USDA Agricultural Research Service: Building Roadmaps for PFAS Research and Mitigation

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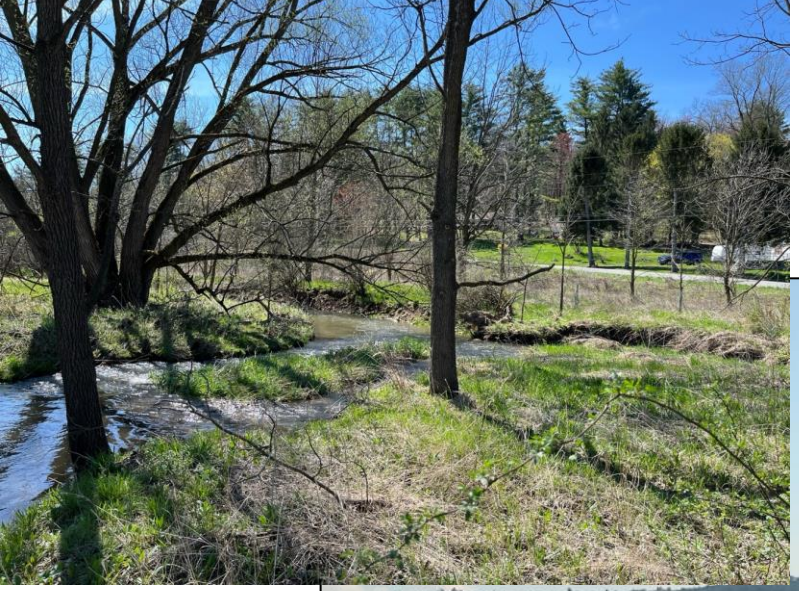
January 14, 2025



PFAS in Agriculture:

when nonstick sticks around

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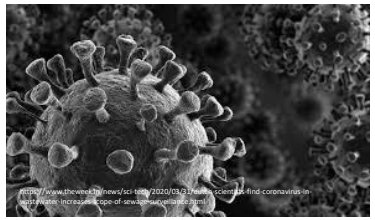
December 17, 2024

Land-application of wastewater residuals

What's in Wastewater Influent?

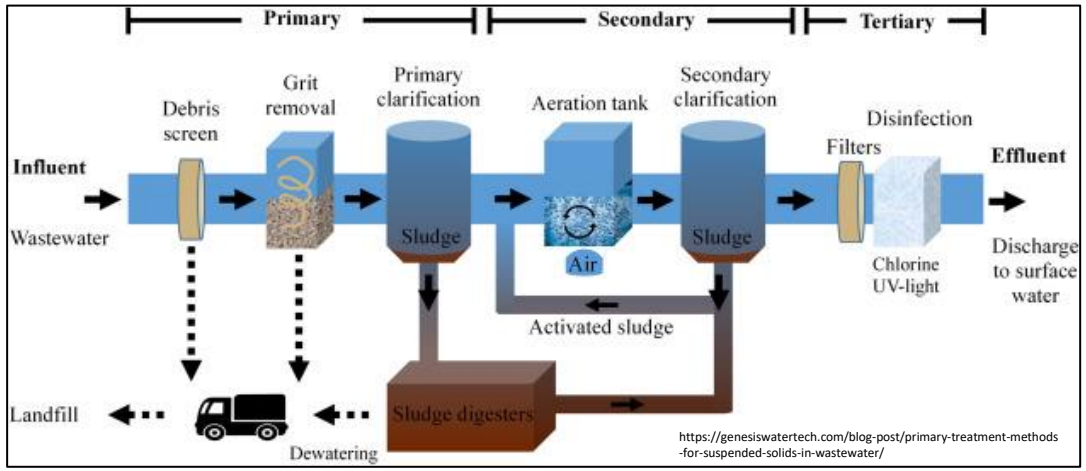
- Pathogens
  - Bacteria
  - Viruses
  - Parasites



- Chemicals
  - Domestic
  - Industrial
  - Hospitals

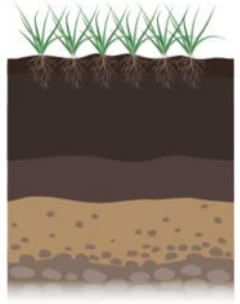
- Nutrients
  - Nitrogen
  - Phosphorus

Options for Wastewater Residuals:



Solid wastes (biosolids):

OR

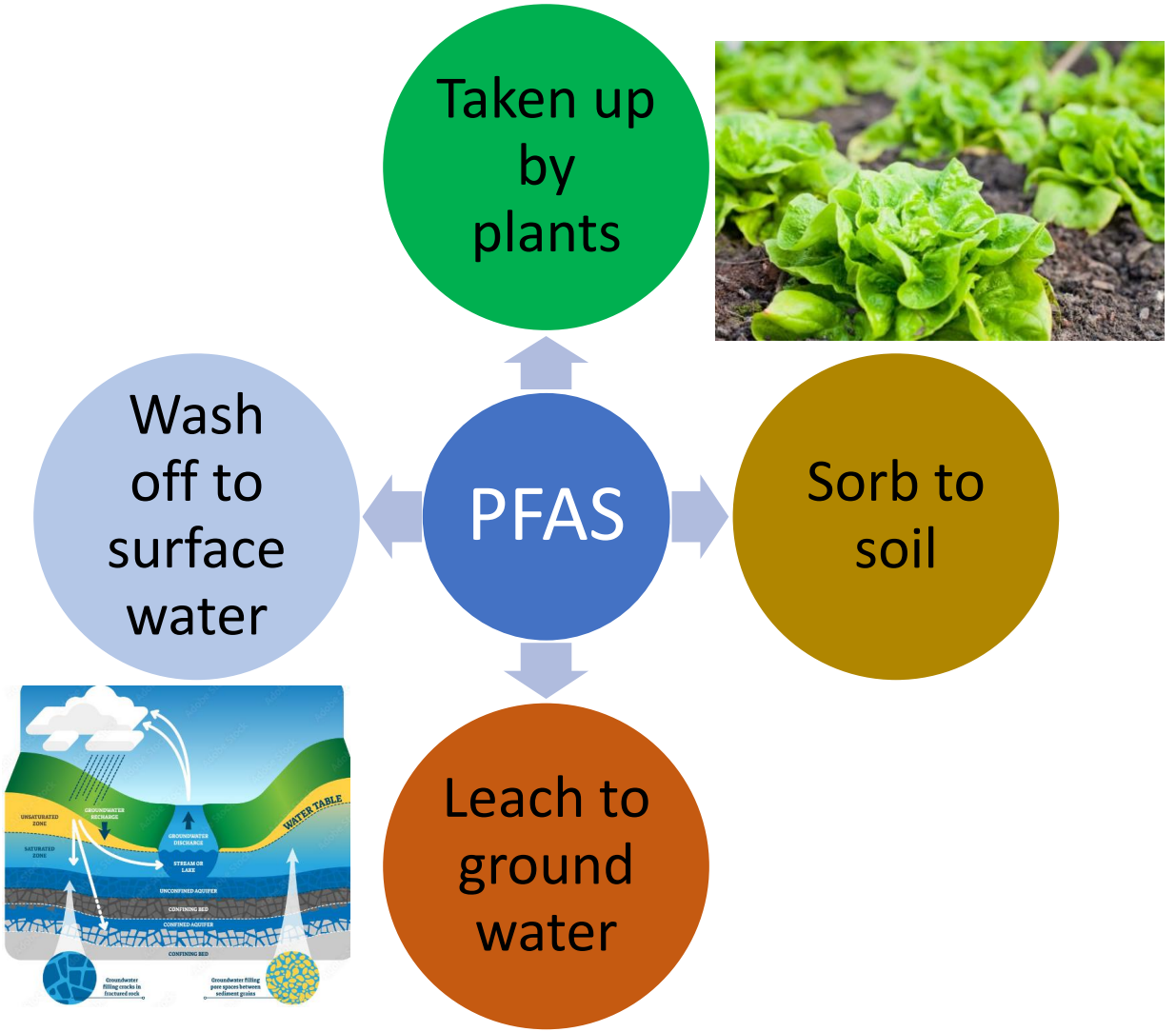


Wastewater effluent:

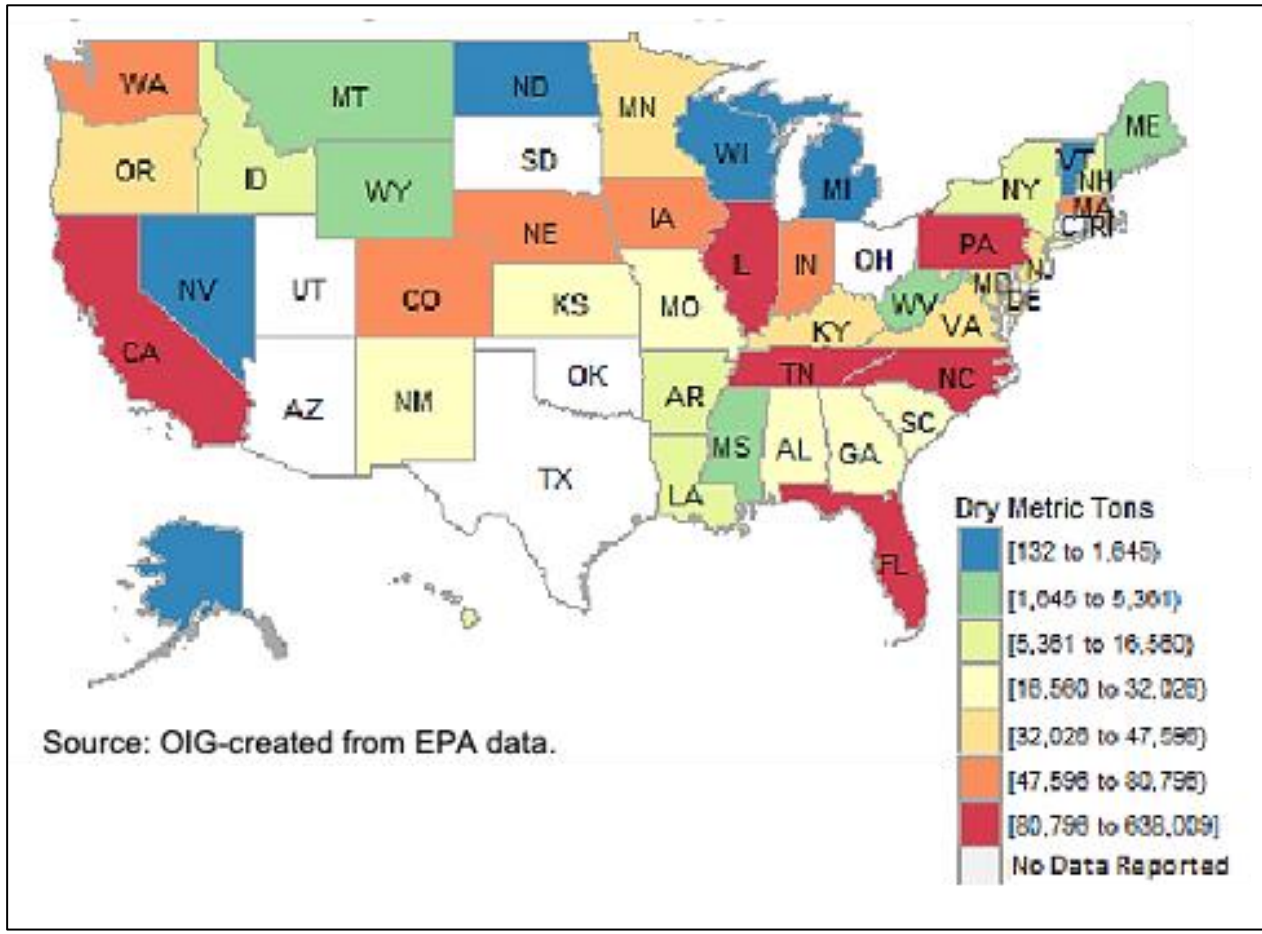
OR

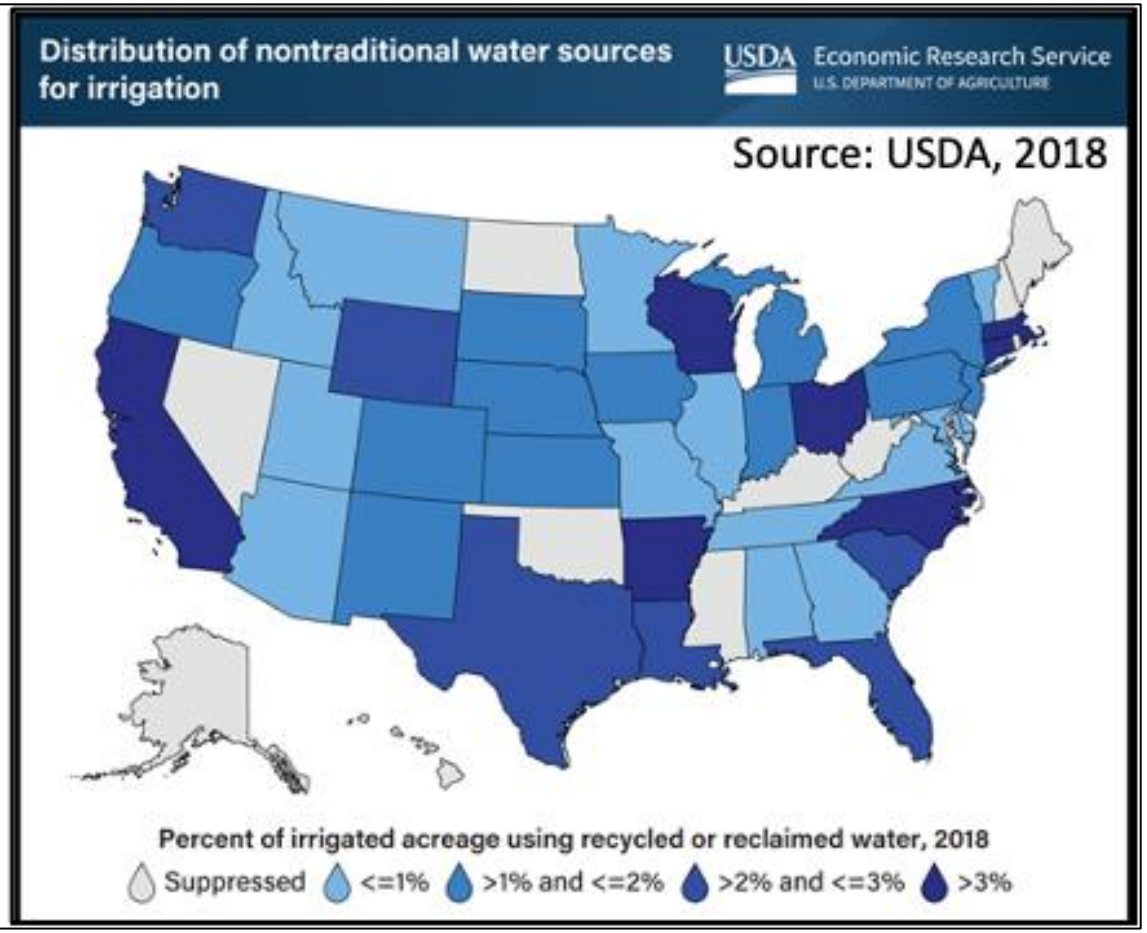
Reuse of wastewater byproducts is a major PFAS route to ag systems

Irrigation of wastewater effluent

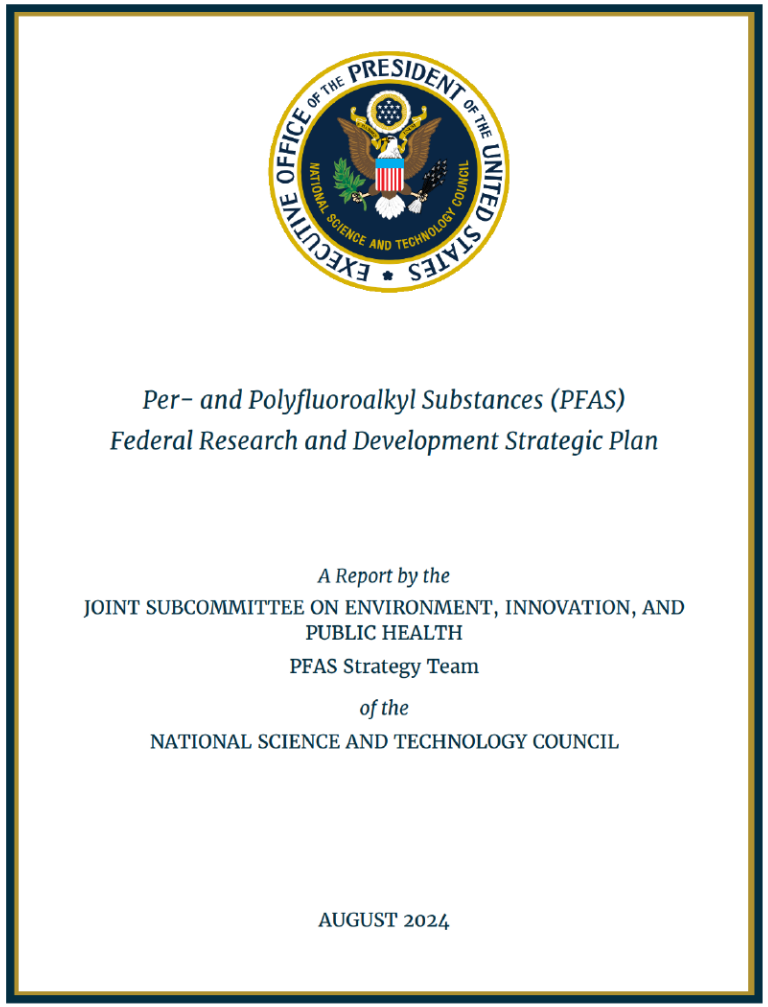


Biosolids application and wastewater irrigation





National PFAS Strategic Plan



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

USDA U.S. Department of Agriculture

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.

4

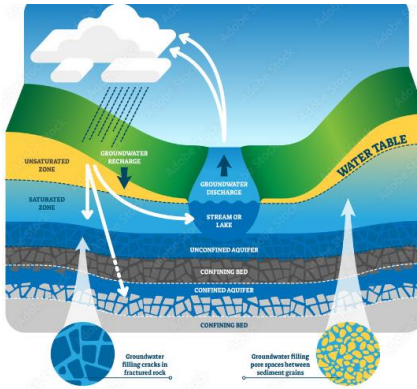
Credit: Greg Jaffe, USDA/OSEC

Strategic plan calls for PFAS research

USDA U.S. Department of Agriculture

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?



ARS-wide workshop on PFAS in Agriculture

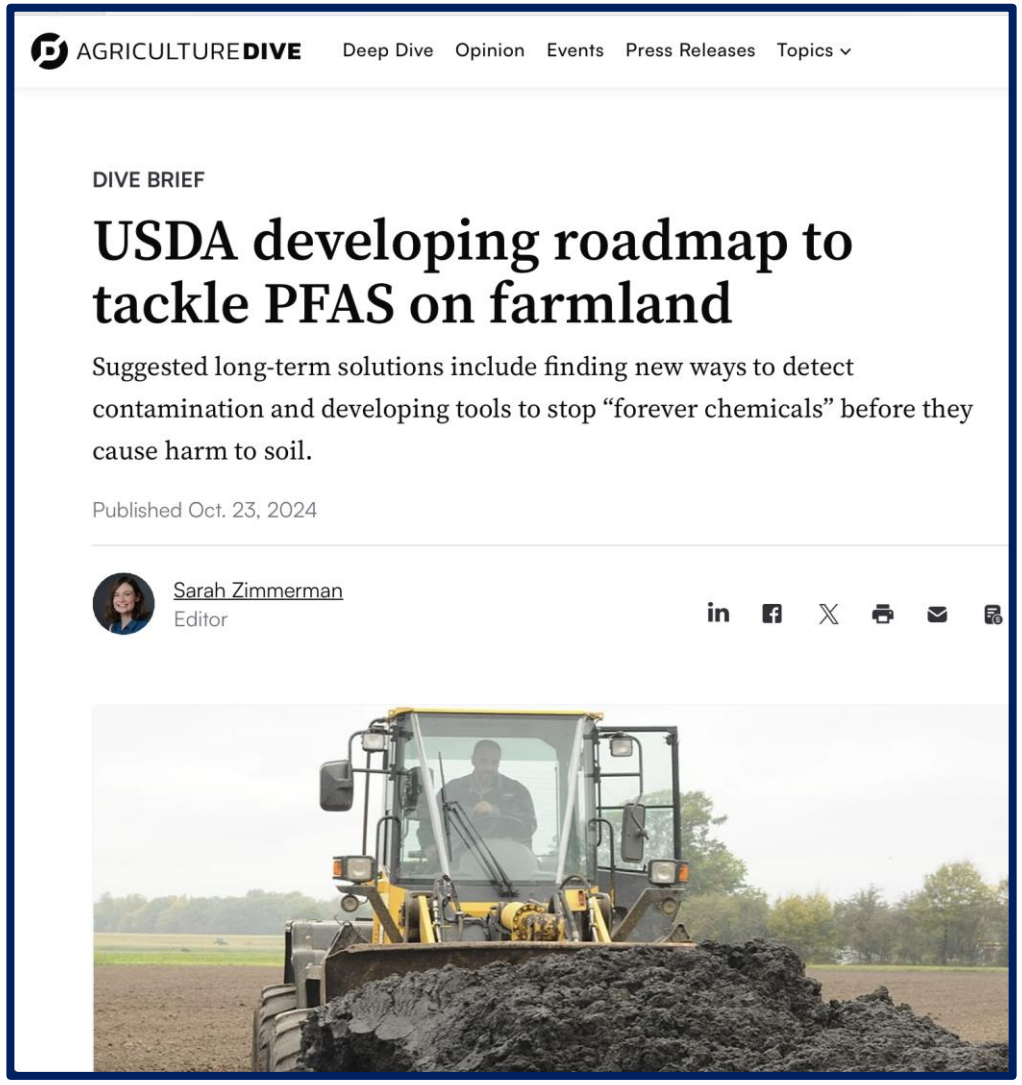
Identifying and Prioritizing Research and Programmatic Needs in the Detection, Mitigation, and Remediation of PFAS in Agriculture and Food Systems

2024 Workshop
Arlington, VA

a collaboration between
USDA ARS & University of Maine

<u>Workshop Goal</u>: Develop a research develop a research roadmap that would lead to short and long-term science-based solutions to meet the emerging challenges posed by the discovery of Per-and polyfluoroalkyl substances (PFAS) in agricultural soils and waters.

ARS-wide workshop on PFAS in Agriculture



AGRICULTUREDIVE Deep Dive Opinion Events Press Releases Topics

DIVE BRIEF

USDA developing roadmap to tackle PFAS on farmland

Suggested long-term solutions include finding new ways to detect contamination and developing tools to stop "forever chemicals" before they cause harm to soil.

Published Oct. 23, 2024

Sarah Zimmerman
Editor

- ARS Planning committee met throughout 2024 to organize.
- 3-day workshop held Sept 10-12, 2024
- More than 150 interagency researchers, universities and state partners.

Designed to identify, strategize, and develop approaches for implementation of plans to solve priority problems that PFAS poses to agriculture, agricultural agroecosystems, food systems, and farming communities.

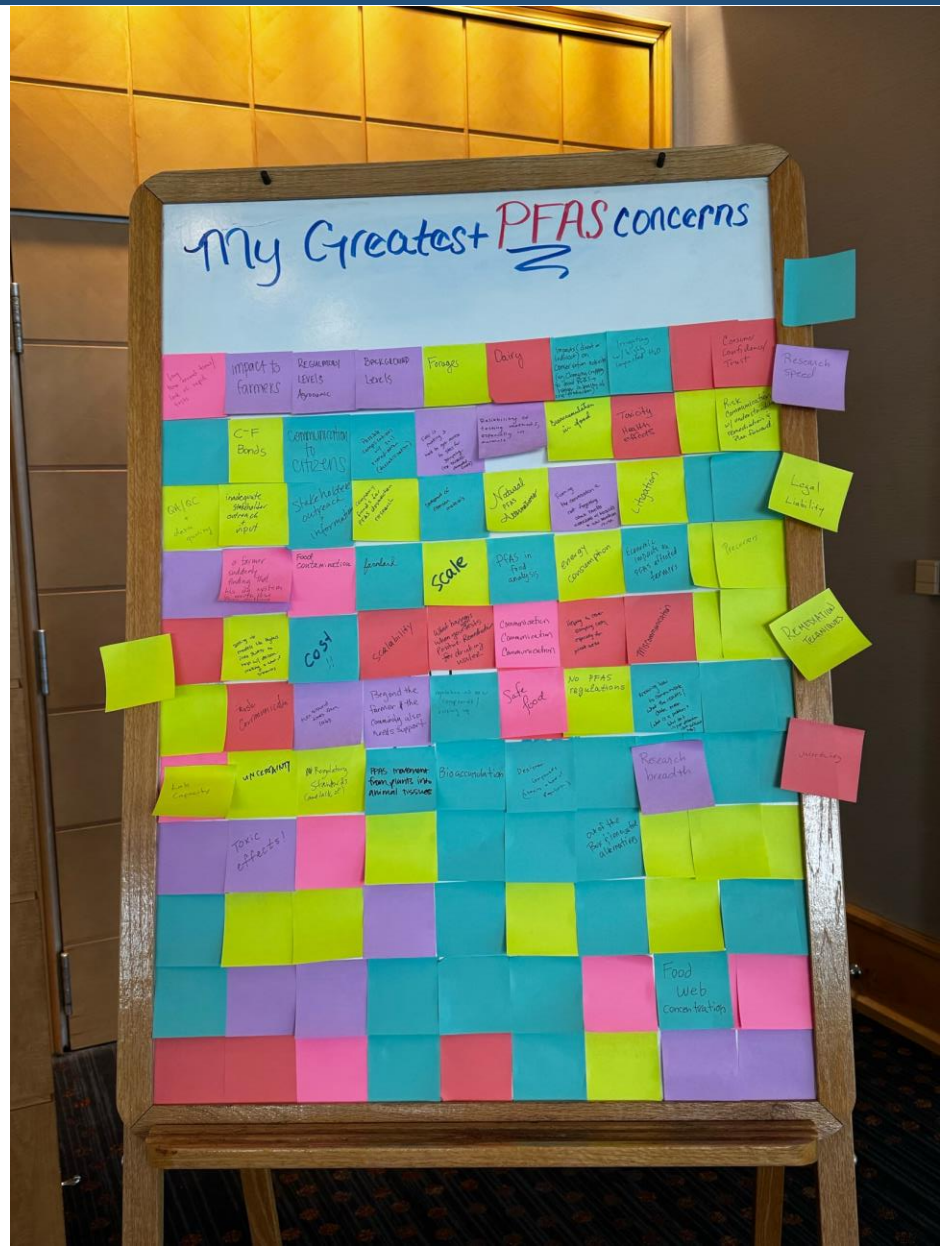
https://www.agriculturedive.com/news/usda-roadmap-pfas-farmland-forever-chemicals/730770/

ARS-wide workshop on PFAS in Agriculture

Format:

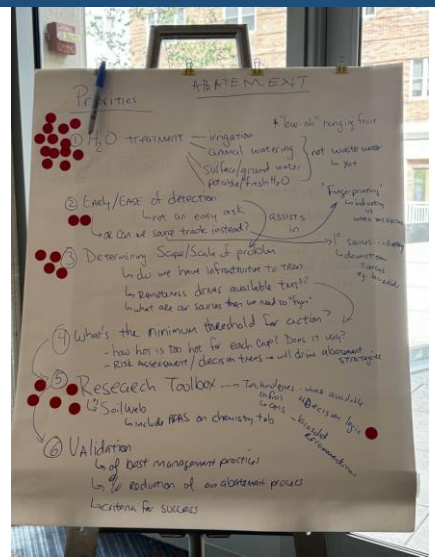
The meeting consisted of **presentations, breakout sessions, and read-outs** designed to facilitate communications and solution development for problems that initially fell into **eight broad conceptual areas** where PFAS impacts agriculture.

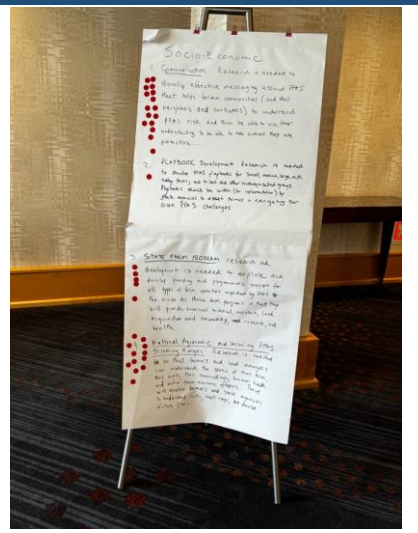
1. **A**batement
2. **D**ata
3. **E**nvironment
4. **F**ood
5. **L**ivestock
6. **M**aterials
7. **P**lants
8. **S**ocio-economic

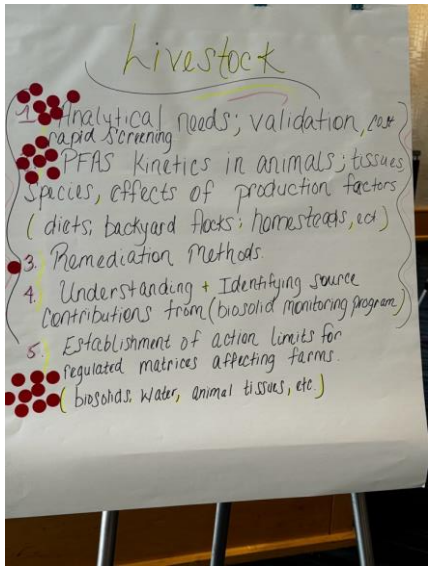


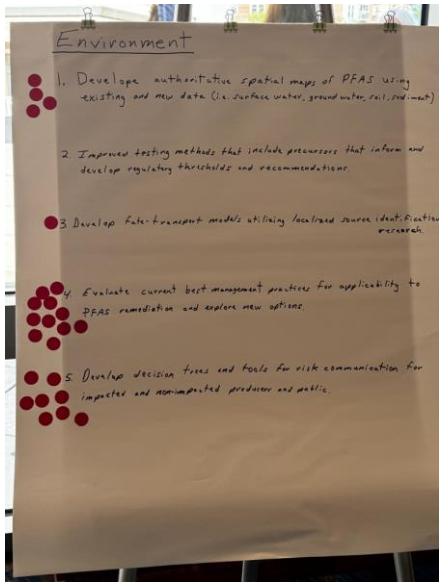
ARS-wide workshop: Agenda & Process

- **Day 1:** Consisted of presentations by subject matter experts for 8 broad areas where PFAS impact agriculture.
- **Day 2:** Attendees met in breakout sessions to identify the key research needs for agriculture in those eight broad areas. Attendees ranked those (red dots) and the coordinating committee determined where similar research needs were communicated as priorities by those breakout sessions.
- **Day 3:** Attendees refined those (now called focal points) and developed high-level roadmaps of what activities would lead to solution development of those priorities and the impacts of those solutions.



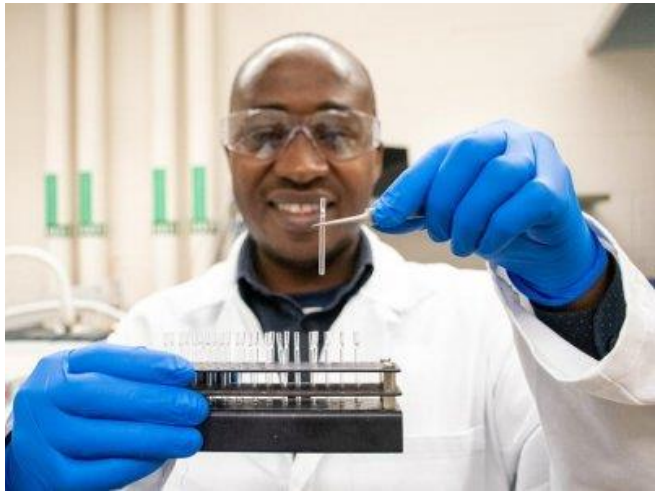






Focal Point #1:
Analytical Methods and Validation needs for PFAS

***Roadmap title*:** The need for rapid quantitative methods for PFAS



Key Aspects

1. Validated & standardized methods for various matrices
2. Networks and forums/sharing information
3. Workshops & trainings
4. Lower cost of analysis

Impacts if completed:

1. Better methods => lower cost & quick turn-around time
2. Generated data will help farmers and communities and inform risk assessment for regulations
3. Trained workforce
4. Improved environmental & human health

Expressed in the following working groups: Abatement, Environment, Food, Livestock, and Plants

Focal Point #2:
PFAS Alternatives, Abatement & Remediation

***Roadmap title*:** Reduce PFAS from agroecosystems while optimizing resource inputs

Key Aspects

1. **R**eplace PFAS in industry, textiles, fire-fighting foams, others
2. **I**mmobilize PFAS so that it is not bioavailable from any matrix
3. **D**estroy PFAS completely, economically, and in environmentally friendly ways

Impacts if completed:

1. Remove 100's of tons of PFAs from food packaging in 5 years
2. Source reduction of PFAs entering agroecosystems
3. Deliver a toolbox for partial reduction of PFAs moving from agroecosystems to environmental systems
4. Develop water treatment systems to remove 90% of PFAs

Expressed in the following working groups: Abatement, Environment, Livestock, and Materials

Focal Point #3:
PFAS Thresholds and Action Limits

***Roadmap title*:** Where and when to apply Thresholds and Action Limits to PFAS in Agroecosystems

Key Aspects

1. Screening and threshold levels for PFAS on all land applied sludges.
2. Mapping to show biosolid (all land) application history and PFAS levels
3. Soil Screening level testing (focusing on precursors, PFOA and PFOS, key PFAS entities) and recognize that these levels will be production system dependent
4. Plant-uptake and plant product thresholds
5. Plant-animal transfer factors and weighting factors for threshold development for livestock related edible tissues.

Impacts if completed:

1. Production of Maps showing biosolid applications, history, and status
2. Identification and measurement of field PFAS levels nationally, including soil mapping at important levels of resolution
3. Production of plant and Plant-animal transfer values will be available for multiple feed ration-animal combinations and that lead to understanding of safe food levels.

Expressed in the following working groups: Abatement, Environment, Food, Livestock, and Socio-Economic

Focal Point #4:
Data Tools & Mapping

***Roadmap title*:** Development of a data integration structure and harmonization system for PFAS in agriculture and food production

Key Aspects

1. Establish trans-disciplinary data governance boards
2. Create data catalogue (inventory)
3. Integrate existing data networks into a common access node that is flexible and agile
4. Develop/establish best practices that include minimum data standards
5. Highlight use cases to develop and refine the overall process
6. Data integration structure and harmonization (DISH)

Impacts if successful:

1. Reduce redundancy in research
2. Fosters data transparency and trust amongst stakeholders
3. Improve efficiency of data queries
4. Identification of data gaps
5. Application within more complex tools
6. Foundation of communication output
7. Accelerates our understanding

Expressed in the following working groups: Environment, Food, and Plants

Focal Point #5:
The Problems of PFAS Scale, Scope and Source Tracking Arising from Biosolids

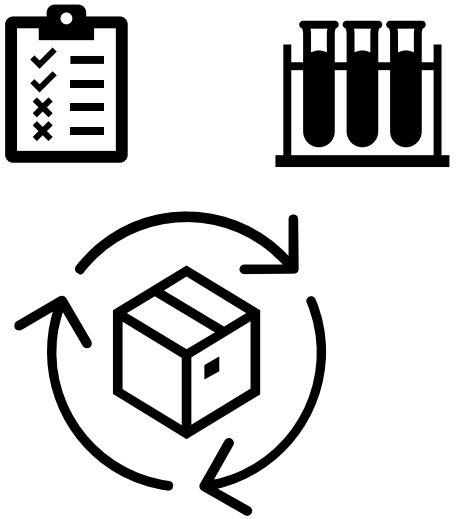
***Roadmap title*:** Development of a Science-based Biosolids Management Program (The BMP)

Key Aspects

1. Background Levels
2. Actionable Thresholds
3. Testing Standardization
4. Data Repository

Impacts if completed:

1. Reduction in agroecosystem exposures to PFAS contamination.
2. Can then divert resources into combatting legacy PFAS contamination.
3. The BMP provides a roadmap for PFAS reductions in other systems (e.g., water reuse)



Expressed in the following working groups: Abatement, Environment, Livestock

Focal Point #6:
Environment, Food, Livestock, Materials, Plants

***Roadmap title*:** Development of solutions to the PFAS problems - in whole production systems: fate, transport and effective management

Key Aspects

1. Predictive tools for PFAS transport through soil, plant, and animal
2. Understanding the effects on plant/animal species, physiology, and component partitioning
3. Evaluate production inputs and outputs
4. Develop guidelines for effective engagement to provide information on management options

Impacts:

1. State and federal agencies have stocked toolboxes for public health and regulatory decision
2. Improved engagement, trust, and technology transfer stakeholders and state cooperators
3. Foundational knowledge to inform critical production decisions
4. Building blocks for best management practices

Expressed in the following working groups: Environment, Food, Livestock, Materials, Plants

Focal Point #7:
Communication and Education

Roadmap title: Development of targeted communication tools to help address uncertainty and provide evidence that generates assurance of good alternatives for PFAS – safe paths forward – for diverse audiences

Key Aspects:

1. Identify knowns (e.g., sites), known unknowns (baseline), unknown unknowns
2. Recognize key audiences: farmers=states; consumers, farm communities, producers (this is state-specific)
3. Have teams of teams who have expertise to address necessary topics
4. Recognize that much PFAS-centric information is available and is expanding, and is of different levels of quality. Build on the best information and ensure effective communication and transparency.
5. How do people respond to information and process and use it?
6. Ensure engagement across all relevant federal and state agencies and experts

Impacts if completed:

1. Better farmer, community and farmscape PFAS health
2. Farmer and consumer confidence
3. Informs late-adopters and helps them adopt

Expressed in the following working groups: Food, Materials, and Socio-Economic

Path Forward

ARS scientists are leading activities for each focal point
Workshop attendees are contributing based on their interests and expertise.

This is an active and ongoing effort. If interested in more information or exploring more opportunities to participate, contact:

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David.knaebel@usda.gov

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Thank you!

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