

Introduction

- Mountain lakes are sensitive to environmental change.
- This project compares nutrient levels and particulate organic matter (POM) in areas with and without filamentous algal blooms (FABs) to understand what's driving them and how to protect these lakes.
- FABs were rarely seen in places like Sky Pond until the last decade which is why they are still poorly understood.
- FABs form along the lake bottom and may alter oxygen levels and nutrient dynamics.



Figure 1. View of Sky Pond in Rocky Mountain National Park, a high-elevation where FAB research was conducted.

★ **Mountain lakes are a critical source of clean water for downstream ecosystems and human use, so we need to study phenomena that may be impacting and or altering their water quality.**

Study Questions

- Are concentrations of ammonia and phosphate higher in areas with FABs compared to areas without FABs?
- Is the amount of particulate organic matter (POM) higher in areas with FABs compared to areas without FABs in Sky Pond?

Methods

- Water samples were collected from sites in Sky Pond with and without FABs, then stored on ice and analyzed in the lab.
- Nutrient levels and particulate organic matter are being compared to identify possible drivers of FAB formation.
- POM was measured by filtering known volumes of lake water through pre-weighed filters.
- Filters were dried in a drying oven, then ashed in a muffle furnace, and reweighed to separate organic and inorganic material.
- Data was input into R for data visualization as well as to run multiple T-tests.

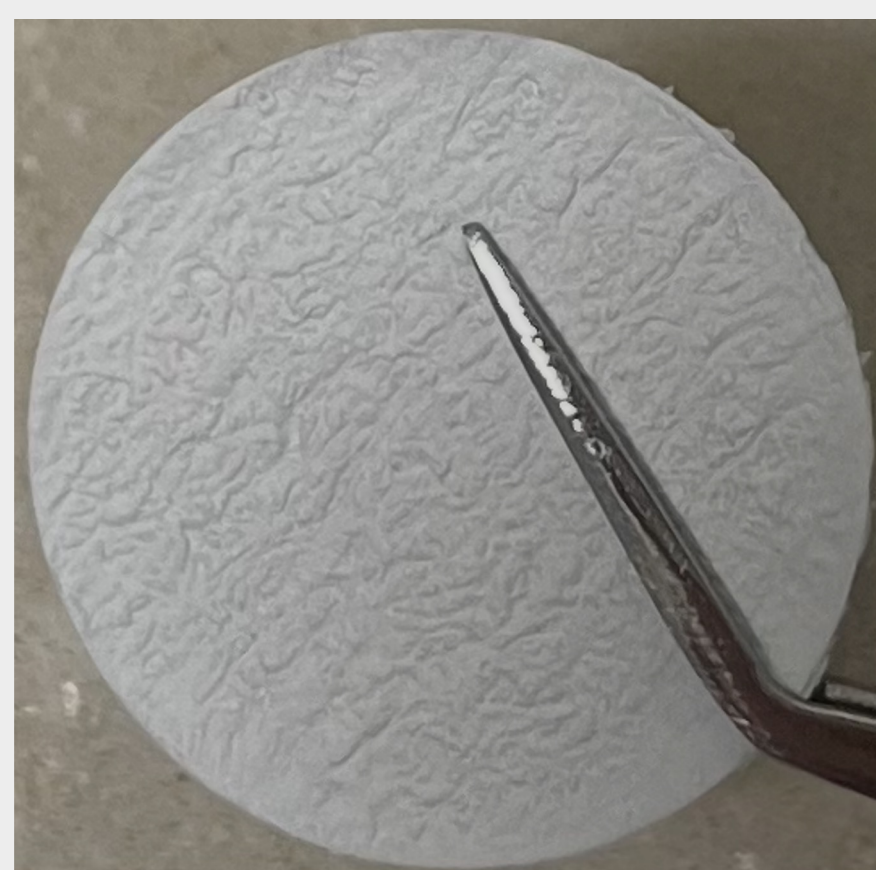


Figure 2. Filter collected from a non-FAB site



Figure 3. Filter collected from Shore Site 2 (our FAB site)

Study Areas

- Sky Pond is a remote alpine lake in Rocky Mountain National Park.
- Sky Pond is located at approximately **10,900 feet (3,323 meters)** above sea level.
- Samples were collected from the inlet, outlet, shore site 1, site 2 (FAB site), site 3, and lake surface (LS).

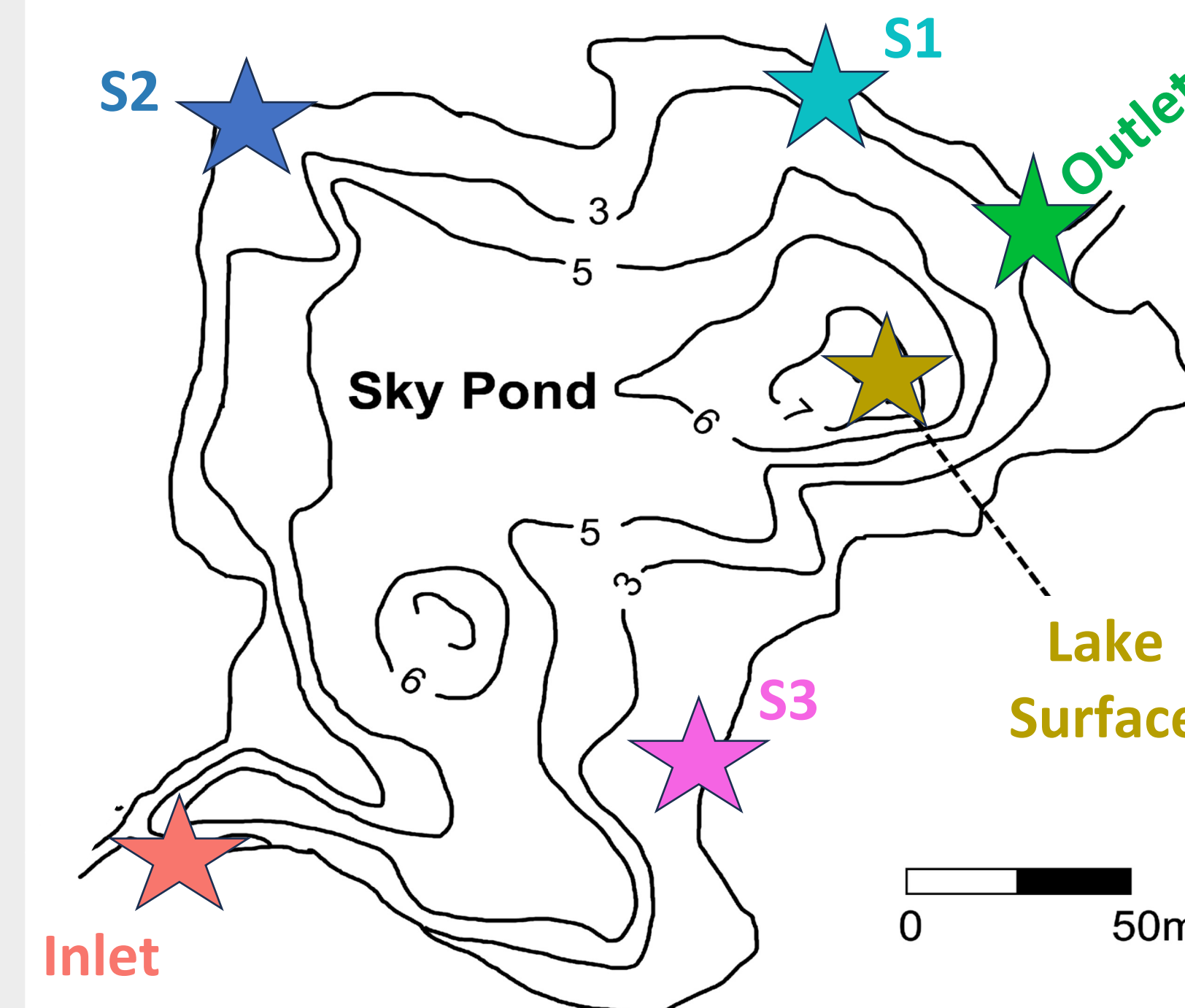


Figure 4. Map of Sky Pond, remote alpine lake where FAB research was conducted.

Nutrient Concentrations Across Sites

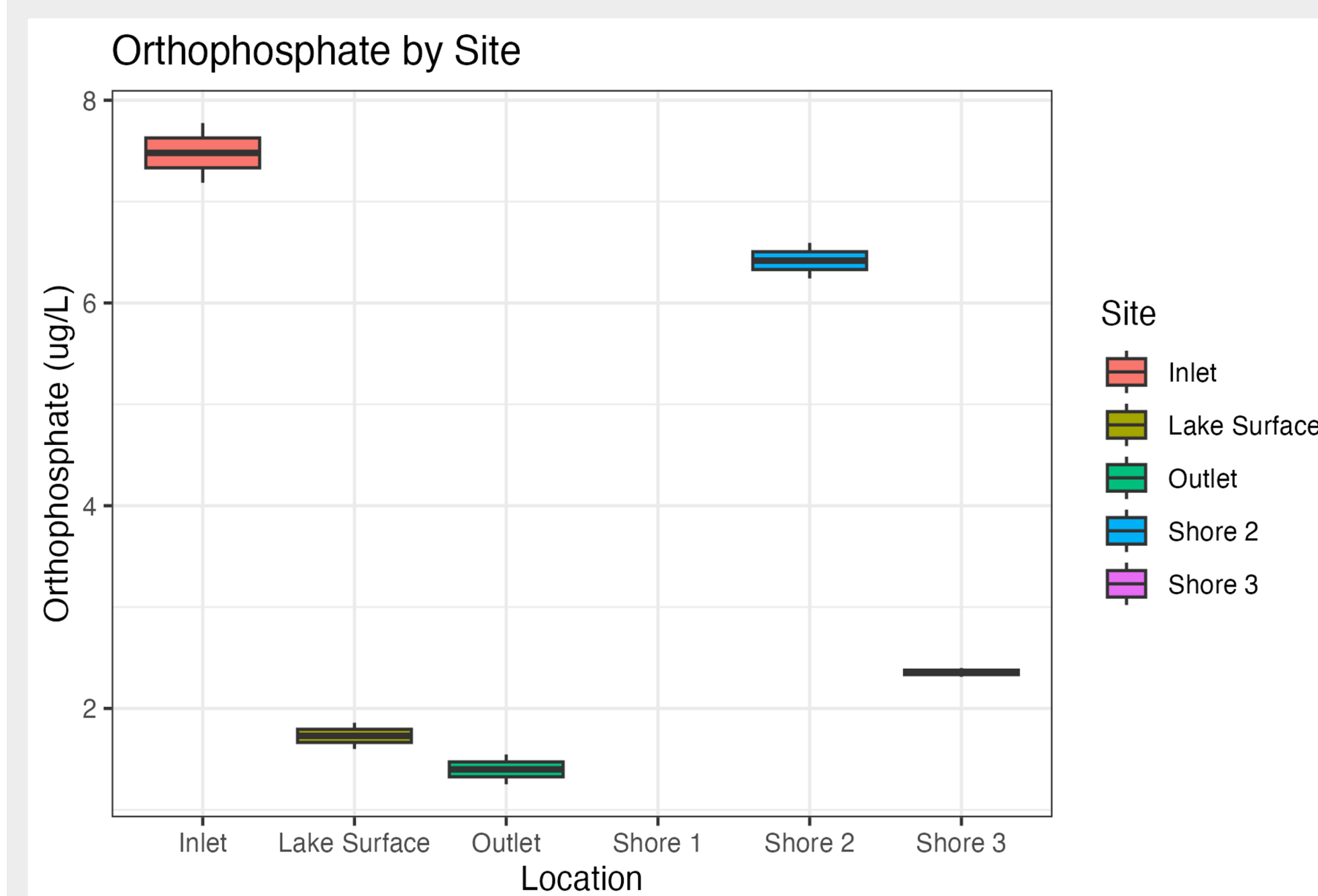


Figure 5. Boxplot showing orthophosphate concentrations (µg/L) across various sites within the lake.

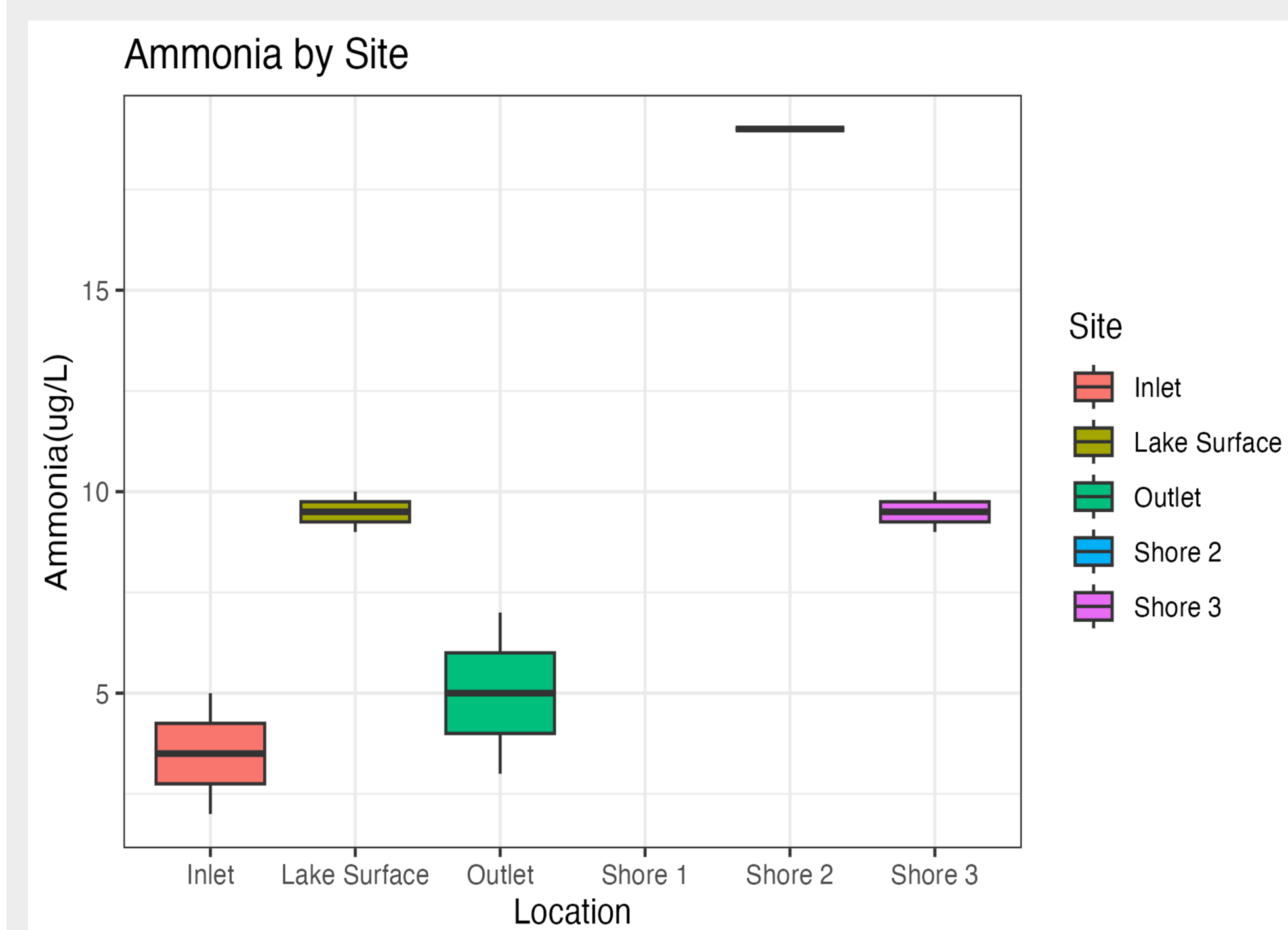


Figure 6. Boxplot showing ammonia concentrations (µg/L) across various lake sites.

- Statistically significant difference between ortho phosphate concentrations in our FAB site (shore site 2) and all other sites without FABs (p-value = 0.01148)
- Statistically significant difference between orthophosphate concentrations in shore site 2 and shore sites without FABs (p-value = 0.0199)

- Statistically significant difference in ammonia concentrations between shore site 2 and all sites without FABs (p-value = 1.202e⁻⁰⁵)
- Statistically significant difference in ammonia concentration at FAB site vs non-FAB shore site (p-value = 0.03348)

Particulate Organic Matter Concentrations

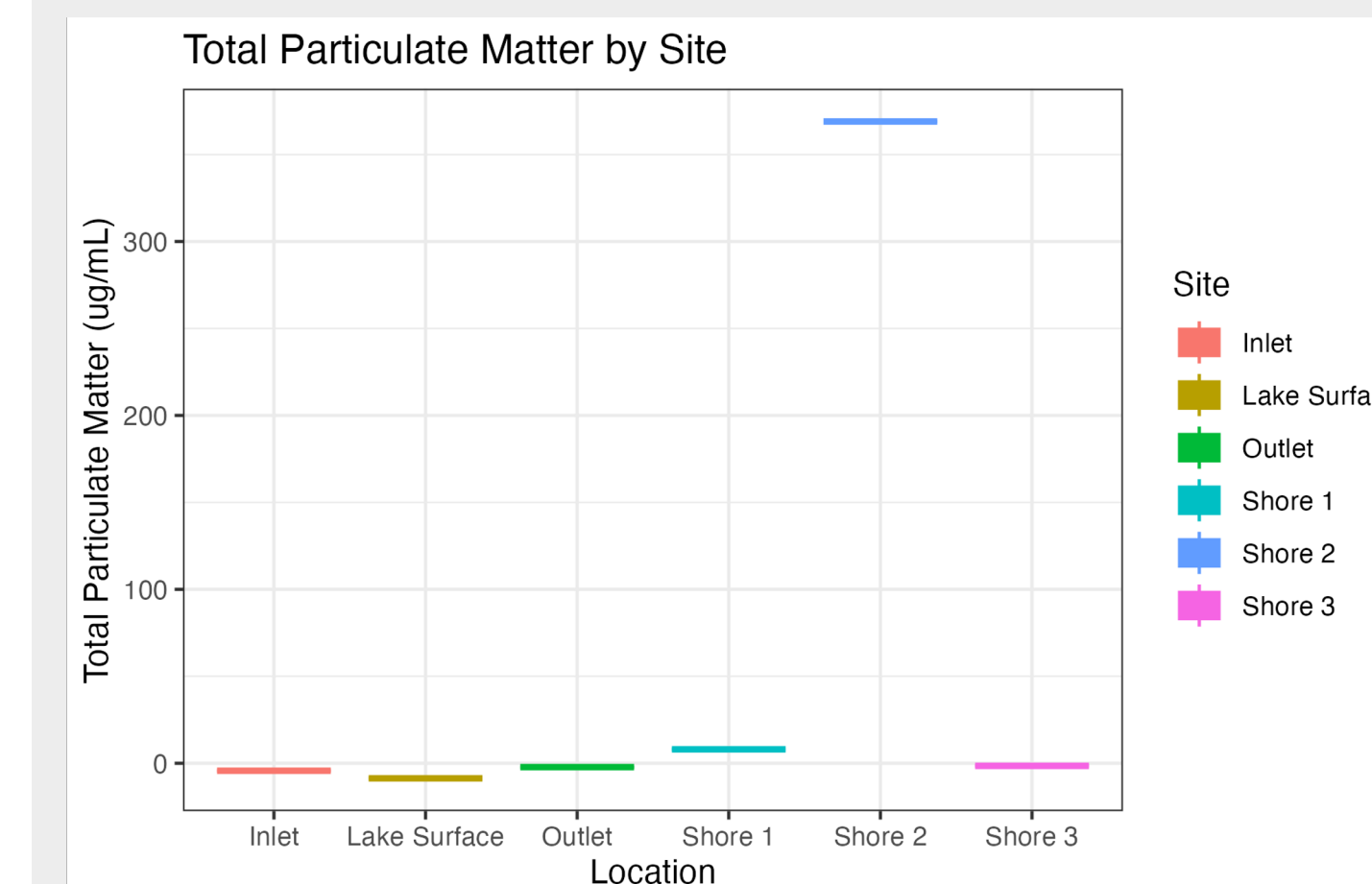


Figure 7. Boxplot of total particulate matter for the same sites.

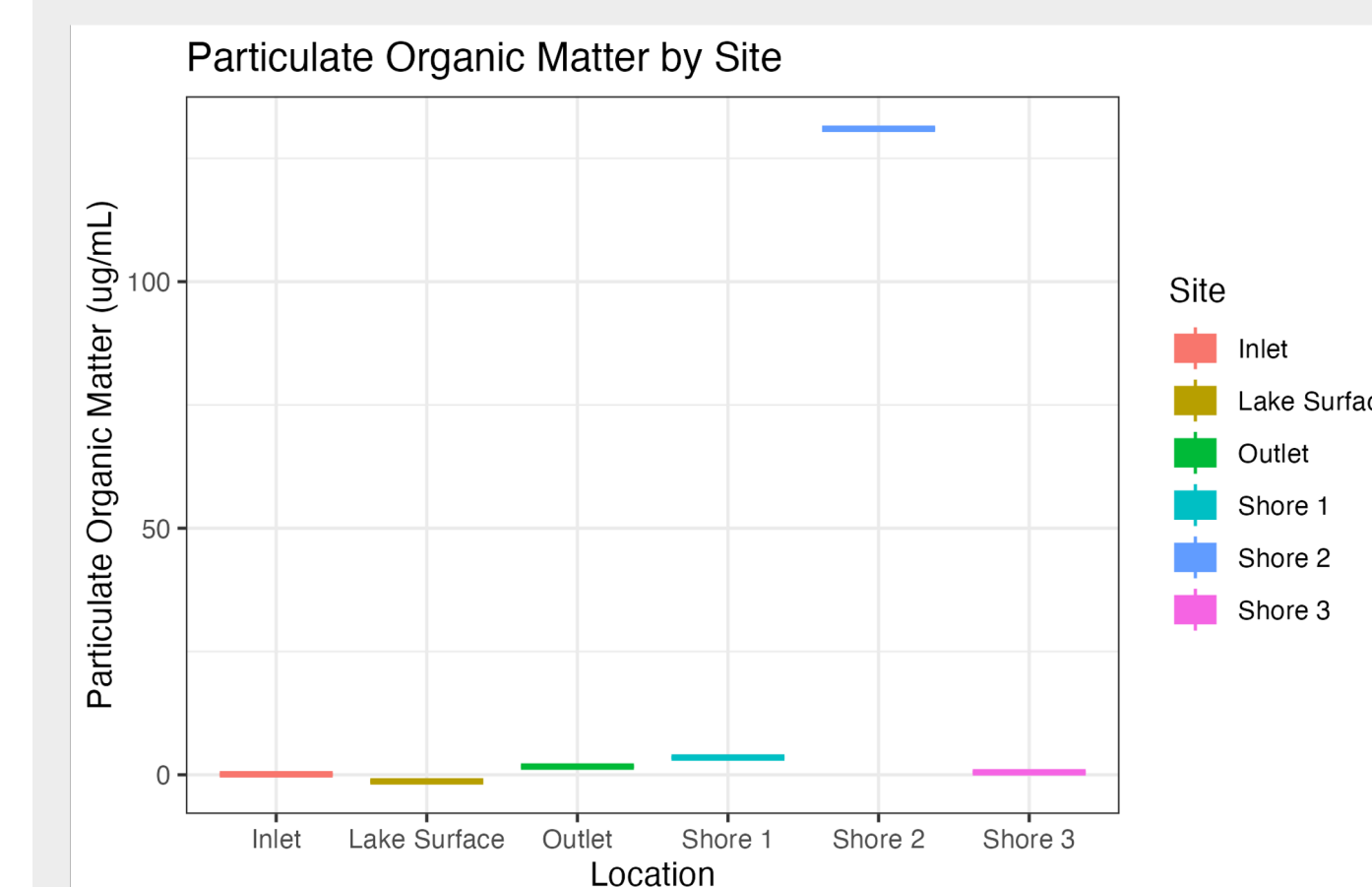


Figure 8. Boxplot of particulate organic matter across all lake sites.

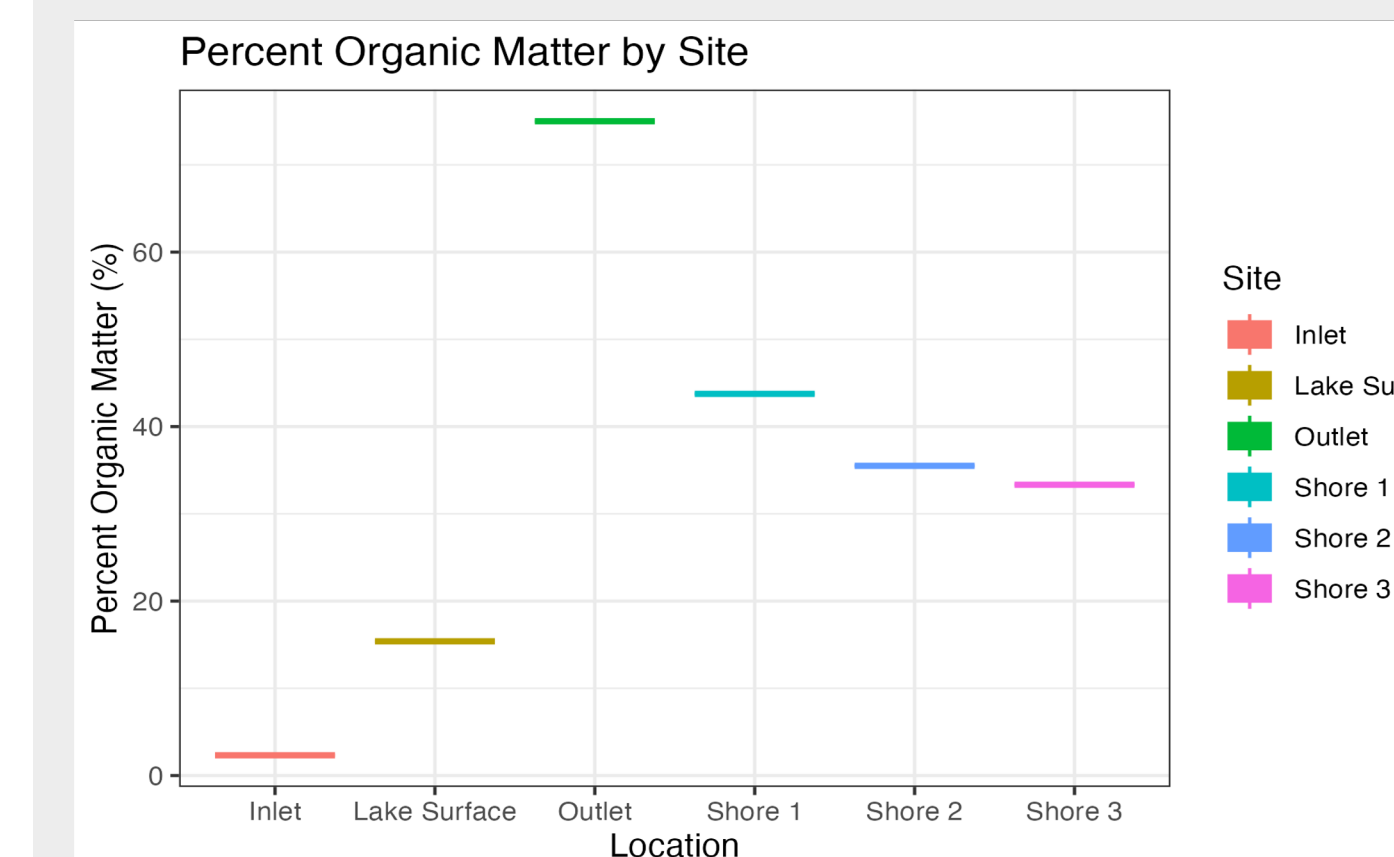


Figure 9. Boxplot of percent organic matter in particulate samples

- No statistically significant difference in total particulate matter concentration between shore sites and non shore sites (p-value = 0.3974)
- No statistically significant difference in particulate organic matter concentration between shore sites and non shore sites (p-value = 0.465)
- No statistically significant difference in percent organic matter between shore and non shore sites (p-value = 0.796)

Conclusion:

- Nutrient concentrations are drastically higher in our site with FABs compared to our sites without FABs. It is unclear whether FABs are producing nutrients or if they are preferentially growing in areas with higher nutrient concentrations.
- We observed a qualitative difference in particulate organic matter between sites with and without FABs, but there was no statistically significant difference between shore sites and non shore sites.

★ **We see chemical differences in between FAB sites and non- FAB sites**

Acknowledgements

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Contact Info

