



FACT SHEET – May 2006

Elevated Radon in Groundwater Drinking Supplies in the Piedmont and Mountains of Western North Carolina, 2005

High levels of carcinogenic radionuclides – most notably radon - naturally occur in ground water drinking supplies in the Blue Ridge and Piedmont Provinces of Western North Carolina. This is problematic because about half of the residents in the region rely on groundwater as their principle potable supply. Further, eight counties in NC - all in Western NC – are classified as EPA Zone 1 counties, with predicted average indoor radon concentrations above the EPA action level of 4 picocuries per liter (pCi/L) (figure 1). The main source of these radionuclides is uranium rich rock – including granites and gneisses – prevalent across much of the region.

Groundwater samples collected by the NC Division of Water Quality from 103 private wells within Buncombe, Henderson, and Transylvania Counties contained high levels of radon (maximum = 45,600 pCi/L and median = 6060 pCi/L) (figure 2, table1). Ninety-eight percent of wells exceeded the U.S. Environmental Protection Agency’s (EPA) proposed maximum contaminant level (MCL) of 300 pCi/L, and 64 percent exceeded the EPA proposed alternate MCL of 4000 pCi/L. Uranium and gross alpha activity exceeded EPA’s MCL in about 3 percent of wells (maximum = 63 micrograms per liter and 56 pCi/L, respectively). Radium-226, radium-224, and radium-223 concentrations were relatively low in all sampled wells (less than 1.4 pCi/L). MCLs are the criteria used to help ensure that drinking water does not pose short- or long-term health risks. Although MCLs do not apply specifically to *domestic* wells, the standards often are used as guidelines in determining potential health risks associated with consuming water from private wells.

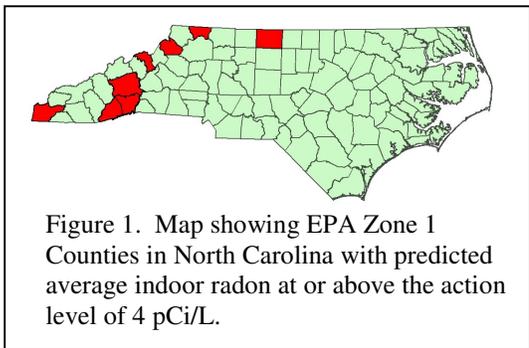


Figure 1. Map showing EPA Zone 1 Counties in North Carolina with predicted average indoor radon at or above the action level of 4 pCi/L.

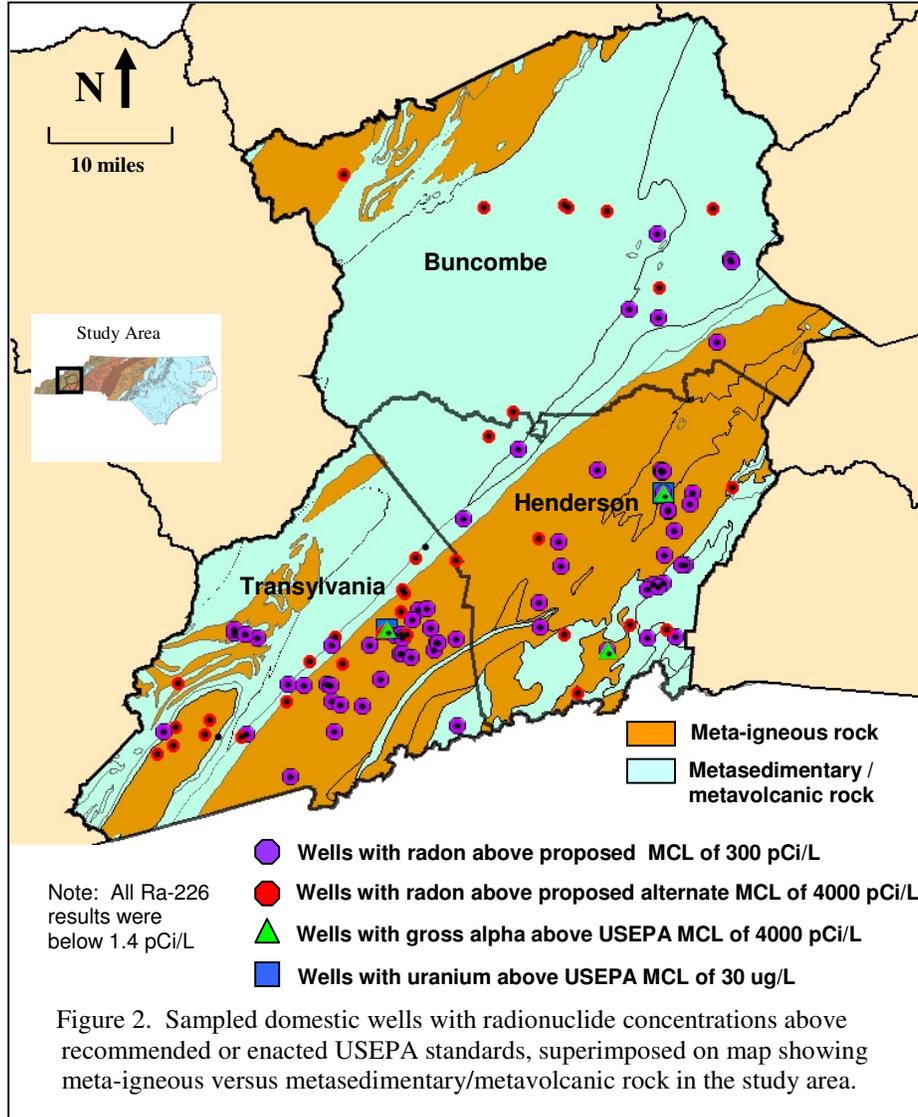
Table 1. Summarized results from private wells in Buncombe, Henderson, and Transylvania Counties that were sampled during 2005 radionuclide study.

Radionuclide	No. of samples	Maximum value	Minimum value	Median value	USEPA Standard	No. exceeding standard
Radon, in pCi/L.....	103	45600	109	6060	300 / 4000*	101
Uranium, in ug/L.....	102	63.3	0.00	<1	30	2
Radium-226, in pCi/L....	102	1.4	0.00	0.096	5**	0
Radium-224, in pCi/L....	33	0.17	0.0011	0.021	--	--
Radium-223, in pCi/L....	32	0.03	0.0000	0.001	--	--
Gross Alpha, in pCi/L...	102	56.2	0.00	0.989	15	3
Indoor radon, in pCi/L...	67	22.8	0.3	2.700	4	23

* recommended

** combined value with Ra228

Radon was significantly higher in wells in meta-igneous rock (average = 9800 pCi/L; maximum = 45,600 pCi/L) than in metasedimentary and metavolcanic rock (average = 4300 pCi/L; maximum = 10,700 pCi/L) (figure 2). Indoor radon ranged from 0.3 to 22.8 pCi/L, with average and median values of 3.8 and 2.7 pCi/L, respectively.



The amount of health risk that results from exposure to water high in radon is still under debate, and the recommended MCL has not been finalized. This study suggests that a significant percentage of private wells in the region may contain water with elevated radon levels. This study, made possible by a grant from the NC Radiation Protection Section and the US EPA, begins to address these critical issues. Additional sampling and analysis will be conducted in 2006. For additional information call or write to: Ted Campbell, N.C. Division of Water Quality, Aquifer Protection Section, Asheville Regional Office, 2090 Highway 70 Swannanoa, NC 28778, 828-296-4683.