Forever Chemicals and Agriculture Case Study:

Maine accelerates across-the-board action to address PFAS chemicals harming farmers and rural communities

Institute for Agriculture & Trade Policy

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INTRODUCTION

Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) pollution has wreaked economic and emotional havoc at two Maine dairy farms, poisoning milk and beef so that they cannot be sold, affecting the health of the farming families, and requiring farmers to kill livestock and dump milk without compensation. PFAS is also known to have contaminated more than 200 residential drinking water wells in the vicinity of farmland in Maine. An estimated 700 additional sewage and industrial sludge-spreading sites across the state may also harbor PFAS-contaminated soil and groundwater. Consequently, the state has become the leading edge in both understanding the destructive consequences of PFAS contamination of food and farmland, as well as identifying and adopting comprehensive policy solutions to address these consequences.

Following years of inaction, the Biden administration and Congress are finally starting to act to address a national public health crisis cause by PFAS in our food, water, soils, air and indoor environments. Maine's experiences offer both a cautionary tale and a potential roadmap for some key policies that should be adopted both at the state and at the federal level, particularly to address impacts on agriculture and rural communities.

BACKGROUND

PFAS are a group of man-made chemicals including PFOA, PFOS, GenX and many other compounds (currently as many as 9,000 known variations) that have become a massive pollution problem across the United States. These "forever chemicals" are extraordinarily persistent in the environment and bioaccumulate in humans, farm and wild animals, fish and plants. They are ubiquitous in consumer products, including food packaging, clothing, dental floss, floor and car waxes and non-stick cookware, and are also commonly used in firefighting foam. PFAS are found in the blood of 98% of Americans, and in women's breast milk. Human exposure to certain PFAS may affect growth, learning and behavior of infants and children, cause endocrine disruption, increase the risk of cancer and suppress the immune system including reducing antibody responses to COVID-19 vaccines.

Nationally, attention has focused particularly on drinking water polluted by industrial discharges and run-off from military bases where PFAS in aqueous film forming foam (AFFF) used in fire suppression and firefighting training exercises has seeped into soils and groundwater. Farms in New Mexico and Colorado have been contaminated by PFAS linked to pollution from military bases. Analysis of Department of Defense records by the Environmental Working Group has identified 678 military installations with confirmed or suspected PFAS contamination. Congress recently included language in the National Defense Authorization Act requiring a report on required notifications to agricultural operations located near military facilities where certain PFAS chemicals have been detected in groundwater that is hydrologically linked to a local agricultural or drinking water source. According to the report, 2,143 agricultural operations have been notified of the potential for PFAS contamination.[1]

There has been significantly less attention paid nationally to the threat to food and farming caused by sewage and industrial sludges and residuals contaminated with PFAS. This is true despite the fact that for decades, with the approval of federal and state regulators, municipal and industrial wastewater treatment facilities in all 50 states cheaply disposed of these wastes through land application, offering it up as free fertilizer for farmers. Environmental oversight has been lax to nonexistent, as waste sludges have been renamed "biosolids" and exempted from most regulation by loopholes in the Clean Water Act.

FOCUS ON MAINE FARMERS

Potential contamination of food and farmland from sewage sludge spread on crops is finally getting some national media coverage. Concerns have been raised in Vermont, where mandated field testing for PFAS has led some farmers to halt use of sludge or to alter the crops grown in order to minimize uptake of the chemicals. After requiring testing of sludge at 41 wastewater treatment plants, Michigan ordered several to stop distributing sludge to farms, and the state is a leader nationally in requiring some industrial dischargers to pretreat PFAS wastes before discharging into wastewater facilities. There is also a growing interest in agronomic research on PFAS.

But nowhere has the spotlight on sludge safety and impacts on food and farmers been more intense than in Maine. Sludge-spreading was first linked to PFAS-contaminated milk in Maine in 2016. Contamination at the Stoneridge Farm in Arundel, Maine was discovered through an Environmental Protection Agency (EPA) program that tests public drinking water systems for chemicals of concern that are not yet regulated. The Kennebunk,

SLUDGE REGULATION

Ostensibly, Section 405(d) of the Clean Water Act (CWA) establishes a regulatory framework for managing the sludgy wastes that remain after water treatment. This waste includes residuals from industrial discharges, as well as household sewage and is euphemistically called "biosolids" by wastewater treatment and composting operations. Unfortunately, the sludge-related provisions of the CWA, which were enacted by Congress in 1993, continued the prior laissez-faire approach to regulating land spreading of sludge, effectively exempting the practice from most pollution control requirements. The Environmental Protection Agency's (EPA) Biosolids Rule, adopted to carry out the CWA provisions, has been utterly ineffective in protecting water, soils and public health from the hundreds of toxic and hazardous constituents of sludge, including PFAS chemicals. The EPA requires only nine pollutants — all heavy metals — and living pathogens such as E. coli and Salmonella to be removed from biosolids. The rest of the hazardous and toxic components of sludge are simply not regulated.

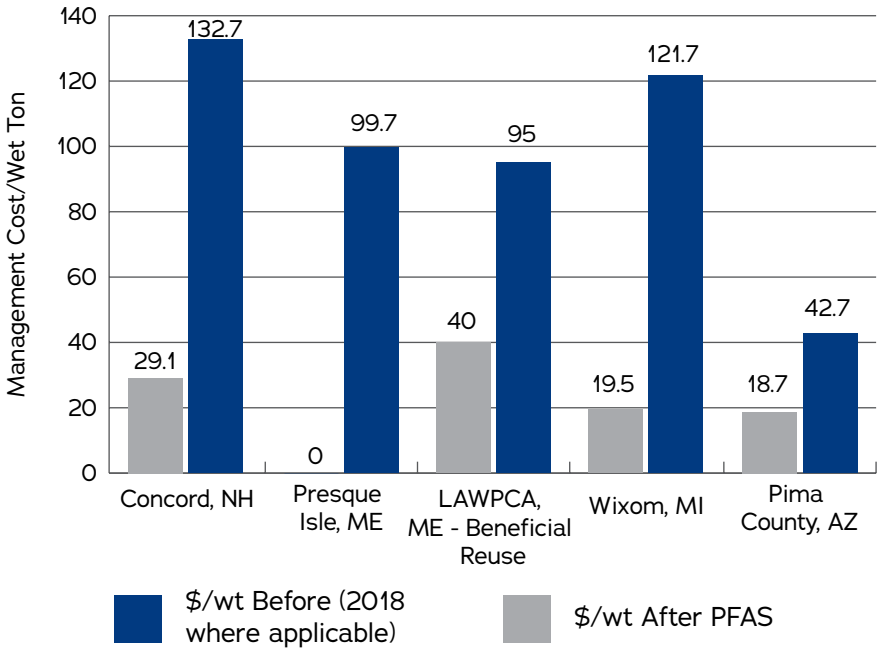
Moreover, as long as sludge is applied to land in accordance with the EPA's Biosolids Rule, the activity is allowed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, also known as the Superfund Law). This exemption has created significant regulatory hurdles to cleaning up past pollution caused by sludge spreading, since the CERCLA is the mechanism for holding polluters strictly liable for environmental harm and accountable for site investigation and cleanup costs.

The deficiencies of EPA's regulation of sludge were detailed by the agency's own Inspector General (IG) in its 2018 Report on the Biosolids Program. At that time, EPA identified 352 pollutants in biosolids where it lacked the resources (including staffing), data and risk assessment tools needed to regulate them. The IG report determined that of the 352 unregulated pollutants in sludge, there were 61 designated as acutely hazardous, hazardous or priority pollutants in other programs.[2]

Despite the damning IG report, states have generally deferred to the EPA and dismissed concerns about use of biosolids on agricultural land. There are sludge spreading programs in all 50 states. A national survey of biosolids use and disposal found about half of the wastewater sludge produced in the U.S. is applied to soils as biosolids, with the rest landfilled or incinerated. Of the total applied to soils, three-quarters is applied to agricultural land, 22% is sold or given to consumers as fertilizer, and 3% is used in land reclamation projects.[3]

Sludge-spreading on cropland and fields has been convenient and economical for farmers, who can obtain nutrient-rich fertilizer for free or even be paid for it, and are only now starting to understand the harmful consequences. The practice has unquestionably saved money for sewer and water district ratepayers and local governments, and thus it isn't surprising that these publicly owned facilities have pushed back against policy changes to limit land application of biosolids. A 2020 report on the financial impacts of PFAS policies and regulations on municipal utilities found dramatic cost increases when these facilities shifted to landfilling their sludge wastes.[4] Other currently available alternatives to land disposal, such as incineration, are even more costly. All of these disposal options cause ongoing pollution and raise environmental justice concerns.

Cost Impacts of Facilities that Switched from Beneficial Reuse to Landfill Disposal in Response to PFAS Regulations



Source: CDM Smith in collaboration with NEBRA, the Water Environment Federation (WEF) and the National Association of Clean Water Agencies (NACWA). October 2020.

Kennebunkport and Wells Water District voluntarily participated in the program in 2016, when PFAS was included the suite of chemicals being investigated, leading to discovery of contamination in a water district well and subsequently at the neighboring farm. If the water utility and farmer Fred Stone had not agreed to the voluntary testing, no one would have been the wiser; it is possible that significant PFAS contamination of both drinking water and milk would remain undiscovered even today.

Dairy farmer Fred Stone, Arundel, Maine, photo credit Elyse Tipton.

The consequences for farmer Fred Stone have been nothing short of devastating. Stone had to shut down operations at his multi-generational farm and kill livestock contaminated with the chemicals. PFAS were also found in soils, hay and cow manure and his family's drinking water — and in Fred and his wife Laura's blood. Stone sought financial assistance from the U.S. Department of Agriculture (USDA) through the Farm Service Agency's Dairy Indemnity Payment Program (DIPP), which compensates farmers for the value of milk they would otherwise sell commercially but for chemical contamination. But Stone was denied assistance under the rules of the program, which was designed to assist with short-term contamination problems. Stone also faced legal challenges in his efforts to sue those responsible for the contamination. Maine's "statute of limitations," which governs when lawsuits must be filed, had ambiguous language that could have been interpreted by a court to require filing any personal injury lawsuit within six years of when the PFAS-contaminated sludge was spread — and not years later when Fred Stone learned that his farm, water and animals were contaminated with PFAS.

Following the discovery and investigation of PFAS at Stoneridge Farm, in 2019 Maine initiated a sludge testing program — and promptly discovered that all municipal sludge tested in the state has contained PFAS. Also in 2019, Maine's Bureau of Agriculture, Food and Rural Resources instituted an annual retail milk testing program. This program, limited as it is — milk is tested at the processor level, where milk from multiple farms is combined and diluted, and only if a PFAS spike is detected is the milk traced back and tested the farm level — nevertheless succeeded in 2020 in identifying a second dairy farm with high levels of PFAS contamination. In fact, the amount of PFOS in milk from the dairy herd at the Tozier farm in Fairfield, Maine may be the highest milk contamination levels ever recorded in North America. Measurements in late June and early July 2020 ranged from 12,700 to 32,200 parts per trillion (ppt). The highest reading is 153 times Maine's standard for determining that milk is "adulterated" and unfit for sale (210 ng/l). As a result, the 10th-generation Tozier farm was forced to stop selling its milk and beef.

This time, contamination was also detected well beyond the farm property, triggering a growing public health crisis that continues today. An ongoing investigation by the Maine Department of Environmental Protection (DEP) found contamination far afield, with PFAS detected in 214 residential wells (so far) in four neighboring communities in central Maine. As noted above, this pollution was discovered only after tested milk was traced back to the source, not because there was any inkling that groundwater in the area was contaminated.

According to a DEP database going back to the 1980s, more than 700 permits were granted for land application of sludge in the state. Based on DEP's records and local knowledge, it appears that in both the Fairfield and Arundel situations, today's contamination from these "forever chemicals" is likely caused by sludge that was applied to land 15 or 20 years ago, or even earlier. The incredibly persistent nature of these chemicals and the extremely high concentrations being measured at significant distances from the location where sludge was applied has raised alarms that there may be much more PFAS

contamination waiting to be uncovered in other parts of the state. Without systematic investigation and testing at these sites, there is no way to know.

Attention has also turned to the role of Maine's paper industry, which disposed of papermaking wastes both directly through land application and indirectly by discharging wastes to municipal sewage treatment facilities. According to reporting by the Portland Press Herald, eight paper companies spread more than 500,000 cubic yards of paper mill waste in Maine between 1989 and 2016. Though large, that figure actually underestimates the significance of the industry's contribution to Maine's PFAS problem because it doesn't include indirect discharges to wastewater plants — facilities that are not equipped to remove PFAS chemicals. Paper wastes have been linked to PFAS contamination of the environment, and PFAS have been and continue to be used in a variety of paper products, including disposable picnic plates, takeout food containers and pizza boxes.

HOME GARDENERS TAKE NOTE

Industrial and sewage sludge has also found its way into compost marketed to households and used on food grown in home gardens. The biosolids industry has downplayed the risk, but municipal and industrial-scale operations including Casella's Hawk Ridge composting facility in Unity, Maine produce compost contaminated with PFAS. Contaminated commercial fertilizer marketed to home gardeners is a national concern. A recent report by the Ecology Center of Michigan and the Sierra Club found PFAS in each of nine fertilizer products tested and marketed as "eco" or "natural." Eight of the nine exceeded Maine's screening guidelines. (Maine currently has the strictest safeguards for PFAS contamination of agricultural lands.) The test products were purchased in eight states and the District of Columbia at national chains including Lowes, Home Depot and Ace Hardware, as well as locally owned garden centers. The biosolids used in these fertilizers included wastes from the Milwaukee Metropolitan Sewerage District, the District of Columbia's Blue Plains plant, the Tacoma, Washington Wastewater Treatment Plant and a Jacksonville, Florida sewer collection system, among others.[5]

MAINE'S FIRST RESPONSE TO THE PFAS CRISIS

The state established a PFAS Task Force in 2019 and started ramping up data collection, including testing landfill leachate, identifying AFFF contamination hot spots, initiating annual retail milk testing and conducting agronomic research in support of setting "adulterated milk" standards for PFAS. The Maine Department of Agriculture, Conservation and Forestry lobbied the USDA to fix the dairy indemnity program to better meet the needs of farmers forced to dump milk because of PFAS. Although the federal program wasn't changed, the department partnered with the Maine Farmland Trust and Maine Organic Farmers and Gardeners Association to offer emergency grants to dairy farmers to cover the costs of ongoing milk tests to help them qualify for DIPP funds in the event of PFOS contamination.

While the state's data collection and research was a necessary and important predicate to developing policy responses, the Task Force report issued in January 2020 failed to recommend comprehensive measures to address the range of harms the data substantiated. The Task Force had limited civil society membership and included representatives of the forest products, paper and sludge composting industries and municipal water and sewage facilities that have built-in conflicts of interest. As a result, the final report mostly deferred to the federal EPA — which under the Trump administration was postponing action and, behind closed doors, manipulating data and overruling career scientists to obscure the true environmental and health consequences of PFAS exposure. Maine legislators introduced several bills to require a more immediate and comprehensive response, but these fell victim to the coronavirus pandemic when the Legislature shut down in March 2020, stranding PFAS (and other) legislation without action.

FAST FORWARD TO 2021

Remarkably, action on PFAS became a defining priority of Maine's 2021 legislative session. This time, PFAS legislation garnered a level of bipartisan support from state legislators (indeed, in most cases, unanimity) that contrasts with partisan responses and deference to the chemical industry in other states such as Wisconsin. More than a dozen bills were introduced by legislators of different political persuasions to address everything from help to farmers to eliminating PFAS from all products sold

in the state. A coalition of advocacy organizations led by Defend Our Health worked closely with several of Maine's citizen legislators including organic farmer Bill Pluecker and social worker Lori Gramlich to advance the legislation. In addition to IATP, an agricultural perspective was provided by the Maine Organic Farmers and Gardeners Association, Maine Dairy Industry Association, Maine Farm Bureau Association, the Agricultural Council of Maine and Maine Farmland Trust.

By mid-July, when Maine's legislature adjourned, it had enacted a suite of nine bills, plus budget provisions, that collectively comprise the most comprehensive and consequential PFAS response anywhere in the country. Indeed, some of the policies have been adopted ahead of European Union regulation, which generally leads internationally on chemicals policy.

Maine's accelerated action on PFAS was helped along by several factors. First, the 2020 discovery of widespread water contamination linked to sewage and industrial sludge-spreading in several communities surrounding the second dairy farm, and the wrenching testimony of those affected, drove home the urgency and seriousness of the problem. Second, the state's ever-expanding investigation received ample media coverage and kept the spotlight on public health and the need for corporate accountability. And finally, the availability of federal American Rescue Act (ARA) funding both directly and indirectly contributed to the governor and Maine Legislature's willingness to spend significant funds to address PFAS. Prior to passage of the ARA and payment of various COVID-19 relief funds to individuals and businesses, state tax revenues were down, and advocates anticipated difficulty in convincing decision makers to prioritize PFAS-related spending. With the injection of federal funding, the projected budget deficit became a surplus, and policymakers were willing to invest in PFAS regulation and cleanup, as well as farmer support, with both general revenue funds and user fees charged to manufacturers and others.

MAINE'S NEW POLICIES INCLUDE:

- Retroactively clarifying the right to sue for PFAS contamination
- A change in the hazardous waste laws to hold manufacturers and other "responsible parties" liable for cleanup and remediation of contaminated soil and water
- Banning most Aqueous Film Forming Foam (AFFF) firefighting foam, a common source of groundwater contamination
- Phasing in by 2030 a first-in-nation ban on PFAS in virtually every consumer product on the market and requiring public disclosure of any intentionally added PFAS ingredients in consumer products starting January 1, 2023
- Mandating testing of 700+ land application sites previously approved for sludge disposal, accompanied by dedicated funding for new staff
- Requiring the Board of Pesticides Control to determine how to regulate PFAS in pesticides, with a response due to the Legislature in 2022
- Establishing an agronomic research program to better understand PFAS' impact on food and agriculture and to assist farmers in selecting safe crops to grow
- Setting an enforceable drinking water standard of 20 ppt for the "sum of six" common PFAS with comprehensive testing and reporting requirements, catching up with neighboring states Vermont, New Hampshire and Massachusetts and adopting some of the most health-protective standards in the nation
- Embracing the polluter-pays principle with fees on PFAS product manufacturers, sewage systems and septage haulers to fund ongoing product regulation and pollution remediation
- Funding 19 positions in the state budget to address PFAS contamination, with $20 million to the DEP to clean up or mitigate PFAS contamination, $10 million to assist impacted farmers and pay for PFAS-related agricultural research, and $25 million in American Rescue Act COVID-19 relief funds to upgrade water and sewer systems, some of which will be used to address PFAS concerns

LESSONS LEARNED

Maine has learned that when you start looking for PFAS, you will find it. One of the most consequential of the new laws, L.D. 1600, will make sure the state continues to systematically look for PFAS where it is most likely to contaminate drinking water or food. It sets a timetable to investigate and test the hundreds of sites granted state permits to land spread sewage sludge, industrial wastes and septage, and the state is moving quickly to implement the law. Even though wastewater sludge has been spread on farmland across the country, to date Maine is the only state to initiate a comprehensive investigation. The reluctance to pursue these investigations nationally undoubtedly reflects the fact that if PFAS is found, the cleanup costs will be significant and powerful industries could be on the hook to pay for it.

Maine's site investigation legislation was unanimously supported by the entire Legislature, but it became law over the opposition of key industries and organizations, and without the governor's signature. It was opposed by water utilities concerned about the cost, which the legislation paid for with fees on the water and sewer districts and septage haulers that likely will be passed along to ratepayers. The bill was also opposed by the state's paper industry. That industry disposed of waste sludges that could be the source of the significant levels of PFAS found at the two Maine dairy farms. Additional testing of fields spread with papermaking wastes may identify more instances of contamination and lead to increased legal liability for these companies.

The Maine Dairy Industry Association also opposed the bill. The dairy farmers worried that soil and groundwater testing would result in additional costs and possible legal liability. In part, the dairy farmers' opposition sprung from an historical discomfort with state environmental regulators and a preference for dealing with the agriculture department. A harsh but understandable reality is that not every farmer is willing to go looking for PFAS contamination, when the consequences of finding it could be destruction of the family farm and the concomitant economic and emotional devastation. As the dairy association's Executive Director Julie-Marie Bickford testified, "The appearance of PFAS chemicals on Maine farmland has caused a loss of income and other dramatic financial costs, health concerns for humans and animals alike, disruptions in the ability to provide enough food for the animals, and in the most extreme cases, complete removal of the animals from the food production chains for both dairy and beef. The problems are the unintended consequences of not knowing the detrimental impacts of these chemicals on living systems." As Bickford further noted, "…PFAS was not created by farmers, and the resulting contamination that has been discovered in Maine is neither the fault of Maine dairy farmers, nor of Maine agriculture in general. In fact — due to the ubiquitous use of these chemicals, their appearance is not limited to the state of Maine. We just happen to be the one of the first in the U.S. to deal with its appearance as a contaminant in agriculture."

The appearance of PFAS chemicals on Maine farmland has caused a loss of income and other dramatic financial costs, health concerns for humans and animals alike, disruptions in the ability to provide enough food for the animals, and in the most extreme cases, complete removal of the animals from the food production chains.

-Julie-Marie Bickford, Dairy Association Executive Director

The package of bills enacted in Maine does include some help for affected farmers. The budget includes $10 million for the agriculture department to abate, clean up or mitigate PFAS contamination affecting Maine agricultural producers and the food supply, and to provide support to affected farms. This funding is also intended to support critical PFAS research necessary for farm viability, as spelled out in separate legislation. Farmers and others harmed by PFAS contamination will benefit from increased access to the courts and indirectly, from a change in state hazardous waste laws that should speed up remediation of contaminated soil and water. Regulating PFAS in pesticides and the product ban will both start to "turn off the tap" and prevent future food and farm contamination. In another food-related measure, legislation enacted in 2019 to ban PFAS in food packaging is scheduled to go into effect in January 2022.

MORE WORK TO BE DONE

Although a number of other states are considering or have enacted PFAS legislation, Maine stands out for the comprehensiveness of its policies, its willingness to commit significant and ongoing funding to their implementation, and its focus on agriculture and farming. There is more work to be done at both the state and at the federal levels, however. Significantly, despite the demonstrable and practically irreversible harm caused by land application of compost and sludge containing PFAS — not to mention the millions of dollars the state is spending to clean it up — Maine continues to allow land disposal where the receiving soils have low or no PFAS contamination. As Patrick MacRoy of Defend Our Health has written, Maine DEP has "created a policy to encourage clean fields to be contaminated with PFAS." This 2019 policy is out of step with the health-protective laws enacted more recently, and legislators and advocates will try to close this loophole in 2022 with additional legislation.[6]

Regulation of PFAS in pesticides is also unfinished business both in Maine and nationally.[7] The New England-based Conservation Law Foundation and the Public Employees for Environmental Responsibility (the group that first exposed the presence of PFAS in pesticides) has called for testing and regulation. Pursuant to legislation, the Maine Board of Pesticides Control has begun work on regulating PFAS in pesticides, but it is not yet clear whether the regulation will be sufficiently comprehensive to address the threat.[8]

THE STATUS OF FEDERAL ACTION ON PFAS

There is only so much that state governments can do without federal help and in the absence of national standards and testing protocols. Until recently, the federal government has delayed taking action or even actively undercut EPA scientists and regulators seeking to implement PFAS protections. This federal inaction is starting to change. Under President Biden, the EPA has begun moving forward to adopt a series of PFAS policies, starting with the release of its PFAS Strategic Roadmap in October 2021.[9]

The Roadmap has many useful elements, including a proposed rulemaking to restrict discharges of PFAS into surface waters and wastewater treatment plants by key industries, and technical work to advance future regulation of air emissions. The plan also proposes to designate PFOA and PFOS, and potentially other PFAS chemicals, as hazardous substances under the federal Superfund law (the Comprehensive Environmental Response, Compensation, and Liability Act or CERCLA). This action would require reporting of PFAS releases into the environment and provide authority to seek cost recovery for remediation. EPA also proposes establishing a national drinking water standard for PFOA and PFOS and plans to sample for 29 PFAS compounds in water systems in 2024 and 2025.

Also in October 2021, the EPA announced a flurry of actions that could more directly affect regulation of sewage sludge and septage disposal. The agency released a revision to the human health toxicity assessment for GenX chemicals, a supposedly safer alternative to PFOS and PFOA that EPA has now determined to be more toxic than what it replaced — known as a "regrettable substitution." EPA also responded to a petition from New Mexico's governor, Michelle Luhan Grisham, seeking to list the entire class of PFAS chemicals as a hazardous waste under Subtitle C of the Resource Conservation and Recovery Act (RCRA). In its response, EPA did not agree to regulate PFAS as a class but said it would initiate a rulemaking to list the chemicals PFOA, PFOS, PFBS and GenX as RCRA hazardous constituents. This is a preliminary step to listing these PFAS chemicals as "hazardous waste" under RCRA, which would then trigger cradle-to-grave waste management requirements under that law.[10]

The agency also announced that it would finalize a risk assessment for PFOA and PFOS in sewage sludge by the winter of 2024, and it has promised to update by December 2023 the current EPA interim guidance on disposing and destroying PFAS. This update is sorely needed. The prior guidance was announced in 2020 and is no longer available on EPA's website. As comments submitted by more than 30 environmental groups detailed, that document actually failed to provide the guidance it promised. While finding that current technologies and practices in use are not effective in destroying PFAS chemicals or containing them from re-release, EPA failed to restrict or further regulate those practices. Among the problematic disposal practices that EPA needs to address in a revised guidance are those that have proven so disastrous in Maine.

What EPA's actions, taken together, mean for the future of sludge/biosolids disposal is unclear. They could set the stage for EPA to prohibit altogether the land disposal of sewage sludge and compost that contain any of the four PFAS chemicals it designates as hazardous constituents under RCRA. To date, EPA hasn't proposed updating its biosolids and composting rules, which rely on a loophole in

the Clean Water Act to allow sewage sludge to be spread on land (see sidebar on sludge regulation). The biosolids rule includes a provision stating that it "does not establish requirements for the use or disposal of sewage sludge determined to be hazardous in accordance with 40 CFR part 261."[11] This is precisely what EPA has taken preliminary steps to do, and it gives the agency authority to further regulate PFAS-contaminated sludges. In any event, a rulemaking to designate four PFAS as hazardous wastes could take years to complete. The waste management industry is still evaluating EPA's announcements while the National Law Journal has said EPA is "well on its way to enacting" major changes that could impact the industry.

For people directly harmed by PFAS contamination and some environmental advocates, EPA's recent PFAS actions may be a case of too little, too late. Many of the planned actions are focused on PFOS and PFOA only, legacy PFAS chemicals that are no longer manufactured in the U.S. Maine and other states have already regulated much more broadly based on scientific studies showing health impacts of other PFAS that have been measured in water, soils, food and human blood. In some cases, as in Maine's regulation of consumer products, states have sought to address all 9,000 PFAS as a class. A risk assessment of sludge containing PFOA and PFOS should have been carried out decades ago; a promise to complete this analysis three years from now illustrates just how irrelevant the federal government has become.

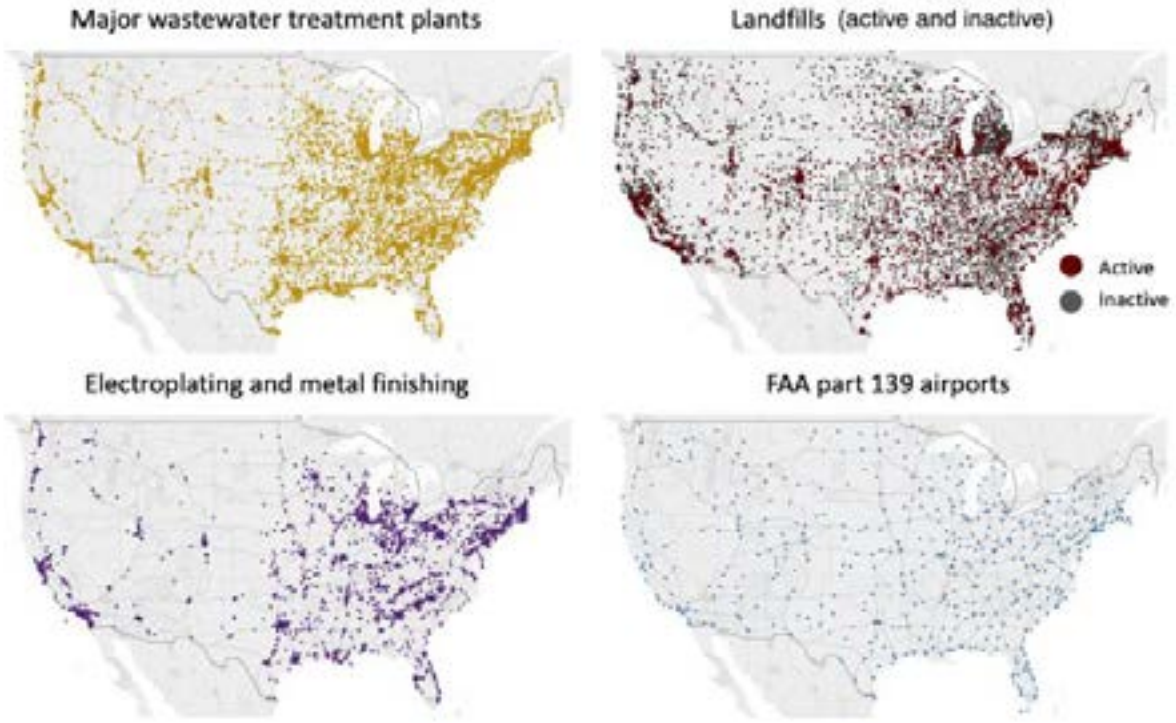


FIGURE 2 Maps showing the locations of four different types of potential per- and polyfluoroalkyl substances dischargers in the contiguous United States, including landfills, wastewater treatment plants, electroplating, and metal finishing facilities and airports

Source: Andrews, D. Q., Hayes, J., Stoiber, T., Brewer, B., Campbell, C., & Naidenko, O. V. (2021). Identification of point source dischargers of per- and polyfluoroalkyl substances in the United States. AWWA Water Science, e1252. https://doi.org/10.1002/aws2.1252

AGRICULTURAL POLICIES STILL MISSING

For some time, Maine governor Janet T. Mills has been pleading with federal officials for action on a long list of PFAS policies specific to agriculture and food-related concerns, including:

- EPA and USDA should invest in agronomic research to better understand PFAS uptake into plants and animals to help reduce PFAS exposure in our food supply and promote farm viability, including investigation of PFAS tolerant crops that can be grown safely on contaminated land.
- USDA should improve and expand the Dairy Indemnity Payment Program (DIPP) to provide funding support for all farmers impacted by PFAS contamination — including animal feed, livestock and specialty crop growers, as well as dairy producers.
- The DIPP timeframe for support should increase from 18 months to 36. Payments to farmers for the value of their livestock should be included, as well as to cover depopulation expenses. The DIPP should continue to fund income replacement and be expanded to underwrite costs (including testing and remediation) associated with a longer-term return to farm viability.
- The Federal Food and Drug Administration (FDA) should establish PFAS adulteration levels for foods and regulatory limits for food packaging to minimize dietary exposures.
- The FDA should expand its published testing methodologies for PFAS in food.

These and other food and farm-related policies are not included in EPA's PFAS Roadmap. The FDA has jurisdiction over PFAS in food ingredients and packaging. The USDA oversees agriculture policy and farm assistance programs. Although both agencies are included in a Biden administration fact sheet on its "plan to combat PFAS pollution," neither has publicly announced significant actions related to PFAS to parallel EPA's Roadmap. In fact, in June 2021, public health and food safety groups filed a citizen petition calling for FDA to step up its regulation of PFAS in food.

Agricultural impacts have also not been specifically targeted by Congress. The PFAS Action Act of 2021 introduced earlier this year would require comprehensive regulation of PFAS in air emissions and water discharges, and fund wastewater treatment and contaminated site cleanup, among other provisions. While there is bipartisan support for action on PFAS, following passage of pandemic relief legislation in early 2021, Congress has been slow to act.

STATES SHOULDN'T WAIT

Even if Congress enacts the PFAS Action Act and EPA fully implements its Roadmap, it will be many years before the PFAS crisis is comprehensively addressed. It is obvious that advocacy and legislation at the state level remains critically important to ensure food is safe and farms are PFAS-free. The experience in Maine suggests focusing on these priorities:

INVESTIGATE POTENTIALLY CONTAMINATED FARMLAND. So-called biosolids — sewage sludge and other residuals — have been used as fertilizer on farmland for decades. States need to systematically investigate soil and water at locations where these wastes have been spread *at any time in the past*. Those states with a large paper industry presence, including Wisconsin (which is also a major dairy state), would be well advised to start testing their milk and farmland for PFAS. States should prioritize testing land currently used for agricultural purposes, or where the site is hydrogeologically linked to a local agricultural or drinking water source. In Maine, PFAS contamination in high concentrations has been carried via groundwater significant distances from where the sludge was applied many years past.

STOP ALL LAND APPLICATION OF "BIOSOLIDS." Land application of sludge that contains PFAS, including composted sludge, is not safe. Continuing to allow this practice will result in water contamination and destroy land for future use as farmland. As farmers in Maine and elsewhere have discovered, once contaminated with PFAS, it is virtually impossible to make soils safe for farming. While EPA has taken initial steps that could change how PFAS-contaminated wastes are regulated in the future, the timing and scope of any changes are up in the air. There is no indication yet that EPA plans to revisit its biosolids rule. States have the authority to act, and doing

so will incentivize the removal of PFAS from wastewater discharges and consumer products and prompt speedier development of safe PFAS destruction technologies.

TEST MILK AND OTHER PRODUCTS AT THE FARM LEVEL. Dairy products appear to be particularly vulnerable to PFAS contamination, although emerging research has identified other crops at risk.[12] Milk should be routinely tested at the farm in addition to after processing. While Maine's annual retail milk testing program was able to identify a specific farm with contaminated milk, this is a very imprecise method that tests diluted milk and may miss other instances of contamination. Most states do not test for PFAS at all and lack a standard for considering PFAS-contaminated milk "adulterated." It is important that farmers are compensated not only for the costs of testing, but also if PFAS is found, for economic loss and remediation costs. The USDA's farmer support programs need to be redesigned to better address farmers' needs, as outlined by Maine Governor Mills above.

ACT QUICKLY TO ADOPT HEALTH-PROTECTIVE DRINKING WATER STANDARDS. Even under EPA's new PFAS Roadmap, it is far from clear that the full range of health-impacting PFAS will be covered by an enforceable drinking water standard, nor what the level of protection will be. Maine is one of several states that have enacted drinking water standards for several common PFAS. These states have already conducted the technical and scientific analysis to support their standards, and other states can take advantage of that work without waiting for EPA to act.[13] The impact of adopting state standards is wide ranging. When Maine moved to rely on its own standard instead of the more limited federal guidance, many more households with PFAS-contaminated water qualified for treatment and purification systems installed and paid for by the state. These standards are also used in remediating contaminated sites, and underly Maine's "adulterated food" standard for contaminated milk.

MAKE POLLUTERS PAY. These programs cost money. Maine used pandemic relief funds to pay for some of its PFAS activities, and if Congress appropriates infrastructure funding or if the bipartisan PFAS Action Plan passes, more could be on the way. Other states have the same access to these federal resources. They should also follow Maine's lead in making polluters pay for PFAS regulation, site investigation and cleanup through fees on septage haulers and sewer districts, and on manufacturers of PFAS-containing products. States should, like Maine, designate PFAS chemicals a hazardous substance under their state Superfund laws and make sure that their laws governing civil lawsuits don't unduly limit filing actions to assess liability, recover damages or require polluters to remediate the harm they have caused.

CONCLUSION

The above measures are intended to address agricultural impacts in the short term. Longer term, removing PFAS from all products where the use is not essential is the only way to get these forever chemicals out of the food supply. Maine had bipartisan support to pass legislation to do just that. Other states and Congress should follow suit.

APPENDIX: PFAS LEGISLATION ENACTED IN THE FIRST SPECIAL SESSION OF THE 130TH MAINE LEGISLATURE

L.D. 129 Resolve, To Protect Consumers of Public Drinking Water by Establishing Maximum Contaminant Levels for Certain Substances and Contaminants. Signed by governor as emergency measure, Resolve Chapter 82.

L.D. 264 An Act To Prohibit Aerial Application of Perfluoroalkyl and Polyfluoroalkyl Substances. Signed by governor as Resolve Chapter 83, Directing the Board of Pesticides Control To Gather Information Relating to Perfluoroalkyl and Polyfluoroalkyl Substances in the State.

L.D. 363 An Act Regarding the Statute of Limitations for Injuries or Harm Resulting from Perfluoroalkyl and Polyfluoroalkyl Substances. Signed by governor as Public Law Chapter 328.

L.D. 558 Resolve, Directing the Department of Agriculture, Conservation and Forestry To Study Alternative Cropping Systems for Farmers Affected by Perfluoroalkyl and Polyfluoroalkyl Substances Contamination. Signed by governor as Resolve Chapter 38, Directing the Department of Agriculture, Conservation and Forestry To Develop a Study Plan Relating to Perfluoroalkyl and Polyfluoroalkyl Substances Contamination in the Agricultural Sector.

L.D. 780 An Act Regarding Uncontrolled Hazardous Substance Sites. Signed by the governor as Public Law Chapter 117.

L.D. 1503 An Act To Stop Perfluoroalkyl and Polyfluoroalkyl Substances Pollution. Became Public Law Chapter 477 as an emergency measure without the governor's signature.

L.D. 1505 An Act To Restrict the Use of Perfluoroalkyl and Polyfluoroalkyl Substances in Firefighting Foam. Signed by the governor as Public Law Chapter 449.

L.D. 1600 An Act To Investigate Perfluoroalkyl and Polyfluoroalkyl Substance Contamination of Land and Groundwater. Became Public Law Chapter 478 without the governor's signature.

L.D. 221 An Act Making Unified Appropriations and Allocations for the Expenditures of State Government (State Budget) and L.D. 1733 An Act To Provide Allocations for the Distribution of State Fiscal Recovery Funds both were enacted and included PFAS-related spending.

A note on Maine legislation:[14]

- The general effective date for nonemergency laws passed in the First Special Session of the 130th Legislature is Monday, October 18, 2021.
- An emergency law takes effect on the date the governor signs it unless otherwise specified in its text.
- *Public laws* are laws of general scope and application codified in the Maine Revised Statutes Annotated. Some portions of public laws are not codified, examples being appropriations clauses, transition clauses and some other provisions are unallocated, i.e., they are not assigned places in the revised statutes.
- *Resolves* have the force of law but do not amend statutes directly and are of very limited duration. Resolves are narrow in scope (for example, the instrument for a one-time occurrence such a temporary study commission).

ENDNOTES

1. Section 335 of the William M. Mac Thornberry National Defense Authorization Act for Fiscal Year 2021 (Public Law 116-283), https://www.congress.gov/bill/116th-congress/house-bill/6395 (last accessed October 14, 2021).

2. For more on PFAS in biosolids see Venkatesana, Arjun K. and Rolf U. Haldena, "National inventory of perfluoroalkyl substances in archived U.S. biosolids from the 2001 EPA National Sewage Sludge Survey." J Hazard Mater. (May 2013): 413–418. doi:10.1016/j.jhazmat.2013.03.016; Sheet, Johnathon and Maddison Ledoux. "Addressing the Impacts of PFAS in Biosolids." Water & Wastes Digest (September 10, 2021), https://www.wwdmag.com/biosolids-management/addressing-impacts-pfas-biosolids (accessed September 21, 2021); Clarke, Bradley O. and Stephen R. Smith. "Review of 'emerging' organic contaminants in biosolids and assessment of international research priorities for the agricultural use of biosolids." Environment International 37, Issue 1 (2011): 226-247. https://doi.org/10.1016/j.envint.2010.06.004; and Alder, Alfredo C. and Juergen van der Voet. "Occurrence and point source characterization of perfluoroalkyl acids in sewage sludge." Chemosphere 129 (2015): 62-73. https://doi.org/10.1016/j.chemosphere.2014.07.045, https://www.sciencedirect.com/science/article/pii/S0045653514009060

3. These figures are based on 2004 data collected by the North East Biosolids and Residuals Association (NEBRA), which is currently in the process of updating its biosolids survey. See, A National Biosolids Regulation, Quality, End Use & Disposal Survey Final Report (July 20, 2007), https://static1.squarespace.com/static/601837d1c67bcc4e1b11862f/t/606b3f35386d813ba708aeb1/1617641292297/NtlBiosolidsReport-20July07.pdf.

4. CDM Smith in collaboration with NEBRA, the Water Environment Federation (WEF) and the National Association of Clean Water Agencies (NACWA). "Cost Analysis of the Impacts on Municipal Utilities and Biosolids Management to Address PFAS Contamination." October 2020. Figure 2- 3. Comparison of biosolids disposal costs before and after PFAS concerns for facilities that switched from beneficial reuse to landfill disposal methods. https://www.wef.org/globalassets/assets-wef/3---resources/topics/a-n/biosolids/technical-resources/cost-analysis-of-pfas-on-biosolids---final.pdf (accessed July 28, 2021).

5. See also Lazcano, Rooney Kim and Youn Jeong Choi, Michael L. Mashtare, and Linda S. Lee. "Characterizing and Comparing Per- and Polyfluoroalkyl Substances in Commercially Available Biosolid and Organic Non-Biosolid-Based Products." Environmental Science & Technology 54 (2020): 8640-8648. DOI: 10.1021/acs.est.9b07281; Choi, Youn Jeong and Rooney Kim Lazcano, Peyman Yousefi, Heather Trim, and Linda S. Lee. "Perfluoroalkyl Acid Characterization in U.S. Municipal Organic Solid Waste Composts." Environ. Sci. Technol. Lett. 6 (May 2019): 372–377. https://doi.org/10.1021/acs.estlett.9b00280.

6. This legislation is in draft form and has been approved for introduction in 2022 (LR 2227, Resolve, To Prohibit the Contamination of Clean Soils with So-called Forever Chemicals, Sponsor: Representative Pluecker, B of Warren). See the Maine Legislature's bill search function to access bill text and status when available: https://legislature.maine.gov/LawMakerWeb/advancedsearch.asp. In addition, several other bills have not yet been approved for introduction but could be after appeals are exhausted. These include to test and treat landfill leachate from state-owned landfills (LR 2322); to ensure that state fish consumption health advisories address PFAS exposure and that data on levels in fish is shared with the public (LR 2504); and to require testing of discharges to waterways from wastewater treatment and other facilities (LR 2334).

7. Pesticides containing PFAS is an emerging field of research. See, e.g., Alexandrino, Diogo A.M., C. Marisa R.Almeida, Ana P.Mucha, Maria F.Carvalho, "Revisiting pesticide pollution: The case of fluorinated pesticides." Environmental Pollution (January 2022), https://www.sciencedirect.com/science/journal/02697491, https://doi.org/10.1016/j.envpol.2021.118315; and Nascimento, Rodrigo A. and Deborah B.O. Nunoo, Ekhine Bizkarguenaga, Lara Schultes, Itsaso Zabaleta, Jonathan P. Benskin, Saulo Spanó, Juliana Leonel. "Sulfluramid use in Brazilian agriculture: A source of per- and polyfluoroalkyl substances (PFASs) to the environment."Environmental Pollution 242, Part B (2018): 1436-1443, https://www.sciencedirect.com/science/article/pii/S0269749118311771

8. The Board of Pesticides Control has not formally proposed a rule as of October 2021. On October 8, the Board voted to review a draft rule in a subsequent meeting and to base that draft rule on the staff recommendation to limit regulation to "75 PFAS that have been flagged, by the National Toxicology Program, as candidates for expedited toxicological screening due to the potential for harm based on chemical structure." PFAS is defined in Maine statute at 32 MRSA 1732(5-A) as "any member of the class of fluorinated organic chemicals containing at least one fully fluorinated carbon atom" (currently 9,252 chemicals). This definition has been referenced by other Maine legislation enacted during the recent legislative session (L.D. 363, L.D. 1503, L.D. 1505, L.D. 1600) but the pesticide bill (L.D. 264) did not include a definition.

9. Environmental Protection Agency. PFAS Strategic Roadmap: EPA's Commitments to Action 2021-2024 (October 2021), https://www.epa.gov/system/files/documents/2021-10/pfas-roadmap_final-508.pdf (last accessed October 19, 2021)

10. See RCRA regulations codified at 40 CFR Part 261, Appendix VIII, https://www.govinfo.gov/content/pkg/CFR-2018-title40-vol32/xml/CFR-2018-title40-vol32-part503.xml#seqnum503.4.

11. STANDARDS FOR THE USE OR DISPOSAL OF SEWAGE SLUDGE, 40 CFR Section 503.6(e), https://www.govinfo.gov/content/pkg/CFR-2018-title40-vol32/xml/CFR-2018-title40-vol32-part503.xml#seqnum503.6

12. See, Ghisi, Rossella and Teofilo Vamerali, Sergio Manzetti. "Accumulation of perfluorinated alkyl substances (PFAS) in agricultural plants: A review." Environmental Research 169 (2019): 326-341., https://www.sciencedirect.com/science/article/pii/S0013935118305577.

13. For example, see California Water Boards website, "PFAS Drinking Water Resources," https://www.waterboards.ca.gov/pfas/drinking_water.html (Last accessed October 21, 2021)

14. See Maine Legislature website, State of Maine Legislature Glossary of Terms, https://legislature.maine.gov/LawMakerWeb/glossary_of_terms.asp (accessed September 9, 2021).