

Environment

By Steve Cronin

What's Going on with Cemetery Groundwater?

Scientists know what goes into the ground frequently winds up in our water. What they don't know is how the equation plays out in cemeteries.

Now, some hydrologists in Michigan are turning their attention to that question. They're conducting a scientific survey in order to get answers.

What they find could change the way we manage cemeteries and their relationship to the environment.

"We spend a lot of our careers looking at water quality and potential sources of contamination. You think about why landfills are regulated and why aren't cemeteries regulated. What is the impact?" said Angela Brennan, a hydrologist with

the United States Geological Survey in Lansing, Michigan.

Brennan, fellow USGS hydrologist Julia Giesen and microbiologist Carrie E. Givens are involved in the study. The USGS has no regulatory authority, so whatever it finds will not automatically lead to new regulation. However, if the survey does discover problems, the USGS would provide the information to state and federal policymakers.

That should not be cause for those in the cemetery industry to worry, the researchers said.

"We get a lot of 'So, what if you find something?'" Brennan said. "There are things they can do – simple things like minimizing irrigation or planting trees or plants with deep roots that uptake contaminants."

It's unlikely there will be regulations requiring sweeping changes at developed portions of cemeteries. But newly developed cemeteries and cemetery sections could be required to take more comprehensive steps to prevent groundwater contamination, the hydrologists said.

That cemeteries have an impact on groundwater quality has long been known. Contamination from the Haworth Cemetery in Yorkshire, England, was blamed for the unusually short lifespan of town residents during Victorian times. In 2015, Smithsonian magazine warned in the article "Arsenic and Old Graves" that homeowners living near Civil War-era cemeteries "should watch out for toxins leaking out of old graves that could be contaminating drinking water and causing serious health problems."

There have been studies of cemeteries and their effects on groundwater. Most of these have been conducted in the United Kingdom, Australia and Canada, including "Assessing the Groundwater Pollution Potential of Cemetery Developments," published by the British Environment Agency in April 2004.

But there has been little study in the United States. What has been done has focused on a local or regional basis, Brennan said.

"We started digging into it a little bit. I think there is a different atmosphere in the U.S., sort of a social stigma attached to doing that kind of work in a cemetery," she said. "There had been some work done by universities here and there, but not a full-blown study."

Their preliminary work convinced the hydrologists the topic was worth examining. This preliminary research began in November 2015 as part of a larger groundwater study in Aurelius Township, Michigan. Sampling was conducted at three small rural cemeteries. Each is still active, and each conducts an average of three burials per year.

Samples were screened for arsenic, formaldehyde, nutrients and bacterial pathogens.

The sampling found elevated nutrient concentrations along with microbial data at two of the cemeteries, indicating human decomposition might be affecting the

groundwater. Fecal coliform, staphylococcus, salmonella growth and other bacteria found in the groundwater at two of the cemeteries "also support the theory that there is a potential human health threat caused by cemetery leachate to groundwater," the hydrologists wrote. "Further analysis is needed to better understand the human health threat associated with pathogens and antibiotic resistant bacteria in cemetery leachate."

"The data collected from this study indicate that even the small, less-active cemeteries may have an impact on groundwater quality, bringing to question what the pollution potential may be from the larger, more active cemeteries," the hydrologists wrote in their analysis of the work.

"The data collected from this study indicate that even the small, less-active cemeteries may have an impact on groundwater quality, bringing to question what the pollution potential may be from the larger, more active cemeteries."

The hydrologists are now planning a larger study. The study would be conducted at a larger, active cemetery with a year of groundwater monitoring that would include three monitoring wells and a test well. The researchers would like to expand the project beyond Michigan to see if results elsewhere are the same.

"The idea of the study is to make it more regional," Giesen said. "The idea would be to be able to expand the study to other regions, to see if they are comparable and applicable to one another."

"If we do find something here,

would it be enough to cause concern in other areas?" Brennan asked.

If the project is approved by the USGS, the hydrologists expect it to take about a year to collect the data and another year before they publish a report on their work.

And even if the study does detect problems, any solutions would be the purview of other agencies.

In addition to limiting irrigation and requiring deep-rooted plantings, regulations could involve creating buffer zones between cemeteries and populated areas, regulating the depth of burials or the location of new cemeteries in areas with high groundwater tables, or regulating materials used in embalming fluid and casket construction.

"In the future, cemeteries may be considered as potential point sources of pollutants with regulations in place to address the potential for contamination, much like landfills are regulated today," the hydrologists wrote.

And while the idea of changes in operations might not be welcome by those in the cemetery and funeral business, the hydrologists say the sooner the potential problems are identified, and solutions put into place, the better for everyone.

"It's tough to say, 'This could cost you,' but if you don't do anything, it might cost you, also," Giesen said. •