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Estimating soil erosion utilizing geospatial method and revised universal soil loss equation (RUSLE) of Abu Ghraibat Watershed, Eastern Misan Governorate, Iraq

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This study examined the synergistic and independent effects of soil properties, vegetation cover, conservation practices, and slope on the spatial distribution characteristics of soil erosion in the Abu-Ghraibat watershed in 2024. Soil samples have been collected and analyzed in the laboratory, along with high-resolution satellite imagery, meteorological data, and digital elevation model (DEM) data. The findings indicate that soil erosion in the Abu-Ghraibat watershed in 2024 was minimal, with a progressively increasing severity from north to south. In the studied area, grassland accounts for over 50% of soil erosion, with regions with vegetation coverage > 30% as the primary contributors, all of which are influenced by slope. Moreover, the enhancement of vegetation in the lower strata of the basin and in grasslands, especially on slopes ranging from 10° to 45°, along with the conversion of sloping woodlands and grasslands into terraces, has proven an effective strategy for mitigating soil erosion in the Abu-Ghraibat watershed. The present study has demonstrated that the RUSLEGIS integrated model may serve as an effective instrument for quantitatively and spatially mapping soil erosion at the watershed level in the Abu-Ghraibat, while accounting for the provision of landscape services.

Keywords Geohazards, Soil degradation, GIS, RUSLE, Abu ghraibat watershed

Soil is a natural resource, and anthropogenic and environmental factors have led to its degradation and reduced productivity[1]. Soil degradation is a critical environmental issue primarily linked to socio-economic aspects. All scientific evidence suggests that soil degradation is predominantly caused by human mismanagement of land, while the impact of natural processes (such as climate, geology, and environmental factors) on soil productivity degradation is minimal compared to the effects of human activities[2]. The loss of soil's ability to provide essential landscape services, including habitats, fertile agricultural soils, and clean water, is one of the most significant consequences of soil degradation. The total area of land affected by soil degradation due to human activities is estimated at 2 billion hectares[3]. Consequently, the land areas impacted by soil degradation from erosion are estimated at 1,100 million hectares due to water erosion and 550 million hectares due to wind erosion[4]. Soil erosion in Iraq has a profound impact on the agricultural sector, siltation in reservoirs, soil degradation, and

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