



WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: NC801

Title: Reuse of Wastewater from Septic Systems

Focus Categories: Waste Water, None

Keywords: Septic Tanks, Hydraulic Conductivity, Wastewater Irrigation

Start Date: 03/01/2001

End Date: 02/28/2002

Federal Funds: \$19,353

Non-Federal Matching Funds: \$38,705

Congressional District: 4th

Principal Investigators:

Aziz Amoozegar
Professor, North Carolina State University

Stuart L. Warren
Professor, North Carolina State University

Wayne P. Robarge
Professor, North Carolina State University

Abstract

Approximately 25% of the United States population and 50% of the people living in North Carolina use septic systems to dispose of their domestic sewage on-site. Based on 1980 and 1990 census data and the estimated number of septic systems permitted in North Carolina annually, the number of housing units in North Carolina with on-site wastewater treatment/disposal systems (i.e., septic systems) could exceed 2 million by 2000. With an average 2.9 persons per housing unit, and 170 L (45 gal) of wastewater per person per day, wastewater applied to the soils through septic systems in North Carolina will exceed 1 billion L/d (275 million gal/d). Based on census data, approximately an equal volume of sewage will be generated daily by residential dwellings in urban areas served by public sewer systems. The EPA estimated the sewage generated by a household to be 35% from toilet facilities, 22% from laundry, 20% from bath/shower and lavatory sinks, 10% from kitchen (sink, garbage-disposal and dishwashing machine), with the remaining 13% from other sources (e.g., a water softener) within a dwelling.

Reuse of treated wastewater from sewer treatment plants is not a new idea. Treated wastewaters from municipalities have been used for irrigating agricultural crops, trees, and ornamental plants. However, limited research has been conducted on the use of gray water (wastewater generated from a dwelling excluding toilet, kitchen sink/garbage disposal, and dishwashing machine) for irrigation. Gray water is being considered for irrigating lawns and gardens in Arizona and California where water shortages are common. Although many parts of the United States, including the southeastern region of the country, may receive adequate rainfall, water shortage during the summer months often limit the use of potable water for irrigating lawns and ornamental plants. While the collective sewage from a residential dwelling cannot be reused without adequate treatment and disinfection, wastewater generated by certain facilities (e.g., laundry machine) in a residential dwelling can perhaps be used for irrigating ornamental plants by a subsurface

system with minimal treatment. However, knowledge about the characteristics of various components of wastewater from households coupled with our understanding of the impact of these wastewaters on soils and plants are needed before such a reuse can be accepted.

This proposal intends to determine the feasibility of on-site use of untreated wastewater from kitchen and laundry facilities for irrigating home landscapes. This general objective will be addressed by determining the characteristics of wastewater from kitchen and laundry facilities from typical residential dwellings and the subsequent effect of this wastewater on growth, appearance, and survival of ornamental plants. In addition, the impact of wastewater and selected compounds found in laundry wastewater on soil hydraulic conductivity will be measured. If the results of the laboratory and greenhouse experiments show that ornamental plants can tolerate wastewater, and the wastewater does not negatively impact soil hydraulic conductivity, gray water from laundry facilities, and wastewater from kitchen of the residential dwelling could then be used for irrigating flower beds, shrubs, and trees. Whether on a public sewer system or a septic tank system, the primary beneficiary of the on-site reuse of wastewater for irrigation purposes is the homeowner who can save by limiting the use of drinking water for irrigation purposes. Another impact of such reuse is the reduction in the amount of sewage entering sewage treatment plants or the septic systems. Municipalities benefit from a lower load of sewage containing nutrients and other chemicals into their sewage treatment plants. Homeowners using septic system also benefit by reducing the amount of wastewater entering the trenches of their septic systems, which in turn increases the longevity of the systems.