PNWS AWWA

PFAS Mitigation in the PNW

Challenges, Strategies, & Future Directions

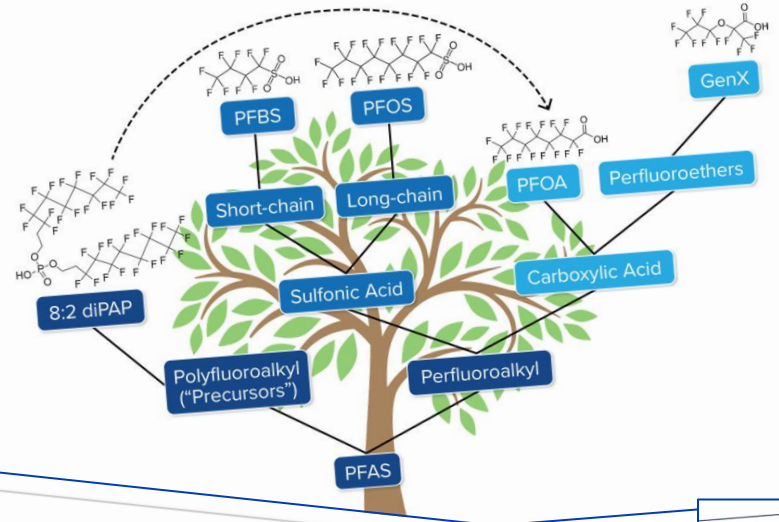
Tyler Kane

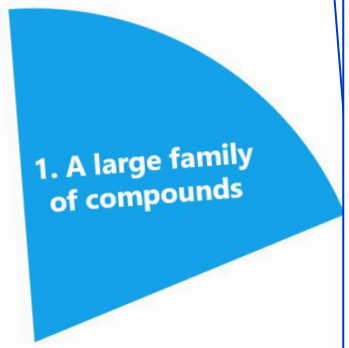
TKANE@CAROLLO.COM

5/6/26 || 11:00 - 11:30am PST

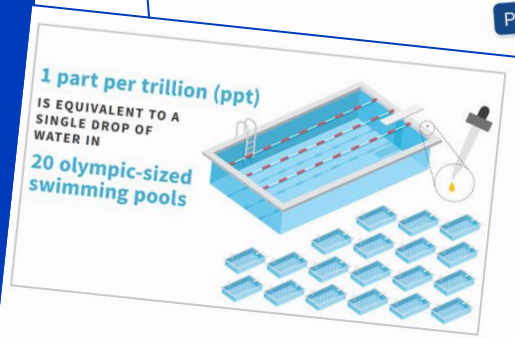
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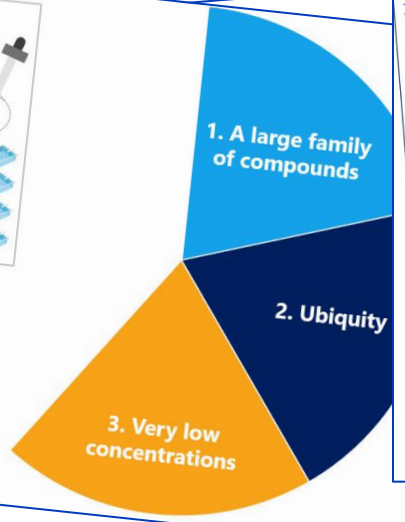
What are unique things about PFAS?



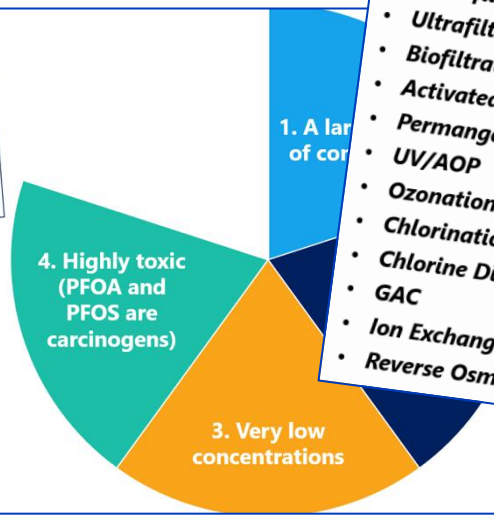




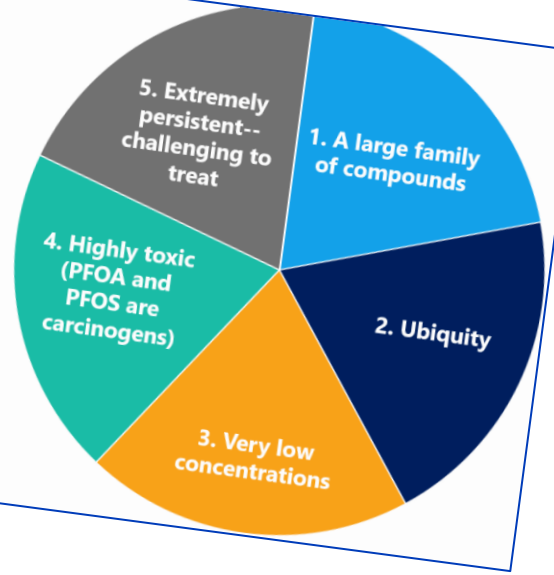












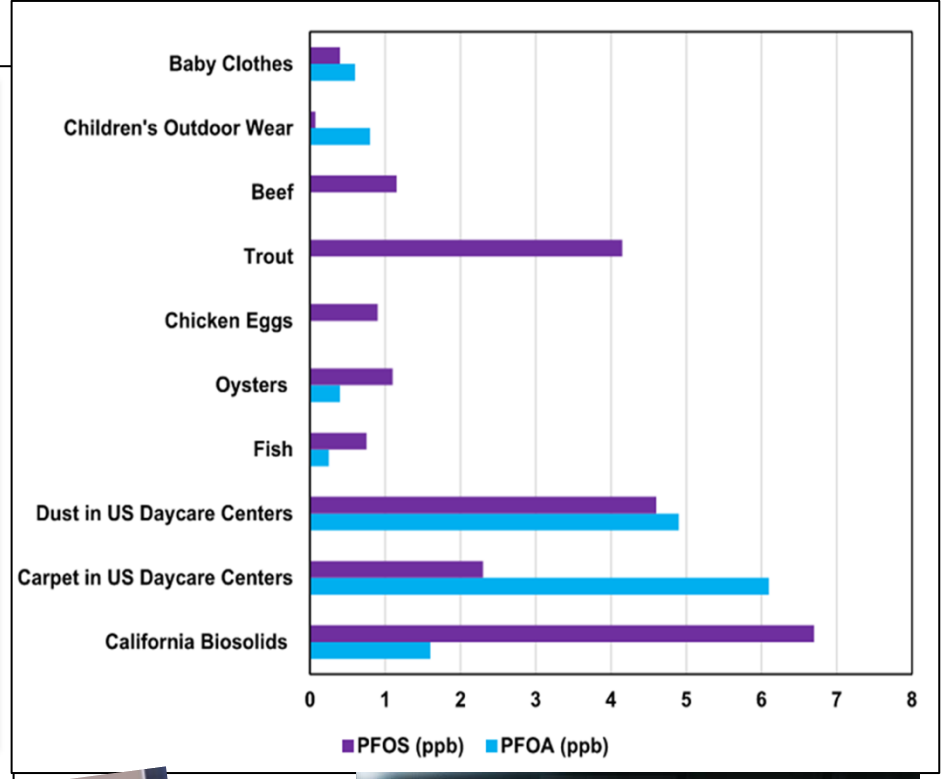
PFOA median
81% from food

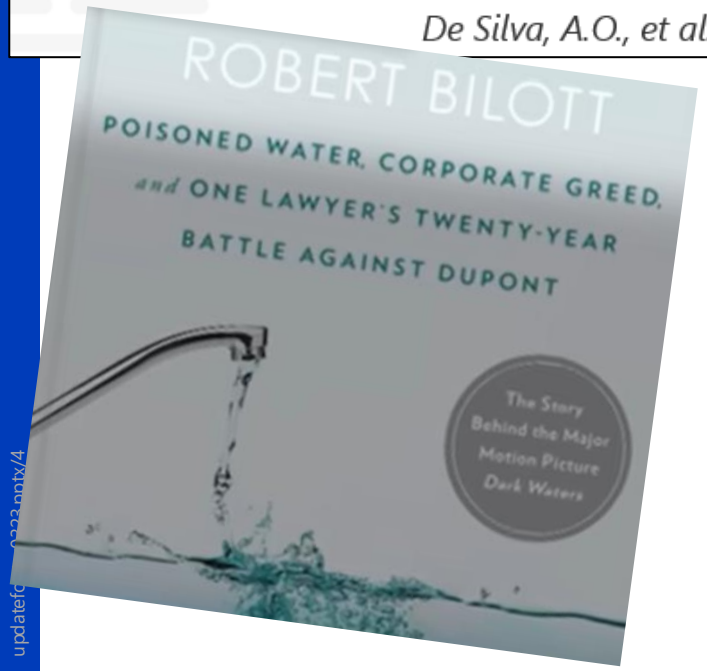
PFOS median
93% from food

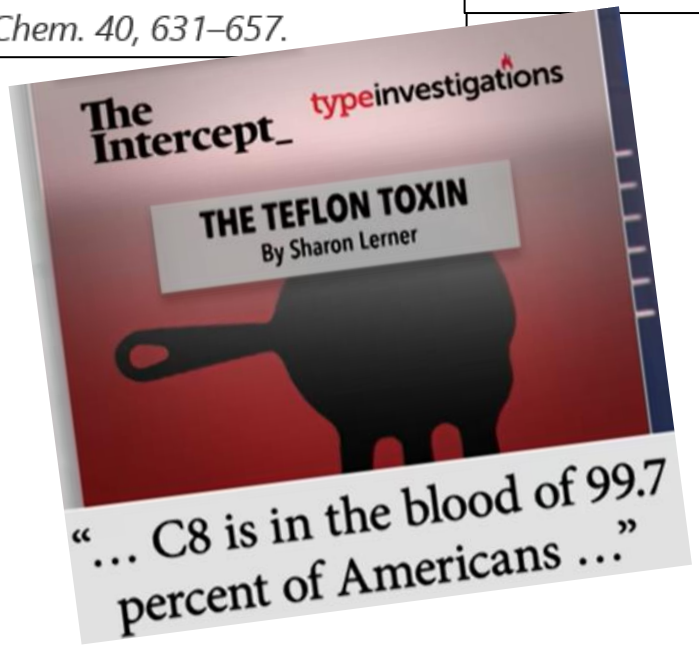
TABLE 2: Literature estimates of source contributions (percentage) to adult exposures to poly- and perfluoroalkyl substances[a]

		Exposure medium[b]				Exposure route[b]			
PFAS	Carbon length	Diet	Dust	Water	Consumer goods	Inhalation	Dermal	Indirect	Study location
PFBA	4		4	96					NA
PFHxA	6	38	4	38		8		12	NA
PFHxA	6	87	4			2			Norway
PFHxS	6	57	38			5			Finland
PFHxS	6	94	1						Norway
PFHpA	7	93	1						Norway
PFHpS	7				100				Norway
PFOA	8	16	11		58	14			NA, EU
PFOA	8	85	6	1	3			4	Germany, Japan
PFOA	8	77	8	11		4			Norway
PFOA	8	66	9	24		<1	<1		USA
PFOA	8	41		37				22	Korea
PFOA	8	99		<1					China
PFOA	8	47	8	12		6		27	NA
PFOA	8	95	<2.5			<2.5			Finland
PFOA	8	89	3			2			Norway
PFOA	8	91		3		5			Ireland
PFOS	8	66	10	7		2		16	NA
PFOS	8	72	6	22		<1	<1		USA
PFOS	8	96	1	1		2			Norway
PFOS	8	81	15		4				NA, EU
PFOS	8	93		4				3	Korea
PFOS	8	100		<1					China
PFOS	8	95	<2.5			<2.5			Finland
PFOS	8	75				3			Norway
PFOS	8	100							Ireland

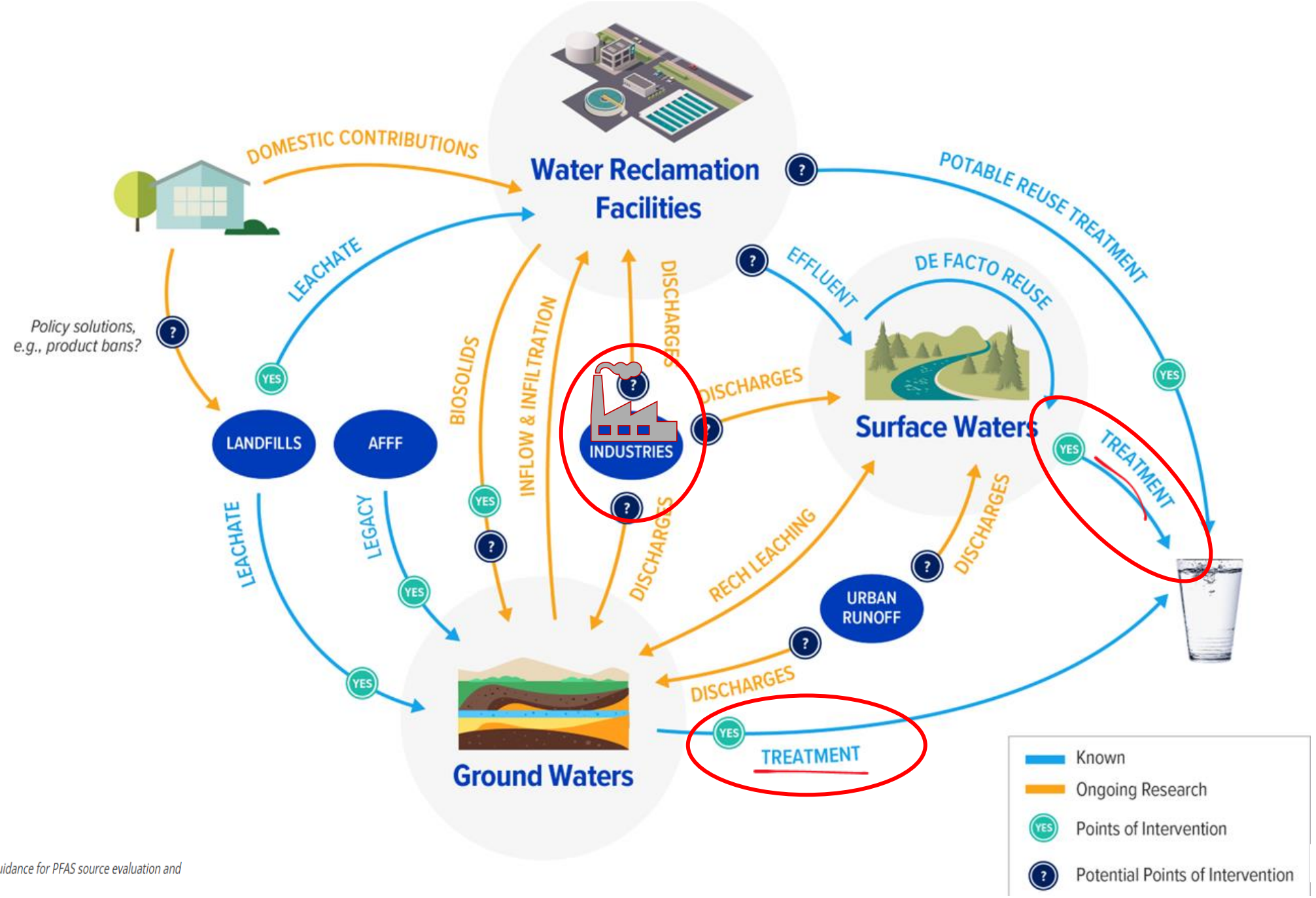
De Silva, A.O., et al., 2021. Environ. Toxicol. Chem. 40, 631–657.



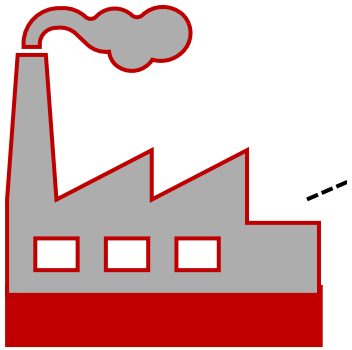








WRF Project #5082 offers guidance for PFAS source evaluation and remediation for utilities



PFAS Producing Industries

1

What's the plan for today?

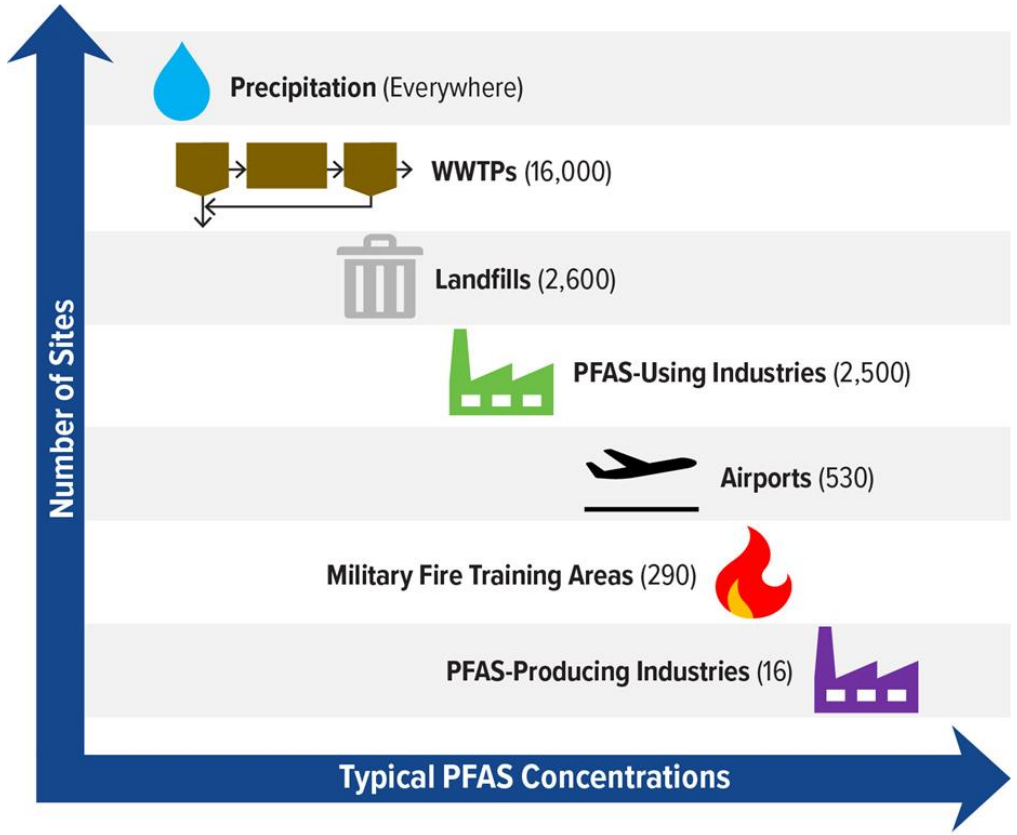


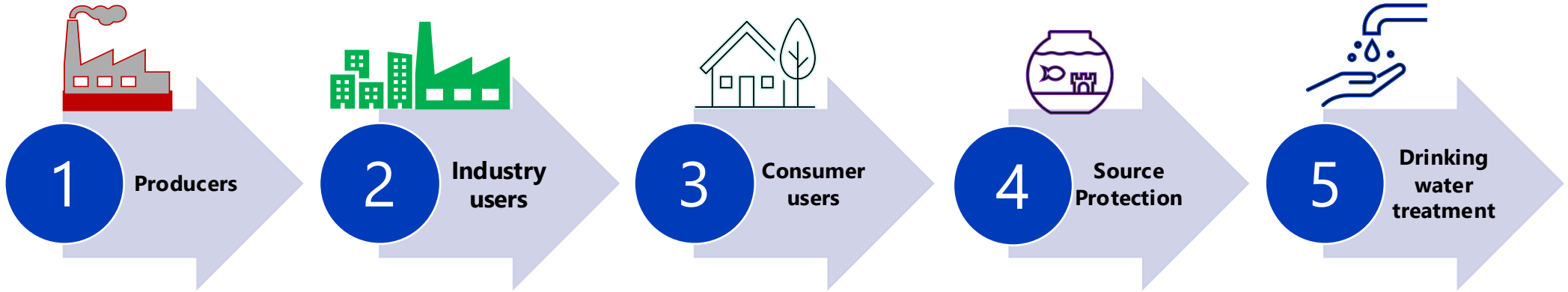
- What does mitigation look like?
  - What challenges are ahead with treatment?
  - Why upstream reduction is needed.

- Discuss broader implications of PFAS in the PNW.
  - Brainstorm ways we can advocate and reduce at the source.
  - Does a regional/ collaborative approach make sense?

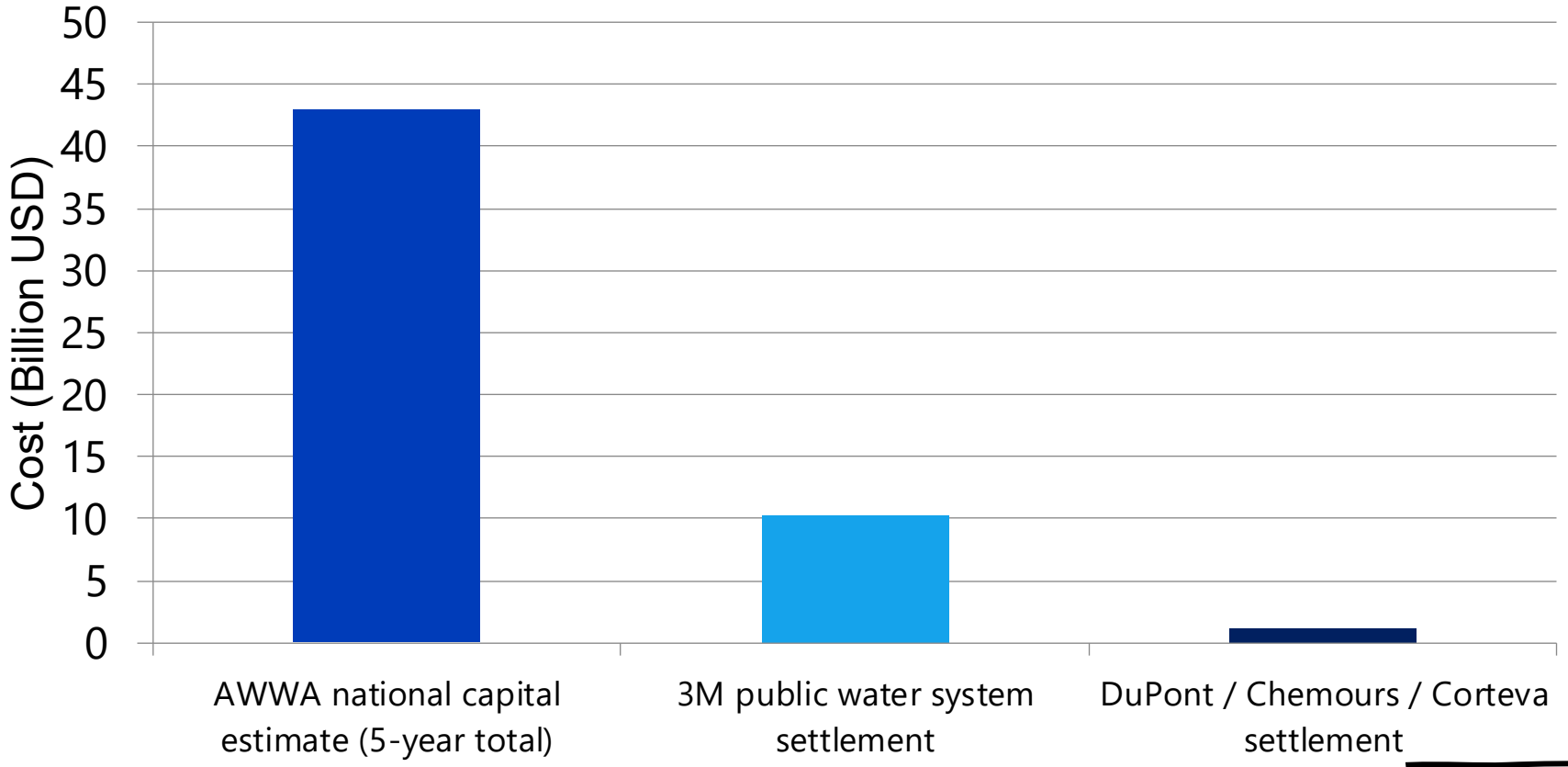
Mitigation

Mitigation

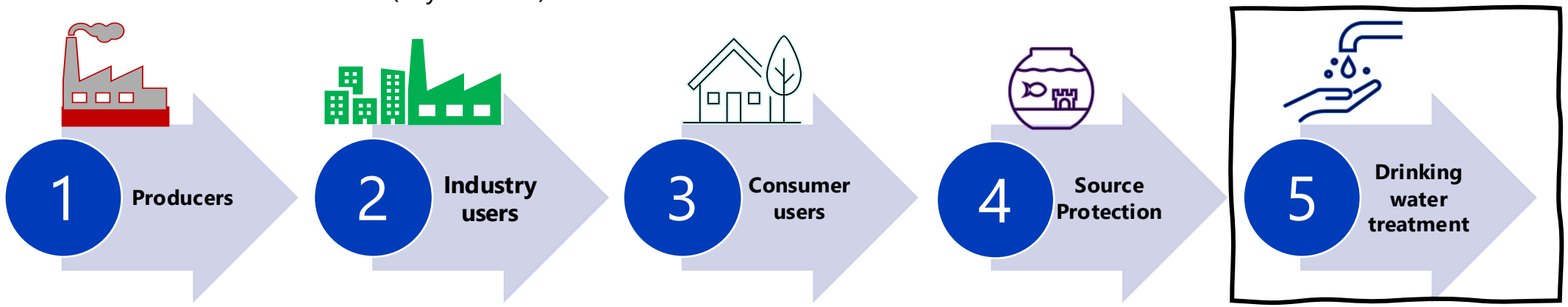

Precipitation (Everywhere)
WWTPs (16,000)
Landfills (2,600)
PFAS-Using Industries (2,500)
Airports (530)
Military Fire Training Areas (290)
PFAS-Producing Industries (16)
Number of Sites
Typical PFAS Concentrations


1
Producers
2
Industry users
3
Consumer users
4
Source Protection
5
Drinking water treatment

Challenges with Treatment: Cascading Capital Costs



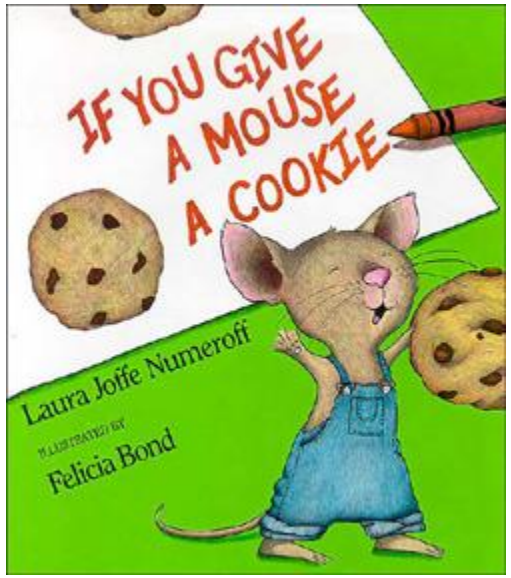
Sources: AWWA (2024) Estimated Cost of Compliance with PFAS Drinking Water Standards; EPA (2024) National Primary Drinking Water Regulation for PFAS – Economic Analysis; 3M Company (2023) Public Water Supplier Settlement Agreement; DuPont, Chemours, Corteva (2023) U.S. Public Water System Settlement.



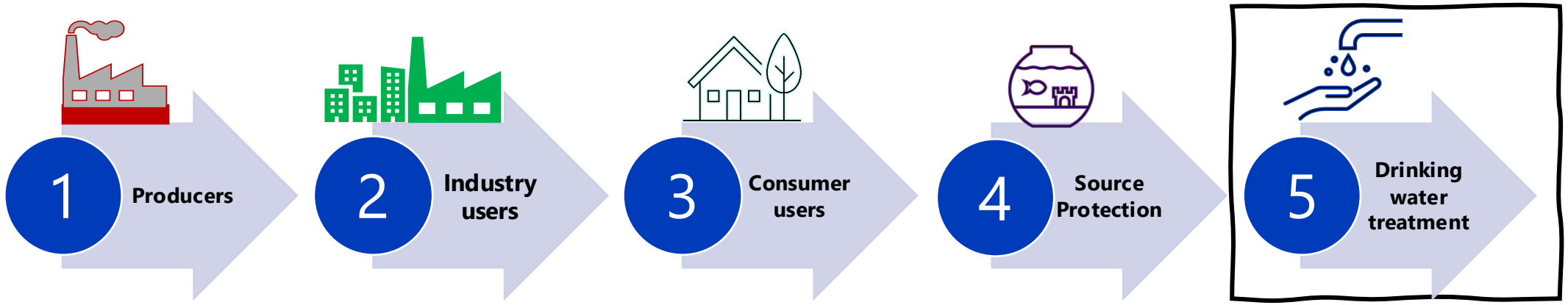
Challenges with Treatment: Cascading Capital Costs

PNW GW system example:

- *Treatment > headloss > larger pump to maintain capacity > larger electrical equipment > bigger generator > additional infrastructure.*
- *High pressure zone GW pumps > high pressure-rated PFAS equipment.*
- O&M adds uncertainty with media costs, regen ability, disposal.



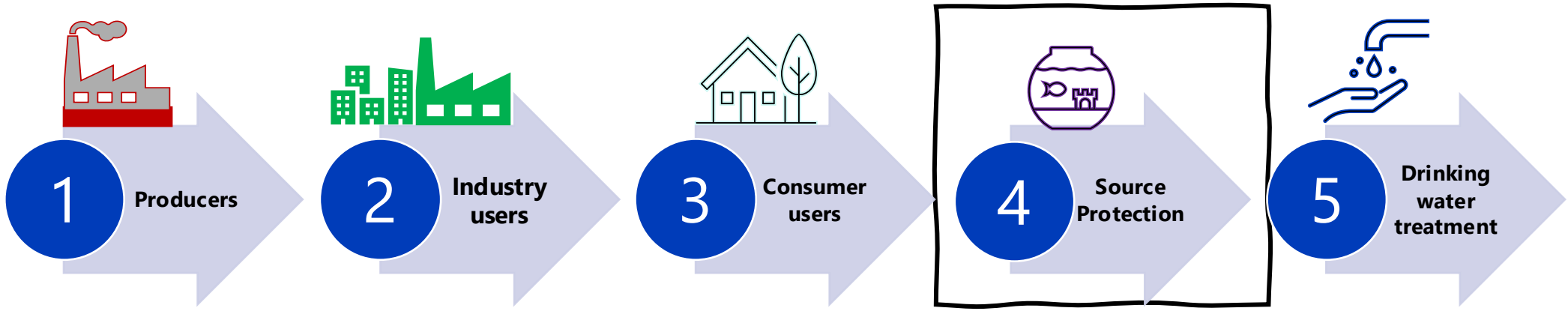
Least cost-effective method of mitigation.



Source Protection Success Stories

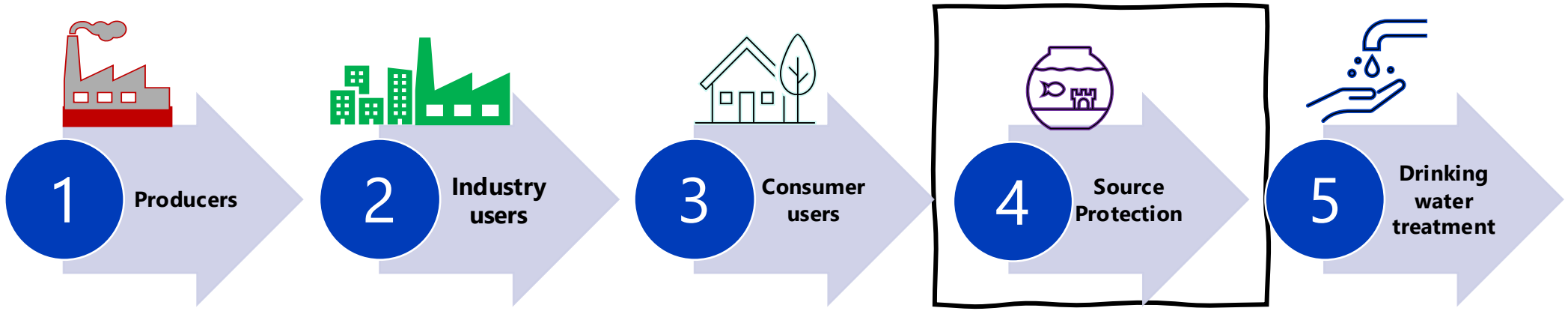
Table 6-1: WRF 5082 Guidebook

	Groundwater	Surface Water	Wastewater
Industry Outreach	●	●	●
Point Source Treatment	●	●	●
Public Education	●	●	●
Advocating for Essential Uses Only	●	●	●
Switching Wells	●		
Containment	●		
Pump-and-Treat	●		



Source Protection Success Stories

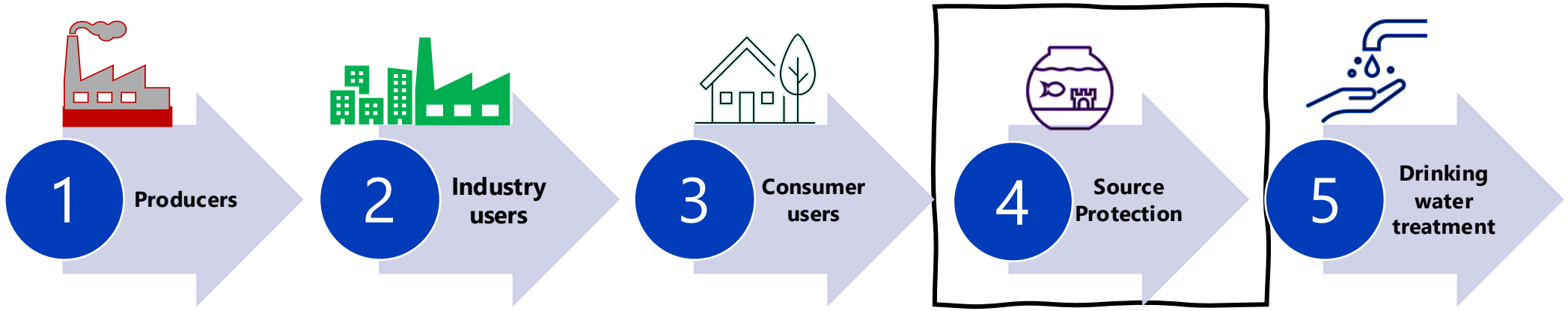
- Cape Fear River, NC:
  - » Newspaper report June 2017 highlighted PFAS in river.
  - » Polluting industry reps met with local officials, agreed to reduce emissions.
  - » 3 months later, PFAS concentrations in the river were orders of magnitude lower.
  - » Media attention can help persuade as a middle step between initial outreach and legal action.
- MI case studies:
  - » As of 2020, six WWTPs had seen over 90% reductions in PFOS in their effluent after utilities required treatment at the source. Led to 80% less PFOS at drinking water intakes.



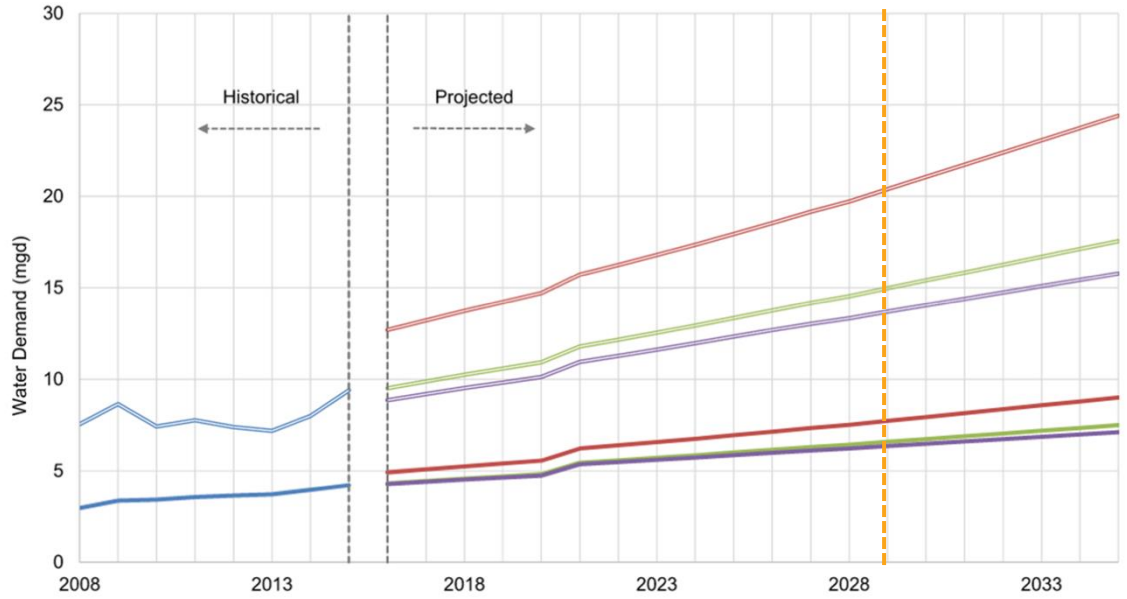
Source Protection Success Stories



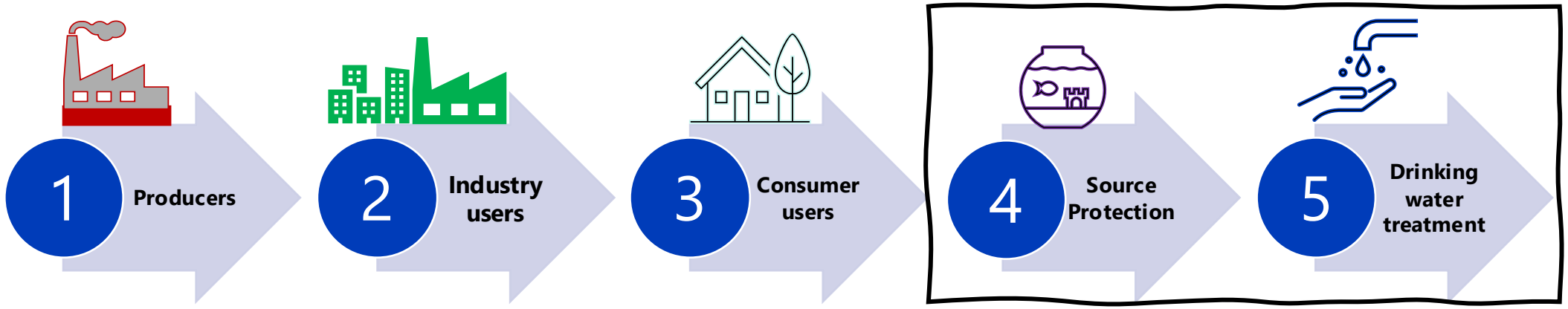
- Work to identify sources of PFAS via sampling plan.
  - » Contaminant source inventory & GW modelling can help.
- Think in terms of mass (concentration & flow) when evaluating data and prioritizing source control.
  - » Forensics can help determine source (industry vs. domestic).
- **WRF 5082 Guidebook** is a great resource.



Source Protection & Treatment Timelines Can Converge

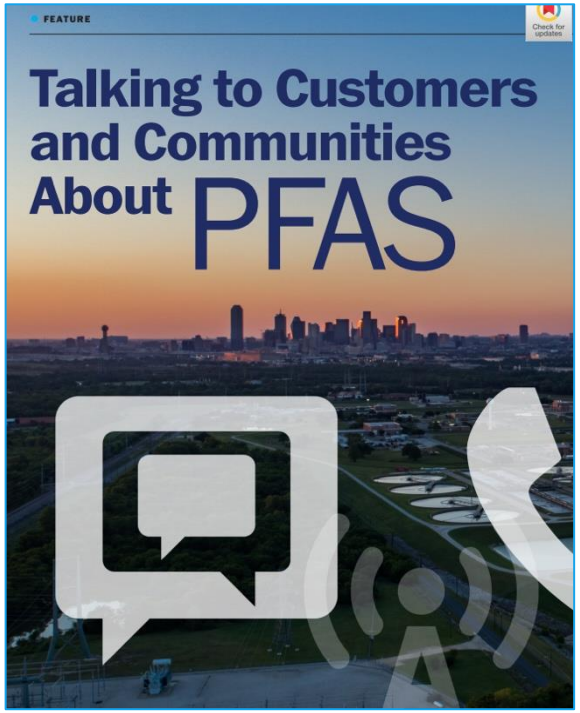




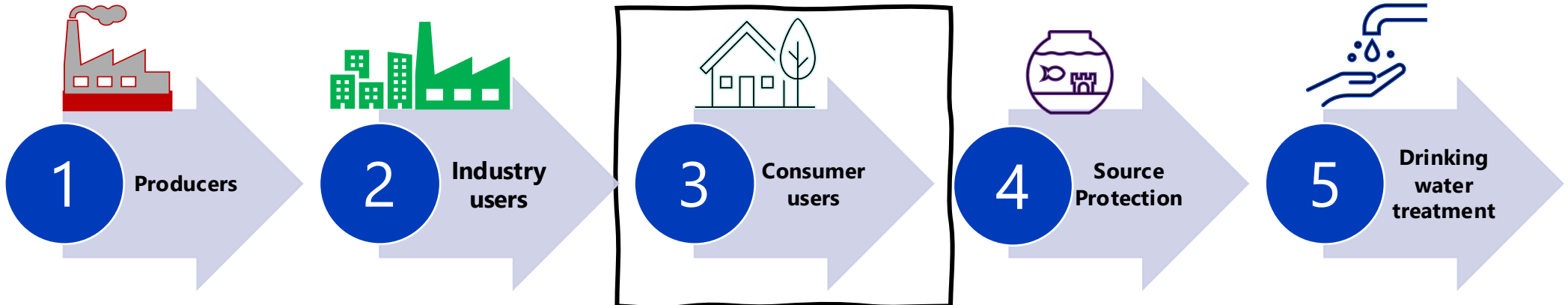


Consumer Considerations

- Even if all **direct** industrial sources are controlled, consumer sources will contribute to the problem (~50+% in many cases).
- Public education, communication, and locally-led programs *can* work.
  - » Resources for communicating about PFAS.
  - » Apps and databases for consumer products (Oasis, Yuka).



Journal AWWA – May 2022



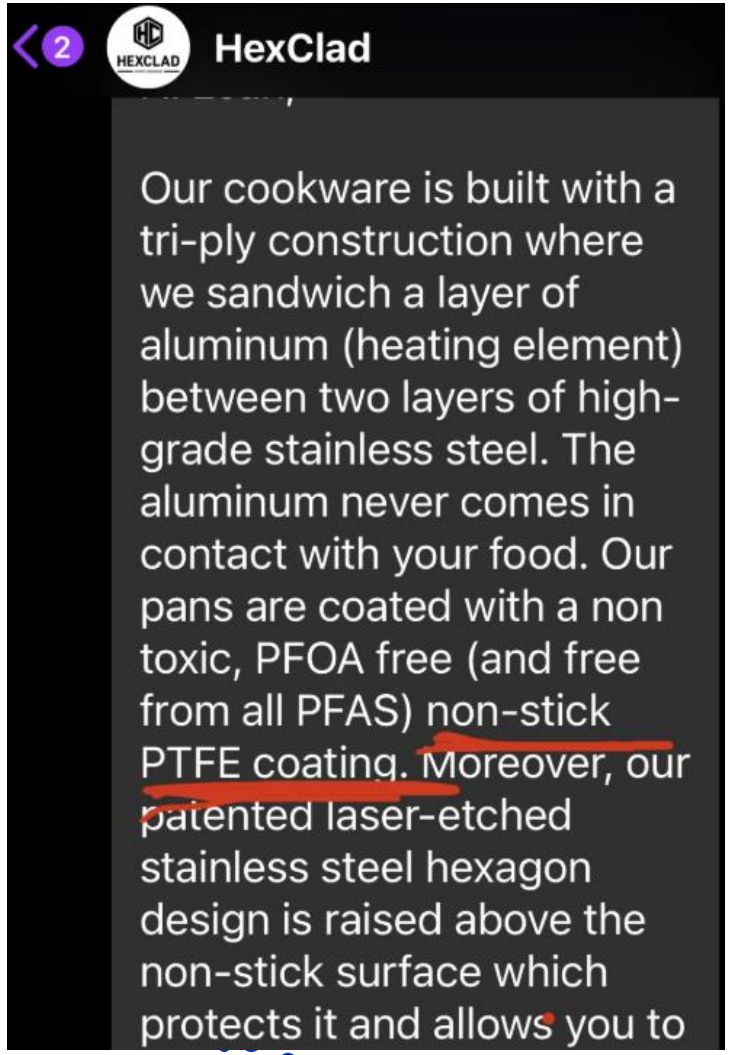
Consumer Considerations

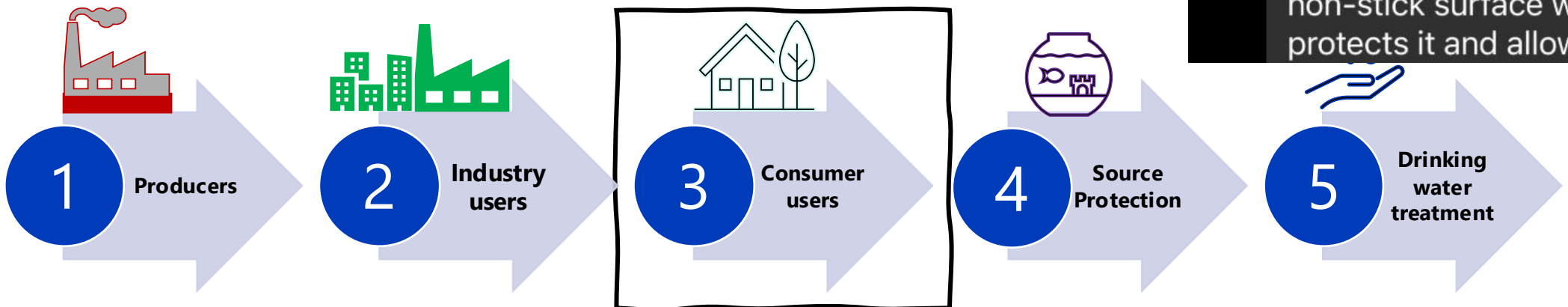
PFOa and PFOs Free!

Warnings

State Chemical Disclosure

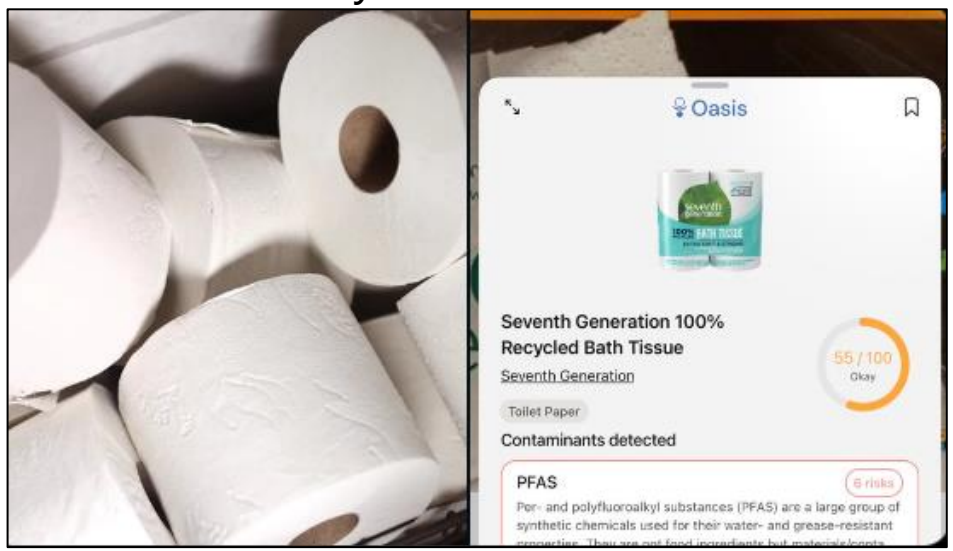
This product contains Polytetrafluoroethylene. For more information about chemicals in this product, visit https://www.t-falusa.com/cookware-commitments.





Industry Enigma

- Many products are made without “intentionally added” PFAS.



KEEN

THE ROAD TO PFAS FREE

April 2023 | Version 2.0

MATERIAL SUPPLIERS TESTING PROCEDURE

Material supplier collects and sends samples → KEEN Selects product from seasonal list → PASS

PASS → YES → Ship material and start production

PASS → NO → DO NOT SHIP
Work on failure resolution

1 Producers → 2 Industry users → 3 Consumer users → 4 Source Protection → 5 Drinking water treatment

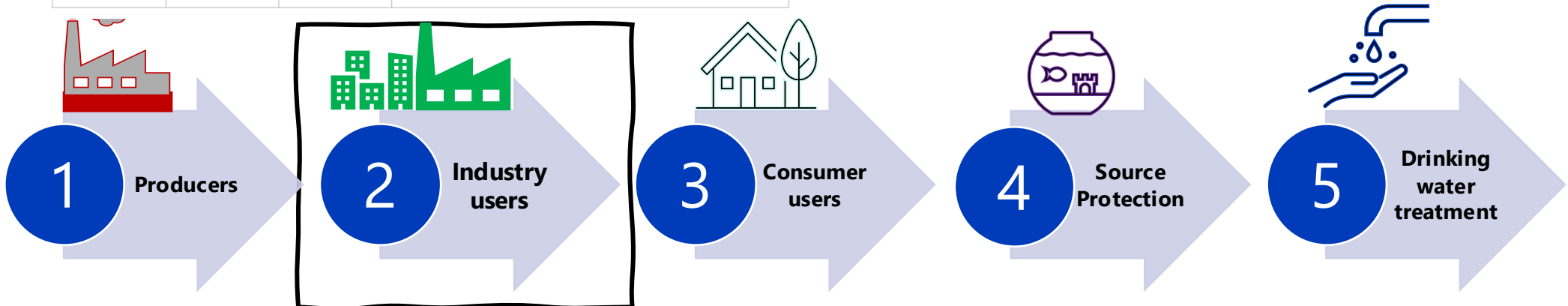
Industry Enigma

- Bottom up (consumer advocacy) approach.
- Top down (regulatory) approach.

STATE	BILL	STATUS	DESCRIPTION
CALIFORNIA	AB 1817	ADOPTED	Beginning January 1, 2025, prohibits PFAS in clothing and textiles. PFAS in outdoor apparel for severe wet conditions will be eliminated as of 2028 and manufacturers will be required to disclose the presence of PFAS in the products as of 2025. Directs manufacturers to use the least toxic alternative.
NEW YORK	S6291A	ADOPTED	Prohibits the sale of any apparel containing perfluoroalkyl and polyfluoroalkyl substances as intentionally added chemicals.
NEW YORK	S5648	UNDER CONSIDERATION	Prohibits the sale of certain products that contain intentionally added PFAS, including textiles and textile articles (non-wearable textile goods, outdoor apparel and PPE). Requires manufacturers of products containing PFAS to provide notice of such fact to persons that offer the products for sale or distribution.
RHODE ISLAND	SB 16	UNDER CONSIDERATION	Prohibits the use of perfluoroalkyl and polyfluoroalkyl substances in carpets, upholstered furniture, textile furnishings, apparel, cosmetics juvenile products, cookware and firefighting foam and gives authority to the department of environmental management to regulate the use.
VERMONT	H.152	UNDER CONSIDERATION	Prohibits the manufacture, sale, and distribution of apparel, cookware, paper products, and pesticides containing PFAS by 2024. Prohibits the manufacture, sale, and distribution of cosmetic products containing certain chemicals and chemical classes by 2026. Prohibits the manufacture, sale, and distribution of all products containing PFAS by 2030.

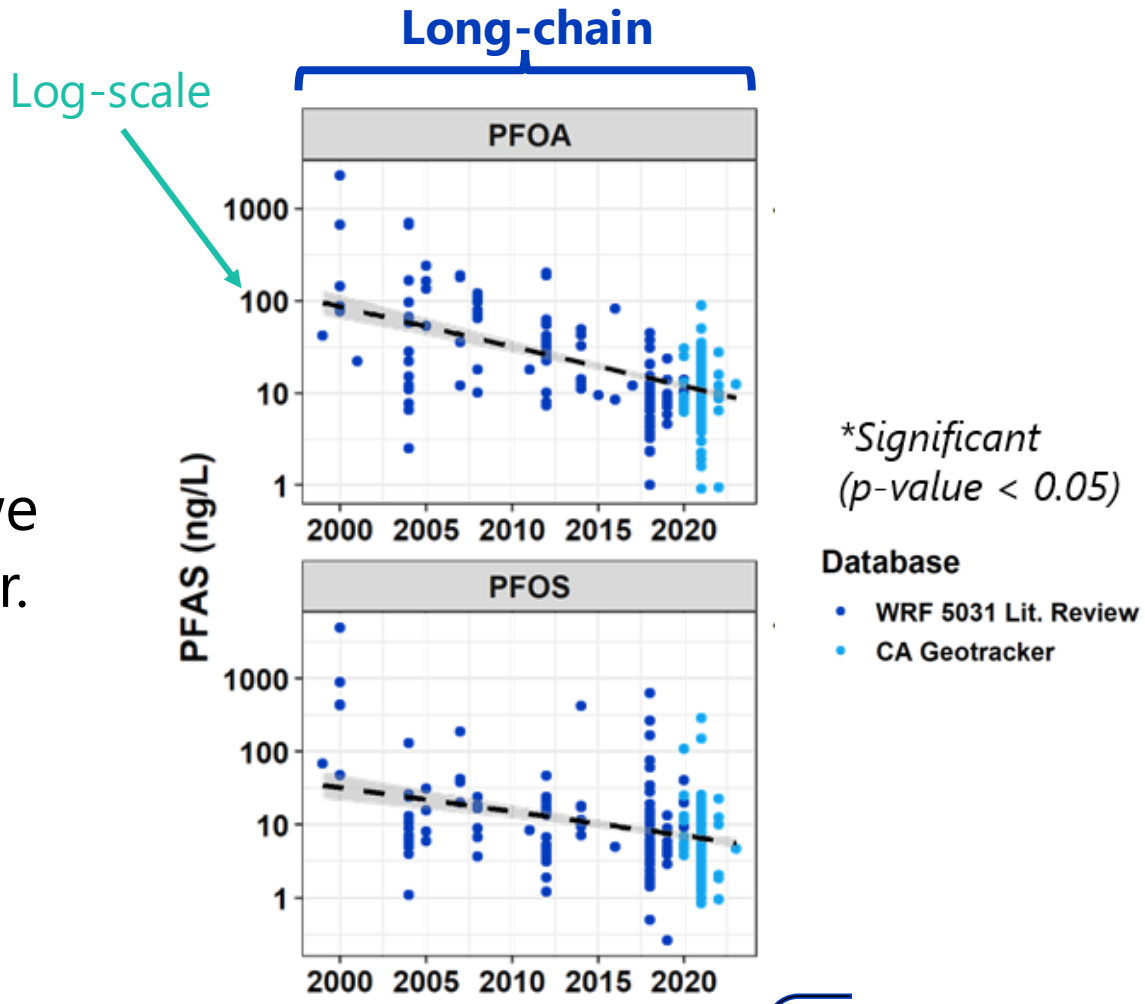
Washington State PFAS Product Bans & Phase-Outs

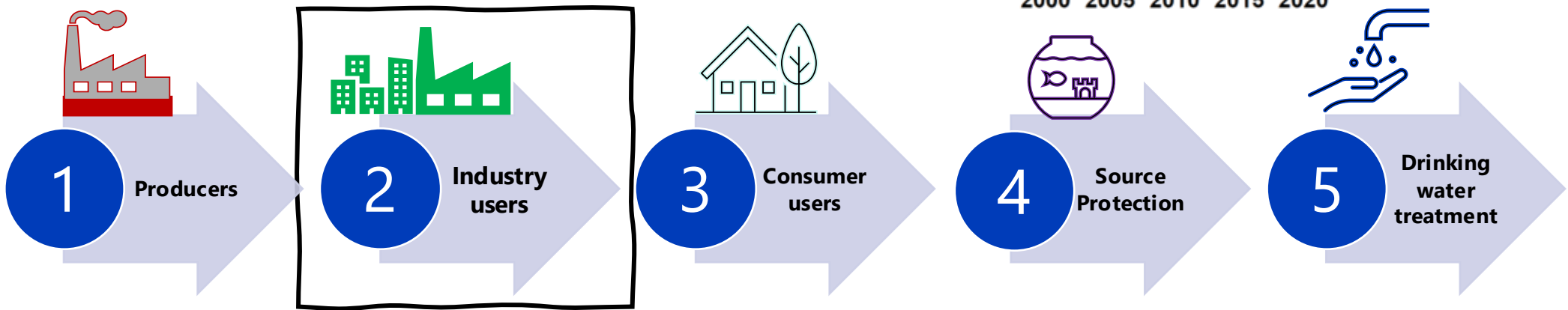
Program	Products Phased/ Banned	Effective Date
Firefighting Foams	AFFF	2018
Food Packaging	Food-contact materials	2023–2024
Safer Products Cycle 1	Carpets, treatments, furniture	2025–2026
Safer Products Cycle 1.5	Apparel, cleaners, auto washes	2027
Reporting & Thresholds	**Reporting + 50 ppm total fluorine rule**	2026–2027



Industry Enigma

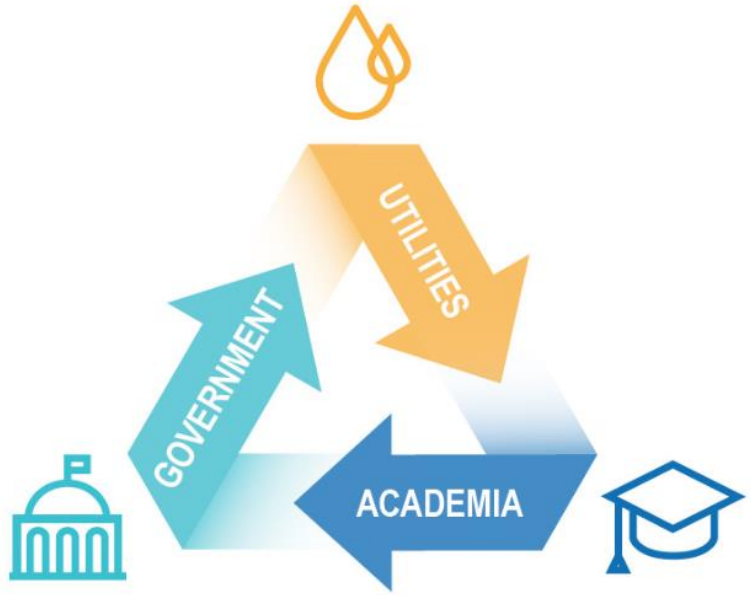
- California Case Study:
  - » Since voluntary phase out of PFOA and PFOS in consumer products, we have seen reductions in wastewater.
- Regs and consumer awareness/ advocacy can work!

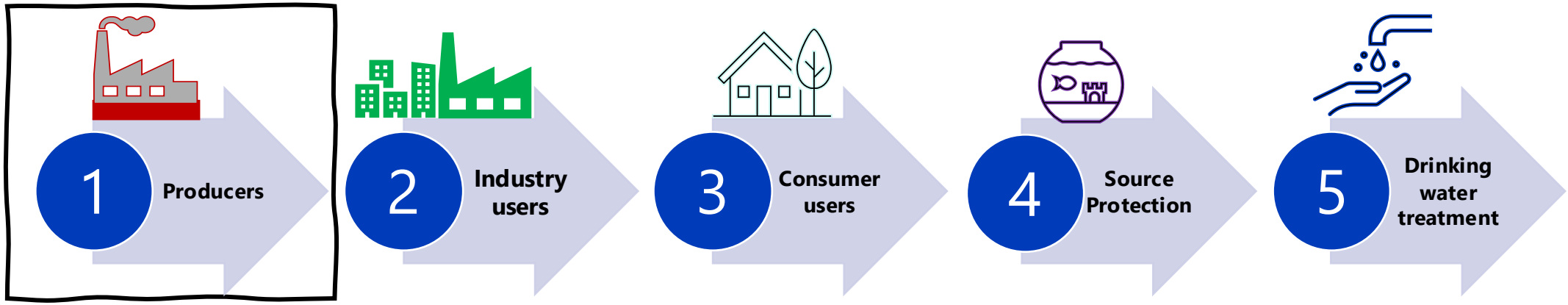




The Producer Problem

- How to take on a large industry?
  - » ~$30B in sales directly related to PFAS production.
  - » They can afford lawyers, outsourcing, etc. but can't afford:
    - Losing market shares; regulations/ bans; better alternatives.
- We should advocate for:
  - » "Essential use" regulation & expanded testing requirements.
  - » Education for consumers, media, regulators, and industry.
  - » Investments in safer alternatives, biomimicry studies.



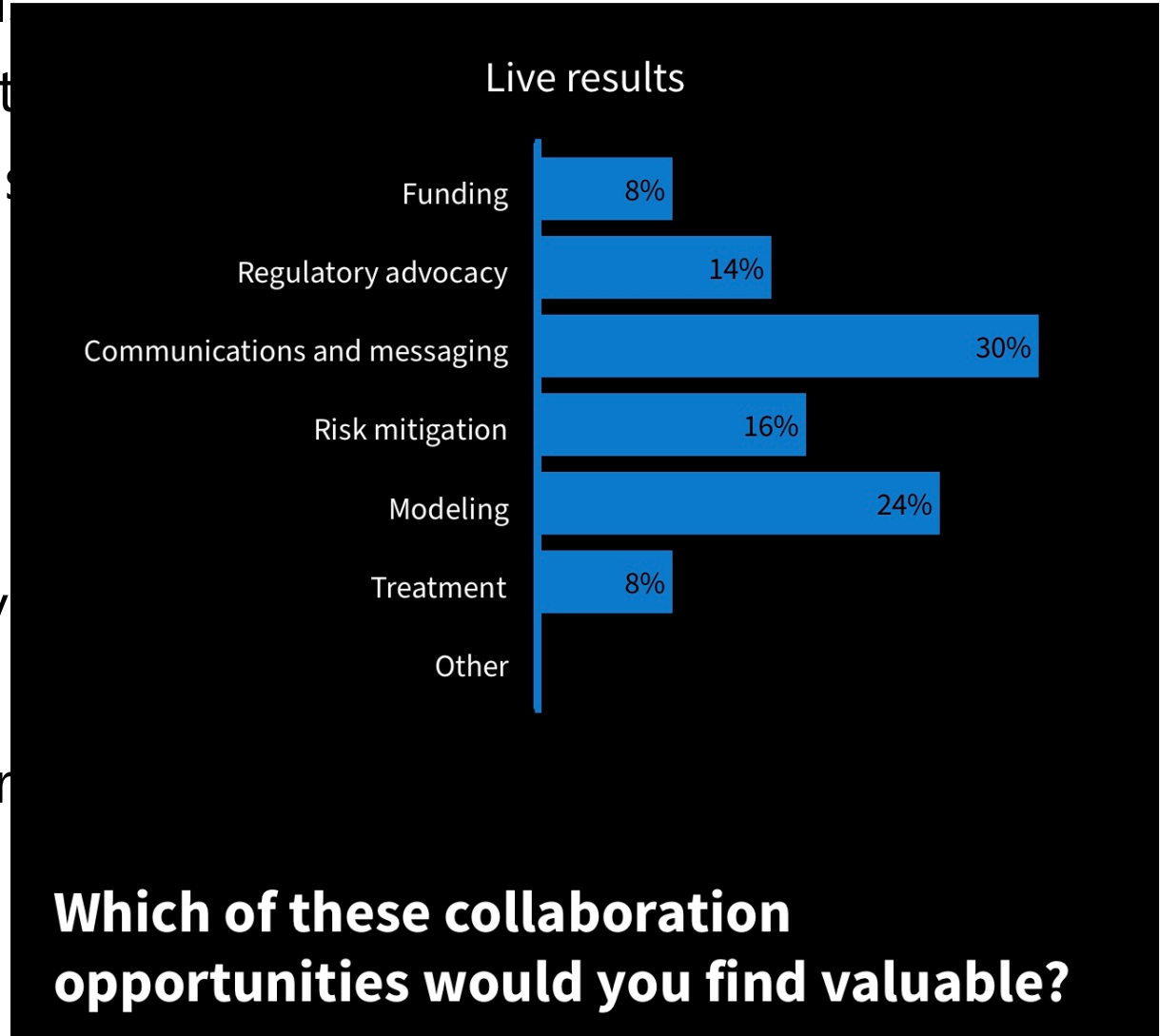


Broader implications of PFAS in the PNW: *Closing Thoughts*

Closing Thoughts

- We spend where PFAS is hardest to control
  - Drinking water is generally the most dilut
  - Treatment will continue to be needed to s public trust in water.
  - Our industry did not create this problem
  - Don't get complacent – the risk is real.

- We underinvest where PFAS is easiest to av
  - Product bans & substitution.
  - Consumer behavior/ education > pressur
  - Advocacy & collaboration.



Communications Strategy

Utilities should have an influential voice with politicians, media, & public, and be a voice for science, fairness, and cost-effective solutions.

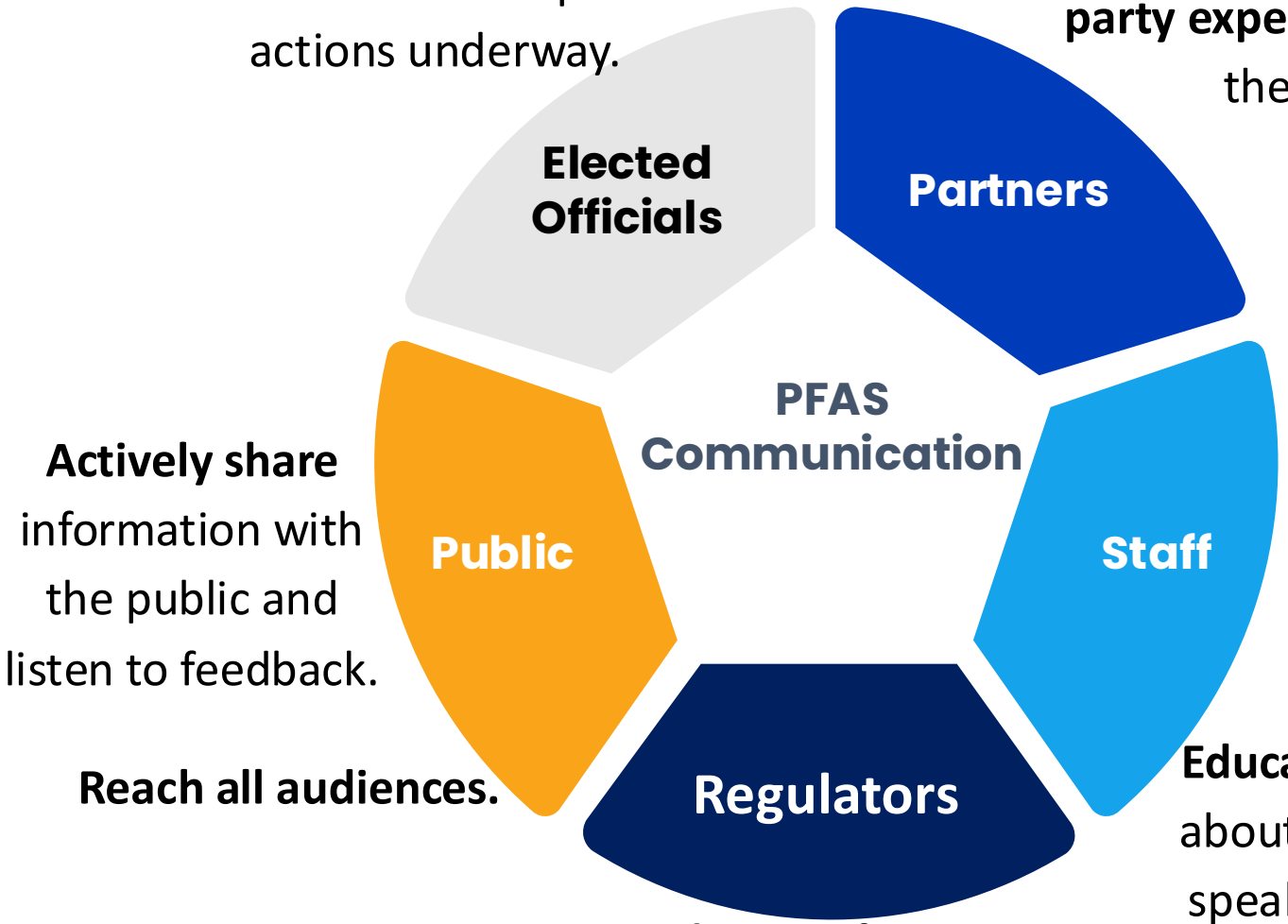
It is important to emphasize that utilities are at most conduits, not sources, of pollution.

Eliminating or reducing pollution at the source is fairer and more cost-effective than treatment at utility facilities.

-WRF 5082 Guidebook

Keep elected officials informed on the topic and actions underway.

Engage credible third-party experts to help tell the story.



Actively share information with the public and listen to feedback.

Reach all audiences.

Educate and train staff about PFAS and how to speak with customers.

Advocate for cost effective solutions

Community-Led Response Planning

What can we do today?

1. PFAS Monitoring (Near- and long-term)
2. Mitigation & Treatment Studies
3. Funding Impacts & Affordability Strategies
4. Partnership Opportunities
5. Advocacy
6. Communications Strategy

Water Utility Councils, AWWA, other Orgs already doing great work on this!



Tyler Kane
TKANE@CAROLLO.COM

Questions/ Comments / Open Discussion