

National Study of Chemical Residues in Lake Fish Tissue

**Food and Drug Administration
Center for Food Safety and Applied Nutrition
Briefing**

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Briefing Overview

Study Significance

Study Design

Accomplishments

Preliminary Results

Final Data Analysis

Future Milestones

A Unique Study

- ◆ First national study of contaminant levels in freshwater fish based on a statistical design
- ◆ Largest set of chemicals ever studied in fish
- ◆ Largest project being conducted under EPA's Persistent, Bioaccumulative, and Toxic (PBT) Chemicals Initiative



Objective

- ◆ *The objective of the National Lake Fish Tissue Study is to estimate the national distribution of the mean levels of selected persistent, bioaccumulative, and toxic chemical residues in fish tissue from lakes and reservoirs in the contiguous United States.*
- ◆ Study results will
 - ◆ Provide the first national estimates of mean concentrations of PBT chemicals in fish tissue.
 - ◆ Define a national baseline for assessing progress of pollution control activities.



Study Participants

- ◆ Extensive national network of partners to evaluate lakes and collect fish for the study, including:
 - ◆ 47 States
 - ◆ 3 Tribes
 - ◆ Other Federal Agencies (NPS, TVA)
- ◆ Agency support for OW's National Project Management Team
 - ◆ 10 Regions
 - ◆ Office of Research & Development/EMAP
 - ◆ Office of Prevention, Pesticides, & Toxic Substances



Sampling Design

- ◆ Random selection of lakes and reservoirs in 4 national annual statistical subsets
- ◆ 500 lakes and reservoirs in the lower 48 states sampled over 4 years
- ◆ Exclusion of Great Lakes due to existing monitoring programs
- ◆ Lake criteria
 - ◆ Permanent body of water with permanent fish population
 - ◆ Surface area of at least one hectare (about 2.5 acres)
 - ◆ 1000 square meters of open, unvegetated water
 - ◆ Depth of at least one meter

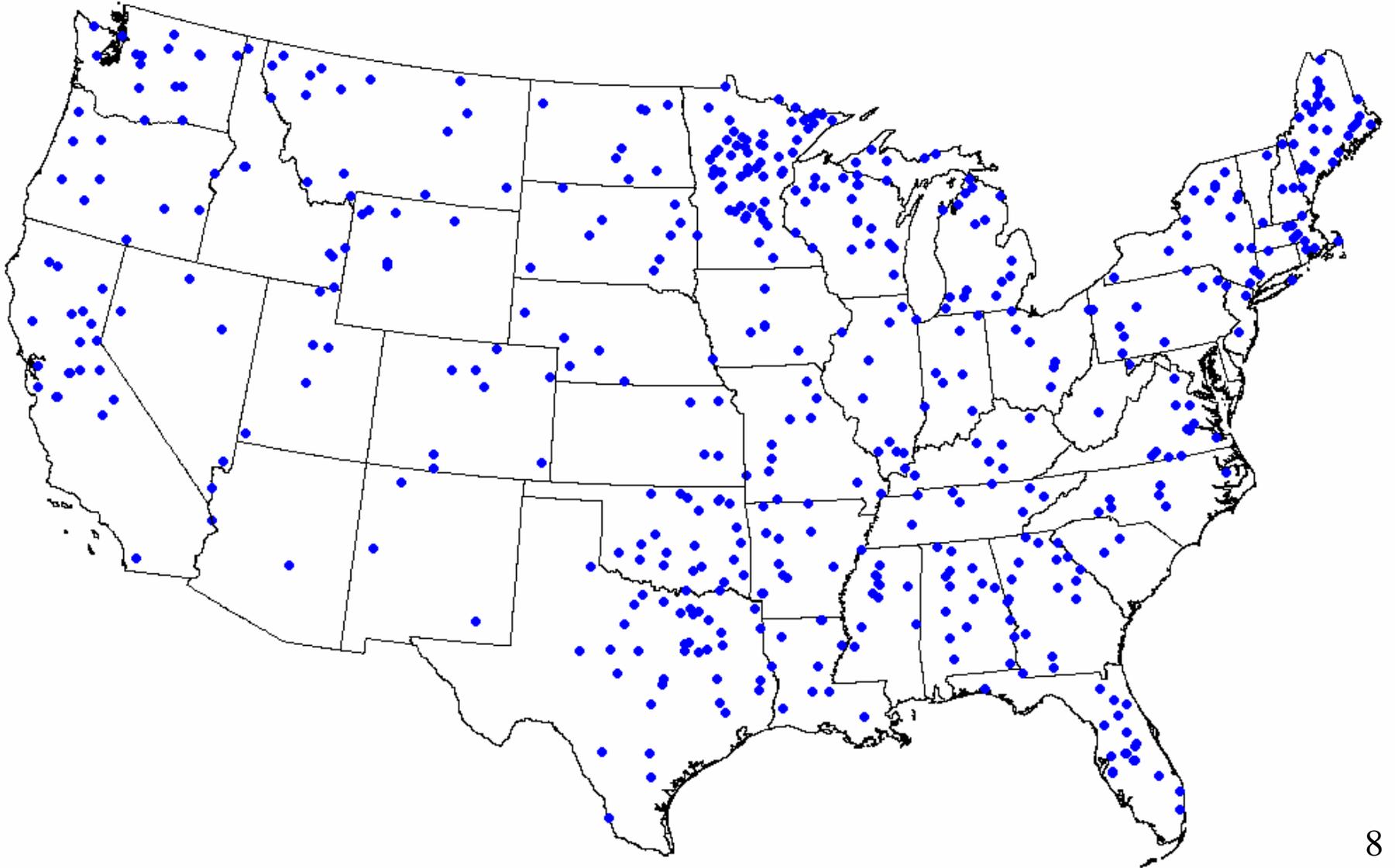


Sampling Design (continued)

- ◆ Six size categories of lakes ranging from 1 hectare to > 5000 hectares
- ◆ Two fish composites per site (predators and bottom dwellers) with each consisting of 5 adult fish
- ◆ 560 g of tissue necessary for analysis of fillets for predators and whole bodies for bottom dwellers
- ◆ Collection of replicate samples from 10% of the lakes to estimate variability



500 Sampling Locations



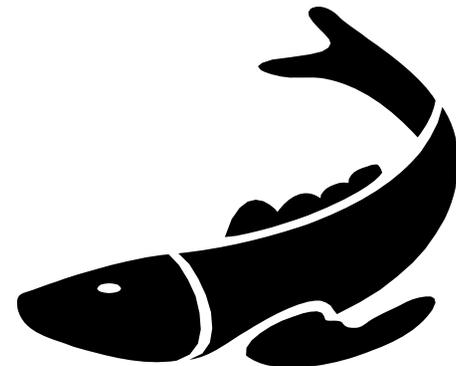
Fish Species

PREDATORS

Largemouth bass	50%
Walleye	10%
Northern pike	7%

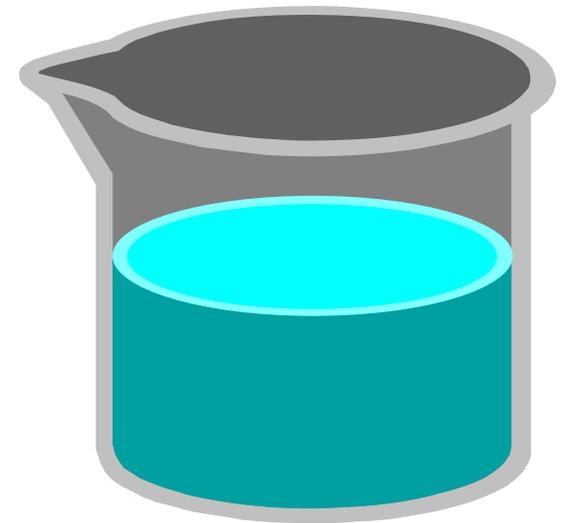
BOTTOM DWELLERS

Common carp	26%
White sucker	20%
Channel catfish	16%



Target Chemicals

- ◆ EPA is analyzing the fish tissue for 268 chemicals, including PCB congeners and breakdown products
 - ◆ 2 metals (Hg and As [5 forms])
 - ◆ 17 dioxins/furans
 - ◆ 159 PCB congener measurements
 - ◆ 46 pesticides
 - ◆ 40 semi-volatile organics (e.g., PAHs)
- ◆ EPA added analysis of PBDEs for Year 4 samples only



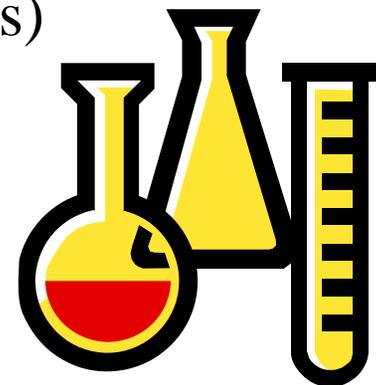
Fish Sampling QA/QC

- ◆ Consistency in fish collection, handling, and shipping through:
 - ⊕ Orientation/training of study participants
 - ⊕ Implementation of detailed SOPs
 - ⊕ Distribution of identical field sampling materials to all sampling teams
 - ⊕ Preparation of fish samples in a controlled laboratory environment



Tissue Analysis QA/QC

- ◆ Consistency and comparability of fish tissue analysis maintained throughout the study by using:
 - ⊕ Same standard analytical method for each chemical
 - ⊕ Same laboratory for each type of analysis
 - ⊕ Consistent method detection limits (MDLs) and QC acceptance criteria standards
 - ⊕ Standard data reporting formats and standard process for data quality assessment



Key Fish Study Activities

Planning



Mobilization



Sample Collection



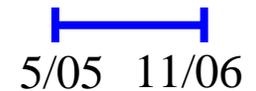
Sample Analysis



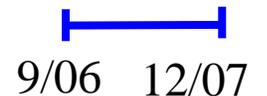
Public Release of Data



Data Analysis



Final Report



1998 1999 2000 2001 2002 2003 2004 2005 2006 2007

Accomplishments

Planning	<ul style="list-style-type: none">• Study design development• Statistical selection of lakes• Target chemical selection
Mobilization	<ul style="list-style-type: none">• 10 orientation/training workshops• Production of QA Plans and Field Sampling Plan• Mapping and reconnaissance of 900 lakes

Accomplishments

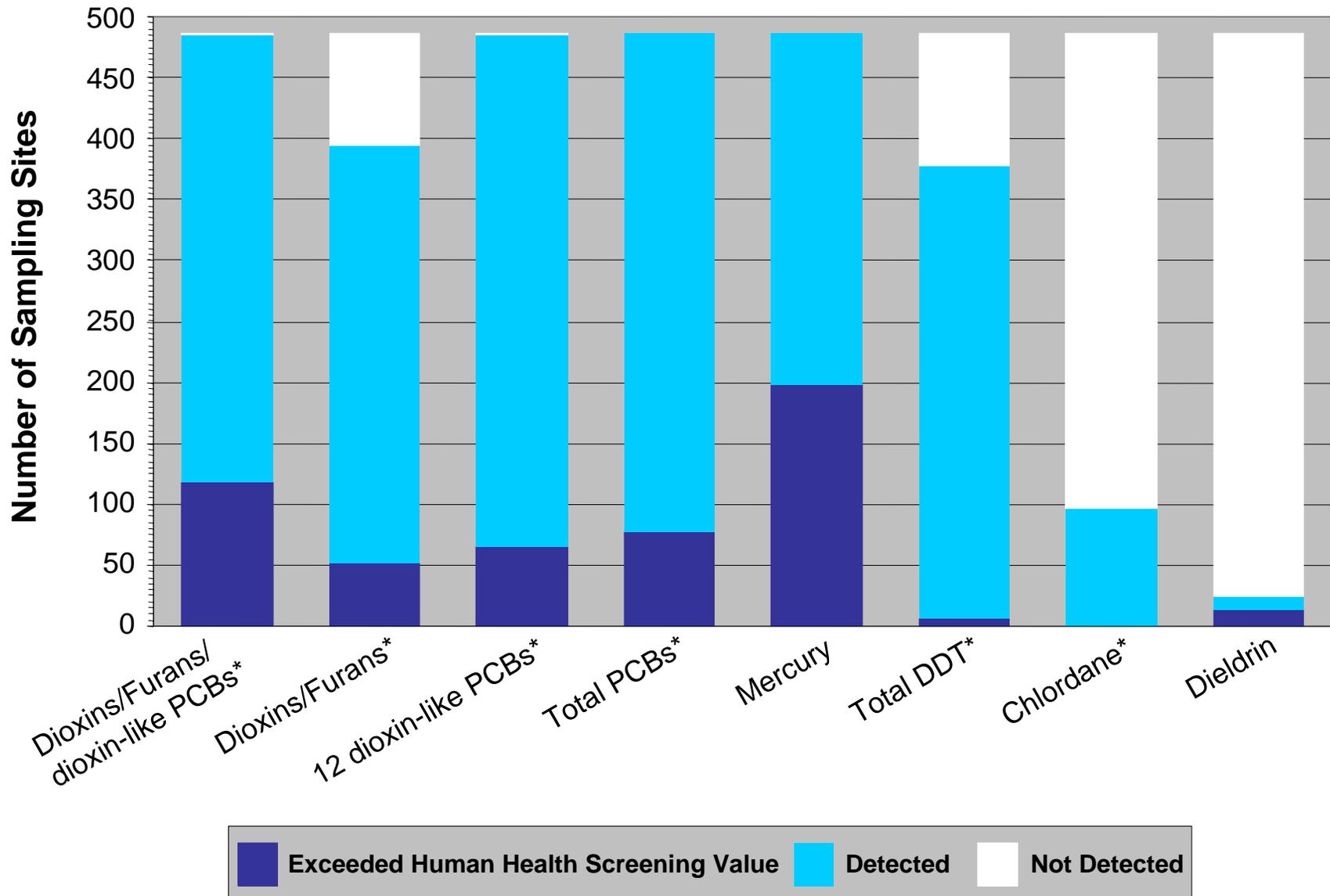
Fish Sampling & Analysis

- Fish collection at 500 lakes
- Completion of fish tissue analysis
- Annual distribution of data to study participants

Public Outreach

- Development of fish study website
(www.epa.gov/waterscience/fishstudy)
- Production of data CDs for public release

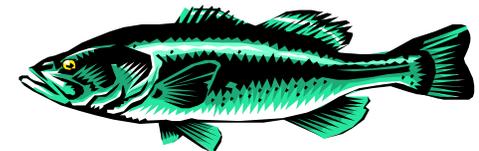
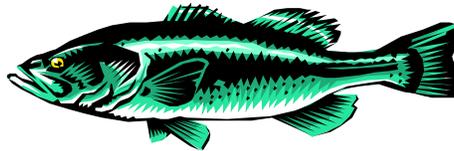
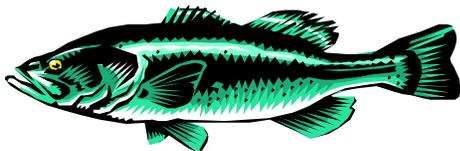
Preliminary Data Summary for Predators (Fillet Analysis, All Years, Unweighted Data)



*Zero for non-detected analytes; sum of congeners for PCBs

Statistical Analysis

- ◆ EPA is analyzing fish study data
- ◆ Data analysis will consist of the following core components:
 - ⊕ Estimates of national means and percentiles
 - ⊕ Cumulative distribution function plots for chemicals and composite types with sufficient data



Statistical Analysis (cont.)

- ✦ National maps of chemicals by composite type for mercury, PCBs, and dioxins/furans
- ✦ Estimate of sampling variability based on replicate sample data
- ✦ Analysis of various sample factors, including:
 - Number of fish in the composite
 - Size effects
 - Species effects



Future Milestones

Short-term (2006)

- Complete statistical analysis of 4-year fish tissue data set
- Develop draft final report for peer review

Long-term (2007)

- Produce final fish study report for public release
- Upload data into EPA's STORET database

