SPATIALLY EXPLICIT AND STOCHASTIC FOREST LANDSCAPE MODEL OF

FIRE DISTURBANCE AND SUCCESSION

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ABSTRACT

Fire disturbance plays an important role in shaping ecosystem dynamics and vegetation patterns in many forested landscapes. This dissertation is dedicated to the modeling of fire disturbance in spatially explicit and stochastic forest landscape models, in particular, LANDIS model. A hierarchical fire frequency model was proposed to model fire occurrence. Four representative fire spread simulation methods were implemented in LANDIS. I compared fire patterns simulated using the four fire spread simulation methods under two fire occurrence process scenarios that are fuel-independent and fuel-dependent. Results showed that the incorporation of fuel into fire occurrence modeling greatly changes simulated fire patterns. Lastly, I used point process modeling approach to study the effects humans and other factors on the probability of fire occurrence in the Missouri Ozark Highlands. The spatial distribution of fire occurrence density, which is one of the results from point pattern modeling, can be further used in LANDIS as an input map for simulating fire occurrence.