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Upper Sugar Creek Watershed, Ohio: A Model Watershed for Study of Pathogen Origin, Fate and Transport

Natsuko Merrick, Warren A. Dick, Linda K. Dick, Gireesh Rajashelara, and Richard H. Moore

Abstract Text:

Transport of human and animal wastes into natural waters can result in contamination with pathogenic microorganisms, which has become an increasingly serious health concern. The inability to differentiate these non-point sources of microbial pollution severely limits our knowledge of the origin and fate of microbial contaminants in aquatic systems, and it allows conflicts to develop among agricultural, environmental, and public health interests. There is a need to discover practical intervention strategies to interrupt transmission of the disease problems associated with contaminated water. For this project, we investigate the origin and transport of microbial contaminants from non-point sources on a watershed scale and identify the social and cultural keys to good management practices within the watershed. This study is novel in its combination of both scientific research and community outreach. Our overall objective is to associate land management practices with transport of microbial contaminants into the headwaters of a multiuse watershed, and to identify social determinants of management decisions that may influence adaptive planning to reduce microbial contamination. This project will be conducted through three phases. First, we will associate land use patterns with bacterial contamination in the study watershed using a targeted sampling approach. We will use qPCR (quantitative PCR) techniques to identify the magnitude of indicator bacteria concentrations at key points in the watershed, and host-specific traditional PCR to determine potential host sources. For the second phase we will conduct a highly focused follow-up sampling to associate specific land management practices with host source diversity of fecal indicators, detection of select pathogens, and microbial indicator concentrations. In the last phase we will identify social and cultural keys to land management decisions that impact the potential for microbial contamination in the study watershed.

Impact Statement:

This project advances the research on the fate and transport of microbial contaminants from non-point sources that are diffuse and difficult to control, by using an innovative microbial source tracking method. It is innovative in its combination of targeted sampling, novel bacterial indicator methods, and pathogen detection to relate local land use and management practices to host sources of microbial contamination. As a further investigation, the association of management practices such as exclusion fencing, no-tillage, buffer strips and manure spreading with the source and density of fecal indicators in the watershed will be studied.