UI engineers conduct residential soils study, one of few such US studies ever done

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University of Iowa engineers have published their findings from a study of residential soils in the city of Cedar Rapids, making it one of only a few such U.S. urban soil studies ever conducted.

The authors of the study, published in the November online edition of the journal Environmental Pollution, collected soils in the residential areas of downtown Cedar Rapids and analyzed them for industrial pollutants known as PCBs (polychlorinated biphyenyls) and chlordanes. Measured values for both chemical groups were found to be similar to other urban/industrial sites around the world. Also, measured values were found to be of the same order of magnitude as the provisional threshold recommended by the U.S. EPA to perform soil remediation.

Project principal investigator Keri Hornbuckle, UI professor of civil and environmental engineering and researcher at IIHR-Hydroscience and Engineering, says that soil often stores residual amounts of persistent organic pollutants such as PCBs and chlordanes and -- because children and others can be be exposed on a regular basis -- contaminated soil may be a source of concern.

Hornbuckle notes that her study is somewhat unique because the few existing reports of chlordanes or PCBs in U.S. soil samples concern remote, unpopulated areas. In researching similar studies, she found only one study reporting chlordanes and two reporting PCBs for U.S. urban-residential soil concentrations. She adds that her study was aided by the fact that she grew up in Cedar Rapids and that several former Cedar

Rapids teachers -- who were very familiar with the city -- assisted the team while sampling was being conducted.

During the historic floods of 2008, flooding of the Cedar River exceeded the historical record of flood discharge in Cedar Rapids and affected a large portion of residential, commercial, and industrial land in the city, including Cedar Lake. Having an average depth of less than four feet, Cedar Lake was long used as a cooling lake for the Sixth Street Generating Station and is contaminated with chlordanes and PCBs. It remains unknown whether the 2008 flooding caused any redistribution of those pollutants in the city, says Hornbuckle.

The UI study technique involved collecting 66 soil samples near Cedar Rapids streets on August 25, 2008 -- about 70 days after the flood. About 94 percent of the sampling sites were located inside the estimated flood area, and researchers concentrated on sampling sites south of Cedar Lake and west of the Cedar River. The total sampling area covered almost 4 square miles. Each sample involved collecting approximately 2 pounds of soil from a 5-inch-deep site using a trowel. The soil samples were placed in labeled, plastic Ziplock freezer bags and brought to the UI, where they were refrigerated prior to being analyzed -- using gas chromatography, mass spectrometry for chlordanes, and tandem mass spectrometry for PCBs.

Hornbuckle says that residents of Cedar Rapids and other cities should know that these chemicals are widely present in urban soils. She adds that we don't know the source of the PCBs found in Cedar Rapids soils, but that chlordane is probably present because homeowners used the insecticide to kill termites and that the original contamination probably occurred more than 30 years ago.

"Both these chemicals are now banned from production and sale, but are still in our environment because they are nearly nonbiodegradable," she

says. "It is my opinion that we should not use chemicals that are so persistent in any household activity, but it is difficult for the average homeowner to know how to judge this. This data is not, but should be, provided on the containers of all the products we purchase."

Manufactured from about 1930 until being banned in the 1970s due to their toxicity and persistence in the environment, PCBs were widely used as coolants, in electrical transformers and in a wide variety of products ranging from waterproofing compounds to paints and pesticides. Chlordanes were used to control termites in buildings and as insecticides on lawns and gardens, as well as on corn and other crops, before the EPA banned their use in 1988.

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