



# Briefing for the Joint Standing Committee on the Environment and Natural resources

January 31, 2022

Melanie Loyzim, Commissioner  
Susanne Miller, Director Bureau of Remediation & Waste Management  
Brian Kavanah, Director Bureau of Water Quality

MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION

*Protecting Maine's Air, Land and Water*

# Presentation Objectives



- Updates on the Statewide PFAS Soil and Water Investigation
- Collection of landfill testing data and treatment of PFAS
- Wastewater Treatment of PFAS at Anson Madison Sanitary District (AMSD)
- PFAS and Surface Water/Fish

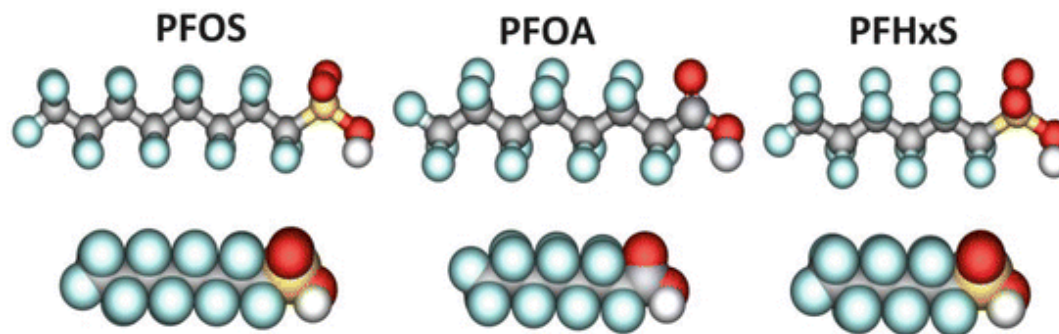


# What are PFAS?

**PFAS = per- and poly-fluoroalkyl substances**

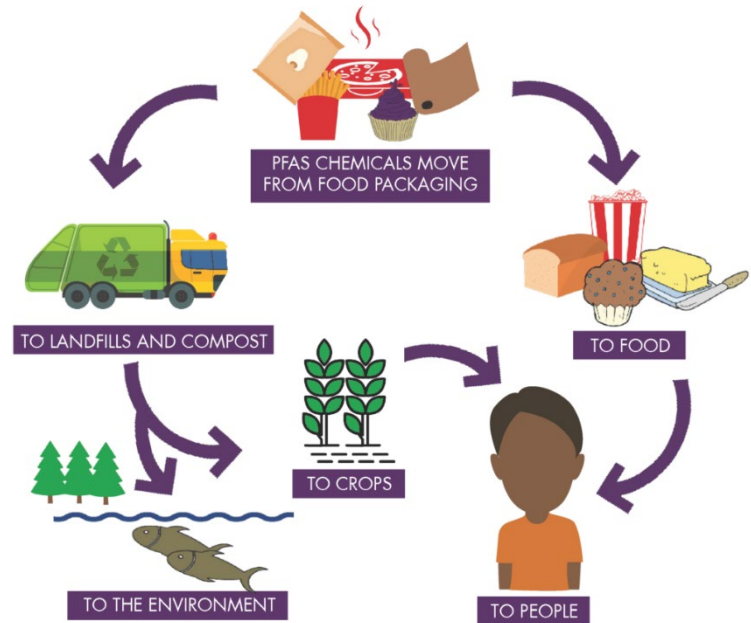
32 MRS §1732, 38 MRS §1612 → any member of the class of fluorinated organic chemicals containing at least one fully fluorinated carbon atom

According to NIH – over 4,700 varieties exist



# Where are PFAS in Maine?

- Surface and Groundwater Sites
  - Public Water Systems and Private Drinking Water Wells
  - Surface Water
- Waste Management Sites
  - Landfills (active and closed)
  - Sludge and Septage Spreading Sites (including Agricultural)
- Contaminated Sites (e.g., AFFF and other sources)
  - Department of Defense Sites
  - Superfund & State Uncontrolled Sites



# Current PFAS Standards

## MAINE PFAS SCREENING LEVELS

June 2021

Compound	Soil Remedial Action Guidelines (mg/kg)					
	Leaching to Groundwater	Residential	Commercial Worker	Park User	Recreator Sediment	Construction Worker
PFBS	7.1	1,700	22,000	4,900	5,700	51,000
PFOS	0.0036	1.7	22	4.9	5.7	5.1
PFOA	0.0017	1.7	22	4.9	5.7	5.1

Soil Beneficial Use (ng/g, dry weight)	
Compound	Beneficial Use
PFBS	1,900
PFOS	5.2
PFOA	2.5

Recreational Angler RAGs (mg/kg wet weight)	
Compound	Fish Tissue
PFBS	52
PFOS	0.052
PFOA	0.052

Interim Drinking Water Standard (ng/l or ppt)	
Compound	Residential
PFOS + PFOA + PFHpA + PFNA + PFHxS + PFDA	20

Milk (ng/l or ppt)	
Compound	Action Level
PFOS	210

Beef (ng/g)	
Compound	Action Level
PFOS	3.4

Dairy - PFOS Crop-Specific Soil Screening Levels (ng/g dry weight)			
	Soil to Hay to Milk Screening Level	Soil to Corn-Silage to Milk Screening Level	Soil to Hay and Corn-Silage to Milk Screening Level
Grass-Based Farm	6.8	120.0	6.4
Average Maine Farm	13.8	54.8	11.0

Helpful Conversions: 0.000001 ppm = 0.001 ppb = 1 ppt

Parts Per Million (ppm)	Parts Per Billion (ppb)	Parts Per Trillion (ppt)
1 milligram/kilogram (mg/kg) = 1 ppm	1 microgram/kilogram (µg/kg) = 1 ppb	1 nanogram/kilogram (ng/kg) = 1 ppt
1 milligram/liter (mg/l) = 1 ppm	1 microgram/liter (µg/l) = 1 ppb	1 nanogram/liter (ng/l) = 1 ppt
1 microgram/gram (µg/g) = 1 ppm	1 nanogram/gram (ng/g) = 1 ppb	1 picogram/gram (pg/g) = 1 ppt

<sup>1</sup> Maine Department of Environmental Protection (Maine DEP), [Maine Remedial Action Guidelines \(RAGs\) for Contaminated Sites](#), effective May 1, 2021.

<sup>2</sup> Maine DEP, [Maine Solid Waste Management Rules: Beneficial Use of Solid Wastes, 06-099 C.M.R. ch. 418](#), Appendix A, last amended July 8, 2018.

<sup>3</sup> Maine DEP, [Maine RAGs for Contaminated Sites](#), effective May 1, 2021.

<sup>4</sup> [Resolve 2021, ch. 82, Resolve, To Protect Consumers of Public Drinking Water by Establishing Maximum Contaminant Levels for Certain Substances and Contaminants](#), Emergency, effective June 23, 2021.

<sup>5</sup> Maine Center for Disease Control and Prevention (CDC), [Action Levels for PFOS in cow's milk](#), Memorandum to Rachael Fluke, Maine Department of Agriculture, Conservation and Forestry (DACF), from Andrew Smith, SM, ScD and Thomas Simones, PhD, Maine CDC, March 28, 2017.

<sup>6</sup> Maine CDC, [Action Levels for PFOS in beef for use in determining whether beef at a farm is adulterated](#), Memorandum to Nancy McBryde, Maine DACF, from Andrew Smith, SM, ScD and Thomas Simones, PhD, Maine CDC, August 4, 2020.

<sup>7</sup> Maine CDC, [Derivation of PFOS soil screening levels for a soil-to-fodder-to-cow's milk agronomic pathway](#), September 16, 2020.

**EPA Strategic Roadmap for PFAS**  
released in October 2021

**EPA's Health Advisory**  
**PFOA, PFOS or PFOA+PFOS**  
**= 70 ppt**

**Maine's Interim Drinking Water Std**  
**= 20 ppt**

**for the sum of six PFAS:**  
**PFOA, PFOS, PFNA, PFDA, PFHpA, and**  
**PFxHS**

# Public Law 2021, Chapter 478

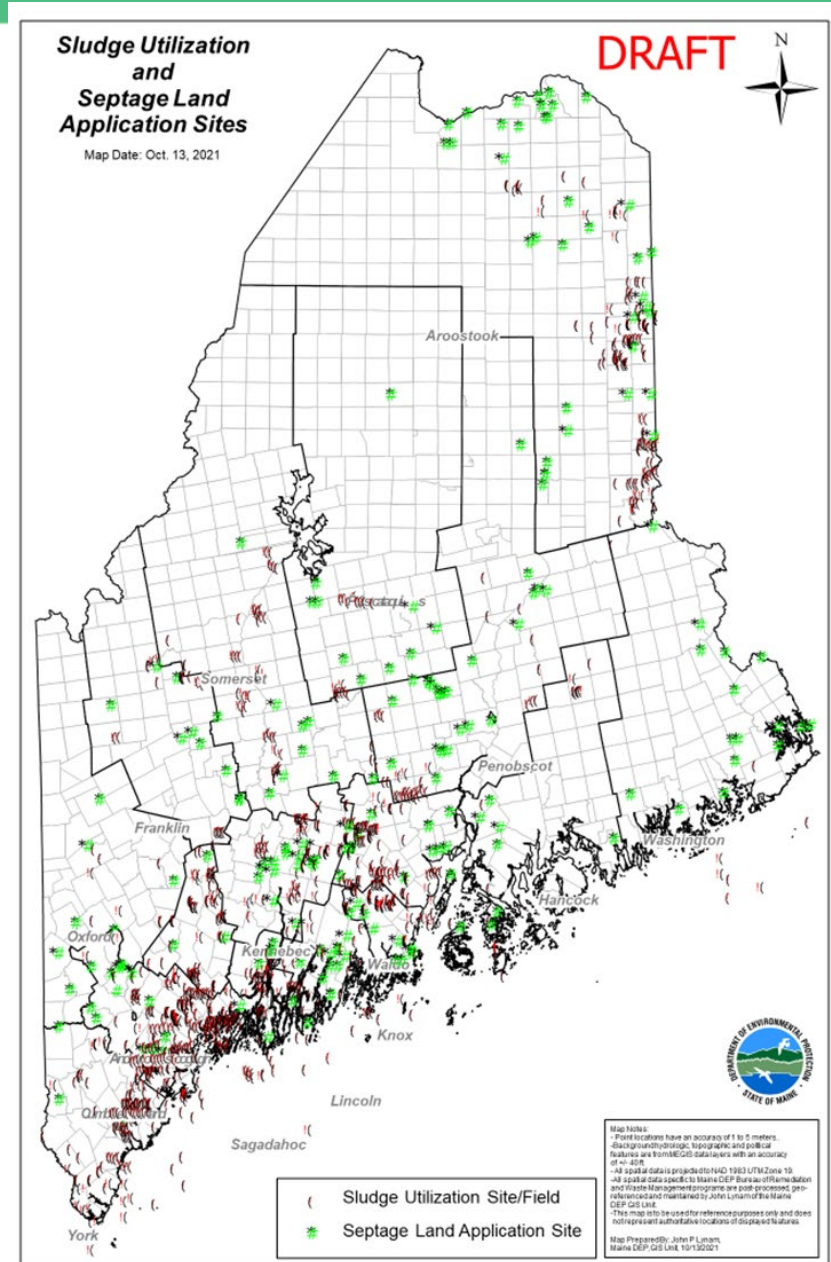
## An Act To Investigate Perfluoroalkyl and Polyfluoroalkyl Substance Contamination of Land and Groundwater

- Effective October 18, 2021
- Requires DEP to:
  - Conduct PFAS soil & water investigation for contamination derived from application of sludge & septage
  - Ensure landfill leachate is sampled
  - Establish Land Application Contaminant Monitoring Fund (LACMF) and collect fees on sludge and septage handling for this fund



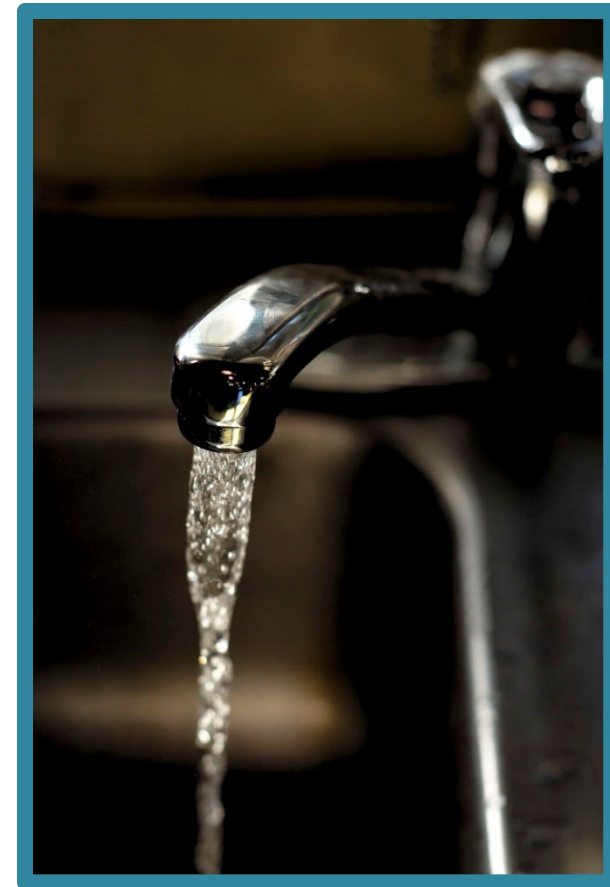
# PFAS Investigation

- Estimate over 700 sludge and septage application sites
- Sites often include multiple fields/locations crossing municipal boundaries
- Some sites were used by multiple generators - sludge from multiple sources may have been applied to one location
- Thousands of data points, several decades of licensing information



# Prioritizing Sampling Locations

- During Summer/Fall 2021 DEP grouped sludge sites into Tiers I-IV based upon:
  - Volume of sludge/septage land applied
  - Anticipated presence of PFAS in sludge
  - Proximity of known receptors
- Other prioritization factors include:
  - Access to sites (permissions from land and homeowners)
  - Weather (for soil sampling)
- Septage sites are being managed separately and sampling will be completed using outside contractors





# Prioritizing Sludge Sampling Locations

Breakdown of Tiers			
<a href="http://www.maine.gov/dep/spills/topics/pfas/index.html">www.maine.gov/dep/spills/topics/pfas/index.html</a>			
Tier	Land application of sludge* (volume - cy)	Other Considerations	Nearest homes
I	10,000 or more		Within ½ mile
II	5,000 - 10,000	Site may be downgraded to Tier III OR elevated to Tier I	
III	Less than 5,000	Site may be elevated to Tier I	
IV	Information gathered to date indicates no sludge was land applied. More research/time needed to verify. Once verified, these sites may be placed in another Tier as appropriate using the above criteria		

\* PFAS likely to be present in sludge based on an evaluation of known sources or contributors of wastewater at a treatment facility.



# PFAS Investigation Timelines



## Estimated

- Tier I sites: Through early 2023
- Tier II sites: 2023 – 2024
- Tier III & IV sites: 2024 – 2025

- Timelines estimated - not exact
  - Investigation expected to speed up as DEP gains experience
  - Difficult to know where expanded, step-out sampling will be necessary, this will impact pace of investigation
  - Staff are working as fast as possible!



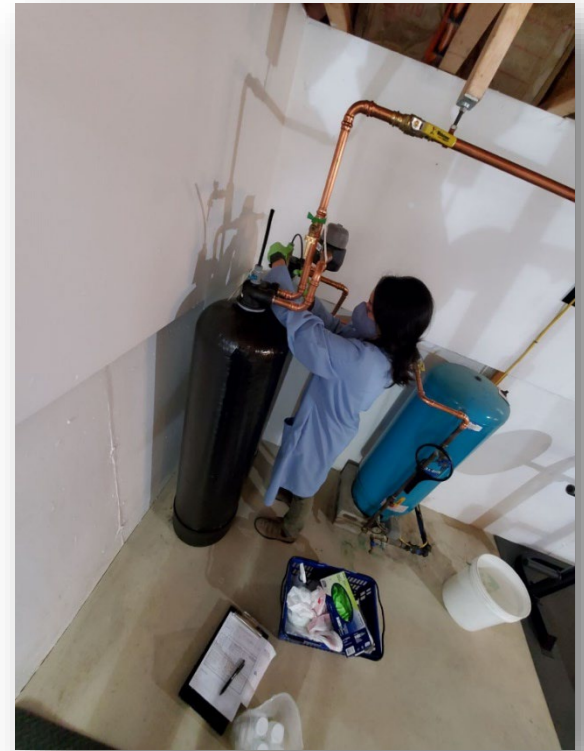
# PFAS Investigation Timeframes

- Half of all sites must be sampled by end of 2024; all by end of 2025
- Extremely fast-paced! Narrow focus – soil and water
- Perspective -- 208 weeks between 1/1/2022 and 12/31/2025
- Approximately 3.5 sites per week (water and soil) by each project team under the best of circumstances
  - Keep in mind each “site” may include multiple fields/residences
  - Multiple samples are obtained in each field location
  - Weather conditions/seasons and other factors will impact pace



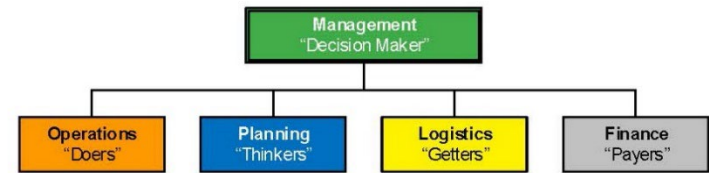
# PFAS Investigation Teams

- Project teams are/will be assigned to each site in each Tier
  - Each Team has a project lead, geology technician and/or a geologist/hydrogeologist
  - Many members of each team are assigned to multiple sites statewide
  - This work is brand new for many existing and new staff
  - Processes continually being refined within DEP and also in coordination with DACF



# PFAS Staffing and Funding

- 11 NEW Full Time Equivalents;  
6 NEW Limited Period Positions
  - Hiring process began August 2021
  - Currently: 8 onboarded, 5 starting soon, 4 still in hiring process
  - Several existing “non-PFAS” staff also still working on PFAS
- \$20M from General Fund for the sampling, treatment, remediation, and monitoring of PFAS
- \$5M from Maine Jobs and Recovery Plan\* (still working on obtaining this!)
- Additional Infrastructure money may become available relating to remediation of PFAS in drinking water and wastewater \*



# PFAS Investigation Process

- In depth review of project licenses and annual reports to determine where land applications really took place
- Develop an initial sampling and analysis plan (SAP) for each site
- Contact landowner/homeowner to schedule sampling events
- Coordinate with the DACF to determine if additional considerations or sampling required
- Conduct sampling event and deliver samples to the laboratory
- Obtain and review lab results for data quality and irregularities
- Follow up with landowner/homeowner with laboratory results
- Evaluate data to determine need for further sampling nearby



# PFAS Post-investigation Process

- Elevated soil results:
  - DEP coordinates with DACF regarding lab results
  - DACF coordinates with landowners to discuss next steps
  - DEP and DACF process still being refined
- Elevated residential water results:
  - DEP coordinates with homeowners to discuss lab results
  - Bottled water provided until filtration systems can be installed and maintained
  - Farm water systems; coordinate with DACF
  - Drinking water lines; coordinate with DWP





Environmental Chemistry  
Chain of Custody  
NH State Version (see the link)

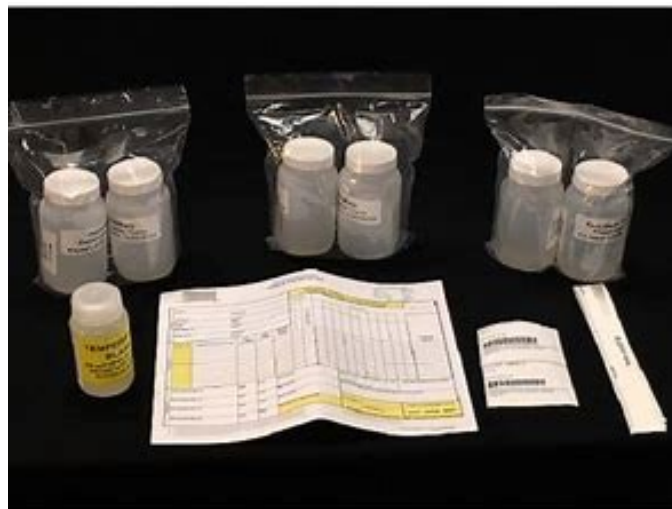
1/2014  
2014 Revision  
2014 Edition  
Form DEP 23-047  
Rev. 03-04-02

Project to Complete:		NH to Complete:	
Company Name:	Address To:	Project No.:	Project To:
State:	City:	State:	City:
Site:	Sample Location:	Date of Sample:	Date of Analysis:
Phone:	Fax:	Phone:	Fax:
Project Name:			
Number of Samples to be Analyzed:		Site of Project:	Project Class:
Please Print Name:		State Results To:	
Name: _____		Name: _____	
Address: _____		Address: _____	
City: _____		City: _____	
State: _____		State: _____	
Zip: _____		Zip: _____	
County: _____		County: _____	
Date of Sample: _____		Date of Analysis: _____	
Please indicate sampling equipment: <input type="checkbox"/> Handheld, <input type="checkbox"/> Handheld w/ GPS, <input type="checkbox"/> Manual Suction, <input type="checkbox"/> Soil Extractor, <input type="checkbox"/> Other _____			
Additional Comments:			

Page 1 of \_\_\_\_\_ pages

# Self-Testing

- DEP can't get to every site at all at once!
- Locations in Tiers II, III, IV:
  - Private drinking water wells can be tested by individual homeowners – guidance is available on DEP website
  - Soil sampling, sampling of animal tissue, sampling of agricultural products is more challenging and will require assistance from DACF, CDC, and or IF&W





# Interagency Coordination

- Communications are ongoing and frequent between DEP, DACF, DIF&W, DHHS (CDC and DWP)
  - Each agency has different objectives/priorities
  - Agency staff try to anticipate upcoming issues
  - Inquiries from the public don't fit neatly within each of the agency's areas of expertise
  - Inter-agency website under development – anticipated early Summer



# Additional Considerations

- Pace of the investigation doesn't meet everyone's needs
- Long term impacts of investigation extend far beyond DEP
  - Agriculture
  - Hunting, Fishing, Gardening
  - Wastewater/Waste management
- Some areas with high levels of PFAS
  - not certain of the source – may fall under uncontrolled sites program



# Landfill Leachate Testing

- September 2021, letter sent to 25 landfills
  - Landfills that “manage and collect” leachate
  - Samples taken in area representative of leachate coming from landfill
  - Fall and spring through 2023
    - total of 5 sampling rounds
  - Follow DEP PFAS sampling protocols and use approved laboratory

PFBA	PFPeA
4:2FTS	PFHxA
PFHpA	PFHxS
6:2FTS	PFHpS
PFOS	PFDA
PFNS	NMeFOSAA
PFDS	FOSA
PFDoA	PFTTrDA
HFPO-DA	ADONA
PFBS	PFPeS
PFOA	8:2FTS
PFUnA	PFNA
NEtFOSAA	PFTA
PFHxDA	PFODA
Sum of PFOA, PFOS, PFNA, PFHpA, PFHxS, and PFDA	



# Leachate data so far...

- Only one round of sampling so far – Fall 2021
- DEP has received data from **19 of the 25 facilities**
  - 2 facilities are still waiting for lab results to send to DEP
  - 3 facilities did not test for all 28 compounds or at all
  - 2 facilities did not respond to any of DEP's inquiries

**Any facility that did not sample correctly or at all are required to sample immediately and again in late spring to make up for fall**



# Leachate data so far...

- Some facilities sampled in one location (required)
- Others have sampled in multiple locations

**Concentrations of Sum of  
6 PFAS range from 5.62  
ng/L to 22,661.5 ng/L**

**PFOA was detected in  
all samples**



# Closed Landfill Testing

- Many closed landfills are unlined and don't "manage and collect leachate"
- These 400 + landfills are managed under DEP's closed landfill remediation program and are generally municipal landfills
- Sampling occurs in monitoring wells instead of through collection of leachate based upon:
  - Knowledge/history of industrial activity in the area that may have contributed to PFAS contamination
  - Proximity to residential wells



# Closed Landfill Testing

- 40 were evaluated and 37 tested in CY 2020 and CY 2021
- 20 more will be evaluated and tested in CY 2022
- 19 filter systems have been installed as a result of PFAS levels exceeding state's interim drinking water standard at residential wells in these 7 municipalities:

Corinna	Lewiston	Oakland	Tremont
Westbrook	Wiscasset	Woolwich	

- One residence in Gorham has been connected to public water
  - May also happen in Kittery (still TBD as investigation unfolds)



# How can PFAS be treated and destroyed?

- PFAS disposal still a major problem to be resolved – current options and considerations Include:
  - Wastewater treatment (leaves behind residual PFAS solids)
  - Landfills (some landfills not enthusiastic to take PFAS wastes from known sources)
  - Hazardous waste landfills (will take PFAS, but very expensive requires transport out of state)
  - Composting (Need to figure out effective recipes, DEP conducting a pilot in 2022 for deer carcasses )
  - Incineration (concerns about air deposition of PFAS, more to be learned)
  - Super critical water oxidation (still in research phase - EPA)





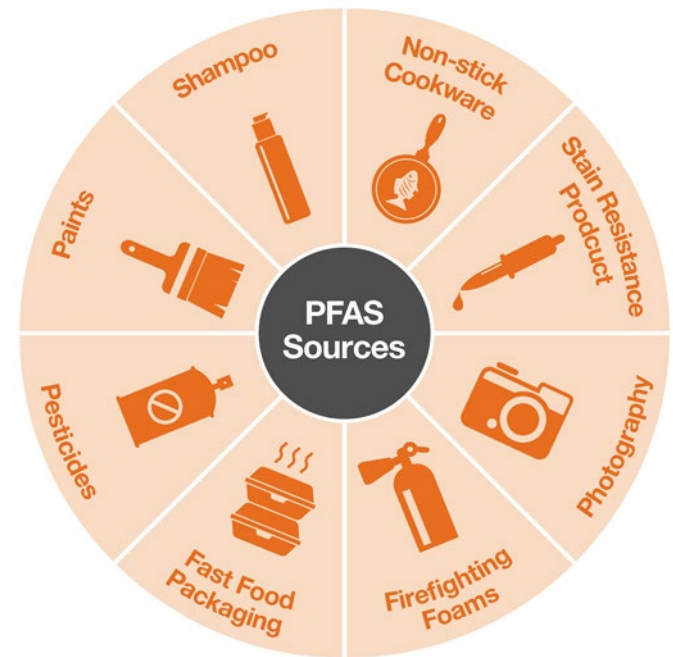
# Treating PFAS in Wastewater

- Why focus on wastewater?
  - Doesn't single out one source of PFAS contamination – many sources (landfill leachate, agricultural waste, septage, and more) go to POTWs – may be more efficient way to treat multiple sources at once
- Provides a temporarily closed loop (until long-term options):
  - Advanced treatment for effluent
  - Disposal of treatment media at secure landfill
  - Disposal of sludge at secure landfill
  - Treatment of landfill leachate at POTW or landfill



# Anson Madison Sanitary District

- Discussions began in 2021 –  
Regional PFAS Treatment Center
  - Assist with liquid agricultural wastes from Fairfield
  - Leachate from Norridgewock and/or other landfills
  - Additional sources to be determined by AMSD
- Currently in the design phase
- Earliest it would be operational - 2023 (if stars align)



# Funding AMSD PFAS Treatment

- Funding still being explored for AMSD
  - DEP providing \$2M under the State Revolving Fund (SRF) Program
  - \$1.6M requested through Congressional Directed Spending; still waiting on outcome
  - Design costs may be higher than anticipated
- ARPA and BIL funds may incentivize additional advanced treatment at other POTWs.



# AMSD PFAS Treatment System

- PFAS is not treated via standard wastewater secondary treatment technology
- Additional tertiary treatment is necessary
- Proposed at AMSD - Foam fractionation system followed by activated carbon



# PFAS and Treating Wastewater

- **Problem** – Effluent Limitation Guidelines (ELGs) or ambient surface water screening levels not in place
- States rely heavily on EPA for:
  - Effluent Limitation Guidelines (ELG) (technology based discharge limits)
  - Development of water quality criteria (WQC) for toxics
    - Aquatic life
    - Human health
- Difficult and costly for states to develop these criteria and guidelines without support from EPA

**Effluent Guideline Excerpt**

**Metal Finishing Subcategory**

*NPDES Permitting*

	Direct Dischargers				Indirect Dischargers			
	BAT		NSPS		PSES		PSNS	
	1-day (mg/L)	30-day (mg/L)	1-day (mg/L)	30-day (mg/L)	1-day (mg/L)	30-day (mg/L)	1-day (mg/L)	30-day (mg/L)
Cadmium	0.09	0.26	0.11	0.07	0.09	0.26	0.11	0.07
Copper	3.38	2.07	3.38	2.07	3.38	2.07	3.38	2.07

Note: Several other parameters also are limited but are not included here.

NSPS = New Source Performance Standards

PSES = Pretreatment Standards: Existing Sources

PSNS = " " " " New " "



# EPA Efforts – PFAS and Water

- EPA developing water quality criteria (WQC) for PFAS.



- Aquatic life – Anticipated Winter 2022
- Human Health – Anticipated Fall 2024

- EPA issuing ELGs for manufacturers of PFAS researching other sectors (like landfills).



# PFAS and Treating Wastewater

- For now drinking water standard is the only regulatory level in ME to draw from
- In the absence of appropriate ambient surface water guidelines or ELGs, difficult to advise how to design treatment systems
  - Treatment may have to be designed for discharge levels difficult to achieve
  - May add significant design costs and delays
  - May cause uncertainty for regulated community



# Establishing Wastewater Limits

- EPA's Ambient Water Quality Criteria - basis
  - Aquatic Life
  - Human Health
- Watershed approach
  - Ensure criteria not exceeded top to bottom
  - Allocation for all dischargers





# Establishing Wastewater Limits

- Developing sampling plan for:
  - Ambient background
  - Effluent discharge levels
- Rulemaking – Ch. 584 Toxics Rule
- Permit modifications to establish limits
- Same approach as other toxic substances



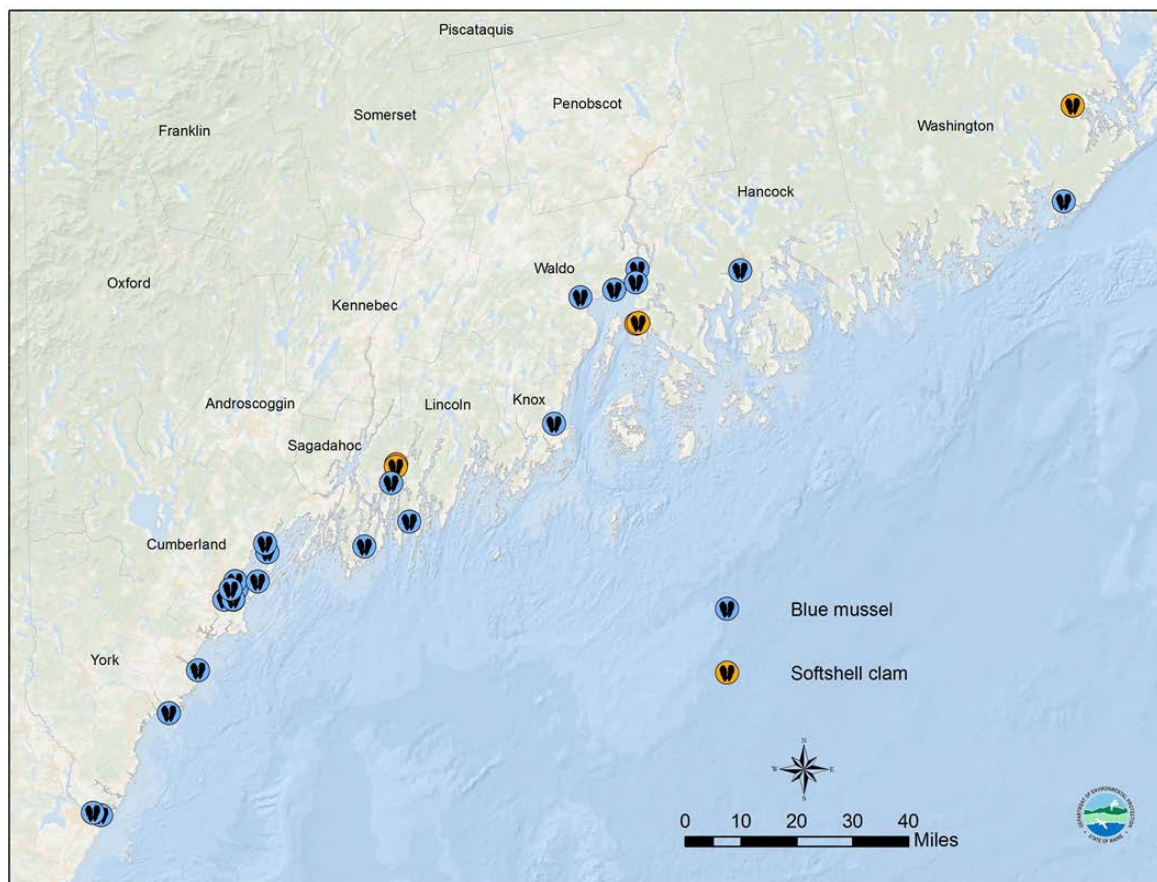
# PFAS in surface water

- DEP's Bureau of Water Quality – Surface Water Ambient Toxics (SWAT) program
  - Sample fish, shellfish and surface water for toxics
  - For fish and shellfish look to Maine CDC (MeCDC) for Fish Tissue Action Level (FTAL) (34 parts per billion, ppb)
  - For water can only use Maine's interim drinking water std. (20 parts per trillion, ppt)

**MeCDC Fish Tissue  
Action Level (FTAL)  
34 ppb**



# SWAT 2019-20 Blue Mussel and Softshell Clam Sites

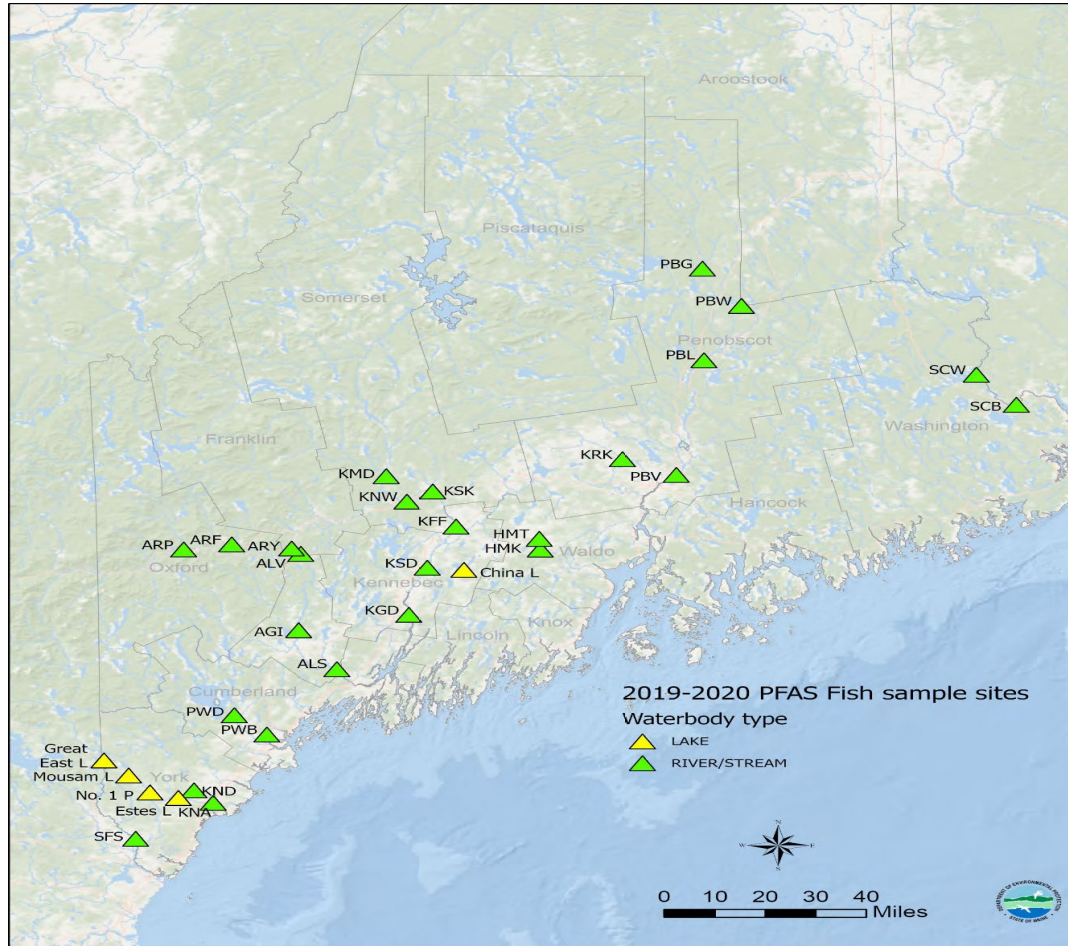


# PFAS Marine Sampling (2019 & 2020)

- Softshell clam edible tissue
  - 3 sites (non detect for 34 PFAS compounds)
- Blue mussel tissue
  - 23 sites (10 PFAS compounds detected just above reporting limits)
  - PFOS was below the MeCDC Fish Tissue Action Level FTAL of 34 ppb



# SWAT 2019-2020 PFAS Fish Tissue Sample Sites



# Fish Tissue 2019 & 2020

Location	Result
Androscoggin	Below FTAL
Half Moon Stream	Below FTAL
Kenduskeag	Below FTAL
Kennebec	Below FTAL
Kennebunk	Below FTAL
Penobscot	Below FTAL
Salmon Falls	Below FTAL
St. Croix	Below FTAL



# PFAS River Sampling – 2020

- **Presumpscot River below Westbrook:**
  - PFOS exceeded the MeCDC FTAL in fish
  - Presumpscot results = 35.7 ppb (mean)
- **Mousam River** - Repeat study confirmed previous FT results:
  - negligible PFOS in the headwaters in Mousam Lake
  - elevated levels in Number One Pond in downtown Sanford
  - levels exceeding the MeCDC FTAL in Estes Lake below Sanford.
  - Estes Lake results = 38.9 ppb & 38.0 ppb (mean)

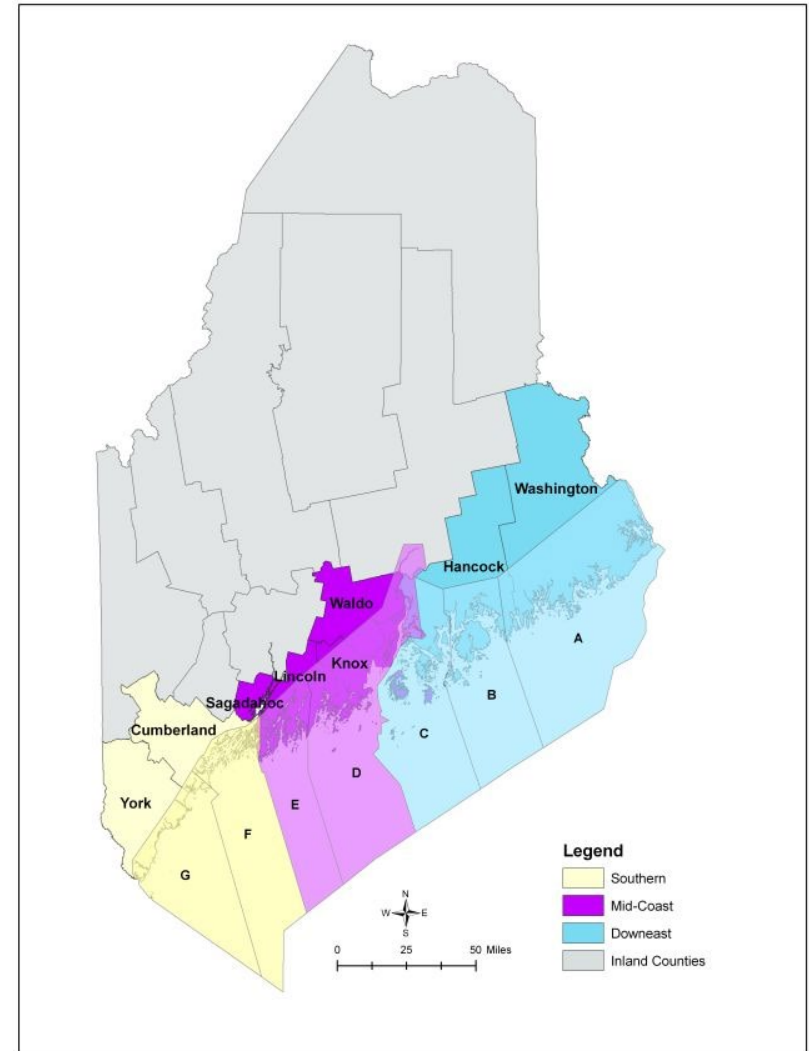


# 2021 Lobster Samples

- Lobster from each of the Zones A – G
  - 18 sites, 2 replicates per site, and 5 lobsters per replicate
- Preliminary PFOS results of lobster muscle tissue are all below the FTAL of 34 ppb (data quality has not yet been assessed)

Contact:

[James.Stahlnecker@maine.gov](mailto:James.Stahlnecker@maine.gov)



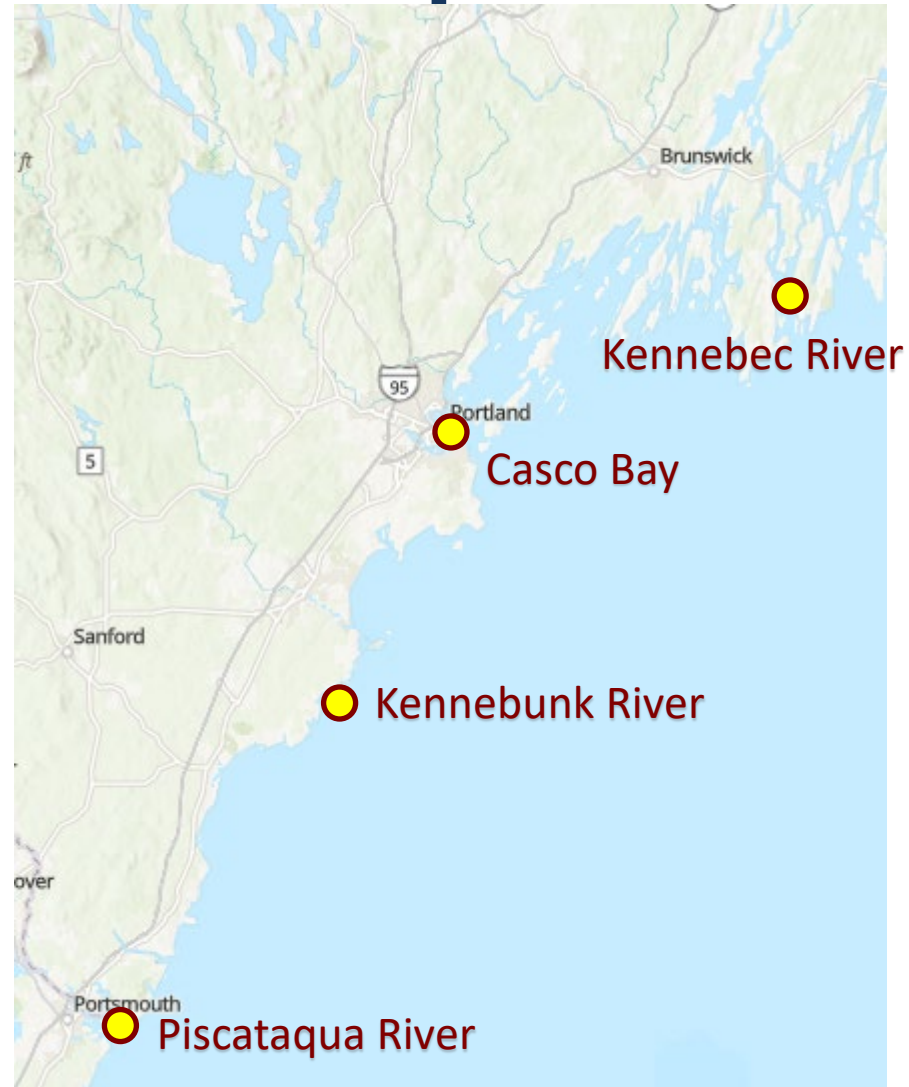


# 2021 Marine Fish Samples

- Striped bass, bluefish, pollock, and Atlantic silversides (muscle tissue)
- Preliminary PFOS results are below the FTAL of 34 ppb (data quality has not yet been assessed)

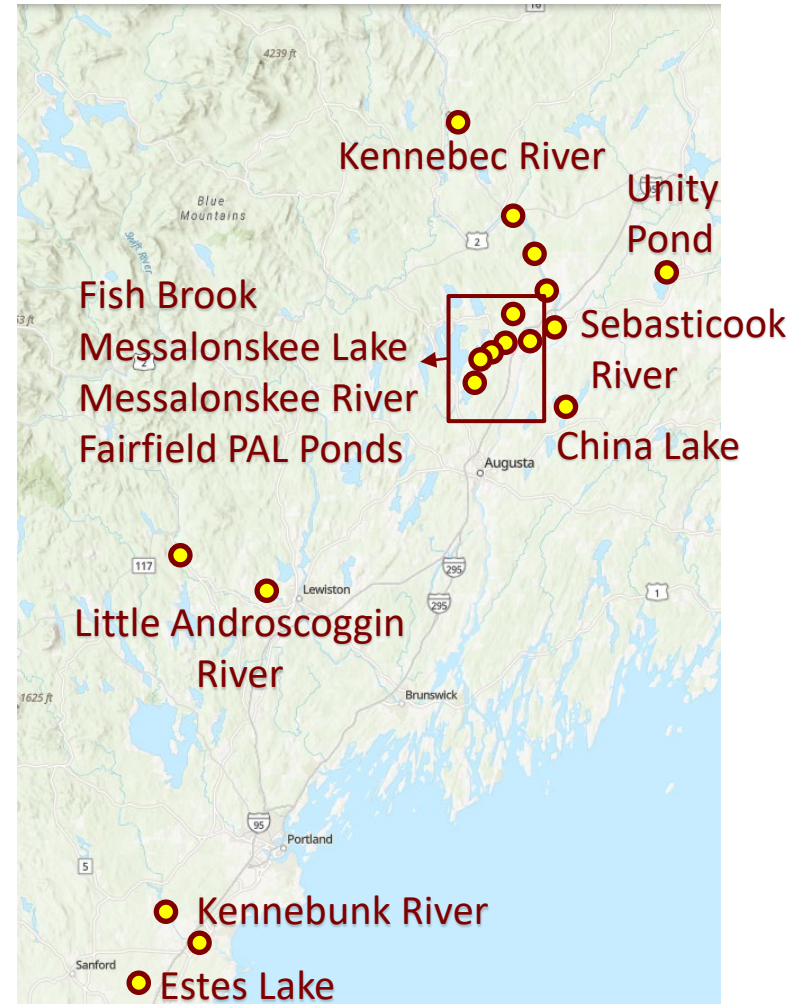
Contact:

[James.Stahlnecker@maine.gov](mailto:James.Stahlnecker@maine.gov)



# 2021 Freshwater Fish Samples

- Collected freshwater fish from 18 sites, mostly in the Kennebec River drainage with a focus on the Fairfield area
- Other samples were from the Little Androscoggin River, Kennebunk River, and Estes Lake
- Lab results are not back yet  
Contact: [thomas.j.danielson@maine.gov](mailto:thomas.j.danielson@maine.gov)



# PFAS Water Samples – 2021

- **Kennebec River - Fairfield:**
  - Water column samples
  - Above and below discharge
  - Two samples
    - Each 1 ppt for PFAS (6)
    - Each 2 ppt for PFAS (28)



# 2022 Sampling

- Freshwater and marine sampling funded by the SWAT program
- U.S. EPA grant for additional sampling
  - ambient water
  - fish tissue





**[Contact us at: pfas.dep@maine.gov](mailto:pfas.dep@maine.gov)**

**[www.maine.gov/dep/spills/topics/pfas/index.html](http://www.maine.gov/dep/spills/topics/pfas/index.html)**

