Cleaning up polluting contaminants takes longer than thought: researcher

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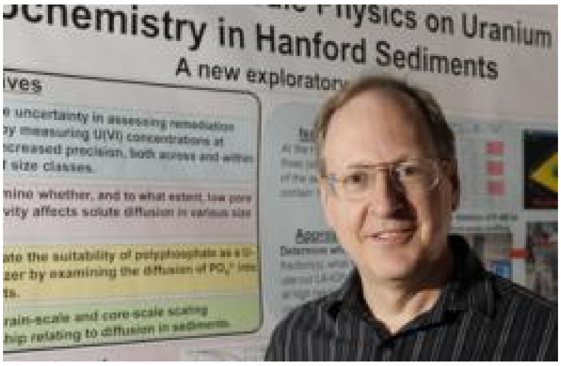

Robert Ewing has been working with soil around the Department of Energy's Pacific Northwest National Laboratory, formerly called the Hanford Site, near Richland, Wash., that was part of the United States' effort to produce plutonium during the Cold War. ISU photo by Bob Elbert

(PhysOrg.com) -- An Iowa State University researcher has discovered why theories and timetables established to predict how long it takes for a contaminated site to be free of pollution are overly optimistic.

For years, scientists trying to predict how long contaminated soils and rocks will stay polluted have been using flawed preconceptions and formulas about the process, according to a new study that shows that the rates vary according to how porous and connected the rocks are.

ISU researcher Robert Ewing has been working with soil around the Department of Energy's Pacific Northwest National Laboratory, formerly called the Hanford Site, near Richland, Wash., that was part of the United States' effort to produce plutonium during the Cold War.

Radioactive waste stored in huge tanks on the site leaked large quantities of uranium into the surrounding soil and rock.

Now, as scientists try to determine how soon the site will be free of contaminants, they have been overestimating how quickly the contaminants will move into the nearby Columbia River.

Ewing explains that, for years, uranium contamination diffused into microscope pores inside the rocks. In order for the site to be free from contamination, the uranium must first diffuse back out of the rocks.

"Once you remove the source of the problem (the polluting uranium), the contaminant moves back out of the rock slowly," said Ewing. "The problem is, how do you describe that slow release?"

The key to the answer is the small holes or pores in the rocks. Depending on how porous the rocks are, and how connected those pores are, the rate at which solutions diffuse out of a rock is predictable, he says.

As contaminants inside a rock begin to leach back out, they can take a long, winding journey through the pores.

Imagine an ant that has wandered into a maze. It goes into the labyrinth quickly and easily.

Coming out, however, it could take hours or days blindly exploring different passageways until it finally, luckily, discovers a way out.

Pollutants inside the rocks at the Hanford site take similar routes out of the rocks and soil they are contaminating.

"Something trying to diffuse out [of the rock] could take decades running into a dead end, and down another dead end, and another, and so forth," he said.

And while the rate at which it leaves the rock seems random, it is predictable.

Ewing's findings are currently published in the journal *Water Resources Research*.

Prior to Ewing's research, environmentalists had not been able to accurately predict the diffusion rate out of rocks.

"Before this research, we were getting results that weren't making sense. We've been scratching our heads about this for 30 or 40 years," said Ewing. "This is an enormous step forward."

The key to understanding the rate of diffusion was when Ewing realized that the distance the contaminant had to travel could vary so greatly, even though it didn't penetrate the rock very far.

"The pathways out of the rock get really weird. You figure that it could come out slower [than it went in]. But it actually comes out even slower than that," Ewing said.

Using the new formula, Ewing hopes that future estimates on how quickly contaminated sites can be free of problems will be more accurate.

Ewing says the formula devised for Hanford would apply to other contaminants at many other sites.

Provided by Iowa State University
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