

# ***Salmonella* and Shiga Toxin Encoding Genes in Coastal Streams of Central California: Relation to Land Use**

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## **Justification:**

Coastal streams that run through agricultural watersheds can be major non-point sources of fecal indicator bacteria (FIB) and zoonotic pathogens including *Salmonella* and *E. coli* O157:H7 to coastal waters. Understanding how agricultural activities influence concentrations of FIB and pathogens in the nation's waterways is a necessary step for **protecting and enhancing the Nation's natural resource base and environment.**

## **Objectives:**

The proposed work aims to elucidate how watershed, physical, and biological factors control the presence and fate of FIB, salmonellae, *E. coli* O157:H7, host specific markers in *Bacteroidales*, and the shiga-toxin gene (a virulence factor of *E. coli* O157:H7) in coastal streams. Field studies are being carried out in 13 coastal streams draining watersheds along the central California coast with diverse land use characteristics to pin-point how agricultural land use impacts the prevalence of these organisms and their subsequent flux to the coastal ocean. Microcosm studies will explore how water chemistry and grazers impact the persistence of salmonellae in stream water.

## **Progress to date:**

Every 6 weeks for the last 12 months, we recorded rain fall, temperature, flow rate, turbidity, pH, dissolved oxygen, specific gravity, salinity, silicate, nitrate/nitrite, phosphate, ammonia, FIB, presence of host-specific *Bacteroidales* DNA markers by PCR, *Salmonella* most probable number (MPN), and the presence of *E. coli* O157:H7 and *stx* for each of 13 sites. A preliminary data analysis was completed. A positive correlation was found between rain fall and FIB at all sites but not for *Salmonella*. No relationship was observed between FIB and any of the other physical parameters measured. Land use was a significant factor influencing the occurrence of FIB. Highest concentrations of FIB were found in streams impacted by urban runoff. Salmonellae were also most frequently isolated from streams impacted by urban runoff. However, land use alone did not adequately explain the occurrence of *Salmonella* in these streams. No significant relationship was found between detection of the *Bacteroidales* host-specific DNA markers or FIB, and the presence of *Salmonella*, *E. coli* O157:H7, or *stx*.

## **Impacts:**

As identified by this study, additional factors must be explored to explain the relationship between physical conditions, land use, and the occurrence of FIB and pathogens in environmental waters. Enumeration of predator species and characterization of sediments found in these watersheds may provide more insight about which variables work in concert thereby influencing the fate and distribution of FIB and pathogens in the coastal environment.