143

Arid Soil Research and Rehabilitation, 14:293–307, 2000

0890-3069/00 $12.00 + .00

Comparative Analysis of Runoff and Sediment Yield with a Rainfall Simulator After Experimental Fire

E. MARCOS
R. TÁRREGA
E. LUIS-CALABUIG

Area of Ecology
Faculty of Biology
University of León
Léon, Spain

Changes produced in runoff and sediment levels before and after fire and during the revegetation process were examined using a rainfall simulator. The area was burned in an experimental fire, reaching temperatures from 35° to 563°C. Then it was revegetated using different species combinations. Fifteen permanent plots were established in the burnt area (4 treatments and a control replicated three times). Simulated rainfall of 15 mm per 5 min was applied in each treatment. No significant differences were found in sediment yield and runoff between treatments, but greatest runoff was observed to occur immediately after the fire. A significant relationship was found between runoff and woody cover, and a decrease in runoff can be observed as cover increases. The relationship between sediment yields and runoff rates was also positive. The low rates observed during rainfall simulation are due to the effect of natural vegetation rather than revegetation treatments. The high organic matter content also had an influence on the low rates of runoff and sediment.

Keywords burning, heathlands, revegetation, soil loss

Heathland communities are among the main types of vegetation in the province of León (NW Spain), covering 33% of its surface (Ministerio de Agricultura 1984). *Erica australis* L. shrubs are the most representative amongst these communities (Luis et al. 1989). Most of these heathlands are the result of human action, first replacing forest by grazing and then abandoning them, which allowed heathlands to invade progressively. For this reason, communities with a high fire risk are formed. A mean of about 600 fires occur annually in León province producing a mean annual burnt surface of 2800 ha (Source: Dirección General del Medio Natural, Ministry of the Environment). The main result of fires is the disappearance of plant cover, so the soil is exposed to erosive agents.

The effects of fire on soil depend on the temperature reached in the fire, its duration and the postfire rainfall. There are three processes of chemical change in soil associated with fire: the combustion of organic matter, ash addition, and changes in nutrient availability (Diaz-Fierros et al. 1990). Generally, a small increase in soil fertility is observed (Raison 1979), although a long-term net loss of nutrients from the ecosystem, mainly by leaching, generally occurs. Forest fires disturb soil properties related to erodibility, since they remove plant cover and also induce

Received 26 July 1999; accepted 22 November 1999.
Address correspondence to Dr. E. Marcos, Area of Ecology, Faculty of Biology, University of León, 24071 León, Spain. E-mail: degemp@unileon.es