

Identification of proximate sources of fecal contamination to Maumee Bay by determining concentrations of *Escherichia coli* in sediments

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Introduction and problem

Maumee Bay is often impaired for recreational use as the result of high *E. coli* concentrations. The importance of each of the potential sources of *E. coli* to Maumee Bay, however, is largely unknown and needs to be identified so that mitigation measures can be taken. In particular, it has been hypothesized that the resuspension of accumulated *E. coli* from bottom sediments may contribute to high *E. coli* concentrations in the water column. Other reasons for elevated *E. coli* concentrations in Maumee Bay may be fecal contamination that arises from the Maumee and Ottawa Rivers and from drainage ditches, elevated temperatures from heated effluents that are conducive to the growth of *E. coli*, and the lack of disinfection of treatment-plant effluents during the winter months.

Goals and objectives

The overall goal of the proposed work is to determine the sources of fecal contamination to Maumee Bay so that future corrective measures can be taken and (or) accurate and timely predictions of recreational water quality can be made. Specific objectives are to

- investigate the spatial and temporal distribution of *E. coli* in sediments of Maumee Bay,
- examine the relationship between environmental and water-quality variables and densities of *E. coli* in sediment and water in the nearshore area, and
- determine whether significant concentrations of *E. coli* are resuspended in Maumee Bay by storms.

Approach

The proposed work will be performed in two data-collection phases. During phase 1, field reconnaissance studies will be done to determine patterns of *E. coli* concentrations throughout the Maumee Bay area. Taking the results from phase 1, investigators will concentrate field efforts on a few “hot spots” of high concentrations of *E. coli* during phase 2. The USGS is collaborating with researchers from UT on studies that involve the collection and analysis of water and lake-bottom sediment samples, and on the collection and compilation of ancillary environmental and water-quality data.

The data-collection period will extend from May 2003 through September 2004. During phase 1 (2003), the USGS will collect lake-bottom and water samples (with help from UT researchers) from 24 sites on five days during the recreational season. The 24 sites will be selected to include good spatial coverage of the study area and (or) be near possible sources of fecal contamination. The UT researchers will determine densities of *E. coli* in sediment traps set throughout the Maumee Bay area. Water samples will be analyzed for concentrations of *E. coli* using the modified mTEC membrane-filtration method. Sediment samples (bed and sediment

trap materials) will be analyzed for concentrations of *E. coli* using the Colilert Quantitray/2000 method (Idexx Laboratories, Westbrook, Maine).

During phase 2 (2004), those sites that were shown to have elevated *E. coli* concentrations in lake-bottom sediment samples collected during phase 1 will be selected for further intensive study. The USGS will collect a total of 24 to 36 samples during each of two sampling rounds from a few sites along transects extending from possible sources of fecal contamination.

The third year (2005) will be dedicated to data analysis and completion of the final reports. Two final technical reports will be published in peer-reviewed journals—one with UT serving as first author and the second with USGS as first author.