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City schools students developing 'bag of tricks' thanks to cave research

By JAKE MOORE jake.moore@bgdailynews.com

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Bowling Green City Schools students, with the help of Crawford Hydrology professor Chris Groves, descend a steep passageway in Great Onyx Cave. Schools students have been researching the cave's waterways for about 10 years. The project is a collaboration between the school district, National Park, WKU and the school district.

Jake Moore jake.moore@bgdailynews.com

Spindly-legged crickets and friendly orange cave salamanders have learned to share their home with a determined group of young researchers from Bowling Green City Schools.

A multi-year partnership between Western Kentucky University, Mammoth Cave National Park and BGISD has given several middle and high schoolers the chance to spend time among the gypsum flowers of Great Onyx Cave, mapping the cavern's waterways to earn valuable research experience.

Chris Groves, professor and director of WKU's Crawford Hydrology Laboratory, said he and Bowling Green High School chemistry teacher Cristen Olson began taking young scientists down into the depths about five years ago.



“In your career, you develop a bag of tricks. The way you get those tricks is by getting experience doing this sort of stuff,” Groves said. “The earlier people start, by the time they get to college or graduate school, they’ll be way ahead of people who don’t have that experience.”

A handful of those experienced students strapped on headlamps and led a group of their teachers down into Great Onyx Cave on Sunday to elucidate the work they’ve been doing.

Chris’ daughter Leah Groves, a BGHS junior, said Great Onyx Cave was chosen as the student’s place of study due to its isolation from pollutants. She said it provided a

natural “control” subject when working with water.

“We’re very deep into the park, so there’s limited sources of contamination and human influence,” Chris Groves said.

Elek Olson, also a BGHS junior, explained that his group placed fluorescent dye into surface water to track how it moves down through the cave, essentially forming a map of its plumbing system.

He explained that a series of dye tracers – little charcoal baggies – are placed in various spots in the cave system to see if they collect any dye.

The tracers are then taken to a lab to be analyzed by a spectrofluorometer, a device that Chris Groves said can detect the dye at levels of “one one-hundredth of one part per billion.”

“That way we can see where the dye went through the cave, if there’s any splits in the water and where the water goes,” Elek Olson said.

The student’s dye work has contributed to some interesting revelations about the national park’s underground web.

Chris Groves said Great Onyx Cave comes within 100 feet of Mammoth Cave, meaning the pair are considered separate entities – but dye tracing done by the students

connected the two caverns through an underwater passage.

“It is the same cave, but by convention in order for it to be considered an entrance to Mammoth Cave, people have to actually go through and make a map of it,” Chris Groves said. “The 100 feet in between the two caves is flooded with water.”

Besides mapping water’s favored routes, the students have also worked to measure its rate of flow.

BGHS junior Kathryn Harris said these measurements were accomplished in two ways: by placing a bucket underneath a cave waterfall and timing how long it took to fill to a certain point, and by pouring diluted salt into a stream to track how the salt concentration changed further along the waterway.

“That’s fundamental,” Chris Groves said. “Let’s say you’re studying pollution. The two things you need to know are how concentrated the (pollution) is and how much flow there is.”

Cristen Olson, Elek’s mother, said she’d next like to get the students involved in researching cave limestone dissolution, a natural occurrence that removes carbon dioxide from the environment.

“If you’re mentioning climate change and the role of CO₂ gas in the atmosphere, this is one of the processes that influences how much CO₂ is in the atmosphere,” Chris

Groves said. “It’s one that’s not been studied very well.”

Elek Olson estimated that the students have spent about 150 hours in Great Onyx Cave alone, taking his first trek inside as a sixth-grader.

Harris, who hopes to build a career in biochemistry, said she has been involved in the project since eighth grade. She was invited to tag along with Leah and Chris Groves on a cave trip and the chance to gain some research experience kept her hooked.

The hard work paid off. The three juniors earned the chance to help represent Kentucky at the American Junior Academy of Science Experience in Washington, D.C., this past spring.

“We got to go to different colleges and museums and learn about different science careers,” Harris said.

Leah Groves added that the students made plenty of connections with professors and researchers thanks to the trip.

Cristen Olsen said she feels like some students think “this kind of research” is unattainable, but science is more about “getting in there, trying it and seeing what happens.”

She said the cave work opens the door of “this is what science is and you can do it,” adding that an alumnus of the program, Clay Kilgore, went on to study geological sciences at WKU and is “doing very well.”

The trio will now have the chance to mentor the next batch of city schools students interested in plunging below the surface.

“I think we’re all very grateful for the experience, whether we go into a STEM career or not,” Harris said. “It’s great that we’ve learned a lot.”