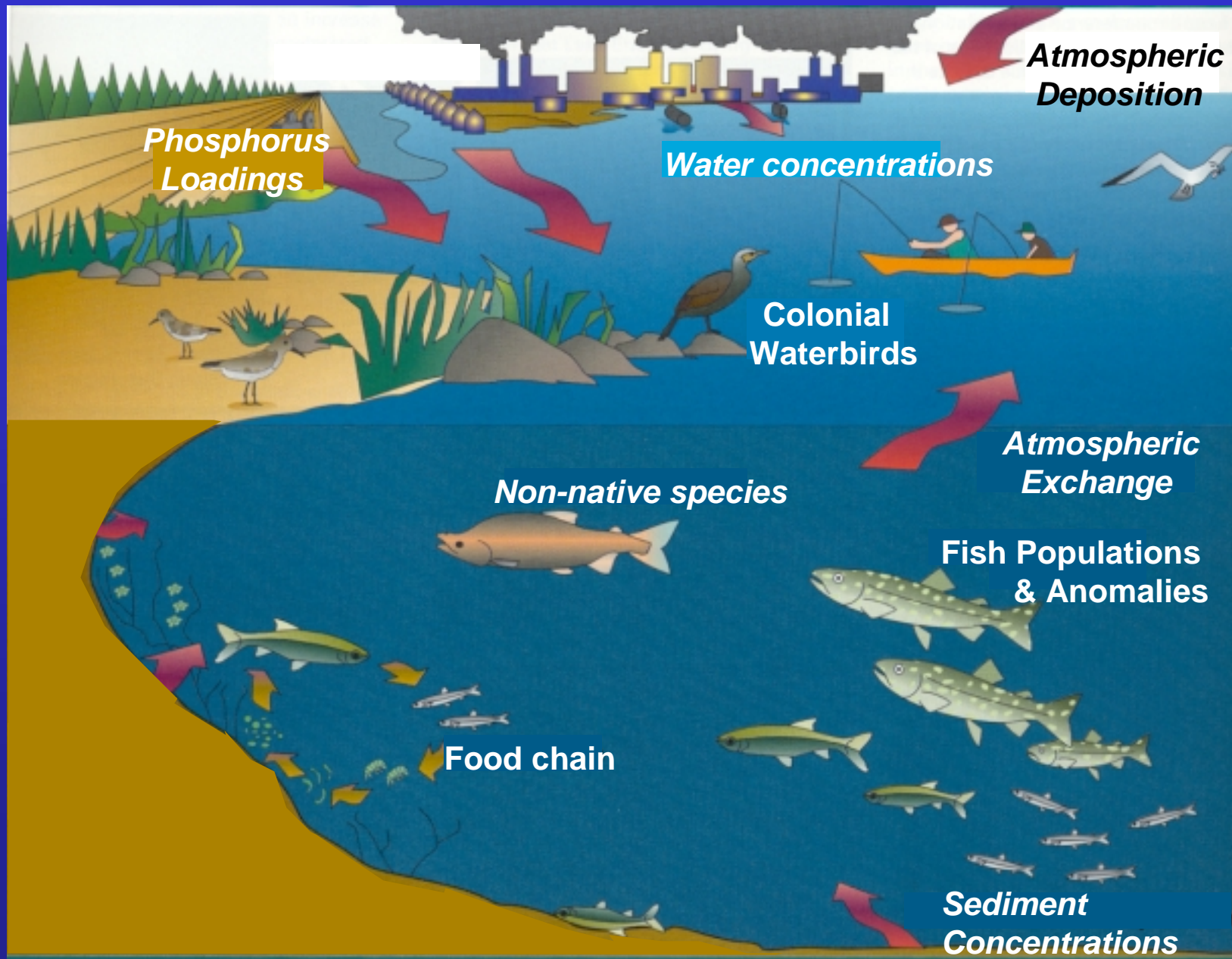


Nearshore and Open Water Indicators

Melanie Neilson
Environment Canada

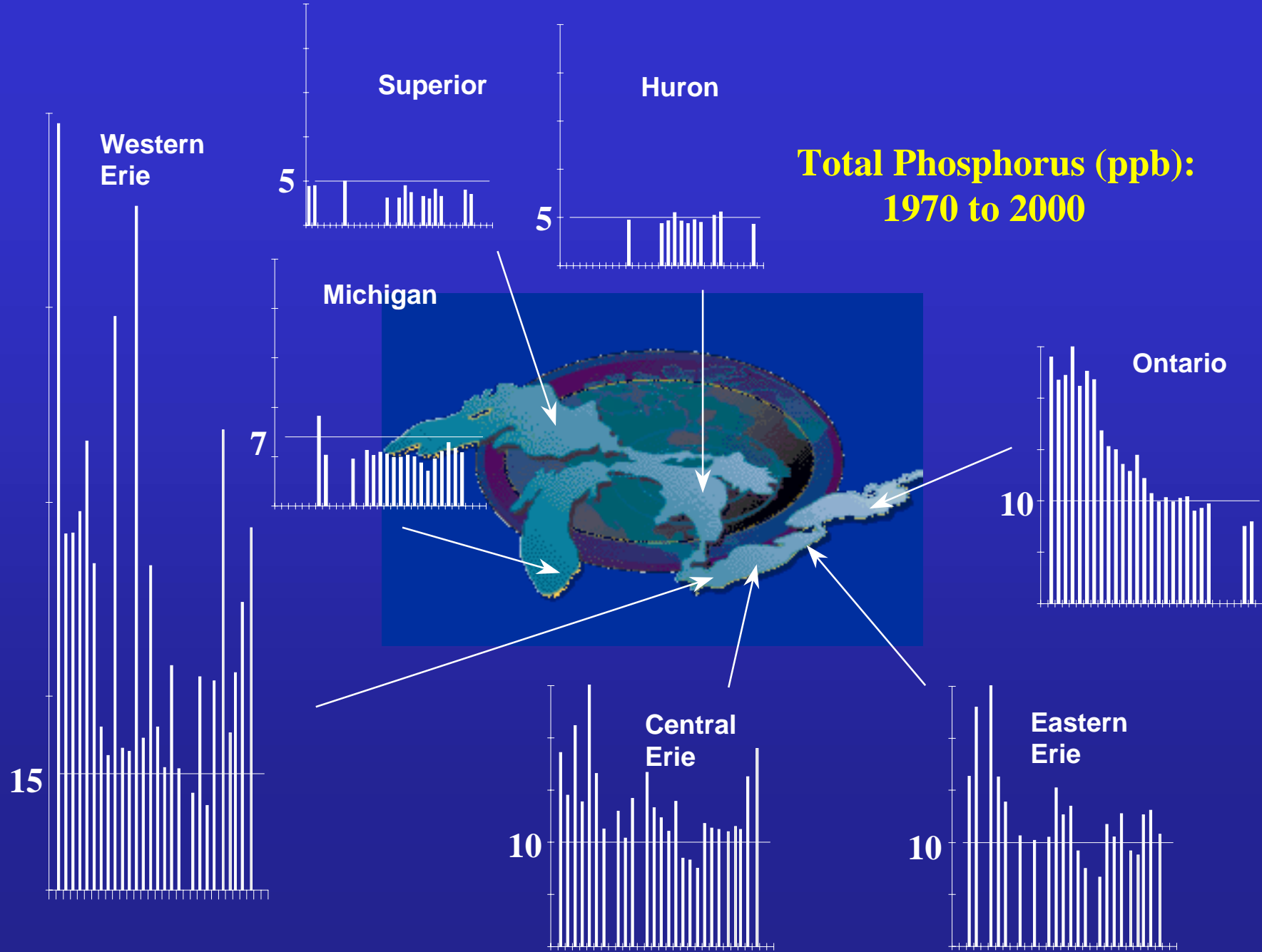


"Water" Pressures

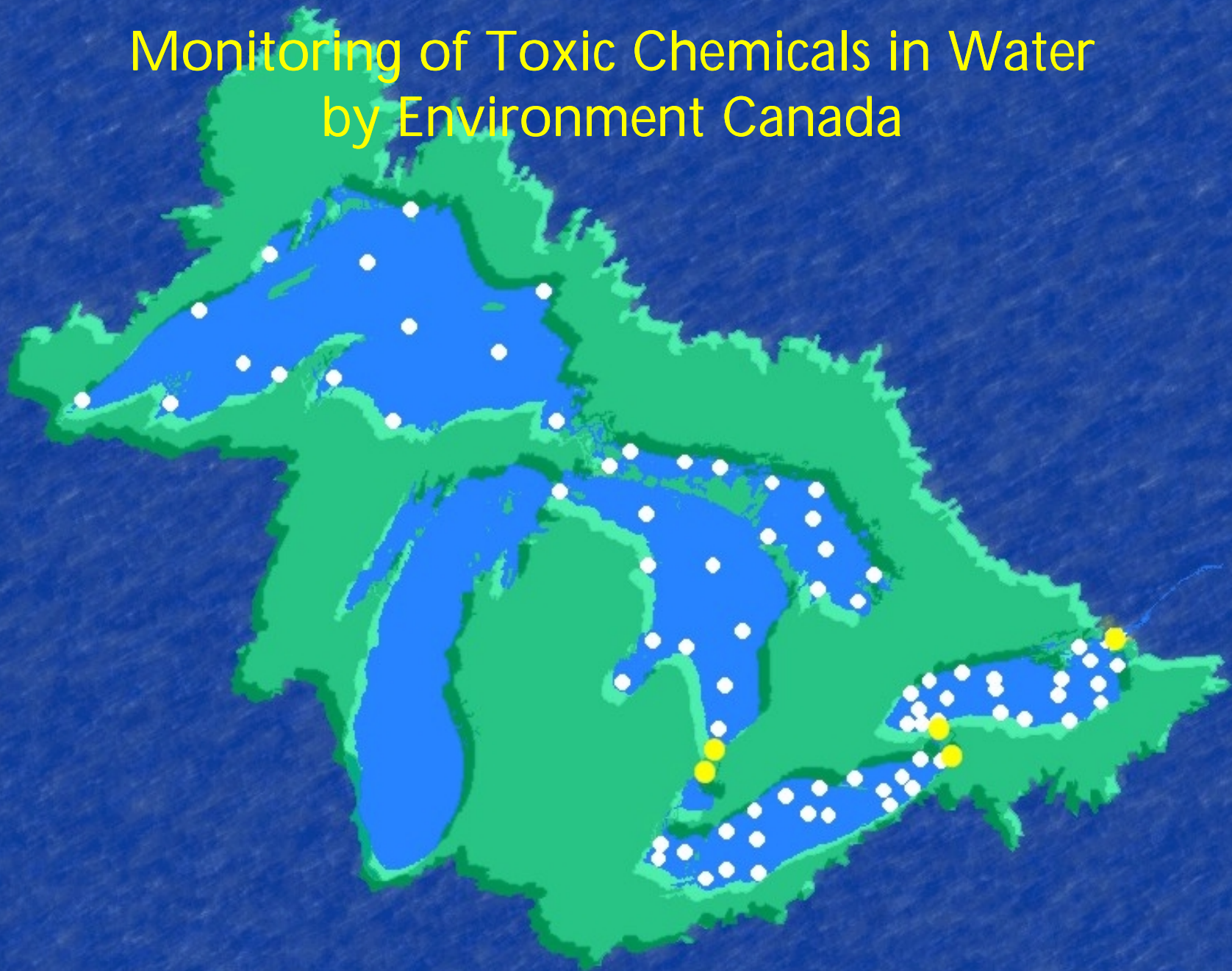
- Nutrients
- Toxic chemicals
- Non-native species



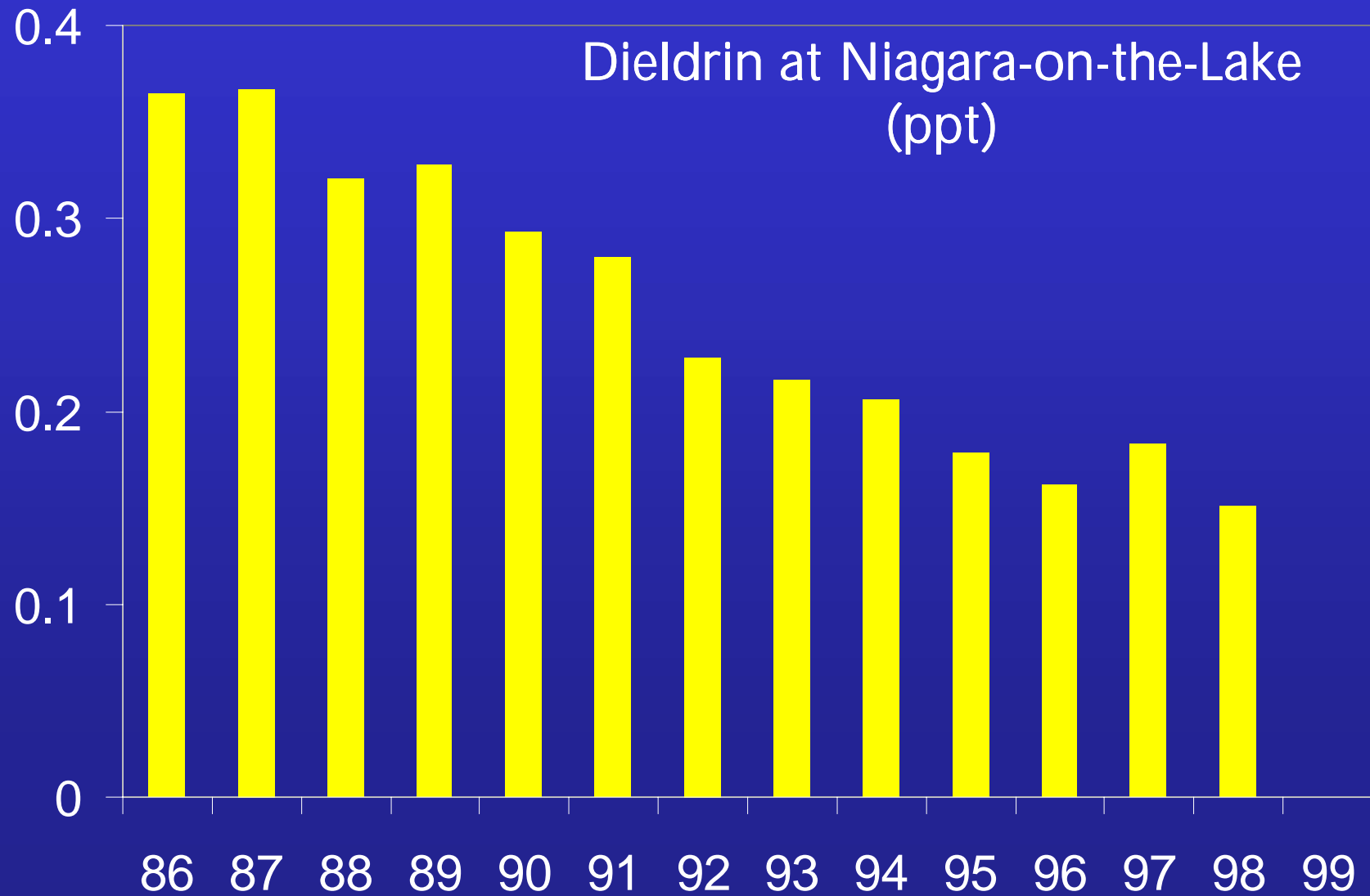
**Total Phosphorus (ppb):
1970 to 2000**



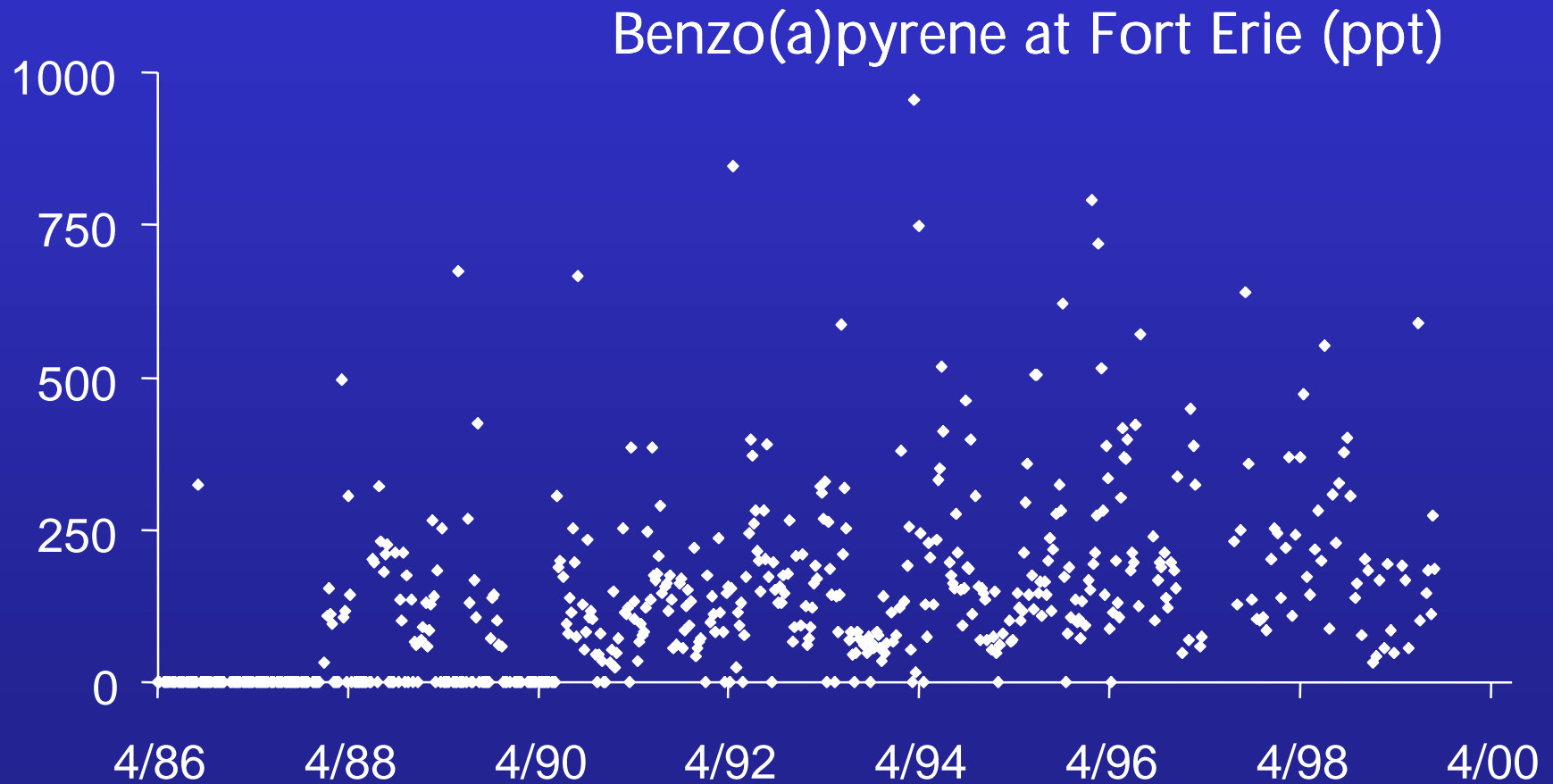
Monitoring of Toxic Chemicals in Water by Environment Canada



Toxic Chemicals: Water

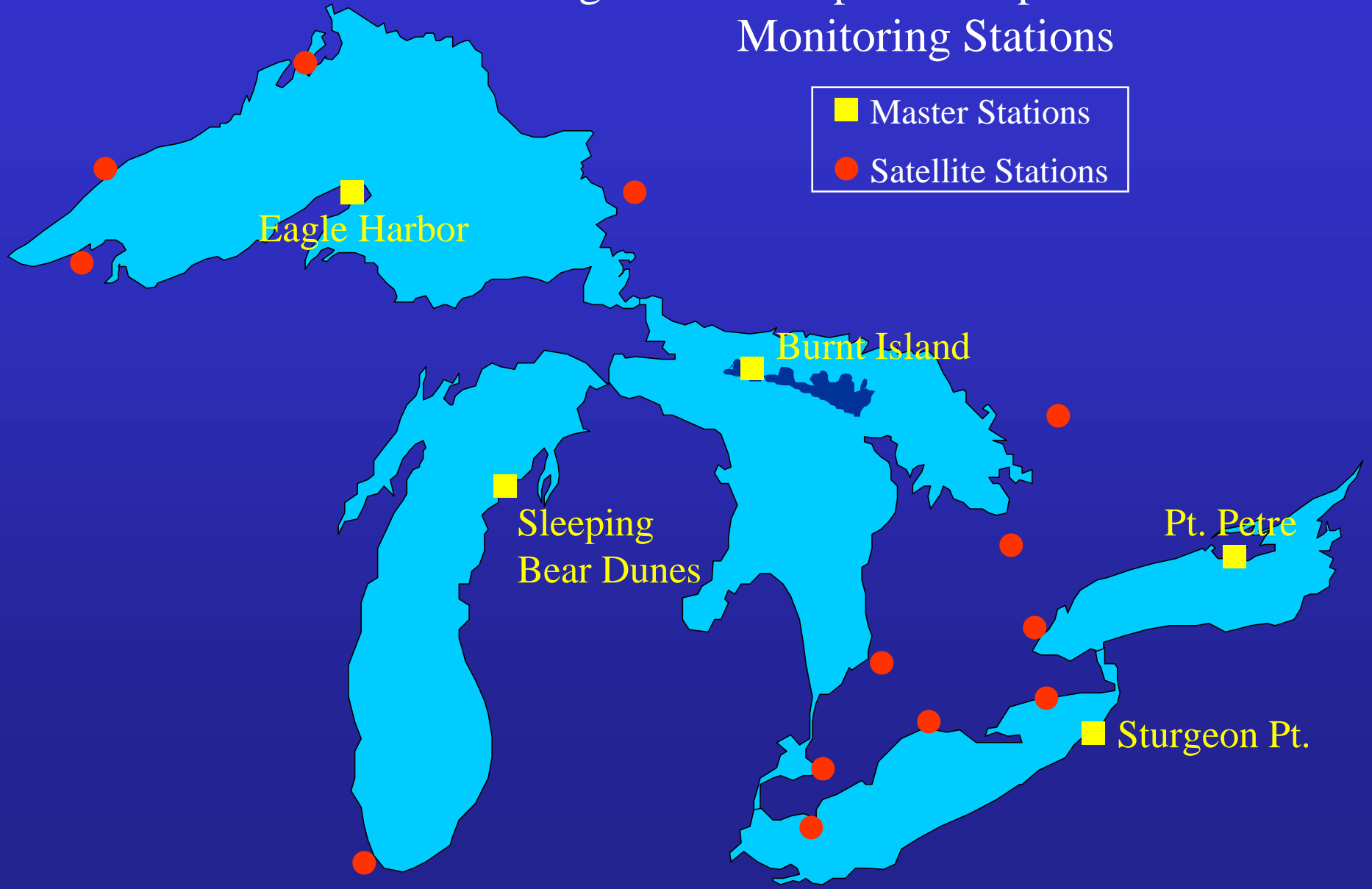


Toxic Chemicals: Water



Integrated Atmospheric Deposition Network Monitoring Stations

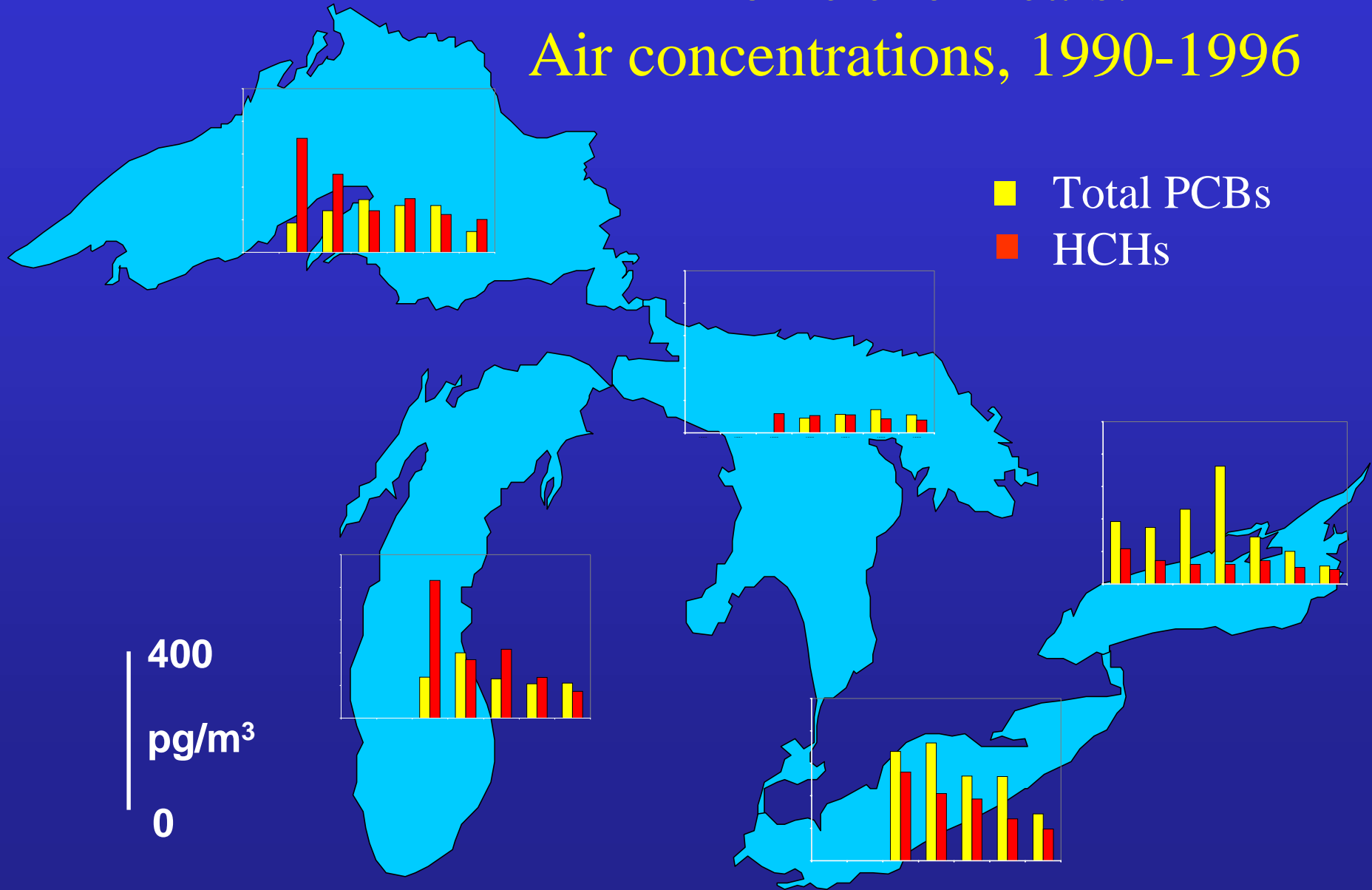
■ Master Stations
● Satellite Stations



Toxic chemicals: Air concentrations, 1990-1996

■ Total PCBs
■ HCHs

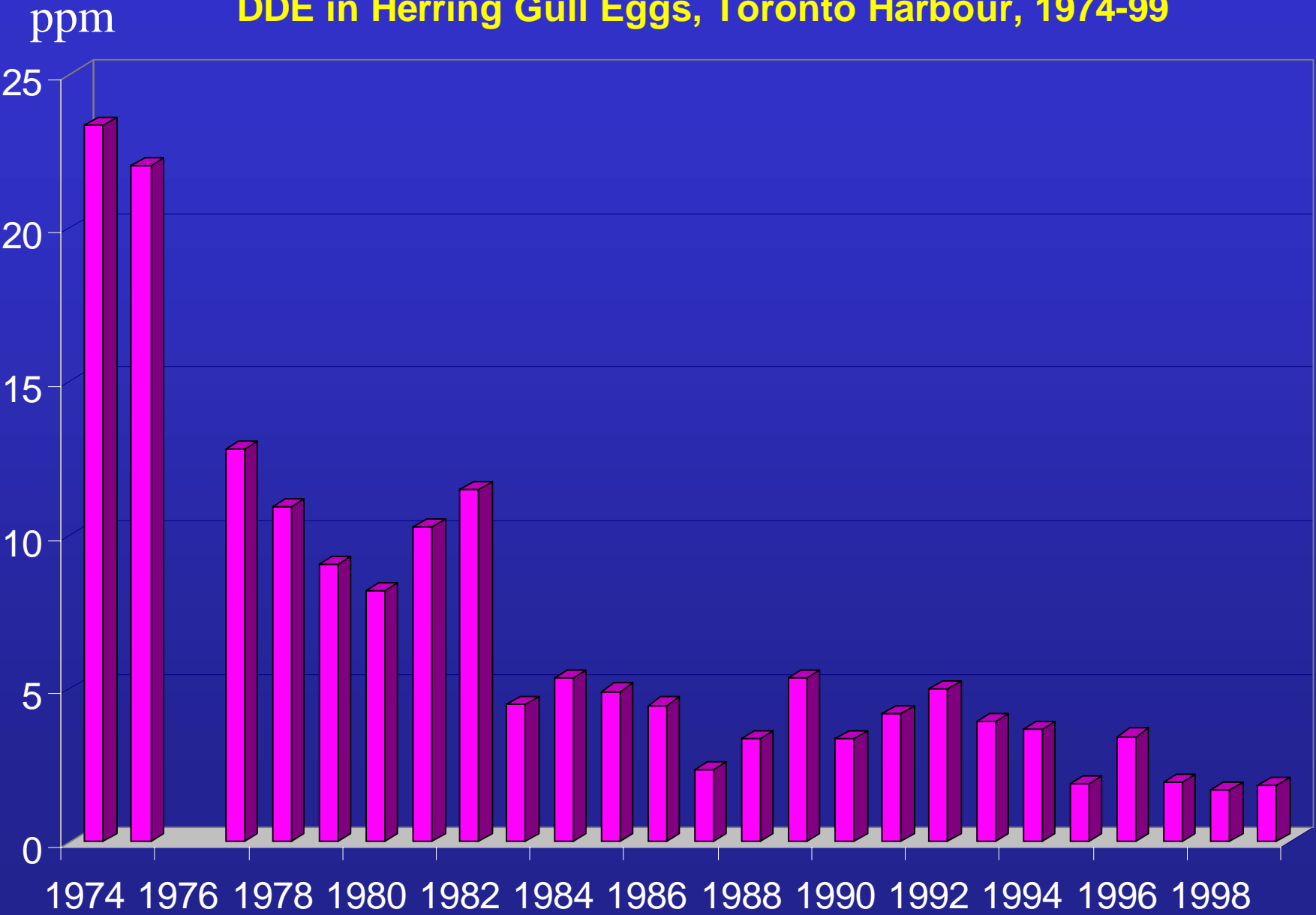
400
pg/m³
0



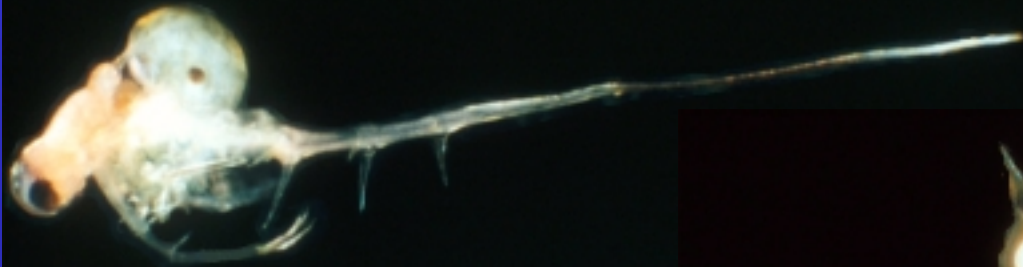
Toxic Chemicals: Colonial Waterbirds



DDE in Herring Gull Eggs, Toronto Harbour, 1974-99



Non-native species



Bythotrephes



Cercopagis



Dreissenid

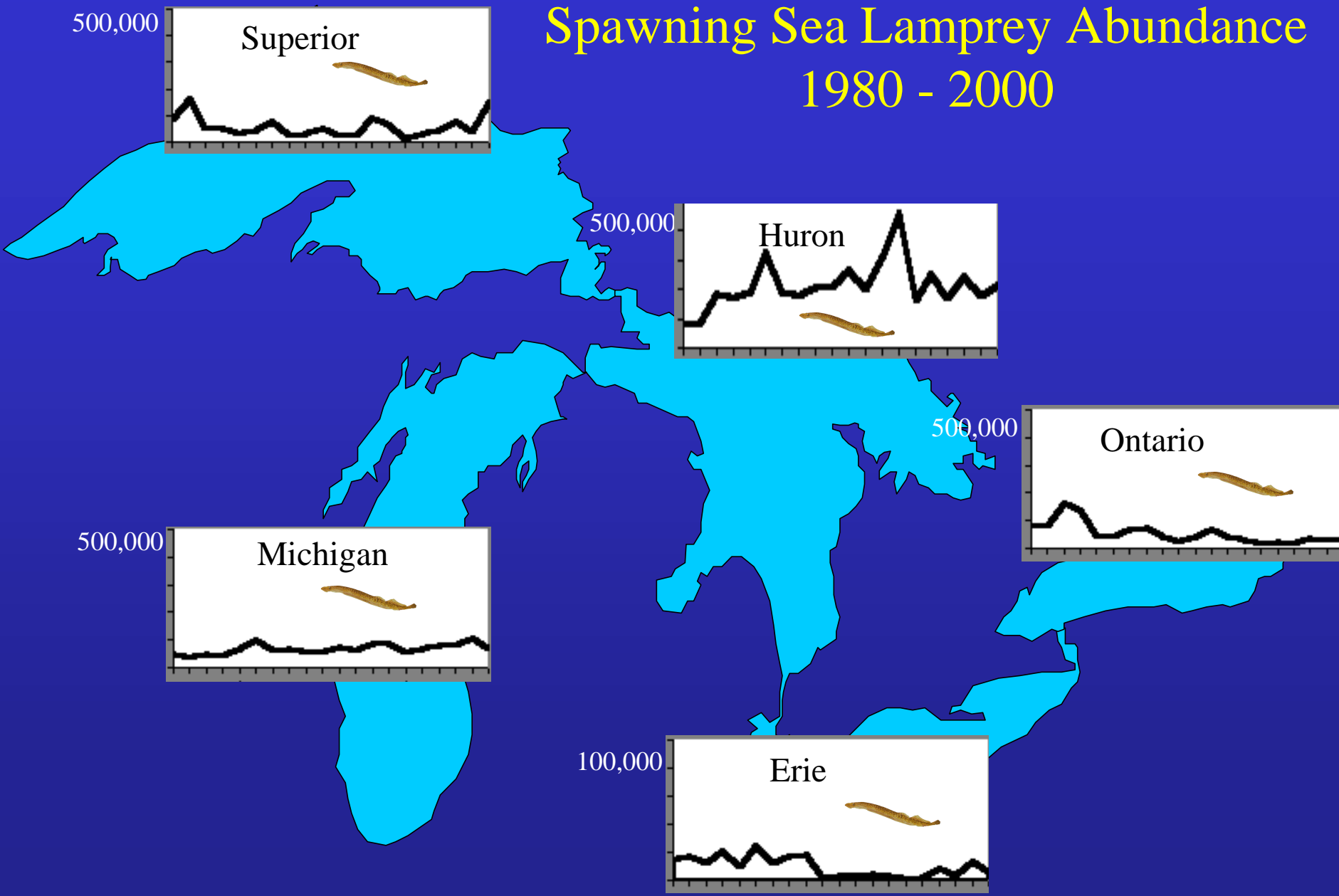


Lamprey



Ruffe

Spawning Sea Lamprey Abundance 1980 - 2000

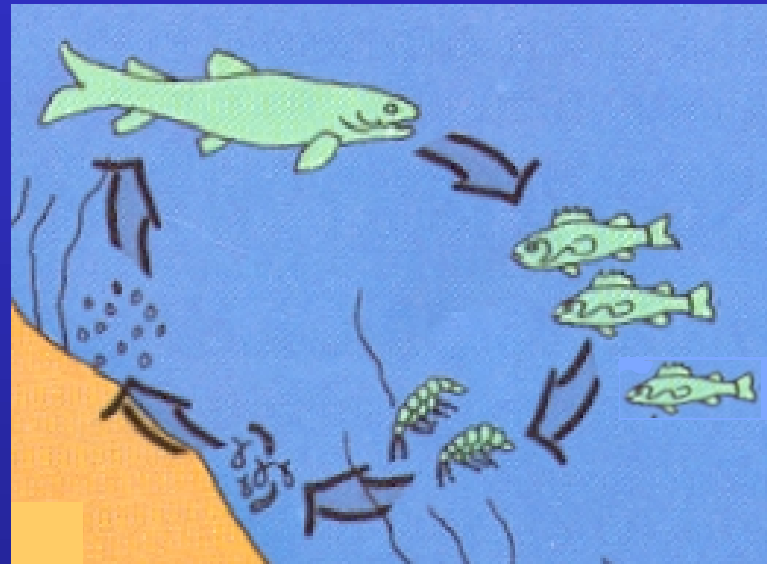
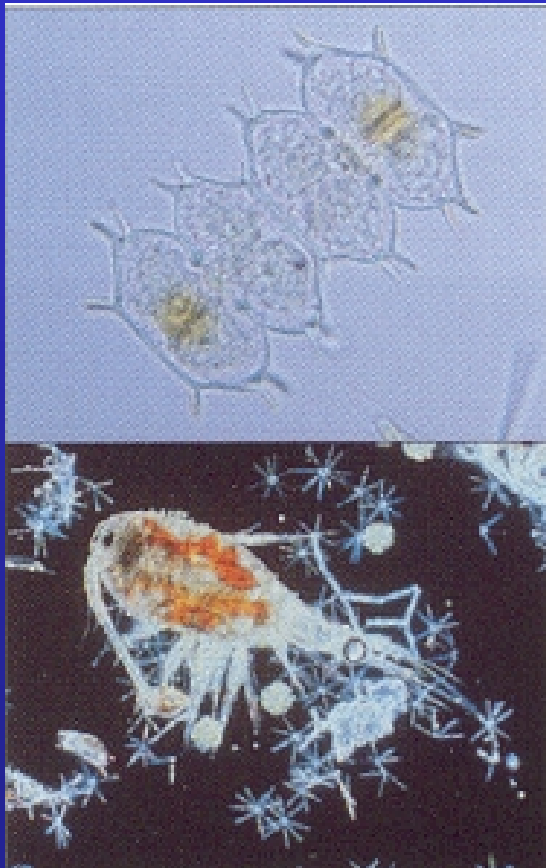


"Water" State

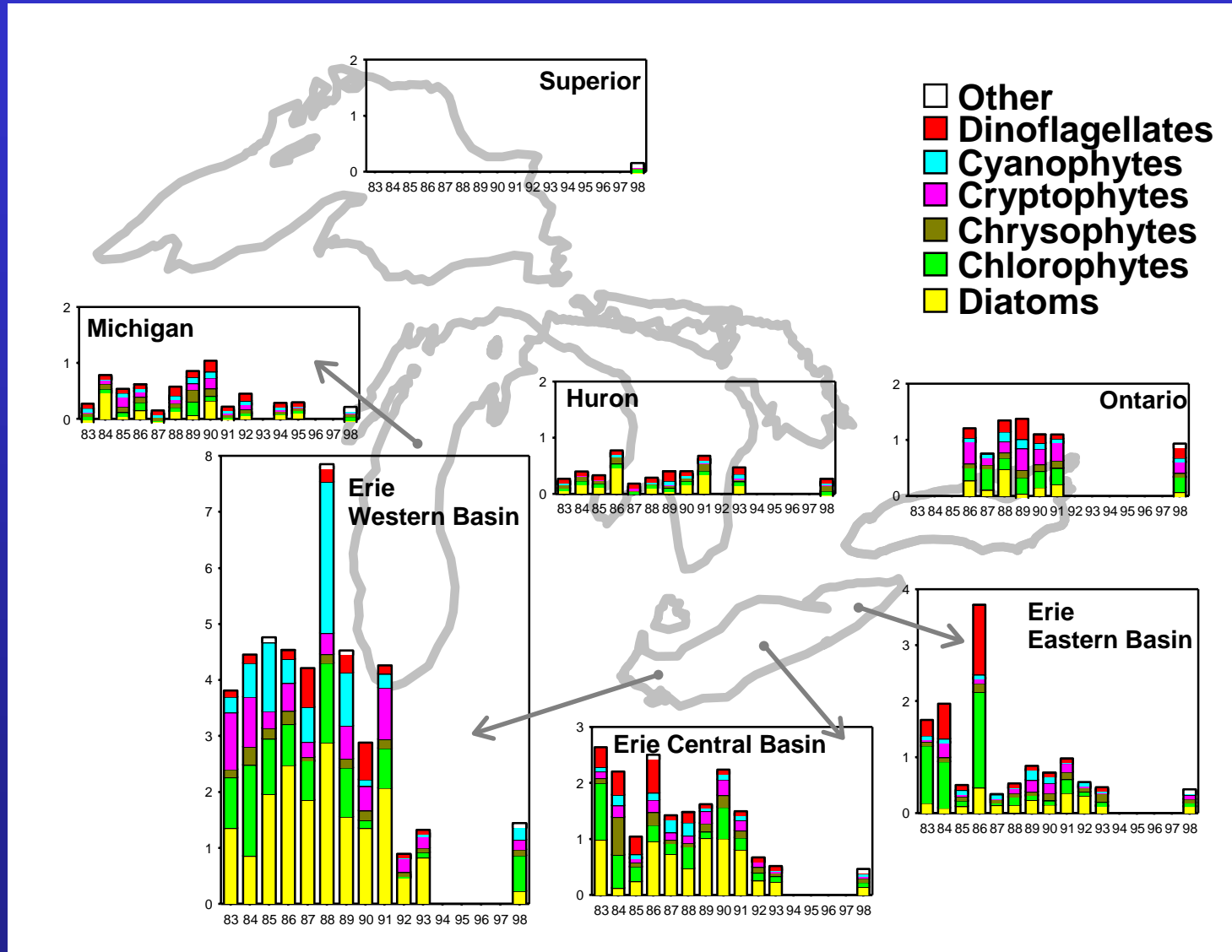


- Population diversity
- Abundance
- Absence of deformities

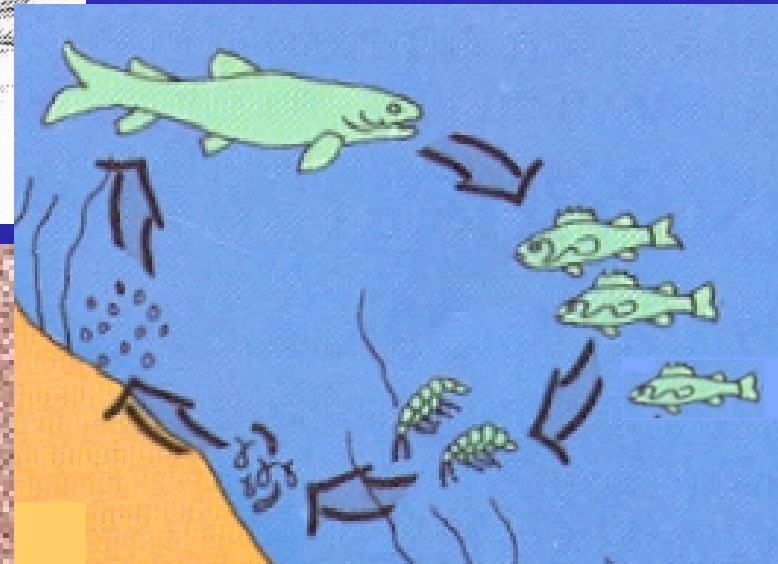
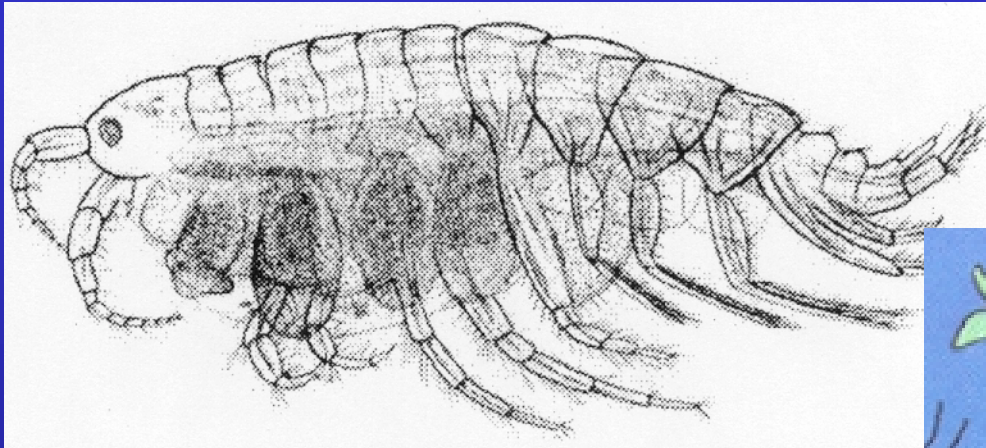
Phytoplankton & Zooplankton



Phytoplankton Biovolume (g/m^3) and Composition, 1983-1998

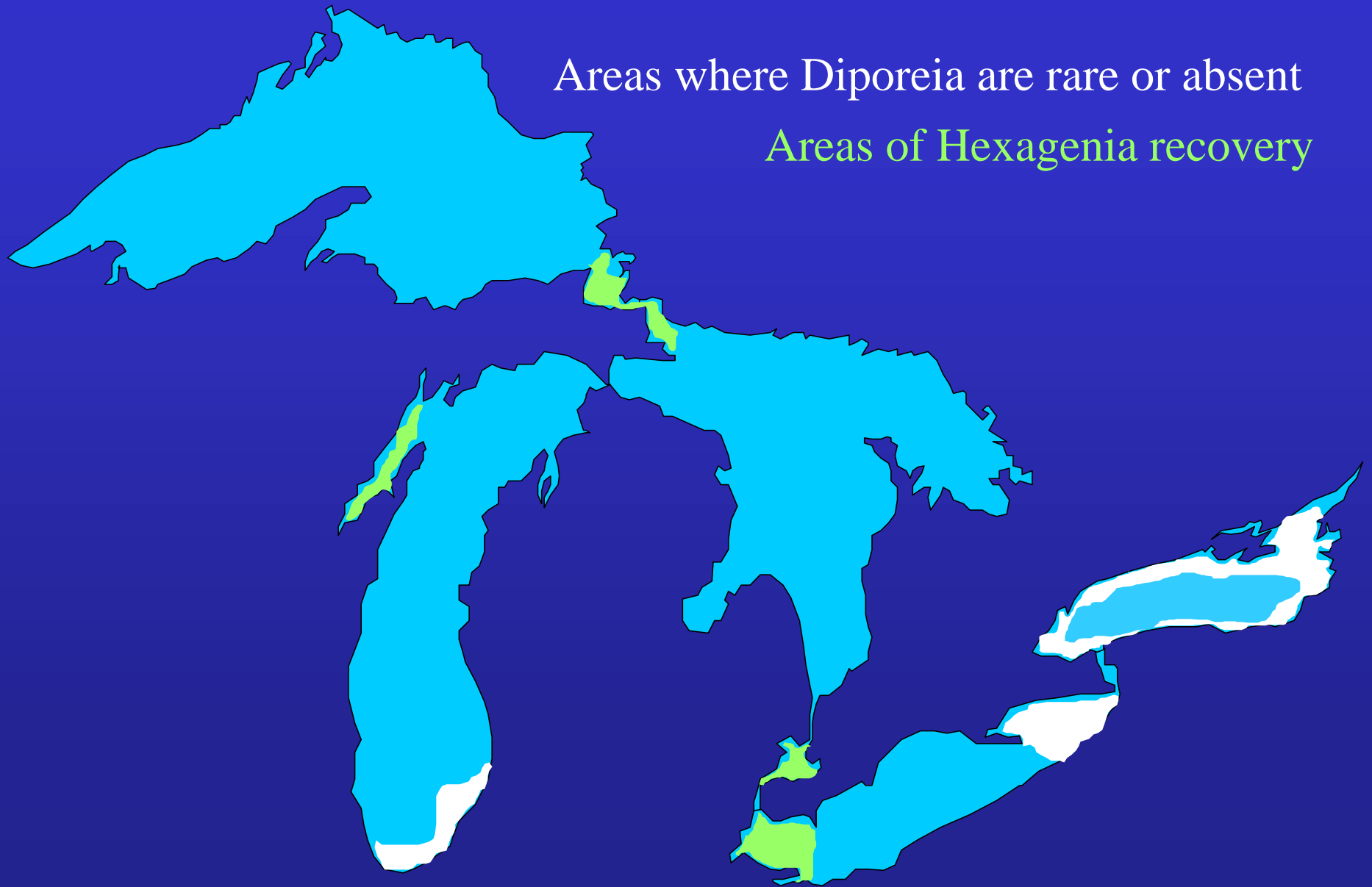


Benthos: Diporeia & Hexagenia



Areas where *Diporeia* are rare or absent

Areas of *Hexagenia* recovery



Preyfish populations



Status of Preyfish Populations

Lake herring ↓
Rainbow smelt ↓
Sculpin ↓

↓ Previously declined and remain low
↓↓ Continuing to decline
↑ Increasing
-- Stable ~ Variable

Alewife --
Bloater ↓
Sculpin ↓

Alewife ↓
Rainbow smelt ↓
Sculpin ↓

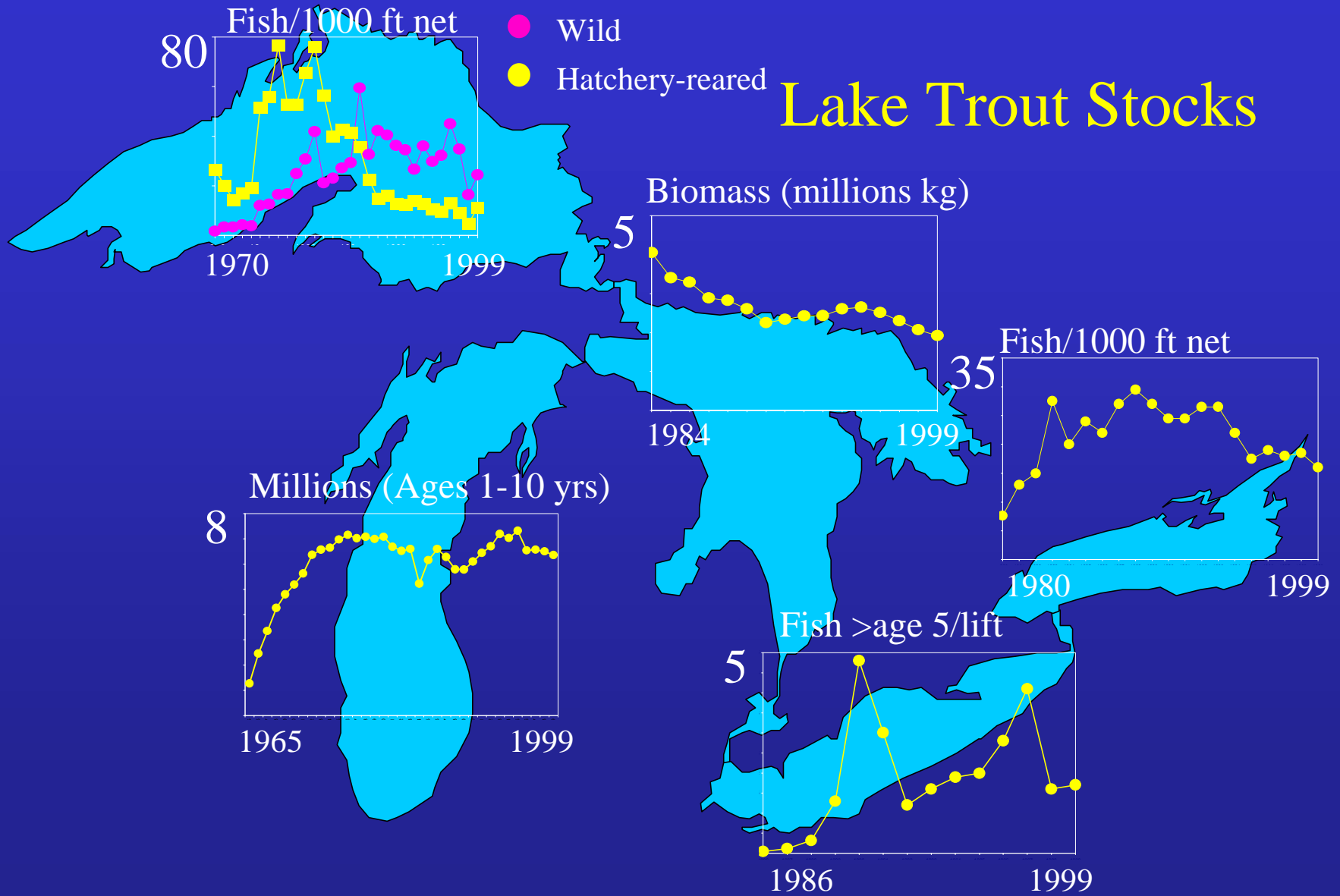
Alewife ↓
Rainbow smelt ↓
Bloater ↓
Sculpin --

Alewife ~
Rainbow smelt ↓
White perch ↓
Gizzard shad ~

Predator Populations: Lake Trout



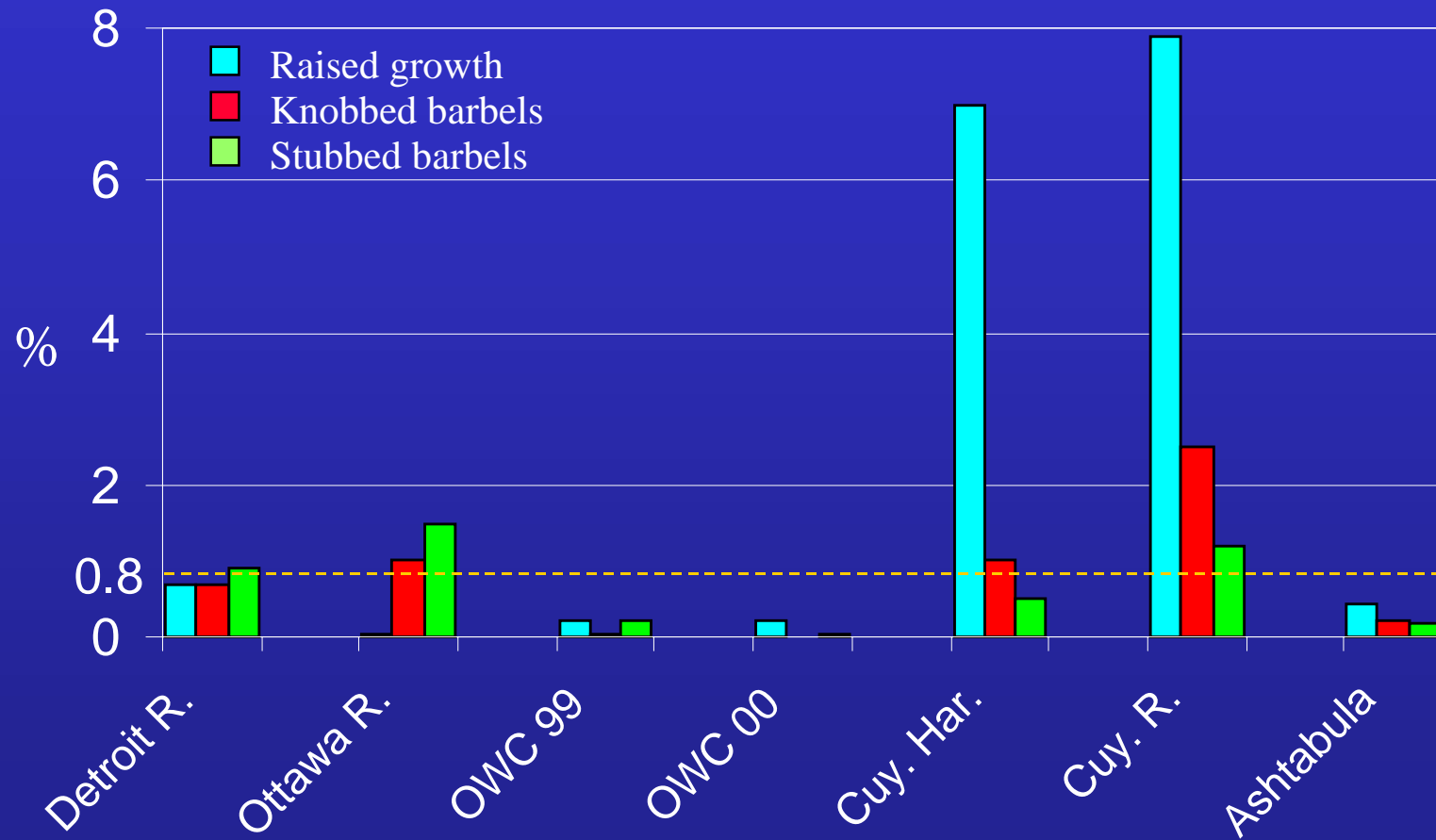
Lake Trout Stocks



Contaminant response:
External anomalies in nearshore fish



Frequency of External Lesions for Brown Bullheads Lake Erie, 1999 - 2000

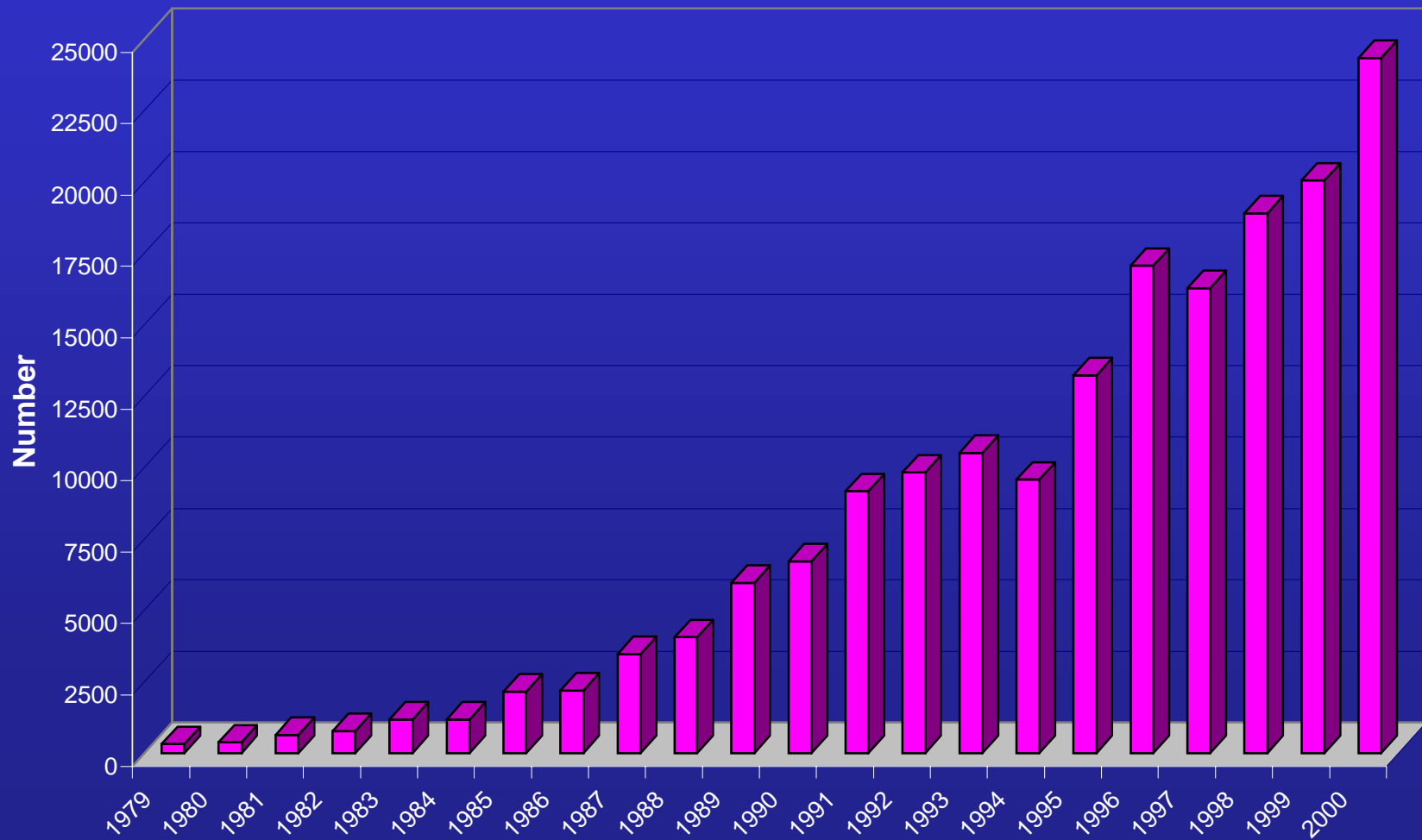


Contaminant Response: Waterbirds



- Populations of most species increased
- Gross effects appear to have subsided
- Many subtle effects surfacing

Double-crested Cormorant nests (breeding pairs) in Lake Ontario, 1979-2000



OPEN AND NEARSHORE WATERS

POOR

MIXED

MIXED

MIXED

GOOD

DETERIORATING

IMPROVING

P conc/ loads



Toxic chemicals in offshore waters



Atmospheric deposition



Contaminants in water birds



Sea lamprey



Phytoplankton

?

Diporeia



Hexagenia



Prey fish



Lake trout



External anomalies (Lake Erie)



Acknowledgements

Indicator

Principal Authors

Phosphorus concentrations

*Scott Painter, Environment
Canada & Paul Bertram,
USEPA*

*Toxic chemicals in offshore
waters*

*Scott Painter, Environment
Canada*

*Atmospheric deposition of toxic
chemicals*

*Ron Hites & Ilora Basu, Indiana
University*

*Contaminants in colonial
waterbirds*

*Chip Weseloh, Environment
Canada*

Sea lamprey abundance

Gavin Christie, GLFC

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Principal Authors

Phytoplankton & Zooplankton

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Diporeia

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Hexagenia

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Preyfish

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Lake Trout

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Wildlife Service*

External anomalies

*Steve Smith, USGS & Paul
Baumann, USGS*

