Get to Know Emerging Drinking Water Contaminants - Per- & PFAS Substances
Client: University of Southern Maine
Using Software Platform: Karasch portal
Getting Audio From: Karasch portal
1:00 PM –2:00 PM
3/3/2022
Karasch
Captioned by: Rebecca Moore

>>: Hi, everyone! On behalf of the South East New England program into the New England Finance Center, welcome to our program on thinking water contaminants brought to you by Weston & Sampson.

I will be assisting logistics for today's program along with my colleague from Syracuse University.

A few housekeeping items: Everyone will be on mute to guarantee audio quality.

You can ask questions by typing them into the Questions box.

We look forward to answering questions so please type them in at any time.

You can request a Certificate for attending the seminar.

Information on how to do so will be available in a follow-up e-mail after the webinar.

Closed Captioning is available for today's webinar.

Just click the Closed Captioning button on the link.

In the control panel, the presentation is available for you to download.

A little bit about SNEP Network.

Here is a map.

[POINTING TO MAP]

SNEP’s mission is to achieve healthy water ships, long-term climate Resilience through Management of stormwater and restoration projects.

We focus on building local capacity through training and webinars in the region.

If you want to learn more, visit our website SNEP Network .org for more information.
On that note, I would like to hand things over to Tessa Clark.

>>: Thank you so much Leah.

It is my pleasure to introduce Steven LaRosa who is a Team Leader at Weston & Sampson who focuses on restoration and redevelopment of hazardous materials.

2015 has been one of the phantom scientists in the emerging contaminants group and has investigated many PFAS levels of impact throughout New England with all kinds of tools.

Steve is an excellent science communicator and has presented to various audiences including the Business Council working extensively across sectors in the southeast- Northeast.

You want to quickly ask attendees about how you are feeling about PFAs.

Please insert the poll question that you are about to see.

[POLL]

I will set you up as a presenter.
Are you concerned about PFAs and PFOAs in your watershed?
Nobody is not concerned.
It will be interesting to see how we move forward on our discussion today.
Are you able to see the "share screen."?

[TECHNICAL DIFFICULTY]

>>: I think we are in good shape here.

Can you see the screen?

>>: It looks great tend to welcome, everybody.

It looks like from our poll that people do have concerns regarding PFAS.

I would like to talk to you about some of the general aspects of PFAS.

Where do they come from?

Why should we be concerned?

Then we will go over some case studies.

One is for a small drink water system in Rhode Island and another is for a wastewater treatment and a collection of wastewaters is and what PFAS are in those.

I will end with what is out there primarily in Massachusetts.

There are some resources there to look at these particular compounds but you will see that we are in a state of flux.

I'm hoping that we will have 15-minutes or so where we have question-and-answer and talk more generally about what folks have 4 concerns.

You will see what these PFAS are and why we should care and what the regulatory status is right now and then take a look at our ACES.

[REFERRING TO SLIDES]

What are PFAS?

* Per and Polyfluoroalkyl substances.

[REFERRING TO SLIDES]

Chains of molecules that are fully fluorinated at all of the locations that a carbon can be bonded to except for one or more of the carbons at the end of the chain who have a functional group on them.

These compounds are synthetic.

They are pretty much only ants made.

There may be 1 or 2 that occur naturally.

Think of these as completely man-made products that are really good at their job.

They are oil resistant, water resistant, chemical resistant, heat resistant.

They are great at what they do.

Because of that, you may have heard of PFAs referred to as "forever chemicals"

(1) Perfluorinated

(2) Polychlorinated.

Perfluorinated have just 1 competent- carbon at the end and these were used as surfactants and you can see on the right that you have one and likes to be in water and one and that likes to be in air or oil.

They are charged differently on each end of the molecule.

They have a tendency to align themselves on the surface of things and that is what makes these great surface coatings.

Polyfluorinated compounds have more than that 1 carbon impacted in that long chain. in this picture, on the left-hand side of sulfur and nitrogen we have some other

compounds which allows from an abiotic and biologic breakdown to occur and use Polyfluorinated compounds get broken down until you have a Perfluorinated compound which is terminal and permanently going to be that Perfluorinated compound and we show with these arrows that there is a way to break this down into one of the most used Perfluorinated compounds PFAs.

There are thousands of possible combinations of PFAs and this shows some of the different classes of PFAs such as Nonpolymers and Polymers PFAS.

Non-polymers PFAS- you hear about these most in the news and to hear about them being used in the firefighting foams used on Air Force bases or with chemical fires and that is where the Per and Polyfluorinated compounds live.

[REFERRING TO SLIDES]

There are various families and you can envision them as complex, straight chain carbons, branch chain molecules with a lot of different things going on.

Then we have Polymers on the right-hand side and those are more things like Teflon which are huge, huge molecules that are 8- 900 carbons in their chains that are very, very stable and are kind of like the Perfluorinated substances in that they do not react and they do not change in their makeup for the most part.

I will get to why I am saying that with these compounds in a little bit.

But those are the main 2 PFAS.

[REFERRING TO SLIDES]

There are a lot of great names here but it is the acronym that is really important.

[REFERRING TO SLIDES]

PFBA.

PFBS.

And there are a number of them.

His full list represents or- and carbon straight chain PFAS and we have all of these different options for what the chemical makeup is and you can imagine that there are thousands of combinations of these.

[REFERRING TO SLIDES]

This is why we are concerned about them.

[REFERRING TO SLIDES]

Firefighting foams, stain resistant carpets, the bottom left is the Denver airport and you see those structures there which are toted fire glass- fiberglass cloths and they were made using PFAS oil-proofing pizza boxes.
Your some more photos of items.
There are 2 major uses of PFAS that have impacted the environment
(1) Firefighting control phones, and commercial industrial products where it is not the PFAS that are the primary part of the product like the foams but they are used to enhance the product such as waterproofing of fabrics on paper, cleaning products, pesticides, waxes.
Anywhere that is a coding and it is water or oil proved, these things have probably been used

Where is that?
Airports.
Air Force Bases.
Naval Facilities.
Firefighting Academies.
Manufacturing Facilities.
Wastewater Treatment Facilities.
Landfill Leachate.
When containers get thrown away.
Release Sources.

[REFERRING TO SLIDES]

Wastewater Treatment Facilities and these nontraditional redistribution methods that are disposal fields and irrigation wells and land applications.
These are complex things to think about so we have come up with a graphic to try and let you think about where and how these things get moved throughout the environment.

[REFERRING TO SLIDES]

Industry uses PFAS and she may see it come out of the stacks and they may have product that can go to landfill and maybe they have discharges like wastewater that goes to the Wastewater Treatment Plant or out to a river.

If industry makes a product, goes across to your home, you use it, get exposed to it, and some of that material will wash off in the laundry.
What goes into your body can't come out of your body and go to the Wastewater Treatment Facility.
These do not get broken down but get past through and may discharge into surface water and may get absorbed into the sludge at a Wastewater Treatment Plant and then go to the landfill.
You start to see how PFAS can move through the environment and your community.
One other thing from a Wastewater Treatment Facilities would be biosolids witches when sludge processes and the pathogens get taken out and you have a great organic product that is left over that has been used for years and years as fertilizer and can be used as fertilizer on farmers' fields or sold as a commercial product for compost and that gets used on plants and can cycle back into your home.
This graphic is something that I want you to keep in the back of your mind as we think about help pervasive PFAS are and how they may impact your environment.
That is your chemistry lesson and we will now move on to toxicology and how these things are being regulated.

[REFERRING TO SLIDES]

From a toxicology standpoint, with thousands of compounds, we do not know what the toxicology of every one of them is.
We do know pretty well what the toxicology is of one of the most frequently used and those often found in the environment and they get broken down into compounds that are from the 4-10 carbon chain links.
There are some others such as genetics that you may have heard of being used as a replacement for historic PFAS.
That is a little more complicated in its makeup but it breaks down to these Perfluorinated, permanent kind of compounds.
So, we have limited toxicology, we have seen links with diabetes, some cancers, weight gain and.

[INDISTINCT NAME]

Which is an 8-chain product that has been indicated as a likely carcinogen and we have

PFOS which is the sulfonate compound got used in the association with cancer.
There are developmental, systemic, and reproductive impacts.
These compounds are very, very stable and they will have a tendency to bio accumulate and a lot of different animals and even implants in us, it relates in the bloodstream and it will stay there.
For months to years before it is excreted.
Bioaccumulation is the issue.
When you get exposed, it is not like being with somebody who is spray painting furniture where if you leave the room, you are no longer exposed and the compounds get released from your body.
If you stay there for much longer and that is what increases your exposure over time even though you are seeing very small amounts.
The EPA has a lifetime health advisory for 2 of these thousands of compounds and they have come up with an advisory and drinking water with of 70ng/L.
Nanograms is an interesting point of measurement but the way to think of it is nanograms per liter is per trillion so if you have one gallon of PFAS then you would have a trillion gallons of water that would add to it to get 1 part per trillion.
It is a very, very small amount.
The EPA will look at it and I will not go through the gory details of how they figure this out but they basically, come up with an amount per kilogram per pound of body weight per day that you can take in over your lifetime and not have an increased risk of one of these health effects.
Where they landed was that you can drink water for 70-years at 70ng/L and it's not increasing your risk of some disease due to PFAS.
This assumes that 20% of what gets into your body comes from drinking water.
So, all of those different levels of mass and up at this very low concentration.
Health Impacts.
* Bio accumulates.
* Ubiquitous- found in blood of polar bears, Penguins, the ice in Antarctica and the Arctic due to its pervasive use and permanence from when it gets into seawater or the air since it does not break down and it goes wherever it does and deposits into those

places.
So, drinking water is the highest risk of what you are intaking.
PFOA/PFOS have been dropped out of production.
Unfortunately, the replacement compounds are some of those thousands down pollutants of PFAS.
What we are seeing is PFOA/PFOS concentrations in blood serum are decreasing once exposure is stopped.
The substitute PFAS such as the smaller train one are increasing.
We have these great compounds that are bad for us but these replacement compounds seem to be being used an equal mass and we do not really know toxicity is.
Where do we see these things?
What are the regulatory environment right now?
[POINTING TO MAP]
You can get this on the northeastern University website because they have a great PFAS website and what you can see here is all of the public drinking water wells that have PFAS in them.
This does not mean that it exceeds to the health advisory or the maximum concentrations but this is where these compounds are present and as you can see, it is everywhere.
There is not a lot of industry might be discharging these.
Maybe around Providence or Warwick we might say that they are industrial areas and that is why and they are being impacted but no- it is in the public drinking water supply.
So, we are looking to the EPA as to what our safe levels.
The EPA has an arduous methodology to come up with what a safe level is intriguing water and getting that regulation out into the world.
Unfortunately, there is not a federal limit.
There is an advisory but not a regulatory.
They have put up advance Notice of proposal.
Not for a drinking water standard but they are considering making PFOA, PFOS, and the Gen-X which is the most popular replacement compound and PFBS and they are thinking about letting them enforce the release and use these compounds and they are

looking at having all public water supplies sample in the next two-years for 29 additional PFAS.

So, they are starting to work but they do not have the nice regulation that will be brought to bear on water systems.

What happened states have picked up the torch and they are regulating PFAS on their own and as you see with this table.

[REFERRING TO SLIDES]

There is a lot of different ways to do that.

Vermont, for instance, uses a sum of 5 PFAS at 20 parts per trillion.

Connecticut: 70 parts per trillion.

Rhode Island uses the EPA Health Advisory that is to compounds is 70 parts per trillion.

So, you can see it is "all over the board."

This is a real concern for those of you out there with drinking water wells who have clients and users or for those of you running wastewater plants.

Are these concentrations but we need going out of our plants?

Who will regulate that?

It is state-by-state right now which makes things really difficult.

EPA has put out a strategic map of how they are going to regulate these compounds.

Right now, and drinking water, it is the EPA driving the Bus.

The EPA has been trying to come up with a safe drinking water level a little over 10-years now for PFOA and PFAS but I am not sure they are going to get there.

Determining what the concentrations are that are safe from an analytical testing and who is regulating what standpoint is confusing.

One thing that will drive regulation and where you need to spend money with PFAS.

[REFERRING TO SLIDES]

Public water supply- are PFAS concentrations going up? Down? Staying the same?

When those regulatory come into your state, what will happen with Wastewater Treatment Facilities?

Once the States have an idea of who is shrinking what, they will look at Wastewater Treatment Facilities and what are they releasing into our surface waters? What are they doing with biosolids? What about Landfills? They are analyzing hazardous

waste sites and they are looking at levels of closure and what we need to require folks to do and these are the priorities that states need to take.

Dealing with it, treating it.
I would go to the slides.
You cannot destroy these compounds easily.
They have to be absorbed onto another media and that media has to be disposed of somehow.
Radio activated carbon- these get stuck onto that he will and the same with.
What does one of these systems look like?
You have Booster Pumps that filter out sediment, soften the water and do some of the removal and resins and often times radioactive carbon is used to polish and make sure that you are at 20 or 10 or 5 part per trillion concentrations when you bring your water out through the Distribution system.
That is water treatment.
Wastewater ...
I bring this up because for you folks, this is the next real concern and it is something that will be a very difficult problem for us to get our hands around and resolve.
Wastewater plants do not do a good job of removing PFAS.
The actually increase the amount of Perfluorinated compounds that you see being discharged.
They take those Polyfluorinated compounds, the ones that can be degraded because they are all about biologic growth and degrading nutrients and using them as a food supply.
You actually see in this graph.

[REFERRING TO GRAPH]

The Influent Concentration of Perfluorinated compounds is below 20.
But when those precursors or Polyfluorinated compounds go through the treatment system, you suddenly see a much higher-concentration and what is going into the surface water.
in a community that uses surface water for drinking water, what happens if you are

downstream?
You start seeing at concerning levels?
If you have sludge at your Wastewater Treatment Facility, where are they going and how are they impacting your community?

Let's look at case studies and applicability.
You folks in Rhode Island probably familiar with the Burrillville site.
Have their water system sampled by DPH in Brown University a number of years ago when they went around to 38 water systems- small water systems that had not been sampled according to EPA regulations.
Sample them because they looked like they were near facilities that may have released PFAS and in Burrillville, they had a bedrock well that had greater than 100 parts per trillion PFOA & PFOS.
This is an Rhode Island and they are just regulating to the 70ng/L.
So, the immediate response, when they found that concentration is they went out and told the users of that water system, of which there were 34-35 homes that were served and they started making Springwater deliveries for their drinking water.
All of the private water supplies were sampled and they had a lot of great public forms to keep folks in town aware.
They looked at the feasibility of a neighborhood treatment facility of the neighborhoods being served and these wonderful things happened within a week of finding the elevated concentration.
We were brought in to try and find the source of contamination and to help with some of the drinking water sampling of the private wells.
To try and figure out what the source was and the extent of the contamination.

[REFERRING TO SLIDES]

This is a busy map but, in the purple, is the well for the Oakland water supply.

[REFERRING TO MAP]

The main road you see near the well is folks who were served by it.
in the yellow squares, you see potential sources of the PFAS being found.
To the right, there was a former mill that made textiles and that had a very large fire.

They've very well may have used PFAS and PFAS may have been put on the fire in the form of foam.
There is also a very small Fire Department.
That is a new facility and although they stored it there, they never performed any mock responses or tested their equipment at this new facility.
They have not put foam on the ground here.
And there are other industries in the area so we had to put on our thinking caps to discover the source.

[REFERRING TO MAP]

This shows the private water sources in the area.
The Public well is farthest right in red and then you can see the Fire Department well in red.
Red is bad, green is good.
This contamination seems to be centered around the Fire Department and then going to the North of the page.
So, we put in monitoring wells and did quite a bit of work.
Looked at the bedrock water which is where the wells are getting their water and the water that deposits in the Spring.
From a red, yellow, green standpoint here.

[REFERRING TO MAP]

We see the contamination in the shallow part of the aquifer is going down towards here.

[POINTING TO BOARD]

We determined that the Fire Department actually has a drain that goes to a leach field on the property.
The residual would be rinsed out when they came back from an event and that would go into a leach field.
There was bedrock under the leach field that happened to be only a few feet under this and so it was strong directly into this and affected the bedrock wells comma.
There was public water supply and all of the homes on this map even the ones with the clean drinking water wells, were added to the water supply and they are now being supplied water from a clean source that is remote to where this happened.

I like this Case Study from the standpoint that this is a very small community and it was a very small source.
There was a lot of talk about the industrial facilities who could have been the source of the bedrock contamination and there could have been acres and acres of impacts but come to find out, we had one small drinking water well that was near a very small release and unfortunately, is swelled to a point where it needed to be abandoned

The next Case Study is about Wastewater Collection System Assessment.
You wanted to look might be discharging into and bringing it to our Wastewater Treatment Plant and then we would have biosolids and such that were impacted and we wanted to see if we could get these folks to not use PFAS so we could have a safe, biosolids product.
Here is an example of an industry resampled.
Every industry in town coordinated with us and allowed us to take samples.
What we did is we sampled at a number of different locations throughout the community.
This actually happened in Vermont which should be obvious by the guy in the field wearing a tie-dye shirt.

[LAUGHING]

Here are some of the results.

[REFERRING TO GRAPH]

And we see Influent, effluent, from the Polyfluorinated break down.
Then we went into the Cascade Street which is residential.
Pearl Street- commercial such as the carwash, grocery stores and then we had Susie Wilson Road, also commercial.
Industrial one PCP and Industrial 2 and Industrial 3 which was a valve company.
So, it looks like the industry must be the culprits that must be what is feeding the concentrations.
The concentrations are only 1 part of the story but the other part is how much flow is coming into these concentrations.
When we look at just the Perfluorinated compounds.

[REFERRING TO SLIDES]

Envision this as a map of the town and appear, where there is Rogers Road (this is a different town) - Rogers Road is a residential area and you can see the size of the circle is the concentration of the compounds.

Pump Station 3 is a residential.

The North Sector is industrial and Pump Station 9 is commercial.

When we think about concentration and flow, the number of mass input, the number of pounds per day input of PFAS, these upper ones that are in residences, put in much more of the mass then the Industrial/Commercial areas.

They may be higher-concentration in the North Sector but they do not discharge very much water so your Wastewater Treatment Facility sees a mixture of all of that.

So, it was very counterintuitive.

The industries did not give us the Perfluorinated compounds that we thought we might see so we looked at the Polyfluorinated compounds and we saw something very different there.

The very residential side of things put in a lot more mass of these Polyfluorinated replacement compounds into the system than the industries did.

The industries put in more than the Perfluorinated but is still did not match up and Pump Station 9 is "commercial row": Restaurants, carwashes, and they have a pretty large mass as well.

This tells us husky as we look at how we get fewer PFAS to come out of wastewater treatment plants.

It may not be industry that is feeding it but you and me as we wash our clothes.

The soaps and waxes at the carwash, a lot of study needs to go on.

A lot more case studies need to go on.

It is indicating that it may be more than just going to ABC Carpet Manufacturer and asking them to no longer use PFAS or change how they are discharging water that may be needed to reduce what we see in our Wastewater Treatment Facilities and thereafter in our surface waters.

The training courses on PFAS go on for days at a time.

I tried to give you as much as I could and one-hour.

Here in Massachusetts, I was able to pull up a lot of resources.
My apologies for our Rhode Island friends.
You can go to the DEP websites to see what is out there for resources.
Massachusetts, we have the PFAS response program.
The applications are due in February and they have provided millions of dollars for folks to respond to PFAS and their Public water supply.
The Clean Water Trust provides a revolving loan Fund, the SRF which a lot of municipalities use have $176-million monies for PFAS response as well as COVID response.

[REFERRING TO SLIDES]

Go to mass.gov and type in PFAS.
If your concern is an individual and would like to see a private well sample, they are doing that for a number of residences.
You can get on the website and asked to see a sample and they will come and do that for free for you and provide you with the results.
We did not get into the complexities of sampling and analysis.
I could give you an 8-hour class on how difficult it is to sample water or a soil or even your shirt and try to come up with a concentration in the part per trillion level that is accurate.
Do get onto the MassDEP and the Rhode Island Department of Health and Department of Management websites and they can talk to you about what's being done and how you can get some assistance with regard to addressing these things.
In terms of websites, the ITRC is a fantastic resource and a tremendous resource to tell you everything you want to know about PFAS.
The Northeastern University PFAS Project is excellent is fantastic.

I want to end with this graphic.

[REFERRING TO SLIDES]

These compounds are pervasive.
Studies in Vermont and Michigan have shown that these are everywhere.
You can go into undeveloped underused green mountain forest and find PFAS and

those soils and virgin, untouched areas and this is why they are so pervasive.
They are permanent.
They do not break down.
We just recycle them by various methods in our environment.
Keep that in mind are thinking about your watersheds, when you are thinking about development and where would be a good place to put a new park and how you will get water to our new low-income area or for irrigation for firms.
PFAS are things that we need to think about.
With that information, I am more than happy to take any questions that you may have or try to explain something that I didn't not do so good a job with (speaker is muted- no sound).
We cannot hear you, Tessa.

>>: I am so sorry about that!

All I have said, so far is to check the handout session for the PDF because we saw that if you have you asked about it in the Questions box.

Go ahead and click "handouts" if you are interested.

I am so sorry, Steve.

Now onto questions.

Thank you, so much for that! incredible overview.

Incredible to think how complex this is.

The first question is about.

[INDISTINCT TERM]

>>: It is looking- being looked at great detail as it is very high carbon and I think it is more efficient and granular activating carbon to grab the PFAS and then you can take the biochar and dispose of that.

>>: Awesome and that draws us into the idea that it is a cheaper option.

>>: It very well may be.

>>: Other questions from other New Englanders about information for Maine and New Hampshire.

I think you saw these PDF and that would answer your questions.

>>: New Hampshire has low levels and they have done a tremendous amount of

sampling.

They have a great website for their Department of Environmental Services and if you type in PFAS, you can see all that they have done for the State.

>>: Awesome.

We have people from watershed councils, drinking water systems, Local Government systems on the call today and we know these contaminants are essentially in every community.

Do you have any advice for local and municipal governments who have not yet to address these issues what they may expect to do?

>>: I think for anyone who has public drinking water supplies, the water quality would be of concern.

Or if you have a Fire Department or on-site wastewater disposal that is soil-based, take a look at the water quality.

If it has not been sampled for PFAS, they will get to you.

Every public water supply in all New England states will be sampled by the end of this year if they have not been already.

The next thing that will come will be wastewater biosolids sampling and determining how that will be managed in the future.

The third 1, if you have a "town dump" it is likely that you are having leaching is come out of that which have PFAS and he will want to see if you have drinking water supplies near there.

>>: I think some of us probably do and in New England, we have a lot of water with our lakes and rivers so anyone with the septic would be extra motivated to get that checked out.

We know that there has been a lot of talk from the Federal level given the impending streams of funding available through the Coronavirus Relief, Bipartisan Infrastructure Bill, Emergency Rescue Plan- we know this will be a priority for the Federal Government so how can communities ensure that they will get funding?

>>: That funding is being huddled through either the State agencies like the Department of Environmental Services, anyone dealing with the water system folks.

A lot of municipalities are used to getting their money is piece way.

If you have Regional Planning Commissions or Community Planning, County Planning Commissions and those types of agencies will also get some funding.

Primarily for site assessments, site cleanup.

Infrastructure wise, I would look at revolving loan Fund methodologies which is what I am hearing most states use as their mechanisms.

>>: With that, I want to thank you all for joining us.

There will be a survey that pops up for you after you take- after you close out of the webinar.

Please let us know what else you would like to learn or any further questions for Steve.

Steve, any closing comments?

>>: I wish I was bringing better news but keep your eyes peeled as millions of dollars are coming along to help out with this in the near future.

>>: Have a great afternoon everyone! Thank you very much.

[ATTENDEES SAYING GOODBYE & THANK YOU]