



## **Effects of gentle remediation technologies on soil biological and biochemical activities - a review.**

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Remediation technologies for contaminated sites are generally designed to reduce risks for human health, ground-water or plant quality. While some drastic remediation measures such as soil excavation, thermal treatment or soil washing eliminate or strongly reduce soil life, in-situ treatments involving plants or immobilizing additives may also restore soil functionality by establishing or promoting a well structured and active community of soil organisms. Biological parameters that are sensitive to contaminants and other pedo-environmental conditions and which contribute to biogeochemical nutrient cycles, can be used as synthetic indicators of the progress and also the efficiency of given remediation approaches. Data from long-term studies on re-vegetated mine spoils show that biological and biochemical activity is enhanced with increasing plant density and diversity. Among the soil amendments, most measures that introduce organic matter or alkalinity to the contaminated soils also improve microbial or faunal parameters. Only few amendments, such as phosphates and chelators have deleterious effects on soil biota. In this review, soil microbial biomass and the activity of the enzymes phosphatase and arylsulphatase are identified as suitable and sensitive biological indicators for soil health. The results and future research needs are summarized.