

Application for 2008-09 TWRI Mills Scholarship Program

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4. Proposed Research

Onsite wastewater treatment systems serve approximately 25% of U.S. households and almost 40% new developments [U.S. Census of Housing, 1997]. Onsite systems are one of many known contributors of pathogens such as *Escherichia coli* (*E. coli*) and nutrients to surface and ground waters [USEPA, 2002]. The most common Onsite Wastewater Treatment System (OWTS) involves a septic tank unit followed by dispersal to a subsurface soil infiltration unit.

The upper part of the Brazos River in North Central Texas has a series of three reservoirs-Possum Kingdom, Lake Granbury and Lake Whitney. Lake Granbury and the communities around it have flourished since the lake was completed in 1969. Lake Granbury is an important source of water supply in this area, providing water for over 250,000 people in more than 15 cities. Recent studies by the Brazos River Authority (BRA) have detected that some of Lake Granbury's coves especially shallow bodies of water which are in little interaction with the main lake are contaminated with *E. coli* [www.brazos.org/gbwpp.asp]. In response to concerns regarding potential risks associated with the *E. coli* contamination of the main lake and subsequent involvement of resources and money, it is important first to address the existing concerns of the lake i.e. *E. coli* contamination. In Lake Granbury area OWTS is used to treat the effluent from the houses. *E. coli* that are present in septic tanks can move into the ground and surface waters due to exchange between the stream and the aquifer, thus causing intercontamination between stream water and groundwater. We hypothesize that a possible source of contamination in the lake may be because of large number of septic tanks, and their poor management. The factors influencing *E. coli* transport, survival and fate in vadose zone remain inadequately characterized. Thus the purpose of this study is to develop an understanding and systematically investigate the transport and fate of *E. coli*. In this study, a vadose zone model 'HYDRUS' will be used to simulate the impact of onsite septic systems and *E. coli* affecting the water quality of the lake in Granbury area.

The specific goals of this research are to consider different scenarios mimicking possible seasonal variability and topographic features that involve the variation in groundwater table and the lake level and model them with the available data as a means of investigating and uniquely characterizing the impact on flow paths and *E. coli* transport in the vadose zone. A sensitivity analysis will also be conducted to the transport parameters. Once the model is established, it will be used to predict *E. coli* concentrations in Lake Granbury.

References:

U.S. Census of Housing, 1997

www.brazos.org/gbwpp.asp, accessed on June 11, 2008

USEPA (2002), Onsite Wastewater Treatment Systems Manual, EPA/625/R-00/008

5. Proposed Use of Funds

I wish to use the TWRI Mills Scholarship to fund both continuing research and future publications and conference meetings such as SSSA (Soil Science Society of America) or AGU (American Geophysical Union), to share my work and learn from other researchers.

6. Intended Career Path

My aim in life is to do research in the field of environmental engineering. To me, research in the field of environmental engineering is the best way I can contribute to society and humanity. After completing my PhD, I intend to work for a federal or state agency or a research university where I can pursue research on water-related issues. My final goal of intended career is to become an influential leader in environmental engineering to clean and preserve water resource for the sustainable development.