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The New Bedford Harbor Superfund site long-term monitoring program (1993–2009)

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Abstract New Bedford Harbor (NBH), located in southeastern Massachusetts, was designated as a marine Superfund site in 1983 due to sediment contamination by polychlorinated biphenyls (PCBs). Based on risks to human health and the environment, the first two phases of the site cleanup involved dredging PCB-contaminated sediments from the harbor. Therefore, a long-term monitoring program (LTM) was developed to measure spatial and temporal chemical and biological changes in sediment, water, and biota to assess the effects and effectiveness of the remedial activities. A systematic, probabilistic sampling design was used to select sediment sampling stations. This unbiased design allowed the three segments of the harbor to be compared spatially and temporally to quantify changes resulting from dredging the contaminated sediments. Sediment was collected at each station, and chemical (e.g., PCBs and metals), physical (e.g., grain size), and biological (e.g., benthic community) measurements were conducted on all samples. This paper describes the overall NBH-LTM approach and the results from the five rounds of sample collections. There is a decreasing spatial gradient in sediment PCB

concentrations from the northern boundary (upper harbor) to the southern boundary (outer harbor) of the site. Along this same transect, there is an increase in biological condition (e.g., benthic community diversity). Temporally, the contaminant and biological gradients have been maintained since the 1993 baseline collection; however, since the onset of full-scale remediation, PCB concentrations have decreased throughout the site, and one of the benthic community indices has shown significant improvement in the lower and outer harbor areas.

Keywords Long-term monitoring · Sediment · PCBs · New Bedford Harbor · Superfund

Introduction

The introduction of anthropogenic contaminants into the environment has resulted in numerous aquatic areas throughout the USA where sediment is contaminated to potentially harmful levels (USEPA 2004a). These sites are in both freshwater and marine locations, and pose various degrees of risk to both human health and the environment. The highest risk sites are identified on the Environmental Protection Agency's (EPA) National Priorities List (NPL) for cleanup under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and additional sites under the Resource Conservation and Recovery Act (RCRA) (USEPA 2004a). Due to the costs and potential risks associated with contaminated site remediation, it is crucial that both

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