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Sources of nutrient and Escherichia coli contamination within the Otter Creek watershed, Madison County, Kentucky

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The Otter Creek watershed exhibits dissolved nutrient (ammonium, NH_4; nitrate, NO_3; phosphate, PO_4) and *Escherichia coli* contamination that compromises its water quality. The watershed covers a substantial portion of Madison County and consists of Lake Reba, Dreaming Creek, and east and west forks, all of which enter the trunk of Otter Creek before flowing into the Kentucky River. Suspected contaminate sources include leaky sewage system pipes, runoff from pasture land, and septic system leachate. We collected 330 water samples on three occasions during summer 2014 to determine the extent and sources of contamination. Nutrients were measured using colorimetric methods, whereas *E. coli* counts were determined by using IDEXX materials.

We found highest nutrient concentrations immediately below discharge from the Otter Creek sewage treatment plant (STP), which is a point source for nitrate (3.5 – 4.4 mg/L N-NO_3) and phosphate (0.8 - 1.0 mg/L P-PO_3). Background levels were ~0.4 mg/L N-NO_3 and ~0.09 mg/L P-PO_4. Nitrate and phosphate values progressively decrease at stations downstream from the STP. Ammonium averages ~0.4 mg/L N-NH_4, ranging from 0 to 1.4 mg/L in May, but measurable ammonium occurs only sporadically in June and July. The highest observed value is 1.8 mg/L N-NH_4 (station CC, June) with the majority of stations having 0 mg/L. 53% of samples exceeded EPA *E.coli* concentration standards for human contact (>575 cfu/100 mL) and are distributed throughout the watershed, displaying classic non-point-source pollution.

Phosphate and fecal microbes are the principal contaminants. Compared to a national data set, phosphate contamination is most severe, often exceeding the 90th percentile value. Nitrate is generally below the 25th percentile level. Ammonium concentration is not related to STP discharge but exceeds the 90th percentile value in May; concentrations approach those of pristine streams in June and July. Non-point sources for nitrate, phosphate, and *E. coli* are likely due to leaky sewage pipes within the town of Richmond, and to pasture runoff in rural areas. Ammonium sources are enigmatic, but seem associated with pasture land and septic systems. Sampling in June and July after rain events saw higher nitrate, phosphate, and *E. coli* concentrations, but lower ammonium levels relative to measurements in May.

Geological Society of America, Southeastern Section, 18 March 2015, *GSA Abstracts with Programs*, 47(2):94.