

The Role of Microtopography in the Expression of Soil Propagule Banks on Reclamation Sites

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Abstract

Legacy propagule banks of salvaged topsoils are excellent sources of plant propagules for reclamation of mine sites. However, prior studies show that less than 50% of species found in original propagule banks actually establish. We hypothesize that the expression of this legacy propagule bank is limited by a lack of diversity of microsites and appropriate growing conditions. In an operational-scale field experiment we manipulated topographical characteristics and substrate materials and explored early vegetation establishment on an east- and south-facing slope. Three different site treatments with different microtopographic characteristics: (i) levelled surface, (ii) parallel ridges, and (iii) large loose piles were created using salvaged upland and lowland forest floor soil material.

Placing materials in loose hills and providing heterogeneity in substrates more than doubled plant abundance, species richness, and increased the proportion of species that require higher soil moisture. However, the site's overall slope aspect had a modulating effect on microtopographic treatments, with the greatest treatment effect on species richness and plant abundance occurring on the east-facing slope, while the greatest effect of treatment on the proportion of species requiring higher soil moisture was observed on the south-facing slope. Lower micro-elevations and northern microaspects of the microtopographic structures had higher soil water content, species richness and plant abundance. Micro-elevation had the greatest effect on expression of

vegetation on hills constructed from cover soil salvaged from upland forests, while microaspect affected vegetation the most on hills constructed from cover soil salvaged from low-lying areas. Variability in microtopography and substrate can create favourable growing conditions that help express a wider range of species from the legacy propagule bank at operational scale.