

Defining the Players

Four distinct groups are key players in the wildland-urban intermix. Their relationship to firefighter safety—before an ignition and once a fire is burning—is critical. These groups include the community, the individual homeowners, the fire agency, and the individual firefighters (Figure 2).



Figure 2—A variety of factors influence firefighter safety.

Access is a critical component of suppressing any fire, and becomes even more critical in wildland-urban intermix fires. Road width, traffic flow, curve radius, and bridge weight limits all impact the timeliness and ability of fire apparatus to reach a fire, or to gain access to protect a structure. Careful

consideration of design criteria to match roads with access and egress needs of the civilian population as well as the needs of fire equipment are essential during the early stages of an area's development.

Once residences are in place, the community is responsible for developing fully integrated

evacuation plans for the civilian population should a fire occur, and for coordinating the efforts of fire control and law enforcement to ensure that both are able to achieve their objectives in a timely manner.

The Homeowner

Although many of the factors that help ensure firefighter safety are responsibilities of the community, the homeowner who chooses to live in the intermix has an important role. Before a home is built, the choice of the construction design and building materials can significantly affect a residence's fire safety, even when the residence is constructed in accordance with appropriate community guidelines and ordinances. Once the structure is constructed, maintaining the defensible space, reducing naturally occurring hazards, and preventing unwanted fires are all responsibilities of the homeowner (Figure 4).

Even though these steps and the actions of the community should greatly reduce the risk of wildfire threat to homeowners in the intermix, homeowners have one additional responsibility: planning for evacuation in times of extreme fire behavior. Homeowners must maintain accountability for all family members, remove important papers and family heirlooms, evacuate pets and livestock, and know the best transportation routes away from the fire. All these aspects of

The Community

For this paper, the "community" is defined as the level of government (town, village, county, State) that is responsible for the laws, regulations, statutes, and ordinances that control development, planning, and law enforcement in areas defined as intermix.

Perhaps the most important function the community can play to ensure firefighter safety is through planning. By requiring developers and builders to adhere to strict standards for building materials, clearing limits, and fire-resistant plant species for landscaping, the community can help ensure that firefighters have a reasonable chance to safely fight a fire (Figure 3).

Other important roles for the community include enforcing existing ordinances for vegetation, conducting fire prevention inspections on a timely basis, and enforcing the approved standards for fire-safe building construction practices.



Figure 3—Planning is the first step to making a home site in the wildland-urban intermix safe from wildland fire.



Figure 4—Defensible space around a home helps ensure firefighter safety.

evacuation must be planned by the homeowner long before the threat of fire. Failure to do so will delay evacuation, and may threaten the safety of firefighters trying to access the area to suppress the fire, protect property, or save the lives of entrapped residents.

The Fire Agency

The overall responsibility for ensuring the safety of firefighters lies with the fire agency having jurisdiction for the area. Once a fire ignition occurs, it is too late to take the steps that are essential to ensure a safe and efficient fire suppression operation. Each fire agency must address several key areas as part of its preplanning effort for fires in the wildland-urban intermix.

First, the training and qualifications of firefighters and fire officers must be focused for the wildland fire suppression job. These skills are often significantly different than those required in the structural fire arena. Failure to address those differences can result in close calls, injuries, and even fatalities because threats are not recognized. Fire

agencies can address these requirements by referring to both ICS 310-1 (Incident Command System Wildland Fire Qualification Subsystem Guide) and NFPA 1051 (National Fire Protection Association Standard for Wildland Fire Fighter Professional Qualifications). Recognition of the effects of the weather, terrain, and fuels on fire behavior and the effectiveness of suppression activities is especially critical in the wildfire environment. Also, chief officers in traditional structural fire agencies often are not trained in wildland operations to the level that a wildland firefighting division supervisor might be: assigning individuals in critical positions who were not qualified or experienced in wildfire has resulted in firefighter burnovers and entrapments (Figure 5).

The equipment selected by the fire agency for the wildfire component of their fire protection responsibility is also an important factor in firefighter safety. Engines and other apparatus that cannot maneuver on narrow, curving roads, or that exceed the load limits on bridges can put firefighters at risk in fast-moving wildfires (Figure 6). Close coordination by the fire agency with the community to adapt the transportation system and new equipment to meet the existing and planned conditions is important in ensure that firefighters can safely perform on an intermix fire.

Communications have always been identified as a critical component in firefighter safety. The *18 Situations That Shout Watch Out*, *10 Standard Fire Orders*, *Downhill Line Construction Guidelines* and *L.C.E.S. (Lookouts, Communications, Escape Routes and Safety Zones)* all include communications as a cornerstone. In the wildland-urban intermix environment, the capability of a communications system to function across jurisdictional boundaries is even more critical. These fires nearly always involve numerous fire agencies, often operating under a unified command structure. Agencies must provide their firefighters with communications systems capable of functioning in these environments. Failure to do so threatens firefighters' safety and limits their ability to perform



Figure 5—Wildland firefighting has specific requirements for training and equipment.



Figure 6—The size and weight of firefighting apparatus can present problems for firefighters in the wildland-urban intermix.

Fire shelters may be the most critical piece of PPE for firefighter safety in the wildland-urban intermix. Although the fire shelter is intended as a tool of last resort, it has saved the lives of hundreds of firefighters in both the wildland and wildland-urban intermix environments. Fire agencies must provide all firefighters who may be working in the wildland-urban intermix with both the fire shelter and the training needed to use it as intended.

Physical fitness, the physical ability to do the job at hand, is another key area where fire agencies can have a positive influence on firefighter safety (Figure 8). Management support for individual firefighter fitness will help reduce heat stress injuries and heart attacks, while

effectively. Communications failures or overload have been identified as a serious problem on both the Oakland Hills Fire and the Spokane, Washington, Fire Storm Fires in 1991, and as a causal factor of the 1993 Glenallen Fire fatalities in Los Angeles County.

Personal protective equipment affects the firefighter in several ways in the wildland-urban intermix. The necessary level of protection from radiant heat must be balanced against the risk of heat stress from too many layers of protective clothing. While most agencies are feeling the pressure of reduced budgets, it is essential that firefighters be supplied with the proper protective clothing and equipment. *NFPA 1977 Standard on Protective Clothing and Equipment for Wildland Fire Fighting*, (Figure 7) specifies the performance and design requirements for wildland fire Personal Protective Equipment (PPE). Wildland fire PPE generally is not interchangeable with the PPE needed for structural fire suppression. High temperatures, low humidity, and high levels of physical activity are extremely demanding on firefighters. Their protective clothing and equipment should not increase the heat stress. Australian studies on “Project Aquarius” emphasize that wildland PPE should be designed “to let the heat out, not keep the heat out.”

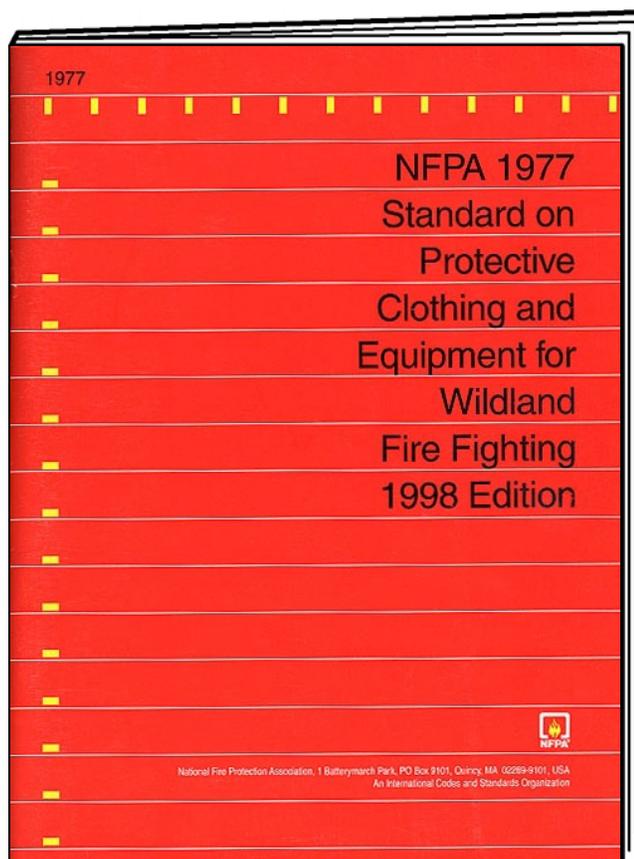


Figure 7—National Fire Protection Association Standard 1977 sets the requirements for wildland fire personal protective equipment.

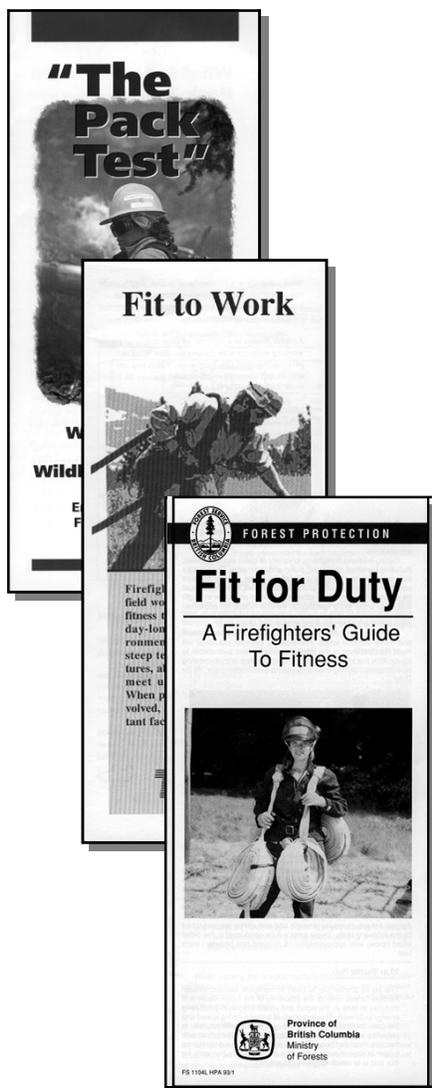


Figure 8—Physical fitness is essential to safe operations on all wildfires.

increasing firefighters' ability to move quickly along escape routes to safety zones. Heart attacks were among the leading causes of firefighter fatalities on both wildfires and structural fires during the 1990's.

The last area where the fire agency has a major role in firefighter safety is in developing policies and standard operating procedures (SOP's) specific to the wildland-urban intermix fire operations. Because these intermix fires

may not be a daily occurrence for some fire agencies, it is essential that their firefighters have clear direction when these events do occur. Specific items included in these policies and SOP's must include chain of command, communications practices and frequencies (including interagency coordination), suppression priorities, and safety practices. A critical question that must be addressed in training deals with the best place to survive a burnover or entrapment: in an engine cab or in a fire shelter. Firefighters were forced to make split-second decisions to deploy fire shelters or remain with their engines during several entrapments in Southern California during 1993 and 1996. Those choices should be well explained in department policy, and reinforced through training, long before firefighters have to make such a decision.

The Firefighter

Although firefighters are the last of the four groups discussed, they are the most critical players in affecting their

own safety on wildland-urban intermix fires. Shakespeare said: "To thine own self be true." This is especially applicable to the individual firefighter. Although many of the actions of the community, homeowner, and fire agency can help ensure firefighters' safety, firefighters as individuals, or as members of a team, are ultimately responsible for their own safety.

Fitness—Whether or not a fire agency has fitness requirements or sponsors a voluntary fitness program, firefighters have the responsibility to ensure that they are physically fit for the job. A review of wildland fire fatalities from 1990 to 1998 shows that 28 fatalities, or 21% of the total, were due to heart attacks (Figure 9). Firefighters must be in good condition to successfully function on long, hot shifts exceeding 12 hours for several days in a row, especially if they then have to move quickly along an escape route to reach a safety zone. Failure to move quickly in such a situation may endanger not only the firefighter, but fellow firefighters as well.

Training—Firefighters involved in structural and wildland fire suppression

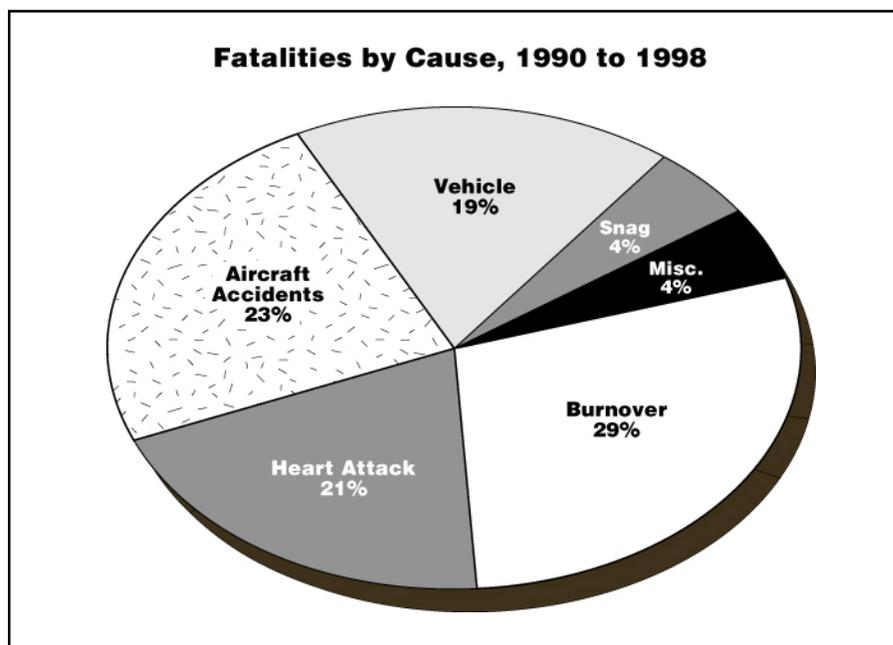


Figure 9—Heart attacks are a leading cause of death for wildland firefighters.

must be trained in both areas of fire suppression. If they lack that training, or are uncomfortable with its adequacy, individual firefighters must address that concern with their supervisor. Failure to understand the fundamentals of topography, strategies, tactics, behavior, or weather has been recognized as a causal factor leading to several burnovers that resulted in serious injuries or death. Numerous avenues are available for firefighters to increase their knowledge of wildland fire. Failure to learn about wildfires could cost firefighters their lives.

The Human Factor—The best training is wasted if the individual involved in a wildland-urban intermix fire is unable to apply that training and respond appropriately. Situational awareness—knowing what is happening around you—is important for firefighters in the intermix if they are to safely and efficiently perform their job. A number of guidelines (*10 Standard Fire Orders*, *18 Situations that Shout Watch Out*, *LCES*, etc.) can help, but they all require firefighters to recognize and respond to the situation in an approved manner to ensure their own safety.

All firefighters, regardless of their position in the fire organization, must do

all they can to foster communications with other individuals above and below them. The constant, open channel of communications established in ordinary circumstances will be especially important when conditions develop that are out of the ordinary, or that may become life threatening. Firefighter safety is enhanced when all members of a fire crew can offer observations or share concerns about developing situations (Figure 10).

Personal Protective Equipment—Wildfires expose the firefighter to a series of hazards different from those faced on structural fires. The PPE is unique to each job, but neither structural nor wildland PPE protects the firefighter if it is used improperly or, worse yet, if it is not used at all. Each firefighter has an individual responsibility to use the appropriate PPE on a wildland-urban intermix fire. Failure to do so may result in heat stress, burns, or death.



Figure 10—Maintaining constant communications is a cornerstone of fire safety.