

Small Mammal Bioaccumulation of Contaminants and Radioactivity near a Mixed Low-level Radioactive and Hazardous Chemical Waste Site —Science to Understand Wildlife Exposure to Environmental Contaminants



Pilot-study results document the presence, concentrations, and distribution of polyfluoroalkyl substances (PFASs), polychlorinated biphenyls (PCBs), and tritium in small mammals, insects, plants, and soils adjacent to a mixed low-level radioactive and hazardous chemical waste site near Beatty, Nevada, and provide a better understanding of potential exposure pathways.

Previous U.S. Geological Survey (USGS) [research](#) at a waste-disposal site in the Amargosa Desert near Beatty, Nevada, documented the pathways of contaminant movement from a commercial site designed to contain mixed radioactive and hazardous chemical wastes. The researchers documented that [radioactive isotopes](#) and chemical wastes such as [mercury](#) and [volatile organic compounds](#) migrated into the surrounding sediment and moved within and away from the disposal site. However, little information exists to understand exposure or effects for resident wildlife near the site.

In order to fill this information gap, USGS and Texas Tech University scientists initiated a pilot study to determine contaminant uptake and accumulation by small resident rodents, plants, and insects to understand bioaccumulation in the local food-web. Sampling locations were selected based on previously established contaminant plume locations and gradients surrounding the site.



Study location at the Amargosa Desert Research Site near Beatty, Nevada (Credit: Michael Barrencea. Public domain.).

Samples were analyzed for tritium, PCBs, and PFASs using methods newly developed at Texas Tech University. These methods provide the precision and sensitivity needed to support field-study objectives given inherent challenges, which include increased data variability when measuring plant and animal tissues relative to other matrices (water, soil, or sediment).

Overall, the pilot-study results indicate the presence of measured contaminants in the ecosystem surrounding the waste site. Small mammals had PFASs, PCBs, and tritium present in their tissues. The primary contaminants found in soil samples were PCBs, and trace amounts of PFASs were detected in soils, insects, and vegetation.



Photo of a kangaroo rat, which was one of the small mammal species trapped during the present study to

Brian Andraski

Research Hydrologist

Nevada Water Science
Center

Email: andraski@usgs.gov

Phone: 775-887-7636

Todd Anderson

**Professor, Department of
Environmental
Toxicology**

Texas Tech University

Email:

todd.anderson@ttu.edu

Phone: 806-834-1587

Although this pilot study did not include a detailed investigation of transport and exposure pathways, a preliminary evaluation was completed that compares previously published transport-study results with new data for contaminant concentrations in small mammals, insects, and vegetation. Results of this comparison indicate that the PFASs source-to-receptor pathway includes subsurface transport, uptake by plants

understand contaminant bioaccumulation by resident biota near a mixed radioactive and hazardous chemical waste disposal site. (Credit: Robert Klinger, USGS Western Ecological Research Center).

and insects, and subsequent consumption and accumulation in small mammals. Ultimately, these pilot-study findings provide the foundation to understand

exposure scenarios that include transport, exposure, uptake, and animal-health effects in an arid environment.

The USGS Water and Wastewater Infrastructure Science Team continues to study the effects of environmental contaminants on wildlife. The results of this study were designed to help resource managers and waste-management professionals better understand potential environmental-health concerns for resident wildlife exposed to mixed contaminants, including PFASs, from low-level radioactive and mixed-waste burial sites.

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