The subject of water scarcity and the rate of water consumption have become popular over the last few decades. Within the topic of water consumption, there are two separate issues from a residential standpoint. The first concern is the steadily increasing need for viable alternative water sources to be utilized for non-potable applications in an effort to reduce potable water demands. The second concern is the need to significantly reduce of nutrient-laden wastewater effluent discharge from septic systems in order to sustain groundwater quality and prevent adverse ecological impacts.

This study addresses both issues with two separate systems integrated into one environmentally functional home that emphasizes low impact development (LID) practices. The first objective of the study is to quantify the performance of the passive onsite sewage treatment and disposal system (OSTDS) Bold & GoldTM reactive filter bed (FDOH classified "innovative system") for nutrient removal. The second objective is to monitor the water quality of the combined graywater/stormwater cistern for non-potable use. The performance of the passive innovative OSTDS is compared to past studies and regulatory standards. Also, a bench scale model of the OSTDS is constructed at the University of Central Florida (UCF) Stormwater Management Academy Research and Testing Lab (SMART Lab) and tested to provide effluent data at two different retention times.

Complex physical, biological, and chemical theories are applied to the analysis of wastewater treatment performance. The performance data from the OSTDS and stormwater/graywater cistern systems are also assessed. The results of the OSTDS are compared to FDOH regulatory requirements for "Secondary Treatment Standards", and "Advanced Secondary Treatment Standards" with positive results. The bench scale results verify that both biological nutrient removal and physiochemical sorption are occurring within the filter media and quantified the relationship between removal rates and hydraulic residence time (HRT).

The graywater/stormwater cistern contains acceptable water quality for non potable uses in this residential setting and operates efficiently. The demand on the cistern results in about 50% capacity utilization of the cistern and there is a consistent but minimal dependency on the artesian well. The salinity content and high sodium adsorption ratio (SAR) of the cistern water did not produce any noticeable adverse impacts on the home other than some scale formation in the toilets and increased demand for soap and detergents for laundry, dishes, washing hands, and showering.

Major: Environmental Engineering

Educational Career:
Bachelor's of Environmental Engineering, BS, 2010, University of Central Florida

Committee in Charge:
Dr. Manoj Chopra, Chair, CECE
Dr. Marty Wanielista, CECE
Dr. Andrew Randall, CECE
Dr. Ni-Bin Chang, CECE

Approved for distribution by Dr. Manoj Chopra, Committee Chair, on August 26, 2011.

The public is welcome to attend.