Guideline Levels for PFOA and PFOS in Drinking Water

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ARTICLE

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Guideline levels for PFOA and PFOS in drinking water: the role of scientific uncertainty, risk assessment decisions, and social factors

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Overview

Goals:

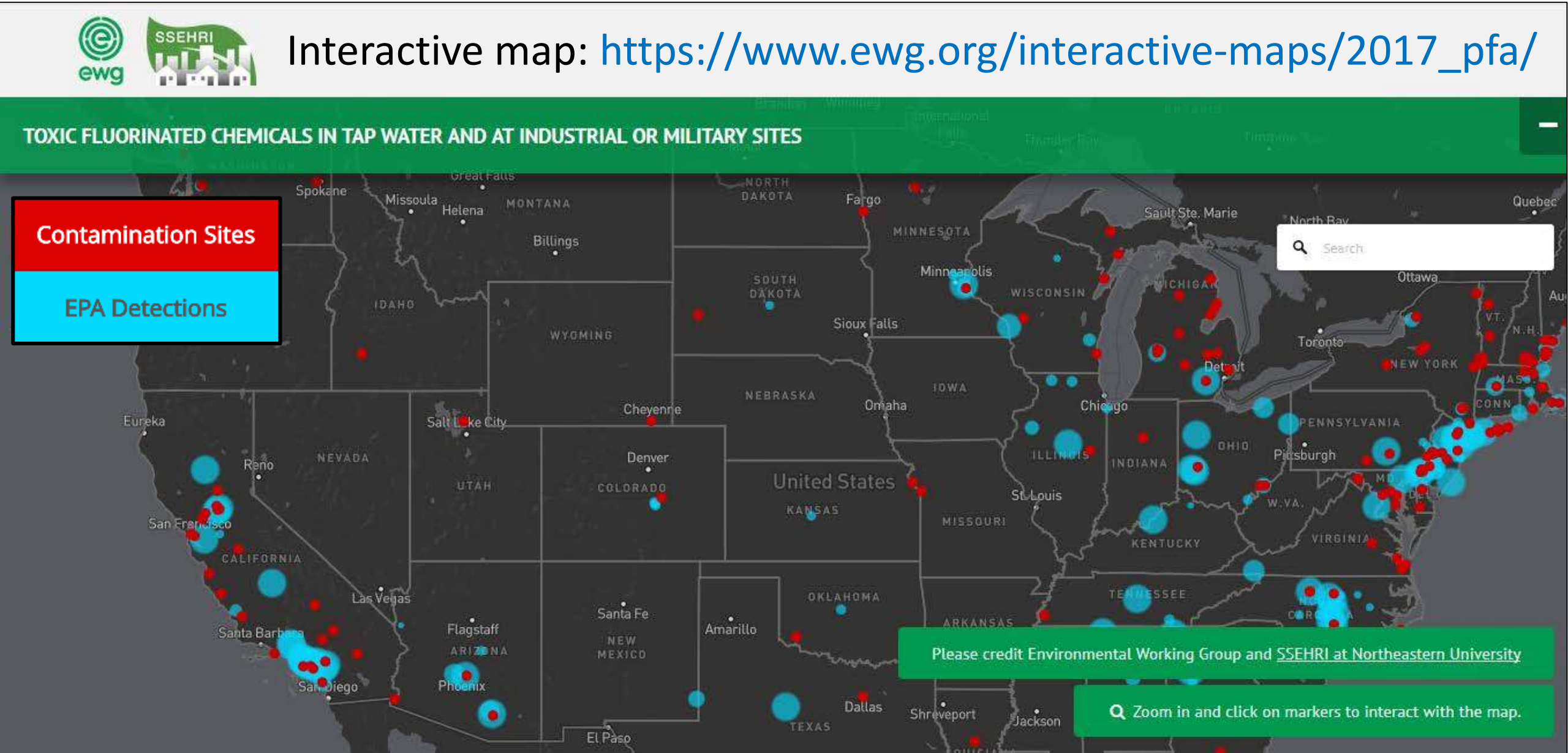
- Examine PFOS and PFOS water guideline levels developed by the U.S. EPA and state agencies
- Explain how and why these levels differ

Methods:

- Compiled information from Interstate Technology and Regulatory Council (ITRC) June 2018 tables on water guideline levels
- Contacted state health and environmental agencies
- Reviewed publicly available risk assessment documents and toxicological summaries

At least 172 PFAS contamination sites in 40 states

Interactive map: https://www.ewg.org/interactive-maps/2017_pfa/



Drinking Water Regulation and Monitoring

- Safe Drinking Water Act (SDWA): regulates 90 chemical, biological, and radiological contaminants in public drinking water supplies
- Maximum Contaminant Level (MCL): enforceable standard based on health, treatment technology, and cost
  → No federal MCLs for any PFAS chemicals
- Unregulated Contaminant Monitoring Rule (UCMR): short-term testing for unregulated contaminants
  → Six PFASs included in 2013-2015 UCMR3
  → EPA's PFAS Action Plan (Feb. 2019): next round of UCMR (2023-2025) will include "different PFAS and at lower minimum reporting levels"

PFOA Guideline Levels

North Carolina DENR (2012)
Interim maximum allowable concentration (proposed)

Alaska DEC (2016)
Groundwater cleanup level

Texas CEQ (2017)
Protective concentration level

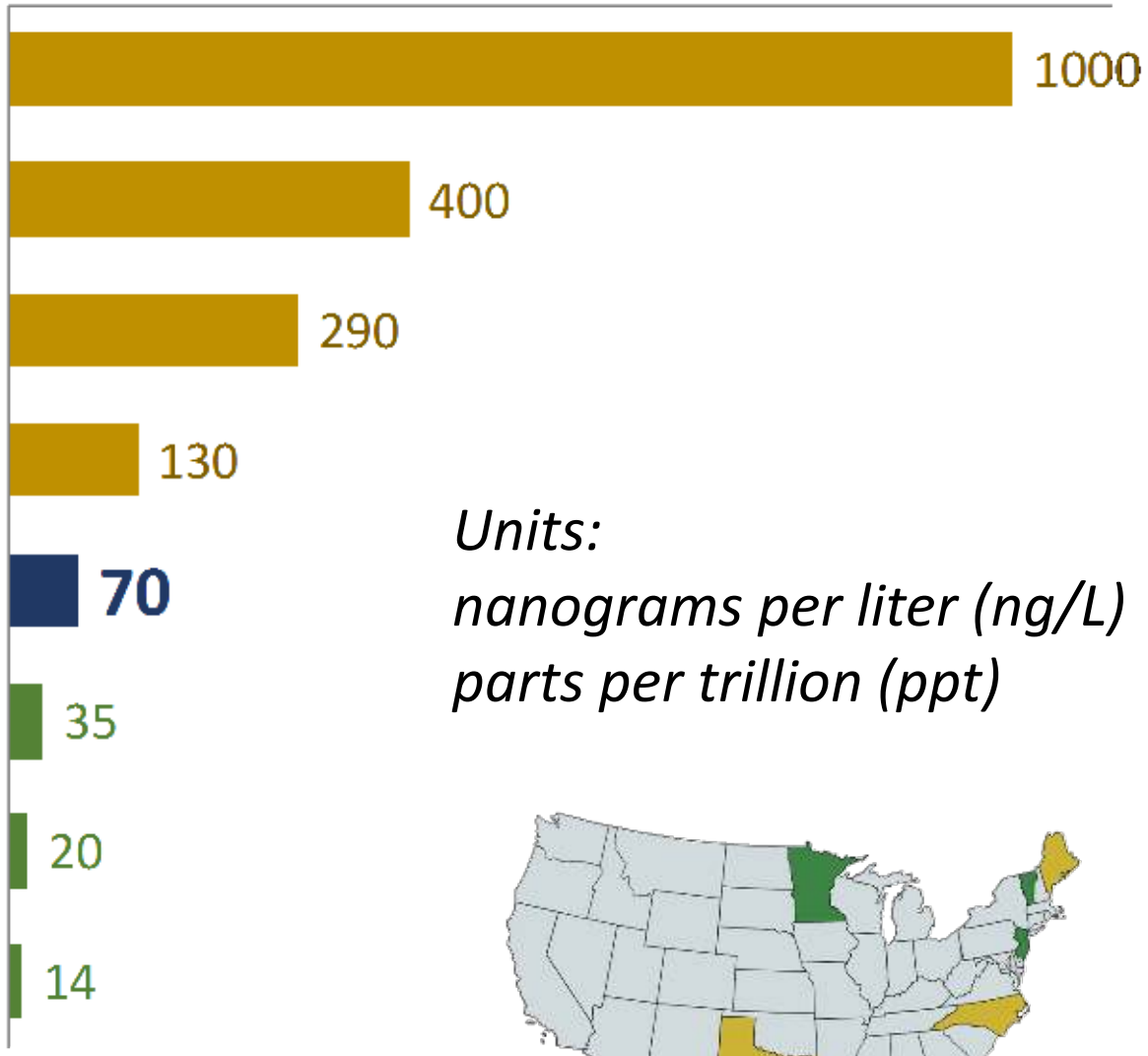
Maine DEP (2016)
Remedial action guideline

U.S. EPA (2016)
Health Advisory Level

Minnesota DOH (2017)
Non-cancer health-based level

Vermont DEC/DOH (2016)
Primary groundwater enforcement standard

New Jersey DEP (2017)
Maximum Contaminant Level (recommended)



Units:
nanograms per liter (ng/L)
parts per trillion (ppt)

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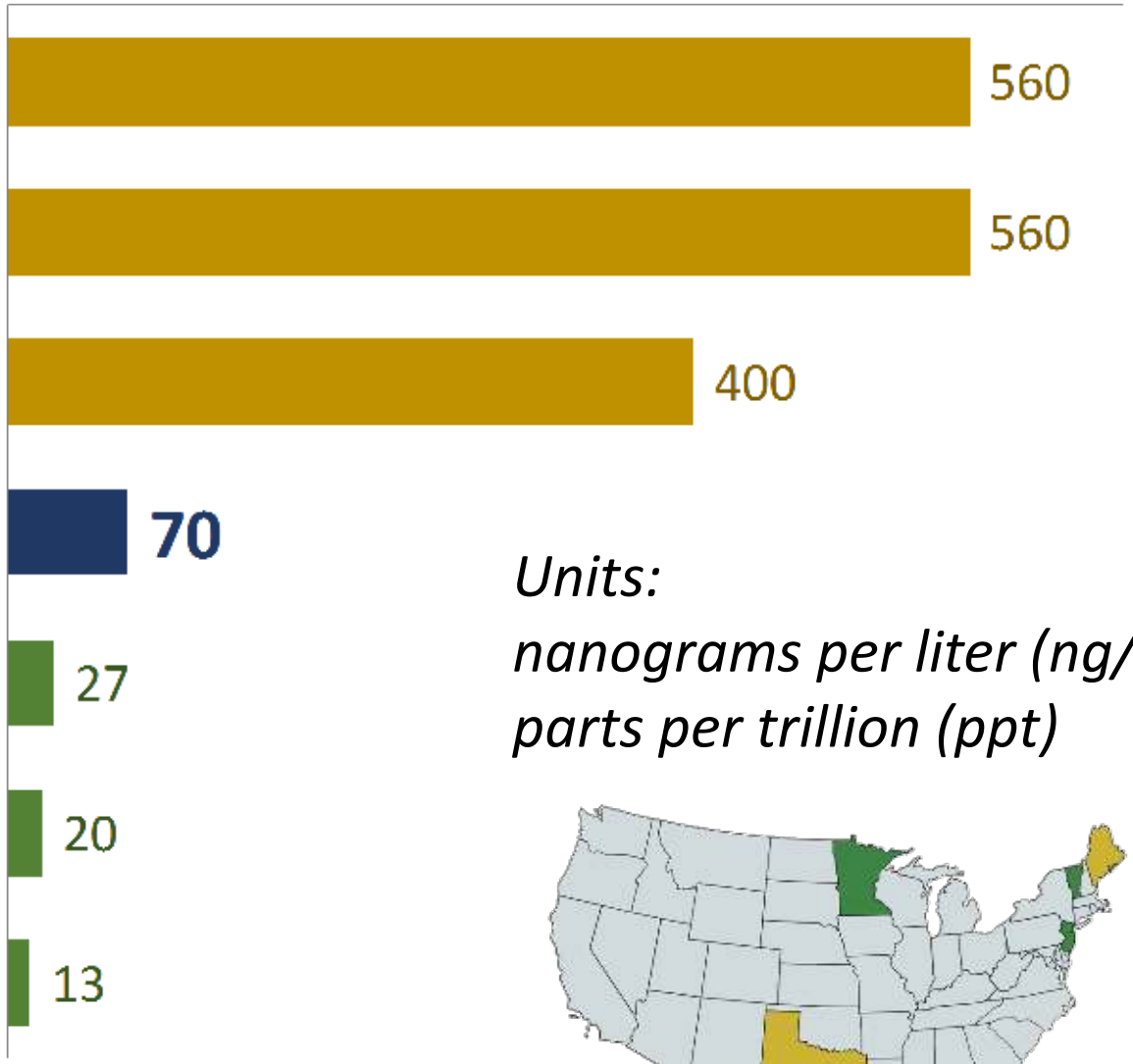
PFOS Guideline Levels



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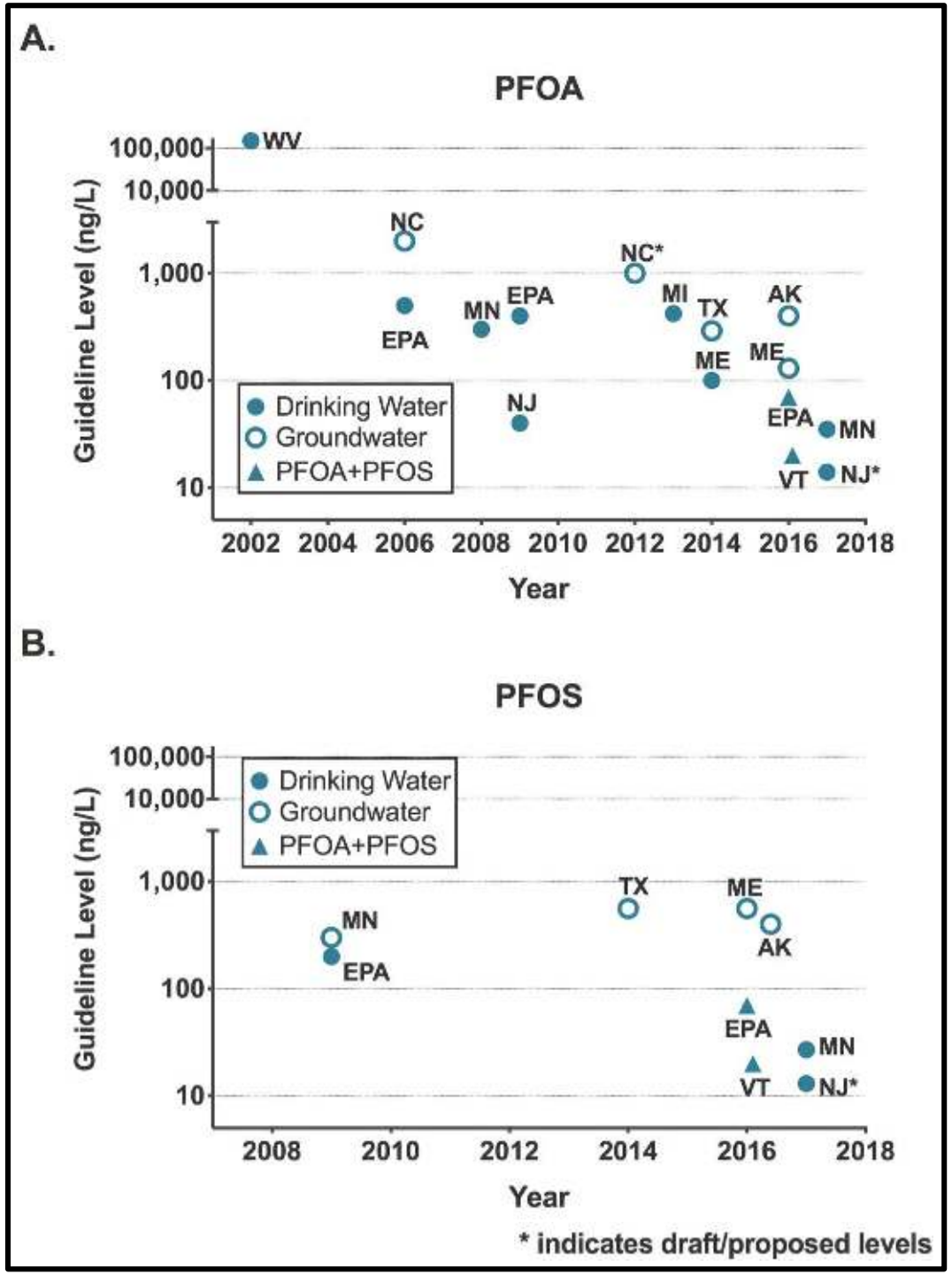
PFOA Advisories	Advisory Level	Toxicological Endpoint	Reference Dose	Uncertainty Factors
U.S. EPA (2016) Health Advisory Level	**70 ng/L**	**Developmental**	**20 ng/kg/day**	**300**	**Intraspecies 10 Interspecies 3 LOAEL to NOAEL 10**
N. Carolina DENR (2012) Interim maximum allowable concentration (proposed)	1,000 ng/L	Liver	N/A	**30**	Intraspecies 10 Interspecies 3
Alaska DEC (2016) Groundwater cleanup level	400 ng/L	Developmental	20 ng/kg/day	300	Intraspecies 10 Interspecies 3 LOAEL to NOAEL 10
Texas CEQ (2017) Protective concentration level	290 ng/L	Mammary Gland	15 ng/kg/day	300	Intraspecies 10 LOAEL to NOAEL 30
Maine DEP (2016) Remedial action guideline	130 ng/L	Liver	6 ng/kg/day	300	Intraspecies 10 Interspecies 3 Database 10
Minnesota DOH (2017) Non-cancer health-based level	35 ng/L	Developmental	18 ng/kg/day	300	Intraspecies 10 Interspecies 3 LOAEL to NOAEL 3 Database 3
Vermont DEC/DOH (2016) Primary groundwater enforcement standard	20 ng/L	Developmental	20 ng/kg/day	300	Intraspecies 10 Interspecies 3 LOAEL to NOAEL 10
New Jersey DEP (2017) Maximum contaminant level (recommended)	14 ng/L	Liver	2 ng/kg/day	300	Intraspecies 10 Interspecies 3 Database 10

PFOA Advisories	Advisory Level	Target Population	Water ingestion rate	Relative source contribution
U.S. EPA (2016) Health Advisory Level	**70 ng/L**	 **Lactating women**	**0.054 L/kg/day (=3.8 L for 70 kg body wt.)**	**20%**
N. Carolina DENR (2012) Interim maximum allowable concentration (proposed)	1,000 ng/L	 Adults	2 L/day (assumes 70 kg body wt.)	20%
Alaska DEC (2016) Groundwater cleanup level	400 ng/L	 Children (0-6 years) residential	0.78 L/day (assumes 15 kg body wt.)	100%
Texas CEQ (2017) Protective concentration level	290 ng/L	 Children (0-6 years) residential	0.64 L/day (assumes 15 kg body wt.)	100%
Maine DEP (2016) Remedial action guideline	130 ng/L	 Adults	2 L/day (assumes 70 kg body wt.)	60%
Minnesota DOH (2017) Non-cancer health-based level	35 ng/L	 Infants exposed from breastmilk	95th percentile water intake and upper percentile breastmilk intake	50%
Vermont DEC/DOH (2016) Primary groundwater enforcement standard	20 ng/L	 Infants (0-1 years)	0.175 L/kg/day	20%
New Jersey DEP (2017) Maximum contaminant level (recommended)	14 ng/L	 Adults	2 L/day (assumes 70 kg body wt.)	20%

Scientific Decisions

- Growing body of evidence leads to lower levels over time
- EPA assessments as basis for state guidelines
- Epidemiological evidence
- Most sensitive endpoints (mammary gland and immunotoxicity) and populations



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Social, Political, and Economic Influences

- Industry “science-based defense strategy”
- Direct industry influence over guideline levels
- “Funding effect”
- Withheld data and Confidential Business Information claims

- State ability and capacity to develop their own advisories

- Community pressure for protective guidelines

Recent Actions

State	Date	Action
MN	April 2019	Lowered health-based advisory value for PFOS to 15 ng/L Proposed new guideline for PFHxS (47 ng/L)
MI	April 2019	New screening levels for PFOA (9 ng/L), PFOS (8 ng/L), PFNA (9 ng/L), PFHxS (84 ng/L), and PFBS (1000 ng/L)
CA	March 2019	Established notification levels for PFOA (14 ng/L) and PFOS (13 ng/L)
PA	February 2019	Announced plan begin process to set PFOS and PFOA MCL
MA	January 2019 April 2019	Announced plan to develop MCL Proposed groundwater cleanup standard of 20 ng/L for 6 PFASs, including PFDA
NH	January 2019	Proposed MCLs and Ambient Groundwater Quality Standards ▪ 38 ng/L PFOA ▪ 70 ng/L PFOS ▪ 70 ng/L PFOA+PFOS ▪ 23 ng/L PFNA ▪ 85 ng/L PFHxS
NY	December 2018	Proposed MCLs for PFOA and PFOS of 10 ng/L

Implications

- Assessments by multiple states and academic scientists suggest that EPA's Health Advisories are not sufficiently protective
  - Lower risk levels from ATSDR and European Food Safety Authority
- Regulatory MCL has benefits and limitations
  - Other options: Listing under CERCLA and/or RCRA
- Moving beyond PFOA and PFOS
- Patchwork of state levels and legislation leads to uneven protection

Our Research Team and Funders

- Alissa Cordner, Whitman College
- Laurel A. Schaider, Silent Spring Institute
- Vanessa Y. De La Rosa, Silent Spring Institute
- Ruthann A. Rudel, Silent Spring Institute
- Lauren Richter, Northeastern University and Silent Spring Institute
- Phil Brown, Northeastern University

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