Fire and Fuels

Key Points

- In the absence of natural fire as a disturbance agent, management activities, including prescribed fire and mechanical management of vegetation, can serve as a partial surrogate for natural disturbance, and promote and maintain desired forest stand structure, composition, and resistance to fire. These conditions may also provide opportunities for effective fire management, including the ability to utilize wildfire to meet land use and resource objectives consistent with management direction (**Appendix B**). However, due to the configuration of BLM-administered lands within the larger landscape, particularly their proximity to where people live, the ability to use wildfire may have limited application, and prescribed fire would likely account for the majority of managed fire under any alternative and the Proposed RMP.
- The BLM-administered lands constitute only a small portion of the entire interior/south dry forest landscape. Consequently, the modest shifts in forest structure and composition under any alternative or the Proposed RMP would not result in any substantial change in the overall landscape fire resilience. The dry forest landscape would continue to have an overabundance of mid-seral closed forest and a deficit of late-seral open forest.
- All alternatives and the Proposed RMP would increase stand-level fire resistance within the dry forest and reduce fire hazard on BLM-administered lands within the Wildland Urban Interface compared to current conditions. Within the Harvest Land Base, there would be greater variation in these variables among the alternatives and the Proposed RMP over time.
- The treatment of activity fuels associated with forest management is necessary to reduce potential fire intensity, particularly in areas with higher fire risk. Alternative C for the entire decision area and Alternative B and the Proposed RMP in southern portion would result in the highest levels of potential activity fuel risk.

Summary of Notable Changes from the Draft RMP/EIS

The BLM corrected a coding error for the acreage of early seral departure from reference conditions in Issue 1 and modified the extent of the Wildland Development Area in Issue 3 to be consistent with the extent used in Issue 4.

Background

Fire History and Fire Regimes

Fire has played a major role as a natural disturbance agent shaping vegetation patterns and structures across western Oregon landscapes for millennia (Agee 1991a and b, and Hessburg and Agee 2003).

Fire regimes quantify the historic spatial and temporal interaction of fire disturbance. Most fire regime classifications describe the presumed conditions under which vegetation communities have evolved and been maintained for a given ecosystem or landscape (Sommers *et al.* 2011). Different fire regime classifications exist, some of which focus on specific and specialized plant communities (e.g., grasslands, chaparral, and peat systems), while others include seasonality of burn and other nuanced factors (Sommers *et al.* 2011). This discussion will focus on the five fire regime groups recognized by LANDFIRE (Barrett *et al.* 2010), based on fire frequency, and expected severity (**Table 3-28**).

Table 3-28. Fire regime groups and descriptions used in current LANDFIRE Fire Regime Condition Class Guidebook Version 3

Fire Regime Group	Frequency	Severity	Severity Description
I	0–35 years	Low/Mixed	Generally low-severity fires replacing less than 25% of the dominant overstory vegetation; can include mixed-severity fires that replace up to 75% of the overstory
II	0–35 years	Replacement	High-severity fires replacing greater than 75% of the dominant overstory vegetation
III	35–200 years	Mixed/Low	Generally mixed-severity; can also include low severity fires
IV	35–200 years	Replacement	High-severity fires
V	200+ years	Replacement/ Any Severity	Generally replacement severity; can include any severity type in this frequency range

Source: Barrett *et al*. 2010

In mixed-severity fire regimes, the influence of fuels, topography, and weather play out across the landscape to affect fire behavior, resulting in highly variable forest structure, vegetation patterning, successional stages (Perry *et al.* 2011, Donato *et al*. 2012), and rich biodiversity (Stephens *et al.* 2015, DellaSala and Hanson 2015). In low-severity fire regimes, fuels tend to be the dominant factor influencing fire behavior, while in high-severity fire regimes weather is the primary driver of fire behavior (Halofsky *et al.* 2011, Hessburg *et al.* 2005, Jain *et al.* 2012, Sommers *et al.* 2011), both of which result in less edge and larger patch sizes than mixed-severity regimes. At both local and regional scales, the influence of terrain, slope position, aspect, management actions, and ignition loading can result in a fine-scale mosaic of fire regimes (Agee 1991b, 1998, and 2005, Odion *et al.* 2004, Taylor and Skinner 2003), particularly in mixed-severity fire regimes.

Within the administrative boundaries of the Coos Bay, Eugene, and Salem Districts (coastal/north portion of the planning area), high proportions of the landscape, ranging from 44 to 53 percent, fall into the infrequent (> 200 years) and commonly replacement-severity fire regime group, with fire return intervals measured in hundreds of years (**Table 3-29**). Historically, fire was not an important frequent change agent acting to influence stand structure distribution of these forested ecosystems. Natural ignitions, weather, and fuel conditions to support fires in these areas rarely aligned, and fires that burned were large and of high severity (Morrison and Swanson 1990).

Table 3-29. Fire return intervals (FRI) by Historic Fire Regime Groups across the planning area

District/ Field Office	Historic Fire Regime Group and Description				
	I	II	III	IV	V
	0-35 Year FRI, Low and Mixed Severity (Percent)	0-35 Year FRI, Replacement Severity (Percent)	35-200 Year FRI, Low and Mixed Severity (Percent)	35-200 Year FRI, Replacement Severity (Percent)	> 200 Year FRI, Any Severity (Percent)
Coos Bay	39%	-	16%	-	44%
Eugene	17%	-	34%	-	50%
Klamath Falls	42%	6%	25%	23%	4%
Medford	91%	-	7%	1%	1%
Roseburg	40%	-	48%	1%	12%
Salem	22%	-	25%	-	53%

Source: LANDFIRE 2010 (LF_1.2.0)

The Klamath Falls Field Office and the Medford and Roseburg Districts (interior/south portion of the planning area) have high proportions, 73–98 percent, of lands within their administrative boundaries classified into low- and mixed-severity fire regime groups (I and III) with frequent (0–35 years), to moderately frequent (35–200 years) fire return intervals (**Table 3-29**). Historically, frequent to moderately frequent fire acted as a relatively important change agent affecting the landscape within the interior/south portion of the planning area.

Much of the southern portion of the planning area is within the Klamath ecological province, recognized for floristic diversity, geographic complexity, highly varied climatic gradients, and the prominent historic role of fire (Whittaker 1960, Atzet and Wheeler 1982). Prior to the 20th century, low- to mixed-severity fires played a substantial role in most dry forest ecosystems (Agee 1991a, Leiberg 1900, Colombaroli and Gavin 2010). Regional studies have found historic pre-settlement median fire return intervals ranging from 8–20 years in the drier and southern portions of the planning area (Sensenig *et al.* 2013, Taylor and Skinner 1998 and 2003), and longer median fire return intervals (35–120 years) in more mesic locations of the dry forest (Agee 1991b, Olson and Agee 2005, Van Norman 1998). These pre-20th century fires resulted both from lighting and human-caused ignitions (Sensenig 2002, Atzet and Wheeler 1982, Lalande 1995). Native Americans influenced vegetation patterns for over a thousand years by igniting fires to enhance values that were important to their culture, sustainability, and for vegetation management (Lalande 1991). Early settlers used fire to improve livestock grazing and farming, and to expose rock and soil for mining, and they set frequent and extensive fires (Atzet and Wheeler 1982, Leiberg 1900), heavily altering natural fire regimes.

Fire Exclusion in the Dry Forest

Historically, frequent low- to mixed-severity fire interacted with the complex landscape, vegetation, and climate to create and maintain patchy, mixed seral stages of shrubland, woodland, and mixed conifer/hardwood forests, in both open and closed conditions (Taylor and Skinner 1998, Hickman and Christy 2011, Duren *et al.* 2012, Dipaolo and Hosten 2015, Baker 2011). Frequent fire also cultivated large open grown trees, hindered the regeneration of fire intolerant species, promoted fire tolerant species and understory diversity, reduced forest biomass, and decreased the compounding impacts of insects and diseases (Halofsky *et al.* 2011, Perry *et al.* 2011, Jain *et al.* 2012). Historically, these heterogeneous

landscape patterns and uneven-aged, uneven-structured stands of fire-dependent species contributed towards the fire resilience and rich biologic diversity of the southern Oregon landscape.

In the early 1900s, suppression of all wildfires became a goal of land management agencies and policy (Graham *et al.* 2004). This effectively took hold in western Oregon in the 1940s with the advent of mechanized equipment and the establishment of the smoke jumper base in Cave Junction (Atzet and Wheeler 1982, Atzet 1996). Effective fire exclusion and other land management practices (e.g., extensive even-aged forest management, mining, and grazing) has altered natural fire return intervals (Hessburg *et al.* 2015), and many areas have missed two to five fire cycles in the interior south (Agee 1991b, Taylor and Skinner 1998 and 2003, Olson and Agee 2005).

The absence of frequent low- and mixed-severity fire along with other land management practices has altered landscape seral distribution (Haugo *et al.* 2015), successional pathways (Donato *et al.* 2012), forest structural development (Halofsky *et al.* 2011), tree establishment (Sensenig *et al*. 2013, Comfort *et al.* in press), forest opening size and frequency (Skinner 1995, Taylor and Skinner 1998, Larson and Churchill 2012), and the horizontal and vertical fuel profile and loading (Agee 1998, Graham *et al.* 2004, Hessburg *et al.* 2005).

Currently, many of the dry forest stands are overly dense, are missing large fire-resistant trees, or are at risk from encroachment or fire-induced mortality (North *et al.* 2009, Jain *et al.* 2012, Comfort *et al.* in press). Dry forest species composition has shifted, resulting in significant reductions in the proportion and diversity of fire-adapted conifers, hardwoods, shrubs, and herbaceous species (Taylor and Skinner 1998 and 2003, Franklin and Johnson 2010, Duren *et al.* 2012). The proportion of shade-tolerant species to fire-tolerant species has increased along with the proportion of small trees to large trees (Comfort *et al.* in press*)*. The abundance of densely forested conditions has compromised individual tree vigor, resulting in extremely slow growth, which can delay or hinder the development of structurally-complex forest (Sensenig 2002, Sensenig *et al.* 2013). Open areas, such as forest gaps, shrublands, savannahs, grasslands, and hardwood woodlands, have been converting to closed areas via the recruitment of conifers (Taylor and Skinner 1998, Hosten *et al.* 2007, Comfort *et al.* in press). Surface, ladder, and canopy fuels have increased in loading and continuity, increasing the potential for larger scale crown and stand-replacing fires (Agee 1998, Sensenig 2002, Graham *et al.* 2004, Hessburg *et al.* 2005).

In general, the result of previous land management practices has resulted in homogenized vegetation patterns and fuel conditions at multiple scales (Hessburg *et al.* 2015) threatening overall forest health, and resistance and resilience to disturbance from fire, insects, and disease (Franklin and Johnson 2012, Sensenig *et al*. 2013). A recent regional evaluation of forest structure and restoration needs suggests that, 40 percent of Oregon and Washington's conifer forests are in need of disturbance through thinning or wildland fire (Haugo *et al.* 2015).

Current Fire Climate Environment and Future Trends

The area south of the Rogue-Umpqua divide generally has more severe and frequent thunderstorms with little precipitation, relative to the northern and coastal portions of the planning area (Agee 1991a, Atzet and Wheeler 1982, Sensenig 2002). While dry lightning is still infrequent in the coastal/north districts (Coos Bay, Eugene, and Salem), human ignitions are prevalent and account for greater than 90 percent of all ignitions within these districts (**Figure 3-22**). Human caused ignitions typically occur in relatively accessible locations and are sparse compared to multiple strikes in lightning events; coupled with overarching climatic patterns, human ignitions are typically manageable for suppression resources. Relative to frequent fire ecosystems, fire exclusion is an inconsequential factor influencing current fire frequency and severity, and structural stage distribution (Brown *et al.* 2004).

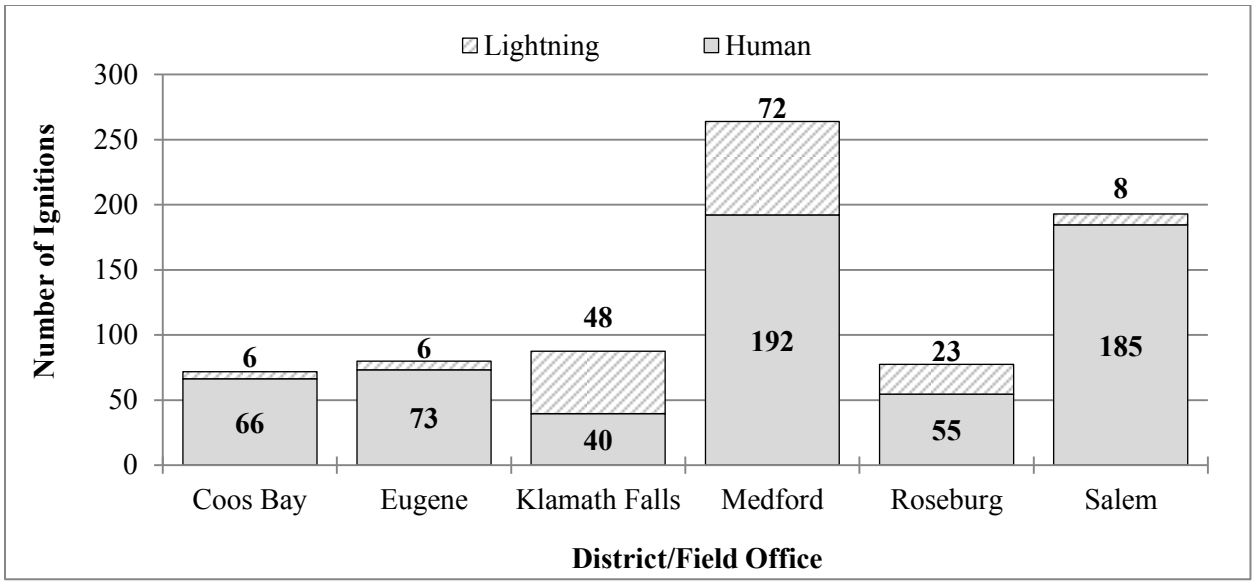


Figure 3-22. Average annual number and cause of ignitions (1984–2013) within the planning area
Source: Oregon Department of Forestry ignition data[44]

While fire regime groups represent historic conditions, the prevailing climatic patterns (hot, dry summers) influencing fire frequency and fire potential still exist in southern portions of the planning area, along with sufficient sources of both naturally and human-caused ignitions (**Figure 3-22**). Depending on fuel conditions, lightning from storms can start numerous wildfires in dry receptive fuels.

In the recent past, these multiple ignition events have on occasion overwhelmed suppression resources and have been a significant factor in the development of large wildfires within the southern portion of the planning area (notable years include 1987, 2002, 2013, and 2014). Currently, the vast majority (93 percent) of acres burned are within wildfire perimeters greater than 1,000 acres, even though these wildfires account for less than 1 percent of all ignitions (**Table 3-30**). These large fires tend to burn during more extreme fire weather conditions, when fire behavior and growth potential exceed or challenge suppression resource availability and capabilities (Planning Level 4 and 5; NIFC 2014). This pattern of fire on the landscape is contrary to historic patterns of frequent fires burning throughout the dry season under various weather conditions across the landscape.

Table 3-30. Wildfire ignitions within the planning area by acre size class categories, 1984–2013

Fire Size Class (Acres)	All Ignitions (Percent)	Total Acres Burned (Percent)
< 10	96%	1%
10-99	3%	2%
100-999	1%	4%
1,000+	< 1%	93%

Source: Oregon Department of Forestry ignition data

[44] ODF ignition data likely underrepresents wildfire occurrence on BLM-administered lands within the Klamath Falls Field Office, as the Gerber Block located in the southeast portion of the field office is not under ODF protection.

In recent decades, the frequency of large wildfires and the annual acres burned have increased across the western states (Westerling *et al.* 2006) and in Oregon (USDI BLM 2013). Modeled projections indicate this trend will continue (Mote *et al.* 2014). Based on an analysis of fire start dates for wildfires greater than 1,000 acres, Westerling and others (2006) found that the fire season is already longer than it was in the 1980s by at least a month. With observed increase in mean summer temperatures and earlier snowmelt, some climate changes have already begun to manifest. These changes in climate strongly correlate with increasing wildfire size, large wildfire frequency, and longer wildfire durations (Westerling *et al.* 2006, Littell *et al.* 2010, Miller *et al.* 2012, see the Climate Change section in this chapter). These observed trends and forecasts suggest that wildfire will continue to be a major change agent affecting ecosystem structure and spatial distribution, further exacerbating the problems of fire exclusion and previous land management activities. In recent decades, there has been growing concern over cost and lasting effects of large wildfires (Ingalsbee and Raja 2015). In part, this prompted Congress to pass the 2009 FLAME Act (43 U.S.C. 1701). This Act directed the Secretary of Agriculture and the Secretary of the Interior to submit a joint strategy to address major wildland fire issues in the United States through the enhancement and development of fire-adapted communities, effective and efficient wildfire response, and resilient landscapes.

Recognition of both the spatial and temporal process and vegetative structure of fire regimes is necessary to promote resilience in frequent fire-adapted forests (Agee 2002, Jain *et al.* 2012). In fire-adapted ecosystems, fire on the landscape can clearly provide benefit to fire-dependent species and promote rich biologically diverse successional stages and vegetation patterning (Agee 1993, Agee 2005, Odion *et al.* 2010, Swanson *et al.* 2011, DellaSala and Hanson 2015). In the absence of utilizing natural fire as a disturbance agent, management activities can serve as a partial surrogate to promote and maintain desired spatial and temporal structural and composition. Despite a presumed low probability that wildfires will intersect treatments (Rhodes and Baker 2008), recently, there has been a growing body of evidence throughout the western states (Martinson and Omi 2013, Ewell *et al.* 2015), Pacific northwest (Prichard *et al.* 2010, Shive *et al*. 2013, and Prichard *et al.* 2014), and in southwest Oregon (local observations) that they do. This evidence demonstrates that vegetation management, incorporating mechanical and prescribed fire treatments, has successfully moderated fire behavior and fire effects, even under extreme weather events (Prichard and Kennedy 2014), and has contributed toward more resilient future forest structure (Stevens-Rumann *et al.* 2013). During extreme fire weather events and plume-dominated fire behavior, even fuel profiles and vegetation structure representative of historic fire regimes may have a reduced likelihood of altering fire behavior (Lydersen *et al.* 2014), and treated areas may become less effective at altering fire behavior (Ewell *et al.* 2015), resulting in large areas of high severity. However, Kennedy and Johnson (2014) and Ewell *et al.* (2015) found that these types of treatments also improved fire management opportunities. These moderated vegetation structures, and thus moderated fire behavior under less than extreme fire weather conditions, may provide opportunities to utilize wildfire (North *et al.* 2015) to meet land use and resource objectives.

Issue 1

How would the alternatives affect fire resiliency in the fire-adapted dry forests at the landscape scale?

Summary of Analytical Methods

To measure dry forest fire resilience at the landscape scale, the BLM[45] quantified the departure of current vegetation structure and landscape composition patterns from a set of reference conditions that represent the historic range of variability (Barrett *et al.* 2010, Keane *et al.* 2009). In this approach, less departure

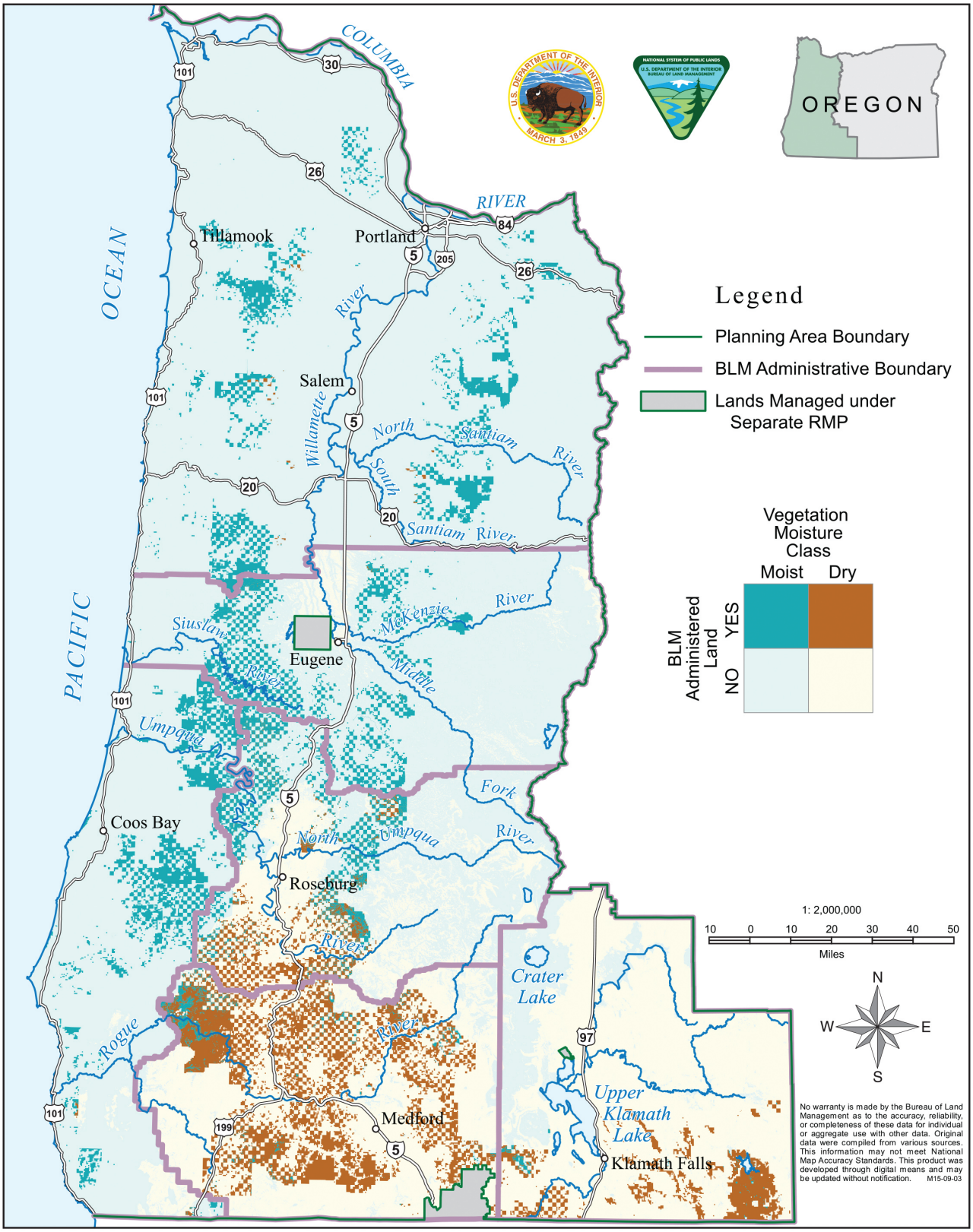
[45] Chris Zanger, Forest Analyst for The Nature Conservancy, conducted this analysis of landscape-scale fire resiliency under an agreement with the BLM.

from reference conditions represents greater fire resiliency. Historic conditions within the dry forests were more resilient to fire disturbance than current conditions, in large part, because frequent fire was present on the landscape (Hessburg and Agee 2003, Brown *et al.* 2004, North *et al.* 2009).

In this analysis, the BLM quantified how the seral stage distribution would vary in 50 years for each alternative and the Proposed RMP, relative to the reference condition. This analytic process built upon the conceptual framework of the LANDFIRE Fire Regime Condition Class concept (Schmidt *et al*. 2002, Barrett *et al.* 2010). The LANDFIRE Fire Regime Condition Class conceptual framework assumes that, given natural disturbance processes (e.g., historic fire regime), a biophysical setting will have a sustainable range of variation in the proportion of each successional stage for a given landscape (Barrett *et al*. 2010). This reference condition—the percentage of a biophysical setting in each seral stage—does not represent a specific historical date, but instead approximates an equilibrium condition, or ecological reference condition, based upon the natural biological and physical processes. While a variety of perspectives exist regarding historic vegetation reference conditions and natural range of variability (Strittholt *et al.* 2006, Colombaroli and Gavin 2010, Baker 2011, and Dipaolo and Hosten 2015), this analysis utilizes LANDFIRE biophysical settings which provide comprehensive reference conditions for all seral-states and have been developed based on literature review, local data, and expert estimates.

Four primary data inputs provided the foundation for this assessment of successional stage departure:

1. A classification and map of forested biophysical settings to identify dry forest and moist forest (ILAP Potential Vegetation Types; **Map 3-2**)
2. A reference condition for the natural range of variability for each biophysical setting (LANDFIRE BPS 2008, Rollins 2009, Ryan and Opperman 2013)
3. A delineation of landscape units for each biophysical setting (i.e., the dry forest within the administrative boundaries of the Klamath Falls Field Office, and Medford and Roseburg Districts) (**Appendix H**)
4. A spatial delineation of forest structure and composition for current and future conditions, under all alternatives and the Proposed RMP (**Appendix H**). These classifications are based on structure and do not infer an ecologically intact seral-state.



Map 3-2: Moist and Dry Vegetation within the Planning Area

The BLM used the Integrated Landscape Assessment Project (ILAP) Potential Vegetation Type spatial data, which approximate an aggregation of plant associations and Plant Association Groups, to classify forests within the planning area into moist and dry forest categories, based on Franklin and Johnson (2012). U.S. Forest Service Region 6 Ecologists reviewed the initial categorizations of moist and dry Plant Association Groups, and BLM district staff refined the data, based on local knowledge of the ground. Using the refined ILAP Potential Vegetation Type 30-meter spatial data, the BLM categorized as 'dry' any Forest Operations Inventory polygons that had more that 50 percent of its area within a dry Potential Vegetation Type.

The BLM recognizes that vegetation types result from complicated relationships among, climate, topography, soils, and disturbance regimes. In addition, while vegetation types typically occur along moisture gradients, they do fall into broad relative moisture categories of moist and dry, particularly at the scale of the planning area. This discrete classification into moist or dry recognizes general differences in disturbance regimes, succession, and species composition, and as such, relevant management objectives and direction. The BLM acknowledges that several other vegetation classification schemes exist (e.g., LANDFIRE 2010, Ecological Systems Classification (Comer *et al.* 2003), National Gap Analysis Program (Jennings 2000), and The National Vegetation Classification System (Anderson *et al.* 1998, FGDC 2008), however, these classification schemes do not group forests into broad moisture categories (e.g., moist and dry) relevant to management decisions, objectives, and direction. For the purposes of this analysis, the BLM uses the classification scheme described above, which is further detailed in **Appendix C**.

This analysis presents effects on landscape-scale fire resiliency that includes land management on BLM-administered lands and non-BLM-administered lands. The analysis area is the dry forest area within the western portion of the Klamath Falls Field Office, and the Medford and Roseburg Districts. Each of these three administrative areas constituted a landscape for the purpose of this analysis. The BLM-administered lands comprise 28 percent of the analysis area. The BLM also refers to this area as the interior/south portion of the decision area. These three administrative units encompass the majority of the dry forest landscape within the planning area (**Map 3-2**). Although the Coos Bay District has a large portion (39 percent) of lands classified as fire regime I within the district boundary (**Table 3-29**), the overwhelming majority of the BLM-administered lands in the Coos Bay District are classified as moist forest (**Figure 3-23**). Therefore, lands within the Coos Bay District are not included in this analysis. The Coos Bay, Eugene, and Salem Districts comprise the moist or coastal/north portion of the decision area.

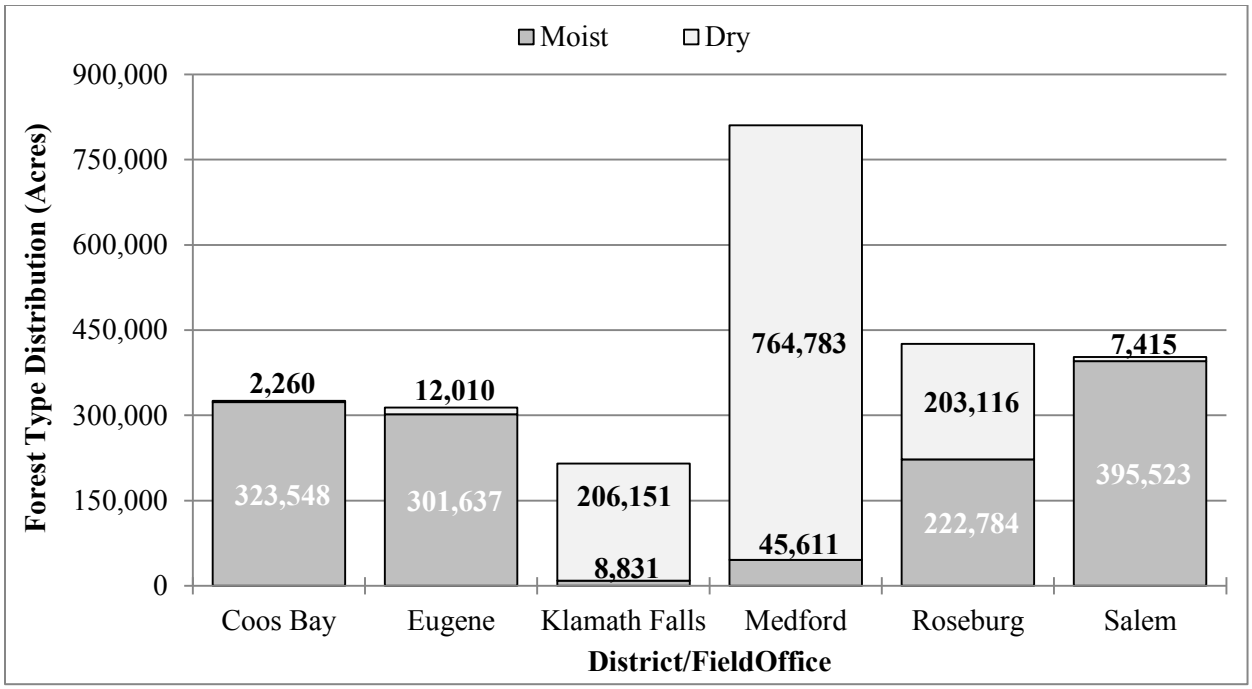


Figure 3-23. Forest type (moist and dry) distribution on BLM-administered lands

In this analysis, the BLM created a cross-walk between the structural stages used in the Woodstock model (**Appendix C**) and the five seral stages used in the LANDFIRE Fire Regime Condition Class conceptual framework: early seral, mid-seral closed, mid-seral open, late-seral closed, and late-seral open (**Appendix H**). Although necessary to produce data suitable for this analytical methodology, the crosswalk from structural stages to seral stages may have resulted in the misclassification of some stands.

The vegetation growth Woodstock model is not able to depict precisely or accurately the within-stand heterogeneity that would result from the management approach in the Uneven-aged Timber Area. Under the action alternatives, the Uneven Aged Timber Area makes up most or all of the Harvest Land Base within this analysis area. Implementation of the management direction in the Uneven-aged Timber Area would likely result in a mix of open and closed stand conditions. This analysis likely represents this fine-scale heterogeneity as closed stand conditions. Therefore, this analysis likely overestimated the extent of mid-seral closed (and, to a lesser extent, late-seral closed) stand conditions that would result from management in the Uneven-aged Timber Area, and potentially underestimated the extent of mid-seral open (and late-seral open stand conditions). However, given the small percentage of the overall dry forest landscape in Uneven-aged Timber Area in any of the alternatives or the Proposed RMP, these errors would not alter the overall trend and magnitude of changes over time at the scale of this analysis.

The BLM assumed that changes in seral stage distribution in the moist forest portions within the Klamath Falls Field Office, and the Medford and Roseburg Districts would not be as relevant to landscape-scale fire resilience, because of the difference in fire severity and frequency associated with fire regimes in those vegetation types.

For the purpose of this analysis, the BLM assumed that the future distribution of forest structure conditions on non-BLM-administered lands would continue to reflect the current distribution of forest structure conditions. The assumption that the future distribution of forest structure conditions on non-BLM-administered lands would continue to reflect the current distribution of forest structure conditions is

consistent with the assumption used in the analysis of forest structure and spatial pattern in the 2008 FEIS, which describes the limitations on analyzing future changes on non-BLM-administered lands and is incorporated here by reference (USDI BLM 2008, pp. 532–536).

The BLM acknowledges that the distribution and spatial arrangement of seral stages would change in the future, but lacks information to make specific projections of how successional stages relevant to this analysis of fire resiliency would change over time on non-BLM-administered lands. Seral stage is a key component of this this analysis, and the BLM lacks information on stand attributes on non-BLM-administered lands that are directly relevant to this analysis. Holding seral stages constant on non-BLM-administered lands provides a reasonable benchmark to determine relative differences in how the management of BLM-administered lands would contribute towards the larger landscape resilience within the analysis period.

This analysis evaluated the departure, relative to a reference condition, of each vegetation type, for each seral stage, in each of the three administrative units. Presenting all of these results together would produce an analysis of bewildering complexity. For example, summing all vegetation types within an administrative unit would show simultaneous overabundance and deficits in each seral stage, because some vegetation types would be overabundant in that seral stage, while other vegetation types would be deficit. Therefore, this analysis focused on the two most common vegetation types in the analysis area: the Douglas-fir/dry and Douglas-fir/moist vegetation types, which account for most (74 percent) of the analysis area (**Table 3-31**).

Table 3-31. Amount of dry forested vegetation types in the interior/south portion of the planning area included in departure analysis

Vegetation Types	All Interior/South Dry Forest	
	(Percent)	(Acres)
Douglas-fir - Dry	41%	1,336,438
Douglas-fir - Moist	33%	1,090,723
Tan oak - Douglas-fir - Ultramafic	8%	277,579
Douglas-fir - White oak	8%	250,616
Shasta red fir - Moist	5%	157,989
Ponderosa pine - Lodgepole pine	2%	66,714
Jeffery Pine	2%	59,152
Western hemlock - Moist	1%	20,192
Mixed Conifer - Warm/Dry	< 1%	15,833
Ponderosa pine - Xeric	< 1%	8,776
Lodgepole pine	< 1%	443
Oregon white oak - Ponderosa pine	< 1%	43
Total Dry Forest Acres in Analysis Area	**100%**	**3,284,497**

The results of this analysis do not include vegetation changes resulting from non-commercial hazardous fuels work, which would likely contribute toward decreasing acres in the mid-closed seral stage similarly among all alternatives and the Proposed RMP.

Appendix H provides detailed information on analytical assumptions, methods and techniques, and geographic and temporal scales in this analysis.

Affected Environment and Environmental Consequences

The Douglas-fir/dry vegetation type shows similar general patterns both currently and in the future for all three administrative units. Therefore, this discussion sums the results for all three administrative units.

Currently, the Douglas-fir/dry vegetation type has a slight overabundance of early seral[46] and a substantial overabundance of mid-seral closed forest (**Figure 3-24**). As stated in the methods, the BLM used forest structure to develop seral stage classifications, and these classifications may not represent an ecologically intact state. The Douglas-fir/dry vegetation type has a slight deficit of mid-seral open forest[47] and late-seral closed forest, and a substantial deficit of late-seral open forest.

[46] Incorporation of the 2013 and 2014 wildfires into the starting condition (see the Analytical Methodologies and Assumptions section of this chapter) increased the over-abundant early seral acreage by approximately 3,000 acres for the current condition. Directly attributed to the wildfires, these acres are assumed to be ecologically functioning complex early seral habitat, which is markedly different from heavily managed early seral forest conditions (DellaSala and Hanson 2015). **Figure 3-24** does not depict this slight overabundance.

[47] In contrast to the Medford and Roseburg Districts, the Klamath Falls Field Office has a slight overabundance of mid-seral open forest (approximately 3,000 acres), both currently and in the future under each alternative and the Proposed RMP. **Figure 3-24** does not depict this slight overabundance.

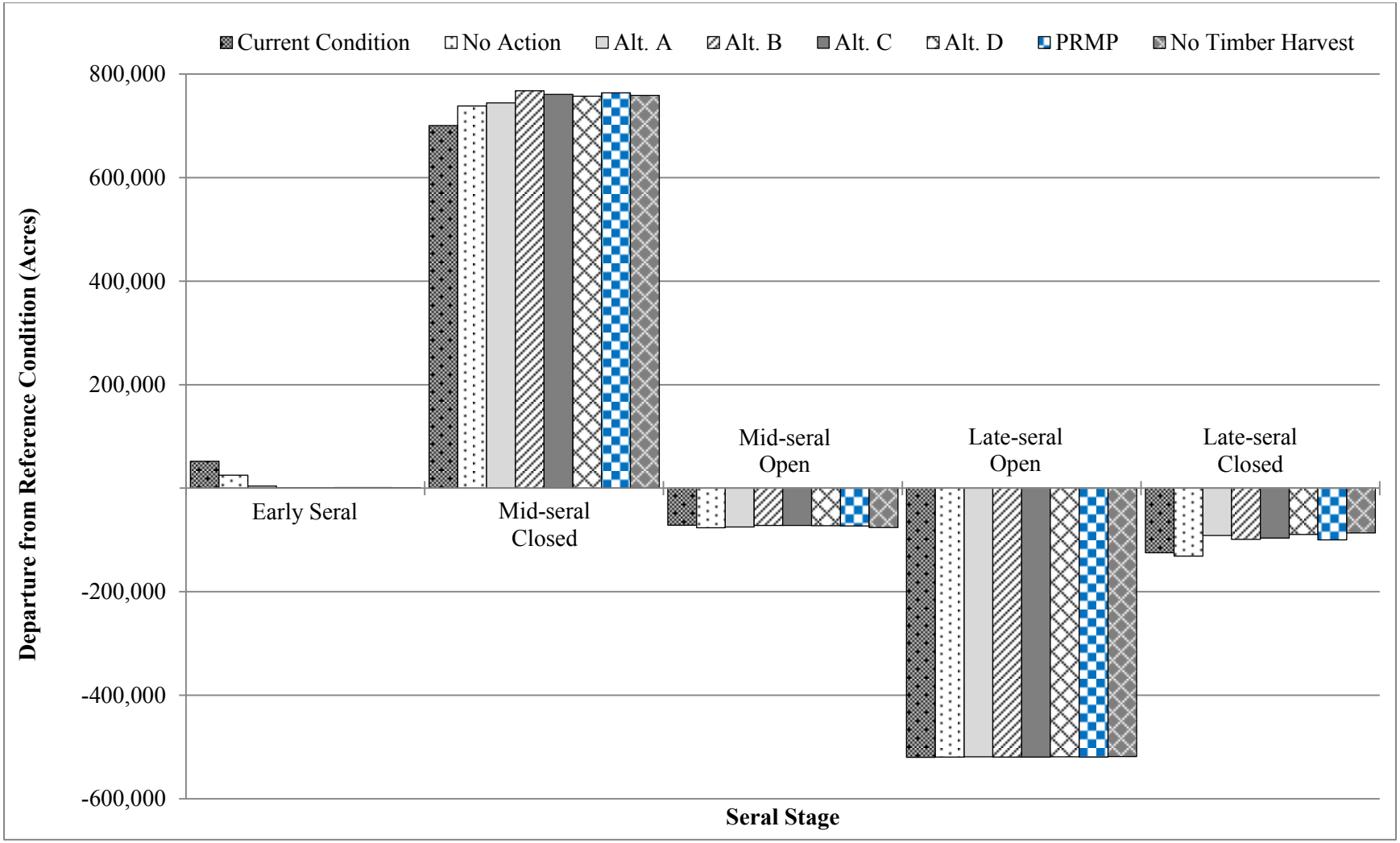


Figure 3-24. Departure from reference conditions in the Douglas-fir/dry vegetation type by seral stage
Note: This includes the current conditions, the alternatives, the Proposed RMP, and the No Timber Harvest reference analysis in 2063.[48]

[48] In contrast to the Klamath Falls Field Office and Roseburg District, Alternatives B, C, and D, the Proposed RMP, and the No Timber Harvest reference analysis would result in a deficit of early seral forest (3,100–6,400 acres) on the Medford District in 50 years. **Figure 3-24** does not depict this deficit.

In 50 years, conditions in the Douglas-fir/dry vegetation type under the No Timber Harvest reference analysis and all alternatives and the Proposed RMP would generally result in continued departure from reference conditions (**Figure 3-24**).

The alternatives and the Proposed RMP would result in only modest shifts in the seral stage distribution on the BLM-administered lands. There would be continued overabundance of mid-seral closed forest conditions. The action alternatives, the Proposed RMP, and the No Timber Harvest reference analysis would result in slight improvements in the early seral departure for the Klamath Falls Field Office and Roseburg District, and late-seral closed departure for the entire interior/south. Under any scenario, there would be no change to the late-seral open forest departure. Because the BLM-administered lands constitute only a small portion of the analysis area, these modest shifts would not result in any substantial change in the overall landscape condition in the Douglas-fir/dry vegetation type. Under all alternatives, the Proposed RMP, and the No Timber Harvest reference analysis, the landscape condition in the Douglas-fir/dry vegetation type would continue to be shaped by an substantial overabundance of mid-seral closed forest and a large deficit of late-seral open forest.

The Douglas-fir/moist vegetation type has differing patterns both currently and in the future for the three administrative units. Therefore, this discussion presents the results for the three administrative units separately.

Currently within the Klamath Falls Field Office, the amount of Douglas-fir/moist early seral vegetation is within the natural range of variability of the reference condition, hence, there are no bars associated with this seral-state (**Figure 3-25**). There is a substantial overabundance of mid-seral closed forest and slight overabundance of mid-seral open forest (**Figure 3-25**). The Douglas-fir/moist vegetation type is also slightly deficit of late-seral closed forest and substantially deficit of late-seral open forest.

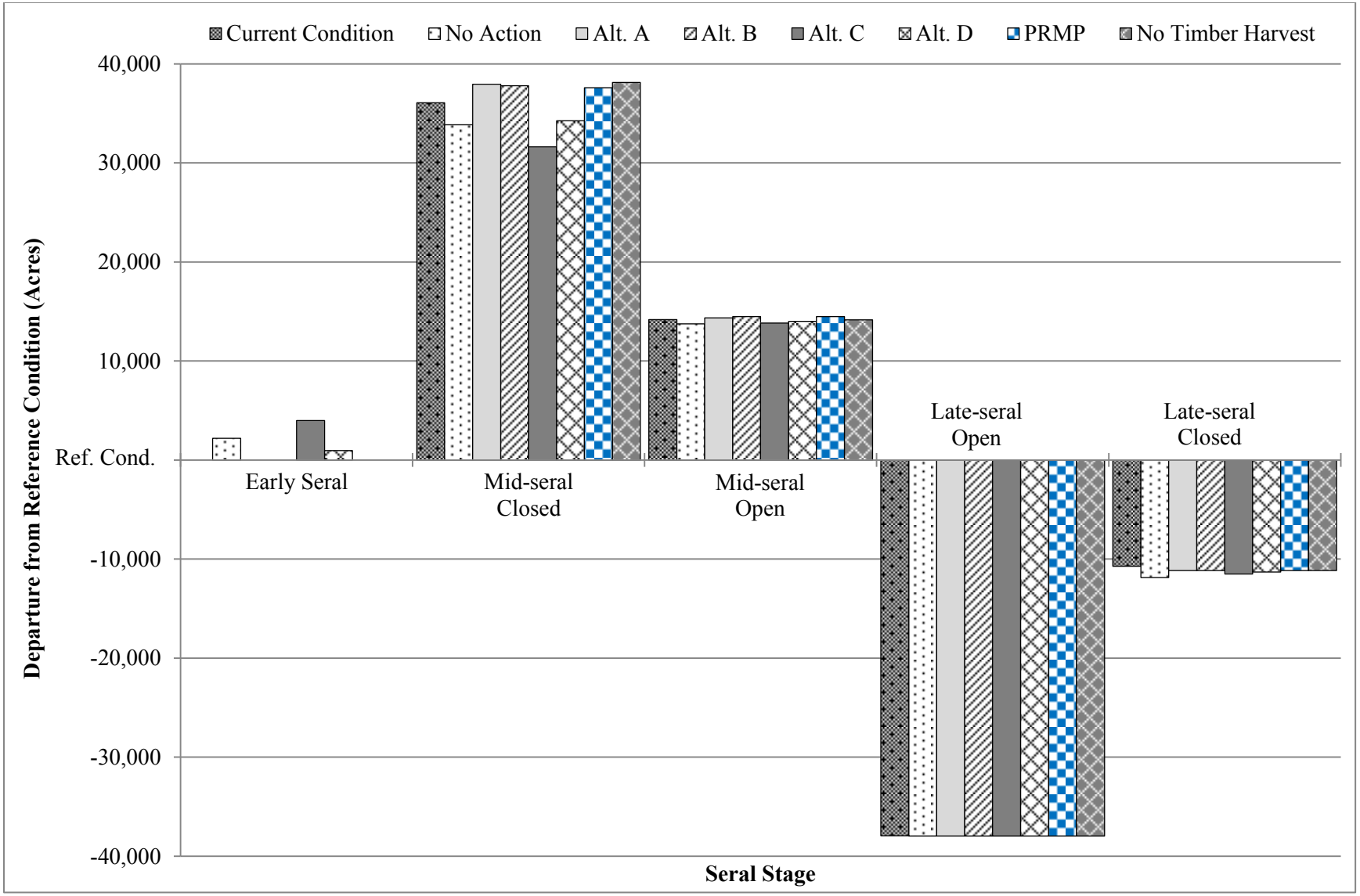


Figure 3-25. Departure from reference conditions in the Douglas-fir/moist vegetation type by seral stage for the Klamath Falls Field Office
Note: This includes the current conditions, the alternatives and the Proposed RMP, and the No Timber Harvest reference analysis in 2063.

In 50 years, all alternatives, the Proposed RMP, and the No Timber Harvest reference analysis would result in only modest shifts of seral stage distribution on BLM-administered lands in the Klamath Falls Field Office. The No Action alternative and Alternatives C and D would slightly reduce the overabundance of mid-seral closed forest, from current conditions. The No Action alternative and Alternatives C and D would result in a sight overabundance of early seral acreage. For all other seral stages, conditions in the Douglas-fir/moist vegetation type under any alternative, the Proposed RMP, and the No Timber Harvest reference analysis would result in essentially no change to current departure from reference conditions.

Currently within the Medford District, the Douglas-fir/moist vegetation type is slightly deficit in early seral and mid-seral open forest (**Figure 3-26**). There is a substantial overabundance of mid-seral closed forest and slight overabundance of late-seral closed forest. The Douglas-fir/moist vegetation type has a sizeable deficit of late-seral open forest.

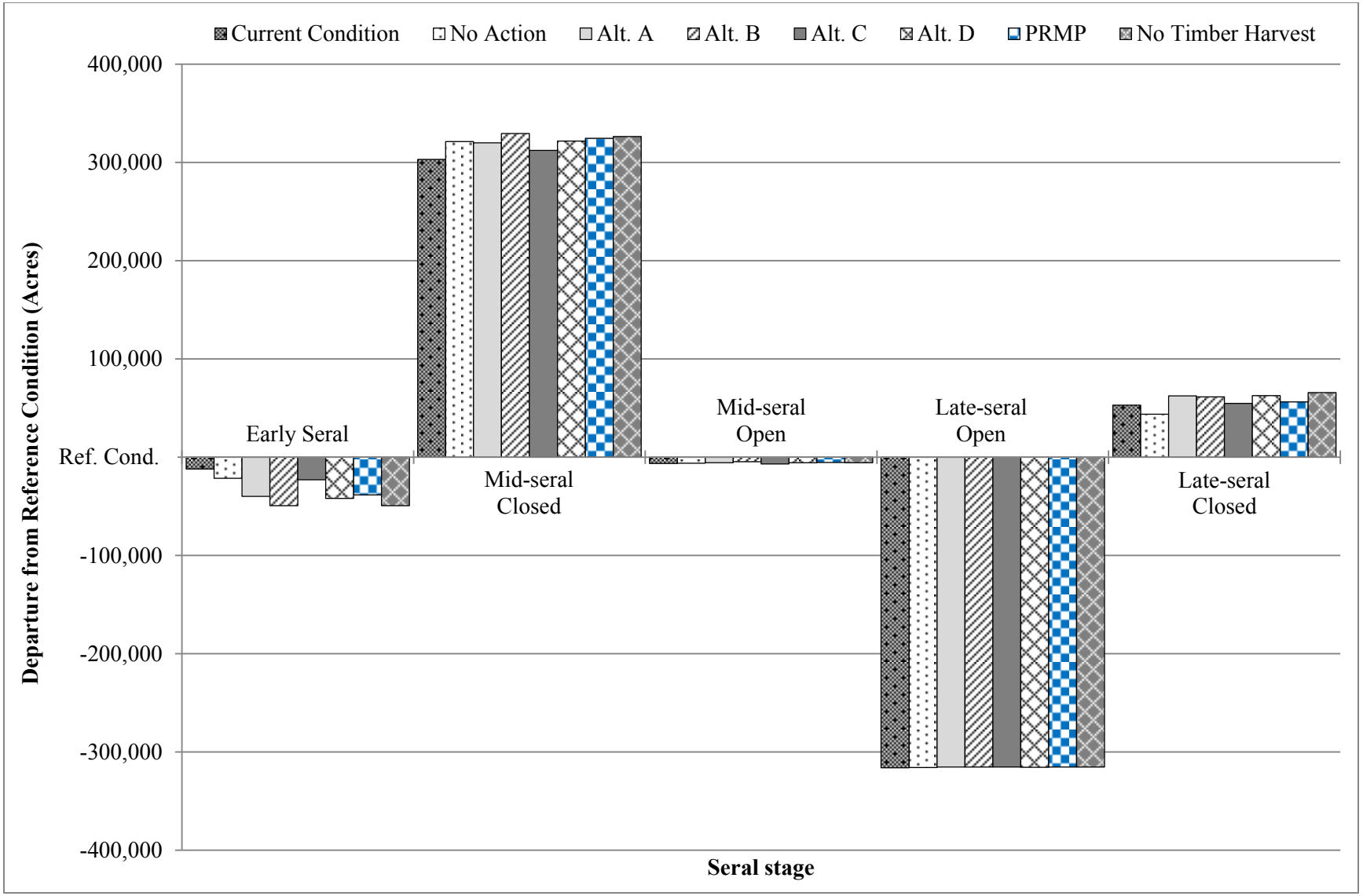


Figure 3-26. Departure from reference conditions in the Douglas-fir/moist vegetation type by seral stage for the Medford District
Note: This includes the current conditions, the alternatives and the Proposed RMP, and the No Timber Harvest reference analysis in 2063.

In 50 years, conditions in the Douglas-fir/moist vegetation type in the Medford District under any alternative, and the Proposed RMP, and the No Timber Harvest reference analysis would generally result in continued departure from reference conditions (**Figure 3-26**) and result in only modest shifts, if any, in seral stage distribution. Again, the Douglas-fir/moist vegetation type would continue to be shaped by an overabundance of mid-seral closed forest and a deficit of late-seral open forest.

Currently within the Roseburg District, the Douglas-fir/moist vegetation type has a slight overabundance of early seral and late-seral closed forest and slight deficit in mid-seral open forest (**Figure 3-27**). Again, there is a substantial overabundance of mid-seral closed forest and a sizeable deficit in late-seral open forest.

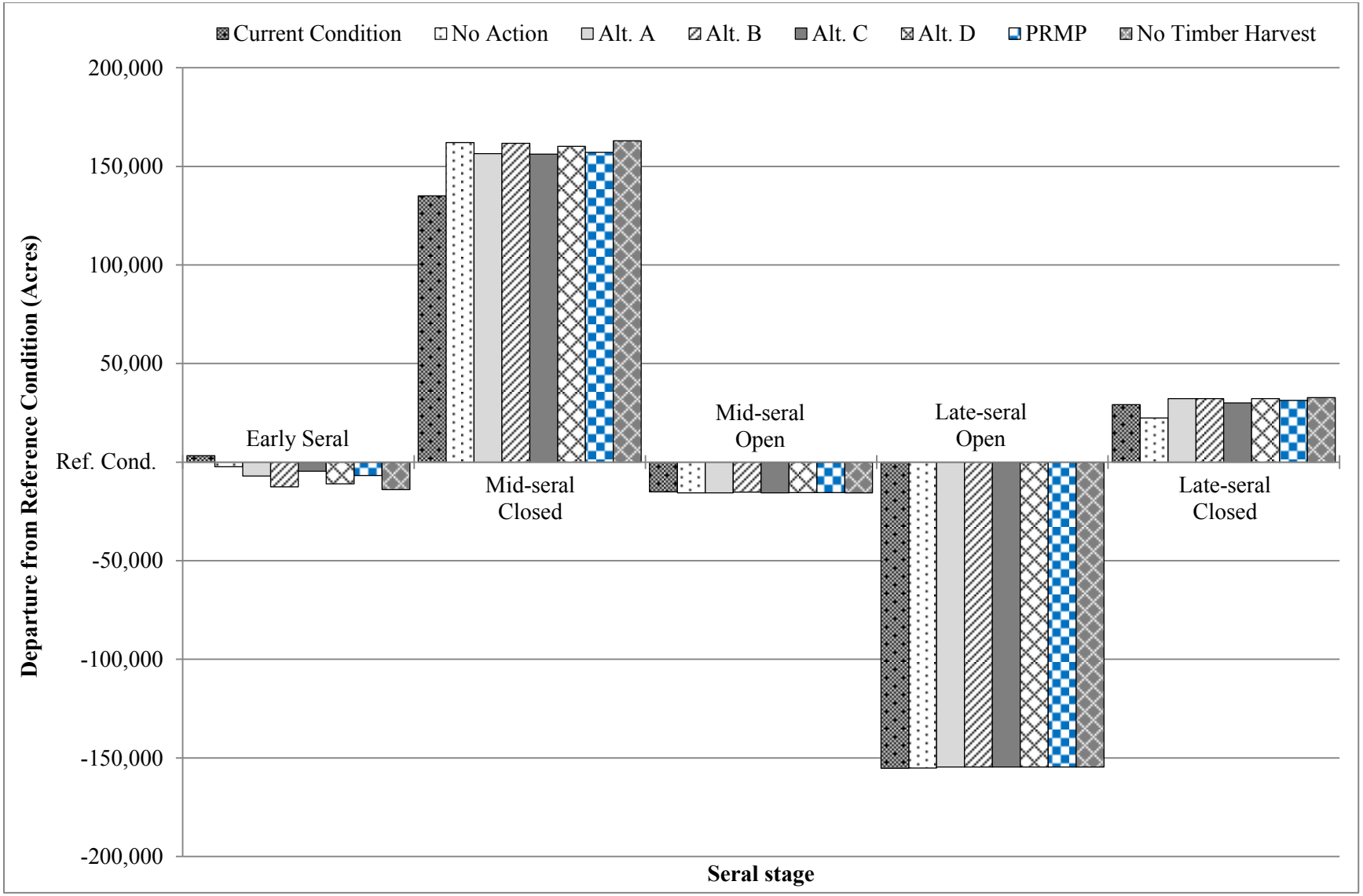


Figure 3-27. Departure from reference conditions in the Douglas-fir/moist vegetation type by seral stage for the Roseburg District
Note: This includes the current conditions, the alternatives and the Proposed RMP, and the No Timber Harvest reference analysis in 2063.

Again, in 50 years, conditions in the Douglas-fir/moist vegetation type in the Roseburg District under any alternative, the Proposed RMP, and the No Timber Harvest reference analysis would generally result in continued departure from reference conditions. There would be a shift in departure of early seral acres from a slight overabundance in the current condition to a slight deficit under all alternatives, the Proposed RMP, and the No Timber Harvest reference analysis. There would be little change from current departure in both the mid-seral closed and late-seral open forest under any alternative and the Proposed RMP.

Similar to the Douglas-fir/dry vegetation type, in 50 years, conditions in the Douglas-fir/moist vegetation type under any alternative, the Proposed RMP, and the No Timber Harvest reference analysis would generally result in continued departure from reference conditions (**Figure 3-25**, **Figure 3-26**, and **Figure 3-27**). The alternatives and the Proposed RMP would result in only modest shifts in the seral stage distribution on the BLM-administered lands, and thus the overall landscape condition in the Douglas-fir/moist vegetation type. Under all alternatives, the Proposed RMP, and the No Timber Harvest reference analysis, the landscape condition in the Douglas-fir/moist vegetation type would continue to be shaped by an overabundance of mid-seral closed forest and a deficit of late-seral open forest.

While objectives associated with the Harvest Land Base and Late Successional Reserve land use allocations in the interior/south coincide with the development of complex and heterogeneous seral stage landscape distribution, aligned with low- and mixed-severity ecosystems (**Appendix B**), in both the Douglas-fir/dry and Douglas-fir/moist vegetation types, the differing BLM management under the alternatives and the Proposed RMP would result in little change in the departure from reference conditions over time, for several reasons. First, the BLM-administered lands represent a small portion of the analysis area. Second, under all alternatives and the Proposed RMP, the BLM would allocate only a small portion of the BLM-administered lands to the Harvest Land Base, in which the BLM would implement the most active management capable of shifting seral stages. Management within reserve allocations would be unlikely to shift seral stages substantially, given the reserve land use allocation objectives. Finally, the 50-year analysis period may be too short in length to show substantial shifts in seral stages (e.g., for development of mid-seral closed forests into late-seral open forests).

In summary, the landscape would remain departed from reference conditions similarly under any alternative or the Proposed RMP, with a continued overabundance of mid-seral closed forest and a deficit of late-seral open forest. Changes in seral stage distribution on BLM-administered lands would account for only small shifts in the landscape departure under any alternative or the Proposed RMP.

Issue 2

How would the alternatives affect fire resistance in the fire-adapted dry forests at the stand level?

Summary of Analytical Methods

Resistance refers to the capacity for an ecosystem to resist the impacts of disturbances without undergoing significant change. For example, wildfire can burn through a resistant forest without substantially altering its structure, composition, or function (Franklin *et al.* 2013).

In this analysis, the BLM assigned forest structural stages (**Appendix C**) to a relative ranking of resistance to stand-replacement fire (**Table 3-32**). These categories range from Low/Moderate fire resistance (i.e., greater tendency of a stand-replacement fire) to High fire resistance (i.e., less probability of a stand-replacement fire). Mixed fire resistance indicates the potential to exhibit the full range of resistance categories (High to Low) (**Appendix H**).

Table 3-32. Resistance to stand-replacement fire by structural stage

Structural Stages	Subdivisions	Resistance to Stand Replacement Fire
Early Successional	with Structural Legacies	Moderate
	without Structural Legacies	Moderate
Stand Establishment	with Structural Legacies	Moderate
	without Structural Legacies	Low
Young Stands – High Density	with Structural Legacies	Low
	without Structural Legacies	Low
Young Stands – Low Density	with Structural Legacies	Moderate
	without Structural Legacies	Moderate
Mature	Single-layered Canopy	High
	Multi-layered Canopy	Mixed
Structurally-complex	Developed Structurally-complex	Mixed
	Existing Old Forest	Mixed
	Existing Very Old Forest	Mixed

While the structural stage classification does not specifically account for surface fuel loading, the BLM assumed that vegetation community structure is an important factor affecting potential fire behavior, post-fire effects, and fire resistance, particularly to crown fire (Jain and Graham 2007), which has the largest immediate and long-term ecological effects (Graham *et al.* 2004). In the frequent fire-adapted dry forest, fire resistant stand structure reduces the likelihood of atypical large-scale crown fires (Agee and Skinner 2005, Jain *et al.* 2012, Franklin *et al.* 2013). In general, stands with higher fire resistance have reduced surface fuel loading, lower tree density, large diameter trees of fire-resistant species, increased height to live crown (Brown *et al.* 2004, Peterson *et al.* 2005, USDI BLM 2008), and discontinuous horizontal and vertical fuels.

This analysis does not account for the complex interaction among fuels (including vertical and horizontal composition and moisture), topography (e.g., slope, topographic position, elevation, and aspect), and weather (e.g., wind, temperature, relative humidity, fuel moisture, and drought) that influence fire behavior, resultant burn severity, and fire effects (Andrews and Rothermel 1982, Scott and Reindhardt 2001) and the specific conditions related to crown fire initiation and spread (Van Wagner 1977). As fire weather indices increase throughout the summer, resistance to stand-replacement fire decreases. Weather events and climatic conditions, including drought, have the potential to result in unexpected and extreme fire behavior, and subject every structure class to high-severity fire. Nevertheless, at this scale of analysis with the data available, the assignment of structural stages to a relative ranking of stand-level resistance provides a robust and consistent basis for comparing the effects of the alternatives and the Proposed RMP.

The analysis area is the dry forest area within the interior/south: the Klamath Falls Field Office, and the Medford and Roseburg Districts, as described in Issue 1. The BLM quantified the acreage of BLM-administered lands in the dry forest in the Klamath Falls Field Office, and the Medford and Roseburg Districts in each fire resistance categories for each alternative and the Proposed RMP over 50 years.

The results of this analysis do not include effects from non-commercial hazardous fuels work, which would contribute toward improving fire resistance similarly among all alternatives and the Proposed RMP.

Appendix H provides detailed information on analytical assumptions, methods and techniques, and geographic and temporal scales.

Affected Environment and Environmental Consequences

Currently, about half of the BLM-administered lands in dry forest have relatively Moderate or Low fire resistance (i.e., greater potential of a stand-replacement fire). Approximately 5 percent of the BLM-administered lands in dry forest currently have High fire resistance (i.e., less potential of a stand-replacement fire) (**Figure 3-28**). The remaining acres are in a Mixed fire resistance.

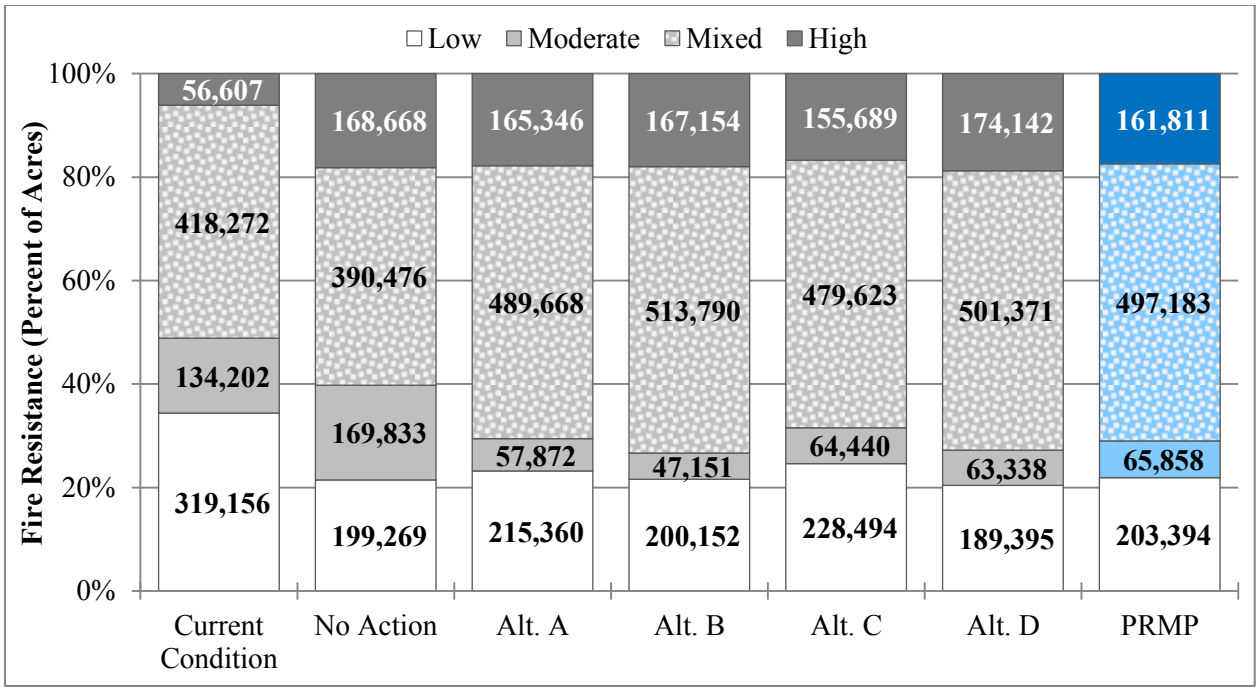


Figure 3-28. Stand-level fire resistance categories in the dry forest in the interior/south for the current condition and in 50 years

In 50 years, all alternatives and the Proposed RMP would result in an increase in stand-level fire resistance across the dry forest and would reduce the acres of Moderate or Low fire resistance and increase the acres of High fire resistance, relative to current conditions across the dry forest. The No Action alternative would result in the least reduction in the acreage of Moderate or Low fire resistance. Although results among the action alternatives and the Proposed RMP are very similar, Alternatives B and D would result in the largest reduction in the acreage of Low or Moderate fire resistance, followed by the Proposed RMP and then Alternatives A and C.

The effects of the alternatives and the Proposed RMP on stand-level fire resistance in both the Medford and Roseburg Districts in 50 years would approximate the effects across the dry forest (**Figure 3-29** and **Figure 3-30**). Differences would be more evident for the Klamath Falls Field Office (**Figure 3-31**), where Alternatives A and B, and the Proposed RMP would result in the most pronounced reduction of Low and Moderate fire resistance conditions and the largest increase in Mixed and High fire resistance acres. The No Action alternative would result in a slight increase in the acreage of both High and Moderate fire resistance from current conditions, and, consequently only a slight reduction in the acreage of Low fire

resistance. Alternative D would result in only a slight increase in High and Mixed fire resistance conditions, and little reduction in Low and Moderate fire resistance. Alternative C would result in no increase in the acreage of High fire resistance and less increase in the acreage of Mixed fire resistance than the other alternatives and the Proposed RMP.

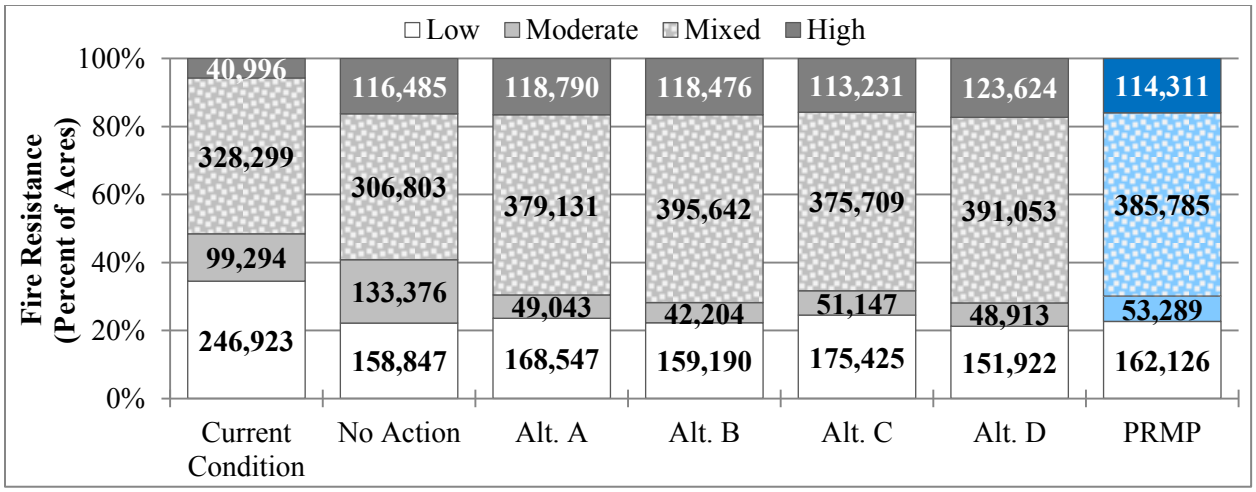


Figure 3-29. Stand-level fire resistance categories in the dry forest in the Medford District for the current condition and in 50 years

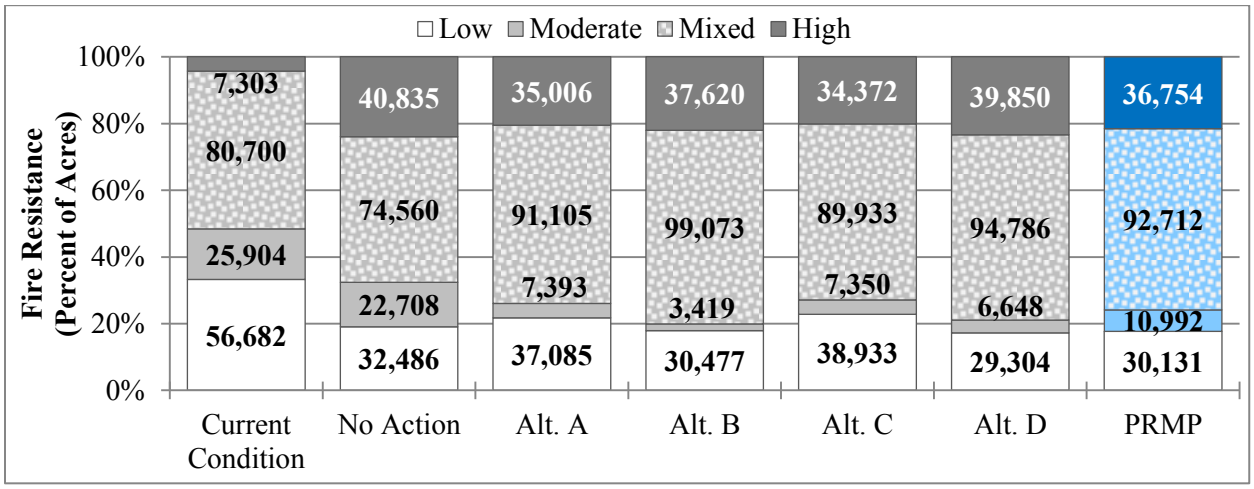


Figure 3-30. Stand-level fire resistance categories in the dry forest in the Roseburg District for the current condition and in 50 years

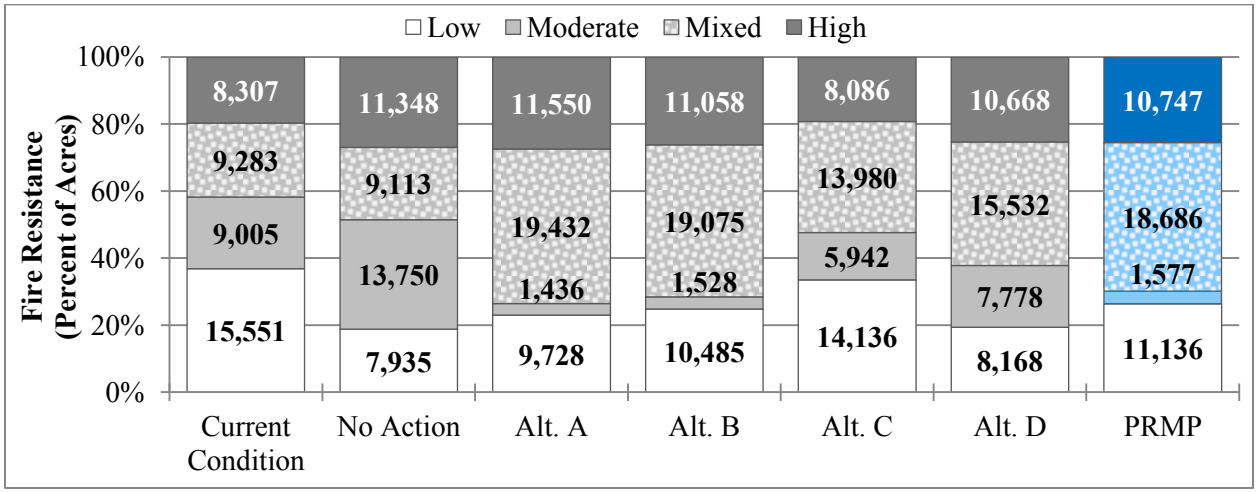


Figure 3-31. Stand-level fire resistance categories in the dry forest in the Klamath Falls Field Office for the current condition and in 50 years

The alternatives and the Proposed RMP differ in the extent and location of both the Harvest Land Base and the Late-Successional Reserve (**Figure 3-32**). The associated changes in vegetation, due to different extents and management direction within the Harvest Land Base among the alternatives and the Proposed RMP, would influence the overall patterns of stand-level fire resistance, rather than changes occurring within the reserves.

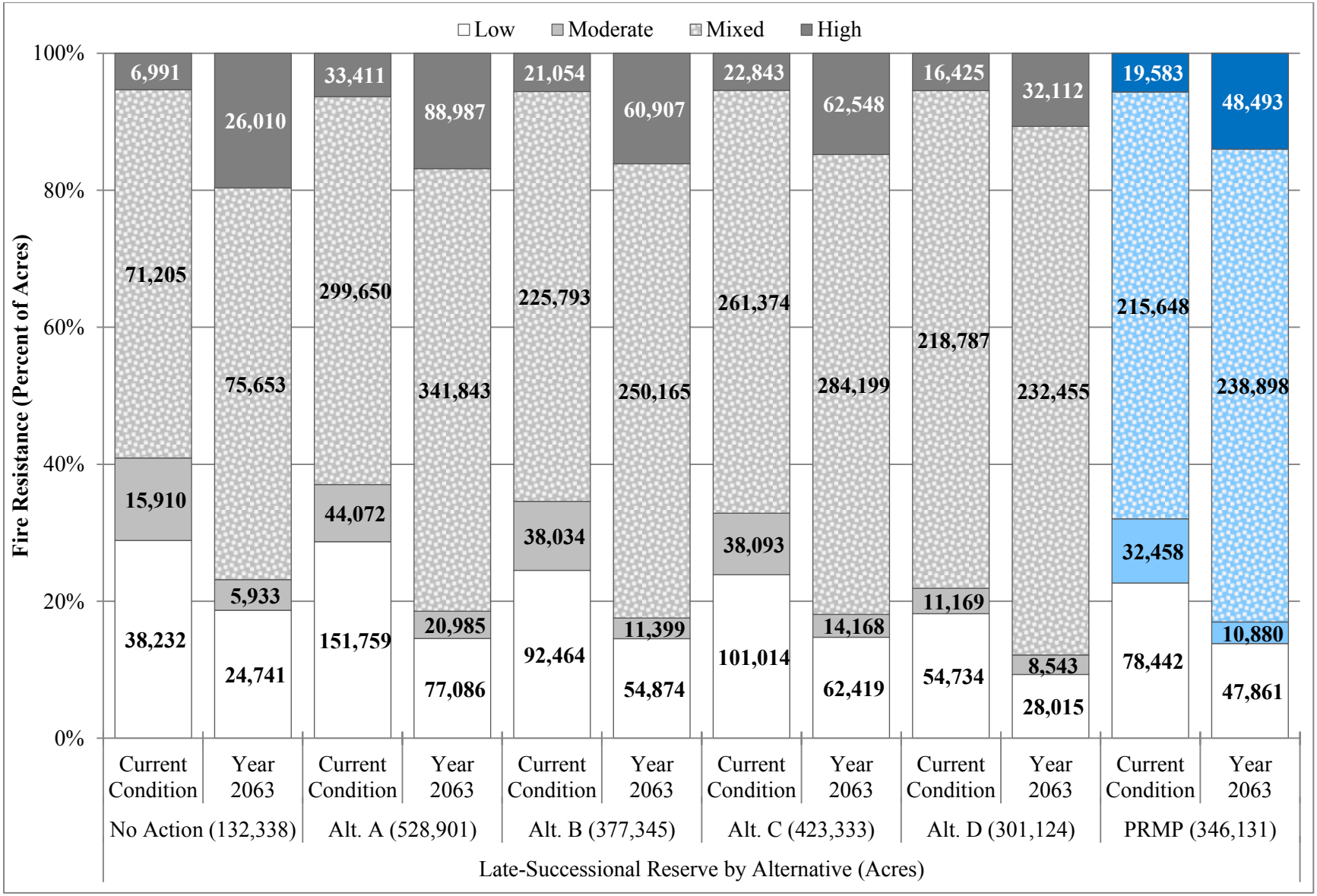


Figure 3-32. Stand-level fire resistance categories in the Late-Successional Reserve in the dry forest in the interior/south for the current condition and in 50 years

Even though the alternatives and the Proposed RMP differ substantially in the extent and location of the Late-Successional Reserve in the dry forest, current fire resistance within the Late-Successional Reserve is similar (**Figure 3-32**). Additionally, all alternatives and the Proposed RMP would similarly reduce the acreage in the low or moderate fire resistance categories within the Late-Successional Reserve after 50 years, thus not influencing the overall patterns of change within the dry forest. However, within the Harvest Land Base, there would be greater variation in the patterns of change in stand-level fire resistance over time, and this would drive the differences among the alternatives and the Proposed RMP across the dry forest overall (**Figure 3-33**). In large part, the lack of difference among alternatives and the Proposed RMP for the dry forest in the interior/south is due to the abundance of acres in the Mixed fire resistance category (**Figure 3-28**), especially in the Late-Successional Reserve (**Figure 3-32**). The Mixed fire resistance category has the potential to exhibit the full range of resistance categories (High to Low), discussed in further detail in **Appendix H**.

The BLM assumed that the restoration approach taken in the Late-Successional Reserve in the dry forest would include stand density reductions, cultivation of large trees with old-growth characteristics, introductions of heterogeneity into increasingly uniform stands, and treatments to reduce fire risk adjacent to high-value habitat. However, treatments in the Late-Successional Reserve – Dry land use allocation may not be a priority; guarantee of treatment occurrence is tenuous. The Proposed RMP includes management direction that directs the application of selection harvest or commercial thinning treatments on 21,500 eligible acres within the Late-Successional Reserve – Dry land use allocation per decade (**Appendix B**), and would afford reasonable certainty of actions occurring on approximately 12 percent of this land use allocation each decade.

Within the Harvest Land Base, the current stand-level fire resistance conditions differ among the alternatives and the Proposed RMP due to the differing extents and locations of the Harvest Land Base (**Figure 3-33**). The No Action alternative has the largest Harvest Land Base (i.e., Matrix and Adaptive Management Areas) and the smallest proportion (52 percent) currently in Low or Moderate fire resistance. While the size of the Harvest Land Base is relatively similar among Alternatives B, C, and D, and the Proposed RMP, the Proposed RMP has the smallest Harvest Land Base with Alternative D having the largest Harvest Land Base within the dry forest. Among these alternatives and the Proposed RMP, approximately 60 percent of the Harvest Land Base acreage is currently in Low or Moderate fire resistance. Alternative A has the smallest Harvest Land Base and the largest proportion (75 percent) in Low or Moderate fire resistance.

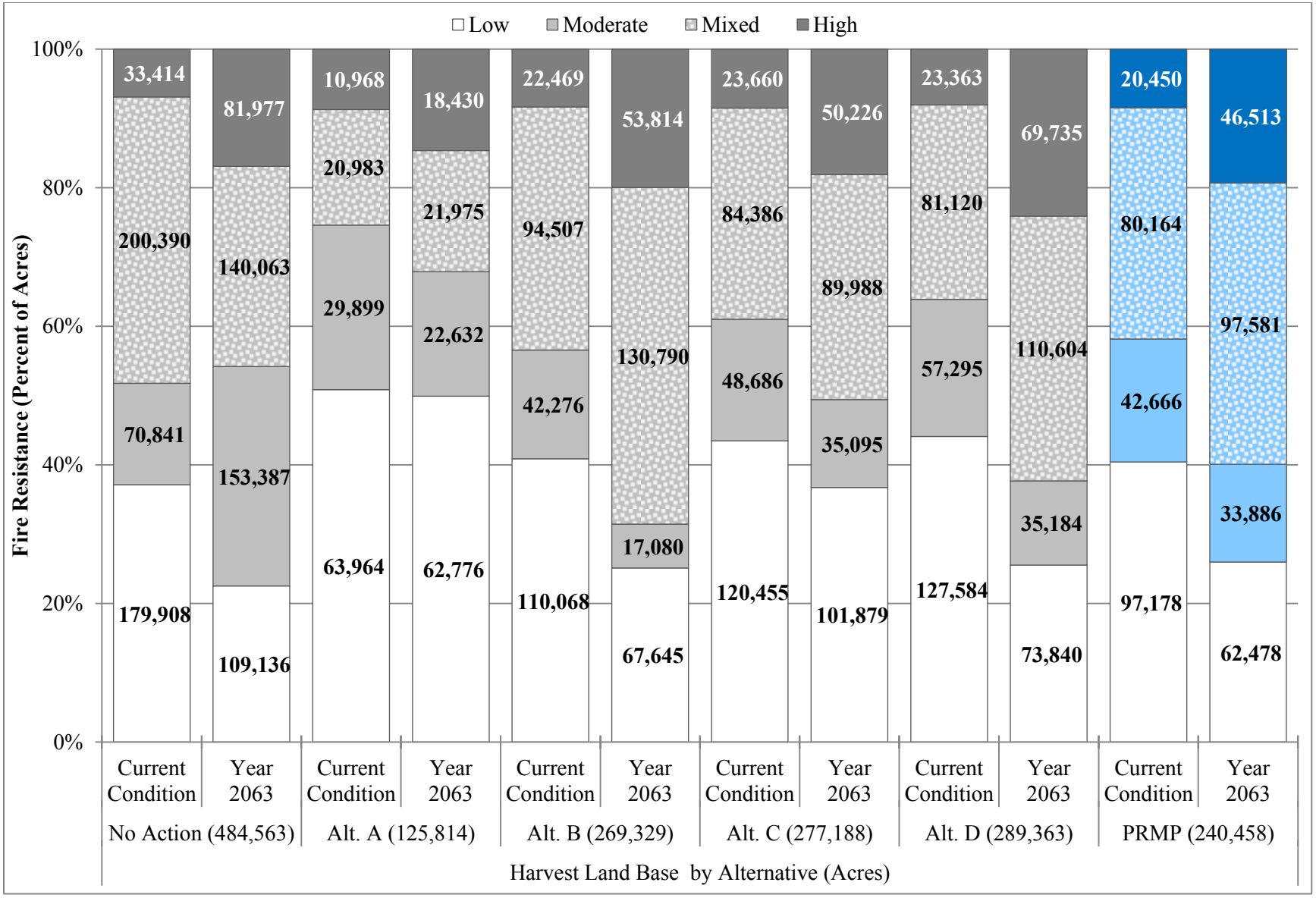


Figure 3-33. Stand-level fire resistance categories in the Harvest Land Base in the dry forest in the interior/south for the current condition and in 50 years

In 50 years, all of the action alternatives and the Proposed RMP would reduce the proportion of the Harvest Land Base in Low or Moderate fire resistance (**Figure 3-33**). Alternative A would reduce this proportion by 7 percent, Alternative C would result in a decrease of 12 percent, and Alternatives B and D would result in the largest decrease (25 and 26 percent, respectively) in the proportion of the Harvest Land Base in Low or Moderate fire resistance. The Proposed RMP would decrease the acres of Low and Moderate fire resistance by 18 percent. In contrast, the No Action alternative would slightly increase the proportion of the Harvest Land Base in Moderate fire resistance, while decreasing the proportion of Low fire resistance in 50 years.

Alternative B, followed by Alternative D and the Proposed RMP, would result in the largest proportions of High and Mixed fire resistance within the dry forest Harvest Land Base in 50 years. The results for each district approximate the same trends as the entire dry forest Harvest Land Base (**Appendix H**).

The differences among alternatives and the Proposed RMP, in stand-level fire resistance within the Harvest Land Base, largely would result from the type of management and associated management direction.

The Harvest Land Base within the dry forest for the interior/south in Alternatives A and C is comprised of both the High Intensity Timber Area and the Uneven-aged Timber Area (**Table 3-33**). A larger proportion of the Harvest Land Base in Alternative A is in the High Intensity Timber Area, which would result in only a slight improvement in stand-level fire resistance in the Harvest Land Base, relative to the current condition. Alternative C has a larger Harvest Land Base with more acres in both the High Intensity Timber Area and the Uneven-aged Timber Area than Alternative A. A larger proportion of the Harvest Land Base in Alternative C is in the Uneven-aged Timber Area which would improve overall stand-level fire resistance slightly more than Alternative A.

Table 3-33. Harvest Land Base allocations in the dry forest in the interior/south

Alternative/ Proposed RMP	Harvest Land Base Allocations	Area (Acres)
No Action	Matrix/AMA	**484,563**
Alt. A	High Intensity Timber Area	71,474
	Uneven-aged Timber Area	54,340
	Total	**125,814**
Alt. B	Uneven-aged Timber Area	269,329
	Total	**269,329**
Alt. C	High Intensity Timber Area	92,588
	Uneven-aged Timber Area	184,528
	Total	**277,188**
Alt. D	Moderate Intensity Timber Area	31,258
	Uneven-aged Timber Area	62,214
	Owl Habitat Timber Area	195,891
	Total	**289,363**
PRMP	Moderate Intensity Timber Area	8,575
	Low Intensity Timber Area	32,513
	Uneven-aged Timber Area	199,370
	Total	**240,458**

The High Intensity Timber Area includes management such as thinning and regeneration harvest with no retention and rapid reforestation on a relatively short rotation. This management approach would result in continuous horizontal and vertical fuel profiles of reduced stand-level fire resistance, more prone to support high-severity fire (Odion 2004, Thompson *et al.* 2007). Although mixed-severity fire regimes would have historically included patches of high-severity fire, there currently exists an overabundance of young and closed conditions in need of mechanical treatment or wildland fire disturbance (Haugo *et al.* 2015). Large areas of no retention are not representative of the prevailing vegetative patterns and structure associated with frequent fire, low-severity or mixed-severity fire regimes (Taylor and Skinner 2003, Larson and Churchill 2012).

In Alternative B, all of the dry forest Harvest Land Base in the interior/south is Uneven-aged Timber Area. Alternative D has most of the Harvest Land Base in the Uneven-aged Timber area or Owl Habitat Timber Area. The Proposed RMP has most of the Harvest Land Base in the Uneven-aged Timber Area. Alternatives B and D would result in the largest decrease in Low and Moderate fire resistance, relative to current conditions, followed by the Proposed RMP.

The management approach in the Uneven-aged Timber Area includes reducing stand densities and promoting or enhancing heterogeneity and large tree growth, through a combination of silviculture treatments, harvest, and prescribed fire. Management in the Owl Habitat Timber Area includes both lighter thinning and uneven-aged management. Both of these management scenarios would result in the largest reduction of low and moderate stand-level fire resistance and the largest increase in the mixed- and high-fire resistance acres. These mixed- and higher-fire resistance stands would result in more discontinuous fuel profiles and a greater resistance to a stand-replacement fire. Additionally, discontinuous fuels tend to reduce the complexities associated with implementation of prescribed fire (Jain *et al.* 2012), presenting more opportunities to apply fire on the landscape and maintain fire-resistant stand conditions.

The Uneven-aged Timber Area management direction also provides the latitude to increase within and between-stand heterogeneity in response to topographic and vegetative complexity (Hessburg *et al.* 2015), as well as create strategic landscape conditions that provide fire management opportunities. (**Appendix B**). The increased spatial heterogeneity at multiple scales, and disruption of fuel continuity, can alter potential fire behavior (Finney 2001) and may create conditions in which wildfire can occur without detrimental consequences, reducing impacts to highly valued resources, including timber and wildlife habitat (Jain *et al.* 2012). Particularly in stands that are not currently structurally-complex, the creation of small openings and heterogeneous (patchy) stand composition will move vegetation patterns and fuel loadings and arrangements toward conditions comparable to low- and mixed-severity fire regimes (Agee 2002). These conditions may also provide opportunities for effective fire management, including the ability to utilize wildfire to meet land use and resource objectives consistent with management direction (**Appendix B**). However, due to the configuration of BLM-administered lands within the larger landscape, particularly their proximity to residential areas, the ability to use wildfire may have limited application. Prescribed fire would likely account for the majority of managed fire under any alternative or the Proposed RMP.

Alternative D has a little more than 30,000 acres of the Harvest Land Base in the Moderate Intensity Timber Area, while the Proposed RMP has 8,575 acres in this sub-allocation. The Moderate Intensity Timber Area includes thinning and regeneration harvest with 5–15 percent basal area retention, longer rotations, and rapid natural or artificial reforestation of species appropriate to the site. This management approach would result in more continuous horizontal and vertical fuel profiles and reduced stand-level fire resistance. However, the Moderate Intensity Timber Area constitutes only about 11 percent of the dry forest Harvest Land Base under Alternative D and 4 percent in the Proposed RMP diminishing its

influence on overall stand-level fire resistance in the interior/south. The Harvest Land Base sub-allocations in the Proposed RMP direct some level of retention of certain large trees (**Appendix B**), which are important fire-resistant structures.

In summary, all alternatives and the Proposed RMP would reduce the acres of moderate or low fire resistance and increase the acres of high fire resistance, relative to current conditions across the dry forest in the interior/south. Although the alternatives and the Proposed RMP would differ only slightly across the dry forest, those differences reflect the varied extent and patterns resulting from management within the Harvest Land Base. The effects of some alternatives and the Proposed RMP, evident within the Harvest Land Base, are less evident at the entire extent of the dry forest, due to the small Harvest Land Base relative to a larger Late-Successional Reserve system.

Issue 3

How would the alternatives affect fire hazard within close proximity to developed areas?

Summary of Analytical Methods

In this analysis, the BLM evaluated stand-level fire hazard within close proximity to developed areas.

In this analysis, the BLM assumed that a one-mile buffer around the West Wide Wildfire Risk Assessment Wildland Development Areas data layer (WWRA 2013) represents the geographic scope of possible immediate risks to the public and firefighter safety within close proximity to communities located within the Wildland Urban Interface (WUI)[49] across the planning area. The Oregon Department of Forestry, on behalf of the Council of Western State Foresters and the Western Forestry Leadership Coalition, completed the West Wide Wildfire Risk Assessment in 2013. This assessment quantified the magnitude of the current wildland fire problem in the west and established a baseline for planning mitigation activities and monitoring change over time. The Wildland Development Areas data layer provides a delineation of where people live in the wildland, classifying a minimum of 1 structure per 40 acres as a developed area. The magnitude of human-caused ignitions that occur there illustrates the substantial exposure and demand on fire suppression resources within close proximity to developed areas and risk to life and property (**Figure 3-34**).

[49] The Healthy Forest Restoration Act (2003) identifies WUI as an area within or adjacent to structures and other human development that meet or intermingle with undeveloped wildland.

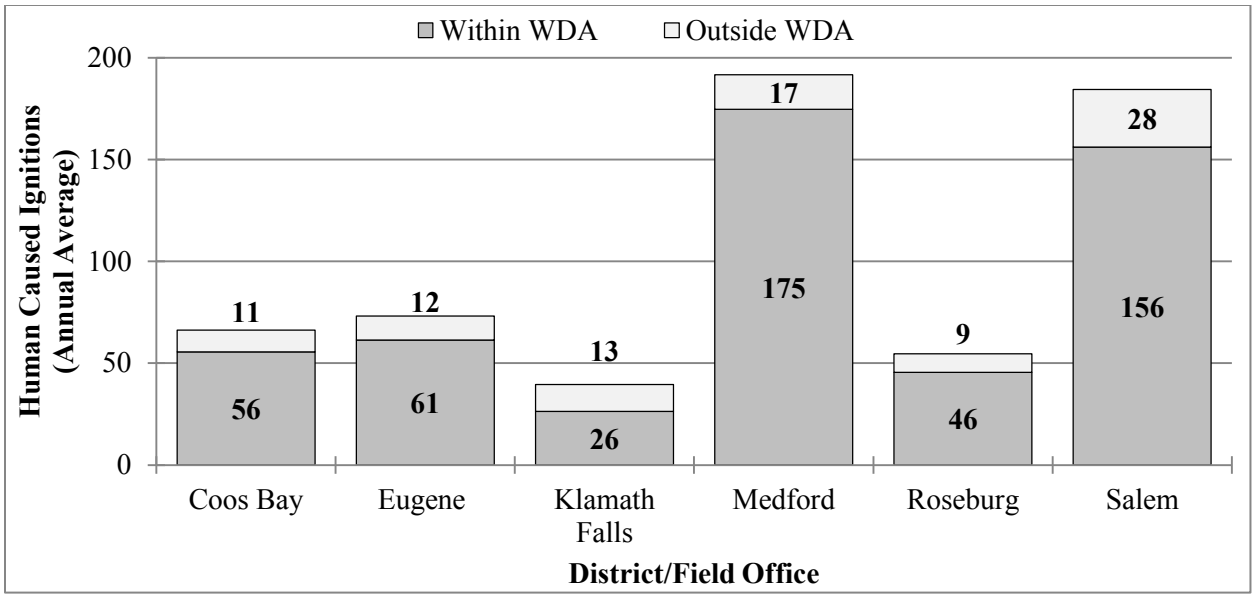


Figure 3-34. Average annual number of human-caused ignitions in proximity to Wildland Development Areas, 1984–2013
Source: Oregon Department of Forestry ignition data

The BLM assigned forest structural stages (**Appendix C**) to a relative ranking of stand-level fire hazard (**Table 3-34**). These categories range from high to moderate fire hazard (i.e., relatively difficult to control) to Low fire hazard (i.e., relatively easy to control). Mixed fire hazard indicates the potential to exhibit the full range of hazard categories (High to Low)). Fire hazard refers to the ease of ignition, potential fire behavior, and resistance to control of the fuel complex, defined by the volume and arrangement of several strata, including surface, ladder, and canopy fuels (Calkin *et al.* 2010). Fire behavior has a direct effect on fire severity, mortality, suppression tactics, and the initiation of crown fire, which presents the greatest resistance to control and the largest potential to threaten wildland urban interfaces (Graham *et al.* 2004).

Table 3-34. Stand-level fire hazard ratings by structural stage

Structural Stages	Subdivisions	Fire Hazard
Early Successional	with Structural Legacies	Moderate
	without Structural Legacies	Moderate
Stand Establishment	with Structural Legacies	High
	without Structural Legacies	High
Young Stands – High Density	with Structural Legacies	High
	without Structural Legacies	High
Young Stands – Low Density	with Structural Legacies	Moderate
	without Structural Legacies	Moderate
Mature	Single-Layered Canopy	Low
	Multi-Layered Canopy	Mixed
Structurally-complex	Developed Structurally-complex	Mixed
	Existing Old Forest	Mixed
	Existing Very Old Forest	Mixed

The BLM assumed that broad descriptions of forest vegetation conditions reflect relative stand-level fire hazard, based on general assumptions regarding the fuel profile and the probable fire behavior within that structural stage classification. The BLM quantified the acreage of forested BLM-administered lands in each fire hazard category for each alternative and the Proposed RMP over the course of 50 years within a 1-mile buffer of the Wide Wildfire Risk Assessment Wildland Development Areas data layer (WWRA 2013).

Similar to the analytical methods for stand-level fire resistance, this analysis does not account for the complex interaction among fuels (including vertical and horizontal composition and moisture), topography (e.g., slope, topographic position, elevation, and aspect), and weather (e.g., wind, temperature, relative humidity, fuel moisture, and drought) that influence fire behavior, resultant burn severity, and fire effects (Andrews and Rothermel 1982 and Scott and Reindhardt 2001).

The results of this analysis do not include effects from non-commercial hazardous fuels work, which would contribute toward reducing fire hazard similarly among all alternatives and the Proposed RMP, and be less likely to result in structural stage shifts.

Appendix H provides detailed information on analytical assumptions, methods and techniques, and geographic and temporal scales.

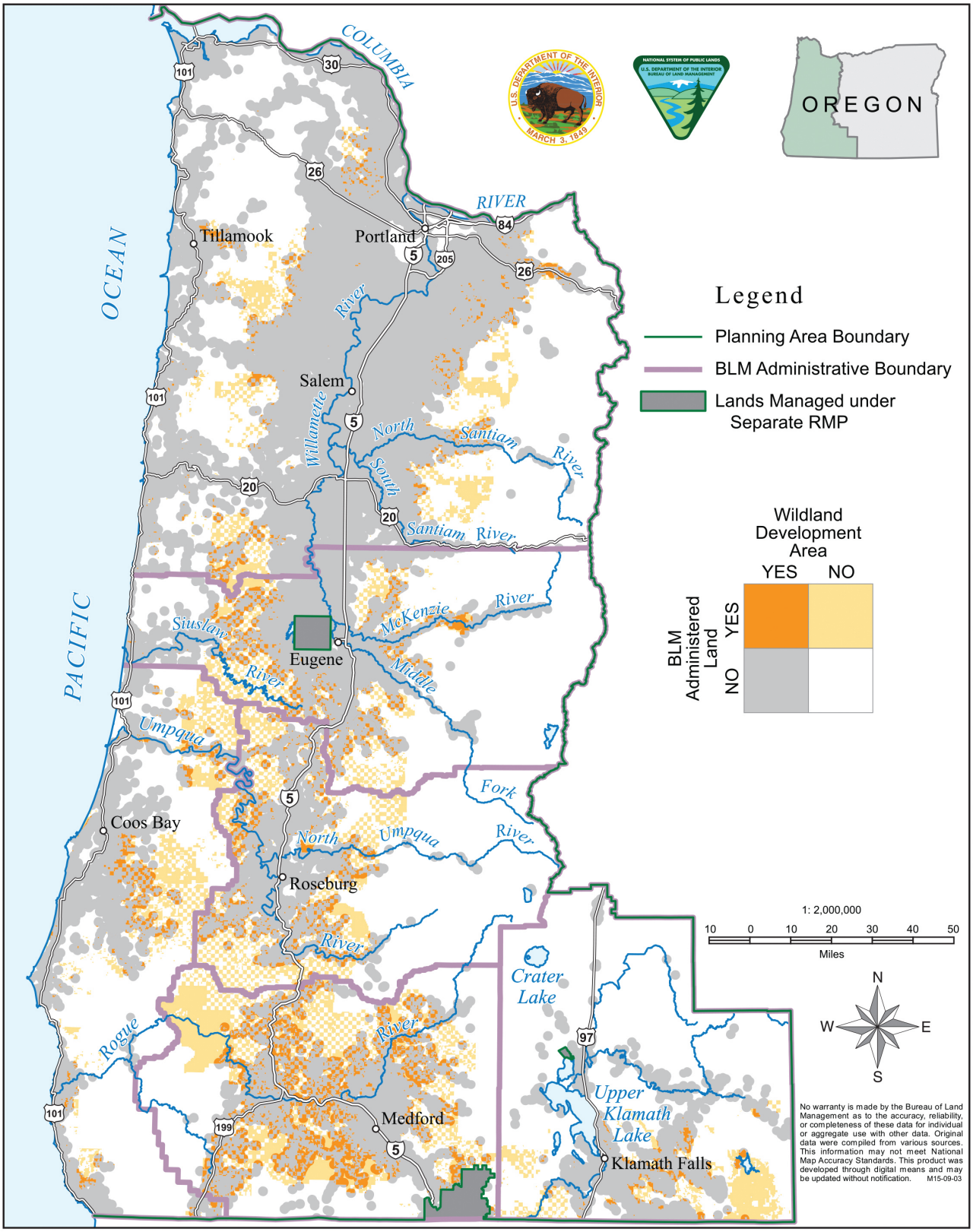
Background

Managing fire hazard in the western United States is becoming an increasingly complex challenge. Wildland fuels continue to build, drought conditions persist, human development spreads, budgets fluctuate, and fire suppression costs increase. New home construction steadily increased within wildland areas in Oregon between 1990 and 2008 (Stein *et al.* 2013, Brown *et al.* 2014), and this trend is likely to continue in the future, given expected increases in Oregon's population (OR OEA 2012).

Much of the planning area has a checkerboard pattern of ownership, with square mile sections alternating between private and BLM-administered lands. The BLM-administered lands in the planning area are typically located in the foothills and mountains surrounding inhabited valley bottomlands and are closely intermixed with small towns, rural residential areas, and private and industrial forests. This is an area commonly referred to as the Wildland Urban Interface (WUI). These lands all have different land use objectives and boundaries that wildfire does not recognize. Additionally, this complex multi-jurisdictional landscape increases the inherent complexities of fuel reduction efforts, particularly prescribed burning, and fire management operations, including managing wildfires to meet resource and land use objectives due to the risk of affecting adjacent lands.

The Healthy Forest Restoration Act (2003) provides the latitude to Community Wildfire Protection Plans (CWPP) to refine their WUI boundary, based on vegetation conditions, topography, and geographic features, including infrastructure, where strategic fuel reduction can reduce risks from large, severe wildfires and promote fire-adapted communities. Additionally, CWPPs may incorporate areas near communities that have important economic, social, cultural, visual, and ecological values in the delineation of their WUI boundary (CWPP Handbook 2004). Collaborating partners, including the BLM, use Community Wildfire Protection Plans and WUI boundaries for local coordination, prioritization, and implementation of landscape-level fuel treatments. These plans often contain fine-scale analysis that provide a robust investigation of ways to prioritize fire risk mitigation around locally identified and vetted highly valued resources and assets (e.g., Metlen *et al.* 2015), and aid in the identification of strategically defensible fuel breaks for wildland fire management.

Between 18 and 44 percent of BLM-administered lands are within 1 mile of Wildland Development Areas (**Map 3-3**). The Eugene and Medford Districts have the largest proportion, 41 and 44 percent, respectively. The Medford District has more than three times the acreage of any other district within close proximity to developed areas. A quarter of BLM-administered lands within Coos Bay (25 percent), slightly more than one third of Roseburg BLM-administered lands (31 percent), and nearly one third of Salem BLM-administered lands (28 percent) are within close proximity to wildland development areas. The Klamath Falls Field Office has the smallest proportion (18 percent) of BLM-administered lands within 1 mile of Wildland Development Areas. For many districts, the footprint of Wildland Development Areas buffered by 1 mile is a considerably smaller extent than the CWPP WUI boundaries.



Map 3-3: Wildland Developed Areas within the Planning Area

The vast majority of BLM-administered lands burned by wildfire are in the interior/south (**Table 3-35**). In the past decade, less than 5 percent of the acres burned in the decision area were in the coastal/north.

Table 3-35. Total acres burned by wildfires within the planning area, 1984–2013

10-year Interval	Coastal/North (Acres)	Interior/South (Acres)
1984–1993	23,476	138,612
1994–2003	12,938	583,724*
2004–2013	6,601	163,352

* Includes the 499,945-acre Biscuit wildfire
Source: Oregon Department of Forestry ignition data

Between 1984 and 2013, human-caused ignitions were the source of most wildfires for nearly all districts within the planning area (**Figure 3-22**). The vast majority of all human-caused ignitions occurred within close proximity to developed areas (**Figure 3-34**). Increased development of homes in the WUI, trail systems, dispersed campsites, recreation, and major travel corridors all serve to increase the risk of human-caused fires.

During this period, the Oregon Department of Forestry has provided fire prevention and protection services on BLM-administered lands in the planning area under the Western Oregon Fire Protection Services contract. Firefighting resources across the planning area have been highly effective at minimizing acres burned for most wildfires, keeping 96 percent of all ignitions to less than 10 acres in size (**Table 3-30**). However, extreme fire weather conditions still present problems for control.

Affected Environment and Environmental Consequences

Currently, almost half of all forested, BLM-administered lands within close proximity to Wildland Development Areas have High to Moderate stand-level fire hazard (i.e., fires are relatively difficult to control). In the coastal/north, approximately 20 percent of forested, BLM-administered lands within close proximity to Wildland Development Areas have Low stand-level fire hazard (i.e., fires are relatively easy to control) (**Figure 3-35**). In the interior/south, only 5 percent of forested, BLM-administered lands within close proximity to Wildland Development Areas have Low stand-level fire hazard (**Figure 3-36**).

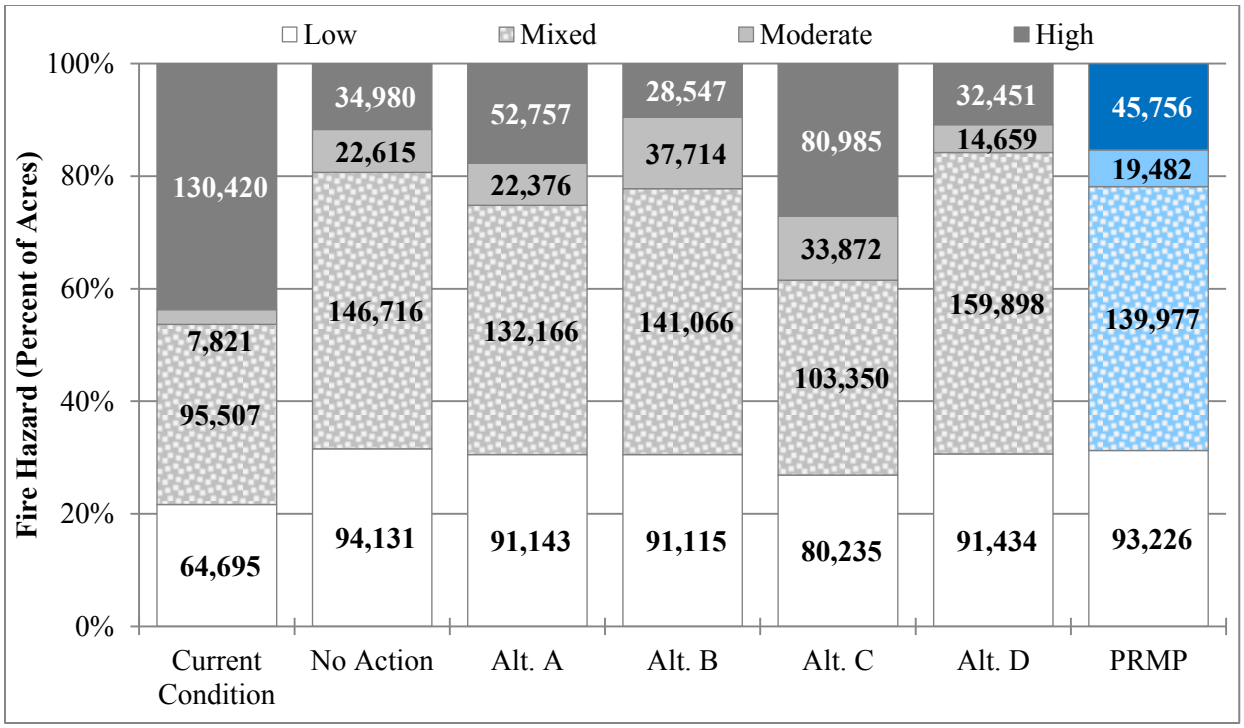


Figure 3-35. Stand-level fire hazard for all BLM-administered lands in the coastal/north within the WUI by current condition and in 2063

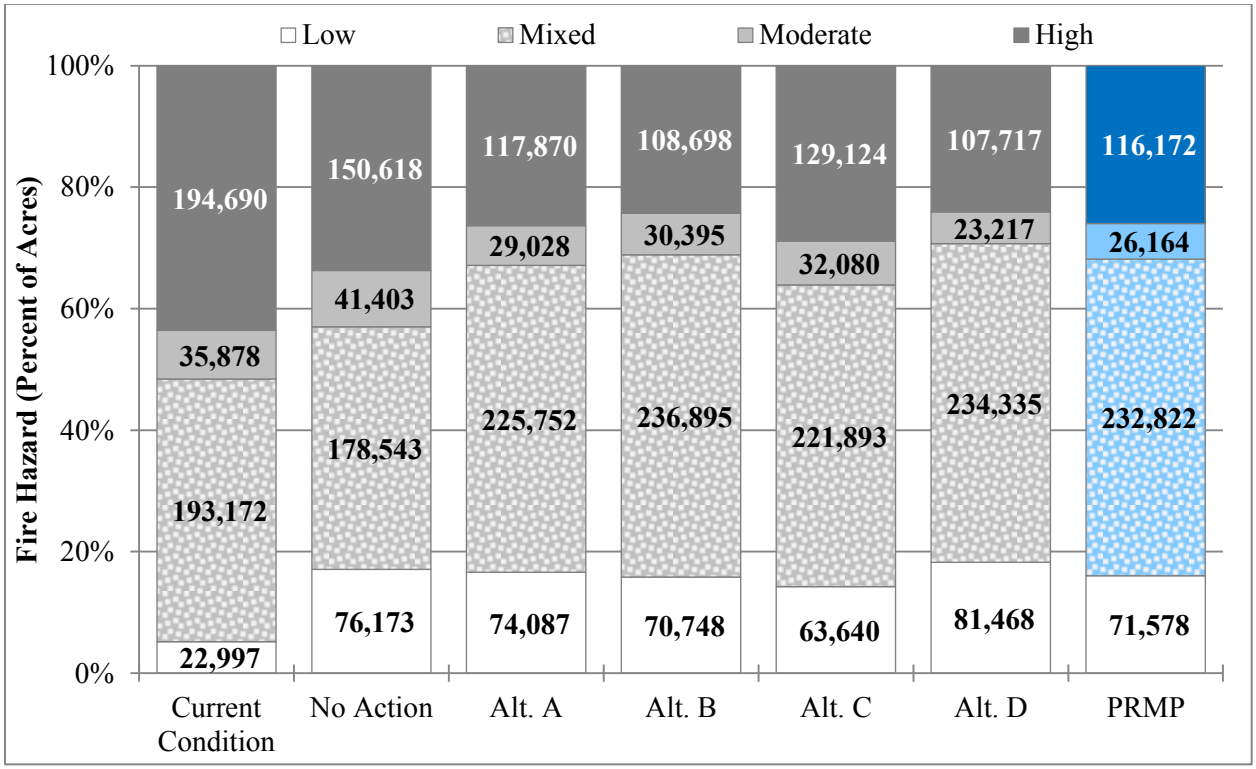


Figure 3-36. Stand-level fire hazard for all BLM-administered lands in the interior/south within the WUI, by current condition and in 2063

In 50 years, all alternatives and the Proposed RMP would result in a decrease of stand-level fire hazard for the 298,441-forested acres within close proximity to Wildland Development Areas (WWRA 2013) in the coastal/north (**Figure 3-35**). All alternatives and the Proposed RMP would reduce the acres of Moderate or High fire hazard and increase the acres of Low hazard, relative to current conditions. Alternative C would result in the least reduction of High or Moderate hazard acreage. The No Action alternative and Alternative D would result in the largest reduction in the acreage of Moderate or High fire hazard, closely followed by Alternatives A and B, and the Proposed RMP. The effects of the alternatives and the Proposed RMP on stand-level fire hazard for individual districts in 50 years would approximate the effects across the entire coastal/north portion of the planning area (**Appendix H**).

In 50 years, all alternatives and the Proposed RMP would result in a decrease in stand-level fire hazard for the 446,737-forested acres within close proximity to developed areas in the interior/south (**Figure 3-36**). All alternatives and the Proposed RMP would reduce the acres of Moderate or High fire hazard and increase the acres of Low hazard, relative to current conditions. The No Action alternative and Alternative C would result in the least reduction of High or Moderate hazard acreage. Alternatives A, B, and D, and the Proposed RMP would reduce Moderate or High fire hazard within close proximity to Wildland Development Areas (WWRA 2013) similarly and to a greater extent than Alternative C or the No Action alternative. The effects of the alternatives and the Proposed RMP on stand-level fire hazard for individual districts in 50 years would approximate the effects across the entire interior/south portion of the planning area (**Appendix H**).

As concluded in Issue 2, all alternatives and the Proposed RMP would have similar effects on fire hazard within the Late-Successional Reserve and the patterns of change would not differ (**Appendix H**). In addition, the extent of the Harvest Land Base under each alternative and the Proposed RMP and the associated changes in vegetation due to differing management direction would influence the overall patterns in stand-level fire hazard, rather than changes within the reserves. However, the relatively small extent of the Harvest Land Base minimizes changes in fire hazard patterns at the scale of all Wildland Development Areas.

In the coastal/north, the alternatives and the Proposed RMP differ in the extent and location of the Harvest Land Base. However, the current fire hazard conditions are relatively similar within close proximity to Wildland Development Areas among the alternatives and the Proposed RMP (**Figure 3-37**). All alternatives and the Proposed RMP have between 50 and 60 percent of the acreage in High or Moderate fire hazard. Alternative C has the largest acreage of Harvest Land Base within proximity to Wildland Development Areas. Alternative C has the largest amount of Harvest Land Base within close proximity to developed areas. The amount of Harvest Land Base within proximity to Wildland Development Areas is relatively similar among the No Action alternative and Alternatives B and D. Alternative A and the Proposed RMP have the smallest acreage of Harvest Land Base within proximity to Wildland Developed Areas.

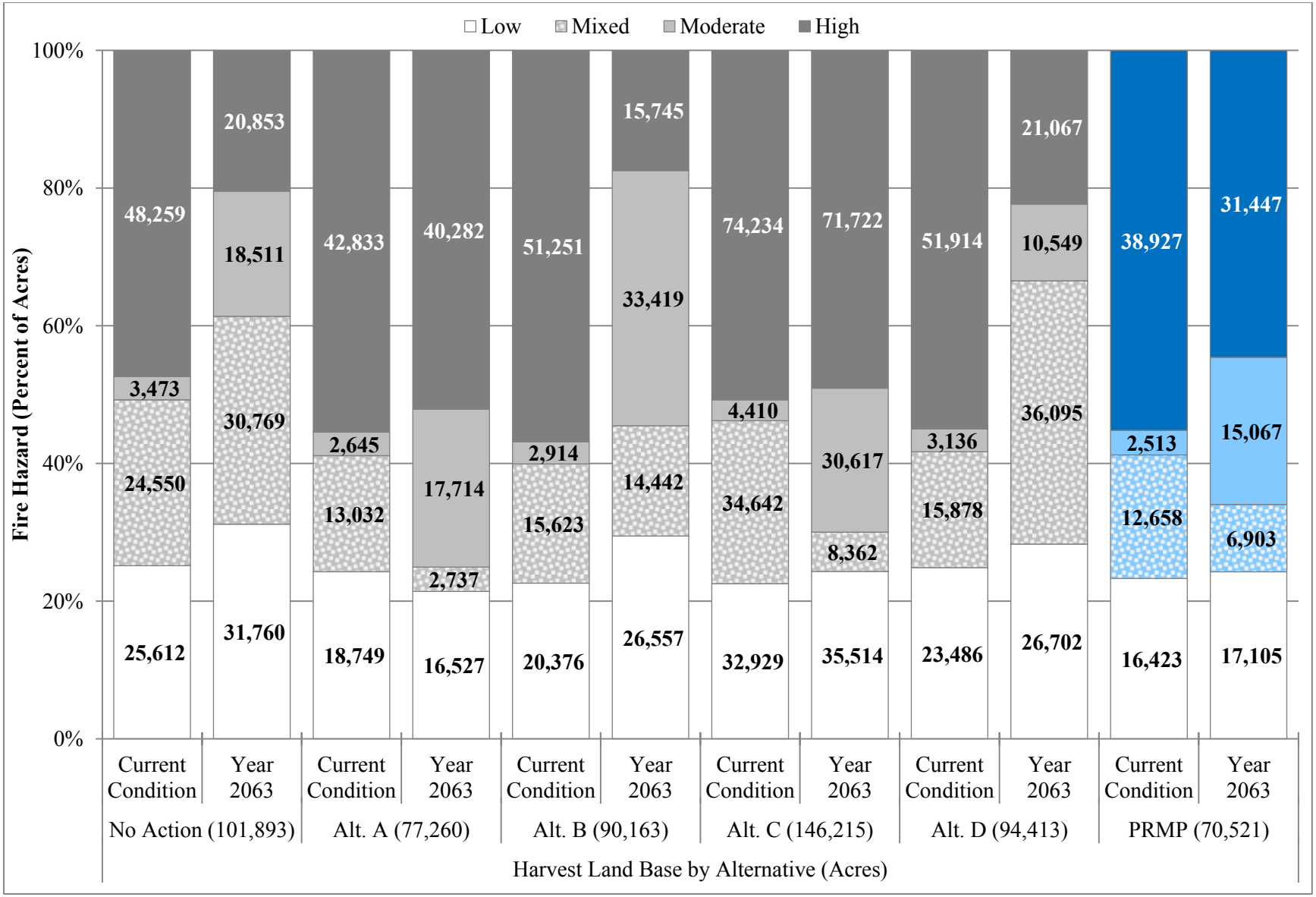


Figure 3-37. Stand-level fire hazard for the Harvest Land Base in the coastal/north within the WUI by current condition and in 2063

In 50 years, the No Action alternative and Alternatives B, C, and D, and the Proposed RMP would vary slightly increase the proportion of low hazard acres in the Harvest Land Base, relative to the current condition in the coastal/north (**Figure 3-37**). Within the Harvest Land Base, Alternative D would decrease the proportion of High and Moderate hazard by 25 percent, and the No Action alternative would result in a decrease of 12 percent. Alternative B would decrease the proportion of High hazard by 39 percent, and increase Moderate hazard by 34 percent, resulting in a slight (6 percent) net decrease of acreage in High or Moderate hazard within the Harvest Land Base. Similarly, Alternative A and C would only slightly decrease the proportion of High hazard and increase moderate hazard, resulting in a net increase (16 percent) of acreage in High or Moderate hazard within the Harvest Land Base. The Proposed RMP would slightly decrease the proportion of High hazard, and increase Moderate hazard, resulting in a slight (7 percent) net increase of acreage in High or Moderate hazard within the Harvest Land Base.

For the interior/south, the alternatives and the Proposed RMP also differ in the extent and location of the Harvest Land Base, and the current conditions of fire hazard differ (**Figure 3-38**). The No Action alternative has the largest Harvest Land Base (i.e., Matrix and Adaptive Management Areas) and the smallest proportion (53 percent) currently in High or Moderate fire hazard. The size of the Harvest Land Base is relatively similar in Alternatives B, C, and D, and the Proposed RMP, and approximately 60 percent of the acreage is in High or Moderate fire hazard. Alternative A has the smallest Harvest Land Base and the largest proportion (75 percent) in High or Moderate fire hazard.

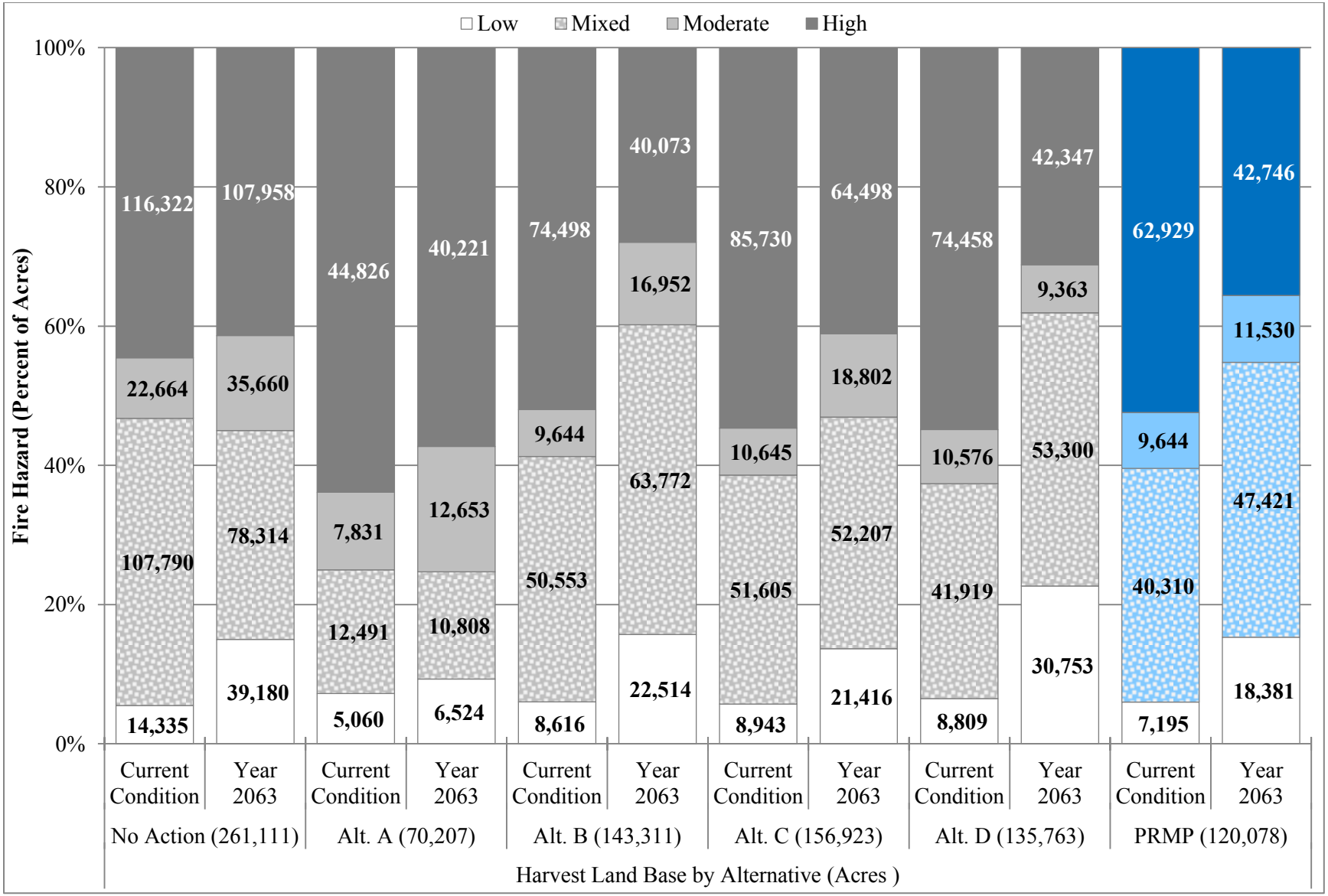


Figure 3-38. Stand-level fire hazard for the Harvest Land Base in the interior/south within the WUI by current condition and in 2063

In 50 years, all alternatives and the Proposed RMP would slightly increase the proportion of Low hazard acres, relative to the current condition in the Harvest Land Base in the interior/south (**Figure 3-38**). Alternative D would decrease the proportion of High and Moderate hazard by 25 percent, Alternative B would result in a decrease of 19 percent, and the Proposed RMP a decrease of 15 percent. Alternative C would only slightly decrease (8 percent) the proportion of High and Moderate hazard. The No Action alternative would result in slight increase in High and Moderate hazard acreage within close proximity to Wildland Development Areas, while there would be no change in Alternative A.

In summary, all alternatives and the Proposed RMP would increase the acres of Low hazard, relative to current conditions, on all BLM-administered lands within close proximity to Wildland Development Areas. Alternatives A and C, and the Proposed RMP would increase the total combined acres in High or Moderate fire hazard, and the No Action alternative and Alternatives B and D would reduce the total combined acres in High or Moderate fire hazard relative to current conditions on all BLM-administered lands within close proximity to Wildland Development Areas. However, among all the alternatives and the Proposed RMP, the differences are slight and largely reflect the different extents and varied patterns resulting from management within the Harvest Land Base. The BLM's management within the planning area is unable to provide more than slight variation to fire hazards within the planning area due to the checkerboard pattern of the landscape within the planning area and the small Harvest Land Base relative to a larger Late-Successional Reserve. The Harvest Land Base effects on fire hazard patterns are diminished at the scale of all BLM-administered Lands within Wildland Development Areas, particularly in the coastal/north.

Issue 4

How would the alternatives affect the number of acres at risk from residual activity fuels associated with timber management?

Summary of Analytical Methods

In this analysis, the BLM determined the potential fire risk associated with residual activity fuels resulting from timber management activities, treatment locations relative to Wildland Development Areas (WWRA 2013), and the Wildland Fire Potential (USDA FS and FMI 2012) for all BLM-administered lands within the decision area.

Fire risk describes the likelihood, susceptibility, and intensity for wildfire and adverse effects to human values. In this analysis, the BLM assumed that Wildland Development Areas are a highly valued resource, the Wildland Fire Potential describes the likelihood for wildfire, and activity fuel loading has the potential to increase fire intensity.

In addition to proximal location of treatments to developed areas, the Wildland Fire Potential (USDA FS FMI 2013) is an important factor in determining the risk from residual fuel loading. The Wildland Fire Potential depicts the relative probability of experiencing extreme fire behavior with torching and crowning, and the potential for wildfire that would be difficult for suppression resources to contain during weather conditions favorable for fire growth. This data is based on past fire occurrence, 2008 fuels data from LANDFIRE, and 2012 estimates of wildfire likelihood and intensity from the large fire simulator (Finney *et al*. 2011). The interior/south has more acreage in the Very High and High Wildland Fire Potential categories than the coastal/north, closely resembling the distribution of moist and dry vegetation (**Table 3-36** and **Figure 3-39)**.

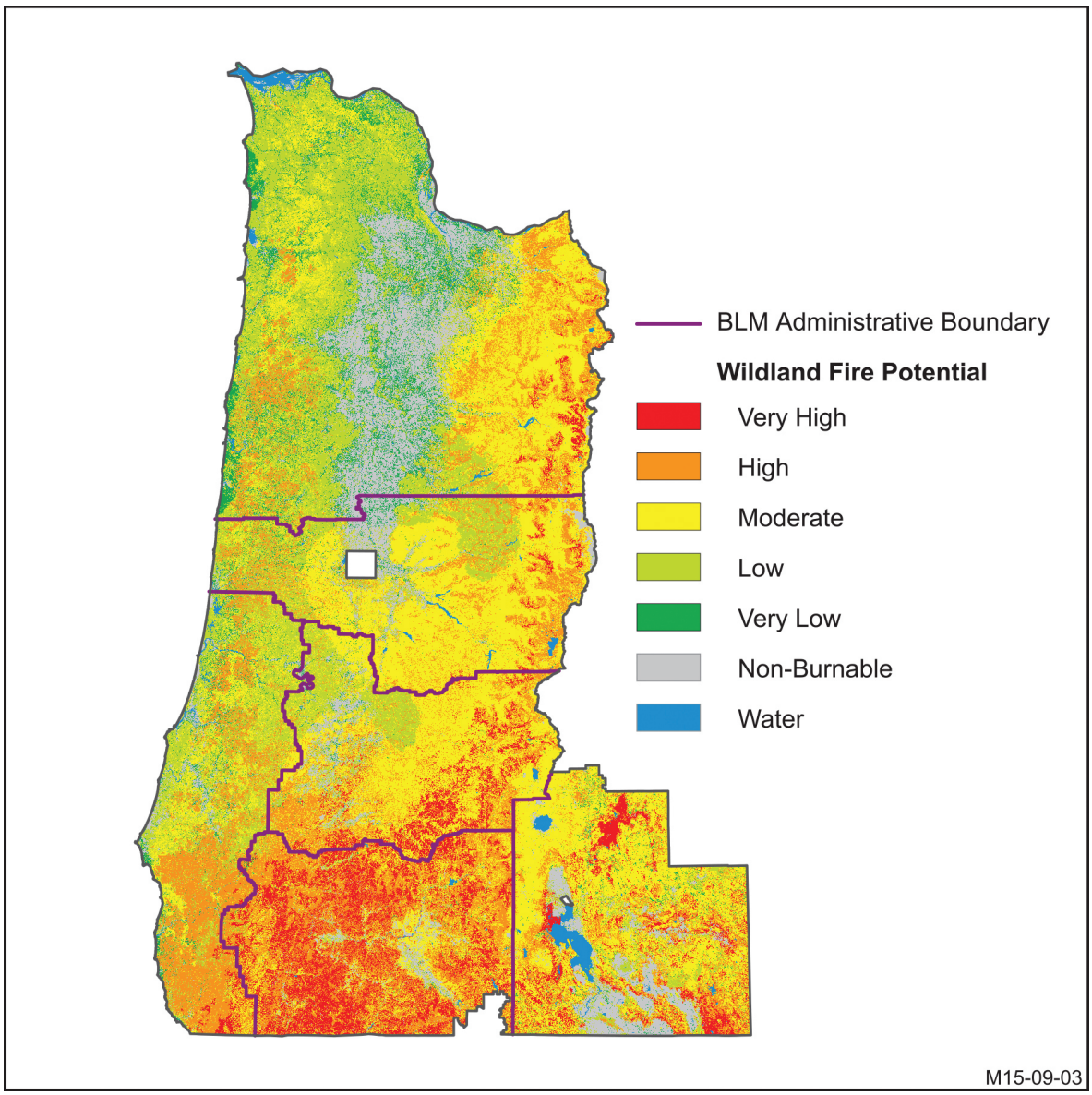


Figure 3-39. Wildland Fire Potential for BLM-administered lands in the planning area

Table 3-36. Wildland Fire Potential acres for BLM-administered lands in the planning area

Wildland Fire Potential	Interior/South (Acres)	Coastal/North (Acres)
Very Low/Low	154,398	377,879
Moderate	385,572	450,944
High	499,709	205,162
Very High	399,605	1,675

In this analysis, the BLM determined a relative weighting of residual activity fuel that would remain following timber management activities (**Table 3-37**), based on the management type and intensity. Timber harvest prescriptions that remove greater basal area from stands leave more surface fuels. This increase in surface fuels has the potential to result in higher rates of spread and greater flame lengths in

the event of a wildfire (Weatherspoon and Skinner 1995, Raymond and Peterson 2005, Prichard *et al.* 2010), increasing the risk to firefighters and public safety (Graham *et al.* 1999 and 2004). Many different treatments can accomplish surface fuel reduction, including prescribed fire, biomass removal, and mechanical mastication or manipulation.

Table 3-37. Relative weighting of residual surface fuel loading by timber management type and intensity

Timber Management Type (Intensity)	Residual Fuel Load (Weighted Value)
Selection (Moderate/Light)	2
Thinning	2
Thinning with No Extraction	3
Selection (Heavy)	3
Pre-commercial Thinning	3
Two-age (Light)	3
Clearcut/Two-age (Heavy/Moderate)	4

The weighting represents the probable amount of fuel loading based on the retention associated with the timber management type, where less retention has more residual fuel loading. Clearcut harvest would occur in the High Intensity Timber Area in Alternatives A and C. Heavy and moderate two-age regeneration harvest would occur in the Matrix in the No Action alternative and the Medium Intensity Timber Area in Alternatives B and D. Light two-age regeneration harvest would occur in the Low Intensity Timber Area in Alternative B. Heavy selection harvest would generally occur in the Uneven-Aged Timber Area in all action alternatives and the Proposed RMP. Moderate selection harvest would generally occur in the Owl Habitat Timber Area in Alternative D. Light selection harvest would occur in reserves in all alternatives and the Proposed RMP. Thinning and pre-commercial thinning would occur throughout the Harvest Land Base in all alternatives and the Proposed RMP. These harvest intensities are rough generalizations used as analytical assumptions, but are not intended to replace or supplement management direction in each alternative or the Proposed RMP.

Additional factors influence the need and ability to mitigate residual fuel loading, such as stand structure, yarding method, harvest unit size, biomass utilization, topographic position, road proximity, soil composition, fuel decomposition rates, fuel compaction, airshed restrictions, and weather conditions. However, the BLM cannot accurately forecast these site-specific and market-driven variables for analysis and modeling at this scale.

The BLM determined the relative risk of residual fuel (**Table 3-38**) based on the weighted combination of Wildland Fire Potential (USDA FS FMI 2013), treatment location relative to the zone within 1 mile of Wildland Development areas (WWRA 2013), and the probable residual activity fuel loading associated with timber management activities. The BLM assigned a weight of 1 to areas beyond 1 mile of development areas and a weight of 2 to areas within 1 mile of wildland development areas. Wildland Fire Potential weights followed the classification scheme (e.g., Very Low/Low = 1 and High = 4). The BLM assigned weights to the harvest activities based on probable residual fuel loading relative to proportional basal area removed (**Table 3-37**). The BLM derived a risk matrix by multiplying these weighted variables and grouping them numerically into four categories. The BLM quantified the average decade total acreage within each risk category over 50 years for each of the alternatives and the Proposed RMP. The BLM evaluated the effects on the relative risk posed from residual activity fuel loading associated with management activities throughout the decision area.

Table 3-38. Risk category based on predicted residual activity fuel following harvest, proximal location to Wildland Development Areas, and Wildland Fire Potential

Wildland Fire Potential	Proximity to Development Areas (WWRA WDA)*	Residual Activity Fuel from Timber Management Activities		
		Low	Moderate	High
Very Low/Low	Outlying	Low	Low	Low
	Within	Low	Low	Low
Moderate	Outlying	Low	Low	Low
	Within	Low	Moderate	Moderate
High	Outlying	Low	Moderate	Moderate
	Within	Moderate	High	High
Very High	Outlying	Low	Moderate	Moderate
	Within	Moderate	High	Very High

* Source: Wildland Development Areas (WWRA 2013) and Wildland Fire Potential (USDA FS FMI 2013)

Background

Historically, the BLM has treated a portion of residual activity fuels following timber management activities for both site preparation and hazardous fuels reduction purposes. The BLM incorporated these assumptions into the modeling as a reasonable expectation of future levels of treatments (**Appendix C**). The treatment of slash from pre-commercial thinning is highly dependent on the residual stand structure, topographic location, and cost/benefit trade-offs of hazard reduction.

Affected Environment and Environmental Consequences

The current fire risk based on Wildland Fire Potential and proximity to WUI, for BLM-administered lands follows a similar pattern to the moist and dry forest distribution across offices (**Table 3-39**). The coastal/north has over 60 percent of BLM-administered lands in the Low risk category. Most of the remaining acres in the coastal/north are at Moderate risk. In the interior/south, nearly half of all BLM-administered lands are at Moderate risk. Nearly a quarter of this area is in the Very High (10 percent) and High (13 percent) risk categories.

Table 3-39. Current fire risk categories for BLM-administered lands

Planning Area Region	Low Risk		Moderate Risk		High Risk		Very High Risk	
	(Acres)	(Percent)	(Acres)	(Percent)	(Acres)	(Percent)	(Acres)	(Percent)
Coastal/North	675,325	66%	295,099	29%	56,926	6%	1,432	< 1%
Interior/South	407,824	28%	684,619	48%	192,465	13%	147,642	10%

Over 50 years, the alternatives and the Proposed RMP would differ substantially in the acreage of timber management activities, and, consequently, the acreage with residual activity fuels. Alternative A would have the fewest average acres of timber management activities per decade in both the coastal/north and interior/south. Alternative C would result in the highest average acres of timber management activities per decade in the coastal/north, and Alternative B would have the highest average acres of timber management activities per decade in the interior/south (**Figure 3-40** and **Figure 3-41**).

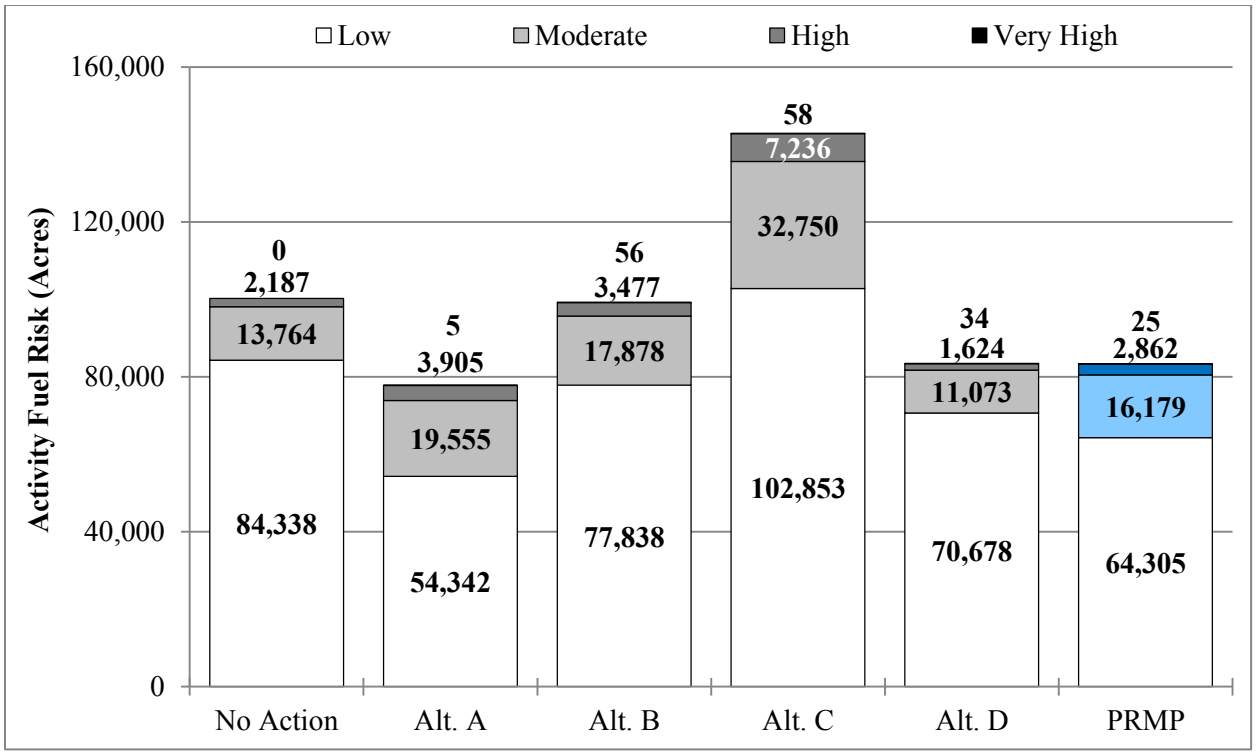


Figure 3-40. Activity fuel risk categories for BLM-administered lands in the coastal/north, decadal average 2013–2063

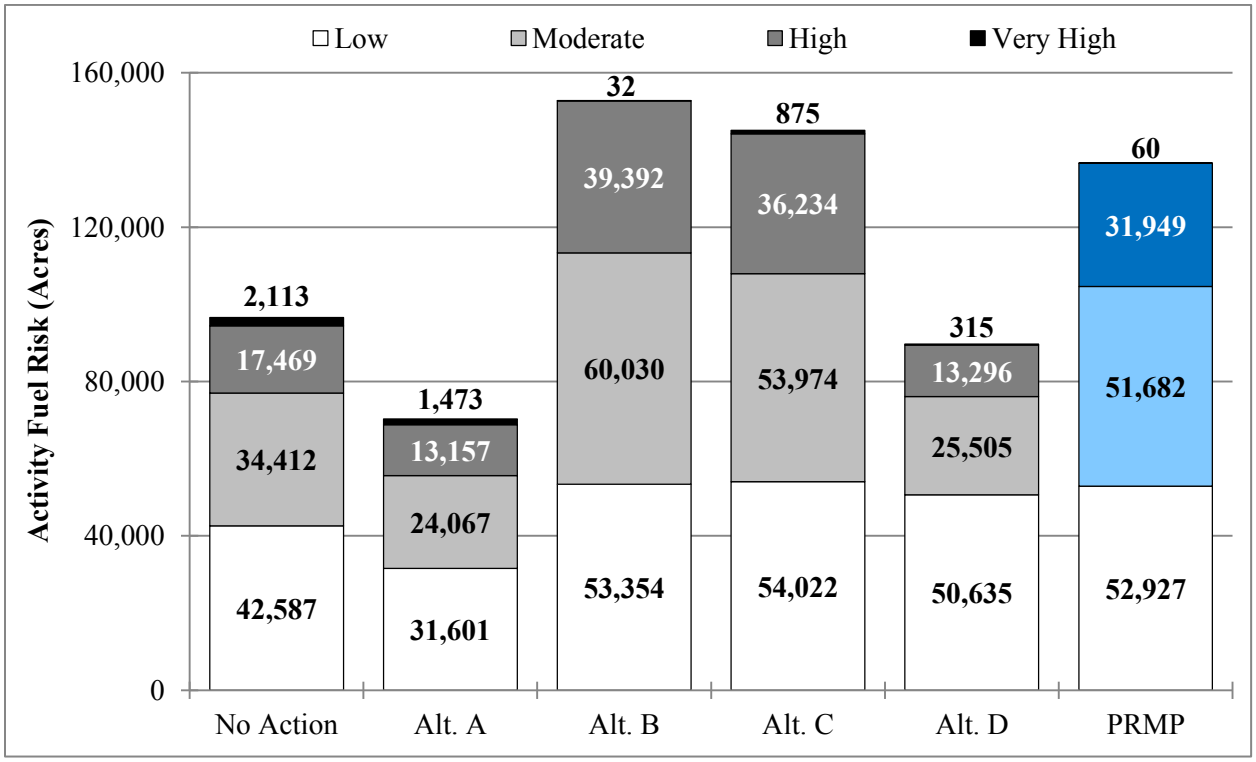


Figure 3-41. Activity fuel risk categories for BLM-administered lands in the interior/south, decadal average 2013–2063

For the coastal/north, the majority of managed acres would be at Low risk from residual activity fuel under all alternatives and the Proposed RMP (**Figure 3-40**). Alternative C would result in the most acres of Moderate and High risk for the coastal/north. Alternative D would result in the fewest average acres per decade of Moderate and High residual fuel risk for the coastal/north. Alternatives A and B and the Proposed RMP would result in similar amounts of Moderate and High residual fuel risk acreage between Alternative C and D. Alternative C would result in the largest amount of Low risk acreage per decade in the coastal/north.

In the interior/south, over the course of 50 years, both Alternatives B and C, followed by the Proposed RMP, would result in the most acres of Moderate and High risk from residual activity fuel. Alternatives A and D would result in the fewest average acres per decade of Moderate and High residual fuel risk (**Figure 3-41**). Alternatives B, C, D, and the Proposed RMP would result in the largest amount of Low risk acreage. The No Action alternative and Alternative A would create a very small amount of acres in very high risk.

The size of the Harvest Land Base and the timber management type and intensity are factors influencing the amount of acres in each risk category by alternative and the Proposed RMP. For example, alternatives or the Proposed RMP that would have the largest amount of timber harvest and pre-commercial thinning per decade, would also have the most acres in Moderate and High risk activity fuel categories. This is true of Alternative C in both the coastal/north and interior/south, and Alternative B and the Proposed RMP in the interior/south. While Alternative A has the smallest Harvest Land Base, a larger portion of it is the High Intensity Timber Area. Consequently, Alternative A would have amounts of Moderate and High risk similar to alternatives and the Proposed RMP with a larger Harvest Land Base, but less intensive harvest management.

By generating residual activity fuels, timber management activities would have the potential to add to the current fire risk if not adequately treated (Agee 1993, Weatherspoon and Skinner 1995, Raymond and Peterson 2005). The acres in residual fuel risk categories provide an estimate of potential future work needed to reduce the risk associated with activity fuels. A variety of follow-up treatments could mitigate most residual activity fuel, depending on the risk and amount of remaining fuel. Depending on the residual stand structure, allocating resources to mitigate the activity fuel loading, particularly through prescribed burning, could result in some level of post-treatment mortality to the residual stand. This could have the effects of reducing the risk and developing stand structural diversity. Alternatively, mitigation of activity fuels might not reduce the hazard or could result in unacceptable levels of tree mortality. In some cases, the Wildland Fire Potential would be minor, and treating activity fuels may not be necessary to reduce risk. For example, under Alternative A, trees cut for restoration thinning in the Late-Successional Reserve in the moist forest would remain on-site. This situation would likely result in low risk, given the districts with greater proportions of moist forest have lower Wildland fire Potential (**Figure 3-23** and **Figure 3-39**).

Coupling the activity fuel risk with stand-level hazard or resistance (see Issues 2 and 3) illustrates the costs and benefits of doing the work to mitigate the risk. For example, in the interior/south, Alternatives B and C, and the Proposed RMP would result in similar amounts of Moderate and High risk residual activity fuel acres. Treatment of activity fuel in Alternative C would clearly reduce a portion of the risk, but the remaining stand structure would be less fire resistant and of higher fire hazard than in Alternative B or the Proposed RMP. Treatment of residual activity fuels in Alternative B and the Proposed RMP may provide a greater overall benefit in reducing risk within the planning area, and the remaining stand structure would be more fire resistant and of lower fire hazard than in Alternative C. In addition, in the interior/south, Alternative D would have the fewest acres in High or Moderate activity fuel risk, as well as improvement in stand-level fire resistance and hazard. This combination might also provide increased stand-level fire resistance and lower risk activity fuel loading. For the coastal/north, Alternative C would

have the largest residual fuel load risk and the highest relative stand-level hazard. For the coastal/north, the No Action alternative, Alternatives B and D, and the Proposed RMP would have lower amounts of both activity fuel risk and stand-level hazard ratings.

In summary, the size of the Harvest Land Base and the timber management type and intensity influence the amount of acres in each risk category by alternative and the Proposed RMP. The acreage in activity fuel risk categories provides an estimate of potential future work needed to reduce the risk associated with activity fuels. Alternative C for the entire decision area, and Alternative B and the Proposed RMP in the southern portion would result in the greatest need for treatment of activity fuel to reduce risk. Coupling the stand-level fire hazard and resistance results with the activity fuel risk helps to illustrate the cost/benefit of doing work to mitigate the risk.

Issues Considered but not Analyzed in Detail

How would the alternatives affect the implementation and effectiveness of hazardous fuels treatments?

All of the alternatives and the Proposed RMP have similar management objectives and management direction regarding non-commercial natural hazardous fuels reduction treatments. Therefore, the BLM assumed in this analysis that similar types and amounts of treatments that have occurred over the past decade would continue in the future under any of the alternatives and the Proposed RMP (**Table 3-40**), despite substantial year-to-year variation in acres treated. For example, acres of under-burning may increase and acres of hand pile burning decrease, as programs shift into the maintenance of previously-treated non-commercial hazardous fuels units.

Table 3-40. Non-commercial natural hazardous fuels treatment acres by treatment type, 2003–2012

District/ Field Office	Biomass Removal (Acres)	Hand Pile and Burn (Acres)	Machine Pile and Burn (Acres)	Mechanical Manual[50] (Acres)	Mechanical Mastication (Acres)	Underburn/ Broadcast Burn (Acres)
Coos Bay	1,161	595	63	122	1,680	1,092
Eugene	-	192	1	10,354	813	15
Klamath Falls	5,443	4,163	17,071	4,592	2,198	9,371
Medford	1,190	62,497	-	15,032	3,161	22,064
Roseburg	-	422	-	2,313	-	3,235
Salem	-	438	-	3,733	280	-

Increasing landscape-level fire resilience and stand-level fire resistance and decreasing stand-level fire hazard would increase the effectiveness of hazardous fuels treatments. To the extent that changes in landscape-level fire resilience, stand-level fire resistance, stand-level fire hazard, and residual activity fuel loading influence the effectiveness of hazardous fuels treatments, the previous issues in this section describe the effects of these factors. However, it is not possible at this scale of analysis with the data available to describe specifically how such changes together would alter the effectiveness of hazardous fuels treatments or to consider how differing combinations of outcomes would alter the effectiveness of hazardous fuels treatments (e.g., increased stand-level fire resistance within a landscape of decreased fire resilience). Therefore, it is not possible to determine any specific change in the effectiveness of hazardous fuels treatments resulting from the alternatives and the Proposed RMP.

[50] Mechanical manual includes thinning, mowing, chipping, lop and scatter, etc. See **Glossary** for additional treatment descriptions.

How would the alternatives affect wildfire response?

There is no accurate way to predict the exact location and timing of wildfires. However, treatments that reduce flame lengths and decrease the probability of crown fire potential would minimize risk to wildland firefighters and the public, and provide more effective fire management opportunities, including safe engagement of suppression resources. These treatments would also increase the potential to utilize all fire management tools, including utilizing wildfires to meet resource objectives. The previous issues in this section describe effects to landscape-level fire resilience, stand-level fire resistance, stand-level fire hazard, and residual activity fuel loading. To the extent that changes in landscape-level fire resilience, stand-level fire resistance, stand-level fire hazard, and residual activity fuel loading potentially influence wildfire response, the previous issues in this section describe the effects these factors. The full range of wildfire response tactics would be available under all alternatives and the Proposed RMP. Maintenance of fire management related infrastructure would not change among alternatives and the Proposed RMP. The ability to conduct salvage harvest in the Late Successional Reserve for purposes of protecting human health and safety within the dry forest would be available under all alternatives and the Proposed RMP. Because these factors would not differ, there is no reasonable basis on which to identify a difference in the effect of the alternatives and the Proposed RMP on wildfire response at this scale of analysis, beyond the effects to landscape-level fire resilience, stand-level fire resistance, and stand-level fire hazard already described above.

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