

## Removal Rates In A Subsurface Flow Wetland And A Comparison To Free Water Surface Wetlands

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**Abstract.** Communities throughout the United States and abroad are seeking out innovative approaches to sustaining their freshwater resources. Graywater reuse for non-potable demands is gaining popularity because it allows for the reuse of minimally contaminated wash water, generated and treated on site. Graywater is defined as any wastewater generated at the home or office including wastewater from the laundry, shower, and bathroom sinks but excluding water from the toilets, kitchen sinks, and dishwasher. When compared to other wastewater generated in the home graywater is minimally contaminated with lower concentrations of organics, solids, nutrients, and pathogens. These characteristics make the water suitable for reuse with minimal treatment when compared to other domestic wastewater sources. Graywater reuse for non-potable demands reduces the demand for treated water and preserves source waters. One method of treating graywater at a community scale for irrigation reuse is constructed wetlands. Despite widespread interest in this innovative approach, concerns about water loss due to evapotranspiration have arisen in connection to using constructed wetlands in the arid climates of the western United States. The objectives of this study were 1) to determine the first order removal rates ( $k$ ) of graywater constituents using a subsurface flow (SF) constructed wetland, 2) to compare those rates to the rates of a free water surface (FWS) constructed wetland in order to provide design guidance for future constructed wetlands that will be used to treat graywater, 3) explore the possibility of incorporating constructed wetlands into greenhouse community garden centers to reduce the losses resulting from evapotranspiration in arid climates and 4) briefly discuss the fate of three common anionic surfactants in constructed wetlands. Constructed wetlands can offer a scalable, economically sound, low tech and easily maintained method of treating graywater for large scale irrigation reuse. While constructed wetlands are an appropriate technology for graywater treatment there is little research providing the removal rates used in the design of constructed wetlands for graywater reuse. Determining removal rates is important for creating wetland design standards for graywater treatment and reuse. Removal rates will be evaluated over the summer/fall of 2010 and the fall/winter of 2011 for a SF wetland. These removal rates will be compared to the removal rates evaluated over a two year period (2008-2010) for a FWS wetland. The results will not only provide important information for the proper sizing of constructed wetlands but may also provide information on what type of wetland is more appropriate for graywater treatment.

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