Assessing Michigan's Beneficial Use of Sport-Caught Fish

St Marys Binational PAC
March 5, 2014
Presented by:
Michelle Bruneau
Michigan Department of Community Health

Overview

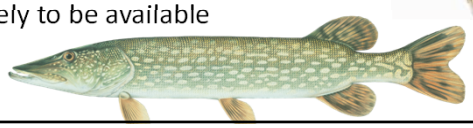
- Results of Fish Consumption Analysis for BUI Assessment
- Results of Fish Tumor Analysis
- Proposed Signs
- New Fish Consumption Guidelines
  - Statewide changes
  - Local changes

BUI Removal Criteria:
Restrictions on Fish & Wildlife Consumption

- BUI Removal Criteria
  - St Marys AOC BPAC accepted MDEQ's Guidance
    - Fish Consumption guidelines same or less than an associated Great Lake or reference site
    - Comparison Study: fish tissue contaminant levels from the AOC compared to same from reference site*
    - Trend Analysis: AOC compared to itself over time*

Proposal:
Restrictions on Fish & Wildlife Consumption

- Target Species (10-20)
  - Carp
    - high PCB burden
    - relatively easy to collect
- Secondary Species (10-20)
  - Northern Pike
  - Rock Bass
  - Yellow Perch
    - resident species
    - likely to be available



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Collected & Analyzed:
St Marys River & Reference Sites

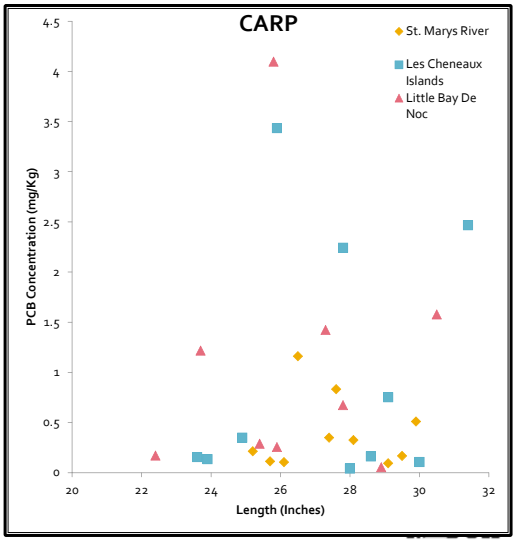
Table 1. Fish samples collected from the St. Marys River AOC and two reference sites in 2012*.

Species	St. Marys River	Les Cheneaux	Little Bay De Noc
Carp	10	10	9
Pumpkinseed	10	10	0
Redhorse Sucker	7	0	10
Rock Bass	10	10	14*
Smallmouth Bass	10	10	10
Walleye	8	0	10
Yellow Perch	10	10	0

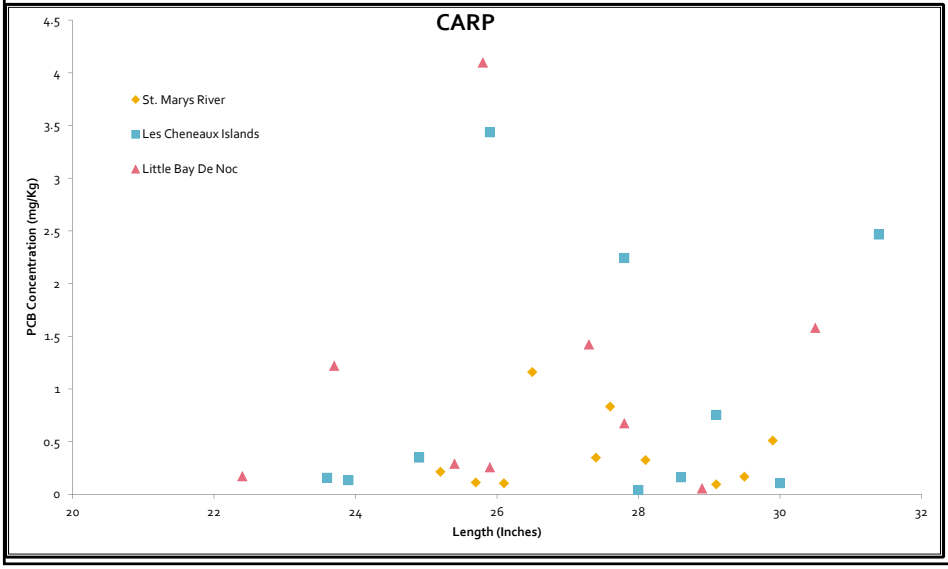
* - rock bass from LBDN collected in 2008

Carp - PCBs

- No significant relationship between fish length and PCB concentrations.
- Total PCBs concentrations in St Marys AOC carp were the **same or lower than the reference sites**.

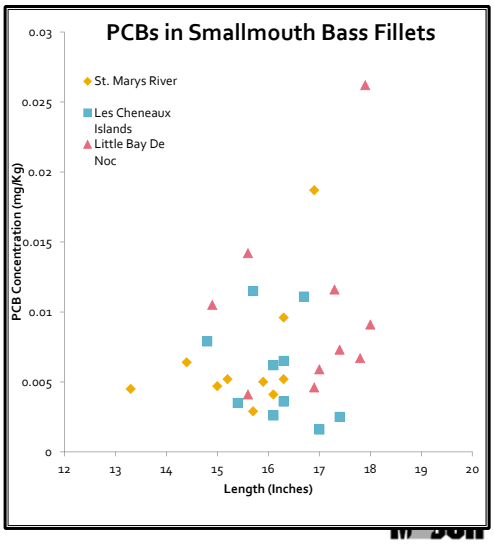


Carp - PCBs

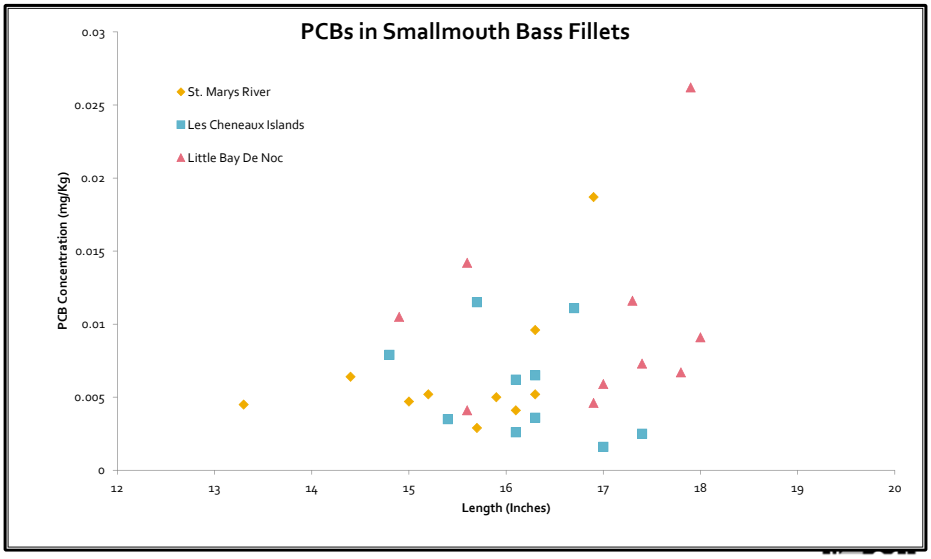


Smallmouth Bass - PCBs

- No significant relationship between fish length and PCB concentrations.
- Total PCBs concentrations in St Marys AOC smallmouth bass were the **same as the reference sites**.



Smallmouth Bass - PCBs



Pumpkinseed, Rock Bass & Yellow Perch - PCBs

- No significant relationship between fish length and PCB concentrations.
- No PCBs were detected.
- Total PCBs concentrations in these St Marys AOC fish were the **same or lower than the reference sites**.

95% UCL on the mean total PCB			
Species	95% UCL (ppm)		
	SMR	LCI	LBDN
Carp	0.64	1.88	2.06
Pumpkinseed	ND	0.004	--
Redhorse Sucker	0.01	--	0.08
Rock Bass	ND	0.001	0.003*
Smallmouth Bass	0.01	0.01	0.01
Walleye	0.01	--	0.33
Yellow Perch	ND	0.002	--

ND – below quantification level;
* - samples collected in 2008

PCBs Overview

- No significant relationship between fish length and PCB concentrations.
- No PCBs were detected in pumpkinseed, rock bass, or yellow perch.
- Total PCBs concentrations in St Marys fish were the **same or lower than the reference sites**.

95% UCL on the mean total PCB			
Species	95% UCL (ppm)		
	SMR	LCI	LBDN
Carp	0.64	1.88	2.06
Pumpkinseed^	ND	0.004	--
Redhorse Sucker	0.01	--	0.08
Rock Bass^	ND	0.001	0.003*
Smallmouth Bass^	0.01	0.01	0.01
Walleye	0.01	--	0.33
Yellow Perch	ND	0.002	--

ND – below quantification level
* - samples collected in 2008 ^ - good site fidelity

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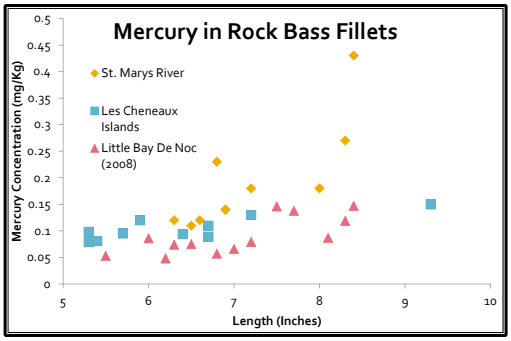
Rock Bass - Mercury

- No significant relationship between fish length and mercury concentrations.
- Total mercury concentrations in St Marys AOC rock bass were **slightly greater than the reference sites.**



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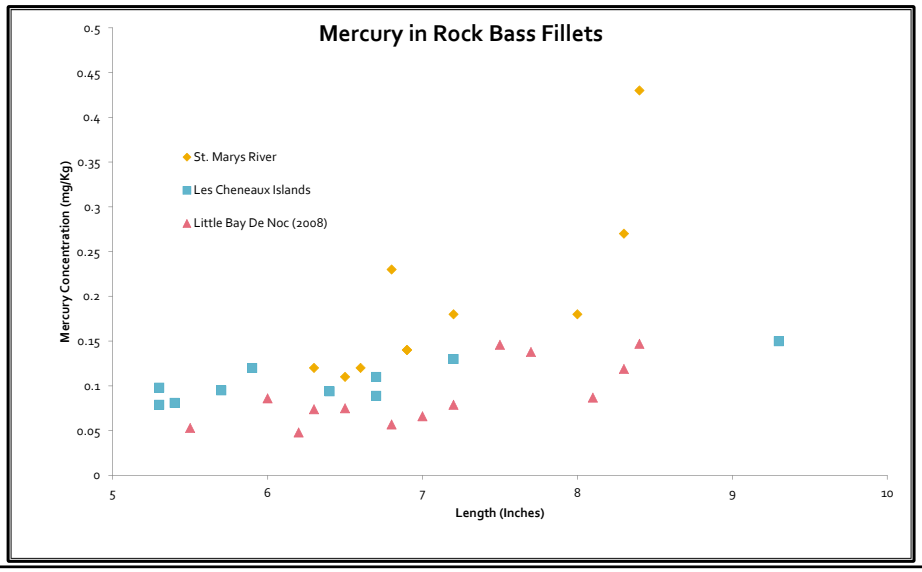
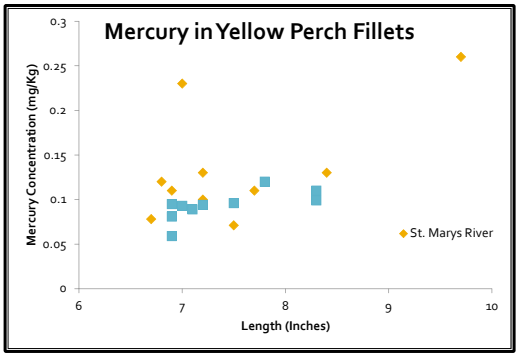
Rock Bass - Mercury



Yellow Perch - Mercury

- No significant relationship between fish length and mercury concentrations.
- Total mercury concentrations in St Marys AOC yellow perch were **slightly greater than the reference sites.**



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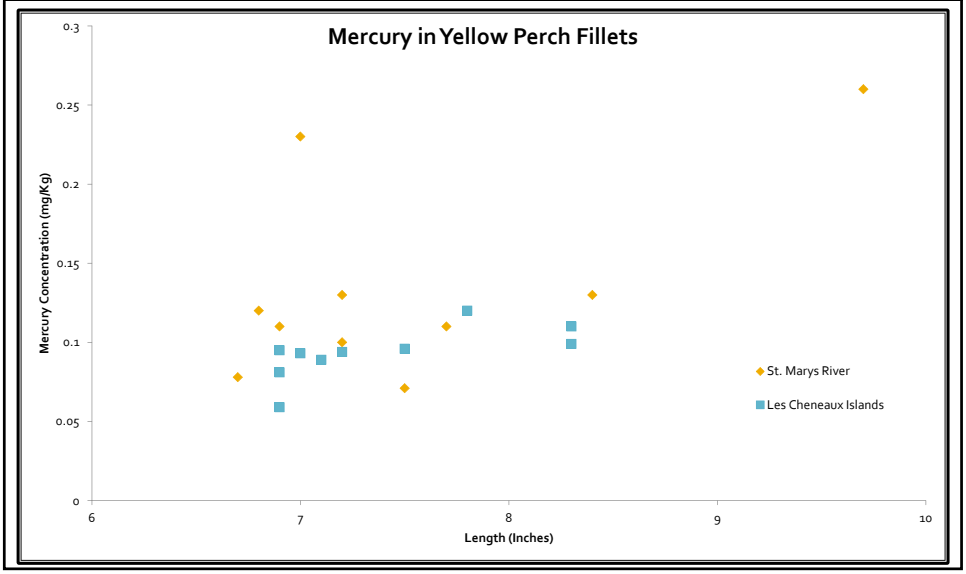
Yellow Perch - Mercury



Mercury Overview

- No significant relationship between fish length and mercury concentrations.
- Total mercury concentrations in St Marys AOC carp, pumpkinseed, and smallmouth bass were the **nearly the same as the reference sites.** Sucker and walleye were **lower than the reference sites.**

95% UCL on the mean total mercury concentration

Species	95% UCL (ppm)		
	SMR	LCI	LBDN
Carp	0.36	0.3	0.38
Pumpkinseed^	0.08	0.08	--
Redhorse Sucker	0.14	--	0.56
Rock Bass^	0.26	0.12	0.11*
Smallmouth Bass^	0.44	0.42	0.36
Walleye	0.43	--	0.55
Yellow Perch	0.18	0.11	--

* - samples collected in 2008 ^ - good site fidelity

Fish Contaminant Summary

- Mercury
  - St Marys ≤ Reference Sites
    - Carp
    - Pumpkinseed
    - Redhorse Sucker
    - Smallmouth Bass
    - Walleye
    - Yellow Perch*
    - Rock Bass*
- PCBs
  - St Marys ≤ Reference Sites
    - Carp
    - Pumpkinseed
    - Redhorse Sucker
    - Rock Bass
    - Smallmouth Bass
    - Walleye
    - Yellow Perch

Fish Contaminant Summary

- DDT
  - St Marys < Reference Sites
    - Carp
    - Pumpkinseed
    - Redhorse Sucker
    - Rock Bass
    - Smallmouth Bass
    - Walleye
    - Yellow Perch
- Dioxin
  - St Marys < Reference Sites
    - Carp

DRAFT Fish Consumption Guidelines

Species	MI Servings per Month			
	Chemical	SMR	LEI	LBDN
Carp	PCBs & Dioxins	Limited	Limited	Limited
Pumpkinseed	Mercury	2	12	--
Redhorse Sucker			--	1
		4	8	8*
Smallmouth Bass		2	2	2
Walleye	PCBs & Mercury	2	--	1#
Yellow Perch	Mercury	4	8	--

* - samples collected in 2008 # - with cleaning and cooking

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Tumor BUI

This BUI will be considered restored when:

- No reports of fish tumors or deformities due to chemical contaminants which have been verified through observation and analysis by the MDNR or MDEQ for a period of five years.
- OR, in cases where any tumors have been reported: A comparison study of resident benthic fish (e.g., brown bullhead) of comparable age and at maturity (3 years), or of fish species which have historically been associated with this BUI, in the AOC and a non-impacted control site indicates that there is no statistically significant difference (with a 95% confidence interval) in the incidence of liver tumors or deformities.

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Fish Tumor or Other Deformities

- Reports of tumors:
  - DNR had one unverified report 3-4 years ago.
  - No other reports.
    - 2009 PAC Support Grant: St Marys River Water Quality Network
  - Fulfills first criteria for US BUI removal.

Fish Tumor or Other Deformities

- 2012: MDEQ examined 10 bullhead from SMR
  - none had visible external tumors or observable (gross) liver tumors
- 2012: MDEQ examined 67 fish of 7 other species
  - Sample included 8 walleye
    - no gross tumors
    - significant because some grossly observable liver tumors were observed in that species in 1987 (exact date uncertain).

GLRI Grant: 2014
Fish BUI Assessments Year 2

- BUI Assessment Summary presented to PAC
- Report will include:
  - Brief overview of fish consumption BUI
  - Will also include information on chemical analysis conducted in 2012-2013
    - Summary of AOC fish filet contaminant data
    - List of chemicals
    - Summary of AOC fish tumor data
    - List of species and number of samples
    - Description of sampling location(s)
    - Summary of reference location analytical data
    - Description of data analysis
    - Suggestions for next steps to assess the fish consumption & tumor BUIs in the St Marys River AOC
      - Removal of BUIs?
      - Further testing?
      - Further remediation?

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GLRI Grant: BUI Assessment

- Development Team
  - Joe Bohr (MDEQ) - *bohrj@michigan.gov*
    - Fish Contaminant Monitoring Program
    - Lead author

DEQ

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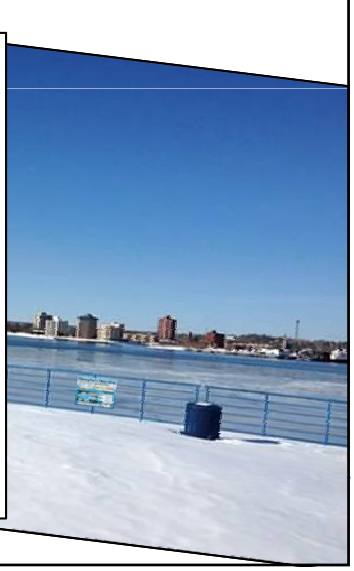
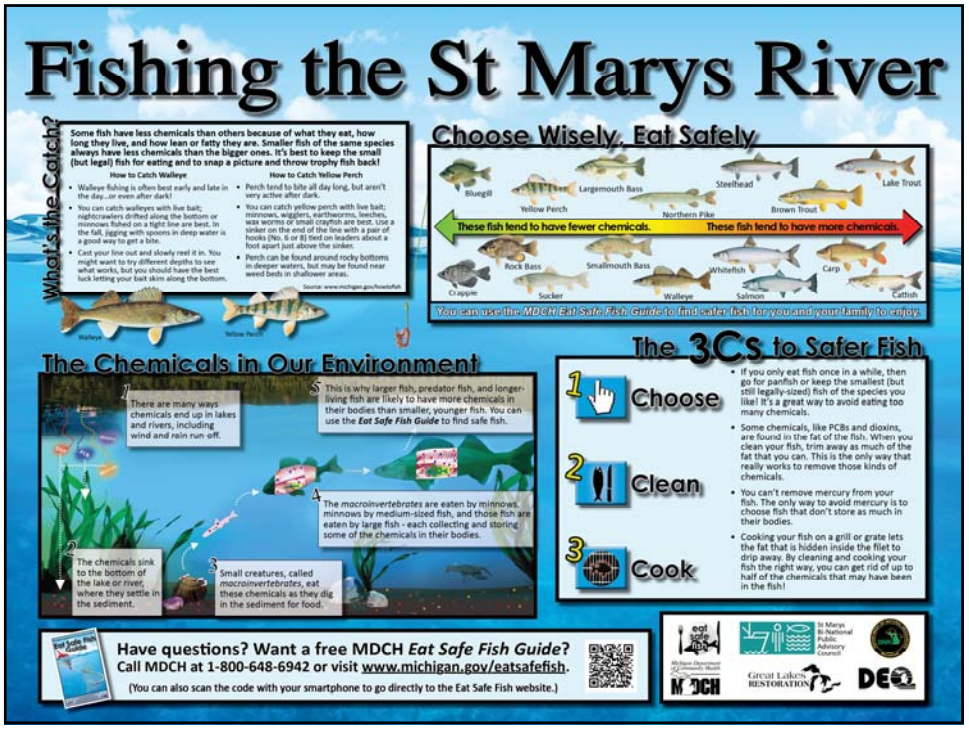
Outreach Materials

- Signs
- Brochures
- Swag
  - Bobbers
  - Tape Measures
  - Coloring/Activity Sheets
  - Coozies?
  - Tackle Boxes?

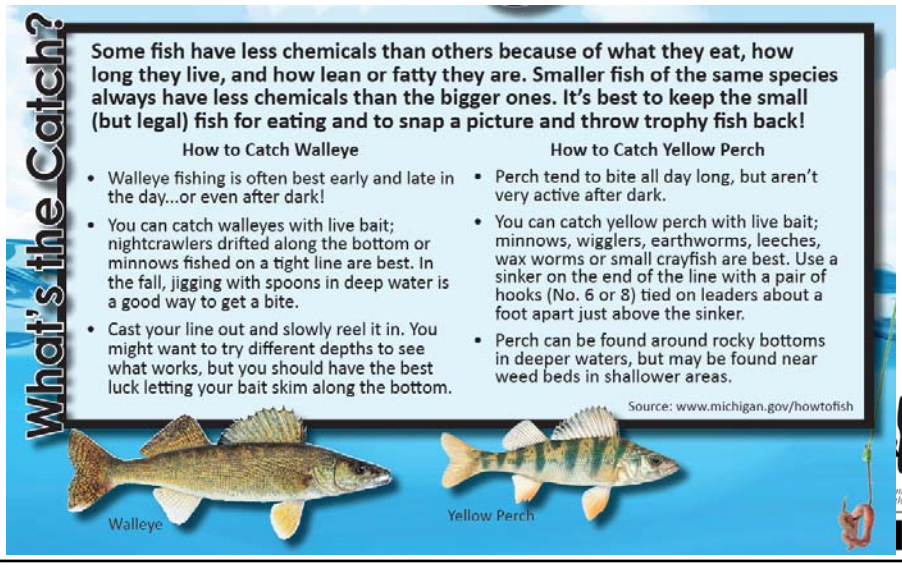
GLRI Grant: 2013
St Marys River Signs

- 18” x 24”
- Premium pressure sensitive vinyl with premium laminate
- Mounted to 3mm DiBond vertical signs with two 3/8” holes for mounting (1 ½” inset top and bottom) and radius corners.





GLRI Grant: 2013
St Marys River Signs



GLRI Grant: 2013
St Marys River Signs

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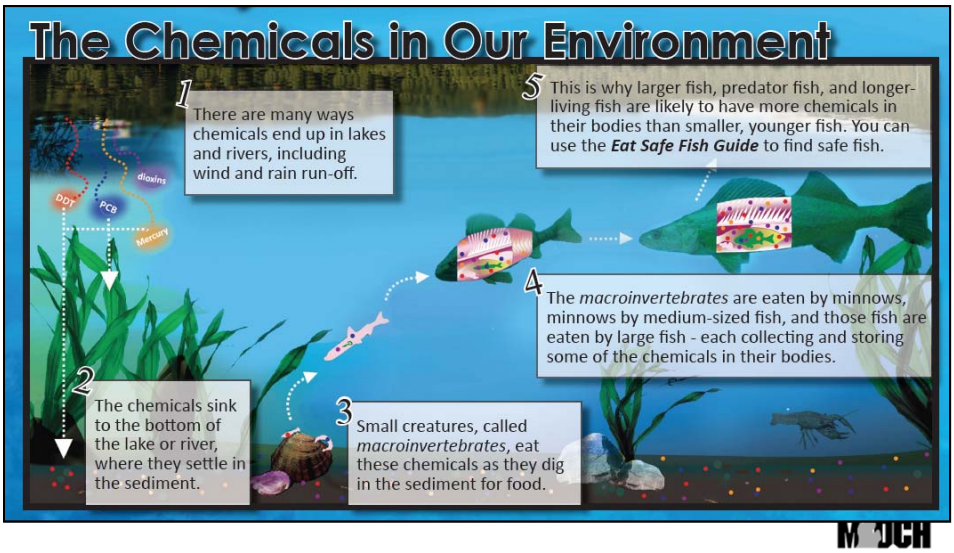
St Marys River Signs



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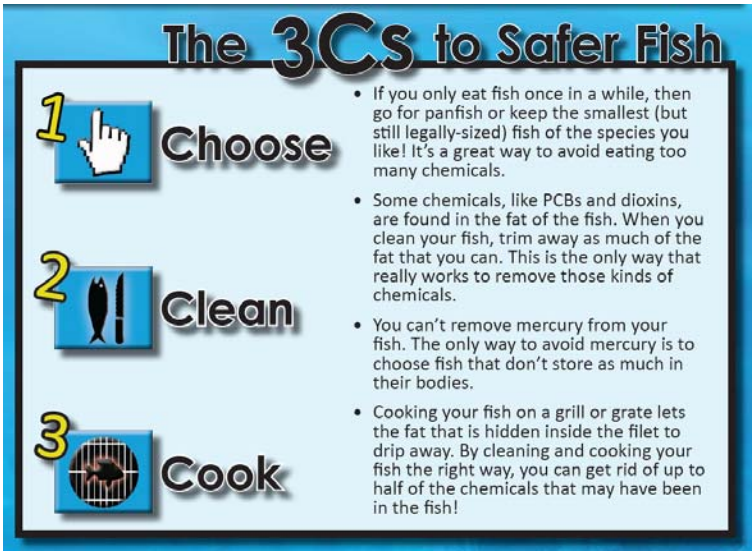
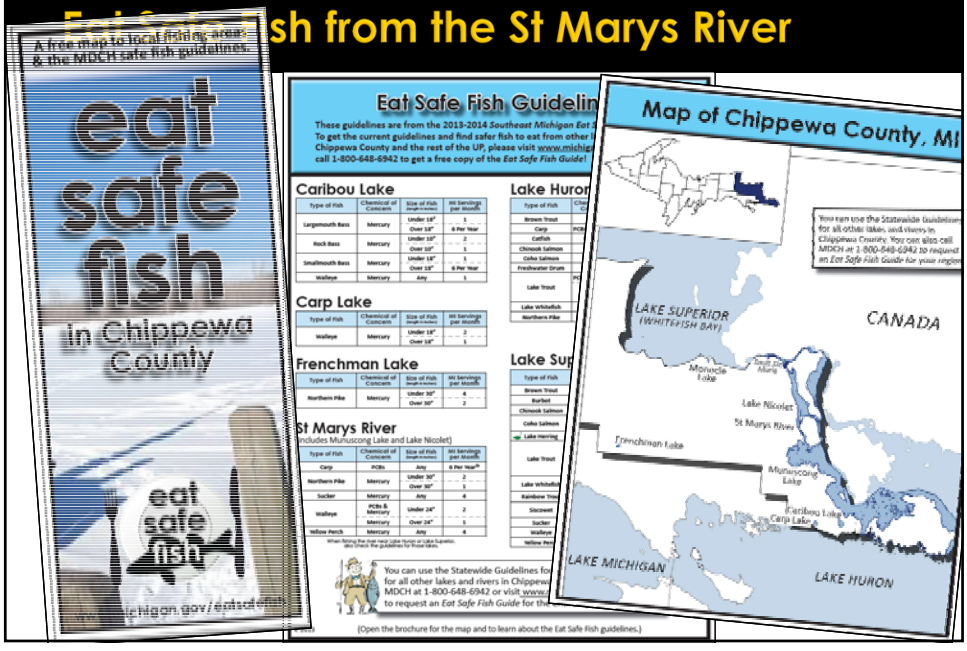
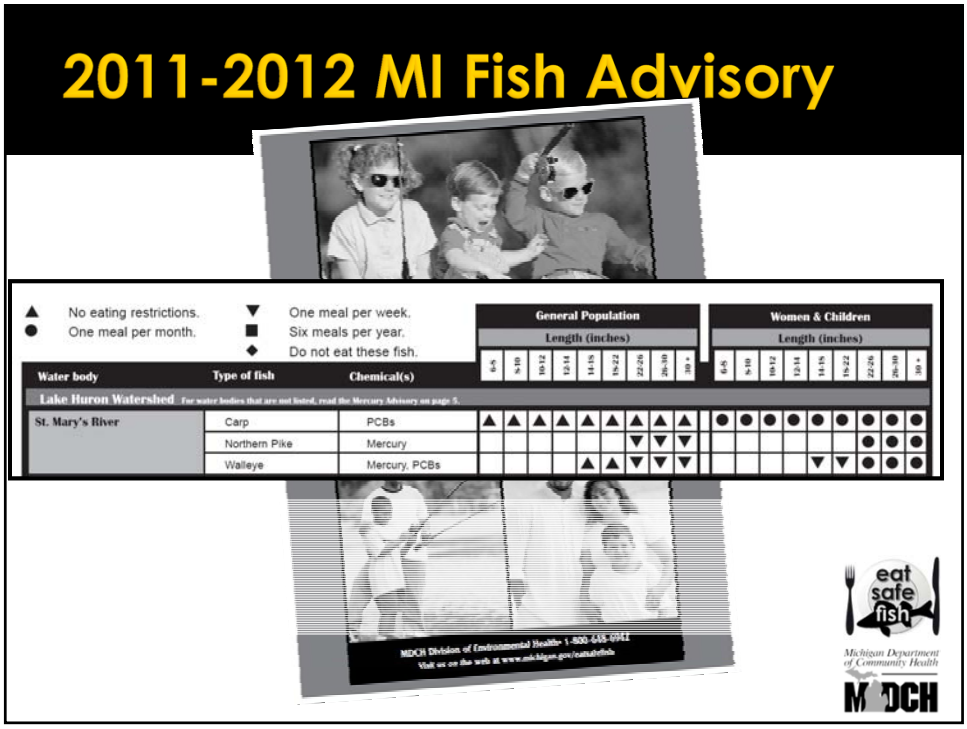
GLRI Grant: 2013
St Marys River Signs



GLRI Grant: 2013
sh from the St Marys River




2011-2012 MI Fish Advisory
No eating restrictions.
One meal per month.
One meal per week.
Six meals per year.
Do not eat these fish.
General Population
Length (inches)
Women & Children
Length (inches)
Water body
Type of fish
Chemical(s)
Lake Huron Watershed
St. Mary's River
Carp
PCBs
Northern Pike
Mercury
Walleye
Mercury, PCBs
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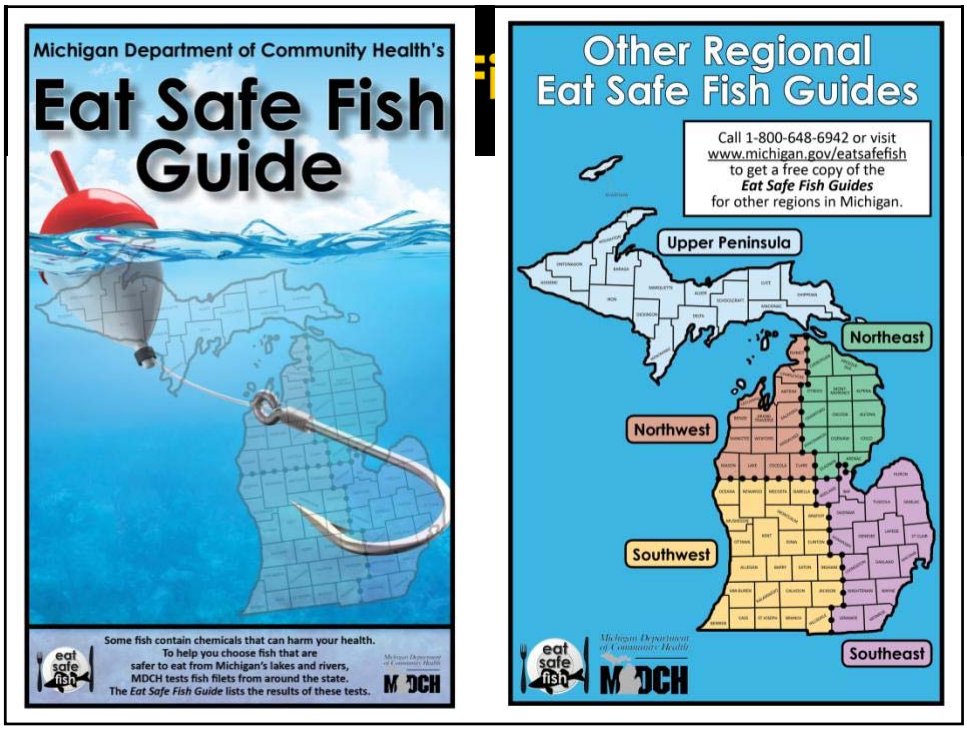
Michigan Department of Community Health's
Eat Safe Fish Guide
Some fish contain chemicals that can harm your health.
To help you choose fish that are safer to eat from Michigan's lakes and rivers, MDCH tests fish filets from around the state.
The Eat Safe Fish Guide lists the results of these tests.
Other Regional Eat Safe Fish Guides
Call 1-800-648-6942 or visit www.michigan.gov/eatsafefish to get a free copy of the Eat Safe Fish Guides for other regions in Michigan.
Upper Peninsula
Northeast
Northwest
Southwest
Southeast

Limited v Do Not Eat

Special *MI Serving* Categories

Limited

If you:

- are under the age of 15,

-or-

- have health problems, like cancer or diabetes,

-or-

- are planning on having children in the next several years, currently pregnant, or breastfeeding,

MDCH suggests you **avoid eating all fish listed as "*Limited*"** because of higher levels of chemicals.

If **NONE** of the above apply to you, it is usually OK to eat fish listed as "*Limited*" **1 or 2 times each year**.

Do Not Eat

No one should eat fish listed as Do Not Eat, regardless of age or health.

When these fish were tested, MDCH found very high levels of chemicals. Eating even one meal of these fish could possibly lead to health problems in the future, regardless of age or health.

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MI Servings

- Based on body weight
- Meals ≠ servings

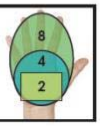
Choosing Safer Fish

The guidelines in the *ESF Guide* are set to be safe for everyone. **This includes children, pregnant or breastfeeding women, and people who have health problems, like cancer or diabetes.**

But the *ESF Guide* is also for healthy adults who want to avoid getting too many chemicals in their bodies. Chemicals like PCBs and dioxins are linked to cancer, diabetes, and other illnesses. Mercury can cause damage to your brain and nerves. MDCH uses chemical limits in the *ESF Guide* that will protect everyone who eats fish.

My Michigan, *MI Serving* Size

- ☑ 8 ounces of fish = size of an adult's hand (large oval)
- ☑ 4 ounces of fish = size of the palm of an adult's hand (small circle)
- ☑ 2 ounces of fish = size of half a palm of an adult's hand (rectangle)



How much is *MI Serving*?

Weight of Person	*MI Serving* Size
45 pounds	2 ounces
90 pounds	4 ounces
180 pounds	8 ounces

Weigh Less? For every 20 pounds **less** than the weight listed in the table, **subtract 1 ounce of fish.**

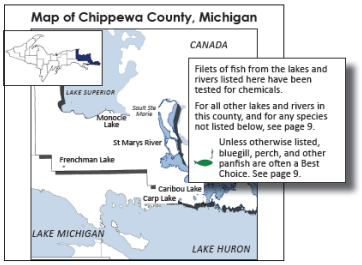
For example, a 70 pound child's *MI Serving* size is 3 ounces of fish.
90 pounds - 20 pounds = 70 pounds
4 ounces - 1 ounce = a *MI Serving* size of 3 ounces

Weigh More? For every 20 pounds **more** than the weight listed in the table, **add 1 ounce of fish.**

For example, a 110 pound person's *MI Serving* size is 5 ounces of fish.
90 pounds + 20 pounds = 110 pounds
4 ounces + 1 ounce = a *MI Serving* size of 5 ounces

Are you pregnant? Fish is good for you and your baby! Use your pre-pregnancy weight to find your *MI Serving* size. It is best to avoid eating fish labeled as "Limited" if you're pregnant or breastfeeding.

Chippewa County



Caribou Lake

Type of Fish	Chemical of Concern	Size of Fish (length in inches)	MI Servings per Month*
Largemouth Bass	Mercury	Under 18"	1
		Over 18"	6 Per Year
Rock Bass	Mercury	Under 10"	2
		Over 10"	1
Smallmouth Bass	Mercury	Under 18"	1
		Over 18"	6 Per Year
Walleye	Mercury	Any	1

Carp Lake

Type of Fish	Chemical of Concern	Size of Fish (length in inches)	MI Servings per Month*
Walleye	Mercury	Under 18"	2
		Over 18"	1

(continued on the next page)

* See page 6 ▲ See page 7 ᵡ See page 8 Best Choice! =

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Chippewa County (continued)

Frenchman Lake

Type of Fish	Chemical of Concern	Size of Fish (length in inches)	MI Servings per Month*
Northern Pike	Mercury	Under 30"	4
		Over 30"	2

St Marys River

Type of Fish	Chemical of Concern	Size of Fish (length in inches)	MI Servings per Month*
Carp	PCBs	Any	6 Per Year2x
Northern Pike	Mercury	Under 30"	2
		Over 30"	1
Sucker	Mercury	Any	4
Walleye	PCBs & Mercury	Under 24"	2
	Mercury	Over 24"	1
Yellow Perch	Mercury	Any	4

See which fish are safe to eat from Lake Huron on Page 16 and Lake Superior on Page 20.

* See page 6 ▲ See page 7 ᵡ See page 8 Best Choice! =

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NEW Format: 2013-2014 ESF

St Marys River

Type of Fish	Chemical of Concern	Size of Fish (length in inches)	MI Servings per Month*	
Carp	PCBs	Any	6 Per Year2x	●
Northern Pike	Mercury	Under 30"	2	●
		Over 30"	1	●
Sucker	Mercury	Any	4	
Walleye	PCBs & Mercury	Under 24"	2	●
	Mercury	Over 24"	1	●
Yellow Perch	Mercury	Any	4	

When fishing the river near Lake Huron or Lake Superior, also check the guidelines on Page 16 and Page 20.

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2011-2012 MI Fish Advisory

▲ No eating restrictions.
● One meal per month.
▼ One meal per week.
■ Six meals per year.
◆ Do not eat these fish.

Water body	Type of fish	Chemical(s)	General Population Length (inches) 6-8	8-10	10-12	12-14	14-15	15-22	22-26	26-30	30+	Women & Children Length (inches) 6-8	8-10	10-12	12-14	14-15	15-22	22-26	26-30	30+
Lake Huron Watershed For water bodies that are not listed, read the Mercury Advisory on page 5.																				
St. Mary's River	Carp	PCBs	▲	▲	▲	▲	▲	▲	▲	▲	▲	●	●	●	●	●	●	●	●	●
	Northern Pike	Mercury							▼	▼	▼							●	●	●
	Walleye	Mercury, PCBs					▲	▲	▼	▼	▼					▼	▼	●	●	●

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Why the Differences?

- No new data incorporated – currently
- **Doubling the meal size is NOT automatically included.**
  - Previous guidelines assumed everyone was trimming and cooking appropriately
  - Assumption removed from NEW guidelines



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Why the Differences?

- Single guideline based on meal size/body weight
- New methods analyzing data:
  - Old data or small samples
  - Standardized comparison methods for all chemicals
    - Using regression and 95% Upper Confidence Limit (UCL) on the mean to determine MI Serving category
- Transparent, defensible, and consistent

Why the Differences?

- MDCH Fish Consumption Guidelines Guidance Document is available at www.michigan.gov/eatsafefish

Why the Differences?

- Updated screening values based on peer-reviewed EPA reference doses

Mercury

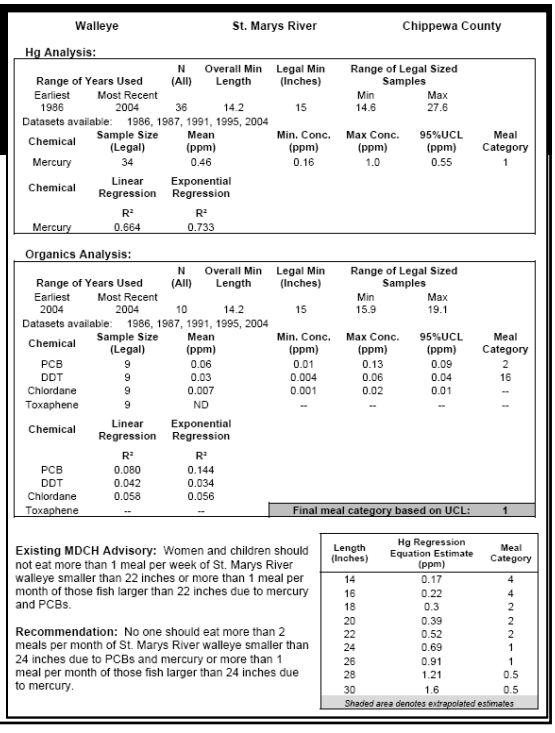
Meal Category	FCSV Ranges
meals per month[a]	*µg/g (ppm)*
16	≤ 0.07
12	>0.07 to 0.09
8	>0.09 to 0.13
4	>0.13 to 0.27
2	>0.27 to 0.53
1	>0.53 to 1.1
6 meals per year	>1.1 to 2.2
Do Not Eat	>2.2

Total PCBs

Meal Category	FCSV Ranges
meals per month[a]	*µg/g (ppm)*
16	≤ 0.01
12	>0.01 to 0.02
8	>0.02 to 0.03
4	>0.03 to 0.05
2	>0.05 to 0.11
1	>0.11 to 0.21
6 meals per year	>0.21 to 0.43
Limited	>0.43 to 2.7
Do Not Eat	>2.7

Data Sheets

- Chemical
  - Mercury
  - PCBs
  - DDT
  - Chlordane
  - Toxaphene
- Range of Yrs
- 95% UCL or Regression > 0.6



Walleye — St. Marys River — Chippewa County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1986	2004	36	14.2	15	14.6	27.6

Datasets available: 1986, 1987, 1991, 1995, 2004

Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	34	0.46	0.16	1.0	0.55	1

Chemical	Linear Regression R^2	Exponential Regression R^2
Mercury	0.664	0.733

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2004	2004	10	14.2	15	15.9	19.1

Datasets available: 1986, 1987, 1991, 1995, 2004

Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	9	0.06	0.01	0.13	0.09	2
DDT	9	0.03	0.004	0.06	0.04	16
Chlordane	9	0.007	0.001	0.02	0.01	--
Toxaphene	9	ND	--	--	--	--

Chemical	Linear Regression R^2	Exponential Regression R^2
PCB	0.080	0.144
DDT	0.042	0.034
Chlordane	0.058	0.056
Toxaphene	--	--

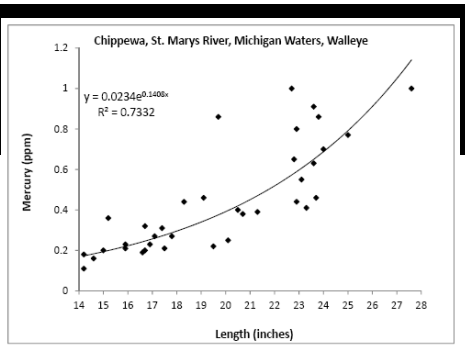
Final meal category based on UCL: 1

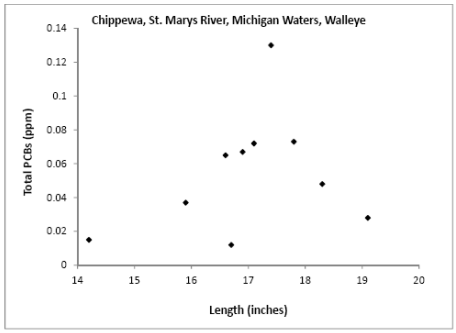
Existing MDCH Advisory: Women and children should not eat more than 1 meal per week of St. Marys River walleye smaller than 22 inches or more than 1 meal per month of those fish larger than 22 inches due to mercury and PCBs.

Recommendation: No one should eat more than 2 meals per month of St. Marys River walleye smaller than 24 inches due to PCBs and mercury or more than 1 meal per month of those fish larger than 24 inches due to mercury.

Length (Inches)	Hg Regression Equation Estimate (ppm)	Meal Category
14	0.17	4
16	0.22	4
18	0.3	2
20	0.39	2
22	0.52	2
24	0.69	1
26	0.91	1
28	1.21	0.5
30	1.6	0.5

Shaded area denotes extrapolated estimates





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Data Sheets

- Chemical
  - Mercury
  - PCBs
  - DDT
  - Chlordane
  - Toxaphene
- Range of Yrs
- 95% UCL or Regression > 0.6

Northern Pike **St. Marys River** **Chippewa County**

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1986	2004	31	18.5	24	23.8	29.8

Datasets available: 1986, 1987, 1995, 2004

Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	14	0.33	0.17	0.58	0.40	2

Chemical	Linear Regression R^2	Exponential Regression R^2
Mercury	0.244	0.300

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2004	2004	7	21.7	24		29.8

Datasets available: 1986, 1987, 1995, 2004

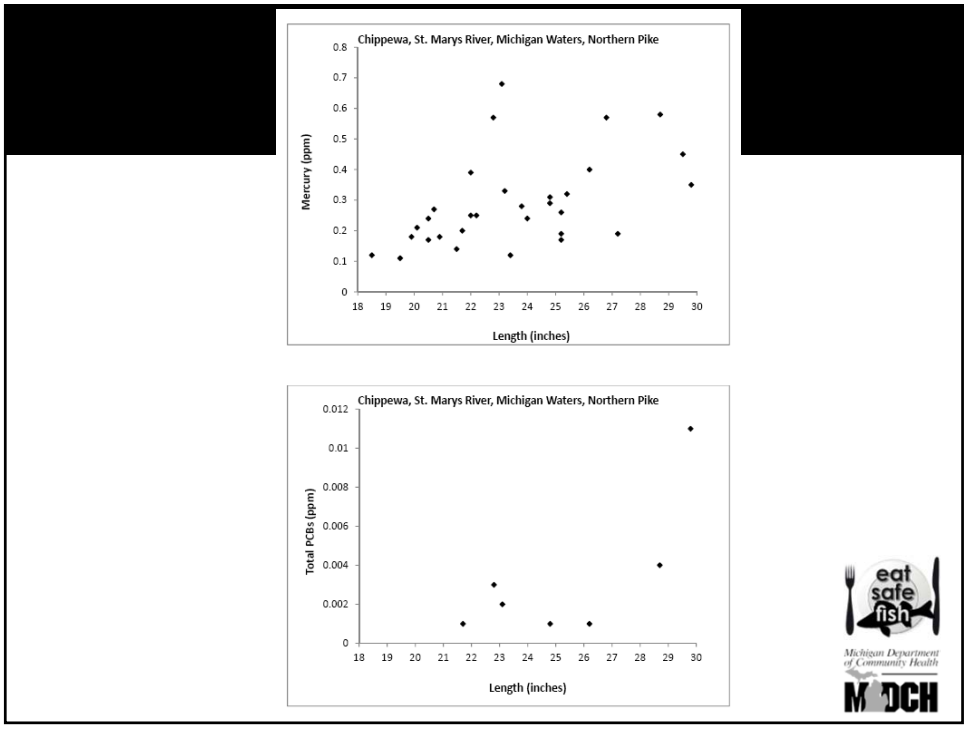
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	4	0.004	0.001	0.011	--	--
DDT	4	0.003	0.001	0.006	--	--
Chlordane	4	ND	--	--	--	--
Toxaphene	4	ND	--	--	--	--

Chemical	Linear Regression R^2	Exponential Regression R^2
PCB	0.523	0.451
DDT	0.419	0.359
Chlordane	--	--
Toxaphene	--	--

Final meal category based on UCL: 2

Existing MDCH Advisory: Women and children should not eat more than 1 meal per month of St. Marys River northern pike due to mercury.

Recommendation: No one should eat more than 2 meals per month of St Marys River northern pike smaller than 30 inches and no more than 1 meal per month of fish larger than 30 inches due to mercury. The size range of fish in this sample set is limited. The statewide length break was applied as the size range of the fish was limited.



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Carp (and pumpkinseed & smallmouth bass) - Mercury

- No significant relationship between fish length and mercury concentrations.
- Total mercury concentrations in St Marys AOC carp, pumpkinseed, and smallmouth bass were the **nearly the same as the reference sites.**

95% UCL on the mean total mercury concentration			
Species	95% UCL (ppm)		
	SMR	LCI	LBDN
Carp	0.36	0.3	0.38
Pumpkinseed	0.08	0.08	--
Redhorse Sucker	0.14	--	0.56
Rock Bass	0.26	0.12	0.11*
Smallmouth Bass	0.44	0.42	0.36
Walleye	0.43	--	0.55
Yellow Perch	0.18	0.11	--
* - samples collected in 2008			