

CAN ENVIRONMENTAL LAW SOLVE THE “FOREVER
CHEMICAL” PROBLEM?

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Although federal environmental law purports to provide the public with comprehensive protection against chemical risks, the U.S. chemical industry is characterized by self-regulation. This self-regulation is exemplified by the dangers posed by per- and polyfluoroalkyl substances (“PFAS”)—broad classes of persistent toxic substances that have now entered nearly every American’s bloodstream and hundreds of public drinking water systems. Despite data linking exposure to these “forever chemicals” to cancer, infertility, and a host of other public health harms, environmental law has failed to safeguard the American people from PFAS’ toxic legacy. How did this occur? And what should be done to address the growing PFAS crisis?

This Article answers these questions in four parts. We first describe and analyze the PFAS toxicity crisis and the ways that it disrupts our collective confidence in environmental law. After all, PFAS’ harm was exposed not by the Environmental Protection Agency (“EPA”) but through state common law tort litigation. Second, we analyze the United States’s current regulatory framework governing toxic substances. This framework relies on what we call a “toxicity honor system.” Too often, this honor system lacks any sense of honor. Third, we address the U.S. Department of Defense’s (“DoD”) heavy reliance on PFAS in military installations and the unique regulatory challenges—and opportunities—this

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presents. While the military is afforded deference in national security matters, the military has also sought regulatory consistency and a single, enforceable drinking water standard. We conclude by offering a regulatory roadmap for PFAS regulation. Our proposal eschews the reactive toxicity honor system in favor of a precautionary approach to environmental protection.

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INTRODUCTION

*“If we are going to live so intimately with these chemicals—eating and drinking them, taking them into the very marrow of our bones—we had better know something about their nature and their power.”*¹

Spurred in part by Rachel Carson’s dire warning about pesticides in *Silent Spring*, Congress passed comprehensive legislation to safeguard the nation’s drinking water and regulate toxic substances in the 1960s and 1970s.² These laws—including the Clean Air Act, Clean Water Act, Safe Drinking Water Act (“SDWA”), and Toxic Substances Control Act (“TSCA”)—once held the promise of comprehensively protecting public health and the environment from toxic chemical exposure.³ Today it’s clear that promise has fallen short. This is demonstrated by environmental law’s failure to address per- and polyfluoroalkyl substances (“PFAS”). PFAS are chemical substances that consist of various combinations of highly stable bonds of fluorine atoms that do not break down easily in the environment.⁴ They are truly “forever chemicals,” now ubiquitous in American households, drinking water, and our collective bloodstreams.⁵

1. RACHEL CARSON, *SILENT SPRING* 17 (First Mariner Books ed. 2002). This highly influential book was first published in 1962, sparking an environmental renaissance that awakened the nation to the dangers presented by the unregulated use of Dichlorodiphenyltrichloroethane (“DDT”) and other pesticides. *See id.*

2. *See* RICHARD J. LAZARUS, *THE MAKING OF ENVIRONMENTAL LAW* 47–97 (2004) (addressing the rise of federal environmental law in the 1960s and 1970s).

3. *See* Richard J. Lazarus, *The Greening of America and the Graying of United States Environmental Law: Reflections on Environmental Law’s First Three Decades in the United States*, 20 VA. ENV’T L.J. 75, 76–79 (2001) (detailing the “remarkably aspirational” first generation of environmental laws and regulations enacted during the 1970s).

4. *Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS)*, NAT’L INST. OF ENV’T HEALTH SCIS., <https://www.niehs.nih.gov/health/topics/agents/pfc/index.cfm> (last visited Feb. 2, 2022). We refer to the generic term “PFAS” throughout the Article to represent thousands of chemical variants of per- and polyfluoroalkyl substances.

5. *See* Samuel Boden, Comment, *Presumptive Innocence v. the Precautionary Principle: The Story of PFAS Regulation in the United States*, 44 ENVIRONS 37, 38–39 (2020). PFAS are not just forever chemicals; they can also be fairly described as “everywhere chemicals.” They have even been found on the top of Mount Everest. Murray Carpenter, *Forever Chemicals, Other Pollutants Found Around the Summit of Everest*, WASH. POST (Apr. 17, 2021, 9:30 AM),

Shockingly, most of what we know about PFAS toxicity stems from common law tort litigation initiated well before the plaintiffs even knew what PFAS were. Due to the work of a single, indefatigable tort lawyer, Rob Bilott, lawsuits were brought against DuPont, a leading manufacturer of PFAS-laden goods.⁶ Court-ordered discovery showcased the harm that these chemicals present.⁷ While Congress and the public are now well aware of the dangers posed by PFAS, thousands of PFAS continue to be produced to this day, largely outside the reach of environmental law and regulation.⁸

Bilott's work makes clear that our regulatory approach to PFAS—and newly developed chemicals in general—amounts to a self-reporting and self-policing “toxicity honor system.”⁹ This honor system places the onus on private companies—not the EPA or other regulatory bodies—to report the dangers posed by new chemicals.¹⁰ This is contrary to the “precautionary approach,” a core environmental principle that seeks to prevent harm from occurring in the face of scientific uncertainty.¹¹ Today, thousands of PFAS of unknown toxicity enter our streams of commerce unabated, untested, and unregulated.¹²

https://www.washingtonpost.com/science/mt-everest-pollution/2021/04/16/7b341ff0-909f-11eb-bb49-5cb2a95f4cec_story.html.

6. This remarkable story was told in a recent book. *See generally* ROBERT BILOTT, *EXPOSURE: POISONED WATER, CORPORATE GREED, AND ONE LAWYER'S TWENTY-YEAR BATTLE AGAINST DUPONT* (2019) (detailing Mr. Bilott's multi-year tort lawsuit against DuPont). Bilott's work was later made into a major motion picture, starring Mark Ruffalo and Anne Hathaway. Christy Pina, *'Dark Waters': 7 of the Film's Stars and Their Real-Life Inspirations*, HOLLYWOOD REP.: <https://www.hollywoodreporter.com/lists/true-story-dark-waters-how-accurate-are-characters-1254811/>.

7. *See* Nathaniel Rich, *The Lawyer Who Became DuPont's Worst Nightmare*, N.Y. TIMES MAG. (Jan. 6, 2016), <https://www.nytimes.com/2016/01/10/magazine/the-lawyer-who-became-duponts-worst-nightmare.html>.

8. For an overview of the growing awareness of the harms caused by PFAS and the failure to enact comprehensive federal regulations, see Boden, *supra* note 5, at 39–52.

9. BILOTT, *supra* note 6, at 95; *see also* Boden, *supra* note 5, at 41 (describing the “overwhelming effort required to overcome the presumptive innocence baked into the federal chemical regulatory system”).

10. Toxic Substances Control Act (TSCA), 15 U.S.C. § 2607(e). Under federal law, companies are required to inform the EPA if they discover that a chemical poses risks to human health or the environment. *Id.*

11. *See, e.g.*, *Ethyl Corp. v. EPA*, 541 F.2d 1, 5 (D.C. Cir. 1976) (upholding the EPA's regulation of gasoline additives based on “the inconclusive but suggestive results of numerous studies” because “regulatory action under this precautionary statute should precede, and hopefully prevent, the perceived harm”).

12. *See* Annie Sneed, *Forever Chemicals Are Widespread in U.S. Drinking Water*, SCI. AM. (Jan. 22, 2021), <https://www.scientificamerican.com/article/forever-chemicals-are-widespread-in-u-s-drinking-water/#>.

Despite recent congressional interest in addressing PFAS toxicity, the SDWA, TSCA, and other federal environmental laws have failed to adequately address the mounting PFAS crisis.¹³ Instead, a diverse group of environmentalists, plaintiffs’ attorneys, affected communities, and frustrated military leaders have called upon the EPA to shift away from the toxicity honor system, advocating for a more proactive approach to chemical regulation.¹⁴

13. See Toxic Substances Control Act (TSCA), 15 U.S.C. §§ 2601–2629 (2019) (authorizing the EPA to regulate certain chemical substances); Safe Drinking Water Act (SDWA), 42 U.S.C. § 300f (1996). The SDWA authorizes the EPA to issue health advisories for contaminants that are not yet regulated. 42 U.S.C. § 300g-1(b)(F). “In 2016, [the] EPA issued Lifetime Health Advisory levels for both PFOA and PFOS in drinking water at 70 parts per trillion (ppt) separately or combined.” MARY H. TIEMANN & ELENA S. HUMPHRIES, CONG. RSCH. SERV., IF11219, REGULATING DRINKING WATER CONTAMINANTS: EPA PFAS ACTIONS 1 (2020); see also Lifetime Health Advisories and Health Effects Support Documents for Perfluorooctanoic Acid and Perfluorooctane Sulfonate, 81 Fed. Reg. 33250, 33250 (May 25, 2016). In July 2021, the House of Representatives passed the PFAS Action Act of 2021, a measure that would demand that the EPA regulate the most common substances (PFOS and PFOA) and designate them as “hazardous substances” under the Comprehensive Environmental Response, Compensation, and Liability Act within a year. Sharon Udasin, *House Passes Bill Requiring EPA to Regulate ‘Forever Chemicals’ in Drinking Water*, HILL (Jul. 21, 2021, 3:47 PM), <https://thehill.com/policy/equilibrium-sustainability/564185-house-passes-bill-requiring-epa-regulate-forever-chemicals>. Still, however, “[t]he widespread use, large number, and diverse chemical structures of PFAS pose challenges to any sufficiently protective regulation, emissions reduction, and remediation at contaminated sites.” SIMONA ANDREEA BALAN ET AL., REGULATING PFAS AS A CHEMICAL CLASS UNDER THE CALIFORNIA SAFER CONSUMER PRODUCTS PROGRAM 1 (2021), <https://ehp.niehs.nih.gov/doi/pdf/10.1289/EHP7431>.

14. See, e.g., Julia Conley, *‘Avalanche of Public Pressure’ Forces Trump’s EPA to Regulate PFAS, but Water Safety Experts Warn of More Delays*, COMMON DREAMS (Feb. 21, 2020), <https://www.commondreams.org/news/2020/02/21/avalanche-public-pressure-forces-trumps-epa-regulate-pfas-water-safety-experts-warn>. The military itself is responsible for large amounts of PFAS contamination and “the last decade has witnessed communities near military bases waking up to a nightmare of PFAS contamination in their water, their soil and their blood.” David Bond, *The US Military is Poisoning Communities Across the US with Toxic Chemicals*, THE GUARDIAN (Mar. 25, 2021), <https://www.theguardian.com/commentisfree/2021/mar/25/us-military-toxic-chemicals-us-states>. Dr. David Michaels, the former head of OSHA, has effectively summarized the problem: “@EPA’s process to regulate chemicals like #PFOA & #PFOS presumes they are innocent until proven guilty. Opponents of regulation can delay the process by manufacturing uncertainty about scientific evidence. We badly need a new system that protects people rather than chemicals.” David Michaels (@drdavidmichaels), TWITTER (Feb. 20, 2020, 5:52 PM), <https://twitter.com/drdavidmichaels/status/1230626353168494593>.

This includes a PFAS national drinking water standard and regulating PFAS as a chemical class.¹⁵

Complicating matters, the U.S. Department of Defense (“DoD”) has historically used two of the most toxic and widely used legacy PFAS variants—perfluorooctanesulfonic acid (“PFOS”) and perfluorooctanoic acid (“PFOA”)—in their firefighting equipment.¹⁶ While manufacturers have taken some steps to phase out PFOS and PFOA, the military still uses a PFAS-laden firefighting substance, “Aqueous Firefighting Foam” (“AFFF”), to fight aircraft and shipboard fires.¹⁷ Tragically, what happens on military bases does not stay there: PFAS runoff seeps into shared public drinking water supplies in adjacent communities.¹⁸

This raises several questions that strike at the core of environmental governance. Does our reactive approach to newly developed chemicals of unknown toxicity pose an unacceptable risk to the American public?¹⁹ Outside the SDWA, what role should other

15. See, e.g., Steve Risotto, *National PFAS Standards are Needed to Protect our Drinking Water*, BLOOMBERG L. (July 15, 2021, 4:01 AM), <https://news.bloomberglaw.com/environment-and-energy/national-pfas-standards-are-needed-to-protect-our-drinking-water>; BALAN ET AL., *supra* note 13, at 1–2 (explaining the rationale behind the State of California’s Department of Toxic Substances Control’s approach of regulating PFAS as a class rather than as individual toxic substances). Most recently, in Flint, Michigan, the SDWA failed to regulate public drinking water supplies. NORA SMITHHISLER, *THE SAFE DRINKING WATER ACT AND FLINT, MICHIGAN: HOW WE CAN UPDATE OUR STANDARDS FOR SAFE DRINKING WATER 1* (Lillian Gabreski ed., 2017), <http://www.cornellpolicyreview.com/sdwa-flint-michigan/?pdf=4461>.

16. See CTR. FOR SCI. & DEMOCRACY, *A TOXIC THREAT: GOVERNMENT MUST ACT NOW ON PFAS CONTAMINATION AT MILITARY BASES 4–5* (2018) [hereinafter *Toxic Threat*], <https://www.ucsusa.org/sites/default/files/attach/2018/09/a-toxic-threat-pfs-military-fact-sheet-ucs-2018.pdf> (mapping 131 active and formerly active U.S. military installations for PFAS contamination, concluding that “immediate action is needed to protect military personnel, their families, and others living near US military installations”).

17. For an overview of how the military uses PFOS and PFOA in firefighting equipment, see generally SEC’Y OF DEF. FOR ACQUISITION & SUSTAINMENT, DEP’T OF DEF., *ALTERNATIVES TO AQUEOUS FILM FORMING FOAM REPORT TO CONGRESS* (2018) [hereinafter *AFFF Report*]. This report was issued in response to Section 1059 of the National Defense Authorization Act for Fiscal Year 2018. *Id.* at 1. By one estimate, “[a]pproximately 305 military installations nationwide have used [Aqueous Film Forming Foam (“AFFF”)] as a fire-fighting material, likely contaminating the drinking water and groundwater near the bases.” Jeffrey Dintzer & Gregory Berlin, *Insight: Congress Confronts PFAS in National Defense Authorization Act—What You Need to Know*, BLOOMBERG L. (March 20, 2020, 4:01 AM), <https://news.bloomberglaw.com/environment-and-energy/insight-congress-confronts-pfas-in-national-defense-authorization-act-what-you-need-to-know>.

18. *Toxic Threat*, *supra* note 16, at 4. This encompasses active military bases as well as those that have been transferred back to the community. See *id.*

19. This approach can be fairly described as an “inverse precautionary principle.” It is opposite of the precautionary principle, which favors preventing

environmental laws play in regulating PFAS and other harmful chemicals? How much deference should we afford to national security agencies—such as the DoD—when their actions threaten military service members, their families, and the surrounding community?²⁰

This Article addresses these questions—and others—arguing that our failure to regulate PFAS in the face of known, harmful effects raises broader, structural questions about environmental law’s efficacy.²¹ In doing so, this Article addresses *why* environmental law has failed to protect the American people from these toxic chemicals. Normatively, this Article proposes *how* environmental law should evolve to close this legal governance gap. Our modern federalism model of environmental law relies on states developing and implementing state-based drinking water standards.²² This environmental-federalism model has some benefits, but it also results in widely varying standards for drinking water—the basis for a healthy human life.²³ The United States lacks a nationwide, enforceable drinking water standard for PFAS, further exacerbating preexisting environmental justice worries. Indeed, studies document

harm rather than compensating victims after the fact. *See* Robert V. Percival, *Who’s Afraid of the Precautionary Principle?*, 23 PACE ENV’T L. REV. 21, 35–37 (2006).

20. *Winter v. Nat. Res. Def. Council, Inc.*, 555 U.S. 7, 15–16, 24 (2008) (discussing the military deference doctrine as it relates to the National Environmental Policy Act and Marine Mammal Protection Act). Under the TSCA, a newly developed chemical can be protected as a trade secret, referred to as “confidential business information.” Steve C. Gold & Wendy E. Wagner, *Filling Gaps in Science Exposes Gaps in Chemical Regulation*, SCIENCE, June 5, 2020, at 1066, 1067, <https://www.science.org/doi/10.1126/science.abc1250>.

21. *See* BILOTT, *supra* note 6, at 366–69. *See generally* ORAN R. YOUNG, EFFECTIVENESS OF INTERNATIONAL ENVIRONMENTAL REGIMES (William C. Clark ed., 2011) (evaluating differing views on the efficacy of environmental regulatory regimes).

22. *See, e.g.*, Daniel C. Esty, *Revitalizing Environmental Federalism*, 95 MICH. L. REV. 570, 570 (1996) (contending that the presumption that “a decentralized approach to environmental policy will yield better results than more centralized programs . . . is misguided”).

23. In other contexts, some advocates have articulated a substantive due process right to a healthy environment in recent climate litigation. *See* Juliana v. United States, 217 F. Supp. 3d 1224, 1234, 1250 (D. Or. 2016) (summarizing the injuries asserted by the children-litigants). Because of the critical role that drinking water systems play in sustaining life, one could plausibly argue that access to safe, clean drinking water is a fundamental right protected by the Constitution’s guarantee of substantive due process. Rachel Carson presciently made this point in *Silent Spring*: “If the Bill of Rights contains no guarantee that a citizen shall be secure against lethal poisons distributed either by private individuals or by public officials, it is surely only because our forefathers, despite their considerable wisdom and foresight, could conceive of no such problem.” CARSON, *supra* note 1, at 12–13.

how poorer communities are disproportionately exposed to harmful chemicals, a reality worsened by PFAS exposure.²⁴

This Article, inspired by Robert Bilott's decades-long work exposing the harmful effects wrought by PFAS, first describes and analyzes the laws surrounding chemical regulation in the United States. In doing so, it actively engages with the scientific literature, showcasing how rapidly changing chemicals of unknown toxicity far too easily enter our streams of commerce.²⁵ These chemicals act as a "hidden enemy," stealthily invading our households, water supplies, and bloodstreams. This Article reimagines how we should assess the long-term risks of chemical substances, arguing that we must establish a single, national standard for safe drinking water.²⁶

This Article makes three novel contributions to the existing scholarly literature. It is the first article to comprehensively analyze how environmental law has failed to regulate these "forever chemicals" through an interdisciplinary approach that marries the scientific literature with our environmental legal framework. Second, this Article addresses the critical but undertheorized relationship between environmental law and national security law. In doing so, it analyzes how national security concerns can be used as a blunt tool to thwart environmental protections. Yet, the PFAS experience also demonstrates that this picture is far more complex: the DoD has led private industry in conducting voluntary drinking water tests and sharing PFAS information with neighboring communities.²⁷ Further,

24. The drinking water in Parchment, Michigan, for example, was found to have PFAS levels over twenty-two times greater than the EPA's health advisory level. See *Historical Timeline*, MICH. PFAS ACTION RESPONSE TEAM, https://www.michigan.gov/pfasresponse/0,9038,7-365-86511_82704_87495-477248--,00.html (last visited Feb. 2, 2022). Our failure to regulate PFAS is also an environmental justice issue. While little research has been conducted on the demographics of PFAS exposure, PFAS contamination may disproportionately harm low income and minority communities due to their proximity to these sources. Jill Johnston & Lara Cushing, *Chemical Exposures, Health, and Environmental Justice in Communities Living on the Fenceline of Industry*, 7 CURRENT ENV'T HEALTH REPS. 48, 49 (2020).

25. See BILLOTT, *supra* note 6, at 366–69; Gold & Wagner, *supra* note 20, at 1066–68 (describing the lack of accessible information about emerging toxic substances and the resulting inability to regulate them effectively).

26. The PFAS Action Act of 2021 amends the SDWA to require the EPA Administrator, after notice and opportunity for public comment, to "promulgate a national primary drinking water regulation for perfluoroalkyl and polyfluoroalkyl substances." PFAS Action Act of 2021, H.R. 2467, 117th Cong. § 5 (2021).

27. See, e.g., UNDER SEC'Y OF DEF. FOR ACQUISITION AND SUSTAINMENT, DEP'T OF DEF., DRINKING WATER CONTAMINATION REPORT TO CONGRESS 2 (2019), <https://media.defense.gov/2021/May/27/2002730785/-1/-1/0/DOD-DRINKING-WATER-CONTAMINATION-RTC-JULY-2019.PDF> ("The Department is committed to addressing the health risk associated with DoD releases of PFOS

defense spending bills remain one of the few “must pass” legislative bills each year. And these bills also enjoy bipartisan support, thus serving as a convenient legislative vehicle to address environmental concerns. Third, this is the first article to propose different regulatory pathways within existing environmental law to both safeguard our drinking water and remediate PFAS contamination.

In Part I, we describe and analyze PFAS, their scientific properties, and associated health problems. We argue that while our tort system plays a critical role as a regulatory backstop, environmental law has fallen short in safeguarding the health of the American people from PFAS exposure.²⁸ Part II addresses how the existing environmental governance framework has allowed PFAS to slip through its regulatory cracks. In Part III, we turn to the military’s use of PFAS, arguing that the military’s reliance on PFAS presents both challenges and opportunities.²⁹ Based on the current state of affairs discussed in Parts I, II, & III, we then argue in Part IV that Congress should establish a single, uniform drinking water standard and regulate PFAS and their thousands of variants as a chemical class.³⁰

I. THE PFAS PROBLEM: TOXIC CHEMICALS HIDING IN PLAIN SIGHT

This Part provides an overview of PFAS chemicals and their current and past uses in commercial, industrial, and military applications.³¹ In analyzing their toxicity and widespread use, we

and PFOA, and ensuring safe drinking water for people living and working on its installations and in the surrounding communities”).

28. For a discussion of the federal common law nuisance doctrine and how this serves as a regulatory backstop in environmental law, see generally Mark P. Nevitt & Robert V. Percival, *Could Official Climate Denial Revive the Common Law as a Regulatory Backstop?*, 96 WASH. U. L. REV. 441 (2018).

29. While it is beyond the scope of this article to fully address this, PFAS use at overseas military installations remains an ongoing issue. Too often, the environmental costs at military installations outside the United States are poorly understood and not considered, resulting in harm to the host nation population. See, e.g., Mark P. Nevitt, *Environmental Law in Military Operations*, in U.S. MILITARY OPERATIONS: LAW, POLICY, AND PRACTICE 401, 433–34 n.246 (2016).

30. Some scientists have already explained that there is a scientific basis for managing PFAS as a chemical class. See Carol F. Kwiatkowski et al., *Scientific Basis for Managing PFAS as a Chemical Class*, 7 ENV’T SCI. & TECH. LETTERS 532, 532 (2020) (presenting a scientific basis for managing PFAS as one chemical class while providing options for how governments and industry can apply the class-based approach). See also William S. Dean et al., *A Framework for Regulation of New and Existing PFAS by EPA*, J. SCI. POL’Y & GOVERNANCE, Apr. 2020, https://www.sciencepolicyjournal.org/uploads/5/4/3/4/5434385/dean_adejumo_caiati_et_al_jspg_v16.pdf (stating that PFAS are “a family of chemicals known to be toxic and highly persistent in both the environment and in humans”).

31. See generally DAVID M. BEARDEN ET AL., CONG. RSCH. SERV., FEDERAL ROLE IN RESPONDING TO POTENTIAL RISKS OF PER- AND POLYFLUOROALKYL

address the unique challenges of regulating a class of complex chemical substances with more than 9,000 variants *after* they have entered the commercial mainstream.³²

A. *PFAS: The “Forever/Everywhere Chemicals” with Debilitating Health Effects*

In the mid-twentieth century, scientists developed two PFAS—PFOA and PFOS—chemicals renowned for their heat and stain resistance.³³ Both chemicals were used in the American commercial mainstream in the aftermath of the Second World War.³⁴ They were placed in a wide variety of household consumer products, including food packaging, outdoor apparel, and nonstick cookware.³⁵ Their ability to suppress high-heat fires made them especially valuable for firefighting, with the military adopting them for its use.³⁶ PFOS and PFOA entered the streams of commerce before we understood their harm to human health and safety and well before the enactment of comprehensive federal environmental laws in the 1970s.³⁷

PFAS refers to “a large group of synthesized chemical compounds that do not occur naturally.”³⁸ Newly developed PFAS—of unknown

SUBSTANCES (PFAS) 1–2 (2019) (discussing the potential risks of PFAS and that federal agencies have taken actions to address the potential risks of PFAS).

32. There is some disagreement about the precise number of PFAS variants due to their constantly changing chemical nature and trade secret protections. The EPA Master List includes 9,252 PFAS chemicals. *PFAS Master List of PFAS Substances (Version 2)*, ENV'T PROT. AGENCY, https://comptox.epa.gov/dashboard/chemical_lists/pfasmaster (last visited Feb. 2, 2022). *But see* Ian T. Cousins et al., *The Concept of Essential Use for Determining When Uses of PFASs Can Be Phased Out*, 21 ENV'T SCI. PROCESSES & IMPACTS 1803, 1804 (2019) (estimating more than 4,700 variants).

33. While science continues to evolve to address the toxicity of long-chain and short-chain PFAS, studies increasingly demonstrate that modified PFAS have the potential to be as toxic as PFOA and PFOS. *See* Dean et al., *supra* note 30.

34. *Id.* (“PFAS have been commercially produced since the 1940s, but their use in consumer products dramatically expanded in the 1950s and 60s.”).

35. *See* Kwiatkowski et al., *supra* note 30, at 532 (“Examples of products that contain or are coated with PFAS include carpets, glass, paper, clothing and other textiles, plastic articles, cookware, food packaging, electronics, and personal care products.”).

36. *See id.* (“PFAS are also used directly or as technical aids . . . in many industrial applications, such as in . . . firefighting foams.”)

37. *See* LAZARUS, *supra* note 2, at 67–97 (addressing the rise of federal environmental law in the 1970s); *see also* CARSON, *supra* note 1, at 187–88 (warning the potential human price for the abusive use of hazardous chemical substances).

38. BEARDEN ET AL., *supra* note 31, at 2. For a description of PFAS and its properties, *see generally* ENV'T PROT. AGENCY, EPA'S PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) ACTION PLAN (Feb. 2019), https://www.epa.gov/sites/default/files/2019-02/documents/pfas_action_plan_021_319_508compliant_1.pdf.

toxicity—continuously enter the commercial mainstream.³⁹ Complicating matters, PFAS “are not a single chemical or compound, but a group of compounds that share similar chemical structures.”⁴⁰ This includes thousands of both “longer [carbon] chain” and “shorter [carbon] chain” chemical variants.⁴¹ Each chain of fluorinated carbon atoms can be attached to different combinations of other atoms.⁴² PFAS slowly bioaccumulate in humans, wildlife, and the environment, earning the ignoble nickname “forever chemicals.”⁴³ By one estimate, 99.7 percent of Americans have measurable PFAS concentrations in their bloodstreams.⁴⁴ To date, Congress, the EPA, and state regulators have largely focused their efforts on just two PFAS—PFOA and PFOS.⁴⁵

Oftentimes, the terms perfluorocarbons (“PFCs”), PFAS, PFOS, and PFOA are used interchangeably.⁴⁶ They should not be. PFCs are greenhouse gas emissions governed by international protocols—they are all PFAS, but not all PFAS are PFCs.⁴⁷ This Article uses the general term PFAS to refer to the entire class of synthetic compounds that are linked by multiple fluorine atoms.

Despite the ubiquity of PFAS in household products and food packaging, it is increasingly clear that even minor PFAS exposure can

39. This includes a replacement for PFOA, known as “GenX,” and a replacement for PFOS, known as “PFBS.” The EPA is in the process of revising the GenX risk assessment based on new data that has been received, but little is still known about either of these new chemicals. Peter Zeeb et al., *Dialogue, The Use of PFAS at Industrial and Military Facilities: Technical, Regulatory, and Legal Issues*, 49 ENV’T L. REP. NEWS & ANALYSIS 10109, 10121 (2019).

40. See BEARDEN ET AL., *supra* note 31, at 2 (describing the complex chemical structures of PFAS).

41. *Id.* at 2, 4.

42. *Id.* at 2 n.5.

43. They pose an invisible threat to human health and welfare. *Id.* at 4. “Bioaccumulation is defined as the accumulation of a substance and especially a contaminant (such as a pesticide or heavy metal) in a living organism.” U.S. GOV’T ACCOUNTABILITY OFF., *MAN-MADE CHEMICALS AND POTENTIAL HEALTH RISKS* 7 n.20 (2021) [hereinafter GAO REPORT]. For an overview of how PFAS enter into the human and animal system, see generally M. Clara et al., *Emissions of Perfluorinated Alkylated Substances (PFAS) from Point Sources—Identification of Relevant Branches*, 58 WATER SCI. & TECH. 59 (2008).

44. See Kwiatkowski et al., *supra* note 30, at 534. For the 99.7% estimation, see Antonia M. Calafat et al., *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*, 115 ENV’T HEALTH PERSPS. 1596, 1597 (2007).

45. Kwiatkowski et al., *supra* note 30, at 534.

46. Zeeb et al., *supra* note 39, at 10111.

47. *Id.*

result in a wide variety of debilitating health effects.⁴⁸ One academic scientist alarmingly described this phenomenon:

[PFAS are] highly mobile and move readily into the ground and surface waters once released into the environment where they can reside for decades to centuries. As a result of their high environmental persistence, widespread use and release of any PFAS, even polymeric PFASs, will lead to irreversible global contamination and exposure of wildlife and humans, with currently unknown consequences.⁴⁹

PFOS and PFOA can extinguish high-heat fires, a characteristic that has made them particularly valuable to firefighters at military installations and commercial airports.⁵⁰ They also act as a powerful sealant for water-resistant outdoor clothing, with traces of PFAS recently discovered at the farthest reaches of the globe on Mount Everest's peak.⁵¹ Unfortunately, PFAS-laden military firefighting equipment—including AFFF—has seeped into the public drinking water supplies used by both the military and local communities.⁵²

As our understanding of PFAS toxicity increases, the reality gets bleaker and more concerning. Recent research now links PFAS exposure to decreased vaccine efficacy in children—a grave concern during the COVID-19 pandemic.⁵³ These toxic chemicals also cause a host of fertility problems for both men and women—recent studies now link PFAS exposure to lower sperm counts in men.⁵⁴ PFAS

48. LAZARUS, *supra* note 2, at 211 (“Ecologists warned that synthetic chemicals could be responsible for decreased fertility, lowering of male sperm counts, reduced intelligence, and dramatic increases of disease, of which cancer was just one example.”). These contaminants were “unfathomably small,” measured in parts per trillion—the “equivalent of one drop of liquid in a train of tank cars six miles long.” *Id.* (citing THEO COLBURN ET AL., *OUR STOLEN FUTURE* 40 (1997)).

49. Cousins et al., *supra* note 32, at 1804.

50. The fire suppressant is known as “Aqueous Film Forming Foam” or AFFF. It is used at military installations, civilian airports, and state and local fire departments. See Maggie Broughton & Ken Rumelt, *Moving the Needle on PFAS Regulation*, VT. J. ENV'T L. (2020) (on file with author).

51. Carpenter, *supra* note 5 (describing PFAS contamination on Mount Everest).

52. GAO REPORT, *supra* note 43, at 7.

53. See Phillippe Grandjean et al., *Estimated Exposures to Perfluorinated Compounds in Infancy Predict Attenuated Vaccine Antibody Concentrations at Age 5-Years*, 14 J. IMMUNOTOXICOLOGY 188, 194 (2017).

54. See Liza Gross, *These Everyday Toxins May Be Hurting Pregnant Women and Their Babies*, N.Y. TIMES (Sept. 23, 2020), <https://www.nytimes.com/2020/09/23/parenting/pregnancy/pfas-toxins-chemicals.html> (summarizing recent scientific findings that these widely used chemicals “may harm pregnant women and their developing babies by meddling with gene regulators and hormones that control two of the body’s most critical functions: metabolism and immunity”).

exposure at even very low doses leads to increased instances of cancer, infertility, and birth defects.⁵⁵

Independent of PFAS, there are tens of thousands of additional synthetic chemicals in circulation today, but the precise number is unknown due to regulations that classify new chemicals as confidential business information.⁵⁶ And this is the status quo fifty years after Rachel Carson penned *Silent Spring* and forty years after Congress passed the TSCA.⁵⁷ Of the approximately 85,000 synthetic chemicals currently in circulation, how many has the EPA eliminated or restricted? Six.⁵⁸

So how did we learn about PFAS toxicity? By pure happenstance. PFAS came to our collective attention due to the indefatigable work of a single tort lawyer, Robert Bilott. He fortuitously took on a case by a West Virginia farmer whose cattle were dying for some mysterious reason.⁵⁹ We turn to this remarkable story below.

B. Dark Waters & Tort Law as Regulatory Backstop: Robert Bilott Versus Dupont

In 1998, lawyer Robert Bilott was approached by Wilbur Tennant, a family friend and patriarch of a family of farmers in West Virginia.⁶⁰ Tennant suspected that a nearby DuPont plant was killing his cattle.⁶¹ He alleged that the DuPont plant was disposing of chemicals in a landfill adjacent to his family’s farm.⁶² The chemicals seeped into nearby streams that the Tennant family’s cattle drank.⁶³ When the Tennants’ cattle began to die mysteriously, DuPont dismissed the family’s concerns, instead blaming their deaths on poor husbandry.⁶⁴

The Tennant family, with Bilott as their attorney, sued DuPont.⁶⁵ DuPont fought back ferociously. DuPont immediately sought to limit discovery to information related to chemicals that were already regulated by the EPA or the West Virginia Department of

55. See BILOTT, *supra* note 6, at 286, 256.

56. Gold & Wagner, *supra* note 20, at 1067.

57. See generally CARSON, *supra* note 1; 15 U.S.C. §§ 2601–2692.

58. NATHANIEL RICH, *SECOND NATURE: SCENES FROM A WORLD REMADE* 37 (2021). “[D]espite the national obsessions with self-image, diet, and longevity, most Americans have no better understanding of the actual substances that most powerfully influence their biological existence than do the ciliates that crawl along the ocean floor.” *Id.* at 36.

59. See BILOTT, *supra* note 6, at 9–12.

60. RICH, *supra* note 58, at 17–18.

61. For an overview of this story, see generally Rich, *supra* note 7.

62. RICH, *supra* note 58, at 19.

63. *Id.* at 19–20.

64. *Id.* at 26–27.

65. *Leach v. E.I. DuPont de Nemours & Co.*, No. 01-C-608, 2002 WL 1270121, at *1 (W. Va. Cir. Ct. Apr. 10, 2002).

Environmental Protection.⁶⁶ As the EPA and state regulators did not regulate any PFAS, PFOA—a key ingredient in the development of DuPont’s Teflon products—slipped under the regulators’ radar and was not included in the initial discovery.⁶⁷ The court ultimately sided with Bilott’s request for broader discovery, but this took several years.⁶⁸ The court ordered DuPont to turn over voluminous records related to PFOA, resulting in a massive “data dump.”⁶⁹ This required Bilott to devote his legal practice (and personal health) to dissecting these complex scientific documents.⁷⁰ During the lengthy discovery process, Bilott learned that both DuPont and a second manufacturer—3M—had conducted numerous in-house studies that found adverse effects of PFOA exposure on test animals.⁷¹ These studies were not shared with the EPA or state regulators.⁷² The discovery process also showcased that several DuPont employees working at PFOA plants developed serious health issues, but this was dismissed as an innocuous “Teflon flu.”⁷³

In 2000, 3M announced that it would cease production of PFOS and PFOA.⁷⁴ Throughout discovery, Bilott communicated with state and federal regulators, keeping them abreast of his findings.⁷⁵ Bilott was shocked that his communications to regulators were met with silence.⁷⁶ After initial hesitancy to bring federal regulatory action, the EPA found that DuPont violated Section 8(e) of the TSCA by failing to report its internal studies’ findings to the EPA.⁷⁷

66. *Id.* at *2.

67. Rich, *supra* note 7.

68. *Id.*

69. *Id.*

70. *Id.* PFOA is part of a family of PFAS widely used in Teflon products, Scotchguard, and AFFF. See *Per- and Polyfluorinated Substances (PFAS) Factsheet*, CTNS. FOR DISEASE CONTROL & PREVENTION, https://www.cdc.gov/biomonitoring/PFAS_FactSheet.html (Jan. 11, 2022).

71. Rich, *supra* note 7.

72. *Id.*

73. *Id.*

74. Press Release, Env’t Prot. Agency, EPA and 3M Announce Phase Out of PFOS (May 16, 2000), https://archive.epa.gov/epapages/newsroom_archive/newsreleases/33aa946e6cb11f35852568e1005246b4.html.

75. BILOTT, *supra* note 6, at 94–95. Bilott stated, “I had always assumed that in the United States, systems were in place to keep us safe from dangerous business practices.” *Id.* at 95.

76. *Id.*

77. Press Release, Env’t Prot. Agency, Reference News Release: EPA Settles PFOA Case Against DuPont for Largest Environmental Administrative Penalty in Agency History (Dec. 14, 2005) [hereinafter EPA Settles], <https://www.epa.gov/enforcement/reference-news-release-epa-settles-pfoa-case-against-dupont-largest-environmental>; see also 15 U.S.C. § 2607(e) (“Any person who manufactures, processes, or distributes in commerce as chemical substance or mixture and who obtains information which reasonably supports the conclusion that such substance or mixture presents a substantial risk of injury to health or

After years of discovery and motions, DuPont ultimately settled with the Tennant family.⁷⁸ This only marked the beginning of DuPont’s legal troubles. In 2001, Bilott launched a second class action tort lawsuit against DuPont on behalf of all 70,000 residents of Parkersburg, West Virginia.⁷⁹ Bilott argued that the residents had all been exposed to high concentrations of PFOA in their drinking water.⁸⁰ In 2004, Bilott and DuPont agreed to settle the class action lawsuit for \$70 million.⁸¹ This funded a massive epidemiological study to determine adverse health effects caused by PFAS.⁸² DuPont also agreed to overhaul Parkersburg’s drinking water system with state-of-the-art technology.⁸³ Significantly, DuPont also agreed in advance that it would not dispute an independent “Science Panel” finding if the Panel concluded that PFOA caused underlying adverse health effects.⁸⁴

While the Science Panel was conducting one of the most exhaustive epidemiological studies in American history, the EPA and DuPont launched a voluntary PFOA Stewardship Program in 2006 that eschewed regulation in favor of a voluntary, industry-led PFOA phase out by 2015.⁸⁵ In 2011 and early 2012, the Science Panel issued

the environment shall immediately inform the Administrator of such knowledge unless such person has actual knowledge that the Administrator has been adequately informed of such information.”(emphasis added)). DuPont settled with the EPA in 2005, agreeing to pay a fine of \$10.25 million and contribute \$6.25 million to other environmental projects. EPA Settles, *supra* note 77.

78. Rich, *supra* note 7.

79. *Id.*

80. Leach v. E.I. DuPont de Nemours & Co., No. 01-C-608, 2002 WL 1270121, at *1 (W. Va. Cir. Ct. Apr. 10, 2002).

81. Taylor Sisk, *A Lasting Legacy: DuPont, C8 Contamination and the Community of Parkersburg Left to Grapple with the Consequences*, ENV’T HEALTH NEWS (Jan. 7, 2020), <https://www.ehn.org/dupont-c8-parkersburg-2644262065/particle-7>.

82. *Id.*

83. *C8 Class Action Settlement*, HILL, PETERSON, CARPER, BEE & DIETZLER, <https://www.hpcb.com/personal-injury/dupont-c8/c8-class-action-settlement/> (last visited Feb. 2, 2022). For an outstanding summary of the role that biomonitoring science in the courtroom can play in exposing toxic chemical risk, see Laura Hall et al., *Litigating Toxic Risks Ahead of Regulation: Biomonitoring Science in the Courtroom*, 31 STAN. ENV’T L.J. 3, 6 (2012).

84. *The C8 Science Panel*, HILL, PETERSON, CARPER, BEE & DIETZLER, <https://www.hpcb.com/personal-injury/dupont-c8/the-science-panel> (last visited Feb. 2, 2022).

85. *Fact Sheet: 2010/2015 PFOA Stewardship Program*, ENV’T PROT. AGENCY, <https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/fact-sheet-20102015-pfoa-stewardship-program> (last visited Feb. 2, 2022). While these goals were met in the United States, 3M reportedly continued to produce PFOS and PFOA in China. See David Lunderberg, *PFOS: The Hidden Danger in our Homes*, CHINA DIALOGUE (Aug. 21, 2017) <https://chinadialogue.net/en/pollution/9999-pfos-the-hidden-danger-in-our-homes/>.

several exhaustive reports, finding probable links between exposure to PFOA and six serious health effects.⁸⁶

Thousands of individual class members immediately filed new personal injury lawsuits against DuPont.⁸⁷ These lawsuits were ultimately consolidated in Ohio federal court via a complex, multi-district litigation procedure.⁸⁸ The personal injury cases commenced in 2015, with the first plaintiff—Carla Bartlett—suing DuPont and the Chemours Company.⁸⁹ Bartlett won.⁹⁰ But DuPont continued to fight. The second plaintiff received over \$5 million in compensatory damages and was awarded \$500,000 in punitive damages.⁹¹ The third plaintiff received over \$10 million in punitive damages.⁹² Following the third lawsuit, in 2017, DuPont capitulated and settled all the personal injury claims for \$671 million.⁹³

Since the conclusion of this settlement, the specific PFAS linked to serious health conditions by the Science Panel have slowly been phased out. Yet Bilott's work continues as new PFAS, of unknown toxicity, are developed. He repeated his strategy of using tort litigation to fund new studies addressing the adverse health effects of other PFAS. In October 2018, Bilott filed a new class action lawsuit against DuPont, Chemours, 3M, and eight other companies using or producing new PFAS.⁹⁴ Bilott's plaintiff class consists of *all* U.S. residents who have "a detectable level of PFAS chemicals in their blood," a number that exceeded 100 million people.⁹⁵ Kevin Hardwick, an Ohio firefighter exposed to PFAS over the course of his career, serves as the lead plaintiff in this complex class action.⁹⁶ This

86. Sisk, *supra* note 81. These include high cholesterol, ulcerative colitis, thyroid disease, testicular cancer, kidney cancer, and pregnancy-induced hypertension. *Id.*

87. Rich, *supra* note 7.

88. Randall Chase, *DuPont, Chemours Reach Agreement over 'Forever Chemicals'*, ABC NEWS (Jan. 23, 2021, 5:58 PM), <https://abcnews.go.com/US/wireStory/dupont-chemours-reach-agreement-forever-chemicals-75448051>.

89. Rich, *supra* note 7. Chemours is an entity that had been previously spun off from DuPont with the purported goal of shielding DuPont from legal liability. Chase, *supra* note 88. Chemours gained control of DuPont's Teflon business. *Id.* Chemours has recently resolved legal liability disputes with DuPont associated with this division. *Id.*

90. Rich, *supra* note 7.

91. Erica Teichert, *Jury Orders DuPont to Pay \$10.5 Million over Leaked Chemical*, REUTERS (Jan. 5, 2017, 10:56 AM), <https://www.reuters.com/article/us-du-pont-verdict-idINKBN14P1VD>.

92. *Id.*

93. Sisk, *supra* note 81.

94. Sharon Lerner, *Nationwide Class Action Lawsuit Targets DuPont, Chemours, 3M, and Other Makers of PFAS Chemicals*, INTERCEPT (Oct. 6, 2018, 7:30 AM), <https://theintercept.com/2018/10/06/dupont-pfas-chemicals-lawsuit/>.

95. *Id.*; see also Calafat et al., *supra* note 44, at 1597.

96. Alex Ebert, *Firefighter Wants Study—Not Money—in Fluorinated Chemicals Suit*, BLOOMBERG L. (Oct. 9, 2018, 1:10 PM),

litigation is ongoing, with Bilott requesting the formation of another PFAS Science Panel to conduct a nationwide study of the health effects of the other PFAS on the U.S. population.⁹⁷ As this complex litigation unfolds, we turn to a more fundamental question: how did environmental law fail to protect these citizens from such debilitating and harmful effects?

II. CURRENT REGULATORY FRAMEWORK & GAPS IN CHEMICAL STATUTORY GOVERNANCE

Bilott’s litigation showcases the enormous reliance (and trust) that environmental law places on self-reporting by chemical companies prior to the introduction of new chemicals. In response to the growing concern about PFAS toxicity, U.S. companies voluntarily phased out the most clearly harmful PFAS that had been the target of Bilott’s initial lawsuits—PFOS and PFOA.⁹⁸ But this voluntary phaseout of these two long-chain carbons did not eliminate the risks posed by the thousands of other PFAS variants. Instead, companies continued to use other PFAS variants—such as the GenX variant—which were purported to be safer.⁹⁹

Due to Bilott’s efforts and the discovery of PFAS contamination at military bases, Congress has slowly awoken from its regulatory slumber. In recent years, Congress has held several hearings to address PFAS contamination and integrated PFAS regulations in yearly defense spending bills (one of the few must pass pieces of legislation).¹⁰⁰ These efforts have, once again, focused on just two legacy PFAS variants—PFOS and PFOA—not the thousands of largely untested PFAS variants already in the commercial mainstream. There is a real risk that this focus on just two “slices” of the massive PFAS “pie” will allow large swaths of other, equally toxic PFAS to slip through the regulatory cracks.

Still, there is no shortage of plausible statutory candidates that *could be* used to regulate PFAS. We identify the following six in our discussion below: (1) SDWA; (2) TSCA; (3) Comprehensive Environmental Response, Compensation, and Liability Act (“CERCLA”); (4) Clean Water Act; (5) Resource Conservation and

<https://news.bloomberglaw.com/environment-and-energy/firefighter-wants-studynot-moneyin-fluorinated-chemicals-suit>.

97. *Id.*

98. *See PFAS History*, 3M, https://www.3m.com/3M/en_US/pfas-stewardship-us/pfas-history/ (last visited Feb. 2, 2022).

99. GenX’s underlying safety and toxicity remains unclear. There is some evidence that short chain PFAS have the same health concerns as large chain PFAS. *See, e.g.*, Dean et al., *supra* note 30 (referencing evidence from the National Toxicology Program).

100. *See, e.g.*, National Defense Authorization Act for Fiscal Year 2018, Pub. L. No. 115–91, § 316, 131 Stat. 1283, 1350–51 (2017).

Recovery Act (“RCRA”); and (6) Emergency Planning and Community Right to Know Act (“EPCRA”).

A. *The SDWA: Congress's Failure to Establish a National Drinking Water Standard*

1. *Current Regulatory Scheme & Recent Actions*

The SDWA, passed in 1974, requires the EPA to establish public drinking water standards that can be administered by the states.¹⁰¹ The SDWA establishes a two-tier system, one enforceable and one advisory.¹⁰² Under the first tier, the EPA Administrator sets standards limiting harmful contaminants in drinking water—this is known as the Maximum Contaminant Level (“MCL”) standard.¹⁰³ Under the second tier, the SDWA authorizes the EPA to issue federal health advisories.¹⁰⁴ The SDWA also provides emergency authorities with powers designed to respond to contamination that poses an “imminent and substantial endangerment to the health of persons”¹⁰⁵

In 2009, the EPA began the process in earnest to regulate PFAS using existing SDWA authorities. The EPA listed certain PFAS for evaluation under the SDWA to determine whether future regulations were warranted.¹⁰⁶ Three years later, in 2012, the EPA issued a rule requiring 5,000 water systems to monitor for six PFAS variants over a two-year period.¹⁰⁷ Following this monitoring period, the EPA identified sixty-three water systems serving an estimated 5.5 million individuals that had PFAS levels above 70 parts per trillion (“ppt”).¹⁰⁸

In 2016, the EPA included PFOS and PFOA on its short list of contaminants and issued a health advisory of 70 ppt for PFOS and PFOA.¹⁰⁹ These SDWA health advisories assist drinking water suppliers and localities to address contaminants that lack federal or state drinking water standards, but they are not legally binding.¹¹⁰ Before regulating any contaminant, the EPA must go through a

101. 42 U.S.C. §§ 300f–300j-26.

102. TIEMANN & HUMPHREYS, *supra* note 13.

103. *Id.* In 2021 the EPA promulgated a new SDWA standard for lead and copper in drinking water. National Primary Drinking Water Regulations, 40 C.F.R. pts. 141–42 (2021).

104. TIEMANN & HUMPHREYS, *supra* note 13.

105. 42 U.S.C. § 300i(a).

106. TIEMANN & HUMPHREYS, *supra* note 13.

107. *Id.* This effort included PFOA and PFOS.

108. *Id.*

109. Drinking Water Contaminant Candidate List4-Final, 81 Fed. Reg. 81099, 81104 (Nov. 17, 2016).

110. *See* TIEMANN & HUMPHREYS, *supra* note 13. States have also begun to issue PFAS drinking water standards, but these standards vary widely. For example, New Jersey set the PFAS drinking water standard between 14 and 15 ppt while Massachusetts set the standard at 70 ppt. *Id.*

lengthy contaminant review and selection process; this occurs every five years.¹¹¹

The EPA did not, however, issue health advisories addressing the vast majority of PFAS. And health advisories are just that—advisory. They lack enforcement authority. They do not trigger an independent cause of action.¹¹² There are also questions about the appropriate toxicological standard. A recent study by the Center for Disease Control estimated that toxic effects occur well before 70 ppt, calling into question the legitimacy of the 2016 health advisory standard.¹¹³ Many states have adopted a much lower PFAS drinking water standard.¹¹⁴

In February 2019, the EPA issued a PFAS Action Plan, with the goal of taking “concrete steps to address PFAS and to protect the public health.”¹¹⁵ The PFAS Action Plan “is moving forward with the MCL process for PFOA and PFOS—two of the most well-known and prevalent PFAS chemicals.”¹¹⁶ The next step is to propose a regulatory determination for drinking water standards.

On February 20, 2020, EPA Administrator Andrew Wheeler signed a preliminary determination, proposing to regulate both PFOS and PFOA.¹¹⁷ This effort is ongoing.¹¹⁸ In the interim, each state bears the burden of promulgating its own drinking water standards. If the EPA ultimately makes a final determination to regulate PFOS or PFOA, then the SDWA provides a strict timetable to impose regulations, which would require the EPA to propose a rule within

111. *Id.* President Biden’s new EPA Administrator, Michael Regan, has experience in regulating PFAS as the former head of North Carolina’s Department of Environmental Quality. Brady Dennis et al., *Biden Picks Top North Carolina Environmental Official to Run EPA*, WASH. POST. (Dec. 17, 2020, 2:21 PM), <https://www.washingtonpost.com/climate-environment/2020/12/17/biden-epa-regan/>. Under his leadership, North Carolina ordered Chemours to virtually eliminate PFAS from seeping into the Cape Fear River. *Id.*

112. *See* BEARDEN ET AL., *supra* note 31, at 15.

113. AGENCY FOR TOXIC SUBSTANCES & DISEASE REGISTRY, AN OVERVIEW OF THE SCIENCE AND GUIDANCE FOR CLINICIANS ON PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) 5 (2019).

114. MELANIE BUSER ET AL., TOXICOLOGICAL PROFILE FOR PERFLUOROALKYLS 760–61 (2021), <https://www.atsdr.cdc.gov/toxprofiles/tp200.pdf>.

115. *EPA’s PFAS Action Plan: A Summary of Key Actions*, ENV’T PROT. AGENCY, https://www.epa.gov/sites/default/files/2019-02/documents/pfas_action_factsheet_021319_final_508compliant.pdf (last visited Feb. 2, 2022).

116. *Id.*

117. *EPA Announces Proposed Decision to Regulate PFOA and PFOS in Drinking Water*, ENV’T PROT. AGENCY (Feb. 20, 2020), <https://www.epa.gov/newsreleases/epa-announces-proposed-decision-regulate-pfoa-and-pfos-drinking-water>.

118. *See* TIEMANN & HUMPHREYS, *supra* note 13. And as noted, the new EPA Administrator, Michael Regan, has experience regulating PFAS/PFOA in North Carolina. *See* Dennis et al., *supra* note 111.

two years and promulgate a new drinking water regulation within eighteen months of such a proposal.¹¹⁹

In January 2021, the Governmental Accountability Office (“GAO”) issued a report summarizing the EPA’s progress in implementing its PFAS Action Plan.¹²⁰ It found that the EPA had only completed three of six actions outlined in its 2019 Action Plan.¹²¹ The EPA had completed the proposal for a supplemental significant new use rule, explored data for listing PFAS chemicals to the Toxic Release Inventory (“TRI”), and proposed a drinking water regulatory determination.¹²² The EPA was still monitoring PFAS in drinking water, exploring industrial sources of PFAS that may warrant potential regulation, and continuing the regulatory process for a hazardous substances designation.¹²³ The GAO noted that the EPA intended to finalize a proposed rulemaking for a nationwide monitoring rule that includes PFAS by December 2021.¹²⁴ On December 27, 2021, the EPA published the final rule.¹²⁵

Finally, states have broad authority under the SDWA to establish wellhead protection areas within their respective jurisdictions.¹²⁶ Each state’s governor submits their wellhead program to the EPA Administrator with the goal of “protect[ing] wellhead areas within their jurisdiction from contaminants which may have an adverse effect on the health of the person.”¹²⁷ Federal agencies—including the DoD—are subject to, and must comply with, each state’s wellhead protection program “in the same manner, and to the same extent, as any other person is subject to such requirements”¹²⁸ But the outer scope of this authority remains murky: in recent years, the DoD has argued that federal law does not authorize state enforcement actions against military services.¹²⁹ And, as discussed in Part III, this will take on increased importance as

119. 42 U.S.C. § 300g-1(b)(1)(iii).

120. GAO REPORT, *supra* note 43, at 21–34.

121. *Id.* at 17.

122. *Id.* at 10.

123. *Id.* at 10–11.

124. *Id.* at 23.

125. *EPA Actions to Address PFAS*, ENV’T PROT. AGENCY, <https://www.epa.gov/pfas/epa-actions-address-pfas> (last visited Feb. 21, 2022).

126. 42 U.S.C. § 300h-7(a)–(g).

127. *Id.* at § 300h-7(a).

128. *Id.* at § 300h-7(h). “The President may exempt any potential source under the jurisdiction of any department, agency, or instrumentality in the executive branch if the President determines it to be in the paramount interest of the United States to do so.” *Id.*

129. Beth LeBlanc, *Air Force Scolds Michigan for Tough Tone on Wurtsmith Contamination*, DETROIT NEWS (Jul. 1, 2019, 3:16 PM), <https://www.detroitnews.com/story/news/local/michigan/2019/01/30/air-force-scolds-michigan-tough-tone-wurtsmith-contamination/2713116002/>.

answers are sought to address the military’s role in contaminating shared drinking water supplies.¹³⁰

2. SDWA’s Emergency & Urgent Threat Authorities

The SDWA also has two provisions of increasing relevance for the prospective PFAS regulatory efforts. First, the SDWA grants emergency powers to the EPA Administrator to take emergency action when state authorities have not acted upon “receipt of information that a contaminant which is present in or is likely to enter a public water system or an underground source of drinking water . . . which may present an imminent and substantial endangerment to the health of persons.”¹³¹ This emergency authority acts as a supplemental regulatory tool that the EPA can use to protect drinking water supplies. While it only applies to situations that present “an imminent and substantial endangerment,” this remains a plausible existing tool to address PFAS contamination.¹³² Since 2002, the EPA has used this emergency authority to address PFAS contamination at four sites, three of which were military installations.¹³³ These actions have resulted in improved testing of drinking water supplies, new connections to public water systems, and the provision of bottled water to affected persons.¹³⁴

Second, the SDWA’s urgent threat provision authorizes the EPA to bypass the administrative rulemaking process to establish drinking water standards.¹³⁵ This is yet another tool to expedite PFAS regulation.¹³⁶ Whether the emergency or urgent threat

130. See 42 U.S.C. § 300j-6(a).

131. 42 U.S.C. § 300i(a); see also *id.* (“The action which the Administrator may take may include (but shall not be limited to) (1) issuing such orders as may be necessary to protect the health of persons who are or may be users of such system (including travelers), including orders requiring the provision of alternative water supplies by persons who caused or contributed to the endangerment, and (2) commencing a civil action for appropriate relief, including a restraining order or permanent or temporary injunction.”).

132. *Id.*

133. TIEMANN & HUMPHREYS, *supra* note 13; ENV’T PROT. AGENCY, *supra* note 38, at 55–56. These four locations include two military installations in Pennsylvania (Willow Grove and Warminster Naval Warfare Center), one military installation in New Hampshire (Former Pease Air Force Base), and the Chemours Washington Works Facility located in both Ohio and West Virginia. *Id.* The EPA issued three emergency orders to the Chemours Facility in 2002, 2006, and 2009. ELENA H. HUMPHREYS, PFAS AND DRINKING WATER: SELECTED EPA AND CONGRESSIONAL ACTIONS 12 (2021), <https://crsreports.congress.gov/product/pdf/R/R45793/9>.

134. BEARDEN ET AL., *supra* note 31, at 19.

135. 42 U.S.C. § 300g-1(b)(1)(D).

136. 42 U.S.C. § 300g-1(b)(1)(D); Hannah Levine, *Zombie Chemicals – Learning from our Past to Prevent Haunting in the Future: Why the EPA Should Regulate PFAS Chemical Compounds*, 21 VT. J. ENV’T L. 177, 189 (2019).

provisions will be fully operationalized as part of broader PFAS regulatory efforts remains to be seen, but they do nevertheless provide the EPA with existing, supplemental authorities that can work in parallel with ongoing legislative efforts.

B. The TSCA and Failure of the “Toxicity Honor System”

The TSCA authorizes the EPA to regulate toxic chemicals with the goal of regulating “chemical substances and mixtures which present an unreasonable risk of injury to health or the environment.”¹³⁷ It authorizes the EPA to regulate virtually all aspects of the manufacture, use, and disposal of chemicals to protect public health.¹³⁸ Prior to its amendment in 2016, however, the TSCA did not require any premarket testing of new chemicals.¹³⁹ PFOS and PFOA were developed in a lab in the 1940s—thirty years before the TSCA was passed and almost twenty years before Rachel Carson’s seminal work on the dangers posed by synthetic chemicals in modern life.¹⁴⁰ Large swaths of existing chemicals of unknown toxicity were effectively grandfathered in when the TSCA was enacted.¹⁴¹ Nevertheless, there are several relevant TSCA provisions that *could* play a role in PFAS regulation.

Under Section 5 of the TSCA, a manufacturer of a new chemical must submit a premanufacture notice to the EPA prior to production.¹⁴² While manufacturers must notify the EPA of their intent to produce new chemicals, the TSCA does not mandate toxicological guidelines nor does it provide specific guidance addressing the acceptable level of toxicity.¹⁴³ In addition, it remains unclear if the EPA is using TSCA authorities to track thousands of chemicals listed as confidential business information (i.e., trade

137. 15 U.S.C. § 2601(b)(2). For an overview of TSCA, see generally JERRY H. YEN, *THE TOXIC SUBSTANCES CONTROL ACT (TSCA): A SUMMARY OF THE ACT AND ITS MAJOR REQUIREMENTS* (2015), <https://crsreports.congress.gov/product/pdf/RL/RL31905>. TSCA was amended in 2016 by the Frank R. Lautenberg Chemical Safety for the 21st Century Act, Pub. L. No. 114-182, 130 Stat. 448 (2016).

138. *Toxic Substances Control Act (TSCA) and Federal Facilities*, ENV’T PROT. AGENCY, <https://www.epa.gov/enforcement/toxic-substances-control-act-tsca-and-federal-facilities> (last visited Feb. 2, 2022).

139. Frank R. Lautenberg Chemical Safety for the 21st Century Act, Pub. L. No. 114-182, 130 Stat. 448 (2016).

140. Bevin E. Blake & Suzanne E. Fenton, *Early Life Exposure to Per- and Polyfluoroalkyl Substances (PFAS) and Latent Health Outcomes: A Review Including the Placenta as a Target Issue and Possible Driver of Peri- and Postnatal Effects*, 443 *TOXICOLOGY* 1, 1 (2020).

141. Bilott refers to this as a “grandfather clause.” BILOTT, *supra* note 6, at 95.

142. 15 U.S.C. § 2604(a)(1).

143. *See id.*

secrets).¹⁴⁴ Some scholars have asserted that companies can assert a business privilege to preclude EPA access to this information.¹⁴⁵ In practice, the EPA has not used the TSCA’s premanufacture authority to block the production and introduction of new chemicals into the commercial mainstream.¹⁴⁶ Still, Congress is attempting to use Section 5 to mandate that the EPA issue an order to prohibit the manufacture, processing, and distribution of any PFAS.¹⁴⁷

The TSCA does, however, require chemical manufacturers to report to the EPA any information indicating that their chemicals are harmful. Specifically, Section 8(e) of the TSCA requires a manufacturer to “immediately inform” the EPA when it obtains information that a chemical “presents a substantial risk of injury to health or the environment.”¹⁴⁸ The first indication that PFAS posed substantial risks came from DuPont employees exposed to PFOA in Teflon manufacturing plants in 1981.¹⁴⁹ But DuPont did not report this critical information; it only surfaced due to Bilott’s tort litigation against DuPont twenty years later. DuPont’s failure to report toxicity data led the EPA to file complaints against DuPont in July and December of 2004.¹⁵⁰ In 2005, DuPont settled complaints of seven violations of Section 8(e) of TSCA by agreeing to pay a penalty of \$10.25 million, the largest TSCA administrative penalty in history.¹⁵¹

In 2009, the EPA announced that it was considering using its Section 6 rulemaking authorities under the TSCA to manage the risk of particularly harmful long-chain PFAS variants.¹⁵² To date, the

144. This is not a small number. One estimate has this as greater than 10,000 chemicals in the TSCA inventory. Gold & Wagner, *supra* note 20, at 1067–68.

145. *See, e.g., id.*

146. Dean et al., *supra* note 30.

147. H.R. 2467, 117th Cong. § 4(j)(2) (2021).

148. 15 U.S.C. §2607(e).

149. Lauren Richter et al., *Non-stick Science: Sixty Years of Research and (In)action on Fluorinated Compounds*, 48 SOC. STUD. SCI. 691, 700 (2018).

150. Complaint at 9–12, 16, 19–20, *In re E. I. du Pont de Nemours & Co.*, No. TSCA-HQ-2004-0016 (Env’t Prot. Agency Jul. 8, 2004); Complaint at 7–8, *In re E. I. du Pont de Nemours & Co.*, No. TSCA-HQ-2005-5001 (Env’t Prot. Agency Dec. 6, 2004)

151. Memorandum from Granta Y. Nakayama, Assistant Adm’r, Env’t Protec. Agency, to Env’t Appeals Bd. 1, 5–6, 11 (Dec. 14, 2005) (on file with author). When 3M obtained similar data concerning the health of its employees, it voluntarily reported the potential risks of PFOS and announced that it was phasing out their production. Karren Mills, *3M Phasing Out Some Chemicals*, AP NEWS (May 17, 2000), <https://apnews.com/article/382a5bb7636129aca3eef7ebabd3a0a>. Similar steps were taken with PFOA, which resulted in a voluntary phase-out over a ten-year period. *See Risk Management for Per- and Polyfluoroalkyl Substances (PFAS) under TSCA*, Env’t Prot. Agency, <https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/risk-management-and-polyfluoroalkyl-substances-pfas> (last visited Feb. 11, 2022).

152. ENV’T PROT. AGENCY, LONG-CHAIN PERFLUORINATED CHEMICALS (PFCs) ACTION PLAN 1 (2009), <https://www.epa.gov/sites/default/files/2016-01/>

EPA has yet to determine that PFAS long-chain variants constitute an “unreasonable risk” and has not initiated rulemaking procedures against PFAS.¹⁵³

Congress recently updated the TSCA in 2016 by passing the Frank R. Lautenberg Chemical Safety for the 21st Century Act.¹⁵⁴ As amended, the TSCA now directs the EPA to set priorities for testing new and existing chemicals and conducting risk evaluations for them.¹⁵⁵ A crucial question for the future will be whether the agency will address PFAS as broad classes of chemicals rather than pursuing chemical-by-chemical evaluations of their thousands of variations, which would be an endless task. Section 26(c) of the TSCA expressly allows the EPA to regulate chemical substances by category if the substances are “similar in molecular structure, in physical, chemical, or biological properties, in use, or in mode of entrance into the human body or into the environment, or the members of which are in some other way suitable for classification as such for purposes” of the TSCA.¹⁵⁶

C. *The CERCLA: PFAS Not Designated as “Hazardous Substances”*

The CERCLA—also known as the “Superfund” statute—is the third relevant statute for PFAS regulatory efforts due to its ability to impose cleanup liability.¹⁵⁷ The CERCLA imposes liability for cleanup costs on broad classes of parties¹⁵⁸ associated with the “release” of any “hazardous substance” into the environment.¹⁵⁹ PFAS are not listed as “hazardous substances” under the CERCLA, thus making it impossible to use the CERCLA to impose liability for

documents/pfcs_action_plan1230_09.pdf. This includes PFOS and PFOA. *Id.* at 3.

153. BEARDEN ET AL., *supra* note 31, at 14. The PFAS Action Act of 2021 states that within five years of the Act’s enactment, “any chemical substance that is a perfluoroalkyl or polyfluoroalkyl substance for which a notice is submitted . . . shall be deemed to have been determined by the Administrator to present an unreasonable risk of injury to health or the environment . . .” H.R. 2467, 117th Cong. § 4(j)(1) (2021).

154. Frank R. Lautenberg Chemical Safety for the 21st Century Act, Pub. L. No. 114-182, 130 Stat. 448 (2016).

155. *Id.* § 4, 6.

156. 15 U.S.C. § 2625(c)(2)(B).

157. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. §§ 9601–9675.

158. “The term ‘person’ means an individual, firm, corporation, association, partnership, consortium, joint venture, commercial entity, *United States Government, State, municipality*, commission, political subdivision of a State or any interstate body.” 42 U.S.C. § 9601(21) (emphasis added).

159. “The term ‘release’ means any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment . . .” 42 U.S.C. § 9601(22).

PFAS remediation costs.¹⁶⁰ If PFAS are designated as hazardous substances under the CERCLA, cleanup liability costs can be applied to current and former site owners, operators, and other persons that arranged for their disposal. So, listing PFAS as hazardous substances would trigger CERCLA liability for persons to pay for response costs, natural resource damages, and public health studies at release sites.¹⁶¹

There has been recent legislative efforts to designate PFAS as CERCLA hazardous substances.¹⁶² The PFAS Action Act of 2021, for example, would designate PFOS and PFOA (but not all PFAS) as hazardous substances.¹⁶³ Although many chemical substances are automatically considered CERCLA hazardous substances when regulated under other federal statutes, this does not apply to contaminants regulated pursuant to the SDWA.¹⁶⁴ Thus, even if the EPA establishes a MCL for PFAS in drinking water, a separate CERCLA hazardous substance designation is also necessary. But EPA-established MCLs can be used as a factor in determining how aggressive CERCLA remedial actions should be.¹⁶⁵

PFAS contamination presents a considerable challenge, much like the challenge of removing the chemical methyl tertiary butyl ether (“MTBE”) that widely contaminated drinking water years ago. MTBE was widely used to oxygenate gasoline but escaped easily from it, contaminating sources of drinking water.¹⁶⁶ While the CERCLA could not be used to address the MTBE contamination because petroleum is exempt from the statute’s coverage,¹⁶⁷ companies that used MTBE to oxygenate gasoline were forced to pay for the costs of

160. 42 U.S.C. § 9601(14). CERCLA defines hazardous substance in reference to hazardous substances designated under the Clean Water Act, 33 U.S.C. § 1321(b), to mean “any element, compound, mixture, solution, or substance” under 42 U.S.C. § 9602, or “any hazardous waste having the characteristics identified under or listed pursuant to section 3001 of the Solid Waste Disposal Act” *See id.*

161. *See* 42 U.S.C. § 9607; 42 U.S.C. § 9601(14).

162. PFAS Action Act of 2019, H.R. 535, 116th Cong. (2020) (directing the EPA to promulgate drinking water regulations for PFAS within two years). The House passed this bill on January 10, 2020.

163. H.R. 2467, 117th Cong. § 2(a) (2021).

164. *See* ENV’T PROT. AGENCY, *supra* note 38, at 14 (“Section 1412 of the SDWA requires the EPA to publish a list of contaminants known or anticipated to occur in public water systems which may require regulation under the Safe Drinking Water Act . . . [t]he EPA included PFOA and PFOS on the fourth Contaminant Candidate List (EPA 2018c).”).

165. *See* 42 U.S.C. § 9621(d).

166. *See* N.H. DEP’T OF ENV’T SERVS., ENV’T FACT SHEET: MTBE IN DRINKING WATER (2020), <https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/2020-01/dwgb-3-19.pdf>.

167. 42 U.S.C. § 9601(14).

remediating it through state tort law.¹⁶⁸ In similar fashion, some states have settled tort actions against PFAS manufacturers seeking reimbursement for the costs of remediating PFAS.¹⁶⁹

A great deal of the PFAS found in drinking water throughout the country may be the result of the widespread use of these chemicals in products and packaging materials. Even if PFAS were to be listed as CERCLA hazardous substances, it is unclear whether the CERCLA can be used as the primary vehicle for holding manufacturers liable for the costs of remediating contamination from PFAS used in products or packaging material. The CERCLA imposes strict, joint and several liability for the costs of remediation on those who “arranged for disposal” of hazardous substances.¹⁷⁰ But manufacturers, who sell a useful product that subsequently is used by others in a manner that releases hazardous substances, generally have not been deemed to have “arranged for disposal.”¹⁷¹

D. *The RCRA: PFAS Not Designated as “Hazardous Waste”*

The RCRA mandates “cradle to grave” management of hazardous waste.¹⁷² Similar to the CERCLA’s failure to regulate PFAS as a hazardous substances, PFAS-contaminated waste is also not listed as a “hazardous waste” under the RCRA’s statutory scheme.¹⁷³ Hence, DuPont was able to lawfully dump its PFAS-laden waste in an unlined and unregulated landfill that poisoned drinking water.¹⁷⁴ Designating PFAS-laden waste as hazardous waste would open the door to regulating generators of PFAS as well as operators of treatment, storage, and disposal facilities. Under the RCRA,

168. See *New Hampshire v. Exxon Mobil Corp.*, 126 A.3d 266, 311 (N.H. 2015).

169. See, e.g., SETTLEMENT AGREEMENT BETWEEN THE STATE OF DELAWARE AND E. I. DU PONT DE NEMOURS AND COMPANY (“EID”), CORTEVA, INC. (“CORTEVA”), THE CHEMOURS COMPANY (“CHEMOURS”), AND DUPONT DE NEMOURS, INC. (“DUPONT”) 4 (2021), <https://attorneygeneral.delaware.gov/wp-content/uploads/sites/50/2021/07/2021-07-13-EXECUTED-PFAS-Settlement-Agreement-DuPont-Corteva-Chemours.pdf>; Amy Cherry, *A Landmark Settlement: Delaware Gets \$50M from DuPont, Other Chemical Companies for PFAS Cleanup*, WDEL.COM (Jul. 13, 2021, 4:31 PM) https://www.wdel.com/news/a-landmark-settlement-delaware-gets-50m-from-dupont-other-chemical-companies-for-pfas-clean-up/article_8d616c5c-e40d-11eb-a379-f7ed59c42056.html.

170. 42 U.S.C. § 9607(a)(3).

171. See *Burlington N. & Santa Fe Ry. Co. v. United States*, 556 U.S. 599, 608–09 (2009).

172. Resource Conservation and Recovery Act (RCRA), 42 U.S.C. § 6901. RCRA was amended in 1992 to clarify RCRA’s application to federal facilities. Federal Facilities Compliance Act of 1992 (FFCA), Pub. L. No. 102-386, 106 Stat. 1505 (1992).

173. 42 U.S.C. § 6901.

174. See Rich, *supra* note 7. This led to the death of Earl Tennant’s livestock and thousands of serious health problems for citizens of Parkersburg, West Virginia. See *supra* Part I.B.

hazardous waste generators would be required to “keep proper records of production and disposal, label products containing PFAS, and report levels of disposal.”¹⁷⁵ Hazardous waste can only be transported by licensed transporters, and treatment, storage, and disposal facilities for such waste must be licensed and are strictly regulated.¹⁷⁶ The RCRA also enables the EPA to conduct inspections at facilities to ensure that treatment, storage, and disposal facilities (and manufacturers) are complying with existing regulations.¹⁷⁷

E. The Clean Water Act

The Clean Water Act seeks to “restore and maintain the chemical, physical, and biological integrity of the nation’s waters.”¹⁷⁸ To accomplish this goal, the EPA regulates point source pollution, requiring facilities that discharge any point source “pollutants” to obtain a National Pollutant Discharge Elimination System (“NPDES”) permit.¹⁷⁹ This permit process is administered by either a state environmental authority or the EPA.¹⁸⁰ Under the Clean Water Act, the EPA also establishes Effluent Guidelines for various industrial categories.¹⁸¹ Despite widespread PFAS contamination in our nation’s navigable waters, PFAS have escaped regulation as point source discharges. The EPA has only recently considered using Clean Water Act authorities as a possible tool to address PFAS. Indeed, the Clean Water Act did not focus on effluent standards for PFAS until 2016, when the EPA identified PFAS as a chemical for “future investigation.”¹⁸²

Under the PFAS Action Plan, PFAS can conceivably be regulated as pollutants within the meaning of the Clean Water Act.¹⁸³ Yet, states have failed to exercise this authority, in part because national Effluent Guidelines do not already regulate PFAS. The EPA has begun to consider using the Clean Water Act to regulate PFAS through the establishment of an intra-agency working group.¹⁸⁴ While it remains to be seen how these nascent efforts will be

175. Dean et al., *supra* note 30 (arguing that RCRA approach results in “a more stringent regulatory pathway than TSCA for managing PFAS that cannot be eliminated or substituted”).

176. *Id.*

177. *Id.*

178. 33 U.S.C. § 1311.

179. 33 U.S.C. § 1342(a) (2020).

180. *Id.*

181. *Id.* § 1311(b)(2)(A).

182. ENV’T PROT. AGENCY, FINAL 2016 EFFLUENT GUIDELINES PROGRAM 7-2 (2018).

183. BEARDEN ET AL., *supra* note 31, at 23.

184. *Id.* at 50.

implemented, DuPont's NPDES permit in North Carolina has regulated the discharge of just one PFAS—"GenX."¹⁸⁵

F. The EPCRA

Finally, under the EPCRA, federal facilities must report any toxic "release" to the EPA's TRI.¹⁸⁶ Under a recent DoD appropriations bill, Congress mandated that the EPA list many PFAS on the TRI.¹⁸⁷ This will at least improve the information available to regulators concerning how much and what kinds of PFAS are being produced and released into the environment. There are limits to the EPCRA and the TRI reporting process as it does not reveal whether or to what extent the public is exposed to these listed chemicals.¹⁸⁸ It does, however, help offer a possible regulatory piece to the PFAS data puzzle. And this information can be used "in conjunction with other information to evaluate the risks posed by exposure."¹⁸⁹

In sum, any one of these six statutes could be employed to address the growing PFAS regulatory gap. Unfortunately, many of the regulatory efforts have focused on addressing the hazards posed by just two legacy PFAS (PFOS and PFOA).¹⁹⁰ The table below provides a snapshot of potential PFAS regulation under existing federal environmental laws.

185. GAO REPORT, *supra* note 43, at 17; *GenX Information for Residents*, N.C. ENV'T QUALITY, <https://deq.nc.gov/news/key-issues/genx-investigation/genx-information-residents> (last visited Feb. 2, 2022).

186. Emergency Planning and Community Right to Know Act, 42 U.S.C. § 116. "The term 'release' means any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of barrels, containers, and other close receptacles) of any hazardous chemical, extremely hazardous substance, or toxic chemical." 42 U.S.C. § 11049(8).

187. H.R. 2467, 117th Cong. § 8 (2021).

188. GAO REPORT, *supra* note 43, at 11–12.

189. *Id.* at 12.

190. Professors Gold and Wagner note, "At present, there is little to indicate whether the environmental dissemination of these substitute PFASs is benign or harmful, and if harmful, how harmful." Gold & Wagner, *supra* note 20, at 1068.

TABLE A. POTENTIAL PFAS REGULATION UNDER FEDERAL ENVIRONMENTAL LAWS

Statute	Potential PFAS Regulation ¹⁹¹
<i>Safe Drinking Water Act (SDWA)</i>	(1) Establishment of a national drinking water standard (2) Use of emergency or urgent threat authorities to expedite drinking water regulations
<i>Toxic Substances Control Act (TSCA)</i>	Premanufacture notice (Section 5) and Information gathering (Section 8)
<i>Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)</i>	PFAS designation as a “hazardous substance”
<i>Resource Conservation and Recovery Act (RCRA)</i>	PFAS designation as a “hazardous waste”
<i>Clean Water Act</i>	PFAS designation as a “pollutant” or establishment of effluent limitations
<i>Emergency Planning and Community Right-to-Know Act (EPCRA)</i>	Mandatory reporting of a release under the Toxic Release Inventory

G. Regulating PFAS as a Chemical Class: The Constant Challenge of New PFAS

To date, Congress, the EPA, and state regulators have largely focused their efforts on regulating two specific long-chain PFAS: PFOS and PFOA. Because these legacy chemicals have also been the focus of voluntary industry actions, they have been steadily phased out while other variants—of unknown risk—slip through. Indeed, initial research suggests that short-chain PFAS variants have the same level of toxicity and pose the same danger to human health as long-chain variants.¹⁹² Meanwhile, the EPA and state regulators are constantly trying to catch up to the latest chemical developments. In conjunction with the EPA, the Agency for Toxic Substances and Disease Registry (“ATSDR”) develops guidelines for assessing chemical exposure risks under various agency programs.¹⁹³ Unfortunately, little is still known about most PFAS, and health and

191. This table reflects many of the legislative proposals in the PFAS Action Act of 2021. While this Article focuses on federal environmental governance efforts, some states have begun to take steps to ban PFAS within their respective jurisdictions. See, e.g., Tom Perkins, *Maine Bans Toxic ‘Forever Chemicals’ Under Groundbreaking New Law*, THE GUARDIAN (Jul. 15, 2021), <https://www.theguardian.com/us-news/2021/jul/15/maine-law-pfas-forever-chemicals-ban>.

192. Dean et al., *supra* note 30.

193. *Id.*

safety data for the vast majority of PFAS variants remain inadequate.¹⁹⁴ Our understanding of the environmental effects of PFAS continues to evolve as “uncertainties remain about health effects that may be associated with exposures to various PFAS.”¹⁹⁵ While tort litigation acts as a regulatory backstop to the creation of new PFAS variants, Bilott’s continual efforts highlight the information asymmetry that too often exists between manufacturers and regulators.¹⁹⁶ As PFOS and PFOA are *voluntarily* phased out by manufacturers, thousands of other PFAS variants remain in the commercial mainstream. Just one minor change in the carbon chain may create a unique chemical that slips through the existing regulatory cracks.

III. A HIDDEN “ENEMY” – CHEMICAL EXPOSURE AT MILITARY INSTALLATIONS & SURROUNDING COMMUNITIES

A. *The Military & PFAS: Challenges and Opportunities for Action*

As Congress has slowly ramped up its PFAS regulatory efforts, the DoD has argued that PFAS-laden firefighting equipment is essential to fight fires onboard Navy ships and on military installations.¹⁹⁷ This is due to the DoD’s strict standard governing how fast a fire must be extinguished on military installations and vessels.¹⁹⁸ To date, non-PFAS firefighting equipment has fallen short of this standard.¹⁹⁹ But PFAS runoff from military installations seeps into the groundwater and public drinking supplies, harming military service members, their families, and surrounding communities.²⁰⁰

194. GAO REPORT, *supra* note 43, at 1. “For most PFAS, there is limited or no toxicity information.” *Id.* at 1 n.3.

195. BEARDEN ET AL., *supra* note 31, at 4.

196. And this is not just tort litigation brought by consumers exposed to PFAS. See Morgan Conley, *DuPont, Others Commit \$4B to ‘Forever Chemical’ Liability*, LAW360 (Jan. 22, 2021, 6:38 PM), <https://www.law360.com/articles/1347674>.

197. *AFFF Report*, *supra* note 17, at 1–2; see also Eric Lipton & Julie Turkewitz, *Pentagon Pushes for Weaker Standards on Chemicals Contaminating Drinking Water*, N.Y. TIMES (Mar. 14, 2019) <https://www.nytimes.com/2019/03/14/us/politics/chemical-standards-water-epa-pentagon.html>.

198. U.S. GOV’T ACCOUNTABILITY OFF., FIREFIGHTING FOAM CHEMICALS 26–27 (2021).

199. This is not a theoretical problem, as evidenced by recent fires onboard the USS BONHOMME RICHARD and USS MIAMI that resulted in the loss of Navy warships valued in the hundreds of millions of dollars. *USS Bonhomme Richard Fire: Suspect Identified as 20-Year-Old Navy Sailor*, BBC NEWS (Aug. 4, 2021), <https://www.bbc.com/news/world-us-canada-58091854>.

200. See, e.g., David S. Cloud, *‘Our Voices Are Not Being Heard’: Colorado Town a Test Case for California PFAS Victims*, L.A. TIMES, (Jan. 30, 2020, 3:00 AM), <https://www.latimes.com/politics/story/2020-01-30/california-pfas-water->

Indeed, PFAS-laden streams adjacent to military installations often exceed the EPA’s health advisory.²⁰¹

While the DoD has continued to use PFAS in its firefighting equipment, it has also sought federal regulatory consistency. As an enormous landowner with facilities in nearly all fifty states, the DoD desires to move away from the state-by-state, ad hoc approach to a single PFAS federal regulatory standard.²⁰² Complicating matters, military installations are routinely closed and turned over for local community use via a congressionally mandated Base Realignment and Closure process.²⁰³ These former bases are often the oldest and most heavily contaminated in the DoD’s inventory. This process requires long-term, expensive remediation before the community can safely enjoy their use.²⁰⁴ And the harm is widespread: PFAS contamination has turned up in the drinking water of 126 of the 401 military installations where PFAS were used.²⁰⁵ Yet the DoD’s reliance on PFOS and PFOA presents both challenges *and* opportunities.

One particular challenge exists to combatting these widespread harms: courts already afford the military a certain amount of deference, allowing the military to potentially sidestep environmental oversight.²⁰⁶ Further, military servicemembers are prohibited from filing tort lawsuits against their employer due to the longstanding *Feres* doctrine.²⁰⁷

contamination-colorado (discussing PFAS runoff from an Air Force base to the town of Fountain, Colorado).

201. *Toxic Threat*, *supra* note 16, at 4–5.

202. For a discussion of how federal environmental law applies to the military via sovereign immunity waivers, see generally Mark P. Nevitt, *Defending the Environment: A Mission for the World’s Militaries*, 36 HAW. L. REV. 27 (2014); Robert V. Percival, *Overcoming Interpretive Formalism: Legislative Reversals of Judicial Constructions of Sovereign Immunity Waivers in the Environmental Statutes*, 43 WASH. U. J. URBAN & CONTEMP. L. 221 (1993).

203. *Base Closure at Federal Facilities*, ENV’T PROT. AGENCY, <https://www.epa.gov/fedfac/base-closure-federal-facilities> (last visited Feb. 2, 2022).

204. An example of this is Joint Reserve Base Willow Grove outside Philadelphia. *Willow Grove Naval Air and Air Reserve Station*, ENV’T PROT. AGENCY, <https://cumulis.epa.gov/supercpad/SiteProfiles/index.cfm?fuseaction=second.cleanup&id=0303820> (last visited Feb. 2, 2022).

205. Lipton & Turkewitz, *supra* note 197. Many of these installations share public water systems with the local community.

206. See Kathryn E. Kovacs, *Leveling the Deference Playing Field*, 90 OR. L. REV. 583, 592 (2011); see also, e.g., *Winter v. Nat. Res. Def. Council*, 555 U.S. 7, 24 (2008).

207. See generally *Feres v. United States*, 340 U.S. 135 (1950). Active military servicemembers are prohibited from suing the government pursuant to the *Feres* doctrine. See *id.* at 146. Nevertheless, servicemembers that suffer from “service connected” disabilities, including toxic environmental exposure, may receive a lifetime compensation and pension benefit for any documented health effects.

Can citizens (nonservicemembers) sue the military? Under many environmental laws, the answer is yes. Several relevant environmental statutes have citizen suit provisions that apply to federal agencies,²⁰⁸ and the Administrative Procedure Act (“APA”) applies to the military departments.²⁰⁹ And the Federal Tort Claims Act (“FTCA”) also authorizes tort claims against the United States in certain instances.²¹⁰

An additional challenge: despite the DoD’s desire for a uniform drinking water standard, the Pentagon has pushed back on broader PFAS remediation efforts at military bases, arguing that environmental cleanup is funded to the regulatory standard.²¹¹ As the EPA does not yet impose a regulatory standard for PFAS in our drinking water supplies, military cleanup efforts have suffered.

Despite these constitutional and regulatory challenges, the DoD’s PFAS reliance offers several opportunities to spark further PFAS progress. First, the DoD has actually led the private sector in communicating PFAS danger, voluntarily testing for PFAS at current and former installations.²¹² This information is provided to local communities, which has led to increased citizen engagement, oversight, and a flurry of new lawsuits.²¹³ Congress has held several hearings on PFAS contamination of drinking water supplies and the need for PFAS remediation.²¹⁴ And Congress passes an annual defense spending bill every year, a convenient legislative vehicle to address PFAS on and off military installations.²¹⁵

Veteran Benefits, 38 U.S.C. §§ 1101–1166. To date, the Department of Veterans Affairs has denied VA disability claims based upon health ailments connected to PFAS exposure. *VA Denies Link Between PFAS Foam and Health Issues in Military Fire Fighters*, L. FIRM NEWSWIRE (June 30, 2021), <https://www.lawfirmnewswire.com/2021/06/va-denies-link-between-pfas-foam-and-health-issues-in-military-fire-fighters/>.

208. For example, the Clean Water Act has a citizen suit provision that applies to federal agencies. 33 U.S.C. § 1365(a)(1).

209. Freedom of Information Act, 5 U.S.C. § 552(f)(1).

210. 28 U.S.C. §§ 2671–2680. For non-military members, the FTCA provides a broad defense for “discretionary functions” performed by federal agencies in carrying out their respective missions; see KEVIN M. LEWIS, *THE FEDERAL TORTS CLAIM ACT (FTCA): A LEGAL OVERVIEW* 18 (2019), <https://sgp.fas.org/crs/misc/R45732.pdf>.

211. *AFFF Report*, *supra* note 17, at 6 (stating that “[b]ecause the LHA is unenforceable guidance, it cannot qualify as a cleanup standard under CERCLA”). These costs are now estimated to be in the billions. U.S. GOV’T ACCOUNTABILITY OFF., *supra* note 198, at 20.

212. Zeeb et al., *supra* note 39, at 10121.

213. *Id.*

214. HUMPHREYS, *supra* note 133, at 4.

215. Camp Lejeune, a Marine Corps base in North Carolina, has a long history of drinking water contamination. See, e.g., Renee Schoof, *Under 2012 Law, VA to Cover Health Costs of Marines’ Ill Dependents at Camp Lejeune*, WASH. POST (Sep. 24, 2014), <https://www.washingtonpost.com/politics/va-to-cover-health->

A second opportunity: because the military operates in nearly every U.S. state and territory, diverse members of Congress across the nation have a concrete stake in PFAS remediation. PFAS cleanup is one of the few bipartisan issues before Congress.²¹⁶ While the DoD still attempts to comply with the hodgepodge of state environmental drinking water standards, these drinking water standards are, literally, all over the map. Failure to comply with state and local regulations could also strain civilian-military relations, leading to greater congressional oversight. In response to these varying standards, the DoD has proposed that the EPA implement a single, nationwide drinking water standard.²¹⁷

As the DoD does more PFAS testing at its military locations and Congress is mandating testing and oversight, this information is shared with the broader public.²¹⁸ Hence, communities no longer need to rely upon tort litigation and discovery alone to understand their PFAS exposure. Lawsuits against the military have ensued, challenging the effectiveness of base cleanup mechanisms.²¹⁹ Due in large part to DoD-sponsored testing and congressional oversight, PFAS tort litigation has exploded as plaintiffs have filed suits against AFFF manufacturers and distributors. For example, more than 500 AFFF-related cases have been consolidated in the U.S. District Court for the District of South Carolina.²²⁰ But as we argue below, the doctrine of sovereign immunity—authorizing lawsuits against federal agencies—is hindered by environmental law’s underlying failure to regulate PFAS as a chemical class.²²¹

care-costs-marine-dependents-who-were-at-camp-lejeune/2014/09/24/caee5212-4430-11e4-b47c-f5889e061e5f_story.html.

216. E.A. Crunden, *House Passes Sweeping PFAS Bill With Bipartisan Support*, E&E NEWS (July 21, 2021, 3:31 PM), <https://www.eenews.net/articles/house-passes-sweeping-pfas-bill-with-bipartisan-support/>.

217. *AFFF Report*, *supra* note 17, at 6.

218. Zeeb et al., *supra* note 39, at 10121 (“DoD has been at the forefront of [the PFAS] issue and has been voluntarily testing their [AFFF] sites . . . [and] publicly notifying private and public well owners of levels they’re finding [that] exceed the health advisory levels.”).

219. *See generally, e.g.*, *New York v. United States*, 620 F. Supp. 374 (E.D.N.Y. 1985). Too often, poorer communities disproportionately lack access to a safe, reliable drinking water supply. *See* US WATER ALLIANCE, CLOSING THE WATER ACCESS GAP IN THE UNITED STATES: A NATIONAL ACTION PLAN 8 (2019).

220. *Aqueous Film-Foaming Foams (AFFF) Products Liability Litigation, MDL No. 2873*, U.S. District Court for the District of South Carolina, <https://www.scd.uscourts.gov/mdl-2873/index.asp> (last visited Feb. 11, 2022).

221. This is made more difficult because none of the PFAS has been designated as a CERCLA “hazardous substance.” *See* discussion *supra* Part II.C.

B. Environmental Law, Federal Facilities, and Sovereign Immunity

Under congressional waivers of sovereign immunity, federal, state, and local environmental laws largely apply to military activities within the United States.²²² These sovereign immunity waivers require that all federal agencies—including the DoD—comply with all federal, state, and local environmental regulations in the same manner and to the same extent as nongovernmental entities.²²³ As a federal agency covered both by the APA and provisions in many federal environmental statutes, the DoD is subject to the APA's regulatory requirements and applicable standards of judicial review.²²⁴

Additionally, within many environmental statutes, citizen suit provisions grant citizens a prescriptive right to sue federal agencies in court. The CERCLA, for example, applies to military activities, and its sovereign immunity provision is analogous to many provisions peppered throughout environmental law.²²⁵ It states:

Each department, agency, and instrumentality of the United States (including the executive, legislative, and judicial branches of government) shall be subject to, and comply with, this chapter in the same manner and to the same extent, both procedurally and substantively, as any nongovernmental entity, including liability under section 9607 ["covered persons"] of this title.²²⁶

The military complies with environmental laws only to the extent that Congress has expressly waived sovereign immunity for federal actions and activities.²²⁷ Yet no federal environmental statute

222. See Nevitt, *supra* note 202, at 34–35.

223. 42 U.S.C. § 9620(a)(1).

224. Jonathan Masur, *A Hard Look or a Blind Eye: Administrative Law and Military Deference*, 56 HASTINGS L.J. 441, 512–13 (2005). Each agency action must not be “arbitrary” or “capricious.” Administrative Procedure Act, 5 U.S.C. § 706; see also JARED P. COLE, AN INTRODUCTION TO JUDICIAL REVIEW OF FEDERAL AGENCY ACTION 9 (2016), <https://fas.org/sgp/crs/misc/R44699.pdf>. The President can still waive certain environmental requirements if he determines that it may be necessary to protect the national security interests of the United States. 42 U.S.C. § 9620(j)(1). Other environmental statutes—such as the Clean Water Act—provide waivers when the President determines that it is in the “paramount interest” of the United States to do so. 33 U.S.C. § 1323(a). Under the TSCA, the EPA Administrator “shall waive compliance with any provision of this chapter upon a request and determination by the President that the requested waiver is necessary in the interest of national defense.” 15 U.S.C. § 2621.

225. See 42 U.S.C. § 9620(a)(1).

226. *Id.* For a critique of the sovereign immunity doctrine, see generally Erwin Chemerinsky, *Against Sovereign Immunity*, 53 STAN. L. REV. 1201 (2001).

227. These waivers of sovereign immunity can be found in most major environmental statutes. Nevitt, *supra* note 202, at 33–44. The DoD also has

prohibits or affirmatively regulates PFAS, making it exceedingly difficult to litigate against the DoD (or any military service) for PFAS violations. We call this the “sovereign immunity paradox.” While Congress has broad sovereign immunity provisions that hold the promise of keeping the DoD’s PFAS contamination in check, Congress has failed to enact prescriptive PFAS regulations that would apply to the military. Unlike efforts to regulate private industry, state regulators’ hands are often tied if they attempt to go beyond the relevant federal statutory provision in holding military bases within their state accountable. Washington and Maine—both home to military installations—have passed legislation banning nonessential PFAS use.²²⁸ Similarly, in the absence of EPA action, California and Massachusetts have enacted strong state standards for PFAS, while Florida—home to several military installations—has chosen not to do so.²²⁹ Do these PFAS restrictions apply to DoD activities in the state?²³⁰ Unlikely. Any state PFAS regulation has to be tied back to a governing federal statute with enforceability provisions. Any relevant sovereign immunity provision must be clear and unambiguous, consistent with prior Supreme Court opinions.²³¹

Consider how this sovereign immunity paradox applies in practice. The SDWA delegates broad authorities to states to enforce drinking water standards and establish an enforceable regulatory standard.²³² All federal agencies—including the DoD—are subject to,

special CERCLA response authorities. 10 U.S.C. § 2701(c)(1). These CERCLA authorities have been used to respond to PFAS releases at federal agencies and active and decommissioned military installations. *See supra* Part II.C. In addition, the DoD has promulgated a manual addressing environmental restoration that is applicable to all the military services. *See generally* U.S. DEPT OF DEF., MANUAL 4715.20, DEFENSE ENVIRONMENTAL RESTORATION PROGRAM (DERP) MANAGEMENT (2012) [hereinafter DoDM 4715.20].

228. Perkins, *supra* note 191; *Washington State, U.S., Prohibits PFAS in Certain Food Packaging*, SGS (Mar. 4, 2021), <https://www.sgs.com/en/news/2021/03/safeguards-02921-washington-state-us-prohibits-pfas-in-certain-food-packaging>.

229. David Brankin et al., *State-by-State Regulation of PFAS Substances in Drinking Water*, JD SUPRA (June 10, 2021), <https://www.jdsupra.com/legalnews/state-by-state-regulation-of-pfas-9713957/>.

230. This state-by-state approach raises additional questions. Why do servicemembers (and the local community) at Fort Drum in New York have one drinking water standard while servicemembers at military installations in Florida have another, far more dangerous standard? Contamination at military bases alone should be a reason for national standards so that national defense will not be jeopardized by a welter of local standards.

231. *United States v. Mitchell*, 445 U.S. 535, 538 (1980).

232. Of course, the DoD can issue its own drinking water standard. *See generally* U.S. DEPT OF NAVY, OPNAVINST 5090.1D, ENVIRONMENTAL READINESS PROGRAM (2014). Military installations overseas comply with what is known as “foreign governing standards.” *See* U.S. DEPT OF DEF., DIR. 6050.16, DOD POLICY FOR ESTABLISHING AND IMPLEMENTING ENVIRONMENTAL STANDARDS AT OVERSEAS

and must comply with, all federal, state, interstate, and local requirements respecting the protection of wellhead areas, public water systems, and underground “injection[s]” into the water systems.²³³ Under the SDWA’s sovereign immunity waiver, citizens and states are authorized to bring a civil suit against the DoD for violations of any SDWA *requirement*.²³⁴ But the EPA has not imposed a national drinking water standard, and PFAS from military bases enter larger bodies of water via a process called “venting groundwater,” not point source charges.²³⁵ As states sue military departments for PFAS contamination and remediation, the DoD is arguing that any sovereign immunity waiver must originate from clear and affirmative federal legal requirements. None of the six federal statutes discussed above clearly regulate PFAS, so the sovereign immunity waivers fall short. For example, PFAS are not considered a point source discharge under the Clean Water Act, and PFAS are not defined as “hazardous substances” under the CERCLA—a point recently made by the Air Force in response to Michigan state regulatory efforts.²³⁶

While the Pentagon has argued for a single drinking water standard, questions arise about what that standard should be. The DoD has argued that the appropriate PFAS cleanup level is 380 ppt, more than five times the proposed EPA advisory drinking level of 70 ppt.²³⁷ Studies have shown that PFAS cause multiple health

INSTALLATIONS (1991) [hereinafter DoDD 6050.16]; *see also* U.S. DEP’T OF DEF., DIR. 4715.05-G, OVERSEAS ENVIRONMENTAL BASELINE GUIDANCE DOCUMENT 11–12 (2007).

233. 42 U.S.C. § 300j-6(a). The SDWA discusses four different activities in which federal agencies engage that require compliance with SDWA requirements. *See* 42 U.S.C. §§ 300j-6(a)(1)–(4) (These listed activities are: “(1) owning or operating any facility in a wellhead protection area; (2) engaged in any activity at such facility resulting, or which may result, in the contamination of water supplies in such area; (3) owning or operating any public water system; or (4) engaged in any activity resulting, or which may result in, underground injection which endangers drinking water . . .”).

234. 42 U.S.C. § 300j-8(a)(1) (“[A]ny person may commence a civil action on his own behalf (1) against any person (including (A) the United States, and (B) any other governmental instrumentality or agency to the extent permitted by the eleventh amendment to the Constitution) who is alleged to be in violation . . .”).

235. Beth LeBlanc, *Air Force Scolds Michigan for Tough Tone on Wurtsmith Contamination*, DETROIT NEWS (July 1, 2019, 3:16 PM), <https://www.detroitnews.com/story/news/local/michigan/2019/01/30/air-force-scolds-michigan-tough-tone-wurtsmith-contamination/2713116002/>.

236. *Id.* The Air Force recently made this point when Michigan state environmental regulators sought to enforce state and federal water regulations at a former Air Force Base. *Id.*

237. Tara Copp, *With Lawsuits on the Horizon, DoD Looks for Ways to Cut Contaminated Water Cleanup Costs*, MIL. TIMES (Mar. 15, 2019), <https://www.militarytimes.com/news/your-military/2019/03/15/with-lawsuits-on-the-horizon-dod-looks-for-ways-to-cut-contaminated-water-cleanup-costs/>.

problems at far lower doses.²³⁸ Studies have also linked PFAS to cancer, thyroid problems, fertility issues, and endocrine disorders.²³⁹ Several states have gone beyond congressional requirements by either accelerating the ban on AFFF or placing restrictions on its use.²⁴⁰ Several states have also gone beyond the EPA’s health advisory by establishing lower MCLs. New York, for example, recently announced a MCL standard of 10 ppt for PFAS and PFOA.²⁴¹

Finally, the DoD has an enormous footprint outside the United States. PFAS problems have emerged overseas on military installations, causing mounting diplomatic issues.²⁴² Unless there is an extraterritorial provision within the U.S. domestic environmental statute, the statute’s provisions do not apply overseas.²⁴³ While there are gaps in *domestic* PFAS environmental governance, the problem of *international* PFAS contamination raises a host of legal, foreign relations, and diplomatic issues that are beyond the scope of this Article. But thankfullfully none of the six environmental statutes discussed in Part II has an extraterritorial provision that clearly applies. While the U.S. military largely complies with host nation environmental regulation, these efforts often fall short.²⁴⁴

Camp Lejeune, a Marine Corps installation in North Carolina, has a large military population that was exposed to unsafe drinking water over several years due to chemicals seeping into the drinking water. See UNION OF CONCERNED SCIENTISTS, A TOXIC THREAT: GOVERNMENT MUST ACT NOW ON PFAS CONTAMINATION AT MILITARY BASES 4–5 (2018), <https://www.ucsusa.org/sites/default/files/attach/2018/09/a-toxic-threat-pfs-military-fact-sheet-ucs-2018.pdf>. “Nearly 1 million people were exposed to drinking water having TCE concentrations as much as 3,400 times higher than safe levels.” *Id.* at 5. Under sovereign immunity waivers, the military must “comply with[] all Federal, State, interstate, and local requirements, administrative authority, and process and sanctions respecting the control and abatement of water pollution in the same manner, and to the same extent as any nongovernmental entity[.]” 33 U.S.C. § 1323(a). This language is mirrored in other relevant federal environmental laws such as the SDWA. See, e.g., 42 U.S.C. § 300j-8(a).

238. The ATSDR recently found that very low doses of PFOS, PFOA can cause increased cancer risk. BUSER ET AL., *supra* note 114, at 523–28.

239. See ENV’T PROT. AGENCY, FACT SHEET: PFOA AND PFOS DRINKING WATER HEALTH ADVISORIES 2 (2016), https://www.epa.gov/sites/production/files/2016-06/documents/drinkingwaterhealthadvisories_pfoa_pfos_updated_5.31.16.pdf.

240. See *supra* notes 228–29 and accompanying text.

241. N.Y. STATE DEP’T OF HEALTH, PUBLIC WATER SYSTEMS AND NYS DRINKING WATER STANDARDS FOR PFOA, PFOS AND 1,4-DIOXANE (2020).

242. See, e.g., Sharon Lerner, *U.S. Military Responsible for Widespread PFAS Pollution in Japan*, THE INTERCEPT (Nov. 7, 2020), <https://theintercept.com/2020/11/07/military-pfas-pollution-japan/>.

243. EEOC v. Arabian Am. Oil Co., 499 U.S. 244, 248 (1991); Nevitt, *supra* note 202, at 36.

244. See, e.g., Kim David Chanbonpin, *Holding the United States Accountable for Environmental Damage Caused by the U.S. Military in the Philippines, A Plan for the Future*, 4 APLPJ 320, 373–376 (2003); Margaret Carlson, *Environmental*

C. Defense Spending Bills: Presenting Opportunities and Challenges for PFAS Regulation

For years, the military has used PFAS-laden AFFF to extinguish fires onboard naval vessels and military installations at home and abroad.²⁴⁵ Since 2018, defense spending bills have addressed PFAS in some capacity, and PFAS remediation at military bases will appear on the congressional radar for the foreseeable future. Annual defense spending bills offer a steady and plausible legislative vehicle to address PFAS more broadly. This transparency and oversight are working hand in hand with tort litigation and other legislative efforts to include the Filthy Fifty Act²⁴⁶ and PFAS Action Act of 2021.²⁴⁷

1. Defense Spending Bills: A Steady Vehicle for PFAS Action

The 2018 National Defense Authorization Act marked the first time that Congress sought to affirmatively regulate PFAS through the defense spending bill process, requiring the Secretary of Defense to issue a report on workable alternatives to AFFF.²⁴⁸ As part of this report, Congress mandated that the DoD develop a new military specification for safe and effective AFFF alternatives that do not contain PFAS, update Congress on its plans to replace AFFF at military installations, and update Congress on planned research and development for AFFF alternatives not laden with PFAS.²⁴⁹ The Act also required the DoD to provide an assessment of how:

[T]he establishment of a maximum contaminant level for PFOA or PFOS under the Safe Drinking Water Act . . . rather than the current health advisory level, would impact the Department's mitigation actions, prioritization of such actions, and research and development related to PFOA and PFOS.²⁵⁰

In the 2018 defense bill, Congress also tasked outside federal agencies, including the Health and Human Services (“HHS”), to

Diplomacy: Analyzing Why the U.S. Navy Still Falls Short Overseas, 47 NAVAL L. REV. 62, 77 (2000).

245. See *AFFF Report*, *supra* note 17, at 1. In addition, airports and municipal fire departments have also used PFAS-laden AFFF, although this nonmilitary use has been slowly phased out over time. See, e.g., BEARDEN ET AL., *supra* note 31, at 3. There are two types of firefighting foams. INTERSTATE TECH. & REGUL. COUNCIL, AQUEOUS FILM-FORMING FOAM (AFFF) 1, 5 (2018). Class A foams are designed to combat wildfires and structural fires, and Class B foams are designed to fight fires caused by flammable liquids. *Id.* Much of the concern within the DoD focuses on Class B foams, which is used on shipboard fires. See *id.* at 1.

246. PFAS Filthy Fifty Act, H.R. 4241, 117th Cong. (2021).

247. PFAS Action Act of 2021, H.R. 2467, 117th Cong. (2021).

248. National Defense Authorization Act for Fiscal Year 2018, Pub. L. No. 115-91, § 1059, 131 Stat. 1283, 1573 (2017).

249. *Id.* § 1059 (b).

250. *Id.* § 1059(b)(4).

“commence a study on the human health implications of . . . (PFAS) contamination in drinking water, groundwater, and any other sources of water and relevant exposure pathways”²⁵¹ Further, the HHS Secretary must “conduct an exposure assessment of no less than 8 current or former domestic military installations known to have PFAS contamination in drinking water”²⁵² This study and assessment are due in 2022.²⁵³

In response to the 2018 defense spending bill, the DoD released an AFFF report, which addressed two specific, positive impacts of establishing a nationwide drinking standard for PFOS and PFOA.²⁵⁴ It did not delve into the broader—and much more difficult—question of PFAS drinking water standards.

First, the report addressed fifty varying state drinking standards, the problems associated with lifetime health advisories (“LHA”), and MCL. A MCL nationwide drinking water standard would “help all entities faced with the challenge of addressing PFOS and PFOA in drinking water standards by providing clear, definitive, and consistent requirements on what actions to take and at what levels”²⁵⁵ Further, “a federal MCL would also encourage national consistency rather than the current[,] varying state efforts.”²⁵⁶

Second, the DoD stated that establishing a nationwide drinking water standard should go hand in hand with the military’s growing PFAS remediation efforts.²⁵⁷ Due to fiscal law constraints governing how appropriations are spent, environmental remediation on military bases is funded to the regulatory standard.²⁵⁸ Hence, the EPA’s PFAS LHA does not authorize the DoD to spend money on PFAS remediation efforts as the LHA is only advisory in nature.²⁵⁹ This fiscal law reality is particularly significant for military installations that are in the process of being repurposed for the local community’s

251. *Id.* § 316(a)(1)(A). This section is titled “Centers for Disease Control Study on Health Implications of Per- and Polyfluoroalkyl Substances Contamination in Drinking Water.” *Id.* § 316.

252. *Id.* § 316(b)(1).

253. *See id.* § 316(b)(3)(B).

254. *See AFFF Report, supra* note 17, at 6.

255. *Id.*

256. *Id.*

257. *Id.* at 4–5.

258. *See id.* at 6. This requirement stems from the Constitution, which grants Congress the power to authorize the use of funds, but no money may be spent without a specific appropriation. U.S. CONST. art I, § 9, cl. 7. The use of federal funds to fund environmental remediation efforts is tied to legally enforceable, affirmative obligations. *Cf. United States v. MacCollom*, 426 U.S. 317, 321 (1976) (“The established rule is that the expenditure of public funds is proper only when authorized by Congress, not that public funds may be expended unless prohibited by Congress.”).

259. *AFFF Report, supra* note 17, at 6.

use. Military installations are always being evaluated for potential closure, and numerous bases have closed since the end of the Cold War.²⁶⁰ Unfortunately, the military has an uneven track record in environmental remediation and cleanup both at home and abroad.²⁶¹ Too often, this results in uneven cleanup standards that delay the local community in utilizing the base to its desired use and full potential. Under the CERCLA risk assessment process, the DoD estimates that the groundwater cleanup levels for PFOS or PFOA are approximately 380 ppt, five times the EPA advisory level.²⁶² Linking a drinking water standard to broader remediation efforts in the AFFF Report, the DoD noted the harm caused to civil-military relations:

[T]he lack of a consistent nationwide approach to meeting CERCLA responsibilities makes it difficult for DoD to plan and execute its cleanup program because DoD cannot determine what cleanup activities are needed at a site. As a result, there is rising frustration among states and communities concerning cleanup at DoD installations due to the absence of a clear legal standard. Additionally, in the absence of Federal drinking water standards, some states are issuing regulations and guidance for PFOS and PFOA, thus adding to the uncertainty and confusion. EPA issuance of drinking water standard[sic] would provide nationwide consistency to address PFOS and PFOA.²⁶³

Since the 2018 spending bill and AFFF Report were released, Congress has continued to address PFAS. In the 2019 defense spending bill, for example, Congress banned the DoD from purchasing firefighting foams containing PFAS and prohibited the use of PFAS in military training exercises.²⁶⁴ In 2020, Congress directed the DoD to develop an effective PFAS-free Class B firefighting foam to replace AFFF by October 2024.²⁶⁵ As part of PFAS remediation, Congress

260. See STEPHEN DYCUS, NATIONAL DEFENSE AND THE ENVIRONMENT 125–35 (1996) (discussing the military base closure and realignment process and stating that “[m]ost bases hold accumulations of toxic or radioactive wastes that must be cleaned up to protect future users and nearby residents”).

261. *Id.* at 80–124 (discussing the numerous challenges in cleaning up military bases following the end of the Cold War).

262. *AFFF Report*, *supra* note 17, at 6. The Defense Environmental Restoration Program is the entity responsible for prioritization and execution of cleanups at military bases. *Id.* at 2, 7.

263. *Id.*

264. See National Defense Authorization Act for Fiscal Year 2020, Pub. L. No. 116-92, §§ 322, 324, 133 Stat. 1198, 1307–10 (2019).

265. See *id.* §§ 322(b), (c)(1). Former Deputy Assistant Secretary of Defense for the Environment, Maureen Sullivan, stated that the DoD will prioritize cases that have PFAS concentrations greater than EPA’s 70 ppt advisory limit. See Rebecca Beitsch, *Pentagon Cleanup of Toxic ‘Forever Chemicals’ Likely to Last Decades*, THE HILL (Mar. 22, 2020, 8:30 AM), <https://thehill.com/policy/energy->

required the DoD to enter into cooperative agreements with communities affected by the military’s PFAS use.²⁶⁶ Finally, the 2020 defense spending bill required public water systems to monitor for “all forms of PFAS for which EPA has approved a sampling method.”²⁶⁷

2. Latest Congressional Efforts: The “Filthy Fifty Act” and PFAS Action Act of 2021

Congress has slowly awakened from its regulatory slumber, holding hearings on PFAS and breathing life into authorities within existing federal statutes.²⁶⁸ Specifically, Congress has begun to require that the EPA place PFAS on the amended TRI.²⁶⁹ Senator Kristin Gillibrand (D-NY) recently introduced the “Filthy Fifty Act,” which requires that the DoD test, remove, and remediate PFAS at fifty identified “military installations, formerly used defense sites, and state-owned facilities of the National Guard in the United States.”²⁷⁰ Bilott’s tort litigation and the military’s increased willingness to share information have sparked public awareness and a surge in PFAS civic activism. In turn, PFAS regulatory momentum now extends beyond defense spending bills to include a flurry of legislative proposals.

The Filthy Fifty Act focuses on PFAS contamination at fifty current and former military installations throughout the United States. It requires the Secretary of Defense to submit a report to Congress “identifying the status of efforts to remediate perfluoroalkyl substances and polyfluoroalkyl substances” at each “filthy fifty”

environment/488723-pentagon-cleanup-of-toxic-forever-chemicals-likely-to-last-decades.

266. See National Defense Authorization Act for Fiscal Year 2020, Pub. L. No. 116-92, § 332, 133 Stat. 1198, 1313 (2019).

267. See *id.* § 7311(a)(2)(A). The 2020 NDAA amended the SDWA to increase PFAS monitoring and provided additional funding to address PFAS in public water supplies. See *id.* §§ 7311–12. It also phased out the military’s use of PFAS-laden firefighting foam, see *id.* § 322, and initially sought to designate PFAS as a CERCLA “hazardous substance,” see H.R. REP. NO. 116-333, at 1744 (2019) (Conf. Rep.).

268. As of this writing, Congress is attempting to safeguard the nation’s drinking water supply via the 2021 “Infrastructure Investment and Jobs Act.” See Drinking Water and Wastewater Infrastructure Act of 2021, H.R. 3684, 117th Cong. §§ 50001–50222. Section 50105, titled “Reducing Lead in Drinking Water,” would amend the SDWA to replace all lead service lines. See *id.* § 50105.

269. See *EPA Releases Preliminary Data for 2020 Toxics Release Inventory Reporting, Including First Ever Reporting on PFAS*, ENV’T PROT. AGENCY (July 29, 2021), <https://www.epa.gov/newsreleases/epa-releases-preliminary-data-2020-toxics-release-inventory-reporting-including-first> (noting that the EPA’s 2020 Toxics Release Inventory data “include[d] the first-ever reporting on per- and polyfluoroalkyl substances (PFAS) added to the TRI by the 2020 National Defense Authorization Act (NDAA)”).

270. The Filthy Fifty Act, S. 1973, 117th Cong. (2021).

site.²⁷¹ It also requires the Secretary of Defense “to conduct testing, removal, and remediation of perfluoroalkyl substances and polyfluoroalkyl substances at all military installations, formerly used defense sites, and state-owned facilities of the National Guard in the United States.”²⁷²

The testing must be complete within two years of the Act going into effect.²⁷³ PFAS removal actions at military installations must take place no later than sixty days following the detection of PFAS at a military installation.²⁷⁴ Within ten years of the Act’s enactment, the Secretary is required to complete all physical construction required for the remediation of PFAS at military installations, formerly used defense sites, and state-owned facilities of the National Guard in the United States.²⁷⁵ The Act establishes a strict standard for PFAS removal or remedial action. It mandates that PFAS must comply with the “most stringent” of three standards—“(1) an enforceable State standard . . . for drinking, surface, or groundwater, or soil”; “(2) [a]n enforceable Federal standard for drinking, surface, or groundwater, or soil”; or (3) a SDWA health advisory.²⁷⁶ By adopting this “most stringent” approach, the Act would add regulatory teeth to the SDWA’s health advisory standard.

Finally, the Filthy Fifty Act broadly defines PFAS to include a “man-made chemical of which all of the carbon atoms are fully fluorinated carbon atoms” and to include a “man-made chemical containing a mix of fully fluorinated carbon atoms . . . and nonfluorinated carbon atoms.”²⁷⁷ While it remains unclear whether the Filthy Fifty Act will pass, this legislation does reflect a continual willingness to address PFAS issues outside of the defense spending cycle.

The PFAS Action Act of 2021 goes beyond military bases. It recently passed the House, receiving bipartisan support.²⁷⁸ The Act requires the EPA Administrator to designate PFOA and PFOS as CERCLA hazardous substances.²⁷⁹ In addition, it requires the EPA Administrator to determine, within five years, whether other PFAS are CERCLA hazardous substances.²⁸⁰ The Act also amends the

271. *Id.* § 3(a).

272. *See id.* (introducing the purpose of the bill in the preamble).

273. *See id.* § 2(a).

274. Under the Filthy Fifty Act, the “Secretary shall take removal actions to ensure that all individuals served by a drinking water source contaminated by PFAS from the installation . . . have access to [safe] drinking water.” *Id.* § 2(b).

275. *See id.* § 2(c).

276. *See id.* § 2(d)(1)–(3).

277. *See id.* § 2(e)(2), (4).

278. The bipartisan PFAS Action Act of 2021 passed the House 241–183, with twenty-three Republican lawmakers joining Democrats in supporting the measure. *See* Udasin, *supra* note 13.

279. *See* H.R. 2467, 117th Cong. § 2(a) (2021)

280. *See id.* § 2(b).

SDWA to require the EPA Administrator to promulgate a nationwide PFAS drinking water standard within two years.²⁸¹ The Act also updates the TSCA to mandate PFAS testing, while prohibiting “the manufacture, processing, and distribution [of PFAS].”²⁸² Finally, the PFAS Action Act updates the RCRA to prohibit PFAS incineration and requires the EPA to develop a “PFAS-free” label for consumer products.²⁸³ While the Act’s prognosis in the Senate remains uncertain, President Biden has indicated that he supports it, and the Act, nevertheless, represents a significant step forward in closing the PFAS governance gap within federal environmental law.²⁸⁴

IV. LEGAL PATHWAYS TO ADDRESS THE “FOREVER CHEMICAL” PROBLEM

In what follows, we offer a normative roadmap to guide Congress, states, and the EPA in their ongoing PFAS regulatory efforts. We focus first on embracing a more precautionary approach to chemical regulation that eschews the toxicity honor system. In addition, we argue that prospective chemical regulation must adopt a chemical class-based approach that goes beyond the two legacy PFAS—PFOS and PFOA. Failure to address PFAS as a chemical class before they enter the streams of commerce exposes us to an endless game of regulatory “whack-a-mole” as environmental law lags behind chemical advances.

A. *The Folly of a Chemical-by-Chemical Approach to Regulation & Pathways to Regulatory Action*

Given how long it takes the EPA to complete risk evaluations and the information asymmetry between regulators and industry, it would be fruitless for the EPA to continue to employ a chemical-by-chemical approach or a tiered approach to assess the risks of the thousands of PFAS variants.²⁸⁵ Congress or the EPA should first work with a diverse group of leading scientists within government, the private sector, and academia to develop a clear definition for PFAS that considers both long-chain and short-chain variants.²⁸⁶ Remarkably, we lack a well understood and accepted definition for PFAS as a chemical class.²⁸⁷ But a class-based approach has several benefits. Regulators, for example, can “extrapolate risk from well-

281. *See id.* § 5.

282. *Id.* § 4.

283. *See id.* §§ 9–11.

284. *See* Udasin, *supra* note 13.

285. *See* Kwiatkowski et al., *supra* note 30, at 536; Dean et al., *supra* note 30.

286. *See* Kwiatkowski et al., *supra* note 30, at 537; Dean et al., *supra* note 30.

287. Professor Kwiatkowski, for example, defines PFAS “as chemicals with at least one aliphatic perfluorocarbon moiety (e.g., -C_nF_{2n}-).” Kwiatkowski et al., *supra* note 30, at 532.

understood PFAS when limiting uses of PFAS in commerce or setting protective cleanup levels.”²⁸⁸ A group of scientific researchers, led by Professor Carol Kwiatkowski, further notes:

[I]t is not possible to thoroughly assess every individual PFAS, or combination of PFAS, for their full range of effects in a reasonable time frame. Without effective risk management action around the entire class of PFAS, these chemicals will continue to accumulate and cause harm to human health and ecosystems for generations to come . . . managing PFAS as a class is scientifically sound, will provide business innovation opportunities, and will help protect our health and environment now and in the future.²⁸⁹

While much is known about the toxicity of long-chain PFAS, such as PFOA and PFOS, thousands of other PFAS variants have not been studied, and it will be prohibitively expensive and time-consuming to exhaustively study all PFAS.²⁹⁰ This class-based approach would also avoid the frustrating game of regulatory lag where regulators are a step behind industry advances. Initial studies are not encouraging about these new PFAS, with the HHS’s National Toxicology Program estimating that short-chain PFAS “are associated with the same liver and endocrine toxicities as long[-]chain PFAS.”²⁹¹

The TSCA gives the EPA the tools for a class-based approach if chemicals “are similar in molecular structure, in physical, chemical or biological properties, in use, or in mode of entrance into the human body or into the environment.”²⁹² Federal regulators will likely assert that all PFAS variants meet these criteria because of their similarities in persistence and toxicity. Representative levels of PFAS—such as PFOS or PFOA—whose toxicity is already widely known, can be used to determine what amounts to unreasonable risk under the TSCA’s regulatory scheme. Still, chemical companies will likely challenge a class-based approach to PFAS regulation, asserting that the TSCA only authorizes regulation of a class of chemicals if *each chemical has the same toxicity*—which PFAS do not. One approach would be to shift the burden to chemical manufacturers to establish that the PFAS they produce are substantially less toxic or more essential than the other members of the class.

Regulating PFAS as a class takes time—up to seven years—but subdividing PFAS into smaller classes, such as long-chain or short-chain substances, will only delay action. In the absence of federal action, states have begun to embrace the “all or nothing” PFAS

288. *Id.* at 537.

289. *Id.*

290. *Id.* at 536–37.

291. *See* Dean et al., *supra* note 30 (referencing evidence from the National Toxicology Program).

292. 15 U.S.C. § 2625(c)(2)(A).

regulatory approach. Maine, for example, banned all intentionally added PFAS in products unless the manufacturer can demonstrate that the use is unavoidable.²⁹³

The EPA could also regulate PFAS via Section 6(g) of TSCA’s “critical or essential” use provision, an approach that has attracted interest in the European Union, but that has not yet been used extensively there.²⁹⁴ A new essential use provision would permit the use of chemicals where the manufacturer can demonstrate that the chemical is so useful that it is worth allowing its use while further studies are conducted.²⁹⁵

Of course, the military will argue that its reliance on PFAS in its AFFF firefighting equipment is a critical military function that must meet military performance standards and qualifies as an essential use.²⁹⁶ One alternative would be for the EPA and DoD to negotiate an agreement on AFFF use until an acceptable replacement product is developed. For example, the agreement could authorize AFFF during certain operational deployments outside the United States or on the high seas, far away from drinking water supplies. As a compromise, the DoD could continue to aggressively work with scientists to develop an alternative technology. In the interim, PFAS-laden AFFF would be prohibited at any military installations that is adjacent to a public drinking water supply. The precise details would need to be worked out, but it seems feasible that there is an opening to balance the operational military considerations with the EPA’s mission of safeguarding the health and safety of the local community.²⁹⁷

Finally, the SDWA’s emergency provision could be used with increasing frequency and urgency to address PFAS risks, particularly if legislative efforts fall short. Since 2002, the EPA has turned to the SDWA’s emergency use authority four times to require responses to PFOA contamination of water supplies.²⁹⁸ This includes three times at DoD sites.²⁹⁹ The emergency provision is broadly written such that the EPA Administrator may take “such actions” upon the receipt of information that a contaminant is likely to enter a public drinking

293. See Perkins, *supra* note 191.

294. See Kathleen Garnett & Geert Van Calster, *The Concept of Essential Use: A Novel Approach to Regulating Chemicals in the European Union*, 10 *TRANSNAT’L ENV’T L.* 159, 159 (2021).

295. See *id.* at 167.

296. AFFF forms a vapor barrier that cuts off oxygen to fires—a critical function that is essential on aircraft carriers where the risk of shipboard fires is acute. See *INTERSTATE TECH. & REGUL. COUNCIL*, *supra* note 245, at 1.

297. See Mark Patrick Nevitt, *The Operational and Administrative Militaries*, 53 *GA. L. REV.* 905, 908–11 (2019) (arguing that there are two militaries, one operational and one administrative).

298. TIEMANN & HUMPHREYS, *supra* note 13.

299. *Id.*

water system that “present[s] an imminent and substantial endangerment to the health of [the] person[].”³⁰⁰ While PFAS contamination at numerous military sites meets the standard of endangering public health, relying upon these emergency authorities would fall short of a comprehensive PFAS solution. Still, this provision could pinpoint the worst PFAS contamination sites and perform a stop-gap governance function while a broader regulatory scheme is established.

B. A Call to Rethink Environmental Law’s Reliance on the Toxicity Honor System

The TSCA places a stunning reliance on what amounts to a toxicity honor system, exemplified by Section 8(e) of TSCA.³⁰¹ It places the burden on private entities to affirmatively report to the EPA any chemical that presents a “substantial risk of injury to health or the environment.”³⁰² Requiring “reasonable support” that a substance “presents a substantial risk of injury” offers manufacturers considerable discretion. This self-reporting to the broader public is only as effective as the corporations’ willingness to disclose harmful chemicals. Corporations are often powerfully incentivized to not fully disclose an underlying chemical’s harm and will only do so as a last resort.³⁰³ It has been difficult to pierce this chemical veil of secrecy absent court-ordered discovery. The best available science concerning PFAS health risks remains in the hands of DuPont and private companies, while the trade secrets exemption obfuscates chemical risk even further.

300. 42 U.S.C. §300i (“The action which the Administrator may take may include (but shall not be limited to) (1) issuing such orders as may be necessary to protect the health of persons who are or may be users of such system (including travelers), including orders requiring the provision of alternative water supplies by persons who caused or contributed to the endangerment and (2) commencing a civil action for appropriate relief, including a restraining order or permanent or temporary injunction.”). *But see* Nat’l Fed’n of Indep. Bus. v. Dep’t of Lab., Occupational Safety and Health Admin., 142 S. Ct. 661, 665–66 (2022) (expressing skepticism toward the use of emergency regulatory authority by OSHA to regulate COVID-19).

301. 15 U.S.C. § 2607(e).

302. *See* BILOTT, *supra* note 6, at 95. Bilott continues, “[c]ompanies were required to report to EPA any information they obtained that supported the conclusion that a chemical presents a ‘substantial risk of injury to health or the environment.’ . . . But in practice, the requirement had no teeth; it was essentially self-policing . . . the whole regulatory system in regard to unlisted chemicals . . . as predicated on the assumption of the willingness of corporations to self-report and self-police.” *Id.*

303. Corporations also know much more about the chemicals underlying toxicity, and they may thwart disclosure by asserting proprietary business privileges.

Too often, new chemicals are quickly developed and inserted into the stream of commerce without a formal review process or a thorough understanding of their long-term effects.³⁰⁴ Chemical regulation requires specific knowledge and highly technical expertise. After all, just one slight change in an organic chain can change a chemical’s toxicity and thwart a regulator’s reach. It can take several years (even decades) to fully comprehend a chemical’s long-term health effects, and these studies are extraordinarily expensive.

It is clear that the TSCA’s heretofore reactive regulatory approach does not adequately protect the American public from harm caused by existing chemicals. This is antithetical to the precautionary principle and approach favored in other environmental law contexts.³⁰⁵ Our current chemical regulatory approach amounts to an *inverse* precautionary principle—chemicals are allowed to enter the commercial mainstream and they are regulated well after their actual harm is understood. The European Union has adopted an approach toward PFAS consistent with the precautionary principle, requiring extensive premarket testing of new chemicals.³⁰⁶ This approach helped influence the TSCA updates reflected in the 2016 adoption of the Lautenberg Act. But experience with PFAS shows that this update did not go nearly far enough.

Because of the constantly changing nature of PFAS and the real possibility that PFAS variants will prove to share similar toxicity properties with PFOA and PFOS, a more comprehensive approach to PFAS regulation is needed.³⁰⁷ As a baseline, Congress should first establish objective, science-based criteria to create a comprehensive PFAS chemical class. Failure to approach PFAS regulation in a more holistic manner will result in federal and state regulators continuously playing regulatory catch-up as they engage in a Sisyphean exercise to keep up with the latest PFAS chemical advances.³⁰⁸

304. See BILOTT, *supra* note 6, at 94–95.

305. Garnett & Van Calster, *supra* note 294, at 163–64.

306. *Id.* at 176–78. REACH Regulation in Europe addresses industrial chemical substances and generally embraces the precautionary principle in chemical regulation. See *id.* at 171–73 (discussing REACH).

307. See Boden, *supra* note 5, at 53–60 (describing comprehensive regulatory alternatives).

308. While it is beyond the scope of this paper to fully discuss this, the issue of agency capture is lurking in the background. In Bilott’s PFAS litigation against DuPont in West Virginia, for example, agency capture facilitated a revolving door between corporate employees and state environmental regulators. Chemical regulation highlights the continual challenges of agency and regulatory capture, particularly in states—such as West Virginia—with weak environmental laws and strong corporate interests. BILOTT, *supra* note 6, at 94–95.

CONCLUSION

In sum, PFAS are complex, and their complexity will require an enormous amount of effort and resources to study their long-term health impacts. Because of the EPA's failure to act, state environmental agencies have been responsible for regulating PFAS contamination in their respective state drinking water supplies, but they often lack the personnel, resources, and expertise to comprehensively address PFAS's debilitating health impacts.

Seventy years after Rachel Carson warned about chemical contamination in *Silent Spring*, environmental law still fails to safeguard the American citizenry from widespread chemical exposure. In his account of his lengthy struggle to find out what was killing cows and poisoning the drinking water of Parkersburg, West Virginia, Bilott notes that he naively assumed that EPA would proactively regulate PFAS immediately upon receiving the evidence that he painstakingly obtained through discovery.³⁰⁹ Tragically, this did not happen. After the Science Panel—created in response to Bilott's lawsuit—confirmed the harmful effects of PFOA, DuPont and 3M phased out PFOA, but replaced PFOA with similar chemicals of unknown toxicity.³¹⁰ This experience showcases the largely reactive way that harmful chemicals have been regulated in the United States.

The failure of federal and state law to protect human health from PFAS exposure provides a powerful story about longstanding gaps in toxic chemical regulation and environmental governance. As of this writing, thousands of both long-chain and short-chain PFAS remain understudied and unregulated.³¹¹ PFAS are continually changing and are constantly being created in laboratories—there are thousands of variants, although this number remains unknown. Regulating just one chemical chain (such as PFOA) will do little to eliminate the dangers posed by the thousands of other PFAS variants.³¹² EPA's regulatory approach to date largely focuses on regulating *independent* chemical chains and not the entire class of PFAS-based chemicals. Alter just one molecule in a complex carbon chain, and the newly formed variant falls through the regulatory cracks.

PFAS offer a cautionary tale about the modern state of environmental law. And it is one whose story is not yet fully written, as there are thousands of chemical variants of PFAS now on the market, and we don't know their underlying health effects. To date,

309. *Id.* at [X].

310. *See supra* Subpart I.B.

311. PFOA is sometimes referred to as “C-8” by Dupont and other manufacturers, referring to the eight carbon compounds that compose the chemical; these are known as long-chain carbons. Rich, *supra* note 7.

312. It also runs into the essential use provision of the TSCA. *See* Garnett & Van Calster, *supra* note 294, at 163–64.

the best scientific information that we have on PFAS’s toxicity stems not from the EPA or a state environmental agency but from industry-sponsored scientific studies and evidence related to a decades-long civil lawsuit brought against DuPont.³¹³ Without this litigation and the work of a single, determined attorney, we may have never learned about PFAS’s underlying harm to the public. What other unknown chemicals are already in our environment that are harmful to the public and escaping through regulatory cracks?

313. See BILOTT, *supra* note 6, at 272–78. In 2015, DuPont spun off its PFAS business to its shareholders in the form of shares in the newly created Chemours Company, a move widely viewed as a strategy to limit DuPont’s future liability for PFAS contamination. See David Schultz & Sylvia Carignan, *Forever Chemicals’ Legacy Weighs on Chemours’ Future*, BLOOMBERG L. (Nov. 4, 2019, 5:00 AM), <https://news.bloomberglaw.com/environment-and-energy/forever-chemicals-legacy-weighs-on-chemours-future>. Chemours subsequently sued DuPont claiming that it was intentionally undercapitalized in the spinoff. See Craig Bettenhausen, *Chemours Settles PFAS Dispute with DuPont, Corteva*, C&EN (Jan. 22, 2021), <https://cen.acs.org/policy/litigation/Chemours-settles-PFAS-dispute-DuPont/99/web/2021/01>. The parties settled in 2021, reaching an agreement where Chemours will be responsible for 50 percent of the costs of PFAS litigation and cleanup, while DuPont and Corteva Agriscience, which spun off from DowDuPont in 2019, will share the other half. *Id.*