# Lake Erie Millennium Network (LEMN)

## Coordinating Great Lakes Research Workshop

**Council of Great Lakes Research Managers**
**International Joint Commission**
**28 April 2004**

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# Lake Erie Millennium Network (LEMN)

***http://www.uwindsor.ca/erie2001***

Binational Network - formed November 1998

Convening Organizations:

F.T. Stone Lab - Ohio State University (Jeff Reutter)

NWRI - Environment Canada (Murray Charlton)

Large Lakes Research lab - US EPA (Russ Kreis)

GLIER - University of Windsor (Jan Ciborowski)

Sponsors: Federal, State, Provincial, Regional organizations

Collaborators: Groups active in research/information exchange

# Stimulus for Formation

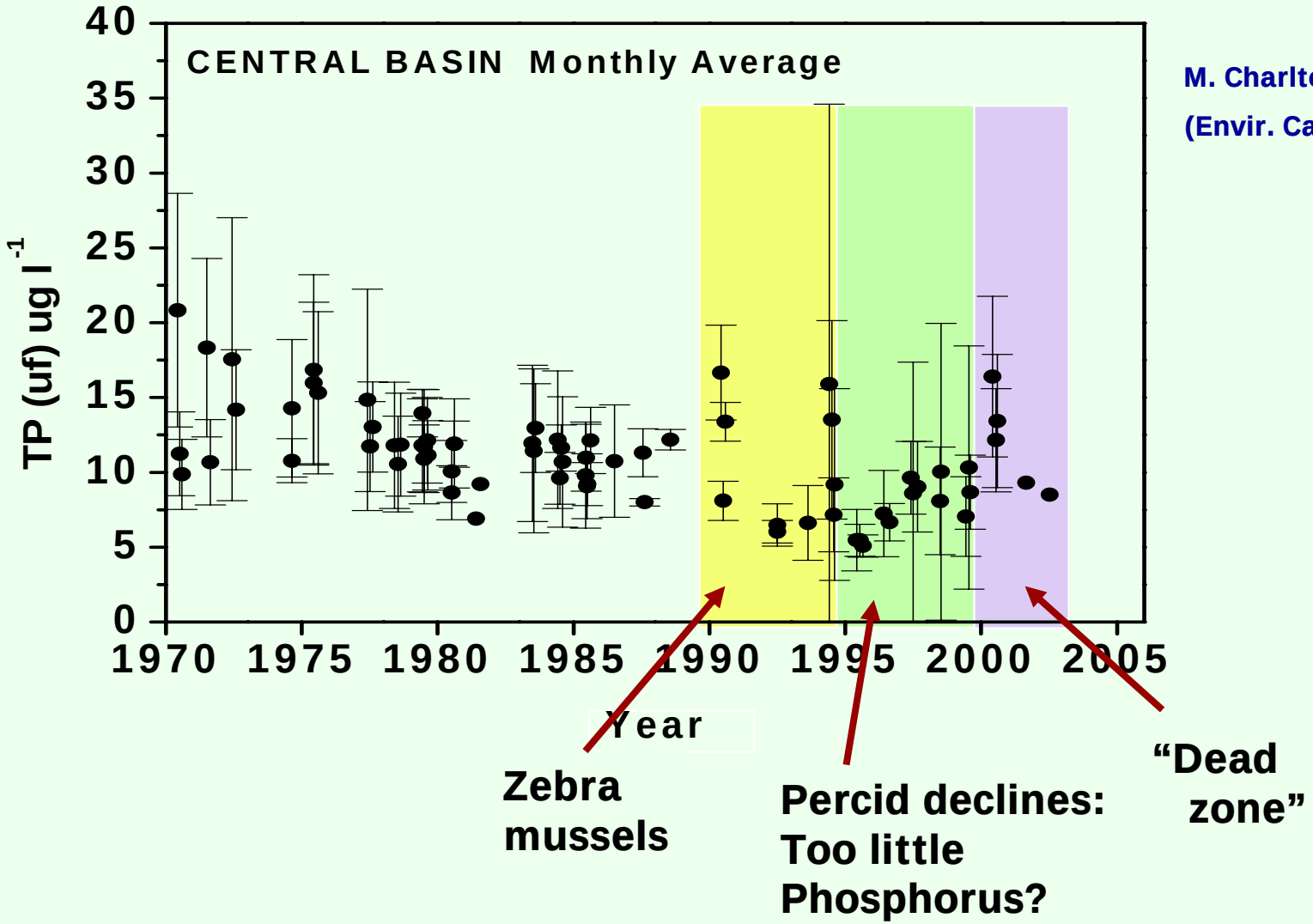
Accelerating ecosystem change ('crises') –
- trophic status & oligotrophication
- contaminant issues
- fisheries issues
- invaders

Evidence of close linkage among issues

[all blamed on zebra mussel & effects on production
→ focal goal of the time]

# What Prompted the Effort?

| | |
|---|---|
| Researchers: | Loss of research funding sources to address lake-wide questions needing collaborative, multidisciplinary expertise |
| Agencies: | LAMPs formed – mandated to ask questions, but poor link between mandates & research knowledge base. (recent research findings & tools) |
| Public: | uninformed lobbying for changes in management strategies to resolve ‘crises’. |
| Initial actions: | Independent, informal 1-day meetings discuss issues & summarize knowledge/ needs (Kreis, Haffner, Reutter, Charlton) |




M. Charlton
(Envir. Canada)

**Is phosphorus a good indicator of Lake Erie's trophic status?**
**It depends on one's point of view**

# Disruptions to the Lake Erie Food Web – one cause?

**Too much phosphorus?** **(proximal causes)**
**Too little surface chlorophyll?**

**Small, persistent hypolimnion?** **(short-term drivers)**
**Greater respiration?**
**More nutrients from lake bottom and shorelines?**

**Invaders?**
**Habitat modification and loss?** **(ultimate causes)**
**Climate change?**

## How do we define and address multiple problems?

- Multiple, contrasting points of view
- Cooperative actions (Project HYPO; IFYGL)

# Coordination

Steering Committee
(representatives of Sponsoring Agencies)

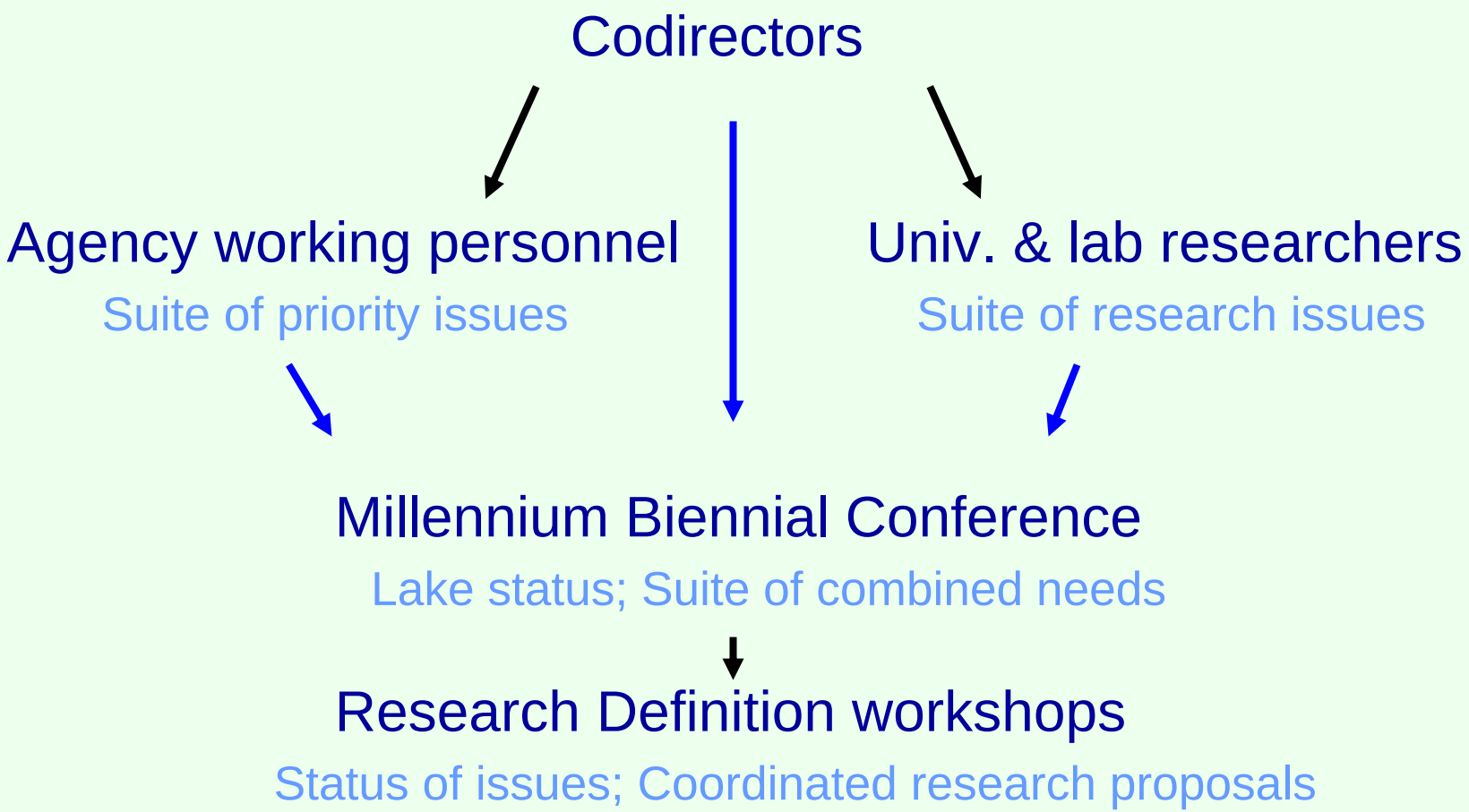
Codirectors (2 in US; 2 in Canada) at
4 nodal institutions: (2 univ.; 2 gov't research labs)

Agency working personnel
(issues/problems)

Univ. & lab researchers
(processes/unknowns)

Larger Lake Erie Community
(conferences; reports)

# Coordination




# Goal & Strategy

Goal: Develop framework for a binational research network to
a) address management needs
b) understand the ecosystem

Step 1) acquire support from managing agencies
- solicit membership (Sponsors & Collaborators)
sponsors – funds for meetings, publications, etc.
collaborators – contrib. to data needs, etc.
- invite research participation (univ. & agency scientists)

# Supporting Groups

## Sponsors

Great Lakes Fishery Commission
International Joint Commission
Lake Erie Lakewide Area Management Plan
through Environment Canada & US EPA
Lake Erie Protection Fund
Michigan Sea Grant
New York Sea Grant
Ontario Ministry of the Environment
Ontario Ministry of Natural Resources
Pennsylvania Dept. Environmental Protection
Pennsylvania Sea Grant
US Geological Survey - Gt. Lakes Sci. Ctr.

Campbell Scientific
DTE Energy, Inc.
Hoskin Scientific

## Collaborators

Citizens Environment Alliance
Cornell University Biological Station
Ducks Unlimited
Essex County Stewardship Network
Essex Region Conservation Authority
Great Lakes Commission
Great Lakes Research Consortium
Great Lakes Environ. Res. Lab - NOAA
Great Lakes Lab Fisheries & Aquatic
Sci. - Fisheries & Oceans Canada
Ontario Commercial Fishery Assoc.
Ontario Fed. of Hunters & Anglers
Ohio Dept. Natural Resources
Ohio Environ. Protection Agency
Ontario Ministry Agriculture & Food
Water Environment Federation

# Strategy

Step 2) -document research & management needs of users and agencies

**Prevailing Issues Workshop** (November 1998)

- identify major questions and management issues

Outcome: list and classification of needs:

- 48 separate topics in 7 subject areas

# Strategy

Step 3) Take stock: - what do we know?
- what do we understand?
- what do we need to know/understand?

**Binational Conference** (April 1999; 2001; 2003)

***Lake Erie at the Millennium: Changes, Trends &Trajectories (1999)***

- 46 invited speakers; 13 contributed papers; 175 attendees
- no concurrent sessions
- compile current knowledge of Lake Erie processes
- forecast trends for the next 3-5 years
- identify critical research gaps

**Outcome:**

- "Research Needs" workshop --> summarized consensus on the 7 subject areas
- *Lake Erie at the Millennium: Changes, Trends, & Trajectories.* Monograph (2004)

# Strategy

Step 4) Clarify research questions

## "Refining Research Needs" Workshops

***1. Limits on Energy Transfer in the Lake Erie Ecosystem - Critical Tests of Hypotheses*** (EPA-funded L. Erie Trophic Status: 28 indiv.)

***2. Contaminant Processes in Lake Erie***

- **Part I.** ***Loadings, Spatial Patterns, and Temporal Trends***
- **Part II.** ***Mechanisms and Processes***
- **Part III.** ***Ecosystem Implications***

***3. Habitat Structure, Function, and Change***

***Anticipating effects of water level changes on habitat distribution & quality***

**. . . Others to follow**

Regulation of Energy Flow at the Top of the Food Web
Invasion Processes and Control
Implications of climate change
Human Health Issues

# “Research Needs” Workshop Philosophy

**Identify data needs that**

**- test hypotheses generated by strong inference approach**

**- provide necessary values for modelling needs**

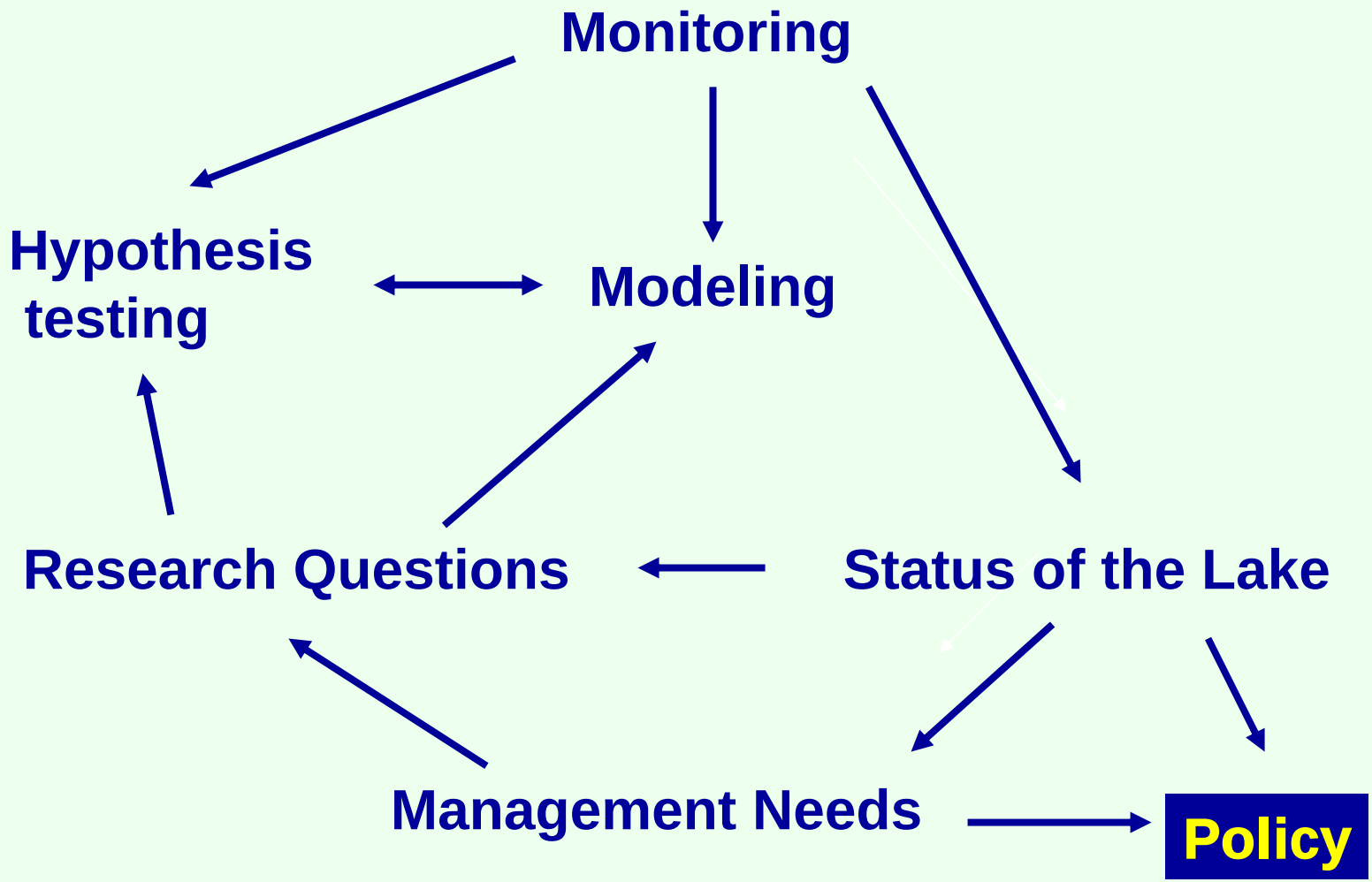
**Strong Inference: multiple hypotheses that distinguish among alternative explanations.**

**Research: “Monitoring with an hypothesis”. (Planning to use monitoring data to test expectations of hypotheses).**

## Strong inference challenge for research questions:

- Summarize possible explanations.
- For each explanation, what unique prediction could be made that would distinguish it from the other explanations?
- What would happen if explanation is correct?
  What other explanations could produce the same result?
- What key variable(s) would change to support the prediction?
- How large a change (X) is needed to be biologically meaningful?
- How many measurements would be needed for 'X' to be statistically significant (unlikely to have occurred by chance)?
- What density of data are needed to model the question?

## Step 4) forming collaborative groups




Relationship among management, research, & monitoring needs within LEMP.

# What Worked

- Very positive response by all agencies & many scientists
  - immediate development of critical mass, credibility, & momentum because of breadth
  - inclusiveness is key
  - instant informal collaborations at meetings/conferences

- Excellent rapport & information exchange between agencies & researchers; high public profile for issues & needs

- Poised to provide crisis response when management priority shifts matched previously developed research proposals & assembled research teams [previous contributors]

- Research needs aligned to address management issues & guide agency policy

# What Worked?

## Research arising from workshops

***1. Limits on Energy Transfer in the Lake Erie Ecosystem - Critical Tests of Hypotheses***

EPA-funded Lake Erie Trophic Status project:

-28 PI's funded by US EPA ($500K)

-all agency collaboration → $2M in kind support

-huge public profile

***2. Contaminant Processes in Lake Erie*** [dormant]

- **Part I. *Loadings, Spatial Patterns, and Temporal Trends***
- **Part II. *Mechanisms and Processes***
- **Part III. *Ecosystem Implications***

***3. Habitat Structure, Function, and Change***

***Anticipating effects of water level changes on habitat distribution & quality***

***Binational Mapping Strategy for Lake Erie watershed***

GLPF & USFWS funded; others pending

-12 PI's & cooperators

- all agency collaboration

# What Isn't Working?

- **Implementing research is still a challenge;**
  - **programs need 2-5 years minimum; ecosystem process**
  - **funding terms of reference 1-2 yr & narrowly defined**
  - **Still few prospects for long-term initiatives**

- **Matching timing of proposals & opportunities is challenging**

- **Funds are available for executing research, not planning, synthesis or reporting**

- **US conflict of interest guidelines impede information transfer to provide guidance**

- **Voluntary organization limits rate of progress**

# Recommendations

- Great Lakes have regional issues & flavours due to societal & biogeographic variation
  - need a hierarchical report/coordination structure; regional → integrative basinwide

- Communicating current research is bottom-up
- Synthesis & pattern recognition is an emergent property of open discussion & consensus-building; but needs planning

- alternate open scientific forums (information inputs & comment) with carefully structured planning/synthesis sessions (strong inference/modeling); facilitators must be experts

- anticipate a funding & timing framework that supports planning, reporting, guidance & research (travel & time are expensive). The plans must be ready when the funding opportunities arise.