NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Private Wells:
Common Contaminants and How to Protect Yourself

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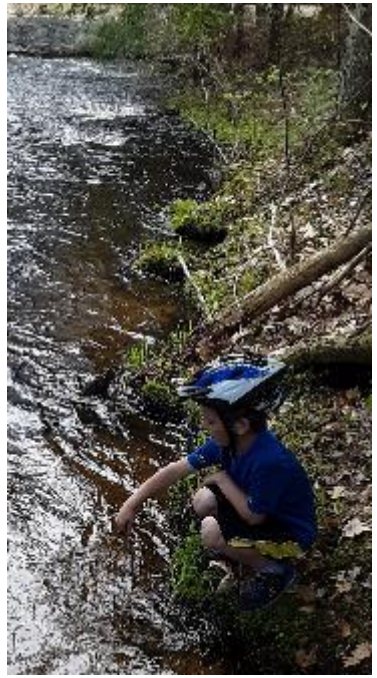
2023 Environmental Health Conference

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

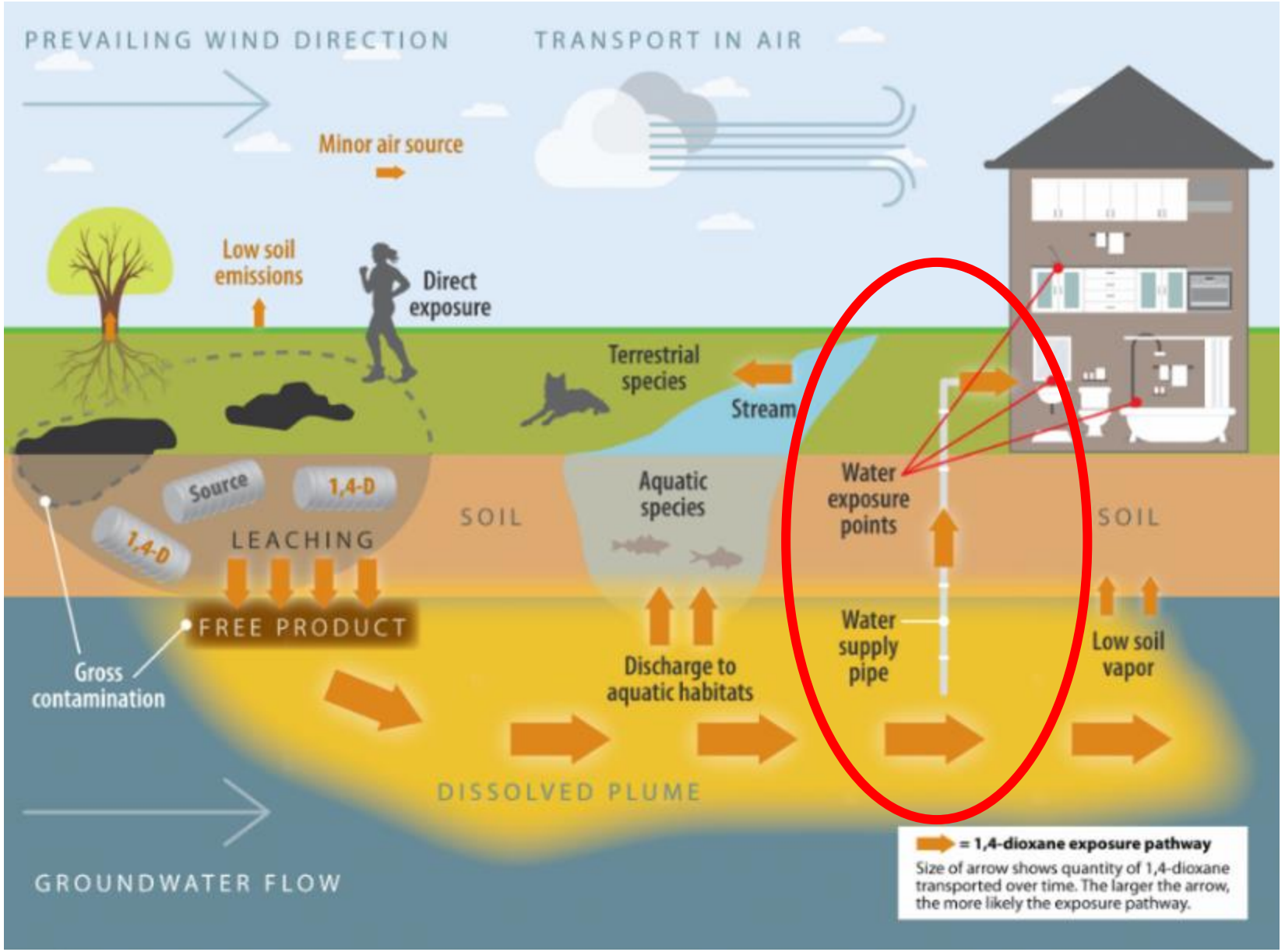
After this session, participants will be able to:

1. List common contaminants found in private wells in NH
2. Name health outcomes associated with contaminants
3. Understand sampling efforts in NH
4. Identify resources available to help reduce exposure



"Environmental Health is the branch of **public health** that focuses on the interrelationships between people and their environment, promotes human health and well-being, and fosters healthy and safe communities."

-National Environmental Health Association (NEHA)



ITRC conceptual site model: https://14d-1.itrcweb.org/toxicity-and-risk-assessment/

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Common Contaminants & Associated Health Outcomes

E. coli

A bacteria found in the fecal matter of mammals, including humans.

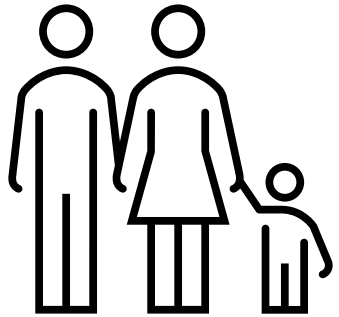
An immediate health hazard.

Indicator or poorly constructed wells or springs.

More information:

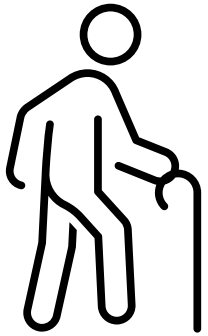
NHDES: https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/2020-01/dwgb-4-1.pdf

If present in water

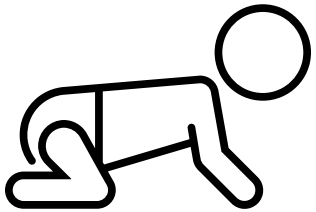


↑ risks for digestive system infections

- diarrhea
- Vomiting
- Cramps
- nausea
- headaches
- Fever
- fatigue



↑ risks for life-threatening infections



↑ risks for life-threatening infections

Arsenic

"King of poisons and poison of Kings."

A naturally occurring element common in NH bedrock.

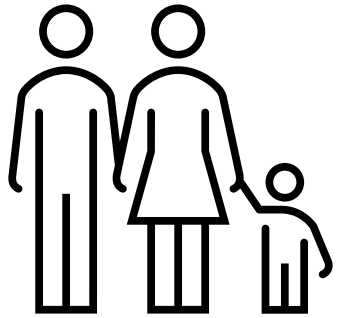
More information:

NHDES:
https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/2020-01/dwgb-3-2.pdf

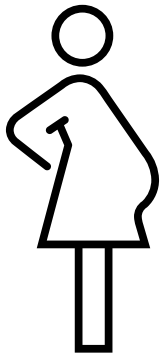
Dartmouth:
https://sites.dartmouth.edu/arsenicandyou/

CDC/ATSDR:
https://www.atsdr.cdc.gov/sites/toxzine/arsenic_toxzine.html

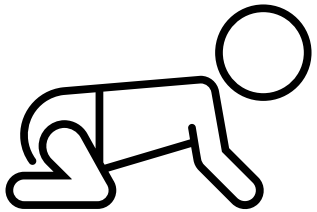
>5 ppb (µg/L)
or
0.005 mg/L



↑ risks for certain cancers (e.g., lung and bladder)
↑ risk for diabetes
↑ risk for cardiovascular disease
↓ immune system function



↓ fetal growth and birth weight
↓ early immune system function



↑ lifetime risk for cancer
↑ lifetime risk of respiratory diseases
↓ IQ and brain development

Lead

A natural element that was widely used in industry until its harm was recognized.

Found in older plumbing and leaches into stagnant water.

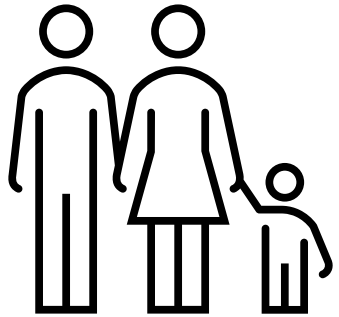
More information:

NHDES: https://www.des.nh.gov/water/drinking-water/lead/faqs

EPA: https://www.epa.gov/lead

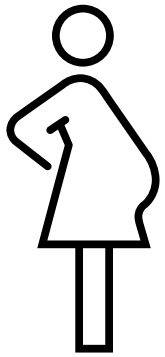
CDC/ATSDR: https://www.atsdr.cdc.gov/sites/toxzine/lead_toxzine.html

>15 ppb (µg/L)
or
0.015 mg/L

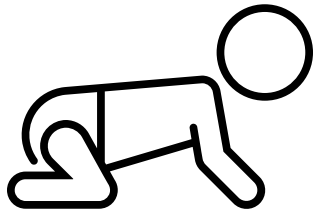


- ↑ risk for kidney disease
- ↑ blood pressure
- ↓ decreased cognitive function and IQ
- ↑↓ immune function
- ↓ sperm production in men

>5 ppb (µg/L)
or
0.005 mg/L,
but aim for
Zero if
possible



- ↑ risk for miscarriage (at high levels)
- ↓ brain and neurological development



- ↑ risk for behavioral problems
- ↑ difficulty learning
- ↓ IQ and brain development (irreversible)

Manganese

A naturally occurring element common in NH bedrock.

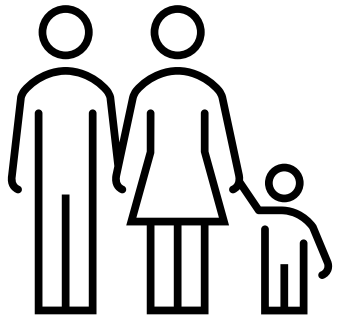
An essential nutrient at low levels, but a **toxin at high levels**.

More information:

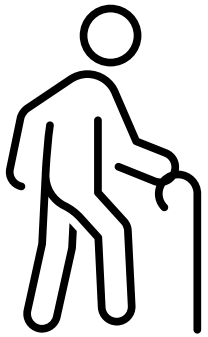
NHDES: https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/ard-ehp-15.pdf

CDC/ATSDR: https://wwwn.cdc.gov/TSP/ToxFAQs/ToxFAQsDetails.aspx?faqid=101&toxid=23

>300 ppb (µg/L)
or
0.300 mg/L

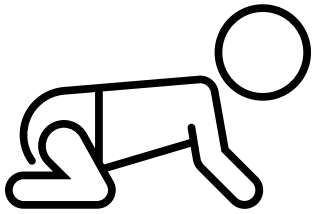


↑ risks for cognitive delays or slurring of speech
↑ muscle tremors and Parkinson's-like symptoms
↓ motor skills



Elderly individuals or people with liver disease retain Mn in their body and may be more susceptible to neurological effects.

>100 ppb (µg/L)
or
0.100 mg/L



↓ IQ and brain development
↓ neurological development and coordination

Certain formula-fed infants are more sensitive because they retain Mn in their bodies.

Radon

A naturally occurring radioactive gas found in NH bedrock.

A wide-spread and potent carcinogen in our environment.

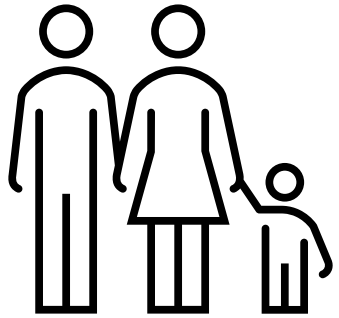
Consider air and water results

More information:

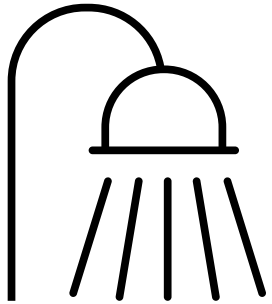
NHDES:
https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/2020-01/dwgb-3-12.pdf

NH DHHS:
https://www.dhhs.nh.gov/programs-services/environmental-health-and-you/radon

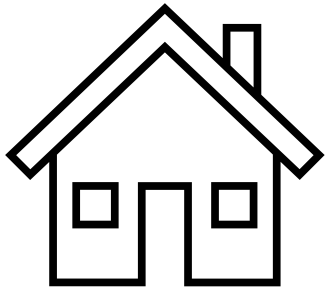
>2,000 pCi/L



↑ risk for stomach and lung cancer



Radon becomes a gas when you shower, resulting in exposure through breathing air and water droplets.



For well results above 2,000 pCi/L, we recommend an air radon test to determine indoor air levels.

*pCi/L means picocuries per Liter; this is a measure of radon's radioactivity per liter of water.

More about **radon**, because it's complicated:

Look at air & water together

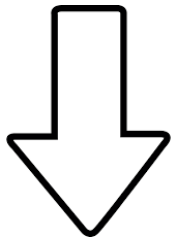
Reduce your exposure as much as you can

- **Test your air for radon**

- **Test your water for radon and determine how much it's adding to the air (using 10,000 to 1 ratio)**

- **Get quotes for treating air and treating water and look at your budget**

- **Reduce the amount of radon in your air as much as possible, below 4 pCi/L if you can.**



- **Often there will be more exposure from air, and an air treatment system will give you more reduction. But not always, so it's important to test both air and water.**

PFAS

Human-made chemicals used in a wide variety of commercial and industrial applications.

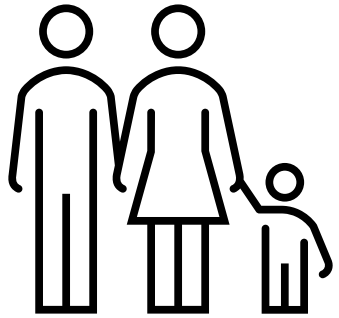
PFAS stands for per- and polyfluoroalkyl substances.

More information:

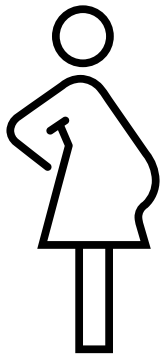
NHDES: https://www.pfas.des.nh.gov/

CDC/ATSDR: https://www.atsdr.cdc.gov/pfas/index.html

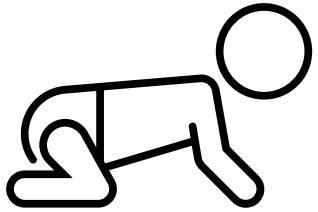
>11-18 ppt (ng/L)
PFOA
PFOS
PFHxS
PFNA



↑ risks for certain cancers (e.g., kidney and testicular)
↑ cholesterol levels
↑ liver enzyme levels
↑↓ immune system function
↑↓ endocrine (hormone) function



↑ risk of pre-eclampsia or pregnancy-induced hypertension
↓ infant birth weight



↑↓ immune system function
↑↓ lipid (fat) metabolism

MtBE

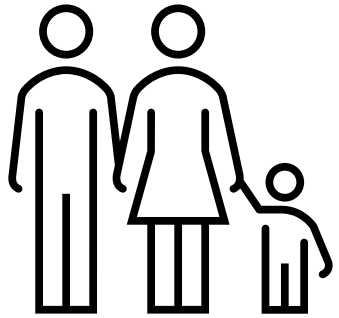
Human-made chemicals used historically to increase octane rating of gasoline. Banned in NH in 2007.

More information:

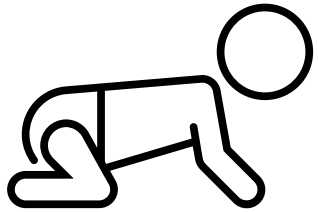
NHDES:
https://www.pfas.des.nh.gov/

CDC/ATSDR:
https://www.atsdr.cdc.gov/pfas/index.html

If present in water



- ↑ liver related problems
- ↑ abnormal growth of lymph nodes
- ↑ damage to male reproductive organs
- ↑ stomach irritation
- ↓ activity levels
- ↓ coordination levels



Unknown if children are more sensitive to MtBE than adults

Inhalation is another exposure route of concern for MtBE

Sources we use to understand risk:

- Agency for Toxic Substances and Disease Registry (ATSDR)
  https://www.atsdr.cdc.gov/toxprofiledocs/index.html
- United States Centers for Disease Control and Prevention (CDC)
  https://www.cdc.gov/nceh/
- United States Environmental Protection Agency (EPA)
  https://www.epa.gov/wqc
- NHDES Publications:
  https://www.des.nh.gov/resource-center/publications
- Peer-reviewed literature
- Technical expertise among staff: Risk Assessors, Toxicologists, etc.

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Testing and Occurrence

Using PFAS as an example

Water Quality Testing

MtBE Drinking Water Quality Program

- MtBE Settlement Funds for VOC Samples
- ECF / ARPA Funds for PFAS Samples
- DWGTF for Other Samples

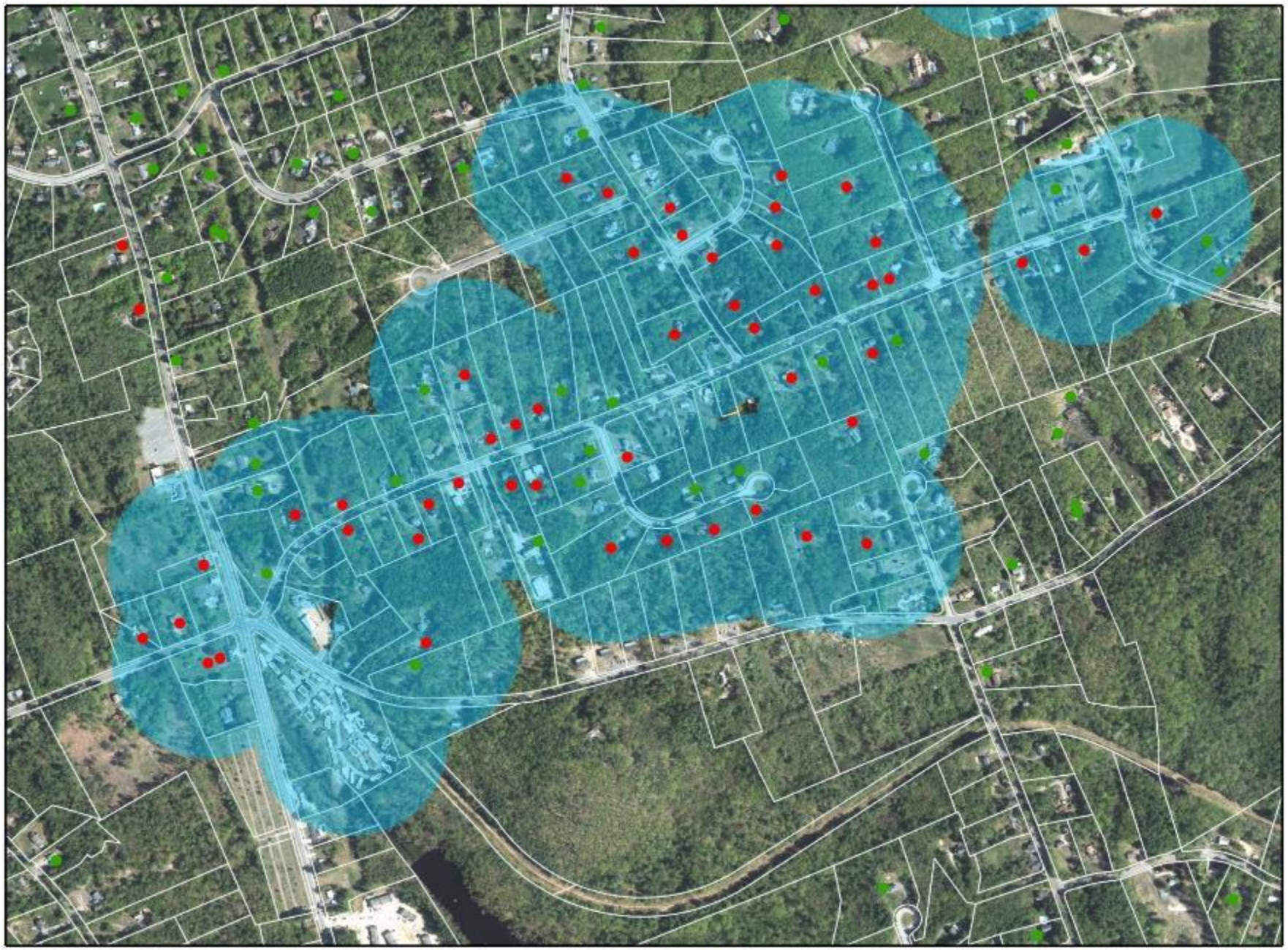
Sampling for PFAS began in 2016

- 2016 – 2018: Targeted known sites
- 2018 – 2019: Targeted potential sites
- 2019 – 2021: Exploratory work
- 2021 – 2023: Switch from sites to areas

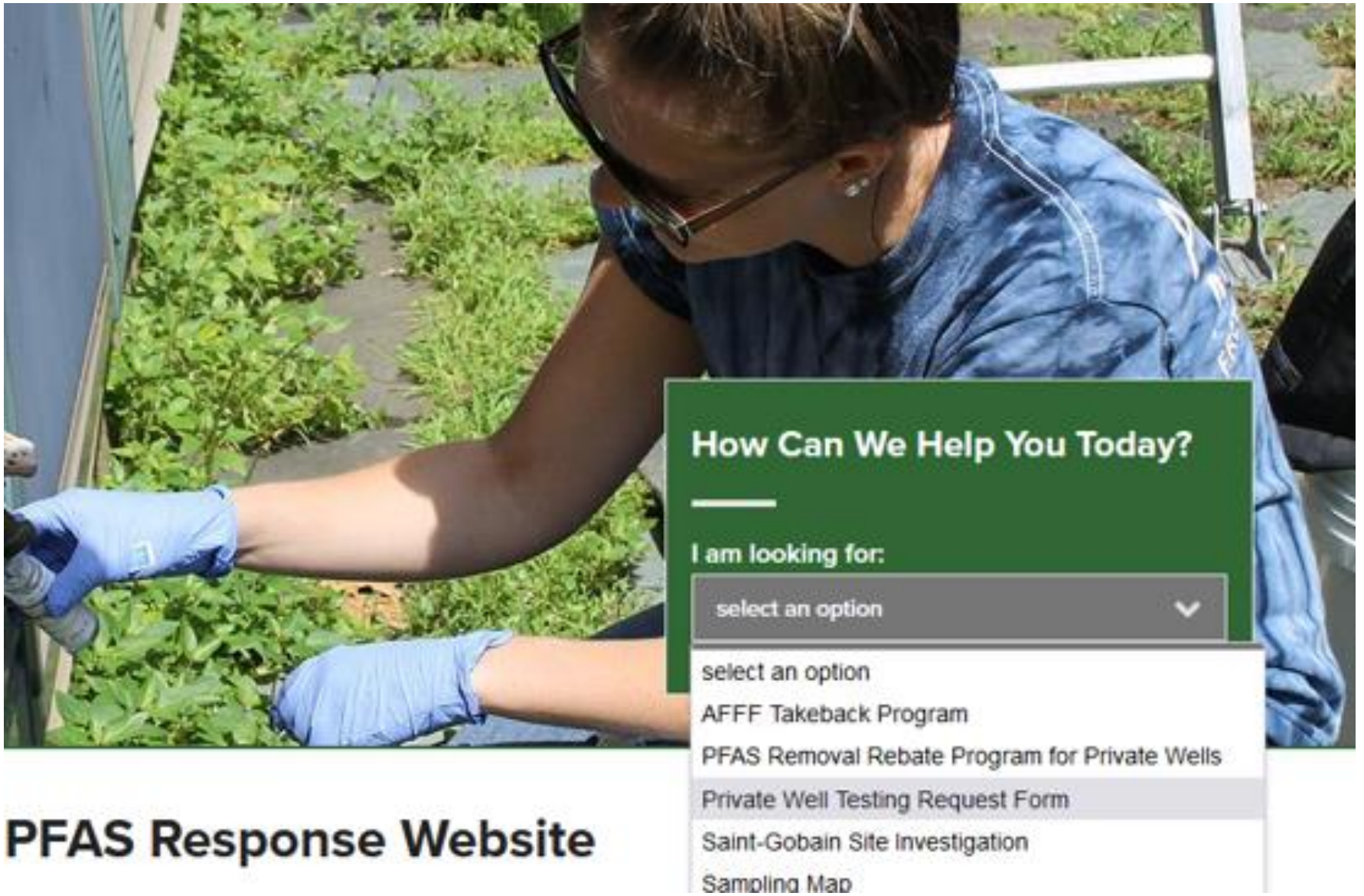
PFAS Notifications

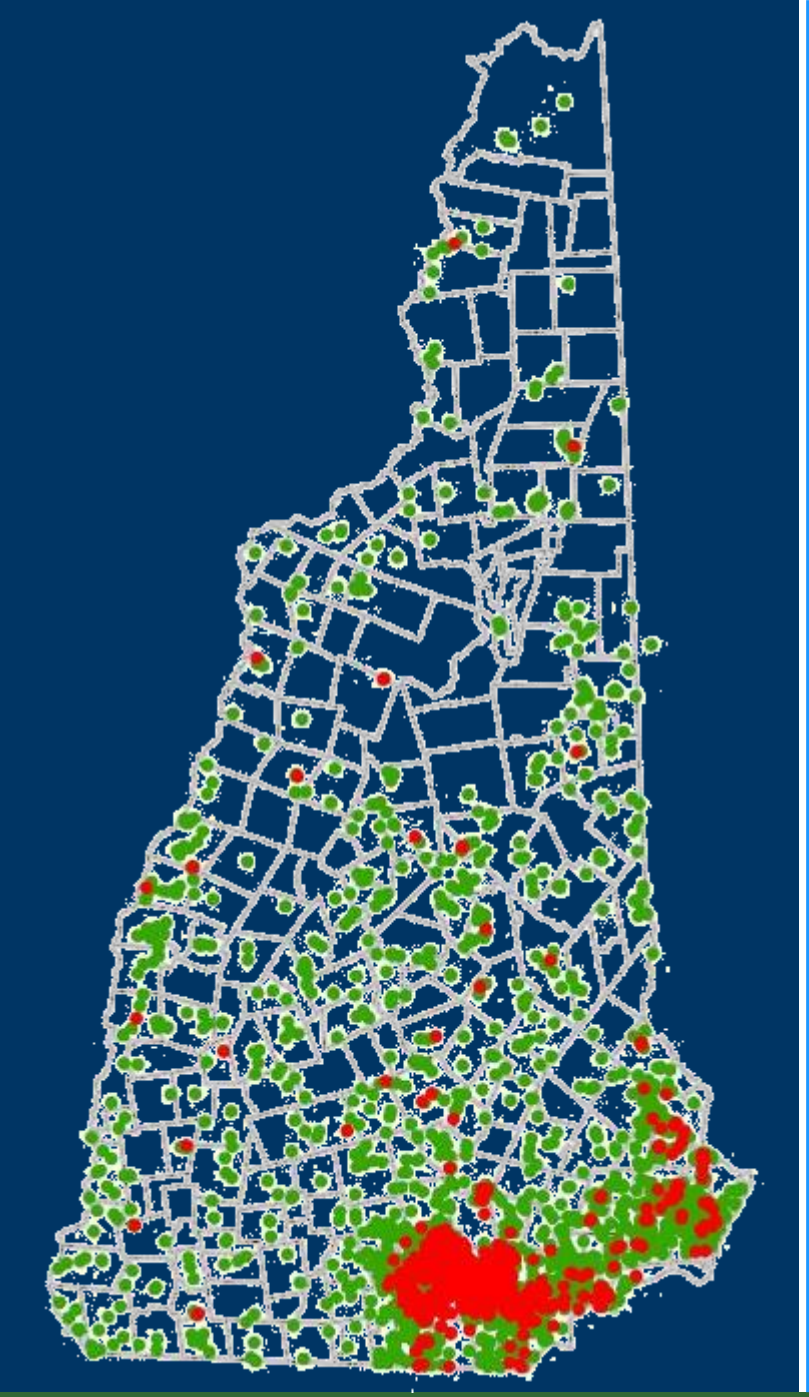
485-C:14-b Notification of Groundwater Contamination Required

- Upon the discovery of GW contamination
- DES shall provide notification to:
  - Property owners within 500’
  - Public water suppliers
  - The local health officer
- Notification shall be made in writing within 45 days of discovery



https://www.pfas.des.nh.gov/



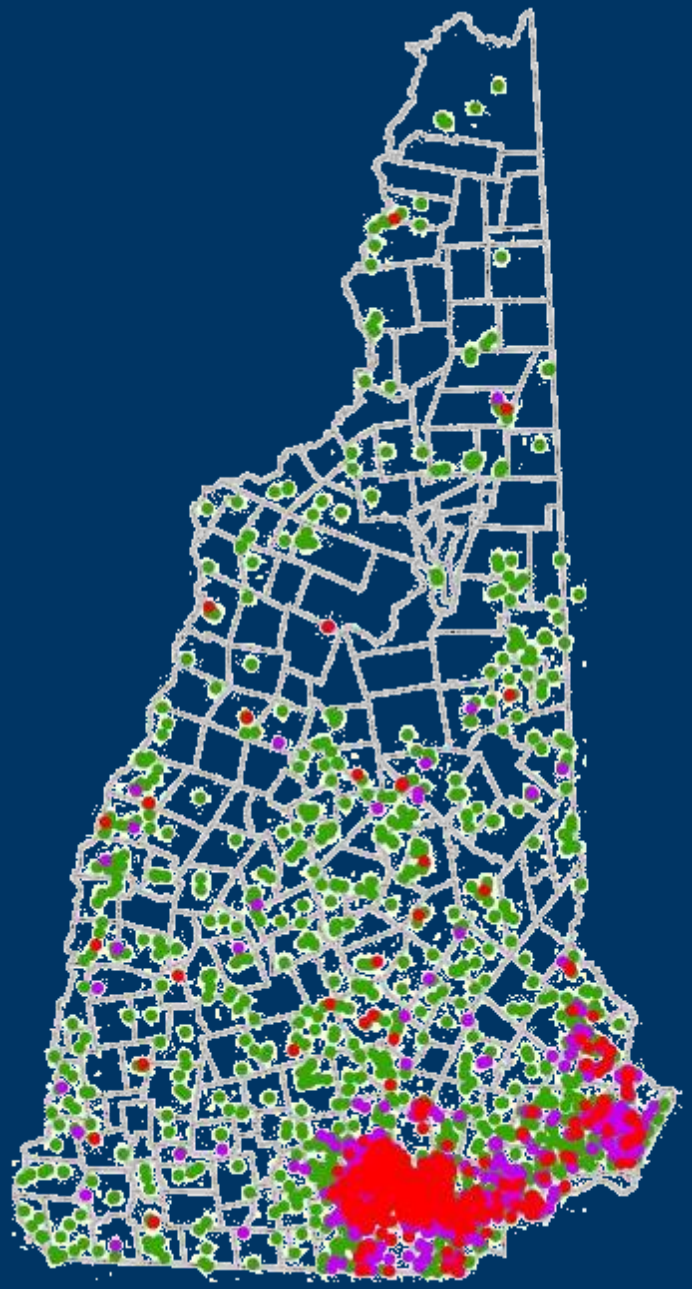


N= 14,701

4,546 samples exceeded one or more NH MCLs

- 4,328 PFOA > 12 ppt
- 551 PFOS > 15 ppt
- 296 PFHXS > 18 ppt
- 42 PFNA > 11 ppt

11,281 had detections



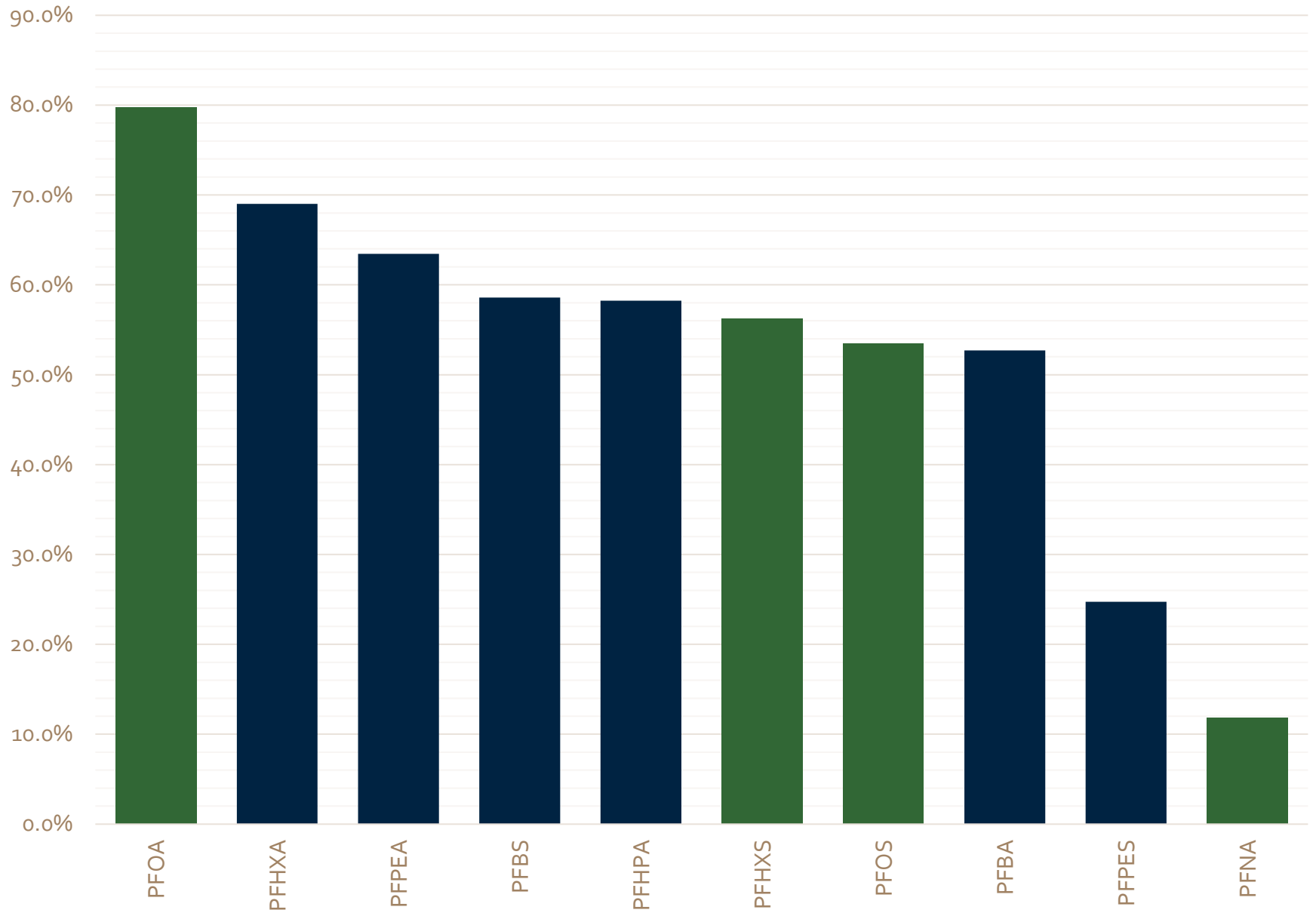
N = 14,701

8,743 exceed at least one EPA proposed standard

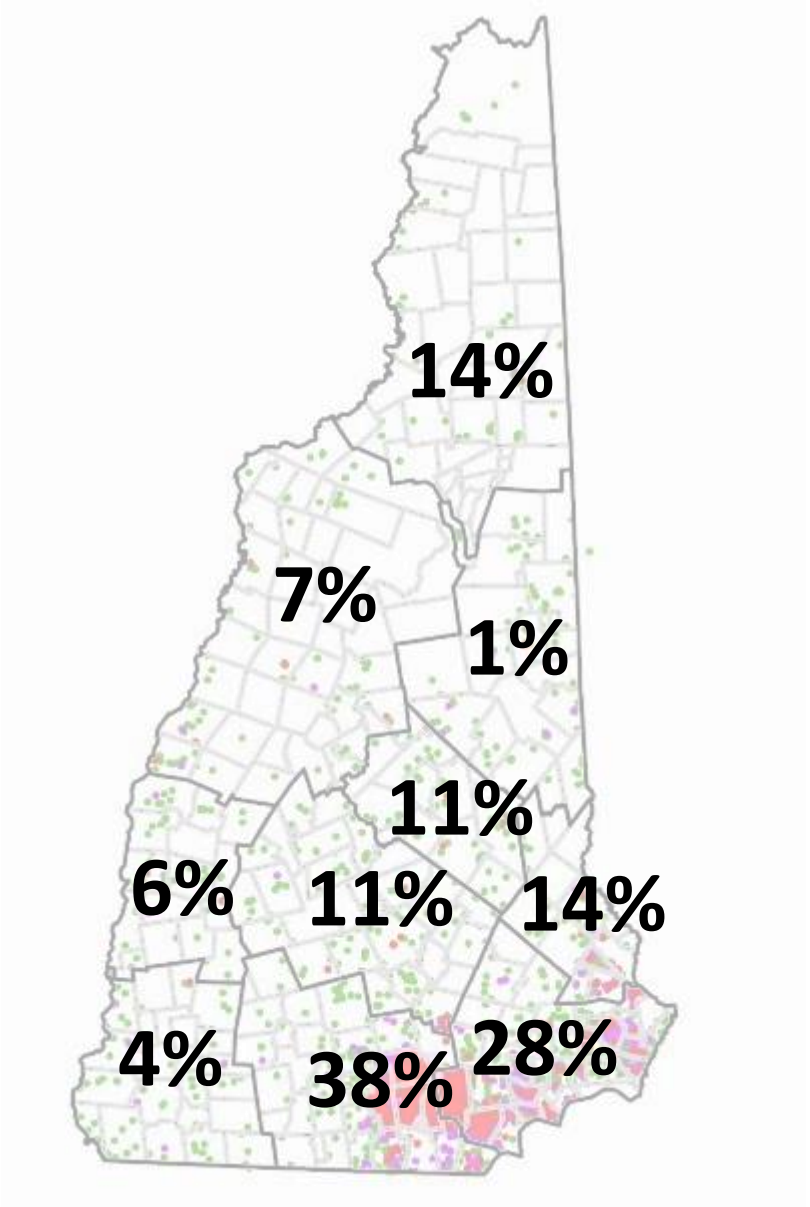
- 8,530 PFOA > 4 ppt
- 2,591 PFOS > 4 ppt
- 595 > HI 1.0

$$\text{Hazard Index (HI)} = \frac{\text{GENX}}{10} + \frac{\text{PFBS}}{2000} + \frac{\text{PFNA}}{10} + \frac{\text{PFHXS}}{9}$$

PFAS RATE OF DETECTION BY COMPOUND



COUNTY	SAMPLES	>AGQS	PERCENT
BELKNAP	114	12	11%
CARROLL	117	1	1%
CHESHIRE	118	5	4%
COOS	80	11	14%
GRAFTON	165	12	7%
HILLSBOROUGH	7227	2723	38%
MERRIMACK	429	47	11%
ROCKINGHAM	6015	1680	28%
STRAFFORD	353	50	14%
SULLIVAN	82	5	6%
TOTAL	**14701**	**4546**	**31%**



Sampling Priorities

- Properties receiving notifications
- Properties not receiving notifications located in communities with a high rate of exceedance
- Direct mailings to properties in high-risk areas that received notifications that have not requested to be sampled
- Screening properties in other communities while en route to sampling a notified property

Key Takeaways from PFAS-focused Sampling

- New PFAS exceedances are detected daily
- Almost all wells have a detection of at least one of the four PFAS compounds that NH regulates
- We find PFAS more often than other human-made contaminants
- PFAS impacts are widely dispersed with elevated levels in areas with no discernible responsible party- but the true impact is unknown because sampling is limited

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Resources

Help is available

NH Environmental Health Guide (NH-EHG): https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/nh-ehg.pdf

NHDES Private Wells website: https://www.des.nh.gov/water/drinking-water/private-wells

NHDES Private Well Testing Recommendations: https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/labs-private-wells.pdf

NHDES PFAS Response (Includes options to request testing and information about the PFAS Rebate Program): https://www.pfas.des.nh.gov/

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