



**Northeastern University**  
*Social Science Environmental Health  
Research Institute*

# The Social and Scientific Discovery of a Class of Emerging Contaminants: Per- and Poly-fluorinated Chemicals

Phil Brown, Northeastern University

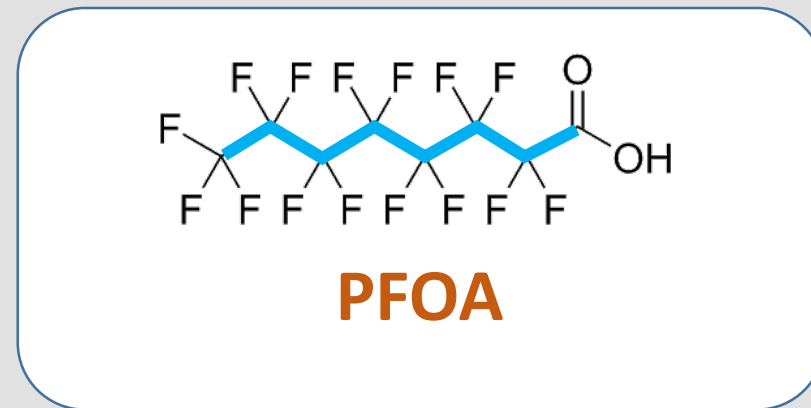
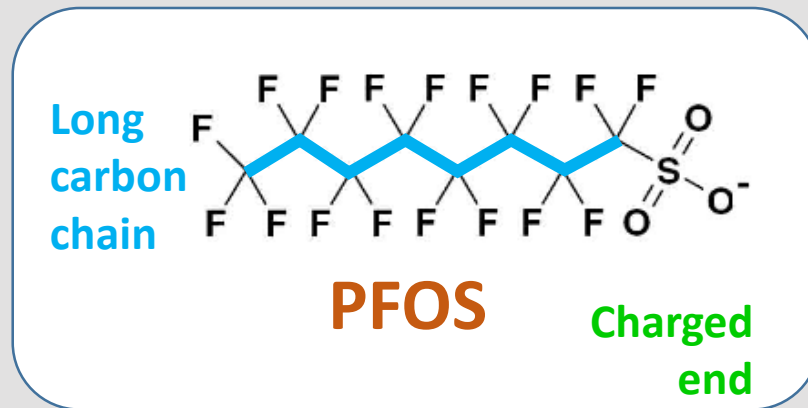
Alissa Cordner, Whitman College

Funding: NIEHS (1R01ES017514-01A1, 1 R25 GM109447-01, 1 T32 ES023769-01, 1R13 ES028097-01), NSF (SES-0924241 and SES-1456897), EPA STAR FP-917119

# Per- and Poly-Fluorinated chemicals (PFASs)

Also known as:

- Perfluorinated chemicals (PFCs)
- Highly fluorinated chemicals



- Common characteristics of PFASs
  - Persistence
  - Long-chains are bioaccumulative
  - Repel oil and water

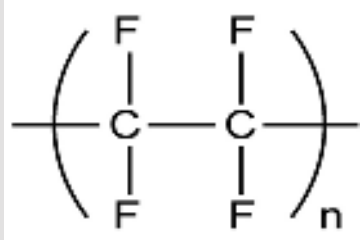
Slide: Dr. Laurel Schaider,  
Silent Spring Institute

# PFAS Uses

- Widely used in industrial and manufacturing processes
- Non-stick cookware
- Waterproof clothing
- Mattresses, carpeting
- Grease-proof food packaging
- Dental floss
- Cosmetics
- Firefighting foams



PFASs are all human-made and have been around for a long time



**1938** **PFTE** (teflon) is discovered



**1951** DuPont begins using **PFOA** in teflon production in West Virginia



**1956** 3M begins selling Scotchgard (**PFOS**)

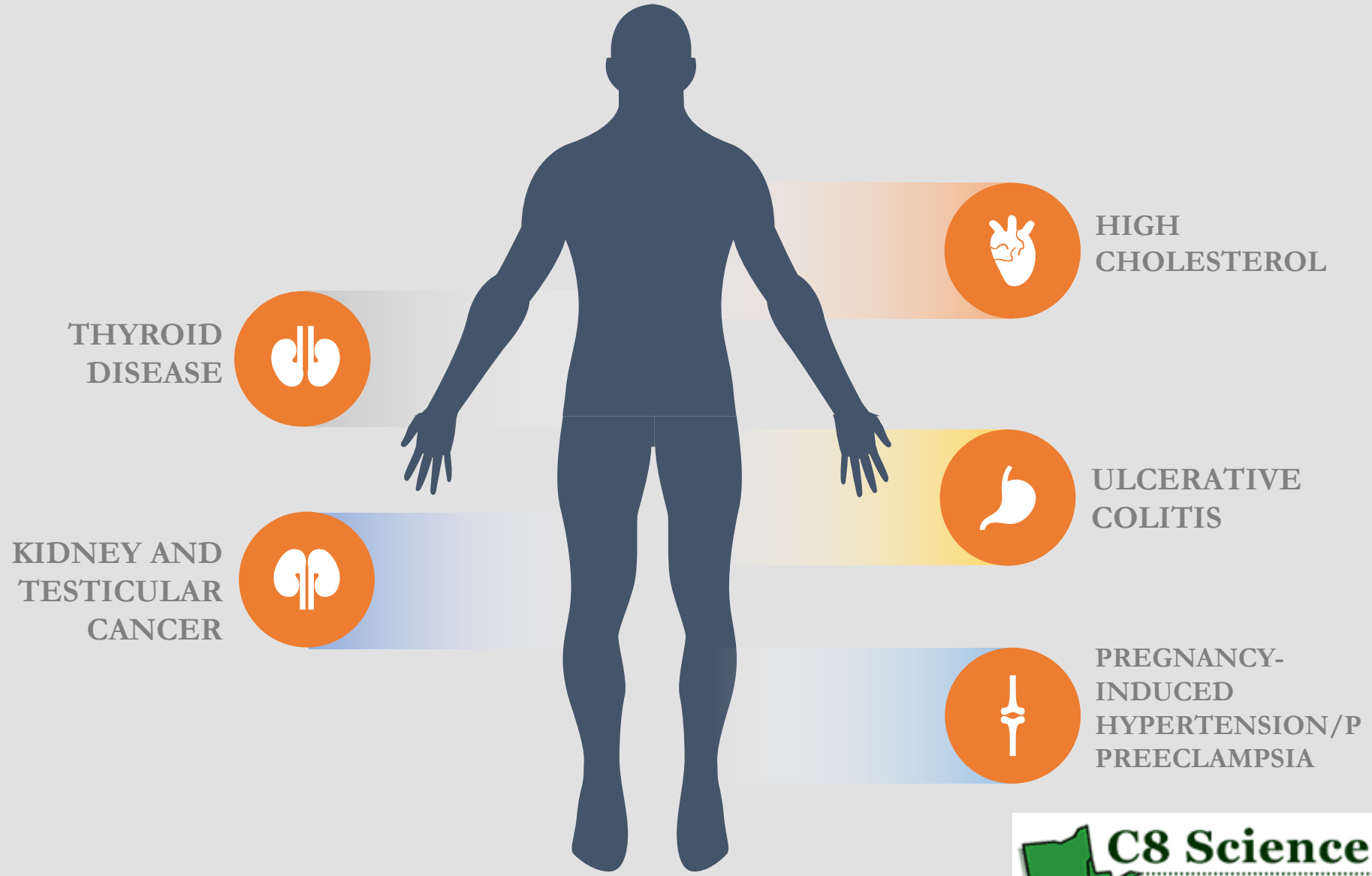


**1967** FDA approves Zonyl Food packaging (**PFOA**)

# Decades of Industry Research and Secrecy

- 1961 – DuPont finds evidence of liver toxicity in animals
- 1962 – DuPont finds evidence of toxicity in humans
- 1976 – 3M finds PFOA in workers' blood
- 1981 – 3M finds PFOA causes rare birth defects in rats
- 1981 – DuPont workers give birth to infants with similar rare birth defects; DuPont removes all women workers from Teflon unit but doesn't say why and doesn't share this data with EPA
- 1984 – DuPont finds PFOA in community drinking water
- 1987 – 3M looks for uncontaminated blood samples to compare to their workers and finds widespread global contamination

# Documented Health Effects: C8 Health Panel

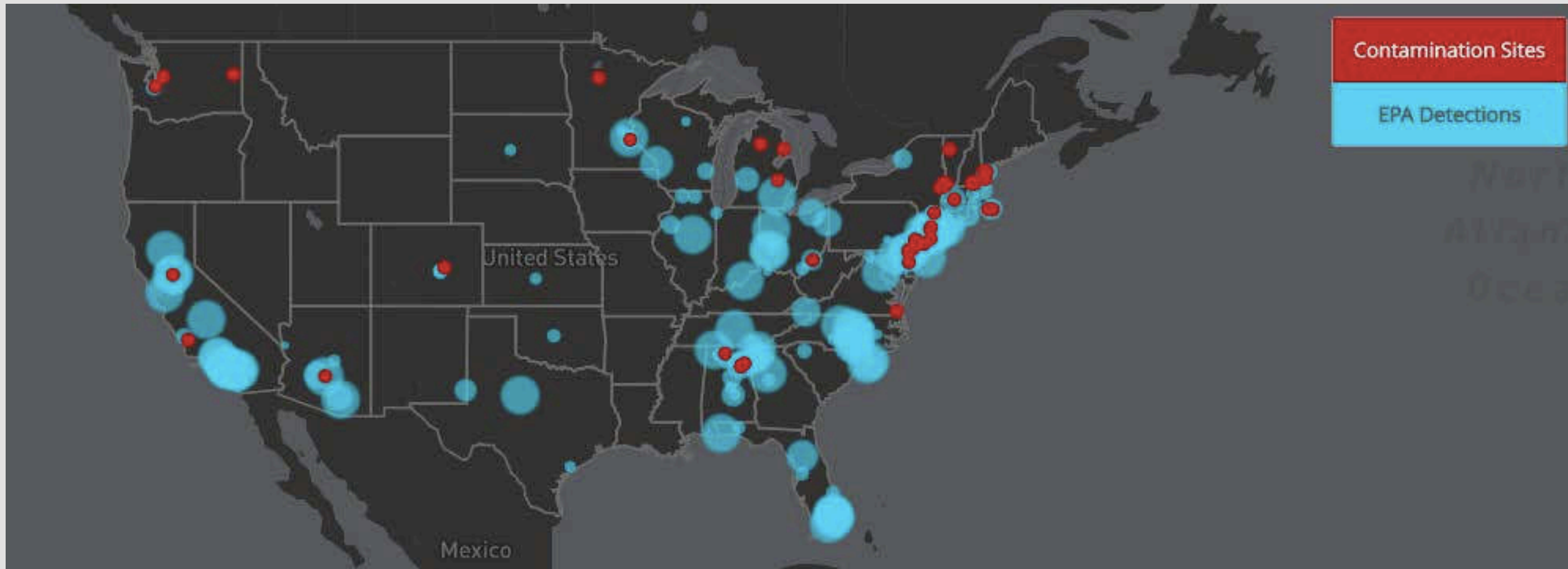


# Documented Health Effects: Other Studies

- International Agency for Research on Cancer
  - Possibly carcinogenic in humans
- Other research
  - Hormonal changes
  - Liver malfunction
  - Obesity
  - Immunotoxicity, incl. interference with child vaccine response
  - Lower birth weight and size
  - Delayed puberty, decreased fertility, early menopause
  - Reduced testosterone
  - Prostate cancer
  - Ovarian cancer



# Toxic Fluorinated Chemicals in Tap Water and at Industrial or Military Sites



Social Science Environmental Health Research Institute and Environmental Working Group, 2017:  
<http://sorenrundquist.com/PFAS>



# Widespread Public Exposure

## **Polyfluoroalkyl Chemicals in the U.S. Population: Data from the National Health and Nutrition Examination Survey (NHANES) 2003–2004 and Comparisons with NHANES 1999–2000**

*Antonia M. Calafat, Lee-Yang Wong, Zsuzsanna Kuklennyik, John A. Reidy, and Larry L. Needham*

Division of Laboratory Sciences, National Center for Environmental Health, Centers for Disease Control and Prevention, Atlanta, Georgia, USA

VOLUME 115 | NUMBER 11 | November 2007 • Environmental Health Perspectives

### **Discussion**

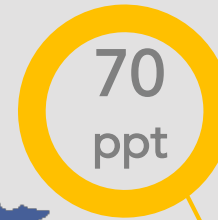
We detected PFOS, PFOA, PFHxS, and PFNA in > 98% of persons in this representative sample of the civilian, noninstitutionalized U.S. population,  $\geq$  12 years of age. These

# State-Level Drinking Water Guidelines – PFOA and PFOS

**Note: DuPont and 3M influence**

- PFOA alone has been detected in 94 public water systems in 27 states

**Minnesota:**  
2017 reduced to 35 ppt  
PFOA and 27 ppt PFOS

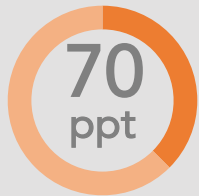


**New York**



**Vermont**

**EPA Health Advisory**



Level



**New Jersey**



**West Virginia:**  
2017 reduced to 70  
ppt (EPA level)

**News break -- Nov. 2017: New Jersey instituted 14 ppt MCL, and considering 13 ppt PFNA – *first regulatory level***

# Long-chain to Short-chain PFASs

- Concerns about toxicity, bioaccumulation, and persistence led industry to phase-out production of long-chain PFASs by 2015 (EPA PFOA Stewardship Program)
- Replacement compounds: Short-chain PFASs
  - PFHxA, PFBS, GenX, short-chain fluorotelomer, 6:2 FTOH, etc.
  - Likely less bioaccumulative...
  - ... But significant exposure and toxicity concerns, and significant data gaps

# Whack-a-Mole approach to chemical policy



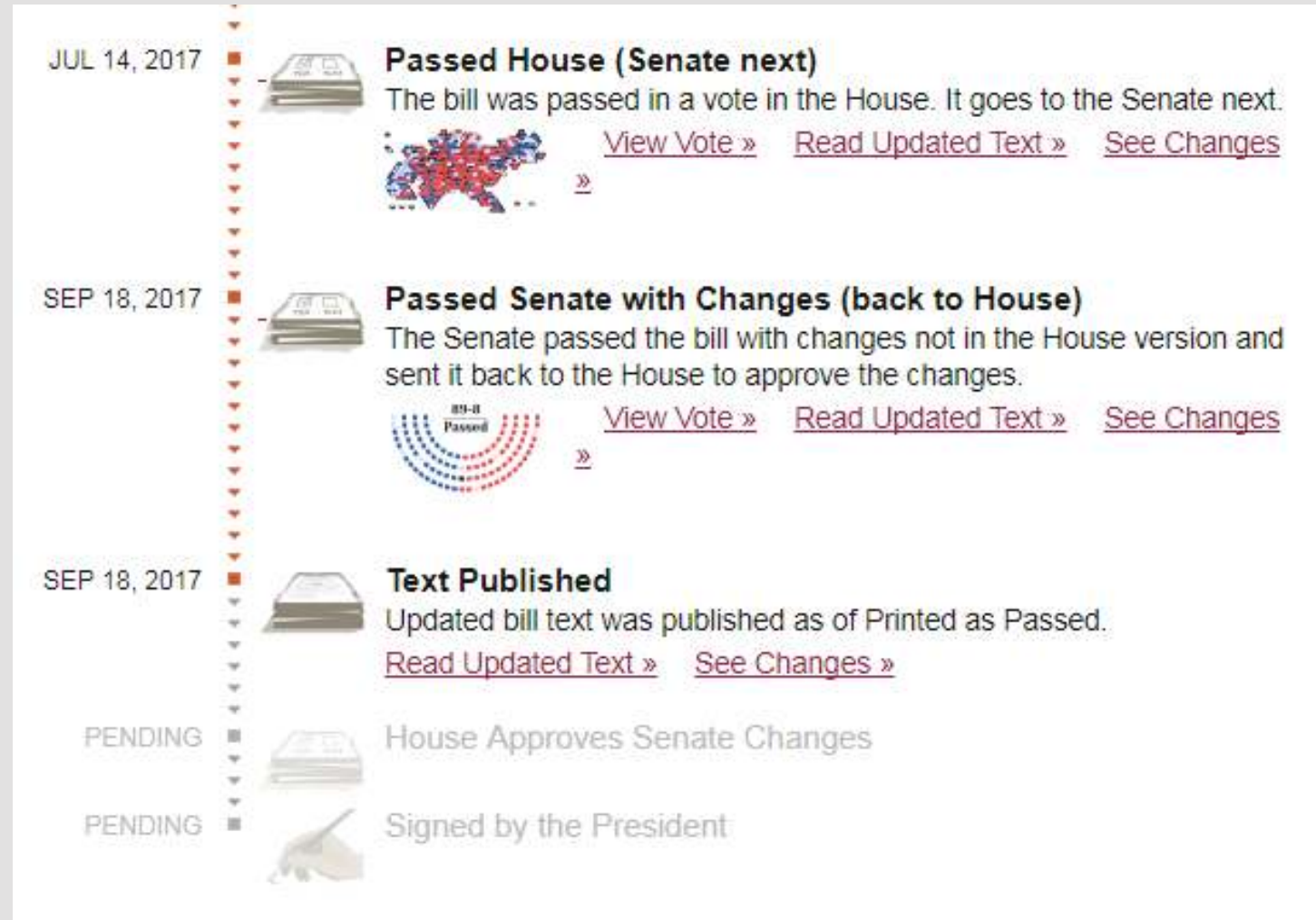
# Chemours and GenX



# Potential National Health Study – Part of National Defense Authorization Act 2018

“The committee recommends a provision that would direct the Secretary of Health and Human Services in consultation with the Department of Defense to **conduct a human health study through the Centers for Disease Control and Prevention** to assess the human health effects of per- and polyfluoroalkyl substances in sources of drinking water.”

Possible \$10 million in funding



# Our Work

- Social Science Environmental Health Research Institute (SSEHRI) at Northeastern University
- [www.pfasproject.org](http://www.pfasproject.org)
- Qualitative Research:
  - 70+ In-depth interviews
  - Multi-sited observation
  - Scientific literature review
  - Regulatory document analysis



# Our Work

- Contamination Site Tracker: <https://pfasproject.com/pfas-contamination-site-tracker/>
  - Currently 81 sites in the U.S. and international

A	B	C	D	E	F	G
Please credit the Social Science Environmental Health Research Institute (SSEHRI) when using this document						
<i>Country</i>	<i>State/Province</i>	<i>Contamination Site</i>	<i>Date of Discovery</i>	<i>Source of Discovery</i>	<i>Contamination Details</i>	<i>PFOA (ppt)</i>
USA	Alabama	Decatur	PFOA discovered in all samples collected 2005-2006. EPA received analytical results in 2008	Water samples taken by the West Morgan-East Lawrence Water and Sewer Authority.	Above 70 ppt at Gadsden Water Works and Sewer Board, Centre Water and Sewer Board, V.A.W., Water Systems Inc., West Lawrence Water Co-op, Northeast Alabama Water, District, Rainbow City Utilities Board, Southside Water Works and Sewer Board. Don Sims, manager of Morgan East Lawrence Water and Sewer Authority, claims that PFOA/PFOS levels reached 300 ppt in years preceding new EPA PHA (12/20/16).	Break down of numbers unavailable.



# Academic Work

## Can Chemical Class Approaches Replace Chemical-by-Chemical Strategies? Lessons from Recent U.S. FDA Regulatory Action on Per-And Polyfluoroalkyl Substances

Alissa Cordner\*

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## Papers in development

- Social and scientific discovery
- Litigation and environmental justice
- Retailer actions
- Social movements and activists

# June 2017 Conference: Highly Fluorinated Compounds – Social and Scientific Discovery, Northeastern University

- **Support:** National Institute of Environmental Health Sciences, SSEHRI, Northeastern's Humanities Center, Northeastern's PROTECT Superfund Research Program, Toxics Action Center, and Testing for Pease
- **Steering Committee members** from Northeastern University, Whitman College, Harvard University, Silent Spring Institute, Testing for Pease, and Toxics Action Center



# Highly Fluorinated Compounds – Social and Scientific Discovery, Northeastern University

- Lead addresses by Dr. Linda Birnbaum (NIEHS), Rob Billott (Taft Law), and Ken Cook (Environmental Working Group)
- 2 days of presentations, with focus on science, regulation, community organizing, litigation, and interactive workshops



# Highly Fluorinated Compounds – Social and Scientific Discovery, Northeastern University

- ~140 attendees, including:
  - Advocates and community leaders from over a dozen communities
  - Representatives of environmental and health nonprofits
  - Regulators from the EPA, NIEHS, CDC, and city, state, and municipal government offices
  - Academics from over a dozen institutions
  - Industry representatives
  - Lawyers
  - Journalists and filmmakers
  - Physicians and health care practitioners



# Impact of conference

- Building networks and sparking new collaborations
- Increased media and regulatory attention to short-chain PFASs



The Intercept

Illustration: The Intercept

## NEW TEFLON TOXIN FOUND IN NORTH CAROLINA DRINKING WATER

Sharon Lerner  
June 17 2017, 5:16 a.m.

**The Teflon Toxin**  
**Part 12**

A toxic chemical used to make Teflon has been detected in the drinking water in Wilmington, North Carolina, and in surface waters in Ohio...

The screenshot shows a news article from 'The Intercept'. The title is 'NEW TEFLON TOXIN FOUND IN NORTH CAROLINA DRINKING WATER'. The author is Sharon Lerner, and the article was published on June 17, 2017, at 5:16 a.m. The article is part of a series titled 'The Teflon Toxin Part 12'. The first sentence of the article reads: 'A toxic chemical used to make Teflon has been detected in the drinking water in Wilmington, North Carolina, and in surface waters in Ohio...'. There are social media sharing icons for Facebook, Twitter, Email, and a comment icon showing 89 comments.

- Plans for mini-conference after Toxics Action Center Conference in Spring of 2018, and 2<sup>nd</sup> National PFAS Conference in June of 2019

# PFAS Project Team – [www.pfasproject.com](http://www.pfasproject.com)

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- Jennifer Ohayon – Northeastern/Silent Spring Institute

## Graduate Students

- Lauren Richter – Northeastern
- Elicia Cousins – Northeastern
- Tibrine De Fonseca – Northeastern
- Marina Atlas – Northeastern

## Undergraduates

- Yvette Niwa – Northeastern
- Chelsea Canedy – Northeastern
- Elizabeth Boxer – Northeastern
- Sokona Diallo – Northeastern
- Nick Chaves – Northeastern
- Clare Malone – Northeastern
- Walker Bruhn – Whitman College

## Collaborators

- Laurel Schaidler – Silent Spring Institute
- Ruthann Rudel – Silent Spring Institute
- Bill Walker – Environmental Working Group
- Courtney Carignan – Michigan State University



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