



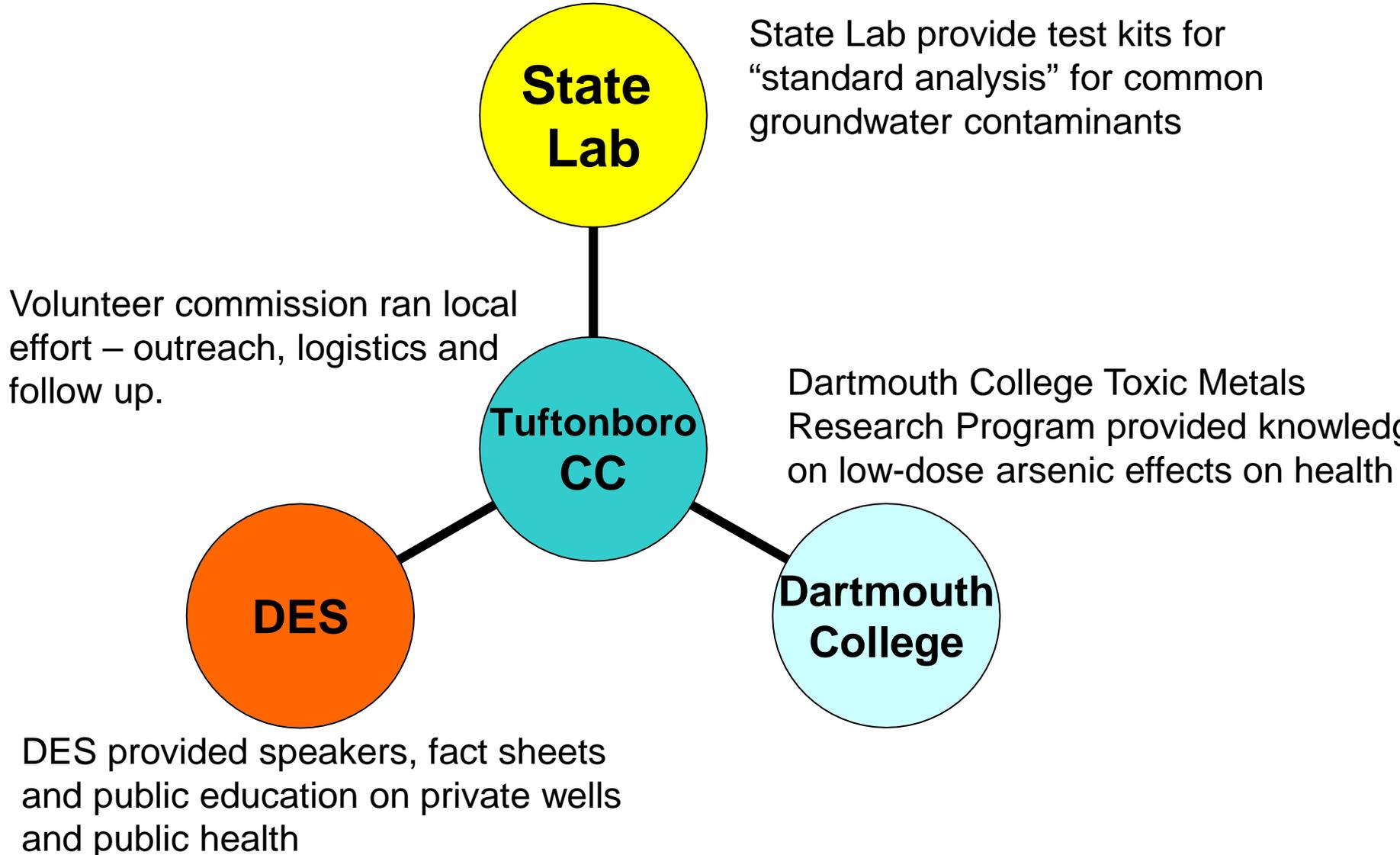
# Collaborative to Minimize Exposure to Arsenic and Other Natural Contaminants in Groundwater

NH Water and Watershed Conference  
March 22, 2013



Steve Wingate, Tuftonboro Conservation Commission  
Pierce Rigrod, Drinking Water & Groundwater Bur., NH DES

# Collaborating – Playing to Your Strengths



# **American Academy of Pediatrics**

## **Policy Statement on Private Wells & Children**

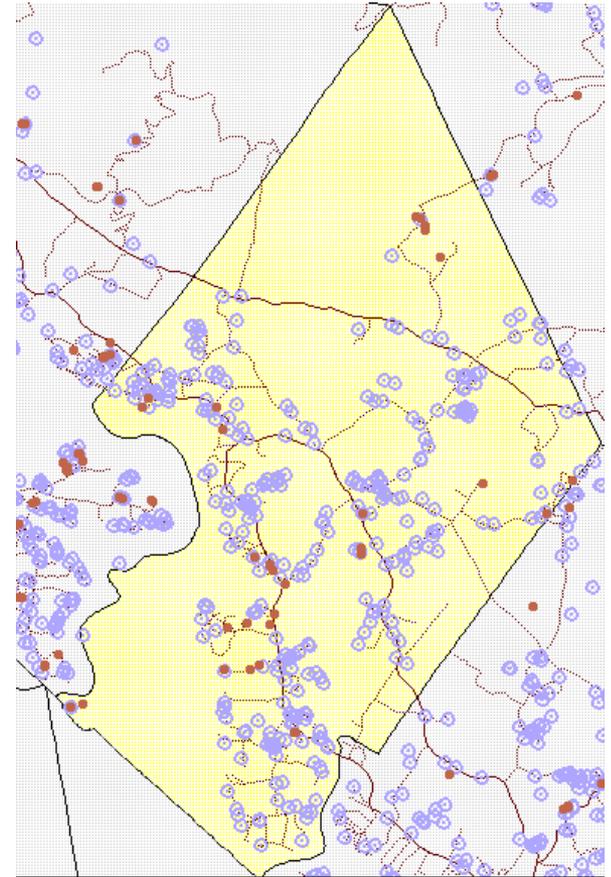
Recommendations to government (May 2009):

- States should **require testing** when a dwelling is sold, and results made available to buyer
- Local governments should provide **access to information** about local groundwater conditions and recommendations for testing
- Testing should be **convenient and free or inexpensive**

# Problem: Few Test for Common Contaminants with Potential Acute or Chronic Health Impacts

95% of residents have a private well

Little evidence residents are testing  
(83 samples from 2006 – 2012 at  
State Lab)



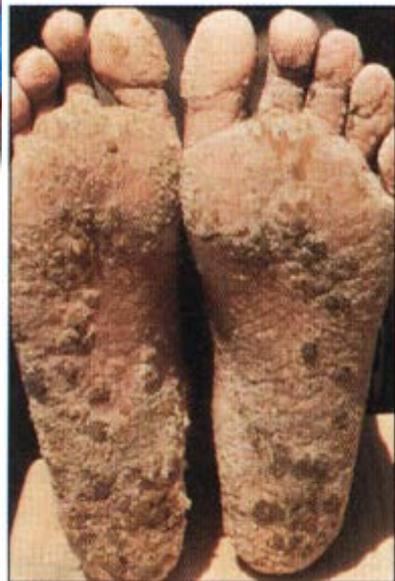
Pop	Private	PWS
2,310	2,191	119

USGS, 2005

One common contaminant in private well water is arsenic.



# Arsenic in drinking water = a global public health issue



- Worldwide, an estimated 250 million to 1 billion people are affected by excess arsenic in groundwater
- A WHO program of digging tube wells in India and Bangladesh to alleviate cholera problem led to exposure to excess arsenic in drinking water
- Highly contaminated areas (India, South America) can contain as much as 1800 ppb (180 times the WHO standard)

# **Arsenic in drinking water: what are the risks?**

- Studies link exposure to arsenic in drinking water to a wide variety of adverse health effects:
  - Cancers (bladder, skin, kidney, liver, and lung)
  - Vascular and cardiovascular disease
  - Reproductive and developmental effects
  - Cognitive and neurological effects
  - Diabetes and other metabolic disorders

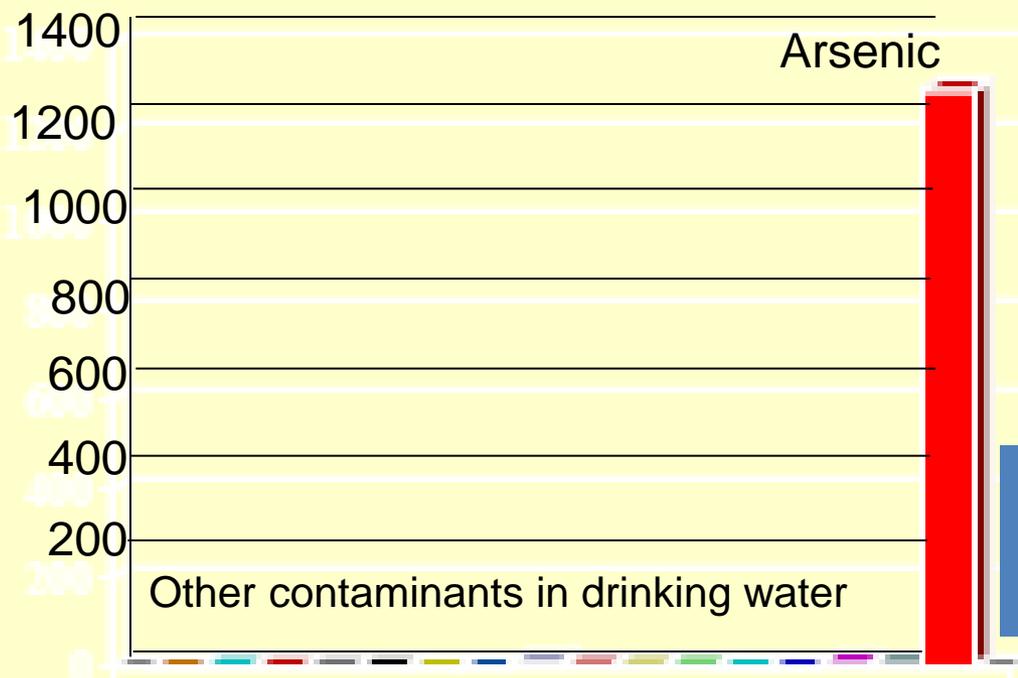
Hughes et al. (2011). “Arsenic Exposure and Toxicology: A Historical Perspective” *Toxicological Sci* 123(2): 305–332.

# Cancer Risk: Arsenic (at 50 PPB) vs. Other Contaminants in DW

Cancer risk from contaminants in drinking water including arsenic

50 PPB (old arsenic standard)

Per 100,000



Cancer risks from arsenic at the old drinking water standard were >100 times higher than the next highest risk contaminant

10 PPB (new standard)  
Cancer risk from arsenic in drinking water (1:300)



# Arsenic in water from public bedrock wells in New England

Approximately **one in five NH wells** have arsenic in excess of the federal drinking water standard, meaning 10% of the state's population (~120,000 people) could be chronically exposed to high levels of arsenic.

Ayotte et al. (2003). "Arsenic Groundwater in Eastern New England: Occurrence, Controls, and Human Health Implications." Environ. Sci. Technol. 37(10): 2075-2083.

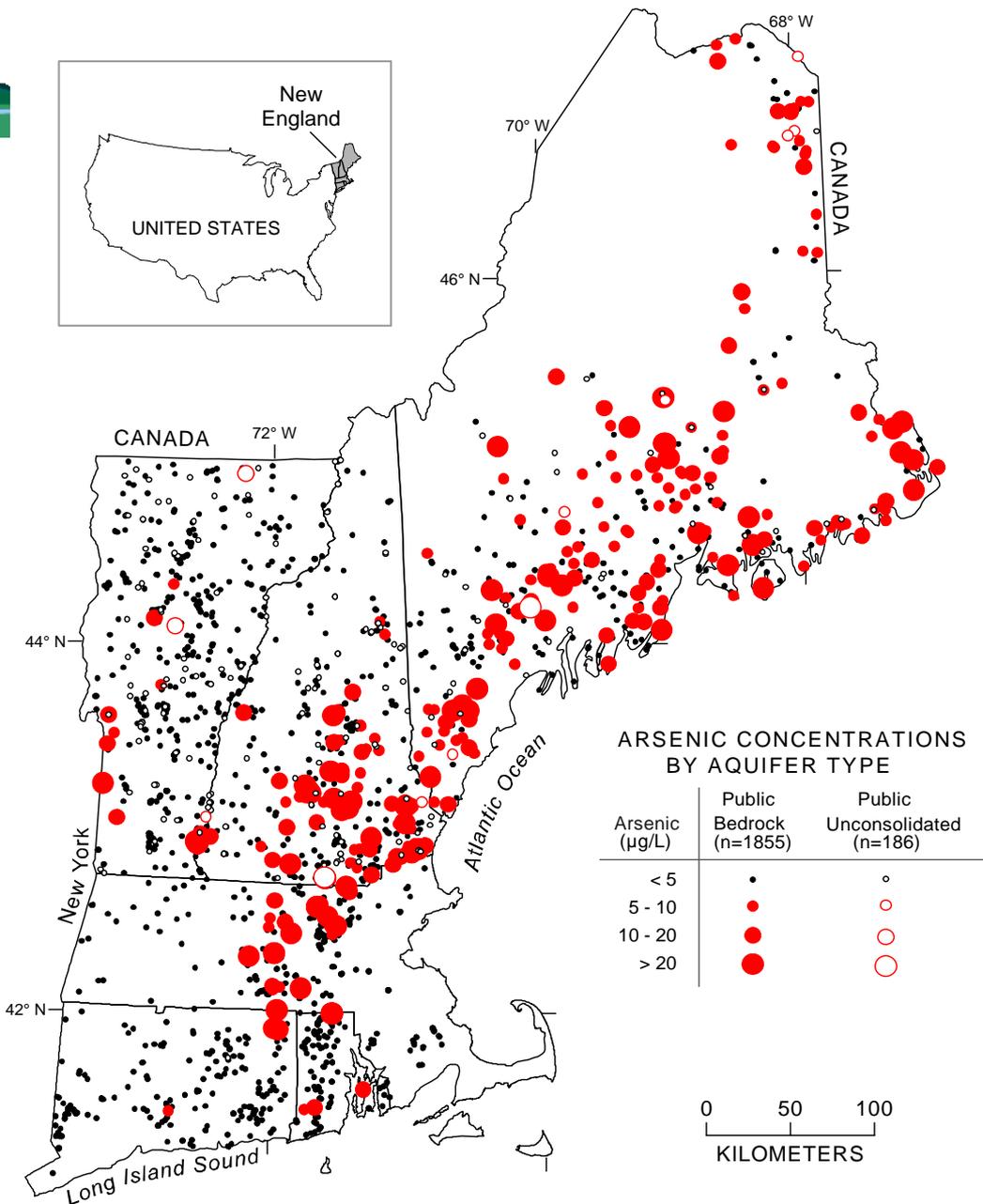


FIGURE 1. Arsenic concentrations in source waters to public-supply wells in New England.

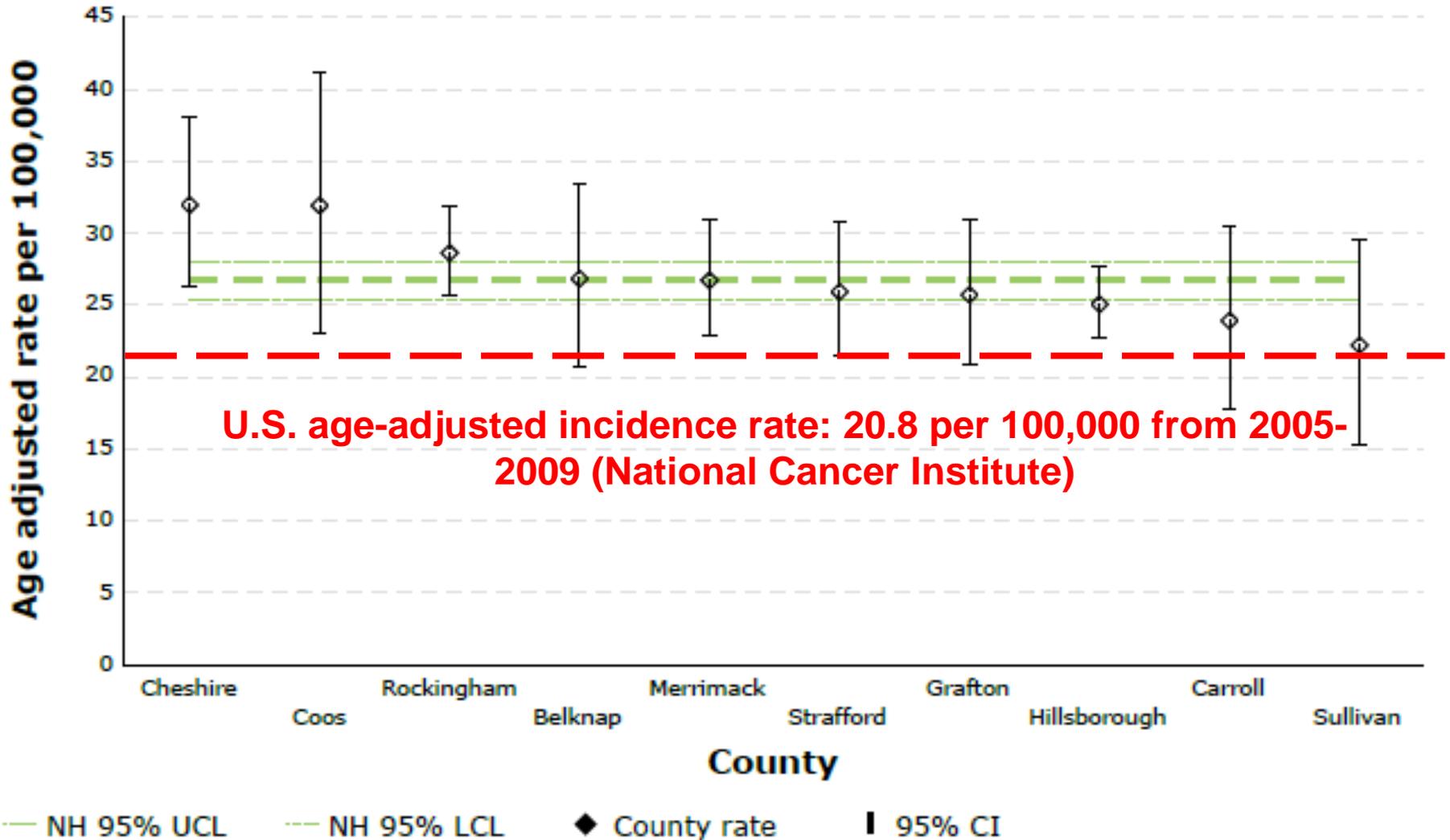
# Arsenic and bladder cancer

- Ingestion of inorganic arsenic in drinking water is recognized as a cause of bladder cancer when levels are relatively high ( $\geq 150 \mu\text{g/L}$ ).
- Among men and woman, bladder cancer rate residuals were significantly correlated with private well use in New England
  - Ayotte et al. Bladder cancer mortality and private well use in New England: an ecological study, *J. Epi. & Community Health* 60 (2006): 168–172.
- **Cancer risk associated with lifetime ingestion of  $10 \mu\text{g/L}$  is much higher than it is for other MCLs.**

# Higher Bladder Cancer Rate in NH than US On Average

## Bladder cancer incidence rates

NH residents; For 2005-2008; Both genders



# Private Wells in NH

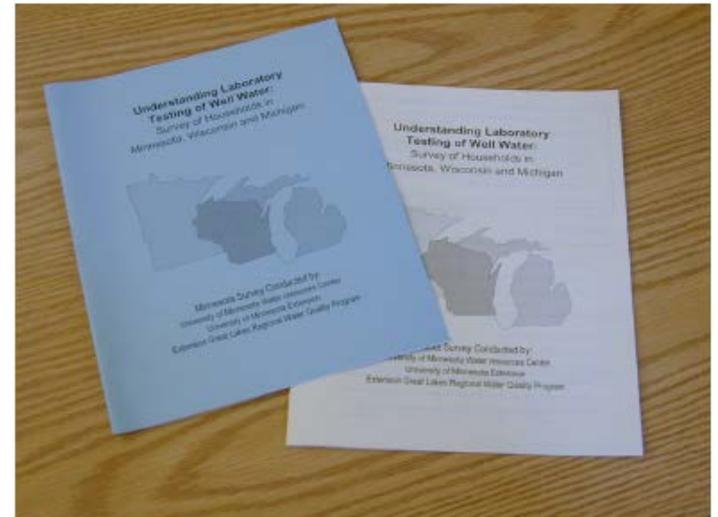
- 40% of NH's population relies on private wells for drinking water
- 1:5 private wells test above the MCL (10 PPB/l) for As
- 120,000 people estimated to be exposed to AS above the health-based standard (10 PPB).



**Regulation of private wells is left to states and towns**

# Social Dimensions of Private Well Testing: Why Don't People Test their Water? 3 States (MI, MN, OH)

1. “Have been drinking it years w/o problems” (53%)
2. “Don't know what to test for” (41%)
3. “Don't know how to test” (35%).



Link to Study - <http://conservancy.umn.edu/handle/58540>

Source: Barbara Liukkonen, U of MN Extension; Lori Severtson, School of Nursing, UW-Madison; Ruth Kline-Robach, Institute of Water Resources,

# Social Dimensions of Private Well Testing: Why Don't People Test their Water?

❖ When people who hadn't tested their water were asked, "*Why haven't you tested water from your well?*" the top ten reasons they gave were ...

1. We've been drinking it for years – **53%**
2. Didn't know what to test for – **41%**
3. Don't know how to test – **35%**
4. It's probably fine – **25%**
5. Didn't know I should test it – **17%**
6. Testing costs too much – **17%**
7. I'll Wait for others to find problems – **12%**
8. Dealing with problem would be too costly - **12%**
9. Missed the testing program – **8%**
10. I don't want to know – **8%**

# Social Dimensions of Private Well Testing: Why Don't People Test their Water?

❖ When asked, “*Do you believe your untreated well water is safe to drink?*” respondents reported they believe it is ...

Very unsafe	Unsafe	Somewhat Unsafe	Somewhat Safe	Safe	Very Safe
4%	5%	11%	13%	47%	20%

**67% believe their untreated well water is Safe or Very Safe**

Source: Barbara Liukkonen, U of MN Extension; Lori Severtson, School of Nursing, UW-Madison; Ruth Kline-Robach, Institute of Water Resources,

# Extension Study: Private Well Testing: 41% “plan” to test”

## Implications for increasing well testing

❖ When asked, “*Have you thought about testing your water?*” those who hadn’t tested responded ...

**41%** - Never thought about it

**12%** - Thought, but not going to test

**6%** - Plan to test in next year

**41%** - Plan to test sometime

That means we can:

- **Raise Awareness of the need to test, and**
- **Provide prompts/reminders to test: 41% are ready to test if we make it easy**

Source: Barbara Liukkonen, U of MN Extension; Lori Severtson, School of Nursing, UW-Madison; Ruth Kline-Robach, Institute of Water Resources,

# Tuftonboro Project Chronology

<p>May</p>	<p style="text-align: center;"><b>Building Knowledge Base</b></p> <ul style="list-style-type: none"><li>• Attended NH DES Drinking Water Source Protection Conference and heard Dr. Josh Hamilton's presentation on low-dose arsenic effects.</li><li>• Michael Paul from Dartmouth Medical Community Outreach attended and presented to Selectman. Enthusiastic support from the selectmen.</li></ul>
<p>June</p>	<p style="text-align: center;"><b>Building Awareness</b></p> <p>Made sure the planned project was covered by the press in our local weekly paper and quarterly town newsletter.</p> <p>Produced two articles about arsenic and other pollutants found in NH wells and the subsequent health effects. Plans for our well testing announced.</p> <p>Published an article about a resident who had discovered an extremely high level of arsenic in their well and the steps they were taking to remediate it.</p>

# Public Education: Promote Community-Wide Testing Events (Tuftonboro)

THE GRANITE STATE NEWS, Thursday, July 19, 2012 A9

## Tuftonboro offers water testing service to residents

BY ELISSA PAQUETTE  
Staff Writer

TUFTONBORO — New Hampshire “The Arsenic State”? The Granite State has the distinction of having high levels of arsenic in its wells, especially artesian wells drilled into the bedrock. Arsenic, a natural, odorless, and tasteless chemical element is contained in a type of com-

mon granite. And when kits from July 23 to 28 at the town offices building on Route 109A and at the transfer station on Route 171.

Instructions and information are in the kits. Residents can pay \$15 for an arsenic test only or \$85 for more wide-ranging testing. Results are confidential. The Commission’s role is only to disseminate the kits, pick them up on the 29th and bring them to the

those cracks. He emphasizes that changes from earth tremors or quakes or nearby drilling occur over time, necessitating testing for potential acute contaminants such as bacteria and nitrates and every three years for chronic contaminants including radon, uranium, lead and copper.

There are various remedies aside from buying water to correct problems that show up in the testing.

Proteja su Familia

Verifique la Pureza de su Pozo Artesiano - Hoy!



Guía para el análisis de la calidad de agua de los pozos artesianos o privados

New Hampshire Department of  
Environmental Services  
y  
US Environmental Protection Agency  
Region 1, New England

Protect Your  
Family

Test Your Well's  
Water Quality Today



A Guide to Water Quality  
Testing for Private Wells  
in New Hampshire



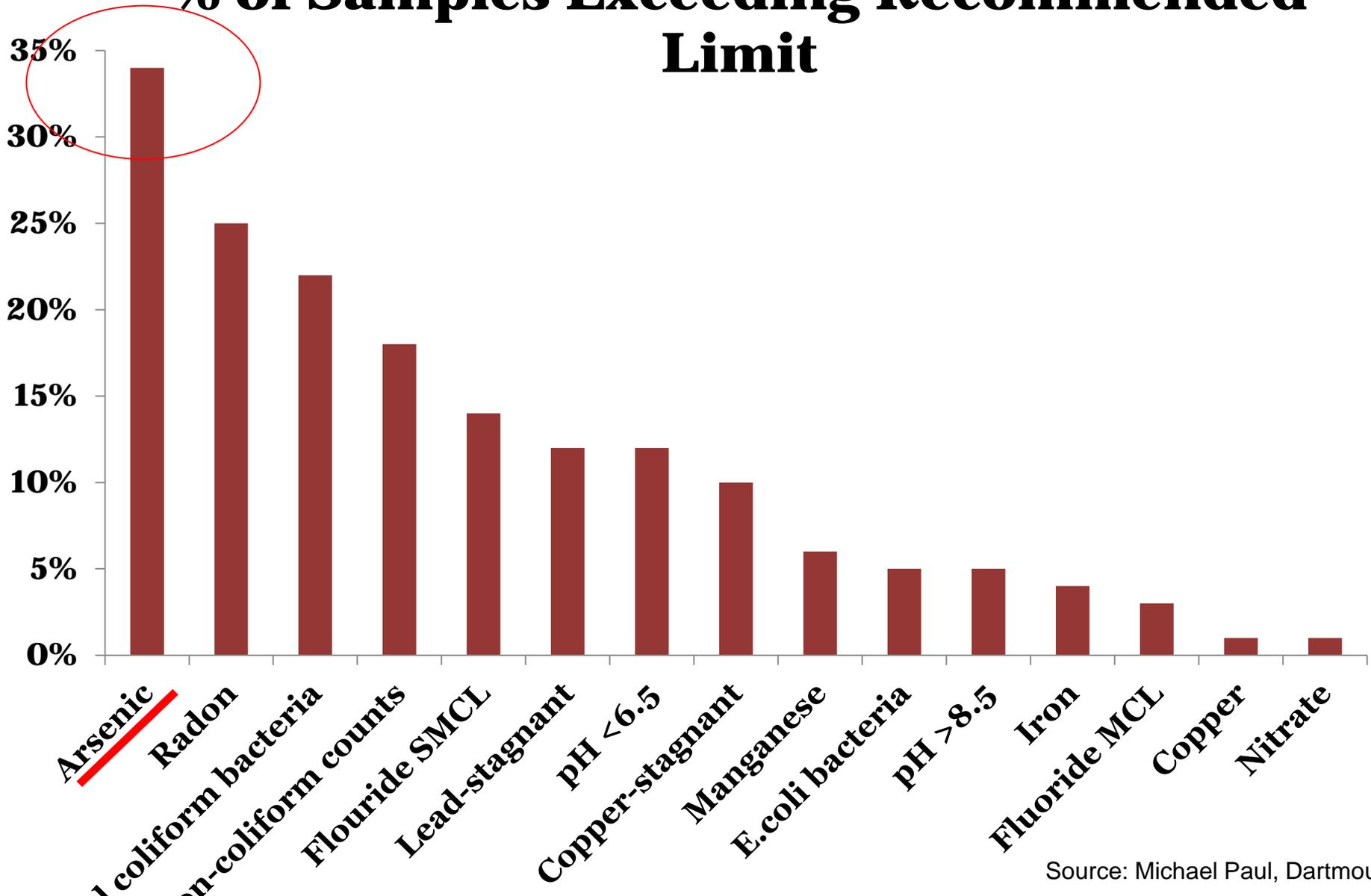
# Conservation Commission's 2012 Well Testing Day

- Obtained 175 sample kits from DES
- Distributed 172 at transfer station over the course of a week (2.5 per house) ~ 430 people
- One Effort = ~ 10-15% of Tuftonboro wells tested



# Good reason to Test (Tuftonboro Results)

## % of Samples Exceeding Recommended Limit



## Tuftonboro Project Details and Chronology

<b>July</b>	Members set up displays including DES handouts. We made three trips to Concord to pick up kits as demand exceeded our estimated needs.
<b>July</b>	Collected samples at the town transfer station. The paper work was checked, samples properly bagged and refrigerated. Next morning two members delivered the samples to DES.
<b>August</b>	As residents received results from DES several members helped some people interpret the report or referred them to DES for assistance.
<b>September</b>	Began planning a public forum on how to evaluate test results and remediation methods available to solve well contamination problems.
<b>October</b>	Prepare a notice on well testing to be included with tax bills (this did not happen because state tax info was received too late) plus press releases.
<b>November</b>	DES workshop on how to interpret your well water report and provide extensive information on remediation measures.

# Tuftonboro's Arsenic Treatment Workshop (11/13/2013)

1. Tuftonboro As vs. rest of NH
2. How to read your lab report
3. When to install treatment
4. Treatment technologies - Whole House vs. Point of Use (POU)

**FYI - The most common media include modified activated alumina and iron-based materials.**  
**(Source: EPA, 2012)**

## Conservation Commission holds water testing forum

BY ELISSA PAQUETTE  
Staff Writer

TUFTONBORO — Members of Tuftonboro's Conservation Commission provided the opportunity on Nov. 13 for residents to review the results of their water tests conducted this past summer and ask questions of scientists from the N.H. Department of Environmental Services (DES).

The forum, held at Tuftonboro Central School, was a continuation of the Commission's efforts to alert residents to the dangers of contaminants, primarily arsenic, in their well water.

The purpose was to assist



ELISSA PAQUETTE  
TUFTONBORO RESIDENT Maggie Dwyre discusses her water testing results with Department of Environmental Services hydrogeologist Christine Bowman at the Conservation Commission's forum held at Tuftonboro Central School on Tuesday evening, Nov. 13, 2012.



See - <http://des.nh.gov/organization/commissioner/pip/factsheets/dwgb/documents/dwgb-3-2.pdf>

# Keys to Success (so far)...

**Local Knowledge Base**— Informed local champions provided assistance to their neighbors and friends, and town officials to make better decisions regarding well testing.

**Building Awareness** - Media, personnel contacts, cable TV, chain reactions - answer key questions (e.g., confidentiality of testing results)

**Easy and affordable** – Overcame common barriers – educational, logistical, technical that often prevent people from testing their wells.

**Planning, Volunteers and follow through**– Coordinated people, resources and materials from multiple sources. (DES, Dartmouth, etc.)

**Permanence** - Keep doing it, get better at it. –Not a one time effort and as more residents learn about it, expect much more testing.

# Summing it Up - Tuftonboro's experience

People believe their water is safe, w/o any data to support that belief

People don't know they should test their well water; what to test for, how to sample, where to take their sample, what the results mean and how to treat it.

People respond to local sources of information but it helps to have "authorities" and information from Dartmouth and DES

Relationships matter (in terms of getting a positive response)

## Issues to consider....

- Confidentiality of test results
- What if the results indicate non-potable water?
- What if the treatment costs exceed the homeowner's ability to pay those costs?
- What is the responsibility of the town?

# Long-term Goal: Change the “norm”

Four out of five people wash their hands.\* **Let's talk to the fifth guy.**



[www.TalkToTheFifthGuy.com](http://www.TalkToTheFifthGuy.com)

\* Harris Interactive observational survey of 6,336 people at public restrooms in six locations across the United States, performed for the America Society for Microbiology. 83% of the sample washed hands after using the restroom.

# Questions?

## Contact Info

### **Pierce Rigrod**

Environmentalist IV

Source Protection Program

Drinking Water & Groundwater Bureau

NH DES / 29 Hazen Drive / Concord, NH

Phone 603.271.0688 | Email: [Pierce.Laskey-Rigrod@des.nh.gov](mailto:Pierce.Laskey-Rigrod@des.nh.gov)

### **Steve Wingate**

Tuftonboro, NH Conservation Commission

Phone: 603-569-3114 | Email: [steviewingate@roadrunner.com](mailto:steviewingate@roadrunner.com)

### **Michael Paul**

Community Engagement Core

Superfund Research Program

The Geisel School of Medicine at Dartmouth

HB 7660, Hanover, New Hampshire 03755

Phone: 603.643.3137 | Email: [michael.paul@dartmouth.edu](mailto:michael.paul@dartmouth.edu)