Above- and belowground metal accumulation and biomass production in young afforestations on experimental brown field sites

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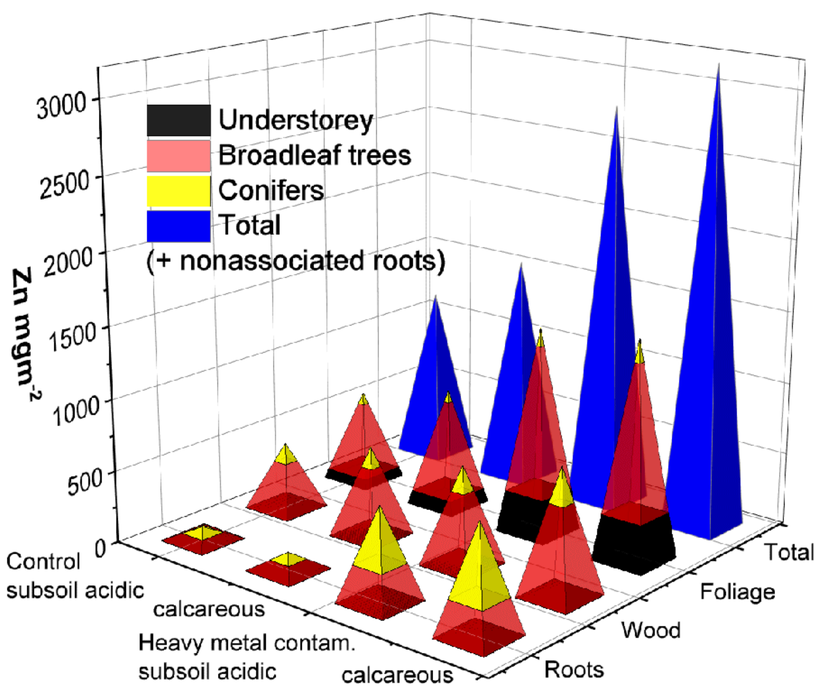
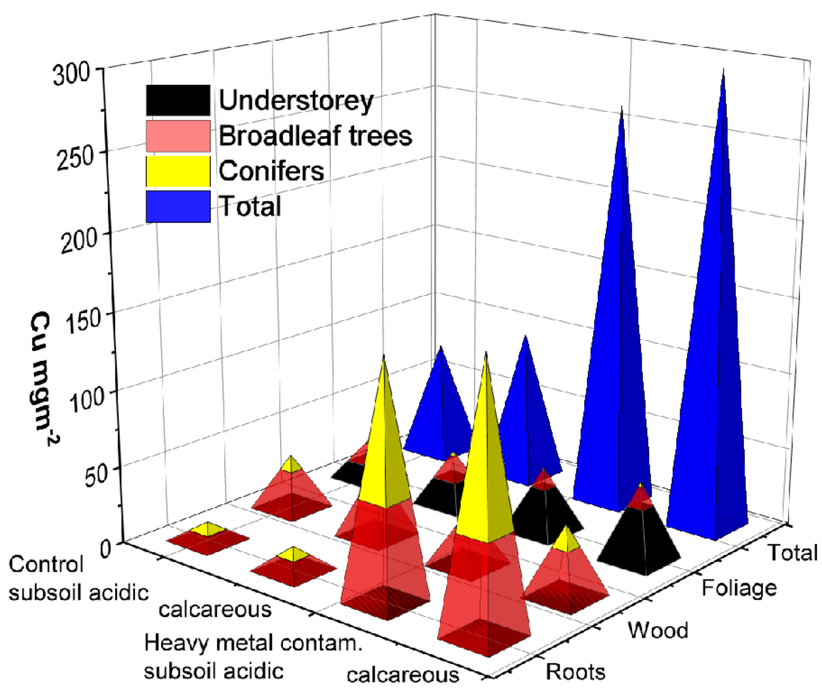
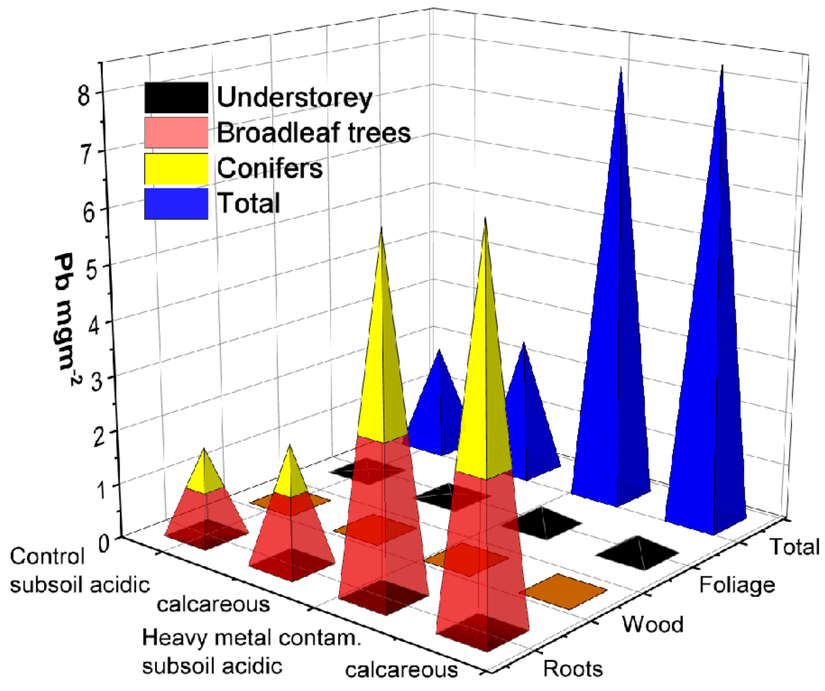
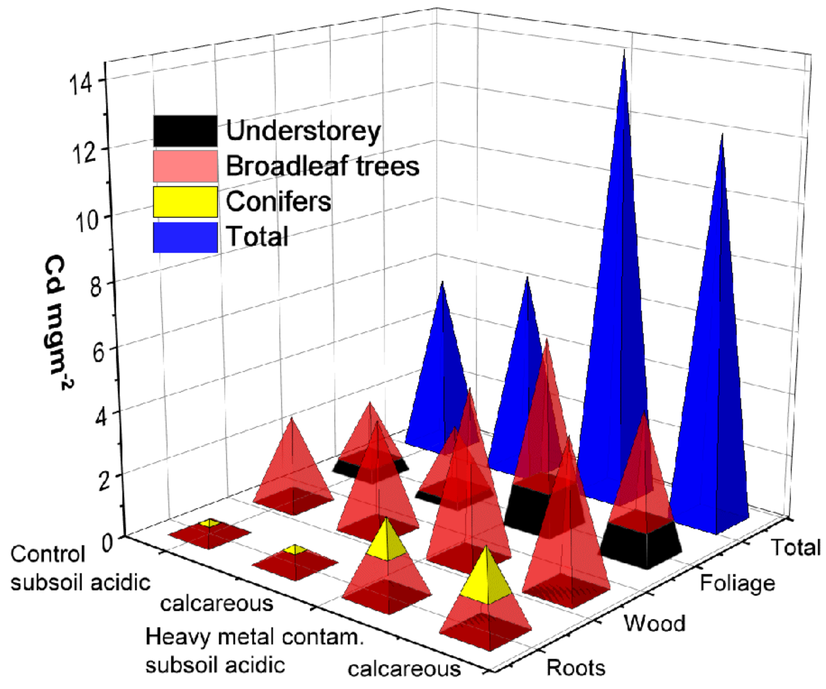
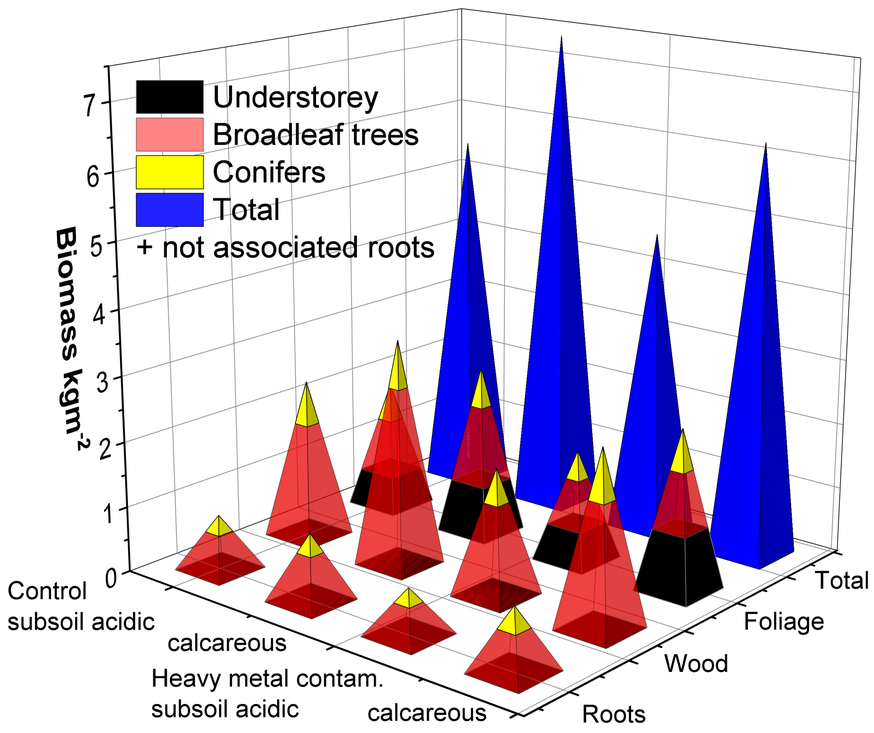
Restoration of ecosystem services by the reclamation of metal-contaminated soils can be combined with the production of biomass. Here, we investigated the metal accumulation and biomass production of young afforestations on experimental plots simulating brownfield sites under well-controlled quasi-natural conditions.











The experiment was carried out in 32 plots, 3 m^2 each. In 16 plots, the 15 cm topsoil was experimentally contaminated with Zn/Cu/Pb/Cd = 2854/588/103/9.2 $mgkg^{-1}$ using smelter filter dust (control plots: 97/28/37/<1). The either calcareous (pH 7.4) or acidic (pH 4.2), 1.5 m deep subsoils remained uncontaminated. All plots were planted with identical groups of conifer (spruce), and broadleaf (willow, poplar, birch) trees, together with understorey plants (tansy, sedge and ramson; oak, beech and spruce seedlings).

Compared with the uncontaminated plots, 2.2/3.2/3.7/2.2 times more Zn/Cu/Pb/Cd were extracted from the contaminated plots within four years of cultivation. Deciduous trees transferred 0.3/0.4% Zn/Cd from contaminated soil into foliage, spruce 0.04%/-% (dl = 0.1 $mgkg^{-1}$) and the understorey 0.08/0.1%. Highest transfer factors were measured for spruce roots (Cu: 0.13%) and lowest for needles (Cu: 0.004%). The contamination did not affect the biomass of the understorey, while only slightly reducing tree growth (deciduous trees, both subsoils: -23%; spruce, acidic subsoil only: -20%). **Hence, site-targeted afforestation can be an attractive strategy to reclaim metal-contaminated sites as a means to restore valuable ecosystem services.**

Madeleine S. Günthardt-Goerg, Pierre Vollenweider, Sandra Hermle, Rainer Schulin (2019) Growth and metal accumulation of young forest trees and understorey plants on contaminated topsoil: influence of subsoil and time. Plant and Soil 437: 375-395