

## Recovering landscapes and its functionality. The holistic LIFE RIBERMINE project (Guadalajara, Spain)

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### ABSTRACT

It is well known that mining activity produce severe environmental impacts, but, at the same time, it is essential for technical developing and current estimations forecast extractive activities are expected to grow in the coming decades. Today's society is very demanding, especially when mining is to be carried out in an ecologically and scenically sensitive environment. In this context, mine rehabilitation is challenged not only recover damaged landscapes, but also its functionality and ecosystem services. LIFE RIBERMINE uses best available techniques focused on replicate the configuration and functionality of natural landscapes, with very success so far. Regarding topographic reconstruction, LIFE RIBERMINE actions have included: (a) the use of the GeoFluv™ - Natural Regrade method for the design of watersheds; (b) the SIBERIA Landscape Evolution Model to simulate the erosive processes that will occur in previously made designs; and (c) the ROYAL® Talus method to replicate natural cliffs in the former mining fronts. In soil replacement and management, surface formations (carbonate colluvium) have been used as soil 'support', with organic amendments of poultry and sheep manure and treatments aimed to increase surface roughness and decompaction. Regarding revegetation, the aim is to assemble a pines and gall oaks forest, with a first phase of introduction of herbaceous and camelephytes to form a stable substrate against erosion and biologically functional; and a second phase of implantation of trees and shrubs. Cutting-edge techniques such as mulching, the use of shrubs that prevent herbivory or the application of "biochar" have been also applied. Additionally, LIFE RIBERMINE monitors the behaviour of the rehabilitated areas, so that the lesson learned will help to improve other restorations in the future. Furthermore, downstream river environments are also being studied to ensure that the rehabilitation is contributing to improve the condition of aquatic habitats, the main objective of the project.

**Keywords:** Geomorphological mining rehabilitation, Ecological mining rehabilitation, Best available techniques, Ecosystem services recovery.