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Sources of nutrient and fecal microbe pollution in Otter Creek, Madison County, Kentucky

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We measured nutrient (nitrate, ammonium, phosphate) and fecal microbe concentrations in surface waters of the Otter Creek watershed, Madison County, Kentucky to access sources of these contaminants. The watershed is approximately 12.5 miles long covering ~169 km² (41,832 acres). The watershed includes East Fork, West Fork, and Dreaming Creek, all tributaries to the main trunk of Otter Creek. The upper portion of the main trunk and Dreaming Creek drain urban areas of Richmond, but 85% of total watershed area is agricultural land, used mainly for grazing cattle. Rural residential areas and woodlands also occur.

The principle contaminants are nutrients and fecal microbes as dictated by land use. Fecal microbe counts are typically between 500 and 1000 cfu/100 mL, but often spike to >2419 cfu/100 mL. Fecal microbe counts are highest when associated with pastureland and in Dreaming Creek. Nitrate concentrations are typically between 1 and 2 mg/L N-NO₃, but increase to 3–7 mg/L N-NO₃ immediately downstream of sewage treatment plant (STP) outflow. Ammonium concentrations are typically 0 mg/L N-NH₄, but spike to 1 mg/L N-NH₄. Phosphorus concentrations are typically near 0.1 mg/L and are highest immediately below the STP, reaching 0.3–0.4 mg/L P-PO₄. Nitrate and phosphorus behave similarly whereas ammonium concentrations are sporadic. Downstream of the STP, nitrate and phosphate decrease progressively until reaching background levels.

We infer that principle fecal microbe sources are leaking sewage pipes and cattle feces. The STP is definitely a point source for nitrate and phosphate contamination.

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