

The Use of Sewage Sludge as a Fertilizer or Soil Amendment Endangers Human Health and the Future of Our Farmland

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The land application of sewage sludge (aka biosolids) and its use as a soil amendment and compost feedstock threatens the future of our farmland and compromises the safety of crops and the health of gardeners.

Problems with PFAS, a contaminant in sewage sludge¹

Per- and polyfluoro alkyl substances (PFAS) are now being recognized as a ubiquitous contaminant in sewage sludge. PFAS chemicals are highly persistent in soil and water. They are commonly called ‘forever chemicals.’ Repeated applications of sewage sludge over the years results in highly elevated concentration of PFAS compounds in soil.

According to the US EPA, more than half of the sewage sludge produced in the U.S. is applied to farmland as biosolids.² Sewage sludge is also composted and sold to home gardeners as a bagged fertilizer/soil amendment. Whenever sewage sludge and sewage sludge products have been tested for PFAS compounds, many of them are detected at concerning concentrations.³

PFAS compounds are very difficult to destroy. None of the sewage sludge treatment methods – such as anaerobic digestion, composting, dewatering, liming – destroy, detoxify, or remove PFAS. Also PFAS is not destroyed by heat or incineration.

PFAS compounds are also toxic. They are strongly associated with a long list of health problems as a result of human epidemiological studies and lab animal studies. These include testicular, kidney and other cancers, kidney disease, thyroid disease, decreased fertility, low birth weight, immune suppression (and thus, a weak response to vaccines), and increased cholesterol. PFAS are considered endocrine-disrupting chemicals as they affect various hormone systems.

When PFAS is in soil or irrigation water, plants take it up. When animals eat plants that contain PFAS, these toxic compounds bioaccumulate in their bodies. Animals higher up on the food

¹ History and Use of Per- and Polyfluoroalkyl Substances (PFAS). Council of Interstate Technology Regulatory Council (ITRC). April 2020. Robert Mueller, New Jersey Department of Environmental Protection, Virginia Yingling, Minnesota Department of Health, Team Contacts. https://pfas-1.itrcweb.org/fact_sheets_page/PFAS_Fact_Sheet_History_and_Use_April2020.pdf

² Basic Information on Biosolids. US EPA. <https://www.epa.gov/biosolids/basic-information-about-biosolids>

³ Sludge in the Garden: Toxic PFAS in Home Fertilizers Made of Sewage Sludge. May 25, 2021. Report produced by the Ann Arbor Ecology Center and the Sierra Club. <https://www.sierraclub.org/sludge-garden-toxic-pfas-home-fertilizers-made-sewage-sludge>

chain, such as human beings, can end up with a high PFAS body burden from eating the meat, milk or eggs of other animals that have ingested PFAS.

The carbon fluorine bond found in all PFAS compounds is extremely strong. As this bond is very rare in nature, microbes and other organisms did not evolve enzymes to break it.

Animals lack enzymes and other mechanisms to break down PFAS compounds that they have ingested. PFAS chemicals are excreted extremely slowly, over many months or years.

Limited federal regulation of sewage sludge for use as fertilizer⁴

US EPA has very limited regulations for sewage sludge. Sewage sludge (biosolids) is classified at Class A or Class B. Class A biosolids are dewatered and heated sewage sludge that meets US EPA guidelines for land application without restrictions. They can be used as fertilizer on farms and in vegetable gardens and can be sold to home gardeners as compost or fertilizer.

For both classes of biosolids, the EPA sets the same limits for 10 metals (arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc). This is the only testing of sewage sludge required for a wastewater treatment plant.

Class A biosolids are not supposed to contain detectible levels of pathogens or attract any disease vectors (such as insects or rodents that transmit human diseases). However fecal coliform and salmonella are the only pathogens for which testing is required.

PFAS compounds widely found in sewage sludge

PFAS concentrations of concern have been found any time that sewage sludge is tested for PFAS.⁵ The application of biosolids can transfer PFAS compounds to the soil, where these compounds can also leach into groundwater and run off into surface water.

⁴ Source Watch. Class A Biosolids. Dec. 25, 2019. The Center for Media and Democracy. https://www.sourcewatch.org/index.php/Class_A_Biosolids

Source Watch. Class B Biosolids. Dec. 25, 2019. The Center for Media and Democracy. https://www.sourcewatch.org/index.php/Class_B_Biosolids

⁵ Arjun K. Venkatsan & Rolf U. Halden. May 15, 2013. National inventory of perfluoroalkyl substances in archived U.S. biosolids from the 2002 EPR National Sewage Sludge Survey. Journal of Hazardous Materials. vol. 252 - 253, pp. 413 - 418. <https://doi.org/10.1016/j.jhazmat.2013.03.016>

Plants take up PFAS from contaminated soil and water. Animals, including livestock and fish and game animals such as deer and turkey, absorb PFAS from contaminated plants, feed or water. PFAS has been found in meat and milk and many foods made from crops. There are still no federal advisories.

No testing of sewage sludge for PFAS in New York

However in NY, there hasn't been any testing of sewage sludge for PFAS contamination. Neither has the state been doing such tests, nor are wastewater treatment plants in NY required to have such tests conducted. There is also no requirement for companies that process and sell sewage sludge-based soil amendments/fertilizers to test their products for PFAS.

In February 2022, the En Con commissioner's office assured a legislative aide that DEC will begin conducting these tests this year.⁶ The person in charge of biosolid regulation at DEC had told me in late 2020 that testing would begin in 2021. Earlier this year, she emailed that funding hadn't been available for testing last year. Personal communication from Sally Rowland, NYS Department of Environmental Communication. Jan 19, 2022 email.⁷

Sources of PFAS in sewage sludge⁸

The sources of PFAS are very numerous. This class of chemicals is found in many consumer and commercial products ranging from personal care products and cosmetics to floor cleaner and stain and water resistant coatings on textiles. There are around 5,000 different PFAS compounds, and about 600 in commerce. Given the multitude of PFAS chemicals, environmental health advocates argue that PFAS must be regulated as a class, rather than individually. The problem of sewage sludge contamination with PFAS cannot be adequately addressed by banning certain uses of PFAS or individual PFAS chemicals.

- paper and packaging
- clothing and carpets
- outdoor textiles and sporting equipment
- ski and snowboard waxes
- non-stick cookware
- cleaning agents and fabric softeners
- polishes and waxes, and latex paints
- pesticides and herbicides

⁶ Personal communication from Jacob Egloff, NYS Assembly (legislative aide to Patricia Fahy). Feb 2, 2022 email.

⁷ Personal communication from Sally Rowland, NYS Department of Environmental (manager of the state's biosolids program). Jan 19, 2022 email.

⁸ History and Use of Per- and Polyfluoroalkyl Substances (PFAS). Council of Interstate Technology Regulatory Council (ITRC). April 2020. Robert Mueller, New Jersey Department of Environmental Protection, Virginia Yingling, Minnesota Department of Health, Team Contacts. https://pfas-1.itrcweb.org/fact_sheets_page/PFAS_Fact_Sheet_History_and_Use_April2020.pdf

- hydraulic fluids
- windshield wipers
- paints, varnishes, dyes, and inks
- adhesives
- medical products
- personal care products (for example, shampoo, hair conditioners, sunscreen, cosmetics, toothpaste, dental floss)

PFAS concentrations in sewage sludge

In the first study of the nationwide occurrence and concentrations of PFAS in sewage sludge (biosolids), published in 2013, ten out of the 13 PFAS compounds tested for were consistently detected in all of the biosolids samples.

While very high levels of PFAS have been detected in sewage sludge from municipalities in which factories use PFAS in manufacturing, PFAS has also been detected in virtually every sample of sewage sludge tested.

The State of Vermont commissioned a study of PFAS at wastewater treatment plants⁹

In the 2019 study of PFAS at wastewater treatment facilities and in landfill leachate commissioned by the state of Vermont, PFAS compounds were detected in all samples tested from every wastewater treatment plant. When analyzed as solids, the sewage sludge samples had concentrations of 20 to 27 parts per billion for 5 different PFAS compounds combined, *regardless of the type of sewage sludge* (thickened, Class A or Class B).

One source of higher PFAS levels in sewage sludge and in wastewater treatment plant effluent is landfill leachate. Some wastewater treatment plants receive landfill leachate. This doesn't make sense as wastewater treatment plants are only designed to break down biological wastes. They are not equipped to detoxify or remove harmful chemicals, such as PFAS compounds, heavy metals, microplastics, and other industrial byproducts.

The two wastewater treatment plants in Vermont that accept landfill leachate also had the highest concentrations of PFAS compounds in their sewage sludge. These two plants in Montpelier and Newport also had significantly higher concentrations of PFAS in the effluent leaving the plants. The state of Vermont required Casella, the waste corporation that owns and operates the

⁹ Gribkoff, Elizabeth. Feb. 5, 2020. High readings for PFAS found in Montpelier and Newport wastewater plants. Vermont Digger. <https://vtdigger.org/2020/02/05/high-readings-for-pfas-found-in-montpelier-and-newport-wastewater-plants/>

Weston & Sampson. Jan. 30, 2020. VTDEC. Poly- and Perfluoroalkyl Substances at Wastewater Treatment Facilities and Landfill Leachate: 2019 Summary Report. https://dec.vermont.gov/sites/dec/files/wmp/SolidWaste/Documents/02.03.20_PFAS_in_LF_and_WWTF_Final_Report.pdf

⁹ Sharon Lerner. June 7, 2019. The Intercept. Toxic PFAS Chemicals Found in Maine Farms Fertilized With Sewage Sludge. <https://theintercept.com/2019/06/07/pfas-chemicals-maine-sludge/>

Coventry landfill, to study PFAS levels in incoming waste. Textiles, including furniture, clothes, and umbrella, and carpeting had the highest PFAS levels of any waste coming into the landfill. One piece of clothing contained over 1,500 parts per billion (1.5 parts per million) PFAS. The Montpelier plant receives effluent from the Randolph landfill, which is closed, but in the past had received PFAS-containing waste from a Teflon-coating factory in Bennington.

In the Vermont study, all landfill leachate samples contained quantifiable concentrations of nearly all of the 24 PFAS compounds that the laboratory was able to detect. Concentrations of the 5 PFAS compounds regulated in Vermont ranged from 376 parts per trillion to 4.7 parts per billion in the leachate.

Sewage Sludge linked to PFAS contamination in Maine and other states¹⁰

PFAS contamination of milk has been reported in several dairy farms around the nation, including two in Maine and one in New Mexico. In Maine, the contamination appears to be due to application of tainted biosolids – treated sewage sludge used as soil amendment – to farmland.¹¹

On Fred Stone’s dairy farm in Maine, the highest PFAS level detected was 1,420 parts per trillion. Mr. Stone spread sewage sludge in the 1980s under a state program encouraging its application to farmland. After the local water district discovered high PFAS levels in a well maintained on the Stone’ land in 2016, the Stones informed their milk distributor and the state DEP. Testing found high PFAS concentrations in the herd’s milk, soil, hay, and cow manure. The Stones cannot sell their milk, beef, or crops. The other Maine dairy farm with PFAS-

‘Forever Chemicals’ Coming to Your Dinner Table, if Not Already There. Bloomberg Law. Sept. 27, 2019. Pat Rizzuto. <https://news.bloomberglaw.com/environment-and-energy/forever-chemicals-coming-to-your-table-if-not-already-there?context=search&index=1>

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Valdmanis, Richard and Schneyer, Joshua. March 19, 2019. The curious case of tainted milk from a Maine dairy farm. Reuters. <https://www.reuters.com/article/us-usa-dairy-chemicals/the-curious-case-of-tainted-milk-from-a-maine-dairy-farm-idUSKCN1R01AJ>

Short (5 min.) video about the PFAS contamination of Fred Stone’s dairy farm, and the science and advocacy surrounding the situation. <https://defendourhealth.org/campaigns/safe-food/sludge-dumping/>

Perkins, Tom. Feb 11, 2022. Michigan beef found to contain dangerous levels of ‘forever chemicals.’ The Guardian. <https://www.theguardian.com/environment/2022/feb/11/michigan-beef-dangerous-levels-forever-chemicals>

Flesher, John and Casey, Michael. Sept. 12, 2019. AP News. Concerns grow over tainted sewage sludge spread on croplands. <https://apnews.com/article/32c65a5b3c27468ea2cdd2ce97848825>

contaminated milk has not been publicly identified.

PFAS concentration in its milk has been detected as high as 32,200 parts per trillion. The state of Maine considered milk to be adulterated at 200 parts per trillion. No testing of milk for PFAS is normally conducted. The US EPA advisory level for PFAS compounds in drinking water is 70 parts per trillion. In 2020, New York state has adopted a maximum contaminant level of 10 part per trillion for PFOA and PFOS, the two most well known PFAS compounds.

(In New Mexico, contamination was likely due to aqueous fire-fighting foam made out of PFOS, used at a nearby military base, which polluted groundwater of the dairy farm with high levels of PFAS in its milk.)

Last year, the young couple at Songbird Farm in Unity, Maine, that has organic produce and heirloom grains for local markets since 2014 found out that their farm had received repeated applications of sewage sludge decades earlier. They sent samples of their water, soil and crops to a testing lab and discovered alarming levels of PFAS contamination. PFAS was detected in the water they drank and gave to their young son at 400 times the level set by the state for safe drinking water. Their soils were also contaminated so the couple is now in limbo.¹²

Previous testing by the state of Maine found that sewage sludge from over 30 different wastewater treatment plants exceeded the state's advisory level for PFAS. New Hampshire detected PFAS in sewage sludge from about 25 permit holders. Unacceptable concentrations of PFAS in biosolids, linked to contamination of farmland, have also been detected by the state of Michigan,

The Maine Department of Environmental Protection now plans to conduct tests of soil and water for PFAS contamination at more than 700 sites, on which farmers previously spread sewage sludge biosolids. New York state has done no such testing on farms where such biosolids have been applied.

Does the state of New York have any records of where sewage sludge has been applied to farmland?

PFAS detection in food

PFAS compounds appear to be common contaminants in food. A 3M food study found high levels of PFOS and PFOA in bread, apples, green beans, milk, and ground beef purchased from grocery stores in six cities in Alabama, Florida, Georgia, and Tennessee. (The 3M corporation in Minnesota first began manufacturing PFOA and PFOS in the 1950s. Dupont's Parkersburg, WV Teflon factory gained notoriety for contaminating the drinking water in the Ohio River Valley

¹² Miller, Kevin. Feb. 7, 2022. 'Complete crisis' as PFAS discovery upends life and livelihood of young Maine farming family. Maine Public Radio. <https://www.mainepublic.org/environment-and-outdoors/2022-02-07/complete-crisis-as-pfas-discovery-upends-life-and-livelihood-of-young-maine-farming-family?fbclid=IwAR3TlsmjFJXTVnpikCavaNI3G2NcGQJu6VigrZi9SDadLBiPsWrysp9cDII>

with PFOA from air emissions and PFOA waste. PFOS contaminated the groundwater at and surrounding numerous military bases and airports. PFOA has been widely used as an aqueous firefighting foam. A factory in Hoosick Falls that used PFOA contaminated the village's drinking water supply for many years.) In 2019, the US FDA conducted PFAS testing on a limited sample of foods. See "PFAS on Your Plate" graphic in the Appendix.

The Sierra Club and the Ann Arbor Ecology Center study of biosolids compost sold to consumers¹³

The Sierra Club and the Ann Arbor Ecology Center identified dozens of home fertilizers made from biosolids (sewage sludge) and purchased 9 different brands made from biosolids sourced from around the country. Then they sent samples from the different biosolids products to testing labs to be analyzed for 33 PFAS compounds. Eight of the 9 products tested exceeded the allowable concentrations for PFOA or PFOS set by Maine, which has the strongest standards of any state. In Maine, biosolids fertilizers with such levels of PFAS could not be applied to farmland.

Each biosolids fertilizer product tested contained between 14 and 20 detectable PFAS compounds. Twenty-four of the 33 PFAS compounds tested for were detected in one or more product. Additional testing found that these products also contained two to eight times greater mass of precursor compounds and hundreds to thousands of times more unidentifiable synthetic fluorine compounds.

The findings of the Sierra Club – Ecology Center study are consistent with national surveys of PFAS in sewage sludge/biosolids, and academic studies that tested biosolids-based fertilizers and composts. The report recommends that consumers refrain from using such products.

The report notes that, "For the large-scale problem of disposing of sewage waste, however, simple solutions are elusive. The federal government and most states have done little to study the issue, let alone address it."

The report recommends immediate action to keep PFAS and other persistent chemicals out of sewage sludge by banning unnecessary uses of PFAS in commerce. It also calls for an end to the use of PFAS, with limited exemptions, in order to protect people from the growing threat of PFAS exposure. In addition, industrial polluters should be prevented from discharging PFAS-containing wastewater, into sewers and water bodies. It urges stronger regulation of land application of biosolids with high levels of PFAS and other harmful chemicals. Industry should be required to pay for the damages that PFAS production and use poses to people and the environment, including costly cleanups of

¹³ May 25, 2021. Sludge in the Garden: Toxic PFAS in Home Fertilizers Made of Sewage Sludge. Report produced by the Ann Arbor Ecology Center and the Sierra Club.
<https://www.sierraclub.org/sites/www.sierraclub.org/files/PFA-Garden-Sludge-Report.pdf>

contaminated places. (Unfortunately, remediation of water sources and agricultural soil

It notes that the US EPA’s “anemic responses to date, as well as structural barriers created by key environmental laws, make quick action unlikely and hinder even the most common-sense measures to contain the chemical crisis.”

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