Nothing Compares
NORTH CAROLINA

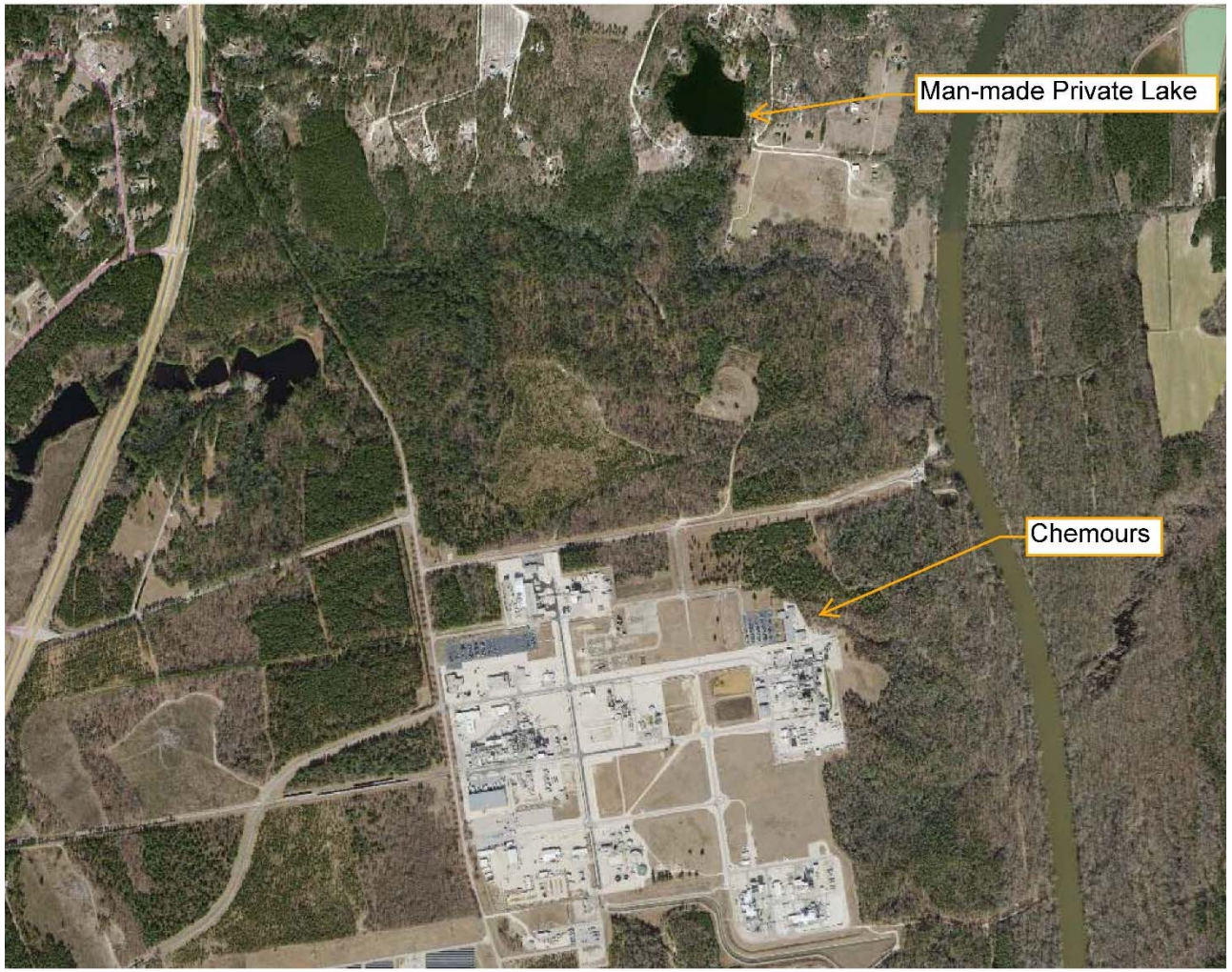
Preliminary PFAS Study in a Privately-Owned Man-Made Lake

June 18, 2018

Department of Environmental Quality

Study Purpose

- Preliminary study of GenX and other PFAS in privately-owned lake
- ~0.7 miles N/NE of Chemours-Fayetteville facility
  - Man-made lake
  - Artificially-stocked with fish



Department of Environmental Quality

Study Design

- Samples
  - Surface water grabs, 2 locations
  - Surface sediment 5-part composites, 2 locations
  - Fish, 3 species
    - Bottom feeders (Omnivores)
    - Insectivores
    - Top predators (Piscivores)
  - Surface spring water flowing into the lake
- Samples collected March and April 2018 by DEQ staff
- 33 Target PFAS analysis by DEQ contract laboratory
  - GEL Laboratories, Charleston, SC
  - 8 PFAS as “estimated concentrations”

Preliminary study – not intended to meet the criteria for a fish consumption advisory

Preliminary Lake Study Results

Preliminary study – not intended to meet the criteria for a fish consumption advisory

- **Spring and Surface Water**
  - GenX was PFAS detected at the highest concentration
    - 1160 ppt spring
    - 968 ppt surface water
  - Same 16 PFAS detected in both waters
    - Other PFAS at 0.507 to 263 ppt
    - PFOS and PFOA detected
  - 3, 4, 5, 6, 7 and 10 carbon PFAS detected

ppt = part-per-trillion, ng/L or ng/kg

Preliminary Lake Study Results

Preliminary study – not intended to meet the criteria for a fish consumption advisory

- **Sediment**
  - GenX was the only PFAS detected
    - 1800 ppt (dry weight)
    - 44.8 ng/g-OC
  - 40,600 mg/kg organic carbon (4.06%)

ng/g = ng PFAS/gram sediment, parts-per-billion
OC = (sediment) organic carbon
ng/g-OC = organic carbon-normalized

Preliminary Lake Study Results

Preliminary study – not intended to meet the criteria for a fish consumption advisory

Fish tissue results –

- **Redear Sunfish (RES)**
  - 7-fish filet composite
  - GenX detected only in the Redear Sunfish
    - 2.70e-04 ppm (wet weight)
  - PFOS only other PFAS detected in RES
    - 4.96e-04 J ppm (wet weight)

- **Blue Catfish (BLC)**
  - Single-fish filet
  - 4 PFAS detected, 4.83e-04 J to 1.27e-03 ppm (wet weight)
    - PFUdA, PFDoA, PFTrDA, PFTeDA
    - 11,12,13,14 carbon PFAS

Preliminary Lake Study Results

Preliminary study – not intended to meet the criteria for a fish consumption advisory

Fish tissue results –

- **Largemouth Bass (LMB)**
  - 5-filet composite (smaller)
  - 2-filet composite (larger)
  - Same 5 PFAS detected in both samples
    - PFOS, PFUdA, PFDoA, PFTrDA, PFTeDA
      - 8, 11, 12, 13, 14 carbon PFAS
    - PFOS detected at 2.26e-03 ppm (mean, wet weight)
    - Other PFAS detected at 3.61e-04 J to 1.27e-03 ppm (wet weight)

Preliminary Lake Study Results

Fish tissue PFOS Biomagnification Factor (BMF) –

- Redear Sunfish, Trophic Level 3
- Largemouth Bass, Trophic Level 4
- Lipid-normalized PFAS concentrations

- BMF (larger LMB/RES) – 3.9
- BMF (smaller LMB/RES) – 3.0

Additional Notes

Preliminary study – not intended to meet the criteria for a fish consumption advisory

- PFAS concentrations in the fish collected at this time of year may not be representative of concentrations at other times of the year, or in other fish species
  - Fish collected at the end of the annual growing season may have higher concentrations

- The results of this preliminary study cannot be applied to any other body of water
- The data collected in this preliminary study cannot be used to infer concentrations of PFAS in fish tissue in other affected bodies of water.

Department of Environmental Quality


Man-made Private Lake
Chemours

Target PFAS List

PFAS Chemical Name	PFAS Code	CASN	No. Carbons	Chemical Formula	PFAS Type	Estimated Concentration [a]
Perfluoro- 2-methoxyacetic acid (PFMOAA)	PFMOAA	674-13-5	3	C3HF5O3	PFECA	X
Perfluoro- butyric acid (PFBA)	PFBA	375-22-4	4	C4HF7O2	PFCA	
Perfluoro- butane- sulfonate (PFBS)	PFBS	375-73-5	4	C4HF9O3S	PFSA	
Perfluoro- 3-methoxy- propanoic acid (PFMOPrA)	PFMOPrA	377-73-1	4	C4HF703	PFECA	X
Perfluoro- (3,5-dioxahexanoic) acid (PFO2HxA)	PFO2HxA	39492-88-1	4	C4HF7O4	PFECA	X
Perfluoro-4-methoxy- butanic acid (PFMOBA)	PFMOBA	863090-89-5	5	C5HF9O3	PFECA	X
Perfluoro- (3,5,7-trioxaoctanoic) acid (PFO3OA)	PFO3OA	39492-89-2	5	C5HF9O5	PFECA	X
Perfluoro- pentanoic acid (PFPeA)	PFPeA	2706-90-3	5	C5HF9O2	PFCA	
Perfluoro- pentane- sulfonate (PFPeS)	PFPeS	2706-91-4	5	C5HF11O3S	PFSA	
Fluorotelomer sulfonate 4:2 (4:2 FTS)	4:2 FTS	757124-72-4	6	C6H5F903S	FTS	
Perfluoro- hexanoic acid (PFHxA)	PFHxA	307-24-4	6	C6HF11O2	PFCA	
Perfluoro- hexanesulfonate (PFHxS)	PFHxS	355-46-4	6	C6HF13O3S	PFSA	
2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)- propanoic acid (PFPrOPrA, "GenX")	PFPrOPrA (GenX)	13252-13-6	6	C6HF11O3	PFECA	
Nafion Byproduct 1	Nafion-bp 1	29311-67-9	7	C7HF13SO5	PFESA	X
Nafion Byproduct 2	Nafion-bp 2	749836-20-2	7	C7H2F14SO5	PFESA	X
Perfluoro- heptanoic acid (PFHpA)	PFHpA	375-85-9	7	C7HF13O2	PFCA	
Perfluoro- heptanesulfonate (PFHpS)	PFHpS	375-92-8	7	C7HF15O3S	PFSA	
Fluorotelomer sulfonate 6:2 (6:2 FTS)	6:2 FTS	27619-97-2	8	C8H5F13O3S	FTS	
Perfluoro- octanoic acid (PFOA)	PFOA	335-67-1	8	C8HF15O2	PFCA	
Perfluorooctane- sulfonate (PFOS)	PFOS	1763-23-1	8	C8HF17O3S	PFSA	
Perfluoro- octane- sulfonamide (PFOSA)	PFOSA	754-91-6	8	C8H2F17NO2S	PFOSA	
Perfluoro- nonane- sulfonate (PFNS)	PFNA	68259-12-1	9	C9HF19O3S	PFSA	
Perfluoro- nonanoic acid (PFNA)	PFNA	375-95-1	9	C9HF17O2	PFCA	
Fluorotelomer sulfonate 8:2 (8:2 FTS)	8:2 FTS	39108-34-4	10	C10H5F17O3S	FTS	
Perfluoro- decanoic acid (PFDA)	PFDA	335-76-2	10	C10GF19O2	PFCA	
Perfluoro- decanesulfonate (PFDS)	PFDS	335-77-3	10	C10HF21O3S	PFSA	
Perfluoro- (3,5,7,9- tetraoxadecanoic) acid (PFO4DA)	PFO4DA	39492-90-5	10	C10H7F11O6	PFECA	X
N-methylperfluoro- 1-octane-sulfon- amidoacetic acid (N-MeFOSAA)	n-MeFOSAA	2355-31-9	11	C11H6F17NO4S	other	
Perfluoro- undecanoic acid (PFUdA)	PFUdA	2058-94-8	11	C11HF21O2	PFCA	
N-ethylperfluoro- 1-octane- sulfon-amidoacetic acid (N-EtFOSAA)	n-EtFOSAA	2991-50-6	12	C12H8F17NO4S	other	
Perfluoro- dodecanoic acid (PFDoA)	PFDoA	307-55-1	12	C12HF23O2	PFCA	
Perfluoro- tridecanoic acid (PFTrDA)	PFTrDA	72629-94-8	13	C13HF25O2	PFCA	
Perfluoro- tetradecanoic acid (PFTeDA)	PFTeDA	376-06-7	14	C14HF27O2	PFCA	

[a] Estimated concetration = No calibration standard available for this PFAS at the time of the analysis, the reported concentration is estimated from the GenX calibration curve

Man-made Lake data - Detected PFAS

Spring and Surface Water results in part-per-trillion; Sediment data in part-per-trillion (dry weight); and, Fish Filet Tissue results in part-per-million (wet weight)

						Spring	Surface Water	Sediment	Fish Tissue			
					sample identification	Spring inflow to Lake	Lake Surface Water - Mean	Sediment - Mean	Blue Catfish fillet, single fish	Redear Sunfish fillet, 7-part composite	Largemouth Bass fillet, MEAN 5-part composite (smaller fish) -	Largemouth Bass fillet, 2-part composite (Larger fish)
					fish ecological specification				Omnivore, bottom feeder, TL 4	Insectvore, middle feeder, TL 3	Piscivore, top predator, TL 4	Piscivore, top predator, TL 4
					collected date	3/7/2018	3/7/2018	3/7/2018	4/23/2018	3/7/2018	3/7/2018	3/7/2018
					analyzed date	3/15/2018	3/15/2018	3/21/2018	5/11/2018	3/27/2018	3/27/2018	3/27/2018
PFAS Chemical Name	PFAS Code	CASN	No. Carbons	Chemical Formula	Estimated Concentration [a]	**ng/L**	**ng/L**	**ng/kg - dry wt.**	**mg/kg - wet wt.**	**mg/kg - wet wt.**	**mg/kg - wet wt.**	**mg/kg - wet wt.**
Perfluoro- 2-methoxyacetic acid (PFMOAA)	PFMOAA	674-13-5	3	C3HF5O3	X	0.713	0.507					
Perfluoro- butyric acid (PFBA)	PFBA	375-22-4	4	C4HF7O2		14.4	12.5					
Perfluoro- butane- sulfonate (PFBS)	PFBS	375-73-5	4	C4HF9O3S		1.33 J	1.42 J					
Perfluoro- 3-methoxy- propanoic acid (PFMOPrA)	PFMOPrA	377-73-1	4	C4HF703	X	255	263					
Perfluoro- (3,5-dioxahexanoic) acid (PFO2HxA)	PFO2HxA	39492-88-1	4	C4HF7O4	X	126	167					
Perfluoro-4-methoxy- butanic acid (PFMOBA)	PFMOBA	863090-89-5	5	C5HF9O3	X	29.7	36.0					
Perfluoro- (3,5,7-trioxaoctanoic) acid (PFO3OA)	PFO3OA	39492-89-2	5	C5HF9O5	X	16.9	23.4					
Perfluoro- pentanoic acid (PFPeA)	PFPeA	2706-90-3	5	C5HF9O2		20.2	15.1					
Perfluoro- pentane- sulfonate (PFPeS)	PFPeS	2706-91-4	5	C5HF11O3S								
Fluorotelomer sulfonate 4:2 (4:2 FTS)	4:2 FTS	757124-72-4	6	C6H5F903S								
Perfluoro- hexanoic acid (PFHxA)	PFHxA	307-24-4	6	C6HF11O2		6.10	4.36					
Perfluoro- hexanesulfonate (PFHxS)	PFHxS	355-46-4	6	C6HF13O3S		0.896 J	0.796 J					
2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)- propanoic acid (PFPrOPrA, "GenX")	PFPrOPrA (GenX)	13252-13-6	6	C6HF11O3		1160	968	0.00180		0.000270		
Nafion Byproduct 1	Nafion-bp 1	29311-67-9	7	C7HF13SO5	X							
Nafion Byproduct 2	Nafion-bp 2	749836-20-2	7	C7H2F14SO5	X	57.0	54.1					
Perfluoro- heptanoic acid (PFHpA)	PFHpA	375-85-9	7	C7HF13O2		2.84	2.78					
Perfluoro- heptanesulfonate (PFHpS)	PFHpS	375-92-8	7	C7HF15O3S								
Fluorotelomer sulfonate 6:2 (6:2 FTS)	6:2 FTS	27619-97-2	8	C8H5F13O3S								
Perfluoro- octanoic acid (PFOA)	PFOA	335-67-1	8	C8HF15O2		4.23	9.61					
Perfluorooctane- sulfonate (PFOS)	PFOS	1763-23-1	8	C8HF17O3S		1.32 J	0.756 J			0.000496 J	0.00284	0.00249
Perfluoro- octane- sulfonamide (PFOSA)	PFOSA	754-91-6	8	C8H2F17NO2S								
Perfluoro- nonane- sulfonate (PFNS)	PFNA	68259-12-1	9	C9HF19O3S								
Perfluoro- nonanoic acid (PFNA)	PFNA	375-95-1	9	C9HF17O2								
Fluorotelomer sulfonate 8:2 (8:2 FTS)	8:2 FTS	39108-34-4	10	C10H5F17O3S								
Perfluoro- decanoic acid (PFDA)	PFDA	335-76-2	10	C10GF19O2								
Perfluoro- decanesulfonate (PFDS)	PFDS	335-77-3	10	C10HF21O3S								
Perfluoro- (3,5,7,9- tetraoxadecanoic) acid (PFO4DA)	PFO4DA	39492-90-5	10	C10H7F11O6	X	7.24	13.3					
N-methylperfluoro- 1-octane-sulfon- amidoacetic acid (N-MeFOSAA)	n-MeFOSAA	2355-31-9	11	C11H6F17NO4S								
Perfluoro- undecanoic acid (PFUdA)	PFUdA	2058-94-8	11	C11HF21O2					0.000872 J		0.00121	0.00109
N-ethylperfluoro- 1-octane- sulfon-amidoacetic acid (N-EtFOSAA)	n-EtFOSAA	2991-50-6	12	C12H8F17NO4S								
Perfluoro- dodecanoic acid (PFDoA)	PFDoA	307-55-1	12	C12HF23O2					0.000710 J		0.000859 J	0.000691 J
Perfluoro- tridecanoic acid (PFTrDA)	PFTrDA	72629-94-8	13	C13HF25O2					0.00127		0.000994 J	0.000813 J
Perfluoro- tetradecanoic acid (PFTeDA)	PFTeDA	376-06-7	14	C14HF27O2					0.000483 J		0.000468 J	0.000361 J
					No. of PFAS detected:	16	16	1	4	2	5	5
Sediment Organic Carbon, average, in mg/kg								40,600				
Fish Length, average, in mm									320	216	409	508
Fish Weight, average, in grams									7928	168	971	1812
Fish Fillet % Lipids, average									0.528	0.122	0.236	0.158

[a] Estimated concetration = No calibration standard available for this PFAS at the time of the analysis, the reported concentration is estimated from the GenX calibration curve

Nafion-bp 1 = Nafion byproduct 1
Nafion-bp 2 = Nafion byproduct 2
TL = trophic level
mm = millimeters

ppt = parts-per-trillion
ppm = parts-per-million

J = estimated concentration
ng/L = ng PFAS per liter water = ppt
ng/kg - dry wt. = ng PFAS per kg dry weight sediment = ppt
mg/kg - wet wt. = mg PFAS per kg wet weight filet tissue = ppm

Man-made Lake data - Detected PFAS (All data reported in parts-per-trillion units, "ppt")

Spring and Surface Water results in part-per-trillion; Sediment data in part-per-trillion (dry weight); and, Fish Filet Tissue results in part-per-trillion (wet weight)

						Groundwater	Surface Water	Sediment	Fish Tissue			
					sample identification	Spring inflow to Lake	Lake Surface Water - Mean	Sediment - Mean	Blue Catfish fillet, single fish	Redear Sunfish fillet, 7-part composite	Largemouth Bass fillet, MEAN 5-part composite (smaller fish) -	Largemouth Bass fillet, 2-part composite (Larger fish)
					fish ecological specification				Omnivore, bottom feeder, TL 4	Insectvore, middle feeder, TL 3	Piscivore, top predator, TL 4	Piscivore, top predator, TL 4
					collected date	3/7/2018	3/7/2018	3/7/2018	4/23/2018	3/7/2018	3/7/2018	3/7/2018
					analyzed date	3/15/2018	3/15/2018	3/21/2018	5/11/2018	3/27/2018	3/27/2018	3/27/2018
PFAS Chemical Name	PFAS Code	CASN	No. Carbons	Chemical Formula	Estimated Concentration [a]	**ng/L**	**ng/L**	**ng/kg - dry wt.**	**ng/kg - wet wt.**	**ng/kg - wet wt.**	**ng/kg - wet wt.**	**ng/kg - wet wt.**
Perfluoro- 2-methoxyacetic acid (PFMOAA)	PFMOAA	674-13-5	3	C3HF5O3	X	0.713	0.507					
Perfluoro- butyric acid (PFBA)	PFBA	375-22-4	4	C4HF7O2		14.4	12.5					
Perfluoro- butane- sulfonate (PFBS)	PFBS	375-73-5	4	C4HF9O3S		1.33 J	1.42 J					
Perfluoro- 3-methoxy- propanoic acid (PFMOPrA)	PFMOPrA	377-73-1	4	C4HF7O3	X	255	263					
Perfluoro- (3,5-dioxahexanoic) acid (PFO2HxA)	PFO2HxA	39492-88-1	4	C4HF7O4	X	126	167					
Perfluoro-4-methoxy- butanic acid (PFMOBA)	PFMOBA	863090-89-5	5	C5HF9O3	X	29.7	36.0					
Perfluoro- (3,5,7-trioxaoctanoic) acid (PFO3OA)	PFO3OA	39492-89-2	5	C5HF9O5	X	16.9	23.4					
Perfluoro- pentanoic acid (PFPeA)	PFPeA	2706-90-3	5	C5HF9O2		20.2	15.1					
Perfluoro- pentane- sulfonate (PFPeS)	PFPeS	2706-91-4	5	C5HF11O3S								
Fluorotelomer sulfonate 4:2 (4:2 FTS)	4:2 FTS	757124-72-4	6	C6H5F9O3S								
Perfluoro- hexanoic acid (PFHxA)	PFHxA	307-24-4	6	C6HF11O2		6.10	4.36					
Perfluoro- hexanesulfonate (PFHxS)	PFHxS	355-46-4	6	C6HF13O3S		0.896 J	0.796 J					
2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)- propanoic acid (PFPrOPrA, "GenX")	PFPrOPrA (GenX)	13252-13-6	6	C6HF11O3		1160	968	1800		270		
Nafion Byproduct 1	Nafion-bp 1	29311-67-9	7	C7HF13SO5	X							
Nafion Byproduct 2	Nafion-bp 2	749836-20-2	7	C7H2F14SO5	X	57.0	54.1					
Perfluoro- heptanoic acid (PFHpA)	PFHpA	375-85-9	7	C7HF13O2		2.84	2.78					
Perfluoro- heptanesulfonate (PFHpS)	PFHpS	375-92-8	7	C7HF15O3S								
Fluorotelomer sulfonate 6:2 (6:2 FTS)	6:2 FTS	27619-97-2	8	C8H5F13O3S								
Perfluoro- octanoic acid (PFOA)	PFOA	335-67-1	8	C8HF15O2		4.23	9.61					
Perfluorooctane- sulfonate (PFOS)	PFOS	1763-23-1	8	C8HF17O3S		1.32 J	0.756 J			496 J	2840	2490
Perfluoro- octane- sulfonamide (PFOSA)	PFOSA	754-91-6	8	C8H2F17NO2S								
Perfluoro- nonane- sulfonate (PFNS)	PFNA	68259-12-1	9	C9HF19O3S								
Perfluoro- nonanoic acid (PFNA)	PFNA	375-95-1	9	C9HF17O2								
Fluorotelomer sulfonate 8:2 (8:2 FTS)	8:2 FTS	39108-34-4	10	C10H5F17O3S								
Perfluoro- decanoic acid (PFDA)	PFDA	335-76-2	10	C10GF19O2								
Perfluoro- decanesulfonate (PFDS)	PFDS	335-77-3	10	C10HF21O3S								
Perfluoro- (3,5,7,9- tetraoxadecanoic) acid (PFO4DA)	PFO4DA	39492-90-5	10	C10H7F11O6	X	7.24	13.3					
N-methylperfluoro- 1-octane-sulfon- amidoacetic acid (N-MeFOSAA)	n-MeFOSAA	2355-31-9	11	C11H6F17NO4S								
Perfluoro- undecanoic acid (PFUdA)	PFUdA	2058-94-8	11	C11HF21O2					872 J		1210	1090
N-ethylperfluoro- 1-octane- sulfon-amidoacetic acid (N-EtFOSAA)	n-EtFOSAA	2991-50-6	12	C12H8F17NO4S								
Perfluoro- dodecanoic acid (PFDoA)	PFDoA	307-55-1	12	C12HF23O2					710 J		859 J	691 J
Perfluoro- tridecanoic acid (PFTrDA)	PFTrDA	72629-94-8	13	C13HF25O2					1270		994 J	813 J
Perfluoro- tetradecanoic acid (PFTeDA)	PFTeDA	376-06-7	14	C14HF27O2					483 J		468 J	361 J
					No. of PFAS detected:	16	16	1	4	2	5	5
Sediment Organic Carbon, average, in mg/kg								40,600				
Fish Length, average, in mm									320	216	409	508
Fish Weight, average, in grams									7928	168	971	1812
Fish Fillet % Lipids, average									0.528	0.122	0.236	0.158

[a] Estimated concetration = No calibration standard available for this PFAS at the time of the analysis, the reported concentration is es[a] Estimated concetration = No calibration standard available for this PFAS at the time of the analysis, the reported concentration is estimated from the GenX calibration curve

Nafion-bp 1 = Nafion byproduct 1
Nafion-bp 2 = Nafion byproduct 2
TL = trophic level
mm = millimeters

Nafion-bp 1 = Nafion J = estimated concentration
Nafion-bp 2 = Nafion ng/L = ng PFAS per liter water = ppt
TL = trophic level ng/kg dry weight = ng PFAS per kg dry weight sediment = ppt
mm = millimeters ng/kg-lipid = ng PFAS per kg fillet tissue lipid = ppt

Man-made Lake data - Detected PFAS (fish tissue as lipid-normalized PFAS concentrations)

Spring and Surface Water results in part-per-trillion; Sediment data in part-per-trillion (dry weight); and, Fish Filet Tissue results in part-per-billion (lipid-normalized)

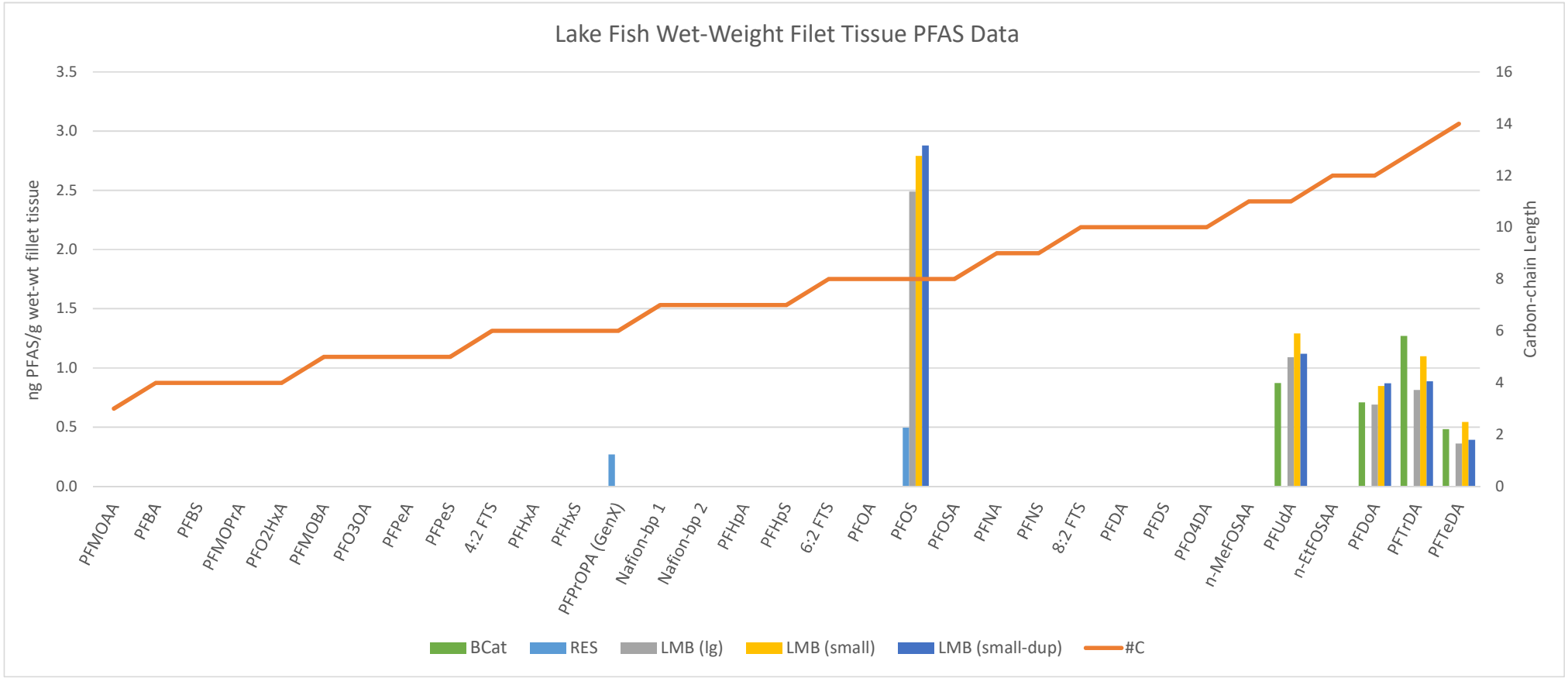
						Spring	Surface Water	Sediment	Fish Tissue			
					sample identification	Spring inflow to Lake	Lake Surface Water - Mean	Sediment - Mean	Blue Catfish fillet, single fish	Redear Sunfish fillet, 7-part composite	Largemouth Bass fillet, MEAN 5-part composite (smaller fish) -	Largemouth Bass fillet, 2-part composite (larger fish)
					fish ecological specification				Omnivore, bottom feeder, TL 4	Insectvore, middle feeder, TL 3	Piscivore, top predator, TL 4	Piscivore, top predator, TL 4
					collected date	3/7/2018	3/7/2018	3/7/2018	4/23/2018	3/7/2018	3/7/2018	3/7/2018
					analyzed date	3/15/2018	3/15/2018	3/21/2018	5/11/2018	3/27/2018	3/27/2018	3/27/2018
PFAS Chemical Name	PFAS Code	CASN	No. Carbons	Chemical Formula	Estimated Concentration [a]	ng/L	ng/L	ng/kg - dry wt.	ng/g-lipid	ng/g-lipid	ng/g-lipid	ng/g-lipid
Perfluoro- 2-methoxyacetic acid (PFMOAA)	PFMOAA	674-13-5	3	C3HF5O3	X	0.713	0.507					
Perfluoro- butyric acid (PFBA)	PFBA	375-22-4	4	C4HF7O2		14.4	12.5					
Perfluoro- butane- sulfonate (PFBS)	PFBS	375-73-5	4	C4HF9O3S		1.33 J	1.42 J					
Perfluoro- 3-methoxy- propanoic acid (PFMOPrA)	PFMOPrA	377-73-1	4	C4HF703	X	255	263					
Perfluoro- (3,5-dioxahexanoic) acid (PFO2HxA)	PFO2HxA	39492-88-1	4	C4HF7O4	X	126	167					
Perfluoro-4-methoxy- butanic acid (PFMOBA)	PFMOBA	863090-89-5	5	C5HF9O3	X	29.7	36.0					
Perfluoro- (3,5,7-trioxaoctanoic) acid (PFO3OA)	PFO3OA	39492-89-2	5	C5HF9O5	X	16.9	23.4					
Perfluoro- pentanoic acid (PFPeA)	PFPeA	2706-90-3	5	C5HF9O2		20.2	15.1					
Perfluoro- pentane- sulfonate (PFPeS)	PFPeS	2706-91-4	5	C5HF11O3S								
Fluorotelomer sulfonate 4:2 (4:2 FTS)	4:2 FTS	757124-72-4	6	C6H5F903S								
Perfluoro- hexanoic acid (PFHxA)	PFHxA	307-24-4	6	C6HF11O2		6.10	4.36					
Perfluoro- hexanesulfonate (PFHxS)	PFHxS	355-46-4	6	C6HF13O3S		0.896 J	0.796 J					
2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)- propanoic acid (PFPrOPrA, "GenX")	PFPrOPrA (GenX)	13252-13-6	6	C6HF11O3		1160	968	1800		221		
Nafion Byproduct 1	Nafion-bp 1	29311-67-9	7	C7HF13SO5	X							
Nafion Byproduct 2	Nafion-bp 2	749836-20-2	7	C7H2F14SO5	X	57.0	54.1					
Perfluoro- heptanoic acid (PFHpA)	PFHpA	375-85-9	7	C7HF13O2		2.84	2.78					
Perfluoro- heptanesulfonate (PFHpS)	PFHpS	375-92-8	7	C7HF15O3S								
Fluorotelomer sulfonate 6:2 (6:2 FTS)	6:2 FTS	27619-97-2	8	C8H5F13O3S								
Perfluoro- octanoic acid (PFOA)	PFOA	335-67-1	8	C8HF15O2		4.23	9.61					
Perfluorooctane- sulfonate (PFOS)	PFOS	1763-23-1	8	C8HF17O3S		1.32 J	0.756 J			407 J	1217	1576
Perfluoro- octane- sulfonamide (PFOSA)	PFOSA	754-91-6	8	C8H2F17NO2S								
Perfluoro- nonane- sulfonate (PFNS)	PFNA	68259-12-1	9	C9HF19O3S								
Perfluoro- nonanoic acid (PFNA)	PFNA	375-95-1	9	C9HF17O2								
Fluorotelomer sulfonate 8:2 (8:2 FTS)	8:2 FTS	39108-34-4	10	C10H5F17O3S								
Perfluoro- decanoic acid (PFDA)	PFDA	335-76-2	10	C10GF19O2								
Perfluoro- decanesulfonate (PFDS)	PFDS	335-77-3	10	C10HF21O3S								
Perfluoro- (3,5,7,9- tetraoxadecanoic) acid (PFO4DA)	PFO4DA	39492-90-5	10	C10H7F11O6	X	7.24	13.3					
N-methylperfluoro- 1-octane-sulfon- amidoacetic acid (N-MeFOSAA)	n-MeFOSAA	2355-31-9	11	C11H6F17NO4S								
Perfluoro- undecanoic acid (PFUdA)	PFUdA	2058-94-8	11	C11HF21O2					165 J		513	690
N-ethylperfluoro- 1-octane- sulfon-amidoacetic acid (N-EtFOSAA)	n-EtFOSAA	2991-50-6	12	C12H8F17NO4S								
Perfluoro- dodecanoic acid (PFDoA)	PFDoA	307-55-1	12	C12HF23O2					134 J		369 J	437 J
Perfluoro- tridecanoic acid (PFTrDA)	PFTrDA	72629-94-8	13	C13HF25O2					241		421 J	515 J
Perfluoro- tetradecanoic acid (PFTeDA)	PFTeDA	376-06-7	14	C14HF27O2					91.5 J		198 J	228 J
					No. of PFAS detected:	16	16	1	4	2	5	5
Sediment Organic Carbon, average, in mg/kg								40,600				
Fish Length, average, in mm									320	216	409	508
Fish Weight, average, in grams									7928	168	971	1812
Fish Fillet % Lipids, average									0.528	0.122	0.236	0.158

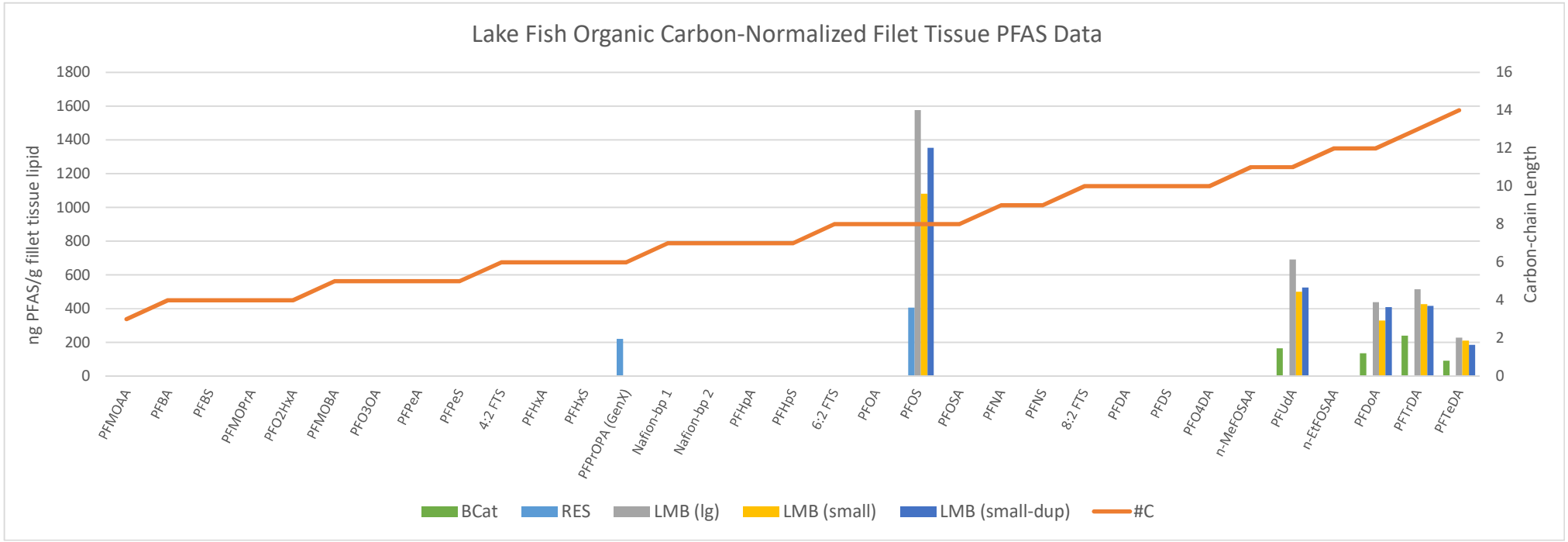
[a] Estimated concetration = No calibration standard available for this PFAS at the time of the analysis, the reported concentration is estimated from the GenX calibration curve

Nafion-bp 1 = Nafion byproduct 1
Nafion-bp 2 = Nafion byproduct 2
TL = trophic level
mm = millimeters

J = estimated concentration
ppb = parts-per-billion
ppt = parts-per-billion

ng/L = ng PFAS per liter water = ppt
ng/kg dry weight = ng PFAS per kg dry weight sediment = ppt
ng/g-lipid = ng PFAS per g fillet tissue lipid = ppb


Lake Fish Wet-Weight Filet Tissue PFAS Data
ng PFAS/g wet-wt fillet tissue
Carbon-chain Length
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
16
14
12
10
8
6
4
2
0
PFMOAA
PFBA
PFBS
PFMOPrA
PFO2HxA
PFMOBA
PFO3OA
PFPeA
PFPeS
4:2 FTS
PFHxA
PFHxS
PFPrOPA (GenX)
Nafion-bp 1
Nafion-bp 2
PFHpA
PFHpS
6:2 FTS
PFOA
PFOS
PFOSA
PFNA
PFNS
8:2 FTS
PFDA
PFDS
PFO4DA
n-MeFOSAA
PFUdA
n-EtFOSAA
PFDoA
PFTrDA
PFTeDA
BCat
RES
LMB (lg)
LMB (small)
LMB (small-dup)
#C


Lake Fish Organic Carbon-Normalized Filet Tissue PFAS Data
ng PFAS/g fillet tissue lipid
Carbon-chain Length
1800
1600
1400
1200
1000
800
600
400
200
0
16
14
12
10
8
6
4
2
0
PFMOAA
PFBA
PFBS
PFMOPrA
PFO2HxA
PFMOBA
PFO3OA
PFPeA
PFPeS
4:2 FTS
PFHxA
PFHxS
PFPrOPA (GenX)
Nafion-bp 1
Nafion-bp 2
PFHpA
PFHpS
6:2 FTS
PFOA
PFOS
PFOSA
PFNA
PFNS
8:2 FTS
PFDA
PFDS
PFO4DA
n-MeFOSAA
PFUdA
n-EtFOSAA
PFDoA
PFTrDA
PFTeDA
BCat
RES
LMB (lg)
LMB (small)
LMB (small-dup)
#C