PFAS and Fiddleheads

The discovery of PFAS (per- and polyfluoroalkyl substances) in some farmland soil and nearby surface waters in areas of the state has led to consumption advisories for freshwater fish as well as deer and wild turkey. In rivers and lakes, fish can take up PFAS when it is present in the water. PFAS in soil can move from the soil into grasses and other plants used for livestock feed. But what about wild edible plants, such as fiddleheads, growing near streams where the soil and water may contain PFAS? Fiddleheads are a popular seasonal food and are often available for purchase or harvested for personal consumption.

State efforts to test Fiddleheads

To better understand whether fiddleheads take up PFAS, Maine CDC and DACF collected soil, surface water, and fiddlehead samples at two locations in central Maine. Areas with known soil and surface water PFAS contamination were selected to determine whether any PFAS could be measured in the edible portion of the fiddlehead plant.

The first location was selected for its higher PFAS levels in surface water, a fish consumption advisory in the stream, and its proximity to nearby biosolid spread fields. Two sets of soil and fiddlehead samples were collected in small areas adjacent to the stream. Another set of soil and fiddlehead samples was collected in a small area about 10 feet back from the stream's edge. The soil directly below the collected fiddleheads was also sampled. Detected levels of the individual PFAS known as PFOS in the soil were similar between the two sampled areas (as shown in Table 1). The stream PFOS level was higher than most surface water samples collected from streams in Maine. PFOS was detectable in the fiddlehead samples with levels generally 10 to 100 times lower than concentrations in soil. Fiddleheads closer to the stream appeared to take up more PFOS than those further away. Other PFAS, mainly PFOA, PFNA, and PFDA were also found in the soil, surface water, and fiddlehead samples at this location but at lower levels than PFOS.

The second location was selected due to its use by foragers and suspected lower PFAS levels in soil and surface water. Soil and fiddlehead samples were collected from a sandy bank area right next to a stream and a second set of samples were collected from an area about 30 feet away from the stream bank. None of the fiddlehead samples collected from this location had PFOS at levels that the lab could detect and no other PFAS were detected in these fiddlehead samples.

Table 1. Stream surface water, soil and fiddlehead PFOS levels at the two sample locations.

	Sample	Surface water (ppb)	Soil (ppb)	Fiddleheads (ppb)
Location 1	Near stream (sample 1)	0.65	11	0.3
	Near stream (sample 2)		10	0.5
	Away from stream		9	0.07
Location 2	Near stream	0.02	1	Non-detect
	Away from stream		0.4	Non-detect

What does this sampling tell us about PFAS in fiddleheads?

PFAS can move into the edible portion of fiddleheads. The amount that moves into fiddleheads will depend on how much is in the soil and surface water. Movement of PFAS into fiddleheads may also depend on how close the fiddleheads are to the stream water.

Similar to other types of plants, PFOS in the edible portions of fiddleheads were lower than what was measured in soil or water. PFOS in fiddleheads could not be detected from plants sampled along the Location 2 stream with lower PFOS levels in soil and surface water. Based on river and stream testing across the state, PFOS surface water levels are typically much lower than the level measured at Location 1 and most surface waters have levels lower than Location 2.

Note that Maine CDC and DACF have currently only sampled fiddleheads for PFAS at these two locations. More sampling would be useful in understanding PFAS uptake in fiddleheads. Other researchers in Maine are sampling fiddleheads for PFAS. To date, DACF is not aware of results from other researchers showing measurable levels of PFOS in the edible portion of fiddleheads.

Is it safe to eat fiddleheads?

Based on the sampling of soil, water, and fiddleheads at two locations and what is known about the occurrence of elevated PFOS in surface waters in Maine, exposure from harvesting and consuming fiddleheads is likely low. The Maine Department of Environmental Protection (DEP) maintains a PFAS Investigation Map. This map can be searched to see if there is testing of nearby fields for PFOS that could impact surface waters or testing of surface water and/or fish for PFOS around fiddlehead harvesting areas. If you or your family are concerned about a specific location that may be impacted based on the PFAS Investigation Map results you can contact Maine CDC. If you're harvesting and selling fiddleheads and have questions, you can contact DACF.

For more information

DACF PFAS Response Program – PFAS.DACF@maine.gov or 207-287-4514

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Maine DEP – PFAS Investigation Map