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Using *E. coli* and *Bacteroides* distribution and abundance in a eutrophic lake as a tracer for nutrient inputs, Wilgreen Lake, Madison County, Kentucky

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Wilgreen Lake is a eutrophic lake that has been listed on the EPA's 303d list as nutrient impaired. Potential sources of this impairment are likely from humans, cattle manure, and fertilizers. We suspect that the majority of nutrients originate from human sources, namely from septic tank effluent emanating from key housing developments ringing the lakeshore. We test our hypothesis with conventional microbial assays (*Escherichia coli*) and RT-PCR techniques (*Bacteroides*).

We took water samples at 19 sampling locations on 4 occasions, and measured the abundance of *Escherichia coli* using IDEXX methods. Corresponding sub-samples slated for potential PCR analysis were stored at -40^{o}C. We chose PCR assay candidates on the basis of elevated *E. coli* levels, and the probability of differing source contributions.

There is a systematic decline in *E. coli* microbial abundance distal to developments with closely-spaced septic units. This suggests that the principal source of microbial input is from septic systems; however, we cannot eliminate the possibility that fecal microbes are introduced into the lake via inflows.

We used quantitative PCR analysis to measure *Bacteroides* abundance, and to distinguish between human and cattle sources. We measured 14 samples and found total fecal microbe concentrations in all samples targeting all *Bacteroides* species ranged from 45 mg/L to 142 mg/L. Unlike other studies, there was no apparent relationship between the concentration of all *Bacteroides* species and that of *E. coli*.

We also attempted to quantitatively determine the proportion of *Bacteroides* contributions from specific sources, namely human and bovine fecal matter. Although fecal contamination was measured in all 14 samples, only 1 sample had significant amounts of human fecal contamination (21%) as measured by the human-associated *Bacteroides* assay. None of the samples had significant amounts bovine fecal concentration as measured by the bovine-associated *Bacteroides* assay. These inconclusive results suggest that either there are other unidentified sources of fecal contamination by *Bacteroides* and/or *E. coli*, or that the prevailing drought conditions skewed our results by not capturing fecal transport effects due to lack of surface and/or groundwater flow.

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