



Gray Water Reuse

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What is Gray Water?

In Oklahoma, gray water is defined as untreated household wastewater that has not come in contact with toilet waste, and includes used water from bathtubs, showers, washbasins, clothes washing machines and laundry tubs. It does not include wastewater from kitchen sinks, kitchen dishwashers or laundry water contaminated with human excreta, such as from diaper washing.

A gray water system is usually installed during the initial construction of a house because it requires a dedicated plumbing system that collects gray water separately from black water (water from the toilet, kitchen sink and dishwasher). Retrofitting existing home plumbing is typically more difficult than new construction, but is possible. The gray water is usually filtered

and briefly held in a storage tank and from there, it is applied (sometime after secondary filtration) for reuse as irrigation water (Figure 1). In some systems, partially treated gray water is even brought back inside the house and used for flushing toilets.

Sources of Water in Oklahoma

While most of the water used in Oklahoma comes from surface water bodies, the state depends on aquifers for 44% of its annual water use. It is estimated that Oklahoma draws around 798,000 acre-feet of water per year from its aquifers (OWRB, 2012). While surface water bodies can be easily replenished

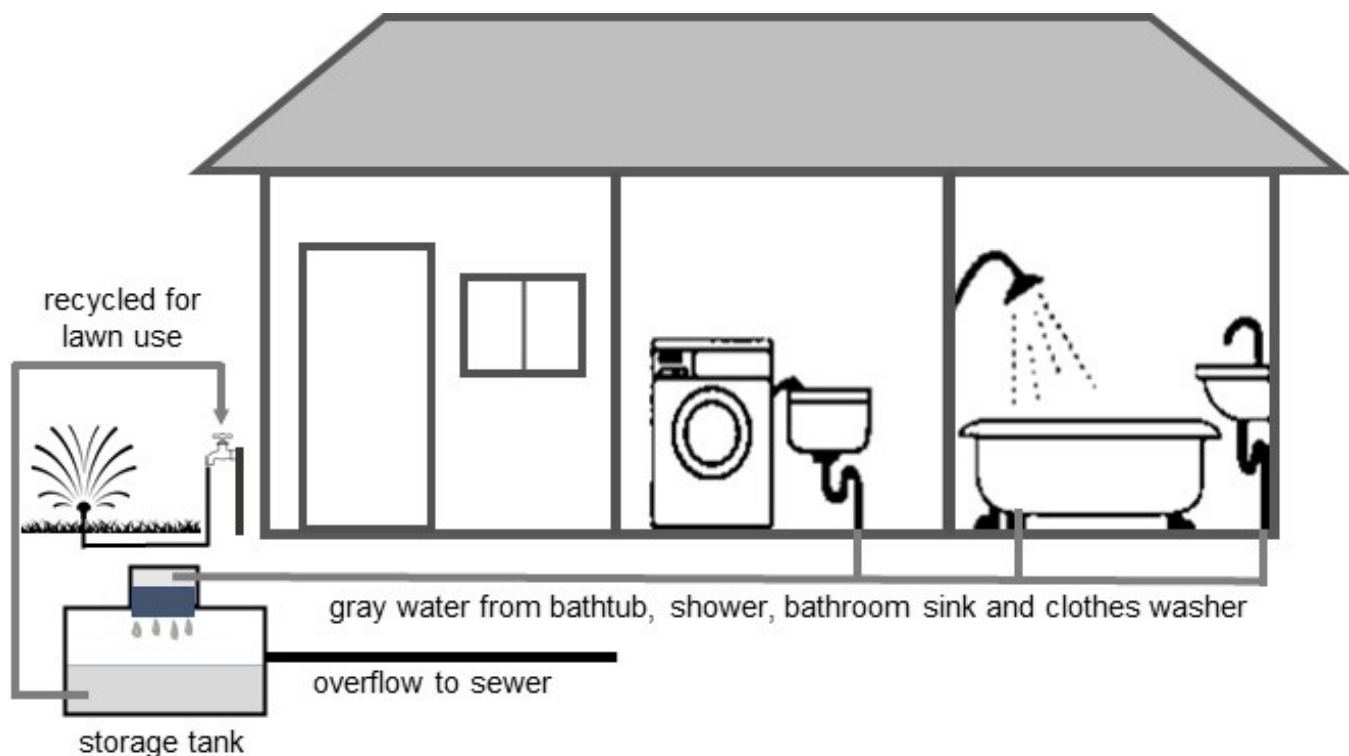


Figure 1. Schematic diagram of a gray water system. (Illustration by SM Abit)

by rain events, recharge of groundwater in aquifers is often a very, very slow process. In fact, the Ogallala Aquifer, Oklahoma's largest aquifer, is only recharged at a rate of 0.2 to 2.2 inches (average of 0.85 inch) per year (USGS, 1980). Considering the limitations of the aquifer recharge, it is prudent to maximize our use of water by reusing some of it, such as gray water, as much as possible. The reutilization of gray water will be particularly beneficial in regions with limited rainfall and where water is mainly drawn from an aquifer.

How Much Gray Water are we Talking About?

On average, 39% of water used in houses becomes gray water (WRF, 2016). Considering that a typical household uses 200 gallons of water daily, each house would generate around 78 gallons of gray water every day. Furthermore, the 1.75 million houses in Oklahoma (U.S. Census, 2019) could jointly produce an enormous amount of around 137 million gallons of gray water each day. This gray water is normally not reused for any other domestic use as it gets mixed with the rest of the wastewater from the toilet, kitchen sink and dishwashers, and ends up in the sewer or the onsite septic system. In addition to private household gray water, untreated municipal wastewater captured from municipal splash pads and the water used by fire departments for cleaning their equipment and vehicles are also considered gray water in Oklahoma.

Benefits of Gray Water Use

Gray water is essentially wastewater, but if it is collected, handled, and stored properly, it can be reutilized as tap water replacement for non-potable needs such as water for irrigating lawns and gardens. An obvious benefit of gray water use is the reduction in household water expense, but even more important is its impact in decreasing the demand for freshwater. A decrease in demand for freshwater will also reduce the need to secure or tap additional (and increasingly more expensive) municipal sources of water for domestic uses. This would help decrease dependence on our groundwater resources and avoid the associated environmental impacts of excessive groundwater withdrawal. Other benefits of gray water use include the following:

- reduced volume of household wastewater sent to onsite septic systems or municipal wastewater treatment plants
- it is a sustainable and effective method of wastewater treatment
- reduced use of energy and chemicals for both water and wastewater treatment
- it is a source of nutrients for plants
- it serves as an irrigation source during droughts or periods of water restriction.

Best Practices in Handling Gray Water

While gray water can be beneficial when reused, it must be handled properly because it could contain chemical and microbial contaminants that are possible health hazards and could potentially harm the environment. Here are a few best practices in handling gray water:

- a) Do not store gray water for more than 24 hours. Bacteria in gray water will breakdown organic compounds creating unpleasant odors if stored for extended durations.
- b) Do not store gray water in air-tight containers as this would promote anaerobic conditions which leads to the generation of unpleasant gases.
- c) Minimize human and pet contact with gray water. Gray water could potentially contain pathogens and harmful contaminants.
- d) Make sure that the plumbing system that applies the gray water to the yard is leak-free and prevents ponding.
- e) Cover the storage tank (but not air-tight) to prevent mosquitoes and other insects from breeding on it.

Irrigating with Gray Water

Greywater could be reutilized for irrigating lawns, trees, ornamentals, and food crops. Here are some suggested practices in the use of gray water for irrigation:

- a) Apply gray water directly to the soil when possible. This could be done by manually applying the gray water directly to the soil or through an automated subsurface drip irrigation system. Although not prohibited in Oklahoma, application through a sprinkler system will allow contact with the above-ground portions of plants. In windy areas, the drift of sprayed gray water can contaminate play areas for kids (and pets) and living areas in backyards.
- b) Plants that are eaten uncooked, including root crops, should not be irrigated with gray water.
- c) Plants that are sensitive to saline conditions are more likely to be adversely affected by gray water.
- d) Use of gray water is recommended on well-established plants. The relatively higher salinity level of gray water may not be good for seedlings or very young plants.
- e) Surface ponding of gray water should be prevented.

Dispersal of gray water over a large area and rotating with fresh water will help avoid buildup of soil salinity. This is particularly important in regions that have limited rainfall or during the dry times of the year.

Oklahoma Gray Water Regulations

In Oklahoma, the rules about gray water are stipulated in state statutes 27A 2-6-107 and 27A 2-6-108. The Department of Environmental Quality (DEQ) is the agency tasked with regulating gray water utilization under these rules. Here's a list of some important rules concerning gray water:

1. The use of gray water systems is only allowed in municipalities that have enacted ordinances addressing the design, permitting, construction, and use of gray water systems within the limits of their municipal boundaries.

2. Gray water originating from residences can only be permitted for use in household gardening, composting, or landscape irrigation.
3. The DEQ will require a permit for applying more than 250 gallons per day (gpd) of private residential gray water. Permits are also required when applying less than 250 gpd if unable to meet all a through j requirements listed under item #4 below.
4. No permit from DEQ is needed for applying less than 250 gpd of gray water if:
 - a) a constructed gray water distribution system provides for overflow into the municipal sewer system or a private on-site wastewater treatment and disposal system,
 - b) a gray water storage tank is covered to restrict access and to eliminate habitat for mosquitoes or other vectors,
 - c) a gray water system is located outside of a floodway and not sprayed or discharged to a waterway,
 - d) the gray water application spot/depth is vertically separated by at least five feet above the groundwater table,
 - e) gray water pressure piping is clearly identified as a non-potable water conduit,
 - f) gray water is used on the site where it is generated and does not run off the property lines,
 - g) gray water is applied in a manner that minimizes the potential for contact with people or domestic pets,
 - h) ponding is prohibited; application of gray water must be managed to minimize standing water on the surface and ensure that the hydraulic capacity of the soil is not exceeded,
 - i) gray water use within municipalities or counties must comply with all applicable municipal or county ordinances enacted pursuant to law and
 - j) a gray water storage system which complies with the provisions of this section may allow for rainwater to be introduced into the system.

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