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Understanding the transmission of wildfire risk on a fire prone landscape – A Case study from Central Oregon

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We develop the idea of risk transmission from large wildfires and apply network analyses to understand its importance within the 3.2 million ha Fire-People-Forest study area in central Oregon, US. Historic wildfires within the study and elsewhere in the western US frequently burn over long distances (e.g., 20–50 km) through highly fragmented landscapes with respect to ownership, fuels, management intensity, population density, and ecological conditions. The collective arrangement of fuel loadings in concert with weather and suppression efforts ultimately determines containment and the resulting fire perimeter. While spatial interactions among land parcels in terms of fire spread and intensity have been frequently noted by fire managers, quantifying risk and exposure transmission is not well understood. In this paper we used simulation modeling to quantify wildfire transmission and built a transmission network among and within land owners and communities within the study area. The results suggested that 84% of the predicted area burned within the 25 communities in the study area was from simulated fires that ignited on federal lands. The wildland urban interface surrounding the communities was predicted to burn at a rate of 2 % per year, with 57% of the area burned from fires ignited on federal lands. The node degree for communities indicated that simulated fires originated on about 6 different landowners. Network analyses in general revealed independent variation in transmitted fire among landowners in terms of both node degree (diversity of landowners exchanging fire) and transmitted fire, indicating that both the spatial grain of land ownership and wildfire topology contribute to transmission among land parcels. We discuss how network analyses of wildfire transmission can inform fire management goals for creating fire adapted communities, conserving biodiversity, and resolving competing demands for fire-prone ecosystem services. We also discuss how biophysical fire networks can potentially be coupled with social fire networks to improve wildfire mitigation planning.