Elevated Outdoor Radon in Ocala Florida

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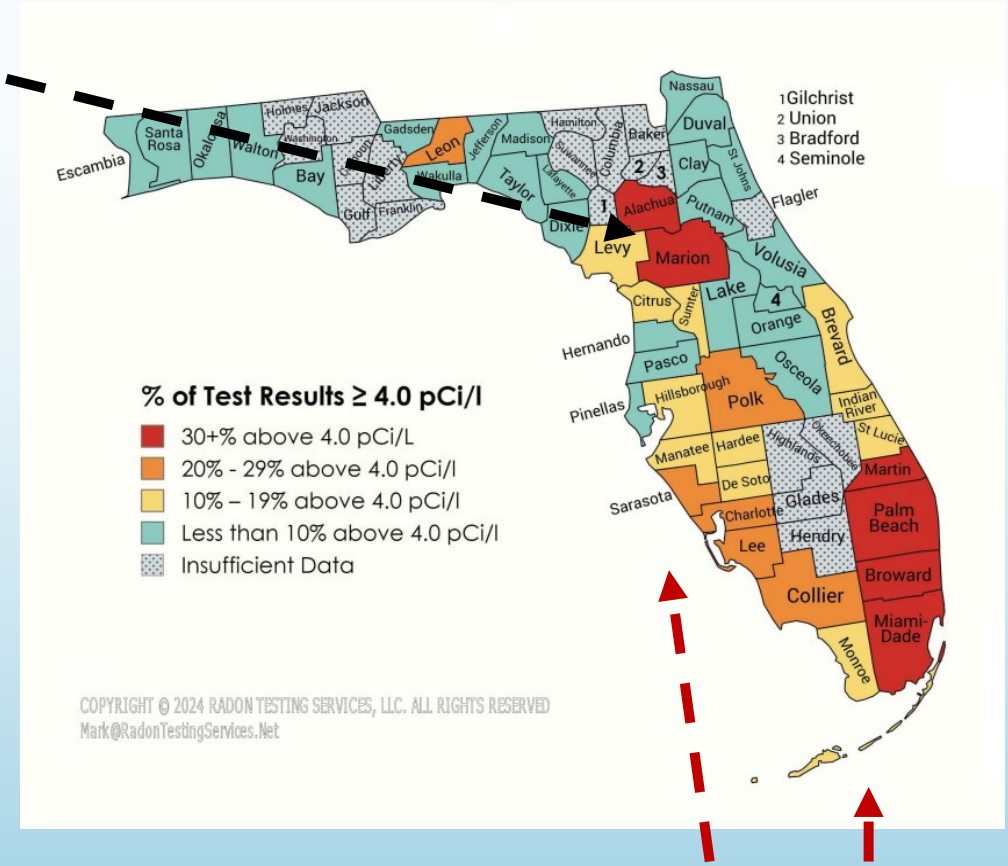
- Slides are available WPB-Radon website

Last November (2025), we brought our camper to my sister's home in Ocala, Florida



I happened to have a continuous radon monitor in the camper

Ocala is located in Marion County,

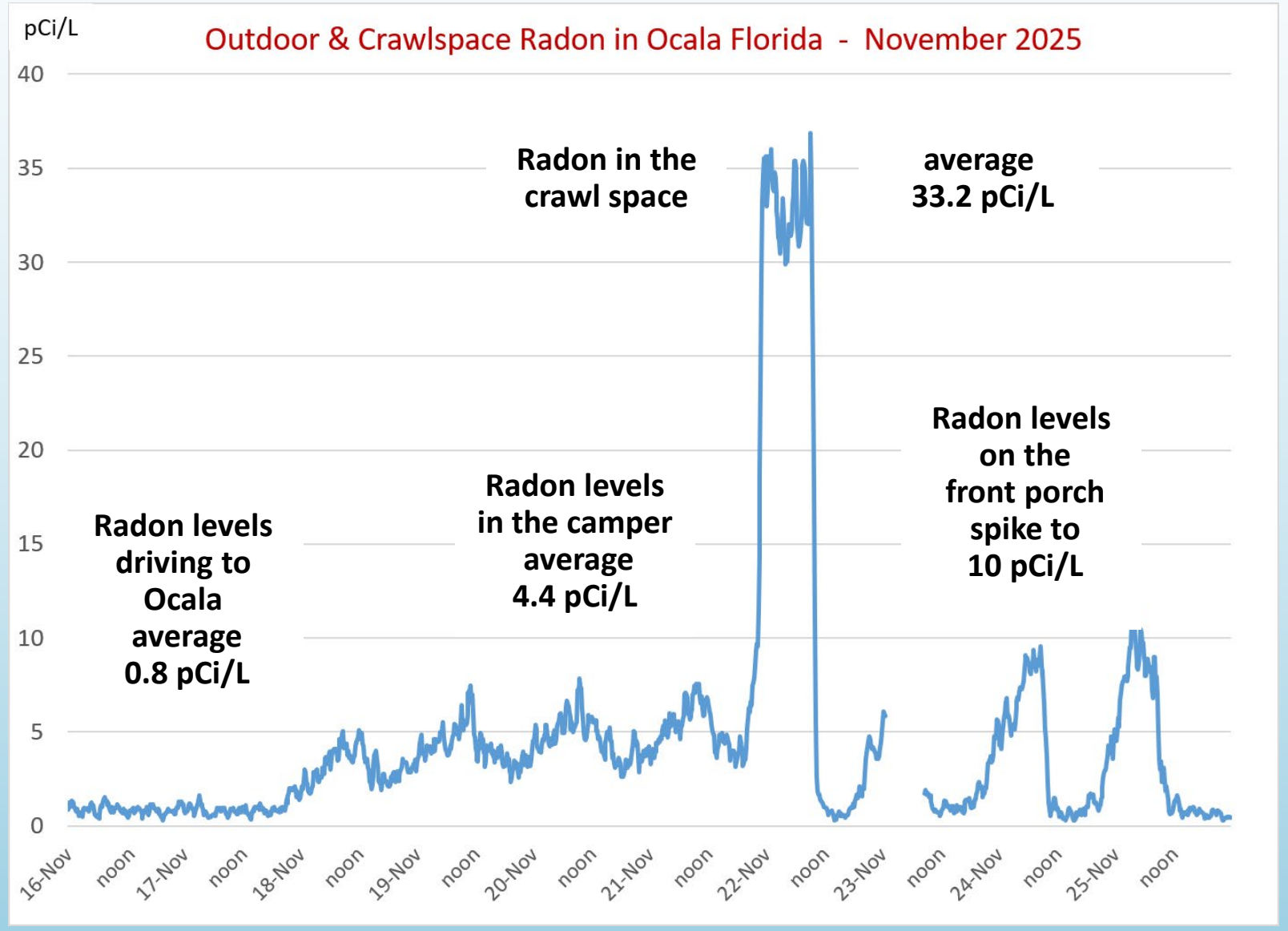


30% of Florida homes in the **red zones** are above 4.0 pCiL

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



Multiple Crawl Space Vents



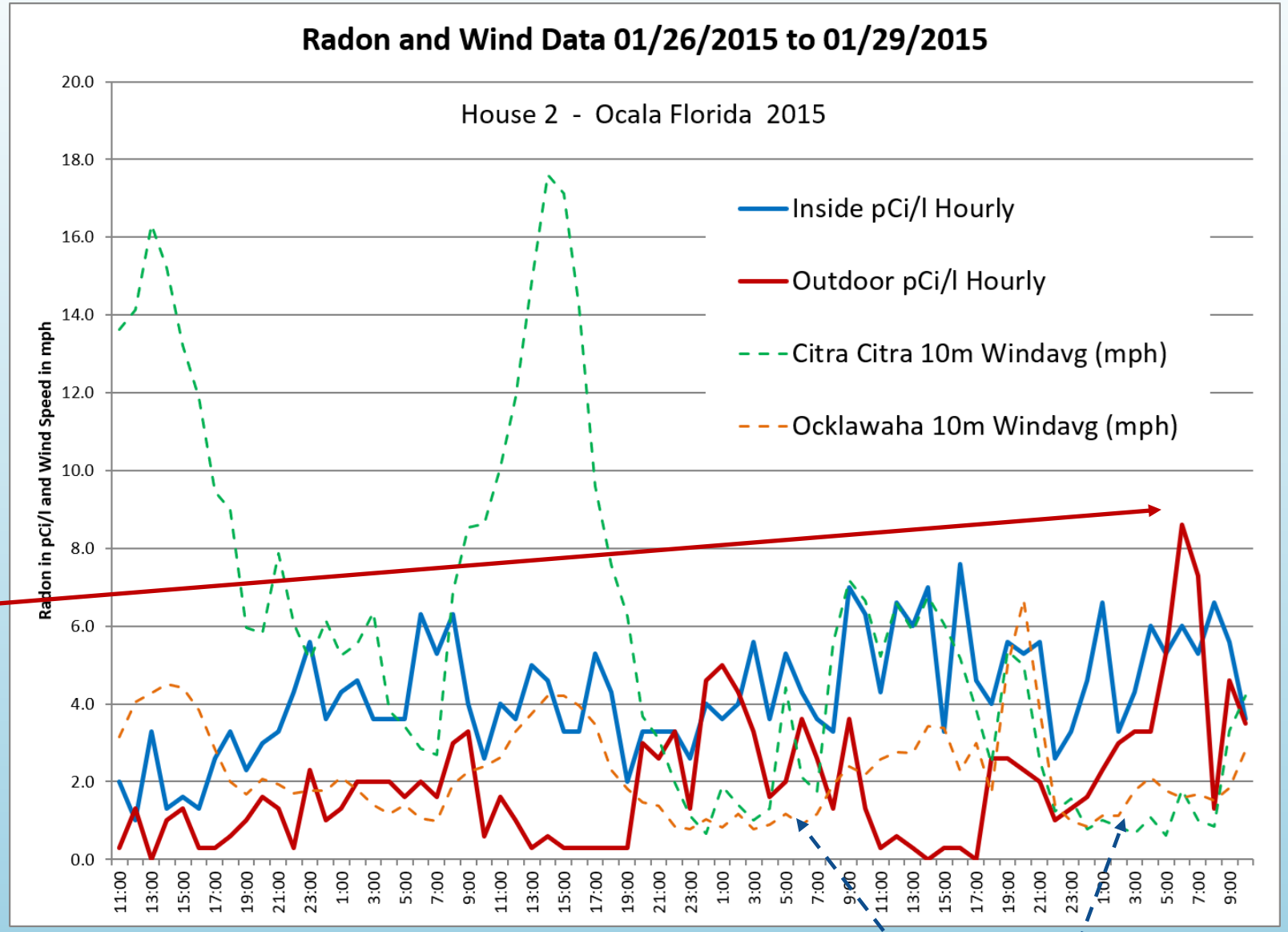
House #1 used as the reference house

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 four other homes

House 5 was 50 miles North of House 1

House 4 was 20 miles North of House 1

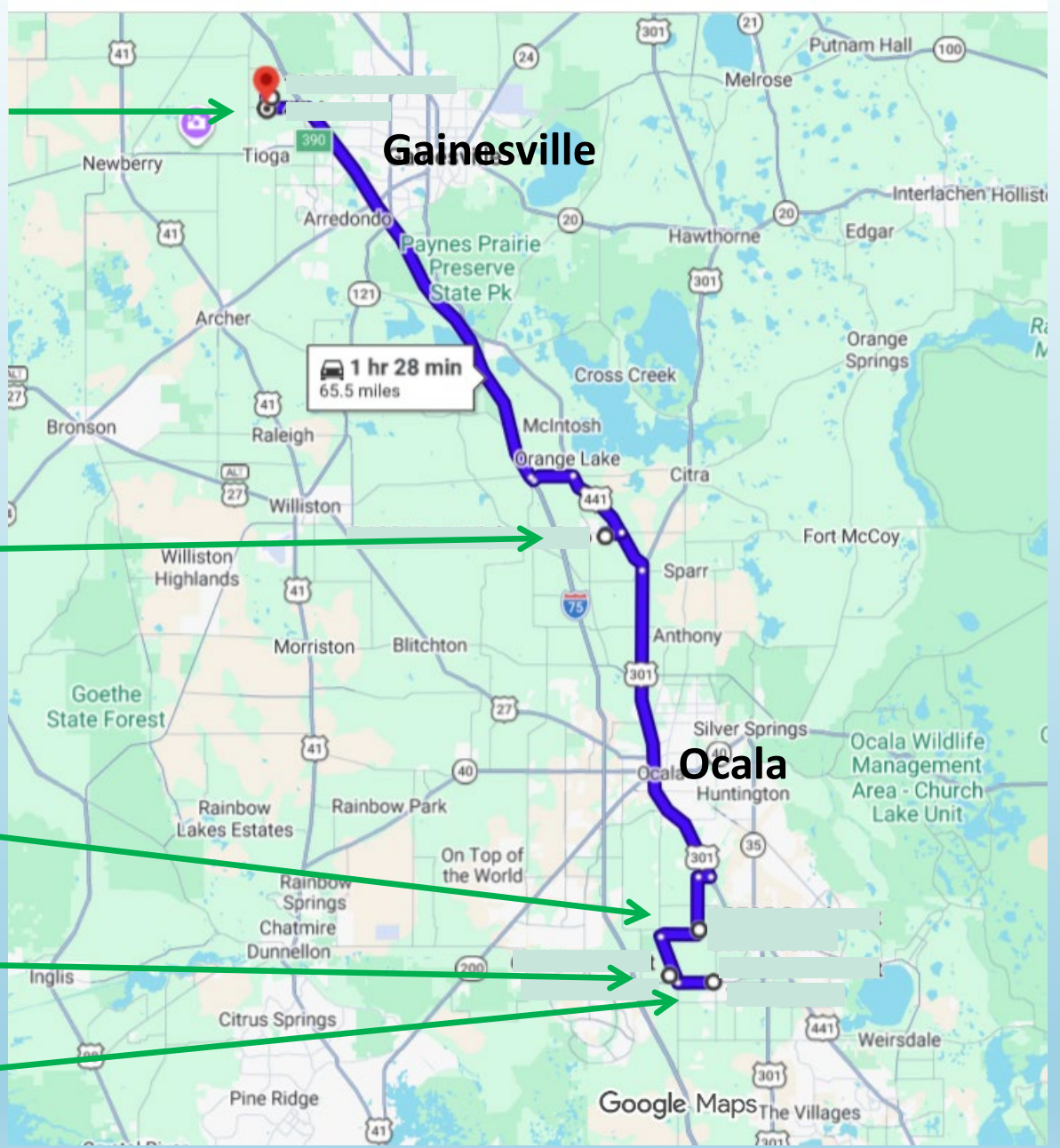
Gainesville House - 5

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

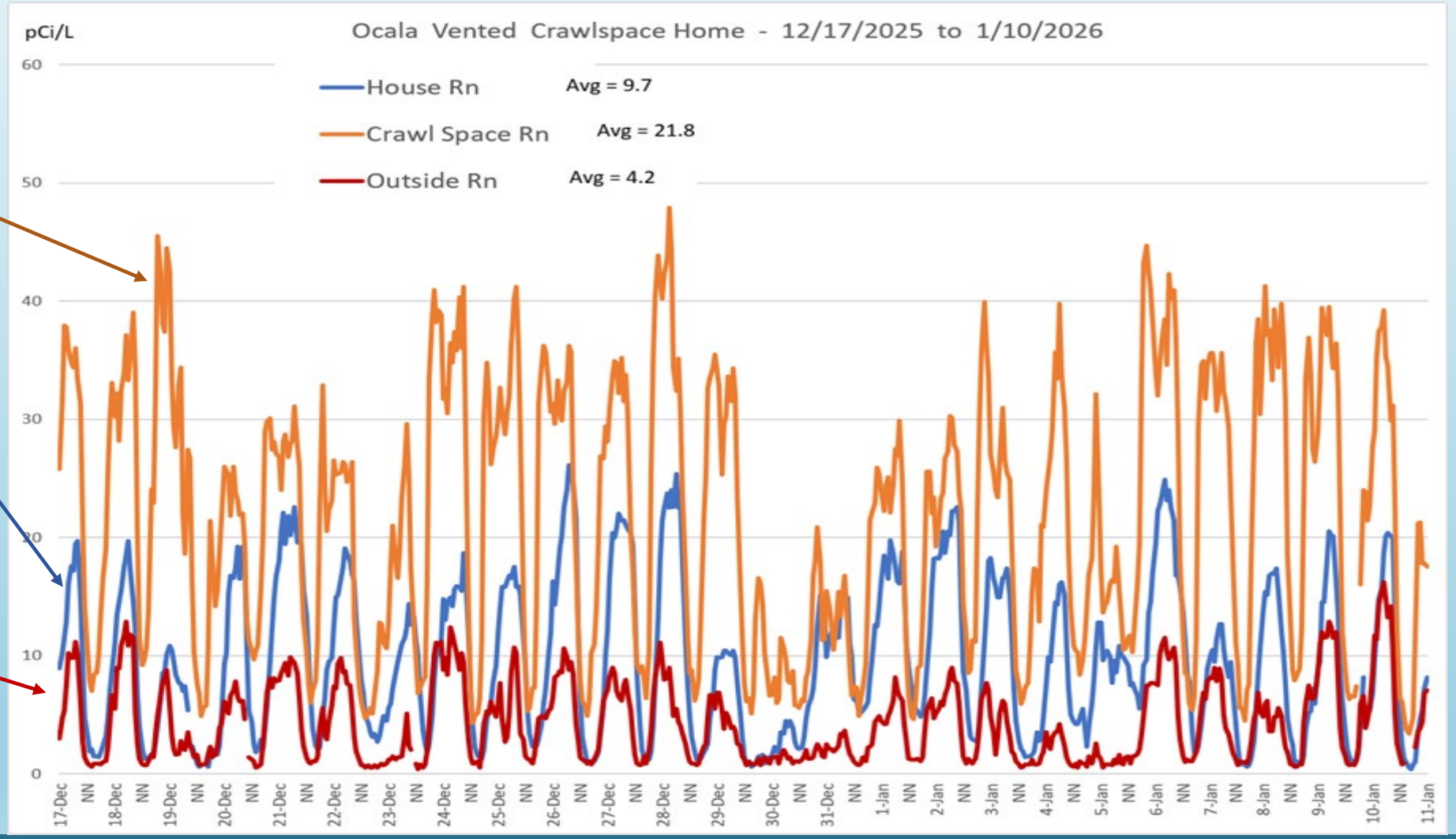
Outdoor averaged 4.2 pCi/L with peaks to 10 pCi/L

Initial Testing December 2025

Vented Crawl Space

Indoor House

Outdoor Radon



An earlier talk discussed the Crawl Space Remediation

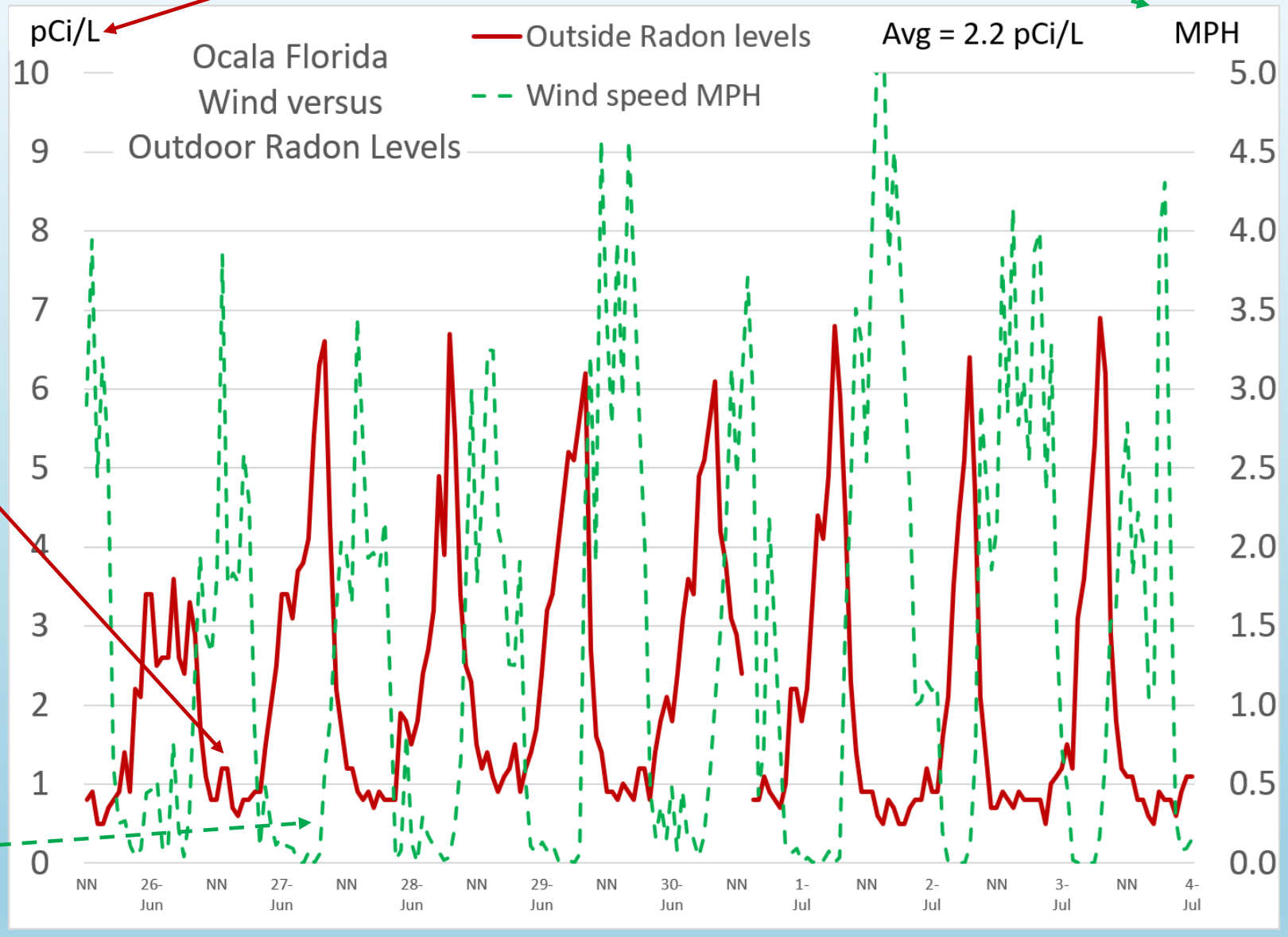
House 1

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



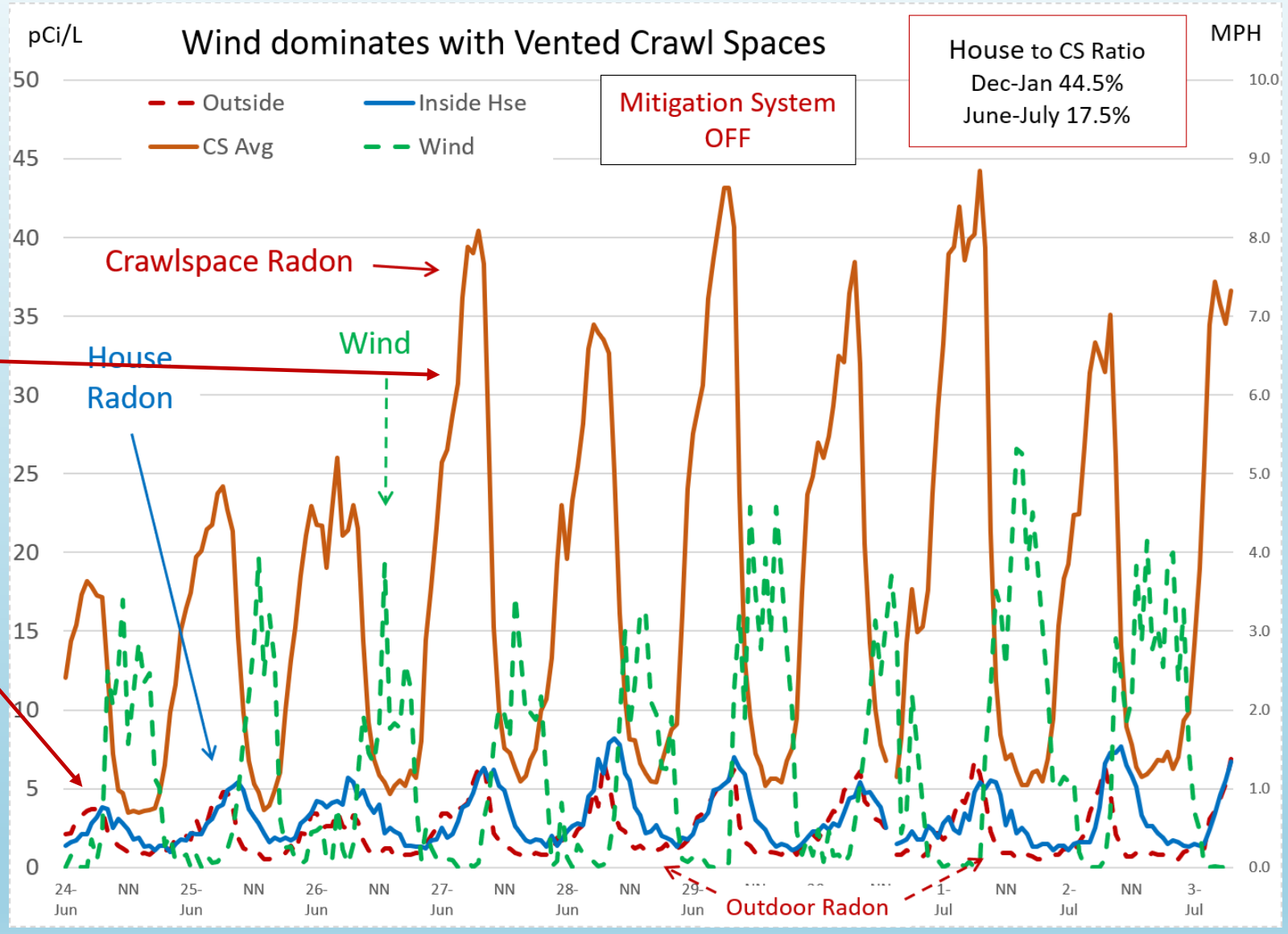
House 1

Radon system turned off

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

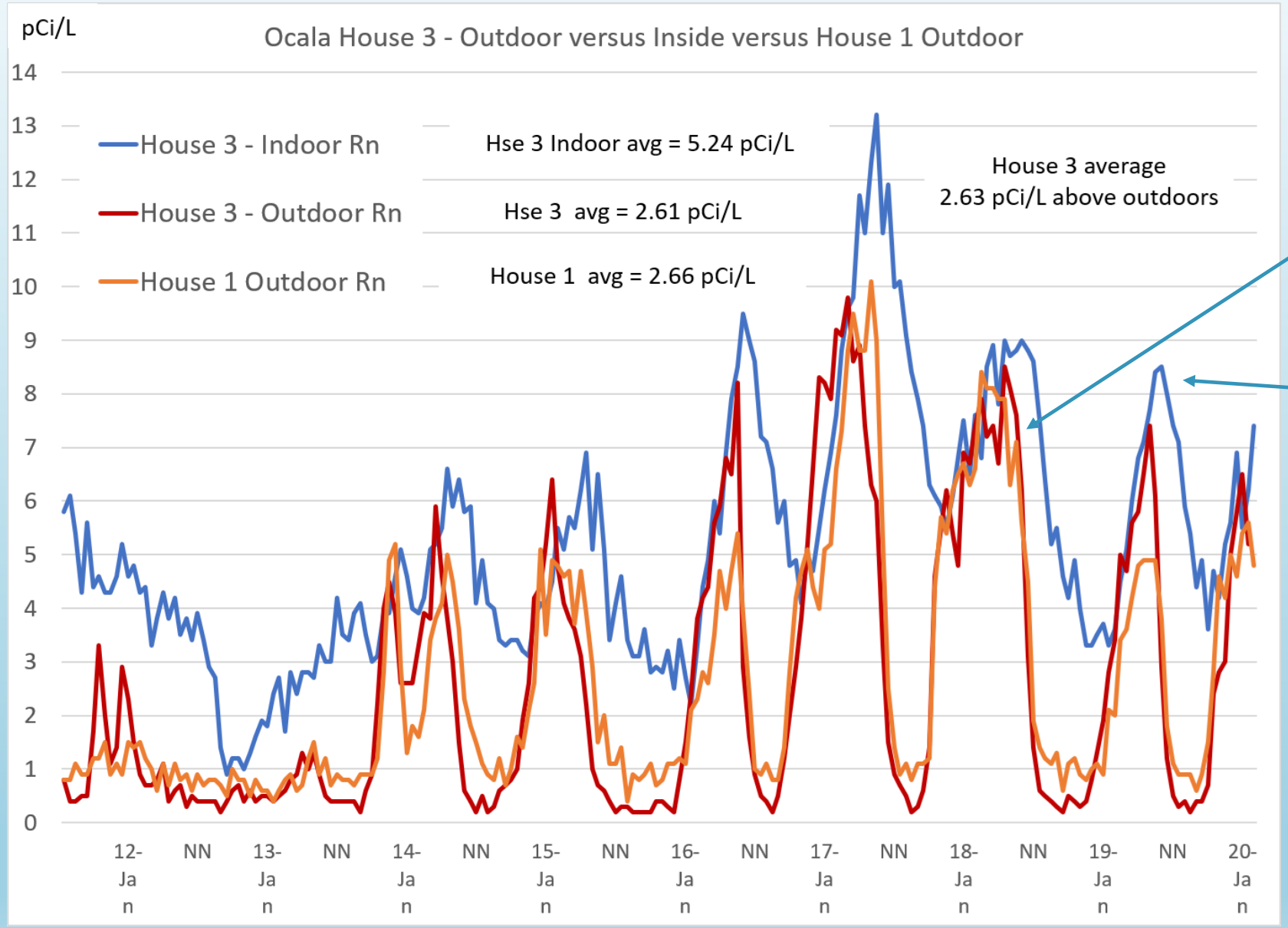
Crawlspace vents without wind are not effective at reducing crawl space radon

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#1)
Orange (Hse#3)

Almost the same

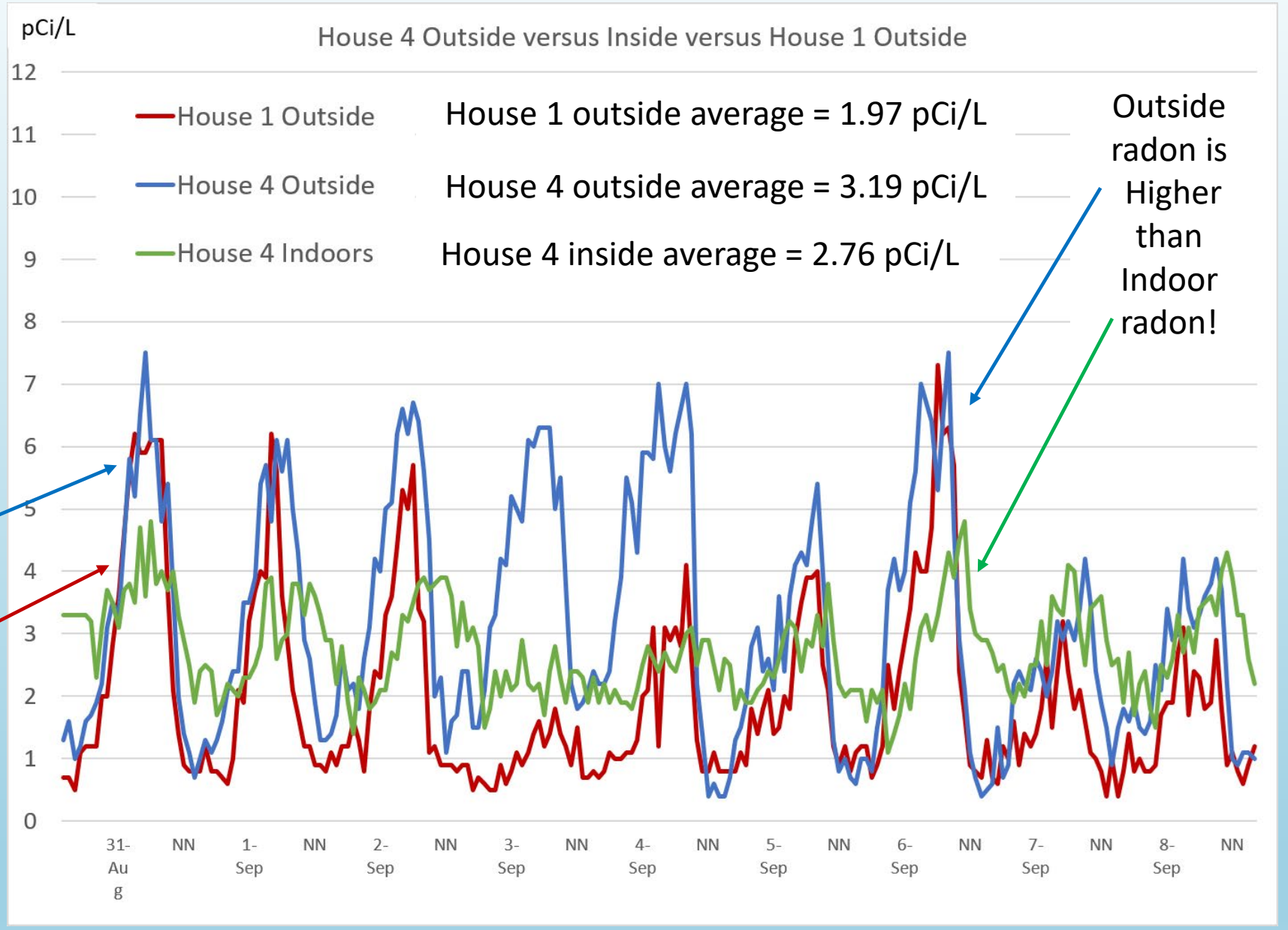
Indoor levels fall off slower than outdoor levels

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

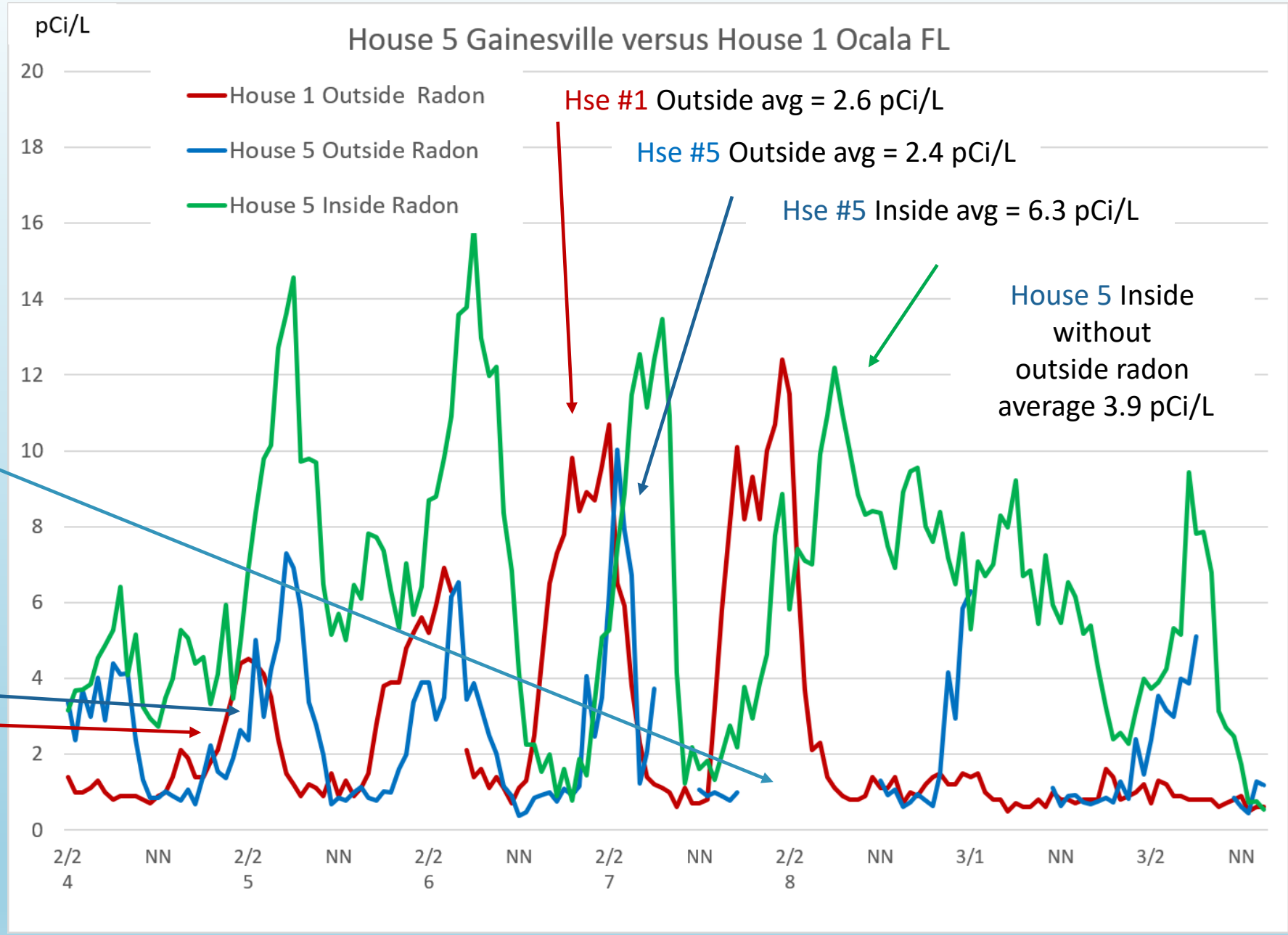


House 1 vs House 5

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

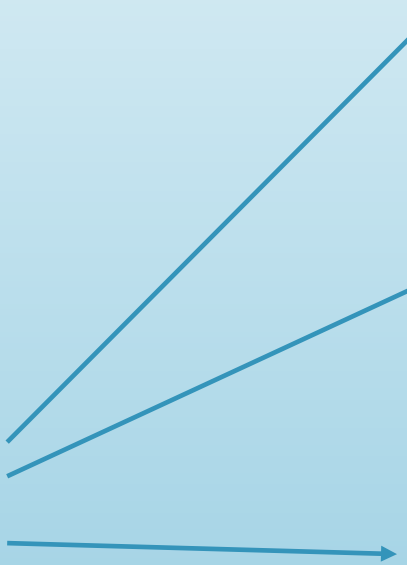
Unfortunately House 5 outside radon monitor stopped recording during high humidity

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

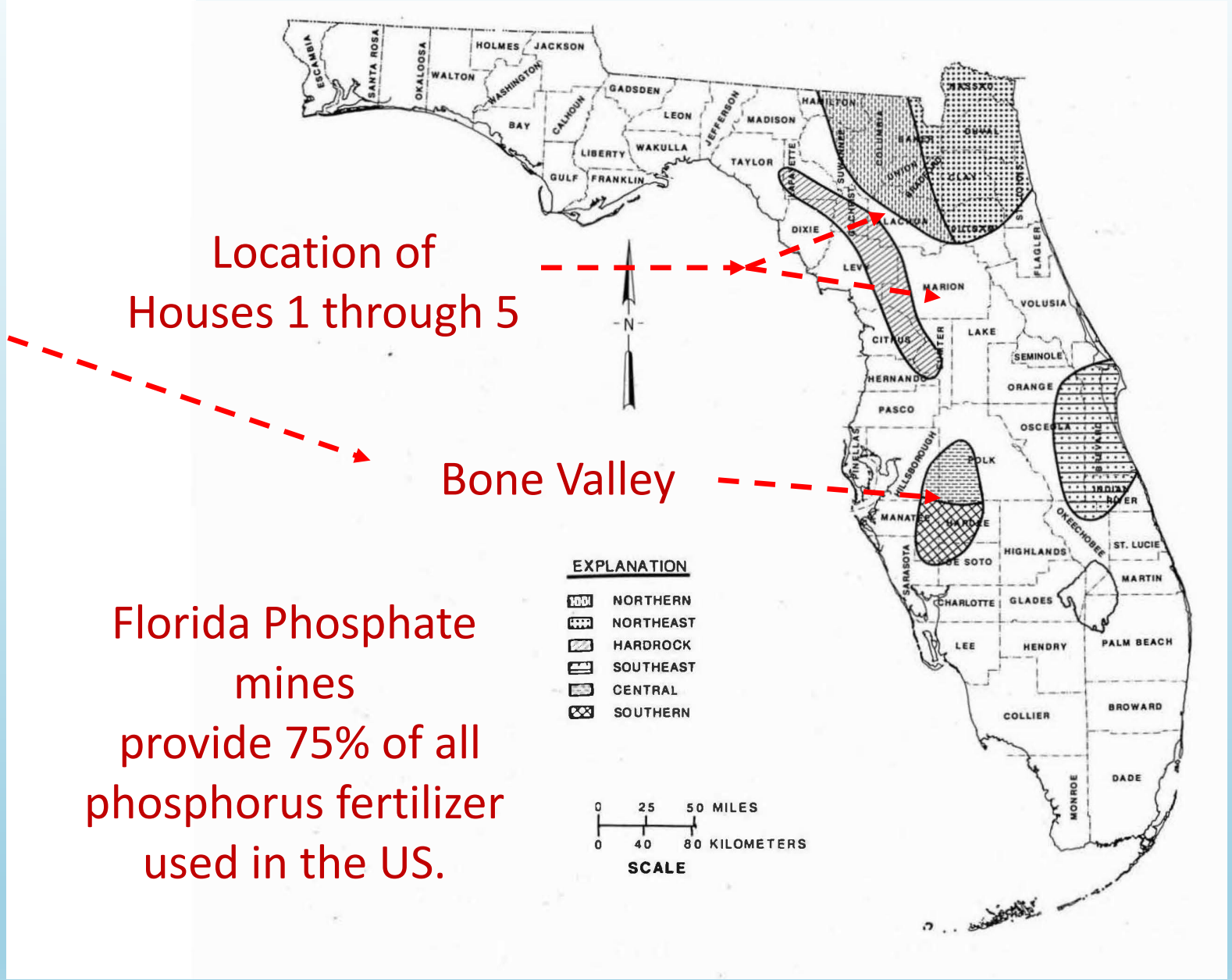
Highest measurements up to 2024

Florida phosphate deposits

Prehistoric bones found while mining southeast of Tampa

Waste product from mining contains high levels of Uranium and Thorium

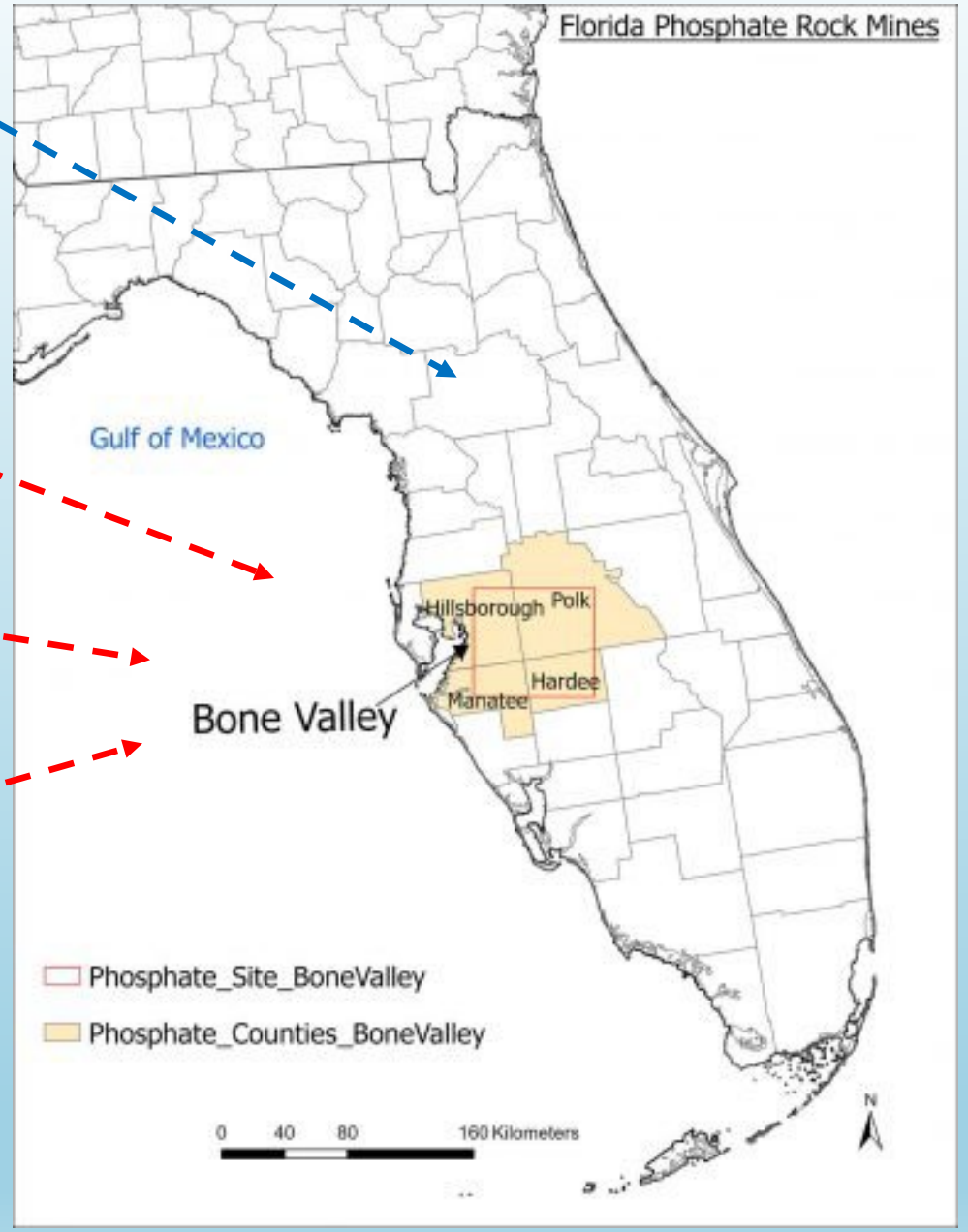
No records of phosphate mining around Ocala



Predominant Florida phosphate mining is done in Bone Valley

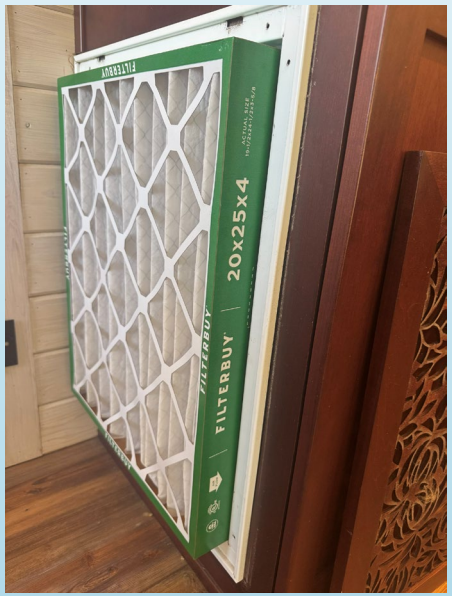
Uranium was extracted from these phosphate areas from 1952 to 1961 and then from 1976 until 1998

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



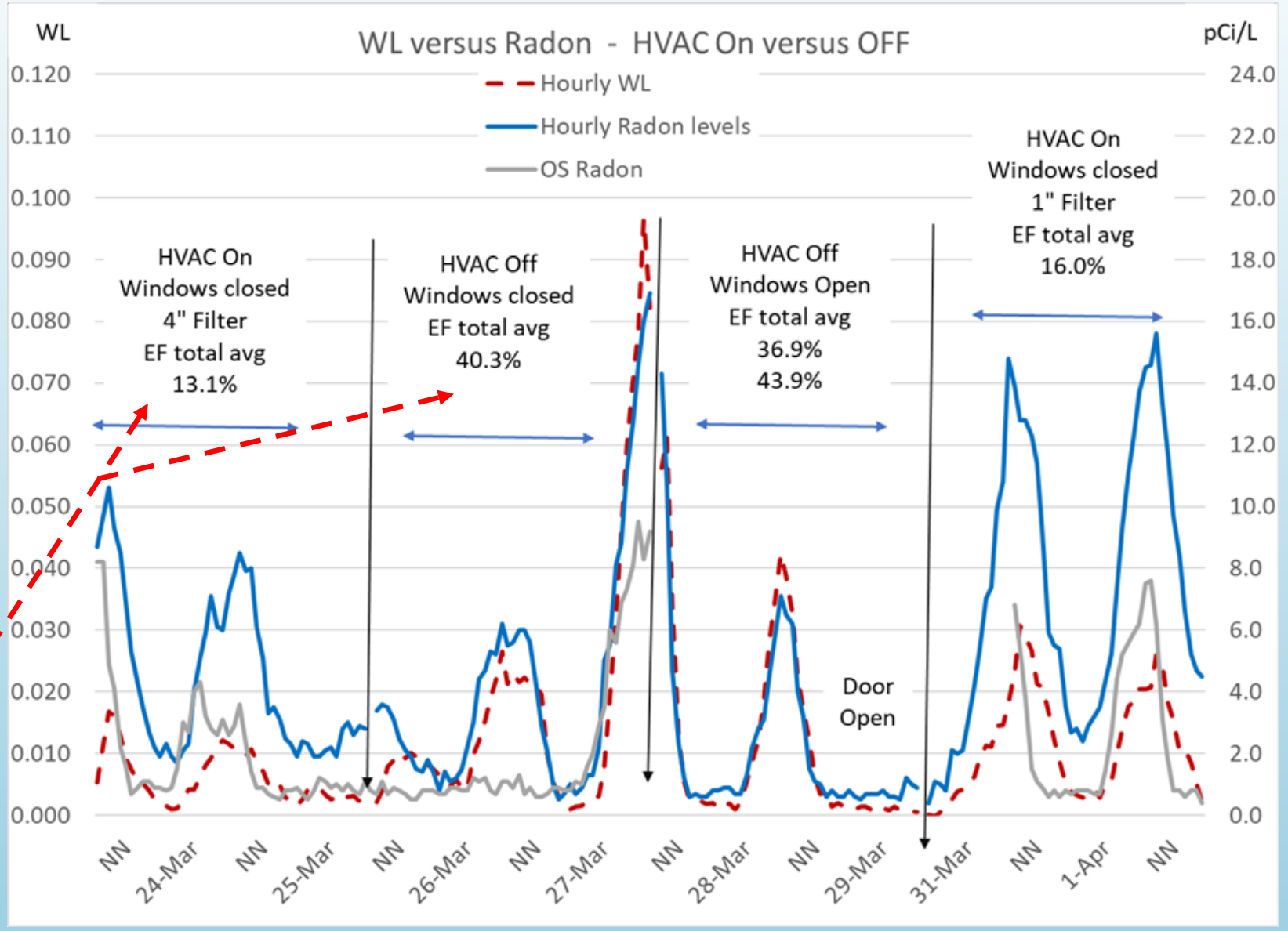
Reducing Outdoor Radon Risk

Replaced 1” air filter with
4” thick Merv filter



Run HVAC continuous on

Radon Decay Products
Equilibrium Factor (EF)
reduced from 40% to 13%

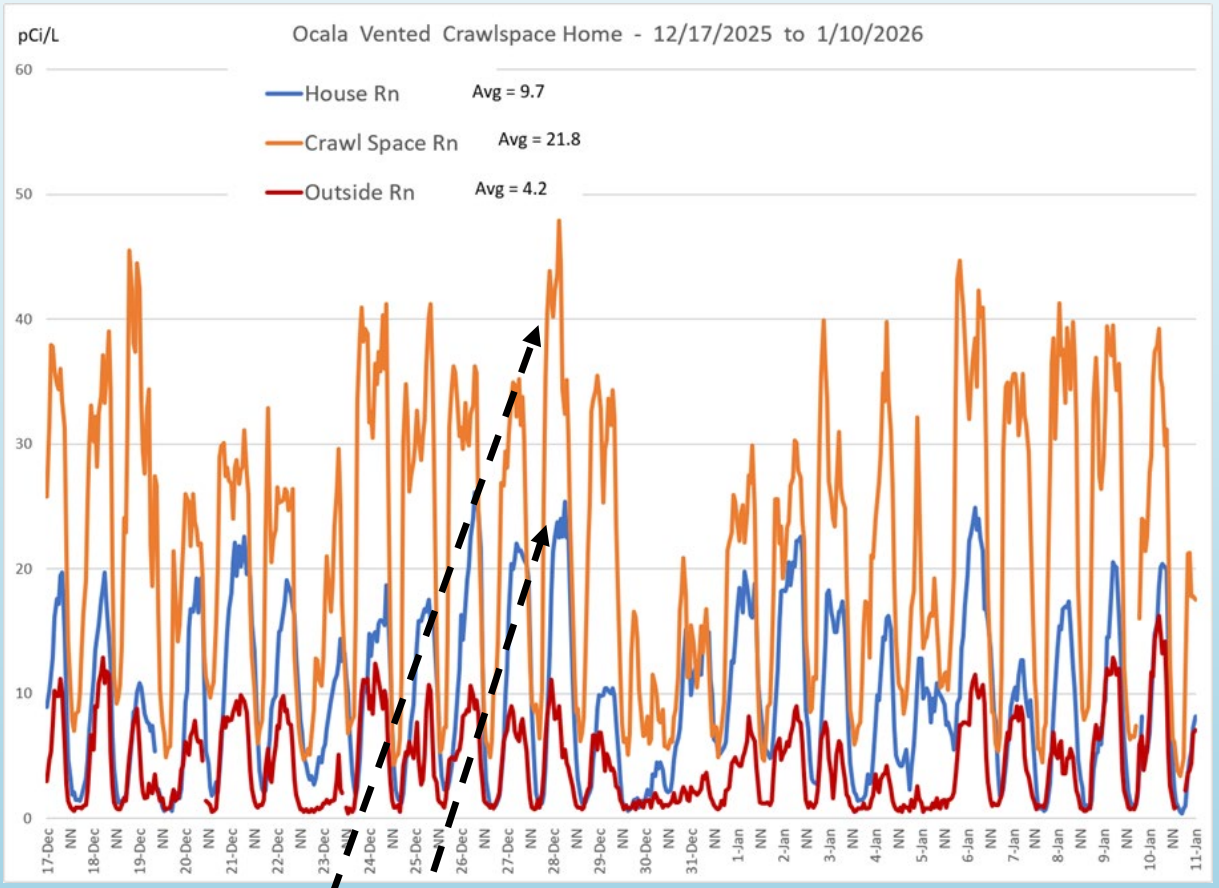


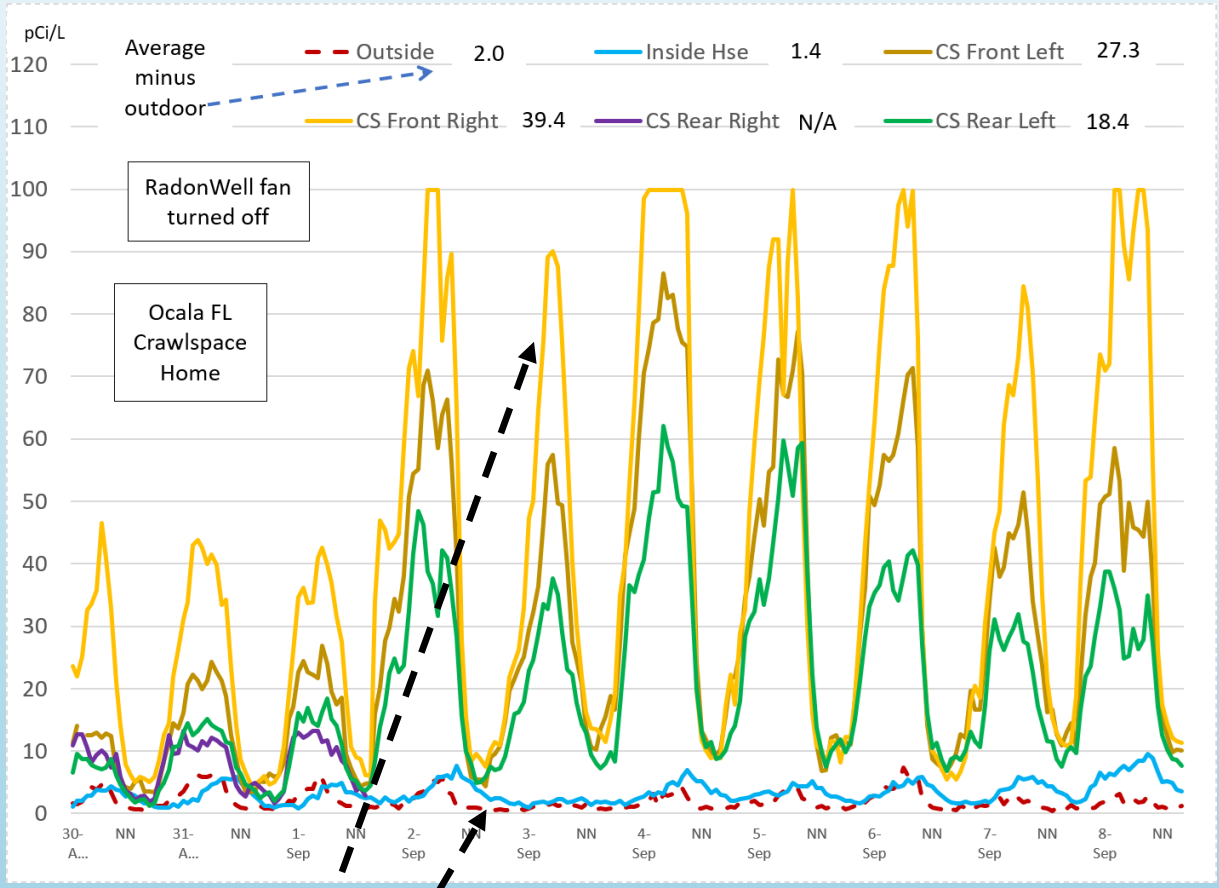
Note: Risk reduction is not linear with EF reduction

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

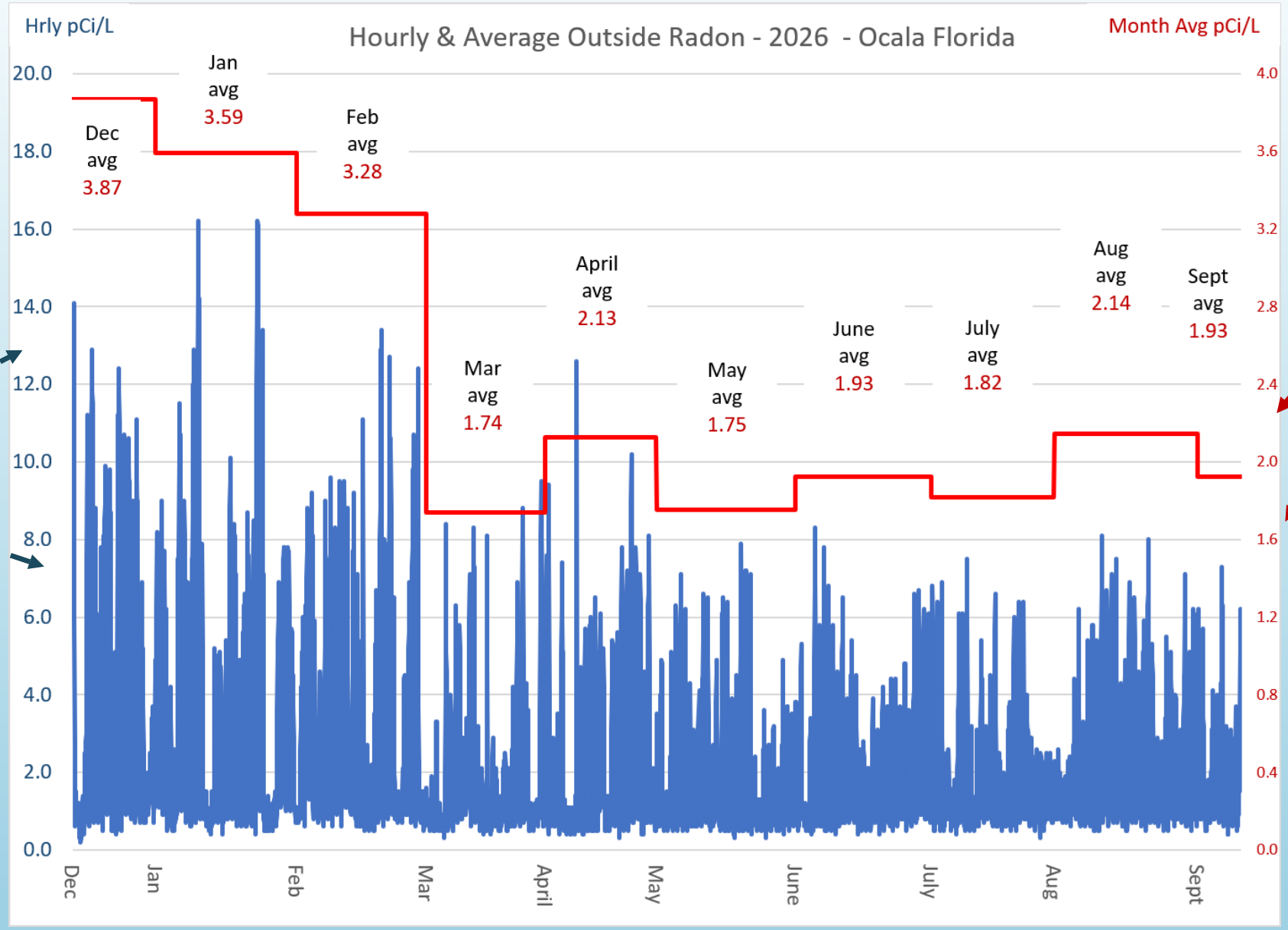
Mitigation
system is off

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

Monthly Average Variation December to September

Hourly variation in pCi/L

Highest hourly in 15 outdoor locations in PA was 2.6 pCi/L



Monthly Average pCi/L

Highest outdoor average in 15 locations in PA was 1.0 pCi/L

Overall average was 0.4 pCi/L

Drop in average could be due to a lack of stack effect or more wind

Conclusions for Outdoor Radon Levels in Central Florida

- 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
at
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