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TO: File

FROM: Sharee Rusnak, Epidemiologist

SUBJ: Farmington River PFAS in Fish Evaluation

DATE: March 30, 2021

This Letter Health Consultation (LHC) was prepared to document our evaluation of fish contaminant data from the Farmington River. Fish contaminant data in this LHC was obtained from Connecticut Department of Energy and Environmental Protection (CTDEEP).

Statement of Issues

The Inland Fisheries Program and the Remediations Program at CTDEEP requested that Connecticut Department of Public Health (CTDPH) evaluate 3 rounds of fish tissue data (collected in August 2019, September 2019, and July 2020) from the Farmington River that was analyzed for per- and poly- fluoroalkyl substances (PFAS) for the Connecticut fish consumption advisory program. This LHC documents the data evaluation process for the Farmington River.

Background

The Farmington River is 46.7 miles in length along its main stem, located in northwest Connecticut with major tributaries extending into southwest Massachusetts. The longest route of the river, from the origin of its West Branch, is 80.4 miles long, making it the Connecticut River's longest tributary by 2.3 miles over the major river directly to its north, the Westfield River. The Farmington River's watershed covers 609 square miles.
On June 8, 2019, an equipment malfunction at a private hanger at Bradley International Airport resulted in a discharge of PFAS containing aqueous film forming foam (AFFF) into a drain connected to the municipal sewer system, ultimately leading to the Metropolitan District (MDC) wastewater treatment plant in Windsor and discharge in the Farmington River. Pictures of the foam discharge on the Farmington River can be found in

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Appendix A. Over the next several weeks after the spill, the responsible party, Signature Flight hired an environmental engineering firm to assist with the cleanup process and to work with CT DEEP and the Connecticut Airport Authority (CAA) to gain a larger understanding of the situation and to remove as much foam from the Farmington River as possible and to begin greater efforts to understand what the long term impacts may be to the ecosystem.

In response to this release into the Farmington River, CTDPH, along with the Town of Windsor and the Windsor Health Department immediately issued an advisory to not consume fish caught in the Lower Farmington River downstream from the Rainbow Dam in the Town of Windsor to the confluence with the Connecticut River (noted as Lower Farmington River) due to presumed elevated levels of PFAS in fish.

The first round of fish data were taken from the Lower Farmington River in August 2019 following the spill and another round was taken in September 2019. During both of these sampling events, fish from the upper part of the Farmington River at Rainbow Dam (Upper Farmington River) were also taken as a control and analyzed for PFAS to compare with the fish samples from the Lower Farmington River.

In October 2, 2019 another spill took place during an airplane crash at Bradley International Airport. Potential impacts were expected to be minimal because the quantity of AFFF used to fight the fire was less than the spill in June and measures were put into place to contain the diluted AFFF immediately following the fire.

A third round of fish sampling and analysis for PFAS was performed in July 2020 from both the Lower and Upper Farmington River. The purpose of this last round of sampling and analysis was to observe whether the PFAS levels have further decreased in fish from the Lower Farmington River.

Health Comparison Values and Fish Contaminant Levels

1. Health Comparison Values

In order to set safe levels of PFAS in fish associated with fish consumption advisories, CTDPH developed a risk based consumption advisory protocol for PFAS in fish. (Appendix B, Table 1). It is important to note that Connecticut's fish consumption advisory cutoff concentrations for PFAS are based only on total perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) concentrations. This protocol was developed using the United States Environmental Protection Agency's (US EPA) Reference Dose (RfD) of 0.02 µg/kg/day for PFOS/PFOA and assumptions about fish meal size and body weight. A more detailed explanation can be found in Rusnak (2019).

2. Fish Contaminant Levels

In August 2019, A contractor for Signature Flight collected 70 fish (two species, yellow perch and white suckers) from the Lower and Upper Farmington River- one above and one below where the first AFFF release entered the River in the town of Windsor. As shown in Table 1, fish tissue samples collected from the Lower Farmington River had average PFOS levels of 174.3 parts per billion (ppb) for yellow perch and 74.8 ppb for white sucker. The maximum PFOS level from this round of sampling and analysis was 215 ppb (yellow perch, Lower Farmington River). Average PFOS levels were much lower in fish collected from the Upper Farmington

River than from the Lower Farmington River. Average PFOS concentrations in fish from the Upper Farmington River were 24.5 ppb for yellow perch and 6.3 ppb for white sucker.[1]

A second round of fish sampling was performed in September 2019 by the same contractor. Average PFOS levels of seventy fish tissue samples of the same two species collected from the Lower Farmington River had decreased by more than 50% compared to samples from August 2019. Average PFOS levels in fish from the Lower Farmington River were 61.7 parts per billion (ppb) for yellow perch and 36.9 ppb for white sucker. The maximum PFOS level in fish was 65.3 ppb (yellow perch) from the Lower Farmington River from this round of sampling. In the Upper Farmington River, fish collected from this area had PFOS levels that were much lower than fish collected from the Lower Farmington River (18.6 ppb for yellow perch and 7.1 ppb for white sucker).

Eighty fish were collected in both the Lower and Upper Farmington River during a third round of sampling in July 2020 by the same contractor. Average PFOS levels of fish tissue samples of the same two species collected from the Lower Farmington River had decreased by more than 71% compared to samples collected in August 2019. Fish collected from the Lower Farmington River had average PFOS levels of 18.3 parts per billion (ppb) for yellow perch and 7.2 ppb for white sucker. The maximum PFOS level for this round of sampling was 36.5 (yellow perch) which was found in the Upper Farmington River. In the Upper Farmington River, fish collected from this area had average PFOS levels of 31.6 parts per billion (ppb) for yellow perch and 6.2 ppb for white sucker.

Average PFOS concentrations in white sucker and yellow perch in the first two sampling events in the Lower Farmington River exceeded levels where CTDPH issues a consumption advisory. Average PFOS levels in fish collected from the Lower Farmington in the last round of sampling did not exceed a level where CTDPH would issue a consumption advisory. Similarly, average PFOS levels in fish from the Upper Farmington River from the first two rounds of sampling did not exceed concentrations where a consumption advisory was necessary to protect public health. However, the average PFOS concentration in yellow perch in the last sampling event in the Upper Farmington River exceeded a level where CTDPH issues a consumption advisory.

Tables 1 and 2 give average PFOS concentrations in white sucker and yellow perch caught in the Upper and Lower Farmington River in 2019 and 2020. Table 1 clearly illustrates that average PFOS concentrations in white sucker in the Upper Farmington River remained low and stable across all three sampling rounds. Table 1 also illustrates that average PFOS concentrations in white sucker from the Lower Farmington River were significantly elevated (as compared to the Upper Farmington River) in August 2019 right after the first PFAS spill, but declined to a concentration similar to the Upper Farmington River by the third sampling round, about a year after the first spill.

[1] It is important to note that PFOA concentrations in all of the fish sampled were below detectable limits.

Table 1. PFOS Concentrations in White Sucker Caught in the Upper and Lower Farmington River in 2019 and 2020.

Location	Date	Number of Samples	Total Number of Individuals	Average PFOS Concentration (ppb)*
Upper Farmington River	8/3/2019	3	15	6.27
Upper Farmington River	9/21/2019	4	20	7.07
Upper Farmington River	7/7-9/2020	4	20	6.22
Lower Farmington River	8/3/2019	4	20	74.77
Lower Farmington River	9/21/2019	4	20	36.9
Lower Farmington River	7/7-9/2020	4	20	7.2

*Parts per billion

Table 2. PFOS Concentrations in Yellow Perch Caught in the Upper and Lower Farmington River in 2019 and 2020.

Location	Date	Number of Samples	Total Number of Individuals	Average PFOS Concentration
Upper Farmington River	8/3/2019	4	20	24.5
Upper Farmington River	9/21/2019	3	15	18.6
Upper Farmington River	7/7-9/2020	4	20	31.6
Lower Farmington River	8/3/2019	3	15	74.77
Lower Farmington River	9/21/2019	3	15	36.9
Lower Farmington River	7/7-9/2020	4	20	7.2

*Parts per billion

Table 2 shows a similar scenario as Table 1 regarding the impact to fish in the Lower Farmington River after the June 2019 PFAS spill. The average PFOS concentration in yellow perch is elevated in the first round of testing, but drastically declines over the year until the third round of testing. However, for yellow perch in the Upper Farmington River, the average concentration of PFOS across the three rounds of testing is not as stable as for the white sucker.

Discussion

Exposure Pathway Analysis

To determine if community members are exposed to contaminated fish in the Farmington River, CTDPH evaluated the environmental and human components that lead to human exposure. CTDPH evaluated the fish tissue data and considered how people may be exposed to contaminants in the fish. The only possible complete

pathway of exposure is via ingestion (eating the fish). An exposure pathway consists of five elements (ATSDR 2005):

1. A source of contamination;
2. Transport through an environmental medium;
3. A point of exposure;
4. A route of human exposure; and
5. A receptor population.

ATSDR categorizes an exposure pathway as either completed, potential, or eliminated. In a completed pathway, all five elements exist and indicate that exposure to a contaminant has occurred in the past, is occurring, or will occur in the future. In a potential exposure pathway, at least one of the five elements has not been confirmed, but it may exist. Exposure to a contaminant may have occurred in the past, may be occurring, or may occur in the future. An exposure pathway can be eliminated if at least one of the five elements is missing and will never be present (ATSDR 2005).

Environmental data showed that yellow perch and white sucker from the Lower Farmington River were contaminated with PFOS. Individuals who catch and eat fish in these water bodies would likely be exposed to PFOS in the fish. In addition, their families and friends would also be exposed to PFOS if they eat the fish.

Public Health Implications for Adults and Children and Conclusion

When determining the public health implications of exposure to hazardous contaminants, CTDPH considers how people might come into contact with contaminants and compares contaminant concentrations with health protective levels. When contaminant levels are below health-based comparison values, health impacts from exposure to those levels are unlikely. Contaminant levels exceeding comparison values do not indicate that health impacts are likely, but instead warrant further investigation. In this health consultation, CTDPH used a Risk Based Consumption Protocol for PFAS in Fish as comparison levels as described in the Health Contaminant Values and Fish Contaminant Levels section of this document.

Ingestion of white sucker and yellow perch from the Lower Farmington River which contain elevated levels of PFAS is a complete exposure pathway and is evaluated in this health consultation, using this Risk Based Consumption Protocol for PFAS in Fish.

Appendix B, Table 1 gives 4 restriction level categories; ‘A’ being the least restrictive and ‘D’ being the most restrictive. After the first round of sampling in August 2019, average PFOS levels from the Lower Farmington River were within the Fish Consumption Advisory Category ‘C.’ However, since the maximum PFOS levels in fish exceeded the cutoff guidelines for Category D, all fish were kept in this most restrictive consumption category until the next round of sampling as a precautionary measure. In addition, to keep the public health message simple, we kept all fish species from the Lower Farmington River in the same restriction level category throughout all sampling events. Appendix B, Table 2 gives the history of fish consumption guidelines for the Lower Farmington River from July 2019 to December 2020.

After the second round of sampling in September 2019, PFOS levels in fish sampling from the Lower Farmington River decreased to a level where they were now in restriction level C. CTDPH then loosened the fish consumption advisory to 'one meal per month.'

A third round of sampling in July 2020 revealed that the levels in fish caught in the Lower Farmington River has decreased to a level where they were now in restriction level A (unlimited consumption) and a PFAS specific consumption advisory was no longer necessary for this area of the River.

One important point to note however, is that PFOS levels in yellow perch in the Upper Farmington River (control area) tended to vary a bit (but still remain fairly low) during the 3 sampling events. However, based on the third round of sampling data, fish now fall into the restriction level C category of one meal per month. These varied PFOS levels may be due to sewerage effluent in the area. Because this category level is consistent with the statewide freshwater advisory for mercury in fish of '1 meal/month-high risk[2], 1 meal/week-low risk,' CTDPH considers this statewide advisory to be protective for exposures to PFAS and thus CTDPH has decided not to issue a PFAS specific consumption advisory for the Upper Farmington River.

CTDPH has concluded that PFOS concentrations in fish from the Lower Farmington River have decreased to a level where no PFAS specific consumption advisory is necessary to protect human health.

CTDPH has decided to remove the previous advisory of 'one meal per month' for the Lower Farmington River for the following reasons:

1. The 3 rounds of fish sampling data have indicated decreasing levels of PFOS contamination in this section of this waterbody. PFOS levels in fish sampled from this waterbody have decreased significantly over time since both spills.
2. Although the last round fish data indicated that PFOS in yellow perch exceeded unlimited consumption cutoff levels, CTDPH has decided not to issue a separate advisory for the upper Farmington River because there is already a statewide freshwater advisory because of elevated mercury in fish that are similar and protective of human health.

In summary, CTDPH has decided to remove the advisory of 'One meal per week-everyone' for all species in the Lower Farmington River because PFOS concentrations have decreased significantly over time and do not remain elevated enough to warrant a specific consumption advisory. In the past, PFOS levels from fish species from the Lower Farmington River could harm people's health if they did not follow the consumption advisory. However, since PFOS levels has decreased to a level that consumption restrictions are no longer necessary, CTDPH believes that this specific consumption advisory is no longer necessary to protect public health.

Recommendations

1. CTDEEP Inland Fisheries Division should continue to work with CTDPH to educate fishing populations about the statewide freshwater fish consumption advisory which includes the Farmington River.

[2] High risk groups includes children under 12 years old, pregnant woman or women planning on becoming pregnant within a year or women who are nursing.

References

ATSDR 2005. Public Health Assessment Guidance Manual. Agency for Toxic Substance and Disease Registry, Available at http://www.atsdr.cdc.gov/hac/PHAManual/ch2.html#2.5.4. Accessed on July 22, 2014.

Rusnak 2019. Memorandum Regarding PFAS in Fish Consumption Limits. Connecticut Department of Public Health, Environmental and Occupational Health Assessment Program. August 16, 2019.

Appendix A. Pictures of AFFF Foam in the Lower Farmington River

Appendix B

Table 1. CTDPH's Risk Based Consumption Protocol for PFAS in Fish^

Restriction Category (Level)	# Meals	PFAS Concentration (ppb)*
A	Unlimited	< 20
B	1 meal/week	≥ 20 to < 40
C	1 meal/month	≥ 40 to < 159
D	Do not eat	≥ 159

^Based on PFOA and PFOS Concentrations.
*Parts Per Million

Table 2. Consumption Advisory History for Fish Caught in the Lower Farmington River

Date	Advisory Category	Consumption Recommendation
July 2019	D	Do not eat
February 2020	C	One meal per month
December 2020	A	Unlimited Consumption