Safe Use of Household Greywater

Cooperative Extension Service
College of Agriculture and Home Economics

Guide M-106

Revised by Marsha Wright, Extension Research Assistant

This publication is scheduled to be updated and reissued 7/01.

Greywater is water that has been used for washing dishes, laundering clothes, or bathing. Essentially, any water, other than toilet wastes, draining from a household is greywater. Although this used water may contain grease, food particles, hair, and any number of other impurities, it may still be suitable for reuse. Reusing greywater serves two purposes: it reduces the amount of freshwater needed to supply a household, and reduces the amount of waste water entering sewer or septic systems.

The New Mexico Environment Department and the Construction Industries Division govern liquid waste disposal in New Mexico, and issue permits for approved systems. Greywater use is restricted by the Liquid Waste Disposal Regulations (LWDR), but the Environment Department can grant a variance if the applicant shows that:

1) "granting the variance will result in public health and environmental protection equal to or greater than the minimum protection provided by the varianced requirement" (LWDR section 202.D.2.); and

2) "the proposed liquid waste system will, by itself or in combination with other liquid waste systems, neither cause a hazard to public health nor degrade any body of water" (LWDR section 202.D. 1).

Note: Be sure to obtain all necessary permits before installing a greywater system.

USES FOR GREYWATER

The amount and quality of greywater will in part determine how it can be reused. Irrigation and toilet flushing are two common uses, but nearly any non-contact use is a possibility.

Greywater is suitable for irrigating lawns, trees, ornamentals, and food crops. Though irrigation methods in greenhouses may differ greatly from outdoor irrigation, several guidelines for use of greywater apply to both situations.

- Apply greywater directly to the soil, not through a sprinkler or any method that would allow contact with the above-ground portion of the plants.

- Root crops which are eaten uncooked should not be irrigated with greywater.

- Plants that thrive only in acid soil should not be watered with greywater, which is alkaline.

- Use greywater only on well-established plants, not seedlings or young plants.

- Disperse greywater over a large area, and rotate with fresh water to avoid buildup of sodium salts.

In addition, when irrigating outdoors, apply greywater only to flat areas where runoff is not likely. A cloth bag attached to the end of the hose will help distribute water and also act as an additional filter. The filter will need to be removed and cleaned periodically (every three or four days).

In arid areas where dry grass or brush pose a fire hazard, homeowners may wish to plant a firebreak or "greenbelt" of a selected high-moisture species. Greywater is ideal for irrigating firebreaks, because it contributes plant nutrients in the process.

Remember that in most areas outdoor irrigation is a seasonal use for greywater, but greywater is produced throughout the year. If reverting to sewer or septic systems during the winter is not feasible, find uses that are possible during all seasons.

Toilet flushing can use considerable amounts of greywater, as it normally accounts for up to 50% of indoor water use. Poor quality greywater is not a problem if it is used to flush toilets, because the water goes into the sewer or septic system where it would have gone had it not been reused. Greywater should be pumped into the toilet bowl for flushing. **DO NOT** put greywater into the toilet tank. Greywater in the tank may not only cause the flushing mechanism to malfunction, but could be backsiphoned into the fresh water supply if water pressure decreases suddenly.

Lagoons or ponds containing greywater can grow algae to feed fish in a separate pond, or provide food for ducks and other waterfowl. Removal of the algae is necessary to keep the system aerobic and prevent foul odors. Ponds are often lined with concrete, stone, or plastic to prevent leakage. This method is a relatively inexpensive and easy way to recycle water, but requires some expertise to site and construct the lagoons.

With an automatic clothes washer, the wash water from a lightly soiled load, or rinse water, can be saved to wash the next load. When reusing laundry water for irrigation, do not use liquid fabric softener or detergents including softener (use softener sheets in the dryer instead). Water should not be reused if the laundry includes diapers. Wash water containing gasoline, diesel, or similar pollutants, should not be used for purposes other than flushing.

UNTREATED GREYWATER

Untreated greywater should not be kept for longer than one day, but adding two tablespoons of chlorine bleach per gallon of water will extend storage time somewhat. Try to use greywater the day it is collected or the high bacteria count will cause objectionable odors.

Observe these precautions when using untreated greywater:

- Greywater containing sodium, bleach or borax can damage plants. For this reason, water from automatic dishwashers should not be used for irrigation.

- Water used to wash cooking utensils in the sink may contain grease, fats and oils, and is not acceptable for greywater use.

- If you plan to use water from your washing machine, avoid liquid fabric softeners and detergents with softeners. Use a dryer fabric softener sheet instead.

TREATING GREYWATER

Investing time and equipment in a system designed to filter, store, and possibly disinfect greywater may make water reuse a more convenient practice. Some questions to answer before building a treatment system are:

- How much greywater will have to be treated? About 65% of domestic wastewater is greywater. Bathing and laundry can generate considerable quantities of greywater in a large household.

- What contaminants are present? Greywater from the bathroom will have different characteristics than that from the kitchen (see fig. 1).

- What are the possible uses after treatment? The planned uses of greywater may call for more or less treatment. Some uses, such as outdoor irrigation, are seasonal; greywater is produced year round.

- What is the soil type and depth to water table at your site? A shallow water table underlying sandy soil could be in danger of contamination.

Answering these questions will help you decide what type and size of system to install. Be-

CHARACTERISTIC

WATER SOURCE	Bacteria	Bleach	Chlorine	Foam	Food particles	Hair	High pH	Hot water	Nitrate	Odor	Oil & grease	Organic matter	Oxygen demand	Phosphate	Salinity	Soaps	Sodium	Suspended solids	Turbidity
Automatic Clothes Washer		•		•			•	•	•		•		•	•	•	•	•	•	•
Automatic Dish Washer	•			•	•		•	•		•	•	•	•		•	•		•	•
Bath tub and Shower	•					•		•		•	•		•			•		•	•
Evaporative Cooler															•				
Sinks, incl. Kitchen	•				•			•		•	•	•	•			•		•	•
Swimming Pool			•												•				

Fig. 1. Water-quality characteristics of selected domestic wastewater.

cause greywater treatment systems are not much in demand, you may have to design and build a system to meet your own specifications and needs. Options to consider for greywater treatment include settling tanks, disinfectants, and filters.

Tanks

In a settling tank, solids and large particles will settle to the bottom, while grease, oils, and small particles will float. The remaining liquid will be reused. A settling tank also allows hot water to cool before reuse. The tank should be large enough to hold twice the expected daily flow plus 40 percent, to allow for sludge accumulation and surge loading. One type of settling tank well-suited for greywater treatment is a septic tank. A septic tank is specifically designed to allow settling, but do not confuse the use of a septic tank to treat greywater with the conventional use of a septic tank. Greywater intended for reuse should NEVER be mixed with toilet wastes.

Greywater coming out of a septic tank contains little or no oxygen. Greywater from an aerobic tank will contain more oxygen, which is better for irrigation purposes. An electrical pump or aerator added to a septic tank can create an aerobic environment. Aerobic conditions allow some decomposition of wastes in the tank, and may help minimize sludge buildup and blockages in the system. Both aerobic and septic tanks will need to be pumped out every three to five years.

Several types of tanks may be suitable for settling or storage of greywater. In addition to metal, polyethylene, fiberglass or wooden tanks that are commonly used, consider using plastic garbage cans, 55-gallon dims, portable swimming pools, or waterbed mattresses.

Disinfection

Two chemicals used to disinfect water are chlorine and iodine, with chlorine being more common. Not only is it readily available (as household liquid bleach or at swimming pool supply houses) and relatively inexpensive, but it is stable in storage and will, in time, vaporize from the water after disinfection. Organic material in greywater may combine with chlorine, and reduce the amount available for disinfection. For this reason, a filter or settling tank before the disinfection point may be advisable.

Iodine is less affected by organic material, persists longer, and may be more effective at the high pH of greywater. Iodine is also fast-acting, requiring no more than two minutes to kill most pathogens.

Several devices are available commercially that dispense appropriate amounts of iodine or chlorine (in solid or liquid form) to a water system. Check with swimming pool supply houses or water treatment companies.

Filters

The type of filter required for a greywater system depends largely upon the amount of greywater to be filtered and the type of contaminants present. A drain filter is an easy and inexpensive way to filter lint and hair out of bath or laundry water. A simple cloth bag tied over the end of a hose or pipe may be sufficient for irrigating outdoors or similar applications.

Many types of commercial water filters are available. Most use an activated charcoal, cellulose, or ceramic cartridge that must be cleaned or replaced regularly. Before buying a filter, determine whether it is a gravity filter (for low volumes) or a pressure filter (for flow rates greater than 20 gallons per minute). Also consider the frequency, cost, and ease of maintenance.

Slow sand or multi-media filters are usually built by the homeowner. These gravity filters

may be constructed in a 55-gallon drum or similar container that is of suitable size. Features that should be part of a filter include a perforated plate or some other device to distribute water evenly over the top, a concrete funnel in the bottom to help water drain to the perforated drain pipe, and a cover and vent to prevent odors. Fill the bottom of the filter with stones that are too large to enter the drain pipe.

Slow sand filters are shallow layers of stone, medium gravel, and pea gravel beneath a deep layer of sand (see fig. 2). A slow sand filter will treat approximately 0.05 to 0.13 gallons per minute per square foot of surface area.

Multi-media filters are filled with a variety of media in order of increasing size, for example, fine sand, coarse sand, gravel, stone, and wood chips, to a total depth of 2 $^{1}/_{2}$ to 3 feet (see fig. 3).

Slow sand filters require regular cleaning and replacement of the top layer of media. Multi-media filters require less frequent cleaning, but all layers must be cleaned or replaced when maintenance is required. Routing greywater through a settling tank before filtering reduces contaminant load and can lengthen the interval between cleanings.

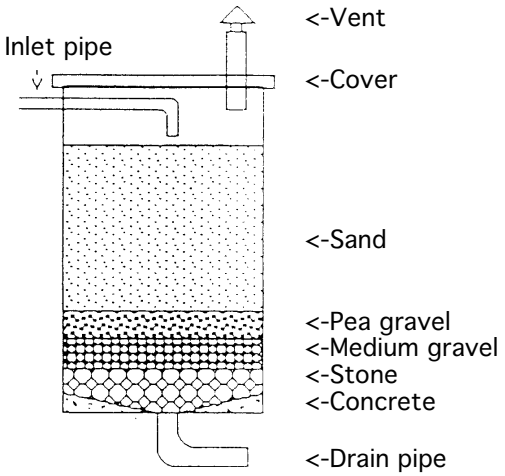

Fig. 2. Slow sand filter.

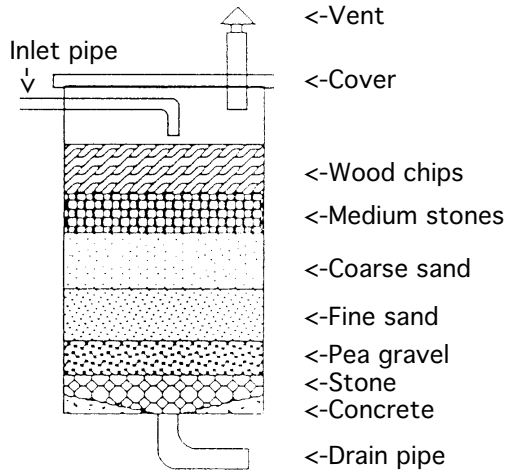

Fig. 3. Mixed-media filter.

VARIABLE

TREATMENT	Bacteria	Bleach	Chlorine	Foam	Food particles	Hot water	Nitrate	Odor	Oil & grease	Organic matter	Oxygen demand	pH	Phosphate	Salinity	Soaps	Sodium	Suspended solids	Turbidity
Aeration								♦		♦	♦	♦						
Alum															♦			♦
Carbon filtration								♦										
Chlorination	♦							♦										
Crop filtration	♦				♦												♦	♦
Crop uptake							♦						♦		♦	♦		
Dilution						♦	♦					♦	♦	♦		♦		
Filtration					♦				♦	♦					♦		♦	♦
Flotation									♦									
Hydrogen peroxide	♦							♦										
Lime	♦							♦								♦		
Settling				♦	♦	♦				♦	♦						♦	
Soil filtration	♦	♦	♦	♦	♦					♦	♦						♦	♦
Soil uptake							♦						♦		♦	♦		
Storage				♦	♦	♦				♦	♦	♦					♦	

Fig. 4. Treatment for water-quality variables.

(Figures 1 and 4 reprinted from *Water and Wastes Engineering* with the permission of Scranton-Gillette Communications, Inc.

Reprinted for electronic distribution July 1996 Las Cruces, NM