

Greywater for Trees and Landscape

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This chapter introduces some practical ways to use water from homes (from dishes, laundry, bathing, etc., NOT from toilets) as irrigation water for trees and landscapes. Rather than contaminate usable water by combining it with sewage, greywater systems keep dish and wash water separate from sewage and reuse it in the landscape. This is a classic means of “turning waste into a resource.” For specific design and installation details for greywater systems, further study is highly recommended.

What Is Greywater?

Any water that has been used in the home, except water from toilets, is called greywater. Dish, shower, sink and laundry water comprise approximately 80% of residential “wastewater.” This may be reused for other purposes, especially landscape irrigation. Toilet-flush water is called blackwater. Contaminated greywater or wastewater that is difficult to handle, such as solids-laden kitchen sink water or water used to launder diapers, is sometimes called “dark grey” or blackwater. Reclaimed water (highly treated municipal greywater and blackwater, usually piped to large-volume users such as golf courses in a separate distribution system) is outside the scope of this article.

Why Use Greywater?

It’s a waste to irrigate with great quantities of drinking water when plants would thrive on used water containing small bits of organic matter. Unlike a lot of ecological stopgap measures, greywater use is a part of the fundamental solution to many ecological problems and will probably remain essentially unchanged in the distant future. The benefits of greywater recycling include:

Lower fresh water use

Greywater can replace fresh water in many instances, saving money and increasing the effective water supply in regions where irrigation is needed. Residential water use is almost evenly split between indoor and outdoor. All except toilet water could be recycled

outdoors, achieving the same result with significantly less water diverted from nature.

Less strain on septic tank or treatment plant

Greywater use greatly extends the useful life and capacity of septic systems. For municipal treatment systems, decreased water flow generally means higher treatment effectiveness and lower costs.

Highly effective purification

Greywater is purified to a spectacularly high degree in the upper, most biologically active region of the soil (Center for Study of Federalism 1972). This protects the quality of natural surface and ground waters.

Site unsuitable for a septic tank

For sites with slow soil percolation or other problems, greywater use may be a good alternative to a very costly, over-engineered system.

Less energy and chemical use

Less energy and chemicals are used due to the reduced amount of both freshwater and wastewater that needs pumping and treatment. For those providing their own water or electricity, the advantage of a reduced burden on the infrastructure is felt directly. Also, treating your wastewater in the soil under your own fruit trees definitely encourages you to dump less toxic chemicals down in the drain.

Groundwater recharge

Greywater application in excess of plant needs recharges groundwater.

Plant growth

Greywater enables a landscape to flourish where water may not otherwise be available to support much plant growth.

Reclamation of otherwise wasted nutrients

Loss of nutrients through wastewater disposal in rivers or oceans is a subtle, but highly significant, form of erosion. Reclaiming nutrients in greywater helps to maintain the fertility of the land.

Increased awareness of and sensitivity to natural cycles

Greywater use yields the satisfaction of taking responsibility for the wise husbandry of an important resource.

Just because

Greywater is relatively harmless and great fun to experiment with. Moreover, life with alternative waste treatment can be less expensive and more interesting.

Mulch Basins

If I had just two words to contribute to improve the world's handling of greywater they would be "mulch basin." Mulch covers the greywater and provides many other benefits.

The basin contains the water where it is needed and prevents it from escaping where it is wasted or a nuisance. The island in the middle of the mulch basin protects the delicate root crown from wet conditions and possible disease.

Mulch basins are a common feature of existing horticultural practice and could hardly be simpler to make and maintain. Don't let this fool you. Though nature takes care of their inner workings, these are fantastically complex biologically, far more complex than a municipal sewage treatment plant.

What's more, the treatment level mulch basins provide is far higher than that of a municipal treatment plant (Los Angeles Department of Water Reclamation) and instead of consuming copious electricity and chemicals to create polluted natural waters and piles of toxic sludge (Wagner and Laniox 1958) mulch basins run on sunlight and yield drinkable groundwater and fresh fruit.

Selecting Plants for Greywater Treatment/Disposal

For disposal, theoretically you don't even need plants; the bacteria on the soil particles will take care of treatment by themselves (as in a sand filter). However, you can only do better with plants. With high perk soil groundwater contamination could occur if wastewater moves through too fast. With very low perk soil ponding and anaerobic conditions can occur. Plants improve physical soil conditions including perk rate, and add their own substantial contribution to getting

rid of the water by transpiring it. The ideal plants for greywater disposal are:

- Tolerant of wet conditions
- Generate their own mulch or physical barrier (keeps greywater from being seen and kids or dogs from playing in it), so you don't have to
- Keep their leaves all year (so they transpire water all year)
- Look beautiful, make fruit or some other useful thing

Wetland plants also serve as solar-powered oxygen pumps. They literally pump oxygen down through their roots, maintaining aerobic conditions in mucky soil. These should be ideally suited for a heavily loaded disposal basin for this reason. Also, many form such a dense stand that the need for adding mulch is obviated; the plants themselves preclude access to the water (if there is even the tiniest area of standing water for more than a week or two, mosquitoes will hatch from it).

Selecting Plants for Greywater Reuse

Trees are the best thing to irrigate with the branched drain system. Water delivered anywhere in the root zone will benefit the whole plant. It is a heck of a lot easier to hit a few big root zones than numerous small ones. Anything smaller than a big shrub is just too small for most greywater systems, which supply only a dozen or so outlets (as compared to hundreds in a drip irrigation system). Even if it were possible to supply more outlets, an inch and a half (4 cm) pipe to every flower would be a lot of plastic.

If your fruit trees are already planted, that's what you'll be watering.. If you have evergreen fruit trees, they are the priority. If your trees are not planted, then you have the opportunity to optimize the coordination between the greywater system and layout of the edible landscaping (Office of Aridland Studies).

Examples of Plants for Greywater Reuse

Bananas—Premier plant for greywater in warm climates. Make sure there is enough basin area and plants so there is no standing water; they are not wetland plants. Clumps will expand until they are using all available water. If they look like they need more water, chop a few down and the rest will do

better. For maximum fruit production, each clump should have a mature, medium and small stalk.

Citrus

Avocado and Mango—Grow into enormous trees. Make sure you have an idea of how to water it when it is forty feet tall!

Pineapple guava—Can be maintained as a four foot hedgerow, or shaped into a twenty foot specimen tree

Fig—No paradise is complete without figs. While deciduous, there is a shorter interval between dropping leaves and growing new ones than for most deciduous fruit trees.

Apple

Plum

Peach

When Not to Use Greywater

There are a number of possible reasons not to use greywater or to use it only during certain times of year:

Insufficient space

In some situations, neighbors are too close, the yard too small or nonexistent.

Drain pipes impossible to get to

If all plumbing is entombed in a concrete slab, accessing most of the greywater won't be economical.

Unsuitable climate

In very wet climates, where using greywater for irrigation is of little benefit, better ways to dispose of it may be available. In very cold climates, freezing may prevent the use of a greywater system for part of the year.

Insufficient combined waste flow

If all greywater is reused all the time, the flow through municipal sewers may occasionally be insufficient to move toilet solids through.

Unsuitable soil

Soil that is extremely permeable or impermeable may preclude the use of a greywater system or at least require special adaptations.

Legality concerns

In most parts of the country, the legality of greywater systems is a “grey” area. However, there seems to be a general movement toward a less paranoid and more realistic official attitude regarding greywater recycling, concurrent with increased experience and improved systems (not to mention more prevalent water shortages and pollution problems) (California Plumbing Code). Authorities generally turn a blind eye toward greywater use even where illegal. In the 1970s, the state of California published a pamphlet that explained the illegality of greywater use and, at the same time, how to do it, and get a tax credit for it!

Health concerns

The main reason greywater remains illegal in many areas is concern for public health. However, in practice, the health threat from greywater has proven to be insignificant. I know of no instance in which a person in the U.S. became ill from greywater. The first actual field test by the Department of Water Reclamation in Los Angeles found that greywatered soil teemed with pathogens. However, the control soil did, as well. Their conclusion: don't eat dirt, with or without greywater! (Los Angeles Department of Water Reclamation)

Poor cost/benefit ratio

In some situations, especially when legal requirements mandate a complex system for a small flow of water, the ecological cost of the system may outweigh the benefits.

Inconvenience

So far, most greywater systems are either more expensive or require considerably more user involvement than well functioning septic or sewer systems.

Health Considerations Concerning Greywater Use

Greywater may contain infectious organisms, so keep this in mind when designing and using a system. In practice, the health risk of greywater use has proven to be minimal. It is, after all, the water you just bathed in, or residue from clothes you wore not long ago. At the same time, it's definitely poor form to construct pathways for infecting people into your design, and

totally unnecessary. All greywater safety guidelines stem from these two principles:

- 1 Greywater must pass slowly through healthy topsoil for natural purification to occur.
- 2 Design your greywater system so no contact takes place before purification.

Here are examples of applying these principles to correct possible problems:

- Direct contact or consumption. SOLUTION: Carefully avoid cross connections and label greywater plumbing, including greywater garden hoses. Use gloves when cleaning greywater filters.
- Breathing of microorganisms. Droplets from sprinklers can evaporate to leave harmful microorganisms suspended in the air, waiting for someone to breathe them. SOLUTION: Don't recycle greywater through sprinklers.
- Microorganisms on plants. Direct application to foliage can leave untreated microorganisms on surfaces. SOLUTION: Don't apply greywater to lawns or directly to fruits and vegetables that are eaten raw (strawberries, lettuce, or carrots, for example). Fruit trees are acceptable if greywater is applied only to the roots.
- Contamination of surface water. If greywater does not percolate through the soil, it can flow into creeks or other waterways untreated. SOLUTION: Discharge greywater underground or into a mulch-filled basin. Don't apply greywater to saturated soils. Apply greywater intermittently so that it soaks in and soil can aerate between waterings. In general, contained greywater application at least 50 feet from a creek or lake is not a problem.
- Contamination of groundwater. It is all but impossible to contaminate groundwater with a greywater system. However, property owners with wells should not irrigate with greywater any closer to the well than county regulations allow for a septic tank leach field.
- Chemical contamination. Biological purification does not usually remove industrial toxins. Toxins either will be absorbed by plants or will pollute groundwater. Many household cleaners are composed of chemicals that are unsuitable for introduction into a biological system. SOLUTION:

Don't buy products that you wouldn't want in your greywater system. Divert water containing those you can't avoid to poison the sewer or septic instead.

- System overload. Greywater systems are safest when using water that is fairly clean initially. Greywater should not contain water used to launder soiled diapers or by anyone with an infectious disease; in both cases, greywater should be diverted to the septic tank or sewer. Also, DON'T STORE GREYWATER; use it immediately, before bacteria multiply. Finally, if you are having a party where 50 people are going to use a system designed for two, consider diverting greywater to the sewer for the night.

Note on Health Risks

Much fuss has been made over the potential health risk of greywater use, without comparison with the actual risk of the current practice of disposing of sewage into natural waters used for swimming, drinking and fishing. This questionable practice short circuits effective natural purification in soil and is considered one of the least desirable techniques by the World Health Organization (Wagner and Laniox 1958).

Approximately 20% of all U.S. communities still dump sewage in natural waters after primary treatment (solids removal) only. After heavy rains, even the most technologically advanced secondary treatment plants are forced to abandon all pretense of treatment and let raw sewage flood into the ocean or river.

Widespread greywater use in a population mostly unaccustomed to taking responsibility for utilizing natural systems would not be 100% risk-free. However, even with the inevitable misuses, greywater recycling as described here is safe compared to other common activities, such as kissing, dogs pooping on lawns, and swimming downstream of municipal sewers.

Cautions from the Author

The design and use of greywater systems carry legal, public health, horticultural, and ecological consequences. The author encourages people to follow common sense and local regulations for greywater treatment. Do not use greywater for food crops or lawns unless you take appropriate precautions against

the possibilities of transmitting disease and contamination from household chemicals.

References

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Original Source

This edition of *The Overstory* was adapted with the kind permission of the author from:

Ludwig, A. 2000. *Create An Oasis With Greywater: Your Complete Guide to Choosing, Building and Using Greywater Systems*. Oasis Design, Santa Barbara, CA, USA.

and

Ludwig, A. 2001. *Branched Drain Greywater Systems: Reliable, Economical Sanitary, Low Maintenance Distribution of Household Greywater to Downhill Plants without Filtration or Pumping* (A

supplement to *Create an Oasis with Greywater*). Oasis Design, Santa Barbara, CA, USA.

and

Ludwig, A. 1999. *The Builder’s Greywater Guide: Installation of Greywater Systems in New Construction and Remodeling* (A supplement to *Create an Oasis with Greywater*). Oasis Design, Santa Barbara, CA, USA.

These publications can be ordered from: Oasis Design, 5 San Marcos Trout Club, Santa Barbara, CA 93105-9726, USA for \$17.95 each, or \$42.85 for all three, including tax & shipping, or visit the web site: <<http://www.oasisdesign.net>>.

This excerpt was originally published as *The Overstory* #102.

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