

Kim, J., Young, P., and Peterson, N., 2019, Bedrock zones in Vermont and radon in air test points and statistics, Vermont Geological Survey Open File Report VG2019-2. Text plus 2 map plates.

Radon is a colorless, odorless, and tasteless gas that forms naturally from the radioactive decay of uranium in rocks, surficial materials, and soils over millions of years. After formation, radon can move through fractures and layering in rocks or through connected pores in surficial materials and soils and enter a home through the foundation. Exposure to radon in indoor air is estimated by the Environmental Protection Agency (EPA) to be the second leading cause of lung cancer, with smoking being the first (e.g. <http://www.healthvermont.gov/radon>; <https://www.epa.gov/radon>). The action level for radon in indoor air is 4 picocuries/ liter and was set by the EPA. For more specific information on the health aspects of radon and mitigation strategies, see the Vermont Department of health at <http://www.healthvermont.gov/radon> or EPA at <https://www.epa.gov/radon>.

For decades, the Vermont Department of Health (VDH) has collected and collated radon in indoor data from all over Vermont. Since 2009, the Vermont Geological Survey (VGS) and (VDH) have collaborated to understand the relationship between radon levels in indoor air and geology. The maps in VGS Open File Report VG2019-2 are the first attempt to publish the radon and geology connections and is entitled “Bedrock Zones in Vermont and Radon-in-Air Tests”. Although these maps give a general indication of the bedrock zones that have higher radon levels, everyone should test the indoor air in their home(s) for radon. Further radon and geology maps are planned by VGS and VDH.

The bedrock geologic map of Vermont by Ratcliffe et al. (2011) is complex and contains hundreds of rock formations. To simplify the bedrock map, we grouped the formations into bedrock zones, which represent rocks of similar age and geologic history (e.g. Kim et al., 2011, 2015); the zones were then joined with the radon data in GIS. The VDH radon-in-air data set contains 14,131 tests. Plate 1 is entitled “Map of Bedrock Zones and Radon-in-Air Test Point Locations and Statistics” and shows the extent of bedrock zones, the locations of all radon tests, and has a table that shows radon statistics for all bedrock zones. The table shows detailed statistics for all tests and for each bedrock belt, which include average, median, high, and low radon levels. In addition, statistics are shown for percentage of tests that: A) equal or exceed 4 picocuries/liter, B) are between 0 – 2 picocuries/liter, C) are between 2-4 picocuries/liter, D) are between 4-10 picocuries/liter, E) are between 10-20 picocuries/liter, and F) are greater than 20 picocuries/liter.

Plate 2 which is entitled “Percentage of elevated Radon-in-Air Tests by Bedrock Zone Map and Statistics” shades the bedrock zones according to the percentage of tests that equal or exceed 4 picocuries/liter and has the same table as Plate 1. The percentage categories are arbitrary and divide the percentage range of elevated tests into five groups, with one group representing the bedrock zone that had less than 10 radon tests (n=1). A simple description of this map is that the Precambrian basement, Green Mountain, and Champlain valley zones cluster

around the statewide elevated radon average of 13%, whereas the Taconic, Connecticut Valley, and Devonian Granites zones have higher percentages of elevated tests and the Bronson Hill Zone has a lower percentage of elevated tests.