Modeling Wildfire Pathways in Forest-Grassland Ecotones in Golestan National Park

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Abstract

Modeling wildfire behavior can simplify the understanding of the relationship between fire and its environment, and allow managers to reconstruct or maintain the natural role of fire. In this study, the Minimum Travel Time algorithm in the FlamMap fire model was used to investigate the main pathways of fire growth and the burn probability as a measure of fire risk in the Golestan National Park in northeastern Iran. Based on the simulation output of the main fire pathways in the park, MTT vectors passed through the drier grassland fuels in the southern areas and then split into multiple vectors toward the eastern and northern parts of the park. Using the Chi-square test at the level of $P < 0.05$, the results indicated that the ecotone is a primary corridor for fire growth on the national park landscape. The estimated burn probability map also showed pronounced spatial variations within the national park. According to this map, the highest burn probability was observed in grasslands and ecotones in the southern part of the park at an altitude of 1500-2000 m. The central and western parts of the park are more resilient to fire, even in severe weather conditions. In this study, the forest-grassland ecotone is presented as an example of a natural ecosystem that can increase fire resiliency in this landscape by controlling the relationship between fire behavior and fuel mosaic. Identifying primary fire corridors can help land managers and decision-makers predict and adjust the temporal and spatial dynamics of natural fire regimes.

Keywords: Burn Probability, Fire Pathways, FlamMap MTT, Golestan National Park

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