Towards an understanding of southern wetlands' carbon emissions potential and the implications for the wise use of wetland ecosystem services in Southern Ontario

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ESSA

Outline

- Wetlands of Southern Ontario
- Drivers of wetland policy in Ontario, and policy directions
- Some observations about the science of wetlands, and implications for policy

Wetlands of Southern Ontario

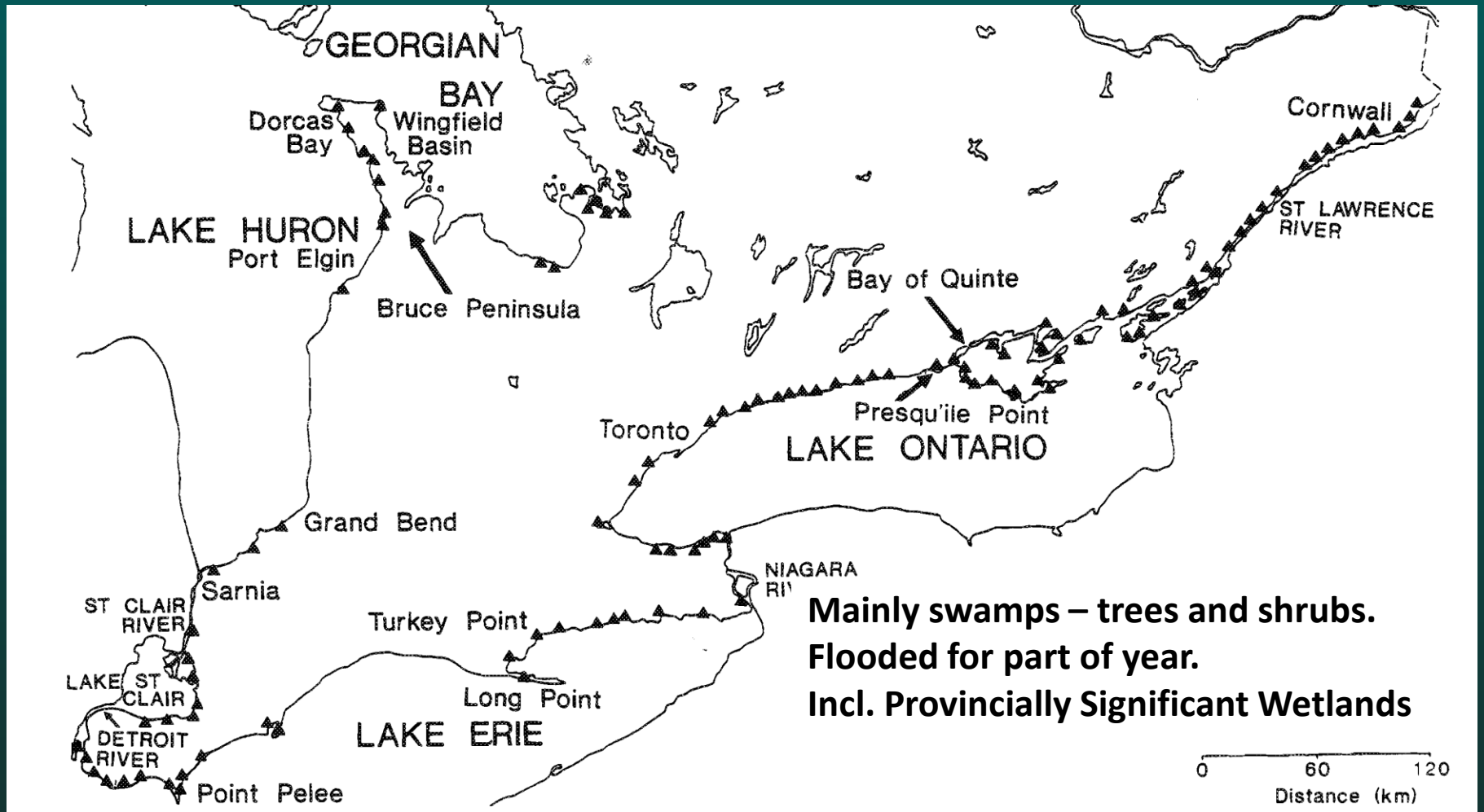

FIG. 1. Location of coastal wetlands (triangles) of the Great Lakes and connecting channels evaluated by OMNR. Note that one triangle may represent more than one wetland or wetland complex.

Main Drivers of Wetlands Policy in Ontario

1. Loss of wetlands: < 1/3 pre-European wetland extent remains – LULC change (development); hydrology change; degradation (pollution) and loss of beavers.
2. Climate change – Chu (2015) model found high vulnerability of wetlands under the scenario that best represented current conditions.
3. Recognition of the services provided by wetland ecosystems.

Wetlands: Ecosystem Services

Wetlands are seen as key opportunities for carbon mitigation and adaptation (flood abatement) – low carbon resilience

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Combatting Canada's Rising Flood Costs:

Natural infrastructure is an underutilized option

September, 2018

Wetland Policy in Ontario

1. Wetland Conservation Strategy (2017) endorses as "*no net loss*" policy – ecological restoration (functional)
2. Wetland Offsetting Policy (compensation) for development impacts (2018)
3. GHG mitigation - Carbon sink (e.g. Ontario Envir. Plan)
4. Flood abatement

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When the Big Storms Hit

The Role of Wetlands to Limit Urban and Rural Flood Damage

Prepared for the Ontario Ministry of Natural Resources and Forestry

Natalia Moudrak, Anne-Marie Hutter, Dr. Blair Feltmate
Intact Centre on Climate Adaptation

Study found that "*wetlands conservation is a cost-effective means to reduce flood risk …*"

Consistent with

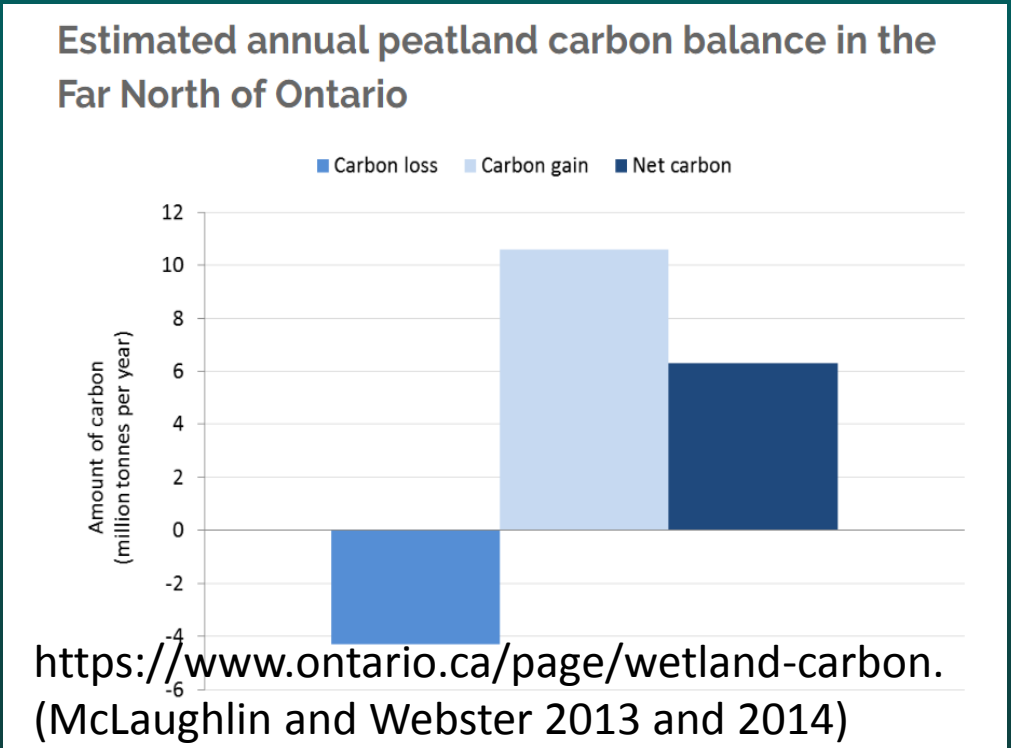
- *Wetland Conservation Strategy for Ontario*,
- Ontario's *Climate Change Action Plan*,
- Govt of Canada's *Pan-Canadian Framework on Clean Growth and Climate Change.*

Not so fast!

Wetlands are also a major source of GHGs

Methane

1. "*Wetlands are the largest natural source of atmospheric* ***methane***" (Turetsky et al 2014)
2. Global Warming Potential = 84
3. Global methane concentrations have increased by 25 Tg since 2006: wetlands, agriculture (rice and cattle), land underlain by permafrost



https://www.ontario.ca/page/wetland-carbon.
(McLaughlin and Webster 2013 and 2014)

Carbon Balance - a quantified approach to determining whether a wetland ecosystem is functioning as a sink or source of carbon, and to what extent.

Peatlands Carbon balances *ranged between a sink of 17.2 to a source of 82.1 CO2 e/year" - McLaughlin & Webster 2014.*

Climate Change Impacts

- Area/function Losses – drying out (and fragmentation) due to less baseflow and higher temperatures, and fire risk,
- Increased productivity (carbon sink potential) - biogeographical range shifts, longer growing seasons
- Increased methane production in dried out areas in particular

Wicked Feedback

- Increasing methane contributions in temperate swamps: Although temperate swamps are estimated to account for ~5% wetlands CH4 emissions (globally) this is likely to increase. In China, Zhu et al (2016) found that there was a 20.4% increase in temperate wetland emissions in the past 30 years.
- Studies show that **ephemeral wetlands (and peripheral transitional areas) produce more methane than permanent ones** (e.g. Hahn et al 2015).
- Methane emissions from swamps amplify climate impacts – (positive feedback)

Implications for Impact Assessment

Taking future climate change into account,

1. Will the wetland function as a net carbon sink or source after intervention?
2. Can re-wetting (e.g. for flood disposal) allow for permanent flooding?
3. Should we focus more on conservation of permanently saturated wetlands as environmental impact mitigation?


Thank you!
UsoVVV