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CHAPTER 3

FIRE POLICY IN THE URBAN–WILDLAND INTERFACE IN THE UNITED STATES: WHAT ARE THE ISSUES AND POSSIBLE SOLUTIONS?

Scott L. Stephens and Brandon M. Collins

ABSTRACT

The urban–wildland interface (UWI) poses a series of challenges to both rural and urban communities in the United States. Some efforts have been developed to promote the use of fire-resistant building materials and creation of defensible space; few comprehensive laws address the threat of external ignitions on structures. Most problems associated with the private side of the UWI are centered on land planning methods. Communities and counties must be encouraged to take more active roles in wildfire protection and this will require a fundamentally new method of land planning and review authority. Without substantial changes in land planning, we will continue to experience large losses of structures and life in the UWI.

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INTRODUCTION

The urban–wildland interface (UWI) is an area where structures are built among and next to forests, shrublands, and grasslands. The UWI poses a series of challenges to both rural and urban communities including ecosystem fragmentation, increased exposure to invasive species, water and air pollution, wildfire, and loss of wildlife habitat (Alavalapaite, Carter, & Newman, 2005). These challenges are exacerbated by the vulnerability of the UWI to rapid land-use change throughout the United States. Addressing these concerns in the complex and changing landscapes at the UWI requires the implementation of clear and effective policies.

Across the conterminous U.S., the UWI covers 719,156 km^2 (9.4% of the total land area) and reportedly contains 44,348,628 housing units (38.5% of all housing units) (Radeloff et al., 2005). Major UWI areas are located along the west coast of the U.S., the Colorado Front Range, southeast Texas, and the northern Great Lakes States. The UWI is also common on the fringe of major metropolitan centers such as Los Angeles, Seattle, Denver, Dallas, Atlanta, Washington DC, New York, and Boston (Radeloff et al., 2005). The area being converted to UWI continues to increase in the U.S.

The environmental consequences of the UWI are becoming increasingly evident. U.S. Forest Service Chief Dale Bosworth (2003) has identified the UWI and further land conversion to this use as one of the four main threats to public and private forests in the U.S. Public concern about the social and environmental impacts of the UWI has grown in recent years (Bengston, Potts, Fan, & Goetz, 2005).

Throughout the western U.S. many key public concerns center on fire in the UWI. Fire poses a direct and obvious threat to lives and structures. As such, fires are eliminated from UWI systems to the fullest extent possible. The consequences of escaped fires in the UWI far exceed those in wildland areas. As a result, policy makers and land managers have focused much attention on alleviating the threat of fire in the UWI.

Programs have been initiated throughout the U.S. to address fire problems in the UWI. These include zoning, growth boundaries, land acquisition, education, community assistance programs, and provision of conservation easements (many of which are discussed by Robert Paterson in Chapter 4). Additionally, there has been growth in referenda and ballot measures where citizens have placed restrictions on future development in the UWI (Bengston et al., 2005). Debates currently exist over the specific types of fire hazard reduction treatments appropriate in relatively remote U.S. federal forests (Stephens & Ruth, 2005). However, the consensus

regarding fire hazard reduction in the UWI is that treatments should reduce surface, ladder, and canopy fuels, regardless of forest types (e.g., ponderosa pine, mixed conifer, lodgepole pine) (Agee & Skinner, 2005).

Several recent federal fire policies such as the National Fire Plan (USDA-USDI 2000), the Collaborative Approach for Reducing Wildfire Risks to Communities and the Environment: Ten-Year Comprehensive Strategy (TYCS) (WGA, 2001), and the Healthy Forest Restoration Act (HFRA, 2003) have specifically addressed fire management in the UWI. The National Fire Plan and TYCS recognizes that key decisions in setting priorities for restoration and fuels management should be made collaboratively at local levels (Stephens & Ruth, 2005). The HFRA specified that 50% of fuels treatments should be done to reduce hazards in the UWI. This has led to the creation of community-based efforts (discussed further in Chapter 9 by David Ganz et al. and Chapter 10 by Patricia Stokowski) that are reducing fire hazards in the UWI using collaborative agreements (Reams, Haines, Renner, Wascom, & Kungre, 2005).

Some efforts have been developed in the U.S. to promote the use of fire-resistant building materials and creation of defensible space in the UWI. The use of combustion-resistant building materials has been shown to be of paramount importance regarding structural survival during wildfires in the U.S. (Cohen, 2000) and Australia (Leonard, Leicester, & Bowditch, 2003). While these aspects are critically important in determining structural survival, few comprehensive laws or statutes exist in the U.S. addressing the threat of external ignitions on structures. One of the reasons for this lack of regulation governing the private side of the UWI is the American spirit of individualism which resents government interference in closely guarded personal rights (McCaffrey, 2004; Mileti, 1999).

The objective of this chapter is to present specific ideas to reform and improve U.S. fire policy and management in the UWI. To be achieved, substantive reform requires better development, dissemination, and utilization of scientifically based information (Franklin & Agee, 2003). The ensuing discussion will develop a conceptual agenda for this policy. Information from this paper should be of interest to planners, managers, and policymakers working in or near the UWI.

NEW POLICY INITIATIVES

Fire cannot be eliminated entirely from the UWI. Staffing of fire management agencies to a level at which all fires are detected and suppressed at a

small size is not possible. Under extreme conditions, fire suppression activities may have little or no effect on fire spread (Graham, 2003; Moritz, Keeley, Johnson, & Schaffner, 2004). The 2003 wildfires in southern California serve as a recent example of the threat that uncontrollable wildfires pose on communities in the UWI. More than 299,000 ha burned in the 2003 southern California wildfires and approximately 3,600 structures were lost (NIFC, 2004; Reams et al., 2005), which was one of the largest structural losses from any wildfire in North America. Efforts to alleviate the threat of wildfire in the UWI have primarily focused on wildland fuel reduction, and have not been consistent between the public and private sectors.

The National Fire Plan and TYCS highlighted and provided funds to reduce fire hazards primarily on the federal wildland side of the UWI. Common fuel treatments used on federal lands that abut the UWI are defensible fuel profile zones (DFPZs) (another name for this treatment is shaded fuel breaks) (Agee et al., 2000; Kalabokidis & Omi, 1998; Stephens & Ruth, 2005). DFPZs are linear landscape elements approximately 0.5–1.0 km wide, typically constructed along roads to break up fuel continuity and provide a defensible zone for fire-suppression forces.

When located near communities, DFPZs can be effective in providing a safe area for fire suppression forces to stop a wildland fire from entering or leaving the private structural side of the UWI. The reduced ladder, surface, and crown fuels in these linear elements will not stop a wildfire, but the behavior of such fires will be reduced inside the DFPZ. Fire behavior can change from a high severity crown fire outside of the DFPZ to a surface fire within it. However, the effectiveness of DFPZs is highly dependent on fire weather. These treatments are generally designed to reduce fire behavior to a controllable level under moderate or possibly high-fire weather conditions, and will not be effective during extreme fire weather because of spot fire initiation.

In some conditions fire suppression forces can initiate a backfire anchored on the DFPZ. Backfires are ignited with the objective of consuming unburned fuel between a suppression point and an approaching wildfire front, and can serve as a very successful suppression strategy. However, as with a wildfire, backfires are influenced by wind, fuels, and topography, and as such, there is risk in implementing such operations. This was evident in the 2000 Los Alamos wildfire, where a backfire contributed to structural losses in Los Alamos, New Mexico.

With the financial resources and emphasis on treating lands in the UWI provided in the National Fire Plan and Health Forests Restoration Act, many areas of federal lands that are adjacent to homes are being treated to

reduce hazards. However, as the UWI continues to expand in the many areas throughout the U.S., costs of providing pre-fire protection (fuel reduction activities) and protection from encroaching wildfires are exacerbating already increased wildfire-related expenditures. As budgets at the federal and state level are unable to keep up with these increasing costs, more responsibility is being placed on local governments and fire services to provide wildfire protection. Local engagement is critical to this process and has been provided by Fire Safe Councils (described further in Chapter 9 by David Ganz et al.), which channel National Fire Plan funds to local communities for pre-fire projects. Many western and southern states have also partnered with the federal agencies to reduce fire hazards in the UWI. Partnerships are particularly important because fire does not respond to artificial boundaries.

One critical aspect of fuels treatments along the UWI is maintenance. Maintenance is important because trees and shrubs will continue to grow and eventually will produce another high-hazard fuel bed. It is therefore absolutely critical that plans and financial resources are available to maintain the DFPZs and other fuel treatments along the UWI. Many federal and state plans are creating DFPZs in appropriate areas but long-term funding and staffing to maintain their effectiveness has not been provided. It is not enough to continue to install these structures, plans and funding must be available for their maintenance.

While the federal wildland side of the UWI has begun to take steps to reduce fire hazards, the private side has not kept up. Fuel treatments along the UWI will be effective in reducing structural losses only if they are used in combination with combustion-resistant homes that have defensible space from wildland and domestic vegetation (Cohen, 2000; Leonard et al., 2003; Moritz & Stephens, 2006; Stephens & Ruth, 2005). Without substantial improvements on the private structural side of the UWI, we will continue to experience large losses from wildfires in the U.S. As said above, fuels treatments along the UWI will not eliminate fires, they will only modify their behavior. If homes with combustible roofs, exposed wooden decks, and low defensible space continue to dominate the UWI, they will still be lost during wildfires. Fires do not discriminate; the most combustible elements will burn, and if the most combustible features are homes, they will be lost.

Many problems associated with the private side of the UWI in the U.S. are centered on land planning methods (see Chapter 4 for further discussion of land use planning and smart growth policies related to wildfire management). In the western U.S., individual counties make land planning decisions primarily based on local needs. Counties promote growth to increase

local tax revenues, which leads to more fragmented landscapes and increases in the area dominated by the UWI. Long-term consequences are seldom included in county plans and coordination with adjacent counties or other land-management agencies are rare. The result is an ever-expanding UWI that places more and more assets and people at risk (Stephens & Sugihara, in press). The western U.S. will never solve the private side of the UWI with such a system in place. Large amounts of financial resources invested in federal or state wildlands in the UWI will only produce modest benefits in terms of the number of structures lost.

Even if large federal or state funds could be allocated to UWI communities, issues of equity arise when considering the disproportionate use of taxpayers' dollars to subsidize wildfire protection in the UWI. This inequity is compounded by the unbalanced allocation of fire suppression resources towards the UWI. During fires that pose any threat to communities, fire suppression resources are primarily focused on protecting lives and structures the UWI. This substantially reduces the capacity of fire-protection agencies to suppress unwanted fire in more remote wildlands. The ecological impacts of this prioritization towards the UWI should be considerable when managing the more remote wildlands. The lack of suppression resources could result in more accelerated losses of sensitive wildlife habitat or plant communities (e.g., old growth, threatened and endangered species). Another form of land management planning is critically needed in this area.

THE AUSTRALIAN EXPERIENCE

The people of Australia have also experienced large losses from fires in the UWI. For the first 150 years of white settlement in Australia, the destruction of houses during wildfires (bushfires) was taken as inevitable, and few efforts were made to investigate or improve the performance of buildings in wildfire-prone areas (Leonard et al., 2003). Beginning in about 1940, Australian researchers gathered information from a series of wildfires that enabled them to promote new policies and construction methods to reduce wildfire losses.

Before this analysis began, there were widespread community beliefs in Australia that wildfire moved at the speed of express trains, that houses exploded into flames and burnt down in minutes, and that there was not much that could be done to prevent this (Leonard et al., 2003). Research has shown that the majority of houses destroyed in Australian wildfires actually survive the passage of the fire front only to burn down in the following

hours due to fire spread from ignitions caused by windborne burning debris (Leonard et al., 2003). This prolonged ember attack mechanism (spotting) is the main cause of structural losses in the UWI.

Since the inception of rural fire brigades in the 1940s and the formalization of wildfire research in Australia, much has been achieved in mitigating risk to life and property (Leonard & McArthur, 1999). The main lessons learned in Australia are

(1) Fire brands are the dominant spread mechanism during high severity wildfires.
(2) Homes must be designed and built to resist ember attack.
(3) If a homeowner is well prepared, staying with the home during a wildfire and actively defending it following the passage of the fire front will greatly increase the probability of the home surviving the fire.

Similar building performance criteria could be applied in the U.S., but this would require a fundamental shift in the way that we do land planning. Counties and local governments would have to relinquish some of their authority or be subject to a review based on how a proposed action would change wildfire risk. Passing some of the authority to make decisions to a higher level (possibly the State) could allow for efficient and critical review in reference to wildfire. In New South Wales, Australia, new subdivisions must pass a fire review at the state level and all in-building must also pass a regulatory review. This has led to development that is much more strategic concerning wildfires. The counties in the western U.S. could also move to such a program but this would require a fundamental shift in land planning that maybe difficult to achieve because of our high value in individual freedoms and private property rights.

The Australian's have also found that able bodied and prepared homeowners can be very effective in reducing losses in the UWI by staying and actively defending their homes. If homes and adjacent vegetation have previously been prepared to resist ember attack, the ability of a home to survive wildfire will be greatly enhanced by small-scale suppression efforts. The strategy entails a homeowner having basic suppression tactics and equipment that can be used to extinguish spot fires. As stated above, most structures in the UWI are ignited by burning debris (i.e., fire brands or spots), not by direct flaming combustion or radiation heat transfer. Fire brands initially ignite very small fires that can be extinguished by private citizens. Of course structures and adjacent vegetation must first be well prepared to resist fire, something that is rare in the U.S. Most homes in the UWI in the western U.S. are highly combustible and have low defensible space. Such conditions

are not conducive to a homeowner supported fire suppression policy and it would be dangerous to adopt such a policy without fundamental reform in the way we build and defend structures.

CONCLUSION

It is logical that the first step to improve UWI policy is to reform U.S. building and land planning methods to incorporate wildfire performance criteria. Although there are some small-scale, community-based projects that are making a difference in the UWI, much more must be done. Communities must be encouraged to take more active roles in wildfire protection. This would result in increased local accountability, and ultimately self-reliance. This will require a fundamentally new method of land planning and review authority. We cannot continue to expand the area dominated by the UWI and expect wildfire losses to decrease.

Other forces such as global climate change (Clark, 1988; Fried, Torn, & Mills, 2004; Karl, 1998; Moritz & Stephens, 2006; Swetnam & Betancourt, 1990; Torn & Fried, 1992) may further complicate fire management in the UWI. Climate change may lead to differences in plant distributions (Bachelet, Neilson, Lenihan, & Drapek, 2001), lightning frequency (Price & Rind, 1994), and could also increase the length of fire season. These changes would further exacerbate wildfire hazards and risks in the UWI.

The National Fire Plan, the Collaborative Approach for Reducing Wildfire Risks to Communities and the Environment: TYCS, and the Healthy Forest Restoration Act have all targeted fire hazard reduction in the UWI. This could produce a more sustainable landscape if the private side of the UWI also takes actions to reduce their hazards and risks. Increased investment in the federal side of the UWI can reduce the resources available to treat relatively remote forested areas. Many watersheds, wildlife habitats, and old-growth forests are currently at risk from high-severity wildfires because of the effects of a century of fire suppression and past harvesting (see Chapter 2 by Roger Kennedy for a further discussion of this topic). Targeting our financial and political resources to the UWI may be desirable to the people that choose to live in these environments but will do little to solve our diverse fire management problems in remote areas.

The creation of new fire policies depends on technical and scientific information, but the choices made are inherently political ones (Stephens & Ruth, 2005). For this reason, even if a particular issue is relatively uncomplicated and the design of a solution may be easily understood, policy

formulation is often complicated. Budgetary concerns, for example, may override even the soundest proposals. It will be critical to develop political support at the local, regional, and state levels to begin to initiate the reforms outlined in this paper. Without substantial changes in land planning, we will continue to experience large losses of structures and life in the UWI.

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