

Phosphorus Loads to Lake Simcoe: 2018-2020

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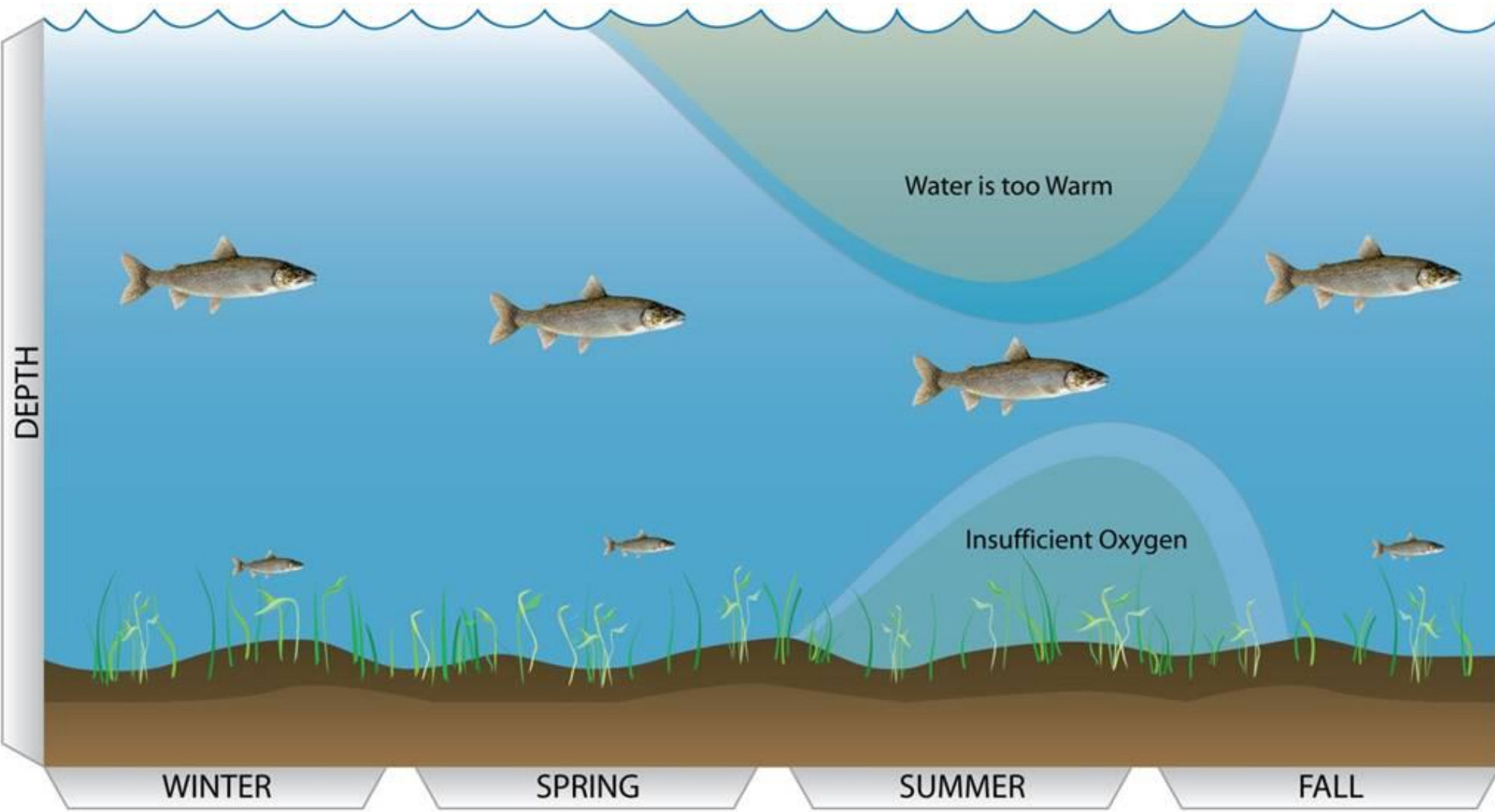
Lake Simcoe Region
conservation authority



Member of Conservation Ontario

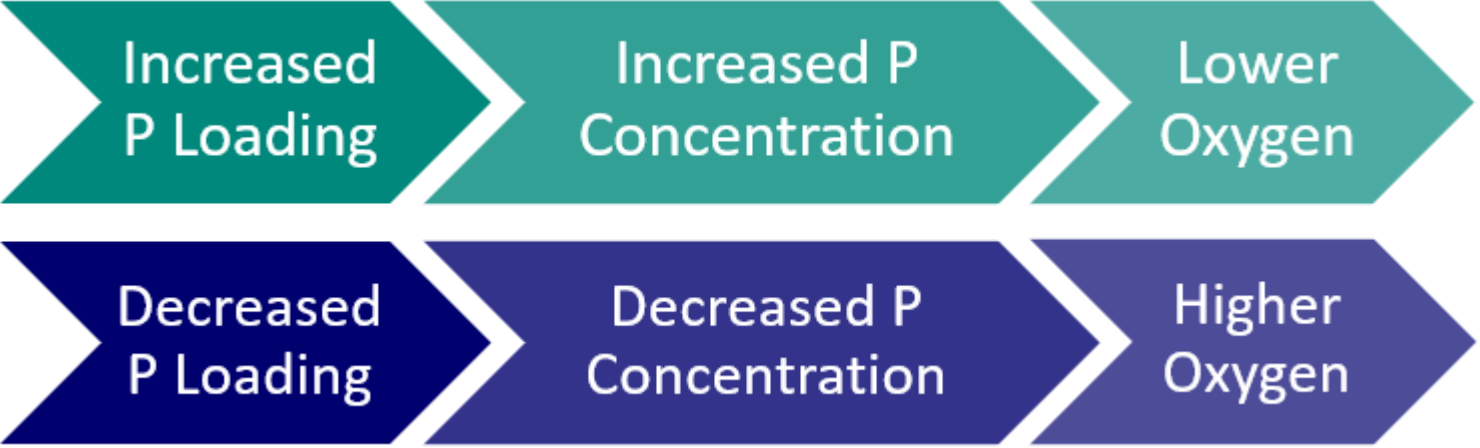
Lake Simcoe Protection Plan

- Target for dissolved oxygen = 7 milligrams per litre
- Estimated load = 44 tonnes of phosphorus per year



Phosphorus Loads, Concentration, and Oxygen

Limnological
Theory





Phosphorus Concentration vs. Load?

Concentration = the amount of substance per defined volume ($\mu\text{g}/\text{L}$ or mg/L)

Load = the amount of substance discharged over time (tonnes/year)



Phosphorus Concentration Vs. Load

Kool Aid for a Family

2 scoops to 1 litre of water
(2 scoops/L)

Kool Aid for the BOD Meeting

4 scoops to 2 litres of water
(2 scoops/L)



Calculation of the Annual Load

(Monitored data not modelled)

Water Quality

- 21 tributary stations
- 7 atmospheric collectors
- Polder loads
- Modelled Septic systems
- 15 WPCP inputs



Water Quantity

- 17 tributary flow gauges
- 11 prorated tributaries
- 12 Climate stations
- WPCP inputs
- Lake Evaporation
- Lake Residence Time
- Lake Water Balance

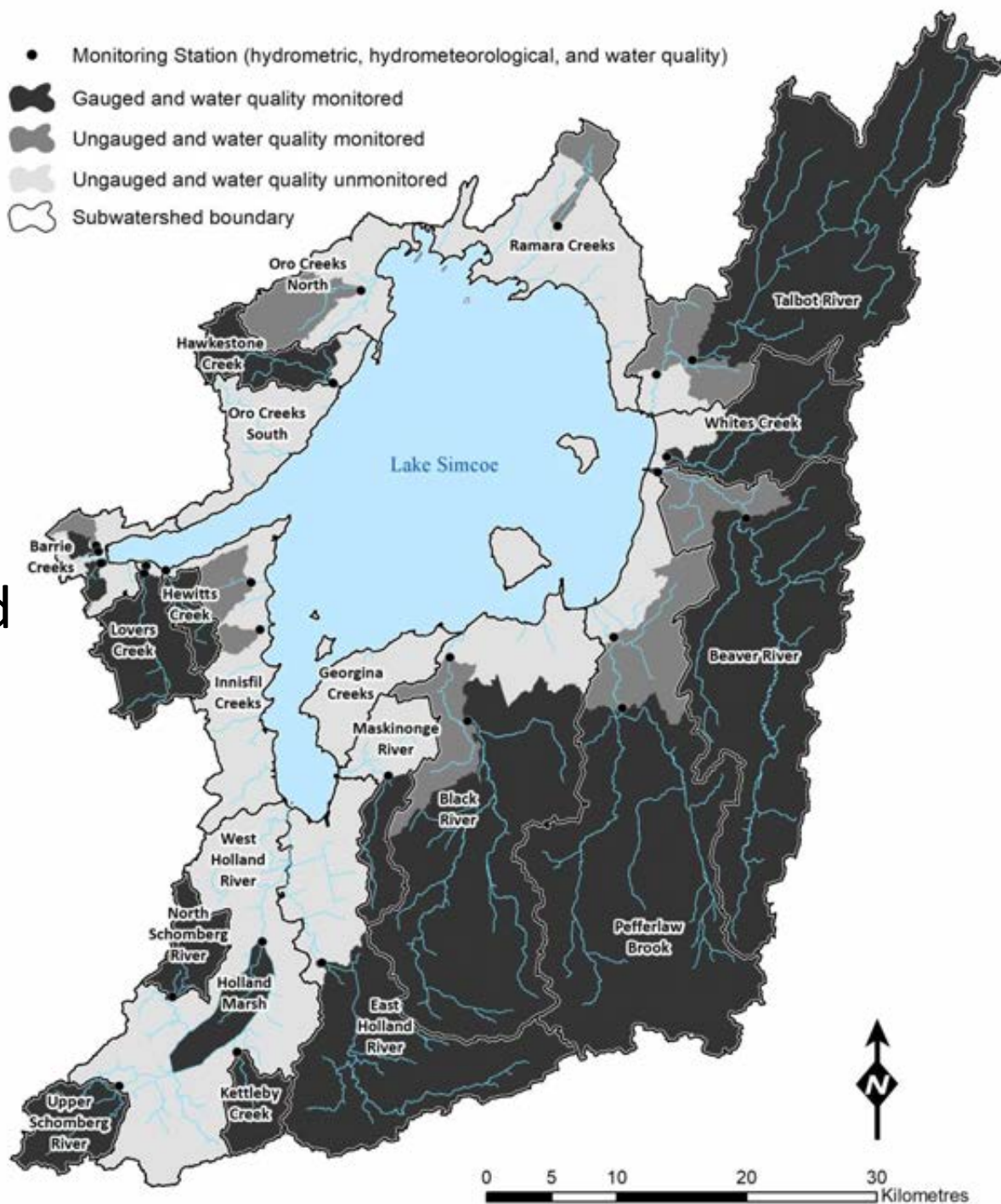


More than 3,000,000 data points annually are used to calculate the load

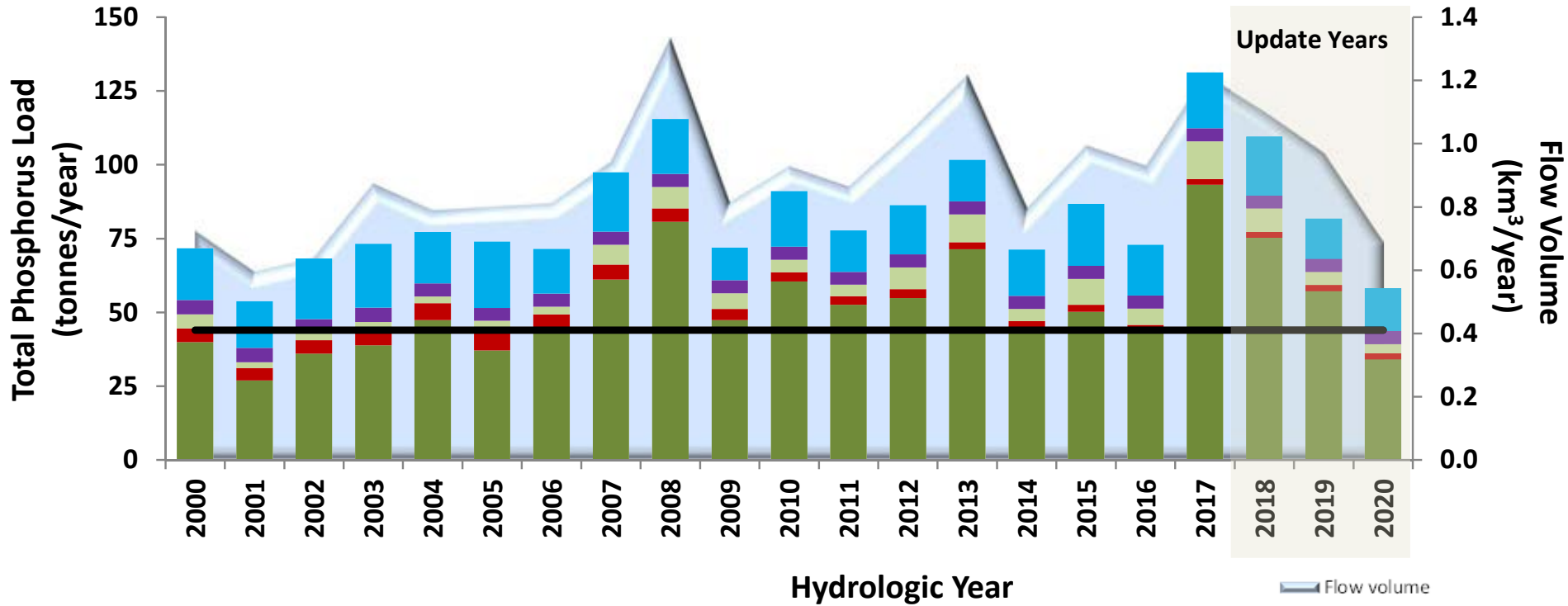


Monitored vs Unmonitored

70% of the watershed is captured by a stream flow or water quality station.



Lake Simcoe Phosphorus Loads (2000- 2020)



Hydrologic Year (June 1st to May 31st)

2018 = 110 tonnes

2019 = 82 tonnes

2020 = 58 tonnes

- Flow volume
- Atmospheric
- Septic
- Polders
- WPCP
- Tributaries
- Load goal

High Load Years

- Tributary load on average is 62% of annual load
- 2008, 2013, 2017 and 2018 were wet years with higher loads
- Climate change is affecting tributary loads
- More intense summer storms:
 - June 2017: 12.6 tonnes P in 2 days
 - 2018: six rain events (20mm to 45mm) contributed to higher load
- More rain in winter on frozen ground
 - Feb 2018 (2017 Hydro year): 15% of annual P load



Before June Storm



After June storm

January 11th, 2020
(2019 Hydrologic Year)

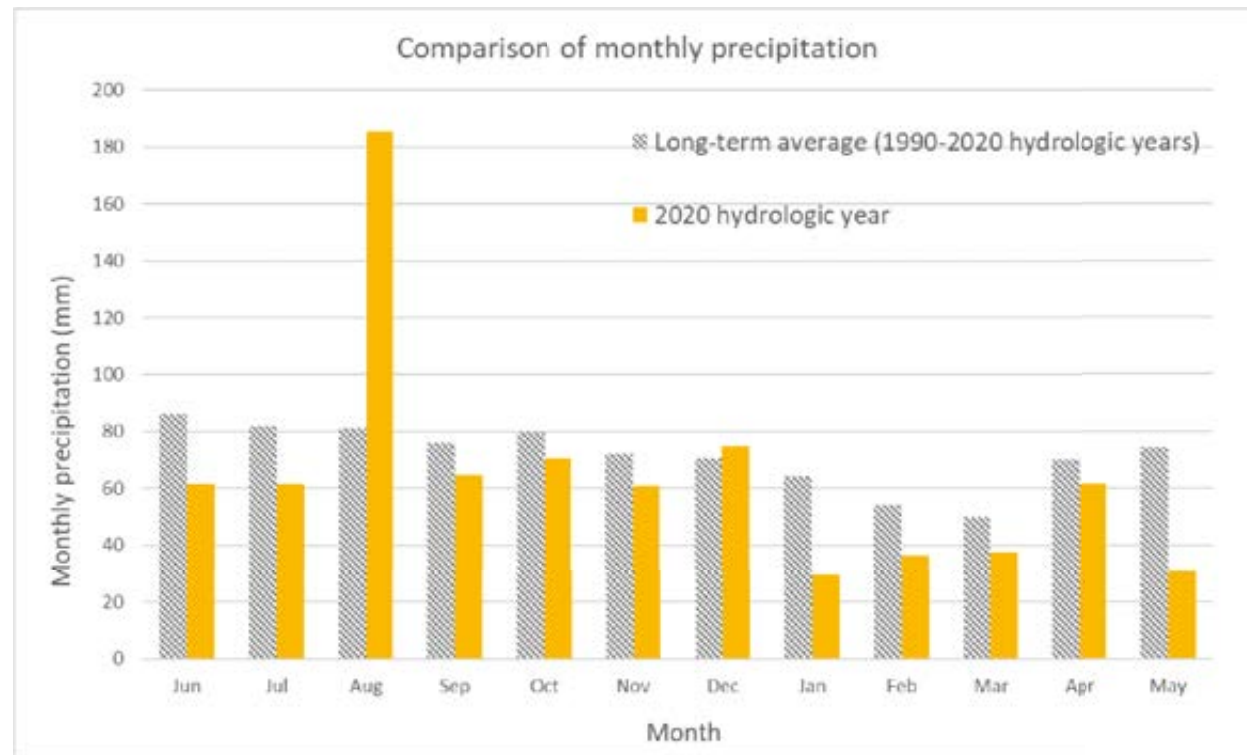


Winter rainfall



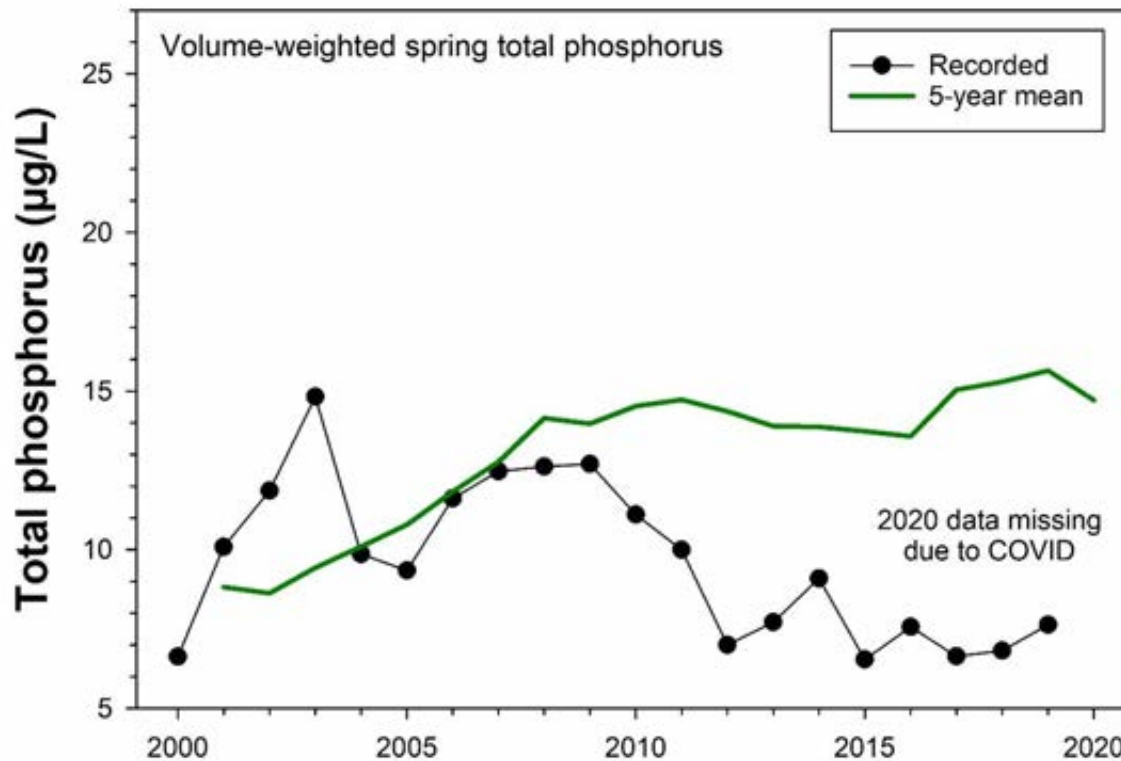
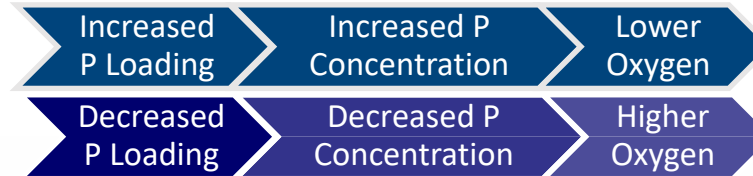
2020 Dry Year – Low Load

- 2020 load was 58 tonnes
- Second lowest load in 20 year record after 54 tonne load in 2001
- A dry year. Precipitation total below long term average for 10 months of the year
- 80mm event Aug 2 2020 on dry watershed produced little runoff and only 0.5 tonnes for the event



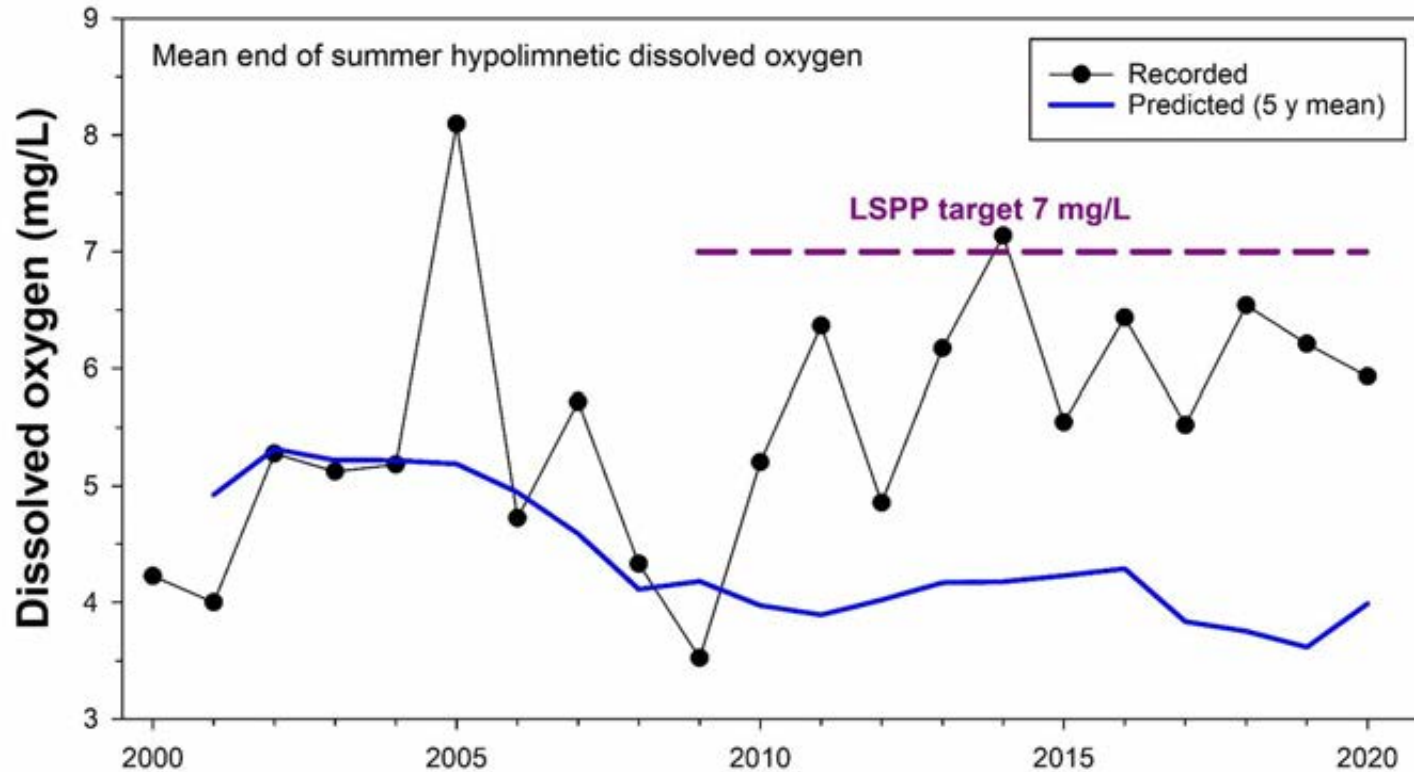
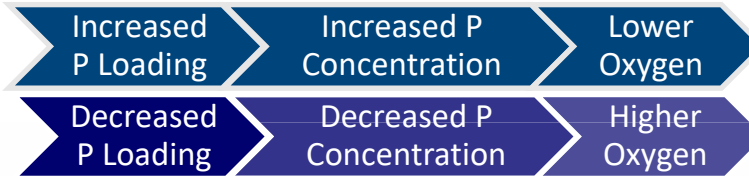
Lake Simcoe Response: P Loads, **P Concentration**, and Oxygen

Limnological Theory



Lake Simcoe Response (continued): P Loads, P Concentration, and **Oxygen**

Limnological Theory



Summary

- Climate Change is causing greater variation in annual phosphorus loads
- Fluctuations in tributary loads due to “wet” and “dry” years are having the greatest impact on loads
- Continued monitoring of phosphorus loads is important to understanding how it is driving lake processes and to develop appropriate lake management strategies
- Find the 2018 to 2020 Phosphorus Loads Report [here](#) (need link)

