

Concentration of Actinides in Plant Mounds at Safety Test Nuclear Sites in Nevada. Shafer, David S., Division of Hydrologic Sciences, Desert Research Institute, Las Vegas, NV; and Jenna Gommes, Department of Environmental and Resource Sciences, University of Nevada, Reno.

Plant mounds or blow-sand mounds are accumulations of soil particles and plant debris around large shrubs and are common features in deserts in the southwestern United States. Believed to be an important factor in their formation, the shrubs create surface roughness that causes wind-suspended particles to be deposited and resist further suspension. Shrub mounds occur in some plant communities on the Nevada Test Site, the Nevada Test and Training Range (NTTR), and Tonopah Test Range (TTR), including areas of surface soil contamination from past nuclear testing.

In the 1970s as part of early studies to understand properties of actinides in the environment, the Nevada Applied Ecology Group (NAEG) examined the accumulation of isotopes of Pu, ^{241}Am , and U in plant mounds at safety test sites. The NAEG studies found concentrations of these contaminants to be greater in shrub mounds than in the surrounding areas of desert pavement. For example, at Project 57 on the NTTR, it was estimated that 15 percent of the radionuclide inventory of the site was associated with shrub mounds, which accounted for 17 percent of the surface area of the site, a ratio of inventory to area of 0.85. At Clean Slate III at the TTR, 29 percent of the inventory was associated with approximately 32 percent of the site covered by shrub mounds, a ratio of 0.91. While the total inventory of radionuclides in intershrub areas was greater, the ratio of radionuclide inventory to area was 0.40 and 0.38, respectively, at the two sites. The comparison between the shrub mounds and adjacent desert pavement areas was made for only the top 5 cm since radionuclides at safety test sites are concentrated in the top 5 cm of intershrub areas. Not accounting for radionuclides associated with the shrub mounds would cause the inventory of contaminants and potential exposure to be underestimated.

As part of its Environmental Restoration Soils Subproject, the U.S. Department of Energy (DOE), National Nuclear Security Administration Nevada Site Office has proposed that the majority of its contaminated soil “Corrective Action Units,” including the safety test sites, be closed by fencing and posting with administrative controls. The concentration of actinides in the shrub mounds has important implications for post-closure management of the safety test sites. Because resuspension factors at safety test sites can be three to four orders-of-magnitude higher than soil sites associated with atmospheric tests where criticality occurred, the shrub mounds are an important factor in stabilization of actinide contaminants. Loss of shrubs associated with mounds from fire or plant die-back from drought could cause radionuclides at these sites to become more prone to suspension and water erosion until the sites are stabilized. Alternatively, although shrub mounds are usually composed of predominantly fine sand size particles, smaller silt and clay size particles in them are often high in CaCO_3 content. The CaCO_3 may act as a cementing agent to limit erosion of the shrub mounds even if the vegetation cover is temporarily lost.