New Discoveries from Old Experiments

FORMBLOOM & REMEdration

Photo: Bryanna Sherbo
Hundreds have worked on Lake 227
Baulch, Larsen, Molot, Salk, Schiff, et al.
NSERC, GWF, GC, et al.
The Fisheries Research Board of Canada
What it is and what it does
227 history in 1 slide

David W. Schindler et al. PNAS 2008;105:32:11254-11258
Continue Lake 227?

Unique

Photo: Brenda Lafrancois via @bobsterner
Continue Lake 227?

- Unique
- Lake Superior has blooms!

Photo: Brenda Lafrancois via @bobsterner
Color Producing Agent (CPA)
Chlorophyll

Photo: Brenda Lafrancois via @bobsterner
Reduce risk
Triggers
New technology
Short-term mitigation options
29 Seasonal Replicate Experiments

- P-only additions to Lake 227 (1990 to 2018)

- Slightly different climate forcings
29 Seasonal Replicates

- A lot of data – *onset* & *collapse*
29 Seasonal Replicates

- A lot of data – onset & collapse

\[
g(E(Y)) = s_1(x_1) + s_2(x_2) + \ldots + s_p(x_p)
\]
New Discoveries from Old Experiments

Time and Space
Where to next?
Role of Fe in cyanos – beyond P&N

- Phospho-ferrous hypothesis
  - P controls amount
  - Fe controls species

Molot et al. 2014 Freshwater Biology; Verschoor et al. 2017 CJFAS
Role of Fe in cyanos – beyond P&N

● *Phospho-ferrous hypothesis*
  – P controls amount
  – Fe controls species
● Where is the iron?
● Ferrous switch between cyanos and eukaryotes?

Molot et al. 2014 Freshwater Biology; Verschoor et al. 2017 CJFAS
Aphanizomenon bloom in Lake 227 shut off in early summer. Was this because of low Mo?

Epilimnion in 2010

Total Mo declined 50% to 1.5 nM during 28 day bloom period.

Would bloom have lasted longer if Mo was higher?
Trace Metals & Broad Applicability

- Can phytoplankton run out of metals for enzymes?

- Nitrogenase (Fe and FeMo)
- Nitrate reductase (Mo)
- Urease (Ni, Mn and Co in lab studies)
REMEdiation: Lakes 303 & 304

- REdox and trace MEtal mitigation options for harmful algal blooms
- Polymictic, P-loading patterns, metals
- Mechanistic tests
Where to now?