

## Long-term variability in bioassessments: A twenty-year study from two northern California streams

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### ABSTRACT

Long-term variability of bioassessments has not been well evaluated. We analyzed a 20-year data set (1984–2003) from four sites in two northern California streams to examine the variability of bioassessment indices (two multivariate RIVPACS-type O/E scores and one multimetric index of biotic integrity, IBI), as well as eight metrics. All sites were sampled in spring; one site was also sampled in summer. Variability among years was high for most metrics (coefficients of variation, CVs ranging from 16% to 246% in spring) but lower for indices (CVs of 22–26% for the IBI and 21–32% for O/E scores in spring), which resulted in inconsistent assessments of biological condition. Variance components analysis showed that the time component explained variability in all metrics and indices, ranging from 5% to 35% of total variance explained. The site component was large (i.e., > 40%) for some metrics (e.g., EPT richness), but nearly absent from others (e.g., Diptera richness). Seasonal analysis at one site showed that variability among seasons was small for some metrics or indices (e.g., Coleoptera richness), but large for others (e.g., EPT richness, O/E scores). Climatic variables did not show consistent trends across all metrics, although several were related to the El Niño Southern Oscillation Index at some sites. Bioassessments should incorporate temporal variability during index calibration or include climatic variability as predictive variables to improve accuracy and precision. In addition, these approaches may help managers anticipate alterations in reference streams caused by global climate change and high climatic variability.

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