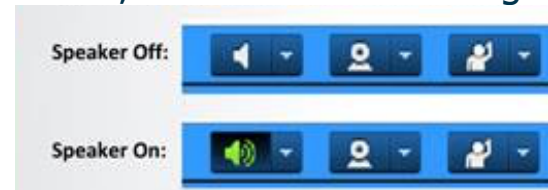


Starting Soon: PFAS Roundtable Session 2

- ▶ Download slides for today
 - ▶ CLU-IN training page at: <https://clu-in.org/conf/itrc/PFAS-Round2/> under "Download Training Materials"
- ▶ Using Adobe Connect
 - ▶ **Related Links (on right)** - Select name of link, then click "Browse To"
 - ▶ **Full Screen button near top of page**

Audio Troubleshooting Hints

- ▶ Turn up the volume on your speakers
- ▶ Turn on the volume in Adobe Connect (if the speaker symbol is white, click on it so it turns green)



- ▶ Turn up the speaker volume in Adobe Connect by clicking "adjust speaker volume"
- ▶ If you use headphones or a separate speaker, select the correct speaker in Adobe Connect by clicking "Select Speaker"
- ▶ Disconnect from VPN
- ▶ For continued audio issues, request a call-in number via the Q&A pod



Advancing
Environmental
Solutions

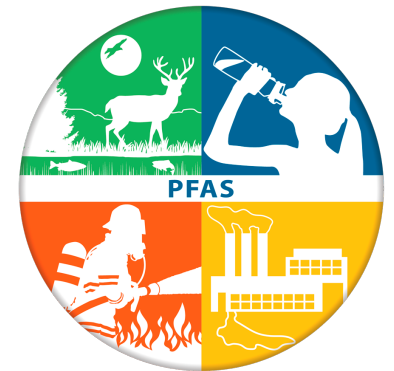
ITRC PFAS Team

ROUNDTABLE WEBINAR SESSION 2:

Physical & Chemical Properties
Site Characterization
Fate & Transport

Sponsored by: Interstate Technology and Regulatory Council (www.itrcweb.org)

Hosted by: US EPA Clean Up Information Network (www.cluin.org)



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PFAS Roundtable Webinar

- ▶ Introduction
- ▶ ITRC PFAS Resources
 - ▶ Find everything online at: <https://pfas-1.itrcweb.org>
- ▶ Roundtable format
- ▶ Topic highlights
- ▶ Roundtable Q&A

Thank you for joining this ITRC PFAS Roundtable!

ITRC – Shaping the Future of Regulatory Acceptance

▶ Host Organization



▶ Network - All 50 states, PR, DC

▶ Federal Partners



DOE



DOD



EPA

▶ ITRC Industry Affiliates Program



▶ Academia

▶ Community Stakeholders

▶ Disclaimer

- ▶ <https://pfas-1.itrcweb.org/about-itrc/#disclaimer>
- ▶ Partially funded by the US government
 - ▶ ITRC nor US government warranty material
 - ▶ ITRC nor US government endorse specific products
- ▶ ITRC materials available for your use – see [usage policy](#)



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<https://www.itrcweb.org/>

Technical and Regulatory Guidance Document

► Final web document (April 2020)

What are PFAS?	How do they behave in the environment?	Why are we concerned about PFAS?	How do we evaluate PFAS in the environment?	How do we remediate PFAS?	What are the major concerns and how do we share what we know?
<ul style="list-style-type: none">• Introduction• History and use• Naming conventions• PFAS releases to the environment• Firefighting foams	<ul style="list-style-type: none">• Physical and chemical properties• Fate and transport processes• Media-specific occurrence	<ul style="list-style-type: none">• Human and ecological health effects• Site risk assessment• Regulations, guidance and advisories	<ul style="list-style-type: none">• Site Characterization• Sampling and Analytical Methods• Case Studies	<ul style="list-style-type: none">• Treatment technologies• Case studies	<ul style="list-style-type: none">• Stakeholder perspectives• Risk communication

► 11 Fact Sheet updates (coming soon)

► Ten online video modules published on YouTube (April 2020)

External files for additional detailed information

- ▶ PFAS Water and Soil Values (US and some international)
 - ▶ updated regularly, last revised September 2020
- ▶ Basis for PFOA and PFOS drinking water values in the US, current version March 2020
- ▶ **Physical and chemical properties**
- ▶ **Bioconcentration factors tables**
- ▶ Ecological toxicity data summary
- ▶ Analytical methods
- ▶ Treatment technologies
- ▶ Water treatment case studies operation summaries
- ▶ Toxicological effects in mammalian species for some PFAS
- ▶ Social Factors vision board

<https://pfas-1.itrcweb.org>

Housekeeping

- ▶ Session time is 2 hours
- ▶ All participants are on mute
- ▶ This event is being recorded
- ▶ Download slides for today at the CLU-IN training page <https://www.clu-in.org/conf/itrc/PFAS-Round2> Under “Download Training Materials”
- ▶ If you have technical difficulties, please use the Q&A Pod to request technical support
- ▶ Need confirmation of your participation today?
 - ▶ Fill out the online feedback form and check box for confirmation email and certificate

Session 2 - Topics

- ▶ Physical & Chemical Properties
- ▶ Site Characterization
- ▶ Fate & Transport

Other ITRC PFAS Roundtables

- ▶ Session 1 (July 2020)
 - ▶ Naming Conventions
 - ▶ Sampling and Analysis
 - ▶ History and Environmental Sources
- ▶ Session 3 (Date TBD)
 - ▶ Treatment Technologies
 - ▶ AFFF
- ▶ Session 4 (Date TBD)
 - ▶ Human, Eco Health Effects
 - ▶ Risk Assessment and Regulations
 - ▶ Risk Communication
 - ▶ Stakeholder Perspectives

Physical and Chemical Properties

- ▶ Challenges and Limitations
- ▶ Physical properties
 - ▶ Ex. Solubility, vapor pressure, critical micelle concentrations
- ▶ Chemical Properties
 - ▶ Ex. C-F properties, functional group properties, chemical and thermal stability
- ▶ Table 4.1
 - ▶ A separate Excel file containing many P&C values collected from the literature



Image Courtesy freeimages.com

Environmental Fate & Transport Processes

- ▶ Factors Affecting PFAS F&T
 - ▶ Phase Partitioning
 - ▶ Media specific migration processes
 - ▶ Transformations
 - ▶ PFAS Uptake into Plants and Aquatic Organisms
- ▶ Table 5-1, BCF, BAF, and BMF values
 - ▶ Select representative values collected from the literature

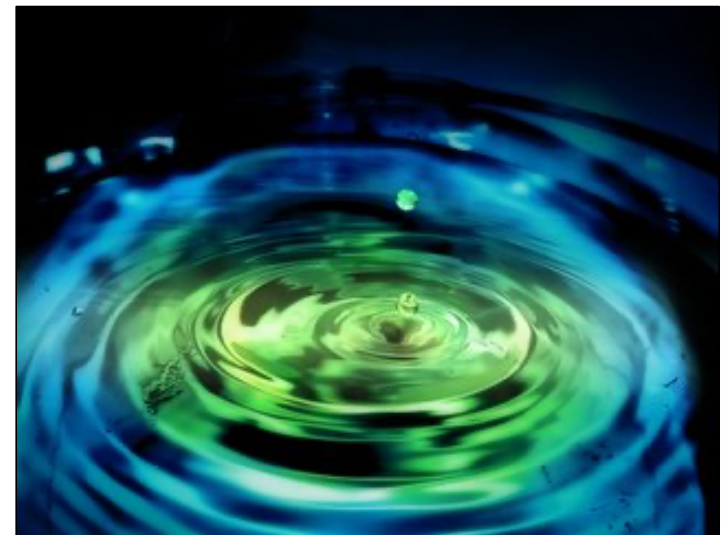


Image Courtesy freeimages.com

Site Characterization

- ▶ Site Characterization Issues Relevant to PFAS
- ▶ Initial Steps and Site Investigation
- ▶ Data Analysis and Interpretation
 - ▶ Retardation coefficients and travel time, modeling
 - ▶ Assessing plume stability
 - ▶ Contributions from other sources
- ▶ Source Identification
 - ▶ Ex. Source ID tools, challenges and reasonable expectations



Image Courtesy freeimages.com

Roundtable Format

- ▶ The moderator will read questions for a response by the panelist(s)
- ▶ Questions are selected from those submitted with:
 - ▶ the participant registration
 - ▶ prior PFAS training classes
 - ▶ PFAS team members
- ▶ Today you may submit additional questions by typing in the Q&A pod
- ▶ It will not be possible to answer all questions during the live webinar
- ▶ A Q&A digest with references to the PFAS Technical and Regulatory Guidance Document will be made available



Sandra Goodrow,
NJ DEP



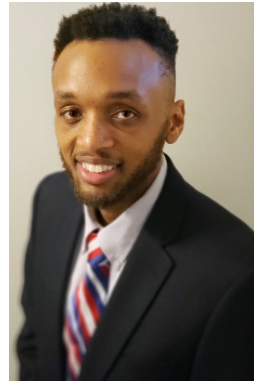
Kate Emma Schlosser,
NH Dept. of Environmental Services



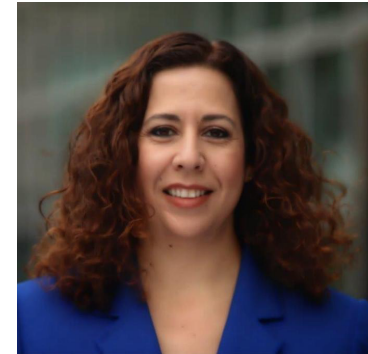
Chris Higgins,
CO School of Mines



Hunter Anderson, AFCEC



Ryan Thomas, GHD



Rula Deeb, Geosyntec



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Session 2 Panelists

Session 2 - Topics

- ▶ Physical & Chemical Properties
- ▶ Site Characterization
- ▶ Fate & Transport

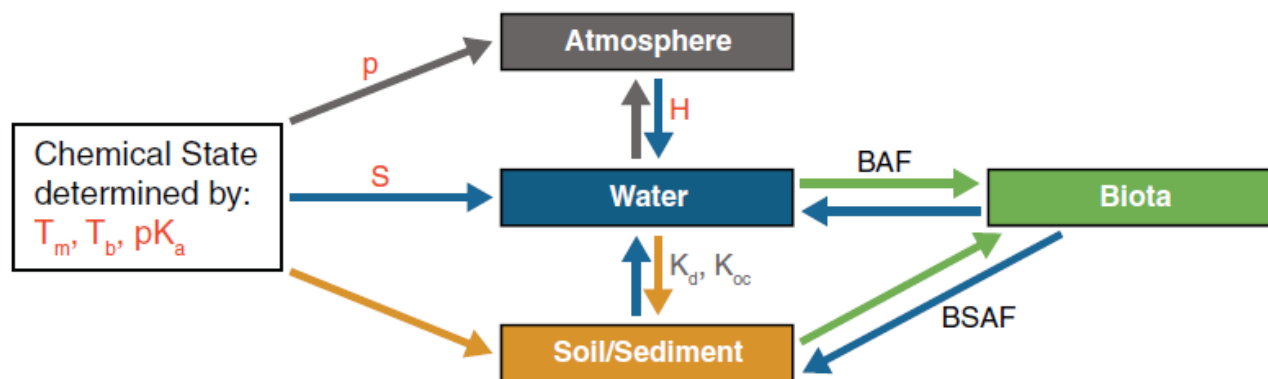
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Session 2

Physical and Chemical Properties

<https://pfas-1.itrcweb.org>

Chemical and Physical Properties Control Environmental Distribution



T_m = melting pt.
 T_b = boiling pt.
 pK_a = acid dissociation constant
 p = vapor pressure
 S = solubility
 H = Henry's law constant
 K_d = soil/sed partitioning coefficient
 K_{oc} = organic carbon partitioning coefficient
BAF = bioaccumulation factor
BSAF = biota-sediment accumulation factor

Session 2

Site Characterization

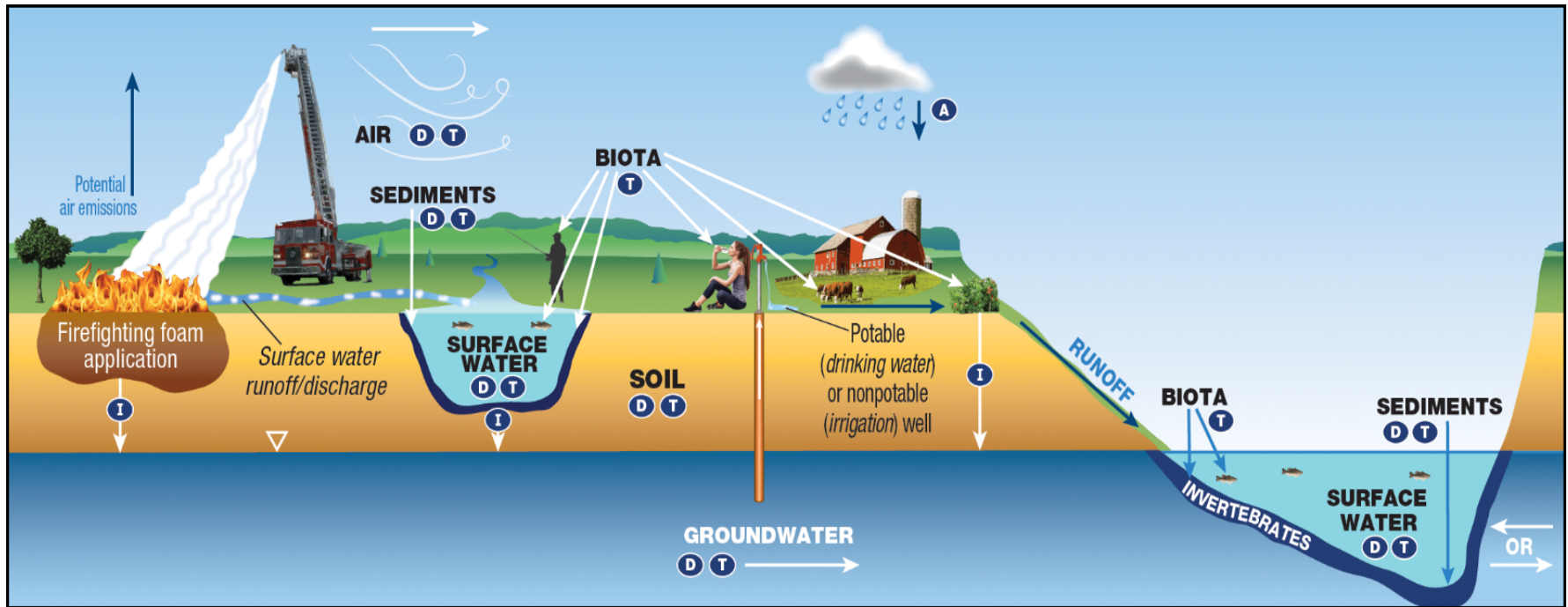
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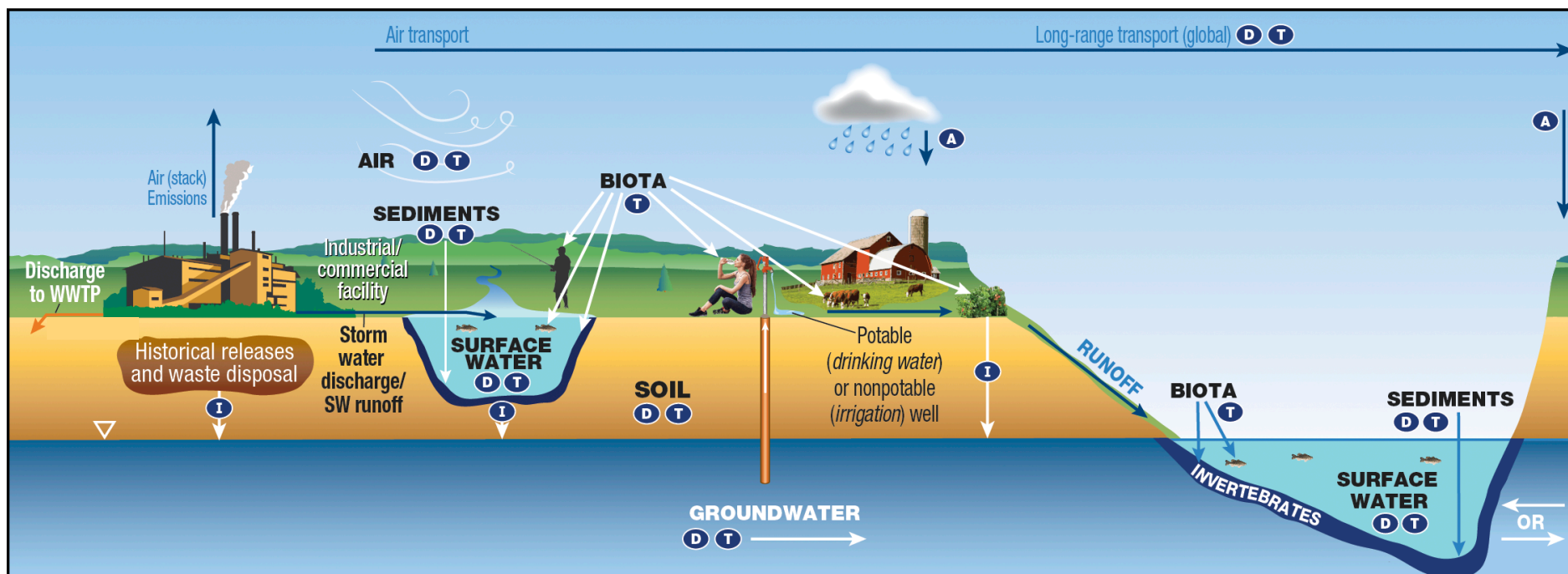
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CSM for AFFF Application Sites



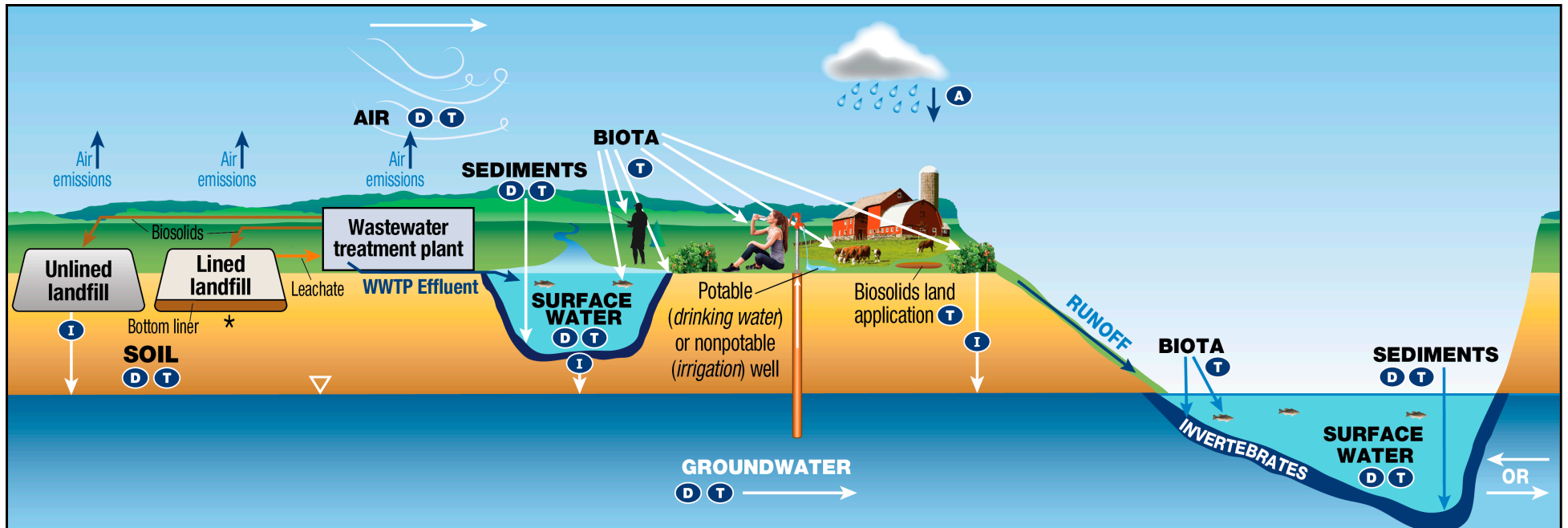
KEY A Atmospheric Deposition D Diffusion/Dispersion/Advection I Infiltration T Transformation of precursors (abiotic/biotic)

CSM for Industrial Sites



KEY A Atmospheric Deposition D Diffusion/Dispersion/Advection I Infiltration T Transformation of precursors (abiotic/biotic)

CSM for Landfills and WWTPs



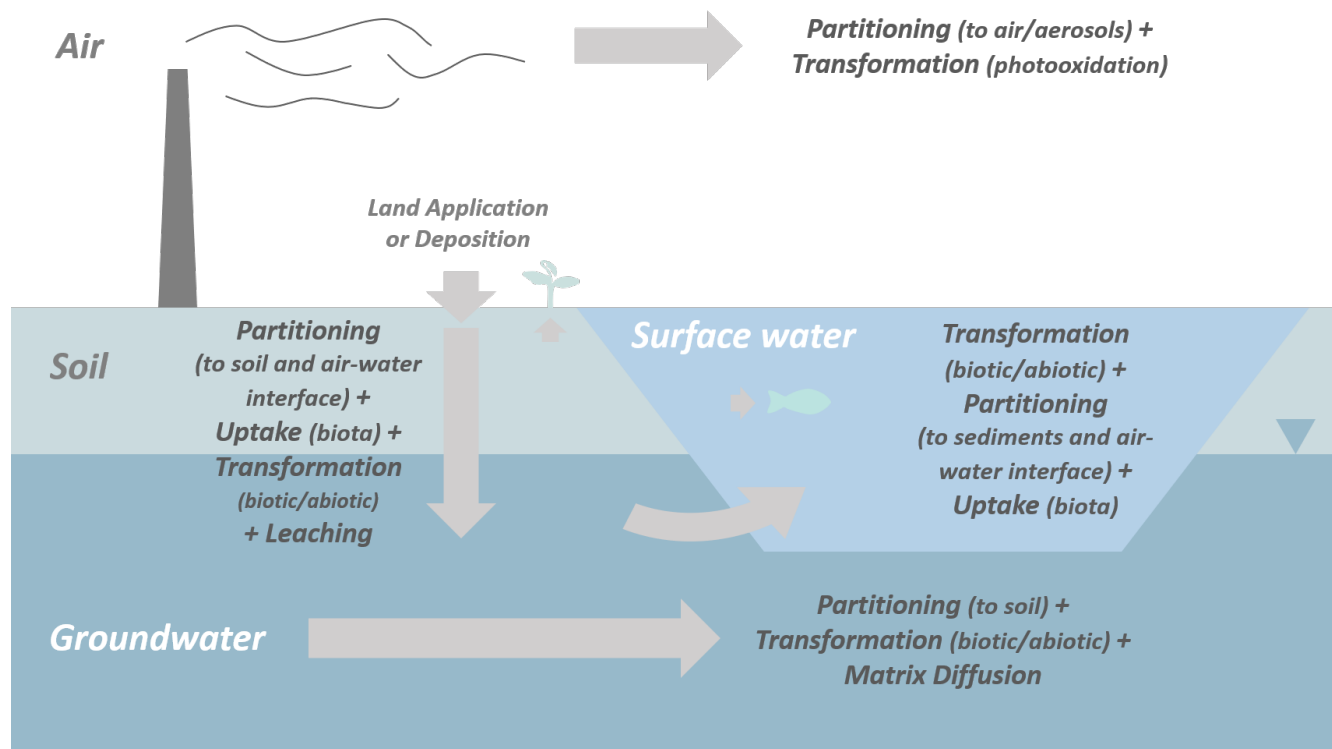
*Leachate release from lined landfills could occur in the event of a liner leak

KEY **A** Atmospheric Deposition **D** Diffusion/Dispersion/Advection **I** Infiltration **T** Transformation of precursors (abiotic/biotic)

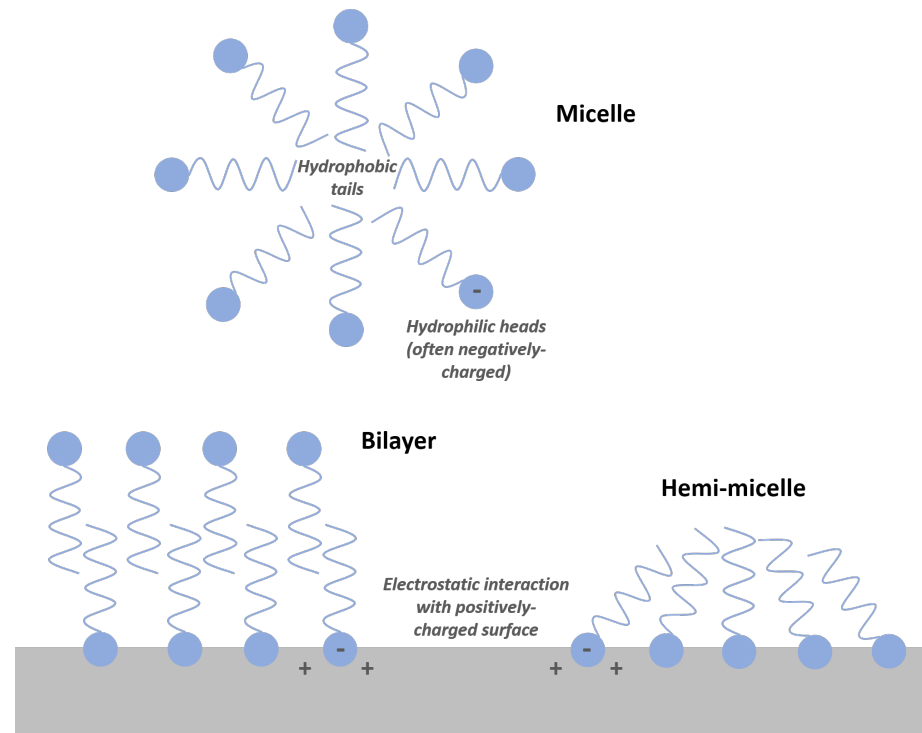
Session 2

Fate and Transport
<https://pfas-1.itrcweb.org>

PFAS Fate and Transport Processes

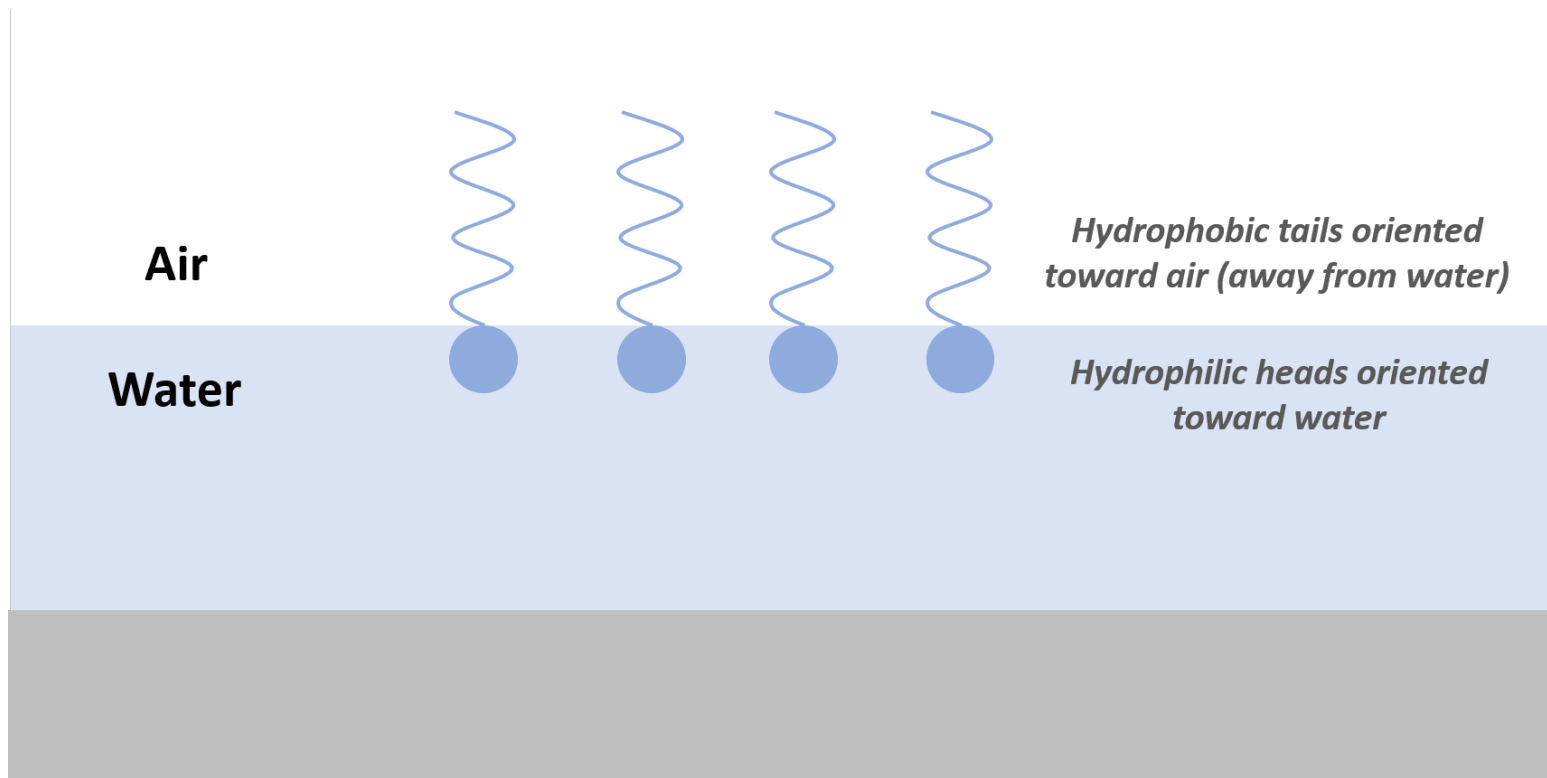


PFAS Forms Micelles and Foam

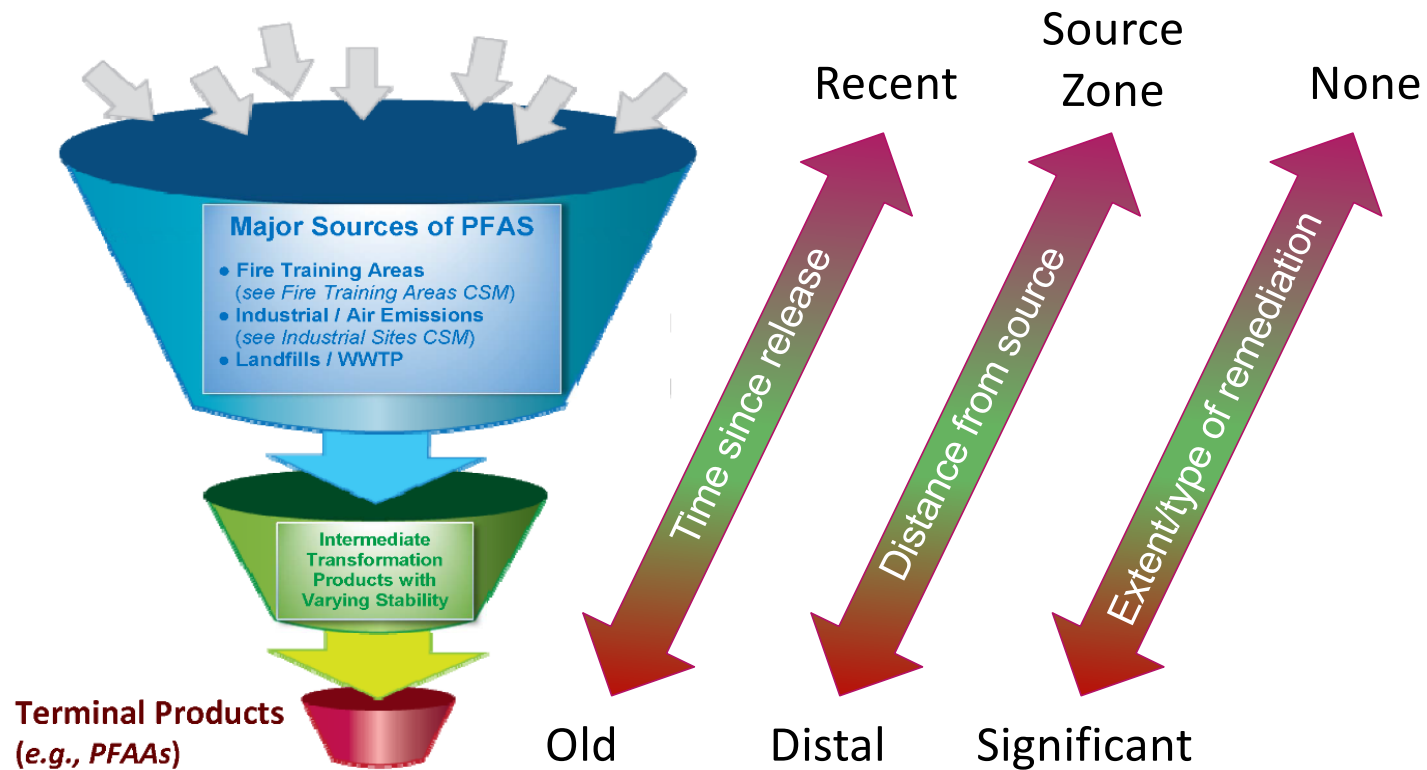


PFAS-1, Figure 5-2, Illustration of the formation of PFAS micelles, hemimicelles, and bilayers.
Source: D. Adamson, GSI, used with permission

Partitioning to Air/Water Interfaces



Complexity Varies with Time, Space, and History



PFAS-1, Figure 5-4.

Source: Adapted from figure by L. Trozzolo, TRC, and C. Higgins, Colorado School of Mines, used with permission and based on [This Photo](#) by Unknown Author is licensed under [CC BY-SA](#)

Session 2 - Topics

- ▶ Physical & Chemical Properties
- ▶ Site Characterization
- ▶ Fate & Transport

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ITRC PFAS Resources

<https://pfas-1.itrcweb.org>

- ▶ Final web document (April 2020)
- ▶ 11 Fact Sheet updates (coming soon)
- ▶ Spreadsheets
 - ▶ PFAS Water and Soil Values Table, updated regularly (last rev. September 2020)
 - ▶ Basis for PFOA and PFOS drinking water values in the US (last rev. March 2020)
- ▶ Ten online video modules published on YouTube (April 2020)
 - ▶ Accessible from the ITRC PFAS home screen

PFAS Team Schedule – through December 2021

- ▶ Continue work on updating technical information and regulatory approaches in this rapidly evolving subject
 - ▶ Small updates and reference additions
 - ▶ Fact sheet reconciling and republishing (4-page versions)
 - ▶ New content, including surface water quality overview

Thank you for attending!

- ▶ Email further questions on today's session to: training@itrcweb.org
- ▶ Feedback Form:
<https://clu-in.org/conf/itrc/PFAS-Round2/feedback.cfm>
- ▶ *Please use the Feedback Form to ask questions for future PFAS Roundtables*



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Future PFAS Roundtables

Session 3 (TBD – Late Winter 2021)

- ▶ Treatment Technologies
- ▶ AFFF

Session 4 (TBD – Late Spring 2021)

- ▶ Human and Eco Health Effects
- ▶ Risk Assessment and Regulations
- ▶ Risk Communication
- ▶ Stakeholder Perspectives



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E C O S

ITRC PFAS Team Leaders:
Bob Mueller, New Jersey Department of Environmental Protection
Kate Emma Schlosser, New Hampshire Department of Environmental Services