

Development and evaluation of sediment quality guidelines based on benthic macrofauna responses

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ABSTRACT

Toxicity-based sediment quality guidelines (SQGs) are often used to assess the potential of sediment contamination to adversely affect benthic macrofauna, yet the correspondence of these guidelines to benthic community condition is poorly documented. This study compares the performance of five toxicity-based SQG approaches to a new SQG approach based on changes in benthic community condition. Four of the toxicity-based SQG approaches, effects range median (ERM), logistic regression modeling (LRM), sediment quality guideline quotient 1 (SQGQ1), and Consensus, were derived in previous national studies, and one was developed as a regional variation of LRM calibrated to California data (CA LRM). The new SQG approach, Chemical Score Index (CSI), was derived from southern California benthic community condition data. The chemical-specific guidelines for each approach were applied to an independent validation set of matched chemical concentration, amphipod mortality, and benthic macrofauna abundance data for southern California. Respective results for each SQG approach were then combined into a summary statistic describing the overall contamination magnitude (e.g., mean quotient) and assessed in accordance with a set of thresholds in order to classify stations into four categories of biological effect. Results for each SQG approach were significantly correlated with changes in sediment toxicity and benthic community condition. Furthermore, cumulative frequency plots and effect category thresholds for toxicity and benthic community condition were similar, indicating that both types of effect measure had similar sensitivity of response to contamination level. The benthos-based CSI had the highest percent agreement for benthic community condition; differences were relatively minor by comparison to differences observed for other SQG approaches.

Full Text

ftp://ftp.sccwrp.org/pub/download/DOCUMENTS/AnnualReports/2008AnnualReport/AR08_091_105.pdf