Friends of the Muskoka Watershed
Science Driving Solutions

# Current trends in Muskoka's lakes: the problems we are facing

Norman Yan PhD FRSC


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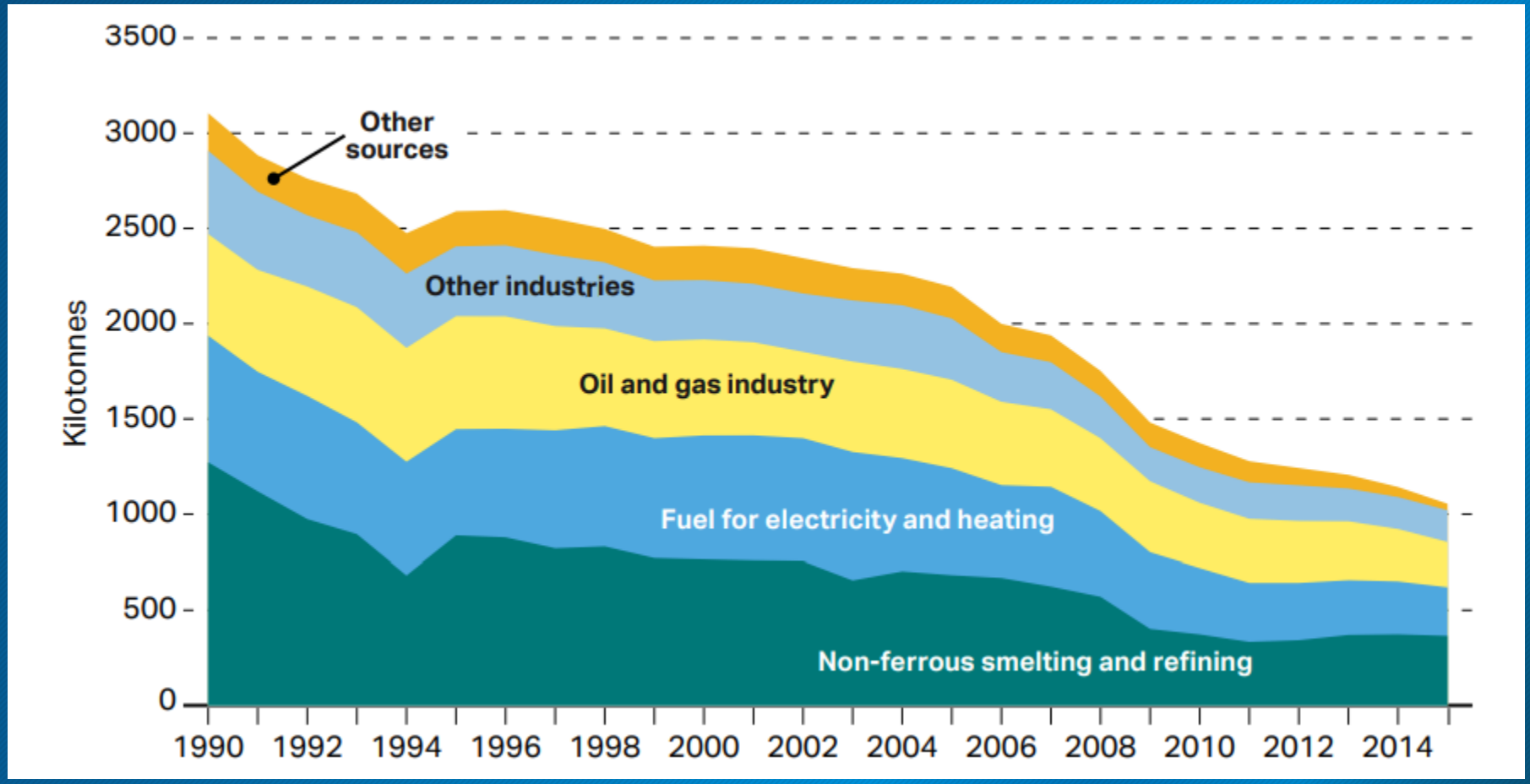
What has changed in Muskoka's watersheds?

# Some changes are clearly positive
# eg. because S02 emissions have dropped

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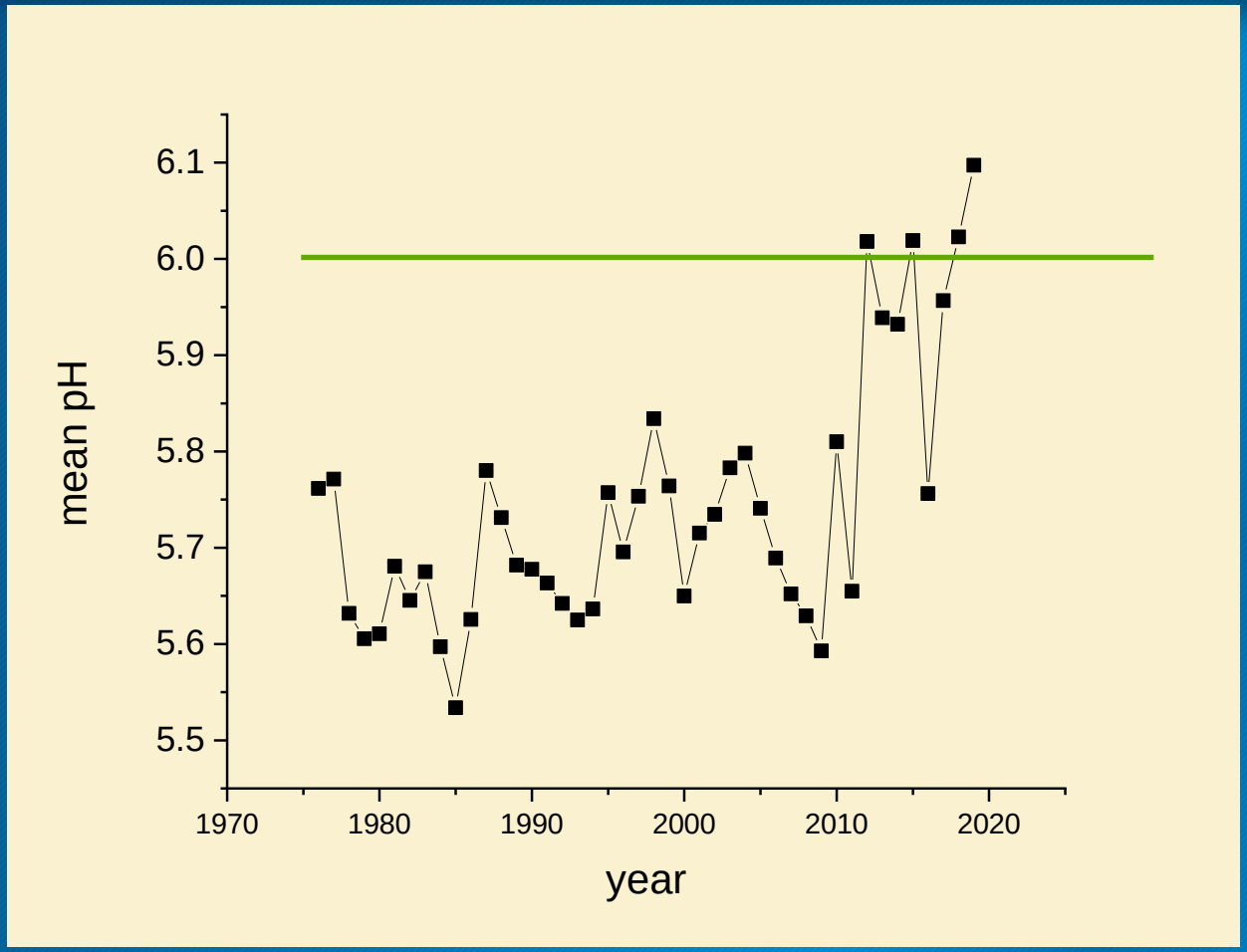
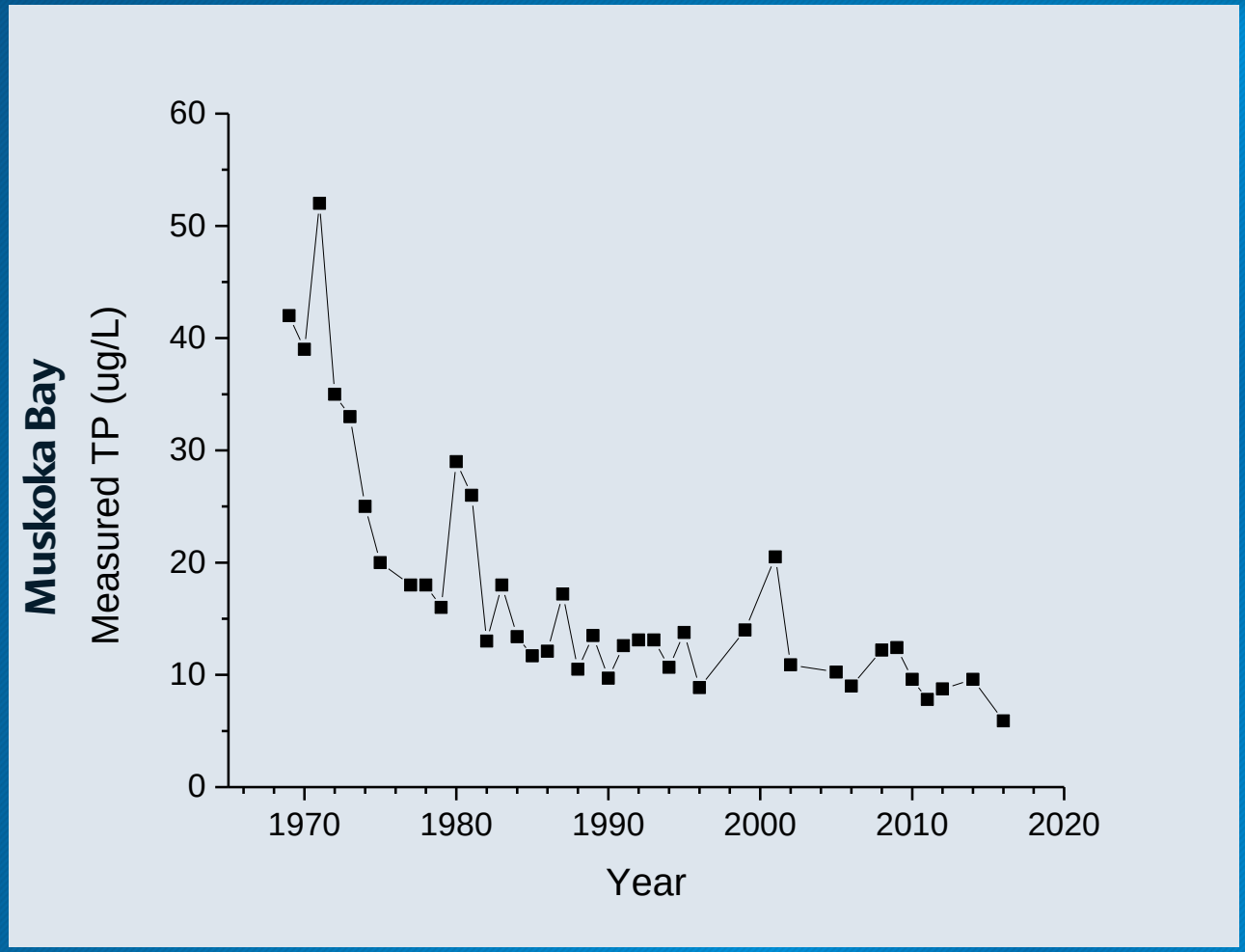
# Muskoka Lakes are not as acidic as they once were: the pH of the 4 acidic Dorset study lakes is now >6

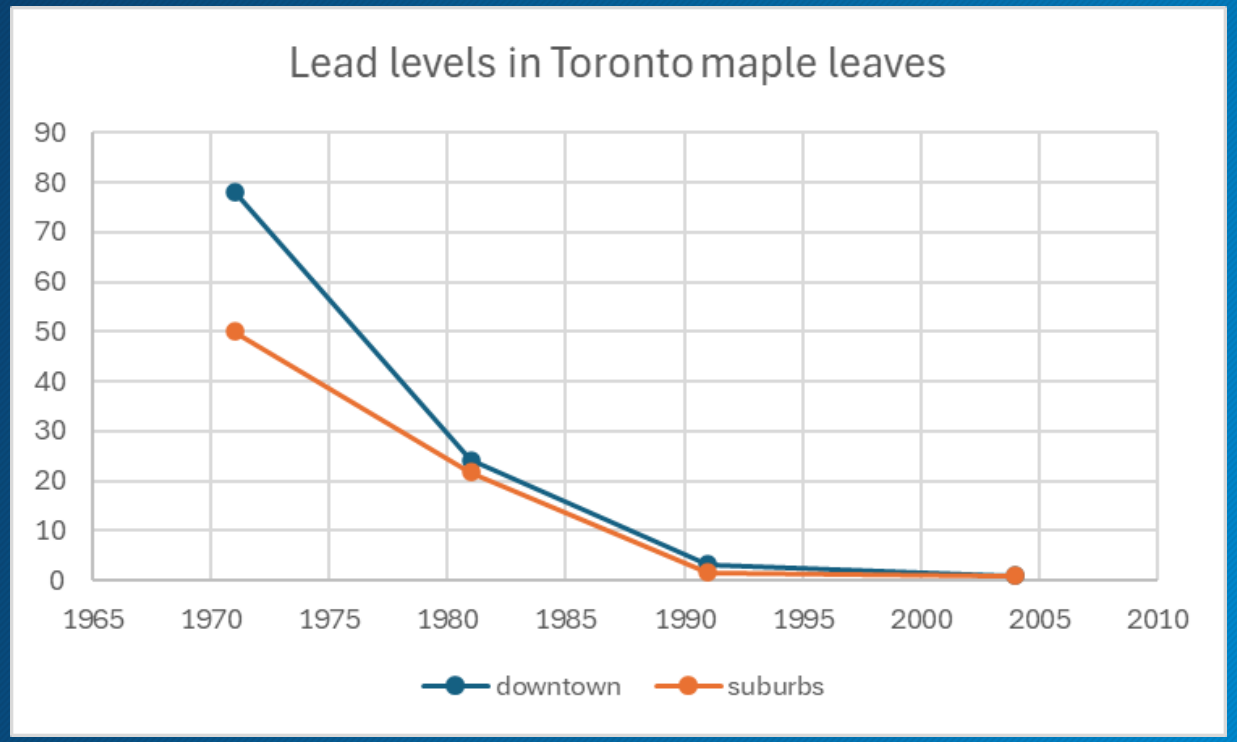


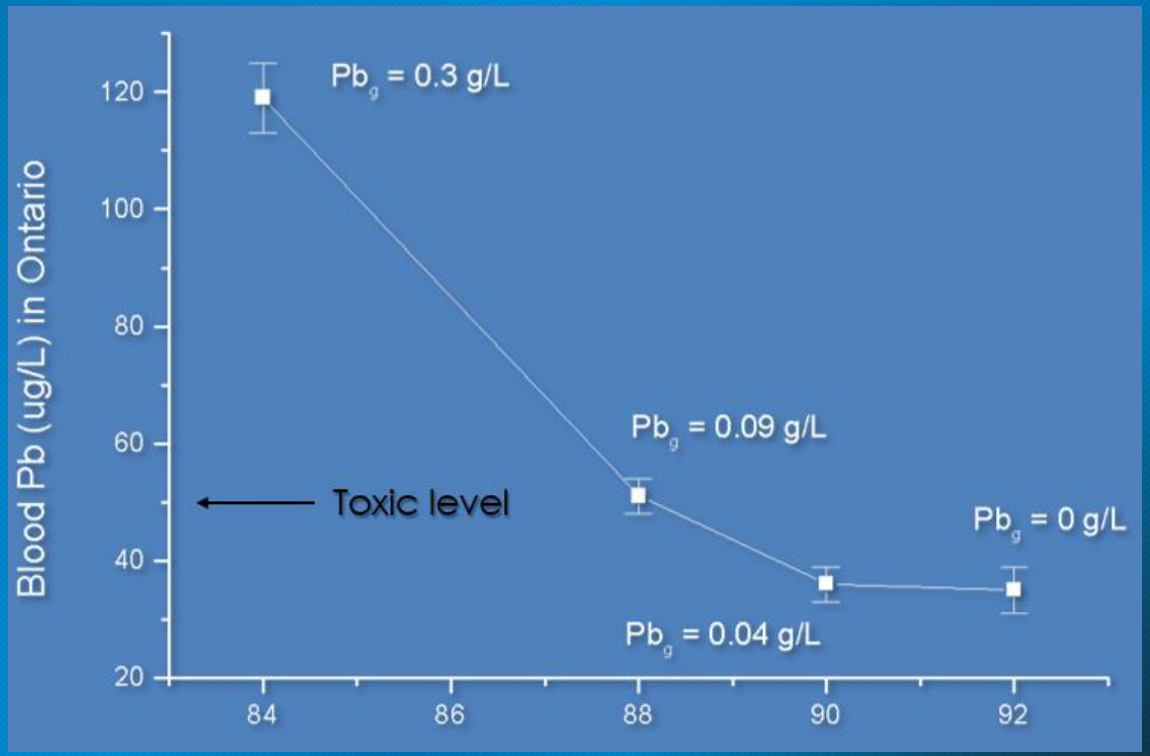

MECP DESC data

# We've reduced phosphorus loading to lakes from urban sewage e.g. Muskoka Bay



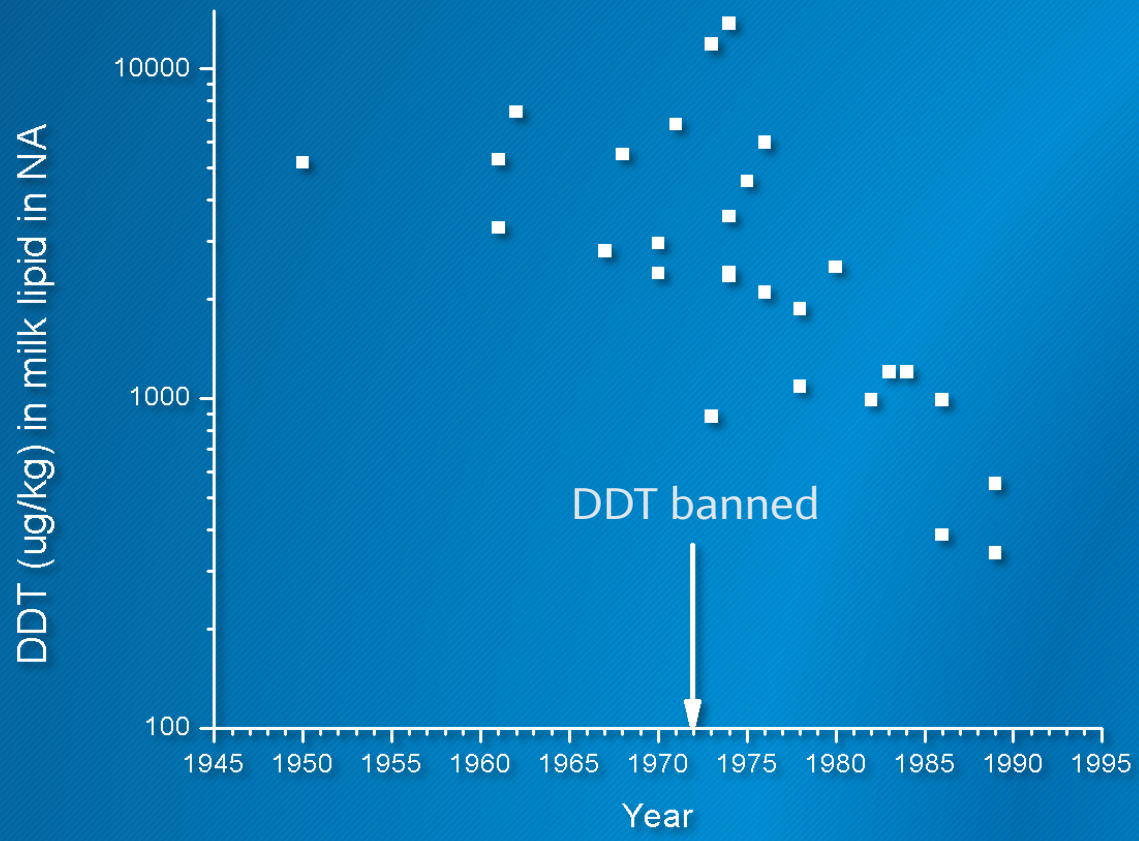
We've dramatically reduced the use of leaded gasoline
So lead levels are falling in the environment and in us



# And DDT levels in human breast milk have fallen 10-fold

(data from 21 North American studies from Smith 1999)

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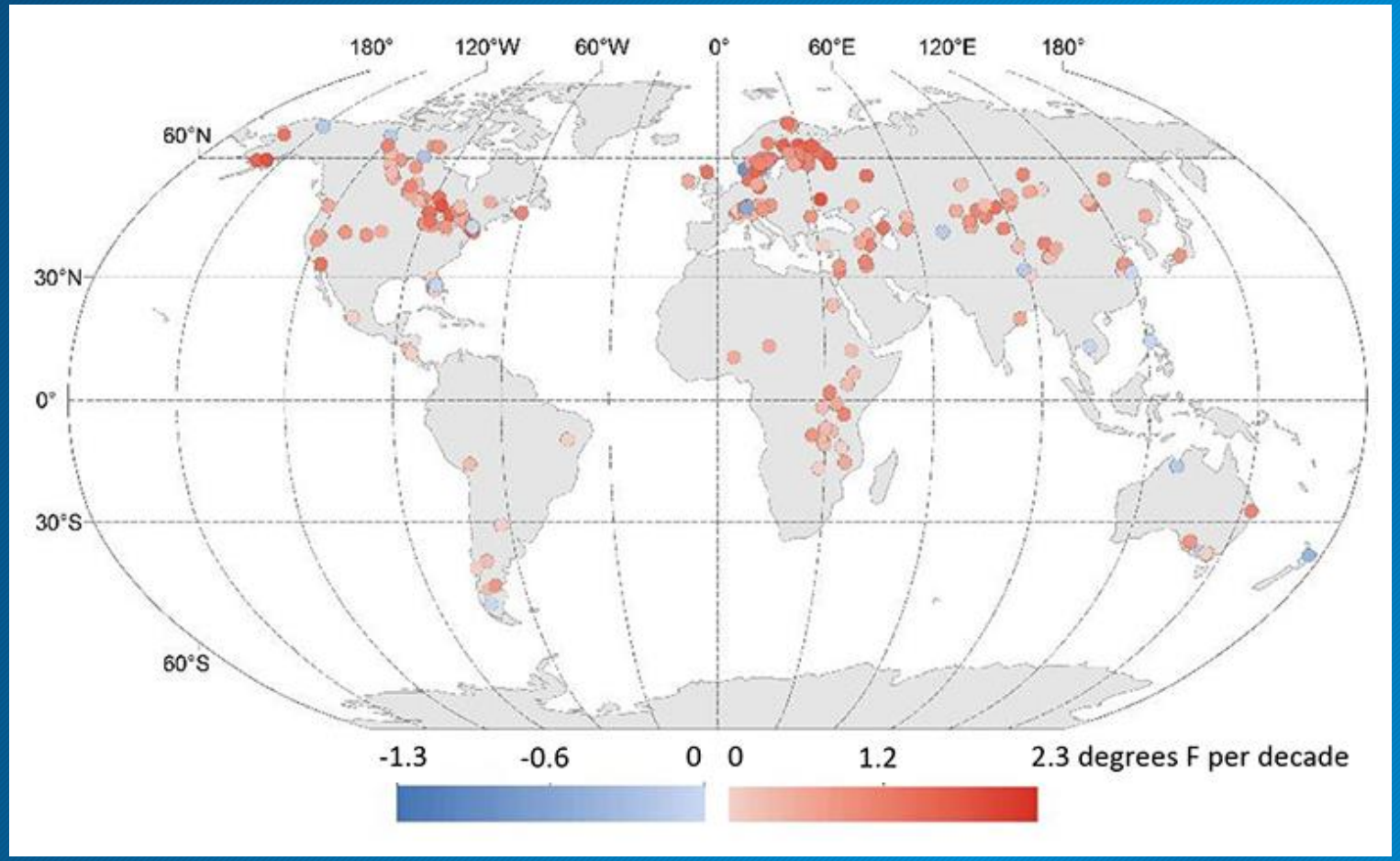
# So we have fixed enormous environmental problems by:

- recognizing the severity and extent of the problem
- identifying its cause
- marshalling the will for action
  - informing the public
  - Confronting naysayers with facts
- Taking appropriate action, and
- Ensuring it works

# So, what are today's environmental problems?
## More frequent and severe spring floods

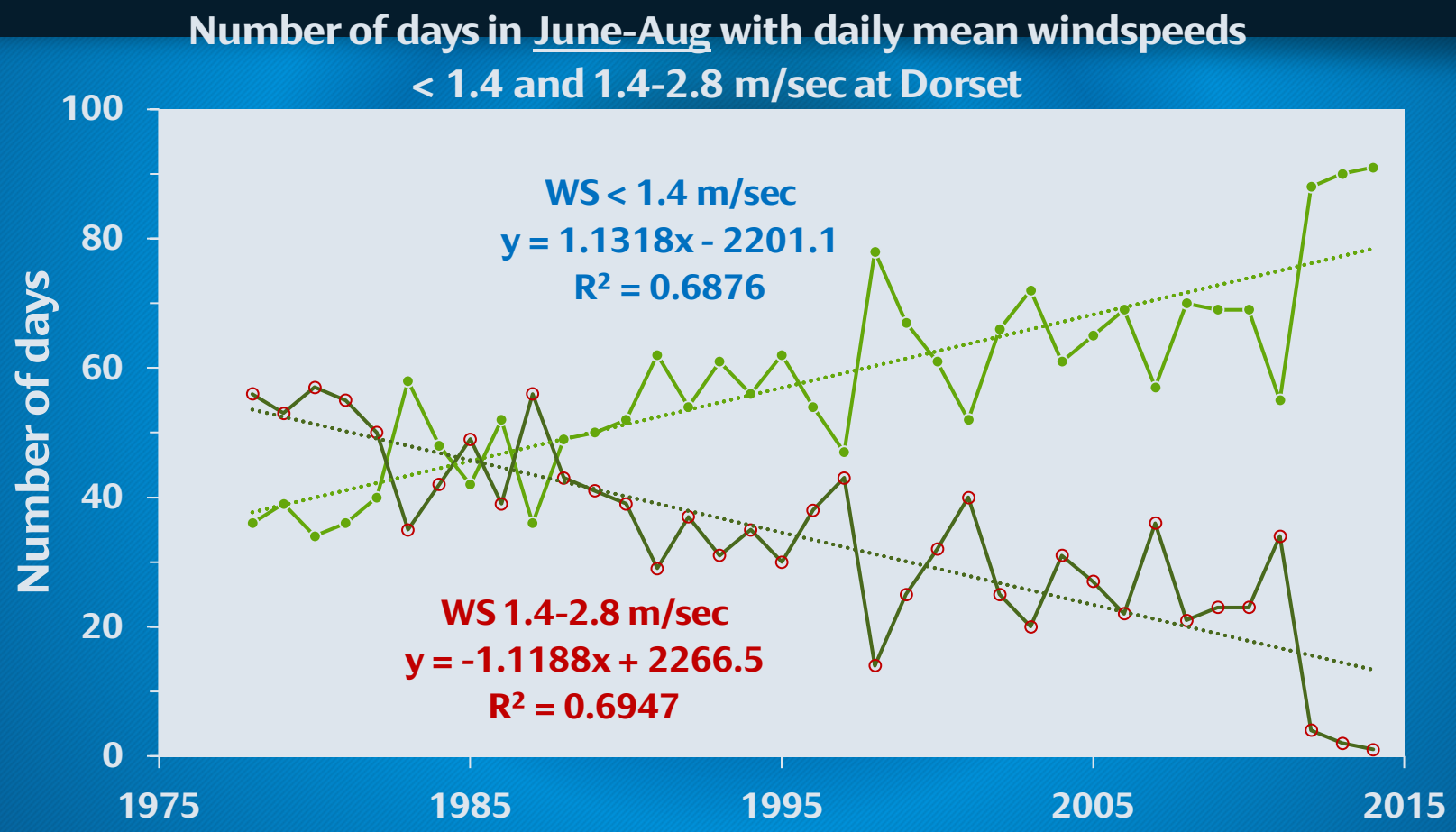
Image from Toronto.com

# Hotter lake water



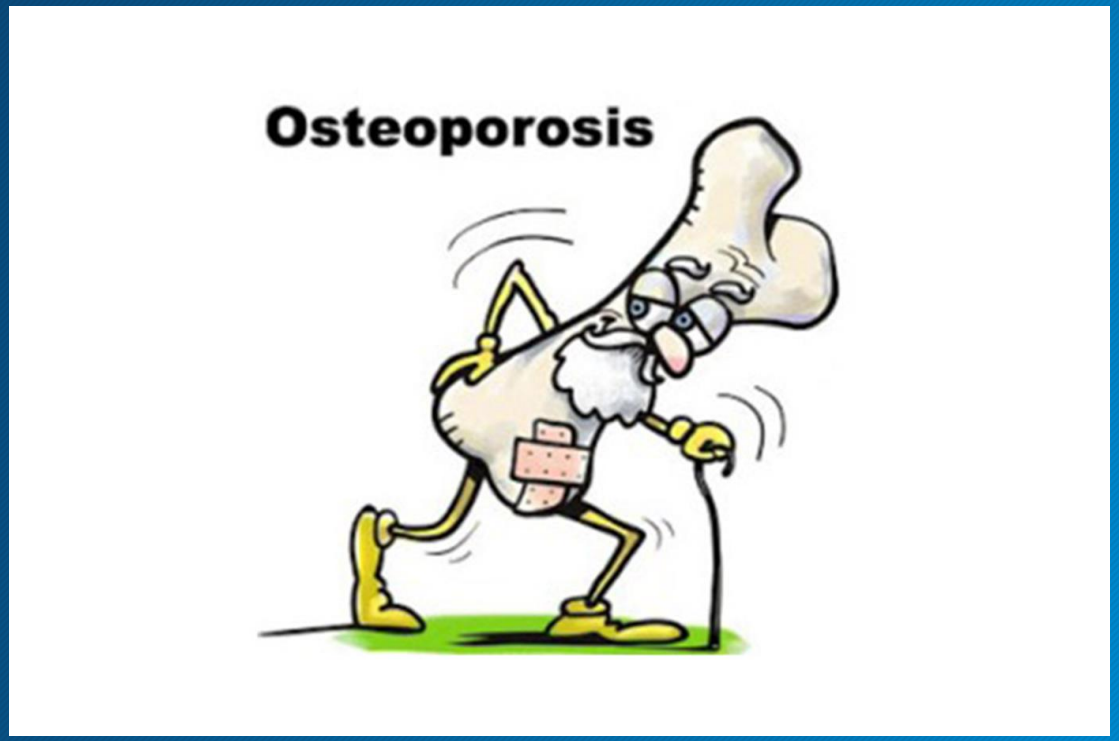

NASA Global Climate change Dec 2015

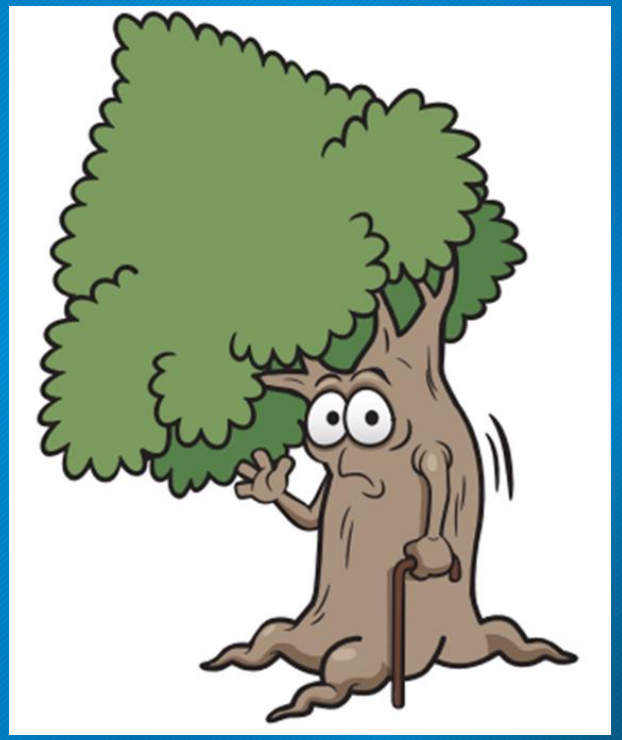
# Weird weather, e.g. fewer windy days



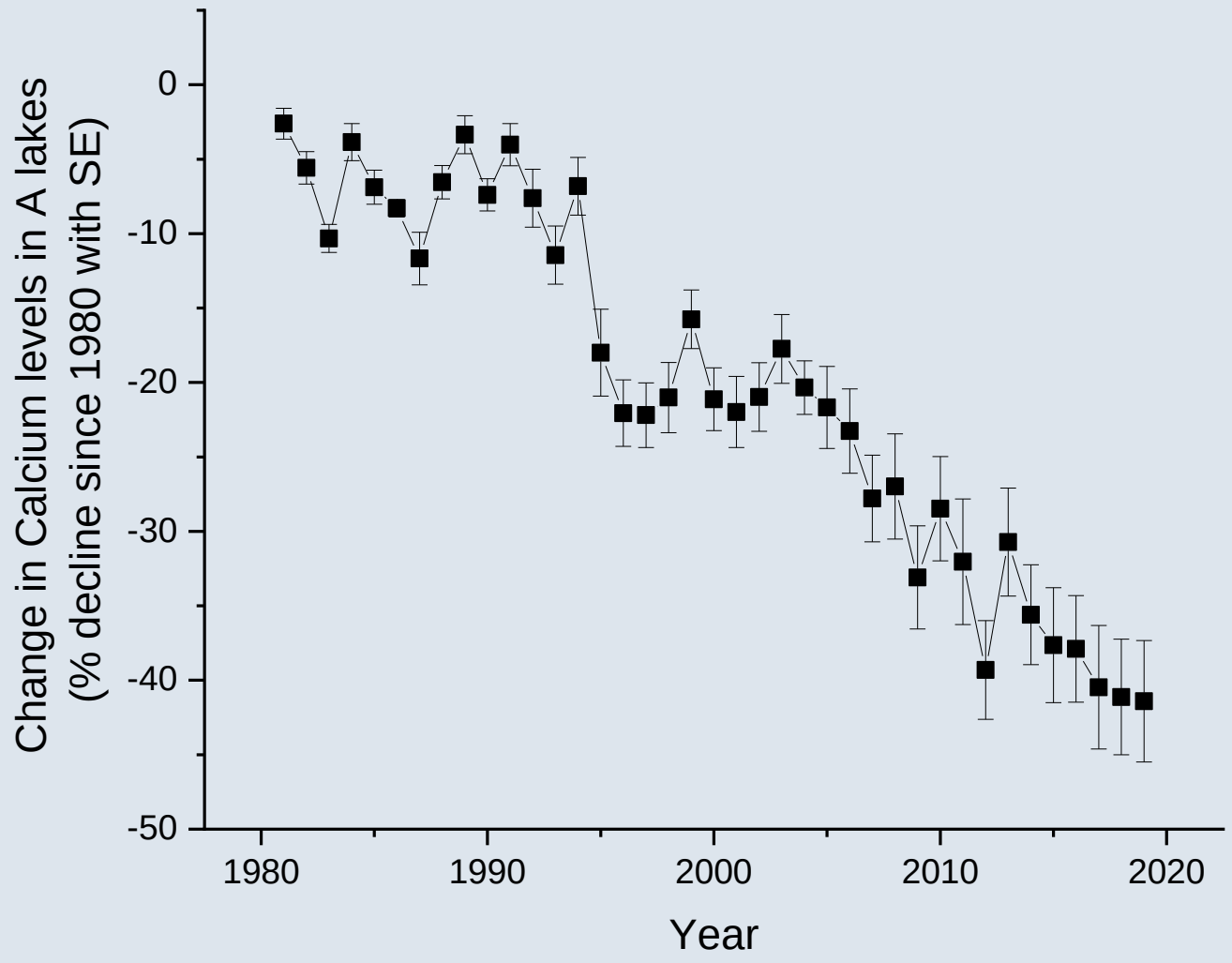

*From Yao MECP DESC and Molot York U

# And then there is Calcium (Ca) decline: “Osteoporosis” in our lakes and forests



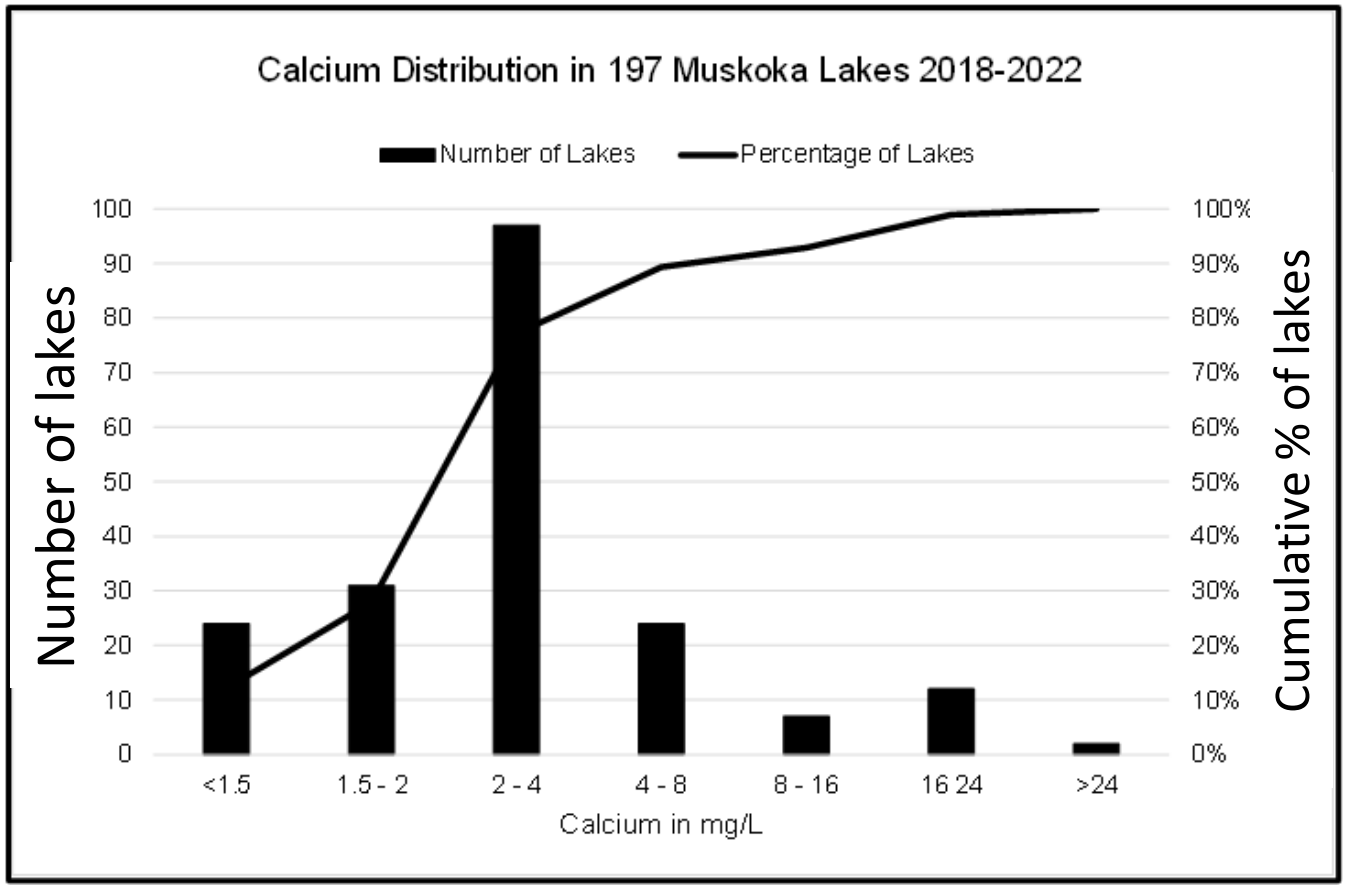



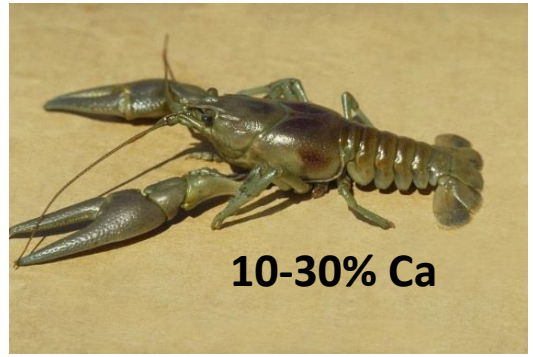
Calcium levels have fallen in Dorset's main study lakes (data from MECP)



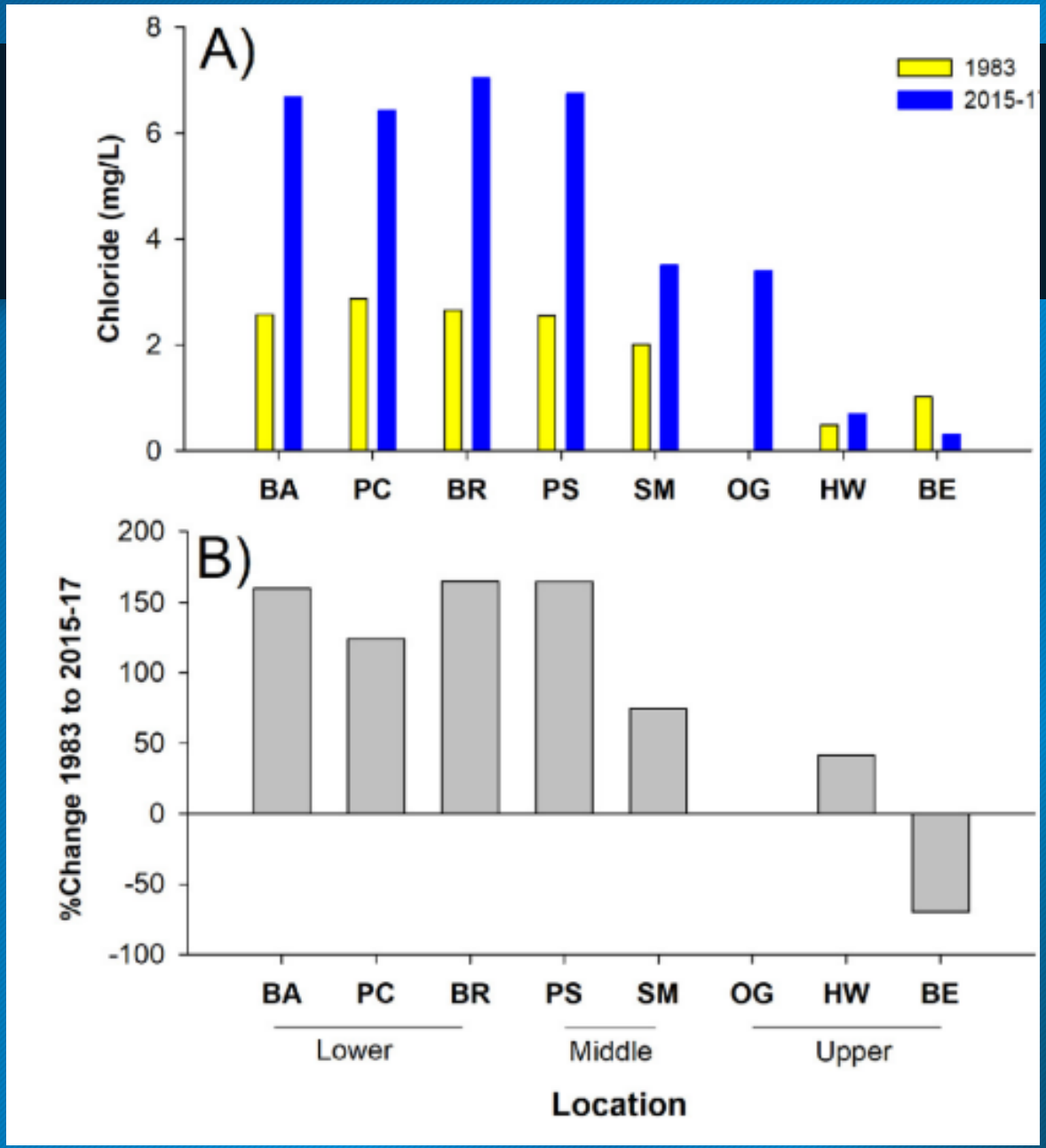
# Calcium levels are now <2 mg/L in 30% of DMM lakes


Daphnia



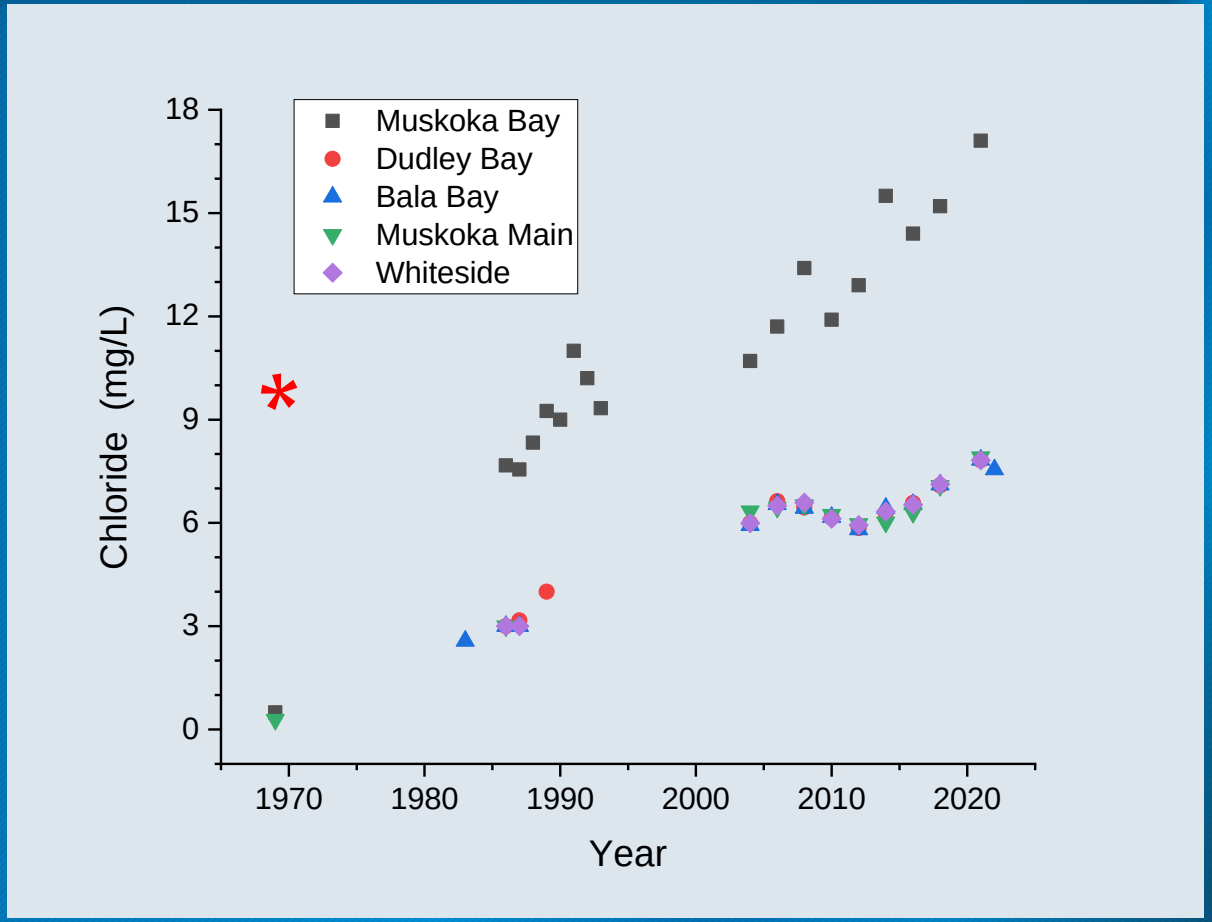



**Chloride levels have increased in the developed part of the watershed (Sorrichetti et al. 2022)**

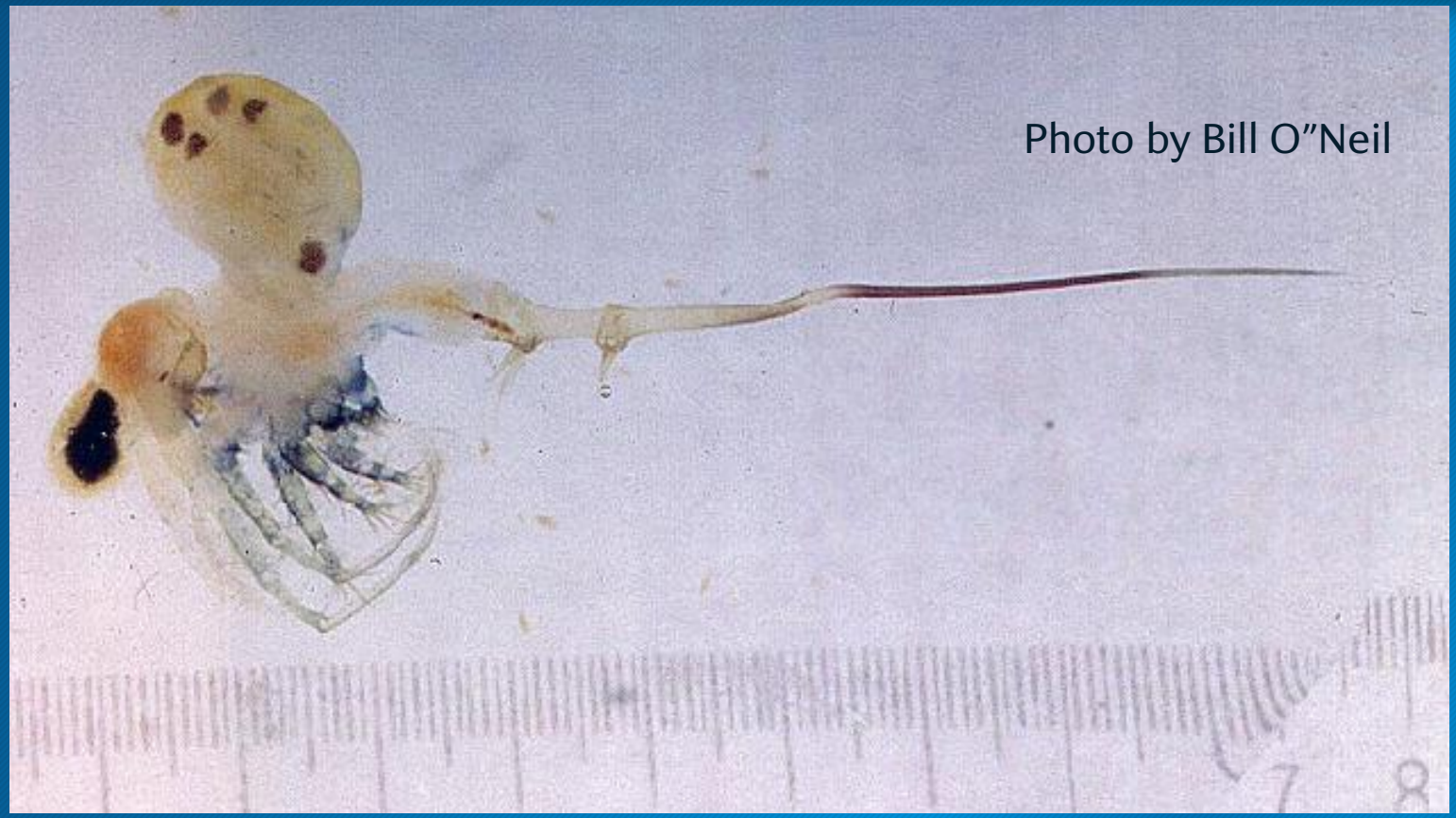


# Including in Lake Muskoka since 1969

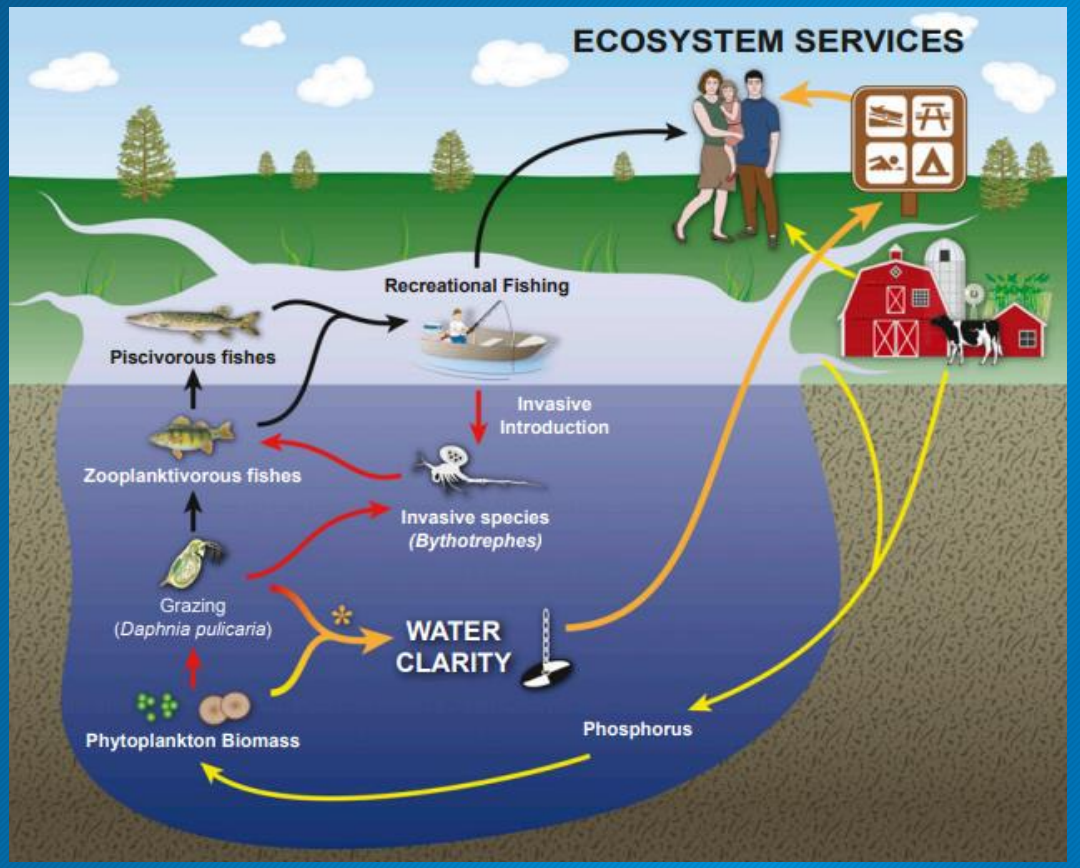
**In Muskoka Bay, Cl levels now exceed 10 mg/L, a level likely toxic to the daphniids that eat algae**



# And we have several invading species e.g. *Bythotrephes* (spiny water flea)



In Lake Mendota, WI, the invasion by *Bythotrephes* lowered water clarity by damaging the "little lawnmower" *Daphnia*.
Restoring lost water clarity by lowering P input would cost $140M!*



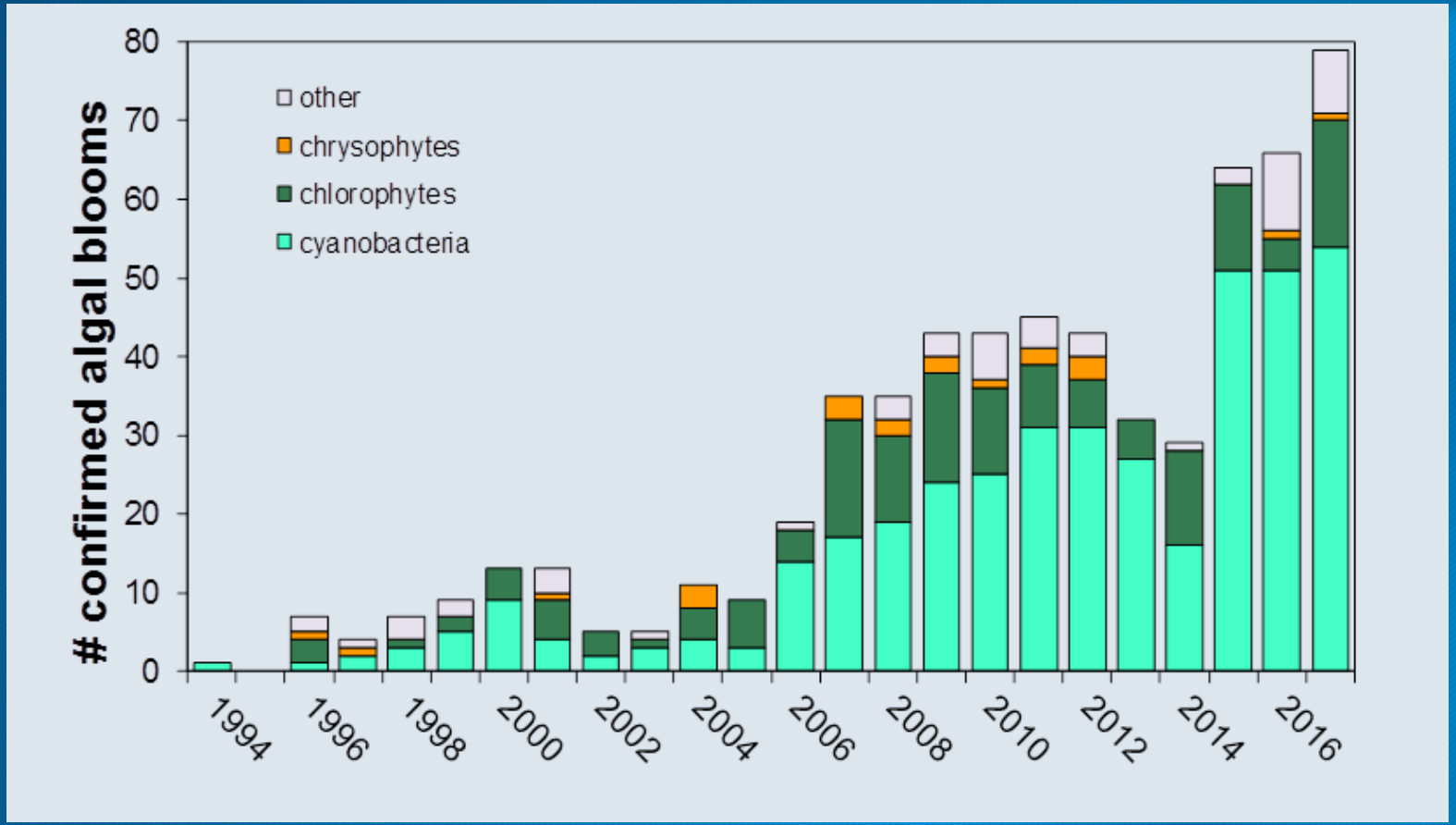

*Walsh et al 2015 PNAS

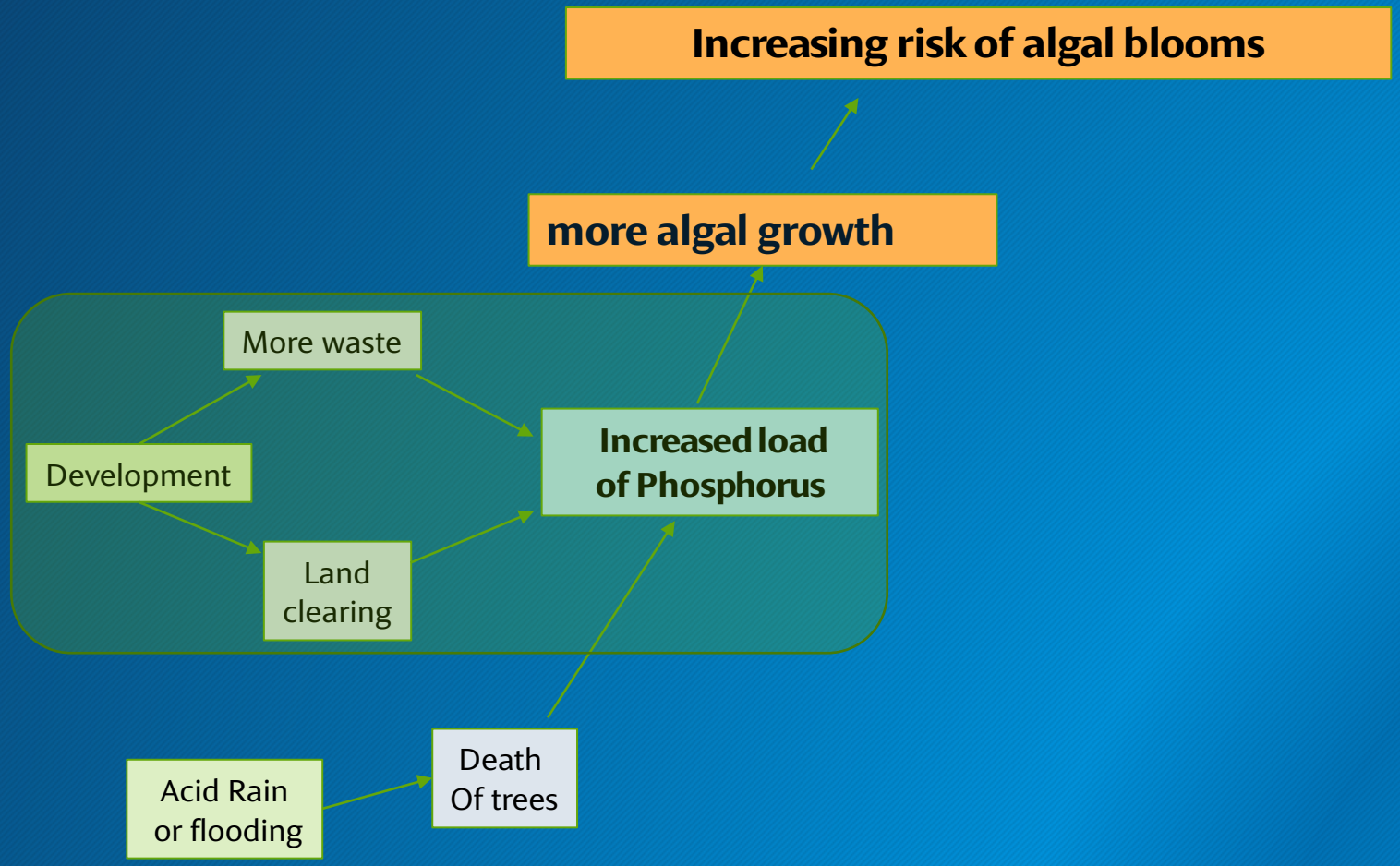
# And blue-green algal blooms have re-appeared
## e.g. the fall bloom in Dickson Lake, Algonquin Park in 2014

(Favot et al. 2019 J. Paleolimnology)

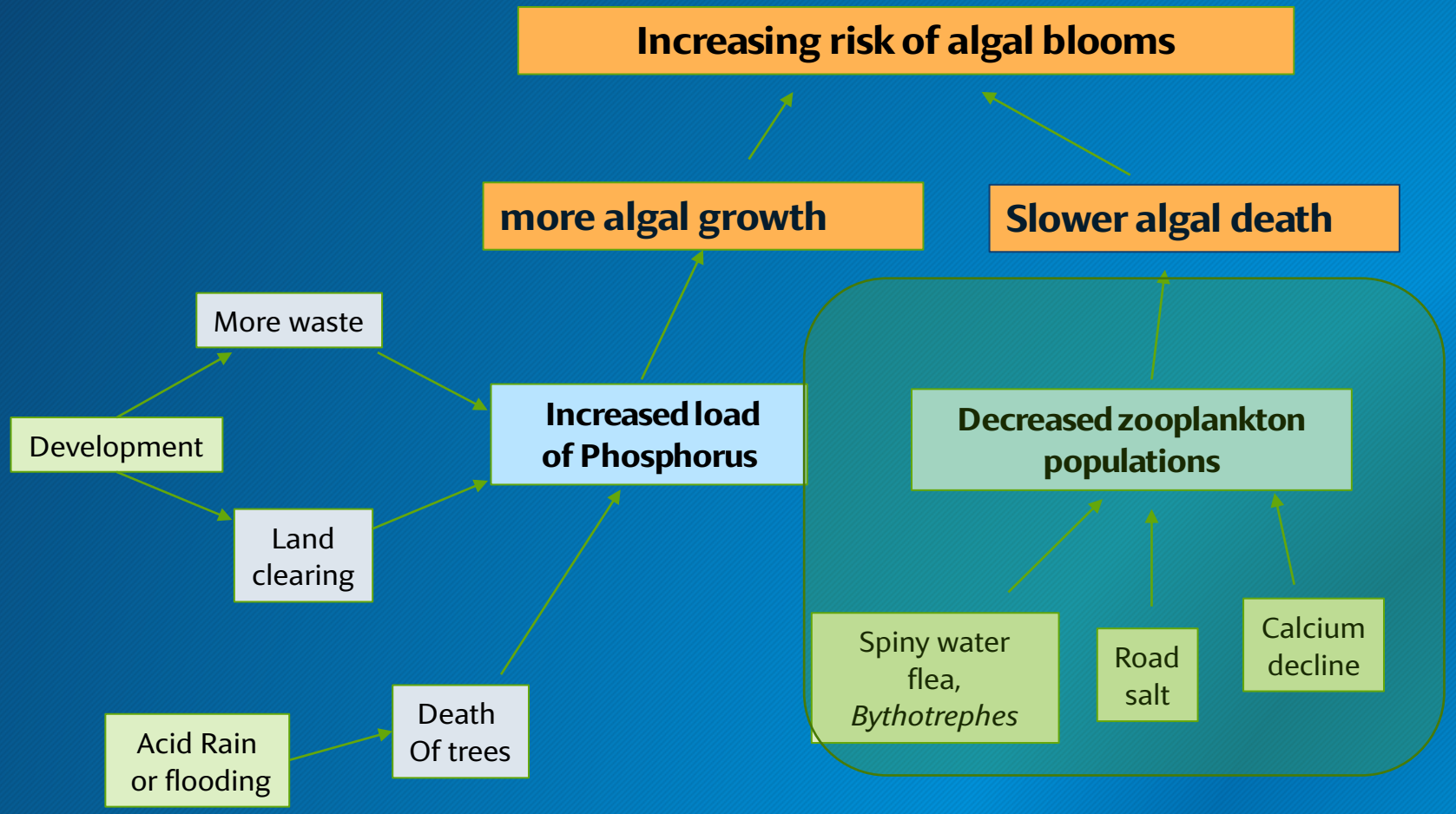
# Dickson Lake wasn't unique*

* Holeton via A. Paterson, MECP and  Favot et al. 2023

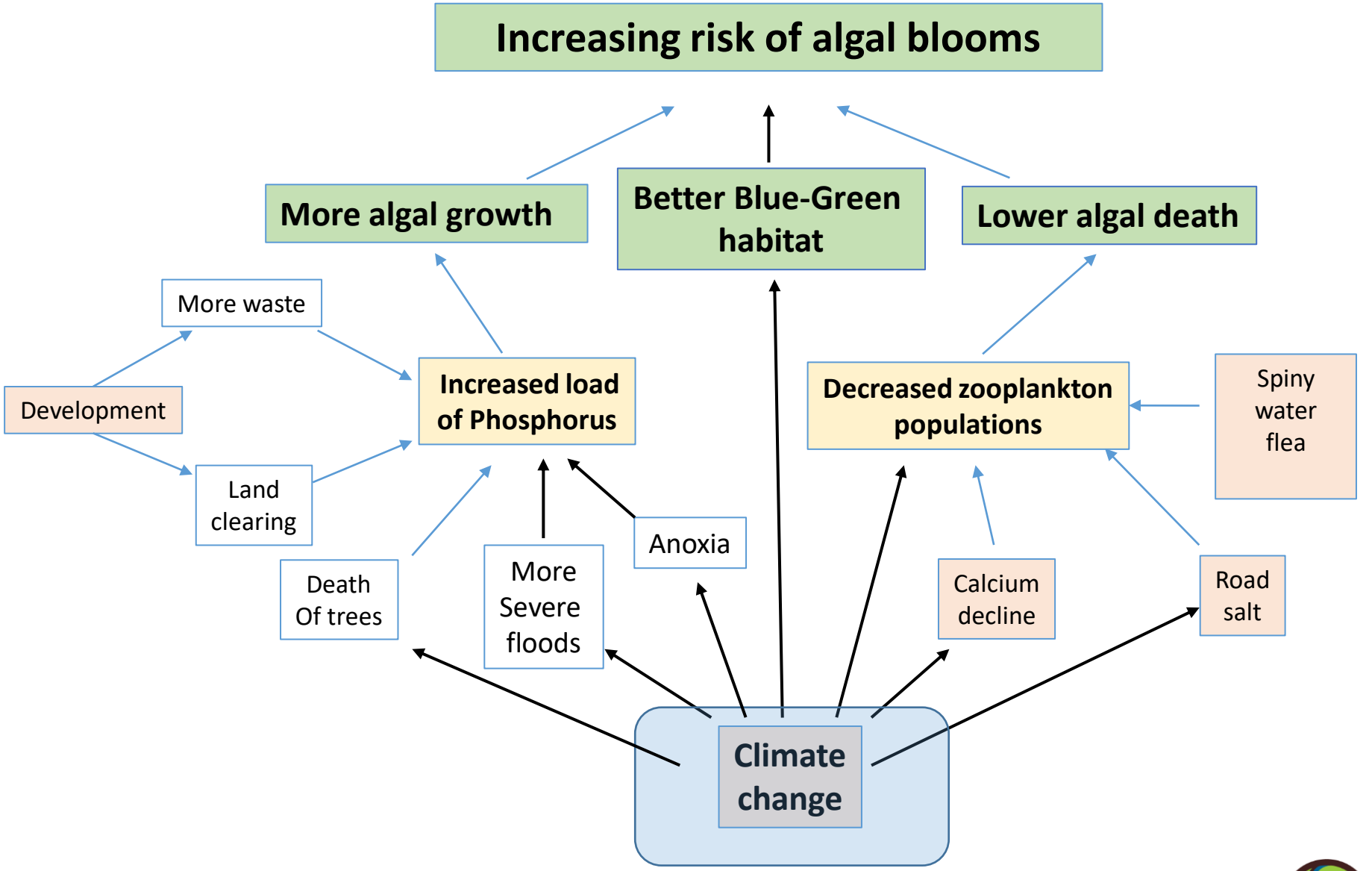





The traditional view: It's all about P supply




but what about slower algal death if there are fewer “lawnmowers”




## And then there is Climate Change

# Many things are changing in Muskoka's environment

- Good changes
  - E.g.: declines in acidity, phosphorus, DDT, and lead
- Threatening changes
  - Ca decline, road salt increase, weather changes,  invading species, algal blooms
  - Also microplastics and many chemicals of concern
- Causes
  - Climate change,  land clearing,  population growth, interactions of threats, inadequate understanding of risks, and thus insufficient protective policies
- Solutions
  - Better science, communication and planning at all levels
  - That's why we are here