

# **Contaminant Indicators**

**Melanie Coulter**

**Detroit River Canadian Cleanup**

# Contaminant Indicators

## INDICATOR

## CONTACTS

**Contaminants in L. Erie  
sediments**

**Chris Marvin, Environment Canada**

**Contam. sediment remediation**

**Michael Zarull, Environment Canada**

**Phosphorus discharges from  
DWTP**

**Gary Fujita, Detroit Water and Sewage  
Department**

**Phosphorus concentrations in L.  
Erie**

**Todd Howell & Lynda Nakamoto,  
Environmental Monitoring and Reporting  
Branch, MOE**

**Chloride levels in L. Erie**

**John Hartig, Detroit River IWR**

**Oil pollution - Detroit & Rouge R.**

**John Hartig, Detroit River IWR & Rose  
Ellison, EPA**

**Contaminants in L. Erie fish**

**D.M. Whittle, Fisheries and Oceans Canada**

**Org. contam. in Herring Gull eggs**

**Chip Weseloh, Canadian Wildlife Service**

**Mercury in L. St. Clair Walleye**

**Al Hayton, Sport Fish Contaminant  
Monitoring Program, MOE**

# Organic contaminants in Western L. Erie Sediments

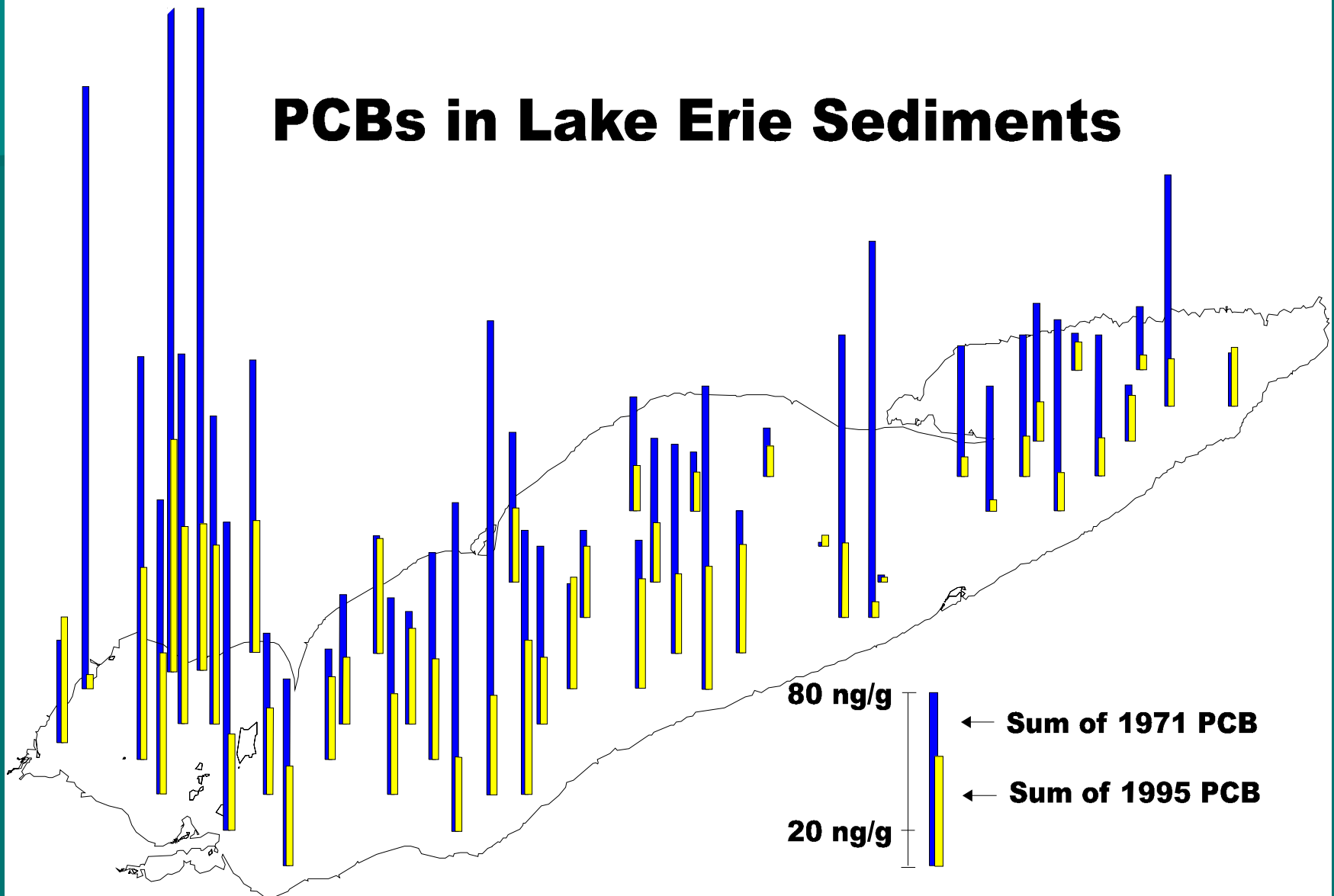
Chris Marvin, Environment Canada

- Liquid & solid waste discharges
- Accumulation record
- TEL & PEL
- Sediment Quality Index

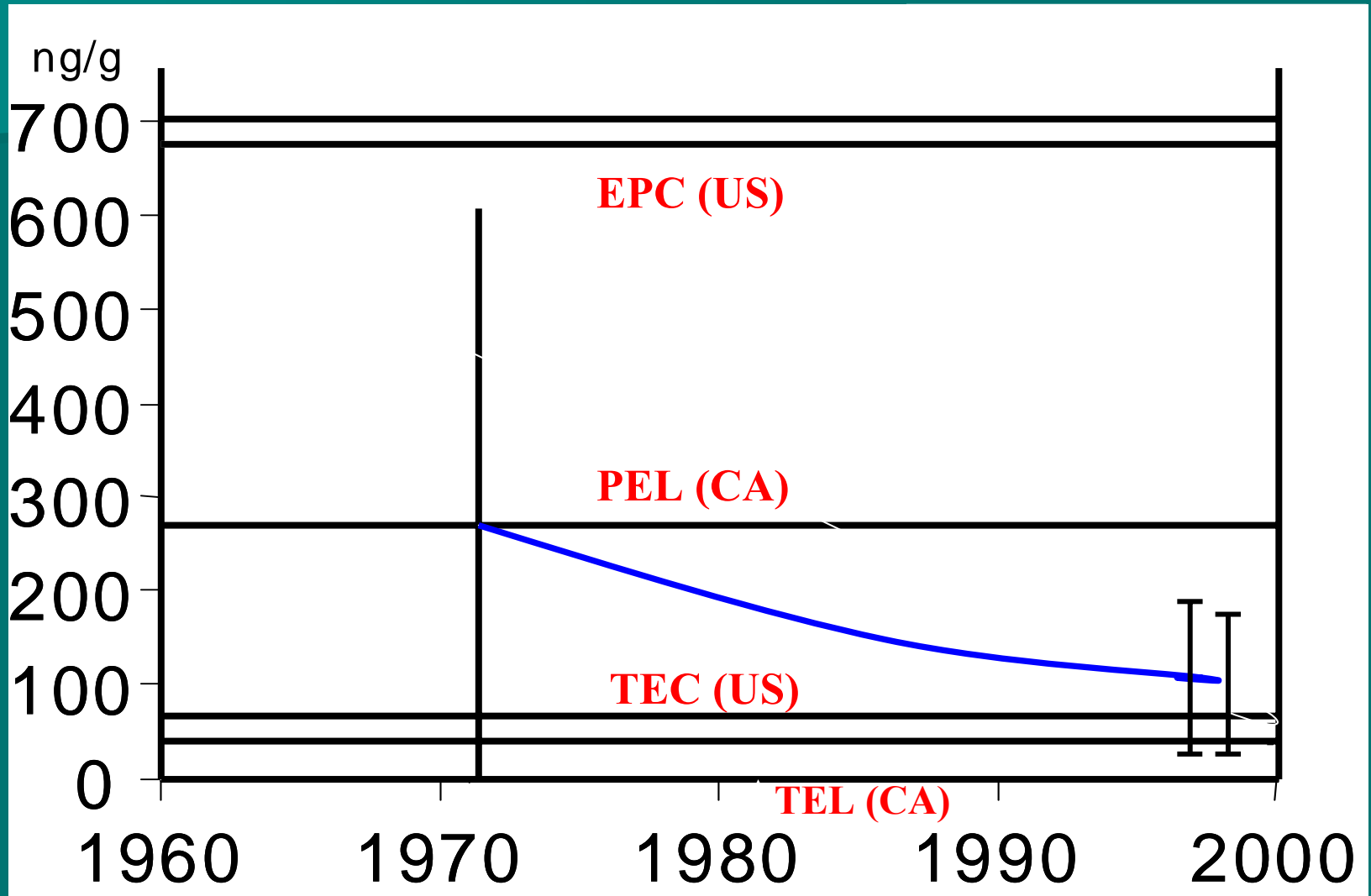


# Organic Contaminants in Western L. Erie Sediments

## PCBs in Lake Erie Sediments



# Organic contaminants in Western L. Erie Sediments



# Organic contaminants in Western L. Erie Sediments



## ■ Needs:

- Remediation
- Research & monitoring
- Binational collaboration

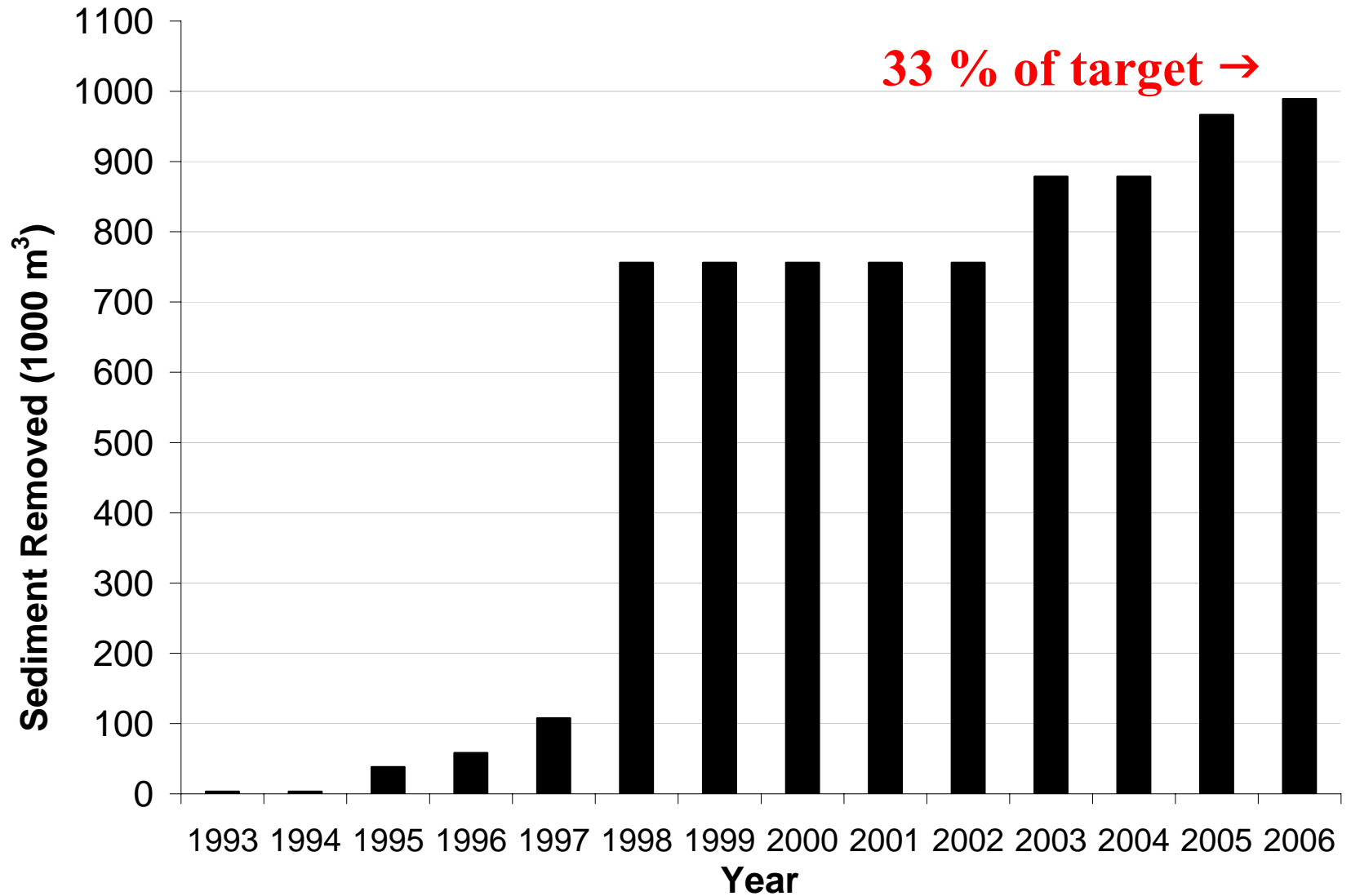
# Contaminated Sediment Remediation

Michael Zarull, Environment Canada



- Obstacle to restoration
- Biological effects of contamination
- Cause of fish consumption advisories

# Contaminated Sediment Remediation





# Contaminated Sediment Remediation

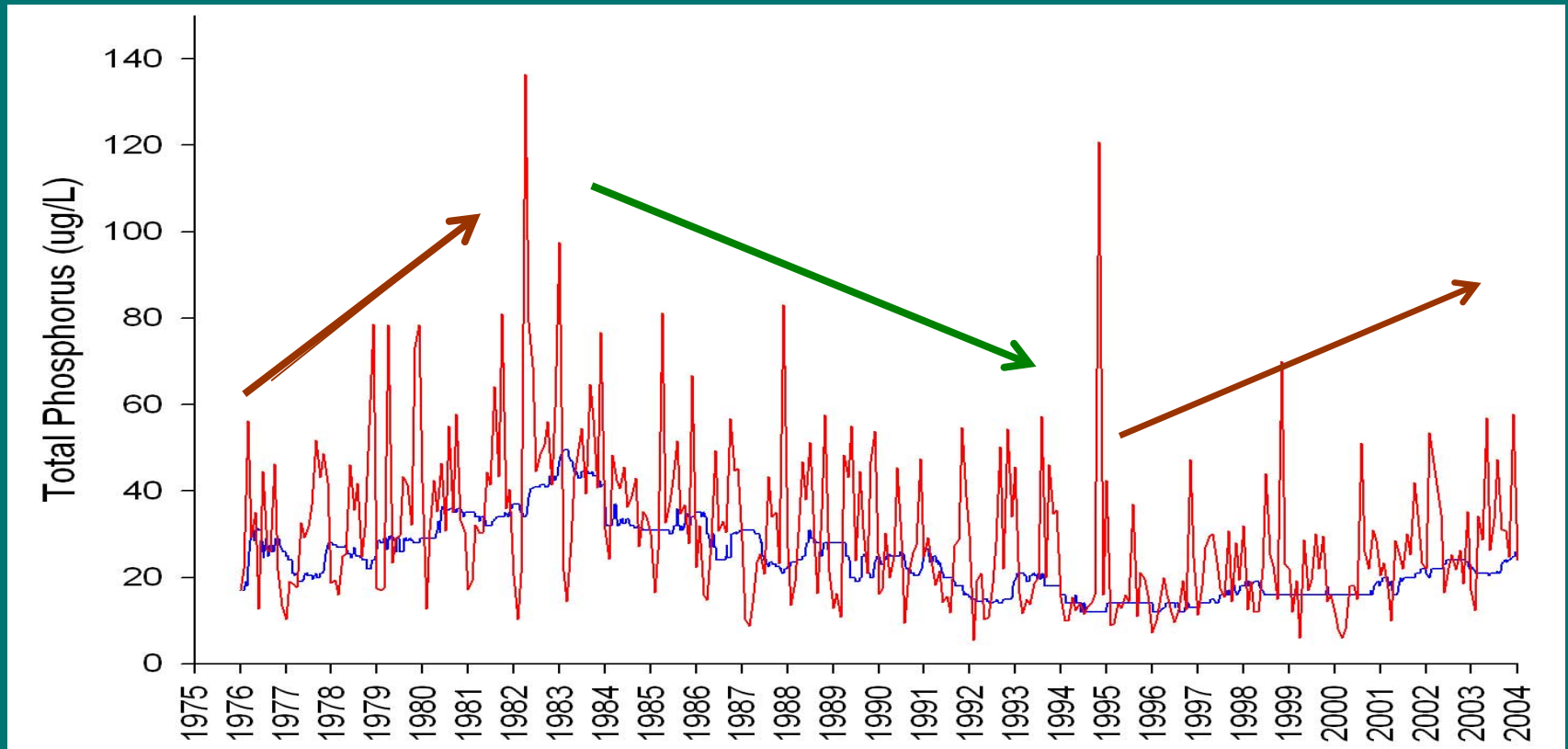


- 2.3 million m<sup>3</sup> remain
  - Trenton Channel
  - Rouge River
  - River Raisin
- Needs:
  - Measuring & monitoring
  - Research
  - Funding

# Phosphorus concentrations in Western L. Erie

Todd Howell & Lynda Nakamoto, MOE

- Primary nutrient limiting algae growth
- 1976: MOE monitoring began



# Phosphorus concentrations in Western L. Erie



Union Water Treatment Plant,  
Kingsville, ON

- ↑ phosphorus since 1994:  
spring turbidity, zebra  
mussels, or round goby?
- Needs:
  - Research & monitoring
  - Intake dataset accuracy
  - Improved ability to  
reflect basin-wide  
conditions

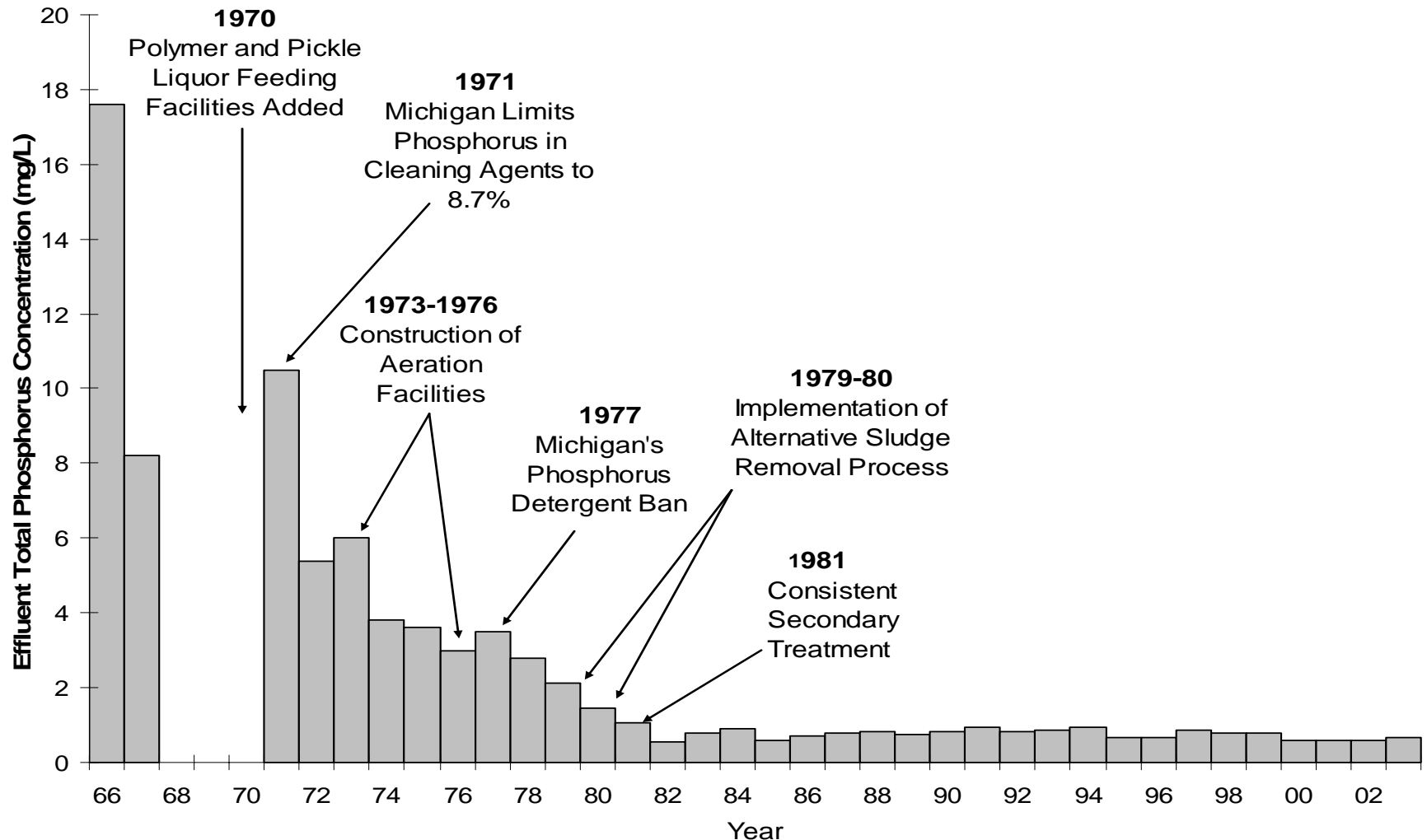
# Phosphorus Discharges from Detroit Wastewater Treatment Plant

Gary Fujita, Detroit Water and Sewage Department



- 700 million gallons wastewater/day
- 1970: phosphorus removal began
- Largest phosphorus contributor & reason for eutrophication reversal

# Phosphorus Concentrations from Detroit Wastewater Treatment Plant





# Phosphorus Discharges from DWTP

## Needs:

- Management programs, monitoring & research
- Lower detection limits (improved L. Erie loading estimates)



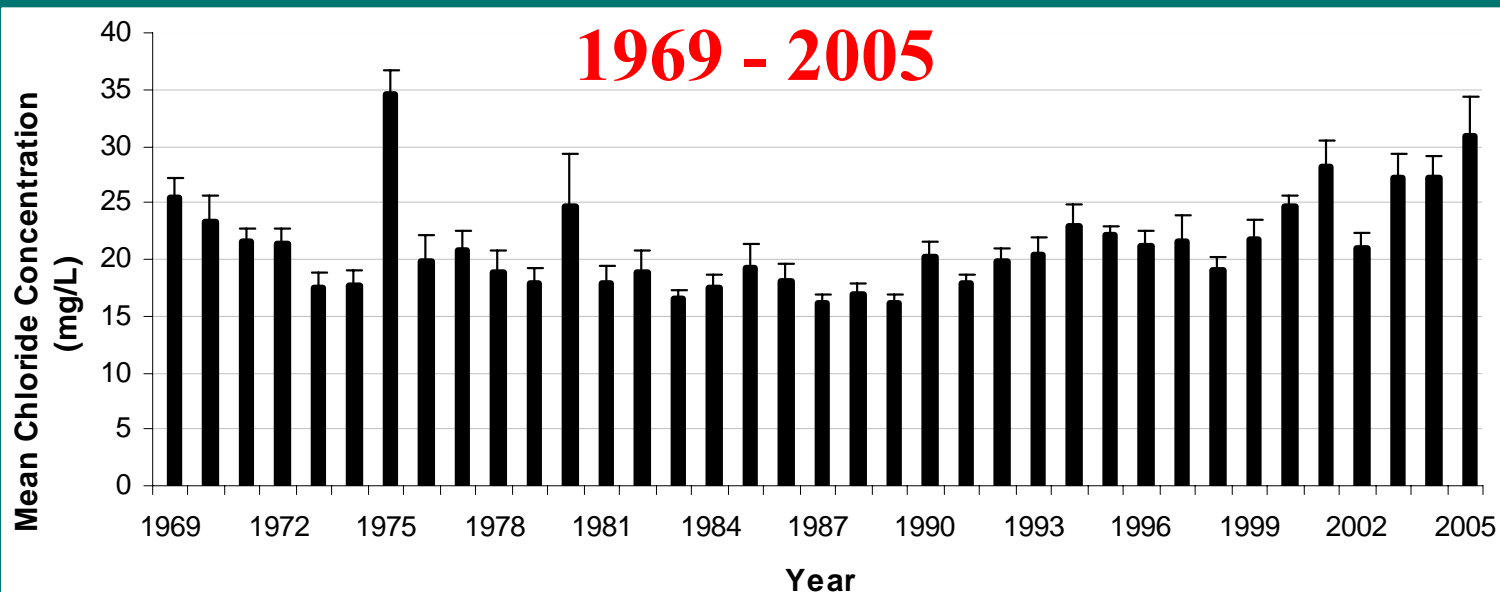
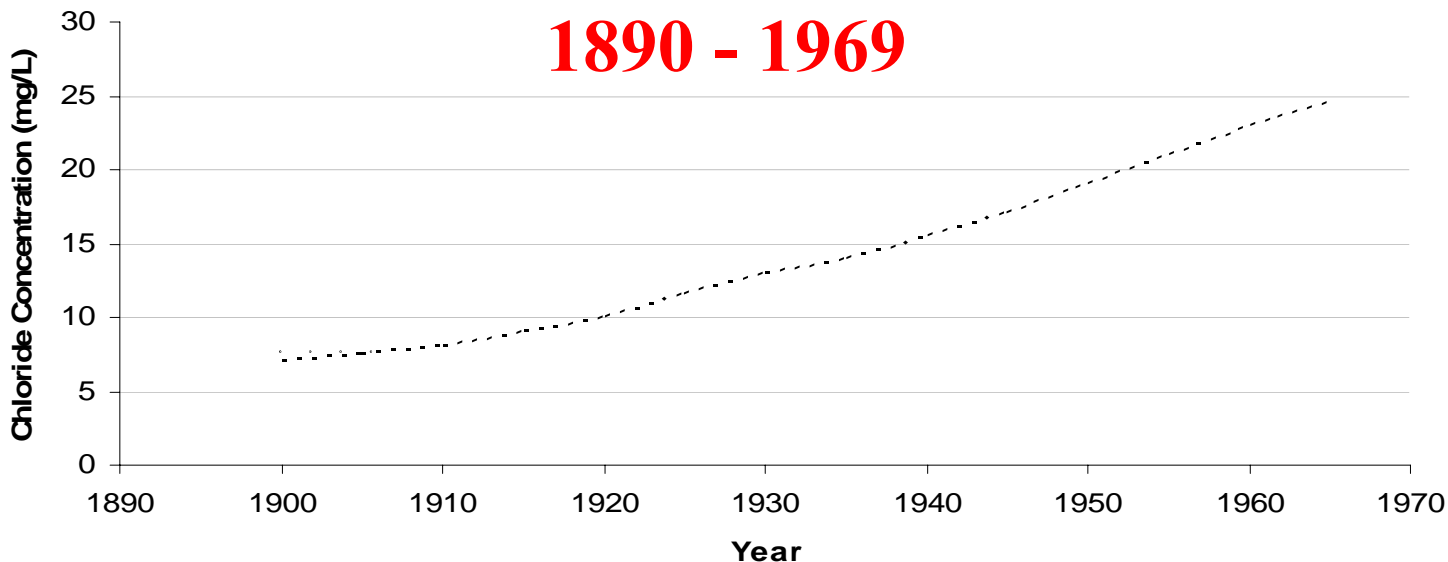
# Chloride Levels in Western L. Erie

John H. Hartig, Detroit River International Wildlife Refuge

- Small amounts essential for cell functions
- Toxic to aquatic biota at high concentrations
- ↑ halophytic algae
- L. Erie  $[Cl^-]$  3X greater than in L. Huron



# Chloride Levels in Western L. Erie





# Chloride Levels in Western L. Erie



- ↓ point sources
- ↑ non-point sources
- Needs:
  - Improve road salting techniques
  - Chloride & biological monitoring



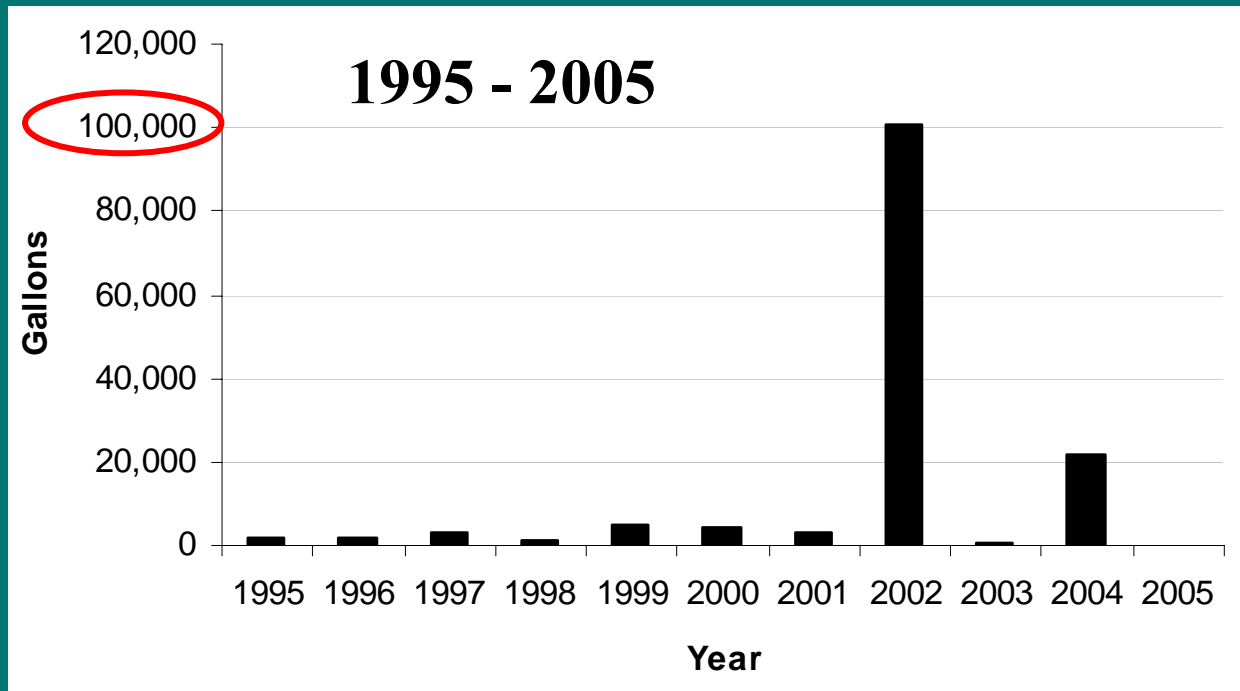
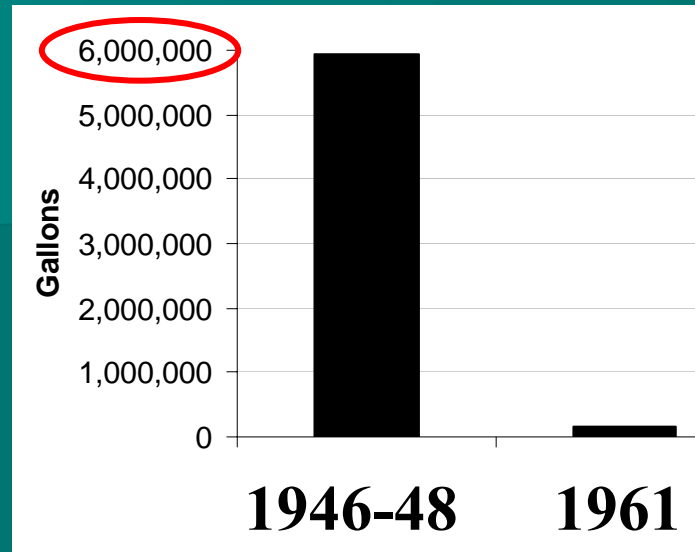
# Oil Pollution of the Detroit & Rouge Rivers

John H. Hartig, Detroit River International Wildlife Refuge

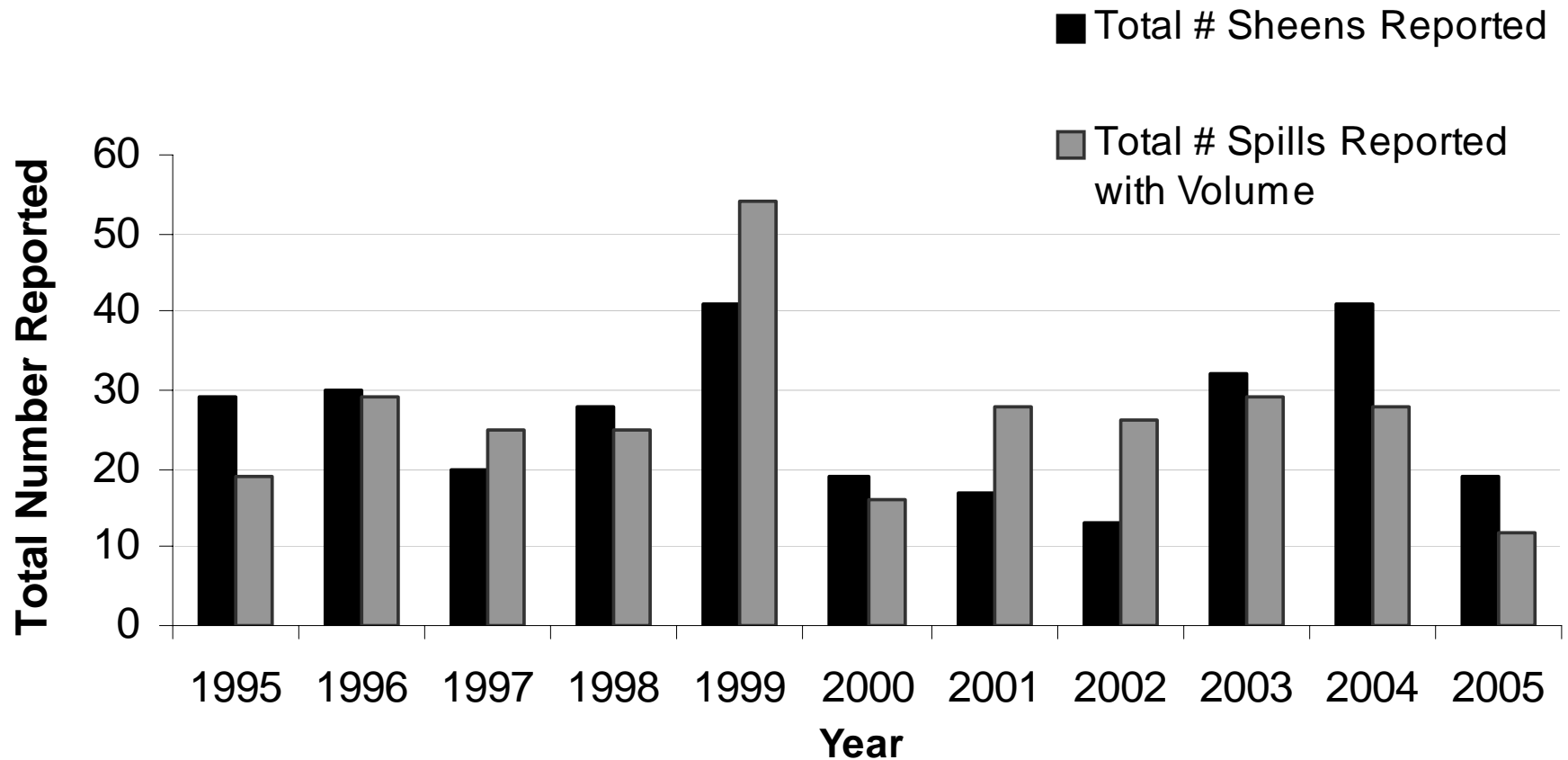


- Devastating to waterfowl:
  - Loss of buoyancy
  - Loss of feather insulation
  - Reduced mobility
  - Sickness/mortality from ingestion
  - Oil-covered eggs
- 1948: 11,000 ducks killed
- Initiated industrial pollution control
- 17-40% of Michigan's spills

# Oil Pollution of the Detroit & Rouge Rivers



# Oil Pollution of the Detroit & Rouge Rivers



# Oil Pollution of the Detroit & Rouge Rivers

- Needs:
  - ↓ allowable oil limits & heighten enforcement
  - Target key outfalls
  - Encourage ISO 14000 certification
  - Early warning system
  - Education & public awareness





# Contaminants in Western L. Erie Fish

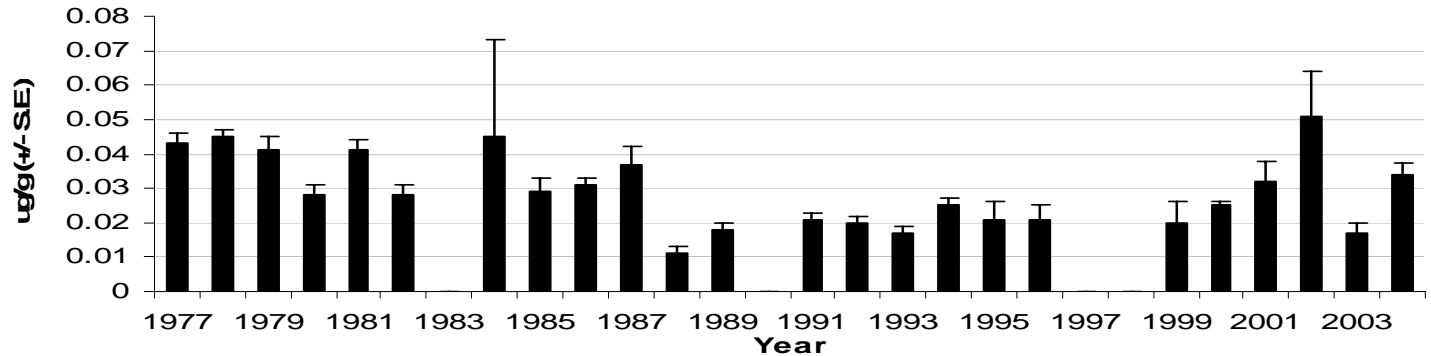
D.M. Whittle, Fisheries and Oceans Canada

- Measured in Rainbow Smelt and Walleye
- 1977: monitoring began
- Measure of remediation success
- Pressure from exotic species & climate change alters accumulation patterns

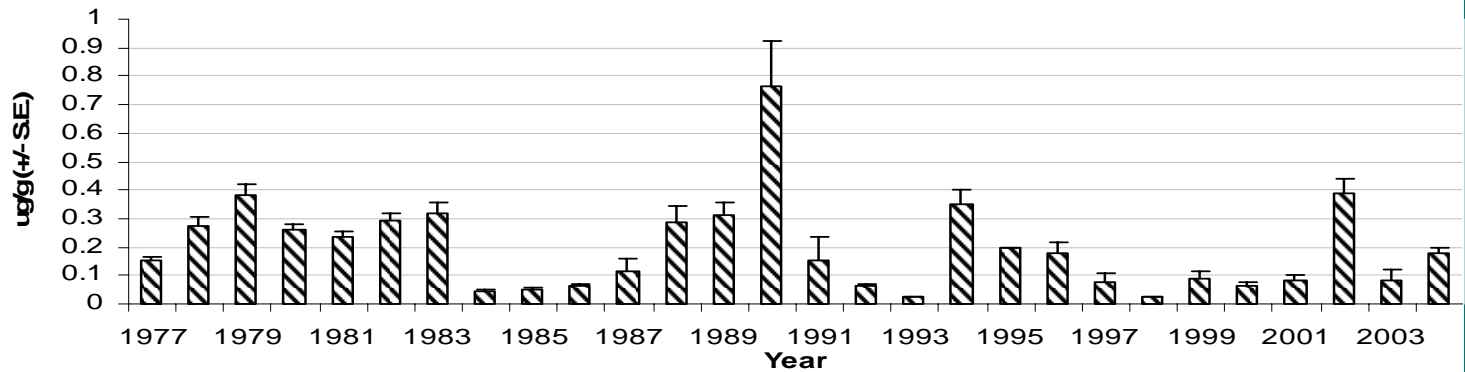


# Contaminants in Western L. Erie Rainbow Smelt

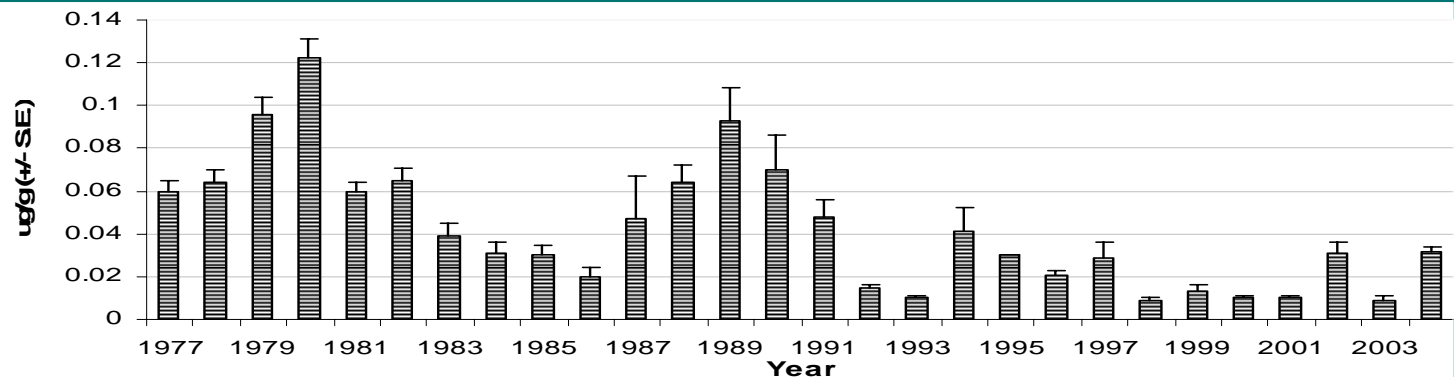
## Mercury



## PCBs

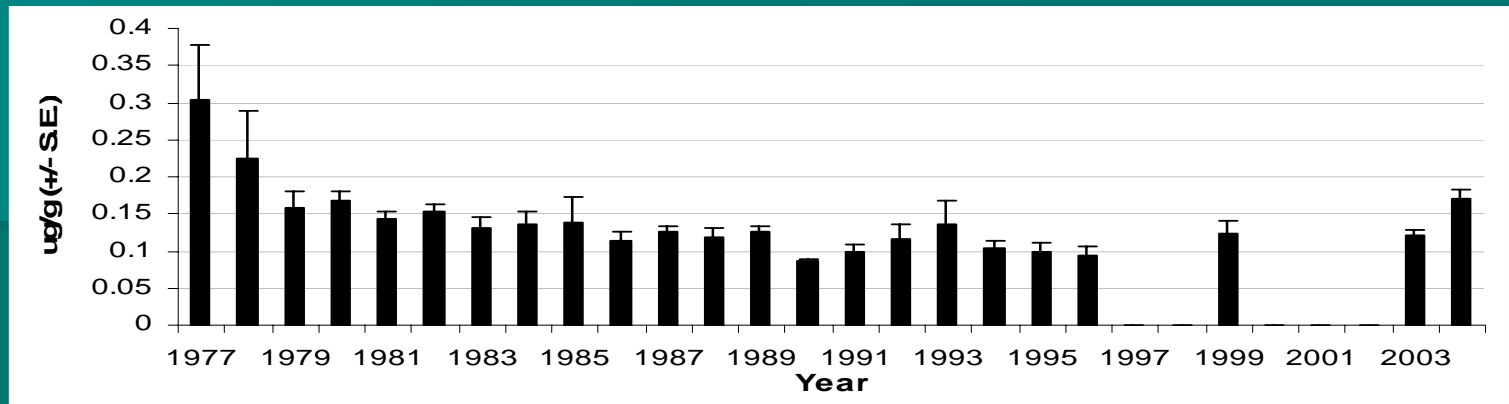


## DDT

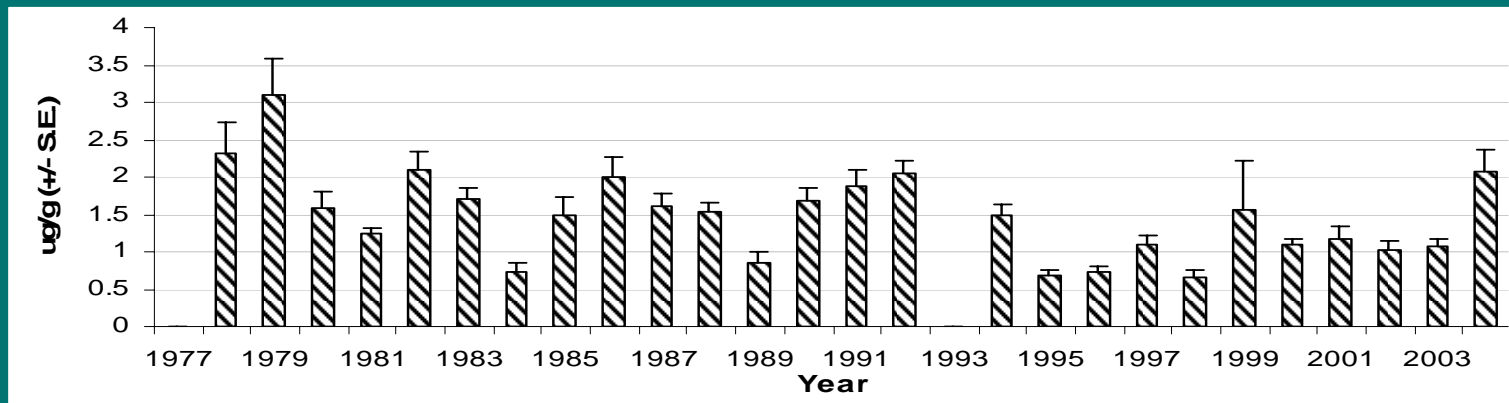


# Contaminants in Western L. Erie Walleye

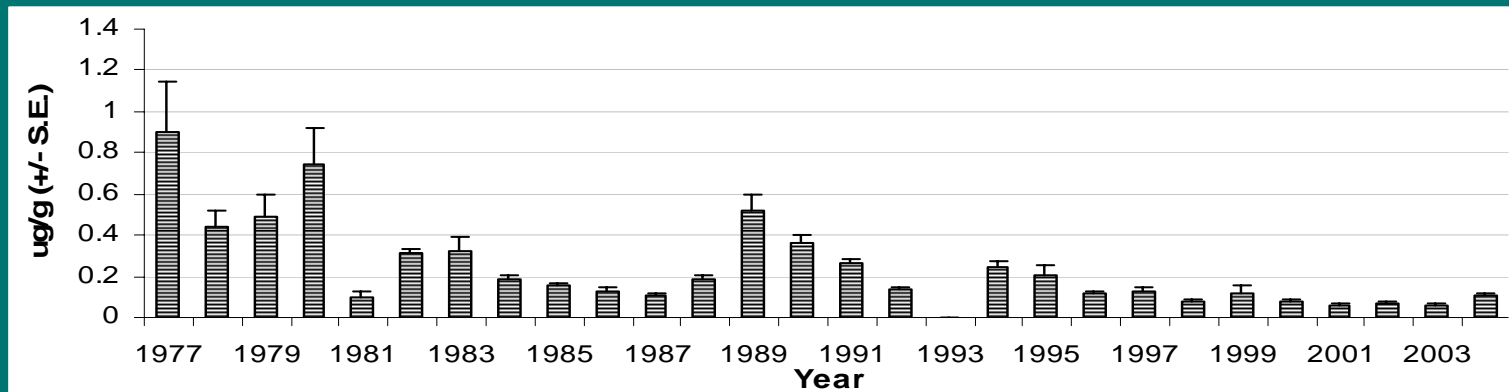
## Mercury



## PCBs



## DDT





# Contaminants in Western L. Erie Fish



- Needs:
  - Control contamination at source
  - Monitoring & models
  - Research

# Organic Contaminants in Herring Gull Eggs

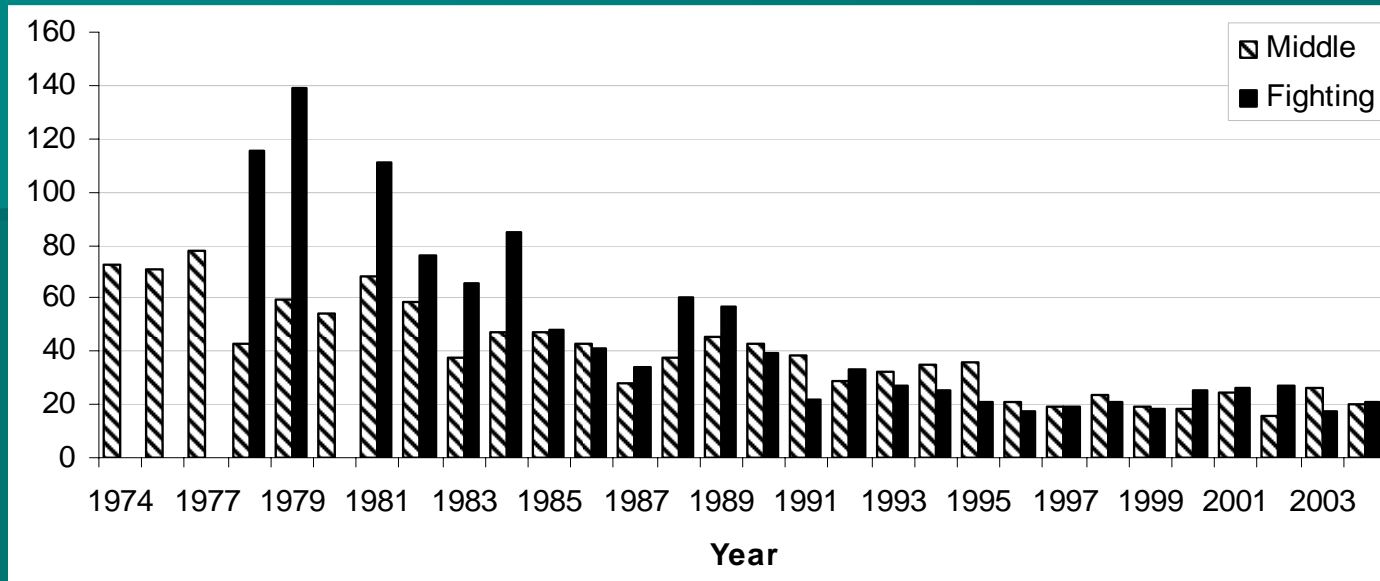
Chip Weseloh, Canadian Wildlife Service



- Ideal tracker of contaminants:
  - Year-round Great Lakes resident
  - Easy to study/locate
  - Feeds primarily on fish
  - High lipid content in eggs
  - Top food web predator
  - Indicate regional contamination

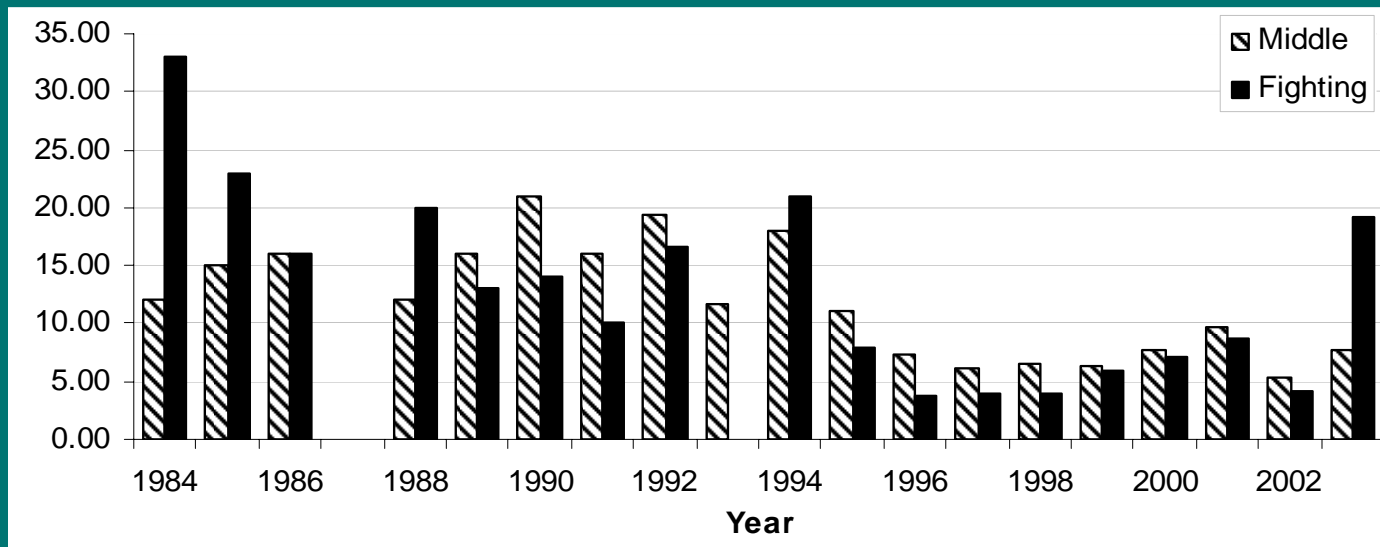
# Organic Contaminants in Herring Gull Eggs

Concentration  
(ug/g wet weight)



PCB

Concentration  
(ng/kg wet weight)



Dioxin

# Organic Contaminants in Herring Gull Eggs

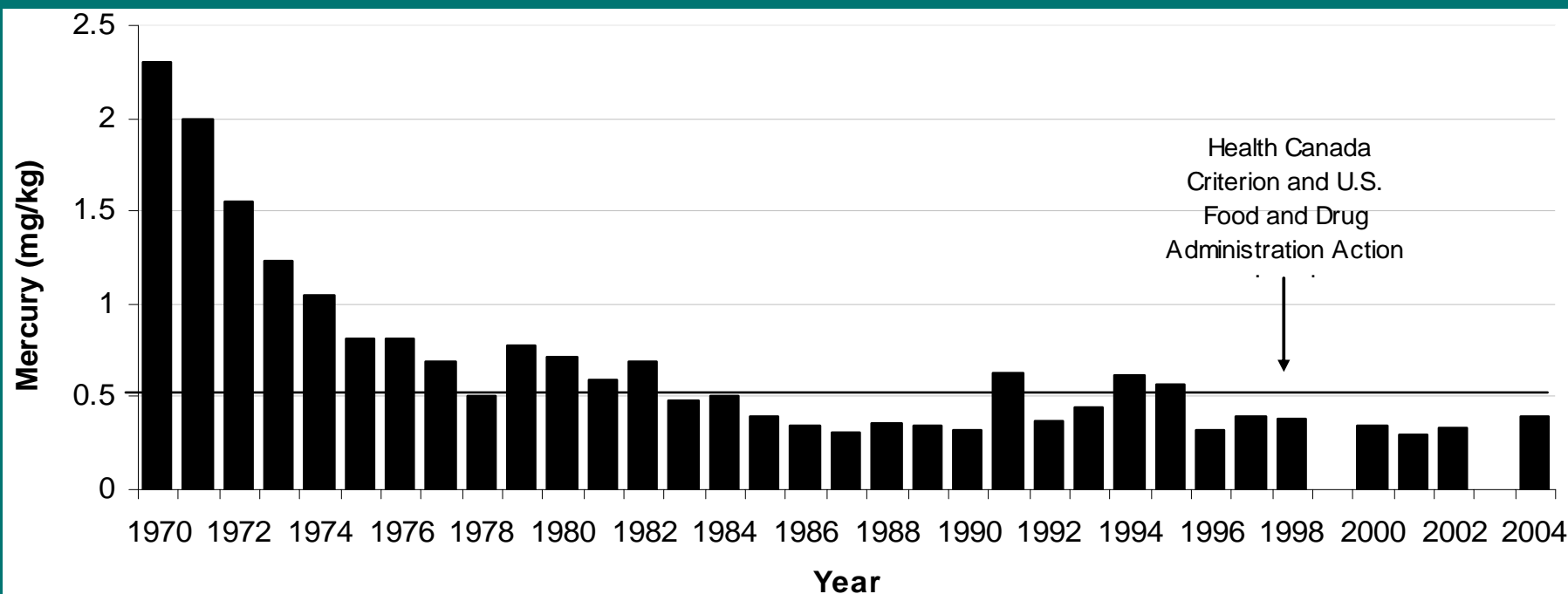
- ↓ levels of toxic, persistent contaminants
- ↑ reproductive success
- Due to diet change ?
- Needs:
  - Monitoring
  - Research



# Mercury in Lake St. Clair Walleye

Al Hayton, Sport Fish Contaminant Monitoring Program

- Insoluble in water but transformed through sediments
- Biologically mobile & toxic
- “Mercury Crisis of 1970”



# Mercury in Lake St. Clair Walleye



- Major source: historic discharges & atmosphere
- Needs:
  - Control at source
  - Monitoring & models
  - Data accessibility



INDICATOR	GOAL	TREND
Contaminated Sediments	↓ sediment contamination	↓ contaminant levels
Sediment Remediation	Remove contaminated sediment	↑ sediment remediation 2.3 million m <sup>3</sup> remain
Western L. Erie Phosphorus conc.	↓ phosphorus concentrations	↑ phosphorus concentrations since 1994
DWTP Phosphorus Discharges	↓ phosphorus loading and concentration	↓ phosphorous loading and concentration
Chloride Levels	Remain below regulatory standards	↑ Concentrations since mid-1990s
Oil Pollution	↓ # oil spills ↑ spill reporting	Major spills in 2002 & 2004 Significant # unreported
Contaminants in Western Lake Erie Fish	↓ mercury, PCBs, DDT	Generally ↓ but high year-to-year variability
Contaminants in Herring Gull Eggs	↓ concentrations of PCB, DDT, dioxins	↓ contaminant concentrations
Mercury in Lake St. Clair Walleye	↓ mercury concentrations	↓ mercury concentrations

INDICATOR	<i>Monitoring &amp; reporting</i>	<i>Source Remediation</i>	<i>Research</i>	HIGH PRIORITIES
Contaminated Sediments	✓	✓	✓	Remediation & binational collaboration
Sediment Remediation	✓	✓	✓	Research & funding
Phosphorus concentrations	✓	✓	✓	Intake dataset accuracy
DWTP Phosphorus Discharges	✓	✓	✓	Management programs & research
Chloride Levels	✓	✓	✓	Improve road salting
Oil Pollution	✓	✓	✓	heightened enforcement & Early warning system
Contaminants in Fish	✓	✓	✓	Control at source
Herring Gull Eggs	✓	✓	✓	Research
Mercury in Walleye	✓	✓	✓	Models & data availability