

# Contaminants in Fish from the St. Clair River/Lake Corridor

## Trends and current status

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Symposium: St. Clair River Area of Concern

June 7, 2012

# St. Clair corridor

- Contaminated fish identified in 1968-69
- Commercial fish ban
- Recognized as an AOC in 1985
- Point sources:
  - Petroleum refineries and chemical plants
  - Upper 10 km of the St. Clair River



Photo credit: Wayne Windjack

# St. Clair corridor

Several remedial actions have taken place

- Closure of chlor-alkali plant in early 1970s
- Upgrades to industrial and municipal facilities
- Dredging (1996, 2002-2004)

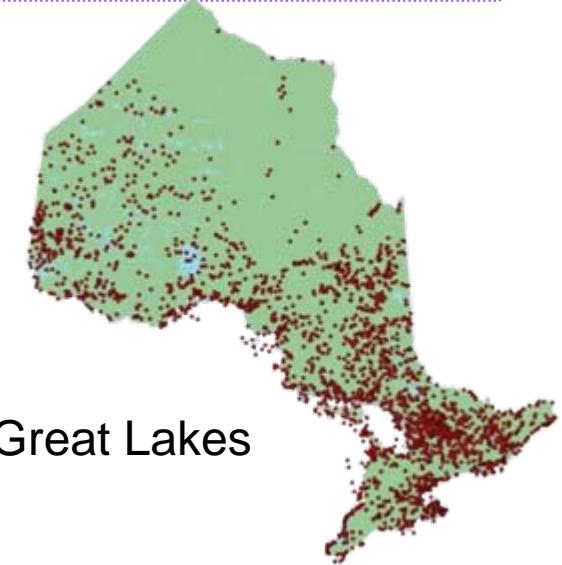
Recent RAP report:

- Conditions have improved
- Problems remain, including impaired “Beneficial Uses” (e.g. restrictions on fish and wildlife consumption)

# Sport Fish Contaminant Monitoring Program

Monitors contaminants

- in sport fish & juvenile fish
- Since 1970s
- Various contaminants
- ~1950 locations across Ontario and Canadian Great Lakes
- Partnership with Ministry of Natural Resources



Assesses health risk

- Partnership with Food Directorate Health Canada (Tolerable Daily Intakes)
- Develop fish advisories based on most restrictive contaminant

Communicates risk to stakeholders

# Guide to Eating Ontario Sport Fish

[www.ontario.ca/fishguide](http://www.ontario.ca/fishguide)

2011-2012

## Guide to Eating Ontario Sport Fish



 Ontario

## Contaminants in Sport Fish

## Important information for protecting your family



Fish can be an important part of a balanced diet. They are low in fat and a great source of high-quality protein and other nutrients.

#### **But Did You Know?**

- Some fish from Ontario waters have contaminants that can be harmful to humans. Scientific studies show that the developing fetus and young children are particularly sensitive to the contaminants found in some freshwater fish. Women of child-bearing age and children under 15 should restrict their consumption of most sport fish caught in Ontario waters. Some freshwater fish should not be consumed at all. Most jurisdictional consumption restrictions apply to Ontario Government in Ontario fish information in the Eating Ontario Safe guide.



### Stone-bought Fish

Most but not all fish purchased from retailers are low in contaminants. Contact Health Canada for specific advice on shark, swordfish and tuna. If you regularly consume store-bought fish and intend to eat sport fish, you should check the Guide to Eating Ontario Sport Fish for specific advice. If in doubt, contact your doctor or the agencies listed below.

Check fish consumption advisories in the Guide to Eating Ontario Sport Fish.

- A new interactive version of the guide is available at [www.ontario.ca/lifeguide](http://www.ontario.ca/lifeguide)
  - Copies of the guide are available at select government offices, retail outlets or by



安吉亞約  
甚麼？

ព្រះជាមន្ត្រីរាជកម្មប្រចាំឆ្នាំ  
នៅ ភ្នំពេញ?

*Wenesh Edming Giigoonh  
Dnowa Ge Mwaand*

**Guidelines** (Guidelines for the Assessment and Management of Traumatic Brain Injury in the Acute Care Setting) (2nd ed.). Washington, DC: American Congress of Rehabilitation Medicine; 2000.

reduzir o risco de infarto e de morte prematura.

For more information, contact:  
Sally Hartman, 800-222-1815,  
or visit [www.ams.org](http://www.ams.org).

 Ontario

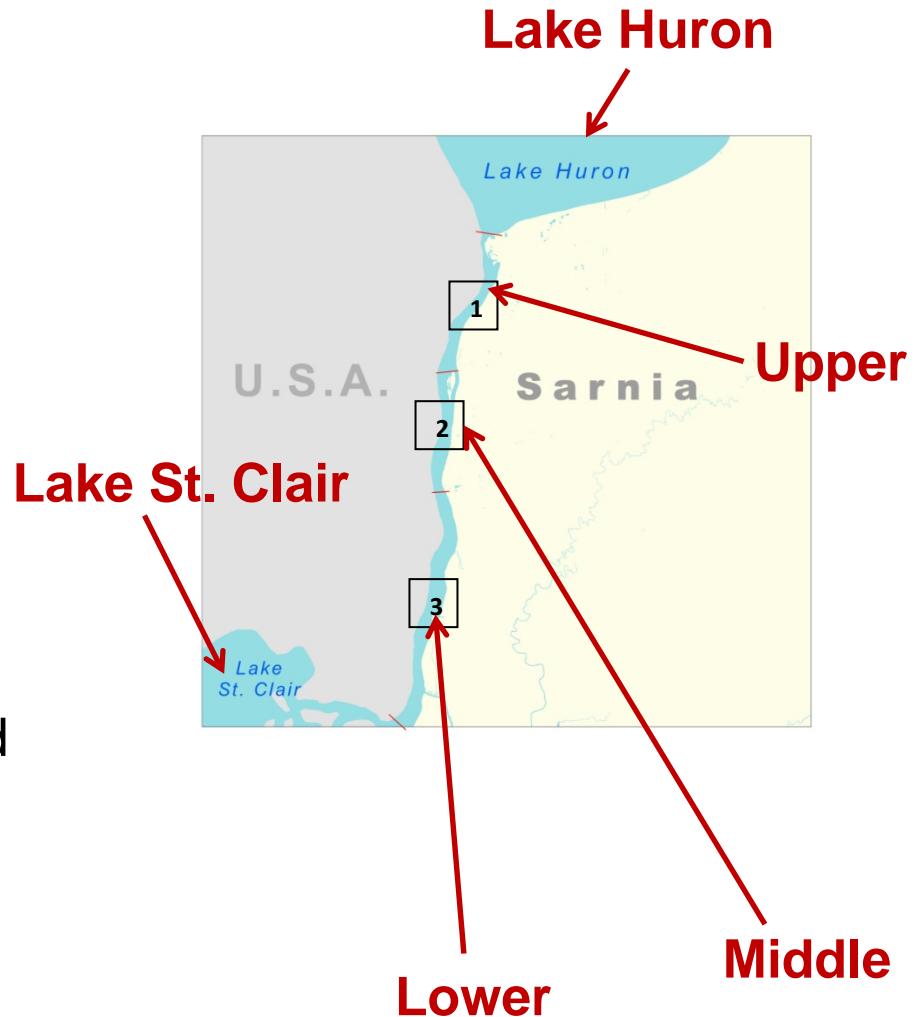
# www.ontario.ca/fishguide

Online portal developed (March 2011) to disseminate the advisories

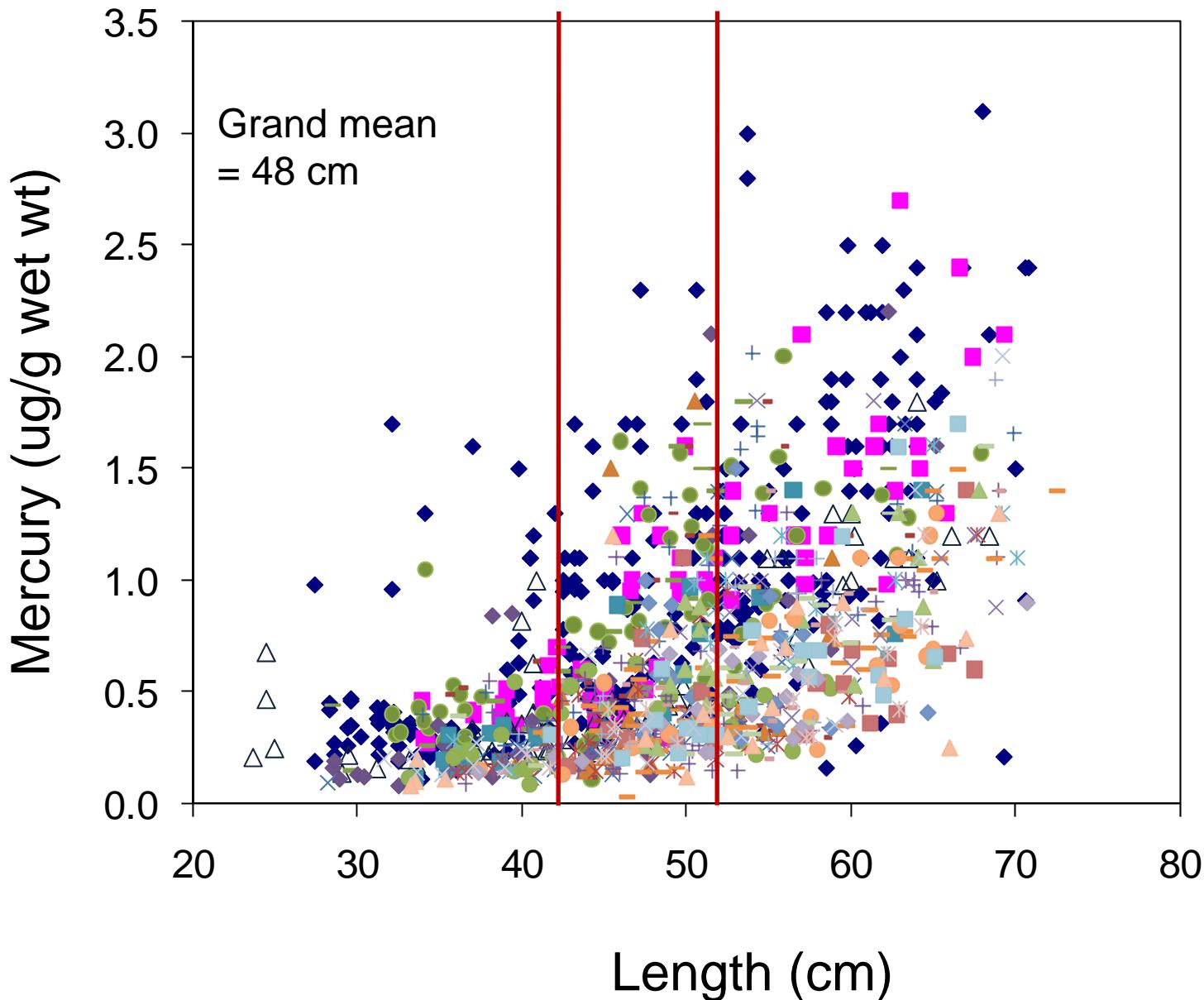
The screenshot shows the homepage of the "Guide to Eating Ontario Sport Fish" website. At the top, there's a navigation bar with links for "HOME", "ABOUT THE MINISTRY", "LEGISLATION", "LOCAL PROJECTS", "BLOG", "NEWS", "RESOURCES", "MEDIA", and "INDEX". Below the navigation bar, there are four main menu categories: "For Residents", "For Businesses", "For Kids", and "Access Environment". A sidebar on the left contains links for the "Guide to Eating Ontario Sport Fish", "Additional Information", "Browse by Category", "Browse by Subject Matter", "Explore Government", and "Contacts". The main content area features a heading "Guide to Eating Ontario Sport Fish (2011-2012)" and a section titled "Interactive Fish Guide". It includes a map of Ontario and surrounding regions with numerous yellow dots representing sampling locations. There are also search fields for "Search Interactive map", "Search waterbody name, location, species name or see help for more advanced options", and checkboxes for "Search Map Location", "Search Fish Species", and "Current Map Display".

# Methods

- Fish collected by the MOE and MNR
- Sport fish:
  - 3 blocks in St. Clair River + Lake St. Clair
  - Skinless, boneless dorsal fillet analyzed
- Temporal trends:  
Focused on:
  - total-PCB, Hg, OCS, HCB, and total-DDT
  - **Lake St. Clair sport fish**
  - ND values treated as  $dl/2$



# Mercury in Lake St. Clair Walleye

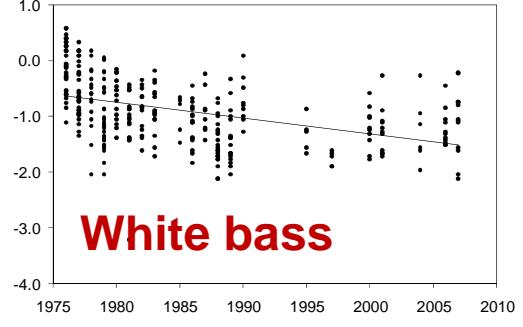
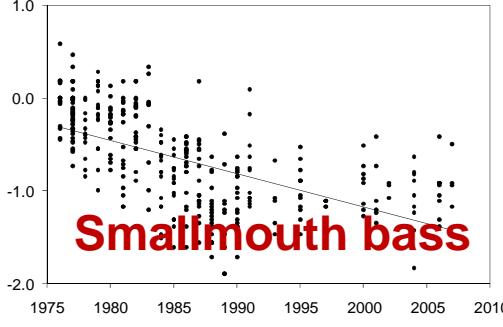
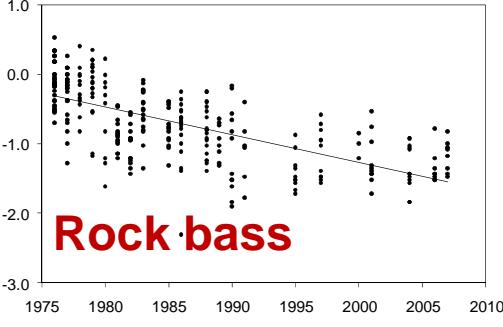
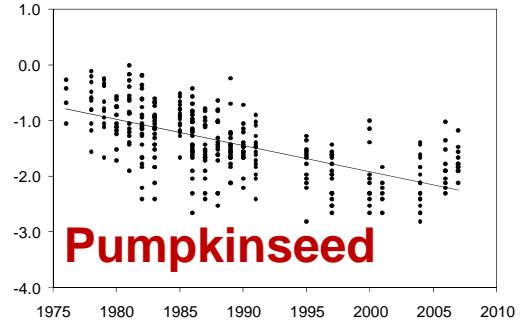
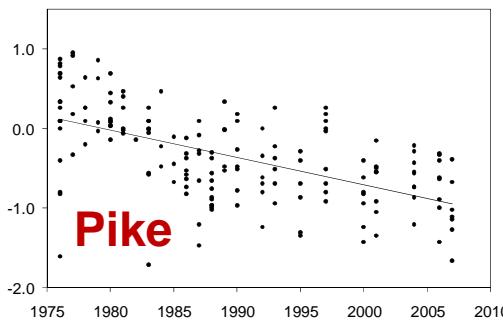
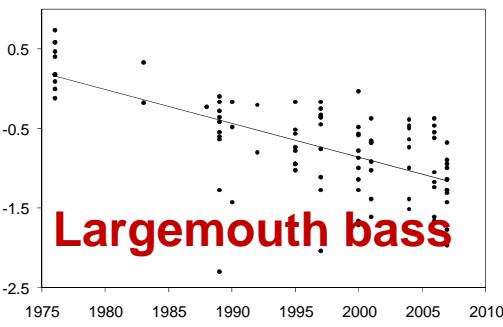
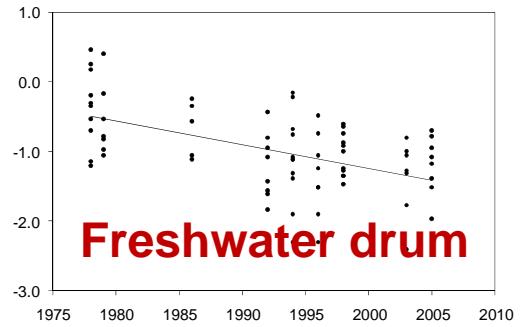
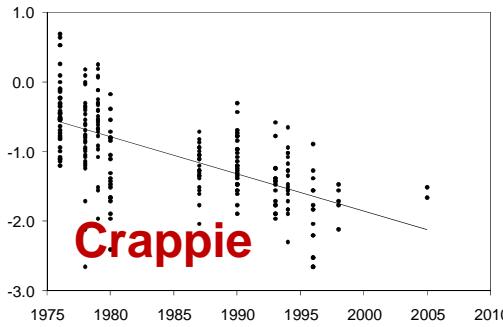
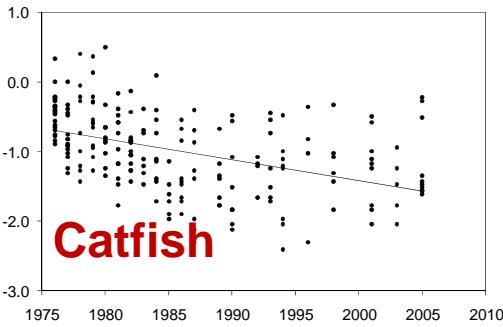
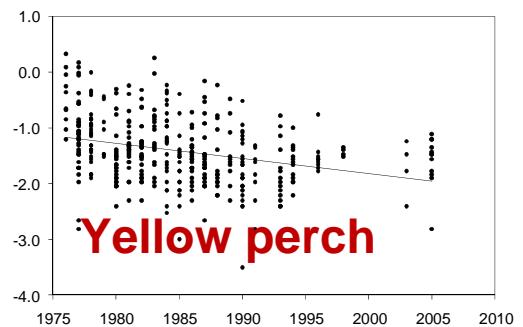
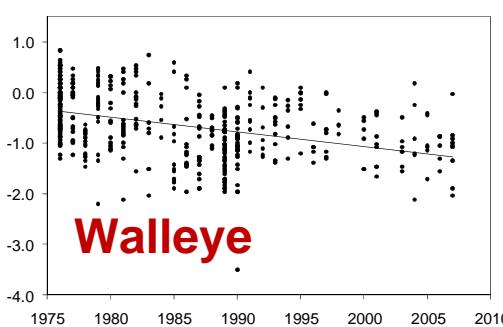
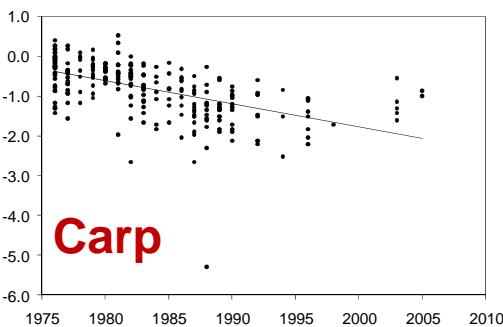


# Comparison to consumption guidelines

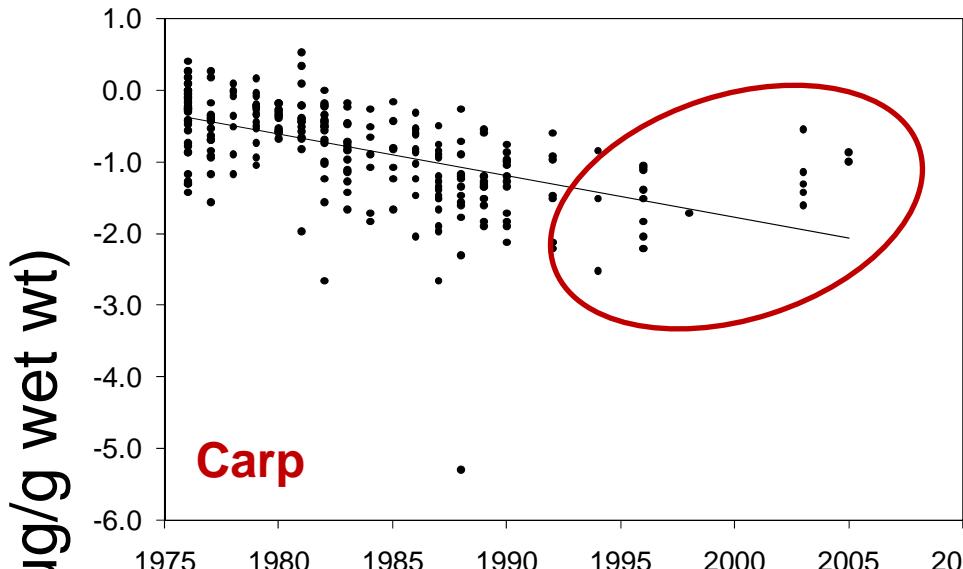
- Fish considered: walleye, yellow perch, and carp
- Guidelines: those used in Sport Fish Guide
- All major chemicals considered:
  - Hg, total-PCB, OCS, HCB, total-DDT, mirex, photomirex, toxaphene, chlordane, PCDD/F, DL-PCB
- All lengths considered; St. Clair River/Lake fish included
- Analysis performed on data from 1999 onwards
  - Assumed to represent current conditions
  - No changing trends during time period

# **Results: Temporal trends**

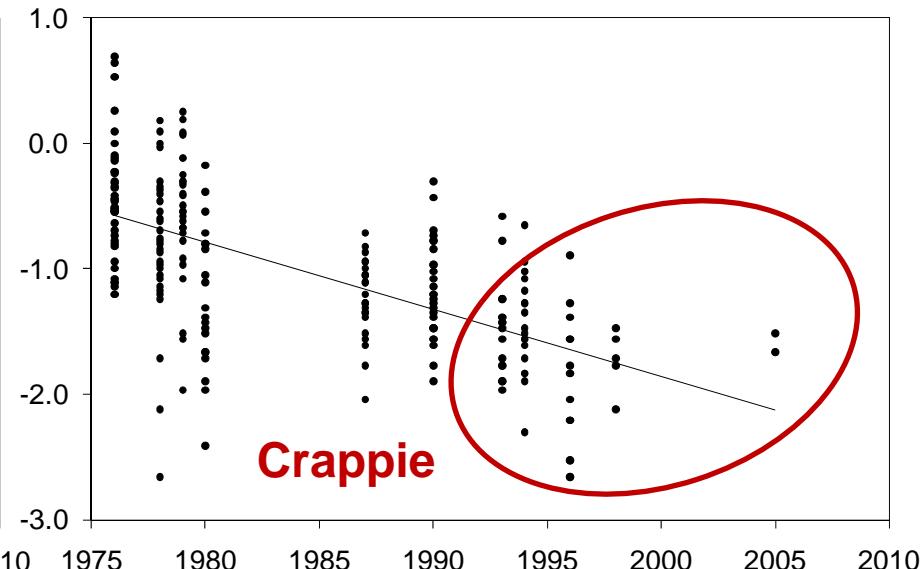
In Mercury (ug/g wet wt)



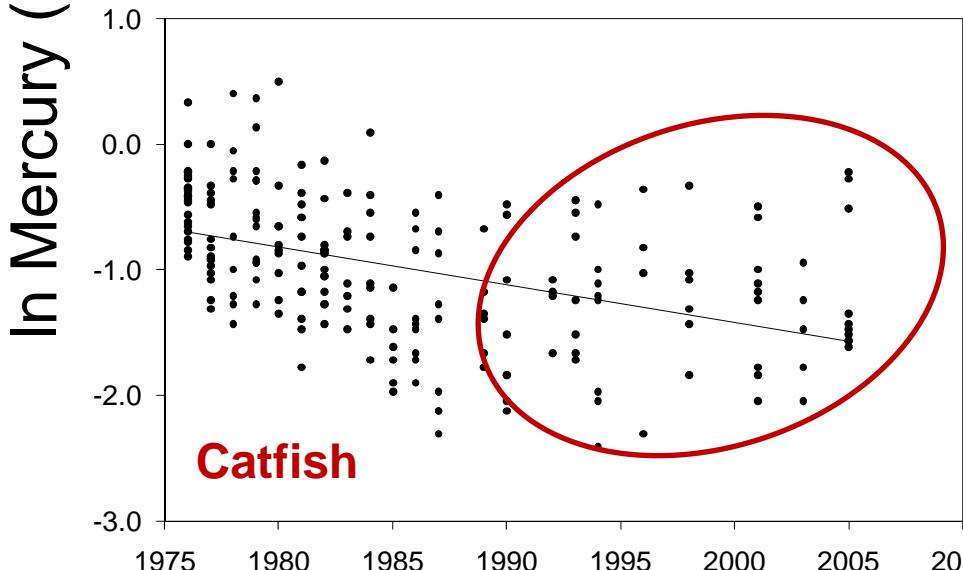
Year



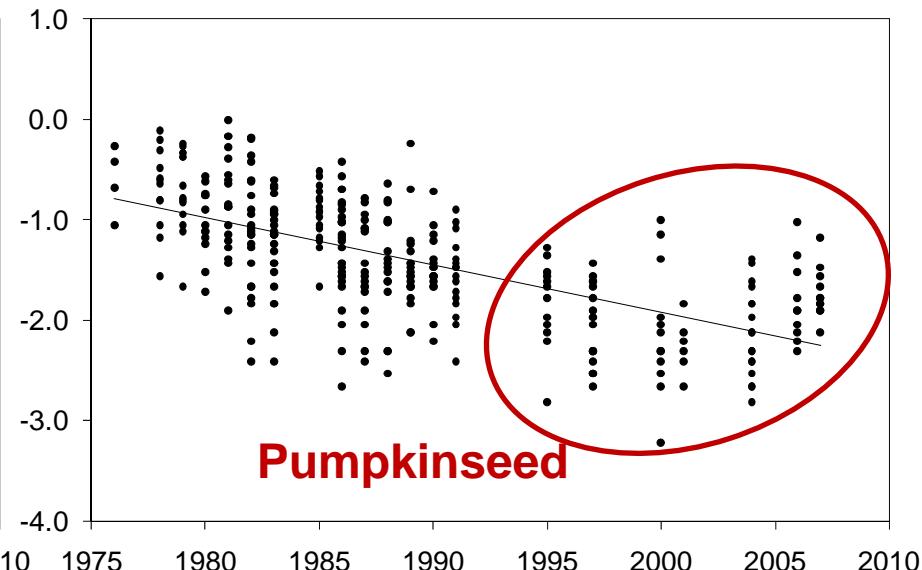
Carp



Crappie



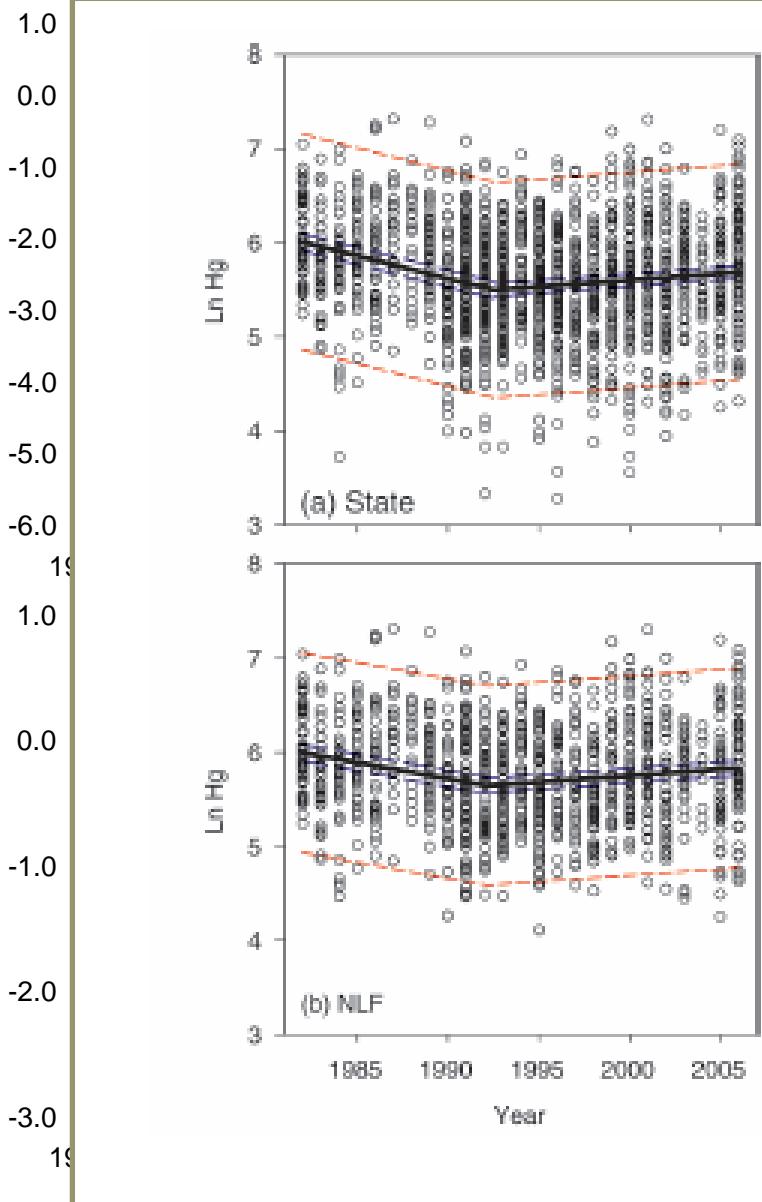
Catfish



Pumpkinseed

Year

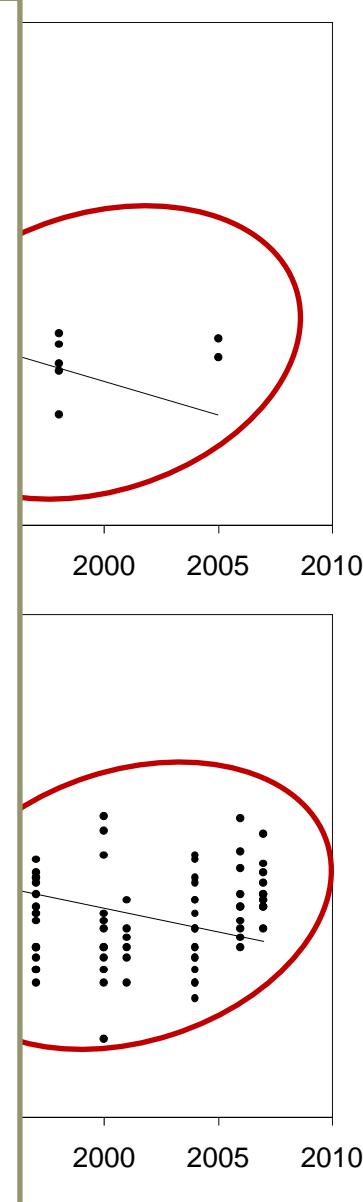
In Mercury ( $\mu\text{g/g}$  wet wt)



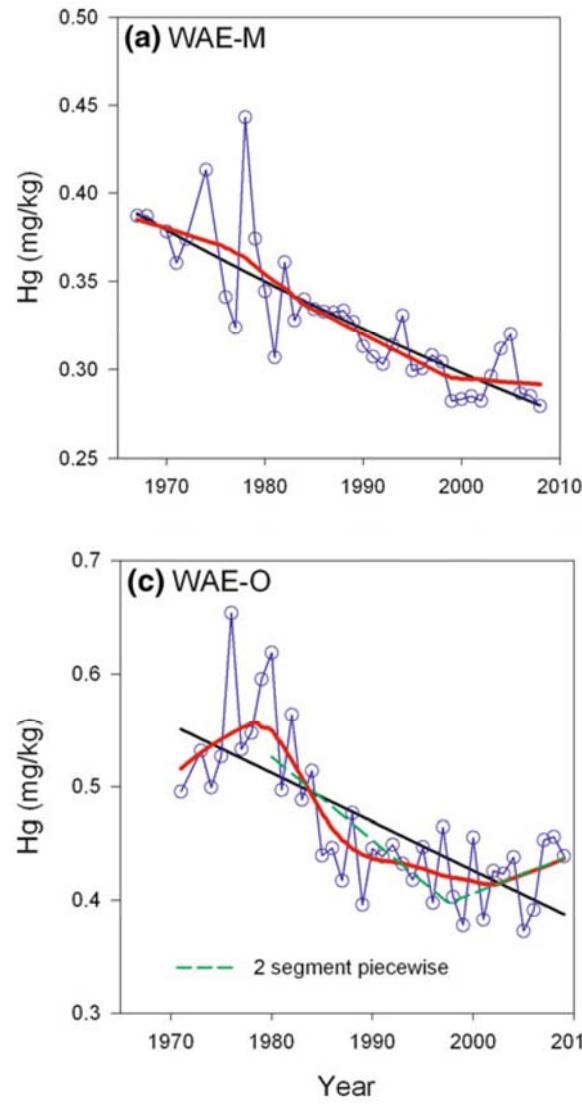
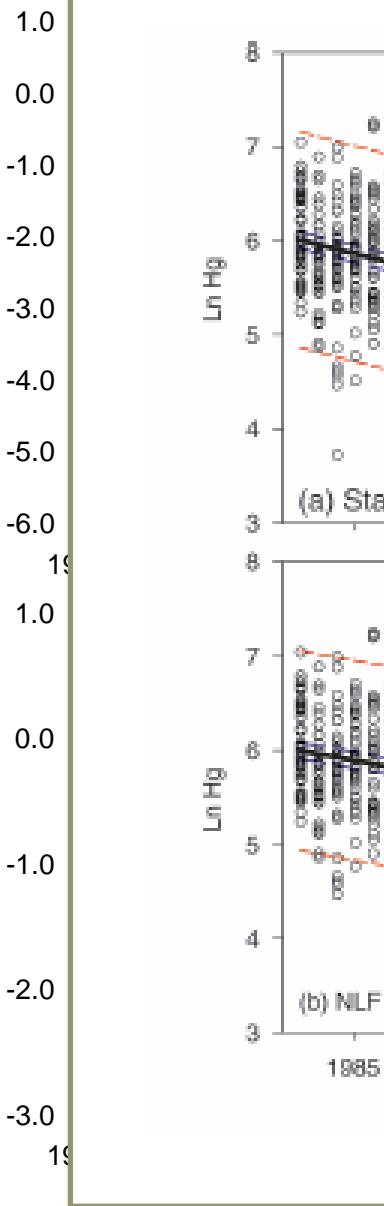
Monson 2009

Trend reversal of Hg  
in northern pike and  
walleye from  
Minnesota Lakes

Year



In Mercury (ug/g wet wt)



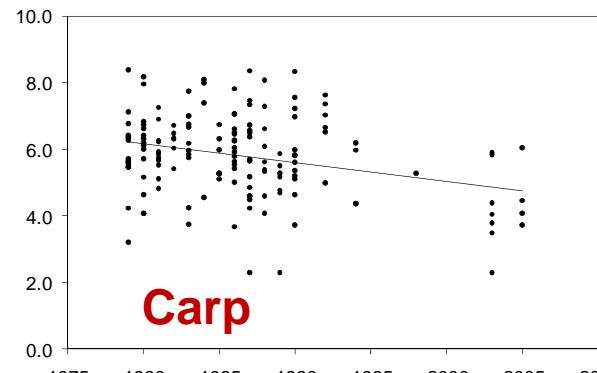
Monson et al., 2011

Trend reversal of Hg  
in walleye from the  
Great Lakes region

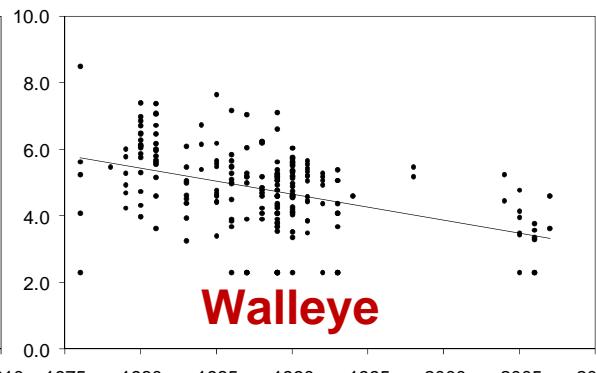
Year

# Total-PCB

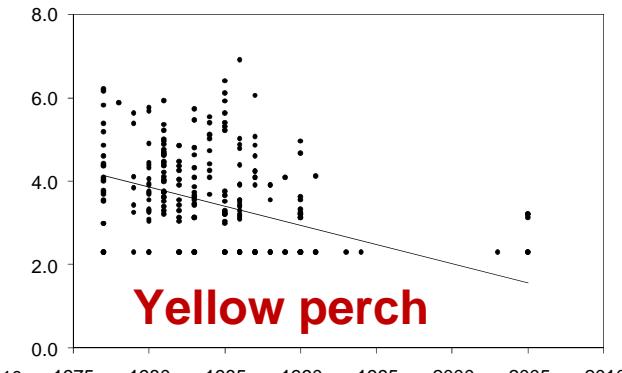
In total-PCB (ng/g wet wt)



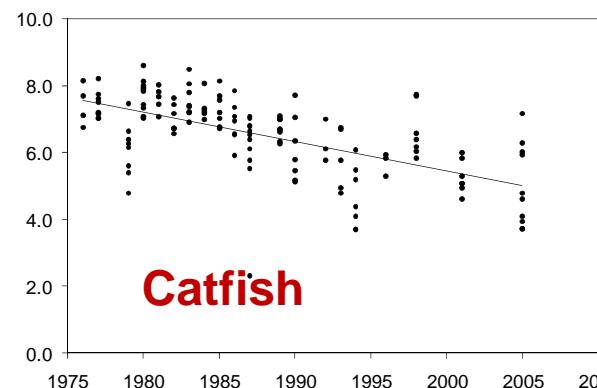
Carp



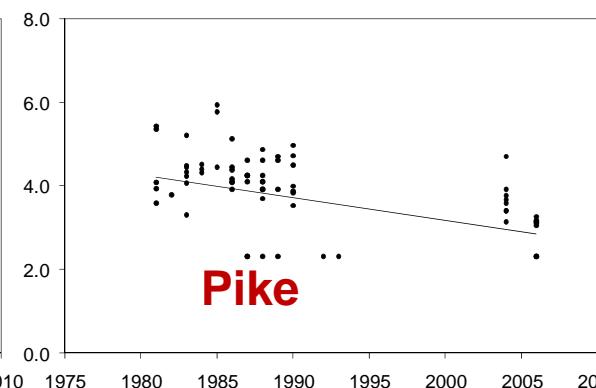
Walleye



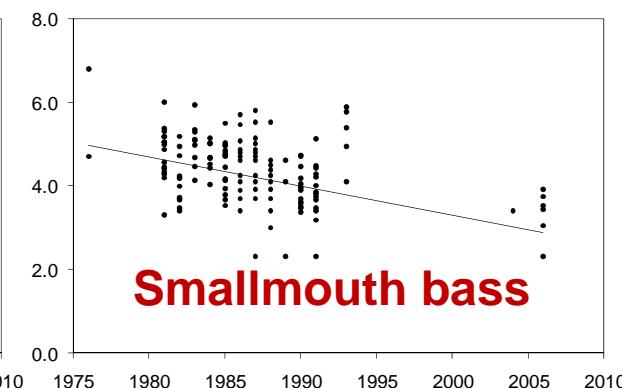
Yellow perch



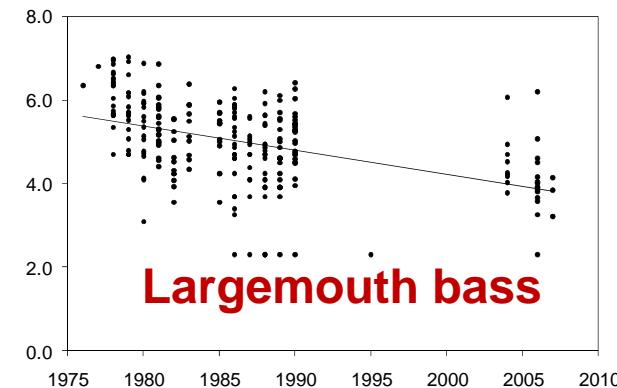
Catfish



Pike



Smallmouth bass



Largemouth bass

Year

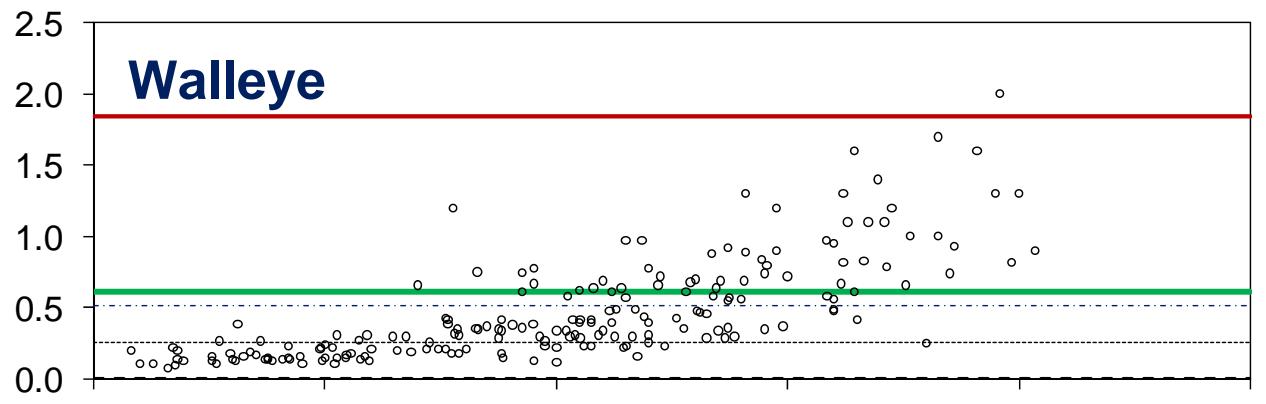
# Contaminant pattern hypotheses?

- Initial rapid declines
  - Control of point source contamination
  - Hg: Chlor-alkali plant closure in early 1970s
  - PCBs and DDT: production banned in 1970s
  - PCB discharges restricted in Sarnia area
  - OCS: Phase-out by chlorine industry in 1970s
- Slowing of rate of decrease since the mid-1980s/mid-1990s
  - Relative importance:
    - ↓ point source
    - ↑ sediment and atmosphere
  - Changes to food web processes

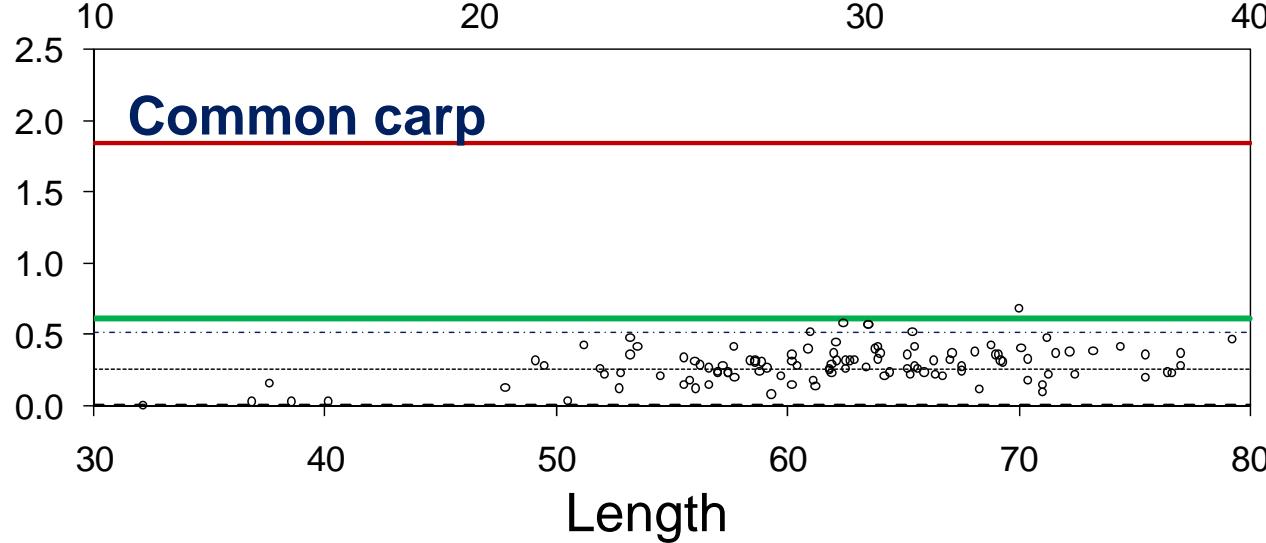
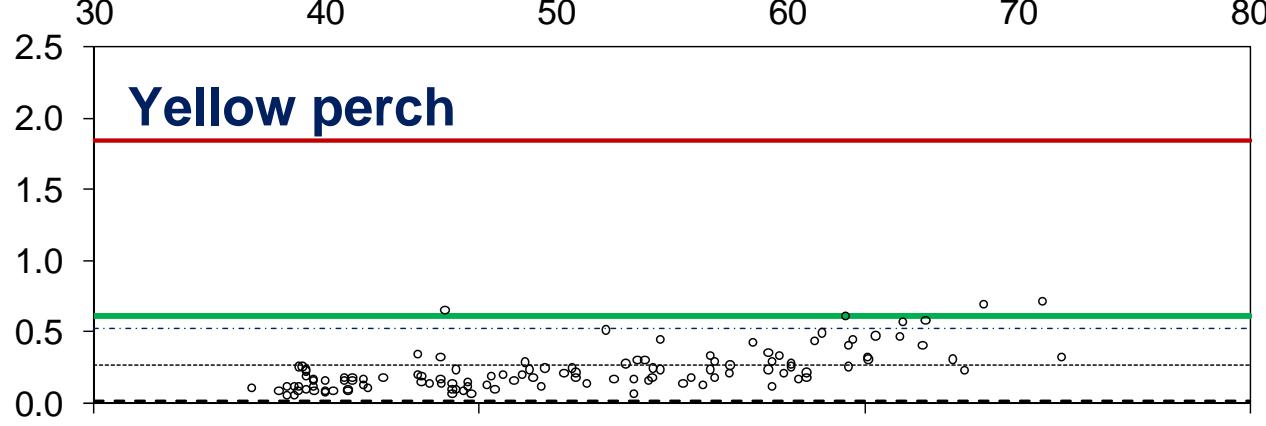
# **Results:**

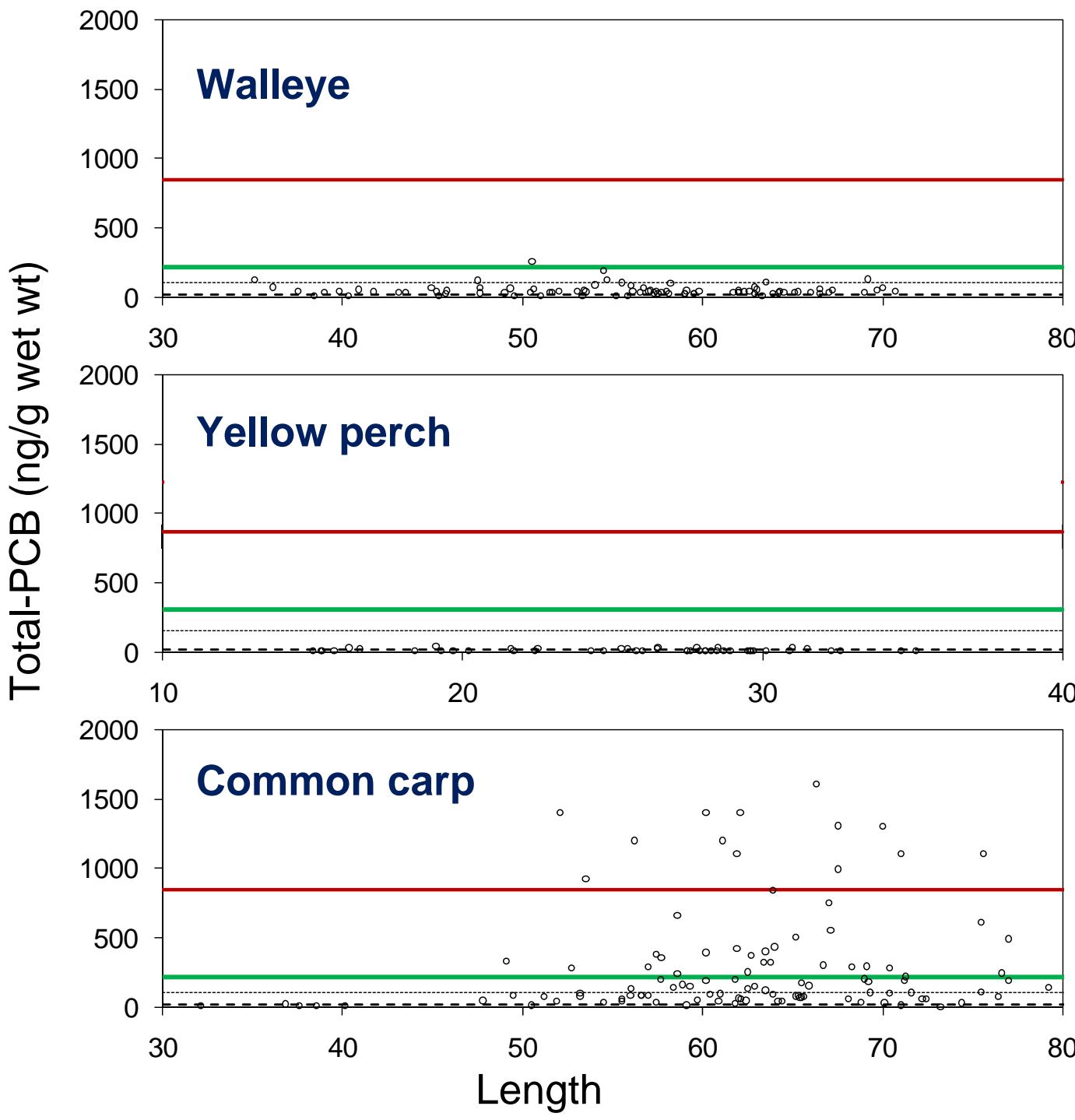
## **Comparison to consumption guidelines**

Mercury ( $\mu\text{g/g}$  wet wt)



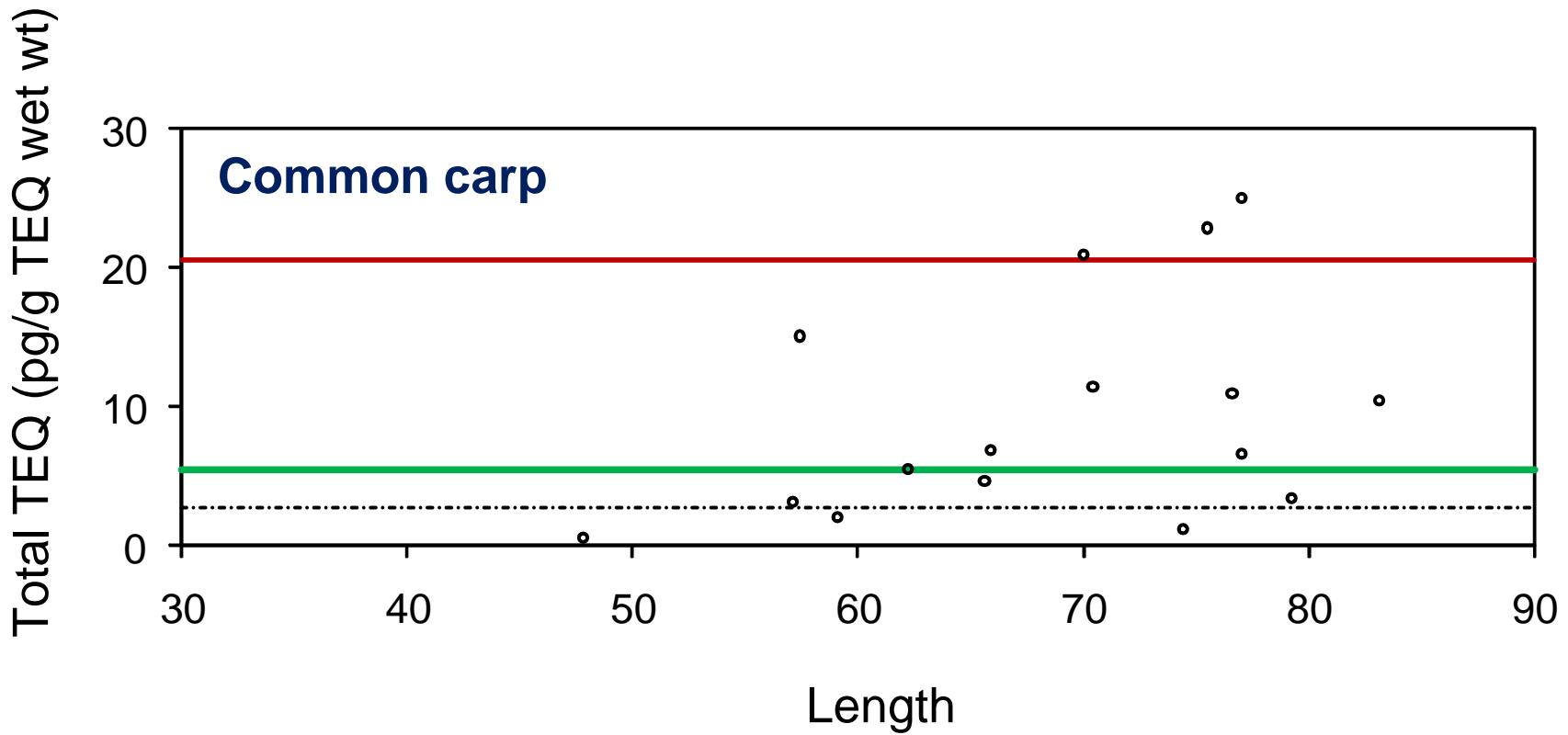
Hg





PCB

# PCDD/F and DL-PCB

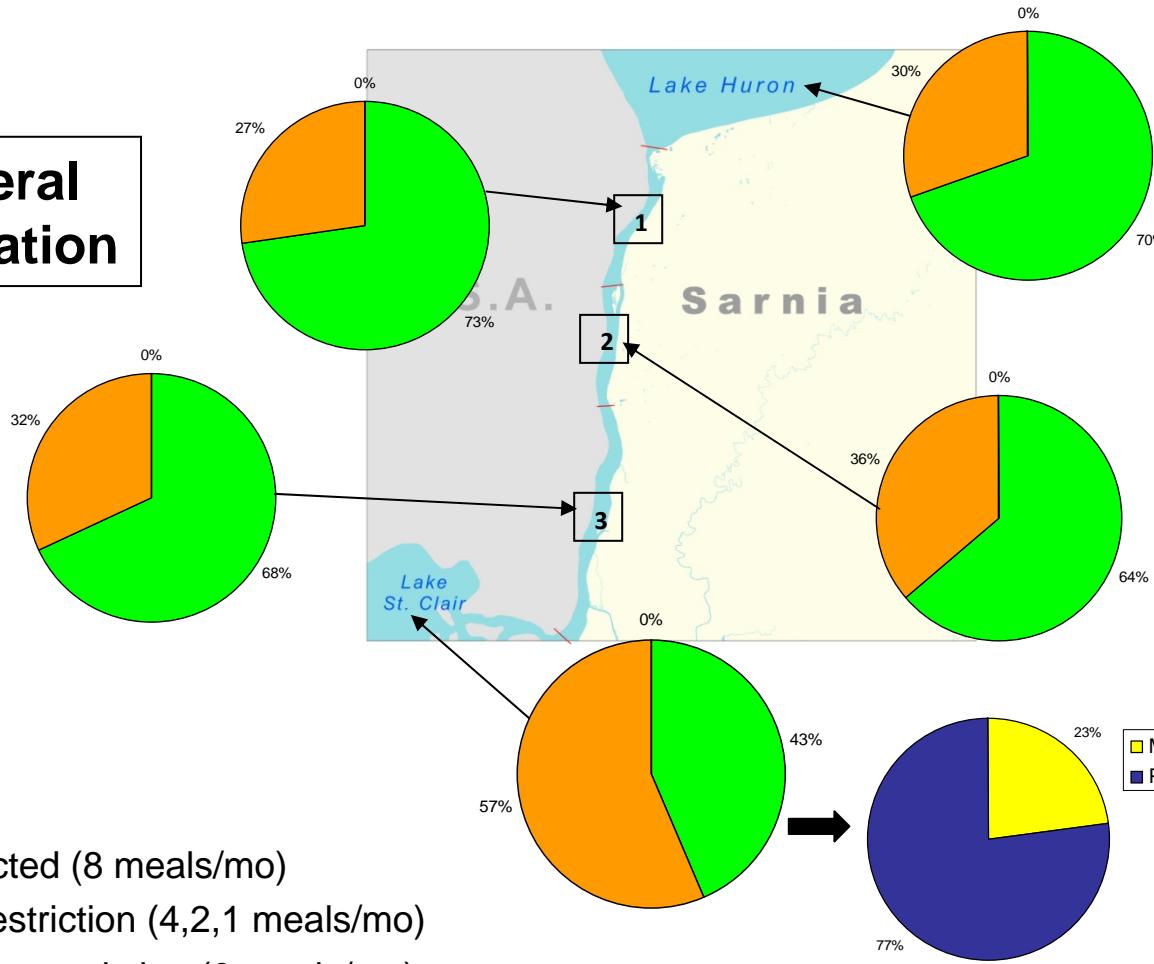


# Fish Consumption Advisories

- Compared current advisories from 3 blocks in St. Clair River, Lake St. Clair and lower Lake Huron
- Categorized restrictions as:
  - Unrestricted (8 meals/mo)
  - Partial restriction (4,2,1 meals/mo)
  - Complete restriction (0 meals/mo)
- Comparison of overlapping size ranges of common species only

# Fish Consumption Advisories - Spatial

## General Population



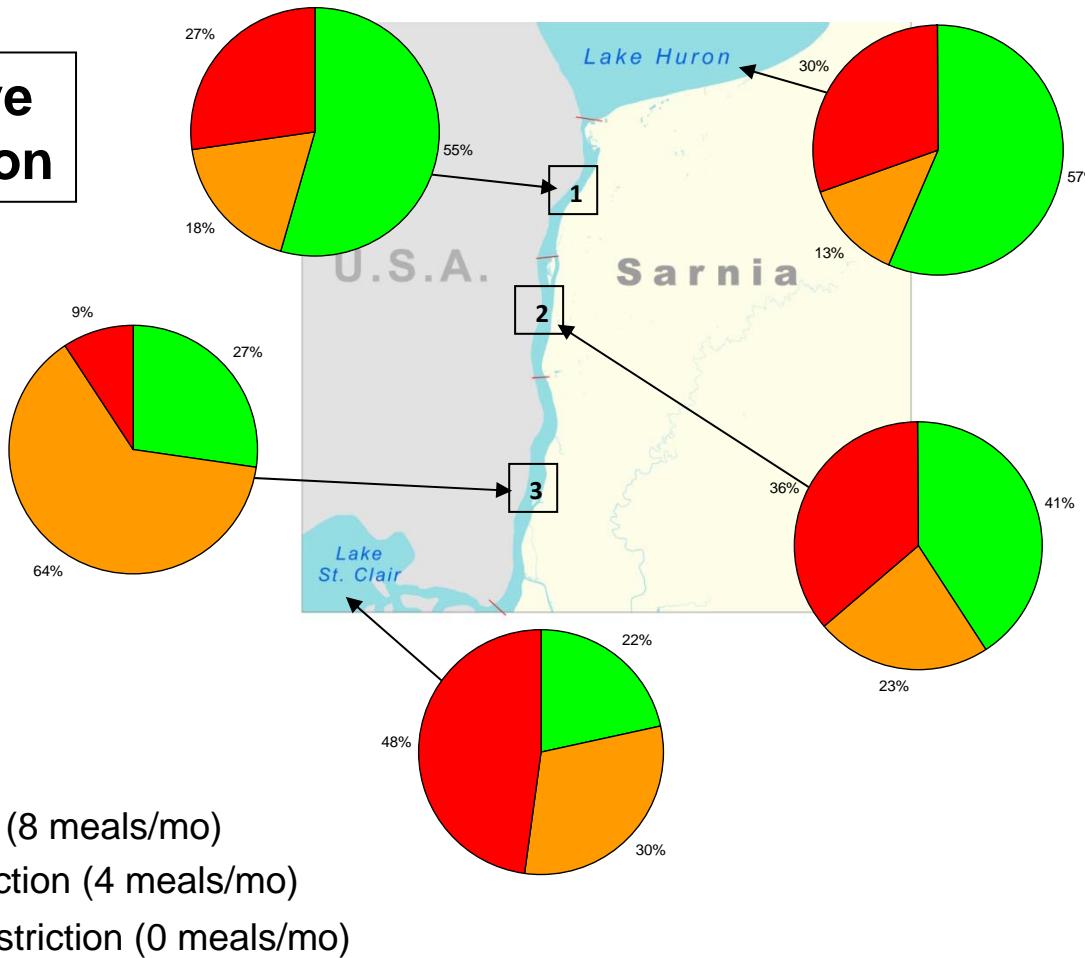
## Species compared

- Carp (45-75cm)
- Freshwater Drum (35-45cm)
- Walleye (25-55cm)
- White Sucker (25-45cm)
- Yellow Perch (15-35cm)

PCBs generally cause all restrictions

# Fish Consumption Advisories - Spatial

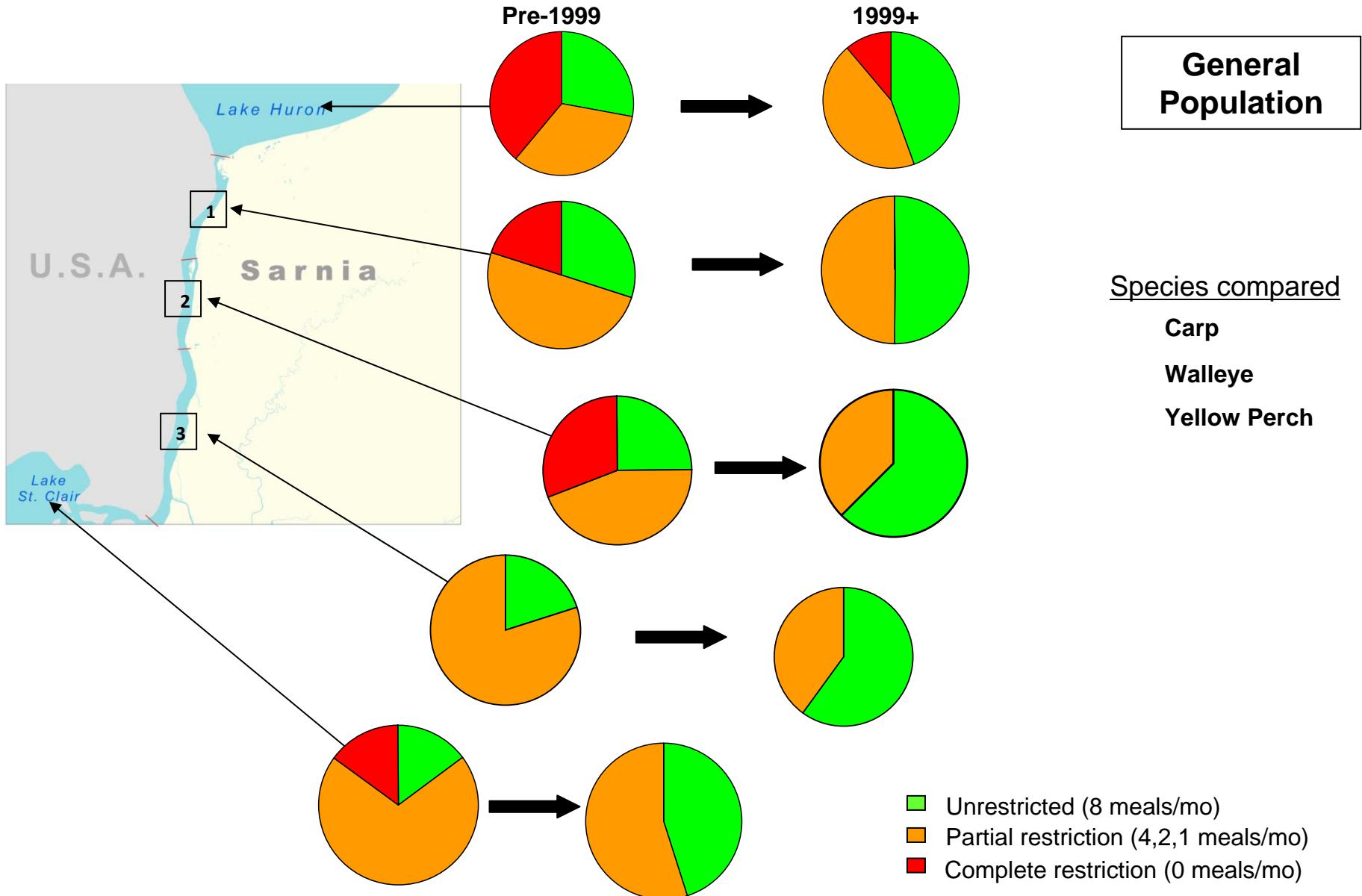
## Sensitive Population



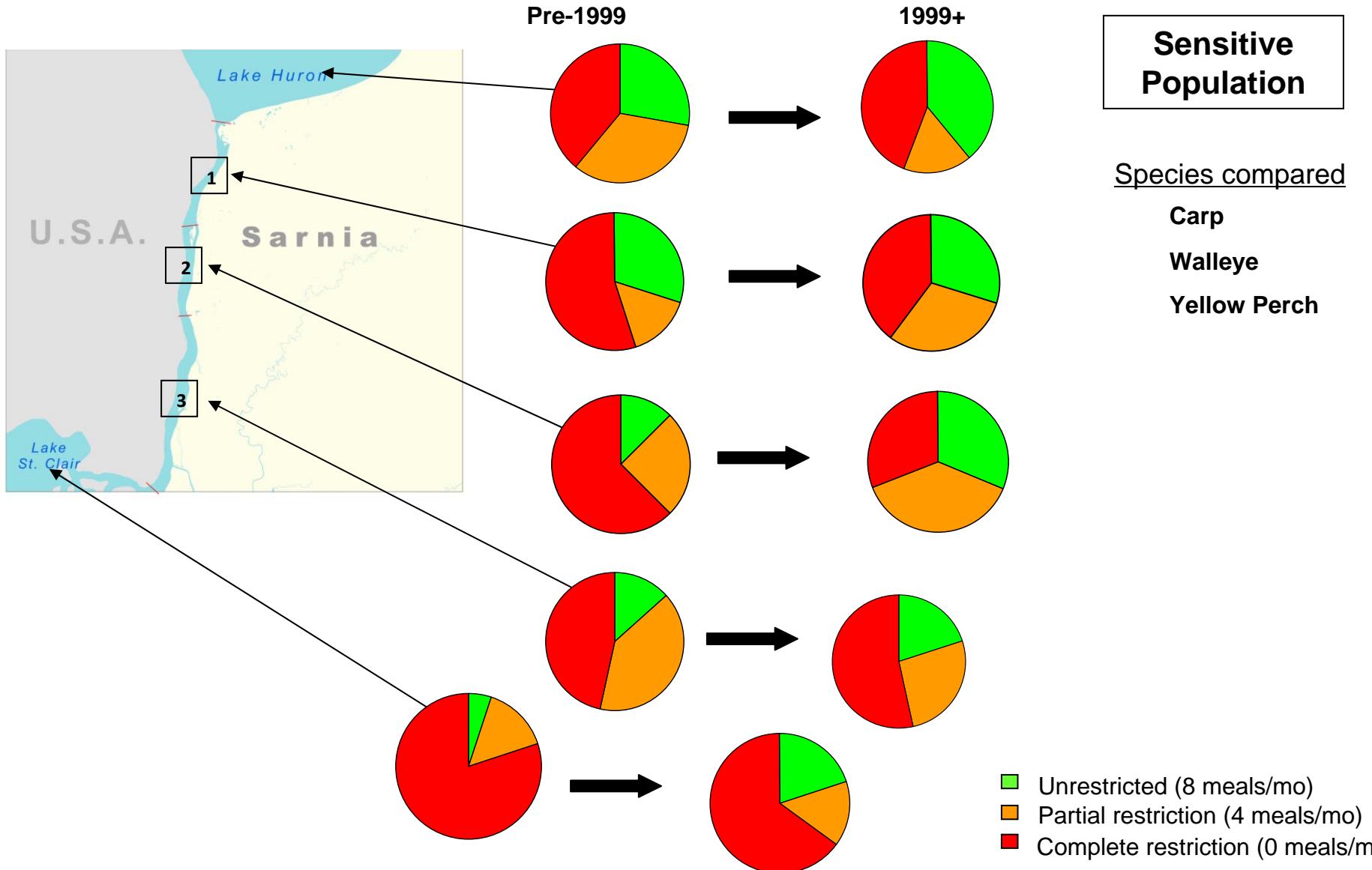
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# Fish Consumption Advisories – Temporal



# Fish Consumption Advisories – Temporal



# Conclusions

- ↓ PCBs, Hg, OCS, HCB, and DDT
- 1970s – 1990s
  - Sources: industry along St. Clair River
- 1980s/1990s onwards
  - Concentrations stabilized
  - Sources: Atmospheric and sediment
- Hg trend reversal in some species; further monitoring necessary

# Conclusions

- Mercury and PCBs still pose a risk to human fish consumers
- Larger sized walleye and carp are a problem
- Given that rate of decline is slowing, natural recovery may be slow
- Decreases in fish tissue concentrations have improved consumption restrictions over time
- More thorough assessment needed to determine if BUI “restored”
- Challenge: ecosystem changes (Hg); appropriate reference area

# Acknowledgements

- Lisa Richman (OMOE)
- Steve Petro (OMOE)
- Staff at the Laboratory Services Branch (OMOE)