Earth Sciences Sector

Studies of Soil Gas Radon and Natural Radioactivity related to Canada's National Radon Program

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The National Radon Program

In 2007 the Government of Canada updated the guideline for the exposure to indoor radon and launched a multi-year, multi-component radon program

The Minister of Health recommends that :

- Remedial measures should be undertaken in a dwelling whenever the average annual radon concentration exceeds 200 Bq/m^3 in the normal occupancy area.

- The construction of new dwellings should employ techniques that will minimize radon entry and will facilitate post-construction radon removal, should this subsequently prove necessary.

Government of Canada Radon Guideline available at
http://www.hc-sc.gc.ca/ewh-semt/radiation/radon/guidelines_lignes_directrice-eng.php

The National Radon Program

The National Radon Program consists of the following 5 components

- Establishment of a National Radon Laboratory for testing equipment, protocols, providing advice, and establishment of a Canadian radon testing and mitigation Certification Program

- Radon Testing Projects (Indoor)
  - Cross-Canada Residential Radon Survey
  - Radon Testing in Federal Buildings

- Radon Research – incl. health effects, remediation and testing techniques

- Education & Public Awareness incl. workshops, public opinion surveys, seminars, website materials

- Mapping and Identification of Radon prone areas
  - Data acquisition, compile detailed information for Canada
  - Map(s) – incl. use of supplementary data from airborne gamma ray spectrometry surveys, geoscience data, soil types and characteristics to guide risk management and identify high risk areas for additional testing

National Radon Laboratory

• Supports testing and research components of National Radon Program including analysis of indoor detectors deployed for Federal and Residential Surveys as part of the NRP

Radon Chamber Lab

Detector Analysis Lab

•Started with EPERMS (2007)
•Switched to ATD's in 2008
•200 ATD's per day

Certification

Certification Program

- A goal of the NRP is to establish a Canadian radon testing and mitigation industry that will include criteria for approving new instrumentation and testing devices, calibration requirements, proficiency testing for service providers, training and quality assurance for labs and service providers.

- Currently being developed by Health Canada in partnership with the U.S. National Environmental Health Association (NEHA-NRPP) and involves the Standards Council of Canada

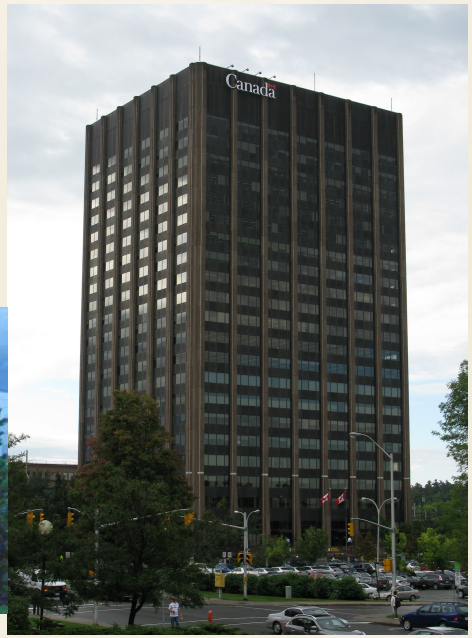
Radon Testing Projects (Indoor)

In 2007 the Government of Canada began a project to test radon levels in federal buildings.

This testing is scheduled to continue through to 2011.

Over 3000 buildings have been tested to date across the country.

Approx 9% of them have rooms with radon > 200 Bq/m^3

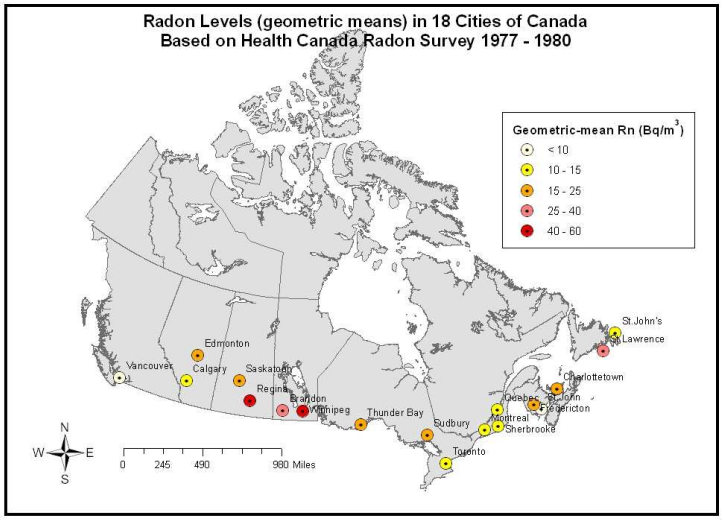


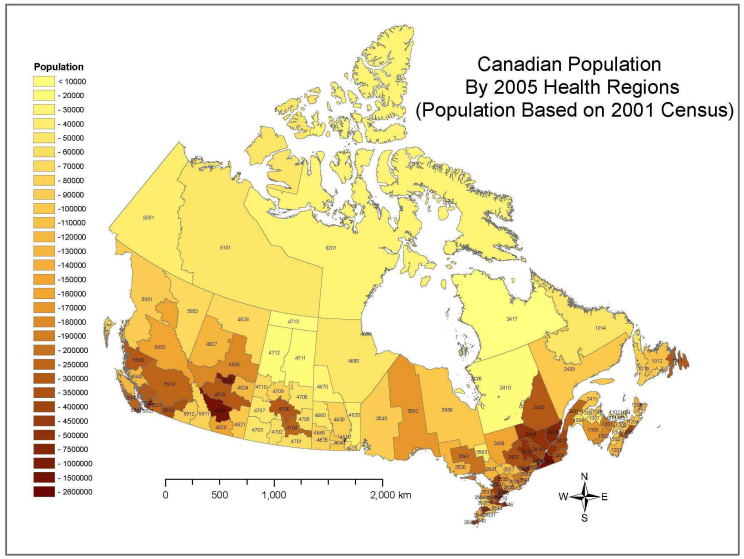
Radon Testing Projects (Indoor)

Cross-Canada residential radon survey was launched in April 2009.

Objective is to test about 18,000 homes over a 2 year period.

ATD's deployed for a minimum of 3 months during the heating season.

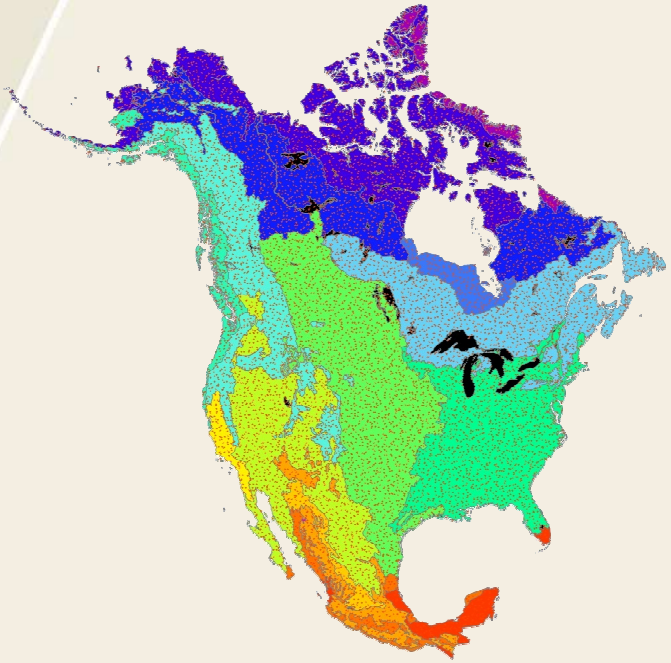




Data based on about 6000 homes analyzed to date showed that 7% of those homes have radon concentrations > 200Bq/m3

Mapping and Identification of Radon prone areas

Between 2007 and 2010 data acquisition activities under the mapping component of the NRP grouped predominantly into 2 categories

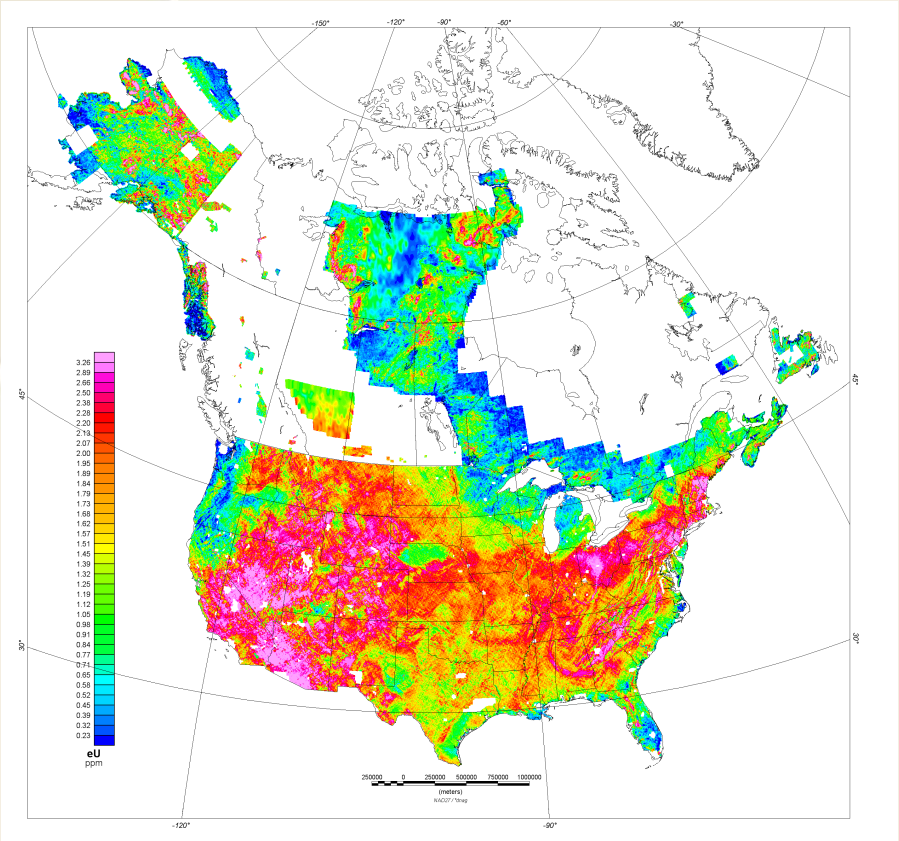


1) New airborne gamma ray spectrometry surveys in selected areas of Canada

2) Soil gas Rn, permeability and ground gamma ray spectrometry measurements as part of the North American Soil Geochemical Landscape Project (NASGLP) including urban sampling in selected urban centers across Canada

Mapping and Identification of Radon prone areas

Airborne Gamma Ray Spectrometry Coverage of Canada and U.S.



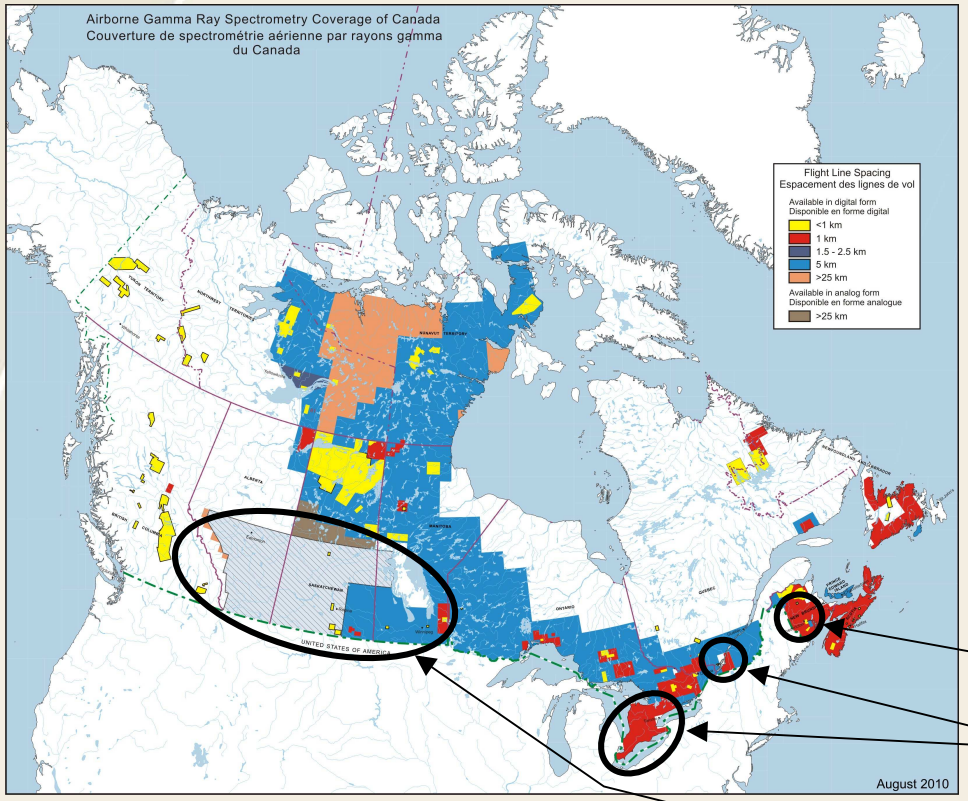
Uranium Map for North America

In Canada, prior to the start of the NRP in 2007, most airborne gamma ray spectrometry (AGRS) data was collected in the 1970's, 80's and 90's to support geological mapping and mineral exploration in areas of high mineral potential – therefore little coverage in populated areas

Most surveys flown with reconnaissance 5 km line spacing (URP – Canada) or 5 mile line spacing (NURE – USA)

Mapping and Identification of Radon prone areas

New Airborne Gamma Ray Spectrometry Surveys



Prior to 2008 approx 2,530,000 sq. km. or 28% of Canada's landmass was covered with AGRS surveys.

Between 2008 and 2010, Radon Strategy funded surveys added over 200,000 line km of new data covering an additional 725,000 sq. km in more densely populated regions of Canada.

New surveys flown with line spacings of either 1km or 5km

New Surveys

2008 Central New Brunswick Survey

2008/09 Southern Ontario and Southern Quebec Surveys

2009/10 southern Manitoba, Saskatchewan and Alberta Surveys

Mapping and Identification of Radon prone areas

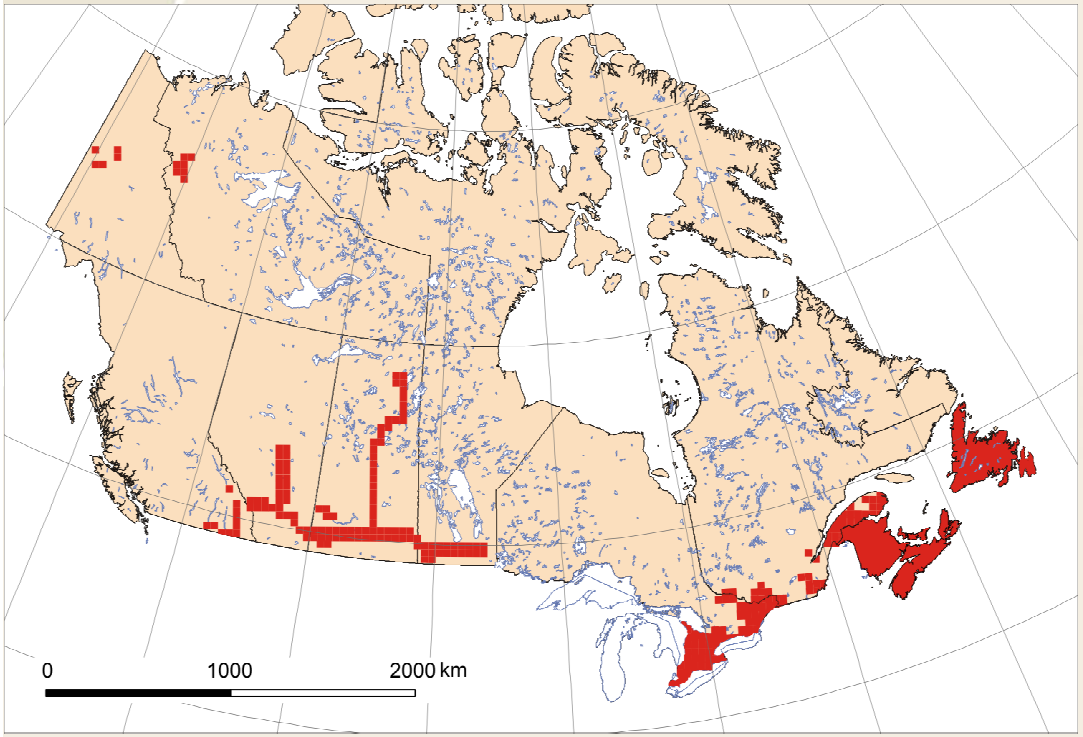
Ground surveys

- Soil Sampling (NASGLP)
- Soil Gas Radon
- In-situ Radioactivity (K, eU, eTh)
- Soil permeability (measured and/or estimated)
- Laboratory Gamma Ray Spectrometry

  (PH (0-5cm), A-, B- and C-Horizon samples)

Mapping and Identification of Radon prone areas

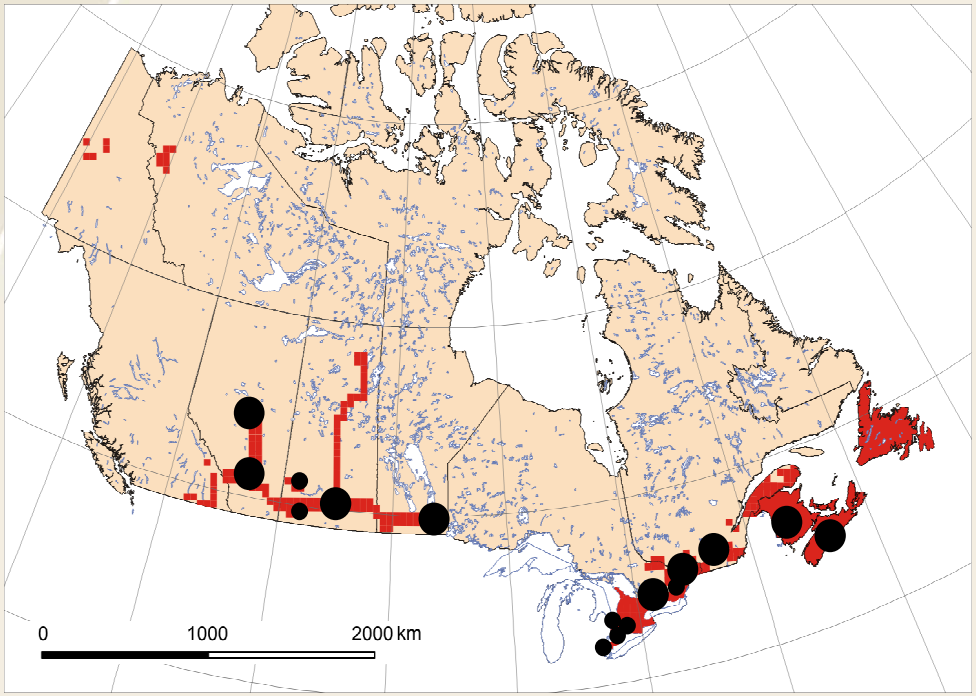
Summary of Soil Gas Radon and GGRS field sites sampled 2007 – 2009 using NASGLP protocols



Completed	09	08	07
- Newfoundland	67	9	
- Prince Edward Is.			9
- Nova Scotia		15	57
- New Brunswick			122
- Quebec	14	22	
- Ontario	74	34	32
- Manitoba		21	
- Saskatchewan	8	59	
- Alberta	17	16	
- British Columbia		11	

Mapping and Identification of Radon prone areas

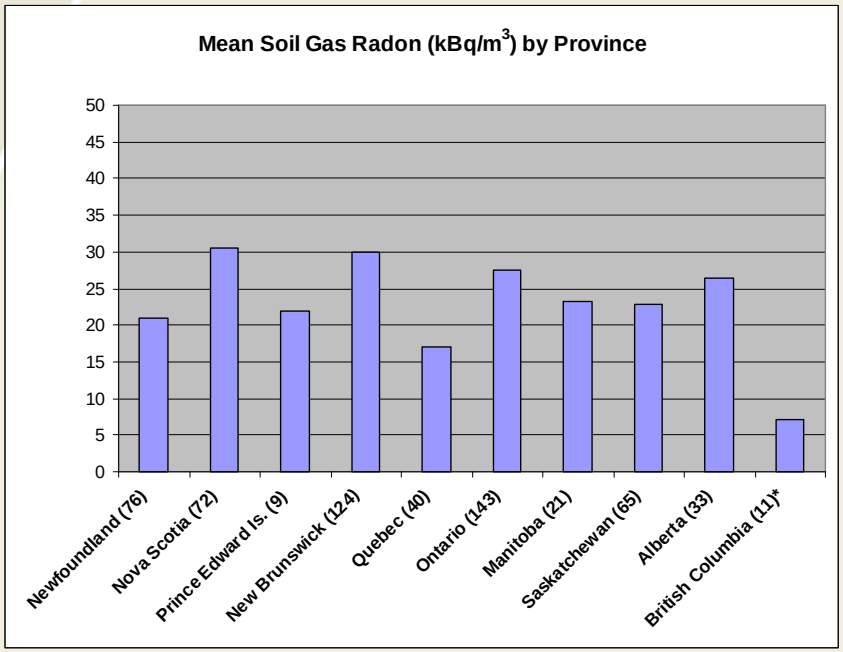
In addition to standard NASGLP soil sites, urban sampling includes the following cities, (urban sites included direct permeability measurements and collection of PH and/or C-Horizon soil samples)

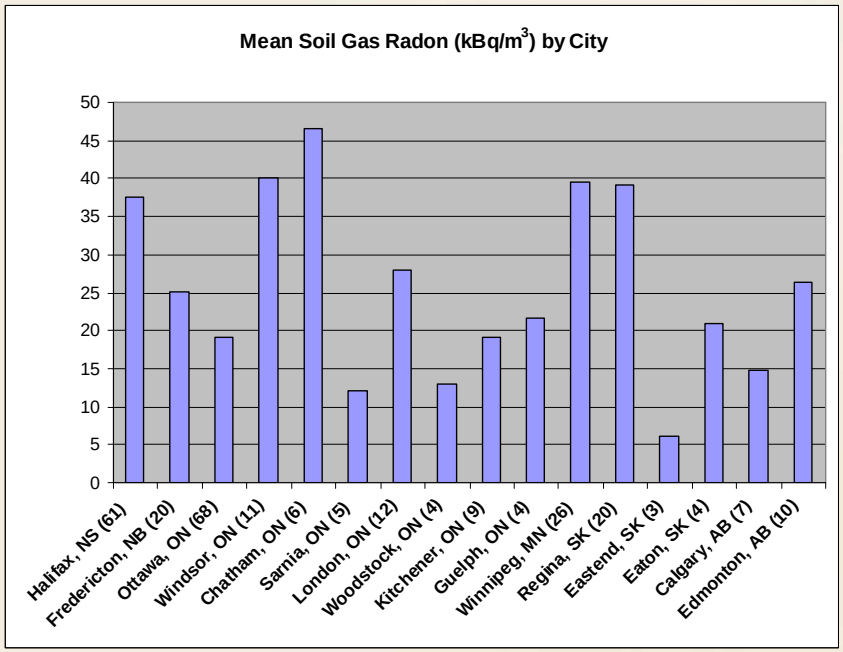


Completed	…10	…09	…08	…07
- Halifax, NS			41	19
- Fredericton, NB				20
- Montreal, QC	76			
- Gatineau, QC	36			
- Ottawa, ON			27	43
- Toronto, ON	76			
- Winnipeg, MN			26	
- Regina, SK			20	
- Eaton & Eastend, SK		7		
- Calgary, AB		9		
- Edmonton, AB		8		
- Southern Ontario Cities – including Windsor, Sarnia, Chatham, London, Woodstock, Kitchener, Guelph and Kingston	26	26	27	
Totals	214	50	141	82

Mapping and Identification of Radon prone areas

Mean soil gas radon concentrations (kBq/m^3) for various Provinces and Cities sampled between 2007 and 2010.





Mapping and Identification of Radon prone areas
Analysis – work in progress

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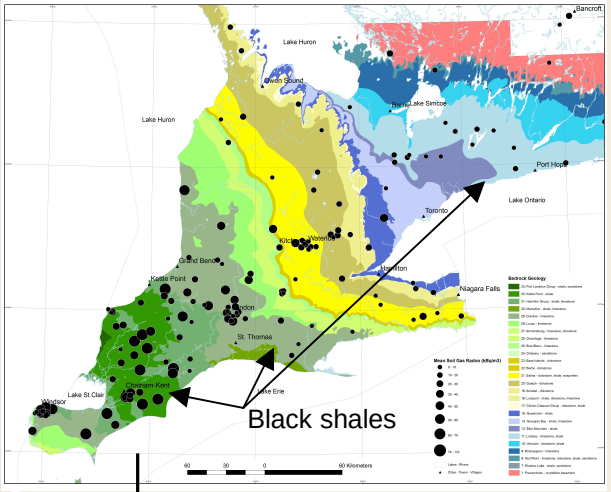
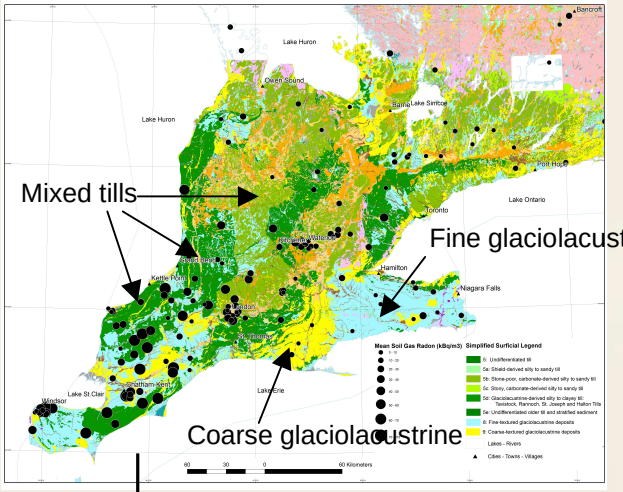
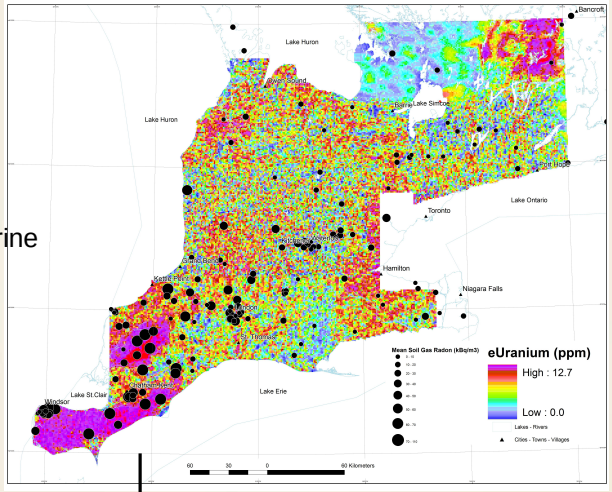


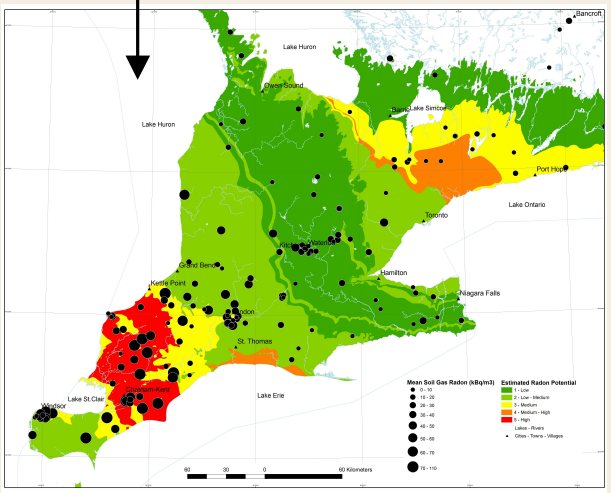
Bedrock Geology



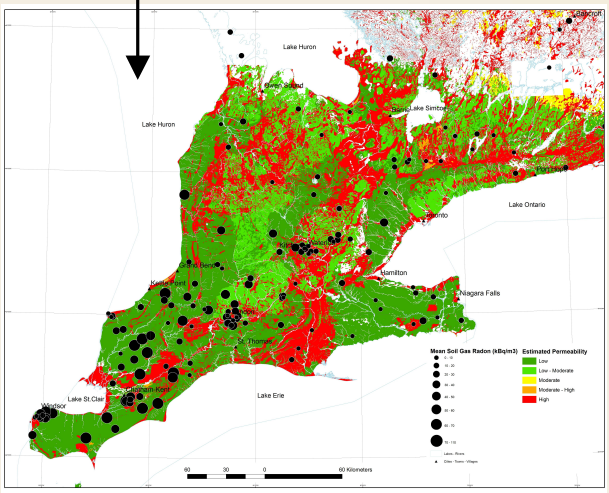
Surficial Geology



Uranium data



Ranked Bedrock Geology



Ranked Permeability

Ranked Uranium data

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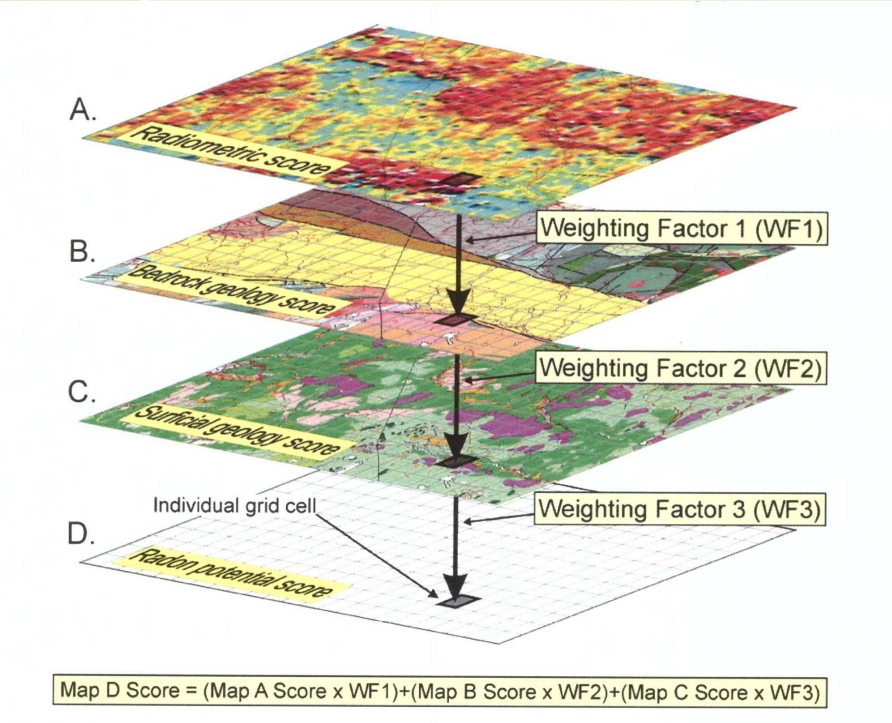
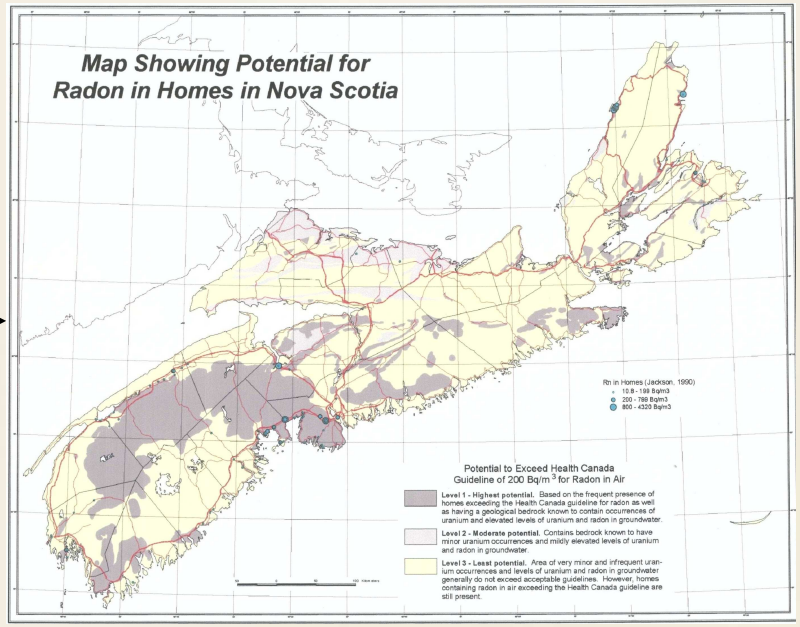
Mapping and Identification of Radon prone areas Analysis – work in progress

Analysis of key data layers – the next step



A GIS-based Approach



This 2009 map to be revised following GIS-based analysis

Images courtesy of G. A. O'Reilly, Nova Scotia Department of Natural Resources

The National Radon Program

Conclusions …

- Significant progress has been made in all 5 components of the National Radon Program since its inception in 2007

- Activities continue in all 5 key areas

- Challenges (there are many)
    - Completion of a national radon survey in 18,000 residential homes
    - Implementation of the revised National Building Code for prevention of radon ingress in new home construction
    - Increase availability of certified radon professionals for testing and remediation
    - Continued Mapping and Identification of Radon prone areas
        - use indoor data to validate and/or modify radon potential maps
        - take this approach and apply elsewhere in Canada

Thank You