

## Western Ecological Research Center

# Publication Brief for Resource Managers

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## Effects of TCE and PCE on Burrowing Animals at Edwards Air Force Base

Ecological risk assessment often requires extrapolation of contaminant effects from laboratory experimentation to the field. Field validation of natural environments is necessary to assess whether contaminants adversely affect wildlife populations. Contaminant exposure may compromise an animal's physical condition and ultimately cause population changes such as decreased reproduction or increased susceptibility to disease or predation. USGS scientist Dr. A. Keith Miles and biologist Sarah Spring conducted a field validation study on the effects of volatile organic compounds on desert wildlife at Edwards Air Force Base (EAFB), California as part of an ecological risk assessment for the Base. Results of this study are published in the September issue of *Environmental Toxicology and Chemistry*.

The objectives were to determine the effects of inhalation of the most prevalent volatile organic compounds at EAFB, trichloroethylene (TCE) and perchloroethylene or tetrachloroethylene (PCE), on the health and dynamics of wild rodents (kangaroo rats and deer mice) and reptiles (side-blotched lizards) living above contaminated groundwater at EAFB. The scientists measured organic soil vapor concentrations at three sites with aquifers containing large plumes of TCE or PCE contamination (5–77 ppm) and two reference sites (i.e., free of TCE, PCE). They compared small-mammal population estimates and small-mammal and reptile histopathology between sites to determine if indicators of ecological health and population dynamics were affected by chronic inhalation of TCE or PCE. Hematology evaluation, blood chemistry, and pathological examination of tissues from 57 small mammals and 29 side-blotched lizards were performed by the University of California Comparative Pathology Laboratory. Liver, lung, spleen, kidney, brain, pancreas, heart, thyroid, and

### Management Implications:

- Environmental levels of TCE and PCE in groundwater were highest at Edwards Air Force Base than reported elsewhere in the United States.
- No discernible effects were detected in pathology of wild rodents and reptiles or population estimates of wild rodents studied.
- This study provides a baseline for ecological risk assessment of the effects of TCE or PCE inhalation on burrowing animals in a natural environment.
- This study corroborated past studies on laboratory-reared rodents at the levels of TCE and PCE detected.

gonads were analyzed for lesions, cell necrosis, tumors, and evidence of carcinogenicity.

Soil gas concentrations of TCE and PCE were below levels observed to cause adverse effects in laboratory animals. Population estimates were similar at target and reference sites. Rodent blood indices did not reveal evidence of exposure. Pathology lesions observed were incidental, commonly found in wild or older animals, and not indicative of exposure to contaminants. These results of similar population abundance among sites and a paucity of pathological evidence suggest that lower and subsequently higher food web organisms probably were not affected by the presence of TCE or PCE in groundwater at EAFB.

*S. E. Spring, A. K. Miles, and M. J. Anderson. 2004. Effects of trichloroethylene and perchloroethylene on wild rodents at Edwards Air Force Base, California, USA. Environmental Toxicology and Chemistry 23(9):2162–2169.*