Abstract


Title: Distribution of naturally occurring soil radionuclides and radon potential of southwest Oregon.

Naturally occurring uranium and thorium in rocks and soil, through a series of radioactive decays, produce radon gas, the second leading cause of pulmonary cancer. Soil samples from 143 B-horizons from the main geologic units in southwest Oregon were analyzed using gamma spectroscopy to quantify the activities of five soil radionuclides. The mean and range values in Bq/kg for Ac$^{228}$, Cs$^{137}$, K$^{40}$, Th$^{232}$, and Bi$^{214}$ (decay product of radon) are 17.4 (4.0 to 48.3), 5.1 (0.7 to 37.3), 303.7 (18.0 to 719.7), 14.2 (1.7 to 41.6), and 19.8 (2.9 to 51.3) respectively.

Bi$^{214}$ activity of B-horizon soil samples is used to define three radon potential zones, Low 1 (less than 25 Bq/kg), Low 2 (25 to 45 Bq/kg), and Moderate (greater than 45 Bq/kg). 73% of the Bi$^{214}$ values fall within Low 1 zone, 24% fall within Low 2 zone, and 3% fall within Moderate zone. Based on soil radionuclide concentrations, southwest Oregon is not considered to be a high potential area for radon.
Percent map areas for Low 1, Low 2, and Moderate radon potentials for the study area are 62%, 32%, and 6% respectively. The highest radon potential is found in the Coast Range where most sites are Low 2 and Moderate potential. The Coastal Plain region has the lowest potential and is mapped mostly as Low 1 radon potential. The Cascade Range, Basin and Range, and High Lava Plains regions contain Low 1 and Low 2 radon potentials. The Klamath Mountains region contains a mix of all three radon potential areas. The formations with Moderate radon potentials are Ty (Yamhill Formation) and Jss (Jurassic black to gray shale, mudstone and sandstone) and are found mainly in the Coast Range.

The Th\textsuperscript{232}/K\textsuperscript{40} ratio and Buntley-Westin color index of the soils both generally increase with soil development. Soils developed on sedimentary formations generally have a higher range in naturally occurring radionuclide values than those developed on igneous formations. Soils developed on felsic rocks tend to have higher Bi\textsuperscript{214} values than those derived from mafic rocks. The Basin and Range region has the lowest range in soil radionuclide activities.