

PFAS Research Needs

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Office of the Secretary

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*Per- and Polyfluoroalkyl Substances (PFAS)
Federal Research and Development Strategic Plan*

A Report by the
JOINT SUBCOMMITTEE ON ENVIRONMENT, INNOVATION, AND
PUBLIC HEALTH
PFAS Strategy Team
of the
NATIONAL SCIENCE AND TECHNOLOGY COUNCIL

AUGUST 2024

Federal Research and Development Strategic Plan

- Task 1.2.2: Expand ongoing research to understand bioavailability, bioaccumulation, and biomagnification of PFAS and mixtures of PFAS in aquatic (estuarine, fresh, and marine), terrestrial, and avian species, and their movement within agricultural lands and the food and feed webs.
- Task 1.1.3: Develop and support additional food product sampling and analysis for PFAS, including foods grown or raised in areas with water contamination; animal/livestock feed ingredients; general population dietary items; fish, wildlife, and plants related to subsistence and cultural practices of Tribal populations and other communities, developing fetuses, infants, or children; and food packaging and processing. Develop reference materials in food to support agricultural research.

Federal Research and Development Strategic Plan

- Task 1.1.4: Support and expand food and animal/livestock feed production sampling and analysis for PFAS to include rural and urban soils, aquaculture systems, areas using reclaimed/reuse water, areas using contaminated groundwater, domestic sludge, and biosolids- and compost-impacted soils.
- Task 2.1.8: Develop testing programs and methods related to quantifying PFAS content, migration, and emissions in animal/livestock feed, food and food packaging, indoor exposure (dust, home/office materials), workplace settings, and consumer products.
- Task 4.1.3: Support research regarding the treatment of PFAS-contaminated agricultural lands and commodities that are protective of human health and the environment, cost-effective, and implementable.

EPA Awards \$15 Million for Research on PFAS Exposure and Reduction in Agriculture

September 4, 2024

Contact Information

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WASHINGTON – Today, September 4, 2024, the U.S. Environmental Protection Agency announced over \$15 million in research grant funding to ten institutions for research to reduce per- and polyfluoroalkyl substances exposure from food and protect our farmlands and farming communities. These community-engaged research projects will collect PFAS bioaccumulation data in agricultural plants and livestock and explore strategies for reducing PFAS exposure, which are important parts of EPA's commitment to protecting human health and the environment from PFAS.

- **Michigan State University, East Lansing, Michigan** - Comprehensive Evaluation of Fate, Transport, Bioaccumulation and Management Solution of PFAS on a Crop and Livestock Farm that Received Biosolids.
- **Passamaquoddy Tribe, Sipayik Environmental Department, Pleasant Point, Maine** - PFAS Accumulation in Finfish and Shellfish Species within the Coastal and Inland Waters of the Peskotomuhkati (Passamaquoddy) Homelands.
- **Temple University, Philadelphia, Pennsylvania** - Investigating the Effects of Irrigation Water, Compost and Biosolid Qualities on PFAS Uptake by Edible Crops in Urban Gardens and Farms.
- **Texas A&M University, College Station, Texas** - PFAS-MAPS: PFAS Mitigation and Monitoring in Amended Plant Systems.
- **Texas Tech University, Lubbock, Texas** - Evaluating and Mitigating Bioaccumulation of PFAS in Plant, Mammalian and Aquaculture Systems.
- **University at Albany, State University of New York Albany, New York** - Practical Management of PFAS Contaminated Agricultural Soil Using an Innovative Platform Integrating Experimental Research and Machine Learning Approaches.
- **University of Illinois, Urbana, Illinois** - Plant Uptake and Mitigation of PFAS Associated with Sewage Effluent and Biosolids Application in Tile-Drained Field.
- **University of Maine, Orono, Maine** - Developing Integrated Mitigation Strategies to Help Farmers Reduce PFAS Risks in Forage and Livestock Systems.
- **University of Utah, Salt Lake City, Utah** - PFAS in Land-applied Biosolids in Agricultural Settings: A Mechanistic Understanding on Fate and Mitigation.
- **University of Virginia, Charlottesville, Virginia** - Novel, Bio-enabled Strategies to Prevent Per- and Polyfluoroalkyl Substances Accumulation in Crops and Food Webs.



September 1, 2024



ARRASQUERO FOR THE NEW YORK TIMES
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g right — the Trump cam-
has been aggressively
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been regarded as unreliable
unreachable, but that Repub-

Toxic 'Forever Chemicals' Turn Up on Farms in U.S.

Research Detects Contaminants in Fertilizer Made From Municipal Sewage

By HIROKO TABUCHI

GRANDVIEW, Texas — For decades, farmers across America have been encouraged by the federal government to spread municipal sewage on millions of acres of farmland as fertilizer. It was rich in nutrients, and it helped keep the sludge out of landfills.

But a growing body of research shows that this black sludge, made from the sewage that flows from homes and factories, can contain heavy concentrations of chemicals thought to increase the risk of certain types of cancer and to cause birth defects and developmental delays in children.

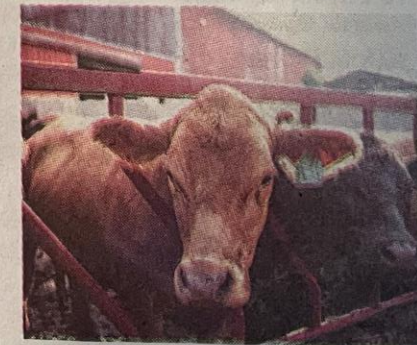
Known as “forever chemicals” because of their longevity, these toxic contaminants are now being detected, sometimes at high levels, on farmland across the country, including in Texas, Maine, Michigan, New York and Tennessee. In some cases the chemicals are suspected of sickening or killing livestock and are turning up in produce. Farmers are beginning to fear for their own health.

The national scale of farmland contamination by these chemicals — which are used in everything from microwave popcorn bags and firefighting gear to nonstick pans and stain-resistant carpets — is only now starting to become apparent. There are now lawsuits against providers of the fertilizer, as well as against the Environmental Protection Agency, al-

In 2022, Maine banned the use of sewage sludge on agricultural fields. It was the first state to do so and is the only state to systematically test farms for the chemicals. Investigators have found contamination on at least 68 of the more than 100 farms checked so far, with some 1,000 sites still to be tested.

“Investigating PFAS is like opening Pandora’s box,” said Nancy McBrady, deputy commissioner of Maine’s Department of Agriculture.

In Texas, several ranchers blamed the chemicals for the deaths of cattle, horses and catfish on their properties after sewage sludge was used as fertilizer on neighboring farmland. Levels of one PFAS chemical in surface water exceeded 1,300 parts per tril-



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Contaminated cattle on Jason Grostic’s farm in Michigan.



Contaminated cattle in Michigan, left, that Jason Grostic cannot sell. A cornfield in Johnson County, above, fertilized with sewage sludge from Synagro.

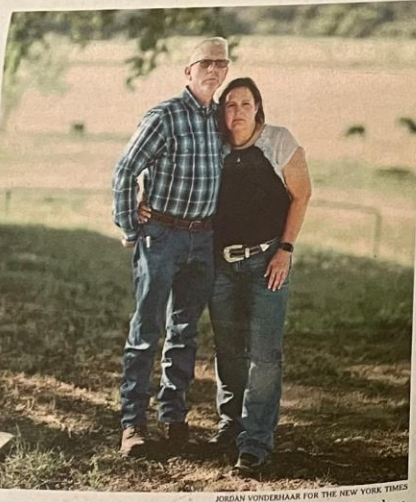


Dana Ames has investigated PFAS contamination for the Constable's Office in Johnson County. Dead calves and other cattle made the Colemans suspicious.

Push to End S Of Phone and

By LUKE BROADWATER
 WASHINGTON — As President Donald J. Trump hunted for people inside the government who were divulging details of an investigation into whether his 2016 election campaign colluded with Russia, the Justice Department turned to a covert tactic.
 Beginning in 2017, department officials secretly collected phone and email records of a dozen people linked to Congress, including lawmakers and a who deal with anonymous whistleblowers, in an effort to see might be coming forward with confidential information.
 Some of the aides, from both political parties, learned recently that their communications were collected, because the government for years hid the extent of the subpoena nondisclosure orders.
 Now, whistle-blower groups are trying to pry information out of the Justice Department, through court and public records requests, and hopes of shaming the agency by ending the practice of collecting congressional communications records.
 Critics say it is not just the privacy of the aides at stake but Congress's ability to oversee. In large part, it depends on a confidant of communication with government whistleblowers, or internal wrongdoing or internal "Blanket subpoena body" who's confidential office that may be adversarial oversight were threat to institutional checks and said Tom Devine, director of the nonprofit Accountability Project, a whistleblower protection group.
 The effort to end spearheaded by a former Republican Oversight. The Jason Foster, recently that his records collected without Mr. Foster and subpoenas raise issues about what conduct covered by the Department was learning what are communityers.
 Justice point out, was ordered administration General Michael A. Takeda, stepped back, though attempts to curb the subpoena reform the investigation by the general independent in
 In a letter, the agency changes administration to inquire into leak inquiries was obtained Times, desk steps taken its policies ensure court Under Member Section to poems that company aide's com
 "The national calls," Carle than went the House January. But we are dema from the practice, that went official nology e their sul

Toxic 'Forever Chemicals' Turn Up on Farms Across U.S.



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 sense," Mr. Coleman said.
 Synagro, which is owned by Goldman Sachs Asset Management, said it was "vigorously contesting" the allegations. It said its preliminary study of PFAS levels where the sludge was applied showed numbers "drastically lower" than what the plaintiffs claimed, less than 4 parts per trillion in surface water, for example.
 "Synagro does not generate PFAS or use them in our processes," said Kip Cleverley, the company's chief sustainability officer. "In other words, we are a passive receiver, as are our wastewater utility partners."
 At the center of the crisis is the Environmental Protection Agency, which for decades has encouraged the use of sewage as fertilizer. The agency regulates pathogens and heavy metals in sewage fertilizer, but not PFAS, even as evidence has mounted of their health risks and of their presence in sewage.
 The E.P.A. is currently studying the risks posed by PFAS in sludge fertilizer (which the industry calls biosolids) to determine if new rules are necessary.
 The agency continues to promote its use on cropland, though elsewhere it has started to take action. In April, it ordered utilities to slash PFAS levels in drinking water to near zero and designated two types of the chemical as hazardous substances that must be cleaned up by polluters. The agency now says there is no safe level of PFAS for humans.

may have applied contaminated biosolids and develop targeted interventions to support farmers and protect the food supply," the E.P.A. said in a statement.
 Research has shown that PFAS can enter the human food chain from contaminated crops and livestock.
 It's difficult to know how much fertilizer sludge is used nationwide, and E.P.A. data is incomplete. The fertilizer industry says more than 2 million dry tons were used on 4.6 million acres of farmland in 2018. And it estimates that farmers have obtained permits to use sewage sludge on nearly 70 million acres, or about a fifth of all U.S. agricultural land.
 Sewage sludge is also applied to landscaping, golf courses and forest land. And it has been used to fill up old mines.
 "There's clearly a need to test every place where biosolids were applied," said Christopher Higgins, a professor of civil and environmental engineering at the Colorado School of Mines. "And any industrial facility that is discharging waste to the municipal wastewater facilities probably should be tested."
 Scientists point out that sludge fertilizer has benefits. It contains plant nutrients like nitrogen, phosphorus and potassium. It helps reduce the use of fertilizers made from fossil fuels. It cuts down on the millions of tons of sludge that would otherwise be incinerated, releasing pollution, or would go to landfills.

"Yet all of the chemistry that society produces, and is exposed to, is in that sewage," said Rolf Halden, professor of environmental biotechnology at Arizona State University, among the earliest researchers to study PFAS in sewage sludge.
The Smell of Death
 Dana Ames, an environmental crimes investigator at the Constable's Office in Johnson County, cut her teeth working missing-person cases and grisly homicides. But her first encounter with sludge fertilizer still came as a rude shock.
 A farmer had applied the sludge to his fields, and two neighboring ranchers lodged a complaint about the smell. She drove out to investigate.
 "I rolled down the window and I literally almost projectile vomited in my vehicle," she said. "I'm accustomed to smelling death. This was worse than death."
 That call led to a remarkable investigation, overseen by Ms. Ames, into PFAS contamination of the sludge being spread in her county. She obtained a sample of the fertilizer and found it contained 27 different types of PFAS, at least 13 of which matched the PFAS in the soil and water samples from the two ranches.
 And when a calf was stillborn at the Coleman ranch, she rushed the carcass to a lab at Texas A&M University. Testing revealed its liver to be full of PFAS.

officials called an emergency meeting about their findings. "This isn't just isolated to this county, or even multiple counties. This is going on all over," said a county commissioner, Larry Woolley. "And the amount of beef and milk that's gone into the food chain, who knows what their PFAS levels are."
 This year the Colemans and their neighbors James Farmer and Robin Alessi sued the biosolids producer Synagro and also the E.P.A., saying the agency had failed to regulate the chemicals in fertilizer.
 They have stopped sending their cattle to market, saying they don't want to endanger public health. Their days are now filled with long hours of caring for a herd they don't expect to ever ship.
 To cover the costs, they work extra jobs and have dipped into their savings. They fear they have lost their livelihoods forever.
 "A lot of people are still scared to talk about it," Mr. Coleman said. "But for us, it's all about being honest. I don't want to hurt anybody else, even though we feel people have hurt us."

Mountains of Sludge
 When the E.P.A. started promoting sludge as nutrient-rich fertilizer decades ago, it seemed like a good idea.
 The 1972 Clean Water Act had required industrial plants to start sending their wastewater to treatment plants instead

also produced vast new quantities of sludge that had to go somewhere.
 It also meant contaminants like PFAS could end up in the sewage, and ultimately in fertilizer.
 The sludge that allegedly contaminated the Colemans' farm came from the City of Fort Worth water district, which treats sewage from more than 1.2 million people, city records show. Its facility also accepts effluent from industries including aerospace, defense, oil and gas, and auto manufacturing. Synagro takes the sludge and treats it (though not for PFAS, as it's not required by law) then distributes it as fertilizer.
 Wastewater treatment involves many stages, including the use of bacteria that eliminate contaminants. The plant checks for heavy metals and pathogens that can be harmful to health. Yet conventional wastewater plants like these were not designed to monitor or remove PFAS.
 Steven Nutter, environmental program manager at Fort Worth's Village Creek Water Reclamation Facility, said the plant followed all federal and state standards. "The ball is in E.P.A.'s court," he said.
 E.P.A.'s own researchers have found elevated levels in sewage sludge. And in the agency's most recent survey of biosolids, PFAS were almost universal. A 2018 report by the E.P.A. inspector accused the agency of failing to properly regulate biosolids, saying it had "re-

Synagro acknowledges in its latest sustainability report that PFAS are a problem. "One of our industry's challenges," it says, "is the potential of unwanted substances in biosolids, like per- and polyfluoroalkyl substances" or PFAS.
 Yet banning sludge fertilizer isn't the way forward, biosolids industry groups say. Maine's ban has only caused the state to truck more sewage out of state, because local landfills can't accommodate it, said Janine Burke-Wilk, executive director of the North East Biosolids & Residuals Association, which represents producers.
 She said regulators should focus on curbing the PFAS entering wastewater by banning use in consumer products or requiring industries to clean their effluent before sending it to treatment plants. "There's not enough money in the world to take it out at the end," she said.
 Figuring out how to deal with this crisis is a challenge, now facing many states. Maine, along with its ban on fertilizer, and its testing of farmland, is also offering financial assistance to affected farmers and helping them shift from growing food. Using the land to grow other crops, like flowers or to install solar panels, are some of the options being promoted.
 Michigan has taken a different approach.
 There, regulators have tested only 15 or so farms that had received fertilizer sludge from Synagro.



E C O S

PFAS in Biosolids: A Review of State Efforts & Opportunities for Action

By Sarah Grace Hughes, Senior Project Manager, ECOS

Migration

States would like more research on environmental fate and transport parameters for various PFAS in soil, sediment, and groundwater, especially. States would like assistance with modeling to gain a clearer understanding of how PFAS leach from soil to groundwater and surface water, and are taken up by crops, plants, wildlife, and fish, as well as what site conditions affect this migration. States also noted that more research on the detection and transformation of oxidizable precursors and how they change in a WWTP would be helpful, as well as on how migration is associated with human health and ecological risks. Source reduction, and limiting industry production of PFAS, will help avoid some of the migration concerns.

Plant Uptake

There are still many unknowns on how crops and other plants take up PFAS when biosolids are land applied or by surface and groundwater interfaces. States would like more research on:

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- What is the impact of PFAS and biosolids to crops (including feed crops, gardening crops, roots, leaves, fruits and vegetables, etc.), and are certain crops more or less likely to uptake?
- What conditions affect uptake (e.g., PFAS concentration in biosolids, plant type, etc.)? This includes questions about direct plant uptake, as well as uptake from plants used as grain and animal feed. Can uptake be controlled by restricting plant type?
- How do PFAS partition for in-ground vs. above-ground plants, and how does this change over time if it is dependent on chain length?
- How does PFAS bioaccumulate in crops grown on land application sites, and what is the relationship between land application and plant uptake?

PFAS

Per- and poly-fluoroalkyl substances (PFAS) are steadily emerging as a major issue to farmers and ranchers in the United States. Federal agencies should work with state departments of agriculture to keep agricultural operations productive and economically viable by offering financial support and providing access to federal programs, either currently existing or to be created in response to this emerging risk.



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NASDA'S POSITION, POLICY AND ACTIONS

NASDA supports developing strategies to remediate lands contaminated with PFAS that allow farmers and ranchers to keep their agricultural land productive.

NASDA supports federal legislation that increases state funding and resources for responding to identified and emerging pollutants, particularly PFAS, impacting agricultural lands, groundwater, surface water, livestock and the nation's food supply.

NASDA encourages the development of a federal framework that collaboratively supports states responding to PFAS and minimizes impacts on interstate commerce.

NASDA encourages using the best available science and appropriate risk assessment in establishing any regulatory standards of threshold levels for PFAS in food products. We encourage complete toxicological evaluations and interpretations before any relevant federal agency releases the data.

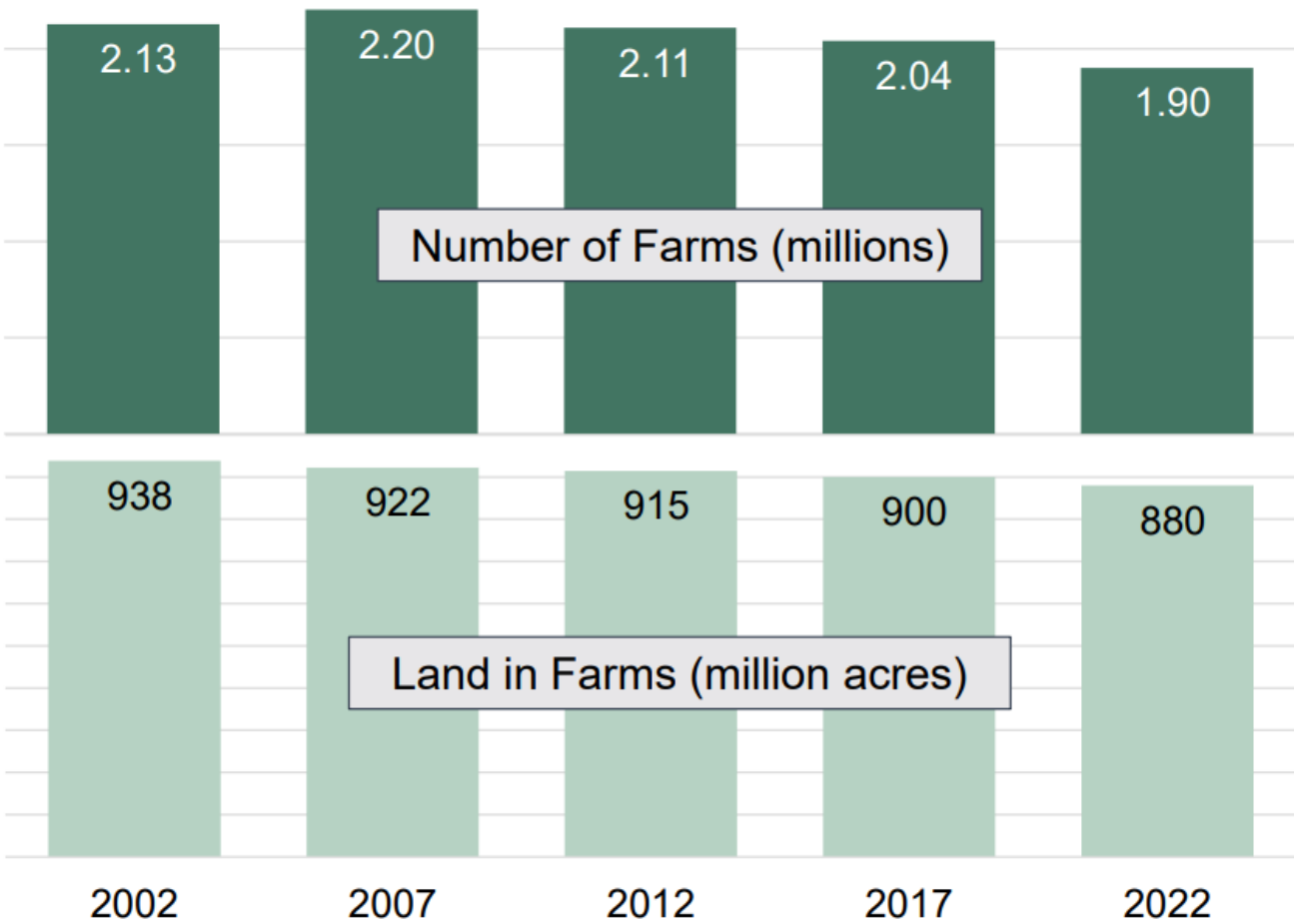
NASDA supports robust financial support for impacted farmers.

NASDA supports federally funding research for mitigation strategies on the risk of PFAS contaminants in the food supply and cleanup efforts.

Research that informs Policy

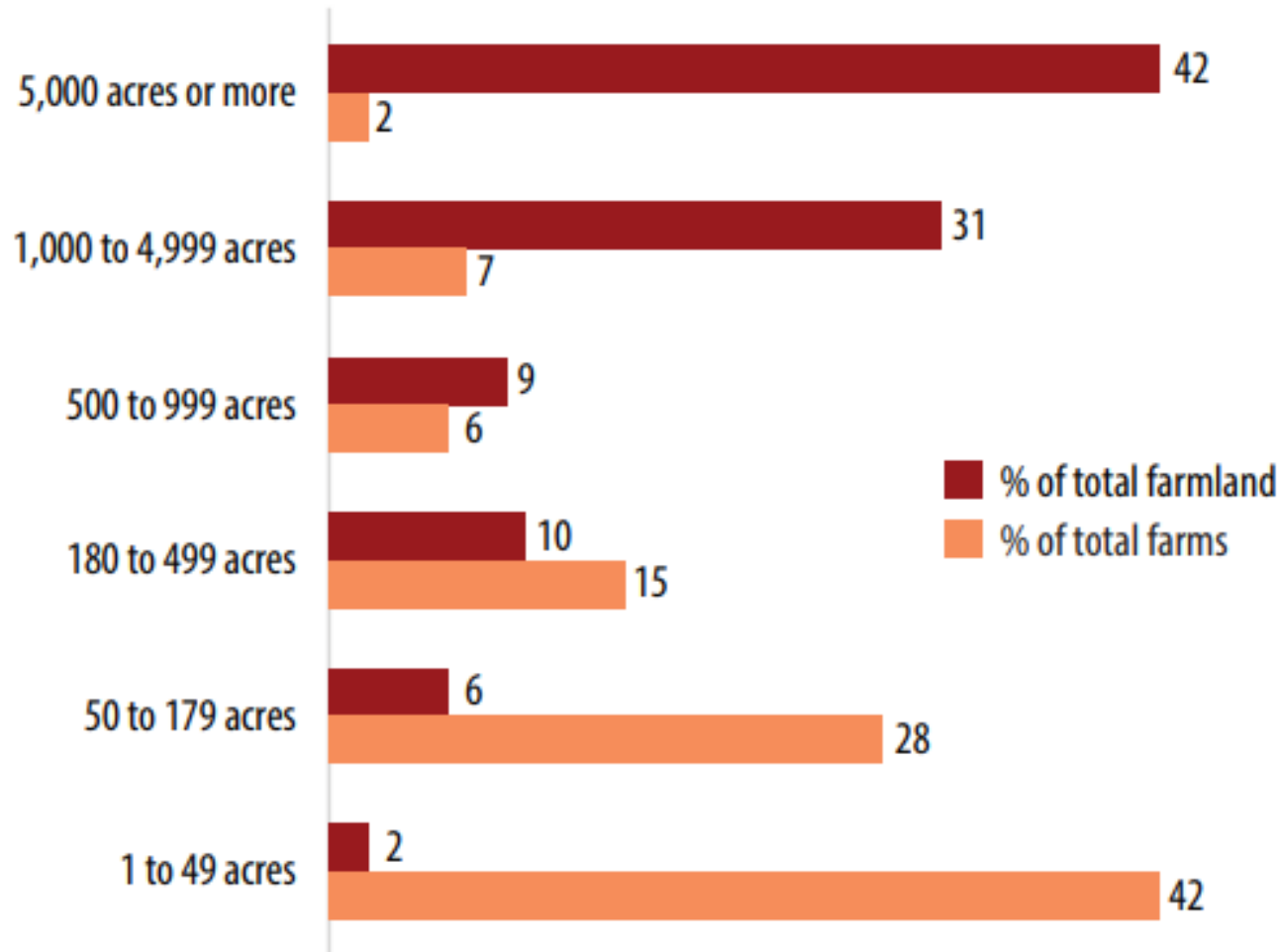
- Levels of PFAS in agriculture and food products – testing methods, results of testing
- How does PFAS get into agriculture and food – sources of contamination (biosolids, groundwater, etc.)
- Extent of contamination locally and nationally --
 - how big is the problem and where are we most likely to find contamination?
- Fate, transport, bioaccumulation –
 - how does PFAS move in the food chain?
 - which crops and animals have bioaccumulation?
- Remediation –
 - how do we keep farmers on their farms?
 - how to remediate soil and water?
 - how do we dispose of contaminated products (animals, crops)?
 - which crops can be grown on contaminated farms?

Number of Farms and Land in Farms, 2002 - 2022



	2017	2022	% change
Number of farms			
	2,042,220	1,900,487	-6.9
Land in farms (acres)			
	900,217,576	880,100,848	-2.2
Average farm size (acres)			
	441	463	+5.0

Farms and Land by Size of Farm



In 2022, the largest 2% of U.S. farms (5,000 or more acres) controlled 42% of all farmland. Conversely, 42% of farms had less than 50 acres and controlled 2% of all farmland.

In 2002, the largest farms controlled 35% of all farmland.

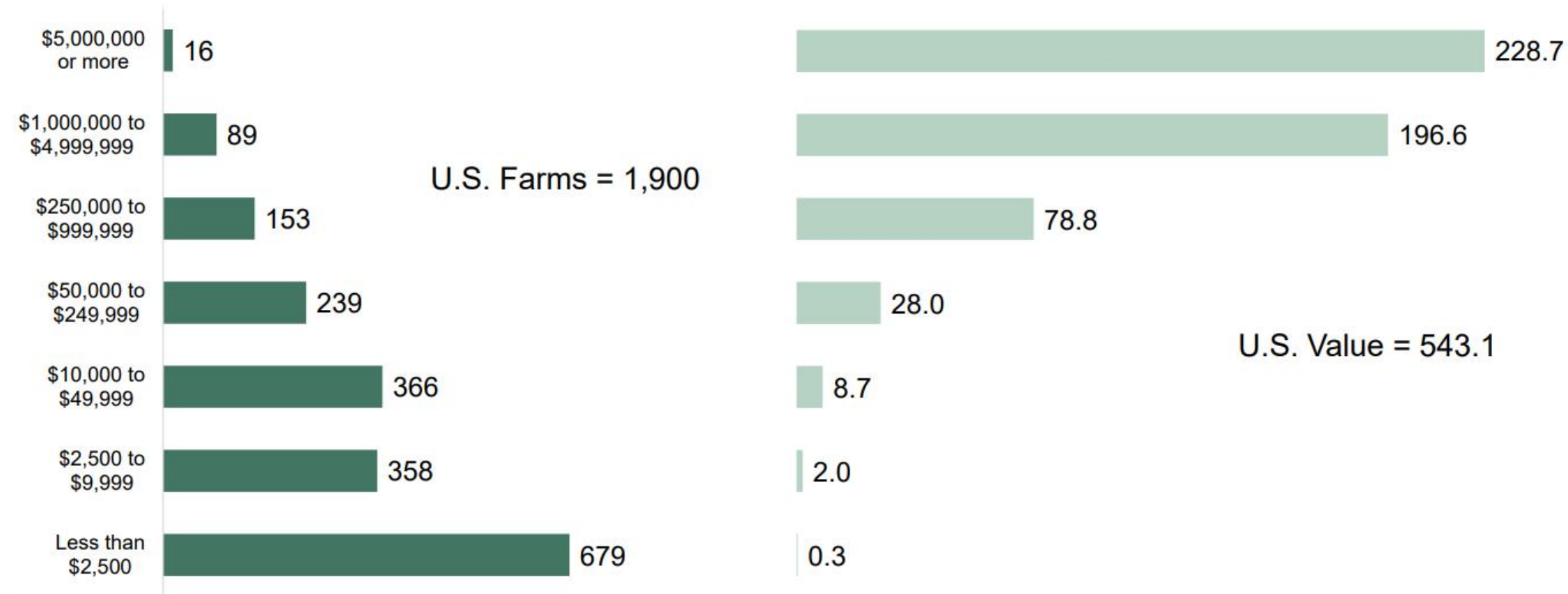
Number of Farms, by Sales Class, 2017 and 2022 (thousands)



Farms and Value of Production, by Sales Class, 2022

Number of Farms (*thousands*)

Value of Production (*\$ billions*)



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