



SAFER
CONSUMER
PRODUCTS

Carpets with PFAS: Chemical Class Approach

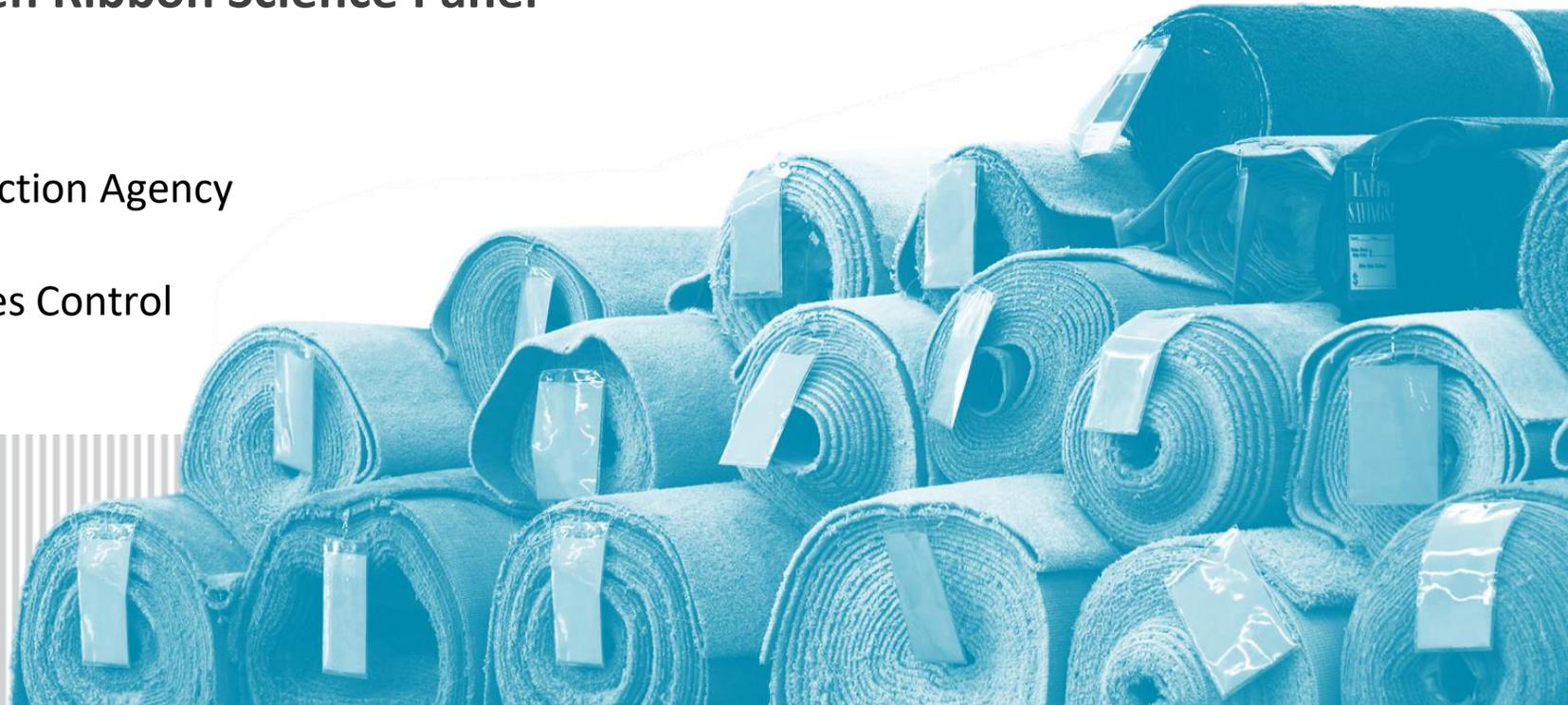
September 13, 2018 • Green Ribbon Science Panel



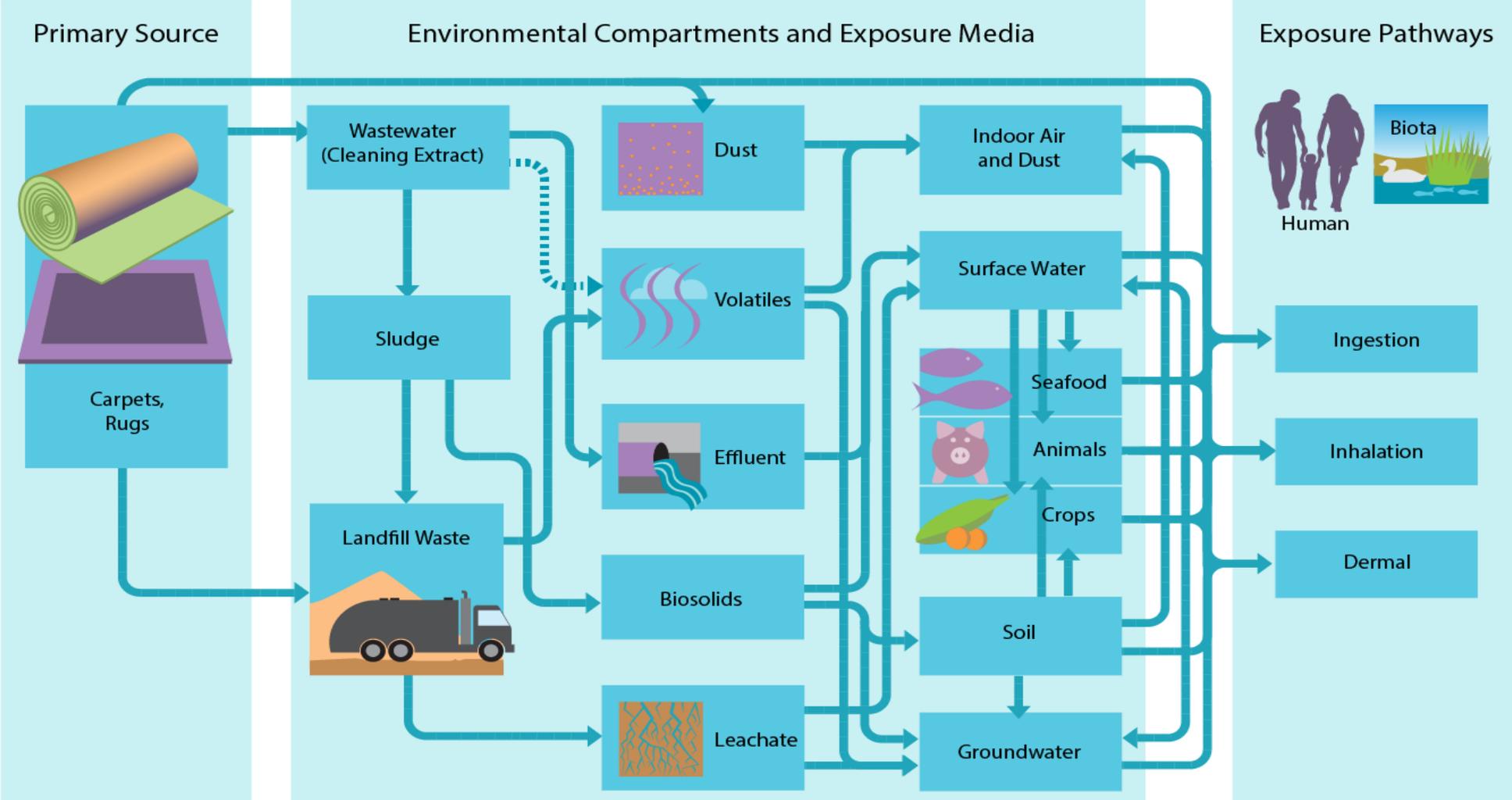
California Environmental Protection Agency



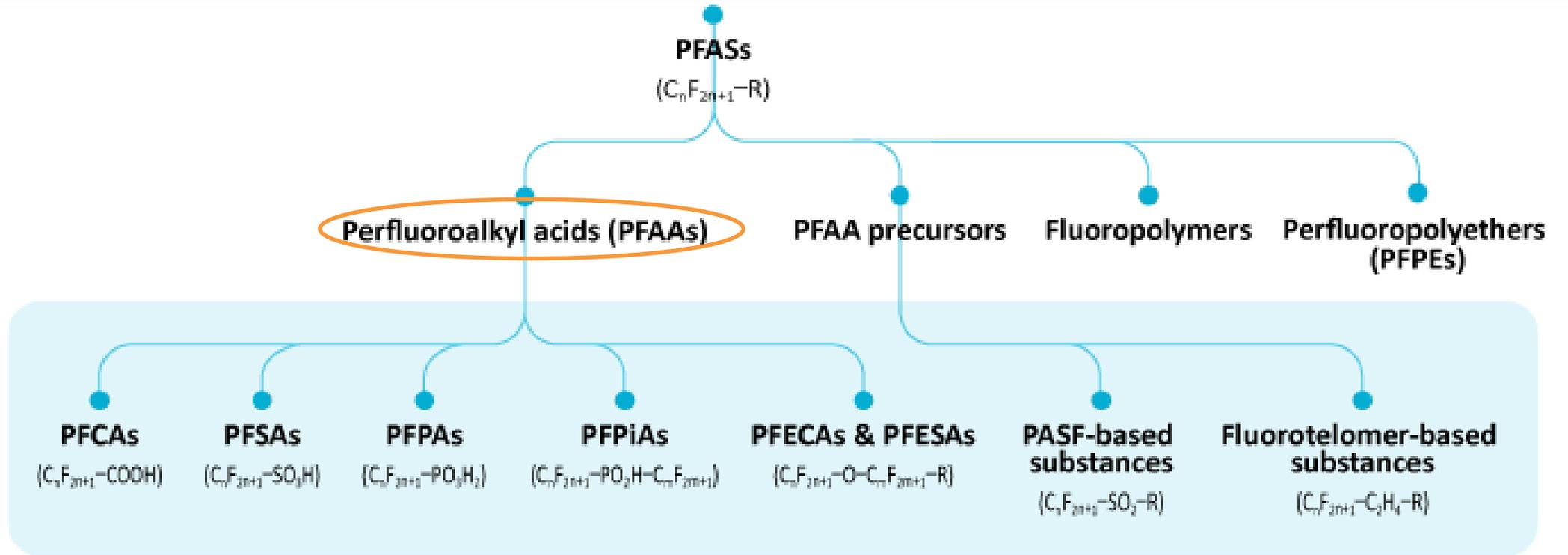
Department of Toxic Substances Control



Conceptual exposure model



Four main PFAS categories

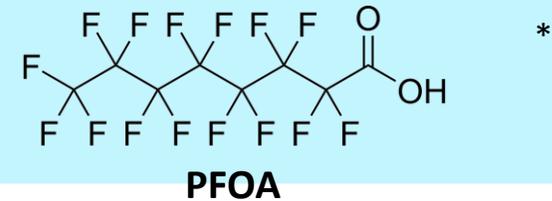


Wang et al. (2017)



Perfluoroalkyl acids (PFAAs)

Characteristics	Perfluorinated (no C-H bonds); non-polymeric
Key concerns	Extreme environmental persistence; Bioaccumulation (especially the longer-chains); Environmental mobility (especially the shorter-chains); Toxicity documented in humans and animals.
Relevance to carpets and rugs	Manufacturing impurities and degradation products of PFAS treatments in carpets and rugs.
Examples	Perfluoroalkyl carboxylic acids Perfluoroalkyl sulfonic acids Perfluoroether carboxylic acids Perfluoroether sulfonic acids

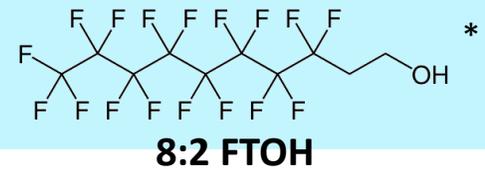


*Image Source:
Wikipedia



PFAA precursors

Characteristics	Mostly polyfluorinated (some C-H bonds); Some non-polymeric, some polymers.
Key concerns	All degrade to PFAAs. Some are also environmentally persistent. Some are mobile in the environment. Some are more acutely toxic than PFAAs.
Relevance to carpets and rugs	Side-chain fluorinated polymers are commonly used in carpets and rugs.
Examples	Fluorotelomer alcohols, aldehydes, carboxylates, etc. Polyfluoroalkyl phosphate esters Side-chain fluorinated polymers



*Image Source:
Wikipedia



Perfluoropolyethers (PFPEs) and fluoropolymers

Characteristics	True polymers, do not degrade.
Key concerns	Manufactured using PFAAs
Relevance to carpets and rugs	PFASs suitable for carpet treatments include “ <i>fluoropolymers, perfluoropolyethers (PFPEs), ...</i> ” (Iverson et al. 2017)
Examples	Polytetrafluoroethylene (PTFE) Polyvinylidene fluoride (PVDF) $\left(\begin{array}{cc} \text{F} & \text{F} \\ & \\ -\text{C} & -\text{C}- \\ & \\ \text{F} & \text{F} \end{array} \right)_n$ PTFE *

*Image Source:
Wikipedia



Questions: Product and chemical description

1. Was SCP effective in communicating the need for the class approach?
2. Do you have questions about the rationale presented or the underlying science?
3. How does the class approach fit with the intent of SCP and the Green Chemistry Law?
4. Individual chemicals and sub-classes within the larger PFAS class are characterized to varying extents with regards to their hazard traits and exposure potential. Is the variable level of characterization significant for the proposed listing?
5. How can and should we apply what we've learned through this class approach for future prioritization of chemical groups?

