

# Wildfire Hazard in the Wildland-Urban Interface

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## INTRODUCTION

Wildfire is a natural hazard that occurs throughout a variety of regions in the United States. Wildfire severity and frequency may depend on a host of factors, not limited to a region's topography, fire history, forest management practices, weather patterns and fuel type. Many ecosystems—including southwestern California chaparral, Midwest tallgrass prairie, and various pine stands of the Southwest, Rocky Mountains and Southeast—depend on fire for natural biological functions.<sup>1</sup> In addition to ecosystem benefits, however, wildfire acts as a risk to communities by jeopardizing personal safety and property, threatening watersheds, crippling infrastructure, prompting erosion and landslides, temporarily displacing residents, impacting recreation and tourism opportunities, and leading to other destructive outcomes. These economic, ecologic, and social risks can be exacerbated through land use and development decisions that allow increased growth in areas prone to wildfire—the area known as the wildland-urban interface, or WUI.

It is common for many communities to perform wildfire mitigation in the WUI. These techniques, such as thinning trees on private and public lands, maintaining forest health through appropriate management, and requiring non-flammable building materials, will reduce wildfire risk to existing and future homes and residents in the WUI. Such programs should not, however, overshadow a broader discussion on the consequences of allowing continued growth in fire prone areas. Fire suppression costs consume more than \$1 billion from the federal budget on an annual basis, most of which is devoted to putting out fires in the WUI.<sup>2</sup> Given the predicted increase in wildfire severity and occurrence due to climate change, municipalities would be prudent to consider fire suppression costs as part of their long-term sustainability goals. Growth management decisions that steer development away from high and extreme fire hazard areas will ultimately give communities an economic advantage.

## THE ROLE OF REGULATION

Regulations for subdivision access, driveway and turnaround dimensions, structural requirements, and defensible space<sup>3</sup> around a home are typically contained within a community's zoning and building code or in a separate wildfire hazard ordinance. These regulations apply to new development, and may be adjusted according to a parcel's hazard ranking. Most communities also require that remodels and additions (e.g. decks, sheds, etc.) comply with wildfire mitigation requirements.

It is difficult, however, to address those homes that existed prior to adopted regulations. In this case, community leaders must rely on voluntary measures and education in order for mitigation to occur. Since the Healthy Forest Restoration Act (2003), many communities have written Community Wildfire Protection Plans. These are comprehensive approaches to guide decision makers, homeowners, and fire officials in designing better approaches toward mitigating wildfire risks. Other voluntary programs, such as the Firewise Communities program, go a long way in helping communities understand and address wildfire risk.



Other challenges in reducing wildfire risk include varying perceptions of risk. A good deal of research indicates that homeowners often underestimate their individual risk to wildfire.<sup>4</sup> This can lead to resistance to regulations on private property or decisions to live in areas that are prone to recurring wildfires. Additionally, a lack of financial resources for performing mitigation such as tree thinning or roof replacements, may inhibit well-intentioned homeowners.

## GOALS FOR REDUCING WILDFIRE RISK IN THE WUI

There is no one approach that will satisfy wildfire risk for every community. It is important that planners and decision makers consider wildfire hazard from multiple angles that mitigate risks and keep people out of harm's way. Further, a blend of voluntary, education, and regulatory measures are best implemented when a variety of stakeholders, including homeowners, fire fighters, planners, foresters, engineers, and developers, are involved.

The primary goals of this chapter are to:

- Help the reader understand that wildfire threat is present in many regions throughout the United States;
- Underscore how economic, social, and ecologic impacts of wildfire are further exacerbated by continued uncontrolled growth in the WUI
- Provide examples of regulatory approaches and enforceable mitigation techniques that reduce wildfire risk to people and property; and
- Show that limiting the extent of the WUI through growth management restrictions can dramatically decrease risk exposure and economic loss brought on by wildfires



Image sources: (from left to right) [http://www.maj.com/gallery/the-girl-next-door/pictures/Other/wildfire\\_2007.jpg](http://www.maj.com/gallery/the-girl-next-door/pictures/Other/wildfire_2007.jpg); [http://www.healthline.com/blogs/outdoor\\_health/uploaded\\_images/wildfire-702922.jpg](http://www.healthline.com/blogs/outdoor_health/uploaded_images/wildfire-702922.jpg); <http://oregonstate.edu/dept/ncs/photos/wildfire.jpg>

<sup>4</sup> Steelman, Todd. 2006. Addressing the Mitigation Paradox at the Community Level. In *Wildfire Risk: Human Perceptions and Management Implications*, edited by W. E. Martin, C. Raish, and B. Kent, Washington DC: RFF Press, 64-80.

<sup>1</sup> National Interagency Fire Center: Communicator's Guide to Wildland Fire (web resource: [http://www.nifc.gov/preved/comm\\_guide/wildfire/fire\\_6.html](http://www.nifc.gov/preved/comm_guide/wildfire/fire_6.html). Accessed April 10, 2008).

<sup>2</sup> Headwaters Economics, 2007 (web resource: <http://headwaterseconomics.org/index.php>)

<sup>3</sup> Defensible Space is the designated area surrounding a building or buildings that will be subject to fuel modification measures intended to reduce fire-spread potential between the structure and adjacent vegetation.

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## NATURAL HAZARDS/WILDFIRE

### KEY STATISTICS:

- Only 14% of forested western private land adjacent to public land is currently developed for residential use. Based on current growth trends, there is tremendous potential for future development on the remaining 86%<sup>5</sup>
- During five of the last eight years, the Forest Services' wildfire suppression expenditures have topped \$1 billion, and total federal wildland suppression expenditures have been more than \$1.4 billion<sup>6</sup>
- A recent study by the Office of Inspector General found that the bulk of US Forest Service (USFS) fire suppression costs were spent on the protection of private property built in the WUI<sup>7</sup>
- Two factors that are the primary determinants of a home's ability to survive wildfire are the home's roofing material and the quality of the "defensible space" surrounding it<sup>8</sup>
- Climate change calculations show that the wildfire season in the western United States during the past 30 years has expanded by 78 days. Substantial fires—those that burn more than 1,000 hectares—have gone from burning an average of nearly 8 days to burning for 37 days. Between 1987 and 2003, fires burned nearly seven times the area of western-U.S. forests as they did from 1970 to 1986<sup>9</sup>



## WILDFIRE IN THE WILDLAND-URBAN INTERFACE (WUI)

		Achievement Levels			References/Commentary	Code Examples/Citations
		Bronze (Good)	Silver (Better)	Gold (Best)		
  	Remove Obstacles	<ul style="list-style-type: none"> <li>▪ Eliminate or reduce code barriers that prohibit residents from tree removal – a necessary action to thin property and create defensible space</li> <li>▪ Modify or override private community covenants (HOAs, CC&amp;Rs) that require fire-prone materials such as wooden siding or roofs</li> </ul>	<ul style="list-style-type: none"> <li>▪ Decrease allowable densities in fire-prone areas</li> </ul>	<ul style="list-style-type: none"> <li>▪ Eliminate residential uses in the WUI</li> <li>▪ Hold homeowners responsible for wildfires started on their private property and escaping to surrounding forests</li> </ul>	<ul style="list-style-type: none"> <li>▪ A risk that communities can face is related to absentee homeowners who purchased lots and have not yet developed their property, and/or have allowed hazardous fuels to accrue. It is important to address these fire risks, especially in consideration of surrounding neighbor who have performed mitigation measures</li> <li>▪ In order to overcome differences between fire fighter street width standards and new urbanist design approaches, the state of Oregon convened a stakeholder group to identify with a set of statewide design guidelines that would satisfy both safety issues and retain community design goals: Neighborhood Street Design Guidelines <a href="http://www.oregon.gov/LCD/docs/publications/neighborstreet.pdf">http://www.oregon.gov/LCD/docs/publications/neighborstreet.pdf</a></li> </ul>	<ul style="list-style-type: none"> <li>▪ Requiring that clearing and mitigation techniques be done on a subdivision-wide scale and incorporated into the overall design rather than lot by lot ensures that landscape scale mitigation captures areas around subdivisions and in open space areas are treated in addition to simply around individual buildings. (Douglas County, CO: <a href="http://www.douglas.co.us/community/planning/documents/ZR-Section17.pdf">http://www.douglas.co.us/community/planning/documents/ZR-Section17.pdf</a>)</li> <li>▪ Australia promotes a different model of bushfire (i.e. wildfire) prevention and suppression than the United States by emphasizing personal risk and responsibility ("If you own the fuel you own the fire") and encouraging a shelter-in-place system where residents who are adequately protected can stay in place during a wildfire. Australia's Rural Fires Act (New South Wales) gives the rural fire service the power to order removal of hazardous fuels across both public and private lands; homeowners can be fined if they fail to perform hazardous fuel reduction <a href="http://www.austlii.edu.au/au/legis/nsw/consol_act/rfa1997138/">http://www.austlii.edu.au/au/legis/nsw/consol_act/rfa1997138/</a></li> </ul>

<sup>5</sup> Headwaters Economics: URL: <http://headwaterseconomics.org/index.php> (2007)

<sup>6</sup> Gebert, Krista. "Wild fire suppression costs." Posted September 22, 2007. URL: <http://www.allbusiness.com/government/government-bodies-offices-regional-local/5514677-1.html>

<sup>7</sup> OIG (Office of Inspector General). 2006. Audit Report: Forest Service large fire suppression costs. Report No. 08601-44-SF

<sup>8</sup> Colorado State University Extension: URL: <http://www.ext.colostate.edu/Pubs/natres/06302.html> (2007)

<sup>9</sup> Milius, Susan. "Wildfire, Walleyes and Wine." Week of June 16, 2007; Science News Online. Vol. 171, No. 24, p. 378 URL: <http://www.sciencenews.org/articles/20070616/toc.asp>

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**NATURAL HAZARDS/WILDFIRE**

		Bronze (Good)	Silver (Better)	Gold (Best)	References/Commentary	Code Examples/Citations
	Create Incentives	<ul style="list-style-type: none"> <li>Coordinate water access among firefighters, engineers, and wildfire mitigation plan requirements for the placement and regulation of cisterns and other water storage tanks</li> <li>Offer vegetation management plan assistance preparation to homeowners</li> </ul>	<ul style="list-style-type: none"> <li>Allow community cisterns in lieu of individual cisterns where lots do not allow easy access or include placement of dry hydrants that allow communities to avoid costly infrastructure improvements</li> <li>Provide a density bonus for cluster developments if lots located outside fire-prone areas</li> </ul>	<ul style="list-style-type: none"> <li>Link the site plan review and approval process with wildfire mitigation plans by tying final approval with the certificate of occupancy and/or building permits</li> <li>Tie insurance programs with wildfire mitigation plans</li> <li>Adopt a TDR system that transfers development rights out of fire-prone areas</li> <li>Provide an ad valorem tax incentive for wildfire mitigation</li> </ul>	<ul style="list-style-type: none"> <li>Creating greater links between the comprehensive planning process and regulations will ensure implementation of wildfire mitigation and protection goals. Alachua County, Florida's Comprehensive Plan (adopted 2005) added a section in their plan to address Wildfire Mitigation LDRs and as of February 2008 incorporated this language into their LDRs</li> <li>Rick Pruetz, FAICP, has prepared TDR studies and ordinances for communities throughout the US. His book <i>Beyond Takings and Givings</i> features TDR examples and explanations: <a href="http://www.beyondtakingsandgivings.com/beyond.htm">http://www.beyondtakingsandgivings.com/beyond.htm</a></li> <li>Firewise Communities program helps communities address wildfire risk by educating homeowners and decision makers about issues such as emergency vehicle access, structure design, and fuels build-up, to reduce fire hazard risk to people and structures. Firewise also brings together a variety of stakeholders to ensure implementation and long term success of mitigation efforts: <a href="http://www.firewise.org">http://www.firewise.org</a></li> <li>Community Wildfire Protection Plans (CWPPs) are a mechanism for communities to receive grant money for mitigation projects. CWPPs must follow specific criteria in accordance with the Healthy Forest Restoration Act (2003): <a href="http://www.healthyforest.info/cwpp/">http://www.healthyforest.info/cwpp/</a></li> </ul>	<ul style="list-style-type: none"> <li>Subdivision layout and wildfire mitigation is more effective when tied to the applicant approval process. This ensures that the work will get done prior to residents moving in. Standard language includes: "Prior to obtaining a permit for construction, the builder must comply with the Vegetation Management Plan requirements for defensible space within 30 feet of the structure (Zones 1 and 2). Implementation of defensible space standards from 30 to 150 feet of the structure (zone 3), are required prior to the issuance of an Occupancy Permit. (Prescott, Arizona: <a href="http://www.cityofprescott.net/d/veg_mgt_review.pdf">http://www.cityofprescott.net/d/veg_mgt_review.pdf</a>) Non-compliance with the WUI Code results in a hold on the construction permitting process</li> <li>Insurance companies are using Prescott Fire Department's inspection reports for individual homes to evaluate wildfire risks; the level of risk determined may affect insurance rates and availability. Homeowners are given two years to comply with the risk reduction recommendations</li> <li>The State of Florida's Model Wildfire Mitigation Ordinance requires local governments to grant a one-time ad valorem tax exemption to all improvements to real property made by or for the purpose of wildfire mitigation and completed in accordance with the wildfire mitigation plan</li> </ul>

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		Bronze (Good)	Silver (Better)	Gold (Best)	References/Commentary	Code Examples/Citations
	Enact Standards	<ul style="list-style-type: none"> <li>Ban wood-shake or cedar shingle roofs</li> <li>Require defensible space around new homes located in high risk areas</li> <li>Require fire-resistant materials roofing, building materials</li> <li>Require multiple access/evacuation routes for fire-prone subdivisions</li> <li>Require provision of on-site water storage for adequate fire fighting capacity</li> <li>Require fire-resistant landscaping</li> <li>Ensure access by requiring proper maintenance of roads, driveways, and house addresses and street signs</li> </ul>	<ul style="list-style-type: none"> <li>Adoption of a local or county level wildfire hazard overlay zone to identify high risk areas</li> <li>Require defensible space on remodels and additions (in addition to new structures)</li> <li>Prohibit development on steep slope areas (30%+) where safe fire-fighting access is difficult</li> <li>Require sprinkler systems or added water resources for homes over a certain size to ensure availability for fire fighting; equip passive water sources (e.g.. swimming pools) with appropriate pumps for emergency use</li> <li>Link driveway permits to wildfire mitigation to ensure proper driveway and roadway standards for access and turnarounds, ingress and egress (for evacuation) are met</li> <li>Require developers to remove trees prior to construction, thereby reducing opportunity for homeowners to become attached to the trees and resist removal</li> <li>Require replacement of trees in non-hazardous locations or contribution to community tree fund</li> </ul>	<ul style="list-style-type: none"> <li>Address seasonal home ownership and vegetation maintenance by requiring fuel management</li> <li>Restrict or prohibit development in high-hazard fire areas</li> <li>Add wildfire suppression capital costs (e.g.equipment) to fire impact fees</li> <li>Require development agreements for major subdivisions that provide for local recoupment of fire-fighting expenses due to location in fire-prone areas</li> <li>Allow the Chief Building Official to impose any further site constraints or mitigation requirements to ensure fire fighter safety and further protection of life and property in the WUI</li> </ul>	<ul style="list-style-type: none"> <li>The American Planning Association PAS Report Planning for Wildfires (Schwab and Meck, 2005) highlights progressive WUI guidelines, ordinances, regulations, and provides an example Fire Danger Rating System and Fire Hazard Severity Form</li> <li>The USDA provides a national database of state and local wildfire hazard mitigation programs, including regulatory, community, education, insurance, and other planning approaches toward nonfederal policies <a href="http://www.wildfireprograms.usda.gov">www.wildfireprograms.usda.gov</a></li> <li>The National Fire Protection Association has issued NFPA 299: Standard for Protection of Life and Property from Wildfire</li> <li>The International Code Council has a Wildland-Urban Interface Community Planning Tool Kit, which includes a model 2006 International Wildland-Urban Interface Code</li> <li>The Colorado State Forest Service publication "Creating Wildfire-Defensible Zones", No. 6.302 is a helpful guide with illustrations and explanations of defensible space for homeowners, foresters planners, and fire officials <a href="http://www.ext.colostate.edu/Pubs/natres/06302.html">http://www.ext.colostate.edu/Pubs/natres/06302.html</a></li> </ul>	<ul style="list-style-type: none"> <li>On January 1, 2008 California adopted a new Fire Hazard Risk Map for the State Responsibility Areas (SRA) and new building codes designed to make buildings located in Fire Hazard Severity Zones (FHSZ) fire-resistant. Ignition resistant standards for homes and businesses include: Decks enclosed with ignition resistant material to within six inches of the ground; eaves protected on the exposed side with ignition resistant material; roof built to Class A fire resistant standards in state responsibility areas and in very high Fire Hazard Severity Zones in local responsibility areas; all under-floor areas enclosed; dual-paned tempered glass for all exterior windows; ignition-resistant materials for exterior doors; all exterior vents designed to prevent ember intrusion</li> <li>The Santa Barbara Fire Department Ordinance #5257, High Fire Hazard Area Requirements, establishes minimum brush clearance standards for properties located within the City's high fire hazard areas: vegetation within these areas must be maintained to create an effective fuelbreak by thinning dense vegetation and removing brush and combustible growth from areas within 100 feet of all buildings. A vertical clearance of 13.5 feet within 10 feet of driveways and streets is also required; annual vegetative treatments for grasses, trees, and shrubs and methods of debris disposal are also specified. Special considerations include increased distance of defensible space on slopes greater than 20 percent and permit requirements for removal of trees over four inches in diameter. The ordinance also recommends residents visit the City's Firescape Demonstration Garden</li> <li>The amended Building Code regulations for Eagle County, CO establishes "minimum design and construction standards for the protection of life and property from fire within the Urban/Wildland Interface. The ordinance applies to "all new building construction, exterior modification to existing buildings, and/or additions that increase a building's footprint or number of stories in moderate, high and extreme hazard zones." Construction specific requirements will be enforced based on a site's assigned Hazard Rating</li> </ul>

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	Enact Standards				<ul style="list-style-type: none"> <li>Several states or municipalities, including Oregon, Florida, Wisconsin, Boulder County (CO) have created an urban growth boundary or similar growth management mechanism for limiting resident migration into the WUI. Source: Paterson, Robert. 2007. <i>Wildfire Hazard Mitigation as "Safe" Smart Growth In Living on the Edge: Economic, Institutional and Management Perspectives on Wildfire Hazard in the Urban Interface</i>, Edited by R. Kennedy and A. Troy, New York: Elsevier Ltd.</li> </ul>	<ul style="list-style-type: none"> <li>As part of their Wildfire Regulations (adopted 1/21/03) Eagle County, Colorado requires that Defensible Space be performed for all moderate, high, and extreme hazard areas. Defensible space shall extend a minimum of 70 feet or to the property line for flat lots, and a minimum of 210 feet on the downhill side for lots with a slope of over 40%. The defensible space regulations require that slash and flammable debris be removed from the defensible space zone, and that all trees and shrubs within 15 feet of the structure be removed. Trees and shrubs over 5 feet tall must have an average crown spacing of 10 feet. Groupings of trees are allowed, provided their crowns are at least 10 feet from the structure. Trees remaining in the defensible space must have branches pruned to a height of 10 feet, but not more than 1/3 of the tree height, and ladder fuels removed  <a href="http://www.eaglecounty.us/emergency/wildfires/maps/WildfireRegs.pdf">http://www.eaglecounty.us/emergency/wildfires/maps/WildfireRegs.pdf</a></li> <li>The City of Palm Coast (Florida) Ordinance No. 2001-11 deems properties with excessive fuel/ hazardous vegetation on undeveloped lots located within 30 feet of adjacent structures as a public nuisance. Failure to comply with standards may result in fines or misdemeanor charges  <a href="http://www.municode.com/resources/gateway.asp?pid=13605&amp;sid=9">http://www.municode.com/resources/gateway.asp?pid=13605&amp;sid=9</a></li> </ul>