

# Categorizing the Spread of Turf Algae Around Puget Sound

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## Introduction

- **Marine, filamentous turf algae** has become more pervasive along urban coastlines over the last 20 years.
- They have **low structural complexity** and **low biomass per area** compared with other seaweeds, and may reduce community productivity in urbanized seascapes.
- Their carpet-like, finely-branching structure acts as a **trap for sediment**, which may create hypoxic conditions for associated invertebrates (ex: microcrustaceans, meiofauna).
- Prior studies have linked expansion of turf algae to urbanization but have not assessed how its function might change over localized urban gradients.

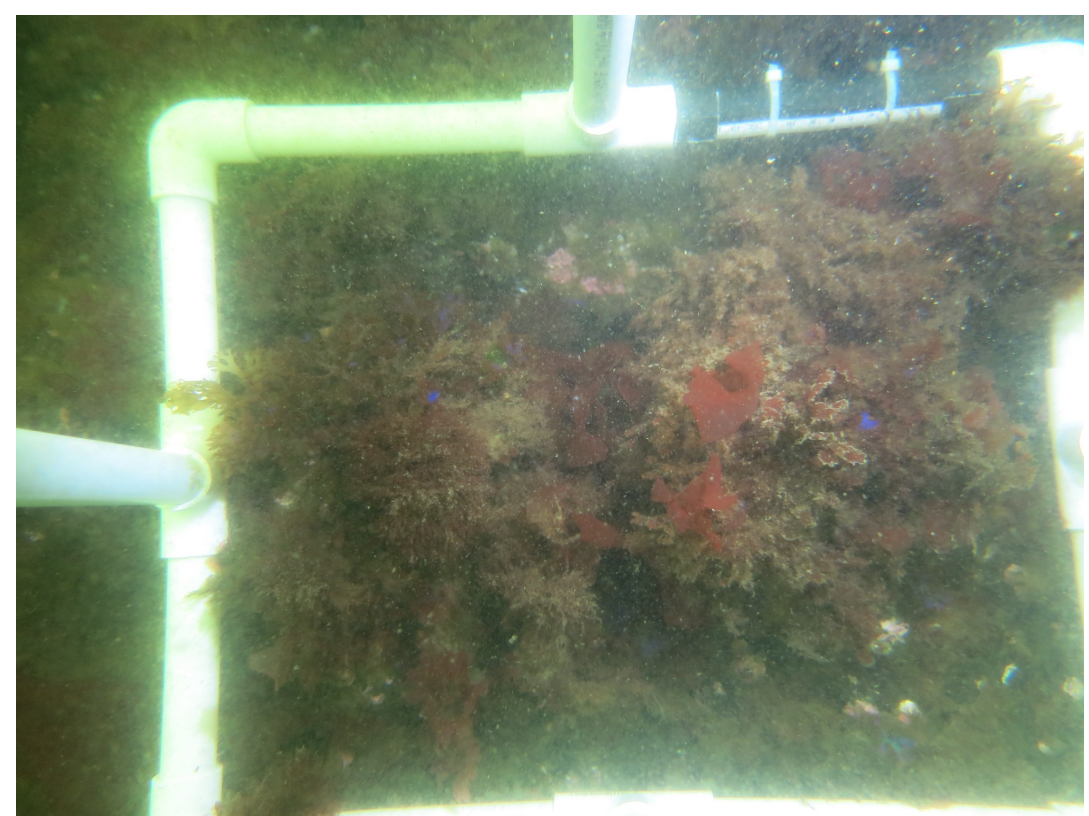


Figure 1: An example of turf algae with a high sediment load.

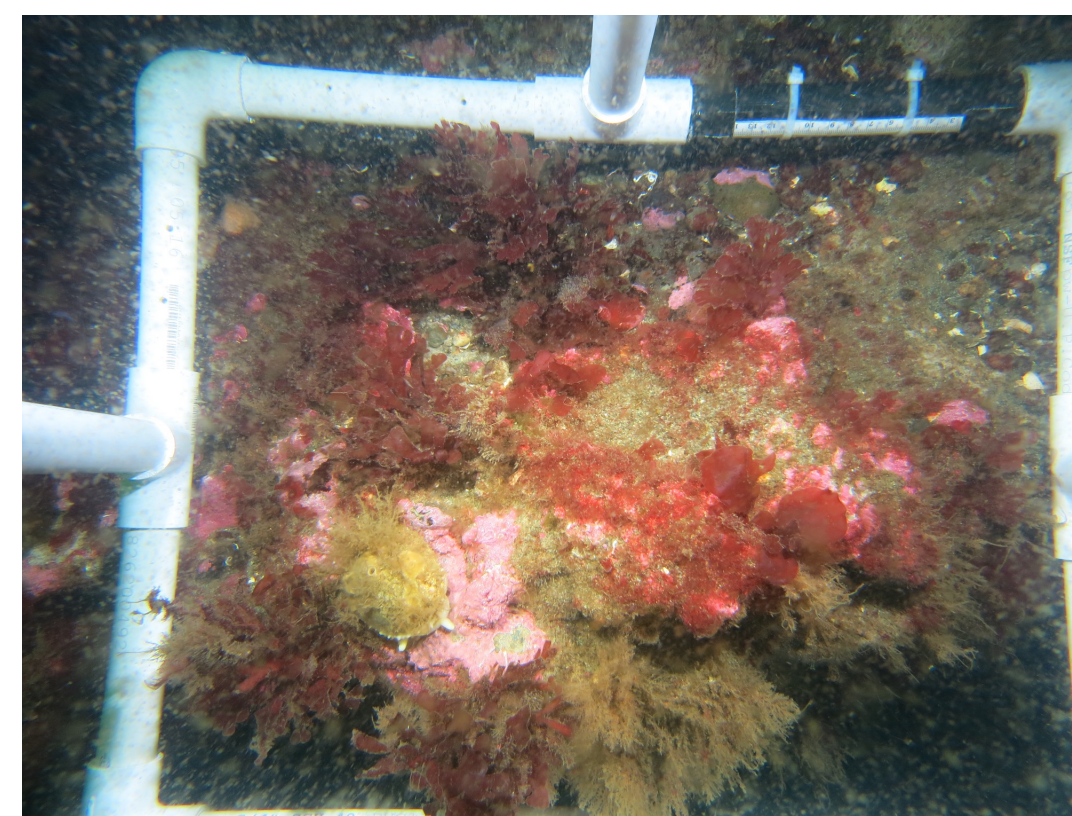
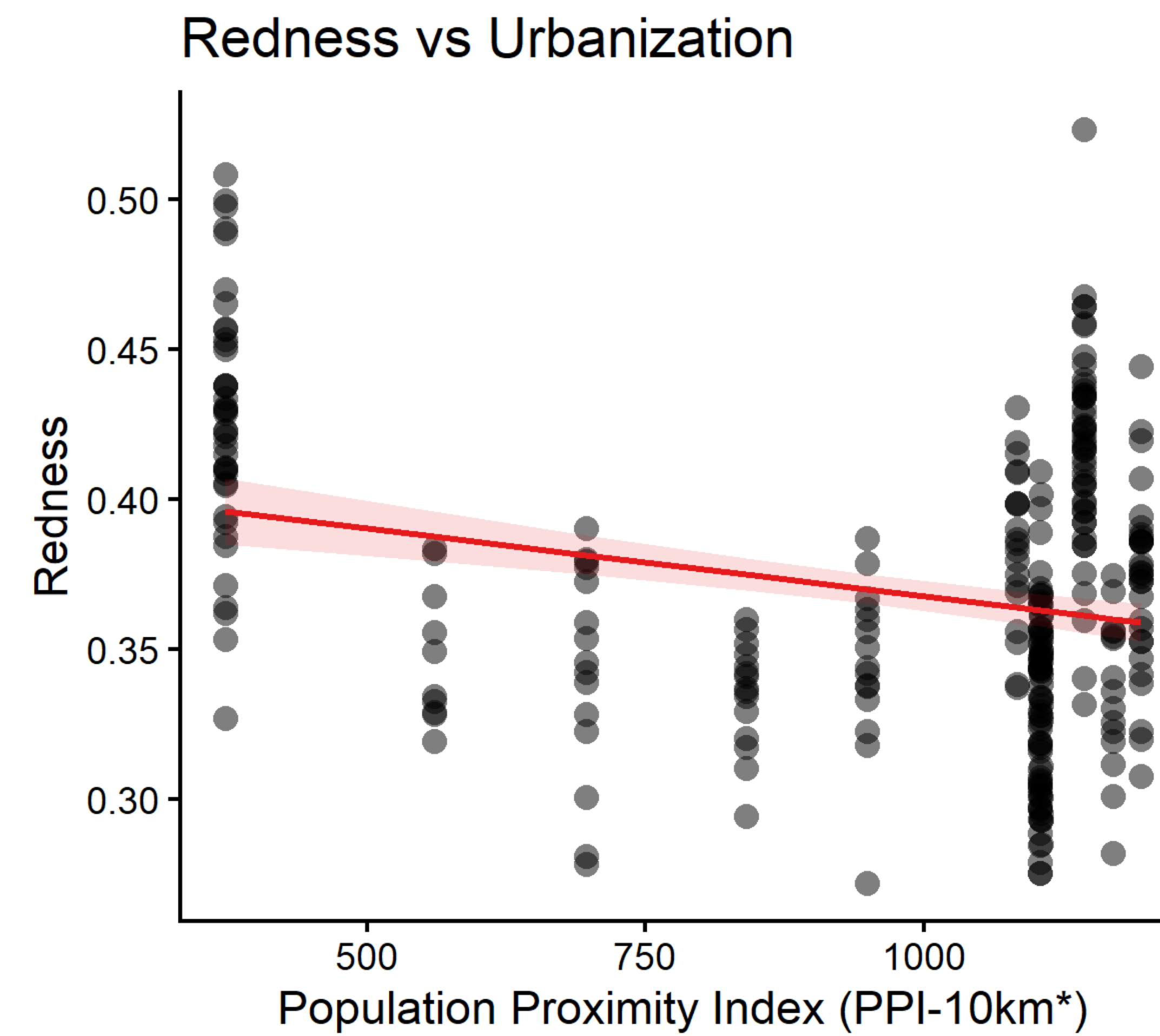
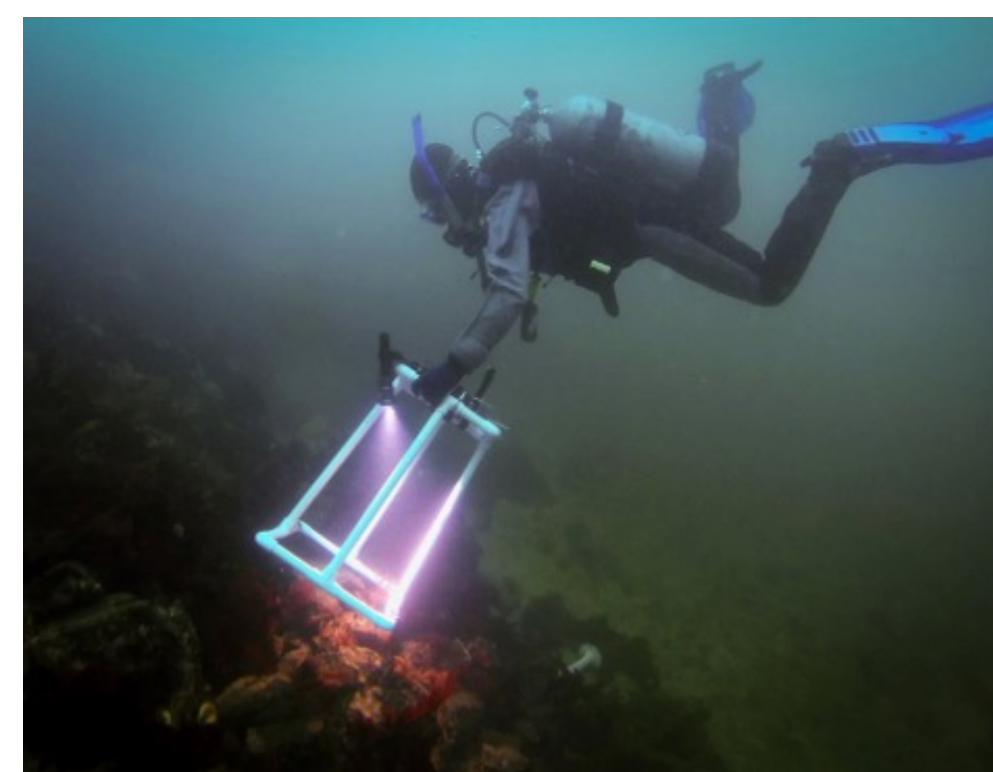


Figure 2: An example of turf algae with a lower sediment load.

## Methods

- Quantified **percent cover** of turf algae, **turf height**, and relative **"redness"** (proxy for sediment load and/or pigmentation level) from photoquadrats collected in 2014 at sites across Puget Sound.
  - Percent cover at 38 sites was determined via the annotation/image recognition software, **CoralNet**.
  - For a subset of photos, the image analysis software **ImageJ** was used to determine redness level of turf algae at 9 sites and average height of algae at 7 sites.
- **Population proximity index**, calculated as the focal mean population density within 10 km (PPI-10km), was used as a proxy for urbanization intensity (see Heery et al. 2026).
- Relationships between turf measures and PPI were assessed in R using generalized linear models (GLMs). Depth and Day of Year (DoY) were also included as model predictors to account for light-availability- and seasonal-effects.



\*PPI-10km = Focal mean of human population density within a 10km radius

Figure 3: Redness value, which is used as a proxy of sediment load and/or pigmentation level, decreased with PPI ( $p < 0.001$ ).

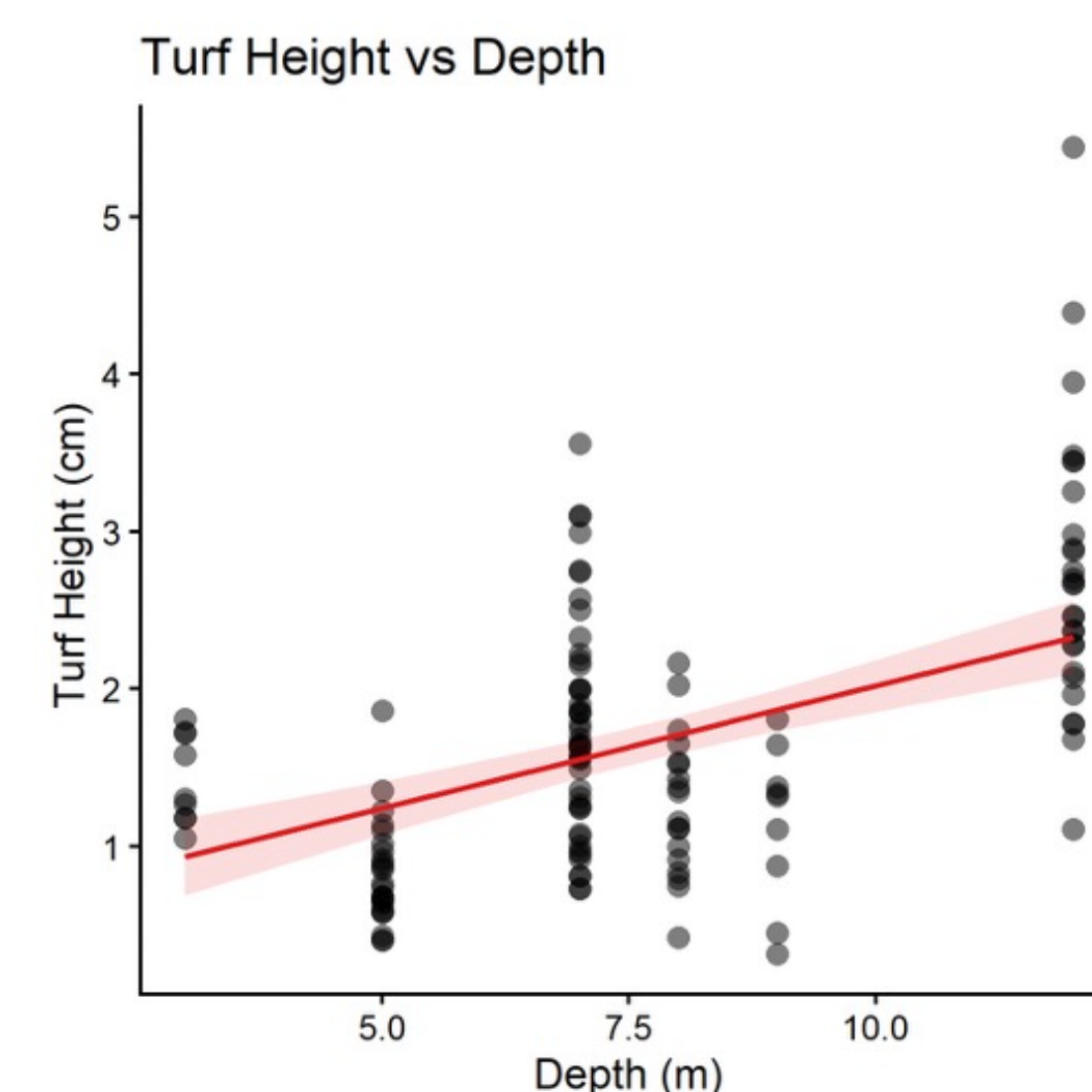


Figure 4: Turf height increased with depth ( $p < 0.001$ ).

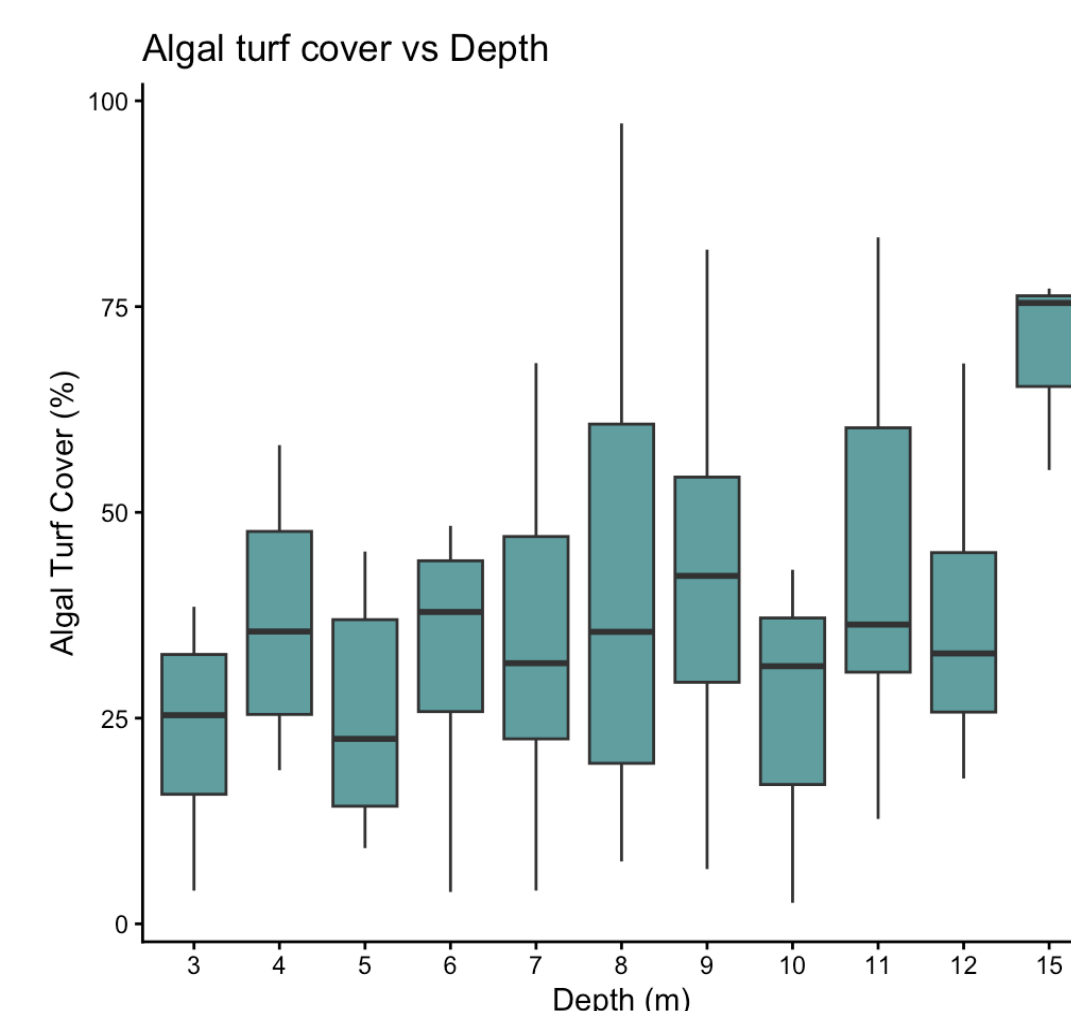


Figure 5: Turf cover increased with depth ( $p = 0.009$ ).

## Results & Discussion

### •Main takeaways:

- Turf cover & height are comparable regardless of urbanization level.
- However, redness ( $\sim$  sediment load / pigmentation) was negatively correlated with urbanization intensity (population proximity index, "PPI").

### •Implications:

- Turf algae may play different ecological roles depending on urban conditions. Sediment load can have negative impacts on aquatic life such as clogged gills, reduced reproductive success, and higher transportation of pollutants.
- Although past literature has implied a negative correlation between coastal development and turf dominance, this relationship was not evident in our dataset and is likely scale-dependent.

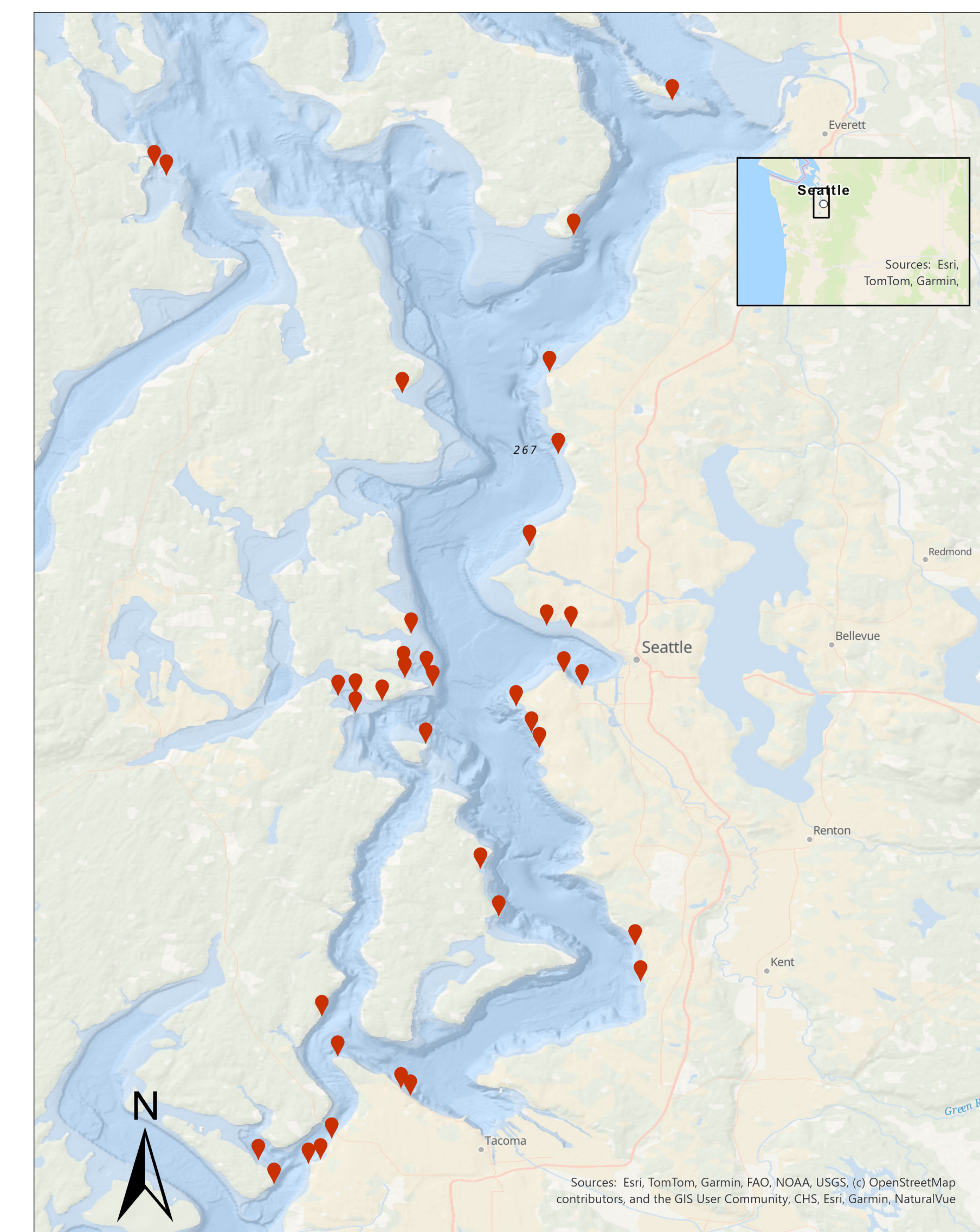


Figure 6: A map of the Puget Sound with markings of where the sources of the images are from.

## References

