

US EPA ARCHIVE DOCUMENT

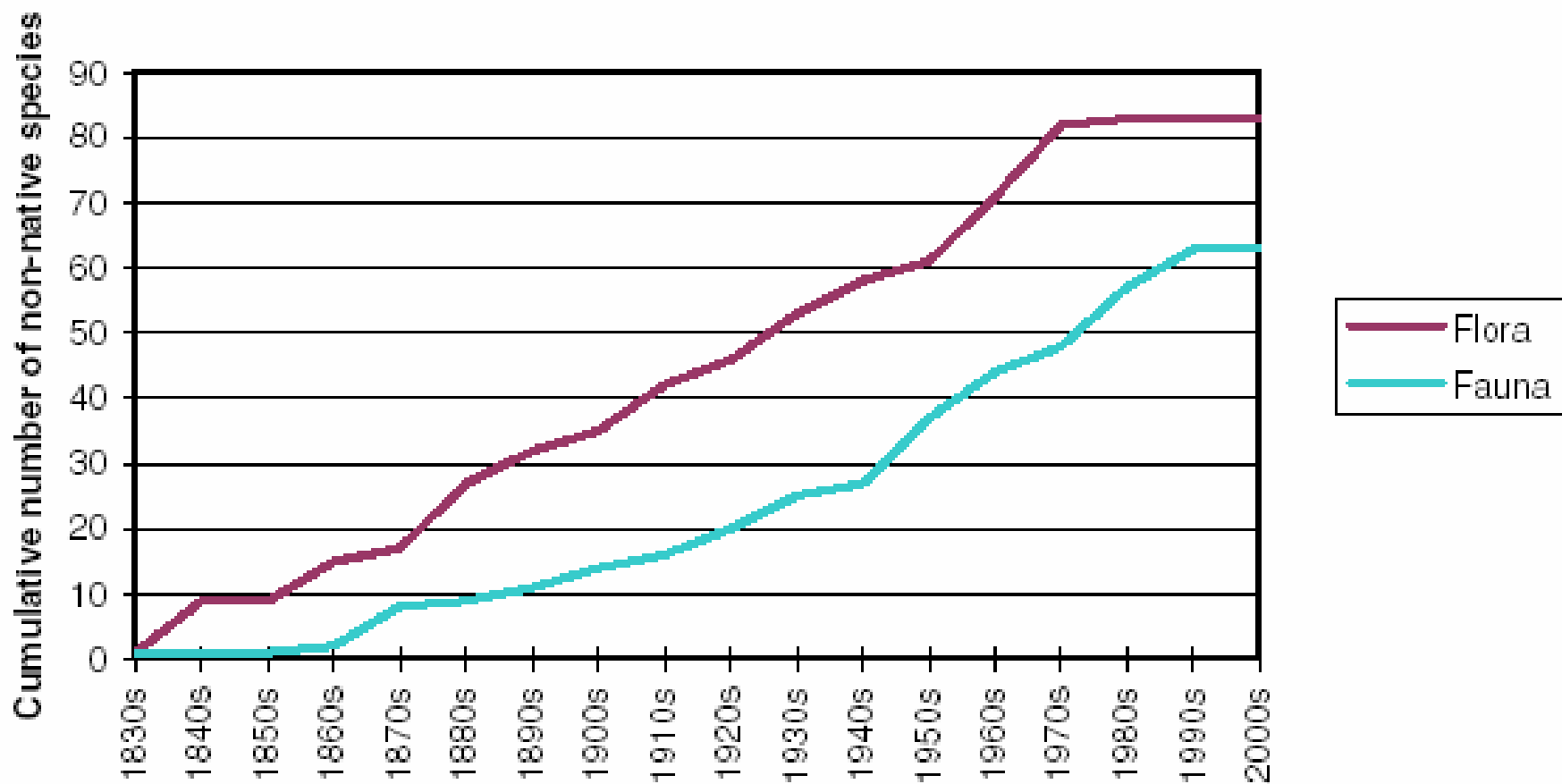
Pressures on the Great Lakes Ecosystem

Donna Myers
United States Geological Survey

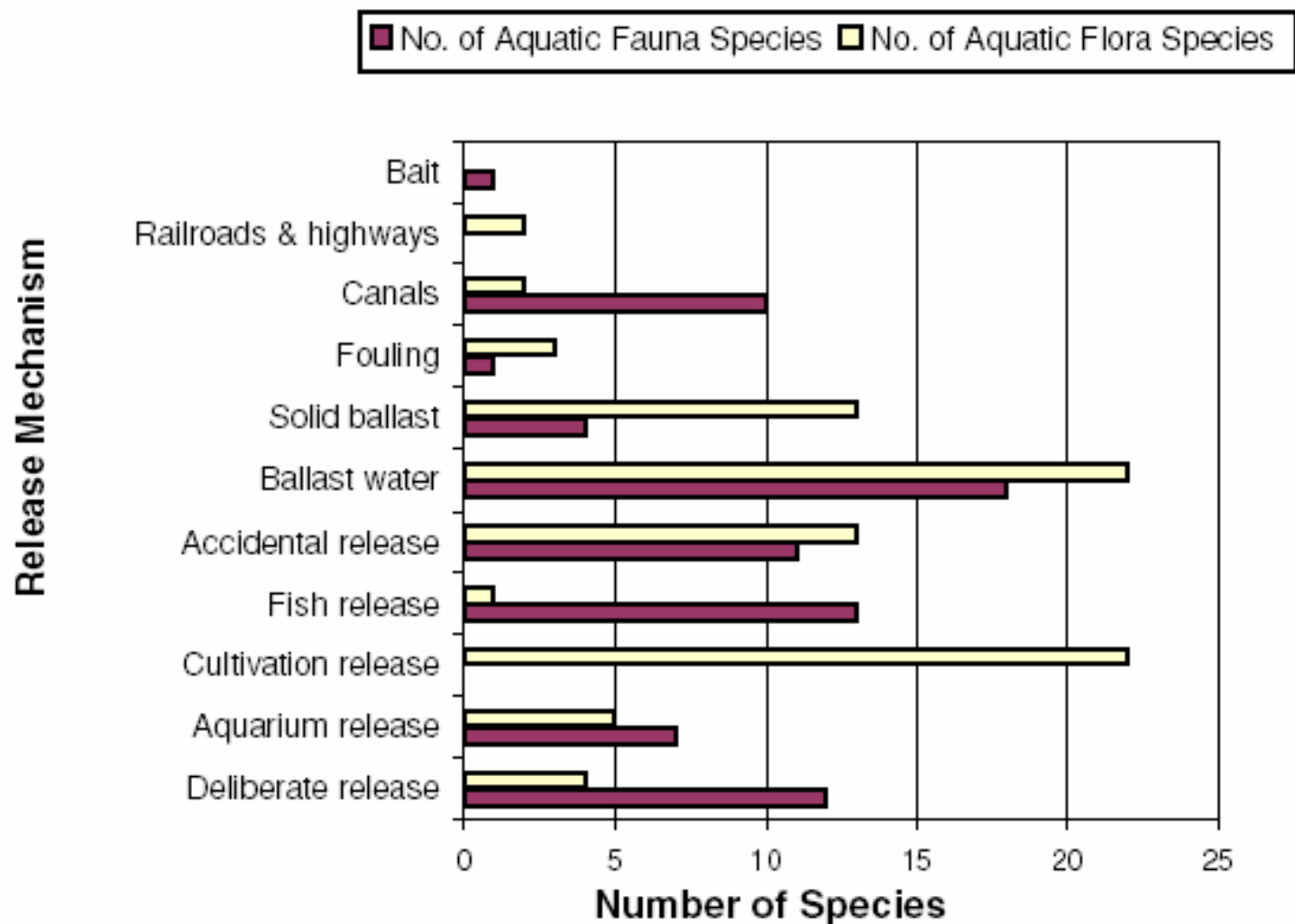
Major Pressures on the Great Lakes

- Non-Native Species
- Toxic Contaminants
- Excessive Nutrients
- Physical Processes

Cumulative Number of Non-native Species Introduced since the 1830's



Release Mechanisms for Non-Native Species



Sea Lamprey



Lampricide Treatment



Sea Lamprey Trap



Toxic Contaminants: How much is in the aquatic food web?

Contaminants in:

- young-of-year spottail shiners
- whole fish
- colonial nesting waterbirds
- snapping turtle eggs

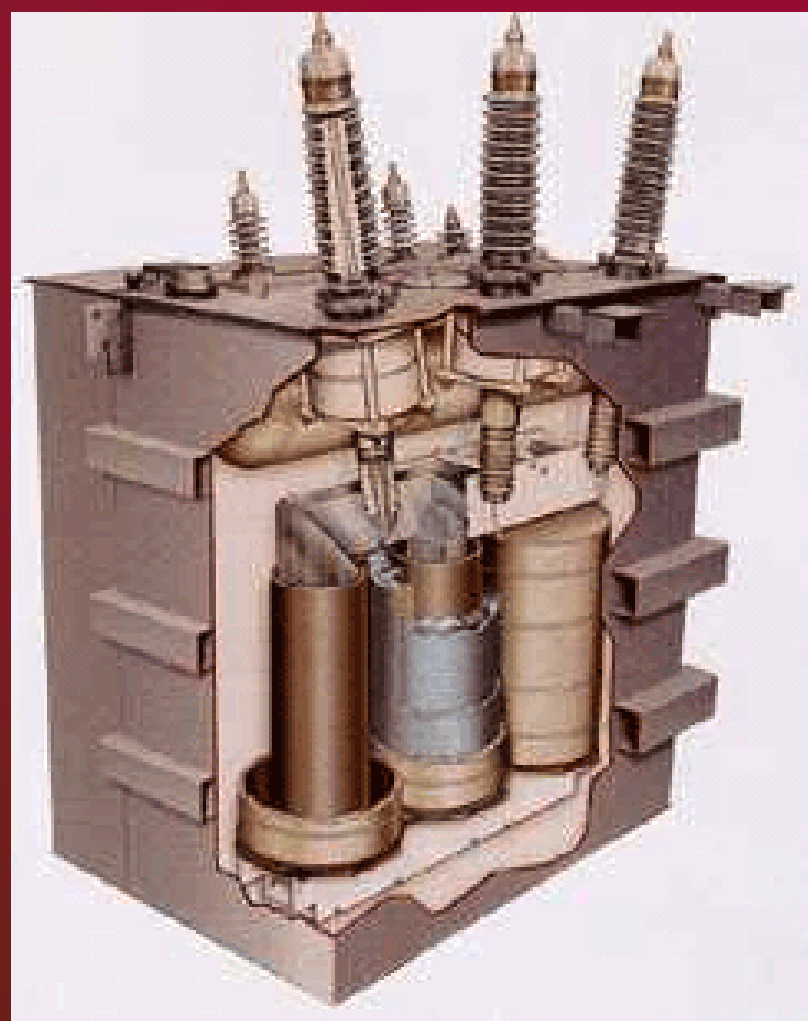


Organochlorine Pesticides

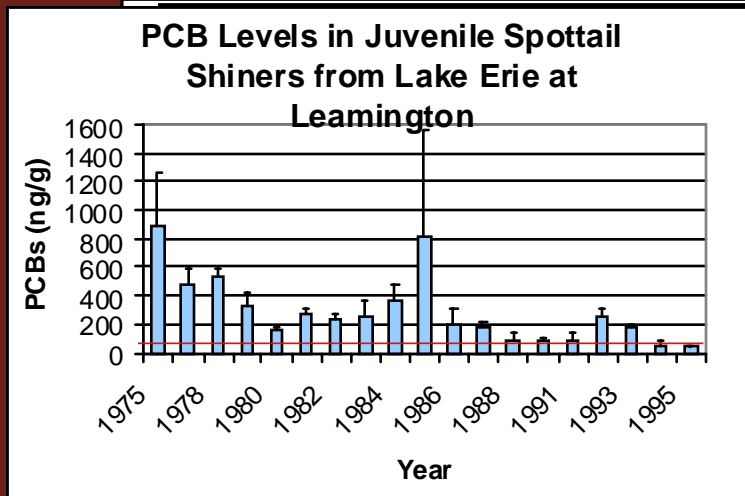
- DDT
 - → DDE, DDD
- Hexachlorobenzene
- Heptachlor epoxide
- Dieldrin
- Mirex

PCBs: organochlorine compounds

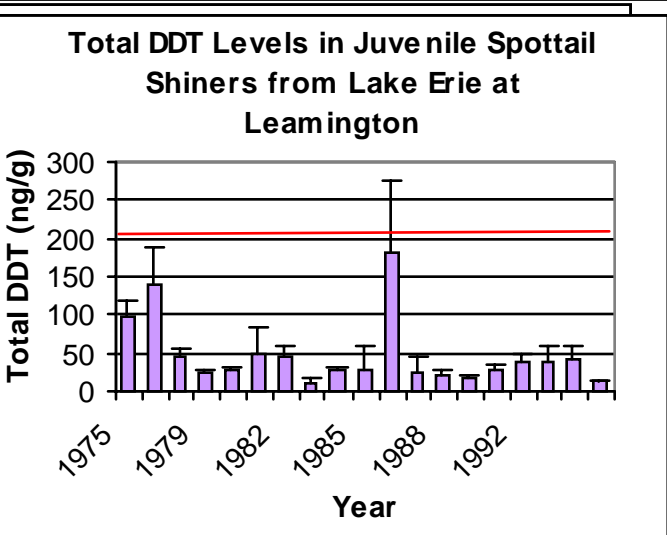
- Found in Transformers (as seen here)



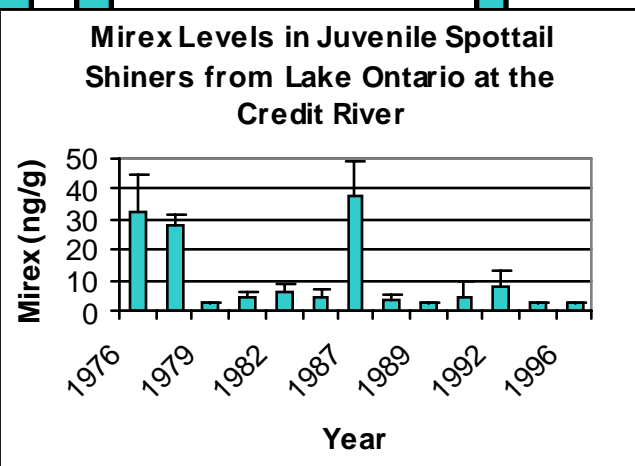
Contaminants in Y-O-Y Spottail Shiners



in Ju
Lake
edit R



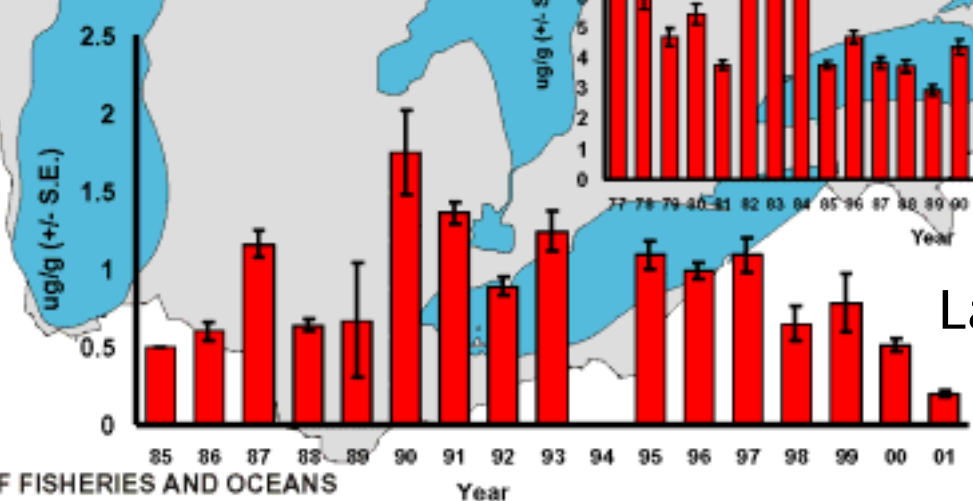
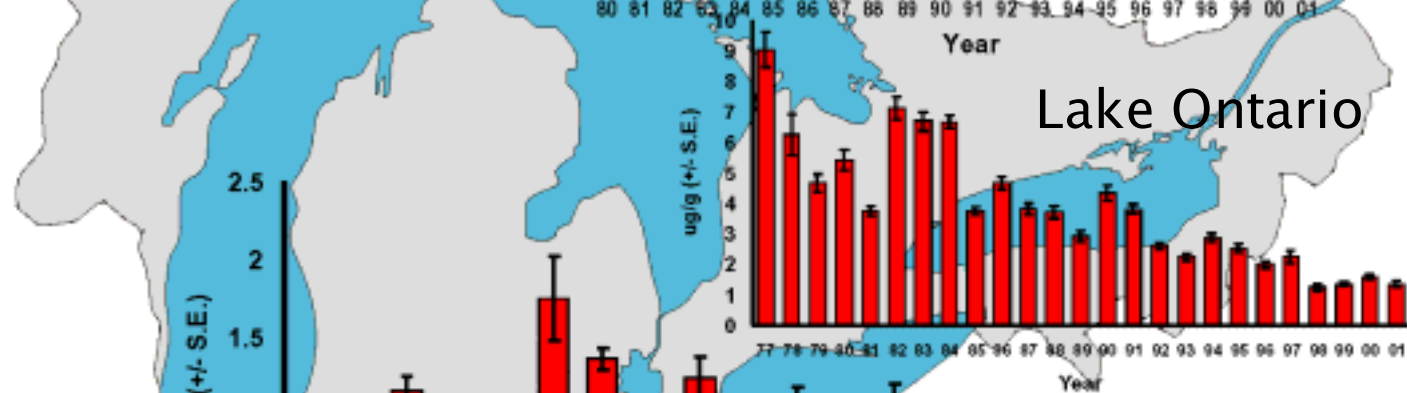
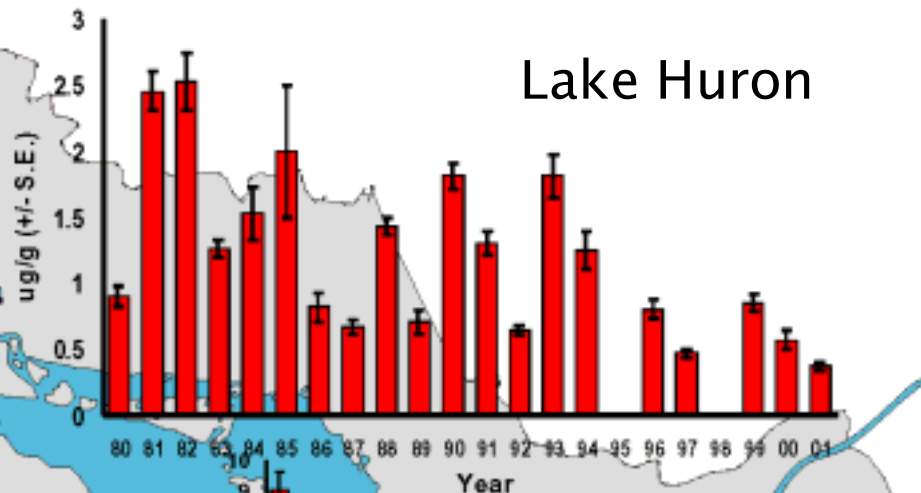
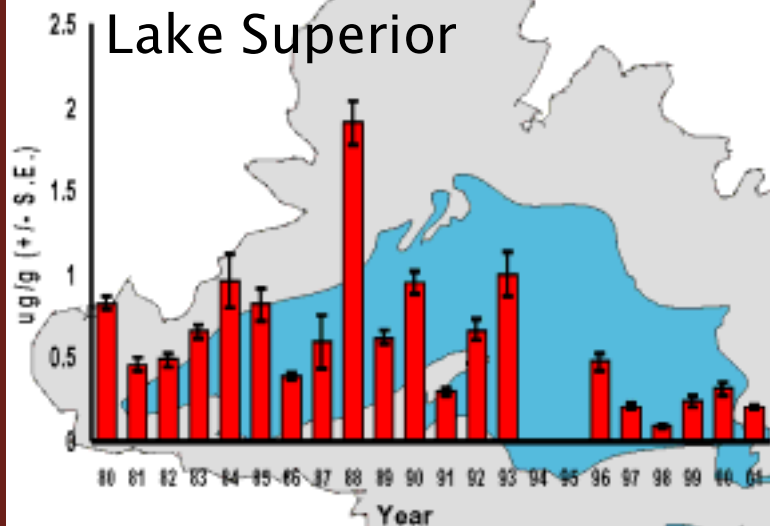
Mirex (ng/g)
20
10
0
1976



1992
1996

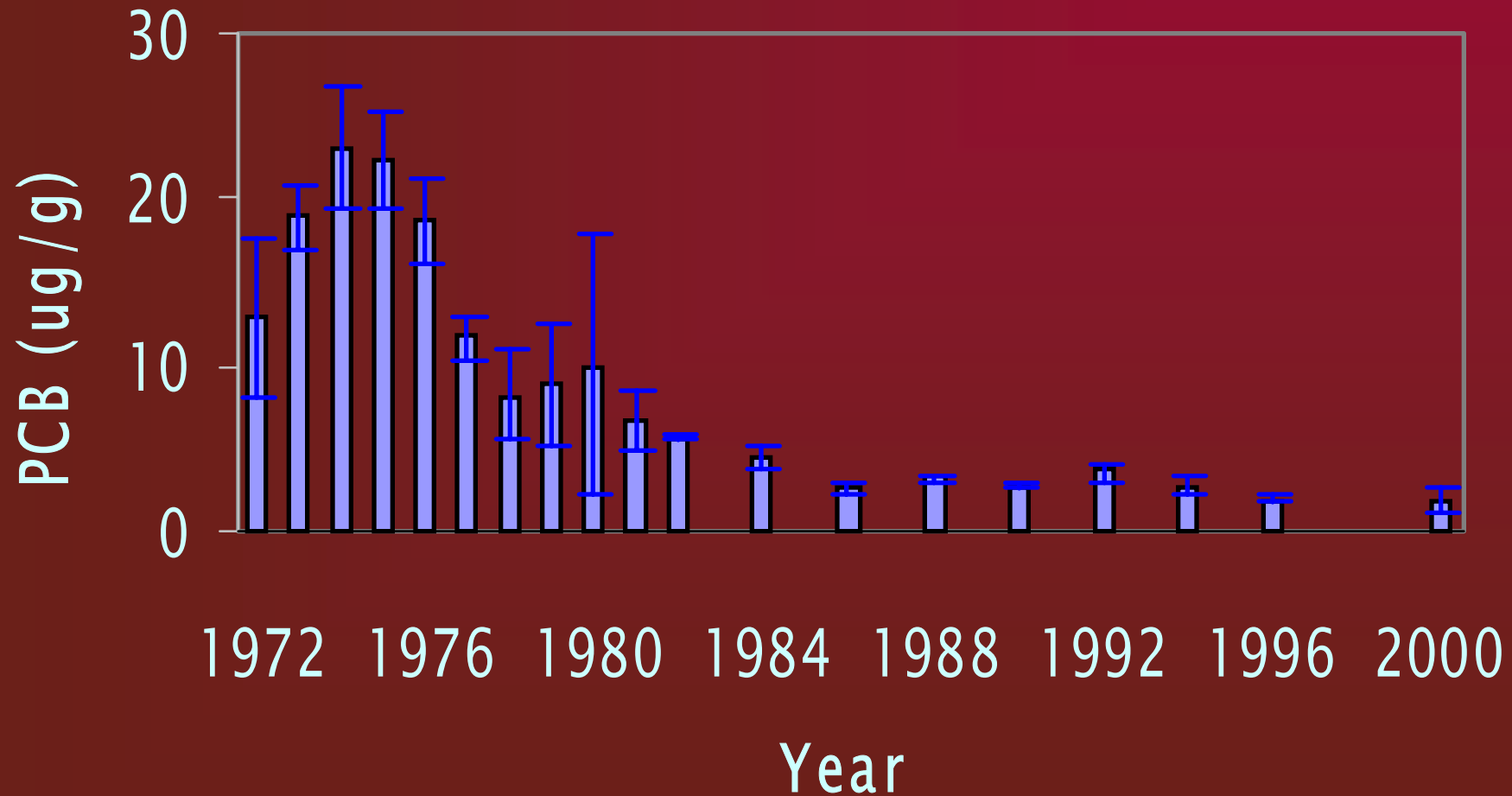
Total PCB Levels in Great Lakes Lake Trout(1977-2001)

(ug/g wet weight +/- S.E., Whole Fish, Age 4' to 6')

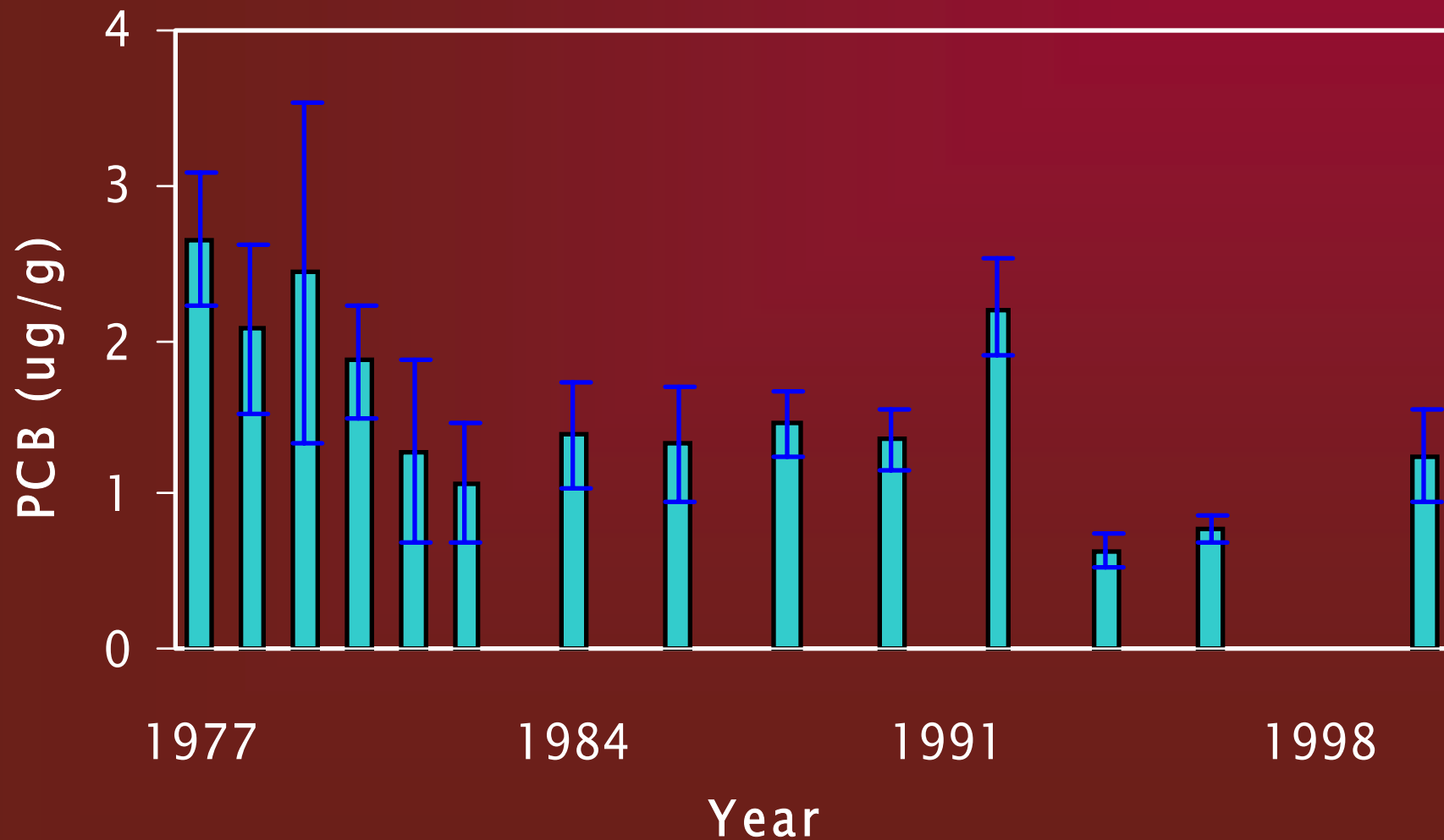


DATA SOURCE: DEPARTMENT OF FISHERIES AND OCEANS

PCBs in Lake Michigan Whole Lake Trout



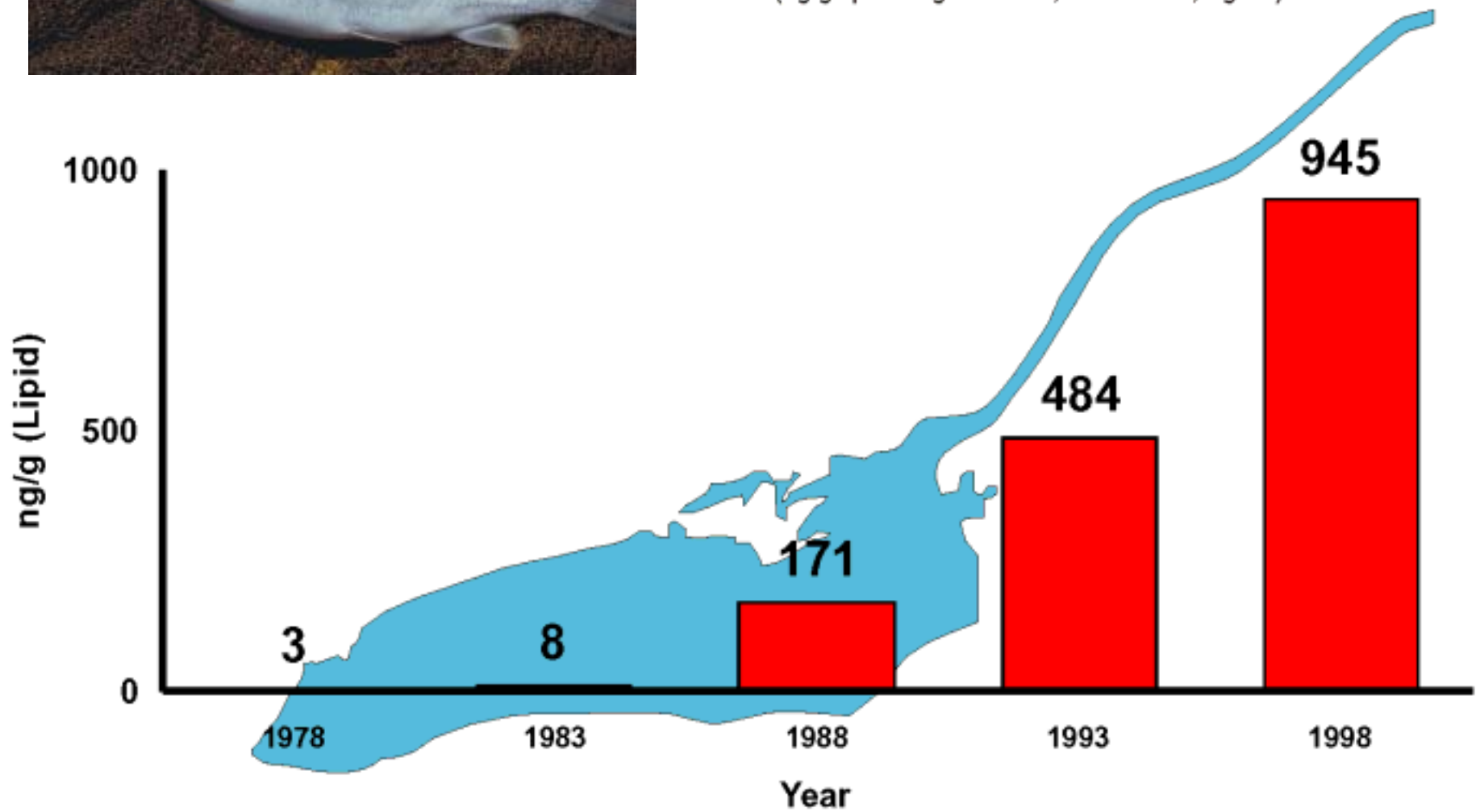
PCBs in Lake Erie Whole Walleye





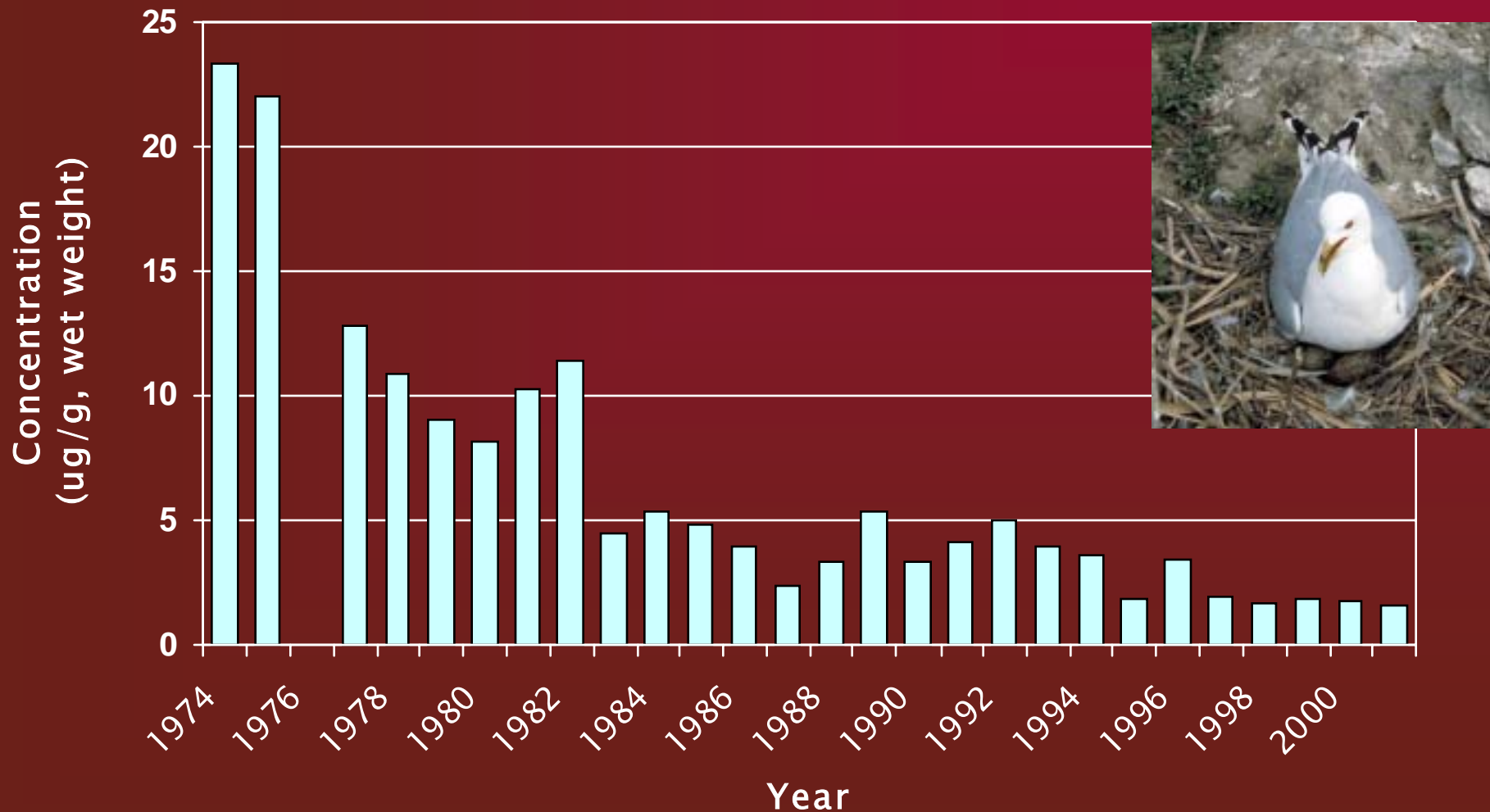
PBDE Trends Lake Ontario Lake Trout

(ng/g lipid weight +/- S.E., Whole Fish, Age 6')

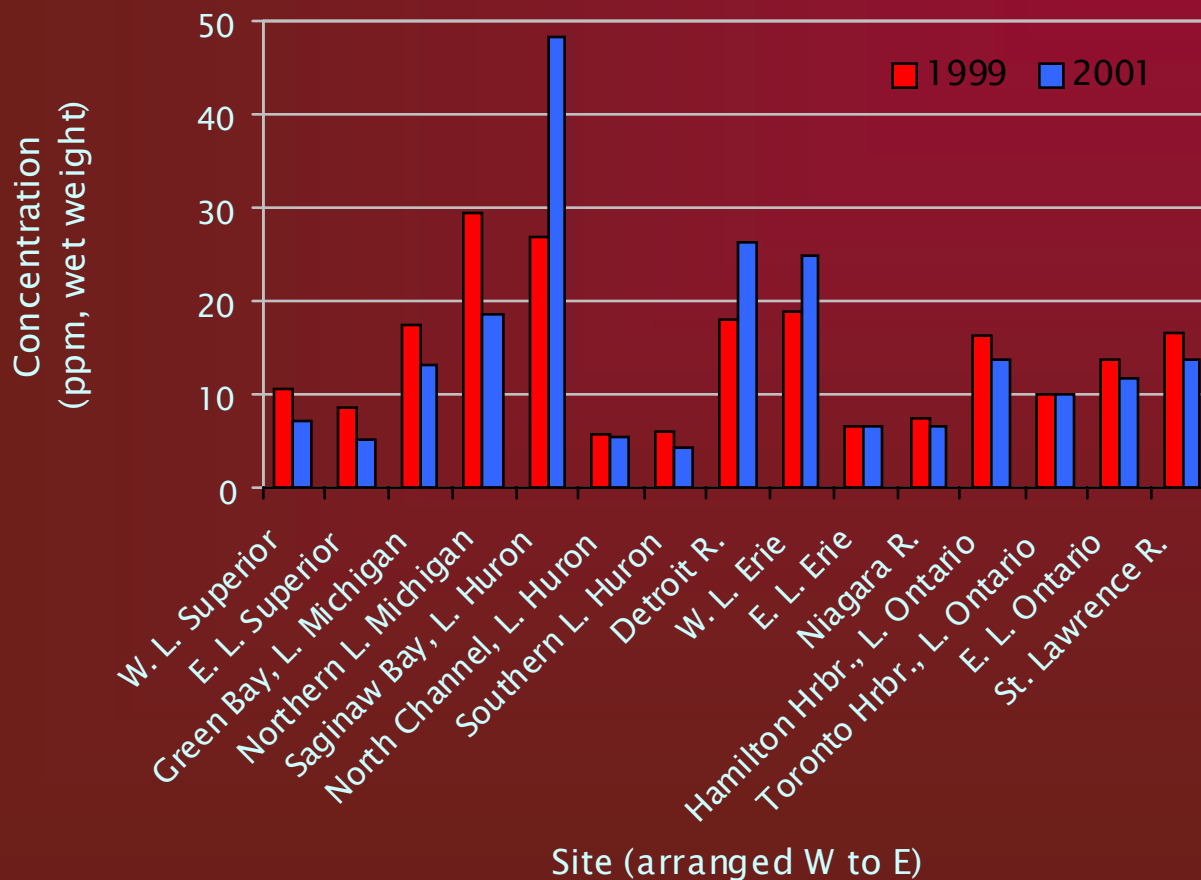


DDE in Herring Gull eggs, Toronto Harbor, 1974 – 2001

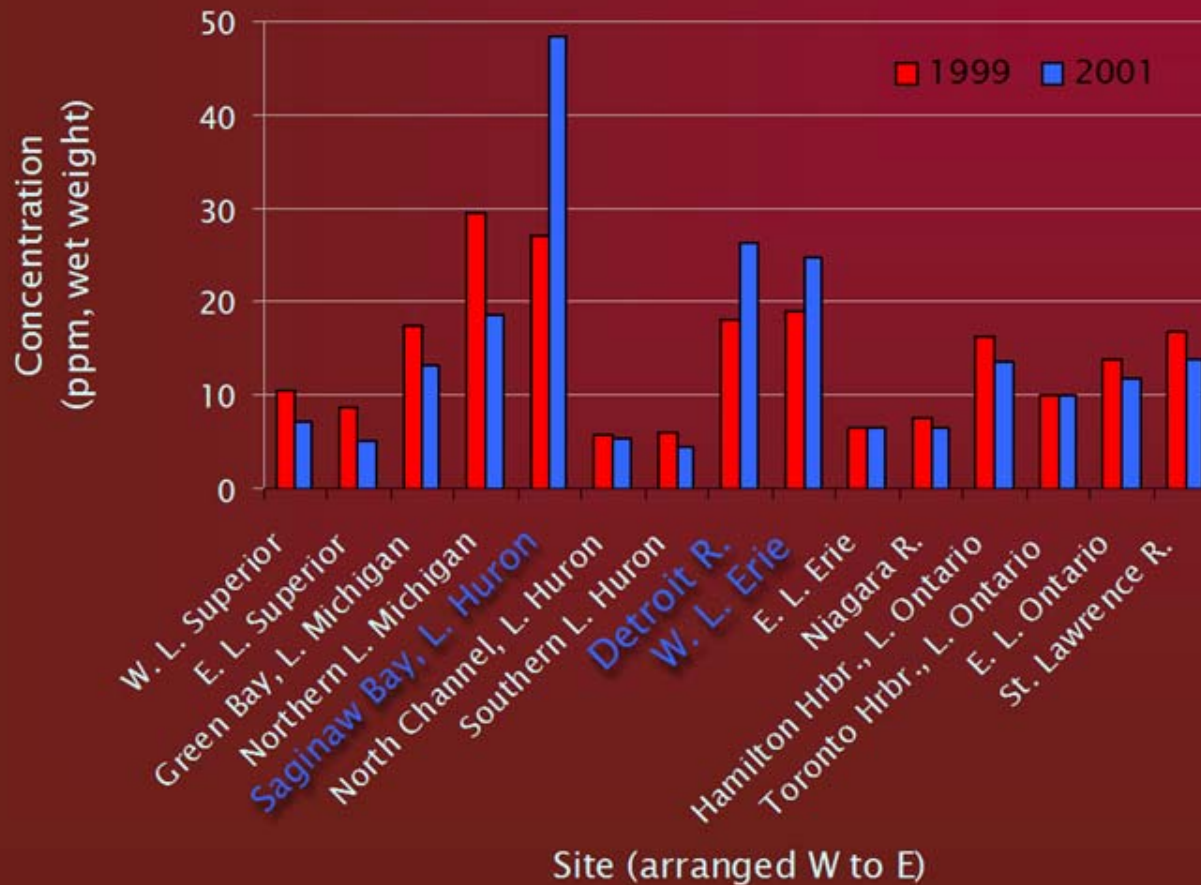
(concentrations in parts per million)



PCBs in Herring Gull Eggs, 1999 and 2001



PCBs in Herring Gull Eggs, 1999 and 2001



Total PCB concentrations (parts per million) in Snapping Turtle eggs from selected sites and years

Site	YEAR			
	1984	1989-91	1998-99	2001
Algonquin Pk. (Reference)	0.187	0.018	0.02	0.02
St. Clair NWA, (Lake St. Clair)	1.095	-	-	-
Turkey Creek, Detroit River	-	-	-	1.832
Wheatley Harbor, Erie	-	-	-	0.413
Rondeau Provincial Park, Erie	1.093	0.617	-	-
Cootes Paradise, Ontario	1.315	3.575	2.956	-
Lynde Creek, Ontario	-	1.43	-	-
Akwesasne, St. Lawrence	0.869	3.946	6.373	-

Toxic Contaminants: How much is in the environment?

- Contaminants in sediment cores
- Toxic chemical concentrations in water
- Atmospheric deposition of toxic chemicals

Sediment Quality Index (SQI) Scores – 1997 Samples

Lake and Basin	SQI Score
Erie	
Western	85
Central	86
Eastern	95
Ontario	
Niagara	67
Mississauga	66
Rochester	70
Kingston	87

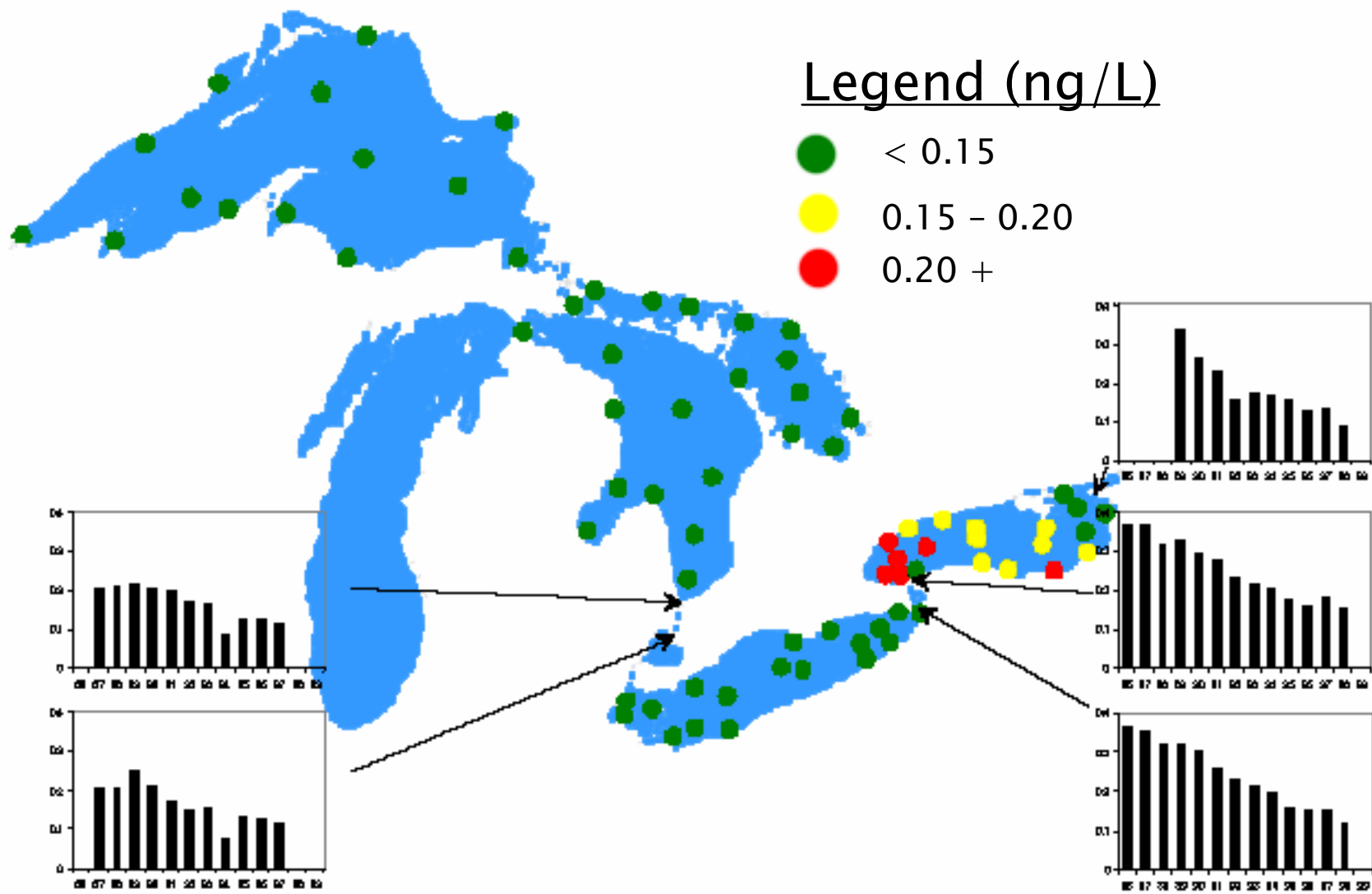
Scale: 0 = Poor, 100 = Excellent

SQL scores for Five Areas of Concern in the U.S.

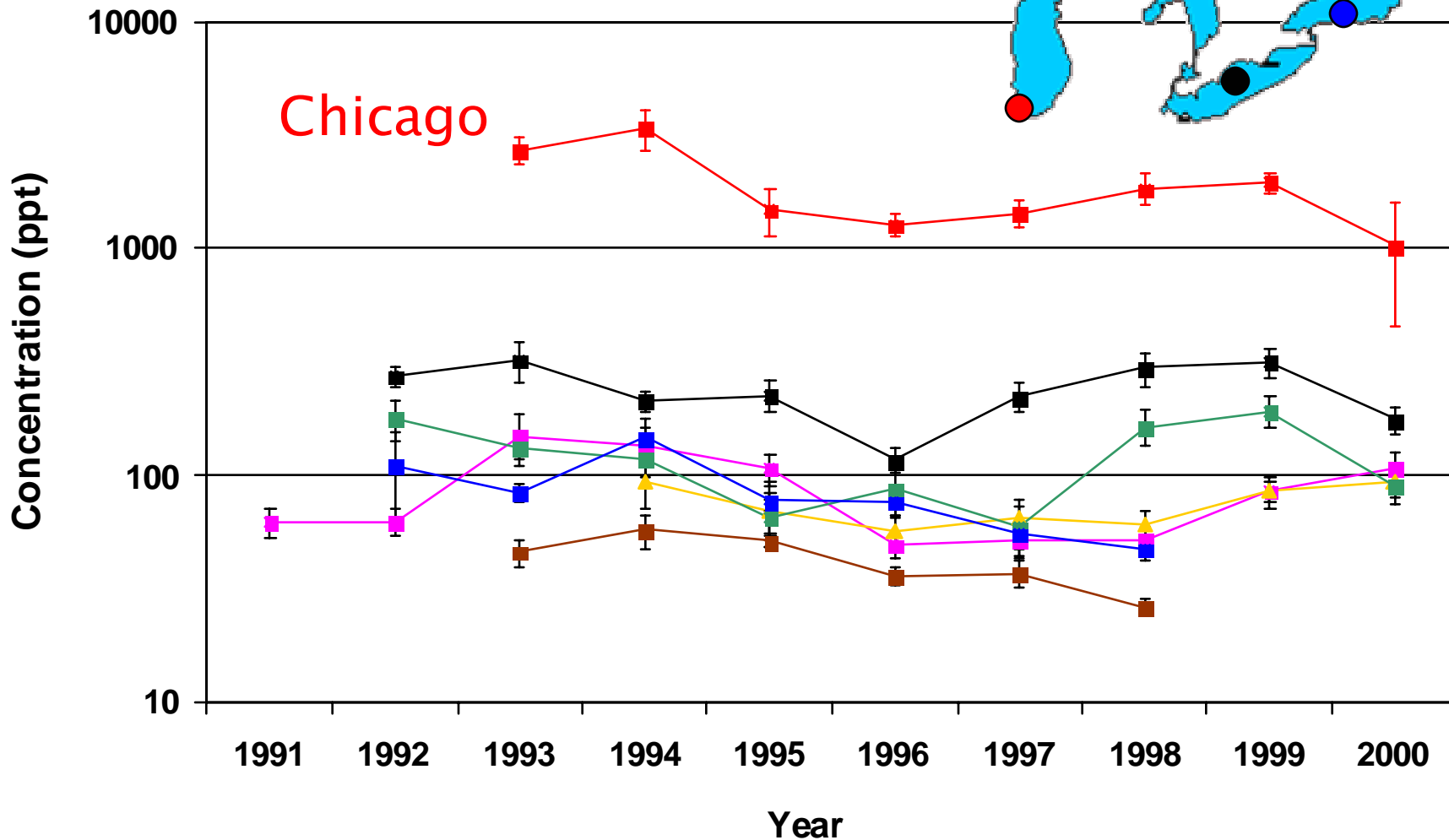
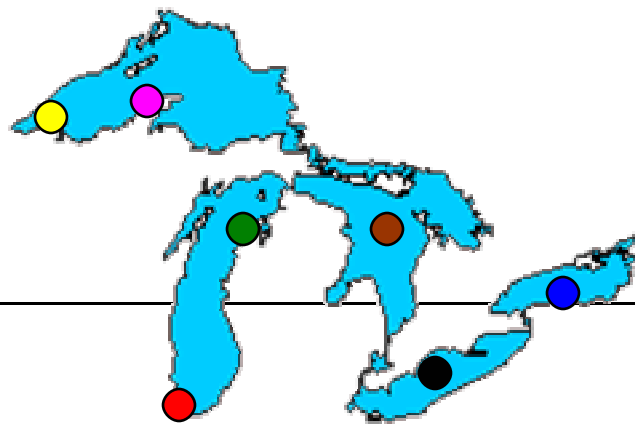
SITE	Lake	SQL Score
Buffalo River, NY	Erie	93
Saginaw River and Harbor, MI	Michigan	58
Ashtabula River and Harbor, OH	Erie	36
Sheboygan River and Harbor, WI	Michigan	29
Grand Calumet River / Indiana Harbor, IN	Michigan	25

Scale: 0 = Poor, 100 = Excellent

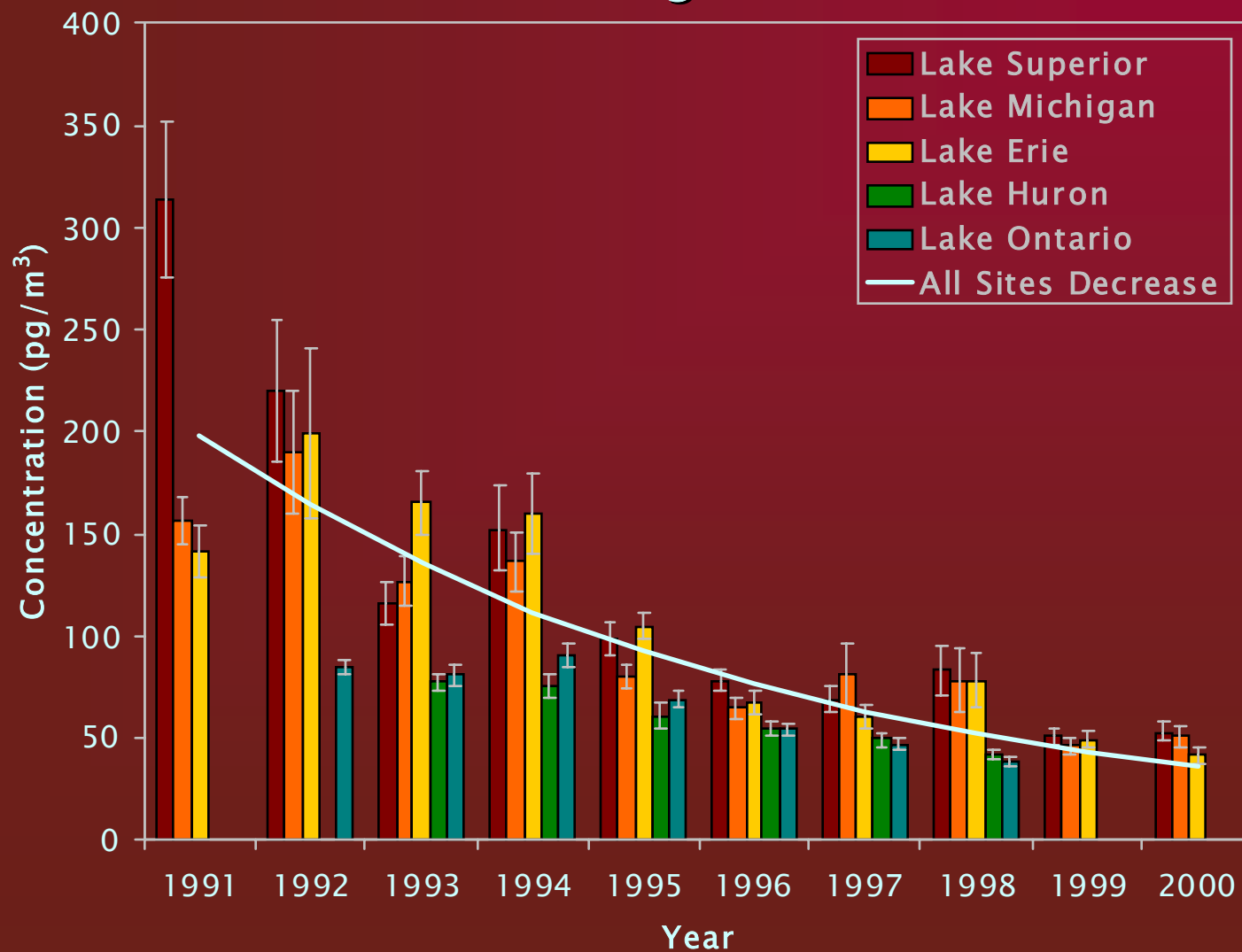
Dieldrin (pesticide) concentrations in Great Lakes Waters 1997 - 2000



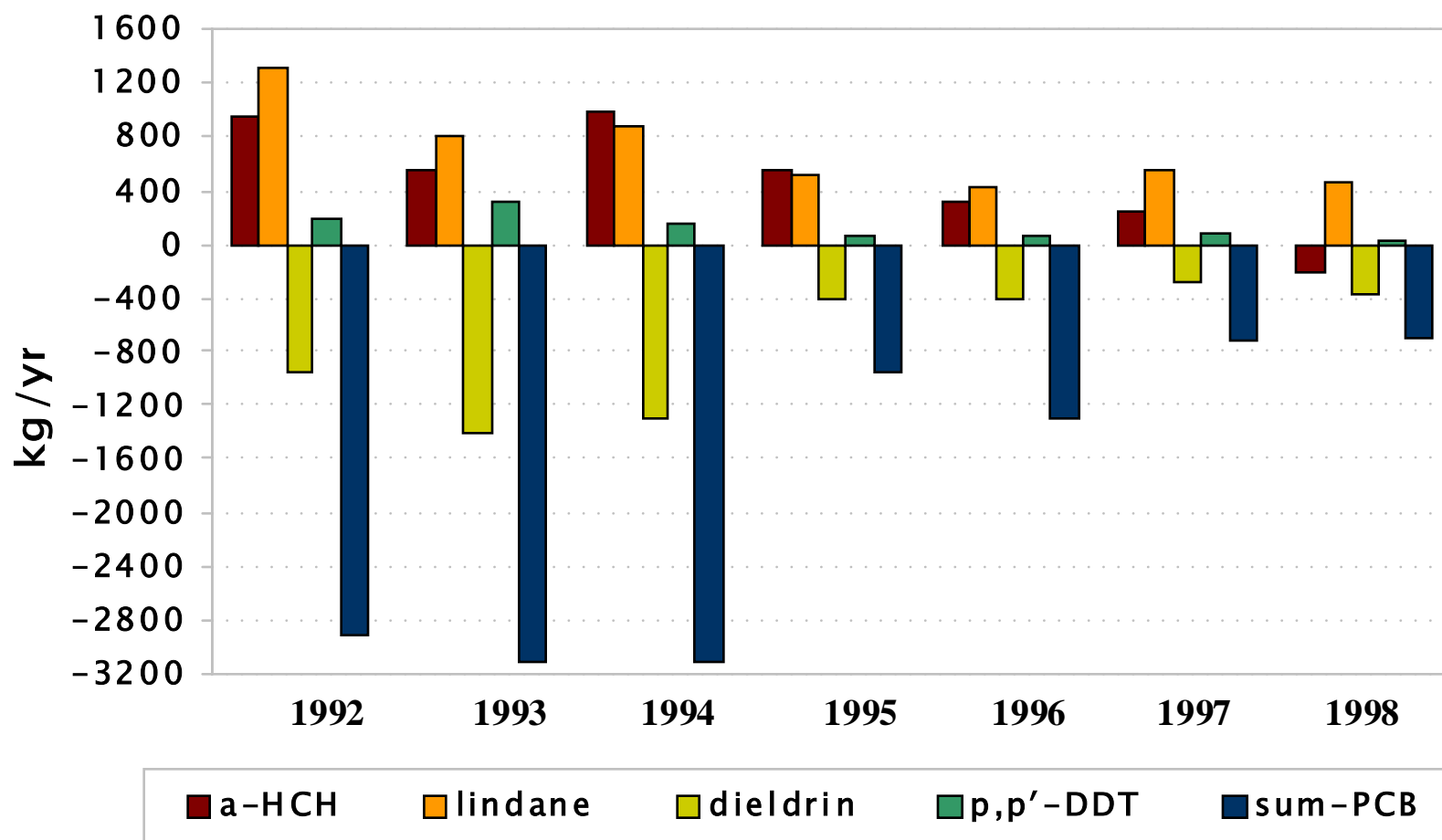
PCBs in atmospheric deposition



Atmospheric Concentrations of Hexachlorocyclohexane



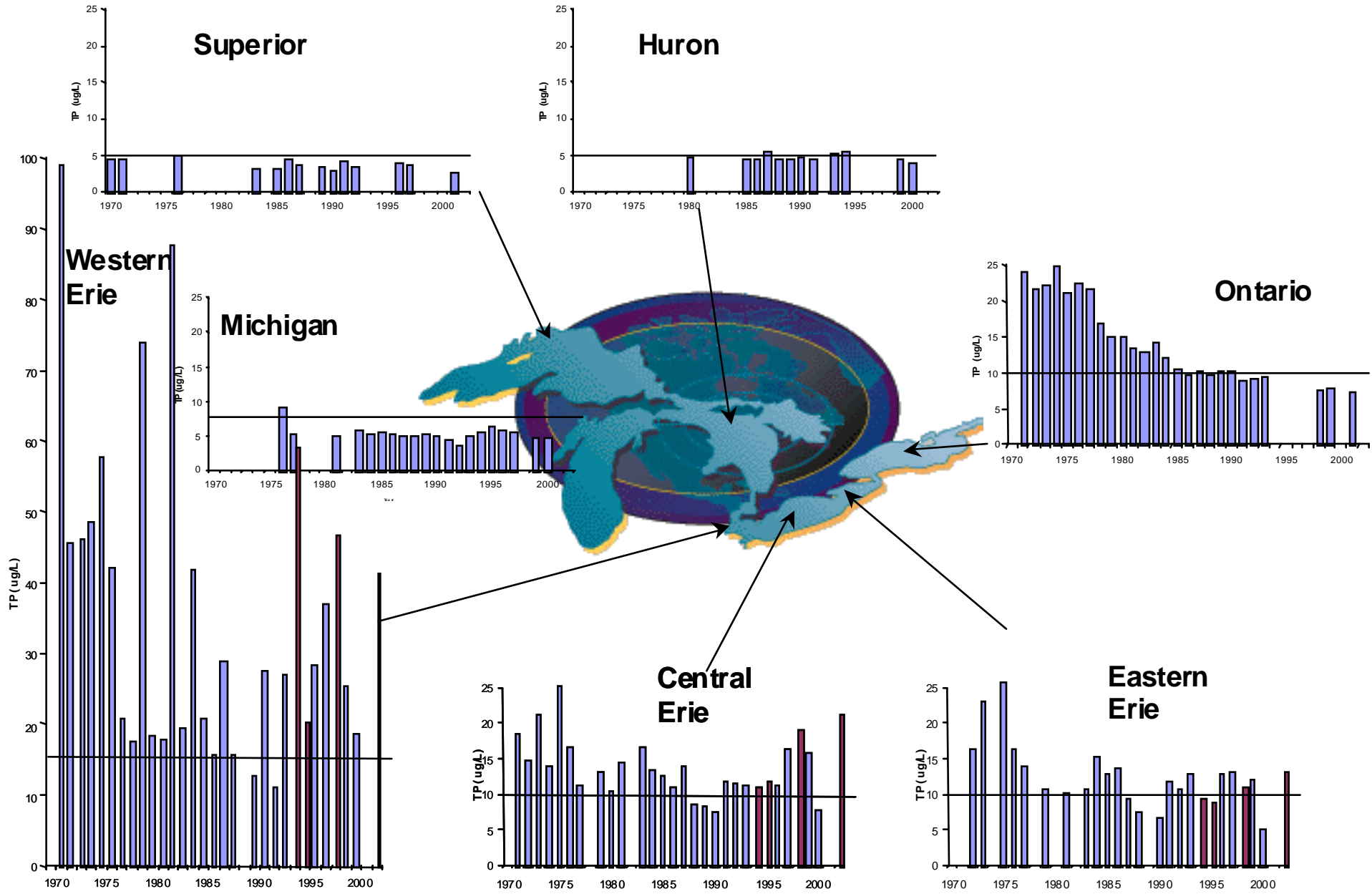
Atmospheric Deposition of Five Organochlorine Compounds (mass deposited per year)



Excessive Nutrients

- Phosphorus concentrations

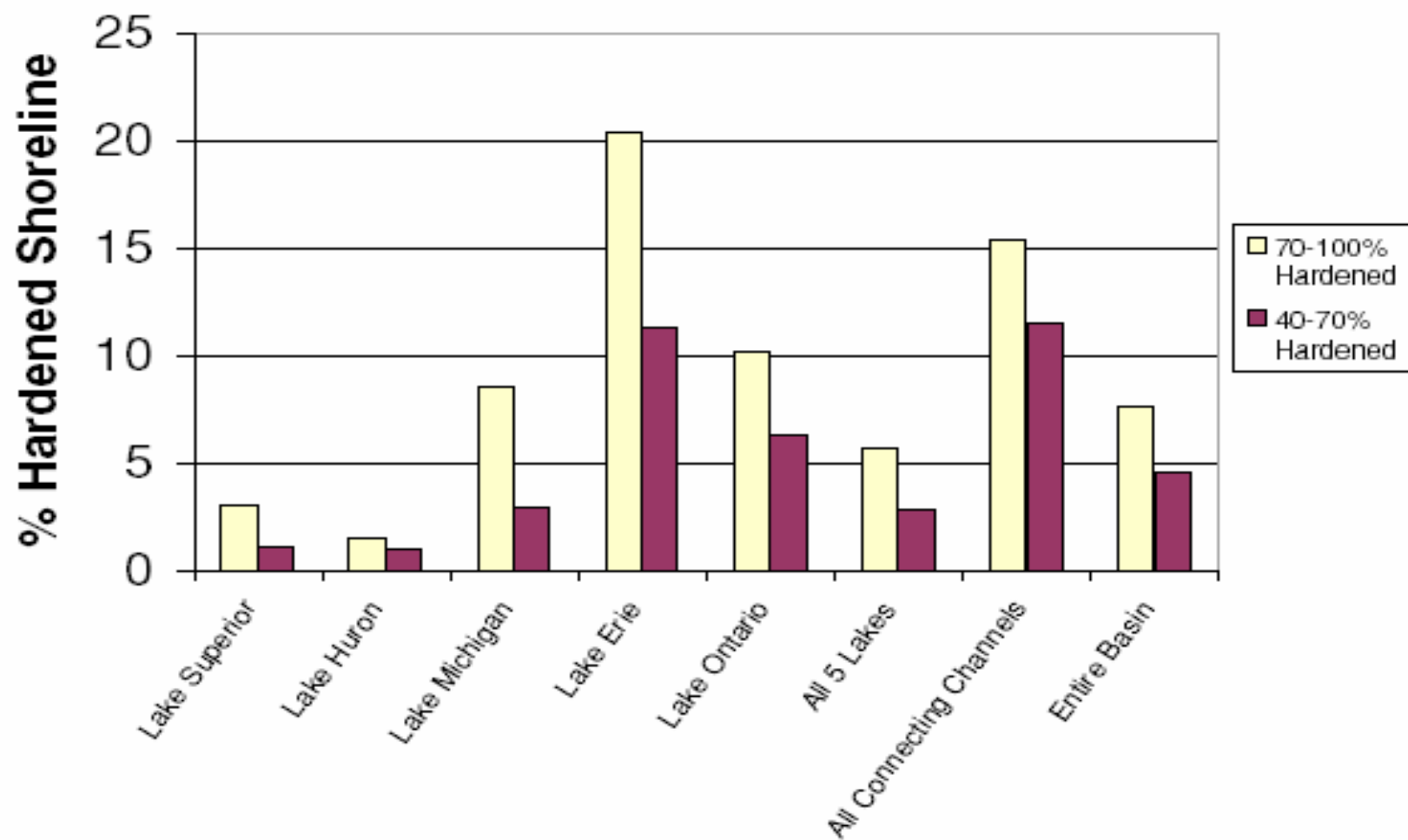




Physical Processes

- Extent of hardened shoreline
- Effect of water level fluctuations
- Climate change – Ice on the Great Lakes

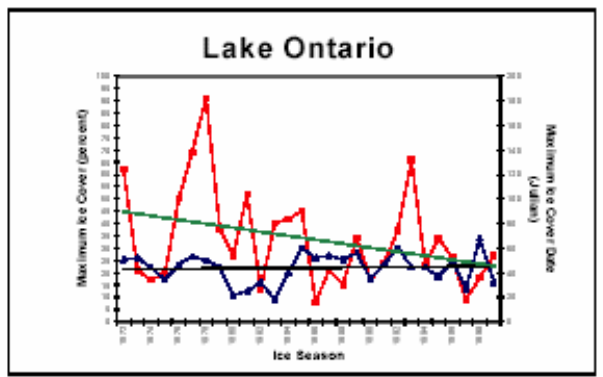
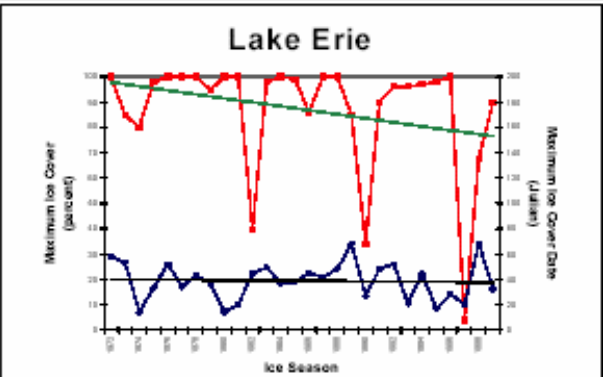
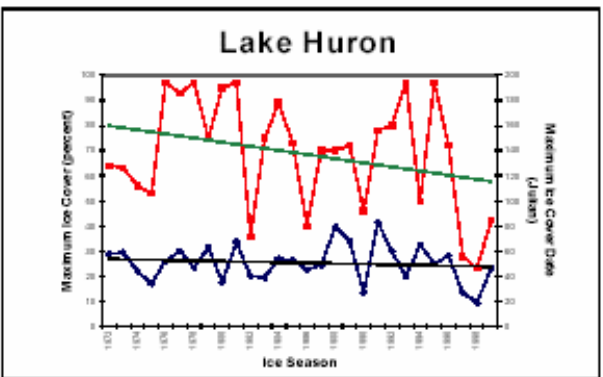
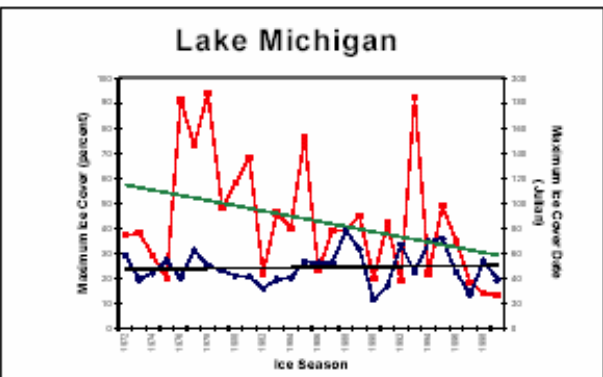
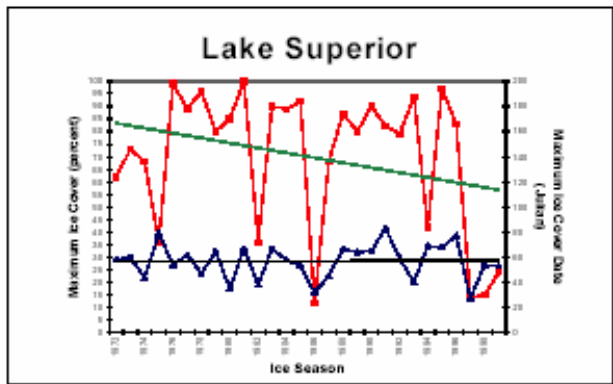
Extent of Hardened Shoreline



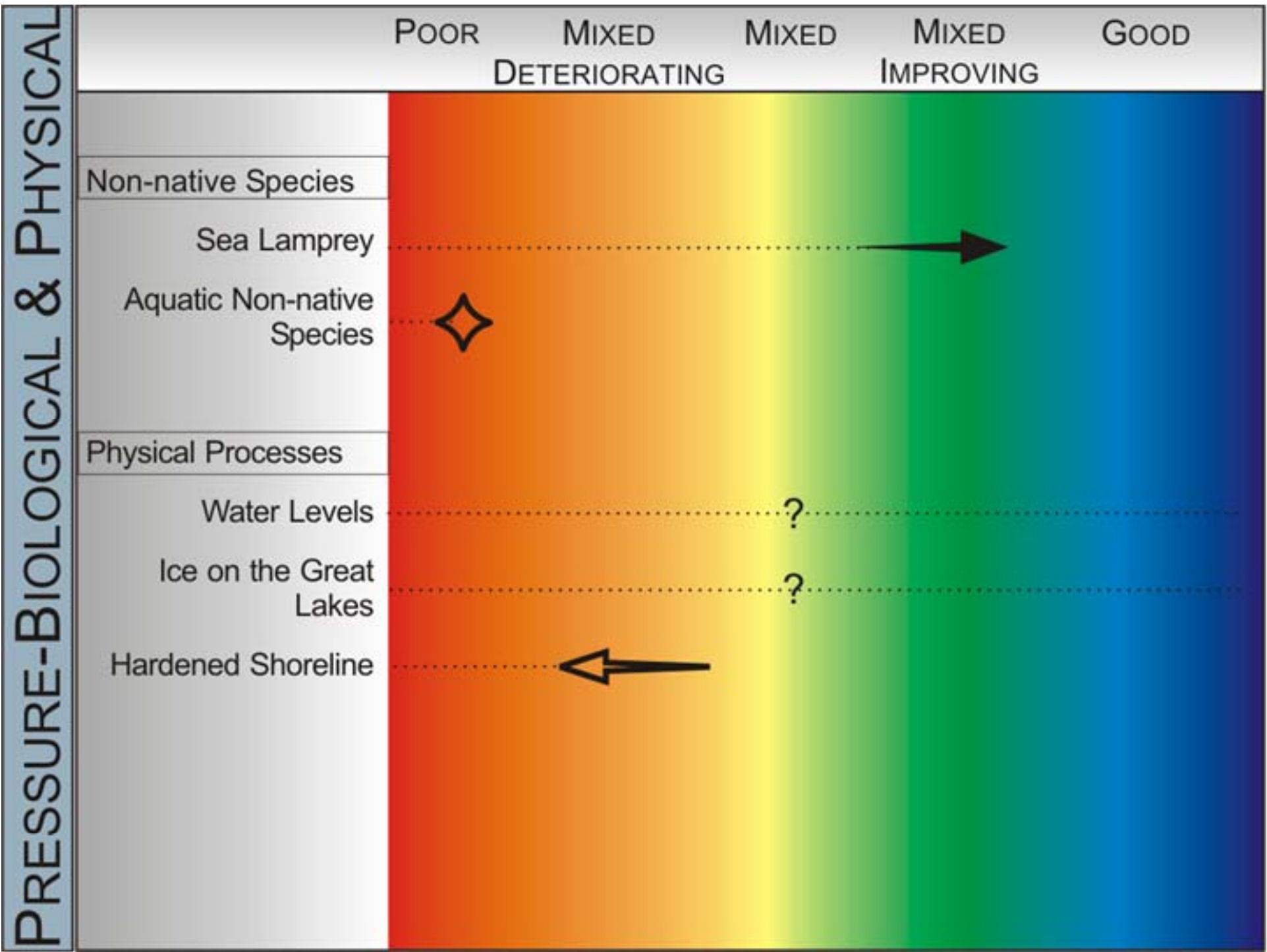
Effect of Water Level Fluctuations



Climate Change – Ice on the Great Lakes







PRESSURE-BIOLOGICAL & PHYSICAL

POOR MIXED MIXED MIXED GOOD
DETERIORATING IMPROVING

Non-native Species

Sea Lamprey

Aquatic Non-native Species

Physical Processes

Water Levels

Ice on the Great Lakes

Hardened Shoreline

