A More Effective Approach for Preventing Wildland-Urban Fire Disasters

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Introduction

Inevitable extreme wildfire conditions do not have to result in disastrous community fire destruction. Local conditions, the characteristics of a home and its immediate surroundings within 100 feet (30 meters) principally determine home-structure ignitions. This area, called the *home ignition zone* (HIZ), effectively defines wildland-urban (WU) fires as a structure ignition problem and not a problem of controlling wildfires. Alternatively, readily reducing structure ignitability within the HIZ and collectively communities, property owners can prevent WU fire disasters without depending on wildfire suppression that fails during extreme wildfire conditions.

Inevitable Wildfires and Extreme Burning Conditions

Wildfire suppression has successfully controlled 95 to 98 percent wildfires with initial attack for over one-hundred years (Stephens and Ruth 2005). Paradoxically, the high degree of successful fire suppression has ensured the inevitability and increased likelihood of uncontrollable, extreme wildfires (Arno and Allison-Bunnell 2002; Williams 2013). Importantly, WU fire disasters have only occurred during these extreme wildfire conditions when fire control fails (Cohen 2010; Calkin et al. 2014). Without seriously questioning this failure, Federal, state and local fire agencies continue wildfire suppression, along with pre-suppression fuel breaks and shrub and forest fuel treatments, as the principal approach for protecting communities (Finney and Cohen 2003; Cohen 2010; Calkin et al. 2014).

Community fire destruction will continue as long as wildfire suppression is the primary approach. The inevitability of uncontrolled extreme wildfires suggests inevitable disastrous home destruction; however, available science indicates practical opportunities for effectively creating ignition resistant homes and thereby preventing community fire disasters without necessarily controlling wildfires (Cohen 2000a; Cohen 2001; Cohen 2004; Cohen and Stratton 2008; Cohen 2010; Calkin et al. 2014; Cohen 2017; Cohen and Westhaver 2022). Readily observable patterns of unconsumed tree canopies and other vegetation surrounding totally destroyed homes indicates high intensity wildfire flames did not spread through communities.

Patterns of Home Destruction during Wildfires

Unconsumed vegetation post-fire, often remaining green, adjacent to and surrounding home destruction is the typical WU fire pattern associated with extreme wildfire conditions (Cohen 2000b; Cohen and Stratton 2003; Cohen 2003; Cohen and Stratton 2008; Graham et al. 2012; Cohen 2017; Cohen and Westhaver 2022). The three photos (Figure 1) of home destruction with adjacent unconsumed shrub and tree vegetation indicate the following:

- ***High intensity wildfire did not continuously spread through the residential area as a wave or flood of flame.***
- ***Unconsumed shrub and tree canopies adjacent to homes did not produce high intensity flames that ignited the homes.***
- ***Homes could have only ignited from lofted burning embers on the home, low intensity surface fire spreading to contact the home, and in high density development, structure-to-structure fire spread.***
- ***The 'big flames' of high intensity wildfires did not cause total home destruction.***

Paradise, CA; 2018 Camp Fire **Southwest CO; 2002 Missionary Ridge Fire** **S Cal; 2007 Grass Valley Fire**

Figure 1.

High intensity wildfires do not spread through communities that experience disastrous fire destruction. A community's streets, driveways, parking areas, building sites, etc. create gaps in the continuous tree and shrub canopies required to maintain high intensity wildfire spread (crown fires) (Cohen 2010). Figure 2 shows a crown fire that spread to but could not continue beyond the first residential street. Although the crown fire terminated at the street, burning embers showered downwind resulting in several blocks of total home destruction (Cohen 2010). Extreme wildfire conditions initiate ignitions within residential areas but the residential fuels, structures and vegetation, continue the residential burning resulting in total home destruction. The community fire spread continues hours after the wildfire ceases influence to the community (Cohen and Stratton 2008; Cohen 2010; Cohen and Westhaver 2022).

Figure 2.

The typical WU fire patterns indicate that conditions local to a structure principally determine structure ignitions with burning embers the principal source of ignitions. The totally destroyed home in Figure 3 indicates burning embers as the only possible ignition source igniting the home directly, and from igniting flammable materials immediately adjacent to the home. Burning embers should be expected during extreme WU fire conditions; however, regardless of the distance burning embers travel, burning ember ignitions depend on the local conditions of the ignitable materials on and adjacent to a home.

Figure 3.

An Effective Approach for Preventing WU Fire Disasters

Extensive research has identified local ignition conditions that determine home ignitions during extreme wildfire conditions (Cohen 2000a; Cohen 2000b; Cohen and Stratton 2003; Cohen 2003; Finney and Cohen 2003; Cohen and Stratton 2008; Graham et al. 2012; Cohen 2017; Cohen and Westhaver 2022). The "local ignition conditions" area has been quantified as a home's ignition characteristics in relation to burning materials in its immediate surroundings within 100 feet (30 meters) and burning embers for all sources (Cohen 1995; Cohen 2000a; Cohen 2004). This area is called the ***home ignition zone*** (HIZ; Cohen 2010; NFPA 2018). An ignition resistant HIZ is not necessarily a unique, specified home ("hardening") and surrounding area ("defensible space") coded list of factors. An ignition resistant HIZ is how a home performs in resisting ignitions related to burning materials within the HIZ and burning embers from all sources. For example, a home with a flammable wood roof can readily ignite during extreme wildfire conditions having no flammable materials within its HIZ. Or, an earth-berm house can be ignition resistant having intensely burning materials within its HIZ.

The relatively small area of the HIZ principally determines home ignitions during extreme wildfires and defines WU fire destruction as a *home ignition problem* that can be prevented by readily addressing home ignition vulnerabilities within the HIZ without necessarily controlling wildfires. Thus, community wildfire risk is not directly determined by wildfire intensity and its location related to wildland. Burning embers, initially from the wildfire and then from burning structures within the community are a principal contributor to community fire spread. Thus, not having a flammable wood roof, removing flammable tree debris from the roof, in rain gutters, on decks, assuring nothing burns (flaming or smoldering) within 5 feet (1.5 m) of flammable walls and attachments, and vents covered with 1/8 inch (3 mm) mesh screen can significantly increase home ignition resistance. Reducing home exposure from flame radiation and convection may require reduced vegetation and trimming but not the necessary removal of most vegetation and large trees within the HIZ (as noted in Fig. 1). As indicated by the typical patterns of WU fire destruction, shrub and tree canopies are not spreading high intensity fires through communities.

The inevitability of uncontrolled extreme wildfires spreading to communities does not mean WU fire disasters are inevitable. We can effectively prevent WU fire disasters by reducing home ignitability and collectively, the community. Ignition resistant communities will increase community fire protection effectiveness, life-safety options for residents and firefighters, and can decrease wildfire suppression costs by not ineffectively attempting control of extreme wildfires to prevent WU fire disasters. For more information on creating ignition resistant homes visit www.firewise.org (NFPA 2018).

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