

## Water Assessment Report

**The purpose of this report is to assess the water consumption of Forest Grove, to identify potential areas for conservation, and to offer other suggestions pertaining to water quality.** The data gathered comes from the Utility Billing information from the years 2008 to 2011. These results represent *metered* watered consumption.

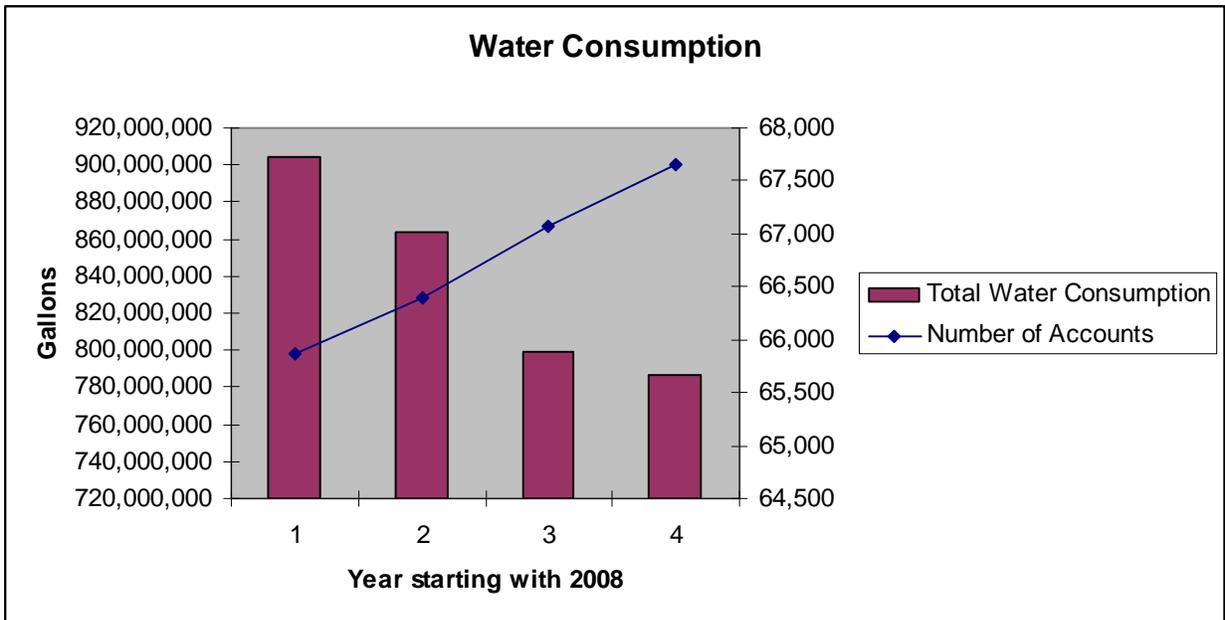
### Definitions

Residential- single family homes or duplexes  
 Multifamily- three or more units on the same tax lot  
 Commercial- retails, restaurants, office spaces  
 Industrial- manufacturing, warehouses, fabrication

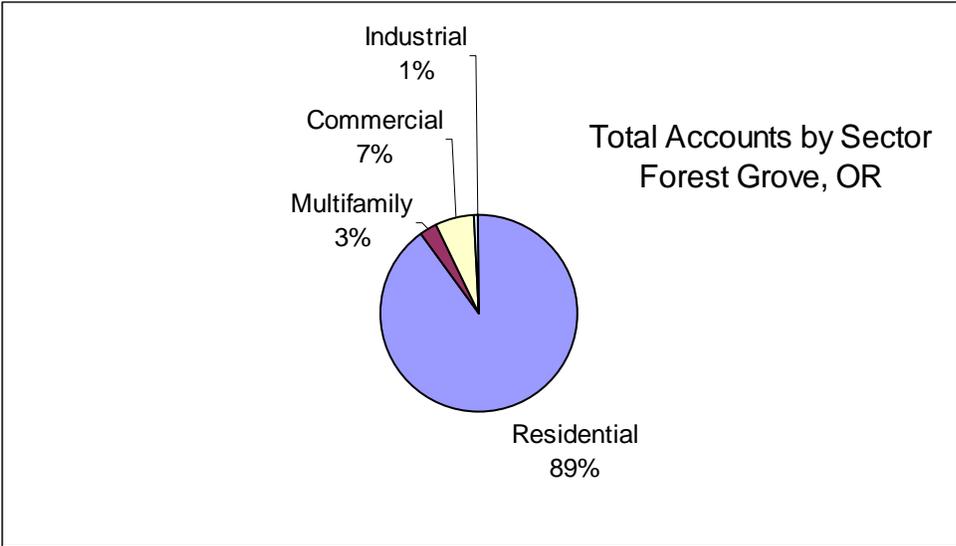
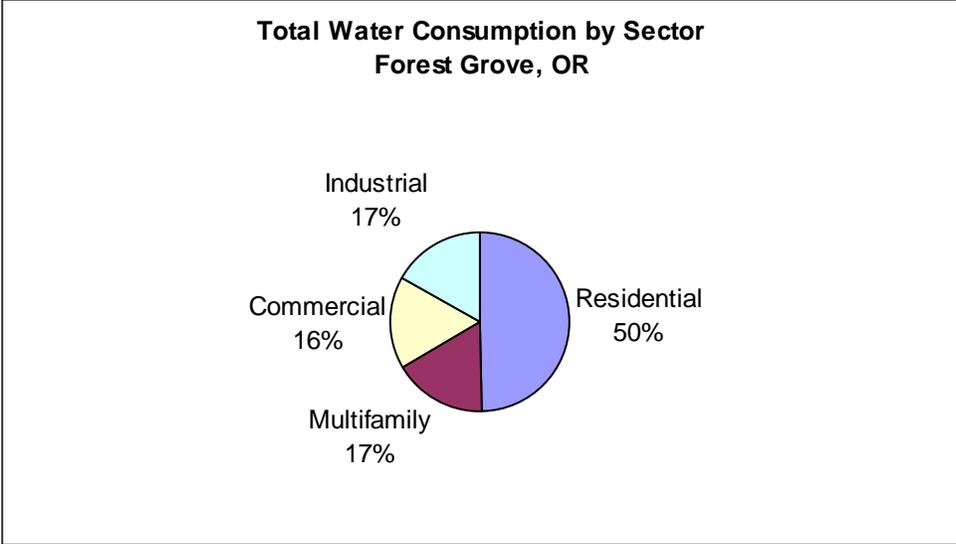
### Summary of Results

Overall, total water consumption in Forest Grove is decreasing, even though the numbers of accounts are increasing.

2008	2009	2010	2011
904,778,300 gal	863,459,300 gal	799,187,800 gal	786,860,700 gal
65,869 accounts	66,395 accounts	67,071 accounts	67,662 accounts



The residential sector accounts for 50% of the metered water consumption and the other three sectors representing roughly an equal amount. The residential sector accounts for 89% of all accounts, followed by commercial, multifamily, and industrial.



In 2008, the average single family or duplex household used 86,574 gallons of water annually. In 2011, the same average single family or duplex household used 77,075 gallons of water, an 11% decrease in water consumption. Commercial usage decreased by 15%, with the average account using 34,126 gallons in 2008, and 28,983 gallons in 2011. The industrial accounts consume the most water, with 454,224 gallons per account in 2008, and 345,804 gallons in 2011. This is a 24% decrease, the most of all the sectors. Multifamily accounts do not follow this trend, as consumption per account has increased, even though total consumption has decreased. In 2008, the average account used 47,891 gallons, and in 2011, 69,200 gallons, a 44% increase. The multifamily accounts have a meter on the whole building, so the yearly average consumption per account is not representative of each individual unit.

2008 vs 2011 Residential	2008	2011
<b>Total Consumption</b>	415,701,700 gal	391,176,700 gal
<b>Total Number of Accounts for the Year</b>	57,620 accounts	60,903 accounts
<b>Yearly Average Consumption Per Account</b>	86,574 gal	77,075 gal

2008 vs 2011 Multifamily	2008	2011
<b>Total Consumption</b>	163,452,200 gal	132,795,500 gal
<b>Total Number of Accounts for the Year</b>	3,413 accounts	1,919 accounts
<b>Yearly Average Consumption Per Account</b>	47,891 gal	69,200 gal

2008 vs 2011 Commercial	2008	2011
<b>Total Consumption</b>	139,846,700 gal	129,062,100 gal
<b>Total Number of Accounts for the Year</b>	4,427 accounts	4,453 accounts
<b>Yearly Average Consumption Per Account</b>	34,126 gal	28,983 gal

2008 vs 2011 Industrial	2008	2011
<b>Total Consumption</b>	185,777,700 gal	133,826,200 gal
<b>Total Number of Accounts for the Year</b>	409 accounts	387 accounts
<b>Yearly Average Consumption Per Account</b>	454,224 gal	345,804 gal

The differences between the total number of accounts is due to changes in utility classification, and the opening and closing of accounts.

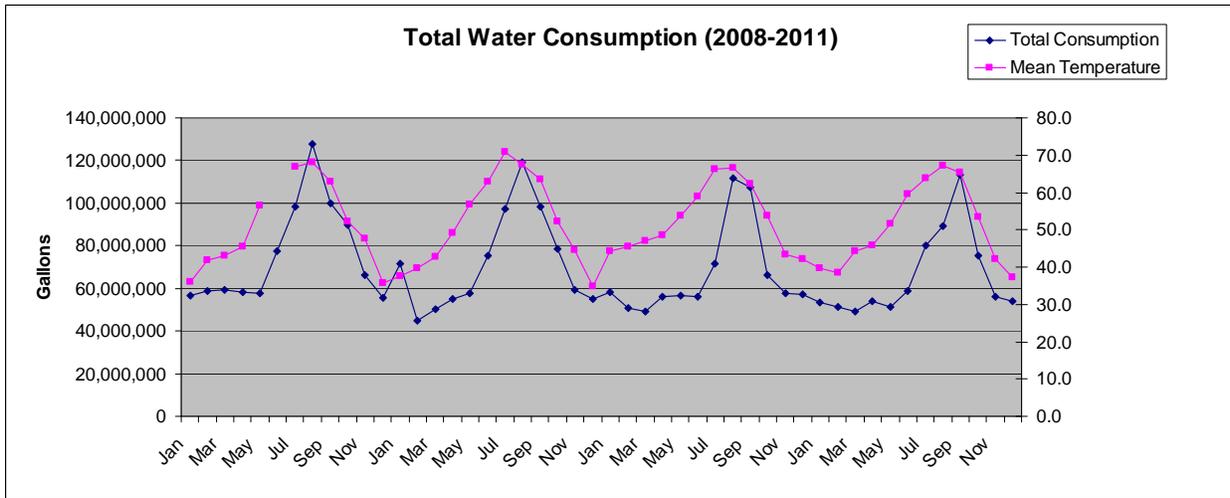
#### *Residential (Single or Duplex Household) vs Multifamily*

The multifamily accounts are not representative of each unit. One multifamily building might have one account for all the units within that building, while a residential account meters that one household. In order to compare the usage between single or duplex households and multifamily units, one residential account must be equivalent to one multifamily unit. According to 2011 data from the City's Land-Use Inventory, there are 2,535 multifamily units. The rule of thumb for vacancy rate is 5%. So in 2011, about 2,409 multifamily units were occupied. Therefore, the yearly average consumption per unit is the total consumption of the multifamily sector divided by the number of occupied units. While the number of multifamily accounts for the years 2008, 2009, and 2010 are available, it is unknown how many multifamily units there were for those years.

Based on 2011 data, the average single family or duplex household used 77,075 gallons in a year, or 6,423 gallons each month. The average multifamily unit used 55,125 gallons or 4,594 gallons each month, 28% less. Factors such as washing machine and dryer access and lawn maintenance account for the differences.

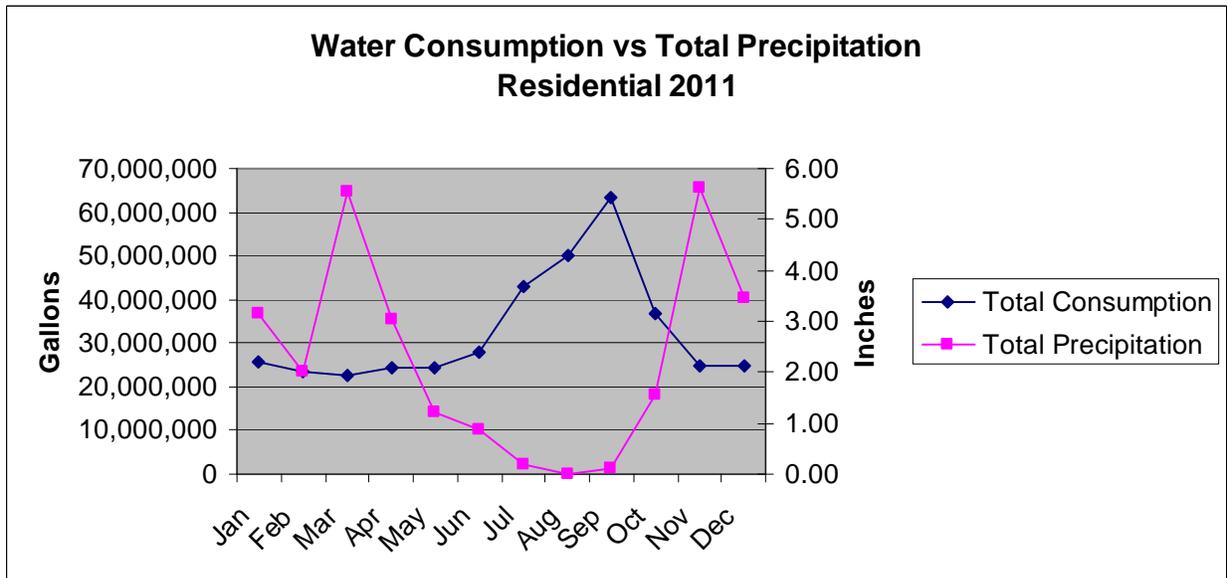
#### *Climate*

The total amount of water consumed directly correlates with each season. This is true for each sector as well. When the temperature rises, so does water consumption. Interestingly, the maximum mean temperature occurs one month before the peak total water consumption.



Source: City of Forest Grove Utility Billing and National Oceanic and Atmospheric Association

As total precipitation decreases, water consumption increases. This is also true of all sectors. Here is an example from Residential 2011.



Source: City of Forest Grove Utility Billing and National Oceanic and Atmospheric Administration

It is unknown which factor, temperature or precipitation, plays the bigger role. Would water consumption change if we had hot but wet summers and cold but dry winters?

*Comparisons*

The Environmental Protection Agency estimates that the average family of four uses 400 gallons of water a day, or 12,000 gallons per month. U.S. Geological Survey estimates the average person uses 80-100 gallons of water a day 9,600-12,000 gallons per month for a family of four.

This equals 115,200-144,000 gallons per year. Forest Grove's water consumption, in comparison, is much smaller than either estimate.

According to a study conducted by the Water Research Foundation, cities in hot dry climates such as Las Vegas single family homes use 203,483 gallons of water a year, while a city in a wetter climate such as Seattle use 61,593 gallons of water a year. Forest Grove's use is similar to Calgary, Canada (79,525 gallons), Cleveland, Ohio (77,341 gallons), and Philadelphia, Pennsylvania (82,764 gallons).

### *Conservation and efficiency*

With only 1% of the world's water safe and accessible, unpredictable extreme weather, climate change, and water conflicts, water conservation and efficiency are not only important, but it is imperative. This may seem strange to those living in wetter climates such as here in the Pacific Northwest, but national droughts in one region greatly affects the other regions.

The community and City has many options for reducing their water usage. These involve two things- decreasing duration of water flow, and decreasing the flow rate of the water. Saving water also saves money on utility billing. The below examples can be advertised through flyers, on the Forest Grove website, and through announcements on the Utility Billing.

#### Examples for water conservation

- In the bathroom-
  - Decrease shower time
  - Lower the flow rate of the shower head through a restrictor
  - Take less baths
  - Invest in low flow toilets, dual flush toilets, or composting toilets
  - Fix leaks, or put a bucket underneath to save the water
  - Do not leave water running when brushing teeth
- In the laundry room-
  - Use Water Sense/Energy Star Appliances
  - Run full loads
- In the kitchen-
  - Fix leaks, or put a bucket underneath to save the water
  - Low flow faucets
  - Run full dishwasher loads
  - Save water from rinsing fruits and vegetables for watering plants or other uses
- Outside-
  - Water irrigation controls will run sprinklers only when needed
  - Landscape with native plants
  - Collect rainwater to be reused to water plants or for toilet flushing
- Gray water-
  - Reuse bath/shower, kitchen, and shower water for irrigation through a gray water system. Water from toilet flushing may not be reused due to possible contamination.
- Submetering-

- For multifamily homes, submetering may be an option. If renters must pay by consumption rather than a flat rate, they are more likely to use less water. While multifamily homes are metered through the whole building, submetering will hold units more accountable for the water they use.
- Community Effort-
  - The Forest Grove districts can hold competitions to see who can reduce their water consumption. While water conservation is an individual effort, together, many individuals working together can achieve a big impact.

To discover how much you can save by shortening shower times, visit -

<http://www.paystolivegreen.com/2009/01/shower-water-and-energy-use-calculator/>

By cutting down your shower from 10 to 5 minutes, you can save 9 gallons of water a day.

Changing the flow rate of the shower head greatly increases the amount of savings.

To discover how much you'll save through EPA Water Sense approved appliances, visit-

[http://www.epa.gov/watersense/our\\_water/be\\_the\\_change.html#tabs-3](http://www.epa.gov/watersense/our_water/be_the_change.html#tabs-3)

Depending on how old the original appliances are, the savings vary. However, the savings from replacing appliances installed after 1994 or installing new ones can save 4,400 gallons in a year.

To discover how much water a leaky faucet wastes, visit-

<http://ga.water.usgs.gov/edu/sc4.html>

Three faucets leaking one drip per day wastes one liter of water a day.

The Regional Water Providers Consortium coordinates with water suppliers and local governments in the Metro region. Their website offers more information on how to conserve water with instructions on installation and "how-to" videos.

### *Water Quality*

The City of Forest Grove releases an annual Water Quality Report that tests the drinking water. The water sources tested are the Watercrest Road Water Treatment Plant and the Joint Water Commission Water Treatment Plant. These treatment plants receive their water from the Gales Creek watershed and the Barney and Scoggins Reservoirs. The quality of the drinking water in Forest Grove does not violate EPA standards and actually exceeds their standards. However, due to high precipitation in the Pacific Northwest, watersheds are vulnerable to pollutants.

Another problem is urban stormwater runoff. Impervious surfaces do not allow water to percolate through the ground. Instead, that water collects pollutants and bacteria as it creates runoffs that run into local water ways. High volumes of storm water runoff leads to pollution, erosion, and flooding.

Fortunately, there are many ways to help mitigate storm water runoff. Article Eight of the Forest Grove Development code offers a list of "Design and Construction Practices to Minimize Hydrological Impacts." These include the construction of rain gardens, green roofs, or other bioretention cells. If construction occurs in a Natural Resource Area, Article Five has mitigation requirements that must be fulfilled to decrease the environmental impact of the construction.

Bioretention cells act as storage as water trickles down to recharge the groundwater, improve the quality of water as plants can filter out pollutants, offer habitat for the local species, and add aesthetic value.

### *Recommendations*

While the practices listed in Article Eight are sustainable and offer many uses, the practices are merely allowed, and not required. There is no reason for a developer to build a rain garden or green roof other than that he or she believes it is the right thing to do. Incentives should be offered to those who comply with such guidelines.

Incentives should be offered for both new development projects, and for residents wanting to change their landscaping. Building a rain garden or bioswale can be a community effort as neighbors can join resources. Bioswales and rain gardens offer the same function, but bioswales slope down stream while rain gardens are on relatively flat terrain. Furthermore, bioswales have no vegetation at the bottom of a channel whereas rain gardens have vegetation within the entire channel.

The community should also be educated about the importance of stormwater management through green roofs, bioswales, and rain gardens. This can be done through information on Utility Billing, booths at the Farmers Market, notices in the News Times, fliers, and lessons at the schools. Spray painted signs on by drains can educate the public about the dangers of excess storm water run-off.



**Figure 1: Rain Garden**



**Figure 2: Rainwater Barrel**

### *Related City Reports*

The City of Forest Grove has a Water Master Plan, updated August 2010 to manage the water needs and resources of the City. With moderate growth, as the City is predicting, the infrastructure and supplies will last. With rapid growth, other measures may need to take affect to sufficiently supply the City with water.

## *Conclusion*

While water conservation may seem like a distant idea for those living in the Pacific Northwest, it is a reality for every other region in the country. Furthermore, excess run-off that can lead to flooding and polluted water ways. The conservation examples and recommendations above will not only provide environmentally friendly solutions, but also bring neighbors closer together.