Seeking to protect groundwater, N.H. looks to regulate PFAS contamination in soil

New Hampshire Public Radio | By Mara Hoplamazian

Published October 19, 2022 at 11:49 AM EDT

LISTEN • 5:06

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Anthony Drouin, residuals management supervisor, collects samples of sludge on June 10. He'll test them for PFAS. Wastewater plants get their sludge tested a few times a year, depending on their size.

On a normal morning for Anthony Drouin, he's knee-deep in soft, thick muck, reaching a long metal pole into a pile of sludge and shoveling it into a bucket.

He stuffs the inky black material, the consistency of cake batter, into little bottles he'll send to a lab to test for a particular set of chemicals: PFAS.

Testing for these man-made chemicals in sludge is a regular part of Drouin's job with the state's Department of Environmental Services. He's the residuals management supervisor, a nicer way of

saying he deals with the afterlives of things most would rather forget: sewage, septage, sludge.

Recently, though, he's focused on another medium: soil.

Concern is growing about PFAS chemical contamination in soil across New England, where the harmful man-made substances have contaminated drinking water supplies.

Now, Drouin and other state regulators are working to better understand how PFAS moves through soil and into groundwater in an attempt to set rules about how much of those chemicals are allowed to remain in the land.

There are a few main ways PFAS can get into soil; industrial pollution and firefighting foam are two significant ones. And the kind of sludge Drouin manages has also been in the spotlight, after it was found to be a major part of soil contamination issues on farms in Maine.

Sludge and soil

Sludge is a by-product of the wastewater treatment process.

“A lot of times people think, ‘Oh, it's pure poop,’” Drouin says. Really, sludge is dead bacteria left over from treatment.

That process can concentrate PFAS in sludge, but the contamination doesn’t come from the wastewater plant.

Wastewater, Drouin says, is kind of like a mirror for society. And society contains a lot of PFAS – from the string of dental floss that makes its way into the toilet bowl, to the chemicals on beauty products we put on our own bodies.

Some wastewater treatment facilities also deal with industrial wastewater, which can have exceptionally high levels of the contaminants.

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Anthony Drouin stuffs the sludge, which has the consistency of cake batter, into little bottles he'll send to a lab.

After another round of treatment, some sludge can get turned into a substance called biosolids, which are sold as fertilizer. Across New England, biosolids are spread on farms, fields, and yards to strengthen soil, in place of man-made fertilizers.

Earlier this year, Maine banned biosolids spreading out of fears of PFAS contamination, and in particular the effects on farms. One couple there found high levels of PFAS in their soil, crops, chickens, and their own blood, decades after a previous owner spread biosolids on their land.

But in New Hampshire, around 40% of that material is still spread on land in the state. For many, that's an unsettling reality – though Drouin says it has a purpose.

"Prior to the Clean Water Act, we were just dumping this directly into our surface water bodies, creating serious pollution," he says. "In order to properly manage that, we had to separate the sludge from the water. Then managing the material after that became the big question."

There are three ways the state can get rid of sludge right now: burn it, put it in a landfill, or spread it over the soil. The latter option is the only one that keeps our waste in the carbon cycle, helping minimize its impact on climate change, Drouin says, though he's hopeful for a fourth option – maybe pyrolysis or gasification – to be approved soon. Those technologies have come under fire from some environmental advocates when they were proposed as an alternative to traditional plastics recycling.

Plants get their sludge tested a few times a year, depending on their size**.** Drouin says even though New Hampshire doesn't have a standard for PFAS in sludge, for the most part, his data shows that biosolids in the state are testing at levels close to Maine's "Soil Beneficial Use" screening level, which he likened to a sludge standard.

Maine's screening level was created in 2018, before the state banned the spreading of biosolids entirely. And what makes a level of PFAS low enough to be safe is still a big question; the EPA recently said levels so low

they're currently undetectable can be harmful for human health, if they get into drinking water.

From soil to water

When PFAS chemicals make their way into soil, there's concern that humans could be harmed – through ingesting the dirt, or maybe through eating vegetables grown on the land. And as the compounds move through the soil into groundwater, they could also get into drinking water.

New Hampshire already has a "direct contact" standard for PFAS in soil, which is meant to protect people who might ingest the soil or get it on their skin. Now, the state is focused on how to set levels for PFAS in soil that would protect groundwater, the source of drinking water for 60% of Granite Staters.

Developing that standard is not a simple process. Regulators say it needs to be airtight. It could be challenged in court, possibly by the companies that produce PFAS chemicals or sell biosolids as fertilizer, as New Hampshire's drinking water standards were in 2019.

So, the Department of Environmental Services is working closely with federal scientists to back the standard up with a study looking at two main things: how widespread contamination is across all the soils in the state, and how PFAS move around in the environment.

Andrea Tokranov, a hydrologist with the US Geological Survey, is helping lead that study. For the first objective, her team tested 100 soil samples from locations across the state that had no known sources

of PFAS contamination. She says that has relevance, even outside of New Hampshire.

“Nobody knows what's in your soil, even if you don't have a [contamination] source locally. We don't know the answer to that. And I think this study contributes to that quite a lot,” she said.

For the second objective, she says the scientists are on the hunt for one value in particular: a partitioning coefficient.

That’s a parameter that can be used in scientific models to determine how much PFAS stays in soil, and how much moves into water, when it’s mixed with both soil and water at the same time.

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Andrea Tokranov, center, a hydrologist with the US Geological Survey, and her team collect groundwater samples at White Farm in Concord on April 20, 2022.

There are thousands of PFAS compounds, and they all look a little different. The ones that have longer chains of molecules have high partitioning coefficients, meaning that they get stuck in soil and could pose less of a problem for groundwater, Tokranov says. And the

shorter ones can travel a lot more in the environment. Different soils can also change that value.

The study's numbers will be specific to New Hampshire soils and will help the state build their standard. Tokranov says they're also building out the scientific literature on PFAS, which other New England states say they're watching.

In New Hampshire, state regulators are required to propose a soil standard to state legislators by November 2023.

What's next?

The main goal of the standard is to add to the rules for contaminated sites. The party responsible for the PFAS contamination would need to remediate the soil so it meets the state's standards.

On the biosolids side, the soil standard will also lay the groundwork for a standard for PFAS in sludge. Regulators plan to start sampling the soil where biosolids have been spread to see if they need to become part of the contaminated sites program.

Regulators can only sample some of the biosolids sites in the state – those that are required to have a permit to spread the material. For other sites, which spread biosolids that are further treated and don't need to have individual permits, the state would need to get permission from landowners, Drouin said.

As the state moves forward, some people in New Hampshire might find out they have unsafe levels of PFAS in their soil – something advocates like Laurene Allen have been thinking about for a long time.

“People are nervous about talking about this,” she said. “They're worried if they acknowledge that they have a concern and if this is a problem, they're going to lose their life, right? It’s not only what you do, it’s also your life savings. Your property is your biggest asset in most cases.”

Allen has long advocated against PFAS contamination in her community in Merrimack. She says Maine’s ban was bold. And, though she recognizes a similar halt could be hard on some industries, she says the health of the state is on the line.

“The state needs to be able to take the knowledge that's out there and courageously use it to say no, to say the environment needs to come first,” she said.

She also wonders what will happen after this soil standard is put in place – will farmers get help cleaning up their land? Who will pay for it? Even state regulators say assigning a responsible party, in the case of biosolids, is really complicated.

Advocates and those in the biosolids industry alike wonder how a standard addresses the root of the problem: the harmful man-made chemicals companies continue to make, and we continue to flush down the drain.