TESTING, MAPPING, PUBLIC EDUCATION AND MITIGATION OF URANIUM AND RADON IN HOUSEHOLD WATERS IN GEORGIA

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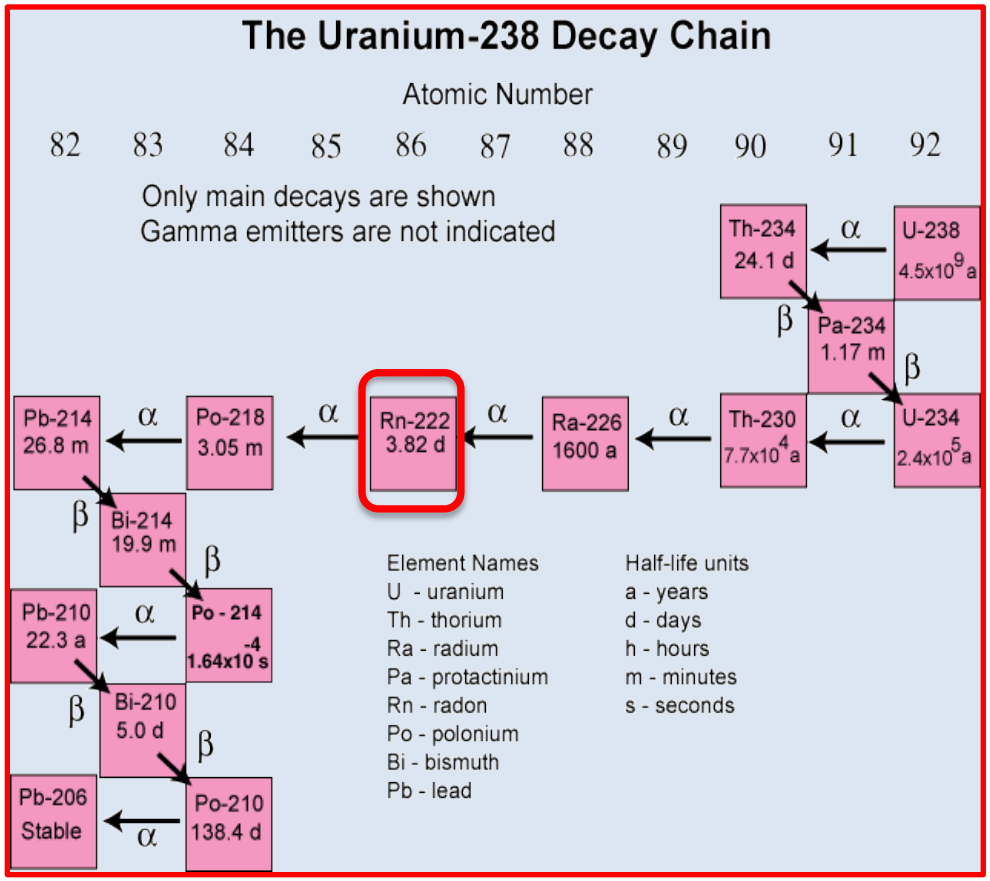
The 2016 International Radon Symposium™

OUTLINE

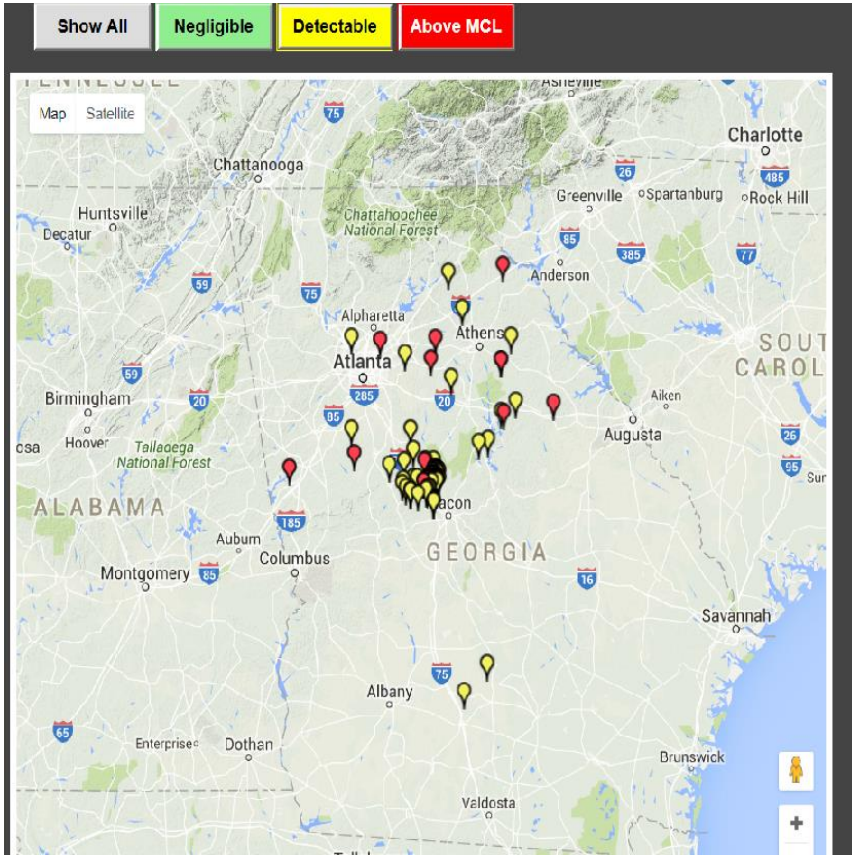
- **Radon in Household Water Testing and Education Program**
- **Various Methods of Sampling, Sample Preparation, Scintillation Fluids, and LSC Assays for Analyzing Radon in Water**
- **Monitoring, Mapping, Public education, and Mitigation Programs for Uranium and Radon in Household Well Waters**

Introduction

- **How is Radon Formed?**



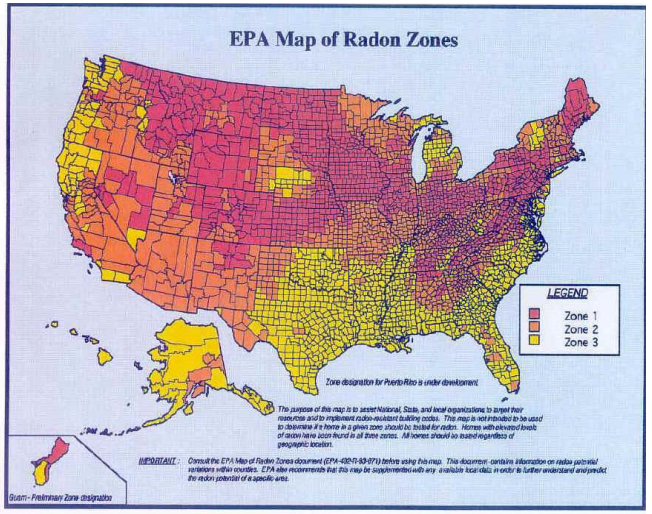
- **Does it Exist in GA Well Waters?**



Introduction

South Eastern United States	Radon-Induced Lung Cancer Deaths per Year	Rank
Georgia	**822**	**1**
Tennessee	693	2
Florida	668	3
Kentucky	600	4
North Carolina	435	5
Alabama	391	6
South Carolina	221	7
Mississippi	113	8

Radon in Indoor Air: Selected State Risk Estimates



Introduction

Health Effects of Radon in Drinking Water

Can Cause Both Lung and Stomach Cancer

In the US, 168 deaths are due to radon in water. Of the 168 deaths:

- **89% is due to lung cancer!**
- **11% is due to stomach cancer**

Action Levels

- Radon in Indoor Air: 4 pCi/L

Radon in Water:

- Proposed MCL: 300 pCi/L
- Proposed AMCL: 4000 pCi/L

Introduction

The AESL-UGA launched a new Radon in Household Water Testing and Education program from August, 2015.

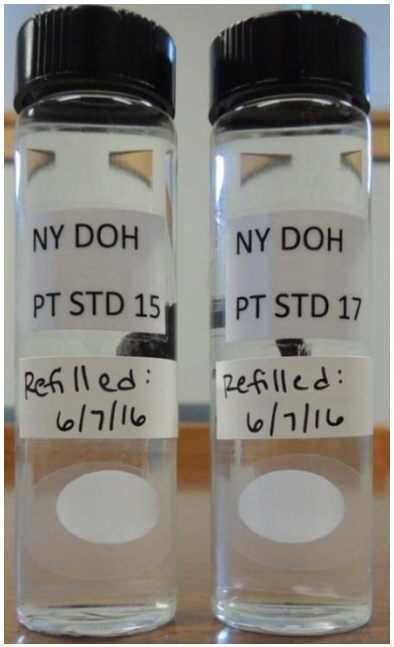
- **However, Developing a Proper Method for "Analysis of Radon in Water" is still an Important Research Task.**
- **Various empirical methods of sampling, sample preparation, and counting assays on a liquid scintillation counter are practiced by different laboratories testing radon in water across the United States.**

The objective our study was to compare various methods of sampling, sample preparation, and liquid scintillation counting assays on the recovery of radon from:

- **Two "Radon in Water" standard samples, and**
- **A few household well water samples from Georgia**

MATERIALS AND METHODS

- **Private Well Water Samples:** 4 wells located above fall line (3 from Monroe County and 1 from Greene County, All of Them Were Know to Contain Several Hundreds ppb Uranium)



- **Standard Samples:** 2 radon in water standard samples (or PT samples) from NYDOH

MATERIALS AND METHODS

- **Two Different LSC Assays: Full spectrum (0 to 2000 keV) versus ROI of ^{222}Rn (130-700 keV)**

MATERIALS AND METHODS

Variables Compared:

- **Two Sampling Methods: Direct-Fill versus Bowl Method**

- **Different Scintillation Fluids: Mineral Oil versus Opti-Fluor**

MATERIALS AND METHODS

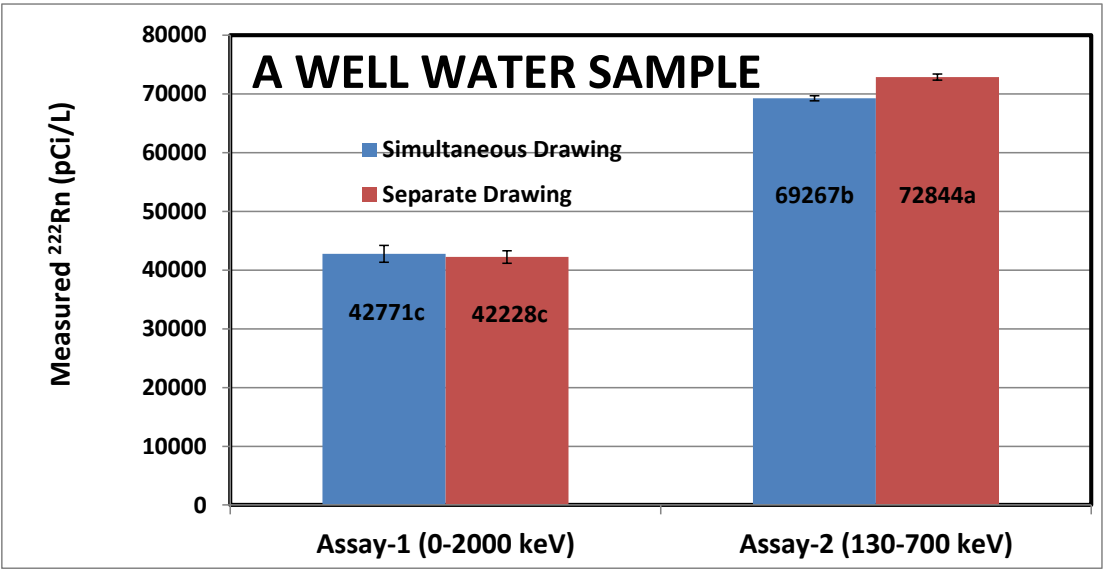
- **Effects Air Bubble: 0cc 0.5cc and 1.0cc**



- **Two Different LSC Assays: Full spectrum (0 to 2000 keV) versus the Region of Interest of ^{222}Rn, that is 130-700 keV.**

- **Statistic: Standard Error of Duplicate Measurements for Each Contrasting Variables**

RESULTS

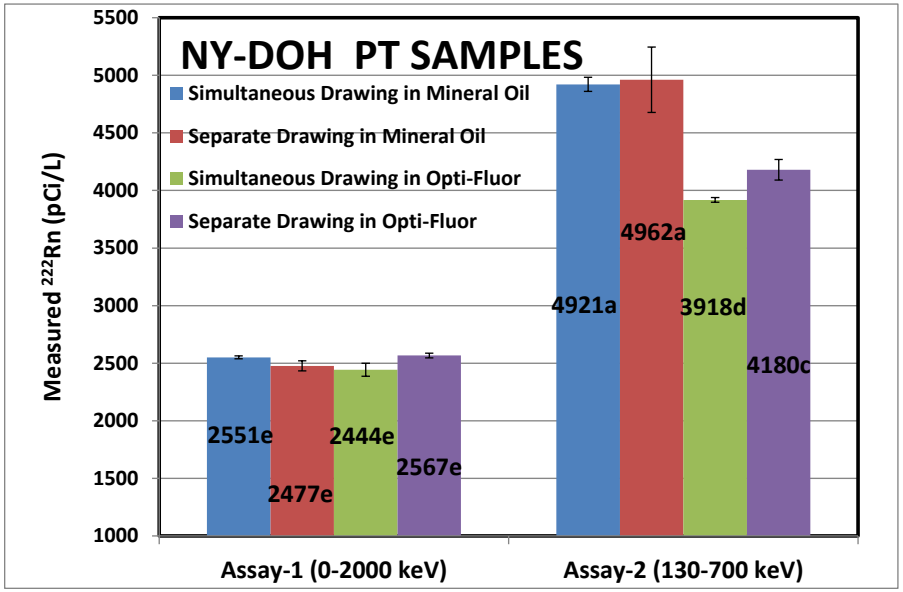


LSC Assays:

- **Full spectrum (0 to 2000 keV)**

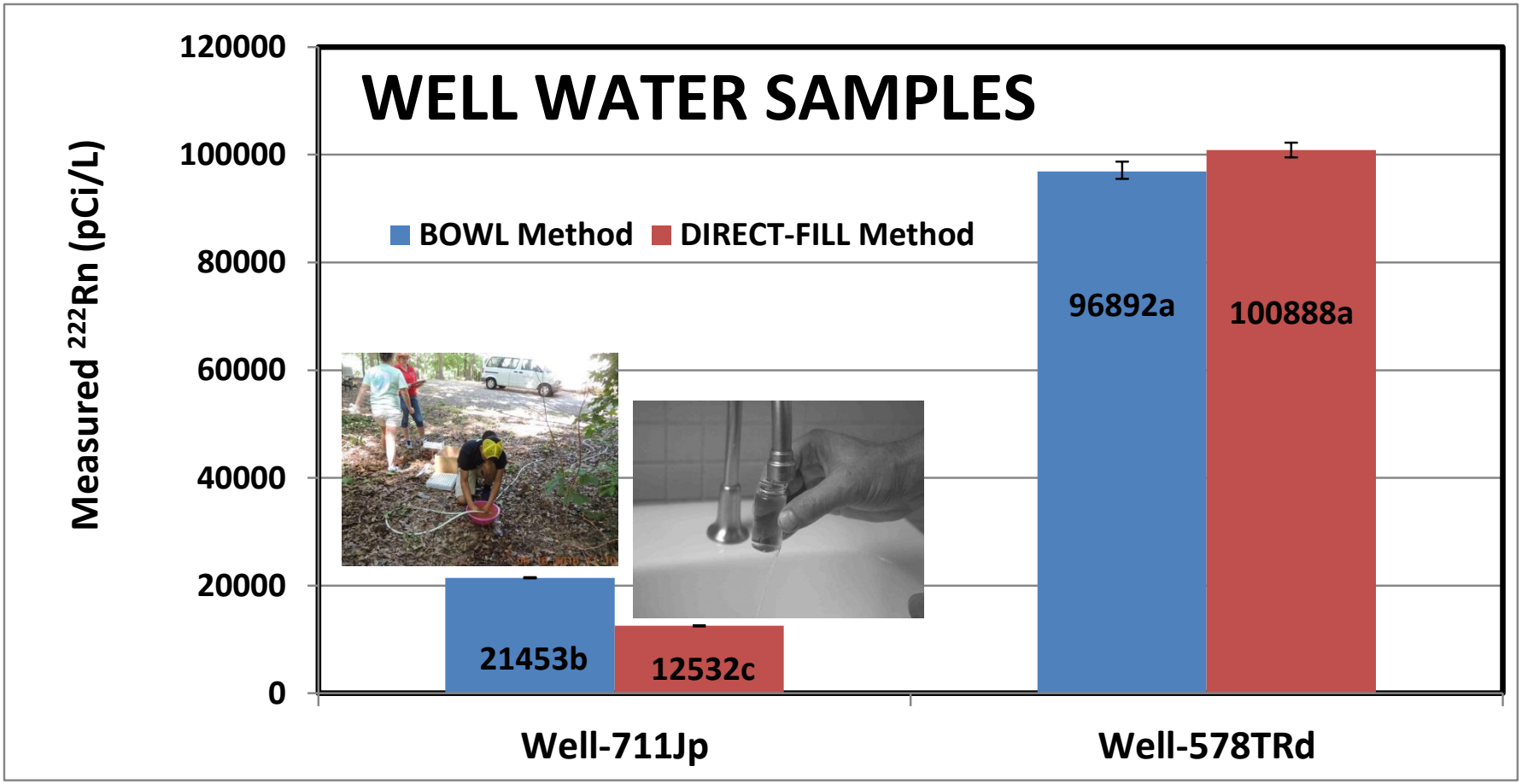
versus

- **ROI of ^{222}Rn (130-700 keV)**



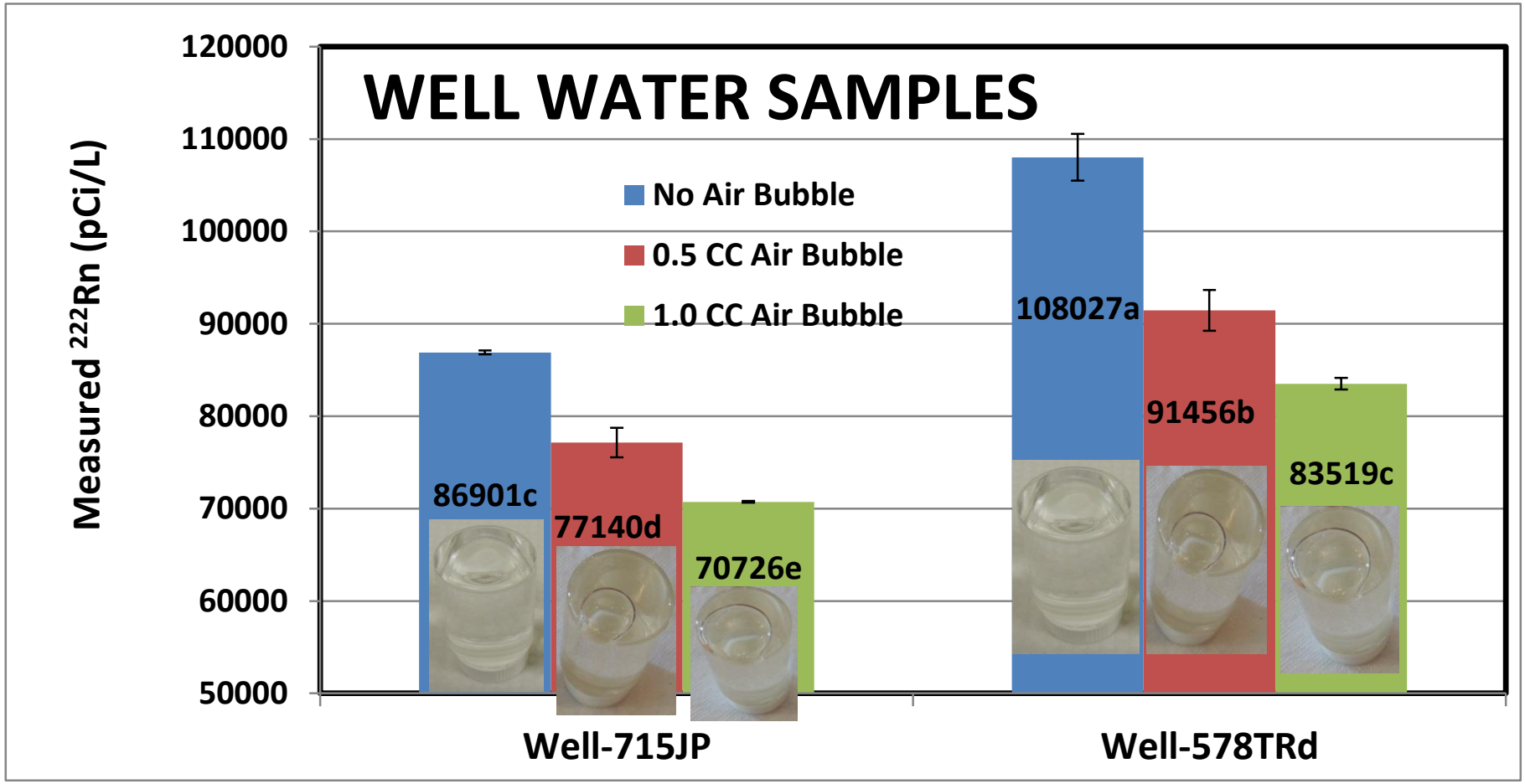
RESULTS

Sampling Methods: Direct-Fill *versus* Bowl Method



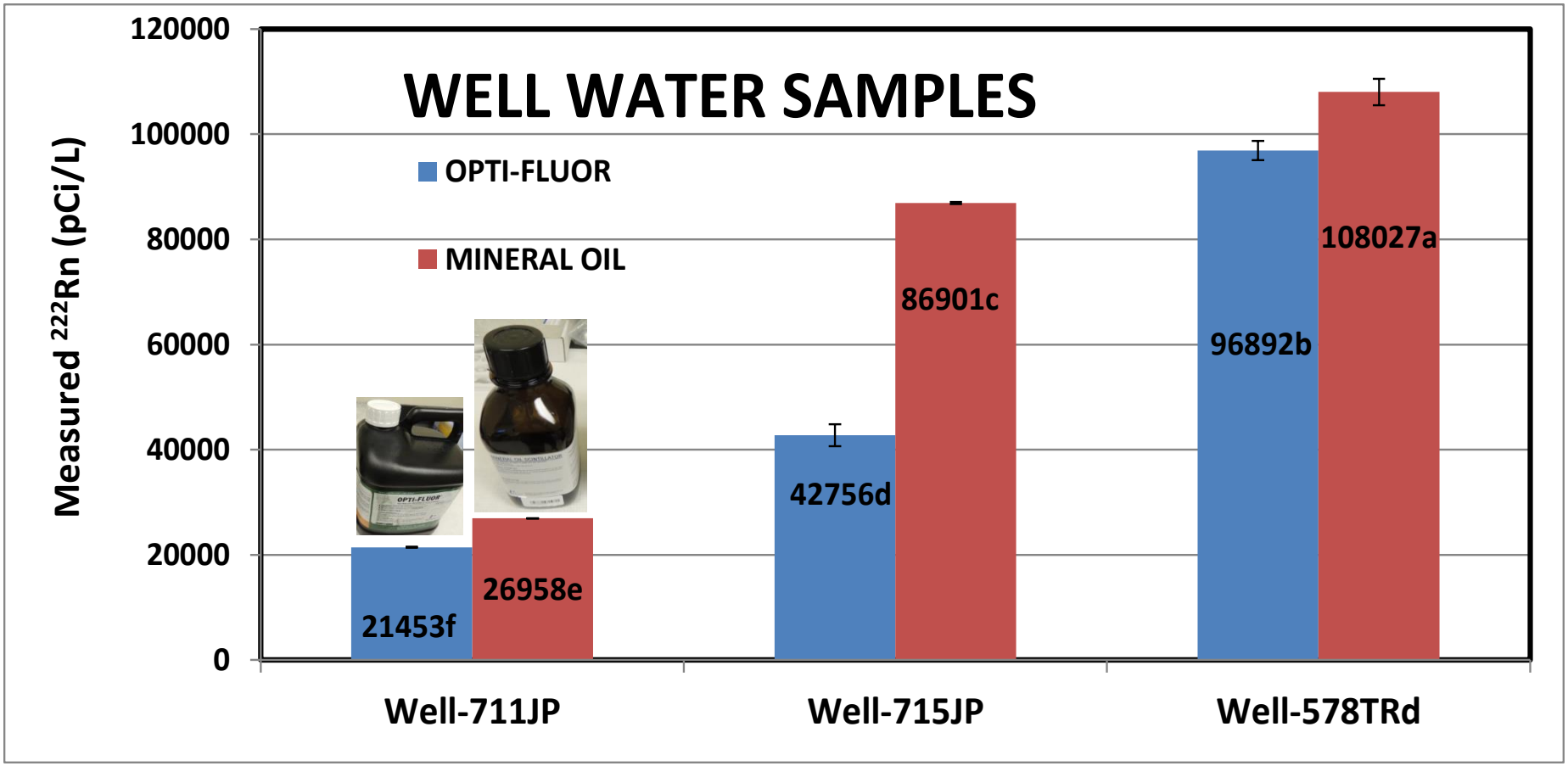
RESULTS

Effects of Air Bubble



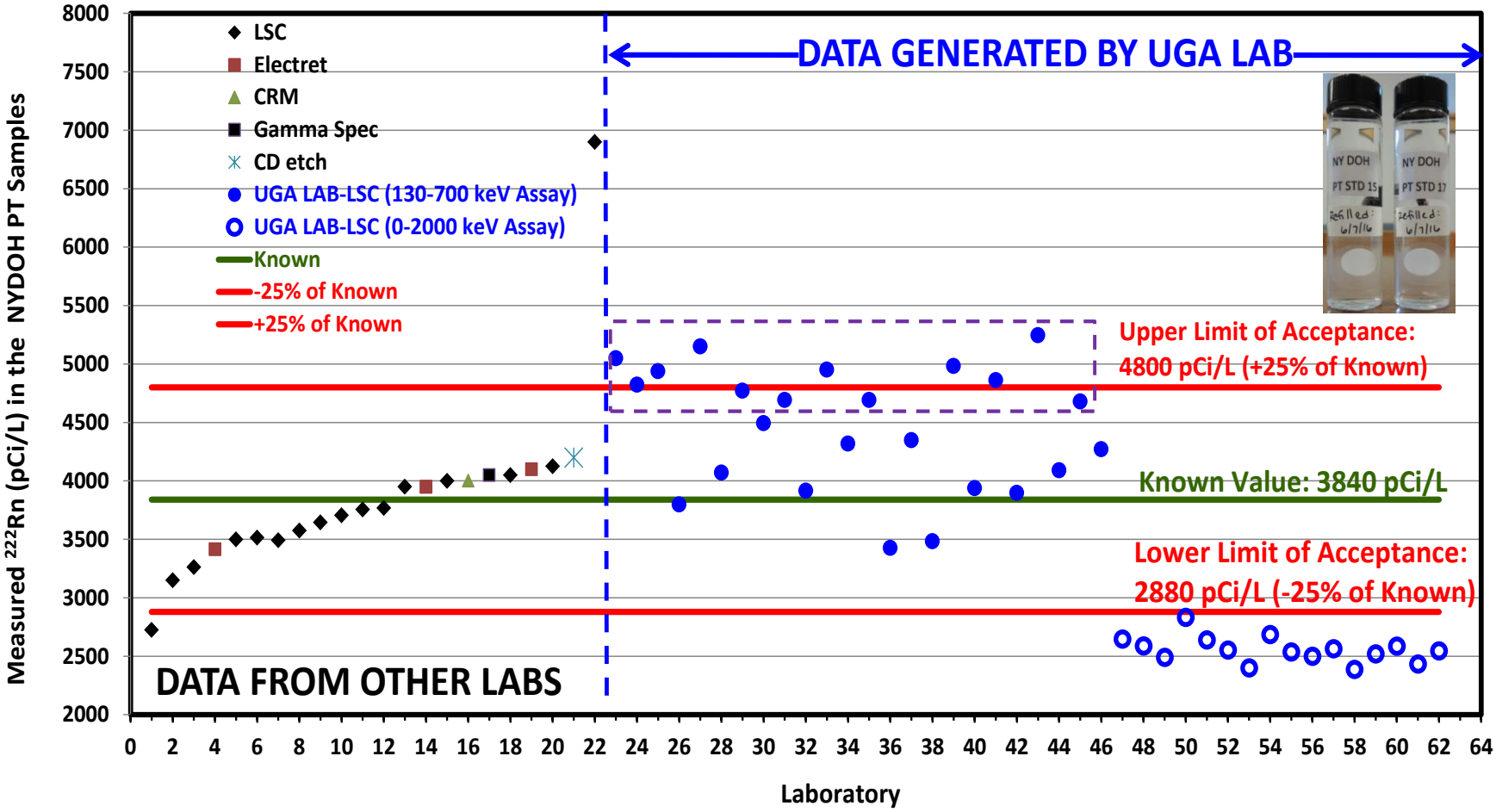
RESULTS

Scintillation Fluids: Mineral Oil *versus* Opti-Fluor



RESULTS

Results From The Two NY DOH Standard or PT Samples

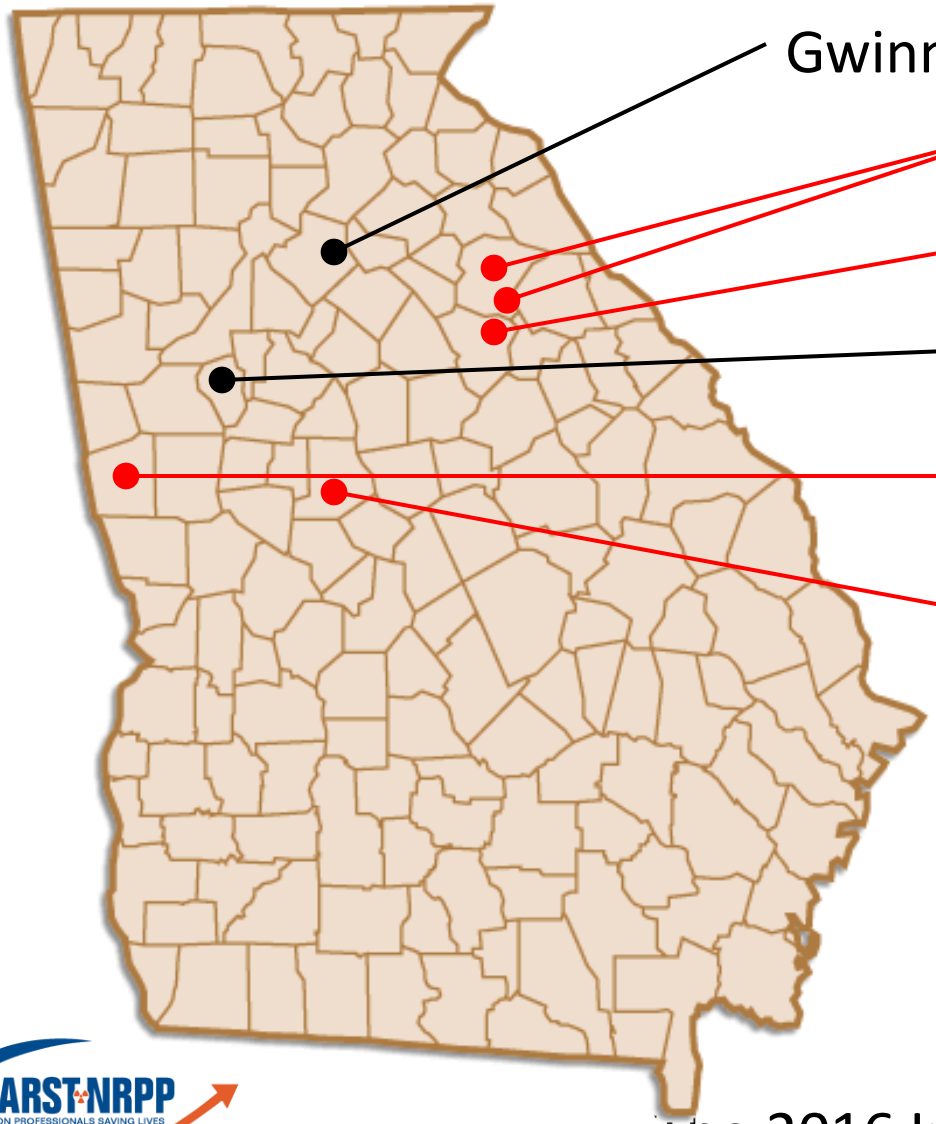


Conclusions

- **Sampling Methods:** Direct-Fill Method is Susceptible to Significant Loss of Radon Gas, So Bowl Method is Better
- **Counting Assays:** The Assay-2 (130-700 keV) is Better Than the Full Spectrum Assay (0-2000 keV)
- **Effects of Air Bubbles:** Air Bubble in the Samples Results in Significant Loss of Radon Gas, Such Loss Becomes Greater as the Size of the Air Bubbles Becomes Larger
- **Scintillation Fluids:** Mineral Oil Generally Gives Higher Radon Counts than Opti-Fluor. But the Results of PT or Standard Samples Showed that Mineral Oil Clearly Over Estimates the Actual Radon Concentration Whereas Opti-Fluor Always Gave the Results Close to the True Value.
- As a Scintillator for Radon in Water, It is Widely Believed that Mineral Oil is a Better than Opti-Fuor. ***But Our Results Show that the Opposite is Indeed True***.

Testing, Mapping, and Education Program: Uranium and Radon in Household Well Waters

Uranium in Drinking Water Wells: AESL Database - Pre ½ Price Program



Gwinnett – 26.6 ppb

Oglethorpe – 62.2 & 70.7 ppb

Green - 53 ppb

Fayette – 15.4 ppb

Troup – 50.4 ppb

Monroe – 69.0 ppb

URANIUM IN DRINKING WATER

A Program With Impact

- ❑ Communication between Extension Office (Monroe) and Trace Metals Lab, AESL, UGA
- ❑ ½ Price Program Initiated (As & U In Well Water Only)
- ❑ Public Information Event Requested (Monroe Co.)
- ❑ Community Involvement In Spreading Information
- ❑ Outreach Collaboration Between Lab Group and FACS
- ❑ Dana Lynch (Monroe Co.; FACS) Recognized For An 'Outstanding Extension Program'

URANIUM IN DW AND RADON IN INDOOR AIR

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Reporter

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Illness linked to well water issues?

High uranium levels leave Juliette family scrambling for answers

BY RICHARD DUMAS

A south Monroe County couple was stunned to learn last month that high levels of uranium and radon in their well could be to blame for their recent health problems.

Phil and Donna Welch were out of town on June 7 when The Monroe County Extension Office hosted a workshop in Bolingbroke concerning the detection of uranium in area wells.

When the couple returned to their Dames Ferry Road home, they read several news articles about the

See WATER page 9A

Phil and Donna Welch with daughter Kacie are testing their home for radon and uranium. (Photo/Richard Dumas)

Senior Editor/Local News Oby Brown
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Tuesday
June 7, 2011
The Telegraph
Section B

LOCAL & STATE

BOLINGBROKE

High uranium levels found in well water

By CARYN GRANT
cgrant@macon.com

Four cases of higher-than-normal uranium levels in well water in the Bolingbroke area have prompted a community session Wednesday to educate people who have private wells about uranium and radon.

The first case, reported to the Monroe County Extension Office last summer, was found only after a resident went to the doctor's office about some lingering health issues, and the doctor suggested a hair follicle test as a follow-up.

Traces of uranium found in the hair sample prompted a water test at the patient's home, said Dana Lynch, a family and consumer sciences county extension agent.

Levels of uranium were found to be twice the level approved by the Environmental Protection Agency.

> The EPA has determined that safe drinking water should contain less than 30 parts per billion of uranium, and studies suggest that drinking water with uranium levels above that level can increase the risk of kidney malfunction.

After the initial reported case of high uranium levels, the extension office held a community forum in April to educate local residents of ways to test their water, the dangers of high uranium levels, and what they can do to prevent ingesting the naturally occurring gas. About 30 residents attended that workshop.

Three new people who either attended that event or knew someone who did later found their well water had high levels of uranium.

All four cases were in the Pate Road area of Monroe County, Lynch said. Officials would not disclose the names of those who found the high levels in their water.

The EPA has determined that safe drinking water should contain less than 30 parts per billion of uranium, and studies suggest that drinking

SEE URANIUM, 4B

If you go

What: Community workshop on uranium and radon risks

When: 6 p.m. Wednesday

Where: Bolingbroke Fire Department, 6037 Rivoli Road

Info: Residents who plan to attend the event are asked to register by calling the Monroe County Extension Office at 994-7014.

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URANIUM IN DW AND RADON IN INDOOR AIR

A Program With Impact

- ❑ I understand about uranium and how it could affect someone's health. 91-94% positive response
- ❑ I understand about radon and how it could affect someone's health. 91-94% positive response
- ❑ I understand what to do if I have uranium in my water. 91-94% positive response
- ❑ I understand what to do if I have radon in my home. 91-94% positive response
- ❑ How likely are you to use the information presented to you today? 91-94% positive response

Radon in Water Can Enrich Radon Level in Indoor Air

A very rough rule of thumb:

Household water with 10,000 pCi/L of radon contributes about 1 pCi/L to the level of radon in the indoor air.

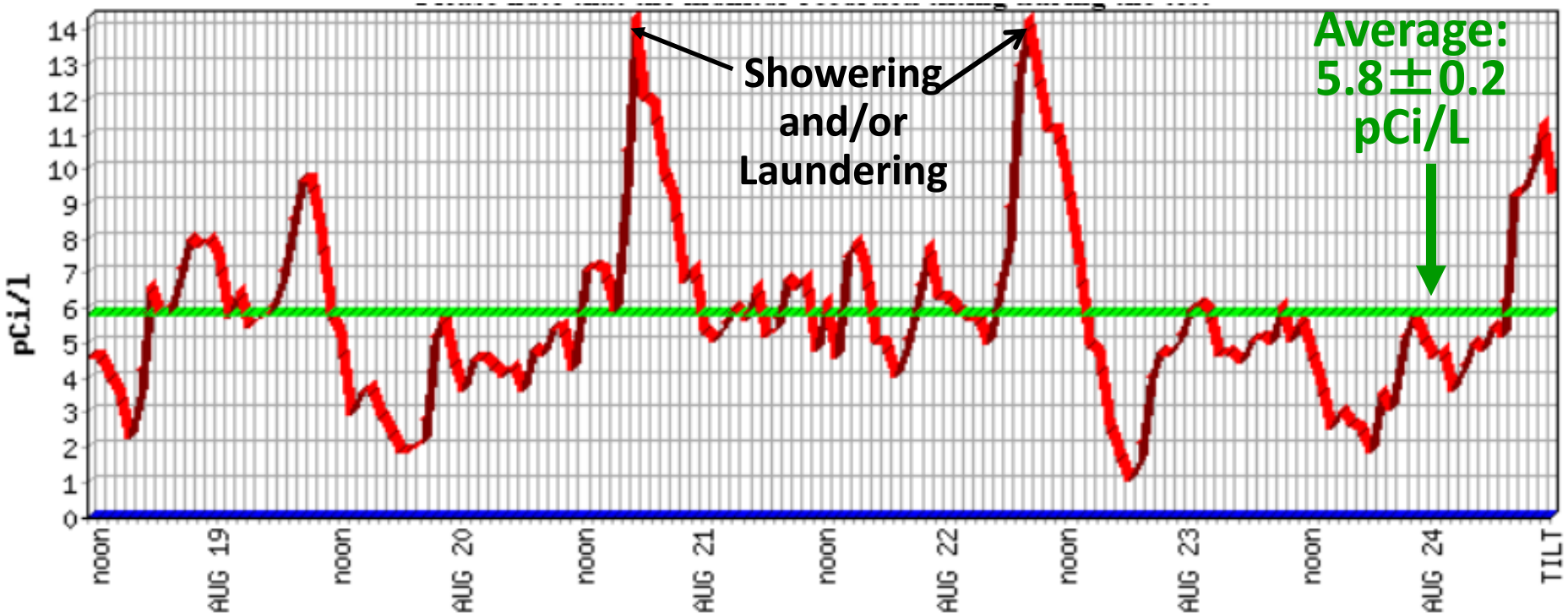
Health Risks from Radon in Drinking Water

Radon in Indoor Air in a GA Home with:

Uranium in Water: 629 ppb

Radon in Water: 79,012 pCi/L

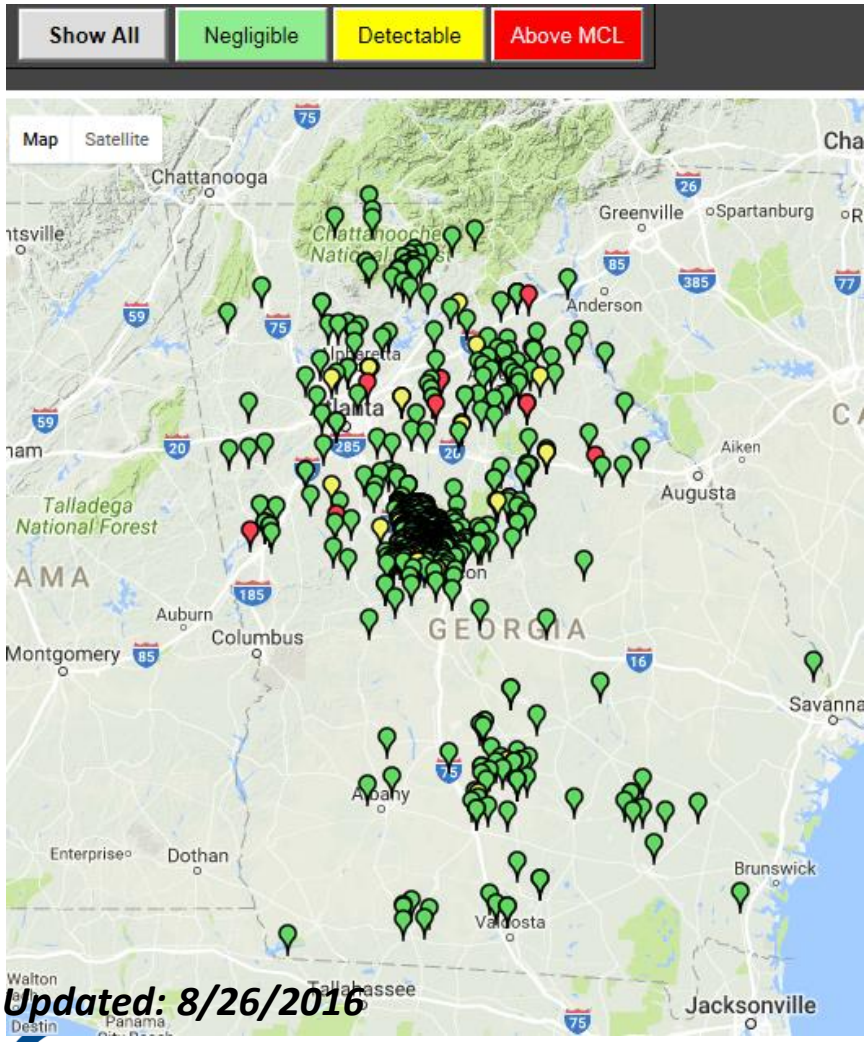
Radium (Ra-226+Ra-228 in Water: 3.8 pCi/L)



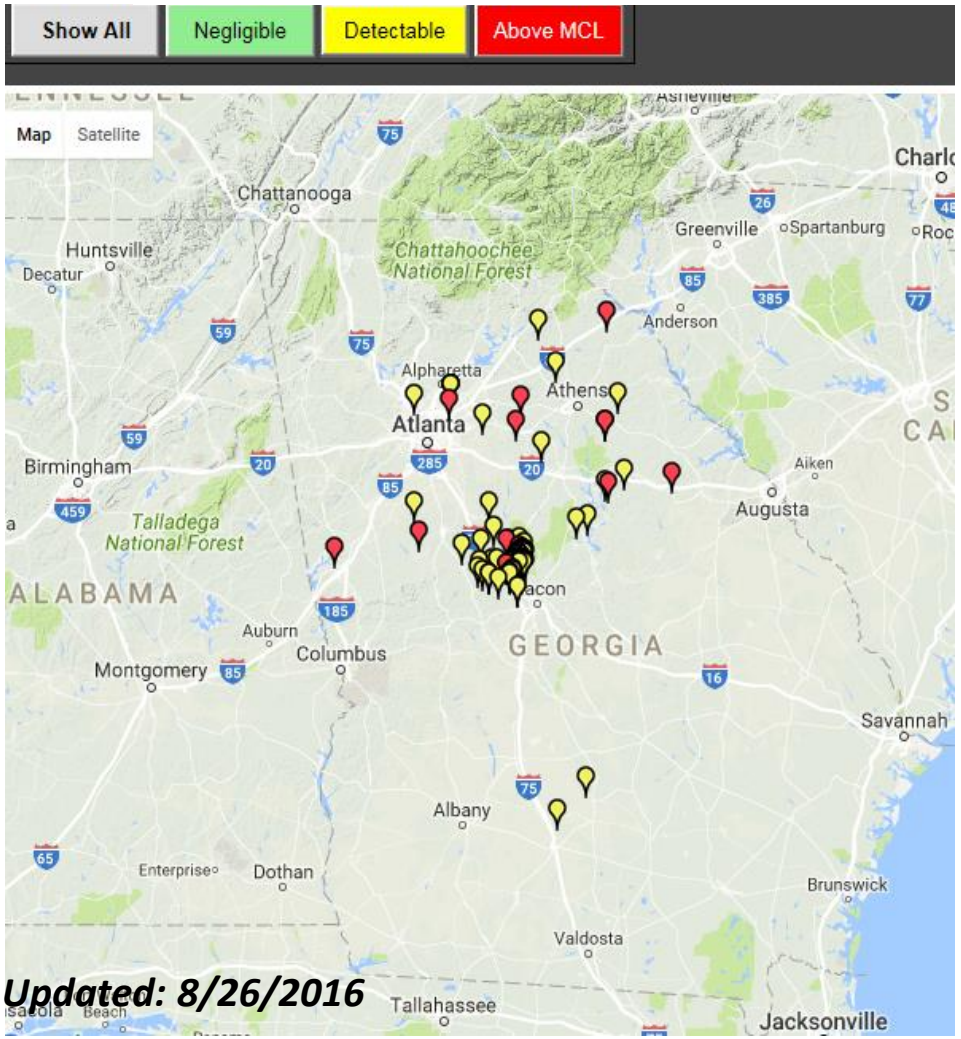
Arsenic, Uranium, and Radon in Georgia Drinking Water FY08 to present

http://aesl.ces.uga.edu/water/map/

State of Georgia Uranium			
Samples	Detectable	Above MCL	Range above MCL mg/L
1210	140	57	0.0301 ... 6.2973



Updated: 8/26/2016



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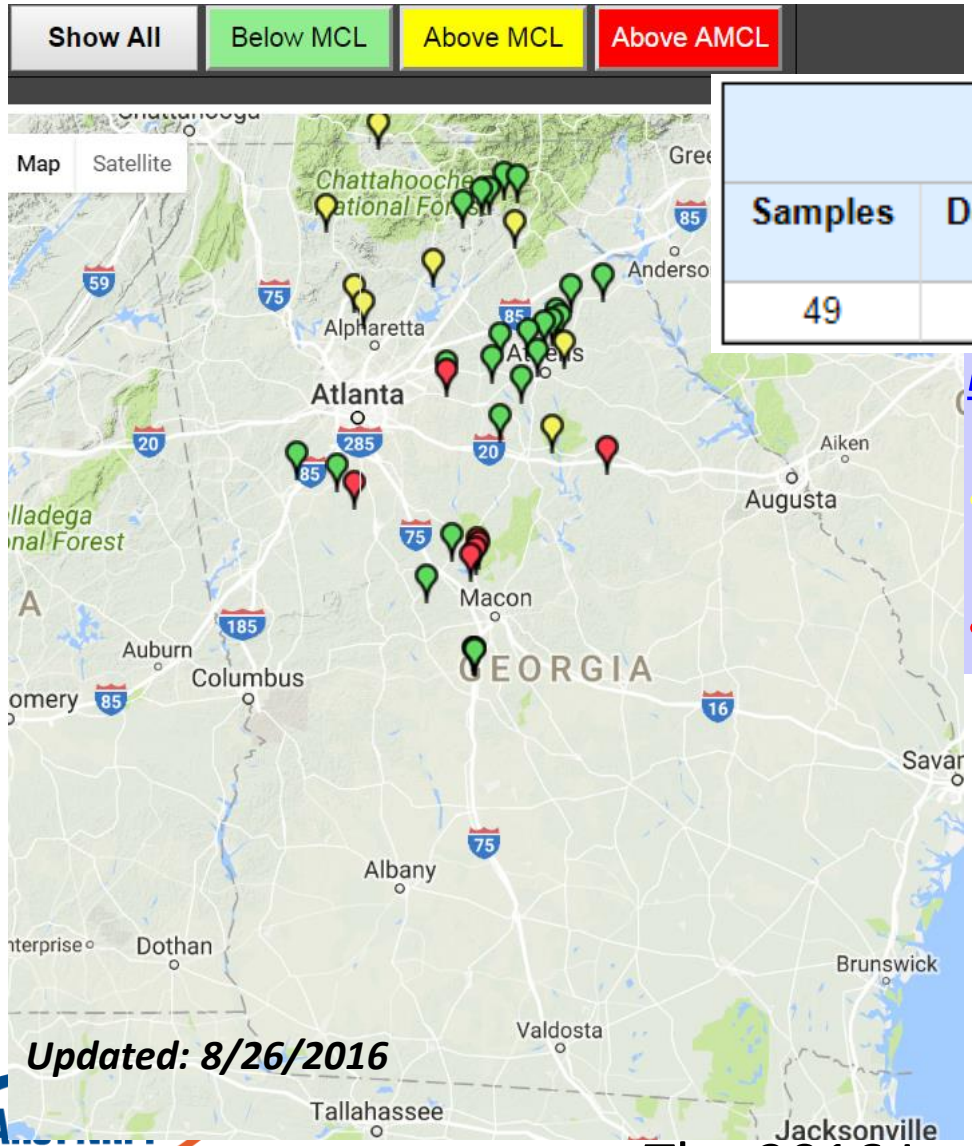

State of Georgia Radon			
Samples	Detectable	Above MCL	Range above MCL pCi/L
49	47	21	350.3846 ... 69709.2897

***Radon in Water*:**

- **Proposed MCL: 300 pCi/L**
- **Proposed AMCL: 4000 pCi/L**

THANK YOU VERY MUCH!!!

QUESTIONS, COMMENTS……

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