Development of NCDHHS PFAS Fish Consumption Advisories

Kennedy Holt

73rd Annual Mid-Atlantic Interstate Seafood Seminar & Gulf and South Atlantic States Shellfish Conference

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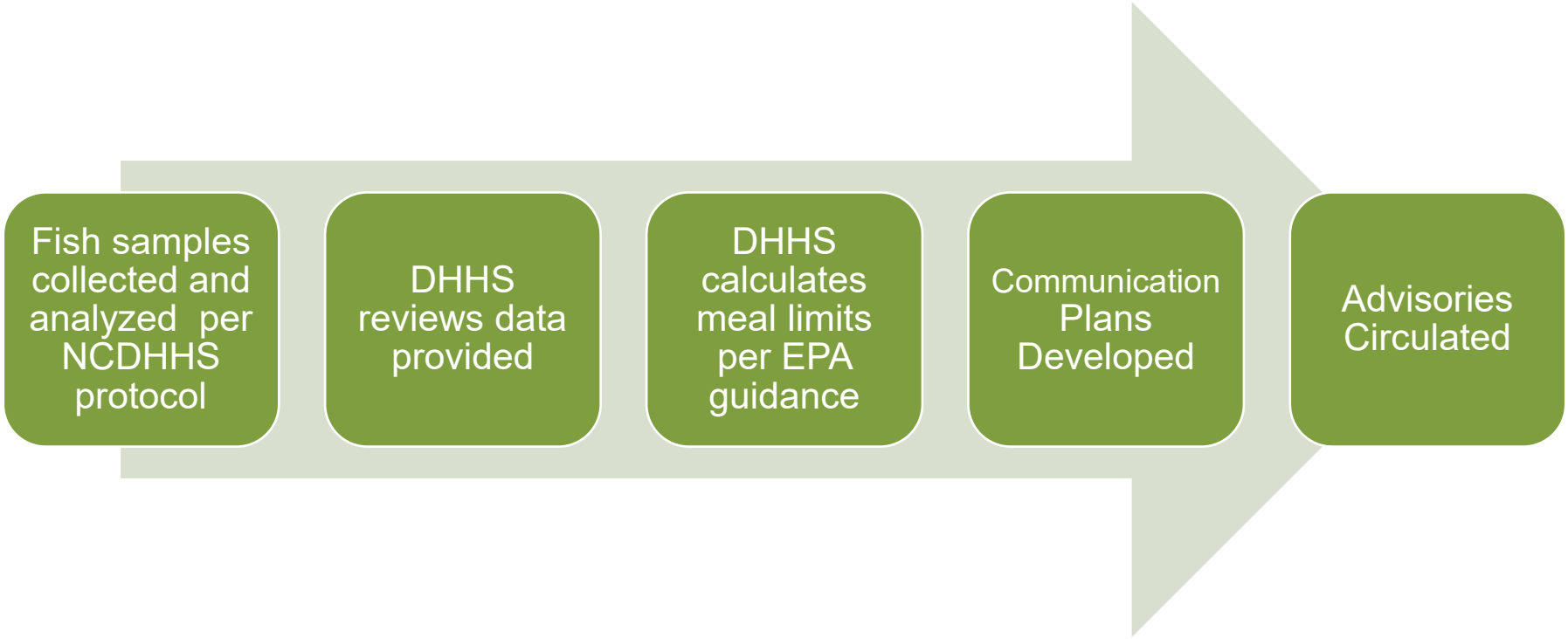
Why does DHHS develop fish consumption advisories?

- Catching and eating fish has health benefits but can also be a source of exposure to harmful pollutants
- We want to help residents reduce exposure to harmful pollutants
- Fish advisories help people weigh the value of catching and eating fish with the risks of pollutants fish absorb from their environment

Process for Fish Consumption Advisories



Background

- **Communities in the middle and lower Cape Fear Region have been requesting information regarding PFAS in fish since 2017**
- **June–August 2022**
  - **250+ fish from 14 species collected from the middle and lower Cape Fear River, starting near the Chemours facility and ending at the Atlantic**
  - **Species collected were identified as the most frequently caught and consumed, according the North Carolina Wildlife Resources Commission**

How can PFAS affect my health?

In adults, children, and pregnant women

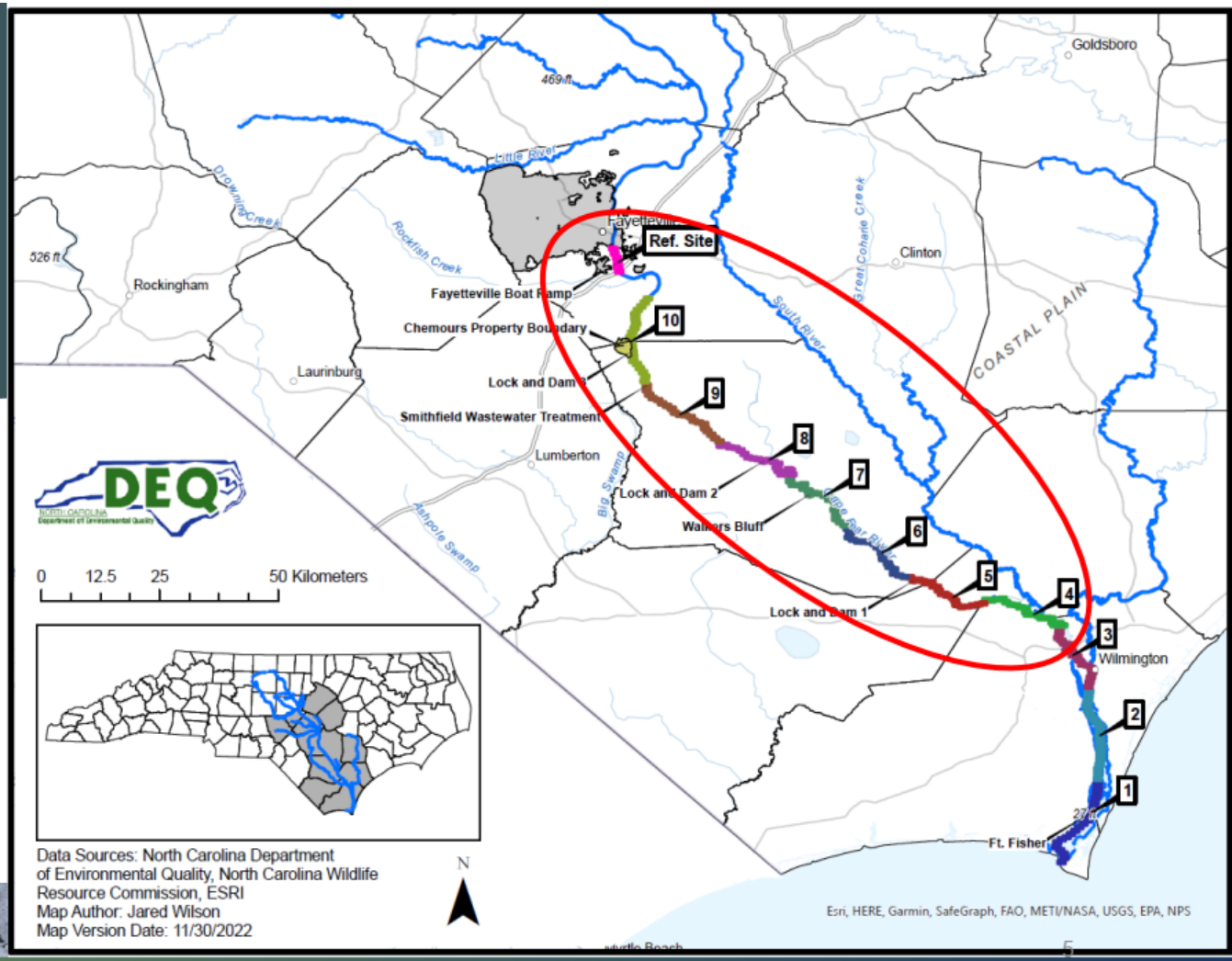
- Increased cholesterol levels
- Decreased vaccine response in children
- Changes in liver enzymes
- Increased risk of high blood pressure or pre-eclampsia in pregnant women
- Small decreases in infant birth weights
- Increased risk of kidney or testicular cancer

More research is needed to better understand the health effects associated with PFAS exposure.

Cape Fear River Sections

2022 Fish & Surface Water Collection Project

Freshwater Species



Background, continued

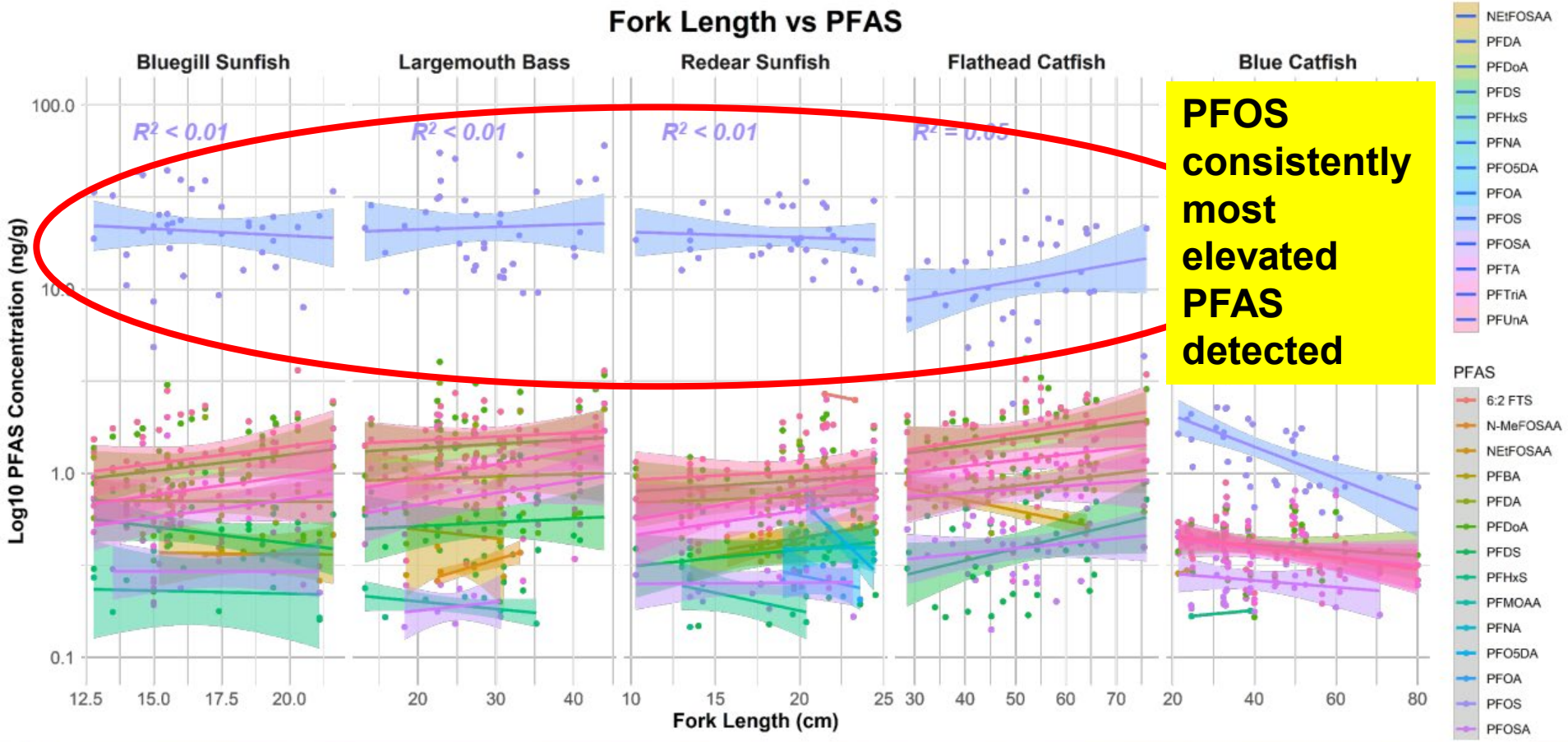
- Fish were analyzed for 56 different PFAS
  - Includes PFOA, PFOS, GenX, PFBS, PFHxS, PFNA
- Data collected to support multiple efforts
  - DEQ
    - Development of bioaccumulation factors
    - Development of surface water quality standards
  - DHHS
    - Development of PFAS-specific fish consumption advisories (FCAs)
- Current results are for freshwater fish only

North Carolina PFAS Data and Fish Consumption Advisories

Log Concentrations of measured PFAS

Preliminary Analysis

PFAS Concentration vs Fish Size



Slide courtesy of NCDEQ, presented at a previous SSAB meeting

Development of Fish Consumption Advisories (FCAs)

- **PFAS FCAs are driven by PFOS**
  - **PFOS concentrations higher than other PFAS chemicals**
  - **Lack of toxicological data for most other PFAS detected**
  - **Consistent with FCAs issued by other states**
- **As of March 2023, EPA classifies PFOS as a likely carcinogen**
- **FCA for PFOS is derived to minimize the risk of cancer and non-cancer endpoints**
  - **We are using meal limit based on non-cancer endpoints, which is lower than meal limit based on cancer endpoints**

Toxicology of PFOS

- **NC FCAs developed using most recent USEPA reference dose (2023)**
  - **Based on most current scientific data**
  - **Most health protective**
  - **Uses same science as proposed MCLs for drinking water supplies (EPA currently accepting public comments)**
- **Reference dose based on the most sensitive endpoints – low birth weight and increased cholesterol**
  - **Fish consumption advisories for susceptible populations warranted to protect against multiple adverse health impacts that can affect children.**

Meal Limit Calculation – Non-Cancer

$$\boldsymbol{ML_{nc}} = \frac{RfD \times BW \times Tap}{C \times MS \times LF \times week/month}$$

- ML_{nc} = non-cancer fish consumption meal limit (meals/week)
- RfD = reference dose (mg/kg/day)
- BW = body weight (kg)
- T_{ap} = time averaging period (days/month)
- C = average contaminant concentration (mg/kg)
- MS = size of one fish meal (kg/meal)
- LF = loss factor due to trimming and cooking

Example PFOS Blue Catfish - ML_{nc}

$$.44\ meals/week = \frac{.0000001 \times 80 \times 30.44}{0.0007472 \times .17 \times 1 \times 4.33}$$

- MLnc = (meals/week) (rounded to one significant digit)
- RfD = .0000001 (mg/kg/day)
- BW = 80 (kg)
- Tap = 30.44 (days/month)
- C = 0.0007472 (mg/kg)
- MS = .17 (kg/meal)
- LF = 1
- Week/month = 4.33

DRAFT Middle and Lower Cape Fear River Freshwater FCAs – PFOS

Combined across all species in each category

Women of childbearing age (15 to 44 years), pregnant women, nursing mothers and children

Species	Fish Consumption Advisory
American Shad, Blue Catfish, Channel Catfish	No more than 1 meal per year
Bluegill, Flathead Catfish, Largemouth Bass, Redear, Striped Bass	Do Not Eat

All Other Individuals

Species	Fish Consumption Advisory
American Shad, Blue Catfish, Channel Catfish	No more than 7 meals per year
Bluegill, Flathead Catfish, Largemouth Bass, Redear, Striped Bass	No more than 1 meals per year

Other states have site specific advisories based on local concentrations, but it is difficult to compare them directly due to different source data, calculations, etc.

State	Advisories in Place
Alabama	Yes
Connecticut	Yes
Illinois	Yes
Indiana	Yes
Maine	Yes
Massachusetts	Yes
Michigan	Yes
Minnesota	Yes
New Jersey	Yes
New York	Yes
Ohio	Yes
Oregon	Yes
Pennsylvania	Yes
Wisconsin	Yes
North Carolina	**Yes**

- PFAS fish consumption advisories from various states range from “do not eat” to 1 meal a week.
- No current PFAS fish advisories: South Carolina, Virginia, Tennessee, Georgia

Draft Signage

PFOS FISH CONSUMPTION ADVISORIES*

for the Cape Fear River at the Fayetteville Boat ramp, near the I-95 overpass, to the Bluffs on the Cape Fear

1
NO MORE THAN 1 SERVING PER YEAR
COMBINED ACROSS ALL SPECIES

Bluegill Sunfish | Flathead Catfish | Largemouth Bass | Redear Sunfish | Striped Bass

7
NO MORE THAN 7 SERVINGS PER YEAR
COMBINED ACROSS ALL SPECIES

American Shad | Blue Catfish | Channel Catfish

*See separate advisory for women of childbearing age, pregnant women, nursing mothers and children.

Fish illustrations by Duane Raver

Benefits of Eating Fish

Fish are good source of lean protein that can promote bone health, decrease the chance of becoming overweight or obese, and decrease the risk of colon and rectal cancers.

Avoiding Bad Fish

The fish above have been found to have high levels of PFOS and/or PFAS. Eating fish with higher levels of chemicals like PFAS or PFOS may cause health problems. These health concerns can be and not limited to; increase in risk of cancer, liver damage, and higher cholesterol.

Serving Size

A serving of fish is:

6 oz cooked fillet **-OR-** **8 oz** raw fillet

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Or visit: https://bit.ly/44ocXZk

Draft Signage

PFOS FISH CONSUMPTION ADVISORIES FOR WOMEN OF CHILDBEARING AGE (15 TO 44 YEARS), PREGNANT WOMEN, NURSING MOTHERS AND CHILDREN

for the Cape Fear River at the Fayetteville Boat ramp, near the I-95 overpass, to the Bluffs on the Cape Fear

DO NOT EAT

COMBINED ACROSS ALL SPECIES

Bluegill Sunfish

Flathead Catfish

Largemouth Bass

Redear Sunfish

Striped Bass

1

NO MORE THAN 1 SERVING PER YEAR

COMBINED ACROSS ALL SPECIES

American Shad

Blue Catfish

Channel Catfish

Fish illustrations by Duane Raver

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Interactive Story Map (in Progress)

Individual Water Body Advisory | What is a Fish Advisory? | State Wide Advisory: Mercury | Fish Identification | Common Pollutants

Albemarle Sound
Site: Albemarle Sound from Bull Bay to Harvey Point; West to the mouth of the Roanoke River and to the mouth of th...

Badin Lake
Site: Badin Lake

Brier Creek
Site: Downstream of Brier Creek Reservoir

Brunswick River
Site: Brunswick River near US Hwy. 74 / US Hwy. 17 bridge

Brunswick River Site 2 of 2
Site: From its confluence with the Cape Fear River downstream to the US-17 bridge

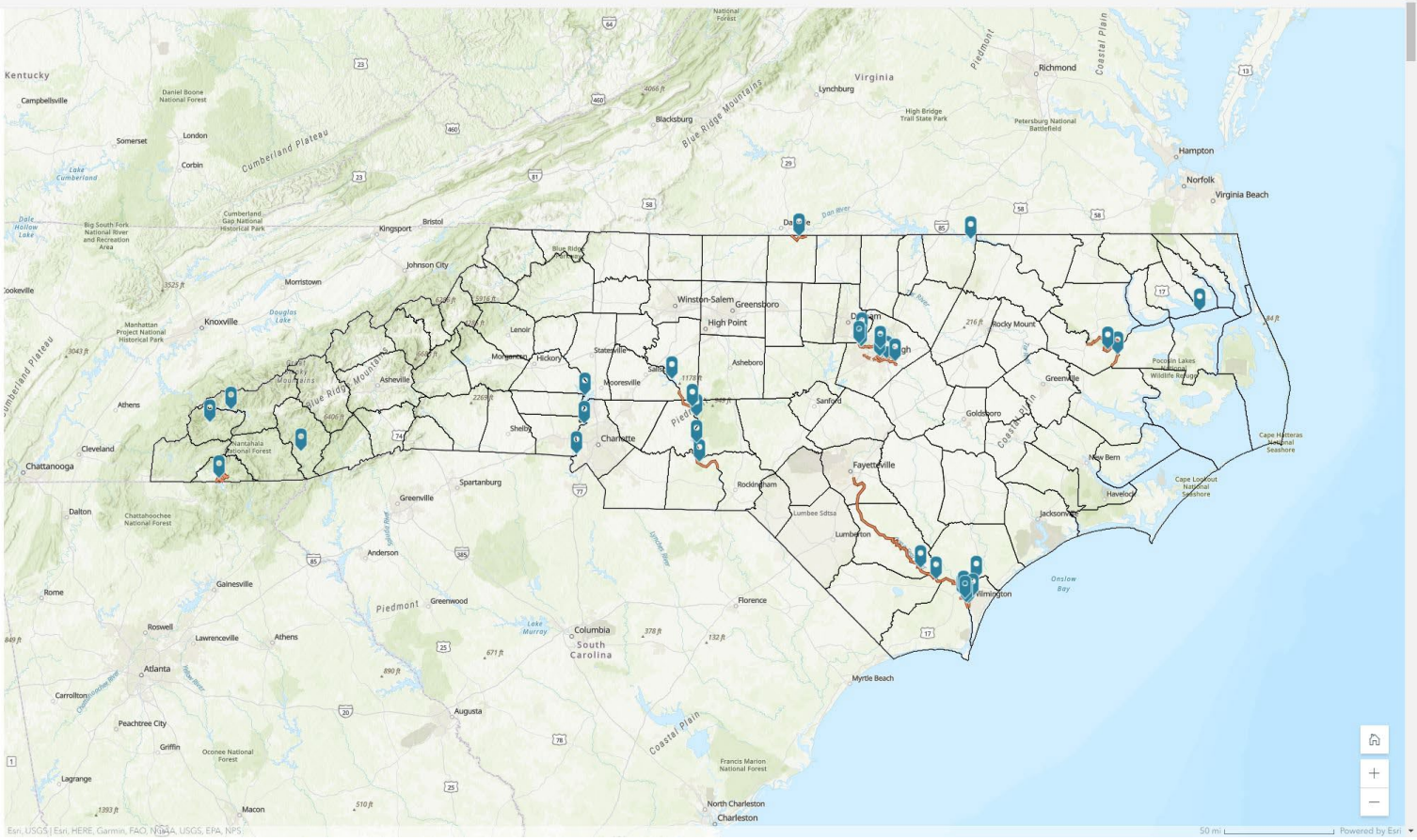
Burnt Mill Creek
Site: Near the Archie Blue Community Park, upstream of the confluence of Burnt Mill Creek with Smith Creek

Cape Fear River (site 1 of 3)
Site: Fayetteville Boat Ramp, near the I-95 overpass, to the Bluffs on the Cape Fear, near the I-140 overpass.

Cape Fear River Site 2 of 3
Site: Between Riegelwood Landing and the confluence of Livingston Creek and Cape Fear River

Cape Fear River Site 3 of 3
Site: Between Riegelwood Landing and the confluence of Livingston Creek and Cape Fear River

Cape Fear River- North East
Site: Near Riverside Park Community Building, upstream of



Interactive Story Map (in Progress)

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Albemarle Sound

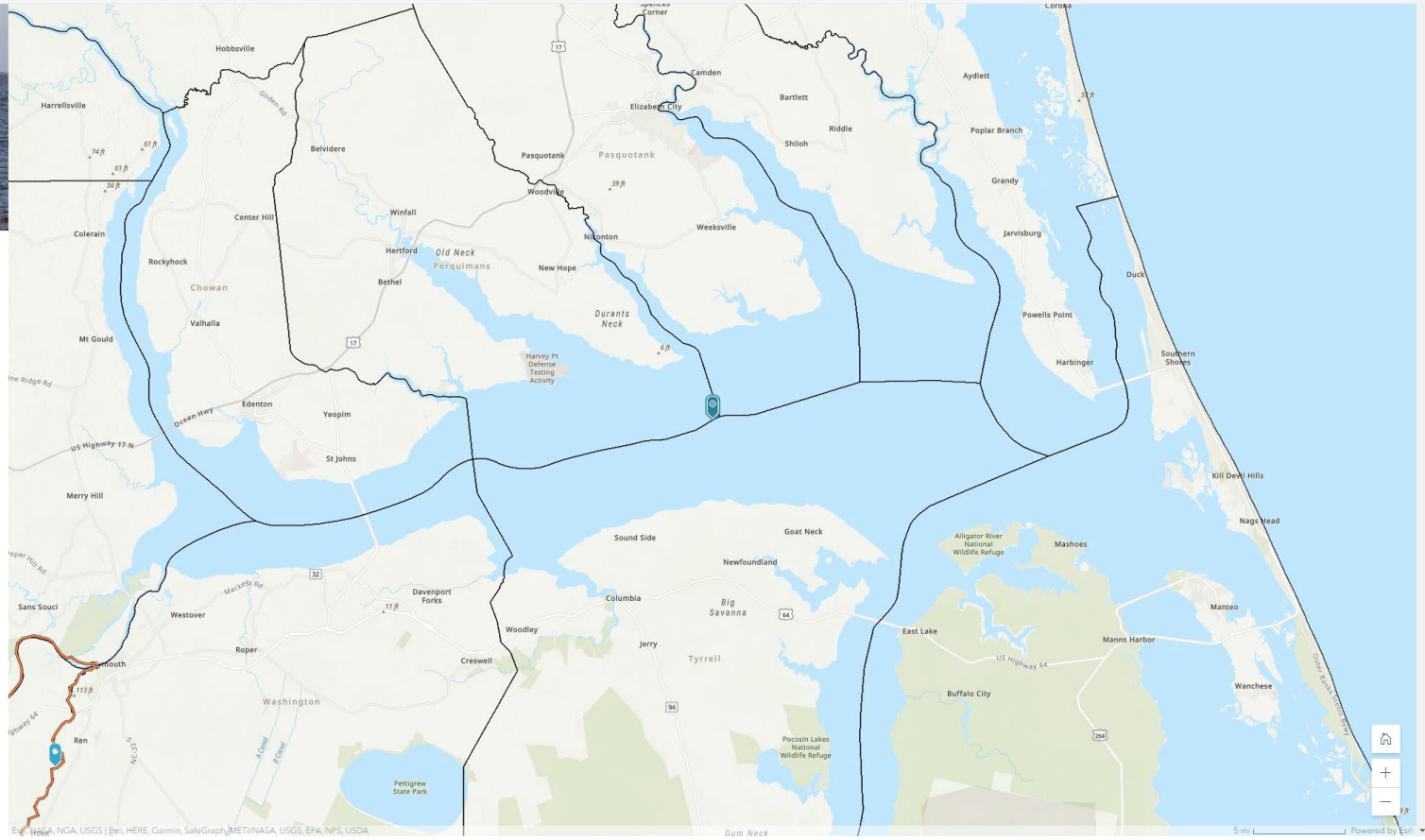
Site: Albemarle Sound from Bull Bay to Harvey Point; West to the mouth of the Roanoke River and to the mouth of the Chowan River to the U.S. Highway 17 Bridge

Pollutant: Dioxins

Counties Affected:
Bertie,Camden,Chowan,Currituck,Pasquotank, Perquimans,Tyrrell,Washington

Fish Species: catfish, carp

Advisory: Catfish and carp from these waters may contain low levels of dioxins. Women of childbearing age and children should not eat any catfish or carp from this area until further notice. All other persons should eat no more than one meal per month of catfish and carp from this area. Swimming, boating, and other recreational activities present no known significant health risks and are not affected by this advisory.



Environmental Justice Concerns

- **While these advisories are important for helping people reduce their exposure to PFAS, it is important to note fish remain an important source of nutrition for many North Carolina residents.**
  - **Many people don't have alternative food options**
  - **Important to consider other options for healthy meals and resources, like nutrition programs, that might be needed**
- **Fish from our local waterways, including the Cape Fear River, have significant cultural value for our Native American populations and other residents.**

Other Considerations

- Fish advisories do not create any legal or regulatory restrictions on fishing or fish consumption
- DHHS fish sampling protocols needed to ensure that measured fish tissue concentrations represent the fish population being sampled
- Advisories stay in place until additional data show they aren't needed

Next steps and ideas

- Additional fish collection for saltwater species at the mouth of the Cape Fear River
- Continued discussions on improving the process and communication
- Collaborating with partners to determine priority needs and additional resources

Questions?

DHHS Occupational and Environmental Epidemiology Branch

Phone: (919) 707-5900

E-mail: oeeb@dhhs.nc.gov

Appendix

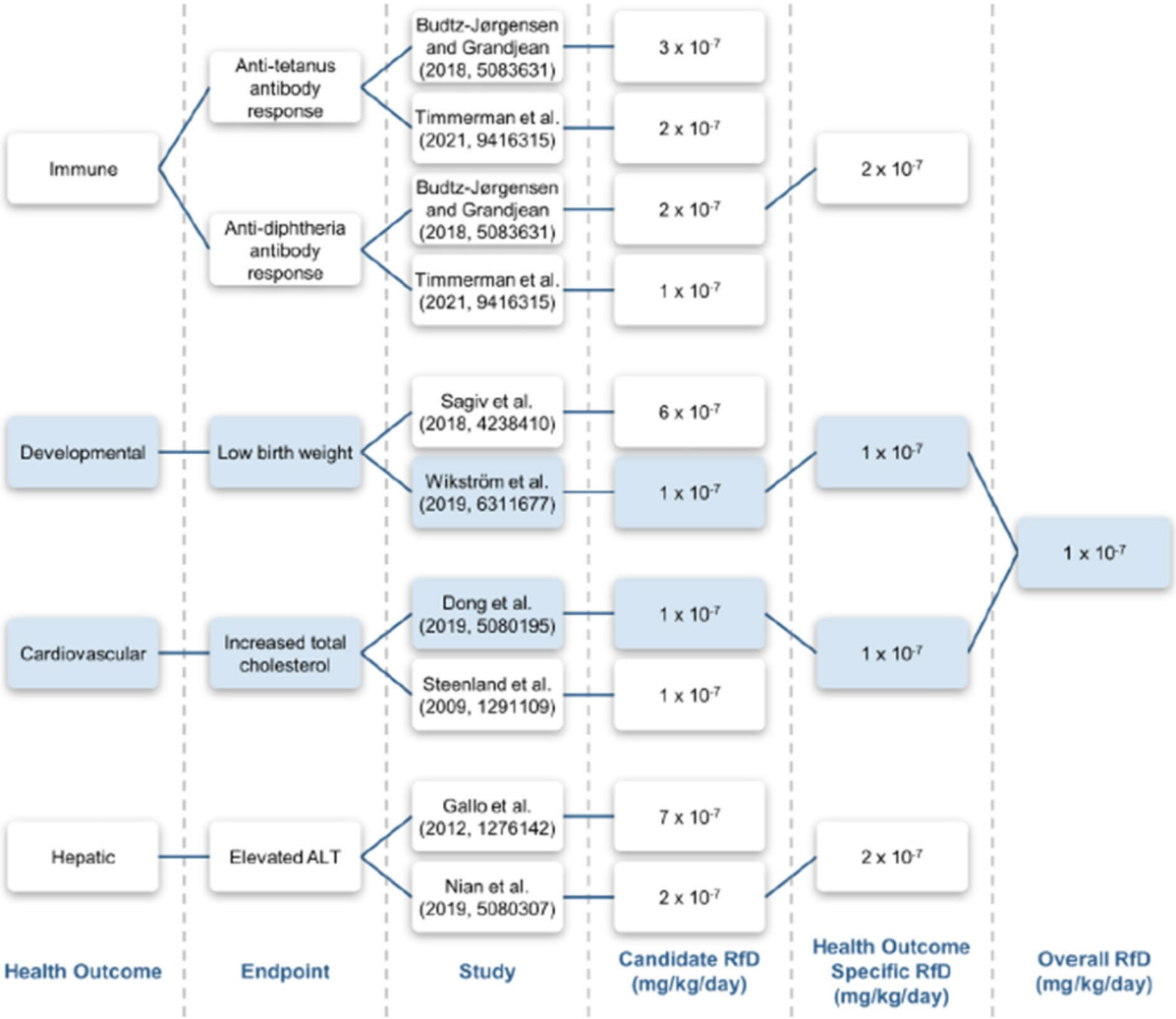


Figure 4-4. Schematic depicting selection of the overall RfD for PFOS

From "PUBLIC COMMENT DRAFT: Toxicity Assessment and Proposed Maximum Contaminant Level Goal for Perfluorooctane Sulfonic Acid (PFOS) in Drinking Water" (USEPA, March 2023)

Key Messages for PFOS Fish Advisory

- **DHHS is recommending limits on consumption of certain freshwater fish species from the middle and lower Cape Fear River.**
- **Fish advisories help people to balance health benefits of catching and eating fish with concerns about PFAS exposure.**
- **Different PFAS chemicals were measured in fish, but the new advisories are driven by the presence of one chemical (PFOS).**
- **This action is similar to PFAS fish advisories in other states, like Michigan and Pennsylvania, as well as existing fish advisories in North Carolina related to mercury and other contaminants.**
- **Concentrations of PFOS found in NC were similar to levels found nationally but our advisory is more restrictive based on use of the new EPA reference dose.**

Additional Messages for PFOS Fish Advisory

- **While these advisories are important for helping people reduce their exposure to PFAS, it is important to note fish remain an important source of nutrition for many North Carolina residents.**
- **Fish from our local waterways, including the Cape Fear River, have significant cultural value for our Native American populations and other residents.**
- **Most PFAS exposures occur through drinking contaminated water or eating food that contains PFAS. Other exposures include indoor dust, some consumer products, and workplaces.**
- **NCDHHS and NCDEQ will continue working with local health departments, academic researchers, community partners, and others to respond to community concerns about PFAS.**