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Wind erosion estimation and assessment using Bayesian belief networks in eastern Isfahan township

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Abstract

Soil erosion by wind is a widespread problem in the arid lands of Iran. This research estimated and assessed the severity of wind erosion in Segzi desertification hotspot located in the eastern part of Isfahan township, focusing on criteria used in the IRIRF (Iranian Research Institute of Forest and Rangelands) model. Bayesian belief networks (BBNs) were also used to convert the IRIFR model to a predictive cause-and-effect model. The severity of wind erosion was calculated using the nine indicators of the IRIFR model on 17 geomorphological faces. The results indicated that three geomorphological faces located in the southern and central parts of the region had high potential for wind erosion. According to the results of the IRIFR model, 24%, 16%, 15% and 45% of the study area were classified as low, moderate, high and very high severity of wind erosion, respectively. Using the IRIFR indicators and conditional probability tables of these indicators, a BBN model was developed and its accuracy was assessed by sensitivity analysis and scenario analysis. Sensitivity analysis for both models showed that wind speed and condition, spatial extent and type of aeolian deposits and erosion features of the soil surface were the most important indicators responsible for wind erosion in the study area. The determination coefficient between the outputs of the IRIFR and BBN models ($R^2 > 0.80$) indicated that the results of both models were significantly correlated ($\alpha = 5\%$). These results indicate that the application of the BBN model for wind erosion assessment can appropriately accommodate the uncertainty of the IRIFR model and help managers to make better decisions for upcoming land management projects.

Keywords: Wind erosion, IRIFR, BBNs, Water, Sensitivity analysis.

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