CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

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Project Number

35388

Project Title

Factors Affecting Aquatic Macroinvertebrate Diversity in Northern California Coastal Streams

Abstract

Objectives/Goals

The objective of this study was to determine which abiotic factors affect macroinvertebrate diversity within local streams.

Methods/Materials

Six study sites in five coastal streams were selected for variability among water quality and habitat variables and were sampled for macroinvertebrates and abiotic variables. Conductivity, water temperature, pH, canopy closure, dissolved oxygen, substrate size, maximum depth, maximum width, and catchment area were measured and recorded. At each study site, three macroinvertebrate samples were collected. Macroinvertebrates were separated by taxa, quantified, photographed, recorded, and returned to the stream.

Results

The number of macroinvertebrate taxa and abundance in each group were analyzed and two diversity indices, Species Richness (SR) and Simpson#s Index of Diversity (SID), were calculated for each site. Five abiotic factors were found to have moderate to high correlation with SR and/or SID. These factors, listed by R-squared value, from low to high, include maximum water depth (r^2 = 0.48, SR; r^2 = 0.46, SID), pH (r^2 = 0.57), substrate size D16 (r^2 = 0.63), canopy closure (r^2 = 0.69), and catchment area (r^2 = 0.78).

Conclusions/Discussion

Previous studies on limiting factors for macroinvertebrates indicate that one or more water quality or habitat variables will affect species diversity. A moderate, positive correlation was evident between SR and pH; this may be a consequence of higher acidity mobilizing heavy metals which are selectively toxic to macroinvertebrates. A moderate correlation was present between SID and the 16th percentile of substrate size (D16).

A moderate to strong, positive relationship was apparent between SID and canopy closure. The range of canopy closure values measured in this study, 72%-79%, was in the middle range of those found in local riparian ecosystems. Perhaps increasing canopy closure to a certain level is beneficial, but once reached, it is likely that periphyton growth would decline limiting macroinvertebrate diversity.

This study demonstrated various abiotic factors have moderate to strong effects on macroinvertebrate diversity. Moderate to high macroinvertebrate diversity promotes healthy and productive stream ecosystems which in turn provide food for hungry salmonids. Healthy salmonid populations supply high quality food and benefits local economies through the sport fishing industry.

Summary Statement

In this study, I collected, analyzed, and determined what abiotic factors affect aquatic macroinvertebrate diversity in northern California coastal streams.

Help Received

My dad mentored me during this project, and Green Diamond Resource Company provided equipment and acces to study sites.

Preliminary