PLAYGROUND WITH A PAST

Sinkhole cleanup addresses decades of dumping

by Larry Archer

Most children growing up in the 1960s felt fortunate if they could spend their backyard playtime swinging on a swing set, digging in a sand box or hiding in a tree house. As a child growing up in rural Laclede County, Doug Goodwin had his own special play area – the family sinkhole.

Located on a small portion of the Goodwin family's 200-plus acre farm in northern Laclede County, the sinkhole offered adventure unlike any tire swing or sandbox.

"It was a kid's playground," said Goodwin.

He soon learned that, unlike most playgrounds, this one had a past. An elderly neighbor provided him with history lessons found in no textbook he had encountered in school.

"When I was a little kid I would sit at her feet and she'd tell stories," he said.

During the Civil War, she would tell him, area residents would take shelter in the cave into which the sinkhole drains in order to avoid the violence that was the Border War between Missouri and Kansas. His parents purchased the property that included the sinkhole in 1954.

"When they first bought the farm, the old-timers said (the cave) went back about a quarter mile," he said. "When Mom and Dad bought it, they said they could walk quite a ways in there."

As he was growing up, entry to the cave was prevented as its historic legacy fell victim to a new legacy – illegal dumping.

Its proximity to Lancaster Road – some sources even refer to the site as the Lancaster Road Sinkhole – made illegal dumping convenient, and the sinkhole and the cave became congested with trash after decades of such abuse.

"My mom always tried to get the dumping stopped and she never could," Goodwin said.

Facing similar frustration, Goodwin reached out to Klaus Leidenfrost of the Missouri Cave & Karst Conservancy, a land trust organized to conserve caves and karst areas in Missouri. Karst areas are known for their caves, springs, sinkholes

More than nine tons of tires have been pulled from the Goodwin Sinkhole since cleanup began in 2012. DNR photo by Jim Vandike

and losing streams caused by the dissolution of subsurface dolomite and limestone over time. The conservancy frequently purchases threatened caves and karst areas, assists landowners with preservation, educates Missourians on cave and karst issues, and, when necessary, coordinates the cleanup of sites like Goodwin Sinkhole.

"Klaus showed me pictures of things they had done before," Goodwin said. The prospect of seeing the site returned to its natural state prompted Goodwin to donate the roughly one-acre site to the conservancy and allow access to it via his property.

In his initial visits to the site, Leidenfrost described it as being identical to a regular landfill, with clothes, car parts, household waste and tires. Lots of tires.

"I counted 400 or 500 tires just on the surface," he said.

The conservancy's cleanup of the site began in early 2012, and according to the organization, by the end of the year volunteers had cleared an estimated 43,760 pounds of trash, more than 9 tons of tires and more than 2,500 pounds of metal.

To facilitate the removal of the surface trash, the department's Solid Waste Management Program arranged, through a settlement case with a landfill company, for the use of roll-off dumpsters and the waiving of hauling and disposal fees for the trash. Through its scrap tire unit, the program also made sure tires removed from the site were properly disposed.

The effort took more than just conservancy members and those with a direct interest in cave preservation. The breadth of involvement – from volunteers to state agencies to equipment operators who donated or discounted their services – has set this project apart from previous sinkhole cleanups that Leidenfrost has coordinated.

"Some of them are cavers," he said.

(Above left) Soldiers from Fort Leonard Wood are among the many volunteers who have contributed hundreds of hours to the cleanup efforts.
Klaus Leidenfrost photo

(Above right) Stormwater runoff flowing through the accumulated trash in Goodwin Sinkhole represents a threat to groundwater quality in the area. Dye tracing at the site has confirmed that water flowing into the sinkhole eventually makes its way to nearby Hahatonka Spring in Camden County.
DNR photo by Jim Vandike

(Left) Klaus Leidenfrost of the Missouri Cave & Karst Conservancy stands atop some of the hundreds of tires that have been removed from the sinkhole since 2012.
DNR photo by Sherri Stone

"We've had Boy Scouts, teachers, soldiers from Fort Wood. It's a mish mash."

Instrumental in this army of volunteers has been the U.S. Army, he said. "Our biggest help lately has been Fort Leonard Wood. We could not do it without them."

In 2012, the first year of the conservancy's efforts at the site, all of the trash above the ground was removed. Still, decades of silt and soil accumulation has buried an unknown amount of additional trash underground.

(Above) Volunteers have worked through the heat of summer and the cold of winter in their attempt to bring the sinkhole back to its original condition. (Right) A relay line of volunteers forms to move materials out of the mouth of the cave into which the sinkhole drains. (Bottom) Heavy equipment is used to remove trash buried by years of silt build-up.

Klaus Leidenfrost photos

"Some places we've dug down 15 feet and we're still finding trash," he said.

The Department of Natural Resources' Environmental Services Program used a hydraulic soil probe to help establish how deep the trash went. The results showed the sinkhole was filled with soil, gravel and trash to depths of more than 30 feet.

According to Leidenfrost, the focus of work in 2013 has been on the buried trash and opening the cave, but spring rains have slowed work, frequently washing sediment back into previously excavated areas.

"When we get a lot of rain it can change everything," he said. "Sometimes the work is undoing what happened since the last time you were there."

Because of the difficulty – and danger – of working in the summer heat, the conser-

vancy took a hiatus from scheduled cleanups during the summer with the intention of resuming the project this fall. In the meantime, Leidenfrost has been working on the effort's biggest challenge – finding additional support for the project.

"It all boils down to dollars," he said. "There's so much material there."

An additional challenge to returning the site to its original condition is the lack of information about the area as it appeared in its original state.

"Nobody knows what it looked like before," Leidenfrost said. "No one can find any photos of it before the dumping."

The sinkhole had become more than just a trash-laden eyesore. It was a threat to local groundwater and to one of Missouri's largest springs, Hahatonka Spring. This beautiful spring, located in Ha Ha Tonka State Park in neighboring Camden County, discharges 50 million gallons of water daily into the Niangua Arm of the Lake of the Ozarks, making it the state's 12th largest spring.

Stormwater runoff from nearly 100 surrounding acres drains into Goodwin Sinkhole. Dye tracing conducted by the Department of Natural Resources' Geological Survey Program in 1980 established that drainage into the sinkhole flows directly to Hahatonka Spring, which is approximately 11 miles northwest of the depression.

For decades, that stormwater runoff filtered through the pollutants found in the sinkhole before the then-contaminated groundwater headed to the spring. A similar dye trace in 2009 confirmed that the drainage to the spring had not changed.

In all, the trash in the sinkhole represented a multi-media environmental concern, involving solid waste, water pollution and impairment of the ability of Hahatonka Spring to recharge.

"It was a combination of a solid waste dump; obstruction of a natural sinkhole and karst feature by trash, soil and gravel; and inhibition of the recharge," according to Tim Rielly, restoration and assessment manager with the department's natural resource damages unit. "It had all the effects of a small-scale landfill."

The department's Water Pollution Program also awarded a $10,000 grant to the Meramec Regional Planning Commission, which used the money to aid in the cleanup. The fund from which the grant was given is dedicated to addressing water pollution related to stormwater runoff.

More than the spring is at risk to pollution entering the groundwater through Goodwin Sinkhole and other karst features like it, Goodwin noted. Drinking water wells located in a wide radius of pollution are also a concern, he said.

"We learned a long time ago that we drink whatever we dump," he said.

Find out more about the Missouri Caves & Karst Conservancy at mocavesandkarst.org/.

Larry Archer is the division information officer for the department's Division of Environmental Quality.

Environmental specialists from the Department of Natural Resources' Environmental Services Program were able to determine the depth of the trash in the sinkhole by taking samples with a hydraulic soil probe.
DNR photo by Scott Myers

Create a Sinkhole Map

Staff geologists provide assistance to citizens by evaluating the causes and impacts of sinkhole formation and collapse. They also maintain a database of sinkholes that are documented or are found on U.S. Geological Survey topographic maps. You can create a map showing known sinkholes and learn more about sinkhole formation and mitigation –

go to dnr.mo.gov/geology/geosrv/envgeo/sinkholes.htm.