Effect of invasive *Typha* on sediment nutrient composition of Great Lakes coastal wetlands across a water depth gradient

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**Abstract**

The invasive hybrid cattail, *Typha x glauca* (hereafter, *Typha*) forms dense monocultural stands in the shallow waters of Great Lakes coastal wetlands. *Typha* competitively absorbs macronutrients such as nitrogen and phosphorus and outcompetes native wetland plants. When *Typha* dies, its biomass accumulates in nutrient-rich floating mats. I hypothesized that the sediment in wetlands invaded by *Typha* will have significantly higher levels of carbon and nitrogen due to the accumulation of organic litter by *Typha*. I analyzed sediment samples from two *Typha* invaded and two uninvaded coastal wetlands to determine how biodiversity affects sediment nutrient composition paired with water level gradients. I combusted sediment samples in an N-C Analyzer to determine sediment percent carbon and nitrogen. I found that sediment taken from deep water vegetative zones had lower concentrations of carbon and nitrogen due to sparse vegetation and exposure to wave action. Average floral diversity was significantly different between medium and deep-water plots.

**Question**

- How does *Typha* invasion affect carbon and nitrogen composition of wetland sediment across a water level gradient?

**Hypotheses**

- Sediment in wetlands invaded by *Typha* will have significantly higher levels of carbon and nitrogen.
- Sediment in shallower water depths will have significantly higher levels of carbon and nitrogen.

**Introduction**

Water level fluctuations have a significant effect on both the biodiversity of wetland vegetation\(^1\) and nutrient export from the wetland.\(^2\) In the past 30 years, average water levels within Great Lakes coastal wetlands (GLCWs) have varied by as much as 2 meters.\(^3\) *Typha*, propagates in periods of low water. It has superior flood tolerance and nutrient uptake compared to native plant species.

*Typha* litter deposits carbon and nitrogen into the ecosystem.\(^4\) However, it is unclear what the effects of high water levels have on the stored carbon and nitrogen in *Typha* dominated GLCWs.

**Methods**

The plots in this study are from the wetlands Cheboygan Marsh, Cecil Bay, Munuscong Bay, and Mackinaw Bay. Three transects of 15 replicates were drawn perpendicular to open water through each of the field sites. Plant diversity (calculated by taking aerial percent cover) and sediment cores were taken for each replicate. Soil samples were ground and sieved. 70 mg of each sample was run through an elemental analyzer. All replicates were analyzed using the software RStudio. All transects were divided into thirds by replicate (1-5, 6-10, 11-15) with the exception of a Cecil Bay transect that had 50 replicates. It was divided into thirds based on total water depth.

**Results**

**Correlation Matrix**

![Correlation Matrix](image)

**Discussion**

Despite the correlation matrix showing a strong positive correlation between *T. glauca* % cover and sediment carbon and nitrogen concentrations, the linear regression models show very weak relationships between the variables. I found that increased *T. glauca* % cover leads to a slight increase in sediment carbon and nitrogen concentrations. Nitrogen concentration seems to be slightly more impacted by an increase in *T. glauca* % cover.

Both sediment carbon and nitrogen concentrations are also significantly lower in deep water replicates than in shallow water replicates. These results show that sediment carbon and nitrogen concentrations are impacted by both water depth and *T. glauca* invasion.

**References**


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