

# *Carbon In, Methane Out: The Greenhouse Gas Balance of North American Wetlands*

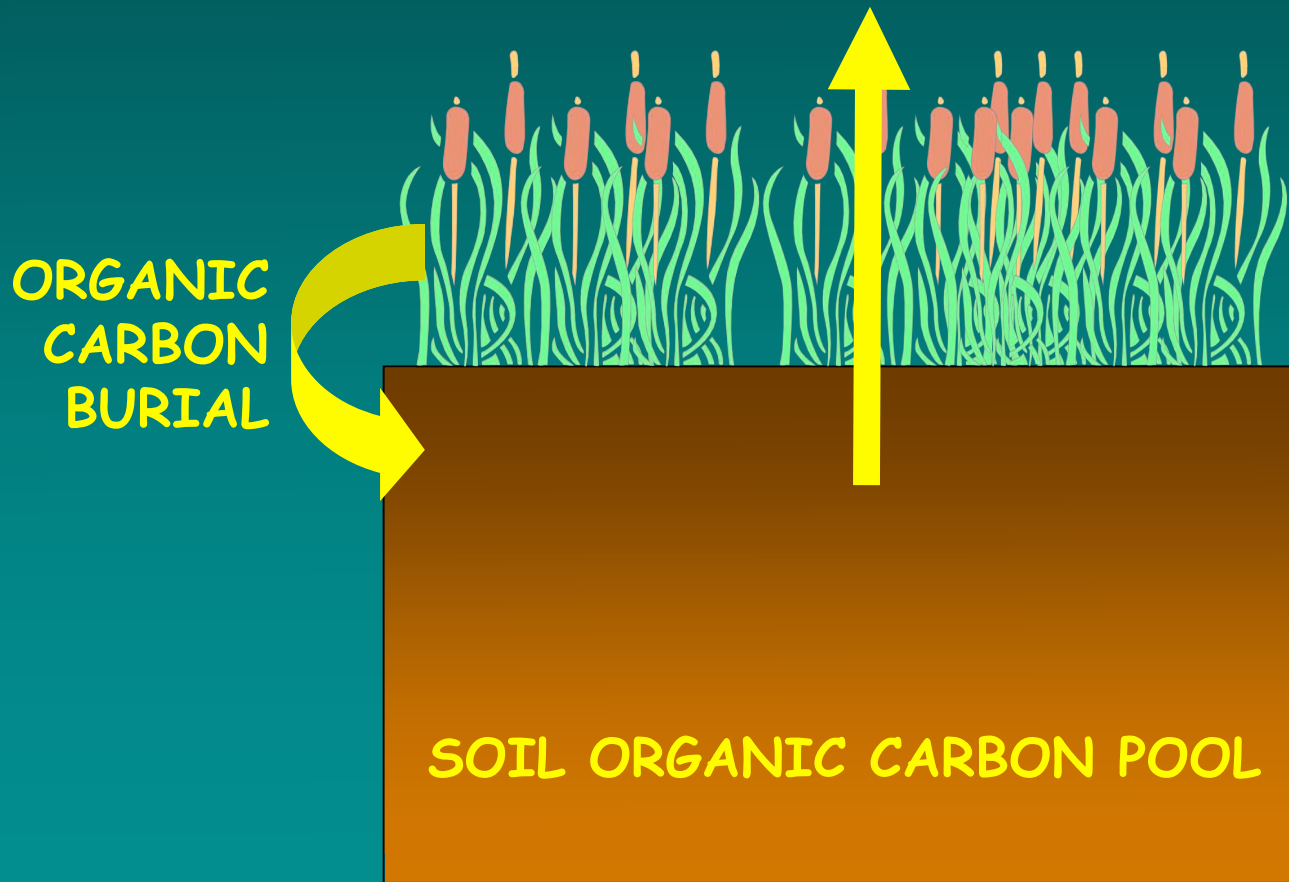
*J. Patrick Megonigal*

*Smithsonian Environmental Research Center*



# Basic Wetland Carbon Budget

Methane Gas ( $\text{CH}_4$ )  
Carbon Dioxide Gas ( $\text{CO}_2$ )



# Many Wetland Types

Freshwater

Saltwater

Mineral Soils



freshwater mineral  
Soils (FWMS)



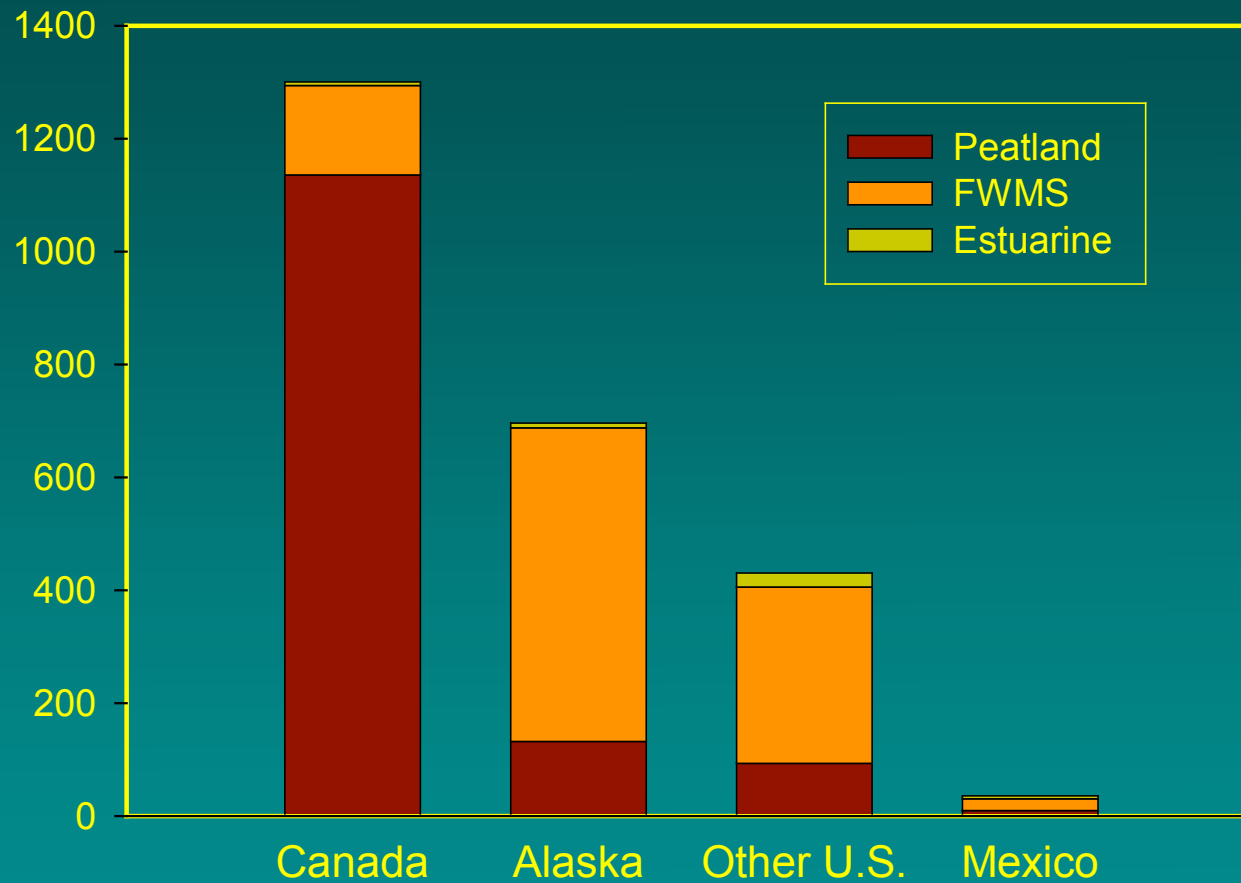
estuarine

Organic Soils



peatlands

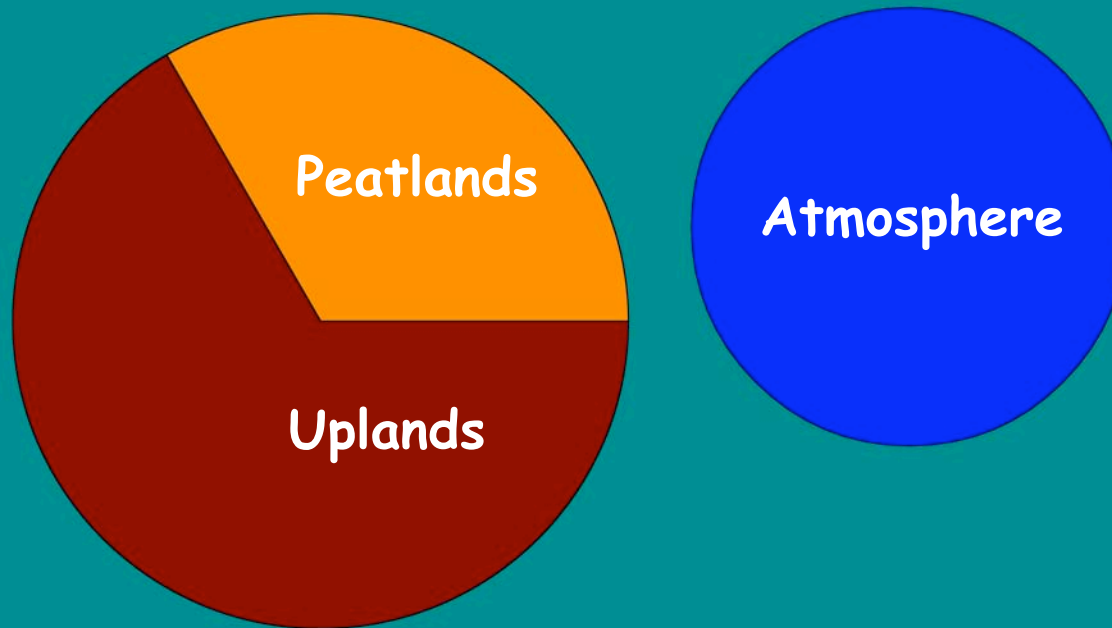
## North American Wetland Area



Total area = 2.5 million km<sup>2</sup>  
41% of global total wetland area



# Peatlands Are Important To Global Carbon Budgets



Peatland soils hold two-thirds as much carbon as the atmosphere. If this soil carbon is lost to the atmosphere, it will accelerate global warming.



Peatland soils are rich in organic carbon because of slow decay rates due to wet and cold soil conditions

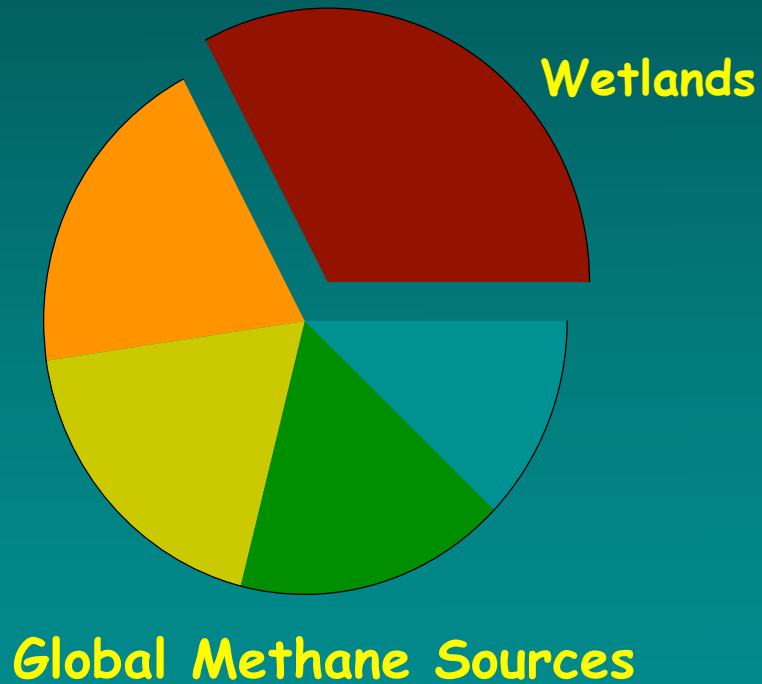


Warming is causing frozen organic soils to thaw. This may cause the organic carbon to oxidize to carbon dioxide. Droughts and draining have the same effects.

# Wetland Soils Sequester Carbon In Sediments

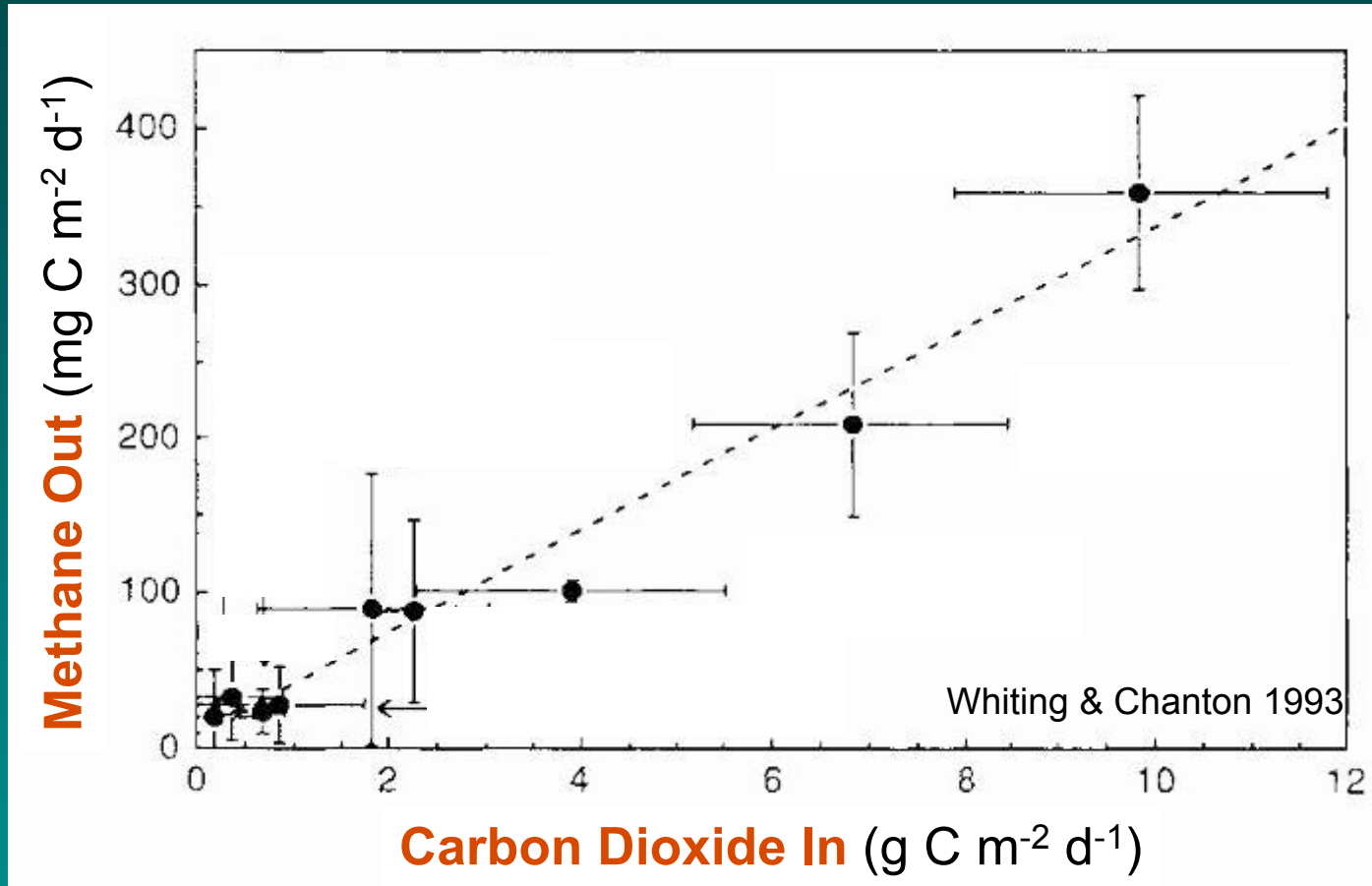


# Wetlands Emit Methane



- Wetlands are 40% of sources
- Methane is 20% of Global Warming

## More Carbon In, More Methane Out?



Some (not all) wetlands emit more methane when plant growth increases. We do not understand what conditions favor carbon sequestration over methane emissions.

## Key Questions About Carbon Sequestration in Wetlands

- How sensitive is peatland carbon to global warming?
- How much carbon is buried in wetland soils by sediments?
- Can wetlands be created to sequester carbon while producing little methane?