PFAS and NJ Fish Consumption Advisories

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Virtual Forum: PFAS in San Francisco Bay Fish
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INTRODUCTION

- In 1980s NJDEP/OCTSR **PCB/Dioxin/metals/pesticides** research identified risks from eating certain fish and shellfish from various waters in the State.

- Consumption advisories based on concentrations of pesticides, PCBs and dioxins were first issued during the 1980s.

- In 1992-94 DSR conducted statewide study of mercury in fish

- In 1994 consumption advisories on fish due to mercury contamination were first issued and updated annually

- Consumption advisories apply to the general population and high risk groups (pregnant women, women of child bearing age and young children)

- Current fish contaminant data are necessary to evaluate and adjust advisories.

- Without regular monitoring data consumption advisories could be either under or overly protective of human health.

NJDEP Fish Consumption Advisories

NJDEP uses **fish tissue sampling** of various sites in New Jersey and **risk assessment** methodology to determine the need for fish consumption advisories for PFAS

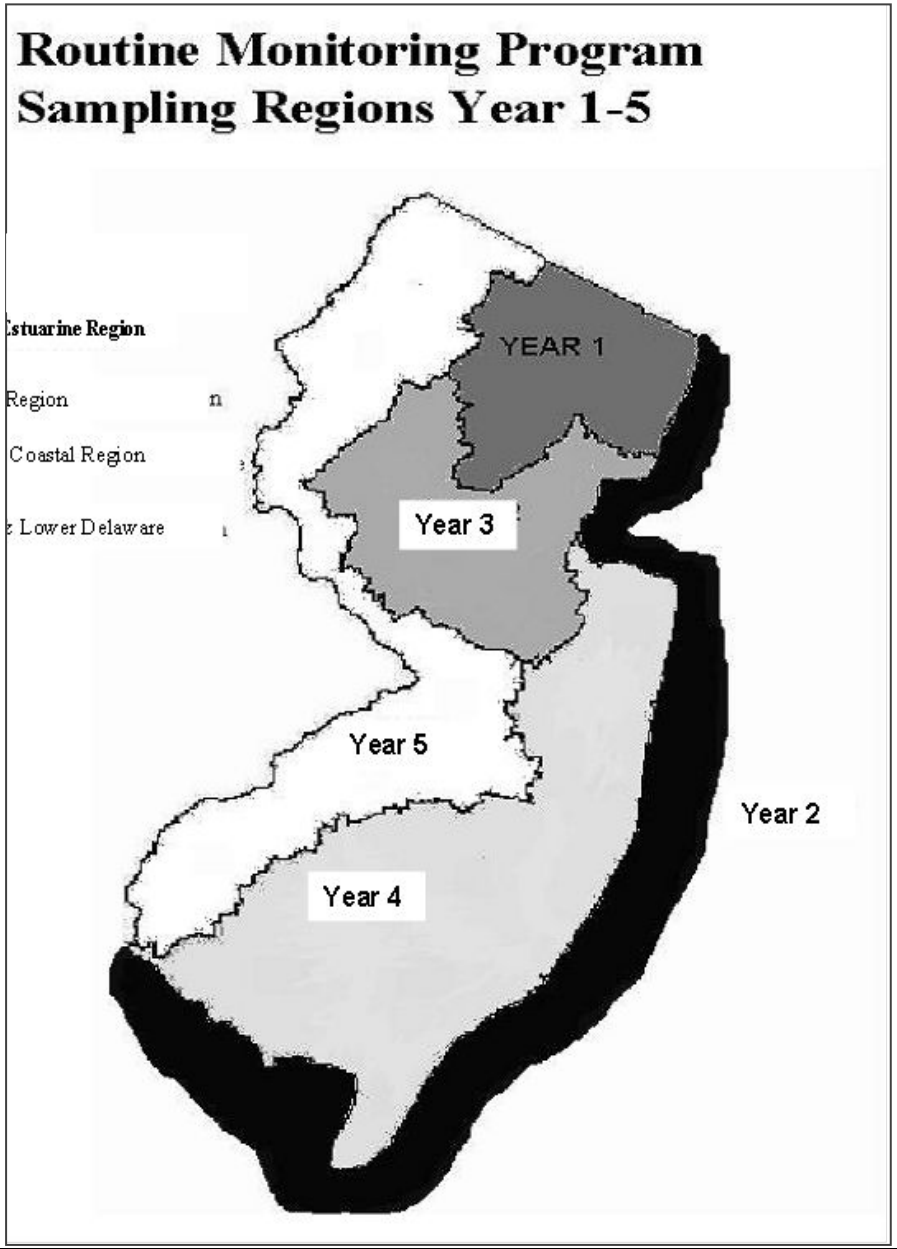
https://www.nj.gov/dep/dsr/njmainfish.htm

- Tiered Approach: Statewide, Regional (Pinelands) and Waterbody-specific Fish Consumption Advisories
- 100% of the state's lakes, streams and reservoirs are under the statewide/regional mercury advisories (4,100+ water bodies) *(once a week/once a month)*
- Most restricted advisories by species typically found in the Pinelands Region (for Mercury)
- Most advisories issued are for the High Risk Population

Design: Site Selection/Analysis

Sampling Sites - Selected through a random stratified approach of all available public waterways within each region.

- public waterways (Federal, State, Municipal or other)
- ponds, lakes, reservoirs, streams and rivers
- typically greater than 10 acres
- accessible to the public and open for recreational fishing
- containing viable populations of target fish species
- “unique lakes” (i.e., major recreational fisheries)



Investigation of Levels of Perfluorinated Alkyl Substances (PFAS) in NJ Fish Species

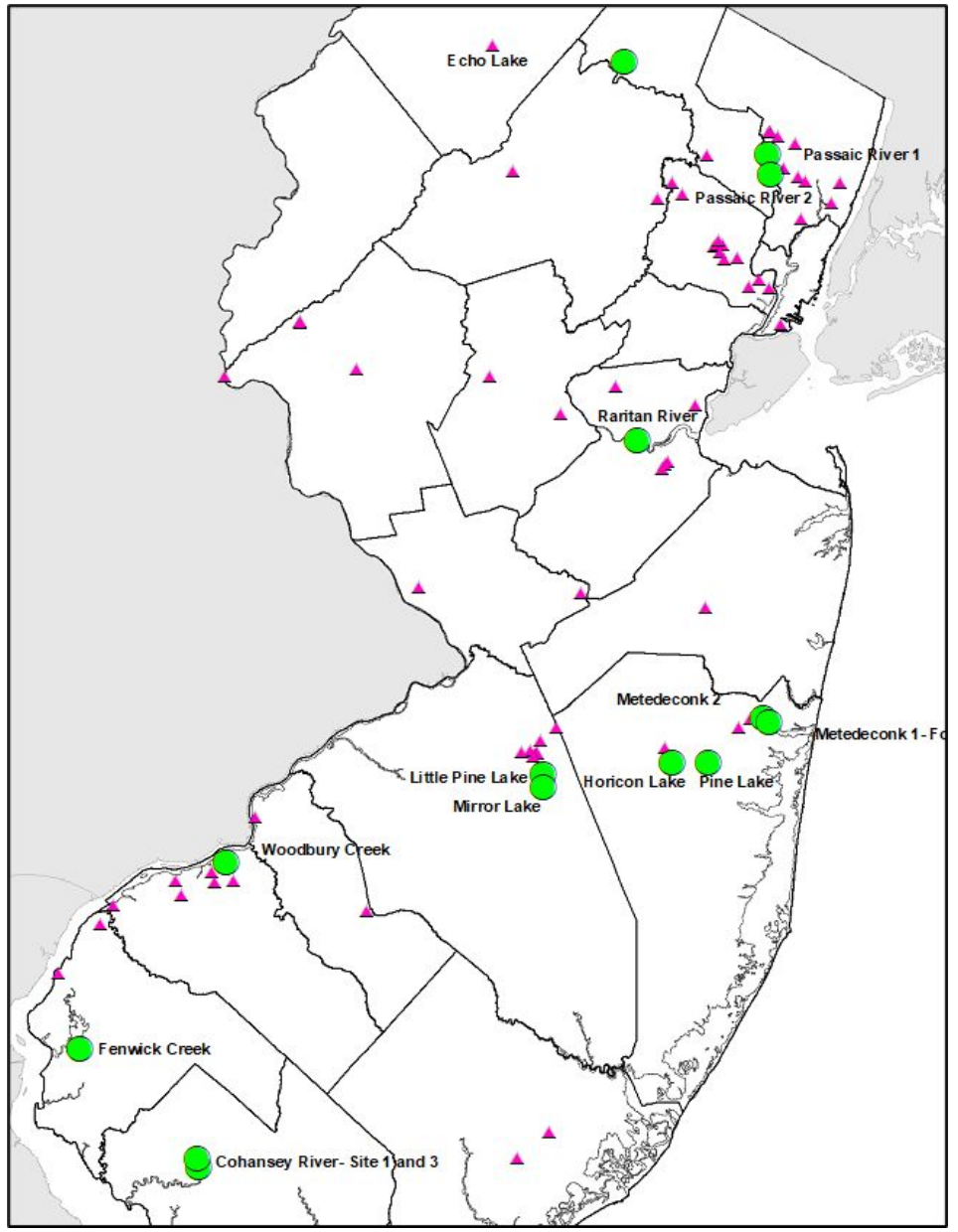
- Initial statewide assessment of the concentration of 13 perfluorinated compounds in fish tissue, sediments, and surface waters.
- Survey included 11 sites (one chosen as a likely background site) where recreational fishing is common.
- Sites were also located according to its proximity to a potential source (facility that manufactures PFAS compounds, or uses PFAS compounds in process)

Fish caught by electrofishing or netting included:

- Yellow perch
- Largemouth bass
- Pumpkinseed
- American eel
- White perch
- Chain pickerel
- Yellow bullhead

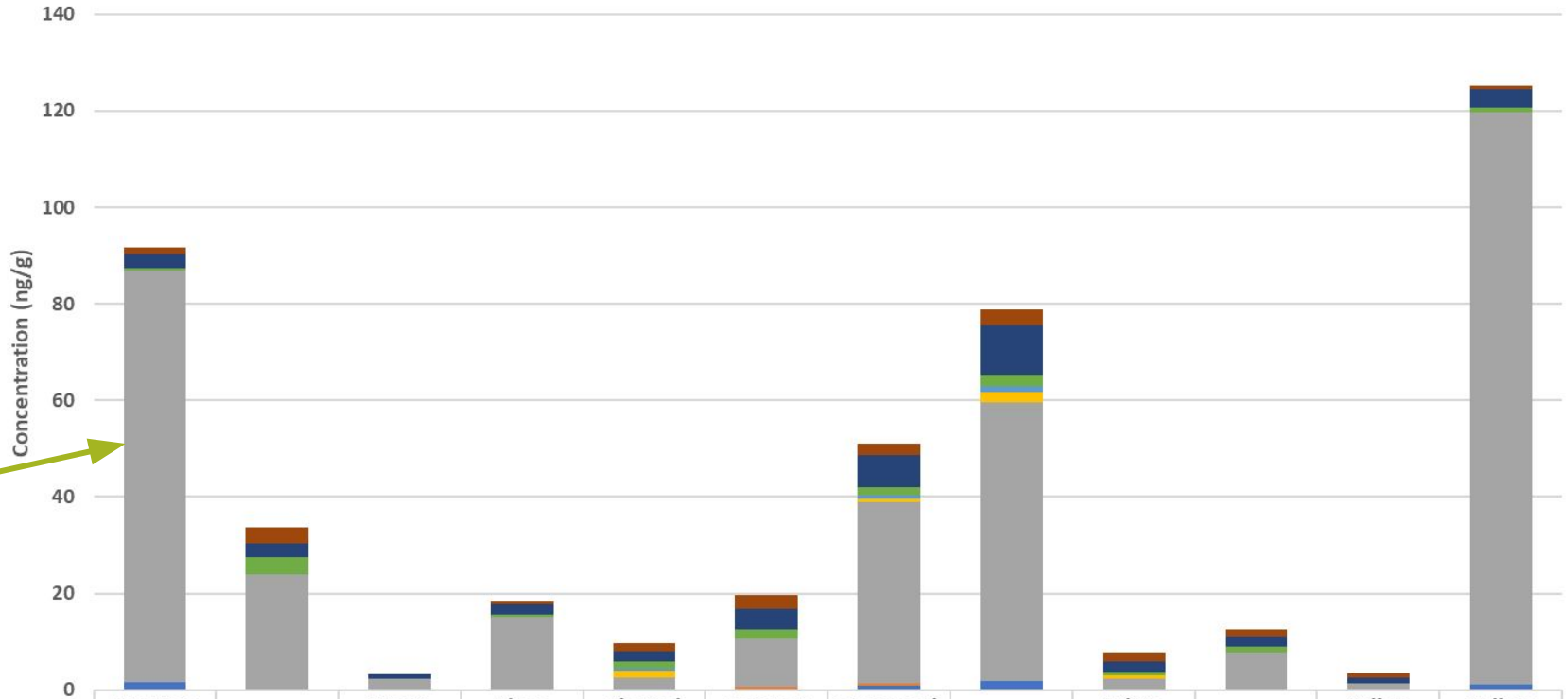
Investigation of Levels of Perfluorinated Alkyl Substances (PFAS) in NJ Fish Species

- To collect fish from **key recreational fishing areas** that are located near potential sources to evaluate levels of PFAS in the consumable fish tissue.
- To **collect surface water and sediment to help determine the fate and transport** of these compounds through the system.
- To apply Reference Dose concentrations to determine if **advisories on frequency of consumption** is warranted.



Fish Tissue Sampling Results

PFOS



	American Eel	Bluegill	Brown Bullhead	Chain Pickerel	Channel Catfish	Common Carp	Largemouth Bass	Pumkinseed	White Catfish	White Perch	Yellow Bullhead	Yellow Purch
PFDoA	1.4	3.5		0.7	1.7	2.8	2.4	3.2	1.8	1.6	0.9	0.7
PFUnA	2.7	2.7	0.8	2.0	2.2	4.3	6.6	10.3	2.1	2.0	1.1	3.8
PFDA	0.6	3.6		0.5	1.4	1.9	1.6	2.3	0.8	1.2		1.1
PFNA					0.5		0.8	1.4				
PFOSA					1.4		0.7	2.1	0.5			
PFOS	85.2	24.0	2.4	15.2	2.5	9.9	37.5	57.6	2.4	7.9	1.4	118.6
PFOA						0.7	0.5					
PFHxS	1.7						1.0	1.9				1.0

Bioaccumulation

- PFOS preferentially partitions to certain **proteins**
  - Therefore, they accumulate in the blood and liver more than in muscle tissue
- PFOS has been shown to rapidly depurate in fish (Relative to PCBs)
  - Falk (2015) found that the longest elimination half life was 8.4 days in muscle Tissue
- Temporal and spatial pairing of fish tissue and water samples are key to determining BAFs
- Highest bioaccumulation appeared to occur in White perch (3), largemouth bass (4), Bluegill sunfish (3), and common carp (2).

Species	BAF	Trophic Level
White Perch	4703.333	3
Largemouth Bass	3964.184	4
Bluegill	2975.433	3
Common Carp	2476.821	2
Brown Bullhead	1777.167	3
Pumpkinseed	1635.081	3
Chain Pickerel	1521.333	4
Yellow perch	1186	3
American eel	1063.577	4
White Catfish	285.3692	4
Channel Catfish	214.3068	4
Yellow Bullhead	112.3333	3

From NJDEP PFAS in Fish Tissue Study, 2020

Fish consumption advisory triggers

- New Jersey developed fish consumption triggers using the **Reference Doses** for previously developed for use in drinking water and ground water standards.
  - PFOA (2 ng/kg/day; NJDWQI, 2017),
  - PFOS (1.8 ng/kg/day; NJDWQI, 2018), and
  - PFNA (0.74 ng/kg/day; NJDEP, 2017)

	General Population		
	PFOA (ng/g; ppb)	PFNA (ng/g; ppb)	PFOS (ng/g; ppb)
Unlimited	≤ 0.62	≤ 0.23	≤ 0.56
Weekly	≤ 4.3	≤ 1.6	≤ 3.9
Monthly	≤ 18.6	≤ 6.9	≤ 17
Once/3 months	≤ 57	≤ 21	≤ 51
Yearly	≤ 226	≤ 84	≤ 204
Do Not Eat	**>226**	**> 84**	**> 204**

General Equation for unlimited consumption:

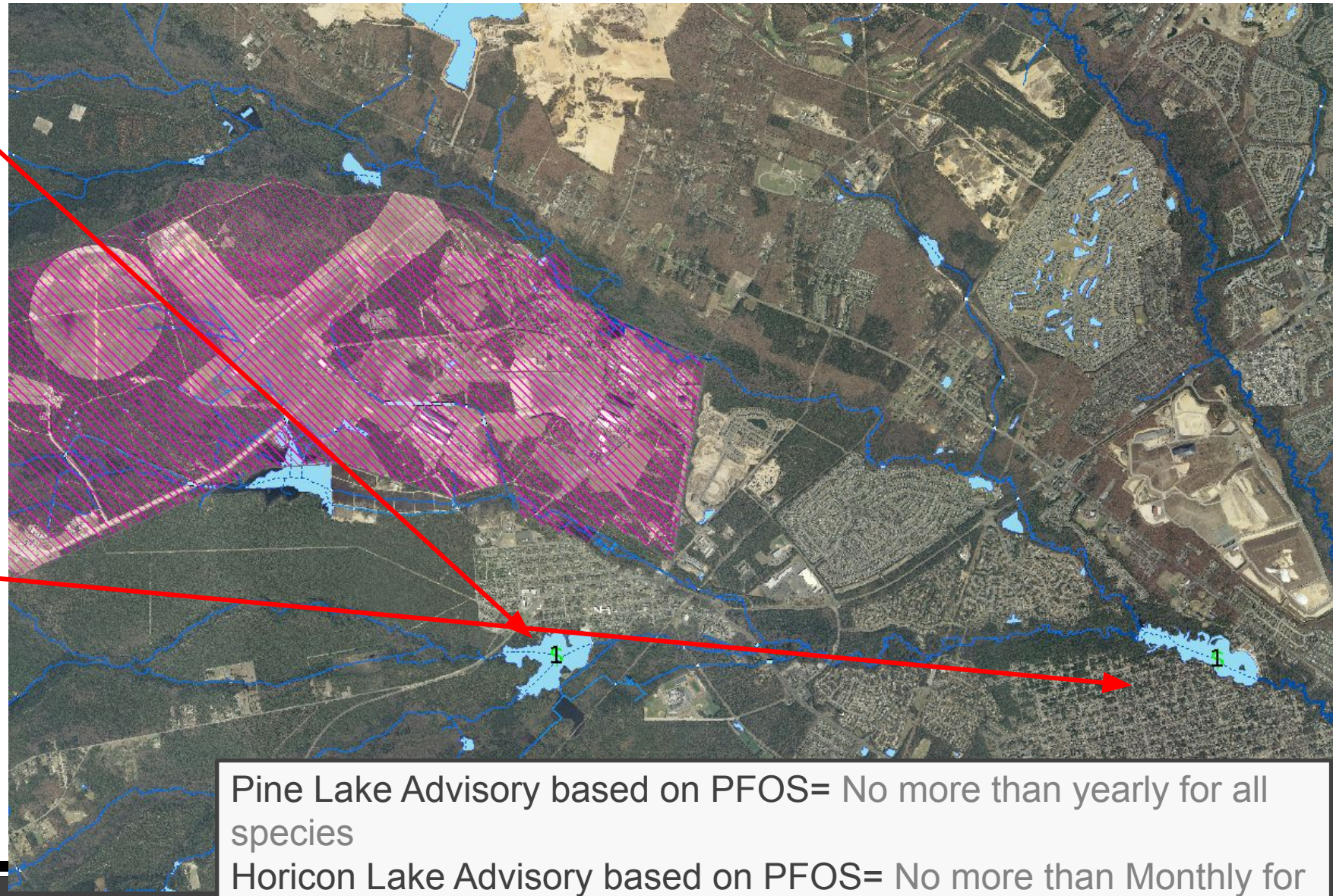
$$\text{Daily trigger concentration}\left(\frac{\text{ng}}{\text{g}}\right) = \frac{\text{RfD } (ng/kg/day)\text{x Body Weight (kg)}}{\text{Meal size (g)}}$$

- Where body weight= 70 kg and meal size is 227 g
- For consumption triggers that are less than daily, the triggers are multiplied by the appropriate timeframe

Lakes near military base- PFOS

Horicon Lake	PFOS	
Chain pickerel	17.9	*ppb*
Chain pickerel	19.7	*ppb*
Chain pickerel	8.04	*ppb*
Yellow bullhead	1.02	*ppb*
Yellow bullhead	1.83	*ppb*
Surface Water	10.0	*ppt*
Sediment	3.25	*ppt*

Pine Lake	PFOS	
American eel	170	*ppb*
American eel	155	*ppb*
Largemouth bass	114	*ppb*
Pumpkinseed	76.9	*ppb*
Pumpkinseed	208	*ppb*
Pumpkinseed	72.7	*ppb*
Surface Water	102.0	*ppt*
Sediment	19.3	*ppt*



Pine Lake Advisory based on PFOS= No more than yearly for all species

Horicon Lake Advisory based on PFOS= No more than Monthly for Chain pickerel and Weekly for Yellow bullhead

Echo Lake

Species	PFOS concentration	
Bluegill	2.39	ppb
Bluegill	1.7	ppb
Bluegill	2.9	ppb
Brown Bullhead	3	ppb
Brown Bullhead		
Brown Bullhead	1.86	ppb
Largemouth Bass	5.12	ppb
Largemouth Bass	4.53	ppb
Largemouth Bass	4.24	ppb
Surface Water	ND	ppt
Sediment	ND	ppb

- Echo Lake has no identified sources
- No other parameters were identified in the sediment sample
- Only low levels of short chained PFAS were detected in the surface water samples

Echo Lake Advisory based on PFOS= No more than weekly for Bluegill sunfish and Brown bullhead; No more than monthly for LMB

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