RADON in your *Home Sweet Home*

Carol O'Neill RN, BSN, ONC ®
Oncology Outreach Nurse Coordinator
Good Samaritan Cancer Center

CATHOLIC HEALTH INITIATIVES®

Good Samaritan CANCER CENTER

Kearney, Nebraska www.gshs.org

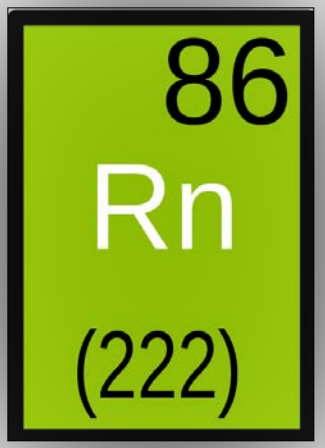
NCI COMMUNITY CANCER CENTERS PROGRAM

What is RADON and why should we care?

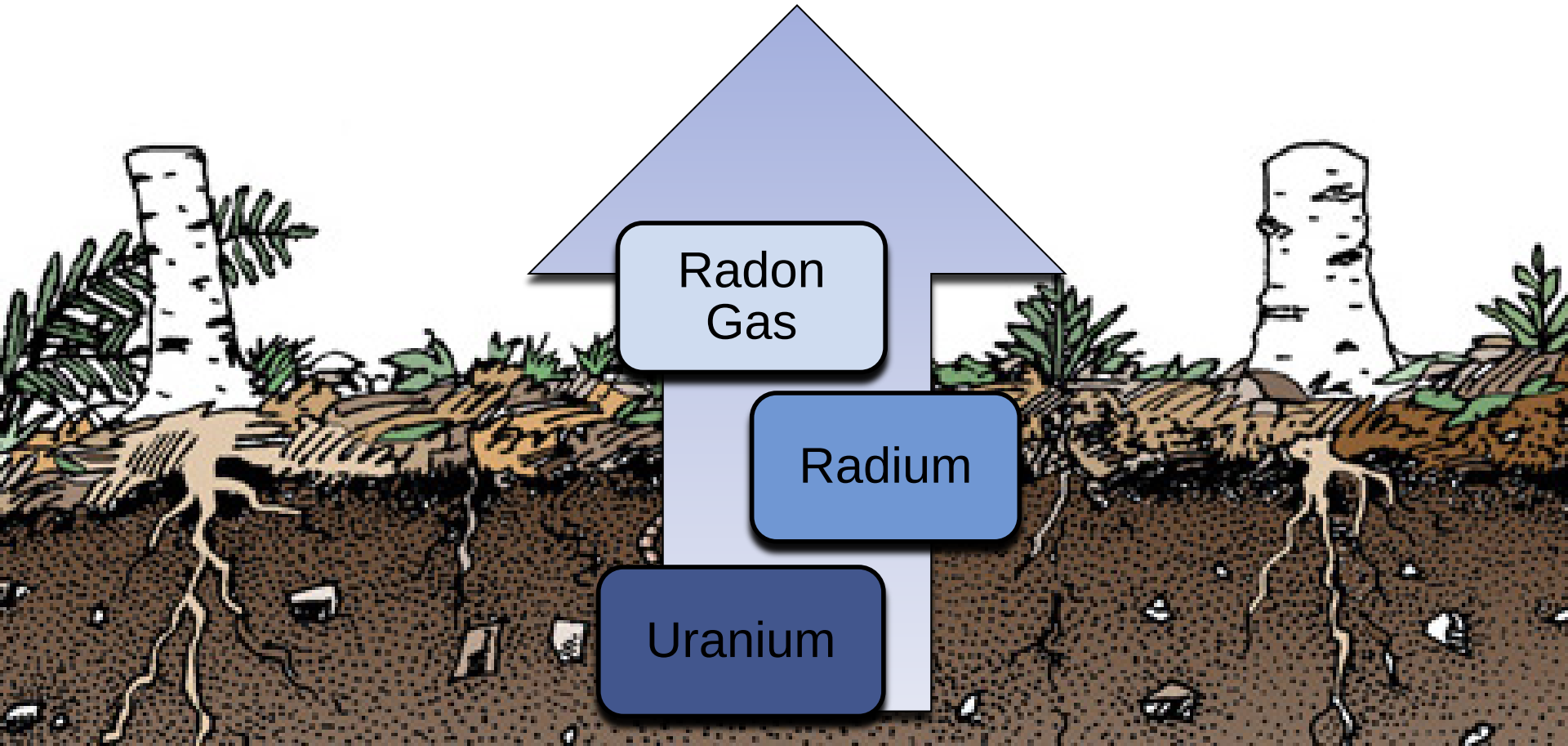
Radon causes lung cancer

- Second leading cause after smoking
- Leading cause among non-smokers
- 21,000 deaths/year (EPA estimates)

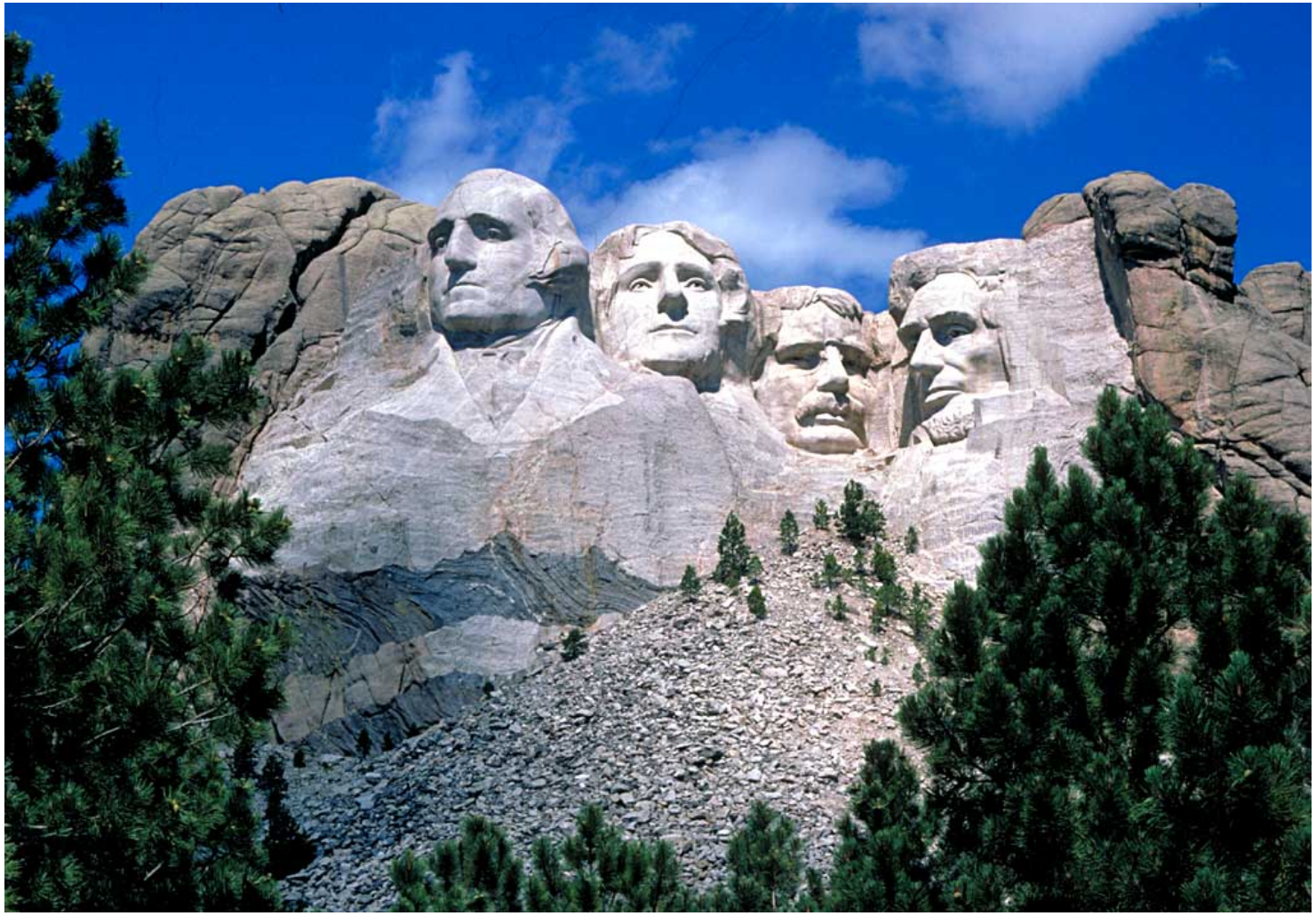
Radon



- Radioactive gas
- Occurs naturally
- “Miners sickness” recognized in the 1500s
- 1950-1960 – Alpha Particles recognized

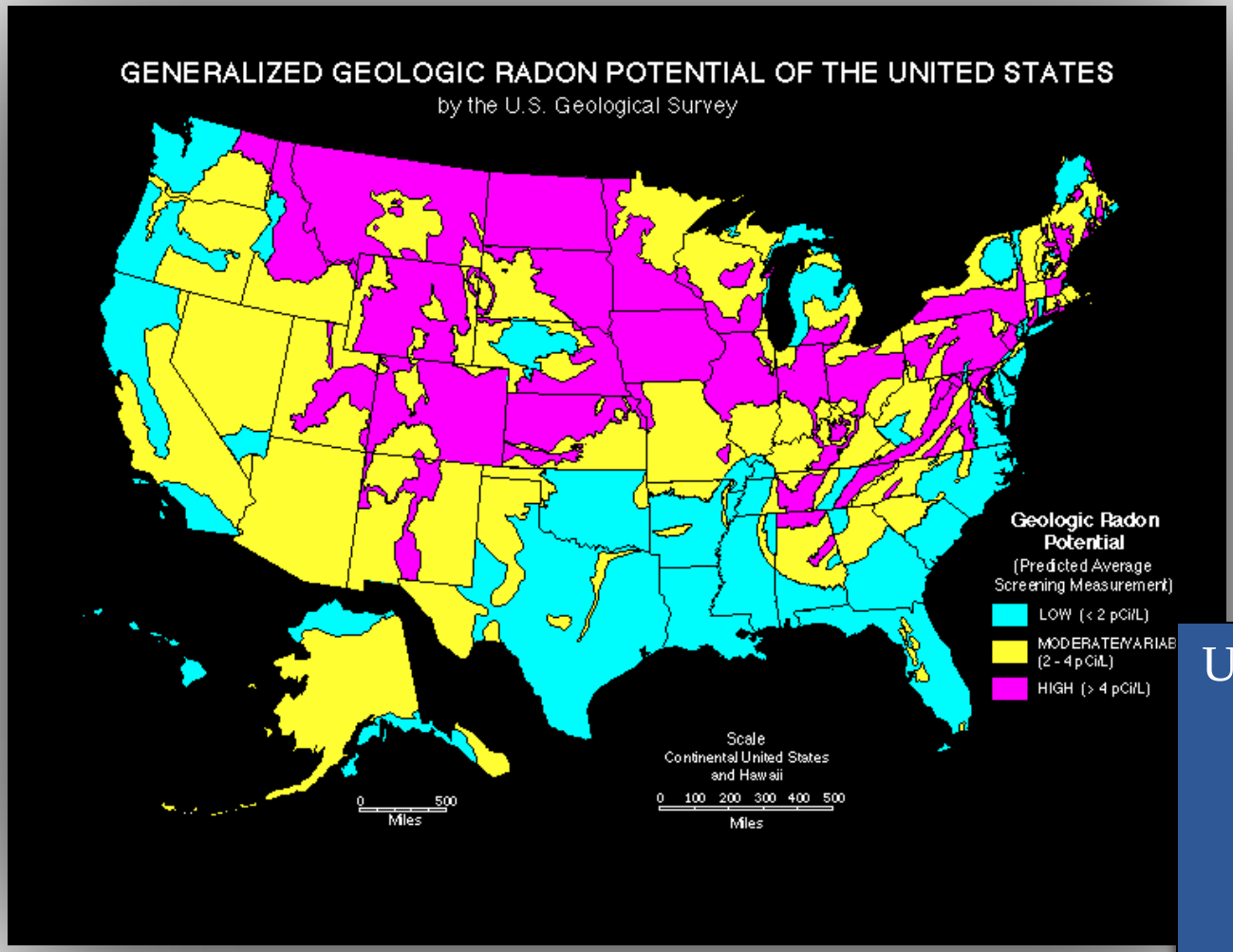

Radon
Gas
Radium
Uranium

Predicting Geologic Radon Levels



Predicting Geologic Radon Levels

Predicting Geologic Radon Levels



US Geological Survey:

- Low 1-2
- Moderate 2-4
- High > 4

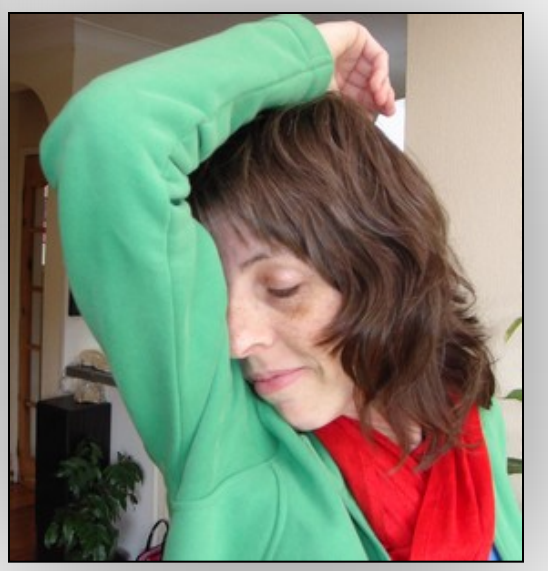
US Geological Survey: http://energy.cr.usgs.gov/radon/usrnpot.gif

Predicting Geologic Radon Levels

- Complex
- Uranium exists in all rock
- Level depends upon:
  - Existing bedrock
  - Where bedrock was transported by glaciers
  - Soil composition, permeability and moisture

Dissipation vs. Accumulation

Once Radon Gas Is In Your Home…



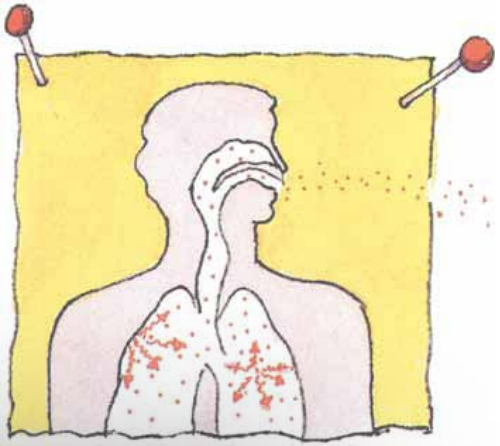
Circulating Alpha Particles (solid)

Radon Gas → Alpha Particles (solid)

Attach to surfaces

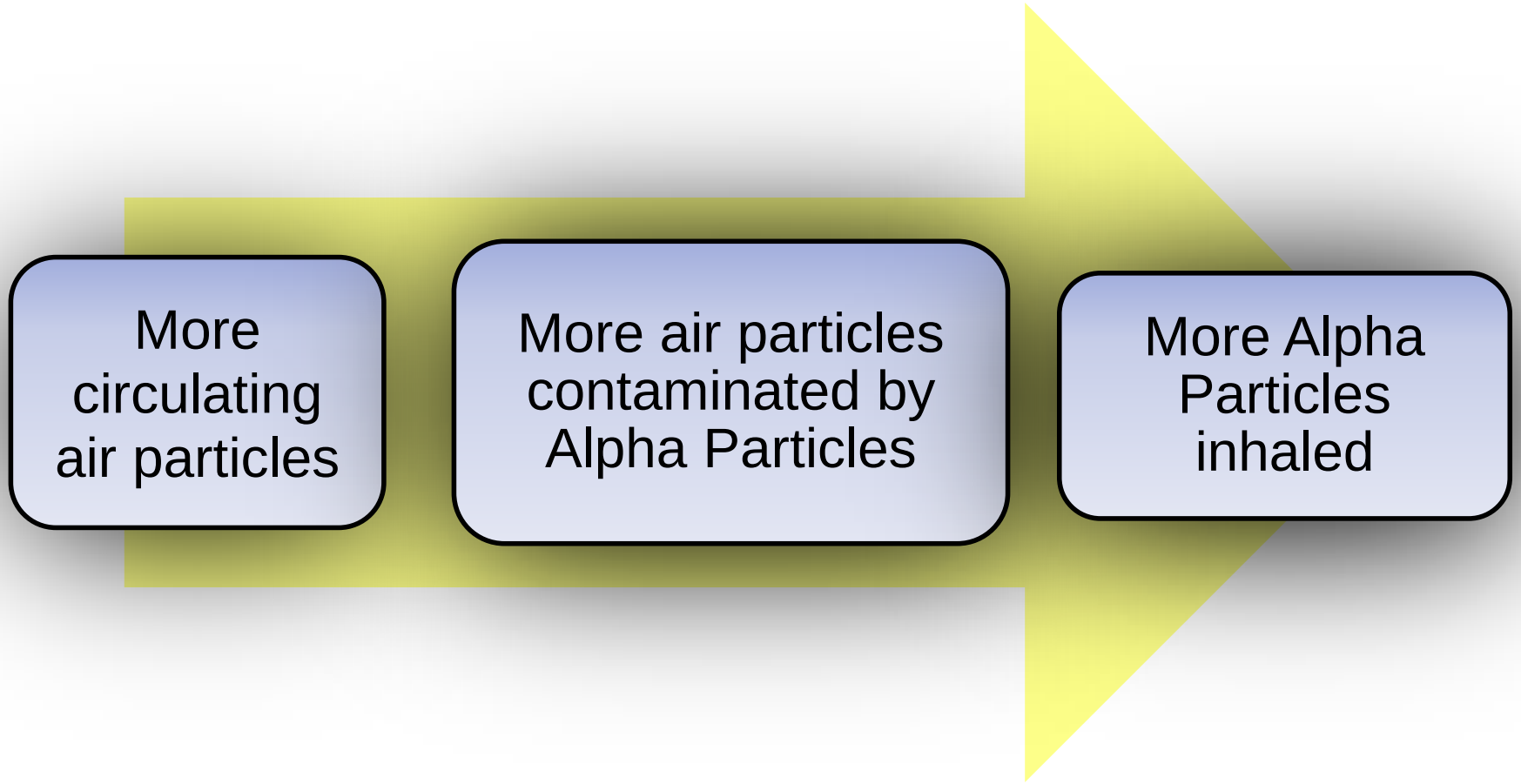
Attach to air particles (aerosols, dust, smoke)

- Inhaled
- Direct radiation exposure
- Damage DNA in cells



Primary source of radon exposure – Inhalation

Indoor Smoking



Radon & Smoking

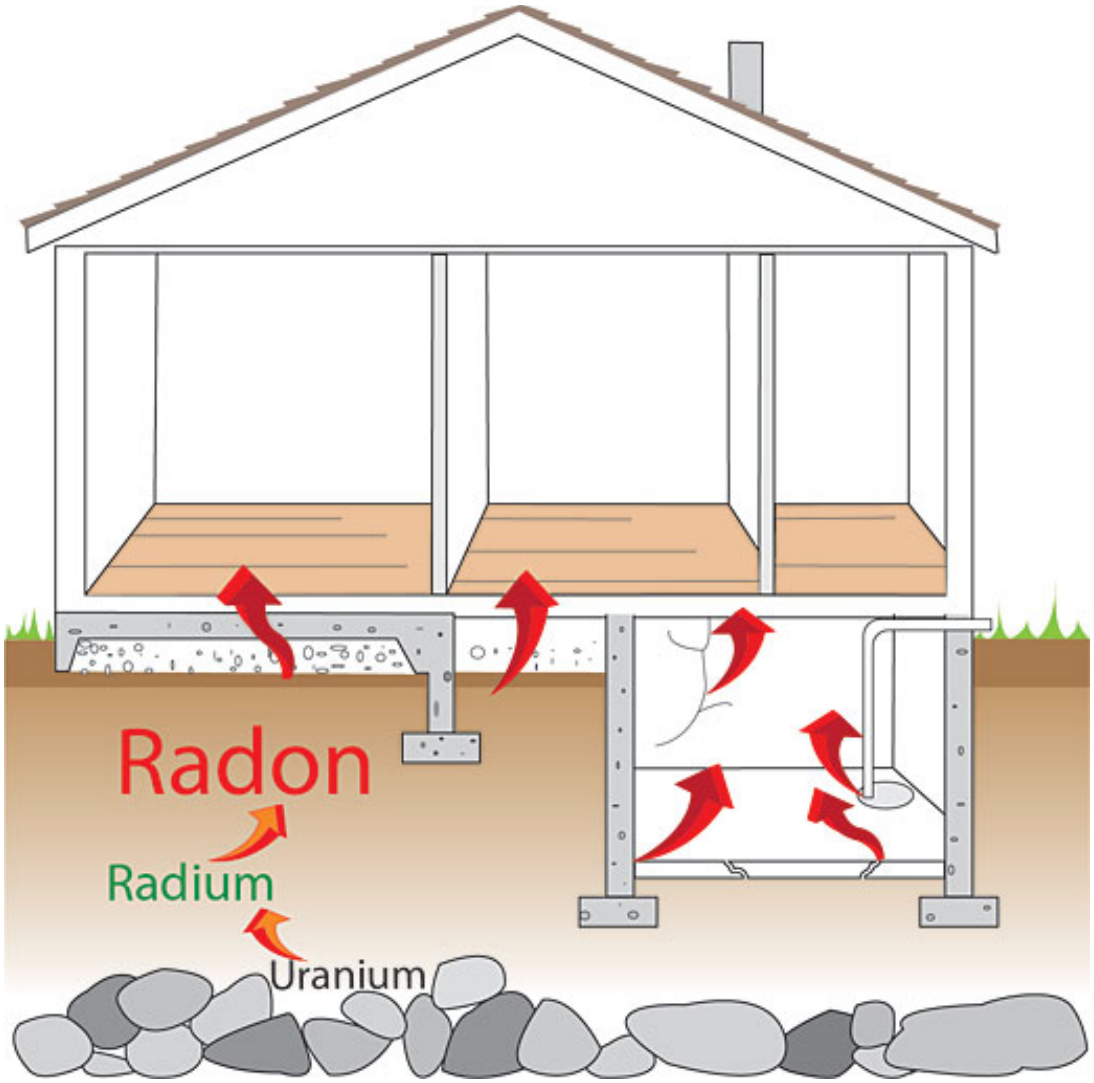
Smokers exposed to high concentrations of radon in homes have greater risk of developing lung cancer than being exposed to either substance individually.

Antonio Neri
Medical Epidemiologist at the CDC

Radon-related deaths:

- 90% smokers
- 10% non-smokers

Radon Entry into Homes



Radon Entry into Homes

Air often flows toward a home's foundation:

- Pressure differences between soil and house
- Openings in the foundation
- ↑ permeability around foundation
  - Disturbed zone (backfill)
  - Gravel bed

Radon Entry into Homes

- Cracks - concrete slabs, floors, walls
- Crawl spaces
- Sump pumps
- Construction joints
- Gaps around service pipes or plumbing
- Gaps in suspended floors
- Cavities inside walls
- Water supply

Radon Measurement

Picocuries per liter of air (pCi/L)

No indoor level is “safe” – any exposure carries risk

Highest level of radon – lowest level of home

EPA recommends action if **4.0 pCi/L or greater**

Indoor Radon Levels in Nebraska

- All homes at risk
- Exposure at HOME presents our greatest risk
- Greatest indoor risk from rock & soil, not water
- Radon levels generally more concentrated in:
  - Basements
  - Ground floor rooms with contact with soil

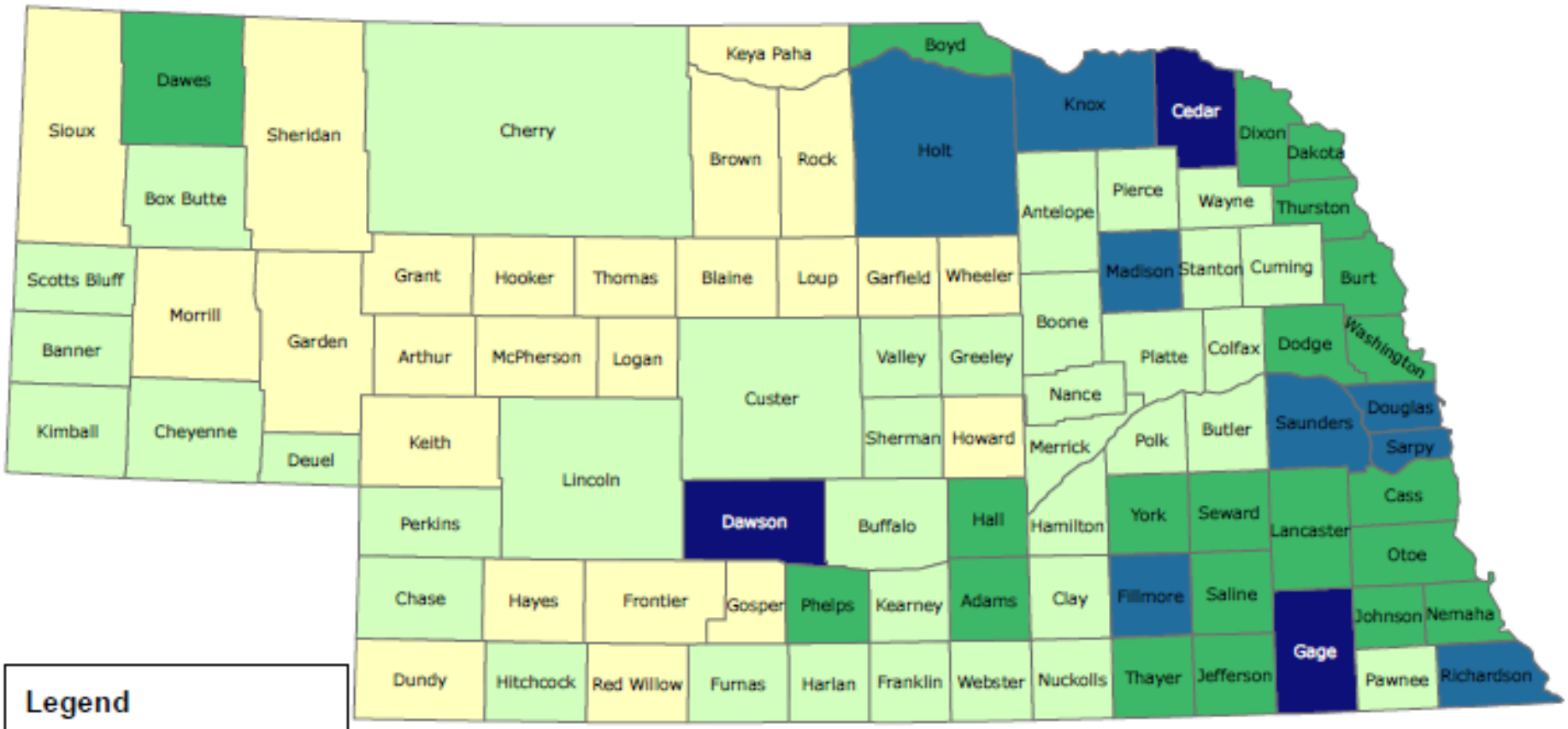
Indoor Radon Levels in Nebraska

- NE has “very high” incidence
- Half of the NE homes tested
  ≥ 4 pCi/L

- All areas of the state
- Levels can vary widely - same neighborhood
- Neighbor’s level not your level

Highest Radon Results by County

Nebraska Radon Program Data through 2011



Legend

Highest Radon Results by County (pCi/L)

- 2 - 19
- 20 - 43
- 44 - 85
- 86 - 204
- 205 - 290

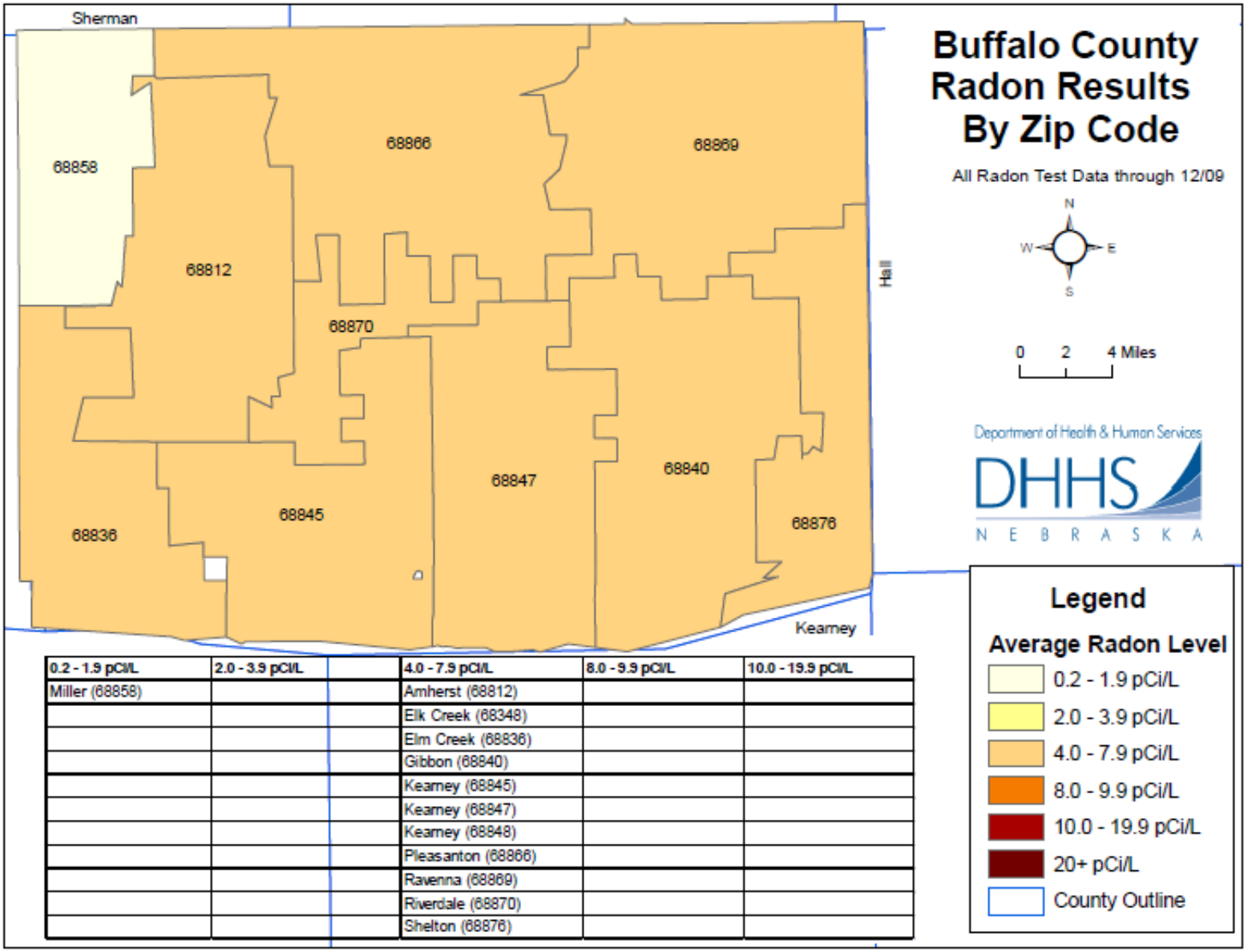
0 50 100 Miles

Department of Health & Human Services

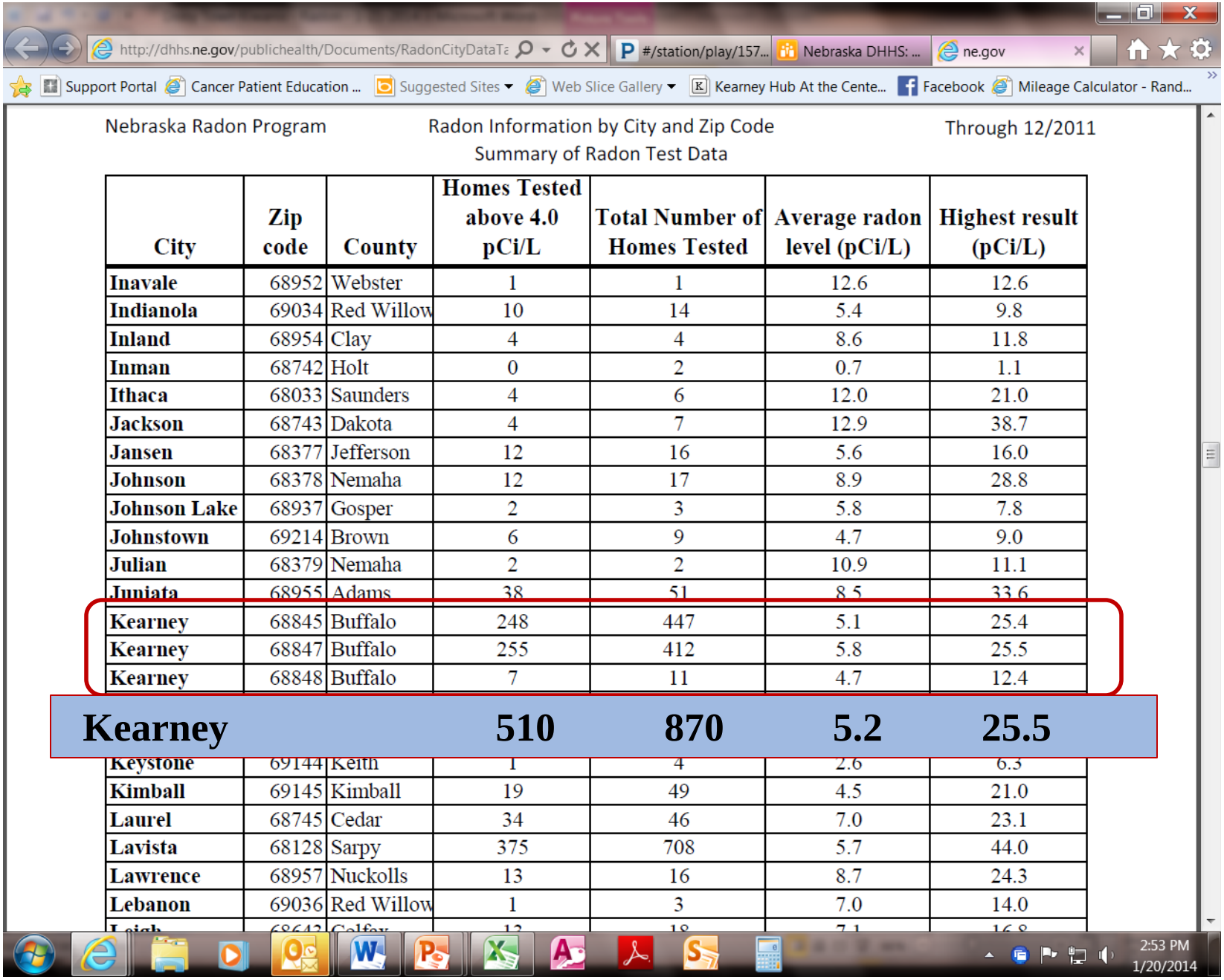
DHHS

NEBRASKA

Map created by: DHHS GIS - 12/12



0.2 - 1.9 pCi/L	2.0 - 3.9 pCi/L		4.0 - 7.9 pCi/L	8.0 - 9.9 pCi/L	10.0 - 19.9 pCi/L
Miller (68858)			Amherst (68812)		
			Elk Creek (68348)		
			Elm Creek (68836)		
			Gibbon (68840)		
			Kearney (68845)		
			Kearney (68847)		
			Kearney (68848)		
			Pleasanton (68866)		
			Ravenna (68869)		
			Riverdale (68870)		
			Shelton (68876)		



Nebraska Radon Program

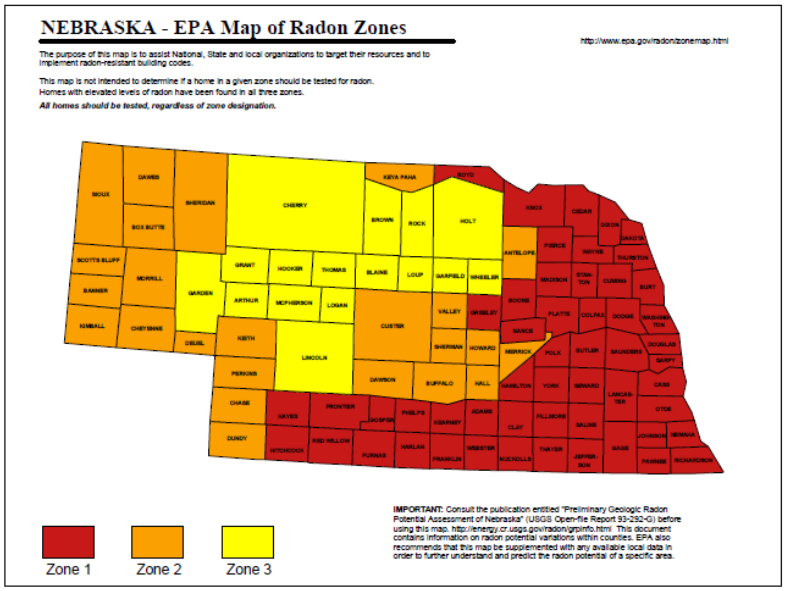
Radon Information by City and Zip Code

Summary of Radon Test Data

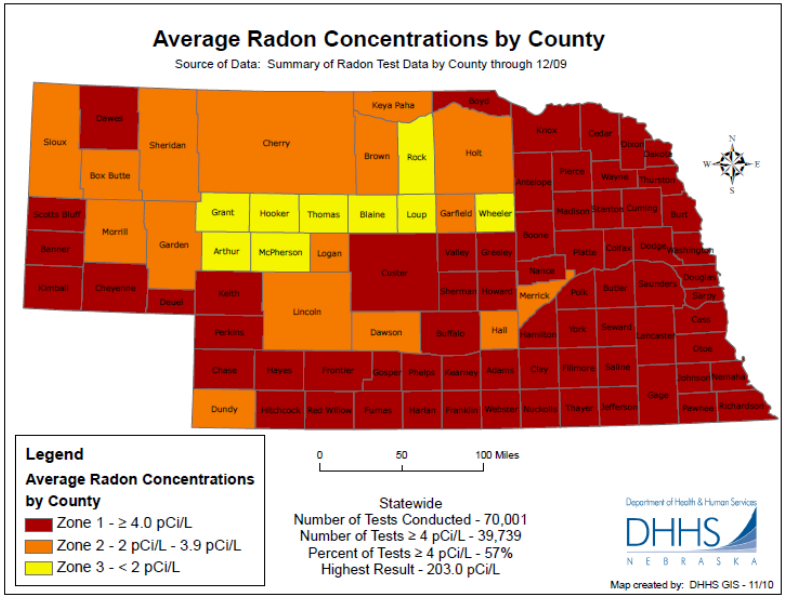
Through 12/2011

City	Zip code	County	Homes Tested above 4.0 pCi/L	Total Number of Homes Tested	Average radon level (pCi/L)	Highest result (pCi/L)
Inavale	68952	Webster	1	1	12.6	12.6
Indianola	69034	Red Willow	10	14	5.4	9.8
Inland	68954	Clay	4	4	8.6	11.8
Inman	68742	Holt	0	2	0.7	1.1
Ithaca	68033	Saunders	4	6	12.0	21.0
Jackson	68743	Dakota	4	7	12.9	38.7
Jansen	68377	Jefferson	12	16	5.6	16.0
Johnson	68378	Nemaha	12	17	8.9	28.8
Johnson Lake	68937	Gosper	2	3	5.8	7.8
Johnstown	69214	Brown	6	9	4.7	9.0
Julian	68379	Nemaha	2	2	10.9	11.1
Juniata	68955	Adams	38	51	8.5	33.6
Kearney	68845	Buffalo	248	447	5.1	25.4
Kearney	68847	Buffalo	255	412	5.8	25.5
Kearney	68848	Buffalo	7	11	4.7	12.4
Kearney			**510**	**870**	**5.2**	**25.5**
Keystone	69144	Keith	1	4	2.6	6.3
Kimball	69145	Kimball	19	49	4.5	21.0
Laurel	68745	Cedar	34	46	7.0	23.1
Lavista	68128	Sarpy	375	708	5.7	44.0
Lawrence	68957	Nuckolls	13	16	8.7	24.3
Lebanon	69036	Red Willow	1	3	7.0	14.0
Leigh	68642	Colfax	12	18	7.1	16.8

EPA Predicted Indoor Readings



Average Indoor Concentrations



Buffalo County:
Zone 2 = 2 - 4 pCi/L

"Moderate Risk"

Buffalo County:
Zone 1 = ≥ 4 pCi/L

Indoor Radon Testing

Testing only way to ID indoor radon level

Testing easy and inexpensive

Recommended by EPA and Surgeon General

Test lowest living level

Two testing options:

- ✓ Do-it-yourself kits (often used as an initial test)
- ✓ Professional testing

Do-it-yourself kits:

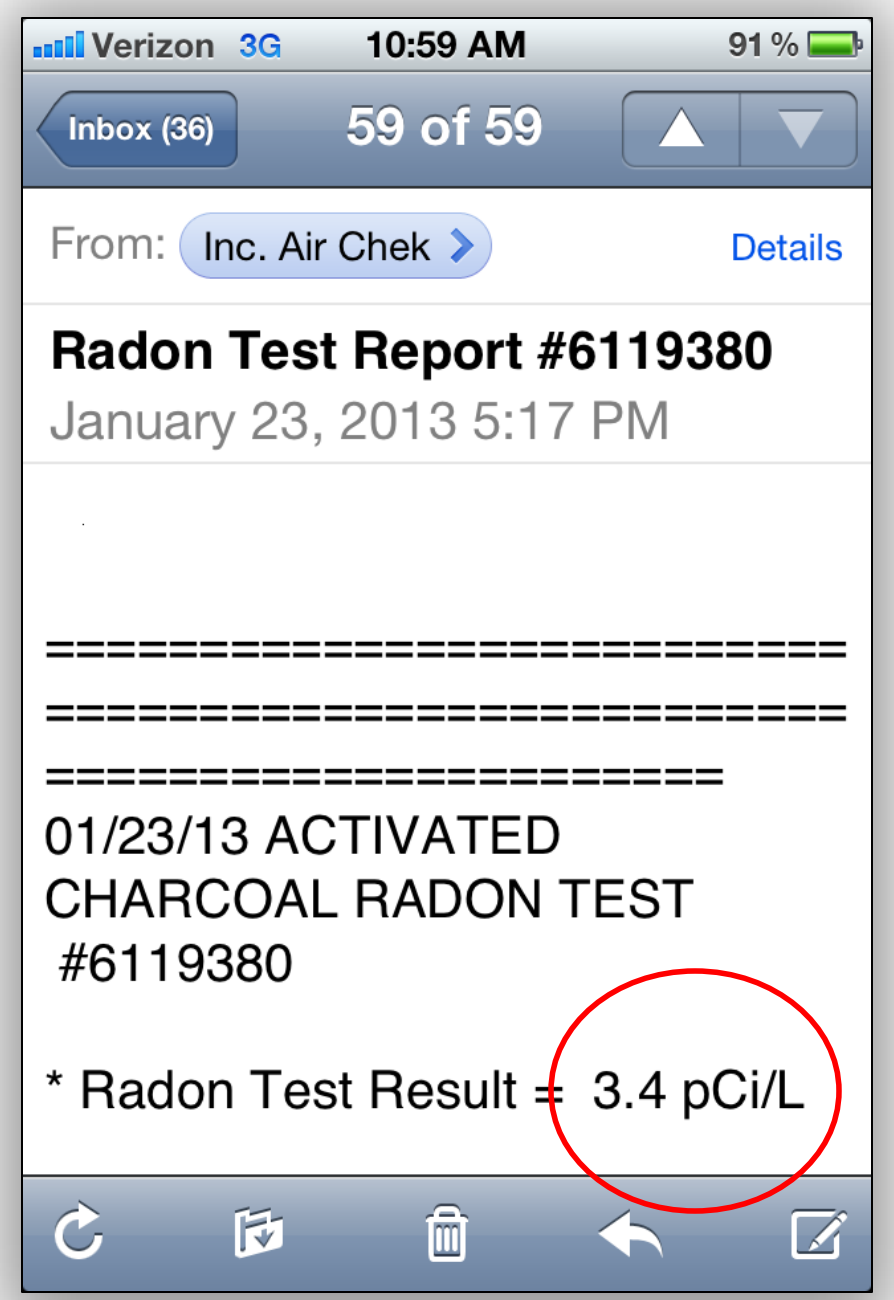
- Home stores
- Health departments:
  - Short term test 2-90 days $5
  - Long term test 91-365 days $15

Follow directions

- Test on lowest living level
- Maintain “closed home” conditions
- Ø utility, laundry, bathrooms, kitchens

- Not recommended for real estate transactions

TOP RATED
RADON
TEST KIT
and
INSTRUCTIONS
AIR
CHEK Inc.
CONTAINS EVERYTHING NEEDED TO CONDUCT A 3 to 7 DAY RADON TEST
KEEP INNER PACKAGE SEALED UNTIL READY FOR USE
LAB ANALYSIS INCLUDED
HOME FOR SALE
TEST BEFORE YOU BUY!
6135332
STARTING CLOCK
ENDING CLOCK
CIRCLE YOUR ANSWER(S) TO EACH QUESTION BELOW:


Verizon 3G
10:59 AM
91 %
Inbox (36)
59 of 59
From:
Inc. Air Chek
Details
Radon Test Report #6119380
January 23, 2013 5:17 PM
==========
==========
==========
01/23/13 ACTIVATED
CHARCOAL RADON TEST
#6119380
* Radon Test Result = 3.4 pCi/L

Professional testing:

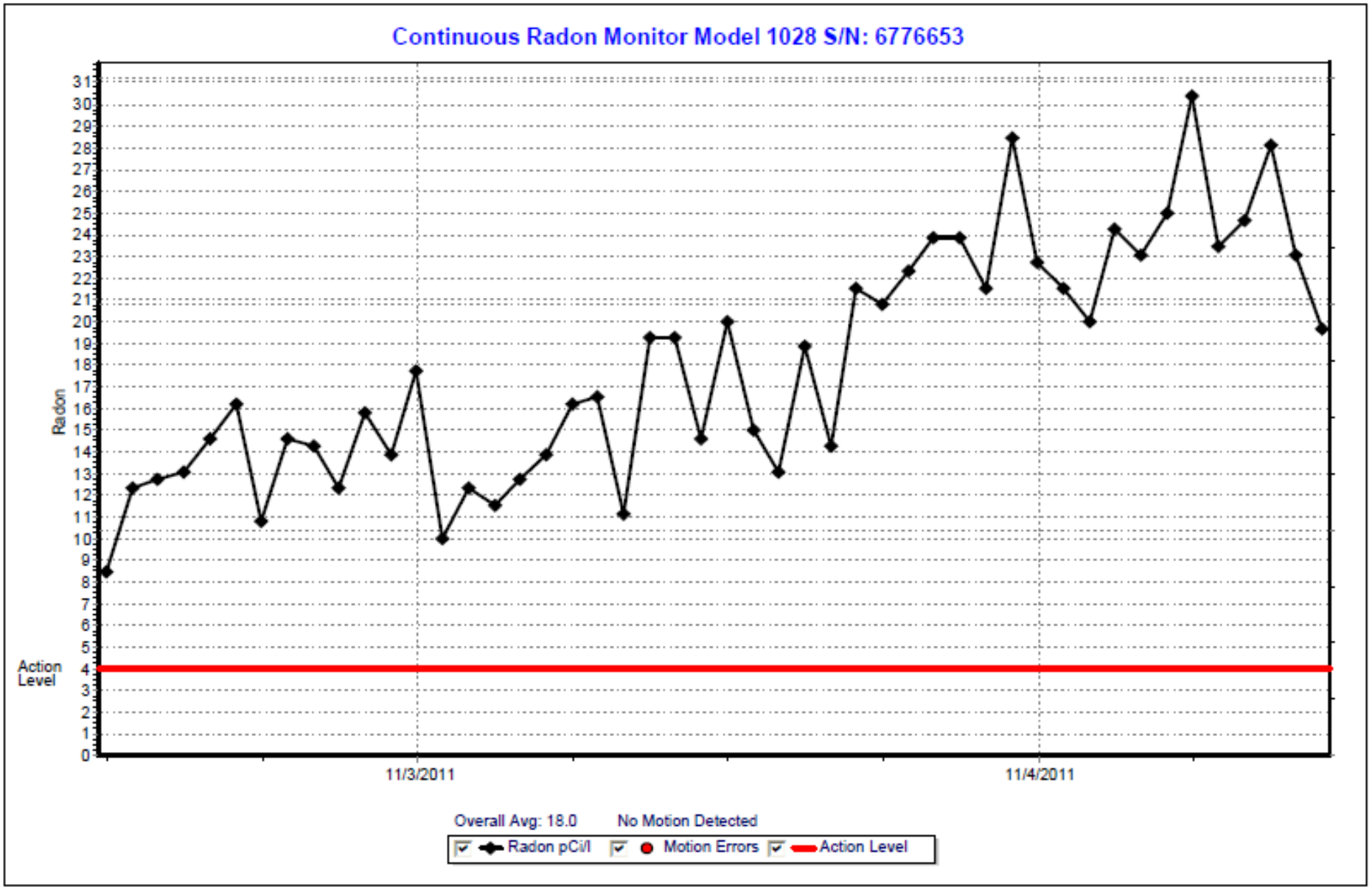
- Radon Measurement Specialist
  - In NE: Licensure required
  - 3 Buffalo C0 (1/2014)
- $85 - $150
- Short term or long term
- Track variations
- Monitor conditions carefully
  - Post ventilation notice
  - Note weather variations

Licensed Radon Measurement Businesses

Nebraska Radon Program
PO Box 95026
Lincoln, NE 68509
1-800-334-9491
www.dhhs.ne.gov/radon

Department of Health & Human Services
DHHS
NEBRASKA

Adams County				
C & A Home Inspections, LLC				
PO Box 103	Kenesaw	68956	(402) 981-8315	mark@cahomeinspect.com
Buffalo County				
Midwest Radon Specialists				
19630 56th Rd	Kearney	68845	(308) 233-7031	marbran1622@hotmail.com
Advantage Property Inspections				
226 Blue Mill Rd	Kearney	68847	(308) 233-2686	garyapi1@gmail.com
Integrity Home Inspection & Testing, LLC				
8 Redwood Dr	Kearney	68845	(308) 627-5471	lkarschner@frontiernet.net
Butler County				


Continuous Radon Monitor Model 1028 S/N: 6776653
Radon
Action Level
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
11/3/2011
11/4/2011
Overall Avg: 18.0
No Motion Detected
Radon pCi/l
Motion Errors
Action Level

How often to test?

- Baseline & every two years
- During different seasons
- Before:
  - Renovation
  - Changing living patterns
- After:
  - Mitigation system installed
  - Foundation settling
  - Changes to HVAC system

Real Estate Transactions

If Selling a Home

- If previously tested, seller *must* disclose results

If Buying a Home

- If previously tested, ask
  - By whom & when?
  - Alterations done?
  - Retest
- If not previously tested
  - Ask for professional test
  - Add contract details

Removing Radon in Existing Home

Mitigation:

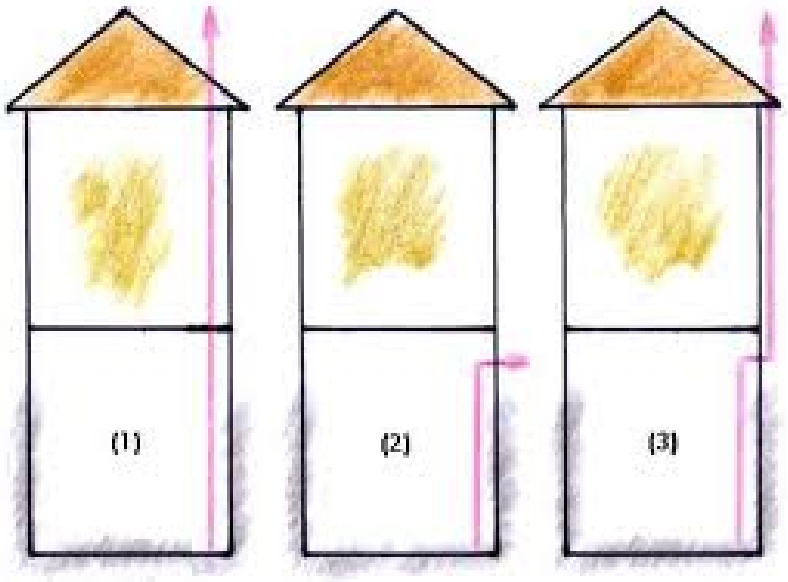
concentration of radon

Action level = 4 pCi/l or above

Most homes can be reduced to 2 pCi/l or below

Components of mitigation:

- ✓ Suction point (perhaps > 1)
- ✓ Ventilation pipe
- ✓ Fan
- ✓ Sealants


(1)
(2)
(3)

Suction Points

INTERIOR SYSTEM

Roof vent

Attic fan

Ventilation pipe

Suction point

EXTERIOR SYSTEM

Exterior fan & ventilation pipe

Suction point

Sealant

Selecting a Mitigation Specialist

- Owner may mitigate own home
- Radon Mitigation Specialist
  - In NE: Licensure required
  - 3 in Buffalo Co (1/2014)
  - 32 in NE (1/2014)
- Obtain estimates
- Ask how system will blend in with home

Licensed Mitigation Businesses

Nebraska Radon Program
PO Box 95026
Lincoln, NE 68509
1-800-334-9491
www.dhhs.ne.gov/radon

Department of Health & Human Services
DHHS
NEBRASKA

Adams County					
Energy Pioneer Solutions, Inc.	3030 S Marian Rd	Hastings	68901	(402) 834-0800	http://www.energypioneersolutions.com/
Buffalo County					
Getz Radon Pros	PO Box 748	Kearney	68848	(308) 627-8059	shadgetz@hotmail.com
Integrity Home Inspection & Testing, LLC	8 Redwood Dr	Kearney	68845	(308) 627-5471	lkarschner@frontiernet.net
Midwest Radon Specialists	19630 56th Rd	Kearney	68845	(308) 233-7031	marbran1622@hotmail.com
Dodge County					
Radon Concepts, LLC	1410 Watson St	Fremont	68025	(402) 459-1004	sreeder@q.com
Douglas County					
Arid Resources, Inc.					

Pre & Post Mitigation Testing

20-year old ranch-style home - NW Kearney, NE

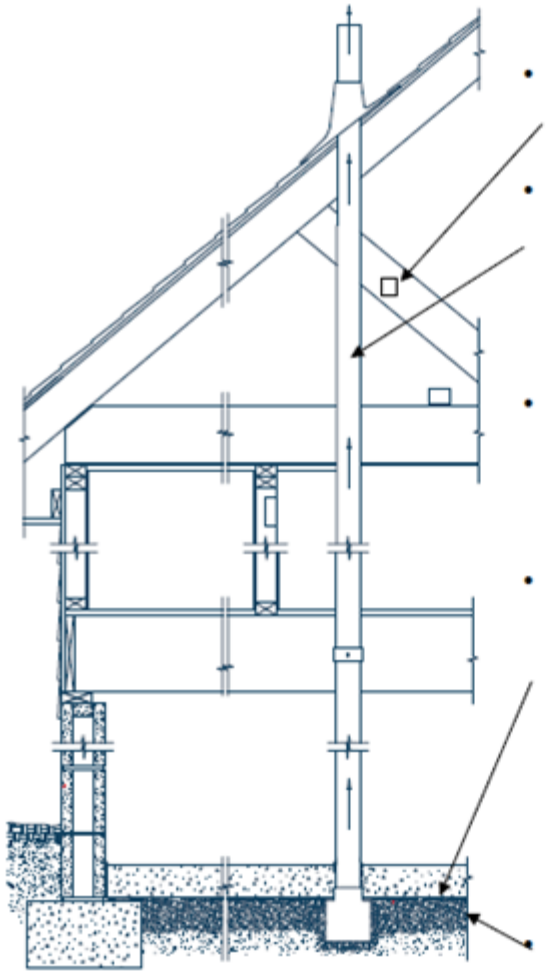
November 2, 2011	Original Test	18.0 pCi/l
November 13, 2011	Mitigation Installation	
November 19, 2011	Post Test	**1.7 pCi/l**

Minimizing Radon Entry in New Construction

Radon Resistant New Construction (RRNC) features include either:

- Active ventilation system
- Passive ventilation system
  - Vertical pipe that passively removes soil gas by natural convection – warm air moving up
  - Fan can be added later if necessary

Radon Resistant New Construction (RRNC)



- **Install an electrical junction box in the attic** to permit the installation of a fan to activate the system, if needed.
- **A 3- or 4-inch diameter PVC ventilation pipe vertically through the building floors.** The ventilation pipe should have a "T" fitting bedded in the aggregate below the plastic sheeting and should terminate at least 12 inches above the surface of the roof.
- **Seal all joints, cracks, or other openings** around all penetrations of both exterior and interior surfaces, **below grade**, with an elastomeric sealant to provide an air-tight seal.
- **Install 6-mil (or 3-mil cross laminated) polyethylene sheeting material on top of the aggregate material.** The sheeting should cover the entire floor area and separate pieces of sheeting should be overlapped at least 12 inches. The sheeting should fit closely around any pipe or other penetrations of the material. Where practical, punctures or tears in the material should be sealed or covered with additional sheeting.
- **Install a 4" thick layer of clean, 1/4 to 2-inch size aggregate** to create a permeable layer (for soil gas collection below the basement slab) and a "capillary break" from the soil beneath it.

Are RRNC techniques required in all new home construction in NE?

No

- Codes determined by city councils
- Rural areas may have no codes
- Most communities adopt the International Residential Code (IRC) for local code
- Requires extensive education & buy-in
  - Community members (health investment)
  - Builders (selling point)

NE Communities with RRNC requirements

(as of 10-2013)

State of Nebraska	No statewide code for RRNC
Cities of Hastings, McCook, Caroll, Madison, Norfolk, Pender and Stanton	Enforces IRC Appendix F
City of Wayne	Enforces passive radon resistant new construction techniques as part of building code

http://www.epa.gov/radon/rrnc/code_listing.html#Nebraska

Is Radon a Gimmick?

- Skepticism is good
- But what other warnings have gone unheeded?

  January 2014 - 50th anniversary of the 1964 U.S. Surgeon General's report on smoking
  - Historic turning point in fight against tobacco
  - Number one cause of preventable death

NE Bill would require RRNC

- Introduced 1/2013
- Passed first round 1/2014
- Krist said, “Nebraska has the third highest radon emission rate in the US, he said, and radon exposure is the number one cause of lung cancer in nonsmokers.”

http://update.legislature.ne.gov/?p=8259

Credible Radon Resources:

Nebraska Radon Program 800-334-9491

http://dhhs.ne.gov/publichealtlh/Pages/radon

Two Rivers Public Health Department 308-995-4778

http://www.tworiverspublichealth.com/

State of Nebraska DHHS Licensure

http://www.nebraska.gov/LISSearch/search.cgi

National Environmental Health Association

www.neha.org/index.shtml

Credible Radon Resources:

National Radon Safety Board www.nrsb.org

American Association of Radon Scientists and Technologists www.aarst.org

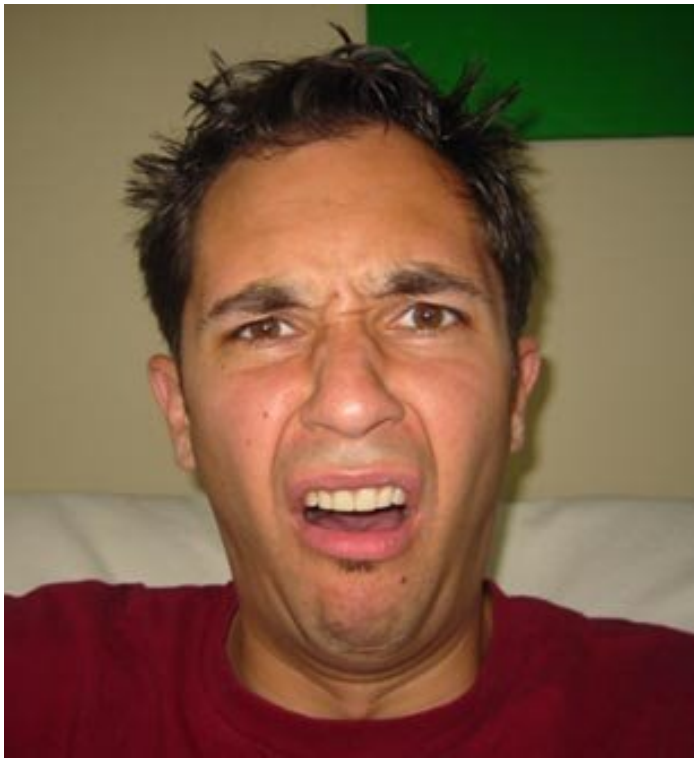
Conference of Radiation Control Program Directors www.crcpd.org

US Geological Service energy.cr.usgs.gov/radon/radonhome.html

American Lung Association www.lung.org

Environmental Protection Agency www.epa.gov/radon

Colorectal Screening



Mammograms

HPV Vaccine (Human Papillomavirus)

HPV Vaccine (Human Papillomavirus)

“This is a vaccine that protects against cancer; what could be better than that?”

Shannon Stokley

Centers for Disease Control and Prevention

CDC Recommendations:

- ✓ Three doses beginning at age 11 or 12
- ✓ Girls since 2006
- ✓ Boys since 2011

Future presentations

Cancer 101

Cancer & genetics

How to help someone with cancer

Panel discussion

CATHOLIC HEALTH INITIATIVES®

Good Samaritan
CANCER CENTER

Kearney, Nebraska www.gshs.org

NCI COMMUNITY
CANCER CENTERS
PROGRAM

Thank You

Carol O'Neill
caroloneill@catholichealth.net