



Ecohydrological interactions in the evolution of constructed slopes in a Mediterranean-Continental environment: the role of runoff

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It is well known that overland flow plays a major role in the functioning of natural ecosystems in drylands, where water is the main limiting factor. However, in reclaimed ecosystems its role is not so well understood. This study shows a synthesis of the research conducted in constructed slopes from coal mining reclamation at El Moral field site (Teruel coalfield, Spain).

Three trajectories have been identified and modeled, associated to runoff volume, particularly to external run-on coming from the upper part of slopes. When rill networks are formed, arrested succession occurs. Rills efficiently drain runoff away from slopes, reducing rainfall infiltration and increasing water deficit. Vegetation dynamics becomes severely affected: seedling emergence, plant establishment and seed production are limited along a gradient of rill erosion. Soil moisture content is spatially redistributed, being higher near rills and lower on inter-rills. This determines the spatial pattern of the dominant species (*Medicago sativa*).

At intermediate levels of runoff amount, micro-landforms as rill fans and splays are generated. Vegetation is adapted to the micro-geomorphology developing a patchy mosaic structure. Seven types of ecohydrological units (classified as runoff sources or sinks) have been identified. A functional interaction between sources and sinks following the Trigger Transfer Reserve Pulse approach (Ludwig et al. 2005)* has been demonstrated.

When runoff does not develop micro-landforms, natural plant colonization leads to another patchy mosaic structure based on individuals of the shrub *Genista scorpius*, which can be considered as natural islands of hydrological enhanced biotic productivity. This species develops a biotic control of the main hydrological processes, playing a key role in the succession of the ecosystem.

These findings allow us to conclude that runoff can be considered as a driving force in the ecological succession of reclaimed ecosystems; therefore, an “expert management of runoff” must be applied in reclamation projects to successfully reach the desired objectives.

* Ludwig JA, Wilcox BP, Breshears DD, Tongway DJ, Imeson AC. 2005. Vegetation patches and runoff-erosion as interacting ecohydrological processes in semiarid landscapes. *Ecology* 86: 288–297