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2022 Water and Fish Collection Project – Status Update

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Project Information

Overview

- PFAS are persistent contaminants that have unknown impacts in many environments.
- In North Carolina, the Chemours facility is a source of PFAS contamination into the Cape Fear River.
- The Cape Fear River runs over 300km and serves as a drinking water source for NC residents.

Goal

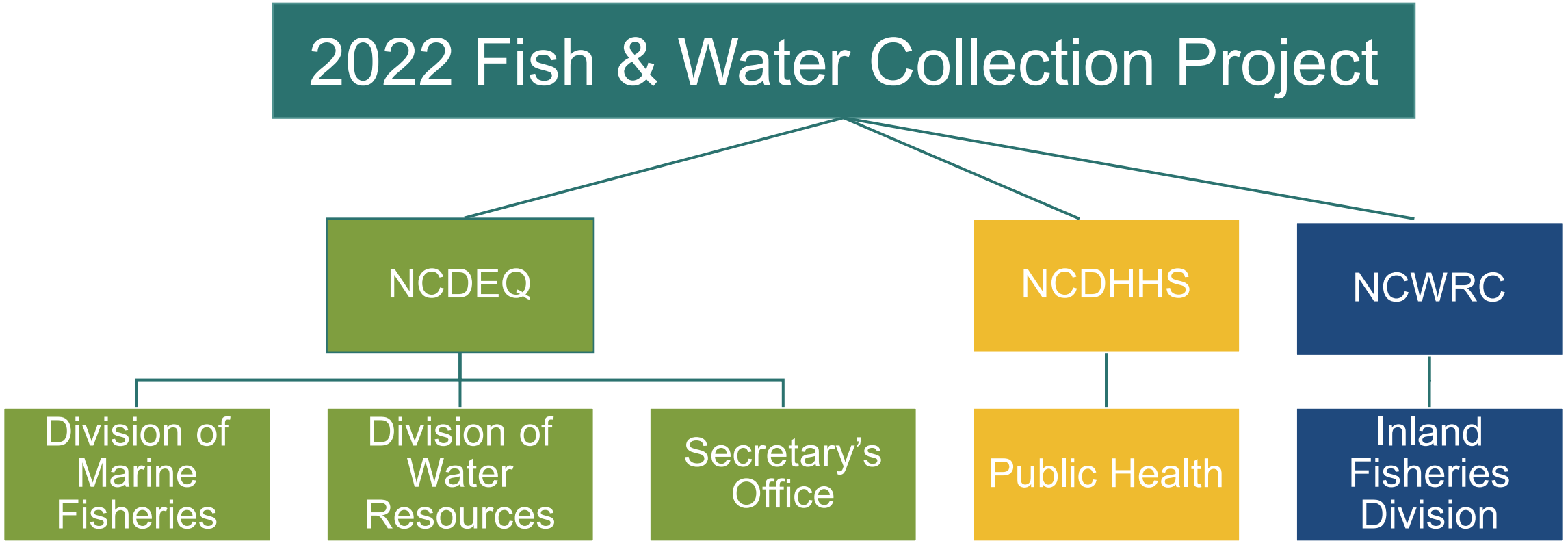
- To examine the extent of the PFAS contamination.
- To better understand bioaccumulation of PFAS.
- To collect fish tissue data for development of fish consumption advisories.

Details

- June – August 2022: 250+ fish across 14 species were collected from the Cape Fear River, starting below the Chemours facility and ending at the Atlantic Ocean.
  - Most frequently caught and consumed fish species in the Cape Fear Region.
- The fish fillets were analyzed alongside water samples collected in situ for 56 different PFAS
  - to support bioaccumulation factor (BAF) calculations across trophic levels in NC.
  - to support NCDEQ standards development to protect public health and NC's water resources.
  - to support the NCDHHS in the development PFAS-specific fish consumption advisories.

NORTH CAROLINA
Department of Environmental Quality

Project Partners

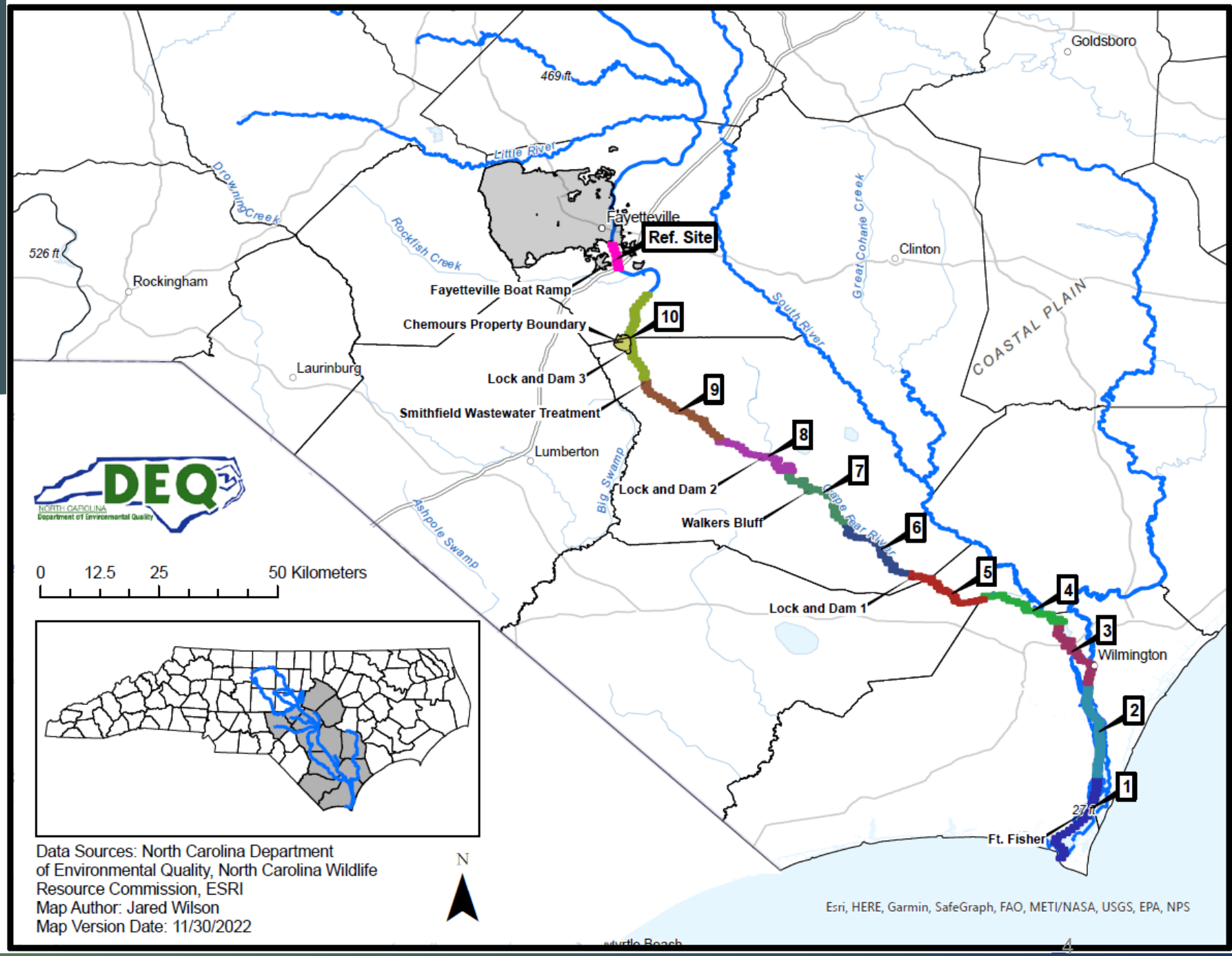


Department of Environmental Quality

2022 Fish & Surface Water Collection Project

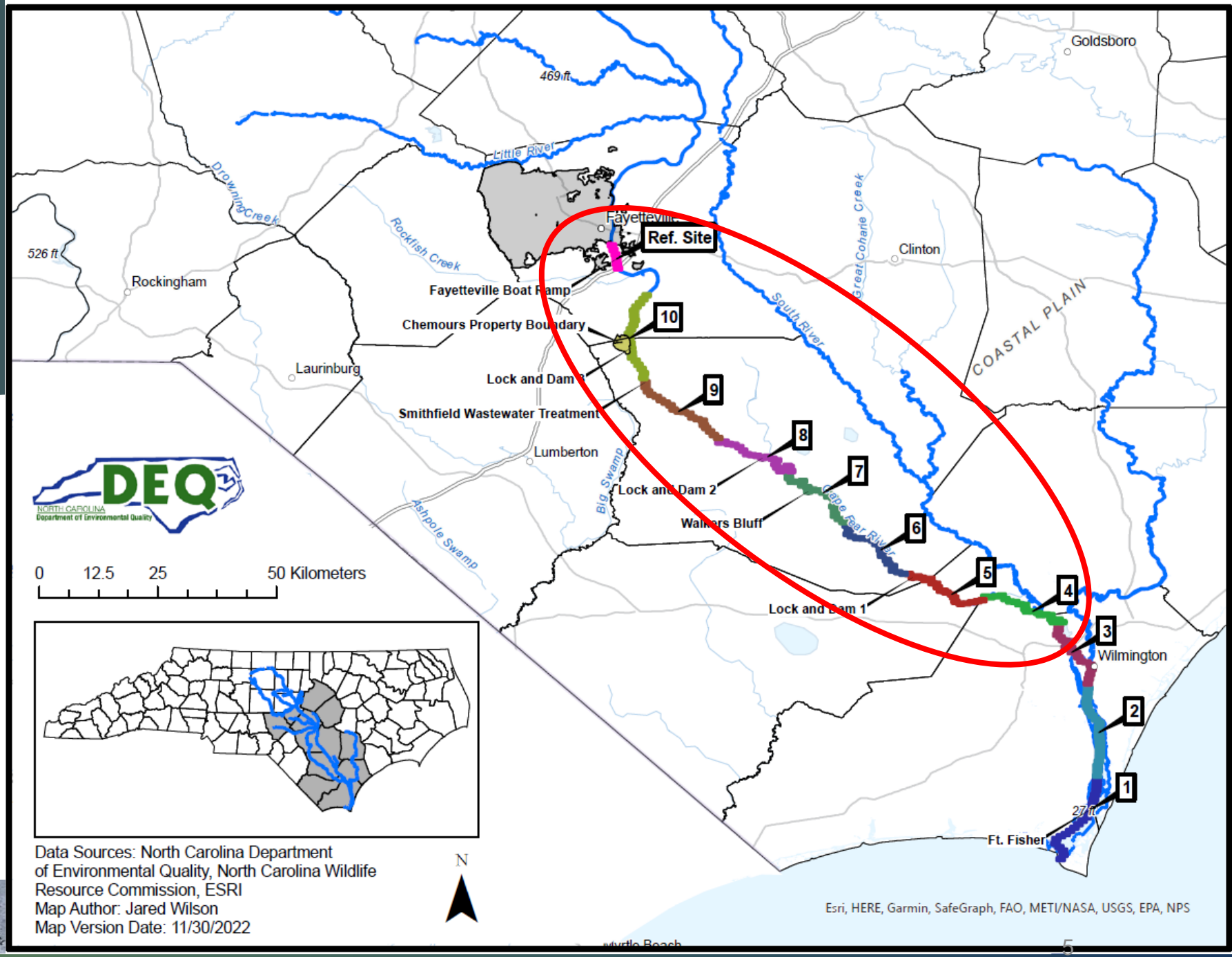
Collection Locations

The Cape Fear River was divided into ten 20km segments beginning at the Chemours property boundary to the Atlantic Ocean.



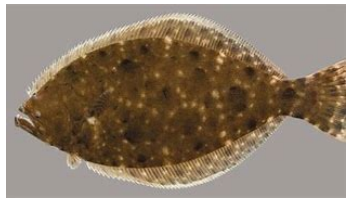
2022 Fish & Surface Water Collection Project

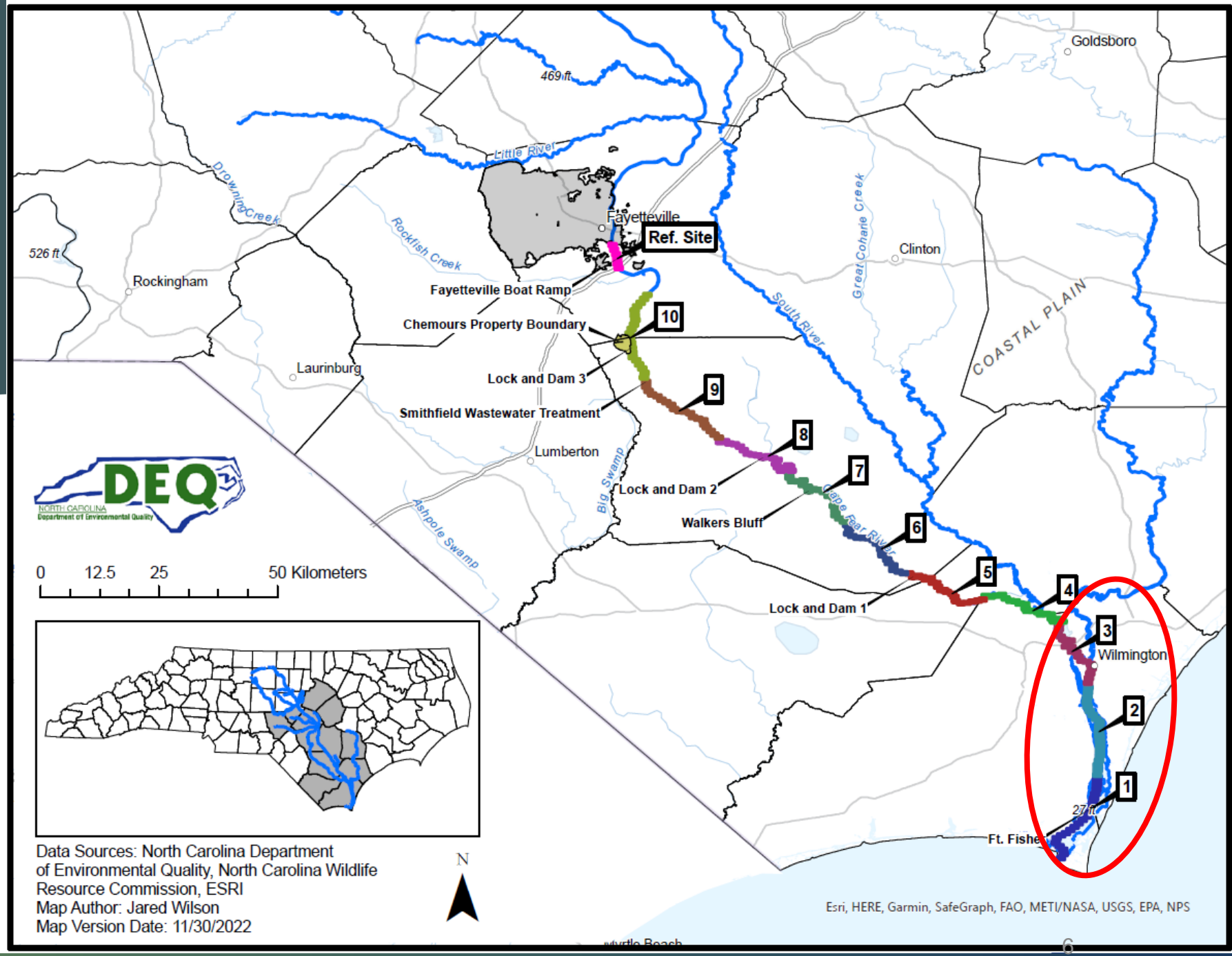
Freshwater Species



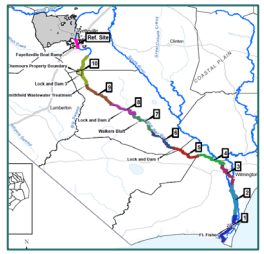
2022 Fish & Surface Water Collection Project

Marine Species



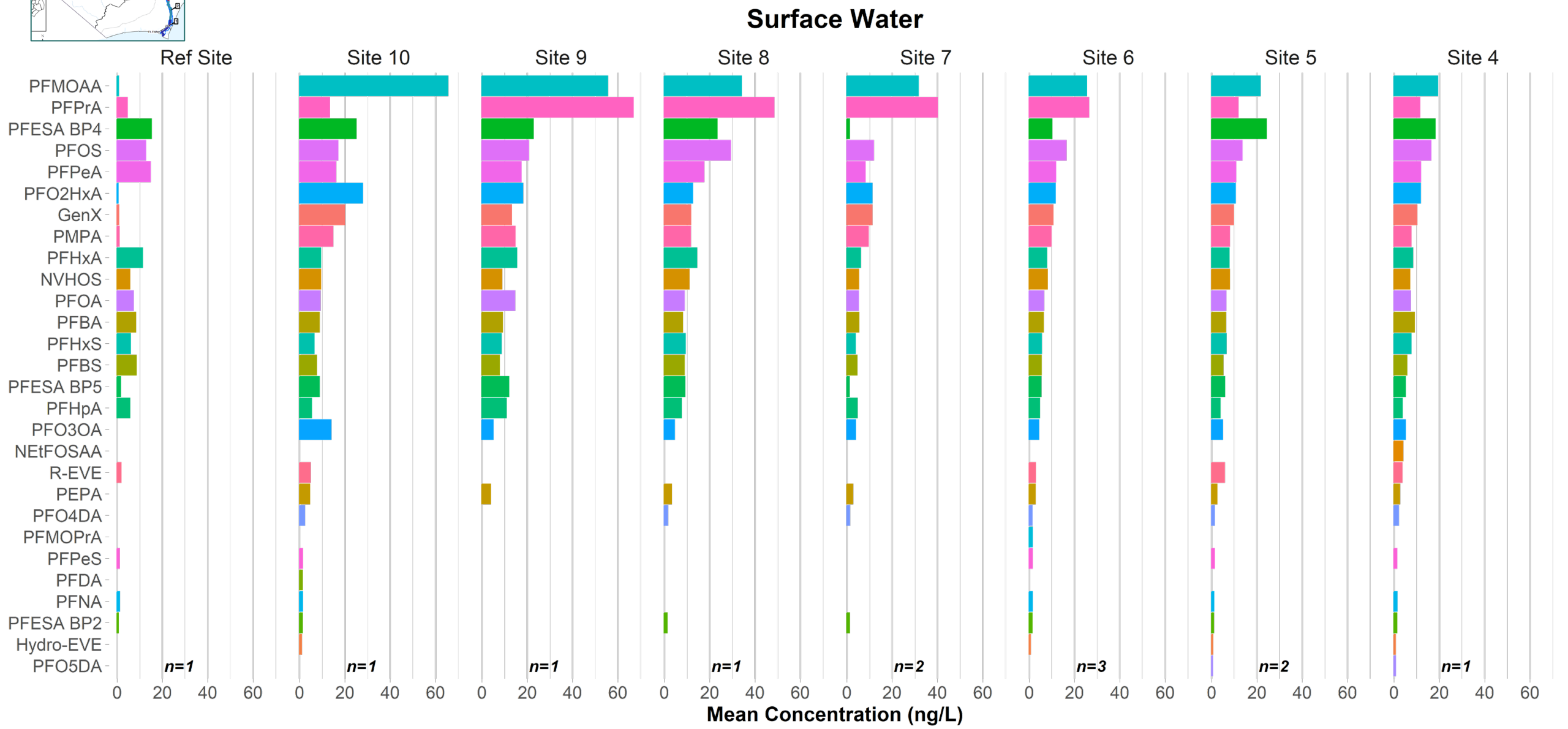


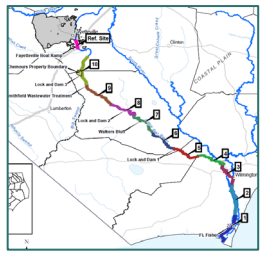
Fish Collection and Processing



PFAS Data – Surface Water

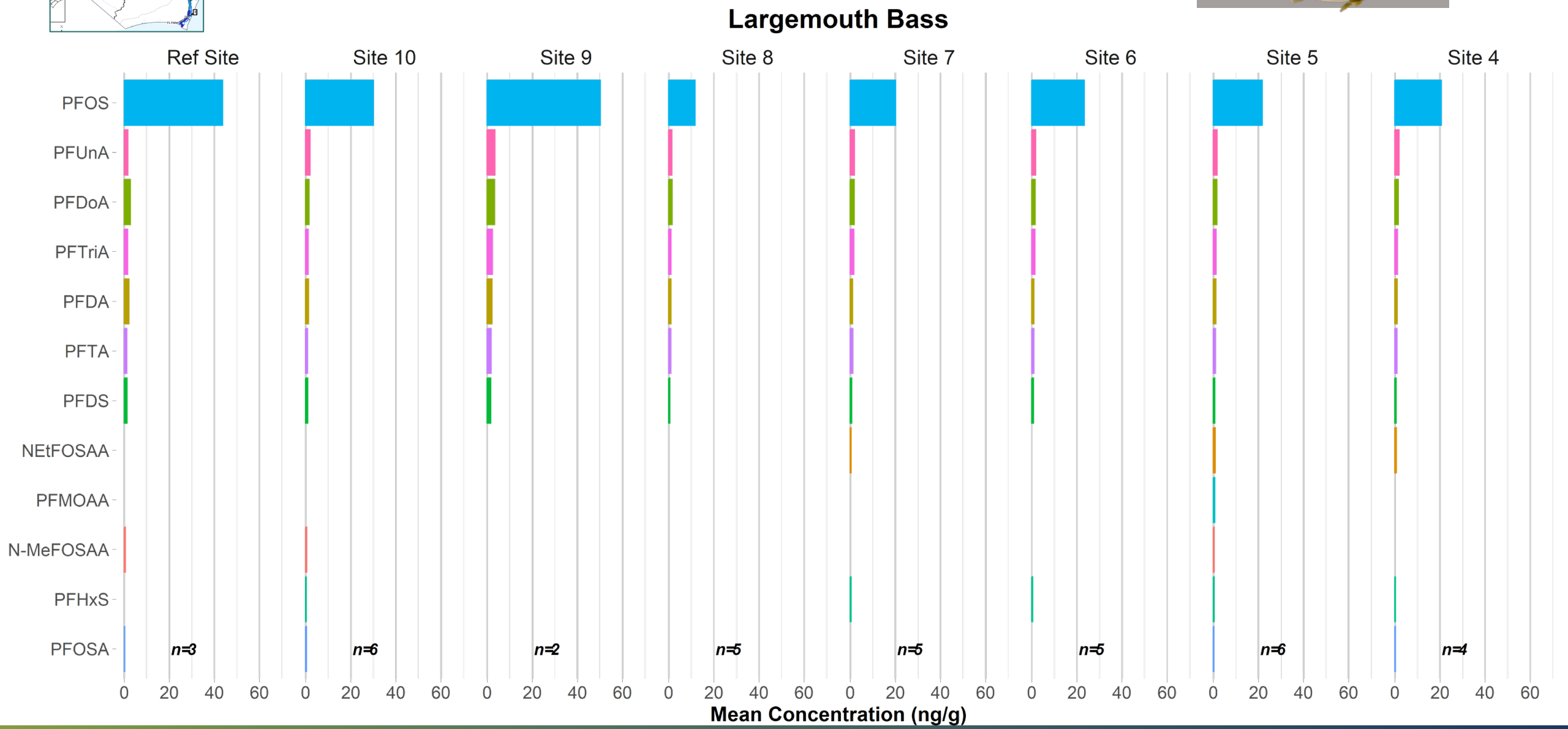
Preliminary Analysis

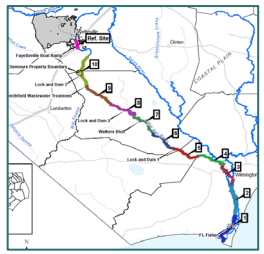




PFAS Data – Largemouth Bass

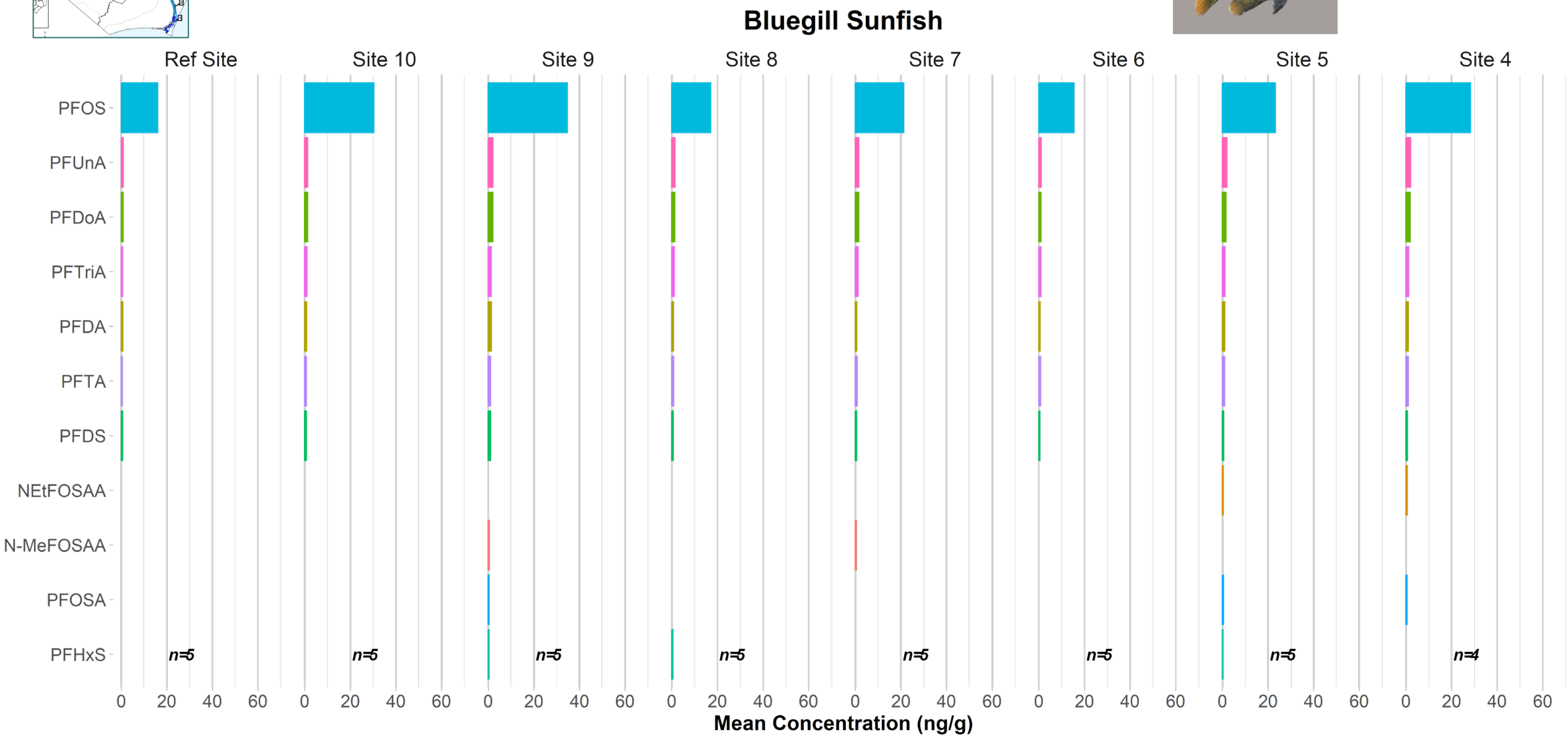
Preliminary Analysis

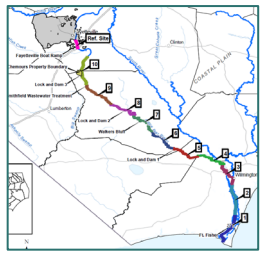




PFAS Data – Bluegill Sunfish

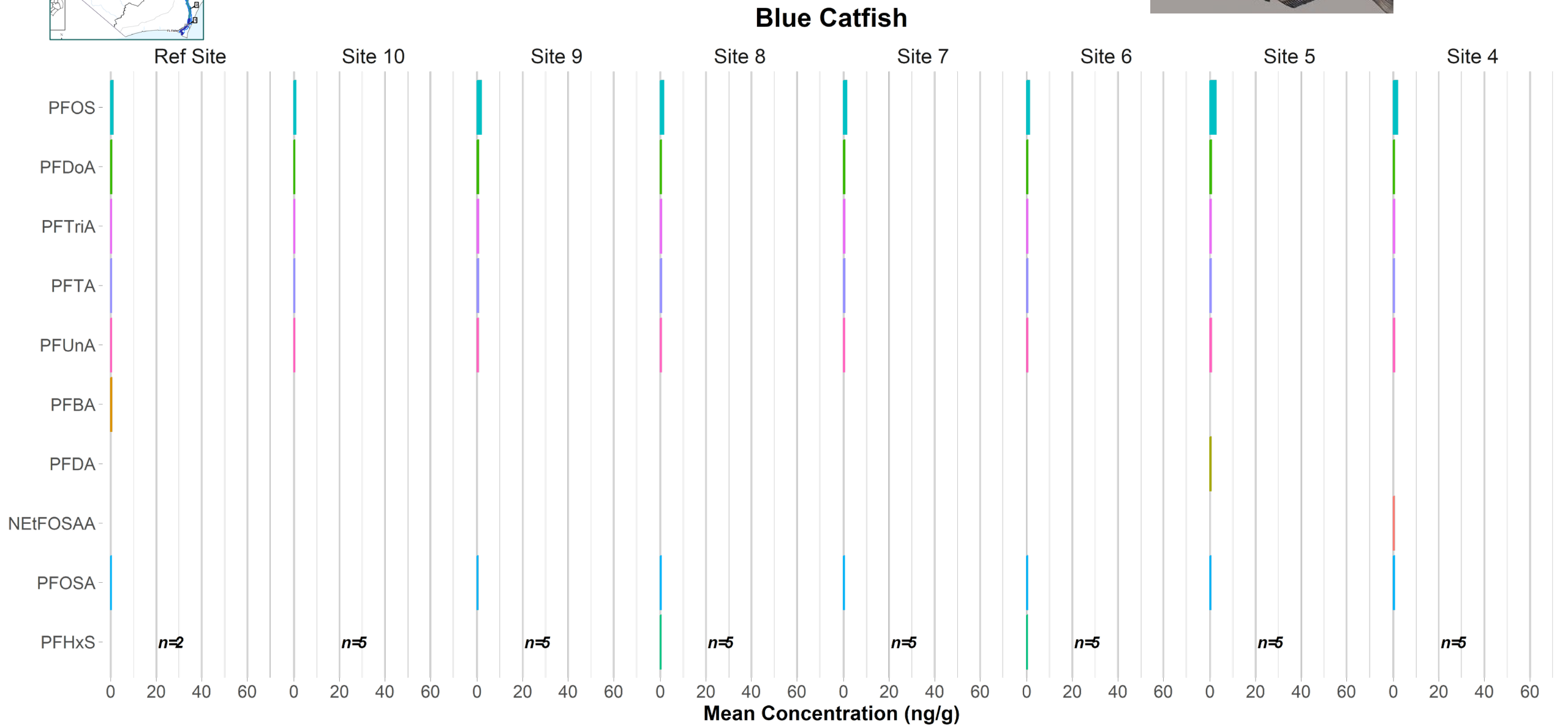
Preliminary Analysis

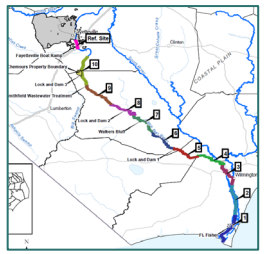




PFAS Data – Blue Catfish

Preliminary Analysis





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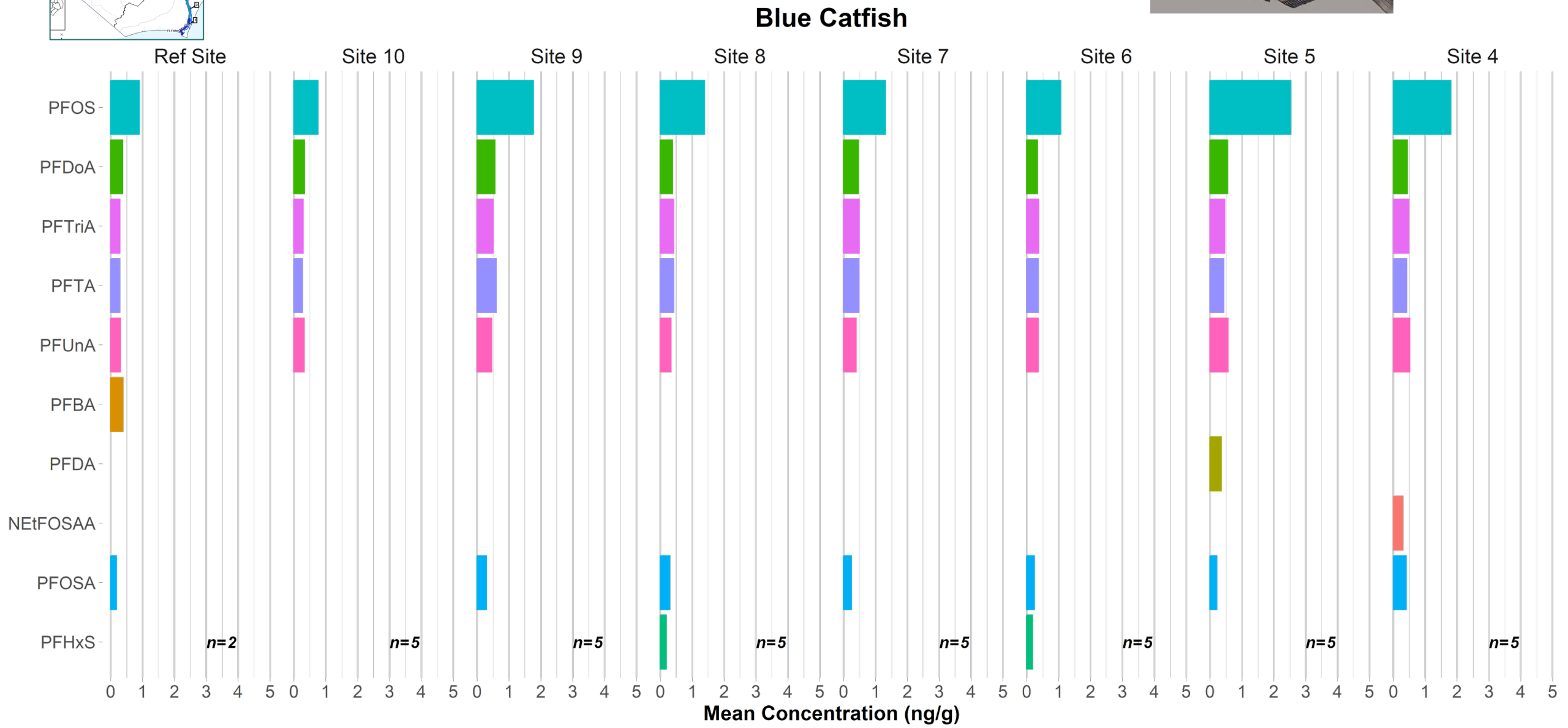
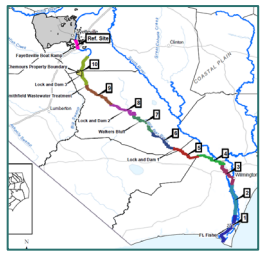
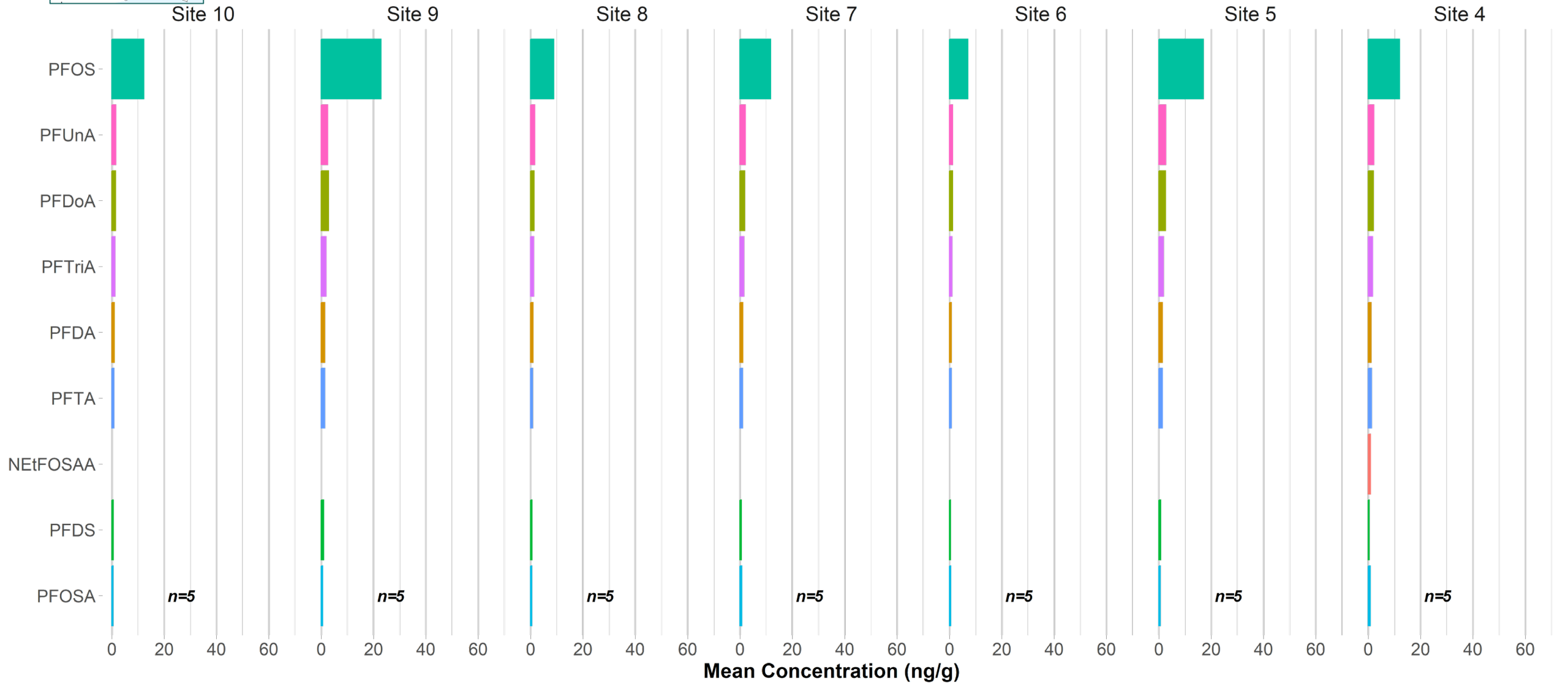
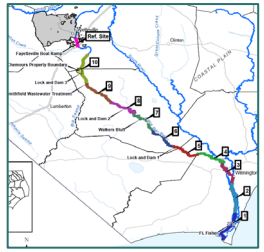




PFAS Data – Flathead Catfish

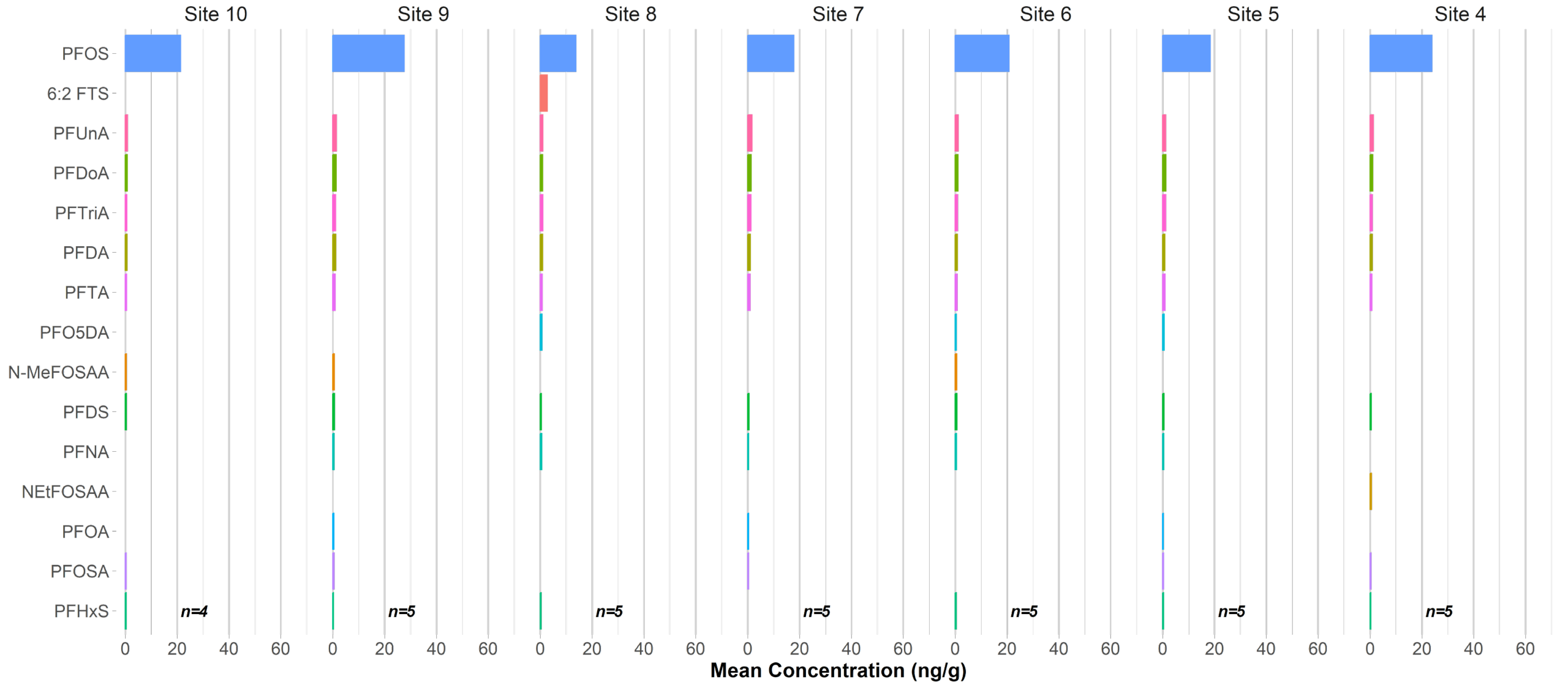
Preliminary Analysis

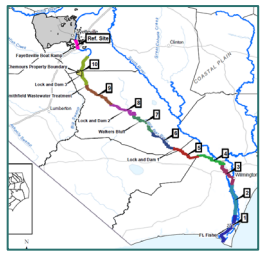




PFAS Data – Redear Sunfish

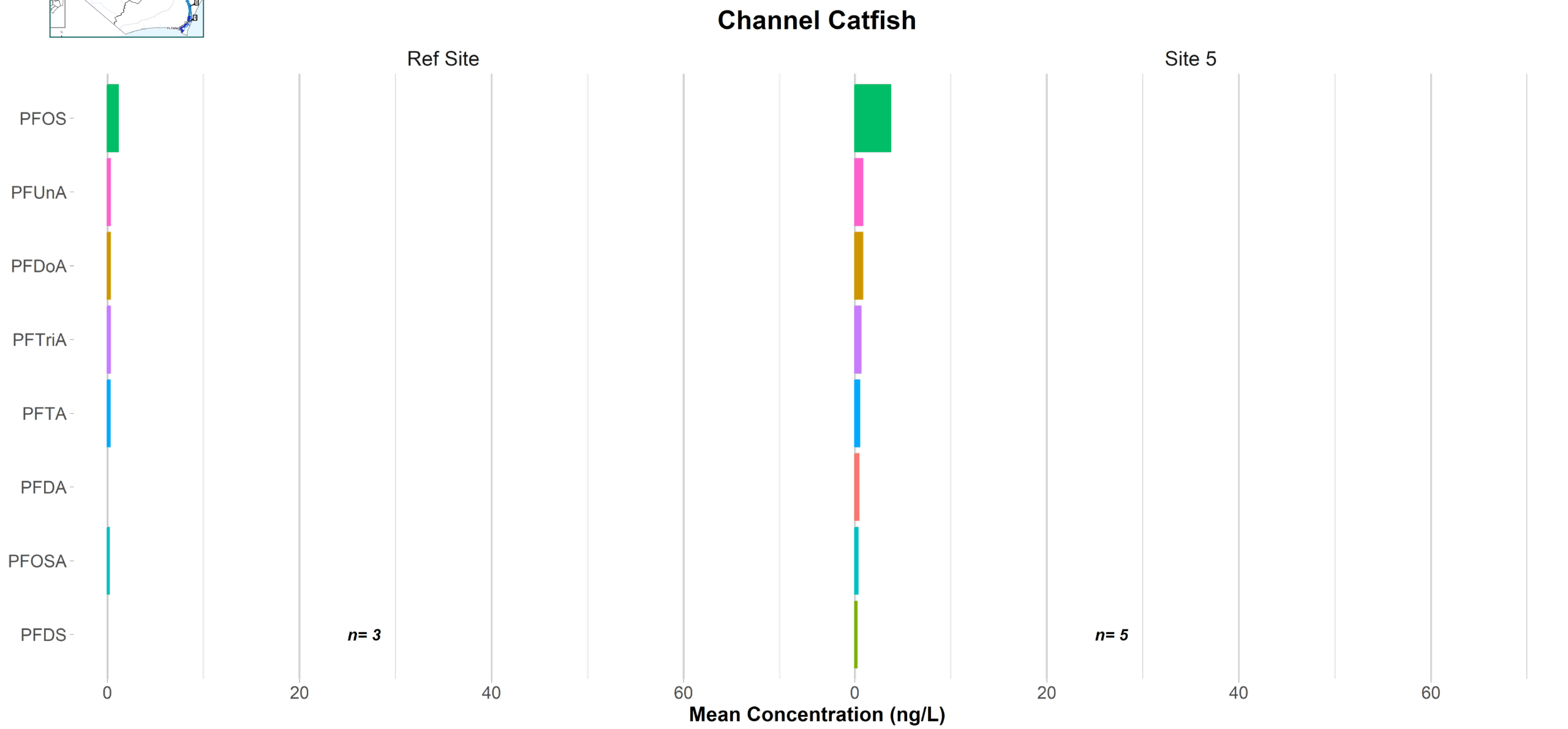
Preliminary Analysis

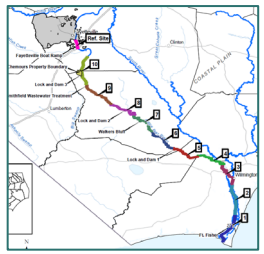




PFAS Data – Channel Catfish

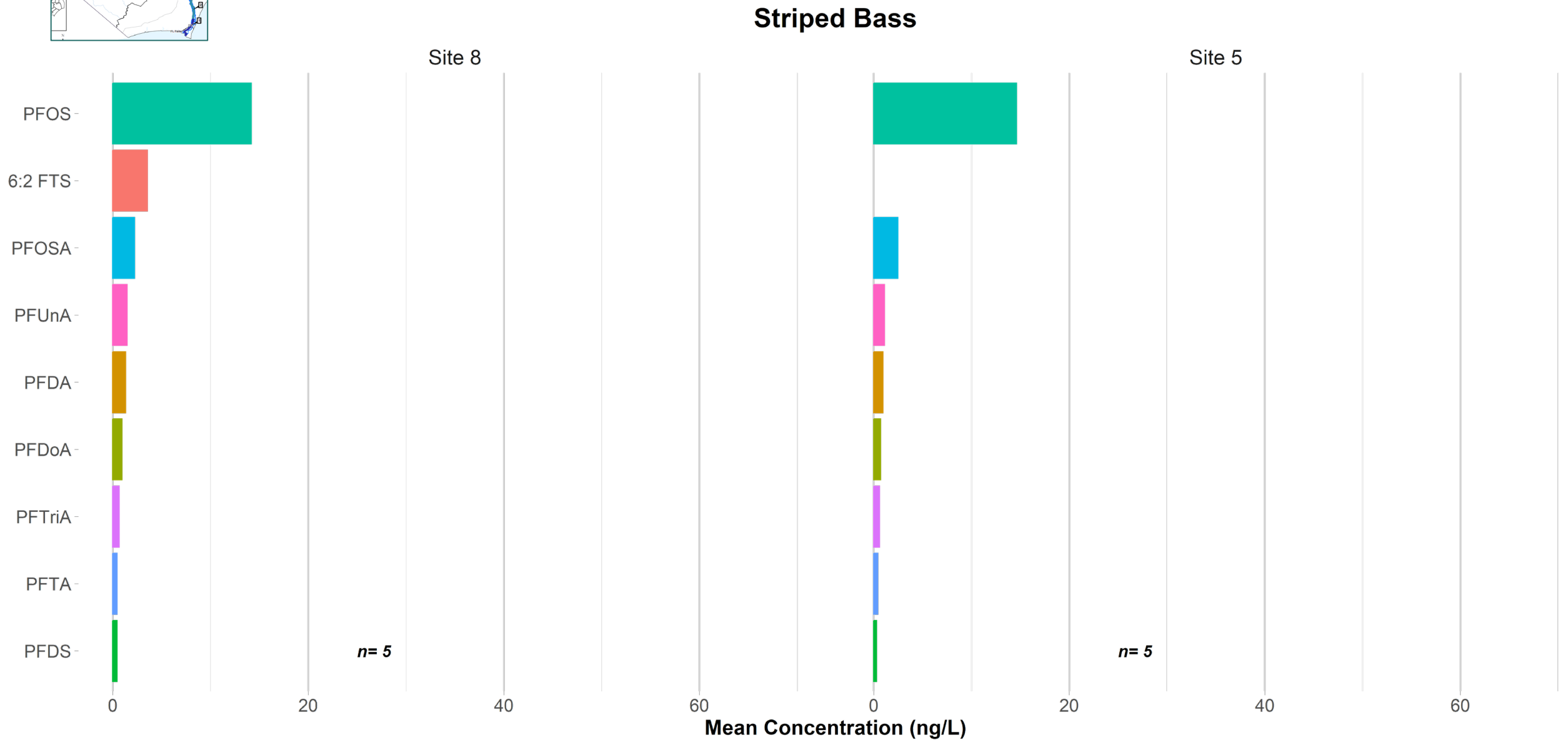
Preliminary Analysis

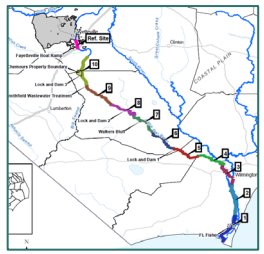




PFAS Data – Striped Bass

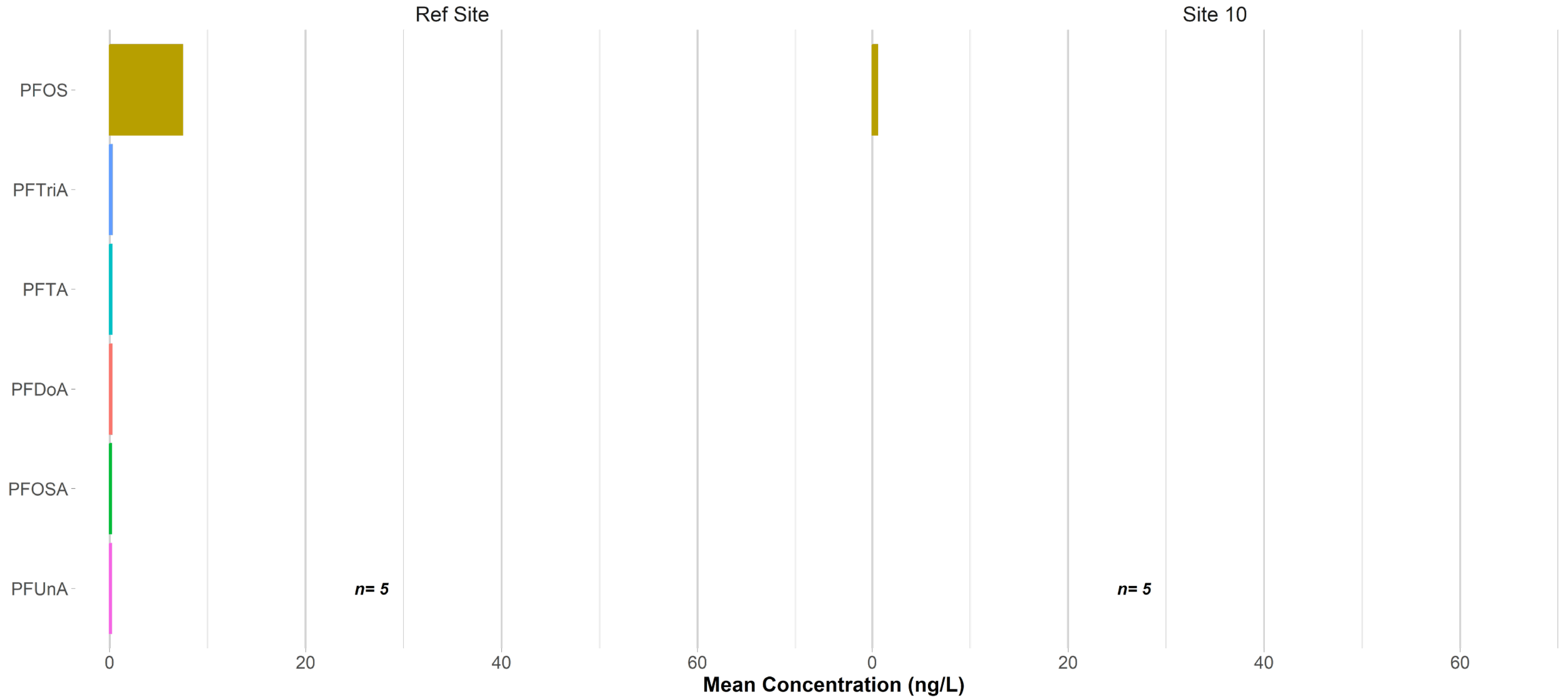
Preliminary Analysis





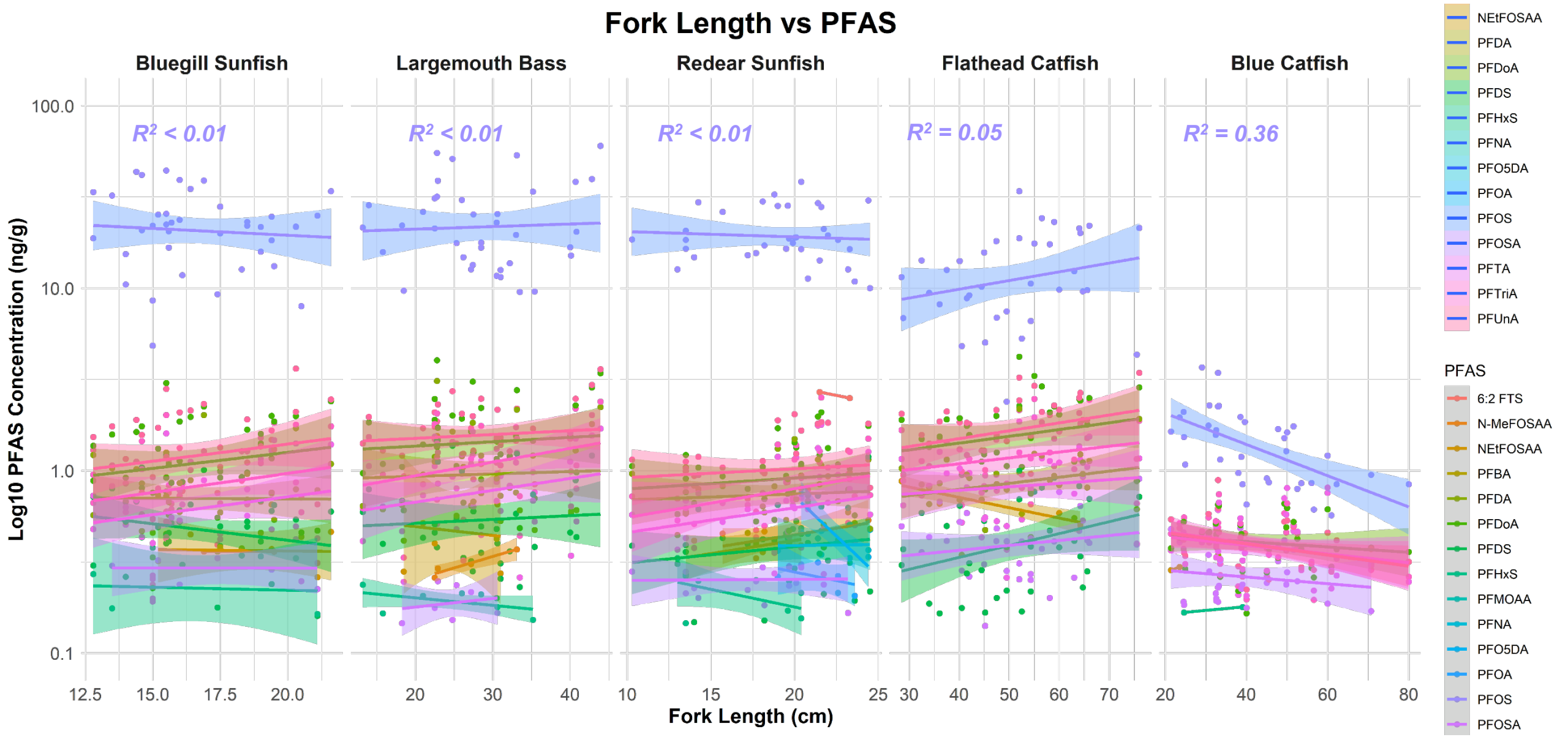
PFAS Data – American Shad

Preliminary Analysis



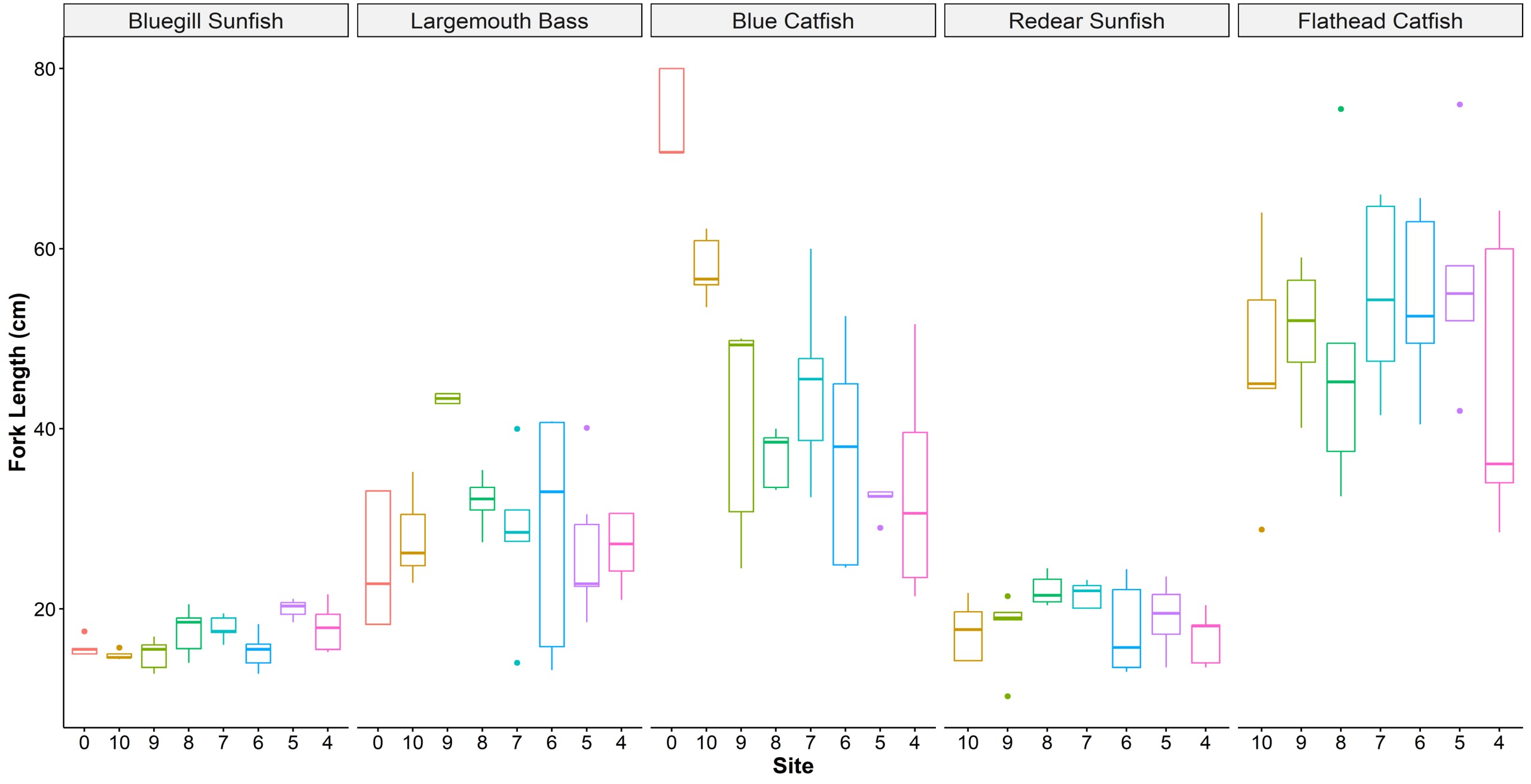
PFAS Concentration vs Fish Size

Preliminary Analysis



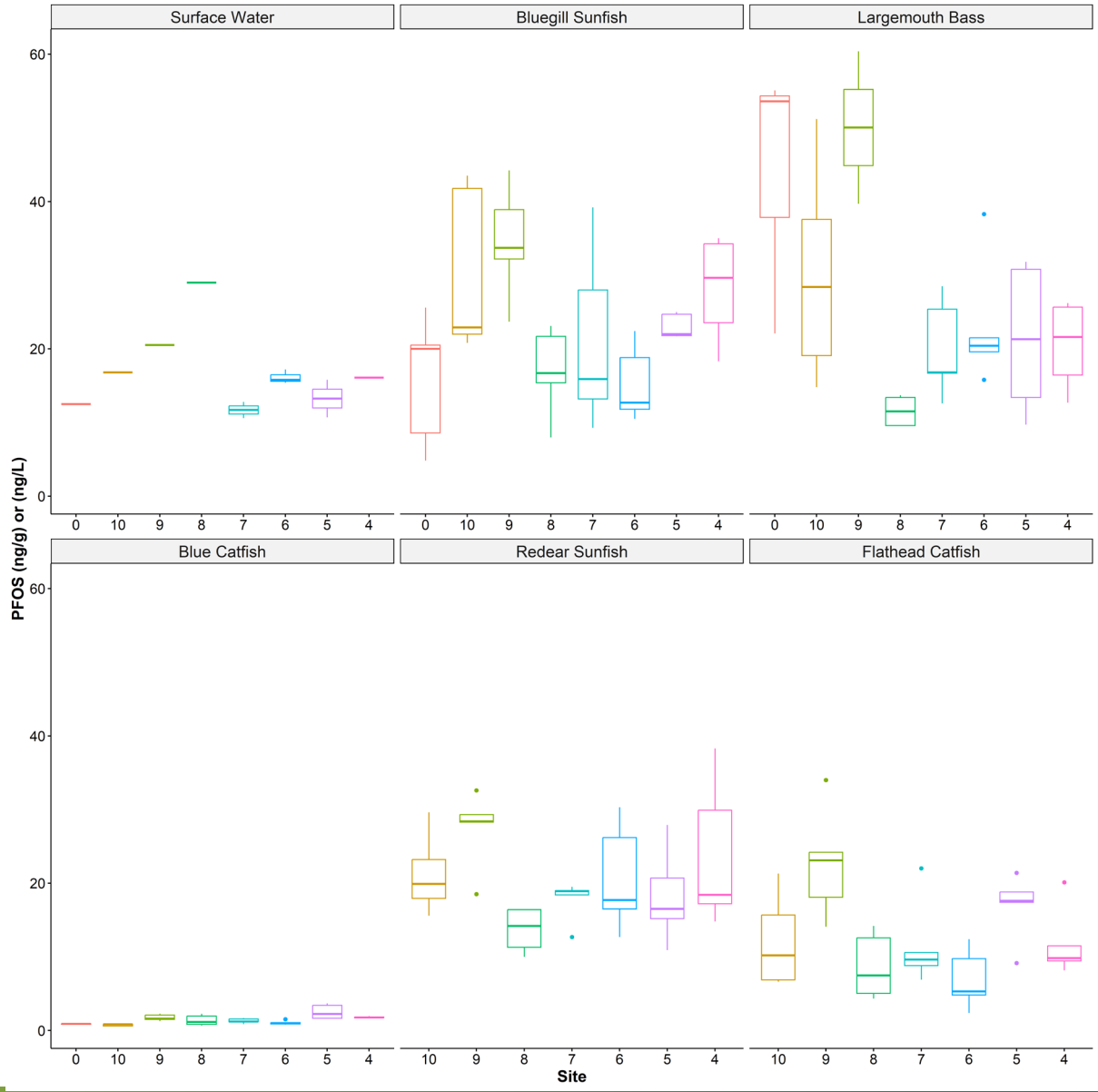
Fish Size Across Each Site

Preliminary Analysis



Preliminary Analysis

Statistical Analysis



Using a Generalized Linear Model with the Gaussian distribution which included
Site, Species, Length, and ***Weight***:

- ***Only Species*** was a significant predictor of PFOS concentration
  - Bluegill Sunfish $p = 0.001$
  - Redear Sunfish $p = 0.001$
  - Largemouth Bass $p = 0.001$
  - Flathead Catfish $p = 0.05$

Bioaccumulation Factors

** Can only be calculated for PFAS that are present in BOTH fish fillet and surface water samples

	BAF (*n*)							
PFAS	**Largemouth Bass (37)**	**Bluegill Sunfish (39)**	**Redear Sunfish (34)**	**Flathead Catfish (35)**	**Blue Catfish (37)**	**Channel Catfish (8)**	**American Shad (10)**	**Striped Bass (10)**
PFOS	1539 (37)	1429 (39)	1264 (34)	805 (35)	92 (37)	169 (8)	247 (10)	892 (10)
PFDA	999 (37)	706 (34)	720 (33)	851 (33)	315 (1)	371 (5)	-	1011 (10)
NEtFOSAA	153 (7)	100 (5)	102 (5)	185 (5)	78 (2)	-	-	-
PFHxS	32 (8)	39 (4)	36 (7)	-	28 (2)	-	-	-
PFMOAA	18 (1)	-	-	-	-	-	-	-
PFBA	-	-	-	-	54 (1)	-	-	-
PFNA	-	-	381 (9)	-	-	-	-	-
PFO5DA	-	-	1270 (4)	-	-	-	-	-
PFOA	-	-	36 (4)	-	-	-	-	-

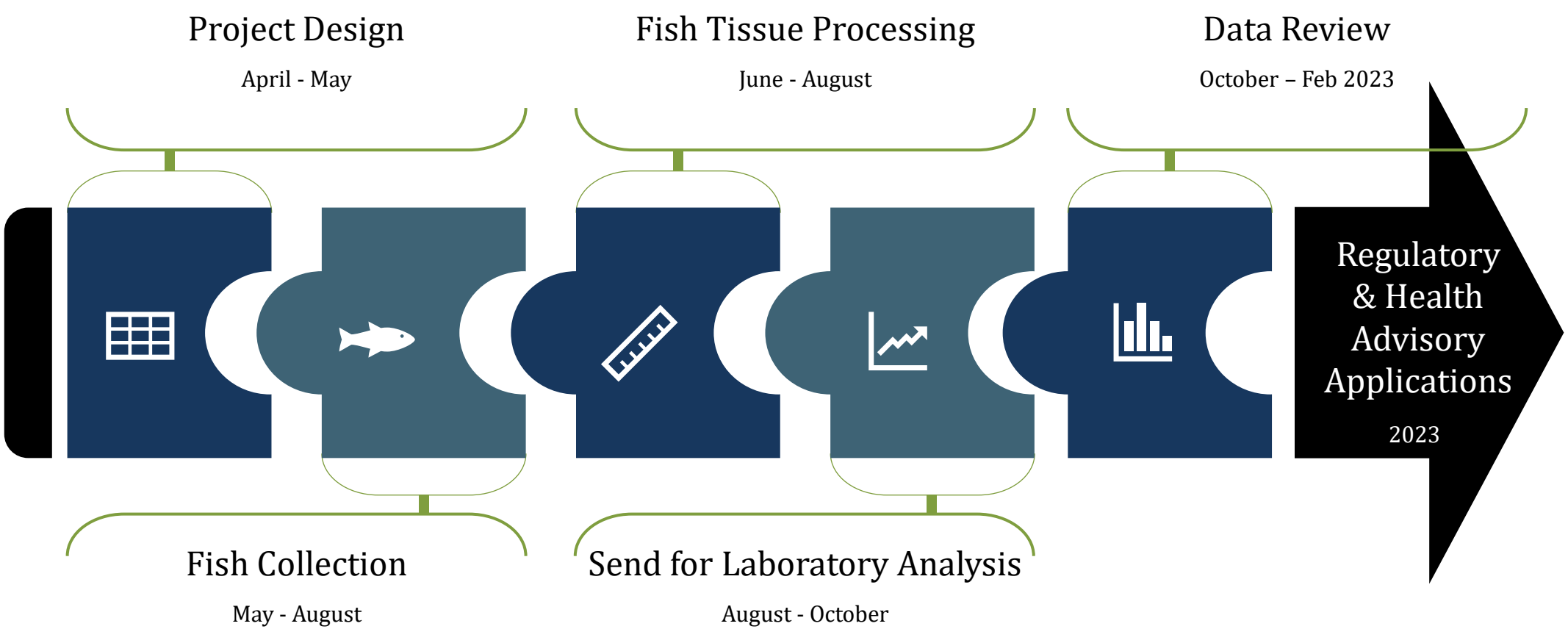
The average [PFAS] of all 12 water samples was used to derive BAFs.

Summary and Next Steps

- Summary
- Altogether, the data collected in this study will inform current activities in NCDEQ and NCDHHS and will provide a comprehensive data set to inform additional PFAS fish studies beyond NC.
- Of all PFAS measured, PFOS was the leading compound in fish fillets from the Cape Fear River
  - Many other studies show PFOS present in fish fillets
- Preliminary statistical analysis show that species is the most significant factor in predicting PFOS concentration in fish fillets.
  - Likely linked to diet and trophic position
  - Length, Weight, and Site/Location were not good indicators of PFOS concentrations

- Next Steps
- Target specific fish to further examine their liver tissue for the suite of PFAS
- Process and analyze the marine species collected

2022 Fish & Water Collection Event Estimated Timeline



Thank you

Department of Environmental Quality