The Current State of the Science & Regulations

PFAS in Biosolids

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PFAS are a large group of man-made chemicals. Many consumer and industrial products and processes have used PFAS for decades because of their ability to resist heat, water, and oil. Until these products are removed from the supply chain, PFAS chemicals will continue to make their way into wastewater and biosolids.

What we know

Biosolids are nutrient-rich organic materials generated when a wastewater treatment facility treats domestic sewage (i.e., treated sewage sludge). Publicly owned treatment works (POTWs) — tasked with treating millions of gallons of domestic, commercial, and industrial wastewater daily—**do not use PFAS** in their operations. However, they can receive PFAS from each of these waste streams. Current research is studying PFAS in biosolids including their ability to move into other media, like water, plants, and animals. Recent research found certain PFAS chemicals in biosolids, including the PFAS chemicals commonly found in toilet paper.[1]

The chemical properties of different PFAS affects their ability to build up in plants and animals. Some PFAS are more likely to stay in the organic rich soils, while others can more easily run-off in water or be taken up by plants.

Regulatory Context

The U.S. Environmental Protection Agency (EPA) has not set standards for PFAS in biosolids. Some states have developed plans to prevent and manage PFAS in biosolids. On January 14, 2025, the EPA released the draft risk assessment for two common PFAS, PFOS and PFOA, in biosolids. The draft risk assessment indicates that in some scenarios, the EPA's acceptable risk thresholds may be exceeded when sewage sludge containing PFOA and PFOS is land applied for beneficial reuse or surface disposed. The draft risk assessment focuses on farm families and their neighbors, who are likely to have much higher potential contact with biosolids than the general public.

The EPA, the United States Department of Agriculture (USDA)[2], and the United States Food and Drug Administration (FDA)[3] are working to understand the following:

- Potential risk of pollutants in land-applied biosolids
- Uptake rate of PFAS in agricultural produce grown on land supplemented with biosolids
- Concentrations of PFAS in the U.S. food supply

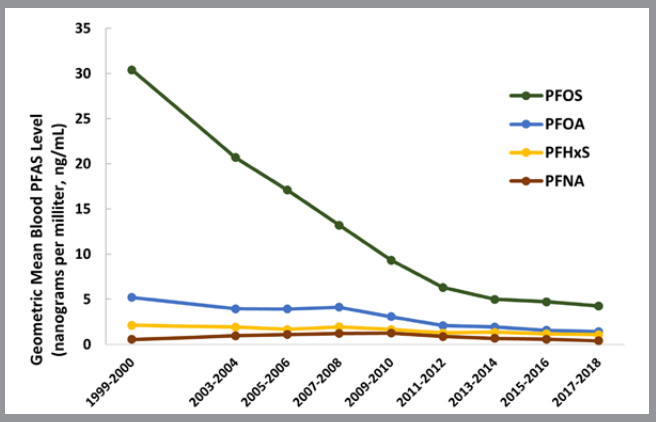
Sources other than biosolids can contribute to PFAS in agriculture, including insecticides, some synthetic fertilizers, and even rainfall.

The FDA has not found PFAS in over 97% of fresh and processed food samples since starting to test in 2019. Most of the samples where PFAS were detected were seafood (e.g., fish and shellfish). Similarly, only 2 (0.1%) of the 3,200 meat and poultry samples tested by the USDA's Food Safety and Inspection Service had detectable levels of PFAS.

PFAS Sources

You can commonly find PFAS in everyday consumer goods including **non-stick cookware**, **food paper packaging**, **cosmetics**, **fabrics and textiles**, and **cleaning products**. **Lithium-ion batteries**, **solar panels**, **fire-fighting foams**, and **medical devices** all use PFAS. PFAS by their very design are intended to be **durable** and **resistant to degradation** and treatment. Thus, PFAS are found in our bodies and our environment.

PFAS Exposure

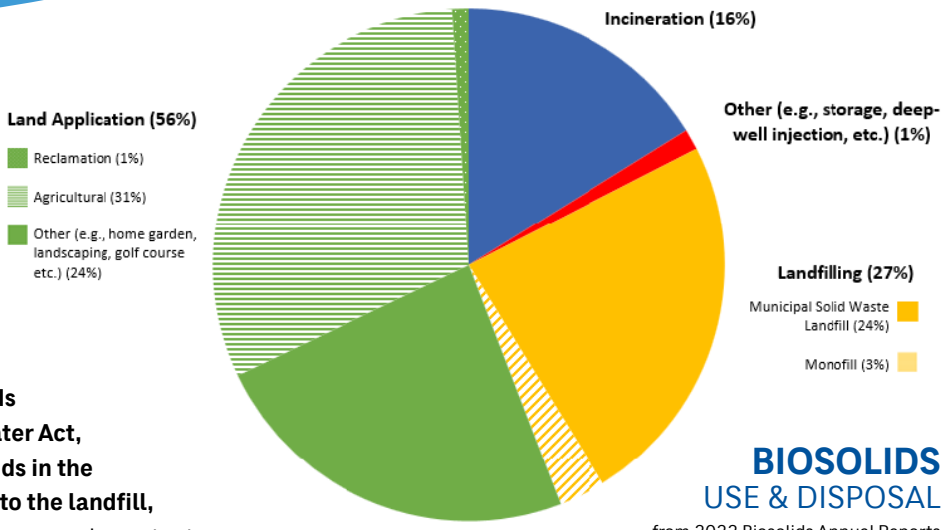


National Report on Human Exposure to Environmental Chemicals, Biomonitoring Data Tables for Environmental Chemicals. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention

PFAS are found in so many consumer and industrial products and applications that everyone has some risk of exposure. Exposure to specific PFAS compounds has been associated with certain health effects, including increases in cholesterol levels, changes in liver enzymes, lower antibody response to some vaccines, small decreases in birth weight, and kidney and testicular cancer.

Almost everyone in the U.S. and other developed countries have measurable amounts of PFAS in their blood. The National Health and Nutrition Examination Survey (NHANES)[4] has been monitoring certain PFAS chemicals in the blood of people living in the United States since 1999. As specific PFAS are phased out of use, which reduces everyday exposure, blood serum levels of those specific PFAS are dropping too.

It is challenging to compare potential risks from different materials or products based on PFAS concentrations alone. That is because each person's exposure to products varies. How often you may eat, touch, or breathe in PFAS associated with various products changes based on the product and how different people use it.



BIOSOLIDS
USE & DISPOSAL
from 2022 Biosolids Annual Reports

Benefits of Biosolid Land Application

Since 1993, land application of biosolids has been regulated under the Clean Water Act, Section 503. As of 2022, 56% of biosolids in the United States are land applied, 27% go to the landfill, and 16% go to an incinerator. Biosolids serve an important function in a sustainable and circular economy. Land applied biosolids offer moisture retention, slow-release nutrients, and carbon sequestration. Biosolids can also be used in other, non-agricultural applications, such as reclaiming lands after wildfires or mining. They also provide a cost-effective alternative to commercially manufactured synthetic fertilizers. Manufactured or synthetic fertilizers can often be prohibitively expensive and come with intensive energy footprints to manufacture. They often have negative water quality impacts because they release nutrients quickly.

Prohibiting land application can have unintended consequences. Those include increased greenhouse gas emissions to produce synthetic fertilizers and from moving biosolids long distances for disposal in a landfill. The cost of synthetic fertilizers to replace biosolids can also create economic hardship on farmers who rely on biosolids.

What's Next?

The EPA's draft risk assessment for PFOS and PFOA in biosolids is not a regulation, and the EPA, Environmental Council of the States (ECOS) and the National Association of State Departments of Agriculture (NASDA) emphasize that one of the most effective short and long term solutions[5] to reducing PFAS in biosolids is to prevent PFAS from entering wastewater treatment facilities in the first place.

The EPA acknowledges that POTWs may have limited options for biosolids management and changes may not be feasible, particularly in the short term. EPA identifies ongoing monitoring, pretreatment programs, and land-application strategies (e.g., distance from waterways, crop type, etc.) as considerations to mitigate potential risk.

A recent study found that up to 50-60% of certain PFAS could be absorbed through the skin from consumer products applied to the skin, like cosmetics.[6] This is an important and more common potential exposure pathway to PFAS than direct exposure to land applied biosolids for most people.

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[1] https://www.acs.org/pressroom/presspacs/2023/march/toilet-paper-is-an-unexpected-source-of-pfas-in-wastewater.html
[2] https://www.farmers.gov/protection-recovery/pfas/faq
[3] https://www.fda.gov/food/process-contaminants-food/questions-and-answers-pfas-food
[4] https://www.atsdr.cdc.gov/pfas/data-research/facts-stats/index.html
[5] https://www.epa.gov/system/files/documents/2023-07/Joint-Principles-Preventing-Managing-PFAS.pdf
[6] Ragnarsdóttir, O., Abdallah, M.A.E. and Harrad, S., 2024. Dermal bioavailability of perfluoroalkyl substances using in vitro 3D human skin equivalent models. *Environment International*, 188, p.108772. https://www.sciencedirect.com/science/article/pii/S0160412024003581