



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



Collected & Analyzed: St Marys River & Reference Sites

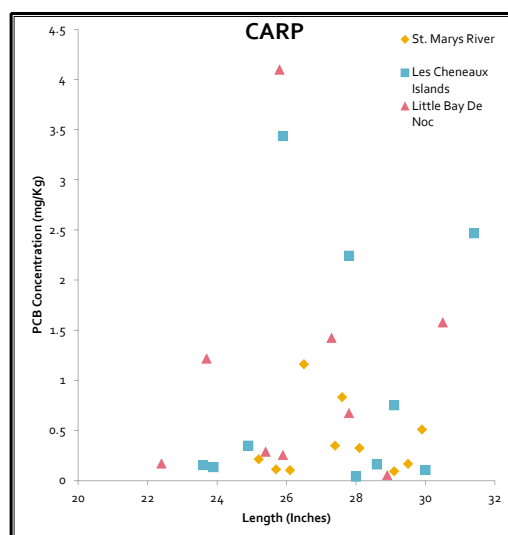
Table 1. Fish samples collected from the St. Marys River AOC and two reference sites in 2012*.

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

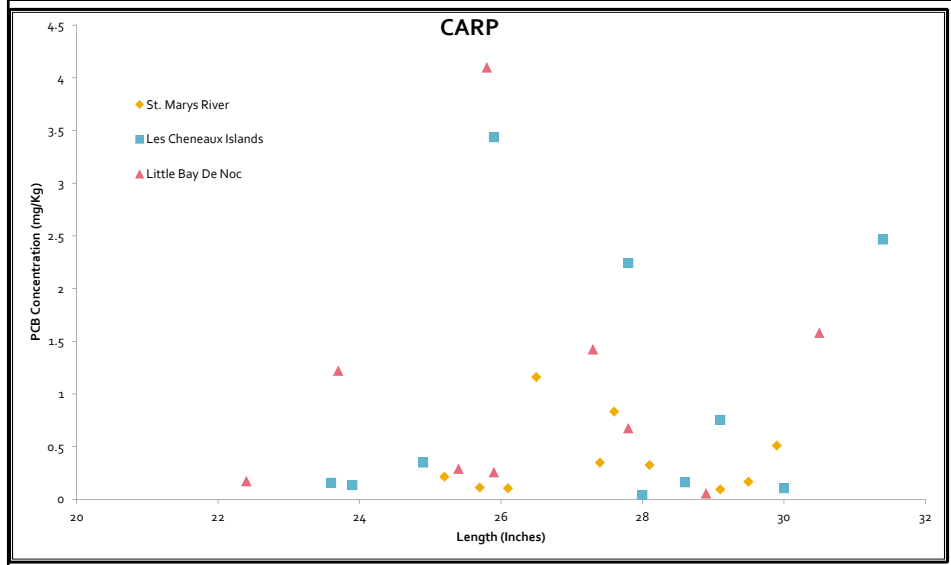
* - rock bass from LBDN collected in 2008

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.**

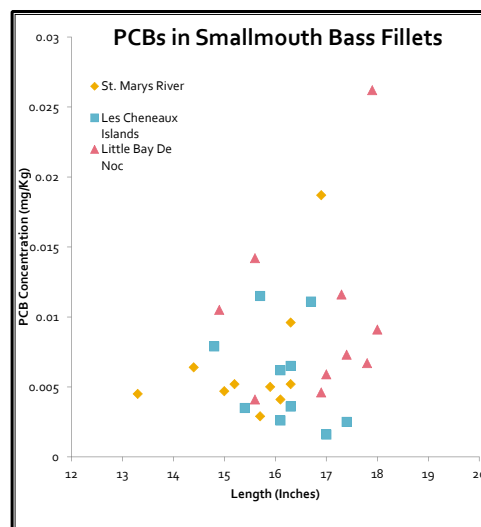


Carp - PCBs

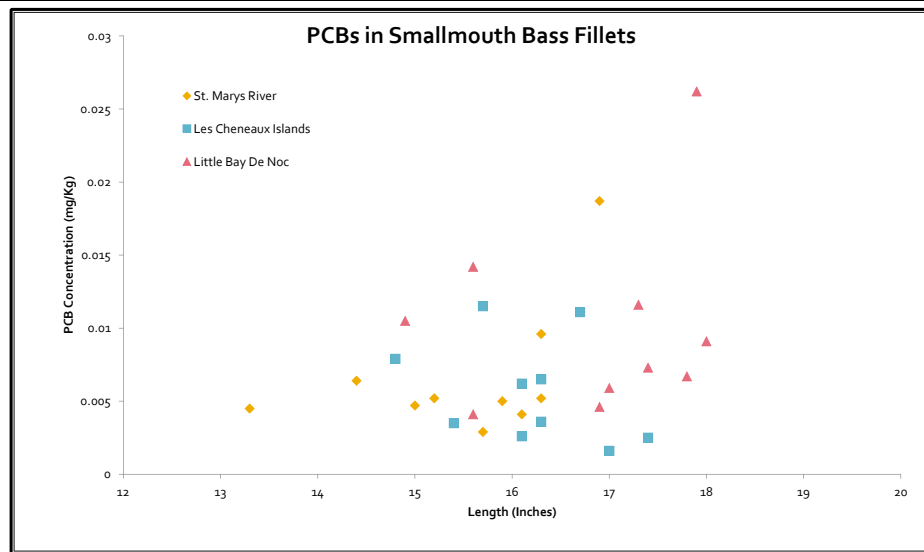


Smallmouth Bass - PCBs

- 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

MDCH

PCBs Overview

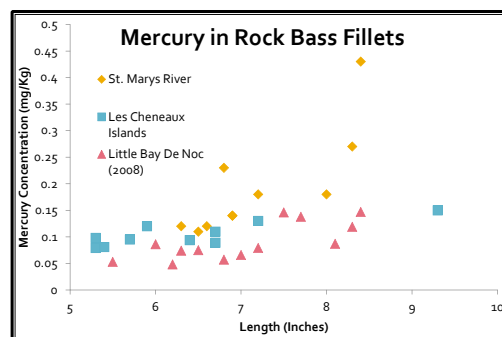
- No significant relationship between fish length and PCB concentrations.
- No PCBs were detected in pumpkinseed, rock bass, or yellow perch.
- Total PCBs concentrations in St Marys fish were the **same or lower than the reference sites.**

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			

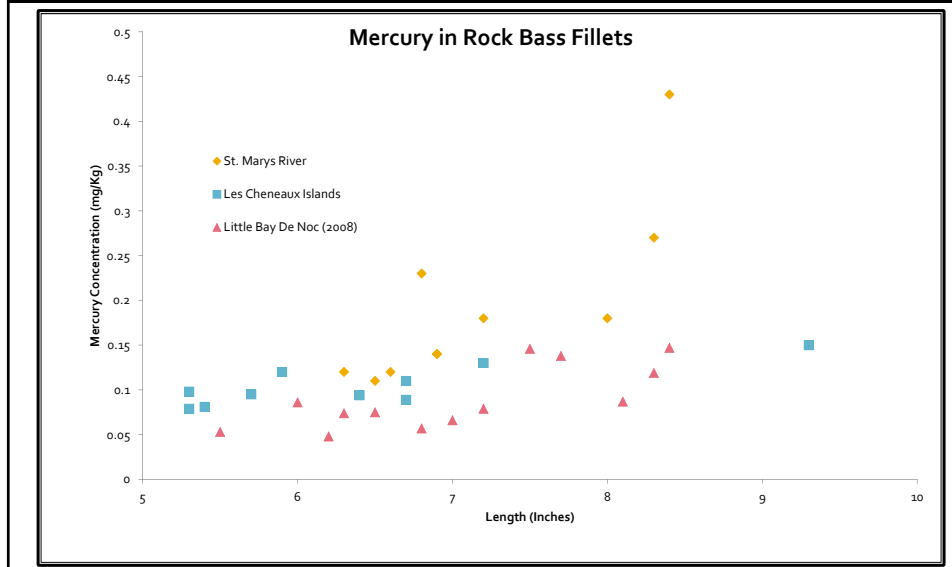


Rock Bass - Mercury

- 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.**

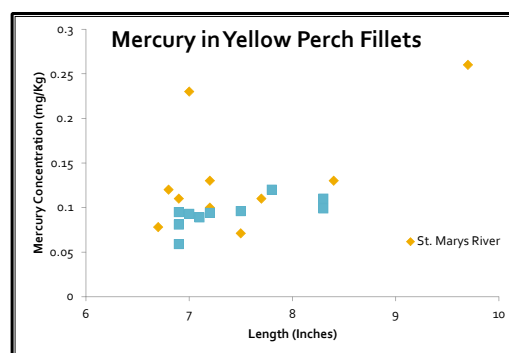


Rock Bass - Mercury

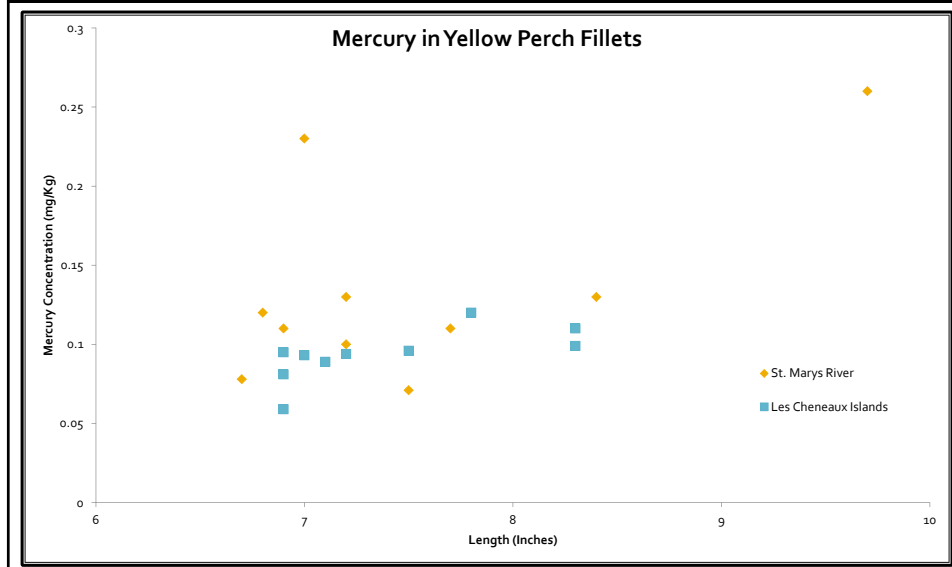


Yellow Perch - Mercury

- 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.**



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 \leq Reference Sites
 - Carp
 - Pumpkinseed
 - Redhorse Sucker
 - Smallmouth Bass
 - Walleye
 - Yellow Perch*
 - Rock Bass*

■ PCBs

- St Marys \leq 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	Mercury	--	--	1
Rock Bass	Mercury	4	8	8*
Smallmouth Bass	Mercury	2	2	2
Walleye	PCBs & Mercury	2	--	1 [#]
Yellow Perch	Mercury	4	8	--
* - samples collected in 2008 # - with cleaning and cooking				

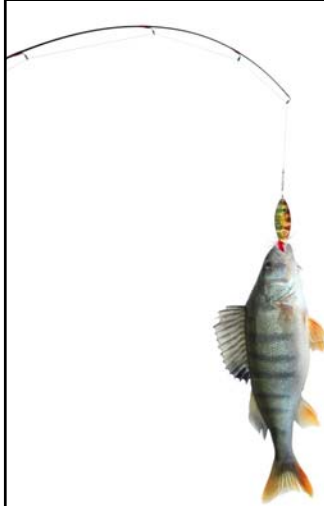
Tumor BUI

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.



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 fileet 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?



GLRI Grant: BUI Assessment

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



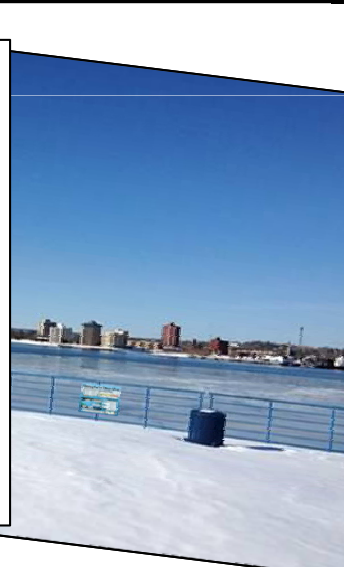
Outreach Materials

- 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 1/2" inset top and bottom) and radius corners.



Fishing the St Marys River

What's the Catch?

Some fish have less chemicals than others because of what they eat, how long they live, and how lean or fatty they are. Smaller fish of the same species always have less chemicals than the bigger ones. It's best to keep the small (but legal) fish for eating and to snap a picture and throw trophy fish back!

How to Catch Walleye

- Walleye fishing is often best early and late in the day...or even after dark!
- You can catch walleyes with live bait; nightcrawlers drifted along the bottom or minnows fished on a tight line are best. In the fall, jugging with spoons in deep water is a good way to get a bite.
- Cast your line out and slowly reel it in. You might want to try different depths to see what works, but you should have the best luck letting your bait skim along the bottom.

How to Catch Yellow Perch

- Perch tend to bite all day long, but aren't very active after dark.
- You can catch yellow perch with live bait; minnows, wigglers, earthworms, leeches, wax worms or small crayfish are best. Use a sinker on the end of the line with a pair of hooks (No. 6 or 8) tied on leaders about a foot apart just above the sinker.
- Perch can be found around rocky bottoms in deeper waters, but may be found near weed beds in shallower areas.

Choose Wisely. Eat Safely

You can use the MDCH Eat Safe Fish Guide to find safer fish for you and your family to enjoy.

The Chemicals in Our Environment

The 3Cs to Safer Fish

- Choose**
 - If you only eat fish once in a while, then go for panfish or keep the smallest (but still legally-sized) fish of the species you like! It's a great way to avoid eating too many chemicals.
- Clean**
 - Some chemicals, like PCBs and dioxins, are found in the fat of the fish. When you clean your fish, trim away as much of the fat that you can. This is the only way that really works to remove those kinds of chemicals.
- Cook**
 - You can't remove mercury from your fish. The only way to avoid mercury is to choose fish that don't store as much in their bodies.
 - Cooking your fish on a grill or grate lets the fat that is hidden inside the fillet to drip away. By cleaning and cooking your fish the right way, you can get rid of up to half of the chemicals that may have been in the fish!

Have questions? Want a free MDCH Eat Safe Fish Guide? Call MDCH at 1-800-648-6942 or visit www.michigan.gov/eatsafefish. (You can also scan the code with your smartphone to go directly to the Eat Safe Fish website.)

GLRI Grant: 2013 St Marys River Signs

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How to Catch Walleye

- Walleye fishing is often best early and late in the day...or even after dark!
- You can catch walleyes with live bait; nightcrawlers drifted along the bottom or minnows fished on a tight line are best. In the fall, jugging with spoons in deep water is a good way to get a bite.
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- Perch tend to bite all day long, but aren't very active after dark.
- You can catch yellow perch with live bait; minnows, wigglers, earthworms, leeches, wax worms or small crayfish are best. Use a sinker on the end of the line with a pair of hooks (No. 6 or 8) tied on leaders about a foot apart just above the sinker.
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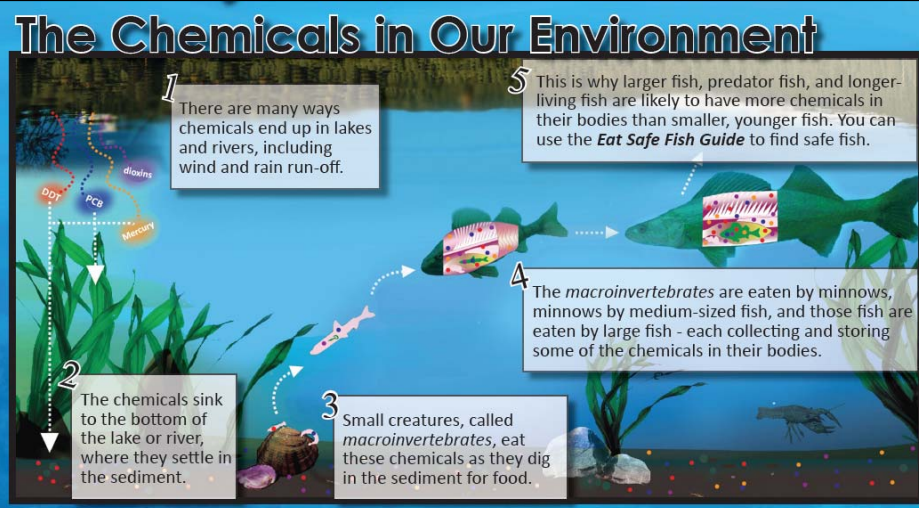
Source: www.michigan.gov/howtofish

GLRI Grant: 2013 St Marys River Signs



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The 3Cs to Safer Fish

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GLRI Grant: 2013 Eat Safe Fish from the St Marys River

A free map to local fishing areas & the MDCH safe fish guidelines.

eat safe fish in Chippewa County

Eat Safe Fish Guidelines

These guidelines are from the 2013-2014 Southeast Michigan Eat Safe Fish Guide. To get the current guidelines and find safer fish to eat from other lakes in Chippewa County and the rest of the UP, please visit www.michigan.gov/eatsafefish or call 1-800-648-6942 to get a free copy of the Eat Safe Fish Guide!

Type of fish	Chemical of Concern	Size of fish (inches)	Max servings per month
Longmouth Bass	Mercury	Under 18"	1
Rock Bass	Mercury	Under 18"	2
Smallmouth Bass	Mercury	Under 18"	1
Walleye	Mercury	Any	1

Type of fish	Chemical of Concern	Size of fish (inches)	Max servings per month
Walleye	Mercury	Under 18"	2
	Mercury	Over 18"	1

Type of fish	Chemical of Concern	Size of fish (inches)	Max servings per month
Northern Pike	Mercury	Under 24"	4
	Mercury	Over 24"	2

Type of fish	Chemical of Concern	Size of fish (inches)	Max servings per month
Carp	Mercury	Under 30"	2
Northern Pike	Mercury	Any	4
Sucker	Mercury	Under 24"	1
Pike & Walleye	Mercury	Under 24"	2
Walleye	Mercury	Over 24"	1
Yellow Perch	Mercury	Any	4

Map of Chippewa County, MI

You can use the Statewide Guidelines for all other lakes and rivers in Chippewa County. You can also call MDCH at 1-800-648-6942 to request an Eat Safe Fish Guide for your region.

Caribou Lake

Lake Huron

Lake Superior

Frenchman Lake

St Marys River (includes Munising Lake and Lake Nicolet)


Map of Chippewa County, MI

eat safe fish
www.michigan.gov/eatsafefish

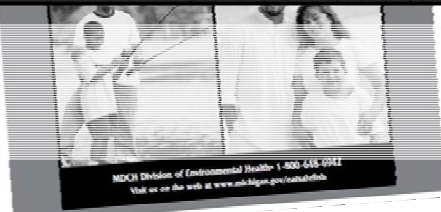
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(Open the brochure for the map and to learn about the Eat Safe Fish guidelines.)


2011-2012 MI Fish Advisory



Water body	Type of fish	Chemical(s)	General Population							Women & Children											
			Length (inches)							Length (inches)											
			6-5	6-10	10-12	12-14	14-15	15-22	22-26	26-30	30+	6-5	6-10	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																			



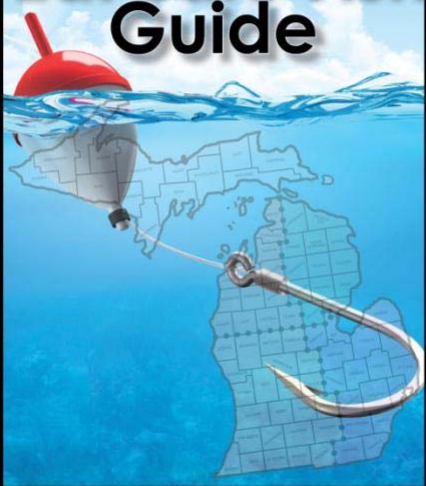
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Eat Safe Fish Guide

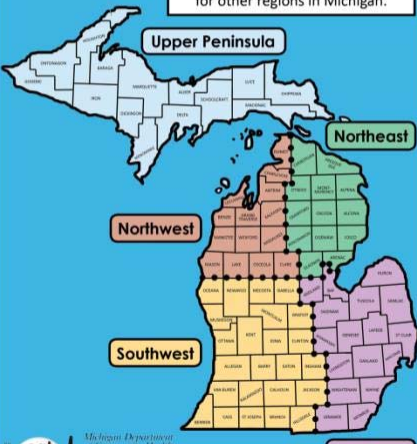




Some fish contain chemicals that can harm your health. To help you choose fish that are safer to eat from Michigan's lakes and rivers, MDCH tests fish filets from around the state. The *Eat Safe Fish Guide* lists the results of these tests.

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.



Limited v Do Not Eat

Special MI Serving Categories

Limited

If you:

- are under the age of 15,
- have health problems, like cancer or diabetes,
- 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

Weight 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

Weight 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.

<h3>Chippewa County</h3> <div> <p>Map of Chippewa County, Michigan</p> </div>																																			
<p>Caribou Lake</p> <table> <tr> <th>Type of Fish</th><th>Chemical of Concern</th><th>Size of Fish (length in inches)</th><th>MI Servings per Month*</th></tr> <tr> <td>Largemouth Bass</td><td>Mercury</td><td>Under 18"</td><td>1</td></tr> <tr> <td></td><td></td><td>Over 18"</td><td>6 Per Year</td></tr> <tr> <td>Rock Bass</td><td>Mercury</td><td>Under 10"</td><td>2</td></tr> <tr> <td></td><td></td><td>Over 10"</td><td>1</td></tr> <tr> <td>Smallmouth Bass</td><td>Mercury</td><td>Under 18"</td><td>1</td></tr> <tr> <td></td><td></td><td>Over 18"</td><td>6 Per Year</td></tr> <tr> <td>Walleye</td><td>Mercury</td><td>Any</td><td>1</td></tr> </table>				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
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<p>(continued on the next page)</p> <p>* See page 6 ^ See page 7 ^ See page 8 Best Choice! = </p> <p>UP MI 2013 www.michigan.gov/eatsafefish • 1-800-648-6942 27</p>																																			
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Walleye	PCBs & Mercury	Under 24"	2																																
	Mercury	Over 24"	1																																
Yellow Perch	Mercury	Any	4																																
<p>See which fish are safe to eat from Lake Huron on Page 16 and Lake Superior on Page 20.</p> <p>* See page 6 ^ See page 7 ^ See page 8 Best Choice! = </p> <p>28 www.michigan.gov/eatsafefish • 1-800-648-6942 UP MI 2013</p>																																			

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 Year ^{2x}
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.



2011-2012 MI Fish Advisory

▲	No eating restrictions.	▼	One meal per week.	General Population												Women & Children											
●	One meal per month.	■	Six meals per year.	Length (inches)												Length (inches)											
◆	Do not eat these fish.			6-9	9-10	10-12	12-14	14-16	16-18	18-22	22-26	26-30	30+	6-9	9-10	10-12	12-14	14-16	16-18	18-22	22-26	26-30	30+				
Water body		Type of fish		Chemical(s)																							
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																		▼	▼	●	●				



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



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



Click on any of the boxes below to learn more about choosing and eating safe fish!



www.michigan.gov/eatsafefish

Why the Differences?

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

Mercury		Total PCBs	
Meal Category	FCSV Ranges	Meal Category	FCSV Ranges
<i>meals per month^a</i>	<i>µg/g (ppm)</i>	<i>meals per month^a</i>	<i>µg/g (ppm)</i>
16	≤ 0.07	16	≤ 0.01
12	>0.07 to 0.09	12	>0.01 to 0.02
8	>0.09 to 0.13	8	>0.02 to 0.03
4	>0.13 to 0.27	4	>0.03 to 0.05
2	>0.27 to 0.53	2	>0.05 to 0.11
1	>0.53 to 1.1	1	>0.11 to 0.21
6 meals per year	>1.1 to 2.2	6 meals per year	>0.21 to 0.43
Do Not Eat	>2.2	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 1986	Most Recent 2004	36	14.2	15	Min 14.6	Max 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	Exponential Regression				
	R ²	R ²				
Mercury	0.664	0.733				

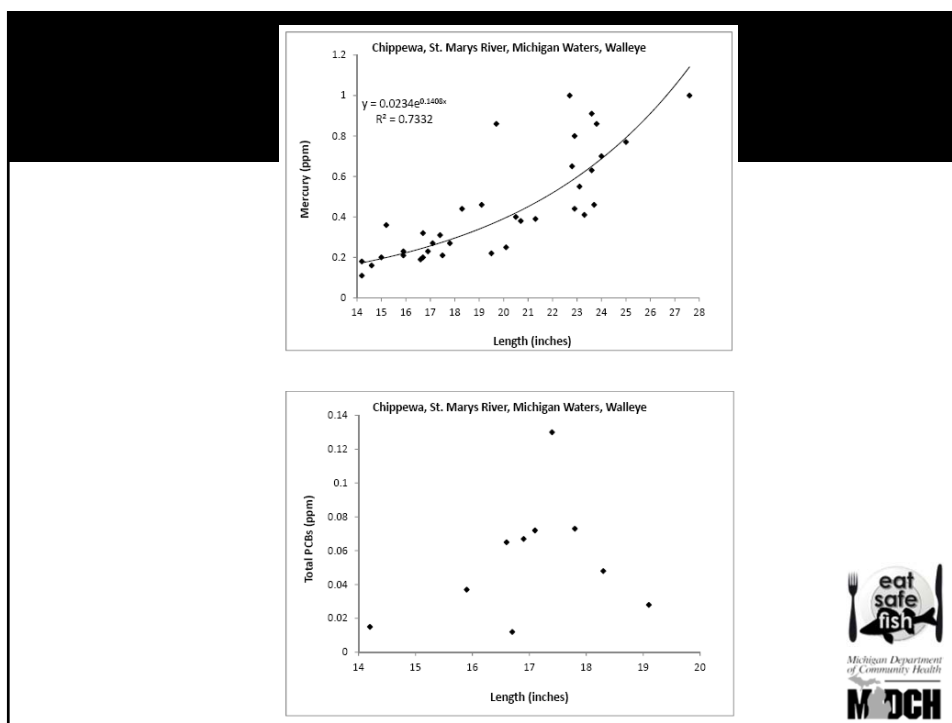
Organics Analysis:						
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest 2004	Most Recent 2004	10	14.2	15	Min 15.3	Max 19.1
Datasets available: 1986, 1987, 1991, 1995, 2004						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (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	Exponential Regression				
	R ²	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



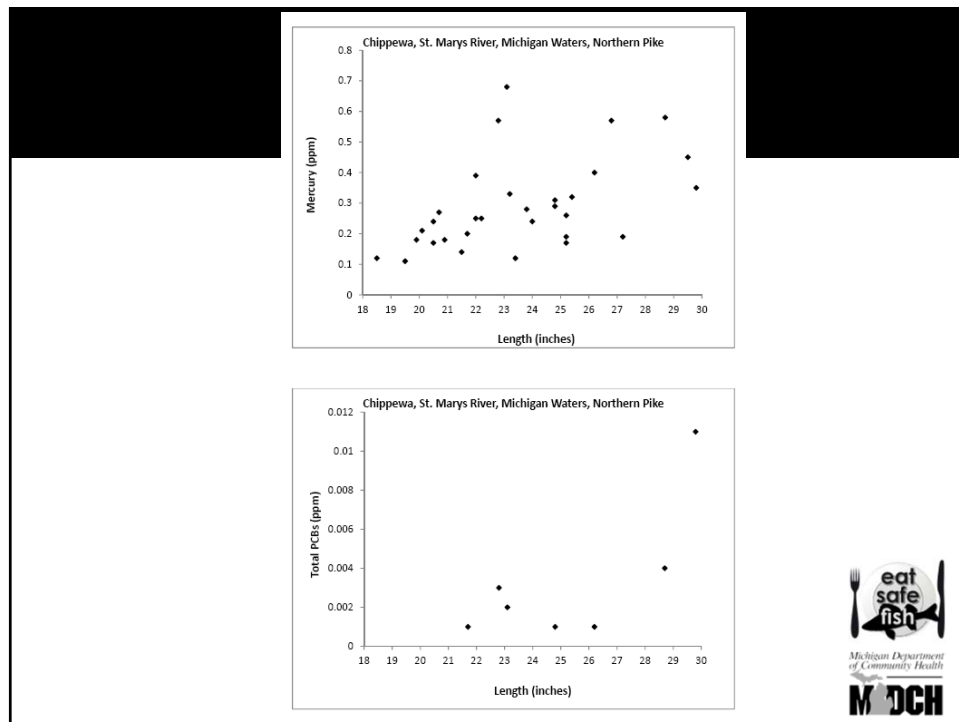
Data Sheets

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

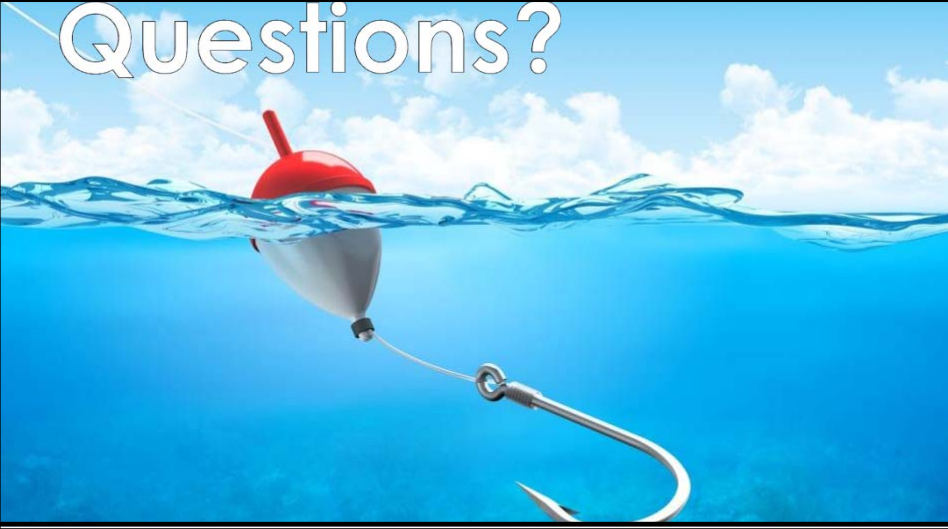
Northern Pike			St. Marys River		Chippewa County		
Hg Analysis:							
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples		
Earliest	Most Recent				Min	Max	
1986	2004	31	18.5	24	23.8	29.8	
Datasets available: 1986, 1987, 1995, 2004							
Chemical	Sample Size (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	Exponential Regression					
	R ²	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	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	
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	Exponential Regression					
	R ²	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.



Questions?



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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			