

Developing diverse, effective, and permanent plant communities on reclaimed surface coal mines: establishing ecosystem function in reconstructed wildlands¹

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Abstract: Surface coalmine disturbances affect vegetation, soil chemical/physical properties, bedrock, and landforms. Reclamation programs that solely emphasize plant community composition and structure rather than effectively repairing disturbed or altered ecological processes ignores the foundation upon which the sustainability of reconstructed plant communities depends. Reclamation success may be improved by addressing primary ecological processes driving ecosystem function as part of the reclamation process. Altered primary processes requires repair of the physical system in conjunction with adding seeds or plants. Landform design strategies designed to capture, store and release water effectively into reconstructed watersheds is the foundation of successfully reclaimed ecosystems. Because functional groups can differ in their spatial and temporal acquisition of resources, improving functional diversity may be a method to more fully utilize soil nutrients in reclaimed soils and improve resilience to weed invasion. Strategically combining species with different seed/seedling traits in seed mixtures can increase chances of achieving adequate plant establishment during revegetation. Monitoring program design should be an integral part of the reclamation planning process and indicators reflecting landscape-scale processes can be adapted to monitor reclamation project success. Effective reclamation plans are process-oriented, seek to initiate autogenic repair, and address landscape interactions. The probability of achieving successful reclamation is enhanced by pursuing the broader goal of improving ecosystem vigor, organization, and resilience utilizing novel assemblages of species that perform desired functions and produce a range of ecosystem goods and services. Reclaiming mined lands requires realistic objectives that consider the ecological potential of the site, land-use goals, and socioeconomic constraints.

Keywords: Reclamation, Phytoremediation, Native plants, Restoration, Biodiversity, Ecological processes, Ecosystem function.

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