



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

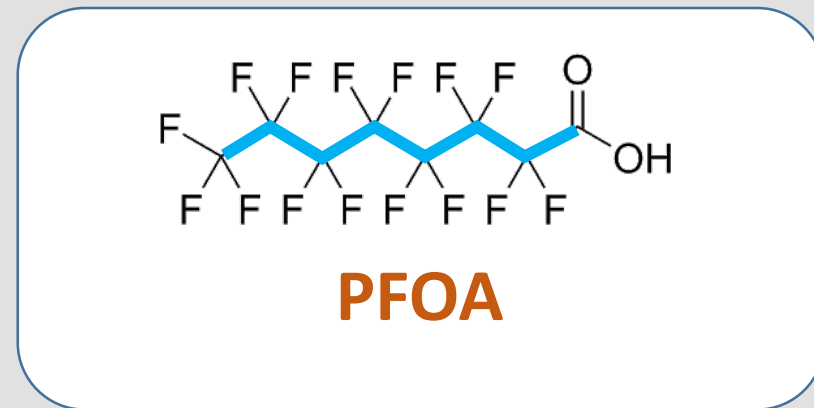
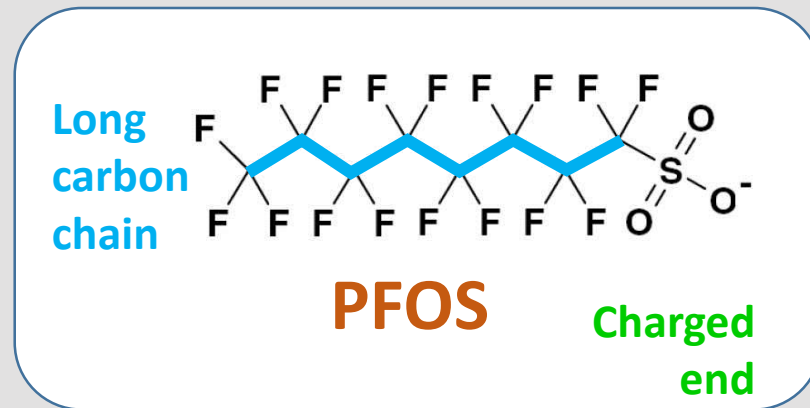
Alissa Cordner, Whitman College

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

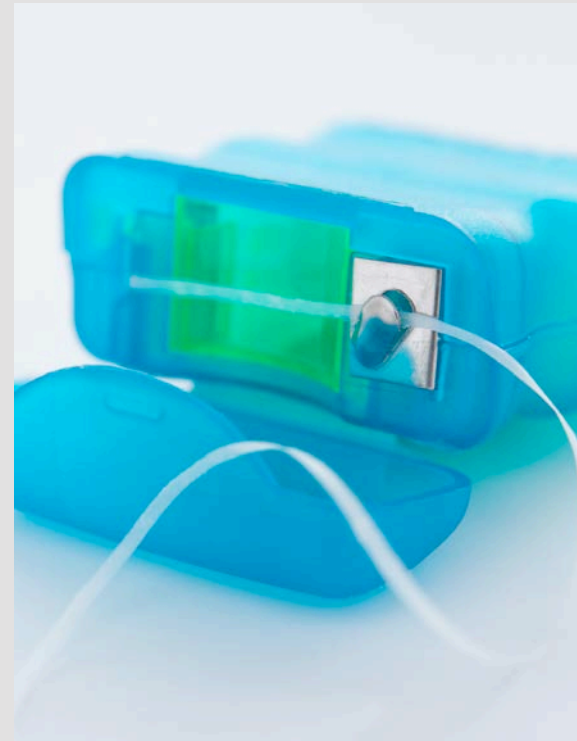


- Common characteristics of PFASs
 - Persistence
 - Long-chains are bioaccumulative
 - Repel oil and water

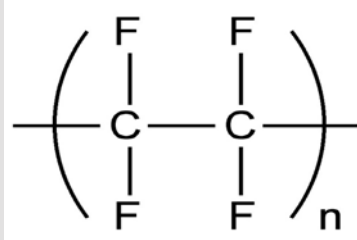
Slide: Dr. Laurel Schaider,
Silent Spring Institute

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

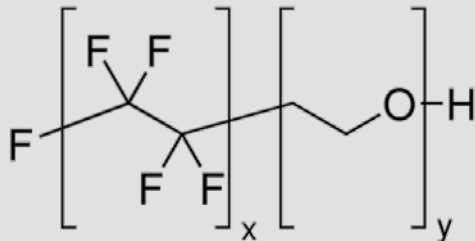
DuPont begins using PFOA in teflon production in West Virginia



For Leather

1956

3M begins selling Scotchgard (PFOS)



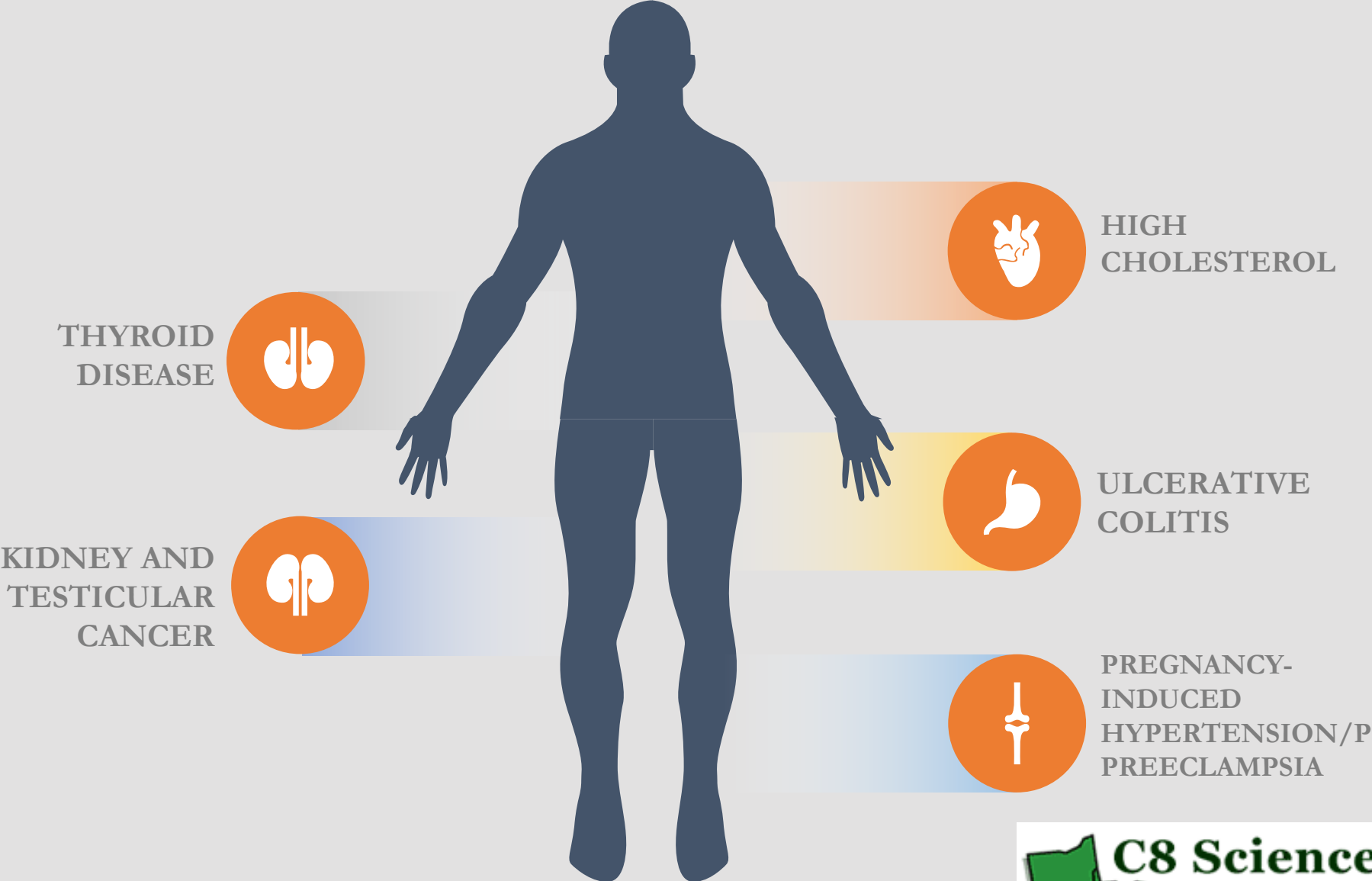
1967

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

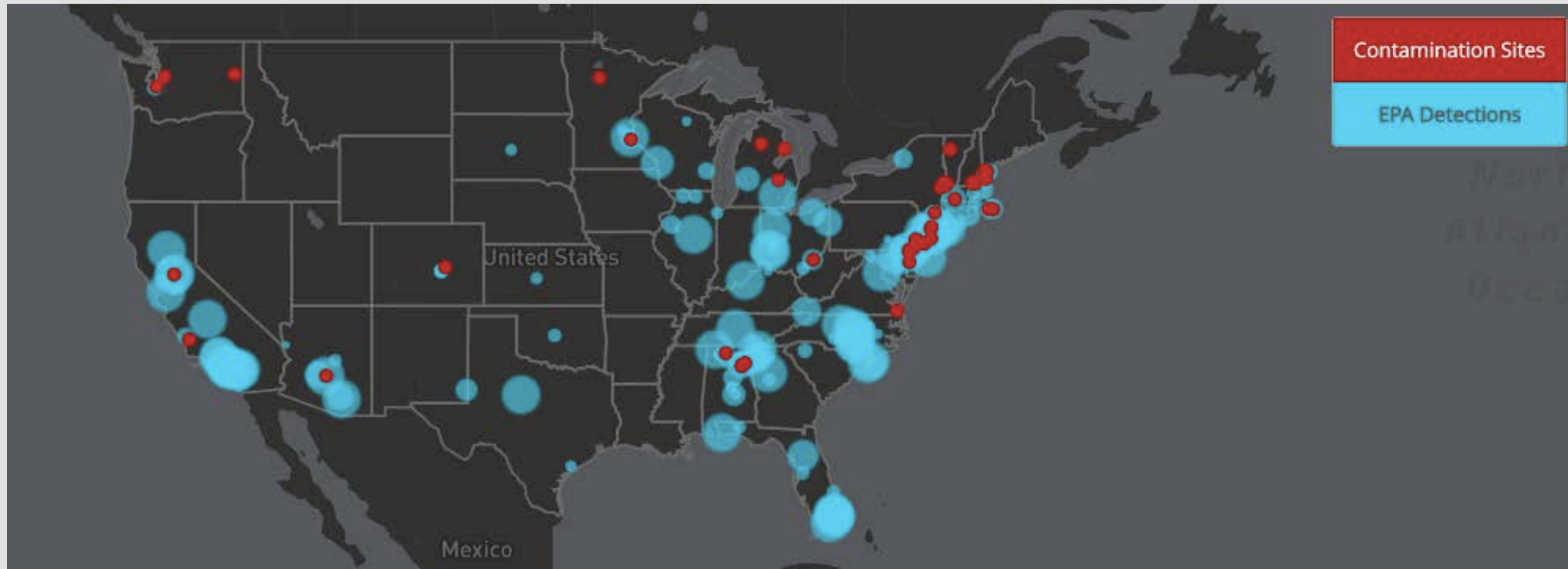


Documented Health Effects: Other Studies

- 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

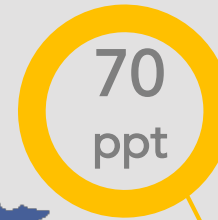
We detected PFOS, PFOA, PFHxS, and PFNA in > 98% of persons in this representative sample of the civilian, noninstitutionalized U.S. population, \geq 12 years of age. These

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

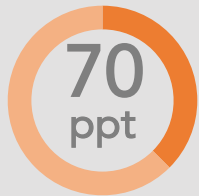


New Jersey



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

EPA Health Advisory



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



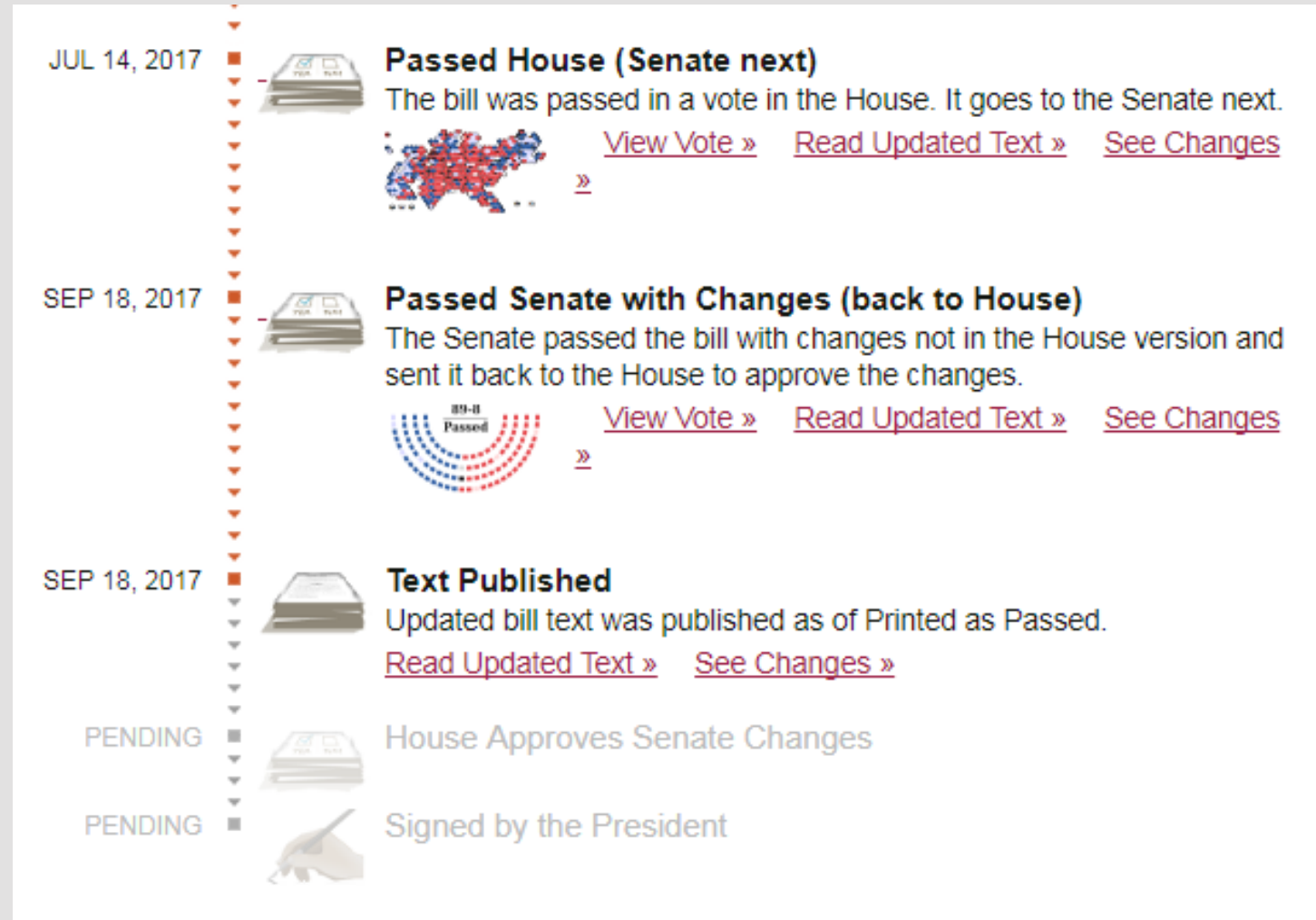
Chemours and GenX



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
- 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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Lauren Richter

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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 social media-style layout for a news article. On the left, there are icons for Facebook, Twitter, email, and a comment bubble with the number 89. The article title is in large, bold, black letters. Below the title is the author's name and a timestamp. The main text of the article is partially visible at the bottom.

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

PFAS Project Team – www.pfasproject.com

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Postdocs

- Vanessa De La Rosa – Northeastern/Silent Spring Institute
- 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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