# The Long and Short Term Effects of Fire on Phytoplankton and Lake Chemistry of Yup'ik Territory in the Yukon-Kuskokwim Delta

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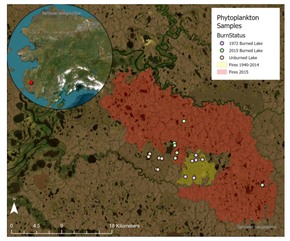
## Introduction

- There are local concerns about fish resilience in the Yukon-Kuskokwim Delta (YK Delta) and Yup'ik subsistence fishing related to the increase in fire frequency and severity due to climate change.
- Increases in fire frequency and magnitude impacts biogeochemistry throughout the tundra, especially within aquatic ecosystems.
- Our goal was to assess those ecosystem changes using chlorophyll-a (chl-a) concentration
- We hypothesized differences in chlorophyll a concentrations across burn histories of lakes in the YK Delta

## Study Area

Yup'ik Territory, Yukon-Kuskokwim Delta, Alaska




## Methods

- Sampled 22 lakes each in unburned area (n=8), 1972 burned area (n=7), and 2015 burned area (n=7)
- Water samples collected for analysis of nitrate, ammonium, phosphate, and dissolved organic carbon (DOC) concentrations
- Tested chl-a in field using Turner Design Fluorometer

## Results

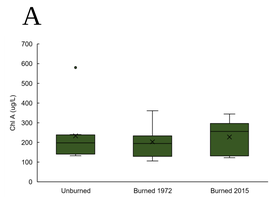
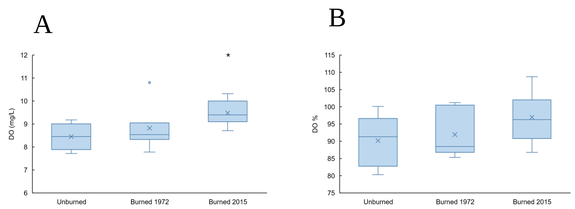



Figure 1. Estimates of chl-a sampled in 2022, from lakes across different burn histories including areas that burned in 2015, 1972 and an unburned area.

Figure 2 A. Dissolved Oxygen (mg/L) sampled in 2022, from lakes across different burn histories. Lakes from the 2015 burn had higher average DO than lakes in the 1972 burn or the unburned areas. (p-value = 0.035567). B. Dissolved Oxygen (%) sampled in 2022, from lakes across different burn histories. Lakes from the 2015 burn had higher DO% than lakes in the 1972 burn or the unburned areas.



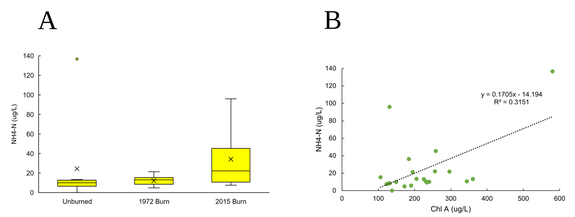




Figure 3. A. Ammonium – NH4-N (ug/L) sampled in 2022, from lakes across different burn histories. B. Chl-a (ug/L) and NH4-N concentrations of lakes in the Yukon-Kuskokwim Delta, Alaska

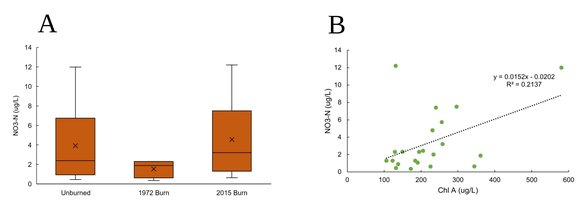



Figure 4. A. Nitrate – NO4-N (ug/L) sampled in 2022, from lakes across different burn histories. B. Chl-a (ug/L) and NO3-N concentrations of lakes in the Yukon-Kuskokwim Delta, Alaska

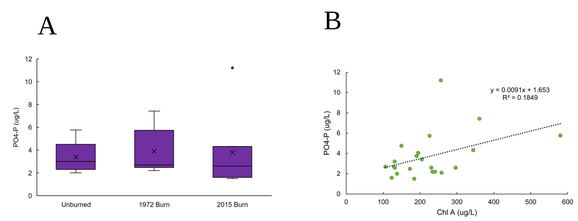



Figure 5 A. Phosphate PO4-P (ug/L) sampled in 2022, from lakes across different burn histories. B. Chl-a (ug/L) and PO4-P concentrations of lakes in the Yukon-Kuskokwim Delta, Alaska.

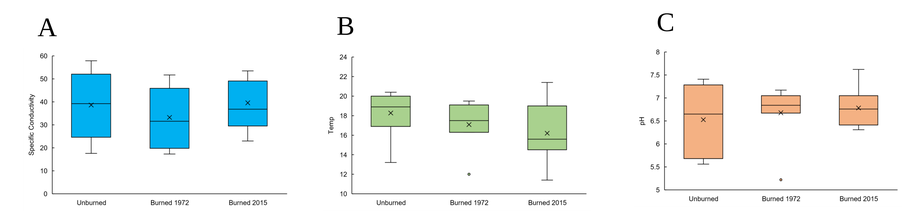



Figure 6 A. Specific Conductivity sampled in 2022, from lakes across different burn histories. B. Temperature sampled in 2022, from lakes across different burn histories C. pH sampled in 2022, from lakes across different burn histories

## Results continued

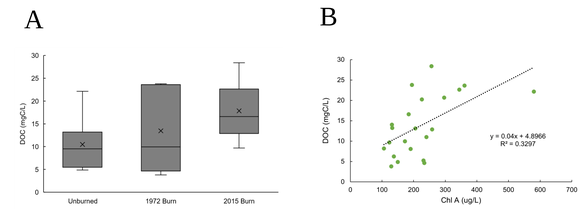



Figure 7 A. Dissolved Organic Carbon (DOC) sampled in 2022, from lakes across different burn histories. B. Chl-a (ug/L) and DOC concentrations of lakes in the Yukon-Kuskokwim Delta, Alaska

## Discussion

- Results suggest that chl-a, over time returns to pre-burn concentrations. In 2019, we saw significantly higher chl-a concentrations in lakes in 2015 burned area. (Figure 1)
- There was significantly higher concentrations of DO in lakes in 2015 burned areas than 1972 burn or unburned areas suggesting increased presence of photosynthetic organisms. (Figure 2 A)
- In 2019, chl-a appeared limited by phosphate concentrations. This year, there is a slightly positive relationship between chl-a and ammonium, nitrates, and phosphates. (Figures 3B, 4B, 5B)

## Conclusion/Future Work

- Future research will investigate other potential environmental factors of importance (ie. Lake depth, weather, light accessibility)
- More research needed on patterns of phytoplankton nutrient limitations
- Species composition of lakes should be evaluated in future

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