



Research Brief for Resource Managers

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Contact:

Chris Dicus

Phone:

(805)-756-5104

Email:

cdicus@calpoly.edu

Wildland-Urban Interface Module | Natural Resources Management & Environmental Sciences Department,
California Polytechnic State University, 1 Grand Ave., San Luis Obispo CA 93407

Current approaches & research needs in the WUI

Mell, W.E., S.L. Manzello, A. Maranghides, D. Butry and R.G. Rehm. 2010. The Wildland-Urban Interface fire problem - Current approaches and research needs. *International Journal of Wildland Fire* 19(2):238-51.

http://www.firescience.gov/projects/07-1-5-08/project/07-1-5-08_Mell_et_al_WUIresearch_needs_ijwf2010.pdf

The purpose of the manuscript is to provide an overview of the WUI fire problem, a short review of current approaches to reducing structure ignitions, a discussion of further research needs, and an overview of the ongoing work at the National Institute of Standards and Technology (NIST). The authors discuss the need for a systematic approach of laboratory experiments, field measurements, and fire behavior modeling to better determine exposure conditions faced by communities and structures.

The authors note that there is currently no standardized method of risk assessment that can be applied nationwide to WUI communities in the US. They argue that an informative WUI fire-risk assessment at a *community* scale (vs. the most common assessments at a landscape scale) should include information on home ignitability that depends on the structural characteristics, the immediate surrounds of the home, and expected exposure conditions due to fire behavior that changes with time, dependent on seasonal variation in fuel and weather conditions. They also point out that the role of structure-to-structure fire spread in WUI settings has not

Management Implications

- To better inform managers, there is a need for research to better explore many facets of WUI fires, including:
 - Hazard and risk assessment at small (e.g. community) scales.
 - WUI fire behavior, including structure-to-structure spread.
 - Structure exposure and vulnerability to both firebrands and heat.
 - Economic cost-benefit analyses of mitigation activities.
- Scientists at NIST are exploring many of the above facets, the results of which can be found at http://www.nist.gov/el/fire_research/wildland/index.cfm.

been given as much attention as vegetation-to-structure fire spread, which is of especial importance in communities with high-density housing.

Multiple web-based resources (e.g., Firesafe, Firewise) and checklists, some specific to geographic regions, are available to residents. However, the availability of so many guidelines has led to some confusion, highlighting the need for a standardized approach applicable for nationwide use, while accounting for local differences due to terrain, weather, vegetation type and housing density.

The authors also contend that there is a need to better identify and characterize (1) the structure

exposure conditions for a range of WUI fire settings (e.g. housing density, terrain, vegetative fuels, winds, wildland fuel treatments); and (2) the vulnerability of a given structure design or building material when subject to a given exposure.

The authors also argue that a systematic, science-based field research effort is needed to characterize how wildland fuel treatments alter the fire behavior and firebrand and smoke generation from WUI fires. They also maintain that there is a need for systematic and standardized field efforts to collect pre- and post-fire data to provide assessments of how implementable and effective current WUI guidelines are.

They also note that because homeowners can be reluctant to follow risk-reduction guidelines due to the cost of implementation, there is a clear need for economic tools that provide cost/benefit analyses of risk reduction practices.

To fill in existing research gaps that best inform managers, scientists at NIST have initiated several studies to address the above needs including an assessment of flammability of ornamental shrubs, experiments to characterize how various types of embers ignite multiple fuel bed types (Figure 1), post-fire studies of structure mortality, creation of models to predict fire spread and smoke transport during WUI fires.

Suggestions for further reading

Cohen, J.D. 2004. Relating flame radiation to home ignition using modeling and experimental crown fires. *Canadian Journal of Forest Research* 34:1616–1626.

Cohen, J.D. 2008. The wildland–urban interface fire problem. *Forest History Today* (Fall), 20–26.

Manzello S.L, J. R. Shields, Y. Hayashi, and N. Daisaku. 2009. Investigating the vulnerabilities of structures to ignition from a firebrand attack. *Fire Safety Science* 9:143-154.



Figure 1. NIST firebrand generator testing exposure of a roof to embers.