Executive Summary

Introduction

This report summarizes the results of the 2003 Santa Barbara County Creeks Bioassessment Program, a collaborative effort of County of Santa Barbara Project Clean Water and the City of Santa Barbara. The Program is a long-term effort to assess and monitor the biological integrity of southern Santa Barbara County streams as they respond through time to changing environmental conditions shaped by natural and human influences. The 2003 Program effort represents the fourth consecutive year of rapid bioassessment monitoring in southern Santa Barbara County streams. The Program involves annual collection and analyses of physiochemical and biological data from local streams using standardized methods adapted from the U.S. Environmental Protection Agency's (USEPA's) *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers*.

The objectives of the 2003 Program effort were to (1) continue biomonitoring of streams in the study area, and (2) building on the data collection and analyses conducted thus far, develop a standardized tool known as an Index of Biotic Integrity (IBI) to be used in assessing the biological integrity of study area streams. IBIs are multimetric tools that provide a standardized, integrative, and readily understandable method for measuring the biological integrity of streams and other water bodies. The term "multimetric" refers to the fact that an IBI is built by combining several individual biological metrics into a single index. "Core" metrics included in the IBI all show distinct separation (i.e., are different) between undisturbed "reference" sites, and human-impacted "test" sites. In addition, the core metrics of an IBI collectively represent multiple aspects of biological community structure such as abundance, richness and diversity, composition, disturbance tolerance, and trophic groups. Values for each core metric at a study site are "scored" on a dimensionless scale (e.g., from 0 to 10) in relation to the known distribution among a collection of reference and test sites. Higher scores (e.g., a 10) approach the conditions at the best reference sites, while lower scores indicate greater departure (i.e., degradation) from reference conditions. Scores assigned to the individual core metrics are equally weighted and combined into an overall score, or measure, of biological integrity for the study site. By translating complex biological data into an overall composite measure of biological integrity, an IBI serves as a powerful tool for communicating the biological status of water resources to a wide audience, and an important basis of environmental management decisions.

Study Area

The study area includes approximately 35 miles of the southern Santa Barbara County coast from the Rincon Creek watershed at the Santa Barbara/Ventura County line west to Gaviota Creek. A total of 44 study reaches in 18 coastal streams have been surveyed one or more times during the spring and summer of 2000, 2001, 2002, and 2003.

Methods

Physiochemical and biological data for the study reaches was gathered through a combination of methods including field surveys, laboratory analysis, spatial data analysis using geographic information system (GIS) software, and review of United States Geological Survey (USGS) 7.5-minute quadrangle maps and aerial photographs. Numerous physiochemical and biological parameters were calculated for each study reach based on the data collected. After the data

set was finalized, statistical tests including analysis of variance (ANOVA) and multiple regression analysis were used to evaluate the data, and the IBI was developed.

Results and Discussion

The following core biological metrics were selected for inclusion in the IBI:

- Insect family diversity
- Percent EPT
- Biotic index score
- Percent sensitive BMIs
- Percent non-insects + Diptera
- Percent predators + shredders

Based on the results of statistical testing, core metrics were among the most sensitive to human disturbance, either increasing or decreasing from highly disturbed to moderately disturbed to undisturbed study reach groups. None had significant natural relationships with physiochemical parameters. Collectively, the core metrics are diversified in that they represent different aspects of community structure including diversity, disturbance sensitivity, and trophic structure. The core metrics are also diversified in that some respond positively to human disturbance (biotic index score and percent non-insects + Diptera) while others respond negatively to disturbance (insect family diversity, percent EPT, percent sensitive BMIs, and percent predators + shredders).

The IBI correctly classified 94 percent of moderately disturbed sites (i.e., as Fair or Good) and 85 percent of highly disturbed sites (i.e., and Very Poor or Poor), or 88 percent overall. There were not any gross inaccuracies in classifying sites. No undisturbed sites were classified lower than Fair, and no highly disturbed sites were classified higher than Fair. Biological integrity classifications were in most cases consistent from year to year at stream sites that were surveyed in multiple years.

Statistical results indicate highly significant differences in IBI scores between the undisturbed, moderately disturbed, and highly disturbed groups. This indicates that the IBI is sensitive to changes in the level of human disturbance.

IBI score did not have any significant natural relationships with physiochemical parameters. Therefore, IBI scores do not appear to be significantly influenced by natural physiochemical variability in the study area.

Recommendations

The IBI developed in this study appears to be mostly reliable in properly assessing the biological integrity of study area streams, and does not appear to be strongly influenced by natural physiochemical variability. As such, the IBI appears to be an effective assessment tool for study area streams. The County and City should continue their annual biomonitoring and use the IBI to assess the biological integrity of the study sites. The IBI should be revisited with every two or three years of new data to see if it can be improved by using new core metrics, refining scoring ranges, etc. Another consideration may be to expand the IBI in the future to include core metrics for other assemblages such as aquatic vertebrates and the riparian plant community. Alternatively, separate IBIs could be developed for the other assemblages.

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