

Potential Long-Term Ecological Impacts Caused by Disturbance of Contaminated Sediments: A Case Study

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ABSTRACT / Several submerged barges were recently removed from the Passaic River, New Jersey, USA, in two areas (areas 1 and 2) where contaminated sediments are known to

exist. During removal of the single barge in area 1, elevated turbidity levels and chemical parameters were measured. Greater increases were measured in area 2, where several barges were removed. In both areas, water column concentrations of polychlorinated dibenzo-*p*-dioxins and dibenzofurans (PCDD/Fs) and several metals exceeded one or more water quality criteria; turbidity levels in area 2 also exceeded regulatory criteria. Potential chemical bioaccumulation from the water column into residential aquatic receptors was estimated using standard models and assumptions. The modeled results predicted that steady-state tissue concentrations of bioaccumulative chemicals would not occur as a result of the brief increase in water column concentrations that occurred during barge removal but that metals and PCDD/Fs could bioaccumulate to levels that exceed regulatory ecological criteria during long-term sediment disturbance activities. In addition, based on some simplistic assumptions regarding settling of suspended sediments, we estimate that chemical bioaccumulation from surface sediments into the food web could result in substantial increases in PCDD/F body burdens in the benthic forage fish, mummichog. Our findings are consistent with the limited number of field studies that have measured increased body burdens of bioaccumulative chemicals following dredging. We suggest that, prior to consideration of extensive dredging as a remedial alternative for any river system, the potential significant and long-term impacts on the food web must be evaluated.