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Evaluation of Sediment Condition Using California's Sediment Quality Objectives Assessment Framework

Steven M. Bay, Darrin J. Greenstein, Shelly L. Moore, Kerry J. Ritter and J. Ananda Ranasinghe

Southern California Coastal Water Research Project, Costa Mesa, CA

EXECUTIVE SUMMARY

Sediment quality has an important influence on the overall condition of a water body. Sediments act as a reservoir for contaminants that can be transferred to the water column through physical disturbance, diffusion, and biological activities. Also, sediments are a primary source of contaminant exposure for sediment-dwelling organisms and animals that feed on the bottom, such as crabs and flatfishes. This exposure can produce adverse impacts on benthic communities and can also lead to indirect effects on wildlife and human health due to the accumulation of contaminants from the food chain.

Sediment is a complex matrix of components and forms. Consequently, evaluating contaminant impacts on beneficial uses based on a single line of evidence is problematic. For example, bulk measures of chemical concentration fail to differentiate between the fraction of a contaminant that is tightly bound to sediment and that which is biologically available. Multiple mechanisms of contaminant exposure, including uptake of chemicals from interstitial water, sediment ingestion, and bioaccumulation through the food web further complicate interpretation of sediment chemistry data.

For these reasons, sediment quality assessment often involves simultaneously evaluating multiple lines of evidence (MLOEs) that measure both contaminant exposure and effects on organisms: an approach commonly known as the sediment quality triad (Long and Chapman 1985). Lines of evidence (LOEs), such as sediment chemistry, toxicity, and benthic community condition are often used. Virtually all of the ambient sediment quality monitoring programs in this country rely on more than one line of evidence (USEPA 1998, Crane *et al.* 2000, MacDonald and Ingersoll 2002, USEPA 2004). Such programs include the National Coastal Condition Assessment program (USEPA 2008), as well as numerous regional monitoring programs.

Historically, sediment quality assessment has been an important feature of many California monitoring programs. It was a major focus in the Bay Protection and Toxic Cleanup Program (BPTCP; Anderson *et al.* 1997), the California Environmental Mapping and Assessment Program (EMAP; USEPA 2005), the San Francisco Regional Monitoring Program (SFEI 2011), and the Southern California Bight 2008 Regional Monitoring Program (SCCWRP 2012). Comprehensive sediment quality information is needed for California's 305(b) and 303(d) programs to establish priorities for water quality programs at the State and Regional Boards. California became one of the first states in the U.S. to establish regulatory objectives for sediment quality when the State Water Resources Control Board adopted sediment quality

objectives as part of its water quality control plan for bays and estuaries (SWRCB 2008). These objectives also included a new sediment quality assessment framework based on the evaluation of three lines of evidence (sediment quality triad): sediment chemistry, sediment toxicity, and benthic community condition.

The new California sediment quality assessment framework was used to conduct an integrated assessment of sediment quality using regional monitoring data collected between 1998 and 2005 (Barnett *et al.* 2007). That study found evidence of contaminant impacts on sediment quality in 83% of California bays and estuaries. However, data interpretation was limited by the 2 availability of relatively few data for San Francisco Bay, incomplete toxicity information, and inconsistencies in benthic indices.

This report presents a new assessment of sediment quality in bays and estuaries, using recent regional monitoring data and several modifications to improve upon previous assessments. Similar to previous studies, this assessment integrates data from multiple regional monitoring programs in order to provide an extensive and statistically robust evaluation of most of California's bays and estuaries. Study enhancements include the analysis of a greater number of samples from San Francisco Bay, incorporation of multiple toxicity tests, and the application of an additional benthic index for some habitats.

Full Text

http://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/764_CASedEvalSQOFramework.pdf