythia	Early Forsythia	1 gallon	3 feet o.c	25
4	Syringa	Late Lilac	5 gallons	5 feet o.c.	7
5	Vinca Minor	Dwarf Periwinkle	flat	12 inches o.c	68

\* o.c. = "on center"

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## **20.694.080 Irrigation plans, submittal requirements**

A. Irrigation plans, and specifications which comply with the Uniform Plumbing Code, must be submitted with the landscape plan to insure adequate irrigation coverage. To increase water conservation, the system must be automatic drip, bubbler, or sprinkler irrigation. Sprinkler irrigation is only allowed on lawn areas, except that some groundcover may use sprinkler irrigation with the approval by the director. All drip and bubbler irrigation systems must be installed separately from turf irrigation systems. All irrigation plans must include the following:

1. Scale at the same scale as the landscape plan, north arrow, location of adjacent streets, property lines, easements, sidewalks, drives, paved areas, lighting, signs, buildings, all utilities and mechanical equipment within the landscape areas, existing trees and other natural or man-made site features influencing the use of the site;
2. Identification and description of automatic irrigation components to insure that vegetation is adequately irrigated. All irrigation plans shall incorporate water conserving principles, including multiple program controllers with percent scaling, low precipitation heads, drip irrigation, and check valves. Where applicable, irrigation details must include the method for the watering of required street trees. All valves and other devices are to be housed in a box of adequate size and design to protect the components.
3. Indication of the system point of connection and size, water pressure available, and maximum demand of the system in gallons per minute (GRM);
4. Irrigation equipment specified must be identified by manufacturer's name and equipment identification number;
5. Cross connection devices installed for all construction shall have a reduced pressure backflow prevented (R.P. device), except for single-family development;
6. All locations of irrigation valves, controllers, hose bibs, quick coupler valves, and backflow preventers. Sprinkler location on plans must include typical pattern of sprays (i.e., full circle, half circle), psi, radius of throw and gallons per minute;
7. Irrigation details must be used to clarify particular situations. Typical details must include backflow prevention devices, valves, irrigation heads, and irrigation controllers;
8. Sizes of irrigation lines. Schedule 40 P.V.C. is required for all pressure lines and under all paved areas. Piping must be installed a minimum of 12 inches underground for non pressure irrigation lines and 18 inches underground for constant pressure irrigation lines. (Ord. 763, 1996)

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## **20.694.090 Landscape materials**

- A. Landscape materials are limited to the following:
1. Living materials, including turf, ground covers, plants and shrubs, vines, hedges, and trees;
  2. Non-living materials, including rocks, gravel, tile, bricks, wood, bark, and related materials, may be used as ground cover within the required landscape areas with the approval of the community development department. No more than 20 percent of the landscape material shall include rock or gravel, and at least 50 percent of the area devoted to groundcover and planter areas shall be living materials. A variety of living and non-living ground cover materials is required for all projects;
  3. Existing trees and shrubs shall be preserved wherever possible and may be considered part of the required landscape material;
  4. Existing trees with a trunk diameter of eight inches or more at a point 12 inches above ground level shall be preserved, unless its removal is authorized on the approved site plan or map;

5. Turf is not allowed in any space measuring less than four feet in width or length. Turf is not allowed in areas with a slope greater than 20 percent (1:5), only drought-tolerant native grasses, which decrease soil erosion and require less water consumption, are allowed on slopes in excess of 20 percent;

6. Plant material and ground cover must be distributed evenly throughout the parking lot or site area.

7. Xeriscape designs using drought tolerant, native plant species are encouraged. (Ord. 763, 1996)

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### **20.694.100 Landscape design standards**

A. At least 15 percent of the total paved area devoted to parking and driveway areas must be offset by pervious areas of landscape material (e.g., xeriscaping, turf, and/or new or existing trees and shrubs). All landscaping must be irrigated with an irrigation system approved by the department.

B. Plant materials existing or proposed within public rights-of-way adjacent to a landscaping project shall be included on the landscape plan but will not be counted toward the total required landscape area.

C. Where a perimeter fence or wall is proposed along a street frontage within a residential subdivision, a minimum five-foot landscape planter area shall be provided outside the fenced area adjacent to the sidewalk. This area shall include street trees and a variety of shrubs and plants to screen the fence and provide an aesthetically pleasing streetscape.

D. On multi-family developments, at least 50 percent of the required common open space areas must be landscaped in pervious material, such as xeriscaping, trees, shrubs, and/or turf.

E. New construction shall provide adequate shade trees in all paved areas and provide an appropriate balance of evergreen and deciduous plantings throughout the site.

F. The landscape plans shall show a minimum of one tree for every 400 square feet of required on-site landscaped area.

G. In addition to paragraph F above, street trees, with a minimum two-inch caliper and five-foot spread, are required for all new commercial, industrial, public, institutional, or residential subdivisions creating parcels of one-half net acre or less. One tree shall be planted, at a maximum, for each 40 lineal feet of street frontage, on average. Street trees must be planted by the developer and include proper irrigation prior to the issuance of a certificate of occupancy. In single-family residential subdivisions, installation of trees and irrigation system shall occur prior to issuance of a certificate of occupancy for each individual dwelling unit. Street trees must be set back a minimum of ten feet from water and sewer lines, 30 feet from an intersection, and ten feet from any driveway, hydrant, or street sign. Trees which grow to more than 20 feet in height may not be planted under overhead utility lines. Street trees within highway rights-of-way shall limit mature spread to 20 feet. Street trees shall follow the approved street tree list found in the Douglas County Design Criteria and Improvement Standards, Appendix B, "Plant List.". Any exceptions to the list shall be at the discretion of the director.

H. All trees must be staked in accordance with the International Society of Arborists standards.

I. Street trees adjacent to sidewalks, parking lots, or streets must be free of fruit or other elements which litter the ground. All street trees must be heat and cold resistant, tolerant of the urban environment, and insect and disease resistant.

J. Shrubs and hedges must be a minimum five-gallon size. Hedges, where required, shall be planted and maintained to form a continuous, unbroken, solid, visual screen within three years after planting.

Vines shall be a minimum of two feet in height at the time of planting and may be used only in conjunction with fences, screens, or walls to meet physical barrier requirements.

K. Wherever rock or bark are used as ground cover, the installation must prevent vegetation growth through the ground cover either through the use of herbicides or landscape fabric material. Fabric material must be properly pinned to the soil to avoid lifting.

L. All required street trees, parking lot trees, and trees required for screening purposes must be a minimum two-inch caliper and five-foot spread. All other landscaped trees may be one and one-half inch caliper for deciduous trees, and six-foot minimum height for evergreen trees. (Ord. 1209; 2007: Ord. 801, 1977; Ord. 763, 1996)

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#### **20.694.110 Screening**

Plant materials shall be used to screen irrigation equipment boxes, storage, refuse, public utilities, and other features which do not enhance the overall appearance of the site. Landscape screening shall achieve the desired effect within three years. (Ord. 763, 1996)

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#### **20.694.120 Site distance for landscaping adjacent to public rights-of-way and points of access**

When an access way or driveway intersects a public right-of-way or when the subject property abuts the intersection of two or more public rights-of-way, all landscaping within the traffic safety site area must provide unobstructed cross-visibility at a level between three feet and eight feet in height. Trees having limbs and foliage trimmed in a manner that no limbs or foliage extend into the cross-visibility area are allowed, provided their location does not create a traffic hazard. (Ord. 763, 1996)

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#### **20.694.130 Final inspection**

All landscaping must be properly installed and be according to approved plans prior to final inspection and certificate of occupancy by the department. An exception is allowed only when the landscaping cannot be completed due to weather related delays. In lieu of the installation of landscaping, financial security per chapter 20.720, shall be provided at 150 percent of the estimated cost of installation. The owner must guarantee installation as specified in the temporary certificate of occupancy agreement, and final inspection must be completed within six months of the issuance of a temporary certificate. The estimated cost of the landscaping is subject to verification by the department. (Ord. 763, 1996)



## **APPENDIX H. COMPATIBLE LANDSCAPING**

The following list is taken from the Truckee Meadows Water Authority (TMWA) website. More information on these plants, including color photos can be found at [www.tmwandscapeguide.com](http://www.tmwandscapeguide.com).

## PERENNIAL FLOWERS

[Artemisia species](#)/Sage or Wormwood (Perennial)—water use: Very Low

[Eriogonum umbellatum](#)/Sulfur Flowered Buckwheat (Perennial)—water use: Very Low

[Achillea species](#)/Yarrow (Perennial)—water use: Low

[Agastache cana](#)/Bubblemint (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

[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 I. CANYON GID RESIDENTIAL WATERING RESTRICTIONS AND  
SCHEDULE OF FINES**



## **CANYON GENERAL IMPROVEMENT DISTRICT WATER IRRIGATION RESTRICTIONS AND FINES**

The Canyon General Improvement District, in accordance with requirements from the Division of Water Resources of the State of Nevada, has three primary restrictions regarding water used for irrigation. These restrictions are as follows:

### **1. Scheduled Watering Days**

*Odd-numbered* houses may use water for irrigation on Tuesday, Thursday, and Saturday.

*Even-numbered* houses may use water for irrigation on Wednesday, Friday and Sunday.

*Common Areas in Rainbow Bend and LCC* may be watered (irrigated) on Monday, Wednesday and Friday.

MONDAY – NO watering for irrigation other than the common areas.

### **2. Hours Restricted From Watering**

No one may use water for irrigation between the hours of 12:00 noon to 4:00 p.m. due to the fact that these are the warmest hours of the day and it is a waste of water.

### **3. Over Watering (water waste) defined and Not Allowed**

Water waste is defined as (but not limited to) careless consumption of water as evidenced by irrigation overflowing or puddling on a property and/or flowing from property into gutters, streets, gullies, neighboring property or washes for more than 30 (thirty) minutes.

### **The following items may be considered exempt from Restriction #1 (Watering Days)**

1. New lawns must be watered every day for a period of time. CGID management is required to audit water usage so it is necessary that a customer notify the manager that a new lawn has been put in and will require additional watering.
2. Flower and vegetable gardens may be watered more frequently if put on a drip system or watered by hand.

### **PENALTIES For Not Following The Water Irrigation Restrictions**

First Offense – will consist of a verbal (in person or via telephone) notification by a CGID employee, LCC board member or Rainbow Bend patrol.

Second Offense – will consist of a written notification from the CGID Manager.

Third Offense – will consist of a door tag with a \$50 fine and the disconnection of water services at the main. Water services will be reinstated once the \$50 fine has been paid and the CGID Manager has been assured the customer will discontinue the misuse of water for irrigation purposes.

## **CANYON GENERAL IMPROVEMENT DISTRICT RESTRICTIONS AND PENALTY FOR FAILURE TO FIX LEAKS**

The Canyon General Improvement District, in accordance with requirements from the Division of Water Resources of the State of Nevada, has a responsibility to ensure that customers do not use excessive water due to leaks or poorly maintained plumbing.

1. It is the responsibility of the CGID staff to audit the monthly usage of each and every customer.
2. Upon noticing unusual usage not due to normal use and irrigation, it is the responsibility of the CGID staff to investigate.
3. This investigation may consist of checking the meter and talking with the customer to determine whether habits have changed or there is a problem with the plumbing.
4. Upon discovering additional water usage due to a leak or poorly maintained plumbing, the customer will be instructed to make the necessary repairs.
5. Should the necessary repairs not be made in a timely manner (usually by the next billing period), the CGID has the responsibility and authority to disconnect the water services to the residence and not reinstate it until a \$50 fine has been paid and the repairs have been made.
6. At any time that a CGID employee discovers a meter dial spinning or observes a leak on the property of any home that is empty, it is the responsibility of the CGID to disconnect those services and not reconnect them again until a realtor, owner....someone...is present to determine where the leak might be and ensure it will be fixed. The water will then be turned back off until the repair has been made.
7. At any time a CGID employee discovers a meter dial spinning or observes a leak on the property of any home that is occupied and the customer refuses to repair the leak, it is the responsibility of the CGID to disconnect the services at the main and not restore them until the leak has been repaired and a \$50 fine has been paid.
8. Any person who turns their water back on without authorization from the CGID, will be liable for any damage incurred and may be subject to a \$50 fine for each occurrence. (Because it is illegal for a customer to turn the water back on when turned off by the utility, in certain situations, the Manager may deem it necessary to call the Storey County Sheriff.)

## **APPENDIX J. 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 (ICI) (4) Agricultural, and (5) Purveyor. The following conservation measures will be classified first by application and then by type. These measures are suggestions and can only be enforced if included as part of an ordinance.

## **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 for the audit.
- Estimation of use for all fixtures and appliances.
- Check for and repair leaks.
- Evaluation of Landscape (See "Landscape Conservation Measures)
- Evaluation of outdoor water use.
- Evaluate efficiency measures.
- Educate customers using available flyers

An audit should take no more than 30 to 45 minutes.

A.1.1.2 Additional Measures. The sample pamphlets in Appendix A 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.

<b>Measure</b>	<b>Description</b>
<b><i>Bathroom/Kitchen Fixtures</i></b>	
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 @ 80 psi
Showerhead retrofit devices	Includes temporary cutoff valves and restrictors.
Low-volume faucets	2.5 gallons per minute @ 80 psi
Faucet retrofit devices	Includes aerators, activation sensors, self closing and metered valves
Faucet maintenance	Includes washer replacement, repacking, tightening, and cleaning aerators
Water pressure reduction	Only needed if house pressure exceeds what's required
<b><i>High Efficiency Appliances</i></b>	
Clothes washers	27 gallons per load
Dish washers	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 should be conducted on park and golf course irrigation systems and could be considered an option on residential irrigation systems, targeting high-volume users.

- Purpose for the audit.
- Estimation of outdoor use based on meter records.
- Check for and repair 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 flyers

A residential landscape audit should take no more than an hour. Parks and golf courses could take substantially longer.

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.2.1.3 Additional Measures. The sample pamphlets in Section 5.1 include additional behavioral conservation measures.

### A.2.2 Hardware/Equipment Measures

Landscape hardware measures consist of two basic groups: (1) Landscape materials and (2) irrigation equipment.

Measure	Description
<b><i>Landscape Materials</i></b>	
Trees, plants, and grass	Should be well suited to climate and altitude and be drought tolerant
Organic mulch	Grass clippings, leaves, wood chips, bark, and 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.
<b><i>Irrigation Equipment</i></b>	
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 directed to where it's needed.

### A.3 INDUSTRIAL, COMMERCIAL, AND INSTITUTIONAL (ICI) CONSERVATION MEASURES

#### A.3.1 Behavioral and Hardware/Equipment Measures

A.3.1.1 ICI Water Audits. Since ICI water audits can require a substantial amount of time (4 hours or more), it may be necessary to have a private engineering firm hired by the water user conduct the audit. There is incentive for ICI customers to pay for audits since the results of an audit could translate into substantial savings. An ICI water audit should include the following elements:

- Support from ICI owners, managers, and employees
- Survey/Estimation of facility use based on meter records.
- Calculation of water-related costs.
- Evaluation of efficiency measures.
- Evaluation of payback periods for measures.
- Efficiency recommendations and implementation.
- Tracking and reporting system.

A.3.1.2 Manual Washing. Manual washing is cleaning done on surfaces with hoses and cloths.

#### MANUAL WASHING

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"><li>• Surfaces should be swept or brushed off before using water to clean.</li></ul>	<ul style="list-style-type: none"><li>• High pressure low-volume hoses with automatic shut-off nozzles</li><li>• High-pressure pumps, steam cleaners.</li></ul>

A.3.1.3 Vehicle Washing. Vehicle washing includes manual washing and automated car washes or a combination of both.

#### VEHICLE WASHING

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"><li>• Limit number of spray nozzles and set flow rates at lowest volume and pressure required.</li><li>• Adjust nozzles in automated systems so that they take full advantage of gravity and position. Also make sure water shuts off after vehicles have passed.</li><li>• Increase conveyor speeds or reduce rinse cycle time.</li><li>• Sweep wash area before using water to clean.</li><li>• Establish a regular maintenance schedule that includes checking for leaks and making repairs.</li></ul>	<ul style="list-style-type: none"><li>• Recycling systems. These would include filters and storage tanks.</li><li>• High pressure pumping systems.</li></ul>

A.3.1.4 Kitchens and Restaurants. Kitchen and restaurant conservation is divided into four areas of application; 1. Food and drink preparation, 2. Dishwashing, 3. Garbage disposal and scraping trough, and 4. Ice making.

#### FOOD AND DRINK PREPARATION

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> <li>• Presoak and wash food service articles in basins instead of running water.</li> <li>• Reduce thawing of food with hot water unless required by law. If required use lower flow.</li> <li>• Avoid running water to melt ice in sinks.</li> <li>• Use full loads in dishwashers and other automated equipment.</li> <li>• Serve water only when requested by customers.</li> </ul>	<ul style="list-style-type: none"> <li>• Low-volume faucets</li> <li>• Hands-free foot pedal valves for faucets</li> <li>• On demand hot water dispensers</li> </ul>

#### DISHWASHING

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> <li>• Presoak utensils, dishes, and pots and pans in basins of water instead of using running water prior to loading dishwashing machines.</li> <li>• Scrape food off of plates rather than use running water.</li> <li>• Operate scraping troughs only while dishes are actually being washed.</li> <li>• Assess the water efficiency of the current dishwashing system to determine where improvements might be made.</li> <li>• Always wash full loads in automated machines.</li> <li>• Operate conveyor type dishwashers only when dishes are actually passing through the machine.</li> <li>• Verify that the dishwashing equipment is using the minimum amount of flow recommended by the manufacturer.</li> <li>• Since many older automated dishwashing systems are neither energy nor water efficient, evaluate the cost of retrofitting or replacing existing equipment.</li> <li>• Turn dishwashers off when not in use.</li> <li>• Routinely check all dishwashing equipment to ensure there are no leaks.</li> <li>• Post signs requesting that personnel minimize their use of utensils, dishes, and pots and pans to save water.</li> </ul>	<ul style="list-style-type: none"> <li>• Manual pre-wash sprayers with “dead man” shut off controls.</li> <li>• Low-flow spray heads on all sprayers.</li> <li>• New water efficient dishwashing equipment.</li> <li>• Electronic eye sensors that shut off conveyor type systems when dishes are not passing through the machine.</li> </ul>

### GARBAGE DISPOSER AND SCRAPING TROUGH

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> <li>Eliminate disposers and troughs.</li> <li>Use the minimum acceptable flow rate on all machines.</li> <li>Reuse wastewater in the mixing chamber of the disposer.</li> </ul>	<ul style="list-style-type: none"> <li>Garbage strainers (instead of disposers)</li> <li>Sensors that detect the amount of flow in a disposer and regulate flow accordingly.</li> <li>Solenoid valves that turn water off when the disposer is off.</li> <li>Flow regulators for disposer supply lines.</li> </ul>

### ICE MAKERS

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> <li>Use the minimum flow rate recommended by the manufacturer on water cooled icemakers.</li> <li>Adjust machines to produce ice only when it's needed.</li> </ul> <p>Collect spent cooling water and reuse it for non-potable purposes.</p>	<ul style="list-style-type: none"> <li>Air-cooled icemakers.</li> <li>Re-circulating systems for water-cooled icemakers.</li> <li>Ice flake machines that use less bleed off than cube machines.</li> </ul>

A.3.1.5 Laundries and Laundromats. This section includes measures that are applicable in hotels, motels, hospitals, nursing homes, diaper services, restaurants, and coin operated Laundromats.

### LAUNDRIES AND LAUNDROMATS

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> <li>Operate equipment with full loads only.</li> <li>Reduce water levels for partial loads.</li> <li>Back flush filters or softeners only when necessary.</li> </ul>	<ul style="list-style-type: none"> <li>Computer controlled rinse water reclamation systems.</li> <li>Wash and rinse water treatment and reclamation systems.</li> <li>Continuous batch washers.</li> <li>Ozone laundry systems.</li> <li>Horizontal axis washers.</li> </ul>

A.3.1.6 Swimming Pools. The measures in this section can be applied to commercial and residential swimming pools.

### SWIMMING POOLS

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> <li>Limit the frequency of pool refilling.</li> <li>Cover the pool with an insulated cover when not in use to reduce losses due to heat and evaporation.</li> <li>Reduce the level of the pool to avoid losses due to splashing.</li> <li>Lower the pool temperature.</li> <li>Back wash filters only when necessary. If timed, verify that frequency is efficient.</li> <li>Regularly check pool for leaks and cracks. Keep pool and filter clean to avoid unnecessary backwashing.</li> </ul>	<p>There are no special equipment measures that would help conserve water in pools. It is important however that available equipment is efficient and used properly.</p>



A.3.1.7 Cooling Systems. This section includes measures for three types of cooling systems: 1. Single-pass, 2. Evaporative, and 3. Equipment. Single-pass cooling uses fresh water to cool without re-circulating any of the water used in the first pass. Evaporative coolers are used for cooling in commercial and residential applications and are commonly known as swamp coolers. Equipment cooling includes both single-pass and re-circulating systems that are used to cool equipment and machinery.

#### **SINGLE-PASS COOLING**

<b>Behavioral Measures</b>	<b>Hardware/Equipment Measures</b>
<ul style="list-style-type: none"> <li>• Reuse water for landscaping, vehicle washing, or another cooling application that allows for water to be at a higher temperature.</li> <li>• Eliminate single-pass systems.</li> </ul>	<ul style="list-style-type: none"> <li>• Air-cooled equipment (i.e. compressors, pumps, icemakers, etc...)</li> <li>• Automatic controls that insure coolers only operate when needed.</li> </ul>

#### **EVAPORATIVE COOLING**

<b>Behavioral Measures</b>	<b>Hardware/Equipment Measures</b>
<ul style="list-style-type: none"> <li>• Regularly check for leaks in hoses and pan.</li> <li>• Replace pads at least annually.</li> <li>• Shut cooler off when building is unoccupied.</li> <li>• Annually service the equipment by oiling moving parts and cleaning off accumulated scale or corrosion.</li> </ul>	<p>There are currently no equipment measures for evaporative coolers. The design of the coolers is relatively simple.</p>

#### **EQUIPMENT COOLING**

<b>Behavioral Measures</b>	<b>Hardware/Equipment Measures</b>
<ul style="list-style-type: none"> <li>• Reuse water in single pass systems for other cooling purposes. Examples of reuse include cooling molten materials, landscape, of boiler make-up water.</li> <li>• Replace al single pass cooling systems with closed-loop systems or replace water-cooled equipment with air-cooled.</li> </ul>	

A.3.1.8 Heating Systems. This section deals with conservation measures for boilers and steam generators which are used to heat large buildings and multiple-building facilities.

#### **HEATING SYSTEMS**

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> <li>Regularly inspect systems for leaks and make repairs.</li> <li>Insulate all piping.</li> <li>Limit boiler bleed-off to a level that satisfies water quality requirements.</li> <li>Discharge blow-down into an expansion tank instead of using cold water to cool it.</li> </ul>	<ul style="list-style-type: none"> <li>Flow meters for make-up and blow-down valves.</li> <li>Automatic controls to discharge blow-down.</li> </ul>

A.3.1.9 Leaks and Water Losses. This section covers water conservation measures relating to leaks and losses.

#### **LEAKS AND WATER LOSSES**

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> <li>Regularly check for leaks at all water connections. Keep in mind that higher pressure applications have more incidence of leakage.</li> <li>Regularly check all vessels that contain water for cracks or bad seals.</li> <li>Regularly check all heating and cooling systems.</li> <li>Repair any leaks that are discovered.</li> </ul>	<ul style="list-style-type: none"> <li>Leak detection equipment. This could include sonic or probe type equipment.</li> <li>Any equipment used to stop a leak. This would depend on the material of the pipe or vessel that has a leak.</li> </ul>

A.3.1.10 ICI Maintenance Practices. This section reemphasizes maintenance conservation measures for ICI facilities that have been mentioned in previous sections. These measures should become standard procedure at all ICI facilities.

- Create a maintenance schedule that includes schedules for leak detection inspections and meter reading, and repair procedures.
- Monitor water-use records keeping track of any increases or decreases in use.
- Conduct water audits every one to three years.
- Shut off supply lines to areas that are not being used.
- Install pressure reducers where feasible.
- Keep a maintenance schedule to clean cooling and heating equipment regularly.
- Recycle and reuse water when feasible.
- Insulate all hot water pipes.
- Replace old equipment with water saving equipment.
- Install timers wherever possible.
- Educate employees on water saving techniques.

## **A.4 GENERAL CONSERVATION MEASURES**

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

### **HOME BEHAVIORS**

1. When washing dishes by hand, don't let the water run while rinsing. 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 drinks, so that every drop goes down you not the drain.
6. Check your water meter and bill to track your water usage.
7. Wash your produce in the sink or a pan that is partially filled with water instead of running water from the tap.
8. Use a broom instead of a hose to clean your driveway or sidewalk and save 80 gallons of water every time.
9. If your shower can fill a one-gallon bucket in less than 20 seconds, then replace it with a water efficient showerhead.
10. Collect the water you use for rinsing produce and reuse it to water houseplants.
11. We're more likely to notice leaky faucets indoors, but don't forget to check outdoor faucets, pipes, and hoses for leaks.
12. When you shop for a new appliance, consider one offering cycle and load size adjustments. They are more water and energy-efficient than older appliances.
13. Time your shower to keep it under 5 minutes. You'll save up to 1000 gallons a month.
14. Install low-volume toilets.
15. When you clean your fish tank, use the water you've drained on your plants. The water is rich in nitrogen and phosphorus, providing you with a free and effective fertilizer.
16. Put food coloring in your toilet tank. If it seeps into the toilet bowl, you have a leak. It's easy to fix, and you can save more than 600 gallons a month.
17. Plug the bathtub before turning the water on, and then adjust the temperature as the tub fills up.
18. Designate one glass for your drinking water each day. This will cut down on the number of times you run your dishwasher.

19. Don't use running water to thaw food.
20. Grab a wrench and fix that leaky faucet. It's simple, inexpensive, and can save 140 gallons a week.
21. When doing laundry, match the water level to the size of the load.
22. Teach your children to turn the faucets off tightly after each use.
23. Before you lather up, install a low-flow showerhead. They're inexpensive, easy to install, and can save your family more than 500 gallons a week.
24. Soak your pots and pans instead of letting the water run while you scrape them clean.
25. Make sure you know where your master water shut-off valve is located. This could save gallons of water and damage to your home if a pipe were to burst.
26. Turn off the water while you brush your teeth and save 4 gallons a minute. That's 200 gallons a week for a family of four.
27. Make sure your toilet flapper doesn't stick open after flushing.
28. Make sure there are aerators on all of your faucets.
29. Install an instant water heater on your kitchen sink so you don't have to let the water run while it heats up. This will also reduce heating costs for your household.
30. Cut back on rinsing if your dishwasher is new. Newer models clean more thoroughly than older ones.
31. Bathe your young children together.
32. Winterize outdoor spigots when temps dip to 20 degrees F to prevent pipes from bursting or freezing.
33. Insulate hot water pipes so you don't have to run as much water to get hot water to the faucet.
34. Drop that tissue in the trash instead of flushing it and save gallons every time.
35. If your toilet was installed prior to 1980, place a toilet dam or bottle filled with water in your toilet tank to cut down on the amount of water used for each flush. Be sure these devices do not interfere with operating parts.
36. Install water softening systems only when necessary. Save water and salt by running the minimum number of regenerations necessary to maintain water softness.
37. Wash clothes only when you have a full load and save up to 600 gallons each month.
38. Listen for dripping faucets and toilets that flush themselves. Fixing a leak can save 500 gallons each month.
39. Cook food in as little water as possible. This will also retain more of the nutrients.
40. Turn the water off while you shampoo and condition your hair and you can save more than 50 gallons a week.
41. Choose new water-saving appliances, like washing machines that save up to 20 gallons per load.

42. Select the proper size pans for cooking. Large pans require more cooking water than may be necessary.
43. Turn off the water while you shave and you can save more than 100 gallons a week.
44. To save water and time, consider washing your face or brushing your teeth while in the shower.
45. For hanging baskets, planters and pots, place ice cubes under the moss or dirt to give your plants a cool drink of water and help eliminate water overflow.
46. Throw trimmings and peelings from fruits and vegetables into your yard compost to prevent from using the garbage disposal.
47. Keep a bucket in the shower to catch water as it warms up or runs. Use this water to flush toilets or water plants.
48. When you are washing your hands, don't let the water run while you lather.
49. Pre-treat stains before washing clothes to avoid re-washing.
50. Use the shortest wash cycle for lightly soil cloths.
51. Check washing machine hoses regularly for leaks.
52. Do not pre-rinse dishes except in cases of sticky or burn-on food.
53. Scrape off food with a utensil or used paper napkin when pre-cleaning for dishwasher.

## **LANDSCAPE BEHAVIORS**

1. Check your sprinkler system frequently and adjust sprinklers so only your lawn is watered and not the house, sidewalk, or street.
2. Avoid planting turf in areas that are hard to water such as steep inclines and isolated strips along sidewalks and driveways.
3. Plant during the spring or fall when the watering requirements are lower.
4. Minimize evaporation by watering during the early morning hours, when temperatures are cooler and winds are lighter.
5. Use a layer of organic mulch around plants to reduce evaporation and save hundreds of gallons of water a year.
6. Divide your watering cycle into shorter periods to reduce runoff and allow for better absorption every time you water.
7. Only water your lawn when needed. You can tell this by simply walking across your lawn. If you leave footprints, it's time to water.
8. Adjust your lawn mower to a higher setting. Longer grass shades root systems and holds soil moisture better than a closely clipped lawn.
9. Use the sprinkler for larger areas of grass. Water small patches by hand to avoid waste.

10. Use porous materials for walkways and patios to keep water in your yard and prevent wasteful runoff.
11. Direct downspouts and other runoff towards shrubs and trees, or collect and use for your garden.
12. Install a rain shut-off device on your automatic sprinklers to eliminate unnecessary watering.
13. Choose a water-efficient drip irrigation system for trees, shrubs and flowers. Watering at the roots is very effective, be careful not to over water.
14. Reduce the amount of grass in your yard by planting shrubs and ground cover with rock and granite mulching.
15. Remember to check your sprinkler system valves periodically for leaks and keep the heads in good shape.
16. Don't water your lawn on windy days. After all, sidewalks and driveways don't need water.
17. Water your plants deeply but less frequently to create healthier and stronger landscapes.
18. When watering grass on steep slopes, use a soaker hose to prevent wasteful runoff.
19. Group plants with the same watering needs together to get the most out of your watering time.
20. Remember to weed your lawn and garden regularly. Weeds compete with other plants for nutrients, light, and water.
21. While fertilizers promote plant growth, they also increase water consumption. Apply the minimum amount of fertilizer needed.
22. Avoid installing ornamental water features and fountains that spray water into the air. Trickling or cascading fountains lose less water to evaporation.
23. Buy a rain gauge to track how much rain or irrigation your yard receives. Check with your local water agency to see how much rain is needed to skip an irrigation cycle.
24. Teach your family how to shut off your automatic watering systems. Turn sprinklers off if the system is malfunctioning or when a storm is approaching.
25. Set a kitchen timer when watering your lawn or garden with a hose.
26. Next time you add or replace a flower or shrub, choose a low water use plant for year-round landscape color and save up to 550 gallons each year.
27. Use a screwdriver as a soil probe to test soil moisture. If it goes in easily, don't water. Proper lawn watering can save thousands of gallons of water annually.
28. Avoid over-seeding your lawn with winter grass. Once established, ryegrass needs water every three to five days, whereas dormant Bermuda grass needs water only once a month.
29. Landscape with Xeriscape trees, plants and groundcovers. Call your local conservation office for more information about these water thrifty plants.
30. If you have an evaporative cooler, direct the water drain to a flowerbed, tree, or your lawn.
31. Leave lower branches on trees and shrubs and allow leaf litter to accumulate on top of the soil. This keeps the soil cooler and reduces evaporation.

32. Start a compost pile. Using compost when you plant adds water-holding organic matter to the soil.
33. Use sprinklers that throw big drops of water close to the ground. Smaller drops of water and mist often evaporate before they hit the ground.
34. More plants die from over-watering than from under-watering. Be sure only to water plants when necessary.
35. Water only as rapidly as the soil can absorb the water.
36. Aerate your lawn. Punch holes in your lawn about six inches apart so water will reach the roots rather than run off the surface.

### **COMMUNITY BEHAVIORS**

1. Encourage your school system and local government to help develop and promote a water conservation ethic among children and adults.
2. Make suggestions to your employer to save water (and dollars) 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. Pick-up the phone and report significant water losses from broken pipes, open hydrants and errant sprinklers to the property owner or your water management district.

### **MISCELLANEOUS BEHAVIORS**

1. Install covers on pools and spas and check for leaks around your pumps.
2. Periodically 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. Use a grease pencil to mark the water level of your pool at the skimmer. Check the mark 24 hours later. Your pool should lose no more than ¼ inch each day.
6. When the kids want to cool off, use the sprinkler in an area where your lawn needs it the most.
7. Make sure your swimming pools, fountains, and ponds are equipped with re-circulating pumps.
8. Bathe your pets outdoors in an area in need of water.
9. While staying in a hotel or even at home, consider reusing your towels.
10. When backwashing your pool, consider using the water on your landscaping