

NC DEPARTMENT OF  
**HEALTH AND  
HUMAN SERVICES**

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## **Appendix A. Summer 2022 Cape Fear River Freshwater Fish Collection**

### **Executive Summary**

During the summer of 2022 (June - August), the NC Department of Environmental Quality (NCDEQ) conducted a large-scale fish and water collection project that took place in the Middle and Lower Cape Fear River. This fish collection and subsequent analyses were undertaken to protect public health and address concerns regarding the consumption of fish from the Middle and Lower Cape Fear River. The fish tissues in this project were collected by the North Carolina Wildlife Resources (NCWRC) and NCDEQ Division of Water Resources (DWR). The fish collected were processed at the NCDEQ DWR laboratory and shipped to a third-party laboratory for analysis of a suite of per- and polyfluoroalkyl substances (PFAS) compounds, including the Chemours Consent Order PFAS, and are being used to inform the NC Department of Health and Human Services (NCDHHS) PFAS Fish Consumption Advisories.

### **Experimental Design for Development of Advisories**

NCDHHS develops [fish consumption advisories](#) on a site-specific basis. Since the Cape Fear River is a moving waterbody, fish were caught throughout the 160-kilometer (km) section (spanning the Fayetteville Boat Ramp, near the I-95 overpass, to the Bluffs on the Cape Fear, near the I-140 overpass) to inform a section-wide fish consumption advisory, if warranted by the data. To ensure fish samples collected could be used to inform the development of NCDHHS fish consumption advisories for the entirety of this portion of the Cape Fear River, the existing NCDHHS Fish Consumption Advisory Standard Operating Procedure (SOP) was followed, with modifications described in Appendix B.

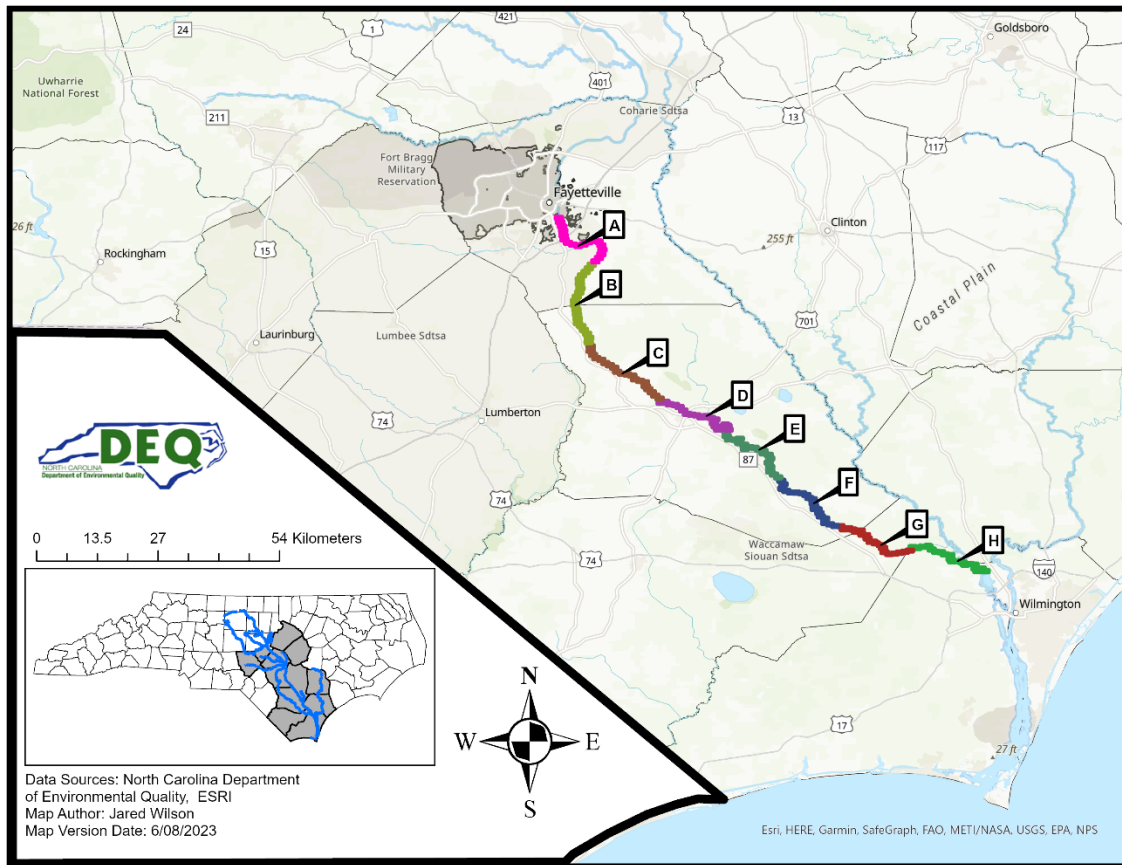
### **Sampling Locations**

The sampling location was a 160-km section of the Cape Fear River spanned from the Fayetteville Boat Ramp, near the I-95 overpass, to the Bluffs on the Cape Fear, near the I-140 overpass. The 160-km section was divided into 20-km sections for sampling. The 20-km sections started slightly north of the Fayetteville Boat Ramp (River km 220) and continued consecutively to just below the Bluffs on the Cape Fear (River km 60; Figure 1).

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**Figure 1:** A map of the middle and lower regions of the Cape Fear River, NC, annotated to show the freshwater sampling locations for the summer 2022 fish collection event. Map was created by Jared Wilson (NCDEQ) using ArcPro (ESRI).

### **Sample Collection**

The fish collected in this study were some of the most frequently caught and consumed in North Carolina based on surveys by the NCWRC, and were caught via electrofishing. To develop a fish consumption advisory for each species of fish and/or trophic level, five individual fish from each species were attempted to be collected from each 20-km section of the river. When the size of the fish species varied widely, fish of the average size recreationally caught by North Carolinians were collected (*e.g.*, catfish of ~8 lbs in weight).

- ***The non-migratory freshwater species collected at every site:*** Redear Sunfish, Bluegill Sunfish, Largemouth Bass, Flathead Catfish, Blue Catfish.
- ***The migratory freshwater species collected based on their summertime movement in the river:*** American Shad, Striped Bass, Channel Catfish (nocturnal/rare; not migratory).

At the time of collection, all 5 fish of the same species from each location were placed in a plastic fish collection bag (US Plastics) to prevent contamination from the boat or other fish being collected. The plastic bag with all 5 individual fish was closed with a zip tie and labeled with the collection location and species. The zip tied and labeled fish collection bags were

placed in well-insulated coolers covered in wet ice for transport to the DWR Water Sciences Section laboratories at Reedy Creek Road in Raleigh, NC.

A total of 211 freshwater fish from 8 species, including both migratory and non-migratory species that are commonly consumed by North Carolinians, were collected from a 160-km section of the Cape Fear River (Table 1).

**Table 1:** The total number of freshwater fish collected at each site in the summer of 2022.

| Fish Species          | Sites |    |    |    |    |    |    |    | Total per Species |
|-----------------------|-------|----|----|----|----|----|----|----|-------------------|
|                       | A     | B  | C  | D  | E  | F  | G  | H  |                   |
| Redear Sunfish        | 0     | 4  | 5  | 5  | 5  | 5  | 5  | 5  | 34                |
| Bluegill Sunfish      | 5     | 5  | 5  | 5  | 5  | 5  | 5  | 5  | 40                |
| Largemouth Bass       | 3     | 6  | 2  | 5  | 5  | 5  | 5  | 5  | 36                |
| Flathead Catfish      | 0     | 5  | 5  | 5  | 5  | 5  | 5  | 5  | 35                |
| Blue Catfish          | 3     | 5  | 5  | 5  | 5  | 5  | 5  | 5  | 38                |
| Channel Catfish       | 3     | 0  | 0  | 0  | 0  | 0  | 5  | 0  | 8                 |
| Striped Bass          | 0     | 0  | 0  | 5  | 0  | 0  | 5  | 0  | 10                |
| American Shad         | 5     | 5  | 0  | 0  | 0  | 0  | 0  | 0  | 10                |
| <b>Total per Site</b> | 19    | 30 | 22 | 30 | 25 | 25 | 35 | 25 | Grand Total: 211  |

### **Laboratory Processing**

A detailed SOP for fish tissue preparation was used to ensure that all samples were processed identically and were comparable. Briefly, upon arrival at the laboratory, morphometric (length and weight) and location data were recorded. Fish were filleted under PFAS-free conditions and the fillets were frozen at -20°C until homogenization. For homogenization, the fillets were removed from the freezer, cut into small (1-2 cm) pieces, then placed in a pre-cleaned stainless-steel blender and scooped into a pre-weighed/ pre-labeled 50ml Falcon tube using a pre-cleaned stainless-steel spatula. The labeled 50mL Falcon tubes were shipped overnight on wet ice to GEL laboratories in South Carolina for PFAS analysis by EPA Method 537.1-modified to also provide data for the Consent Order PFAS compounds.

### **Data Analysis**

When the data was received from GEL Laboratories, NCDEQ staff reviewed the quality measures associated with the analytical method, PFAS compounds analyzed, and uncertainty criteria. The data was determined to be of high quality through these metrics and was further analyzed for trends related to the fish species collected.

A [summary presentation of the data](#) can be found on the NCDEQ website. Briefly, all species had similar patterns of PFAS detected in their fillets. All PFAS detected were in low concentrations, except for PFOS, which was present in higher concentrations than the other PFAS (Table 2). There were no site-specific differences observed and using a General Linearized model that included fish weight, fish length, site, and species, fish species was the only significantly predictive factor of PFOS concentration in the fillets of the species in this study.

### **Fish Consumption Advisory Calculations**

Calculated meal limits can be found in Appendix B.