

Modeling US freshwater macroinvertebrate communities and ecological health

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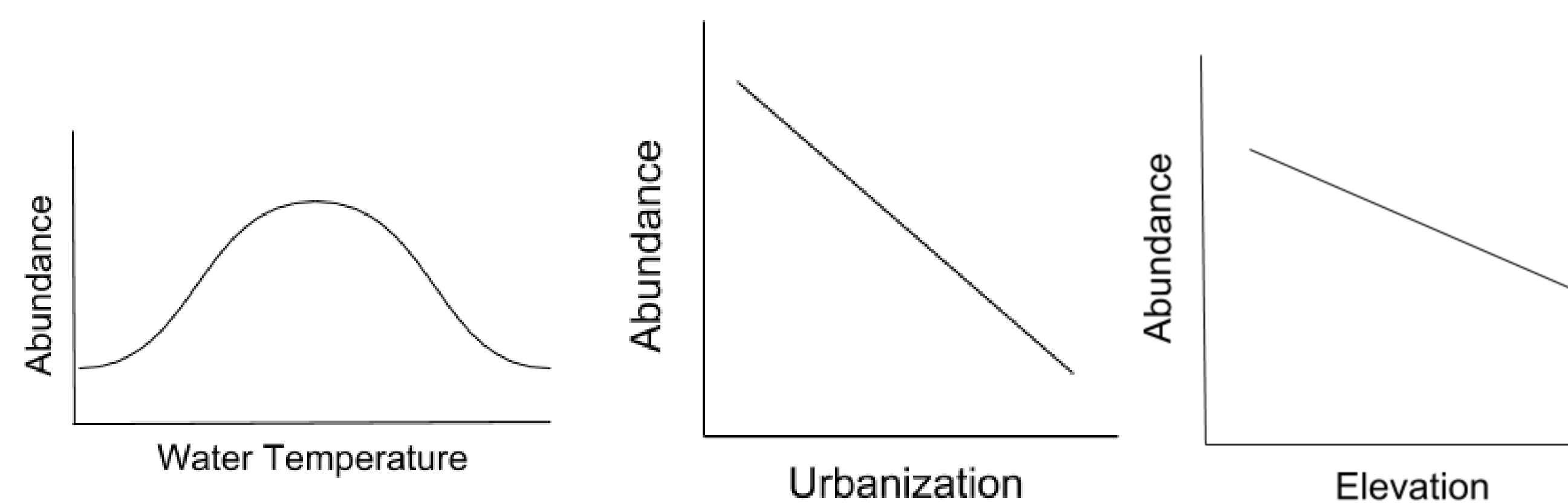
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Introduction

Macroinvertebrates are aquatic invertebrates visible to the naked eye. They are valuable indicator species sensitive to environmental changes.

Our objective was to study macroinvertebrate community responses to ecological change at a continental scale.

Hypotheses



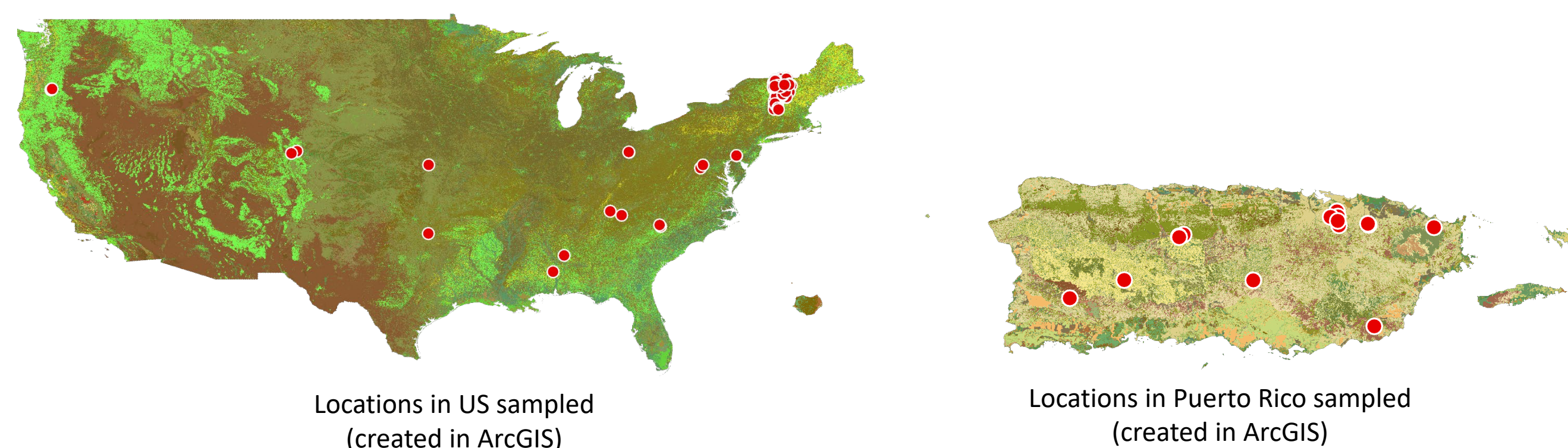
Methods

I searched through existing studies on macroinvertebrates in database repositories, mainly LTER and DataOne.

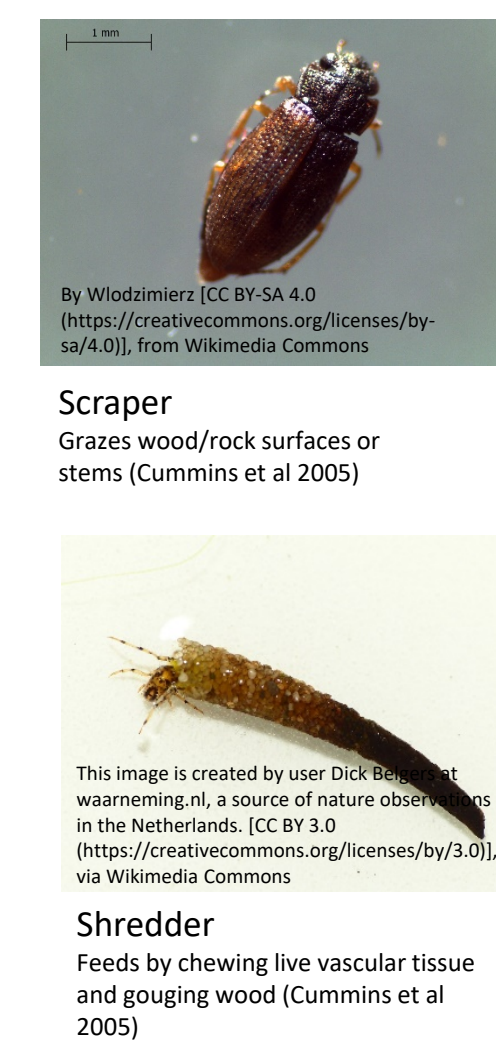
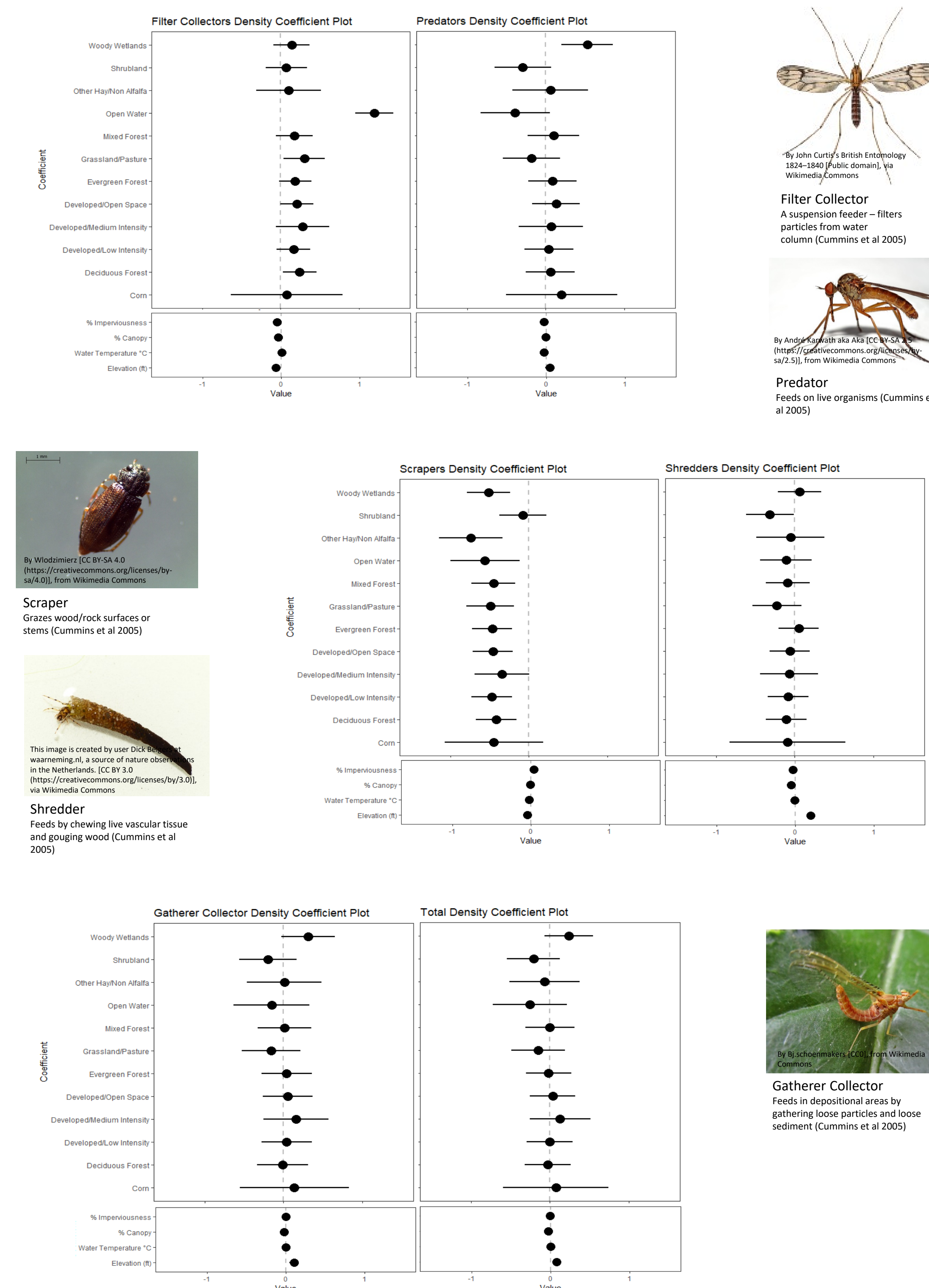
After narrowing down my findings to studies that used similar methods and reported density (abundance/m²) in the United States, I compiled 1499 observations from 1990-2018.

I organized observations by functional feeding group. I downloaded from sites including the United States Department of Agriculture (landcover data) and United States Geological Survey (elevation, water temperature, percent imperviousness, and percent canopy data).

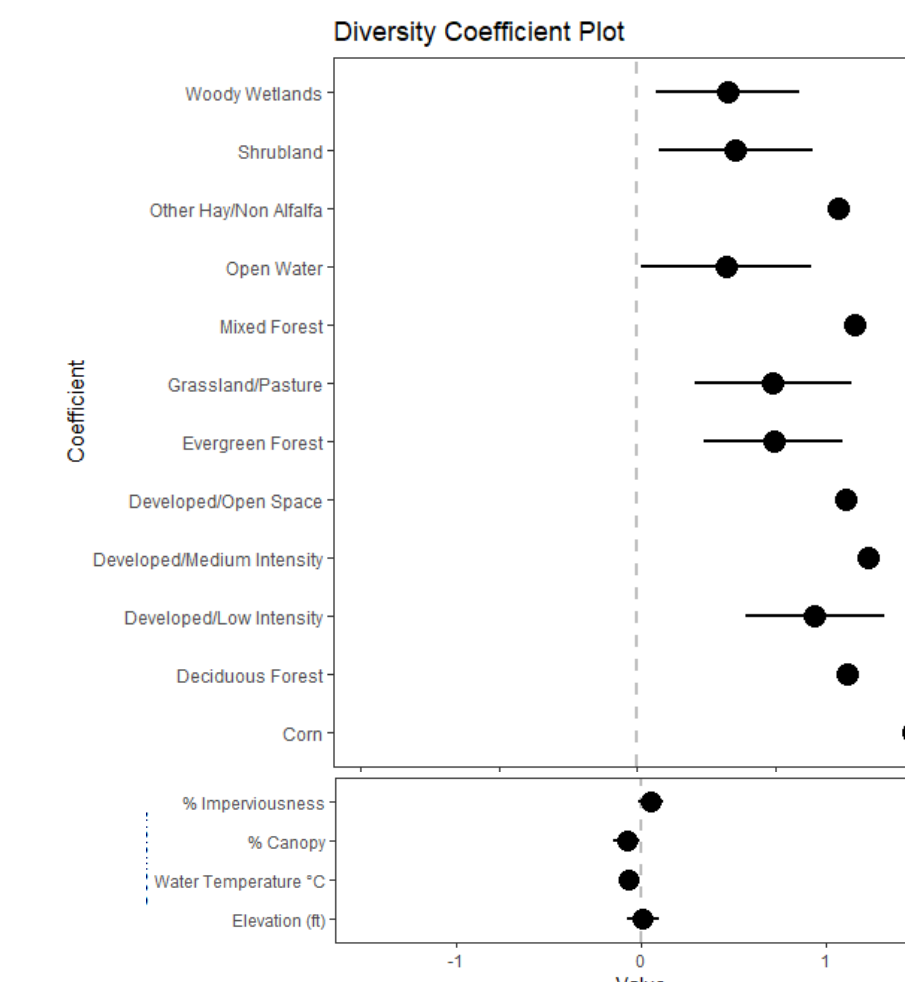
Then I built linear mixed effects models in R and tested the impacts of environmental variables on macroinvertebrate abundance and density using ANOVA statistical tests.



Results



These plots represent the correlation coefficients between the different land cover types, water temperature, and elevation. So what this shows, basically, is how these variables relate to each other – the degree of how changes to one variable predicts change of another.



Discussion

According to the results, there were not any significant correlations between the macroinvertebrate functional feeding group abundance and environmental variables, aside from open water, which I interpret as macroinvertebrates being more abundant in open water. For the diversity, it appeared to be correlated positively with several landcover variables, including forested and developed areas.

Many studies have shown that macroinvertebrates are impacted by several factors. For example, according to a study (Lundquist et al 2018), urbanization led to lower richness, biomass, and abundance within functional groups. In other studies (María Laura Miserendino et al 2017), elevation, pH, total suspended solids, conductivity showed to be impactful variables on macroinvertebrate abundance.

So it is likely that some of these variables affect macroinvertebrate abundance, but changes to methods and more extensive data could provide clearer results between these relationships.

Next Steps

I plan to examine species-level relationships with the environmental variables tested, using presence-absence and abundance-only models. I hypothesize that we may find statistically significant relationships when individual species are modeled.

Acknowledgments

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