This work is part of the Environmental Impact Assessment and Restoration Plan for the Quarry “Los Quebrados de la Serrana”, located in the municipality of Noce (Toledo, Spain), developed in a framework research contract between the Complutense University of Madrid and the construction company Construcciones Llozaya S.A.

Mining and Environment: Mining is an essential activity to our wellbeing, to such an extent that we are totally dependent on it. On the other hand, mining is an activity that generates a strong environmental impact, because it affects to all the compartments of the ecosystem. Therefore it is necessary to reconcile this activity as essential as transforming for the environment, with the environment in which it takes place.

The quarry “Los Quebrados de la Serrana”: The Project of quarry Los Quebrados de la Serrana, promoted by Construcciones Llozaya S.A., is located on the so-called Plateau of Toledo (see Figure 1). It is expected to extract high quality slates of high value for its use in high value markets. At the same time, this is a Distribution and Importance Area for the Imperial Eagle. Inevitably, the extraction activities will alter of the relief which support various ecosystems where the rabbit lives. Rabbit is the main prey of the imperial eagle, a bird listed as Endangered Species. So the objective of this work is to combine the extraction of slate with the maintenance and the Distribution and Importance Area of the Imperial Eagle through a Restoration Plan based on Ecological Restoration models (3) (4).

The core of the Restoration Plan is a geomorphological restoration design. This design, along with replacement of soils and revegetation, will create a series of habitats capable of supporting optimal rabbit densities.

The design of the geomorphological reconstruction of the quarry Los Quebrados de la Serrana is based on the creation of a topography that mimics the natural forms of a geomorphological referent of the local environment, characterized by convex-concave slopes and drainage networks. To do this, the methodology GeoFluv™ and the Natural Regrade software have been used, because these are the only tools in the market which can design mining restorations on the basis of geomorphological principles. The whole process is carried out taking into account four aspects:

- Identification of a geomorphological referent: Since the sterile materials generated for the mining operation will be similar to the colluvium deposits of metamorphic rocks, the base of two nearby hills of similar characteristics, called Layos and Pulgar, were chosen as the geomorphological referents. Parameters such as drainage density and the shape of channels were extracted from these referents.
- Weather conditions-climate: They are taken into account to dimensioning the channels. It is calculated based on the precipitation values for different return periods.
- Type of sterile: In this case are sterile blocks and calcareous of different sizes. Its nature, besides the soil which will be replaced, will determine the run-off coefficient.
- Quantity of sterile and topography: the software also considers the characteristics of the quarry: hollow of operation, method of extraction and volume of sterile.

The mining hollow left after the mining operation will be endorheic (not pour water out of it). So the main channel ends in a pond which is going to give rise to a wetland. The channels are prepared to evacuate water of rains of different duration and return period. All this through its bankfull and a floodplain.

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For these examples (four geomorphological referent, climate, type of sterile and quantity of sterile and topography) it has been done the first design in Europe using the Natural Regrade software (1) (see Figure 2).

In short, this is a reclamation solution which allows to restore habitats that will support the rabbit, and will make compatible mining and imperial eagle conservation. In addition to the research contract between the UCM and the construction company Construcciones Lozoya, this work represents a contribution to the Spanish research projects REMEDINAL 2 (S2009AMB-1783) and Improvement of the hydrological control (CGL2010-21754-C02-01), the latter funded by the Ministry of Science and Innovation, Spain.

References

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