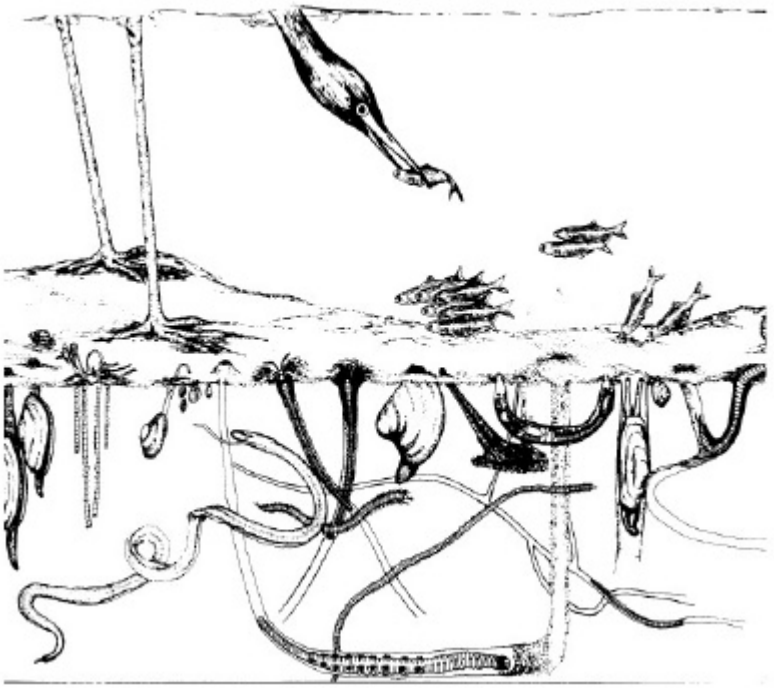
Innovative Sediment and Water Quality Management:
In Situ Stabilization of Persistent Organic Contaminants in Sediments

Background. The management of sediments and the control of sediment contaminants are among the most challenging and complex problems facing environmental engineers and scientists. Hydrophobic organic contaminants such as polychlorinated biphenyls [PCBs], polycyclic aromatic hydrocarbons [PAHs], and DDT are long-lived in sediments and impair water quality by leaching into overlying water, accumulating in sediment-dwelling organisms and aquatic biota, and transferring through the food web to humans and other animals. In our work with sediment from three urban locations across the country, we find that the majority of the PAHs and PCBs are strongly bound to coal-derived and char particles [Ghosh et al., 2001; Talley et al., 2001; Ghosh et al., 2000]. We also find that PAHs bound to coal-derived particles are resistant to desorption, microbial biodegradation, and bioaccumulation by earthworms. Our current work extends this understanding by demonstrating how the addition of low-cost sorbents, such as activated carbon, may sequester persistent contaminants like PCBs and PAHs, thereby reducing contaminant solubility, exposure, and accumulation in sediment-dwelling organisms.

Research Objectives. The purpose of this research is to understand the processes by which PCBs are released from the contaminated sediments, transported to the sorbent additive, and sequestered in the sorbent additive. This work will involve mathematical modeling of PCB transport between classes of particles, and will be based on experimental results from current and ongoing work.



US EPA, Office of Water, April 1998, EPA-823-R-98-001

Collection of PCB contaminated sediments at Hunters Pointt, CA

Clam in PCB contaminated sediment

Ghosh, U.; R.G. Luthy; J.S. Gillette; R.N. Zare. Microscale Location, Characterization, and Association of Polycyclic Aromatic Hydrocarbons on Harbor Sediment Particles. ***Environ. Sci. & Technol,*** 34, 1729-1736, 2000.

Ghosh, U.; J.W. Talley; R.G. Luthy. Particle-scale Investigation of PAH Desorption Kinetics and Thermodynamics from Sediments. ***Environ. Sci. & Technol***., 35, 3468-3475, 2001.

Talley, J.W., U. Ghosh, S.G. Tucker, J.S. Furey, R.G. Luthy. Particle-Scale Understanding of the Bioavailability of PAHs in Sediment. ***Environ. Sci. & Technol***., Special issue in honor of James J. Morgan, 36, 477-483, 2002.