Phytoremediation: Plant-Based Remediation of Contaminated Soils and Sediments

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Phytoremediation is defined as the use of green plants to remove, contain, or render harmless environmental contaminants. This definition applies to all plant-influenced biological, chemical, and physical processes that aid in remediation of contaminated substrates (Cunningham & Berti, 1993). This is not a new concept. The use of plants to treat wastewater has been practiced for over 300 years (Hartman, 1975) and plant-based remediation methods for dredged material slurries (Lee et al., 1976) and metal-contaminated soils (Yamada et al., 1975) have been proposed since the mid seventies. Plant-based remediation also has been evolving in the control of both indoor air pollution (Raloff, 1989) and urban smog. The renewed interest in phytoremediation is driven by both advances in technology as well as the search for better, cost-effective solutions. Plants, along with their associated microflora, are being utilized in both containment and decontamination remediation strategies for contaminated soils as well. This chapter will focus on and discuss plant-based remediation of contaminated soils and sediments.

SITE REMEDIATION PROGRAMS

There are many technologies available to site remediation personnel. All in-situ site remediation programs, however, follow either a contaminant containment (also referred to as a stabilization) or contaminant reduction (often referred to as a "clean-up") strategy. Under contaminant containment, there is no actual reduction in contaminant present, but health and environmental risks are reduced to acceptable levels by a physical or chemical manipulation of the site. The construction of caps, vaults, and hydraulic isolation curtains are examples of engineering strategies in this category. A more recent example is the development of soil stabilization methods that rely on changes in soil chemistry and the growth of plants. In-situ contaminant reduction strategies include microbial based degradation, soil flushing, venting,