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# Mysteries of the Underground River

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# Mysteries of the Underground River

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## Abstract

Have you ever heard of a river that flows backwards? Mammoth Cave, the longest cave system in the world, has an underground river exhibiting reverse flow patterns since at least the 1960's and most likely earlier. Beginning in 2009, 7th graders from T.K. Stone Middle School in Elizabethtown, Kentucky have been teaming with WKU researchers to study and conduct research about this phenomenon.

## Introduction

Normally, the underground River Styx discharges into the nearby Green River at the River Styx Spring. When this underground river reverse flows, water from the Green River floods the River Styx.

When first discovered, scientists were using methods to test the flow which produced limited information. Initially, researchers tested chemical characteristics to see if chloride content could be used as a signal of reverse flow patterns.

Eventually, scientists found that water temperature was the best indicator of reverse flow. When in reverse flow, the temperature of River Styx goes outside its normal temperature boundaries due to the influx of water from the Green River.

Scientists have, in fact, studied the temperatures of two underground rivers in Mammoth Cave to find out more about the reverse flow. Adjacent to the River Styx, the Echo River is a fairly consistent 13.5 to 14.5 degrees Celsius, making it a natural control site for monitoring water temperatures during periods of normal and reverse flow in the River Styx.

## Student Research

The T.K. Stone student research team, led by researchers Rick Toomey and Shannon

Trimboli and teachers Susan Ryan and Kim Weber, installed HOBO<sup>®</sup> data loggers in the Green River, the River Styx and the Echo River in October of 2009. Using this updated technology, the data loggers record temperatures every two hours in all three locations.

Since 2009, each spring and fall, current 7th graders from T.K. Stone travel to Mammoth Cave and hike nearly two miles to transfer information from the data loggers to a HOBO<sup>®</sup> shuttle which stores the temperature data until downloaded.

## Think Outside the Cave

Students continue their work back at the school throughout the winter using Microsoft Excel to condense the large amount of data into graphs and charts for further analysis.

The partnership between the school, WKU, and the National Park Service has allowed the students to experience real-life science investigations. Using applied math and science, students analyze their findings and converse with WKU partners regarding their ideas for future investigations in relation to this underground mystery.