

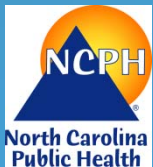
# Yadkin-Pee Dee River System Fish and Sediment Study

May 13, 2013

Mountain Morrow State Park

Division of Public Health

N.C. Department of Health & Human Services



N.C. Division of Public Health / DHHS



N.C. Department of Environment & Natural Resources

Division of Waste Management  
Division of Water Quality



U.S. Environmental Protection Agency



Study design:

DENR, DPH, EPA,

Sampling:

DENR, EPA

Sample analysis:

EPA

Health risk analysis:

DPH



# Sediment – Yadkin River System

- Collect surface sediment where expect people to have contact
  - Boat ramps
  - Swimming beaches
- Center channel
  - Trace PCBs through the river system

# Sediment – Human Health Risk Assessment

- Ingestion –
  - Simulated a child (1-6 years old) swallowing sediment accidentally
- Direct contact
  - Skin contact with sediment
- Most sensitive health effects considered
- Used highest sediment PCB concentration

# Fish Tissue Studies

2011 –

- High Rock Lake
- Lake Tillery

2012 –

- Falls Reservoir



Sampling strategy

- Species people catch and eat
- Fillets
- Collect in different areas of each water body

# Feeding strategies -

Top level predator species  
*Piscivore* – eat other fish  
ex: Largemouth bass



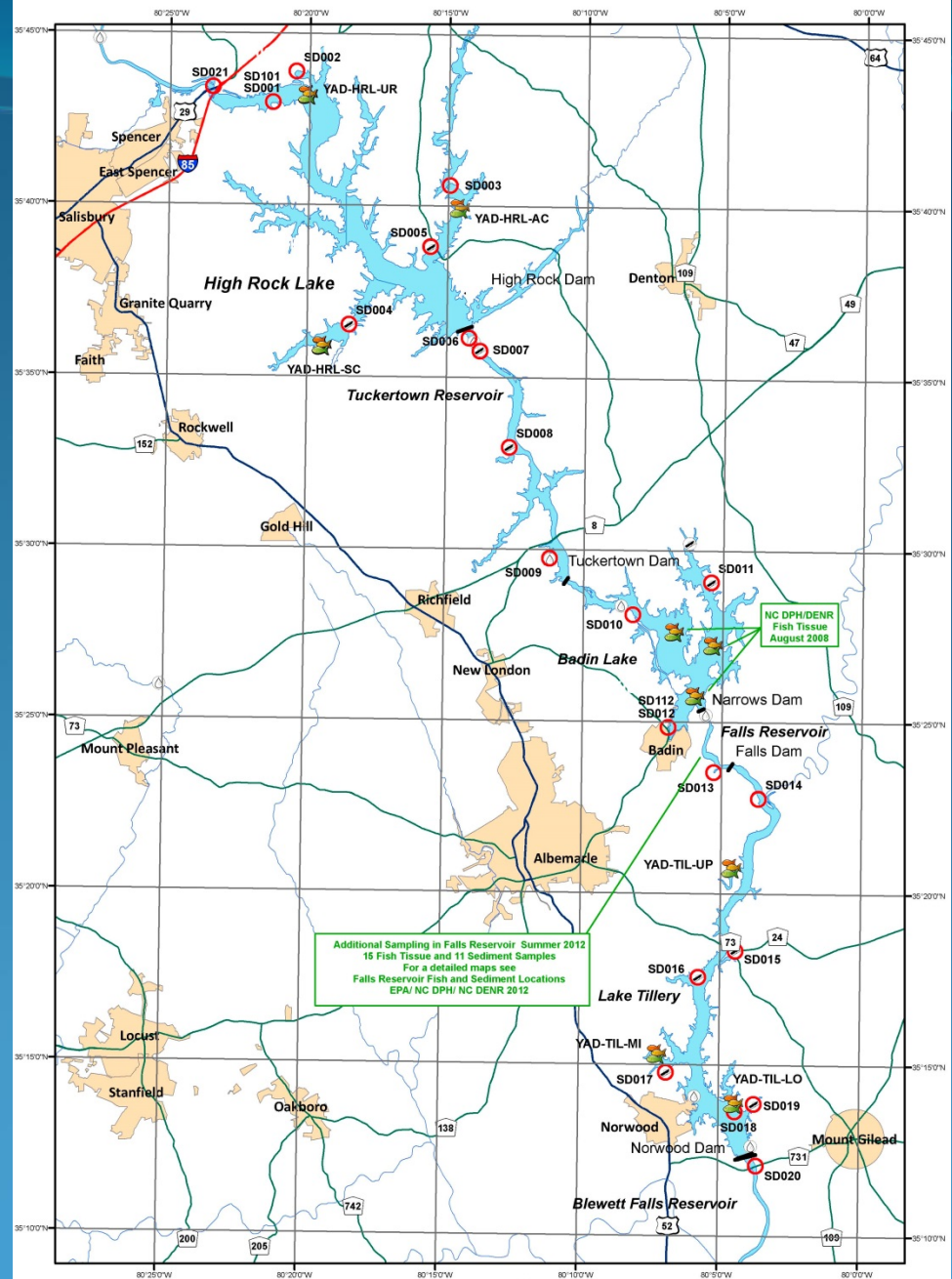
Middle level species  
*Insectivore* – eat insects  
ex: Bluegill sunfish



Bottom feeding species  
*Grazers*  
ex: Catfish



# Yadkin-Pee Dee River System



Additional Sampling in Falls Reservoir Summer 2012  
 15 Fish Tissue and 11 Sediment Samples  
 For a detailed maps see  
 Falls Reservoir Fish and Sediment Locations  
 EPA/ NC DPH/ NC DENR 2012

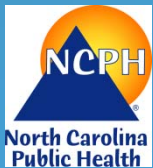
NC DPH/DENR  
 Fish Tissue  
 August 2008

- Surface Water Intake
- Sediment Sample Locations (2011)
- Fish Sample Locations (2011, unless noted)
- Boat Access



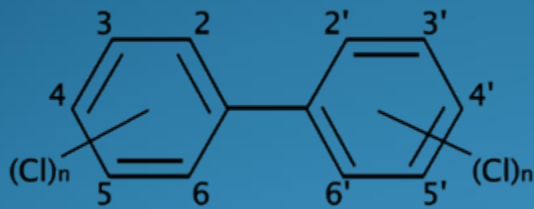
Source: NC Department of Environment and Natural Resources, Division of Waste Management, Division of Water Resources, NC Department of Transportation, NC Department of Administration, State Property Office, NC OneMap, NC Center for Geographic Information and Analysis

North American Datum 1983  
 NC State Plan FIPS 3200  
 Map Created by:  
 NC Division of Waste Management, Site Evaluation and Removal Branchy GS  
 Map Created on: 31<sup>st</sup> March, 2011



# Polychlorinated biphenyls -

## "PCBs"



- Class of 209 related man-made chemicals
- "biphenyl backbone"
- 1 – 10 chlorines

## "Aroclors"

- Unique commercial mixtures
- Variable properties



# History of PCBs

World-wide -

- Manufactured 1929 – 1977  
1.1 millions tons
- 1100 tons remain in the “open”  
environment

USA –

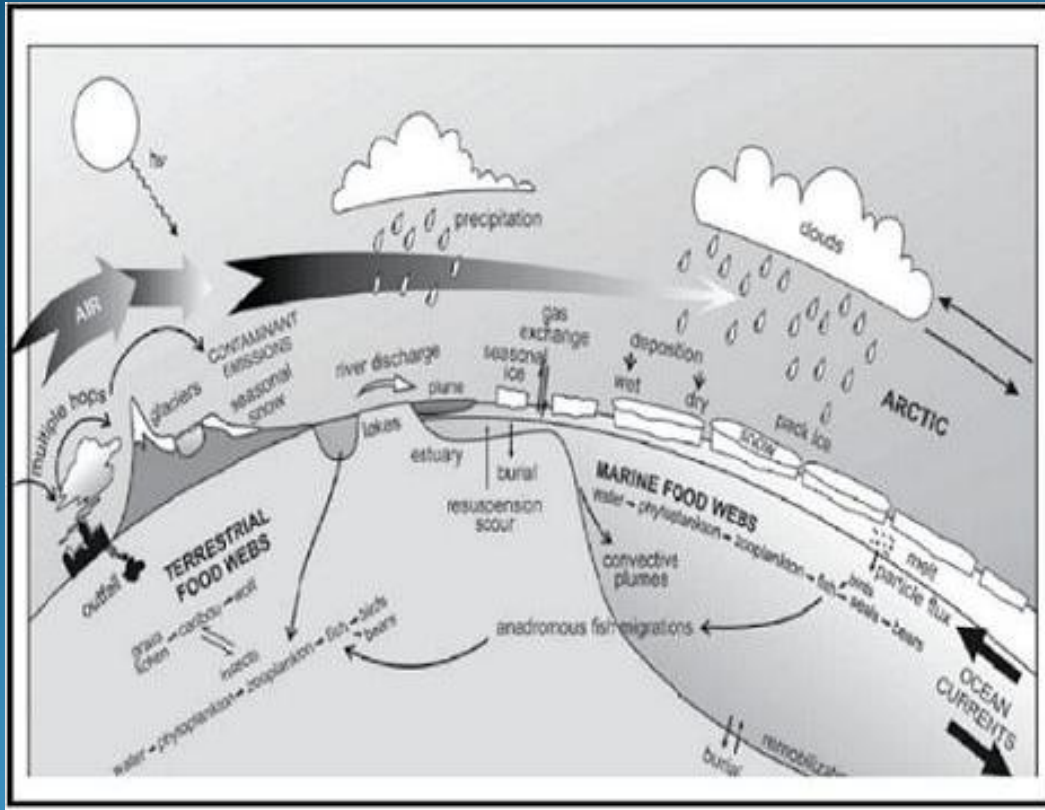
- 625,000 tons sold



Uses –

- insulating liquids
- transformers
- capacitors
- hydraulic fluids
- inks
- pesticides
- waxes
- carbonless paper

# PCBs are everywhere -



**Global atmospheric transport**

- point source not required



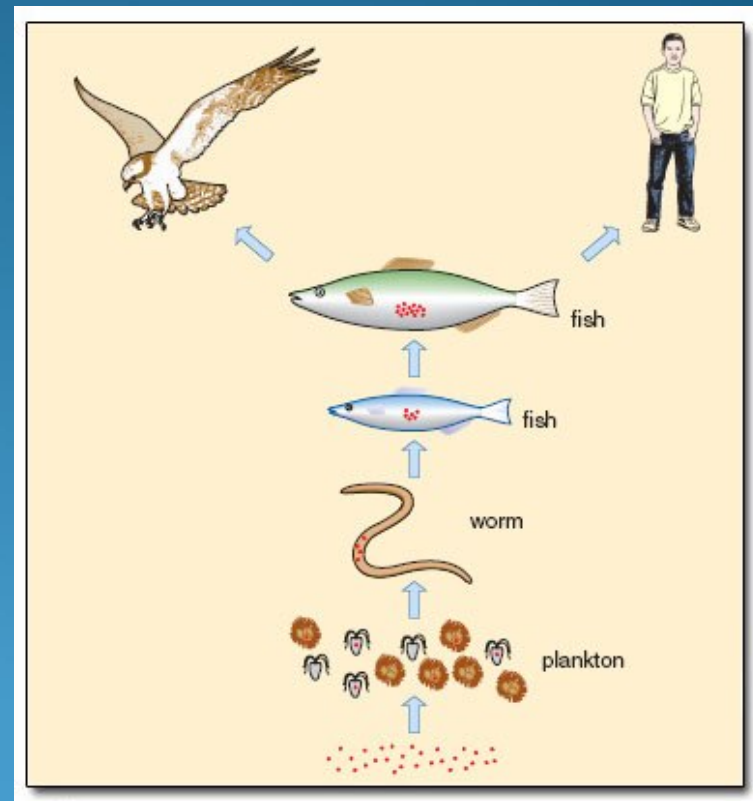
# PCBs “biomagnify”

PCB concentrations increase:

- from prey → predator
- up each level of food chain
- with organism age & size

Contaminated fish is the dominant exposure source for the general population.

Source: USEPA

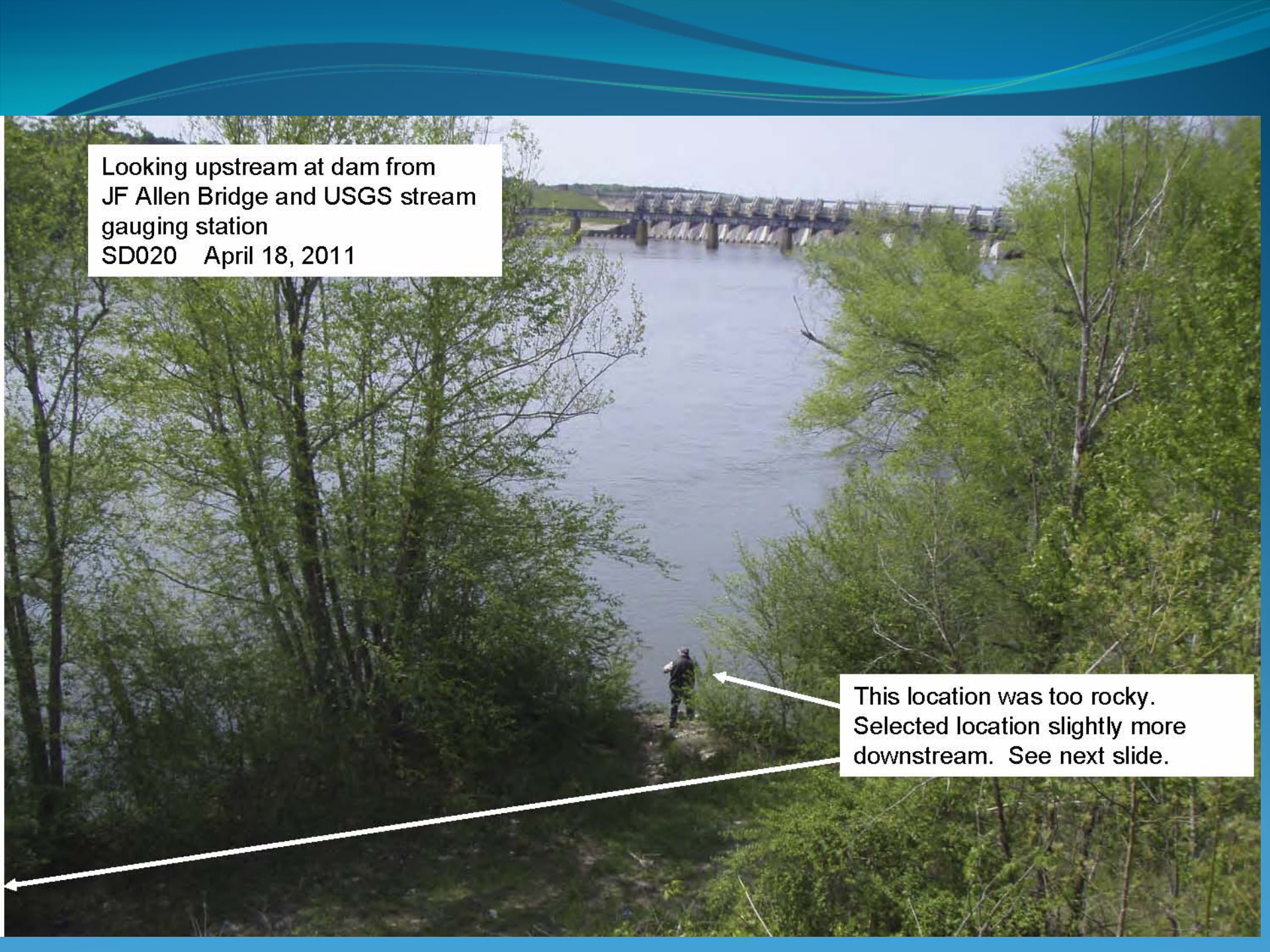


# The Results -



# Sediment - 2011

- 21 surface sediments from -
  - upper High Rock Lake
  - to Lake Tillery, south of Norwood Dam
- Aroclor PCBs detected at 2 locations
  - 0.10 mg/kg Aroclor 1232,
    - south of Norwood Dam
  - 0.50 mg/kg Aroclor 1254,
    - small cove north of Falls Dam



Looking upstream at dam from  
JF Allen Bridge and USGS stream  
gauging station  
SD020 April 18, 2011

This location was too rocky.  
Selected location slightly more  
downstream. See next slide.

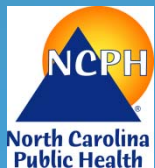
SD013 April 19, 2011



# 2011 Sediment Results

**No harmful health effects indicated** for:

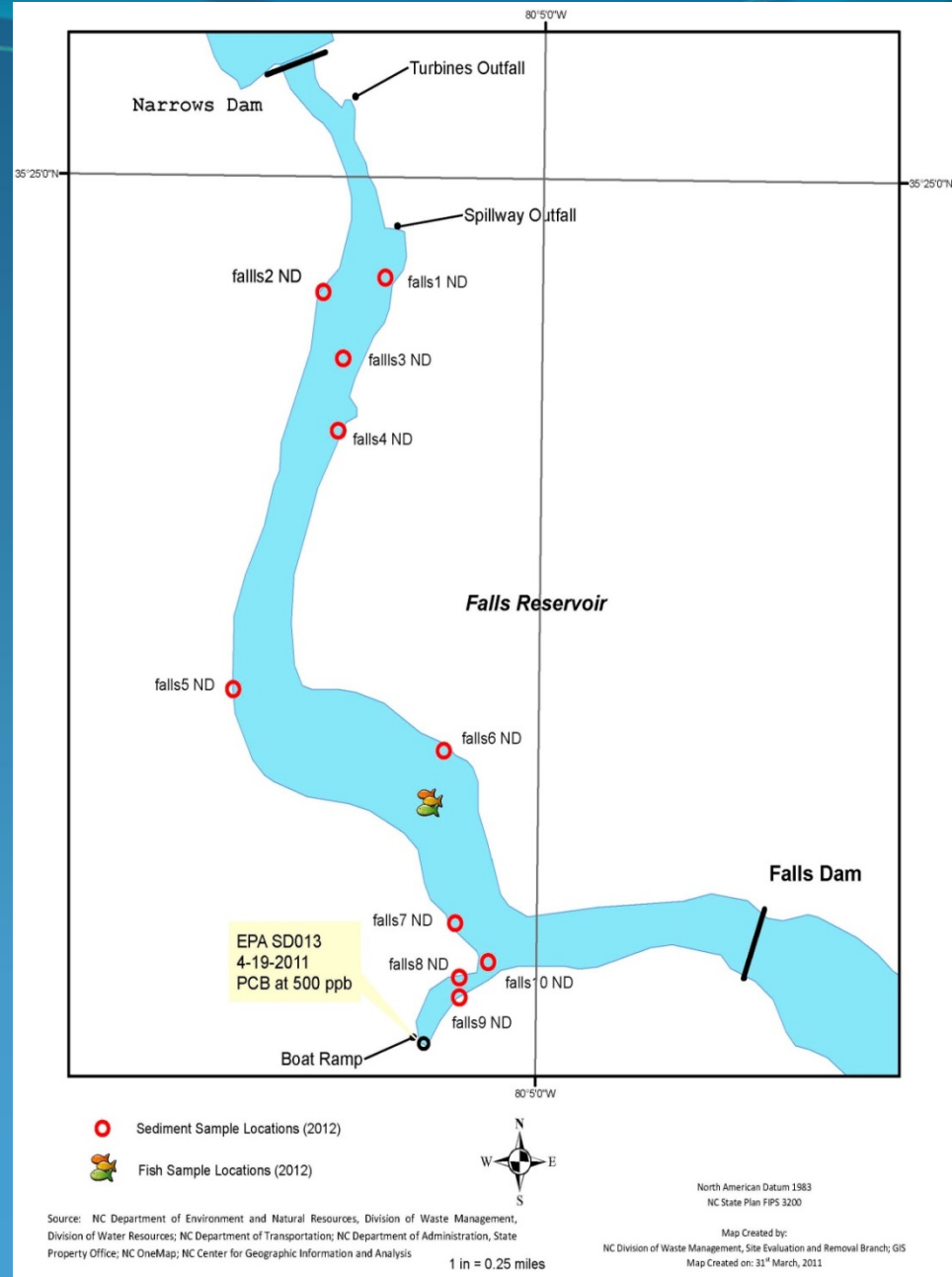
- Children 1-6 years old
- All other age groups





# Sediment - 2012

- Falls Reservoir
- 10 surface sediment samples
- Follow-up to highest sediment PCB concentration in 2011 study
- **No Aroclor PCBs were detected**



# Fish Tissue - Human Health Risk Assessment

- Total PCB congener concentration
- Eat 6 ounce meal per day for life
- Compare to N.C. DPH Total PCB Action Level
  - 0.50 mg/kg total PCBs, or
  - 50,000 ng/kg total PCBs
- Analyze for 209 PCB congeners

## High Rock Lake, 2011

- 123 total fish collected, 45 fillet samples analyzed

## Falls Lake, 2012

- 49 total fish collected, 15 fillet samples analyzed

## Lake Tillery, 2011

- 115 total fish collected, 44 fillet samples analyzed



*Largemouth bass, White bass*

*Bluegill sunfish, Black crappie, White crappie,  
White perch, Yellow perch,  
Redear sunfish, Redbreast sunfish*

*Channel catfish, Flat bullhead, White catfish,  
Blue catfish, Flathead catfish*

# Fish Tissue Results

- 9 samples in exceeded the PCB Action Level
  - 3 each in High Rock, Falls & Tillery
  - All were catfish species
  - All were greater than 18 inches
- Recommendation to limit ingestion of catfish greater than 18 inches to not more than 1 meal per week (due to PCBs)
- But -----

## N.C. Statewide Meal Consumption Limit Recommendations for **Mercury** in Fish

<p><b>Women of child-bearing age (15-44 years old), pregnant women, nursing mothers, &amp; children less than 15 years old</b></p>	<p><b>All others</b></p>
<p><i>DO NOT EAT fish <b>HIGH</b> in mercury</i></p>	<p><i>Eat only 1 meal per week of fish <b>HIGH</b> in mercury</i></p>
<p><i>Eat up to 2 meals per week of fish <b>LOW</b> in mercury</i></p>	<p><i>Eat up to 4 meals per week of fish <b>LOW</b> in mercury</i></p>

Fish **HIGH** in mercury

### **Statewide**

largemouth bass

### **South and East of I-85**

**catfish**

Blackfish (bowfin)

Jack fish (chain pickerel)

Warmouth, Yellow perch

### **South and East of I-95**

black crappie

Fish **LOW** in mercury

Bluegill sunfish

Farm-raised catfish

Farm-raised trout

Farm-raised crayfish

Tilapia

Trout



# Potential Health Issues

## Mercury -

- Children are much more sensitive!

Damage to:

- Nervous system
- Intelligence
- Blindness
- Kidneys
- Digestive system
- Cancer?

## PCBs -

Damage to:

- Skin
- Liver
- Anemia
- Stomach
- Thyroid
- Immune & reproductive systems
- Liver or kidney cancer

