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Ecological protection effects on typical slopes with various combination of engineering measures and plant measures

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In recent years, due to the rapid development of the China, various production and construction projects have produced many exposed slopes which need to be restored by special recovery measures. However, the regulation effects of vegetation on sediment of slopes with different ecological recovery measures are different. Taking the reconstruction slope of large-scale open pit mine, highway and other demonstration projects as an example, this study analyzed the precipitation, rainfall density, runoff and sediment variation characteristics of 91 rainfalls, and explained the mechanism of vegetation configuration on sediment production on slopes. The results were shown that: (1) the vegetation coverage, early water content and total porosity were the key factors restricting the runoff generation on the slope, among which grey correlation were 0.72, 0.74 and 0.79 respectively. The total porosity, litter thickness and vegetation coverage were the key limiting factors of sediment yield on slope, and their grey correlation degree were 0.64, 0.60 and 0.58 respectively. (2) the comprehensive contribution degree P could reflect the influence of engineering and plant measures on slope sediment production. The analysis showed that the P value of most slopes with engineering and plant measures ranged from 0.31 to 0.77, and the larger the value, the better the effect of reducing soil erosion was. Sediment reduction effect of interlocking bricks greening measure and runoff reduction effect of vegetative carpet greening with coconut fiber measure were the best which P value were separately 0.77 and 0.55. (3) The comprehensive assess coupling model for vegetation-soil system were derived based on vegetation quantitative characteristics, diversity data, soil physicochemical properties and soil and water conservation benefits. Typical protection measures were ordered according to coupling degree (Cd). Three kinds of rocky slopes in mountainous area including metal net hanging combined with spray seeding measure, earth retaining with brick setting measure, ecological bags measure were recommended. Five kinds of soil slopes in mountainous area including grass protection, metal nets within ecological bags, geo-grid cell measure, six arises brick with hollow measure and vegetative carpet greening with coconut fiber measure were recommended. Two kinds of loose slopes including vegetative carpet greening with coconut fiber measure and ecological bags measure were recommended. Six arises brick with hollow measure was recommended in plain soil slopes. In conclusion, the combination of engineering measures and plant measures should be adopted for protection, so as to achieve the purpose of preventing and controlling soil and water loss.

