

Understanding herbaceous communities as a tool for restoring degraded slopes in Mediterranean conditions

S. Matesanz, D. Tena & F. Valladares

Centro de Ciencias Medioambientales, C.S.I.C. Serrano, 115, E-28006 Madrid, Spain

Keywords: motorway slopes, restoration, hydroseeding, structure and dynamics of herbaceous communities

ABSTRACT: The conventional restoration activities used to restore degraded motorway slopes (hydroseeding, seedling planting) usually render poor results when working in adverse environments as Mediterranean climates. The present study was carried out in Southern Spain (Málaga) and its specific objectives were: i) to study the succession and time evolution of herbaceous communities by quantifying the influence of slope age on phenology, cover, canopy height and species richness, ii) to classify plant species according to their ecological success, iii) to test different restoration tools. Significant relationships were found between the age of plant community and species richness, diversity and other variables. By quantifying these and other processes related to the structure and dynamics of these communities, the effects of the restoration activities can be understood and suggestions for their improvement can be obtained.

1 INTRODUCTION

Restoring perturbed areas produced during the construction of large infrastructures such as motorway slopes is, nowadays, an important although complex issue for both ecologists and construction firms. This gets even more complicated under adverse conditions such as Mediterranean climate (García-Fayos et al. 2000). In these cases, the conventional restoration activities (hydroseeding, seedling planting) usually render poor results. Among the main reasons for these frequent failure are the lack of knowledge of basic ecological aspects from the herbaceous communities which are target of the rehabilitation, the real microclimatic conditions and the poor, steep and rocky soils. The present study is part of a larger project (TALMED) aimed at filling some of these gaps.

2 METHOD

The study sites were motorways slopes with herbaceous communities resulting from both the hydroseeding and natural processes of colonization from the seed bank and the surrounding vegetation. Data on species composition and abundance, plant cover, biomass, and canopy height were collected in ca. 50 slopes in surveys performed from 2001 to 2003 in Málaga (Spain). Other abiotic variables, like climatic variables, soil properties, inclination and orientation of each slope were also measured in 6 -1m² plots in each of six slopes.

3 RESULTS

The initial lack of interspecific competition, shown by a low plant cover, led to high species richness in the first year. Plant cover increased, while species richness decreased, Compositae and Poaceae became more abundant while Leguminoseae became less abundant with the age of the herbaceous community (Fig. 1, Table 1).

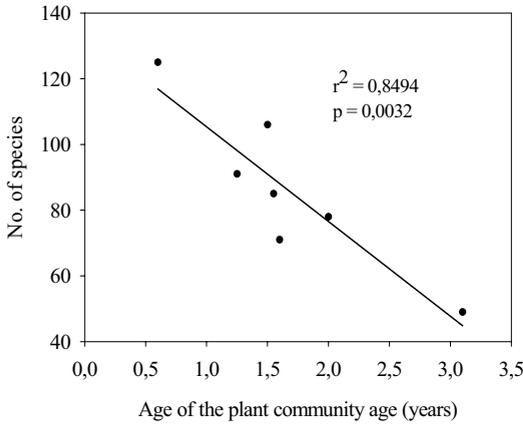


Figure 1. Relationship between plant community age and species richness in motorway slopes in Southern Spain (Málaga). Each point represents the average richness measured in slopes of the same age. Each slope was 0,1 to 1Ha.

Table 1. Results from regressions between the number of species of the five most abundant families and the age of the community in six slopes.

Family	Relation with slope age
Compositae	Positive ($r^2 = 0,484$; $p = 0,003$)
Leguminoseae	Negative ($r^2 = 0,342$; $p = 0,041$)
Poaceae	Positive ($r^2 = 0,503$; $p = 0,002$)
Cruciferae	Non significant
Geraniaceae	Non significant

4 CONCLUSIONS

Conventional practices applied to the restoration of slopes involve the addition of seeds plus organic soil enriched with various fertilizers. As observed here, these practices lead to highly competitive communities, with an eventually reduced richness and a decreased number of nitrogen-fixing Leguminoseae. This kind of herbaceous community is prone to collapse under extreme perturbations (e.g. drought, fire). The understanding of the effects of the restoration activities on the structure and dynamics of the herbaceous communities is a requisite for the improvement of the success of the restoration of perturbed slopes under Mediterranean conditions.

ACKNOWLEDGMENTS

Thanks to Marga Costa, Patricio García-Fayos, Esther Bochet, and David Sánchez, Daniela Brites and Iker Dobarro for their support. This study was funded by the group FERROVIAL-AGROMÁN, S.A and Spanish grant TALMED (MCYT REN 2001-2313/GLO).

REFERENCES

García-Fayos, P, García-Ventoso, B & Cerdà, A. 2000. Limitations to plant establishment on eroded slopes in southeastern Spain. *Journal of vegetation Science* 11: 77-86.