Fuels

Introduction

Fuels management is a process of limiting risks to key ecosystem components with an objective of maintaining appropriate conditions for each fire regime present on the landscape. The goal is to maintain appropriate components of the fuels complex, such as large woody material and soil organic matter, consistent with fire return for specific plant associations, while providing for fire fighter and public safety, as well as, protection of natural resources. Important considerations in this process are the identification of fire regimes, characterized by biophysical environment (moisture regime) and plant association. Managing the fuel loads within the variability of individual regimes while meeting protection objectives helps identify the management actions needed on a given landscape.

Fire Regimes

Fire regime is a generalized description of the role fire plays in an ecosystem and is an effective way to classify the effects of fire on vegetation (Agee, 1993). The document titled Protecting People and Sustaining Resources in Fire-Adapted Ecosystems – A Cohesive Strategy, October 13, 2000 established five primary fire regime groups for all lands managed by the U.S. Forest Service in the United States. These are broad and simplified categories that help us to understand the ecological fundamentals of the biotic systems that occur on this landscape, and its previous relationship with fire as a process which acted upon them at different frequencies and resulting severities for thousands of years.

Fire Regime Code	Description
I	Less than 35 year return interval, low severity, usually non-lethal.
II	Less than 35 year return interval, stand replacement severity.
III	35 – 100 year return interval, mixed severity.
IV	100 – 200 year return interval, stand replacement severity.
V	200+ year return interval, stand replacement severity.

Fire Regime I

Fire Regime I includes the lower and mid elevation forested plant associations, ponderosa pine, Douglas-fir and warm grand fir groups (see section 34.1 for the complete list of the plant associations that are assigned to this group). These systems historically had rather short fire free periods that prevented high fuel loads from accumulating and limited the layers within the stand.

They have been most affected by human activities over the past century due to the terrain, species composition, and proximity to our communities. They generally have the highest values at risk to loss from disturbance, and often are in proximity to private property. The Cohesive Strategy identified this group as being the primary focus of our current and future management activities (along with Fire Regime II).

Fire Regime II

Fire Regime II includes low and mid elevation grassland plant associations; bunch grasses and fescues as well as other grass types (see section 34.2 for the complete list of the plant associations that are assigned to this group). These systems historically had rather short fire free periods that prevented high fuel loads from accumulating and limited tree and brush encroachment within these areas. There are a variety of current situations found within this fire regime, depending upon previous grazing, settlement patterns, noxious weed development, and fire frequencies. The expectation within the Cohesive Strategy is this group will also be a high priority for wildland management, along with Group I.

Fire Regime III

Fire regime III consists of the forest plant associations found at mid elevation, more mesic sites than those of Fire Regime I, moist Douglas-fir, moist grand fir clusters, and some shrub groups (see section 34.2 for the complete list of the plant associations that are assigned to this group). Because of the higher moisture availability normally found within these sites they have evolved with a longer fire regime. This lengthening of the fire free period and the greater site productivity of these sites contributes to a greater degree of biomass accumulation in these plant associations. The combination of tree species adapted to these site that have a somewhat lower resistance to fire and the higher fuel loads creates a mixture of fire effects on the plants associated with this group – the classic "mosaic pattern".

Fire Regime IV

Fire Regime IV consists of forested species found at mid to high elevation sites. This group is well represented by the lodgepole pine types and tree species associated with it such as subalpine fir. Spruce plant associations are included within this group, but would generally be considered as having a fire free period of 100 years +. These species are very fire intolerant of fire. Fire Regime IV areas are lower priority for management treatments and where land management direction and appropriate conditions exist are candidates for the management of natural ignitions.

This Fire Regime is often found at the headwaters of the Forests watersheds and can influence water quality/quantity within the watershed. This group is currently considered prime lynx and snowshoe hare habitat; consequently management actions will need to consider effects to these terrestrial species.

Fire Regime V

Given the long fire free period of this group it is considered a fire refuge. Generally the plant associations found within this group are associated with high local moisture availability, rock, lack of fuel availability or other combinations of the physiographic setting that inhibit the propagation of fire.

Condition Classes have been developed to categorize the current condition with respect to each of the five fire regimes. Current condition is defined in terms of the departure from the historic fire regime, as determined by the number of missed fire return intervals – with respect to the historic fire return interval – and the structure and composition of the system resulting in alterations to the disturbance regime. The relative risk of fire-caused losses of key components that define the system increases for each respectively higher numbered condition class.

Condition Class 1 areas are within or near historical range and risk of losing key ecosystem components is low. Vegetation species and structure are intact and functioning within historical range.

Condition Class 2 develops as one or more fire return intervals are missed, primarily due to well-intentioned suppression efforts, while understory vegetation continues to grow, becoming denser. If this accumulating vegetation is not treated, fires begin to burn more intense – making them more difficult to suppress. The impact of fires to biodiversity, soil productivity, and water quality becomes more pronounced.

Condition Class 3 areas within these same ecosystems, fires are relatively high risk. The forest is littered with considerable amounts of dead material and is choked with hundreds of small trees that reach into the crowns of the larger, older-age forest above. Under these conditions, stands have the potential for severe, high intensity wildland fires. At these intensities, wildland fires kill all of the trees – even the large ones that, at lower fire intensities, would survive (Laverty & Williams, 2000).

Regulatory Framework

Malheur Forest Plan

The Malheur National Forest Plan includes Fire management direction to ensure that fire use programs are cost-effective, compatible with the role of fire in forest ecosystems, and responsive to resource management objectives. Fire management direction in Appendix G of the Forest Plan also directs that fire pre-suppression and suppression programs are cost-effective and responsive to the Forest Plan.

The goals for fire management are to: 1) initiate initial management action that provides for the most reasonable probability of minimizing fire suppression costs and resource damage, consistent with probable fire behavior, resource impacts, safety, and smoke management; and 2) identify, develop, and maintain fuel profiles that contribute to the most cost-efficient fire protection program consistent with management direction (Forest Plan IV-4).

The following Forest wide direction is provided for fire management: 1) Utilize prescribed fire to meet land management objectives, 2) manage residue profiles at a level that will minimize the potential of high intensity wildfire and provide for other resources (Forest Plan IV-44). Air quality standards require that air quality impacts be minimized, especially to Class I airsheds and smoke sensitive areas, mitigation measures be used when appropriate, and burning is conducted in accordance with the State Smoke Management Plan (Forest Plan IV-40).

Malheur National Forest Fire Management Plan

The Malheur National Forest Fire Management Plan (FMP) provides operational guidance on how to carry out fire management policies that will help achieve resource management objectives. A fire management planning system that recognizes both fire use and fire protection as inherent parts of natural resource management will ensure adequate fire suppression capabilities as well as support fire reintroduction efforts (FMP).

The fuels management portion states that the appropriate type and amount of fuel treatment is tiered to the Forest Plan Management Area specific Standards and Guidelines. Levels and methods of fuel treatment will be guided by the protection and resource objectives of each management area. Emphasis will be on ecological restoration treatments. Where appropriate, fuels treatments will allow for the utilization of wood residues using a marketing strategy. Management Areas (MA) affected by the fire were MA1-General Forest, MA-2 Range, MA-13 Old Growth, MA-3B, Anadromous Riparian Area, and MA14-M Scenic, middle ground with partial retention

Clean Air Act

The Clean Air Act establishes certain minimum requirements that must be met nationwide, but states may be able to establish additional requirements. Users of prescribed fire must comply with all applicable federal, state and local air quality regulations. The Clean Air Act establishes major air quality goals, and provides means and measures to attain those goals by addressing existing and potential air pollution problems. The major air quality goals include attaining National Ambient Air Quality Standards (NAAQS), preventing significant deterioration of air quality in areas cleaner than the NAAQS.

Each state (including Oregon) has a State Implementation Plan (SIP) that provides the means by which these goals are to be attained. The SIP may contain measures such as emission standards for air pollution sources, air quality permit programs, and regulations controlling specific air pollutant sources such as mobile sources, wood-burning stoves and slash burning. Any burning in Oregon needs to comply with the State of Oregon Smoke Management Implementation Plan. Forest Service policy is to integrate air resource objectives into all Forest Service planning and management activities. The Forest Service and Oregon Department of Environmental Quality entered into a Memorandum of Understanding (MOU) concerning air quality. All alternatives would follow the agreements within the MOU. Because of this, impacts from any activity are minimized. FASTRACS is the program that is used to meet requirements to report prescribed fire smoke management to the State of Oregon. Registering, planning and reporting accomplishment of prescribed fire activities will be accomplished using this program.

National Fire Plan

The National Fire Plan provides national direction for hazardous fuel reduction, restoration, rehabilitation, monitoring, applied research, and technology transfer. The USDA Forest Service and Department of Interior (DOI) are developing a common strategy for reducing fuels and restoring land health in fire-prone areas. The DOI and USDA Forest Service have prepared 2 Documents outlining strategies for protecting people and the environment by restoring and sustaining land health; Protecting People and Sustaining Resources in Fire-adapted Ecosystems.[1] The purpose of the strategy is to:

1. Establish national priorities for fuel treatment; ensuring funding is targeted to the highest risk communities and ecosystems.
2. Evaluate tradeoffs between programs that emphasize wildland urban interface and those emphasizing ecosystem restoration and maintenance.
3. Measure the effectiveness of strategic program options at different funding levels.

[1] See - A Cohesive Strategy (USDA Forest Service, 2000) and Integrating Fire and Natural Resource Management - A Cohesive Strategy For Protecting People By Restoring Land Health (DOI, in draft).

4. Recommend a strategic program to best achieve national fuel treatment objectives for community protection and ecosystem restoration and maintenance.
5. Emphasize landscape-scale, cross-boundary treatments that reduce hazards while providing benefits to other ecosystem values.

The strategy will emphasize improved working relationships between federal land managers, as well as with multiple key disciplines inside the various land management and regulatory agencies and bureaus across geographic scales. Applicable National Fire Plan goals and objectives include:

- Reducing the number of small fires that become large
- Restoring natural ecological systems to minimize uncharacteristically intense fires
- Creating new jobs in both the private and public sectors
- Improving capabilities of state and volunteer fire organizations
- Reducing threats to life and property from catastrophic wildfire

Analysis Methods

The Forest Vegetation Simulator (FVS) with the Draft Fuel and Fire Extension (FFE) on the Blue Mountain Variance was used to determine estimated fuel loadings, fuel models, and flame lengths. The model simulates stand growth, decay, fire event mortality and probability of fuels change under future fire events, and smoke emissions. The model also produces snag and large down woody loadings over time. The sub program First Order Fire Effects Model (FOFEM) helps determine tree mortality. FOFEM estimates potential tree mortality due to wildfire or prescribed fire in tree stand profiles existing before and after harvest in the units planned for underburning. Two major assumptions are made: 1) The fire is burning in an unbroken front through a continuous fuel bed, and 2) There are no fuels greater than 3 inches in size present. A discontinuous fuel bed would result in unburned areas that would lower the expected mortality predicted by the model. Fuels in the 3 inch and greater size classes would increase fire intensity (Flame Lengths), and duration (Severity to soils and trees), thereby raising the expected mortality level. The limitations of these models are that the above assumptions do not account for small-scale variability in fuels, environment, weather, and topographical changes.

Fuel model and flame lengths are two key factors to define possible fire suppression tactics and firefighter safety. Fire behavior inputs used by FVS for severe (includes the torching flame length of brush or tree crowns) and moderate (limits the fire to surface fuels only) conditions that were applied to fuel models and generated flame lengths were:

Table FF-1: Input Elements for FVS Fire Behavior Outputs

FIRE CONDITION	1 hr	10 hr	100 hr	1000 hr	Duff	Live	20ft wind	Temp
Mid Summer/severe	4%	5%	6%	10%	15%	60%	20 mph	90 deg
Early summer/mod	6%	7%	8%	15%	125%	100%	6 mph	70 deg

Data from stand exams and aerial photo interpretation were combined for determining stands that were similar to existing stands data, when no specific stand exam data existed. They were then grouped and given consideration for burn severity, and the average stand exam data was used for that grouping.

Table FF-2: Grouped Units

General Stand aspect/density	General Severity	Main Stand Exam ID Referenced	Proposed Units Associated with these Categories
NW-E light	Mod	10709-1990-0090	42, 44
NW-E med	Severe	30111-1993-0251	14, 18, 32, 33, 34, 35, 36, 40, 41, 66
NW-E heavy	Severe	30113-2002-0167	20, 21, 23, 24, 25, 26, 27, 28, 29, 30, 45, 48, 50
SE-W light	Partial	30111-1993-0191	09, 10, 13, 15, 16, 17, 19, 43, 46, 49, 54, 58, 59, 62,63
SE-W med	Mod	30109-1996-0087	22, 31, 47, 52, 56, 57, 58, 61
SE-W heavy	Light	30111-1993-0158	01, 02, 03, 04, 05, 06, 07, 08, 12, 51, 53, 55, 60, 64
LP med/hvy	Partial	30111-1993-0243	11, 37, 39, 65
RHCA	Partial	30111-1994-0179	none

Cumulative Effects

The list of actions in the beginning of Chapter 3 was used to analyze the Cumulative Effects. Each one was considered to see if any of them, in combination with the actions proposed for the Easy Fire Recovery Project, had a measurable effect. Those that did were discussed further in the Cumulative Effect sections that follow each topic.

Existing Condition

Fire History

The Easy fire occurred in the Upper Middle Fork of the John Day River (UMFJDR) and the Upper John Day River (UJDR) Watersheds. During the 16 years preceding the Easy Fire, these landscapes have seen numerous large fires.

Table FF-3: Past Large Fires

WATERSHED	NAME	YEAR	ACRES
UMFJDR	Grouse Knob	1986	23
UMFJDR	Road Creek	1988	12
UMFJDR	Phipps	1996	43
UJDR	Deardorff	1986	945
UJDR	Glacier	1989	9,319
UJDR	Corral Basin	1990	113
UJDR	SnowShoe	1990	11,831
UJDR	Incident 029	1997	161
UJDR	Slide Mountain	2000	411
		TOTAL	**22,858**

In 1937 a portion of the 30,790 acre Big Cow Fire also burned within the Upper John Day River Watershed. This history, including the burn severity of the Easy Fire, is evidence that a significant portion of these landscapes can be characterized as stand replacement fire regimes.

The Easy Fire began in mid July by lighting and spread by torching and spotting to the southwest, driven by down drafts from the cell that produced the lighting. After it passed, the general southwest winds spread the multiple spot fires near the bottom of Reynolds creek upslope in an active crown fire combining with the main fire and moved to the northeast. Fire spread the next day and night consisted of surface fire through recently harvested Rain and Sun Demo units where fuels treatment had not yet occurred, and from torching, active and independent crown fire in stands that have never been actively managed. The fires growth was slowed down in stands with past fuels treatment, resulting in low severity effects. The fire was halted at the top of a ridge where past harvest and fuels treatment had been applied. As a result only a few acres burned in the Dry Creek sub-watershed.

The Easy Fire burned in varying severities in the existing plantations, but mostly with light severity or not at all. Approximately 10% of the existing plantations were unburned, 50% burned with light severity, 12% burned with moderate severity, and 28% burned with high severity.

Fire Occurrence

The Fire Occurrence Rate (FOR) describes the probability of fire occurring on a given area per year based upon fires records for a given area. It is quantified in terms of fires per thousand acres per year.

Fire occurrence data, from 1975 to 2001, for the three subwatersheds affected by the Easy Fire was used to determine the FOR:

130 Fires / 44.671 thousand acres / 26 years = 0.1119 FOR

This indicates that there is a 11% chance of a fire occurring within any 1,000 acre block of the Easy Fire Recovery EIS area per year. That probability estimate amounts to about 2 to 3 fires per year (or almost 90 fire starts) that will have occurred within the next 30 years.

The following table provides FOR the calculation for the three individual sub watersheds:

Table FF-4: Percentage calculations

Sub-watershed	# of Fires/	Per 1000 acres/	# of years covered =	Result	Percentage
Bridge	40	12.182	26	0.1263	12.6%
Clear	34	12.519	26	0.1045	10.5%
Reynolds	56	19.970	26	0.1079	10.8%

Lightning was determined to be the cause of 81 percent of the fires (119 fires). Escaped campfires account for most human caused fires (20 fires). All but a few were contained to 1/4 acre in size or less.

Large fires in the Blue Mountains are a part of the ecosystem. The 2002 High Roberts Fire, which burned in the Upper John Day River Watershed re-entered the 1990 Snowshoe Fire. While high intensity fire behavior was not exhibited, large woody fuels, resulting from deadfall sustained combustion.

Vegetation

Prior to the fire the Easy Fire Recovery Project Area could be described as a Fire Regime III in a Condition Class III. About 70% of the area was characterized by an overstory of Douglas-fir and grand fir, with scattered western larch and ponderosa pine and a midstory of grand fir. About 30 % of the area was characterized by an over story of Ponderosa Pine/Douglas Fir. The mid story in most of the project area was grand fir about 80 years old, much of it dead and dying. The understory was mostly fir regeneration (with much of the area infected with Armillaria root rot). The Upper Middle Fork John Day Watershed Analysis describes the Historic Range of Variability. “In the warm/dry forest, ponderosa pine was almost 42% of the stand make- up and Douglas-fir was 27%. In the cool/ moist forest, almost 47% of the stand make up was Ponderosa Pine and Douglas-fir was 31%. (Note: The cool/moist forest referred to in the Watershed Analysis is equivalent to the areas currently classified as Cold Dry, Cool Dry, and Cool Moist.) The larger portion of fire dependent species in the cool/moist is probably due to more moisture for site productivity in conjunction with fire killing back the true fir species. If fire had been allowed to play its natural role over the last century, these percentages would still be apparent today”.

Many of the stands had developed into over stocked true fir species conducive to a stand replacement, rather than a mixed severity fire common to a Fire Regime III. In a Condition Class I Warm/dry stands would have had fire naturally occurring about every 20 to 40 years. Resulting lower severity fires were agents of stability helping to maintain stands with high proportions of fire tolerant species and large areas of relatively open “park-like” conditions with small areas of denser forest patches in areas missed or more resistant to fire.

The Lodgepole plant associations averaged 6 to 12 inch DBH. The area was infected with Armillaria root rot, and already well advanced into the decadence typical of older trees. The life cycle of lodgepole pine is typically 90 to 120 years. During this age range, lodgepole dies and falls to the ground accumulating a heavy fuel loading. This fuel loading remains until a wildfire comes through the area and burns with high intensity because of the large amount of fuels available. In Lodgepole Pine stands, high levels of mortality can occur even with low intensity fire, which would have occurred naturally every 20 to 30 years.

Past harvest in the Easy Fire Area has had similar effects on tree species as several small-scale stand replacement fires, by removing stems. These open areas provided some barriers to fire spread, but treated areas were too fragmented to effectively limit spread and severity.

Table FF-5: Vegetation Burn Severity (acres)

Total Acres	Unburned	Light	Partial	Moderate	Severe
5,839	157	749	61	1,870	3,002
Percent of area	2%	13%	1%	32%	52%

The total area in the Easy Fire project area is 5,839 acres. The total area burned within the project area perimeter is 5,682 acres. In addition, a significant amount of structure similar to what burned in the Easy Fire remains in the subwatersheds affected by the fire. As a result the potential for high severity – stand replacement fire still exists in the area within these specific areas. However, these conditions could be expected to exist normally in a fire regime IV and V and are considered to be appropriate at the current scale.

Table FF-6: Existing Crown Fire Potential Acreages

Sub-watershed	High	Mod	Low	None	Water	Unknown
Bridge	3,931	8	6,474	235	58	3
Clear	4,275	0	7,261	323	8	1
Reynolds	8,024	2,019	5,380	184		2,725

The potential for another large-scale high-severity fire within the fire area in the next 5 years is minimal. About 5 years from now, many of the fire-killed trees will have fallen. Mixed with the natural grasses, brush and regeneration, will be the down woody fuels from the newly collapsed trees. These fire dependent ecosystems that are allowed to reach the climax stage set themselves up for a second large scale high severity fire that 'cleans up' the excess live and dead fuels.

Surface Fuels

Fuel loading (tons/acre) can be modeled into fire behavior predictions, which produce anticipated flame lengths. Flame lengths are an indicator of fire intensity and type of fire attack that can be used on a fire. A flame length less than four feet can be attacked with hand tools, and fire fighters can work close to the flames. Flame lengths of 4-8 feet will require heavy equipment, such as dozers, and fire size will be larger and more costly to suppress. In short, the probability of suppressing fires at small acreages decreases as flame length increases. See Fuels Specialist Report for graph of flame lengths by Fuel Model under general summer conditions.

Current surface fuel loads have been reduced significantly from pre-fire levels. In all biophysical environments with moderate to high severity, the current 0-3" fuel loads are from 0 to 3 tons\acre with little or no ladder fuels. The fire intensity and severity in these areas is expected to be low for the next 1-5 years. Within 2-3 years, the grass and shrub layer will be continuous enough to carry a fire.

In all biophysical environments with low severity, the current 0-3" surface fuel loads are from 5 to 10 tons\acre and still have much of the ladder fuel component. Surface fuels were consumed in a mosaic pattern. Fine fuels are accumulating from fire killed needles and branches. Low to moderate fire intensity and severity can be expected, burning in a mosaic pattern.

It can be expected, as with the large diameter trees, that standing dead and dying trees under 9 inches dbh within the fire area will fall over time and become surface fuels. The resulting horizontal fuels loading will be dependent on the severity of the burn in which these trees occur. Severity has a direct impact on the mortality of the small trees and their recruitment as standing dead. In addition to the natural fall of these smaller trees, small diameter fuels will accumulate as a result of harvest activities. A portion of the small diameter fuels accumulating as a result of harvest activities will be treated in Alternative 2, 3 and 4. In Alternative 5, small diameter fuels will also be treated by mechanical means. Larger trees will also add to the fuel load over a period of about 20 years.

Fire Regimes

The following table displays the fire regimes within the subwatersheds affected by the Easy Fire:

Table FF-7: Fire Regimes within affected sub watersheds (acres)

Subwatershed	I	II	III	IV	V	total
Bridge	3,668	1,394	5,128	1.951	8	10200
Clear	2,369	1,301	8,009	1,269	0	12948
Reynolds	6,749	8	11,109	3,427	25	21318
Percent of area	29%	6%	55%	10%	<1%	44466

Fuel Models

For purposes of clarity, existing fuels within the analysis area will be described in terms of fuel models developed for the Fire Behavior Prediction System (FBPS).

There are seven major fuel models (FM) represented within this planning area. For control purposes, it is our intent to reduce fire behavior to a level in which initial attack forces can apply direct attack (flame lengths of less than 3.8 feet).

1. FM 1 is representative of grasses in plantations that are very open with little brush competition.
2. FM 5 is representative of plantations between 2-9 feet tall regeneration with Ceanothus.
3. FM 8 is one of two types of stands. One is heavily harvested after fuels treatment, and the second is most typically a mature stand that has a very light fuel loading.
4. FM 9 is representative of lodgepole and ponderosa pine timber litter in the watersheds.
5. FM 10 is represented by mix conifer stands that have a heavy down woody component.
6. FM 11 represents the lighter slash load from partial harvest units devoid of fuels treatment, and forest stands as they are collapsing.
7. FM 12 best describes past harvest plantations that have been thinned in the last 3 years, and areas of heavy blow down.

Table FF-8: Current Surface Fuel Model Acres

Sub watershed	FM 1	FM 3	FM 5	FM 8	FM 9	FM 10	FM 11	FM12 tsi/ref	Non-Veg	Unknwn/ PVT
Bridge	1,455	73	146	6,458	8	3,702	229	16	58	3
Clear	609	44	20	7,261	0	3,399	876	259	8	1
Reynolds	1,580	0	184	5,380	2,019	7,981	43	0		2,725
Fire Area	383	0	6	4,630	47	734	39	0	0	0

Public and Fire Fighter Health and Safety

In areas burned with high and moderate severity fire, there are many continuous acres with standing dead trees, or snags. Snags pose a threat to public and firefighter safety as they can fall at any time and without warning. Hazard trees along open roads in the project area have been identified.

Vegetative structure and fuel loading create obstacles that hamper or slow down firefighter's line construction production capabilities, and relates directly with firefighter safety. High resistance to control leads to more accidents to firefighters from a variety of hazards. Included in these hazards are such dangers as smoke inhalation and burnovers. As a result of surface fuel consumption during the Easy Fire, the resistance to control was lowered in all severely and moderately burned areas. A lack of canopy fuels in severely burned areas has reduced the potential for crown fires.

Air Quality

The Easy project area lies about 10 air miles northeast of Prairie City, which is in the John Day River valley (a large, high mountain valley). The lowest elevation of the valley is at Prairie City where the river flows westward through the valley. The prevailing winds are from the Southwest and West. During the day, diurnal heating forces air up valley and up slope out of the valley. During the night, air follows the drainages in the valley toward Prairie City. Inversions affect air quality the most during winter months, but during the rest of the year inversions sometimes develop in the morning hours and dissipate by noon.

The Strawberry Mountain Wilderness Area is located 10 miles to the southwest of the project area. There are several homes scattered in John Day River Valley that have been effected by smoke from nearby field and forest burning in the past. The town of Prairie City has been most affected. When smoke is lifted up and out of the valley area, as was the case with the Easy Fire, communities to the northeast are impacted. These communities include Bates, Unity, and Baker City. However these communities do not lie within non-attainment areas and smoke impacts do not exceed limits under the Oregon State Implementation Plan.

Currently, air quality in surrounding sensitive areas is limited to short-term impacts. These impacts are from wood burning, prescribed burning, and field burning to the west. The greatest impact to the Strawberry Mountain Wilderness Area is from field burning in Central Oregon. This burning affects regional haziness and can last for several days in the spring and summer. Prairie City seems to be impacted the most from wood stove smoke during the winter months and from prescribed burning in the spring and fall. Influences from prescribed burning usually last for 2-3 days after completion of a burn, and are worst at night.

Environmental Consequences

Direct and Indirect Effects

Common to Alternatives 2, 3, and 4

Implementation of Alternatives 2, 3, and 4 would manipulate the fuels complex to the point that future fire severity to soils and damage to vegetation would be greatly reduced as compared to the No Action Alternative. The stands in the treatment areas would develop toward a more resilient structure and composition. Stands in areas characterized as a warm dry biophysical environment could be managed in the future (20-30 years) using prescribed fire to maintain desired fuel profiles and desired species composition and stocking. The activities associated with these alternatives would provide for the opportunity in the future to utilize prescribed fire to meet land management objectives, manage residue profiles at a level that will minimize the potential of high intensity wildfire, and provide for other resources, which would meet Forest-wide direction for fire management (Forest Plan IV-44). An economic benefit would also be achieved by implementing fuels reduction activities in conjunction with salvage harvest activities, because fuel reduction might not be funded otherwise.

Fire protection would be difficult in future planted area and areas where no fuel reduction is done, especially in riparian areas and steep areas where fuels removal costs were too high to be off set by the value of the biomass. Enough removal or rearrangement of the fuel bed is needed to ensure a reduction in fire hazard. Whole-tree yarding of dead trees removes up to 70 percent of the 0 to 3 inch fuels and top-attached yarding removes up to 50 percent. With dead trees, many of the limbs are broken off in felling and yarding operations, so a portion of the 0 to 3 inch fuels remain in the unit. Harvest activities will contribute an average of approximately 6.5 tons per acre in this size class of fuel. However, subsequent post-harvest fuel treatments will result in fuel loadings within desired future conditions for larger than 9-inch fuels.

Small diameter trees that suffered mortality during the fire, along with trees that were already dead prior to the fire, will fall over the next 10 years. Fire mortality levels in trees less than 9 inches dbh varied by severity. A combination of live and dead small diameter trees existed prior to the fire. Ocular estimates were used to determine the effects of the Easy Fire. In the areas burned at a high severity it is estimated that all of the small diameter dead trees were consumed by the fire and that approximately 90 percent of the live trees were killed. In the moderate severity areas approximately 50 percent of the dead trees remain and approximately 60 percent of the live tree were killed. In the light severity areas approximately 90 percent of the dead trees remain and approximately 30 percent of the live tree were killed. As a result, conditions exist that allow an accumulation of high levels of surface fuels. Table FF-8b describes the fuel load that can be expected from the contribution of standing dead small diameter trees.

Table FF-8b: Surface Fuel Load from Fall Down of Small Diameter Trees – Year 2012

	Light Severity	Moderate Severity	High Severity	Total
Tons Per Acres	1.4*	4.5*	6.1*	12.0

*These values are weighted averages for the entire fire area

Common to Alternatives 2, 3, 4, and 5

Planting adds more vertical structure to the fuel array and plantations between 10 and 20 years of age often burn like a brush fuel model (a small scale crown fire). If pre-commercial thinning occurs the crown continuity would be reduced but, the surface fuel loading in the hazardous size classes (0-3 inches) would be increased, if left untreated this would add the resistance to control of a wildfire because of the resulting fire intensity.

Table FF-9 estimates surface fuel models and crown fire potential for 20 years in the future regardless of the Alternative selected. The reason for similarities is due to the fact that natural regeneration with collapsing stands or overstory removal with planting and thinning will result in similar fire behavior. Salvage of larger dead over story trees will not reduce the fuels build up in all other size classes. Tractor units that might be grapple piled after much of the zero to seven inch DBH have fallen would be the exception to this map changing those acres from a FM 11 to a FM 8. This would occur because those fuels would have been on the ground during the piling operation and therefore removed before a future fire. The limitation of the assumptions used to generate the acreages is that crown fire potential is related to canopy closure including brush and tree regeneration/plantations with large woody component and fuel model underneath the canopy.

- FM10, 11, and 12 = high;
- FM9 =moderate;
- FM8 = low;
- FM1, and 5 = none

Table FF-9: Crown Fire/Surface Fuel Model Summary, 2022

Surface Fuel Model	Acres	Crown Fire Potential	Acres
FM 1	03	HIGH	5,028
FM 5	123	MODERATE	554
FM 8	131	LOW	131
FM 9	554	NONE	126
FM 10	1,801	ROCK	0
FM 11	797	WATER	0
FM 12	2,430	UNKNOWN	0
Total	5,839	Total	5,839

It is clear that the number of acres in FM 12 is significantly increased in 20 years. There was an absence of FM12 immediately after the Easy Fire, which consumed much of the 0 to 3 inch surface fuels.

Fire behavior outputs are for a simulated fire in 2025. Trend graphs will show mid summer flame lengths in the years:

- 2012, 2024 (before a next fire event)
- 2025 (after the next fire event)

See Appendix C of the Fuels Specialist Report for trend line graphs of flame lengths. Those time lines will best display the change over time. Fuel Loadings are only used to determine the Fuel Model. The Fuel Model determines estimated fire behavior and flame length outputs in feet. Those estimates are generated by FVS under mid summer and early summer environmental conditions with harvest of 7 to 36 inch dbh. Higher fuel loadings will occur on helicopter and skyline units and those higher loadings left in the units are estimated in Appendix D of the Fuels Specialist Report (Fuels Units Summary Table).

Fire and fuels direct and indirect effects can be measured by fuel loads, fuel models, fire behavior, public and firefighter health and safety, and air quality. The greater the course woody debris fuel loading, the greater the negative effects on soils and stand structure in the environment. For fire and fuels management, direct and indirect effects are those that occur from the proposed activity at approximately 10 years, 20 years, and 40 years. Cumulative effects are those effects from other activities, past, present, and future, that add to or subtract from the effects of this project.

Effects on Humans (Alternatives 2,3,4 and 5)

Few health effects from smoke will occur to forest users due to their limited exposure. Warning signs required by mitigation and public notices should notify forest users of areas with active burns so they may avoid those areas. Some health impacts from smoke may occur to nearby residents should strong, persistent inversions hold dense smoke close to the ground for several days. The nearest community, Prairie City lies 10 miles southwest of the area. There is a nephalometer located at Grant Union High School in Canyon City just south of John Day, which is about 25 miles southwest of the fire area. A smoke plume trajectory model is being developed at the Pacific Northwest Experiment Station, which will predict smoke plume direction and concentration down wind of burning operations. Currently it is not officially available for use. However, when it comes on line for district use, it will be used in accordance with the burn plan to minimize smoke impacts on local communities and other areas of concern. No air quality data specific to the planning area exists. The closest monitoring station is located in Baker City, OR, nearly 30 miles northeast of the planning area. Due to the distance involved and the primary fall burning season, strong inversions are both unlikely to develop and unlikely to hold a dense smoke plume to adversely affect the previously mentioned communities.

Job Hazard Analysis indicates what practices and protective gear are necessary to reduce the risk of injuries from all fuel treatment activities. Health impacts from smoke are highly unlikely during pile burning operations, but possible during broadcast and underburning operations. Current studies are available to help evaluate long-term health effects from multiple exposures to smoke. The district strives to limit worker exposure to dense smoke and encourages workers to let holding and burning bosses know when the smoke is too dense. Workers showing signs of carbon monoxide poisoning are removed from the main operations area and reevaluated the next day to determine their ability to perform at their full capability. Workers not able to perform will be given light duty or duty that keeps them out of the smoke for an additional period of time.

Alternative 1

This alternative would not meet the purpose and need to reduce severity in future wildland fires. Severity to soils and vegetation from future wildland fire will be extreme in this alternative. This alternative represents the greatest risk for high severity wildland fire, especially to soils, when the next large fire occurs in the area probably in 20 to 30 years when grasses, forbs, shrubs and natural tree regeneration are intermixed with the collapsed snags that resulted from the 2002 Easy fire.

No entry would occur in this alternative. In areas outside existing plantations, the fuel loading in 25 years would be 36 tons per acre in large diameter fuels greater than 9 inches and an additional 12 tons per acre in fuels less than 9 inches. Fuel loading outside plantations would exceed the desired future condition for both large fuels and small fuels. Within existing plantations, the fuel loading is estimated at 3 tons per acre in fuels less than 9 inches and 6 tons per acre in fuels greater than 9 inches. The weighted average tons per acre for the entire Easy Project Area, including areas outside and in plantations for Alternative 1 in 25 years is estimated at 10 tons per acre in fuels less than 9 inches and 31 tons per acre in fuels greater than 9 inches, both of which exceed the desired future conditions (Table FF-10).

The dead fuel loading coupled with the grass, forbs, and brush understory component would predispose the area for a second large scale high severity fire. Such consequences are typical in these PAG's when they have had fire exclusion and reached their climax/stand reinitiating stage. Associated with these stand conditions are greater fire intensities and severity with increased rates of spread. The impact to forest health would be to restart the life cycle time lines back to zero over a larger area than would have historically occurred. The effects on air quality would be a much higher quantity of smoke emissions when wildland fire occurs. This is due to the fact that forest conditions are hotter, dryer, and windier under summer conditions, and consume a significantly greater amount of down woody material, as well as litter, duff, and foliage components. Particulate Matter (PM) 2.5 will be used. About 2,187 acres were either not burned, plantations, RHCA's, or not economically feasible to salvage and are not included in the acres analyzed in Alternative 1. However, all 5839 acres are considered in the projected Fuel Model table and map for the year 2022 (Figure # 25, Map Section).

The reason that flame lengths increase in action alternatives after treatment is at least twofold. The first is due to the increase in grass and brushes since the area has more sunlight. No action would actually have more shading until the stand collapses, and limit vegetation growth where the tree is laying on the ground. The second is because by about 10 years after planting and natural regeneration the young trees will torch and actively carry fires through their crowns.

Untreated fuel levels in 10 years would be above threshold fire behavior flame lengths under mid summer weather conditions. A low severity prescribed fire would not be possible with the high amounts of down woody debris left in the untreated forest. See Table FF-11 below:

In about 20 years, the majority of fire-killed overstory trees will have fallen onto a bed of already collapsed small and medium size trees with grass and shrubs interspersed with conifer seedlings and saplings. Based on fire occurrence in the area, a second large-scale wildland fire should have or will soon occur, consuming large quantities of fuel in all size classes. Fire behavior predictions indicate that this fuel bed would support a fast moving, high intensity fire. Flame lengths would exceed 8 feet, making hand-line suppression impossible. Mortality of trees naturally regenerated in the area would be near 100%. The fuels contributed by the Easy Fire would probably need 80-150 years to decay to a point where the only likely fire would be a low severity surface fire.

Fire suppression would continue within the project area, though the amount of fuels left on site will affect fire suppression efforts. Aggressive fire suppression in the untreated forest may provide protection to life, property, and habitat for 1-7 years. Past this timeframe, the risk for a large intense fire will continue to increase as biomass collects on the forest floor and stands grow dense. Resistance to control would be high.

The No Action Alternative would not allow for moving the area closer to the historical range of variability for fuel loading, fuel models or fire behavior, since the next fire would cause another stand reinitiation.

Alternative 2

Salvage logging would remove large dead trees on 1,777 acres, leaving moderate to high amounts of dead trees (less than 9" DBH) and leaving 2.39, 21+ inch DBH snags/acre. In order to further reduce fuels in skyline units Alternative 2 directs that limbs will be yarded with Logs. However, breakage of limbs will be greater for dead trees. Additional fuel treatments on the small diameter dead and dying material could occur in units that still exceed flame length thresholds. These treatments would be grapple piling 456 acres on slopes less than 35%. The piles would then be burned. Helicopter units will only have dead trees removed greater than 12" DBH, and will lop and scatter 545 acres. Since the value of grand fir cannot support adequate fuels treatment from a salvage harvest, reducing the fuel bed height is the only treatment option. The need for these treatments will be verified after harvest.

As shown in Table FF-11, the flame length for a fire during a mid summer day in all biophysical environments will exceed an 8-foot flame length. Such flame lengths span the limit of mechanical suppression equipment and exceed the threshold (historical) for these events over the next 20 years. Fire suppression would continue in these areas, but fires would show high to extreme fire behavior with high resistance to control except on tractor units that were grapple piled. The degree of severity to soils and the residual stand would be lessened. Since large woody material would be removed, residual burn out time that causes more soil damage and overstory mortality would be reduced.

Fuel loading for small diameter fuels in salvage units in 25 years in Alternative 2 would be about 10 tons per acre, same as No Action (Table FF-10). Fuels less than 9 inches would exceed the desired future condition for that size class. Fuel loading for large diameter fuels in salvage harvest units in 25 years would be about 6 tons per acre. Large fuel reduction would achieve the desired future condition for those size classes. This component of the fuels complex is currently standing dead small diameter trees, which without interim treatments, could accumulate to unacceptable levels. This alternative would meet the purpose and need to reduce severity in future wildland fires. Severity to soils and vegetation from future wildland fire would be overall moderate for this alternative.

This alternative has the lowest fuel loading in the larger than 9 inch diameter fuels of all the alternatives when averaged across the entire project area. The overall fuel loading in 25 years for the entire project area, using weighted averages would be about 22 tons per acre in the large diameter fuels, and about 10 tons per acre in the small diameter fuels. The desired future condition would be met for large fuels but not small fuels when averaged across the project area. The difference in the large woody fuel load between Alternative 2 (2.39 snags per acre) and Alternative 3 (1-2 snags per acre) would be offset by the larger number of treatment acres in Alternative 2, compared to Alternative 3. Alternative 2 leaves fewer snags per acre in units and treats more acres than Alternative 4. This alternative would meet the purpose and need to reduce severity in future wildland fires. Severity to soils and vegetation from future wildland fire would be overall moderate to high for this alternative.

It can be assumed that these snags will eventually fall and become part of the horizontal fuel loading. The additional load is not significant but with expected fall down of the less than 9-inch dbh material over the next 10 years the potential for soil scorch where these logs may occur will be increased. The proximity of these logs to the more flammable small fuels would make them more susceptible to consumption.

Grapple machines minimize ground disturbance and compaction. Piles are burned in late fall after sufficient moisture to minimize fire spread. Whole Tree Yarding, Yard Limbs with logs, Yarding Trees with tops attached and grapple piling are proposed in this alternative as options for fuel treatment. About 4,062 acres will be left with no fuels treatment and would exceed fire suppression mechanical flame length threshold during the next wildland fire event.

Alternative 3

Salvage logging would remove dead tree volume on 1,298 acres, leaving moderate to high amounts of dead trees (up to 9 inches DBH) and leaving 0 snags/acre in units, but leaving 1 to 2 trees per acre to meet down wood requirements, and leaving all the snags in the surrounding areas. This alternative has the same fuels treatment recommendation as Alternative 2, with the exception of Yarding Trees with tops attached.

Fuel loading for large diameter fuels in salvage units in 25 years in Alternative 3 would be about 5 tons per acre (Table FF-10), and about 10 tons per acre for small diameter fuels. This alternative would be within the desired future condition for large diameter fuels within salvage units, but not for small diameter fuels. Alternative 3 would have the lowest fuel loading for larger than 9-inch diameter fuels within treatment units when compared to Alternatives 2, 4, and 5.

The overall fuel loading in 25 years, using weighted averages across the project area would be about 24 tons per acre for large diameter fuels and 10 tons per acre for small diameter fuels, which is within the range for desire condition for large fuels but not for small fuels. This alternative would meet the purpose and need to reduce severity in future wildland fires. Severity to soils and vegetation from future wildland fire would be overall moderate to high for this alternative. About 4,451 acres would not be treated and would exceed fire suppression mechanical flame length threshold during the next wildland fire event. The effects for these acres would be the same as Alternative 1.

This alternative does the best job of achieving objectives for reducing total fuel load within proposed harvest or treatment areas. It results in the greatest reduction of large diameter fuels, which have the highest potential to cause soil damage if burned in a future fire event. As in Alternative 2, the smaller diameter fuels existing in the form of standing dead trees have the potential the cause the desired future condition of these size classes of fuels to be exceeded.

Alternative 4

Salvage logging would remove dead large tree volume on 956 acres, leaving moderate to high amounts of dead trees (up to 9 inches DBH), and a higher level of large dead trees (greater than 9 inches DBH) than Alternatives 2 and 3 by leaving 13 snags/acre in units. This alternative has the same fuels treatment recommendation as Alternatives 2 and 3, but on fewer acres than both Alternatives 2 and 3.

Fuel loading within salvage units in 25 years in Alternative 4 would be about 17 tons per acre for large fuels and about 10 tons per acre for small fuels (Table FF-10). The large diameter fuel loading would be within the desired future condition, but the small diameter fuel loading would exceed the desired future condition.

Overall, across the entire project area, the weighted average fuel loading in 25 years for large diameter fuels would be about 28 tons per acre and about 10 tons per acre for small fuels, both of which are higher than the desired condition for those diameter classes. This alternative would move the overall fuel loading for the entire project area closer to the desired condition than Alternative 1 and 5, and would partially meet the purpose and need to reduce severity in future wildland fires. However, severity to soils and vegetation from future wildland fire would be overall high in this alternative. With the large fuels in the upper range of the desired condition in combination with excessive small diameter fuels there is a high risk of future severe fires. About 4,883 acres would be left with no fuels treatment and would exceed fire suppression mechanical flame length threshold during the next wildland fire event.

Alternative 5

Fuel loading within treatment areas in 25 years in Alternative 5 would be about 36 tons per acre in the large diameter fuels and about 6 tons per acre in the small diameter fuels. (Table FF-10). This would exceed the desired future condition for large diameter fuels, but would meet it for the small diameter fuels. Alternative 5 would have the lowest fuel loading within treatment areas in small diameter fuels when compared to Alternatives 2, 3, and 4.

Overall, across the entire project area, the weighted average fuel loading for large diameter fuels in 25 years would be about 31 tons per acre and about 7 tons per acre for small diameter fuels. This would exceed the desired future condition for large diameter fuels but would meet it for small diameter fuels. Alternative 5 would have the lowest weighted average fuel loading across the entire planning area for small diameter fuels when compared with all the other alternatives, but would be the same as the No Action alternative for large diameter fuels. Therefore, the severity of future fire would be nearly the same as that for the No

Action alternative. Although small fuels would be reduced compared to No Action, the large down fuels would increase over time resulting in the potential for extreme effects to soils.

Grapple machines used to reduce activity created slash would not cause soil excessive disturbance and compaction. Hand piling would primarily be used on slopes greater than 35% with moderate to high fuel loads. Piles would be burned in late fall after sufficient moisture to minimize fire spread.

This Alternative does not meet the purpose and need to reduce fuels that contribute to fire severity. However, it does the best job of reducing the smaller diameter fuels and is the only alternative that results in meeting the desired future condition for those size classes. If these fuels are allowed to accumulate, the total fuels complex would be the most susceptible of all of the action alternatives to a fire start that would result in the most severe effects, because of the quantity of large fuels that would be retained on site.

Summary

Alternatives 2, 3, 4, and 5 achieve the desired condition and meet the purpose and need to various degrees. The attainment of fuels objectives needs to be balanced with the threat of future fire severity economics and effects to wildlife habitat.

The effects to fuel loading, smoke production, and flame length for all alternatives are described in the following tables. The values for existing fuel loading are an average per acre loading across the fire area, which includes previously treated plantations. These are weighted averages based on the variability in the distribution of fuels.

Table FF-10: Comparison of Alternatives: Fuel Loading and Smoke Emissions

Fuel Loading (tons per acre @ 25 years)					Smoke Management (future fire – 25 years)		
Altern-ative	Expected Fuel Loading Outside Proposed Treatment Areas *** (weighted avg) CWD/Fine Fuels****	Average Expected Fuel Loading Inside Proposed Treatment Areas (weighted avg) CWD/Fine Fuels***	Expected Fuel Loading Averaged over Entire Project Area*** (weighted avg) CWD/Fine Fuels****	Desired Future Condition CWD/Fine Fuels	Smoke Tons per Acre (PM2.5)	Acres	Smoke PPM** (PM2.5)
Alt 1	31/10	N/A	31/10	5-25/5-7	.1-.3	3,652	1,596
Alt 2	28/10	6/10	22/10	5-25/5-7	.1-.2	1,777	535
Alt 3	29/10	5/10	24/10	5-25/5-7	.1-.2	1,298	390
Alt 4	30/10	17/10	28/10	5-25/5-7	.1-.2	956	291
Alt 5	22/8	36/6	31/7	5-25/5-7	.1-.2	3,652	1,352

*PM2.5 = in the 2.5 micron size
** PPM = parts per million
*** Includes existing plantations in the weighted average
**** CWD = course woody debris larger than 9” diameter / Fine Fuels = less than 9” diameter

Table FF-11: Expected Fuel Model/Flame Lengths - 10 years

General Stand Aspect/Density	Alt. 1 FM--FL	Alt. 2 FM--FL	Alt. 3 FM--FL	Alt. 4 FM--FL	Alt. 5 FM--FL
NW-E/light	10--59.4	10/8--52.8	10/8--52.8	10/8--55.0	10/8--52.8
NW-E/med	10/12--15.0	10/2--29.0	10/2--29.0	10/2--30.7	10—60.3
NW-E/heavy	12/10--13.8	10/8—18.3	8/10--23.2	10/2--18.4	10/8—18.3
SE-W/light	5/2--20.2	2/8--14.8	2/8--14.8	2/8--15.2	2/8--14.8
SE-W/med	8/10--2.8	8--29.7	8--29.7	8/10--30.8	8--29.7
SE-W/heavy	10/12--6.3	10--60.3	10--60.3	10--60.3	10--60.3
LP med/heavy	10/5--13.2	5/10--24.9	5/10--24.9	10/5--25.9	5/10--24.9
RHCA	10/8--38.0	10/8--38.0	10/8--38.0	10/8--38.0	10/8--38.0

Cumulative Effects

Effects Common to All Alternatives

Many of the plantations in the fire area will have to be replanted because the young trees could not survive the flame length from a grass/brush surface fuel let alone the extra fuel loading from precommercial thinning or from the future collapse of trees from fire mortality. The area has been affected by harvest over the past two decades. Harvest units have seen an aggressive fuels treatment program occur in activities that occurred five or more years ago.

The Highway 26 Fuels Reduction Project, planned for implementation in 2007, would reduce fuel loading in an area that is about 2-3 miles northwest of the Easy Project Area, thus reducing the probability of a fire start spreading from Highway 26 into the Easy Project Area.

When allotments are reactivated in the future, the grass and shrub layer will be greatly reduced. These fine fuels, along with dead branches and twigs, would affect fire flame lengths. The resumption of grazing under all alternatives would affect the fine fuel component of the fuel profile. Where fine fuels are reduced substantially, decreased flame lengths and decreased rates of spread could be observed. Lower flame lengths and rates of spread increase suppression capabilities.

Other projects planned for the Easy Fire project area (to be covered under categorical exclusions) include planting hardwoods in riparian areas. Planting projects will add to the fuel profile and are accounted for in the FVS simulation runs. They have a negative effect on stand survivability during the next wildland fire event, and in most of the runs all regeneration is lost and the stand is re-initiated.

A critical consideration for long-term cumulative effects is the need for future fuels reduction treatments to reduce surface fuels that will accumulate as small diameter trees fall. After harvesting is completed under Alternatives 2, 3,and 4, fuels would be monitored to determine the need for future fuel treatment activities. With these future actions, fuels would be maintained at desired levels. This would also allow for the management of the area using prescribed fire as the primary tool to develop resilient stands in warm dry biophysical environments.

Harvest and subsequent fuels treatments will modify the existing fuels complex to reduce activity created slash which, if left untreated would increase hazard fuels and fire risk from it's current condition, and reduce the long term potential for severe impacts to soils by limiting the loading, through dead fall, of large woody debris.

Public and Fire Fighter Health and Safety

Direct and Indirect Effects -Common to All Alternatives

The primary concern for public and firefighter safety is how many snags will be left on site. Trees that have been killed by fire are left in varying conditions of soundness. Some are partially hollowed out, leaving the tree weakened. Others have had the roots partially exposed. These trees are extremely hazardous because one can never tell exactly when they will fall down. Sometimes, a slight wind can bring a 30 inch DBH, 100 foot tall tree to the ground without any warning. Over time, the wood starts to decay, further weakening the tree. Alternatives 1, 4, and 5 leave, by far, the most snags. Alternatives 2 and 3 leave the least.

The other concern is the amount of large fuels once the snags are on the ground. The higher the fuel load, the more resistance to control, the increased hazard to firefighters, and the increased risk of a fire adversely affecting public safety. See Table FF-10 for a comparison of fuel loads by alternative.

Cumulative Effects

None of the past, present, or future actions listed in the beginning of Chapter 3 are expected to have an effect on public and firefighter health and safety.

Air Quality

Direct and Indirect Effects

Along with implementing the MOU, there are seven items the Forest Service addresses in an environmental document when proposing alternatives that may affect air quality.
These seven items are:

1. Describe alternative fuel treatments considered and reasons why they were not selected over using fire.

A. No Treatment
Not selected due to the need to remove debris at landings and reduce future fuel loads over entire area.

B. Mechanical Treatment
Tops and limbs are utilized at the landing for chip and are hauled off. This may be used if the chip market becomes favorable.
C. Lop and Scatter

This method is not recommended because of the high fuel loads.
D. Whole Tree Yarding, Yard Tops Attached, Yard Limbs with logs
These methods were chosen to remove much of the fuels to a landing for possible utilization.

2. Quantity of fuels to be burned (acres, type).

Alternative 1: No fuels are to be burned under this alternative. Under a wildfire scenario about 20 years from now all fuels would be affected.

Alternative 2: Would burn approximately 434 acres of slash treated at landing piles. Would burn approximately 889 acres of slash of hand and machine piles throughout each unit.

Alternative 3: Would burn approximately 322 acres of slash treated at landings. Would burn approximately 832 acres of slash piled with hand and machine piles throughout each treated acre.

Alternative 4: Would burn approximately 213 acres of slash treated at landing. Would burn approximately 723 acres of slash piled with hand and machine piles throughout each treated acre.

Alternative 5: Hand Felling, grapple piling, and pile burning on areas with gentle slopes suitable for ground-based machinery 1,750 acres. Hand felling, hand piling, and pile burning would occur on steeper slopes 1,902 acres.

3. Describe the type of burns (piles)

Alternatives 2 and 3: machine pile at landings. In addition, Alternatives 2 & 3 machine and hand pile scattered material throughout the project area.
Alternative 4: Machine and hand piles would be scattered throughout the project area.
Alternative 5: Machine and hand piles would be scattered throughout the project area.

4. Describe measures taken to reduce emissions (fuel moisture content, site preparation, removal of debris-YUM/PUM whole tree yarding etc).

Wood fiber utilization should be implemented before piles are burned. Piles will be burned when slash on pile is at low fuel moisture (either by covering piles or timing burns before fall precipitation saturates the piles). Pile burning will be scattered over time, which will reduce daily emissions.

Alternatives 1: No actions would be taken to reduce or limit emissions as a result of wildland fire.

Alternatives 2, 3 and 4 would reduce severity of next wildland fires, reducing future emissions.

Alternative 5: Hand piling and pile burning would remove 0-7” material, which would create smoke emissions under prescribed conditions. This would produce less smoke than if the fire burned during a wildland fire.

5. Quantify the amount of emissions to be released.

Alternative 1: No emissions short term. Potential for excessive emissions long term under the next wildland fire scenario has a Particulate Matter (PM) 2.5 estimated at 1,227 tons.

Alternative 2: Approximately 738 tons of PM 2.5 emissions from fuels treatment.
Alternative 3: Approximately 598 tons of PM 2.5 emissions from fuels treatment.
Alternative 4: Approximately 652 tons of PM 2.5 emissions from fuels treatment.
Alternative 5: Approximately 982 tons of PM 2.5 emissions from fuels treatment.

6. Describe the regulatory/permits requirements for burning; i.e., the applicable parts of the smoke management plan.

Alternative 1: None
Alternatives 2 through 5: Action Alternatives need to meet Oregon State Smoke Management Plan as amended by the MOU with the Forest Service.

7. Provide a quantitative description of air quality impacts of burning activities, focusing on new or increased impacts on downwind communities, visibility in

Class I Wildernesses, etc.

Alternatives 1: No impact from management ignited fire.
Alternatives 2, 3, 4 and 5: There are five areas of concern for health standards.
The amount of smoke produced per day is so minute that it would be dispersed before reaching any populated areas or the nearest Class I area. Measures will be taken to reduce hazards from smoke impacts on roadways. The nearest Class I Area for air quality that can be affected by burning in the watershed is the Strawberry Mountain Wilderness area. Air quality standards are to be met from July 1 through September 15 in Class I Areas.
Emissions limits have been established for the Blue Mountains that take into account wildfire emissions. When emissions limits are met, no more burning is allowed for the year.

Cumulative Effects

None of the past, present, or future actions listed in the beginning of Chapter 3 are expected to have effects on air quality.

Consistency with Direction and Regulations/ Clean Air

Malheur National Forest Plan and Fire Management Plan

Alternative 1 is not responsive to the objectives and standards in the Forest Plan, as it will not allow the utilization of prescribed fire in the future because fuel loadings will be high and outside of historical range. These fuel loadings would create conditions allowing for another high severity fire. Potential for excessive emissions impacting air quality from high intensity fire is higher.

Alternative 2 is responsive to objectives and standards in the Forest Plan. Proposed fuel reduction activities will reduce the largest amount of large woody fuels and therefore reduce the level of severity during the next wildland fire. These activities also result in a more cost-efficient protection program, as fires would show more moderate resistance to control.

Because only the greater than seven inch dbh (on tractor ground) and only the greater than 12 inch dbh are being removed on helicopter ground, fuel levels will still not be within the historical range until after the next wildland fire. After that event, much of the landscape will have more compatibility with the role of fire. This alternative would meet standards relating to air quality.

Alternative 3 is responsive to Forest Plan direction as described above for Alternative 2 on the reduced acres proposed for treatment.

Alternative 4 is only partially responsive to objectives and standards in the Forest Plan. Burning activities proposed with this alternative will meet standards relating to air quality.

Alternative 5 is only partially responsive to the Forest Plan. While it reduce hazardous fuels and resistance to control, it does not encourage the utilization of wood residue however, it does provide for long-term site productivity and wildlife habitat needs.

Wildland and Prescribed Fire Management Policy & the Implementation Procedures and Reference Guide

Alternative 1 and Alternative 4 do not address principles developed to guide the Federal wildland fire management program that are relevant to this project such as providing for firefighter and public safety, protecting land management objectives, or contributing to ecosystem sustainability.

Alternative 2 addresses the principles listed above by reducing fuel loads.

Alternative 3 addresses the principles listed above but not as well as Alternative 2. The higher snag levels retained under this alternative pose a potential threat to firefighter and public safety. The areas not treated under this alternative will have increased resistance to fire control although the areas are not continuous.

Alternative 5 addresses the principles of the implementation and procedures guide but, present trade offs between achieve long-term fuel reductions objectives and other resource values. In addition as described in alternative 3 risks to fire fighter and public safety will be a factor stand succession.

Laws and Regulations

State and federal air quality regulations would be followed. All burning would be done in accordance with the Oregon State Smoke Management Plan in order to ensure that clean air requirements are met.

Irreversible and Irretrievable Commitments

There are no irreversible and irretrievable commitments of resources that may result from the alternatives with respect to fire and fuels.