



WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2004KY45B

Title: Characterizing pollution impacts to urban karst aquifers from artificial and enhanced recharge

Project Type: Research

Focus Categories: Groundwater, Non Point Pollution, Water Quality

Keywords: hydrogeochemistry, storm runoff, lawn chemicals, wastewater

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Non-Federal Matching Funds: \$47,784

Congressional District: KY 6th

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Abstract

Pollution in urban areas has been documented extensively throughout Kentucky, and is one of the top three contributors to impairments of surface streams in the Commonwealth. Well developed karst terrain occurs in 25 percent or more of Kentucky, and many of the largest urban areas are built on karst. Little filtering or degradation of the pollutants occurs before reaching groundwater in karst areas because of the relatively rapid water movement.

Recent research of base flows at karst springs in Kentucky identified an undocumented groundwater effect within the urban areas. When compared with rural karst springs, the springs located in urban areas discharge from two to ten times their predicted base flows. Increased impervious surface in urban areas is known to reduce precipitation infiltration and natural groundwater recharge. However, artificial or enhanced recharge from leaking infrastructure, lawn watering, and other urban activity appears to increase groundwater flow significantly. Typical wastewater and water supply infrastructure has been estimated

to lose from 8% to 60% of its flow to underground leakage, and is likely a major factor in the observed base flow change.

This study proposes to monitor three karst springs in the Bluegrass Region that show the most significant deviation from normal base flow. Monitoring the impacted springs will quantify urban pollution that is reaching the karst aquifer, and help determine the source of groundwater impacts. Russell Cave Spring and McConnell Spring in Lexington, and Big Spring in Versailles are the target monitoring points. McConnell Spring discharges into Wolf Run, a tributary to 303(d) first priority Town Branch. Russell Cave Spring discharges into 303(d) second-priority North Elkhorn Creek, upstream of the backup water intake for the City of Georgetown. Big Spring feeds Glenss Creek, and all three locations eventually flow to the Kentucky River.

Information from the study will be relevant to any location where urban areas overly karst aquifers. The study will provide learning opportunities for Kentucky Geological Survey student interns, and the results can be used to educate residents, businesses and local agencies in best management practices to minimize targeted pollutants, and to identify infrastructure problems.