Overview of Binational Approaches to Address Nutrients and Impacts in Lake Erie

Michael Murray, Ph.D.,[1] Sue Watson, Ph.D.,[2]
Raj Bejankiwar[3]

[1]National Wildlife Federation
[2]Environment Canada
[3]International Joint Commission

National Conference on Ecosystem Restoration
Greater Chicago, IL
July 29 – Aug. 2, 2013

Development of Great Lakes Water Quality Agreement (GLWQA)

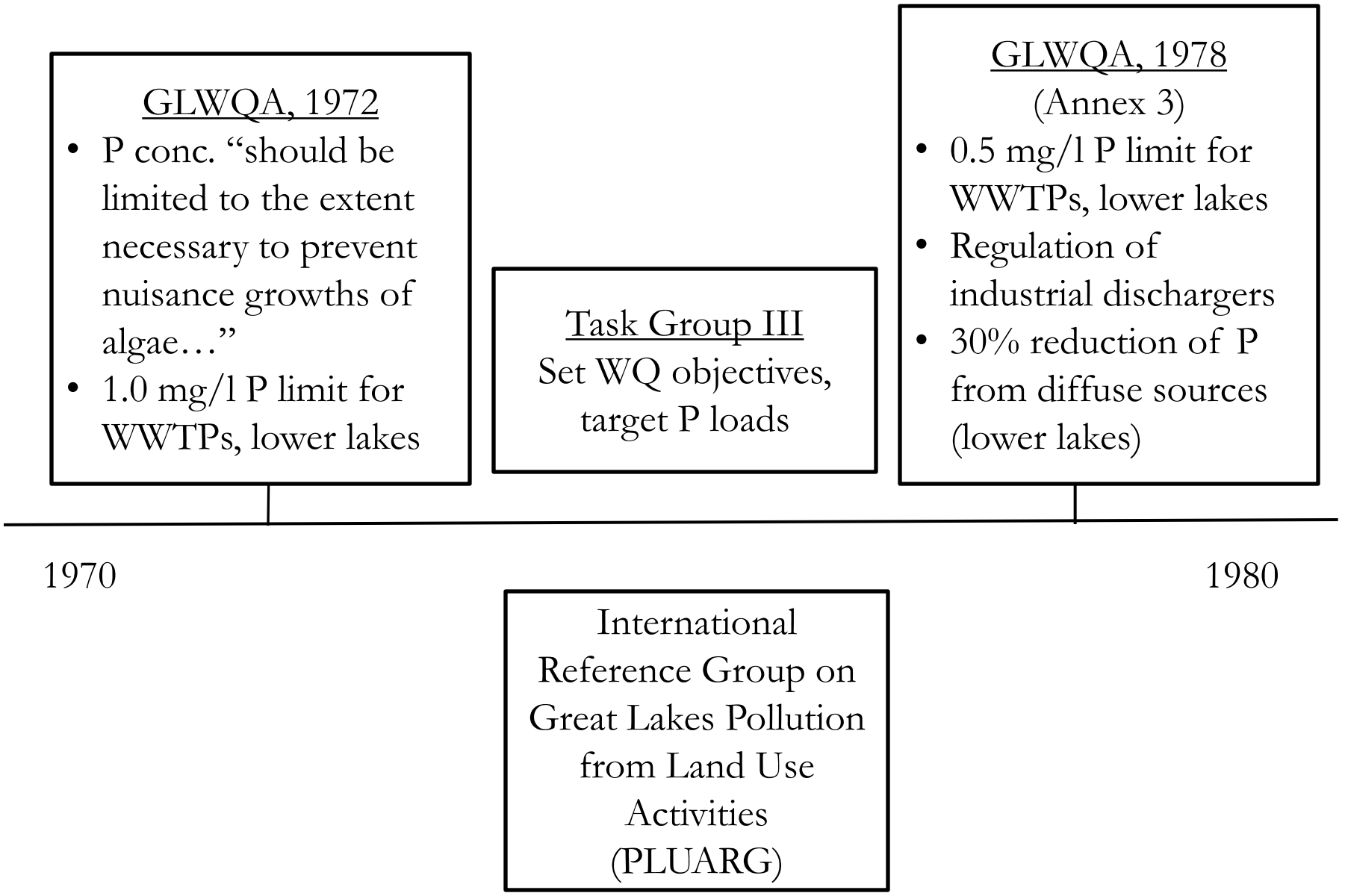
- Early 20th Century concern over pollution problems in rivers
- By 1960s, eutrophication major issue; 1964 reference to International Joint Commission

Ohio Historical Society

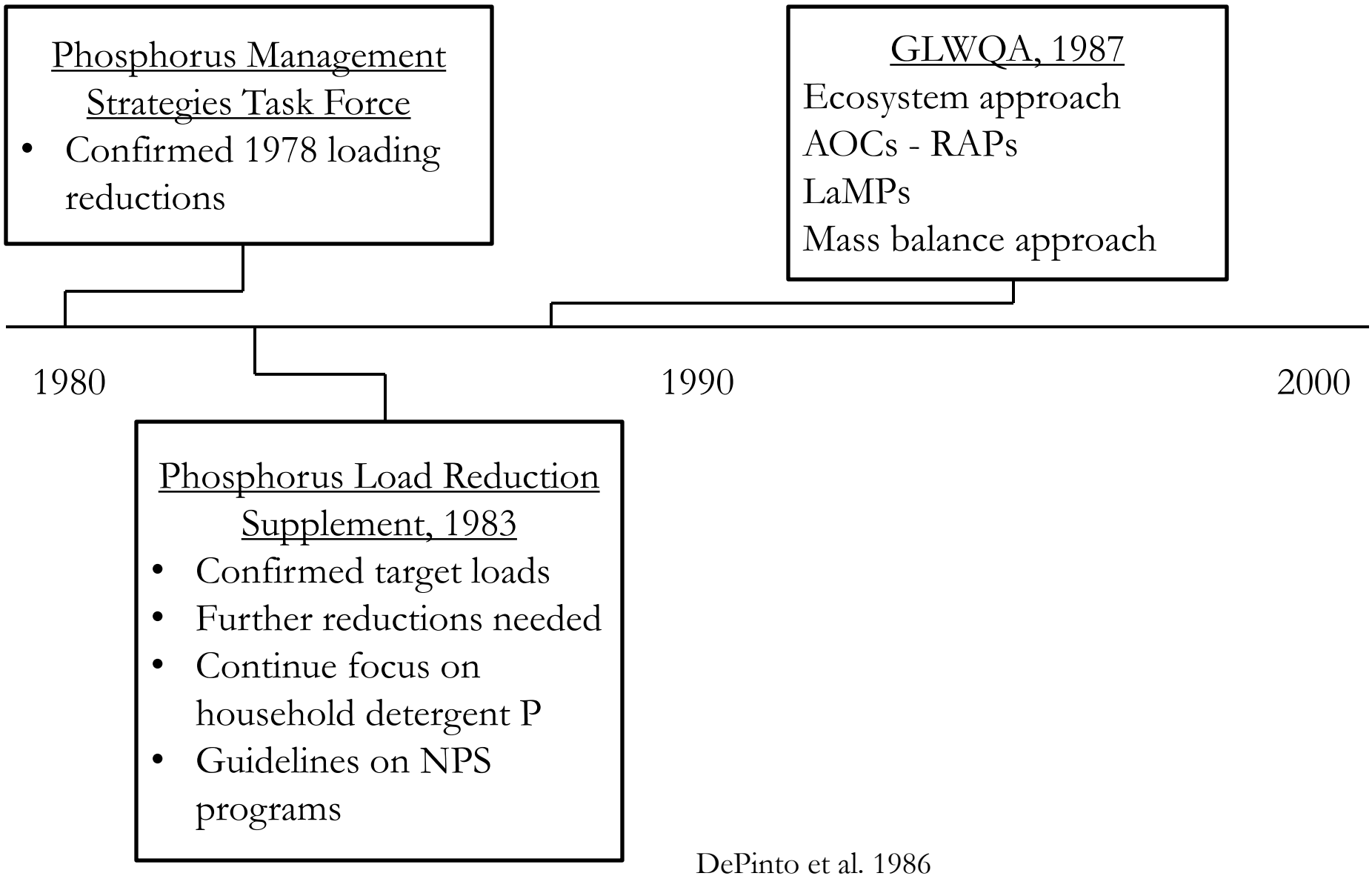
Great Lakes Industrial History Center

- IJC investigated, held hearings, issued report in 1970 (including water quality objectives)
- Intense negotiations led to development of water quality agreement

Evolution of GLWQA



Evolution of GLWQA (1980-2000)



DePinto et al. 1986

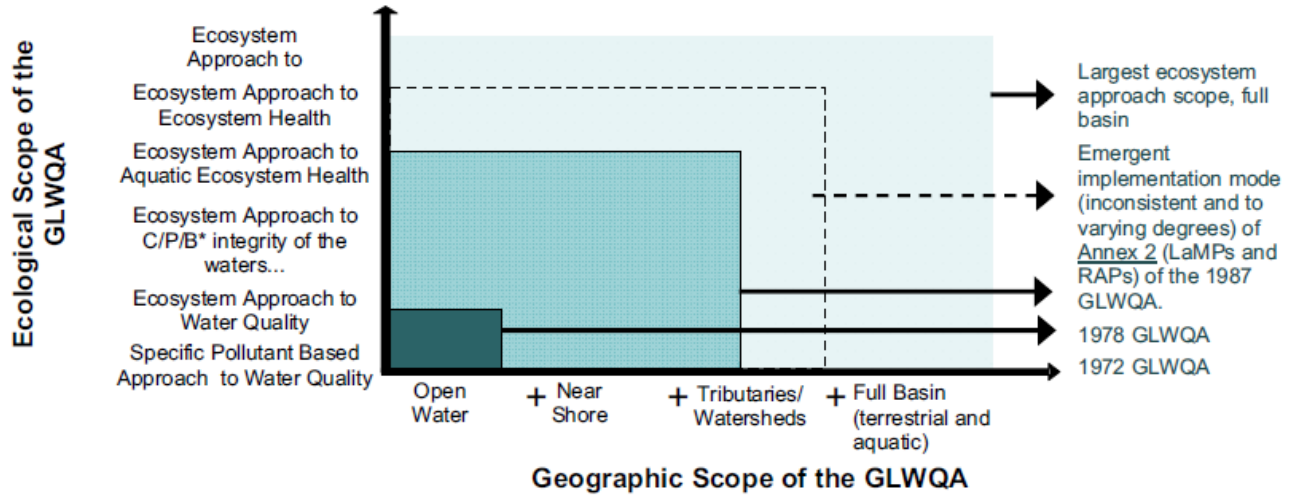
Evolution of GLWQA (2000 →)

Reviews
IJC, Parties
(2005- 07)

Great Lakes
Water Quality
Protocol of 2012

2000

2010



Agreement Review Committee, 2007

Great Lakes Water Quality Agreement, Federal, State, Provincial Programs, and Phosphorus Reduction

IJC

GLWQA

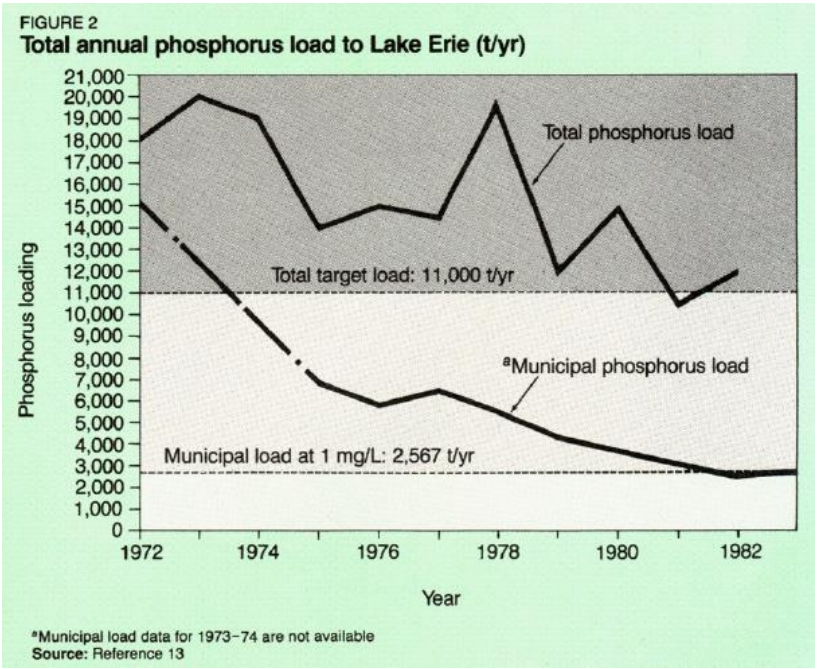
Science Advisory Board
- Research, informing stakeholders

Water Quality Board
- State, provincial, federal officials considered need for more stringent standards, programs

Canada
- e.g. Canada-Ontario Agreement

U.S.
- e.g. Clean Water Act

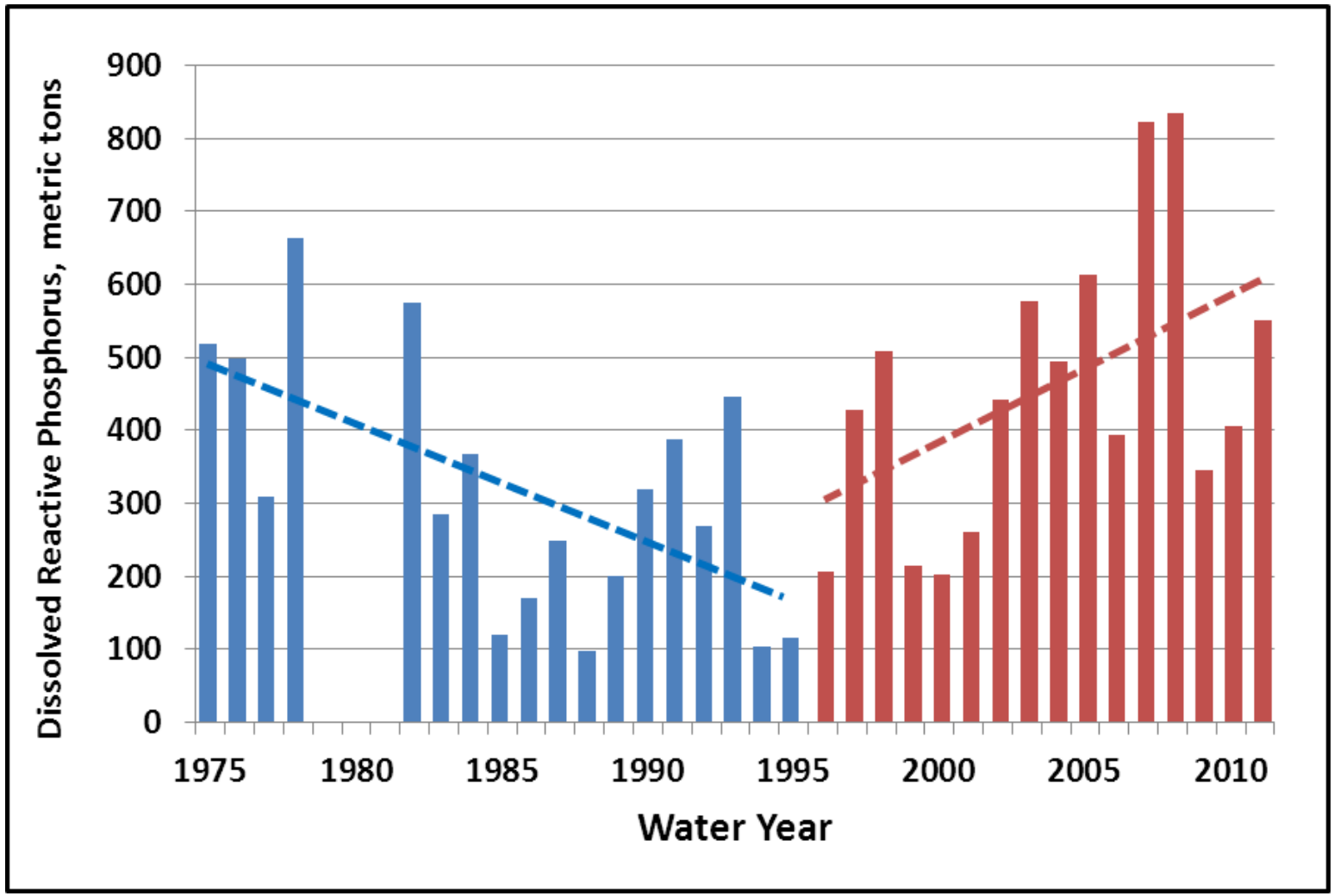
Adapted from Botts and Muldoon, 2005



DePinto et al. 1986

Resurgence of Eutrophication

Annual Export of Dissolved Reactive Phosphorus from the Maumee River at Waterville, OH



National Center for Water Quality Research, Heidelberg University

Great Lakes Water Quality Protocol of 2012 – Annex 4

- Lake ecosystem objectives related to:
  - Hypoxic zones (esp. Lake Erie)
  - Nuisance algae
  - Healthy nearshore/algal assemblage
  - Cyanobacteria biomass
  - Oligotrophic state in Lakes Superior, Michigan, Huron, Ontario, E Lake Erie
  - Mesotrophic conditions in western, central Lake Erie

Interim Phosphorus Load Targets (Metric Tonnes Total P Per Year)	
Lake Superior	3400
Lake Michigan	5600
Main Lake Huron	2800
Georgian Bay	600
North Channel	520
Saginaw Bay	440
Lake Erie	11000
Lake Ontario	7000

Parties (with other partners) shall:

- Open waters: review objectives, targets, determine allocations
- Nearshore waters: develop substance objectives, establish load reduction targets for priority watersheds

Newer Canadian, U.S. Programs

Great Lakes Nutrient Initiative
(Environment Canada)

- Quantify current loadings
- Improve understanding of impacts
- Establish binational ecosystem objectives, P objectives, load targets
- Develop policy options, strategies
- Develop binational nearshore assessment, management framework

Great Lakes Restoration Initiative
(USEPA, other agencies)

- Toxic substances and AOCs
- Invasive species
- **Nearshore health and NPS**
- Habitat and wildlife protection and restoration
- Accountability, education, monitoring, evaluation, communication and partnerships

IJC Lake Erie Ecosystem Priority

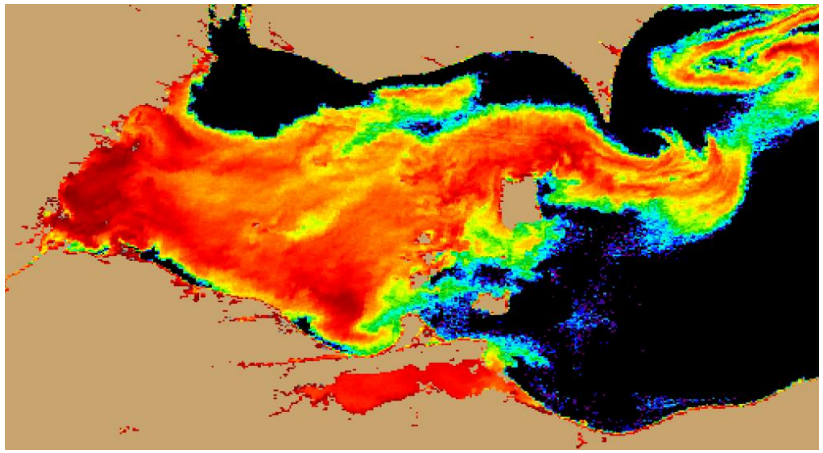
"In 3 years, we will have measurably reduced DRP (dissolved reactive phosphorus) loads and algae. We will have a better scientific understanding of causes and controls and an adequate monitoring system in place. We will have improved coastal resiliency and governance as well as better public understanding and support…"

NOAA

IJC Lake Erie Ecosystem Priority

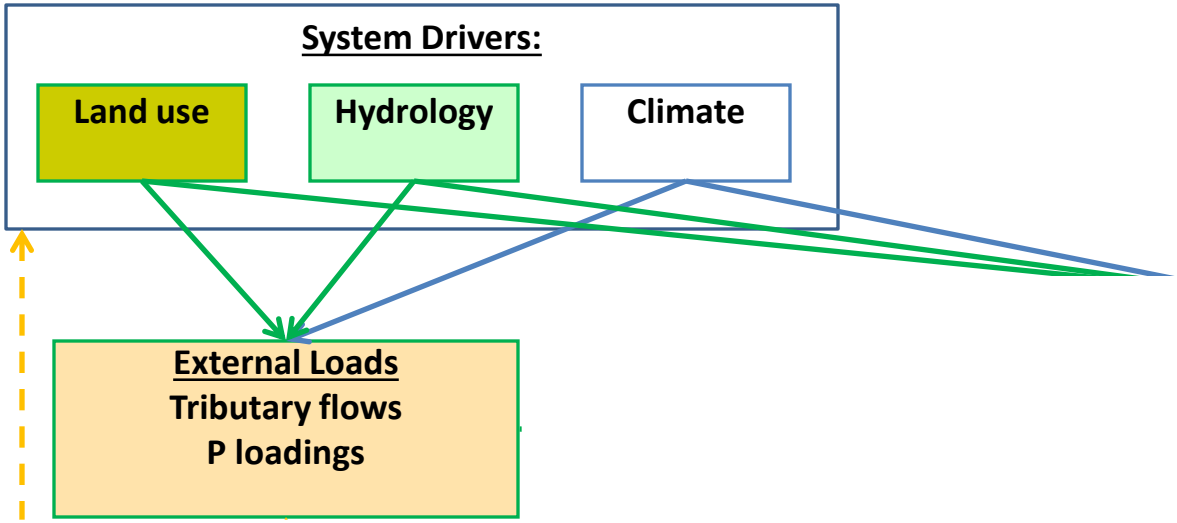
- Includes four science reports (Taking Action on Lake Erie)
  - Nutrient loads
  - Climate
  - Best management practices
  - Response curves

- Monitoring programs
- Legislative/regulatory
- Socioeconomic (costs, etc.)
- Recommended social/economic solutions
- Public outreach/stakeholder engagement



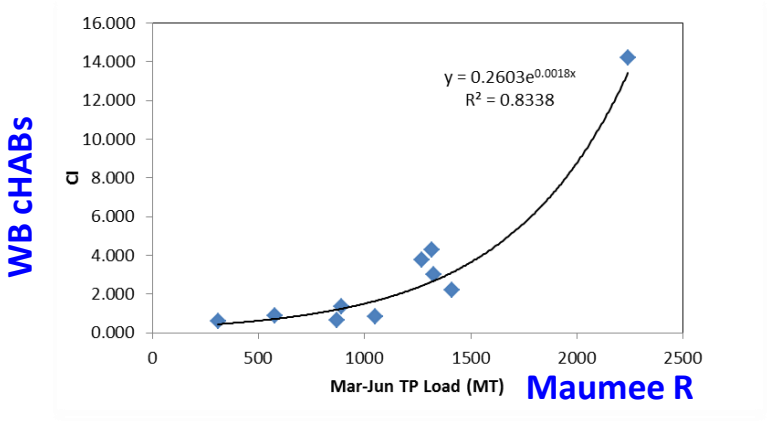
NOAA

Conceptual Model TAcLE



Subgroups:

- D1
- D2
- D3
- D5



WB cHAB index	outcome	TP Mar-June TP Load (MT)
<1	no or mild bloom	< 750
1-2.4	moderate bloom	750-1250
2.4-6	severe bloom	1250-1750
>6	extreme bloom	>1750

→→ 24% reduction in Maumee R spring TP load to 'avoid' WB blooms

Summary

- Significant progress made addressing phosphorus and eutrophication in Great Lakes
- GLWQA has played important role
  - Promoting research/synthesis
  - Support for policies/programs
  - Education/public outreach
- Resurgent eutrophication problems, need for additional programs, implementation
- IJC Lake Erie Ecosystem Priority helping to establish framework for needed programs

Acknowledgments

TaCLE Co-Chairs: Sue Watson (EC), David Carpenter (University at Albany)

IJC staff: Raj Bejankiwar, Jennifer Boehme, Dave Dempsey

Dozens of Great Lakes researchers involved in various components of LEEP.

Funding for MWM provided by the Joyce Foundation and the C.S. Mott Foundation.

Contact:
Michael W. Murray, Ph.D.
National Wildlife Federation
734-887-7110
murray@nwf.org

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David Dolan, Ph.D.
1949 - 2013

Contact:
Michael W. Murray, Ph.D.
National Wildlife Federation
734-887-7110
murray@nwf.org