

SOIL MOISTURE AND RADON GAS

Bliss L. Tracy
Radiation Protection Bureau
Health Canada

CGEO Workshop on Soil Moisture
Saskatoon SK
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*Radiation Surveillance and Health Assessment Division /
Division de la surveillance du rayonnement et des évaluations de santé*





Outline

- **What is radon?**
- **Where does it come from?**
- **Why is it considered hazardous?**
- **How can soil moisture data help us to understand occurrences of radon?**

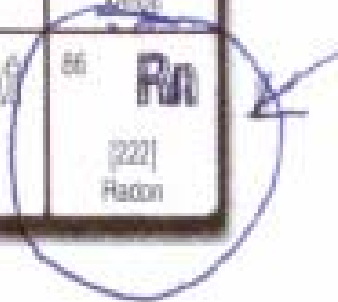


Table of the Elements

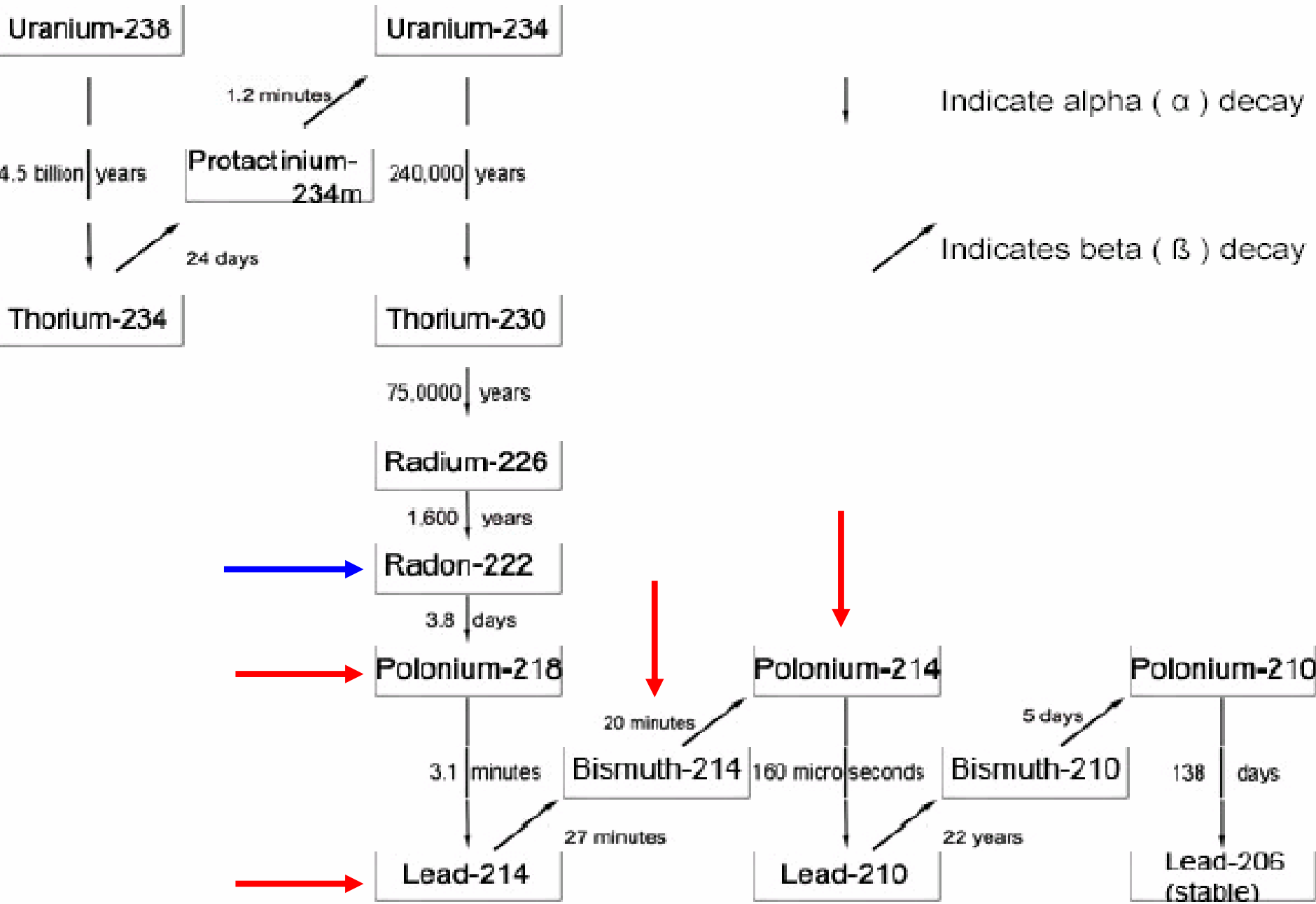
-  Alkali metals
-  Alkaline earth metals
-  Transition metals
-  Other metals
-  Noble gases

-  Halogens
 -  Other non-metals
 -  Lanthanides
 -  Actinides
- Symbol in white: element has no stable nuclides*

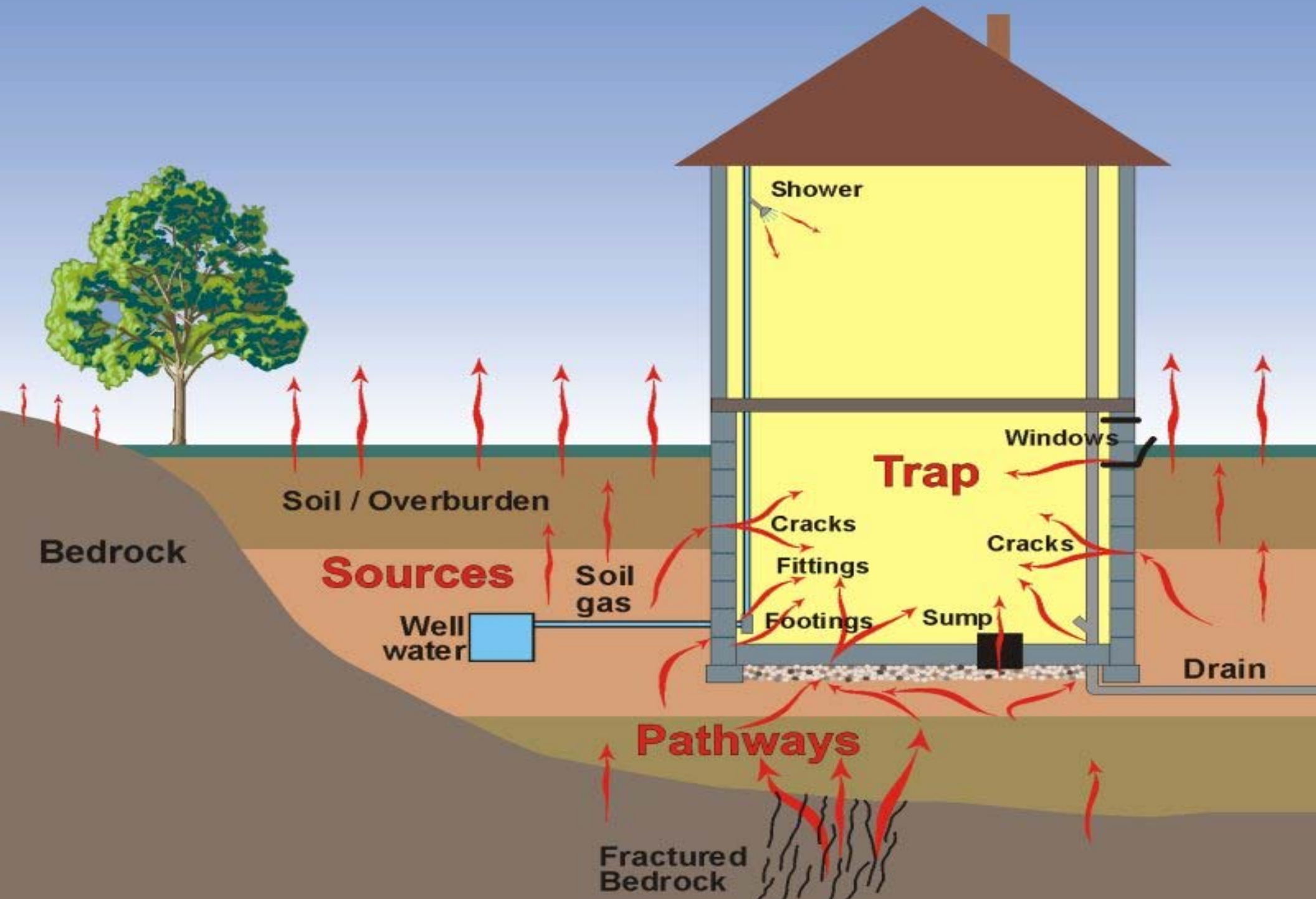
										3A	4A	5A	6A	7A	8A					
										5	6	7	8	9	10					
										B	C	N	O	F	Ne					
										10.811 Boron	12.0107 Carbon	14.0067 Nitrogen	15.9994 Oxygen	18.9984 Fluorine	20.1797 Neon					
										13	14	15	16	17	18					
										Al	Si	P	S	Cl	Ar					
										26.9815 Aluminum	28.0855 Silicon	30.9738 Phosphorus	32.065 Sulfur	35.453 Chlorine	39.948 Argon					
										28	29	30	31	32	33	34	35	36		
										Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
										55.845 Iron	58.9332 Cobalt	58.9334 Nickel	63.546 Copper	65.409 Zinc	69.723 Gallium	72.64 Germanium	74.9215 Arsenic	78.96 Selenium	79.904 Bromine	83.796 Krypton
										44	45	46	47	48	49	50	51	52	53	54
										Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
										101.07 Ruthenium	102.9055 Rhodium	106.42 Palladium	107.8682 Silver	112.411 Cadmium	114.818 Indium	118.710 Tin	121.760 Antimony	127.60 Tellurium	126.9045 Iodine	131.293 Xenon
										76	77	78	79	80	81	82	83	84	85	86
										Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
										190.23 Osmium	192.217 Iridium	195.078 Platinum	196.96655 Gold	200.59 Mercury	204.383 Thallium	207.2 Lead	208.9804 Bismuth	[209] Polonium	[210] Astatine	[222] Radon
										108	109	110	111	112			114			
										Hs	Mt	Ds	Uu	Uub			Uuq			
										[277] Hassium	[268] Meitnerium	[281] Darmstadtium	[272] Ununium	[285] Unbibium			[289] Ununquadium			



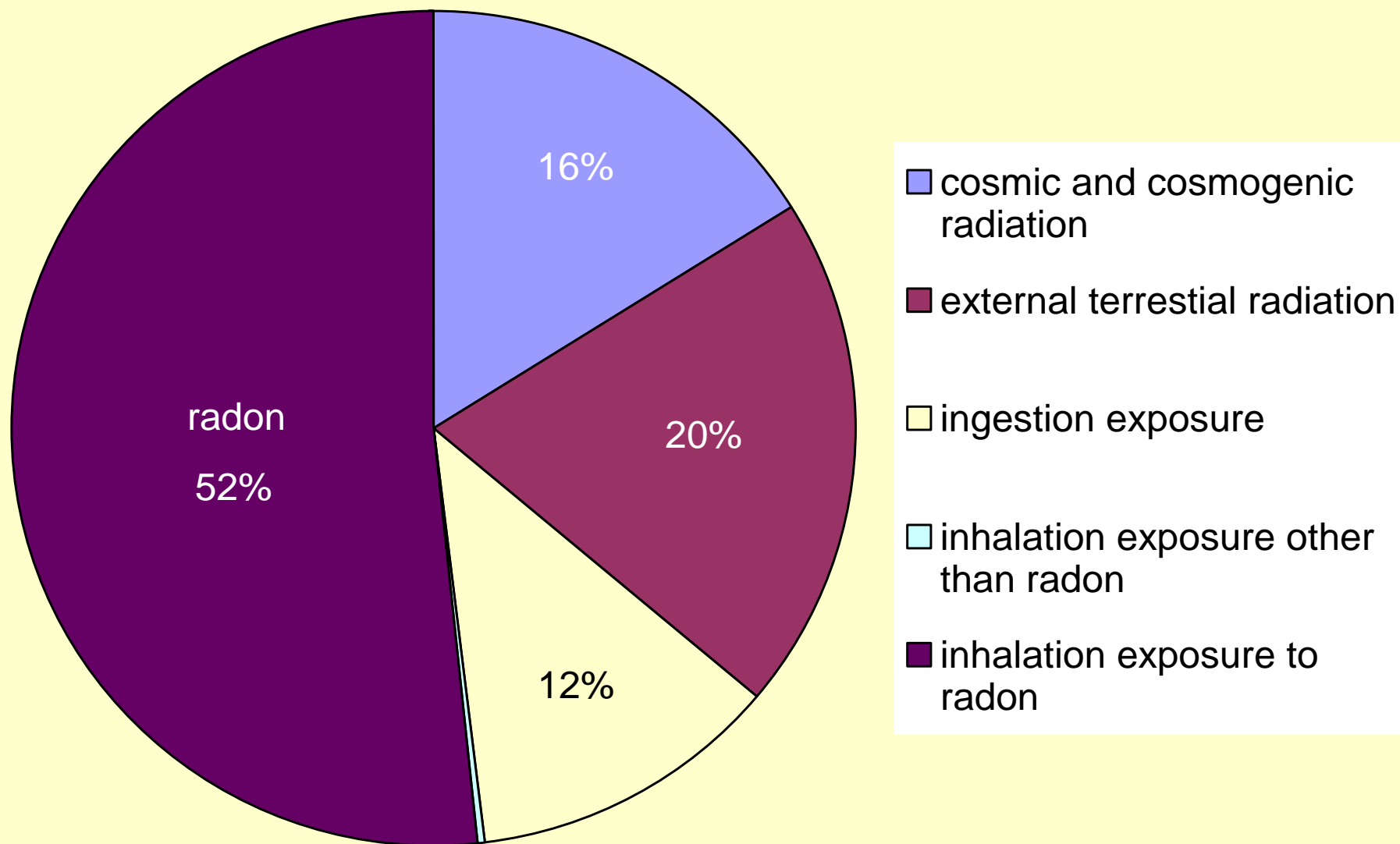
Decay Scheme Uranium-238



Radon Movement



average worldwide exposure to natural radiation sources

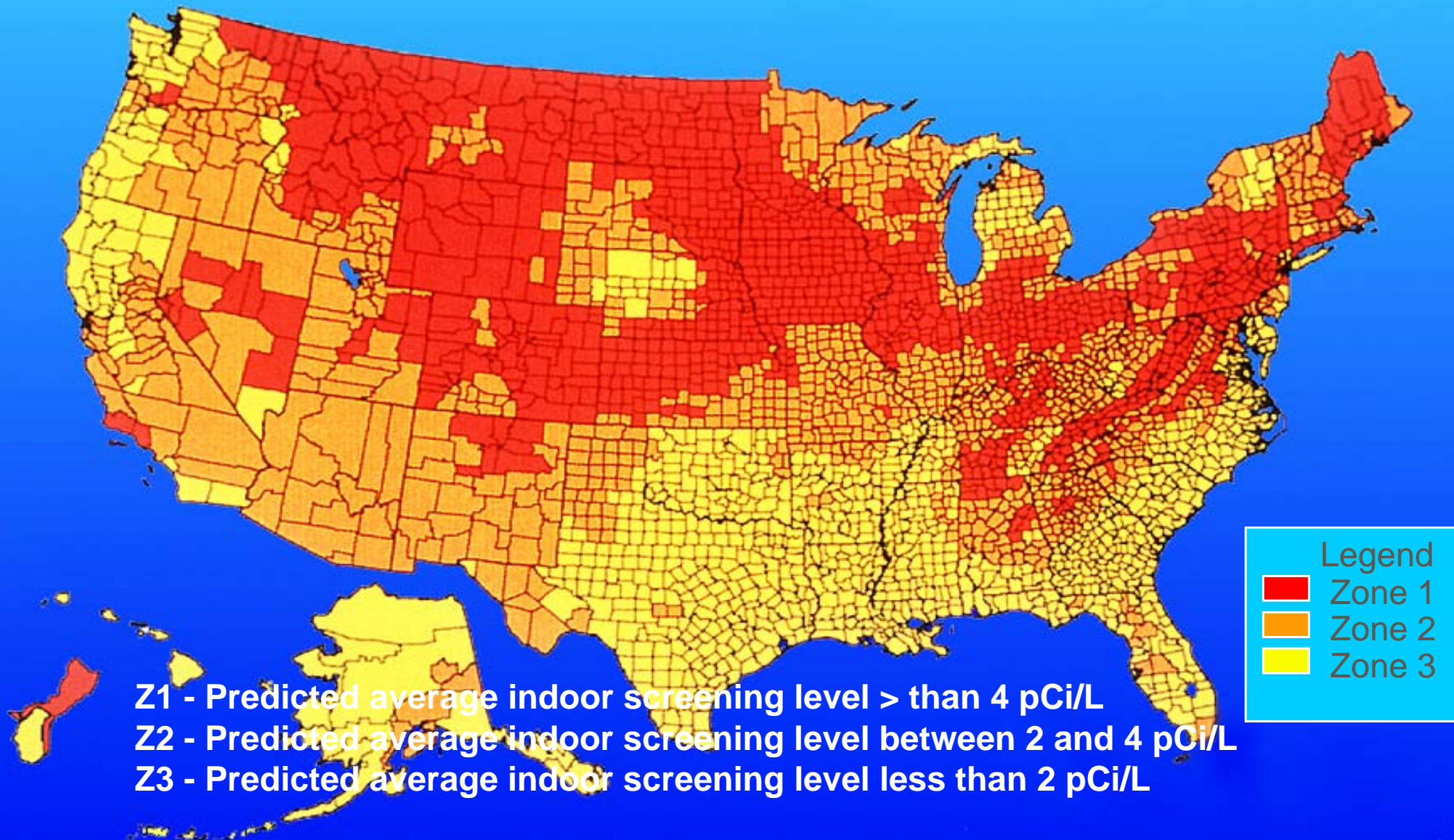


Radon guideline for homes was recently changed from 800 to 200 Bq/m³ - Why?

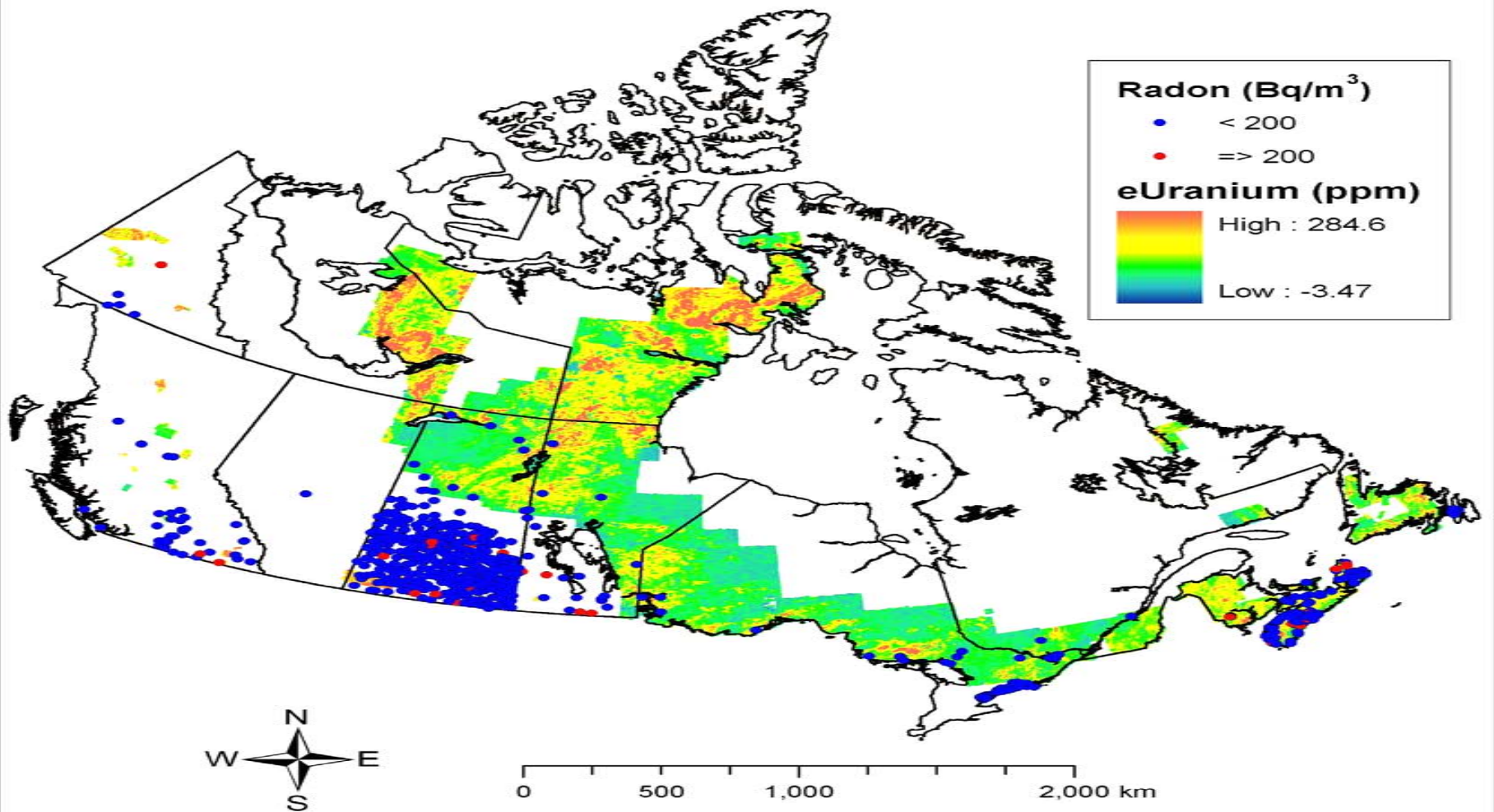
- **There is clear evidence of a real lung cancer risk below 800 Bq/m³**
- **We needed to harmonize with international guidelines and practices**
- **A significant number of lives could be saved (~400/year).**



EPA Map of Radon Zones



Available eUranium and Radon Data in Canada



THE RADON MAPPING PROJECT

- Build a database for all radon measurements in Canada – past, present, and future
- Supplement with airborne gamma surveys and soil gas measurements
- Bring in other geological parameters, e.g., rock formations, soil types, moisture content
- Conduct research into mapping methods using all of this information
- Generate maps with GIS software & make available to public



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Can soil moisture content be used to predict radon levels in homes?

- **Radon levels tend to be higher in the prairies where soils are generally dryer.**
- **Outdoor radon levels in Saskatchewan were 15 Bq/m³ in a wet summer and 60 Bq/m³ in a dry summer (Grasty 1994).**



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Hypothesis

- **If we could show a correlation between soil moisture and any of the following:**
 - **Radon in soil gas**
 - **Radon emanation from soil**
 - **Radon levels in homes**
- **Then we could use soil moisture data along with other geological information to identify radon-prone areas of Canada.**



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Two pilot studies underway this summer

- **Measurements of radon in soil gas beginning this year in the Atlantic provinces**
- **Proposed study with U of Saskatchewan on radon emanation and soil type**



QUESTIONS

