

Elevated Outdoor Radon in Ocala Florida

- Bill Brodhead
- WPB Enterprises Inc
- www.WPB-Radon.com
- Slides are available
WPB-Radon website

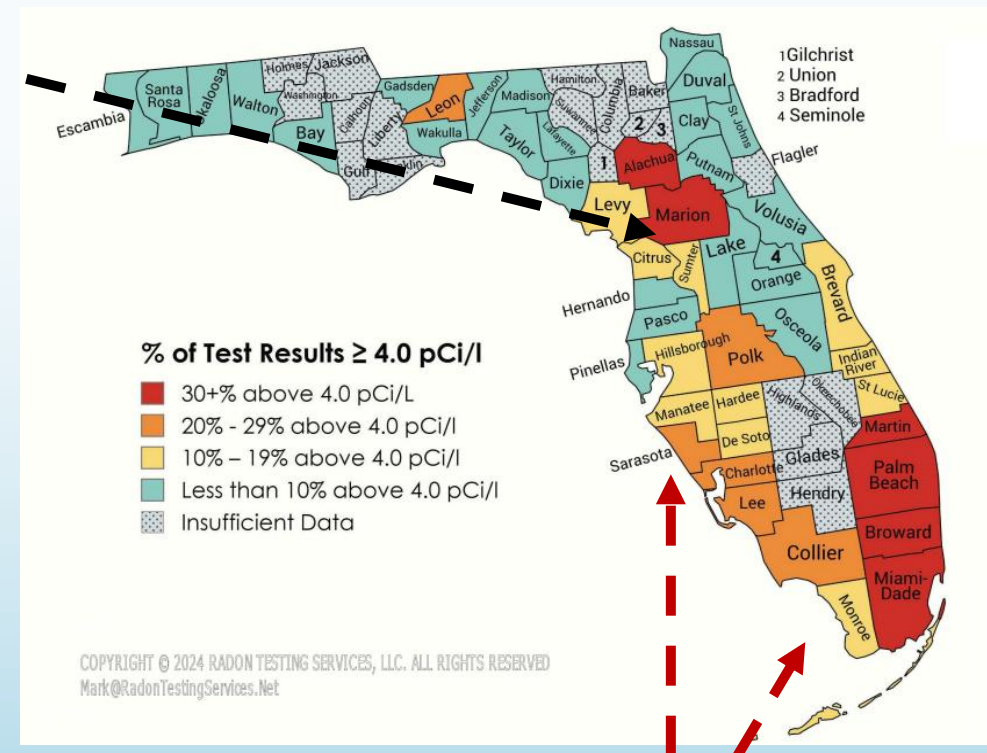


Last November (2025), we brought
our camper to this home
in Ocala, Florida



I happened to have a
continuous radon monitor in the camper

Ocala is located in
Marion County,

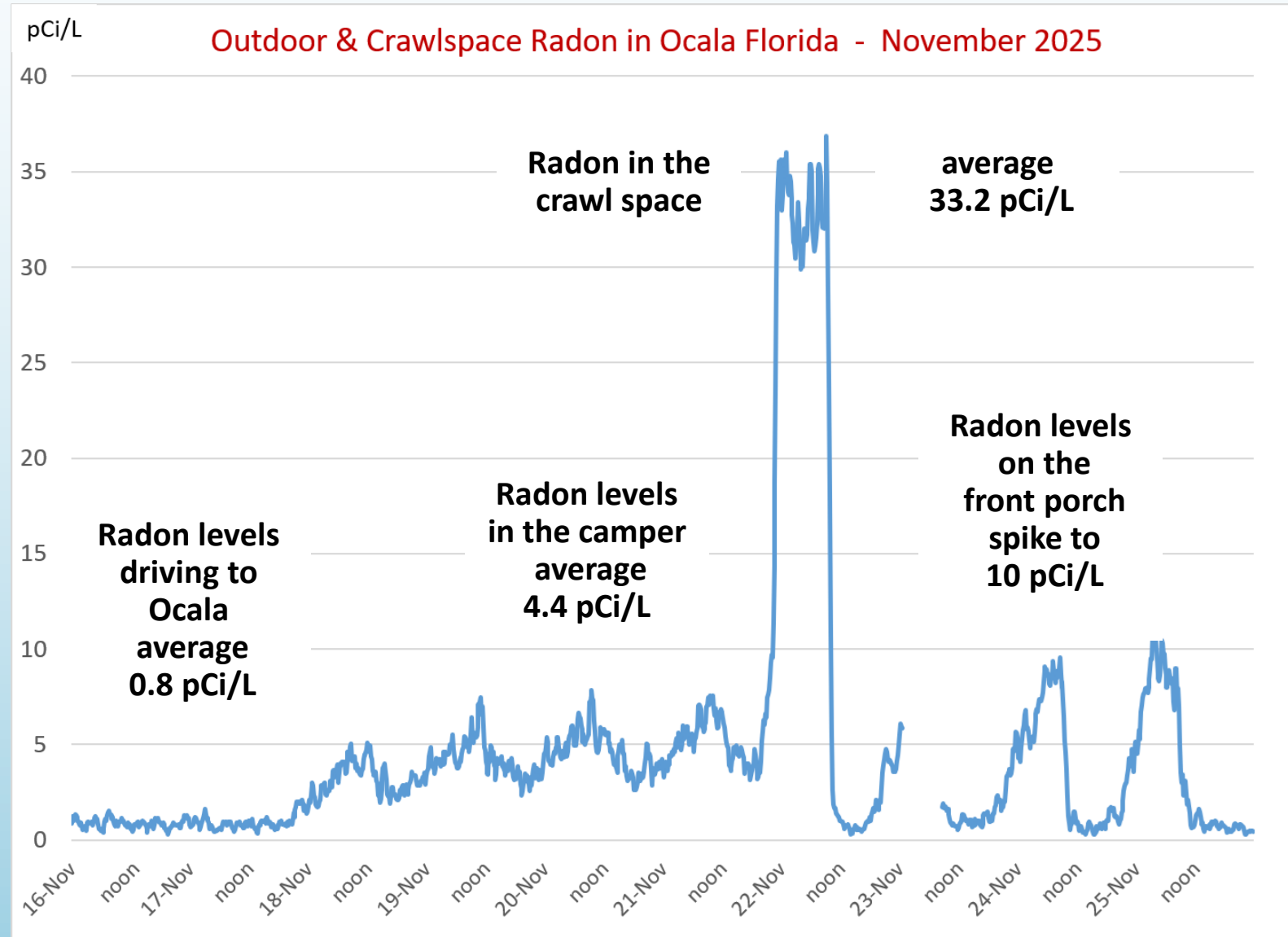


30% of Florida homes in
the red zones are above 4.0 pCiL
47% are above 4.0 in Marion County

House #1 is a
manufactured double-wide,
with crawl space vents &
No mitigation system



Multiple Crawl Space Vents



House #1 was used as the reference house

Eleven Years ago

Florida

Radon & Indoor Air Program made these

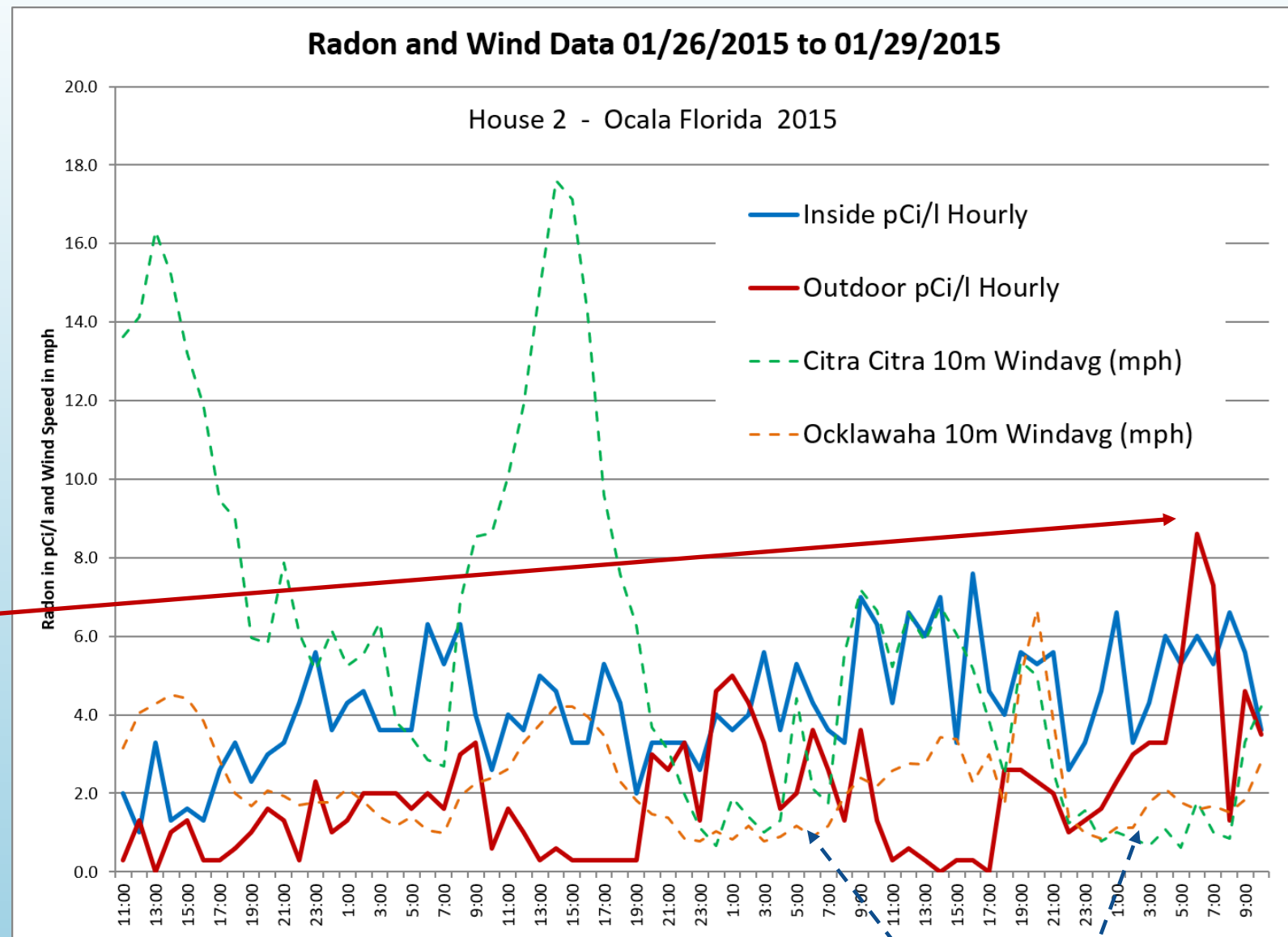
outdoor measurements at a home 4 miles from my sister's house

House 2 had a two-suction ASD system

Outdoor radon peaked at 8 pCi/L

Typical local soil radium is about 1 pCi/gm.

House 2 had soil samples varying from 6 to 65 pCi/gm of radium



Outdoor Radon is elevated during low-wind periods

Next slides,
compare
outdoor radon at
House 1
with
three other homes

House 5 was
50 miles North
of **House 1**

House 4 was
20 miles North
of **House 1**

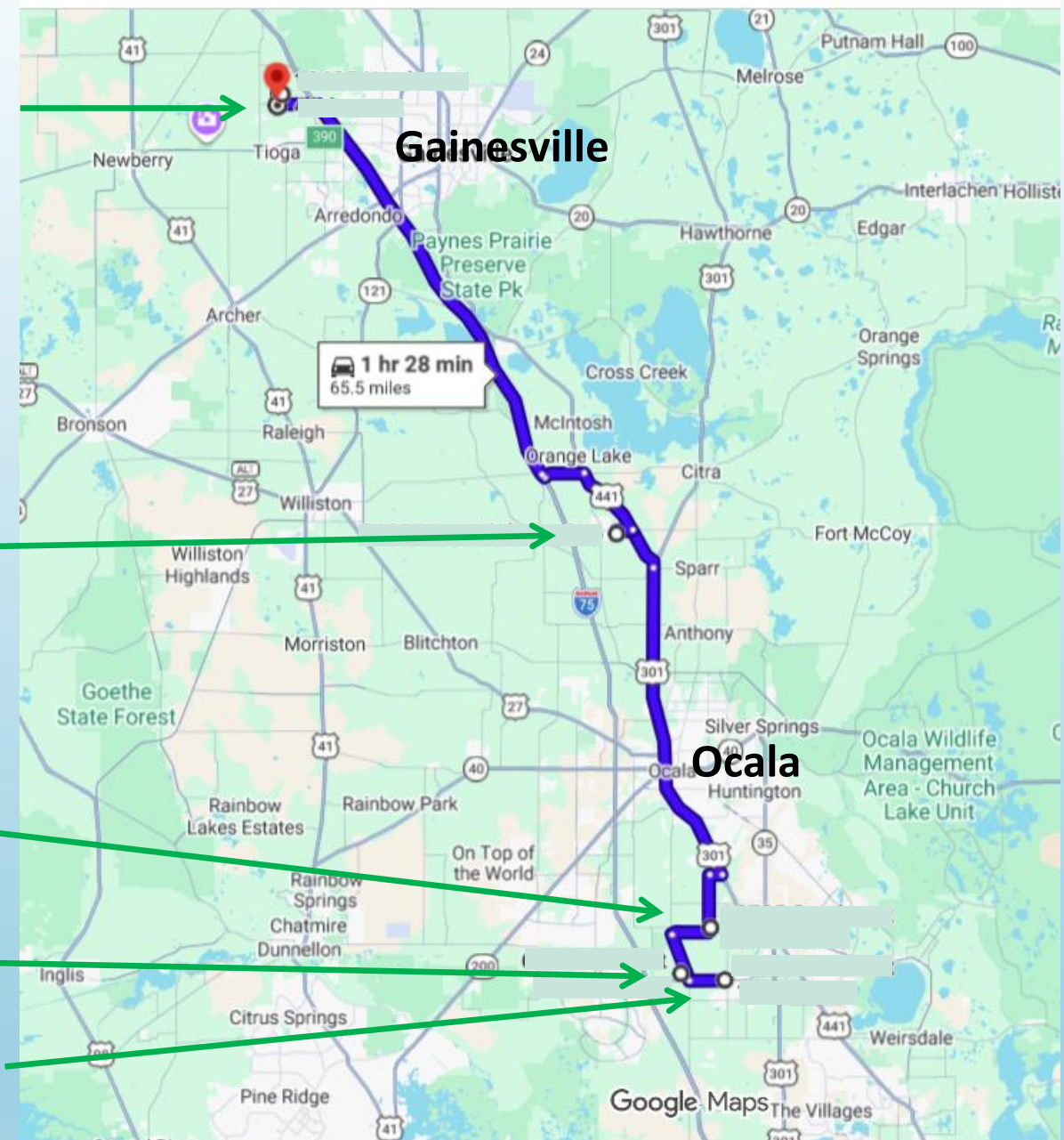
Gainesville House - 5

Reddick House - 4

Ocala House - 1

Ocala House - 3

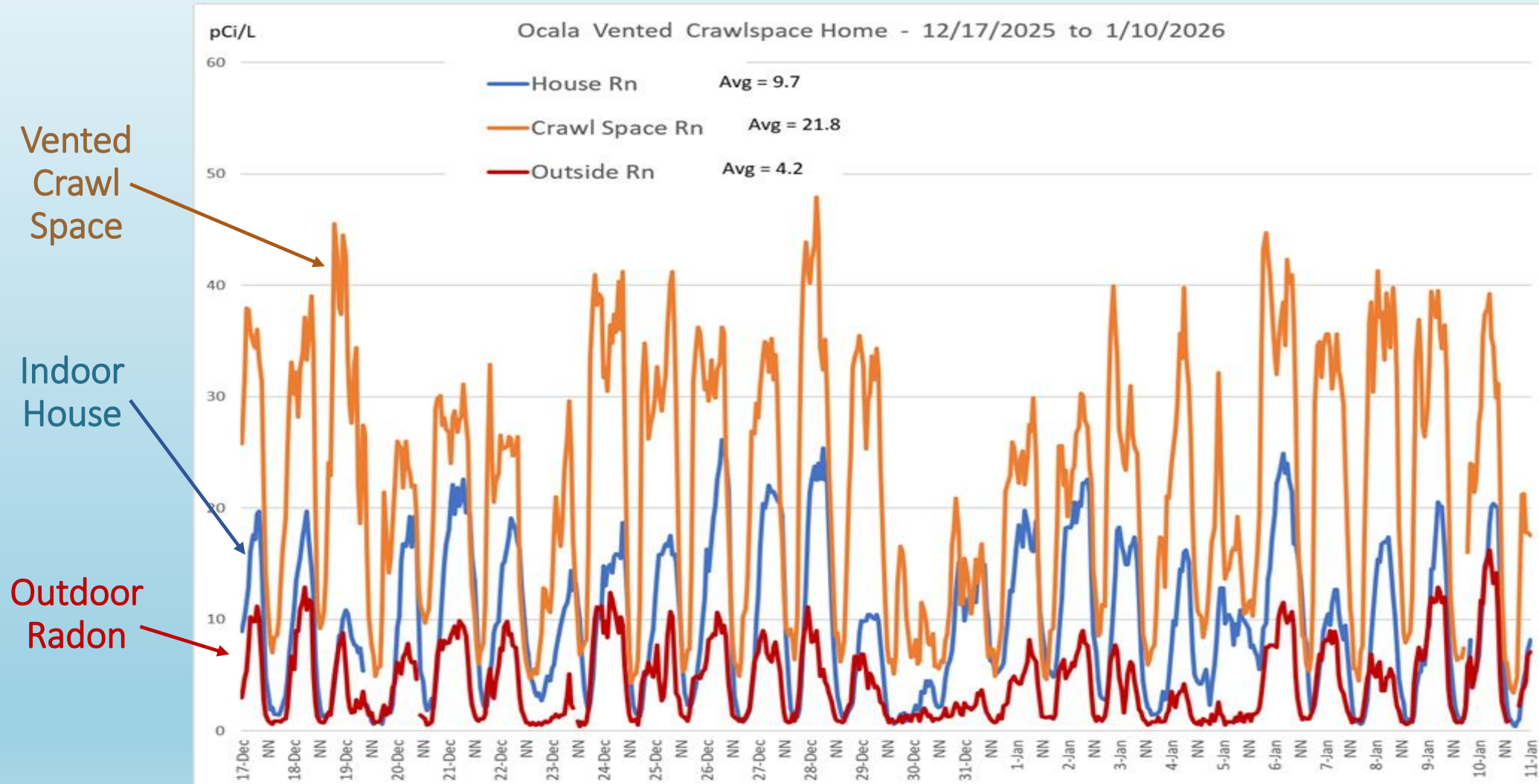
2015 State Tested House - 2



House 1
No mitigation
system installed
December 2025

Vented Crawl Space 21.8 pCi/L with peaks to 40 pCi/L
House averaged 9.7 pCi/L with peaks to 20 pCi/L
Outdoor averaged 4.2 pCi/L with peaks to 10 pCi/L

Initial
Testing
December
2025



A separate
talk
discussed the
Crawl Space
Remediation

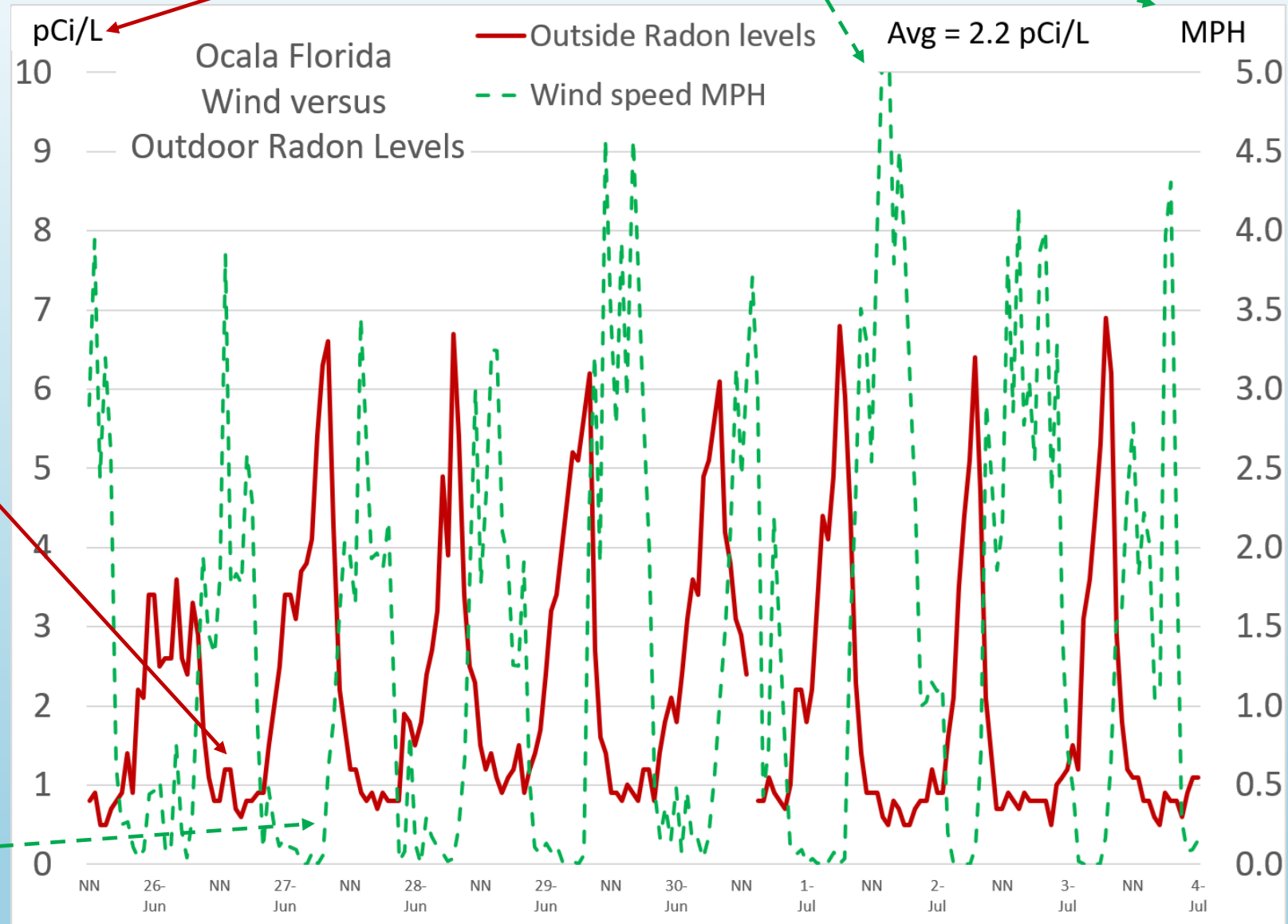
House 1

Radon system
turned off

On windless nights,
outdoor radon
levels
start increasing,
about midnight
and continue
until mid-morning

During the day,
sun heats the soil
and causes
convective airflow

Outdoor Radon versus Wind Speed



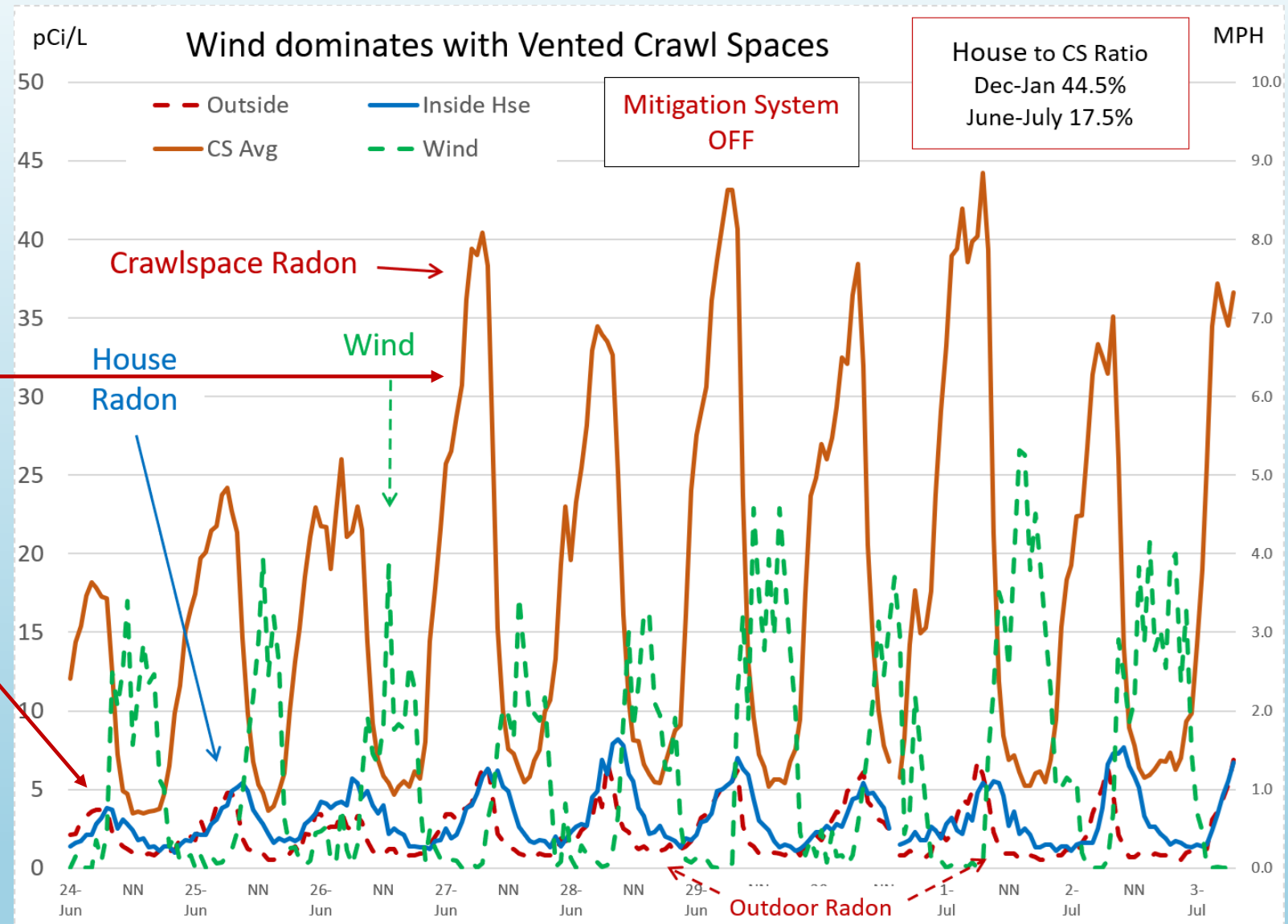
House 1

Radon system
turned off

Wind would
lower the
crawl space radon
from 35 pCi/L
to about
5 pCi/L

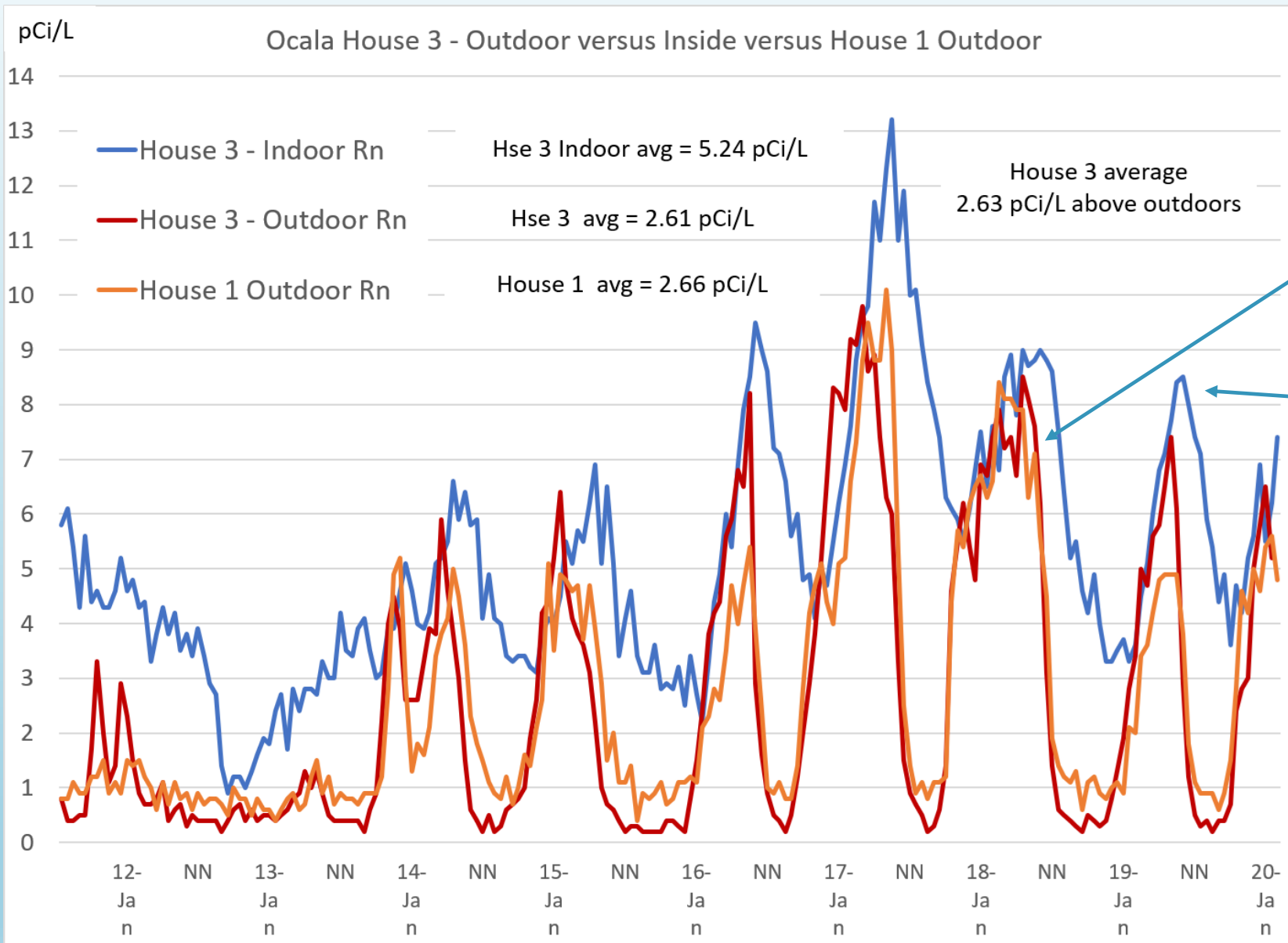
Crawlspace vents
without wind
are not effective
at reducing
crawl space radon

Wind versus Crawl Space Radon Levels



House 1 vs House 3 (4 miles away)

House 3 has a radon mitigation system



Outdoor radon levels

Red (Ref. Hse#3)

Orange (Hse#1)

Almost the same

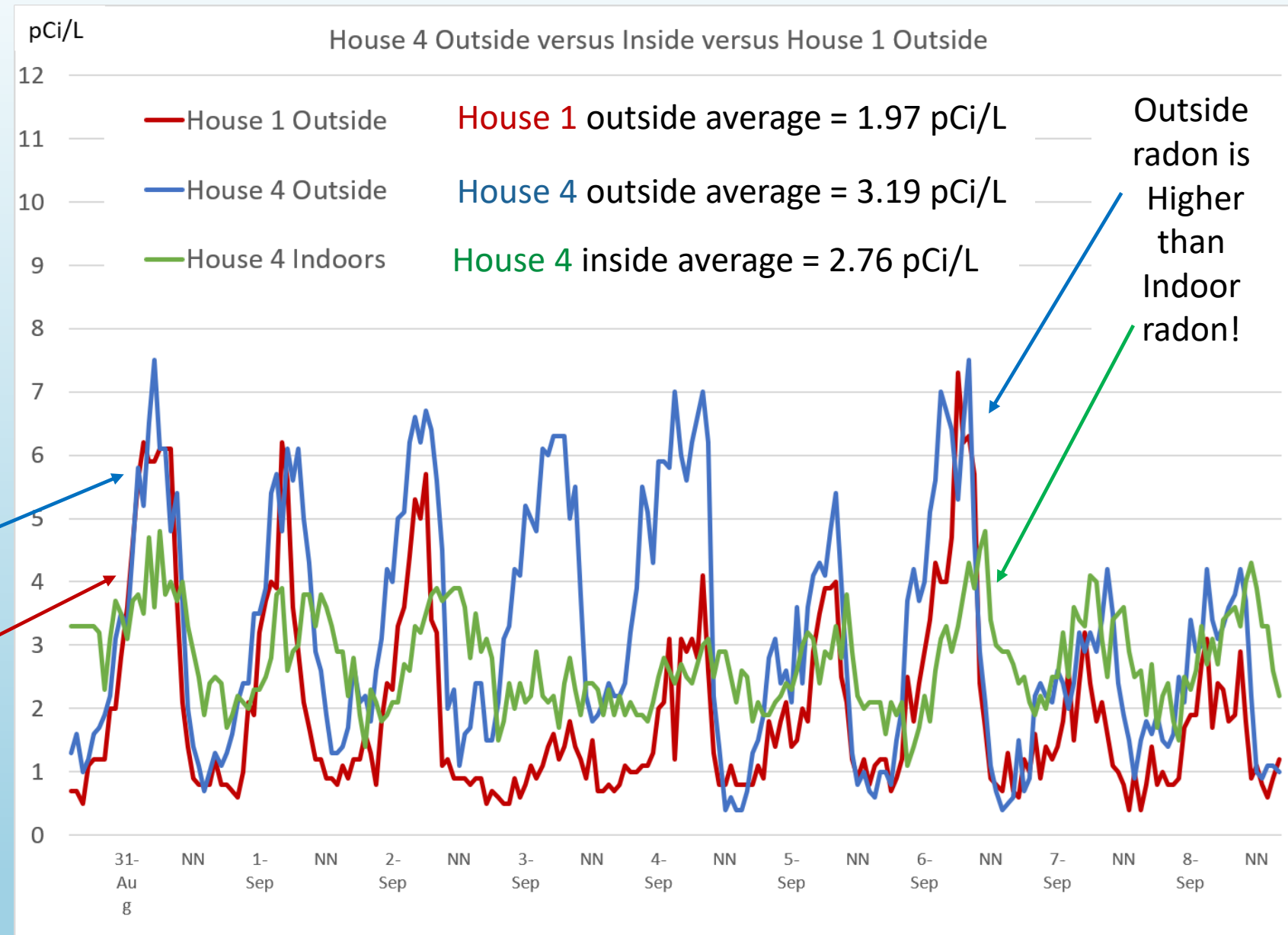
Indoor levels fall off slower than outdoor levels

Indoor 5.2 pCi/L levels would be 2.6 pCi/L if outdoor radon was very low

House 1 vs House 4 20 miles apart

House 4 is
North of House 1
between
Ocala and Gainesville

Outdoor Radon at
House 4
matches or exceeds
House 1
outdoor radon

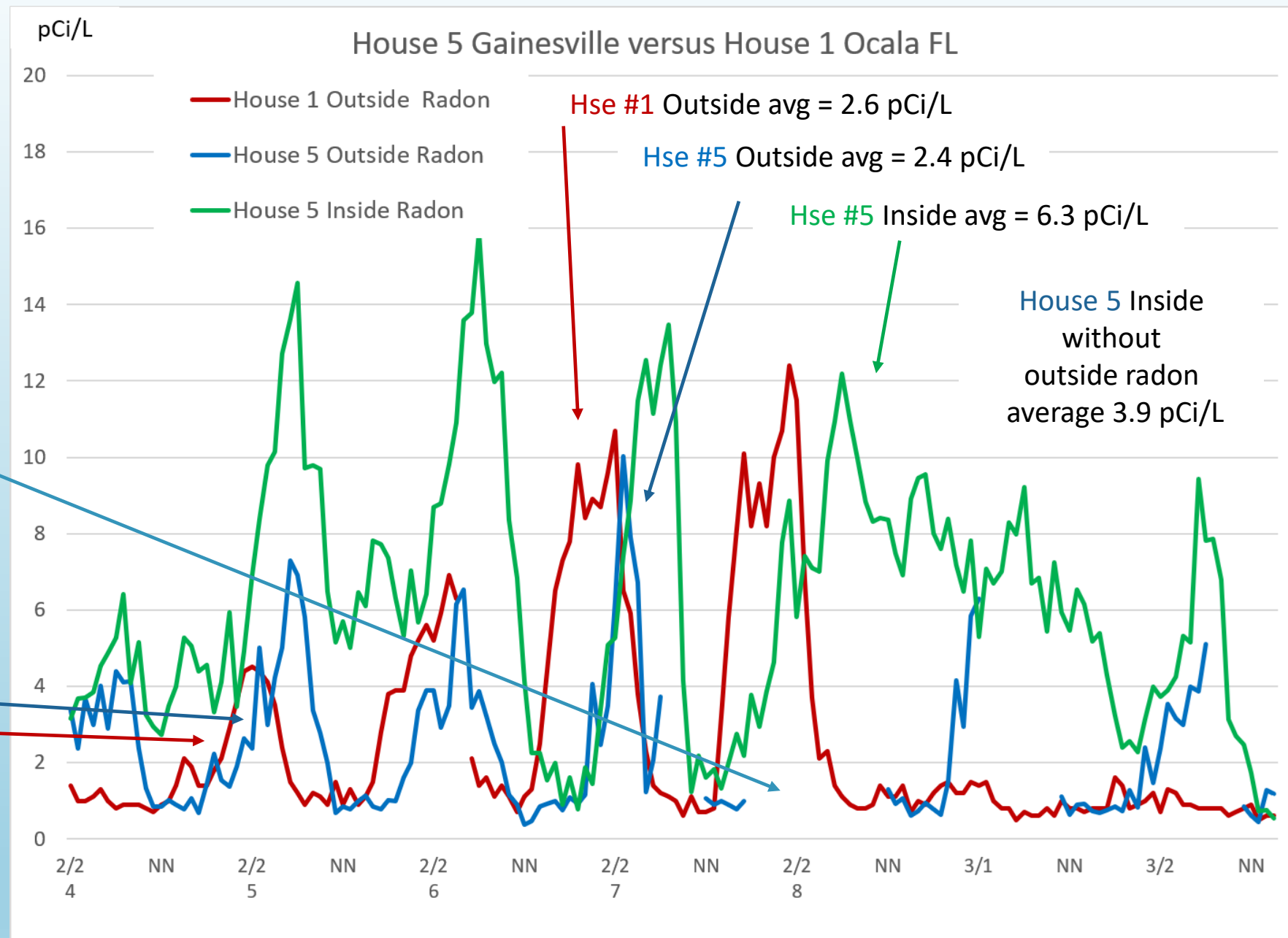


House 1 vs House 5

House 5 is 50 miles North of House 1 with no radon mitigation system

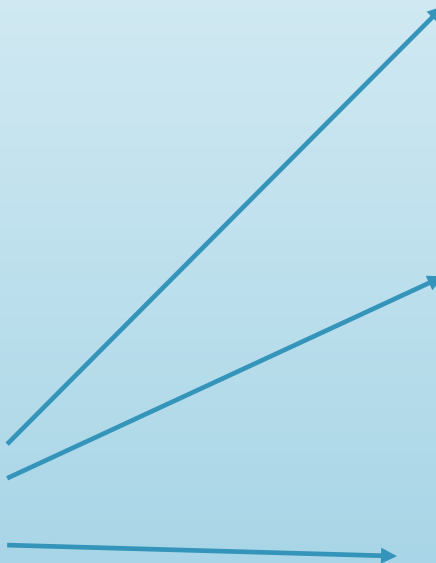
Unfortunately, House 5 outside radon monitor stopped recording during high humidity

The first three days House 1 and House 5 tracked each others outside radon



Data compiled by
Mark Perry of
Radon Testing Services
New Smyrna Beach, FL

Highest indoor radon
measurements
were predominately
around Ocala &
Gainesville



Highest FL Results

1.	307.1 pCi/L	Tallahassee
2.	298.4 pCi/L	Gainesville
3.	261 pCi/L	Ocala
4.	199.7 pCi/L	Tampa
5.	128.6 pCi/L	Ocala
6.	123.8 pCi/L	Gainesville
7.	114 pCi/L	Lake City
8.	112.1 pCi/L	Ocala
9.	111.7 pCi/L	Gainesville

Highest measurements up to 2024

Florida phosphate deposits

Prehistoric bones found
while mining
southeast of Tampa

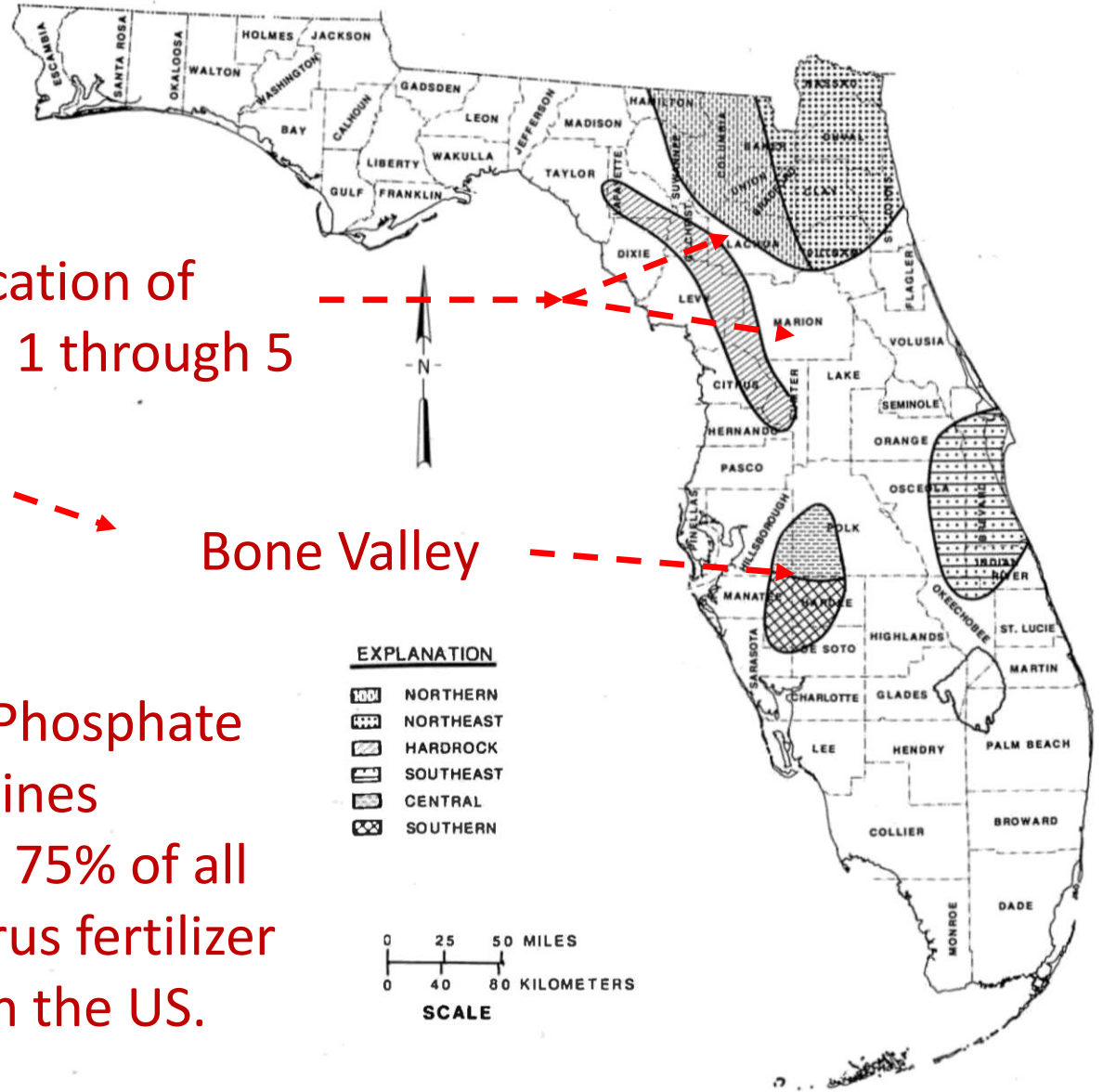
Waste product from mining
contains high levels of
Uranium and **Thorium**

No records of
phosphate mining
around Ocala

Location of
Houses 1 through 5

Bone Valley

Florida Phosphate
mines
provide 75% of all
phosphorus fertilizer
used in the US.

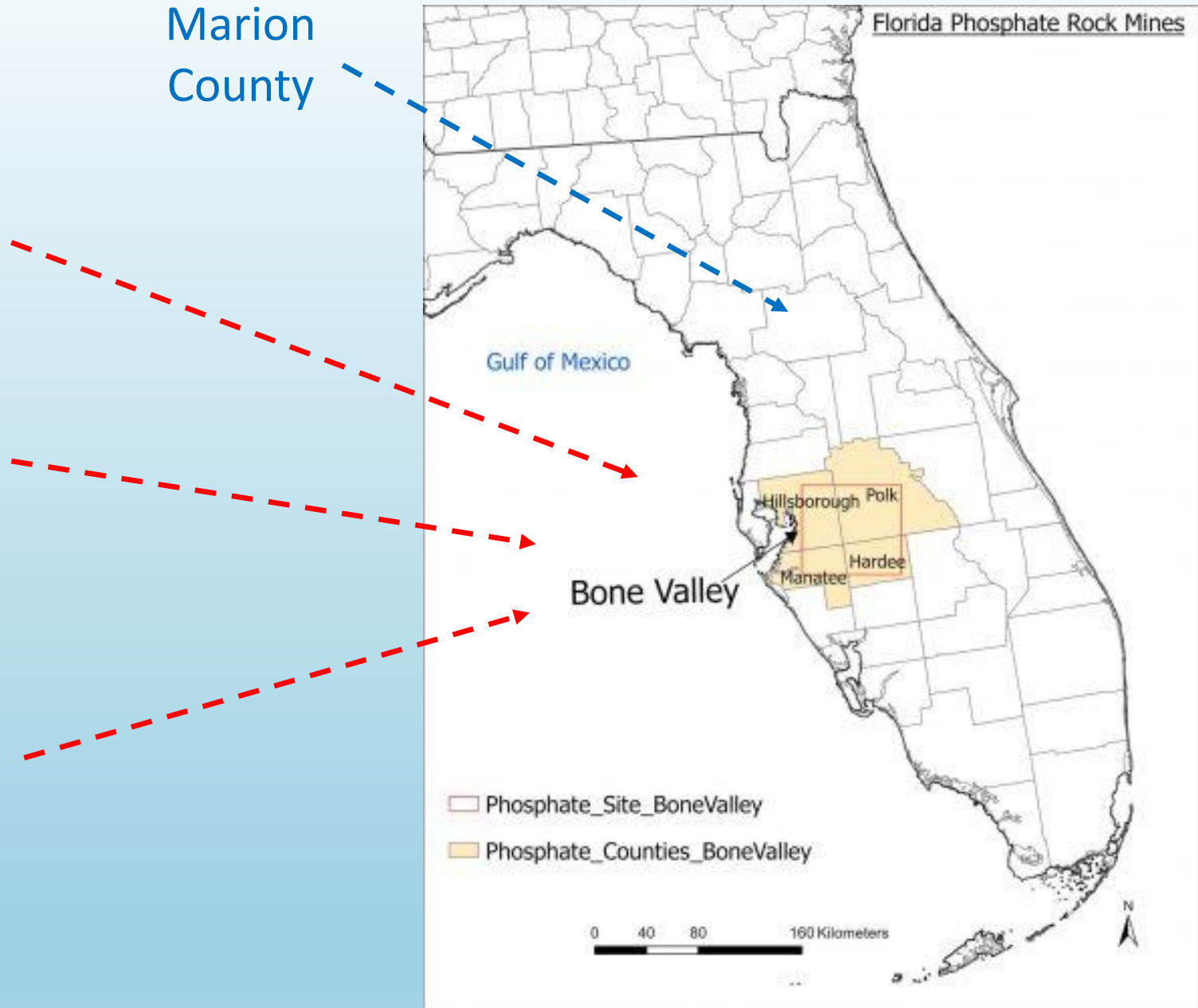


Predominant Florida phosphate mining is done in Bone Valley

Uranium was extracted from these phosphate areas from 1952 to 1961 and then from 1976 until 1998

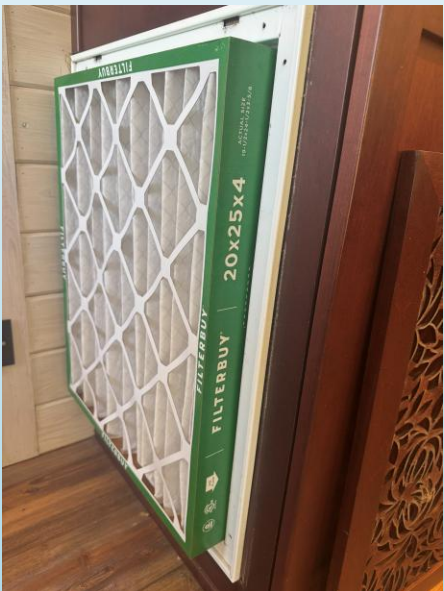
This area is North America's largest uranium resource, containing an estimated 1 million tons of uranium

Marion County

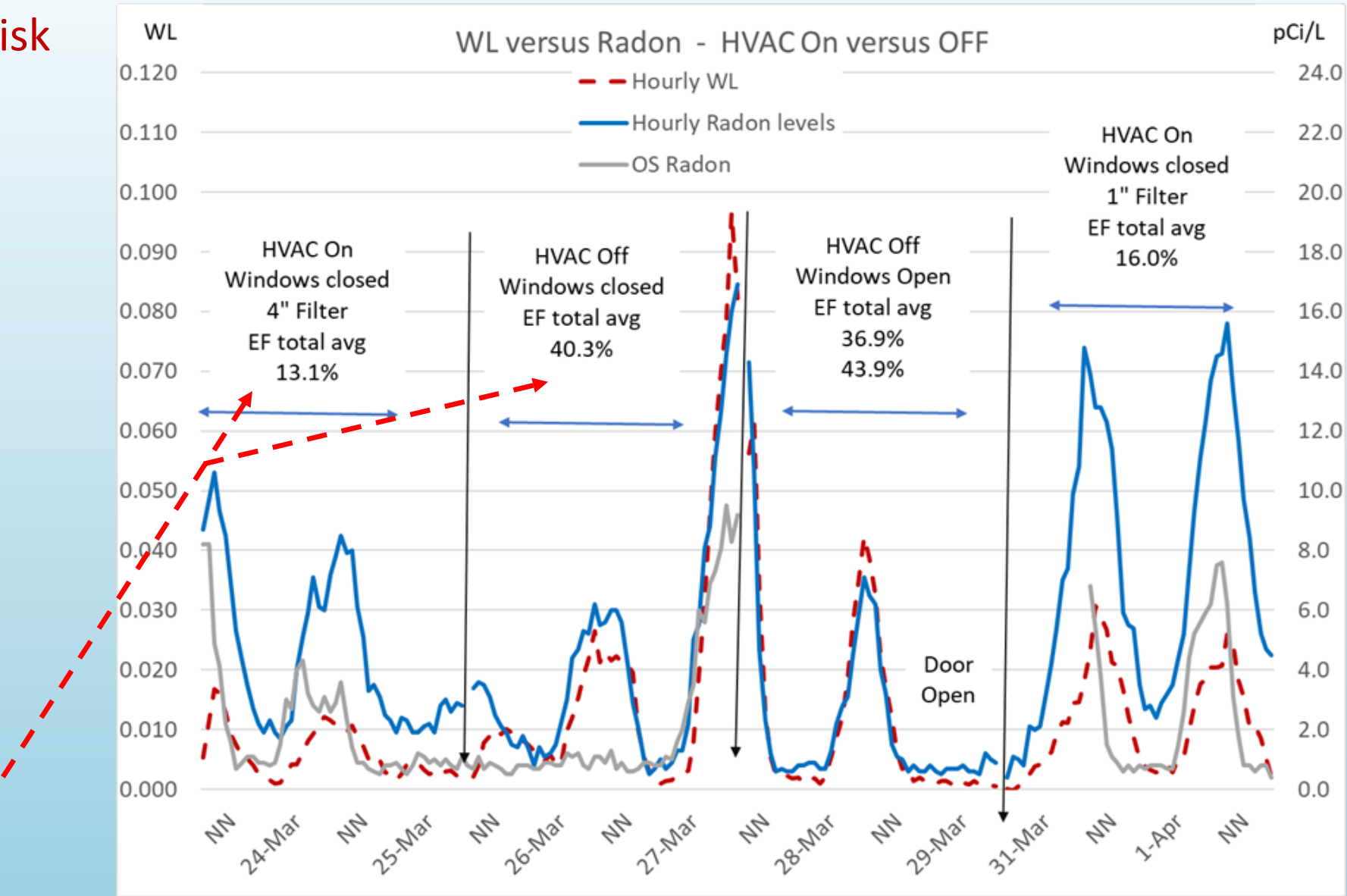


Reducing Outdoor Radon Risk

Replaced 1" air filter with
4" thick Merv filter



Run HVAC continuous on
Radon Decay Products
Equilibrium Factor (EF)
reduced from 40% to 13%

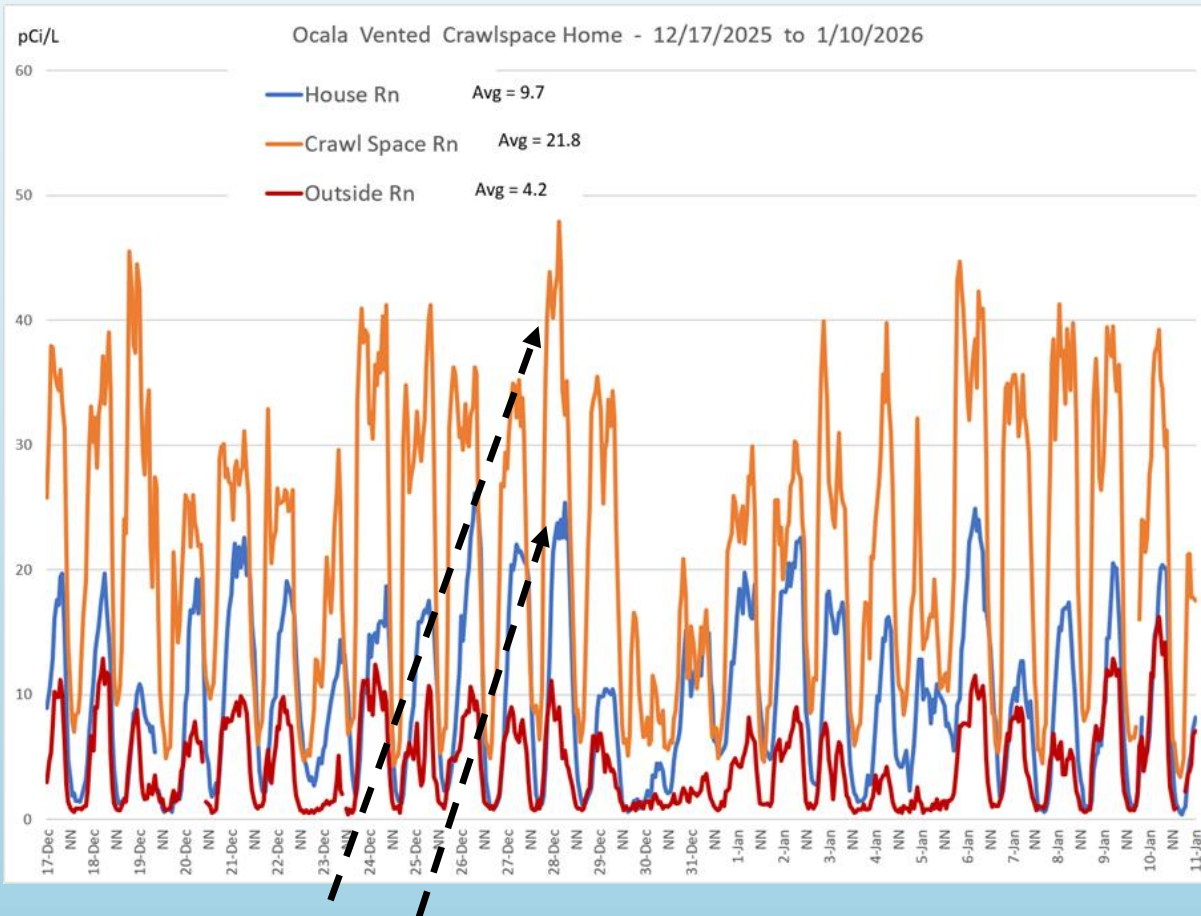


Note: Risk reduction is not linear with EF reduction

December-January
Indoor was **44%** of
Crawl Space radon

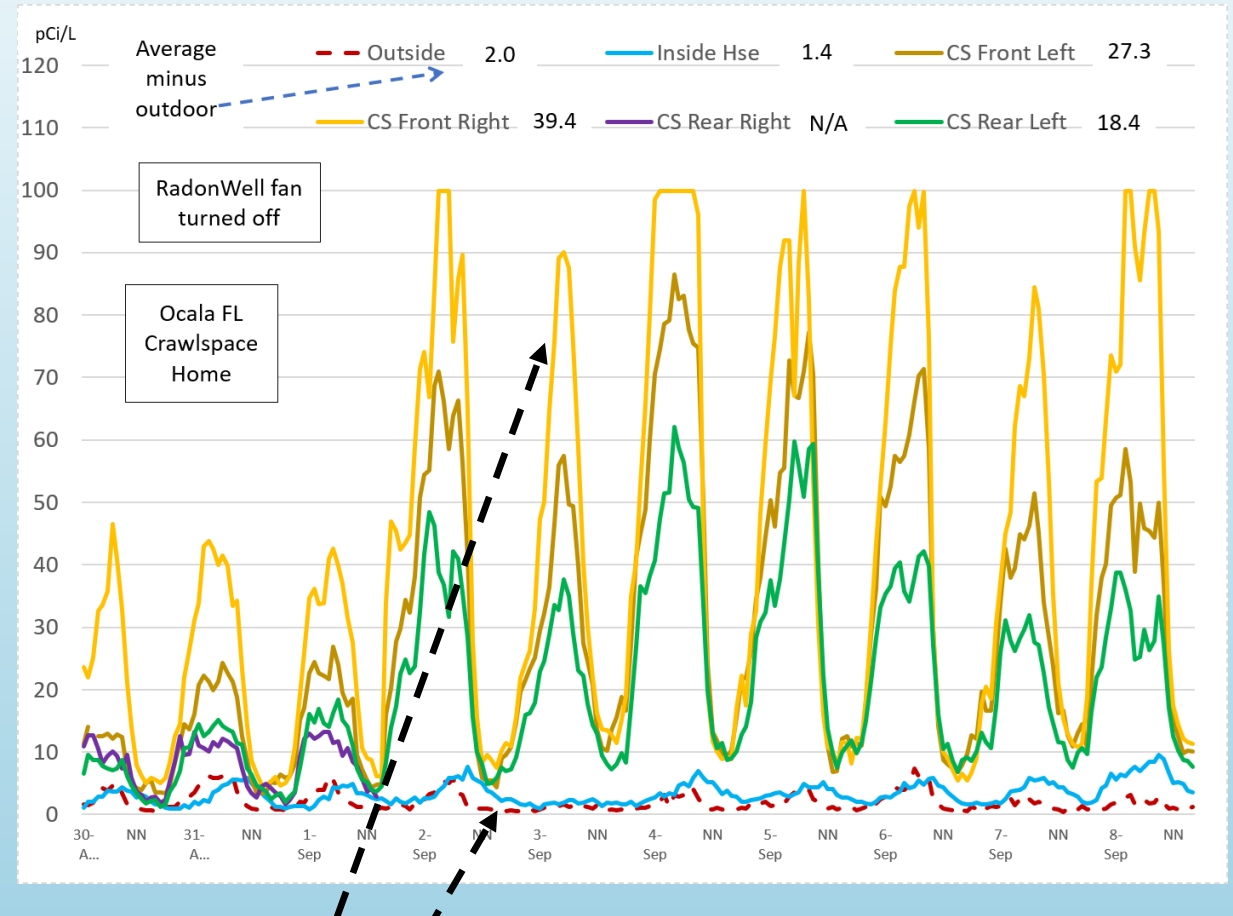
Winter to Summer variation

August-September
Indoor was **11%** of
Crawl Space radon



Smaller difference CS versus Indoor
House 10 pCi/L while CS 22 pCi/L

Mitigation
system is off

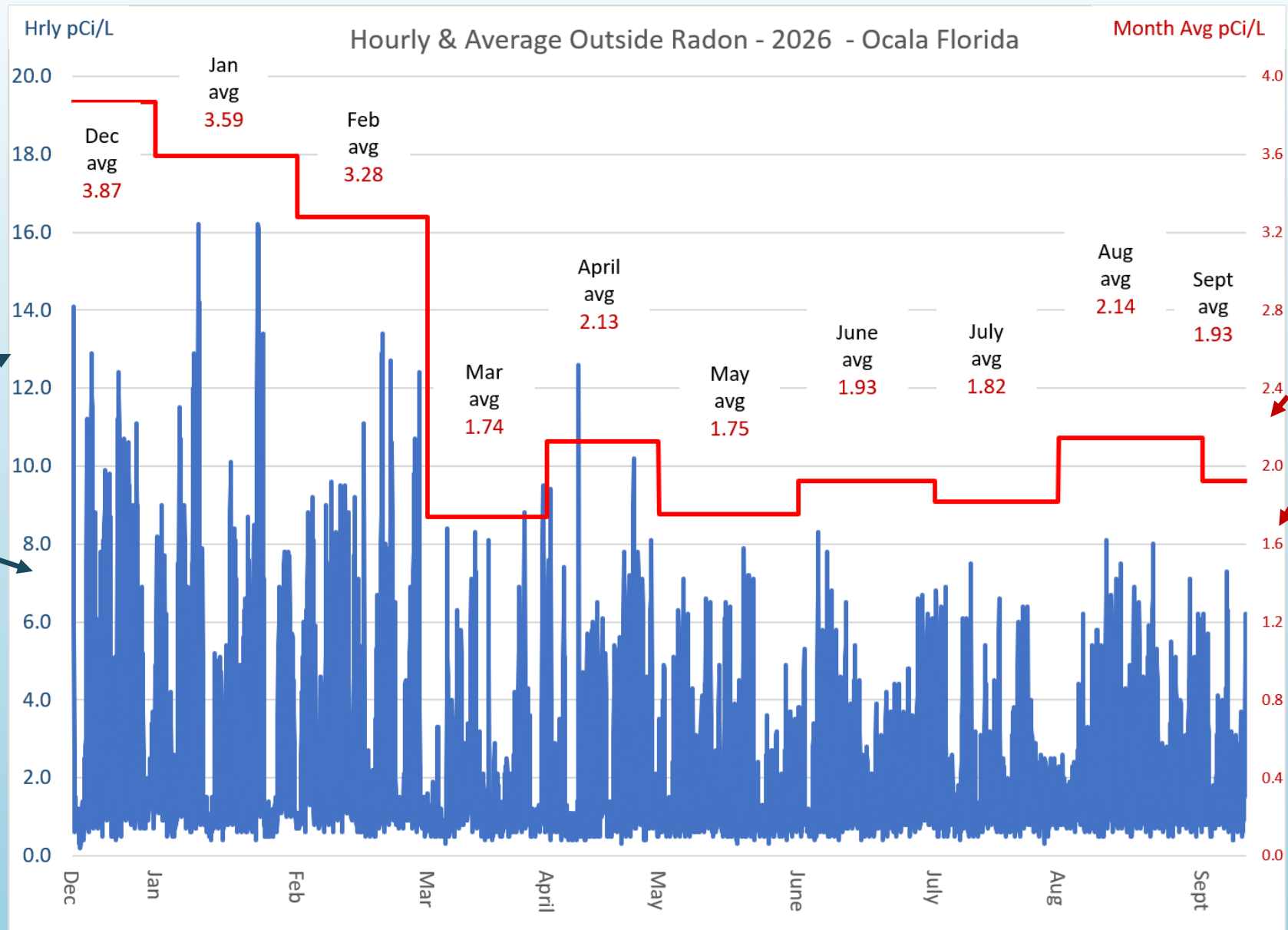


Big difference CS versus Indoor
House is 3.4 pCi/L while CS 30 to 60 pCi/L

Hourly & Monthly Average Crawlspace Radon December to September

Hourly variation in pCi/L

Note: Highest hourly at 15 outdoor locations in **Pennsylvania** was only 2.6 pCi/L



Monthly Average pCi/L

Highest outdoor average at 15 locations in **Pennsylvania** was 1.0 pCi/L

Overall average was 0.4 pCi/L

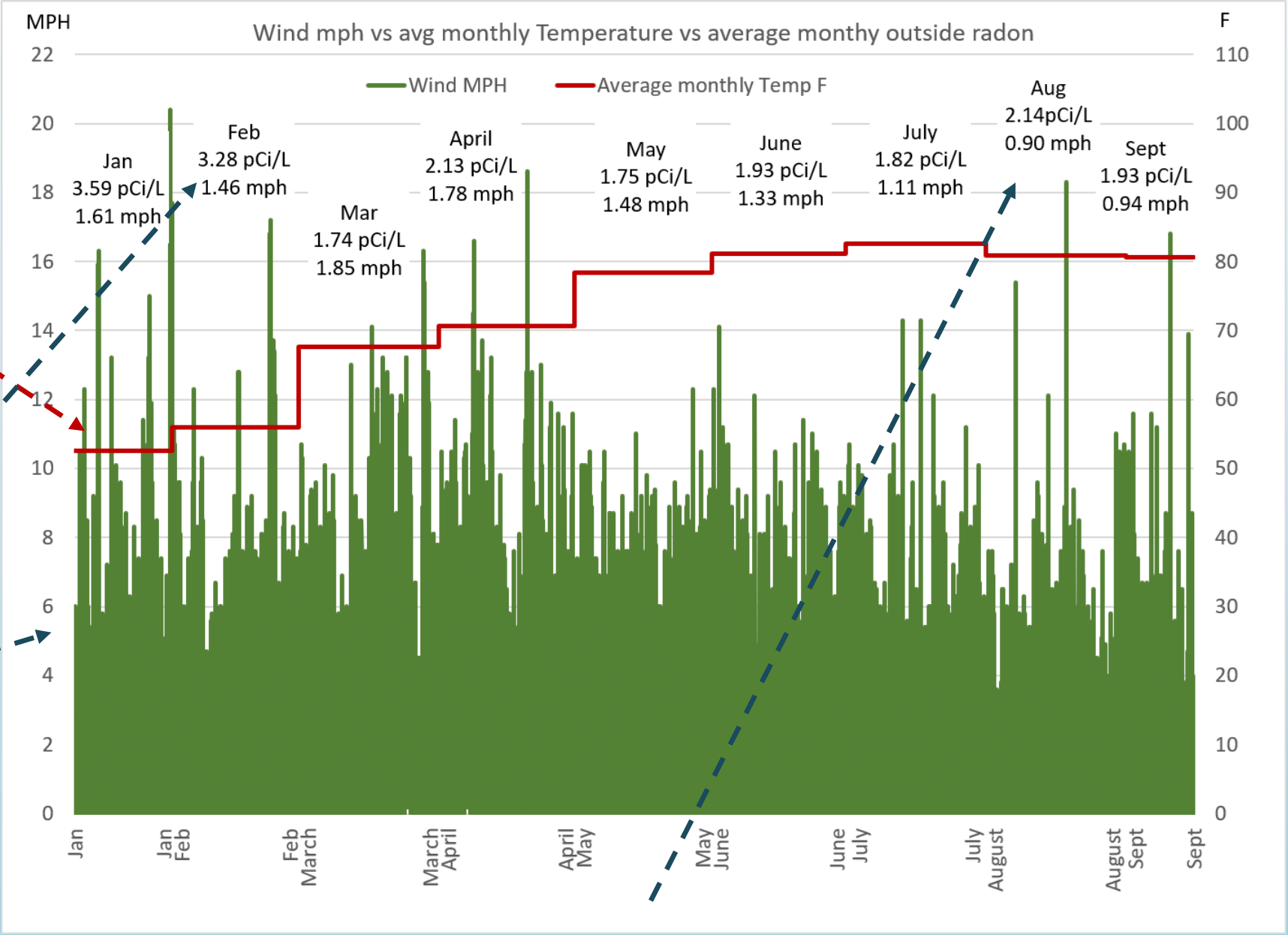
Next slides consider the effect of wind and temperature

Monthly
Crawlspace Radon
vs Wind
vs Temperature

Lower outdoor
temperatures
correlated with
higher
outdoor radon

15 minute
average
wind speed

Note:



Note:

Decreasing wind should produce higher outdoor radon

Conclusions for Outdoor Radon Levels in Central Florida

- North Central Florida has elevated Indoor and Outdoor radon levels
 - Outdoor radon levels on calm nights would often peak to 10 pCi/L
- Outdoor radon levels predominantly occur during extended no-wind weather
- Outdoor radon levels in this region increase indoor levels about an average of 2 pCi/L
 - Indoor radon level lags behind outdoor radon by a few hours
- A vented crawl space can still have significantly elevated radon levels
 - Continuous HVAC operation provides some risk reduction
- Florida crawl space contributes less radon indoors in the summer

Slides or other papers are available
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