



Predicting the effects of climate change and erosion on biodiversity and ecosystem functioning in semiarid environments

E. Bochet, P. García-Fayos

Centro de Investigaciones sobre Desertificación, Valencia, Spain (esther.bochet@uv.es /
Phone: +34-96-1220540)

Future scenarios of global change forecast important changes in the Mediterranean Region, such as a decrease of the biological diversity of ecosystems as well as changes in vegetal cover and some soil properties relevant to soil resistance to erosion processes. Considering these predictions, and given the accelerated rhythm of Mediterranean ecosystem degradation, there is an urgent need to know the effects that climate change might have on ecosystems and their components.

In this study, we aimed at analyzing the interaction effect of climate change and soil erosion on soil properties, plant species richness and plant functional groups in a semi-arid ecosystem. We hypothesized that a negative interaction on plant species richness exists between climate change and soil erosion and that it is mediated by soil properties and plant life-history traits. A climatic gradient mimicking the predicted future changes in temperature and precipitation for year 2040 was selected in the Province of Teruel (Spain). At the extremes of this climatic gradient, an erosion gradient was also selected comprising flat and steep slopes resulting in a 2 x 2 crossed experimental design. Vegetation surveys were performed in 20 m² plots in 15 flat highland areas and 15 associated eroded slopes of each extreme of the climatic gradient to determine number of species, vegetal cover and plant life-form composition. Soil was sampled in the same plots to determine relevant soil properties to erosion, as bulk density, aggregate stability, fertility and water holding capacity.

Vegetal cover and species richness decreased with climatic change (higher temperatures and lower precipitation) and erosion severity. However, the two factors had opposite effects on the proportion of annual species, with a positive effect for climatic

change and negative one for erosion. Bulk density increased, whereas aggregate stability, fertility and water holding capacity decreased with climatic change and erosion. Moreover, the interaction between both factors had a significant effect on all variables studied, but vegetal cover: erosion had a higher effect on the variables studied in the wetter and colder area of the climatic gradient than in the drier and warmer one. Finally, species richness was more closely correlated with soil properties than vegetal cover, indicating that it is a better indicator of soil erosion than the commonly used vegetal.