

Investigation of the Fate and Transport of Fecal Contamination using Microbial Source Tracking

Chris Obropta and Robert Miskewitz

Rutgers University

Grant Number: 2007-35102-18145

Fecal pollution has the potential to negatively impact public health through the contamination of recreational, shellfish-harvesting, and potable water supplies. As a result it is imperative to maintain the microbiological water quality. Often fecal coliform, is used as an indicator of fecal pollution. There are, however, uncertainties associated with this. Fecal coliform can be used to indicate the presence of fecal pollution but can not identify its source(s). These sources can be, in general terms, stationary or transient within a given region. Stationary sources include failing onsite wastewater treatment systems (OWTS), and uncontrolled runoff from animal feed operations (AFOs). Transient sources include migrating waterfowl such as Canada geese and Snow geese and wildlife such as deer, muskrats, and raccoon. In many cases, transient sources cannot be quantified and are consequently not considered in TMDL calculations. As a result these are not typically included in the water quality model used to define the wasteload allocation (WLA).

Microbial source tracking (MST) techniques have recently been developed that have the ability to identify the origin of fecal pollution. One of the most promising includes targeting bacteroidetes. The group bacteroidetes include *Bacteroides*, a genus of obligately anaerobic, gram-negative bacteria that are found in all mammals and birds. *Bacteroides* are abundant in fecal matter and have been recognized as having broad geographic stability and distribution in target host animals. Rutgers University Department of Environmental Sciences, Rutgers University Biotech Center, and Rutgers Cooperative Extension (RCE) Water Resources Program have recently demonstrated their ability to conduct MST assays of *Bacteroides* to identify and quantify fecal sources in an agricultural watershed of southern New Jersey. RCE Water Resources Program is currently using MST techniques to determine the relative contributions of small scale dairy operations to fecal contamination in the Upper Salem River watershed. Field sampling of water quality as well as MST samples have been collected bi-weekly continuously since June 2007. In addition, targeted storm events have also been sampled. A SWAT model that will be used to assess the fate and transport of fecal contamination is currently under development. It has been calibrated for a two year period with at the outlet of the watershed to a Nash Sutcliffe Efficiency Coefficient of 0.48. Development of this model will continue to include flow calibration at nine additional points throughout the watershed, and species specific fecal contamination calibration. The results of this study will be used to reduce the uncertainty of source identification in an agricultural watershed.