Per- and Polyfluoroalkyl Substances (PFAS) in Florida Water

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September 10, 2025
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Goal of Today's Presentation

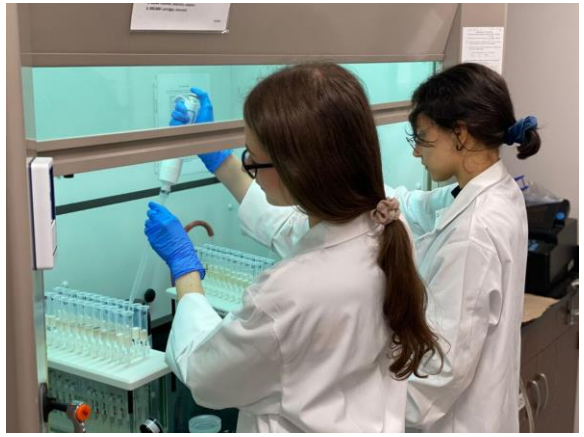
Present latest PFAS data
Educate on PFAS concerns
Connect with stakeholders
Answer your questions

We need your support
- Volunteering
- Funding
- Dissemination
- Community action

Bowden Laboratory at UF

My laboratory focuses on the “Life Cycle” of legacy and emerging chemicals

Service and collaboration



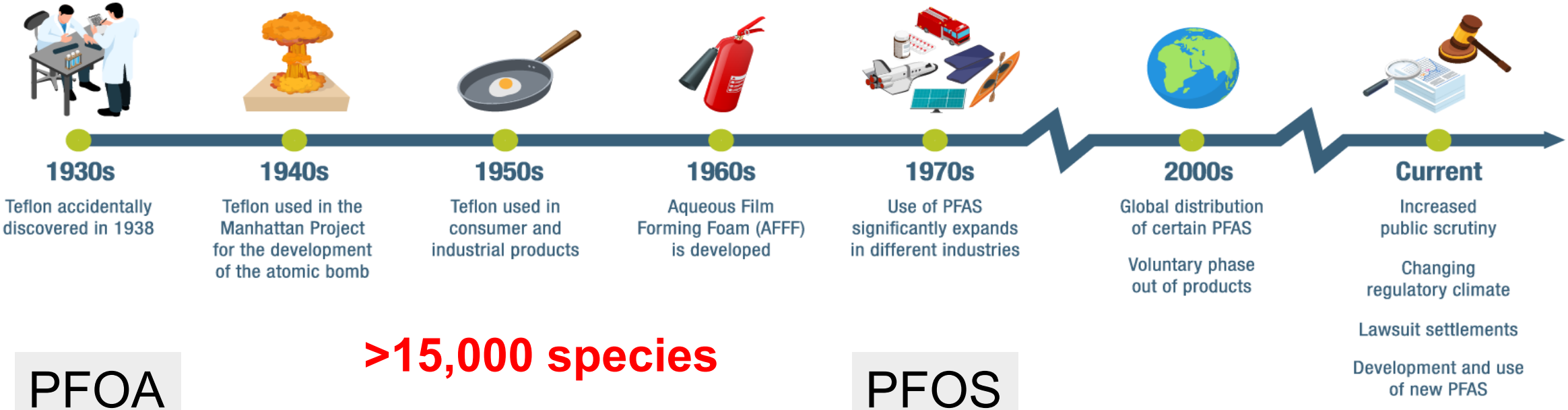
Education and training

Community engagement

Community awareness

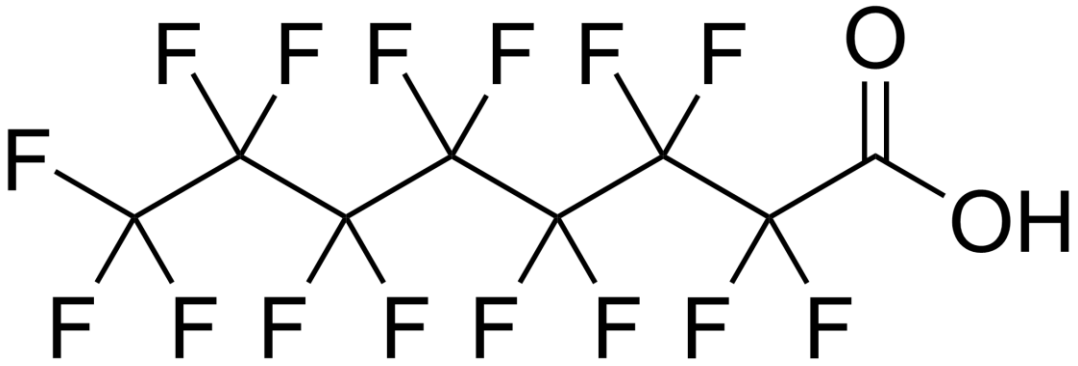
>60 PFAS publications to date plus >25 ongoing PFAS projects
(>140 pubs overall)

Per- and Polyfluoroalkyl Substances (PFAS) History

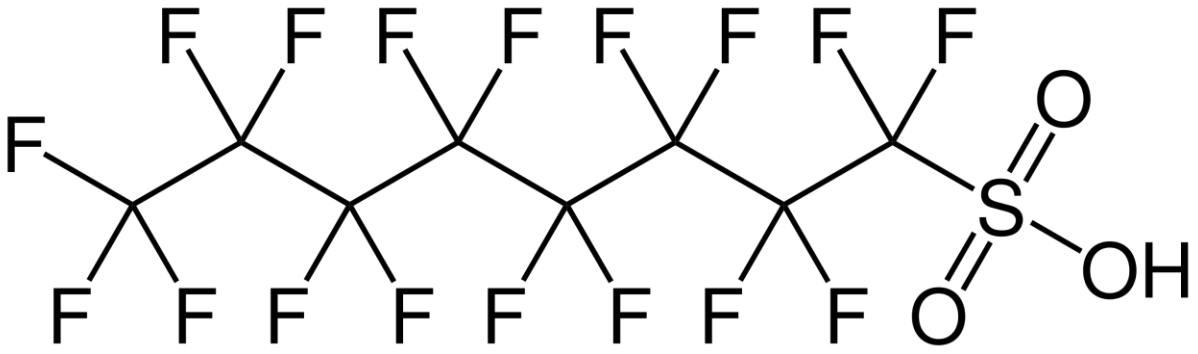


>15,000 species

PFOA



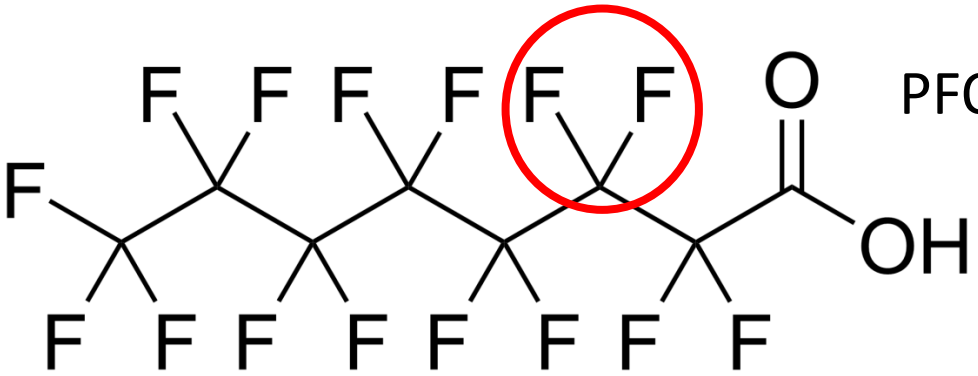
PFOS



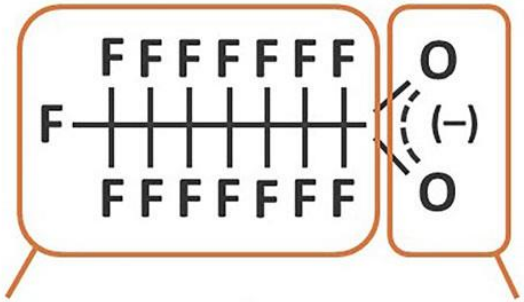
https://www.kimley-horn.com/what-is-pfas/

Common PFAS Uses

"forever chemicals"



PFOS



Fluorocarbon tail
- Strong bonds
- Hydrophobic

Functional group
- Hydrophilic

Understanding PFAS | riversideca.gov

Bandaids

Toilet paper

Watch bands

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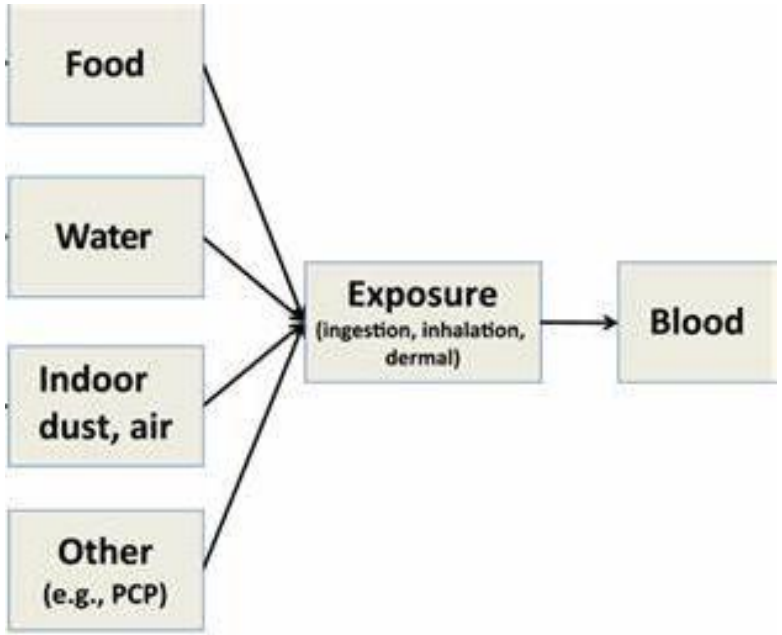
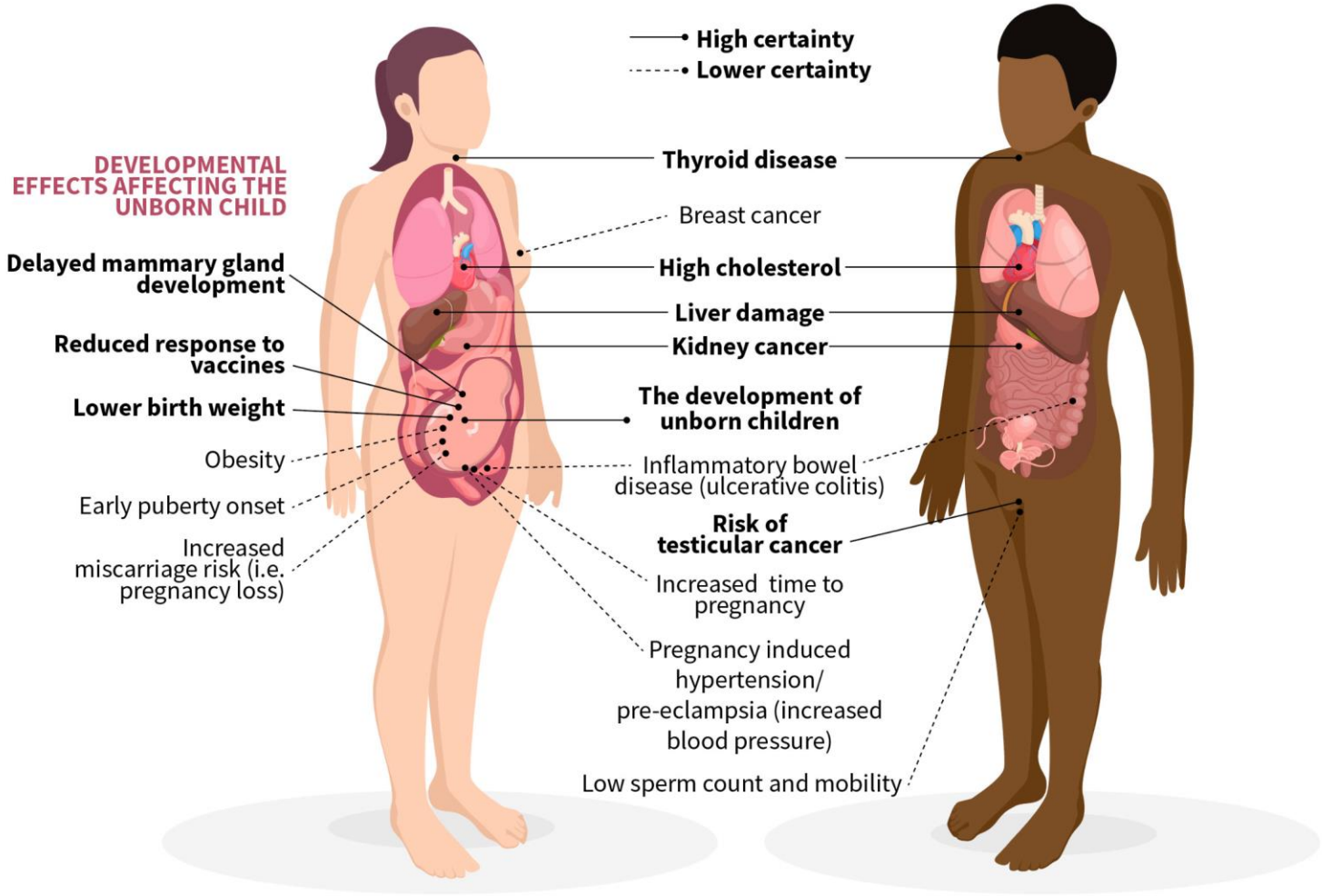
PFAS Health Concerns



….NHANES…98% of US population has PFAS…..

…endocrine disruptors, metabolism disruptors, obesogens….



PFAS are:

- Not readily metabolized
- Bioaccumulate in plasma
- Elimination half-life > years
- Cross placental
- Found in breast milk

https://www.rsc.org/policy-evidence-campaigns/environmental-sustainability/sustainability-reports-surveys-and-campaigns/cleaning-up-uk-drinking-water/

US EPA PFAS Initiatives

Provisional Health Advisory
Developed to assess potential risk from exposure to these chemicals through drinking water
Matrix: Drinking Water

2009

Drinking Water Guidance
Non-enforceable guidance adopted by several states
Matrix: Drinking Water
PFOA: 70 ng/L
PFOS: 70 ng/L

2016

Interim Health Advisory Levels
Identify levels to protect humans from adverse health effects resulting from PFAS exposure
Matrix: Drinking Water
PFOA: 0.004 ng/L
PFOS: 0.02 ng/L
PFBS: 2,000 ng/L
Gen-X: 10 ng/L

PFAS Strategic Roadmap
Agency-wide plan to address PFAS concerns through 2024

Proposed Maximum Contaminant Level
Enforceable National Primary Drinking Water Regulation. Proposed goal of zero.
Matrix: Drinking Water
PFOA: 4 ng/L
PFOS: 4 ng/L
PFNA, PFHxS, Gen-X: 10 ng/L

Under current political climate, "wait and see"

2024 Proposed MCL Enacted

Regional Screening Levels
PFAS concentrations developed for Superfund site remediation
Matrices: Tapwater, Residential and Industrial Soil
PFprA, PFBA, PFHxA, PFOA, PFNA, PFUnDA, PFDoDA, PFTetDA, PFODA, PFBS, PFHxS, PFOS, Gen-X

“Crowdsourcing” – PFAS in Florida Drinking Water

As public awareness increases in FL, so does interest to test Florida drinking water

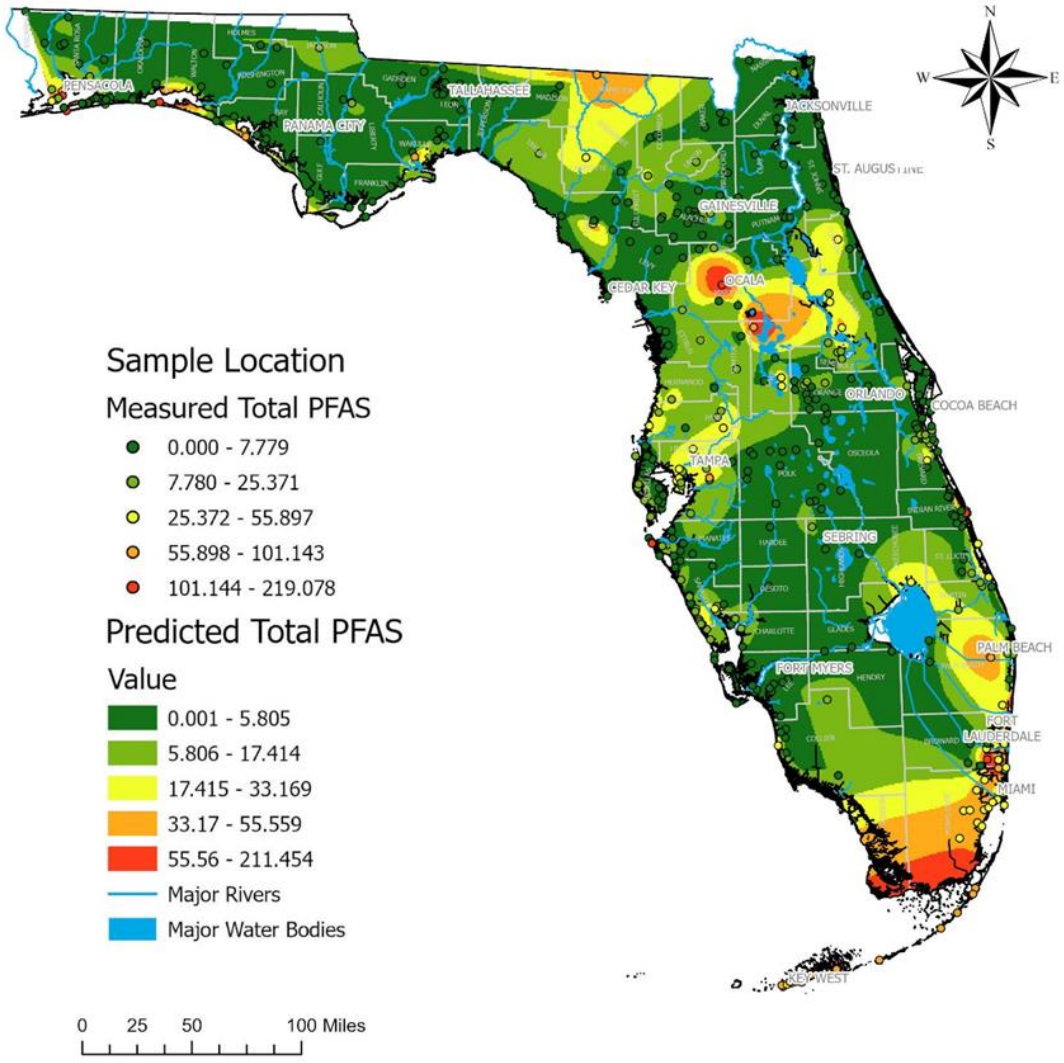
Started late 2022, sampled >450 taps in state of Florida with sampling network

At least one in every county (n=67), from city water, well, and bottled water sources

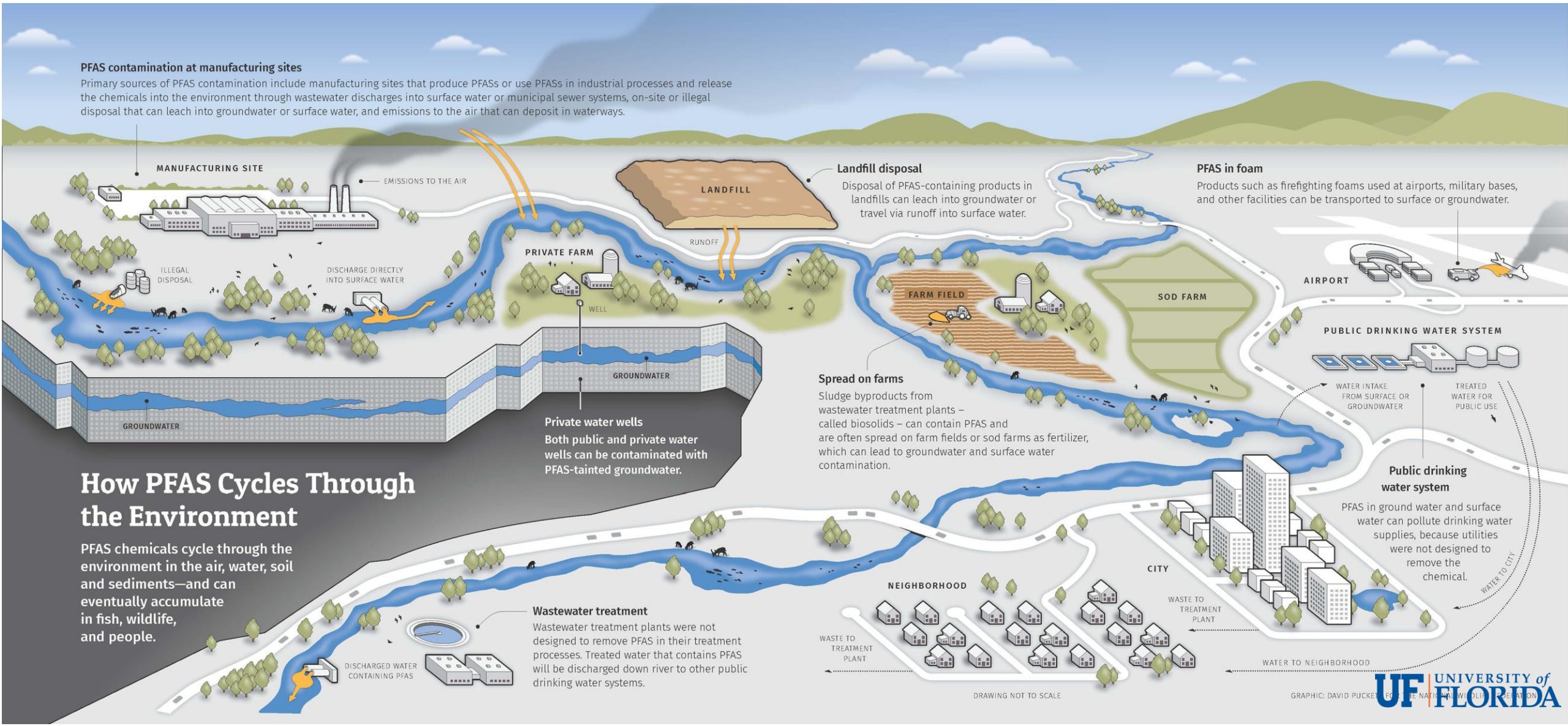
Science of The Total Environment
Volume 926, 20 May 2024, 171932

Crowdsourcing citizens for statewide mapping of per- and polyfluoroalkyl substances (PFAS) in Florida drinking water

Thomas D. Sinkway [a], Qaim Mehdi [b], Emily K. Griffin [b], Keyla Correia [b], Camden G. Camacho [a], Joe Aufmuth [c], Carolina Ilvento [d], John A. Bowden [a b]

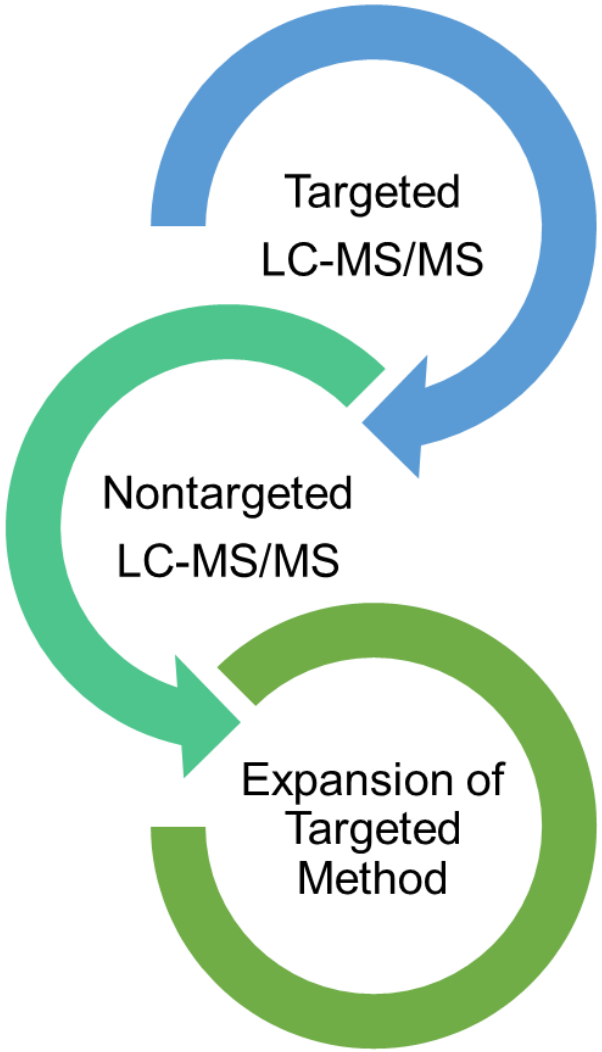


The PFAS Cycle (where does drinking water come from?)



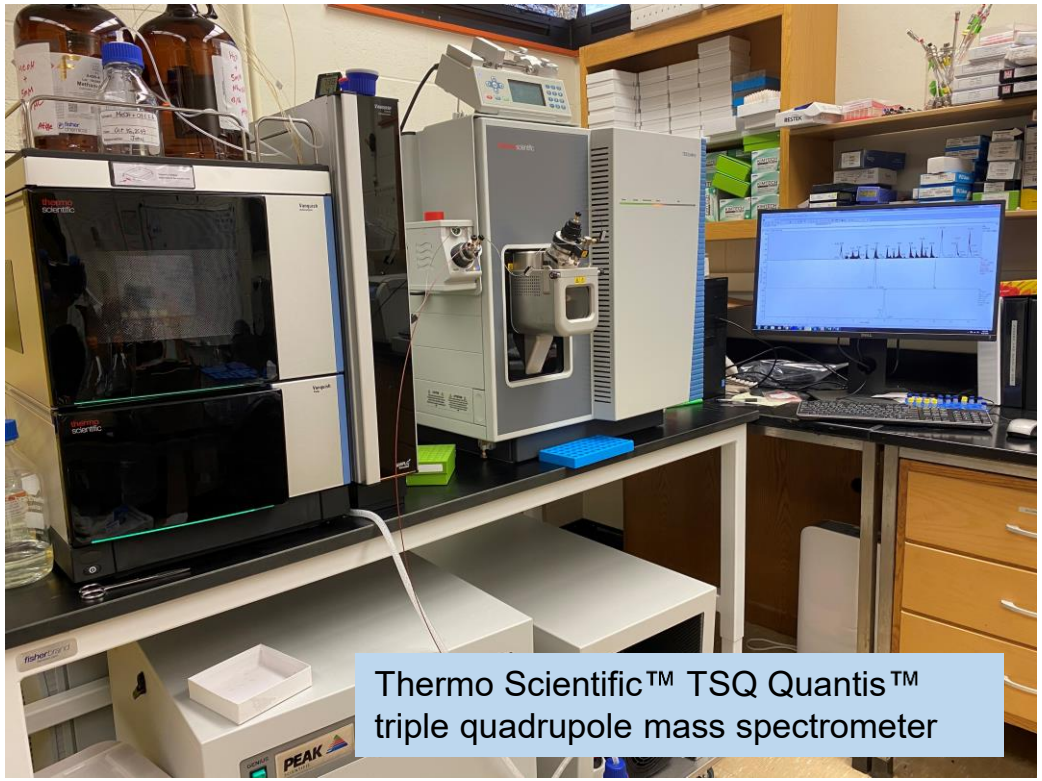
via [The National Wildlife Federation]

Our Analytical Workflows for PFAS

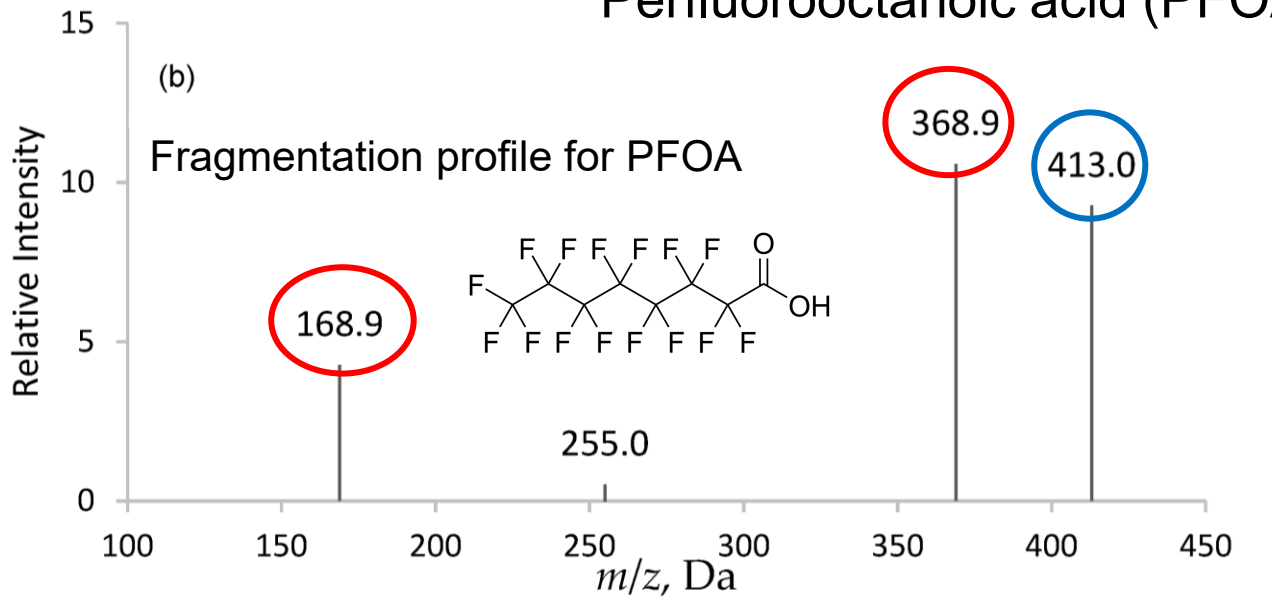


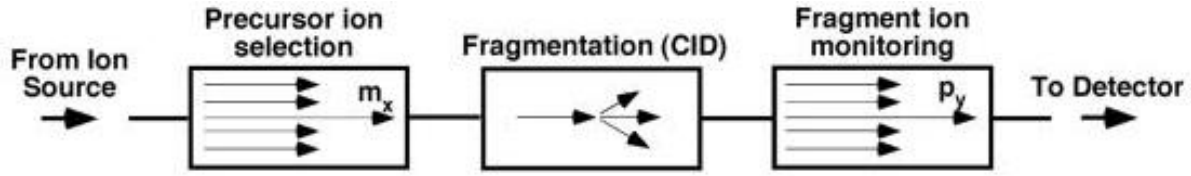
Graduate student Brian Martinez and undergraduate Allison Oldnettle performing solid-phase extraction for PFAS

PFAS Measurement: Traditional Workflow



Perfluorooctanoic acid (PFOA)



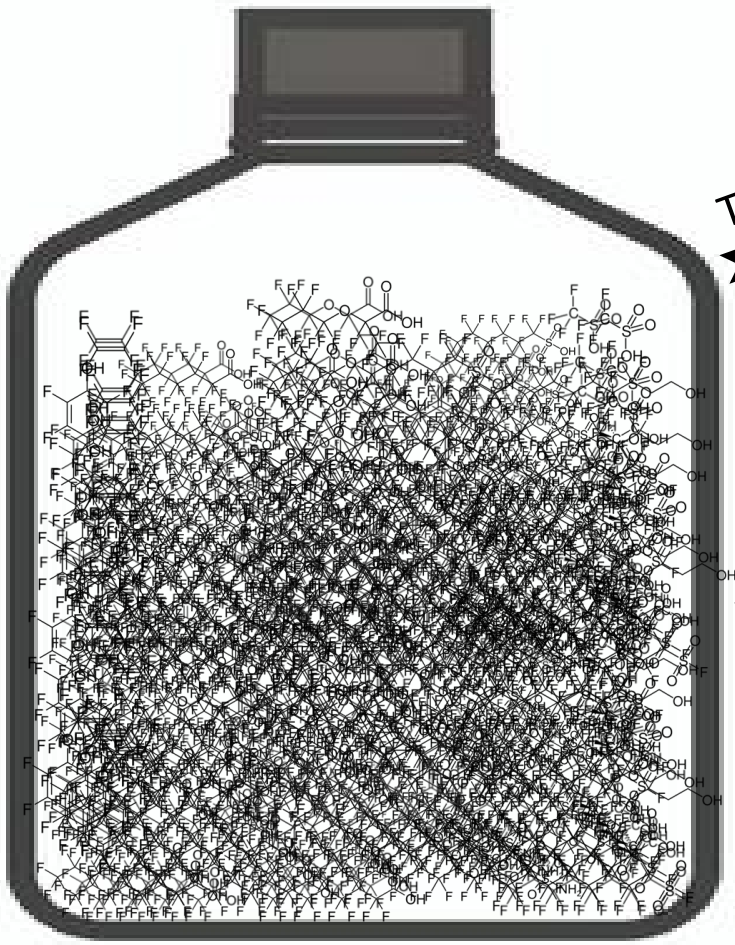


Targeted methods are "hypothesis testing"

- Validated by standards (EPA methods)
- Quantitative via isotope dilution
- Capable of being routine/robust
- Detection down to low ppt

413.0	✂	168.9	Confirm
413.0	✂	368.9	Quant
Precursor	->	Fragment Transition	

PFAS Measurement: New Strategies (Total Fluorine)



Remember >15,000 PFAS

Traditional PFAS Testing

'Targeted (~50-100 PFAS)'

Table 1. Concentrations and Frequencies of Individual PFAS (and Sum, Σ) across the State of Florida[a]

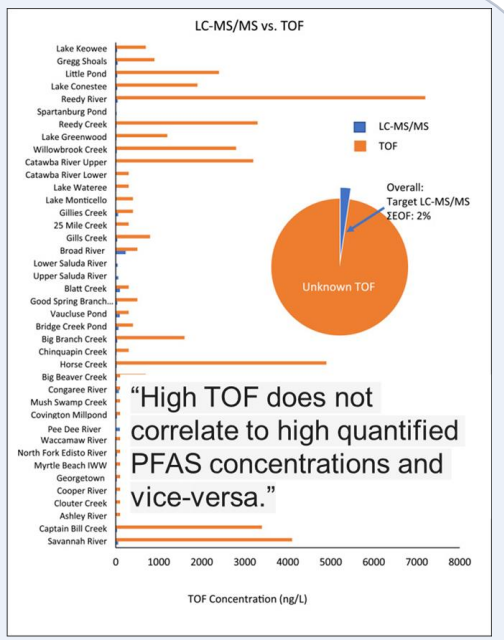
PFAS	frequency detection	frequency quantified	frequency by county	mean (ng/L)	max (ng/L)
PFOA	94%	83%	100%	5	81
PFBS	65%	64%	93%	5	48
PFHxA	61%	61%	82%	6	180
PFNA	54%	39%	96%	2	352
PFOS	53%	48%	91%	10	1135
PFHpA	53%	44%	87%	5	84
PFHxS	50%	17%	94%	17	365
PFDA	33%	16%	90%	2	27
Syn35	24%	1%	75%	6	24
PFHxPA	16%	14%	54%	15	322
FBSA	11%	11%	42%	5	85
Syn32	9%	6%	21%	1	7
PFPrS	5%	3%	51%	5	24
PFUdA	4%	4%	42%	3	114

Calculation #1 = Fluorine with Targeted Assay

Total Fluorine (PIGE)

Upper boundary of fluorine-containing compounds

Calculation #2 = Total Fluorine



"High TOF does not correlate to high quantified PFAS concentrations and vice-versa."

Forster, A.L., Geiger, T.C., Pansari, G.O., Justen, P.T. and Richardson, S.D., 2024. Identifying PFAS Hotspots in Surface Waters of South Carolina Using a New Optimized Total Organic Fluorine Method and Target LC-MS/MS. *Water Research*, p.121570.

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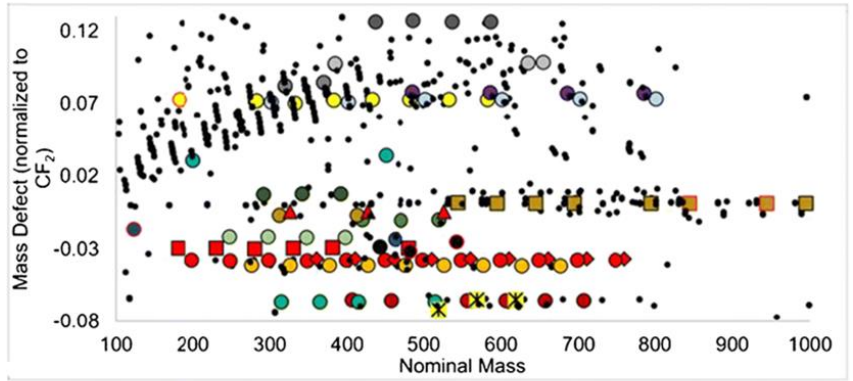
PFAS Measurement: New Strategies (NTA)

Total TF — Targeted TF

Estimate of how many other PFAS are present and are currently undetected/monitored

Thermo Scientific™ Q Exactive™ Orbitrap™ series mass spectrometer (**high resolution MS**)



Nontargeted Analysis methods are **"hypothesis generating"**

Home › Analytical and Bioanalytical Chemistry › Article

FluoroMatch 2.0—making automated and comprehensive non-targeted PFAS annotation a reality

Research Paper | Published: 20 May 2021

Volume 414, pages 1201–1215, (2022) Cite this article

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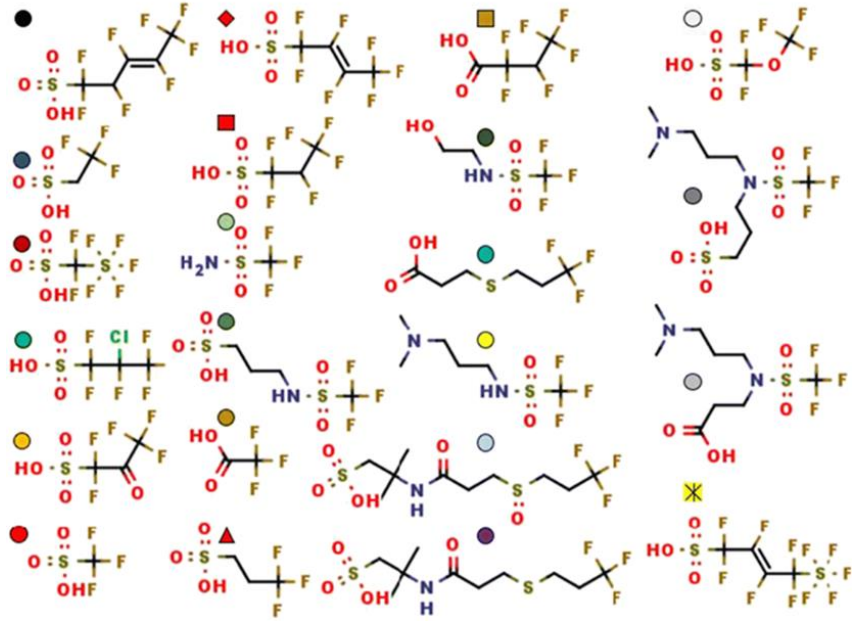
Jeremy P. Koelmel, Paul Stelben, Carrie A. McDonough, David A. Dukes, Juan J. Aristizabal-Henao, Sara L. Nason, Yang Li, Sandi Sternberg, Elizabeth Lin, Manfred Beckmann, Antony J. Williams, John Draper, Jasen P. Finch, Jens K. Munk, Chris Deigl, Emma E Rennie, John A. Bowden & Krystal J. Godri Pollitt



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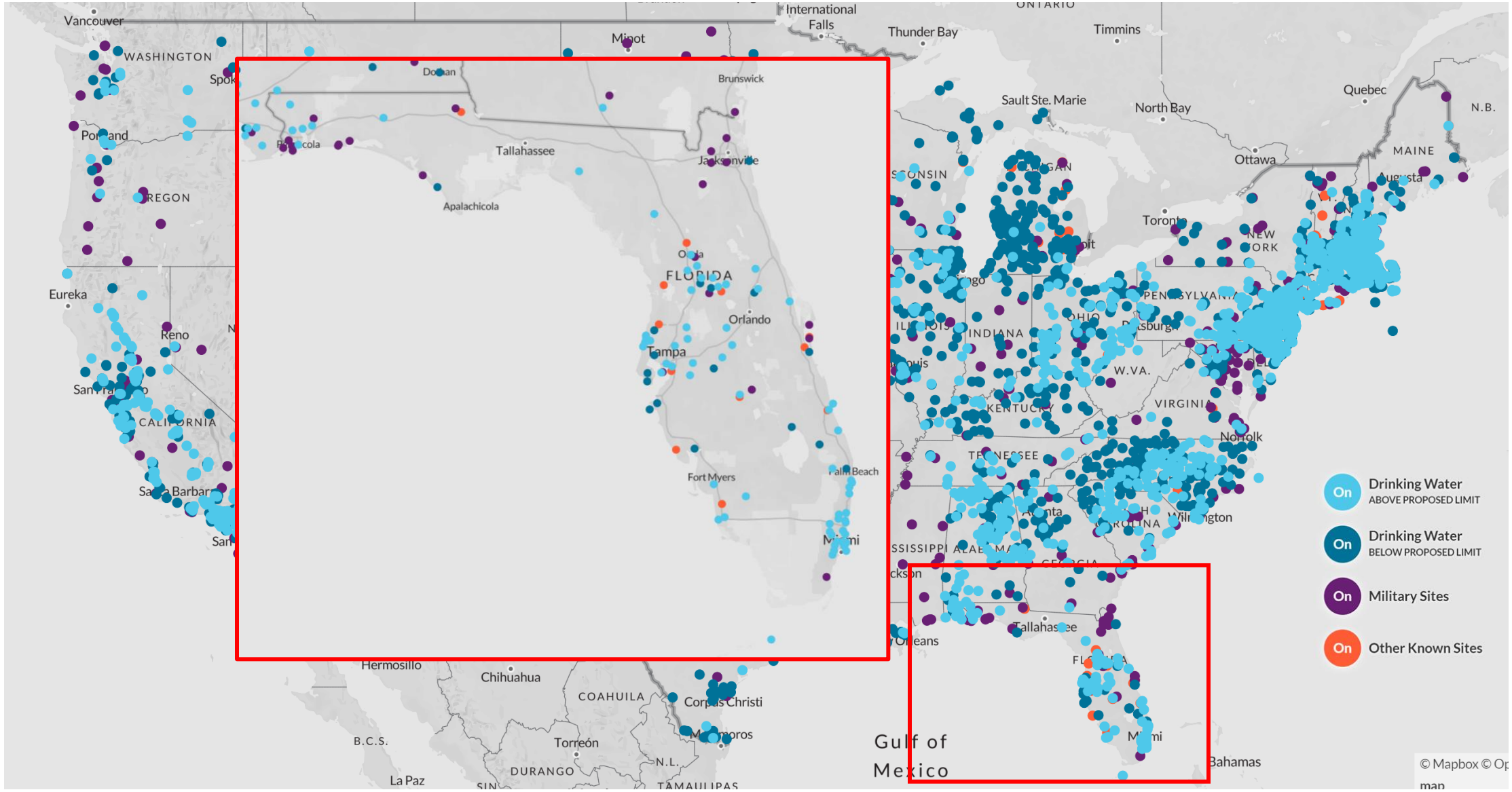
PFAS Surveillance in Water



Interactive Map: PFAS Contamination Crisis: New Data Show 2,854 Sites in 50 States (ewg.org)

“Crowdsourcing” – PFAS Distribution in Florida Surface Water

Water is important resource in Florida but there is a scarcity of PFAS data

Started with campus funding during pandemic in 2020

Provide PFAS baselines for prospective monitoring and potential hotspots

Get Florida educated on PFAS and create sampling network

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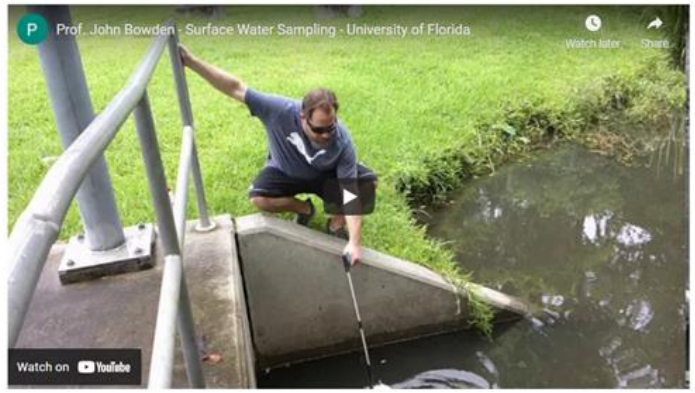
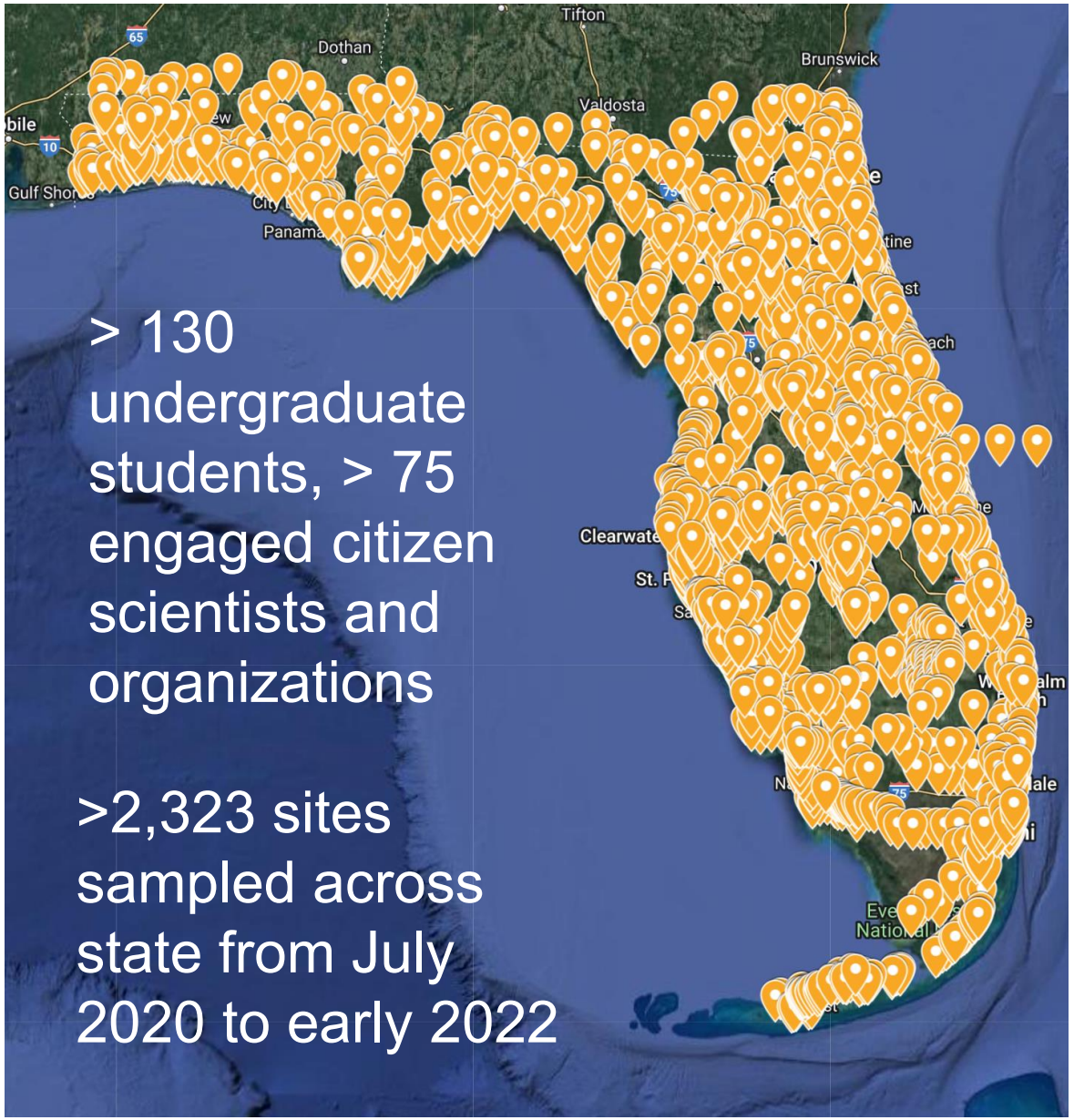
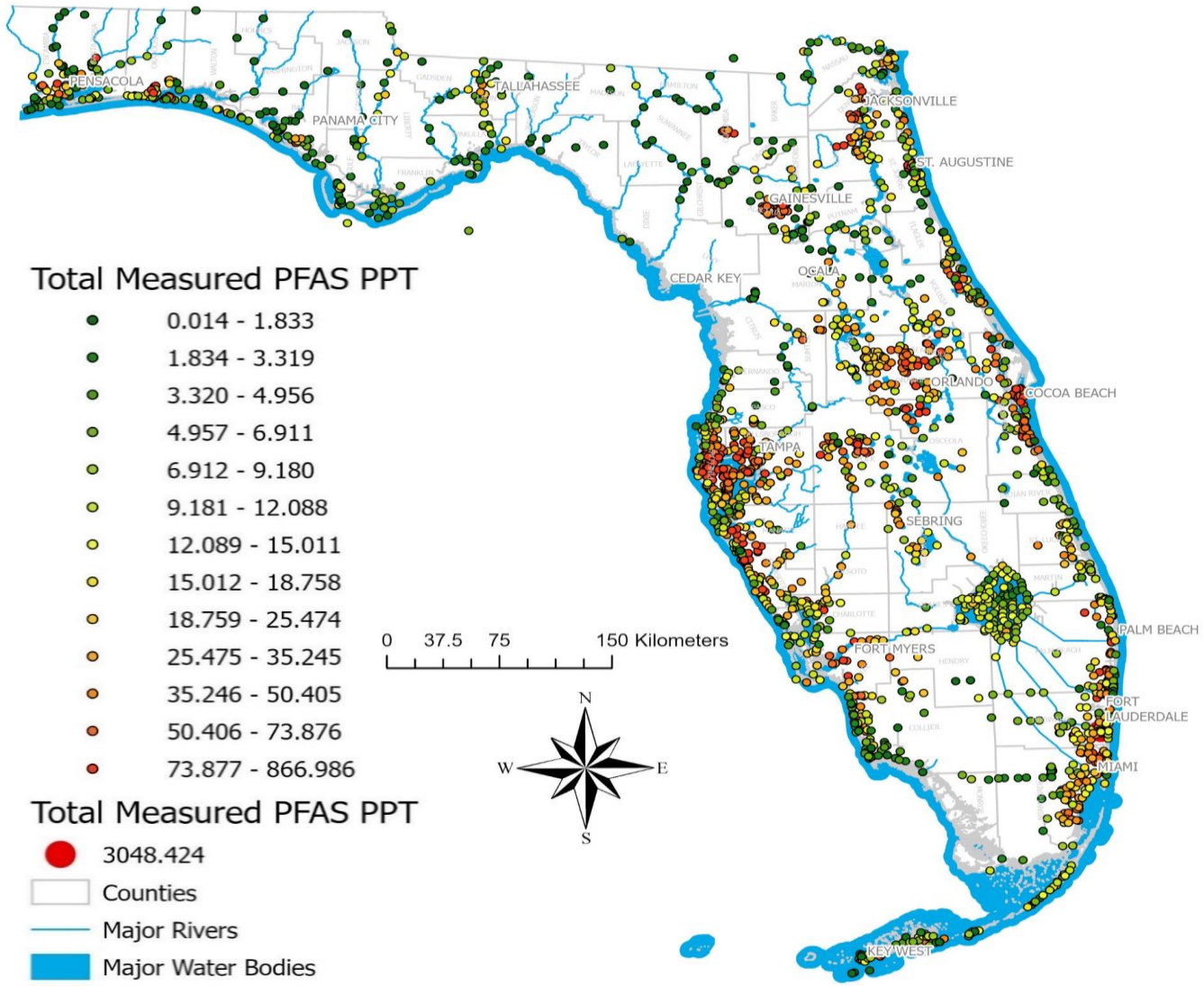




PFAS Distribution in Surface Water

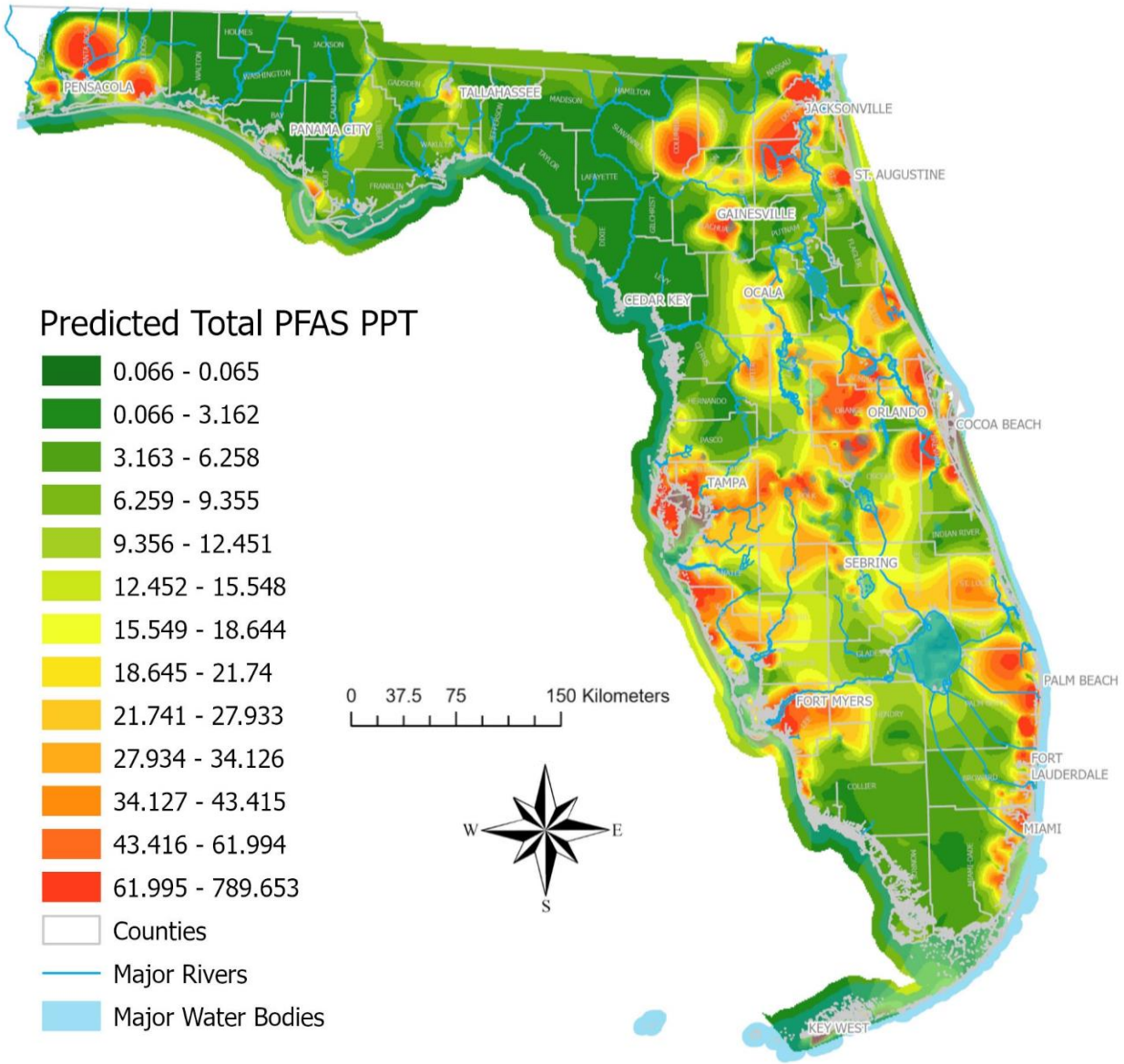


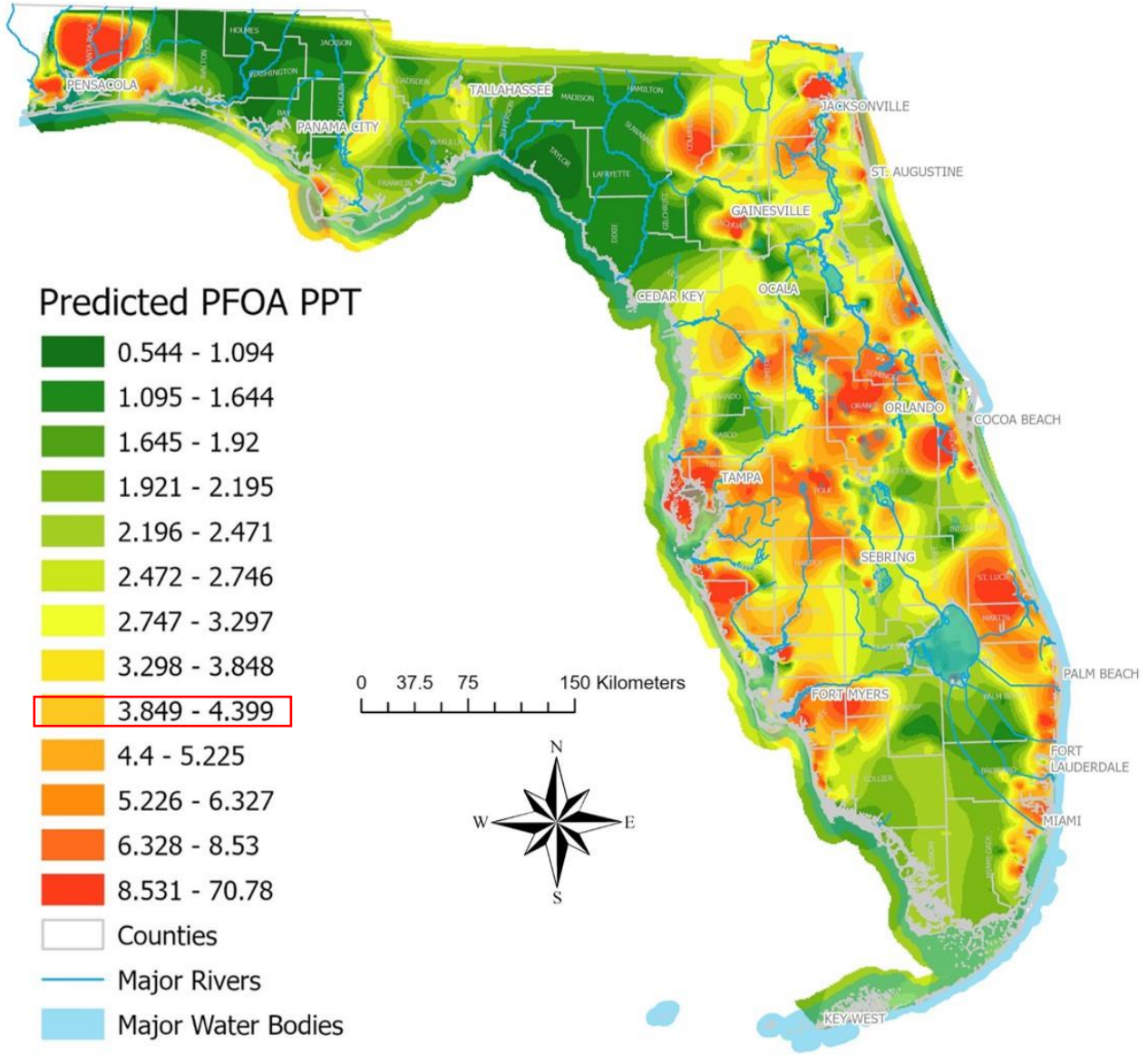
- 92 PFAS monitored
- 33 unique PFAS detected
- ΣPFAS max was 3048 ppt
- ΣPFAS mean was 29 ppt

https://www.bowdenlaboratory.com/

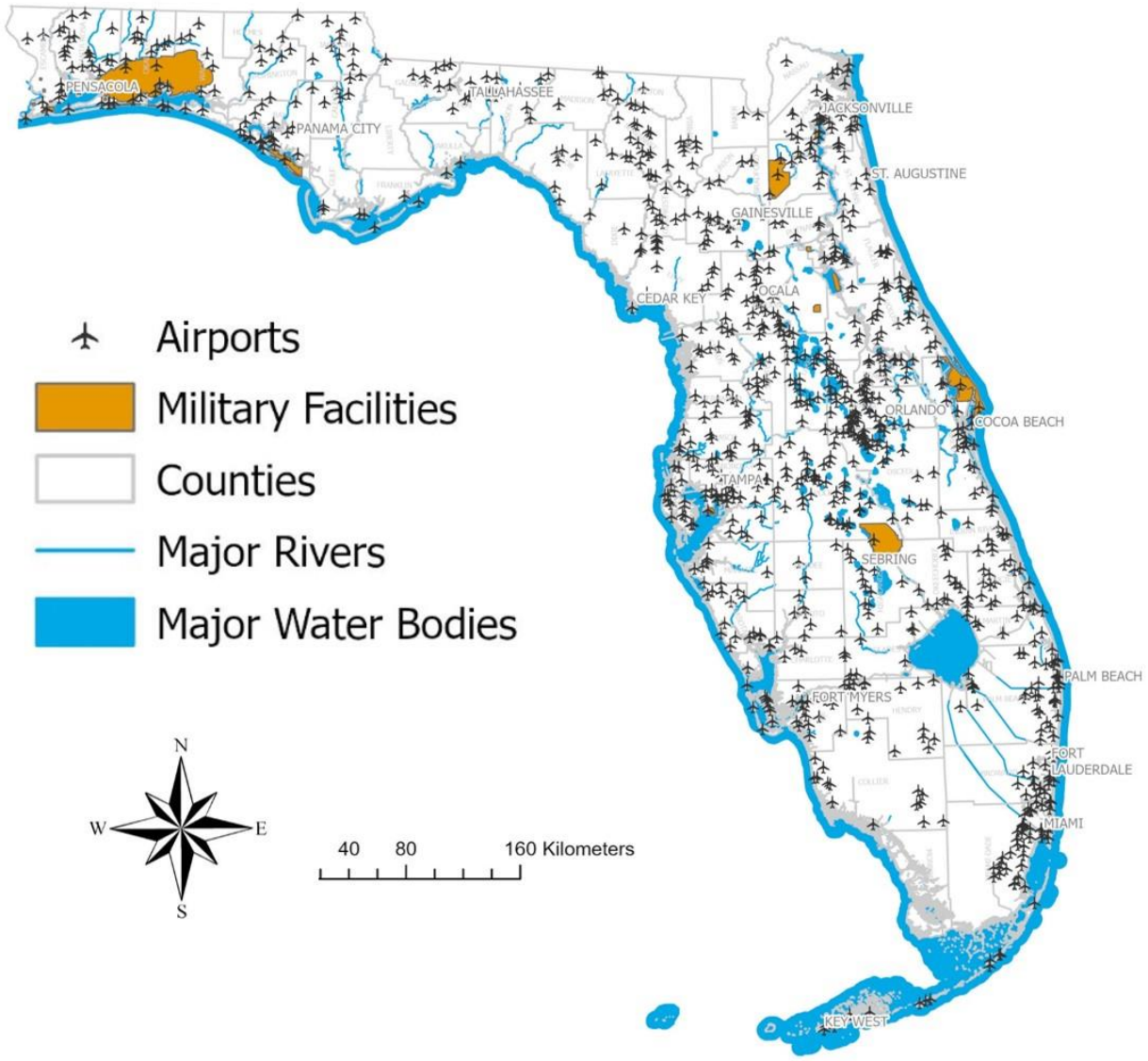
ACS EST Water 2024, 4, 10, 4343–4355

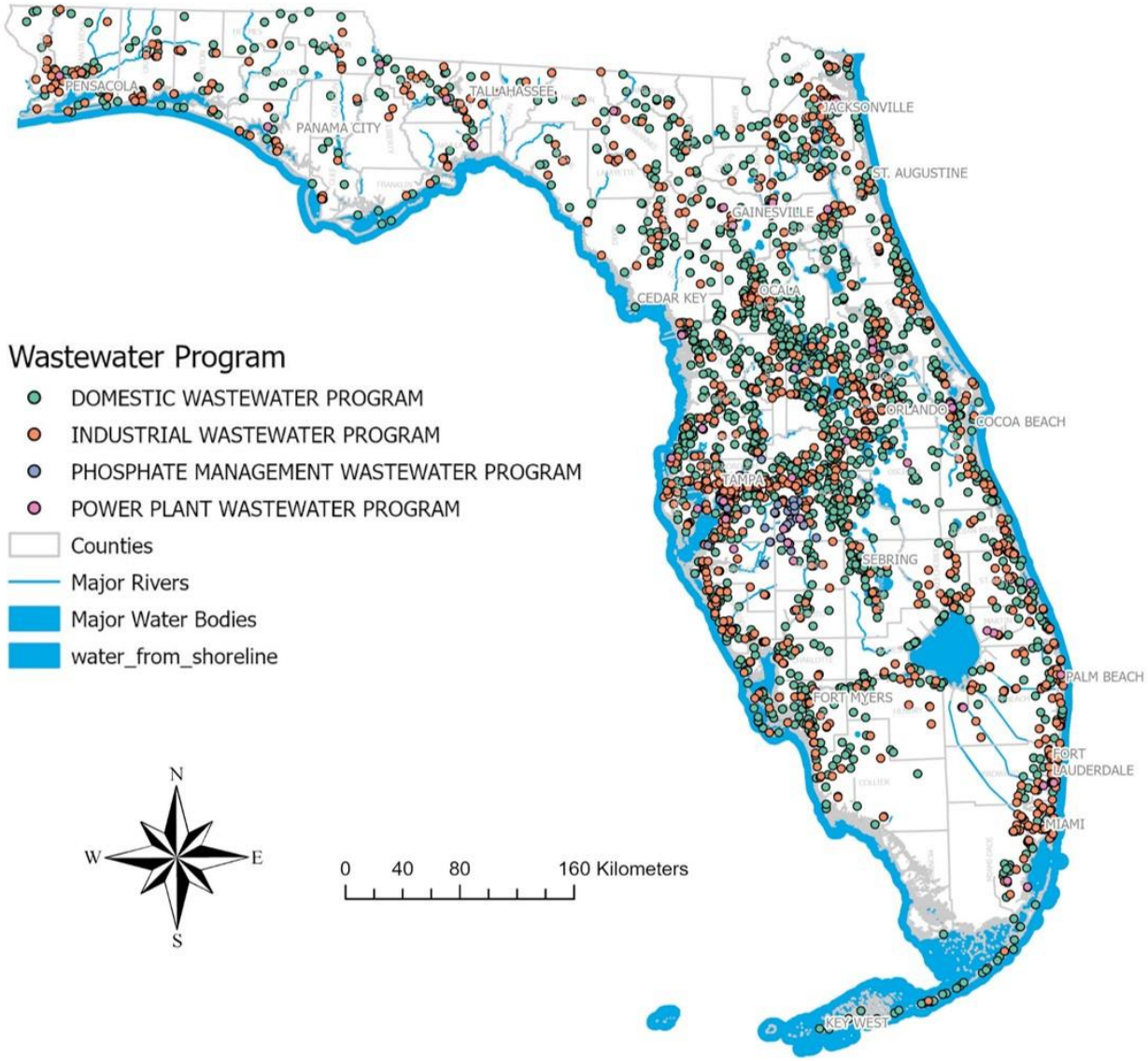
PFAS Prediction Maps for Florida Surface Water





PFAS Sources in Florida Surface Water?





PFAS Sources in Florida Surface Water: Spills

Florida Department of Environmental Protection

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POLLUTION NOTICE
Enterprise Solutions

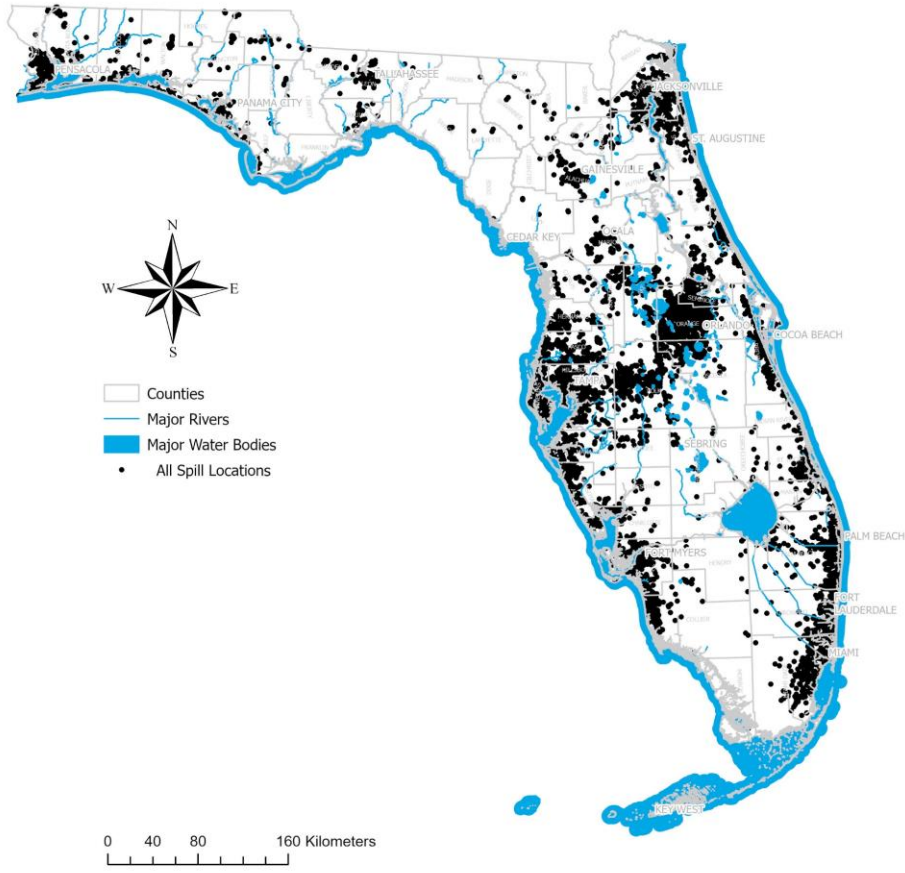
In compliance with §403.077, F.S., and the public interest, the Department of Environmental Protection is making available any Notices of Pollution that it has received. This information is available below.
This information is presented as provided by the reporting entity. The Department of Environmental Protection is not responsible for the accuracy of any information submitted.

Export Data to Excel
GIS Map (Last 30 Days Reported)

[First/Prev] 1, 2, 3, 4, 5, 6, 7, 8 [Next/Last]

Incident Name	Incident Report	Report Date/Time	Facility Name	Facility Address	Affected Counties	Reporter Name	Reporter Title	Reporter E-mail	Reporter Phone
A1A Fuel Tank	February 20th 2024 a faint fuel smell was reported to prime contractor DB Civil Construction in the area of a fuel storage tank located on A1A near Crossroad Lake Drive intersection. Upon investigation by DBCC, a possible spillage of ounces was observed to have contacted nearby soil during equipment refueling operations. In response to this observation, DBCC removed and disposed of affected soil and applied a visqueen barrier to the affected soil area. The tank is being relocated into a sealed storage container. The hoses have been elevated	02/21/2024 04:59 PM	A1A Right of Way	Crossroad Lakes Drive; Ponte Vedra Beach, FL 32082; Directions: Heading North on A1A, construction yard just after Crossroad Lakes Drive. Not located at actual address.; Ponte Vedra Beach FL; 32082	St. Johns	Ross Giannini	Project Manager	rossg@dbcivilconstruction.com	(904) 864-0572

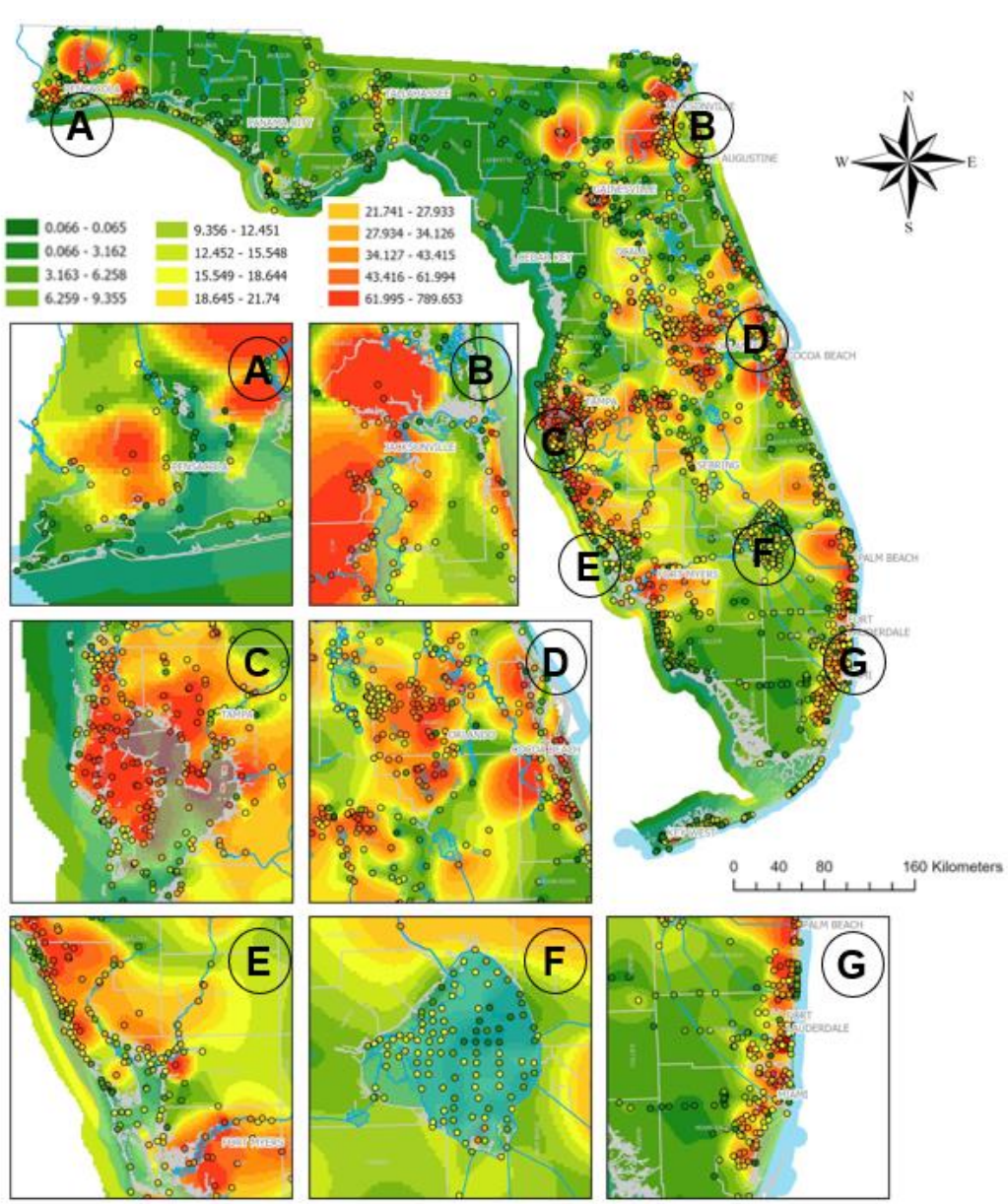
All spill locations (n = 10,959)

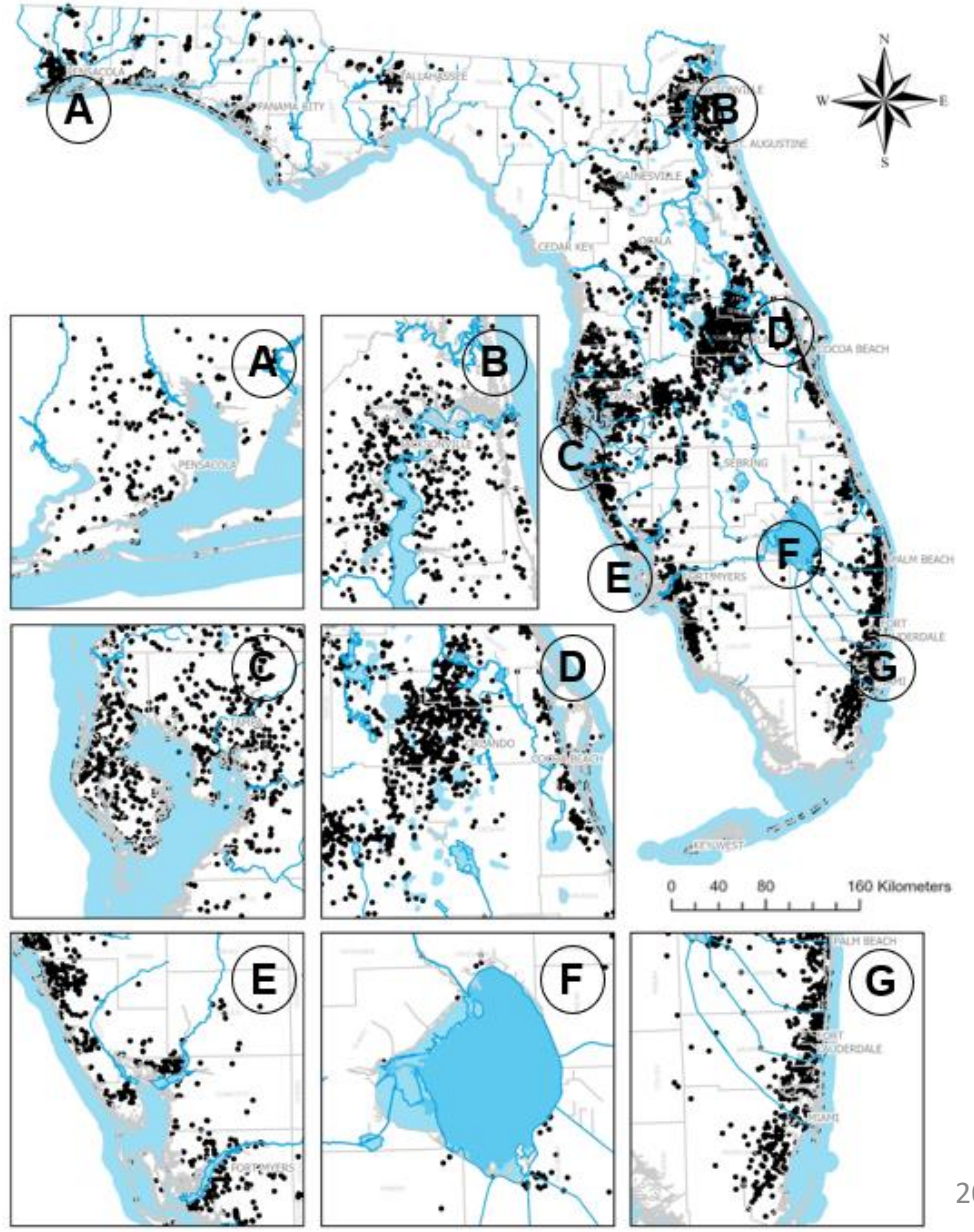


Reporting 2017-2022
7,395 Spills
1.4 billion gallons

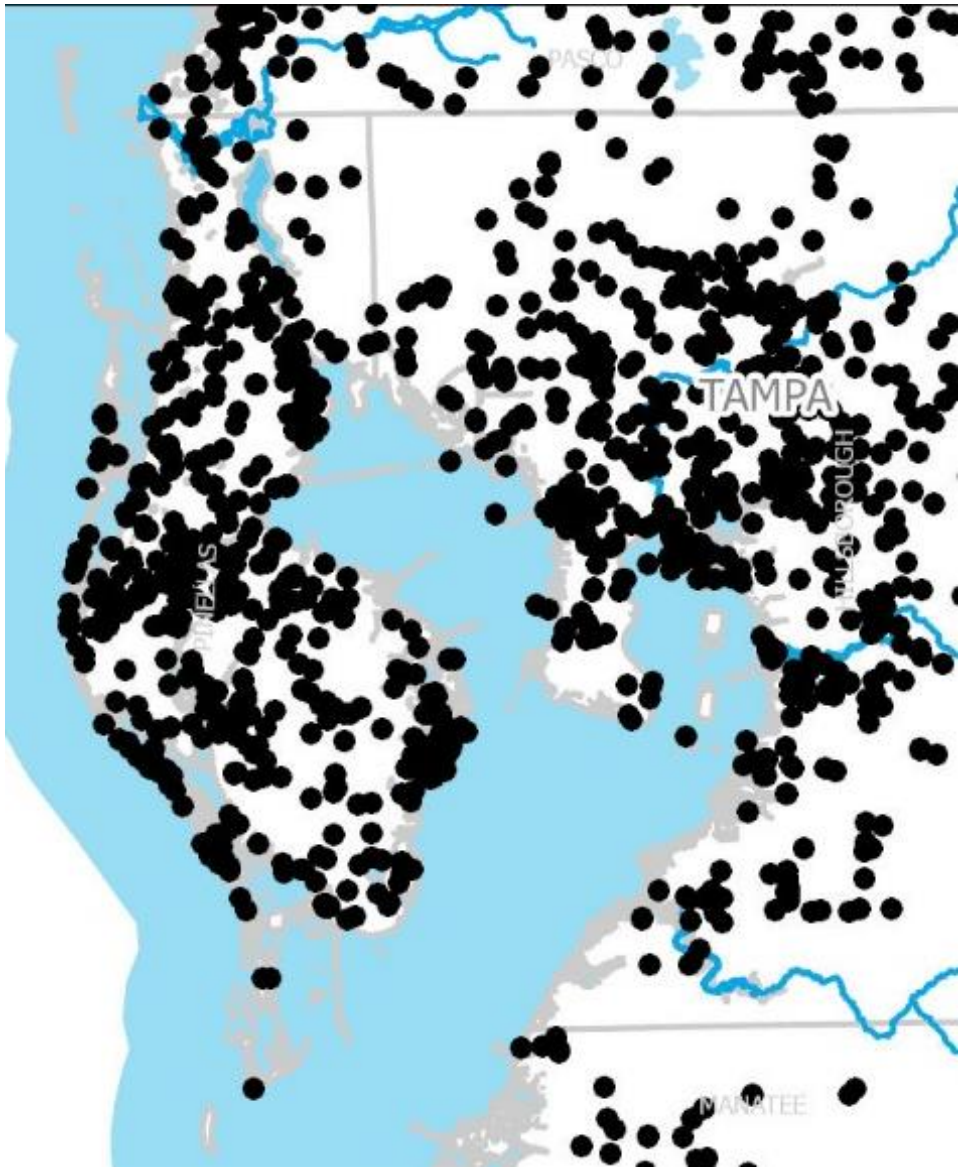
https://prodenv.dep.state.fl.us/DepPNP/reports/viewIncidentDetails?page=1

PFAS Sources in Florida Surface Water: Spills?

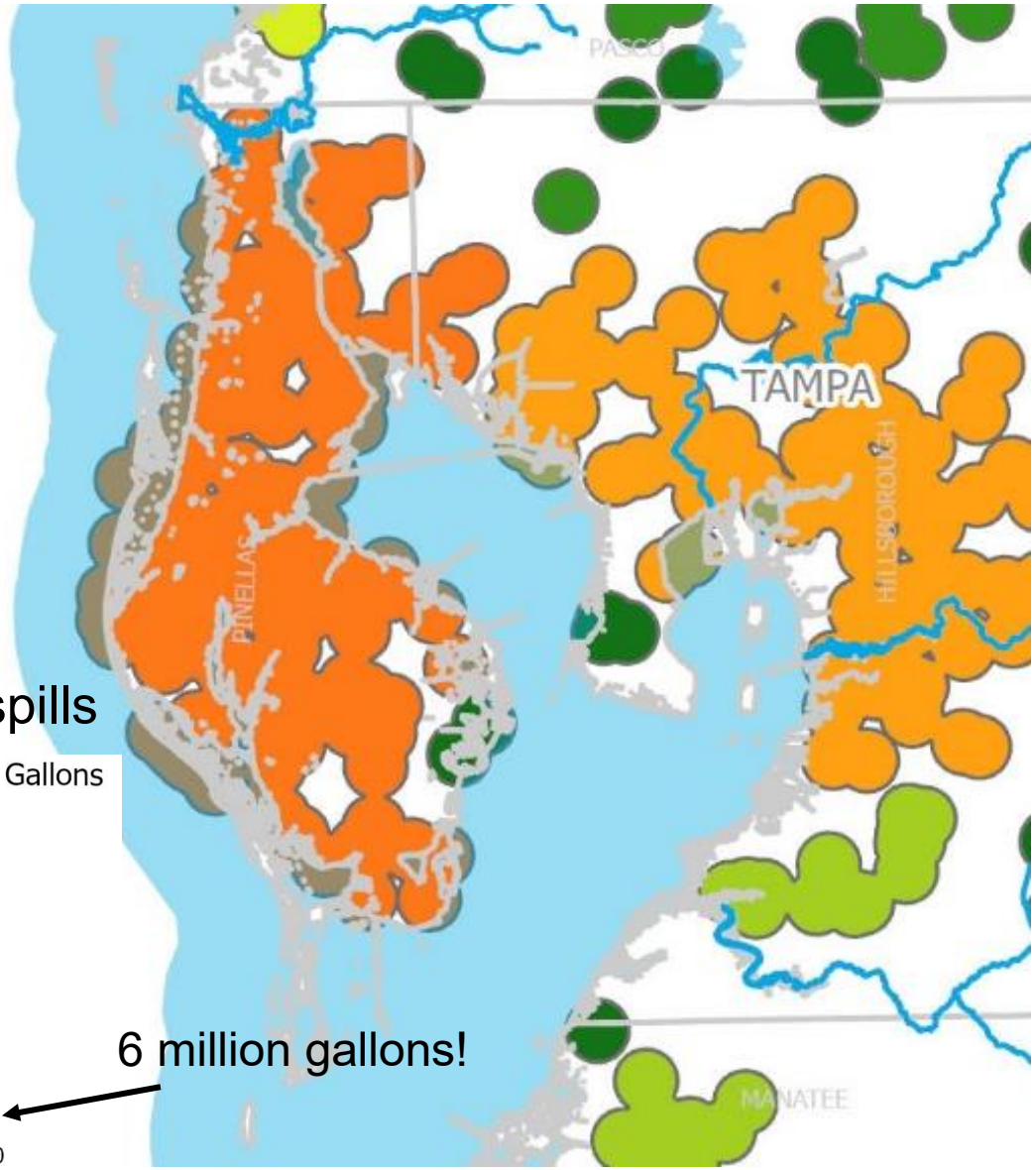




PFAS Sources in Florida Water: Raw Sewage



All spills



Raw sewage spills

Sum All Raw Sewage in Gallons

- 10.00 - 27000.00
- 27000.01 - 80218.00
- 80218.01 - 167579.00
- 167579.01 - 343945.00
- 343945.01 - 598650.00
- 598650.01 - 1055350.00
- 1055350.01 - 1598919.00
- 1598919.01 - 3717000.00
- 3717000.01 - 6058314.00
- 6058314.01 - 73988500.00

6 million gallons!

Results – PFOA and PFOS Mass Loading

Category	Units	Influent	Effluent	Wet sludge	Total
Spill volume 2017- 2022	Gallons	445,000,000	970,000,000	2,300,000	1,417,300,000
Spill volume post study	Gallons	273,000,000	30,000,000	700,000	303,700,000
Concentration PFOA[a]	ng/L	11	8.4	1,200	
Concentration PFOS[a]	ng/L	35	31.8	11,700	
Mass of PFOA released 2017 - 2022	g	18.5	30.8	10.4	59.7
Mass of PFOA released post study	g	11.4	1.0	3.2	15.5
Mass of PFOS released 2017 - 2022	g	59.0	116.8	101.4	277.2
Mass of PFOS released post study	g	36.2	3.6	30.9	70.7

[a]Concentrations obtained from historical meta-analysis of PFAS in waste (Thompson et al. 2022)

Data Dissemination

www.bowdenlaboratory.com
https://www.bowdenlaboratory.com/florida-surface-water.html

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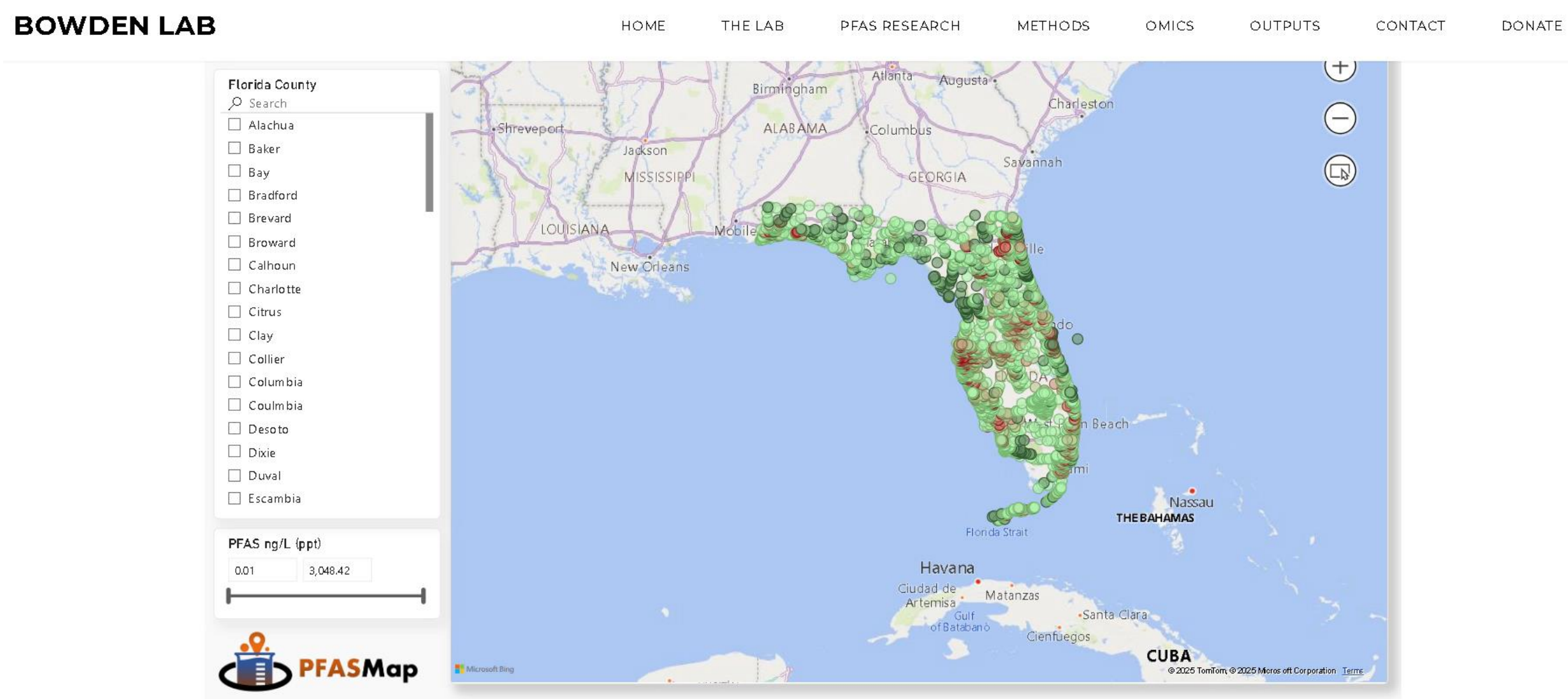
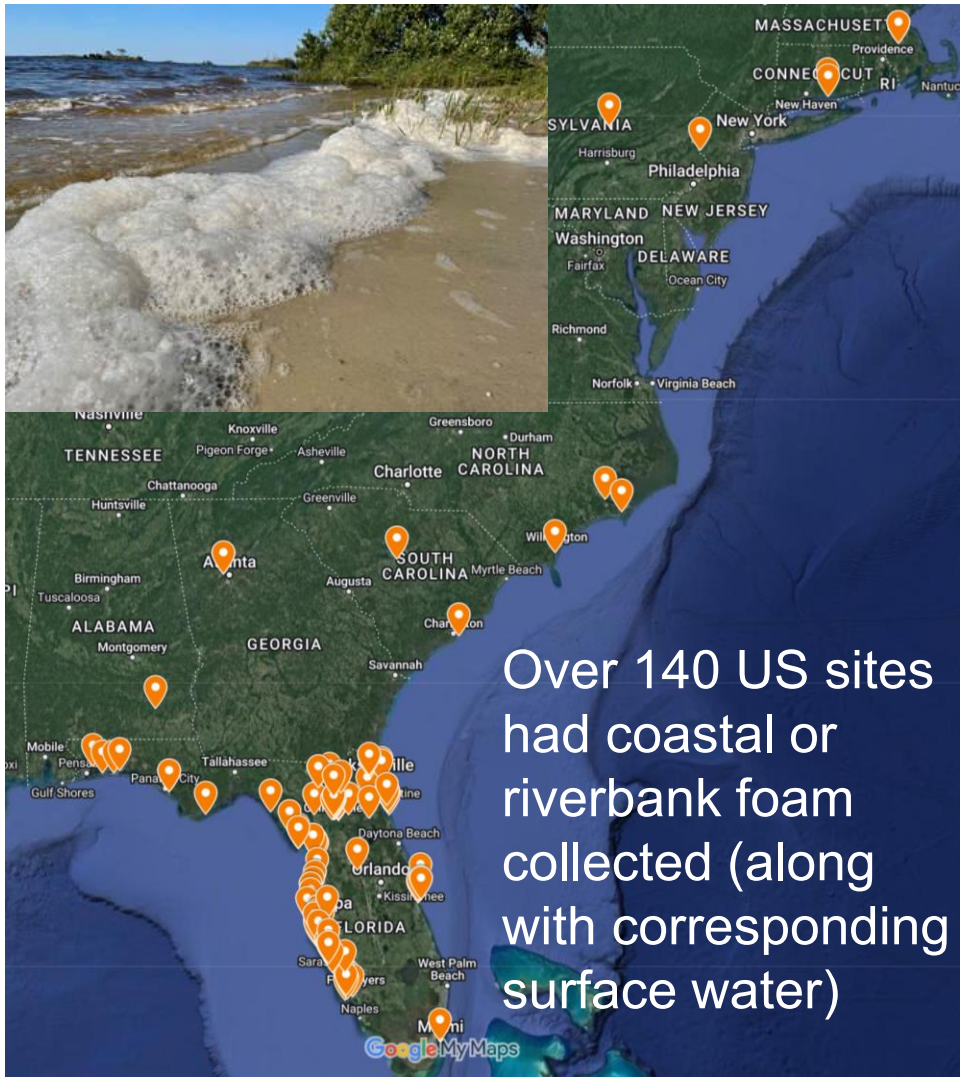


Foam in Fresh and Salt Waters (and Sea Spray)

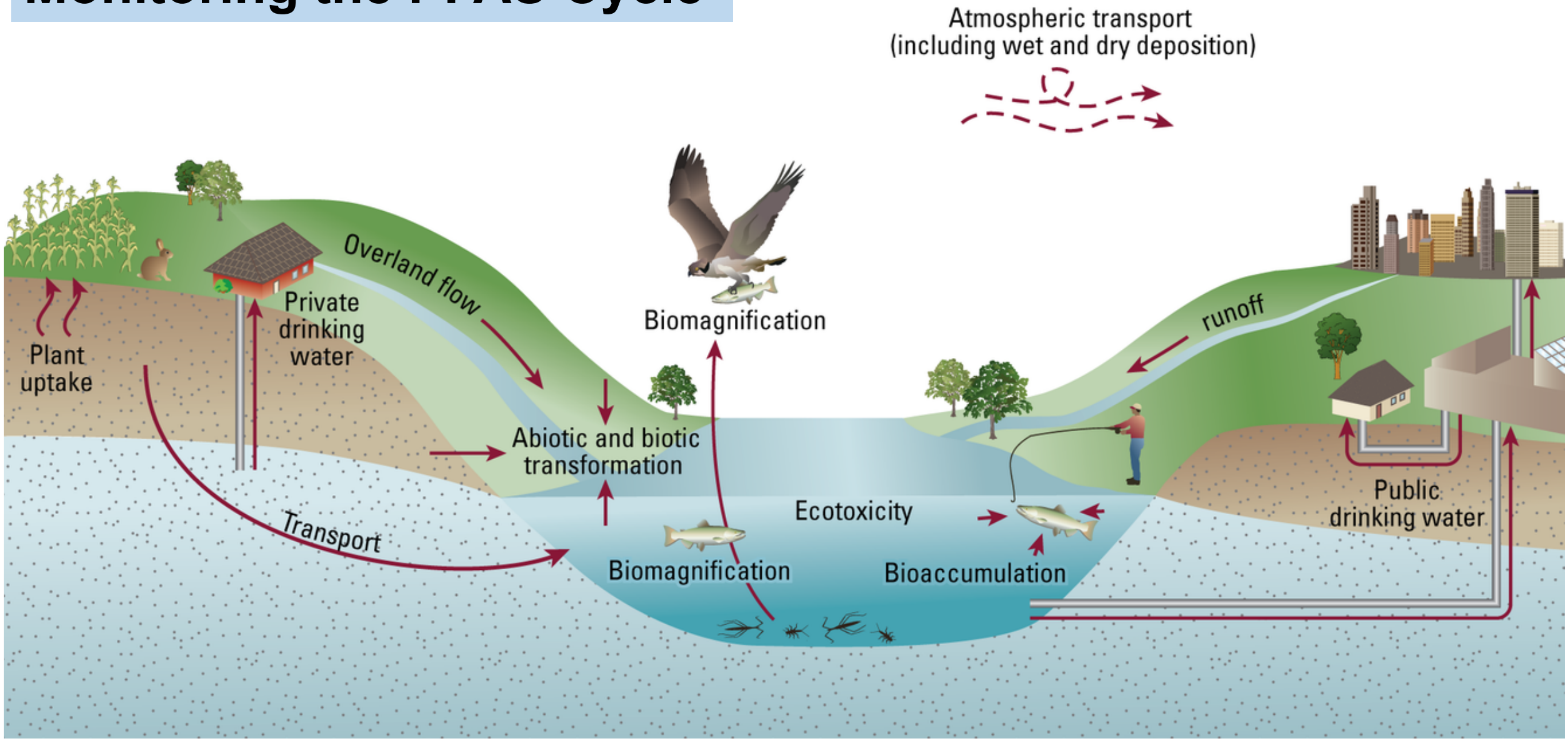


in preparation…

The range of ΣPFAS in foam was between 30x to 1000x higher in comparison to adjacent surface water

Highest ΣPFAS was 100 ppb, with most ranging from 5 ppb to 50 ppb in foam

Monitoring the PFAS Cycle



USGS PFAS Website

Our PFAS Work

Marine wildlife studies in Florida

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ELSEVIER

Marine Pollution Bulletin
Volume 140, March 2019, Pages 610-615

Per- and polyfluoroalkyl substances (PFAS) in plasma of the West Indian manatee (*Trichechus manatus*)

Kady Palmer [a] ✉, Jacqueline T. Bangma [b], Jessica L. Reiner [c] ✉, Robert K. Bonde [d] ✉, Jeffrey E. Korte [e] ✉, Ashley S.P. Boggs [c], John A. Bowden [c f] ✉

Journal of the American Society for Mass Spectrometry > Vol 34/Issue 9 > Article

Cite Share Jump to Expand

RESEARCH ARTICLE | May 10, 2023

Aquatic Vegetation, an Understudied Depot for PFAS

Emily K. Griffin, Lauren M. Hall, Melynda A. Brown, Arielle Taylor-Manges, Trisha Green, Katherine Suchanec, Bradley T. Furman, Victoria M. Congdon, Sara S. Wilson, Todd Z. Osborne, Shawn Martin, Emma A. Schultz, Mackenzie M. Holden, Dylan T. Lukacsa, Justin A. Greenberg, Katherine Y. Deliz Quiñones, Elizabeth Z. Lin, Camden Camacho, and John A. Bowden*

ECOTOXICOLOGY AND PUBLIC HEALTH | July 17, 2025

Occurrence and Maternal Transfer of Per- and Polyfluoroalkyl Substances (PFAS) in Pregnant Sharks from Florida Coastal Waters

Qaim Mehdi, Thomas D. Sinkway, Lauren E. Blackman, Adriana L. Iorfida, Avery M. Pittman, Corinna Sutterer, Hailey L. Hinchliffe, Kira A. Zautcke, Meg E. Morrow, Neel Shah, Ines A. Chambrier-Athias, Karly E. Cohen, Gareth J. Fraser, Douglas H. Adams, and John A. Bowden*

ELSEVIER

Science of The Total Environment
Volume 927, 1 June 2024, 171758

Species-specific profiles of per- and polyfluoroalkyl substances (PFAS) in small coastal sharks along the South Atlantic Bight of the United States

Qaim Mehdi [a], Emily K. Griffin [a], Juliette Esplugas [a], Jim Gelsleichter [b], Ashley S. Galloway [c], Bryan S. Frazier [c], Alina S. Timshina [d], R. Dean Grubbs [e], Keyla Correia [a], Camden G. Camacho [f], John A. Bowden [a d f] ✉

ELSEVIER

Marine Pollution Bulletin
Volume 213, April 2025, 117673

Sand dollars (*Mellita quinquiesperforata*): A new bioindicator for tracking PFAS in coastal waters

John A. Bowden [a b] ✉, Qaim Mehdi [a] ✉, Lauren E. Blackman [a] ✉, Keyla Correia [a] ✉, Thomas D. Sinkway [b] ✉, Jana Marcin [b] ✉, Bradley T. Furman [c] ✉, Victoria Congdon [c] ✉, Joe Aufmuth [d] ✉

ELSEVIER

Science of The Total Environment
Volume 809, 25 February 2022, 151143

Detection of long chain *per*- and polyfluoroalkyl substances (PFAS) in the benthic Golden tilefish (*Lopholatilus chamaeleonticeps*) and their association with microscopic hepatic changes

Erin L. Pulster [a 1] ✉, Amanda E. Wichterman [b 1] ✉, Susan M. Snyder [a] ✉, Susan Fogelson [c] ✉, Bianca F. Da Silva [d] ✉, Kaylie A. Costa [d] ✉, Joe Aufmuth [e] ✉, Kristina L. Deak [a 2] ✉, Steven A. Murawski [a] ✉, John A. Bowden [d 3] ✉

Tampa Bay – A Model Site?

Tampa Bay water utility secures $21 million to fight PFAS contamination in drinking water

By EHN Curators ▪ Jul 24, 2025 ▪ 1 min read

HOME • BLOG • NEWS AND PUBLIC AFFAIRS • MANATEE COUNTY GROUP C...

Manatee County group calls for awareness of 'forever chemicals' in sewer sludge

POSTED ON JANUARY 23, 2025 • BY CHRIS YOUNG

Here's what new 'forever chemical' drinking water limits mean for Tampa Bay

Some water supplies in the Tampa Bay area have contamination levels higher than the new federal limits. Here's what's being done about it.

Temple Terrace residents share concerns over harmful 'forever chemicals' in the drinking water

WUSF | By Jessica Meszaros
Published August 14, 2025 at 5:27 AM EDT

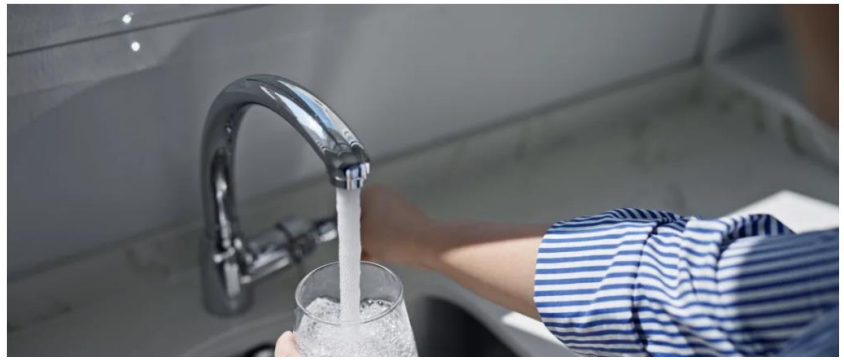
LISTEN • 1:32

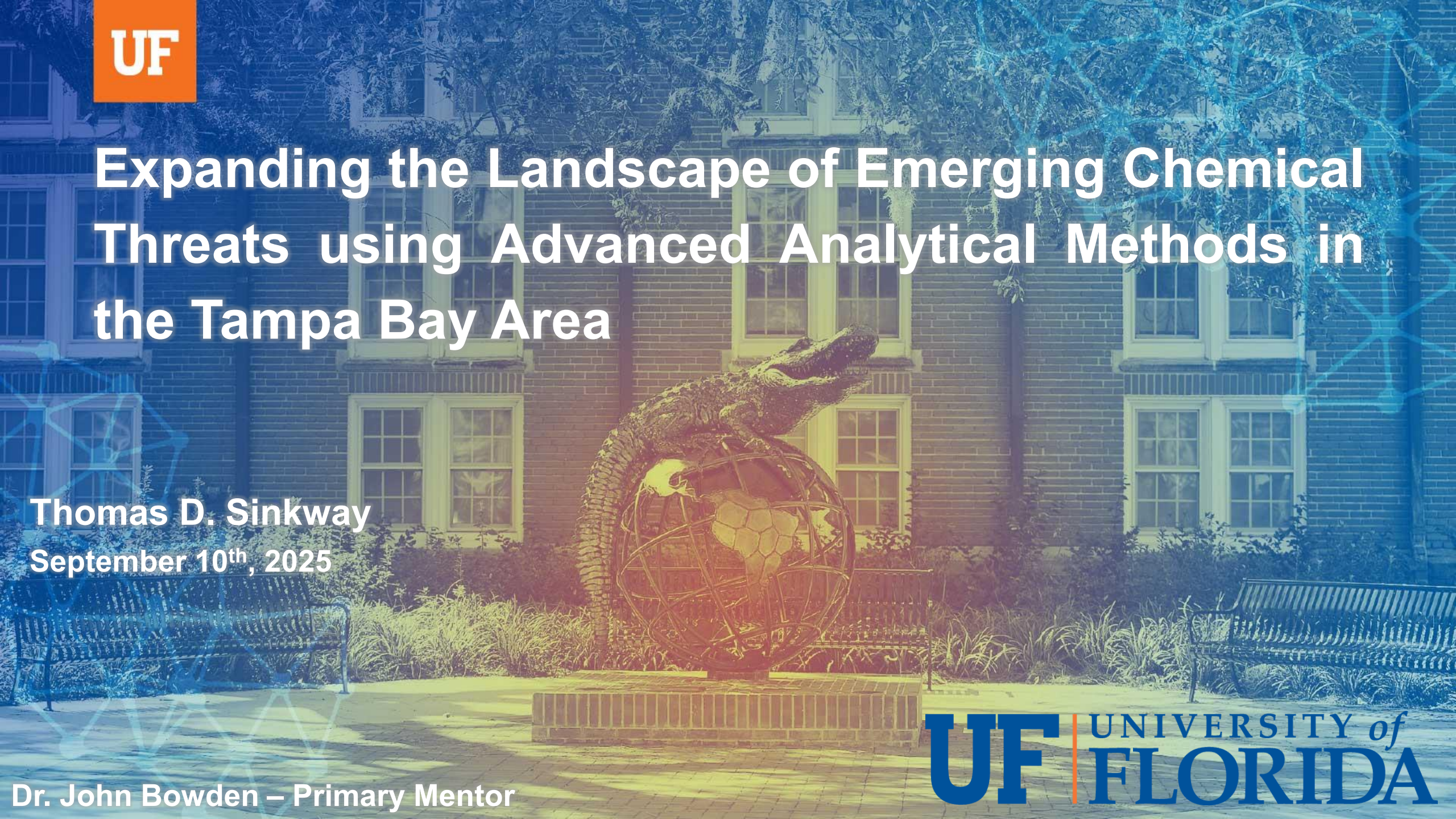
FREE AND CLEAR

Forever Chemicals in North Port's Tap Water Prompt a Grassroots Testing Effort

Suncoast Waterkeeper's "Forever Free" program is intended to inform and empower the public.

By Kim Doleatto • August 18, 2025





Expanding the Landscape of Emerging Chemical Threats using Advanced Analytical Methods in the Tampa Bay Area

Thomas D. Sinkway

September 10th, 2025

Dr. John Bowden – Primary Mentor

UF | UNIVERSITY of FLORIDA

Overview

Project Background

Targeted PFAS

Total Organic Fluorine

Drugs of Abuse/Pharmaceuticals/Antibiotics

Outputs

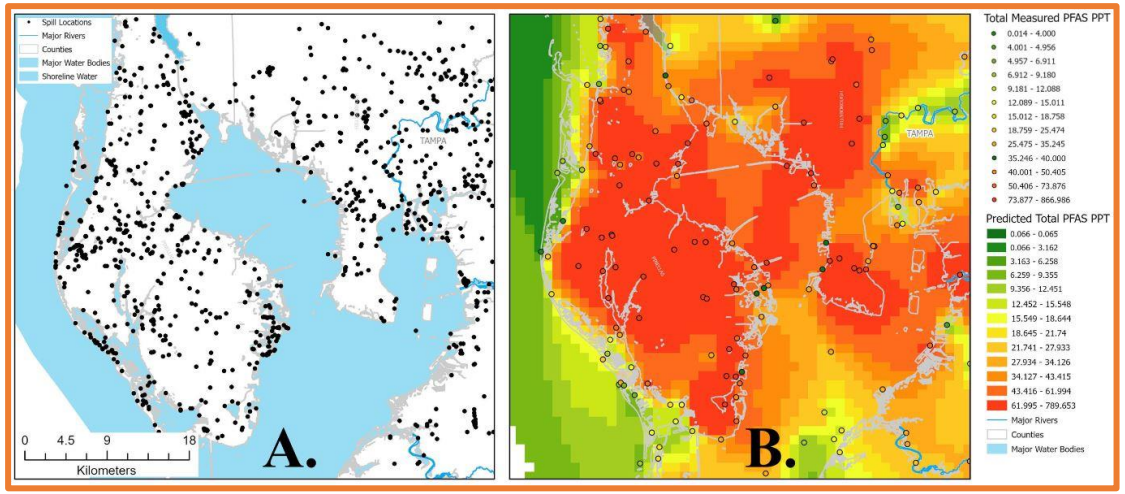
Future Directions

Tampa Bay Model Site

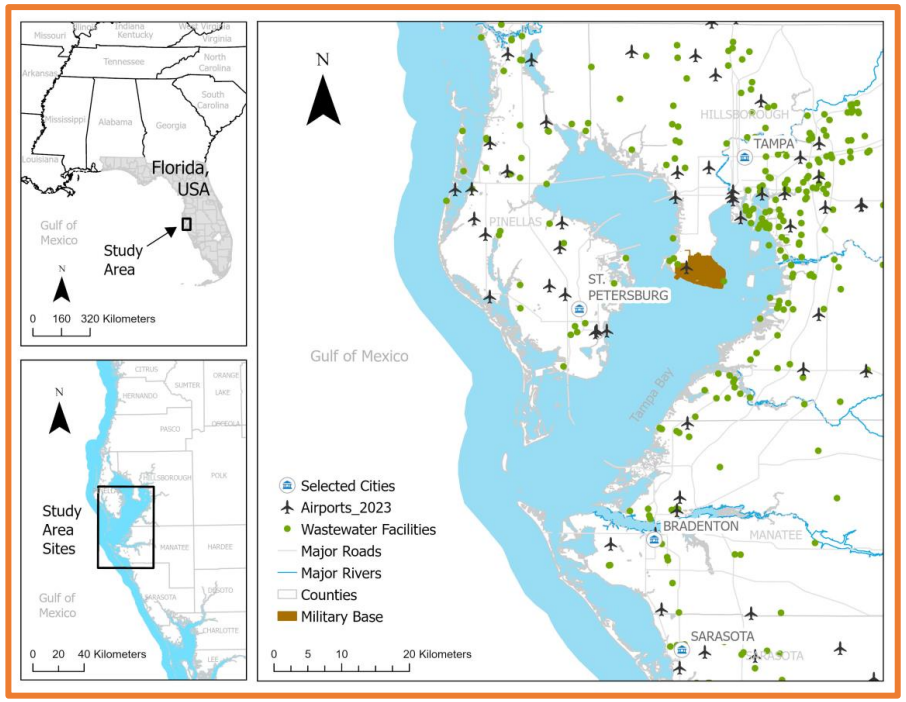
- Tampa Bay Region
  - Previously detected high concentrations with many unique species of PFAS
  - Many potential point sources
  - FDEP reported pollution-based spills
  - Serves as a proxy for other major cities
  - Improve the ability to determine specific sites of pollution and path of PFAS in the Tampa Bay

Florida County	Number of Samples	Max ∑PFAS (ng/L)	Mean ∑PFAS (ng/L)	Number of Unique PFAS
Hernando	10	23	7	9
Pasco	32	76	15	12
Pinellas	120	500	56	25
Hillsborough	89	354	42	22
Manatee	43	101	21	12

West Coastal Florida County Comparison



†(A). Map of reported FDEP spill locations between 2017-2022. (B). Predictive heat map for ∑PFAS



Potential Point Sources in Tampa Bay Region

Camacho et al., 2023; Pulster et al., 2022; Li et al., 2022; Griffin et al., 2023

Project Aims

Aim 1:

To determine the ∑PFAS targeted method concentrations

Aim 2:

To determine the total organic fluorine (TOF) method concentrations

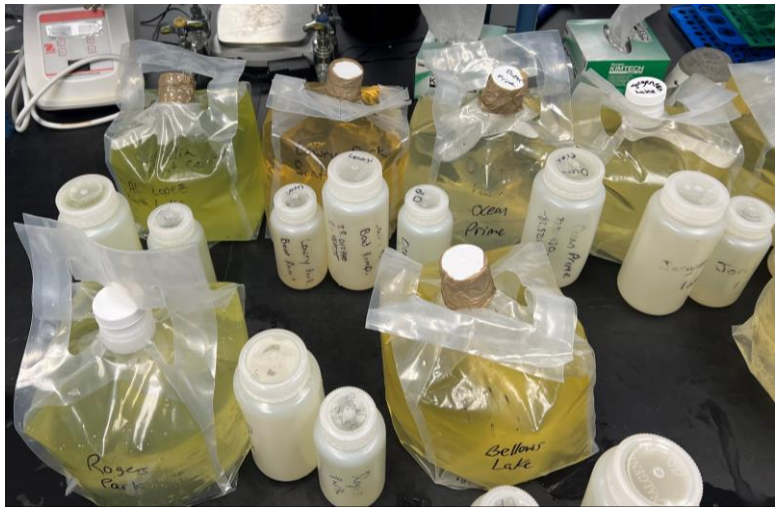
Aim 3:

To determine the drugs of abuse (DoA) targeted method concentrations

Sampling Map

515 Sampling Sites

43 Volunteers

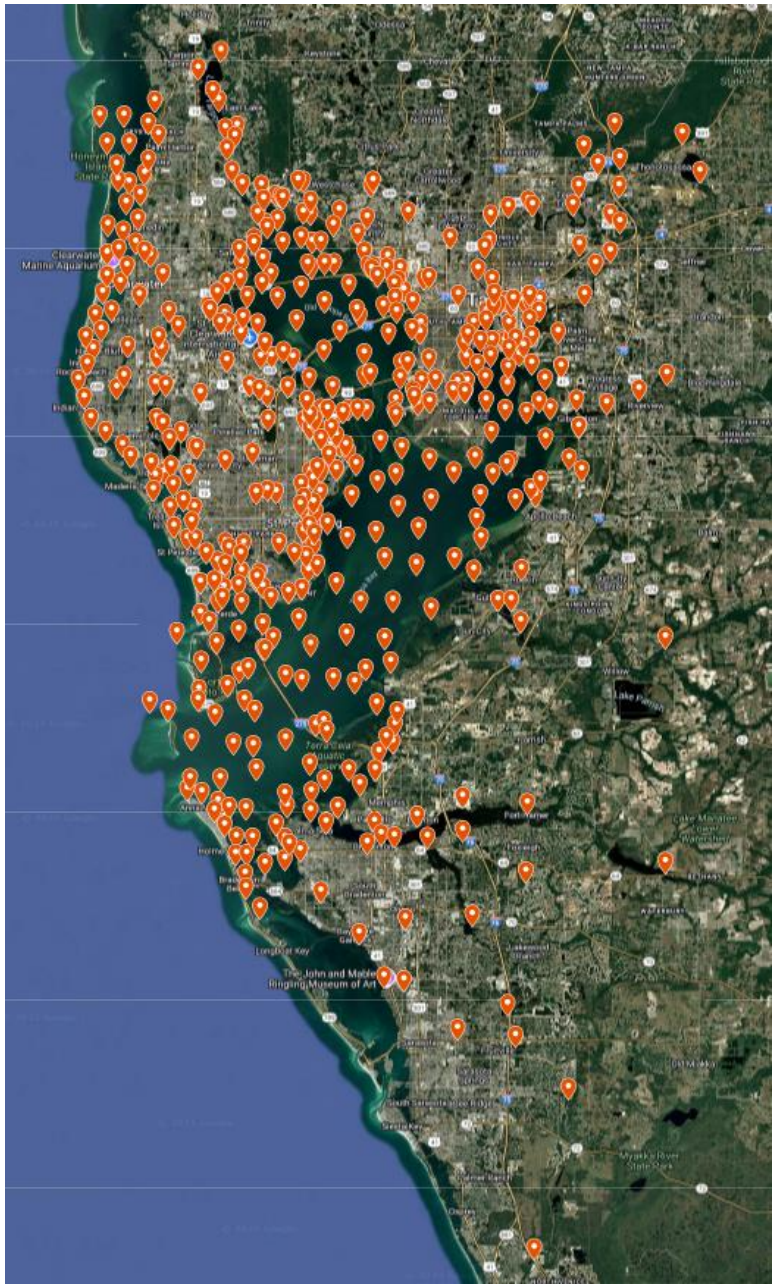


Example of Sampling Collections

250 mL bottle (PFAS)

500 mL bottle (DoA)

1 gallon bag (TOF)



Map of Sampling Locations

Project Goals

Goal:

High site resolution for better identification of point sources and vulnerable regions of contamination

Overview

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Targeted PFAS

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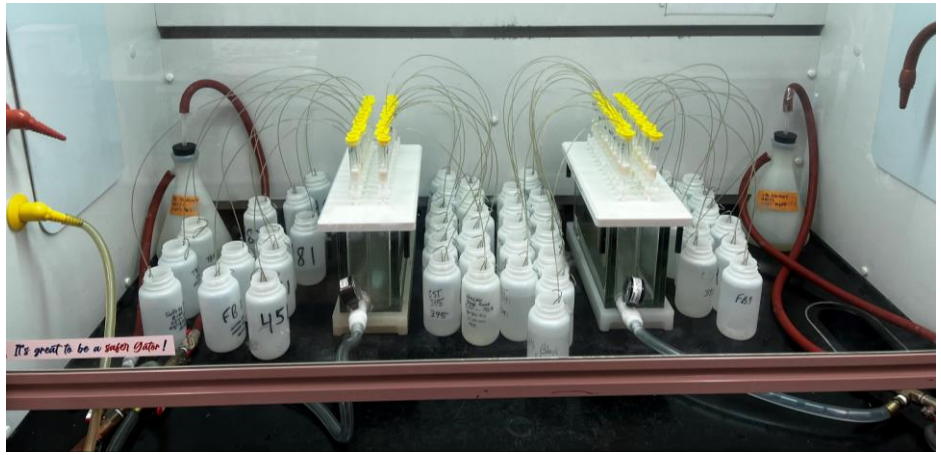
Outputs

Future Directions

Targeted PFAS

Goal:

To determine the concentration of known PFAS species in all samples



Extraction of Samples

Compound	Number of Detections	Frequency Detected	Quantified	Frequency Quantified	Mean (ng/L)	Min (ng/L)	Max (ng/L)	Median (ng/L)
PFOA	2188	94%	1926	83%	5	1	81	3
PFBS	1520	65%	1496	64%	5	0	48	4
PFHxA	1418	61%	1417	61%	6	1	180	4
PFNA	1260	54%	909	39%	2	0	352	1
PFOS	1237	53%	1113	48%	10	0	1135	6
PFHpA	1227	53%	1019	44%	5	1	84	4
PFHxS	1161	50%	400	17%	17	3	365	12
PFDA	756	33%	373	16%	2	0	27	2
∑PFAS	**NA**	**NA**	**NA**	**NA**	**29**	**0**	**3048**	**13**

Example of Previous Outputs in Surface Water

Overview

Project Background

Targeted PFAS

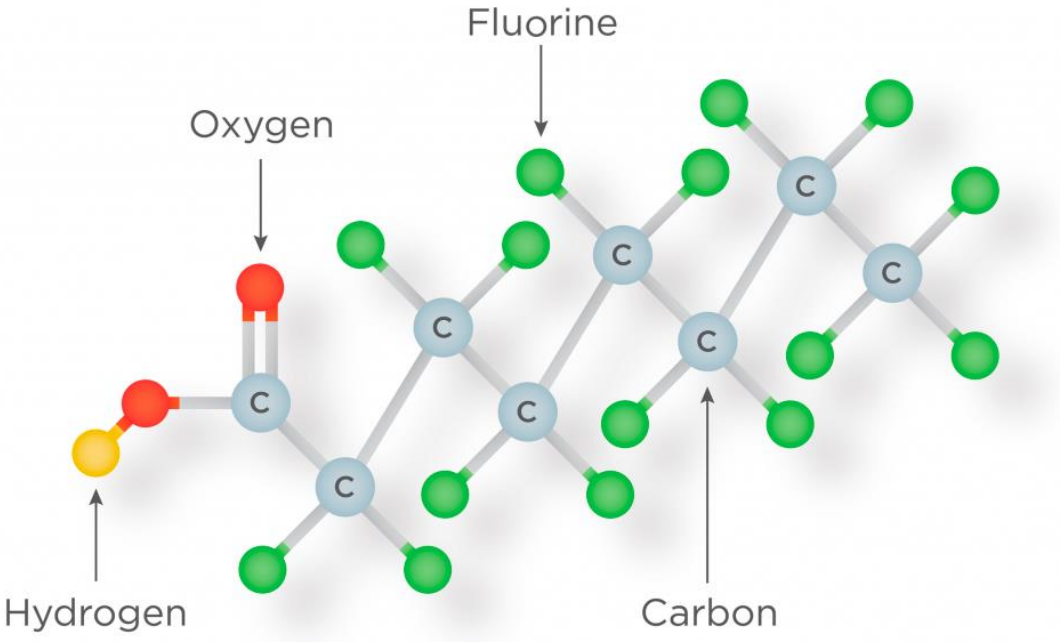
Total Organic Fluorine

Drugs of Abuse/Pharmaceuticals/Antibiotics

Outputs

Future Directions

Defining Landscape



TF = Upper boundary of fluorine-containing compounds

How much unknown PFAS is present???
What are these unknown PFAS???

PFAS measured by targeted mass spectrometry (~ 40-75)

Nontargeted method
to identify unknown PFAS

Total Organic Fluorine

Goal:

To pass the sample through the filters to capture fluorine compounds and establish an upper boundary of contamination

UNIVERSITY OF NOTRE DAME

Dr. Graham Peaslee

Example of Caps Used and Goal of Sample Passing

Overview

Project Background

Targeted PFAS

Total Organic Fluorine

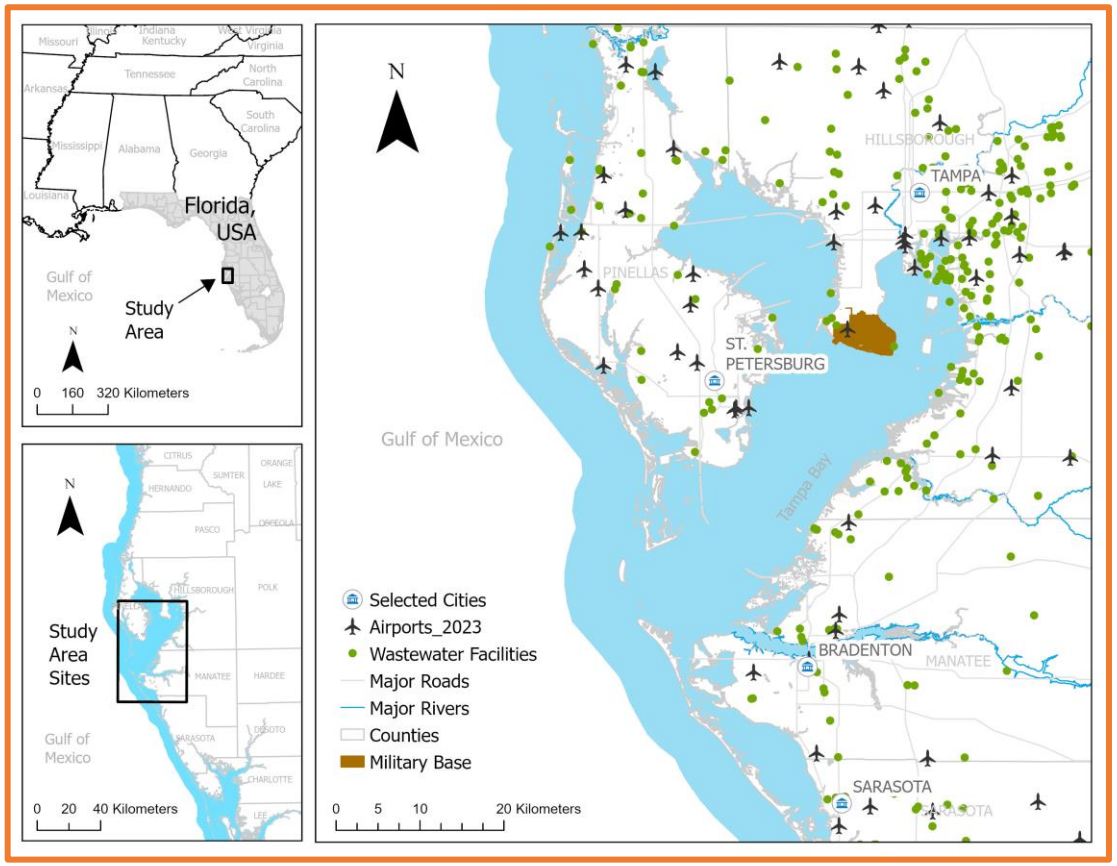
Drugs of Abuse/Pharmaceuticals/Antibiotics

Outputs

Future Directions

Drugs of Abuse Status and Sources

- Previously conducted research for National Drug Early Warning System (NDEWS)
  - Funded by National Institute on Drug Abuse (NIDA)
  - Providing prompt, reliable, accurate data on emerging substance use trends
  - Novel surveillance to detect new drug trends
- Little known information in Tampa Bay
- Apply similar methodology in the Tampa Bay area to survey any potential trends or sources of pollution



Potential Point Sources in Tampa Bay Region

Targeted Drugs of Abuse & Contaminants

Goal:

To determine the concentration of known drugs of abuse, pharmaceuticals, pollutants in all samples

Classes:

- Opioids
- Antibiotics
- Stimulants
- Depressants
- Benzodiazepines
- Emerging Contaminants

Compounds

Metoprolol	Sulfamethoxazole	Benzoylecgonine
6-PPD-Q	Doxycycline	Buprenorphine
Metformin	Erythromycin	Caffiene
Imidacloprid	Cephalexin	Carfentanil
Atenolol	Trimethoprim	Cocaine
Diazepam	Azithromycin	delta9-THC
Lorazepam	Ciprofloxacin	delta9-THC-COOH
Nordiazepam	Codeine	EDDP
Carvediol	Gabapentin	Etizolam
Haloperidol	Zolpidem	Etomidate
Trimethoprim	Venlafaxine	Fentanyl
Glibenclamide	Mitragynine	Hydrocodone
Atrazine	Oseltimivir	Isotonitazene
Flecainide	Clonazepam	Ketamine
Escitalopram	3_4-MDMA	Medetomidine
Empagliflozin	Methylphenidate	Mescaline
Theophylline	N,N-Dimethylpentylone	Methadone
Warfarin	Flualprazolam	Methamphetamine
Sitagliptin	Oxazepam	N,N Dimethyltryptamine
Hydroxybupropion	Benzylpiperazine	Naloxone
Tapentadol	Tramadol	Nicotine
Quinidine	MDPV	Norbuprenorphine
Abacavir	PVP	Norfentanyl
Acebutolol	4-hydroxymethamphetamine	Norketamine
Sotalol	4-hydroxyxylazine	Noroxycodone
Mirtazapine	6-acetylmorphine	Oxycodone
Minoxidil	Alprazolam	para-Fluorofentanyl
Carbidopa	Amphetamine	Xylazine
		Heroin

List of 85 Compounds

Overview

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Total Organic Fluorine

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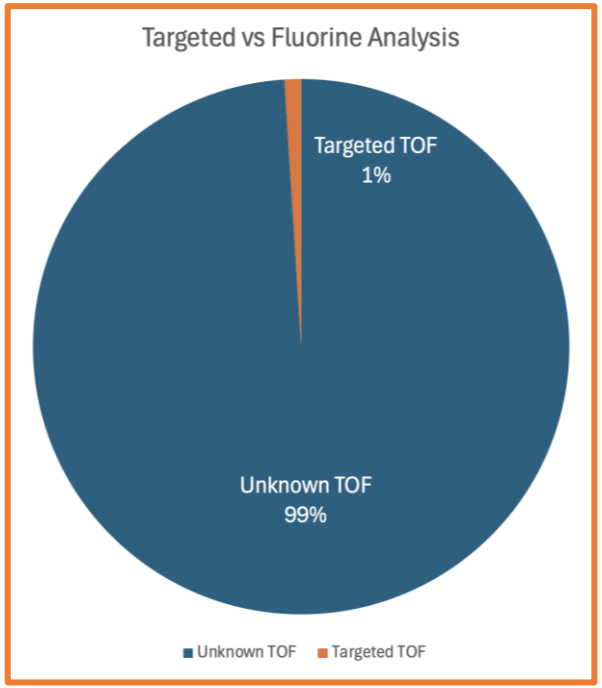
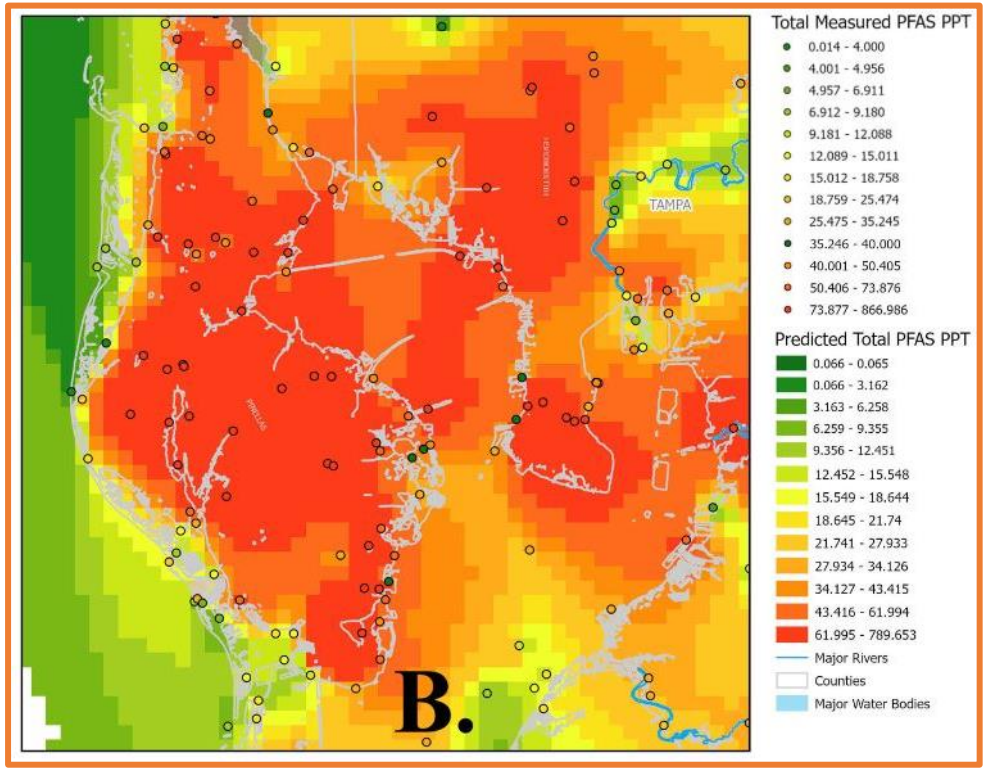
Outputs

Future Directions

Outputs



TOF Comparison



Heat Maps for Potential Point Sources

Bowdenlaboratory.com

Manuscript 1

Exploring Drugs of Abuse and Other Emerging Chemical Contaminants in the Tampa Bay Region

Manuscript 2

Re-Defining the PFAS Landscape in the Tampa Bay Region by Utilizing Targeted and Total Organic Fluorine Methodologies

2024; Forster et al., 2023

Overview

Project Background

Targeted PFAS

Total Organic Fluorine

Drugs of Abuse/Pharmaceuticals/Antibiotics

Outputs

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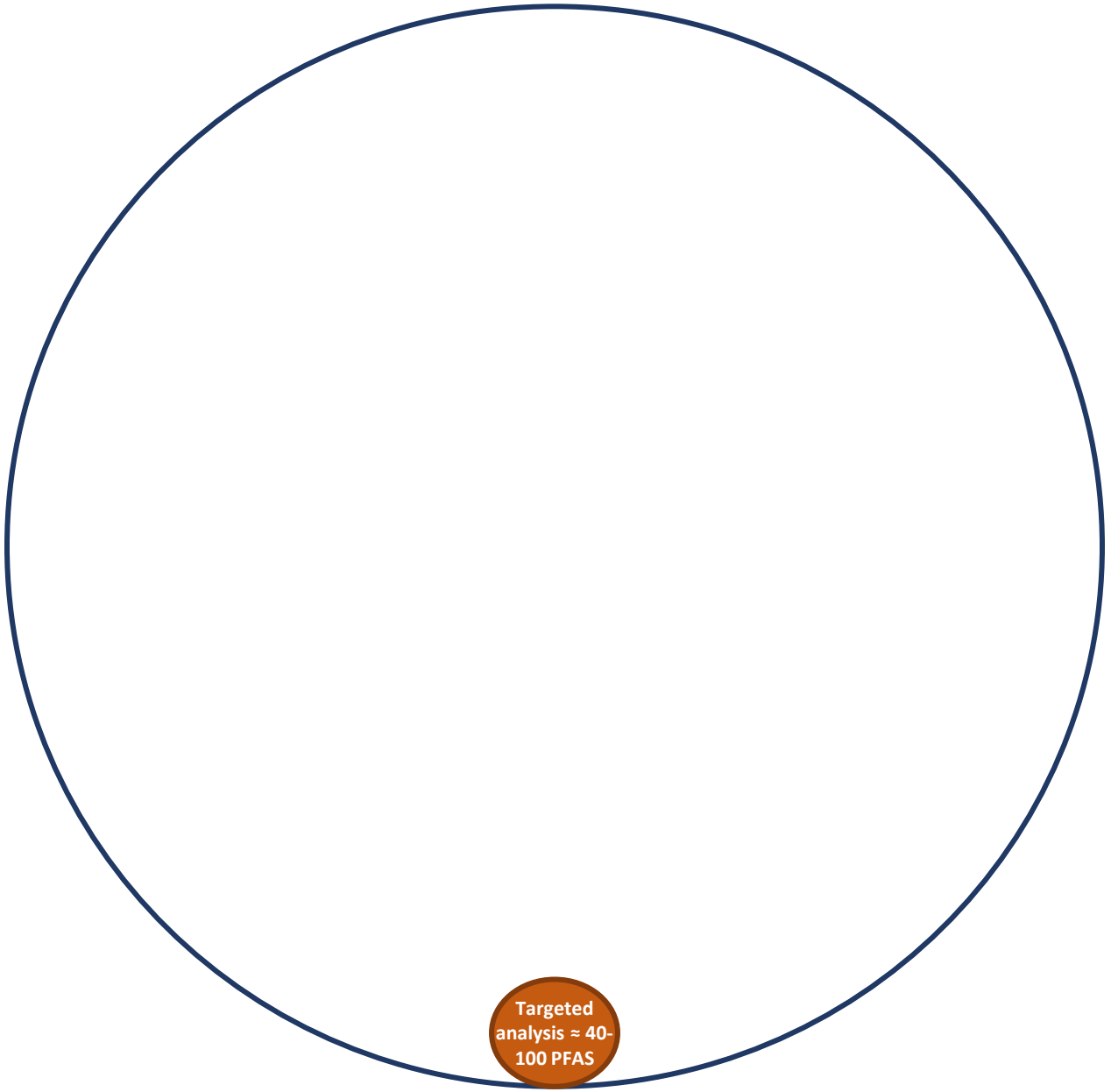
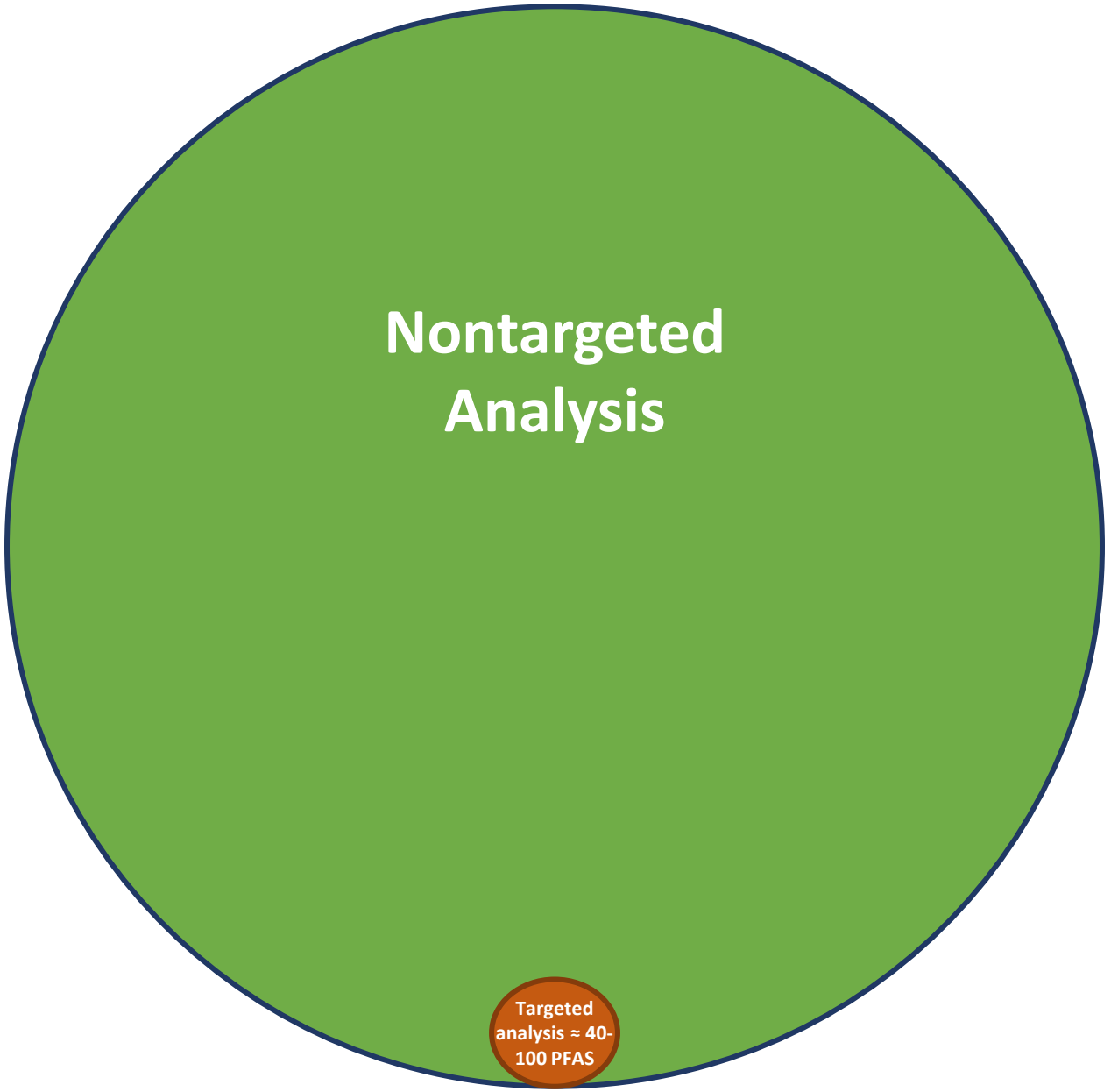
Total Organic Fluorine



Total Organic Fluorine



Questions

Isabella Cioffi

- 2nd year Analytical Chemistry PhD student
  - Research Goals:
    - PFAS in Florida Fish
      - Consumption Advisories
  - Contact:
    - cioffi.is@ufl.edu

NOAA Office for Coastal Management Reported:

Florida Population (2015-2019)	
Coastal Shoreline Population	*16,013,108*
Total State Population	*21,538,187*

American Community Survey Five-Year Estimates. https://coast.noaa.gov/digitalcoast/data/acs.html.

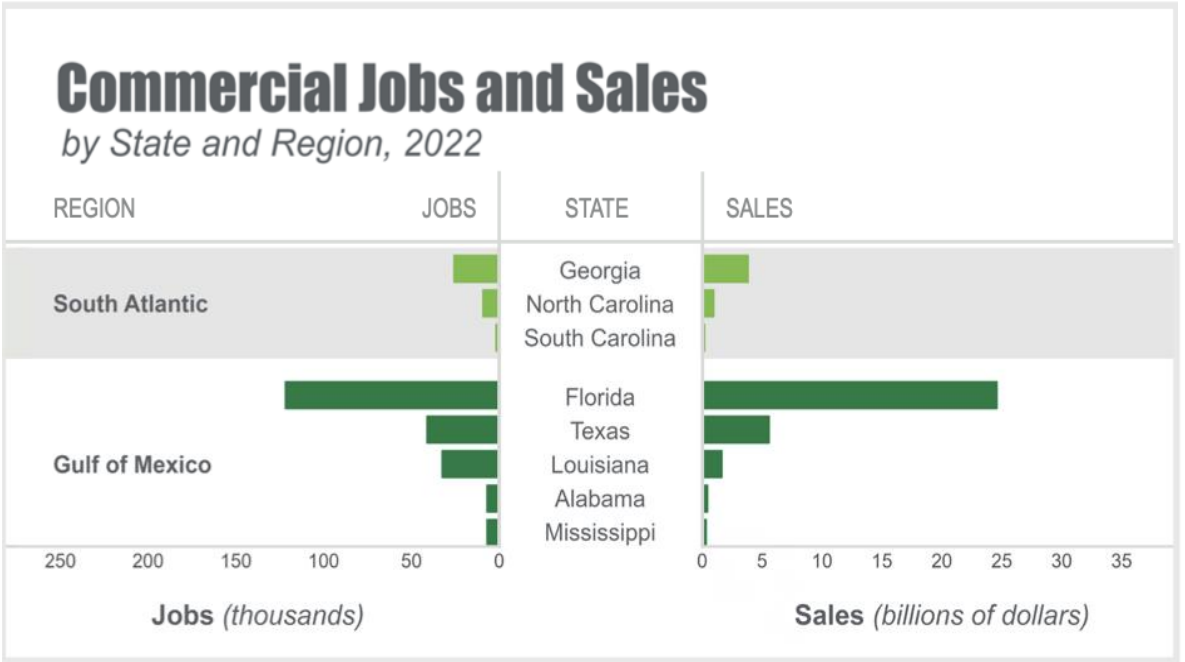
Number of Point Source Pollution Locations	
Airports (Private, Public, Commercial)	*1,270*
Facilities with Wastewater Treatment	*4,100*
Military Installations (Active)	*20*

OurAirports. Airports. https://ourairports.com/countries/US/FL/.
FLDEP. *General Facts and Statistics about Wastewater in Florida*. April 20, 2022.
VeteranPCS. *What military bases are in Florida?* January 4, 2025.

Non-Point Source Pollution (acres)	
Agricultural Land Use	*9,700,000*

Services, F. D. of A. and C. *Florida Agriculture Overview and Statistics / Agriculture Industry / Home - Florida Department of Agriculture & Consumer Services*.

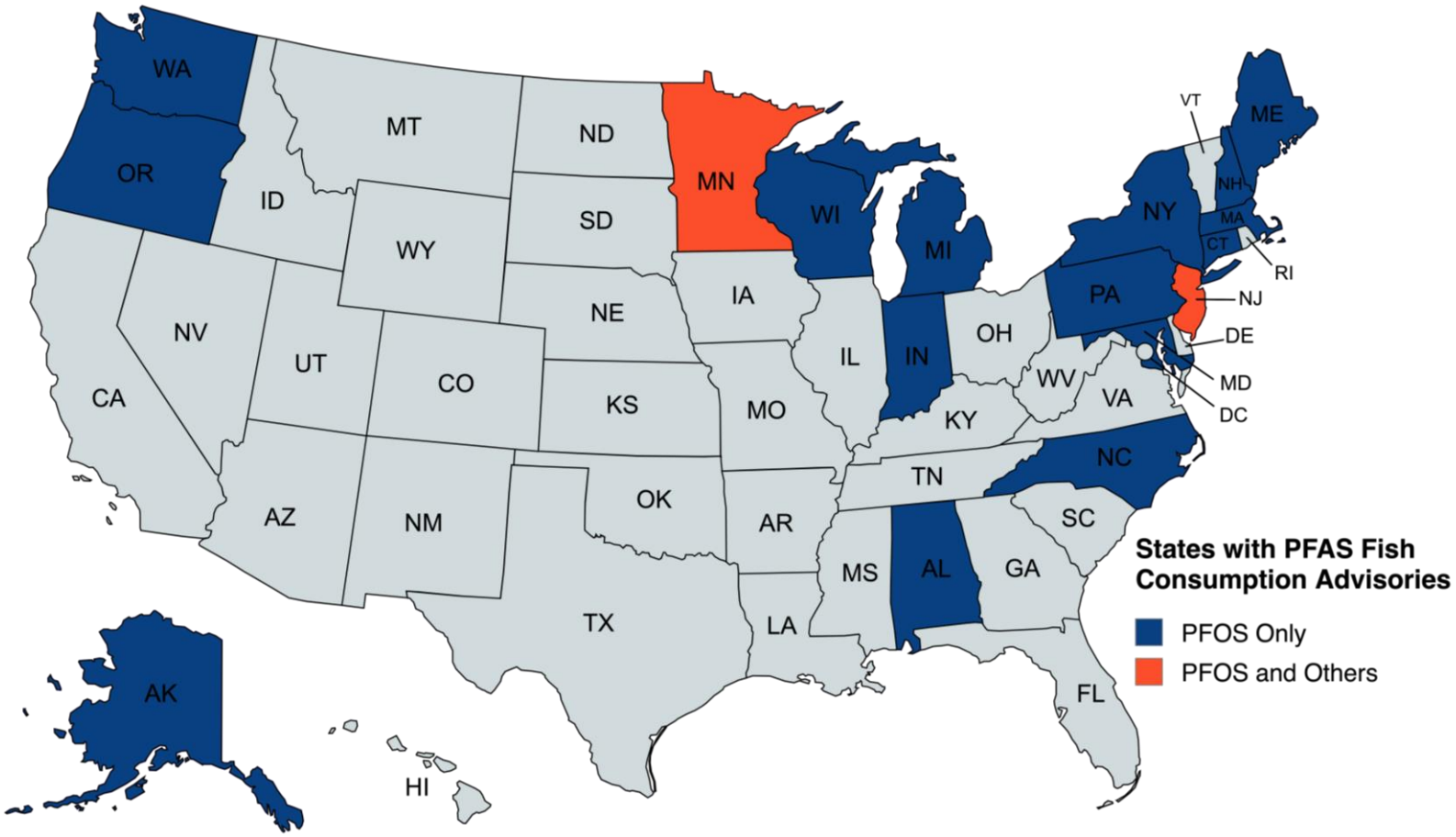
Fisheries Economic of the United States 2022



"*Florida generated the largest employment impacts in the **Gulf of Mexico Region** with 121,710 full- and part-time jobs. Florida also generated the largest sales impacts ($24.6 billion), value-added impacts ($8.2 billion), and income impacts ($4.6 billion).*"

-National Marine Fisheries Service. 2024. Fisheries Economics of the United States, 2022. U.S. Dept. of Commerce, NOAA Tech. Memo. NMFS-F/SPO-248B, 28 p.

State Assessments of PFAS in Fish



- Florida
  - Suggests to just not eat fish from contaminated water
  - No state consumptions advisories

Exposure to PFAS

You can be exposed to PFAS by:

- Drinking PFAS contaminated water.
- Eating foods produced near places where PFAS were used or made.
- Eating fish caught from PFAS contaminated water.

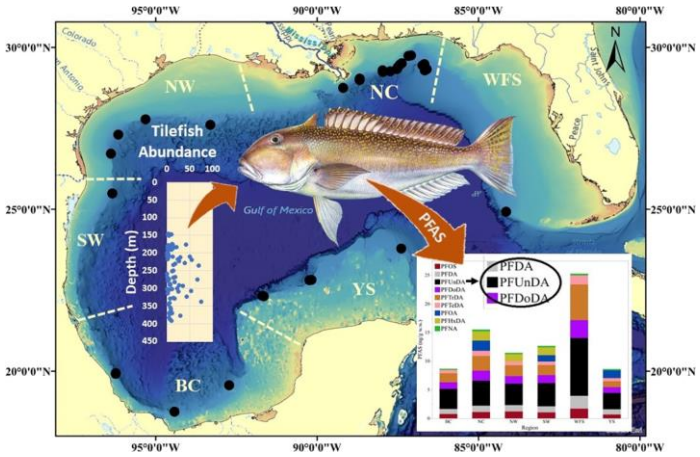
Map created via MapChart

PFAS General Health Information,Florida Department of Health Bureau of Environmental Public Health

Florida Fish Literature To Date

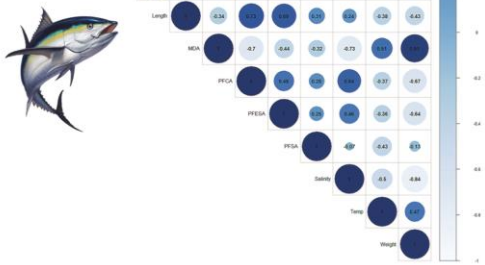
Detection of long chain *per*- and polyfluoroalkyl substances (PFAS) in the benthic Golden tilefish (*Lopholatilus chamaeleonticeps*) and their association with microscopic hepatic changes

Erin L. Pulster [a,1], Amanda E. Wichterman [b,1], Susan M. Snyder [a], Susan Fogelson [c], Bianca F. Da Silva [d], Kaylie A. Costa [d], Joe Aufmuth [e], Kristina L. Deak [a,2], Steven A. Murawski [a], John A. Bowden [d,*,3]



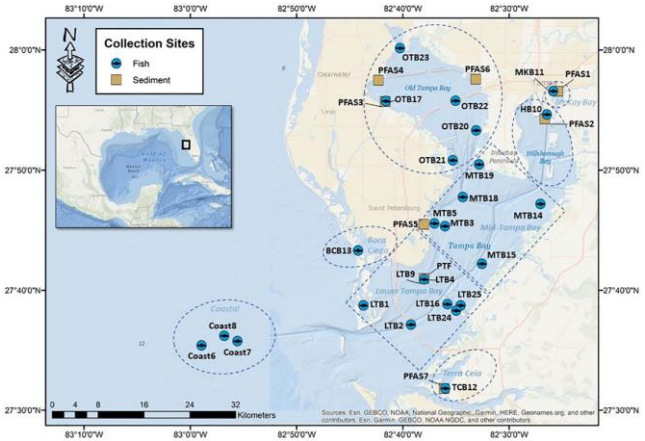
Bioaccumulation potentials of per-and polyfluoroalkyl substances (PFAS) in recreational fisheries: Occurrence, health risk assessment and oxidative stress biomarkers in coastal Biscayne Bay

Olutobi Daniel Ogunbiyi [a,b,*], Leila Lemos [b], Richard P. Brinn [c], Natalia Soares Quinete [a,b,**]



Assessing per- and polyfluoroalkyl substances (PFAS) in sediments and fishes in a large, urbanized estuary and the potential human health implications

Erin L. Pulster [1,2*]



- Determine PFAS levels in 600+ samples (SWFL)
- 16 Invasive Species
  - 8 commonly eaten
- Skin on versus Skin off
- Consumption Advisory

- Determine PFAS levels in 4000+ samples
  - 86 saltwater species
  - 14 Coasts/Regions
- Samples from Crowdsourcing

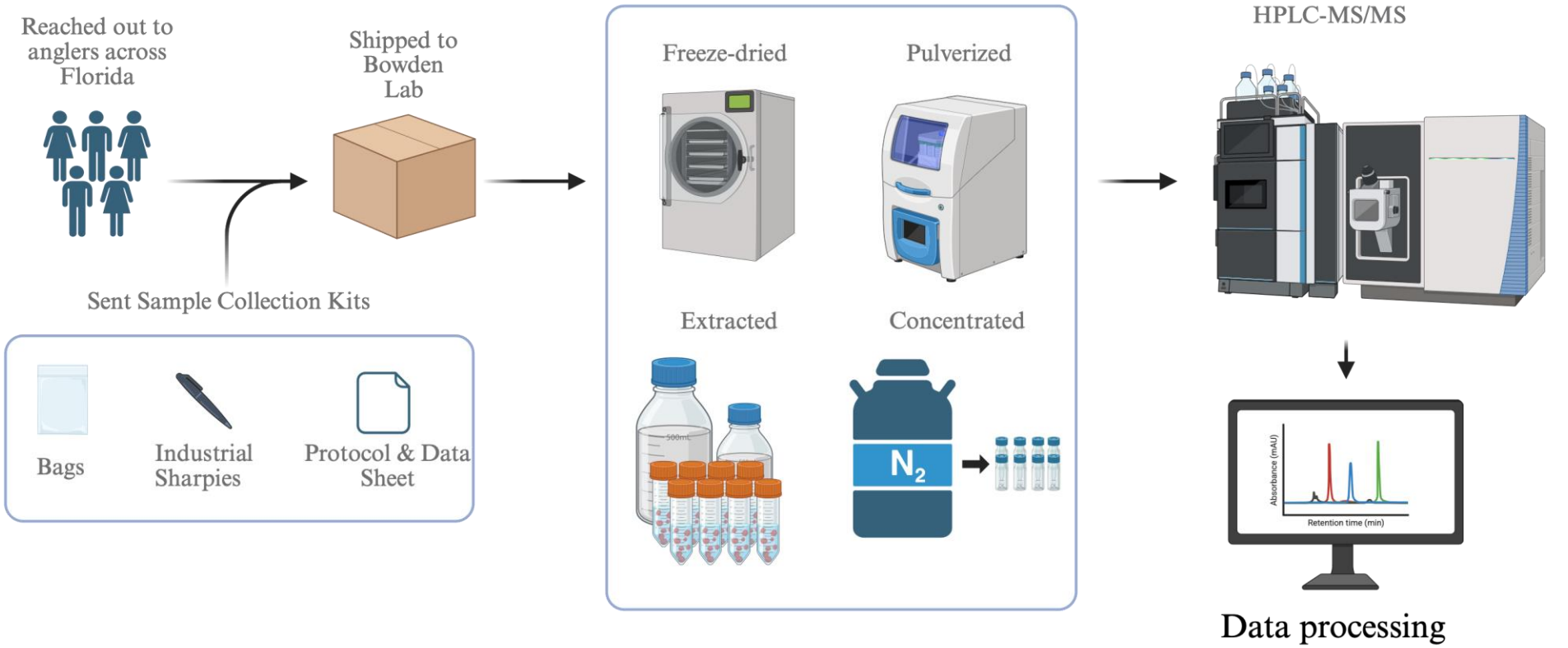
- 45 species with Risk Assessment Potential
  - 13 species with robust data sets for assessment

- Collection is still open for:
  - Gulf Flounder
  - Southern Flounder
  - Mahi Mahi

Current List of Species and Quantity

Almaco Jack	18	Black Margate	3	Cobia	5	Gray Triggerfish	49	Irish mojarra	9	Lookdown	1	Queen Triggerfish	1	Sailor's Choice	6	Silver Jenny	3	Striped mojarra	15	Whitespotted Soapfish	1
Amberjack	8	Black Mullet	10	Common Snook	319	Graysby	14	Jolthead Porgy	5	**Mahi Mahi**	**2**	Rainbow Runner	1	Sand Perch	6	Silver Perch/Silver Croaker	241	Striped Mullet	15	Whiting	1
Atlantic Croaker	18	Black Sea Bass	108	Crevalle Jack	38	Greater Amberjack	26	King mackerel	3	Mangrove Snapper	124	Red Drum	283	Sand Seatrout	11	Slender Sharksucker	3	Sword Fish	2	Yellow Jack	1
Atlantic Spanish Mackerel	4	Bluefish	5	Dog Snapper	1	Greater barracuda	36	Ladyfish	12	Mutton Snapper	17	Red Grouper	29	Sand Tilefish	1	**Southern Flounder**	**17**	Tomtate Grunt	280	Yellow stingray	2
Atlantic Tripletail	**6**	Blueline Tilefish	1	Florida Pompano	29	**Gulf Flounder**	**5**	Lane Snapper	93	Northern Red Snapper	454	Red Hind Grouper	2	Scamp Grouper	19	Southern Kingfish	9	Vermillion Snapper	403	Yellowfin mojarra	27
Banded Rudderfish	18	Bluestriped grunt	23	Gafftopsail Catfish	5	Hardhead Catfish	5	Largehead Hairtail	1	Permit	2	Red Porgy	30	Sheepshead	294	Spottail Pinfish	3	Wenchman	3	Yellowtail Snapper	3
Big Eyed Snapper / Torro	4	Bonefish	28	Gag Grouper	18	Hogfish	10	Lionfish	122	Pigfish	11	Remora (family)	19	Short Disk Sharksucker	1	Spotted Sea Trout	193	Western Atlantic Seabream	37		
Black Drum	51	Checkered Puffer	3	Golden Tilefish	28	Horse eye Jack	3	Little Tunny	16	Pinfish	210	Rock Sea Bass	11	Silk Snapper	7	Squirrel Fish	1	White Grunt	15		

Laboratory Workflow



Sample Collection

1. Contacted Fishermen, Charter Fishing Operations, and Seafood Market
2. Shipped sampling kits to all interested parties.
3. 0.2-0.3 g samples collected from the dorsal tissue of the fish species. Collectors then shipped frozen samples back to our lab.

Extraction

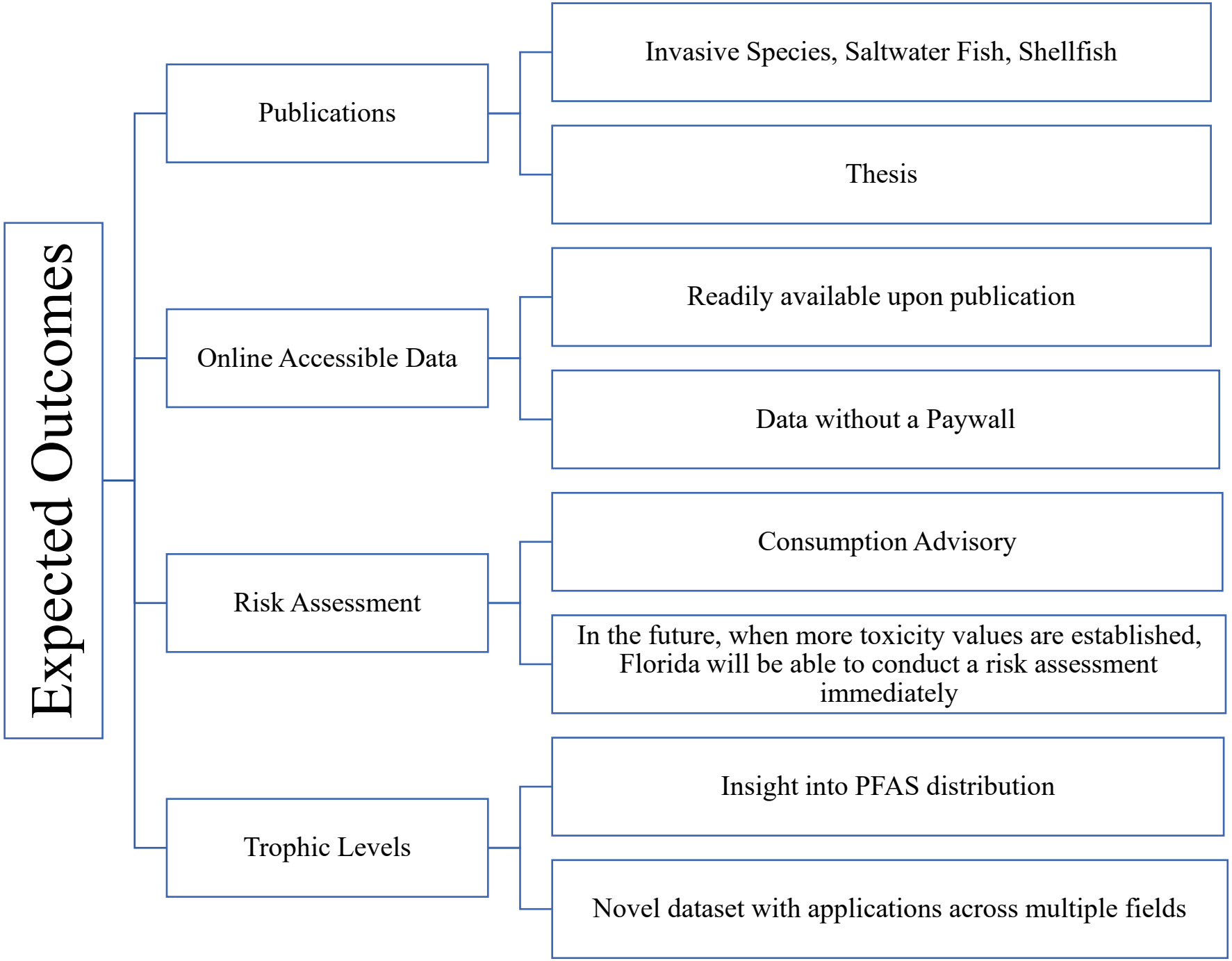
4. Samples are freeze dried
5. Steel balls are added to the sample and then shaken at 1800 rpm to turn the sample into powder
6. Solvents are added to the sample to extract the PFAS
7. The remaining sample is reduced and reconstituted in Methanol. Samples are ready for analysis.

Analysis

8. Samples are loaded into the HPLC-MS/MS
9. Once the samples have run, the data processing begins.

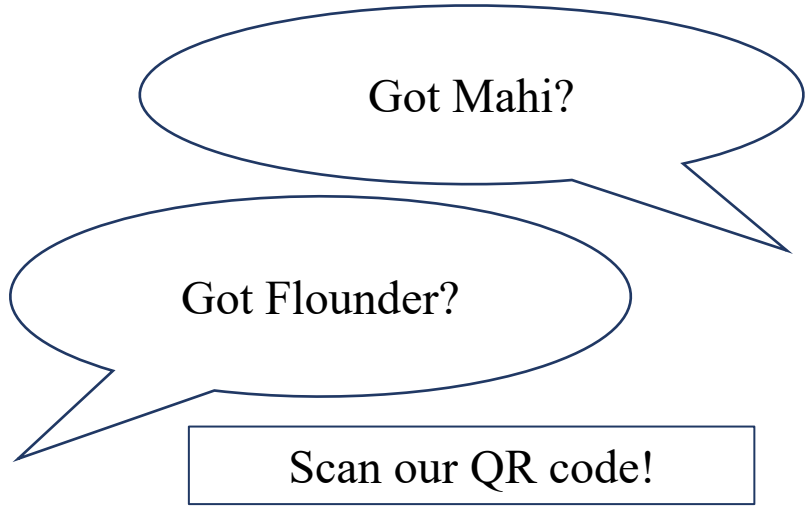
Future Direction

- PFAS in Florida Shellfish
  - Targeting shellfish due to its wide consumption and proximity to sediment
  - Currently in the collection phase (2025-early 2027)
  - Certain species need sample sets from their east and west coast populations
  - Florida Species of Interest:
    - Shrimp
    - Crab
    - Lobster
    - Oyster
    - Clams


Expected Outcomes
Publications
Invasive Species, Saltwater Fish, Shellfish
Thesis
Online Accessible Data
Readily available upon publication
Data without a Paywall
Risk Assessment
Consumption Advisory
In the future, when more toxicity values are established, Florida will be able to conduct a risk assessment immediately
Trophic Levels
Insight into PFAS distribution
Novel dataset with applications across multiple fields

Thank you!

- Volunteer Sample Collectors make our studies possible!
  - If you are interested:
    - Sample kits
    - Protocols
    - Data Sheets
    - Free shipping with our FedEx account



Florida Fish
www.bowdenlaboratory.com

Questions or comments, please email Dr. Bowden at john.bowden@ufl.edu

Thank you

UF UNIVERSITY of FLORIDA