# 7.0 WILDLAND/URBAN INTERFACE FIRES

## 7.1 Overview

Fire has posed a threat to mankind since the dawn of civilization. Fires often cause substantial damage to property and also result in deaths and injuries. For the purposes of mitigation planning, we define three types of fires:

- Structure fires and other localized fires,
- Wildland fires, and
- Wildland/urban interface fires.

Structure fires are fires where structures and contents are the primary fire fuel. In dealing with structure fires, fire departments typically have three primary objectives: first, minimize casualties; second, prevent a single structure fire from spreading to other structures; and third, minimize damage to the structure and contents. Structure fires and the other common types of fire are most often confined to a single structure or location, although in some cases they may spread to adjacent structures.

Wildland fires are fires where vegetation (grass, brush, trees) is the primary fire fuel and thus involve few or no structures. For wildland fires, the most common suppression strategy is to contain the fire at its boundaries, to stop the spread of the fire and then to let the fire burn itself out. Fire containment typically relies heavily on natural or manmade fire breaks. Water and chemical fire suppressants are used primarily to help make or defend a fire break, rather than to put out an entire fire, as would be the case with a structure fire. For wildland fires, fire suppression responsibility is shared by local and state fire agencies.

Wildland/urban interface fires are fires where the fire fuel includes both structures and vegetation. The defining characteristic of the wildland/urban interface area is that structures are built in or immediately adjacent to areas with essentially continuous vegetative fuel loads When wildland fires occur in such areas, they often spread quickly and structures in these areas may, unfortunately, become little more than additional fuel sources for wildland fires. Fire suppression efforts for wildland/urban interface fires focus on savings lives and on protecting structures to the extent possible.

This chapter focuses on wildland/urban interface fires which pose a substantial threat to parts of Multnomah County, especially in the unincorporated areas.

In Multnomah County, as elsewhere in Oregon, recent patterns of development have led to increasing numbers of homes being built in areas subject to wildland/urban interface fires. Fires in these areas pose high levels of life safety risk for occupants as well as high levels of fire risk for homes and other structures.

## 7.2 Wildland/Urban Interface Fires

Many urban or suburban areas have a significant amount of landscaping and other vegetation. However, in most areas the fuel load of flammable vegetation is not continuous, but rather is broken by paved areas, open space and areas of mowed grassy areas with low fuel loads. In these areas, most fires are single structure fires. The combination of separations between buildings, fire breaks, and generally low total vegetative fuel loads make the risk of fire spreading much lower than in wildland areas.

Furthermore, most developed areas in urban and suburban areas have water systems with good capacities to provide water for fire suppression and fire departments that respond quickly to fires, with sufficient personnel and apparatus to control fires effectively. Thus, the risk of a single structure fire spreading to involve multiple structures is generally quite low.

Areas subject to wildland/urban interface fires have very different fire hazard characteristics which are very similar to those for wildland fires. The level of fire hazard for wildland/urban interface fires depends on:

- Vegetative fuel load,
- Weather,
- Topography,
- Fire suppression resources and
- Fire-safe construction and defensible space practices.

The level of fire hazard in wildland/urban interface areas is often high not only because of high vegetative fuel loads, but also because of topography. Many of these areas are hilly or mountainous and steeper slopes exacerbate fire spreading and impede fire suppression efforts. Water resources for fire suppression are typically lower in these areas which are predominantly residential and served by pumped pressure zones. Fire department response times may also be longer because of distance and/or narrow streets. These reduced fire suppression resources make it more likely that a small wildland fire or a single structure fire in an urban/wildland interface area will spread before it can be extinguished.

Another important factor in the level of risk for individual structures or neighborhoods is the extent to which fire-safe construction practices and vegetation management practices such as weed abatement and maintenance of defensible space around structures are or are not implemented. Effective implementation of fire-safe construction practices and defensible space around structures substantially reduces the risk of a fire destroying structures when a fire occurs.

The level of fire hazard in areas prone to wildland/urban interface fires is also greatly increased during periods when weather conditions of high temperatures, low humidity, and high winds may greatly accelerate the spread of a wildland fire and make containment difficult or impossible.

Life safety risk in interface areas is often exacerbated by homeowners' reluctance to evacuate homes quickly. Instead, homeowners often try to protect their homes with whatever fire suppression resources are available. Such efforts generally have very little effectiveness. For example, the water flow from a garden hose is too small to meaningfully impact even a single structure fire (once the structure is significantly engulfed by flames) and is profoundly too small to have any impact on a wildland/urban interface fire. Unfortunately, home owners who delay evacuation in well meant but misguided attempts to save their homes may place their lives in jeopardy by delaying evacuation until it may be impossible.

Major fires in the urban/wildland interface have the potential for enormous destruction and high casualties. For example, the October 20, 1991 East Bay Fire in Oakland California burned about 1,600 acres with 25 fatalities, 150 injuries, and over 3,300 single-family homes and 450 apartment units destroyed. Total property damages were over $1.5 billion. This fire was fueled by high vegetative fuel loads and occurred on an unusually hot, dry, windy day. The fire spread extremely quickly, with over 800 homes engulfed by fire within the first hour, and the rapid fire spreading completely overwhelmed initial fire suppression efforts.

## 7.3 Fire Agencies in Multnomah County

The responsibility for fire suppression and fire prevention in Multnomah County is shared by many fire agencies, including:

Portland Fire Bureau

Gresham Fire Department

Lake Oswego Fire Department

Sandy Fire

Clackamas Fire District #1

Multnomah County Rural Fire Protection District #10

Multnomah County Rural Fire Protection District #14

Riverdale Rural Fire Protection District #60

Sauvie Island Rural Fire Protection District #30

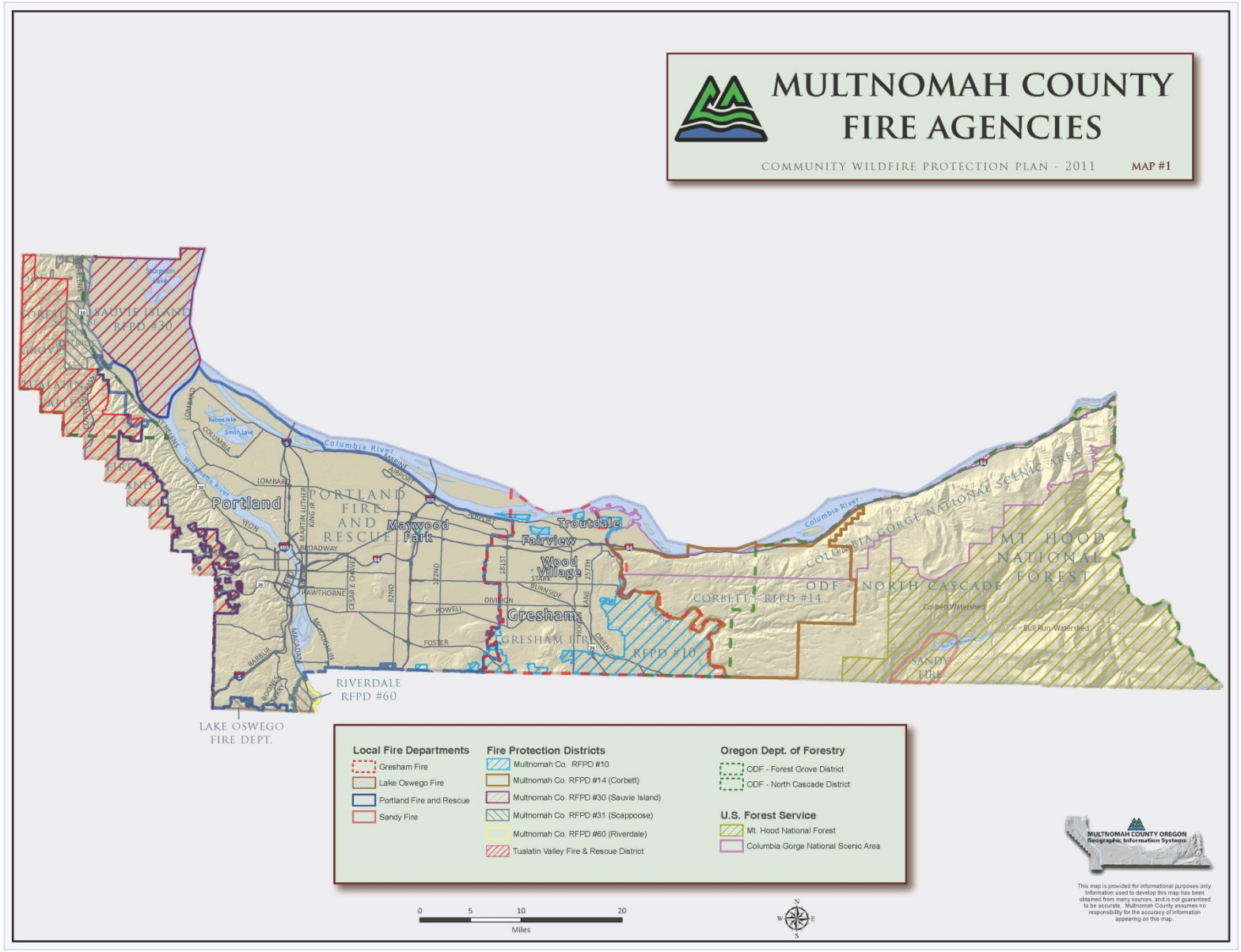
Scappoose Rural Fire Protection District #31

Tualatin Valley Fire & Rescue District

Oregon Department of Forestry

Figure 7.1 on the following page shows the fire protection service areas for the fire agencies above. Fire protection responsibility is shared between the Oregon Department of Forestry and local fire agencies for a large area in eastern Multnomah County and a smaller area in the northwest part of the County.

**Figure 7.1**
**Fire Protection Service Areas in Multnomah County**



## 7.4 Historical Fire Data

The Oregon Department of Forestry website (www.odf.state.or.us) has a table of the most important historical fires in Oregon over the past 150 years. Many of the largest fires occurred before 1945. The two largest fires, the 1868 Coos Bay fire and the 1849 Siletz fire consumed 988,000 and 800,000 acres, respectively. The next four largest fires occurred between 1933 and 1945, with each fire consuming between 240,000 and 180,000 acres. The 1987 Silver Fire, burned 97,000 acres. More recent major fires in Oregon include the 2002 Biscuit Fire that burned nearly about 471,000 acres in Oregon and the 2003 B&B Complex fire that burned 90,769 acres. None of these major fires occurred in Multnomah County.

The Oregon Department of Forestry website (www.odf.state.or.us) has several categories of wildland fire data listed, including: numbers of forest fires and numbers of acres burned in Oregon forest lands. However, these ODF data are only for ODF-responsibility lands, about 16 million acres, and do not include forest lands where primary fire suppression responsibility is federal or local. These data provide one measure of wildland fire data for Oregon. For ODF responsibility lands in Oregon as a whole, the 10-year average number of wildland fires is 1,062. For Multnomah County, the average number of wildland fires in ODF responsibility areas is about 3 to 4 fires per year.

ODF data for the 51 year period from 1960 to 2011 indicate a total of only about 1,600 acres burned in ODF responsibility areas. These data indicate an average of only about 30 acres burned per year. However, about 90% of the total acreage burned occurred in 1990, with zero or nearly zero acres burned in many years.

## 7.5 Wildland/Urban Interface Fire Hazards for Multnomah County

The Oregon Department of Forestry's latest Oregon's Communities at Risk Assessment (2006) classifies 14 communities in Multnomah County for wildland/urban interface fire risk. These classifications are based on the combination of ignition risk, hazard level, fire protection capability and values at risk.

The following communities are rated as "moderate" risk: Fairview, Gresham, Lake Oswego, Portland, Troutdale, Wood Village and Multnomah County overall. The service areas of the following fire agencies are also rated as moderate risk: Multnomah County Fire District #10, Riverdale Rural Fire Protection District, Sauvie Island Rural Fire Protection District, Scappoose Rural Fire Protection District, and Tualatin Valley Fire and Rescue. Maywood Park is rated as "low" risk.

ODF uses a five-tiered methodology to assess wildfire or wildland/urban interface fire risk throughout Oregon. The five ranking factors include the following:

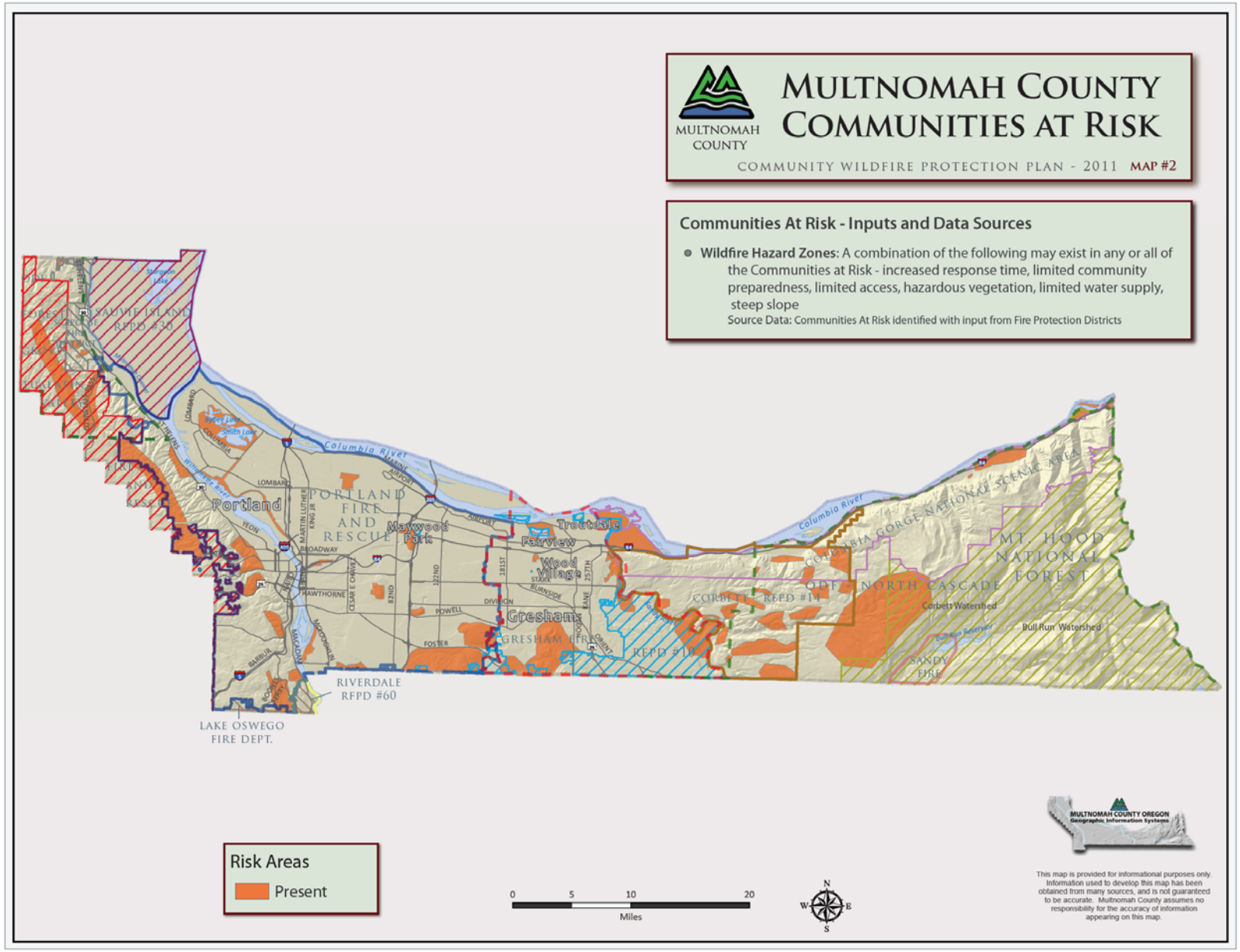
- **Hazard**: vegetation, topography and climate
- **Risk**: historical fire occurrence and ignition sources
- **Values**: community values, watersheds, critical facilities and infrastructure
- **Protection Capabilities**: Fire district response time
- **Structural Vulnerability**: wildland/urban interface

The communities/areas within Multnomah County with the highest risk from wildland/urban interface fires are shown as the red-orange shaded areas in Figure 7.2 on the following page.

The risk from wildland/urban interface fires arises from the combination of the five ranking factors listed above. That is, these areas have all or most of the following attributes:

- High vegetative fuel loads,
- Steep topography,
- Relative high rates of historical fire occurrence and or ignition sources, especially human-caused ignition sources
- High values of buildings, watersheds, or critical facilities and infrastructure
- Limited protection capabilities: response time, fire department resources, water supplies
- Structural vulnerability of buildings: extent of fire-safe construction and defensible space.

**Figure 7.2**
**Communities at Risk in Multnomah County**



The numbers of structures in the communities at risk areas shown in Figure 7.2 are shown below in Table 7.1.

**Table 7.1**
**Numbers of Structures in Communities at Risk Areas**

| **Unincorporated** | Industrial | Commercial | Multi-Family Residential | Parks - Open Space | Mixed Use Residential | Single-Family Residential | Mixed Use Employment | Rural | **Total** |
|---|---|---|---|---|---|---|---|---|---|
| **Wildfire, All Buildings** | | | | | | | | | |
| | 4 | 0 | 0 | 0 | 0 | 263 | 1 | 1366 | 1634 |
| | | | | | | | | | |
| **Wildfire, County Buildings** | | | | | | | | | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | | | | |
| **Incorporated** | Industrial | Commercial | Multi-Family Residential | Parks - Open Space | Mixed Use Residential | Single-Family Residential | Mixed Use Employment | Rural | **Total** |
| | | | | | | | | | |
| **Wildfire, All Buildings** | | | | | | | | | |
| | 127 | 0 | 769 | 263 | 220 | 11027 | 34 | 360 | 12800 |
| | | | | | | | | | |
| **Wildfire, County Buildings** | | | | | | | | | |
| | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 2 |

As shown above, there are over 1,600 buildings in communities at risk areas (Figure 7.2) in the unincorporated areas of Multnomah County. These buildings are predominantly single-family residential or rural buildings, along with four industrial buildings. In the incorporated areas of Multnomah County, there are 12,800 buildings which are mostly residential, but with a mix of other uses as well, including 127 industrial buildings.

## 7.6 Wildland/Urban Fire: Potential Loss Estimates

The identified high risk areas for wildland/urban interface fires have high risk because of the many factors discussed above.

Potential losses from wildland/urban fires impacting Multnomah County vary over a very wide range. Fires may result only minor damage to a few structures or result in the destruction of a few structures, a few dozen structures or hundreds of structures. In extreme events, such as the 1991 Oakland Hills fire in California, loss of several thousand structures is possible.

The following table has rough estimates of the order of magnitude of potential losses to structures and infrastructure, based on the following parameters per structure:

- Average structure replacement value: $250,000,
- Average contents replacement value: $75,000,

- Landscaping damages: $5,000
- Displacement costs for temporary quarters: $20,000,
- Other damages, including vehicles and infrastructure: $50,000
- Total damages per structure burned: $400,000

**Table 7.2**
**Potential Losses from Wildland/Urban Interface Fires in Burbank**

| Structures Burned | Approximate Losses |
|---|---|
| 1 | $400,000 |
| 10 | $4,000,000 |
| 100 | $40,000,000 |
| 1000 | $400,000,000 |

In addition to the potential for property damage, wildland/urban interface fires in Multnomah County pose substantial risk of deaths and injuries to both residents and firefighters. For a major wildland/urban interface fire in Multnomah County the number of deaths could be none or as high as several dozen or more, with several times as many injuries as deaths. Furthermore, high levels of smoke from major fires pose health risks, especially for vulnerable populations, including: individuals with asthma and other respiratory diseases or cardiovascular disease, the elderly, and children.

The above estimates an commentary notwithstanding, the likelihood of major wildland/urban interface fires destroying many dozens, hundreds or thousands of structures in Multnomah County appears rather low, given the wildland fire history over recent decades.

## 7.7 Multnomah County Ordinances for Wildland/Urban Interface Fires

Multnomah County relies on the regulations implemented by the rural fire protection districts to address fire flow and access for property in the rural plan areas. These regulations are based on the Oregon Fire Code.

The Multnomah County Code Volume 2: Land Use Ordinances has forest practices setbacks and fire safety zones for the West Hills Rural Plan Area and has Commercial Forest Use Zone regulations for all of the rural plan areas. The Commercial Forest Use Zones embrace the hazard mitigation planning strategy to reduce risk by:

- Requiring that the Primary Fire Safety zone be appropriate to the downhill slopes surrounding the development site. Primary Fire Safety zones are 20 feet for slopes less than 10% and increase to 80 feet, 105 feet, and 130 feet for slopes from 10% to 19%, 20% to 24%, and 25% to 39%, respectively.
- Reducing the amount of fuel available within the Primary Fire Safety Zone by requiring the distance between tree crowns to be at least 15 feet,

trimming low-hanging branches to eight feet above ground as the trees mature and limiting all other vegetation to less than two feet in height.

- Requiring a Secondary Fire Safety Zone to reduce the amount of fuel available to feed a fire in the forest. The reduction in fuel helps to keep a fire out of the tree crowns and to keep a fire from over-running the Primary Fire Safety Zone.
- Dwellings and structures must have a fire retardant roof and a spark arrestor on each chimney.

## 7.8 Mitigation Strategies for Wildland/Urban Interface Fires

### 7.8.1 Synopsis of Common Strategies

This section summarizes common strategies for reducing the level of fire risk to both property and life safety in wildland/urban interface areas. The common strategies have four elements:

1) reduce the probability of fire ignitions,

2) reduce the probability that small fires will spread,

3) minimize property damage, and

4) minimize the life safety risk.

**Reduce the probability of fire ignitions**

Efforts to reduce the probability of fire ignitions focus on manmade causes of ignition through a combination of fire prevention education, enforcement and other actions. Fire prevention education actions include efforts to heighten public awareness of fire dangers, especially during high danger time periods and better education about fire safe practices, such as careful disposal of smoking materials, and adhering to restrictions on burning of rubbish and debris. Fire prevention enforcement actions include strict enforcement of burning restrictions and vigorous investigation and prosecution of arson cases. One physical action to reduce the probability of ignitions is to maintain or upgrade tree-trimming operations around power lines to minimize fires starting by sparking from lines to vegetative fuels as well as vigorous enforcement of overgrown vegetation and tall grass ordinances.

**Reduce the probability that small fires will spread**

Possible mitigation actions to reduce the probability that small fires will spread include enhancement of water supply and fire suppression capabilities for high risk areas, expansion of existing firebreaks, creation of new firebreaks and expanding defensible spaces around structures in wildland/urban interface areas.

### Minimize Property Damage

The education and action items discussed above may help to reduce future property damages by reducing the number of fire ignitions and by reducing the probability that a small fire will spread. In addition, specific fire safe building practices can be implemented (if not yet implemented) or enforced vigorously (if not yet vigorously enforced). Fire safe building practices have two main elements:

- Fire safe design and construction of structures, and
- Maintenance of defensible spaces around structures.

The National Fire Protection Association (NFPA) has an excellent "Firewise" communities program with a highly informative website (www.firewise.org). The firewise website can also be reached from the main NFPA website (www.nfpa.org). The Firewise website has very informative publications and videos for local officials and homeowners to help understand, evaluate, and improve the fire safety of structures at risk from wildland/urban interface fires. The firewise construction and firewise landscaping checklists are particularly recommended as concise summaries of the primary fire-safe designs and practices for homeowners at risk from wildland/urban interface fires.

The NFPA's Firewise Construction Checklist, makes the following main recommendations (among others):

1) site homes on as level terrain as possible, at least 30 feet back from cliffs or ridge lines,

2) build homes with fire-resistant roofing materials, such as Class-A asphalt shingles, slate or clay tiles, concrete or cement products, or metal,`

3) build homes with fire-resistant exterior wall cladding, such as masonry or stucco,

4) consider the size and materials for windows; smaller panes hold up better than larger ones, double pane and tempered glass windows are more fire resistant than single pane windows; plastic skylights can melt and allow access for burning embers,

5) prevent sparks and embers from entering vents by covering vents with wire mesh no larger than 1/8", box eaves, and minimize places to trap embers on decks and other attached structures, and

6) keep roofs, eaves, and gutters free of flammable debris.

The NFPA's Firewise Landscaping Checklist includes the following main recommendations (among others), based on a four-zone planning concept around the house:

1) Zone 1 should be well irrigated area of closely mowed grass or non-flammable landscaping materials such as decorative stone, at least 30' in all directions around the home,

2) Zone 2 should be a further irrigated buffer zone with only a limited number of low-growing, fire-resistant plants,

3) Zone 3, further from the house, can include low growing plants and well-spaced, well-pruned trees, keeping the total vegetative fuel load as low as possible, and

4) Zone 4 is the natural area around the above three landscaped zones. This area should be thinned selectively, with removal of highly flammable vegetation and removal of ladder fuels that can spread a grass fire upwards into tree tops.

**Minimize Life Safety Risk**

The mitigation actions above may help to minimize life safety risk by helping to reduce the number of ignitions, by reducing the probability that small fires will spread, and by encouraging more fire-safe practices of building construction and fire-safe landscaping. These practices are meritorious for reducing the fire hazards to structures. However, they may also give homeowners a false sense of life safety security. A false sense of security may encourage people to stay in homes at risk during wildfires, rather than evacuating immediately at the first fire warning.

The most important action to minimize life safety risk during wildland/urban interface fires is immediate evacuation. Thus, reducing life safety risk requires public education and emergency planning to encourage and expedite warnings and evacuations (voluntary or mandatory).

### 7.8.2 FEMA Mitigation Actions for Wildland/Urban Interface Fires

The various FEMA mitigation grant programs (see: Appendix 1) include mitigation projects to reduce the risks from wildland/urban interface fires. Mitigation measures that FEMA commonly funds include:

- Defensible space activities,
- Hazardous fuel reduction activities, and
- Ignition resistant construction activities.

FEMA mitigation grants may also be available for some other wildand/urban interface fire mitigation activities. However, FEMA mitigation grants do not typically fund water system capacity enhancements, equipment or apparatus purchases or emergency planning activities.

### 7.8.3 Mitigation Action Items for Wildland/Urban Interface Fires

The following table contains wildland/urban interface fire mitigation action items from the master Action Items table in Chapter 4.

**Table 7.3**
**Wildland/Urban Interface Fire Mitigation Action Items**

| Hazard | Action Item | Coordinating Organizations | Timeline | Plan Goals Addressed | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Life Safety | Protect Property and Infrastructure | Emergency Management Capabilities | Public Awareness and Education | Environmental Stewardship |
| **Wildland/Urban Interface Fire Mitigation Action Items*** | | | | | | | | |
| Short-Term #1 | Track and report progress of action items in the Community Wildfire Protection Plan. | Multnomah County Emergency Management | Annually | X | X | X | X | X |
| Short-Term #2 | Review and amend as necessary planning and development regulations to incorporate mitigation strategies for urban/wildland interface fires considering the recommendations in the 2011 Multnomah County Community Wildfire Protection Plan. | Multnomah County Land Use Planning | 3 Years | X | X | X | X | X |
| Short-Term #3 | Consider how Multnomah County Land Use Planning should coordinate with fire agencies' planning for wildland/urban interface fires. | Planning | 1-2 Years | X | X | X | X | X |

* See Multnomah County CWWP for a long list of potential action items.