



WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2003CA50G

Title: Dynamics of Point and Non-Point Source Fecal Pollution from an Urban Watershed in Southern California

Project Type: Research

Focus Categories: Ecology, Surface Water, Water Quality

Keywords: non-point source pollution, fecal indicator bacteria, water quality, microbial ecology, surface water transport

Start Date: 09/01/2003

End Date: 08/31/2006

Federal Funds: \$159045.00

Matching Funds: \$250000.00

Congressional District: 48

Principal Investigators: Grant, Stanley B. (University of California, Irvine); Holden, Patricia (None); sanders, brett franklin (UC Irvine)

Abstract: A growing number of the nation's rivers, estuaries, and coastlines are impaired for fecal indicator bacteria (FIB). This problem is particularly acute in southern California, where the shedding of FIB and pathogens from urbanized watersheds routinely triggers swimming advisories at coastal saltwater and inland freshwater beaches, and the closure of shellfish harvesting areas in estuarine and coastal systems. Identification and mitigation of FIB pollution is complicated by the many human and non-human non-point sources of these organisms, and the complex and interrelated physicochemical, transport and ecological processes that control their spatial and temporal distributions in watersheds. This proposal will fund field measurements and modeling studies aimed at understanding how storms affect FIB sources, ecology, and transport within several sub-drainages of the Santa Ana River (SAR) watershed in southern California. The SAR watershed is an ideal natural laboratory to conduct FIB ecology and transport studies because: (1) The river is a source of drinking water for over 2 million people, and hence the presence of FIB and pathogens in runoff is highly undesirable. (2) Four sites within the watershed, and three sites near its coastal outlet, are listed as fecal coliform impaired (i.e.,

303(d) listed) by the US EPA. (3) The watershed contains a variety of land-use types, ranging from industrial cattle farming operations to highly urbanized communities. (4) There is a wealth of historical water quality and hydrological data by virtue of its status as a NWQA site, and the numerous health effects studies that have been commissioned over the years by the local water district and others. To carry out the proposed research, a team with expertise in microbial ecology (T. Holden), water quality (S. Grant), and modeling (B. Sanders) will join with USGS researchers (C. Church and J. Izbicki) to study three sites within the SAR watershed. At each site, the researchers will: (1) Characterize the local and external forcing of FIB measurements over time scales ranging from hours (during storms) to decades (where historical data is available). (2) Characterize how the speciation and microbial diversity of FIB in the sediments and water column change in response to storms. (3) Develop a conceptual and mathematical model of FIB streambed ecology, sediment-bed/surface-water exchange, and water column transport suitable for incorporation into off-the-shelf models, such as BASINS. The data collection, analysis, and modeling activities proposed in this study will fill a void in current understanding of how FIB distributions in urbanized watersheds are controlled by ecological processes, transport phenomena, or a combination thereof. This information, in turn, is critically needed to develop scientifically-based total maximum daily load (TMDL) plans for FIB impaired watersheds in southern California.

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