Letting in the Light: Science In the Public Interest

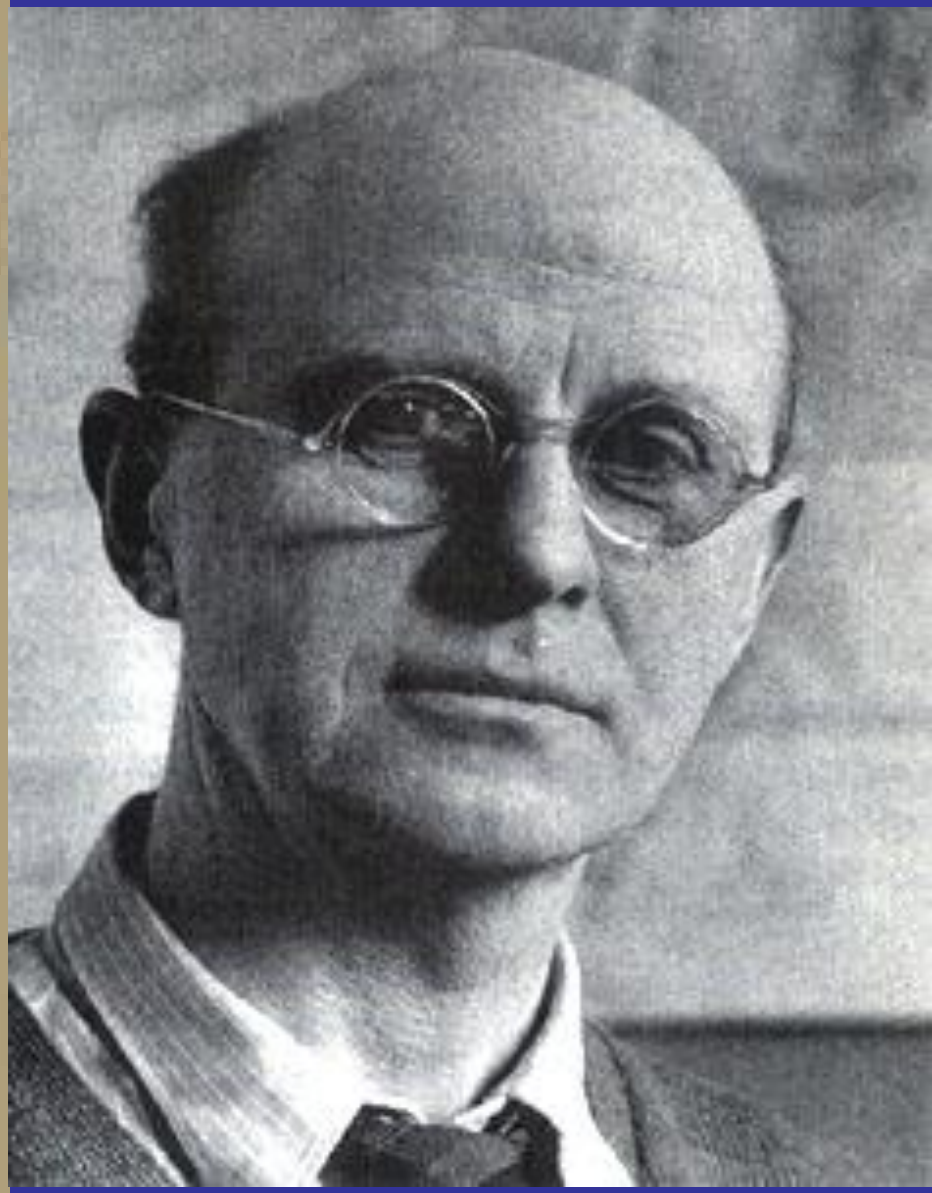
DW Schindler

Department of Biological Sciences

University of Alberta

THE ECOLOGY OF INVASIONS BY ANIMALS AND PLANTS

CHARLES S. ELTON



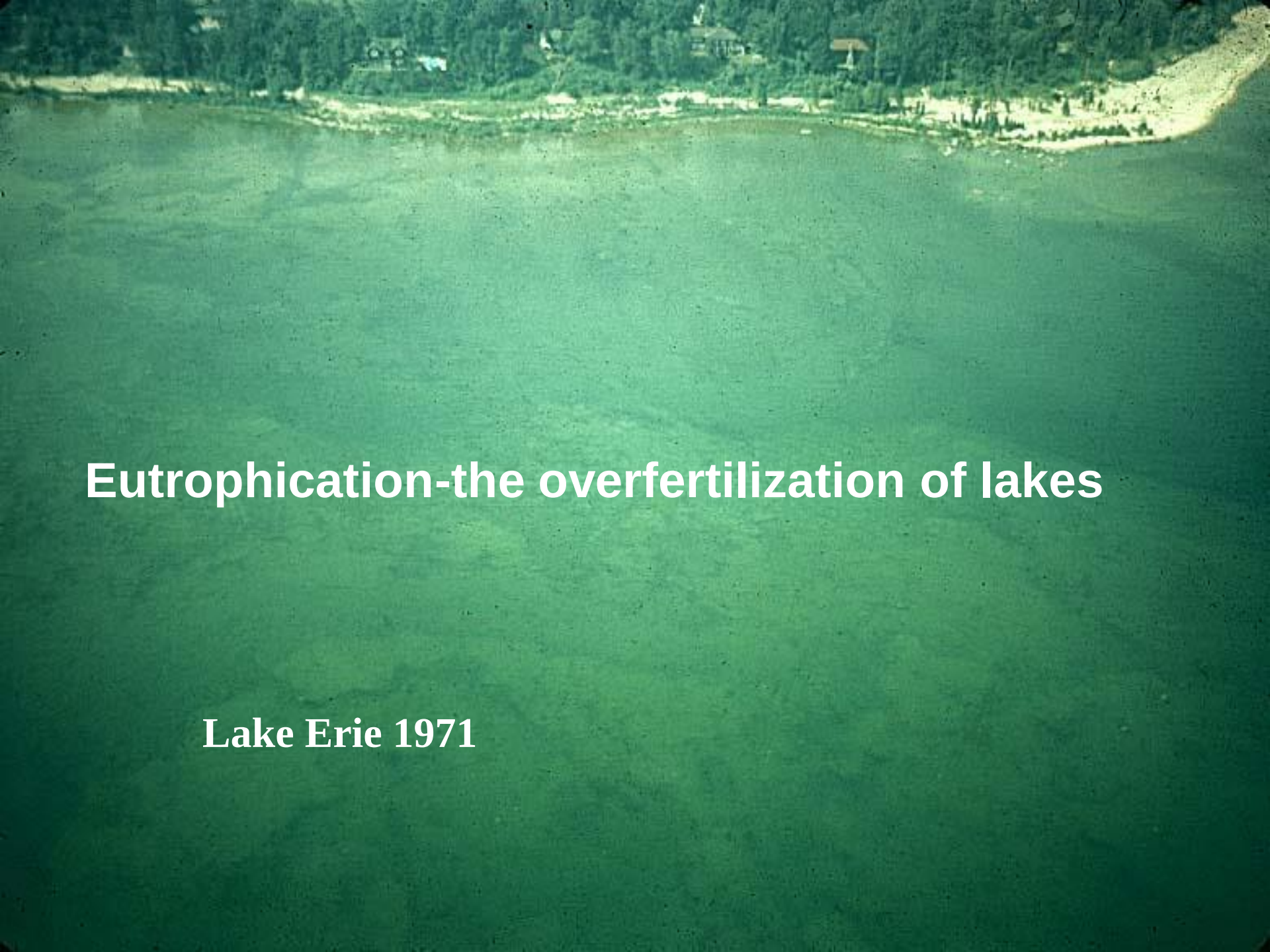
EUTROPHICATION:

CAUSES, CONSEQUENCES, CORRECTIVES

PROCEEDINGS OF A SYMPOSIUM

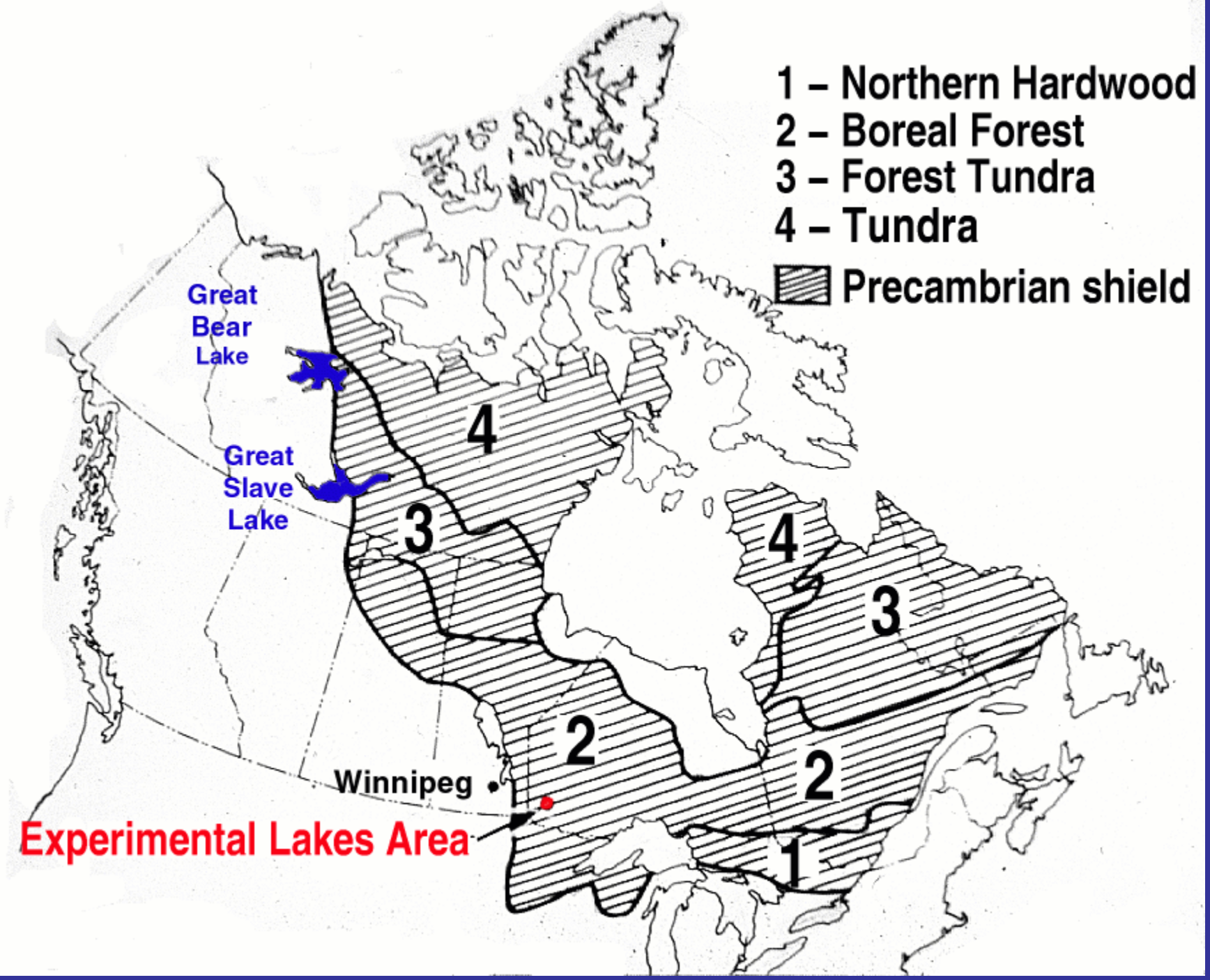
NATIONAL ACADEMY OF SCIENCES

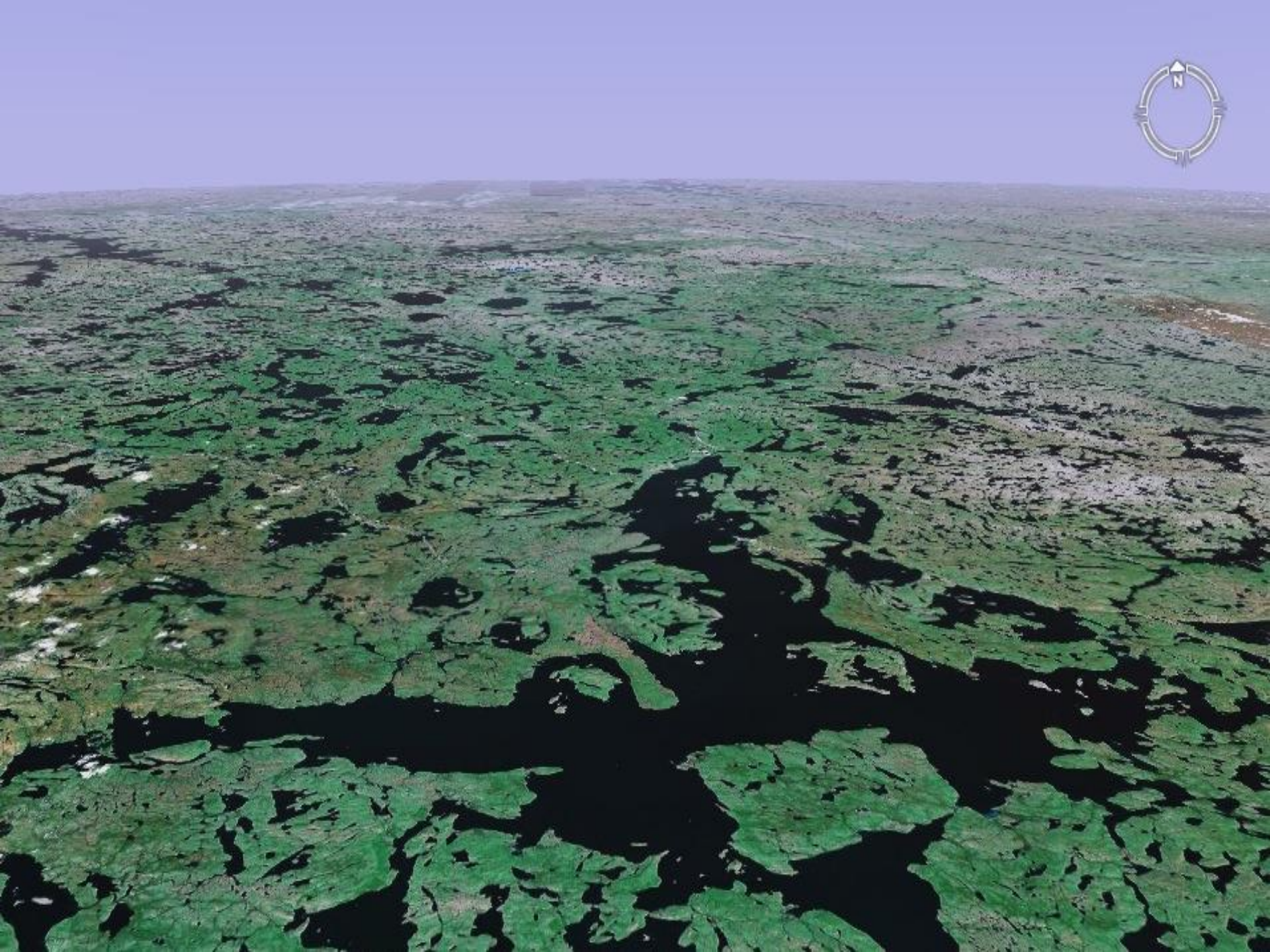
Washington, D.C.
1969

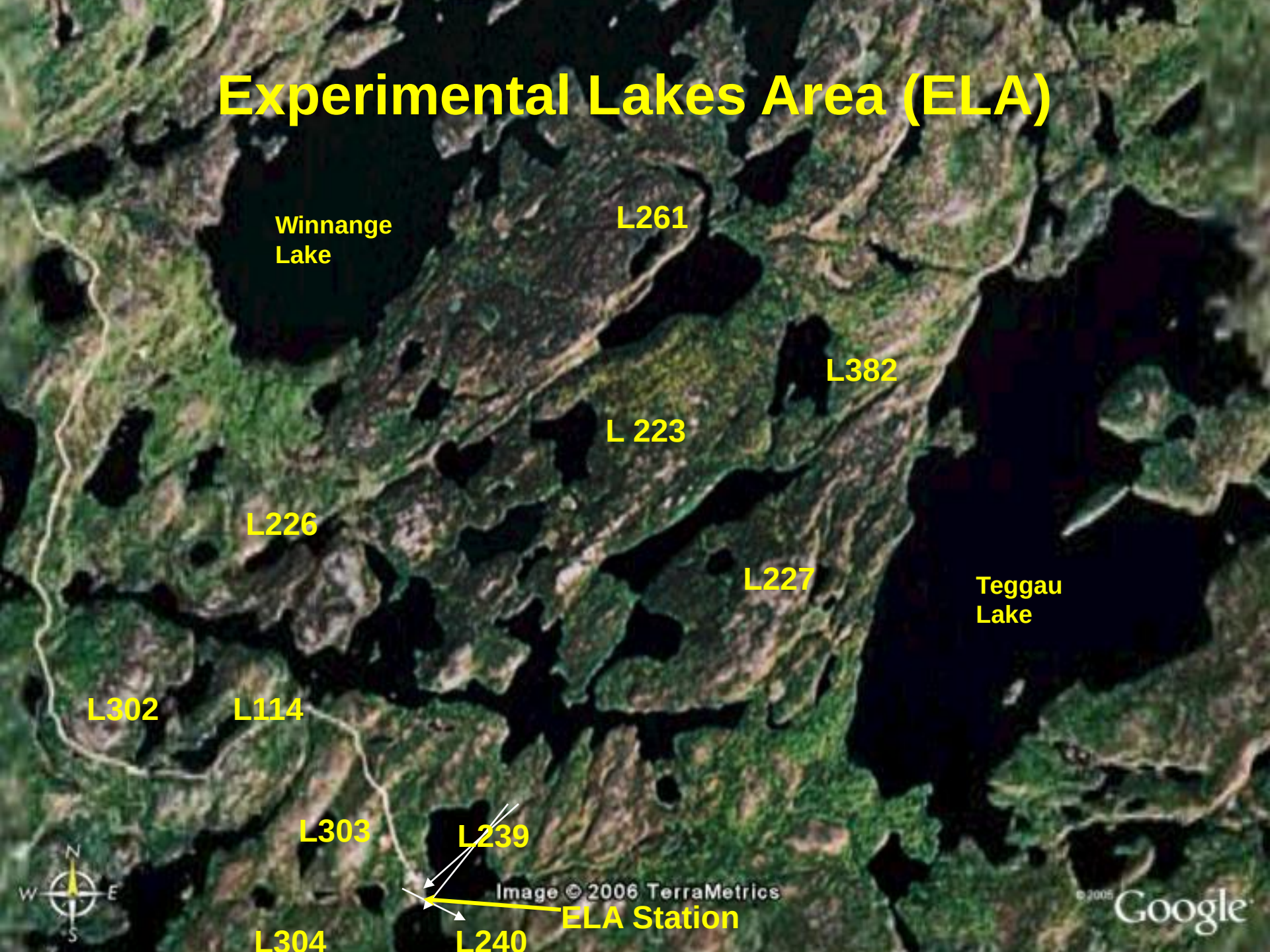

Eutrophication-the overfertilization of lakes
Lake Erie 1971

J.R. Vallentyne

(Johnny Biosphere)


1 – Northern Hardwood
2 – Boreal Forest
3 – Forest Tundra
4 – Tundra
Precambrian shield
Great Bear Lake
Great Slave Lake
4
3
4
3
2
2
1
Winnipeg
Experimental Lakes Area


N

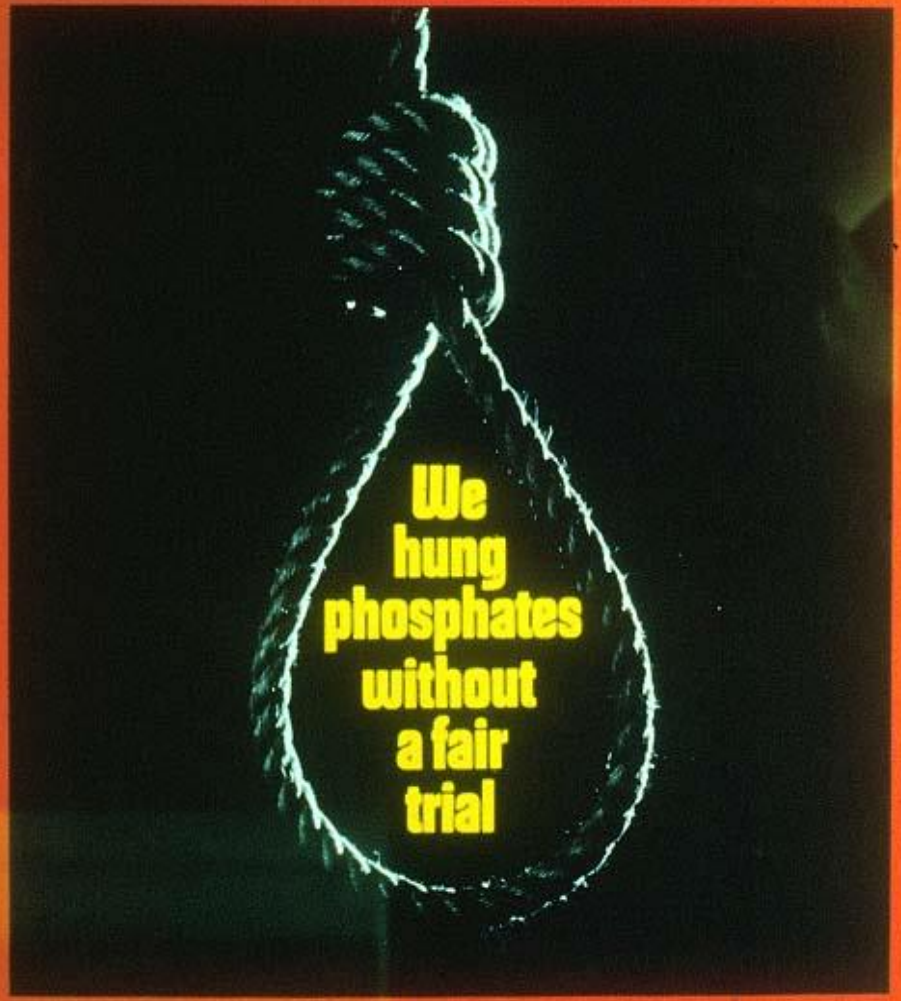

Experimental Lakes Area (ELA)
Winnange Lake
L261
L382
L 223
L226
L227
Teggau Lake
L302
L114
L303
L239
L304
L240
ELA Station
Image © 2006 TerraMetrics
Google

ELA Camp
December 1968

CANADIAN
RESEARCH & DEVELOPMENT

A MACLEAN-HUNTER PUBLICATION

MARCH/APRIL 1970



How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming

Merchants of DOUBT

Naomi Oreskes

& Erik M. Conway

Lake 227

Before fertilization

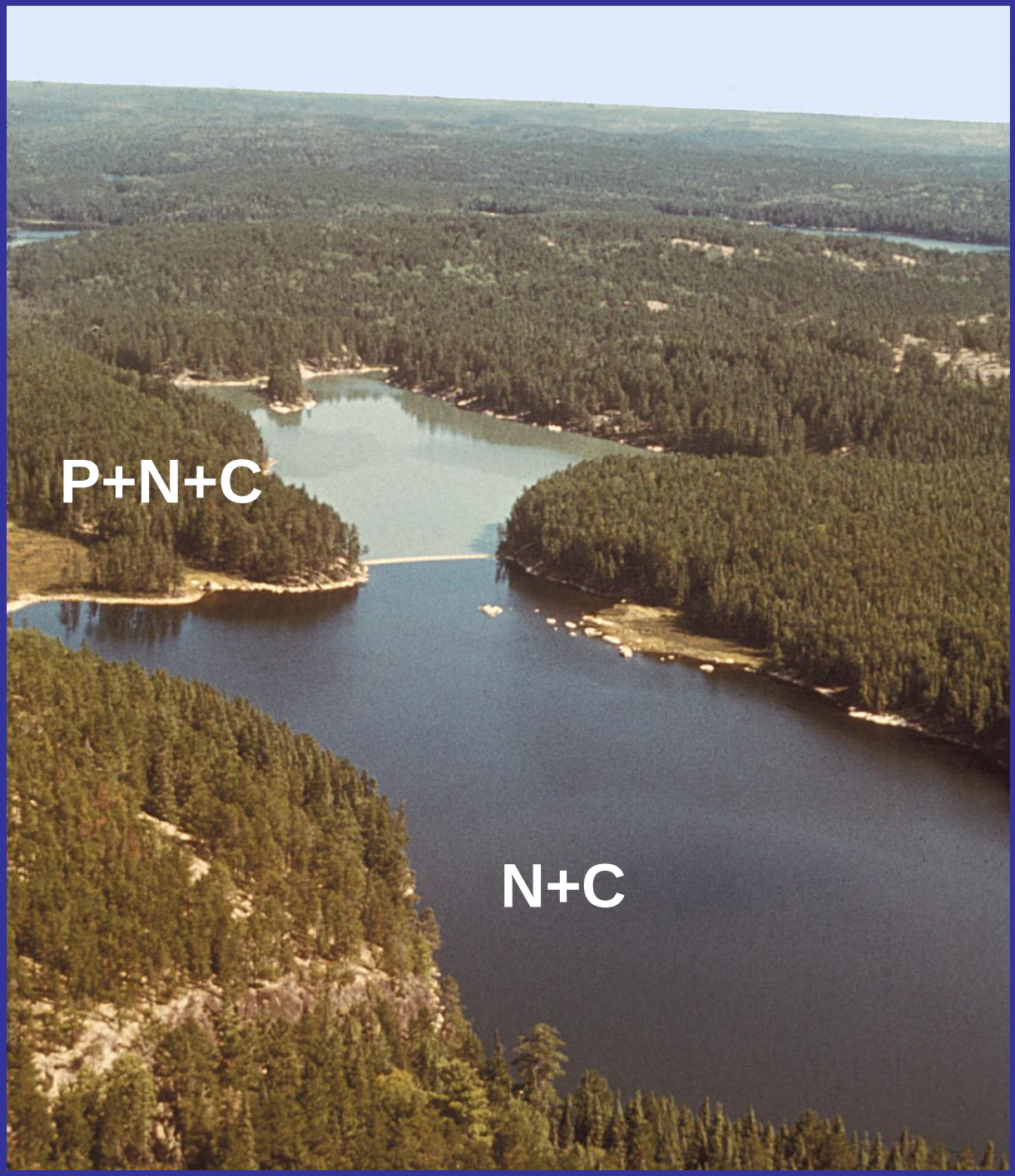
After fertilization with P+N – The Carbon Hypothesis Is Falsified.

Lake 226- testing the N hypothesis

Schindler
Science 1974

"The most powerful picture in the history of limnology"-

Prof. Jim Elser
U. of Arizona



Eutrophication- from pilot research to Canadian policy in 3 years

Phosphorus removed from detergents

Phosphorus removed from sewage by tertiary treatment

Science was welcomed and implemented by Canadian Government Policy Makers

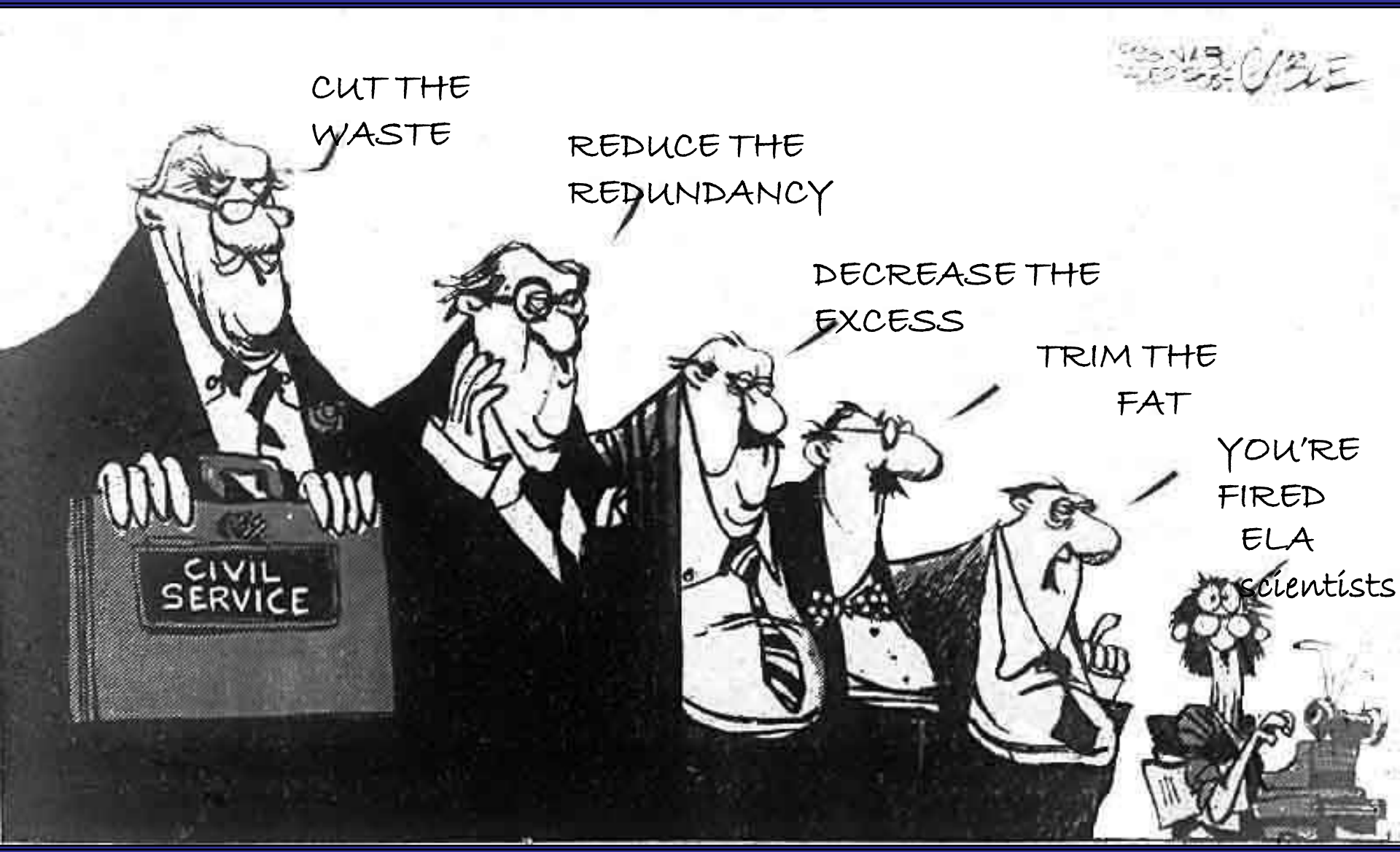
Eutrophication 2-convincing the USA

Where P control has worked – partial list of case histories

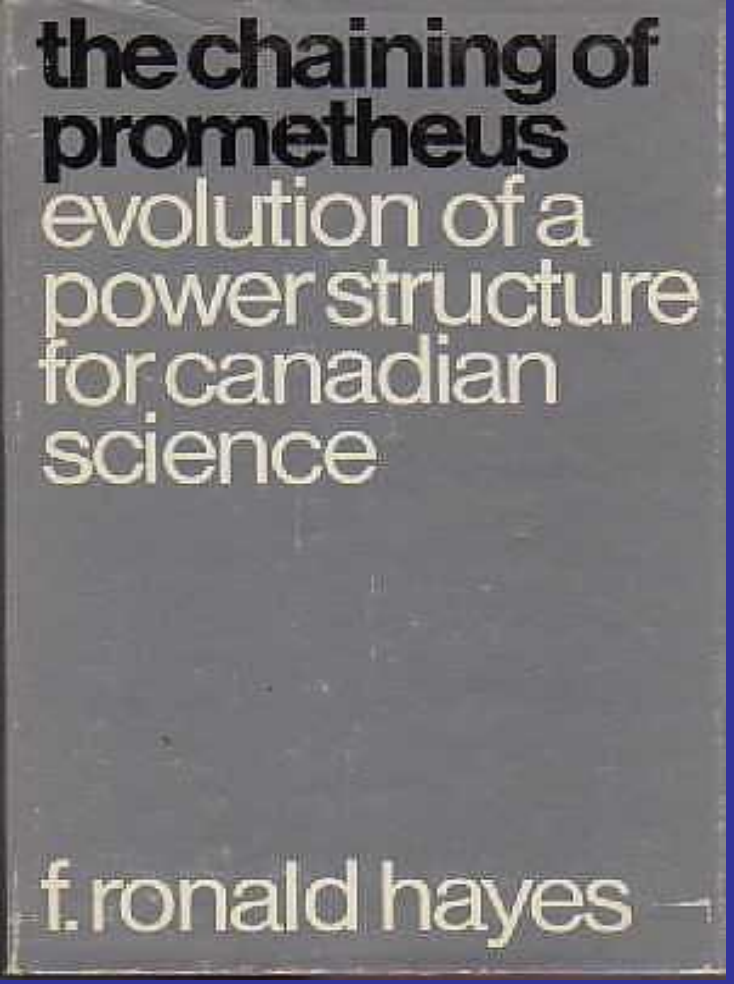
Lake Erie
Lake Ontario
Lake Michigan
Lake Huron
Lake Superior
Lake Onondaga, NY
Lake Geneva, Switzerland
Lake Lucerne, Switzerland
Lake Zurich, Switzerland
Lake Constance, Switzerland
Lake Norrviken, Sweden
Lake Malaren, Sweden
Lake Hjalmaren, Sweden
Lake Vattern, Sweden
Lake Vanern, Sweden
Lake Mjosa, Sweden
Gravenhurst Bay, Muskoka
Kootenay Lake, BC
Moses Lake, Washington
Several ELA lakes
Stockholm Archipelago -G. Brattberg, *Vatten* 42, 141-153 (1986)

There are *NO* examples of where decreasing nitrogen loading has successfully reduced eutrophication of a lake!

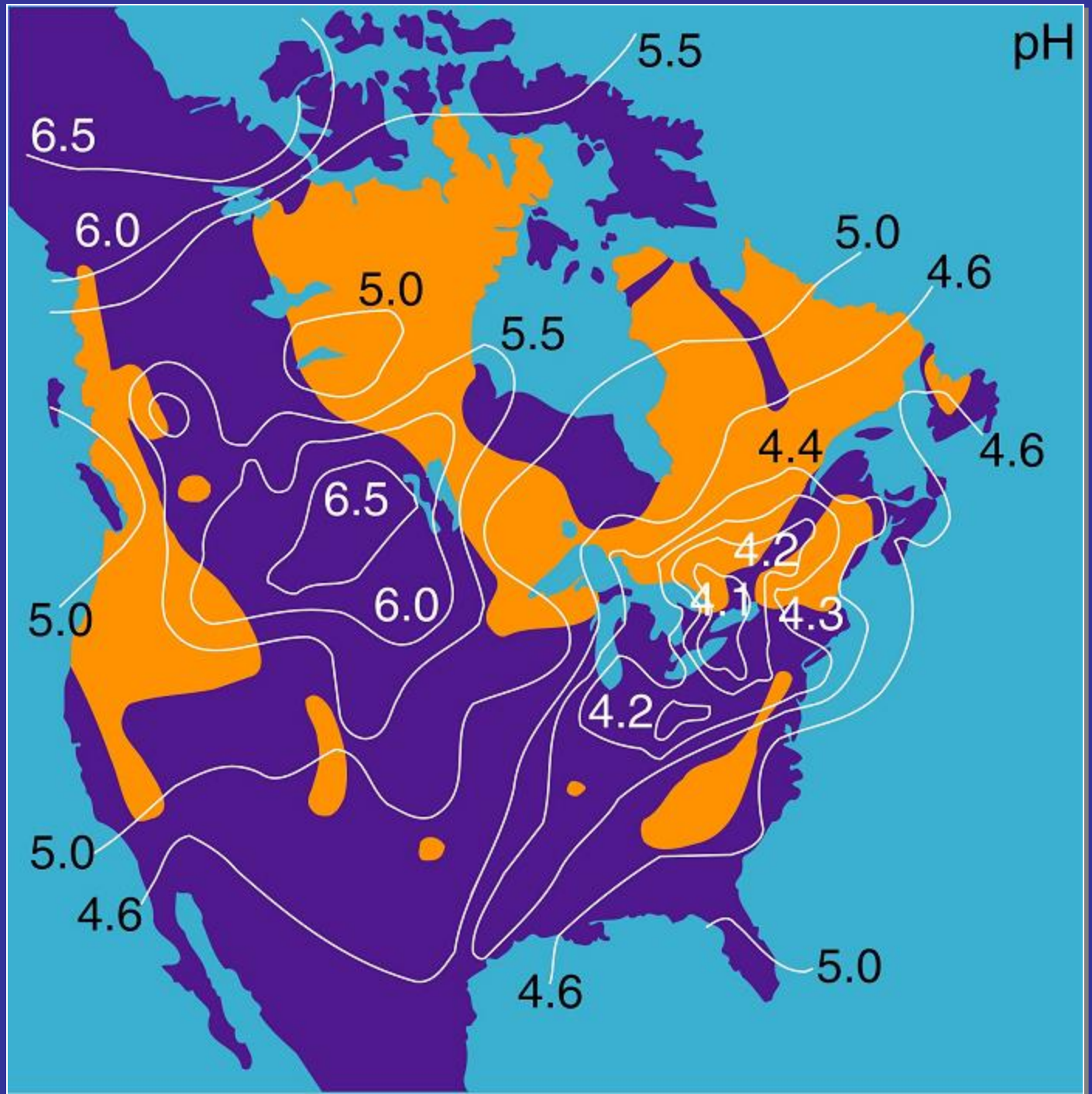
Schindler 2012 Proc. Roy. Soc. London (B) 279: 4322-4333.



The Fisheries Research Board and ELA are forced into the Civil Service - ELA is "sunsetted."

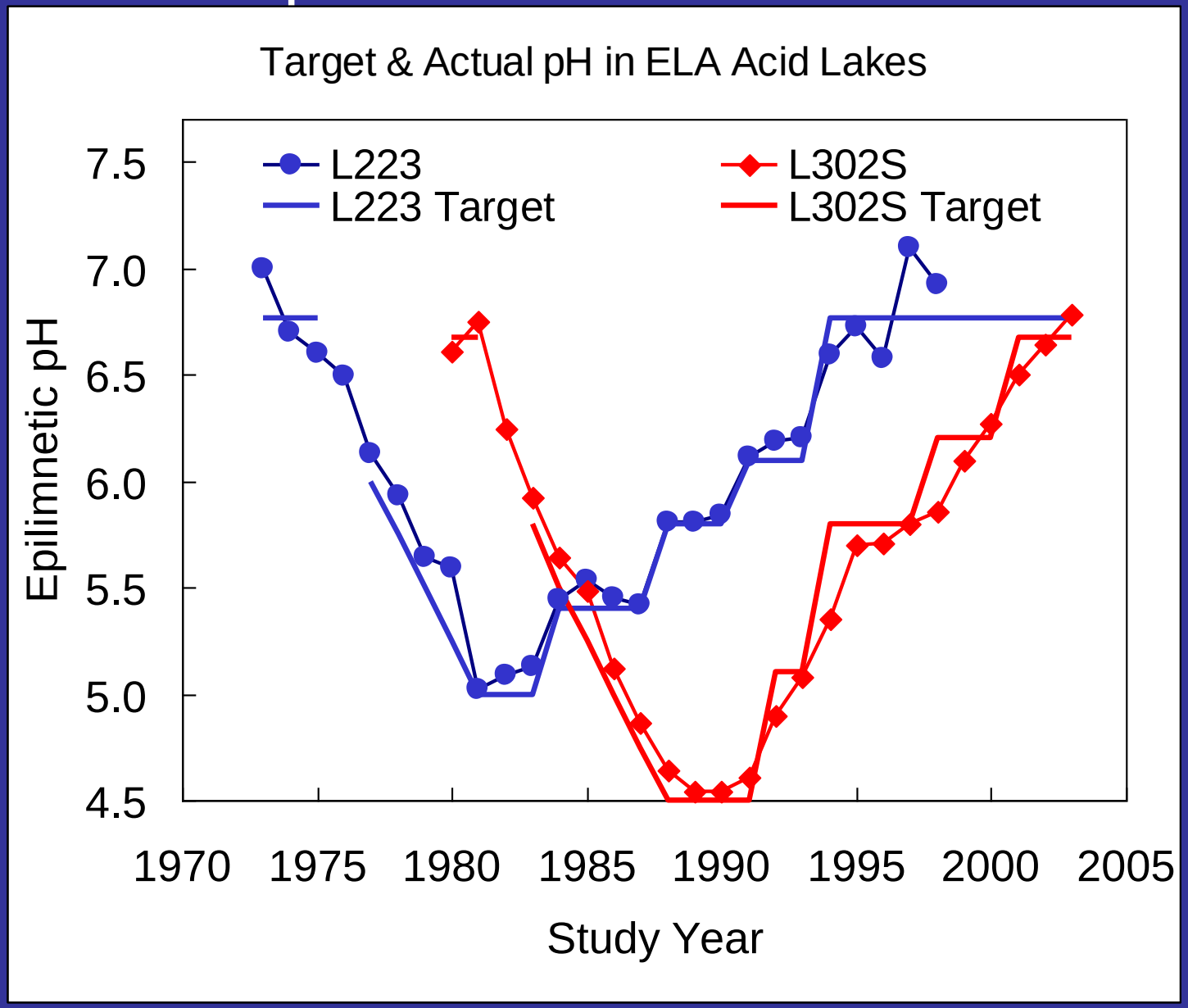


(line management) "will slyly slip sawdust into the oats of the research donkey until the animal becomes moribund" F.R. Hayes


pH
5.5
6.5
6.0
5.0
5.0
4.6
5.5
4.4
4.6
6.5
4.2
6.0
4.1
4.3
5.0
4.2
5.0
4.6
4.6
5.0

Lake 223 ELA

pH in L223 & L302S



Mysis relicta

Gone at pH 6

Pimephales promelas **(Fathead minnow)**

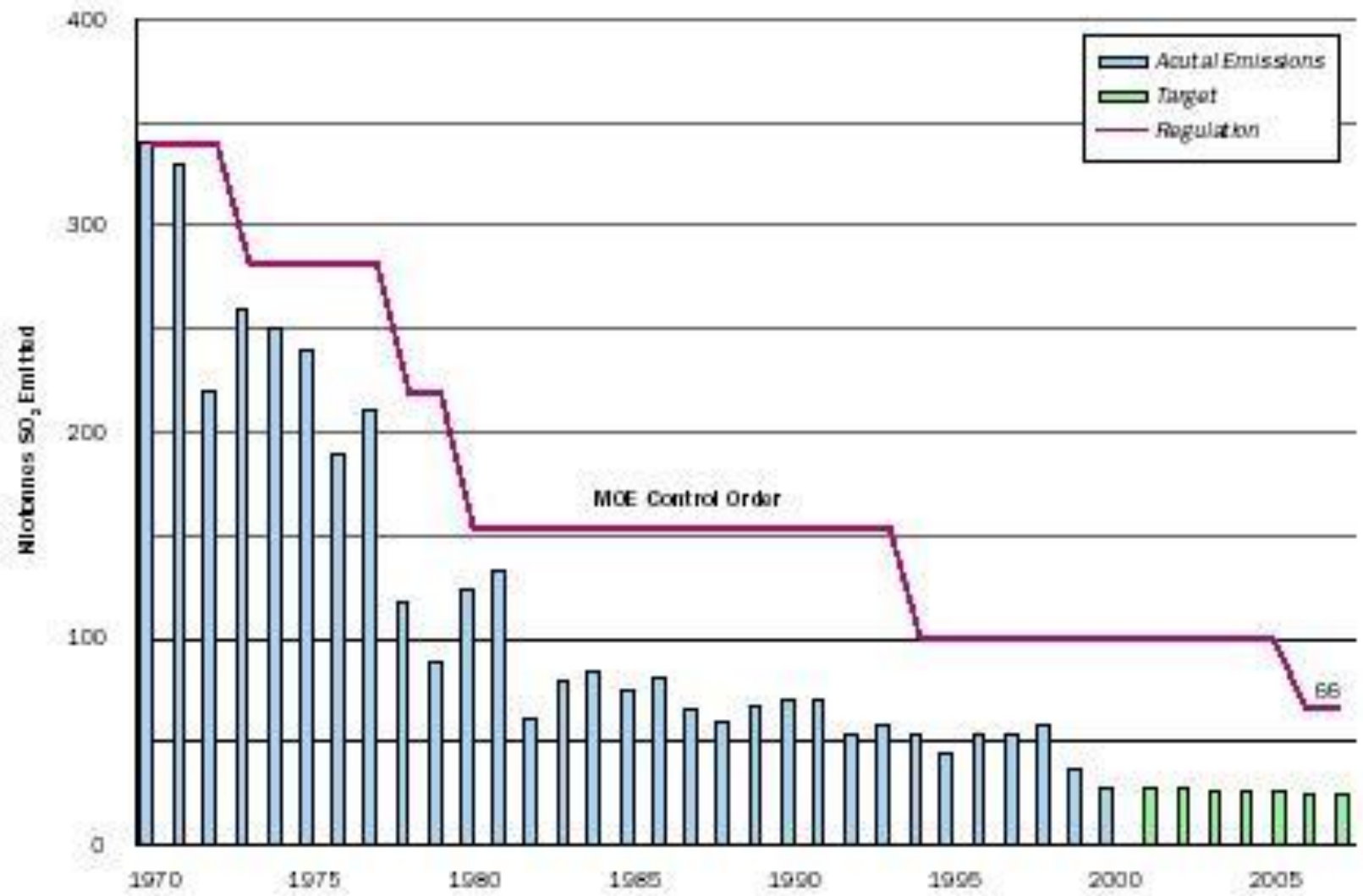
Photo by Ken Mills

pH 5.6

Schindler et al. 1985. Science 228: 1395-1401. Photos by Ken Mills

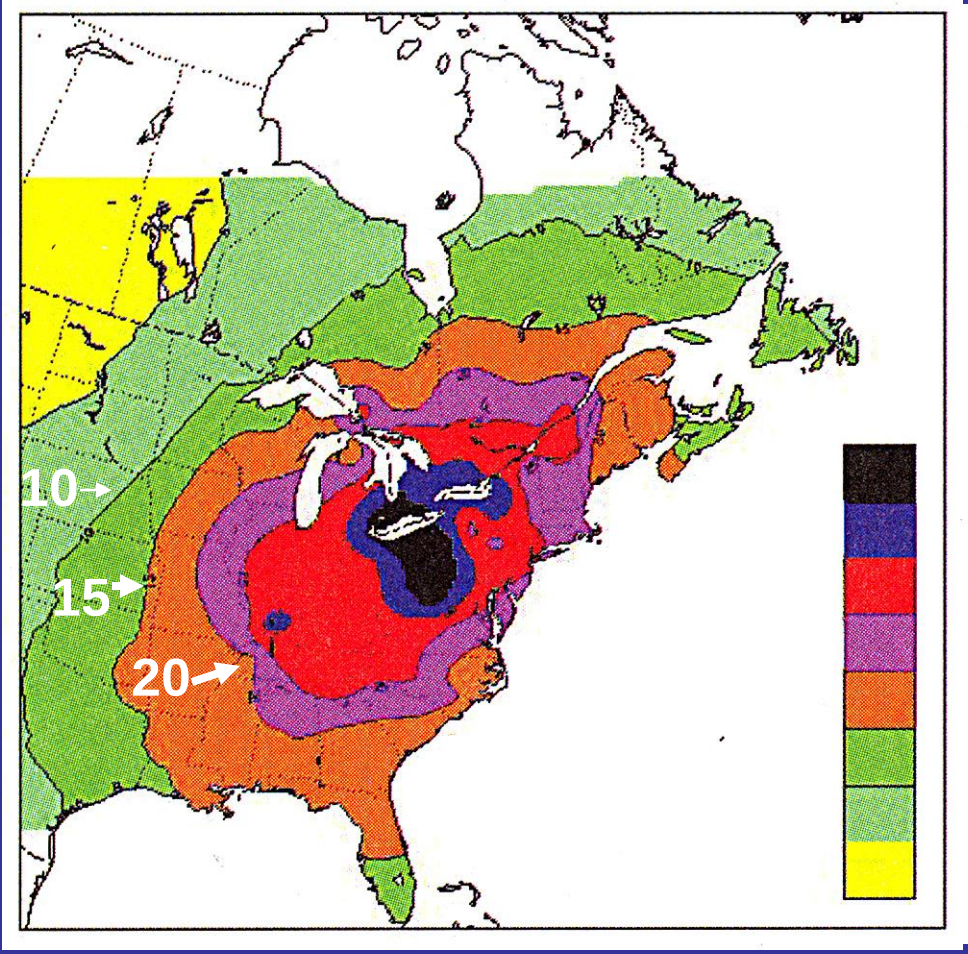
Changes in the number of species in various taxonomic groups in Lake 223 during experimental acidification

Taxonomic Group	1974-75 pH > 6.5	1981-83 pH 5.0-5.1	% Lost
Planktonic algae	78	73	6
Benthic algae	30	16	47
Zooplankton	31	19	39
Dipteran insects	70	36	51
Benthic crustaceans	3	0	100
Fish	6	3	50-100
Total species	218	144-147	33-34

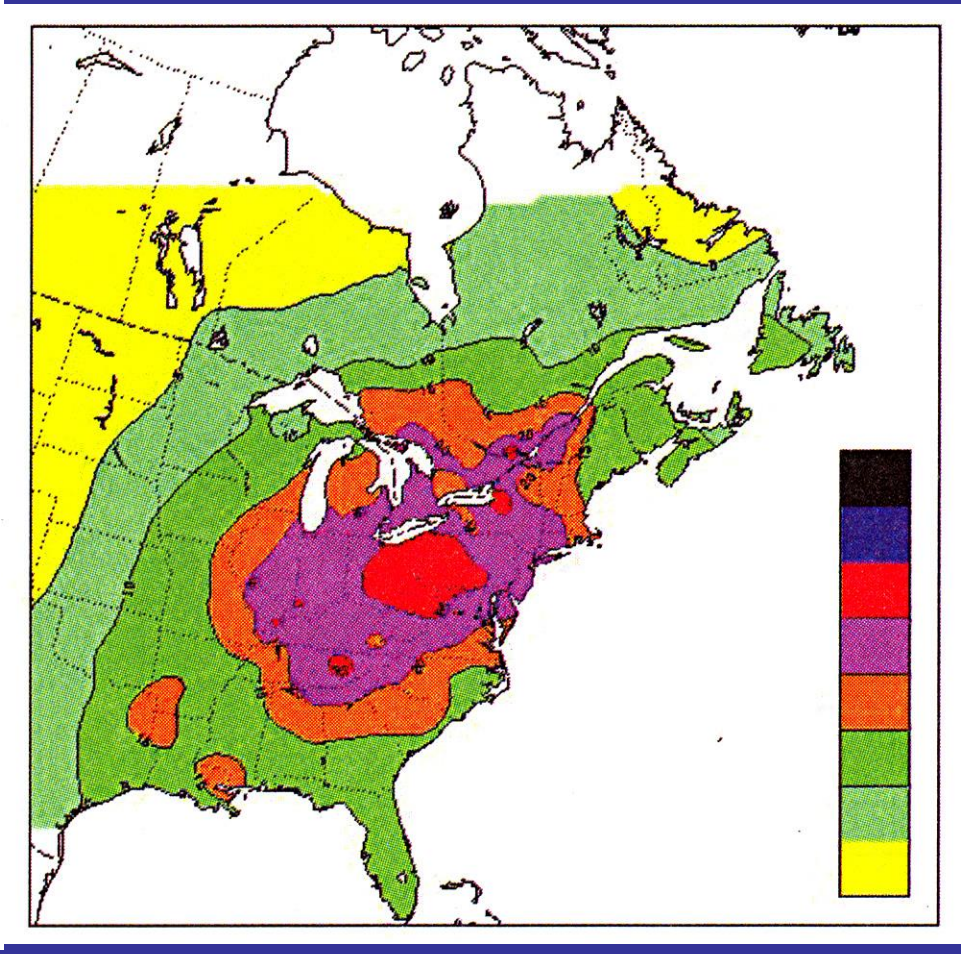


Industry leads government in response

Five-year mean excess sulphate wet deposition patterns



Deposition levels 1980-1984
(kg/ha/year)



Deposition levels 1991-1995
(kg/ha/year)

Source: Chul-Un Ro, Environment Canada (1999)

Acid Rain

Reductions in acidifying emissions in Canada & USA

- **110, 000 fish populations saved**
- **5.1 million species populations saved.**
- **$ 33,000/fish pop. = $3.6 Billion**
- **$700/sp. Pop. = $3.6 Billion**

Minns et al. 1990 Can J Fish Aquat Sci.

1989- the move to Alberta- the ALPAC panel

Friends of Science Billboard in Calgary

Area,	thousands km2
Alberta	662
France	505
Sweden	450
Norway	386
Germany	357
UK	249
Oil Sands	140
Greece	131

"Alberta's door remains open..

… over 150 (more) years!"
(referring to the tar sands)

Premier Ed Stelmach, May 4 2009
Geneva, Switzerland

Alberta

The ~~Tar~~ Sands Oil

Alberta energy is clean energy!

Sustainable prosperity

Tremendous economic opportunity!

We protect the environment, optimize economic growth.

Innovative, responsible, and collaborative development of oil sands.

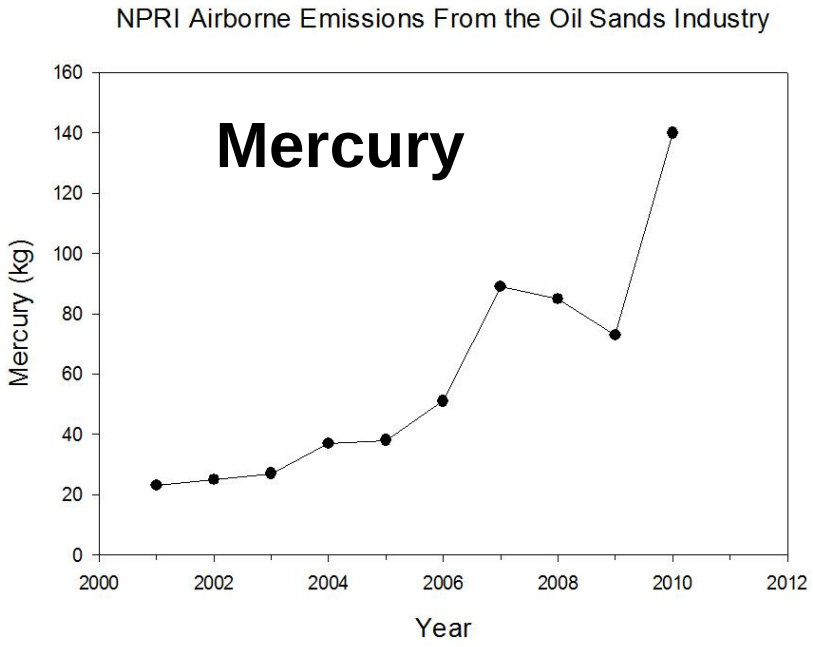
Alberta has some of the most stringent environmental regulations in the world.

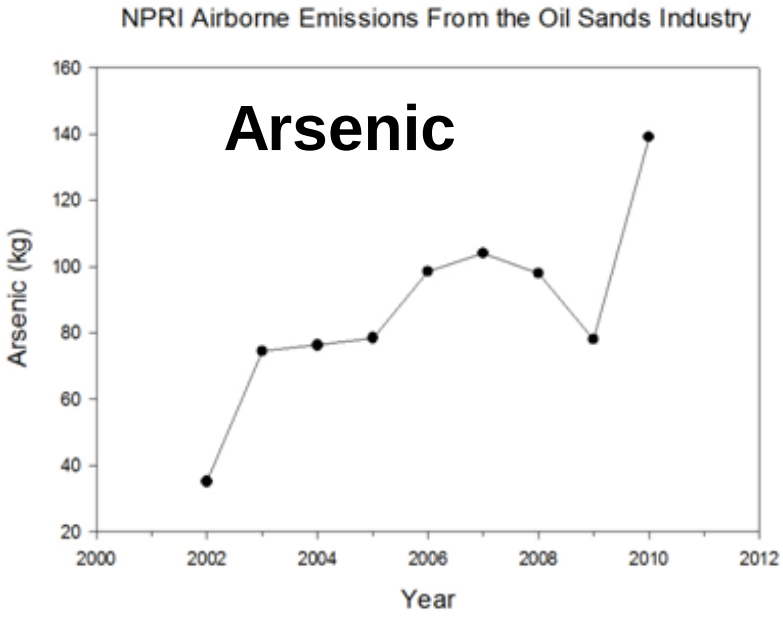
2010 Canadian newspapers…..

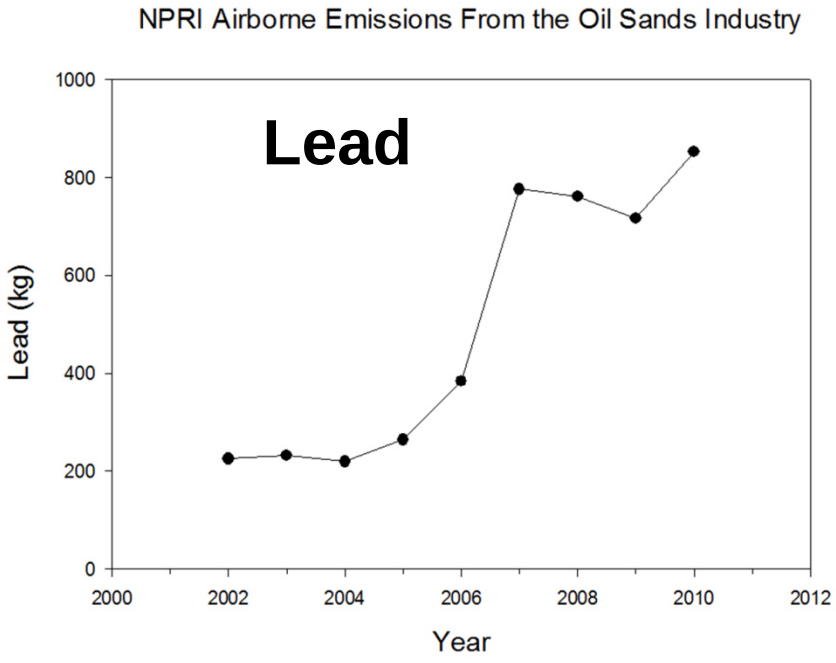
MYTH: Shells oil sands mining operations are polluting the Athabasca River.

REALITY: ***Shell staff chemist Brad Komishke says this belief overlooks oil sands geology. Oil sands have been leaching naturally into the river for the past 10,000 years. Shell ensures its operations don't add a drop to that. We contain all the process water and rain water on our sites to make sure they don't flow into the river.***

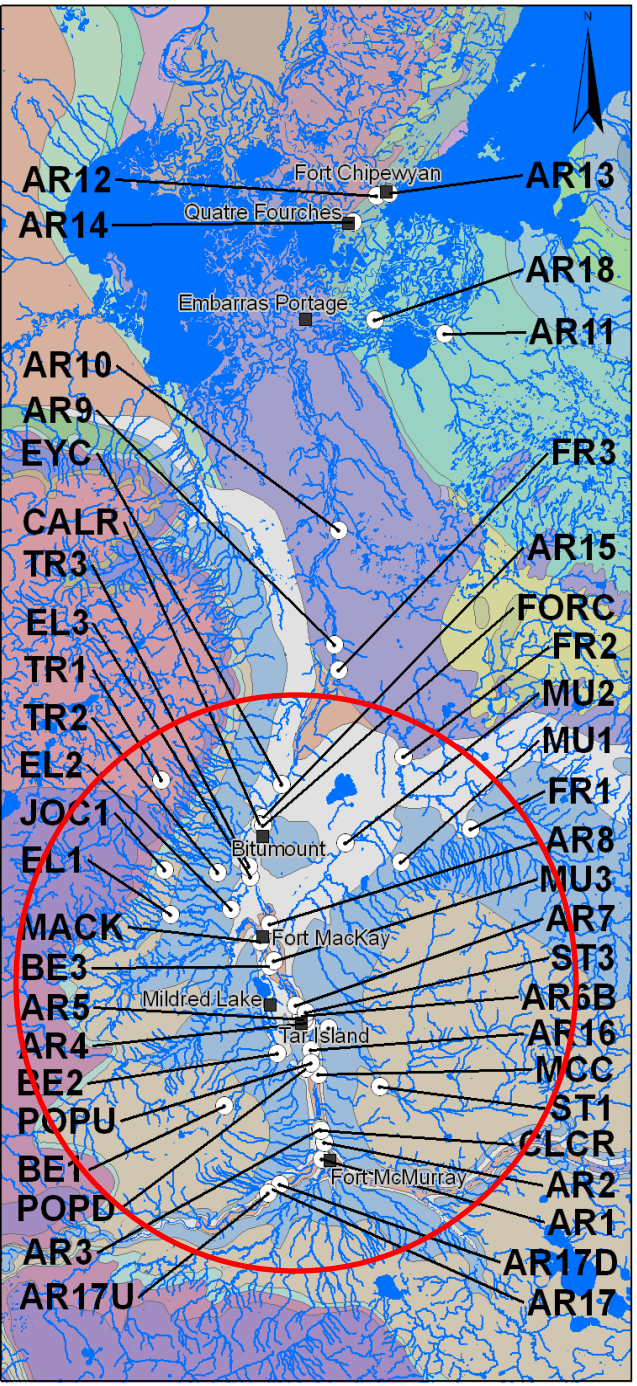
Natural outcrop of oil sands in banks of Steepbank River, near Suncor Voyageur plant November, 2010







National Pollutant Release Inventory



Athabasca Sampling Sites 20090325

- Athabasca Sites
- Places

FORMATION

- Clearwater Formation
- Grand Rapids Formation
- Granite gneiss
- Manitou Falls Formation
- McMurray Formation
- Middle Devonian
- Waterways Formation

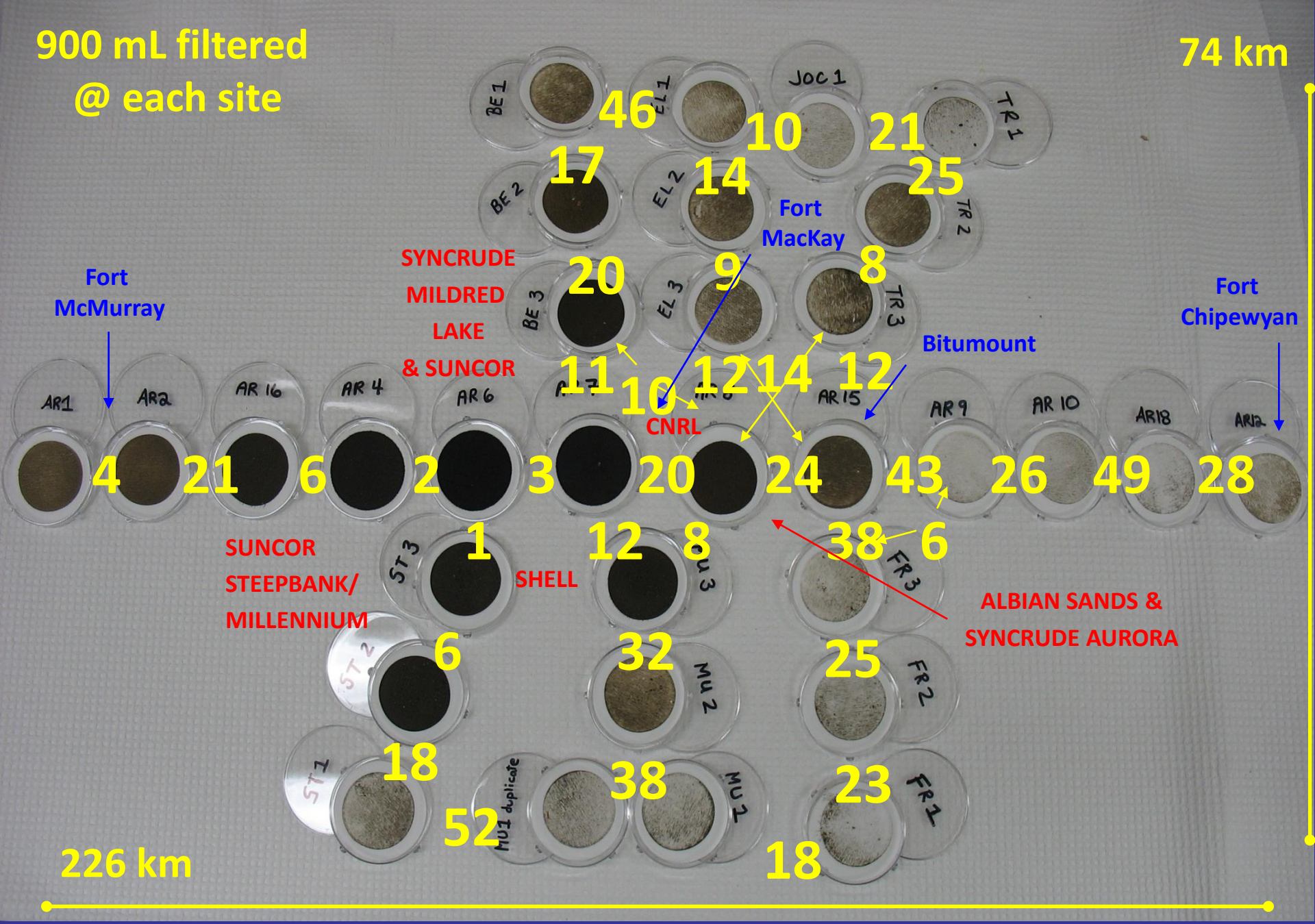
0 10 20 30 40 50
KILOMETERS

Projection: NAD 1983 UTM Zone 12
Spatial Data: NRCan NTDB
http://geogratis.cgdi.gc.ca
Alberta Geological Survey (AGS)
http://www.ags.gov.ab.ca/GIS

A study deliberately designed to test the contributions of natural vs. industrial sources of contaminants

D. W. Schindler
Jeff Short
Peter Hodson
Erin Kelly

Funding from Walter And Duncan Gordon Foundation and Tides Foundation .



White filters used for filtering melted snow samples. March 2008

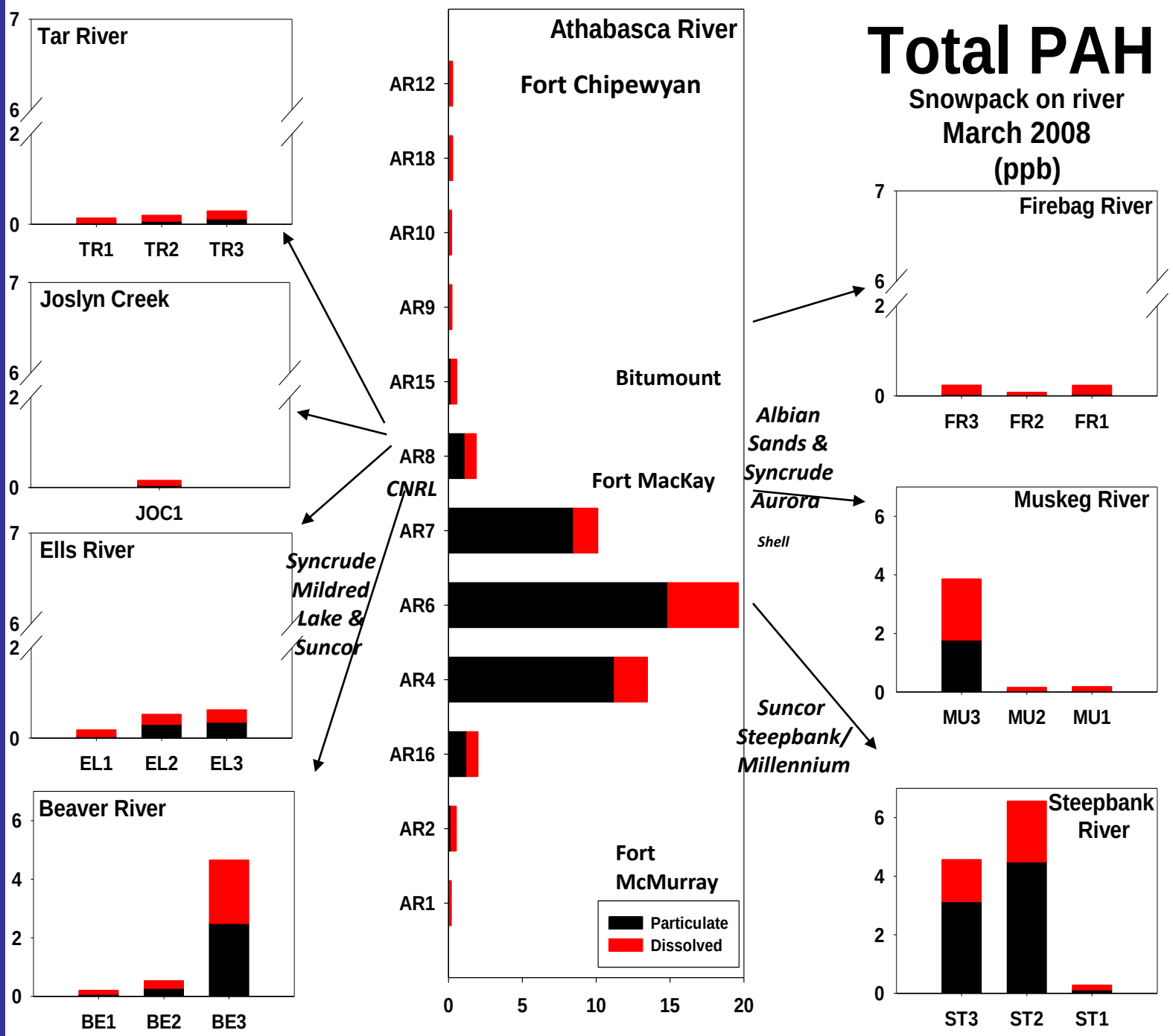
Unimpacted
Site AR1

Impacted Site AR6
- Note oil on surface of melted snow.

Melted Snow

Total PAH

Snowpack on river
March 2008
(ppb)



Our two papers in the Proceedings of the National Academy of Sciences (U.S.A.) and one in Nature:

Erin N. Kelly, Jeffrey W. Short, David W. Schindler, Peter V. Hodson, Mingsheng Ma, Alvin K. Kwan, and Barbra L. Fortin. 2009. Oil sands development contributes polycyclic aromatic compounds to the Athabasca River and its tributaries. PNAS 106: 22346-22351.

Erin N. Kelly, David W. Schindler, Peter V. Hodson, Jeffrey W. Short, Roseanna Radmanovich, and Charlene C. Nielsen. 2010. Oil sands development contributes elements toxic at low concentrations to the Athabasca River and its tributaries. PNAS 107: 16178-16183.

David W. Schindler 2010. Tar sands need solid science. Nature 468: 499-501.

“Science must underpin our policies. If we compromise on scientific facts and evidence, repairing nature will be enormously costly – if possible at all”

(G.H. Brundtland. 1997. The scientific underpinning of policy. Science 277: 457).

Canadian Science Policy is the Subject of International Ridicule

Science in retreat. 2008. *Nature* 451(7181):866.

"… Canada's researchers have plenty to be proud of, consistently maintaining their country's position among the world's top ten….Alas, their government's track record is dismal by comparison."

"Canada's leading scientists can be advocates, …..urging the government of the day to boost their country into a position of leadership rather than a reluctant follower."

The "Death of Evidence" march on Parliament, July 10, 2012.
No science, no evidence, no truth, no democracy.


23,771 Canadians oppose the Government's decision to cancel the ELA program
SAVE ELA
EXPERIMENTAL LAKES AREA