Appendix C
Risk Assessment Methods

The following section outlines the specific methods, data, and values used to evaluate wildfire risk in Lane County.

Identifying the Wildland Urban Interface

The wildland urban Interface (WUI) is the area where development meets and intermingles with undeveloped wildland vegetation. Identifying the WUI is an important first step in a wildfire risk assessment. The WUI broadly outlines all areas potentially threatened by wildfire where impacts on humans are likely.

The Lane County WUI was developed by analyzing structural density and 6th field watersheds. A ¼ mile was buffer was established around each address point represented in a countywide address file. These address points, each indicating a dwelling or other structure, created a density surface layer. This density surface is combined with the boundaries of all 6th field watersheds intersecting with it, resulting in the WUI boundary. The 6th field watershed refers to a classification method used to identify and rank drainage basins. Extending the WUI boundary to the 6th field watershed generally pushes the WUI boundary to the nearest ridgelines or points of 6th field watershed stream origin. Wildfire behavior analysts have determined that 6th field watershed-based WUIs are significant because ridgelines often form natural firebreaks and can be used to generally identify impacted areas.

Within the broadly defined wildland urban interface zone there are areas where wildland fires are not possible due to the lack vegetative fuels. These areas include bodies of water and highly developed urban centers. By excluding surface water polygons and areas identified as urban within the crown fire and vegetation data sets these areas have been masked.

Risk

To determine the relative risk of a wildland fire starting the risk layer was modeled using the density of historic fire ignitions. The data is derived from ODF and federal fire ignition databases. Ignition data from the State Fire Marshal's office was also available but was not calculated into this assessment. The majority of Fire Marshall data represents fire ignitions within Eugene/Springfield metro area. These ignitions are typically lawn or field fire events and not true wildland fires. Fire ignition points were given a 1.5 mile buffer and then converted to a density layer. Calculations were run to generate fires per 1000 acres per 10 years and the results were broken into 3 classes:

0-.1 (low) has a point value of 5, .1-1.1 (moderate) has a point value of 20, 1.1+ (high) is given a point value of 40. See Table C.1 below.

Table C.1: Risk Layer Scores

Historic Fire Occurrences: (per 1000 acres)	Points:	Risk Ranking:	From:	To:
0 to .1	5	Low	5	13
.1 to 1.1	20	Moderate	13	27
1.1+	40	High	27	40

Source: Lane County Land Management Division, 2005

Hazards

Hazards evaluated within this assessment are broken down into four categories: weather, topography, vegetation and crown fire potential. See Table C.2 below.

Weather accounts for the largest point value in the hazard layer. The weather hazard factor is derived from data provided by ODF, which was developed following an analysis of daily wildfire danger rating indices in each regulated use area of the state. The weather is classed from 1(lowest) to 3 (highest). The majority of Lane County has a classification of 2 (medium-moderate). There is, however, a significant break along the coast range, in which the area of the county west of the coast range is classified as 1 (low). The area classed as 1 is given a point value of 0, while the area classed as 2 has a point value of 20.

Weather: 0-40 (0-20 for Lane County – no risk-high weather areas are present)

The topographic layers: slope, aspect, and elevation were generated from 10-meter DEMs (Digital Elevation Models). Slopes are classed by percent slope ranges: 0-25%, 26-40% and 41%+. These ranges carry values ranging from 0 (least slope) to 3 (most slope). Aspect is broken into three classes: 0 (N, NW, NE), 3 (W, E), 5 (S, SW, SE). A higher value corresponds to the amount of exposure to sunlight or excessive heat an area receives based on its aspect. Slope and aspect affect both the intensity and rate of spread of a wildfire. Elevation ranges are broken at 3,000 and 5,000 ft. Elevation affects the type of vegetation and length of fire season. Lower elevations are considered more hazardous. This layer ranges in value from 0 (high elevation) to 2 (low elevation).

Topography: 0-10

The vegetation layer comes from BLM data displaying vegetation types. Vegetation is broken into three different fuel model types based on the fire behavior and common fire characteristics of the vegetation within each fuel model type. Each fuel model type is given a fuel hazard factor (value) from 1(low) to 3 (high).

Vegetation: 0-20

Crown fire potential is produced by first isolating areas with coniferous trees with trunk sizes over 5 inches in diameter at breast height. These areas are then split into three classes; conifer cover less than 30 percent has low crown fire potential (0), conifer cover between 30 and 70 percent has moderate potential (5), and conifer cover over 70 percent has the highest crown fire potential (10). Crown fire data is derived from Bureau of Land Management's Interagency Vegetation Mapping Project (IVMP).

Crown Fire Potential: 0-10

Table C.2: Hazard Layer Scores

Hazard Factor	Risk and Point Breakdown		
	Low	Moderate	High
Weather	0	20	N/A
Slope	0	2	3
Aspect	0	3	5
Elevation	0	1	2
Fuel	5	15	20
Crown Fire Potential	0	5	10

Source: Lane County Land Management, 2005

Community Values at Risk

Interface fires can be devastating events especially when their path crosses with highly populated or developed areas or those areas where important community infrastructure is located. In order to determine what values are for areas at risk to wildfire two main categories were analyzed.

First, the values for residences were modeled using the Lane County regional address dataset. Each address point (structure) was first given a ¼ mile buffer. A surface was then created displaying home density per 10 acres. The results were broken into 3 classes and given associated point values. .1-.9 (rural) has a value of 2, 1-5 (suburban) has a value of 15 and 5.1+ (urban) is given a value of 30.

Second, the presence of community infrastructure was analyzed in conjunction with housing density. Lane County recently concluded an exhaustive inventory of all industrial, commercial and public facility zoned lands as part of its periodic review work program. This inventory was used to identify and map a range of critical facilities and community establishments including: schools, churches, community

centers, health care facilities, major manufacturing, utility and fuel storage facilities. To the extent possible, the location of public utilities - municipal watersheds, water storage sites and power substations and generation sites were identified and mapped.

The presence, or lack of, community infrastructure was determined and assigned the following point values: 0 (none present), 10 (one present), and 20 (more than one present). These values have been combined with those generated from the home density analysis to make up the total Values Protected layer. See Table C.3, below.

Table C.3: Community Values at Risk Layer Scores

Housing Density Units: (homes per 10 acres)		Points	Presence of Community Infrastructure:	Points	Values Protected Rating:	From:	To:
Rural	.1-.9	2	None present	0	Low	2	15
Suburban	1-5.0	15	One present	10	Moderate	16	30
Urban	5.1+	30	More than one present	20	High	31	50

Source: Lane County Land Management Division, 2005

Protection Capability

The capacity of communities to prepare for and respond to the threat of wildfire is a critical component of a wildfire risk assessment. This capacity is determined by analyzing three features:

1. **Structural fire protection:** In Lane County, areas that fall within one of the twenty-five fire protection districts receive structural fire protection. All other (unprotected) areas receive only wildland fire protection from the Oregon Department of Forestry or the US Forest Service.

2. **Response time:** Areas inside of fire protection districts are broken into two groups – those areas that receive an assistance response in less than ten minutes and those areas where a response takes longer than ten minutes. In unprotected areas, the wildland protection is divided into areas where a response takes under or over twenty minutes.

3. **Community preparedness:** The level of mitigation efforts undertaken by the community to enhance wildfire awareness or to augment the effectiveness of fire response can be a very telling feature when calculating the overall protection capability of a community. Areas with involvement led by community stakeholder groups such as phone trees or other citizen backed mitigation efforts are considered more effective than areas were such efforts are conducted solely by fire protection districts or other government agencies.

In order to model response times inside and outside of a fire district it was necessary to use a road centerline layer that contained speed limits for each road segment. A countywide road centerline layer existed that contained values for "posted" speed zones. Posted speed zones ranged from 5mph to 65mph. Posted speed zones represented only a small portion of roads in Lane County, the remaining roads are officially considered "basic rule" which has a maximum speed of 55mph. It was decided to use the posted speed limits for the analysis but to use a different method for speed limits for the roads under "basic rule" since they didn't adequately represent true driving speed. For the roads with no posted speed zones a speed limit was assigned to roads based on the functional classification of the road:

Major Arterial – 55mph

Major Collector – 45mph

Minor Arterial – 45mph

Minor Collector – 40mph

Local Access Road – 25mph

Private Road – 25mph

Once all roads contained a speed value it was converted to a 30-meter grid. Any cell outside of a road was assigned 3mph. Values were calculated for each cell that represented the amount of time in minutes it would take to travel across each 30-meter cell. This travel time grid along with a point based fire station location layer were then used to perform a "cost grid" analysis that created a response time grid with values in minutes. Areas within a fire district with a response time of less than 10 minutes were assigned a point value of 0 and those areas within a fire district and a response time of greater than 10 minutes were assigned 8 points. Outside of the fire district boundary those areas with response times less than 20 minutes were assigned 15 and the areas outside a fire district and having response times greater than 20 minutes were assigned 36 points.

The level of community preparedness was determined through fire district surveys and interviews with Oregon Department of Forestry personnel. Areas where known community led mitigation and preparedness activities occur received a better, (0 points) ranking. Areas where mitigation activities are conducted by agency personnel only received 2 points. Areas with no known mitigation of preparedness efforts received 4 points. See Table C.4 below.

Table C.4: Protection Capability Layer Scores

Structural Fire Protection	Response Time	Points
Structural protection response:	< 10 minutes	0
Structural protection response	> 10 minutes	8
No structural protection, wildland response:	< 20 minutes	15
No structural protection, wildland response:	> 20 minutes	36
Community Preparedness		**Points**
Organized community efforts		0
Primarily agency effort		2
No effort		4
Protection Capability Rating:	**From:**	**To:**
Low	**0**	**9**
Moderate	**10**	**16**
High	**17**	**40**

Source: Lane County Land Management Division, 2005

Weighting of Factors

Table C.5: Weighting of Factors Used in the Risk Assessment

Risk Assessment Layer	Points Possible
Risk	5-40
Hazard	0-40
Values at Risk	15-50
Protection Capabilities	10-50
Total Possible	39-190

Source: Lane County Land Management Division, 2005

Overall Risk

Table C.6: Overall Risk Rating Used in the Risk Assessment

Risk Rating	Point Ranges
Low	39-89
Medium	89.1-139
High	139.1-190

Source: Lane County Land Management Division, 2005

Incorporating Local Input

Local fire fighters are a key resource in the identification of at risk areas and substantive input from every Lane County fire district was actively sought during this assessment.

Fire districts were engaged through the Lane County Fire Defense Board (FDB). From November 2004 to February 2005 risk assessment team members met regularly with municipal and rural district chiefs and representatives. The FDB was briefed on the methods used in the assessment and had the opportunity to provide comments and direction. The primary tool used to gather input from fire districts was a fire protection risk assessment and protection capability questionnaire. A draft questionnaire was developed and circulated to the FDB for review. After comments were submitted a final questionnaire and service area base map was provided to each of the twenty-five Lane County fire districts.

The intent of the questionnaire was to gather data related to the known WUI threats and protection capabilities. Districts were asked to provide specifics on a number of topics including: the extent of community preparedness to wildfire, the location of at risk areas due to fuels, poor access, and limited water supply, ISO public protection capability ratings, and others. A copy of the questionnaire is included at the end of this Appendix.

In addition to the questionnaire, enlarged aerial photo service area base maps were provided to each fire district. Fire chiefs were given colored pens and instructions and asked to indicate areas of special concern that fell into the following categories: developed areas at risk to wildfire due to the presence of vegetative fuels and topography, access and egress limited areas, areas with prevalent landscaping dangers including lack of defensible space and limited water supply for fire suppression, and areas affected by wind-throw, ice storms, or insect and disease epidemics.

Finally, information regarding wildfire threats was gathered through site visits conducted for use in the Lane County Natural Hazard Mitigation Plan. Between November and December 2003, Emergency Management Staff toured the majority of rural fire districts within the county. Windshield surveys and interviews with chiefs produced data about several hazards, including wildland urban interface fires.

Information provided by fire districts was used in two ways. First, protection capability data gathered through the questionnaire was incorporated into the GIS analysis. Information regarding fire assistance agreements and fire response time was used in the development of the response time layer and data about organized community stakeholder mitigation activities was used in the protection capability rating. Second, areas of special concern indicated through the

survey, mapping exercise and t site visits were compared to areas identified as high risk through the GIS analysis.

All areas of special concern identified by the fire districts are outlined in the in the assessment area panels located findings section of the risk assessment. Eventually, the fire district survey maps will be digitized and converted into an electronic format that is viewable online.