

Mine Spoil, Microbes and Rehabilitation of an Endangered Ecological Community

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At Mount Owen Mine Complex, Hebden, NSW (32°23'13"S 151°06'10"E), the capacity of spoil (ie, rock removed from above and between coal seams) to act as a medium for rehabilitation of an endangered forest is being tested. Approximately 4 years after replacement, the spoil in the experimental plot is characterized by a high proportion of large fragments (on average 40% of samples occurs in the >2mm size class), alkaline pH (average of 8.6), low electrical conductivity (ranging from 48-130 microsiemens), and minimal labile organic carbon content (averaging 0.8% potassium permanganate oxidisable carbon). In order to improve character, the spoil has been treated with microbes (rhizobia, ectomycorrhizal fungi, arbuscular mycorrhizal fungi and dark septate endophytic fungi) and municipal waste compost. Growth and survival of indigenous forest plants (*Hakea sericea*, *Acacia parvipinnula*, *Corymbia maculata* and *Dodonea viscosa*) have been monitored for approximately 3.5 years. All plants (including non-mycorrhizal and non-leguminous species) have responded positively to inoculation, though the response was not always statistically significant compared to controls or other treatments. Microbial DNA profiles obtained from the spoil and plant roots using Internal Transcriber Spacing (ITS) and 16S regions suggest some dispersal of fungi and bacteria from surroundings (and/or capacity of microbes to survive, despite significantly altered conditions resulting from mining). Profiled non-inoculum organisms such as *Scleroderma* spp and *Aspergillus* spp may be benefitting the rehabilitation through bioweathering or spoil particle aggregation. Microbe diversity varies between treatments, but is not necessarily statistically significant. Evenness Indices suggest some dominance of the microbial communities in all treatments. Multivariate cluster analysis has been undertaken to measure the similarity of microbial communities. The results highlight the value of soil microbes in the rehabilitation process and the linkages between the above and below ground communities.