

GRAY WATER

What is Gray Water?

Gray water, graywater, grey water, greywater



A Gray Water Reuse System

As defined by the Montana Department of Environmental Quality (DEQ), gray water is wastewater that is collected separately from a sewage flow and that does not contain industrial chemicals, hazardous wastes, or wastewater from toilets (Circular DEQ 4 2.27). This includes water from the clothes washing machine, the shower/bath, and the bathroom sink. Exceptions to this rule are if the washing machine is used for cleaning reusable diapers. That wastewater would include more bacteria and would therefore be less suitable to other uses that gray water can be put to.

INCLUDED WITHIN



What is gray water and how can it be reused?

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Things to consider with gray water reuse and permitting information

2



An example of a gray water irrigation system

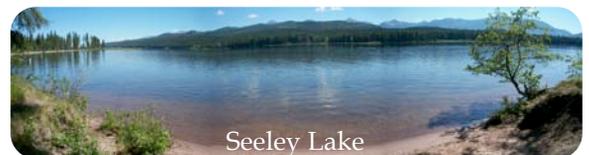
3



Other ways to conserve water

4

"Water is the lifeblood of Montana"
-Montana Environmental Information Center



Seeley Lake

How Can Gray Water be Reused?

All water that enters your home from a public water supply is potable, meaning that it is clean enough to drink. However, there are many other uses of water that do not require potable water. Gray water can be used instead. Gray water is slightly less clean than potable water and far cleaner than black water, or sewage, and can be reused to meet total water needs while reducing the amount of potable water that is wasted.

Gray water can be reused indoors for toilet flushing. Water for the toilet does not need to be potable since you won't be drinking it, therefore gray water can be

captured and reused for toilet flushing.

Another use of gray water is for outside irrigation. Your house can be plumbed so that the gray water flows from its source (shower, sink, etc.) to a subsurface irrigation system for your outdoor plants. The complexity of these systems varies but all, in some way, reduce the amount of potable water that is used outdoors. It is important to be careful which plants you water with gray water, because many plants do not tolerate the higher levels of sulfates and phosphates contained in gray water. There are, however, many plants that thrive on these additional nutrients and would be a good match for gray water irrigation.



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Is Gray Water Reuse Right for Me?

If gray water is to be reused indoors strictly for the purpose of flushing toilets, then a permit is not necessary. Gray water accounts for anywhere from 30% to 60% of total indoor water use, and toilet flushing about 30%, so gray water can completely replace potable water for flushing. The only other consideration would be if the existing plumbing is simple enough to modify.

Many factors affect whether or not gray water is viable for outdoor irrigation including how much is produced and the physical characteristics of the site. To determine how much gray water your residential household produces the Montana DEQ recommends the following flow rates per person:

Source:.....Gallons per Day:
 Showers, tubs, washbasins.....25
 Laundry.....15

A typical four-person household generates approximately 160 gallons of gray water per day.

The next step is to evaluate the site. Things to consider include soil absorption, plant life, changes in elevation, and existing plumbing. It's necessary to ensure proper drainage on the site and a soil percolation test helps determine this. Your local county sanitarian should be your first contact and can put you in touch with an individual authorized to perform the test.

Once it's determined how much soil can be absorbed, you should also consider the water demand of



2009 Bill Signing

the plants on site to make sure the amount of water generated is adequate to water the plants.

Sites that have all gray water sources at an elevation above the irrigation zone are the simplest because gravity can be used to distribute the water.

Lastly, it's important to consider existing plumbing and how easily it can be altered. If all your pipes are sealed beneath concrete, it makes the task close to impossible.

Permitting



2007 Bill Signing

In 2007, the Montana State Legislature legalized gray water reuse for residential houses and expanded that law in 2009 to include all buildings. A permit is not required for gray water reuse in toilet flushing, however there is for irrigation. Following the enactment of those laws, were rules and regulations set by the Department of Environmental Quality, however the local departments of health are responsible for permitting the systems. Your local

county sanitarian is your first contact for obtaining a permit.

Some basic requirements include:

- **Subsurface dispersal** of at least 6 inches below the surface ensures there will be no human contact with the gray water.
- **Marking piping as non-potable** ensures that future modifications won't cross-contaminate the plumbing.
- **A minimum soil absorption area** ensures proper drainage and that gray water won't puddle.
- **A three-way diverter valve** ensures that gray water can be diverted to the normal wastewater treatment system during times of no irrigation.

Other requirements apply as systems incorporate more complex elements. For example, backflow prevention devices are necessary for systems that are augmented with potable water, or where pumps are needed to distribute the water (Circular DEQ 4).

GREYWATER CONTAINED AND COVERED IN A BRANCHED DRAIN-FED MULCH BASIN

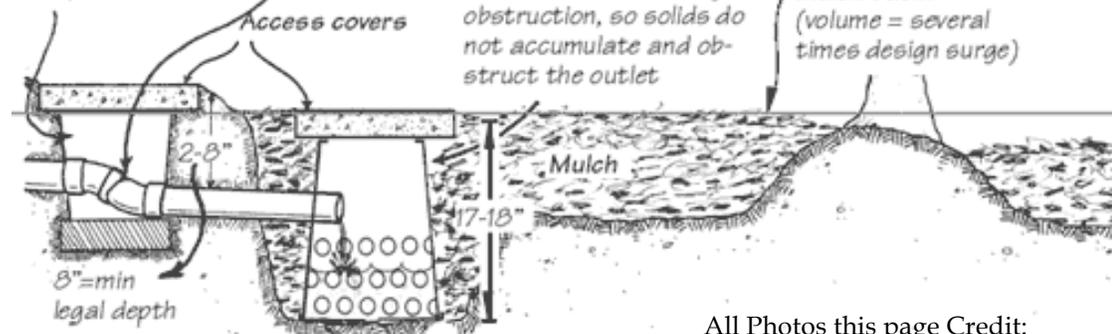
Flow splitter register

empty 1 gal plastic pot covered with stepping stones allows access to double ell for cleaning without knocking dirt or leaves in (the most common way to disturb the flow)

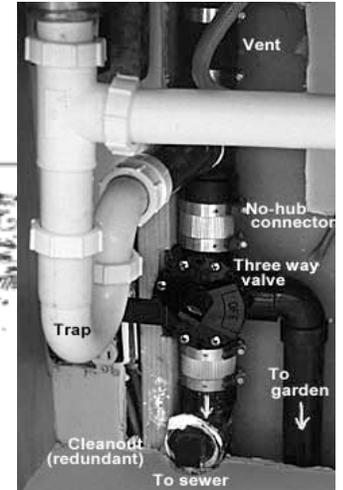
Flow Splitter should sit on brick for easy leveling

Outlet chamber

upside-down, empty 5 gal plastic pot with bottom cut out and holes drilled in the sides. Allows solids out into mulch for biodegradation so clogging does not occur. It is very important that discharge end of pipe is 2" or more above any obstruction, so solids do not accumulate and obstruct the outlet



Double Ell flow splitter with a clean-out.



All Photos this page Credit: Oasis Design

Gray Water Irrigation System

There are numerous types of gray water reuse systems of varying complexity. The simplest of the systems consists of a pipe that directs gray water from its source (such as the washing machine) to the irrigation system outdoors and uses the force of gravity to move the water. More complex systems involve storage tanks and pumps to move water uphill, and are occasionally augmented with potable water where gray water is not adequate to meet irrigation needs. These more complex elements come with added costs, time, and effort to ensure proper system functioning and permitting.

The above illustration shows a branched drain-fed mulch basin system with subsurface dispersal in an enclosed chamber. The water is collected from approved gray water sources in the house in piping separate to that of black water, or sewage flow. All piping is labeled with gray water, so that future homeowners will know not to cross-contaminate those pipes with potable water. In addition, three way valves are used to divert the gray water to an approved sewage treatment system during winter

months or in the case of contamination. For example, when washing cloth baby diapers in the washing machine, the wastewater should be diverted to the sewage treatment system because fecal matter could contaminate the garden.

Water collected from gray water sources is then moved by gravity through pipes sloping downhill at 1/4 of an inch per foot. It's distributed to plants through the mulch basin, which also helps to filter the water. Double ell flow splitters are used to direct the water to different parts of the landscape. The flow splitters and the end of the pipe should be accessible for maintenance and protected by a pot or bucket to prevent clogging when access is necessary. Decorative garden stones can be placed on top to mark the access points and make the garden aesthetically pleasing.

This type of system is ideal when the gray water source is higher in elevation than the landscape. When its necessary to transport water uphill, additional pumps will be necessary, therefore complicating the process.

Water Conservation

Without other methods of water conservation gray water reuse will not solve all the problems of potable water shortages. Two important water-conserving strategies to incorporate are low-flow fixtures and xeriscaping. Low-flow faucets, showerheads,

and toilets dramatically reduce the amount of potable water that is used while also having no significant change in lifestyle. It's an easy and effective way to get dramatic decreases in water usage.



Xeriscaping refers to landscaping that minimizes the need for irrigation. This can be achieved by using plants that are native to the area. Those plants will thrive on the amount of rainfall that naturally falls. Talking to a local nursery can be helpful in determining how to make this work for you. Another benefit to this type of landscaping is that it is low maintenance.

Gray Water in Green Building

The simplest and most effective way to get gray water reuse systems in place is by incorporating them into new construction because then the hassle of re-doing existing plumbing is eliminated. The city of Tucson, Arizona requires all new construction to be plumbed with gray water stub-outs. Stub-outs keep gray water flow separate from sewage flow and make it easy for a future building owner to install a gray water reuse system.

In the State of Montana, state buildings are required to be built and operated as high-performance buildings. The standards developed by the Architecture and Engineering Division for high-performance buildings require that project or construction managers look at opportunities to use water runoff and wastewater on site. This is the perfect type of opportunity to incorporate gray water reuse.

Another option for incorporating gray water reuse in green building is for local governments to offer incentives to developers for installing stub-outs or incorporating gray water reuse systems into the building.

SOURCES

Architecture and Engineering Division. "Montana's High Performance Building Expectations." 2009.
 City of Tucson. "Ordinance No. 10579." 2008.
 Ludwig, Art. Oasis Design.
 Montana Dept. of Environmental Quality. "Circular DEQ 4," 2009.

WATER CONSERVATION TIPS



Inside

- Check for Leaks
- Fill a few plastic bottles with sand or pebbles and place inside your toilet tank away from operating mechanisms to reduce the amount of water stored in the tank.
- Compost instead of using a garbage disposal.
- Insulate pipes to avoid heat loss and wasting water while waiting for it to heat up.



Outside

- Make sure sprinklers water only your lawn and not the sidewalk.
- Measure the amount of water with a tuna can. Set it on the lawn and when the sprinkler fills it up, you've watered enough.
- Water at dusk so that the water does not evaporate.
- Ideally, install a drip irrigation system.
- Put a layer of mulch around plants to slow evaporation.
- Check for leaks



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S.A.V.E. Foundation • PO Box 1481 • Helena, MT 59624 • Phone: 406-449-6008
 E-Mail: recycle@savemobile.org • Web: www.Savemobile.org