



GLNPO Monitoring Programs

Lake Ontario Contaminant
Monitoring & Research Workshop

March 27-28, 2007



Cooperative Monitoring Achievements

Early stages of cooperative monitoring

- 2001 and 2002 – Lake Erie work
- 2002 and 2003 - LOADS and LOLA

Recent cooperative monitoring efforts

- Lake Erie DO surveys
- Lake Michigan Mass Balance redux
- Lake Superior supplemental work
 - ◆ Tributaries and add'l atmospheric contaminants
 - ◆ Inter-laboratory comparison
- Lake Huron
 - ◆ Lower food web



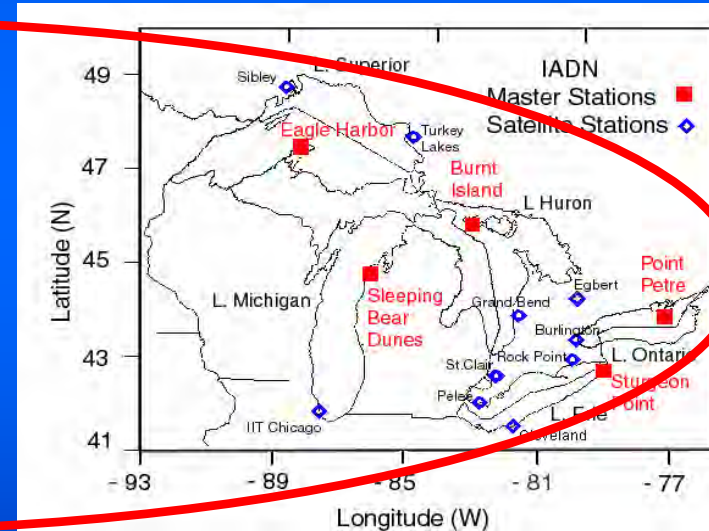
Nutrients

- ◆ Total Phosphorus
- ◆ Total Dissolved Phosphorus
- ◆ Nitrite + Nitrate
- ◆ Soluble Reactive Silica
- ◆ Particulate C,N,P



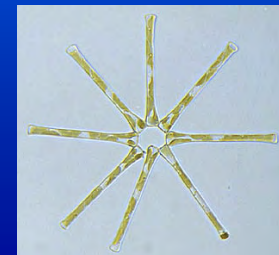
Contaminants

- ◆ Air (IADN)
- ◆ Open Water
- ◆ Fish Tissue



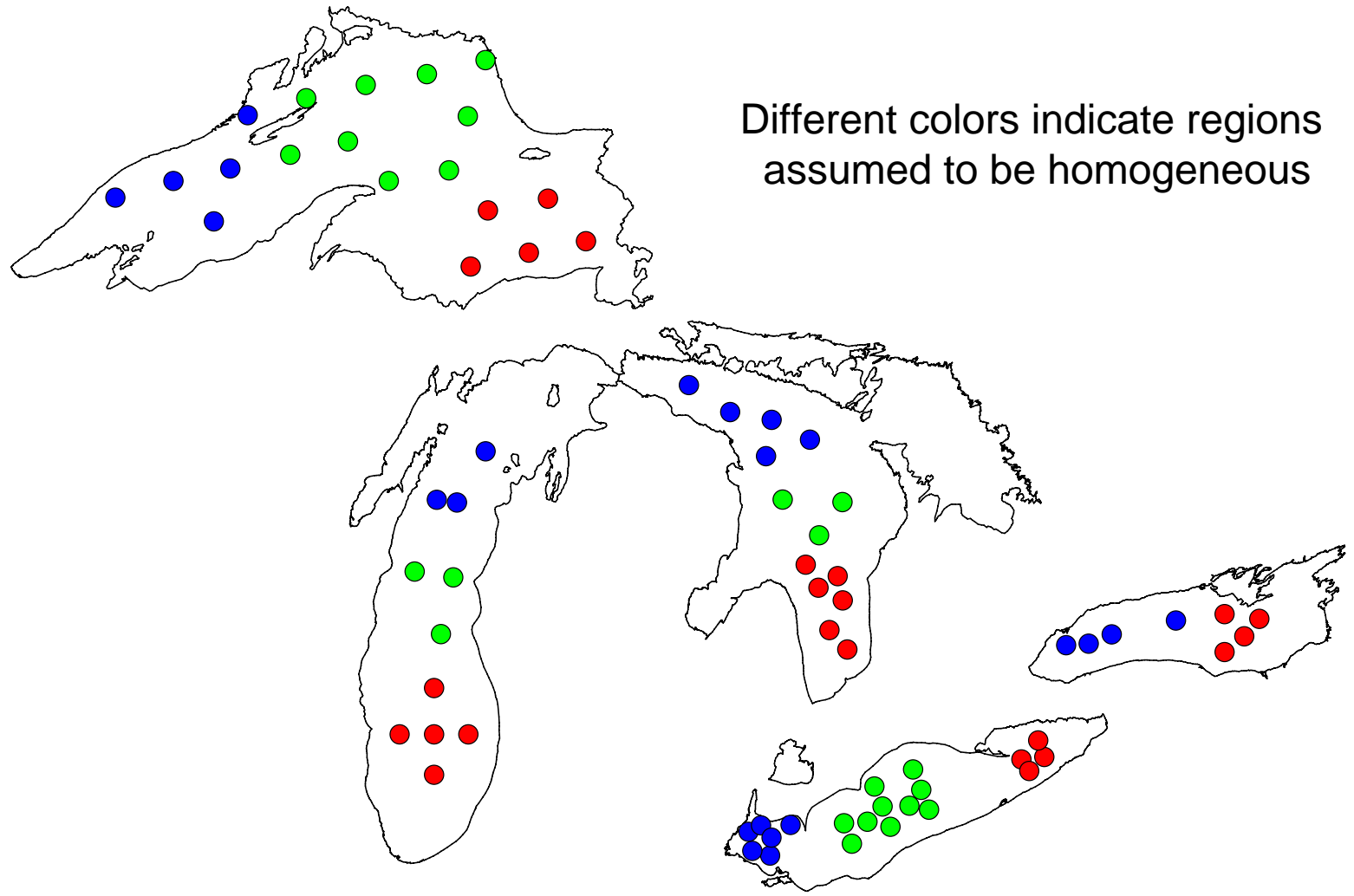
Biological Indicators Program

- ◆ Phytoplankton
- ◆ Zooplankton
- ◆ Benthic Invertebrates





GLNPO Sampling Stations





Water Quality

Nutrients

- Total Phosphorus
- Total Dissolved Phosphorus
- Nitrite + Nitrate
- Soluble Reactive Silica
- Particulate C,N,P

Conventionals –

- pH, turbidity, alkalinity, specific conductance



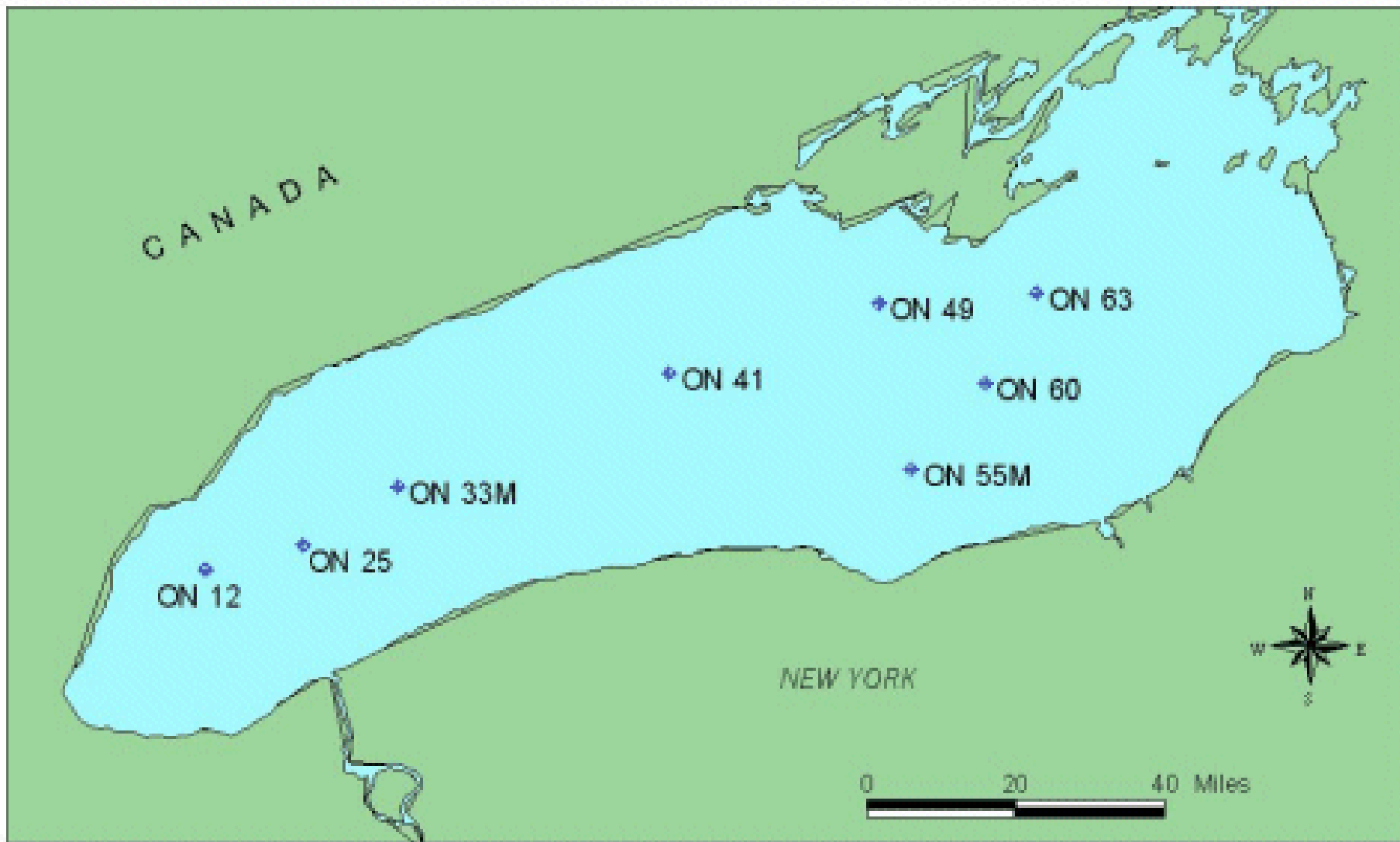
GLNPO Biology Program Measures



- Benthos Community Composition
 - Community Composition
 - Size Structure of Community
- Phytoplankton
 - Community Composition, Biomass
 - Deep Chlorophyll Maximum
 - Historical Communities
- Crustacean Zooplankton
 - Community Composition
 - Size Structure of Community

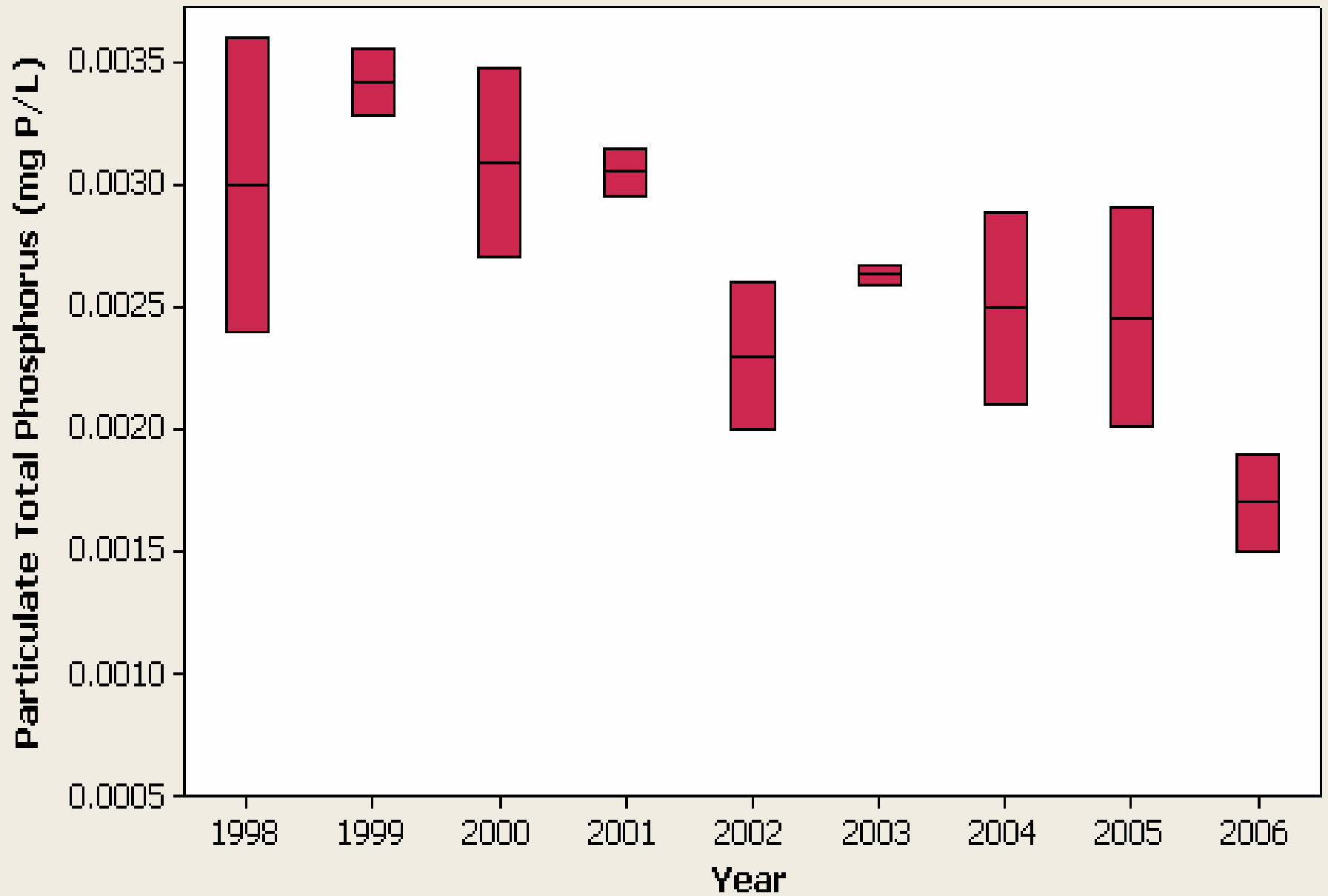


Lake Ontario Sampling Stations Spring Survey



◆ Open Water Stations

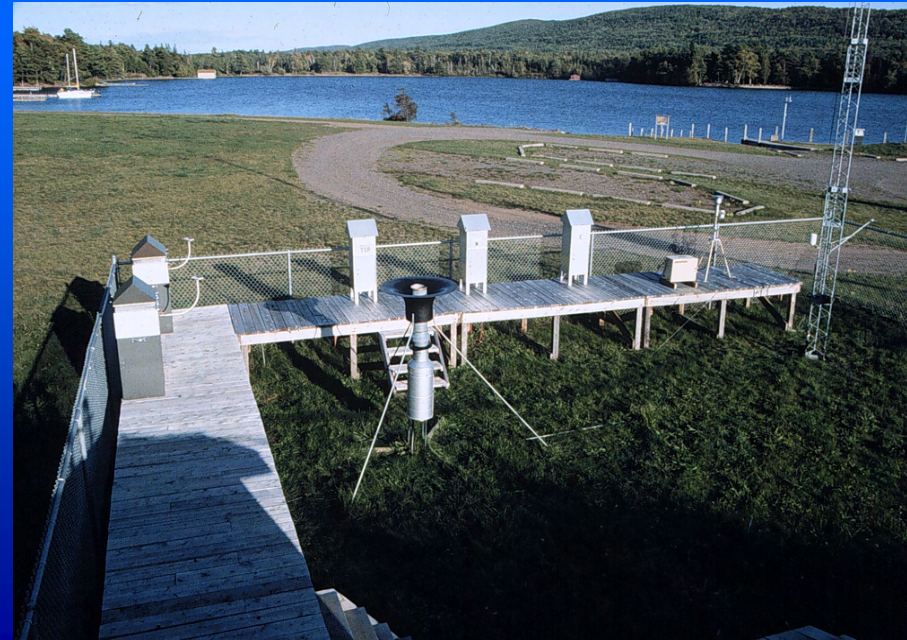
Lake Ontario - Spring



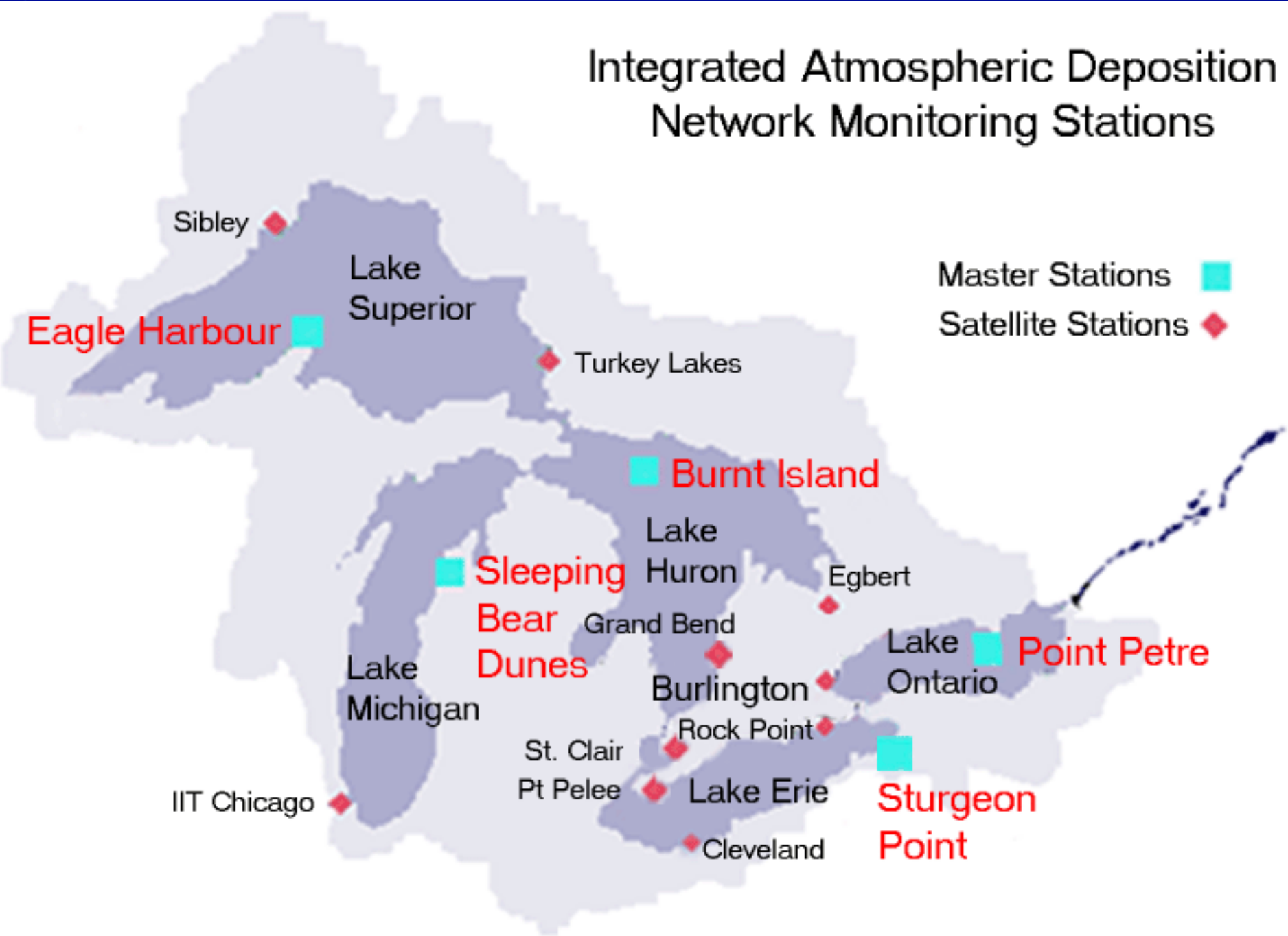


The Integrated Atmospheric Deposition Network (IADN)

- Annex 15 of the Great Lakes Water Quality Agreement; 1990 Clean Air Act Amendments
- Measure PBT chemicals in air and precipitation
- Gas, particles, precipitation concentrations; meteorological parameters
- Examine concentration trends, calculate loadings
- In operation since 1990
- Partnership: U.S. EPA, U.S. grantee (IU), Environment Canada (MSC, OR-EHD)



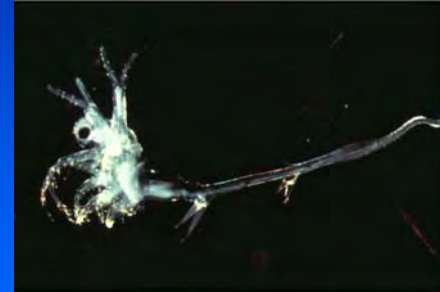
Integrated Atmospheric Deposition Network Monitoring Stations



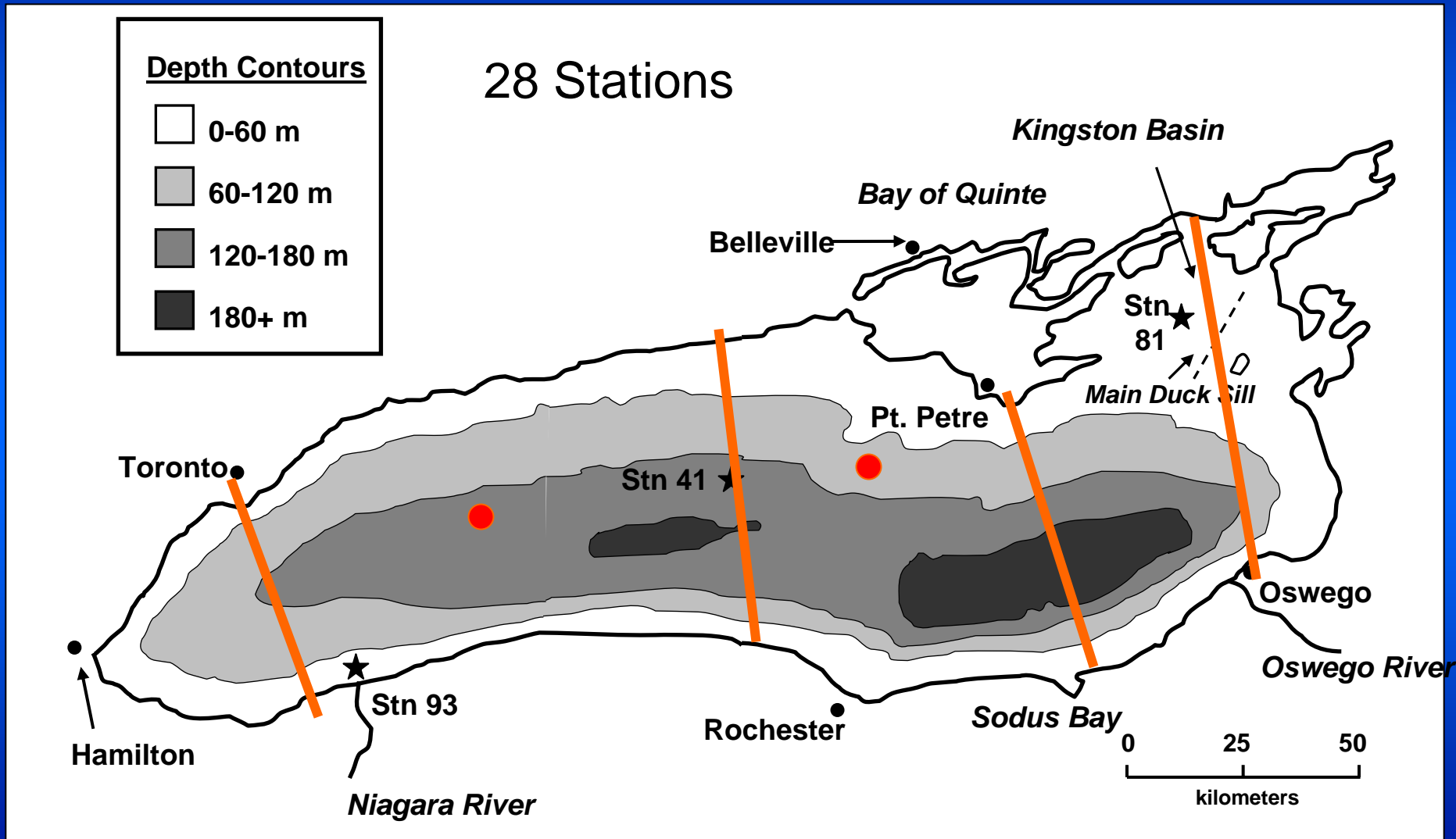


Lake Ontario Lower Aquatic Foodweb (LOLA) Key Questions

- What is the current status of native benthic and zooplankton communities?
- What is the current status of mysid populations?
- How do the results of this study compare with similar studies conducted before the arrival of zebra mussels?
- What changes have occurred in nearshore waters <50 m deep where zebra and quagga mussels impacts are greatest?
- Can traditional zooplankton assessments be improved by the use of new remote sensing technologies?



LOLA 2003 Transect Locations (28 Stations)





LOLA Partners

- *Lake Ontario Lakewide Management Plan (NY DEC, OMOE, EPA R2, EC)*
- *Great Lakes Fishery Commission Lake Committee (NY DEC, OMOE)*
- *Department of Fisheries & Oceans Canada*
- *National Oceanic & Atmospheric Administration*
- *Cornell University*
- *U.S. EPA Great Lakes National Program Office*
- *U.S. EPA Office of Research & Development, Duluth*
- *University of Toronto*
- *State Univ. of New York, ESF*



Thank you!







Great Lakes Fish Monitoring Program (GLFMP)

Open Lake Trends Monitoring

- Monitor contaminant trends in the open waters of the Great Lakes (using fish as indicators)
- Assess the overall effects of toxics on fish and fish-consuming wildlife
- Whole lake trout

Game Fish Fillet Program

- Monitor potential human exposure to contaminants through consumption of popular sport species
- Salmon fillets





GLFMP Contaminant List

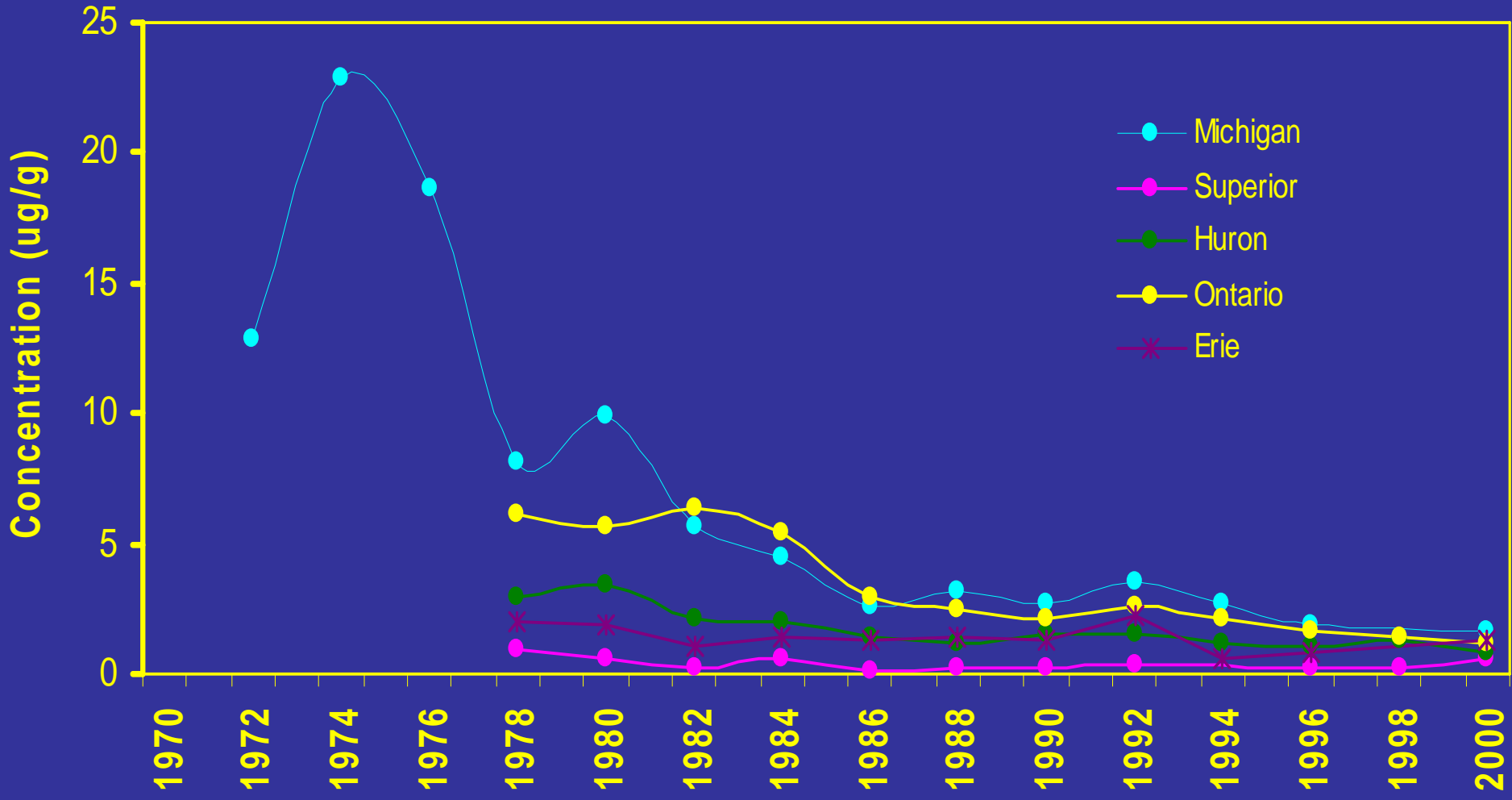
- PCB congeners
- Hexachlorobenzene
- Pentachlorobenzene
- Octachlorostyrene
- alpha BHC
- Lindane
- Aldrin
- Dieldrin
- Heptachlor epoxide-b
- Heptachlor epoxide-a
- Cis-chlordane
- Trans- chlordane
- Oxychlordane
- Cis- nonachlor
- Trans- nonachlor
- pp, op-DDT
- pp, op-DDE
- pp, op-DDD
- Endrin
- Mirex
- Toxaphene& homologs
 - **PCDD/Fs**
 - **PBDEs**
 - **PBB-153**
 - **PCNs**
 - **Hg**
- Fraction lipid
- *PFOS*
- *TBBPA*
- *SCCPs*
- *APEs*
- *chlorothalonil*

Great Lakes Fish Monitoring Program Collection Sites



PCBs in Great Lake Top Predator Whole Fish

Walleye in Lake Erie





LOADS Project Design

- Lake-based air/water sampling
 - Water column, gas-phase, precipitation, and dry dep
 - Lake Guardian cruises 4/02, 9/02, 7/03
 - LIMNOS cruise summer 2002
 - EC buoy
- Land-based air sampling
 - Sterling, NY
 - Pt Petre, Ontario
 - Other NY sites
 - Rochester, NY – 2004 (Hg)



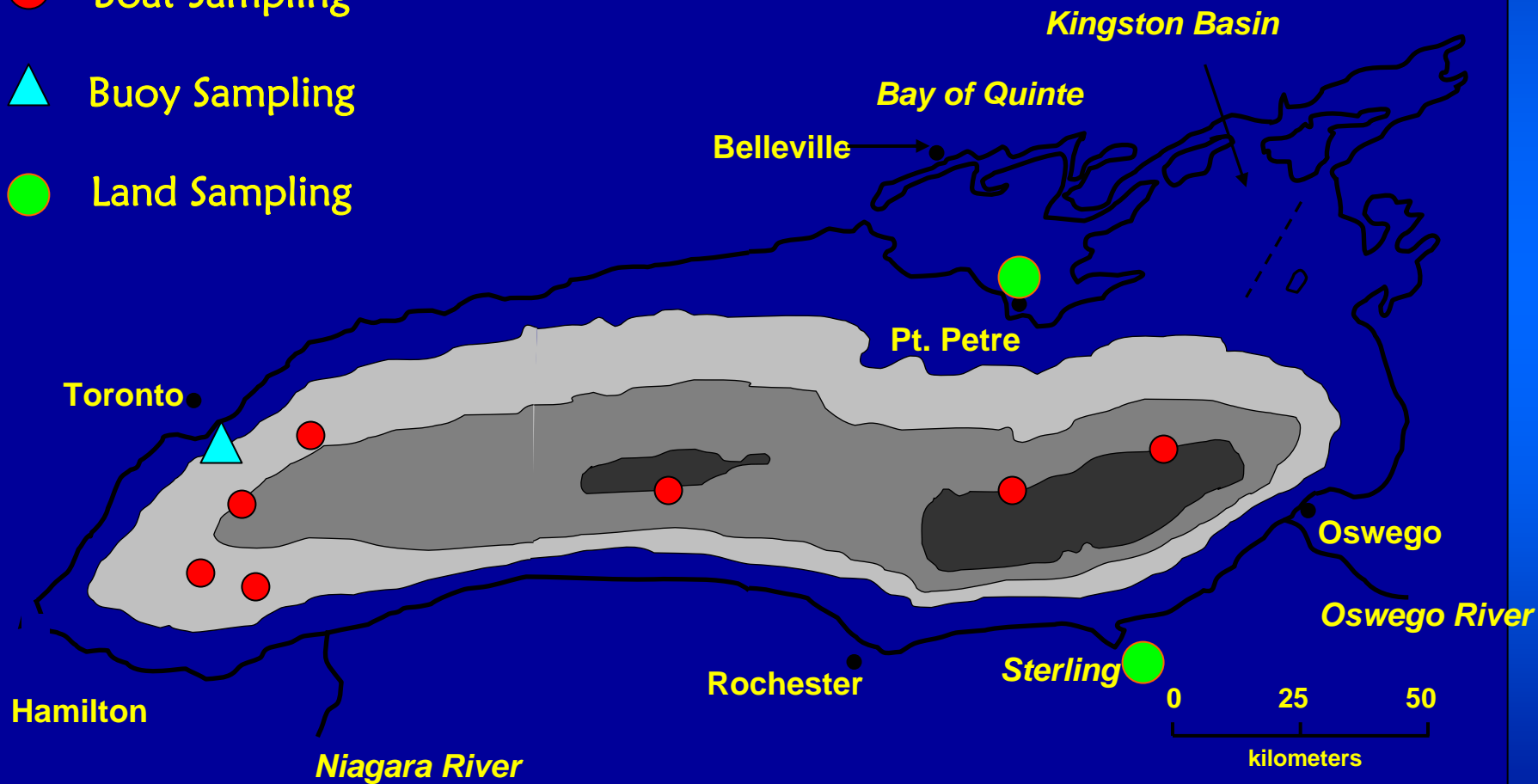


LOADS Sampling Locations

● Boat Sampling

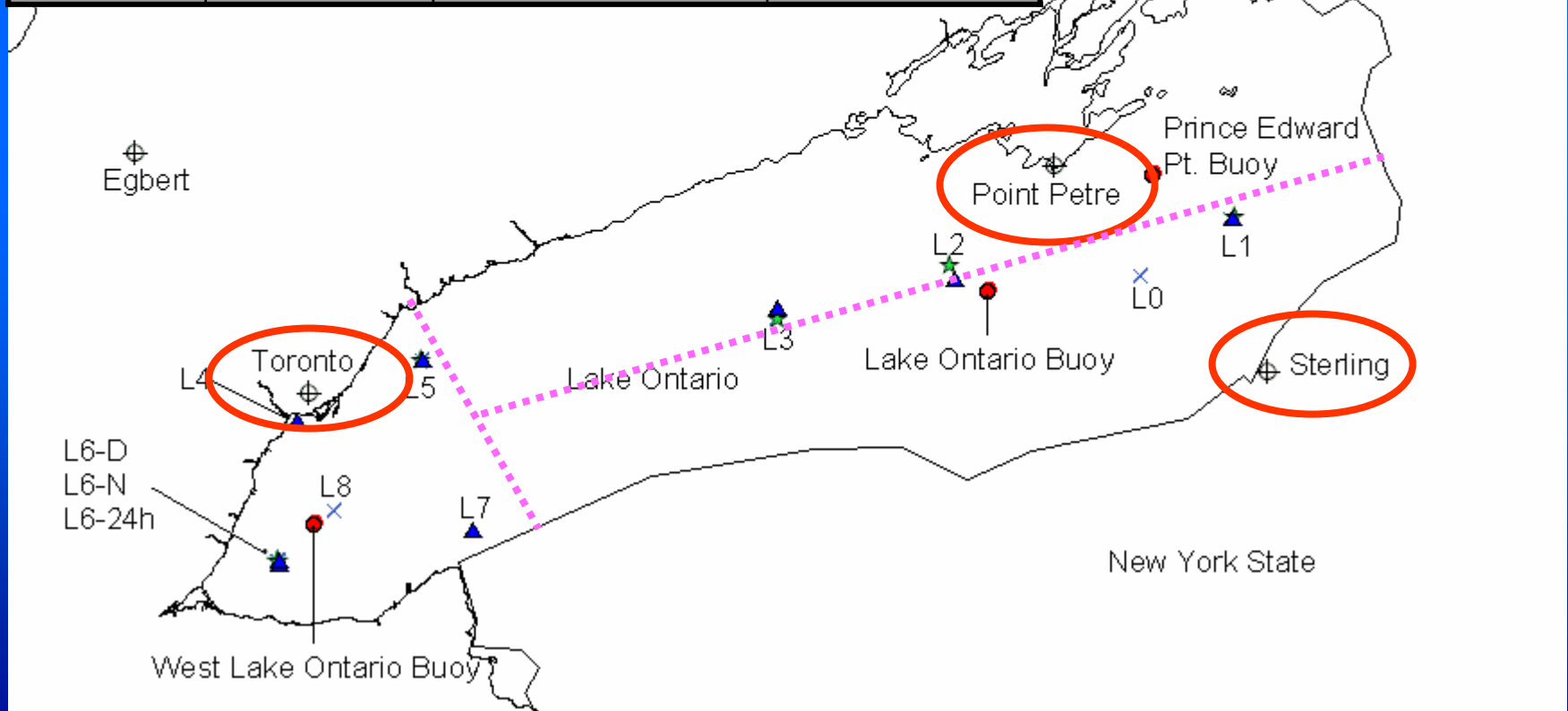
▲ Buoy Sampling

● Land Sampling



Scenarios

Scenario	Urban (%)	Point Petre (%)	Sterling (%)
1	5	47.5	47.5
2	10	45	45
3	20	40	40
4	30	35.5	35.5





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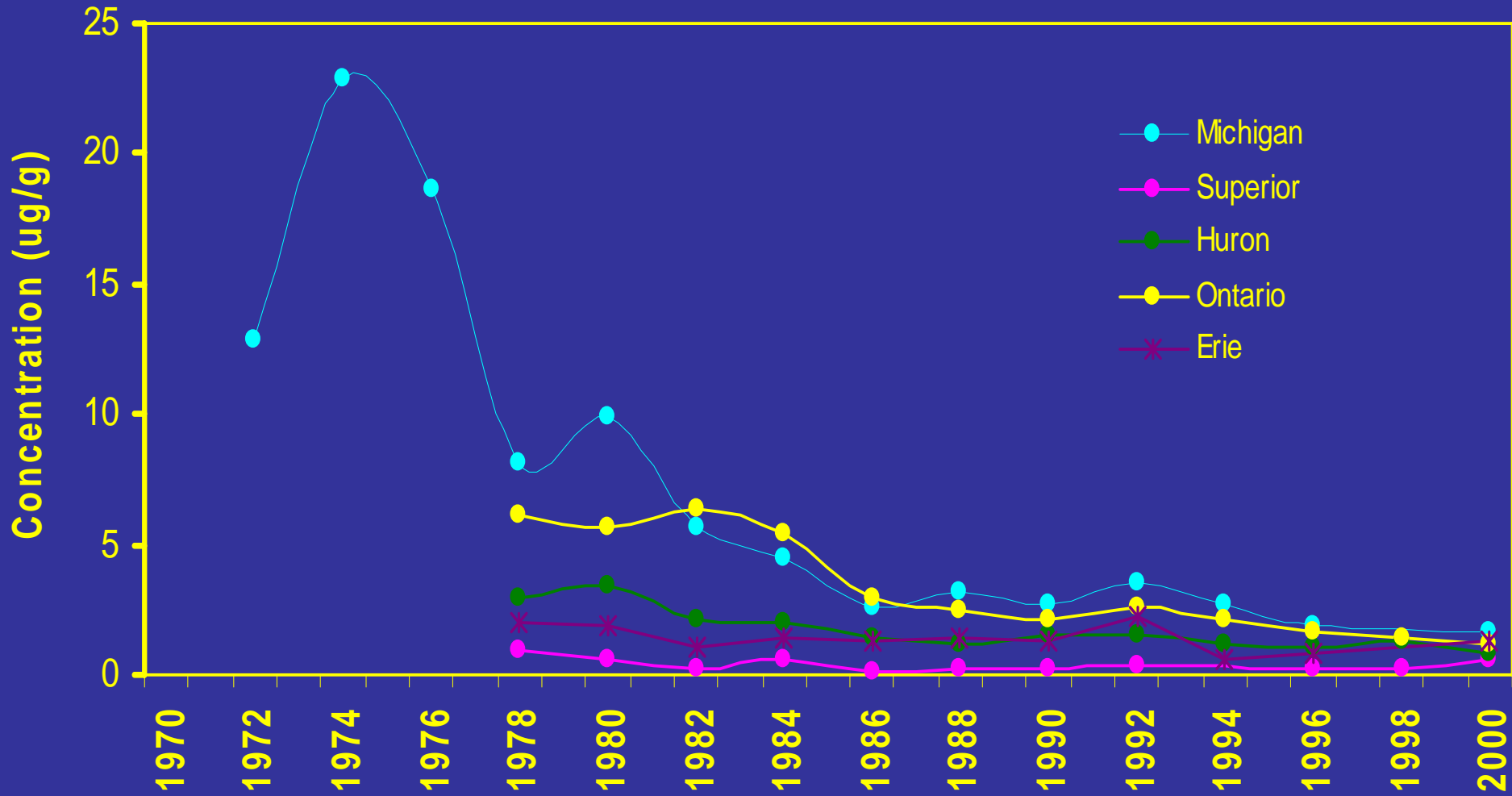
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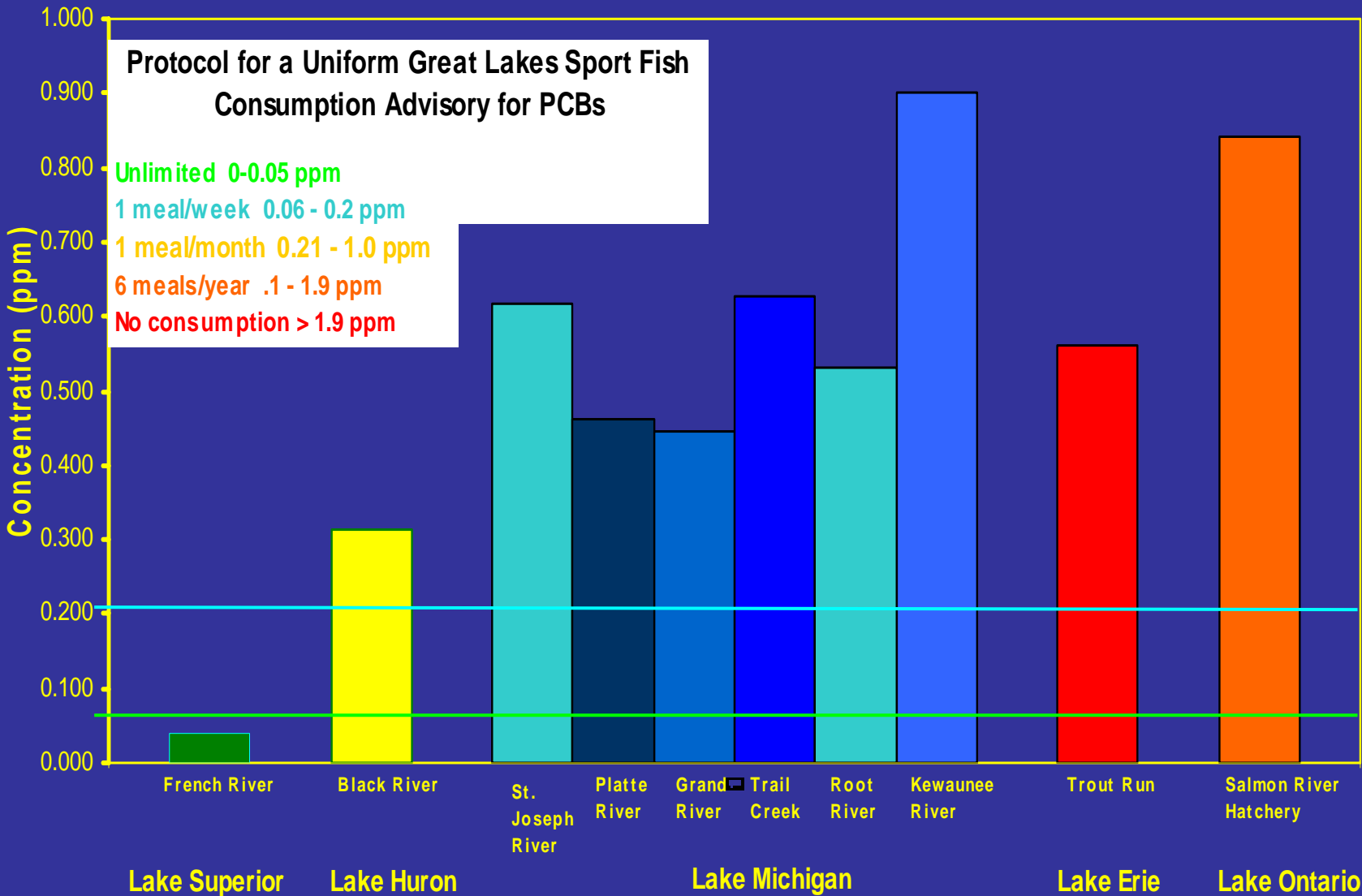


PCBs in Great Lake Top Predator Whole Fish

Walleye in Lake Erie

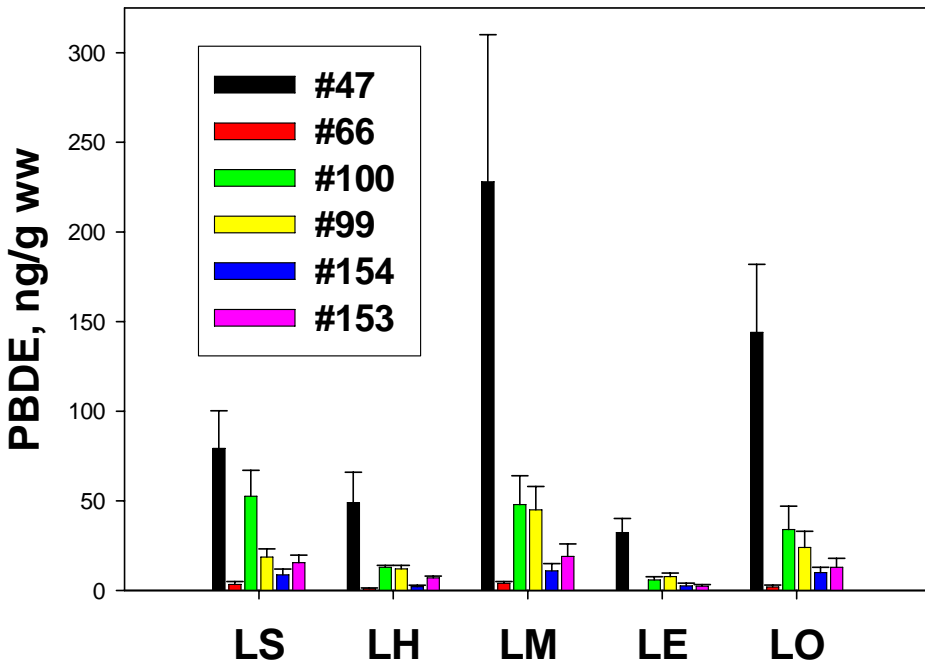


PCBs in Site Specific Great Lakes Coho 2002

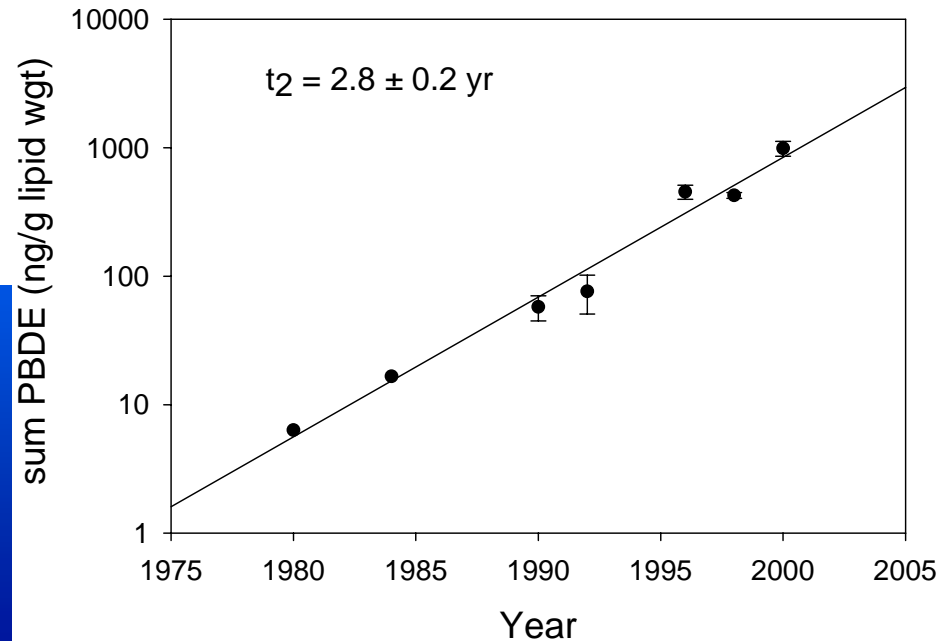




PBDEs in Lake Trout



Source: 2000 data – Elizabeth Murphy, GLNPO



Source: Zhu and Hites, *ES&T* (38) 2004.



Thank you!



1. The first part of the text discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is crucial for ensuring transparency and accountability, particularly in the context of financial reporting and auditing. The text notes that proper record-keeping allows for the identification of any discrepancies or irregularities, which can be investigated and resolved promptly.

2. The second part of the text focuses on the role of internal controls in preventing and detecting errors or fraud. It highlights that a robust system of internal controls is essential for safeguarding an organization's assets and ensuring the integrity of its financial statements. The text suggests that these controls should be designed to minimize the risk of misstatements and to provide a clear path for the flow of information within the organization.

3. The third part of the text addresses the need for regular communication and collaboration between different departments and stakeholders. It stresses that effective communication is key to ensuring that everyone is on the same page and that any potential issues are identified and addressed early on. The text encourages a culture of openness and transparency, where employees feel comfortable reporting any concerns or discrepancies.

4. The fourth part of the text discusses the importance of staying up-to-date on the latest regulations and standards. It notes that the regulatory environment is constantly evolving, and organizations must stay informed to ensure they are in compliance. The text suggests that this can be achieved through ongoing training and education for all employees, as well as regular consultations with legal and accounting advisors.

5. The fifth part of the text concludes by emphasizing the overall importance of a strong ethical foundation. It states that a commitment to high ethical standards is not only a legal requirement but also a key factor in building trust and credibility with customers, investors, and other stakeholders. The text encourages organizations to foster a culture of integrity and to hold all employees accountable for their actions.

6. The final part of the text provides a summary of the key points discussed and offers some practical advice for implementing the recommendations. It reiterates that a combination of accurate record-keeping, strong internal controls, effective communication, and a commitment to ethical standards is essential for ensuring the reliability and integrity of an organization's financial reporting. The text ends with a call to action, encouraging all employees to take ownership of their role in maintaining the highest standards of financial reporting.





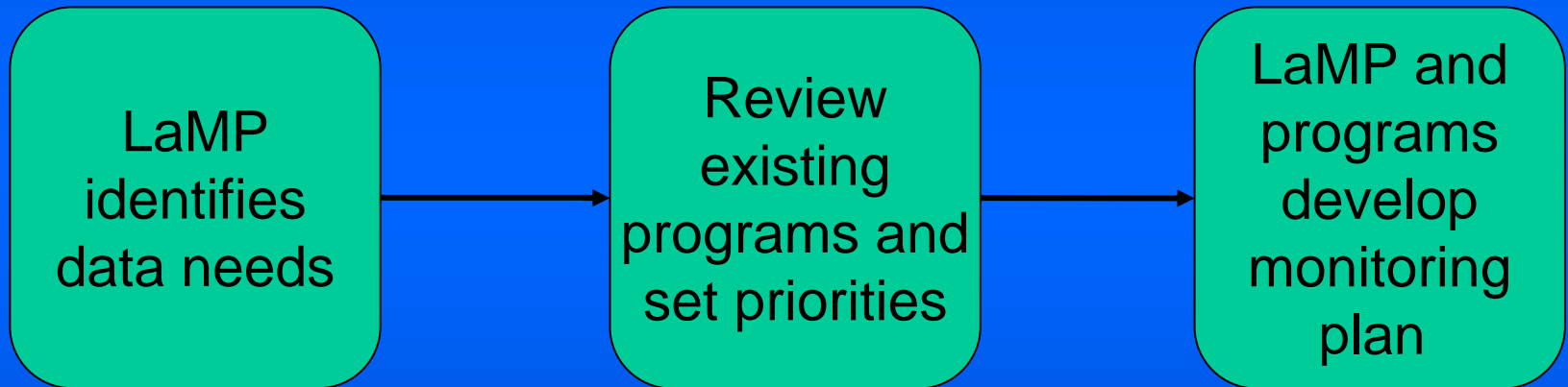
Cooperative Monitoring Initiative

Cooperative Monitoring Initiative Schedule: Canadian Research Vessel Limnos, and the U.S. Research Vessel Lake Guardian

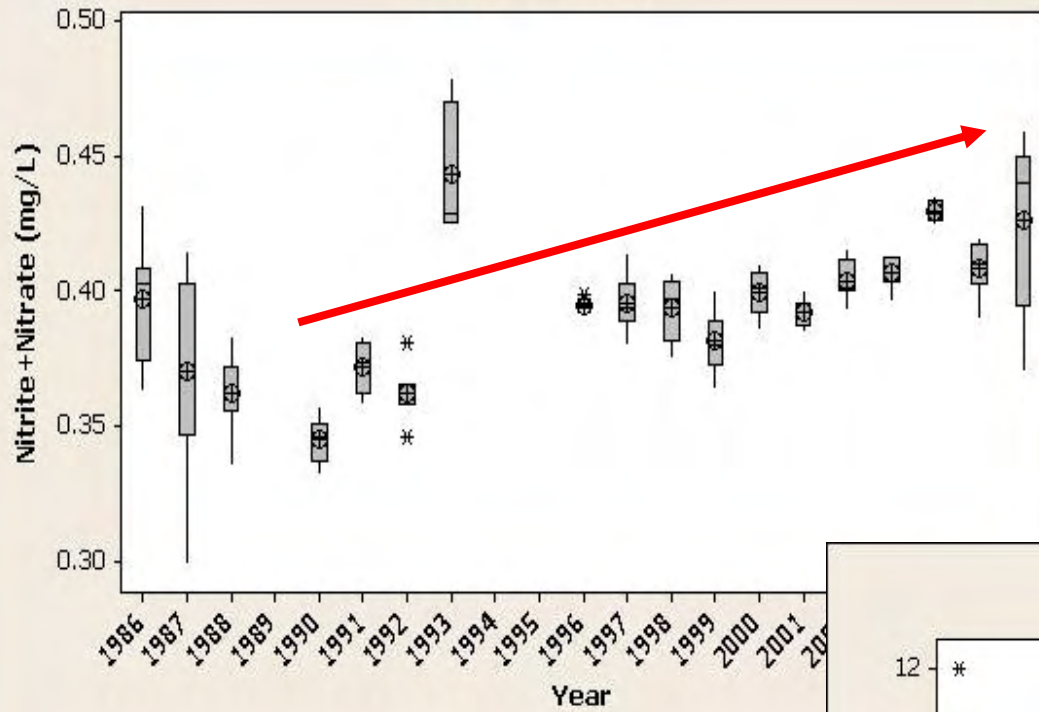
- 2003 - Lake Ontario
- 2004 - Lake Erie
- 2005 - Lake Superior (Canada), Lake Michigan (US)
- 2006 - Lake Superior – Joint
- 2007 - Lake Huron
- 2008 - Lake Ontario
- 2009 - Lake Erie



Cooperative Monitoring Process



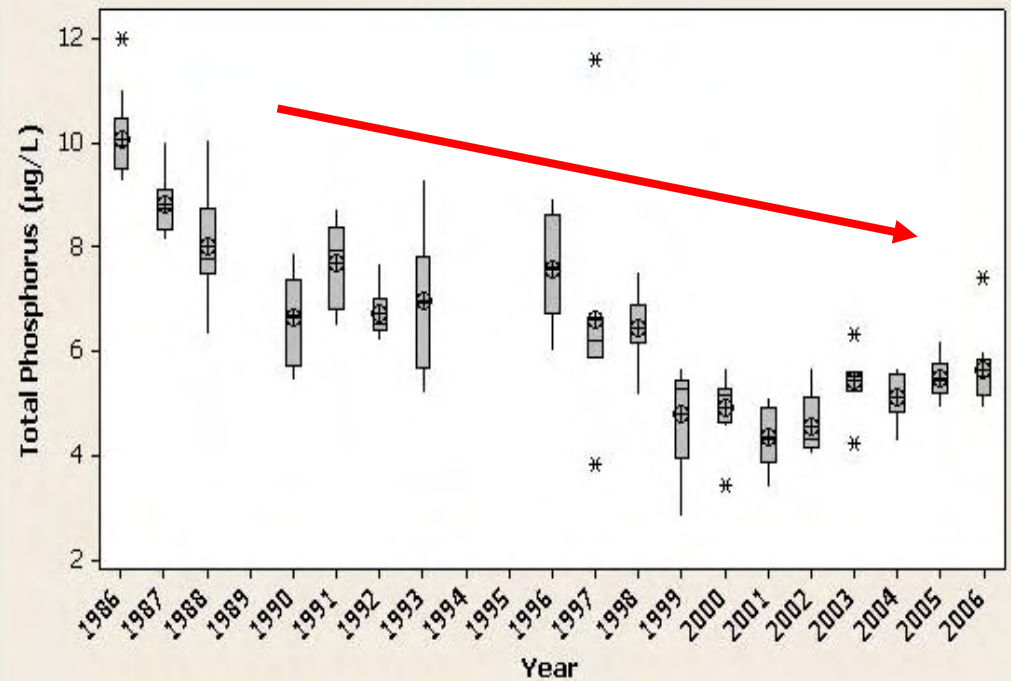
Nitrite + Nitrate



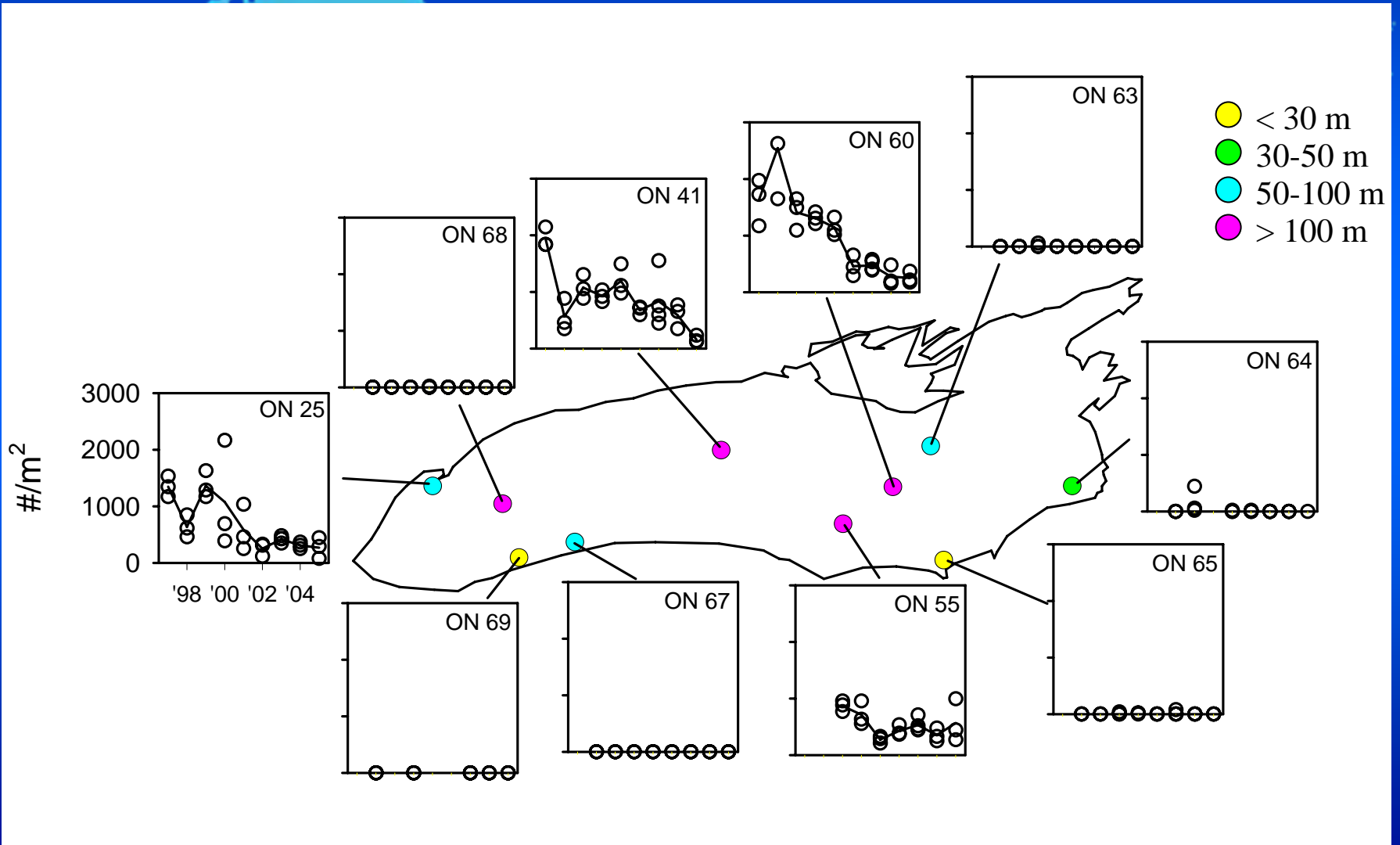
Nitrite + Nitrate increasing...

While TP decreasing, but...

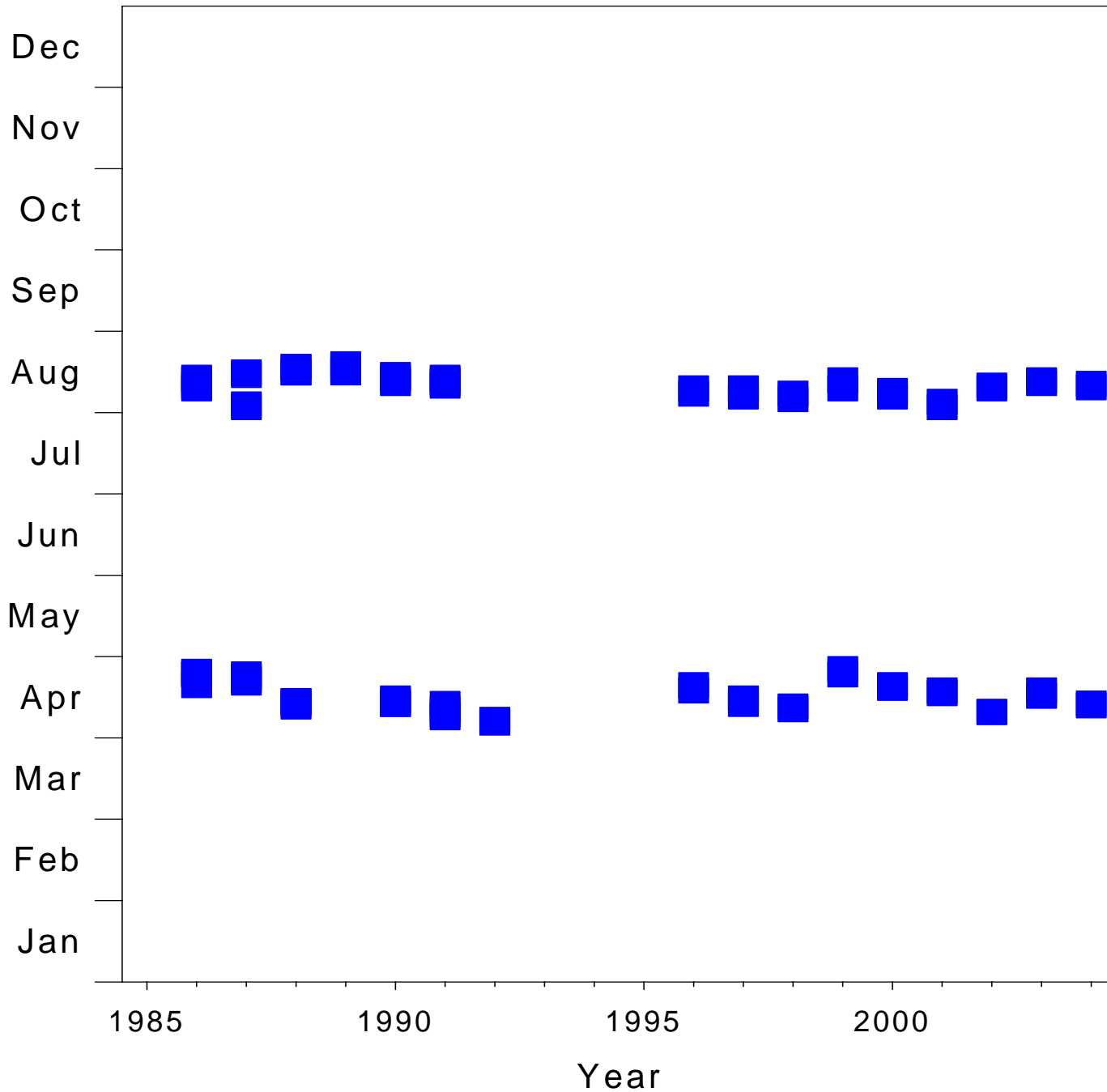
Total Phosphorus



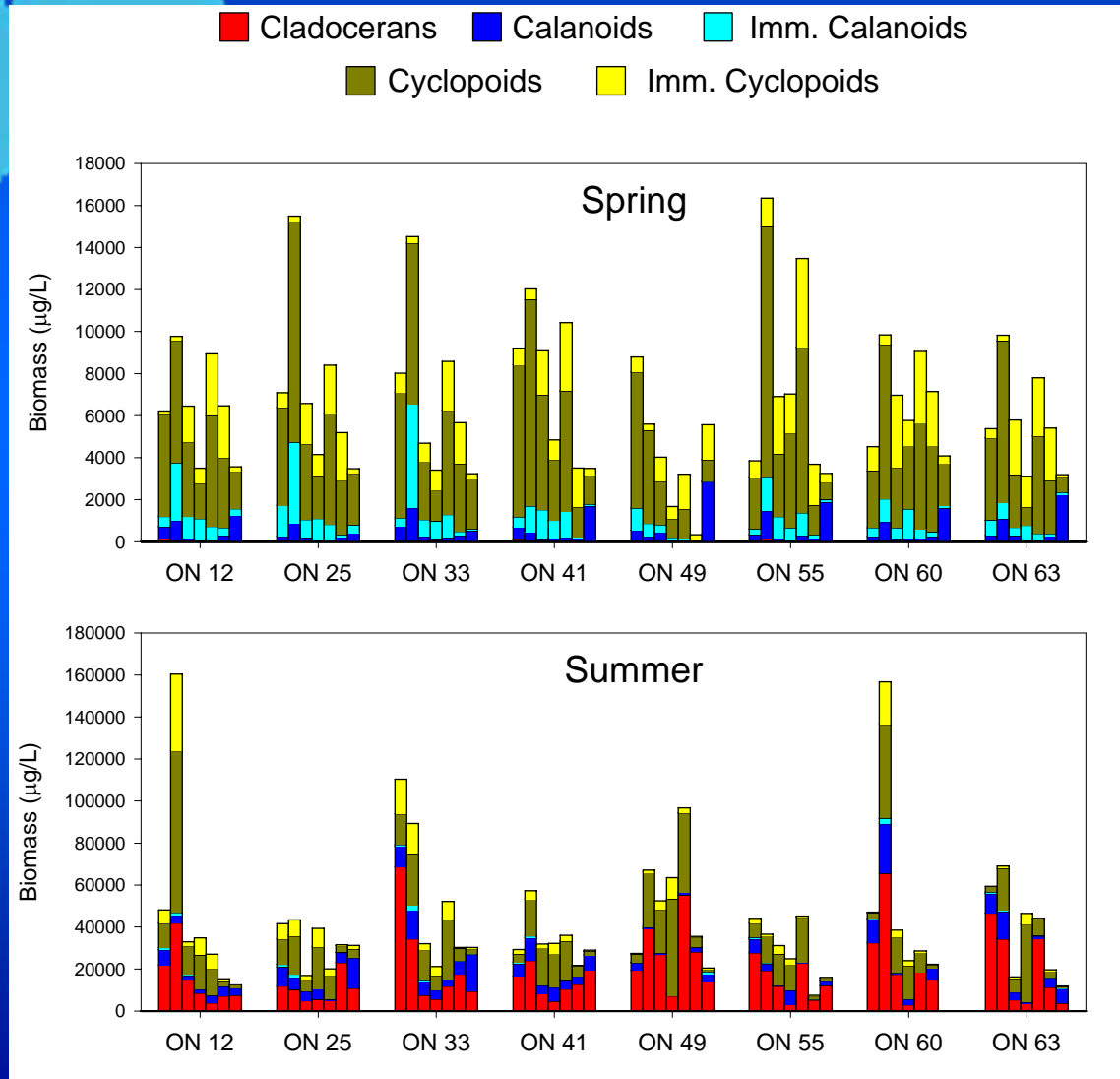
Diporeia Abundances in Lake Ontario, 1997-2005



Lake Ontario Cruises 1986-2004



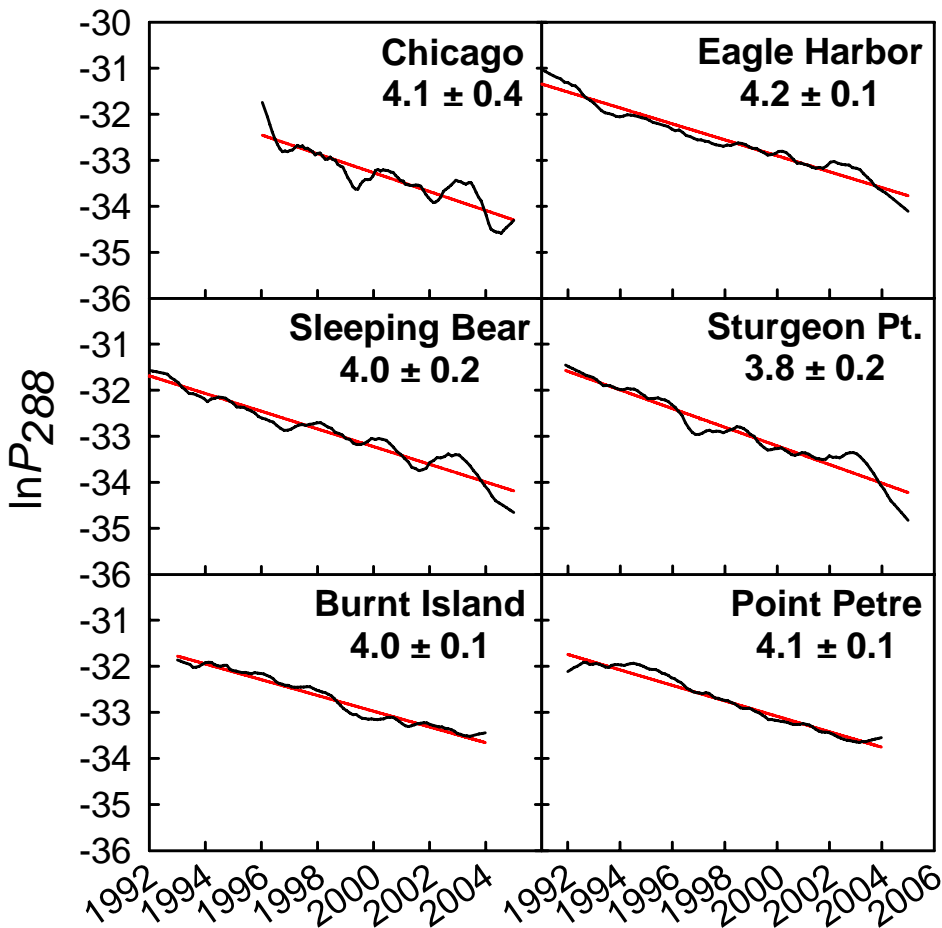
Zooplankton Biomass in Lake Ontario 1998-1999, 2001-2005



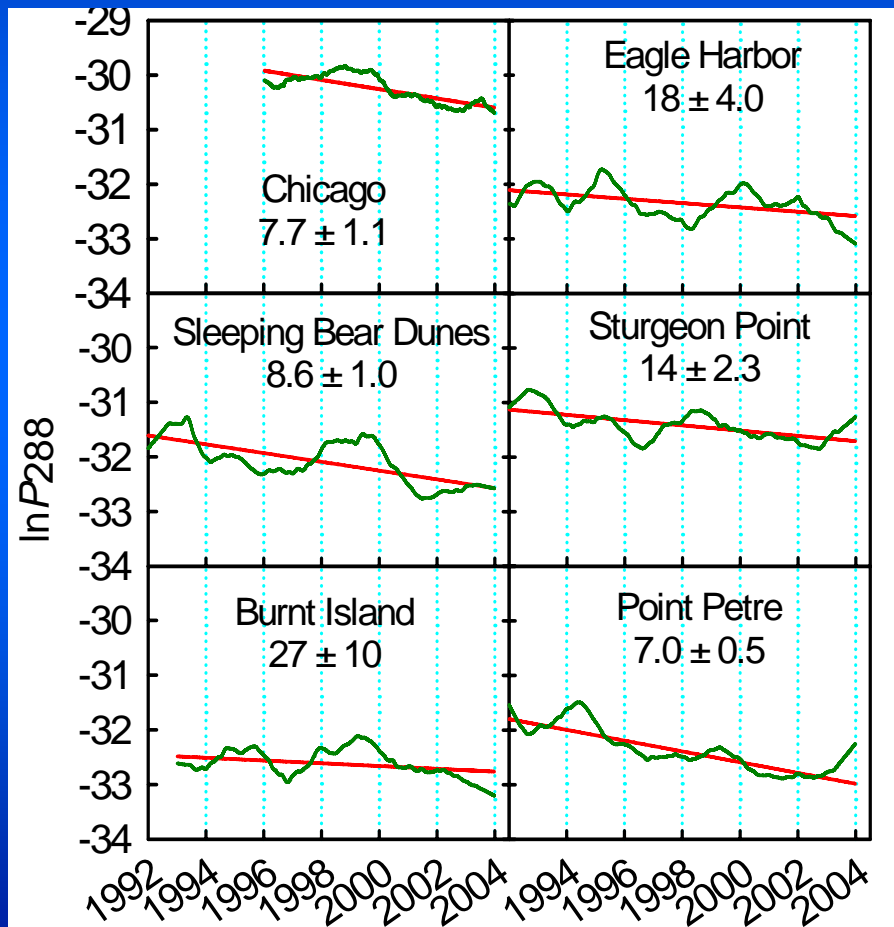


Levels of banned organochlorine pesticides are generally decreasing.....

a-HCH in the gas phase (half-lives in years)



PCBs in the gas phase (half-lives in years)





Atmospheric Loadings Trends

