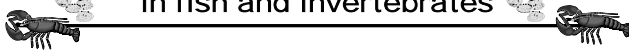


## Polycyclic aromatic hydrocarbons (PAHs) in fish and invertebrates



Usha Varanasi



Northwest Fisheries Science Center  
NOAA Fisheries  
Seattle, Washington

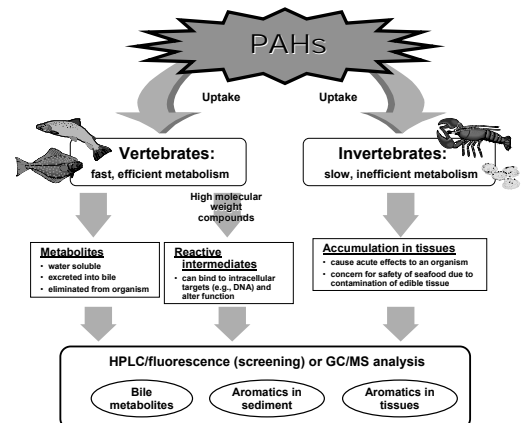
## Polycyclic aromatic hydrocarbons (PAHs)

- Petrogenic (LMW) and pyrogenic (HMW) sources
- Natural sources (seeps, fires)
- Anthropogenic sources (spills, internal combustion engines, coal burning, wood preservatives)



**Questions:** Is seafood safe to eat?  
Are there adverse effects on the organisms?

**Answer:** Different for fish and shellfish



## Responding to PAH contamination

Questions that need to be answered:

- Chemical composition of the source
- Fate and toxicity of the source
- Resources at risk
- Type of investigation to be conducted
- Sampling design
- Analytical approaches

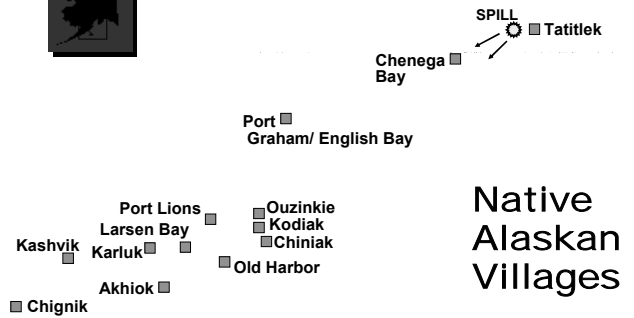
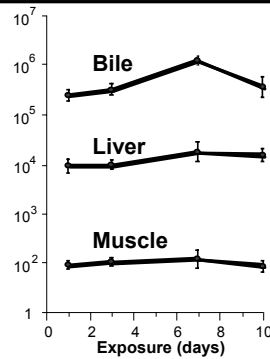
## Tiered approach: Screening -vs- Detailed analyses

- Screening methods are rapid and cost-effective
- Screening methods provide a semi-quantitative estimate of contamination in samples
- Screening allows priority selection of a subset of samples for detailed analysis (e.g., GC/MS)
- Detailed analyses provide confirmation of screening results
- Detailed analyses provide quantitative information about individual contaminants

## Screening Methods: Analyzing AC metabolites in bile

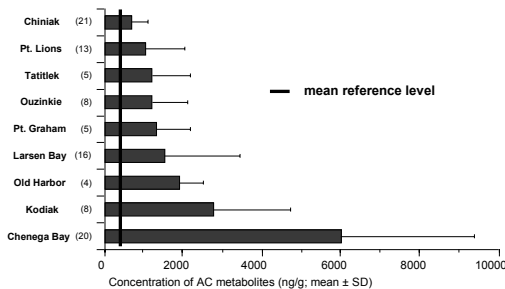
Laboratory exposure of fish to contaminated sediments demonstrated that:

- ACs readily taken up
- ACs extensively metabolized
- Metabolites concentrated in bile for elimination
- Marked differences in tissue concentrations



Native  
Alaskan  
Villages

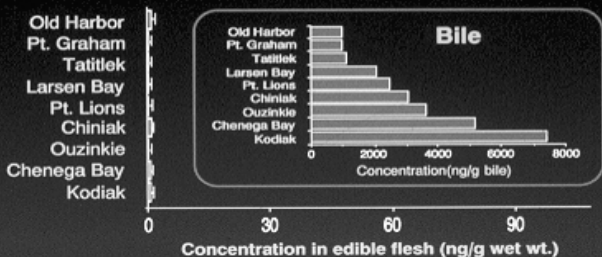
## Concentrations of AC metabolites in pink salmon bile following the Exxon Valdez oil spill



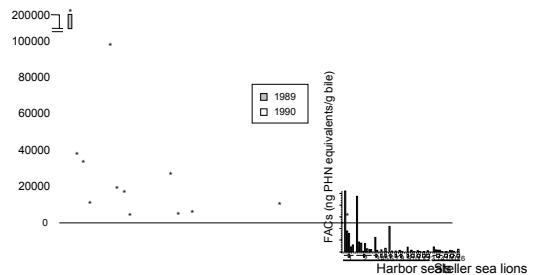
## Total PAHs measured in fish muscle and invertebrates after EVOS 1990

Yakutat (reference site)		Total PAHs (ng/g, ww)
Coho salmon muscle (n = 6)		3.0
Mussels (n = 6)		3.0 ± 2.0
Butter clams (n = 9)		1.0 ± 1.0
Littleneck clams (n = 6)		0.8 ± 0.3
Chenega Bay (oiled site)		Total PAHs (ng/g, ww)
Pink salmon muscle (n = 3)		0.8
Mussels (n = 8)		640 ± 620
Butter clams (n = 9)		330 ± 340
Littleneck clams (n = 16)		120 ± 44
Tatitlek	Smoked salmon	23,000 ng/g wet wt.
Old Harbor	Smoked salmon	7,900 ng/g wet wt.

## Aromatic contaminants in bottomfish (halibut, cod, Irish lord, rockfish, and yellowfin sole)



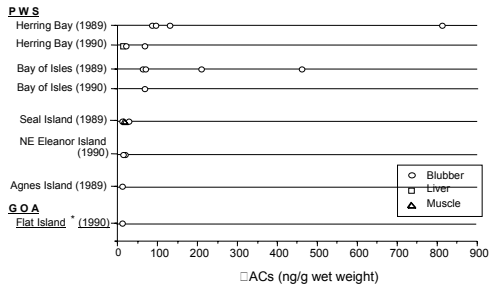
## Bile PAHs in Marine Mammals



Sites 1-8 and 14 are located in Prince William Sound and remaining sites in Gulf of Alaska

\* Indicates a marine mammal that was visibly oiled

## PAHs in Marine Mammals



\* Marine mammal from Gulf of Alaska, all others from Prince William Sound

## PAHs and Seafood

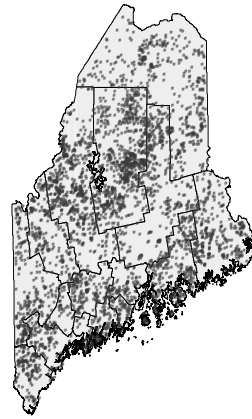
- PAHs are toxic compounds, derived from a variety of sources, including oil spills and combustion of petroleum.
- Fish and invertebrates, when exposed to PAHs, readily assimilate them into their bodies.
- Fish efficiently metabolize PAHs, and excrete them from their bodies. It is very rare to detect significant amounts of PAHs in the tissues of fish.
- Invertebrates, however, are much less efficient metabolizers of PAHs, and PAHs are commonly found in these species in PAH-contaminated areas.
- While PAHs do not accumulate in fish, they have a number of adverse effects on the fish themselves.

## Current/Upcoming Issues with PAHs

- PAH input into the environment is increasing in many areas
- Seafood Safety Standpoint:
  - fish (not a concern)
  - invertebrates (concern)
- Biological Effects Standpoint:
  - fish and invertebrates (concern)
  - Need to monitor the adverse effects (reproductive, sensory, physiological)

# Setting Statewide Advisories based on upper percentile lake averages

Eric Frohberg  
Environmental Toxicology Program  
Maine Bureau of Health

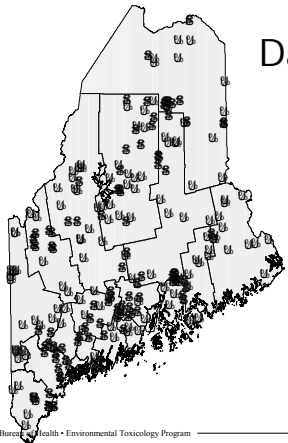


## Problem

- 3000+ Lakes and Ponds in Maine.
- Need to make inferences based on data
- Use a mean concentration an upper percentile lake average estimate?

Bureau of Health • Environmental Toxicology Program

## Data Sources



- REMAP – 1993 EPA Study
- 120 Random Lakes
- SWAT – 1994 to current – added 80 lakes
- \$50,000 per year to support Hg Advisory

Bureau of Health • Environmental Toxicology Program

## Implications in Choice of Statistic

### Mean Lake Concentrations

- Average Population Weighted Exposure
- Assumes Random Fishing

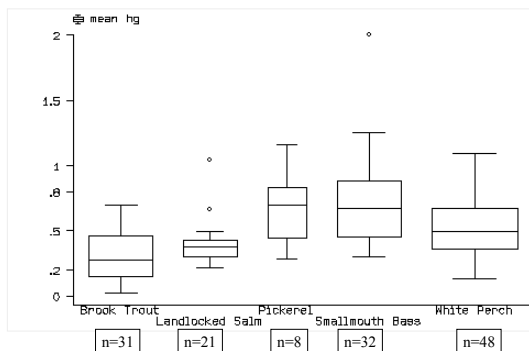


### Upper Estimate of Lake Concentration

- Reflects uncertainty
- Matches hypothesized exposure patterns

Bureau of Health • Environmental Toxicology Program

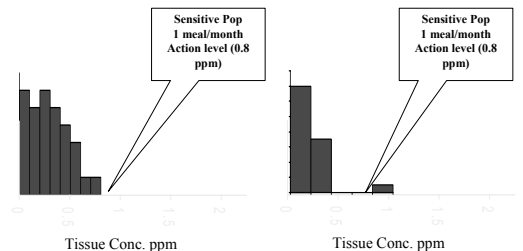
## Variation of Lake Average Hg by Species



Sample size represents number of lakes

Bureau of Health • Environmental Toxicology Program

## % of Lakes above Action Level

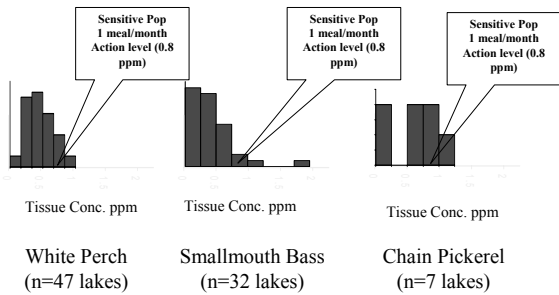


Brook Trout  
(n=31 lakes)

Landlocked Salmon  
(n=21 lakes)

Bureau of Health • Environmental Toxicology Program

## % of Lakes above Action Level



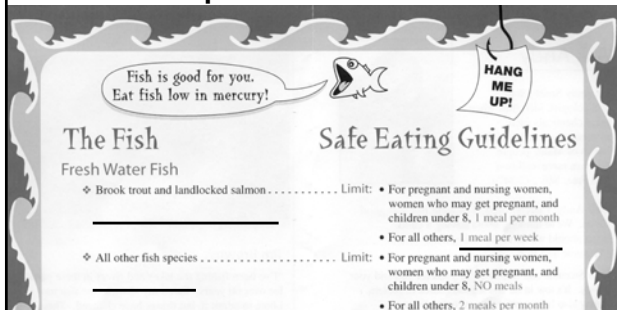
Bureau of Health • Environmental Toxicology Program

## Impact on Advice



Bureau of Health • Environmental Toxicology Program

## Impact on Advice



Bureau of Health • Environmental Toxicology Program

## Implications

### Positive

- Reflects what we think we know about exposure
- Reflects uncertainty
- Provides incentive for testing

### Negative

- Over protective for the vast majority of lakes



## Is The Fish I'm Feeding My Family Safe?

Fishing is a tradition many Native Americans still preserve and practice. Fish are an important part of a healthy diet. They are a

lean, low-calorie source of protein.

To our ancestors, fishing was necessary to feed their families.

However, today's lakes, rivers, and oceans contain chemicals that could pose health risks if these fish are eaten in large amounts. It's hard to believe fish that looks, smells, and tastes fine may not be safe to eat. Keep your family and traditions alive by following the *Safe Eating Guidelines* and these three easy steps.



### Step #1.

**Call Your Local or State Environmental Health Departments.**

Your favorite fishing hole may have high levels of chemical pollutants. Contact your local or state environmental health departments to see if any health advisories are posted in areas you fish. (see back panel for contact information)

### Step #2

**Select Certain Kinds and Sizes of Fish for Eating.**

If you eat game fish, such as lake trout, salmon, and bass, eat smaller, younger fish. They are less likely to contain harmful levels of pollutants than larger, older fish. Eat top feeders, such as perch, brook trout and smelt, instead of bottom feeders like catfish and carp. They feed on insects and are less likely to contain high levels of harmful chemicals.

### Step #3.

**Clean and Cook your Fish Properly.**

It is a good idea to remove the skin, fat, and internal organs as soon as possible. Follow proper food handling and storage techniques to prevent the growth of bacteria and viruses. The way you cook fish can make a difference in the kinds and amounts of chemical pollutants remaining in the fish. Grill, bake, or broil your fish so fat possibly containing pollutants can drain away. Eat less deep-fried fish because frying seals in any chemicals that may be present in that fish. Lastly, if you like smoked fish, remember to fillet the fish and remove the skin before smoking.



## Plans for the Future

- anthropological research combined with elements of a consumption survey
- interviews with Tribal elders
- Tribal based risk assessment






**MICMAC  
HEALTH  
DEPARTMENT**

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Presque Isle, Maine  
04769  
Ph: (207) 764 – 7219

E-mail: **[fcorey@micmachhealth.org](mailto:fcorey@micmachhealth.org)** (Environmental Director) - OR -  
**[speterson@micmachhealth.org](mailto:speterson@micmachhealth.org)** (Environmental Chemist)



# North Dakota's Fish Consumption Advisory:

A Statewide Advisory Based  
on Average Concentration

Presented by  
Mike Ell, Environmental Scientist  
ND Dept of Health  
Bismarck, ND

October 22, 2002



## Outline

- History
- Development of Current Statewide Advisory
- Considerations for the Future

## History

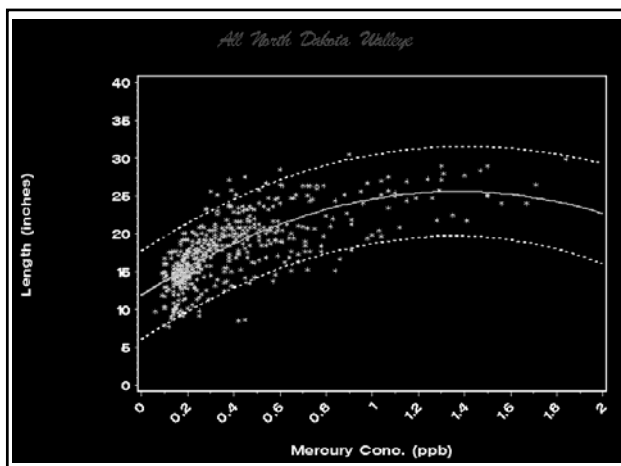
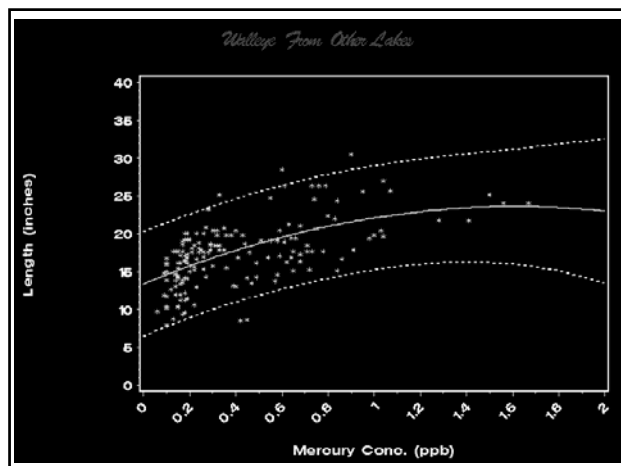
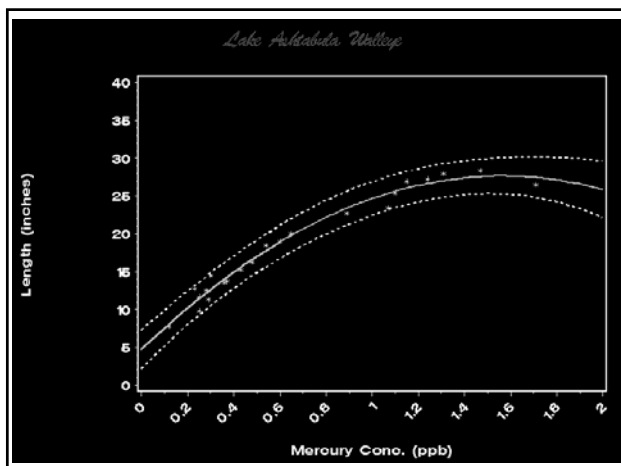
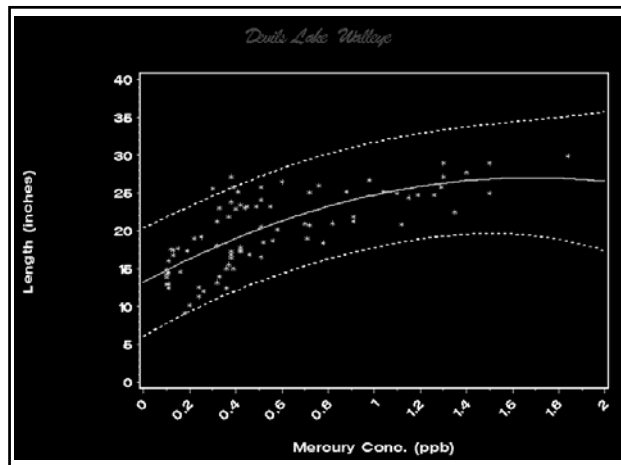
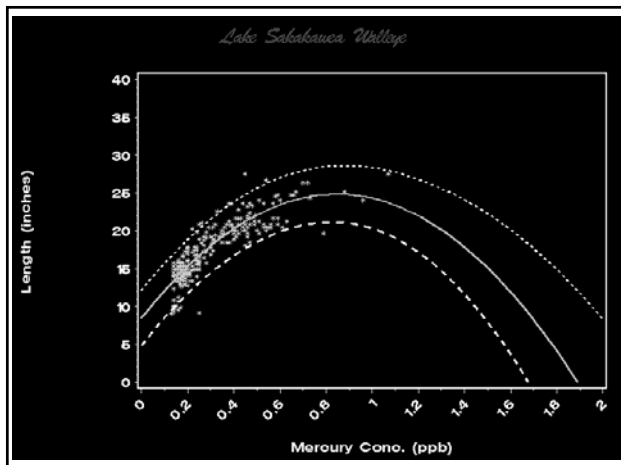
- First fish collections for mercury analysis in 1991
  - Resulted in limited fish advisory for Devils Lake during the summer of 1991
- First published advisory occurred in March 1992
  - Included ten lakes and reservoirs, including Devils Lake, and two rivers

- Continued sampling with additional lakes and reservoirs added each year
- Peaked in the mid 90's with over 30 lakes and rivers and 20 species of fish listed
- Numbers declined through the late 90's due to limited sampling
  - Focus on Devils Lake and Lake Sakakawea
    - Predominant fisheries in the state
    - Research interest in mercury effects and lake manipulations

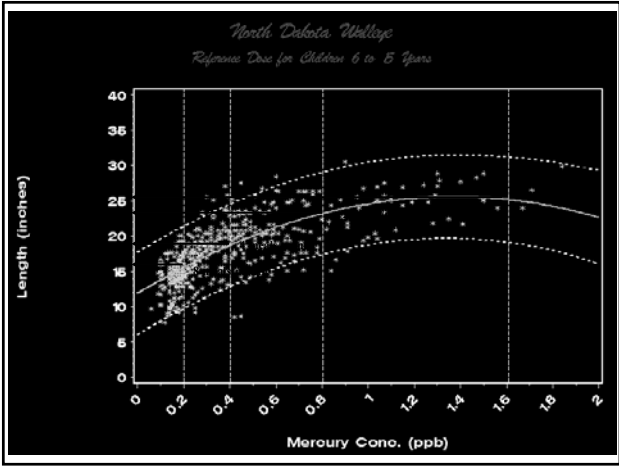
## Statewide Advisory

- First issued in January 2001
- Rational
  - Mercury occurs in fish in all lakes, reservoirs, rivers, and streams in the state
  - For advise to be useful it shouldn't be complicated
- Based on standard assumptions and existing fish tissue data for all lakes and rivers
- Final advisory reduced to simple consumption advice

Dose Management for a Generic Statewide Fish Consumption Advisory				
Assumptions				
	EPA's RID mg/(Hg)/kg-bw/day	Body Weight kilograms	Average Meal Size ounces	Maximum Average Daily Dose mg/(Hg)/day
Children under age 6	0.0001	20	4	0.002
Pregnant and nursing women	0.0001	60	8	0.006
Children between ages 6 and 15	0.0003	40	8	0.012
All other women	0.0003	60	8	0.018
All other men	0.0003	75	10	0.0225
Dose Control				
	Maximum Methyl-Mercury Concentration in Fish			
	8 meals/month	4 meals/month	2 meals/month	1 meal/month
Children under age 6	0.067	0.134	0.268	0.536
Pregnant and nursing women	0.101	0.201	0.402	0.804
Children between ages 6 and 15	0.201	0.402	0.804	1.608
All other women	0.302	0.603	1.206	2.413
All other men	0.392	0.693	1.206	2.413



Dose Management for a Generic Statewide Fish Consumption Advisory				
Assumptions				
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Dose Control				
Maximum Methyl-Mercury Concentration in Fish				
	8 meals/month	4 meals/month	2 meals/month	1 meal/month
Children under age 6	0.007	0.134	0.269	0.538
Pregnant and nursing women	0.101	0.201	0.402	0.804
Children between ages 6 and 15	0.201	0.402	0.804	1.608
All other women	0.302	0.603	1.206	2.413
All other men	0.352	0.603	1.206	2.413



**NORTH DAKOTA ADVISORY FOR HUMAN CONSUMPTION OF FISH**

The chart applies to fisheries of the state, data for crappie, trout and white sucker are incomplete, and the fish in many lakes, rivers and streams have not been sampled. It does not consider other human exposures of methylmercury (as mercury), such as eating ocean or other inland fish.

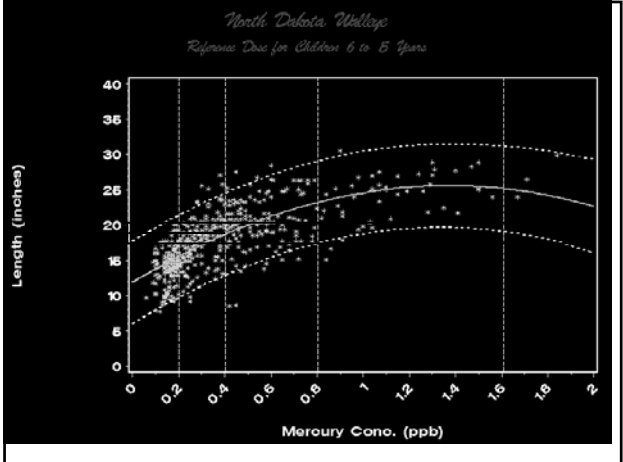
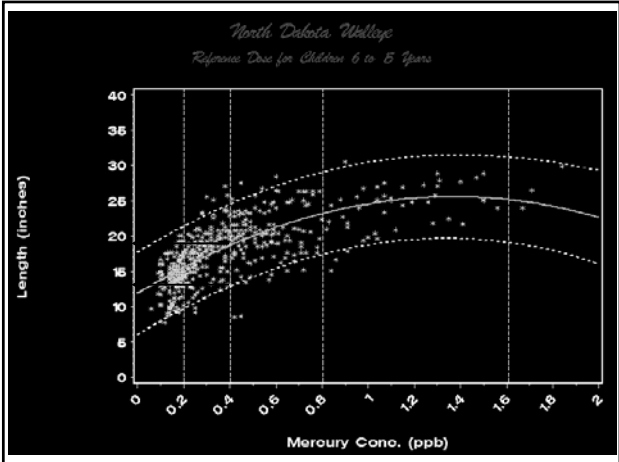
**Meal frequency:** none – no consumption advised  
occasional – occasional consumption, 1 to 2 meals per month, avoid eating shrimps  
moderate – moderate consumption, 2 to 4 meals per month  
frequent – frequent consumption, 4 to 6 meals per month

**Summary:** “children 6 & younger”, pregnant women and nursing women can occasionally eat only smaller fish, and children over age 6 and all other adults can frequently eat smaller fish when eating the meals of moderate and larger fish.

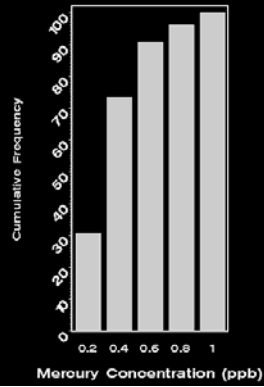
Fish Species	Consumption	Fish Size		
		Smaller	Medium	Larger
BASS, largemouth smallmouth	Children 6 & younger Pregnant & nursing women	occasional	occasional	none
smaller sizes are less than 10 inches	Children over 6 & under 15 All other people	moderate	moderate	moderate
BASS, white	Children 6 & younger	occasional	none	none
smaller sizes are less than 12 inches	Pregnant & nursing women All other people	moderate	moderate	occasional
CHINOOK SALMON	Children 6 & younger Pregnant & nursing women	moderate	moderate	occasional
smaller sizes are less than 10 inches	Children over 6 & under 15 All other people	frequent	frequent	moderate
NORTHERN PIKE	Children 6 & younger Pregnant & nursing women	moderate	occasional	occasional
smaller sizes are less than 15 inches	Children over 6 & under 15 All other people	frequent	moderate	moderate
WALLEYE	Children 6 & younger Pregnant & nursing women	moderate	occasional	occasional
CHANNEL CATFISH	Children over 6 & under 15 All other people	frequent	moderate	moderate
YELLOW PERCH	Children 6 & younger Pregnant & nursing women	moderate	moderate	occasional
smaller sizes are less than 11 inches	Children over 6 & under 15 All other people	frequent	frequent	frequent

# Why Use The Mean Concentration?

- Provides more flexibility to the consuming public
  - Give the public more opportunity to keep fish and to eat those fish
- While providing protection



### All Walleye Between 18 and 20 inches



## Considerations for the Future

- **Sample Design**
  - Targeted vs Statewide Sampling
  - Probabilistic Sampling
- **Public Communication**



Note: The following slides are from the presentation by Bob Frey

## MERCURY ADVISORIES – APRIL 11, 2001

- WAITED FOR NAS VALIDATION OF EPA RfD
- BASED ON EPA 1999 FACT SHEET  
EPA-823-F-99-016, SEPTEMBER 1999
- MODIFIED LEVELS SLIGHTLY FOR EASE OF USE
- CROSS-CHECKED WITH PCB ADVICE
- ISSUED NEARLY 80 NEW ADVISORIES

## ADVISORY TRIGGERS

CATEGORY	PA	FACT SHEET
UNRESTRICTED	0 - 0.12	>0.08 – 0.12*
1 MEAL/WEEK	0.13 – 0.25	>0.12 – 0.24
2 MEALS/MONTH	0.26 – 0.50	>0.32 – 0.48
1 MEAL/MONTH	0.51 – 1.0	>0.48 – 0.97
6 MEALS/YEAR	1.01 – 1.9	>0.97 – 1.9
DO NOT EAT	> 1.9	> 1.9

\* 8 MEALS/MONTH

## DATA

551 MERCURY DATA POINTS  
10 YEARS OF DATA

ADVICE	NUMBER	% OF SAMPLES
UNRESTRICTED	222	40
1 MEAL/WEEK	169	31
2 MEALS/MONTH	118	21
1 MEAL/MONTH	37	7
6 MEALS/YEAR	5	>1
DO NOT EAT	0	--

## DATA EXAMPLES

SPECIES	# SAMPLES	Hg RANGE mg/kg
WALLEYE	44	0.069 – 1.564
LARGEMOUTH BASS	54	0.078 – 0.99
SMALLMOUTH BASS	97	0.06 – 0.733
BROWN TROUT	75	0.007 – 0.856
CARP	50	0.04 – 0.576
CHANNEL CATFISH	37	0.027 – 0.78

## SPECIES COMPARISONS

CATEGORY	WALLEYE	LARGEMOUTH	SMALLMOUTH
UNRESTRICTED	3 (7%)	8 (15%)	17 (18%)
1 MEAL/WEEK	13 (30%)	18 (33%)	33 (34%)
2 MEALS/MONTH	18 (41%)	19 (35%)	39 (40%)
1 MEAL/MONTH	5 (11%)	9 (17%)	8 (8%)
6 MEALS/YEAR	5 (11%)	0	0
DO NOT EAT	0	0	0

## SPECIES COMPARISONS II

CATEGORY	WALLEYE	BROWN TROUT	CARP
UNRESTRICTED	3 (7%)	52 (70%)	29 (58%)
1 MEAL/WEEK	13 (30%)	19 (25%)	15 (30%)
2 MEALS/MONTH	18 (41%)	3 (4%)	5 (10%)
1 MEAL/MONTH	5 (11%)	1 (1%)	1 (2%)
6 MEALS/YEAR	5 (11%)	0	0
DO NOT EAT	0	0	0

## STATEWIDE ADVISORY – APRIL 11, 2001

- EAT NO MORE THAN 1 MEAL/WEEK OF RECREATIONALLY CAUGHT SPORT FISH
- REASONS:
  - UNTESTED WATERS
  - UNTESTED SPECIES IN WATERS WITH ADVISORIES
  - CURRENTLY UNKNOWN CONTAMINANTS

## TMDL IMPLICATIONS

- PA LISTS WATERS WITH ADVISORIES ON 303(d)
- HOW DO YOU HANDLE A STATEWIDE ADVISORY  
WATERS WITH ACTUAL DATA ARE TO BE LISTED

OPTION 1 – LIST ONLY WATERS WITH 2 MEALS/MONTH  
OR MORE RESTRICTIVE

OPTION 2 – ALSO LIST WATERS WHERE ACTUAL DATA  
SHOW 1 MEAL/WEEK

# Minnesota Statewide Fish Consumption Advice

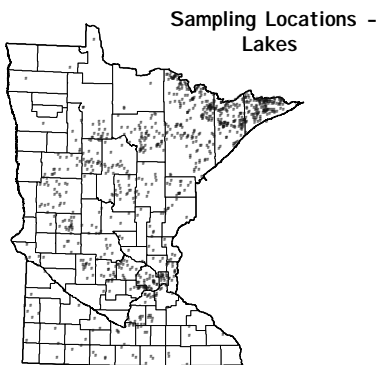
Pat McCann

Minnesota Department of Health

October 22, 2002

## Why have a Statewide Advisory?

- Can't test every water and every species
- Some level of Hg is in every fish we test
- Every water should have some advice – particularly for the sensitive population
- Myth - the waters listed in the fish advisory are bad, others good
- Simplify the communication

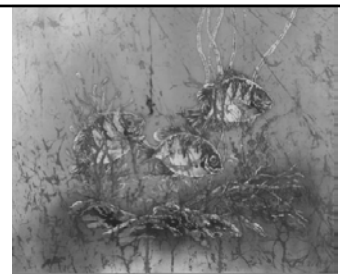


## Can existing data be used to predict untested waters advice?

- Yes and No – not with statistical rigor, but yes in a general sense
- High variability in meHg production
  - Predictors not completely understood or measured
- Sampling not designed for predictive purposes (selection bias and sample type consistency problems)

## A “Weight of Evidence” Approach

- Data Analysis
  - Means and regression analysis
    - By species and geographic location
- Harvest rates
- Input from other state agencies
- Consistency with neighboring states
- Consistency with site-specific advice format



**Eat fish  
often?**

**MDH**  
MINNESOTA DEPARTMENT OF HEALTH

A Minnesota Guide  
to Eating Fish

Safe Eating Guidelines: General Population	
▶ For adults who eat fish all year long*	
Kind of fish	How often can you eat it?
<b>Fish caught in Minnesota:</b>	
Sunfish, crappie, yellow perch, bullheads	→ unlimited amount
Walleyes, northern pike, smallmouth bass, largemouth bass, channel catfish, flathead catfish, white sucker, drum, burbot, sauger, carp, white bass, rock bass, other species	→ 1 meal a week
<b>Commercial fish:</b>	
Limit the following species: shark, swordfish, tile fish, king mackerel	→ 1 meal a month
* In general, adults who eat fish just during vacation or one season can eat fish twice as often as recommended in these guidelines.	

Safe Eating Guidelines: Special Populations		
For pregnant women, women who may become pregnant and children under age 15*		
Kind of fish	How often can you eat it?	
<b>Fish caught in Minnesota:</b>		<b>Special Note:</b>
Sunfish, crappie, yellow perch, bullheads	→ 1 meal a week	Please see the two tables on page 6 for exceptions to these guidelines. These exceptions are for eating fish from certain Minnesota waters levels of have higher levels of contaminants. →
Walleyes shorter than 20 inches, northern pike shorter than 30 inches, smallmouth bass, largemouth bass, channel catfish, flathead catfish	→ 1 meal a month	
white sucker, drum, burbot, sauger, carp, white bass, rock bass, other species	→ Do not eat.	
Walleyes longer than 20 inches, northern pike longer than 30 inches, muskellunge	→ Do not eat.	
<b>Commercial fish:</b>		
• Shark, swordfish, tile fish, king mackerel	→ Do not eat.	
• Other commercial species, including canned tuna	→ See MDH's brochure, "An Expectant Mother's Guide to Eating Minnesota Fish," for guidelines.	
* There is no change in these guidelines for eating fish just during vacation or one season.		

[illegible]

# Input from other Agencies

- Department of Natural Resources
  - Continue to provide site-specific advice
  - Concern about list of “bad” waters
  - Concern about future funding for monitoring
- Pollution Control Agency
  - In line with their trend and mechanistic work
  - TMDL list
  - Concern about future funding for monitoring
- Tourism
  - Concern about list of “bad” waters and impact on northern MN



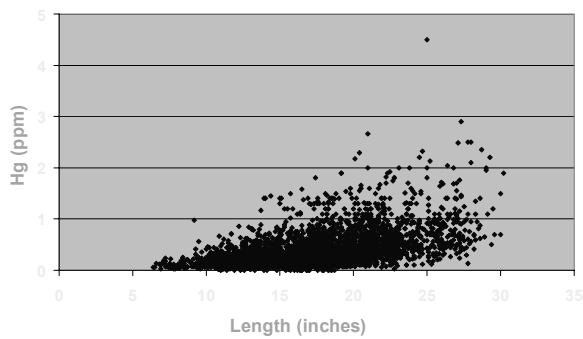
## Meal Advice Categories – Mercury Women and Children

Unlimited consumption	< 0.05 ppm
1 meal / week	0.06 - 0.2 ppm
1 meal / month	0.21 - 1.0 ppm
Do not eat	> 1.0 ppm

Unlimited consumption	< 0.05 ppm
1 meal / week	0.06 - 0.2 ppm
1 meal / month	0.21 - 1.0 ppm
Do not eat	> 1.0 ppm



## Walleye

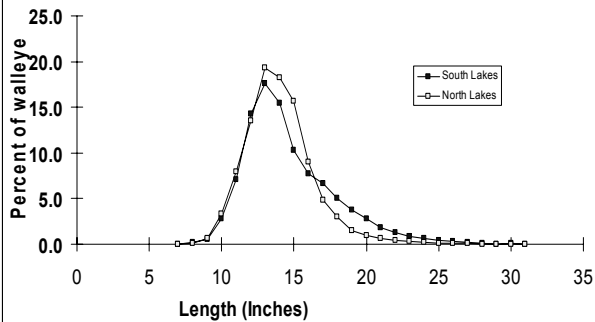


## Means Analysis

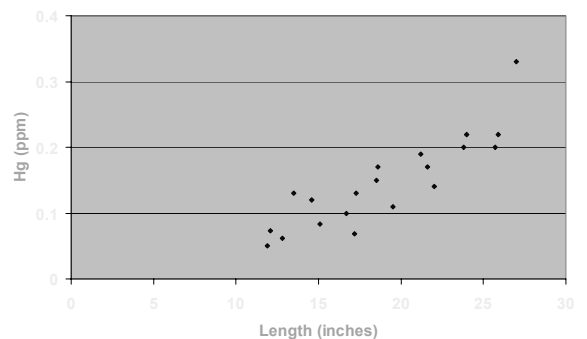
	N	Mean (µg/g)	Upper 95%CI on mean
All Walleye	3761	0.39	0.41
NE Walleye	2268	0.45	0.47
Not NE Walleye	1493	0.31	0.32

## Minnesota Walleye Harvest

North and South of U.S. Highway 2



## Mille Lacs Lake Walleye



## Communication

- General Statewide Advice
  - “Eat fish often?” and Mom’s Guide brochures
  - MDH web site
  - DNR Fishing Regulations
- Site Specific Advice
  - MDH web site
  - DNR Lake Reports - web and hard copy

## Eat fish often?

Most fish are healthy to eat. And fish are an excellent source of low fat protein.

But any fish (store-bought or sport-caught) could contain contaminants such as mercury and PCBs that can harm human health — especially the development of children and fetuses.

The Minnesota Dept. of Health provides advice on how often fish can be safely eaten. The consumption guidelines below are based on mercury levels

## Tips for reducing contaminants

1. Eat smaller fish. Large fish contain higher levels of contaminants.
2. Eat more panfish (sunfish, crappie) and fewer predator fish (walleye, northern pike, lake trout).
3. Trim skin and fat, especially belly fat. Also, eat fewer fatty fish such as carp, catfish, and lake trout. PCBs build up in fat.

measured in fish from lakes across the state. Specific advice for waters where fish have been tested is on the DNR web site (www.dnr.state.mn.us) and in DNR lake survey reports.

## General Consumption Guidelines for fish caught in MN

For Children and Women of Child-bearing Age	
Panfish	1 meal/week
Walleye < 20 inches	1 meal/week
Northern Pike < 30 inches	1 meal/month
All sizes of other species not listed	1 meal/month
Walleye > 20 inches	Do not eat
Northern Pike > 30 inches	Do not eat
Muskellunge	Do not eat
For Other Adults	
Panfish	Unlimited
All sizes of other species	1 meal/week

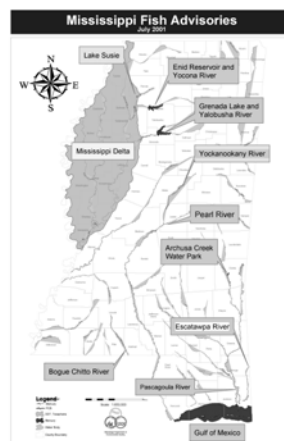
For more information, call the MN's Dept. of Health at 651/215-0550 or toll-free 800/657-3888.



## Regional Fish Advisory for the Mississippi Delta



Henry Folmar  
October 21, 2002



**Fishing is an  
important part  
of the culture in  
the Delta.**



**Most Delta fisherman eat what they catch.**

### **DDT in the Delta is not a new problem.**

- DDT was heavily used as a cotton insecticide beginning shortly after WWII.
- Decline in fish eating species like the Bald Eagle and Brown Pelican.
- Fish Advisories for Wolf, Mossy and Washington Lakes in 1970's.
- DDT was banned in 1972 and toxaphene in 1982.

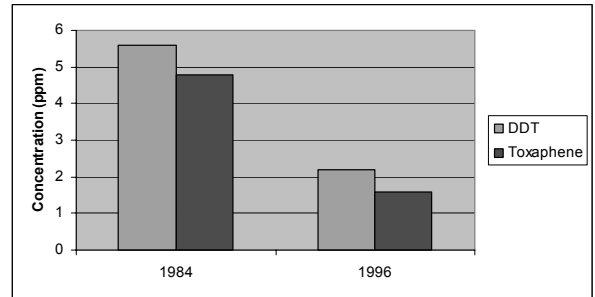
### **Recent studies show DDT and toxaphene levels in the Delta are among the highest in the country:**

- USFWS - Yazoo R. @ Redwood - whole carp had highest DDT levels of 112 sites across the country.
- USFWS - Monitored pesticides in fish and wildlife on refuges around the country. Led to closure of Yazoo Refuge to Fishing.
- USGS - NAWQA Study - MS portion of Delta had highest levels of DDT and toxaphene in fish of any of their 230 sites nationwide.

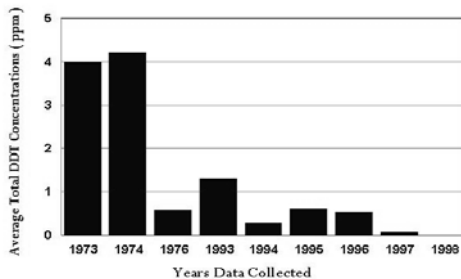
### DDT and toxaphene levels in fish in the Delta are declining.

- Data from USFWS and MDEQ and other agencies show conditions are improving.

### Concentrations of DDT and toxaphene in whole carp from the Yazoo River at Redwood, MS (USFWS).



### Average DDT concentrations in largemouth bass in the Delta 1973-1998 (MDWFP, MDEQ)



### So if things are getting better, why all the fuss?

- The level considered to be safe has changed.
- FDA rescinded their action level for DDT in 1993.
- States were encouraged to begin using EPA guidance that was more protective.
- The Mississippi Fish Advisory Task Force led an effort to develop new criteria following the EPA guidance

### Criteria Setting Process

- MS Fish Advisory Task Force (DEQ, DH, DWFP, DAC, and DMR)
- Followed EPA Guidance
- Technical Review Committee (UMC, MSU, USGS, USDA, USFWS, EPA, COE)

### Mississippi Fish Advisory Criteria for DDT and Toxaphene

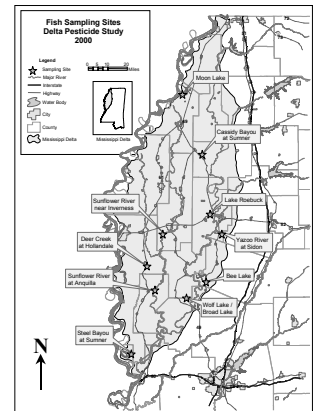
Fish Tissue Concentration (mg/kg)		
Consumption	DDT	Toxaphene
No limit	<1.0	<0.4
2 meals/month	1.0 - 5.9	0.4 - 1.9
No Consumption	>6.0	>2.0

## The objectives of the Mississippi Delta Fish Tissue Study were to:

- Evaluate the concentration of DDT and toxaphene in edible tissue from 10 selected sites.
- Use these data to evaluate human health risks associated with eating fish.
- Develop a species concentration gradient for DDT and toxaphene that will help focus future monitoring efforts.

## Sampling Sites

### Mississippi Delta Fish Tissue Study 2000



## Good News:

- All largemouth bass, bream, crappie, freshwater drum and all catfish less than 3lbs were below the criteria at all sites.
- 66% of all samples were below the criteria for DDT.
- 73 % of all samples were below the criteria for toxaphene.
- Farm raised catfish samples were below the criteria for both DDT and toxaphene.

## Bad News:

- All ten sites had at least two samples that exceeded Mississippi's limit consumption criteria for DDT or toxaphene.
- 7 of 9 Cassidy Bayou samples exceeded the criteria.
- 7 of 13 Roebuck Lake samples exceeded the criteria, including 3 samples that were above the no consumption criteria.
- Some form of advisory was warranted at each site sampled

## DELTA FISH ADVISORY

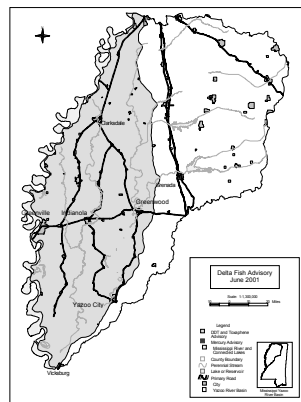
3 FISH BELOW

**DO NOT EAT ANY BUFFALO FISH FROM ROEBUCK LAKE**

**DO NOT EAT MORE THAN TWO MEALS PER MONTH OF THESE FISH**

**NO LIMIT ON THESE FISH**

**MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY**  
For more information call toll free - 1-888-786-0661



## Delta Fish Tissue Advisory Area

- Includes Mississippi Portion of Delta from Memphis to Vicksburg from MS River Levee to the bluff hills.
- Does not include MS River or connected oxbow lakes.

### Outreach/Public Information

- News Conference in Jackson/Stoneville
- News Release
- Sampling Demo for TV and Print Media
- Radio and TV spots on Delta Area Morning Shows
- Call in shows on gospel and blues radio stations in and around the Delta
- Sent letters and posters to Delta Area Fish Markets and Grocery Stores

### Outreach Efforts Cont'd

- Went door to door in some communities explaining advisories and answering questions.
- Participated in two Delta area Health Fairs (Greenville and Clarksdale).
- Participated in three Wildlife Expos in Greenville and Jackson
- Appeared on Mississippi Outdoors TV Show.
- Appeared on Listen to the Eagle, a statewide radio call in show.

### Outreach Efforts Cont'd

- Sent letters, maps and brochures to all commercial fishermen in the state.
- Printed Advisories in MDWFP Outdoor Digest.
- Printed Signs for Roebuck Lake and rest of Delta.
- MDWFP and MDEQ put up signs at boat ramps and public fishing areas.
- Placed Maps, Brochures, Posters, and Advisory Table on MDEQ WebSite.
- Mailed letters, maps and brochures to 1400

### Outreach Efforts (Cont'd)

- 16,000 Coloring books for distribution in schools, head start programs and other children's groups.
- Distribution of posters and brochures through WIC offices and county Health Departments in the Delta.
- Fish Advisory Brochure and Poster in Spanish.



### Next Steps

- Continue monitoring looking for hot spots and clean areas that can be removed from advisory.
- Continue Outreach Efforts.
- TMDL's by June 2003.

## Questions?

### Contact Information:

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