CHAPTER 14

A REVIEW OF STATE AND LOCAL REGULATION FOR WILDFIRE MITIGATION

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1. BACKGROUND

Wildfire may result from natural processes or as the result of human actions (Ffolliott 1988, Mees 1990). As a natural phenomenon, it is important in sustaining forest health in fire-dependent ecosystems. While some wildfire may be ecologically beneficial, it poses a threat to residential communities located within or adjacent to the forest. Wildfire is considered a hazard when it endangers things that people value, such as life, property and cultural values (Burton et al. 1978). Each year the challenge of protecting Wildland-Urban Interface (WUI) communities captures headlines in American newspapers, as wildfire forces the evacuation of homes.

State governments have been granted police powers to protect the health, safety and welfare of their citizens by the Constitution. With regards to land use policy, the states pass this power to local governments enabling them to adopt regulations to control situations that pose a threat to life and property. In response to wildfire-related losses in the WUI, two states and numerous county and local governments have established regulatory programs to reduce wildfire hazards in high risk areas.

2. BASIS FOR REGULATORY PROGRAMS

Case studies of past wildfire disasters have demonstrated that some homes are more vulnerable to wildfire than others. Two factors have emerged as the primary determinants of a home's ability to survive wildfire. These are the home's roofing material and the vegetative space surrounding it. An analysis of California's Bel Air fire revealed that 95 percent of homes with both non-flammable roofs and at least 10-18 meters of vegetative clearance around the home survived the wildfires (Howard et al. 1973). In the Painted Cave fire of 1990, an 86 percent survival rate of homes with non-flammable roofs and a clearance of 10 meters or more was documented (Foote and Gilless 1996). In the Spokane fire storm of 1991, over 60 percent of the homes lost had little or no defensible space. An analysis of the

T. P. Holmes et al. (eds.), The Economics of Forest Disturbances: Wildfires, Storms, and Invasive Species, 273–293.

losses showed that most of the homes had a proximity to flammable fuels of 7 meters or less. (NFPA 1992).

Additionally, results from the Structural Ignition Assessment Model (SIAM), which includes modeling, field experiments and analysis of case studies, indicate that "the home ignition zone extends to a few tens of meters around a home, not hundreds of meters or beyond. Home ignitions and thus, the Wildland-Urban Interface fire-loss problem principally depend on home ignitibility" (Cohen 2000). Findings from the case studies of past wildfires and the SIAM model demonstrate that defensible space regulations do not have to be draconian to be effective. A minimum of 30 feet of defensible space combined with fire-resistant roofs where topographic slope is minimal, dramatically reduces a property's wildfire vulnerability. Since both the roof type and the landscaping immediately around the home are choices within the control of the homeowner, homeowner cooperation is essential to the success of wildfire risk reduction programs.

If losses can be prevented by two actions on the part of the homeowner, it seems logical that the simplest way to reduce wildfire losses is to establish mandatory requirements for non–combustible roofs and a minimum of 10 meters of clearances around homes in high wildfire risk areas. However, new regulations are often difficult to pass and, in the interest of public safety, local officials attempting to influence homeowners to reduce risk around their homes must first convince homeowners of the need to protect themselves.

3. OBSTACLES TO ADOPTION OF REGULATORY PROGRAMS

Several factors may affect the feasibility of the adoption of regulations. First, the ability to obligate financial resources and dedicate personnel for the administration and enforcement of regulations can limit their practicality for many cash-strapped local governments. Second, requiring defensible space may be unpopular with residents due to the cost of removing vegetation and, in many locations, may be politically unacceptable. Former urban residents often favor the privacy and aesthetics found in an unaltered wildland environment and may underestimate their wildfire risk exposure (Bradshaw 1987, Loeher 1985). Residents may also view defensible space requirements as infringements of private property rights (Winter and Fried 2000). Support for more restrictive regulations seems to increase after a community has experienced a wildfire (Abt et al. 1990).

Even where ordinances have been adopted, a lack of public support can stymie enforcement efforts. Fire managers strive to establish a cooperative relationship with homeowners and may view enforcement of unpopular defensible space standards as counterproductive to the overall goal of community wildfire protection. As a result, it is often more expedient to offer educational programs and

homeowner assistance to motivate homeowners to reduce fuels around their homes. These homeowner education programs have been shown to be effective in encouraging private property owners to take steps to reduce risk (Hodgson 1994, Rice and Davis 1991). Where ordinances have been adopted, most jurisdictions employ a comprehensive approach to wildfire risk reduction. Fire managers use a mix of regulatory, educational, and incentive or assistance programs to motivate homeowners to take responsibility for creating defensible space and their home wildfire safety (Reams et al. 2005).

4. RESEARCH METHODS

This chapter will review state laws and local ordinances for wildfire mitigation, as well as model codes or guidelines for ordinance development. Information for the chapter is from two primary sources. First, an analysis of programs identified in the USDA Forest Service's National Database of State and Local Wildfire Hazard Mitigation Programs, www.wildfireprograms.usda.gov. The website database inventories state and local wildfire mitigation programs implemented to reduce wildfire risk on private ownerships in the WUI. Regulation is one of several program types adopted by state and local jurisdictions described on the website. Other program types identified on the website include community outreach and homeowner education, regional wildfire hazard risk assessments and mapping programs, and homeowner incentives for fuels treatment and removal. The second source of information is a survey of wildfire mitigation program administrators. The survey gathered contextual information about program adoption and implementation and provided insight into the effectiveness of regulation as a tool for reducing wildfire risk.

5. MODEL WILDFIRE PROTECTION CODES

Counties and communities at risk for wildfire need not struggle with the science and legal requirements of developing effective and enforceable wildfire risk reduction ordinances. Model codes or ordinances serve as templates for potential regulations which may be adopted by a jurisdiction. Local decision makers may select all components of a model ordinance for adoption, or may choose only those elements they believe to be most appropriate for their community. Two national organizations, the International Code Council (ICC) and the National Fire Protection Association (NFPA) have developed model Wildland-Urban Interface wildfire protection codes as standards for states and local governments to adopt. In addition, fire protection agencies in three states, California, Florida, and Utah have developed model codes for adoption by local governments in their respective states. These models have found acceptance in many fire-prone communities, where they are either adopted as separate ordinances, or incorporated into the requirements of the zoning ordinance and subdivision

regulations. In California, where there are statewide regulations for defensible space, communities in fire-prone areas are required to either adopt the model code which contains the state standards or one which has more stringent requirements. The model ordinances include:

1. National Fire Protection Association (NFPA) 1144: Standard for Protection of Life and Property from Wildfire, 2002;
2. International Code Council's, International Urban-Wildland Interface Code (UWIC), 2003;
3. California's Local Responsibility Area (LRA) Model Ordinance for the Defensibility of Space and Structures, 1994;
4. Florida's Model Wildfire Mitigation Ordinance, 2004; and
5. Utah's Wildland Urban Interface Standards, 2005.

These comprehensive model ordinances include standards for roofing and the use of fire resistant construction materials, water supplies for firefighting, road, bridge and driveway design, subdivision ingress and egress, vegetative management and road clearance standards. The models generally include provisions for administration, permit requirements, and enforcement.

5.1 Defensible Space

A core concept in the model codes and the resulting wildfire mitigation ordinances is that of structure protection through the creation of defensible space. Defensible space may be defined as an area either natural or manmade where material capable of causing a fire to spread has been treated, cleared, reduced, or changed to act as a barrier between an advancing wildland fire and life, property, or resources. The following excerpt from the Urban-Wildland Interface Code (2003) provides an example of the requirements for defensible space:

> "Persons owning, leasing, controlling, operating, or maintaining buildings or structures requiring defensible spaces are responsible for modifying or removing non-fire-resistive vegetation on the property owned, leased or controlled by said person.
>
> Ornamental vegetative fuels or cultivated ground cover, such as green grass, ivy, succulents or similar plants used as ground cover, are allowed to be within the designated defensible space provided they do not form a means of readily transmitting fire from the native growth to any structure.
>
> Trees are allowed within the defensible space provided the horizontal distance between crowns of adjacent trees, and crowns of trees and structures, overhead electrical facilities, or unmodified fuel is not less than 10 feet (3048mm). Deadwood and litter shall be regularly removed from trees."

Generally, fuel reduction recommendations include both vertical and horizontal separation of vegetative fuels. Vertical separation is achieved through the reduction of ladder fuels, including shrubs and vines and low hanging branches, which might carry fire from the forest floor to the crown. Horizontal separation is achieved by thinning trees to a specified spacing.

Fire protection agencies and organizations are also providing guidance for property owners through educational publications such as Firewise brochures that offer landscaping design options for defensible space. These generally include lists of recommended fire-resistive plant species for the area, as well.

5.2 Wildfire Hazard Risk Assessment Rating Guide

Each of the model ordinances is supplemented with a fire hazard rating guide that allows inspectors to evaluate the fire hazard risk of existing homes and proposed residential developments. The hazard-rating scales differ in complexity and in the weights given to the various factors. Wildfire risk factors generally include: vegetation type, fire history, density of development, building materials, ingress and egress roads, water supply for firefighting, and presence of defensible space. The models recommend that the risk assessments be updated periodically, usually at three or five year intervals.

5.3 Roofing Standards and Defensible Space Requirements

The five model ordinances all contain requirements for both defensible space and fire-resistant roofs, however the specific standards vary. The NFPA 1144 specifications are for 30 feet of defensible space and the use of fire-resistant roofing materials. The types of roofing materials required depends on the risk classification of the property, with the least flammable roof types, Class A roofs, required for high-hazard properties. The area of defensible space required by the UWIC is 30, 50 or 100 feet depending on the hazard classification of the property–moderate, high, or extreme, respectively. Roof requirements are also based on the assessed hazard designation, as well as a property's level of conformance with defensible space standards and the availability of water supplies for fire fighting.

Of the state model ordinances, the California model recommends the most stringent standards. The code requires Class A-rated roofs, and a minimum of 100 feet of defensible space for buildings in the Very High Fire Hazard Severity Zone (VHFHSZ). The Utah Wildland-Urban Interface Standards are based on the UWIC and utilize the UWIC sliding scale for defensible space. Roofing standards are also based on the same factors as the UWIC, however, Class A roof coverings are required in all three hazard categories -- moderate, high, or extreme. The Florida model ordinance recommends Class A roofs, 30 feet of defensible space around structures, as well as 12 feet of defensible space around the perimeter of new developments.

5.4 Vegetation Management Plans

All five model ordinances require property developers to submit Vegetation Management Plans (VMP) with building plans prior to subdivision approval or issuance of building permits. The VMP is a site-specific wildfire analysis that addresses topographic and vegetative features and includes elements and timetables for the removal of slash, ground fuels, ladder fuels, dead trees and the thinning of live trees. A plan for maintaining fuel-reduction measures after initial development is also required. Regulations requiring developers to include a maintenance component in VMP's provide some assurance that wildfire protection afforded by the initial fuel reduction projects will continue to reduce the community's wildfire risk exposure.

6. STATE LEGISLATION

As of mid-2005, only two states, California and Oregon had adopted legislation requiring landowners to conduct vegetative modifications to reduce wildfire hazard. Washington and Colorado have tried unsuccessfully to pass state-level wildfire protection legislation, but have found greater acceptance through creating guidelines and offering assistance to counties and towns that enact vegetation management regulations.

6.1 California

For the purpose of fire protection, California lands are divided into two categories: State Responsibility Areas (SRA's) and Local Responsibility Areas (LRA's). The SRA is the land for which the state has the primary responsibility for preventing and suppressing fires. In LRA's, either local government or federal authorities have primary fire protection responsibility.

California uses a Fire Hazard Zoning system to identify geographic areas that are at severe risk of wildfire. Regulations apply to properties ascertained to be in Very High Fire Hazard Severity Zones (VHFHSZ) in both the SRA and the LRA. The VHFHSZ in the SRA was identified in the "Maps of Fire Hazard Severity Zones in State Responsibility Areas of California" adopted in 1984. The LRA VHFHSZ was mapped in the mid-1990's. In December 2007, California is scheduled to adopt new SRA fire hazard maps using improved mapping techniques, fire science and data. In 2008, new maps of the VHFHSZ in the LRA will be presented and adopted. The maps will form the basis of legal requirements for new wildland-interface building standards, focusing on ignition-resistant building materials for roofs, walls, windows, decks and other building elements. (California Department of Forestry and Fire Protection 2007).

Regulations pertaining to development in the VHFHSZ are found in California's Public Resource Code, the General Code, and the Health and Safety Codes. Public Resource Code (PRC) 4291 was enacted in 1985, initially requiring 30

feet of defensible space around all structures in the VHFHSZ and amended in 2005 to require a minimum of 100 feet of vegetative clearance around structures. Subsequent enactments include PRC 4290, enacted in 1991, which set additional standards for roads and access, signage and building identification, greenbelts, and private water supplies for firefighting. These additional elements continued to raise fire safety standards in the SRA.

Despite these regulations, wildfire continued to threaten homes and lives in California's ever-growing wildland-urban interface. A contributing factor was that regulations at that time did not apply to all fireprone areas of the state, only the SRA.

In 1992, California adopted the Bates Bill (General Code Sec. 51175-51189), to extend wildfire mitigation regulations to LRA. The regulations are comparable to those that existed in the SRA since 1985, and brought fire-hazard reduction regulations to all high-wildfire risk areas throughout the state.

Minimum fire safety standards for development in the VHFHSZ were set forth for local governments to adopt. A wildfire risk assessment of the state was completed in 1995, and model ordinances were drafted. Any jurisdiction located within in the VHFHSZ is required to adopt the model ordinances or demonstrate that restrictions already in place meet or exceed the Bates Bill requirements. The 2005 amendment to PRC 4291 not only extended the minimum clearance around structures in the VHFHSZ from 30 feet to 100 feet or to the property line, it also specified that state law, local ordinance, rule or regulation, or insurance company may require vegetative clearances greater than 100 feet from structures.

Local governments implement the regulations through their building permit and subdivision approval processes. The California Department of Fire and Forestry (CDF) consults with local governments and reviews all proposed construction and development, advising on wildfire mitigation issues. The CDF is responsible for enforcement of the wildfire protection regulations. They employ a force of inspectors to visit homes in VHFHSZ areas and CDF has the authority to fine landowners for failure to comply with regulatory standards.

6.2 Oregon

Oregon adopted the Forestland-Urban Interface Fire Protection Act (Act) in 1997, however, administrative rules implementing the Act were not adopted until 2002. The program, administered by the state, is being phased in slowly in designated high risk counties. To date, the Act has been implemented in two counties, Jackson and Deschutes.

In accordance with the Act, properties designated by the State as Forestland-Urban Interface (FUI) are assessed for wildfire risk based on factors such as climate, natural vegetative fuels, topography, and housing density. The Department of Forestry (DOF) notifies property owners of their assigned classification, whether low, moderate, high or extreme.

The required defensible space standards differ based on the type of roofing materials used. Minimum defensible space distances for homes with non-fire-resistant roofs are: 30, 50, and 100 feet for properties classified as moderate, high, or extreme hazard, respectively. Distances for homes with a fire-resistant roof are 30 feet in moderate and high hazard areas, and 50 feet in areas of extreme hazard.

To implement the Act, the DOF mails all owners of urban-interface forestland a property evaluation form. The form allows owners to self-assess compliance with the required standards. Accredited assessors are trained to assist homeowners with the certification process, provide prescriptions for mitigation work, and may conduct needed property treatments at the landowner's cost. Property owners have two years in which to complete the necessary wildfire risk-reduction measures and return a certification form to DOF. In counties where stricter requirements already exist, those ordinances supersede the state law.

No enforcement or inspection measures are included in the regulations at this time. In the event of a wildfire, the DOF will determine whether the ignition or spread of the fire was directly related to the owner's failure to meet the standards. If a landowner is found to have directly caused the wildfire, the costs of suppression of that fire will be assessed to the owner up to $100,000. Property classifications are updated every five years or when a transfer of ownership occurs.

7. STATE GUIDELINES

Four states: Colorado, Montana, Virginia, and Washington have developed guidance documents to assist local jurisdictions in the development of regulatory programs. The guidelines generally address firesafe subdivision design and wildfire protection measures for existing homes. The state guidelines differ from the model ordinances of California, Florida, and Utah in that they do not contain provisions for administration and enforcement. Furthermore, with the exception of the Virginia guidelines, these documents are not in a regulatory code format. Rather, they are in a less formal descriptive format, often with graphic representations of recommended wildfire protection standards. As found in the state model ordinances, state guidelines for vegetation modification are often more stringent than those provided in the UWIC and NFPA 1144 model codes.

7.1 Hazard Severity Rating and Defensible Space

Similar in content to the UWIC and NFPA model codes, many of the guidelines include wildfire-hazard-severity rating systems to evaluate the wildfire risk to individual properties and subdivisions.

For example, the Washington "Model Fire Hazard Policies and Development Standards for County and City Comprehensive Land Use Plans" establishes a Wildfire-Hazard Rating System with possible classifications of low, moderate, high and extreme fire hazard. A minimum area of defensible space of 50 feet is

established for all properties classified as moderate, high, and extreme wildfire risk.

State guidelines differ in their recommendations for defensible space. The Washington and Virginia guidelines recommend a 50 and 70 foot treatment zone, respectively. Montana and Colorado establish a more complex three-zone modification scheme with varying levels of treatment recommended within each zone These guidelines correlate the extent of the defensible space area to the property's degree of slope. The Montana "Fire Protection Guidelines for Wildland Residential Interface Development" recommend increased distances of defensible space only on the upslope approach to structures (Montana Department of Natural Resources 1993), (figs. 14.1, 14.2, and 14.3). The recommended distances range from 100 feet for level terrain to 150 feet for slopes of 20-30 percent.

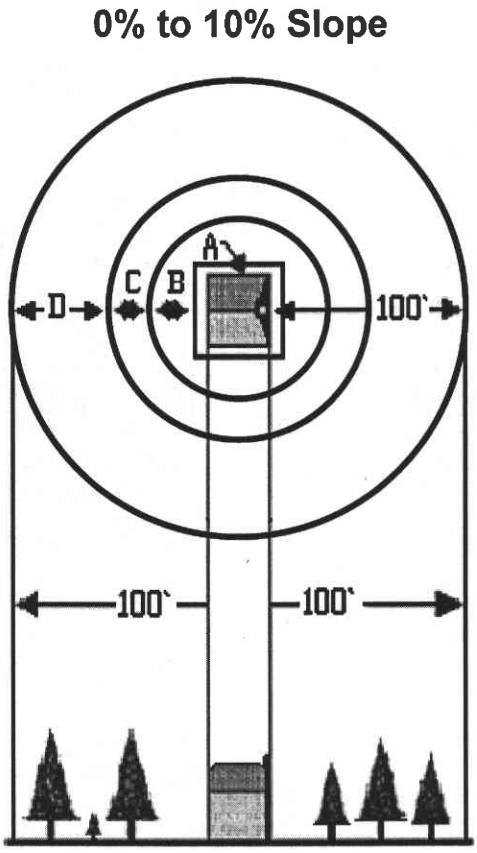

Figure 14.1. Montana Fire Protection Guidelines for Wildland Residential Interface Development.

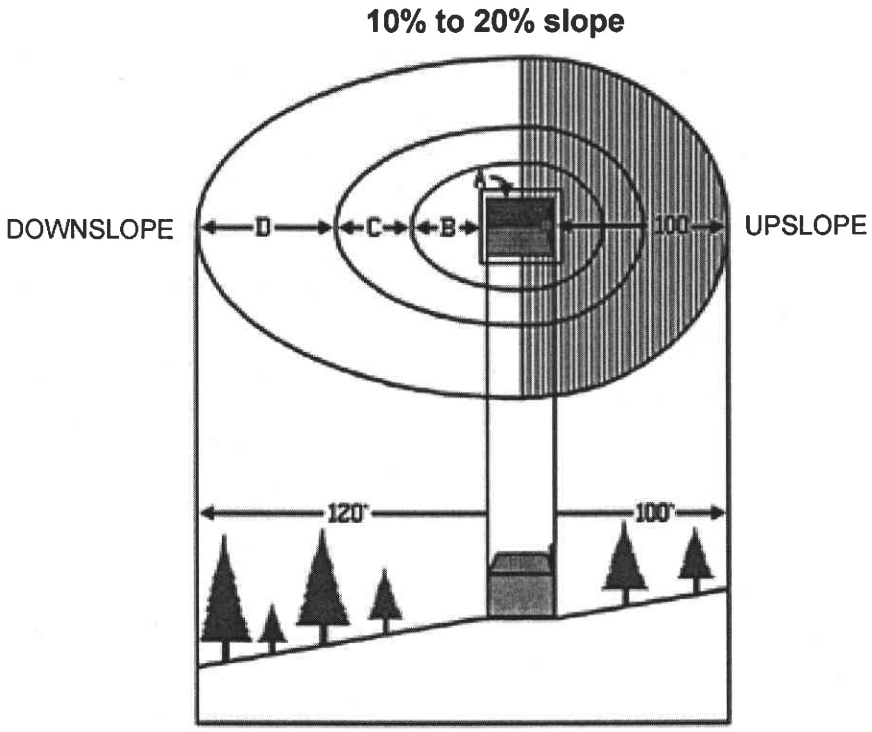

Figure 14.2. Montana Fire Protection Guidelines for Wildland Residential Interface Development; 10% to 20% slope.

The Colorado guidelines also correlate distances of defensible space to slope within a three-zone treatment area. However, the Colorado guidelines call for larger areas of defensible space for both upslope and downslope approaches to the structure with greater distances for upslope areas (Dennis 2003) (fig. 14.4). In addition, the Colorado treatment standards are fairly complex in that modifications in tree and shrub spacing are correlated to the degree of slope; thinning is intensified as slope increases (Dennis 2003) (fig. 14.5).

7.2 Goals for Growth

Washington provides leadership in its guidelines by suggesting that a wildfire protection policy statement be incorporated in high risk county Growth Management Plans. The model policy statement is exemplified in the Yakima County Growth Management Plan with the stated goal to "Protect life and property in rural Yakima County from fire hazards." Florida's guidance documents also

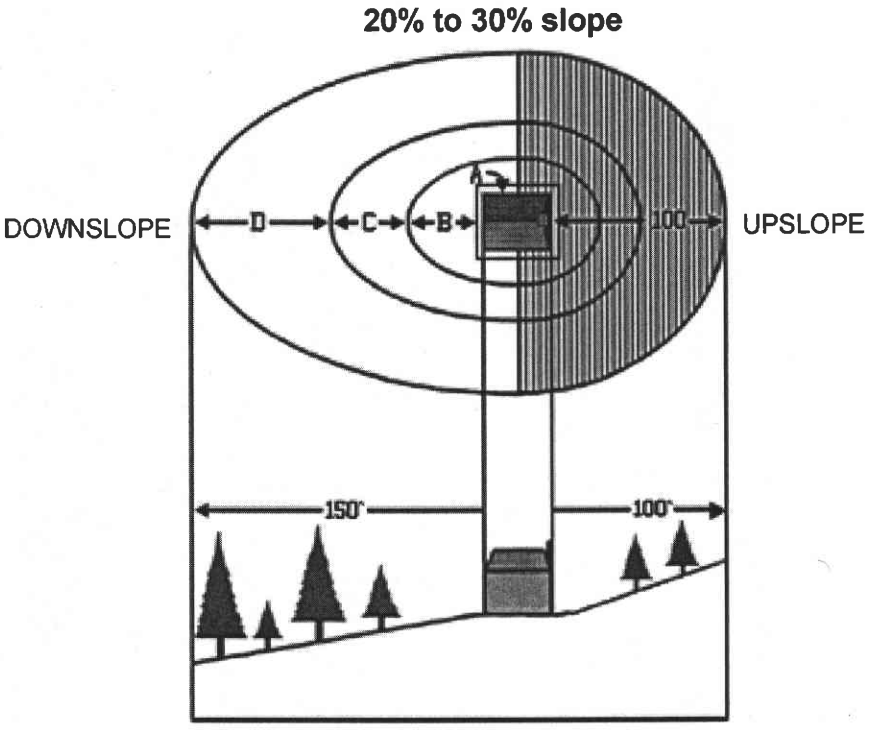

Figure 14.3. Montana Fire Protection Guidelines for Wildland Residential Interface Development; 20% to 30% slope

recommend providing a goal statement in local governments' comprehensive plans to bring protection from wildfire to the forefront for all planning purposes. The inclusion of wildfire protection goals in the vision statement for growth provides important reinforcement for the adoption of wildfire mitigation regulations.

8. LOCAL ORDINANCES

With the exception of California and Oregon, local ordinance development is a voluntary action undertaken by local leaders to address community wildfire protection. Ordinances initiated by county and municipal governments are generally based on the UWIC or NFPA 1144 model code, the respective state's recommended model ordinance, or wildfire protection guidelines. In a review of the regulations listed on the National Database of State and Local Wildfire Hazard

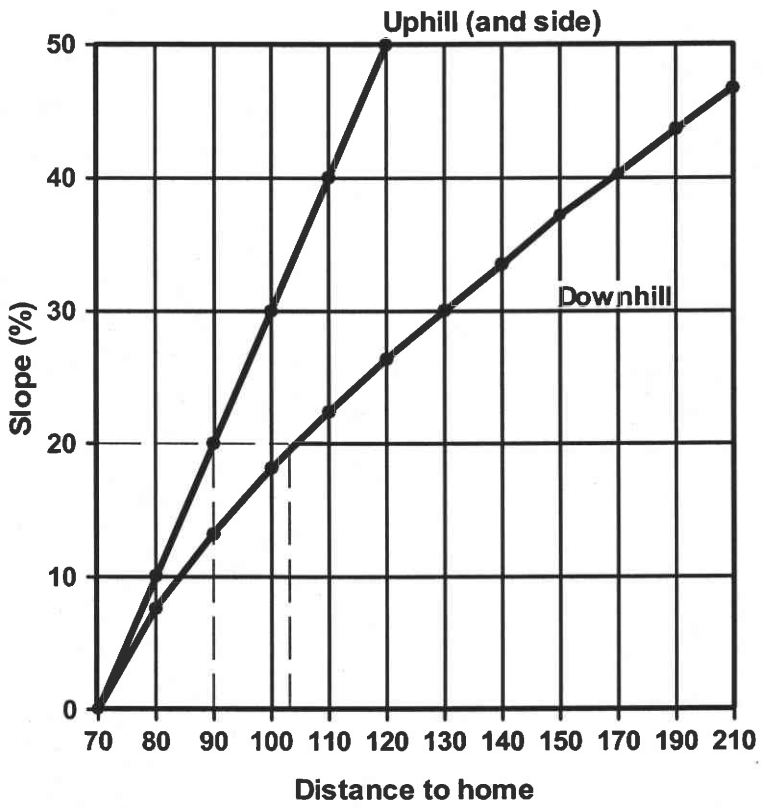

Figure 14.4. Colorado guidelines for defensible space dimension.

% slope	Tree Crown Spacing	Brush and Shrub Clump Spacing
0 – 10%	10'	2 ½ x shrub height
11 – 20%	15'	3 x shrub height
21 – 40%	20'	4 x shrub height
> 40%	30'	6 x shrub height

Figure 14.5. Colorado guidelines, tree crown and shrub spacing.

Mitigation Programs, similar standards were found in many defensible space regulations with varying ranges of requirements for the standards (table 14.1).

Local jurisdictions often modify guidelines and model codes to meet unique characteristics or specific needs of their communities. Some local ordinances focus only on standards and permitting processes aimed at creating firesafe communities as new subdivisions are developed. Others include provisions for fuel modification on existing properties, as well.

A number of jurisdictions have adopted ordinances with defensible space standards that are more stringent than those found in the state's model ordinance to achieve a particular purpose. Local governments in California have adopted some of the most restrictive ordinances in the nation. Required defensible space zones of more than 100 feet are not uncommon and fuel modification treatments can involve removing all flammable, native vegetation (including grasses and shrubs) within 100 feet of the home. For example, the city of Glendale's Hazardous Vegetation Ordinance (Building and Safety Code Vol. VI , Sec. 16, App. II-A), establishes landscape requirements to protect the visual quality of the hillsides and promote fire safety. The ordinance is unique in that a landscape/fuel modification permit must be obtained not only for new construction and significant remodels, but for re-landscaping or grading projects, as well. The selection of plant species for landscaping are also limited by the ordinance and pruning of several indigenous tree species for wildfire protection requires a permit. In addition, a four-zone fuels modification system for a total of 150 feet goes beyond the specified three-zone, 100 feet modification scheme found in the state model.

Table 14.1. Vegetation Management Components of Wildfire Mitigation Programs

Hazard rating guide — Evaluation system for assessing wildfire hazards on individual properties or subdivisions
Vegetation Management Plan — Required submission to demonstrate developer's planned actions for fuels mitigation and maintenance
Generalized Defensible Space Requirements Fuel modification areas of 30 to 150 feet around structures and 12 feet around the perimeter of new developments including: • Removal of flammable vegetation, excluding cultivated ground covers and single trees • Thinning of trees to allow 10 feet of spacing between canopies • Pruning trees to allow 10 feet of spacing between tree canopies and structures • Pruning trees from 6 to 15 feet from the ground • Pruning trees for a vertical clearance of 12.5–15 feet along roads • Clearing brush for a 10-foot fuel break adjacent to roads

The adoption of an established model code with additions and deletions of some model provisions is fairly common. For example Ruidoso, New Mexico has adopted the UWIC in its Land Use Code (Art. III, Ch. 42, Sec. 70). However, requirements for vegetative modifications include unique woodland thinning provisions; thinning requirements establish minimum basal areas by species composition in a zone located 30-60 feet from structures.

Local ordinances may also be designed to specifically address removal of native combustible plant materials that create a wildfire hazard. For example, in Oregon, the Sunriver Homeowners Association's Ladder Fuel Reduction Plan (Sec. 4.01E.2, Sunriver Rules and Regulations) requires the removal of bitterbrush and manzinita, predominant flammable native shrubs. All bitterbrush, noxious weeds, dead vegetation, and other flammable shrubs within fifteen feet of a structure must be removed. In addition, bitterbrush and manzanita must be cleared three feet beyond the drip line of tree branches.

Similarly, in Monrovia, California, where highly combustible native chaparral is prevalent, required treatments include cutting all grass, weeds, and chaparral within 30 feet of homes to 3 inches in height or less; and thinning chaparral plants to an average 12 to 18 feet of separation within 200 feet of the property owner's home (M.M.C. Sec. 8.14.01-8.14.14). In a situation where the 200 feet of clearance from the home extends beyond the property line, the owner remains responsible for the vegetative clearance. To accomplish the required treatment, generally, the affected owner obtains a release from the adjacent owner and treats the property at his own expense.

Developers have a vested interest in complying with wildfire protection regulations. However, new homeowners may be less motivated to maintain fuel modifications once new subdivisions are established and the initial wildfire protection goals achieved. The procedures utilized by local governments in California illustrate one approach to achieving continuity in vegetation treatments after initial subdivision establishment. The local jurisdictions fire departments conduct inspections of all properties and send out "A Notice to Abate Fire Hazard" to owners of properties where the need for treatment has been determined. If the property owner does not complete the required treatments within the designated timeframe, the Fire Department has the authority to have the fuel modifications conducted, with the cost billed as a lien against the property.

Some local governments have included a provision requiring new developments to adopt covenants or deed restrictions for vegetation maintenance in their wildfire protection ordinances. These provisions require future homeowners and/or homeowners' associations to maintain defensible space. Upon purchase of property, the homeowner signs an affidavit accepting the restrictions on the deed. Covenants or deed restrictions typically set out criteria such as minimum square footage, type of construction, architectural style and so forth to ensure that homes built there conform to the neighborhood (Crawford 2005). Incorporating defensible space requirements in restrictive covenants is a new use of an old tool. Subdivision covenants or deed restrictions provide reinforcement

of wildfire protection measures at the neighborhood level. At the time of home purchase, owners are advised of the property's vulnerability to wildfire and their responsibility to protect themselves by maintaining defensible space around the home. For enforcement purposes, the subdivision's Declaration of Covenants, Conditions and Restrictions (CC&R's), generally include a provision enabling the homeowners' association to levy fines should homeowners fail to comply with maintenance requirements.

In some localities, subdivision CC&R's for defensible space maintenance are required by local ordinances. For example, Santa Fe County, New Mexico through its Urban Wildland Interface Code (Ordinance No. 2001-11), requires vegetation management measures to be recorded in the covenants of all new subdivisions of twelve or more lots. Local code may also direct subdivision maintenance of fuel treatments in common areas. The City of Ormond, Florida addresses this need in its Land Development Code (Ch. III, Art.13A). The Code stipulates that the developer must prepare a greenbelt and/or conservation area maintenance plan that provides for the management of common areas for fuel reduction and hazard mitigation by the property owners' association. The plan must be incorporated in to the subdivision's CC&R's and recorded with the final plat.

9. INSURANCE PROGRAMS

Although insurance requirements differ from direct government regulations, they serve to reinforce wildfire protection regulatory programs by introducing a clear, economic incentive for property owners to undertake measures to reduce wildfire risk. Defensible space requirements to obtain insurance coverage can be quite stringent in some high fire hazard areas of California. For example, in Glendale, the state insurance program, the Fair Plan can require up to 400 feet of fuels treatment around structures. In addition, if brush exposure is down-slope from structures and over 30 degrees, only half of the cleared distance is counted. Under the Fair Plan, the clearance distance requirement applies to vegetation that extends beyond the property boundary. If the property owner is unable to conduct the treatment in the area extending into the neighboring ownership, a surcharge, based on the distance of the untreated area, will be applied to each $1,000 of insurance. The surcharge is removed once the treatment is accomplished.

Insurance availability for homes in high wildfire risk areas in other states is an emerging concern due to increased losses experienced by insurers in recent years. In 2003, State Farm Insurance Company began implementing a program to reduce the potential for future financial losses in some high hazard areas. The program is underway in Colorado, Arizona, and New Mexico. Over a three year period, 22,000 homes located in the targeted states will be inspected to identify fuel modifications and other mitigation measures needed to reduce wildfire hazard. Homeowners will have 24 months to complete the recommended treatments. After the allotted time period, agents will conduct follow-up inspections

for compliance. If wildfire safety measures have not been completed, non-renewal of the insurance policy for the property may be considered.

Collaboration with local fire officials can facilitate the insurance company's property evaluations. For example, in Prescott, Arizona, the Fire Department's inspection reports for individual homes are being used as a basis for evaluating wildfire risk to determine policy coverage for individual homes.

A significant role exists for insurance companies in helping to create an effective framework of wildfire risk mitigation strategies. Kovacs (2001) points to areas of particular importance, beyond providing compensation for property loss. These include public education through the industry's on-going involvement in wildfire management programs, such as California's Fire Safe Council and the Firewise Community network. Second, the industry provides powerful incentives for hazard mitigation to residents of Wildland-Urban Interface communities through insurance pricing. Third, the insurance industry continues to function as active stakeholders in community wildfire reduction efforts through promotion of safer land use, along with improved building practices and standards.

10. INSIGHTS DRAWN FROM PROGRAM ADMINISTRATORS

During the spring and summer of 2005, researchers surveyed managers and administrators of wildfire risk reduction programs listed and summarized on the National Database of State and Local Wildfire Hazard Mitigation Programs website, www.wildfireprograms.usda.gov. The purpose of the survey was to gather additional information directly from program officials concerning the goals and objectives of their programs, the obstacles they have experienced in their work, and their recommendations for the most cost-effective methods to reduce risks to communities. Administrators representing 29 regulatory risk reduction programs responded to the survey.

10.1 Program Goals and Objectives

One of the attributes of interest was the extent to which regulatory-based risk reduction programs integrate other broad goals and objectives. For example, do programs that oversee the implementation of building codes also incorporate outreach and public education activities into their efforts? We found that respondents from each of the 29 regulatory-based programs include activities designed to help community residents understand, not only relevant defensible space requirements, but also the underlying wildfire risks and a variety of established mitigation strategies. Similarly, 28 of the 29 regulatory-based efforts include specific activities to help home and property owners establish and maintain a commitment to vegetation management and to assist in the removal and disposal of vegetative material. Moreover, all 29 administrators of these programs report that

they examine wildfire risk criteria, attempt to evaluate the overall levels of risk to communities, and designate specific areas of high risk. Clearly, the responses of these administrators suggest that regulatory-based wildfire risk reduction efforts include a variety of related program objectives designed to provide residents with information concerning the risks they are facing, the actions they may take to reduce that risk, as well as the specific legal requirements, standards, and guidelines applicable to their communities.

Next, we were interested in the types of regulations these programs are administering. We found that the most common types of regulations are those for subdivisions and residential development, with 75 percent of respondents overseeing these requirements. Other commonly used regulations for wildfire risk reduction or mitigation included implementation of state guidelines (62 percent), building codes (65 percent), and fire codes, (59 percent). Roughly one-third of the respondents administer zoning ordinances (34 percent) and land-use codes (31 percent) that include vegetation management provisions. The least commonly administered regulations among the respondents were real estate disclosure, with about 27 percent of respondents implementing this type of regulation. Only the State of California requires disclosure of wildfire risk classification in real estate transfers.

10.2 Obstacles to Implementation

We asked the administrators to identify obstacles that they believe are impeding progress toward reducing wildfire risk within their jurisdictions. After reviewing a list of potential obstacles, they were asked to indicate the extent to which each item is an obstacle or impediment to their efforts by giving each a score from 0–5, with 5 indicating an extreme obstacle. According to the respondents, the most serious obstacles facing their programs are budgetary constraints (3.6 on a 5-point scale). In addition, respondents reported that negative attitudes among property owners are often impediments to reducing wildfire risk. These may include public apathy (3.17 on a 5-point scale) and resistance from homeowners concerning removal of dangerous vegetation and maintaining a more fire-resistant landscape (average score of 2.93). The average responses are presented in table 14.2.

10.3 Emerging Strategies for More Effective Regulatory Programs

As state and local decision makers struggle with how best to reduce wildfire risks and overcome budgetary constraints, strategies that leverage resources, such as forming collaborative relationships with other organizations are increasingly attractive. The American Planning Association (APA) recently called for increased pre-fire planning, citing the sheer volume of new development in the Wildland-Urban Interface. The authors of the APA report, Planning for Wildfires,

Table 14.2. Descriptive Statistics, Obstacles Reported by Wildfire Program Administrators

	N	Mean
Budget is an obstacle	29	3.5862
Apathy among prop. owners	29	3.1724
Homeowner resistance	29	2.9310
Inadequate enforcement of regs	29	2.5862
Tree protection ordinances	29	1.9655
Legal appeals to trt. adjacent public lands	29	1.9310
Need more technical help	29	1.7931
Constraints from env. regs	29	1.7586
Lack of qualified staff	29	1.5172
Inadequate public input into program	29	1.4138
Low coop. among stakeholders	29	1.3793
Valid N (listwise)	29	

state that the rapid growth of many of these communities makes it imperative that residents, business owners, developers and local decision makers adopt strategies for safer designs for new neighborhoods and risk-mitigation for existing developments. "Safe Growth" has become an important element of the anti-sprawl, environmentally friendly "Smart Growth" movement among professional planners. In addition, they point to an increasing federal emphasis on mitigation planning as a way to reduce the damages associated with catastrophic wildfire. This emphasis is seen in the Disaster Mitigation Act of 2000, as well as the Healthy Forests Restoration Act of 2003 (Schwab and Meck 2005).

There is ample evidence that administrators of regulatory-based programs are working with other agencies from various levels of government to formulate more effective pre-fire plans to reduce wildfire risks. According to our survey of administrators, twenty-seven of the twenty-nine reported that they participate in collaborative partnerships, with a mean of three different levels of government–local, county, state, or federal–represented. This indicates that most administrators regularly interact with multiple public decision makers, thus increasing the likelihood of more coordinated implementation of current regulations, as well as more coherent planning for future risk reduction standards and requirements.

In addition, program administrators recommend several specific program activities they have found to most valuable in reducing risk within their jurisdictions. We asked administrators to indicate, on a scale of 1-5, with 5 indicating "extremely cost effective", the specific program activities they have found to be most cost-effective. According to their responses, these risk reduction activities have been most effective:

Regulations for fuels treatment in new developments (3.96),
Meeting with neighborhoods and communities (3.72),

Public education (3.52),
Cost/Share assistance for homeowners' fuels treatment (3.52), and
Demonstration Projects (3.44).

From these recommended program activities, it is clear that administrators favor a more comprehensive approach to reducing risk that entails implementing legal requirements while also offering specific instruction and assistance to property owners.

These survey results and the information compiled for the National Database of State and Local Wildfire Hazard Programs website suggest that regulations play an important role in a comprehensive approach to reducing wildfire risk at the state, local and community levels throughout the nation. Furthermore, mitigation efforts are often developed from collaborative plans that incorporate goals of multiple stakeholders to achieve continuity in mitigation practices across high fire risk landscapes. Comprehensive regulatory programs include: 1) state laws or guidelines to direct local governments, 2) growth management or comprehensive plans that incorporate wildfire risk reduction goals at the regional level, 3) county and municipal ordinances that establish specific requirements for developers and property owners, and 4) mechanisms for maintaining defensible space such as inspection/notification programs or the use of deed restrictions to drive homeowners' mitigation efforts at the subdivision level. However, as demonstrated in the survey results, for regulatory-based efforts to be effective, administrators need adequate funding, appropriate technology to assess risk to communities, clear guidelines to implement, and the support of a public that is often skeptical about the benefits of vegetation management and enhanced building codes.

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CHAPTER 14

A REVIEW OF STATE AND LOCAL REGULATION FOR WILDFIRE MITIGATION

Terry K. Haines, Cheryl R. Renner, and Margaret A. Reams

1. BACKGROUND

Wildfire may result from natural processes or as the result of human actions (Ffolliott 1988, Mees 1990). As a natural phenomenon, it is important in sustaining forest health in fire-dependent ecosystems. While some wildfire may be ecologically beneficial, it poses a threat to residential communities located within or adjacent to the forest. Wildfire is considered a hazard when it endangers things that people value, such as life, property and cultural values (Burton et al. 1978). Each year the challenge of protecting Wildland-Urban Interface (WUI) communities captures headlines in American newspapers, as wildfire forces the evacuation of homes.

State governments have been granted police powers to protect the health, safety and welfare of their citizens by the Constitution. With regards to land use policy, the states pass this power to local governments enabling them to adopt regulations to control situations that pose a threat to life and property. In response to wildfire-related losses in the WUI, two states and numerous county and local governments have established regulatory programs to reduce wildfire hazards in high risk areas.

2. BASIS FOR REGULATORY PROGRAMS

Case studies of past wildfire disasters have demonstrated that some homes are more vulnerable to wildfire than others. Two factors have emerged as the primary determinants of a home's ability to survive wildfire. These are the home's roofing material and the vegetative space surrounding it. An analysis of California's Bel Air fire revealed that 95 percent of homes with both non-flammable roofs and at least 10-18 meters of vegetative clearance around the home survived the wildfires (Howard et al. 1973). In the Painted Cave fire of 1990, an 86 percent survival rate of homes with non-flammable roofs and a clearance of 10 meters or more was documented (Foote and Gilless 1996). In the Spokane fire storm of 1991, over 60 percent of the homes lost had little or no defensible space. An analysis of the

T. P. Holmes et al. (eds.), The Economics of Forest Disturbances: Wildfires, Storms, and Invasive Species, 273–293.

losses showed that most of the homes had a proximity to flammable fuels of 7 meters or less. (NFPA 1992).

Additionally, results from the Structural Ignition Assessment Model (SIAM), which includes modeling, field experiments and analysis of case studies, indicate that "the home ignition zone extends to a few tens of meters around a home, not hundreds of meters or beyond. Home ignitions and thus, the Wildland-Urban Interface fire-loss problem principally depend on home ignitibility" (Cohen 2000). Findings from the case studies of past wildfires and the SIAM model demonstrate that defensible space regulations do not have to be draconian to be effective. A minimum of 30 feet of defensible space combined with fire-resistant roofs where topographic slope is minimal, dramatically reduces a property's wildfire vulnerability. Since both the roof type and the landscaping immediately around the home are choices within the control of the homeowner, homeowner cooperation is essential to the success of wildfire risk reduction programs.

If losses can be prevented by two actions on the part of the homeowner, it seems logical that the simplest way to reduce wildfire losses is to establish mandatory requirements for non–combustible roofs and a minimum of 10 meters of clearances around homes in high wildfire risk areas. However, new regulations are often difficult to pass and, in the interest of public safety, local officials attempting to influence homeowners to reduce risk around their homes must first convince homeowners of the need to protect themselves.

3. OBSTACLES TO ADOPTION OF REGULATORY PROGRAMS

Several factors may affect the feasibility of the adoption of regulations. First, the ability to obligate financial resources and dedicate personnel for the administration and enforcement of regulations can limit their practicality for many cash-strapped local governments. Second, requiring defensible space may be unpopular with residents due to the cost of removing vegetation and, in many locations, may be politically unacceptable. Former urban residents often favor the privacy and aesthetics found in an unaltered wildland environment and may underestimate their wildfire risk exposure (Bradshaw 1987, Loeher 1985). Residents may also view defensible space requirements as infringements of private property rights (Winter and Fried 2000). Support for more restrictive regulations seems to increase after a community has experienced a wildfire (Abt et al. 1990).

Even where ordinances have been adopted, a lack of public support can stymie enforcement efforts. Fire managers strive to establish a cooperative relationship with homeowners and may view enforcement of unpopular defensible space standards as counterproductive to the overall goal of community wildfire protection. As a result, it is often more expedient to offer educational programs and

homeowner assistance to motivate homeowners to reduce fuels around their homes. These homeowner education programs have been shown to be effective in encouraging private property owners to take steps to reduce risk (Hodgson 1994, Rice and Davis 1991). Where ordinances have been adopted, most jurisdictions employ a comprehensive approach to wildfire risk reduction. Fire managers use a mix of regulatory, educational, and incentive or assistance programs to motivate homeowners to take responsibility for creating defensible space and their home wildfire safety (Reams et al. 2005).

4. RESEARCH METHODS

This chapter will review state laws and local ordinances for wildfire mitigation, as well as model codes or guidelines for ordinance development. Information for the chapter is from two primary sources. First, an analysis of programs identified in the USDA Forest Service's National Database of State and Local Wildfire Hazard Mitigation Programs, www.wildfireprograms.usda.gov. The website database inventories state and local wildfire mitigation programs implemented to reduce wildfire risk on private ownerships in the WUI. Regulation is one of several program types adopted by state and local jurisdictions described on the website. Other program types identified on the website include community outreach and homeowner education, regional wildfire hazard risk assessments and mapping programs, and homeowner incentives for fuels treatment and removal. The second source of information is a survey of wildfire mitigation program administrators. The survey gathered contextual information about program adoption and implementation and provided insight into the effectiveness of regulation as a tool for reducing wildfire risk.

5. MODEL WILDFIRE PROTECTION CODES

Counties and communities at risk for wildfire need not struggle with the science and legal requirements of developing effective and enforceable wildfire risk reduction ordinances. Model codes or ordinances serve as templates for potential regulations which may be adopted by a jurisdiction. Local decision makers may select all components of a model ordinance for adoption, or may choose only those elements they believe to be most appropriate for their community. Two national organizations, the International Code Council (ICC) and the National Fire Protection Association (NFPA) have developed model Wildland-Urban Interface wildfire protection codes as standards for states and local governments to adopt. In addition, fire protection agencies in three states, California, Florida, and Utah have developed model codes for adoption by local governments in their respective states. These models have found acceptance in many fire-prone communities, where they are either adopted as separate ordinances, or incorporated into the requirements of the zoning ordinance and subdivision

regulations. In California, where there are statewide regulations for defensible space, communities in fire-prone areas are required to either adopt the model code which contains the state standards or one which has more stringent requirements. The model ordinances include:

1. National Fire Protection Association (NFPA) 1144: Standard for Protection of Life and Property from Wildfire, 2002;
2. International Code Council's, International Urban-Wildland Interface Code (UWIC), 2003;
3. California's Local Responsibility Area (LRA) Model Ordinance for the Defensibility of Space and Structures, 1994;
4. Florida's Model Wildfire Mitigation Ordinance, 2004; and
5. Utah's Wildland Urban Interface Standards, 2005.

These comprehensive model ordinances include standards for roofing and the use of fire resistant construction materials, water supplies for firefighting, road, bridge and driveway design, subdivision ingress and egress, vegetative management and road clearance standards. The models generally include provisions for administration, permit requirements, and enforcement.

5.1 Defensible Space

A core concept in the model codes and the resulting wildfire mitigation ordinances is that of structure protection through the creation of defensible space. Defensible space may be defined as an area either natural or manmade where material capable of causing a fire to spread has been treated, cleared, reduced, or changed to act as a barrier between an advancing wildland fire and life, property, or resources. The following excerpt from the Urban-Wildland Interface Code (2003) provides an example of the requirements for defensible space:

> "Persons owning, leasing, controlling, operating, or maintaining buildings or structures requiring defensible spaces are responsible for modifying or removing non-fire-resistive vegetation on the property owned, leased or controlled by said person.
>
> Ornamental vegetative fuels or cultivated ground cover, such as green grass, ivy, succulents or similar plants used as ground cover, are allowed to be within the designated defensible space provided they do not form a means of readily transmitting fire from the native growth to any structure.
>
> Trees are allowed within the defensible space provided the horizontal distance between crowns of adjacent trees, and crowns of trees and structures, overhead electrical facilities, or unmodified fuel is not less than 10 feet (3048mm). Deadwood and litter shall be regularly removed from trees."

Generally, fuel reduction recommendations include both vertical and horizontal separation of vegetative fuels. Vertical separation is achieved through the reduction of ladder fuels, including shrubs and vines and low hanging branches, which might carry fire from the forest floor to the crown. Horizontal separation is achieved by thinning trees to a specified spacing.

Fire protection agencies and organizations are also providing guidance for property owners through educational publications such as Firewise brochures that offer landscaping design options for defensible space. These generally include lists of recommended fire-resistive plant species for the area, as well.

5.2 Wildfire Hazard Risk Assessment Rating Guide

Each of the model ordinances is supplemented with a fire hazard rating guide that allows inspectors to evaluate the fire hazard risk of existing homes and proposed residential developments. The hazard-rating scales differ in complexity and in the weights given to the various factors. Wildfire risk factors generally include: vegetation type, fire history, density of development, building materials, ingress and egress roads, water supply for firefighting, and presence of defensible space. The models recommend that the risk assessments be updated periodically, usually at three or five year intervals.

5.3 Roofing Standards and Defensible Space Requirements

The five model ordinances all contain requirements for both defensible space and fire-resistant roofs, however the specific standards vary. The NFPA 1144 specifications are for 30 feet of defensible space and the use of fire-resistant roofing materials. The types of roofing materials required depends on the risk classification of the property, with the least flammable roof types, Class A roofs, required for high-hazard properties. The area of defensible space required by the UWIC is 30, 50 or 100 feet depending on the hazard classification of the property–moderate, high, or extreme, respectively. Roof requirements are also based on the assessed hazard designation, as well as a property's level of conformance with defensible space standards and the availability of water supplies for fire fighting.

Of the state model ordinances, the California model recommends the most stringent standards. The code requires Class A-rated roofs, and a minimum of 100 feet of defensible space for buildings in the Very High Fire Hazard Severity Zone (VHFHSZ). The Utah Wildland-Urban Interface Standards are based on the UWIC and utilize the UWIC sliding scale for defensible space. Roofing standards are also based on the same factors as the UWIC, however, Class A roof coverings are required in all three hazard categories -- moderate, high, or extreme. The Florida model ordinance recommends Class A roofs, 30 feet of defensible space around structures, as well as 12 feet of defensible space around the perimeter of new developments.

5.4 Vegetation Management Plans

All five model ordinances require property developers to submit Vegetation Management Plans (VMP) with building plans prior to subdivision approval or issuance of building permits. The VMP is a site-specific wildfire analysis that addresses topographic and vegetative features and includes elements and timetables for the removal of slash, ground fuels, ladder fuels, dead trees and the thinning of live trees. A plan for maintaining fuel-reduction measures after initial development is also required. Regulations requiring developers to include a maintenance component in VMP's provide some assurance that wildfire protection afforded by the initial fuel reduction projects will continue to reduce the community's wildfire risk exposure.

6. STATE LEGISLATION

As of mid-2005, only two states, California and Oregon had adopted legislation requiring landowners to conduct vegetative modifications to reduce wildfire hazard. Washington and Colorado have tried unsuccessfully to pass state-level wildfire protection legislation, but have found greater acceptance through creating guidelines and offering assistance to counties and towns that enact vegetation management regulations.

6.1 California

For the purpose of fire protection, California lands are divided into two categories: State Responsibility Areas (SRA's) and Local Responsibility Areas (LRA's). The SRA is the land for which the state has the primary responsibility for preventing and suppressing fires. In LRA's, either local government or federal authorities have primary fire protection responsibility.

California uses a Fire Hazard Zoning system to identify geographic areas that are at severe risk of wildfire. Regulations apply to properties ascertained to be in Very High Fire Hazard Severity Zones (VHFHSZ) in both the SRA and the LRA. The VHFHSZ in the SRA was identified in the "Maps of Fire Hazard Severity Zones in State Responsibility Areas of California" adopted in 1984. The LRA VHFHSZ was mapped in the mid-1990's. In December 2007, California is scheduled to adopt new SRA fire hazard maps using improved mapping techniques, fire science and data. In 2008, new maps of the VHFHSZ in the LRA will be presented and adopted. The maps will form the basis of legal requirements for new wildland-interface building standards, focusing on ignition-resistant building materials for roofs, walls, windows, decks and other building elements. (California Department of Forestry and Fire Protection 2007).

Regulations pertaining to development in the VHFHSZ are found in California's Public Resource Code, the General Code, and the Health and Safety Codes. Public Resource Code (PRC) 4291 was enacted in 1985, initially requiring 30

feet of defensible space around all structures in the VHFHSZ and amended in 2005 to require a minimum of 100 feet of vegetative clearance around structures. Subsequent enactments include PRC 4290, enacted in 1991, which set additional standards for roads and access, signage and building identification, greenbelts, and private water supplies for firefighting. These additional elements continued to raise fire safety standards in the SRA.

Despite these regulations, wildfire continued to threaten homes and lives in California's ever-growing wildland-urban interface. A contributing factor was that regulations at that time did not apply to all fireprone areas of the state, only the SRA.

In 1992, California adopted the Bates Bill (General Code Sec. 51175-51189), to extend wildfire mitigation regulations to LRA. The regulations are comparable to those that existed in the SRA since 1985, and brought fire-hazard reduction regulations to all high-wildfire risk areas throughout the state.

Minimum fire safety standards for development in the VHFHSZ were set forth for local governments to adopt. A wildfire risk assessment of the state was completed in 1995, and model ordinances were drafted. Any jurisdiction located within in the VHFHSZ is required to adopt the model ordinances or demonstrate that restrictions already in place meet or exceed the Bates Bill requirements. The 2005 amendment to PRC 4291 not only extended the minimum clearance around structures in the VHFHSZ from 30 feet to 100 feet or to the property line, it also specified that state law, local ordinance, rule or regulation, or insurance company may require vegetative clearances greater than 100 feet from structures.

Local governments implement the regulations through their building permit and subdivision approval processes. The California Department of Fire and Forestry (CDF) consults with local governments and reviews all proposed construction and development, advising on wildfire mitigation issues. The CDF is responsible for enforcement of the wildfire protection regulations. They employ a force of inspectors to visit homes in VHFHSZ areas and CDF has the authority to fine landowners for failure to comply with regulatory standards.

6.2 Oregon

Oregon adopted the Forestland-Urban Interface Fire Protection Act (Act) in 1997, however, administrative rules implementing the Act were not adopted until 2002. The program, administered by the state, is being phased in slowly in designated high risk counties. To date, the Act has been implemented in two counties, Jackson and Deschutes.

In accordance with the Act, properties designated by the State as Forestland-Urban Interface (FUI) are assessed for wildfire risk based on factors such as climate, natural vegetative fuels, topography, and housing density. The Department of Forestry (DOF) notifies property owners of their assigned classification, whether low, moderate, high or extreme.

The required defensible space standards differ based on the type of roofing materials used. Minimum defensible space distances for homes with non-fire-resistant roofs are: 30, 50, and 100 feet for properties classified as moderate, high, or extreme hazard, respectively. Distances for homes with a fire-resistant roof are 30 feet in moderate and high hazard areas, and 50 feet in areas of extreme hazard.

To implement the Act, the DOF mails all owners of urban-interface forestland a property evaluation form. The form allows owners to self-assess compliance with the required standards. Accredited assessors are trained to assist homeowners with the certification process, provide prescriptions for mitigation work, and may conduct needed property treatments at the landowner's cost. Property owners have two years in which to complete the necessary wildfire risk-reduction measures and return a certification form to DOF. In counties where stricter requirements already exist, those ordinances supersede the state law.

No enforcement or inspection measures are included in the regulations at this time. In the event of a wildfire, the DOF will determine whether the ignition or spread of the fire was directly related to the owner's failure to meet the standards. If a landowner is found to have directly caused the wildfire, the costs of suppression of that fire will be assessed to the owner up to $100,000. Property classifications are updated every five years or when a transfer of ownership occurs.

7. STATE GUIDELINES

Four states: Colorado, Montana, Virginia, and Washington have developed guidance documents to assist local jurisdictions in the development of regulatory programs. The guidelines generally address firesafe subdivision design and wildfire protection measures for existing homes. The state guidelines differ from the model ordinances of California, Florida, and Utah in that they do not contain provisions for administration and enforcement. Furthermore, with the exception of the Virginia guidelines, these documents are not in a regulatory code format. Rather, they are in a less formal descriptive format, often with graphic representations of recommended wildfire protection standards. As found in the state model ordinances, state guidelines for vegetation modification are often more stringent than those provided in the UWIC and NFPA 1144 model codes.

7.1 Hazard Severity Rating and Defensible Space

Similar in content to the UWIC and NFPA model codes, many of the guidelines include wildfire-hazard-severity rating systems to evaluate the wildfire risk to individual properties and subdivisions.

For example, the Washington "Model Fire Hazard Policies and Development Standards for County and City Comprehensive Land Use Plans" establishes a Wildfire-Hazard Rating System with possible classifications of low, moderate, high and extreme fire hazard. A minimum area of defensible space of 50 feet is

established for all properties classified as moderate, high, and extreme wildfire risk.

State guidelines differ in their recommendations for defensible space. The Washington and Virginia guidelines recommend a 50 and 70 foot treatment zone, respectively. Montana and Colorado establish a more complex three-zone modification scheme with varying levels of treatment recommended within each zone These guidelines correlate the extent of the defensible space area to the property's degree of slope. The Montana "Fire Protection Guidelines for Wildland Residential Interface Development" recommend increased distances of defensible space only on the upslope approach to structures (Montana Department of Natural Resources 1993), (figs. 14.1, 14.2, and 14.3). The recommended distances range from 100 feet for level terrain to 150 feet for slopes of 20-30 percent.

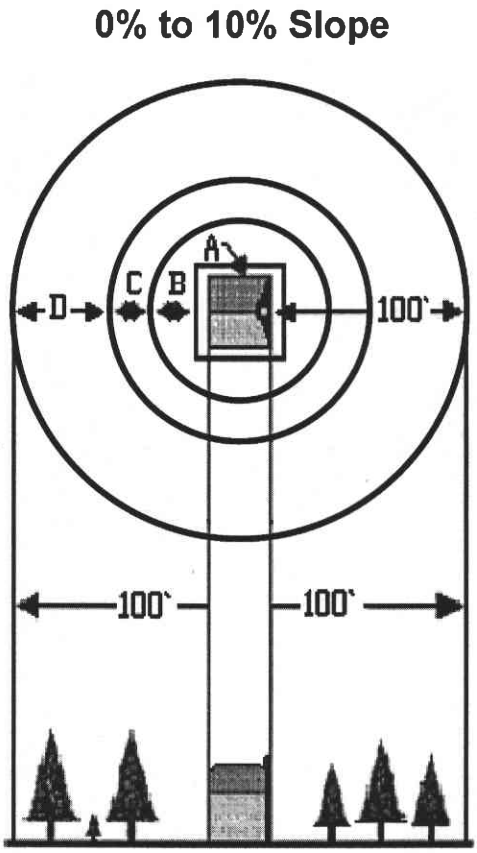

Figure 14.1. Montana Fire Protection Guidelines for Wildland Residential Interface Development.

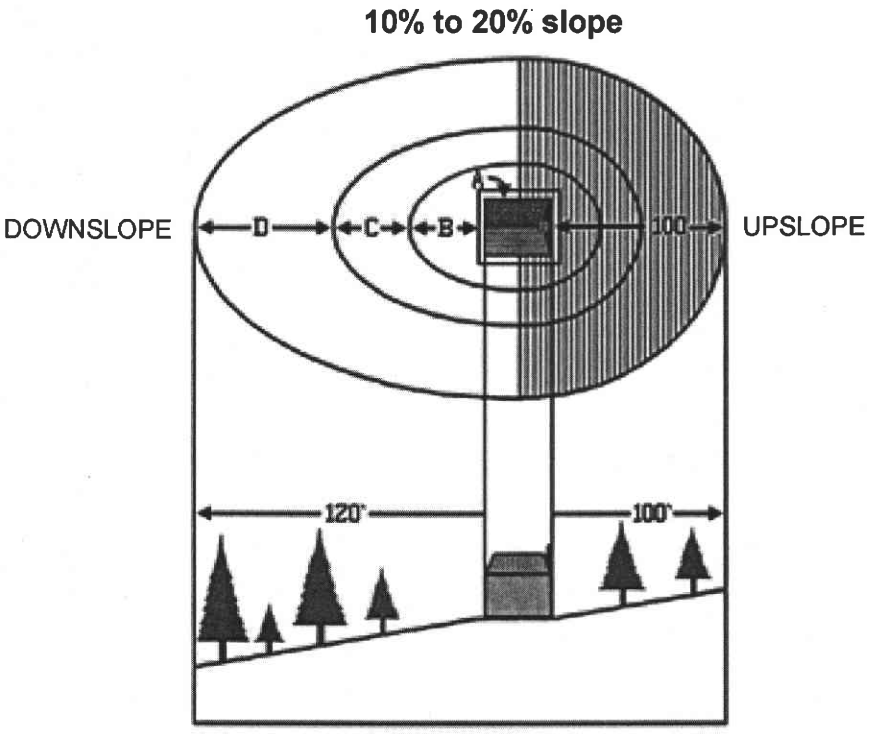

Figure 14.2. Montana Fire Protection Guidelines for Wildland Residential Interface Development; 10% to 20% slope.

The Colorado guidelines also correlate distances of defensible space to slope within a three-zone treatment area. However, the Colorado guidelines call for larger areas of defensible space for both upslope and downslope approaches to the structure with greater distances for upslope areas (Dennis 2003) (fig. 14.4). In addition, the Colorado treatment standards are fairly complex in that modifications in tree and shrub spacing are correlated to the degree of slope; thinning is intensified as slope increases (Dennis 2003) (fig. 14.5).

7.2 Goals for Growth

Washington provides leadership in its guidelines by suggesting that a wildfire protection policy statement be incorporated in high risk county Growth Management Plans. The model policy statement is exemplified in the Yakima County Growth Management Plan with the stated goal to "Protect life and property in rural Yakima County from fire hazards." Florida's guidance documents also

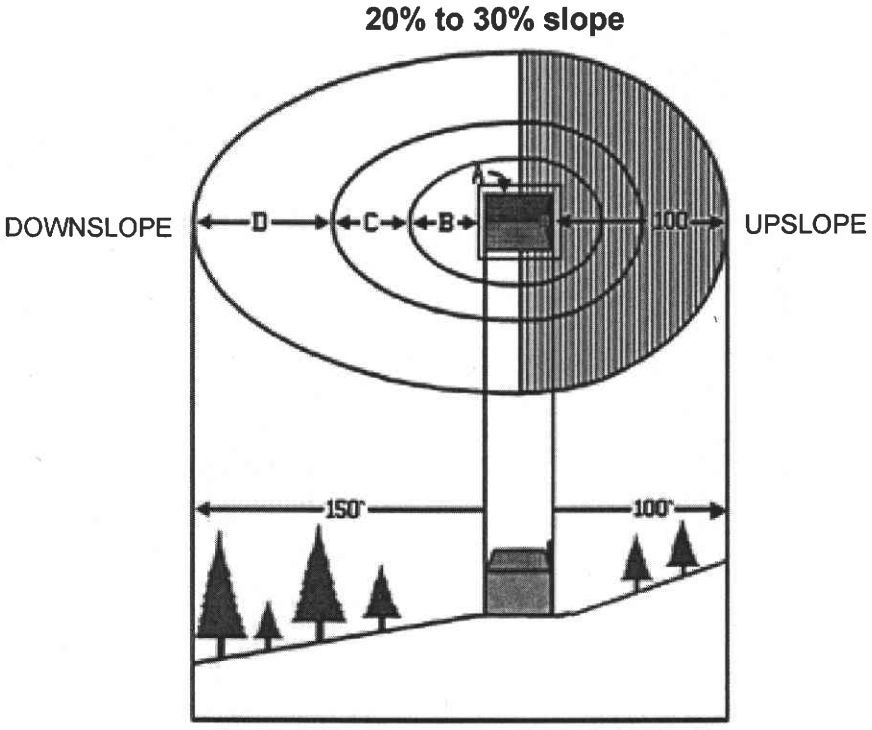

Figure 14.3. Montana Fire Protection Guidelines for Wildland Residential Interface Development; 20% to 30% slope

recommend providing a goal statement in local governments' comprehensive plans to bring protection from wildfire to the forefront for all planning purposes. The inclusion of wildfire protection goals in the vision statement for growth provides important reinforcement for the adoption of wildfire mitigation regulations.

8. LOCAL ORDINANCES

With the exception of California and Oregon, local ordinance development is a voluntary action undertaken by local leaders to address community wildfire protection. Ordinances initiated by county and municipal governments are generally based on the UWIC or NFPA 1144 model code, the respective state's recommended model ordinance, or wildfire protection guidelines. In a review of the regulations listed on the National Database of State and Local Wildfire Hazard

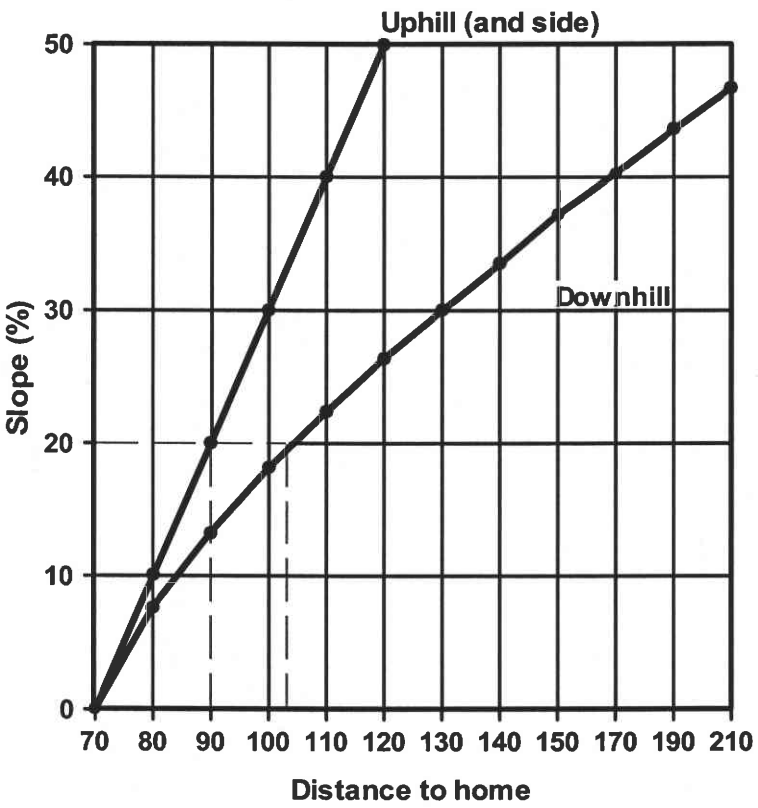

Figure 14.4. Colorado guidelines for defensible space dimension.

% slope	Tree Crown Spacing	Brush and Shrub Clump Spacing
0 – 10%	10'	2 ½ x shrub height
11 – 20%	15'	3 x shrub height
21 – 40%	20'	4 x shrub height
> 40%	30'	6 x shrub height

Figure 14.5. Colorado guidelines, tree crown and shrub spacing.

Mitigation Programs, similar standards were found in many defensible space regulations with varying ranges of requirements for the standards (table 14.1).

Local jurisdictions often modify guidelines and model codes to meet unique characteristics or specific needs of their communities. Some local ordinances focus only on standards and permitting processes aimed at creating firesafe communities as new subdivisions are developed. Others include provisions for fuel modification on existing properties, as well.

A number of jurisdictions have adopted ordinances with defensible space standards that are more stringent than those found in the state's model ordinance to achieve a particular purpose. Local governments in California have adopted some of the most restrictive ordinances in the nation. Required defensible space zones of more than 100 feet are not uncommon and fuel modification treatments can involve removing all flammable, native vegetation (including grasses and shrubs) within 100 feet of the home. For example, the city of Glendale's Hazardous Vegetation Ordinance (Building and Safety Code Vol. VI , Sec. 16, App. II-A), establishes landscape requirements to protect the visual quality of the hillsides and promote fire safety. The ordinance is unique in that a landscape/fuel modification permit must be obtained not only for new construction and significant remodels, but for re-landscaping or grading projects, as well. The selection of plant species for landscaping are also limited by the ordinance and pruning of several indigenous tree species for wildfire protection requires a permit. In addition, a four-zone fuels modification system for a total of 150 feet goes beyond the specified three-zone, 100 feet modification scheme found in the state model.

Table 14.1. Vegetation Management Components of Wildfire Mitigation Programs

Hazard rating guide — Evaluation system for assessing wildfire hazards on individual properties or subdivisions
Vegetation Management Plan — Required submission to demonstrate developer's planned actions for fuels mitigation and maintenance
Generalized Defensible Space Requirements Fuel modification areas of 30 to 150 feet around structures and 12 feet around the perimeter of new developments including: • Removal of flammable vegetation, excluding cultivated ground covers and single trees • Thinning of trees to allow 10 feet of spacing between canopies • Pruning trees to allow 10 feet of spacing between tree canopies and structures • Pruning trees from 6 to 15 feet from the ground • Pruning trees for a vertical clearance of 12.5–15 feet along roads • Clearing brush for a 10-foot fuel break adjacent to roads

The adoption of an established model code with additions and deletions of some model provisions is fairly common. For example Ruidoso, New Mexico has adopted the UWIC in its Land Use Code (Art. III, Ch. 42, Sec. 70). However, requirements for vegetative modifications include unique woodland thinning provisions; thinning requirements establish minimum basal areas by species composition in a zone located 30-60 feet from structures.

Local ordinances may also be designed to specifically address removal of native combustible plant materials that create a wildfire hazard. For example, in Oregon, the Sunriver Homeowners Association's Ladder Fuel Reduction Plan (Sec. 4.01E.2, Sunriver Rules and Regulations) requires the removal of bitterbrush and manzinita, predominant flammable native shrubs. All bitterbrush, noxious weeds, dead vegetation, and other flammable shrubs within fifteen feet of a structure must be removed. In addition, bitterbrush and manzanita must be cleared three feet beyond the drip line of tree branches.

Similarly, in Monrovia, California, where highly combustible native chaparral is prevalent, required treatments include cutting all grass, weeds, and chaparral within 30 feet of homes to 3 inches in height or less; and thinning chaparral plants to an average 12 to 18 feet of separation within 200 feet of the property owner's home (M.M.C. Sec. 8.14.01-8.14.14). In a situation where the 200 feet of clearance from the home extends beyond the property line, the owner remains responsible for the vegetative clearance. To accomplish the required treatment, generally, the affected owner obtains a release from the adjacent owner and treats the property at his own expense.

Developers have a vested interest in complying with wildfire protection regulations. However, new homeowners may be less motivated to maintain fuel modifications once new subdivisions are established and the initial wildfire protection goals achieved. The procedures utilized by local governments in California illustrate one approach to achieving continuity in vegetation treatments after initial subdivision establishment. The local jurisdictions fire departments conduct inspections of all properties and send out "A Notice to Abate Fire Hazard" to owners of properties where the need for treatment has been determined. If the property owner does not complete the required treatments within the designated timeframe, the Fire Department has the authority to have the fuel modifications conducted, with the cost billed as a lien against the property.

Some local governments have included a provision requiring new developments to adopt covenants or deed restrictions for vegetation maintenance in their wildfire protection ordinances. These provisions require future homeowners and/or homeowners' associations to maintain defensible space. Upon purchase of property, the homeowner signs an affidavit accepting the restrictions on the deed. Covenants or deed restrictions typically set out criteria such as minimum square footage, type of construction, architectural style and so forth to ensure that homes built there conform to the neighborhood (Crawford 2005). Incorporating defensible space requirements in restrictive covenants is a new use of an old tool. Subdivision covenants or deed restrictions provide reinforcement

of wildfire protection measures at the neighborhood level. At the time of home purchase, owners are advised of the property's vulnerability to wildfire and their responsibility to protect themselves by maintaining defensible space around the home. For enforcement purposes, the subdivision's Declaration of Covenants, Conditions and Restrictions (CC&R's), generally include a provision enabling the homeowners' association to levy fines should homeowners fail to comply with maintenance requirements.

In some localities, subdivision CC&R's for defensible space maintenance are required by local ordinances. For example, Santa Fe County, New Mexico through its Urban Wildland Interface Code (Ordinance No. 2001-11), requires vegetation management measures to be recorded in the covenants of all new subdivisions of twelve or more lots. Local code may also direct subdivision maintenance of fuel treatments in common areas. The City of Ormond, Florida addresses this need in its Land Development Code (Ch. III, Art.13A). The Code stipulates that the developer must prepare a greenbelt and/or conservation area maintenance plan that provides for the management of common areas for fuel reduction and hazard mitigation by the property owners' association. The plan must be incorporated in to the subdivision's CC&R's and recorded with the final plat.

9. INSURANCE PROGRAMS

Although insurance requirements differ from direct government regulations, they serve to reinforce wildfire protection regulatory programs by introducing a clear, economic incentive for property owners to undertake measures to reduce wildfire risk. Defensible space requirements to obtain insurance coverage can be quite stringent in some high fire hazard areas of California. For example, in Glendale, the state insurance program, the Fair Plan can require up to 400 feet of fuels treatment around structures. In addition, if brush exposure is down-slope from structures and over 30 degrees, only half of the cleared distance is counted. Under the Fair Plan, the clearance distance requirement applies to vegetation that extends beyond the property boundary. If the property owner is unable to conduct the treatment in the area extending into the neighboring ownership, a surcharge, based on the distance of the untreated area, will be applied to each $1,000 of insurance. The surcharge is removed once the treatment is accomplished.

Insurance availability for homes in high wildfire risk areas in other states is an emerging concern due to increased losses experienced by insurers in recent years. In 2003, State Farm Insurance Company began implementing a program to reduce the potential for future financial losses in some high hazard areas. The program is underway in Colorado, Arizona, and New Mexico. Over a three year period, 22,000 homes located in the targeted states will be inspected to identify fuel modifications and other mitigation measures needed to reduce wildfire hazard. Homeowners will have 24 months to complete the recommended treatments. After the allotted time period, agents will conduct follow-up inspections

for compliance. If wildfire safety measures have not been completed, non-renewal of the insurance policy for the property may be considered.

Collaboration with local fire officials can facilitate the insurance company's property evaluations. For example, in Prescott, Arizona, the Fire Department's inspection reports for individual homes are being used as a basis for evaluating wildfire risk to determine policy coverage for individual homes.

A significant role exists for insurance companies in helping to create an effective framework of wildfire risk mitigation strategies. Kovacs (2001) points to areas of particular importance, beyond providing compensation for property loss. These include public education through the industry's on-going involvement in wildfire management programs, such as California's Fire Safe Council and the Firewise Community network. Second, the industry provides powerful incentives for hazard mitigation to residents of Wildland-Urban Interface communities through insurance pricing. Third, the insurance industry continues to function as active stakeholders in community wildfire reduction efforts through promotion of safer land use, along with improved building practices and standards.

10. INSIGHTS DRAWN FROM PROGRAM ADMINISTRATORS

During the spring and summer of 2005, researchers surveyed managers and administrators of wildfire risk reduction programs listed and summarized on the National Database of State and Local Wildfire Hazard Mitigation Programs website, www.wildfireprograms.usda.gov. The purpose of the survey was to gather additional information directly from program officials concerning the goals and objectives of their programs, the obstacles they have experienced in their work, and their recommendations for the most cost-effective methods to reduce risks to communities. Administrators representing 29 regulatory risk reduction programs responded to the survey.

10.1 Program Goals and Objectives

One of the attributes of interest was the extent to which regulatory-based risk reduction programs integrate other broad goals and objectives. For example, do programs that oversee the implementation of building codes also incorporate outreach and public education activities into their efforts? We found that respondents from each of the 29 regulatory-based programs include activities designed to help community residents understand, not only relevant defensible space requirements, but also the underlying wildfire risks and a variety of established mitigation strategies. Similarly, 28 of the 29 regulatory-based efforts include specific activities to help home and property owners establish and maintain a commitment to vegetation management and to assist in the removal and disposal of vegetative material. Moreover, all 29 administrators of these programs report that

they examine wildfire risk criteria, attempt to evaluate the overall levels of risk to communities, and designate specific areas of high risk. Clearly, the responses of these administrators suggest that regulatory-based wildfire risk reduction efforts include a variety of related program objectives designed to provide residents with information concerning the risks they are facing, the actions they may take to reduce that risk, as well as the specific legal requirements, standards, and guidelines applicable to their communities.

Next, we were interested in the types of regulations these programs are administering. We found that the most common types of regulations are those for subdivisions and residential development, with 75 percent of respondents overseeing these requirements. Other commonly used regulations for wildfire risk reduction or mitigation included implementation of state guidelines (62 percent), building codes (65 percent), and fire codes, (59 percent). Roughly one-third of the respondents administer zoning ordinances (34 percent) and land-use codes (31 percent) that include vegetation management provisions. The least commonly administered regulations among the respondents were real estate disclosure, with about 27 percent of respondents implementing this type of regulation. Only the State of California requires disclosure of wildfire risk classification in real estate transfers.

10.2 Obstacles to Implementation

We asked the administrators to identify obstacles that they believe are impeding progress toward reducing wildfire risk within their jurisdictions. After reviewing a list of potential obstacles, they were asked to indicate the extent to which each item is an obstacle or impediment to their efforts by giving each a score from 0–5, with 5 indicating an extreme obstacle. According to the respondents, the most serious obstacles facing their programs are budgetary constraints (3.6 on a 5-point scale). In addition, respondents reported that negative attitudes among property owners are often impediments to reducing wildfire risk. These may include public apathy (3.17 on a 5-point scale) and resistance from homeowners concerning removal of dangerous vegetation and maintaining a more fire-resistant landscape (average score of 2.93). The average responses are presented in table 14.2.

10.3 Emerging Strategies for More Effective Regulatory Programs

As state and local decision makers struggle with how best to reduce wildfire risks and overcome budgetary constraints, strategies that leverage resources, such as forming collaborative relationships with other organizations are increasingly attractive. The American Planning Association (APA) recently called for increased pre-fire planning, citing the sheer volume of new development in the Wildland-Urban Interface. The authors of the APA report, Planning for Wildfires,

Table 14.2. Descriptive Statistics, Obstacles Reported by Wildfire Program Administrators

	N	Mean
Budget is an obstacle	29	3.5862
Apathy among prop. owners	29	3.1724
Homeowner resistance	29	2.9310
Inadequate enforcement of regs	29	2.5862
Tree protection ordinances	29	1.9655
Legal appeals to trt. adjacent public lands	29	1.9310
Need more technical help	29	1.7931
Constraints from env. regs	29	1.7586
Lack of qualified staff	29	1.5172
Inadequate public input into program	29	1.4138
Low coop. among stakeholders	29	1.3793
Valid N (listwise)	29	

state that the rapid growth of many of these communities makes it imperative that residents, business owners, developers and local decision makers adopt strategies for safer designs for new neighborhoods and risk-mitigation for existing developments. "Safe Growth" has become an important element of the anti-sprawl, environmentally friendly "Smart Growth" movement among professional planners. In addition, they point to an increasing federal emphasis on mitigation planning as a way to reduce the damages associated with catastrophic wildfire. This emphasis is seen in the Disaster Mitigation Act of 2000, as well as the Healthy Forests Restoration Act of 2003 (Schwab and Meck 2005).

There is ample evidence that administrators of regulatory-based programs are working with other agencies from various levels of government to formulate more effective pre-fire plans to reduce wildfire risks. According to our survey of administrators, twenty-seven of the twenty-nine reported that they participate in collaborative partnerships, with a mean of three different levels of government–local, county, state, or federal–represented. This indicates that most administrators regularly interact with multiple public decision makers, thus increasing the likelihood of more coordinated implementation of current regulations, as well as more coherent planning for future risk reduction standards and requirements.

In addition, program administrators recommend several specific program activities they have found to most valuable in reducing risk within their jurisdictions. We asked administrators to indicate, on a scale of 1-5, with 5 indicating "extremely cost effective", the specific program activities they have found to be most cost-effective. According to their responses, these risk reduction activities have been most effective:

Regulations for fuels treatment in new developments (3.96),
Meeting with neighborhoods and communities (3.72),

Public education (3.52),
Cost/Share assistance for homeowners' fuels treatment (3.52), and
Demonstration Projects (3.44).

From these recommended program activities, it is clear that administrators favor a more comprehensive approach to reducing risk that entails implementing legal requirements while also offering specific instruction and assistance to property owners.

These survey results and the information compiled for the National Database of State and Local Wildfire Hazard Programs website suggest that regulations play an important role in a comprehensive approach to reducing wildfire risk at the state, local and community levels throughout the nation. Furthermore, mitigation efforts are often developed from collaborative plans that incorporate goals of multiple stakeholders to achieve continuity in mitigation practices across high fire risk landscapes. Comprehensive regulatory programs include: 1) state laws or guidelines to direct local governments, 2) growth management or comprehensive plans that incorporate wildfire risk reduction goals at the regional level, 3) county and municipal ordinances that establish specific requirements for developers and property owners, and 4) mechanisms for maintaining defensible space such as inspection/notification programs or the use of deed restrictions to drive homeowners' mitigation efforts at the subdivision level. However, as demonstrated in the survey results, for regulatory-based efforts to be effective, administrators need adequate funding, appropriate technology to assess risk to communities, clear guidelines to implement, and the support of a public that is often skeptical about the benefits of vegetation management and enhanced building codes.

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