Balancing uncertainty and complexity to incorporate fire spread in an eco-hydrological model

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Abstract

Wildfire affects the ecosystem services of watersheds, and climate change will modify fire regimes and watershed dynamics. In many eco-hydrological simulations, fire is included as an exogenous force. Rarely are the bidirectional feedbacks between watersheds and fire regimes integrated in a simulation system because the ecohydrological model predicts variables that are incompatible with the requirements of fire models. WMFire is a firespread model of intermediate complexity designed to be integrated with the Regional Hydro-ecological Simulation System (RHESSys). Spread in WMFire is based on four variables that (i) represent known influences on fire spread: litter load, relative moisture deficit, wind direction and topographic slope, and (ii) are derived directly from RHESSys outputs. The probability that a fire spreads from pixel to pixel depends on these variables as predicted by RHESSys. We tested a partial integration between WMFire and RHESSys on the Santa Fe (New Mexico) and the HJ Andrews (Oregon State) watersheds. Model assessment showed correspondence between expected spatial patterns of spread and seasonality in both watersheds. These results demonstrate the efficacy of an approach to link eco-hydrologic model outputs with a fire spread model. Future work will develop a fire effects module in RHESSys for a fully coupled, bidirectional model.

Read the complete article in the *International Journal of Wilfire Science* [1]. *[2]*

Associated Project:
Salience & Wildfire [3]

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[1] http://www.publish.csiro.au/wf/pdf/WF16169
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[3] https://www.sesync.org/project/data-intensive-analysis-andor-modeling-for-socio-environmental-synthesis/salience-wildfire