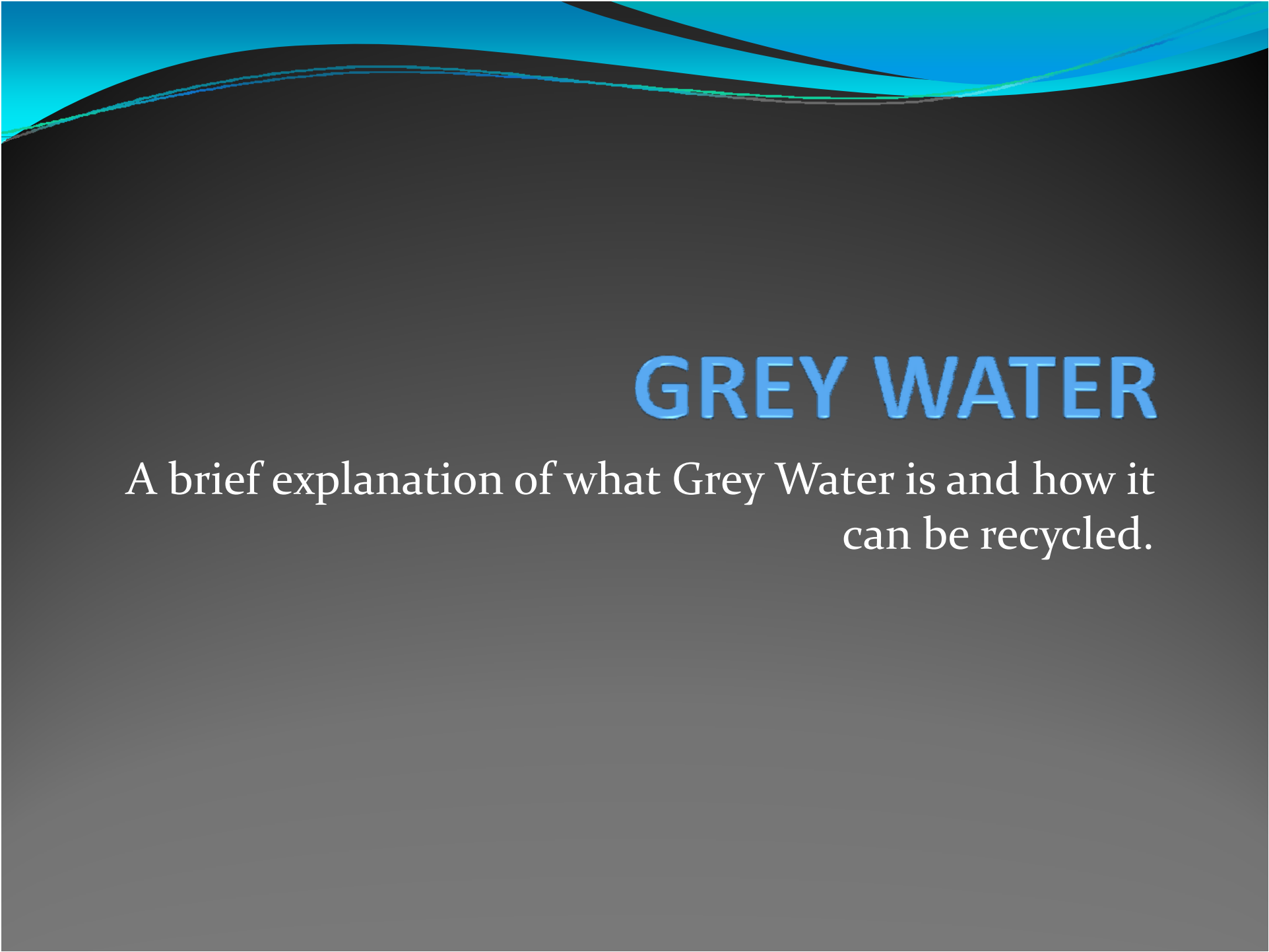
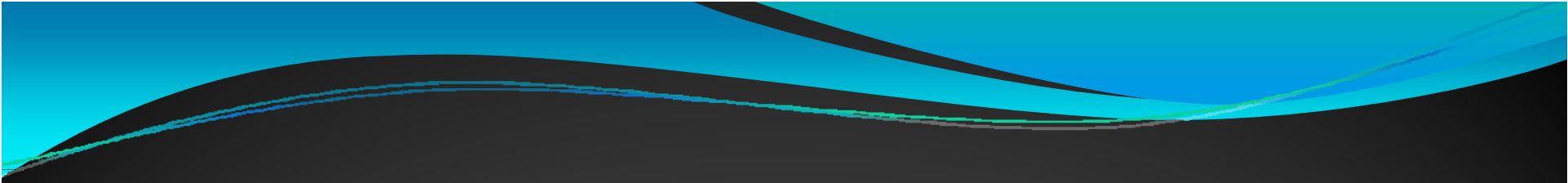




GREY WATER

A brief explanation of what Grey Water is and how it
can be recycled.



Madera County Code

Chapter 13.55 - WATER CONSERVATION

Sections: 13.55.010 - Purpose of regulations

“The board of supervisors of the county of Madera finds that conservation of water is a prudent and desirable goal necessary for the public health and safety. The board further finds that it is timely for the county of Madera to take those steps necessary for the public health and safety. The board further finds that it is timely for the county of Madera to take those steps necessary to ensure an adequate local supply of water, and that a water conservation program will assist in meeting that goal.”

(Ord. No. 667, § 1, 10-8-13; Ord. 532 § 1(part), 1990)

Madera County Code

13.56.010 - Water efficient landscape ordinance intent

It is the intent of the Board of Supervisors in adopting the ordinance codified in this chapter to:

- Establish provisions for water management practices and water waste prevention;
- Establish a structure for planning, designing, installing, maintaining, and managing water efficient landscapes in new and rehabilitated projects;
- To reduce the water demands from landscapes without a decline in landscape quality or quantity;
- To retain flexibility and encourage creativity through appropriate design;
- To assure the attainment of water efficient landscape goals by requiring that landscapes not exceed a maximum water demand of seventy percent of its reference evapotranspiration (ET_o) or any lower percentage as may be required by state legislation, whichever is stricter;
- To eliminate water waste from overspray and/or runoff;
- To achieve water conservation by raising the public awareness of the need to conserve water through education and motivation to embrace an effective water demand management program; and
- To implement the requirements of the California Water Conservation in Landscaping Act 2006 and the California Code of Regulations Title 23, Division 2, Chapter 2.7. (Ord. No. 647, § 1, 1-5-10)

2013 C.P.C Definitions

The California Plumbing Code defines Grey Water as:

Untreated waste water that has not been contaminated by any toilet discharge, has not been affected by infectious, contaminated, or unhealthy bodily wastes, and does not present a threat from contamination by unhealthful processing, manufacturing, or operating wastes. "Grey water" includes, but is not limited to, waste water from bathtubs, showers, bathroom wash basins, clothes washing machines, and laundry tubs, but does not include waste water from kitchen sinks or dishwashers.

WHAT IS GREY WATER?

2013 C.P.C.

The 2010 C.P.C. and the 2013 C.P.C. address the recycling of grey water. Prior to the 2010 C.P.C. grey water was tightly regulated by Building Departments and Health Departments. In the past, grey water was considered a nuisance and a health hazard. Partly due to the improper use of grey water. Allowed to drain on to and stand on the surface of the ground. Attracting insects and bacteria.

During the past few years, due to the shortage of water and interest in saving water, building departments, health agencies, and the public in general have changed their views and studies have shown that grey water does not create a health hazard. If used within a 24 hour period, the grey water is managed and not allowed to stand stagnate, grey water can be a safe and effective method of irrigation and a viable means of recycling.

Grey water comprises 50-80% of residential waste water.

CURRENT BUILDING CODE

Diseases associated with Grey Water

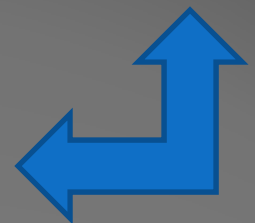
California Greywater Policy Data and Calculations				
Oasis Design © Feb 24, 2009. Check http://oasisdesign.net/greywater/law/california/index.htm#references for updates to this spreadsheet. May be reproduced if credit and notice of reproduction are given.				
Datum	What	Date	Source	URL, comment
Greywater system exposure in California				
36,553,215	Population of California	2007	US census bureau	http://quickfacts.census.gov/qfd/states/06000.html
13.9%	Households with greywater systems	1999	Soap and Detergent Manufacturer's Association Graywater	p. 14 http://www.sdscience.org/docs/Graywater_Habits_&
5,080,897	Greywater users	2009	Calculation; population * percent greywater users	extrapolation from 1999
2.87	People per household	2000	US census bureau	http://quickfacts.census.gov/qfd/states/06000.html
1,770,347	Greywater systems	2009	Calculation; greywater users / people per household	(this assumes the proportion of greywater use has not changed since 1999)
System user years-CA				
5,080,897	Greywater users	2009	Note: This is a back of the envelope-type calculation; the point is still valid if it is off by a factor of two or four	
10.0%	Households with greywater systems	1950	Estimate; in general, older infrastructure has more greywater use, approaching 100% with rural 70+ year old buildings	
10,586,223	Population of California	1950	US Census Bureau	www.census.gov/dmd/www/resapport/states/california.pdf
1,058,622	Greywater users	1950	Calculation; population * percent greywater users	
3,069,760	Average number of greywater users	1949-2009	average of 2009 and 1950 greywater users	
60	Years from 1949-2009		calculation	
184,185,576	System-user-years of greywater exposure, not counting neighbors		calculation; average greywater users * years	
Greywater system exposure in United States				
303,824,640	Population of US	2008	CIA estimate	https://www.cia.gov/library/publications/the-world-factbook/p
7.0%	Households with greywater systems	1999	Soap and Detergent Manufacturer's Association Graywater	http://www.sdscience.org/index.php?option=com_content&
21,267,725	Greywater users	2009	Calculation; population * percent greywater users	extrapolation from 1999
2.59	People per household	2000	US census bureau	http://quickfacts.census.gov/qfd/states/06000.html
8,211,477	Greywater systems	2009	Calculation; greywater users / people per household	extrapolation from 1999
System user years-US				
21,267,725	Greywater users	2009	Note: This is a back of the envelope-type calculation; the point is still valid if it is off by a factor of two or four	
10.0%	Households with greywater systems	1950	Estimate; in general, older infrastructure has more greywater use, approaching 100% with rural 70+ year old buildings	
152,271,417	Population of US	1950	NPG historical data	http://www.npg.org/facts/us_historical_pops.htm
15,227,142	Historic greywater users	1950	Calculation; population * percent greywater users	
18,247,433	Average number of greywater users	1949-2009	average of 2009 and 1950 greywater users	
60	Years from 1949-2009		calculation	
1,094,845,995	System-user-years of greywater exposure, not counting neighbors		calculation; average greywater users * years	
Reports of greywater-transmitted illness in US				
0	Reports of greywater transmitted illness		18 years of greywater policy discussion, Letter from CDC	
400	People struck by lightning in the US, per year	2008	NOAA lightning safety	http://www.lightningsafety.noaa.gov/medical.htm
344	People drowned in bathtubs	2005	National safety council	http://www.nsc.org/research/odds.aspx
Greywater system permit compliance rate in California				
1,770,347	Greywater systems	2009	from above, extrapolation from 1999	(this assumes the proportion of greywater use has not changed since 1999)
200	Permitted greywater systems	1992-2009	ReWater Systems, 70±, Bill Wilson + Kevin 20±, Ted Adams, 5± Art Ludwig, 2±...rest are a guess. I'd say lower bound is	
8,852	Ratio of unpermitted to permitted systems		calculation	
0.011%	Percent of permitted systems		calculation	
Reportable GW Diseases, Potential & Reported				
Disease	Total Cases in 2007	Est. 60 Years Cumulative Cases	Cases Linked to Graywater	
Cholera	7	288		0
Cryptosporidiosis	11,170	502,650		0
E. coli, Shiga toxin-producing (STEC)	4,847	218,115		0
Giardiasis	19,417	873,765		0
Hepatitis A	2,979	134,055		0
Legionellosis	2,716	122,220		0
Salmonellosis	47,995	2,159,775		0
Shigellosis	19,758	889,110		0
Vibriosis (non-cholera Vibrio species infections) §	447	20,115		0
Totals	123,713	4,920,093		0

Diseases associated with Grey Water

California Greywater Policy Data and Calculations

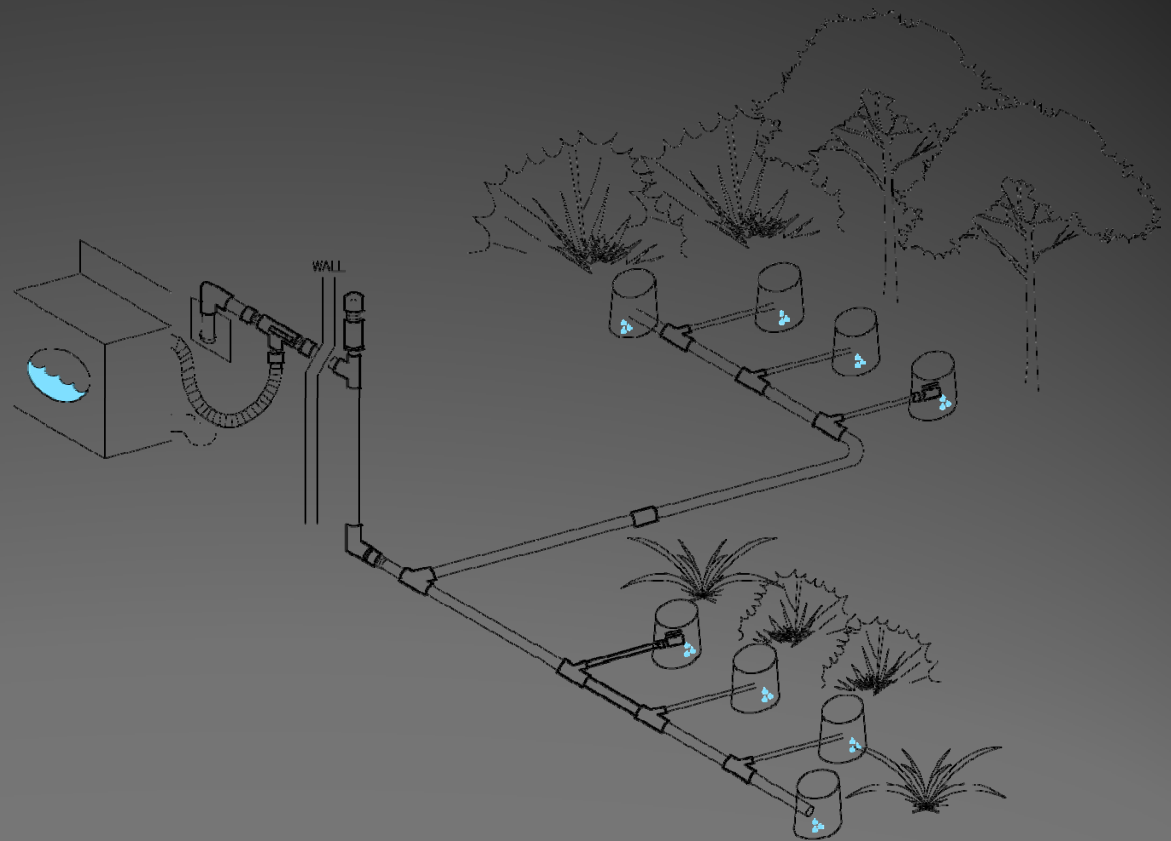
Reportable GW Diseases, Potential & Reported		Total Cases		
	Disease	in 2007	Est. 60 Years Cumulative Cases	Cases Linked to Graywater
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Why Use Grey Water?

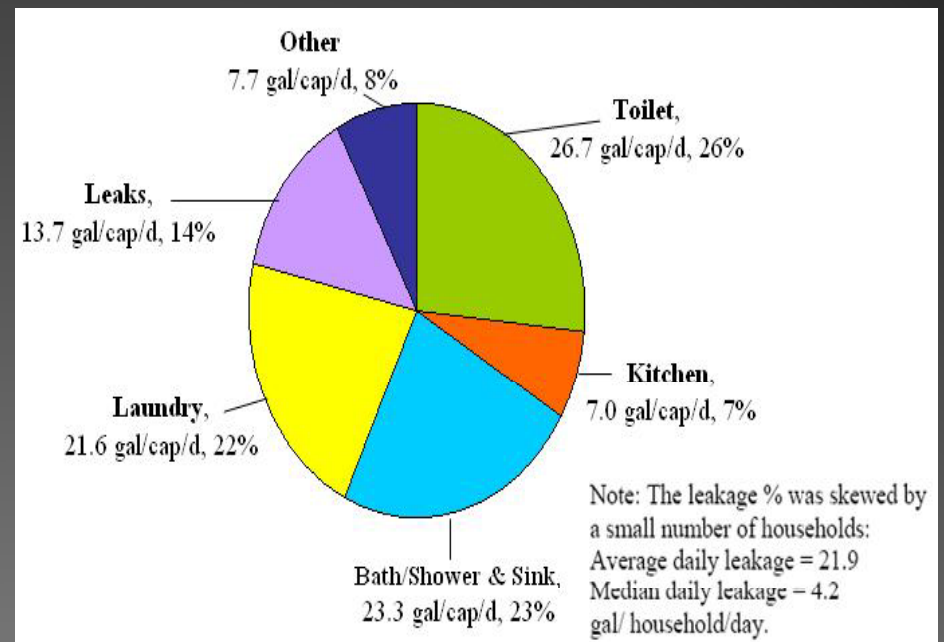
- 1) Plants thrive on used water with bits of compost.
- 2) Reduced fresh water use.
- 3) Less strain on private septic systems and municipal treatment plants.
- 4) Better treatment of waste water. Soil is more effective at filtering.
- 5) Less energy is used and fewer chemicals used to treat waste water.
- 6) Ground water recharge.
- 7) Plant growth.
- 8) Reclamation of otherwise wasted nutrients.
- 9) Increased awareness of and sensitivity to natural cycles.



Average Indoor Residential H2O Use

At first glance it appears that the largest water use comes from a household toilet, at 26% of our daily water consumption. (Based on research by the American Water Works Association). If we look closer we begin to realize that over half our water use (53%) is actually Grey Water. This is water that can be recycled and used to help maintain landscaping. Our Kitchen use makes up for only 7% of our water use. If we combine the water we use from our Kitchen and our toilet, at 33%, we can still see that the largest portion of water consumed in a household can be recycled.

On a side note, at 14% of use, please repair your leaky faucets!



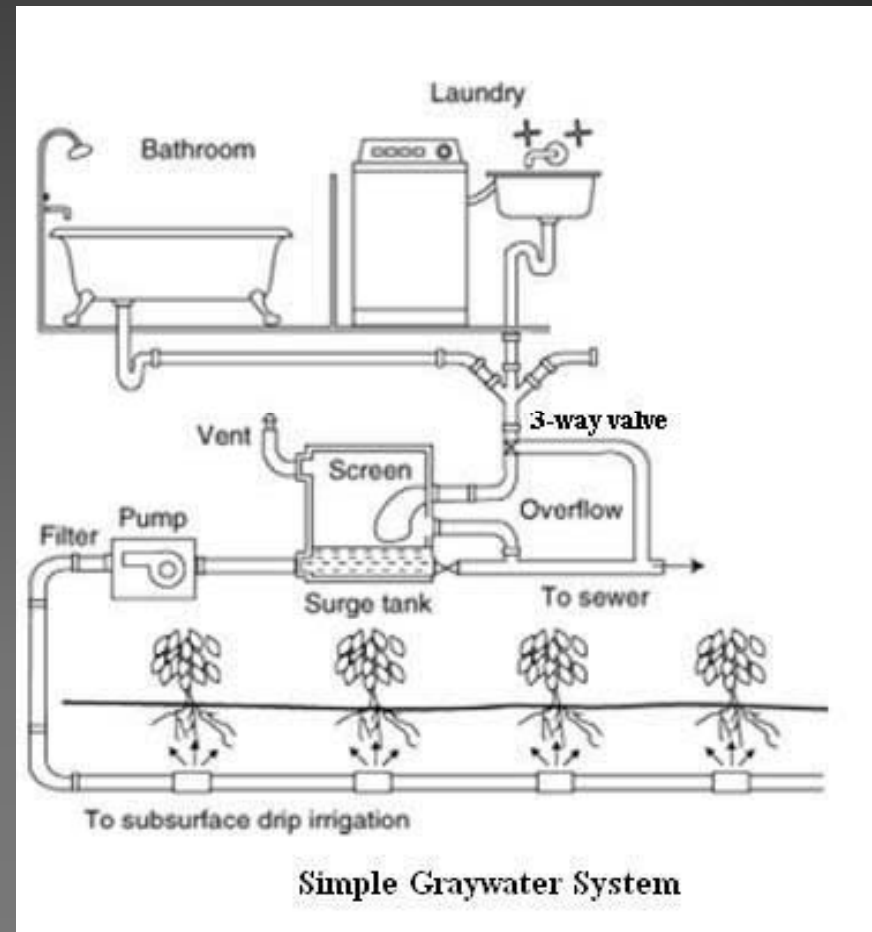
Types of Grey Water Systems

There are two basic types of Grey Water Systems

1. The first would be a simple gravity flow system. This system would require no pumps and no electricity. The grey water would flow into a tank and from the tank into your irrigation system or grey water leach field.

The gravity system would require the tank to be below the house and above the area you plan to irrigate.

2. The second system uses a pump to pressurize the system and push the grey water to your desired irrigation area. This requires the use of electricity, a pump, switches, etc. This system could pump the grey water uphill to any location desired.



Building Permits

The simple gravity system, generally, would not require a Building Permit. It would be a simple system not requiring electrical connections, pumps, and switches. As long as the plumbing does not interfere with existing framing, electrical or mechanical systems.

The second system using a pump to pressurize the system WILL require a Building Permit. This system involves electrical connections, pumps, switches and possibly complicated plumbing. Due to the risk to the Health and Safety of the home owner, the Building Department needs to verify the electrical connections, switches and all associated plumbing. **A PERMIT IS REQUIRED!**



u16172462 fotosearch.com

Planning a New Grey Water System

1. Calculate the number of occupants of your home as follows:

First Bedroom	2 occupants
Each Additional Bedroom	1 occupant

2. Estimated daily Grey Water flows for each occupant:

Showers, bathtubs, and wash basins	25 G./Day/Occupant
Clothes washer	15G/Day/Occupant

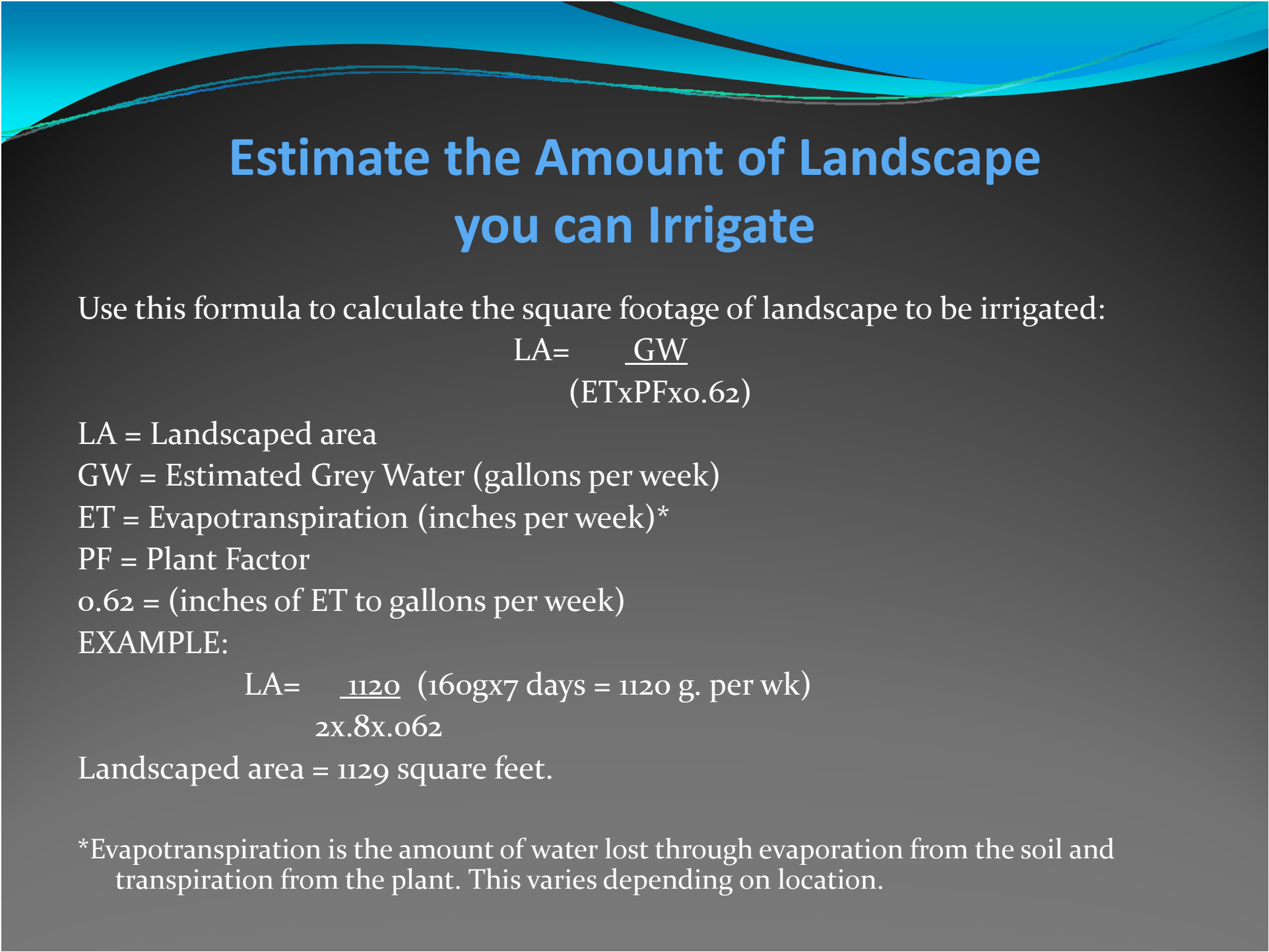
3. Multiply the number of occupants by the estimated grey water flow.

A family of 4 occupants would calculate to this:

$4 \times 25 \text{ G/Day} = 100 \text{ Gallons}$

$4 \times 15 \text{ G/Day} = \underline{+60 \text{ Gallons}}$

160 Gallons of Grey Water Per Day



Estimate the Amount of Landscape you can Irrigate

Use this formula to calculate the square footage of landscape to be irrigated:

$$LA = \frac{GW}{(ET \times PF \times 0.62)}$$

LA = Landscaped area

GW = Estimated Grey Water (gallons per week)

ET = Evapotranspiration (inches per week)*

PF = Plant Factor

0.62 = (inches of ET to gallons per week)

EXAMPLE:

$$LA = \frac{1120}{2 \times 8 \times 0.62} \quad (160 \text{ g} \times 7 \text{ days} = 1120 \text{ g. per wk})$$

Landscaped area = 1129 square feet.

*Evapotranspiration is the amount of water lost through evaporation from the soil and transpiration from the plant. This varies depending on location.

Which plants should I water with Grey Water?

Plants that are not suitable for irrigation with greywater

Azaleas	Ferns	Magnolias
Begonias	Foxgloves	Oxalis (Wood Sorrel)
Bleeding Hearts	Gardenias	Primroses
Crape Myrtle	Holly	Redwoods
Deodar Celular	Hydrangeas	Rhododendrons
Dogwood	Impatiens	Violets

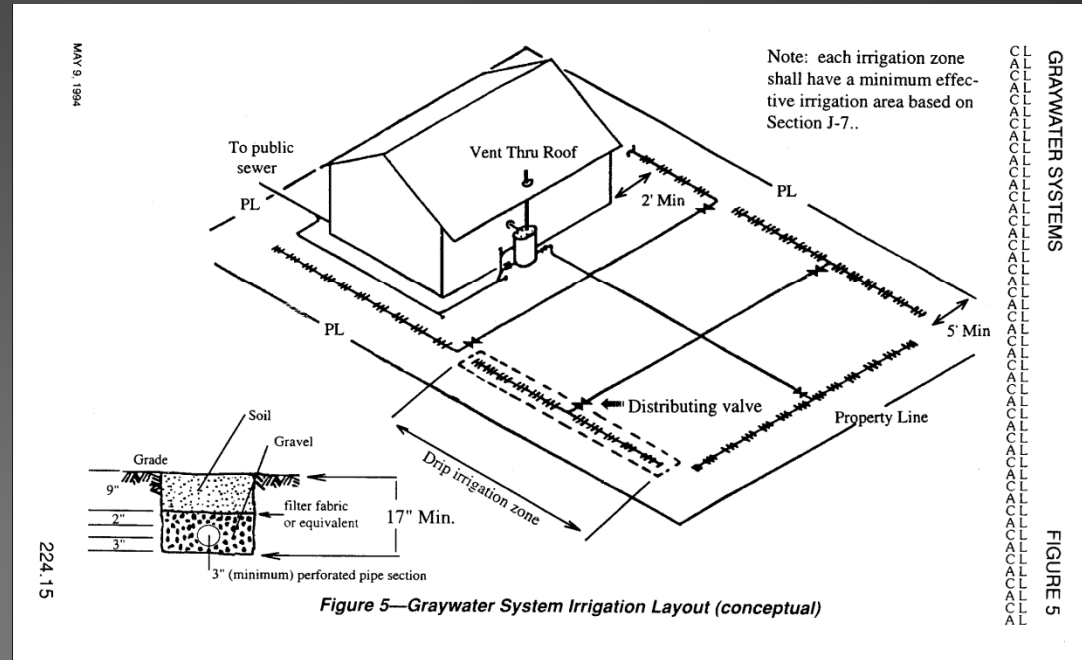
Plants that might tolerate greywater irrigation (except greywater from kitchens with dishwashers)

Bearded Iris	Junipers	Rosemary
Burning Bush	Oaks	Roses
Cottonwood	Pine, Austrian	Russian Olive
(Many Native) Desert Plants	Pine, Italian Stone	Sage, Big Basin
Fringed Sage	Pine, Mugo	Sedum
Honeysuckle	Rabbit Brush	Sumac (staghorn)

Approved Method of Distribution (1)

There are two methods of Grey Water distribution. Both require subsurface distribution to prevent ponding. When ponding occurs bacteria can grow which attracts insects and makes the water unsafe.

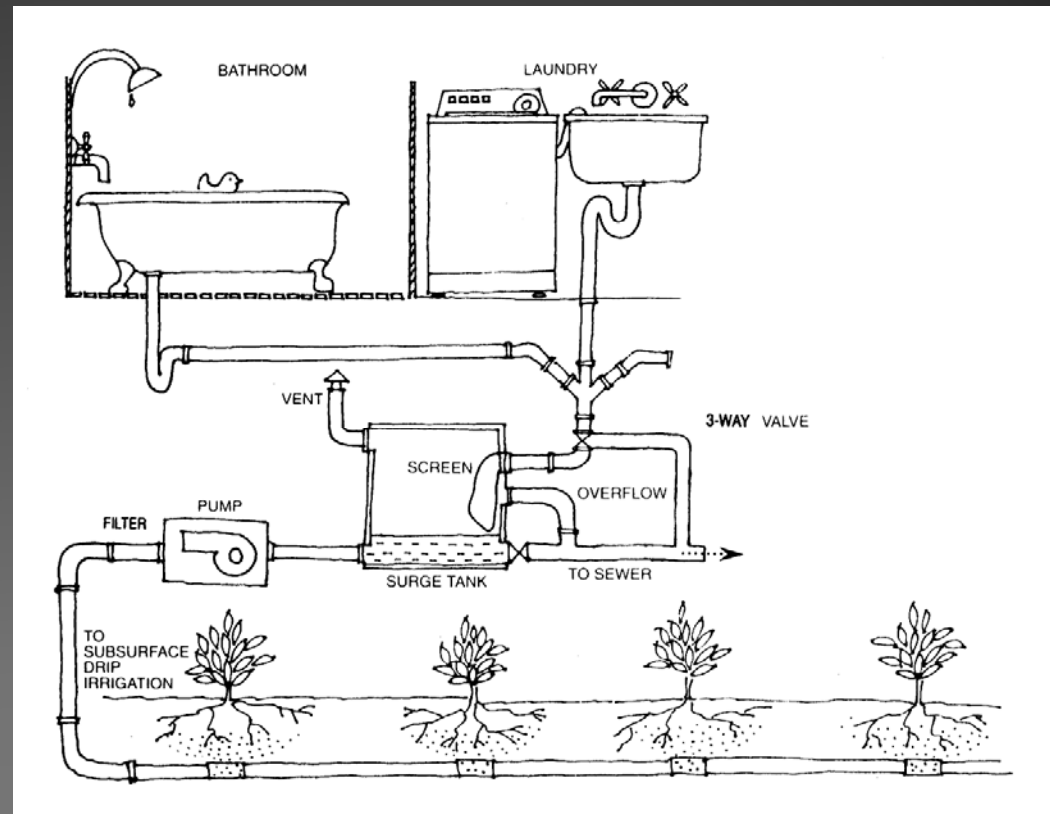
1. The first method is a subsurface “Leach Field”. This is where Grey Water is distributed into a rock filled trench of sufficient length to absorb the water. The trench is covered with landscape cloth, top soil and then mulch



Approved Method of Distribution (2)

2. The second method of distribution is through a drip line or individual emitters and specific plants.

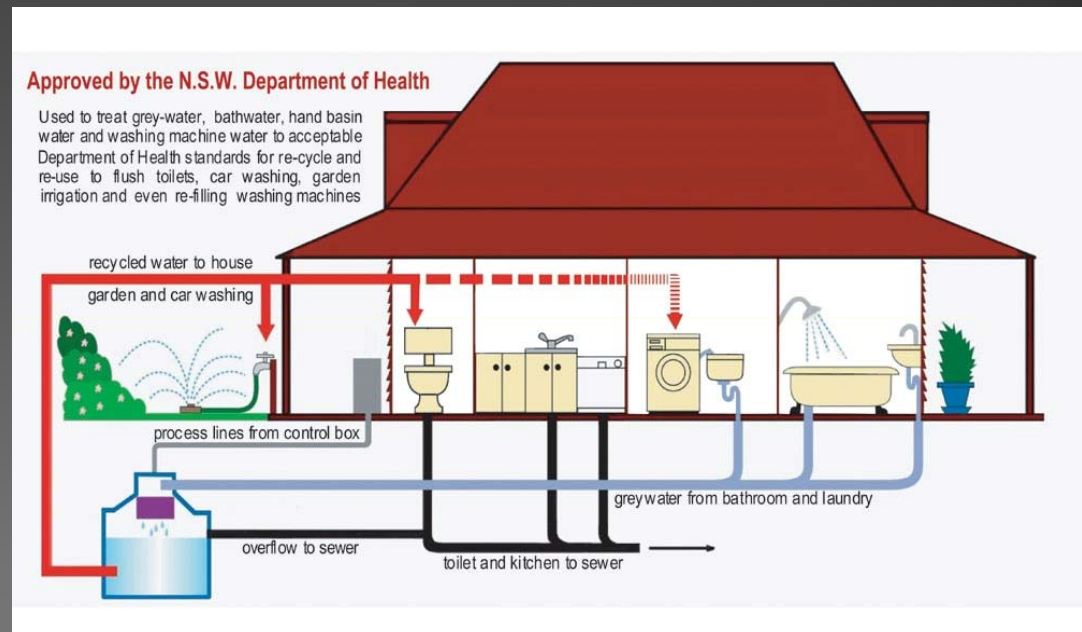
The drip line or the emitters are installed subsurface. Drip irrigation is directed to individual plants. The drip lines are buried under at least 2" of mulch to prevent ponding.



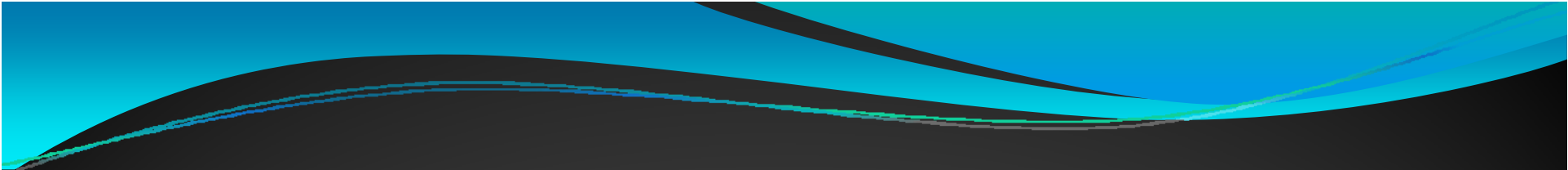
Another Possibility

As a third, more complicated possibility, Grey water can be stored in a tank and recycled to flush toilets, wash cars or used to wash clothes.

When stored in a tank, the Grey Water should be chlorinated to prevent bacteria growth. This is usually done through an automatic chlorinating system. The tank requires a tight fitting lid with a gasket and all associated piping and valves should be marked as Grey Water and labeled as unsafe to drink.



This type of Grey Water system **requires a Building Permit** and more management to keep the system running in good order.



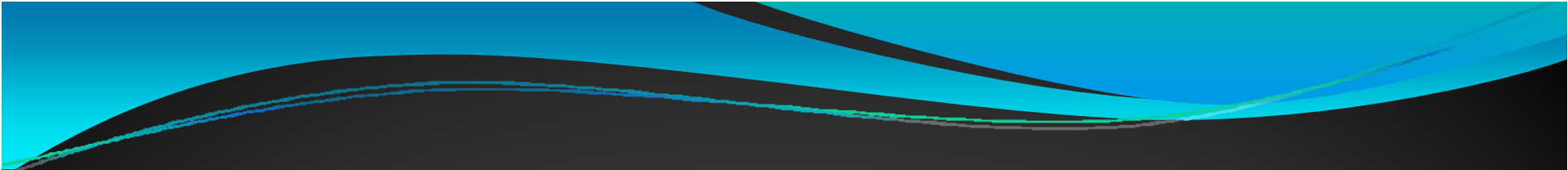
Frequently Asked Questions

Can Grey Water be stored for future use?

- **Do not store Grey Water!** Fresh water and rain water can be stored for future use, but Grey Water should be used within 24 hours after it is produced. Grey Water contains nutrients from soaps and dirt. As the nutrients start to decompose, the oxygen in the water is used up and the water begins to smell. It is possible to treat Grey Water, but, this is impractical because fresh Grey Water is produced daily.

Can I use the water from my Dishwasher?

- Water from dishwashers is high in salt and therefore harmful to most plants. Dishwater also contains oils and grease from animal fats. In California, dishwasher water is considered “black water” and cannot be used in a grey water system.



Frequently Asked Questions

Can I use Grey Water if I have a Water Softener?

- Most water softeners use salts to bind the metals in the water and make the water “soft”. Due to the high salt content of the water, it is not suitable as grey water as it is harmful to plants. An alternative to sodium water softeners are potassium softeners.

Do I need to use traps & vents in grey water plumbing?

- Whenever possible , grey water should be **diverted downstream** of the P-Trap and vent. In some instances it is more convenient to install the diverter valve before the P-Trap. It is safe to do so, as the valve will prevent sewer gases from entering the house.

Frequently Asked Questions

Is Grey Water safe for the environment?

- There are two main rules to follow to protect the environment
 1. Use biodegradable products that are salt and boron free. Salt and Boron are harmful to plants and the soil. **Send nothing toxic down the drain!**
 2. Do not allow grey water to contaminate a fresh water source like, a stream, creek, river or a high ground water table.

What soaps/products can I use with a Grey Water System?

- All products should be non toxic and biodegradable. They should be free of salt and borax. Chlorine bleach should be avoided. Hydrogen peroxide bleaches are less harmful and can be used instead of chlorine. Another consideration is the pH of the water. Many soaps do not change the pH of water, some do. Generally liquid soap does not change the pH, while bar soaps make the water very basic.

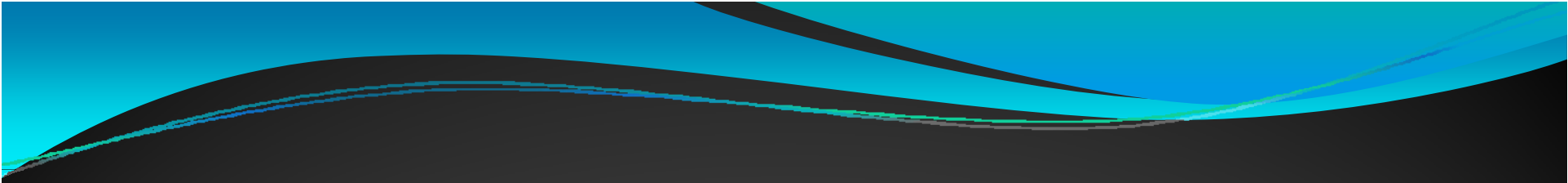
Frequently Asked Questions

How much does a Grey Water System cost?

- Cost varies depending on how complex or simple the plumbing will be. On how large your yard or garden will be. For a simple system much of the work will be digging shallow trenches to bury pipe and creating mulch basins.
- Material cost depending on size and complexity \$100.00 - \$600.00
- Full installation \$700.00 - \$4,000.00
- Automated pumped system for drip irrigation \$5,000.00 - \$20,000.00

Should I use Filters?

- The most effective filter is biologically active soil covered in mulch. In a simple system, filters usually cause more problems than benefits. Filters need regular maintenance and **filters must be changed or the system will fail.** Filters will remove large particles, but not salt or dissolved chemicals.
- Design your system so that large particles won't clog the system. Large particles will get caught in the mulch bed and compost.



Frequently Asked Questions

What if I'm on a septic system?

- Grey water, especially from a washing machine, is often kept out of the septic system to extend its life. Diverting water from a failing septic system can be helpful and is a common practice in rural areas.

Can I install a Grey Water System if I have a concrete slab?

- If your house is on a concrete slab you still have some Grey Water options.
- You can use the water from your washing machine as it is easily accessible without altering your existing plumbing.
- Elevate your bath tub and send the drain to the outside.
- Use the Grey Water from the second floor if you have a two story home.

Recycling Grey Water

Recycling Grey Water will not solve all your landscaping watering requirements. Based on the previous calculation, a family of 4 using 160 gallons per day, can irrigate 1129 square feet of landscaping. By irrigating individual plants or specific flower beds they will be able to maintain a pleasant landscape for outdoor use. Maintaining your Grey Water System will be important to prevent back-ups, ponding and to keep the water flowing. Used in conjunction with Rainwater Harvesting and water conservation we can reduce our potable water consumption during this time of drought and onward!



Overview & Questions

- Calculate and estimate your water use/needs and design an approved grey water method
- Contact the County and determine if and what permits are needed
- Purchase needed equipment and install
- Continue to use grey water on approved items and disperse appropriately



Building Dept. 675-7821
Environmental Health 675-7823