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Technical reclamations are wasting the conservation potential of post-mining sites. A case study of black coal spoil dumps

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ABSTRACT

Despite the increasing evidence that post-mining sites often provide biodiversity refuges in anthropogenically impacted landscapes, thus offering valuable analogues of natural habitats, technocratic methods still prevail over natural processes in restoration practice. Selection of the restoration approach, however, crucially affects the future conservation value of every site. As a contribution to recent debates, we studied the communities of vascular plants and seven arthropod groups (orthopteroids, spiders, leafhoppers, ground beetles, herbivorous beetles, true bugs, and butterflies and moths) colonising technically reclaimed versus spontaneously developed plots on black coal spoil dumps in the Kladno district, Czech Republic. In all studied groups, spontaneously developed sites hosted a high proportion of species of conservation concern, which were nearly absent from the technically reclaimed plots. Combined with existing single-taxon studies of diverse post-mining sites, and our previous similarly broad study of limestone quarries, our results provide strong evidence of the counterproductivity of costly technical reclamations of postindustrial sites with respect to biodiversity conservation. Relevant legislation should favour natural processes over technical reclamation when deciding the fates of post-mining localities. Technical reclamation should be reserved just for those cases of well-justified public concerns.

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1. Introduction

Post-mining sites, an unavoidable consequence of the mining industry, cover almost 1% of the world's land (Walker, 1992) and represent important land forms in many regions. Recently, it has been repeatedly documented that their dry, rugged and often sparsely vegetated surfaces often host endangered species of declining unproductive and/or periodically disturbed biotopes (e.g., Schulz and Wiegleb, 2000; Benes et al., 2003; Krauss et al.,

2009; Lundholm and Richardson, 2010), thus providing refuge and/or compensatory habitats for species that are rapidly declining from modern landscapes (Thomas et al., 1994; Dennis et al., 2004). On the other hand, the conservation potential of post-mining sites depends on their fate after the mining has been terminated (Prach and Hobbs, 2008; Tropek et al., 2010). The two most common contrasting approaches are (1) *technical reclamation*, typically comprising of covering the sites with fertile topsoil, sowing grass–herb mixtures and planting trees; and (2) *spontaneous succession* without any human intervention. Still rarely used is *directed succession*, when natural processes are actively influenced; e.g., through support of conservation-desired plants (by sowing or species-rich hay transferring), or suppressing invasive plants (Rydgren et al., 2010; Novak and Prach, 2010; Richardson et al., 2010).

Several recent papers, based on single-taxa (Hodacova and Prach, 2003; Holec and Frouz, 2005; Mudrak et al., 2010) and a broad multi-taxa study (Tropek et al., 2010), revealed that technical reclamation is both counterproductive for biodiversity, and

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