



## **Phytostabilization of polluted soils by mining activities in Cartagena-La Unión Mountain, SE Spain**

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The intense mining activity carried out in Cartagena-La Unión Mountain, in Murcia region, Southeast Spain, has provoked extremely high accumulation of heavy metals in the environment. These mine soils have contents of toxic metals high enough to prevent or restrict plant growth. They are also very deficient in macronutrients, mainly nitrogen and phosphorous and physical properties. Due to the absence of vegetation cover, these soils are very liable to erosion, either eolic or hydric, and they represent the major source of heavy metals pollution on the local environment due to dust blow and leaching of the results of mineral weathering into nearby watercourses. This pollution may also have serious detrimental effects upon crops and public health. Therefore there is a great need to stabilize these lands because of the existing risks. A range of reclamation techniques are available for mine soils. Covering them with imported soil or other minerals may be a successful remediation option, but it can be prohibitively expensive for large areas owing to high transportation costs and limited soil availability. Thus, long-term rehabilitation can only be achieved through the use of vegetation to stabilise these lands. It can be a permanent and visually attractive solution and, at the same time, relatively inexpensive. Stabilisation, of these lands by the establishment of vegetation slows the processes of erosion and metal leaching. *Brassica fruticulosa*

and *Zygophyllum fabago* were the two selected species for revegetation processes because they are tolerant adapted to stress factors of mine sites, such as nutrient limitation, drought and low or moderate concentrations of heavy metals. Although revegetation is desirable, these mine soils are very unfavourable substrate for plants because the presence of many growth-limiting factors such as, particularly phytotoxic levels of residual heavy metals, macronutrient deficiencies, acidity, reduced water retention and poor physical structure. As a result it is necessary to overcome limitations to vegetation establishment. Thus for soils with low pH values and acid producers, only neutralization could prevent acid drainage and remobilization of metallic ions. For that reason, in order to revegetate this area, the addition of carbonate, as marble waste, and organic matter were required to raise pH and consequently decrease metal mobility and risks associated to their toxicity. Organic wastes, such as sewage sludge and pig manure, were also needed for overcoming nutrient deficiencies.