Comparison of Nitrates at Creamer's Field and Sheep Creek

Research Question: How do nitrates and pH vary between agriculture and non-agriculture sites?

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Introduction

For this study we explore the possibility of additional nitrates in waterbodies as result of agricultural activities. Nitrates have a well documented effect on the environment and waterbodies surrounding agricultural zones. Nitrate runoff into surface water systems causes eutrophication, resulting in high fish mortality and algal blooms (Bijay-Singh, 2021). This damage can easily affect food webs and the overall health and productivity of an area. Fairbanks, and Alaska as a whole, is still in the early stages of agricultural development. As a result, local ecosystems are relatively untouched compared to areas with more established agricultural industry. Creamer's Field is an important habitat for wildlife and overabundance of nitrates could have a negative impact on these waterfowl.

Methods

Two study sites were selected to test for the presence of nitrates. Site A (64.86043 N 147.73712 W): a pond at Creamer's Field Migratory Waterfowl Refuge, and Site B (64.86319 N 147.87195 W): a pond located off Sheep Creek Road adjacent to Smith Lake. The pond at Site A is surrounded by open agricultural fields, dominated by grasses and understory vegetation at the time of collection. The area is very flat with compact soils and is at 470ft elevation. Site B is surrounded by spruce forest and marshy land connects it to Smith Lake. The banks are dominated by cattails and various sedges and abuts the road on the west side. The elevation of Site B is 500ft. Both sites experience frequent bird activity and are located close to urban areas and roads. Samples were taken every two weeks from each site over the course of a month, on 9/25/2025, 10/09/2025 and 10/23/2025, between 7:00 and 9:00 AM. Nitrate levels were determined using a Nitrate Nitrogen 0.25-10 test kit. pH was tested using pH paper strips. Air and water temperature were determined using thermometers. All tests were done in accordance with GLOBE protocols.

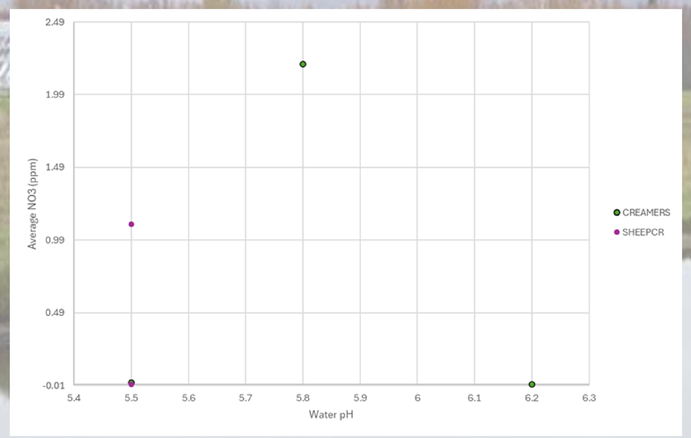
Land Acknowledgment

We acknowledge the history and current stewardship of Alaska Native nations in the area of study, located on the ancestral lands of the Dena people of the lower Tanana River.

Results

The results from the data gathered from these observations is shown in the graphs below. What our data presents is that on average, Creamer's field contains higher nitrate concentrations than the Sheep Creek site. There is no lineation apparent between pH and nitrate concentration.

Graph 1 Nitrate Concentrations (ppm)



Graph 2 pH in comparison to Nitrate levels

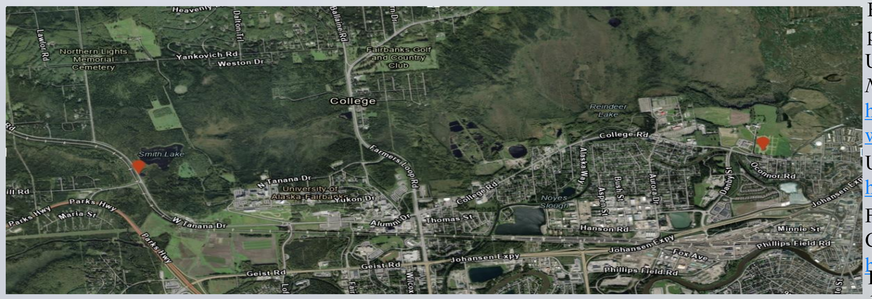


Fig. 4 Map denoting site locations

Discussion

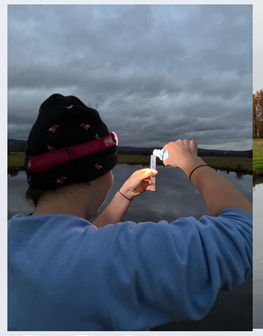


Fig. 1 Thea Person pours sample water into test tube

Fig. 2 Creamer's Field Pond early in the morning

Fig. 3 Inga Peterson prepares nitrate test in the field

Reflecting on our methodologies, a major limitation to our data set is the fact that collection occurred in the fall and was a relatively small sample set. In the future, we would like to increase sample sets and include dissolved oxygen and CE tests. Our findings only partially support our hypothesis. While on average site A has higher nitrate values, it was not to the expected amount nor did it align with pH. Literature review (Fan, J. He, & Zhang 2023, Hofman, Lees 2004, EPA, 2015)shows that pH levels must be in a range surrounding 6.5 to support the processes of nitrification. Nitrification is a crucial process of the cycling of nitrogen through the ecosystem. Both sites reported pH much lower than that at all collection times. This is an interesting factor to consider when thinking about nitrogen in the Fairbanks areas.

According to the EPA, the MCL is 10mg/L or 10ppm(EPA, 2021). It is good to note that we are operating within the EPA standards. Even without a strong correlation outcome from this experiment, nitrates are going to be a growing concern within Fairbanks as time goes on. It is important to have preliminary data and awareness before we start to see our water sources and habitats harmed by high levels of nitrates. This project has taught us that data collection for creating a baseline can have infinite rewards to watershed health in the future.

References

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