

Greywater System Design Process - General Information

Although each greywater system will follow the same guidelines, each situation will be unique. Choosing a greywater system is mainly shaped by your goals (why do you want to use greywater?), your plumbing (where can you access the greywater?), and your yard/landscape. Once you are clear on your goals, the logistics of your particular house and yard, and your budget, the best system will be clear.

Planning Questions:

Answer the following questions to help decide what kind of system you should install.

1. What are your goals for your greywater system? Are you trying to maximize greywater reuse or ecologically dispose of water?
2. Where are your pipes located? Can you access them to reroute the greywater?
3. How is your yard sloped? Is the area to be irrigated downhill from the pipes?
4. How much greywater are you producing and how much irrigation need do you have?
5. How does the soil drain? Does it drain quickly? Slowly? In between? (There are instructions for how to do a simple percolation test on page 12 of Create an Oasis with Greywater).
6. Do you need or want a permit?

Filters

Filters are used to prevent clogging. Filters take out particles. If you design your system so you don't have small openings you won't have clogging problems and won't need filters.

The best functioning low tech systems don't have any filter other than MULCH.

Wetlands also filter water, removing nutrients and evapo-transpiring water. The larger the wetland the less greywater comes out.

Soaps and Products

- NO Boron/Borax (it is a plant microtoxin)
- NO Salts (sodium anything). Over time salt will degrade the soil structure.
- To prevent salt buildup avoid salt, flush with rain or fresh water.
- Use non-toxic cleaning products.

Greywater Friendly Products:

Washing machine: Oasis, Ecos, Biopac Liquid Detergent

Sinks: Oasis, Dr. Bronners

Showers: Aubrey Organics, some of Burt's Bees products, Dr. Bronners

Look up any products on www.cosmeticdatabase.org

Percolation Test:

Find out how water drains in your soil. Use simple method found in Create an Oasis with Greywater (worksheet attached).

Infiltration of Greywater:

- Mulch basins!
- Straw mulch for veggies.

Plants and Greywater

Plants that don't like greywater:

- Drought dependant plants (e.g. oak trees)
- Acid loving (ferns, blueberries, etc.)

Greywater is best for:

- Trees (fruit)
- Bushes (fruiting hedges)
- Large annuals or perennials

For food crops:

- Don't put greywater onto the edible portion of the plant.
- Always mulch the soil.
- No root crops.
- Lettuce is not good.
- Yes for berries, fruit trees, large veggies like tomatoes, corn, beans, etc.

Resources

- Information adapted from Greywater Recycling Workshop hosted by Grey Water Action. More information can be found at www.greywateraction.org (home-owner trainings, installer's training, list of installers)
- San Francisco Graywater Design Guidelines for Outdoor Irrigation (downloadable manual- sfwater.org/graywater)
- Create an Oasis with Greywater by Art Ludwig (book) www.oasisdesign.net
- Ask This Old House episode "Graywater, Small Engines"
- Kit for L2L www.gray-2-green.com

Permitting

According to State Plumbing Code Chapter 16A "Laundry to Landscape" systems do not require a permit. Systems that alter a structures plumbing do usually require a permit.

Permitting starting point:

Jurisdiction	Contact Department	Phone Number
County of Sacramento	Water Resources	(916)874-6851
City of Sacramento	Building Department	(916)808-8860
Placer County	Environmental Health	(530)745-2364
El Dorado County	Environmental Health	(530)621-5300

How To: Percolation Test

In a well-functioning greywater system, greywater soaks into the ground without pooling or running off. In general, clayey soils drain very slowly, while sandy or gravelly soils drain quickly. A home percolation test is a simple way to measure how quickly your soil drains and to determine how much area you need to infiltrate the greywater. Professional percolation tests, required for septic leach fields, are expensive, and unnecessary for a small greywater system. Many greywater codes use a soil type chart to predict drainage rates instead of percolation rate data.

Greywater percolation tests should be conducted at the depth of discharge, ideally less than one foot. To compare the home percolation test with (deeper) professional percolation tests, see the reference documents.

Step by Step:

Step 1. Dig a 6"-12" deep hole in your future greywater infiltration zone.

Step 2. Place a ruler (or stick marked in inches) in the bottom of the hole. The measuring device should reach the top of the hole.

Step 3. Fill the hole with water several times to saturate the soil. This may take several hours or overnight in clayey soils.

Step 4. Note the time. Fill the hole with water. When the hole is empty, note the time and calculate the time needed to drain the hole.

Step 5. Convert this rate to minutes per inch (divide the minutes by inches- 120min/5 inches is 24min/in)

Step 6. Find your percolation rate on the chart below.

Soil Percolation Chart

Infiltration Rate(min/inch)	Area Needed (sq.ft/gal/day)	<i>Example: After filling the hole four times, the water level dropped 6 inches in 75 minutes. 75 divided by 6 is about 13 minutes/ inch.</i>	<i>Example: Now we multiply our greywater flow (14 gallons per day) by the area needed (0.4). 14 X 0.4= 5.6, so we need about 6 square feet of ground to absorb our daily greywater flow.</i>
0-30	0.4	<i>13 min/inch is between 0 and 30, so we use this line.</i>	<i>We need 6 sq. feet for 14 gallons/day</i>
40-45	0.7		
46-60	1		<i>If we were in this line we'd need 1.0 X 14 or 14 sq. feet.</i>
61-120	2		

Using information from Chapter 16 in the California Plumbing Code: The California greywater code requires you to calculate infiltration area based on soil type rather than percolation rate. We think it's more accurate to do a percolation test than to rely on soil type, but both give you important information. Regardless, if you used their chart and assumed you had very **clayey soil**, you'd need 1.1 square foot per gallon of greywater per day.

Type of soil	Sq. ft/ 100 gal/day	Gallons Max. absorption/sq. ft/ 24 hrs
Coarse sand or gravel	20	5.0
Fine sand	25	4.0
Sandy loam	40	2.5
Sandy clay	60	1.7
Clay with considerable sand or gravel	90	1.1
Clay with small amount of sand or gravel	120	0.8

So if you produced 14 gallons per day, you'd need 15.4 (round up to 16) square feet of infiltration area. If you have 4 trees, then you'll need an area of 16/4, or 4 square foot per tree. Most mulch basins have around 12 sq. feet of disposal area, so there's plenty of room.