

Research question:

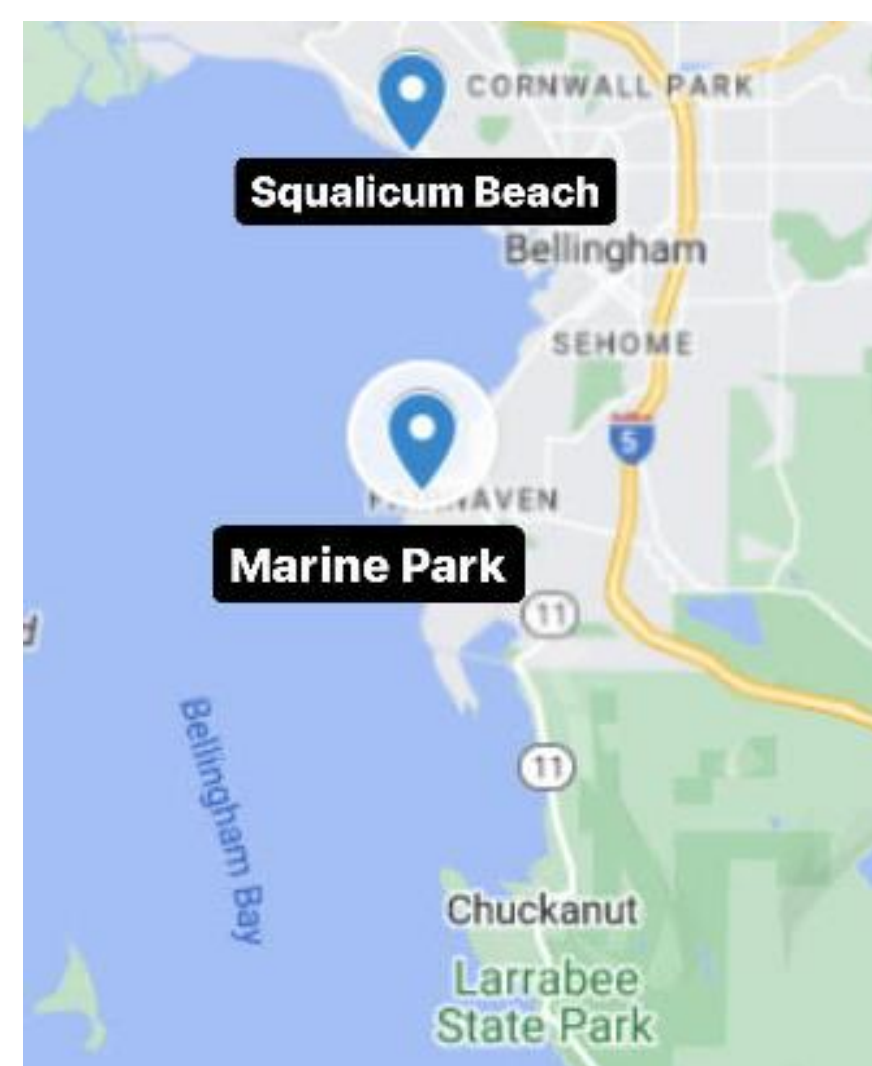
What percentage of marine plants near and on Squalicum Beach shoreline, and Marine Park's offshore coast are invasive?

Background & Hypothesis

I studied Bellingham Bay, aiming to prevent invasive species and raise awareness. While expecting few invasive plants in Whatcom County's public beaches, I found none of the potential invasives like Japanese Kelp, Japanese Eel Grass, Sargassum, and Caulerpa (Marine Invasive Species Identification Guide for the Puget Sound Area, 2009) Water testing for acidity and nitrates was flawed, but I gained insights into local water acidity.

Introduction

On Thursday, May 18, 2023, at an outdoor temperature of 70°F, from 1:40pm to 3:40pm I studied Marine Park offshore coastline and Squalicum Beach onshore coastline. To see the percentage of invasive aquatic plants I could find. I later confirmed the identity of my photographed marine plants with the "Marine Plants List" by Puget Sound Estuarium (2023).



Methods (Squalicum Beach)

I selected the southern part of Squalicum Beach for data collection because previous research indicated a rich diversity of marine plants, making it an excellent location to gather information. However, I faced limitations in entering the water due to strong tides, which made it impractical to kayak and I took an abundance images, I cannot even display it all.

In this figure A, you can see a field of seaweeds mainly Gutweed or Sea lettuce, *Ulva intestinalis*, and including Red String Seaweed, *Sarcodiotheca gaudichaudii*.

In figure B I thought there was a possibility of this being invasive Japanese Kelp, *Undaria pinnatifida*. But after triple checking (more than three times) it's more likely Sugar Kelp, *Saccharina latissima*. I used the Marine Invasive Species Identification Guide for the Puget Sound Area (2009) to compare.

Methods (Marine Park)

I used a freshwater aquatic plant testing method of using a metal rake on a rope, I tested at various locations offshore (circled) by letting down the rake and pulling it back up. I observed floating (broken off) Eelgrass, *Zostera marina*, at site three but did not pick it up with my rake. I made a rough field diagram of Marine Park after testing there.

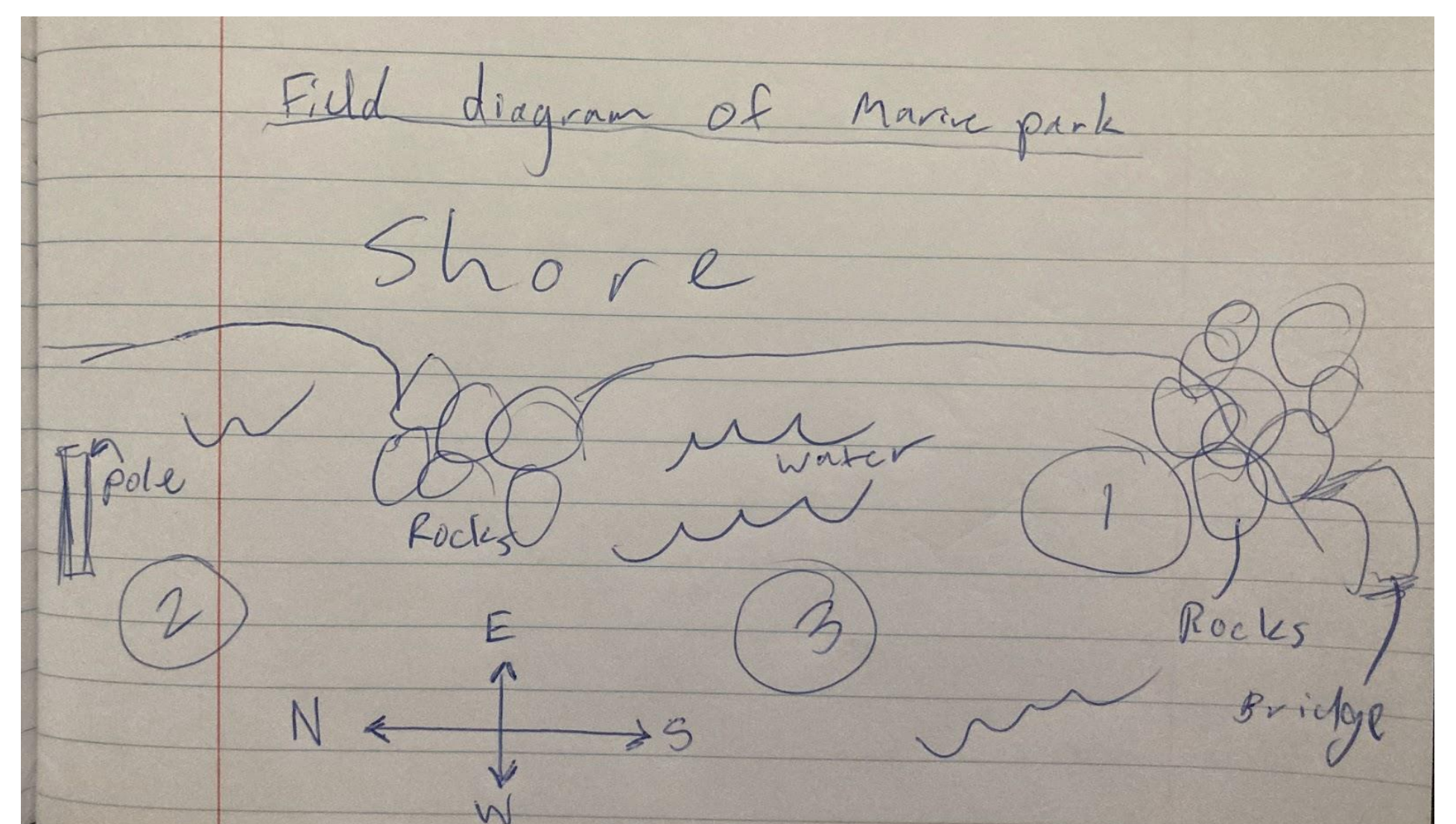

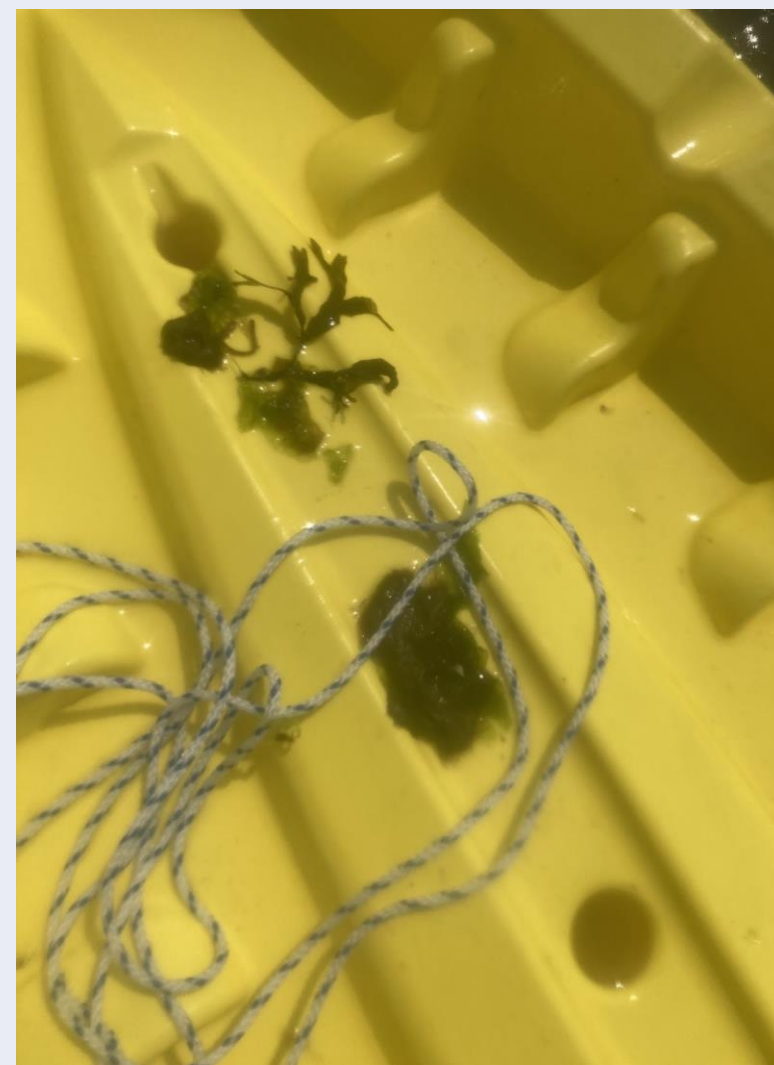



Table of marine plants found by rake test

Stop	Image	Rake Findings
1		-Sea lettuce (<i>Ulva lactuca</i>)
2		-Sea lettuce (<i>Ulva lactuca</i>) -Turkish washcloth (<i>Mastocarpus papillatus</i>) -Diatoms
3		-Diatoms

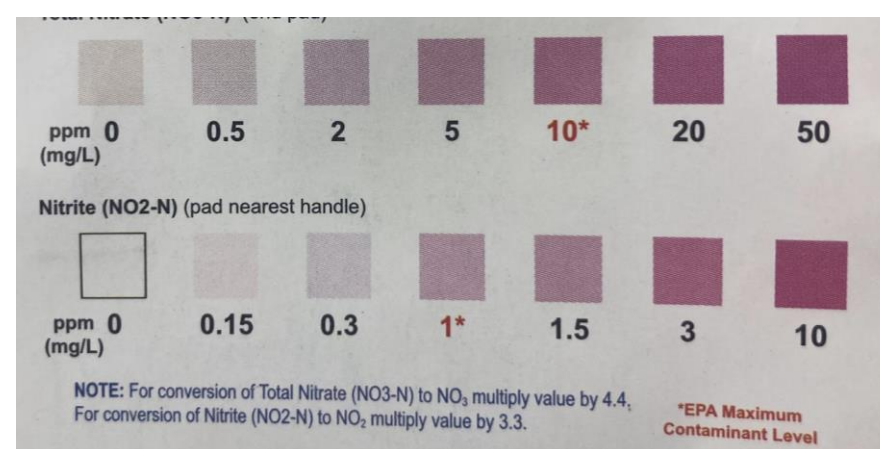
Results

My eventual findings were that about **0% of Squalicum Beach shoreline, and Marine Park's offshore coast are invasive** this is of course within the data I collected.

On Site Water Testing

Table of water testing results

Location (cap color)	PH	Nitrates (mg/L)
Marine Park (purple)	6	0
Squalicum Beach (white)	5	0



During the study, I conducted pH testing by directly immersing the pH strips in the free-flowing water and assessed nitrates using on-site collected water in tubes. However, it should be noted that the nitrate strips used were known to be unresponsive in lab testing, leading to potentially inaccurate results in the field

The main purpose of testing nitrates was to understand their implications for the marine plants found on the rake, such as eutrophication, increased algae growth, and potential oxygen depletion from algae decomposition (Environmental Protection Agency, 2023).

Despite concerns about the reliability of the pH strips, given the localized nature of the tests, they may still hold some validity (Crummett & Anil, 2020).

References

- Crummett, L. T., & Anil, A. C. (2020). Acidification decreases microbial community diversity in the Salish Sea, a region with naturally high pCO₂. Retrieved from <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0241183>
- Environmental Protection Agency. (2023). Nutrient Policy Data. Retrieved from <https://www.epa.gov/nutrient-policy-data>
- Marine Invasive Species Identification Guide for the Puget Sound Area. (2009). Puget Sound Marine Invasive Species Network. Retrieved April 27, 2023, from <https://www.yumpu.com/en/document/read/42599606/marine-invasive-species-identification-guide-for-the-puget-sound-area>
- Puget Sound Estuarium. (2023). Marine Plants List. Retrieved from <https://pugetsoundestuarium.org/marine-plants-list/>

Acknowledgements

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Figure A



Figure B



Discussion

While I noted lots of Eelgrass and other native marine plants, I did not find any invasive plants in my research. My study supports my hypothesis of minimal invasive plants. However, it is important to acknowledge limitations regarding flawed water testing results along with me being limited to close to shore and diversity of parks (only two).

In data collection on Bellingham Bay, my goal was to prevent invasive species and raise awareness. Preserving native habitats is crucial to prevent the displacement of native species and the detrimental impacts of invasive species, which can disrupt delicate ecosystems and cause overpopulation.

In an ideal scenario, a more comprehensive study would involve testing at numerous locations in Bellingham Bay using a systematic and consistent approach. This would enable the collection of a larger dataset and provide a more robust overview of invasive plants in the area.