BACKGROUND AND SUPPORTING DOCUMENTS on Starkweather sediment PFAS testing/results

Government agencies wouldn't test sediments

Since spring 2018, MEJO has asked the City of Madison, Dane County, PHMDC and DNR to test PFAS in Starkweather Creek water, sediments and fish, or ask Air National Guard to do so. Our advocacy eventually led the city to allocate funding for Starkweather testing; water and fish data was released last fall and winter. No sediment samples were tested.

In October, as we were planning Starkweather projects, we again asked agencies about sediment PFAS data. On October, 22, 2019, Jeff Lafferty, epidemiologist at Public Health Madison Dane County, responded to our questions. "After consultation with WI DNR and DHS," he wrote, "there is currently no sediment data from Starkweather Creek."

Lafferty went on to note that "based upon previous research at other sites…PFAS compounds are typically found in higher concentrations in the water than in sediment. Therefore, while no sediment data has been collected at this site, we expect the PFAS levels in the sediment of Starkweather Creek to be much lower compared to concentrations seen in water samples."[1]

Brynn Bemis from city engineering added, "We would love to have additional PFAS-specific sediment data," she said, "but in its absence, we must rely on the plethora of studies available on stormwater impacts to urban water bodies."

Studies on "stormwater impacts to urban bodies" unaffected by point PFAS sources, however, aren't the best predictors of levels of PFAS in Starkweather Creek sediments downstream of the Truax base, with documented high levels of PFAS in soils and groundwater. This 2016 study by the Air Force Civil Engineering Center, for instance, shows high sediment PFAS levels downstream of military sites that used AFFF.

MEJO shared this study with government officials but apparently they did not read it. On Feb. 8, 2020, when asked at a public meeting on PFAS in fish why Starkweather sediments had not been tested for PFAS yet, Lafferty's supervisor Doug Voegeli, Director of Environmental Health at PHMDC, repeated the same assurance to attendees: PFAS do not stick to sediments and are mostly found in the water. Also, he assured, people aren't exposed to sediments.

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[1] Lafferty went on to advise, however, that "Despite this information, the State and PHMDC would recommend any person wading in the water or touching the sediment at Starkweather Creek to wash their hands and avoid any unnecessary contact with sediments or other potential sources of possible PFAS contamination. Any potential exposure via dermal contact is a minor concern since PFAS does not easily enter the body via absorption through the skin. Therefore, our recommendations for your staff during this project would be to wash hands after wading in the water and/or touching the sediment. This would be especially true for younger children due to more frequent hand-to-mouth activity."
Lafferty's advice ignores a couple of key factors that could exacerbate the exposures: 1) People, especially children and teens, can have broken skin—cuts, scrapes, etc.—that could facilitate entry of the PFAS into the body; 2) there are few/no places to wash off near the creek other than public bathrooms at Olbrich Park (open only in the summer).

What do the Starkweather PFAS levels mean?

There are currently no standards for PFOS in sediments. How do Starkweather sediment PFOS levels compare to background levels in freshwater sediments—e.g., freshwater bodies not affected by point sources with high PFAS levels? We asked a UW environmental fate and transport expert, who advised that concentrations in Lake Superior would be "a good representation of background levels" and shared studies reporting PFOS levels in Great Lakes sediments.[2]

The highest level of PFOS we found in Starkweather sediments was 13-214 times the range of Lake Superior levels reported in these studies—and 55 times higher than our comparison sample.[3] A 2019 New Jersey study found no detectable PFOS in sediments in a freshwater reservoir chosen as a background site because there were no known PFAS sources nearby.

Our testing was limited—just five samples gathered along the edge of the creek, since that's what we could access and afford to test. If more extensive testing was done, it's likely that higher levels of PFAS compounds would be found in the creek sediments in Truax Field and downstream of it.

Sediment data also needed for ecological risk assessment—and to design remedial strategies

Assessing PFAS levels in sediments is important for a number of reasons beyond assessing risks from direct dermal contact or accidental ingestion—especially for ecological risk assessment.

According to Remucal (2019) "sorption to sediment represents one of the few losses of PFAS from the water column." Sediments then serve as reservoirs of PFAS, continuously releasing them into water. According to the Interstate Technology Regulatory Council (ITRC) fate and transport fact sheet, "[s]oils and sediments may act as secondary sources of PFAS to groundwater and surface water through leaching and percolation processes, respectively."

As previous scientific studies show—and MEJO's data support—sediments tend to store the longer chain PFAS compounds, which are currently understood to be more toxic than the shorter chain compounds (though a growing number of studies are suggesting that shorter chain compounds may be just as harmful).[4] "PFOS, PFOA, and other long-chain PFCAs," the ITRC fact sheet states, "are typically the predominant PFAS identified in surface sediment."[5]

PFAS compounds in sediments will eventually make their way up into benthic organisms, fish, throughout the aquatic food web and beyond. According to Bhavsar et al. (2016), fish take up contaminants from both sediments and water. Some fish also consume benthic organisms; Remucal (2019) notes at "there is evidence of increased concentrations of PFAS in benthic organisms." This is

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[2] See Remucal (2019)

[3] The UW professor summarized in an email: "The mean PFOS concentration in surface sediments increases from 0.1 ng/g (100 ppt) in Lake Superior to 0.45–0.7 ng/g (450-700 ppt) in Lake Michigan to 0.9 ng/g (900 ppt) in Lake Huron to 1.7 ng/g (1700 ppt) in Lake Erie." Bhavsar (2016) reported a background level of 1 ng/g (1000 ppt).

[4] See here and here and here.

[5] ITRC cites Rankin et al. 2016; Strynar et al. 2012

not surprising, since according to the ITRC, benthic organisms "act as the main component of the food web base and play a key role in the dynamics of biomagnification."

Birds also consume benthic organisms and take up contaminants from sediments; some studies suggest that sediments are more important PFAS exposures to birds than water. A presentation at the Battelle Sediment Conference in February 2019 state that "[f]or aquatic-dependent birds, "Sediment-associated PFAS, rather than water-associated PFAS, were the source of the highest predicted PFAS exposures, and *are likely to be very important for understanding and managing AFFF [firefighting foam] site specific ecological risks*." (highlights added)[6]

More testing needed to fully assess human and ecological health risks and design remedial strategies

Over time, anything that moves through the ecological food web usually ends up in human beings one way or another. Even if people are not exposed directly to PFAS in sediments or water, many people—especially those who hunt and fish for subsistence—eat fish, birds and other wildlife that may have ingested PFAS.

Knowing PFAS levels in sediments is also critical for designing effective remedial strategies. If high levels of PFAS remain in creek sediments, they will leach out of them into fish and the ecological food web indefinitely. Given this, a thorough remedial strategy must address sediments.

So why have the city, county, PHMDC, and Air National Guard been so resistant to testing sediments?

The 2015 "Perfluorinated Compounds Preliminary Site Visit Report" by Air National Guard consultants noted that "based on historical practices, COCs (contaminants of concern) could be present in sediment in locations that have received drainage from the Base storm sewer system." In July 2017, consultants advised that site investigation activities should assess PFAS in all media, including sediments. One month later, however, their final plan said "[t]here is no sediment sampling scheduled."

In July 2018, DNR wrote MEJO: "We intend to require testing of surface water and sediment for PFAS at the Truax ANG site…the need to perform surface water and sediment sampling will be formally communicated to ANG in the very near future (they are aware of the need for this sampling and they are in agreement with the concept)." Over a year and a half later, we see no evidence that this has happened.

Not all of the PFAS is from the Truax base. Both Dane County and the City of Madison also used the burn pits on airport property that are likely highly contaminated with PFAS that leaches into Starkweather Creek, which flows past both of them. Yet both entities, as described above, have steadfastly refused to test creek sediments.

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[6] The presenter cited Larson et al. (2018)

Why? Perhaps the city and county—deemed by DNR on October 7, 2019 and October 11, 2019 as responsible parties for the PFAS contamination—are hesitant to test sediments because results might point more specifically to them as responsible parties?[7]

This is only speculation, but it is supported by the fact that both Dane County and the City of Madison tried to claim that they are not responsible parties after receiving the DNR letters. Dane County responded to DNR requests, but did so "under protest." In response to NR 700 requirements, in December, Dane County sent DNR an investigation plan that proposes to review records to ascertain whether they used PFAS at the burn pits.

On March 6, 2020, the county submitted a plan to do limited testing at the burn pits, but admitted that "As such, the investigation described here is not intended to fully define the nature, extent, and distribution of PFAS, if present, in soil and/or groundwater." The plan seems designed to blame someone else for the contamination.

The City of Madison, meanwhile, hasn't even begun to move forward on addressing its responsibilities for PFAS at the burn pits. On Feb. 6, 2020, DNR sent the Madison mayor a letter disagreeing with the city's unsubstantiated claims that it shares no responsibility for this.

Undoubtedly Madison and Dane County are concerned about their liabilities and eventual costs if they are deemed responsible. While understandable, concerns about potential liabilities should not take priority over protecting public and environmental health. To adequately do this, we need comprehensive sediment PFAS data from the creek.

The city, county, and/or Truax ANG should do more Starkweather sediment PFAS testing as soon as possible to protect people who interact with the creek, understand ecological risks, and to help design appropriate and effective remedial strategies.

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[7] According to Remucal (2019) "sediment cores are excellent records of historical contamination for other chemicals, such as polychlorinated biphenyls and mercury and it is valuable to assess their utility for serving as records of PFAS trends."