Research Brief for Resource Managers

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Relative Importance of Building Materials on Structure Survival in San Diego County WUI Wildfires

The design and materials used in construction is critical to preventing structure loss during wildland urban interface (WUI) fires. However, while laboratory based tests have been used to develop building construction standards, there has been little empirical research of these construction features in real wildland fires. This research uses structural loss data from two catastrophic wildland fires (Fig.1) to rank the most effective fire safe construction materials at the local-scale. After that, the authors go on to offer a simple decision tree illustrating the complex interactions between the two scales of fire-safety preparedness: local-scale materials & landscape-scale layout.

After two damaging fires in San Diego Co., CA (Fig. 1; 2003 & 2007), the San Diego Department of Planning and Land Use (DPLU) inspected both burned and unburned homes within fire boundaries and characterised them with local- (e.g., construction materials, structure age, defensible space) and landscape-scale variables (e.g., housing density, percent slope, distance to roads,

Management Implications

- *Local-scale, structural materials tips*: use dual pane vinyl windows, stucco exteriors, and sealed, tile roof shingles in new construction or in retrofitting old construction; remove vegetation that overhangs or touches structures.

- *Landscape-scale design tips*: plan higher densities of newer homes and buildings (>54 structures/km^2); provide easy access to a major road for all structures.

- Regardless of how prepared a homeowner may be at the local-scale, landscape-scale attributes like housing density and slope may be more important factors for survival.

surrounding fuel type). Multiple regression models were then used to rank the effectiveness of the different kinds of materials for preventing structure loss. A non-parametric classification tree was then created to illustrate the interrelationships among the landscape-scale variables in promoting structural survival (Fig. 2). These results should help everyone in San Diego County prioritize where best to begin the most effective fire prevention actions within a given budget.
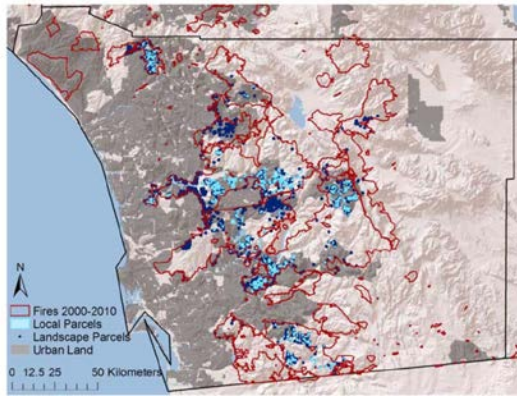
Fig. 1. Study area showing fire perimeters between 2000-2010 and the locations of parcels analyzed at the local and landscape
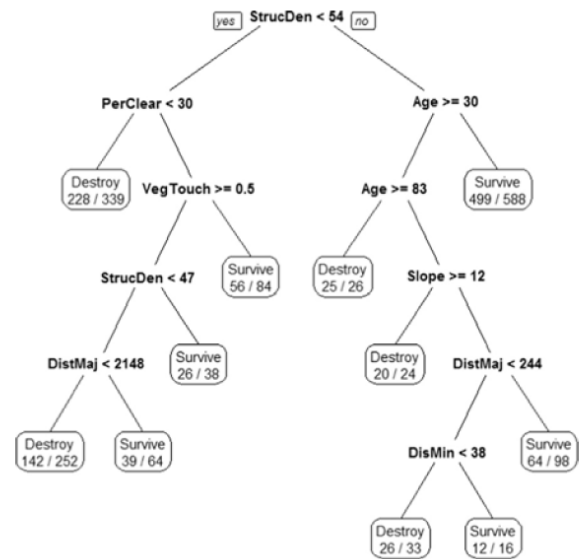

Fig. 2. Classification tree depicting the structure of landscape-scale factors associated with homes surviving wildfires in San Diego, CA.

Abbreviations:
StrucDen: Structure Density
Age: Age of structure
PerClear: Percent of Vegetation cleared around the structure
VegTouch: If sides of structure were being touched by vegetation
DistMaj: Distance to major road
Distmin: Distance to minor road

At the local, single structure-scale, the construction materials were found to be very important to structure survival during wind-driven fires with windows (vinyl frames & dual panes), sealed tile roofs, stucco exteriors, and non-touching/non-overhanging vegetation (defensible space) being most important in that order. At the landscape-scale, the combination of higher structural density (>54 structures/km^2 (or >21 structures/m^2)) and newer construction age (<30 years old) was the most important attribute for survival (Fig.2). The next most important attributes were having an optimal percent vegetation clearance (30%) and having the house on a low percent slope (<12% slope). Easy access to major roads also significantly enhanced structural survival (<244 m).

When comparing the importance of the two scales, housing density patterns and location were more important than materials and individual preparedness. The implication is that "homeowners could do everything correctly to prepare their house for fire safety, *but if the structure is located in a hazardous setting*, none of these actions may be strong enough."

Because of the large percentages of unexplained variation in these models, these researchers predict that there are likely many more unquantified factors that could also help explain "the multivariate nature of community vulnerability to wildfire."