



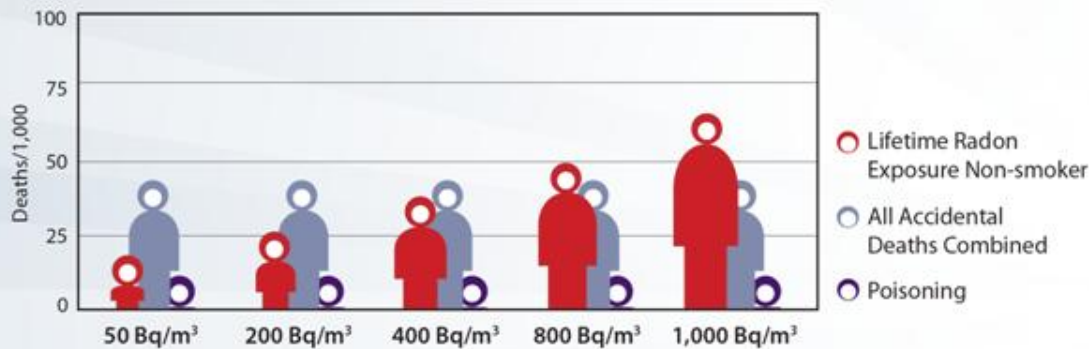
Mapping the Geologic Radon Potential of Canada

Alan Whitehead, Radon Environmental Management Corp.

RSI Radon Symposium, Ryerson University

May 1, 2014





**“Saving lives is
our mission.**

**Raising awareness is
our passion.”**

- Alan Whitehead, President & CEO

Radon Environmental is a building and health sciences company focused on reducing public exposures to radon gas. The leading environmental cause of lung cancer is radon exposure.

The company is investigating and developing new and innovative approaches to minimizing public exposure.

Radon Environmental: The Company



**RESULTS OF HEALTH CANADA'S 2012
CROSS-CANADA SURVEY OF RADON
CONCENTRATIONS IN HOMES**

**Revised risk estimate: 16% lung
cancer deaths attributable to
indoor radon exposure**



Health Canada, the Centre for Disease Control, lung associations and community health units take the risk of radon exposure seriously. From the Health Canada 2012 cross-country radon survey report, some provinces showed 20% of homes above the guideline of 200 Bq/m³. Risk estimates are currently conservative.

Risk Response and Testing





For the past 20 years, the United States has lead the way in radon public awareness and education. In 1993 the USGS published the “Generalized Geologic Radon Potential Map of the United States,” which has since served as a model for other countries.

Risk Maps Around the World

PATCHWORK OF RESULTS FROM RADON MEASUREMENT CAMPAIGNS ACROSS EUROPE



USES OF RADON MAPS IN THE EUROPEAN UNION

PLAN RADON CAMPAIGNS

Belgium, Finland, Germany, Greece, Ireland, Italy, Spain, Sweden, United Kingdom

DISTRIBUTE RADON DETECTORS

Czech Republic, Finland, United Kingdom

RADON PREVENTION NEW BUILDINGS

Finland, France, Ireland, Italy, Spain, Sweden, United Kingdom

INCREASE PUBLIC AWARENESS

Denmark, Finland, France, Ireland, Italy, United Kingdom

Natural hazards like radon have a strong spatio-temporal component. Because of this, maps play a decisive role in risk communication. The European Union uses radon map prediction to plan their campaigns, distribute detectors, prevent radon in new dwellings, and increase public awareness.

Maps for Risk Communication

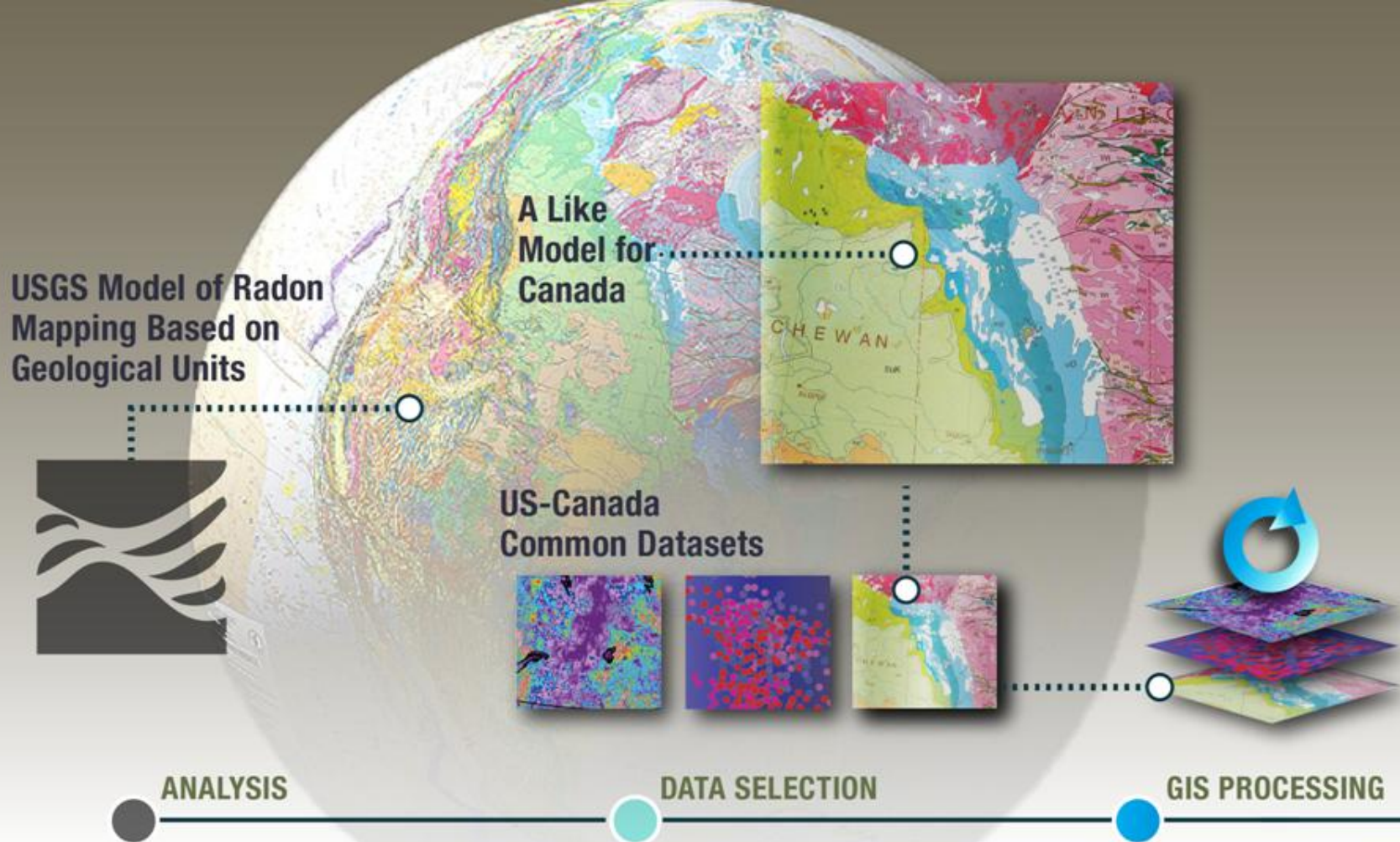


In 2010 our team of geoscience professionals developed the first geologic Radon Potential Map of Canada with the objective of identifying and prioritizing hazard zones.

This geographical picture of radon risk is now a tool to drive major testing and mitigation activities across the country.

A Radon Potential Map for Canada





Core methodology: USGS approach to mapping the geologic radon potential of the United States.

Geological units form the basic framework. GIS processing evaluates geological rock units in relation to US radon potential classes, uranium geochemistry and radiometric geophysical response.

Mapping Methodology

1.

Relative Radon Hazard*

- Zone 1 – High
- Zone 2 – Elevated
- Zone 3 – Guarded

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2.

*Important

All dwellings need to be tested for radon: a wide spectrum of radon readings can occur in all three zones.

In this map, the regions depicted reflect geologic conditions where higher radon readings might be found in Zone 1 versus Zone 2 and Zone 3 respectively.

3.

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MESSAGING

The challenge was illustrating radon as a national hazard while emphasizing that all dwellings need to test. Our solution was to:

1. define the risk in each zone as relative, leaving out averages,
2. further characterize zones by a corresponding human alert level,
3. stress the need to test regardless of zone.

Methodology Final Step

Relative Radon Hazard*

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49°
130°
FINISH

Levels of radon risk can now be assessed over the extensive Canadian landmass.

The Completed Map

Radon Potential Map Canada

Relative Radon Hazard*

- Zone 1 – High
- Zone 2 – Elevated
- Zone 3 – Guarded

*Important

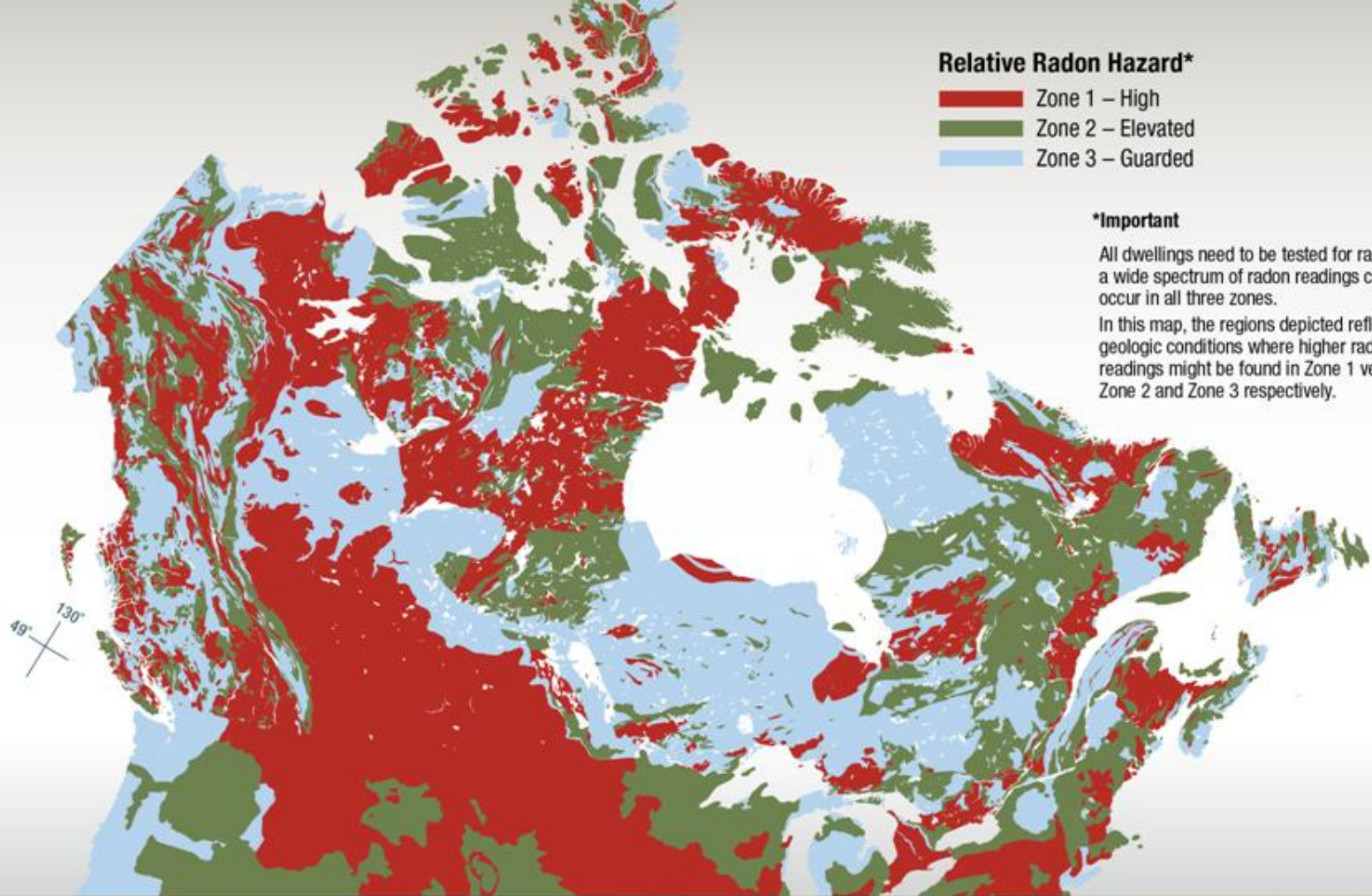
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300 0 300 600 km

A horizontal scale bar with markings at 300, 0, 300, and 600 kilometers.



Merging the USGS and Canada map.
 How would they fit together?

Continental Picture



Radon Potential Map Canada

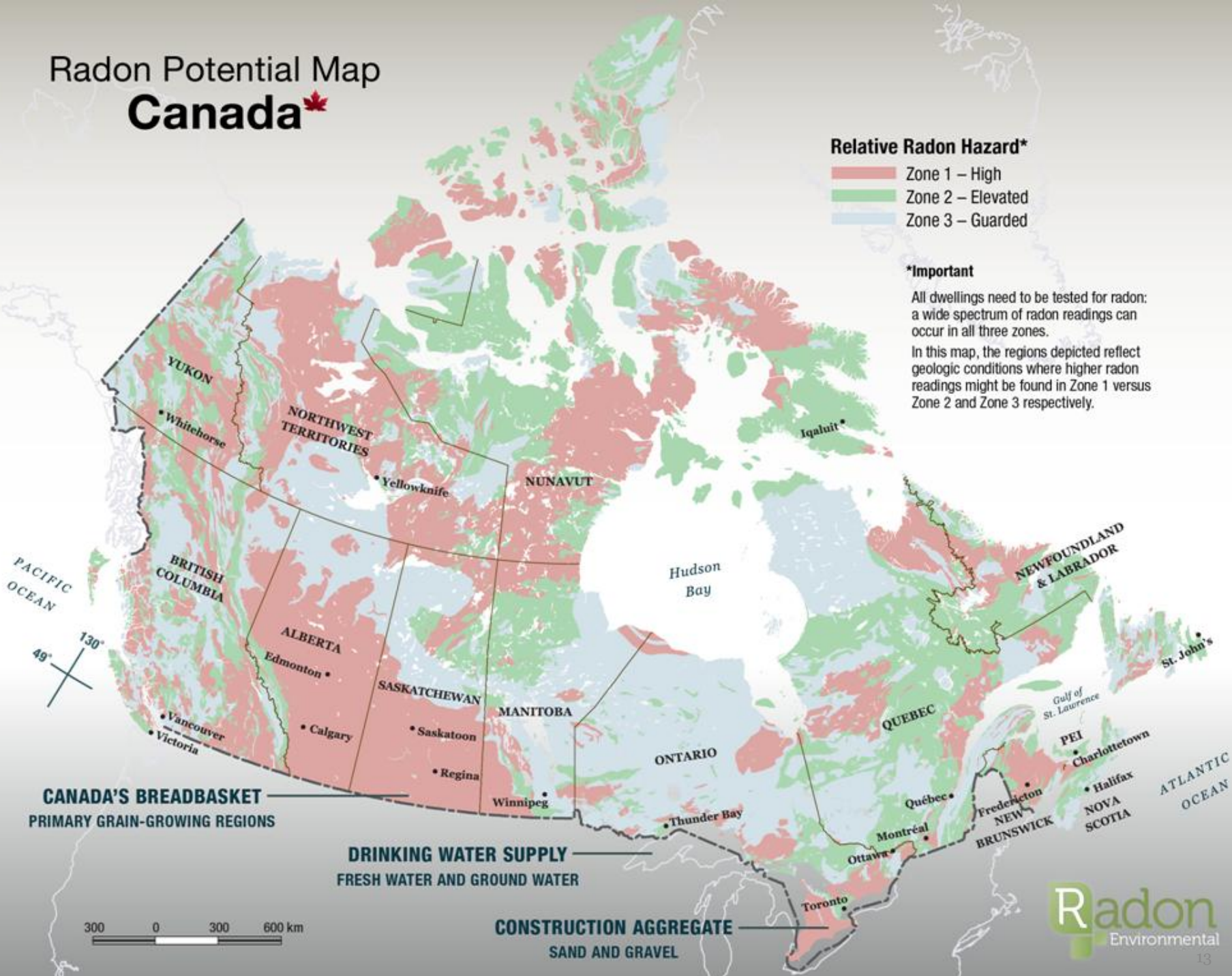
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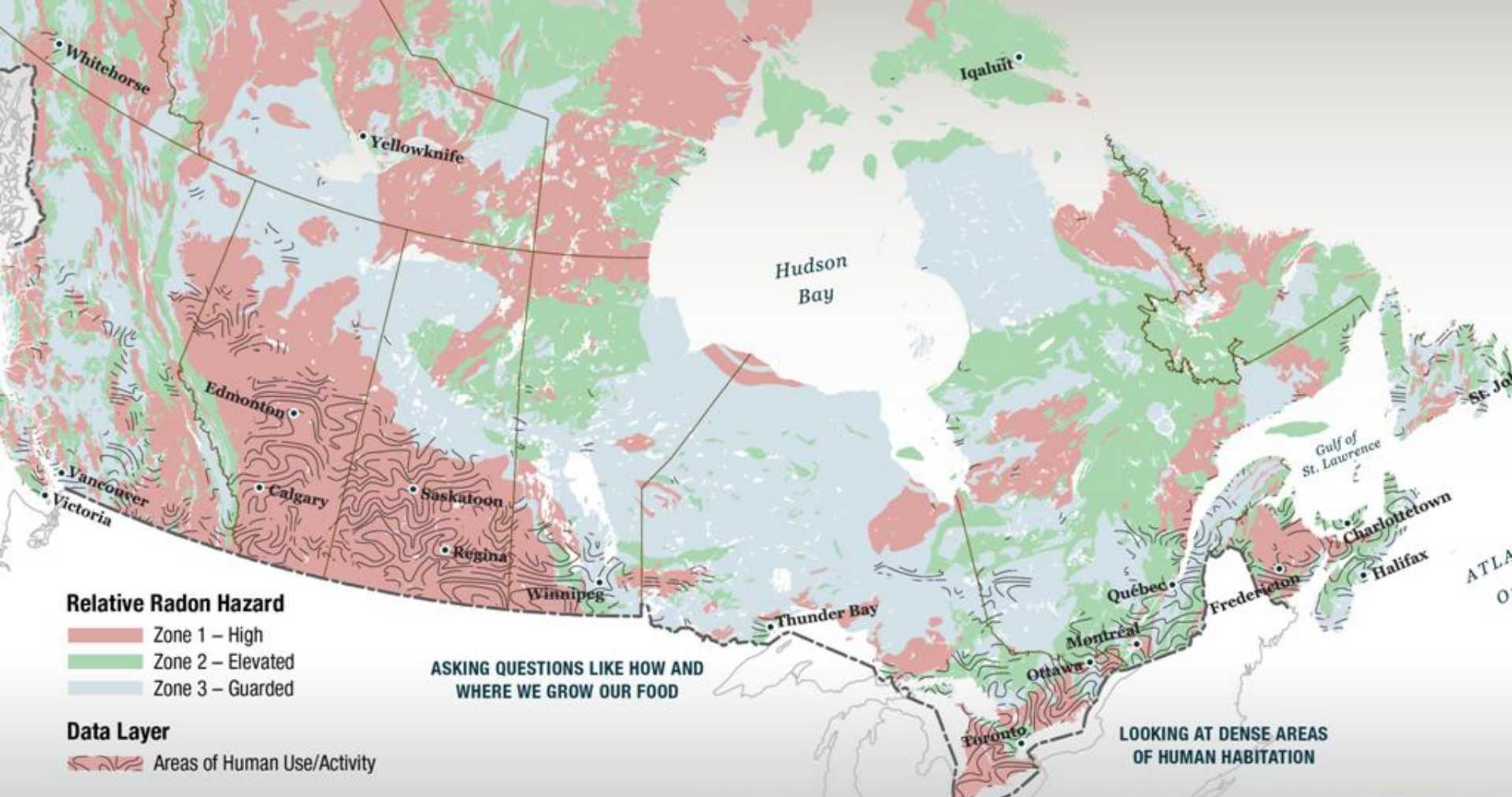


CANADA'S BREADBASKET
PRIMARY GRAIN-GROWING REGIONS

DRINKING WATER SUPPLY
FRESH WATER AND GROUND WATER

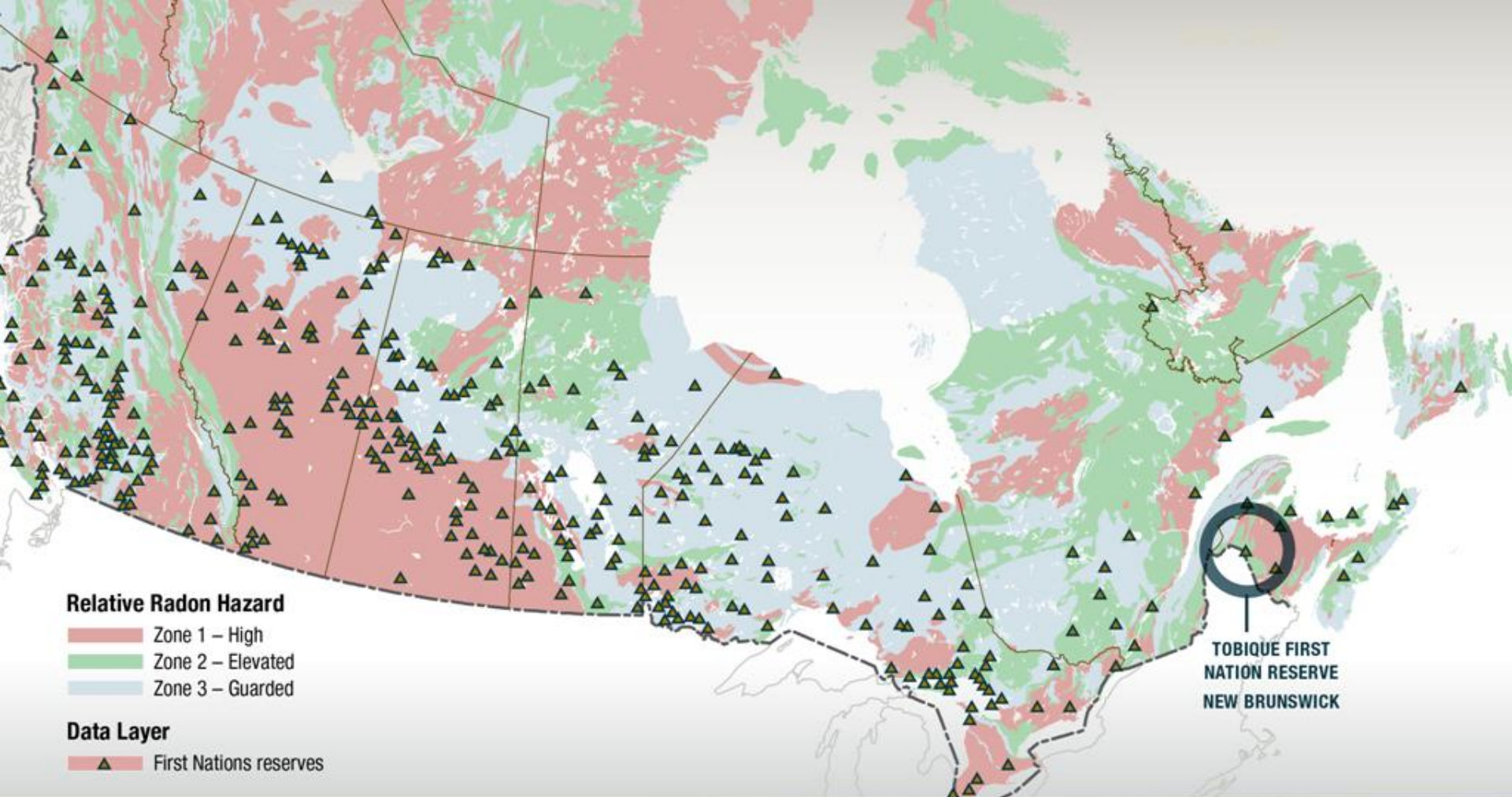
CONSTRUCTION AGGREGATE
SAND AND GRAVEL

ATLANTIC OCEAN



With the map it's possible to examine relationships between potential radon hazards and populations – a factor in urban and rural planning. Is the chosen site for a senior community, public school or hospital in a high radon hazard zone? The map can be a tool to stimulate discussion.

Relationships: Assessing Impact

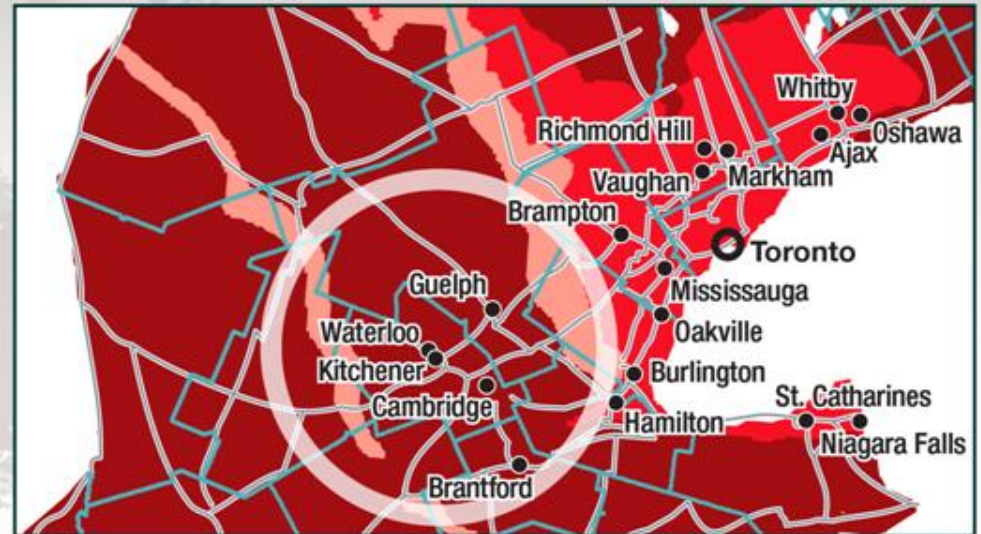
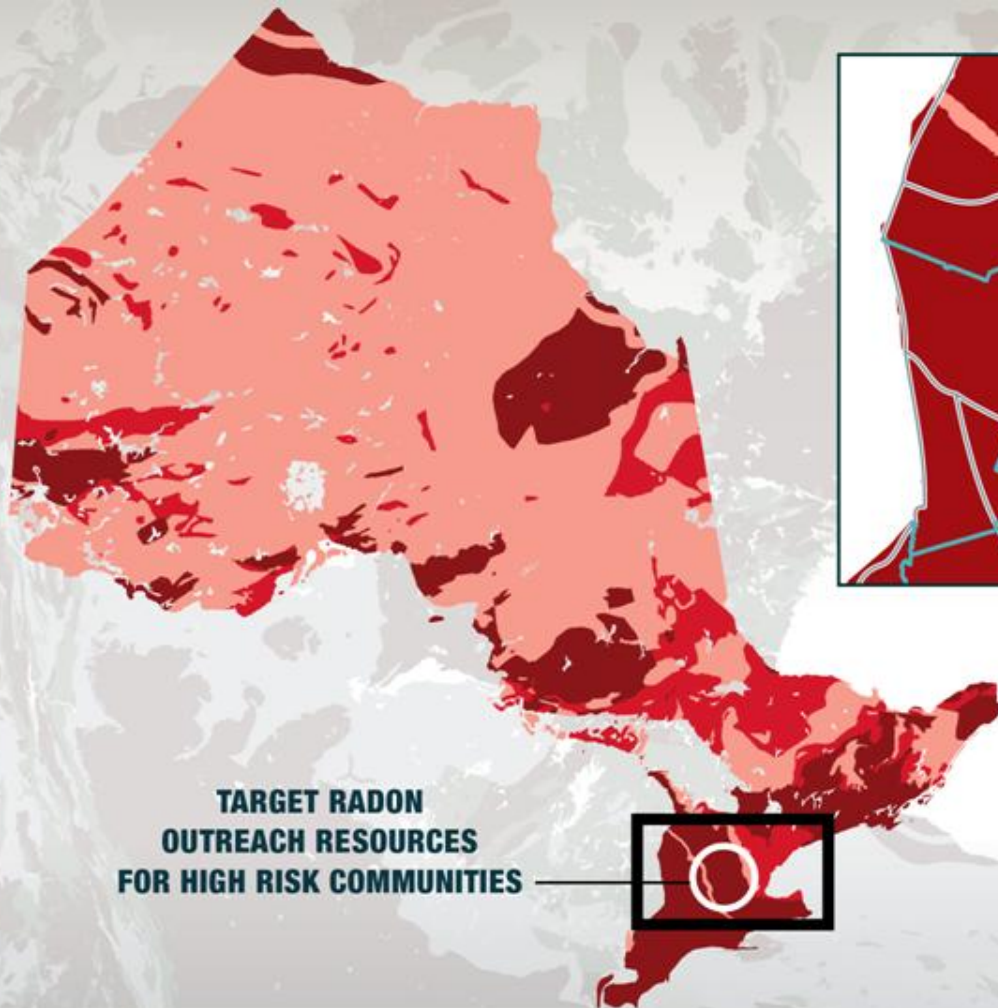


Many First Nations reserves in Canada are located in high radon hazard zones. What are these communities to mitigate their risk and how will governments act?

The Tobique First Nation was featured in recent news after homes tested very high for radon.

Relationships: Assessing Impact





Radon Potential Map Ontario

Relative Radon Hazard*

- Zone 1 – High
- Zone 2 – Elevated
- Zone 3 – Guarded

- National capital
- Most populous city
- Major city
- Major road/highway
- Health region boundary
- International boundary

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The Radon Potential Map of Canada is continually evolving. With new data (for example, regional lung cancer statistics), we can add new map layers to understand relationships.

Radon potential maps have been generated for the provinces and territories, and pilot municipal mapping is in progress.

Regional Radon Stories



EVERY DWELLING HAS THE POTENTIAL TO HOST HIGH LEVELS OF RADON.

EVERY CANADIAN NEEDS TO TEST

Granite countertops

Building materials

Water supply

Ground beneath dwelling

Points of radon entry

Optimal testing location

The only true test of radon in an indoor space is measurement. From the potential maps, certain regions have a higher potential for radon than others. Radon levels indoors depend on additional variables, such as building construction, radioactive materials in the building, air exchange, radon in water, and seasonal conditions.

Necessary Action: Testing



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