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PFAS & FUTURE IMPACT ON INDUSTRY

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2025 ADJUVANTS, INERTS & CROP PROTECTION CONFERENCE

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Agenda

- ✓Introduction
- ✓Mapping Risks and Exposure
- ✓State Regulatory Outlook
- ✓What's Next?

Introduction
What are PFAS?

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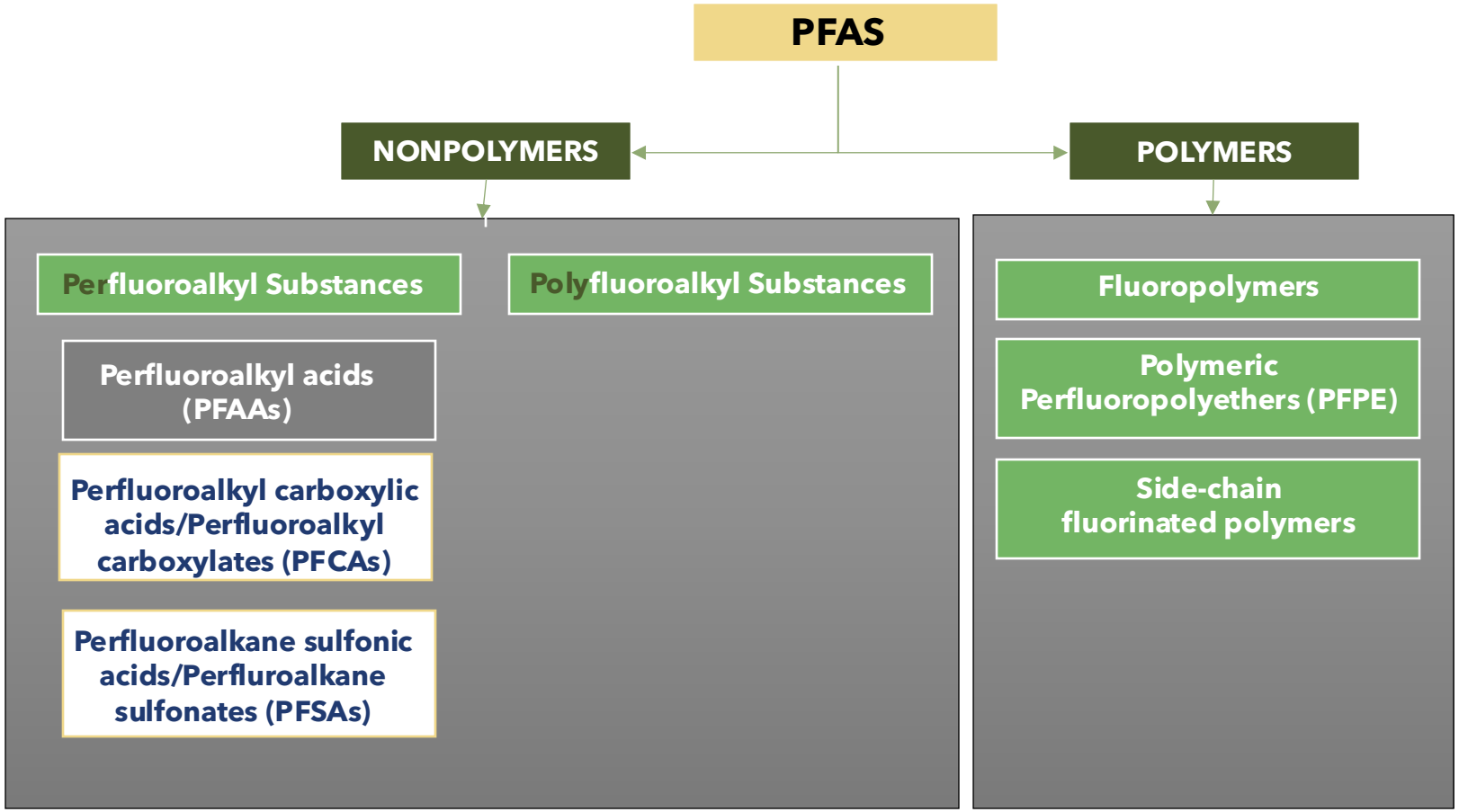
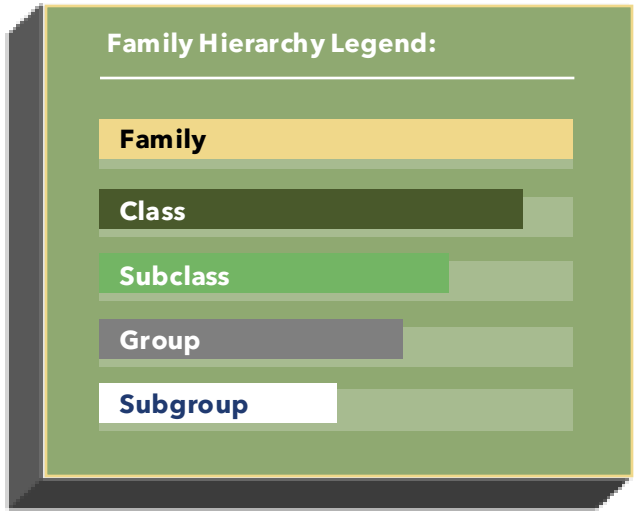
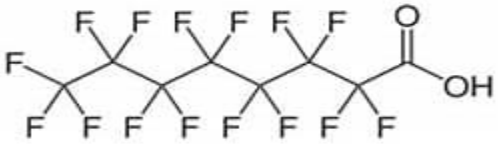
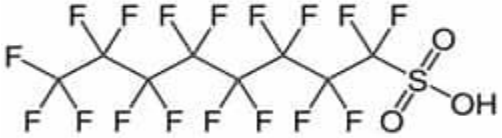






PFOA

PFOS



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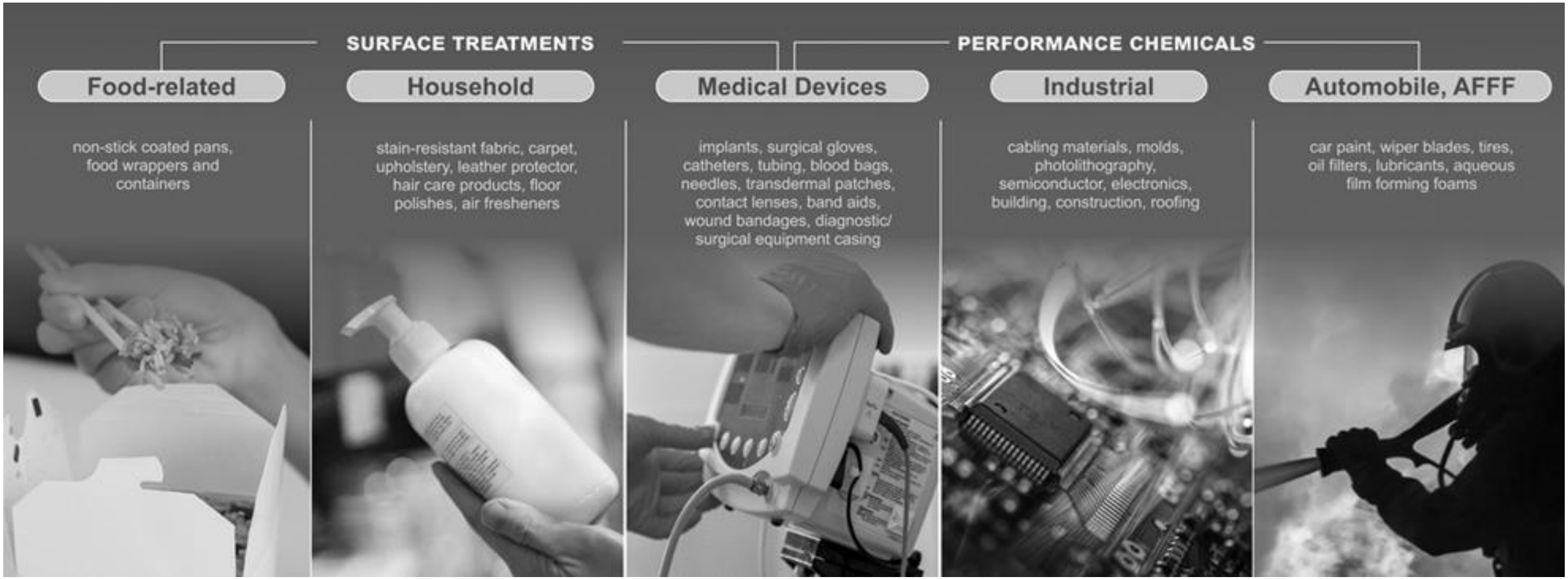
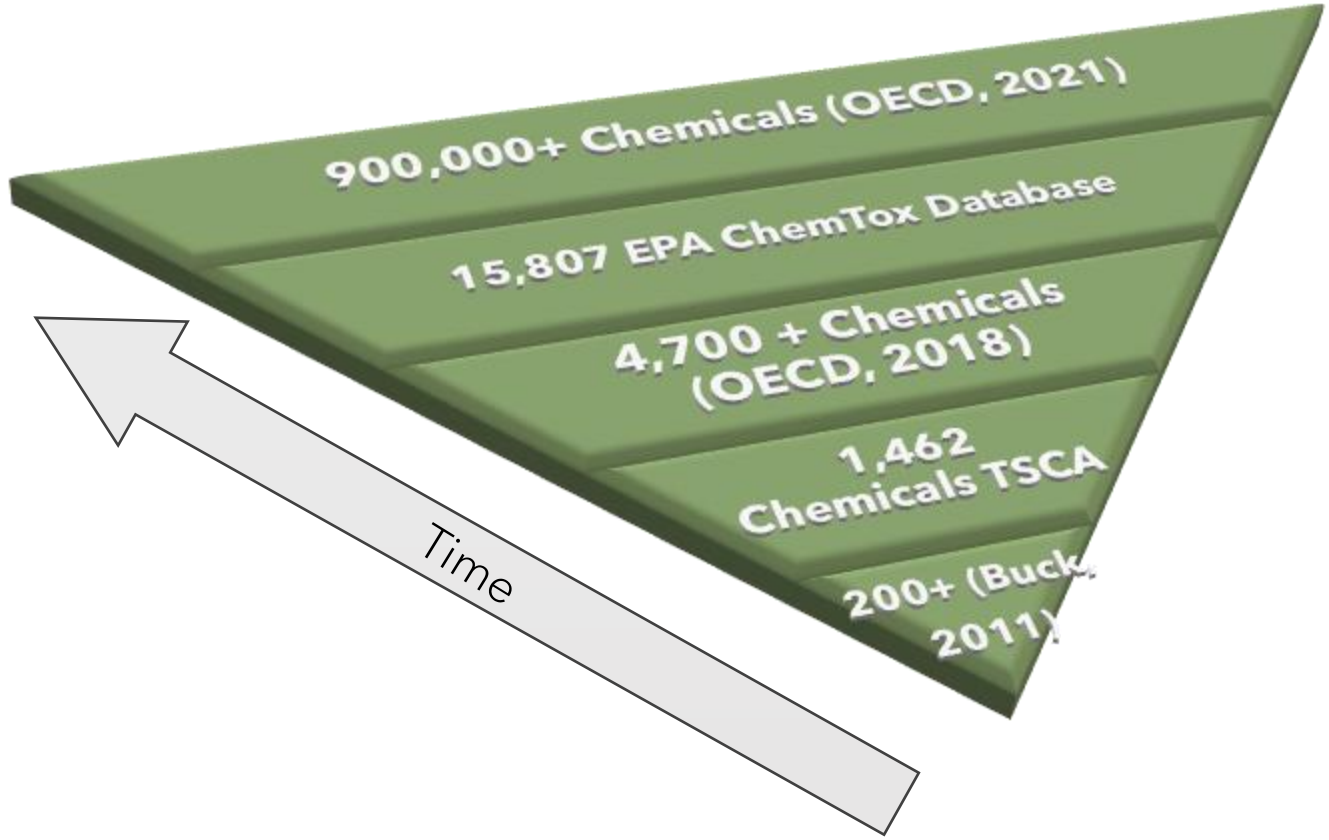
Challenge #1
PFAS are Ubiquitously Used and Found



Challenge #2
PFAS Definitions are Inconsistent and Growing

- ✓ There is no universally accepted definition
- ✓ References, definitions, and resources include:
  - Buck et al. (2011)
  - OECD (2018)
  - OECD (2021)
  - USEPA CompTox Chemicals Dashboard
  - TSCA 8a(7)



DEFINITIONS NEED TO BE FIT FOR PURPOSE

Challenge #3
Accurate Analytical Measurement of PFAS

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Total Fluorine (TOF, AOF)
DL generally 20 ppm+

Non-target Analysis/ Suspect Screening

Target Analysis
DL generally single digit ppt

Challenge #4
Definition of PFAS-Free

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Firefighting Foam via Total Organic Fluorine
<1 ppm PFAS
No intentionally-added PFAS

Food Packaging via Total Fluorine
<100 ppm
No intentionally-added PFAS

Products via Total Organic Fluorine
<100 ppm (Jan 2025)
<50 ppm (Jan 2027)

Firefighting Foam via EPA 1633 (Targeted)
<1 ppb unintentionally added
No intentionally-added PFAS

Products (No method Specified)
No limit specified
Only PFAS definition provided

Intentionally-added vs Unintentional By-Product??
Essential or Currently Unavoidable Use?

Agricultural Relevance of PFAS

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Agricultural Relevance of PFAS

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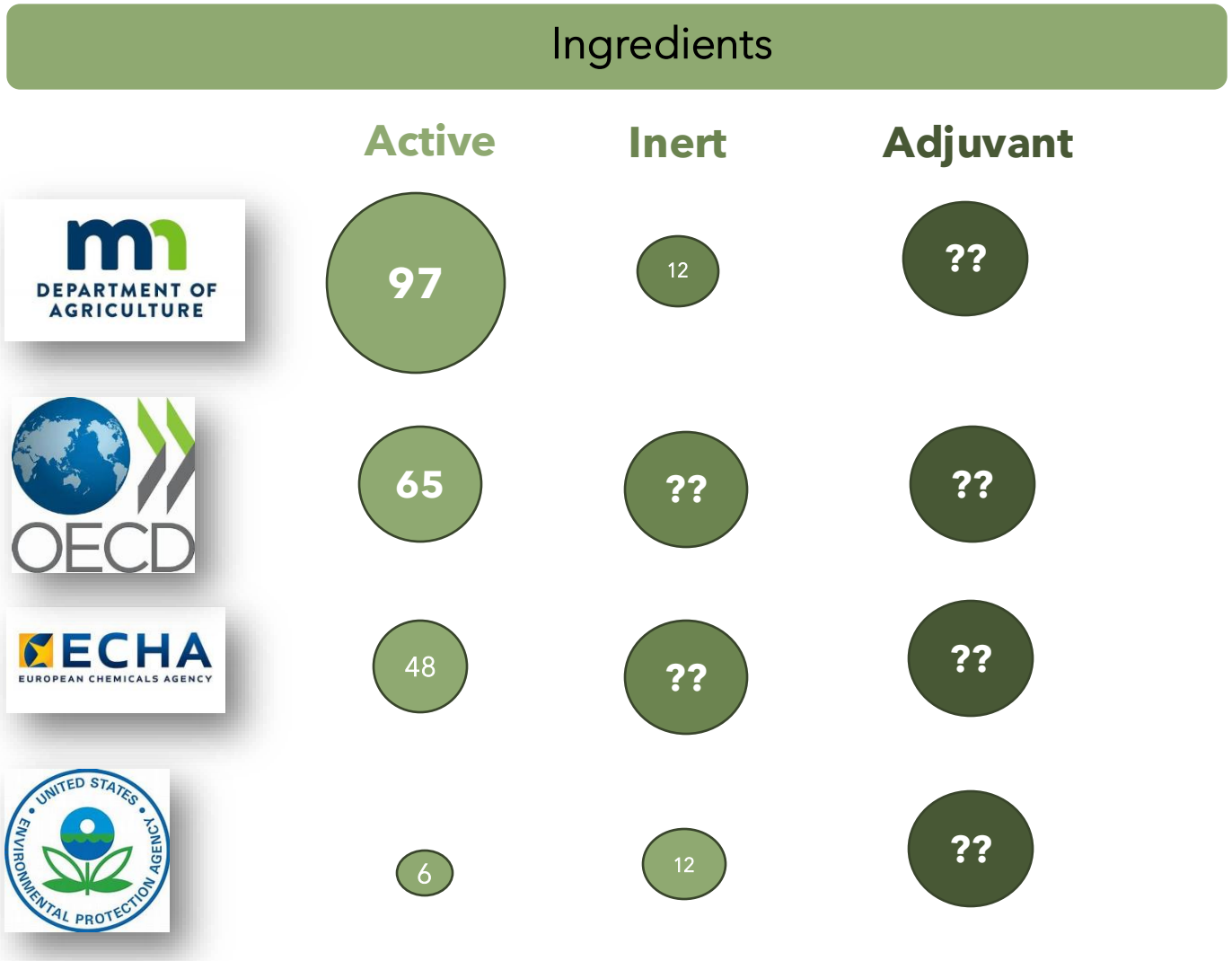

- ✓ There is no universally accepted definition
- ✓ State, Federal, and International definitions differ
- ✓ This results in patchwork of regulated PFAS and products

Agricultural Relevance of PFAS

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Packaging

- ✓ PFAS unintentionally added to pesticides via leaching from fluorinated HDPE containers.
- ✓ Under FIFRA Sec 6(a)(2), registrants required to inform EPA about adverse effects of their products
- ✓ EPA considers any level of PFAS to be potentially toxicologically significant and may trigger reporting
- ✓ Cross-contamination during packaging manufacturing may also be a source.

State Regulatory Outlook

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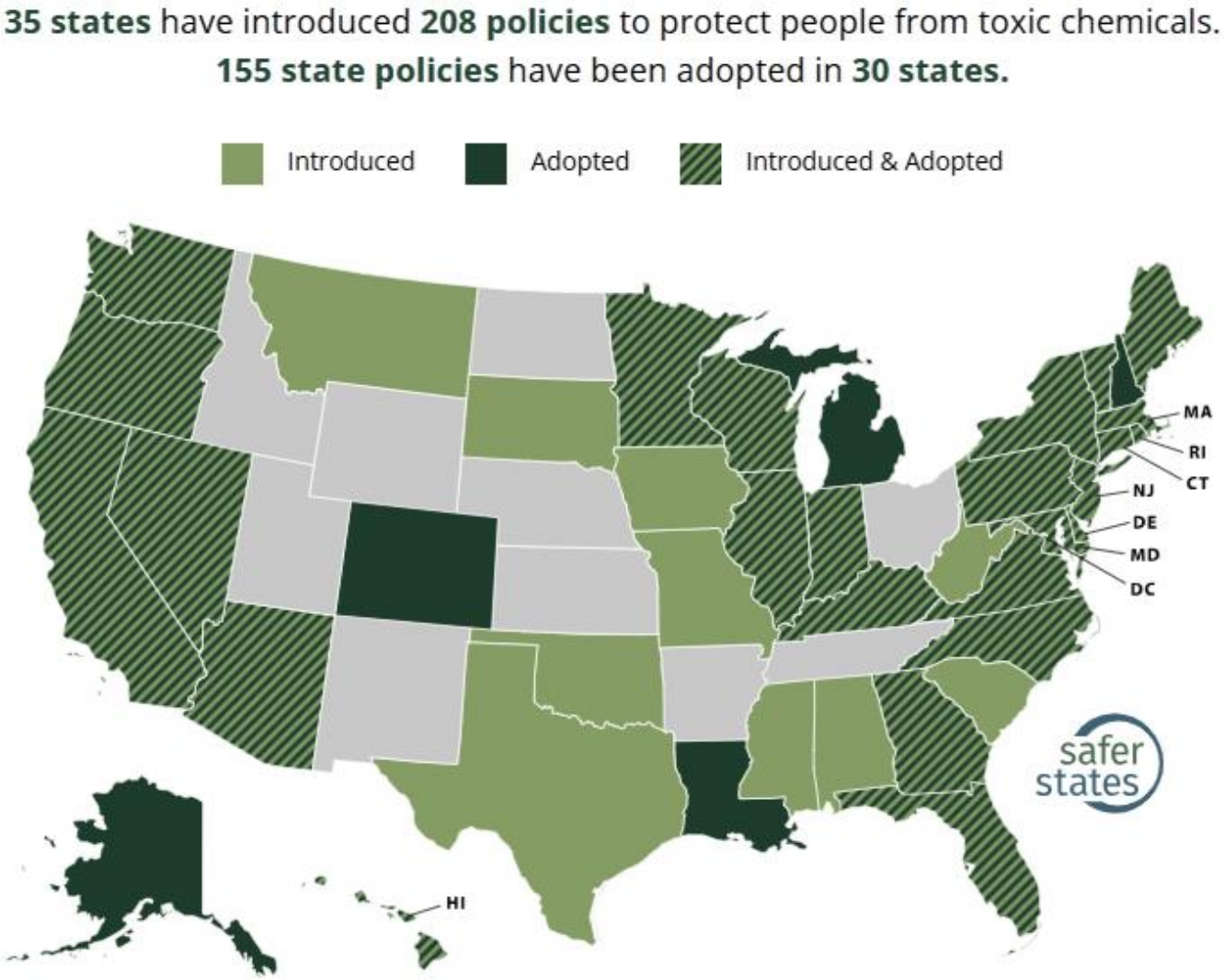
- ✓ States moving aggressively on products, including packaging and pesticides
- ✓ For example:
  - MA, (2025)- Establishes an ecologically-based mosquito management program. Prohibits aerial applications and products containing PFAS.
  - ME- Ban pesticides containing intentionally-added PFAS by Jan 1, 2030.
  - MD, (2025)-Requires the Dept of Ag to develop and maintain a list of registered pesticides that contain PFAS. Prohibits pesticides containing PFAS.
  - MN (2025)- No pesticide products with intentionally-added PFAS by Jan 1, 2032



https://www.saferstates.org/priorities/pfas/

Solutions for Risk and Liability Management

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Functional

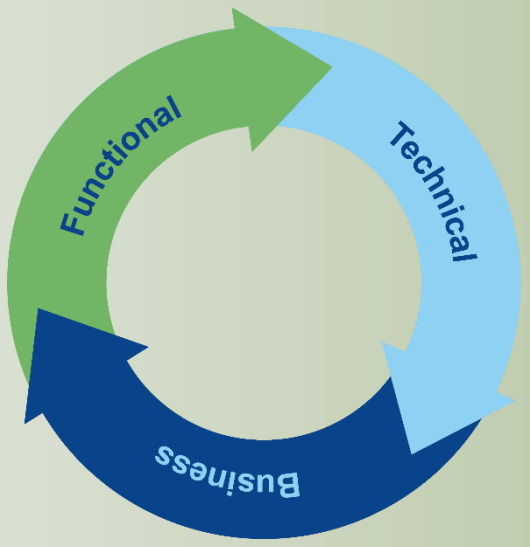
Alternative Assessment

Supply Chain Evaluation

Technical

Hazard Assessment

Lifecycle Assessment



Business

Strategy, Risk Management

Business

Cost/Liability Management

Vulnerability Assessment

- ✓ Develop a management framework
- ✓ Be nimble, create/ modify BMPs based on regulatory or litigation trends
- ✓ Prioritize, set aside program funding, and mitigate risk

What's Next with PFAS?

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- ✓ Federal program movement slower
- ✓ States expected to pick up speed
- ✓ Europe continues focus on broad PFAS product ban under REACH
- ✓ Litigation risks in the US continue to grow
- ✓ Prepare, prioritize, and be proactive

THANK YOU

For more information

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Examples of Battelle PFAS Publications

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2019
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Huang, M. C., Dzierlenga, A. L., Robinson, V. G., Waidyanatha, S., DeVito, M. J., Eifrid, M. A., Granville, C. A., Gibbs, S. T., & Blystone, C. R. (2019). Toxicokinetics of perfluorobutane sulfonate (PFBS), perfluorohexane-1-sulphonic acid (PFHxS), and perfluorooctane sulfonic acid (PFOS) in male and female Hsd:Sprague Dawley SD rats after intravenous and gavage administration. Toxicology Reports, 6, 645–655. https://doi.org/10.1016/j.toxrep.2019.06.016
2020
Chauhan, S.P. "Assessment of Commercially Available PFFs", SERDP & ESTCP Webinar Series, #120 (2020).
Popovic, J., Thorn, J. R., Jones, A. R., & Kornuc, J. J. (2020). Evaluation of a drop-in waste volume reduction method for liquid investigation derived waste containing per- and polyfluoroalkyl substances. Journal of Environmental Management. https://doi.org/10.1016/j.jenvman.2020.111502
2021
Barth, E., McKernan, J., Bless, D., & Dasu, K. (2021). Investigation of an immobilization process for PFAS contaminated soils. Journal of Environmental Management, 296, 113069. https://doi.org/10.1016/J.JENVMAN.2021.113069
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Guelfo, J. L., Korzeniowski, S., Mills, M. A., Anderson, J., Anderson, R. H., Arblaster, J. A., Conder, J. M., Cousins, I. T., Dasu, K., Henry, B. J., Lee, L. S., Liu, J., McKenzie, E. R., & Willey, J. (2021). Environmental Sources, Chemistry, Fate and Transport of Per- and Polyfluoroalkyl Substances: State of the Science, Key Knowledge Gaps, and Recommendations Presented at the August 2019 SETAC Focus Topic Meeting. Environmental Toxicology and Chemistry. https://doi.org/10.1002/etc.5182
Huang, M. C., Dzierlenga, A. L., Robinson, V. G., Waidyanatha, S., DeVito, M. J., Eifrid, M. A., Granville, C. A., Gibbs, S. T., & Blystone, C. R. (2021). Corrigendum to "Toxicokinetics of perfluorobutane sulfonate (PFBS), perfluorohexane-1-sulphonic acid (PFHxS), and perfluorooctane sulfonic acid (PFOS) in male and female Hsd:Sprague Dawley SD rats after intravenous and gavage administration" [Toxicol. Rep. In Toxicology Reports (Vol. 8, p. 365). Elsevier Inc. https://doi.org/10.1016/j.toxrep.2021.02.001
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von Holst, H., Nayak, P., Dembek, Z., Buehler, S., Echeverria, D., Fallacara, D., & John, L. (2021). Perfluoroalkyl substances exposure and immunity, allergic response, infection, and asthma in children: Review of epidemiologic studies. Heliyon, 7(10), e08160. https://doi.org/10.1016/j.heliyon.2021.e08160
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Determining the Presence of PFAS in Coated Bentonite Pellets. (n.d.). SAME. Retrieved February 10, 2023, from https://www.same.org/tmearticle/determining-the-presence-of-pfas-in-coated-bentonite-pellets/
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Seay, B. A., Dasu, K., MacGregor, I. C., Austin, M. P., Krile, R. T., Frank, A. J., Fenton, G. A., Heiss, D. R., Williamson, R. J., & Buehler, S. (2023). Per- and polyfluoroalkyl substances fate and transport at a wastewater treatment plant with a collocated sewage sludge incinerator. Science of The Total Environment, 162357. https://doi.org/10.1016/j.scitotenv.2023.162357
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2024
WP20-5335. Final Report. Chauhan, S.P. Validation of PFAS-Free Fire Suppression Alternatives (FF_FSA) against Military Specifications. 2024

20 different publications from 2019- 2024

Sources

Toxicology

Epidemiology

Fate and Transport

Treatment

Destruction

Products

Alternatives