

INVESTIGATION THE FATE AND TRANSPORT OF FECAL CONTAMINATION USING MICROBIAL SOURCE TRACKING

Robert Miskewitz, Mehran Niazi, and Christopher C. Obropta
Rutgers University

Abstract:

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, a type of bacteria found in the intestinal tract of warm-blooded animals, 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), uncontrolled runoff from animal feed operations (AFOs), and discharges from sewage treatment plants. 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.

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. The water quality field sampling program has been underway for one year and a SWAT model has been built and successfully calibrated. The results of this study will be used to reduce the uncertainty of source identification in an agricultural watershed.

Keywords

Microbial source tracking, fecal contamination, SWAT, coliform, watershed modeling