CHAPTER 3. EXISTING CONDITION AND ENVIRONMENTAL CONSEQUENCES

This chapter summarizes the physical, biological, social, and economic environments of the project area and the effects of implementing each alternative on that environment. It also presents the scientific and analytical basis for the comparison of alternatives presented in the alternatives chapter.

Specialist Reports

This EIS hereby incorporates by reference the Forest Vegetation, Fire and Fuels, Roads, Wildlife, Soil, Water, Fisheries, Scenery, Recreation, Range, Botany, Heritage, and Socio-Economics Specialist Reports in the Project Record (40 CFR 1502.21). These Specialist Reports are located in each specialist's section of the Project Record and contain the detailed data, methodologies, analyses, conclusions, maps, references, and technical documentation that the resource specialists relied upon to reach the conclusions in this EIS.

Forest Vegetation

Introduction

The forest vegetation burned by the Flagtail Fire forms a diverse pattern created by soil types, aspect, elevation, moisture and temperature regimes, natural disturbances, and past management activities. The fire burned across approximately 7,120 acres of the Malheur National Forest, of which about 6,180 acres was forested. About 3,150 acres of the fire resulted in total mortality, about 2,400 acres of the fire resulted in 60-90% mortality, and about 460 acres of the fire resulted in 30-60% mortality. In the areas where the fire did not kill all of the trees, the surviving trees are in a mosaic or underburn pattern with patches of differing percentages of tree survival. Only about 170 acres that were forested did not burn, mostly in riparian areas or previously harvested and reforested areas. Map 6 shows the patterns of tree mortality.

Regulatory Framework

The National Forest Management Act (NFMA) requires that harvested lands be reforested within 5 years. The Forest Service has established a policy that this requirement is applied to salvage as well as to “green” timber sales. In addition, where no salvage is done, deforested lands should be reforested as quickly as practicable (Regional Forester letter 11/19/2002).

The Malheur NF Land and Resource Management Plan (Forest Plan) provides Forest-wide management goals and objectives. The applicable standards for the forest vegetation portion of this analysis are:

- Maintain stand vigor through the uses of integrated pest management such as stocking level control and species composition in order to minimize losses due to insects and diseases.
- While favoring high quality natural regeneration, consider the effectiveness of various regeneration methods and prescribe the best site-specific method. Satisfactory stocking of any regenerated stand will be expected to occur within 5 years after harvest.
- Use seed collected from phenotypically superior trees from the same seed zone and elevation band for growing planting stock.
- Manage to maintain or re-establish ponderosa pine on sites where ponderosa pine is subclimax.

The Regional Forester’s Eastside Forest Plans Amendment #2 gives additional direction for timber sales. Since all of the alternatives do not propose harvesting live trees (except for incidental amounts) this project is not subject to the ecosystem standard (HRV) but still must apply the riparian and wildlife standards. The applicable wildlife standards for the forest vegetation portion of this analysis are:

- If late and old structure (LOS) is below HRV, there should be no net loss of LOS. The ICBEMP terminology used in this document is old forest single-stratum or old forest multi-strata rather than LOS.

- Manipulate vegetation that is not LOS so that it moves towards LOS. Where open, parklike stands occurred historically, encourage the development of large diameter trees with an open canopy structure.

Analysis Methods

Data about the Flagtail area was gathered with a variety of methods. Beginning while the fire was still uncontrolled, district resource specialists who were on the ground advising the suppression forces on appropriate firefighting tactics were also gathering information on the fire effects. After the fire was controlled the silviculturist examined most of the timber stands and mapped the fire severity to the forest vegetation using aerial photographs flown after the fire. The stands were then stratified and formal stand exams were taken on a portion of each stratum.

All acres in this section are approximate and are generally rounded off to the nearest 10 acres. Structural stage percentages are shown to the nearest percent, since some are at very low levels, but they are not intended to indicate a degree of precision closer than 5%.

The project area is defined as the National Forest lands within the perimeter of the Flagtail Fire. In some cases, the analysis area includes both surrounding private and Federal forestland up to 5 miles outside the fire boundary to adequately discuss cumulative effects (such as insect spread to stands outside the fire area).

Biophysical Environments

Specific plant species tend to be found together in a characteristic set of ecological conditions. The unit of classification based on the probable, or projected, climax plant community type is termed the "Plant Association", and may be used to describe and classify sets of ecological conditions. The Plant Associations found within the Flagtail planning area are documented in *Plant Associations of the Blue and Ochoco Mountains* (Johnson and Clausnitzer, 1992). For purposes of classification and analysis, plant associations may be grouped into areas with like temperature/moisture and fire disturbance regimes called Plant Association Groups (PAGs).

Stand Development

In order to compare the alternatives, the growth of the naturally reforested stands and planted stands is tracked into the future to show the time to produce old forest structures. The goal of this analysis is to compare the alternatives in a consistent manner; the growth projections do not necessarily predict the actual growth expected to occur, as they do not take into account all factors that could affect tree growth. To be consistent, several assumptions have been made to simplify the analysis. Stand density management by periodic thinning and underburning is likely to occur into the future and is assumed to take place. No large-scale disturbances such as stand replacement fire or insect infestations are included.

Stand establishment has been estimated to take 5 years if planted, natural reforestation would take 10 to 20 years if within the seed fall zone (within 800' of live trees) or 20-50 years if outside the seed fall zone. Growth was then projected to be 1.5 inches DBH per decade. To reduce the success of bark beetle attacks, 1.0 inch DBH per decade is considered the minimum growth rate and a growth rate above 2.0 inches DBH per decade can indicate an understocked stand. The midpoint of the range (1.5 inches DBH per decade) was chosen, this is a conservative number based on the general objective to grow stands between 1.0 inch and 2.0 inches DBH per decade.

When used in this section, “short-term” means in the next 20 years and “long-term” means over 20 years. Benchmarks were selected at 50, 100, and 150 years to display the structural stage differences between the alternatives at various times in the future. These roughly are the times when stages grow from one to another.

Historical Conditions

Many of the forests in the West have been altered from their historical condition since Euro-American settlement. This has occurred as a result of fire suppression, logging, cattle grazing, and other activities. There is an increasing realization that the forests of the Blue Mountains evolved with the fire, insects, and other periodic disturbances that occur here and that the historical condition was often more resilient and sustainable than the present condition.

In particular, the Hot Dry and Warm Dry biophysical environments were typically composed of large ponderosa pine and western larch at fairly wide spacing and there was little conifer undergrowth. Periodic low intensity ground fires kept the fuel loads at low levels and killed conifer regeneration and kept the trees thinned. The low levels of ground fuels and the lack of fuel ladders from the ground to the tree crowns reduced the amount of crown fires and the widely spaced crowns did not allow crown fires to spread for long distances. With the wide spacing the trees grew at sufficient growth rates to allow them to better resist bark beetles.

The vegetation has evolved with the periodic disturbances of the region and is adapted to surviving them. The desired condition is to move the forest towards the historical condition for each biophysical environment. This will reduce the risk of uncharacteristically severe fire and restore ecological structure, function, and processes to the forest.

Cumulative Effects

The list of actions in Appendix J 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 Flagtail Fire Recovery Project, had a measurable effect. Those that did were discussed further in the Cumulative Effect sections that follow each topic.

General Existing Condition

Biophysical Environments

The Plant Association Groups (PAG) that occur in the Flagtail Fire (Malheur NF lands only): See Map 5 for forest type distribution.

Dry Forest		
Hot Dry PAG	240 acres	3%
Warm Dry PAG	5,660 acres	80%
Cold Forest		
Cool Dry PAG	280 acres	4%
Total Forested Area	**6,180 acres**	**87%**
Woodland (Juniper)		
Hot Dry Woodland PAG	450 acres	6%
Hot Moist Woodland PAG	140 acres	2%
Total Woodlands	**590 acres**	**8%**
Non Forest PAGs	**350 acres**	**5%**
Total Area in Flagtail Project Area	**7,120 acres**	

The following sections describe the biophysical environments found in the project area, and the past (pre-fire) and potential vegetation of those environments. The existing vegetation has been greatly modified by the Flagtail Fire that occurred in July 2002. Many stands were killed or damaged, bringing them far from the desired condition described in Chapter 1 for each biophysical environment.

Table FV-1 displays the amount of each Plant Association Group that burned and the severity to the trees. The predictions of mortality were determined following the recommendations in "**Factors Affecting Survival of Fire Injured Trees: A Rating System for Determining Relative Probability of Survival of Conifers in the Blue Mountain and Wallowa Mountains**", Scott, et al., 2002 (Forest Vegetation Project Record) which identifies both trees that are already dead, and trees expected to die.

Table FV-1: Burn Severity Acres by Plant Association Group

Plant Association Group	No Burn	Acres Burned	Low Severity (30-60% mortality)	Moderate Severity (60-90% mortality)	High Severity (90-100% mortality)
Hot Dry	10	230	20	90	120
Warm Dry	140	5520	440	2210	2870
Cool Dry	20	260	-	100	160
TOTAL (Forested Areas)	**170**	**6010**	**460**	**2400**	**3150**

Note: The Woodlands PAGs burned in a mosaic pattern with variable mortality.

Hot-Dry Plant Association Group

The lower elevations (3,000-4,500 feet) on south and west facing slopes generally contain plant associations of the hot-dry plant association group. These associations cover approximately 240 acres (3%) of the project area. The driest sites were occupied by scattered western juniper and ponderosa pine. Slightly more moist areas supported nearly pure stands of ponderosa pine. These associations contained primarily ponderosa pine, as well as occasional Douglas-fir, western juniper, and groups of quaking aspen entering the stands from adjacent wetter areas.

The Hot Dry PAG is a Fire Regime I (frequent, low intensity, non-stand replacement fire). Trees typically grow in small even aged clumps ¼ to 1 acre in size in stands generally dominated by larger ponderosa pine and few understory trees and shrubs. Tree density is somewhat low, resulting in open stands and good growing room that maintains tree vigor. Mortality from fire is light and patchy; rarely is the whole stand killed. Natural reforestation of small patches is often good, but the large seed does not disperse very widely with the wind. Ponderosa pine seed crops are infrequent, occurring 3 to 8 years apart.

Pre-Fire Stand Conditions

Many of these stands were harvested and the advance natural regeneration is now 60-80 years ago. Since then, the majority of them were precommercial thinned (removing excess trees less than 7 inches in diameter). Though some stands were commercially thinned in the last 20 years, many of these stands were growing at twice the density than they would have under the natural fire regime. This contributed to the intensity of the Flagtail Fire and to increased mortality. Bark beetles and dwarf mistletoe were at higher levels than would be expected under historical conditions, weakening or killing trees and adding to the fuel loads.

Post-Fire Stand Conditions

Approximately 230 acres burned with differing intensity in the Hot Dry plant association group. About half of the stands burned with high severity (90-100% mortality), and another third burned with (60-90% mortality). Nearly all of the trees were killed in the high fire intensity areas. In the moderate and low intensity fire areas there was variable mortality and many of the surviving trees were damaged.

Warm-Dry Plant Association Group

The mid-elevations (4,500-5,500 feet) on south slopes and north and east facing slopes at lower elevations generally contain plant associations grouped in the warm-dry plant association group. These areas contain plant associations with seral ponderosa pine and climax Douglas-fir or grand fir and cover approximately 5660 acres (80%) of the project area. Western larch was a component in many of these stands, as well as incidental amounts of lodgepole pine.

The Warm Dry PAG is the most common biophysical environment group in the Flagtail Fire area. These areas were the most changed from historical conditions, especially the species composition. The increased stocking and changed species composition contributed to the high severity fire, compared with what would be expected in the historical stand conditions.

Generally, the Warm Dry PAG is a Fire Regime I and is similar to that described for the hot-dry biophysical environment, with a slightly longer return interval and more patches of mortality scattered through the stands.

Pre-Fire Stand Conditions

Many stands were partial harvested starting about 60 years ago. More recently, partial removal and limited regeneration harvest occurred in some stands. In general, fire exclusion and harvest of mature seral species trees led to an increase in Douglas-fir and grand fir species, an increase in fuel levels, and greater stand densities. These conditions led to higher fire intensity and greater tree mortality. Bark beetles and dwarf mistletoe were at higher levels than would be expected under historical conditions, weakening or killing trees and adding to the fuel loads.

Post-Fire Stand Conditions

As with the hot dry stands, about half of the warm dry stands burned with high severity (90-100% mortality), and another third burned with (60-90% mortality). Together approximately 5080 acres burned with high to moderate intensity in the Warm Dry plant association group. Many of the Douglas-fir and grand fir found in these stands were killed by fire. A few of the larger, thicker-barked Douglas-fir and grand fir may survive; many of the large ponderosa pine are not expected to survive due to the deep bark scale piles at the base of the trees, especially those with poor crown ratios. The deep litter piles around the bases of the ponderosa pine burned or smoldered for long periods of time killing the cambium.

Cool-Dry Plant Association Group

These areas contain lodgepole pine plant associations and cover about 280 acres (4%) of the project area. They occur throughout the upper elevations and in the colder basins and areas of flat topography that form frost pockets. These associations mostly contain dense, even aged lodgepole pine stands, with minor components of ponderosa pine, western larch, grand fir, and Engelmann spruce.

The lodgepole pine associations are generally a Fire Regime III (moderate frequency, mosaic pattern). Often the patches that burn are high severity, stand replacement fire. Trees grow close together and form dense stands subject to stagnation and bark beetle attacks that often result in high mortality. Stands burn with great vigor due to the heavy fuel loads, usually resulting in complete mortality.

Pre-Fire Stand Conditions

In the last 20 years, regeneration harvests have taken place within some of these areas. Tree density was high in younger stands, but older stands were becoming more open due to high mortality rates from disease and insect infestations (mountain pine beetle in lodgepole and spruce budworm and fir engraver in grand fir), which created an abundance of standing and downed fuel. Most stands burned with high to moderate severity, which was within the historical fire regime.

Post-Fire Stand Conditions

In the Cool Dry plant association group, approximately 260 acres burned with moderate to high intensity. In a few areas creeping ground fire burned in a mosaic, leaving some islands untouched. Lodgepole are not expected to live because of bole scorch due to their very thin bark. Smaller diameter grand fir and Douglas-fir are also not expected to survive. Though most trees in this area are not fire tolerant species, some may survive because they sustained very little scorch or were missed by the fire.

Woodland (Juniper) Plant Association Groups

Historically, these dry sites were occupied by widely scattered western juniper and ponderosa pine. Fire exclusion in the last century has allowed juniper and sagebrush to greatly increase their coverage and for ponderosa pine to encroach into former pine savannahs and to form overstocked stands. These associations cover approximately 590 acres (8%) of the project area.

The Woodland PAGs are a Fire Regime II (moderately frequent, stand replacement fire) that burned in a mosaic pattern due to the sparse and patchy vegetation. The fires killed the sagebrush and juniper, and thinned out the ponderosa pine trees, effectively maintaining open grasslands and pine savannahs.

Pre-Fire Stand Conditions

Western juniper stocking was at a greater density than it would have been under the natural fire regime, reducing the amount of open grasslands and forage. The scattered open grown ponderosa pine was being overcrowded by juniper and young ponderosa pine and was declining in vigor. Formerly open grasslands had become dominated by sagebrush.

Post-Fire Stand Conditions

The sagebrush dominated portions of these PAGs burned in a mosaic pattern depending on vegetation patterns and fire behavior. The stands that contained stands of juniper or ponderosa pine generally burned with high mortality due to the lack of fire tolerance by juniper and the overstocked conditions in the encroaching pine trees. There were a few juniper or ponderosa pine patches that did not burn due to their isolated locations.

Living Trees

Existing Condition

Areas of living trees are found around the fire perimeter and in the southwest portion of the fire where the fire was not wind driven and slowed and burned with less intensity. Some are also scattered throughout the fire, usually in areas of low fuels, flat topography, lower stand density, and in stands of fire tolerant species.

Within the fire perimeter, approximately 3150 acres (51%) of forested areas burned with high severity to the vegetation, killing virtually all trees in those stands. Standing snags and downed logs were largely consumed.

Approximately 2400 acres (39%) of the forested area burned with moderate severity to the vegetation, some western larch and ponderosa pine are expected to survive, while the balance of trees in these stands will die of basal, root, or crown scorch. Many areas burned in a mosaic pattern of different severities. Most of the snags and downed logs were consumed.

Approximately 460 acres (7%) of forested acres burned with low severity to the vegetation. These stands are generally second growth ponderosa pine stands with the appearance of an underburn. However, mortality is generally between 30 and 60% of the stand due to basal scorching caused by a long-lasting smoldering ground fire.

About 170 acres (3%) of the forested area did not burn, mostly in riparian areas.

Table FV-2: Subwatershed Acres Burned and Tree Mortality

Subwatershed	Total SWS Acres	SWS Acres Within Flagtail Fire	Forested Acres Burned	Low Severity (30-60% mortality)	Moderate Severity (60-90% mortality)	High Severity (90-100% mortality)
Jack Ck. 60507	10,230	3,090 (30%)	2,470	430	1,100	940
Snow Ck. 60509	6,280	3,350 (53%)	3,010	-	960	2,050
Hog Ck 60511	5,940	260 (4%)	290	10	180	100
Keller Ck. 60515	7,830	420 (5%)	240	20	160	60
TOTAL	**30,270**	**7,120 (24%)**	**6,010**	**460**	**2,400**	**3,150**

Insects and Disease In Live Trees

Some of the remaining live trees have been fire damaged and are at greater risk to die within the next two or three years from drought, disease, and insects. Some localized mortality is likely, particularly bark beetles in fire damaged Douglas-fir 15 inches DBH or larger, and low vigor ponderosa pine trees. Live trees are found in stands that burned with low or moderate severity, about 2,860 acres, and in areas that did not burn, which total 170 acres.

Ponderosa pine

Insects can be expected to attack trees weakened by the fire or growing in a weakened condition prior to the fire. Ips beetles colonize freshly killed trees and, if the populations build up to epidemic levels, can spill over into remaining live trees. Western and mountain pine beetles attack weakened trees and can also spread into nearby stands. Damaged trees often undergo drought stress that can cause a reduction of pitch pressure, which is their defense against bark beetles. Annual volume of mortality to bark beetles in the three years following a fire rises 300-1,400 percent from pre-fire levels.

Don Scott, Lia Spiegel, and Craig Schmitt, Blue Mtn. Zone Entomologists and Pathologist for the Forest Service, visited the Flagtail Fire and concluded that ponderosa pine with less than 20% remaining live crown ratio are highly susceptible to later mortality. Trees that had poor vigor prior to the fire are at great risk, with 30% or less live crown ratio. Bole scorch level is a significant factor; especially older trees with mounds of bark scales around the base that burn for a long time and partially girdle the trees.

Turpentine beetles were found in the base of ponderosa pine trees within a month of the Flagtail Fire, but are not expected to kill remaining live trees. Dwarf mistletoe in ponderosa pine will continue to weaken trees that survived the fire. Mistletoe increased the flammability of individual trees and increasing tree mortality and reducing the overall incidence of mistletoe in the area.

Douglas-fir

Douglas-fir bark beetles are expected to spread widely and attack fire-injured trees, eventually killing most trees with intermediate or heavy fire damage. Studies have shown that Douglas-fir bark beetle infest 80-90 percent of Douglas-fir with greater than 20 percent crown scorch. Don Scott, Blue Mtn. Zone Entomologist for the Forest Service, predicts beetle activity in Douglas-fir trees greater than 15 inches DBH that sustained moderate to severe fire damage. Dwarf mistletoe in Douglas-fir will continue to weaken trees that survived the fire. Mistletoe can be a serious disease of Douglas-fir, forming large brooms which reduce growth and eventually weaken the tree. Mistletoe increased the flammability of individual trees and increasing the amount of mortality to the infected trees, which will greatly reduce the overall incidence of mistletoe in Douglas-fir.

Western larch

There are few insect or disease problems in western larch. Mistletoe is the one exception and can cause decline and eventual mortality due to stripping the branches off of the bole of the tree. Mistletoe increases the mortality of the infected trees, which has somewhat reduced the overall incidence of mistletoe in western larch.

Grand fir

Grand fir is host to many insect and disease pests. Spruce budworm attacks will likely be reduced due to the lack of host trees, a more open and thus warmer environment, and the lack of a multi-story forest structure. Fir engraver is not as aggressive as the Douglas-fir bark beetle, but can cause mortality to true fir trees with heavy damage. Grand fir infected with heart rots or root rots are more likely to succumb if weakened by fire damage. Fire scars on trees not killed by the fire will be entry points for disease and insects, which can cause future damage and mortality.

Lodgepole pine

Most of these stands burned completely and will have no insect or disease problems, other than root diseases that could infect new tree roots. The main pathogen is bark beetles in stagnated lodgepole pine stands.

Fire Hazard to Live Trees

Live trees are found in stands that burned with low or moderate severity, about 2,860 acres, and in areas that did not burn, which total 170 acres. The fire burned most of the ground fuel and killed many of the “ladder fuel trees” in the stands and currently the fire hazard is low.

Environmental Consequences

Insects and Disease In Live Trees

Direct and Indirect Effects

Effects Common to All Alternatives (incl. No Action)

Live trees are found primarily on approximately 2860 acres in stands that burned with low or moderate severity, in the 170 acres that did not burn, and in the forested areas surrounding the Flagtail Fire.

Dead trees can provide habitat for insect buildups that can then cause additional mortality in nearby live trees. There can be a big brood of insects the first season after a fire that then falls off as the source of freshly killed trees diminishes. The second and succeeding years generally have lesser insect outbreaks. Immediate salvaging (before the next summer) of infested trees prior to the insects dispersal to nearby live trees can reduce the risk of additional mortality.

Due to the length of time to analyze the fire area and prepare this NEPA document, it was not possible to salvage trees in the summer of 2003. However, salvaging trees after the first season may result in a small decrease of insect activity and mortality in surrounding live trees in the succeeding years. Alternative 2, which leaves the least number of dead and dying trees, has a slightly lower risk for additional mortality. Alternative 3 leaves approximately 50% more of the dead and dying trees , 1470 acres not salvaged and more snags [13 snags per acre], compared to Alt. 2 and this would place the remaining live trees at proportionately more risk. Alternative 4 is essentially the same risk as No Action, as insects generally prefer the larger trees that would be left. Alternative 5 leaves approximately 25% more of the dead and dying trees, 605 acres not salvaged and more snags [2.39, 7 or 13 snags per acre], compared to Alt. 2 and this would place the risk to the remaining live trees between Al. 2 and Alt. 3.

Cumulative Effects

Rapid salvage of fire killed trees on private lands and the roadside hazard trees on the National Forest that were removed under a CE prepared for that project will have a slight beneficial effect on reducing insect population buildups and spread into the remaining live trees in and near the Flagtail fire. These trees were mostly removed during the fall of 2002 and winter of 2003 before any movement of insects could happen in the spring and summer of 2003. The total number of trees removed on National Forest lands is less than 1% of the number of fire killed trees, so the total benefit is very slight.

Fire Hazard to Live Trees

Direct and Indirect Effects

Effects of No Action

Under this alternative, no salvage would take place. The lack of dead tree salvage will result in an increased fire hazard to the remaining live trees as the dead trees fall down over the next few years. The high fuel loadings would result in any fire after 10 years from now being a high intensity fire that could kill most of the natural regeneration and many of the remaining live trees.

Effects Common to All Action Alternatives

In all alternatives, trees expected to survive the fire are to be left, except for safety concerns and as necessary to facilitate harvest systems. The alternatives that harvest more snags reduce the future fire hazard more than the alternatives that harvest less. Alternative 2 harvests the greatest number of dead trees and reduces the future fire hazard to the remaining live trees the most. Alternatives 3 and 5 harvest a smaller portion of the area that Alternative 2 harvests, and also leave higher numbers of snags for wildlife so they have a future fire hazard higher than Alternatives 2 but substantially lower than Alternatives 1 and 4. Alternative 4 treats the small fuels (<8 inches) but does not harvest any commercial sized dead trees. The future fire hazard in the flashy small fuels is reduced, but the fire intensity due to the large fuels that will remain is similar to the No Action alternative.

Cumulative Effects

The salvage of fire-killed timber on private lands is mostly complete and has reduced the fuels levels to safe amounts. Other projects to be accomplished under CE documents include riparian fuel treatments that further reduce the fire hazard.

Shade and Microclimate

Existing Condition

Shade at any one time generally covers 30-70 percent of the ground in conifer stands. In the intensely burned areas, shade has been reduced to between 5 and 20 percent. This has increased the amount of solar radiation reaching the ground; the resulting higher temperatures have changed the microclimate for plants. Vegetation that is well adapted to warmer temperatures and full sunlight will benefit compared to vegetation that grows in shade and desiccates rapidly. This will favor ponderosa pine, western larch, and lodgepole pine establishment over grand fir and Douglas-fir. In addition, the amount of ground vegetation and shrubs will increase compared to that which existed under the closed forest conditions prior to the fire.

The shade that crosses the forest floor as the shadows of trees follow the position of the sun through the day cover a much greater portion of the ground than the numbers shown above. This transient shade has been shown to be adequate to reduce drought stress in tree seedlings and to increase survival.

Environmental Consequences

Direct and Indirect Effects

Effects of No Action

Under this alternative, no salvage or reforestation would take place. Existing shade would remain at current levels. It would gradually decrease in the short term as the dead trees fall. The microclimate of the burned landscape will exhibit greater extremes in temperature, wind, and moisture than pre-fire conditions. Standing dead and downed trees will buffer this environment somewhat, as will the re-growth of shrubs and ground vegetation. However, conifer forest capable of providing shade and cover will not return for several decades longer than the Action Alternatives.

Effects Common to All Action Alternatives

Salvaging will decrease shade to approximately 4-10 % in the most intensely burned areas. The amount of shade will vary slightly by alternative, as the amount of material retained for snags will vary by alternative. More rapid reforestation by planting with the action alternatives will result in a quicker return to more shade and cover than the No Action alternative. Artificial shade is not needed for successful reforestation, stocking surveys done in planted fire-killed strands show no significant difference between areas that were salvaged and not salvaged.

Cumulative Effects

The reduction of noncommercial sized fuels in riparian areas will further decrease shade and cover in the short run, but the reforestation of riparian areas will speed the return to forested conditions.

Reforestation of Burned Forestland

Existing Condition

Approximately 6010 acres of forestland burned in the Flagtail Fire. About 460 acres burned with low mortality and are adequately stocked. About 5550 acres burned with moderate or high severity, of which 580 acres is Woodlands (juniper), leaving 4970 acres to be reforested. Approximately 380 acres were planted in Spring 2003 under another NEPA document, leaving 4590 acres to be documented in this EIS. Approximately 300 acres are expected to reforest naturally, the remaining 4290 acres will need to be planted to meet reforestation objectives.

Following are discussions of areas planned for natural recovery and where planting is recommended in the Action alternatives.

Environmental Consequences

Natural Recovery Areas

Direct and Indirect Effects

Effects Common to All Alternatives (Incl. No Action)

Under all alternatives, planting will not take place in forested areas that still have adequate stocking of live trees; in lodgepole pine stands; and in woodland (juniper) areas.

Forested Areas that have Adequate Stocking

Forested areas that burned with low intensity often have substantial numbers of live trees remaining. With their continued survival, the number of live trees is sufficient to meet management objectives on the site without artificial reforestation.

Small patches of trees, less than an acre or two, have been killed. Natural reforestation of these small patches is expected to be successful because there are abundant remaining seed sources, a mineral soil seedbed in many spots, and a brief lapse in vegetative competition. Though ponderosa pine seed is large and does not disperse well with the wind, seed crops are fairly frequent and successful reforestation can be expected in 10 years within 800 feet of seed trees.

Lodgepole Stands

Complete regeneration of lodgepole areas that burned with high intensity is very likely within several years due to availability of seed sources and exposure of a seedbed. Vegetative competition could delay seedling establishment. Lodgepole pine, western larch, and ponderosa pine are the species most likely to regenerate. Lodgepole pine and western larch produce abundant lightweight seed that is easily dispersed and exhibit rapid juvenile growth, thus they are likely to dominate early succession.

Woodland (Juniper) Plant Association Groups

Sparsely forested or non-forested areas will not be reforested as they naturally had a low stocking of conifers. Typical was savannah conditions with widely scattered large ponderosa pine and grasslands that were maintained by frequent low intensity fires. Scattered conifer trees, mostly ponderosa pine, would be expected to be able to become established in micro-sites that the fire has made suitable for seed germination. Establishment and survival are expected to be low, resulting in the desired savannah conditions that were historically typical for this biophysical environment. Anticipated future prescribed burning would limit establishment of juniper or sagebrush on these sites, increasing the extent of grasslands.

Planting Areas

Direct and Indirect Effects

Effects of No Action (Natural Reforestation)

Approximately 4590 acres remain in need of reforestation. There are approximately 1440 acres that are in need of reforestation that contain living trees, and the 800’ seed dispersal band around live trees contains another 1900 acres. The total area expected to naturally reforest within 2 decades totals 3340 acres (about 73% of the area to be reforested).

The area beyond the 800' seed dispersal zone of high mortality totals 1250 acres (about 27% of the area to be reforested) and is expected to naturally reforest within 2 to 5 decades. This would be accomplished by gradual seed dispersal by strong winds and animals, and by seed from second-generation seed crops from trees that are growing up in the original seed dispersal zones. Ground vegetation will be very dense and seedling establishment will be more difficult due to the vegetative competition. These areas may not be fully stocked with 100 trees per acre for up to fifty years.

Lodgepole pine is a prolific seeder after fire, and monitoring of other fires on the Malheur NF has shown that natural reforestation of lodgepole sites is usually successful unless other species are desired.

The need to reforest the project area (NFMA and Regional Forester 11/02 Letter) will not be met through the No Action alternative, as it will take up to 5 decades longer.

Effects Common to all Action Alternatives (Planting)

Approximately 4290 acres is proposed for planting, and 300 acres by natural reforestation, in all of the action alternatives. The units in Alternative 2 that were dropped from salvaging between the Draft and Final EIS are to be reforested by planting; as are the areas not salvaged in Alt. 3, 4, or 5.

Table FV-3 shows the number of acres to be planted in each of the next several years. These numbers are dependent on actual funding and nursery stock availability.

Table FV-3: Planned Reforestation by Year

Year	Riparian Planting Acres	Upland Planting Acres
Documented in the 2003 Riparian/Upland Planting CE		
2003	190*	190*
Documented in this EIS		
2004	0	200*
2005	0	2045
2006	0	2045
Total	**0**	**4290**

*** Planting in 2003 and 2004 is with trees sown in the nursery before the Flagtail Fire. Bare root seedlings normally take 2 years to grow in nursery beds before outplanting.**

Survival of planted trees is expected to be sufficient to stock these areas. Natural regeneration will supplement planted trees in those areas where it occurs.

Conifer species appropriate to each site will be planted. Seedlings will be grown from seed collected within the seed zone that includes the Flagtail Fire, from the elevation band appropriate for the site. Genetic diversity will be higher in planted areas than those that naturally regenerate from the limited number of live trees that remain.

Species and spacing will differ by the Plant Association Groups:

- Ponderosa pine is to be planted at an average 15’ x 15’ spacing in the Hot Dry PAG.
- A mix of ponderosa pine, Douglas-fir, and western larch is to be planted at an average 13’ x 13’ spacing in the Warm Dry PAG.
- A mix of ponderosa pine, western larch, and western white pine (lodgepole pine is expected to naturally seed in) at an average 11’ x 11’ spacing in the Cool Dry PAG.

These spacings are designed to allow the trees room to grow without needing precommercial thinning to maintain adequate growth rates. This is wider than normal spacing, and will allow for more natural ground and shrub vegetation to become established. The spacings are to be varied to duplicate the irregular patterns of natural reforestation and to produce variable densities in the future. Non-reforested areas up to one acre in size are permissible, to provide diversity and wildlife forage. As addressed below, seedling mortality caused by competing vegetation or animal damage is accepted, within limits, providing additional vegetative diversity and wildlife forage areas. Some planting before salvage logging is planned for this project, primarily in helicopter logged units, and has been successful in the past on the Summit and Reed Fires.

Seedling mortality on the district is primarily due to drought stress, competing vegetation that exacerbates drought stress, pocket gopher damage, and big game browsing damage. Seedling survival averages 65 percent for the Malheur N. F. Planting spacing takes this into account in order to achieve fully stocked stands into the future. Failure of planted areas on the Blue Mountain Ranger District is less than 5%.

Reforestation survival in this project area is expected to be close to the 65 percent average if planting is accomplished within 4 years. If it is delayed beyond then, animal damage and competing vegetation may become a problem and animal damage protection measures and control of competing vegetation may be necessary to achieve adequate survival. In that case a new NEPA document will need to be prepared before vegetation or animal damage control is undertaken.

Cumulative Effects

There are approximately 380 acres that were planted in the project area in 2003, utilizing available tree seedlings. These were analyzed in a CE signed in 2003 and involve 190 acres in riparian areas and 190 upland acres judged to benefit from prompt planting with conifers to reduce the need for competing vegetation control.

The nearby private lands that were deforested by the Flagtail fire will need to be reforested by the landowners to meet the Oregon Forest Practices Act requirements.

Competing Vegetation

Natural revegetation by native species is an important process in the recovery of the fire area. Early seral and fire adapted species will respond to the open conditions and rapidly regenerate, providing valuable ground cover. Several species, though a natural part of the post-fire recovery, have the potential to respond so aggressively that they compete for site resources resulting in reduced growth and survival of forest trees. It is often the most important factor limiting conifer regeneration in the Inland Northwest.

The effect of the fire has been to greatly reduce the ground vegetative competition, especially in areas that burned severely and killed the grass roots. The vegetation coverage will increase for the next several years as grass and other ground vegetation resprouts and seeds in. Planting within 4 years of the fire is expected to allow the tree seedlings to become established before the ground vegetation becomes a serious competitor. Since irregular spacing is desired to better mimic natural regeneration it is not necessary to fully stock every area and openings of up to an acre are permissible. Refer to the Specialist Report or the Silvicultural Prescription for more detailed information.

Direct and Indirect Effects

Effects of No Action

In this alternative, no additional planting would occur thus there would be no site preparation and no control of competing vegetation. Since no manual, mechanical, or herbicide control methods are planned, there would be no health or safety risks to forest workers or the public.

Effects of the Action Alternatives

Pinegrass and sedges

On severely burned sites, grass roots will have been killed. Re-establishment of grasses will be slower and have less coverage than less severely burned areas, with the result that the thresholds for grasses are not likely to be exceeded. Areas that burned with moderate severity, and that occur on south or west aspects may come closer to exceeding the 30% ground coverage threshold, however, most of these areas had fairly dense overstories that reduced the amount of ground coverage before the fire. It will take several years for the grasses to become established to the point where they exceed the treatment thresholds.

Snowbrush Ceanothus

All areas proposed for planting in the Flagtail Fire were analyzed to predict levels of competing vegetation. The greatest potential for establishment of ceanothus is in the grand fir/pinegrass and grand fir/elk sedge plant associations on south and west slopes in areas that experienced high intensity burning. Units were analyzed by their biophysical environment, aspect, and burn severity. No areas with a high potential to exceed the competition thresholds for snowbrush ceanothus are anticipated in the Flagtail Fire area.

No manual, mechanical, or herbicide control methods are planned for control of either sod forming grasses or ceanothus. There may be some nonforested areas within units, but it is expected to be in small, dispersed areas that total less than 10% of the area. Total future timber production will be less, but stand structural diversity will be increased and there will be more forage produced in the openings for wildlife and cattle. Reforestation success is expected to be similar to the historical average 65 percent survival rate after 5 years on the Malheur National Forest, which would fully meet the purpose and need to reforest the project area.

Since no manual, mechanical, or herbicide control methods are planned, there would be no health or safety risks to forest workers or the public.

Cumulative Effects

No vegetation control treatments are planned for the Federal lands that are reforested, including the 380 acres to be planted in the spring of 2003 under a separate CE document; therefore there will be no additional cumulative effect from this project.

Animal Damage

Animal damage control is sometimes needed for prompt reforestation of burned areas to meet management objectives. Several species that may have an impact to reforestation success are discussed below. Planting within 4 years of the fire is expected to allow the tree seedlings to become established before animal damage becomes a problem. Since irregular spacing is desired to better mimic natural regeneration it is not necessary to fully stock every area and openings of up to an acre are permissible. This will reduce the need for animal damage control. Refer to the Specialist Report or the Silvicultural Prescription for more detailed information.

Direct and Indirect Effects

Effects of No Action

In this alternative, no additional planting would occur thus there would be no site preparation or control of damaging animals. Since no manual, mechanical, or herbicide control methods are planned, there would be no health or safety risks to forest workers or the public.

Effects of the Action Alternatives

Big Game and Livestock Damage

Big game browsing damage to conifer seedlings is expected to be moderate to low in the first years following the fire. The lack of forage and cover throughout much of the fire may reduce big game use of the area. Where deer and elk are present, planted container stock may sustain damage because other food sources are limited. As vegetation recovers, bringing in more deer and elk, browse damage may increase, but it is not expected to reach levels that require seedling protection.

Livestock browsing or trampling to conifer seedlings is usually very minor, and cattle grazing is excluded from the Flagtail area for a minimum of 2 years to allow vegetation to recover. Therefore, no significant damage is expected to conifer seedlings. Protection of aspen sprouts will be covered under another Categorical Exclusion document.

Porcupine Damage Control

The extent and severity of the fire has reduced preferred porcupine habitat to the few areas with tree survival. Seedling damage and mortality is not expected to be over thresholds, except in very limited areas, in the next five years. Therefore, it is not expected to impede progress toward reforesting burned stands.

Pocket Gopher Damage Control

Pocket gophers will relocate or starve since the Flagtail Fire burned much of the ground vegetation and the food base will be very limited. The population will slowly recover as grass and forbs increase, and animals return from adjacent intact habitat. Gopher populations are not expected to recover until two or three growing seasons following the fire, and it may take longer for them to repopulate the fire interior.

Since none of the types of animal damage are expected to exceed treatment thresholds, reforestation goals should be met without any animal damage control. There may be localized damage that results in non-forested openings. Areas up to 2 acres in size and totaling less than 10% of the area are acceptable. These areas can provide increased structural diversity and forage for wildlife and grazing animals. There would be small losses in the amount of timber produced if openings are greater than ¼ acre, but the cost savings of not doing animal damage control offsets the timber loss.

Since no manual, mechanical, or herbicide control methods are planned, there would be no health or safety risks to forest workers or the public.

Cumulative Effects

No animal control treatments are planned for the Federal lands that are reforested, including the 380 acres to be planted in the spring of 2003 under a separate CE document; therefore there will be no cumulative effects.

Future Stand Resiliency

Existing Condition

The Flagtail Fire has eliminated most of the less resilient and less sustainable forest components that existed prior to the fire. Trees that were not fire tolerant have been killed and overstocked stands have either been thinned out or totally killed. The heavier than normal fuel loads on the ground and the standing ladder fuels have been burned up. With most of the unhealthy components now gone, there is a good opportunity to establish appropriate species and to manage the stands with prescribed fire and thinning to enhance long-term sustainability.

Environmental Consequences

Hot Dry & Warm Dry Plant Association Groups

Direct and Indirect Effects

Effects of No Action

No salvage of tree stems or yarding of tops would occur to reduce future fuel levels. As the fire killed trees fell the ground fuels would increase above historical levels for the Hot Dry and Warm Dry plant association groups. High fuel levels would preclude reintroduction of the low-severity, high frequency fire regime until the woody material decays, and any wildfires could kill the young natural regeneration that becomes established.

Natural reforestation would be somewhat sporadic; patches of young trees would be a part of the landscape for the next century. Ponderosa pine would be the main species, with greater amounts of Douglas-fir and western larch than would have existed under historic conditions of frequent underburning. With the increased fuel loads, even low intensity fire would be a danger to these young trees until they reach 5 to 7 inches DBH and thirty feet or more in height and during dry periods stand replacement fire is very likely. Use of prescribed fire would be delayed for up to 3 decades while the trees grew large enough to survive low intensity fire and the greater numbers of Douglas-fir and grand fir would provide ladder fuels to the crowns, increasing the difficulty of burning.

Effects of the Action Alternatives

Fire Hazard

Salvage of dead timber and reforestation of burned areas with seral species will allow re-establishment of the historical stand conditions and allow the use of fire to resume its natural role in the landscape sooner than if left to occur naturally. The Hot Dry stands would be planted with ponderosa pine and the Warm Dry stands with a mix of ponderosa pine, western larch, and Douglas-fir. These stands could withstand low intensity fire in about 20-30 years, allowing the reintroduction of fire. Future stand structure and composition will be closer to what existed before the beginning of this century. Stands of fire-tolerant trees at lower densities and with reduced fuel loadings will be suitable for periodic underburning. As a result, future wildfires will not be as severe or as large in the project area.

In Alternative 2 approximately 4230 acres would be salvaged (91%) of the burned Hot Dry and Warm Dry forest stands. This would reduce fuels in the stands where it would be the heaviest in the future, and break the continuity of fuel profiles across the landscape.

In Alternative 3 approximately 2820 acres would be salvaged (61%) of the burned Hot Dry and Warm Dry forest stands. This would reduce fuels in the stands where it would be the heaviest in the future, and break the continuity of fuel profiles across the landscape. Non-salvaged areas would still have high future fuel loads precluding periodic underburning in the future and will remain at risk for high severity wildfires.

In Alternative 4 no acres would be salvaged. This would not reduce the heavy fuels in the stands in the future, nor break the continuity of fuel profiles across the landscape. There would be treatment of the unmerchantable sized fuels that would reduce the lighter fuels. All large snags would be left in this alternative, except for hazard trees along roads. As the standing dead trees fall during the next 30 years the fire hazard will increase, risking high severity wildfire and precluding prescribed fire.

In Alternative 5 approximately 3670 acres would be salvaged (79%) of the burned Hot Dry and Warm Dry forest stands. This would reduce fuels in the stands where it would be the heaviest in the future, and break the continuity of fuel profiles across the landscape. Non-salvaged areas would still have high future fuel loads precluding periodic underburning in the future and will remain at risk for high severity wildfires.

Insects and Disease

The salvage of fire-killed timber with this project will have little effect on the buildup of insect populations since it will not take place until over a year after the fire. This would allow populations to build up and disperse to nearby live trees before the salvage operation. Reforesting with seral species such as ponderosa pine will have a positive effect in the future as they are more resistant to insect and diseases than other species that may naturally seed in the fire.

Cumulative Effects

The primary cumulative effect of salvaging nearby private land is the reduction of future fuel loads to more historical amounts. This will reduce the chance of wildfire moving from private lands onto the National Forest and will allow for periodic prescribed burning to occur that would maintain these lands in a more resilient condition. The salvaging will also help to reduce potential insect buildups, since most of the private lands have already been salvaged. The State Forestry Practices Act requires reforestation of the private lands that are deforested. Planting with seral species such as ponderosa pine will improved resistance to fire, insects, and disease. The salvage of hazard trees along roads and at the Bear Valley Work Center are not expected to have had much effect, as the relative size of those projects was small compared to this analysis.

Cool Dry Plant Association Group

Direct and Indirect Effects

Effects of No Action

No salvage or yarding of tops would occur to reduce future fuel levels. Fuels would increase above historical range, fueling fires of greater intensity than historically would have occurred, and could kill young trees that become established.

Most of these acres would probably naturally reforest within 5 to 10 years, as lodgepole pine and western larch are prolific seeders with relatively light seed that disseminates well. Natural reforestation would occur in this plant association group sooner than others in the fire.

Effects of the Action Alternatives

Fire Hazard

The historical fire regime is a higher intensity stand replacement fire at longer intervals. Some stands will be left to reforest naturally, while some will be reforested by planting to increase the species diversity with a mix of Douglas-fir, western larch, western white pine, and lodgepole pine. The primary effect of the salvage will to break the continuity of future fuel levels across the landscape, reducing the size of future fires.

Insects and Disease

The salvage of fire-killed timber will have little effect on the buildup of insect populations since it will not take place until over a year after the fire. Reforesting with seral species such as western larch will have a positive effect in the future as they are more resistant to insect and diseases that other species that may naturally seed in the fire.

Cumulative Effects

There is little Cool Dry forest on private lands, so there are not expected to be any cumulative effects from any activities that may occur.

Woodland (Juniper) Plant Association Groups

Direct and Indirect Effects

Effects of All Alternatives

Woodlands may occur as inclusions within Hot Dry or Warm Dry stands. In none of the alternatives are Woodlands to be salvaged or have fuel treatment. With natural reforestation, juniper and ponderosa pine would gradually seed in across the burned areas. Reforestation would be somewhat sporadic; patches of young trees would be a part of the landscape for the next century. Re-introduction of low intensity fire in the future would maintain these areas in a savannah condition with few juniper or sagebrush and scattered large open grown ponderosa pine.

Fire Hazard

Trees that naturally regenerate could withstand low intensity fire in about 30-40 years, allowing the reintroduction of fire. With periodic prescribed underburning, stem density and encroachment will be reduced compared with before fire conditions. The future stand structure and composition will be closer to what existed before the beginning of this century, widely spaced open grown ponderosa pine and few junipers or sagebrush.

Insects and Disease

Not salvaging fire-killed timber in the Woodlands will have little effect on the buildup of insect populations since salvage would not take place until over a year after the fire.

Stand Structural Stages

Existing Condition

The structural stage classifications used here are consistent with the terms and methods used in the Interior Columbia Basin Ecosystem Management Project. Information on pre-fire stand structures and biophysical environments were derived from the Upper Silvies Watershed Assessment. The structural stages used are:

SI – stand initiation

SEOC – stem exclusion open canopy

SECC – stem exclusion closed canopy

UR – understory reinitiation

YFSS – young forest single story (not an ICBEMP stage, used here to identify the difference between future SEOC stands with trees less than 15" DBH and larger sized SEOC stands with trees greater than 15" DBH)

YFMS – young forest multi-story

OFSS – old forest single story

OFMS – old forest multi-story.

The objective of the proposed activities is to only salvage dead trees and will not have any further change on the existing post-fire structural stages. There may be incidental harvest of live trees in road or landing locations or that are removed for safety. Therefore, Regional Forester's Eastside Forest Plan Amendment #2 does not require an analysis for structure stages. (This revised interim direction applies to all timber sales, with some exceptions, which include salvage sales).

The existing and historical range of structural stages is displayed for informational purposes only. Future structural stages are shown in the Environmental Consequences section to show the effects of the lag between planting and natural reforestation has on future forest stage development and other resources, such as wildlife habitat.

Table FV-4 shows the range of structural stages believed to have existed before settlement by Euro-Americans. Information is derived from Powell, 1998, Umatilla National Forest Silviculturist, who did an analysis in cooperation with Charlie Johnson, the Blue Mountain Area Ecologist, and other Malheur, Umatilla, and Wallowa-Whitman National Forest Silviculturists.

Table FV-4: Historical Range of Structural Stages in Blue Mtns.

PAG	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
Hot-Dry	5-15%	5-20%	0-5%	0-5%	5-10%	20-70%	5-15%
Warm-Dry	5-15%	5-20%	1-10%	1-10%	5-25%	15-55%	5-20%
Cool-Moist	1-10%	0-5%	5-25%	5-25%	40-60%	0-5%	10-30%
Cool-Dry	5-30%	0-5%	5-35%	5-20%	5-20%	1-10%	1-20%

Table FV-5 shows the current (post-fire) condition of the stand structures on National Forest lands within the Flagtail Fire. See Maps 7 and 8 for structural stages before and after the fire.

Table FV-5: Current Stand Structural Stages, Flagtail Fire Project Area

PAG	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
Hot-Dry	35%	45%	0%	19%	1%	0%	0%
Warm-Dry	54%	9%	0%	36%	.5%	0%	.5%
Cool-Dry	77%	1%	0%	20%	2%	0%	0%

Environmental Consequences

Structural stages are predicted based on average growth for a Warm Dry PAG site (92% of the Flagtail analysis area) under a scenario of natural regeneration for No Action and planting for the Action Alternatives. Thinning and periodic prescribed underburning are assumed for both scenarios to maintain stand densities for an average growth rate of 1.5 inches DBH per decade. For simplicity, no other stand disturbing agents were considered

Direct and Indirect Effects

There will be no direct effects to the **current (post fire) structural stages** with any of the action alternatives since few live trees are to be harvested. The **future stand structural stages** in the burned landscape will be different with No Action than under the Action alternatives. This is largely as a result of the longer period necessary for natural regeneration to reforest the burned areas outside of the seed dispersal zone.

Effects of No Action

The approximately 3340 acres within the seed dispersal zone are expected to reforest naturally within 20 years. The seed dispersal zone has 1440 acres with some live trees and 1900 acres within 800' of live trees. On the other 1250 acres (20% of the deforested area) that are located farther from seed sources it is estimated that it would take 20 to 50 years for trees to become established and start to grow. Therefore, development of structural stages would be delayed due the lag in reforestation both in the seed dispersal zone and outside of it.

Table FV-6 shows the difference at 50, 100, and 150 years from now. The No Action alternative has 9% OFSS in 50 years growing to 43% in 150 years.

Table FV–6: Future Structural Stages for No Action (Warm Dry PAG)

	SI	SEOC	SECC	UR	YFSS	YFMS	OFSS	OFMS
Existing	54%	9%	0%	36%	0%	0.5%	0%	0.5%
50 Years	20%	34%	0%	0%	0%	36%	9%	1%
100 Years	0%	20%	0%	0%	34%	36%	9%	1%
150 Years	0%	0%	0%	0%	20%	0%	43%	37%

Effects Common to All Action Alternatives

Under all action alternatives, burned areas are planned for reforestation within five years. All of the action alternatives have the same amount of reforestation by planting, with nearly identical rates of structural development. The reduction of the regeneration lag will yield a 20% increase of old forest structural stages compared with the No Action.

Table FV–7 shows the difference at 50, 100, and 150 years from now. The action alternatives have 9% OFSS in 50 years, increasing to 63% in 150 years, an increase of 20% compared to the No Action Alternative.

Table FV-7: Future Structural Stages for the Action Alternatives (Warm Dry PAG)

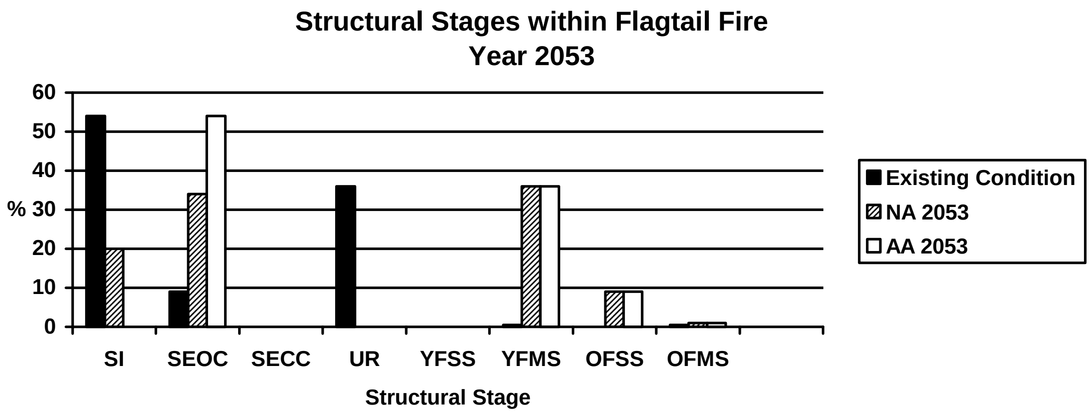
	SI	SEOC	SECC	UR	YFSS	YFMS	OFSS	OFMS
Existing	54%	9%	0%	36%	0%	0.5%	0%	0.5%
50 Years	0%	54%	0%	0%	0%	36%	9%	1%
100 Years	0%	0%	0%	0%	54%	36%	9%	1%
150 Years	0%	0%	0%	0%	0%	0%	63%	37%

Cumulative Effects

Reforestation of private lands is expected to be fairly rapid as many burned portions are required to be planted under the Oregon Forest Practices Act. These lands would grow into SEOC in the next 50 years, but under the present market forces, cannot be expected to reach the larger size classes before they are harvested.

The following graphs, (Figures FV-1 through FV-3), compare the predicted stand structural stage composition 50, 100, and 150 years into the future for the No Action and the Action alternatives.

Figure FV-1: Predicted Structural Stages - 50 years



NA = No Action, AA = Action Alternatives

Figure FV-2: Predicted Structural Stages - 100 years

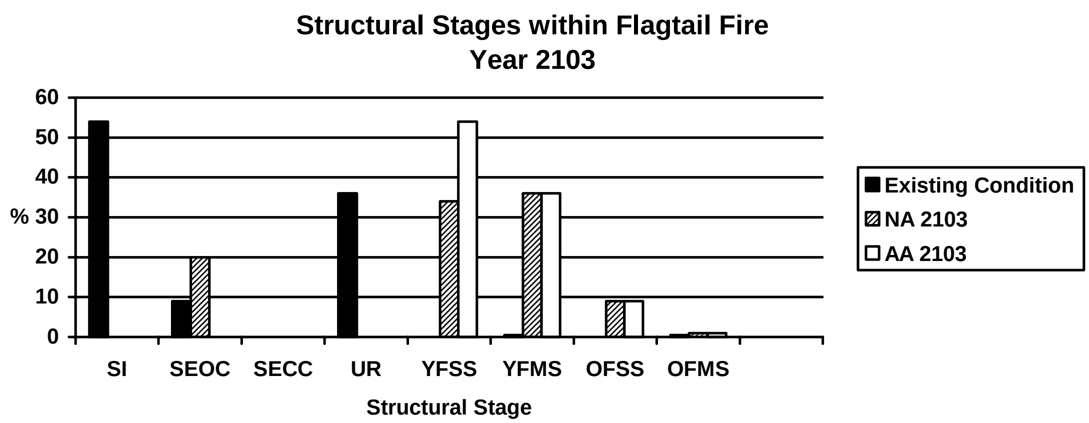
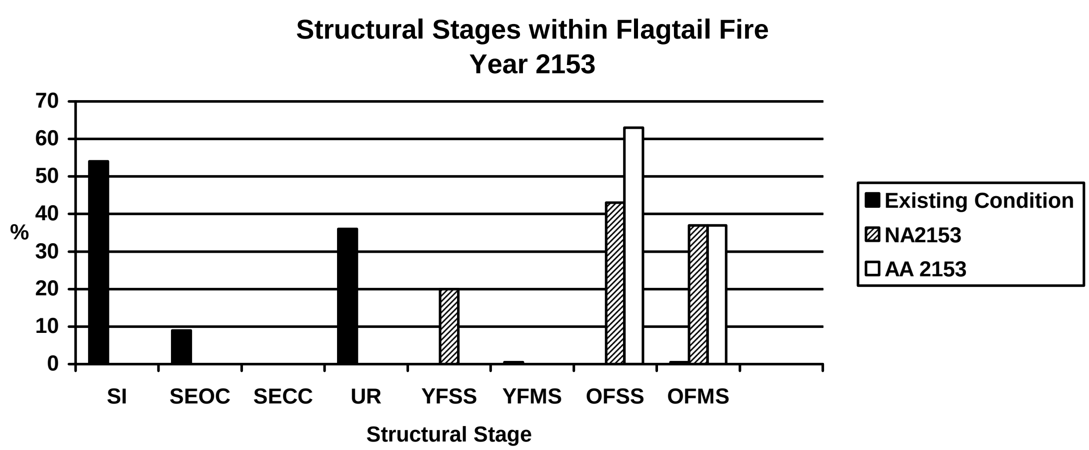


Figure FV-3: Predicted Structural Stages - 150 years



Consistency with Direction and Regulations

NFMA (Regional Forester's Letter of Nov. 19, 2002)

The No Action Alternative does not meet direction to reforest areas as soon as possible. The Action Alternatives all meet the direction that salvaged areas are reforested within 5 years and that other deforested areas be reforested as soon as possible.

Forest Plan

The No Action Alternative does not meet the Forest Plan direction to establish ponderosa pine (and other early seral species) in appropriate sites to increase fire, insect, and disease resiliency. The Action Alternatives all meet the direction to minimize losses due to insects and disease by establishing ponderosa pine and western larch where they are appropriate within 5 years after harvest. Both natural regeneration and planting are utilized to reforest the burned areas and seed used to grow the seedlings is collected from superior trees within the seed zone and elevation band.

Regional Forester's Eastside Forest Plans Amendment #2 (Eastside Screens)

All alternatives meet the direction to not decrease old forest structural stages, since live trees are not harvested (except for incidental green trees cut for road and landing construction and for safety). The Action alternatives better meet the objective to shorten the time to grow additional old forest structural stages, since planting will establish trees 10 to 40 years sooner, giving them an advantage over the natural regeneration.

Irreversible and Irretrievable Commitments of Resources

Irreversible Commitments

There are no anticipated long-term irreversible commitments of the forest vegetation since it is renewable as long as the soil productivity is maintained. There may be short-term losses of growth related to soil compaction, but compaction is to be kept below 20% of the forest area, and the growth reduction on compacted ground is about 15%. This would result in a total maximum growth loss of approximately 3% of the growth potential until the compaction gradually diminished (in about 50 years).

Irretrievable Commitments

There are irretrievable commitments of the growth of forest vegetation for about 5 years because of the new landings and roads that are built for the salvage operation. They are to be rehabilitated after use, but there will be a lag in reforestation and growth since the sites are impacted more heavily than the surrounding forestland.

Fire and Fuels

Introduction

Fire and Fuels Management

Fuels management is a process of managing the hazard in relation to the size and severity of a potential fire event. The objective of fuels management is to reduce the fire hazard to a level where cost effective resource protection is possible should a wildfire ignite. Of the three components affecting wildland fire behavior (fuels, weather, and topography), only fuels can be manipulated.

The influence of fine fuels such as litter, duff, and grasses, and small woody fuels (less than 3 inches diameter) have the most effect on spread rate and intensity of fires. These fuels are used in fire behavior models developed for predicting the fire behavior of the initiating fire (Rothermel 1983).

Course Woody Debris (>3inches) have little influence on spread and intensity of the initiating fire; however, they can contribute to development of large fires and high fire severity. Fire persistence, resistance-to-control, and burnout time (effects to firefighter and public safety, soil heating and tree mortality) are significantly influenced by loading, size, and decay state of large woody fuel. Torching, crowning, and spotting contribute to large fire growth and are greater where large woody fuels have accumulated under a forest canopy. Large woody fuel, especially containing large decayed pieces, are a suitable fuelbed for firebrands and can hold smoldering fire for extended periods of time (Brown et al 2003). Spot fires can also be started in rot pockets of standing snags. The distance firebrands travel is dependent of size of the firebrand, wind speed, and height above ground of the source. A reburn results when falldown of the burned forest contributes significantly to the fire behavior and fire effects of the next fire.

Fire hazard most commonly refers to the difficulty of controlling potential wildfire. Fire behavior characteristics such as rate-of-spread, intensity, torching, crowning, spotting, fire persitence, or resitance to control are generally used to determine and describe fire hazard. As Brown et al (2003) indicated, fire severity can be considered an element of fire hazard.

Fire risk is the chance of a fire starting from any ignition source and is determined by using the frequency of past fire starts. Fire frequency is expressed statistically as the number of fire starts per one thousand acres per year. The Upper Silvies Watershed Analysis states that the fire frequency is 1.4 fires per one thousand acres per decade. This puts the watershed at a high fire risk rating.

Based on Brown et al. (2003) and local knowledge, the optimum quantity of downed Coarse Woody Debris (CWD) is 5 to 15 tons/acre for Fire Regime I and 10 to 25 tons/acre for Fire Regime III. These fuel loadings take into account wildlife and soils concerns. A re-burn involving these quantities of CWD should not lead to unusually severe fire effects. If quantities of CWD are at the high end of the range and composed of mostly smaller diameter pieces (3-6 inches), adverse soil heating might occur at very low fuel moisture contents. A modifying factor in determining an optimum CWD is that the larger the diameter of downed

CWD, the greater the loading that can be allowed without undesirable fire effects (Brown et al. 2003).

Of course all of this potential fuel loading is not going to be on the ground at the same time. Many variables influence the rate at which snags fall, including species, diameter, growth rate, age, weather, and site conditions (Evers, 2002). It is generally accepted that most of the snags will be on the ground within 10-30 years creating a future fire and fuels concern.

Regulatory Framework

Malheur Forest Plan and the Malheur Fire Management 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 and that fire presuppression and suppression programs are cost-effective and responsive to the Forest Plan (Appendix G).

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 applicable Forest wide direction is provided for fire management: 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).

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. The Fire Management Plan is updated annually or as policy and Land and Resource Management Plans change. 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.

National Fire Plan

In August 2000, President Clinton asked Secretaries Babbitt and Glickman to prepare a report recommending how best to respond to the severe fires, reduce the impacts of those fires on rural communities, and ensure sufficient firefighting resources in the future. President Clinton accepted their report, *Managing Impacts of Wildfires on Communities and the Environment*, in September 2000. This report provides an overall framework for implementing fire management and forest health programs.

Operating principles directed by the Chief of the Forest Service in implementing this report include: firefighting readiness, prevention through education, rehabilitation, hazardous fuel reduction, restoration, collaborative stewardship, monitoring, jobs, and applied research and technology.

The Flagtail Fire Recovery Project addresses the hazardous fuel reduction element, which states: Assign highest priority for hazardous fuels reduction to communities at risk, readily accessible municipal watersheds, threatened and endangered species habitat, and other important local features, where conditions favor uncharacteristically intense fires (Laverty & Williams 2000).

The focus of the Cohesive Strategy, which was signed October 2000, is on hazardous fuel reduction to restore ecosystems that evolved with frequent, low intensity fire with a high priority for treatment of Wildland Urban Interface (WUI) areas. Approximately 50% of the Flagtail Fire falls within a WUI area because of structures on private land.

The 10-Year Comprehensive Strategy, signed August 2001, reflects the views of a broad cross section of stakeholders with a desired end result of healthier watersheds, enhance community protection, and diminished risk of and consequences of severe fire. The strategy established 4 primary goals: 1)Improve Prevention and Suppression, 2)Reduce Hazardous Fuels, 3)Restore Fire Adapted Ecosystems, and 4)Promote Community Assistance. A set of actions to facilitate attaining each goal was also established.

The Implementation Outcome as described in the National Fire Plan 10-year Implementation Plan is reduced risks associated with wildland fires to communities and the environment due to hazardous fuel reduction. The Flagtail Project addresses the potential of fires in decades to come, rather than fires in the immediate future. The project recognizes the values at risk in the structures in close proximity to the project area and values in the resources within the Flagtail area that will be developing.

Analysis Methods

Four topics are listed in Chapter 1 regarding the purpose and need to reduce fuels. Chapter 1 identifies a key issue questioning the need and validity of the proposed fuel reduction. Every issue is not analyzed in this Fire and Fuels section, but may be addressed by other specialists in this section. The Fire and Fuels section addresses the following fuels related issues:

- Fuel loading and fire behavior
- Public and Firefighter Health and Safety
- Air Quality

Future fuel loading (tons/acre) and fire behavior for the Flagtail Fire were modeled on data obtained through stand exams. Stands within the project area were stratified based on species, structure, and burn severity. Exams were completed on a sample of the stands within each grouping. The data from these exams was extrapolated to all stands within that grouping. Weights of standing dead trees were calculated from the Handbook for Predicting Residue Weights of Pacific Northwest Conifers (Brown et al. 1980). These weights include limbs, branches, needles and bole of dead trees. Tons per acre for each plant association group was determined by averaging the fuel loadings for each stand within that plant association group.

With the results of these exams, we are able to predict future fire behavior and effects, using BEHAVE, a fire behavior prediction and fuel modeling system that predicts fires rate of spread, flame length and spotting potential. This model assumes a continuous bed of fuels with no change in aspect, slope, moisture, wind speed and direction. The contribution of large woody fuel to surface fire intensity is likely underestimated in fire behavior models that treat large wood pieces as smooth cylinders (Brown et al. 2003). The effects of the predicted fire behavior is modeled using FOFEM – First Order Fire Effects Model, a computer program used to analyze and predict fire's effects on vegetation, soils, and air.

The data from these exams and models is also used to measure the effects to public and firefighter health and safety and air quality. For air quality, the measure is the amount of PM-10 produced and can be modeled with FOFEM.

The fire and fuels direct and indirect effects can be measured by fuel loads and fire behavior, public and firefighter health and safety, and air quality. The greater the fuel loading is, the greater the effect on the environment. For fire and fuels management, direct and indirect effects are those that occur from the proposed activity from 1-20 years and 20-50 years. Cumulative effects are those effects from other activities, past, present, and future, that add to or subtract from the effects of this project.

Fuel Loading and Fire Behavior

Existing Condition

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 Cohesive Strategy 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 regimes have been mapped for the Malheur National Forest and are tied to the Plant Association Groups (PAG) that are defined in the Vegetation section of this document.

Fire Regime I is described as low severity fire with a frequency of 0-35 years. Plant communities within this Fire Regime include ponderosa pine, dry Douglas-fir and very dry white fir. The Hot Dry and Warm Dry Forest PAG are inlcluded in this Fire Regime.

Fire Regime II is described as having mixed and high severity fires with a return interval of 0-35 years. This fire regime includes mesic sagebrush communities with return intervals generally of 25-35 years and mountain shrub communities (bitterbrush, ceanothus among others) with typical return intervals of 10-25 years. Plant Association Groups within the Flagtail area include Hot Dry Woodlands (Western Juniper with low or stiff sagebrush) Other specific communities include mountain big sagegrush and low sagebrush. off tied to the Hot Dry Shrublands and Woodlands and includes juniper and sagebrush sites.

Fire Regime III is mixed severity fire with a frequency of 35-100+ years. This regime usually results in heterogeneous landscapes. Large, high severity fires may occur but are usually rare events. This regime is subdivided into three subregimes based on the Pacific Northwest variant. Subregime A has a return interval of less than 50 years and includes mixed conifer, dry grand fir. Lower severity fire tends to predominate in many events. Plant Association Groups within this regime include the Cool Dry Forest. Lodgepole sites within the project area are included in this PAG. Subregimes B and C have longer return intervals (50-100 and 100-200 years respectively) but are still of mixed severity.

The riparian areas in the Flagtail Fire area are classified either Fire Regime I or III depending on the location in the riparian and soil moisture.

The following table displays the fire regimes within the Flagtail project area:

Table FF-1: Fire Regimes within the Flagtail project area

Fire Regime Group	Frequency (Fire Return Interval)	Historical Severity	Percent of Project Area
I	0 – 35 years	Low severity	83%
II	0 – 35 years	Stand replacement severity	8%
III	35 – 100+ year	Mixed severity	4%

*There is also 5% of the area in non-forest

Fire Current Condition Classes are a qualitative measure describing the degree of departure from historical fire regimes, possibly resulting in alterations of key ecosystem components such as species composition, structural stage, stand age, canopy closure, and fuel loadings. An appropriate mix of seral structure stages on the landscape for the particular PAG and therefore fire regime, is the primary indicator of Fire Condition Class. Departure from the historical fire regime may have been caused by a number of things including but not limited to: fire suppression, timber harvesting, grazing, introduced insects or disease, or other past management activites. Stands within each Fire Regime can be qualitatively described by these condition classes.

Condition Class 1: Fire regimes are within an historical range and the risk of losing key ecosystem components is low. Vegetation species and structure are intact and functioning within historical range.

Condition Class 2: Fire regimes have been moderately altered from their historical range. Risk of losing key ecosystem components is moderate. Fire frequencies have departed from historical frequencies by one or more return intervals (either increased or decreased). Vegetation attributes have been moderately altered from their historical range.

Condition Class 3: Fire regimes have been significantly altered from their historical range. Risk of losing ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals.

Most of the Flagtail Fire area burned under extreme fire weather conditions when much of the area was in a Fire Condition Class 3. The condition class was due change an excess of late seral species and excess multi-story structure. The extreme weather included minimum relative humidity of 15%, winds that exceeded 12 mph, and temperature close to 90 degrees. A weather related factor is the Energy Release Component (ERC). ERC gives seasonal trends based on humidity, daily temperature, and precipitation. Wind is not factored in.

Average ERC during the summer months ranges from 20 to 60. An ERC of 67 or higher has been reached only 10% of the time over the last 10 years. The ERC at the time the Flagtail fire stared was 68-70. The fire burned with higher intensity and severity than would have been the case if the area had been in condition class 1. Burning under these conditions led to higher mortality thus leading to the potential for higher fuel loads in the future. If those fuel loads are not treated within 10 – 15 years, the potential for a re-burn with high severity exists.

The following table (FF-2) displays the severity of the fire by plant association group and Fire Regime in acres.

Table FF-2: Severity of Fire by Plant Association Group in Acres

Plant Association Group/Fire Regime	No Burn	Low Severity 30-60% Mortality	Moderate Severity 60-90% Mortality	High Severity 90-100% Mortality
Hot Dry/ I	10	20	90	120
Warm Dry/ I	140	440	2210	2870
Cool Dry/ III	20	0	100	160
Total Acres	**170**	**460**	**2400**	**3150**

The total acres burned in the Flagtail Fire is 6,010 acres.

Currently, 35% of the Hot-Dry PAG and 54% of the Warm-Dry PAG are in stand initiation stage (See also the Vegetation section of this Chapter). Historically, 5-15% of each PAG was in the stand initiation structural stage. In the Hot-Dry PAG, there is 20%-30% more area in the stand initiation structural stage and in the Warm-Dry PAG, there is 39%-49% more area in the stand initiation structural stage than was within the historical range for the Blue Mountians. Both these PAGs have been moderately to signifcantly altered from their historical range due to the fire. Much of the area can currently be considered to be in Condition Classes 2 and 3 because of this excess of early seral structure stage (per comm Louisa Evers).

Fuel loading (tons/acre) can be modeled into fire behavior predictions, which will produce anticipated flame lengths. Flame lengths are an indicator of fire intensity and the 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 flame. 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.

There are several methods used to treat fuels such as logging, yard top attached, whole tree yarding, lop and scatter, machine pile, hand pile and prescribed underburning. Yard tops attached and whole tree yarding are done during the salvage operations. Both methods bring top and limbs to a landing, where it is piled and burned or allowed to be used commercially as chip or firewood. Lop and scatter is used with lighter fuel loads and helps break up concentrations and places the material closer to the ground to help speed up decomposition. Machine piling is done with a grapple on a low ground pressure (<8 psi) track excavator on slopes less than 35%. Grapple piling is used in areas with moderate to high fuel loads. Piles are then burned during the late fall after sufficient moisture to minimize fire spread. Grapple machines minimize ground disturbance and compaction. Cost is approximately $100.00 per acre. Hand piling is primarily used on slopes greater than 35% with moderate to high fuel loads. Piles are burned in the late fall after sufficient moisture to minimize fire spread. Cost is approximately $150.00 per acre. Prescribed underburning is used with lighter fuel loads over large areas. The cost is approximately $58.00 per acre.

Yard tops attached, grapple piling and hand piling are proposed in this document as options for fuel treatment.

83% of the Flagtail Project Area was historically classified as Fire Regime 1, condition class 1. Under these conditions the fuel loadings would have been in the range of 0-15 tons/acre. At the time the Flagtail fire burned, these areas were in condition class 3 due to change in species composition and stand structure.

4% of the Flagtail Project Area was historically classified as Fire Regime 3, condition class 1. Under these conditions the fuel loadings would have been in the range of 15-25 tons/acre. At the time the Flagtail fire burned, these areas were either condition class 2 or 3.

Current fuel loads have been reduced significantly from pre-fire levels. In all biophysical environments with <u>moderate to high severity</u>, the current fuel loads are from 0 to 5 tons\acre with little or no ladder fuels. The fire intensity and severity in these areas is expected to be low for the next 1-10 years. Within 2-3 years, the grass and shrub layer will be continuous enough to carry a fire and may be represented by the National Fire Danger Rating System (FBPS), fuel model 2 and condition class 1. This description also applies to the private lands affected by the Flagtail Fire.

In all biophysical environments with <u>low severity</u> the current 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. These areas may be represented by the FBPS fuel model 9 and are condition class 2.

Forest Service lands outside the fire area but in the same sub-watersheds as the project area are mostly Fire Regime I condition class 3. These areas are still at risk for uncharacteristically severe fires.

Private lands affected by the fire have had salvage logging and fuel treatments completed or in the process. There are therefore low fuel loadings on private land.

Environmental Consequences

Direct/Indirect Effects

Common to All Alternatives

Within the first 10 years, grasses and shrubs will be reestablished, allowing fires to burn under historical fire regimes. Most fires in the Flagtail Fire area will exhibit low severity and have low resistance to control. The fire area can be used as a location to stop fires that start on adjacent lands.

Many riparian areas will exceed the range of historical levels of fuels in 10-20 years. This will leave those areas susceptible to higher fire severity.

Common to All Action Alternatives

Grapple piling and handpiling with removal of the piles through utilization (grapple piles) or burning the piles are methods used to treat fuels under these alternatives. These methods have the similar effects on fuelbeds, both reduce the quantity of fuels and the continuity of fuels across the landscape.

During salvage and other fuel treatments, there is increased human activity and equipment that could cause fire starts. However, past records do not indicate high numbers of fire starts due to human activity during harvest and fuel treatments. The Malheur National Forest Fire Management Plan states between 1970 and 2001, 2% of the fires were caused by smoking, 1% by slash burning, 1% were industrial caused, and 2% were miscellaneous human caused combining for only 3% of the acres burned. This summary includes areas of increased activity that occurred during this time period. In addition, contract provisions during logging operations and provisions included in service contracts mitigate both the potential for fire starts and require equipment for fire suppression when conditions warrant this. In the long-term, the potential for human-caused fire starts will decrease due to road closures.

3,150 acres or 52% of the forested area burned at high severity to the vegetation (90-100% mortality). In these areas, most to all of the crowns were consumed in the fire so as a result, there would be little increase in fine fuels due to harvest. 2,400 acres or 39% of the forested area burned at moderate severity to the vegetation (60-90% mortality). The balance of the trees will die of basal, root, or crown scorch. In areas that burned with moderate to high severity, the current fuel loads are 0 to 5 tons per acre with little or no ladder fuels. In these, areas, crown consumption was variable. An increase of fine fuels can be expected where the crowns remained largely intact following the fire. However, this will be adding to a surface fuel load of only 0 to 5 tons per acre.

The spacing and species for planting will vary depending on the Plant Association Group. These spacing is wider (see Vegetation section) and are to be varied to duplicate the irregular patterns of natural reforestation. This is closer to the natural range of variability for each Fire Regime and Plant Association Group.

Common to Alternatives 2, 3, and 5

Utilization through harvest as a fuels treatment has the most significant affect on fuelbeds as it reduces the quantity through removal. It has the most impact on the larger fuels. Harvest also lowers the continutiy of fuels across the landscape. The alternatives vary by the number of acres treated.

Alternative 1

As shown in Table FF-3, untreated fuel levels in 20 years would be above threshold (Historical). A low severity, frequent burn would not be possible with the high amounts of debris left in the untreated forest (see Table FF-3). For example, unit 34 is a unit in Fire Regime I that burned with high severity. With the number of snags left in the unit, the expected future fuel load is calculated to be 66.9 tons/acre.

The No Action alternative would allow increased fuel loading, increased future fire severity, and changes to the historical disturbance cycle. This alternative would not meet the purpose and need to restore/reintroduce fire to a more natural role of controlling undergrowth and allowing seral species to dominate their historical range (see Table FF-5).

Within 10-20 years, the majority of fire-killed trees will have fallen onto a bed of grass and shrubs interspersed with conifer seedlings and saplings. Fire behavior predictions indicate that this fuel bed would support a fast moving, high intensity fire. Flame lengths could exceed 7 feet, making hand-line suppression impossible. Tree mortality on the trees that naturally regenerated the area would be near 100%. The fuels contributed by the Flagtail Fire would probably need 80-150 years to decay to a point where the only likely fire would be a low severity ground 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 5-10 years. Past this time-frame, the potential for an intense reburn with severe effects will continue to increase as biomass collects on the forest floor and this material contributes to the next fire. Resistance to control would be high.

Fuel loads in the Wildland Urban Interface areas would exceed the threshold for historical levels. This would increase the likelihood of a high intensity fire entering the private land adjacent to the project area.

Hot Dry/Warm Dry Biophysical Environments (83% of Project Area)

The No Action alternative would not allow for recovery of the historical fire regime. Frequent, low intensity burns kept the fuel loadings low and favored large, open-grown Ponderosa Pine. Forests that once were characterized by large pines and sparse grass and shrubs will be converted to vast areas of early seral stands of regeneration in which grass and shrubs are the dominant ground vegetation. The post-fire level of large woody debris would become heavier over time, as dead trees begin to fall. Future fires (20-50 years) may be high severity fires similar to the Flagtail Fire. The future potential 0 to 3 inch component of the fuel profile varies but averages approximately 10 tons/acre.

Cool Dry Biophysical Environments (4% of Project Area)

These areas contain lodgepole pine plant associations. Lodgepole Pine associations are generally a moderate frequency, mosaic pattern fire regime. Trees grow close together and form dense stands subject to stagnation and bark beetle attacks that often result in high mortality. In the Flagtail project area these stands are surrounded by Fire Regime I areas, which would increase the likelihood of low intensity fire entering more frequently. This would thin some trees and reduce the ground fuels, thus allowing a mosaic type burn when a high intensity fire occurs.

The No Action Alternative would not allow recovery of the historical fire behavior in Fire Regime III. Because of the higher moisture availability normally found within these sites, they have evolved with a longer fire regime with a mosaic of fire effects. The adjacent Fire Regime I areas will burn with higher intensity. Within 20 years, much of the standing dead snags in the Lodgepole areas will be on the ground, leaving many of these areas susceptible to stand replacing fire instead of mosaic.

Alternative 2

Salvage logging would remove dead tree volume, leaving low to moderate amounts of dead trees (up to 12 inches DBH) and leaving 2.39, 21+ inch DBH snags/acre. Yard tops attached is planned to further reduce fuels in the tractor and skyline units. Additional fuel treatments on the small diameter dead and dying material could occur in units that still exceed the threshold. These treatments would be hand piling 1,240 acres on slopes greater than 35% and grapple piling 1,450 acres on slopes less than 35%. The piles would then be burned. The need for these treatments will be verified after harvest. As an example, the fuel loads in unit #34 would be reduced from 66.9 tons/acre to 7 tons/acre by salvaging with yard tops attached and then cutting and grapple piling the material under 8 inches DBH. The 7 tons/acre that will be on the ground in 20 years includes approximately 2.5 tons/acre from the large snags and 4.5 tons/acre from the material between 8-12 inches DBH that will be left on site. See Figure 24, Map Section, for location of fuel treatments.

As shown in Table FF-3, the fuel load in all biophysical environments will meet threshold (Historical) in 20 years. This allows for maintenance of condition class 1 areas through future low intensity prescribed fires (see Table FF-5). A reburn, when fall down resulting from the Flagtial fire contributing to the next fire, will not occur across the prjoject area. Fire suppression would continue in these areas, but fires would show low to moderate fire behavior with low resistance to control (see Table FF-4).

Fuel loads in the Wildland Urban Interface areas would meet the threshold for historical levels. Wildfires are more likely to be contained before they enter the private land.

Alternative 3

Salvage logging would remove dead tree volume on 3,860 acres, leaving low to moderate amounts of dead trees (up to 12 inches DBH) and leaving 13 snags/acre from 10 to 21 inches DBH. These snags would be left mostly in clumps of 2-6 acres. These clumps of standing dead trees would present difficulties for future fire suppression and fuels management activities; however, the scope of the effect would be primarily limited to these patches. None of these patches will be left directly adjacent to private land. Additional fuel treatments on the small diameter dead and dying material could occur in units that still exceed the threshold. See chapter 2, alternative descriptions. These treatments are combinations of yarding tops attached, grapple piling and hand piling. As shown in Table FF-3, the fuel load in salvaged units in all biophysical environments meets threshold (Historical). This allows for maintenance of condition class 1 areas through future low intensity prescribed fires (see Table FF-5). A reburn, when fall down resulting from the Flagtial fire contributing to the next fire, will not occur across the prjoject area. The falldown could contribute to fire effects and fire behavior in the patches that are not treated. Fire suppression would continue in these areas, and fires would show low to moderate fire behavior with low resistance to control (see Table FF-4). As an example, the fuel loads in unit 34 would be reduced from 66.9 tons/acre to 12.5 tons/acre by salvaging with yard tops attached and then cutting and grapple piling the material under 8 inches DBH. The 12.5 tons/acre that will be on the ground in 20 years includes approximately 7.5 tons/acre from the snags and 5.0 tons/acre from the material between 8-12 inches DBH that will be left on site.

1,150 forested acres identified as needing fuel reduction treatments within the Flagtail Project area will exceed the threshold for historical fuel loads.

Of the 1,150 acres, 550 acres would not have commercial harvest but fuel treatments on the dead and dying un-merchantable trees could occur. 290 acres would be available for hand piling and 260 acres would be available for grapple piling. These treatments would treat smaller standing dead trees only, which are expected to start adding to the ground fuels in the next 5-10 years. Over this time, the trees larger than 8 inches DBH are also becoming part of the fuel profile but by reducing the small material, a reduction in the intensity and severity of a re-burn would be extended an additional 5 to 10 years, from that of no action. See Figure 25, Map Section, for locations of fuel treatments.

Of the 1,150 acres, 300 acre of the forested burned areas will not have any salvage or fuel treatments. These areas do not have enough dead tree volume to warrant salvage or a high enough level of small diameter trees to affect total fuel loadings through un-merchantable fuel treatments. Leaving the trees on these acres would result in fuel loadings that are over thresholds (see Table FF-3).

Other areas are set aside for Black-Backed Woodpecker habitat in 75 acre blocks (300 acres). These areas are not available for salvage or un-merchantable fuel treatments.

These 1,150 acres will have increased fuel loading and increased future fire severity. The areas are scattered with the largest block being approximately 400 acres. Fire suppression would continue within the non-salvaged areas, though the amount of fuels left on-site will result in high resistance to control. The use of future low intensity prescribed fires would be prohibitive in these areas. The continuity of the fuels across the project area would be broken up, reducing the potential for a large fire similar to the Flagtail Fire.

Fuel loads in the Wildland Urban Interface (WUI) areas would meet the threshold for historical levels in a majority of the areas. Areas that exceed the threshold for fuel loads are scattered. Fire suppression would continue within these WUI areas, though the amount of fuels left areas will increase future fire severity and resistance to control in these scattered areas.

Alternative 4

No commercial salvage would occur in this alternative. Treatment of dead and dying un-merchantable material would be allowed to reduce fuel loads. These treatments would be hand piling 1,800 acres on slopes greater than 35% and grapple piling 3,190 acres on slopes less than 35%. The piles would then be burned. These treatments would treat smaller standing dead trees only, which are expected to start adding to the ground fuels in the next 5-10 years, reducing the intensity and severity of a re-burn, from that of no action, in that time period. Further treatments would be needed in 10-30 years to reduce fuels from larger dead trees to historical levels. See Figure 26, Map Section, for locations of fuel treatments.

As shown in Table FF-3, fuel loads in all bio-physical environments exceed the threshold (Historical) in 20 years. This alternative would allow increased fuel loading, increased future fire severity, and changes to the historical disturbance cycle, although slightly reduced from the No Action alternative. A reburn, when fall down resulting from the Flagtial fire would contribute to the next fire, could occur across the prjoject area. The falldown would contribute to fire effects and fire behavior across the landscape. As shown in Table FF-4 and FF-5, this alternative would not meet the need to establish fuel conditions that will allow for future management actions that movethe landscape towards historical conditions. As an example, the fuel loads in unit 34 would be reduced from 66.9 tons/acre to 47.8 tons/acre by cutting and grapple piling the material under 8 inches DBH.

Fuel loads in the Wildland Urban Interface areas in 20 years would exceed the threshold for historical levels in most areas. This would increase the likelihood of a high intensity fire entering the private land adjacent to the project area.

Within 20 years, the majority of the remaining fire-killed trees will have fallen onto a bed of grass and shrubs interspersed with conifer seedlings and saplings. As shown in Table FF-4, fire behavior predictions indicate that this fuel bed would support a fast moving, high intensity fire. Flame lengths could exceed 7 feet, making hand line suppression impossible. Tree mortality on the trees planted in the area would be near 100%. The fuels contributed by the Flagtail Fire would probably need 80-150 years to decay to a point where the only likely fire would be a low severity ground 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 5-10 years. Past this time frame 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.

This alternative would not allow for recovery of the historical fire regime. Frequent, low intensity burns kept the fuel loadings low and favored large, open-grown Ponderosa Pine forests that once were characterized by large pines and sparse grass and shrubs will be converted to vast areas of early seral stands in which grass and shrubs are the dominant vegetation. The post-fire level of large woody debris would become heavier over time, as dead trees begin to fall. Future fires (20-50 years) may be high severity fires similar to the Flagtail Fire.

The following Table (FF-3) shows the expected fuel loads in 20 years by Fire Regime and Ecoclass for each alternative.

Alternative 5

This alternative was designed to mimic snag distributions expected at the landscape level on dry forests. Snag level prescriptions varied between salvage units based on a variety of criteria including forest type, aspect and slope, visual quality in the County Rd 63 Visual Corridor, Wildland Urban Interface, and economics.

Salvage logging would remove dead tree volume on 3,740 acres, leaving low to moderate amounts of dead trees (up to 12"DBH) and leaving a range of 2.39 to13 snags/acre from 10 to 21 inches DBH. Additional fuel treatments on the small diameter dead and dying material could occur in units that still exceed the threshold. Treatments include; yarding tops attached, grapple piling, hand piling, post and pole removal, or a combination of yard tops attached and one of the other mentioned treatments. As shown in table FF-3, the average fuel load in salvaged units in all biophysical environments meets threshold (Historic). This allows for maintenance of condition class 1 areas through future low intensity prescribed fires (see Table FF-III). A reburn, when fall down resulting from the Flagtial Fire contributing to the next fire, will not occur across the prjoject area. The falldown could contribute to fire effects and fire behavior in the patches that are not treated. Fire suppression would continue in these areas, and fires would show low to moderate fire behavior with low resistance to control (see Table FF-II). As an example, the fuel loads in unit 34 would be reduced from 66.9 tons/acre to 5 tons/acre by salvaging with yard tops attached and then cutting and grapple piling the material under 8 inches DBH. The fuels that will be on the ground in 20 years includes approximately 2.5 tons/acre from the snags and 2.5 tons/acre from other material that will be left on site.

Other areas are set aside for Black-Backed Woodpecker habitat. These areas are at least 75 acres in size and not available for salvage or un-merchantable fuel treatments. Higher future fire severity can be expected in these areas with high resistance to control, however surrounding areas that are treated would show low resistance to control and allow for probable success suppression efforts.

Fuel loads in the Wildland Urban Interface (WUI) areas would meet the threshold for historic levels in a majority of the areas. Areas that exceed the threshold for fuel loads are scattered throughout the WUI and are small in size. Fire suppression would continue within these WUI areas though the amount of fuels left will increase future fire severity and resistance to control in these scattered areas. Across the project area, fire suppression abilities will be improved from that of the No Action providing for firefighter safety.

Table FF-3: Expected Fuel Loads in 20 years by Fire Regime and Ecoclass

Regime / Plant Association Group	Historical Tons/Acre	Alt. 1	Alt. 2	Alt. 3		Alt. 4	Alt. 5	
				Salvage	No Salvage & Treat Small Fuels		Salvage	No Salvage & Treat Small Fuels
1/Hot Dry, Ponderosa Pine	5-7	42	8	12	15	34	12	N/A
1/ Warm Dry, Mixed Conifer	7-15	46	12	13	17	33	12	20
3/Cool Dry, Lodgepole Pine	15-25	48	21	19	22	28	21	N/A
1,3/Riparian Class 1 and 2	7-25	44	N/A	N/A	N/A	N/A	N/A	N/A

Figures 16-19 in the Map Section show expected fuel loads in 20 years for each alternative.

The following table shows fire behavior effects by alternative. All predictions are calculated out 20 years at extreme fire conditions similar to the Flagtail fire for the Hot Dry/Warm Dry plant association groups. All predictions assume a continuous bed of fuels with no change in aspect or slope. Actual flame length and tree mortality will be either higher or lower depending on these factors. Mortality is expected to be in a mosaic pattern for Alternatives 2, 3, and 5.

Table FF-4: Fire Behavior Effects at Extreme Fire Conditions at 20 Years

Effects in 20 Years	Alt. 1	Alt. 2	Alt. 3		Alt. 4	Alt. 5	
			Salvage	No Salvage & Treat Small Fuels		Salvage	No Salvage & Treat Small Fuels
Flame Length	7	2	2	7	7	2	7
Tree Mortality	100%	50%	50%	100%	100%	50%	100%

The following table shows fire behavior effects by alternative at prescribed fire conditions. All predictions are calculated out 20 years at conditions that are prescribed for a low intensity, stand management type of burn. All predictions assume a continuous bed of fuels with no change in aspect, slope, moisture, wind speed and direction. Actual flame length and tree mortality will be either higher or lower depending on these factors. The mortality shown in all alternatives can be reduced somewhat by using different lighting techniques than the model allows.

Table FF-5: Fire Behavior Effects at Prescribed Fire Conditions at 20 Years

Effects in 20 Years	Alt. 1	Alt. 2	Alt. 3		Alt. 4	Alt. 5	
			Salvage	No Salvage & Treat Small Fuels		Salvage	No Salvage & Treat Small Fuels
Flame Length	4	1	1	4	4	1	4
Tree Mortality	75%	25%	25%	75%	75%	25%	75%

Cumulative Effects

For this project, the cumulative effects analysis area was considered to be the project area. Ongoing and reasonably forseeable actions, as listed in Appendix J, that could affect fire and fuels include; fuel treatments (private lands), livestock grazing, personal use firewood, hazard tree removal, and riparian fuel treatment.

Fuel treatment on private lands would reduce the fuel loading on adjacent lands This would improve suppression capabilities on that land should another fire occur.

Domestic livestock grazing would not occur for at least two growing seasons under all alternatives. By the end of this time period, the grass and shrub layer will become continuous enough to carry a fire and may be represented by the Fire Behavior Prediction System (FBPS), fuel model 2. These fine fuels, along with dead branches and twigs would affect fire intensity. The resumption of grazing under all alternatives can 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.

Hazard tree removal would slightly reduce fuels within the areas that are being treated. This reduction would not be enough to affect fire behavior except on a limited basis if there are enough trees removed due to them being a hazard.

A fuel reduction project is planned for the Flagtail Fire project area to reduce future fuel loads in riparian areas. This project could include cutting and hand-piling dead and dying trees under 8-inch DBH, then burning the piles, or future low intensity prescribed fires. The effect of this project would be to reduce future fuel loadings in certain riparian areas from approximately 50 tons/acre to approximately 34 tons/acre moving towards the threshold of 25 tons/acre. The potential for future high severity fire effects would be reduced allowing low intensity prescribed fires to back into the riparian areas.

All other ongoing and future projects listed in Appendix J would not affect fuels and future fire severity.

Public and Fire Fighter Health and Safety

Existing Condition

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 the open roads in the project area have been identified. At this time all roads have been closed until that hazard can be removed.

In order to protect important values from undesired fire, firefighters must be able to remove the fuel and contain the fire. They must be able to do this in a manner that is safe for them. The shorter the fire's duration, the less potential exists for adverse weather changes or extreme fire behavior that can make conditions less safe for firefighters. There is also less exposure to elements such as smoke. Firefighters can more safely fight a fire if it stays small, has lower intensities, low spotting potential, and low resistance to control. High resistance-to-control ratings are reached when large woody fuels exceed 25 tons per acre in combination with small woody fuels of 5 tons per acre or more. The number of pieces larger than 10 inches in diameter is more important than the loading in determining resistance-to-control (Brown, 2003).

Resistance to control relates directly with firefighter safety. High resistance to control leads to more accidents to the firefighters from a variety of hazards including smoke inhalation and burnovers. As a result of surface fuel consumption during the Flagtail Fire, the resistance to control was lowered in all severely and moderately burned areas. A lack of canopy fuels in the severely burned areas has reduced the potential for crown fires.

Environmental Consequences

Direct/Indirect Effects

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 come 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. The No-Action alternative and Alternative 4 leave, by far, the most snags. Alternatives 2, 3, and 5 leave the least with Alternative 2 leaving fewer than 3 and 5.

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 the public. See Table FF-3 for a comparison of fuel loads by alternative.

Cumulative Effects

A fuel reduction project is planned for the Flagtail project area to reduce fuel loads in the riparian areas. The potential for high severity fire effects would be reduced thus reducing resistance to control and decreasing hazards to firefighters and public. Other projects as listed in Appendix J are not expected to have an effect on public and firefighter health and safety.

Air Quality

Existing Condition

The Flagtail project area lies adjacent to Bear Valley, a large, high mountain valley with the Silvies River draining the surrounding area. The lowest elevation of the valley is at Seneca, where the river flows from the valley to the south. 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 Seneca. Inversions affect air quality the most during the 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 the only Class I airshed located in the analysis area. It is located 14 miles to the northeast of the project area. A Class I area allows only very small increments of new pollution above already existing air pollution levels. There are several homes scattered in Bear Valley that are often effected by smoke from nearby burning, with the town of Seneca being affected the most. When smoke is lifted up and out of the valley area, as was the case with the Flagtail Fire, communities to the northeast are affected. These communities include John Day, Prairie City, and Baker City.

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 the Willamette Valley and Central Oregon. This burning affects haziness and can last for several days in the spring and summer. Bear Valley seems to be impacted the most from wood smoke during the winter months and from prescribed burning in the spring and fall. The impacts from prescribed burning are usually for 2-3 days after completion of the burn, and are worst at night.

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, the impacts from any activity are minimized. Fastracs is the program that is used to meet our requirement 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.

Environmental Consequences

Direct/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. Yard Tops Attached

This method was chosen to remove much of the fuels to a landing for possible utilization.

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

Alternative 1: No fuels are to be burned under this alternative.

Alternative 2: Would burn approximately 15.0 tons of slash per acre treated at landing piles. Would burn approximately 10 tons of slash per acre of hand and machine piles throughout each unit.

Alternative 3: Would burn approximately 13 tons of slash per acre treated at landing. Would burn approximately 10 tons of slash piled with hand and machine piles throughout each treated acre.

Alternative 4: Would burn approximately 10 tons of slash per acre treated.

Alternative 5: Would burn approximately 14 tons of slash per acre treated at landing piles and approximately 10 tons of slash piled with had and machine piles thoughout each treated acre.

3. Describe the type of burns (broadcast,pile understory etc.)

Alternatives 2, 3, and 5: Machine piles at landings, machine and hand piles scattered throughout the project area.

Alternative 4: Machine and hand piles 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).

Piles will be burned when the slash is at low fuel moisture. Pile burning will be occur over several years, which will reduce daily emissions.

Alternatives 2, 3, and 5: Reduced threat of large reburn, reducing future emissions.

5. Quantify the amount of emissions to be released.

Alternative 1: No emissions short term. Potential for excessive emissions long term.

Alternative 2: Approximately .4 tons of PM 10 emissions are produced per acre treated from burning of piles.

Alternative 3: Approximately .3 tons of PM 10 emissions are produced per acre treated from burning of piles.

Alternative 4: Approximately .2 ton of PM 10 emissions are produced per acre treated from burning of piles. Potential for excessive emissions long term.

Alternative 5: Approximately .4 ton of PM emissions are produced per acre treated from burning of piles.

See the *Fire and Fuels Specialist* Report for additional information on emissions

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 the 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 minimal that it would be dispersed before it reaches any populated areas or the nearest Class I area. Measures will be taken to reduce hazards from smoke impacts on roadways if needed. 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 the emissions limit is reached, no more burning is allowed for the year.

Cumulative Effects

None of the present and ongoing actions listed in Appendix J are expected to have effects on air quality. Any burning of fuels on private land would potentially add to the emission amounts described above but would only increase the amounts slightly.

Consistency with Direction and Regulations

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 the historical range. These fuel loadings would create conditions allowing for another high severity fire. Potential for excessive emissions that would impact air quality from high intensity fire are higher.

Alternative 2 is responsive to the objectives and standards in the Forest Plan. Proposed fuel reduction activities will minimize the potential of high intensity fire that also results in a cost-efficient protection program, as fires would show low resistance to control on the landscape. Reduced fuel levels would allow future use of prescribed fire to meet land management objectives. Fuel levels would be within the historical range on much of the landscape allowing 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 acres proposed for treatment.

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

Alternative 5 is responsive to Forest Plan direction as described above for Alternative 2. .

National Fire Plan

Alternative 1 is not responsive to the National Fire Plan.

Alternatives 2, 3, and 5 are responsive to the National Fire Plan by reduction of hazardous fuels. Alternative 2 reduces more acres of hazardous fuels than Alternative 3 or 5. Alternative 2 would reduce fuel in all Wildland Urban Interface areas to historical levels, while Alternatives 3 and 5 treat most but not all of these areas. The acres treated are however, sufficient to make the 3 Alterntives equally responsive to the NFP.

Alternative 4 includes fuel reduction of small diameter material, but it only reduces risks associated with wildland fires to the environment for short time periods without additional future fuel reduction activities so isn't responsive to the NFP.

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 and Oregon State Implemention Plan in order to ensure that clean air requirements are met. All alternatives are designed to meet National Ambient Air Quality standards through avoidance of practices that degrade air quality below health and visibility standards.

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.

Roads/Access

Introduction

The transportation system associated with the Flagtail Fire Recovery Project consists of 87 roads covering approximately 74 miles (see Figure 9, Map Section). This total includes all roads within the Flagtail Fire Project area as well as roads outside the project area that would be used as haul routes for the project. Approximately 63 miles of road associated with the Flagtail Fire are under Forest Service jurisdiction; the remaining 11 miles are Grant County Road 63. County Road 63 extends through the Flagtail Fire Recovery Project area and will be used as a haul route and for access to all parts of the project area. The county maintains this road through a Forest Road Development Agreement between Grant County and the Forest Service. Approximately 11 miles of County Road 63 will be used by the project. The County would be responsible for all maintenance on this route.

Of the roads under Forest Service jurisdiction, approximately 79% (50.1 miles) of these roads are Maintenance Level 2 which means that they receive minimal maintenance other than when they are used for projects such as timber sales. Prior to the Flagtail Fire these roads were drivable at designed maintenance levels though resource damage was occurring. Roads were not properly maintained after the fire and related activities which has left them in need of additional maintenance. Approximately 10% (6.2 miles) are either Maintenance Level 3 or 4 which means that they receive maintenance as called for under the Malheur NF Road Maintenance Plan. The remaining 11% (7.2 miles) are Maintenance Level 1 roads which are closed to vehicular traffic. However, many of these roads were opened for firefighter activities and need to be reclosed.

Regulatory Framework

A Roads Analysis for the Flagtail Area was completed in May 2003 (Flagtail Fire Recovery Roads Analysis, USDA Forest Service 2003) consistent with current direction (USDA Forest Service 1999), and it is incorpoarated in this FEIS by reference. All roads within the fire boundary or related to the fire recovery project (roads outside the fire which will be used for the fire recovery project or which will be affected by proposed activities) were included in this analysis. The analysis showed that there were roads in the area which should be closed to the public and other roads which should be decommissioned. The reasons suggested for the decommissioning of these roads include: unnecessary for future management purposes; protection of adjacent resources such as streams or aspen stands; reduction of sediment into adjacent streams. The Flagtail Fire Recovery Project is an opportunity to implement some of those recommendations.

The scope of the analysis for Roads/Access in this EIS includes all the roads related to this fire recovery project; however, this analysis was supplemented with additional access information inside the Flagtail Fire area to better reflect that most of the access changes are occurring in the Flagtail Fire boundary.

Existing Conditions

Most of the land within the Malheur National Forest is roaded with the majority of the roads being Maintenance Level 1 and 2. However, the fire also burned on both sides of Grant County Road 63, the main access to the Izee area from John Day, and Forest Service roads 24 and 2195 which are Maintenance Level 3 roads. All of the roads with the exception of Grant County Road 63 will need some work done on them. This work will range from simple maintenance to reconstruction as defined on Page 3231 of the Federal Register / Vol. 66, No. 9 / Friday, January 12, 2001 / Notices.

The transportation system associated with the Flagtail Fire Recovery Project consists of 87 roads covering approximately 74 miles (see Figure 9, Map Section). This total includes all roads within the Flagtail Fire Project area as well as roads outside the project area that would be used as haul routes for the project. Approximately 63 miles of road associated with the Flagtail Fire are under Forest Service jurisdiction; the remaining 11 miles are Grant County Road 63. Of these roads, about 67.3 miles are open, and 7.2 miles are closed. Within the Flagtail Fire Project area (not including haul routes outside the area), there are 51.8 miles of road with 46.5 miles of open road and 5.3 miles of closed road (see Table RO-1).

Included in the haul route is approximately 11 miles of Grant County Road 63 which crosses through the project area. Approximately 3 miles of the route are within the Flagtail Fire Recovery Project area and the remaining 8 miles extends from the northeast boundary of the project area to US Highway 395. This road is maintained by Grant County through a Forest Road Development Agreement between the county and the Forest Service.

Table RO-1: Existing Road Miles

Road Miles	Total	Open	Closed
Related to the Flagtail Project (including haul routes)	74.5	67.3	7.2
In the Flagtail Fire Project area	51.8	46.5	5.3

Following the fire, all roads except County Road 63 (the Izee Highway) have been temporarily closed to public access. This closure was necessary due to the numerous fire-damaged trees along roads, which presented a hazard to the users of the road. These trees will need to be felled prior to the road being reopened to the public or used for hauling logs. Hazard tree removal (of commercial size trees) on County Road 63 (Izee Hwy), and in the Forest Road 2400011 area, and partial removal of hazard trees in two other areas along Forest Roads 2400865, and 2400017 reduced the danger of snags falling onto these roads. Other trees considered hazards remain in the project area.

Some of the roads that are currently open (i.e., they no longer have a berm or other closure device) were opened to allow firefighter access during the fire and can be closed again. Any of the currently closed roads that are needed for project use will need some maintenance performed prior to use. Road 2400080, for example, was closed naturally, so before project use begins, brush will need to be cleared, and blading of the road surface will need to be done. Proper drainage structures will also need to be installed. This road is proposed for decommissioning after use and will need a log culvert pulled and seeding applied.

On most roads, the roadway surface is either rutted or has rill erosion, or both, which is caused by water running down the roadway or rutting made by the passage of a vehicle. This causes sedimentation to filter into adjacent streams. For example, drainage structures that were previously constructed on Road 2400048 are now in need of reshaping drainage dips, grade sags, cross ditches or waterbars.

Another example is road 2400133. The first 0.3 miles of this road will need to be reconstructed before project use. The road is in the bottom of the draw and becomes wet and muddy when used under wet conditions. It will need to be bladed and shaped, with proper drainage installed, and have at least 6 inches of aggregate placed on it to prevent rutting and siltation of the nearby stream. In addition there is a culvert which will need to be replaced with a larger culvert.

Other maintenance needs range from simply blading the road to reshaping the surface. Most roads in the Flagtail area will need this work done. There are also areas where rock will need to be placed to create a surface that will be resistant to rutting during the wet times of the year. For example, road 2400033, spot rocking should be applied to the road surface to protect the roadbed and to prevent any sedimentation going into streams. This road is proposed to stay open. Other maintenance items needed, includes brushing areas where there is vegetation encroaching on the road and seeding those areas where the soil has been disturbed by maintenance activities.

Included in the maintenance requirements for these roads is the following work which can be performed as maintenance in any contracts:

Blade and shape road including existing drainage dips, grade sags, and waterbars.
Remove and replace culverts with same size or larger culverts up to 36 inches diameter
Repair damaged culverts
Place rock in some existing drainage dips and grade sags
Place rock in wet areas of road
Brushing
Remove hazard trees

The following work is classified as maintenance under the definition listed in the Federal Register but will be listed as reconstruction in any contracts that are signed.

Construct new drainage dips.
Construct new waterbars.
Construct new outlet ditches.
Remove and replace culverts with same size or culverts greater than 36 inches diameter.
Place geotextile on existing road surface.
Place fill material in ruts in road.
Repair or replace existing cattleguards.

The Roads Analysis identified approximately 15 miles of road which could be decommissioned after any management activities are concluded. The reasons for the decommissioning of these roads are: no longer needed for future management purposes;

protect adjacent resources such as streams or aspen stands; reduce sediment into adjacent streams.

One road in particular is in need of decommission. Road 2400205 crosses Snow Creek over a log culvert which is not in good shape. If this culvert should collapse it could cause increase sediment to be deposited into the creek.

Environmental Consequences

Direct, Indirect, and Cumulative Effects

Alternative 1

The consequences of this alternative would be to leave the road system in the same condition it is in now (Figure 9, Map Section). Access would be provided at existing levels, but there would be no opportunity to close or decommission roads or to improve drainage by installing additional drainage dips, waterbars, or cross ditches. This alternative would not improve fish passage in Snow Creek by replacing a culvert on Road 2400133. This alternative would result in sedimentation into streams at the current levels or higher from existing roads, though no new road construction would occur and no temporary road would be built (see Watershed section of Chapter 3 for sediment effects). Hazard trees would be felled to provide safe access, but no removal would occur except trees used for planned riparian enhancement projects (in-channel wood as described in Chapter 1, Additional Fire Recovery Projects Ongoing or Completed).

Table RO-2: Road and Access Activities Occuring Inside the Flagtail Fire Boundary*

Activity	Measure	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
New Road Construction	Miles	0	0.3	0.3	0	0.3
New Temp. Roads	Miles	0	3.9	2.9	0	3.3
Roads Open	Miles	46.5**	29.2**	29.2**	30.1**	29.2**
Roads Decommissioned	Miles	0	13.1	13.1	11.9	13.1
Roads Closed	Miles	0	6.6**	6.6**	6.6**	6.6**
Unclassified Roads Decommissioned	Miles	0	2	2	2	2

*Roads Decommissioned category includes roads formerly closed; Roads Closed category includes only roads newly closed

**Table displays miles within the fire area; miles of roads open in the analysis area by alternative are: Alt. 1=67.3, Alts. 2, 3, and 5=48.4, Alt. 4=49.3 . In closing roads 6300-660, -661, and -662 inside the fire area, an additional 1.7 miles of roads (6300–664 and –665, and part of -662) would be closed outside the fire boundary to these roads' terminus.

Alternative 2, 3, and 5

These three alternatives recommend the same level of work on the transportation system (Table RO-2). Access would be reduced with approximately 29.2 miles of road remaining open to public use. Approximately 6.6 miles (plus 1.7 miles outside the fire boundary) of road which is currently open to traffic would be closed and approximately 13.1 miles of road were selected to be decommissioned (Figures 10, 11, and 13, Map Section). The work which would be done on all of these roads would include blading to eliminate existing ruts, brushing for safety, maintenance of existing drainage features such as drainage dips, waterbars, and cross ditches, placing rock in areas where it will help to decrease sedimentation into streams, and seeding. The accomplishment of this work will make the open roads safer to travel, reduce sedimentation, lower the open road densities and the total road densities, improve fish passage in Snow Creek, and improve fish habitat by closing and/or decommissioning roads in RHCAs. Hazard trees would be felled to provide safe access, and removal would occur as described in Chapter 2.

Much of the road work would be accomplished with timber sale funding. New construction would retain access to the upper part of Snow Creek drainage through replacement and decommissioning of a road in the Snow Creek RHCA. New temporary roads, authorized under the timber sale contract, would provide access for timber harvest activities. Since temporary roads are not intended to be part of the Forest transportation system, they would be decommissioned after timber sale activities were completed.

Alternative 4

This alternative also reduces access with approximately 30.1 miles of road remaining open to public use. Alternative 4 would close approximately 6.6 miles (plus 1.7 miles outside the fire boundary) of currently open roads and decommission approximately 11.9 miles of road (Figure 12, Map Section and Table RO-2). The roads which currently have CFR closures listed but were opened for fire activities would be closed. Since Road 2400133 along Snow Creek would not be replaced, access would be retained to the upper part of Snow Creek, but this road would continue to produce sediment with its accompanying detrimental effect on fish habitat and water quality. Hazard trees would be felled to provide safe access, but no removal would occur. This alternative would not have any commercial timber harvest so associated road work would have to be funded through other (often competitive) sources. Road work could be delayed until other funding was obtained. Temporary roads would not be needed so none would be constructed.

Cumulative Impacts of All Alternatives

As described above, past activities and occurrences (such as the Flagtail Fire) have affected roads and access in the analysis area. Past and proposed activities that affect roads and access have been analyzed in direct and indirect effects.

In review of Appendix J (Cumulative Effects), two ongoing and future actions could affect roads and access. The Forest Road Development Agreement associated with Grant County Road 63 is expected to continue to provide maintenance of this road and allow for use of this road within the Analysis Area. Routine surveys of roads would provide condition and effectiveness information to drive ongoing management and maintenance of roads. All other ongoing and future actions are not expected to affect roads and access. The cumulative effect of roads and access on other resources is discussed in each resource section.

Consistency with Direction and Regulations

Alternative 1 would not bring this area any closer to meeting the Standards and Guidelines for road densities, fish habitat, or water quality which are contained in the Malheur Forest Plan. Through implementation of Alternative 2 or 3 the Forest would move closer to meeting those Standards and Guidelines. Alternative 4 would move closer to meeting the Standards and Guidelines as funding became available to implement the activities.

Irreversible and Irretrievable Commitments of Resources

Alternative 2, 3, 4, or 5 if implemented, use rock on roads for spot rocking. This would be an irreversible commitment of rock (considered to be a resource). This rock would come from either the Flagtail Material Source or the Dipping Vat Material Source.

The only irretrievable commitment of forest resources proposed in Alternatives 2 and 3 would be the loss of productivity on the ground where 0.3 miles of new road would be built. There would be a short-term loss of productivity where temporary roads are built but those areas would be returned to productivity when the roads are rehabilitated.

Terrestrial Wildlife

Introduction

This section describes the terrestrial wildlife species found in the project area and the effects of the alternatives on these species. Rather than addressing all wildlife species, discussions focus on Forest Plan management indicator species (MIS), threatened, endangered, and sensitive (TES) species, Forest Plan featured species, and landbirds (see individual species lists below). TES species effects are analyzed in more detail in the Flagtail Fire Recovery Biological Evaluation (Appendix D).

The existing condition is described for each species, group of species, or habitat. Direct, indirect, and cumulative effects of alternatives are identified and discussed.

Regulatory Framework

The three principle laws relevant to wildlife management are the National Forest Management Act of 1976 (NFMA), the Endangered Species Act of 1973 (ESA), and the Migratory Bird Treaty Act of 1918. Direction relative to wildlife is as follows:

- NFMA requires the Forest Service to manage fish and wildlife habitat to maintain viable populations of all native and desirable non-native wildlife species and conserve all listed threatened or endangered species populations (36CFR219.19).
- ESA requires the Forest Service to manage for the recovery of threatened and endangered species and the ecosystems upon which they depend. Forests are required to consult with the US Fish and Wildlife Service if a proposed activity may affect the population or habitat of a listed species.
- MBTA established an international framework for the protection and conservation of migratory birds. This Act makes it illegal, unless permitted by regulations, to "pursue, hunt, take, capture, purchase, deliver for shipment, ship, cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird . . ."

Forest Service Manual Direction provides additional guidance: identify and prescribe measures to prevent adverse modifications or destruction of critical habitat and other habitats essential for the conservation of endangered, threatened, and proposed species (FSM2670.31 (6)). The Forest Service Manual directs the Regional Forester to identify sensitive species for each National Forest where species viability may be a concern.

The principle policy document relevant to wildlife management on the Forest is the 1990 Malheur National Forest Land and Resource Management Plan, referred to as the Forest Plan for the remainder of this section. The Forest Plan provides standards and guidelines for management of wildlife species and habitats. Standards and guidelines are presented at the Forest level (LRMP, pp. IV-26 to IV-33) or Management Area level (LRMP pp. IV-50, IV-53, IV-56 to IV-57, IV-105 to IV-107, and IV-108). Management Areas include General Forest (MA-1), Rangeland (MA-2), Non-Anadromous Riparian Area (MA-3A, Old Growth (MA-13) and Visual Corridors (MA-14).

The 1995 Regional Forester's Eastside Forest Plans Amendment #2 amended Forest Plans for the National Forests in Eastern Oregon and Eastern Washington, including the Malheur National Forest. Amendment # 2 established interim wildlife standards for old growth, old growth connectivity, snags, large down logs, and northern goshawks. The Regional Forester has periodically distributed letters clarifying direction in Amendment #2 (Regional Forester, October 2, 1997; October 23, 1997; June 11, 2003).

Additional management direction is provided for migratory landbirds. Concern for declines in population trends has led to the creation of an International Partners in Flight (PIF) network and program. In 1992, an Oregon-Washington Chapter of PIF formed, with a separate Oregon subcommittee for assessing conservation needs at the state level. In 1994, the Forest Service, Region 6, signed a Memorandum of Agreement with 14 other agencies and non-agency entities to develop a program for the conservation, management, inventory, and monitoring of neotropical migratory birds. Executive Order 13186 (66 FR 3853, January 17, 2001) directs the Forest Service to consider the conservation of landbird species in the design, analysis and implementation of activities on federal lands administered by the US Forest Service.

Analysis Methods

Effects on wildlife will be assessed for the burned area of National Forest land, focusing on effects of activities within proposed treatment units. The Flagtail fire has changed approximately 7,120 acres of wildlife habitat and the proposed activities will affect the trajectory of recovery of the burned area. The existing condition is described for each species, group of species, or habitat. Direct, indirect, and cumulative effects of alternatives are identified and discussed.

Rather than addressing all wildlife species, the Forest Plan focuses on three categories of wildlife: management indicator species (MIS), featured species, and threatened, endangered and sensitive (TES) species. In addition, interest has been raised for neotropical migratory birds. Categories and wildlife species are summarized below:

- **Management Indicator Species (MIS)**

  The Malheur Forest Plan, as amended, identifies 15 Management Indicator Species (MIS) and their associated habitat requirements. MIS habitat requirements are presumed to represent those of a larger group of wildlife species, and act as a barometer for the health of their various habitats. Pine marten, pileated woodpecker, and northern three-toed woodpecker represent old growth habitats, Rocky Mountain elk represent big game species, and primary cavity excavators (most woodpeckers) represent dead wood habitats. Effects to MIS species will be discussed in the Old Growth Forest, Big Game Habitat, and Primary Cavity Excavator sections respectively.

- **Featured Species**

  The Malheur Forest Plan defines a featured species as a wildlife species of high public interest or demand. The featured species associated with the project area are northern goshawk, blue grouse, and antelope. Effects to northern goshawk and blue grouse will be discussed in the Featured Species – Northern Goshawk and the Featured Species –

Blue Grouse sections, respectively Effects to antelope will be discussed as part of the Big Game Habitat Section.

- **Threatened, Endangered and Sensitive (TES) Species**

  An endangered species is an animal or plant species listed under the Endangered Species Act that is in danger of extinction throughout all or a significant portion of its range. A threatened species is an animal or plant species listed under the Endangered Species Act that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. A sensitive species is an animal or plant species identified by the Forest Service Regional Forester for which species viability is a concern either a) because of significant current or predicted downward trend in population numbers or density, or b) because of significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution. Threatened, endangered, and sensitive species effects are summarized in this section by TES status and species. The Flagtail Fire Recovery Biological Evaluation in Appendix D provides a more detailed discussion.

- **Landbirds including Neotropical Migratory Birds (NTMB)**

  Landbirds, including neotropical migratory birds, are discussed because many species are experiencing downward population trends. Discussion can be found in the section Species of Concern – Landbirds including Neotropical Migratory Birds (NTMB)

Species presence/absence determinations were based on habitat presence, wildlife surveys, recorded wildlife sightings, observations made during fire reconnaissance, non-Forest Service databases, and status/trend and source habitat trend documented for the Interior Columbia Basin. Formal wildlife surveys were not conducted for most species. Effects on habitats are discussed, with the assumption that if appropriate habitat is available for a species, then that species occupies or could occupy the habitat. This strategy is based upon science that demonstrates connections between species populations and viability and the quantity and condition of habitat at appropriate scales of analysis (USDA Forest Service 2001). There is a high confidence level that species discussed in this document are either currently present in the area or were prior to the fire.

Effects on species will be determined by assessing how alternatives affect the structure and function of vegetation relative to current and historical distributions. The Forest Vegetation section of this document defines the historical vegetation patterns and structure within the Malheur National Forest. Field reconnaissance information, pre-fire and post-fire aerial photos, and Geographic Information System databases provided additional information.

Some wildlife habitats require a detailed analysis and discussion to determine potential effects on a particular species. Other habitats may either not be impacted or are impacted at a level which does not influence the species or their occurrence. The level of analysis depends on the existing habitat conditions, the magnitude and intensity of the proposed actions, and the risk to the resources.

Old growth habitat was analyzed through fire area reconnaissance, the District's old growth map layer, Dedicated and Replacement Old Growth surveys, and post-fire structural stage determinations made by the District silviculturist. Because the Flagtail fire damaged several

Dedicated and Replacement Old Growth areas (MA-13), this analysis considered opportunities to relocate these management areas in unburned areas outside the fire area.

Elk habitat was evaluated using the Habitat Effectiveness Index (HEI) (Thomas et al. 1988), marginal and satisfactory cover percentages, and open road densities. Cover acres were estimated using 2002 aerial photo interpretation data; cover percentages were reduced to reflect losses due to the fire. Open road densities were calculated using the District access travel management database. Values were estimated for National Forest lands at the subwatershed level. The large expanses of private land to the east of the project area were not included in calculations, although they were considered in cumulative effects discussion.

Snag densities and sizes were estimated using data obtained through stand exams. The District silviculturist stratified forest stands by tree species, stand structure and burn severity. For the DEIS, exams were completed on a sample of the stands within each grouping, and then extrapolated over the remainder of the stands or treatment units. Because the Decision Maker decided to forgo salvage in the Riparian Habitat Conservation Areas (RHCAs), no exams were initially collected in these areas. Between the DEIS and FEIS, additional snag data was collected to improve the analyses for snags, fuels, harvest volume and economics. For the FEIS, snag data has been collected on nearly every stand or proposed treatment unit within the burn area perimeter, including stands in the RHCAs.

This EIS uses the DecAID analysis tool (Mellen et al. 2003) to evaluate alternative effects on dead wood habitats. DecAID is an internet-based computer program developed as an advisory tool to help federal land managers evaluate effects of management activities on wildlife species that use snags and large, down logs. The tool synthesizes published literature, research data, wildlife databases, and expert judgment and experience. Both woodpecker use and snag inventory data was used in this analysis.

Effects to threatened, endangered and sensitive (TES) species are summarized in this Chapter and then described in more detail in the Wildlife Biological Evaluation in Appendix D.

Landbirds, including neotropical migratory birds (NTMB), were analyzed based on high priority habitats identified in the Oregon-Washington Chapter of Partners in Flight, Northern Rocky Mountains Bird Conservation Plan (Altman 2000). While the Forest has not conducted official NTMB surveys in the project area, the Oregon Breeding Bird Atlas (Adamus et al. 2001) includes observational data for this area. Much of the data for the Malhuer National Forest was obtained from local biologists and ornithologists. Most NTMB species that are expected in the project area were recorded within the atlas'hexagons for the area. Based on a review of the District's wildlife database and observations made during reconnaissance of the fire area, there is a high confidence level that species discussed in this report are either currently present in the area or were prior to the fire.

Cumulative effects analyzed in respect to past, ongoing and foreseeable future activities listed in Appendix J. These effects were first analyzed within the context of the project area, i.e., the burn area. If there were no contributions to negative or positive cumulative effects at that scale, then no further analysis was conducted. If there were contributions to effects at that scale, then the analysis scale was broadened to a larger land base scale, usually the subwatershed level

Alternative 1, the No Action alternative, is required by NEPA. It is used as a benchmark to compare and describe the differences and effects between taking no action and implementing action alternatives. The No Action alternative is designed to represent the existing condition; resource conditions are then projected forward in time to estimate resource changes expected in the absence of the proposed management activities. However, if the No Action alternative is chosen, the Forest Service still maintains the discretion to adjust Dedicated and Replacement Old Growth areas (MA-13), plant trees, and close roads by conducting separate environmental analyses.

Old Growth Forest

Existing Condition

Dedicated and Replacement Old Growth

Region 6 developed a network of designated habitat areas to provide blocks of old growth coniferous forest across the landscape designed to support old growth management indicator species populations and allow for dispersal of individuals. These are known as Dedicated Old Growth (DOG) areas and Replacement Old Growth (ROG) areas. Replacement areas may not have all the characteristics of old growth, but are managed to achieve those characteristics so that when a Dedicated Old Growth area no longer meets the needed habitat requirements, the replacement old growth area can take its place.

On the Malheur National Forest, these old growth blocks were designed to provide the necessary network of habitat areas for pileated woodpecker and pine marten. Although these old growth areas are managed specifically for these two species, the Forest Plan assumes the old growth network will provide habitat for many other old growth associated species as well. In addition, the three-toed woodpecker is identified as a management indicator species for old growth lodgepole; however, habitat on the Malheur is quite limited and few old growth areas have been formally designated. No formal surveys have been conducted for these species. Pre-fire, the DOG and ROGs have periodically been visited to record species sightings.

Pileated Woodpecker

Pileated woodpecker prefer mature and old growth forests with at least 60% canopy cover (Bull and Holthausen 1993). This species relies heavily on snags and downed wood material for foraging. Nests are built in cavities excavated in large (> 21 inches DBH) dead or decadent ponderosa pine, western larch or grand fir trees. Pileated woodpeckers are not strongly associated with post-fire habitats; individuals may use a burned area for foraging, but are not expected to nest there (Bull and Holthausen 1993).

Habitat trend information derived from Interior Columbia Basin studies (Wisdom et al. 2000) indicated that about 60% of the watersheds in the Blue Mountains showed a decreasing trend in pileated woodpecker habitat and 30% showed an increasing trend. Declines in source habitat are primarily attributed to a reduction in late seral forest. Breeding Bird Survey (BBS) data indicated a 7.8% annual decline in populations in Oregon and Washington from 1966 through 1994 (Wisdom et al. 2000).

The Forest Plan directs that pileated woodpecker Dedicated Old Growth (DOG) areas are to be at least 300 acres of mature and old growth habitat; Replacement Old Growth (ROG) areas are intended to be half the size of the DOG, i.e., about 150 acres. Pileated woodpecker DOGs were delineated Forest-wide to provide an even distribution of habitat areas, one DOG every 12,000 acres, or approximately 5 miles apart. Management requirements were derived from the US Forest Service 1986 Minimum Management Requirements.

Pine Marten

Pine martens prefer mature old growth forest with a well-developed canopy. Martens show a strong avoidance of open areas, probably as a response to predator avoidance (Hawley and Newbry 1957). Cover and prey species largely determine their distribution and abundance. Snags and downed woody material are important for winter and summer dens, resting sites, and cover for prey species. Strickland and Douglas (1987) found that marten did not use recent burns because habitat changes reduced prey populations and overhead cover. Avoidance persisted for as long as 23 years post-disturbance, generally until regenerated forests provided overhead cover.

Habitat trend information derived from Interior Columbia Basin studies (Wisdom et al. 2000) indicated that about 50% of the watersheds in the Blue Mountains showed a decreasing trend in marten habitat and 35% showed an increasing trend. The distribution of marten within the Interior Columbia Basin has been fairly stable, but population changes are not known (Wisdom et al. 2000).

The Forest Plan directs that pine marten DOGs are to be 160 acres and ROGs are to be 80 acres. Pine marten DOGs were delineated every 4,000 to 5,000 acres, or approximately 3 miles apart. Management requirements were derived from the US Forest Service 1986 Minimum Management Requirements.

Northern Three-Toed Woodpecker

There are no designated habitat areas for northern three-toed woodpecker in the project area. This species is also a management indicator species for dead and defective habitat; Existing Condition for this species is discussed in the section below on Primary Cavity Excavator Species.

Habitat trend information derived from Interior Columbia Basin studies (Wisdom et al. 2000) indicated that about 70% of the watersheds in the Blue Mountains showed an increasing trend in three-toed woodpecker habitat and 30% showed a decreasing trend. Breeding Bird Survey (BBS) data is insufficient to determine population trends in the Interior Columbia Basin, but data summarized across the West indicates a 0.7% annual decline in populations from 1966 through 1994 (Wisdom et al. 2000).

Old Growth Forest Within the Project Area

Two DOG areas and one ROG area are located within the burn area (see Figure 14, Map Section). Prior to the fire, DOG 220 contributed towards pileated woodpecker management requirements and DOG/ROG 221 contributed to pine marten management requirements.

The fire burned through both old growth areas; fire intensities ranged from moderate intensity or mosaic burns (60% to 90% tree mortality) to severe intensity or total burns (greater than 90% tree mortality). Table WL-1 below identifies the DOGs and ROGs within the project area, subwatersheds, total acres, total acres burned, and post-fire structural stage.

Table WL-1: Dedicated and Replacement Old Growth Areas Burned

Old Growth Area	MIS Species	Subwatershed	Total Acres	Acres Burned by Mortality Class	Post-fire Structural Stages
DOG 220	Pileated Woodpecker	Snow - 60509, Jack - 60507	325	Severe = 124 ac. Mod. = 201 ac.	SI, UR
DOG 221 ROG 221	Pine Marten	Jack - 60507, Snow - 60509	611	Severe = 484 ac. Mod. = 127 ac.	SI, UR

DOG = Dedicated Old Growth, ROG = Replacement Old Growth
MIS = Management Indicator Species
Tree Mortality Classes:
Severe Mortality (total burn) = 90%+ tree mortality
Moderate Mortality (mosaic burn) = 60% to 90% tree mortality
Low Mortality (underburn) = 30% to 60% tree mortality
SI = Stand Initiation; UR = Understory Re-initiation

Post-fire, there is essentially no mature or old growth habitat remaining that meets pileated woodpecker, pine marten or three-toed woodpecker habitat requirements based on the current Forest Plan guidelines. The DOG and ROG areas are no longer functioning as old growth. Stands have been converted to understory re-initiation (UR) and stand initiation (SI) structural stages. Canopy cover has been reduced below 20% and in many places eliminated all together. Snags resulting from the fire will provide nesting and foraging habitat for northern three-toed woodpeckers and foraging habitat for pileated woodpeckers.

The fire also destroyed old growth habitat outside of the DOG and ROG areas. Forest vegetation data estimates that 1,585 acres or 26% of the forestlands were classified as old forest multiple strata (OFMS) prior to the fire. Post-fire, about 30 acres of old growth remain (see Forest Vegetation Section). What little habitat remains is small and highly fragmented, and although vegetation conditions may classify these areas as old growth, they likely provide for few old-growth dependent species. These old growth conditions may be important as legacy structures in future stands.

The Upper Silvies Watershed Analysis (USDA 2001) estimated that about 19,900 acres or 30% of the watershed classified as old growth. Post-fire, old growth estimates for the watershed would be about 28%. It is estimated that historically the amount of old growth was far greater (see Chapter 3, Forest Vegetation, Stand Structural Stages, Table FV-4).

Old Growth Connectivity

Connectivity refers to habitat between old growth areas that allows species to move between these areas. Regional Forester's Eastside Forest Plans Amendment 2 (1994) requires that connectivity corridors be established between late and old structure stands. Stands should commonly have medium diameter or larger trees (≥9 inches DBH), and canopy closure should be within the top 1/3 of site potential. Corridors should be at least 400 feet wide. If appropriate stands are not available, then the next best stands will have to provide connectivity, and should be managed to improve connectivity. Generally, connectivity corridors are maintained or managed at higher tree densities and canopy cover than adjacent areas to provide more security for dispersal or movement.

Post-fire connectivity habitat is best evaluated by viewing the tree mortality/survival map (see Figure 6, Map Section). Light mortality or underburn areas and non-burn areas (10% of the forested areas) are currently providing the best connectivity in the area, and are likely the only stands that meet Forest Plan standards. Moderate tree mortality areas (39% of the forested acres) may provide some additional connectivity, but are highly fragmented in many places due to the mosaic nature of the burn. Severe tree mortality areas do not provide connectivity. Connectivity between old growth stands in and immediately adjacent to the fire area is now highly limited.

Environmental Consequences

The Vegetation Section, Stand Structural Stages, of this DEIS projects old growth development in the burn area under the No Action and Action alternative scenarios (see Vegetation Section and Tables FV-6 and FV-7).

Direct and Indirect Effects

No Action

There would be no direct effects to old growth habitats within the project area. The fire has essentially eliminated all old growth from the burn area. Habitat effectiveness for old growth species would remain as described in the existing condition. The No Action alternative would have no immediate effects on pine marten, pileated woodpeckers, or their habitats. Research has shown that martens are unlikely to be present in burned areas for 20 or more years post-fire (Strickland and Douglas 1987). Pileated woodpeckers are not strongly associated with post-fire habitats; individuals may use a burned area for foraging, but are not expected to nest there (Bull and Holthausen 1993).

The No Action alternative would not designate any new DOG areas to replace those lost in the fire, creating gaps in the old growth network. Existing DOGs and ROGs would not meet Forest Plan standards for designated habitats, and there would be a net reduction (936 acres) in suitable habitat for pileated woodpecker and pine marten under the MA-13 designation.

Old growth development throughout the entire project area is dependent on the number and size of the trees that survived the fire. In 50 years, old growth conditions could be naturally reestablished on about 10% of the project area (see Vegetation Section, Table FV-6), still substantially lower than the 26% that existed before the fire. This old growth would develop from stem exclusion open canopy stands (SEOC) that were lightly burned by the fire, and consequently retained many medium–sized live trees. Because old growth would develop from existing live trees, reforestation success is of little consequence in these stands. Contrarily, in the moderately to severely burned areas, old growth development *is* highly dependent on regeneration success. Under a natural regeneration scenario, it is expected that it will take newly regenerated stands 150 to 180 years to reestablish old growth structure.

Stands would develop into either old forest single stratum (OFSS) or old forest multiple strata (OFMS) depending on site-specific conditions including biophysical environment, amount and rate of natural regeneration, natural disturbance, and future management activities. It is expected that the landscape would include a mosaic of both old growth types. OFSS would favor such species as white-headed woodpecker and flammulated owl and

OFMS would favor cover-dependent species such as pileated woodpecker, pine marten and northern goshawk. Combined, the two old growth structural stages could comprise as much as 80% of the project area by year 150.

The No Action alternative would maintain existing connectivity. Although dead tree boles might provide a small amount of cover, the use of burn areas for connectivity is very limited. Light mortality or underburn areas and non-burn areas (10% of the forested areas) are currently providing the best connectivity in the area (see Figure 6, Map Section), and are likely the only stands that meet Forest Plan standards. In moderately and severely burned areas (90% of the forested areas), connectivity habitat for species that rely on ground cover, such as pine marten, could be reestablished once snags have fallen and live trees have been reestablished. Because the No Action alternative relies on natural regeneration to reforest burned areas, recovery of this minimal level of cover could take 35 to 65 years. Although these stands may provide connectivity habitat as early as year 35 for some animals, it should be noted that conditions would still not meet connectivity definitions as defined by the Regional Forester's Eastside Forest Plans Amendment #2 (1994). Moderately and severely burned areas could take 60 to 90 years to develop into connectivity habitat as defined in Amendment #2.

The risk of an intense reburn is high with this alternative, although risks do not increase for 10 to 20 years, the time it is expected for snags to fall to the ground and elevate fuel loads beyond risk thresholds. Development of OFSS and OFMS would be further delayed if another stand replacement fire were to occur.

Action Alternatives

All action alternatives would designate new MA-13 old growth areas to replace those lost in the fire (see Map Section, Figure 14, for original and new locations). The relocation of Dedicated Old Growth (DOGs) and Replacement Old Growth (ROGs) should better maintain the integrity of the Forest's old growth network. The Flagtail Fire has reduced the ability to maintain the old growth network at the recommended spacing, but action alternatives would maintain desired acres in MA-13.

Under all action alternatives, DOG 220 will be converted to a Replacement Old Growth area. This old growth area burned with moderate to severe mortality of trees. Although this area no longer classifies as old growth, a sufficient number of large live trees remain to manage this area as replacement old growth. A new DOG would be designated immediately outside the fire perimeter in the Hog subwatershed, approximately ¼ mile away. In the new DOG, stands are generally classified as old forest multiple strata (OFMS) and young forest multiple strata (YFMS). One stand of stem exclusion (SE) is included; however, the new DOG has been increased from 325 acres to 353 acres to ensure sufficient habitat. Although the number of large diameter trees in the YFMS stands are lower than that required for old growth classification, many of the other characteristics that define old growth (multiple canopies, snag and down wood habitat) are intact. A non-significant Forest Plan amendment would be required to create the new DOG and convert the original DOG to a ROG. A new DOG would add 353 acres of mature habitat to the MA-13 designation.

Under all action alternatives, DOG/ROG 221 will be relocated outside the fire perimeter. This old growth area burned with severe mortality of trees; few live trees remain. Areas outside the fire perimeter do not provide a similar sized block of mature and old growth habitat. Consequently, *two* new DOG/ROGs would be established to replace the one lost in the fire. DOG/ROG 221-A will be relocated approximately 3 miles northwest in the Wickiup subwatershed. DOG/ROG 221-B will be established about 2 miles southeast in the Jack subwatershed. Both sites provide late-seral habitat, a combination of old forest multiple strata (OFMS) and young forest multiple strata (YFMS) stands. These smaller DOG/ROGs would not provide the same quality habitat as the larger, single block of old growth that existed prior to the fire; however, the new locations provide better opportunities to manage for old growth given the level of fire damage in the original location. The new DOG/ROGs will meet size requirements in the Forest Plan. Acres in the DOG/ROG 221-A and 221-B would be converted from General Forest (MA-1) to Dedicated Old Growth (MA-13). Conversely, existing DOG/ROG 221 would be converted from MA-13 to MA-1. A non-significant Forest Plan amendment would be required to relocate DOG/ROG 221 and change Management Area (MA) designations. The new DOG/ROG areas would replace 611 acres of mature habitat in the MA-13 designation.

Table WL-2 summarizes changes to Dedicated and Replacement Old Growth Area Designations by Alternative.

Table WL-2: Dedicated and Replacement Old Growth Areas Burned

Old Growth Area	MIS Species	Subwatershed	Alternative 1	Alternatives 2, 3, 4 and 5	
			Acres	Acres	Comments
DOG 220 (Existing)	Pileated Woodpecker	Snow - 60509, Jack - 60507	325	353	DOG relocated to Hog Subwatershed – 60511. Converted from MA-1 to MA-13 Old Growth
ROG 220 (New)	Pileated Woodpecker	Snow - 60509, Jack - 60507	0	325	New ROG in same location as old DOG
DOG 221 (Existing)	Pine Marten	Jack - 60507, Snow - 60509	431	0	Converted from MA-13 to MA-1 General Forest
ROG 221 (Existing)	Pine Marten	Jack - 60507, Snow - 60509	180	0	Converted from MA-13 to MA-1 General Forest
DOG 221-A (New)	Pine Marten	Wickiup - 60513	0	189	Converted from MA-1 to MA-13 Old Growth
ROG 221-A (New)	Pine Marten	Wickiup - 60513	0	83	Converted from MA-1 to MA-13 Old Growth
DOG 221-B (New)	Pine Marten	Jack - 60507	0	248	Converted from MA-1 to MA-13 Old Growth
ROG 221-B (New)	Pine Marten	Jack - 60507	0	137	Converted from MA-1 to MA-13 Old Growth
TOTAL			DOG = 756 ac. ROG = 180 ac.	DOG = 790 ac. ROG = 545 ac.	

DOG = Dedicated Old Growth, ROG = Replacement Old Growth
MIS = Management Indicator Species
MA-13 = Management Area for Old Growth:
MA-1 = Management Area for General Forest

Salvage harvest and fuels reduction would not affect mature or old growth habitat in the short-term. Burned areas are no longer functioning as old growth habitat and are not likely to be used by pileated woodpecker for nesting or by pine marten for denning before forest cover is reestablished. These species may use dead wood habitats for foraging substrate, but neither has a strong association with post-burn habitats. In all alternatives, snag and woody debris guidelines would maintain habitat components for foraging (see the Primary Cavity Excavator section for addition information on foraging habitat).

Under the new MA-13 designations (see Table WL-2), only ROG 220 would be entered for treatment. Alternatives 2 and 5 would treat 277 of 325 acres with a combination of commercial and non-commercial harvest. Alternatives 3 and 4 would treat 192 acres and 277 acres respectively, but only non-commercial trees would be felled. Habitat within ROG 220 is not functioning as old growth, but will be managed to provide old growth in the future; no adverse effects to pileated woodpecker nesting habitat or pine marten denning habitat is expected. This area provides some of the better site conditions (aspect, forest type) for providing future OFMS.

Although the new ROG 220 could take as many as 150 years to redevelop into old growth, the mosaic of large, live and dead trees provides legacy features for future old growth. Snags would eventually fall, but could still provide down wood structure for cover and forage. Alternatives 3 and 4 would retain snags 10 inches DBH and greater; therefore, leaving the most structure. In ROG 220, snags 10 inches DBH or greater range from about 35 to 65 snags per acre; snags 20 inches DBH and greater range from 3 to 8 snags per acre. Alternative 5 would retain 7 snags per acre, including the largest 5 snags over 14 inches DBH. Alternative 2 would retain 2.39 snags greater than 20 inches DBH.

All four action alternatives would decommission all existing roads within ROG 220, about 1.7 miles. Elimination of roads will benefit the ROG in the long-term, reducing the potential for future habitat fragmentation and traffic disturbance.

As stated in the No Action alternative, old growth development throughout the entire project area is dependent on the number and size of the trees that survived the fire and the rate of conifer regenetration. In 50 years, old growth conditions could be naturally reestablished on about 10% of the project area (see Vegetation Section, Table FV-7), the same as under the No Action alternative. This old growth would develop from stem exclusion open canopy stands (SEOC) that were lightly burned by the fire, and consequently retained many medium–sized live trees.

Planting proposed in all action alternatives would reforest moderately and severely burned areas more quickly than if no action was taken and natural regeneration was required to reforest the area (see Vegetation Section, Tables FV-6 and FV-7). Old growth development would be accelerated. The disparity in planting trees versus natural regeneration does not become readily apparent until around 100 years when late and mature stands (YFMS, OFMS, OFSS) could comprise 100% of the area under the action alternatives versus 80% under the no action alternative. By year 140, 100% of the stands could be OFSS or OFMS versus the No Action alternative, which would take 150 to 180 years to move 80% of these areas into the OFSS/OFMS stage.

All action alternatives would maintain existing connectivity by retaining all live trees except those felled to facilitate logging operations or reduce safety hazards (see existing condition section). Although standing dead trees might provide a small amount of cover, the use of burn areas for connectivity is very limited.

Future connectivity habitat would develop as described in Alternative 1 except that tree planting would accelerate habitat recovery. Marten would likely first return to sites where vegetation cover has recovered and an abundance of downed logs have accumulated; e.g., non-harvested riparian areas. Alternatives 2, 3 and 5, forgo commercial harvest on 30%, 53%, and 40% of the forest acres, respectively. In addition, Alternative 3 also retains the highest snags levels within salvage units (see Primary Cavity Excavator section). Alternative 4 forgoes all commercial harvest, and therefore, would generate favorable conditions on the most acres. In the moderately to severely burned areas, recovery of cover for dispersal of pine marten could take 15 to 25 years versus 35 to 65 years under the No Action scenario. Restoration of connectivity habitat as defined by the 1994 Regional Forester's Plan Amendment #2 could take 50 years to develop as compared to 60 to 90 years under the No Action alternative.

Under Alternative 4, the elevated fuel loads expected in 10 to 20 years increase the risk of an intense re-burn; another stand replacement fire could further delay development of old growth. Development of OFSS and OFMS would be further delayed if another stand replacement fire were to occur. Alternatives 2, 3 and 5 also leave some burn areas untreated, but salvage logging and fuels reductions reduce overall fuel loads and break up the continuity of fuels remaining.

Cumulative Effects

All of the activities in Appendix J have been considered for their cumulative effects on old growth and associated species. The following discussion focuses on those past, ongoing and reasonable foreseeable future activities that may contribute negative or positive effects.

Since 1993, the Forest Plan as amended, has directed the Malheur National Forest to conduct timber sales in a manner that moves stands towards OFMS and OFSS structural stages, and timber sales planned since that time should not have contributed to loss of mature and old growth forest. Although future timber management activities have yet to be proposed for the unburned areas of the affected subwatersheds, any management would be expected to continue under current or similar direction. In burned riparian areas, hardwood and conifer planting is being planned under separate NEPA documents; conifer planting will help accelerate development of old growth. The Forest's firewood policy prohibits the cutting of firewood in Dedicated and Replacement Old Growth areas, so prescribed snag and downed wood levels should be maintained.

Adjacent private lands have already been salvage logged and planted. In the past these timber stands have not been managed for old growth habitat and no change in this strategy is expected. These areas are not expected to provide OFMS or OFSS habitat.

In 2002/2003, fire-killed, hazard trees were salvaged on 14 acres at the Bear Valley Work Center and on 650 acres along roads. Future fuels reduction is planned on 100 acres inside Riparian Habitat Conservation Areas (RHCAs); dead, unmerchantable trees 8 inches DBH and smaller would be felled, then hand piled and burned outside of the riparian areas. When combined with salvage logging and fuels treatment proposed in Alternatives 2, 3 and 5, landscape-level fuels treatments are expected to help reduce the risk of an intense re-burn and another stand replacement fire. Under Alternatives 1 and 4, combined fuel treatments are less likely to reduce fuel loads sufficiently to avoid intense re-burns in the future.

In the short-term, the four action alternatives would not contribute to cumulative losses of mature and old growth habitat because stands treated no longer function as old growth. In the long-term, the action alternatives would contribute positively to cumulative effects by accelerating the development of old growth, and therefore, contribute positively toward the viability of species that use these habitats.

Summary

Salvage harvest and fuels reduction would not affect mature or old growth habitat in the short-term. Burned areas are no longer functioning as old growth. Pileated woodpeckers and pine martens are not strongly associated with post-burn habitats. In all alternatives, snag and woody debris guidelines would maintain habitat components for foraging; the amount of dead wood habitat retained varies by alternative (see the Primary Cavity Excavator section for addition information on dead wood habitat).

Planting proposed in all action alternatives would reforest moderately and severely burned areas more quickly than if no action was taken and natural regeneration was required to reforest the area. In the moderately to severely burned areas, old growth habitat could be recovered in 140 years versus 150 to 180 years under the No Action alternative.

The No Action alternative would not designate any new Dedicated Old Growth stands to replace those lost in the fire, creating gaps in the old growth network. Conversely, all action alternatives would designate new old growth areas.

Under Alternatives 1 and 4, the elevated fuel loads expected in 10 to 20 years increase the risk of an intense re-burn; another stand replacement fire could further delay development of old growth. Alternatives 2 and 3 also leave some burn areas untreated, but salvage logging and fuels reductions reduce overall fuel loads and break up the continuity of fuels remaining.

There are no significant direct, indirect or cumulative effects to pileated woodpeckers or pine martens or their habitat from any of the alternatives.

Big Game Habitat

Existing Condition

Rocky Mountain elk, mule deer and antelope are the big game species of concern due to their high public value. The project area is entirely within big-game summer range. Species are considered wildly distributed across the District, Forest and the Blue Mountain Region. Rocky Mountain elk are identified in the Forest Plan as a management indicator species (MIS); habitat quality is evaluated in terms of forest cover, forage quality, and open road density. Antelope are identified in the Forest Plan as a featured species dependent on open landscapes.

Two habitat components, thermal/hiding cover and forage, have been significantly reduced as a result of the fire. Many animals may have dispersed into the unburned portions of the Hog and Keller subwatersheds as well as other adjacent subwatersheds. Loss of habitat may concentrate more animals into adjacent areas, forcing increased competition for cover. Loss of habitat has likely affected big game distribution and use, rather than actual population numbers.

Antelope primarily use open landscapes. Most of their habitat is on private property in Bear Valley, although they are often seen along the forest edges around Bear Valley as well. Forest edges and aspen stands provide fawning habitat. Although the fire opened up landscapes, the high density of standing dead trees combined with an initial deficiency in forage may still preclude high use. The fire has probably had minimal impact on antelope populations and distribution because there is little change in the current habitat situation.

Thomas, et al. (1988), developed the Habitat Effectiveness Index (HEI) model for estimating elk habitat effectiveness on the landscape. Overall habitat effectiveness (HEscr) incorporates three variables or indices for summer range: cover quality (HEc), size and spacing of cover (HEs) and open road density (HEr). The Forest Plan establishes minimum standards for these indices. In addition, the Forest Plan establishes minimum standards for retention of satisfactory cover (%S), marginal cover (%M), total cover (%S and M), and open road density (see Table WL-3).

Table WL-3 displays existing HEI values, cover percentages, and open road densities for each subwatershed affected by the fire. The large expanses of private land to the east of the project area were not included in the analysis. Most of this private land is in open grasslands and shrublands and would not give a good picture of the real effects of cover losses and open road densities. Where the private lands were forested, stands have been intensively managed and much of the forest was burned over by the fire.

Table WL-3: Existing HEI Values, Cover Percentages and Open Road Densities by Subwatershed.

Subwatershed	HEc	HEs	HEr	HEcsr (HEI)	%S	%M	Total Cover %	Open Road Density (miles per square mile)
Forest Plan Standard	.30	.30	.40	.40	8%	5%	20%	3.2
Jack - 60507	.81	.22	.22	.37	6%	4%	10%	4.84*
Snow - 60509	.66	.14	.29	.34	1%	2%	3%	4.05
Hog - 60511	.67	.73	.32	.53	14%	27%	41%	3.75*
Keller - 60515	.63	.74	.51	.59	10%	29%	39%	1.75

HEI = Habitat Effectiveness Index
HEc = habitat effectiveness derived from the quality of cover
HEs = habitat effectiveness derived from the size and spacing of cover
HEr = habitat effectiveness derived from the density or roads open to vehicular traffic
%S = Satisfactory Cover
%M = Marginal Cover
% Total Cover = %S + %M
* Portions of the Keller and Hog subwatersheds are in the Murderer's Creek-Flagtail Cooperative Travel Management Area (also known as a green dot closure area).. Restriction periods occur in the fall and correspond to general deer hunting season and elk hunting season. Open road densities in this table do not reflect seasonal closures. These closures would further reduce open road density and increase HEr and HEI values. Very little of the green dot area is within this project area; although numbers would change to the benefit of big game, the change is relatively small.

Forage

Elk, deer and antelope are already using the burn area (personal observation); post-burn forage is limited, but the new sprouts are nutrient-rich and highly palatable. Forage is expected to recover rapidly Oregon Department of Fish and Wildlife (K. Rutherford, ODFW wildlife biologist, personal communication May 8, 2003) reported that in the Summit Fire area, northern Blue Mountain District, deer and elk use increased as forage recovered rapidly following the 1996 fire. Improved forage increased big game reproductive rates and subsequently, has increased populations. Forage may not recover as rapidly in the Flagtail Fire area because no seeding was undertaken following the fire.

Cover

Little marginal or satisfactory cover remains within the fire perimeter. Some smaller patches exist where the fire burned at low severity, but few stands meet the minimum 40% canopy closure or the 10- to 30-acre patch size standards established in the Forest Plan. Deer and elk are believed to use thermal cover to reduce the effects of weather and temperature extremes and to hide from predators. The fire eliminated nearly all of the cover within the Snow and Jack subwatersheds, and neither subwatershed meets Forest Plan cover or HEI standards (see Table WL-3). The fire burned fewer acres in the Hog and Keller subwatersheds; therefore, these subwatersheds still meet cover and HEI standards (see Table WL-3).

It is important to note that recent research at the Starkey Experimental Station in La Grande, Oregon (Cook 1998) has raised the concern that resource managers may be overstating the importance of thermal cover, i.e., marginal and satisfactory cover, on elk condition. Studies suggest that the energetic benefits of thermal cover may be inconsequential to elk performance, and that it is forage or nutritional effects that may have the greater impact on individual animal performance. However, these studies do not dispute elk's preference for dense forest stands or the numerous studies that show elk using dense stands disproportionately to their availability. Dense conifer cover contributes to better distribution of elk across available habitat, and may be more of a disturbance/hiding cover issue than a thermal regulation issue.

Post-fire, very little hiding cover exists within the fire perimeter. Hiding cover provides a visual barrier between big game animals and disturbance sources. This is especially important during hunting season when big game animals alter their travel patterns to avoid humans. Dead tree boles might offer some security, but only where snag densities are high, and even then it is of limited value compared to a similar live, green tree situation.

Oregon Department of Fish and Wildlife (K. Rutherford, ODFW wildlife biologist, personal communication May 8, 2003) concluded that the Flagtail fire, at 7000 acres, could affect big game use and distribution, but was unlikely large enough to affect population numbers. Although the fire greatly reduced security cover, the surrounding unburned areas provide sufficient cover to meet habitat needs. Elk and deer will likely forage in the burn area, primarily during the night, and retreat to security areas during the day. During the hunting season, elevated human use and hunting pressure in the cover-deficient burn area will likely force animals into adjacent unburned areas.

Roads

The Jack, Snow, and Hog subwatersheds do not meet Forest Plan standards for open road density; the Keller subwatershed meets the Forest Plan standard (see Table WL-3). Research has shown that higher open road densities reduce habitat effectiveness for deer and elk (Thomas et al., 1979). Following the fire, all roads except County Road 63 (the Izee Highway) have been temporarily closed to public access. Once hazard trees along roads are felled, roads could be reopened and area access could be restored to pre-fire levels as displayed in Table WL-3. High open road densities would likely affect big game use and distribution, particularly given the lack of hiding cover in the burn area.

The greatest potential for impact is during the hunting seasons, when hunter traffic, and the associated "stimulus" associated with those activities is at the highest level. Portions of the Keller and Hog subwatersheds are in the Murderer's Creek-Flagtail Cooperative Travel Management Area (also known as a green dot closure area). Restriction periods further reduce traffic in the fall and correspond to general deer and elk hunting seasons. Open road densities in Table WL-3 do not reflect seasonal closures. These closures would further reduce open road density and increase HEr and HEI values. Very little of the green dot area is within this project area; although numbers would change to the benefit of big game, the change is relatively small.

Perhaps more important than the impacts of road densities upon elk habit use and selection is the spatial relationships of those roads. Recent studies at the Starkey Experimental Station analyzed road distribution and its impacts on elk habitat use (Rowland et al. 2001 and Wisdom et al. 1998). Researchers found a strong correlation between road activity and habitat selection. Roads that averaged as little as one vehicle per 12-hour period were affecting habitat selection out to 1,000 meters or more. Elk were increasingly found in areas further away from open roads, while those areas with many roads and limited distances between roads received very limited use. Conversely, mule deer responded to the distribution of elk by avoiding areas of high elk density. This behavioral pattern put mule deer closer to roads. The mule deer showed strong preference for cover habitat, especially in the first few hundred meters of an open road.

In the Flagtail project area, the existing road network provides very few areas of security where elk can select habitats free from road influences. All habitat is within 1,000 meters of an open road. About 95% of the area is within 500 meters of an open road; i.e., only 5% of the area is further than 500 meters. Therefore, the presence of open roads likely reduces the habitat effectiveness of the area, particularly given the levels of cover loss from the fire. This spatial analysis suggests roads have a greater influence on elk and deer than the road density model suggests.

Environmental Consequences

Direct and Indirect Effects

No Action

Elk and deer are already using the burn area. Forage is expected to recover rapidly. Plants tend to sprout vigorously from the roots if the above ground portions are killed by fire, although it may take 2 to 5 years for grasses, sedges and forbs to return to their pre-fire abundance and volume. Shrub recovery may take 2 to 15 years. Fire can also increase nutrient content and palatability of forage, although the increased quantity of forage after a fire may be more significant than the increased quality of that forage (USDA 2000). As stated in the existing condition section, elk and deer will likely forage in the burn area during the night and retreat to security areas during the day.

Most of the fire-killed trees are expected to be on the ground within 10 to 20 years. Large concentrations of down woody material could impede big game movements (Thomas et al., 1979, Thomas and Toweill 1982). Consequently, the highest use of the area may be in the first 10 years, after forage has redeveloped and before many of the trees have fallen.

Excessive fuel loads would preclude the opportunity to use prescribed fire in the future. Historically, most of the subwatershed was shaped by frequent, low intensity fires, which reduced fuels levels and encouraged the growth of more succulent forage, ultimately benefiting deer and elk.

The fire destroyed most of the marginal, satisfactory and hiding cover. Alternative 1 would not further reduce cover. Development of new cover would depend on natural regeneration, unless burned areas are planted under a separate environment analysis. In the severely burned areas, recovery of hiding cover (tree vegetation) may take 35 to 65 years. Marginal cover would take 60 to 90 years to develop; satisfactory cover would likely take 90 to 120 years. Dead tree boles might offer some hiding cover, but only where snag densities are high, and even then it is of limited value compared to a similar live, green tree situation. Most of the small diameter trees will be on the ground in 10 years, so what does exist is short-lived. Lack of fuel treatment would create a high risk for an intense reburn of the area; such a fire could further delay development of cover.

Open road densities would remain in excess of standards in the Jack, Snow, and Hog subwatersheds; only the Keller Creek subwatershed would meet the open road density standard. Current road distribution could also continue to affect big game use with only 5% of the fire area further than 500 meters from an open road. High open road densities reduce security and increase the potential for disturbance, especially given the lack of hiding cover. During the hunting season, elevated human use and hunting pressure in the cover-deficient burn area will likely force animals into adjacent unburned areas.

As discussed, in the existing condition section, antelope primarily use the large open landscapes in Bear Valley. Although the fire opened up landscapes, the high density of standing dead trees may still precludes high use. As with deer and elk, antelope may take advantage of the initial flush of forage. Otherwise, the no action alternative is likely to have little affect on existing antelope populations and distribution.

Action Alternatives

As described under the No Action alternative, deer and elk use will increase as grasses, forbs and shrubs recover. Elk and deer will primarily forage in the burn area during the night and retreat to security areas during the day. In Alternatives 2, 3 and 5, salvage activities may result in a delayed or slower rate of response for some forage species; however, forage production is still expected to be high. Prescribed reforestation is planned at spacing designed to allow the trees room to grow without needing precommercial thinning to maintain adequate growth rates. This prescribed spacing is wider than normal seedling spacing, and should provide foraging habitat longer. Much of the burn area would be available for high quality forage until tree canopy recovers and begins to limit the development of ground vegetation.

In Alternatives 2, 3 and 5, salvage harvest would limit the future build up of ground fuels; therefore, access to forage is expected to remain high relative to Alternative 1. In Alternative 4, concentrations of downed logs could impede big game movement as described in Alternative 1.

Salvage of dead and dying trees would not directly impact remaining marginal and satisfactory cover, as only fire-killed trees would be salvaged. Only incidental removal of green trees would be needed to facilitate logging. Logging would not have a significant effect on hiding cover. Dead tree boles offer little security and what cover currently remains would be on the ground in 10 years. It is likely that many individual animals have already been displaced by the fire and are using surrounding areas for security habitat.

Planting would accelerate reforestation, allowing hiding cover and thermal cover to develop sooner than under a natural reforestation scenario. In the severe burn areas, recovery of hiding cover (conifer vegetation) would take 15 to 25 years versus 35 to 65 years under the No Action scenario. Marginal cover would develop in about 50 years versus 60 to 90 years under the No Action alternative. Satisfactory cover would likely take 80 years to develop versus 90 to 120 years under the No Action alternative.

Optimum calving and fawning habitat includes a combination of thermal cover, hiding cover, and quality forage located in close proximity to water. Habitat is provided primarily within riparian areas where high quality, succulent vegetation and water are readily available. Down trees can provide some security for calving and fawning. Salvage logging is not planned in riparian areas, although hazard trees may be felled. As snags fall and vegetation recovers, riparian areas are likely to become ideal for calving and fawning, especially where roads have been closed.

Under Alternatives 2, 3 and 5, salvage would reduce the potential for excessive build up of fuels in 10 to 20 years as snags fall. Salvage would permit the use of prescribed fire in the future to maintain low fuel loads and encourage the growth of more succulent forage, ultimately benefiting deer and elk.

Although Alternative 4 conducts fuels reduction activities, treatment is limited to fire-killed trees less than 8 inches DBH. Fire risk would still be elevated in 10 to 20 years as snags fall and fuel concentrations increase; another stand replacement fire could further delay development of cover. Excessive fuel loads would preclude the opportunity to use prescribed fire in the future.

Open road densities would increase during the logging operations. Roads would be opened to provide for logging access and log haul. In addition, Alternatives 2, 3 and 5 would construct 0.3 miles of system road and 4.1, 3.5 and 3.3 miles of temporary road respectively. Impacts to deer and elk are expected to last only 1 to 3 years, as there is great economic incentive to salvage dead and dying trees quickly. Disturbance during road construction and logging is expected to be minimal as animals are already expected to move out of the fire area during the day due to the lack of hiding cover. The timber sale purchaser would close roads that would be used for log haul; the Forest Service would be responsible for the remaining closures. The timber sale purchaser would decommission temporary roads.

Following implementation, road closures and road decommissioning would reduce open road densities below those that existed prior to the fire as displayed in Table WL-4. Alternative 1 reflects the existing condition and No Action alternative. In addition, the table displays habitat effectiveness for open road densities (HEr) and overall habitat effectiveness (HEI). All alternatives, the No Action alternative as well as the Action alternatives, maintain existing cover. Consequently cover and spacing indices were not re-calculated; they remain as displayed in Table WL-3 in the existing condition section.

Table WL-4: Open Road Density, Habitat Effectiveness s for Open Roads (HEr) and Total HEI (Habitat Effectiveness Index)

Alternative	Open Road Density (miles per square mile)	HEr*	HEcsr (HEI)*
Forest Plan Standard	3.2	.40	.40
Jack Subwatershed - 60507			
Alt. 1	4.84	.22	.37
Alt.'s 2, 3, 4 and 5	3.87	.31	.41
Snow Subwatershed- 60509			
Alt. 1	4.05	.29	.34
Alt.'s 2, 3, 4 and 5	2.39	.45	.38
Hog Subwatershed - 60511			
Alt. 1	3.75	.32	.53
Alt.'s 2, 3, 4 and 5	3.74	.32	.53
Keller Subwatershed- 60515			
Alt. 1	1.75	.51	.59
Alt.'s 2, 3, 4 and 5	1.75	.51	.59
*HEI = Habitat Effectiveness Index *HEr = habitat effectiveness derived from the density of roads open to vehicular traffic			

New road closures were only considered in the burn areas, and consequently effects are most dramatic in those subwatersheds where the most acres burned. In the Snow subwatershed, open road densities are reduced from 4.05 to 2.39 open miles per square mile, meeting Forest Plan standards. In the Jack subwatershed, open road densities are reduced from 4.84 to 3.87 open miles per square mile. The Jack subwatershed would still not meet Forest Plan standards, but open road densities are being moved towards the standard. In the Keller and Hog Subwatersheds, the Murderer's Creek-Flagtail Cooperative Travel Management Area (also known as a green dot closure area) requires additional closures during the general deer and elk hunting seasons, to the benefit of deer and elk. In future environmental analyses, additional road closures would likely be considered in the unburned portions of the subwatersheds; the major objective would be to reduce open road densities to meet Forest Plan standards.

Even after the proposed road closures are implemented, all habitat would remain within 1,000 meters of open roads. However, the percentage of the Flagtail project area that is within 500 meters of open roads would to be reduced from 95% under the No Action alternative to 78%. Therefore, 22% of the area would be at least 500 meters from open roads versus 5% under the No Action Alternative.

Therefore, road closures would reduce the potential for human disturbance to big game, resulting in greater use of available habitat, less unnecessary energy expenditure, and greater escapement from hunters. This would positively affect big game habitat and other species that prefer low human disturbance, particularly given the high loss of hiding cover from the fire. The total habitat effectiveness indices (HEI) and open road indices (HEr) improve as a result of the road closures (see Table WL-4). After proposed road closures occur, the two areas identified by the Oregon Natural Resources Council as unroaded (see map at the end of Chapter 4, Letter #11), would provide some of the better undisturbed habitats in the fire area.

Under Alternative 4, no commercial logging is proposed and no new roads are constructed. Consequently, the Forest Service would implement all proposed closures. Proposed road closures may take longer to implement than under Alternatives 2, 3 and 5 because funding sources are more limited. Under Alternative 4, it is expected that most closures would occur within 5 years versus 1-3 years under Alternatives 2, 3 and 5. Once all proposed road closures are completed, open road densities would be as described for Alternatives 2, 3 and 5 (see Table WL-4).

Construction of .3 miles of system road would not fragment any large blocks of interior habitat; this section of road is being constructed through burned forest and is intended to replace existing road that is being decommissioned in nearby riparian areas. Temporary road construction could temporarily fragment some habitats, but roads would be decommissioned immediately after logging is completed. Effects would last only 1-3 years. In burn areas, habitat fragmentation from roads becomes more of an issue once older forests have developed, well beyond 3 years.

As discussed, in the existing condition section, antelope primarily use the large open landscapes in Bear Valley. Although the fire opened up landscapes, the high density of standing dead trees may still precludes high use. As with deer and elk, antelope may take advantage of the initial flush of forage. The action alternatives are likely to have little affect on existing antelope populations and distribution.

Cumulative Effects

The existing condition section describes cover, forage, and open road density conditions immediately following the fire. In Table WL-3, cover, road density, and habitat effectiveness values reflect the effects of the fire as well as past timber management and access management activities. Table WL-4 displays habitat effectiveness values following implementation of the alternatives. Additional planned projects in Appendix J (Cumulative Effects) are not expected to change these values in the short-term.

The action alternatives would provide benefits to big game by closing additional roads and therefore further reducing potential big game disturbance and improving big game distribution. Benefits may be somewhat offset by the adverse effects of elevated road use expected on the remaining open roads. When area access is restored, hunting, firewood cutting, and other Forest uses are expected to increase in the burn area. In addition, off road vehicle (ORV) use could induce greater big game disturbance, particularly given the loss of hiding cover.

In burned riparian areas, hardwood and conifer planting is being planned under separate NEPA documents. In 2003, conifer trees were planted on 190 acres in riparian areas and 190 acres in uplands. Hardwoods were planted on 25 acres in 2003; additional hardwoods are proposed for interplanting on the same acres in 2004. Aspen restoration is being planned on an estimated 250 acres (76 aspen sites). Aspen is a favored browse species; initially, taller fences may exclude some big game use, but fences are expected to be removed or left unmaintained once new regeneration has developed sufficiently to out-pace browsing. Wood placement in steams would improve riparian conditions. Noxious weed treatments would reduce weed competition with preferred, native, forage species. Cumulatively, restoration activities would improve forage and accelerate development of hiding cover and fawning/calving habitat.

Livestock grazing would be delayed for at least two years post-burn to allow for recovery of ground cover (Post-fire grazing guidelines - Appendix H). Some uncontrolled cattle use occurred in the summer/fall of 2003, but effects to riparian and upland habitats were considered well within Forest Plan and Interagency Interdisciplinary Team (IIT) standards. When livestock grazing is re-initiated, grazing would be managed to meet Forest Plan and IIT standards as well. Grazing standards have been established at levels to provide sufficient forage to support both wild and domestic ungulate use.

Adjacent private lands have already been salvage logged. Reforestation is required where commercial timber harvest has occurred and the land is left under-stocked. Private lands were planted in 2003. Some private landowners have forage-seeded burned areas to benefit both big game and domestic livestock.

In 2002/2003, fire-killed, hazard trees were salvaged on 14 acres at the Bear Valley Work Center and on 650 acres along roads. Future fuels reduction is planned on 100 acres inside Riparian Habitat Conservation Areas (RHCAs); dead, unmerchantable trees 8 inches DBH and smaller would be felled, then hand piled and burned outside of the riparian areas. When combined with salvage logging and fuels treatment proposed in Alternatives 2, 3 and 5, landscape-level fuels treatments are expected to help reduce the risk of an intense re-burn and another stand replacement fire. Under Alternatives 1 and 4, combined fuel treatments are less likely to reduce fuel loads sufficiently to avoid intense re-burns in the future.

Future timber and access management activities have yet to be proposed for the unburned areas of the affected subwatersheds. Since the Flagtail Recovery Project is expected to have few negative effects on big game habitat in the short-term, and since future activities will be designed with recognition of habitat losses due to the fire, adverse cumulative effects to big game are expected to be incidental regardless of the alternative selected. In the mid- to long-term, the effects of this project combined with restoration projects in Appendix J would be considered favorable to big game.

Summary

The primary differences in alternatives relate to cover recovery, road closures, and build-up of down logs and future fuel loads. Under both the No Action and Action alternatives, overall habitat effectiveness for deer and elk would be expected to improve over time as cover develops. Population numbers are expected to remain stable; distribution and use may change initially as a result of improved forage and reduced cover.

Under the action alternatives, planting would accelerate reforestation, allowing hiding cover and thermal cover to develop sooner than under a natural reforestation scenario. In the severe burn areas, recovery of hiding cover would take 15 to 25 years versus 35 to 65 years under the No Action scenario. Marginal cover would develop in about 50 years versus 60 to 90 years under the No Action alternative. Satisfactory cover would likely take 80 years to develop versus 90 to 120 years under the No Action alternative.

Road closures have the most immediate benefit to deer and elk by reducing the potential for disturbance, particularly given the loss in hiding cover from the fire. Disturbance would be elevated during logging operations, and then reduced as road closures are implemented. The action alternatives reduce open road densities within the fire area; the No Action alternative does not.

Salvage logging reduces the future build-up of down logs that could impede big game movements and elevate risk of a future re-burn. Under Alternatives 1 and 4, big game use in the area would likely increase in the first 10 years in response to the flush in forage; after 10 years, use would decrease as high concentrations of downed trees limits big game. Alternative 1 does not remove any trees; future fuel loads would be in excess of risk thresholds. Alternative 4 only removes tree 8 inches DBH and smaller; although fire risk is reduced, future fuel loads would still be considered in excess of risk thresholds. In Alternatives 2, 3 and 5, salvage reduces the future build-up of down to the benefit of big game. Alternative 2 salvage logs the most acres (4,345 acres), followed by Alternative 5 (3,740 acres) and then Alternative 3 (2,871 acres).

Primary Cavity Excavator Species

Existing Condition

In the dry forest types of eastern Oregon, 66 bird and mammal species are known to use snags for nesting or shelter and 41 vertebrate species make use of downed logs (Mellen et al. 2003). Primary cavity excavators, such as woodpeckers, sapsuckers and flickers, are forest dwelling birds that are specialized for nesting and foraging in decayed wood. They require trees with rotted heartwood for excavating nest holes and use both snags and down logs for foraging.

The Forest Plan identifies 11 primary cavity excavators as management indicator species (MIS) for the availability and quality of dead and defective wood habitat: black-backed woodpecker, three-toed woodpecker, Lewis' woodpecker, white-headed woodpecker, pileated woodpecker, downy woodpecker, hairy woodpecker, northern flicker, Williamson's sapsucker, red-breasted sapsucker and yellow-bellied sapsucker. The red-breasted and yellow-bellied sapsuckers were formerly classified with the red-naped sapsucker. Neither the red-breasted or yellow-bellied sapsucker are known to occur in eastern Oregon; the red-naped sapsucker does occur throughout the area and will be used as a substitute MIS in this discussion. By providing habitat for these primary cavity excavators, habitat is provided for many other dead wood dependent species as well.

Habitat trend information derived from Interior Columbia Basin studies (Wisdom et al. 2000) was reviewed. Habitat trends vary across the Blue Mountains with some watersheds experiencing increased habitat and others decreased habitats, but overall, the trend is towards a loss of habitat. Population trends for these species do no reflect the loss of habitats, with only the pileated woodpecker showing large declines (Wisdom et al. 2000).

The Flagtail fire burned across approximately 7,120 acres of federal lands, of which about 6,180 acres were forested. Approximately 3,150 acres of the forested land burned severely (90% tree mortality), 2,400 acres burned moderately (60%-90% tree mortality), and 460 acres burned lightly (30%-69% tree mortality). About 170 acres that were forested did not burn, mostly in riparian areas. In the severe and moderate mortality areas, most of the pre-fire snags and down logs were consumed. In the light and no-mortality areas, pre-fire snags and downed wood habitats are relatively intact.

The fire created an abundance of new snags. Post-fire density, size and distribution of snags are a result of several factors: fire severity, past harvest, stand age, tree species composition, and the effects of past disturbances such as wind, fire, pathogens, and insects. Post-fire snag densities are estimated at 3 to 105 snags per acre, 10 inches DBH or greater. Snags greater than 20 inches DBH range from 0 to 14 snags per acre. Stands that were classified as OFMS, YFMS, and UR pre-fire, (48% of forested area) currently have the most large diameter snags. Snag estimates are calculated at the stand level.

Primary cavity excavators use burned forest habitats and green forest habitats differently. Tree canopy cover, understory shrub and grass cover, and snag numbers and qualities are all different. Snag habitats in post-fire environments are unique for several reasons: 1) early post-fire forests and associated insect outbreaks result in a rapid increase in nest sites and food supplies, 2) initially, most of the new snags are “hard” snags consisting of sound sapwood that may delay use by species that prefer “soft” snags, 3) many woodpecker species appear to respond positively to burned habitats, with some species using them as source habitats, and 4) fires leave few or no green trees for future snag replacements.

Among the management indicator species, the black-backed woodpecker, three-toed woodpecker, hairy woodpecker, Lewis’ woodpecker and northern flicker are strongly associated with post-fire habitats whereas the pileated woodpecker, white-headed woodpecker, downy woodpecker, red-naped sapsucker and Williamson’s sapsucker have much lower associations (Saab and Dudley 1997, Hutto 1995, Sallabanks 1995). The large numbers of snags created by a fire provide elevated nesting and foraging opportunities and probably contribute to good nest success and high productivity.

Fire-hardened snags and non-fire hardened snags or soft snags provide different niches for various woodpecker species. Some opportunistic birds, such as black-backed, three-toed and hairy woodpeckers, are capable of excavating nests in harder trees; other species, such as Lewis’ woodpecker and the northern flicker, require softer snags for excavating nest sites (Raphael and White 1984). Initially in burned areas, snags are primarily fire-hardened snags. Eventually, fire-killed trees that were previously sound soften with decay introduced by the multitude of insects that colonize dead and dying trees following a burn. Consequently, various woodpecker species may re-invade post-fire habitats in a series of waves, although there is certainly considerable overlap in use periods.

A key to understanding snag dynamics following fire is to know something about the longevity of snags. Many variables factor into the longevity of snags: condition of the tree before it died, cause of death, soil type, climate, extreme weather conditions, protection of snags by topography or other vegetation, tree species, snag height, and snag diameter. Morrison and Raphael (1993) found that snags created by fire decayed rapidly and fell quicker than those on unburned forests, and that large snags had greater longevity than smaller snags. Knotts (1997) summarized snag fall down rates estimated in various post-fire studies, and concluded that most snags will fall within 10 to 30 years.

In an unburned forest, enough snags are left to provide for 100 percent potential populations, and enough live trees, of various sizes, are left to become snags in the future, ensuring that snag habitat is provided over time. In areas where fire burned severely and killed all or nearly all trees, there are few live, green trees left to become snags in the future. Few snags will be available again until a new forest develops, trees reach sizes useful for woodpeckers, and these trees begin to die.

Management Direction for Dead Wood Habitats

Currently, retention of snags and down logs is based on the Forest Plan as amended by Regional Forester Eastside Forest Plans Amendment #2. This Amendment directed Forests to manage snags at the 100% population potential and to use the best available science to determine actual numbers. The Forest Plan, as amended, requires that an average 2.39 snags per acre, 21 inches DBH and greater, be retained. Amended standards for down logs are as follows: 20-40 lineal feet per acre for ponderosa pine types, 100-140 lineal feet for mixed conifer types, and 120-160 linear feet for lodgepole pine types. It is assumed that these snag and down log levels will provide the minimum level required for 100% of potential population levels of primary cavity excavators (LRMP 1990, Thomas 1979). Overall, the fire area has snags well in excess of Forest Plan standards; conversely, down logs, are well below standards, a situation that will quickly be rectified as snags begin to fall.

DecAID Tool

Subsequent to Amendment #2 direction, Rose et al. (2001) invalidated the biological potential models; they provided no replacement methodology but mentioned a Forest Service tool (DecAID) that was being developed. Very recently DecAID (Mellen et al. 2003) has been completed. DecAID is an internet-based computer program being developed as an advisory tool to help federal land managers evaluate effects of management activities on wildlife species that use dead wood habitats. The tool synthesizes published literature, research data, wildlife databases, and expert judgment and experience. DecAID is not intended to be prescriptive; i.e., it is not used to establish standards for snags or down logs. Information is used primarily as a comparison tool. DecAID provides two sets of data with which to analyze snag habitats: 1) snag inventory data and 2) wildlife use data.

Comparison of Inventory Data: Table WL-5 displays post-fire snag distributions in the Flagtail Fire area as compared to inventory distributions derived from DecAID. The DecAID snag distribution was derived from unharvested inventory plots in ponderosa pine/Douglas-fir habitat types in Oregon and Washington Eastside forests; for this analysis, this distribution is assumed to best reflect expected snag levels in dry forest types.

The first half of the table displays snag distribution for snags greater than 10 inches DBH. The second half of the table displays snag distribution for snags greater than 20 inches DBH. Snag levels are displayed by density group (e.g., density group 1 has 1-4 snags per acre). Percentages reflect the proportion of the forested acres in the Flagtail Fire project area that have the specified snag densities (e.g., Under Alternative 1, 75% of the forested acres in the fire area has snag densities in excess of 36 snags per acre).

Table WL-5: Post-fire Snag Densities for the Flagtail Fire Project Area by Density Group (Snags/Acre). DecAID Distribution (Mellen 2003) and Existing Condition.

Density Group (Alpha/Numeric Code)	Snags/Acre	DecAID Snag Distribution*	Alt. 1 (No Action) and Alt 4+
Snags equal to or greater than 10” DBH			
1	1-4	52%	10.28%
2	4-8	15%	0.99%
3	8-12	22%	1.08%
4	12-16	7%	0.48%
5	16-20	0%	2.31%
6	20-24	0%	0.94%
7	24-28	0%	1.36%
8	28-32	0%	2.63%
9	32-36	2%	5.04%
10	> 36	0%	74.89%
		99.5%	**100%**
Snags equal to or greater than 20” DBH			
A	0-2	47%	26.88%
B	2-4	39%	34.54%
C	4-6	8%	16.12%
D	6-8	0%	7.03%
E	8-10	3%	11.65%
F	10-12	0%	2.43%
G	12-14	0%	0.33%
H	14-16	0%	1.02%
I	16 –18	0%	0.00%
J	>18	0%	0.00%
		100%	**100%**
*DecAID Inventory Data: Wildlife Habitat Type = Ponderosa Pine/Douglas-fir; Structural Condition = Larger Trees			

It is useful to compare existing snag distributions in the Flagtail Fire area to those in the DecAID inventory data. Table WL-5 indicates that total snag levels (snags 10” DBH and greater) in the fire area are much higher than snag levels displayed in DecAID. This disparity is particularly obvious when comparing density groups 1 through 4 and density groups 10. The large diameter snag densities (snags 20” DBH and greater, density groups A-J) are also elevated when compared to the DecAID inventory, but the disparity is noticeably reduced.

This comparison suggests that because of the fire, the Flagtail project area may currently support snags at a much higher level than would be typically expected in dry forest types. Therefore, the Flagtail project area may also be providing far more habitat for cavity excavator species than is typical for these forest types. The DecAID tool suggests using caution when applying distributions in post-fire environments. Figure 31 in the Map Section displays snag densities by stand.

Comparison of Wildlife Use Data: Data in DecAID suggests that snag level and down log levels for some primary cavity excavators may need to be higher than the levels based on 100% of biological potential population models. Post-fire snag numbers in Flagtail were compared against woodpecker use data in DecAID; recent post-fire data in the ponderosa pine/Douglas-fir wildlife habitat type was used for comparison (Mellen et al. 2003). DecAID suggests that post-fire habitats would need to provide much higher levels of snags than live, unburned forests to support use by primary cavity excavators.

DecAID presents information on wildlife use based on snag density and snag diameter. This information is presented at three statistical levels: low (30% tolerance level), moderate (50% tolerance level), and high (80% tolerance level). A tolerance level can also be defined as an "assurance of use" or the likelihood that individuals in a population of a selected species will use an area given a specified snag size and density. For instance, at the 30 percent tolerance level for any given species, it would be expected that only 30 percent of a population would find suitable or usable habitat at the specified snag density. Consequently, 70 percent of a population would *not* find suitable habitat conditions in habitats at that snag density.

Snag density, size and distribution influence use levels and vary by individual species. For example, post-fire data in DecAID suggests that Lewis' woodpecker would need 10 snags/acre to meet the 30% tolerance level, whereas black-backed woodpeckers would need 62 snags/acre.

It should be noted that DecAID does not model biological potential or population viability. There is no direct relationship between tolerances, snag densities and sizes used in DecAID and snag densities and sizes that measure potential population levels (Mellen 2003, USDA Forest Service 1990, Thomas 1979).

Primary cavity excavators generally prefer larger diameter trees for nesting. In the Forest Plan, snags less than 12 inches DBH are not "counted" as contributing towards habitat; in DecAID, snags less than 10 inches DBH are not counted as contributing towards habitat.

Table WL-6 displays the percentage of total suitable habitat in the Flagtail Fire area by cavity nesting species and tolerance level. Values are displayed for five species that the Forest Plan identifies as Management Indicator Species (MIS). For the remaining MIS in the Forest Plan, DecAID does not provide wildlife use information for post-fire habitats; effects discussions will be more qualitative than quantitative.

Table WL-6: Existing tolerance level for cavity nesting species within the Flagtail Fire project area.

Species	Percentage of total forested habitat in Flagtail Fire area by Tolerance Level*			
	<30% Tolerance Level	*30% Tolerance Level*	*50% Tolerance Level*	*80% Tolerance Level*
Black-backed Woodpecker	66%	32%	2%	0%
Hairy Woodpecker	12%	27%	59%	2%
Lewis' Woodpecker	12%	66%	22%	0%
Northern Flicker	28%	72%	0%	0%
White-headed Woodpecker	15%	38%	46%	1%
*Based on DecAID Woodpecker Use Data: Wildlife Habitat Type = Ponderosa Pine/Douglas-fir; Structural Condition = Open; Recent Post-fire Habitats				

Generally, post-fire habitat conditions are considered ideal for primary cavity excavator species, but Table WL-6 suggests that even under the best of situations, snag densities in the Flagtail area will provide for few species at the 80% tolerance level. Habitats in the Flagtail project fire area are generally dry ponderosa pine or dry mixed conifer types. Stand densities are generally lower than in moist, mixed conifer sites due to drier habitat conditions, southerly aspects, and lower site productivities, slope conditions. Even in severe burn conditions, these vegetation types would not be expected to produce ultra high snag densities.

The Lewis woodpecker and hairy woodpecker have the highest levels of habitat available to them as a result of the 2002 fire (see Table WL-6). Both species are strongly associated with fire (Hutto 1995, Sallabanks 1995, Saab and Dudley 1997, Saab et al. 2002). Lewis' woodpeckers use burned forests because of the relatively open canopy that allows for shrub development and associated arthropods prey, perch sites for foraging, good visibility, and space for foraging maneuvers (Saab et al. 2002, Marshall 1992b, Jackman 1974, Raphael and White 1984, Saab and Dudley 1997). Maximum use may be delayed for several years until fire-killed trees began to fall, stands become more open, snags are well decayed and shrub densities have increased. Hairy woodpeckers are capable of excavating nests in harder snags, and therefore, are expected to rapidly invade the burned area (Raphael and White 1984).

Northern flickers respond positively to fire (Hutto 1995, Sallabanks 1995, Saab and Dudley 1997). Snag densities in the Flagtail fire area support use primarily at the 30% tolerance level. Data in DecAID suggests that stands would need to have over 17 snags per acre greater than 20 inches DBH to meet the 50% tolerance level, an unlikely scenario in these dry forest types (Mellen 2003).

The black-backed and three-toed woodpeckers tend to favor areas with high snag densities; therefore, these species have benefited from the fire, but at relatively low levels compared to the other species. For the black-backed woodpecker, 32% of the project area meets the 30% tolerance level; 2% meets the 50% tolerance level. Even though DecAID suggests that snag densities in Flagtail will only provide for black-backed woodpecker up to the 50% tolerance level, populations are expected to respond favorably compared to pre-fire conditions, which provided poor habitat. Black-backed and three-toed woodpeckers begin to use burned habitat shortly after the fire; they are strong excavators and can drill into newly created, hard snags. The relatively low number of black-backed woodpeckers in unburned forests may be sink populations (populations that are generally decreasing), maintained by emigrants from burns when conditions in a fire area become less suitable; in other words, burns may support source populations of black-backed woodpeckers (populations that increase and spread) (Hutto 1995).

DecAID provides post-fire data for white-headed woodpeckers, suggesting that the Flagtail Fire area could support use primarily at the 30% to 50% tolerance level. Several studies on white-headed woodpeckers, however, suggest the species is not closely associated with burned habitats (Hutto 1995, Sallabanks 1995, Raphael and White 1984, Saab and Dudley 1997), primarily because of the lack of many live trees. The species primarily forages on live, mature and overmature ponderosa pine, feeding on seeds from cones and scaling tree bark for insects. The species may use large, well-decayed snags in the burned area for nesting, provided that the burned area is within a potential home range that includes large, live ponderosa pine.

Pileated woodpeckers are not strongly associated with post-fire habitats (Hutto 1995, Sallabanks 1995, Raphael and White 1984, Saab and Dudley 1997). DecAID does not provide any post-fire woodpecker use data. The species has a strong preference for mature or old growth stands with high canopy cover (see Chapter 3, Terrestrial Wildlife, Old Growth Habitat). Pileated woodpeckers are unlikely to nest in the fire area, but would likely use the area for foraging if it is within a potential home range that also includes mature or old growth forest with high canopy cover for nesting and roosting.

The red-naped sapsucker, Williamson's sapsucker and downy woodpecker are not strongly associated with post-fire habitats (Hutto 1995, Sallabanks 1995, Saab and Dudley 1997). DecAID does not provide any post-fire woodpecker use data for these species. Sapsuckers primarily use live trees for foraging; however, they do obtain food by fly-catching, gleaning, and pecking, and could take advantage of habitat provided by the numerous dead trees (Jackman 1974). The red-naped sapsucker is strongly associated with forests containing pure stands of aspen or mixed stands of aspen and conifers (Jackman 1974, Hutto 1995). Aspen stands are very limited in the project area, comprising about 75 acres; many stands were burned in the fire and grazing by wild and domestic ungulates has greatly limited regeneration. The downy woodpecker may benefit from the fire; however, they feed and nest primarily in deciduous trees in riparian areas as well.

Post-fire, down logs levels are considered low, even compared to Forest Plan standards. DecAID does not provide wildlife tolerances for down logs. DecAID does summarize inventory information for the ponderosa pine/Douglas-fir forest types in eastern Oregon and Washington; information is presented as percent cover of down logs rather than log length. As with snag densities, DecAID suggests that the down log levels were much more variable on the landscape, with some areas having no down logs and other areas having concentrations greater that the Forest Plan standard. Eventually, as snags in the Flagtail Fire area start to fall, there is an opportunity to mimic a more variable level of down logs.

Environmental Consequences

Post-fire snag retention was raised as a key issue in this analysis (see Key Issues in Chapter 1). Several public letters raised concern that cavity dependent species use burned forest habitats differently than live, green forests, and that salvage logging could *potentially* have negative impacts. The 1995 report by Beschta, et al. also concluded that cavity dependent species require higher levels of snags in post-fire habitats than are typically required by Forest Plans. Other letters raised the concern that salvage alternatives were leaving too many snags. Concerns are addressed through this analysis.

The alternatives retain varying levels, sizes and distribution of snags. All alternatives would meet or exceed Forest Plan snag standards, as amended, i.e., 2.39 snags per acre, 21 inches DBH or greater. Consequently, all alternatives would provide the number of snags for 100% of potential population levels of primary cavity excavators (LRMP 1990, Thomas 1979).

Data in DecAID suggests that snag level and down log levels for some primary cavity excavators may need to be higher than the levels based on 100% of biological potential population models. Because of the variation between the biological potential models (LRMP 1990, Thomas 1979) and DecAID (Mellen et al. 2003), results of both assessments are provided in this discussion.

The following discussions use snag inventory data from the Flagtail Fire area and compares it to snag inventory and woodpecker use data described in DecAID.

Effects to primary cavity excavators will be addressed in three time scales:

- 0-10 years: discusses the effects to species/habitats immediately following implementation of the no action or an action alternative,
- 10-30 years: discusses the effects to habitats as post-fire snags begin to fall,
- 30+ years: discusses time period after which new snag creation becomes an issue.

As stated in the existing condition section, the black-backed woodpecker, three-toed woodpecker, hairy woodpecker, Lewis' woodpecker and northern flicker are strongly associated with post-fire habitats whereas the pileated woodpecker, white-headed woodpecker, down woodpecker, red-naped sapsucker and Williamson's sapsucker have much lower associations (Saab and Dudley 1997, Hutto 1995, Sallabanks 1995). This effects discussion will focus more fully on the first list of species.

Direct and Indirect Effects

Comparison of Inventory Data: Table WL-7 displays snag distribution by alternative, and compares them to the inventory distribution derived from DecAID. The DecAID snag distribution was derived from unharvested inventory plots in ponderosa pine/Douglas-fir habitat types in Oregon and Washington Eastside Forests; for this analysis, this distribution is assumed to reflect expected snag levels in dry forest types.

The table displays distribution by density groups (e.g., 1-4 snags per acre). The first half of each table displays snag distribution for snags greater than 10 inches DBH. The second half of each table displays snags distribution for snags greater than 20 inches DBH. Percentages reflect the proportion of the forested acres in the Flagtail Fire project area that have the estimated snag densities (e.g., Under Alternative 1, 75% of the forested acres in the fire area has snag densities in excess of 36 snags per acre).

Table WL-7: Snag Distribution by Alternative

Density Group (Alpha/Numeric Code)	Snags/Acre	DecAID Snag Distribution*	Alt. 1 (No Action) and Alt 4+	Alt. 2	Alt. 3	Alt. 5
Snags equal to or greater than 10" DBH						
1	1-4	52%	10.28%	66.74%	10.28%	31.88%
2	4-8	15%	0.99%	5.31%	0.99%	23.69%
3	8-12	22%	1.08%	1.08%	1.08%	1.10%
4	12-16	7%	0.48%	1.50%	50.18%	12.35%
5	16-20	0%	2.31%	2.01%	2.09%	1.96%
6	20-24	0%	0.94%	2.85%	1.15%	3.87%
7	24-28	0%	1.36%	2.93%	1.36%	2.36%
8	28-32	0%	2.63%	2.37%	1.30%	0.00%
9	32-36	2%	5.04%	1.03%	3.12%	3.77%
10	> 36	0%	74.89%	14.19%	28.45%	19.02%
		99.5%	**100%**	**100%**	**100%**	**100%**
Snags equal to or greater than 20" DBH						
A	0-2	47%	26.88%	27.61%	26.88%	26.88%
B	2-4	39%	34.54%	66.03%	60.36%	60.50%
C	4-6	8%	16.12%	3.68%	5.04%	5.72%
D	6-8	0%	7.03%	0.98%	3.39%	3.39%
E	8-10	3%	11.65%	1.19%	2.80%	1.99%
F	10-12	0%	2.43%	0.45%	1.47%	1.47%
G	12-14	0%	0.33%	0.05%	0.05%	0.05%
H	14-16	0%	1.02%	0%	0.00%	0.00%
I	16 –18	0%	0.00%	0%	0.00%	0.00%
J	>18	0%	0.00%	0%	0.00%	0.00%
		100%	**100%**	**100%**	**100%**	**100%**

**DecAID Inventory Data: Wildlife Habitat Type = Ponderosa Pine/Douglas-fir; Structural Condition = Larger Trees*

+Alternative 4 only removes non-commercial size snags less than 8 inches DBH; therefore, snags levels in this table would be the same as for Alternative 1, No Action.

Comparison of Wildlife Use Data: Tables WL-8 through WL-12 display tolerance levels for each primary cavity excavator species as a percentage of the Flagtail Fire area. Calculations are based on forested sites (6,180 acres or 87% of the area) and exclude acres unsuitable as forestlands, i.e., acres that do not support trees or snags (about 940 acres or 13% of the fire area). The tables display tolerance levels for each alternative. Alternative 4 only removes non-commercial size snags less than 8 inches DBH; therefore, snags levels in this table would be the same as for Alternative 1, No Action.

Table WL-8 - Black-backed Woodpecker. – Wildlife Tolerance Levels (% of Flagtail Fire Area)

Alternative	**Wildlife Tolerance Levels**			
	0-29%	***30-49%***	***50-79%***	***80% +***
1 and 4	66%	32%	2%	0%
2	97%	3%	0%	0%
3	91%	8%	1%	0%
5	92%	7%	1%	0%
*Based on DecAID Woodpecker Use Data: Wildlife Habitat Type = Ponderosa Pine/Douglas-fir; Structural Condition = Open; Recent Post-fire Habitats				

Table WL-9- Hairy Woodpecker – Wildlife Tolerance Levels (% of Flagtail Fire Area)

Alternative	**Wildlife Tolerance Levels**			
	0-29%	***30-49%***	***50-79%***	***80% +***
1 and 4	12%	27%	59%	2%
2	74%	16%	10%	0%
3	12%	67%	20%	1%
5	57%	29%	14%	1%
*Based on DecAID Woodpecker Use Data: Wildlife Habitat Type = Ponderosa Pine/Douglas-fir; Structural Condition = Open; Recent Post-fire Habitats				

Table WL-10 - Lewis' Woodpecker – Wildlife Tolerance Levels (% of Flagtail Fire Area)

Alternative	**Wildlife Tolerance Levels**			
	0-29%	***30-49%***	***50-79%***	***80% +***
1 and 4	12%	66%	22%	0%
2	73%	24%	3%	0%
3	12%	80%	8%	0%
5	56%	37%	7%	0%
*Based on DecAID Woodpecker Use Data: Wildlife Habitat Type = Ponderosa Pine/Douglas-fir; Structural Condition = Open; Recent Post-fire Habitats				

Table WL-11 - Northern Flicker – Wildlife Tolerance Levels (% of Flagtail Fire Area)

Alternative	**Wildlife Tolerance Levels**			
	0-29%	***30-49%***	***50-79%***	***80% +***
1 and 4	28%	72%	0%	0%
2	82%	18%	0%	0%
3	28%	72%	0%	0%
5	42%	58%	0%	0%
*Based on DecAID Woodpecker Use Data: Wildlife Habitat Type = Ponderosa Pine/Douglas-fir; Structural Condition = Open; Recent Post-fire Habitats				

Table WL-12 - White-Headed Woodpecker – Wildlife Tolerance Levels (% of Flagatil Fire Area)

Alternative	Wildlife Tolerance Levels			
	0-29%	*30-49%*	*50-79%*	*80% +*
1 and 4	15%	38%	46%	1%
2	76%	19%	5%	0%
3	65%	24%	11%	1%
5	71%	19%	10%	1%

*Based on DecAID Woodpecker Use Data: Wildlife Habitat Type = Ponderosa Pine/Douglas-fir; Structural Condition = Open; Recent Post-fire Habitats

No Action

Period 0-10 years

Alternative 1 would provide for the greatest number of snags for primary and secondary cavity excavators. Approximately 6,180 acres of habitat with abundant snags currently exist. About 75% of the forest acres have snag densities in excess of 36 snags per acre; the DecAID inventory data suggests that 0% of these dry forest types typically have snags densities this high (see Table WL-7). The large diameter snags are also elevated when compared to the DecAID inventory. Figure 31 in the Map Section displays snag densities by stand. As discussed in the existing condition section, this comparison suggests that, because of the fire, the Flagtail project area may currently support snags at a much higher level than would be typically expected in dry forest types.

Throughout the burn area, existing snags and large down logs would remain undisturbed, providing potential nesting, roosting, and foraging habitat for primary cavity excavators and other species dependent on dead wood habitats such as small mammals, amphibians, and insects. Existing snags would be available in several size classes with differing densities. Species associated with dead wood habitats would respond favorably.

In the early post-burn period, primary cavity excavator numbers would increase until they are limited by same-species territoriality. Comparing existing snag densities and sizes against post-fire woodpecker use levels in DecAID (Tables WL-8 through WL-12), it is expected that the landscape would support most primary cavity excavators at the 30% to 50% tolerance levels. See the existing condition section.

It is likely that three-toed and black-backed woodpeckers would benefit the most from this alternative as they take advantage of the elevated snag levels. Three-toed and black-backed woodpeckers are strongly associated with early post-fire conditions and they tend to select nest sites with the highest snag densities and the least amount of logging (Saab and Dudley 1997). They rapidly colonize stand-replacement burns within 1 to 2 years of a fire; however, within 5 years they become rare, presumably due to declines in bark and wood-boring beetles (Kotliar et al. 2002). Hairy woodpeckers are also capable of excavating nests in harder snags, and therefore, are expected to rapidly increase in the burned area.

Lewis' woodpecker and the northern flicker would benefit from this alternative, as a maximum number of large snags would be available for nesting habitat. Maximum use may be delayed for several years until fire-killed trees began to fall, stands become more open, snags are well decayed and shrub densities have increased.

White-headed woodpeckers primarily forage on live, mature and overmature ponderosa pine, feeding on seeds from cones and scaling tree bark for insects. The species may use large, well-decayed snags in the burned area for nesting, provided that the burned area is within a potential home range that includes large, live ponderosa pine.

The pileated woodpecker has a strong preference for live canopy cover and would likely benefit only minimally from this alternative. Pileated woodpeckers may use the burn for foraging if it is within a potential home range that also includes mature or old growth forest with high canopy cover for nesting and roosting.

The red-naped sapsucker and Williamson's sapsucker would not greatly benefit from the No Action alternative, since their primary means of foraging is sapsucking live trees. However, they do obtain food by fly-catching, gleaning, and pecking, and could take advantage of the numerous dead trees. The downy woodpecker may benefit from this alternative; however, they feed and nest primarily in deciduous trees in riparian areas.

Initially, before snags begin to fall, large down logs may be deficient. In the severely- and moderately-burned areas (89% of the forested acres), most of the down logs were consumed. In the lightly- and non-burned areas (11% of the forested acres), downed wood habitats are relatively intact.

Period 10-30 years: Loss of Post-fire Snags

The benefits primary cavity excavators derive from the fire are somewhat limited in time. Primary cavity species will use the area, increasing in numbers until the time when a sufficient number of snags have fallen to begin to limit the density of woodpeckers.

Most of the smaller snags (~10-14 inches DBH) will fall within the first 10 years post-burn, as well as some of the larger snags, decreasing overall snag density. At that point, habitat will be less suitable for black-backed and three-toed woodpeckers, which prefer a high density of smaller, harder snags; it will be more suitable for species such as Lewis' woodpecker, northern flicker, downy woodpecker, white-headed woodpecker, and Williamson's sapsucker, which prefer softer snags and more open habitat. Hairy woodpecker will still likely use the site extensively. Red-naped sapsuckers may increase, particularly in unburned or lightly burned riparian areas. Pileated woodpeckers nesting would likely remain low.

Raphael and White (1984) estimated expected snag densities at year 15 post-fire given average snag fall down rates. They estimated that 4 hard snags are required today to retain one soft snag at year 15. Achieving a Forest Plan standard of 2.39 snags/acre at age 15 would require retention of about 10 hard snags per acre. Using the findings by Raphael and White and a No Action strategy, it is expected that snags levels at year 15 would still be well in excess of Forest Plan standards. Snag levels would still meet 100% population potential. Comparing DecAID values against Raphael and White's findings, most of the fire landscape would still remain within the 30% to 50% tolerance level for primary cavity excavator species; snag levels for black-backed woodpecker would drop below the 30% tolerance level.

As snags begin to fall, down log levels would greatly increase thereby increasing denning, nesting, and feeding habitat for down wood dependent species. By 15 years, the levels of down wood would greatly exceed the minimum Forest Plan standard. The same conclusion can be reached comparing expected down log distributions in Flagtail against the distributions in DecAID.

Period 30 + Years: Future Snag Recruitment and the Snag Gap

An important issue with respect to cavity nesters in stand replacement fire areas is that there are few live trees available to become snags in the near future. While snags are abundant after a fire, once they fall down, snags will not be available again until a new forest develops, trees reach sizes useful for woodpeckers, and these trees begin to die. This scenario can create a *snag gap* where no large snags are available. Although snag levels currently exceed Forest Plan standards, this analysis assumes that most post-burn snags will be on the ground within 30 years. Larger snags are likely to persist longer than smaller snags, with some remaining longer than 30 years.

In forested stands that burned lightly or moderately, sufficient green trees may remain to provide snag replacements either immediately or in a protracted time period as compared to the severely burned areas. Stands with a live tree component comprise about 3,030 acres (49%) within the fire area. Stands that classify as old forest multiple strata (OFMS) or young forest multiple strata (YFMS) have sufficient numbers of large diameter trees to provide snag replacements immediately. Stem exclusion open canopy (SEOC) and understory reinitiation (UR) stands would take approximately 20 years to grow 14-inch DBH trees and 70 years to grow 21-inch DBH trees.

In forested stands that burned with high severity, very few or no green trees would be available to become snags in the near future. Stand initiation acres comprise about 3,150 acres (51% of forested acres) within the fire area. Reliance on natural regeneration to reforest these areas delays development of large diameter trees and potential snag replacements (see Chapter 3, Forest Vegetation, Reforestation of Burned Forestland and Stand Structural Stages). Stand initiation (SI) stands would take 80 to 120 years to grow 10-inch DBH trees, 100 to 140 years to grow 14-inch DBH trees and 150 to 190 years to grow 21-inch DBH trees.

Data in DecAID (Mellen 2003) suggests a snag diameter of 14” DBH would meet the 30% tolerance level for most cavity excavator species, given a sufficient density of snags. Therefore, with no reforestation, there is a snag gap between 30 years post-fire and 100 years post-fire where large snags could be deficient in the severely burned portions of the project area, a gap of 70 years. If larger snags persist longer than expected, the snag gap would be reduced further, particularly for Alternatives 1 and 4, which retain the most large diameter snags.

Action Alternatives

Salvage harvest reduces snags numbers, which negatively affects some primary cavity excavator species, such as the black-backed woodpeckers, and benefits others such as the Lewis’ woodpecker. Snag retention levels vary by alternative (see Table WL-7); therefore, effects vary as well.

In all action alternatives no snags would be removed from riparian habitat conservation areas (RHCAs) unless they need to be felled to reduce safety hazards along open roads. Forested

RHCA acres total approximately 600 acres or 10% of the potential forest lands within the burn area. An additional 1,195 acres of burned forests, about 20% of the potential forested lands, were not considered economically viable for salvage harvest; as with the RHCAs, snags would not be dropped unless they need to be felled to reduce safety hazards.

Harvest does raise the risk of blowdown of residual snags. Alternatives leave a varying mix of snag densities. Snags will be distributed in larger, non-harvested blocks, small patches or dispersed. Blowdown risk is reduced when snags are left in untreated patches. In the light severity burn areas, snags are interspersed with live trees, reducing the risk of blowdown as well. Estimated snag fall down rates incorporate losses expected from blowdown.

In salvage units, snags may need to be felled for operational or safety needs during logging (i.e., landings, skyline corridors, safety). Forest Service personnel contacted the Oregon Occupational Safety and Health Administration (OSHA) for their input on this issue (communication between J. Hensley, Malheur National Forest and L. Wenick, Oregon OSHA, January 2004). Based on discussions with OSHA, logging in fire salvage sales could require that an estimated 5 to 10% of protected snags be felled to meet operational/safety needs. The need to fell protected snags is reduced when salvage logging is conducted within 2 to 3 years post-fire; most snags are still in a *hardened* condition that makes them less of a risk of being danger trees. In the Flagtail Fire Recovery project, design and mitigation features have been included in the action alternatives to further reduce the potential for loss of protected snags. In salvage units, snags marked for retention would be clumped, where possible, and located at least 150 feet from open roads and other improvements such as fences (see FEIS, Chapter 2, Alternatives Considered in Detail, and Management Requirements, Constraints and Mitigation Measures, Terrestrial Wildlife). If a tree marked for snag retention is required to be felled for operational needs, a snag of equal or larger size planned for harvest would be left as a replacement, where feasible. The loss of protected snags would likely be less than 2%. This would be considered incidental given the level of snags being left.

Alternative 2

Period 0-10 years

Alternative 2 proposes timber salvage on 4,345 acres (70%of forested acres) and no timber salvage on about 1,795 acres (30% of forest lands). In salvage units, a minimum of 2.39 snags per acre over 21 inches DBH would be retained where available. Snags would be left individually and in random clumps, averaged on a 40-acre basis. In helicopter units, all other merchantable trees down to 12 inches DBH would be removed. In tractor and skyline units, all other merchantable snags down to 10 or 8 inches DBH would be removed; utilization specification vary by species. Under this proposal, forested RHCAs would not be salvage logged, but hazard trees would need to be dropped along open roads. Fuels reduction activities would remove snags less than 8 inches DBH on 2,570 acres.

Table WL-7 displays the post-treatment snag distribution; salvage harvest would aggressively shift snag densities towards the lowest snag density classes. Snag distribution in Alterative 2 better mimics the snag distributions in DecAID than Alternative 1, although one could argue that salvage may be overly aggressive in some instances. For example, density group 1 indicates that 67% of the project area would have 1 to 4 snags per acre versus 52%

under the DecAID inventory. Density groups 2 through 4 appear low as compared to the DecAID distribution, but density groups 5 through 10 are high. Given, the standard of error expected for snag inventories, these disparities may or may not be significant. Figure 32 in the Map Section displays snag densities by stand or unit.

Alternative 2 would reduce potential roosting, nesting and foraging trees. Tables WL-8 through WL-12 indicate that removing snags would reduce woodpecker use levels for all species. Portions of the project area would still support woodpeckers at the 30% and 50% tolerance level, but far more acres would fall into the 0-29% tolerance level.

Direct effects would primarily be displacement from nests by removal or destruction of nest structures (snags, ground nests) during salvage operations. Adverse effects would likely be higher for such species as black-backed woodpeckers, three-toed woodpeckers and hairy woodpeckers. These species tend to use post-fire habitats first because of their ability to excavate hard snags. Logging would likely be completed within 2 to 3 years of the fire when most snags would still be hard enough to limit use by other species.

Three-toed and black-backed woodpeckers tend to select nest sites with the highest snag densities and the least amount of logging. Therefore, it is unlikely they would use salvage-logged units for nesting or foraging. Non-salvaged acres would provide the only post-fire nesting habitat for these species, comprising 1,795 acres or 30% of the potential forest lands within the burn area, and most of these areas would only provide use at the 0-29% tolerance or use level. Only 3% of the fire area would provide for black-backed woodpeckers at the 30% tolerance level or better, reduced from 34% under the existing condition. Black-backed woodpeckers respond best to unlogged conditions, and even within non-salvage areas, some snags would be dropped to reduce hazard trees along open roads and to provide woody debris in streams for bank stability.

Hairy woodpeckers often occupy post-fire habitat soon after the burn. Salvage would reduce habitat; following salvage 23% of the area would classify at the 30% tolerance level or better versus 88% of the area under the No Action alternative.

The Lewis' woodpecker, northern flicker and other species that prefer soft snags over hard snags would begin to expand into the fire area as snags begin to decay and fall, but because of the low post-salvage snag levels, use would still remain well below the 30% tolerance level (see Tables WL-10 and WL-11). Most non-salvage areas (30% of forest lands) would provide use at the 30% to 50% tolerance.

Table WL-12 suggests that white-headed woodpecker habitat would be greatly reduced, but the changes in tolerance levels may be misleading, as discussed in the existing condition section. In reality, the species may not use expansive, severely burned areas regardless of the number of snags retained, instead tending towards the periphery of burned areas where there is a mosaic of live and dead trees. In live, green stands, DecAID suggests that white-headed woodpeckers need far lower densities of snags for use, ranging from 1 to 8 snags per acre greater than 10 inches DBH.

Pileated woodpeckers would probably not be directly affected by the removal of large diameter snags, as studies show they are also rare visitors to early post-fire communities. Indirectly, removal of large diameter snags precludes accumulation of large, down logs, and consequently, reduces future foraging habitat. In salvage units, the low densities of snags left would not provide high quality foraging habitat even after snags fall. In non-salvage areas, the potential for quality foraging habitat would remain high. In Replacement Old Growth area 220, salvage harvest on 277 acres would reduce dead wood habitats. ROG 220 is being intentionally managed for future old growth (see Chapter 3, Terrestrial Wildlife, Old Growth Habitat). Given this status, it would be preferable to maintain higher levels of snags/downed wood for pileated woodpeckers in the future.

Red-naped sapsuckers and downy woodpeckers would not be significantly affected by the reduction in nesting and foraging habitat, since they stay mostly in deciduous stands of aspen and cottonwoods. Williamson's sapsuckers forage mostly on live trees, and are also unlikely to be affected.

Initially, before snags begin to fall, large down logs may be deficient. In the severely- and moderately-burned areas (89% of the forested acres), most of the down logs were consumed. In the lightly- and non-burned areas (11% of the forested acres), downed wood habitats are relatively intact.

Period 10-30 years: Loss of Post-fire Snags

Using the findings by Raphael and White (1984) on fall down rates, i.e., that 4 hard snags would need to be retained initially to produce 1 soft snag at year 15, it is expected that within salvage units nearly all snags would be on the ground by year 15. Snags are expected to be below the 2.39 snags per acre required to meet 100% population potential. Only within non-salvage areas, would snags meet levels that meet 100% population levels.

DecAID values were compared against Raphael and White's findings. In salvage units, tolerance levels for primary cavity excavator species would drop below the 30% level by year 15. In non-salvage units, sufficient snags would remain to provide for most primary cavity excavators at the 30% to 50% tolerance level; only the black-backed and three-toed woodpeckers would have snag use levels drop below the 30% tolerance level.

As snags begin to fall, down log levels would increase thereby increasing denning, nesting, and feeding habitat for down wood dependent species. By year 15 post-fire, the levels of down wood would likely meet the minimum Forest Plan standard. Down log distributions in DecAID suggest that 60% of the Flagtail area should support down logs at .1 to 1% cover and 40% of the area should support down logs at levels greater than 1%. Under Alternative 2, it is likely that only non-salvage areas could eventually support down logs at levels greater than 1%. Alternative 2 leaves 30% of the area as non-salvage areas, suggesting that levels would fall short of those expected in dry forest types.

Period 30 + Years: Future Snag Recruitment and the Snag Gap

Discussions for the No Action alternative estimated the number of years it would take before large diameter trees would be available again for snag creation. The No Action alternative relied on natural regeneration to reforest the burn area. Under Alternative 2, planting can accelerate reforestation and reduce the amount of time burned areas are without large snags.

The primary benefits of planting would be achieved on the 3,150 acres that were severely burned and have essentially no live trees left. On these acres, the time it takes to grow 10-inch DBH trees would be reduced from 80-120 years under the No Action alternative to 70 years under Alternative 2. The time it takes to grow 14-inch DBH trees would be reduced from 100-140 years under the No Action alternative to 90 years under Alternative 2. The time it takes to grow 21-inch DBH trees would be reduced from 150-190 years under the No Action alternative to 140 years under Alternative 2.

Data in DecAID (Mellen 2003) suggests a snag diameter of 14" DBH would meet the 30% tolerance level for most cavity excavator species, given a sufficient density of snags. Under Alternative 2, there is a snag gap between 15 years post-fire and 90 years post-fire when large snags could be deficient in the severely burned areas, a gap of 75 years as compared to 70 years under the No Action alternative. Note that the snag gap is greater under Alternative 2. Because initial snag retention under Alternative 2 is so low, the snag gap materializes at year 15 compared to year 30 under the No Action alternative.

Alternative 3

Period 0-10 years

Alternative 3 was designed to provide a broader range of post-fire habitats for primary cavity excavators than the other action alternatives. This alternative proposes timber salvage on 2,870 acres (46% of forested acres) and no timber salvage on approximately 3,309 acres (54% of forest lands). Estimated harvest acres reflect untreated snag patches to be left in some units. Fuels reduction activities would remove snags less than 8 inches DBH on 2,450 acres.

Primary cavity excavators use post-fire habitats differently under active management (primarily salvage logging) versus non-management (no logging). In Idaho, studies of salvage logging in post-burn habitats indicated a continuum in habitat use among primary cavity excavators with the extremes represented by black-backed and Lewis' woodpecker (Saab et al. 2002). Generally, black-backed woodpeckers prefer high densities of unlogged trees whereas Lewis' woodpecker prefers to nest in open or partially logged areas. The study suggested that leaving a range of conditions characteristic of these two species would likely incorporate habitats features necessary for other members of the cavity-nesting community. The following snag design elements use this strategy.

In salvage units, an average 13 snags per acre would be randomly distributed using the following snag size classes: 2.5 snags > 21 inches DBH; 7 snags 14 inches to 20.9 inches DBH; and 3.5 snags 10 inches to 13.9 inches DBH. Snag retention levels are higher than those proposed in Alternative 2 and 5 to provide increased cavity excavator habitat while still reducing fuel loads to levels that better mimic historical conditions. Merchantability specifications would be as described for Alternative 2, with additional snags 10-12 inches DBH being retained in helicopter units.

Where possible, snags would be retained in untreated patches 2 to 15 acres in size. Studies show that cavity dependent species select nest sites with higher tree densities and cavity nesters as a group prefer patches of snags as opposed to single snags retained in uniform, even spaced distribution (Rose et al. 2001, Saab et al., 2002, Kotliar 2002). Snag patches would support snag densities up to 75 snags per acre leaving areas in units between patches with an average of 6 to 11 snags per acre. Because of the mosaic pattern of the burn and the desire to retain snags in patches, snags may not be distributed at the 40-acre basis as required by the Forest Plan, which will require a non-significant Forest Plan amendment.

Alternative 3 proposes no timber salvage on approximately 3,309 acres or 54% of forestlands. Non-salvage acres include four black-backed/three-toed woodpecker areas (see Figure 33 in the Map Section), riparian habitat conservation areas (RHCAs), and stands that were dropped as uneconomical once higher snag requirements were prescribed. Outside salvage units, all snags 10 inches DBH and greater would be retained except those felled along open roads to reduce safety hazards and those felled to provide coarse woody material for streams, draws, and uplands (Chapter 1, Additional Fire Recovery Projects Ongoing or Completed, Actions Outside of this EIS to Address Recovery Needs).

Each of the four black-backed/three-toed woodpecker areas would be about 75-acres in size and set aside for their high snag densities, preferred post-fire habitat areas for these woodpecker species. Stand size and number of areas was based on Forest Plan Management Area 13 (MA-13) recommendations for three-toed woodpeckers. Minimum management requirements suggest establishing habitat acres of 75 acres for every 2,000 to 2,500 acres (USDA 1986). The 75-acre patch size also matches minimum recommendations for black-backed woodpeckers made in several Idaho post-fire studies (Saab and Dudley 1997, Saab et al. 2002). To establish the black-backed/three-toed woodpecker areas, Units 9, 19, 85, 87, 99, 128, 136, 138, 140, 142, and 149 in Alternative 2 were dropped under Alternative 3 and combined with adjacent, unsalvaged riparian areas. No salvage harvest or fuels reduction activities would be conducted in these areas, as these species prefer unlogged conditions.

Table WL-7 displays the post-treatment snag distribution; snag densities are aggressively shifted towards mid-level snag density group #4. Snag densities remain generally high when compared to the DecAID inventory distribution. Density groups 1 though 3 are low when compared to the DecAID distribution, suggesting that Alternative 3 leaves more snags than typically occur in dry forest types. In the large diameter snags, density groups A and B, when combined, reflect a value similar to the DecAID inventory (86% in DecAID and 87% in the Flagtail Fire area. This suggests that Alternative 3 may closely mimic the number of large diameter snags one would expect in dry forest types at the landscape level. Figure 33 in the Map Section displays snag densities by stand or unit.

The direct effect of this alternative would be the removal of potential roosting, nesting and foraging trees. Tables WL-8 through WL-12 indicate that removing snags would reduce woodpecker use levels for all species. Most acres would provide for cavity excavators at the 30% tolerance level, although a range of tolerances would occur over the project area.

In salvage units, retention of 13 snags per acre would provide for Lewis' woodpecker, hairy woodpecker, and northern flicker at the 30% level (see Tables WL-9, WL-10, and WL-11). Lewis' woodpeckers, in particular, tend to favor open or partially logged landscapes for nesting, although they prefer post-logging densities that equate to medium-density, non-burned habitats (Saab et al. 2002). The relatively open canopies allow for shrub development and associated arthropods prey, perch sites for foraging, good visibility, and space for foraging maneuvers. Typically, the species does not use burns until several years after a fire, when stands are more open, snags are well decayed and shrub densities have increased. Salvage harvest has primarily shifted snag levels and tolerance levels from the 50% to the 30% level.

Most non-salvage acres, about 3,309 acres or 54% of forestlands, would provide snag habitat for most primary cavity excavators at the 30% to 50% tolerance level with some areas providing use at the 80% level. These areas provide the greatest opportunities for the black-backed and three-toed woodpeckers. The four black-backed/three-toed woodpeckers areas were specifically selected for their high snag densities and would likely support use at the 30% to 50% tolerance or use level. Snag densities in other non-salvage areas vary, but would likely provide for these species up to the 30% tolerance level. Recall that even under the No Action scenario, the Flagtail Fire does not have snag densities at a level that would support black-backed woodpeckers at the 80% tolerance level. About 9% of the fire area would provide for black-backed woodpeckers at the 30% tolerance level or better, reduced from 34% under the existing condition. Habitat could be somewhat degraded along open roads if hazard trees need to be dropped for safety reasons. Black-backed and three-toed woodpeckers are likely to use salvage units only for foraging, but the 2- to 15-acre retention patches are probably too small to be used by these species for nesting habitat.

Table WL-12 suggests that white-headed woodpecker habitat would be greatly reduced, but the changes in tolerance levels may be misleading. As stated for Alternative 2, the species may not use expansive, severely burned areas regardless of the number of snags retained, instead tending towards the periphery of burned areas where there is a mosaic of live and dead trees. In live, green stands, DecAID suggests that white-headed woodpeckers need far lower densities of snags for use, ranging from 1 to 8 snags per acre greater than 10 inches DBH with 0.3 to 4 of these snags greater than 20 inches DBH (Mellen et al. 2003). In stands that burned with light severity as well as some of the stands that burned with moderate intensity, retention of 13 snags per acre should maintain more acres at the 50% tolerance level then Table WL-12 indicates.

Pileated woodpeckers would probably not be directly affected by the removal of large diameter snags, as studies show they are also rare visitors to early post-fire communities. Indirectly, removal of large diameter snags precludes accumulation of large, down logs, and consequently, reduces future foraging habitat. In salvage units, the low densities of snags left would not provide high quality foraging habitat, although levels would still be better than those expected under Alternative 2. In salvage units, the low densities of snags left would not provide high quality foraging habitat even after snags fall. In non-salvage areas, the potential for quality foraging habitat would remain high. No salvage harvest would occur in Replacement Old Growth area 220, which is being intentionally managed for future old growth (see Chapter 3, Terrestrial Wildlife, Old Growth Habitat).

Red-naped sapsuckers and downy woodpeckers would not be significantly affected by the reduction in nesting and foraging habitat, since they stay mostly in deciduous stands of aspen and cottonwoods. Williamson's sapsuckers forage mostly on live trees, and are also unlikely to be affected.

Initially, before snags begin to fall, large down logs may be deficient. In the severely- and moderately-burned areas (89% of the forested acres), most of the down logs were consumed. In the lightly- and non-burned areas (11% of the forested acres), downed wood habitats are relatively intact.

Period 10-30 years: Loss of Post-fire Snags

Using the findings by Raphael and White (1984) on fall down rates, i.e., that 4 hard snags would need to be retained initially to produce 1 soft snag at year 15, it is expected that retention of 13 snags per acres would generate 3.2 snags/acre at year 15. Snags are expected to be slightly above the 2.39 snags per acre required to meet 100% population potential as established in the Forest Plan.

DecAID values were compared against Raphael and White's findings. In salvage units, tolerance levels for primary cavity excavator species would drop below the 30% level by year 15. In non-salvage units, sufficient snags would remain to provide for most primary cavity excavators at the 30% to 50% tolerance level; only the black-backed and three-toed woodpeckers would have snag use levels drop below the 30% tolerance level.

As snags begin to fall, down log levels would increase thereby increasing denning, nesting, and feeding habitat for down wood dependent species. By year 15 post-fire, the levels of down wood would likely meet the minimum Forest Plan standard. Down log distributions in DecAID suggest that 60% of the Flagtail area should support down logs at .1 to 1% cover and 40% of the area should support down logs at levels greater than 1%. Under Alternative 3, it is likely both salvage and non-salvage areas could eventually support down logs at levels greater than 1%. At the landscape level, down logs would be in excess of levels suggested by the DecAID for dry forest types.

Period 30 + Years: Future Snag Recruitment and the Snag Gap

Under Alternative 3, planting can accelerate reforestation and reduce the amount of time severely burned areas are without large trees, and therefore large snags. Leaving a greater number of post-fire snags may initially retain snags on site longer than Alternative 2, possibly to year 30 post-fire versus year 15 as under Alternative 2. This may decrease the length of the snag gap from 75 years to 60 years.

Alternative 4

Period 0-10 years

Alternative 4 would reduce fuels on 4,780 acres, removing snags 8 inches DBH or less. Throughout the burn area, larger snags and downed woody material would remain undisturbed, providing potential nesting, roosting, and foraging habitat for cavity dependent species. Effects would be similar to Alternative 1. Table WL-7 displays the post-treatment snag distribution; snag densities are identical to Alternative 1; DecAID comparisons and conclusions would be similar to Alternative 1 as well. Comparison of snag distributions suggests that, because of the fire, the Flagtail project area may currently support snags at a much higher level than would be typically expected in dry forest types. Figure 31 in the Map Section displays snag densities by stand or unit.

Removal of the smaller snags is unlikely to have much effect on cavity excavator populations. Generally, cavity excavators favor large snags over smaller snags for both nesting and foraging. Although smaller snags can provide foraging habitat, they probably will not support the same insect populations as larger snags and most fall to the ground within the first 10 years post-fire. Although black-backed and three-toed woodpeckers favor high densities of smaller snags in unlogged conditions, removing understory trees are likely to have only minimal effects. Both species tend to nest in snags larger than 8 inches DBH, so only foraging substrate would be reduced. On most acres, post treatment tree densities would still be high enough to support use.

Comparing existing snag densities and sizes against those displayed in DecAID, it is expected that snag numbers would support most primary cavity excavators at the 30% to 50% tolerance level or better, as described for Alternative 1. Typically post-fire habitat conditions are considered ideal for black-backed woodpeckers, but DecAID suggests that even under the best of situations, snag densities in Flagtail will provide for use only up to about the 50% tolerance level. Species associated with dead wood habitats would respond favorably under this alternative.

Period 10-30 years: Loss of Post-fire Snags

Effects would be similar to Alternative 1.

Period 30 + Years: Future Snag Recruitment and the Snag Gap

Because burned areas will be planted, Alternative 4 is similar to Alternatives 2 and 3. Because most commercial-sized snags would be retained, the snag gap is expected to last from year 30 to year 90, a snag gap of 60 years. If larger snags persist longer than expected, the snag gap would be reduced further, particularly for Alternatives 1 and 4, which retain the most large diameter snags.

Alternative 5

Period 0-10 years

Alternative 5 was designed to provide a broader range of post-fire habitats for primary cavity excavators than the other action alternatives. This alternative proposes timber salvage on 3,740 acres (60% of forested acres) and no timber salvage on approximately 2,440 acres (40% of forest lands). Estimated harvest acres reflect untreated snag patches to be left in some units. Fuels reduction activities would remove snags less than 8 inches DBH on 2,400 acres.

The snag distribution data in DecAID suggests that dry forests may have supported lower snag levels than those created by the Flagtail Fire (Table WL-7). In addition, the data suggests that snag levels varied greatly across the landscape based on natural site conditions. Some areas likely had high concentrations of snags and other areas had few or no snags. Alternative 5 was designed to more closely mimic snag distributions expected at the landscape level. Under Alternatives 2 and 3, snag prescriptions would be nearly identical in every unit. Under Alternative 5, snag level prescriptions would vary by salvage unit based on a variety of criteria including forest type, aspect and slope, and other resource needs, such as visual quality, proximity to the wildland urban interface, and economics.

In salvage units, generally, one of three snag prescriptions would be applied. Units would retain either 13 snags per acre, 7 snags per acre, or 2.39 snags per acre. Figure 34 in the Map Section displays snag densities by stand or unit.

Under the 13-snag prescription, an average 13 snags per acre would be randomly distributed across harvest areas using the following snag size classes:

- 2.5 snags > 21-inch DBH;
- 7 snags 14-inch to 20.9-inch DBH;
- and 3.5 snags 10-inch to 13.9-inch DBH.

Under the 7-snag prescription, an average 7 snags per acre would be randomly distributed across harvest areas using the following snag size classes:

- 2.5 snags > 21-inch DBH;
- 2.5 snags 14-inch to 20.9-inch DBH;
- and 2 snags 10-inch to 13.9-inch DBH.

Under the 2.39-snag prescription, the Forest Plan standard for snags would be applied;

- an average 2.39 snags > 21-inch DBH would be randomly distributed across each unit.

A large-scale fire such as Flagtail provides nearly unlimited options to vary snag densities at a landscape level. Generally, the 13-snag, 7-snag and 2.39 snag prescriptions would be applied to salvage units using the following criteria. The 13-snag prescription would be applied in the visual corridor along County Highway 63 to maintain visual quality and to meet medium snag distribution levels. The 7-snag prescription would be applied on steeper north and east slopes, aspects that typically have higher tree densities and support conditions that often sustain snags for longer periods of times. In addition, fire frequency on north slopes tends to be lower, and therefore when fires do occur, they tend to be of mixed severity causing higher tree mortality. The 2.39 snag prescription would be applied on south and west aspects that typically support drier, less productive conditions and lower tree densities and along the wildland urban interface where lower fuel loads would reduce fire risk to private lands. In addition, consideration was given to applying lower snag prescriptions to helicopter and skyline units where retaining higher snag densities can make salvage more cost-prohibitive.

Under the 13-snag prescription, snags would be retained in untreated patched 2 to 15 acres in size, because cavity nesters as a group prefer patches as opposed to single snags retained in uniform, even spaced distribution (Rose et al, 2001, Saab et al, 2002, Kotliar 2002). Untreated patches would be retained on about 10% of each unit with location determined primarily by operational considerations. Snags located outside these patches would be clustered as natural snag patterns allow. Untreated patches would not be required in small units or units that have snags mixed with live trees; in these units better snag distribution will be achieved without the untreated patches.

Under the 7-snag and 2.39-snag prescriptions, untreated patches would not be required, because at these lower snag levels, retention of untreated patches would result in large areas between the patches being devoid of snags. Better snag distribution would be achieved without the untreated patches. Snags would be clustered as natural snag patterns allow.

Although this snag strategy prescribes 2.39 to 13 snags/acre, helicopter units would actually retain all 10-12-inch DBH snags because of utilization standard limitations described under Alternative 5, Forest Vegetation/Structure. These snags, ranging from about 5-30 snags per acre, provide additional benefits to wildlife.

Four 75+ acre black-backed woodpeckers areas would be established as described for Alternative 3 (see Map Section, Figure 34). These designated areas would be used in combination with other untreated areas to provide preferred habitat for this species.

Outside salvage units, all 10" DBH+ snags would be retained except those felled along open roads to reduce safety hazards and those felled to provide coarse woody material for streams, draws, and uplands (Chapter 1, Additional Fire Recovery Projects Ongoing or Completed, Actions Outside of this EIS to Address Recovery Needs).

Alternative 5 creates higher snag variability than Alternatives 2 and 3. Variability is greater at both the unit and landscape level. In the visual corridor along County Road 63, units with 13 snags per acre would have some snag patches with snag densities up to 75 snags per acre leaving areas in units between patches with an average of 6 to 11 snags per acre 10 inches DBH and larger. Units with a 7- or 2.39-snag per acre prescription do not include untreated patches; snags would be distributed as natural patterns allow. Because of the mosaic pattern of the burn and the desire to retain snags in patches, snags may not be distributed at the 40-acre basis as required by the Forest Plan, which will require a non-significant Forest Plan amendment.

Alternative 5 proposes no timber salvage on approximately 2,240 acres or 40% of forestlands. Non-salvage acres include four black-backed/three-toed woodpecker areas, riparian habitat conservation areas (RHCAs), and stands that were dropped as uneconomical once higher snag requirements were prescribed.

Table WL-7 displays the post-treatment snag distribution. Alternative 5 would shift snags densities towards the lower snag density groups. Alternative 5 may come closest to mimicking the DecAID snag distributions, although snags levels are still somewhat higher than those suggested by DecAID. In the large diameter snags, density groups A and B, when combined, reflect a value similar to the DecAID inventory (86% in DecAID and 88% in the Flagtail Fire area. This suggests that Alternative 5 may closely mimic the number of large diameter snags one would expect in dry forest types at the landscape level. Figure 33 in the Map Section displays snag densities by stand or unit.

The direct effect of this alternative would be the removal of potential roosting, nesting and foraging trees. Tables WL-8 through WL-12 indicate that removing snags would reduce woodpecker use levels for all species. Snag densities would support species at a range of tolerance levels, generally up to the 50% tolerance level. Woodpecker levels would fall somewhere between those expected for Alternatives 2 and 3.

In salvage units, retention of 13 snags per acre would provide for Lewis' woodpecker, hairy woodpecker, and northern flicker at the 30% level. Lewis' woodpeckers, in particular, tend to favor open or partially logged landscapes for nesting, although they prefer post-logging densities that equate to medium-density, non-burned habitats (Saab et al. 2002). Units with the 7-snag or 2.39-snag prescription do not meet the 30% tolerance levels for Lewis' woodpecker and hairy woodpeckers; the 2.39-snag prescription does not meet the 30% tolerance level for flickers.

Most non-salvage acres, about 2,440 acres or 40% of forestlands, would provide snag habitat for most cavity excavators at the 30% to 50% tolerance level with some areas providing use at the 80% level. These areas provide the greatest opportunities for the black-backed and three-toed woodpeckers. The four black-backed/three-toed woodpeckers areas were specifically selected for their high snag densities and would likely support use at the 30% to 50% tolerance or assurance level. About 8% of the fire area would provide for black-backed woodpeckers at the 30% tolerance level or better, similar to Alternative 3, but reduced from

34% under the existing condition. Habitat could be somewhat degraded along open roads if hazard trees need to be dropped for safety reasons. Black-backed and three-toed woodpeckers are likely to use salvage units only for foraging, but the 2- to 15-acre retention patches are probably too small to be used by these species for nesting habitat.

Species that do not commonly use burned forest, such as pileated and white-headed woodpecker, would be minimally affected by Alternative 5 in the short-term. The existing condition is not suitable for extensive use by these species because live trees and canopy cover are not available over most of the project area. Snags located along the periphery of the burn may provide the best opportunities for foraging or nesting if they are in close proximity to green stands that provide other critical habitat components. Indirectly, removal of large diameter snags precludes accumulation of large, down logs, and consequently, reduces future foraging habitat for pileated woodpeckers. In Replacement Old Growth area 220, salvage harvest on 277 acres would reduce dead wood habitats. ROG 220 is being intentionally managed for future old growth (see Chapter 3, Terrestrial Wildlife, Old Growth Habitat). Alternative 5 would retain 7 snags per acre in the ROG, including the largest 5 snags over 14 inches DBH, providing snags/downed wood for pileated woodpeckers in the future.

Red-naped sapsuckers and downy woodpeckers would not be significantly affected by the reduction in nesting and foraging habitat, since they stay mostly in deciduous stands of aspen and cottonwoods. Williamson’s sapsuckers forage mostly on live trees, and would also unlikely be affected.

Initially, before snags begin to fall, large down logs may be deficient. In the severely- and moderately-burned areas (89% of the forested acres), most of the down logs were consumed. In the lightly- and non-burned areas (11% of the forested acres), downed wood habitats are relatively intact.

Period 10-30 years: Loss of Post-fire Snags

Using the findings by Raphael and White (1984) on fall down rates, i.e., that 4 hard snags would need to be retained initially to produce 1 soft snag at year 15, it is expected that retention of 13 snags per acres would generate 3.2 snags/acre at year 15. Snags are expected to be slightly above the 2.39 snags per acre required to meet 100% population potential as established in the Forest Plan. In the remaining salvage units, snags are expected to fall below the Forest Plan standard by year 15.

DecAID values were compared against Raphael and White’s findings. In salvage units, tolerance levels for primary cavity excavator species would drop below the 30% level by year 15. In non-salvage units, sufficient snags would remain to provide for most primary cavity excavators at the 30% to 50% tolerance level; only the black-backed and three-toed woodpeckers would have snag use levels drop below the 30% tolerance level.

As snags begin to fall, down log levels would increase thereby increasing denning, nesting, and feeding habitat for down wood dependent species. By year 15 post-fire, the levels of down wood would likely meet the minimum Forest Plan standard. Down log distributions in DecAID suggest that 60% of the Flagtail area should support down logs at .1 to 1% cover and 40% of the area should support down logs at levels greater than 1%. Under Alternative 5, it is likely non-salvage areas could eventually support down logs at levels greater than 1%.

At the landscape level, down logs would meet or exceed levels suggested by the DecAID for dry forest types.

Period 30 + Years: Future Snag Recruitment and the No-Snag Gap

Under Alternative 5, planting can accelerate reforestation and reduce the amount of time severely burned areas are without large trees, and therefore large snags. Snag prescriptions vary by unit from 2.39 snags per acre to 13 snags per acre, so the snag gap could vary by unit as well. The snag gap in severely burned areas could vary from 60 to 75 years.

Cumulative Effects

Due to past management including overstory removal, salvage harvest, roadside hazard tree removal, firewood cutting, and fire suppression, snag and down wood quantities have declined from historical levels. In non-harvested areas outside the fire area, snag density is often in excess of the Forest Plan standard of 2.39 snags per acre and provides for 100% potential population levels of most species. In harvested areas outside the fire area, snag density is often below the Forest Plan standard and does not provide for100% population levels. 2002 photo interpretation data estimate that areas not burned by the fire average approximately 1.5 snags per acre over 15 inches DBH and 0.5 snags per acre over 20 inches DBH.

Current trends indicate that snag and down wood numbers are increasing due to reduced harvest over the past decade and increased retention levels required by Regional Forester's Eastside Forest Plans Amendment #2. Any future timber harvest or prescribed fire activities would be designed to promote the development of late and old growth habitat and retain a snag and down wood component. Such management strategies are expected to improve habitat for cavity dependent species.

Stand replacement fires are particularly important for species such as the black-backed and three-toed woodpecker. In unburned forests, species numbers are relatively low and may be sink populations (populations that are generally decreasing). Fires serve as source habitats (populations increase and spread). When habitat conditions in a fire area become unsuitable, birds likely immigrate to the unburned areas (Hutto 1995). Consequently, periodic fires may be needed to maintain populations across the landscape.

Stand replacement fires in the immediate area have been rare in the last 30 years; generally, initial attack of wildfires has been successful in minimizing stand replacement fires. The closest stand replacement fires were the 1986 Scalp Fire, the 1989 Table Mountain Fire, the 1994 Cabin Fire, and the 1994 Scotty Fire. The Scotty Fire was located about 1.5 miles south of the project area; the remainder of the fires were located on the far side of Bear Valley, approximately 10 to 20 miles east. Fire-killed trees were salvaged in all four fires; salvage prescriptions retained a portion of the snags to meet minimum Forest Plan standards. Data on snag densities is not available; however, ocular estimates indicated many snags have fallen. Salvage reduced snag densities below levels needed for black-backed and three-toed woodpeckers. Other primary cavity species, such as the Lewis' woodpecker, hairy woodpecker and northern flicker, have likely used these habitats, but currently these snags are no longer at densities or decay stages that provide optimum forage opportunities. The 2002 Monument and Easy Fires are located over 35 miles north and east of the project area;

certainly these fires benefit dead wood dependent species, but for this analysis, they were considered outside the cumulative effects area.

Under a separate NEPA analysis, a proposal is being considered to fell individual snags along streams and ephemeral draws, and use them as course, woody material in channels. Within Category 1 and 2 RHCAs, 20 snags per miles or about 2 to 4 snags per RHCA acre would be felled. Within Category 4 RHCAs, 20 to 50 snags per mile or about 2 to 4 snags per RHCA acre could be felled. Within emphemeral buffers, 20 to 70 snags or 3 to 11 snags per acre could be felled. RHCAs have been excluded from salvage units; snags would not be salvaged although trees may be felled to reduce hazards along open roads. Some of these trees may be used in streams to meet course woody debris needs. Ephemeral draw buffers are found in some units; however, snag prescriptions would retain higher levels of snags to accommodate for those to be used for steam restoration.

Future firewood cutting could reduce snag levels further; however, mitigation has been included in logging system design. In Alternatives 2, 3 and 5, snags in salvage units would be located at least 150 feet from open roads where possible. Under current Forest firewood cutting policies, this makes these snags off limits for cutting. In addition, firewood cutting would be delayed within the fire area until 2004 under Alternatives 1 and 4, or until after harvest under Alternatives 2, 3 and 5 (expected to be 2005).

Private lands typically do not provide large diameter snags. In the past, adjacent landowners have generally harvested damaged or dying trees to capture their economic value before they decay to a level where they no longer have any market value. Timber management has favored harvest of large diameter trees because of their higher economic value; removal of overstory trees releases smaller trees that are then managed over the next harvest cycle. Adjacent private lands that burned in the Flagtail fire have already been salvage logged.

Cumulatively, Alternatives 2, 3, and 5 contribute reductions in habitat for primary cavity excavator species. Alternative 4 reduces foraging habitat by treating snags less than 8 inches DBH, but additive effects would be considered negligible given the total number of snags that would be retained. Alternative 1, by retaining nearly all snags, would not contribute to further declines in snag habitat.

The Forest Plan requires that snag levels be averaged on a 40-acre basis to maintain an even distribution across the landscape. Retaining all snags in the fire area would not necessarily elevate woodpecker use in snag deficient, unburned areas, except along the periphery of the fire where a mosaic of burned and unburned forest occurs or where territories overlap with the fire area. Black-backed and three-toed woodpeckers may be the exception; these species use post-fire habits as source habitats and immigrate to non-burn areas once snags fall in the burn area.

Projects are being planned simultaneously to plant riparian areas with hardwood and conifer species and to expand and fence aspen groves. Livestock grazing has been discontinued in the burn area until ground vegetation recovers. Cumulatively, these actions will help reestablish hardwood vegetation to the benefit of primary cavity species that use these habitats, such as the Lewis woodpecker, red-naped sapsucker, and downy woodpecker.

Cumulatively, retaining high levels of snags within the project area (particularly in the Alternatives 1, 3 and 4), along with moving toward the 100 percent population levels in the surrounding area, would ensure that populations of cavity-dependent species would increase over time.

Summary

The following table (Table WL-13) summarizes snag densities, cavity excavator use as quantified by DecAID, and snag retention area acres for each of the alternatives.

Table WL-13: Snag Densities, Cavity Excavator Use, and Snag Retention Areas

Resource Issue	Unit of Measure	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Snag Density in Salvage Units	Snags /Acre	All, 3-105*	2.39	≥13	All, 3-105*	2.39 - ≥13
Cavity Excavator Use Level**	Tolerance Level (%)	5-80+	5-30	30-50	5-80+	5 - 50
Untreated Acres Providing Natural, Post-burn Snag Levels	Acres (% of forested acres)	6,180* (100%)	1,795 (30%)	3,310 (53%)	6,180* (100%)	2,440 (40%)
Down Logs Levels at Year 15.	Meets Forest Plan Standards	Yes	Yes	Yes	Yes	Yes
	Meets or Exceeds DecAID Levels	Yes	No	Yes	Yes	Yes
Snag Gap in Severely Burned Areas	Years Without Snags	70	75	60	60	60-75

* Alternatives 1 and 4 do not conduct commercial harvest. Data for these two alternatives are presented to show snag levels in the absence of commercial harvest of snags 10" DBH and greater. Alternative 4 conducts fuels treatment of dead tree 8" DBH or less.
**Displaying cavity excavator use levels as an overall range for multiple species provides a relative difference between alternatives; however, a more accurate portrayal is displayed by individual species in Tables WL-8 through WL-12.

The differences in alternatives are best evaluated by comparing 1) predicted snag distributions for each alternative against DecAID snag distributions and 2) predicted woodpecker tolerance or use levels as derived from DecAID.

Comparing Snag Distributions: Inventory data in DecAID provides a suggested snag distribution for dry forest types (see Table WL-7). The Flagtail project area may currently support snags at a much higher level than would be typically expected in dry forest types. Following implementation, Alternative 5 may come closest to mimicking the DecAID snag distributions, followed by Alternative 2, then Alternative 3. Because Alternatives 1 and 4 do not harvest 10+ inch DBH snags, snag densities are highly elevated compared to distributions in DecAID. Therefore, the inventory data suggests that reductions in snag levels or woodpecker use levels could be balanced against other resource needs while still providing sufficient habitat of wildlife species.

Comparing Wildlife Tolerance or Use Levels: Tolerance levels have less to do with viability of species and populations, and more to do with the distribution of individuals across a project area. The alternatives represent different levels of snag retention, and thus would affect woodpecker presence and distribution. The No Action alternative would maintain snag habitats across the entire fire-affected area. About 6,180 acres of suitable habitat exists. Species such as the black-backed and three-toed woodpeckers would rapidly colonize stand-replacement burns within 1 to 2 years of the fire; however, within 5 years they would decline, presumably due to declines in bark and wood-boring beetles (Kotliar et al. 2002). For other species, such as the Lewis' woodpecker, northern flicker and hairy woodpecker, suitable habitat conditions will persist longer, upwards of 25 to 30 years. Once the majority of snags fall, cavity excavators would not likely occupy the area, or they would exist at greatly reduced levels.

Table WL-13 displays cavity excavator use or tolerance levels as an overall range for cavity excavator species. Values provide a relative difference between alternatives; however, a more accurate portrayal is displayed by individual species in Tables WL-8 through WL-12. Alternatives 1 and 4 support most primary cavity excavators at the 30% to 50% tolerance level or better. Alternatives 3 and 5 support most primary cavity excavators at the 30% to 50% level. Alternative 2 would reduce snag densities for much of the area below the 30% tolerance level. Therefore, Alternatives 1 and 4 provide the most habitat for these species, followed by Alternative 3, and then Alternative 5. Alternative 2 reduces the most habitat, as is the least favorable to dead wood associated species.

Another way to compare alternatives is to review the number of acres of suitable habitat protected, either in "reserve patches" specifically established for woodpecker species or non-salvage areas established for other reasons, e.g., RHCA protection or low economic viability. These unlogged patches are particularly important to species such as the black-backed and three-toed woodpeckers that may use unlogged burn areas as source habitats to maintain populations across the landscape. Table WL-13 summarizes untreated areas by alternative. Alternatives 1 and 4 essentially retain all existing habitat, about 6,180 acres, although Alternative 4 degrades the habitat somewhat by treating trees 8 inches DBH and less. Alternatives 3 and 5 set aside approximately 3,310 acres and 2,440 acres, respectably. Alternatives 3 and 5 establish 4 black-backed/three-toed woodpecker areas, helping provide important source habitat for these species. Alternative 2 does the least to provide suitable habitat and distribution of woodpecker species; about 1,795 acres are left untreated, and likely presents elevated risks to black-backed and three-toed woodpeckers. Only 3% of the fire area would provide for black-backed woodpeckers at the 30% tolerance level or better, reduced from 34% under the existing condition.

While snags are abundant after a fire, once they fall down, they will not be available again until a new forest develops, trees reach sizes useful for woodpeckers, and these trees begin to die. The period when snags are not available can be referred to as the "snag gap." Although snag levels currently exceed Forest Plan standards, it is expected that most post-burn snags will be on the ground within 30 years. The time it takes to reforest burn areas differs between natural regeneration and planting. Natural regeneration can delay reforestation by 10 to 50 years depending on the availability of a live tree seed source. The No Action Alternative relies on natural regeneration; the Action Alternatives primarily use planting. In severely burned area, the No Action creates a snag gap of 70 years. Alternative 2 creates a snag gap of 75 years, greater than the No Action alternative. In Alternative 2, so few snags are left during salvage logging that the snag gap would materialize at year 15 instead of year 30. Alternatives 3 and 4 create snag gaps of 60 years. In Alternative 5, the snag gap varies from 60 to 75 years depending on unit snag prescription. If larger snags persist longer than expected, the snag gap would be reduced further, particularly for Alternatives 1 and 4, which retain the most large diameter snags.

Featured Species – Northern Goshawk

Existing Condition

The northern goshawk inhabits conifer-dominated forests. Goshawks utilize a wide range of forest structural conditions, often hunting prey in more open stands, yet relying on mature to old growth structure for nesting and fledging. Nests are commonly on north aspects in drainages with dense canopy (60-80%), in large trees, and near water or other forest "edges" (Reynolds et al. 1992 and Marshal 1992). Habitat trend information derived from Interior Columbia Basin studies (Wisdom et al. 2000) indicated that about 50% of the watersheds in the Blue Mountains showed a decreasing trend in goshawk habitat and 35% showed an increasing trend. Breeding Bird Survey (BBS) data suggests stable populations in western North America from 1966 through 1995; trend information derived from a study in the southwest indicated a 4% annual decline in populations (Wisdom et al. 2000). On the Blue Mountain Ranger District, known goshawks nest sites are monitored annually.

Pre-fire, 6,180 acres or 87% of the area was forested with 26% classified as old growth that could have potentially provided nesting habitat. Three known goshawk territories existed within the fire perimeter. A 30-acre nest site and 400-acre post-fledging area (PFA) had been delineated for the Jack Creek and Dipping Vat territories. No post-fledging areas (PFAs) had been delineated for the Swamp Creek territory, but nest sites had been identified. These territories have been surveyed annually since the early- to mid-1990s.

The fire burned through all three territories; fire intensities ranged from light intensity or underburns (less than 30% tree mortality) to moderate intensity or mosaic burns (60% to 90% tree mortality) to severe intensity or total burns (greater than 90% tree mortality). Table WL-14 below identifies the original goshawk territories, subwatersheds, activity record, total acres, total acres burned, and post-fire structural stage.

Table WL-14: Northern Goshawk Territories Burned

Post-fledging Area (PFA) Name	Subwatershed	Nest Activity Record	Total Acres	Acres Burned by Tree Mortality Class	Post-fire Structural Stages
Jack Creek	Jack - 60507	Active 6 out of the last 11 years.	413	Mod. = 300 ac. Low = 28 ac.	SI, UR, SEOC, OFMS
Dipping Vat	Jack - 60507	Active 10 out of the last 11 years.	443	Severe = 340 ac. Mod. = 103 ac.	SI, UR
Swamp Creek	Snow – 60509	Active 5 out of the last 8 years.*	NA	Severe tree mortality	SI

NA = Not applicable – No post-fledging area had been identified around nest site.
Tree Mortality Classes:
Severe Mortality (total burn) = 90%+ tree mortality
Moderate Mortality (mosaic burn) = 60% to 90% tree mortality
Low Mortality (underburn) = 30% to 60% tree mortality
SI = Stand Initiation; UR = Understory Re-initiation, SEOC = Stem Exclusion Open Canopy, OFMS = Old Forest Muli Strata
* In the Swamp Creek area, goshawks only actively nested 2 of the 8 years. During the other 3 active nest years, the nest site was occupied by other raptor species.

As a result of the fire, the Dipping Vat and Swamp Creek territories no longer classify as old growth habitat; essentially, all trees, including the nest trees, were killed in the territories. These territories are no longer considered functional; goshawks are not expected to return to these sites under current conditions. In the Jack Creek territory, the fire burned in a mosaic fashion; tree mortality ranges from 30% to 90%. Forest structural stages were converted from OFMS and YFMS to UR, SEOC, and SI structural stages. Two of the three nests trees in the Jack Creek PFA survived the fire; however, given the fire damage in the immediate area (about 30% tree mortality), it is uncertain whether goshawks will reoccupy these nests. Just outside the fire perimeter, about 85 acres of the original territory remains old growth; this area provides suitable nesting habitat. The mosaic burn in the remainder of the PFA opened up canopy and reduced the quality of the nesting habitat but does provide good foraging habitat. It is unknown whether or not goshawks will continue to nest and breed in this territory.

Post-fire, it is highly unlikely that goshawks will use the interior portion of the fire area for nesting, as forested stands with 60 to 80% canopy cover and suitable trees no longer exist. It is likely that goshawks will forage in the burn area. In light to moderately burn areas, fires typically improve foraging habitat for raptors by reducing hiding cover and exposing prey populations (Smith 2000). In the more severely burned areas, it is uncertain to what degree goshawks will use these areas for foraging because of the loss of cover; limited literature is available.

The three original territories and adjacent nesting habitat were surveyed for goshawks in 2003. No nesting goshawks were identified within or immediately adjacent to the burn perimeter. Foraging goshawks have been periodically sighted in the fire area; it is assumed that these individuals are taking advantage of the improved foraging conditions. The three original territories and adjacent nesting habitat will continue to be surveyed annually to determine whether or not goshawks will return for nesting. Three additional goshawk territories are located within the subwatersheds affected by the fire. Nest sites are located over ½ mile from the fire perimeter, and therefore, are not affected.

Environmental Consequences

Direct and Indirect Effects

See the Old Growth Section of this Chapter for additional effects on goshawks and their preferred nesting habitat.

No Action

There would be no direct adverse effects to goshawks from Alternative 1 because no salvage logging or fuels reduction activities would occur. Reforestation of the area would be dependent on natural regeneration, which would delay development of future forest including mature and old growth forest. See Old Growth section for the time it would take to reestablish old growth. Because goshawks will prey on dead wood associated species, retention of large quantities of snags and down logs will provide goshawks high quality foraging habitat. Under Alternative 1, the elevated fuel loads expected in 10 to 20 years increase the risk of an intense re-burn; another stand replacement fire could further delay development of nesting habitat.

Action Alternatives

The action alternatives all propose management activities within original goshawk post-fledging areas; however, there would be no direct adverse effects to nesting habitat because essentially only dead or dying trees would be removed. Some live trees would be removed for road construction, helicopter landings, and to reduce safety hazards, but effects would be considered incidental. The action alternatives would positively affect northern goshawk habitat by accelerating reforestation so that stands would become mature sooner than if no action was taken (see Old Growth section for the time it would take to reestablish old growth).

Of the three known territories burned, the Jack PFA has the best chance of being reoccupied. Two nest trees survived the fire, although it is uncertain whether goshawks will reoccupy these sites given the adjacent tree mortality and loss of canopy cover. No salvage will occur in these nest stands under any of the action alternatives. The Dipping Vat and Swamp Creek territories no longer contain any habitat suitable for nesting or post-fledging activities; goshawks are not expected to reoccupy these sites. Although the fire destroyed nesting habitat within the burn area, goshawks may establish new nests in unburned stands located outside the fire perimeter. Mature and old growth stands suitable for nesting, as well as the surviving nests stands in the Jack PFA, would be monitored annually for goshawk activity as needed. If active nest sites are identified within or immediately adjacent to the project area, management activities would be prohibited within ½ mile of the nest sites from April 1 to September 30 to avoid disturbing goshawks during the breeding season.

Salvage harvest would reduce foraging habitat by removing snag habitats that can support goshawk prey. Because goshawks will prey on primary cavity excavators, retention of dead wood habits will help improve goshawk foraging habitat. Goshawks prey on a variety of small mammal species as well; as snags fall and vegetation recovers, habitat for these prey species will improve. The greater the number of snags retained, the better the goshawk foraging habitat. The action alternatives prescribe different snag densities (see Primary Cavity Excavator section of this chapter). In salvage units, Alternative 2 would meet Forest Plan standards by retaining 2.39 snags per acre. Alternative 3 would exceed Forest Plan standards by retaining at least 13 snags per acre. Alternative 4 would retain all snags over 8 inches DBH. Alternative 5 would retain a varying number of snags ranging from 2.39 snags to 13 snags per acre of greater. Adult goshawks foraging in the area are not likely to be disturbed by project activities.

Research (Reynolds et al. 1992 and Marshal 1992) varies on conclusions as to the effects of salvage harvest in and adjacent to nest stands and whether or not goshawks will use these stands following harvest. Several studies (Marshal 1992) have suggested that selection harvest of trees can reduce nesting; however, it is unclear whether restricting harvest to dead trees would have a similar effect. Goshawk management recommendations by Reynolds et al. (1992) do not exclude timber harvest.

Action alternatives close or decommission roads. Generally, road closures reduce the potential for disturbance of nesting birds; however, site-specific effects are difficult to assess in the Flagtail Fire area due to the inability to predict if and where goshawks will nest until vegetation is restored.

Under Alternative 4, the elevated fuel loads expected in 10 to 20 years increase the risk of an intense re-burn; another stand replacement fire could further delay development of nesting habitat. Alternatives 2, 3 and 5 also leave some burn areas untreated, but salvage logging and fuels reductions reduce overall fuel loads and break up the continuity of fuels remaining.

Cumulative Effects

All of the activities in Appendix J have been considered for their cumulative effects on northern goshawk. The following discussion focuses on those past, ongoing and reasonable foreseeable future activities that may contribute adverse effects to the species or its habitat.

Nesting habitat is typically the limiting factor for goshawks. Past timber harvest reduced mature and old growth habitat preferred for nesting and fledging. Since 1993, the Forest Plan as amended, has directed the Malheur National Forest to conduct timber sales in a manner that moves stands towards OFMS and OFSS structural stages, and timber sales planned since that time should not have contributed to loss of mature and old growth forest.

Additional restoration activities are being planned for riparian areas in the burn area and include aspen restoration, hardwood and conifer planting, felling of down logs across stream channels, and fuels reduction. The scale of these projects relative to salvage logging is incidental. Existing nest trees in the Jack PFA would be protected. When the alternatives in this proposal are combined with these restoration projects, effects on northern goshawk would still be considered minimal.

Adjacent private lands have already been salvage logged. In the past these timber stands have generally not provided nesting habitat for goshawks. These stands are not being managed for old growth conditions, and therefore are not expected to provide nesting habitat in the future.

Forage is not considered a factor limiting goshawk population viability, and consequently cumulative changes to foraging habitat, whether positive or negative, would not contribute to a measurable change in goshawk populations.

In 2002/2003, fire-killed, hazard trees were salvaged on 14 acres at the Bear Valley Work Center and on 650 acres along roads. Future fuels reduction is planned on 100 acres inside Riparian Habitat Conservation Areas (RHCAs); dead, unmerchantable trees 8 inches DBH and smaller would be felled, then hand piled and burned outside of riparian areas. When combined with salvage logging and fuels treatment proposed in Alternatives 2, 3 and 5, landscape-level fuels treatments are expected to help reduce the risk of an intense re-burn and another stand replacement fire. Under Alternatives 1 and 4, combined fuel treatments are less likely to reduce fuel loads sufficiently to avoid intense re-burns in the future.

Goshawks are highly sensitive to disturbance during the breeding season. When seasonal restrictions on management activities were disregarded in the past, breeding success may have been reduced. Since 1990, seasonal restrictions on activities have been regularly used in the vicinity of occupied nests. Suitable nesting habitat is to be monitored annually; if monitoring identifies occupied nesting habitat, seasonal restrictions would be applied to all management activities.

In the short-term, the four action alternatives would not contribute to cumulative losses of mature and old growth habitat because stands treated no longer function as old growth. In the long-term, the action alternatives would contribute positively to cumulative effects by accelerating the development of old growth, i.e. goshawk nesting habitat. Cumulatively, management actions are not expected to reduce population viability.

Summary

Neither the No Action alternative nor the Action alternatives are expected to affect populations or viability of northern goshawks. The Flagtail fire already reduced or eliminated nesting habitat in the three known goshawk territories. Harvest doesn’t change live tree canopy; alternatives harvest few live trees. In the Jack PFA, two nest trees survived the fire, but goshawks did not return in 2003. Removal of dead and dying trees would reduce snag habitat used by goshawk prey, but forage, particularly in the fire area, is not considered a limiting factor for goshawks. Mature and old growth stands suitable for nesting would be surveyed annually for goshawk nesting activity. If new nest sites are identified within or immediately adjacent to the project area, silvicultural prescriptions would be modified as needed and seasonal restrictions would be applied to management activities to avoid disturbing goshawks during the breeding season.

By planting trees, the action alternatives would accelerate recovery of vegetation; in severely burned areas, development of nesting habitat could take 10 to 40 years less than under the No Action alternative.

Under Alternatives 1 and 4, the elevated fuel loads expected in 10 to 20 years increase the risk of an intense re-burn; another stand replacement fire could further delay development of nesting habitat. Alternatives 2, 3 and 5 also leave some burn areas untreated, but salvage logging and fuels reductions reduce overall fuel loads and break up the continuity of fuels remaining.

Featured Species – Blue Grouse

Existing Condition

Blue grouse inhabit coniferous forests intermixed with grassy or scabby openings. They use large mistletoe infected Douglas-fir trees, generally located within the upper 1/3 of slopes, as winter roosts.

Habitat trend information derived from Interior Columbia Basin studies (Wisdom et al. 2000) indicated that about 80% of the watersheds in the Blue Mountains showed a decreasing trend in blue grouse habitat and 10% showed an increasing trend. Declines in source habitat are primarily attributed to a reduction in late seral forest. No population data is available, but populations are likely lower than they were historically (Wisdom et al. 2000).

Pre-fire, blue grouse likely inhabited the project. Post-fire, there is little or no habitat within the burn area considered suitable for winter roost habitats; however, nesting habitat will be available once a variety of grasses and forbs becomes established and provide hiding cover.

Environmental Consequences

Direct, Indirect, and Cumulative Effects

No Action

Relying on natural regeneration to reforest the burn area would delay development of mature and old growth trees. Blue grouse favor mature/over-mature trees as winter roosts. Since fuels would not be treated under Alternative 1, there is the high risk of an intense re-burn that could delay recovery of vegetation.

Action Alternatives

Direct effects of salvage logging and fuels reduction would be disturbance to blue grouse nesting/foraging in the project area, forcing them out of activity areas and into adjacent undisturbed areas. Generally, trees expected to survive the fire would be retained, even if they were infected with mistletoe; only incidental live trees would be removed for safety or operational reasons during logging. Indirect effects to blue grouse could be increased competition for nesting/foraging habitat outside the burn area. It is assumed that salvage logging and fuels reduction activities will have minimal effects on blue grouse, as there is little habitat favored by blue grouse remaining within the burn area. Ground vegetation for nesting/foraging is expected to recover rapidly. Grasses and forbs are expected to reestablish naturally in 2 to 5 years; shrubs are expected to reestablish in 2 to 15 years. Blue grouse favor mature/over-mature trees as winter roosts; planting trees would accelerate development of mature and old growth trees. Alternative 4 has high risk of an intense re-burn that could delay recovery of vegetation.

All of the activities in Appendix J have been considered for their cumulative effects on blue grouse. Cumulatively, where livestock grazing coincides with nesting/foraging, grazing would likely reduce height of ground vegetation and possibly degrade nesting/foraging habitat. Livestock grazing is to be delayed at least 2 years to allow recovery of vegetation.

The alternatives under this proposal contribute minimal adverse effects to ground vegetation recovery.

Summary

Neither the No Action alternative nor the Action alternatives are expected to affect populations or viability of blue grouse.

Threatened or Endangered Species – Bald Eagle

Existing Condition

Bald eagle nests are usually in multistoried, predominantly coniferous stands with old growth components near water bodies which support adequate food supply (U.S. Dept. Interior 1986). The nearest known nest site is approximately 18 miles south in the Silvies Valley.

On the Malheur National Forest, bald eagles congregate at winter roost sites in mature forest stands in Bear Valley, which provide a microclimate that helps protect them from cold weather and wind. Eagles typically arrive in early November and depart about the end of April. No winter roost sites are within the project area; however, two sites are located along potential timber haul routes. One winter roost exists on Forest Service land along County Road 63 in Bear Valley, between the project area and Highway 395. The roost trees are about 500 feet north of County Road 63. This roost was monitored from 1990 through 1998, except for the winter of 1996-97. Monitoring indicated use in or near the roost every year it was monitored.

A second winter roost is located on private land in Bear Valley, about 1.5 miles east of the project area on Forest Service Road 24. The roost is within 250 feet and line-of-sight of Forest Service Road 24. Monitoring over the years has been inconsistent, but the site is believed to be used annually.

Environmental Consequences

Direct, Indirect and Cumulative Effects

No Action

Under the No Action Alternative, there would be no new management activities; therefore, there should be no direct, indirect or cumulative effects to bald eagles or their habitat.

Action Alternatives

Human activities have the potential to disturb perching or roosting eagles (Spahr 1991; Steenhof 1978). Of these activities, vehicle traffic is the least disturbing, as long as the vehicle does not stop, because eagles apparently become accustomed to traffic (Steenhof 1978). Significant changes in traffic volume, however, have the potential to cause disturbance to roosting eagles or eagles entering the roosts.

County Road 63 is the primary travel route for people living in the Izee vicinity and people living along County Road 63 to travel to John Day, Oregon and points north and east, and to

Seneca, Oregon and points south of Bear Valley. Most traffic is probably from residents of either Izee or Bear Valley; however, recreational and cattle ranching- and logging-associated traffic also use the road. Later in the year, during October and November, traffic would be expected to be elevated due to big-game hunting seasons.

The Grant County roads department periodically places traffic counters on County Road 63 between the roost and Highway 395. Average daily traffic ranged from 138 vehicles per day in 1995 to 213 in 1993. The average daily traffic for all years combined was 171 trips per day. Although traffic during big-game hunting season is higher, this elevated traffic flow does not appear high enough to discourage use of the winter roost.

Salvage logging proposed under Alternatives 2, 3 and 5 would generate the greatest increase in traffic volume. It is estimated that a salvage sale could generate an average daily traffic flow of 38 trips per day past the County Road 63 winter roost. When combined with local traffic, average daily traffic from all sources would be estimated at 209 trips per day. This traffic level would be within the range of 138 to 213 trips per day recorded by the traffic counters over several years; therefore, there would be no discernable increase in the traffic volume.

There is a greater disturbance risk associated with the winter roost located adjacent to Forest Road 24. Although, traffic flow data is not available for these roads, traffic volume is assumed to be far lower than volumes recorded for County Road 63. It is assumed that any timber sale traffic from a Flagtail Salvage Sale past this winter roost would be well above average traffic levels for these roads, and could cause disturbance to roosting eagles. Therefore, from November 1st to April 30th, log haul and other timber sale-related traffic would be directed to alternate routes to avoid this winter roost area.

All other management activities would generate only incidental changes in traffic flow. Alternative 4 does not propose any commercial timber logging; therefore, traffic volume would be lower than the other action alternatives. No additional direct, indirect or cumulative effects are anticipated from management activities under any of the Action alternatives. Proposed activities within the project area are sufficiently distant from the winter roost sites that no other disturbance risks are expected.

All of the activities in Appendix J have been considered for their cumulative effects on bald eagle winter roosts. Ongoing and reasonably foreseeable activities are not expected to degrade winter roost areas, nor elevate disturbance to levels where eagles will no longer roost.

Determination

There would be **NO EFFECT (NE)** to bald eagles or their habitat under the No Action alternative or any of the action alternatives. No bald eagles nest or roost within the project area. No effects are anticipated on winter roost sites located outside the project area in Bear Valley. Under the action alternatives, changes in traffic volume past the winter roost area on Forest Road 24 had the potential to disturb roosting eagles, but seasonal restrictions will be applied to mitigate potential effects.

Threatened or Endangered Species – Gray Wolf

Existing Condition

Historically, wolves occupied all habitats on this Forest (Wisdom et al. 2000), but are currently considered extirpated. Today, the Malheur, Wallowa-Whitman and Umatilla National Forests are probably suitable habitats for wolves. In 1999, a collared wolf from the experimental, non-essential Idaho population traveled to the three Blue Mountain National Forests and stayed until it was captured and returned to Idaho. Another wolf was found dead near Baker City in the spring of 2000. Over time, wolves dispersing from the Idaho wolf population could return to the Blue Mountains and establish packs.

Environmental Consequences

Direct, Indirect and Cumulative Effects, and Determination

All Alternatives

Wolves are limited by prey availability and are threatened by negative interactions with humans. Generally, land management activities are compatible with wolf protection and recovery, especially actions that manage ungulate populations. Habitat and disturbance effects are of concern in denning and rendezvous areas. No such habitat is currently occupied in Oregon.

Determination

At this time, the determination for almost all project activities on the Malheur National Forest is **NO EFFECT (NE)** for the following reasons:

- No populations currently occupy the Malheur National Forest.
- No denning or rendezvous sites have been identified on the Malheur National Forest.
- There is an abundance of prey on the Forest; therefore prey availability is not a limiting factor.

Threatened or Endangered Species – Canada Lynx

Existing Condition

Potential lynx habitat on the Malheur National Forest is defined as stands above 5,000 feet that are subalpine fir, lodgepole pine, Engelmann spruce, or moist grand fir types. Lynx require a mix of early and late seral habitats to meet their food and cover needs. Early seral habitats provide the lynx with a prey base, primarily snowshoe hares, while mature forests provide denning space and hiding cover (Koehler 1990). Pockets of dense forest must be interspersed with prey. Lynx den sites are in forests with a high density of downfall (Koehler 1990). Favored travel ways within and between habitat areas include riparian corridors, forested ridges, and saddles. Although there are several unconfirmed sightings of lynx in Grant County, there is no indication that lynx occurs in the project area.

Research indicates that lynx need approximately 10 to 15 square miles of high quality habitat to support a functional home range (Ruggiero et al. 1994). The four subwatersheds affected by the Flagtail fire contain very little lynx habitat. No subalpine fir, Engelmann spruce or moist mixed conifer forest exists. About 850 acres, or 3% of the subwatershed acres, are in lodgepole and grand fir forest types that would classify as habitat. Within the burn area, 280 acres, or 4% of the burn area, are in lodgepole pine that would classify as habitat; the fire burned through these areas. Forest managers have conducted several mapping analyses of lynx habitat on the Malheur National Forest; none of these analyses classified the Flagtail project as a Lynx Analysis Unit (LAU). The number of acres is considered insufficient for lynx and what does exist is noncontiguous; therefore, this area is not considered suitable habitat for lynx to occupy. The nearest area that approximates lynx source habitat is located in the Strawberry Mountains, about 10 miles to the northeast.

In general, the project area is relatively dry, with mostly ponderosa pine dominated stands. Mixed conifer, high canopy closure stands with grand fir did exist prior to the fire, but they comprised only a smaller portion of the area and are still relatively dry sites. Historically, under natural fire regimes, the area was probably even more dominated by open, ponderosa pine stands than it is today, so it is not as if site potential would be conducive to historical lynx habitat.

Environmental Consequences

Direct, Indirect Effect and Cumulative Effects, and Determination

All Alternatives

Because lynx habitat is so limited in the project area, both now and historically, there would be no direct, indirect or cumulative effects expected from any of the alternatives. It is very unlikely that lynx would use the project area due to the lack of habitat. Project actions would have no effect on Canada lynx or their habitat; therefore, the call is **No Effect (NE)**.

Sensitive Species

Wolverine

Existing Condition

Wolverines were always rare in Oregon, although recent sightings, tracks, and collected remains document their continued presence at low densities in the state (Csuti et al. 1997). Current distribution appears to be restricted to isolated wilderness areas. Verts and Carraway (1998) believe that while there is a possibility of self-maintaining population of wolverine in the state, most animals seen or collected are likely dispersers from Washington and Idaho populations. Confirmed observations on the Malheur National Forest are from the Strawberry Mountain Wilderness and include a partial skeleton found in 1992 and tracks and a probable denning site found in 1997. Additional sightings of animals and tracks have occurred on the District, but none have been confirmed.

The likelihood of wolverine using or frequenting the area is expected to be very low. Source habitat is essentially non-existent in the project area. There are no subalpine forest types with or without talus surrounded by trees in or adjacent to this area. The Flagtail fire severely or moderately burned 5,550 acres of forested ground (90% of the forested acres), eliminating the contiguous forested conditions favored by wolverine. The nearest area that approximates wolverine source habitat is located in the Aldrich and Strawberry Mountains, about 10 miles to the north and northeast, respectively.

Foraging and dispersal habitat for wolverine occurs throughout the Blue Mountain Ranger District. Wolverines could possibly use any area of the District to satisfy life needs; however, areas of high deer and elk concentrations, low human impacts, low human disturbance, and potential denning sites that appear to be home range requirements are limited.

The project area may provide some marginal foraging and dispersal habitat for wolverines, but it is assumed that high levels of human disturbance (management activities, firewood cutting, and recreational use) and development (primarily high road densities) make most of this area unsuitable for wolverine for summer foraging habitat. Winter foraging habitat is limited because elevations in the Flagtail area are above those typically associated with big game winter range. In addition, the Flagtail fire reduced habitats for many mammal species by destroying much of the cover, both vegetation and down logs. Post-fire, the loss of cover further reduces area use by wolverine and its prey species.

Environmental Consequences

Direct and Indirect Effects

No Action

The No Action alternative would have no direct effects to wolverine or potential habitat. Indirect effects result from potential changes in habitat for wolverine prey. Overall habitat effectiveness for deer and elk would be expected to improve over time as cover develops. Big game population numbers are expected to remain stable; distribution and use may change initially as a result of improved forage and reduced cover. By relying on natural regeneration for reforestation, recovery of trees would be slower than under a planting scenario. See the Big Game Habitat section for discussion of the effects of the No Action alternative on big game. Cover/forage habitat for small mammals, i.e., alternative prey, is expected to increase as vegetation recovers and snags fall and provide down logs.

The risk of an intense reburn in the project area is high with this alternative, although risks do not increase for 10 to 20 years, the time expected for snags to fall to the ground and elevate fuel loads. Another stand replacement fire would delay recovery of cover vegetation for dispersal or movement.

Action Alternatives

There are no confirmed records of wolverine occurring in the project area; therefore, there would be no direct effect to this species.

Indirect effects to wolverine, and its preferred habitat, would be minimal, regardless of the alternative. Post-fire, the project area is considered unfavorable for wolverine occupation. Human disturbance related to proposed salvage activities might displace transient or dispersing wolverine from potential foraging habitat during the duration of the project. Post-salvage road closures would help reduce the level of human disturbances as habitat conditions become more favorable to prey species.

Management recommendations by Banci (1994) suggest that management activities should incorporate strategies that improve the deer and elk forage base for wolverine, without significantly changing vegetation structure. The action alternatives would improve big game habitat; planting of trees would accelerate recovery of hiding and thermal cover, and road closures would reduce open road densities. Big game population numbers are expected to remain stable; distribution and use may change initially as a result of improved forage and reduced cover. Overall habitat effectiveness for deer and elk would be expected to improve over time as cover develops. The Big Game Habitat section discusses effects of the action alternatives to big game. Cover/forage habitat for small mammals, i.e., alternative prey, is expected to increase as vegetation recovers and snags fall and provide down logs.

Salvage logging reduces the future build-up of down logs that could impede big game movements and elevate risk of a future re-burn. Alternatives 2, 3, and 5 propose timber salvage on 4,345 acres (70%of forested acres), 2,871 acres (46% of forested acres), and 3,740 acres (60% of forested acres), respectively. Alternative 4 only removes tree 8" DBH and smaller; although fire risk is reduced, future fuel loads would still be considered in excess of risk thresholds. Another stand replacement fire could further delay development of cover.

Cumulative Effects

All Alternatives

All of the activities in Appendix J have been considered for their cumulative effects on wolverines. Past adverse effects on wolverine foraging and dispersal habitat have been primarily a result of timber harvest and road construction; the project area has been a relatively highly managed area. Activities that have cumulatively affected big game habitat and populations can also have contributing effects to wolverine. This project, combined with ongoing and reasonably foreseeable future projects, is expected to improve big game habitat (see the Big Game Habitat, Cumulative Effects section).

In burned riparian areas, hardwood and conifer planting, aspen restoration, and wood placement in streams are being planned under separate NEPA documents (see Appendix J – Cumulative Effects). Cumulatively, restoration activities would improve habitat for wolverine prey species. Livestock grazing would be delayed for at least two years post-burn to allow for recovery of ground cover (Post-fire grazing guidelines - Appendix H). Some uncontrolled cattle use occurred in the summer/fall of 2003, but effects to riparian and upland habitats were considered well within Forest Plan and Interagency Interdisciplinary Team (IIT) standards. When livestock grazing is re-initiated, grazing would be managed to meet Forest Plan and IIT standards as well, benefiting wolverine prey species.

Adjacent private lands have already been salvage logged. Reforestation is required where commercial timber harvest has occurred and the land is left under-stocked. Private lands were planted in 2003. Some private landowners have forage-seeded burned areas to the benefit of big game. Adjacent private lands are intensively managed and even less likely to support wolverine than National Forest lands in the project area.

In 2002/2003, fire-killed, hazard trees were salvaged on 14 acres at the Bear Valley Work Center and on 650 acres along roads. Future fuels reduction is planned on 100 acres inside Riparian Habitat Conservation Areas (RHCAs); dead, unmerchantable trees 8 inches DBH and smaller would be felled, then hand piled and burned outside of riparian areas. When combined with salvage logging and fuels treatment proposed in Alternatives 2, 3 and 5, landscape-level fuels treatments are expected to help reduce the risk of an intense re-burn and another stand replacement fire. Under Alternatives 1 and 4, combined fuel treatments are less likely to reduce fuel loads sufficiently to avoid intense re-burns in the future.

Future timber and access management activities have yet to be proposed for the unburned areas of the affected subwatersheds. Since the Flagtail Fire Recovery Project is expected to have few negative effects on wolverine in the short-term, and since future activities are expected to create more continuous, unfragmented habitat, wolverines are expected to benefit. With recognition of habitat losses due to the fire, adverse cumulative effects are expected to be incidental regardless of the alternative selected. In the mid- to long-term, the effects of this project combined with restoration projects in Appendix J would be considered favorable to wolverine.

Determination

Due to the nature of the No Action alternative, there would be **NO IMPACT (NI)** to wolverine.

Action alternatives **may impact individuals or habitat**, **but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population** (**MIIH**). Human disturbance related to proposed salvage activities could have short-term, indirect effects on wolverines, although the risk of disturbance to wolverines is considered low. Wolverines are considered transient based upon their large home ranges. None of the treatment areas include denning habitat. Following management activities, road closures would reduce motorized access to the benefit of wolverines. None of the alternatives will affect wolverine habitat or species viability because the principal big game prey base is expected to remain stable.

Western Sage Grouse

Existing Conditions

Sage grouse are obligate residents of sagebrush habitat, usually inhabiting sagebrush-grassland or juniper-sagebrush-grassland communities.

In 1993, Oregon Department of Fish and Wildlife (ODFW) biologists estimated that Bear Valley had about 60 birds and a stable population. ODFW monitored a known active lek on private land about 1 to 2 miles east of the Flagtail project area. In 2003, ODFW biologists (K. Rutherford, ODFW wildlife biologist, personal communication May 8, 2003) revised the 1993 estimates; they believe grouse populations in Bear Valley may have declined, primarily due to predation (coyotes), but also because of livestock grazing and agricultural conversion.

Rutherford (2003) reported that the previously known active lek is no longer active. Little monitoring has been done in recent years to validate declines, but numbers are believed to be reduced.

In the Upper Silvies watershed, the majority of the shrub-steppe habitats are associated with the larger expanses of habitat in Bear Valley. There is very little sage grouse habitat on Forest Service managed lands. In the project area, about 780 acres, or 10.5% of the project area, classify as juniper/sagebrush, sagebrush shrublands or dry grasslands. The Bald Hills at 245 acres provides the largest block of potential habitat; the remaining acres are predominantly smaller openings 1 to 20 acres in size. Several stringer habits extend into the project area from Bear Valley. Additional small openings in the surrounding forest could contain sagebrush habitat.

Habitat in the project area is considered marginal. There is no documented occurrence of sage grouse within the Flagtail project area; there are no known leks or suspected leks. It is possible that adult sage grouse with young may use non-forested areas, but use would be only occasional and random. Potential late season brood rearing habitat exists within meadow/ephemeral wet riparian areas; hens with broods or hen groups may use these lower elevation habitat as sagebrush types dry up and herbaceous plants mature in June and July, but again, use is expected to be occasional or random.

Within the fire area, the shrub-steppe habitats burned in a mosaic pattern depending on vegetation patterns and fire behavior. Unburned islands of sagebrush can retain habitat features important to sagebrush-dependent species. Given, the small extent of habitat within the project area, the wildfire likely had minimal effect on species that depend on these semi-arid environments.

Environmental Consequences

Direct and Indirect Effect

No Action

Under the No Action Alternative, there would be no new management activities; therefore, there should be no direct effects to sage grouse or their habitat.

Given the small extent of sagebrush habitats, the wildfire likely had minimal effect on species that depend on these environments. Recovery of sagebrush habitats is dependent on the severity of the burn. Grass and herb species respond more rapidly after fire than sagebrush (Smith 2000). Because sagebrush does not sprout from underground buds, these communities can require several decades to establish post-fire vegetation composition and structure similar to that on unburned sites (Smith 2000). A mosaic burn, such as occurred in much of the Flagtail sagebrush communities, can accelerate recovery of these habitats as compared to completely burned areas. Unburned islands of sagebrush provide an important seed source. Unburned islands of sagebrush could provide limited habitat for sagebrush-dependent species and a seed source for regenerating burned areas.

Action Alternatives

Juniper woodland, shrub-steppe and grassland habitats would not be treated under any of the action alternatives; therefore, there would be no direct or indirect effects to sage grouse. Effects would be as described for the No Action alternative.

Cumulative Effects

All Alternatives

All of the activities in Appendix J have been considered for their cumulative effects on western sage grouse. The following discussion focuses on those past, ongoing and reasonable foreseeable future activities that may contribute adverse effects to the species or its habitat.

Juniper woodlands, sagebrush shrublands and dry grasslands have probably changed due to 100 years of fire suppression. Other conifer species have encroached on these habitats, reducing their size. On residual acres, juniper density probably has increased. Livestock grazing, primarily early in the century, may have caused changes in shrub, grass and forbs composition or abundance. The Flagtail fire reduced all conifer species, killing both juniper and the conifer species that compete with juniper. Juniper woodland and shrubland habitats are very limited in the project area. Few management activities are proposed, and natural recovery rates from the fire are expected. Proposed erosion control on the Bald Hills would slow runoff, allowing more water to percolate in soils and be available for vegetation growth.

As stated in the existing condition section, sage grouse populations on private lands in Bear Valley have declined primarily as a result of predation, livestock grazing and agricultural conversion. Adjacent private lands have already been salvage logged. Private lands were planted in 2003. Some private landowners have forage-seeded burned areas. Generally, these lands are not managed to preserve or restore sagebrush habitats.

Livestock grazing in the Flagtail project area would be delayed for at least two years post-burn to allow for recovery of ground cover (Post-fire grazing guidelines - Appendix H). Some uncontrolled cattle use occurred in the summer/fall of 2003, but effects to riparian and upland habitats were considered well within Forest Plan and Interagency Interdisciplinary Team (IIT) standards. When livestock grazing is re-initiated, grazing would be managed to meet Forest Plan and IIT standards as well. At moderate grazing levels, livestock grazing can be compatible with sage grouse management.

Current levels of noxious weeds in the project area are below threshold levels that can cause measurable changes in terrestrial habitat. Over the long-term, habitat may be degraded by encroaching noxious weeds if they are not controlled.

In 2002/2003, fire-killed, hazard trees were salvaged on 14 acres at the Bear Valley Work Center and on 650 acres along roads. Future fuels reduction is planned on 100 acres inside Riparian Habitat Conservation Areas (RHCAs); dead, unmerchantable trees 8 inches DBH and smaller would be felled, then hand piled and burned outside of riparian areas. When combined with salvage logging and fuels treatment proposed in Alternatives 2, 3 and 5, landscape-level fuels treatments are expected to help reduce the risk of an intense re-burn and another stand replacement fire. Under Alternatives 1 and 4, combined fuel treatments are less likely to reduce fuel loads sufficiently to avoid intense re-burns in the future.

With all cumulative effects considered, the additive effects of the proposed alternatives will not lead to any adverse effects to the population nor will it contribute to a trend toward federal listing or loss of viability to the population or species.

Determinations

Due to the nature of a No Action alternative, there would be **NO IMPACT (NI)** to western sage grouse or it habitat.

Activities proposed under the action alternatives are not expected to measurably change sagebrush habitats or potential late brood-rearing habitat. Given that there would be no direct, indirect or cumulative effects, there would be **NO IMPACT (NI)** to this species.

Gray Flycatcher

Existing Condition

The gray flycatcher prefers relatively treeless areas with tall sagebrush, bitterbrush, or mountain mahogany communities, but is also associated with pinyon-juniper woodland with understory sagebrush, and open ponderosa pine forests (Csuti et al. 1997). This species is most abundant in extensive tracts of big sagebrush, often selecting areas along washes where the sagebrush is especially tall. In the western Great Basin, this species nests in tall big sagebrush shrublands (Ryser 1985). During the nonbreeding season, this species commonly inhabits arid scrub, riparian woodland, and mesquite (NatureServe 2000). The Malheur National Forest considers this species as a rare (not seen every year) summer resident. Gray flycatchers have not been reported in the project area. No surveys for gray flycatchers have been conducted.

In the Upper Silvies watershed, the majority of the shrub-steppe habitats are associated with the larger expanses of habitat in Bear Valley. There is very little gray flycatcher habitat on Forest Service managed lands. In the project area, about 780 acres, or 10.5% of the project area, classify as juniper/sagebrush, sagebrush shrublands or dry grasslands. The Bald Hills at 245 acres provides the largest block of potential habitat; the remaining acres are predominantly smaller openings 1 to 20 acres in size. Several stringer habits extend into the project area from Bear Valley. Additional small openings in the surrounding forest could contain sagebrush, bitterbrush and mountain mahogany habitat.

Within the fire area, the shrub-steppe habitats burned in a mosaic pattern depending on vegetation patterns and fire behavior. Unburned islands of sagebrush can retain habitat features important to sagebrush-dependent species. Many of the small isolated patches of sagebrush, mountain mahogany and bitterbrush that occupied the understories of forested communities were lost in the fire. Given, the small extent of habitat within the project area, the wildfire likely had minimal effect on species that depend on these semi-arid environments.

Environmental Consequences

Direct, Indirect and Cumulative Effects

All Alternatives

In the Flagtail area, gray flycatchers occupy many of the same habitats as western sage grouse. Effects to sagebrush habitats would be similar to those for sage grouse. In harvest units, occasional bitterbrush, mountain mahogany, and sagebrush shrubs could be affected, but damage would be incidental. The fire killed most of these shrubs, and harvest design typically avoids larger shrub areas.

Determinations

Neither the No Action alternative nor the Action alternatives are expected to measurably change bitterbrush, mountain mahogany, or sagebrush shrub habitats. Given that there would be minimal direct, indirect or cumulative effects from this project, there would be **NO IMPACT (NI)** to this species.

Upland Sandpiper

Existing Condition

In the Blue Mountains, upland sandpiper habitat is large flat or gently rolling expanses of grassland in mountain valleys and open uplands with small creek drainages and wet to dry meadows (Akenson and Schommer 1992). Use areas have a wide diversity of plants, and forb abundance is particularly important. They often use stringer meadows, which generally are at least 125 acres. Bear Valley and Logan Valley to the east have supported breeding populations, but numbers have declined dramatically since the late 1980s/early 1990s. The reasons for the declines are uncertain.

There are no known sightings of sandpipers within the project area. Surveys have not been conducted specifically for this species on either federal or private lands. The closest nest sites are located on private lands in Bear Valley about 1 to 3 miles southeast near Scotty Creek and 1 to 2 miles northeast adjacent to Keller Creek. The project area contains potentially suitable breeding habitat on approximately 350 acres, primarily along Jack Creek and the Silvies River, but also in stringer meadows along the edge of Bear Valley. Meadow habitats are smaller than the recommended 125 acres. Compared to the extensive habitat in Bear and Logan Valley there is limited suitable upland sandpiper habitat. Therefore, use is expected to be occasional and random within the Flagtail project area. Fire damage in meadow habitats was variable; moister meadows tended not to burn or burned in a mosaic pattern. Vegetation is expected to recover rapidly.

Environmental Consequences

Direct and Indirect Effect

No Action

Under the No Action Alternative, there would be no new management activities; therefore, there should be no direct or indirect effects to upland sandpipers or their habitat.

Action Alternatives

The proposed activities will not enter meadow habitats; therefore, no impacts to upland sandpipers would be expected.

Cumulative Effects

All Alternatives

Major threats to breeding habitat are from predation, forest succession and livestock grazing (NatureServe 2003). All of the activities in Appendix J have been considered for their cumulative effects on upland sandpipers. Few management activities would affect sandpiper habitat.

Livestock grazing would be delayed for at least two years post-burn to allow for recovery of ground cover (Post-fire grazing guidelines - Appendix H). Some uncontrolled cattle use occurred in the summer/fall of 2003, but effects to riparian and meadow habitats were considered well within Forest Plan and Interagency Interdisciplinary Team (IIT) standards. When livestock grazing is re-initiated, grazing would be managed to meet Forest Plan and IIT standards as well. Prescribed burning, grazing, or mowing can be used to provide essential nesting conditions, but these activities can be detrimental if conducted inappropriately.

Current levels of noxious weeds in the project area are below threshold levels that can cause measurable changes in terrestrial habitat. Over the long-term, habitat may be degraded by encroaching noxious weeds if they are not controlled.

Livestock grazing and agricultural activities on private lands in Bear Valley can influence sandpiper habitat, although, as stated previously, management activities can be compatible with sandpiper management. Salvage logging of private timberlands has had little effect on sandpiper habitat. Private lands were planted in 2003. Some private landowners have forage-seeded the burned areas.

In 2002/2003, fire-killed, hazard trees were salvaged on 14 acres at the Bear Valley Work Center and on 650 acres along roads. Future fuels reduction is planned on 100 acres inside Riparian Habitat Conservation Areas (RHCAs); dead, unmerchantable trees 8 inches DBH and smaller would be felled, then hand piled and burned outside of riparian areas. When combined with salvage logging and fuels treatment proposed in Alternatives 2, 3 and 5, landscape-level fuels treatments are expected to help reduce the risk of an intense re-burn. Under Alternatives 1 and 4, combined fuel treatments are less likely to reduce fuel loads sufficiently to avoid intense re-burns in the future. Meadow habitats recover relatively rapidly after fire.

Neither the No Action nor the Action Alternatives would contribute additive adverse effects.

Determination

Neither the No Action alternative or the Action Alternatives are expected to measurably change upland snadpiper habitat; therefore, there would be **NO IMPACT (NI)** to this species.

Bobolink

Existing Condition

Bobolinks are found in native and tame grasslands, haylands, lightly to moderately grazed pastures, no-till cropland, small-grain fields, wet meadows, and planted cover (Dechant et al., 2001). Bobolinks prefer habitat with moderate to tall vegetation, moderate to dense vegetation, moderately deep litter, and without the presence of woody vegetation. If habitat is not maintained, use by bobolinks declines significantly, possibly due to the accumulation of litter and encroachment of woody vegetation. Bobolinks respond positively to properly timed burning or mowing treatments, and moderate grazing.

Bobolinks are very local and scattered in the eastern one-third of Oregon and are known to breed on the Malheur National Wildlife Refuge, south end of Blitzen Valley, Harney County, Union County, and Wallowa County (Marshall 1996). Locally, sporadic nesting occurs in the Prairie City, Mt. Vernon, Silvies Valley, and Bear Valley areas (Sweeney, 2001; Winters 2001). Bobolinks have not been reported in the project area. No surveys for bobolinks have been conducted.

Bobolinks appear to prefer large grassland areas to small, requiring approximately 25-110 acres depending on habitat quality. About 350 acres of capable habitat exist in the Flagtail area, with the majority of the acres along Jack Creek and the Silvies River, but also in stringer meadows along the edge of Bear Valley. Meadows habitats are generally smaller with only a few greater than 25 acres in size. Most of these acres are grazed and may not be providing tall enough grass for bobolinks. Meadows exit in the forest, but they tend to be small or habitat is naturally dry and low in productivity. Because of the low quality and the natural fragmentation, bobolinks would likely use only the largest areas. Fire damage in meadow habitats was variable; moister meadows tended not to burn or burned in a mosaic pattern. Vegetation is expected to recover rapidly.

Environmental Consequences

Direct and Indirect Effect

No Action

Under the No Action Alternative, there would be no new management activities; therefore, there should be no direct or indirect effects to bobolinks or their habitat.

All Alternatives

The proposed activities will not enter meadow habitats; therefore, no impacts to bobolinks would be expected.

Cumulative Effects

All Alternatives

All of the activities in Appendix J have been considered for their cumulative effects on bobolinks. Few management activities would affect bobolink habitat.

In the Flagtail area, bobolink habitat overlaps many of the same habitats as those available to upland sandpipers; therefore, cumulative effects from past, ongoing and reasonably foreseeable future activities are similar to those described in the Upland Sandpipers, Cumulative Effects section. Livestock grazing is likely to have the most influence on habitat, but at moderate grazing levels, grazing can be compatible with bobolink management.

Neither the No Action nor the Action Alternatives would contribute additive adverse effects.

Determination

Neither the No Action alternative or the Action alternatives are expected to measurably change bobolink habitat; therefore, there would be **NO IMPACT (NI)** to this species.

Columbia Spotted Frog

Existing Condition

Spotted frogs are rarely found far from permanent water. Breeding habitat is usually in shallow water in ponds or other quiet waters along streams. Breeding may also occur in flooded areas adjacent to streams and ponds. Habitat has been degraded by past management activities, such as livestock grazing, road construction along streams, and timber harvest adjacent to streams, springs, and marshes. No habitat surveys have been conducted specifically for spotted frog; however, habitat probably exists along most perennial and some intermittent streams.

It is unknown what effects the Flagtail fire had on individual animals. Generally, the fire killed most of the trees in the riparian uplands while leaving shrubs, forbs and grasses in the floodplains untouched or spot-burned due to the high moisture content of this ground vegetation. Snow Creek is the major exception; portions were severely burned with nearly all vegetation being killed.

Environmental Consequences

Direct and Indirect Effect

No Action

Habitat requirements for spotted frogs are limited, but it is assumed that if healthy stream channels and riparian vegetation are maintained, then population viability will be maintained.

Under the No Action alternative, there would be no new management activities; therefore, there would be no direct effects to spotted frogs or their habitat. Although the fire killed most of the conifer overstory, the expected flush of ground vegetation, particularly shrub species, may elevate the amount and distribution of riparian hardwoods to levels higher than existed prior to the fire. Grasses and forbs are expected to reestablish naturally in 2 to 5 years; shrubs are expected to reestablish in 2 to 15 years. Riparian vegetation likely provides cover for frogs and habitat for insects that frogs may feed on. The Flagtail fire created many snags that will be available for recruitment into project area streams in the future, down logs across streams can help stabilizes channels and create pools for frogs.

The No Action alternative would do nothing to reduce impacts of the existing road system. Roads in RHCAs would continue to confine stream channels and restrict frog habitat by inhibiting the expansion of wetlands that were reduced or degraded by road construction where these habitats originally existed. It would be expected that sedimentation from existing roads would increase over time, unless other projects are implemented to address these impacts.

Action Alternatives

Habitat requirements for spotted frogs are limited, but it is assumed that if healthy stream channels and riparian vegetation are maintained, then population viability will be maintained. Spotted frogs are fairly resistant and tolerant of nondestructive intrusion.

Salvage logging and fuels reduction activities would have minimal adverse effects to Columbia spotted frogs or their habitat. Overall, streams would be protected with INFISH RHCA buffers. There may be limited felling of hazard trees in RHCAs, but the trees would be left on site. It is unlikely that felling of hazard trees would kill spotted frogs, and effects to habitat would be considered minimal. Harvest and fuels treatment activities outside riparian areas are expected to have little to no indirect impacts on riparian and aquatic systems. Vegetation recovery and recruitment of snags in stream channels would be as described for Alternative 1, both considered beneficial to the riparian and aquatic system.

The activities with the highest potential for affecting streams are road management activities, particularly those that directly affect riparian vegetation, floodplains, or stream channels. Alternatives 2, 3 and 5 propose 0.3 miles of system road construction and 13.1 miles of road decommission. The objective of the road construction is to relocate an existing section of road impacting Snow Creek; the existing road would be decommissioned under these alternatives. The road construction is not within RHCAs. Road effects are typically magnified when activities occur within 100 feet of streams; only 4.2 miles of decommissioning would occur within 100 feet of streams.

Proposed road management actions such as culvert replacement or cleaning at stream crossings, or road decommission, reconstruction, or maintenance within 100 feet of streams would produce short-term (1-2 years) sediment into project area streams. These activities have the potential to adversely affect spotted frog habitat by increasing fine sediments in the short-term, although sediment may be less of a concern for frogs than fish species. The short-term increase in sediment would be very small in size and scale due to the small area of disturbance at each project point. Best management practices (BMPs) are incorporated into standard road maintenance and reconstruction practices and would reduce the probability and magnitude of the short-term risks. In the mid- to long-term, road reconstruction and maintenance would reduce the chronic sediment production of existing roads by removing ruts and rills from the driving surface, adding less erosive surfacing material, and improving drainage. Road decommissioning is designed to benefit riparian habitat and water quality in the mid- to long-term by improving filtration, restoring ground cover, reducing sediment yield and restoring floodplains.

Alternative 4 forgoes opportunities to relocate the Snow Creek road; road construction is dropped and road decommissioning is reduced from 13.1 miles to 11.9 miles. Only 3.4 miles of road decommissioning would occur within 100 feet of streams. Alternative 4, by reducing road construction and decommissioning, would reduce both short-term impacts and long-term benefits regarding sediment, drainage network, and peak/base flows proportionate to the reduced level of activities.

Cumulative Effects

All Alternatives

All of the activities in Appendix J have been considered for their cumulative effects on spotted frogs. The following discussion focuses on those past, ongoing and reasonable foreseeable future activities that may contribute adverse effects to the species or its habitat.

Road construction, timber harvest and grazing activities on private and public land have reduced spotted frog habitat quality and complexity in and adjacent to project area streams.

In burned riparian areas, hardwood and conifer planting is being implemented under separate NEPA documents. In 2003, conifer trees were planted on 190 acres in riparian areas and 190 acres in uplands. Hardwoods were planted on 25 acres in 2003; additional hardwoods are proposed for interplanting on the same acres in 2004. Aspen restoration is being planned on an estimated 250 acres (76 aspen sites). Placement of coarse woody debris in streams would improve channel condition and create additional pools. Proposed fuels reduction in the RHCAs would remove only snags 8 inches DBH or smaller, reducing future fuel loads and risk of reburn that could delay recovery of vegetation. In the short-term, restoration activities could impact individuals or habitat. In the long-term, these actions will help reestablish riparian vegetation and stream integrity to the benefit of spotted frogs.

Livestock grazing would be delayed for at least two years post-burn to allow for recovery of ground cover (Post-fire grazing guidelines - Appendix H). Some uncontrolled cattle use occurred in the summer/fall of 2003, but effects to riparian habitats were considered well within Forest Plan and Interagency Interdisciplinary Team (IIT) standards. When livestock grazing is re-initiated, grazing would be managed to meet Forest Plan and IIT standards as well.

Current levels of noxious weeds in the project area are below threshold levels that can cause measurable changes in terrestrial habitat. Over the long-term, habitat may be degraded by encroaching noxious weeds if they are not controlled.

Adjacent private lands have already been salvage logged. Private lands were planted in 2003. Some private landowners have forage-seeded the burned areas. Private lands are not typically managed to maximize wildlife habitat; therefore, habitat needs become more demanding on federal lands.

In 2002/2003, fire-killed, hazard trees were salvaged on 14 acres at the Bear Valley Work Center and on 650 acres along roads. Future fuels reduction is planned on 100 acres inside Riparian Habitat Conservation Areas (RHCAs); dead, unmerchantable trees 8 inches DBH and smaller would be felled, then hand piled and burned outside of riparian areas. When combined with salvage logging and fuels treatment proposed in Alternatives 2, 3 and 5, landscape-level fuels treatments are expected to help reduce the risk of an intense re-burn and another stand replacement fire. Under Alternatives 1 and 4, combined fuel treatments are less likely to reduce fuel loads sufficiently to avoid intense re-burns in the future.

The action alternatives would not contribute to further degradation of riparian areas. Restoration activities associated with the action alternatives are expected to contribute long-term benefits to the recovery of spotted frog habitat, more so than the No Action alternative, likely improving conditions beyond the pre-fire baseline.

Determination

Due to the nature of a No Action alternative, there would be **NO IMPACT (NI)** to spotted frogs or their habitat.

The Action alternatives **may impact individuals or habitat**, **but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population** (**MIIH**). The only short-term impacts to spotted frogs would be those from road maintenance or decommission activities that occur within 100 feet of streams; anticipated sediment impacts are expected to have a negligible effect to spotted frogs or populations. However, the long-term reduced impacts to riparian aquatic resources (also due to road management activities) would result in a **beneficial impact** for spotted frog.

Species of Concern - Landbirds Including Neotropical Migratory Birds (NTMB)

Existing Condition

Neotropical migratory birds breed in temperate North America and spend the winter primarily south of the United States-Mexico border. Of the 225 migratory birds that are known to occur in the western hemisphere, about 102 are known to breed in Oregon and about 82 are known to breed on the Malhuer National Forest. They include a large group of species, including many raptors, cavity excavators, warblers and other songbirds, with diverse habitat needs spanning nearly all plant community types and successional stages. Long-term population data on many of these birds indicate downward population trends although not all species populations are declining (Sharp 1996, Saab and Rich 1997, Altman 2000, USFWS 2002). Habitat loss is considered the primary factor in decline of neotropical migratory birds.

Forest Service compliance with the Migratory Bird Treaty Act (MBTA) has been challenged several times with regard to the "take" provision. Recently (July 2000), a United States Court of Appeals for the District of Columbia ruled that the Federal Agencies are subject to provisions of the MBTA.

Current Forest Service policy regarding bird conservation and the MBTA is:

- Permits must be obtained from the U.S. Fish and Wildlife Service (USFWS) for banding, capturing, or any other activity where there is intentional killing of birds, including control of depredating birds.
- The Forest Service must analyze the effects of actions on migratory birds and document such effects in a NEPA document.
- Negative effects to birds should be mitigated to the extent possible and where possible, plans to benefit birds should be incorporated in project or activity design.
- There currently is no process for reviewing projects with USFWS or applying for a permit for “unintentional” take. The USFWS will be providing additional guidance regarding the Federal Agencies through the formation of an interagency working group.

In 2000, the Oregon-Washington Chapter of Partners in Flight published its Northern Rocky Mountains Bird Conservation Plan (Altman 2000). The Plan provides conservation recommendations for the various species of landbirds that occupy the Oregon and Washington portions of the Interior Columbia Basin. The Plan identified the following priority habitats for landbird conservation: old-growth dry forest, old growth moist forest, riparian woodland and shrubland, and unique habitats including alpine and subalpine forests, shrub-steppe, montane meadow and aspen habitats. The Conservation Plan also identified burned old forest as a limited habitat due to fire suppression; the Flagtail Fire has obviously created a large amount of burn habitat that could provide for various landbird species. Many of the avian species/habitats identified in the Northern Rocky Mountains Bird Conservation Plan (Altman 2000), are also addressed in the USFWS’s Birds of Conservation Concern (USFWS 2002).

Table WL-15 lists those priority habitats and associated focal species that would be expected in the project area. No alpine, subalpine, or moist forest types are associated with the area. The table identifies each focal species, their primary breeding habitat, and whether the Flagtail Fire positively or negatively affected them.

Table WL-15: Neotropical Migratory Birds – Focal Species found in the Project Area by Habitat Type, Including Fire Effects and Resource which Identified Focal Species

Focal Species	Primary Breeding Habitat	Initial Flagtail Fire Effects to Species
Dry Forest Types (ponderosa pine and dry mixed conifer)		
White-headed woodpecker	old growth - i.e., old forest single stratum (OFSS)	Negative/Positive
Flammulated owl	OFSS with interspersions grassy openings and dense thickets	Negative
Chipping sparrow	OFSS with regenerating pines	Negative/Positive
Lewis' woodpecker	Patches of burned OFSS or OFMS	Positive
Riparian Woodland and Shrublands		
Lewis' woodpecker	Large hardwood snags	Positive
Red-eyed vireo	Hardwoods - canopy foliage and structure	Negative
Veery	Hardwoods - Understory foliage and structure	Negative
Willow flycatcher	Hardwoods - Riparian shrub	Negative
Red-naped sapsucker	Aspen	Positive
Shrub-steppe Habitats		
Vesper Sparrow	Shrub-steppe shrublands	Neutral

Some neotropical migratory birds respond positively to fire, while others respond negatively in burned areas. However, generally, species richness and overall species abundance tends to decrease. The following sections summarize the effects of the Flagtail fire on the high priority habitats listed above. Discussion will only focus on those habitats that exist in the project area now or that existed prior to the fire.

Dry Forests

The dry forest types refer to the dry ponderosa pine dominated habitats and the dry mixed conifer habitats, i.e., conifer stands of ponderosa pine, Douglas-fir, and/or grand fir. The majority of the forest acres in the Flagtail area are classified as dry forest types.

The Conservation Strategy (Altman 2000) identifies four habitat components of the dry forest types that are important to landbirds; old forest single stratum (OFSS), OFSS with patches of regenerating pines, OFSS with grassy openings, and burned habitats (see Table WL-15). Pre-fire, 6,180 acres or 87% of the area was forested with 26% classified as old growth. Because of past timber harvest and fire suppression, all old growth was classified as old forest multiple strata (OFMS) rather than old forest single stratum (OFSS). Prior to the fire, burned old forest was also lacking, as fire suppression had all but eliminated the influence of this disturbance factor in the project area. Large-scale declines in OFSS have raised concern for such species as the white-headed woodpecker, flammulated owl, white-breasted nuthatch, pygmy nuthatch, Williamson's sapsucker, and Lewis' woodpecker. These bird species have likely suffered some of the greatest population declines and range retractions (Altman 2000).

The fire converted essentially all mature and old growth stands to early or very early successional stages (see Old Growth Section). Dense understory thickets and regeneration patches burned extensively, although patches remain scattered throughout the area. Overstory nesting species and foliage or crown feeders, have likely disappeared within the severely burned areas, and decreased in the moderate severity burn areas. Local species adversely affected may include the pine siskin, golden-crowned kinglet, mountain chickadee, hermit thrush, ruby-crowned kinglet, yellow-rumped warbler, and western tanager.

Flycatchers, ground feeders, and cavity nesters are expected to increase as a result of the fire. Local species that may benefit include the Lewis' woodpecker, olive-sided flycatcher, red-naped sapsucker, chipping sparrow, western-wood peewee, Hammond's flycatcher, dusky flycatcher, dark-eyed junco, Cassin's finch, mountain and western bluebirds, evening grosbeak, and American robin. The Primary Cavity Excavator Section describes woodpecker, sapsucker and flicker species in more detail; most of these species respond positively to the fire.

Riparian Woodlands and Shrublands

Riparian woodlands and shrub habitats are typified by the presence of hardwood tree and shrub species, along with associated wetland herbaceous species. Water is obviously an important component of these habitats, whether it is in the form of standing wetlands, spring and seeps, or flowing water (rivers and streams). Although these habitats generally comprise only a small portion of the landscape, they usually have a disproportionately high level of avian diversity and density when compared to surrounding upland habitats.

The Conservation Strategy (Altman 2000) identifies three habitat components within the riparian woodlands and one within the riparian shrub habitats that are important to many landbirds. They include large snags, canopy foliage cover, understory shrub cover, and dense shrub patches (see Table WL-15). In addition, the Conservation Strategy identifies aspen and montane grasslands as unique habitats important to landbirds. In the Flagtail area, many of these habitats are associated with riparian areas or ephemeral draws, so they are included in this section.

Within the project area, riparian woodlands and shrublands are generally associated with Category 1 streams (6.6 miles) and Category 2 streams (4.2 miles). Priority hardwood habitats include willow, alder, and aspen; other hardwood species are present but at much lower levels. Riparian shrub- and grasslands comprise 350 acres or 5% of the project area. These acres only represent riparian openings; hardwood shrubs are also present in the understories of conifer-dominated riparian areas. Small, remnant aspen stands are scattered over approximately 75 acres and are found in Category 1, 2 and 4 streams and ephemeral draws; most aspen stands are old and decadent, exhibit poor vigor, and lack regeneration. Prior to the fire, many riparian areas were already deficient in hardwood trees and shrubs due to past and current management activities, including timber harvest, livestock grazing and fire suppression. Heavy grazing by domestic livestock and browsing by deer and elk often inhibited hardwood regeneration.

Degraded riparian habitats have likely affected such landbird species as Lewis' woodpecker, red-naped sapsucker, downy woodpecker, red-eyed vireo, willow flycatcher, ash-throated flycatcher, tree swallow, house wren, swainson's thrush, calliope hummingbird, song sparrow, spotted towhee, western wood pewee, warbling vireo, American redstart, orange-crowned warbler, and mountain chickadee.

Fire severity in riparian areas was variable. Snag habitat is now abundant. Generally, the fire killed most of the trees in the riparian uplands while leaving shrubs, forbs and grasses in the floodplains untouched or spot-burned due to the high moisture content of this ground vegetation. Snow Creek is the major exception; portions were severely burned with nearly all vegetation being killed. The Flagtail fire damaged nearly all of the aspen stands, although in most stands at least some of the aspen trees survived. The fire likely improved habitats for species that use riparian snags, such as the Lewis woodpecker and downy woodpecker. Initially, the fire likely reduced habitat for species such as the red-eyed vireo, veery and willow fly catcher; however, species are expected to recover rapidly as hardwood shrubs recover.

Shrub-steppe Habitats

Shrub-steppe habitats are comprised primarily of dry woodlands, shrublands and grasslands. Juniper woodlands cover 590 acres or 8% of the project area. Dry shrublands/grasslands comprise approximately 190 acres or 2.5% of the project area. The Bald Hills at 245 acres provide the largest block of potential habitat; the remaining acres are predominantly smaller openings 1 to 20 acres in size. Several meadow stringer habitats extend into the project area from Bear Valley. The project area provides limited shrub-steppe habitats as compared to the large expanses of habitat in Bear Valley to the east. Within the fire area, the shrub-steppe habitats burned in a mosaic pattern depending on vegetation patterns and fire behavior. Unburned islands of sagebrush can retain habitat features vital to species such as vesper and Brewer's sparrow. Given, the small extent of habitat within the project area, the wildfire likely had minimal effect on species that depend on these semi-arid environments.

Environmental Consequences

Direct and Indirect Effects

No Action

The fire removed large expanses of forest, including nearly all the mature and old growth habitat. Species that are foliage or crown feeders and overstory nesting species, likely disappeared within the severely burned areas, but may still be using the moderate and low burn areas. Delays in reforestation under the no action alternative would delay recovery of forest canopy, with adverse effects to landbird species that feed and nest in forest canopies. The No Action alternative removes no snags or downed logs; habitat would be maximized for species that use post-fire conditions such as the olive-sided flycatcher and the Lewis' woodpecker. The Primary Cavity Excavator section describes effects to cavity excavators in detail.

Dry Forests

The fire removed large expanses of forest, including nearly all the mature and old growth habitat. Bird species that are foliage or crown feeders and overstory nesting species, likely disappeared within the severely burned areas, but may still be using the moderate and low burn areas. Delays in reforestation under the No Action alternative would delay recovery of forest canopy, with adverse effects to landbird species that feed and nest in forest canopies. The No Action alternative removes no snags or downed logs; habitat would be maximized for species that use post-fire conditions such as the olive-sided flycatcher and the Lewis' woodpecker. The Primary Cavity Excavator section describes effects to cavity excavators in detail.

Riparian Woodlands and Shrublands

The fire reduced riparian vegetation. Initially, many landbirds associated with these habitats likely declined; however, effects are likely short-lived. Although the fire killed most of the conifer overstory, the expected flush of ground vegetation, particularly shrub species, may elevate the amount and distribution of riparian hardwoods to levels higher than existed prior to the fire. Grasses and forbs are expected to reestablish naturally in 2 to 5 years; shrubs are expected to reestablish in 2 to 15 years. Population numbers for grass and shrub nesting neotropical migratory birds is expected to remain stable or increase due to recovery of ground vegetation, both inside and outside riparian areas. Species such as the willow flycatcher, red-eyed vireo and western meadowlark, would likely respond positively.

Shrub-steppe Habitats

Juniper woodlands/sagebrush shrublands comprise only 10.5% of the project area. Given, the small extent of these habitats, the wildfire likely had minimal effect on landbird species that depend on these environments. Recovery of sagebrush habitats is dependent on the severity of the burn. Because sagebrush does not sprout from underground buds, these communities can require several decades to establish post-fire vegetation composition and structure similar to that on unburned sites (Smith 2000). A mosaic burn, such as occurred in much of the Flagtail sagebrush communities, can accelerate recovery of these habitats as compared to completely burned areas. Unburned islands of sagebrush provide an important seed source. In studies in Idaho (Petersen and Best 1997), prescribed burns killed about 50% of the shrubs; total bird abundance declined significantly in the first year after fire, and then rebounded in years two and three to levels similar to those in unburned areas. In the Flagtail fire area, unburned islands of sagebrush will likely provide habitat for species such as the Brewer's and Vesper sparrow, and a seed source for regenerating burned areas.

The risk of an intense reburn is high with this alternative, although risks do not increase for 10 to 20 years, the time expected for snags to fall to the ground and elevate fuel loads. Another stand replacement fire would delay recovery of vegetation.

Action Alternatives

Salvage logging is known to further reduce species richness in burn areas (Sexton 1998). Raphael and White (1984) reported that in their studies that species richness declined only in the most severely salvaged burns, although even partial salvaging altered species composition.

Salvage logging between May and August, the primary nesting season, would present the highest risk to any neotropical migratory birds nesting in the area. Some individual birds could be directly affected, but this should not be a significant number and would not affect populations or viability.

The risk of an intense reburn is high with Alternative 4, although risks do not increase for 10 to 20 years, the time expected for snags to fall to the ground and elevate fuel loads. Another stand replacement fire would delay recovery of vegetation.

Dry Forests

At a minimum, it is expected that removal of snags would have a negative effect on population numbers of cavity nesting landbirds including neotropical migratory species (see Primary Cavity Excavator Species section). Direct effects would primarily be displacement from nests by removal or destruction of nest structures (snags, ground nests) during salvage operations. The degree of impact varies by alternatives and is best correlated with the number of acres treated. Alternatives 2, 3, and 5 propose timber salvage on 4,345 acres (70%of forested acres), 2,871 acres (46% of forested acres), and 3,740 acres (61% of forested acres), respectively. Alternatives 3 and 5 modify marking prescriptions in salvage units, leaving a higher number of snags, a broader range of snag diameters, and small patches of snags untreated, likely reducing impacts. Alternative 4 would have minimal impact. Large diameter snags are retained on 6,180 acres; only snags 8 inches DBH or less would be removed.

The action alternatives would accelerate reforestation of the project area through planting conifers. Reforestation would reestablish trees in the burn area within 5 years. Many neotropical migratory species require high tree canopy levels for nesting and foraging, and it will likely take at least 30 to 50 years before overstory canopies are restored to levels that even remotely mimic pre-fire conditions. Habitat for species that require mature or old growth conditions may take 75 to 150 years to develop (see Old Growth discussion).

Riparian Woodlands and Shrublands

In riparian areas, no salvage logging or fuels reduction activities are proposed under any of the action alternatives. Where open roads are located in riparian areas, hazard trees may be felled. Proposed road closures and road decommissioning in riparian habitat conservation areas (RHCAs) would likely benefit landbird species in the mid- to long-term by reducing the potential for disturbance and restoring habitats. Direct effects to riparian landbirds, including neotropical migratory species, are likely to be minimal due to the short timeframe expected to complete these activities and the low percentage of overall acres being treated. Indirectly, riparian landbirds may experience increases in population levels as a result of the fire. Snag-dependent species are expected to increase. Population numbers for grass and shrub nesting species is expected to remain stable or increase due to recovery of grass, forbs and shrub vegetation as described in the No Action section.

Shrub-steppe Habitats

Juniper woodland, shrub-steppe and grassland habitats would not be treated under any of the action alternatives. Neotropical migratory species that utilize these habitats would not be adversely affected. Effects would be as described for the No Action alternative.

Cumulative Effects

All of the activities in Appendix J have been considered for their cumulative effects on spotted frogs. The following discussion focuses on those past, ongoing and reasonable foreseeable future activities that may contribute adverse effects to the landbirds or their habitat.

Habitat loss is considered the primary factor in decline of neotropical migratory birds. Previous sections identified high priority habitats for conservation of neotropical migratory birds: old-growth dry forest including burn habitats, riparian woodland and shrubland, montane meadow, aspen habitats, and juniper woodlands.

Cumulative effects on mature and old growth coniferous forest are discussed in the Old Growth section, and conclude that the action alternatives would have varying positive effects for mature and old growth habitat and for the species that use those habitats.

Cumulative effects to snag and related post-fire habitat are discussed in the Primary Cavity Excavator Species section. Snag habitat would be reduced under all action alternatives. Alternative 4 only removes snags 8 inches DBH and under.

Riparian vegetation within and adjacent to the Flagtail Fire area has been altered by many years of livestock grazing, primarily earlier in this century, that concentrated use in riparian areas; and by suppressing historical fire regimes that allowed encroachment of conifers, which shaded out hardwoods such as aspen. Livestock grazing also negatively affected grasslands by reducing native species' abundance and diversity. The condition of some riparian areas and grasslands has been improved by new management practices and restoration activities in more recent years, but many are still not fully restored to conditions that are most suitable for associated native wildlife species.

In burned riparian areas, restoration projects are being implemented as described in Appendix J. Hardwoods and conifers are being planted. Aspen stands are being fenced. Placement of coarse woody debris in streams would improve channel condition. Proposed fuels reduction in the RHCAs would remove only snags 8 inches DBH or smaller, reducing future fuel loads and risk of reburn that could delay recovery of vegetation. Cumulatively, these actions will help improve riparian health to the benefit of neotropical migratory birds.

Shrub-steppe habitats have probably changed due to 100 years of fire suppression. Other conifer species have encroached on these habitats, reducing their size. On residual acres, juniper density probably has increased. Livestock grazing, primarily early in the century, may have caused changes in shrub, grass and forbs composition or abundance. The Flagtail fire reduced all conifer species, killing both juniper and the conifer species that compete with juniper. Juniper woodland and shrubland habitats are very limited in the project area. Few management activites are proposed, and natural recovery rates from the fire are expected. Proposed erosion control on the Bald Hills would slow runoff, allowing more water to percolate in soils and be available for vegetation growth.

Livestock grazing would be delayed for at least two years post-burn to allow for recovery of ground cover (Post-fire grazing guidelines - Appendix H). Some uncontrolled cattle use occurred in the summer/fall of 2003, but effects to riparian and upland habitats were considered well within Forest Plan and Interagency Interdisciplinary Team (IIT) standards.

When livestock grazing is re-initiated, grazing would be managed to meet Forest Plan and IIT standards as well.

Adjacent private lands have already been salvage logged. Reforestation is required where commercial timber harvest has occurred and the land is left under-stocked. Private lands were planted in 2003. Some private landowners have forage-seeded burned areas. Private lands are not typically managed to maximize wildlife habitat; therefore, habitat needs become more demanding on federal lands. Private lands likely provide for neotropical migratory birds at lower levels than the federal lands.

Current levels of noxious weeds in the project area are below threshold levels that can cause measurable changes in terrestrial habitat. Over the long-term, habitat may be degraded by encroaching noxious weeds if they are not controlled.

In 2002/2003, fire-killed, hazard trees were salvaged on 14 acres at the Bear Valley Work Center and on 650 acres along roads. Future fuels reduction is planned on 100 acres inside Riparian Habitat Conservation Areas (RHCAs); dead, unmerchantable trees 8 inches DBH and smaller would be felled, then hand piled and burned outside of the riparian areas. When combined with salvage logging and fuels treatment proposed in Alternatives 2, 3 and 5, landscape-level fuels treatments are expected to help reduce the risk of an intense re-burn and another stand replacement fire. Under Alternatives 1 and 4, combined fuel treatments are less likely to reduce fuel loads sufficiently to avoid intense re-burns in the future.

Future projects would have to abide by existing management direction to maintain or enhance mature and old growth habitat, maintain snags and down log standards, and protect or enhance riparian areas, grassland and woodland communities. Future planning will consider potential effects to neotropical migratory birds. In the mid- to long-term, the effects of this project combined with the restoration projects in Appendix J would be considered favorable to landbirds.

Summary

Alternatives would not be expected to reduce viability of any landbird species including neotropical migratory species.

The primary effect of the action alternatives would be to reduce snag habitats; the Primary Cavity Excavator section summarizes effects to landbirds that use these habitats. Action alternatives propose few to no activities within riparian areas, aspen stands, grasslands, and juniper woodlands, habitats considered a high priority for landbird conservation. Therefore, all other adverse affects to landbird species, including neotropical migratory species, would be considered minimal.

By planting trees, the action alternatives would accelerate recovery of vegetation; in severely burned areas, regeneration of conifer trees could take 10 to 40 acres less than under the No Action alternative.

Under Alternatives 1 and 4, the elevated fuel loads expected in 10 to 20 years increase the risk of an intense re-burn; another stand replacement fire could further delay development of forest vegetation. Alternatives 2, 3 and 5 also leave some burn areas untreated, but salvage logging and fuels reductions reduce overall fuel loads and break up the continuity of fuels remaining.

Consistency with Direction and Regulations

The Malheur National Forest Plan objective for old growth is to provide suitable habitat for old growth dependent wildlife species, ecosystem diversity and preservation of aesthetic qualities. Regional Forester's Eastside Forest Plan Amendment #2 provided additional direction to protect existing late and old structure (LOS) stands and to manipulate vegetation that currently does not classify as LOS towards LOS. All alternatives are consistent with the Forest Plan, as amended. None of the alternatives will reduce old growth habitat remaining after the fires. Only incidental live trees will be cut. Natural regeneration and planting are expected to re-vegetate forest although at different rates. Planting accelerates recovery of vegetation and development of old growth. Although changes in MA-13 old growth and MA-1 General Forest designations will require a non-significant Forest Plan amendment, these changes remain consistent with the Forest Plan, as amended. All alternatives meet old growth connectivity standards in the Regional Forester's Eastside Forest Plans Amendment #2.

The Malheur National Forest Plan requires that 20% of summer range be maintained as marginal and satisfactory cover. Because of the fire, the Jack Creek subwatershed (10% cover) and Snow Creek subwatershed (3% cover) no longer meet this standard. None of the alternatives further reduce marginal and satisfactory habitat. Natural regeneration and planting are expected to re-vegetate forest although at different rates. Planting accelerates recovery of vegetation and development of hiding and thermal cover. The Jack Creek, Snow Creek and Hog Creek subwatersheds do not meet Forest Plan standards for open road density. The action alternatives close additional roads within the burn areas. Following road closures, the Snow Creek subwatershed would meet the standard and the Jack Creek and Hog Creek subwatersheds would be moved towards the standard. In future environmental analyses, additional road closures would likely be considered in the unburned portions of the subwatersheds.

All alternatives would meet or exceed Forest Plan snag standards, i.e., 2.39 snags per acre, 21 inches DBH or greater. Large down logs do not meet Forest Plan standards as a result of the fire, at least in the severely- and moderately-burned areas. In the action alternatives, mitigation has been incorporated to retain all existing down logs required to meet the standards. As snags begin to fall, down log levels would increase thereby increasing denning, nesting, and feeding habitat for down wood dependent species. By year 15 post-fire, all alternatives are expected to meet the minimum Forest Plan standard.

Under Alternatives 3 and 5, snags may not be evenly distributed on a 40-acre basis as required by the Forest Plan, requiring a non-significant Forest Plan amendment. Instead, snags in salvage units would be retained in a combination of dispersed snags and untreated patches. Studies show that cavity dependent species select nest sites with higher tree densities and cavity nesters as a group prefer patches of snags as opposed to single snags retained in uniform, even spaced distribution (Rose et al, 2001, Saab et al, 2002, Kotliar 2002).

For northern goshawks, all alternatives are consistent with the Forest Plan and the Regional Forester's Eastside Forest Plans Amendment #2. The action alternatives would fell trees within the former post-fledging areas (PFAs), but only dead and dying trees would be removed. In the Jack PFA, no commercial harvest would occur in the remaining nest stands.

Natural regeneration and planting are expected to re-vegetate forest although at different rates. Planting accelerates recovery of vegetation and development of nesting habitat. Mature and old growth stands suitable for nesting, as well as the existing nest sites, would be monitored annually for nesting activity. If new nest sites are identified within or immediately adjacent to the project area, management activities would be prohibited within ½ mile of the nest sites from April 1 to September 30 to avoid disturbing goshawks during the breeding season.

All alternatives are consistent with the 1918 Migratory Bird Treaty Act (MBTA) and the Migratory Bird Executive Order 13186. Alternatives were designed under current Forest Service policy for landbirds. The Northern Rocky Mountains Bird Conservation Plan (Altman 2000) and the U.S. Fish and Wildlife Service's Birds of Conservation Concern (USFWS 2002) were reviewed for effects disclosure. Salvage logging and other vegetation management cannot completely avoid unintentional take of birds, no matter what mitigations are imposed on the activities. Mitigation, such as retention of snags and down logs, retention of live trees, and avoidance of riparian areas, grasslands and juniper woodlands proposed in this project will minimize take of migratory birds

All alternatives are consistent with the Endangered Species Act (see Appendix D, Wildlife Biological Evaluation). Alternatives are expected to have **No Effect** on threatened and endangered species. Alternatives are expected to have either a **No Impact** or a **Beneficial Impact** to all sensitive species except the California wolverine and Columbia spotted frog. In the case of these latter two species, action alternatives **may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species**. Based on these effects calls, consultation with the US Fish and Wildlife Service was not considered necessary.

Irreversible and Irretrievable Commitments of Resources

The loss of snags would be an irretrievable loss until replacements function as snags. There are no other irreversible or irretrievable commitments of resources associated with wildlife or wildlife habitat that may result from the implementation of alternatives.

Soil

Regulatory Framework

The Malheur National Forest Plan meets all legal and regulatory requirements for soil conservation. Forest Service Manual R6 Supplement No. 2500.98-1, section 2520.2 says objectives of soil management are "To meet direction in the National Forest Management Act of 1976 and other legal mandates. To manage National Forest System lands ... without permanent impairment of land productivity and to maintain ... soil ... quality. .... Soil quality is maintained when soil compaction, displacement puddling, burning, erosion, loss of organic matter and altered soil moisture regimes are maintained within defined standards and guidelines." So if an action maintains detrimental impacts within the standards and guidelines of the Forest Plan, legal requirements for soil conservation would be met.

Forest-Wide Standards state:

101. Harvest timber from slopes which are less than 35% using ground skidding equipment and from slopes greater than 35% using cable or aerial systems. Approve exceptions through the environmental analysis process, which will include a logging feasibility analysis.

125. Evaluate the potential for soil displacement, compaction, puddling, mass wasting, and surface soil erosion for all ground-disturbing activities.

126. The total acreage of all detrimental soil conditions shall not exceed 20% of the total acreage within any activity area, including landing and system roads. Consider restoration treatments if detrimental conditions are present on 20% or more of the activity area. Detrimental soil conditions include compaction, puddling, displacement, and severely burned soil, and surface erosion.

127. Minimum percent effective ground cover following land management activities:

Soil Erodibility	First Year %	Second Year %
Very High	60-75	75-90
High	50-60	65-75
Moderate to High	45	60
Moderate	38	50
Low to Moderate	30	40
Low	20	30

128. Seed all disturbed soil that occurs within 100-200 feet of a stream or areas further than 200 feet that could erode into a stream.

129. Seed all skid trails with slopes greater than 20%.

Analysis Methods

The District soils specialist trained 6 technicians to collect data on existing condition. On most tractor ground that had been logged in the last 30 years, the technicians collected quantitative data on transects, using the protocol in Appendix E. In burned forest areas where transect data was not collected, the technicians walked through to see if detrimental impacts (excluding roads and landings) were clearly less than 10%. Ten percent was chosen because if detrimental impacts are clearly less than 10%, then impacts likely would be less than 6%, and impacts would be less than 20% after logging. If the technician could not say the impacts were clearly less than 10%, then they collected transect data. The technicians inspected all forested areas (including proposed harvest units) that burned. These inspections reveal almost all impacts from past activities, including timber harvest, landings, roads, fire suppression, livestock grazing, fuel treatments, and ORVs.

The District soils specialist has formed professional judgments on the probable qualitative effects. Professional judgment is based on monitoring, personal observation (including observation in similar areas, and in this area), scientific literature, the Malheur Land and Resource Management Plan (Forest Plan) Environmental Impact Statement, and professional contacts. However, the quantitative effects cannot be precisely predicted. Soil science is not advanced enough to make precise predictions. In addition, effects of management depend on unknowns, such as weather, details of implementation, and whether a wildfire will occur.

Spatial boundaries for soil effects are proposed unit boundaries, or the boundaries of past sales. Unless otherwise stated, effects are described for the time period immediately after the proposed actions, when effects are maximum.

Existing Condition

Soil Types

The best soil description and map available is the Soil Resources Inventory (SRI). Information about soil types from the SRI forms the basis for the following discussion. However, this map was made for large-area planning, and mapped at the scale of one inch per mile. Generally, field observations and aerial photos indicate the SRI map is correct, but not in all cases. For instance in the Flagtail fire there are about 260 acres mapped as non-forest or marginal forest soil that are in fact forested. As another instance, the SRI shows many areas in Flagtail fire as being steeper than 30% slope, where they are actually less than 30%. For these reasons, the Soils Map (see Figure 15, Map Packet) is modified from the SRI map, through use of a map of slope steepness and a digital aerial photo. Table SO-1 shows soil erodibility and properties. More details on soil types is found in the "Soil Hazard Ratings," "Concise soil descriptions," and "Soil Types and Burn Severity by Unit" parts of Appendix E.

Table SO-1: Soil Erodibility and Some Properties

Soil Type	Erodibility*	Soil Depth (inches)	Volcanic Ash Thickness (inches)	Slope (%)	Typical Vegetation
3	LM	>24	variable	<15	moist & dry meadow
31	LM	12-24	0	<30	ponderosa
32	M	18-30	6-12	30-70	mixed conifer
33	MH**	12-24	0	30-70	ponderosa
34	VH	6-12	0	10-70	juniper & ponderosa
35	VH	4-8	0	30-70	big sagebrush
36	M	24-36	12-18	30-70	mixed conifer
37	MH	6-12	0	<30	big sagebrush
41	LM	12-30	0	<30	ponderosa
42	M	12-36	6-12	<30	mixed conifer
46	MH	8-15	0	<30	juniper & ponderosa
47	H	4-12	0	<30	low sagebrush
58	L	24-48	15-24	<30	mixed conifer
59	M	18-48	12-18	30-70	mixed conifer

* H=High, L=Low, LM= Low to Moderate, M=Moderate, MH= Moderate to High, VH=Very High

** This erodibility rating corrects the rating currently attached to the SRI, which was "H". See the soils specialist report for details.

Sedimentary rocks occur over most of the area (soil types 31 to 37) with extrusive volcanic rocks in the southern part (soil types 41 to 59). The volcanics form a plateau, with an escarpment below. On the sedimentary geology, topography tends to be corrugated hills.

Sensitive soil types in the planning area are the unforested, shallow, rocky soils supporting low amounts of ground cover – “shallow soils” (soil types 34, 35, 37, 46 & 47). Erodibility ratings for soil type 34, 35, and 47 are "high" and "very high." Shallow soils hold about 0.5 to 1.8 inches of available water (see Glossary) and they support juniper woodlands or non-forest vegetation. A belt of shallow soils lies on the top and upper south-facing slopes of the Bald Hills. In addition shallow soils exist on part of the narrow plateau at the south end of the fire, and as inclusions in forest stands. These soils generally would not be included in timber harvest units.

Among forested soils, the most sensitive are those with both 1) slopes greater than 30% and 2) little or no volcanic ash on top (soil type 33). Erodibility rating for soil type 33 is "moderate to high". Of the mapping units containing soil type 33, almost all are in complexes with less steep ground or with ash soil, so generally the soil map does not show exactly where soil type 33 is. Areas of soil type 33 are on both sides of the Silvies River and around the Bald Hills. Harvest on this soil type would generally be by skyline or helicopter, though this soil type is also found as inclusions in tractor units. Non-ash soils are mostly gravelly loam holding 2-2.5 inches available water and they typically support ponderosa pine. Non-ash forest soil on slopes less than 30% (soil types 31 & 41) is abundant throughout the area. Ash soil (soil types 32, 36, 42, 58, & 59) tends to occur on north facing slopes throughout the area, particularly on the escarpment. Soil that has substantial amounts of volcanic ash (6 inches or more) is less erodible than non-ash soil because ash holds more water, permitting more rapid plant growth, and thus more rapid establishment of ground cover and ground cover that is more effective. In addition, ash soil has a high porosity and little clay, so it has a high infiltration rate. On the other hand, in the absence of ground cover, ash soil can be more easily eroded than non-ash soil, because ash soil particles are easily detached by running water. Also, in severely burned areas, ash soils tend to be more hydrophobic (see Glossary). However, on balance, non-ash soils are expected to erode more than ash soils. Ash soils typically hold 3 to 5.5 inches available water and support mixed conifers.

In contrast to erodibility, displacement hazard is higher for ash soils than non-ash soils. Like erodibility, displacement hazard is much greater for steep soils.

Compactability for these soils mostly is rated moderate or low to moderate. The only forested soil rated higher than moderate is soil 41, which is rated moderate to high.

Connections of Upland Soil to Streams

The easily weathered sedimentary rocks have contributed to large volumes of colluvial/alluvial fill in wide valley bottoms where meadows have formed. Channel erosion is the primary source of sediment in this landscape. Upland erosion from shallow soils and road erosion are secondary sources. Most of the sediment produced in the uplands is deposited in draw bottoms or on wide valley bottoms before reaching streams. Mass movement is very uncommon in this landscape.

Runoff from the shallow soils in the Bald Hills eroded gullies in several ephemeral draws decades ago. These gullies were stable before the fire, partly due to tree roots and deep forest floor (see Watershed section). About five acres of shallow soil on the Bald Hills is actively eroding near the corner of Sections 13, 18, 19, and 24, contributing soil and water to a gullied ephemeral draw tributary of Jack Creek.

Effects on Soil of Past Actions

In the fire area, about 3640 acres have been harvested in the past 30 years, including about 3210 acres of tractor harvest. Detrimental impacts (see Glossary), especially compaction, exist on tractor units from previous timber sales and fuel treatments (Table SO-2. See also Appendix E, Expected Soil Conditions, Alt.1 column). About 100 acres have detrimental impacts on 16 - 18% of the area; no activity area has detrimental impacts on more than 20% of the area. In areas that have not been harvested in the past 30 years, the highest detrimental impact is 10%. Small amounts (<1% of the area) of detrimentally burned soil were caused by the fire, and small amounts of displacement and compaction were caused by fire suppression. Skyline units have low amounts of detrimental impacts. Units entered more than 30 years ago have lower detrimental impacts than more recent units, because compaction has been loosened by natural processes.

Table SO-2: Units from previous timber sales with 12% or more detrimental impacts.

Unit*	Existing Detrimental Impacts % of unit	Acres In Unit
SNOW 33	18	34
SNOW 37	17	39
JACK 27 **	16	23
DIPPING VAT 02 "B" **	16	6
96 II 05	14	31
COLD 54	12	26
JACK 01 "A"	12	72
JACK 01 "B"	12	64
SNOW 32 "B" **	12	20
VAT 201 "B" **	12	48
VAT 347	12	16

* “A” and “B” means subdivisions of the unit

** A large part of these stands is too steep and/or stony to subsoil.

Most of the ephemeral draws have skidtrails on or near their bottom from previous logging, which makes them more prone to erosion. In fact, some draws are gullied. Effects of these gullies on soil productivity is negligible, because of the small area involved. Gullies can have substantial effects on water quality. See the Watershed section for more information

Productivity is limited by low amounts of water, by cold temperatures, and perhaps by insufficient nutrients, especially nitrogen. Fire usually decreases the amount of nitrogen on the land (though easily available nitrogen often increases for one to a few years). In the absence of fire, nitrogen increases, as nitrogen from the atmosphere accumulates in the organic matter of biomass, forest floor, and soil, especially due to the fixation of nitrogen by *Ceanothus*. Significant fires had not burned in the area for many decades, so the loss of nitrogen during fires had not occurred, and nitrogen had accumulated so that nitrogen levels were higher than in the 1800s, before fire suppression became effective.

Effects of the Fire

The BAER Severity map corresponds to soil severity of the fire (see Figure 2, Map Packet). Table SO-3 shows acres. By BAER definition, "High" soil severity areas should have less than 20% ground cover after the fire, "Moderate" areas should have 20-50% ground cover, and "Low" areas should have greater than 50%. On this fire, the silviculturist found much of the duff layer was consumed in some areas mapped as moderate and low soil severity, so ground cover was lower than the definition in many areas. In areas mapped as low soil severity, many trees that are expected to die remain with live needles. Ground cover will quickly increase in 2003 as needles drop from dead trees and as ground vegetation re-grows, so ground cover in these areas probably will exceed 50% by summer 2003. In areas mapped as moderate soil severity, ground cover will not increase as fast, because fewer live needles remain and less ground vegetation will resprout. Thus, areas mapped as moderate soil severity should usually be treated similarly to areas mapped as high soil severity. The amount of tree mortality supports this conclusion (Table FV-2, Forest Vegetation Section, Chapter 3). For instance, Table SO-3 shows 1,720 acres total with high soil severity, but Table FV-2 shows 3,150 acres total with tree mortality greater than 90%.

Table SO-3: Soil Severity by Subwatershed (based on BAER mapping 7/31/02)

Subwatershed	Total acres	Low Severity acres	Moderate Severity acres	High Severity acres	Unburned (within fire perimeter)# acres	Total Burned# acres	% of SWS burned*
Jack Cr.	10,180	1,330	780	500	730	2,610	26 (13)
Hog Cr.	6,140	140	70	20	70	220	4 (1)
Snow Cr.	6,430	940	1,340	1,160	560	3,440	54 (39)
Keller Cr.	7,520	140	50	40	140	220	3 (1)
Total	30,270	2,540	2,240	1,720	1,500	6,500	21 (13)

* Percent of subwatershed burned, with percent high plus moderate severity in parentheses. (Note: estimates are low because they do not include areas that burned after July 31).

\# Unburned (within fire perimeter) is actually smaller than shown and Total Burned is actually higher because these figures do not include areas that burned after July 31.

Many areas do not meet Forest Plan standards for ground cover, and are at risk for soil erosion. The Burned Area Emergency Rehabilitation Team reported 575 acres with high hydrophobicity. This hydrophobicity is on ash soil with high or moderate severity. Table SO-4 shows the number of acres of soil steeper than 30% that burned with moderate or high soil severity. These are the areas that have the highest risk of erosion (Table SO-1).

Table SO-4: Acres of ground steeper than 30%, that burned with moderate or high soil severity (see Figure 15, Map Section).

Subwatershed	Ash Soil 32,36,59 acres	Ash/ Non-Ash Complex acres	Non-Ash Forest Soil 33 acres	Shallow Soil 34,35 acres	Total acres
Jack Cr.	80	10	90	40	220
Hog Cr.	20	10	0	0	30
Snow Cr.	130	450	190	70	840
Keller Cr.	0	40	0	0	40
Total	230	510	280	110	1,130

Little detrimentally burned soil resulted from the fire. In order to count as detrimentally burned, a patch of reddish over blackened soil must be at least five feet wide (see Appendix E). Patches that met this criteria are rare.

The current nitrogen status of severely burned sites is unknown. Some of the nitrogen that accumulated over the decades was lost in Flagtail fire. In lightly burned areas, probably more nitrogen still remains than before fire suppression became effective. More nitrogen was lost from severely burned areas, but the amount of loss is unknown.

Cross -country fire line construction by dozers increased the potential for erosion by displacing ground cover and soil and, in places, concentrating runoff. Rehabilitation of the firelines greatly decreased this potential erosion (see Chapter 1, Background section).

The Future

Ground cover, hydrophobicity, detrimental impacts, and nutrients change over the course of years. The "Changes Under All Alternatives" section in the "Cumulative Effects" section below describes expected changes.

Environmental Consequences

Soil effects that are not described below would be so small as to be negligible. These negligible effects include effects on mass movement, effects on detrimentally burned soil, effects on soil microbes, and other effects.

Direct and Indirect Effects

Alternative 1, No Action Alternative - Direct and Indirect Effects

See the Affected Environment section for existing conditions. Under the No Action Alternative, no additional soil will be compacted, puddled, or displaced. No additional soil will be eroded by ground disturbing activities. Modeling erosion with the Disturbed WEPP model indicates a five-year storm would erode about 0.26 ton/acre from tractor ground that was burned at high and moderate severity. No organic matter or nutrients would be removed. Rough calculations with many assumptions indicate that perhaps 300 lb/ac nitrogen would be fixed by *Ceanothus* within 50 years after the fire.

As described in the "Fire and Fuels" section of Chapter 3, the hazard of a sever wildfire, and the associated risk of erosion, is higher under this Alternative than under Alternatives 2, 3 and 5, after about 10 years.

See the "Changes Under All Alternatives" section in the "Cumulative Effects" section for a description of expected changes.

Alternatives 2, 3, & 5, Harvest Alternatives - Direct and Indirect Effects

Roads

Three tenths of a mile of permanent road construction would remove about one acre of land from production.

Productivity of a small amount of land (<1% of the planning area) would be greatly decreased by displacement and compaction from temporary road and landing construction. On subsoiled roads, most productivity lost to compaction would be restored; probably 1/2 of the area of the roads would be in this condition. Productivity lost to displacement and untreated compaction would recover over the course of several decades; probably 1/2 of the area of the roads would be in this condition. For instance, in unit 32, subunit 9614A, temporary road construction would increase detrimental impacts about 1%.

Road decommissioning would slowly increase productivity of about 40 acres of former roads.

Tractor Harvest

Harvest would decrease ground cover. Ground cover on skidtrails would be decreased to about 10%. On skidtrails that are seeded (the more erodible ones), ground cover will recover in about two years. (According to mitigations described in Chapter 2, skid trails that will be seeded include those on low severity burns with slopes greater than 20%, those on moderate or high severity burns with slopes greater than 10%, those down-slope of shallow soils in the Bald Hills, and those within 100 feet of a stream.) On the less erodible, un-seeded skidtrails, ground cover will recover in about five years. Harvest could add a little additional ground cover from slash. This addition would be small in most units because trees tops will be taken to the landing and burned, or piled and burned, for fuel control. Modeling with "Disturbed WEPP" indicates erosion would be reduced by about 0.01 or 0.02 yd^3/ac, due to the increased ground cover.

Skidding on steep slopes or unsuitable land often causes displacement. Water bar construction also often causes displacement. Skidding also bares soil, decreases infiltration, and channels overland flow, and thus accelerates erosion. This acceleration occurs especially on steep slopes and on soil that has insufficient ground cover, including shallow soil and moderately and severely burned soil. In Flagtail fire, skidding would not be done on shallow soil, because of mitigation in Chapter 2. Even with waterbars and seeding, skidtrails sometimes erode a small amount. For instance, some skidtrail erosion may occur on slopes steeper than 30% in unit 4. Concentrated runoff from roads, shallow soils, or draws can exacerbate skidtrail erosion (McNeil 2001, see Appendix E), and runoff from existing and new skidtrails could interact similarly. Usually erosion of skid trails decreases through one to three years, until it stops. Decreased productivity due to severe displacement and erosion can last hundreds of years. But, mitigations would keep displacement and erosion to a minimum. For instance, Davis and coworkers (2001) found displacement and erosion after skidding on a severely burned 40% slope to be at an acceptable level on Summit fire on Blue Mountain Ranger District. At Flagtail, effects from steep slope skidding would be limited because slopes steeper than 35% are less than 150 feet wide, and occupy a small proportion of tractor units. Mitigations that effectively control displacement and erosion include prohibitions on skidding on steep slopes (>40 or >45%) (for a list of units, see Chapter 2, Mitigations section), prohibitions on skidding near scabs (for a list of units, see Chapter 2, Mitigations section), locating snag clumps on slopes steeper than 35% where feasible, control of runoff below shallow soils in the Bald Hills (for a list of units, see Chapter 2, Mitigations section), limitations on skidding in draws, and seeding and water bar requirements (see Chapter 2). For instance, seeding skidtrails steeper than 10% in moderately & severely burned areas is necessary to re-establish ground cover; waterbars alone are insufficient. The same slope limitations apply to all soil types because steep ash soil is easily displaceable, and steep non-ash soil is relatively easily erodible.

Under most weather, skidding would cause negligible soil export from the units, despite soil movement within units as described in the preceding paragraph. Soil normally is deposited down slope as the water percolates into the soil. Some quantitative information on soil export is available. Two to three years after Summit fire, skidding caused export of a total of 0.02 m^3 of soil from units totaling 230 acres (McNeil 2001, see Appendix E). This export was below-average (because there was no heavy thunderstorm, and other reasons) but it does indicate skidding usually causes negligible soil export from units, even after fire. Similarly, Davis and coworkers (2001) saw no evidence of soil movement from logged, severely burned units on Summit fire. Also, when soil is eroded in this landscape, it usually travels less than the 50 foot intermittent RHCA widths, though in rare instances it can travel 65 feet or more (McNeil 1999).

On the other hand, McIver & Starr (2000) report on field studies in the West that indicate sediment can be produced by logging after wildfire. Of the five logging operations reviewed, two produced sediment (one of these had three studies), two did not produce sediment, and one had mixed results. Reasons for the varying results include variations in details of operations, in study methods, in ground cover, in weather, and in soils. In these respects, the study most relevant to Flagtail fire is Summit fire; the two sites would have similar operations and soil erodibility, and likely would have similar ground cover and weather. The Malheur Soil Resource Inventory rates soil erodibility on the most common soil type on "tractor ground" (forest soils less than 35% slope) in Flagtail (soil type 31) as "low to moderate", and in Summit monitoring units (soil type 181) as "moderate to high." Like Flagtail, the Summit monitoring units contained inclusions of slopes steeper than 35%.

Even though skidding likely would cause negligible soil export from units, there is a small risk of a small amount of soil export from units with moderately and severely burned soil. Weather and ground cover are difficult to predict, and they could be worse than Summit Fire; perhaps a much heavier rain will occur, or perhaps there will be less ground cover. In order to account for these possibilities, soil erosion for 2005 was modeled using the Disturbed WEPP model, as described in the analysis file. WEPP is a state of the art erosion model, and Disturbed WEPP adapts it to forests, including burned areas. Results presented in the analysis file indicate that in about two years out of three, no soil erosion is expected; in about one year out of five, about 0.05 - 0.06 yd^3/ac additional soil would be eroded due to skidding on moderately and severely burned soil. This is the net increase, after accounting for the 0.01-0.02 yd^3/ac decreased erosion due to slash. In terms of soil productivity, this is a negligible loss. In certain units where slash would be scattered on skidtrails (listed in Chapter 2, Mitigations, Watershed), sediment export would be reduced to about 0.04 yd^3/ac. With storms more intense than one-year-out-of-five, more sediment would be produced. In 2006 and later, erosion due to logging would be negligible.

Except for areas that happen to be harvested under winter conditions, much of the skidtrails would be compacted, and some of the soil tracked only once or twice would be compacted. Compaction usually lasts more than 20 years; some compaction lasts more than 50 years. Skid trails for this operation would occupy less than 9% of each unit, because skid trails would be spaced about 120 feet apart. The amount of compaction depends much more on soil moisture than on soil type. Skidding on dry soil would increase detrimental impacts by 4.5%, because skidtrails usually are about 50% to 80% compacted, and because existing skidtrails would be re-used where they were appropriately located. Skidding on moist soil would increase detrimental impacts by 6.5%. If the unit happens to be harvested over deep snow or on deeply frozen soil, compaction would be about 0.5%. Use of feller-bunchers on dry soil would increase detrimental impacts by 1.5% (McNeil 1996, see Appendix E), to a total of 6% for dry soil and 8% for skidding on moist soil. Effectiveness of mitigations that ban skidding under wet conditions, that require dry or winter conditions and low ground pressure for machinery off skidtrails, and that require subsoiling of skidtrails in certain sub-units, would keep compaction to a practical minimum, and indicate the Forest Plan standard would be met in most stands without subsoiling. For instance, Davis and coworkers (2001) examined several units on Summit Fire, and found none where standards appeared to be violated. As a numerical example, in sub-unit Snow32B of unit 118, where existing detrimental impacts are about 12% (Table SO-1), skidding on moist soil and use of a feller buncher on dry soil would increase detrimental impacts to about 20%.

Re-entry with the small post-and-pole sales would not increase detrimental impacts or erosion above the amounts disclosed above, because the same skidtrails and mitigations would be used. Hazard tree removal along roads would have negligible soil effects, because there would be no skidding off roads.

Puddling is associated with compaction, and statements about compaction also apply for puddling.

Subsoiling

Subsoiling of skidtrails is planned for the portions of units 006, 032, 034, 056, 059, 073, 074, 075, 077, 078, 090, 118, 120, 150, 180, and 182 that are expected to exceed 18% detrimental impacts, totaling about 490 acres. (Because skidtrails occupy only a small part of the units, only about 40 acres would be subsoiled.) In these subsoiling areas, soil type is 31. Site-specific observations indicate most of the soil in these sub-units is suitable for subsoiling in terms of slope, depth, and stoniness, but there are inclusions of unsuitable soils in most units. For more detail, see the "Subsoiling Suitability" section of Appendix E. Subsoiling would mostly, but not entirely, loosen compacted soil. Subsoiling skidtrails would reduce detrimental impacts by about 6%. For instance, if sub-unit Snow 37 of unit 120 had detrimental impacts on 22% of the unit after harvest, subsoiling skidtrails would reduce detrimental impacts to about 16%. This decrease is will ensure these sub-units would meet the Forest Plan Standard.

Landings would also be subsoiled where suitable. Because landings occupy only a small proportion of land, and because parts of landings occupied by slash would not be subsoiled, and because much of the detrimental impact on landings is due to displacement as well as compaction, subsoiling landings would decrease detrimental impacts by about 1%.

Subsoiling bares soil, forms channels, makes soil particles more easily detachable, and disrupts roots, thus raising the risk of erosion for a few years. However, subsoiling also increases infiltration, which decreases the risk of erosion. This increased infiltration, and the subsoiling mitigations, means that sediment production from erosion due to subsoiling would be negligible.

Fuels Control

Mitigations in Chapter 2 require grapple piling equipment to have a low ground pressure, to operate on dry soil, and to operate on skid trails where possible, so the District soils specialist expects grapple piling would compact about 1% of each unit where it is used. Feller bunchers of similar ground pressure operating off skidtrails caused about 1.5% compaction (McNeil 1996, see Appendix E). This would be in addition to impacts caused by harvest. For instance, if sub-unit Snow32B of unit 118 had detrimental impacts on 18% of the sub-unit after harvest, it would have about 19% after grapple piling.

Direct and indirect effects from hand piling and burning would be negligible, because no heavy equipment is used.

Skyline and Helicopter Harvest

Skyline logging causes much less displacement, erosion, and compaction than tractor logging - detrimentally affecting about 1 - 2% of the area. Logs that drag during skyline logging can displace soil and concentrate erosive runoff in furrows. Required cross drains would divert runoff from the furrows, so the amount of erosion would be negligible, and soil would be unlikely to leave the unit.

Detrimental impacts of helicopter logging would be negligible, outside landings, because no heavy equipment would be used on soil.

Nutrients

Mitigations would keep nutrient loss by displacement and erosion to a minimum, so it would be negligible. However, logging would remove nutrients and organic matter in logs, and fuel control would remove nutrients and organic matter during burning. The removal, especially removal of nitrogen, may decrease site productivity a few percent on some sites. Removing organic matter and nutrients by logging and fuel control likely would move many sites back toward their fertility status before European-Americans arrived (see Affected Environment Section). Also, on many or most sites, productivity likely is not limited by nutrients or organic matter. Also, a relatively small amount of nutrients is predicted to be removed, because wood has a low concentration of nutrients (compared to foliage, small branches, and the remaining forest floor), because a large amount (about 2100 lb/ac) of nitrogen is in mineral soil (Geist and Strickler 1978), and because some trees will be left (because they will not be merchantable, because they will contribute to wildlife habitat, and because they will help prevent erosion in draws). In logged units, woody fuel loads would be similar to conditions before Euro-Americans arrived. Little dead wood existed before fire suppression became effective, because fires burned it up. (See the Fire and Fuels section for estimates of the amount of fuels that would be left.) The ecosystems persisted for thousands of years with low levels of dead wood, so removal of the excess dead wood would have only a small adverse effect.

Tree planting would decrease nitrogen fixation by *Ceanothus*, as trees compete with the shrubs. Rough calculations with many assumptions indicate that perhaps 160 lb/ac of nitrogen would be fixed under the action alternatives, down 140 lb/ac from Alternative 1. This 140 lb/ac nitrogen is about 7% of the nitrogen in the soil. It is unlikely that disturbance from logging would be severe enough to decrease nitrogen fixation because the shrubs would grow back.

Alternative 4 - Treatment Without Harvest - Direct and Indirect Effects

Effects of this Alternative would be similar to effects under the No Action Alternative. One difference is that grapple piling would compact about 2% of the area in grapple piling units. (The 2% is greater than the 1% for harvest units, because piling machines will not be able to use skidtrails.)

Another difference is that road decommissioning would slowly increase productivity of the former roads.

Another difference is effects on nutrients. The piling and burning for fuel control would remove some nutrients. Also, tree planting would decrease nitrogen fixation by *Ceanothus*, as trees compete with the shrubs. Rough calculations with many assumptions indicate that perhaps 160 lb/ac of nitrogen would be fixed under the action alternatives, down 140 lb/ac from Alternative 1. This 140 lb/ac nitrogen is about 7% of the nitrogen in the soil.

Cumulative Effects

Changes Under All Alternatives

In 2002 the fire made about 580 acres of soil hydrophobic. Hydrophobicity is expected to rapidly decrease, so that more than 50% of it disappears before summer 2003, and it is at pre-fire levels by summer 2004.

Recovery of ground cover in moderately and severely burned areas will take from less than a year to perhaps 2007, depending on the site. As long as ground cover remains below Forest Plan standards, the risk of erosion will remain elevated. Ground cover on moist, lightly burned sites, such as many riparian areas, will recover within a year; drier, more severely burned areas will take a few years to recover. Ground cover will mostly result from recovery of ground vegetation. Some additional ground cover will come from needles and wood from burned trees. The Burned Area Emergency Rehabilitation Team estimated that severely burned upland forest sites would have about 35% ground cover in 2003. This estimate may have been somewhat optimistic; observations in September 2003 indicated at least part of unit 004 has ground cover of about 20%. Units 24 and 10, with moderate severity, had ground cover that appeared to vary from 30 to 70%. Johnson (1998) found that five years after severe fire, ground cover on 13 forest sites similar to those in Flagtail fire ranged from 60% to 98%, averaging 82%. Ground cover will continue to increase as forest conditions develop.

Root action, animals that burrow in the soil, and freezing water will gradually loosen compacted soil over the course of decades. Firewood cutters and off-road vehicles would compact a negligible amount of soil.

Soil organic matter will gradually accumulate. Nutrients will gradually accumulate due to inputs (in precipitation, dry deposition, weathering of parent material, and nitrogen fixation) and retention. As noted under the Direct and Indirect effects sections, nitrogen fixation rates would be higher under Alternative 1 than under the action Alternatives. These processes will take decades.

The lack of cattle grazing for at least two years would cause either no effect on ground cover, or perhaps increase ground cover (relative to ground cover if cattle were to graze). Resumption of grazing after two or more grazing seasons would maintain current levels of compaction in riparian areas. Resumption of grazing would be implemented so it would not violate ground cover standards, or increase soil erosion (that is, erosion of soil outside stream channels).

An erosion control project on about 5 acres of the Bald Hills is a reasonably foreseeable action that is expected to be covered under a Categorical Exclusion NEPA process (CE). This project would increase ground cover, trap eroded soil, and gradually decrease erosion.

Fuels reduction in RHCAs (a CE project) would decrease the risk of detrimental effects of wildfire.

If another wildfire occurs, ground cover would decrease below Forest Plan standards in many places, and more soil would be eroded and nutrients and organic matter lost. More soil may be detrimentally burned as logs burn near the ground.

Soil effects from other past, present, and foreseeable actions would be negligible. These actions include road maintenance and reconstruction, hazard tree removal along roads (no skidding off roads), CE projects (planting hardwoods, fencing aspen, adding woody debris to streams), mushroom gathering, and other activities listed in Appendix J.

Alternative 1 - No Action Alternative - Cumulative Effects

The hazard of detrimental effects from a wildfire is higher under the No Action Alternative than under the Action Alternatives, because of high resistance to control and greater severity (see Fire and Fuels Section). Detrimental effects include loss of ground cover, hydrophobicity, erosion, and detrimental burning.

Alternatives 2, 3, & 5 - Harvest Alternatives - Cumulative Effects

Detrimental impacts from this entry would add to existing impacts, which resulted from past actions, and which were determined by inspections of soil conditions. Existing impacts are described under the Affected Environment section. Quantitatively, they are shown under Alternative 1 in the "Expected Soil Conditions After Proposed Activities" in Appendix E. Past actions include timber harvest, landings, roads, fire suppression, livestock grazing, fuel treatments, and ORVs. Detrimental impacts from the proposed operations (road construction, harvest, subsoiling, fuels control) add to past actions. For instance, detrimental impacts for unit 118, sub-unit Snow 32B, Alternative 5, with skidding under moist conditions and feller buncher use under dry conditions, would be 16+0+8-1-6+1=18% (existing + road construction + skidding - landing subsoiling - skidtrail subsoiling + fuels control). Appendix E shows what the expected site-specific condition would be, for sub-units (parts of units) that are expected to have the most detrimental impacts after the proposed activities.

Tree planting will help increase ground cover after trees become established. (As noted above, ground cover will meet the Forest Plan standard in most places within 5 years.)

Erosion from the unclassified roads in the Bald Hills would decrease as they are no longer disturbed by traffic and self-maintaining drainage is installed.

Fuels treatment would decrease the hazard of a wildfire occurring. If a wildfire occurs, the proposed fuels treatments would decrease soil fire severity (Vihnanek & Ottmar 1993).

Alternative 4 - Treatment Without Harvest - Cumulative Effects

Detrimental impacts from this entry would add to existing impacts, which are described under the Affected Environment section. Appendix E shows what the expected site-specific condition would be, for sub-units (parts of units) that are expected to have the most detrimental impacts after the proposed activities.

Tree planting will help increase ground cover after trees become established. (As noted above, ground cover will meet the Forest Plan standard in most places within 5 years.)

Erosion from the unclassified roads in the Bald Hills would decrease as they are no longer disturbed by traffic and self-maintaining drainage is installed.

The hazard of detrimental effects from a wildfire is higher under Alternative 4 than under the Alternatives 2, 3, and 5 (see Fire and Fuels Section). If a wildfire occurs, the proposed fuels treatments would decrease soil fire severity for about 10 years, but after that time the hazards would be only slightly less than the No Action Alternative (see Fire and Fuels Section).

Comparison of Alternatives - Soil

In all Action Alternatives, soil export from proposed units is expected to be similar to that under the No Action Alternative. But there is a small risk of small increase in erosion with tractor harvest on severely and moderately burned soil. Acres of tractor harvest on severely and moderately burned soil is shown in Table SO-5. Applying the estimates of erosion from Disturbed WEPP indicates that on the 1410 acres of high and moderate soil burn severity tractor ground, that a five-year storm would produce about 370 yd^3 of erosion under Alternatives 1 and 4, about 430 yd^3 under Alternatives 2 and 5, and about 420 yd^3 under Alternative 3.

Table SO-5. Acres of tractor harvest on areas that burned with high and moderate soil burn severity.

	Alternative 1 acres	Alternative 2 acres	Alternative 3 acres	Alternative 4 acres	Alternative 5 acres
Jack Cr. sws*	0	500	390	0	500
Hog Cr. sws	0	20	20	0	20
Snow Cr. sws	0	850	680	0	750
Keller Cr. sws	0	40	30	0	30
Total area	0	1,410	1,120	0	1300
Slopes steeper than 30%	0	160	110	0	130

*sws = subwatershed

Forest Plan soil protection standards would be met under all Alternatives. Detrimental impacts (displacement, erosion, compaction, puddling, and detrimental burning) would be about 7% of tractor logged acres (see Comparison of Alternatives by Activity, Chapter 2). This would be about 190 acres for Alternative 2, 140 acres for Alternative 3, and 170 acres for Alternative 5. Appendix E shows what the expected site-specific condition would be, for sub-units that are expected to have the most detrimental impacts after the proposed activities. The soil productivity issue mentioned in the Chapter 1, Key Issues, #3 Soil section is addressed by maintaining detrimental impacts within Forest Plan standards and guidelines, as stated in Chapter 3, Soil, Regulatory Framework section.

Consistency With Direction and Regulations

All alternatives would be consistent with Forest Plan soil protection standards, because all the Forest-Wide Standards mentioned above under the "Regulatory Framework" section would be met.

Irreversible and Irretrievable Commitments of Resources

Under Alternatives 2, 3 & 5, a small risk exists of a small amount of soil erosion from skidtrails. If a wildfire burns after about 10-15 years, the risk of soil erosion is higher under Alternatives 1 and 4 than Alternatives 2, 3, & 5. No other irreversible impacts are expected.

Watershed

Regulatory Framework

Malheur Forest Plan

The Malheur National Forest Plan (USDA 1990) as amended, provides direction to protect and manage resources. Only direction pertaining to the water resources portion of the Burned Area Recovery project is included here.

The Forest Plan Goals for water resources include:

- Provide a favorable flow of water (quantity, quality, and timing) for off-Forest users by improving or maintaining all watersheds in a stable condition. (Goal 27, p. IV-2)
- Maintain or enhance water quality to meet State of Oregon standards, considering downstream uses and protection of other riparian and floodplain values. (Goal 28, p. IV-2)

The Forest Plan Objectives state how resources will be managed under the Forest Plan. They are discussed by Riparian Area and for Soil and Water (only objectives pertaining to water are listed):

Riparian Area:

- All riparian areas will be managed to protect or enhance their value for water quality, fish habitat and wildlife.
- All new or updated management plans will include a strategy for managing riparian areas for a mix of resource uses. A measurable desired future riparian condition will be established based on existing and potential vegetative conditions. When the current riparian condition is less than that desired, objectives will include a schedule for improvement. (NOTE: Access and Travel Management Plans are proposed under alternatives 2, 3, and 4).

Water:

- Manage soil and water resources to maintain or enhance the long-term productivity of the Forest.
- Much of the management activity under this Plan will be directed toward improving those riparian areas which are in undesirable condition. A combination of watershed improvements in or adjacent to riparian areas will be the major soil and water improvement activities on the Forest. Any one method or a combination of methods may be incorporated to treat a less than desirable riparian area.
- Integrate mitigation into management activities. Examples of mitigation for soil and water protection include waterbarring skid trails, seeding disturbed soil along riparian areas and size and distribution of harvest units.

Forest-wide Standards provide further guidance:

Protection of Water Quality:

- Comply with State requirements in accordance with the Clean Water Act for protection of waters of the State of Oregon (Oregon Administrative Rules, Chapter 34041) through planning, application, and monitoring of best management practices (BMPs) in conformance with the Clean Water Act, regulations, and federal guidance issued thereto. (Standard 117)

- In cooperation with the State of Oregon, the Malheur National Forest will use the following process:
  (a) Select and design BMPs based on site-specific conditions
  (b) Implement and enforce BMPs.
  (c) Monitor to ensure that practices are correctly applied as designed
  (d) Monitor to determine the effectiveness of practices in meeting design expectations and in attaining water quality standards.
  (e) Evaluate monitoring results and mitigate where necessary to minimize impacts from activities where BMPs do not perform as expected.
  (f) Adjust BMP design standards and application when beneficial uses are not being protected and water quality standards are not being achieved. Evaluate the appropriateness of water quality criteria for reasonably assuring protection of beneficial uses. Consider recommending adjustment of water quality standards. (Standard 118)

- Implement the State Water Quality Management Plan, described in Memoranda of Understanding between the Oregon Department of Environmental Quality and US. Department of Agriculture, Forest Service (February 2, 1979 and December 2,1982), and 'Attachments A and B' referred to in this Memoranda of Understanding (Implementation Plan for Water Quality Planning on National Forest Lands in the Pacific Northwest, December 1978, and Best Management Practices for Range and Grazing Activities on Federal Lands, respectively).

  Site-specific BMPs will be identified and documented during environmental analysis, along with evaluations of ability to implement and estimated effectiveness. BMPs are described in General Water Quality Best Management Practices, Pacific Northwest Region, November 1988. (Standard 119)

- Evaluate site-specific water quality effects as part of project planning. Design control measures to ensure that projects will meet Oregon water quality standards. Projects that will not meet Oregon water quality standards shall be redesigned, rescheduled, or dropped. (Standard 120)

- Conduct a watershed cumulative effects analysis in watersheds where project scoping identifies cumulative effects of activities on water quality or stream channels as an issue. This will include land in all ownerships in the watershed. Disperse activities in time and space to the extent practicable, and at least to the extent necessary to meet management requirements., On intermingled ownerships, coordinate scheduling efforts to the extent practicable. (Standard 121)

- Rehabilitate disturbed areas that could contribute sediment to perennial streams. (Standard 122)

Updates to Standards 117 and 119: "Complying with State Requirements in accordance with the Clean Water Act…and federal guidance issued thereto." and "Implement the State Water Quality Management Plan….."

Since the Forest Plan was signed, how the Forest Service complies with State Requirement in accordance with the Clean Water Act and how the Forest Service implements the State Water Quality Management Plan has been renegotiated with the State and modified, partly in response to changes in how the US Environmental Protection Agency (EPA) administers the Clean Water Act with the State of Oregon. A new Memorandum of Understanding Between USDA Forest Service and Oregon Department of Environmental Quality to Meet State and Federal Water Quality Rules and Regulations was signed in May 2002. (USDA Forest Service, May 2002) and additional federal guidance and protocols have been issued (Furnish and McDougle, 1999; Hildago-Soltero, 2000; Jensen, undated; USDA Forest Service, Pacific Northwest Region, Regional Office, 1999; USDA Forest Service, undated, "Appendix A"; USDA Forest Service, undated, "Appendix C"). Appendix K, Part 1, presents a summary of how the direction, guidance, and protocols in the above documents were applied to the Flagtail Fire Recovery Project.

Management Areas and Amendments to the Forest Plan

The Forest Plan, as amended, establishes Management Areas and Standards that pertain to water resources. (Forest-wide Goals and Standards apply to all.) On the Malheur National Forest, the relationship of these Management Areas and the Standards defined for them is confusing and described below.

The original Forest Plan established Management Area MA 3A – Non-Anadromous Riparian Areas. This Management Area, including Description, Goals, and Standards, is described on pages IV-55 to IV-61 of the Forest Plan.

The Forest Plan was amended with Amendment 29 for Management Area 3A in 1994. It established a Desired Future Condition for MA 3A and modified two MA3 Standards for the Resource Element of Fish, Water Quality and Wildlife. The description of the Desired Future Condition and the modified Standards are found in Amendment 29 to the Malheur Forest Plan.

The Inland Native Fish Strategy (INFISH), as Corrected, amended the Malheur Forest Plan in 1995. INFISH provides interim direction to protect habitat and populations of resident native fish outside of anadromous fish habitat in parts of five states, including eastern Oregon. INFISH establishes Riparian Management Objectives and Standards and Guides to provide protection of fish and fish habitat. INFISH also identifies areas, defined by standard distances from streams and wetlands, in which these Standards and Guides would apply. These areas are called Riparian Habitat Conservation Areas (RHCAs) and are applied across all Forest Plan Management Areas.

Standard Riparian Habitat Conservation Area (RHCA), and the additional INFISH Riparian Goals, Riparian Management Objectives (RMOs) and Forest-wide aquatic standards apply except when watershed analysis or site specific analysis has occurred or when current Forest Plan direction provides more protection for inland native resident fish habitat as described in the Decision Notice Correction for the Inland Native Fish Strategy. The RMOs and standards contained in Malheur Forest Plan Amendment 29 are considered more protective than those in INFISH, supercede comparable ones in INFISH, and apply to the Flagtail project area. The criteria for defining standard RHCAs and the additional Riparian Goals, RMOs and Forest-wide aquatic standards established by INFISH which apply to the Flagtail project area are found in Appendix A of the INFISH Decision Notice (USDA Forest Service, 1995).

INFISH provides standard widths for RHCAs as well as direction on defining site-specific widths that varied from the standard. The standard RHCA widths, based on slope distances as described in Chapter 1 and the Fisheries Report, were adopted for this project.

INFISH definitions of Riparian Habitat Conservation Areas do not correspond exactly with the definition of Forest Plan Management Area 3A – Non-anadromous Riparian Area. Three primary differences that apply to the Flagtail Project Areas are:

- Standard widths of RHCAs are generally wider than the corresponding widths of MA 3A buffers. The standard RHCA widths apply in the Flagtail project area along fish bearing, perennial, and intermittent streams and wetlands. Consequently, at least two Management Areas usually comprise each RHCA; RHCAs are composed of an inner core of MA 3A, defined by the Forest Plan, and an outer portion which is allocated to another Management Area.
- MA 3A, but not RHCA, includes "those Class IV streams and upland areas, . . . which have high water table conditions during some parts of the growing season. Class IV channels will be recognized as the important link between uplands and the downslope perennial streams. They will be managed to ensure bank and channel stability" (Forest Plan, p. IV-55). The direction to recognize the link between uplands and downslope perennial streams is interpreted in the Flagtail project area to include ephemeral draws, which, if not managed properly, will erode into channels. "These Class IV and other riparian areas will have a variable width, depending on site specific needs for all riparian dependent species" (Forest Plan, p. IV-55).
- MA 3A, but not RHCA, includes "dry" quaking aspen stands.

Ephemeral draws of various lengths shown on Figure 16 were assigned buffers of 10-50 feet depending on draw condition and adjacent, proposed activities (see Mitigation).

Aspen mapping and protection with 100 ft. buffers, under the Unique Habitat Wildlife Forest Plan Standard, is ongoing.

The two, modified, Standards included in Amendment 29 address several of the same resource elements described as RMOs in INFISH, effectively establishing a set of RMOs that is both specific to the Malheur National Forest and more protective of inland resident fish habitat, which is permitted under INFISH. Thus, INFISH applies to the Malheur National Forest except for the RMOs which are superceded by Amendment 29 Standards. Both the Water Temperature RMO of INFISH and the Water Temperature Standard described in

Amendment 29 are superceded by revisions to the State of Oregon Water Quality Standard for Temperature established under the Clean Water Act referenced above. RMOs are discussed in the Fisheries Report.

Analysis Methods

Tools to Estimate Existing Condition

Summary of Information Sources: Information sources used to describe the existing condition of the Flagtail area include the Malheur National Forest (MNF) Geographic Information System, the Upper Silvies Ecosystem Analysis at the Watershed Scale (Upper Silvies WA) (1997), the MNF Soil Resource Inventory, post-fire surveys of detrimental soil conditions, USGS stream gauge records, stream surveys based on the Region 6 Stream Survey Protocol (1994, 1996), riparian surveys based on the MNF riparian survey protocol (adopted from managing Riparian Ecosystems (Zones) for Fish and Wildlife in Eastern Oregon and Eastern Washington, 1979), ocular surveys developed by former district aquatic personnel, post-fire channel cross-section and longitudinal transects, Burned Area Emergency Rehabilitation (BAER) report, post-fire (site-specific) reconnaissance and informal stream/ephemeral draw evaluations conducted by district personnel (including the fish biologist, hydrologist, and soil scientist), field surveys and monitoring of rehabilitation of fire suppression activities, results of WEPP modeling, and the soils and other specialists' reports prepared for this project (including soils, fuels, and vegetation). The results of post-fire reconnaissance and informal stream/ephemeral draw evaluations are documented in a table of existing conditions by stream segment. The MNF Geographic Information System was used to evaluate and analyze data available in spatial formats. The BAER report included results of modeling of potential runoff from a selected design storm event. It also included results of the Watershed Erosion Prediction Program (WEPP) modeling of post-fire hillslope erosion and sediment transport to streams. The results of additional WEPP modeling conducted by the project soil scientist between the DEIS and the FEIS were also incorporated. Information described above was integrated using local and regional knowledge and professional judgement.

Effects Analysis Methods

The actions proposed in the action alternatives and in the No Action Alternative were evaluated qualitatively, based on the principles of applied watershed science and professional judgment and knowledge of the area. Consideration was given to post-fire condition, desired post-activity condition, and the application of site-specific Best Management Practices (BMPs). The analysis built on the Environmental Consequences for Soils Report and incorporated information from other specialists' reports such as Fuels and Vegetation. Effects were identified and discussed based on site-specific conditions and expected outcomes, including those described in the Existing Condition and those used as measures for the Water Issue. Comparison of alternatives also incorporated the results of additonal WEPP modeling as described above.

Unknown and Unavailable Information: Stream conditions on private land within and downstream of the burn area are generally unavailable. Conditions on a short segment of the Silvies River visible from County Road 63 and along triburary streams where they leave the Forest boundary can be estimated visually. Also, assumptions about some conditions which are generally controlled by topography can be derived from publicly available sources such as USGS maps (available to the District as the GIS Primary Base Series cover). Details of past management history on private land, including harvest, especially prior to the fire, is unknown, although general conclusions about past stand management may be made based on observations from public lands and travelways and principles of stand growth.

Routine stream flow data are unavailable because the nearest stream gauging station is located at least 30 miles down the Silvies River in a portion of the basin that differs substantially hydrologically from the Upper Silvies Watershed. Data from a temporary peak flow gauge located below the Wickiup Creek confluence with the Silvies River apply to the area located above most of the burn; only the small, Hog Subwatershed portion of the burn (ephemeral draws) drains into the formerly gauged area.

Wetlands were not mapped in GIS but the District locates and protects them during implementation. Protection is consistent with the Standards and Guidelines of the Forest Plan, as amended.The locations of wetlands were noted generally and included in the description of the Existing Condition.

The research and the state of knowledge for many of the water quality parameters, watershed processes, and watershed functions in most of the United States, including the Malheur National Forest, have not advanced enough so that definitive quantitative data are commonly available (USDA Forest Service, undated, "Policy and Framework….").

Recent research demonstrates that some watershed and water quality parameters are highly variable. For instance a recent study (1998, Bunte and MacDonald), "using good scientific methods for making sediment measurements, in a specific watershed, for ten years resulted in measured sediment at *plus or minus 100 percent of the actual value (precision) at the 95 percent confidence interval (reliability).* Modeling would be expected to be more variable. The soil scientist used Disturbed WEPP to model erosion in selected areas within Flagtail. The results of this modeling were extrapolated to the project area based on local knowledge and landscape characterstics.

Because watershed science is not exact and few data are available, the common practice for watershed specialists, like other earth scientists, is to integrate available information with knowledge of basic principles of watershed science and with the physical and biological characteristics of the landscape. Integrating these factors results in a reasoned understanding of watershed conditons, functions, and processes. This understanding can be used to evaluate effects of proposed activities. For the Flagtail project area, this understanding is laid out in the Existing Condition which forms the basis for the comparison of alternatives. This process of integration of available information with basic principles is consistent with 40 CFR 1502.22 (Unknown and Unavailable Information).

Other Issues: Three concerns, some of which relate to the Beschta Report (Beschta, 1995), are considered qualitatively in the effects analysis. These are legacy conditions, the effectiveness of Best Management Practices, and watershed cumulative effects. These concerns are addressed qualitatively as described below.

Legacy Conditions: Legacy conditions have been identified as a concern (other issues considered). Legacy conditions are described in the Affected Environment and considered in Cumulative Effects. Site-specific legacy conditions were considered in the selection and design of BMP systems and other watershed mitigation and would be considered in the site-specific implementation of BMPs and mitigation in order to protect water quality.

Rehabilitation of some legacy conditions is proposed in the action alternatives. Examples include decommissioning of classified and unclassified roads under all three action alternatives and waterbarring of old skid trails which would be re-used in alternatives 2, 3 and 5. Projects proposed outside this EIS for the Flagtail area address rehabilitation of other legacy conditions as described in Chapter Chapter 1, Actions Outside of this EIS to Address Recovery Needs and Watershed Cumulative Effects sections. Legacy conditions for which treatment is on-going include riparian hardwood planting along the Silvies River and other streams and placement of coarse woody material in ephemeral draws and the Silvies River. Other conditions, such as erosion in the Bald Hills would be treated by foreseeable actions.

BMP Effectiveness: The effectiveness of BMPs has been identified as a concern (other issues considered). Evaluations at national and regional scales indicate that BMPs are effective within the design specifications. For instance, evaluations of BMP implementation and effectiveness in the Pacific Southwest Region (Forest Service, 1998; Forest Service, 2001) indicate that BMPs are implemented as prescribed 80%-95% of the time, depending on the practice. Effectiveness of implemented practices was rated at about 78% to 95%, depending on the practice. Local experience, based on informal and formal monitoring on the District, while not compiled into formal databases similar to these national and regional evaluations, indicates that the conclusions from these evaluations apply on the Blue Mountain Ranger District.

In addition EPA has recently provided guidance on incorporating BMPs into silvicultural activities (Note: EPA's definition of silvicultural activities includes actions associated with silvicultural treatments including but not limited to road building, burning, etc.) EPA has identified a ten management measures which establish the goals to be achieved, guidelines for operations, or steps to be taken to be achieved for protecting water quality during silvicultural activities. Numerous management practices, both managerial and structural, are recommended by measure by EPA. EPA also advocates approaching control of nonpoint source pollution by using systems of BMPs since single practices cannot address the full range and extent of control needed at the variety of sites where silvicultural activities occur (US EPA, 2001).

This guidance was used to develop the BMPs and other watershed and soils mitigations described in chapter 2, especially in areas where legacy or other site-specific conditions are a concern. An example of a BMP system would be controlling erosion in some units by the retention of slash, waterbarring of skid trails and incorporation of ephemeral draw buffers. Potential systems of BMPs may be identified by comparing objectives for BMPs that are described in Chapter 2.

Cumulative Watershed Effects: Cumulative watershed effects are discussed, by alternative, under each of the three major sub-titles of the Watershed Environmental Consequences Section. The area considered for cumulative watershed effects is the entire Silvies drainage including the lower river segment (River Mile 0 to 20) which is the next downstream river segment included on the State of Oregon Section 303(d) List of Water Quality Limited Waterbodies. The time period considered for cumulative effects begins with the initial operations and continues until watershed effects from the proposed actions are considered to be recovered, generally up to 50 years. Synergistic effects potentially developing from interactions between proposed activities and legacy or other local conditions are considered.

Allotment Interactions

The Malheur National Forest has adopted guidelines for grazing after prescribed or wild fire. They recommend rest for at least two years following a wild fire, recognizing increased watershed sensitivity to cumulative effects from grazing and other management activities. It is assumed that the burn area would be rested from grazing for two or more years, consistent with these guidelines. Grazing, when re-initiated, would be in compliance with applicable standards. Decisions about re-initiating grazing are not part of this EIS and would be made under the authority of the Grazing Permit.

Analysis File: Additional analysis and supporting data are found in the Watershed Specialist's Report and in the Analysis File; these are incorporated into this analysis by reference.

Background Information

Overview of Project Area

The project area lies at the northern end of the Great Basin in the Basin and Range physiographic province), just south of Aldrich Range of the Blue Mountains. Elevation ranges in elevation from approximately 4800 feet along Swamp Creek near the Forest Boundary on the north side of the fire to above 6000 feet on the narrow plateau which is the divide between Jack and Hog subwatersheds. Figure 3, Map Section displays the hydrologic setting of the project area.

The Flagtail Fire area is drained by the Silvies River and its tributaries, which drain into Malheur Lake. A 4.5 mile interfluvial segment of the Silvies River flows within the Flagtail Fire boundary in the Snow Creek subwatershed. Ephemeral tributaries to the Silvies River in Hog Creek subwatershed burned although the river is outside the fire boundary in this subwatershed.

The project area is within the Flagtail Burn Area in the Upper Silvies Watershed (5th field Hydrologic Unit Code (HUC)) in the Silvies Subbasin (4^{th} field HUC) of the "Oregon Closed Basins" Basin (3rd field HUC). Portions of four subwatersheds (6th field Hydrologic Unit Code) lie within the project boundary; less than one acre is mapped in GIS within a fifth subwatershed (Wickiup) where no activities are proposed. Flagtail Fire also burned on private land in three of these subwatersheds (Snow, Keller, and Jack) and in West Bear Valley subwatershed where there is no national forest land.

The climate in the Flagtail area is considered sub-humid continental. Most of the precipitation occurs as snow. Intense, short-duration thunderstorms occur during summer. Isolated summer thunderstorms produce localized, erosive peak flows in small watersheds (generally, less than 10 square miles). Thunderstorms are usually not large enough to produce erosive peak flows in watersheds larger than about 10 square miles. Temperatures vary widely, both seasonally and by elevation. Annual temperatures normally range from –30 degrees F during the winter to above 90 degrees F in summer; colder temperatures have been recorded in Bear Valley. Freezing temperatures can occur at any time of the year, especially at the higher elevations. The majority of annual runoff occurs as snowmelt in April through June; low flows occur in August and September.

Snow Creek (Figures 3 and 16, Map Section) is included on the Oregon Department of Environmental Quality's 2002 Clean Water Act Section 303(d) List of Water Quality Limited Waterbodies (303(d) List) for summer rearing temperature for salmonids (trout). The lower 20 miles of the Silvies River (Figure 3, Map Section), which are about 68 river miles below the project area, are also included on the 2002 list for summer rearing temperature for salmonids, dissolved oxygen, and temperature March 1 – June 30 (spawning). Scotty Creek, south of the project area is the only other stream in the Upper Silvies Watershed included on the 303(d) List (Figure 3, Map Section).

No emergency situations or recommendations for emergency treatment for watershed or fisheries resources were identified in the Burned Area Emergency Rehabilitation (BAER) report. Team members recognized a non-emergency concern with soil erosion in some ephemeral draws and stream channels due to pre-existing conditions and changes in vegetation and ground cover caused by the fire. These areas are discussed below.

Existing Condition and Effects

This section is organized by three major topics: 1) Stream Channels, Riparian Habitat Conservation Areas, Management Area 3A, and Uplands; 2) Water Quantity; and 3) Water Quality.

Stream Channels, Riparian Habitat Conservation Areas (RHCA's), and Management Area 3A (Non-anadromous Riparian Area), and Uplands

Existing Condition

Figure 16, in the Map Section, shows stream and mapped ephemeral draws. Table WS-1 displays the subwatersheds and stream distances within the project area. Project area by subwatershed is displayed in Table WS-9. Most ephemeral draws, intermittent streams, aspen stands, wetlands, and perennial streams are confined in narrower valleys at mid and higher elevations. Relatively long ephemeral draws transition into short segments of intermittent or perennial streams or into less confined wetlands above tributary confluences. Low elevation, perennial and fish-bearing streams are usually found in wide, flat valleys although portions of Snow Creek lie in narrow valleys. Wetlands vary in size from less than 1 ac. (INFISH Category 4 wetlands) to greater than one acre (INFISH Category 3 wetlands).

Table WS-1: Lengths of Streams by Category/Class* and Subwatershed Within the Project Area

Subwatershed	Fish Bearing (Miles)	Perennial (Miles)	Intermittent (Miles)	Ephemeral Draws (Miles)
Hog Creek	0	0	0	2.7
Snow Creek	5.7	2.5	5.3	16.5
Keller Creek	0	.2	0	1.7
Jack Creek	.9	1.5	4.2	15.1
Total	6.6	4.2	9.5	36.0

* Categories and class defined in Chapter 1. Estimates differ from BAER report due to updating of GIS in March 2003 following field work in fall 2002.

The primary erosion process is widening, deepening, and upslope extension of channels and draws (Upper Silvies WA) which increases the efficiency of runoff and produces sediment. The fire reduced ground cover, increasing the potential for surface runoff to reach draws or channels. The project soil scientist estimated that ground cover would approach near pre-fire levels in 2007. Channel stability is not expected to change as a result of direct or indirect effects of the fire according to the BAER evaluation. The BAER evaluation used a design storm typical of a two year event which has a probability of occurring at a given time of 50%.

Visual estimates were made of soil burn severity along streams using BAER maps. Table WS-2 through WS-5 display distance (estimated) of stream burned by soil burn severity, stream category or class, and subwatershed. The soil severity evaluation is based on conditions along the stream bank and within 10-15 feet of the bank. These are not always typical of the adjacent RHCAs. Within RHCAs soil burn severity varied by vegetation type with most forested areas burning and most meadows not burning as described below. Figures 2 and 6, Map Section, display soil burn severity and vegetation mortality.

Table WS-2: Summary of Burn Soil Severity along Mapped Ephemeral Draws by Subwatershed (distances rounded to nearest .05 mi.)*.

Subwatershed	Within Project Boundary (Miles)	High Soil Severity Burn (Miles)	Moderate Soil Severity Burn (Miles)	Low Soil Severity Burn (Miles)	Unburned (Miles)
Hog Creek	2.70	0.05	0.20	1.50	0.95
Snow Creek	16.50	7.45	4.00	3.85	1.20
Keller Creek	1.70	0.20	0	1.50	0
Jack Creek	15.10	4.90	3.30	4.50	2.40
Total	36.00	12.60	7.50	11.35	4.55

Figures are based on ocular estimates from maps.

Table WS-3: Summary of Burn Severity along Intermittent Streams by Subwatershed (distances rounded to nearest .05 mi.).*

Subwatershed	Within Project Boundary (Miles)	High Soil Severity (Miles)	Moderate Soil Severity (Miles)	Low Soil Severity (Miles)	No Burn (Miles)
Hog Creek	.0	0	0	0	0
Snow Creek	5.30	.0.35	0.35	4.05	0.55
Keller Creek	0	0	0	0	0
Jack Creek	4.20	0.35	0.40	1.45	2.00
Total	9.5	.70	.75	5.50	2.55

**Figures are based on ocular estimates from maps.*

Table WS-4: Summary of Burn Severity along Perennial Non-fish-bearing Steams by Subwatershed (distances rounded to nearest .05 mi.).*

Subwatershed	Within Project Boundary (Miles)	High Soil Severity (Miles)	Moderate Soil Severity (Miles)	Low Soil Severity (Miles)	No Burn (Miles)
Hog Creek	0	0	0	0	0
Snow Creek	2.50	0.10	.65	.95	0.80
Keller Creek	.20	0	0	.20	0
Jack Creek	1.50	0	0	0.70	0.80
Total	4.20	0.10	0.65	1.85	1.60

**Figures are based on ocular estimates.*

Table WS-5: Summary of Burn Severity along Fish-bearing Streams by Subwatershed (distances rounded to nearest .05 mi.).*

Subwatershed	Within Project Boundary (Miles)	High Soil Severity (Miles)	Moderate Soil Severity (Miles)	Low Soil Severity (Miles)	No Burn (Miles)
Hog Creek	0	N/A	N/A	N/A	N/A
Snow Creek	5.7	0.7/4.8	0.3/0.3	0/0	4.7/0.6
Keller Creek	0	N/A	N/A	N/A	N/A
Jack Creek	0.9	0.1/0.1	0.7/0.7	0/0	0.1/0.1
Total	6.6				

** Figures are based on ocular estimates.*

RHCAs in the wide valley bottoms and in small or narrow ("stringer") meadows associated with intermittent, perennial, and fish bearing streams are vegetated with grasses and grass-like plants such as sedges and with sparse shrubs (see Botany section). These meadows generally did not burn or only burned with spot fires.. They continue to buffer runoff and filter sediment, similarly to before the fire. WEPP modeling conducted between the DEIS and FEIS indicated that the narrower meadows typical of Snow Creek drainage would trap only about 20% of the surface runoff produced in a five year or greater event. The probability of such an event occurring at any time is 20%. The wider meadows found in Jack and Keller subwatersheds and along the Silvies River in Snow and Hog subwatersheds would be expected to trap proportionately more sediment.

Conifers typical of the adjacent uplands are found in the outer, drier ("upland") portions of most RHCAs associated with perennial and fish bearing streams and wetlands and along the non-meadow portions of intermittent streams. Exceptions to this pattern of vegetation are found along Snow Creek where much of the valley is narrower and forested and fewer meadows occur. Over 60% of the trees were killed on about 80% of the forested areas within RHCAs. Vegetation along ephemeral draws is typical of the adjacent uplands. Soil burn severities and vegetation mortality of conifers in RHCAs and draws are usually similar to the adjacent uplands.

Snow Creek drainage burned in a different pattern because much of the streamside was forested. Hardwoods present on the streambanks within forested areas burned similarly to the adjacent forest. About one-half mile (forested) along Snow Creek (fish-bearing and perennial segments) and a perennial tributary burned with moderate or high soil severity, killing conifers and riparian hardwoods and reducing ground cover and filtering capacity. Felling of hazard trees along road 2400133 restored some filtering capacity although more recovery is expected as ground vegetation and litter recover over the next five years and as more snags come into contact with the ground.

Conifers and riparian hardwoods planted in spring 2003 are expected to accelerate recovery of shade in 7-10 years for the hardwoods and 40 years for the conifers. Roots from these plantings will contribute to accelerated recovery of bank instability in about three years.

MA3A is vegetated with either aspen or, in ephemeral draws, conifer stands or other plants that are similar to those on the adjacent uplands. There are minor inclusions of aspen at scattered locations in the draws. The soil burn severity in these areas is similar to that on the adjacent hillslopes. One aspen area, located near the end of road 2400056, would be included in the area considered for treatment under the Proposed Action. A detailed description of the existing condition of this stand is found in the Botany section. Legacy conditions are present as described below.

Conditions of the drainage system, including uplands, in the project area are variable. Anthropogenic disturbance is present as described below in the Legacy Conditions section. Large seep systems are found in the headwaters of Jack and Snow creeks and their tributaries and in portions of the valley bottoms of the Silvies River and Jack, Snow, Cold and several unnamed creeks. Flows often infiltrate and decrease going downstream. In other portions of the same valley bottoms, seep systems and wet meadows have dried out when channels down cut; consequently soil water from these areas is assumed to drain rapidly into the downcut channels and run off faster and earlier as described in Legacy Conditions Section below.

A segment of the Silvies River below Snow Creek and ephemeral draws in lower Jack Creek subwatershed meet or nearly meet minimum Forest Plan standards for large wood following the initial implementation of the Flagtail Placement of Coarse Woody Material CE between the DEIS and the FEIS. Forest Plan standards for large wood which are not met currently, would be met along fish bearing streams and along approximately 60% of other streams and draws as the CE continues to be implemented in the next three years. Placement of coarse wood reduces sediment mobilization, disperses concentrated flows, and improves other impaired watershed functions resulting from legacy conditions. Forest Plan standards may be exceeded as fire-killed trees fall in increasing numbers over the next 15-30 years. Commercial sized hazard trees along some open roads were removed from ephemeral draws and from the outer portions of some RHCAs in fall 2002 under a Categorical Exclusion. Non-commercial sized hazard trees were felled and left. Hazard trees within the inner portions of RHCAs were felled and left in place.

The condition of the Silvies River on private land adjacent to County Road 63 in Snow Subwatershed appears to be similar to that on Forest Service land. Its gradient continues to flatten gradually as it transitions from the narrower intermoutain valleys on the Forest Service lands to Bear Valley. Bear Valley is a typical Great Basin valley which is over ten miles wide. Similarly maps indicate that the tributaries to the Silvies River on private land are also flat gradient streams typical of the Great Basin. The condition of tributaries of the Silvies River visible from public land or travelways is variable with entrenchment estimated to vary from less than a foot to several feet, variable amounts of bank cutting, widening that is estimated to vary from less than 20% to over 100%, and loss of riparian hardwoods and beaver. Sedges and other riparian herbaceous species appear to be present along many of the drainages. The greater amounts of disturbance are found lower in the subwatersheds, several miles from the Forest Boundary. Ponds have been constructed on streams in Keller and Jack subwatersheds, based on map and field observations.

About 1080 ac. of private land is within the burn boundary. Like nearby Forest Service land, it is a mosaic of forested and non-forested areas. According to the BAER map (Figure 2, Map Section), about one-half appears to have burned with high or moderate soil severity and about half with low soil severity or no burn. Observations from public lands and travelways and anecdotal knowledge of historical forest management indicates that forest stands are commonly ponderosa pine which has been precommercially or commercially thinned.

For the purposes of this document, the portions of Jack Creek which drain the Bald Hills and lie generally north of the 2400 road will be called lower Jack Creek. The area to the south of the 2400 road will be called upper Jack Creek.

Fire Suppression and Suppression Rehabilitation: About 23 miles of fireline (dozer) were built during Flagtail Fire. Fireline was placed in areas of concern including a crossing of a perennial tributary to upper Jack Creek, an ephemeral draw and seep tributary to the Silvies River in Hog Subwatershed, and on steep slopes and near a seep above Tributary 7 to the Silvies River (confluence at T.16S., R.29E., S.13, NW, SW). These areas, along with the rest of the fireline were rehabilitated in fall 2002. Fire suppression rehabilitation, (waterbarring and slash placement) was considered effective by December 2002. These three areas were selected for monitoring in July 2003. Rehabilitation was effective along the perennial tributary to Jack Creek and on the steep slopes and near the seep above Tributary 7 to the Silvies River. Evidence of slight concentrations of overland flow and associated sediment movement was noted along the ephemeral draw tributary to the Silvies River in Hog Subwatershed. Generally sediment was accumulating behind downed material (<3 in . d.b.h.) which was not frequently distributed. Erosion paths varied in length from two to ten feet. Erosion seeding has been recommended for this area and is scheduled for implementation in spring 2004. Numerous off-road tracks were made by vehicles used during suppression, generally on the uplands; these areas are not connected to the drainage network. Fire retardant was used throughout the fire area with no observable consequences. No retardant use was observed in RHCAs or in ephemeral draws.

Legacy, Road, and Pre-fire Conditions: Anthropogenic causes of erosion and other disturbance are evident, primarily along stream channels and valley bottoms and in ephemeral draws with less than 45% gradient, but also in non-forested areas, and on previously harvested hillslopes where tractor yarding occurred. These conditions occur within both the areas without roads identified during public comments. These conditions affect water quantity and water quality as described in the following sections and may interact with effects of the fire. Table WS-6 displays miles of mapped ephemeral draws by degree of pre-fire impacts by subwatershed.

Table WS-6: Degree of Impact* in Ephemeral Draws in Project Area by Subwatershed (lengths in miles)**

Subwatershed	Total Ephemeral Draws in Fire Boundary (Miles)	Highly Impacted Draws (Miles)	Moderately Impacted Draws (Miles)	Low Impacted Draws (Miles)	Natural-Appearing Draws (Miles)
Hog Creek	2.70	1.90	.20	.60	0
Snow Creek	16.50	2.25	5.80	7.90	.55
Keller Creek	1.70	.15	0	1.55	0
Jack Creek	15.10	2.35	2.85	9.40	.50
Total	36.00	6.65	8.85	19.45	1.05

*__Highly__ impacted draws are gullied, have eroding ruts, or are actively rilling. **Moderately** impacted draws have relatively wider areas of detrimental or non-detrimental disturbance (for instance skid trails are greater than 11 ft. wide) and evidence of little ground cover or tree recovery pre-fire. **Low** impacted draws have narrower areas of impact (for instance less than 10 ft wide), and evidence of some ground cover and tree recovery before the fire, or evidence of sediment moving through culverts and depositing locally. **Natural-Appearing** draws appeared to have ground cover and tree vegetation similar to the adjacent hillslope plant community and no visual signs of ground disturbance; these were commonly found on steeper ground.
**Figures are based on ocular estimates from maps.

The Upper Silvies WA (2001) states that some riparian zones and valley bottoms have been drained as a result of stream channel downcutting. Examples are found along segments and some tributaries of the Silvies River, Snow Creek, Jack Creek, and Cold Creek. As a result, these areas store less water, dry out earlier, and are less resilient to disturbance, because of the loss of deep rooted plant species, than before the downcutting. Soil water from these areas is assumed to rapidly drain into the downcut channels and to run off faster and earlier. Stream channel conditions are described in more detail in the Fisheries Section. Similar conditions exist in ephemeral draw tributaries to lower Jack Creek (north of the 2400 road). More rapid runoff and dewatering of shallow fills in ephemeral draws appears to be occurring.

Overall these processes contribute to an extended drainage network that is considered more efficient at transporting water to the outlets of subwatersheds. Peak and near peak flows tend to occur earlier, to be slightly higher, and to last longer than in less disturbed and less efficient networks. Consequently, less water is retained and stored in the soil for gradual release. Meadows dry out sooner than under undisturbed conditions. The Upper Silvies WA (2001) also suggests that past flow increases may have been large enough to cause channel erosion, especially in previously disturbed channels, partially because of the fine fill materials found in the valley bottoms.

Deeper riparian water tables, the result of channel entrenchment, supply less water to streams in late summer. It is suspected that fewer beaver ponds are present to feed minimum flows, although at least one colony of beaver has been observed along the Silvies River.

Movement of soil water and sediment has also been modified by the construction of roads and by unclassified extensions of roads, especially within 100 feet of channels and draws, as shown in Table WS-7 for the entire subwatersheds. Table WS-7 does not include unclassified extensions of roads which have similar effects. These extensions are estimated to total less than two miles and are located primarily in the Bald Hills area of Jack subwatershed, which is included in one of the areas without roads that was identified by public comment. Among others, roads 2400092, 2400196 and 2400133 capture water from tributaries or deliver sediment and concentrated flows to Jack or Snow creeks. Road 2400133 also has a culvert fill which is failing and delivering sediment to Snow Creek.

On most roads, the roadway surface is either rutted or has rill erosion, or both, which is caused by water running down the roadway or rutting made by the passage of a vehicle. This lengthens flow paths, potentially increasing sediment detachment and water concentration and delivering potentially increased amounts of sediment and water into adjacent streams. Project engineers identified roads where previously constructed drainage structures, such as drainage dips, grade sags, cross-ditches and waterbars, that are not routing water and sediment off roads efficiently or in a timely manner (see Transportation secction) or where these structures are lacking. Reshaping these structures would route water and sediment off roads before reaching streams.

Table WS-8 displays stream crossings in the Flagtail Burn Area by subwatershed.

Table WS-7: Roads within 100 feet of Stream Channels and Draws in Flagtail Project Area by Subwatershed and Total Roads and Road Densities for Subwatersheds in the Flagtail Burn Area by Subwatershed.

Subwatershed	Flagtail Project Area - Roads Within 100 ft. of Channel (mi.)	Total Roads Within 100 ft. of Channel (mi.)	Total Roads in Flagtail Project Area -	Total Roads* (mi.)	Subwatershed Road Densities* (mi./sq. mi.)
Hog Creek	.1	8.3	1.2	55.0	5.8
Snow Creek	5.9	7.4	25.0	35.1	3.5
Keller Creek	.1	6.7	2.4	44.4	3.8
Jack Creek	2.9	7.4	23.0	49.3	3.1
Total	9.0	27.5	51.6	183.8	

*includes public and private ownership

Table WS-8: Stream and Draw Crossings within Flagtail Project Area by Stream Type and Subwatershed (Number)

Subwatershed	Total	Fish bearing	Perennial, Non-Fish Bearing	Intermittent	Ephemeral Draws
Hog Creek	6	0	0	0	6
Snow Creek	45	7	6	9	23
Keller Creek	5	0	1	0	4
Jack Creek	32	1	3	15	13
Total	88	8	10	24	46

Shade, along the Silvies River and portions of Snow, Jack and other perennial and fish bearing streams, was reduced pre-fire due to the loss of hardwood shrubs. Riparian vegetation conditions are described in more detail in the Botany Section.

The 2003 RHCA plantings would accelerate the recovery of shade in 7-10 years for the hardwoods and in about 40 years for the conifers. They would maintain or improve stream bank conditions beginning in about 3 years due to root growth. Coarse woody material placement, erosion control, and riparian fuels treatments, would contribute to a gradual improvement in legacy and on-going conditions beginning at the time of implementation.

Between the DEIS and FEIS the project soil scientist modeled potential hillslope erosion in 2004 using the Disturbed WEPP model (see Soils Section). The use and results of WEPP modeling are summarized below and discussed in more detail in the Water Quality – Sediment section. WEPP does not address sediment transport within draws or stream channels.

WEPP modeling conducted between the DEIS and FEIS indicates that only about 20% of sediment eroding from hillslopes during five year or greater events would be trapped within 50 ft. of ephemeral draws or in the narrower valleys typical of these areas or the Snow Creek drainage. Although the fire has exacerbated pre-fire conditions in some ephemeral draws, primarily by removing ground cover and increasing erosion potential, as described below, many of these areas lie upslope of wide valley bottoms. Erosion during less than five year precipitation events would likely occur in the upper portions of the tributaries and sediment transported down these draws would likely be deposited lower down, within the draws or intermittent channels, or on wide valley bottoms before reaching perennial or fish bearing streams (for example, near the 2400011 or 2400017 roads). Exceptions are Snow Creek and tributaries 6 and 8 to the Silvies River (confluences at T.16S., R.29E., S.13, NW, NE and T.16S., R.29E., S.26, NE, NE, respectively). These streams are either downcut through meadows above the confluence with the Silvies River or flow directly, without going through meadows, into the Silvies River.. A greater proportion of sediment is likely to be caught where valley bottoms are wider along Jack Creek, Swamp Creek, and the Silvies River or where drainages transition into Bear Valley. Vulnerability to accelerated erosion is greatest in the previously gullied and skidded draws that drain the Bald Hills in either Snow or lower Jack subwatersheds (see Figure 16, Map Section), some of which lie within one of the areas without roads identified by public comment. Most gullies were stable prior to the fire, due to deep accumulations of needle litter. The increased vulnerability resulted from moderate or high soil severity burn (see Figure 2, Map Section), which removed ground cover, exposed mineral soil, and increased local runoff. In addition, due to deep litter accumulation in these draws, sustained heat may have killed roots of forbs and grasses, delaying ground cover recovery.

Conditions which contribute to increased risk of surface erosion are also found in other draws in Snow, Jack and Hog subwatersheds and, to a much lesser extent, in Keller subwatershed. Some of these areas lie with the two areas without roads identified by public comment. Most draws which have been skidded down appear to have lacked ground cover and tree regeneration before the fire. Active erosion, related to past, pre-fire management activities implemented before the application of Best Management Practices (BMPs), was observed in several places in fall 2002. Tributary 8 to the Silvies River (confluence at T.16S., R.29E., S.26, NE, NE) is particularly at risk due to the current, potentially active headcut at the lower end of a former landing at the end of road 2400058. The landing was apparently formed by filling a gully at the head of an eroded, intermittent channel. Headcutting or other erosion was also observed in lower Jack Creek tributaries (Dipping Vat Creek and its tributaries and Tributary 2 of Tributary 1 (confluence at T.16S., R.29E., S.24, SE, NE)) below the gullied ephemeral draws previously described. An actively eroding, non-forested area (3-5 acres) of the Bald Hills also funnels water to ephemeral draws at the head of Tributary 2 of Tributary 1 of lower Jack Creek and is transitioning to erosion pavement. Rilling was observed on skidded areas the ephemeral draw portion of Tributary 11 (confluence at T.16S., R.29E., S.23, NE, NE) to the Silvies River. Recruitment of woody material to trap sediment may not be timely or adequate in areas of active erosion.

Steep ephemeral draws below road crossings, with or without culverts, burned, exposing mineral soil and reducing ground cover. These draws are located primarily in Snow Creek subwatershed where they are direct tributaries to the Silvies River (for instance, draw tributaries toTributary 6 of the Silvies River (confluence at T.16S., R.29E., S.13, NW, NE)). Other culverts, found in less steep draws that had been previously skidded down (generally with impacts classed as low, such as those along the 2195 road in Snow Subwatershed) in areas which also burned either with moderate or high intensity, showed evidence of sediment movement through the culverts in fall 2002. Deposition and/or scour is occurring downslope (generally less than 1 cu. ft. of material was disturbed). Soil disturbance in previously harvested areas and effects of the Flagtail Fire on soil, such as hydrophobicity and ground cover, are described in the Soils Section.

During the period when ground cover is recovering, the interactions between conditions created by the fire and legacy conditions which resulted in increased vulnerability to erosion are expected to be reduced with the implementation of on-going and foreseeable activities. Placement of coarse wood in these areas under the CE reduces vulnerability to legacy conditions; it is not intended to mitigate fire effects on ground cover. Both monitoring in Summit Fire (McNeil, 2001) and monitoring of sedimentation related to culverts (McNeil, 1999) demonstrated the potential for interactions between current disturbance and legacy conditions.

Erosion patterns resulting from legacy conditions would continue to develop in response to precipitation events, to natural recovery of ground cover and other vegetation, and to implementation of on-going and foreseeable activities. Vulnerability is greatest in the previously gullied draws that drain the Bald Hills in either Snow or Jack subwatershed or which have rilled near other ridge tops. Vulnerability to erosion was greatest in 2003 and is declining as ground cover continues to recover and watershed improvement projects become effective. Ongoing activities include plantings in RHCAs, previously described, and the placement of coarse woody material in some stream channels and ephemeral draws, both of which occurred in 2003. Foreseeable acitivities that would ameliorate additional legacy conditions include Bald Hills erosion control and aspen protection and restoration. These activities supplement natural recruitment of hardwoods, conifers and coarse wood, improving riparian vegetation recovery, infiltration, and sediment trapping.

Full recovery of ground cover is expected to occur by about 2007 at which time vulnerability to accelerated erosion would be similar to pre-fire levels. However, due to the implementation of improvement projects such as the placement of coarse woody material, vulnerability would be reduced below pre-fire levels. As Bald Hills Erosion Control CE is implemented, vulnerability in that area would be further reduced.

Sediment trapping and water holding capacity within draws and intermittent channels is expected to improve gradually: first, over the next five years as ground vegetation and litter recovers from the fire and ongoing and foreseeable actions continue to be implemented; second, over the next 5-15 years as ground cover becomes re-established and legacy effects diminish in response to ongoing and foreseeable actions; and third, as trees fall in increasing numbers over the next 15-30 years.

Beaver are present within the project area (in the Silvies River) but are probably at much reduced numbers based on local anecdotal history which is consistent with the trend for beaver populations across the West. Also, beaver may be transistory within the project area due to reduced numbers of riparian hardwoods.

Environmental Consequences

Direct and Indirect Effects

No Action (Alternative 1)

No activities are proposed under this Alternative. Since no activities are proposed, there are no direct or indirect effects from management activities on stream channels, RHCAs, MA 3A, or uplands under the No Action Alternative. Fire and fire line recovery would continue based on climate and natural processes operating on the existing condition including legacy conditions.

Burned trees are expected to fall on hillslopes and in stream channels and draws in increasing numbers over the next 15 – 30 years. Trees which fall in channels and draws would increase sediment trapping compared to the Existing Condition. Reestablishment of effective ground cover on hillslopes, ephemeral swales, and ephemeral draws which burned with moderate or high soil severity, would take up to five years. Ground cover in other areas would recover sooner (see Soils Section). During the recovery period, exposed mineral soil would increase vulnerability to accelerated erosion. Soil conditions and erosion in upland non-forested areas would not improve. Forest stands would recover as described in the Forest Vegetation Section.

Numerous problems with road (classified or unclassified) drainage and old skid trails on hillslopes would not be treated, including within the two areas without roads that were identified by public comment. at a rate inversely proportional to the rate of maintenance. Examples include roads 2400092, 2400196, 2400, and roads accessing the Bald Hills. Runoff and sediment would continue to be routed to stream channels and ephemeral draws from roads, primarily from classified and unclassified roads within 100 feet of draws and streams as described for the Existing Condition. On-going road maintenance is not expected to remedy chronic and acute sources of sediment in a timely manner, partly due to funding levels.

Since no timber hauling would occur, no road dust would be released during haul and enter streams. Temporary roads would not be built (which increases potential for erosion and decreases infiltration locally for a short window of time during operation) and decommissioned. Old skid trails and landings in the dry aspen stand (MA 3A) in Unit 62 would not be used and would not be improved. Wood would gradually fall on old skid trails, over the next 15-30 years, decreasing overland flow and soil movement. No new skid trails or landings would be created. Ground disturbance associated with harvest activities or, for 1-2 years, with road construction, reconstruction, and decommissioning would not occur.

Stream bank stability is expected to remain about the same, both in burned and unburned areas. In riparian areas that burned with high or moderate soil severity, where hardwood shrubs died, naturally occurring shrubs would become re-established and provide bank stability in about 7-10 years. Existing roots from dead shrubs and trees would continue to provide stability for about 7-9 years, until they decompose.

Channel stability would remain vulnerable due to sediment loading from road impacts and other legacy activities but is not expected to change as a result of the fire, under the most common precipitation events, based on the WEPP and peak flow modeling by the BAER team and by the project soil scientist between the DEIS and FEIS. Five year and greater storm events are likely to result in observable erosion as described in the Water Quality – Sediment Section.

Fuels would accumulate as described in the Fuels Section increasing the soil, watershed, and stream channel hazard from future fires. In addition to loss of ground cover and increased hazard for erosion, stream side vegetation would likely be killed and set back along more streams than occurred in the Flagtail fire, reducing shade and setting back temperature recovery. The likely accumulation of fuels would also preclude using fire as a tool in future management activities to move the uplands and RHCAs toward the Desired Condition.

Since no activities would occur under this Alternative, the overall effect would be to maintain pre-fire degraded watershed and stream channel conditions for up to 15-30 years, until burned trees fall in sufficient numbers to provide sediment trapping in ephemeral draws and streams. This Alternative does not improve road conditions which are impacting streams, as recommended in the Upper Silvies WA (2001).

Cumulative Effects

Since there are no direct or indirect effects under this Alternative, there would be no cumulative effects resulting from management activities. Cumulatively, effects of the Flagtail Burn Area on downstream conditions would remain similar to the Existing Condition, including on-going activities, for about 15-30 years until trees fall. On-going and foreseeable activities would further improve watershed conditions. Downstream conditions may then improve in proportion to the additional recruitment of wood. Other conditions such as those of most hillslopes and roads would remain unchanged. Opportunities for interactions among legacy conditions would be present which local monitoring indicates may result in erosion or concentration of flows.

In review of Appendix J (Cumulative Effects), ongoing and reasonably foreseeable actions that could affect watershed function of the landscape would be fuels treatments, other harvest, and reforestation on private land and, on Forest lands, recreation and trail use, livestock grazing and management, conifer and riparian hardwood planting, addition of coarse woody material to streams and draws, spring development, timber harvest and other silvicultural treatments in the Upper Silvies Watershed, Bald Hills erosion control, aspen protection (fencing), riparian fuel treatment, and fireline seeding.

Based on the Disturbed WEPP modeling conducted between the DEIS and FEIS, it is expected that because silvicultural treatments, on either private or federal land, are required to be implemented with BMPs, no measurable effects on watershed function would be observed under the most probable runoff events (< 5 year frequency). As discussed in more detail in the Water Quality – Sediment section, effects of five year and greater events are not expected to be measurable due to the “noise” (variability) associated with erosion and sediment monitoring.

The effects of re-initiation of grazing would be similar to those before the fire as the same standards and guidelines would apply. Recreation and related uses appear to be isolated with respect to watershed function. Use may result in local degradation but is unlikely to affect overall trends in watershed recovery. Riparian and conifer planting in RHCAs and aspen protection would provide shade and bank stability, improving both post-fire and legacy conditions. More discussion of shade effects is found in the Water Quality – Temperature section. Placement of coarse woody material in draws and channels, aspen protection, and Bald Hills erosion control would all improve watershed function impacted by legacy conditions, primarily channel morphology and function and sediment control.

Other fire and fireline recovery would progress based on climatic conditions, legacy conditions and ongoing and foreseeable activities (described in Chapter 1) and interactions among these. Some legacy conditions in the two areas without roads, identified by public comment, would be ameliorated, moving watershed conditions toward those typical of areas without roads.

The overall effect of this Alternative combined with on-going and foreseeable activities would be slightly improved cumulative watershed condition with the same potential for watershed damage from wild fire as previously described.

Direct and Indirect Effects

Alternatives 2, 3 and 5

A variety of activities would occur on this post-fire landscape. Site-specific BMPs, combined into systems, and other mitigation (see Chapter 2), which have been generally shown to be effective on the Malheur National Forest, would be applied. Potential systems of BMPs may be identified by the BMP objective described in Chapter 2. Site-specific legacy conditions were considered in the selection and design of BMPs and other watershed mitigation and would be considered in the implementation of BMPs and mitigation in order to protect water quality.

Alternatives 2, 3 and 5 differ in the amount of harvest and fuel treatments and also in the amounts of various yarding systems as shown in Table 2-1 in Chapter 2. There are about 500 fewer acres of tractor yarding, about 170 fewer acres of skyline and about 315 fewer acres of helicopter yarding in Alternative 3 when compared to Alternative 2. There are about 200 fewer acres of tractor yarding, about 260 fewer acres of skyline and about 140 fewer acres of helicopter yarding in Alternative 5. Harvest, fuel treatments, and reforestation proposed under Alternatives 2, 3 and 5 would move the landscape toward the Desired Condition, allowing fire to burn within its historical range and reducing the potential for adverse watershed effects.

Site-specific design and implementation of BMPs are expected to retain disturbed soil within the activity unit (see Chapter 2 and Soils Section) under the most common precipitation or runoff events (≤ 2 yr events) as determined by the project soil scientist using WEPP (see Soils Section). Implementation of these BMPS would also disperse concentrations of water caused by activities and meet Forest Plan standards for detrimental soil conditions. Controlling these effects would reduce the potential for extending the drainage network, the primary erosion mechanism in the Flagtail Burn Area. Consequently, although more activities are proposed under Alternatives 2 and 5 than under Alternative 3, the effects of the alternatives on the drainage network in the project area are expected to be the same, under the most common precipitation events, as summarized below.

Excluding equipment from ephemeral draw buffers except at designated crossings would eliminate uncontrolled disturbance which may transport erosion products into the stream network. Because it is recognized that BMPs may not be 100% effective, depending on weather and microsite conditions, standard INFISH RHCAs and variable width, no cut buffers on selected ephemeral draws (see Figure 16, Map Section) or other multiple mitigation measures, as described below, would also be applied to control erosion and concentrated overland flow. Ephemeral draw buffers are based on ephemeral draw impact ratings (see Table WS-7):

- 10 ft. each side, generally, where the ephemeral draw impact rating is low or not apparent if either skyline or helicopter yarding is proposed,
- 25 ft. each side, generally, where impacts are rated low or where impacts are rated moderate if skyline or helicopter yarding is proposed,
- 50 ft. each side where impacts are rated moderate if tractor yarding is proposed or where impacts are rated high.

These buffers would allow for future recruitment of coarse and large woody material (12 inch diameter at the small end) at the minimum Forest Plan Standard (20 pieces of wood per mile) which would maintain or improve water holding capacity in draws. The 25 ft. and 50 ft. buffers also provide filter strips which are expected to be adequate to trap most sediment moving due to either legacy disturbances or in case sediment generated by proposed activities move off-site (McNeil, 2001a, McNeil 2000b) or for precipitation events that occur more frequently than five years except as described below. Buffer strips would also prevent further degradation of sediment trapping and water holding capacities of previously impacted draws, given post-fire conditions.

Harvest activities near RHCAs or ephemeral draws, that burned with either moderate or high severity and where filtering capacity may be reduced as a result of the burn and slower recovery of ground cover, would be mitigated with additional measures. These areas include RHCAs along Snow Creek and along unnamed intermittent streams and ephemeral draws in areas of Jack and Snow subwatershed that burned with moderate or high soil severity. Yarding by skyline or helicopter, installing sediment fencing, increasing waterbar frequency, seeding of less steep slopes, and restricting operations to dry or frozen conditions are mitigation measures that are expected to prevent disturbed soil from entering or crossing RHCAs with reduced filtering capacity.

By limiting skidding across ephemeral draws to designated crossings, the water holding and sediment trapping capacity of the draws would be maintained. Placement of slash in skid trails and landings in the dry aspen (MA3) portion of Unit 62 would provide erosion control, sediment trapping, and microsite protection for aspen sprouts. Drainage, such as water bars, would be installed on about old skid trails that are reused (about 10-60% of old skid trails would be reused, depending on unit).

Mitigation also includes no timber harvest in RHCAs. Wetlands would be protected within RHCAs and would be avoided. Additional wetlands discovered during layout or other activities would have RHCAs applied for protection and would then be avoided.

Under these alternatives, the remaining hazard trees along open roads and closed roads used for haul would be felled and removed except that hazard trees within RHCAs would be felled and left with effects as described in Cumulative Effects for Alternative 1. Because only minimal soil disturbance would be associated with removing hazard trees outside RHCAs, as described in Soils Section, there would be no effect on the drainage network. Similarly treatment of non-commercial material in riparian areas within the visual corridor of County Road 63 would be treated by hand which is not expected to result in soil disturbance. Removing this material where it may impede the function of road ditches would protect against possible ditch or road failure due to the plugging of a ditch.

The application of site-specific BMPs to the replacement or removal of culverts during reconstruction and decommissioning of stream crossings would limit additional sedimentation to streams to up to about one cubic yard of sediment per culvert treated, during implementation and for up to two years following implementation. Maintenance is not expected to add to stream sediment due to the application of BMPs.

Maintenance (including dust abatement), reconstruction and decommissioning of roads, as shown in Table 2-1, Chapter 2 or in the Management Requirements/Mitigation Measures table in Chpater 2, would reduce road-related disturbance to RHCAs, stream channels, and ephemeral draws after year 2, which would reduce potential for channel widening, downcutting or extension upslope. Decommissioning of temporary roads would reduce associated disturbance by controlling opportunities for sediment production or concnetration of surface flows. Details of the effects of these proposed activities are discussed in the Water Quality Section (see Tables WS-11 through 13, and WS-15 through 17). Each of these alternatives reduces road-related disturbance to stream channels and would likely improve channel conditions at rates possibly measurable over 10-20 years, particularly in Snow Creek (see Fisheries Section). One new segment of road (.3 mi.) would be constructed in the uplands of Snow Creek to allow streamside roads 2400133 and 2400203 and one crossing of Snow Creek to be decommissioned while providing access into the upper part of Snow Creek Subwatershed. The application of BMPs and road design criteria would limit soil disturbance during and following road construction and decommissioning and would prevent the extension of the drainage network. Additional effects of proposed road treatments are discussed in the Water Quantity and Water Quality sections. Treating these roads addresses recommendations in the Upper Silvies WA (2001).

The application of site-specific BMPs, INFISH RHCAs, and ephemeral draw buffers is expected to keep soil within an activity area, or in the cases of road decommissioning, construction, reconstruction or maintenance, reduce road-related disturbance reaching streams under the most common precipitation events (< 5 year frequency).

Consistent with guidance for the design and implementation of BMPs, BMPs selected to prevent erosion and concentrated runoff from leaving activity units were re-evaluated when WEPP modeling by the project soil scientist indicated that 5 year and greater precipitation events, which occur in about 20% of the years, would result in about .07 cu. Yd./ac, of eroding soil reaching activity unit boundaries. Only about 20% of this soil would be trapped in ephemeral draws or RHCAs where valley bottoms are relatively narrow. This amount represents an increase of about 25-30% over the Existing Condition. Three and four year events which are slightly more common would result in trace (≤.01 cu. Yd./ac.) amounts of erosion moving beyond unit boundaries steeper slopes.

Re-evaluation of BMPs resulted in the proposal of additional BMPs to control the additional erosion. Two additional BMPs which prescribe leaving slash scattered in the units and scattering slash on skid trails to reduce the amount of erosion reaching unit boundaries were incorporated. Scattering slash on skid trails would be prescribed only in units (see Mitigation, Chapter 2) where the transport of additonal sediment may adversely impact stream function. The combination of the two additional BMPs reduced the amount of erosion likely to reach unit boundaries during a five year or greater event by about 28-44% to .04-.05 cu. Yd./ac.or by 14- 28% to 0.05 -0.06 cu. Yd./ac. where only the BMP for leaving slash in units was implemented. No additional, economically feasible BMPs were identified to control erosion resulting from tractor yarding. (U. S. EPA, February 2001). The effect of eroded soil reaching unit boundaries on stream sedimentation is discussed in the Water Quality – Sedimentation section.

The results of the modeling indicated that under the most common precipitation events (1 and 2 year storms), BMPs included in the DEIS would function so that soil disturbed by ground-based yarding would remain within units and would not be transported to unit boundaries. With 3 and 4 year events, under the BMPs included in the DEIS, trace amounts of soil would be moved to lower unit boundaries, where they would be vulnerable to entering RHCAs or ephemeral draws. Trace amounts of sediment would be expected to be captured in the filter strips or behind wood placed under the Flagtail Coarse Wood Placement CE or naturally recruited downfall. These results were consistent with monitoring from Summit Fire Restoration EIS and local observations. DISTURBED WEPP indicated that with five year or larger storms, which have a probability of occurring 20% of the time, would move at least 04 cu. yd./ac. of sediment to the lower boundaries of units, in which most of the area burned with moderate to high severity, depending on storm size. This amount of sediment would move on slopes generally greater than 10%; less would move to the lower unit boundaries on flatter slopes and in units with less severe burning.

Consistent with the BMP process, the prescribed BMPs were evaluated and revised to provide better control of sediment. Two additional BMPs were prescribed, leaving slash scattered in vulnerable units and scattering slash on skid trails in vulnerable units. The amount of soil exported to lower unit boundaries on soils that burned with moderate to high severity according to DISTURBED WEPP modeling, which incorporated the additional BMPs, was reduced by about one-third and reduced or eliminated the trace amounts of soil moved under smaller storm events. Soil movement would be reduced to unmeasurable amounts when ground cover recovered in about four to seven years.

Since the most rigorous sediment research has indicated wide variability in sediment production and transportation (plus or minus 100%) and modeling is recognized as being more variable (USDA Forest Service, undated, "Forest Service Policy…"), it is possible that no or only trace amounts of sediment would be produced by five year storms. Consequently, given the application of additional BMPs to control soil movement and sedimentation, the Forest Service may rely on monitoring during events and following infrequent precipitation events and modify BMPs in accordance with results. Vulnerability is greatest in the relatively narrow window of time during operations before all BMPs, such as waterbarring and slash scattering, are in place. Once BMPs are in place vulnerability is reduced to that described above and gradually decreases over about two to five years as ground cover develops post-fire on both skidded and non-skidded areas. Faster recovery is expected on the more erosive soils where seeding is required (see Chapter 2, Management Requirements and Mitigation Measures). When ground cover has fully developed, vulnerability to soil movement approaches that of pre-fire conditions.

Overall these Alternatives would improve watershed and stream channel condition more than Alternative 4 when both road and harvest activities are considered. The effects of harveset activities are expected to remain within the unit under the most common precipitation events (< 4 year) while these alternative contain higher amouns of road maintenance, reconstruction and decommissioning than Alternative 4. Road maintenance and reconstruction would begin during the first year of implementation with decommissioning/obliteration beginning at year 1 or 2 after implementation of the timber sale. Road conditions which adversely affect watershed condition would be improved as recommended in the Upper Silvies WA (2001).

Most areas currently identified as DOGs or ROGs or proposed for replacment DOGs or ROGs contain pre-fire legacy disturbance typical of the Flagtail area, as described in the Existing Condition. This is also true for the areas designated Unroaded Areas 1 and 2 in the Roadless Area section. Consequently, effects of activities in these areas are expected to be similar to those already described. Since watershed characteristics typical of unroaded areas are not present and BMPs are expected to control sediment and concentrated flows within unit boundaries for the most frequent events, it is expected that unroaded values would neither improve nor worsen as a result of the proposed activities.

Cumulative Effects

Cumulative effects of activities described in Appendix J are similar to those described for the No Action Alternative.

By keeping effects within activity areas or by reducing road-related disturbance, the proposed activities would not add cumulatively to legacy conditions such as channel or draw degradation. Legacy conditions would not be aggravated under any action alternative. Design and placement of site-specific BMPs during the implementation of the action alternatives would control effects of proposed activities and would prevent the aggravation of legacy conditions. Areas of active erosion and areas that are vulnerable to erosion would be buffered. For instance, with the application of BMPs such as waterbars and buffers, it is unlikely that water flow would be concentrated from new skid trails onto old skid trails into vulnerable ephemeral draws.

Road treatments in these alternatives cumulatively reduce disturbance to stream channels and draws and would likely improve channel conditions at rates possibly measurable over 10-20 years.

Potential watershed damage from a future, wild fire is at least equal to what occurred with the Flagtail Fire due to the accumulation of fuels as described in the Fuels Section. In adddition to causing more severe effects on soils, more severe wild fire would be likely to set back the recovery of planted vegetation and natural regeneration in RHCAs and on uplands.

Other fire and fireline recovery would progress based on climatic conditions and the effectiveness of the 2003 RHCA plantings and ongoing and foreseeable activities as discussed for the No Action Alternative.

The overall effect of the activities proposed under this Alternative and of on-going and foreseeable activities, as described for the No Action Alternative, would be improved watershed cumulative condition, proportional to the amount of roads decommissioned and amount of improvements in road drainage.

Overall these Alternatives combined with on-going and foreseeable activities would improve cumulative watershed condition more than the other two alternatives.

Direct and Indirect Effects

Alternative 4

Effects of Alternative 4 would be similar to Alternatives 2, 3, and 5 except that drainage problems on old upland skid trails would not be remedied as no skidding is proposed. Drainage on proposed open and closed roads would not be improved as no road maintenance is proposed. Effects of not implementing road maintenance would be the same as those described for Alternative 1. About 1.3 mi. of road would continue to deliver sediment to Snow Creek since no reconstruction (0.3 mi.) is proposed and about 1 mile less of decommissioning, including a stream crossing, is proposed. Correspondingly, about 0.3 mi. of road in the Snow Creek subwatershed would not be constructed; however, since the construction of this road in Alternatives 2 and 3 was not expected to extend the drainage network, Alternative 4 does not differ substantially from Alternatives 2 and 3 in the effects of new road construction on watershed conditions. Decommissioning about 12 miles of road would address recommendations in the Upper Silvies WA (2001) to ameliorate road impacts on streams but to a lesser extent than Alternatives 2 and 3. Due to reduced road treatments, improvements in channel condition, particularly in Snow Creek, would not be measurable as soon as under the Alternatives 2 and 3.

Proposed fuel treatments and reforestation would move the landscape toward the Desired Condition, allowing fire to burn within its historical range and reducing the potential for adverse watershed effects. The use of low psi equipment and application of other site-specific BMPs for fuels treatments would prevent extension of the drainage network.

The application of site-specific BMPs, INFISH RHCAs, and ephemeral draw buffers is expected to keep soil within an activity area, or to reduce the amount of sediment or concentrated flows reaching streams during road decommissioning as described for Alternatives 2, 3 and 5.

Effects of activities in DOGs, ROGs, proposed DOGs and ROGs and similar areas are expected to be similar to those already described because of the existing condition of these areas as described for the harvest alternatives. Since watershed characteristics typical of unroaded areas are not present and BMPs are expected to control sediment and concentrated flows within unit boundaries for the most frequent events, it is expected that unroaded values would neither improve nor worsen as a result of the proposed activities.

Overall this Alternative would improve watershed and stream channel condition beginning at year 1 or 2, but to a lesser extent than Alternatives 2, 3 and 5 since less maintenance, reconstruction and decommissioning are proposed. Road conditions which adversely affect watershed condition would be improved as recommended in the Upper Silvies WA (2001).

Cumulative Effects

Cumulative effects of activities described in Appendix J are similar to those described for the No Action Alternative.

By keeping effects within activity areas or by reducing road-related disturbance, the proposed activities would not add cumulatively to legacy conditions such as channel or draw degradation.

Alternative 4 is similar to Alternatives 2. 3 and 5 in that it cumulatively reduces disturbance to stream channels and draws and would likely improve channel conditions at rates possibly measurable over 10-20 years. It differs in the magnitude of improvement, in that legacy and road conditions would not be improved as much. The potential for upland erosion from old skid trails would remain. The delivery of sediment and concentrated flows from roads to streams would not be reduced as much because of deferring maintenance and because of reduced road reconstruction and decommissioning along Snow Creek.

Other fire and fireline recovery would progress based on climatic conditions and the effectiveness of the 2003 RHCA plantings and ongoing and foreseeable activities as discussed for the No Action Alternative.

Overall this Alternative combined with on-going and foreseeable activities would improve cumulative watershed condition to a lesser extent, proportional to the amount of activities, than Alternatives 2, 3 and 5.

Water Quantity

Existing Condition

The water quantity discussion includes annual water yield, peak flows, and minimum flows. Normal spring runoff occurs from March through June, and peak flows occur from late February to late May. Summer thunderstorms typically occur over areas that are less than 10 square miles in size and are not as common as in other parts of the Forest (Upper Silvies WA).

Annual Water Yield: Few data are available for water quantity parameters in the Flagtail Burn Area or in the Blue Mountains of northeastern Oregon. Those that are available, from the Barometer Watershed Program on the Umatilla National Forest, suggest that trends for annual water yield may differ from those expected elsewhere (Helvey and Fowler, 1995). Information from Helvey and Fowler (1995) forms the basis for much of the following discussion.

Annual water yield in areas with high amounts of hydrologic openings may not follow general, commonly accepted trends because of climate and geology. Hydrologic openings are usually defined as forested areas where most trees are less than 30 years old.

Helvey and Fowler (1995) found that a larger change in vegetation may be required than that found by Troendle and Leaf (1980) before changes in annual yield are detected in mixed conifer stands in northeastern Oregon, at least in drainages smaller than 300 ac. The research indicates that a change of at least 60% in hydrologic openings is required before changes in yield may be observed.

While mixed conifer stands typically grow on wetter sites than are found in most of the Flagtail Burn Area, the mixed conifer stands included in the study grew over a range of soil moistures. Helvey and Fowler (1995) suggest that changes may not be detectable, particularly in the relatively dryer areas sampled, until nearly all the forest vegetation is removed. Changes may also be smaller than expected and more difficult to detect when sample plots are located on highly fractured volcanic geologies. Similar trends are believed to hold for the dryer vegetation, for the moderately fractured sedimentary rocks, and for the sizes of drainage areas found in the Flagtail Burn area. The ability to detect changes in annual water yield in eastern Oregon may also be dependent on weather and may be easier to detect in wetter years (Helvey and Fowler, 1995). These trends are consistent with observations by the project hydrologist.

Table WS-9 displays subwatershed area on the Malheur National Forest and percent of subwatershed in hydrologic openings including timber harvest outside the burn boundary, timber harvest within the burn boundary in low severity and no burn areas, and tree mortality caused by Flagtail Fire, based on data in the MNF GIS. Hydrologic openings created by the fire are defined as areas where greater than 60% of the trees were killed or are expected to die or where stands are less than 30 years old. Stands which were less than 30 years old and burned with high or moderate severity were classified as hydrologic openings created by the fire. Since low severity burns resulted in higher percentages of mortality than expected (see Silviculture section), lower rates of mortality over extensive areas were converted into hydrologic openings by considering both mortality rate and area affected.

Trees classified as "likely to die" were counted as dead for the purposes of determining hydrologic openings; consequently, if these trees die, hydrologic openings would not need to be adjusted. If these trees live, hydrological openings may have been overestimated and consequently potential changes in yield, overestimated. However, since no changes in yield were expected based on Helvey and Fowler (1995), the effect of green trees surviving, that were expected to die, would result in no change in the estimate of yield.

Prior to the fire, more than 30% of Keller subwatershed had trees less than 30 years old. Jack and Hog subwatersheds had over 20% of the forested areas in this age class. It is estimated that relatively few openings had been created on private timber land within the four subwatersheds or within West Bear Valley subwatershed (contains no Forest Service land); an unknown amount of commercial thinning, which does not create hydrologic openings, has occurred.

Table WS-9: Pre- and Post-fire Area in Hydrologic Openings by Subwatershed, Forest Service lands only (rounded to nearest whole percent).

Subwatershed	Total Acres (Sq. mi.)	Hydrological Openings Created by Timber Harvest in Forested Areas Outside Flagtail Burn Area (Acres (% of Sub-watershed))	Flagtail Burn Area with Moderate or High Mortality* (Acres (% of Sub-watershed))	Flagtail Burn Area with Low Mortality** (Acres (% of Sub-watershed))/	Conversion of Areas with Low Mortality to Equivalent Area of Moderate or High Mortality*** (Acres(% of Sub-watershed))	Hydrological Openings Created by Timber Harvest in Unburned or Low Severity Burn Forested Areas Inside Flagtail Burn Area (Acres-Estimated (% of Sub-watershed))	Total area in Hydrologic Openings, Post-fire (Acres/ Percent of Subwatershed in Hydrologic Openings)
Hog Creek	10,183 (15.9)	2209 (22%)	500 (5%)	0	0	0	2709/27%
Snow Creek	6,137 (9.6)	947 (15%)	3000 (49%)	0	0	25 (0%)	3972/65%****
Keller Creek	6,431 (10.0)	2358 (37%)	200 (3%)	0	0	25 (0%)	2583/40%
Jack Creek	7,519 (11.8)	1710 (23%)	2050 (27%)	425 (6%)	213 (3%)	40 (0%)	4463/59%

*The assumption is made that most areas with moderate or high mortality were not regeneration units with only a few snags left.

**Does not include areas shown as unburned in BAER flight of July 31, 2002 which later burned.

***Assumed that with forest tree mortality of 30-60%, midpoint is 45% which is equivalent to 90% mortality on one half the acres; in response to a public comment numbers were modified to show hydrologic openings created pre-fire (25 ac) separate from fire-created openings. The column immediately to the left was also modified for this reason. 238= 425/2 + 25

@Added for FEIS and acres of harvest created hydrologic opening were excluded from low severity burn estimate as opening was created by harvest prior to fire.

****cumulative change of 1% compared to DEIS, due to additonal acres (harvest created hydrologic openings in low severity or no burn areas) and rounding

Post-fire hydrologic openings increase to over 55% for Jack and Snow subwatersheds and by about 5% or less for the other two subwatersheds, as shown in Table WS-9.

The total area in hydrologic openings post-fire on Forest Service lands in Hog Subwatershed is about 27%, including the increase of about 5% of the subwatershed area due to the fire. The total area in hydrologic openings post-fire in Keller Subwatershed is about 40%, including the increase of about 3% due to the fire.The total area in hydrologic openings post-fire in Jack Subwatershed is just under 60%, including the increase of about 27% due to the fire. The total area in hydrologic openings post-fire in Snow Subwatershed is about 65%, including the increase of about 49% attributed to the fire. These values establish the post-fire baseline for hydrologic openings with in the project area.

Although total hydrologic openings in Snow Creek subwatershed within the project area are greater than 60%, Helvey and Fowler (1995) suggest that in dryer areas, which the Flagtail Fire area is, changes in yield may not be detectable until nearly all the trees are removed. Consequently no detectable increase in yield is expected in Snow Creek or from Forest Service lands in any of the other subwatersheds within the project area.

Evaluation of hydrologic openings on private land was based on the BAER report which included GIS evaluation of fire severity on private lands. An additional 2%-5% of Jack and Keller and 8-10% of Snow Creek subwatersheds were classifed as hydrologic openings. Again, although these increases put over 60% of Jack subwatershed in hydrologic openings and increase the amount of Snow Creek in hydrologic openings further, because Flagtail area is dryer than most of the area studied by Helvey and Fowler (1995), it is expected that no change in yield would be detectable.

It is also uncertain what annual yield may be in the years immediately after the fire because, in the Flagtail geology, this may be determined more by weather than other factors (Helvey and Fowler, 1995). It is expected that recovery to pre-fire yields would occur more rapidly than is typical elsewhere in Oregon, once trees are established and growing vigorously (Helvey and Fowler, 1995), because water is the limiting factor for tree growth in the Flagtail burn.

These results are in contrast to Troendle and Leaf (1980) who noted that generally, after 20 to 30 percent of a watershed is harvested, a substantial change in yield can be detected. They are also in contrast to commonly accepted observations that severe fires appear to increase annual water yield because of the increase in peak flows and due to the loss of forest vegetation and corresponding reduction in yearlong evapotranspiration. Generally, annual yields would decline as forest cover becomes established.

The drainage network is considered to be more efficient because of downcutting and related conditions, previously described.

Changes in annual yield and peak and minimum flows to the Silvies River from the Flagtail Fire would also be difficult to detect because of the dispersion of the burn in five subwatersheds and because about one half of the Upper Silvies Watershed lies above the Jack Creek confluence with the Silvies; consequently, water yield from the Flagtail burn area (about 13 sq. mi.) is intermingled with yield from about 80 sq. mi. of unburned watershed, diminishing the effects of any increase in yield or peak flow on the Silvies River from the fire area.

Based on the above discussion, it is assumed for this analysis that measurable changes in yield to the Silvies River would not be detectable following the fire. It is also assumed that the post-fire conditions combined with effects of past harvest would not have measurable effects on annual water yield.

Peak and Minimum Flows: The Upper Silvies WA (2001) states that, pre-fire, the net effect of past management activities is likely a slight increase in peak flows and that this change is likely small compared to the natural peak flows. Severe fires are often assumed to increase peak flows. However, during BAER analysis, the post-fire increase in runoff for a 25-year event (6 hour duration, 1 inch rainfall total, typical of fall rains) occurring in 2003 was calculated. The predicted increase was 5 percent for soil burn severity conditions shown on Figure 2, Map Section. Helvey and Fowler (1995) also found that peak flows resulting from snowmelt do not increase following the creation of 60% of an area in hydrologic openings from timber harvest. Results for the creation of openings, in which more than 90% of trees have been removed, are mixed, depending on the method of analysis. They also found that peak flows from snowmelt occurred earlier when openings were created.

The slight, post-fire increase in runoff under “design storm” conditions would be expected to decrease over time as ground cover and other soil conditions recovered, reaching pre-fire range as early as 2007. Interaction of post-fire conditions with legacy disturbance is expected to result in little change to the predicted design runoff because most areas of disturbance do not connect directly to perennial or fish bearing streams or they can likely transport a 5% increase in flow without further eroding. Most wide valley bottoms still provide buffering and sediment filtering capacity. Peak flows, like annual yield, from the Flagtail Burn would also be intermingled with runoff from about 80 unburned square miles.

Minimum flows are considered to be lower and of longer duration due to legacy conditions than before pre-European-American settlement.

Environmental Consequences

Direct and Indirect Effects

No Action Alternative

No activities are proposed under this Alternative. Since no activities are proposed, there are no direct or indirect effects to total water yield, peak flows, or minimum flows under the No Action Alternative.

Fire and fire line recovery would continue based on climate and natural processes. Total water yield, peak flows, and minimum flows are expected to remain about the same as described for the existing condition, based on climate and geology of the area, for about 15-30 years (Helvey and Fowler, 1995). By about 15-30 years, sufficient trees are expected to fall to modify some legacy conditions, such as gullying and elevated sedimentation. Consequently, water storage capacity in ephemeral draws and stream channels would be enhanced and concentrated flows from old skid trails and unclassified roads would be slowed. Local peak and minimum flows would be expected to move toward the Desired

Condition, improving late season flows. Amelioration would occur over a relatively small area of the Silvies watershed (about 13 out of 98 sq. miles) and would be widely distributed among the subwatersheds, likely making these effect non-measurable.

The accumulation of downed logs would also likely increase the potential for watershed damage, including further alteration of peak and minimum flows, in the event of a wild fire.

Other legacy conditions, such as road drainage problems and roads within 100 ft. of stream channels and draws, which contribute to increased drainage efficiency and to increased peak flows and decreased minimum flows (Upper Silvies WA, 1997) would not be remedied.

The potential change in runoff from the post-fire design storm (BAER) was estimated to be about 5%; no further increases would occur under this Alternative.

The overall trend for about 15-30 years, although not measurable, would be to maintain the existing, modified peak and minimum flows, which are the result of legacy and post-fire conditions (up to about 5 years) because no activities are proposed. After that time, peak and minimum flows would remain modified but to a lesser extent due to the recruitment of coarse wood into draws and channels which would provide water storage for late season flows.

Cumulative Effects

Cumulative effects of activities described in Appendix J are similar to those described for the No Action Alternative.

Since there are no direct or indirect quantifiable effects to total water yield, peak flows, or minimum flows from this Alternative, there would be no quantifiable cumulative effects under Alternative 1.

Other fire and fireline recovery would progress based on climatic conditions and on ongoing and foreseeable activities such as the placement of coarse woody material in stream channels and ephemeral draws. The placement of coarse wood would enhance water storage capacity upon placement in year 1. Routine road maintenance would not remedy road drainage problems, which extend the drainage network and contribute to increase drainage efficiency.

Overall this Alternative combined with on-going and foreseeable activities would provide some water storage for late season flows beginning at year 1 due to the placement of coarse woody material; storage capacity would increase at about years 15-30 with the subsequent recruitment of dead trees. Road impacts on peak and minimum flows would remain.

Direct and Indirect Effects

Alternatives 2, 3, 4 and 5

Although proposed activities differ in magnitude and type under alternatives 2, 3, 4 and 5, none of the alternatives would have measurable effects on total water yield, peak flows, or minimum flows. While the effects of the proposed activities would not be measurable, some activities are expected to improve legacy or post-fire conditions, moving the project area toward the Desired Condition for water quantity. Other proposed activities neither improve nor detrimentally impact water quantity and would not move the area measurably toward the Desired Condition. Activities with both types of effects are discussed below.

Activities included in all four action alternatives, which would move the area toward the Desired Condition of reduced drainage network and drainage efficiency, include the decommissioning of roads, especially roads within 100 ft. of streams and draws, as shown in Tables WS-11 through 13, and WS-15 through 17 by alternative. Additional activities included in Alternatives 2, 3, and 5 which would move the area toward the Desired Condition include the installation of drainage dips or other drainage structures during road maintenance, reconstruction of 0.3 mi. of road along Snow Creek, decommissioning of an additional 1.0 mi. of road along Snow Creek, and waterbarring of old skid trails following harvest activities.

Activities included in Alternatives 2, 3 and 5, which would neither improve nor detrimentally impact water quantity, include:

- the removal of dead and dying trees,
- the removal of incidental green trees in proposed landings, skid trails, new or temporary roads,
- the site-specific application of BMPs to harvest and fuel treatments (which would retain concentrated flows within the activity units),
- the site-specific application of BMPs to the construction and decommissioning of temporary roads,
- the construction of 0.3 mi. of new road on the hillslope, with the application of BMPs, to allow 1.0 mile of road in Snow Creek to be decommissioned while continuing to provide access to the upper portion of Snow Creek Subwatershed;
- construction of temporary roads, and
- haul along roads.

The difference between Alternatives 2, 3 and 5 is that there are the same amounts of activities that move the area toward the Desired Condition but fewer of the activities that neither improve nor detrimentally impact water quantity in Alternative 3.

Activities included in Alternative 4, which would neither improve nor detrimentally impact water quantity, include the removal of dead and dying trees in fuel treatments and the site-specific application of BMPs to these treatments to retain concentrated flows within the activity units. Also several road-related activities would not occur so that degraded conditions which extend the drainage network and increase drainage efficiency would remain as they would under the No Action Alternative. These activities include road maintenance, reconstruction of road 2400133 along Snow Creek, and reduced decommissioning along roads 2400133 and 2400203 (including a crossing) near Snow Creek.

Road density, another indicator of drainage efficiency, would decrease as described under the Water Quality section with the largest changes in Snow and Jack subwatersheds under all action alternatives and with minimal change between action alternatives (see Tables WS-11 and WS-18). Again, the decrease in peak flows due to decreased road densities is not expected to be measurable.

Overall these Alternatives would improve peak and minimum flows beginning at year 1 or 2, in proportion to road treatments, and again at about years 15-30 as more trees fall down within RHCAs and ephemeral buffers and provide water storage capacity.

Cumulative Effects

Cumulative effects of activities described in Appendix J are similar to those described for the No Action Alternative.

Since none of the action alternatives would have a quantifiable change in total water yield, peak flows, or minimum flows, there would be no quantifiable, cumulative effects on water quantity. Since there would be no cumulative effects on water quantity, there would be no interactions with effects from other activities downstream such as fire salvage and other harvesting from private land below the Forest in the Upper Silvies Watershed, with effects from activities in the Middle Silvies Watershed, with effects from the Silvies Canyon Restoration Project or other activities in the Lower Silvies Watershed, or with conditions in the lower 20 miles of the Silvies River which are included on the Section 303(d) list.

Other fire and fireline recovery would progress based on climatic conditions and ongoing and foreseeable activities as discussed for the No Action Alternative except that routine road maintenance would maintain drainage improvements on the 24 and 2195 roads proposed under Alternatives 2, 3 and 5.

Overall these Alternatives cumulatively combined with on-going and foreseeable activities would improve peak and minimum flows, in proportion to road treatments combined with the placement of coarse woody debris.

Water Quality

Existing Condition

Introduction

Streams on the MNF meet many water quality standards (Oregon, 2004) established by the Oregon Department of Environmental Quality under the Clean Water Act (CWA) (Quigley, 1989). Land uses on the Malheur National Forest are defined by the Forest Plan and, consequently, limited opportunities for exposure to pollutants occur. Applicable water quality parameters which could potentially be affected by the proposed activities were reviwed and are addressed in one of two ways. The discussion of general water quality parameters is separated from discussion of streams included on the CWA Section 303 (d) List of Water Quality Impaired Waterbodies (303(d) List). The general water quality discussion is organized by parameter and is based on applicable State standards and/or other concerns. General water quality concerns are discussed in sections titled “General Water Quality – (specific parameter)” below. Discussion of turbidity, for which there is a separate water quality rule, is incorporated in to the discussion of sediment Sediment is described under the water quality rule for Statewide Narrative Criteria.

The sediment discussion also includes discussion of sediment transport from hillslopes into channels and draws based on application of the Disturbed WEPP model (see Soils Section). These sections are followed by a discussion of water quality in 303(d) listed streams and the parameters for which they are listed (see Clean Water Act Section 303(d) List of Water Quality Impaired Waterbodies section below)

As shown in Table WS-1 and Figures 3 and 16 (Map Section), there are numerous stream sources of perennial water. There are also numerous springs, seeps, moist and wet meadows, and other aquatic ecosystems. Figure 3 (Map Section) shows locations of 303(d) listed streams in the Upper Silvies Watershed in which the Flagtail project area is located; it also references listed segments of the Silvies River.

Beneficial Uses of Water - Beneficial uses of water within the project area are fisheries (redband rainbow trout (MIS and Sensitive) and Malheur mottled sculpin (Sensitive) and other species), terrestrial wildlife, livestock, and road watering. Downstream uses are similar but also include agricultural irrigation.

General Water Quality - Temperature

The Upper Silvies WA describes stream temperatures in the watershed and discusses reasons for stream temperature elevation in some detail. Conditions in the Flagtail project area are consistent with these descriptions. Instantaneous stream temperatures measured in or adjacent to the project area during stream and riparian surveys (1994) and continuously recording thermographs (1993-98) indicate that temperatures are elevated in fishbearing and non-fishbearing perennial streams. The Silvies River within the project boundary is warmer than Snow Creek, likely due to upstream conditions, entrenchment, and direct exposure to the sun. Lack of shade and reduction in interflow contribute to elevation of temperatures in tributary streams. Prior to the fire, Region 6 Stream and related surveys indicated that shade on most streams did not meet Forest Plan standards due to the lack of streamside vegetation (see Botany and Fisheries sections) and due to stream channel condition as described in the Fisheries Section. Most conifers within RHCAs were killed by the fire, as described previously. Riparian hardwood shrubs were scarce prior to the fire due to past management activities. Generally the above ground portion of shrubs was killed if fire occurred in riparian areas with the roots and root collar surviving to sprout. The primary exception is along Snow Creek where the streamside burned with high severity, killing shrub roots and eliminating the potential for hardwood sprouting. Roads within 100 ft. of perennial streams (Table WS-7) probably contribute to reduced available shade and reduced interflow.

General Water Quality - Sediment and Turbidity

Post-fire hillslope erosion and sediment delivery to streams were modeled by the BAER team using the Disturbed Watershed Erosion Prediction (WEPP) model. WEPP predicts sediment transport to the drainage immediately downslope but not through the drainage network; it also does not incorporate the presence of wide valley bottom filter strips.The design storm modeled was a two year runoff event (one inch of rain over six hours), most likely occurring during a summer thunderstorm, and occurring on the average “worst case” post-fire (2003) soil conditions (based on 10 post-fire sample sites).. The average post-fire erosion potential under this scenario was predicted to be 1 ton/ac. with the average sediment delivery to streams predicted to be 0.88 tons per acre (564 cu. yd. per square mile), indicating that about 88% of the soil detached would reach a stream as sediment under the design storm. This yield wouold be expected to be measurably different from the sediment yield from an unburned, undisturbed condition, since the yield from a five year event is estimated to be less than .01 cu. yd./ac., based on examination of WEPP parameters. Sediment yield would be expected to return to pre-fire levels as ground cover becomes re-established and hydrophobicity breaks down as described in the Soils Section.

The Upper Silvies WA summarizes other information sources that indicate that water quality may be less than desirable. These include macroinvertebrate studies and observations about turbidity and sediment. Turbidity is included in discussions about sediment; macroinvertebrate conditions are discussed in the Fisheries Section. The Upper Silvies WA indicates that background sediment levels of the perennial and fish bearing streams are naturally high due to the fine, valley bottom, colluvial soils (sands and silts) and the low stream gradients and discharges. Due to these conditions, these stream channels are sensitive to local disturbance and increased sediment inputs (see Fisheries Section). The Upper Silvies WA indicates that legacy activities, implemented without the application of BMPs, combined with natural conditions have likely contributed to less than desirable water quality. Past management activities including grazing, roading, timber yarding, and railroading have resulted in widening, deepening, and upslope extension of ephemeral draws and stream channels and the production of sediment.

Classified and unclassified roads are inadequately drained and flow directly into ephemeral, intermittent and perennial streams. The roads and other legacy disturbance extend the drainage network and connect to the stream system.

Observations made by district employees during field reviews in the mid-1990s and following the fire identified erosion from roads as a source of sediment to streams. Roads within 100 feet of stream channels have the greatest potential to contribute sediment (Burrows and King, 1989). This potential has been substantiated by local monitoring information from some of these subwatersheds which shows that in an unburned forest, at the 96^{th} percentile, sediment is trapped within 65 feet from road disturbance by ground cover or locally flat topography (McNeil, 1997). Sediment trapping along roads in flat areas, which burned with low soil severity, is likely to approach pre-fire levels after spring 2003. Recovery in other areas would be deferred as described in the Soils Section.

For this analysis, roads within 100 ft. of the stream system, as shown in Table WS-7, were considered the most likely to contribute sediment . Road densities, especially greater than 3 mi./sq mi. are also considered an indicator of declining watershed health and of increased risk of stream sedimentation. Table WS-10 displays road densities and road status by miles (open/closed) for the subwatersheds in the Flagtail Burn Area.

Table WS-10: Current Road Status for Subwatersheds in Flagtail Project Area (Includes Private and Public Ownership) by Subwatershed.

Subwatershed	Open Roads (Miles)	Closed Road (Miles)	Open + Closed Road (Miles)	Road Density (Mi/ Mi^{2})
Hog	35.93	19.11	55.04	5.79
Jack	45.78	3.56	49.34	3.10
Keller	23.08	21.32	44.4	3.79
Snow	32.85	2.23	35.08	3.47
Total	137.58	46.22	183.8	

Between the DEIS and FEIS the project soil scientist modeled potential erosion in 2004 using the Disturbed WEPP model (see Soils Section). WEPP results are not statistically valid due to the low number of areas sampled but may be used to indicate general conditions. WEPP indicated that erosion was proportional to precipitation events and slope with no erosion occurring with one to two year events and trace amounts occurring on steeper slopes with three to four year events. These calculations represent a substantial reduction in erosion potential compared to that described in the BAER report. WEPP was used to estimate relative amounts of erosion associated with the Existing Condition and incorporated the presence of legacy conditions. WEPP was used to evaluate erosion conditions in two areas.

Ten flowpaths randomly located in the Snow Creek subdrainage were used to characterize erosion conditons across the landscape under a variety of slope and burn conditions. The Snow Creek subdrainage was chosen because it was the only substantial drainage in which the majority of the area burned. The distribution of slopes and burn severity appeared to be typical of the Flagtail area. The drainage is not typical of the Flagtail area in that valley bottoms are generally narrower and more confined and provide less filtering capacity than those throughout the rest of the project area. This application of WEPP modeled sediment delivery to either streams or ephemeral draws.

WEPP analysis for Snow Creek subdrainage indicated that the average yield was 0.12 cu. yd./ac. or about 152 cu. yds. total for the subdrainage post-fire (2004); average yield also approximates the sediment yield for a five year event. This is at least a eleven fold increase over the expected sediment yield (less than 12.7 cu. yds.) under a similar runoff event on unburned conditions. Based on examination of WEPP parameters, the sediment yield from an unburned, undisturbed condition was estimated to be less than .01 cu. yd./ac. for a five year event.

Disturbed WEPP was also run on two local areas representing the two steepest classes of ground on which tractor yarding could potentially be proposed, to characterize conditions on slopes that average between about 22% and 28% or 28% and 35%. Also these areas were selected because large portions of them burned with moderate or high intensity. Modeling indicated that areas burned with low intensity produced little erosion. Due to the way WEPP was implemented for this evaluation, erosion yields are estimated at hillslope locations above stream channels and draws, corresponding to upper boundaries of RHCAs and ephemeral draw buffers. However, WEPP also indicated that about 20% of measurable sediment is trapped, on average, by filter strips such as RHCAs and ephemeral draws.

Estimates from WEPP for erosion occurring on the two areas representing the steepest ground that could be tractor yarded and that burned with moderate to high severity under were 0.24 cu. yd./ac. for slopes averaging from about 22% and 28% and 0.31 cu. yd./ac.on slopes averaging from about 28% to 35%, five year runoff events. These values were consistent with values generated by WEPP for similar ground in Snow Creek The amount of sediment reaching streams or draws would be about 20% less.

On slopes of about 22-28% about 0.24 cu. yd./ac of eroded soil would reach these points. Proportionally greater amounts would be moved on steeper slopes and lesser amounts on less steep slopes. The model also indicated that only about 20% of the erosion would be trapped within 50 ft. of ephemeral draws or on the narrower valley bottoms which indicates that there is a reasonable probability that sediment would reach streams.

Results of the WEPP modeling in the two cases described above indicate that none to trace or very small amounts (probably averaging less than 0.01 cu. yd./ac.) of erosion would occur on areas that burned with moderate to high severity with the most probable weather events (< 5 year frequency); most probable events are those expected to occur about 80% of the time and are designated "less than five year events." No erosion was indicated for either one or two year runoff events. Trace amounts of erosion developed on the steepest slopes with three year events and trace amounts of erosion developed over more of the area and slightly increased on the steepest ground with four year events. Erosion on areas that either burned with low severity or are flatter would be less.

When five year or greater events were considered (probability of occurrence is 20%), WEPP modeling indicated that upland erosion and sedimenation of streams that would be measurable on the average across the landscape would occur, although erosion would not be measurable in some local, less severely burned areas. Erosion associated with the five year event also approximates the average amount of erosion that would occur under all events ranging from 1 to 100 years.

It was estimated that about one third to one-half of sediment entering draw bottoms or stream channels would be trapped by the placement of coarse wood under the Flagtail Placement of Coarse Woody Material CE and natural recruitment. The remainder is expected to be transported into and though the stream system. The flat gradient streams in the lower parts of the Flagtail project area are efficient transporters of fine sediments. Sediment entering these streams would be expected to be transported downstream or deposited on floodplains.

The amount of sediment predicted to enter streams with a five year event in 2004, even if coarse wood were not present, is about 25-35% of the amount predicted for 2003 by the BAER team for a two year event. This change **is probably not measurably** different from the BAER estimate **due to the variability associated with sediment research** (Bunte and MacDonald, 1999)**,** the small quantities predicted, and the background levels of sediment. A similar pattern would be expected for turbidity although theoretically a change of this magnitude would be detectable, given the occurrence of appropriate storm events**.** No threats to human life or property or degradation of natural resources related to sediment were identified by the BAER team for sediment loads three to four times as large with less associated flow., Additional sediment inputs of this size may result in the deposition of point or other bars locally in streams identified in the Exisiting Conditions for Stream Channels….Uplands section; however, the amount of sediment is still expected to be within the capability of streams to move because of channel conditions (see Fisheries section).

Large precipitation events are likely to produce larger amounts of sediment; which may become a concern with the Forest and downstream. However, due to the high variability and cost associated with sediment research and the lack of flow and other data for the Flagtail area, it is not possible to determine the impacts of such events except to note that the drainage outlets for the approximately 13 square miles of the Flagtail burn are distributed across about 80 square miles of the upper Silvies sub-basin. Changes in sediment production due to the Flagtail fire would occur on about 16% of the land base and would probably not be measurable given the variability associated with the best sediment research. Sediment with the potential to reach the drainage network would gradually decline to pre-fire levels by about 2007 as ground cover recovered according to the soil science report.The placement and gradual natural recruitment of wood that would occur in the first 10-15 years after the fire would further reduce the amount of sediment moving through the system.

The results of the WEPP modeling appear to be consistent with the administrative studies of erosion associated with road culverts (McNeil,1999) in an unburned landscape and of sediment yields in harvest units of Summit Fire (McNeil, 2001) and with professional experience and knowledge of the Blue Mountain Ranger District.

The influence of sediment on stream channel morphology, function or related parameters is further discussed in the Fisheries Section.

General Water Quality – Chemical Pollutants:

The discussion of chemical pollutants, such as petroleum products, is found in the Fisheries Section.

Clean Water Act Section 303(d) List of Water Quality Impaired Waterbodies

Snow Creek (Figures 3 and 16, Map Section) is the only stream within the Flagtail project area included on the Oregon Department of Environmental Quality's 2002 Clean Water Act Section 303(d) List of Water Quality Limited Waterbodies (303(d) list). It is listed for summer rearing temperature for salmonids (trout). Scotty Creek, located south of the project area, is the only other stream in the Upper Silvies Watershed on the 303(d) list (see Figure 3, Map Section). It is also listed for summer rearing temperature. Neither on-going watershed processes nor activities in the project area have the potential to affect Scotty Creek as its catchement is not connected to the project area. The lower 20 miles of the Silvies River, which are located about 68 river miles below the project area, are also included on the 2002 list for summer rearing temperature for salmonids, dissolved oxygen, and temperature March 1 – June 30 (spawning).

Summer rearing temperatures do not meet State standards when the maximum 7-day temperature average exceeds 64 degrees F. ODEQ has established standards for dissoloved oxygen and temperature March 1 – June 30 (spawning) which are available on the ODEQ web site (Oregon, 2004).

Environmental Consequences

Direct and Indirect Effects

No Action Alternative

General Water Quality -Temperature: Higher peak and near peak flows resulting from increased drainage efficiency due to legacy conditions would continue. These conditions maintain risk that stream channels may degrade further by widening the stream and increasing solar radiation to and subsequent heating of streams throughout the year. Streamside shade and stream temperatures would not recover fully from the effects of the fire for over 50 years when both naturally regenerated, mature conifers and riparian hardwoods would provide effective stream shade.

General Water Quality - Sediment: . Since no activities are proposed, no new, potential sources of sediment or turbidity would be developed and state water quality standards would be met. The no action alternative also does not decrease sediment and leaves the existing sediment in the stream system Sediment delivery to streams and draws from roads and legacy sources would continue because this alternative would not improve cross drainage of roads and skid trails and because road maintenance, reconstruction and decommissioning would not occur, as shown in Tables WS-7, 8, and 10. Adequate filter strips would not be present along about one mile along Snow Creek and several unnamed intermittent stream segments that burned with moderate and high soil severity until ground cover became reestablished. Under high runoff events ($\geq$ 5 year frequency), sediment transport would be similar to that described for Existing Condition. WEPP modeling for this alternative in 2004 indicated that an index value of 79 cu. yd. would be produced from that part of the Snow Creek subdrainage in which units are proposed under Alternative 2. Unit area was chosen in order to make comparisons between the No Action and the Action Alternatives. This yield represents an estimated eleven fold increase over the sediment transported to the drainage network under pre-fire conditions.

Legacy conditions would also increase the likelihood that sediment would be produced due to drainage network extension. By about 15-30 years, sufficient trees are expected to have fallen to reduce or capture soil eroding from some legacy conditions, such as gullying, old skid trails, and unclassified roads. Coarse wood in draws and channels would also capture sediment. Consequently, sediment storage on hillslopes and ephemeral draws and stream channels would be enhanced

The likely fuels accumulation and potential for future wild fire after 15-30 years would increase the potential for additional sediment to reach stream channels, due to a greater reduction in ground cover, than was experienced with the Flagtail fire. Potential is greater where valley bottom meadows do not provide buffering capacity.

General Water Quality – Chemical Pollutants:

Effects of chemical pollutants are discussed in the Fisheries Section.

Clean Water Act Section 303(d) List of Water Quality Limited Waterbodies

No changes to the Section 303(d) List of Water Quality Limited Waterbodies would be made under this alternative. Effects on 303(d) listed streams (e.g. Snow Creek) would be similar to those described above in the General Water Quality - Temperature section above.

Recognizing that a WQRP will be required for the Silvies Sub-basin in 2007, the Flagtail IDT has identified the elements of a WQRP incorporated into the Flagtail Fire Recovery Project under the NEPA process in Appendix L.

Summary

No activities are proposed under this Alternative. There are no Direct and Indirect Effects. Fire and fire line recovery would continue based on climate and natural processes.

The No Action Alternative does not reduce or increase sediment delivery or improve temperature. Since no activities would occur under this Alternative, the overall effect would be to maintain degraded watershed and stream channel conditions for up to 15-30 years (sediment), until burned trees fall in sufficient numbers to provide sediment trapping in ephemeral draws and streams or for up to 40 years until conifers and riparian hardwoods grow large enough to provide stream shade.

Cumulative Effects

General Water Quality

Activities described in Appendix J were reviewed for cumulative effects on water quality.

Since there are no direct or indirect effects from this alternative, there would be no cumulative effects. Since there would be no cumulative effects on water quality, there would be no interactions with effects from other activities downstream such as fire salvage and other harvesting from private land below the Forest in the Upper Silvies Watershed, with effects from activities in the Middle Silvies Watershed, with effects from the Silvies Canyon Restoration Project, other activities in the Lower Silvies Watershed or or on the lower 20 miles of the Silvies River.

Other fire and fireline recovery would progress based on climatic conditions and on ongoing and foreseeable activities such as the felling of hazard trees, planting of conifers and riparian hardwoods in RHCAs, and placement of coarse woody material in stream channels and ephemeral draws. The effects of re-initiation of grazing would be similar to those before the fire as the same standards and guidelines, which allow for gradual recovery of riparian vegetation in degraded areas, would apply; grazing would not be expected to have measurable effects on stream temperature for two, somewhat opposing reasons. First utilization of shade-providing vegetation is limited. Second, although riparian vegetation recovery is expected under the current standards and guidelines, it may be slow and correlated changes in temperature would be difficult to measure against the natural variation of stream temperatures.

Felling the remaining hazard trees would remove up to 3% of site-potential shade that is provided by tree stems; removing this amount of shade would not have measurable effects on stream temperature. Felling hazard trees in RHCAs along about five miles of the 31 road in Hog subwatershed would have similar effects on Hog Creek above the project area. Planted riparian hardwoods would likely maintain cooler water temperature when shrubs reach maturity in approximately 7-10 years; but, due to the wide spacing of planting, this effect may not be measurable. Additional shade from planted conifers would develop in about 30-40 years; again, due to the distribution of these planting, reductions in temperature may not be measurable due to the maturing of conifers alone. However, it is expected that the shade provided by a combination of riparian hardwoods and conifers would maintain cooler temperatures that would be measurable. The placement of coarse wood would enhance water storage capacity upon placement in year 1 which would also contribute to cooler water temperatures. Grazing to Forest Plan standards would not be expected to decrease shade or to contribute to sedimentation.

Placement of coarse wood in draws and channels would enhance sediment trapping from roads and legacy conditions, beginning in year 1 and would be likely to capture one third to one half of sediment exported under a five year runoff event. Natural recruitment would increase storage capacity over time. Sediment yields are expected to approach pre-fire amounts in about 2007 when nearly full recovery of ground cover is expected (see Soils Section). The remainder of sediment exported from hillslopes would be transported downstream with effects as described in the fisheries section. Routine road maintenance would not remedy road sediment problems, which would continue to contribute to elevated sediment levels.

Consequently there would be no detectable cumulative effects on water quality that would interact with effects from other activities downstream in the Middle Silvies Watershed, with effects from the Silvies Canyon Restoration Project or other activities in the Lower Silvies Watershed, or with conditions in the lower 20 miles of the Silvies River which are included on the Section 303(d) list.

One exception would be the Silvies River reach immediately below the Forest Boundary, in the lower part of Snow Subwatershed, where water temperatures may be detectably cooler in the long term (after 20 years) and where sediment reduction on the Forest may result in improved channel conditions.

The overall effect of this Alternative and of on-going and foreseeable activities would be a slightly improved watershed cumulative condition but road and other legacy conditions and on-going activities, including Off Road Vehicle use, which produce sediment would continue.

Clean Water Act Section 303(d) List of Water Quality Limited Waterbodies

Since there are no direct or indirect effects from this alternative, there would be no cumulative effects on Snow Creek or on the lower 20 miles of the Silvies River. There would be no cumulative effects on Scotty Creek because it does not drain the project area and because there are no direct or indirect effects from this alternative. As described for General Water Quality, Appendix J was reviewed. Similarly, planting conifers and riparian hardwoods and placing coarse woody material in Snow Creek would maintain or reduce stream temperatures. Felling hazard trees in RHCAs would not have a measurable effect on stream temperatures due to the small amount of shade removed..The cumulative effects of re-initiation of grazing would be similar for those described in the General Water Quality section.

Direct and Indirect Effects

Alternatives 2, 3, and 5

General Water Quality - Temperature: Road decommissioning within 100 ft. of perennial and fish bearing streams (see Table WS-11) would improve shade to variable degrees, depending on site-specific distances between decommissioned roads and streams, after about 40-50 years. Following decommissioning, about 80% of the road area treated would support forest vegetation with potential to shade the streams. Establishing additional shade on about 3.0 mi. of roads near streams moves the area towards meeting Forest Plan standards for stream shade and reduced heating of streams. The remaining 20% of roads within 100 ft. of perennial streams would likely revegetate with meadow species including sedges; generally these stream segments are located too far away from stream water for meadow vegetation to provide effective shade.

Subsurface flow, currently interrupted by roads within 100 ft. of perennial streams, would be reestablished over 20 to 30 years. Subsurface flow generally contributes colder water to stream channels; effects may not be measurable except where long segments of road which parallel streams and riparian meadows are treated. Improved cross drainage would reduce the risk of channel erosion and widening and exposure to solar radiation. Exposure of stream water to solar radiation during culvert removal would not be expected to effect stream temperatures measurably.

Although increasing shade and subsurface flows together would move stream temperatures toward the Desired Condition, changes in stream temperature may not be detectable against the natural variability of stream temperatures for at least 20-30 years. The road decommissioning activities proposed under the FEIS and watershed improvements in the CEs are typical of activities that may be included in Water Quality Restoration Plans to improve water quality.

General Water Quality - Sediment: The application of site-specific BMPs (see Chapter 2 and Appendix BMP), INFISH RHCAs, and ephemeral draw buffers is expected to prevent sediment and concentrations of water from developing and leaving activity units under the more common precipitation events (≤ four year events). Mitigations to drain roads and reduce sediment identified in the Flagtail Roads Analysis were incorporated into Chapter 2 Mitigations of this document.

About 10%-60% (on average, about 30%) of existing skid trails are expected to be reused, depending on their locations within particular units. The application of site-specific BMPs, including installation of cross drainage, to these skid trails would improve legacy conditions and keep disturbed soil and concentrated surface flows within activity units. Similarly, the application of BMPs, including cross drainage, to new skid trails would also keep disturbed soil and concentrated surface flows within activity units. BMPs include building water bars or similar drainage structures or placing downed wood to create cross drainage. Additional drainage mitigations would be applied to tractor yarded units (over 300 acres) below the Bald Hills. In addition, units with inclusions of shallower or rocky soils would have seasonal operating restrictions or protective buffers applied. Seeding of skid trails, as described in Mitigations, Chapter 2, would also contribute to decreased drainage efficiency and sediment trapping.

Installation of cross drainage in the form of rolling dips or water bars would be included as part of maintenance of open and closed roads. These drainage structures would be placed at frequent intervals to drain water away from the road (see Mitigations, Chapter 2 for approximate spacing). Water and sediment would be redistributed from road surfaces to adjacent uplands and valley bottoms where water would be absorbed into the ground and sediment trapped by re-established ground vegetation and litter or microtopography. These treatments would reduce hydrological connections between roads or skid trails and streams. They would also reduce the risk that additional connections would develop. Decreasing drainage spacing, outsloping of road surfaces, and retarding flows and sediment at drainage outlets are the most common techniques for reducing or eliminating hydrologic connectivity (Furniss et al. 2001). These treatments which "disconnect" roads and skid trails from streams are usually simple, inexpensive, and effective in reducing effects and risks to water quality and aquatic habitats.

Roads and skid trails acting as conduits for water and sediment to streams would be decreased. Proposed treatments and mitigations would rehabilitate some legacy activities, reduce drainage efficiency and sediment transport, and help move peak and near peak flows toward the Desired Condition. Macroinvertebrates in the stream system would improve with decreased erosion and sedimentation as described in the Fisheries Section.

The possible transport of sediment into other streams with five year or greater events was evaluated. Additional mitigation was not recommended on units where the destination stream flowed through flat, wide valley bottoms because the wider valley bottoms would be more likely to trap sediment as would flatter gradient streams typical of flatter valleys. Additional mitigation (scattering slash on skid trails) in units where resources were more vulnerable reduced sediment export from tractor harvest units by 0.1 cu.yd./ac. The combination of scattering slash on skid trails and in the units reduced sediment production by about one third.

Reconstruction of 0.3 mi. of the 2400133 road along Snow Creek would reduce sediment entering the stream by about year 2. BMPs applied during reconstruction would limit sediment entering the stream during and in the first two years following reconstruction to about one cubic yard.

Roads within 100 feet of streams would be reduced by nearly 6 miles (see Table WS-11). BMPs described in Chapter 2 would be applied to road decommissioning and would activity-related sediment to about one-half cubic yard during decommissioning and in the first year immediately following treatment limit (see Tables WS-12 and WS-13). Sediment input would not be persistent or chronic and would disburse with the next high flow. Decommissioning the 2400133, 2400203, 2400092 and 2400196 roads in Snow and Jack subwatersheds, respectively, and roads along Tributary 8 to the Silvies River and other draws that drain the Bald Hills are expected to reduce sediment delivery the most. Effects of decommissioning up to two miles of unclassified extensions of roads, primarily in the Bald Hills area, would be similar to those described for classified roads. Since segments of Snow Creek burned with high and moderate soil severity, a sediment fence would be placed along parts of Road 2400133 to supplement the post-fire filtering capacity of the RHCA until either ground cover recovers sufficiently or until the road is decommissioned. The fence would be placed where there is less than a 100 ft. band of suitable ground cover between the creek and the road.

Table WS-11: Alternatives 2, 3 and 5 - Proposed Road Decommissioning in Flagtail Burn – Total and Within 100 ft. of Stream Channels and Ephemeral Draws -- by Stream Type and Subwatershed (Miles*)

Sub-watershed	Total Road Miles Proposed for Decomm-issioning	Total Subwatershed Roads within 100 Ft. of Channels and Draws (Miles)	Road Miles Within 100 ft. of Streams or Draws	Proposed Decommiss-ioning — Roads Within 100 Ft. of Fish-bearing Channel (Miles)	Proposed Decommiss-ioning– Roads Within 100 Ft. of Perennial Channels (Miles)	Proposed Decommiss-ioning– Roads Within 100 Ft. of Intermittent Channels (Miles)	Proposed-Decommiss-ioning– Ephemeral Draws and Uplands (Miles)
Hog	0.1	8.3	.1	0	0	0	0.2
Jack	7.1	3.6	5.9	.8	.0	.7	5.6
Keller	0	6.7	.1	0	0	0	0
Snow	5.9	4.6	2.9	2.0	.1	.7	3.0
Total	13.1	23.2	9.0	2.8	0.1	1.4	8.8

**Based on ocular estimate.*

Table WS-12: Alternatives 2, 3 and 5 - Fish-bearing and Perennial Stream Crossings (number)

Sub-watershed	Fish-bearing			Perennial		
	Existing Condition	Proposed Decommissioning	Post-Activity	Existing Condition	Proposed Decommissioning	Post-Activity
Hog	0	N/A	N/A	0	N/A	N/A
Jack	1	1	0	3	1	2
Keller	0	N/A	N/A	1	0	1
Snow	7	2	5	6	4	2
Total	9	3	5	10	5	5

Table WS-13: Alternatives 2, 3 and 5 - Intermittent Stream and Ephemeral Draw Crossings (number)

Sub-watershed	Intermittent			Ephemeral		
	Existing Condition	Proposed Decommissioning	Post-Activity	Existing Condition	Proposed Decommissioning	Post-Activity
Hog	0	N/A	N/A	6	0	6
Jack	15	6	9	13	3	10
Keller	0	N/A	N/A	4	0	4
Snow	9	4	5	23	6	17
Total	24	10	14	46	9	37

Site-specific BMPs would be used to retain sediment within harvest units and to limit the amount entering streams during culvert and road work. Sediment which would result from culvert work would disperse with the next high flows so there would be no cumulative effect of sedimentation. Reductions in potential sediment producing interactions with legacy effects such as gullied or otherwise impacted draws would occur.

Road density is shown in Table WS-14. Road density would be decreased under alternatives 2, 3 and 5, moving the project area toward the Desired Condition. Reduced road density is in an indicator of decreased drainage efficiency and decreased sediment transport . The largest changes are in Snow Creek and Jack Creek subwatersheds. Road densities in these subwatersheds would remain elevated but would decrease below 3 mi./sq. mi., which is one threshold used to indicate watershed health.

Table WS-14: Alternatives 2, 3 and 5 - Open and Closed Road Miles and Road Density by Subwatershed. (Includes Private and Public Ownership)

Subwatershed	Open Roads (Miles)	Closed Roads (Miles)	Open + Closed Roads (Miles)	Decommissioned Roads (Miles)	Road Density (Mi/ Mi^{2})
Hog	35.93	18.96	54.89	0.2	5.78
Jack	38.13	4.13	42.26	7.1	2.66
Keller	23.08	21.32	44.4	0.0	3.79
Snow	22.26	7.23	29.49	5.8	2.92
Total	119.4	51.64	171.04	13.1	

These two action alternatives improve water quality by improving stream temperature over 20-40 years and by reducing sediment delivery beginning within two years of road maintenance, reconstruction and decommissioning. Beneficial effects on water quality would be largest under these alternatives because more road related problems would be alleviated and BMPs would be applied to limit disturbance from harvest activities.

Under five year or greater runoff events WEPP indicated that Alternatives 2, 3 and 5 would produce 33%, 15%, and 28% more sediment, respectively, than under the No Action Alternative. However, because variation for sediment sampling is plus or minus 100% under the best conditions (Bunte and MacDonald, 1999) and the variation for sediment modeling is greater, these three harvest alternatives do not differ from the No Action Alternative.

General Water Quality – Chemical Pollutants

Effects of chemical pollutants are discussed in the Fisheries Section.

Clean Water Act Section 303(d) List of Water Quality Limited Waterbodies

No changes to the Section 303(d) List of Water Quality Limited Waterbodies would be made under any alternative. Effects on 303(d) listed streams (e.g. Snow Creek) would be similar to those described above in the General Water Quality - Temperature section above. In addition, although culvert removal on the 2400203 road would expose stream water to solar radiation, no measurable effect on stream temperature is expected due to the short distance that would be exposed and the rate of stream flow. Similarly no measurable effect on stream temperature is expected due to the removal of incidental amounts of shade provided by dead tree boles during obliteration of about 0.8 mi. of the 2400133.

Recognizing that a WQRP will be required for the Silvies Sub-basin in 2007, the Flagtail IDT has identified the elements of a WQRP incorporated into the Flagtail Fire Recovery Project under the NEPA process in Appendix L.

Summary

Alternatives 2, 3, and 5 contain varying amounts of commercial harvest, particularly of tractor yarding; however, the effects on sediment delivery to streams would not be measurably different due to the implementation of BMPs and the high variability associated with assessing sediment transport. For these same reasons, these alternatives are not measurably different from Alternatives 1 and 4. These alternatives contain the same amount of riparian road decommissioning, which is greater than that proposed under Alternative 4 and the No Action Alternative. Consequently total direct and indirect effects on temperature are expected to be greater than those that would occur under the other alternatives. They differ in the amount of road maintenance which would occur with Alternative 3 receiving the least and Alternative 2, the most. No maintenance would occur under the other alternatives.

Cumulative Effects

General Water Quality

Cumulative effects of activities described in Appendix J are similar to those described for the No Action Alternative.

The overall effect of the activities proposed under these alternatives and of on-going and foreseeable activities would be improved water quality due to the reduction of sediment and the gradual recovery of shade and subsurface flow over 7-40 years. These beneficial cumulative effects would be passed downstream but likely would be diluted and not measurable due to their dispersion over time and over approximately 15 river miles of the Silvies River (the confluence of Jack Creek is located about 15 miles downstream of the Snow Creek confluence).

It is recognized that erosion monitoring is considered to be more variable than erosion studies (USDA Forest Service, 1999, "A Framework…"), the best of which have a variability of plus or minus 100%. The limited administrataive studies conducted on the Malheur indicate that for high probability, low runoff events, WEPP appears to be consistent with local events. No data are available to check the consistency of the model with low probability, high runoff events.

The overall effect of these alternatives combined with on-going and foreseeable activities would be to improve water quality more than under Alternative 4 because of the additional riparian road decommissioning along Snow Creek and more than under Alternative 1. Treatments would likely become effective beginning (unmeasurably) at years 7-10 and may become measurable by years 20-30.

Clean Water Act Section 303(d) List of Water Quality Limited Waterbodies

As described for General Water Quality, Appendix J was reviewed; effects of these activities are similar to those described for the No Action Alternative. Cumulative effects on Snow Creek are greatest under these three alternatives due to the combined rehabilitation of riparian vegetation, coarse woody material, and riparian roads. Planting conifers and riparian hardwoods and placing coarse woody material in Snow Creek would maintain or reduce stream temperatures over various periods of time. Felling hazard trees in RHCAs would not have a measurable effect on stream temperature due to the small amount of shade removed. Decommissioning roads and crossings in Snow Creek would add to the effects of other activities. There would be no cumulative effects on the lower 20 miles of the Silvies River because this segment is located too far away. There would be no cumulative effects on Scotty Creek because it does not drain the project area and because there are no direct or indirect effects from this alternative.

Direct and Indirect Effects

Alternative 4

General Water Quality – Temperature

Effects would be similar to those described for the other action alternatives except that treatements in Snow Creek drainage would be reduced with a corresponding reduction in effects as discussed in the Clean Water Act Section 303(d) List of Water Quality Limited Waterbodies below.

General Water Quality – Sediment

The effects of Alternative 4 are the same as Alternative 2, 3 and 5 for fuels or harvest activities since soil and concentrated water would be retained within activity units because of the use of low psi equipment and the application of other BMPs. Sediment reduction due to road decommissioning would be similar to that of the other three action alternatives except that sediment inputs to Snow Creek would not be reduced along about 0.8 miles of stream and at one crossing (see Tables WS-15, WS-16, and WS-17). This change is so small at the subwatershed scale that there is no change in road densities (see Table WS-18) compared with the other action alternatives. No improvements would occur to old skid trails that are poorly drained. Routine maintenance of roads is not likely to provide the same sediment control that maintenance associated with the other three action alternatives would due to funding limitations. Rilling and rutting would continue to concentrate sediment and flows as described for the Existing Condition and the No Action Alternative. Overall sediment delivery would be reduced under this alternative, but not to the same extent as under Alternatives 2, 3 and 5 since fewer roads would be treated.

Table WS-15: Alternative 4 - Proposed Road Decommissioning in Flagtail Burn – Total and Within 100 ft. of Stream Channels and Ephemeral Draws -- by Stream Type and Subwatershed (Miles)

Sub-watershed	Total Road Miles Proposed for Decomm-issioning	Total Subwatershed Roads within 100 Ft. of Channels and Draws (Miles)	Proposed Decommiss-ioning –- Roads Within 100 Ft. of Fish-bearing Channel (Miles)	Proposed Decommiss-ioning– Roads Within 100 Ft. of Perennial Channels (Miles)	Proposed Decommiss-ioning– Roads Within 100 Ft. of Intermittent Channels (Miles)	Proposed-Decommiss-ioning– Ephemeral Draws and Uplands (Miles)
Hog	0.1	8.3	0	0	0	0
Jack	7.1	3.6	.8	.0	.7	2.1
Keller	0	6.7	0	0	0	0
Snow	4.7	4.6	1.2	.1	.7	1.8
Total	11.9	23.2	2.0	0.1	1.4	3.9

Table WS-16: Alternative 4 - Fish-bearing and Perennial Stream Crossings (number)

Sub-watershed	Fish-bearing			Perennial		
	Existing Condition	Proposed Decommissioning	Post-Activity	Existing Condition	Proposed Decommissioning	Post-Activity
Hog	0	N/A	N/A	0	N/A	N/A
Jack	1	1	0	3	1	2
Keller	0	N/A	N/A	1	0	1
Snow	7	2	5	6	3	3
Total	8	3	5	10	4	6

Table WS-17: Alternative 4 - Intermittent Stream and Ephemeral Draw Crossings (number)

Sub-watershed	Intermittent			Ephemeral		
	Existing Condition	Proposed Decommissioning	Post-Activity	Existing Condition	Proposed Decommissioning	Post-Activity
Hog	0	N/A	N/A	6	0	6
Jack	15	6	9	13	3	10
Keller	0	N/A	N/A	4	0	4
Snow	9	4	5	23	5	18
Total	24	10	14	46	8	38

Table WS-18: Alternative 4 - Open and Closed Road Miles and Road Density by Subwatershed. (Includes Private and Public Ownership)

Subwatershed	Open Roads (Miles)	Closed Roads (Miles)	Open + Closed Roads (Miles)	Decommissioned Roads (Miles)	Road Density (Mi/ Mi^{2})
Hog	35.93	18.96	54.89	0.2	5.78
Jack	38.13	4.13	42.26	7.1	2.66
Keller	23.08	21.32	44.4	0.0	3.79
Snow	22.26	7.23	29.49	5.0	2.92
Total	119.4	51.64	171.04	12.3	

WEPP modeling indicated that the sediment yield under typical 5 year and greater runoff events would be similar to the No Action Alternative due to the lack of skid trails. Again this value is not substantially different from the harvest alternatives due to the variation associated with both sediment sampling and sediment modeling and to the implementation of BMPs.

General Water Quality – Chemical Pollutants

Effects of chemical pollutants are discussed in the Fisheries Section

Clean Water Act Section 303(d) List of Water Quality Limited Waterbodies

No changes to the Section 303(d) List of Water Quality Limited Waterbodies would be made under this alternative. Effects on 303(d) listed streams (e.g. Snow Creek) would be reduced compared to the other action alternatives and compared to treatments on other streams in the project area. A culvert on the 2400203 road would not be removed and about 0.8 mi. of the 2400133 would not be decommissioned, reducing beneficial effects on Snow Creek compared to the other action alternatives.

Recognizing that a WQRP will be required for the Silvies Sub-basin in 2007, the Flagtail IDT has identified the elements of a WQRP incorporated into the Flagtail Fire Recovery Project under the NEPA process in Appendix L.

Summary

Alternative 4 includes less ground- disturbing activity than the other action alternatives but because of the uncertainty associated with sediment modeling and measures and the implementation of BMPs, the difference between Alternative 4 and the other action alternatives is not measurable. Under Alternative 4 fewer roads would be treated, for either maintenance or decommissioning; consequently the primary source of sedimentation in the project area would not be controlled as much as under the other action alternatives. The number and miles of roads and crossings that would be decommissioned in Snow Creek (on the 303(d) list) would be reduced, resulting in less rehabilitation in this drainage. The difference between alternatives would probably not be measurable for 20-30 years at a minimum due to the length of the recovery period.

Cumulative Effects

General Water Quality

Cumulative effects of activities described in Appendix J are similar to those described for the No Action Alternative.

The cumulative effects are similar to those for Alternatives 2, 3 and 5. Improvements in stream temperature and sediment would be reduced slightly because of fewer road rehabilitation activities along Snow Creek and no road maintenance. The overall effect of the activities proposed under these alternatives and of on-going and foreseeable activities would be improved water quality due to the reduction of sediment reaching streams and the gradual recovery of shade over 7-40 years. These beneficial cumulative effects would be passed downstream as described for Alternatives 2, 3 and 5.

Placement of coarse woody material would be similar as for the other alternatives. Material not trapped by the wood would be exported downstream as described in the fisheries section.

Clean Water Act Section 303(d) List of Water Quality Limited Waterbodies

EDIT Since there are no direct or indirect effects on the listed stream from these alternatives, there would be no cumulative effects on Snow Creek. Similarly there would be no cumulative effects on the lower 20 miles of the Silvies River. There would be no cumulative effects on Scotty Creek because it does not drain the project area and because there are no direct or indirect effects from this alternative. As described for General Water Quality, Appendix J was reviewed. Similarly, planting conifers and riparian hardwoods and placing coarse woody material in Snow Creek would maintain or reduce stream temperatures over various periods of time. Felling hazard trees in RHCAs would not have a measurable effect on stream temperature due to the small amount of shade removed. The effects of re-initiation of grazing would be similar to those before the fire as the same standards and guidelines, which allow for gradual recovery of riparian vegetation in degraded areas, would apply; grazing would not be expected to have measurable effects on stream temperature for two, somewhat opposing reasons. First utilization of shade-providing vegetation is limited. Second, although riparian vegetation recovery is expected under the current standards and guidelines, it may be slow and correlated changes in temperature would be difficult to measure against the natural variation of stream temperatures.

Comparison of Alternatives

The similarity/differences of the alternatives on watershed effects has already been discussed in previous sections. These discussions form the basis for this summary. According to WEPP modeling of harvest activities, almost no differences are seen among the five alternatives when the less than five year or most probable (80%) runoff events are considered for year 2004. (The larger of these events would be expected to yield zero to trace or small amounts of sediment from the steepest slopes in the Flagtail area.) When five year events are considered, while WEPP displays calculable differences between alternatives, these differences are not considered statistically or observably different (USDA Forest Service, undated, “Forest Service Policy…”). The difference among alternatives is the time window during which the area would be most vulnerable to five year and larger events, considering both harvest and roading. Due to time constraints no WEPP modeling was conducted for years beyond 2004. In order to identify windows of vulnerability, alternatives were rated based on timing and persistency of vulnerability to increased sediment yields from either harvest activities or roading. These ratings are included in the Watershed Specialist’s Report.

When only harvest and fuel treatment activities are considered in establishing this window of vulnerability, Alternatives 1 and, to a lesser extent, Alternative 4 clearly are vulnerable for a shorter period of time because ground cover recovery is not delayed as it is in the alternatives that include harvest. Alternative 4 includes grapple piling which is expected to have very small (2%) decrease in ground cover during year of operation, which then recovers (see Soils Section) in less than three years. However, following harvest, ground cover continues to recover in the harvest alternatives, decreasing vulnerability to five year and larger storms over time until the vulnerability is about the same as for Alternatives 1 and 4 about seven years after the fire (five years after the harvest activities). Because ground cover on skid trails would still be recovering five and six years after the fire (three to four years after harvest) under Alternatives 2, 3, and 5 compared to Alternatives 1 and 4 in which ground cover would be approaching pre-fire conditions, the window of vulnerability for the alternatives which include harvest would be longer.

However, when consideration of roading is included in the evaluation, Alternatives 1 and 4 leave streams in more vulnerable condition than do the other three alternatives after about three years. This elevated vulnerability would last as long as the roads are present on the landscape. Under Alternative 1 the elevated vulnerability due to roading is located throughout the area because no road treatments of any kind are proposed. Under Alternative 4 the increased vulnerability is limited in space to Snow Creek; however, the magnitude of the vulnerability to this creek is relatively large as Alternative 4 leaves a road (0.8 mi.) that is a known sediment source in place as well as a crossing that is undersized and is placed on a locally long, shallow fill. Also, reconstruction of another sediment source, a failing culvert fill, on Snow Creek would not be implemented.

Thus, under Alternatives 2, 3, and 5, the Flagtail area is most vulnerable to five year and larger events following harvest and until sometime between post-fire years four and seven when the adverse effects of delayed ground cover recovery are countered by the beneficial effects of road maintenance, reconstruction, and decommissioning. Conversely, under Alternative 1, the vulnerability to five year and larger storms is less than under the harvest alternatives until between post-fire years four and seven. After this point of balance, under Alternative 1, the effects of the roads are not countered by a lack of disturbance. Under Alternative 4 this point of comparison is slightly different and more complex to describe due to the proposed fuel treatments and lack of harvest and due to a reduction in proposed road treatments. Under Alternative 4 the Flagtail area is most vulnerable to five year and larger events following fuels treatment and until sometime between post-fire years four and six when the adverse effects of delayed recovery of a very small amount of ground cover (2%) are countered by the beneficial effects of road decommissioning. However, since fewer roads and crossings are decommissioned, this effect is reduced relative to the harvest alternatives after post-fire year six because the road segment along and crossing of Snow Creek would remain on the road system, untreated, and a known sediment source at another crossing of Snow Creek (culvert fill failure) would not be controlled by reconstruction. In addition, most of the remaining open and closed roads would not have been maintained and their condition would be the same as the existing condition (see Transportation and Watershed Sediment Existing Conditions).

While the discussion above considers the most compressed schedule for implementation of proposed activities, the trend would be maintained if activities were implemented over more years. Implementing activities over a longer time would result in a shift in the "balance point" between the effects of harvest/fuel activities and road activities approximately proportional to the extension in time.

There are no measurable differences in effects among Alternatives on 303(d) listed streams – either on Snow Creek, listed for temperature, in the project area; on other listed segments in the Upper Silvies Watershed (Scotty Creek, also listed for temperature) because its confluence with the Silvies is downstream of the confluences of all the project streams); or on the downstream listed segment of the Silvies River (listed for temperature and dissolved oxygen) which is below (outside) the boundary for watershed cumulative effects.

As the WEPP modeling showed, the vulnerability of the Flagtail area to greater than five year runoff events, remained elevated about eleven-fold two years after the fire. As discussed in the Fire section, fuel treatment activities proposed under the various alternatives vary in their effects on future catastrophic fire with future catastrophic fire expected to be progressively more intense under Alternative 2, Alternative 5, Alternative 3, Alternative 4, and the No Action Alternative. Similarly the likelihood of having a fire with a risk of sedimentation less than, similar to, or greater than that for the Flagtail Fire for five year and greater events follows a similar progression. The difference in effects of future potentially catastrophic fires under the most probably runoff events was not modeled. However, since the model is sensitive to the amount of ground cover lost, which would be higher with more intense fire, it is expected that either the magnitude of post-fire runoff following a five year or greater event would increase or a smaller, more likely event would result in sedimentation that could be calculated or both. These changes would be in proportion to the intensity and size of the fire.

Consistency With Direction and Regulations

The five alternatives are consistent with the Clean Water Act and other applicable laws and the Forest Plan as amended because they would not measurably increase watershed effects over natural, post-fire levels. The action alternatives also provide two different levels of road reconstruction and decommissioning, either of which would move watershed function toward desired future conditions.

The FEIS is consistent with the "Forest Service and Bureau of Land Management Protocol for Addressing Clean Water Act Section 303(d) Listed Waters." In addition to the Protocol, the May 2002 Memorandum of Understanding Between USDA Forest Service and Oregon Department of Environmental Quality to Meet State and Federal Water Quality Rules and Regulations states "WQRP's (Water Quality Restoration Plans) should be completed where management activities have the potential to affect impaired waters 303(d) listed and a TMDL is not yet in place (p. 6). For this project the protocol and decision framework were not initiated because the project would not measurably affect the parameter (summer temperature) for which Snow Creek is listed and, therefore, a WQRP is not needed for this project.Similarly, the project would not affect the three parameters for which the lower Silvies River (river miles 0-20) is listed (Water Quality Section). This determination is also based on the application of INFISH RHCAs and site specific BMPs (see Chapter 2 – Mitigation). Also the implementation of the Protocol requires a collaborative approach with the State and Tribes with the Forest Service assisting in the development of a TMDL. The TMDL for the Silvies sub-basin is scheduled for 2007 (Oregon, 2004b).. Following this timeline and using a collaborative approach, the Forest will undertake the development and implementation of a WQRP for the Silvies sub-basin in order to provide the specific actions needed for the Forest to meet TMDL requirements. Thus, the FEIS is consistent with the direction and regulations of the Clean Water Act and 303(d) listed streams. Recognizing that the Forest would be developing a WQRP in support of the State scheduled TMDL, the components of a WQRP were identified and incorporated into the Flagtail Fire Recovery Project in Appendix L.

The proposed alternatives would have no impact on floodplains or wetlands as described in Executive Orders 11988 and 11990. Wetlands that meet the Jurisdictional Definition (Corps of Engineers) are found in the Flagtail Burn Area. These areas will be avoided during activities as described in the Mitigation and mapped as determinations are made.

Irreversible and Irretrievable Commitments of Resources

There are no irretrievable or irreversible watershed effects under any of the Alternatives.

Fisheries

Introduction

This report lists species and status of fish present in the Flagtail Fire Project Area as well as existing conditions for fish and fish habitat. This report builds on conclusions from soils and watershed analyses and determines direct, indirect and cumulative effects on fish habitat and populations.

The major limiting factors listed in the Upper Silvies WA (2001) that are degrading fish habitat quality and thereby fish populations in the Flagtail project area were excessive summer water temperatures, high sediment loads, widened channels, lack of quality pool habitat, and lack of fish habitat connectivity at all stream flows. Responses to recommendations from the Upper Silvies WA to improve these conditions are discussed in direct/indirect effects section where activities associated with this project would modify existing conditions or in cumulative effects if other projects will modify aquatic conditions.

Regulatory Framework

Riparian habitats are areas of land directly affected by water that exhibit either visible vegetation or physical characteristics reflecting an influence from the water. The Malheur National Forest originally designated these areas under the land allocation of Management Area (MA) 3A. The Forest Service's Inland Native Fish Strategy (Inland Native Fish Strategy, 1995) for the Intermountain, Northern, and Pacific Northwest Regions directed the Malheur National Forest to apply Riparian Habitat Conservation Areas (RHCAs). The project area is located at the northern end of the Great Basin with no connection to the ocean and hence contains no anadromous fish and is therefore not under the direction from Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (1995b), which is also known as PACFISH. RHCAs are portions of watersheds where riparian-dependent resources receive primary emphasis, and management activities are subject to specific standards and guidelines. RHCAs are further differentiated by the following categories: Fish-bearing streams, or Category 1; perennial streams, or Category 2; and intermittent channels, or Category 4. Table FI-1 below lists miles of stream channel by Category.

Table FI-1: Miles of Stream Channels by Category

Area	Category 1	Category 2	Category 4
Total Miles in Flagtail Fire Area	6.6	4.2	9.5
Total Miles in Subwatersheds	35.9	29.9	61.3
Percent of Channel in Fire Area	18.4%	14.0%	15.5%

INFISH replaced Regional Forester's Eastside Forest Plans Amendment #2 to establish default buffers on RHCAs around all streams, wetlands, water bodies, and landslide prone areas on the Forest (USDA 1995a: A-4 to A-6). The INFISH Decision Notice was further clarified with a *Decision Notice Correction for the Inland Native Fish Strategy* that stated "…it appeared that it might not be clear that the selected alternative **does** replace the interim direction established May 20, 1994 by Region 6 Regional Forester John E. Lowe in the *Decision Notice for the Continuation of Interim Management Direction Establishing Riparian, Ecosystem, and Wildlife Standards for Timber Sales."* The default values for non priority watersheds (those not containing bull trout) were used for this project and Table FI-2 summarizes the buffer widths that would apply throughout the project area. There are about 820 acres of MA 3A in the project area.

Table FI-2: INFISH RHCA Buffer Widths

Type of RHCA	RHCA Width (Feet)
Fish-bearing stream reaches	300
Permanently flowing, non-fish stream reaches	150
Seasonally flowing or intermittent stream reaches	50
Ponds, lakes, or wetlands > 1 acre	150
Ponds, lakes, or wetlands < 1 acre	100
Landslide prone areas	100

Amendment #29 of the Malheur National Forest Plan (1994) established additional Forest-wide fisheries standards for Management Area 3A, non-anadromous riparian areas. These Riparian Management Objectives (RMOs) included habitat elements of sediment/substrate, water quality, channel morphology and riparian vegetation to be managed within their natural ranges of variability. Amendment #29 set specific Desired Future Conditions (DFCs) for these habitat elements. These RMOs are listed on pages A-2 to A-4 in the INFISH Decision Notice (USDA 1995a). A copy of the INFISH Decision Notice is available in the Project File.

There are 13 Forest-wide fisheries standards in the INFISH Decision Notice listed on pages A-6 to A-13 (USDA 1995a) that apply to this project. These include: RF-2(b-f), RF-3(a-c), RF-4, RF-5, FM-1, FM-4, RA-2, RA-3, RA-4, RA-5, and WR-1. The other INFISH standards are outside the scope of this project. Refer to pages A-6 to A-13 in the INFISH Decision Notice (USDA 1995a) for the description of these standards.

There are two INFISH standards that apply to culverts in the burned drainages: RF-4 and RF-5 (USDA 1995a). Standard RF-4 states, "construct new and improve existing, culverts, bridges, and other stream crossings to accommodate a 100 year flood…where those improvements would/do pose a substantial risk to riparian conditions". INFISH standard RF-5 states, "provide and maintain fish passage at all road crossings of existing and potential fish-bearing streams."

Analysis Methods

The analysis area consists of the four subwatersheds, Hog Creek, Jack Creek, Keller Creek and Snow Creek. Information was compiled from the Upper Silvies Watershed Analysis (2001), stream survey reports and data (pre-fire), as well as field surveys conducted after the 2002 Flagtail fire. Region 6 Level II stream and riparian habitat surveys were conducted on the Silvies River, Snow Creek, Jack Creek and tributaries between 1994 and 1996. This information is compared with standards and guidelines from the Malheur National Forest

Land and Resource Management Plan (1990) including amendment 29 to determine relative "health" or condition of the riparian areas, streams and the effects to fish and fish habitat. Existing stream channel conditions were compared to expected conditions to provide fish habitat based on geomorphology characteristics of hill slopes, valley bottom width/gradient, substrate parent materials and riparian vegetation communities.

This section builds on conclusions from soils and watershed analyses to determine direct, indirect and cumulative effects on fish habitat and populations. The low gradient landscape both within and downstream of the project area would limit potential for observable cumulative effects to the confluence of the Silvies River and Keller Creek from the north side and Jack Creek at the forest boundary from the east side.

Direct, indirect and cumulative effects of all alternatives are disclosed for Sensitive Species (USDA 2000) and Management Indicator Species. A Biological Evaluation (Appendix G) was prepared for Sensitive Species as directed by the Malheur National Forest Plan (USDA 1990) as amended.

AQUATIC SPECIES

Management Indicator Species, Threatened, Endangered and Sensitive Species

Management Indicator Species (MIS) are species of vertebrates and invertebrates whose population changes are believed to best indicate the effects of land management activities. Through the MIS concept, the total number of species found within a project area is reduced to a subset of species that collectively represent habitats, species and associated management concerns. The MIS are used to assess the maintenance of populations (the ability of a population to sustain itself naturally) and biological diversity (which includes genetic diversity, species diversity, and habitat diversity), and to assess effects on species in public demand.

An endangered species is an animal or plant species listed under the Endangered Species Act that is in danger of extinction throughout all or a significant portion of its range. A threatened species is an animal or plant species listed under the Endangered Species Act that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. A sensitive species is an animal or plant species identified by the Forest Service Regional Forester for which species viability is a concern either a) because of significant current or predicted downward trend in population numbers or density, or b) because of significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

The Malheur Forest Plan directs analyses to focus on MIS species or Sensitive Species. The only MIS occurring in the project area or downstream is redband trout (*Oncorhynchus mykiss gairdneri*). Both redband trout and Malheur mottled sculpin (*Cottus bendirei*) are on the Region 6 Sensitive Species List (USDA 2000). There are no Threatened or Endangered fish species in project area streams or in the Silvies River Subbasin, which is an inland fishery, so consultation with National Oceanic and Atmospheric (NOAA) Fisheries or United States Fish and Wildlife Service (USFWS) was not necessary.

Existing Condition

Historical Perspective on Fish Occurrence – The following narrative on fish occurrence and species presence was taken from the Upper Silvies Watershed Analysis (2001). The Flagtail Project Area is a non-anadromous, inland fishery watershed, and it supports Great Basin redband trout and Malheur mottled sculpin. Other species may be found in the Upper Silvies River. District stream classifications and inventory database categories recognize all fish species in terms of occupancy and riparian habitat conservation areas (RHCA) designations. However, management attention is more focused on Management Indicator Species (MIS) or listed Threatened, Endangered, and Sensitive (TES) species and their affected habitats.

Redband trout have been confirmed and documented in the Silvies River, Snow Creek, and Jack Creek in the burn area from Region 6 Hankin and Reeves, Level II surveys (1994-1996). The map (Figure 16, Map Section) of fish bearing streams (Category 1) shows where redband trout exist in the project area. Malheur mottled sculpin have been confirmed and documented by Forest Service or Oregon Department of Fish and Wildlife surveys as occupying the Silvies River in the burn area. The presence of Malheur mottled sculpin has been documented as far back as the 1955 Bison genetic studies as well as during ODFW population sampling conducted in 1978-1979, yet most survey notes usually document them as generic sculpin.

Grazing practices and numbers between 1870 and 1930, coupled with the removal of beaver led to the majority of changes in riparian plant communities and channel morphology of the Silvies River (Upper Silvies WA 2001). Livestock grazing removed vegetation, damaged banks causing downcutting and stream channel widening. Logging, railroad and road building also modified the Silvies River, tributaries and associated riparian areas by removing trees and down wood in riparian areas and draw bottoms as well as disturbing valley bottoms to create the transportation systems. This resulted in downcutting and straightening of the stream channels.

GREAT BASIN REDBAND TROUT

Native trout found in the internal basins of Oregon are redband trout derived from the Columbia River system. Redband trout are on the Region 6 Sensitive Species List. Malheur Lake Basin is the largest of the Oregon desert basins and contains the greatest amount of trout habitat. The Silvies River is one of six sub-basins feeding into the lake. Basin fish fauna show little difference from the Columbia River fauna, suggesting a rather broad and geologically recent connection between Malheur Lake and Malheur River; which flows east into the Snake River system.

It is not known if pure native trout populations exist in the Malheur basin (Behnke 1992). Hatchery introduction has occurred across the basin in years past and native redband face constant hazards in the high desert environment. However, the Flagtail Project Area's climatic extremes of high summer temperatures and low flow conditions frequently produce oxygen depletion in the water. Malheur redband are a genotypic sub-species adapted to these unstable, harsh, environments and because they are more adapted to variable water conditions, they probably have resisted hybridization with hatchery fish. Observations in the Silvies watershed have verified this adaptive nature by finding redband in some very marginal waters with high temperatures late in the summer. They tend to be small in size and are better suited for the microhabitats being maintained by base flows of less the 0.3 cfs. Hatchery rainbows would not be able to tolerate the harsh water conditions. Populations are likely diminished due to simplification of habitat, sediment input and high summer temperatures compared to natural conditions. Spawning occurs in the spring generally from April through May.

MALHEUR MOTTLED SCULPIN

The Upper Silvies WA (2001) states that the Malheur mottled sculpin (*Cottus bendirei*) was originally collected in Rattlesnake Creek in Harney County with other similar samples found the Lower Silvies River with studies conducted in 1963 and 1971. Malheur mottled sculpin are on the Region 6 Sensitive Species List.

At the local watershed level, this analysis simply recognizes 2 sub-forms of *Cottus bairdi* in the Silvies River. The Scotty Creek samples (1997) just south of the project area and perhaps the rest of the watershed favor *bendirei* while the lower Silvies River samples (1955-1968) favored *hubbsi*. Mottled sculpin require water temperatures below 79°F with high dissolved oxygen and low turbidity. They are found in streams with moderate to rapid current and are associated with rubble, gravel, or rocky bottoms. They seldom are found in silted areas. Malheur mottled sculpin are sensitive to changes in water quality including increases in water temperature and sediment. Populations are likely diminished due to simplification of habitat, sediment input and high summer temperatures compared to natural conditions. Population trends are stable in this subbasin. Spawning occurs in the spring generally from February through May. They were thought to be serious predators of trout eggs and fry, but results of studies on their food habits have revealed that few trout eggs or fry are actually eaten. Mottled sculpins are much more important as forage for trout.

Habitat and Biological Surveys of Streams in the Fire Area

Stream surveys were conducted on the fish-bearing streams impacted by the Flagtail fire (2002), namely the Silvies River, Snow Creek, Keller Creek and Jack Creek between 1994 and 1996 (see Figure 16, Map Section). These surveys followed the Region 6 Level 2 protocol based on the Hankin Reeves basinwide stream survey methodology. Additional information listed in this report was gathered and analyzed after the Flagtail Fire.

Water temperature is a key factor affecting growth and survival of all aquatic organisms. Spring spawning temperatures are not an issue but excessive rearing temperatures are a problem in the project area. The State of Oregon sets the upper limit of 64^{o} Fahrenheit for salmonids. Native redband are better adapted to variable Eastside temperature fluctuations, but any prolonged exposure to temperatures at or above 77^{o} Fahrenheit is lethal. Passage barriers (culverts) can reduce the ability of fish to move to cold water refugia that can sustain populations of sensitive fish (Furniss et al. 1991). Cool water habitats in the Silvies River should be provided by deep pools, cold water side channel, riffle or pool habitats with ground water inflow, or side tributary channels feeding in colder water to the River. Tributaries to the Silvies River provide cold water from headwaters and spring/seep sources. Increased temperatures also impact fish by reducing the prey base of aquatic insects and reducing the dissolved oxygen. This can lead to disease and mortality.

The following narrative gives results of stream surveys, compares data with MNF LRMP standards, which are consistent with INFISH RMOs, and then describes effects on fish and fish habitat. Table FI-3 summarizes existing conditions and LRMP standards.

Table FI-3: Level 2 Stream Survey Results and LRMP Standards

Stream Name and Survey Reach	Existing LWD♠ Per Mile	LRMP Standard (LWD Per Mile)	Existing Pools/Mi.	LRMP Standard Pools/Mi.	Existing Bank Stability	LRMP Standard Bank Stability
Silvies River R1	5.7	20-70	59	75-132	90	80%
Silvies River R2	0.6	20-70	65	75-132	79	80%
Silvies River R3	0.0	20-70	16	75-132	99	80%
Jack Cr. R3	3.2	20-70	39	151-264	100	80%
Jack Cr. R4	8.7	20-70	55	151-264	99	80%
Snow Cr. R1	5	20-70	78	75-132	96	80%
Snow Cr. R2	15	20-70	86	75-132	97	80%

♠ LWD includes both large and medium woody debris which is effective in smaller streams

Silvies River—The Silvies River is very important for fish due to its large size compared to other streams in the project area and its location in a wide, low gradient valley bottom. It has the greatest potential to provide spawning and rearing habitat for fish. Unfortunately, it is also the most impaired stream in the project area because of the effects of past land management activities conducted without Best Management Practices (BMPs) and the stream channel is highly sensitive to further impacts based on Rosgen stream classification (1996). The stream downcut and gullied in the past, disconnecting the floodplain and lowering the water table. The channel is in an intermediate stage of recovery but not at the final point of evolution. A large portion of the Upper Silvies drainage is open landscape with only meadow vegetation or dry terrace sagebrush and bunch grass ground cover. Sedges and rushes are present along most streambanks. However, some point bars are still not vegetated. Bank cover from riparian shrubs remains marginal in most areas. Channels are fully exposed to solar heating, evapotranspiration, and slow moving base flows, which contributes to higher water temperatures down through the system.

The upper reaches, approximately 6 miles, of the Silvies River are on MNF land; the remainder (downstream) is on private land. A Level 2 stream survey was conducted in 1994. Redband trout, Malheur mottled sculpin and speckled dace were identified during the survey. The Silvies River mainly provides winter rearing and some spawning habitat for redband trout. Malheur mottled sculpin use the Silvies River for summer/winter rearing and spawning habitat. While there are redband trout and Malheur mottled sculpin in the Silvies River during base flows, numbers are reduced from natural levels due to high water temperatures.

Reaches 1 through 3, encompassing 4.1 miles, are within the Flagtail Fire boundary (Figure 16, Map Section). All reaches failed the LRMP standard for pools per mile, but survey information ranged from 52% to 79% pools (by stream area). Superficially, this gives the appearance that the Silvies River has a great abundance of pool habitat. However, pool quality is poor overall. There is some deep pool habitat, but many pools have only slightly greater depth than riffles and the main difference was slower water movement. A large portion of the pool area is part of the tailout with shallow water depths and functions more like a glide or run. The Silvies River is deficient in LWD and failed LRMP standards on all reaches, even when large and coarse wood, which both influence streams of this size, were included in totals. Historically in the stringer meadows on the Silvies River, LWD would have been comprised of aggregates of hardwood shrubs/trees, beaver dams, and some conifers where forested areas abut the meadow or moved from upstream during high flows.

Stream channel classification (Rosgen 1996) was currently B5c and B6c with entrenchment levels characteristic of an F channel type based on Stream channel cross sections completed in 2002. Small substrate in the channel bed and banks is expected due to the parent materials available in the low gradient valley bottom of the Silvies River. The small substrate (sand) and moderate entrenchment (disconnection from the floodplain) make this stream sensitive to sediment and flow modifications.

Bankfull widths and width to depth ratios increased as the survey progressed upstream; bankfull widths normally get smaller as there is less water above tributaries, higher in the drainage. Average bankfull width went from 7.7 to 9.9 to 15 feet in Reaches 1 through 3, respectively. The lack of LWD and continued disturbance limiting establishment of deep-rooted riparian vegetation (both herbaceous and shrubs) were likely the cause of bankfull width measurements being higher than expected in this stream. Rock weirs created in the 1980s further widened the channel in Reach 3. Post fire surveys noted areas where cattle had caused extensive bank damage and heavy utilization of riparian herbaceous and woody vegetation.

Channels with high bankfull width to depth ratios without shade or undercut banks commonly allow the sun to elevate stream temperatures above that optimum for salmonid summer rearing. High width to depth ratios can also limit winter rearing by allowing streams to freeze. High width to depth ratios in smaller streams can severely limit habitat available for fish at base flows due to inadequate depth as well as high water temperatures.

The small substrate of the channel bed and resultant lack of spaces between gravel or cobble, where juvenile fish spend the winter, reduce the quality of this habitat. Lack of shade, undercut banks and cover reduces fish habitat quality, particularly during base flow periods. Redband trout move into smaller tributary streams during the summer to access cooler water during base flow periods. Low LWD component reduces availability of high quality pools, sorting of gravel to create spawning habitat, and increases channel instability and sediment transport, all of which impact fish habitat and populations.

Temperatures in the Upper Silvies River (at the Bear Valley work center) in 1996 reached 64^{o}F or higher starting June 29 and ending August 31, with 61 days exceeding rearing standards based on an average seven day, maximum high. The maximum reading was 72^{o}F that year. In 2000, water temperatures in the Upper Silvies River exceeded 64^{o}F for 70 days between June 19 and August 28, based on an average seven-day, maximum high. The maximum reading was 75.2^{o}F that year.

Overall, the Silvies River provides poor habitat for redband trout and Malheur mottled sculpin compared to expected conditions for the natural range of variability.

Snow Creek—A Level 2 survey was completed on Snow Creek in 1996 for 2.3 miles to the upper limit of fish distribution (Figure 16, Map Section). Redband trout and speckled dace were identified during the survey. Snow Creek is valuable summer rearing habitat for fish. Summer water temperatures are substantially lower in this stream than in the Silvies River, into which it flows. The small size of the stream limits usefulness for winter rearing as the stream may freeze every year. In fact, biological sampling showed fish distribution and population density changed drastically between summer and winter.

Average bankfull width was 6.2 feet in Reach 1. The stream had some floodplain available and was moderately sinuous overall (Rosgen B5 channel) with channel and bank substrate composed of sand. There were some segments where the valley bottom widened (Rosgen C5b and a segment of E5 channel) to create small meadows and other short segments where the valley bottom became more narrow and steeper (Rosgen A channel type). This stream failed to meet minimum LRMP standards for large and medium wood frequencies. The survey noted large quantities of silt, even in pool tailouts and riffles and noted many pools lacked depth necessary for good habitat. It also noted areas where ungulate browsing had reduced shade provided by alder and caused bank trampling. Post fire surveys in 2002 also noted areas where cattle had caused bank damage and heavy utilization of riparian herbaceous vegetation.

Riparian vegetation ranges from sedges and rushes in meadow areas to dense woody shrubs and forbs to conifer overstory with grasses, rushes, sedges, and a small number of shrubs in the riparian area.

In 2000, water temperatures in Snow Creek at Road 24 exceeded 64 for 12 days between July 1 and August 28, based on an average seven-day, maximum high. The maximum reading was 77.8^{o}F that year. However, Snow Creek temperatures were an average of 8 degrees lower than the Upper Silvies River during the same period of peak temperatures.

Overall, Snow Creek provides fair habitat for redband trout compared to expected conditions for the natural range of variability.

Jack Creek—A Level 2 stream survey was conducted in 1996 for 3.1 miles to the upper limit of fish distribution. Almost 1 mile of Reach 4 is within the Flagtail fire area (Figure 16, Map Section). Redband trout and speckled dace were identified in Jack Creek. The headwaters of Jack Creek likely function as summer rearing habitat as stream temperatures warm up downstream. Average bankfull width of Reach 4 in the fire area was 3.2 feet. The small size of the stream limits usefulness for winter rearing as the stream likely freezes for several months every year. The stream channel was moderately sinuous and composed of silt or sand substrate with some floodplain available (Rosgen B6) inside the fire area. Downstream, Jack Creek has braided channel sections (Rosgen D4/6) in a large, wet meadow, just downstream of the fire area until the valley bottom narrows resulting in similar channel characteristics (Rosgen B6/B4) as those inside the fire area. Minimum LRMP standards for large and coarse wood as well as pool frequencies were not met in Jack Creek.

Field crews reported several large pools created by beaver dams in Jack Creek immediately downstream of the fire area. It is not known if these dams are presently active. There is an active headcut, over 7 feet deep in places, in survey Reach 1, downstream of the fire perimeter. Jack Creek may be diverted through an irrigation ditch on private land and flow into Scotty Creek so impacts from the fire could be transported to Scotty Creek on private land.

In 2000, water temperatures in Jack Creek at the Forest Boundary exceeded 64^{o}F for 48 days based on an average seven-day maximum high between June 19 and August 8, when the stream channel became dry at the hydrothermograph. The stream continued to flow upstream in the Flagtail Fire area. Maximum temperature recorded was 78.5°F that year.

Overall, Jack Creek provides fair habitat for redband trout compared to expected conditions for the natural range of variability.

Swamp Creek—This is a perennial, non-fish bearing stream in the Keller Creek subwatershed. There are redband trout approximately ¼ mile downstream of the fire area, where Swamp Creek flows into Hay Creek (Figure 16, Map Section). There is no information on channel conditions in the project area as surveys stopped when fish presence ended. Only ¼ mile of the stream is within the project area.

Hog Creek—No portions of fish bearing, perennial or intermittent stream channels to Hog Creek are located in the fire area. The fire boundary is 0.3-0.5 miles from live water. The small percentage of the subwatershed burned and distance from streams make channel conditions irrelevant in this stream.

Macroinvertebrates

Macroinvertebrate populations in degraded watersheds are more susceptible to effects of fire due to the cumulative effects of past actions (Minshall 2003 in press). Recovery of ecosystems from the impacts of wildfire is likely slower where natural processes are already impaired. Surveys listed in the Upper Silvies WA (2001) noted a majority of stream insect species tolerant of high temperature and sediment loading. This is supporting evidence of the disturbed riparian and stream conditions of project area streams.

Fire Impacts on Stream Elements and Fish

Effects to streams and fish from the fire are limited to direct heating of the water during the fire, and indirect effects such as increase in summer water temperature from removal of shade provided by the conifer overstory prior to the fire, increases in sediment from removing ground vegetation in riparian areas, and increases in large or coarse woody debris as snags fall into streams.

The Soils and Watershed sections describe the effects from the fire or suppression and rehabilitation activities on aquatic processes. The following paragraphs build on those sections to describe the effects on fish and fish habitat.

Snow Creek Subwatershed—The Snow Creek subwatershed includes Snow Creek and a segment of the Silvies River (from the forest boundary upstream to just above the confluence with Snow Creek). A large portion of the subwatershed was burned (Figure 6, Map Section). However, only ½ mile of Snow Creek had high intensity fire along the stream banks, killing all conifer overstory and much of the hardwood vegetation understory. There was much lower mortality of herbaceous vegetation. Consumption of riparian vegetation may reduce bank stability with high stream flows. Downed woody of the riparian area and some in the stream channel was consumed. The majority of the fish-bearing portion of this stream had fire of varying intensities within 25-30 feet of the stream. This caused mortality of conifers that previously provided shade to the stream. These snags may provide woody debris to the riparian area and stream in the future. Direct effects of the fire were likely limited to Snow Creek, which burned with high intensity on a portion of the riparian area and raised stream temperatures to lethal levels. This likely resulted in direct mortality of fish in that segment of stream and potentially downstream to the confluence with the Silvies River. However, neither the BAER team nor other personnel conducting field reconnaissance during and after the fire observed dead fish.

Fire along the Silvies River occurred mainly on the forested hillsides down to the riparian meadows in the valley bottom. Fire did not directly impact the streambanks. Fire came to within 10 feet of the south side of the stream in some locations. This caused mortality of conifers that had provided shade but may provide LWD to the riparian area and stream in the future.

Jack Creek Subwatershed—Fire burned to the outer fringes of the true riparian zone of Jack Creek for less than 500 feet, but did not destroy any vegetation within 20 feet of the streambanks (Figure 6, Map Section). This caused mortality of conifers that had provided shade but may provide LWD to the riparian area and stream in the future.

Keller Creek Subwatershed—Swamp Creek, a perennial non fish-bearing stream had fire come to within 30 feet of the stream, ¼ mile above the confluence with Hay Creek, a fish-bearing stream (Figure 6, Map Section). The majority of fire burned in uplands, near the subwatershed boundary, which would have minimal impacts to below measurable amounts in the channels in the subwatershed.

Hog Creek Subwatershed—Hog Creek and the headwaters of the Silvies River lie within this subwatershed. Fire burned for approximately 0.2 miles outside of the riparian zone along the Silvies River (Figure 6, Map Section). The majority of fire burned in uplands, near the subwatershed boundary, which would have no effects on the Silvies River.

Fire Suppression

The MNF adheres to Minimum Impact Suppression Tactics (MIST) to minimize impacts or potential for impacts from fire suppression efforts including erosion/sediment, noxious weed introduction or spread, chemical contamination, etc. while maintaining firefighter safety. Resource Advisors were on the ground during fire suppression activities in 2002 and worked with fire planning and logistics to determine appropriate suppression actions that minimized potential for impacts to natural resources as per MIST guidelines. No retardant was used near streams. Resource Advisors also determined rehabilitative measures necessary after fire suppression activities were completed.

Additional post-fire monitoring was conducted in July 2003 after the DEIS was published. The monitoring further documented effects of the fire, suppression and rehabilitation as well as recovery. The hydrologist and fishery biologist did not identify any sources of erosion, sedimentation or chemical contamination impacting fish or fish habitat caused by the fire, suppression or rehabilitation activities. Monitoring of the specific locations of concern listed on page 199 in the Flagtail DEIS revealed no erosion or other hydrologic impacts. No evidence of additional sediment, excessive flows or channel modification was observed in fish-bearing streams in the fire area or downstream in the Silvies River or Jack Creek.

Hazard Tree Management

Hazard trees, both commercial and submerchantable-sized, were felled along roadsides and the interior of the fire during fire suppression and mop-up activities for fire-fighter safety.

The portion of the tree in the road prism was cut and moved out of the road prism, but left onsite. The remainder of the tree outside the road prism was not moved.

Commercial-sized hazard trees were felled as part of the Flagtail Roadside Hazard Tree CE. Trees outside of RHCAs or in the outer portions of RHCAs were felled and removed as a commercial product. Trees in the inner portions of RHCAs, within 66 feet of perennial or fish-bearing streams, were felled and the portion of the tree in the road prism removed; the remainder was left onsite.

Hazard tree management activities during and after the fire did not impact fish or fish habitat because trees determined to be a hazard were only a fraction of those in the fire area and many were left onsite after being felled. Trees felled and left onsite remained to capture any sediment moving down the hillslope. Additionally, those trees removed as a commercial product were harvested with equipment on the road to minimize ground disturbance (see Watershed section).

Roads

Forest roads can degrade fish habitat and isolate portions of streams from fish (Furniss et al. 1991). Roads degrade fish habitat by contributing sediment to the stream, increasing stream width to depth ratios through bank damage, decreasing the shade component through hazard tree removal, brushing out for safe sight distance, firewood cutting, and/or by further impacting fish numbers by facilitating angler access. Roads also increase the drainage network, decreasing the time it takes for water to reach stream channels, thereby increasing peak and near peak flows and reducing base flows. Road crossings can impact fish if culverts plug and the road fails which contributes sediment directly to the channel and by creating barriers to passage to some life stage at some flow level. Most fish passage barriers at high flows are created when culverts are too small or too steep which creates high water velocities that prevent fish from moving upstream. Passage barriers at low flows are commonly created when culvert outlets are over 8-inches from the level of the stream or when the culvert provides too little water depth for fish to swim.

The Upper Silvies WA (2001) recommended reducing roads and road impacts within RHCAs as well as identifying/correcting fish passage barrier problems. Roads in the project area that travel along riparian areas, specifically within 100 feet of streams or that intersect streams tend to impact the aquatic resource more than roads located in uplands. Table FI-4 lists miles of road that likely impact streams due to proximity. Open and closed roads impact hydrology and sedimentation. Closing roads to access may reduce sediment caused by rilling from wheel ruts but closed roads are monitored less frequently and commonly receive less maintenance. Mass failures and landslides are rare in this landscape in the current climate regime. Some rilling and gullying does occur where road drainage is not adequate for the site and where road maintenance has not been kept current. The majority of roads are located on Malheur National Forest land (Figure 9, Map Section).

Stronghold populations of salmonids are associated with higher-elevation forested lands and the proportion declines with increasing road densities (Quigley et al. 1996). The higher the road density, the lower the proportion of subwatersheds that support strong populations of key salmonids. Specifically, the Quigley document shows a strong correlation with road densities of 2 miles/mile^2 or higher and reduction of strong populations of salmonids. Further reductions of strong salmonid populations were identified at densities of 3 and 4 miles/mile^2 or greater. Currently, all subwatersheds have road densities over 3.0 miles/mile^2. The table below lists road densities of subwatersheds in the project area.

Table FI-4: Road Information

	Project Area			Entire Subwatershed (Public & Private)			
Subwatershed (SWS)	Total Road Miles	Road Miles within 100 ft. of Cat. 1-4 Channels	Stream Crossings on Roads	Total Road Miles	Road Miles within 100 ft. of Cat. 1-4 Channels	Stream Crossings on Roads	Total Road Density Mi/ Mi^2
Hog*	1.2	0.1	0	55.0	8.3	73	5.8
Jack	23.0	2.9	19	49.3	5.1	50	3.1
Keller	2.4	0.1	1	44.4	6.7	73	3.8
Snow*	25.0	5.9	22	35.1	7.4	36	3.5
Total	51.6	9.1	42	183.8	27.5	232	NA

*Not true subwatersheds; Snow Creek and Hog Creek SWS include the Silvies River

Snow Creek—The crossing with Road 24 is currently a barrier to fish passage at low flows due to an 8-inch jump height. This is likely a partial barrier to upstream migration when fish are seeking out colder water for summer rearing and is documented in the Roads Analysis. Road 2400133 has drainage problems on the lower portion near its connection with Road 24. This causes water to concentrate and saturate the road surface and is a direct sediment source to Snow Creek from the road prism and at an undersized culvert, which is a barrier to fish passage at high flows. Road 2400133 south of the connection with 2400203 has rilling evident for several hundred feet as the road is the low point of the topography and actively funnels water. This is a direct sediment source to Snow Creek. Road 2400203 crosses about 300 feet upstream of the fish bearing portion of Snow Creek. This crossing contributes chronic sediment to Snow Creek and could input even greater amounts of sediment if the culvert became plugged. The road through fill disconnects the wetland above the road and reduces water storage capacity as reported in the Watershed section. Water storage is important for fish because the release of water late in the summer increases base flows and reduces water temperature. Road 2400205, currently closed and recovering, crosses Snow Creek using a 34-foot long log culvert that is in poor condition. The collapse of this structure would be a sediment source and barrier to fish movement or migration.

Jack Creek—Road 2400095 and 2400196 are low standard, native surface, valley bottom roads going through a wet meadow and crossing perennial and intermittent channels that flow into Jack Creek. The roads are compacting soils, modifying subsurface water movement and causing bank damage on the channels. There is a plugged log culvert on Road 2400095, which is causing water to run down the road surface for 100 yards and then into Jack Creek.

The culvert just downstream from the fire area on Forest Road 24 has a 6-inch jump height from the culvert outlet to the water surface during low flow conditions. This is likely a partial barrier to upstream migration when fish are seeking out colder water for summer rearing.

Hog Creek—There are approximately 0.3 miles of road within the Flagtail Burn area in this subwatershed. The roads are located high on the slope in the subwatershed and do not impact stream channels, fish habitat or fish.

Keller Creek— There are few roads within the Flagtail Burn in this subwatershed. Only about 0.3 miles of road are located within RHCAs and no problems have been identified. The rest of roads are located high on the slope in the subwatershed and are not impacting stream channels, fish habitat or fish populations.

Environmental Consequences

Direct and Indirect Effects

Effects Common to All Alternatives

Sediment from hillslopes in the Project Area

The Water Erosion Prediction Program (WEPP) was used to predict sediment transport to streams from various runoff events. Sediment transport decreases with time after ground disturbing activities such as fire (see Soils and Watershed sections). For this analysis Year 2 after the fire (2004) was used to compare all alternatives. Pre-fire sediment rates were 0.01 tons/acre. Post-fire runoff rates, modeled for Year 2, ranged from 0.01-0.4 tons/acre depending on slope and fire severity. Management activities increased rates by 0.04-0.07 tons/acre for tractor logging (depending on mitigation measures), 0.02 tons/acre for skyline, while helicopter activities did not increase sediment transport rates.

WEPP was used to predict sediment transport for high probability runoff events, which were considered to be less than 5-year events. WEPP modeling (see Soils and Watershed sections) determined that no measurable levels of sediment would reach fish-bearing streams from all alternatives. The project hydrologist and fishery biologist conducted field monitoring in 2003, in which only high probability runoff events occurred, and found no sediment movement on hillslopes in the project area which supports the findings of the WEPP model.

WEPP was also used to predict sediment transport for low probability runoff events, which were determined to be 5-year or greater events. The WEPP model predicted a potential 11 to 15-fold increase in sediment transported from units into fish-bearing streams when analyzing alternatives. While the increase in sediment reaching streams differs by alternative (see Table FI-5, see Soils and Watershed sections), the effects to fish and fish habitat are the same. This is because fish habitat would be modified from the over 1100% increase in baseline sediment transported to streams (as a result of consumption by fire of ground vegetation) compared to pre-fire levels. The additional increases in sedimentation associated with harvest/fuels treatments would not have any further observable effect on fish or fish habitat.

Table FI-5. Sediment Increase Compared to Pre- and Post-Fire Conditions from a Low Probability Runoff Event

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Compared to Pre-fire Baseline*	1100%	1500%	1300%	1100%	1400%
Compared to Post-fire Existing Condition	0%	33%	15%	0%	28%

*Percentages rounded to hundreds

It is difficult to predict the effects on fish and fish habitat of an episodic or pulse event of this magnitude after a fire. Increases in sediment loads to streams can reduce the quality and quantity of fish habitat (Meehan 1991). However, Rieman and Clayton (1997) state that pulse disturbances from fires or floods may be necessary to maintain or create high quality fish habitat. Furthermore, redband trout and Malheur mottled sculpin have evolved with these events and are resilient to these pulse disturbances.

Overall, pool habitat quantity and quality may be reduced and stream channel width to depth ratios increased as well as spawning habitat reduced in quality and quantity in the project area. Channel degradation or "downcutting" could also occur which could disconnect floodplains from Snow Creek or Jack Creek or further disconnect the floodplain in the Silvies River. These changes would result in reductions in populations of redband trout and Malheur mottled sculpin for all alternatives. Conversely, a sediment pulse from a 5 year or greater runoff event may create more pool habitat by backing up against in-channel LWD, build point bars and stream banks and aggrade the stream elevation in the Silvies River causing it to reconnect to the floodplain. These changes would result in improved habitat and increased populations of redband trout and Malheur mottled sculpin for all alternatives.

A runoff large event could also kill fish in streams by degrading water quality with high amounts of sediment. Debris torrents are unlikely in the fire area due to the low gradient landscape. A large, pulse event could kill all fish in the streams of the project area. However, there are fish outside the fire area that would likely move into Snow Creek, Jack Creek and the portion of the Silvies River in the fire area. Furthermore, pulse sediment events tend to be highly localized, and thus would not likely have the same effect to all streams or even the entire length of one stream (Rieman and Clayton 1997).

In summary, a 5-year or greater runoff event would have the same effects, whether positive or negative, on fish and fish habitat from any alternative because the magnitude of sediment transported to streams as a result of the fire. There would be no effects to fish and fish habitat from sediment in all alternatives from a 5-year or less runoff event.

Alternative 1

Vegetation and Roads

Current post-fire existing conditions would remain. No timber harvest would occur. There are not effects expected for fish or fish habitat in Keller Creek and Hog Creek because the effects of the fire are too small in scale and too far from stream channels. Effects of high and low probability runoff events are listed in the Effects Common to All Alternatives in the Fisheries section and sediment transport discussion in the Watershed section. Other effects of this alternative include continued vegetation succession without harvest or thinning activities resulting in the continued buildup of fuels. Future fuel loading in excess of the historic range of variability would occur on 4765 acres (see Figure 17 in Map section for spatial distribution, see Fuels section of FEIS for further details). Untreated, post-fire fuel loadings would prohibit the use of fire as a management tool in later management actions to move the landscape and RHCAs toward the desired condition for vegetation and plant communities in the project area. This could again lead to fuel loading which caused the high fire severity as it related to vegetation in upland areas in the Flagtail fire area. This could potentially impact fish habitat and populations of redband trout and Malheur mottled sculpin.

This alternative would leave the road system as it is. No road mitigation improvement, relocation or decommissioning projects would occur with this alternative. Roads closed under CFR and opened for fire suppression activities would be closed. All open roads within the riparian areas would continue to be left open. Road densities and road miles within RHCAs would remain at current levels listed in Table FI-4. No impacts such as sediment from road reconstruction or decommission would occur with this alternative. Road maintenance activities such as re-grading roads, cleaning plugged culverts and blocked ditchlines would be a benefit by maximizing dispersion of water and minimizing sediment transport; these activities would continue at regularly scheduled intervals. At current and expected future funding levels, this would not allow accomplishment of all maintenance needed. This alternative would do little to address concerns and recommendations listed in the Upper Silvies WA (2001) regarding current negative impacts of roads on aquatic habitat.

Roads in the project area that travel near streams or cross streams commonly impact fish and fish habitat more than roads located in uplands. Table FI-4 lists miles of road that likely impact streams due to proximity (100 feet or less). Mass failures and landslides are rare in the current climate regime. Some roadbed saturation leading to rilling and gullying does occur where road drainage is not adequate for the site.

Stronghold populations of salmonids are associated with higher-elevation forested lands and the proportion declines with increasing road densities (Quigley et al. 1996). The higher the road density, the lower the proportion of subwatersheds that support strong populations of key salmonids. Specifically, the Quigley document shows a strong correlation with road densities of 2 miles/mile^2 or higher and reduction of strong populations of salmonids. Further reductions of strong salmonid populations were identified at densities of 3 miles/mile^2 and 4 miles/mile^2 or greater.

Road densities would remain at or above 3 miles/mile^2 in all subwatersheds and miles within 100 feet of Category 1-4 channels would remain high (Table FI-4). Roads with drainage problems listed in the Existing Condition would continue to be chronic sediment sources, or press disturbances, to project area streams and would continue to maintain degraded fish habitat and reduced fish populations.

In summary, increased fuel loading could lead to high severity fire in the future. Stream sedimentation caused by roads would continue to be a problem so stream attributes such as pool riffle ratios, pool to pool spacing and lack of quality deep pool habitat would remain out of balance from those expected for the analysis area streams thereby continuing to impact fish populations. This would likely maintain degraded conditions of fish habitat and reduced populations of redband trout and Malheur mottled sculpin.

Alternative 2

Harvest & Fuels Treatments

One purpose and need of the proposed action is to promote healthy and appropriate upland vegetation characteristic of historical plant communities. Harvest, fuel reduction, and reforestation efforts would move the vegetation and fuel loading toward historical levels. This would allow fire in the landscape to maintain vegetation while minimizing potential to negatively impact fish and fish habitat in project area streams.

Forest management activities can affect water yield, sediment and channel structure thereby modifying fish habitat and populations (Chamberlin et al 1991). Increases in sediment yield beyond a stream's ability to transport the material can decrease the amount and quality of instream habitat available to fish. Increases in water yield can also modify fish habitat by destabilizing banks and modifying channel dimensions. Harvest would only include dead and dying trees and therefore not affect water yield or peak flows (see Watershed section for details). Harvest and fuels treatments are not expected to create or transport sediment outside of the harvest unit or cause erosion problems due to limited sediment transport capabilities in the landscape associated with high-probability runoff events. The effects of a low-probability runoff event would be the same as the existing condition due to the majority of sediment coming from effects of the fire (see Effects Common to All Alternatives in the Fisheries section and sediment transport discussion in the Watershed section). Subsoiling skid trails and landings would decompact soils, improving site productivity for vegetation, improving infiltration rates, and reducing potential for sediment transport or erosion. Mitigation measures and BMPs listed in Chapter 2 are highly effective to reduce the potential for drainage network increase, which is the primary erosion/sedimentation process in this landscape (see the Soils and Watershed sections for further details). The use of INFISH buffers on Category 1-4 stream channels as well as creation of buffers and designated skid trail crossings on ephemeral draws would protect streams and fish.

Harvest and fuels treatments would reduce fuel loading from excess of the historic range of variability on 4245 acres; fuel loading would remain in excess of the historic range of variability on 520 acres (see Figure 18 in Map section for spatial distribution, see Fuels section of FEIS for further details). Areas with fuel loading in excess of the historic range of variability reduce the ability to use prescribed burning as a management tool in uplands and riparian areas in future management actions to move toward desired conditions and could lead to high severity wildfire. This could potentially impact fish habitat and populations of redband trout and Malheur mottled sculpin.

All hazard trees in RHCAs or those less than 8-inches DBH outside RHCAs would be available to trap sediment moving on hillslopes until/unless removed for use in RHCA CE projects. Hazard trees in the visual corridor of County Road 63 could be used for RHCA CE projects and would be reduced to levels commensurate with LRMP standards for visuals. Adequate amounts of downed trees would be retained to ensure sediment is not transported to fish-bearing streams. There would be no effects to fish or fish habitat.

Roads

Road management activities would include relocation, maintenance, and decommission of existing roads (Figure 10, Map Section). This alternative includes construction and subsequent decommission of 3.9 miles of temporary road (Figure 10, Map Section).

Road maintenance activities (approximately 60 miles total) are not expected to impact fish or fish habitat with the use of BMPs and mitigation measures and would have long-term benefits by improving drainage, reducing road failure potential at stream crossings and reducing chronic sediment input to streams.

Road construction (0.3 miles) associated with relocation is not expected to cause impacts to fish or fish habitat but is a benefit by removing (decommissioning) roads impacting Snow Creek and putting them higher in the landscape while keeping the road system connected. This is in accordance with direction from INFISH guideline RF-3 (b) to avoid adverse effects on inland native fish by prioritizing road relocation out of RHCAs. Construction and decommission of temporary roads is not expected to have any effect on fish or fish habitat due to their location outside RHCAs (most on or near ridgetops) on low gradient slopes.

The use of roads for log haul or other activities is not expected to impact fish or fish habitat due to mitigation measures and road improvement activities listed below. The Malheur National Forest has a policy (with direction from INFISH RF-2) to regulate traffic during wet periods to minimize erosion and sediment delivery. This includes log haul as well as any other vehicle traffic. Road maintenance/reconstruction activities would be implemented to bring roads up to appropriate standards to minimize sedimentation and maximize water dispersion before hauling would occur. Log haul traffic would be directed to improved roads (see Figure 24 for locations) and maintenance activities would be completed after haul to keep the road in an appropriate condition to minimize sediment and meet riparian management objectives. Mitigation measures such as dust abatement (mainly for safety concerns), hauling on dry or frozen ground, and ceasing haul activities during muddy conditions are highly effect to minimize sediment input to streams.

An essential part of the proposed action alternative is to decommission roads impacting riparian areas and streams in valley bottoms and to relocate transportation systems higher on the landscape where impacts would be minimized. Activities in this alternative respond to recommendations in the Upper Silvies WA (2001) to reduce roads and road impacts within RHCAs and identify/correct fish passage barrier problems. Some existing roads would be decommissioned after use for harvest/haul as part of this project (Figure 10, Map Section, Table FI-6). Some sediment may be transported to streams at the time of project implementation. There is the potential to impact individual fish when road management activities occur, particularly culvert replacement or removals. Greater impacts to individual fish during implementation and benefits to fish habitat and populations after implementation would be obtained by removing road/stream crossings or roads within 100 feet of streams, where roads are more likely to impact riparian areas and streams (see Watershed section).

Diesel, helicopter fuel, gas, hydraulic fluid, and oil lubricant are the main chemicals that would be found within the project area. All of these items have the potential to impact fish if allowed to enter project area streams. Only road management activities such as maintenance, reconstruction, decommission and culvert replacement would occur within RHCAs where chemical contamination of fish habitat is possible. Most of the work would employ the use of machinery and trucks to dig or pick up, as well as, move in or remove rock and soil material. Chemical contamination is possible but is not expected because Malheur National Forest safety measures, considered highly effective, would be followed relative to the use, storage, and handling of petroleum products.

Road densities would remain elevated but would drop below 3 miles/mile^2 in Snow and Jack Creek subwatersheds. Roads within 100 feet of Category 1-4 channels would be reduced by over 4 miles total (see Table FI-5). This is a 47% reduction from the existing condition within the project area. These roads contribute the majority of sediment from the existing transportation system to streams. Stream sedimentation caused by roads would be reduced, potentially increasing pool riffle ratios, while decreasing pool to pool spacing and width to depth ratios compared to current conditions. This would result in stream parameters moving toward attainment of LRMP standards and INFISH RMOs in the project area.

Table FI-6: Alt 2 ATM Conditions Post-Implementation

	Project Area				Entire Subwatershed (Public & Private)			
Subwatershed (SWS)	**Decommission Miles**	**Total Road Miles**	**Road Miles within 100 ft. of Cat. 1-4 Channels**	**Stream Crossings on Roads**	**Total Road Miles**	**Road Miles within 100 ft. of Cat. 1-4 Channels**	**Stream Crossings on Roads**	**Total Road Density Mi/ Mi^2**
Hog*	0.1	1.1	0.1	0	54.9	8.3	73	5.8
Jack	7.1	16.3	1.4	11	42.3	3.6	41	2.7
Keller	0	2.4	0.1	1	44.4	6.7	73	3.8
Snow*	5.9	19.7	3.2	12	29.5	4.6	25	2.9
Total	13.1	39.5	4.8	24	171.1	23.2	212	NA

*Not true subwatersheds; Snow Creek and Hog Creek SWS include portions of the Silvies River

The impacts from sediment during implementation and the potential to impact individual fish listed above would be far outweighed by short and long-term benefits of removing chronic sediment sources, or press disturbances, improving shade and lowering risk of road/stream crossing failures thereby improving fish habitat and populations of redband and Malheur mottled sculpin in the project area.

Snow Creek Subwatershed—The drainage/saturation problems on the lower portion of Road 2400133 would be improved by rocking the surface and placement of additional relief drainage structures, replacement of a culvert at a crossing with Snow Creek, and decommission of one segment of road near Snow Creek. The replacement of the culvert on Road 2400133 would also improve fish habitat connectivity.

Road 2400133 south of the connection with 2400203 would be decommissioned and woody debris would be placed on the surface to stop rilling, which is contributing sediment to Snow Creek. The 34-foot long log culvert on Road 2400205 at Snow Creek would be removed during low flow conditions when this road is decommissioned. The stream banks and floodplain would be rehabilitated to mimic those upstream and downstream. Road 2400203 at the crossing with Snow Creek would be decommissioned to reduce chronic sediment from the road and the potential for sedimentation caused by road failure if the culvert became plugged with sediment and debris. The stream banks and floodplain would be rehabilitated to mimic those upstream and downstream. The decommission of a portion of Road 2400203 from its present location along Snow Creek and relocation to outside of the RHCA connecting with Road 2400078 would reduce sediment impacts to Snow Creek.

Temporary roads would be built high in the subwatershed outside of RHCAs, would remain for 1-2 years until harvest activities were completed, and would then be decommissioned. No impacts to fish or fish habitat would occur with these activities because of their distance from streams, the low gradient landscape and mitigation measures.

Jack Creek Subwatershed —Road 2400095 and 2400196 would be decommissioned under this alternative. There would be no observable impacts from decommission activities associated with blocking access at the beginning and end of roads. The removal of one partially plugged log culvert during low flow or dry conditions may input some sediment to Jack Creek at the time of implementation. Placement in the stream channel of sedges and other herbaceous vegetation disturbed during removal of the log culvert and banks will minimize sediment impacts to Jack Creek from this tributary. Benefits of decommissioning the roads and removal of the log culvert would include reduction of compaction, erosion and sediment input to Jack Creek.

Keller Creek Subwatershed—Temporary roads would be built along the subwatershed boundary between Keller Creek and Snow Creek, would remain for 1-2 years until harvest activities were completed and then be decommissioned. Only a small portion of this subwatershed is in the project area. No impacts to fish or fish habitat would occur with these activities because mitigation measures, low gradient landscape and distance from streams.

Hog Creek Subwatershed—Roads in the project area are high on the slope in the subwatershed and therefore unlikely to impact fish or fish habitat because of distances to stream channels. Only a small portion of this subwatershed is in the project area. No impacts to fish or fish habitat would occur with these activities because mitigation measures, low gradient landscape and distance from streams.

Combined Effects of Road, Harvest and Fuels Treatments

Potential impacts would be mitigated through implementation of BMPs, use of INFISH buffers and mitigation measures on ephemeral draws, all of which are highly effective. In summary, there would be no effects expected on fish habitat, individuals or populations of redband trout or Malheur mottled sculpin from sediment from harvest/fuels management compared to post-fire existing conditions. Temporary road construction/decommission would not have any effect on streams or fish due to low impact design, location outside RHCAs (most on or near ridge tops) and the low gradient topography. Road maintenance activities would not impact fish or modify habitat with implementation of BMPs and mitigation measures, which are highly effective. Road decommission and culvert replacement activities have the greatest potential for short-term localized impacts to individual fish from sediment during implementation. Chemical contamination from road management activities is possible but unlikely due to mitigation measures. Benefits to fish habitat and populations of redband trout and Malheur mottled sculpin would occur after year 2 with the removal of passage barriers and the reduction of chronic sediment input to project area streams.

Alternative 3

Harvest and Fuels Treatments

Immediate sediment effects to fish and fish habitat from fire, harvest and fuels treatments are the same for all alternatives (see Effects Common to All Alternatives at the beginning of the Environmental Consequences section for fisheries). Harvest and fuels treatments would reduce fuel loading from excess of the historic range of variability on 2342 acres; fuel loading would remain in excess of the historic range of variability on 2423 acres (see Figure 19 in Map section for spatial distribution, see Fuels section of FEIS for further details). Areas with fuel loading in excess of the historic range of variability reduce the ability to use prescribed burning as a management tool in uplands and riparian areas in future management actions to move toward desired conditions and could lead to high severity wildfire. This could potentially impact fish habitat and populations of redband trout and Malheur mottled sculpin.

All hazard trees in RHCAs or those less than 8-inches DBH outside RHCAs would be available to trap sediment moving on hillslopes until/unless removed for use in RHCA CE projects. Hazard trees in the visual corridor of County Road 63 could be used for RHCA CE projects and would be reduced to levels commensurate with LRMP standards for visuals. Adequate amounts of downed trees would be retained to ensure sediment is not transported to fish-bearing streams. There would be no effects to fish or fish habitat.

Roads

Activities in this alternative respond to recommendations in the Upper Silvies WA (2001) to reduce roads and road impacts within RHCAs and identify/correct fish passage barrier problems. Road management activities are the same as in Alternative 2 except 2.9 miles of temporary road would be built (Figure 11, Map Section, Table FI-6). Since temporary road construction or decommission would not impact fish or fish habitat, the direct and indirect effects of road activities are expected to be the same as alternative 2.

Combined Effects of Road, Harvest and Fuels Treatments

No effects to individual fish, fish habitat or populations of redband trout or Malheur mottled sculpin are expected from harvest or fuels treatment activities with implementation of BMPs, INFISH buffers and mitigation measures on ephemeral draws, all of which are highly effective. However, lower harvest levels would result in future fuel loading in excess of the historic range of variability on 2423 acres and therefore greater potential for high severity wildfire which could reduce quality and quantity of fish habitat and thereby reduce populations of redband trout and Malheur mottled sculpin.

Direct and indirect effects are the same as those listed in Alternative 2 because road management activities would have the same potential impacts to individual fish during implementation and benefits to fish habitat and populations of redband trout and Malheur mottled sculpin into the future with the reduction in chronic sedimentation.

Alternative 4

Harvest and Fuels Treatments

No commercial harvest would occur under alternative 4. Only fuels treatments would be completed under this alternative. Some units that would have used skyline or helicopter logging systems under alternative 2 or 3 would have submerchantable materials felled, then hand piled and burned. Some units that used tractor logging systems under alternative 2 or 3 would have submerchantable materials felled, grapple piled and burned. The use of INFISH RHCAs on Category 1-4 stream channels, considered highly effective, would protect streams and fish. Fuels treatments are not expected to have effects to fish or fish habitat. Fuels treatments are not expected to create or transport sediment outside of the harvest unit or cause erosion problems due to limited sediment transport capabilities in the landscape associated with high-probability runoff events. The effects of a low-probability runoff event would be the same as the existing condition due to the majority of sediment coming from effects of the fire (see Effects Common to All Alternatives in the Fisheries section and sediment transport discussion in the Watershed section).

Fuels treatments would reduce fuel loading from excess of the historic range of variability on 405 acres; fuel loading would remain in excess of the historic range of variability on 4360 acres (see Figure 20 in Map section for spatial distribution, see Fuels section of FEIS for further details). Areas with fuel loading in excess of the historic range of variability reduce the ability to use prescribed burning as a management tool in uplands and riparian areas in future management actions to move toward desired conditions and could lead to high severity wildfire. This could potentially impact fish habitat and populations of redband trout and Malheur mottled sculpin.

All hazard trees would be available to trap sediment moving on hillslopes until/unless removed for use in RHCA CE projects. Hazard trees in the visual corridor of County Road 63 could be used for RHCA CE projects and would be reduced to levels commensurate with LRMP standards for visuals. Adequate amounts of downed trees would be retained to ensure sediment is not transported to fish-bearing streams. There would be no effects to fish or fish habitat.

Roads

The use of roads for activities associated with this alternative is not expected to impact fish or fish habitat due to mitigation measures listed in Chapter 2 and road improvement activities listed in Alternative 2.

An essential part of this action alternative is to decommission roads in valley bottoms impacting riparian areas and streams. Activities in this alternative respond to recommendations in the Upper Silvies WA (2001) to reduce roads and road impacts within RHCAs. Some existing roads would be decommissioned after use for access for fuels treatment as part of this project. Some sediment may be transported to streams at the time of project implementation. There is the potential to impact individual fish when road management activities occur, particularly culvert replacement or removals. Greater impacts to individual fish and benefits to fish populations would be obtained by removing road/stream crossings or roads within 100 feet of streams where roads are more likely to impact riparian areas and streams (see Watershed section).

Road management activities would be similar to the other action alternatives except that no relocation, reconstruction or temporary road construction/decommission would occur (Figure 12 Map Section and Table FI-7). Another difference from the other action alternatives is that road maintenance activities, which would be a benefit by maximizing dispersion of water and minimizing sediment transport, would only continue at regularly scheduled intervals. At current and expected future funding levels, this would not allow accomplishment of all maintenance needed and result in sediment continuing to impact fish habitat in project area streams.

Decommission activities on Roads 2400133 and 2400205 associated with road relocation in the riparian areas of Snow Creek would not occur with this alternative. Reduced decommission activities and no reconstruction actions would reduce potential impacts from sediment to individuals during implementation. It would also reduce benefits at year 2 and after to fish habitat and populations from reduction of sediment contribution and addition to late season flows.

Road densities would remain elevated but would drop below 3 miles/mile^2 in Jack Creek and would drop to 3 miles/mile^2 in Snow Creek subwatershed. This alternative would reduce roads within 100 feet of Category 1-4 channels by 3.5 miles total (see Table FI-6). This is a 37% reduction from the existing condition within the project area. Roads in close proximity to streams or channels contribute the majority of sediment from the transportation system to streams. Road activities to correct drainage problems listed in the Existing Condition are listed in Alternative 2 by subwatershed with the exception of a segment of Road 2400133 would not be reconstructed (and the culvert not replaced) and segments of Roads 2400133 and 2400134 which would not be decommissioned with this alternative. Stream sedimentation caused by roads would be reduced, potentially increasing pool riffle ratios, while decreasing pool to pool spacing and width to depth ratios compared to current conditions. This would result in stream parameters moving toward attainment of LRMP standards or INFISH RMOs in the project area.

Table FI-7: Alt 4 ATM After Implementation

	Project Area				Entire Subwatershed (Public & Private)			
Subwatershed (SWS)	**Decommission Miles**	**Total Road Miles**	**Road Miles within 100 ft. of Cat. 1-4 Channels**	**Stream Crossings on Roads**	**Total Road Miles**	**Road Miles within 100 ft. of Cat. 1-4 Channels**	**Stream Crossings on Roads**	**Total Road Density Mi/ Mi^2**
Hog*	0.1	1.1	0.1	0	54.9	8.3	73	5.8
Jack	7.1	16.3	1.4	11	42.3	3.6	41	2.7
Keller	0	2.4	0.1	1	44.4	6.7	73	3.8
Snow*	4.7	20.5	4.0	13	30.4	5.4	26	3.0
Total	11.9	40.3	5.6	25	172	24.0	213	NA

*Not true subwatersheds; Snow Creek and Hog Creek SWS include portions of the Silvies River

Chemical contamination is possible but is not expected because Malheur National Forest safety measures, considered highly effective, would be followed relative to the use, storage, and handling of petroleum products.

The potential to impact individual fish from road management activities would be far outweighed by benefits to fish habitat and populations of removing chronic sediment sources, improving shade and lowering risk of road/stream crossing failures thereby improving fish habitat and populations of redband trout and Malheur mottled sculpin in the project area.

Combined Effects of Road and Fuels Treatments

There are no effects expected on fish habitat or populations from increases in water yield and sediment compared to existing conditions from the fuels management activities with implementation of BMPs and INFISH RHCAs, all of which are highly effective. However, there would be future fuel loading in excess of the historic range of variation on 4360 with only fuels treatments (no harvest) and therefore greater potential for high severity wildfire, which could reduce quality and quantity of fish habitat and thereby reduce populations of redband trout and Malheur mottled sculpin.

Road management activities have the greatest potential for localized impacts to individuals from sediment during implementation and benefits to fish habitat and populations of redband trout and Malheur mottled sculpin after implementation with the reduction of chronic sedimentation. Alternative 4 would reduce roads within 100 feet of Category 1-4 streams by 37% and remove 17 road/stream crossings. This would benefit fish and fish habitat with a reduction of chronic sedimentation of streams.

Alternative 5

Harvest and Fuels Treatments

Immediate sediment effects to fish and fish habitat from fire, harvest and fuels treatments are the same for all alternatives (see Effects Common to All Alternatives at the beginning of the Environmental Consequences section for fisheries). Harvest and fuels treatments would reduce fuel loading from excess of the historic range of variability on 2707 acres; fuel loading would remain in excess of the historic range of variability on 2058 acres (see Figure 21 in Map section for spatial distribution, see Fuels section of FEIS for further details). Areas with fuel loading in excess of the historic range of variability reduce the ability to use prescribed burning as a management tool in uplands and riparian areas in future management actions to move toward desired conditions and could lead to high severity wildfire. This could potentially impact fish habitat and populations of redband trout and Malheur mottled sculpin.

All hazard trees in RHCAs or those less than 8-inches DBH outside RHCAs would be available to trap sediment moving on hillslopes until/unless removed for use in RHCA CE projects. Hazard trees in the visual corridor of County Road 63 could be used for RHCA CE projects and would be reduced to levels commensurate with LRMP standards for visuals. Adequate amounts of downed trees would be retained to ensure sediment is not transported to fish-bearing streams. There would be no effects to fish or fish habitat.

Roads

Activities in this alternative respond to recommendations in the Upper Silvies WA (2001) to reduce roads and road impacts within RHCAs and identify/correct fish passage barrier problems. Road management activities are the same as in alternative 2 except 3.3 miles of temporary road would be built (Figure 13, Map Section, Table FI-6). Since temporary road construction or decommission would not impact fish or fish habitat, the direct and indirect effects of road activities are expected to be the same as alternative 2.

Combined Effects of Road, Harvest and Fuels Treatments

No effects to individual fish, fish habitat or populations of redband trout or Malheur mottled sculpin are expected from harvest or fuels treatment activities with implementation of BMPs, INFISH buffers and mitigation measures on ephemeral draws, all of which are highly effective. However, lower harvest levels would result in future fuel loading in excess of the historic range of variability on 2058 acres and therefore greater potential for high severity wildfire which could reduce quality and quantity of fish habitat and thereby reduce populations of redband trout and Malheur mottled sculpin.

Direct and indirect effects are the same as those listed in Alternative 2 because road management activities would have the same potential impacts to individual fish during implementation and benefits to fish habitat and populations of redband trout and Malheur mottled sculpin into the future with the reduction in chronic sedimentation.

Cumulative Effects

The past, present and foreseeable future actions listed in the Flagtail FEIS Appendix J were analyzed in conjunction with direct and indirect effects of project activities to determine cumulative effects on fish and fish habitat in project area streams and downstream in the Silvies River and Jack Creek. Effects of the fire and past actions were described in the existing condition portion of the Fisheries Section.

Alternative 1

Legacy impacts from roads, harvest and grazing activities conducted without BMPs on private and public land have reduced fish habitat quality and complexity in project area streams and downstream in the Silvies River and Jack Creek. Riparian vegetation has been reduced and width to depth ratios are high resulting in excessive summer rearing temperatures. This has reduced fish populations of redband trout in the Silvies River, Jack Creek and Snow Creek and Malheur mottled sculpin in the Silvies River compared to natural conditions.

On private land downstream of the project area, road-building, logging of fire-killed trees and thinning of live trees occurred between fall 2002 and spring 2003. Harvest and fuel treatment activities are expected reduce future fuel loading and the potential for wildfire starting on private land that could impact fish and fish habitat both in and downstream of the Flagtail Fire area. The extent of road-building activities on private land or the effects are unknown but are not expected to impact the Flagtail Fire area upstream.

Sediment transported through the existing road and associated drainage system would continue sediment delivery to streams which would maintain degraded conditions of stream channels and fish populations.

All hazard trees remaining in the project area would be available to trap sediment moving on hillslopes until/unless removed for use in RHCA CE projects. Adequate amounts of downed trees would be retained to ensure sediment is not transported to fish-bearing streams. Minimum standards for instream LWD (MNF LRMP Amendment 29) would be met before removing trees from RHCAs. There would be no effects to fish or fish habitat. Hazard tree activities planned in the Hog Subwatershed upstream of the fire area are expected to have a positive effect on fish habitat because hazard trees in RHCAs would be used to meet instream LWD standards (MNF LRMP Amendment 29) in Hog Creek. Hazard trees in RHCAs in excess of those needed for instream LWD may be removed.

Large and coarse woody levels are expected to rise as a result of natural recruitment as snags (fire-killed trees) fall in the fire area. Coarse wood placement completed under a CE in 2003 on 1.5 miles of the Silvies River and several ephemeral draws in the project area and more planned for 2004 will increase down wood levels in streams and draws immediately upon implementation. This will meet minimum LRMP standards and INFISH RMOS for LWD frequencies in fish-bearing streams when fully implemented. Coarse wood placed downstream of the outlets of culverts on Road 24 at Jack Creek and Snow Creek (planned for 2004) will reduce jump height and therefore improve habitat connectivity at low flows. Other activities completed under CEs in 2003 and ongoing in 2004 include streamside riparian hardwood planting (in Snow Creek, Jack Creek and the Silvies River) and conifer planting in upland portions of RHCAs which will provide wood to streams and channels in the future (5-7 years for shrubs and 20+ years for conifers) as single pieces or aggregates. Woody material will capture sediment in all channels including low probability, high runoff events. In Category 1 streams woody material would sort gravels improving spawning substrate, create and maintain pools and improve channel width to depth ratios to better maintain stream temperatures in project area streams and downstream in the Silvies River system.

Water temperatures during base flows would be elevated compared to pre-fire levels because conifers killed by the fire previously provided shade. Water temperatures would then decrease potentially to lower than pre-fire conditions as riparian shrubs from natural recruitment and those planted under CEs provide shade to better maintain stream temperatures within 7-10 years. Shrubs would begin to improve channel width to depth ratios by root strength within 3-5 years in project area streams and downstream in the Silvies River system. Riparian hardwoods also provide habitat and food for macroinvertebrates after 4-5 years that could then be food for fish.

No grazing on pastures in the fire area for a minimum of 2 growing seasons would reduce cumulative effects of wild and domestic ungulate browsing and grazing pressure to allow hardwoods to re-establish and herbaceous vegetation to recover in riparian areas. The effects would be similar and additive to hardwood planting and protection. Some uncontrolled cattle grazing occurred in summer/fall 2003 but no measurable effects to riparian habitat or stream channels were observed. Re-initiation of grazing by domestic livestock within Forest Plan and Interagency Interdisciplinary Team (IIT) standards would not retard attainment of Riparian Management Objectives (RMOs) in project area streams.

A fuels reduction project may occur inside RHCAs where dead, submerchantable trees under 8-inch DBH would be felled, then handpiled and burned outside of riparian areas. This would have no impact to hydrology and sediment but would potentially reduce severity of future wildfires inside RHCAs thus reducing mortality to riparian vegetation and negative effects to streams and fish populations.

Overall, natural addition of large woody debris, shrub regeneration, actions associated with CEs and deferral of grazing are expected to improve aquatic conditions compared to the existing condition thereby improving fish populations. Bankfull and wetted width to depth ratios should decrease in all streams with the largest reduction in the Silvies River. Redband (in all streams) and Malheur mottled sculpin (in the Silvies River) populations should improve and expand with better summer/winter rearing and spawning habitat due to lower sediment loads, more/higher quality pools and lower summer water temperatures.

Alternative 2

Legacy impacts from roads, harvest and grazing activities conducted without BMPs on private and public land have reduced fish habitat quality and complexity in project area streams and downstream in the Silvies River and Jack Creek. Riparian vegetation has been reduced and width to depth ratios are high resulting in excessive summer rearing temperatures. This has reduced fish populations of redband trout in all fish bearing streams and Malheur Mottled sculpin in the Silvies River compared to natural conditions.

Cumulative effects would be beneficial and similar to the No Action alternative due to actions completed under CEs in 2003 and 2004 including riparian hardwood planting, upland conifer planting in RHCAs, and coarse wood placement in streams and ephemeral draws. This will meet minimum LRMP standards and INFISH RMOS for LWD frequencies in fish-bearing streams in the project area. Hazard tree activities upstream of the fire area in the Hog Subwatershed are expected to have a positive effect on fish habitat because hazard trees in RHCAs would be used to meet instream LWD standards (MNF LRMP Amendment 29) in Hog Creek. Trees in excess of those needed for instream LWD may be removed.

Some uncontrolled cattle grazing occurred in summer/fall 2003 but no measurable effects to riparian habitat or stream channels were observed. The Forest policy for deferral of grazing for a minimum of 2 years after a fire and grazing within IIT standards after re-initiation would not retard attainment of RMOs.

On private land downstream of the project area, road-building, logging of fire-killed trees and thinning of live trees occurred between fall 2002 and spring 2003. Harvest and fuel treatment activities are expected reduce future fuel loading and the potential for wildfire starting on private land that could impact fish and fish habitat both in and downstream of the Flagtail Fire area. The extent of road-building activities on private land or the effects are unknown but are not expected to impact the Flagtail Fire area upstream.

The road management activities associated with the action alternatives are expected to have benefits by reducing sediment that would improve habitat complexity and fish populations more than the No Action alternative, likely improving conditions beyond the pre-fire baseline. This responds to recommendations in the Upper Silvies WA (2001) to improve aquatic conditions. The impacts of sediment during implementation of road management activities are expected to have a no observable effect to fish habitat or populations.

Bankfull and wetted width to depth ratios should decrease in all streams with the largest reduction in the Silvies River. Redband (in all streams) and Malheur mottled sculpin (in the Silvies River) populations should improve and expand with better summer and winter rearing as well as spawning habitat due to lower sediment loads, more pools and lower summer water temperatures.

Alternative 3

Cumulative Effects would be the same as those listed for Alternative 2. This is because the cumulative effects of road management activities and harvest/fuels treatments when combined with the effects of actions completed under CEs are the same for both alternatives.

Alternative 4

Legacy impacts from roads, harvest and grazing activities conducted without BMPs on private and public land have reduced fish habitat quality and complexity in project area streams and downstream in the Silvies River and Jack Creek. Riparian vegetation has been reduced and width to depth ratios are high resulting in excessive summer rearing temperatures. This has reduced fish populations of redband trout in all fish bearing streams and Malheur Mottled sculpin in the Silvies River compared to natural conditions.

On private land downstream of the project area, road-building, logging of fire-killed trees and thinning of live trees occurred between fall 2002 and spring 2003. Harvest and fuel treatment activities are expected reduce future fuel loading and the potential for wildfire starting on private land that could impact fish and fish habitat both in and downstream of the Flagtail Fire area. The extent of road-building activities on private land or the effects are unknown but are not expected to impact the Flagtail Fire area upstream.

Cumulative effects for Alternative 4 would be most similar but less beneficial in the long-term compared to those for Alternatives 2 and 3 due to road management activities which were designed to address recommendations from the Upper Silvies WA (2001) to improve aquatic habitat. The main differences with this alternative would be fewer road decommission or improvement activities would be implemented to improve aquatic habitat and heavier fuel loading would remain after management actions that would allow greater potential for high severity wildfire in the future.

Actions associated with CEs including riparian hardwood planting, upland conifer planting in RHCAs, coarse wood placement in streams and ephemeral draws are expected to improve aquatic conditions compared to the existing condition thereby improving fish populations and meeting LRMP standards and RMOs as stated in Alternative 1. Hazard tree activities in the Hog Subwatershed are expected to have a positive effect on fish habitat as hazard trees in RHCAs will be used to meet instream LWD standards (MNF LRMP Amendment 29) in Hog Creek. Trees in excess of those needed for instream LWD may be removed. Some uncontrolled cattle grazing occurred in summer/fall 2003 but no measurable effects to riparian habitat or stream channels were observed. In addition, the Forest policy for deferral of grazing for a minimum of 2 years after a fire and grazing within IIT standards after re-initiation would not retard attainment of Riparian Management Objectives.

Bankfull and wetted width to depth ratios should decrease in all streams with the largest reduction in the Silvies River. Redband trout (in all fish bearing streams) and Malheur mottled sculpin (in the Silvies River) populations should improve and expand with better summer and winter rearing as well as spawning habitat due to lower sediment loads, more pools and lower summer water temperatures.

Alternative 5

Cumulative Effects would be the same as those listed for Alternatives 2 and 3. This is because the cumulative effects of road management activities and harvest/fuels treatments when combined with the effects of actions completed under CEs are the same for these alternatives.

Comparison of Alternatives

The following table lists indicators relevant to fish and fish habitat to compare the existing condition (Alternative 1) and conditions resulting from implementation of the action alternatives (Alternatives 2, 3, 4 and 5). In short, the lower the number in each column, the better stream conditions would be for fish and fish habitat in the project area and downstream in the Silvies River and Jack Creek.

Table FI-8. Comparison of Alternatives for Fisheries Values

	Road/Stream Crossings	Miles of Road within 100 Feet of Category 1-4 Channels	Total Road Miles	Acres Exceeding HRV Fuel Levels
Alternative 1	42	9.1	51.6	4765
Alternative 2	24	4.8	39.5	520
Alternative 3	24	4.8	39.5	2423
Alternative 4	25	5.6	40.3	4360
Alternative 5	24	4.8	39.5	2058

Determination of Effects on Sensitive Species

Redband trout and Malheur mottled sculpin are designated as the management indicator species for fisheries analyses in the Malheur Forest Plan (USDA 1990), and as a Sensitive Species by the Regional Forester (USDA 2000). Potential determinations for Sensitive Species are as follows:

- **NI** No Impact
- **MIIH** May Impact Individuals or Habitat, but Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species
- **WIFV** Will Impact Individuals or Habitat with a Consequence that the Action May Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species
- **BI** Beneficial Impact

The following is a summary of effects determinations for alternatives documented in the Biological Evaluation of the Flagtail project. Table FI-9 lists determinations for all alternatives.

Alternative 1, No Action:

Fuel loading will increase in the project area as snags fall and new vegetation grows. This could lead to high severity wildfire that has the potential to impact fish and fish habitat in the project area. The activities with the highest potential for affecting sediment input to streams are road management activities. Under this alternative, there would be no road management activities other than ongoing routine road maintenance. This can be considered no change from the existing condition. However, this alternative would do nothing to reduce impacts of the existing road system and degraded stream conditions as they relate to fish habitat. It would be expected that sedimentation from existing roads would remain constant or increase over time, unless other projects are implemented to address these impacts. This alternative "**May Impact Individuals or Habitat**" for redband trout and Malheur mottled sculpin now and in the future. These impacts would not cover a large enough area to reduce population viability and therefore would not result in a "**WIFV**" determination for redband trout or Malheur mottled sculpin habitat and populations.

Alternatives 2, 3, 4 and 5:

Fuel loading would be reduced as a result activities associated with the action alternatives and a fuel treatment project in RHCAs implemented under a CE. This could lead to reduced impacts (severity) of future wildfire that has the potential to impact fish and fish habitat in the project area. The activities with the highest potential for affecting sediment input to streams are road management activities. Under the action alternatives, there would be road management activities which include construction/relocation of system roads (Alternatives 2, 3 and 5), construction of temp roads (Alternatives 2, 3 and 5), maintenance (including creation of additional relief drainage structures), reconstruction (culvert replacement on Snow Creek in Alternatives 2, 3 and 5) and decommission of existing system roads. The only impacts on fish or fish habitat would be those from during implementation and up to 1 year after reconstruction or decommission activities within 100 feet (mapped GIS) of streams. The impacts would be limited to the immediate vicinity of the activity and "**May Impact Individuals or Habitat**" but would not likely contribute to a trend towards Federal listing or loss of viability to the population or species. However, the long-term reduced impacts to aquatic indicators would result in a "**Beneficial Impact**" for redband trout and Malheur mottled sculpin habitat and populations.

Table FI-9: Sensitive Species Biological Evaluation Summary

Aquatic Species	Effects Determination Alternative 1 No Action	Effects Determination Alternative 2	Effects Determination Alternative 3	Effects Determination Alternative 4	Effects Determination Alternative 5
Interior Redband Trout	**MIIH**	**MIIH (BI)**	**MIIH (BI)**	**MIIH (BI)**	**MIIH (BI)**
Malheur Mottled Sculpin	**MIIH**	**MIIH (BI)**	**MIIH (BI)**	**MIIH (BI)**	**MIIH (BI)**

*Effects in Parentheses are Long Term Effects (greater than 2 years) if different from Short Term Effects (1-2 years)

Consistency With Direction and Regulations

The alternatives are consistent with Forest Plan direction. None of the potential combined effects are expected to adversely affect INFISH RMOs or redband trout population viability. Application of INFISH direction would maintain or improve fish habitat conditions in the Project Area. Riparian and stream channel conditions, or RMOs) are expected to improve with road management activities and actions completed under separate CEs which include riparian hardwood planting, upland conifer planting in RHCAs, as well as Malheur National Forest direction to defer grazing for two or more years following a fire. Resumption of grazing is not expected to retard attainment of RMOs as long as Forest Plan (in uplands) and Interagency Interdisciplinary Team, or IIT, (in riparian areas) standards are met.

Consultation with NOAA or USFWS is not necessary for fisheries because the area is part of an inland fishery and contains no ESA fish species. The Magnuson-Stevens Fishery Conservation and Management Act as amended (1996) does not apply to the project area because it is an inland fishery.

Recreational fishing opportunities are limited in the Flagtail burn area by water quality and habitat degradation. The proposed action and action alternatives include aquatic conservation and restoration actions that would improve the quantity, function, sustainable productivity, and distribution of recreational fisheries as directed under Executive Order 12962, Recreational Fisheries.

Irreversible and Irretrievable Commitments of Resources

No irreversible effects are expected. Reduced fish population viability for redband trout could be an irretrievable commitment of resources, but the possibility is not expected. INFISH established explicit goals and objectives for inland fish habitat condition and function. By following INFISH standards and guidelines as well as design and mitigation measures specific to this project, it is believed that irretrievable commitment of this resource can be avoided. The goal is to achieve a high level of habitat diversity and complexity through a combination of habitat features.

Scenery

Introduction

The fire area is most often viewed from County Road 63 and Forest Roads 24 and 2195. The fire is bordered on the east by Bear Valley where the fire is viewed as background. Elevations range from about 4800 feet in BearValley to about 6,000 feet at the highest ridge point locations on the fire. Travelers through the valley are afforded a variety of natural appearing views and a considerable amount of human-altered landscapes. Timber harvest in the form of scattered stumps and skid trails and road systems are the most obvious alterations to the natural landscape. Clearings for farms and ranches in Bear Valley initiate patterns of pasture and fence lines that disappear into the surrounding forests.

Regulatory Framework

The Malheur NF scenic resource is managed by direction provided in the Malheur NF Plan (1990). Visual Quality is assessed and evaluated under Landscape Aesthetics, USDA Forest Service Handbook Number 701, December 1995. The Malheur National Forest Plan includes Forest-wide management area (MA) standards:

Viewshed Corridor

About 1,400 acres, or 19%, of the project area is within the Izee Viewshed, which is Management Area 14 (Figure 23, Map Section, Visual/Viewshed Corridors) and encompasses those areas that are seen from County Road 63. The county road parallels the Silvies River within the fire area. The management goal is to manage corridors as scenic viewsheds with primary consideration given to their scenic quality and the growth of large diameter trees. Forest Plan Correction #1, dated January 31, 1995, allows salvage harvest in a visual corridor without corridor viewshed plan. The Forest Plan direction is to manage the Izee Viewshed with visual quality objectives of partial retention in the foreground and modification in the middleground. The visual condition is to be slightly altered in appearance. Fuel residue profiles to meet visual quality objectives are referenced to photo series publications in the Forest Plan.

General Forest and Rangeland (MA 1 & 2), Old Growth and Old Growth Replacement (MA 13) and Riparian (MA 3A)

About 5,800 acres, or 81%, of the project area is within these management areas, General Forest and Rangeland. Management direction for MA 1 is to emphasize timber production on a sustained yield basis while providing for other resources and values. For MA 2, the management direction is to emphasize forage production on non-forested areas on a sustained yield basis while providing for other resources and values. The visual management goal is to manage for maximum modification which is heavily altered in appearance. Deviations may strongly dominate the landscape character, however, they must be shaped and blended with the natural terrain so that elements such as unnatural edges, roads, and landings do not dominate the composition. Old growth and Riparian Management Areas are managed for visual management objectives consistent with adjacent lands.

Analysis Methods

Management activities such as timber harvesting can affect forest scenic quality by changing the predominant form, color, line, or texture in a given viewing area. The degree of visibility of these events depends on the interaction of certain elements to the viewers such as:

- Slope and aspect of the land
- Surrounding landscape
- Frequency and duration of view
- Fuel reduction treatment methods used
- Slash disposal methods

These factors have been incorporated into the analysis of the effects of each alternative in meeting VQOs. VQOs are minimum guidelines for meeting Forest Plan visual goals. The Malheur National Forest's visual resources are managed under the USDA's National Forest Scenery Management System located in Agricultural Handbook Number 701. The scope of the analysis is limited to the area burned by the fire. The time frames used for benchmarks are 5, 15, 25, 50, and 150 years when conditions, mostly vegetation related, have changed enough to display differences between alternatives.

Existing Condition

Viewshed Corridor (MA 14)

When traveling west on County Road 63 from Bear Valley, the burned private land is encountered first and is comprised of mostly black boles of trees along both sides of the Silvies River along with groups of burned aspen trees. Salvage logging has already occurred on the private lands, including many visible skid trails, large landings with large piles of non-utilizable portions of trees that are close to the road and to the river. There are many small diameter snags still standing, reducing the contrast between private and publicly owned land.

On publicly owned land, the topography limits the viewing distance from County Road 63 to mostly foreground, which is defined as within one quarter to one half mile of the viewer. Only a small amount of middleground is visible. The primary feature of the view from the county road is the Silvies River flowing through meadows with live scattered and grouped conifers, hardwoods, including clumps of aspen and shrubs that add diversity in color and form. The meadow area had high moisture and green vegetation at the time of the fire and was relatively unaffected by the fire. Rock outcrops and rocky openings add to the diversity to the landscape. Opportunities exist for visitors to view waterfowl, other types of birds, beaver activity, deer, elk and other wildlife. See the recreation section for a listing of recreational opportunities present in the area.

The upland vegetation of the visual corridor before the fire included structurally diverse stands of ponderosa pine with some small stands of lodgepole pine, aspen clumps, scattered western larch in the south half. High burn severity areas, where over 90 percent or more of the trees were killed, cover about 90 percent of the visual corridor. About 5 percent has a moderate burn severity where mortality ranges from 60 to 90 percent and about 5 percent has a low burn severity where mortality ranges from 0 to 60 percent.

The fire has changed the visual condition from slightly altered to moderately altered. The immediate foreground has stumps, most with blue paint still visible, slash piles and scattered slash concentrations that resulted from the removal of hazard trees along the county road and from around the Bear Valley Work Center administrative site. The road side hazard tree removal did not have the mitigating measures that could have reduced the negative visual impacts of timber harvesting.

The visual quality rating changed from partial retention to modification for both the foreground and middleground. The current condition does not meet the visual management objective of partial retention for the foreground. The scenic integrity has been reduced from moderate to low. The ecological integrity is currently unacceptably low because a large stand replacement fire condition is not typical of the way the dry forest historically burned. Ecological integrity is an indication of the sustainability of a landscape, which affects the long-term conditions of landscape aesthetics.

Outside the Visual Corridor (MA 1, 2, 3A, 13)

The area is enjoyed for the positive natural elements, such as landform, vegetative patterns, and streams. The primary forest type in the area is the dry forest that includes a majority of ponderosa pine. Other species present include Douglas-fir, grand fir, lodgepole pine and western larch on the aspects that are more northerly.

Some mosaic patterns of burning intensity are visible, including some green tree patches and areas where the foliage was scorched brown but not consumed. High burn severity areas cover about 35 percent of the area. The moderate burn severity areas cover about 45 percent of the area. Low burn severity areas cover about 20 percent of the area and include non-forest openings and some riparian areas. Much of the vegetation that provided special interest to viewing have been killed such as large trees, aspen patches and western larch. Roads, landings and skid trails are more visible throughout the area due to the loss of screening vegetation.

The visual quality rating is currently modification which meets the visual management objective of maximum modification. The scenic integrity level has been reduced from moderate to low by the fire. The ecological integrity is unacceptably low in this area for the same reasons as for the visual corridor. Alternative 5 was added. The effects of not harvesting in riparian buffers was expanded.

Environmental Consequences

In the following descriptions it is assumed that the mitigating measures described will be implemented and will rectify or compensate for the described undesirable effects from proposed activities.

Visual Quality

Direct and Indirect Effects

Alternative 1

Viewshed Corridor (MA 14)

No reforestation activities would occur and vegetative recovery would take place at a slower rate than if planted. The visual quality rating would remain at modification (Table LA-2) until the area is sufficiently reforested enough to give a forest-like appearance to avoid the appearance of large openings and to provide screening of stumps, roads and old skid trails. It will take up to 50 years to reforest most of the area through natural regeneration due to the lack of seed trees. The visual quality objectives of obtaining large ponderosa pine and western larch will take about 180 years, about 30 years longer than with the other alternatives. Heavy fuel loading created in about 15 years by falling snags would average about 46 tons per acre for most of the area and would not meet visual quality objectives for the visual corridor foreground. There would be an increased the chance of a stand-replacing fire in the future due to the heavy fuel loading increasing the time needed to meet the desired future condition.

Roadside Hazard Tree Cutting

Roadide hazard tree cutting would occur on roads open to the public. As mentioned in the existing condition, some of the larger road side hazard trees have already been cut and residue piled in the visual corridor, but additional smaller hazard trees still need to be cut. County Road 63 and Forest Road 24 are within the RHCA for the Silvies River. Along portions of these roads, large amounts of residue will be created from cutting hazard trees. Under Alternative 1, these are to be left in place. Since many of these trees would fall onto the road or the roadside ditch on the uphill side, they would need to be moved to the approximate 15 foot strip between the ditch and a fence that runs parallel to the road. The negative visual effects created from the roadside hazard tree cutting would be the stumps which can be mitigated by making them as low as possible, and the slash piled up along the road on the uphill side which would not meet the visual quality objectives for the visual corridor.

Outside the Visual Corridor (MA 1, 2, 3A, 13)

Natural regeneration recovery would be similar to what would occur in the visual corridor except that there are areas with more live trees that will speed up natural regeneration due to an increase in seed source. After about 15 years, the visual quality changes to maximum modification due to increased visibility after many snags have fallen (Table LA-3). Roads and past management activities are more visible. Since the visual quality objective is maximum modification, the change does not affect meeting Forest Plan standards. The change back to visual quality of modification is delayed by 25 years compared to the action alternatives.

Common to Alternatives 2, 3 and 5

Tree Marking and Harvest Unit Designation

Tree marking with paint, ribbons and signs can have a negative visual impact in visual corridor foreground areas. .

Mitigating measures:

Where paint can be seen from County Road 63, it is to be applied to the side of the tree facing away from the road to avoid seeing paint from the road. This is mostly effective, but some paint will still be visible. Ribbon and signs are to be removed upon completion of the harvest unit activities and is very effective.

Logging Systems

Skyline Logging

This system takes logs from stump to a landing using an overhead system of cables to which logs are attached and logs dragged through cable corridors throughout the unit. The corridors may leave straight vertical lines in a fan-shaped pattern on the landscape. Depending on factors such as the slope and aspect of the land, surrounding landscape, and frequency and duration of view, skyline logging systems may need mitigating measures in the visual corridor to meet Partial Retention VQO. About 38 percent of the visual corridor would be skyline harvested with these alternatives. The duration of view is short due to the number of curves on County Road 63. Units 8 and 22 have the most duration of view of the skyline units in the foreground of the visual corridor and are on steep slopes. The other skyline logging units are partially screened by topography or are in the middleground where a more altered landscape is allowed.

Mitigating measures:

Winter skyline logging over snow and frozen ground retains vegetation in the corridors and minimizes soil exposure and is a very effective mitigating measure and it is especially beneficial for units 8 and 22 due to the high visibility and duration of the view. If winter logging is not possible and negative visual impacts of color or texture contrasts are present, debris will need to be spread over disturbed corridors in sufficient amounts to eliminate the contrast. This can be mostly effective if sufficient material is available to reduce the contrast sufficently.

Tractor Yarding

This method is used on gentle slopes (generally less than 35% slope). Tractor yarding leaves skid trails unless it is done over snow or frozen ground. Skid trails are not as straight of a linear form as with skyline corridors but they can create negative impacts that do not meet partial retention.

Mitigating measures:

Winter tractor logging over snow and frozen ground is the most effective measure to avoid negative visual impacts. Units 4, 26, 28 and 104 are the most likely not to meet partial retention if not winter logged due to being close to County Road 63, slope, aspect and duration of view. An alternate measure is to use a machine capable of picking up logs and boulders and smoothing berms to rehabilitate skid trails. This was done as fire rehabilitation for the dozer fire lines and it was very effective in meeting visual management objectives. Areas of greater than 200 square feet of soil disturbance in the immediate foreground of County Road 63 shall be treated to replace disturbed vegetation or scatter debris to make the area similar in appearance to adjacent undisturbed areas. This is mostly effective provided the debris and vegetation used is the same type and amount as outside the disturbed area.

Helicopter Logging

This results in very little impact to the visual resource because there is little to no ground disturbance (no roads, skid trails, skyline corridors). Helicopter landings can have negative impacts to visual quality.

Mitigating measures:

Landings are to be rehabilitated within 1 to 2 years after use by sub-soiling compacted areas, scattering debris and vegetated by seeding or planting. This is mostly effective provided the debris and vegetation used is the same type and amount as outside the disturbed area.

Utilization Standards

There will be additional trees left in harvest units that will not meet utilization standards and not removed by post sale fuels treatments. These extra dead trees are up to 10 or12 inches in diameter on skyline logged units and 12 inches in diameter on helicopter logged units. These trees will help provide additional screening and give visual variety, helping to reduce the negative visual impacts of timber harvesting.

Riparian Buffers

Riparian buffers range from 300 feet on each side of fish bearing streams, 150 on each side of other perennial streams, 50 to 25 feet for some ephemeral draws down to 10 feet for a few ephemeral draws. Wetlands would have a 50-foot riparian buffer if less than an acre. Wetlands greater than 1 acre would have a 150 foot buffer. These buffers may at times, have a straight line delineating the buffer (untreated) from the treated part of the unit. Generally, these should look natural as riparian areas usually have denser growth along streams that is noticeable on the landscape. County Road 63 is within the 300 foot wide riparian buffer along the Silvies River. This means that, except for roadside hazard tree removal, there will be no trees harvested within up to about 250 feet on the north side and 350 feet of the south side of the road. This helps to reduce the negative visual effects of harvesting. However, when these snags fall down, the fuel loading would exceed Forest Plan standards for the foreground distance zone.

Common to Alternatives 2, 3, 4 and 5

Roadside Hazard Tree Cutting

Roadside hazard tree cutting would occur on roads open to the public. As mentioned in the existing condition, some of the larger road side hazard trees have already been cut and residue piled in the visual corridor, but additional smaller hazard trees still need to be cut. County Road 63 and Forest Road 24 are within the RHCA for the Silvies River. Where large amounts of residue are created from cutting hazard trees, it would be moved where it could provide benefit to the riparian area or piled and burned. The negative visual effects created from the roadside hazard tree cutting would be the stumps which can be mitigated by making them as low as possible.

Fuel Reduction Treatments

Fuel treatments done as part of salvage harvest include whole tree yarding for tractor and skyline logging systems and hand piling tops and limbs in helicopter logged units. Fuel treatments planned where trees less than 8 inches in diameter are cut include grapple piling or machine skidding on slopes less than 35 percent and hand piling on steeper slopes. Slash piles may be on the landscape until sufficient burning factors are met.

Mitigating measures:

Areas of greater than 200 square feet of soil disturbance in the immediate foreground of County Road 63 shall be seeded or planted to replace disturbed vegetation or scatter debris to make the area similar in appearance to adjacent undisturbed areas. This is mostly effective provided the debris and vegetation used is the same type and amount as outside the disturbed area.

Tree Cutting

Stumps that are created as part of timber harvest or fuel reduction activities can have negative impacts on visual quality due to color contrasts and un-natural form.

Mitigating measures:

Stumps of trees cut in the immediate foreground (300 ft from County Road 63) are to be cut to within 6 inches of the ground. Stumps should be cut at an angle away from the road to avoid the face of the stump being a contrasting color impact. This is mostly effective in reducing color contrast but not very effective in eliminating the stump form.

Planting

Tree planting will result in prompt reforestation that will provide screening of stumps, skid trails and roads to improve the visual quality level sooner than with no action..

Alternative 2

Viewshed Corridor (MA 14)

The visual quality would be reduced from modification to maximum modification because treatments would leave only about an average of about 2.4 large snags per acre (Table LA-1) in addition to snags not meeting utilization standards, resulting in an appearance similar to large created openings. Mitigation measures mentioned above for stump appearance, slash treatment and disturbed ground will reduce the other negative effects of harvesting activities in the visual corridor. The visual quality will improve to modification by age 15 due to reforestation screening the stumps. Fuel loading remaining after harvest would be treated to meet Forest Plan visual quality standards. Accumulation of fuels from snag fall in about 15 years would average about 8 tons per acre for most of the area and would meet visual corridor foreground visual quality objectives.

Outside the Visual Corridor (MA 1, 2, 3A, 13)

The effects are similar to what occurs in the visual corridor except for a 10 year delay in reaching the visual quality rating of modification because the land is more altered and larger trees are needed to provide screening. Since the visual quality objective is maximum modification, the delay does not affect meeting Forest Plan standards.

See also Common to Alternatives 2, 3 and 5.

See also Common to Alternatives 2, 3, 4 and 5

Alternative 3

Viewshed Corridor (MA 14)

Alternative 3 creates a high snag variability across each unit. Some snag patches would have snag densities up to 75 snags per acre leaving areas in units between patches with an average of 6 to 11 snags per acre 10 inches DBH and larger. In units, snags 10 inches DBH and larger would average 13 per acre (Table LA-1). The helicopter units will retain all 10 to 12 inch DBH snags adding between 5 to 30 snags per acre. The visual quality would not be reduced as much as with Alternative 2 because of the higher number of snags to be left, allowing the visual quality rating to remain at modification. However, there would be a visible difference from both Alternatives 1 and 4. The burned area will give the appearance of a forest fire being the cause of the dead trees rather than that of a created opening resulting from harvesting as with Alternative 2. Mitigation measures for stumps, slash treatment and disturbed ground will reduce the negative effects of harvesting activities in the visual corridor. Visual corridor foreground visual quality objectives for future fuel loadings will be met.

Outside the Visual Corridor (MA 1, 2, 3A, 13)

The amount of snags remaining is the same as described for the visual corridor. After about 15 years, the visual quality changes to maximum modification due to increased visibility after many snags have fallen. The effects to visual quality are the same as Alternative 2 after 15 years.

See also Common to Alternatives 2, 3 and 5.

See also Common to Alternatives 2, 3, 4 and 5.

Alternative 4

Viewshed Corridor (MA 14)

Cutting dead trees less than 8 inches in diameter and treating created fuels would have about the same effect to the visual quality rating as with Alternative 3 but the evidence of cutting and treatment would less noticeable, more snags are left (Table LA-1) and creation of large stumps are avoided. Mitigation measures to reduce the negative effects of fuel reduction activities for stump appearance, slash treatment and disturbed ground are the same as with Alternative 3. Fuel loading created in about 15 years by falling snags is about 20 percent less than fuels generated by Alternative 1 but that is not enough of a reduction to meet visual quality objectives for the visual corridor foreground.

Outside the Visual Corridor (MA 1, 2, 3A, 13)

The effects to visual quality are the same as with Alternative 3.

See also Common to Alternatives 2, 3, 4 and 5.

Alternative 5

Viewshed Corridor (MA 14)

The effects to visual quality are the same as with Alternative 3.

Outside the Visual Corridor (MA 1, 2, 3A, 13)

The effects to visual quality are slighty less than with Alternative 2 because about 14 percent fewer acres are treated. However, the different is not enough to change the visual quality rating as described for Alternative 2.

See also Common to Alternatives 2, 3 and 5.

See also Common to Alternatives 2, 3, 4 and 5.

Table LA-1: Acres Harvested and Snag Density by Alternative in the Visual Corridor Immediately After Harvest

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Acres Harvested	0	920	750	0	830
Snag Density*	All, 10-80	2.39	≥13	All, 10-80	≥13

* Snags that are 10 inches DBH and larger.

Table LA-2: Effects to Visual Quality by Alternative in the Visual Corridor (Resultant VQO)

	In 5 years	In 15 years	In 25 years	In 50 years	In 150 years
Alternative 1 (No Action)	Modification	Modification	Modification	Partial Retention	Partial Retention
Alternative 2	Maximum Modification	Modification	Partial Retention	Partial Retention	Partial Retention
Alternative 3	Modification	Modification	Partial Retention	Partial Retention	Partial Retention
Alternative 4	Modification	Modification	Partial Retention	Partial Retention	Partial Retention
Alternative 5	Modification	Modification	Partial Retention	Partial Retention	Partial Retention

Table LA-3: Effects to Visual Quality by Alternative Outside Visual Corridor

	In 5 years	In 15 years	In 25 years	In 50 years	In 150 years
Alternative 1 (No Action)	Modification	Maximum Modification	Maximum Modification	Modification	Modification
Alternative 2	Maximum Modification	Maximum Modification	Modification	Modification	Modification
Alternative 3	Modification	Maximum Modification	Modification	Modification	Modification
Alternative 4	Modification	Maximum Modification	Modification	Modification	Modification
Alternative 5	Maximum Modification	Maximum Modification	Modification	Modification	Modification

The majority of the area outside of the visual corridor is in the general forest management area (MA 1) and will be more visibly altered by past and future management activities, so the visual quality rating would not be expected to reach partial retention, even for Alternative 1 where there are existing roads throughout the landscape.

Landscape Aesthetics/Scenic Integrity

Environmental Consequences

Direct and Indirect Effects

Alternative 1

The scenic integrity level would decrease from the current low to very low in about 15 years (Table LA-4) because there will not be enough snags standing to break up the out-of-scale appearance of large openings and excessive fuel loadings. The landscape will consist of cross-stacked logs with some standing snags and live trees remaining in the lower severity burn areas. Roads will be more visible. The aesthetics would not improve until tree regeneration is large enough to screen the excessive fuels and roads. Due to the limited number of nearby seed sources, it will take about 50 years for natural conifer regeneration to bring back a forested appearance to increase the scenic integrity level rating to low. Shrubs, forbs sedges and grasses are a component of scenic integrity and recovery can be as soon as two years for low severity burned areas but recovery may take 5 years or more in severely burned areas. The ecological integrity rating is low because a new stand of trees that develops would not be resistant to stand replacement fires due to excessive fuels.

Alternative 2

Salvage harvest and fuel removal activities would reduce the scenic integrity level from low to very low (Table LA-4). Large openings (form), existing roads, and effects from tractor and skyline logging systems (line and color) will be the most evident of all action alternatives.

Shrubs, forbs sedges and grass recovery would be the same as Alternative 1 except for the areas disturbed by harvesting activities which would have a longer recovery period than with undisturbed areas. Contrasts between ground cover, vegetation, and lighter disturbed soils in skid trails and cable corridors will be evident on 65 percent of the visual corridor and 51 percent of the area outside the visual corridor. This contrast will continue until the vegetation in undisturbed areas encroaches into the disturbed areas or until tree cover is established.

The scenic integrity level would improve to low in about 25 years because by that time the trees will be tall and dense enough to give a forested appearance. About 150 years would be needed to meet the scenic integrity level of high when the old forest structural stage is obtained and the ecological integrity is high. The high ecological rating is dependent on additional management activities, such as thinning and prescribed burning to avoid overstocking and dead fuels that would make the area vulnerable to a stand replacement fire.

Alternative 3

After harvest and fuel treatment activities, the scenic integrity would still be within the "moderately altered" landscape character description, so it would remain at low (Table LA-4). Large openings (form), existing roads, and effects from tractor and skyline logging systems (line and color) will be less visible than with Alternative 2 due to the increased number of snags retained and the reduced amount of area harvested. Contrasts between ground cover, vegetation, and lighter disturbed soils in skid trails and cable corridors will be evident on 65 percent inside the visual corridor and 38 percent outside of the visual corridor.

As with Alternatives 1 and 4, the scenic integrity level would be reduced to very low in about 15 years because there will not be enough snags standing to break up the out-of-scale appearance of large openings and excessive fuel loadings. The effects of tree planting in improving the scenic integrity level will be the same as with Alternative 2. The future ecological integrity and the benefits to maintaining a high scenic integrity are the same as discussed with Alternative 2.

Alternative 4

The scenic integrity level remains at low after the fuel reduction activities and would decrease to very low in about 15 years for the same reasons as for Alternative 1 (Table LA-4). The non-commercial removal of small dead trees will cause a slight visual improvement from Alternative 1 by reducing fuel loading. Alternative 4 would have about the same effect to scenic integrity as Alternative1 because the future fuel loading is still excessive. The effects of tree planting will have the positive visual benefits of the other action alternatives and will help screen the excessive fuels that will accumulate. Alternative 4 has a low ecological integrity rating for the same reasons and with the same effects as with Alternative 1.

Alternative 5

Since the visual corridor is treated with the same prescription as Alternative 3, the effects to scenic integrity in this area will be the same as with Alternative 3. Outside the visual corridor, the prescription is similar to Alternative 2 but affects about 14 percent fewer acres which is not enough to change the scenic integrity rating. The overall rating in five years was a range from low to very low due to the two areas having different snag levels remaining (Table LA-4).

Table LA–4: Effects to Scenic Integrity by Alternative

	In 5 years	In 15 years	In 25 years	In 50 years	In 150 years
Alternative 1 (No Action)	Low	Very Low	Very Low	Low	Low to Moderate
Alternative 2	Very Low	Very Low	Low	Moderate*	High*
Alternative 3	Low	Very Low	Low	Moderate*	High*
Alternative 4	Low	Very Low	Very Low to Low	Low to Moderate	Moderate
Alternative 5	Low toVery Low	Very Low	Low	Moderate*	High*

*The moderate rating may be low and the high rating may be moderate outside the visual corridor after 50 years depending on the type and amount of vegetation management.

Cumulative Effects for Visual Quality, Landscape Aesthetics and Scenic Quality

Common to All Alternatives

Cumulative effects for scenery includes the area burned by the fire both on private lands and publicly owned lands. In review of Appendix J (Cumulative Effects), past, ongoing and reasonably forseeable actions that could affect the scenery resource would be the following: wildfire, associated fire suppression efforts and fireline rehabilitation, timber harvest on both National Forest System land and private land, aspen fencing, fencing for livestock control, fuels treatment and reforestation on both National Forest System land and private land, National Forest and private roads and maintenance, County Road 63 maintenance, conifer and hardwood planting and protection, hazard tree cutting and riparian fuel treatment.

The cumulative effects of the wildfire, suppression activities, past timber management activities, and roads have greatly affected the visual quality that resulted in the existing condition being less than the Forest Plan objective for the visual corridor. The salvage logging that has occurred on private lands within the fire and the roadside hazard tree removal done to date on publicly owned lands affected about 12 percent of the fire area and are the most visible of the past timber management activities due to the disturbed ground, slash piles created, untreated slash, and color contrast of the stumps and skid trails. The increased visibility has made barbed wire fencing more noticeable which slightly detracts from a natural appearance.

Future activities that are expected to occur involve projects to speed vegetation recovery that can greatly improve visual quality, landscape aesthetics and scenic integrity within 25 years with a moderate improvement within 15 years. Vegetation recovery projects have effects that can last 100 years or more. Planting of hardwoods, shrubs and conifers is planned under a CE on about 70 acres in the visual corridor and about 330 acres of riparian and upland areas outside the visual corridor. Cages placed around planted hardwoods can add an un-natural appearing structures in the riparian areas resulting in a slight decrease in a natural appearance for about five years. The conifer planting will accelerate the recovery of the vegetative screening of storage areas, roads accessing the site, and the buildings in the Bear Valley Work Center administrative site. The planned fencing of quaking aspen sprouts will not only allow recovery, but expansion of the area occupied by aspen stands from about 77 acres to about 300 acres. Aspen recovery and expansion will increase visual diversity, especially when the trees turn color in the fall. Pole fencing around aspen patches can appear as rustic appearing if not built too tall. Tree planting is likely on salvaged private lands in accordance with Oregon forest practices regulations.

Future fuel treatments in riparian areas will reduce the excessive fuels that accumulate, greatly improving the visual appearance in the visual corridor because the the first 250 feet more or less along County Road 63 is in the immediate foreground and no other dead debris removal would be done except for hazard tree removal . Road maintenance can create a slight decrease in appearance when the blading and vegetation removal is fresh, but within one year, can result in a slightly improved appearance with the roads not having an overgrown appearance. All other ongoing and future actions listed in Appendix J would not affect scenery.

Alternative 1

No additional cumulative effects to what is common to all alternatives is expected.

Alternative 2

Conifer planting combines with other planned planting to speed the vegetation recovery on most of the area that was burned. This will have the positive visual effect of earlier elimination of the large openings. Aspen recovery and expansion when combined with hundreds of acres of planted western larch trees will increase visual diversity more than double over that of Alternative 1. The diversity will be the most apparent when the trees turn color in the fall. This alternative harvests trees on about 61 percent of the area combining with the other recent harvests for a total of about 73 percent of the fire area. The combined removals add to the size and number of large created openings for a greater negative visual effect. The future project to reduce fuels in RHCA's combined with the fuel reduction planned in this alternative will ensure that the residue profile standards as part of the visual quality objectives in the foreground distance zone of the visual corridor are met.

Alternative 3

The vegetation recovery benefits to landscape aesthetics of planned projects combined with those planned with this alternative is similar to Alternative 2. This alternative harvests trees on about 40 percent of the area combining with the other recent harvests for a total of about 52 percent of the fire area which is about 21 percent less than with Alternative 2. Alternative 3 will result in a less altered landscape than with Alternative 2 due to the fewer acres treated and the higher number of snags left within treatment units. The future project to reduce fuels in RHCA's combined with the fuel reduction planned in this alternative will ensure that the residue profile standards as part of the visual quality objectives in the foreground distance zone of the visual corridor are met.

Alternative 4

There would be little additional cumulative affects to landscape aesthetics by removal of small dead trees when added to recent harvests due to the high number of larger dead trees retained.

Alternative 5

The vegetation recovery benefits to landscape aesthetics of planned projects combined with those planned with this alternative is similar to Alternative 2. This alternative harvests trees on about 53 percent of the area combining with the other recent harvests for a total of about 65 percent of the fire area which is about 8 percent less than with Alternative 2. The effects to landscape aesthetics from the removal of dead trees with Alternative 5 is intermediate between Alternatives 2 and 3. The future project to reduce fuels in RHCA's combined with the fuel reduction planned in this alternative will ensure that the residue profile standards as part of the visual quality objectives in the foreground distance zone of the visual corridor are met.

Consistency with Direction and Regulations

Visual Quality Objectives (VQOs) are minimum objectives and can be managed to a higher level where feasible. Modifications to the established visual quality objective requires a non-significant amendment to the Forest Plan if it is determined to be the best way to meet the management area goals of the Forest Plan.

Visual Corridor (MA 14)

Foreground

The VQO of Partial Retention is met by age 25 by Alternatives 2, 3, 4 and 5 as a result of tree planting that accelerates reforestation. Alternative 1 does not reach partial retention until about 50 years due to the slower rate of reforestation through natural regeneration. Alternative 2 has a short term reduction in visual quality due to retaining only about 2.4 trees per acre but improves to be the same as all the other alternatives in about 15 years as a result of tree planting. Alternative 2 harvests about 930 acres in the Izee Viewshed Corridor which is about 13 percent of the corridor. The short term reduction in Alternative 2 would require a non-significant Forest Plan amendment

Middleground

The VQO of Modification is met with Alternatives 1, 3, 4 and 5. As in the foreground, Alternative 2 reduces the visual quality to maximum modification requiring a non-significant Forest Plan amendment.

Outside the Visual Corridor (MA 1, 2, 3A, and 13)

The VQO of Maximum Modification would be met by all alternatives. Alternatives 1, 3 and 4 start at the higher rating of modification but are at maximum modification by age 15 when most of the snags have fallen. Because of tree planting accelerating reforestation, Alternatives 2, 3, 4 and 5 improve to modification about 25 years sooner than with Alternative 1.

Irreversible and Irretrievable Commitments

There are no irreversible or irretrievable commitments associated with the consequences of any of the alternatives analyzed to the visual quality or scenic integrity.

Recreation

Introduction

Forest visitors desire or expect specific types of recreational experiences and settings. Recreational opportunities are described in this recreation analysis in relationship to the Flagtail Fire Recovery Project. This analysis describes facilities and dispersed sites in the Flagtail Fire Project Area and analyzes affects of proposed activities on those recreation resources. Guidelines from the Malheur National Forest *Land and Resource Management Plan* 1990 are used to determine the condition of facilities and dispersed campsites.

The existing condition and effects of alternatives on Scenery (and Visuals) are not discussed here. They are discussed separately under the Chapter 3, Scenery section. This analysis is divided into two sections: 1) Existing Condition and 2) Effects of Alternatives for Recreation.

Regulatory Framework

Recreation Opportunity Spectrum (ROS)

The project area is managed as roaded modified and roaded natural. The project area has motorized opportunities from previous timber harvest; however, Access Management Plans have reduced these roaded opportunities over the last few years.

Those seeking roaded access and a more modified environment may find more opportunities available to them as harvest activities take place.

Management Direction

The Forest Plan direction is to manage General Forest and Rangeland (MA 1 & 2) to construct, relocate, or protect designated system trails and facilities during management activities, to maintain dispersed camping opportunities in a roaded setting and manage these areas for partial retention as roaded modified, and to provide roaded recreation opportunities. Management Area 13 (Old Growth) is also to be managed as roaded modified.

Administrative Site (MA 19) is to be managed for administrative needs and to consider these sites' historic and architectural values. Recreation in MA 3A (Non-Anadromous Riparian) is managed as roaded modified but standards include limiting and distributing [recreation] use as necessary to protect and/or rehabilitate riparian areas. MA 14 is managed as roaded natural ROS.

Analysis Methods

GIS was used to identify dispersed campsites. The recreation analysis considered the area within the fire boundary.

Existing Condition

Currently, the Flagtail Fire planning area contains a wide variety of recreational activities. This area plays an important role by providing settings for various types of outdoor recreation – hunting, camping, driving in the woods, hiking, and winter activities. There is currently one special use permit issued for the area for an outfitter guide (big game hunting) operation. Viewing opportunities are abundant of the Aldrich and McClellan Mountain roadless areas. Due to ease of access from Grant County Road 63, this area is popular with recreationists where visitors may enjoy the project area for outdoor recreational opportunities. County Road 63 provides the main access for roaded and other recreational activities. With the exception of County Road 63, the major road, corridors are gravel-surfaced, one-lane, and native surface routes initially developed to provide timber and mineral access, which now provides access for recreation type activities.

Administrative Site

The project area has one administrative site, which is the Bear Valley Work Center (Figure 3, Map Section). Some of the buildings are in the Recreation Rental program. Prior to the Flagtail Fire, the Work Center was staffed during the summer months by fire crews and rented during the off-season. One of two buildings that burned to the ground was in the rental program. Since the fire, the site has been available for renting. Approximately 4 to 6 vehicles can park at the site. There is one trailhead (see bike trail below) within the project area. The existing trailhead is located at the Bear Valley Work Center. Use is considered low at the trailheads (2 people/day). Barriers are placed at this site to reduce vehicle use within the administrative site. Hazard trees and some tree planting occur to reduce hazards and to stock for vegetation management of the sites. Bear Valley Work Center has a pole and wire fence around the site to keep the cows from entering the site. Routine maintenance includes rocking the road, pulling noxious weeds, and monitoring any paths created by recreationists that lead to the nearby stream.

Trails

There is approximately 3 miles of bike trail within the planning area on the paved County Road 63. The majority of the trail is rated in the more difficult and most difficult categories. General maintenance concerns include felling of hazard trees to protect the trail.

This trail is in fairly good shape with minimal maintenance. The fire had no impact on the trail since it is outside of the fire boundary. The fire damaged the existing trailhead.

Dispersed Recreation Use

The analysis area receives low to moderate recreation use, which is spread throughout a six month period starting in late May and running through mid-November. Under the code-a-site-system, one dispersed campsite is located within the project area and offers the recreationist a more primitive camping experience. There are other dispersed campsites not recorded in GIS; they may not be recorded in GIS because there is little or no current use at these sites.

Environmental Consequences

INTRODUCTION

This report addresses the effects to the recreation facility, dispersed campsite, and trailhead in the Flagtail area. Effects to Recreation are measured in terms of whether the alternatives meet the Recreation Objectives outlined in the Forest Plan. These effects can be direct, indirect, or cumulative.

The principal basis for analysis of environmental consequences in the Flagtail Project area is Forest visitors' desire or expectation of specific types of experiences and settings. These settings and experience opportunities can be described using the Recreation Opportunity Spectrum (ROS) guidelines. The effects on the recreational resource can be assessed by analyzing the change in the acres of each ROS class that would result under the alternatives. A change in ROS class would reflect a change in the available recreation opportunities.

Direct and Indirect Effects

Methods used to evaluate the effects of the alternatives include: changes in the ROS; harvest in currently important recreation places and recreation sites.

The Bear Valley Work Center building that was burned (Recreation Rental) would not be rebuilt through any alternative in this EIS.

No Action Alternative

The ROS was not changed by the fire and will not change as a result of this alternative.

While recreational visits within the analysis area would remain near the same levels as previous years under this alternative, traditional use patterns and recreational opportunities would be impacted. The outfitter guide permittee may continue to use the area to guide clients or, because the fire affected big game use of the area, may use permitted areas outside of the project area.

The one identified (GIS) dispersed campsite is not recognized as experiencing erosion or off-site vegetation damage, and will remain in its current condition. As a result, minor soil and vegetation degradation would continue to occur at this site. The dispersed camp identified near the junction of FS Roads 133 and 030 will remain open. Recreationists will continue to use other dispersed sites that may have undesirable conditions and that are not recorded in GIS. The dispersed campsites past the junction of FS Road 050 along Jack Creek will continue to be used.

County Road 63 has traditionally provided access into numerous Forest Service roads leading to dispersed campsites. Day use activities such as fishing, sightseeing, and driving would continue, but could decrease due to reduced scenic integrity along the roads. Based on past observations, motorists would likely create new parking and camping areas to replace the traditionally used roads. This would increase ground disturbance in the project area. Elevated levels of dead trees along roads, trailheads, trail crossings, developed recreation sites, and dispersed campsites would increase public safety risks.

No improvement of road access will result in no increase in opportunities for those who prefer an easily accessed setting. Usually well maintained roads means better access resulting in an increase of recreational visitors. It is expected that as more recreationist use the planning area (USDA Forest Service, 2000), and as recreational means of transportation advance, there will be an associated increase in need for road-related recreation activities.

Alternatives 2 and 3, and 5

There will be no change in the ROS classification if any of these alternatives is implemented.

Alternatives 2, 3, and 5 harvest activities may displace some recreationist and the outfitter guide permittee to new areas to camp, hunt, or to travel due to decreased aesthetic appeal of the forest. The outfitter guide's permitted area is larger than the project area; there is no concern with proposed activities because there are areas outside of the project area under permit that the outfitter guide can use to guide his clients and because the fire and treatments are not expected to affect overall big game population numbers (Chapter 3, Terrestrial Wildlife). Alternatives 2 and 5 will harvest more acres resulting in displacing some recreationist over a broader area on the landscape than Alternative 3. Noise may be heard from harvest activities resulting in some impacts on recreationist during this type of activity and adversely affecting the recreational experience for some people. Decommissioning roads can reduce access for some recreational type activities such as traveling roads. Haul routes will be heavily used by logging traffic, creating a higher level of traffic and safety concerns for the recreating public on roads. Signs will be posted to reduce this hazard (see Chapter 2, Management Requirements, Constraints, and Mitigation Measures).

In Alternatives 3 and 5, the areas with high levels of snag habitat may pose safety concerns for the recreating public who enjoy cross-country hiking.

All alternatives will provide safe and adequate roaded, trail, and trailhead access for the recreating public, through the cutting of hazard trees. Dispersed recreation will occur in the project area. The dispersed site at the junction of FS Roads 133 and 033 will be available for use, but access will be from Road 033 instead of Road 133. Closing FS Road 048 at the FS Road 050 junction will leave one campsite open but will close the remaining campsites in Jack Creek RHCAs. Forest Plan states to limit use as necessary to protect and/or rehabilitate riparian areas. The campsites are not in good locations causing degradation of the RHCA by vehicle use trampling vegetation and compacting soils.

In Alternative 5, with snag distributions expected at the landscape level, the area may appear more natural looking to the recreationist with timber harvest not as noticeable.

Alternative 4

Alternative 4 will maintain limited access due to less improvement of roads in this action alternative. This alternative will provide safe and adequate roaded, trail and trailhead access for the recreating public, through the cutting of hazard trees. No harvest will occur, so recreationists would not be affected by noise and traffic from harvest; however, noise and traffic from fuels reduction activities would occur and could negatively impact recreational experiences. The outfitter guide's permitted area is larger than the project area; there is no concern with proposed activities because there are areas outside of the project area under permit that the outfitter guide can use to guide his clients and because the fire and treatments are not expected to affect overall big game population numbers (Chapter 3, Terrestrial

Wildlife). Dispersed sites would remain accessible as described in Alternatives 2, 3, and 5. Decommissioning roads can reduce access for some recreational type activities such as traveling roads.

As dead and damaged trees fall, cross-country travel will become difficult. People will have to crawl over downed material to get from one place to another.

Effects common to all action alternatives

Recreational values will be altered for visitors due to burned trees and vegetation. It is not an old growth forest anymore, and it not green anymore. There will be a lack of shade for campsites.

Although the action alternatives propose to close some roads after harvest, others will remain open. There would be reduced roaded opportunities to publics who use roads to hunt, camp, gather mushrooms or berries because of road decommissioning and closure. Areas once easily accessible to the public may require additional effort (e.g., longer hikes or use of horses) to be accessed. This would benefit those visitors who prefer less roaded recreation.

Firewood cutting would be reduced until after harvest activities occur, but could then increase with the number of dead trees available. Mushroom gathering is expected to greatly increase in 2003 and then taper off in the following years. Horn hunting and other activities occur as well. Christmas tree cutting will be limited in the project area.

Hunting experience will be changed. As ground cover grows, it will provide more forage for big game animals. Hunting may be less desirable until new under-story vegetation is established. Hunters should anticipate a change in game use due to a loss of cover and changes in forage. Although future recreation use within the project area is difficult to determine, visitation has increased rapidly in the past few years. As the project area changes over time, so may the make-up of visitors and the activities they pursue. Recreationists will have to either adapt to the new situations or seek another area in which to recreate.

Special forest product gatherers often visit from outside the community. Because morel mushrooms respond to disturbances such as fire, it is believed that the area will have a great potential in spring 2003 for a major morel harvest. Mushroom gathering will have a short-term effect, possibly interfering with other recreation activities. These forest users favor few restrictions on access to gather mushrooms and other special forest products.

Under all the action alternatives, the project area will continue to provide a wide range of recreation opportunities, activities, settings, and experiences; however, recreation in roaded settings clearly dominates. In the short term, change in setting generally results in a small increase in roaded settings.

Cumulative Effects

No Action Alternative

Recreation activities will continue.

Alternatives 2, 3, 4, and 5

As described above, past activities and occurrences, particularly the Flagtail Fire, have affected the recreation resource. Past and proposed activities that could affect recreation resources have been analyzed in direct and indirect effects. Recreation activities, including hunting, camping, firewood cutting, and other uses, will continue as described above. In review of Appendix J (Cumulative Effects), no other ongoing or future actions are expected to have a measurable affect on the recreation resource.

Consistency with Direction and Regulations

All alternatives are consitent with Forest Plan direction and regulations. In terms of Executive Order 13287, the Bear Valley Work Center is a historic property that was rented out to the public as a recreational rental prior to the Flagtail Fire. The proposed alternatives would not have an effect since the building will be dealt with outside the scope of this document.

Irreversible and Irretrievable Commitments

There are no irreversible or irretrievable commitments related to recreation from this project.

All alternatives are consitent with Forest Plan direction and regulations. In terms of Executive Order 13287, the Bear Valley Work Center is a historic property that was rented out to the public as a recreational rental prior to the Flagtail Fire. The proposed alternatives would not have an effect since the building will be dealt with outside the scope of this document. There are no irreversible or irretrievable commitments related to recreation from this project

Rangeland Resource

Analysis Methods

The area impacted by the fire was summarized as it relates to the whole of the allotments impacted. The project itself will not prevent use of the allotments.

Existing Condition

Livestock grazing has been a part of the landscape of the Malheur National Forest since the 1860's when the first miners and homesteaders entered this area. Allotments within the planning area have been grazed by both domestic cattle and sheep, becoming almost exclusively grazed by cattle in the past 40 years. Although livestock grazing on National Forest System lands has decreased since the early 1900s, the ranching industry remains an important part of the Grant County economy.

Early grazing was essentially unregulated and resulted in resource impacts, some of which are still observable today. During the middle part of the century, the Forest Service took significant action to regulate livestock numbers, and to establish workable grazing seasons and allotments. In the latter part of the century, emphasis shifted to development of range management systems and regulation of effects on specific resources. During the past twenty years or so, emphasis has been on protection and management of riparian and aquatic habitats.

According to Area Ecologist, Charlie Johnson, there has been a marked improvement on most rangelands on the Malheur National Forest since the 1970s. However, the impacts at the turn of the century and continuing into the 1950s were sometimes too severe for the dry, warm non-forested communities to sustain. The result was degraded rangeland ecosystems with little opportunity (time) for natural rectification (reasserting of balance) for the natural community. He notes the improvements since the 1970s were mainly where rotational grazing (deferred or rest) were implemented, generally with added fencing.

Charlie Johnson's notes from the mid 1990s characterize the vegetation within the planning area as outside the normal range of variation. He asserts key factors influencing this are severe disturbance and a lack of maintenance disturbance processes. Because fire has such a profound influence on the ecosystem the curtailment of fire's natural cycle combined with livestock grazing has significantly contributed to the ecosystems being outside natural variation. Although his report was generated for other reasons, he adds that present health of vegetation within allotments also relates to the incursions by administrative projects to harvest trees. The removal of larger trees coupled with removal of fire from the ecosystem has led to promotion of later seral tree species when fire seral tree species were favored in the removal. These plant communities are now far outside the natural range of variation, which effects the overall rangeland/allotment health and production. (Charles G. Johnson, Jr; Summary Report for Rangeland Health on Selected Allotments, 6/6/95). For these reasons, prior to the Flagtail Fire, it was difficult to state that upland range conditions were continuing to improve, as the reverse may be more appropriate.

The non-forested riparian areas are recovering from past grazing practices; however, Kentucky bluegrass continues to dominate many sites where native grasses once resided.

The willows are not recovering as rapidly due to a number of possibilities such as ungulate browsing, competition for sunlight and soil nutrients and site changes from sediment deposits and lowering of the water table (Upper Silvies Ecosystem Analysis).

The Malheur National Forest Land and Resource Management (USDA Forest Service 1990) both allows for and encourages grazing. Stated goals (FLMP IV-2) include;

- Provide a sustained production of palatable forage for grazing by domestic livestock and dependent wildlife species (FLMP, 1990).
- Manage rangelands to meet the needs of other resources and uses at a level which is responsive to site-specific objectives.
- Permit livestock use on suitable range when the permittee manages livestock using prescribed practices.

Forage species (grasses, grass likes and forbs) recovery response time is often very rapid to change, such as green up the year following a fire. Because of this, short term effects are generally under five years and long term effects are over five years.

Current Condition

Three grazing allotments were impacted by the Flagtail Fire. They are the Flagtail, Jack Creek, and Scotty C&H Allotments. Based on the BAER team map, the fire impacted 7,028 acres but only burned 5,656 acres on these allotments (see Table RA-1). Of those acres burned, the BAER team identified 3,536 acres as receiving a moderate to high severity burn.

The Flagtail Allotment is permitted for use by 359 cow/calf pairs for a period of June 10 through September 30 under a five unit deferred rotation system. The portion of the Swamp Creek Unit that was burned is planned for rest from grazing for at least two growing seasons in compliance with the Forest's post-fire grazing guidelines.

The Jack Allotment is permitted for use by 219 cow/calf pairs for a period of June 6 through September 25 under a four unit deferred rotation system. Because most of this allotment was burned it will be rested for at least two growing season in compliance with the Forest's post-fire grazing guidelines.

The Scotty Creek Allotment is permitted for use by 700 cow/calf pairs for a period of June 1 through September 30. The area burned is planned for rest for at least two years in compliance with the Forest's post-fire grazing guidelines (Appendix H).

Table RA-1: Summary of Acres by Unit

Allotment	Unit	Acres By BAER Defined Severity*				Total Acres	Total Burned
		Unburned	Low	Mod.	High		
Flagtail	Swamp Creek	231	100	164	337	832	601
Jack Creek	Bald Hills	109	666	907	1024	2706	2597
	Jack Creek	289	530	124	15	958	669
	Jack/Snow	721	719	534	135	2109	1388
	Silvies	16	71	174	113	374	358
Total Jack Allotment		**1135**	**1986**	**1739**	**1287**	**6147**	**5012**
Scotty	Scotty Creek	6	34	9	0.00	49	43
Total All Allotments		**1372**	**2120**	**1912**	**1624**	**7028**	**5656**

*The BAER severity map was generated from remote imagery (see Chapter 6, “Fire Severity” for definitions)

The Flagtail Fire destroyed an estimated 5.7 miles of fences under Forest Service jurisdiction (map in Range Project Record). Those fences needed for livestock control that were damaged by the fire will need to be reconstructed prior to the resumption of grazing on the burned areas of the allotments. If other methods for effective control of livestock can be agreed upon by the permittee and the responsible official grazing may resume before fences are reconstructed.

Environmental Consequences

Resting the area from domestic livestock grazing for at least two growing seasons (all alternatives) would promote the re-establishment of high forage quality grasses and forbs.

Direct, Indirect, and Cumulative Effects

Alternative 1 - No Action

Forage Availability

In this alternative short term effects (up to 10-15 years) would be increased forage availability (following rest) as grasses and forbs would have little competition from shrubs and trees for a number of years.

The long-term effects (after 10-15 years), however, would be decreased forage availability as snags fall and material accumulates on the forest floor, inhibiting the growth of ground vegetation.

Distribution of Livestock

In the long term, after 10–15 years, as the large quantity of snags fall the difficulty in getting proper livestock distribution will increase. There would be decreased distribution of cattle through the units, resulting in an increased possibility of overuse of forage in some areas, and no use in others. As debris accumulates access to water sources could be impaired which will further disrupt livestock distribution patterns. The lack of application of prescribed fire under the no action alternative would directly affect the amount of downed material hindering cattle distribution.

Range Improvements

Under Alternative 1, no action, existing spring developments and fence lines, about 11.2 miles (map in Range Project Record), will require more intensive maintenance, as falling snags and accumulating debris will likely cause damage to the structures and impede fence rights-of-way and routes to water sources.

Permittee/Range Management Access

Under the no action alternative there would be no closures or decommissioning of roads. This would allow current road access to spring developments, salt grounds and fence lines.

The eventual accumulation of fallen debris under the no action alternative would result in impediment of horseback riders in moving cattle, as well as ATV's used to inspect and maintain fence lines and spring developments away from established roads.

In the long term, as forage becomes less available the number of permitted livestock or period of use may need to be reduced.

Alternatives 2, 3, and 5

With the implementation of Alternatives 2, 3, and 5 during the recovery period, grazing management techniques to achieve desired use levels would be implemented. This could include adjusting location of livestock turnout, placement of salt blocks or other management practices that would promote use by livestock in those portions of the pasture away from the fire. Specific grazing management adjustments would be developed in coordination with the allotment permittee and incorporated into the annual plan.

Forage Availability

Alternatives 2, 3, and 5 will promote increased forage availability in the short term, (following rest) as grasses and forbs will have little competition from shrubs and trees for water, sunlight and soil nutrients for a number of years.

Forage will be more readily available in the long term (15 years or more) as salvage harvest and reduces the number of snags that will fall and accumulate on the forest floor. Fuels treatment associated with these alternatives will reduce the accumulation of large material on the ground, which will also increase forage availability.

Reforestation under alternatives 2, 3, and 5 would impair forage availability to some extent, as the young trees become competition for grasses and forbs. Management of the planted trees may at some point include thinning and commercial harvest, which could open up the canopy and allow more ground vegetation growth in the long term. Decommissioning of roads under these alternatives will also provide more forage as grasses become established in the old roadbeds.

Seeding included as mitigation in these alternatives would delay the recovery of herbaceous forage, though grasses may provide short-term low-palatability forage in seeded areas. Subsoiling to eliminate compaction meets Forest Plan standards but will increase the amount of time it takes to meet or exceed pre-fire vegetation conditions on these acres.

Distribution of Livestock

Harvest and fuel treatment under Alternatives 2, 3, and 5 would result in the reduction in the potential abundance of downed logs, which would, over time, present physical difficulties to livestock grazing operations. Fewer impediments to travel from large log accumulations on the ground would facilitate cattle movement, and thus distribution, over the allotment, resulting in more even utilization of forage resources. The expected reduction in large materials on the ground would allow more open travelways for livestock to salt and water sources, further enhancing livestock distribution patterns.

Closure and decommissioning of roads will, over time, affect changes in livestock use patterns, as fallen snags fall across roads that currently provide open and unobstructed routes. This may result in better distribution of cattle, as in negotiating around downed materials the animals may be channeled to sources of forage overlooked in the past.

In the long term, Alternative 3 will impact livestock distribution more than Alternative 2 or 5 because it leaves 13 snags per acre, whereas Alternative 2 leaves only 2.39 snags per acre. Alternative 5 would have a moderate impact on livestock distribution, when compared to Alternatives 2 and 5 because snags per acre will vary by unit from 2.39 to 13.

Range Improvements

Under Alternatives 2, 3, and 5 the reduction in the potential for falling snags will lessen the chance of damage to fence lines and spring troughs, resulting in standard maintenance rather than the excessive repairs expected from large numbers of falling snags. Activities occurring in these alternatives increase the likelihood that remaining fences, about 11.2 miles, could be damaged, removed, or altered during treatment. However, mitigation measures in Chapter 2, Management Requirements, Constraints, and Mitigation Measures, will assure that fences scheduled for maintenance that are damaged will be repaired or replaced in a timely manner (map in Range Project Record). Fuels treatment will likely provide more open access along fence rights-of-way and routes to water sources, to properly utilize these structures.

Permittee/Range Management Access

Closure and decommissioning of roads within the fire area will limit access to some salt grounds, springs and fences which otherwise could be accessed by vehicle. However, horseback or ATV access along fence lines and to salt grounds and spring developments away from roads will be enhanced by the reduction in the quantity of snags and lesser accumulations of large materials on the ground.

Access by horse or ATV will be improved under alternatives 2, 3, and 5. In general most permittee or range management work is accomplished by either of these methods, so road closure or decommissioning is not likely to be a hindrance in general.

Alternative 4

With the implementation of Alternative 4, during the recovery period, grazing management techniques to achieve desired use levels would be implemented. This could include adjusting location of livestock turnout, placement of salt blocks or other management practices that would promote use by livestock in those portions of the pasture away from the fire. Specific grazing management adjustments would be developed in coordination with the allotment permittee and incorporated into the annual plan.

Forage Availability

Alternative 4 will promote increased forage availability in the short term (up to 10-15 years), (following rest) as grasses and forbs will have little competition from shrubs and trees for water, sunlight and soil nutrients for a number of years. Likewise, short-term benefits will result from treatment of unmerchantable fuels, providing more open area for increased ground vegetation.

In the long term fallen snags and material accumulation on the forest floor will inhibit the growth of ground vegetation.

Reforestation under Alternative 4 would impair forage availability, as the young trees become competition for grasses and forbs. Management of the planted trees may, at some point, open up the canopy and allow more ground vegetation growth in the long term, where accumulated fuels did not impede the growth of ground vegetation.

Decommissioning of roads under this alternative will provide more forage as grasses become established in the old roadbeds.

Distribution of Livestock

The short-term reduction of fuel loads under this alternative would result in fewer impediments to travel from fuels accumulation on the ground. This would facilitate cattle movement, and thus distribution, over the allotment, resulting in more even utilization of forage resources but not as much as the action Alternatives 2 and 3 would.

In the long term, 10 –15 years, as the large quantity of snags fall, the difficulty in getting proper livestock distribution will increase. There would be decreased distribution of cattle through the units, resulting in an increased possibility of overuse of forage in some areas, and no use in others. As debris accumulates, access to water sources could be impaired which will further disrupt livestock distribution patterns.

Range Improvements

Under Alternative 4, existing spring developments and fence lines will require more intensive maintenance, as falling snags and accumulating debris will likely cause damage to the structures and impede fence rights-of-way and routes to water sources.

In the short term, fuels treatment will likely provide more open access along fence rights-of-way and routes to water sources, to properly utilize these structures but not as much as alternatives 2, 3, and 5 would.

Permittee/Range Management Access

Closure and decommissioning of certain roads within the fire area will limit access to salt grounds, springs and fences which otherwise could be accessed by vehicle. In general, most permittee or range management work is accomplished by ATV or horseback, so road closure or decommissioning is not likely to be a hindrance in general.

Under Alternative 4, horseback or ATV access along fence lines and to salt grounds and spring developments away from roads will be enhanced for the short term, by the reduction in fuel accumulations following fuels treatment but not as much as Alternatives 2, 3, and 5.

In the long term, the eventual accumulation of fallen snags under Alternative 4 would result in impediment of horseback riders in moving cattle, as well as the use of horses or ATVs to inspect and maintain fence lines and spring developments away from established roads.

In the long term as forage becomes less available the number of permitted livestock or period of use may need to be reduced but, possibly not as much as would be needed in Alternative 1.

Cumulative Impacts of All Alternatives

As described above, past activities and occurrences (such as the Flagtail Fire) have affected the range resource. Past and proposed activities that could affect range resources have been analyzed in direct and indirect effects.

In review of Appendix J (Cumulative Effects), ongoing and future actions that could affect the range resource include the following: Treatment of noxious weeds will help maintain the rangeland forage resource. Aspen fencing will continue to exclude livestock grazing from fenced areas. Future/additional aspen and hardwood fencing will exclude additional small parcels within the allotments reducing the total available forage for livestock to a minor degree. Locations of fences may affect control of livestock and increase utilization of forage near the exclosure sites. Recreational use of the area could cause dispersal of uncontrolled livestock via open gates, and recreational livestock may use some forage. Placing large wood into stream channels (wood addition to channels) will help disperse livestock around riparian areas. All other ongoing and future actions in Appendix J would not affect range. The cumulative effect of livestock use on other resources is discussed in each resource section if applicable.

Consistency With Direction and Regulations

As previously mentioned the project will not prevent grazing of the allotments. The effects of the wildfire will require a cessation of grazing for a period to allow recovery of herbaceous vegetation.

Irreversible and Irretrievable Commitments

The project as described will not result in any irreversible or irretrievable effects to the range resource. Thus this project is consistent with guidelines for range set forth in the Forest Plan.

Botany

Introduction

The following section discusses effects concerning the risk of spreading invasive species, the impacts on American Indians use, and impacts on known sensitive species. Each of these discussions measures impacts by choosing certain treatments, or actions that influence the magnitude of impacts. For example, acres of ground disturbance and miles of open road are major factors in noxious weed spread.

Regulatory Framework

Malheur Forest Plan

The Forest Plan requires that all proposed projects assess the potential impact of activities on the habitat of sensitive plant species, and perform a biological field evaluation when sensitive species are present.

The Forest Plan requires assessing Native American cultural resources and considers edible native plants to be part of these resources.

Analysis Methods

Noxious Weeds

Activities that expose bare ground or areas where vehicle traffic occurs were used to assess the potential of spreading weeds. Acres affected by tractor yarding, grapple piling, and landings were chosen as indicators to evaluate effects, because off-road equipment would disturb soil during harvest activities and could spread seed or reproductive plant parts stored in the soil. Roads are a significant source of seed and off-road equipment use has the potential to greatly increase weed spread to large areas. Planting conifers would ensure that ground cover is more quickly established and site conditions are not as favorable to noxious weeds.

Culturally Important Plants

Available access for tribal members was evaluated by using the number of miles of open road within the fire boundary and distribution of roads. To evaluate improvements for native hardwoods, the miles or area planned for planting with culturally important plants, or acres of aspen stand improvements were measured.

Sensitive Plants

Roads decommissioned near existing populations or potential habitat was used to evaluate impacts on these species. No other measures were used because no activities are planned within documented sites or within potential habitat for known species.

Background

Forest Understory Vegetation, Juniper Woodlands, Riparian, Grasslands

There are four general understory vegetation types within the fire boundary: upland forest, juniper woodlands, riparian areas, and meadow habitats. This section discusses the relative abundance, distribution, and condition of understory vegetation within these types.

Upland Forest Understory Vegetation

The fire killed nearly all shrub, forb, grass, and sedge vegetation in the uplands within forested areas, although shortly after the fire, sprouts of Oregon grape, elk sedge, pinegrass, and unidentified forbs were seen within burned areas. A partial list of plants encountered during 2003 surveys is contained in Appendix I.

Since a major portion of the fire area was in the warm-dry and hot-dry potential vegetation groups, most of the understory species are adapted to fire to create favorable conditions for their regeneration. It is likely that many species may still be present as seed or portions of plants that survived the fire underground and are still capable of regenerating. Grass species such as Sandberg bluegrass (*Poa secunda),* blue bunch wheatgrass (*Pseudoroegneria spicata*), and pinegrass (*Calamogrostis rubescens*) are probably well represented, as are upland sedges such as elk sedge (*Carex geyeri*). Among the forb species that are probably present are lupine (*Lupinus spp.*), western yarrow (*Achillea millefollium*), aster (*Penstemon globules*), arrowleaf balsamroot (*Balsamorhiza saggitata*), and common shrubs such as snowberry (*Symphorocarpus albus*).

Juniper Woodlands

Juniper woodlands occur on a small proportion of the project area (8%), but an estimated 80% of these areas are concentrated on or within a short distance of the Bald Hills. The remaining woodlands are located at the south end of the project area at the headwaters of Snow and Jack Creeks. Bluebunch wheatgrass is associated with this woodland type: on deeper soils, these woodlands contain a mix of dry understory site species, such as big sage (*Artemisia tridentata Nutt. ssp. vaseyana*), and, on shallow soils, mountain mahogany (*Cercocarpus ledifolius*) is found growing with juniper, a mix of juniper and ponderosa pine, or alone on the harshest sites. Most vegetation within sites were killed if they were adjacent to densely forested areas or if ponderosa pine had grown into these drier sites. However, on the harshest sites these species survived, because in such areas as the Bald Hills the vegetation was naturally sparse and far enough from the fire to escape ignition.

Riparian Areas

The fire burned an estimated 35% of the total length of Snow Creek riparian area, and only a small portion of the Jack Creek riparian area, near the intersection of the 2400048 and 2400050 roads, burned. Other valley bottom riparian areas were mostly unburned, preserving important hardwood species, such as willows, alder, and aspen.

The condition of most hardwoods located within riparian, valley bottom areas within the Silvies River, Jack Creek, Snow Creek riparian areas, is still declining, from lowered water table, lack of natural disturbance, increasing competition from noxious weeds and other exotic species, and continued heavy domestic livestock grazing and wildlife browsing. They are old, decadent, and exhibit poor vigor, and reproduction, if any, is poor.

Animals have damaged many common hardwoods, such as willow, alder, dogwood, and aspen. Young plants are killed or unable to reproduce because domestic livestock and big game browse new growth to the point where the plant is unable to develop into a mature plant and reproduce. For example, aspen suckers are heavily browsed and cannot develop a mature stem, and bitterbrush, being heavily browsed, cannot produce seed (Upper Silvies Ecosystem Analysis at the Watershed Scale).

Grasslands

The numbers and distribution of once prominent native grasses such as tufted hairgrass (*Deschampsia cespitosa*), and native fescues, sedges, and forbs have declined since large scale domestic livestock grazing began and fires were routinely suppressed. (Upper Silvies Ecosystem Analysis at the Watershed Scale Report). *Poa praetensis* (Kentucky blue-grass) is now established and thriving within meadow areas, and has reduced the amount and distribution of once common native species (Flagtail Allottment EAR and Allottment Management Plan, 1981, Bear Valley Ranger District).

<u>Invasive Species – Noxious Weeds and Introduced Species</u>

Existing Condition

Noxious Weeds

The Flagtail Fire and fire suppression activities have created conditions favorable for establishment of noxious weeds. The fire burned an estimated 7,120 acres, and fire suppression activities created 29 miles of fire lines (hand and mechanical); used 54 miles of road; constructed safety zone clearings and landing sites (Technical Specialist's Report Burned Area Emergency Rehabilitation, 2002); opened closed roads, and drove cross-country (personal communication on 4/22/2003 with Eric Wunz, Flagtail Fire Resource Advisor).

Sixty-seven weed locations have been documented within or adjacent to the Flagtail Fire project area. Twenty two locations were documented before the fire (Appendix I - Bear Valley Weed Locations) and 41 additional sites, on an estimated 52 acres, have been located within the fire boundary while inspecting firelines, helicopter landings, and other areas where fire suppression activities disturbed soil and could have deposited weed seed. Four additional species have been documented: Canada thistle, field bindweed, houndstongue, and common teasel (Table BT-2).

Survey personnel used "Weed List of Grant County" list to determine target species. Twelve species of noxious weeds occur in or within two miles of the Flagtail Fire project area: dalmatian toadflax, yellow toadflax, diffuse knapweed, spotted knapweed, Canada thistle, scotch thistle, field bindweed, houndstongue, tansy ragwort, teasel, and white top. Species of greatest concern are spotted knapweed, diffuse knapweed, dalmatian toadflax, and white top, because these weeds can spread quickly, crowding out native plants, and are difficult to eradicate once established.

Fourty-five of the sixty-seven weeds sites within the fire boundary burned (six located before the fire and 39 since). Most sites are located within 300 feet of roads. Another eighteen sites are present within 3 miles of the project area and could be transported into the area. For locations see the following tables and Figure 22 in the Map Packet.

Approximately 35% of the total weed acres within the project area burned with moderate to high severity. The remaining 65% burned at a low severity or did not burn. For most invasive species this means the plants probably were not killed and will probably resprout and produce seed or additional underground parts from which they will produce new plants. The species that will probably survive include dalmation toadflax, diffuse knapweed, field bindweed, and houndstongue.

Table BT-1: Flagtail Fire Area - Noxious Weed Locations Known Before the Fire

Within the Project Area		
Road Number	**Species**	**Acres**
2400	YELLOW TOADFLAX	0.10
6300	DIFFUSE KNAPWEED	0.11
	SPOTTED KNAPWEED	1.71
	YELLOW TOADFLAX	0.10
		0.35
		0.10
		2.5
Outside the Project Area		
2100	DALMATIAN TOADFLAX	0.11
3100	SCOTCH THISTLE	0.10
	TANSY RAGWORT	0.10
6300	DALMATIAN TOADFLAX	0.10
		0.11
		0.10
		0.11
	WHITETOP	0.10
		0.11
	YELLOW TOADFLAX	0.10
		0.10
		0.10
2195205	DALMATIAN TOADFLAX	0.11
6300679	DALMATIAN TOADFLAX	0.16
3100348	DIFFUSE KNAPWEED	0.10
		0.10
	TOTAL Acres Outside Project Area	**1.7**

Source: Malheur N.F. GIS, May 2003

Table BT-2: Flagtail Fire Area – Noxious Weed LocationsLocated After the Fire

Common Weed Name	Within Road Corridor	Within Treatment Unit
Canada thistle (29.75 acres)		014
		130
	2195	011
	2400011	070 075
	2400017	075 077 078 110
	2400022	
	2400050	180 182
	2400083	056
	2400086	
	2400131	120 124
	2400134	
	2400136	114 118 120
	2400865	058
teasel (0.1 acres)	Near junction of 2400017/2 400077	

Common Weed Name	Within Road Corridor	Within Treatment Unit
dalmation toadflax (0.9 acres)		014
	2195	011
	2400011	070
	2400017	075 077 078 110
	2400083	056
	2400086	
	2400134	
	2400136	114 120
	2400865	052 058
	6300661	010
field bindweed (0.5 acres)	2195579	011
scotch thistle (0.4 acres)	2400017	090
		090
	2400067	
	2400865	052

Source: 2003 BAER Flagtail Fire Noxious Weed Field Survey Spreadsheet and Map

The following information describes the known growth habits, treatment options, and if known, effects of fire upon these species.

Canada Thistle (*Cirsium arvense L. Scop.*)

Fire severity was moderate to high on five sites (6.6 acres) and ranged from low to unburned on 10 sites (19.5 acres). Three sites (3 acres) did not burn. Fire may kill the plant, but seeds buried in the soil may survive for many years. If the roots survive, root buds are able to form new plants if the weed is disturbed. It is capable of colonizing burned areas by wind dispersing the seed. Fire may reduce the number of flowering heads, reducing seed production, and prescribed fire during the dormant season may help slow the spread by stimulating native grass species. Increased grass production interferes with the thistle growth and production, and may decrease its spread.

Canada thistle is a relatively long-lived creeping perennial that forms a colony from deep and extensive horizontal roots. Established perennial plants require more than one year of treatment. Current treatment consists of cutting the plants at late bud or early bloom to prevent seed dispersal. Cultivating seedlings 2 1/2 weeks after emergence prevents them from becoming perennial. Some biological control methods such as insects and fungus, may reduce the vigor and the density of the sites, but are currently unavailable for treatment on public land.

Diffuse and Spotted Knapweed (*Centaurea diffusa* Lam. and *C.maculosa* Lam.)

Both species resist low intensity fires because of their stout taproot. High intensity fire may kill the plant, but seeds buried in the soil may survive.

Knapweeds invade and rapidly move into disturbed sites resulting in a reduction of perennial vegetation. They are vigorous and competitive once established. One of the most common forms of transport for these species is along transportation corridors, being moved by equipment and vehicles. A Montana State University Study showed that a vehicle driven several feet through a spotted knapweed infestation can pick up about two thousand seeds, which are then dispersed along highways. In this same study, 90% of the weed seeds were dispersed from the tires within 10 miles from the infestation (Sheley, 1994).

Diffuse Knapweed **-** Fire severity was moderate to high on one site (0.11 acres)and low on one site (0.1 acres). The ability to re-grow after mowing suggests that a low severity fire may only top-kill the plant. Severe fire probably kills it. Seeds buried in the soil probably survive. Dry soil conditions associated with burns may discourage diffuse knapweed colonization.

Diffuse knapweed requires two years to complete its life cycle. It is highly aggressive and is capable of establishing on land in good condition. .

The current treatment for Diffuse knapweed, pulling the plants to remove most of the root, may offer some control. Biological control agents are available for this weed, but have not been widely distributed in our area and are not currently approved for use on Forest Service land.

Spotted Knapweed – Fire severity was low on one site (1.71 acres). Spotted knapweed may increase after fire and established plants may re-grow and buried seed may germinate after fire.

Spotted knapweed is a short-lived perennial. It is ranked as the number one weed problem on rangeland in western Montana. This knapweed occurs in disturbed grasslands, shrublands, and open forests, it is common in Douglas-fir and ponderosa pine sites. It spreads readily in forest areas as a result of timber harvest activities. It is a perennial, and a plant may live 3-5 years and up to 9 years. It has a stout taproot, and older plants may develop lateral shoots from beneath the soil and form multiple “rosettes” (first year leaves). It produces an incredible number of seeds, as many as 2600 seeds per square foot. Seeds are can spread up to 3 feet away from the parent plant. Seeds are also spread in hay, by animals, and by vehicles.

Biological control agents have been dispersed to various spotted knapweed sites. It is generally resistant to manual control efforts and may sprout from root fragments left in the soil. It is estimated that an aggressive program of pulling done several times per year would require 5-10 years for results to be obvious.

Field Bindweed (*Convolovulus arvensis L.)*

Fire severity was low on one site (0.5 acres). Fire will kill the above ground plant but its deep rhizomes would survive most fires and produce new plants. Researchers found 70 percent of the roots of field bindweed were in the top 6 inches of soil, so low to moderately severe fires could set back plant growth or kill plants without extensive rhizomes.

Field bindweed is a perennial that grows from an extenisve root system, often climbing or forming dense tangled mats. It is a difficult weed to eradicate because of the long, deep taproot which can penetrate the soil to a depth of 10 feet and which produces numerous long lateral roots. Rhizomes overwinter and readily sprout in the spring. Seeds remain viable for up to 50 years. Field bindweed cannot tolerate shade, therefore it is unlikely that field bindweed would persist in later stages of plant succession.

Because seed survives in digestive tracts, small mammals and birds could transport seed onto a burned site. In addition to seed scarification occurring by stomach acids, fire scarification of surviving seed could enhance or promote germination.

Houndstongue (*Cynoglossum officinale L.)*

Fire severity ranged from low to unburned on one site (3 acres) and did not burn one other site (2 acres). Houndstongue plants may also survive fire, since nutrient reserves in the taproot acquired during the first year are sufficient for normal seed production the following year, even if the plants are completely defoliated early in the spring. A high severity fire would probably be necessary to kill houndstongue because of its hardy taproot.

Houndstongue was introduced from Europe. It is a biennial, requiring two years to produce seed, forming a rosette the first year and a flowering stalk the second. The “nutlets” break apart at maturity and cling to clothing or animals, but wind is considered to be the primary dispersal mechanism. This plant is toxic to cattle and horses, and to a lesser extent, sheep, containing pyrrolizidine alkaloids, which cause liver cells to stop reproducing.

Tansy Ragwort (*Senecio jacobaea* L)

This single site (0.1 acres) is outside the fire area. Tansy ragwort is generally considered to be a biennnial but it will become a perennial if disturbed. The species is moving into areas as a contaminant of hay and straw from infested areas and on equipment or vehicles. Most local sites have been associated with hunters and their activities. The species is widespread in Washington, Oregon and California. While it is not presently in all western states, it does infest millions of acres of private range, public range, and pasture land in the Pacific Northwest. Tansy is toxic to cattle and horses. It has several alkaloids, which produce irreversible liver damage.

Current treatment consists of hand pulling or cutting. However, roots left in the ground are capable of forming new plants, and this method is especially ineffective in moist areas. A biological control agent is currently unavailable for our area.

Common Teasel (*Dipsacus fullonum L.*)

The single site (0.1 acres) within the fire boundary did not burn.

The plant grows as a basal rosette for a minimum of one year then sends up a tall flowering stalk and dies after flowering. During the rosette stage teasel develops a large tap root. The tap root may be over 2 feet long and 1 inch diameter at the crown.

Teasel was introduced to North America possibly as early as the 1700's to use in raising the nap of cloth. Teasel has spread rapidly in the last 20-30 years, probably aided by construction of the interstate highway system.

If left unchecked, teasel quickly can form large monocultures excluding all native vegetation. A single teasel plant can produce over 2,000 seeds. Seeds also can remain viable for at least 2 years. Seeds typically don't disperse far; most seedlings will be located around the parent plant which often provides bare ground for new teasel plants after the adult dies. Immature seed heads may be capable of producing viable seed.

If treated in the early stages of infestation it is possible to cheaply and quickly control teasel. For small populations mechanical methods are effective. Young rosettes and the teasel root can be dug up using a dandelion digger. Very small seedlings can be pulled up by hand when the soil is moist. Flowering plants can be cut before seed set by cutting off the flowering heads and cutting the flowering stalk slightly below ground level to prevent resprouting from the root crown. All parts must be removed from the area. Several years treatment may be necessary to totally eradicate teasel from a natural community. Prescribed burning in combination with herbicides can be effective in reducing and eliminating the plant if treated for at least several consecutive years, however herbicide application is not approved for Forest Service land.

Scotch Thistle (Onopordum acanthium L.)

Fire severity was moderate on one site (0.1 acres) and another site (0.1 acres) did not burn. Germination of dormant seed in the upper soil layer is stimulated by low intensity burning. Germination of dormant seed in the upper soil layer is stimulated by low intensity burning.

This very large thistle (up to 12 feet tall) is an exotic invader from Europe. Rosettes two feet across are not uncommon. The species may form stands so dense that they are impenetrable to livestock and wildlife. It is quite aggressive and becoming a serious problem in much of NE Oregon. Scotch thistle is a biennial, and is reproduced solely from seed. The current treatment method involves cutting the plants down in the late bud or early flowering stage.

Small infestations should be physically removed or cut a few inches below the soil surface. Seedbank longevity is a major factor in managing these thistles. Reestablishing competitive perennial grasses and monitoring infested areas on a yearly basis is critical. There are no biological agents which have been specifically released for scotch thistle control in the United States.

Dalmation and Yellow Toadflax (*Linaria dalmatica* Mill.and *L. vulgaris* Mill.)

Fire severity was moderate to high on nine dalmation toadflax sites (9+ acres) and six yellow toadflax sites (0.4+ acres). Fire severity was low on 8 dalmation toadflax sites (9.5+ acres) and two yellow toadflax sites (0.2+ acres).

Fire is not effective in reducing toadflax plants because the soil temperatures are not hot enough to kill the root buds or buried seeds. Fire burning the tops of the plants could stimulate production of vegetative shoots, and their seeds may remain dormant in the soil for up to 10 years. They do not compete well for soil moisture against established perennials and winter annual crops.

Yellow toadflax is a perennial originally introduced as an ornamental, and is still marketed under the name "butter and eggs", or "Jacob's ladder". It is a relative of *Dalmatian toadflax*, a more widely spread noxious weed of the John Day valley. Plants may produce 15,000-30,000 seeds, and have extensive, well developed root systems. The root system consists of underground stems (rhizomes), a vertical taproot, and a system of lateral roots, which have vegetative buds that sprout into new plants. Roots may be three feet long, while lateral roots may spread several meters. It primarily reproduces from root shoots, and exhibits rapid growth of patch size by this method. It has evolved with disturbance, and is most competitive and persistent in disturbed or less favorable habitats.

Current treatment involves pulling plants close to the first bloom as possible. One biological control agent is available, but is not yet successfully established in our area.

Whitetop/Hoary Cress (*Cardaria draba* L.)

The single site (0.1 acre) is located outside the fire area. Whitetop can survive fire due to the presence of buds located on an extensive underground root system and by germination of seed stored in the soil. It is a deep rooted perennial, which reproduces from root segments and abundant seed. White top will increase rapidly if disturbed, and can spread to new areas by seed or root fragments in soil on equipment. The plant starts growth very early in the spring and have bloomed and set seed by mid-summer. Populations may be expected to slowly increase in size over time, and spread to new areas unless treated.

Currently the only treatment available is to cut down plants before they set seed.

Other Introduced Species

Riparian grassland areas adjacent to the Silvies River and other smaller moist meadows are particularly affected by aggressive species such as Kentucky blue grass (*Poa pratensis*). This species has expanded into sites that once had native grass species, reducing native species distribution and patch sizes because blue grass is more resilient than natives to compaction and lowered water tables. In the drier upland areas, cheatgrass (*Bromus tectorum L.*) has increased by competing more successfully for moisture than native species and by creating highly flammable conditions before native species can set seed, reducing the numbers and distribution of native bunchgrass species.

Environmental Consequences (Effects of Alternatives on Limiting the Spread of Invasive Species)

Measuring Alternative Impacts

The following measures are used to evaluate the potential of spreading weeds by ground disturbance from off-road equipment and use of open roads. Reforestation is used to evaluate how establishing vegetation quickly may impact weed establishment.

- Miles of open road within the fire boundary and distribution
- Acres of tractor yarding, grapple piling, landing construction outside units
- Miles of road construction
- Acres of reforestation

Acres affected by tractor yarding, grapple piling, and constructing landings were chosen for indicators because off-road equipment and road construction disturb and expose bare mineral soil over large areas during harvest activities, and could spread seed or reproductive plant parts stored in the soil. Open roads are also a significant source of weed spread because vehicles can easily spread seed. Off-road equipment use has the potential to greatly increase weed spread to large areas. Reforestation quickly establishes ground cover and creates unfavorable site conditions for noxious weeds colonization.

Felling roadside hazard trees and post and pole salvage were not used to analyze effects because impacts do not differ much between the action alternatives (same units and 10 fewer acres in Alternative 3), and neither activity would create additional ground disturbance. Equipment would only remove roadside hazard trees while parked on existing roads or within a treatment unit, and post and pole removal would only occur within salvage treatment units (Chapter 2). The effects of pile burning was also not analyzed because burning will not create additional ground disturbance that would spread weeds and treatment areas would plant conifers on the same acres for each action alternative.

The following table displays the impacts and percent change, if one exists, from Alternative 1 (No Action) or Alternative 2 (Proposed Action).

Table BT-3: Comparison of Alternatives on Risk of Weed Spread

Activity	Unit of Measure	Alt. 1 (NA)	Alt. 2 (PA)	Alt. 3	Alt. 4	Alt. 5
Reforestation	Acres	0	4590	4590	4590	4590
Fuel Treatment - Grapple Pile	Acres	0	1250	1380 (+10.4%)	3000 (+240%)	1180 (- 6%)
Roads New Construction	Miles	0	0.3	0.3	0	0.3
New Temp. Roads	Miles	0	3.9	2.9 (-16%)	0	3.3 (- 15%)
Open Roads	Miles	46.5	29.2 (-37%)	29.2 (- 37%)	30.1 (- 35%)	29.2 (- 37%)
Decommissioned Roads	Miles	0	13.1	13.1 (no change)	11.9 (- 9%)	13.1 (no change)
Salvage Harvest Tractor	Acres	0	2670	1990 (-26%)	0	2470 (-8%)
Helicopter Landings (Constructed Outside Units)	Acres	0	7	3 (- 57%)		7 (no change)

Direct Effects

Alternative 1

There would be no risk that weed seeds would be spread by equipment, since harvest activities would not occur.

Alternatives 2, 3,and 5

Thirty weed sites have been identified within the burn area, twenty-four within proposed treatment areas, and additional weed sites are located adjacent to the project area. There is a chance that off-road equipment could bring weed seed from outside the project area or further spread existing weed seed or plant parts. These alternatives would build a short length of classified road, between 3 to 4 miles of temporary road, construct 3 to 7 acres of landings outside of treatment units, fell road-side hazard trees; and create the most ground disturbance of any of the alternatives.

The risk would be low that this equipment would bring seed into the project area, since Contract Provision CT 6.35 would require equipment operating off of roads be cleaned before entering National Forest lands (Mitigation Measures, Chapter 2). The risk is also low that equipment would enlarge existing weed populations or spread seed or plant parts to new areas because weed locations have been identified and mitigation measures require equipment operators take precautions to reduce the risk that reproductive material would be carried on machinery:

- Avoid existing weed areas until seed source is eliminated,
- Avoid locating landings, skid trails, or parking within 10 feet of known sites,
- Report new weed locations, and
- Clean equipment between units if it has contacted weed seed.

Adherence to these measures would be effective because weed locations are known and can be avoided, existing and new sites would be mapped, and past experience with weed treatment has shown that quick treatment and future monitoring is an effective tool (Appendix I).

Alternative 4

This alternative creates less soil disturbance than activities in Alternatives 2, 3, or 5 because it does not construct additional roads or landings, and uses low ground pressure machinery to pile treated areas, which does not disturb the soil to the extent of tractor yarding (Environmental Consequences - Soil). The risk is low that Alternative 4 would disturb soil enough to create favorable conditions for weed establishment. Adherence to the mitigation measures mentioned for Alternatives 2, 3, and 5 would effectively limit spreading known weed populations to new areas.

Indirect Effects

Alternative 1

This alternative would promote the spread of noxious weeds by not reducing open road miles and vehicle access and not hastening the vegetation recovery of the area. Since roadways support the heaviest known populations of noxious weeds and pose the biggest threat for invasion (Upper Silvies Ecosystem Analysis at the Watershed Scale), this alternative would have the greatest risk of vehicles spreading noxious weeds into and throughout the project area by not decreasing the amount of open roads and vehicle access. There are few areas within the project area that do not have vehicle access. Alternative 1 would also not plant conifers on previously forested upland areas outside of riparian habitat conservation areas (RHCA). The risk is high that weeds could establish within the project area before native vegetation could occupy the site.

Alternatives 2, 3, 4, and 5

There is a low risk that these alternatives would increase the spread of weeds because of the combination of project design elements, plans for quick reforestation, applying grass seed adjacent to known weed sites, and a strategic decrease in area accessible by motorized vehicles.

The risk that existing weeds might spread and find favorable growing sites would be reduced by requiring seeding disturbed areas near documented noxious weed sites with native grass seed or a certified weed-free, non-persistent grass mix (Mitigation Measures, Chapter 2). Seeding to reduce weed spread and establishment has been found to be effective in reducing the spread and density of weeds after wildfires (NRSC News, July 2003 and personal communication with Umatilla NF botanist).

Alternatives 2, 3 and 5 would reduce the amount of open roads by 37%, slightly more than Alternative 4, by decommissioning 13.1 road miles and permanently reducing access along many small draws and riparian areas. Alternatives 2, 3, and 5 would also decommission more than a mile of the Snow Creek road, an important riparian area, while Alternative 4 would not. By closing many short roads, all the action alternatives greatly reduce the potential surface area that weeds could colonize. The access travel management plan will reduce access to riparian areas and the Bald Hills, which are particularly vulnerable to weed invasion (Upper Silvies Ecosystem Analysis at the Watershed Scale).

Alternative 4

Conifers would still be planted in the upland areas and, with the exception of leaving Snow Creek vehicle access unchanged, the access management plan described for Alternatives 2, 3, and 5 would be implemented.

Cumulative Effects

All Alternatives

Effects of Fire and Fire Suppression Activities

There is a risk that the fire itself may have stimulated undocumented weed populations and that weeds were transported into the project area by off-road equipment during suppression activities. These weeds could germinate and spread, but this risk would be reduced because the Forest has decided to monitor for noxious weeds on disturbed areas created by fire suppression activities over the next three years. These areas include hand and machine fire lines, constructed safety zones and landing sites, and roads (Technical Specialist's Report Burned Area Emergency Rehabilitation, 2002 and Appendix J).

Effects of Reasonably Foreseeable Actions

Other Flagtail Fire Recovery Analyses

Other Flagtail Fire recovery projects are planned for the near future or have begun, (Actions Outside of this EIS to Address Recovery Needs, Chapter 1). There are plans to fence aspen; treat fuels within riparian areas; fell hazard trees; and create windrows to control erosion on the Bald Hills area. Other projects, such as planting hardwoods in riparian areas; planting conifers within riparian habitat conservation areas (RHCA), and placing woody debris in stream channels and draws are completed (Appendix J).

These activities should not increase the spread of noxious weeds because activities are planned outside known weed locations, would not create ground disturbance by off-road equipment, or would create such limited and localized disturbance (scalping for planting spots) that existing seeds should not be able to colonize. These activities would also use the same precautions that apply to this analysis: to limit weeds spread, weed populations would be treated to remove the seed source before ground disturbing treatments (Mitigation Measures, Chapter 2). Reforesting will reduce the risk that weeds could become established because planted conifers and hardwoods will provide future shade and compete with any germinating weed species.

Effects of Other Fire Recovery Decisions

Noxious Weed Monitoring and Treatment

The decision to monitor weeds within the fire area was made as part of the Flagtail Fire Burned Area Emergency Rehabilitation process. Monitoring will occur for three years, 2003 through 2005, to determine whether noxious weeds were introduced into the burned area by equipment or expanded from known locations. Monitoring activities will include walking fire lines, landings, and other areas where soil disturbance could have deposited weed seed. These actions should reduce the risk that weeds could spread or existing populations could enlarge (Appendix J).

Deferred Livestock Grazing

As another precaution, livestock grazing will be deferred for at least 2 years in those allotments affected by the fire. This management strategy is important for both the short and long-term recovery of the area to assure that vegetation is re-established. This action should also reduce the risk of domestic livestock transporting seeds into the fire area and ensure that conditions in the future will not be as favorable for weed establishment (Appendix J).

Blue Mountain District Noxious Weed Monitoring Program

The district treats identified weed sites and maintain a database to track treatment success. This cumulative effect of this program and the BAER weed monitoring will reduce the number of future weed sites and improve the recover of vegetation on a landscape scale. (Appendix J)

Culturally Important Plants

Existing Condition

Many native plants are considered "sensitive" because local American Indian tribes consider the use of these plants, and the activities connected to these plants, a means of connecting themselves to their heritage and preserving their cultural identity.

This project area is an area of interest to the Confederated Tribes of the Warm Springs and lies within the boundaries of their ceded lands. The area is also an area of interest for the Burns Paiute Tribe and Confederated Tribes of the Umatilla. Each tribe has listed plants that are considered important for their cultural identity. These plants, which include trees, shrubs, forbs, root crops, sedges and grasses, supply such needs as food, tobacco, chewing gum, seed sources, teas, medicine, insect repellants, dyes, and materials for basketry and other building materials.

The Upper Silvies Ecosystem Analysis at the Watershed Scale recognized that, in general, native grasses, woody plants, sedges are all declining. Camas, a plant that was once widespread and associated with meadows, has been declining as water tables within riparian areas declined.

Many hardwood species such as mountain mahogany, black cottonwood, quaking aspen, water birch, alders, chokecherry, willows, ceanothus, serviceberry, sagebrush, Oregon grape, dogwood, bitterbrush, rose, snowberry, spirea, and huckleberry, are now decadent and unable to reproduce successfully because of lack of fire and an increase in domestic grazing and big game browsing in riparian areas. Hardwood populations within riparian areas have fewer plants within remaining concentrations, these plant "clusters" are smaller, and there are fewer of them throughout the project area. Fire has created conditions that favorssuckering and spread of aspen clones, but because of the poor condition of many of the remaining mature aspen some decadent clones may already have been lost.

Culturally important tree species, ponderosa pine and western larch, found above the riparian areas (in the uplands) were greatly affected by the fire, and their distribution and conditions are described in the Affected Environment portion of Chapter I within the Forested Vegetation section. Generally, thin strips and patches of these species within the Silvies River and Jack Creek corridors were unburned, as were important hardwood species, such as willows, alder, and aspen, and other traditionally desirable plants such as sagebrush. However, the condition of these plants is still declining and may not be producing viable seed.

Environmental Consequences

Tribal members of the Confederated Tribes of the Warm Springs Indian Reservation, Burns Paiute Tribe, and Confederated Tribes of the Umatilla Indian Reservation are concerned that road closures or decommissioning could reduce access to traditional use areas.

The tribes are concerned that populations of culturally important native species are in decline, and that non-native species are taking their habitats.

Tribal members are also concerned that treatments associated with reforestation activities to prevent animal damage could damage traditional use areas or plants if chemical treatments are used. This concern will not be discussed further in the effects section because no lethal control measures (chemicals or traps) will be used for this or other Flagtail Fire recovery projects. Some type of physical barrier, such as fencing or mesh tubing, would protect hardwood plantings.

Measuring Alternative Impacts

The following measures are used to evaluate available access for tribal members, and whether native species would be promoted.

- Miles of open road in the fire area and distribution
- Acres or miles of area planned to plant with culturally important plants and species planted
- Expansion of aspen stands

Available access for tribal members was evaluated by using the number of miles of open road in the subwatersheds and distribution of roads. Locations of important sites are not known, so the discussion of vehicle access was the primary consideration.

Planting native species and acres of aspen protected evaluate improvements for native and culturally important species These measures were used because information was available.

The effects of animal damage activities was not included because there are no chemical or other lethal methods proposed for this or other projects in the Flagtail Fire boundary.

Indirect Effects

Alternative 1

This alternative would have the best access to desirable sites, since because no roads would be closed or decommissioned, leaving nearly 47 miles of road open (Table BT-2).

Alternatives 2, 3, and 5

These alternatives reduce available access from 35 to 37 percent, leaving approximately 29 open road miles (Table BT-3). Roads would remain open for vehicle access along the Silvies River; the lower portion of Snow Creek; and along the 2400017 road on the eastern fire boundary. The closed portion of the Jack Creek access would be available by permit. There would only be two roads that would allow vehicle access to the Bald Hills area: Forest Roads 2400865 would access this area from the west and Forest Road 2400024 from the east.

Alternative 4

This alternative provides slightly better access than Alternatives 2, 3, or 5 because vehicle access would remain for the most of the Snow Creek area (Forest Roads 2400133 and 2400203), leaving 30.1 miles of total open road.

The following table summarizes changes in vehicle access within the project area.

Table BT-4 - Vehicle Access Changes - Alternatives 2, 3, and 5

AREA NAME	PROPOSED ROAD ACCESS CHANGES
Snow Creek	Access eliminated (decommissioned) south of the 2400147/2400133 road junction.
Jack Creek	Access restricted from the intersection with Forest Road 2400050 (closed) and eliminated at the beginning of the 2400048 (decommissioned). Access basically eliminated to most of the Jack Creek riparian and meadow areas.
Bald Hills	Access eliminated (decommissioned) from Forest Road 2400011 to the north, between Forest Roads 2400865 and 2400013 Access restricted on Forest Road 2400013 (closure)

Cumulative Effects

Alternative 1

While aspen may benefit from the effects of the Flagtail Fire, stand conditions would not be improved through this alternative since no roads would be decommissioned to hasten aspen recovery. Roads that currently access small drainages pass through 14 decadent aspen stands impeding regeneration and stand recovery.

Alternatives 2, 3,4, and 5

Aspen stands would recover more quickly because vehicle access through 14 existing aspen stands would be eliminated as roads are decommissioned. Aspen regeneration should increase and expand because soil compaction would decrease and result in improved water filtration, distributing water to a larger area of the stand.

All Alternatives

Other Flagtail Fire Recovery Analyses (Categorical Exclusions)

Hardwood and Conifer Planting

There are plans to plant additional hardwoods in riparian areas during the 2004 field season. Planting and protection activities would improve vegetation recovery and develop larger distribution for hardwood shrub and trees by extending boundaries around existing, remnant aspen stands, planting hardwoods in riparian areas; planting conifers within riparian habitat conservation areas (Appendix J).

Cottonwood seedlings and cuttings from five species of willow have been planted in 2003 on 25 acres (6.3 miles) along Snow Creek, the Silvies River, and Jack Creek. Native conifers have also been planted on 380 acres of upland sites and riparian habitat conservation areas. Seed and planting materials planted and proposed for planting, were collected within this watershed to increase their numbers and develop young, healthy patches. Dogwood and willow seedlings produced from cuttings will be planted within riparian areas the spring of 2004.

Aspen Enhancement and Protection

Aspen would be fenced, competing conifers would be cut and could be removed, and fuels would be reduced to protect an estimated 240 to 250 acres, expanding the 76 acres of remnant stands that were identified during the 2002/2003 aspen inventory. These treatments would increase regeneration and allow clones to develop desirable structure and age classes, by excluding large animals until trees are large enough to be browsed. (Appendix J).

Sensitive Plant Species

Existing Condition

There are no threatened or endangered plant species and no habitat for threatened or endangered plant species in the Flagtail Fire Project area. Three sensitive plant species occur within the Flagtail Fire Project boundary: *Botrychium crenulatum, B. minganese*, and *Carex interior*. Habitat for *Thelypodium eucosmum* was suspected, however surveys verified no habitat existed within the project area.

Monitoring for known populations of sensitive plants was completed September 25, 2002 and confirmed that previously documented locations were relatively unburned. Three locations have been documented within the Flagtail Fire project boundary: two species of botrychiums (related to ferns), *Botrychium crenulatum* and *Botrychium minganese Victorin*, and *Carex interior* (sedge). *Botrychium minganese* and *Carex interior* are located within Snow Creek drainage and *Botrychium crenulatum* within the Jack Creek drainage. In some areas burned trees fell across the riparian area or downed logs burned in place, but few plants in these locations were killed by the fire (Flagtail Sensitive Species Survey, September 25, 2002). A new *botrychium minganese* subpopulation was documented on July 16, 2003 during project area surveys. Although these plants were at a new location within the Snow Creek drainage, they are near enough to a previously documented site to be considered part of that existing population.

Environmental Consequences

Timber harvest, road work and use, log skidding, and other associated activities could affect habitat or plants. Specifically, road decommissioning and felling hazard trees within riparian areas could harm habitat or plants.

Road construction (both system and temporary) were not included in the discussions because none exists within or near potential habitat or known sensitive plant populations.

Measuring Alternative Impacts

The following measures were used to evaluate impacts of road decommissioning and hazard tree treatments.

- Roads decommissioned near existing populations or potential habitat
- Impact of felling hazard trees and treating fuel levels on sensitive species and potential habitat.

Direct Effects

Alternative 1

The no action alternative would not impact sensitive species because no activities would occur near documented plant locations.

Alternatives 2, 3, 4, and 5

Felling hazard trees along open roadsand removing culverts during road decommisisoning operations should not impact sensitive species because no known populations are located in affected areas and felling hazard trees would use only manual methods.

Indirect Effects

Alternative 1

This alternative would not improve habitat conditions for known sensitive species because it would not decommission any roads within riparian areas where botrychium and sedge species have been located. Water flow and distribution would not improve or expand to perhaps provide larger habitat for these species or other sensitive species.

As designated hazard trees and other dead trees fall naturally within riparian areas, they would eventually provide physical barriers to protect sensitive plants or their habitat from animal trampling. However, fuel levels would not be reduced and future fire severity could damage habitat or plants.

Alternatives 2, 3, and 5

These alternatives would best improve habitat conditions for sensitive plants the of all alternatives. As part of the access management plan, these alternatives would decommission roads adjacent to the Jack Creek and Snow Creek riparian areas. Culverts would be removed as the Snow Creek road (2400133) is decommissioned near its junction with Forest Road 2400203. Two sensitive species, *Botrychium minganese* (related to ferns) and *Carex interior* (a sedge), are located above this area. By removing the culvert, water flow and distribution would improve and perhaps expand to perhaps provide larger habitat for these species.

Downed wood that remains after hazard trees are felled and fuels are treated, should enhance habitat by providing shade and would protect sensitive species habitat by providing physical protection. By treating areas with high fuel levels, fuel treatments would reduce future impacts and fire severity on riparian habitats and sensitive plant populations.

Alternative 4

This alternative would be less effective than Alternatives 2, 3, or 5 in increasing pootential habitat for sensitive species. The only difference between this alternative and the other action alternatives is this alternative would not improve habitat within the Snow Creek drainage. This alternative would not decommission the upper portion of the Snow Creek roads (2400133 and 2400203) and would not remove culverts to restore natural water drainage.

Cumulative Effects

Planting native species, placing large wood in draws, and fencing aspen areas would provide protection for riparian areas and might create habitat for sensitive plant species by improving habitat and watershed function.

Planting native species would restore native vegetation that is important to maintaining desirable site conditions for sensitive species by establishing plants that are adapted to local conditions and disturbances, and reduce the extent and distribution of exotic plant populations. Placing large wood in draws would improve soil productivity by holding soil in place until native plants could colonize. Some sensitive plants, such as *Thelypodium eucosmum,* grow in such localized areas where only spring moisture is available. Fencing aspen areas could also protect spring sources and increase potential habitat for riparian dependant species.

Summary

The proposed project will have **No Impact** on individual *Carex interior* or *Botrychium* species plants or habitat, and will not contribute to a trend towards federal listing or cause a loss of viability to the species because there would be no affect on known populations, no ground disturbing activities, and only limited, small scale disturbance to potential habitat. There is no effect on *Thelypodium eucosmum* within the project area because there is no habitat in the project area.

None of the alternatives would impact known populations of sensitive plants because there are none within the project area. Alternatives 2, 3, and 5 may benefit sensitive species by creating potential habitat as a portion of the Snow Creek road is decommissioned and natural drainage is restored by removing culverts. Alternative 4 would not decommission that portion.

Consistency with Direction and Regulations

All alternatives are consistent with the Forest Plan and other direction with respect to botanical resources.

Irreversible and Irretrievable Commitments

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

Heritage

Introduction

The purpose of this report is to analyze the effects of fire recovery activities proposed under the Flagtail Fire Recovery Environmental Impact Statement (EIS) on cultural resources. The Flagtail Fire was ignited in July of 2002. It burned approximately 8,200 acres; 7,120 acres are located on the Malheur National Forest, Blue Mountain Ranger District and the remaining 1,080 acres are on private land. The Flagtail Fire Recovery Project area consists of the 7,120 acres, of which 6,180 acres are forested, within the Upper Silvies Watershed. The post-fire landscape consists of 3,150 severely burned acres, 2,400 moderately burned acres, and 460 lightly burned acres. The area is currently characterized by fire-killed ponderosa pine, mixed conifer and interspersed with recent and decant aspen stands.

Cultural resources are fragile and irreplaceable resources that chronicle the history of people utilizing the forested environment. Cultural resources, or Heritage resources, include:

- Historic properties, places which are eligible for inclusion to the National Register of Historic Places (NRHP) by virtue of their historic, archaeological, architectural, engineering, or cultural significance. Buildings, structures, sites, and non-portable objects (e.g., signs, heavy equipment) may be considered historic properties. Traditional Cultural Properties (TCP's), localities that are considered significant in light of the role it plays in a community's historically rooted beliefs, customs, and practices (Parker and King, 1998), are also considered historic properties. Historic properties are subject to the National Historic Preservation Act's Section 106 review process.
- American Indian sacred sites that are located on federal lands. These may or may not be historic properties.
- Cultural uses of the natural environment (e.g., subsistence use of plants or animals), which must be considered under NEPA.

No key issues involving cultural resources have been identified during the scoping efforts for the project.

Regulatory Framework

The legal framework that mandates the Forest to consider the effects of its actions on cultural resources is wide-ranging. In this case, Section 106 of the National Historic Preservation Act (NHPA) of 1966 (amended in 1976, 1980, and 1992) is the foremost legislation that governs the treatment of cultural resources during project planning and implementation. Federal regulations such as 36 CFR 800 (Protection of Historic Properties), 36 CFR 63 (Determination of Eligibility to the National Register of Historic Places), 36 CFR 296 (Protection of Archaeological Resources) and Forest Service Manual 2360 (FSM 2360) clarify and expand upon the NHPA. The Pacific Northwest Region (R6) of the Forest Service, the Advisory Council on Historic Preservation (ACHP), and the Oregon State Historic Preservation Office (SHPO), signed a programmatic agreement (PA) regarding the management of cultural resources on National Forest system lands in 1995. The 1995 PA outlines specific procedures for the identification, evaluation, and protection of cultural resources during activities or projects sponsored by the Forest Service. It also establishes the process that the SHPO utilizes to review Forest Service undertakings for NHPA compliance.

The National Environmental Policy Act (NEPA) of 1969 is also a cultural resource management directive as it calls for agencies to analyze the effects of their actions on sociocultural elements of the environment. Laws such as the National Forest Management Act (NFMA) of 1976, the Archaeological Resources Protection Act (ARPA) of 1979, the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990, Executive Order 13007 (Indian Sacred Sites) Executive Order 13084 (Consultation and Coordination with Indian Tribal Governments), also guide Forest Service decision-making as it relates to Heritage. The American Indian Religious Freedom Act (AIRFA) of 1978 requires that federal agencies consider the impacts of their projects on the free exercise of traditional Indian religions. Executive Order 13175 (EO 13175), Consultation and Coordination with Indian Tribal Governments, November 6, 2000, directs federal agencies to engage in regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications and to strengthen the United States government-to-government relationship with Indian tribes.

The Malheur National Forest Land and Resource Management Plan, the Malheur Forest Inventory Plan (Thomas 1991), and the Programmatic Memorandum of Agreement for Historic Railroad Systems (1986), all have been developed to tier to the previously mentioned laws and corresponding Forest Service manual direction as it sets forth resource management goals, objectives, and standards. Although, the Malheur National Forest was not originally included in the Programmatic Memorandum of Agreement for Historic Railroad Systems (1986), approval was issued Region wide with the 1995 Programmatic Agreement. Forest-wide management standards that are pertinent for this cultural resource effects analysis include:

- Conduct a professionally supervised cultural resource survey on National Forest lands to identify cultural resource properties. Use sound survey strategies and the Malheur National Forest Cultural Resource Inventory Survey Design.
- Evaluate the significance of sites by applying the criteria for eligibility to the National Register of Historic Places.

Consider the effects of all Forest Service undertakings on cultural resources. Coordinate the formulation and evaluation of alternatives with the State cultural resource plan, the State Historic Preservation Office and State Archaeologist, other State and Federal agencies, and with traditional and religious leaders of Native American Indian groups and tribes with historic ties to the project planning area.

Consultation with Others

Many of the previously described laws, regulations, and directives instruct the Forest Service to consult with American Indian tribes, the state, and other interested parties on cultural resource management issues. The Flagtail Interdisciplinary Team and the Blue Mountain Ranger District invited public comment on fire recovery proposals in the burned area by submitting a project scoping letter to approximately 103 organizations and individuals. Fire recovery proposals were likewise outlined during open house public meetings that were held in John Day, Oregon, in February of 2003. To date, there have been no concerns raised during scooping regarding the effects of fire recovery proposals on cultural resources. In consultation with the three American Indian tribes that have rights or interests in the Flagtail Fire Recovery area, no heritage issues were raised (see Chapter 1, Coordination with Other Governments and Agencies). The heritage inventory has been completed to the standards in Thomas 1991. The results of the inventory are presented in the Heritage Specialist Report and the final inventory report is being completed for submission to SHPO under the terms of the 1995 Programmatic Agreement.

Existing Conditions/Affected Environment

Cultural resource identification efforts in the vicinity of the Flagtail planning area have focused on three primary types of resources: prehistoric archaeological sites, historic archaeological sites, and places that support resources of contemporary tribal interest. Cultural resource identification efforts that have been conducted include three previous pedestrian cultural resource inventory surveys, that include; 641-79/029 Fence Springs Development Project CRIS, 641-85/014 Hines Logging Railroad CRIS, and 641-91/131 Upper Silvies (Vat and Snow).

Literature reviews, and consultation with American Indian tribes and other stakeholders that are historically associated with the area were conducted. As a result of the July 2002 Flagtail Wildfire numerous environmental alterations occurred and a resurvey of the high intensity burn areas was deemed necessary. Surveys were conducted on various days from September through December of 2002. The increase in surface visibly allowed 12 new prehistoric sites, 3 new historic sites, 15 new prehistoric isolates, and 6 new historic isolates (1 of which is within a new prehistoric site) were located upon resurvey. This most recent cultural resource inventory survey was designed to conform to the standards set in the Malheur National Forest Cultural Resource Inventory Plan, 1991. Approximately 39% of the Flagtail Fire Recovery Area was inventoried using the Malheur's Inventory Methods. A total of 33% of the high and medium strata was inventoried and examined, with a stratified sample survey strategy that has been approved by the Oregon State Historic Preservation Office (Thomas 1991). Of these 53 cultural properties recorded as sites, a total of 41 sites require protection and should be avoided (with the exception of site H640-0016, this site will suffer very minimal and reversible effects under Alternatives 2, 3, and 5; for mitigation proposals see Chapter 2 of the Flagtail EIS under "Management Requirements, Constraints, and Mitigation Measures" Heritage sub-section) and 12 sites are ineligible for inclusion on the NRHP. In addition, all prehistoric and historic isolates are ineligible.

Previously known sites within heavily burned areas were revisited in 2002 and several were expanded in area, owing mainly to increased ground visibility due to the removal of leaf litter and ground plants by the fire. The Flagtail Fire Recovery Project area is characteristically gentle, with northeast to southwest aligned ridges. The Silvies River is the main feature within the burn; it dissects the northern portion of the burnt area in a northeast direction. Jack Creek runs through the central portion of the burn and empties into the Silvies River several miles downstream. Elevations vary from about 4800 feet to 6100 feet. The Silvies River is fed by numerous creeks and springs in or near the burn, including Wickiup Creek, Cold Creek, and Snow Creek. Springs in the area include Dipping Vat Spring, 96 Spring, and Poison Spring, as well as several unnamed springs. Culturally important plant species, such as biscuitroot, wild onion, balsamroot, camas, yampa, and various berries, are present in the project area. Such territory could be expected to contain at least some prehistoric sites, since it offers warm-season opportunities for hunting, fishing, and the gathering of plants for food and other uses.

Known prehistoric sites in the project area all consist of lithic artifacts such as flaked-stone tools and points, and flakes associated with the manufacture of such tools. Sites are mostly very small, and in general probably represent expedient tool manufacture or reworking, most likely associated with modest seasonal use of the area for hunting and gathering. No large sites with heavy lithic concentrations or stratified deposits of cultural materials, which might suggest heavy and long-term use, are known within the project area.

Historic uses of the project area are reflected, archaeologically, in the form of sites related to past logging operations, stock grazing, and remnants of an old hand-crank era telephone line. Of special concern are 8 spur lines off of the old Hines Logging Railroad, which lie within proposed harvest units (see mitagation measures). Since several sections of the affected railroad bed meet the criteria for inclusion on the NRHP, mitigation measures are required. Also, the Bear Valley Work Center is located within the Flagtail project area, where two of the structures on the compound were lost to the fire.

To assess potential fire damage to previously known sites and to discover possible new sites within the Flagtail Fire boundary, a stratified survey was designed. In this design, areas where burning was light to moderate would not be surveyed, while areas of more intense burning, where duff and ground vegetation has been removed by fire, would receive intensive archaeological survey, and previously known sites would be revisited. Because ground visibility was dramatically increased in these heavily burned areas, it was predicted that new sites would be found and areas of existing sites could well be expanded. This intensive survey covered 4,767 acres.

A large portion (4,067 acres) of the lands designated for new archaeological survey within the Flagtail burn area was covered during September thru December of 2002. The Cultural Resource Inventory Heritage Report that incorporates all known cultural properties has been completed for submission to SHPO. The newly discovered sites continue in the character of those previously known in the Flagtail burn area, but demonstrate two things: 1) that within forested areas with significant ground cover, many sites may be passed by, even by trained archaeological surveyors; and 2) use of the area was somewhat more intense than previously known.

Environmental Consequences

Direct and Indirect Effects

Alternative 1 (No Action):

Implementation of the no action alternative would not directly nor indirectly affect heritage resources since there would be no change to the integrity of eligible or potentially eligible heritage resources. Failure to reduce the accumulated fuel load would increase the potential for a second phase of wildfire loss, thereby increasing the potential for adverse effects on cultural resources, particularly trails, buildings, structures, combustible sites and lithic materials.

Recent research suggests that the scientific value of obsidian dominated lithic scatters located at or near the surface of the ground is often degraded by surface temperatures generated during high and moderate severity wildfires (Trembour 1990).

Fire severity: Fire severity, loosely, is a product of fire intensity and residence time. Fire severity is generally considered to be low, moderate, or high. A *light severity* burn is one that leaves the soil covered with partially charred organic material. A *moderate-severity* burn results from a burn in which all of the organic material is burned away from the surface of the soil; any remaining fuel is deeply charred. A *high-severity* burn results in all of the organic material being removed from the soil surface; organic material below the surface is consumed or charred (DeBano et al 1998).

Field and laboratory studies indicate that damage to obsidian dominated surface sites correlates directly to fire temperature and fire residence time in wildfire situations (Skinner et al. 1997; Linderman 1992). A study conducted at the Dome Fire on the Santa Fe National Forest in New Mexico, found an inverse relationship between the ability of obsidian artifacts to provide chronologic data, and the degree of burning the artifacts experienced during the wildfire (Steffen 2002). The Dome Fire study found that archaeological specimens with measurable obsidian hydration bands were present in higher frequencies (87% retained OH bands) within assemblages that were not burned, than within assemblages that were burned (27% retained OH bands).

In addition, without reforestation or watershed improvement, heritage sites could be at risk from erosion and flooding. Finally, two popular forest activities, those of mushroom harvesting and horn hunting (antler gathering) could have an indirect effect in the wake of the fire. There is the potential with many people searching the exposed forest floor; a small percentage of harvesters will prove unscrupulous and will illegally collect cultural artifacts.

Alternatives 2, 3, 4 and 5:

There would be no direct negative affects to cultural resources for Alternatives 2, 3, 4 and 5. The Malheur N.F. will insure that mitigation measures identified in this EIS (Chapter 2, Management Requirements, Constraints, and Mitigation Measures), as taken from the PMOA are carried out for the management of affected historic railroad systems. Avoidance measures of heritage sites that are deemed eligible or potentially eligible will be implemented as per Stip. III.B.2(a-d) of the 1995 Programmatic Agreement (Chapter 2, Management Requirements, Constraints, and Mitigation Measures). Dispersed hazard tree cutting (all action alternatives) and removal (Alternatives 2, 3, and 5) will occur. If this activity occurs within heritage site boundaries mitigations would be imposed (Chapter 2, Management Requirements, Constraints, and Mitigation Measures). With prescribed mitigation, hazard tree removal in historic or archeological sites would have limited ground disturbance and no impact to historic and prehistoric sites is expected. Responsible management that implements prescribed mitigation measures has proved to be highly successful at protecting eligible heritage sites from negative impacts. It is recognized that even the most intensive field surveys may not locate all heritage sites. The portions of this project that would be implemented through a timber sale or restoration contracts under any action alternative would include the **#C6.24** clause which enables the Forest Service to modify or cancel any service contract to protect heritage resources, regardless of when they are identified. Reducing motorized access by decommissioning open roads could benefit cultural resources through limiting vehicle access to eligible sites, thereby reducing the opportunities for looting or vandalism.

Alternatives 2, 3, 4, and 5 reduce future fuel loadings to varying degrees, which reduces the severity and resistance to control future fires (see Fire and Fuels section of Chapter 3 of the Flagtail Fire Recovery EIS for a comparison of magnitude). Therefore, these alternatives decrease the potential for a second phase of wildfire loss in the project area. All action alternatives have the same amount of reforestation acreage proposed; thus, all action alternatives equally decrease the risk of erosion and flooding.

There exists the potential for negative indirect effects to cultural resources for Alternatives 2, 3, 4 and 5. Although the general mitigation measure to protect heritage sites is avoidance of those sites, this very avoidance could lead to an indirect effect for burned over sites, in that the surfaces of those avoided sites will remain exposed to the elements longer than the surrounding forest because there will be no reseeding. Rainfall will also impact these bare sites leading to the potential of runoff displacing artifacts, even those slightly below surface.

Alternative 2 has higher fuel reduction treatment acreage. Therefore, this alternative decreases the potential for a second phase of wildfire loss in the project area. All action alternatives have the same amount of reforestation acreage proposed thus; all action alternatives equally decrease the risk of erosion and flooding.

Cumulative Effects

When an artifact is deposited on the ground it is set into motion by a number of natural processes with the help of gravity. Weathering facilitates natural processes such as pedogenesis, (soil development), pedoturbation, (soil disturbance), physiogenic (mechanical processes such as ice and water) and biogenic (biological processes such as plant and animal disturbance). All of these processes contribute to the burial, transformation and dispersion of archaeosediments. Cultural material displaced by natural processes, combined with intervening geologic events caused by wildfire has the potential to mask the distributions of buried features.

In Alternative 1, hazard tree felling is reasonably foreseeable but removal would not occur; downed trees would be left on site. Mitigations would likely be imposed that would protect sites.

As a result of the proposed activities in the action alternatives a lower probability of stand replacing wildfires is expected. While many types of cultural resources can survive low-severity fires with little or no damage, high-severity burns destroy or damage a wide range of heritage sites.

Prior to establishment of the Forest Service Heritage Resource Program, past effects of timber harvest, fire suppression, and trail, road, and recreational facility development occurred with little analysis of cultural resource impacts. Adverse effects may have occurred from livestock grazing, irrigation development, and dispersed recreation. Little effort was made to deter private collection of historic or prehistoric artifacts on NFS lands, and losses of cultural resources were extensive in certain locations. The adoption and enforcement of federal cultural resource protection legislation and regulations over the past 30 years has reduced the rate of cultural resource deterioration.

Mushroom harvesting and horn hunting (antler gathering) as identified in Appendix J of the EIS in the wake of the fires may adversely affect cultural resources. There is the potential with many people searching the exposed forest floor; unscrupulous harvesters will illegally collect cultural artifacts.

It is unlikely that there would be cumulative effects to identified heritage resources in the post Flagtail Fire Recovery Project area from any of the proposed activities identified in Appendix J, of the Flagtail Fire Recovery EIS. However, if any such effects are identified, re-initiation of the SHPO consultation process will occur, and appropriate avoidance or new mitigating measures would be developed.

In the consideration of other past, present, and future activities in the cumulative effects analysis (please refer to Appendix J in the Flagtail Fire Recovery EIS), it is apparent that Alt. 2, 3, 4, and 5 adequately consider past, present and future actions.

Consistency with Direction and Regulation

Heritage and Tribal interests are regulated by federal laws that direct and guide the Forest Service in identifying, evaluating and protecting heritage resources. All of the alternatives would comply with federal laws. The Malheur National Forest Plan tiers to these laws, therefore the proposed action alternatives will meet Forest Plan standards. Completion of the Heritage inventory under the terms of the 1995 PMOA and also providing the interdisciplinary team with appropriate input as per NEPA, all relevant laws and regulations have been met. The Programmatic Memorandum of Agreement (PMOA) for the Management of Historic Railroad Systems for the Wallowa-Whitman National Forest will be utilized (1986). The Malheur N.F. was provided authority to utilize this PMOA in the 1995 Programmatic Agreement with SHPO.

Irreversible and Irretrievable Commitments

There are no irreversible and irretrievable commitments of resources that may result from the alternatives with respect to cultural resources, except for the potential that subsurface historic artifacts might be disturbed during the placing of skid roads under alternatives 2, 3, and 5. Appropriate mitigation steps are in place (see Management Requirements, Constraints, and Mitigation Measures in Chapter 2 of this FEIS).

Economics/Social

Regulatory Framework

NEPA requires integrated use of the natural and social sciences in all planning and decision-making that affect the human environment. The human environment includes the natural and physical environment and the relationship of people to the environment (40 CFR 1508.14). Forest Service land management planning regulations require the integration of social science knowledge into Forest and Regional planning processes (36 CFR 219.5).

Executive Order 12898, 1994, ordered federal agencies to identify and address the issue of environmental justice (i.e., adverse human health and environmental effects of agency programs that disproportionately impact minority and low income populations).

Analysis Methods

Although individuals and communities over a wide geographic area use national forest resources, it is the residents and businesses of counties near the Forest who depend most heavily on the availability of the resources. Consequently, the effects of Forest management on social and economic factors are strongest within these areas. For this reason, the Malheur National Forest affected area or impact zone consists of Grant and Harney counties in Oregon.

This analysis incorporates by reference the social and economic analysis entitled *Recovery Efforts 2002 Fires Social and Economic Conditions* that was done for the fire recovery efforts on the Malheur National Forest (Kohrman 2003).

Existing Condition

Changes in levels of resource use associated with the Flagtail Recovery Project may affect the major social and economic characteristics of the surrounding geographic area. The affected area or impact zone for the Malheur National Forest consists of Grant and Harney counties in Oregon. Agriculture, manufacturing (particularly wood products), and retail trade are important sources of employment and income in this region. Grant County, for example, has a low level of economic diversity, a high dependence on federal timber and forage, and a low resiliency for change. Reliance on timber and forage from federal lands is moderate to high in counties in the impact zone (Kohrman 2003).

Many communities in the impact zone are closely tied to the Forest in both work activities and recreation. Several communities, such as John Day, Canyon City, Mt Vernon, Prairie City, Burns, and Hines are geographically isolated from the closest larger cities such as Pendleton, Ontario, Bend, Baker City and La Grande (Kohrman 2003).

Refer to the Malheur National Forest, Land and Resource Management Plan, Final Environmental Impact Statement, Appendix B, for further detailed description of the main social and economic characteristics of the area (USDA 1990).

Employment

While agriculture and forest products provide the core employment for Grant and Harney counties, total employment provides the number of full-time and part-time jobs at a certain period. Wood products employment totaled 530 direct jobs, and 131 indirect job approximately14% of the total non-farm employment, in Grant and Harney counties (average annual in 2000). Local government, retail trade, and services employ the most people in Grant and Harney counties (State of Oregon 2003). See Figures EC-1 and EC-2 for an illustration of the total non-farm employment by county.

Figure EC-1: Grant County Nonfarm Payroll Employment (Average Annual for 2000)

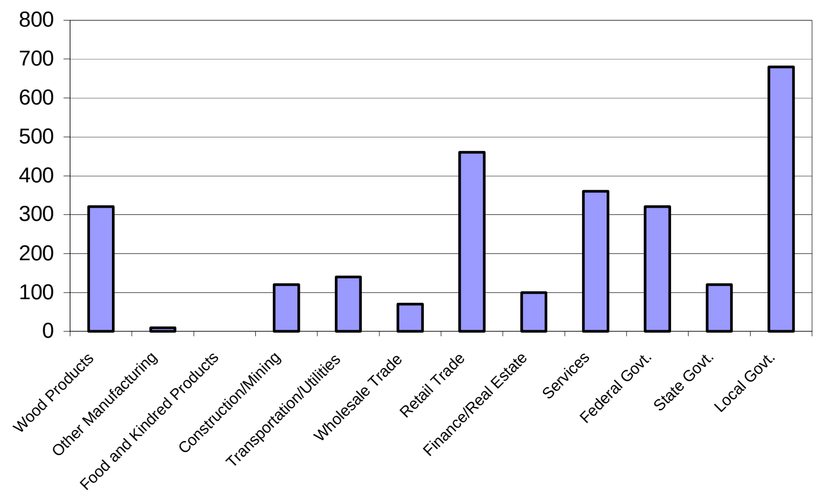
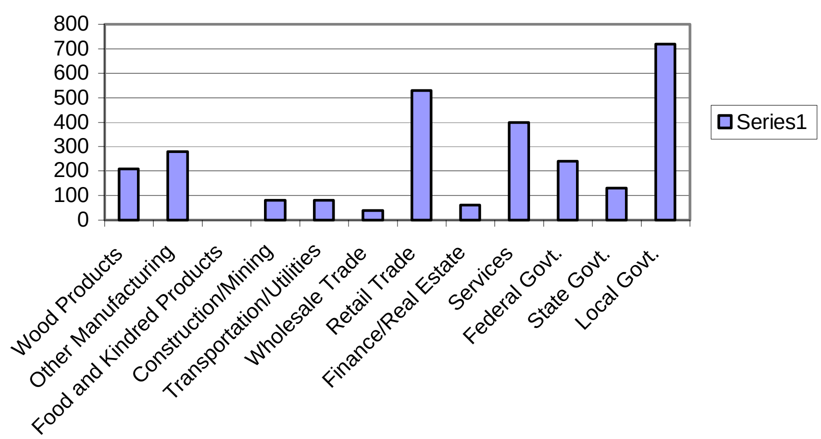


Figure EC-2: Harney County Nonfarm Employment



Ranchers in Grant and Harney counties with federal permits in the analysis area are highly dependent on forage from federally managed lands compared to other counties in the region. The value of cattle reared on forage from federally managed lands represents more than 10 percent of total agricultural sales in Grant and Harney Counties (Kohrman 2003). Baker, Wheeler and Malheur counties are rated moderately dependent (between 3.57 percent and 10 percent of total agricultural sales comes from cattle raised on forage from federally managed lands). Union, Umatilla, Morrow, and Gilliam counties are less dependent (less than 3.57 percent). Shifts in permitted use of federal grazing allotments change the availability of this forage source. The impact these shifts have on the local economy varies according to the adjustments that local ranchers have to make within their ranch operation.

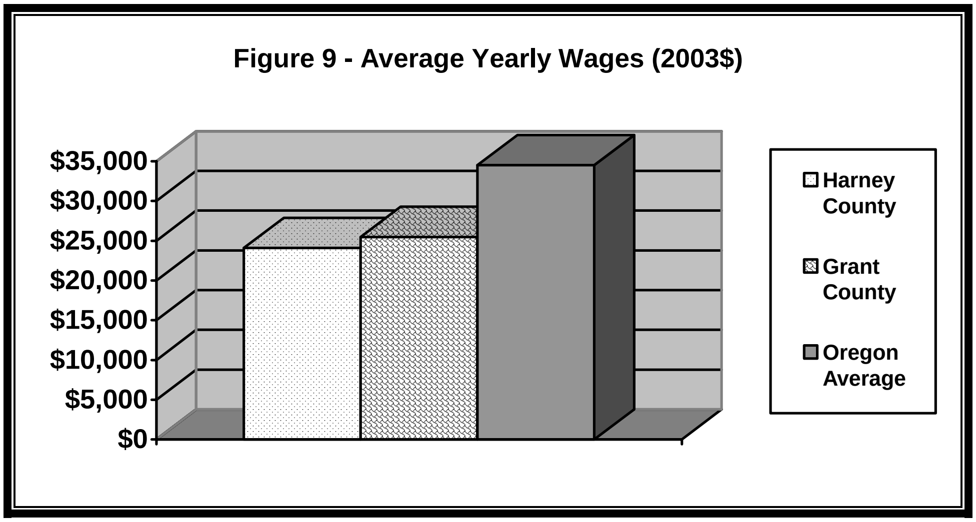
Recreation-based industries, while prevalent elsewhere in the region, have not been a major contributor to the local economies. Recent efforts indicate that the volume of business is only enough to supplement income rather than provide a primary source of income (Kohrman 2003). The exception is hunting season, which typically draws larger numbers of people into the area. Stores that sell sporting goods benefit during this period. Recreation-based employment is seasonal and service oriented with wages at the lower end of the pay scale (Kohrman 2003). Economic activity based on recreation may have limited growth potential for communities in the area (Kohrman 2003). Seasonal limitations, the dispersed nature of recreation within the counties, along with a general lack of large, water-based recreational opportunities does not create the concentrated numbers of recreationists and readily identifiable recreation destinations necessary to support many recreation industries (Kohrman 2003).

Historically, government employment and expenditures has provided a degree of stability in rural communities (Kohrman 2003, Oregon Department of Employment 2000). With reduced Forest Service budgets and work force, and a switch to management emphasis that produces generally lower amounts and value of products, federal workforce and program expenditures has not buffered economic downturns as in the past (Kohrman 2003). This situation, combined with fluctuations in the other base industries, has had a significant effect on the economy (Kohrman 2003).

Average Wages

Average annual pay per job provides an indication of the quality of jobs in the analysis area. Average salaries (2003 dollars) for all industries in Grant and Harney counties are $25,481 (Grant) and $24,098 (Harney) (2003 dollars). In comparison, statewide average annual salary is $34,517. Wages in Grant and Harney counties are lower primarily due to lower wage rates per hour and a larger number of part-time jobs compared to the state as a whole (Kohrman 2003). See Figure EC-3 for an illustration of average yearly wages.

Figure EC-3 (Fig. 9): Average Yearly Wages



Per Capita Income

Per capita income measures economic well being taking into account both population and income changes, although it does not address income distribution. Per capita personal income is total personal income divided by the estimated population. Per capita income in Grant and Harney counties is approximately $22,439 and $22,670 (2003 dollars), respectively. These counties lag behind the statewide average of $29,347 (2003 dollars).

Refer to: Kohrman E. B. 2003, Recovery Efforts 2002 Fires, Social and Economic Conditions, U.S. Department of Agriculture, Forest Service, Malheur, Umatilla, and Wallowa-Whitman National Forest, for further detailed description of the main social economic characteristics of the area.

Environmental Consequences

The social and economic effects of the various proposed management alternatives were assessed in terms of viability of harvestable timber, employment supported by the alternatives, and the economic efficiency for relative comparison between alternatives.

Viability of Timber Harvest

Direct and Indirect Effects

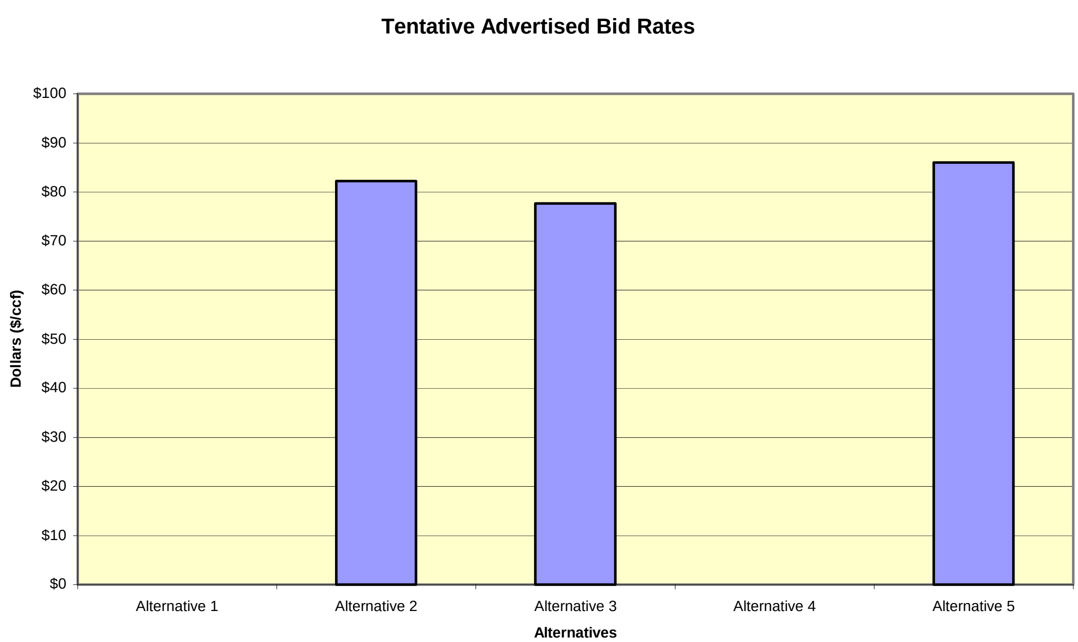
All Alternatives

The area proposed for commercial harvest within the Flagtail Recovery Project area was analyzed to determine the economic viability of harvesting timber by determining the tentative advertised bid rates per hundred cubic feet ($/ccf). This estimate was based on estimates of volume, species, amount of sawtimber material, logging systems costs, haul costs, road maintenance costs, contractual costs, erosion control and other developmental costs, temporary road costs, and specified road reconstruction costs, and the value of timber proposed for removal. The preliminary value of the timber was based on the prices for the same species and material of all sales actually sold within Appraisal Zone 3 (primarily Blue Mountain forests) within the last 12 months.

The tentative advertised bid rates estimated for the Flagtail Recovery Project reflect the most current volume, price and cost estimates for this analysis. The economic analysis is based on net volumes from Table 2-1 in Chapter 2. Net volumes are based on stand exams that were extrapolated over the project area and, based on visual feedback from cruisers and plots conducted by the Tri-Forest measurement specialist, reduced to reflect loss of merchantable sawtimber due to insects and time/weather/checking. At this point (February 2004), observed fall down is minimal in merchantable sawtimber, so fall down was not calculated into displayed net volumes. An initial bid rate was determined by subtracting the costs associated with logging from the base period prices adjusted for the quality of the material and current market conditions. This rate was further reduced per current appraisal methods (Transaction Evidence Appraisal) to allow for competition between bidders to determine the tentative advertised bid rate. The computer software program, TEA_ECON was used for this analysis.

All alternatives that harvest timber would produce positive bid rates indicating that the project would provide a viable harvest proposal. Based on this analysis, bid rates for the three action alternatives were similar. Alternative 2 had an advertised bid rate of $82.21/ccf; alternative 3 had a bid rate of $77.63/ccf; and alternative 5's bid rate is $85.99. Alternative 2 would produce the highest potential revenue from the sale of timber based on more harvest volume. Alternative 1 and 4 would not harvest any timber and therefore, would not produce any revenue or benefits to wood products industries; however, alternative 4 which includes pre-commercial thinning and fuel reduction would provide some job benefits and revenues to the local area. Refer to Figure EC-4 for an illustration of tentative advertised bid rates by alternative.

Figure EC-4: Tentative Advertised Bid Rates by Alternative



Cumulative Effects

Estimates for tentative advertised bid rates for alternatives 2, 3, and 5 are within the range of rates experienced by the three Blue Mountain forests (Malheur, Umatilla, and Wallowa-Whitman) within the last two years (Kohrman 2003). Advertised bid rates have fluctuated over the past few years reflecting the volatility of the market for timber. Changes to prices would likely occur in the future at the time of the appraisal depending on actual market conditions at that time.

Employment

Direct and Indirect Effects

All Alternatives

The primary effect on timber-harvest related employment would occur from commercial harvesting associated with the alternatives over the next two years. Financially viable sales would be necessary to provide opportunities for timber-harvest related employment. Levels of harvest volume by alternative would affect employment and income in several ways:

- directly - (effects attributable to employment associated with harvesting, logging, mills and processing plants for sawtimber, pulp, chips, veneer and plywood)
- indirectly - (effects attributable to industries that supply materials, equipment, and services to these businesses)
- induced - (effects attributable to personal spending by the business owners, employees, and related industries).

Employment and income effects were derived from response coefficients from the input-output model, IMPLAN (Impact Analysis for Planning) for the Roadless Social Economical Report, for the Malheur National Forest impact zone and from the forest-level Timber Sale Program Information Reporting System (TSPIRS) analysis in fiscal years 1996 to 1998 (Kohrman 2003). Job estimates include temporary and permanent full-time, part-time employment. The estimates do not include unpaid family workers or sole-proprietors.

This analysis assumes that all harvesting would occur over the next two years. Employment effects from recreation and domestic-livestock grazing activities were not analyzed. The estimates provide a relative comparison of jobs supported by the alternatives to communities and counties in the regional impact zone and not necessarily to any one county.

No harvest related activities would occur under Alternatives 1 (No-action) or 4 and therefore, no contribution to direct, indirect, or induced employment and income associated with timber harvesting would result from the project. Declining trends in timber harvesting from NFS lands would continue in the future and contribute to declines in wood products employment over the next two decades. Changes in the economic base and wood products infrastructure for the impact area would also continue to be influenced by fluctuations in market prices, international market conditions, changes in technology and industry restructuring.

Alternative 2 would support the highest level of employment at 355 jobs over the two-year period. Alternative 3 is the lowest with 170 jobs while alternative 5 would support 260 jobs. Alternative 4 will support a lesser number of jobs in fuel reduction activities. We do not have a model to quantify employment and income effects for fuel reduction activities. The overall employment and income effect from the action alternatives would continue to support the wood products manufacturing component of the economic base of the impact area. The magnitude of the economic effects would be limited to two years associated with the harvesting activities. Any individual county or community in the impact area could experience greater benefits in the short-term (2-3 years) particularly the communities very highly specialized in wood products manufacturing.

However, several factors would influence the ability of any one county or community to experience the largest extent of the harvest-related employment and income effects. The financial viability of the timber sale proposals would influence whether potential purchasers closest to the project area could be competitive with other purchasers to acquire the majority of the supply of wood. Employment projections would depend on other factors such as market conditions, quality and quantity of the volume offered for sale, timing of the offerings, and financial conditions of local firms.

The distribution of economic impacts would depend on the location of the timber purchaser awarded the contracts at the time of the sale, the availability of equipment and skills in the impact area, and the location and availability of the wood processing facilities and related infrastructure. Given the size of the potential volume compared to offerings in the last year from NFS lands across the Blue Mountains, several mills located in other counties in Northeast Oregon would be potentially interested in the supply of wood offered. Since all alternatives will include significant amounts of helicopter volume, companies outside of Northeast Oregon may bid on the helicopter logging portion of the sale, and distribute the jobs and income effect to other regions of the State. Refer to the following table for an illustration of employment effects from timber harvesting by alternative.

Table EC-1: Timber-harvest Related Employment and Income (2003$) by Alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Employment					
Total direct, indirect and induced	0	355	170	0	260
% change	0%	0%	-52%	0	-27%
Income					
Total direct, indirect and induced	$0	$10.09 million	$4.83 million	0	$7.39 million
% change	0%	0%	-52%	0	-27%

Cumulative Effects

Annual timber related employment supported by timber harvested from the Malheur National Forest for the years 1999-01 averaged 388 direct jobs, based on an annual harvest, for these years, of 39 MMBF. Employment supported by commercial harvesting in alternative 2 would support approximately 91 percent toward this level of annual employment. Alternative 3 would support approximately 44 percent toward this level and Alternative 5 would support 67 percent. Alternatives 1 and 4 would not provide harvest opportunities and therefore not support employment in the impact zone from timber harvesting.

Other employment would continue to occur as a result of other timber sales in progress or reasonably foreseeable, domestic-livestock grazing, recreational activities, and other special use receipts across the Forest. Commercial collection of non-timber forest products such as mushrooms may continue to occur although the quantity of harvest is unknown. In addition, other employment opportunities would also be provided by restoration and enhancement activities outlined for the Monument and Easy Recovery Projects and would depend on the level of funded projects.

Economic Efficiency

Forest Service Handbook 2409.18 provides direction to analyze financial efficiency and, if needed, economic efficiency to identify the most efficient alternative that achieves the desired objectives of the project. Consideration of the proposal that maximizes net public benefits is an important consideration of the decision-making process.

An economic efficiency analysis was completed that focused on identifiable and quantifiable ecosystem benefits and costs for each alternative in terms of the present net value (benefits minus costs) to assess which alternative comes nearest to maximizing net public benefits (36 CFR 219.3).

Ecosystem functions provide a broad set of ecosystem services such as clean water or native forest stands that are valuable to both human and nonhuman components of the ecosystem. These ecosystem values may be assessed in economic and noneconomic terms. Economic valuation provides a partial measure of the full range of ecosystem values in commensurate terms for assessing economic tradeoffs. Noneconomic values are necessarily assessed in terms relevant to other disciplines such as ecology or ethics. Changes in ecosystem services must be measurable and quantifiable in like terms, preferably monetary measures, in order to assess a relevant change in economic value (Kohrman 2003).

This analysis is based on identifiable and quantifiable economic benefits and costs and is more typically a financial comparison between revenues and costs. The objective of the economic efficiency analysis is to show a relative measure of difference between alternatives based on direct costs and values used. All dollar values have been discounted in terms of the present net value (2003 dollars). Discounting is a process whereby the dollar values of costs and benefits that occur at different time periods are adjusted to a common time period so that they can be compared. The real (exclusive of inflation) discount rate of four percent was used in the analysis over the planning period.

Present net value is defined as the present (discounted) net value of project benefits minus the present (discounted) net value of project costs. A benefit-cost ratio is the ratio of present net benefits to present net costs. Present net value is a more appropriate measure for comparison between alternatives when land and productive activities are limiting such as in an environmental analysis of alternatives. A benefit-cost ratio comparison is more appropriate when investment capital is limited, for example when considering budget allocation among a number of different activities. Refer also to the Malheur National Forest, FEIS, Appendix B, for a comprehensive quantification of the net public benefits for the Forest Plan (USDA 1990).

Direct and Indirect Effects

All Alternatives

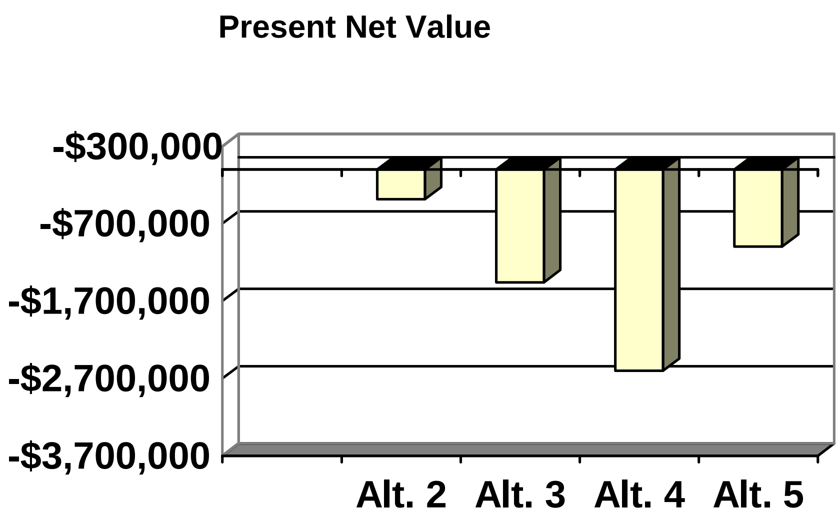
Measurable and quantifiable economic market benefits identified in the Flagtail Recovery Project include discounted revenue from timber volume proposed for harvest. Revenue is derived from the tentative advertised bid rate for the timber multiplied by the total cubic-feet proposed for harvest and discounted to the present. Refer to the section above on Viability of Timber Harvest.

In addition to use values, existence values otherwise referred to as passive, nonuse or preservation values may capture important economic value to the public (Kohrman 2003). Although these benefits are important components of the ecosystem services provided to humans, the production relationship between ecosystem functions and ecosystem services (such as changes in recreation visitor days, fishing days, animal units months, or fish population) is not well defined or measurable at the project level in terms that provide meaningful comparisons of commensurate dollar values.

Measurable and quantifiable costs at the project level include direct costs to the Forest Service for preparing and administering the commercial timber and implementing other restoration activities including reforestation, decommissioning roads, rehabilitation of skid trails. Refer to Chapter 2 – Alternatives Comparison, for a complete list of activities.

The economic analysis is based on net volumes from the Alternative Comparison Table in Chapter 2. Estimated net volume for Alternative 2 is 20.4 MMBF; Alternative 3 is 9.8 MMBF; and Alternative 5 is 15 MMBF. Alternatives 2, 3, 4, and 5 illustrate a negative present net value based on discounted revenue received from the project compared to the discounted total dollar-quantified costs for the project. Negative present net values can be attributed to restoration costs which include reforestation (planting) and fuel reduction. Alternative 4 does not harvest timber and would receive no revenue, but will accrue costs associated with reforestation and fuel reduction; and therefore, have a negative present net value. The no-action Alternative (Alternative 1) would not harvest timber and would not produce quantified benefits due to the data limitations described for quantifying economic benefits and costs beyond those identified at the project level. Alternative 1 would have no costs associated with harvesting although ongoing costs associated with management of the area would continue. Planning costs associated with the project are treated as "sunk costs" which have already been incurred regardless of the alternative and are not graphed.

Figure EC-5: Present Net Value by Alternative



The dollar-quantified present net benefit from the project compared to the dollar-quantified present net costs is shown in the table below.

Table EC-2: Present Net Benefits and Costs by Alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Present Net Benefits					
Timber Value	$0	$2,969,185	$1,311,883	$0	$2,031,142
Present Net Costs					
Sale preparation and administration	$0	$1,070,368	$487,017	$0	$745,054
Restoration and mitigation projects	$0	$2,283,975	$2,283,974	$2,602,148	$2,283,975
Present Net Value					
Present Net Value	$0	-$385,158	-$1,459,108	-$2,602,148	-$997,887

The present net value for each harvest alternative is directly related to snag level requirements. Alternatives 2, 3, 4, and 5 all have negative present net values due to reforestation and fuel reduction costs. Alternative 2 has the greatest present net value (-$385,158) of the harvest alternatives while alternative 3's present net value (-$1,459,108) is the lowest. Alternative 5 has a present net value of -$997,887. Costs for sale preparation and administration vary by alternative based on the amount of timber harvested and acres treated. Costs for restoration and mitigation projects vary due to reforestation and fuel reduction costs. These costs reflect the cost of reforestation on 4784 acres. Alternative 1 would have no project-associated costs for comparison to the action alternatives.

Potential benefits that were not quantified in economic terms due to the limitations of measuring the production relationship between ecosystem functions and ecosystem services at the project level include improvements to soil productivity, reduced erosion, water quality improvements in temperature, terrestrial and aquatic habitat improvement. Potential improvements in fish habitat would increase fingerling survival rates, overall fish population levels and increase recreational fishing opportunities.

Other potential qualitative economic benefits or costs from the alternatives include changes to the diversity, quality and quantity of wildlife habitat for both game and non-game terrestrial species. With respect to big-game populations, the economic value of hunting would depend on how changes in population levels and spatial distribution of game animals affect either the quality or intensity of the hunting experience. Consequently, the overall level of hunting would change with corresponding economic impacts from hunting-related expenditures. Changes in non-game population levels and diversity would affect wildlife viewing, photography and other non-consumptive uses of the area. Refer to the Recreation and Terrestrial Wildlife sections of this EIS for further discussion of effects to these resources.

Other opportunity or externalized costs that would potentially occur include damage to soils from harvest operations in tractor units, resulting in long-term losses in soil productivity and potential timber harvest, losses in wildlife habitat as a result of salvage of large dead trees, or increases in sedimentation to downstream fish habitat from erosion in the fire area. These costs are not well defined or measurable at the project level in terms that provide comparison of commensurate dollar values. Refer to the other environmental consequences sections in this EIS for a discussion of effects to ecological and human use for a relative comparison between alternatives.

Tribal Interests

All tribes of federally recognized American Indians have off-reservation interests, and some maintain treaty-reserved rights on public lands within ceded territories. Lands within the Flagtail Recovery planning area are ceded by treaty with the Confederated Tribes of Warm Springs. The planning area is, however, within overlapping areas of interest of the Burns Paiute and the Confederated Tribes of the Umatilla Reservation (CTUIR).

The "inherently sovereign" status of federally recognized Indian tribes requires that land managing agencies consult with tribes on a government-to-government basis over planned actions that may affect tribal interests (McConnell 1991). Some examples of tribal interests include: traditional cultural practices, ethnohabitats, sacred sites, certain plant and animal resources, and socio-economic opportunities. The Malheur National Forest Land and Resource Management Plan also directs the Forest to consult with tribes over the effects of projects planned within their areas of historic interest (Malheur LRMP 1990).

At early stages of the planning process, the District initiated government-to-government consultation with tribes that have an area of interest that takes in the Flagtail Fire Recovery project area. To date, tribal consultation efforts consist of: scoping letters mailed to each potentially affected tribal council, emails sent to tribal resource specialists, and a face-to-face meetings with representatives from all three tribes. The consultation process did not result in the documentation of any specific concerns regarding project impacts on resources of tribal interest. A general concern regarding cultural plant habitat and access management within all areas burned in the fire season of 2002 was expressed by the Burns Paiute tribe. The effects of the Flagtail Project on these tribal concerns are discussed under Culturally Important Plants in the Botany section of Chapter 3 of this EIS. No concerns were raised in the discussions with the Confederated Tribes of the Warm Springs Reservation or the Confederated Tribes of the Umatilla Indian Reservation.

Social Analysis

A social and economic analysis entitled *Recovery Efforts 2002 Fires Social and Economic Conditions* has been done for the fire recovery efforts on the Malheur National Forest (Kohrman 2003). This document is incorporated by reference under 40 CFR § 1502.21. The document presents social and economic affected environment information for this analysis. It provides information on human uses, social and economic characteristics, and conflicts among various users and uses of the ecosystem. It also discloses the health of the relationships among the people (community), the forest, and the larger ecosystem; perceptions and values related to ecosystem management; and recent social and economic trends in the economic region. The focus is primarily on but not limited to Grant and Harney Counties.

The communities surrounding the Flagtail Fire Recovery area are considered rural in character and have a disproportionately high unemployment compared with the Oregon State average of 7.3 percent and the National average of 5.8 percent. Unemployment in Baker County for February 2003 was 12.6 percent, Grant County – 14.6 percent, Harney County – 13.1 percent and Malheur County – 11.4 percent. Average income for these counties is also below the national and state average: United States $36,214, Oregon $33,202, Baker County $24,190, Grant County $24,492, Harney County $23,308, Malheur County $23,163 (OED 2003a). Forest management and cattle production are the main industries supporting Grant and Harney Counties. Grant County is experiencing its sixth consecutive year of declining non-farm employment, and this is quite possibly the longest ongoing downturn any local Oregon labor market has ever experienced (OED 2003).

The local communities within a one- or two-hour drive that are anticipated to be directly or indirectly affected by the proposed action, alternatives, and their associated economics include Burns/Hines (pop. 4565), Dayville (140), John Day/Canyon City (2740), Long Creek (260), Mount Vernon (650), Monument (150), Seneca (230), Sumpter (175), and Unity (145). Larger cities two or more hours away from John Day include Baker City (10,160), La Grande (12,795), Ontario (10,680), and Pendleton (16,915) (ODOT 2001). The nearest metropolitan areas are the Tri-Cities Area of Kennewick, Pasco, and Richland in Washington State and Boise, Idaho.

Direct and Indirect Effects

All Alternatives

Alternatives 2, 3, and 5 require helicopter logging. There are no locally-owned helicopter logging businesses. All locally owned logging businesses are using ground-based or cable yarding equipment. Therefore, even if a locally-owned logging businesses is the purchaser of the proposed timber sales, a portion of the income generated from these sales will leave the local area to a sub-contracting helicopter business. The reverse is also true; if a helicopter logging business purchases the sales, they may hire a portion of the work to be done by local loggers. Alternative 2 proposes 868 acres of helicopter logging, 802 acres of skyline, and 2675 acres of ground-based logging. Alternative 3 proposes 455 acres of helicopter, 427 acres of skyline, and 1989 acres of ground-based logging. Alternative 5 proposes 730 acres of helicopter logging, 535 acres of skyline, and 2475 acres of ground-based logging.

The rural communities of these Eastern Oregon Counties are highly dependent on firewood for personal home heating. Firewood gathering for home use has occurred in the Flagtail fire area before the fire. The area is currently closed to personal use firewood cutting and will remain closed for two years. However, there are other opportunities for firewood gathering close by, therefore, there are no anticipated adverse affects.

Minorities comprise 5.4 percent of Baker County population, 5.5 percent of the Grant County and 9.9 percent of Harney County, and 31.2 percent of Malheur County of which 25.6 percent is of Hispanic origin with the majority living east of Vale (Kohrman 2003 & U.S. Census Bureau 2003). The primary American Indian tribes involved are the Burns Paiute and Umatilla. With the exceptions of the Burns Paiute and Hispanics east of Vale, minorities are scattered throughout the counties.

Executive Order 12898 on environmental justice requires federal agencies to identify and address any disproportionately high and adverse human health or environmental effects on minority and low-income populations. There is no existing information on how much use the area receives from these populations. It is estimated that this area receives limited use because of the distance from population centers except during the fall deer and elk hunting seasons. The anticipated direct and indirect social effects to these populations are primarily due to change of access from road closures and decommissioning proposed in the action alternatives. This change from road to non-road access would have its greatest effect on the young, elderly, and disabled. Those with other forms of off-road transportation – horses, off-highway vehicles, mountain bicycles, et cetera – would be less affected than those without these opportunities. Alternatives 2, 3, and 5 will change access on approximately 19.0 miles of road through decommissioning or closure. Alternative 4 changes access on 18.1 miles of road using the same methods. The effects are proportionate based on the miles of road closed. Because there are other areas next to the project area where road access is not changed and estimated use by these populations is low, the anticipated effects are not disproportionately high or adverse.

Cumulative Effects

Because of past, present, and reasonably foreseeable future actions, there are economic and social cumulative effects due to road closures and timber harvest.

Due to decreased roads funding for the Malheur National Forest over the past several years, there is a cumulative effect as the Forest continues to reduce road densities in other project areas in order to meet budgetary constraints and other resource needs. Road closures and decommissionings would probably be considered and implemented in future timber sale areas. Socially, this means the current level of access by roads would decline. Recreation, acquiring non-timber forest products, and other opportunities dependent on road access would also decline in areas of the road closure or decommissioning.

The 1990 Malheur National Forest Land and Resource Management Plan (LRMP) established an allowable sale quantity (ASQ) for the forest of 38.4 million cubic feet or 211 MMBF average per year. An ASQ is an upper limit for the plan period, not proposals for sale offerings or an assigned target. Actual sale levels depend on factors like: limitations of modeling, changes in law and regulations, changes in social-economic values, listing of threatened and endangered species, changes in budgets, and site-specific conditions. The Regional Forester amended this plan in 1994 through Amendment No. 2 (Eastside Screens), and by PACFISH and INFISH in 1995 in response to some of these changing factors. Table EC-3 compares the Malheur National Forest's annual offered timber volume with its assigned target timber volume for the fiscal year since the 1990 LRMP went into effect. Accomplishment of timber targets is based on volume offered.

Table EC-3: Malheur National Forest Timber Offer by Fiscal Year 1991 to 2002

Fiscal Year	Target Vol MMBF	Offered Vol MMBF
1991	229.0	201.6
1992	220.0	100.8
1993	197.0	71.7
1994	101.0	33.1
1995	85.0	66.9
1996	100.0	80.9
1997	110.0	38.9
1998	95.0	77.1
1999	63.5	34.1
2000	45.0	17.5
2001	36.7	15.4
2002	24.2	2.7

In response to a request by then–Oregon Governor Kitzhaber, the Blue Mountains Demonstration Area published in 2002 an assessment entitled Assessment of Timber Availability from Forest Restoration with the Blue Mountains of Oregon (USDA 2002). The assessment describes management actions over the past decade, current vegetation conditions where a reliable supply of wood could be available, estimates the quantity and type of forest timber products that may result from forest restoration actions, and a market analysis for potential timber products and the associated economic impacts on individual communities.

This assessment concludes that 71 percent of the National Forest lands in the Blue Mountains of Oregon were not available for substantial and sustainable harvesting of timber. Only minimal amounts of timber would be harvested during restoration treatments of these lands, and prescribed fire may be the primary tool available to accomplish fuels reduction and thinning. This trend would likely continue because there is no anticipated change in management direction. It further concludes that the remaining 29 percent of the national forest lands that are available for substantial and sustainable timber harvest (Active Forestry lands) was actively managed over the last three decades. Up to a third of these lands have experienced timber harvest or non-commercial thinning since 1988. Approximately 58 percent of these Active Forestry lands are currently overstocked. However, nearly half of these overstocked lands are suitable only for non-commercial thinning treatments, yielding only incidental amounts of merchantable timber. This trend is also likely to continue.

Selection of the No Action Alternative has the potential to continue the decline of timber related employment in the rural communities of Baker, Grant, Harney, and Malheur Counties. The action alternatives would provide some short-term (1 to 2 years) economic relief. They provide various amounts of salvaged large diameter wood (greater than 12 inches diameter at breast height) rather than the biomass utilization brought about by just thinning smaller diameter trees. This larger diameter wood is the type of material needed to support the 3 large-diameter saw mills operating in the John Day/Prairie City area. The amount of local economic relief would be determined by whether the purchaser is local or distant, what mill(s) local or distant that actually receives the logs, and the price for lumber.

These cumulative economic effects could cause cumulative "quality of life" social effects. Continued loss in timber related jobs could affect the remaining infrastructure and capacity in the local rural communities and could disrupt the dependent local goods and services industries. Diversification opportunities for these local rural economies are currently limited, and this trend is expected to continue until economical biomass utilization can be further developed (LeVan 1998).

Human Health and Safety

Existing condition

There are concerns about effects to human health and safety of people using the project area and roads accessing the area. Safety concerns to workers and the public about hazard trees along roadsides were also raised as concerns.

Direct and Indirect Effects

Health effects are limited in scope and duration. This analysis summarizes the human health and safety effects described in other sections of the DEIS.

No-Action Alternative (Alternative 1)

Alternative 1 would not improve road access. Deteriorating conditions of standing fire-killed trees along roads would result in a decline in user safety. In order to maintain public safety, some roads would be closed to motorized vehicles. The costs of road maintenance and reconstruction would increase in the future due to further declines in the road system.

Alternatives 2, 3,4, and 5

There would be an increase in the level of use within the project area and to roads accessing the area; increases in the level of use on roads will potentially increase the number of encounters between heavy equipment for logging and other recreational visitors and increase the likelihood of accidents in the short-term (2-3 years). Reconstruction design standards for width, brushing, and hazard trees would mitigate potential encounters and provide safer access on current roads in the long-term after the harvesting activities concluded. Directional signing and public information about logging activities would lessen encounters and increase safety. During skyline and helicopter yarding operations it would be necessary to stop traffic on County road 63. This will be necessary because cables will be spanning the road and helicopters will be flying logs across the road.

Worker health effects and safety from all phases of logging operations would potentially occur. The work environment would be physically demanding and hazardous.

Consistency with Malheur Forest Plan and Other Regulations

This socio-economic analysis is consistent with NEPA and the Malheur National Forest Plan (1990). The Forest Plan contains direction under social-related headings such as recreation, visual quality, etc. The discussions of how the alternatives analyzed in this EIS meet that direction is included in those sections of this document.

Executive Order 12898 - The anticipated direct and indirect social effects to minority or low-income individuals, women, or civil rights are primarily due to change of access from road closures and decommissioning proposed in the action alternatives. Because there are other areas next to the project area where road access is not changed and estimated use by these populations is low, the anticipated effects are not disproportionately high or adverse. None of the alternatives would substantially affect minority or low-income individuals, women, or civil rights (see Social Analysis above).

Irreversible and Irretrievable Commitments

There are no irreversible and irretrievable commitments of resources that may result from the alternatives with respect to socio-economics because the alternatives do not permanently change the use of the area.

Short-term Uses and Long-term Productivity

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

The Multiple Use - Sustained Yield Act of 1960 requires the Forest Service to manage National Forest System lands for multiple uses (including timber, recreation, fish and wildlife, range, and watershed). All renewable resources are to be managed in such a way that they are available for future generations. The harvesting and use of standing timber can be considered a short-term use of a renewable resource. As a renewable resource, trees can be re-established and grown in again if the productivity of the land is not impaired.

Maintaining the productivity of the land is a complex, long-term objective. All alternatives protect the long-term productivity of the Project Area through the use of specific Forest Plan standards and guidelines, mitigation measures, and BMPs. Long-term productivity could change as a result of various management activities proposed in the alternatives. Timber management activities would have direct, indirect, and cumulative effects on the economic, social, and biological environment.

Soil and water are two key factors in ecosystem productivity, and these resources would be protected in all alternatives to avoid damage that could take many decades to rectify. Sustained yield of timber, wildlife habitat, and other renewable resources all rely on maintaining long-term soil productivity. Quality and quantity of water from the Analysis Area may fluctuate as result of short-term uses, but no long-term effects to water resource are expected to occur as a result of timber management activities.

All alternatives would provide the fish and wildlife habitat necessary to contribute to the maintenance of viable, well-distributed populations of existing native and non-native vertebrate species. The abundance and diversity of wildlife species depends on the quality, quantity, and distribution of habitat, whether for breeding, feeding, or resting. Management Indicator Species are used to represent the habitat requirements of all fish and wildlife species found in the Project Area. By managing habitat of indicator species, the other species associated with the same habitat would also benefit. The alternatives provide standards, guidelines, and mitigation measures for maintaining long-term habitat and species productivity. The alternatives vary in risk presented to both fish and wildlife habitat and habitat capability.

None of the alternatives would have an effect on the long-term productivity of timber resources. Trees would be regenerated to provide post-fire productivity.

Unavoidable Adverse Effects

Implementation of any action alternative may result in some adverse environmental effects that cannot be effectively mitigated or avoided if the proposal is to take place. The interdisciplinary procedure used to identify specific harvest units and roads was designed to eliminate or lessen substantial adverse consequences. In addition, the application of Forest Plan standards and guidelines, BMPs (Best Management Practices), and mitigation measures followed by monitoring (Management Requirements, Constraints, and Mitigation Measures, Chapter 2 and Appendix F) are intended to further minimize the extent, severity, and duration of these effects. The specific environmental effects based on the significant issues were discussed earlier by resource in this chapter. Management requirements and mitigation measures common for all action alternatives are disclosed in Management Requirements, Constraints, and Mitigation Measures, Chapter 2.

Although standards and guidelines, BMPs (for water quality), mitigation, and monitoring are designed to prevent adverse effects to soil, water, and fish and wildlife habitat, the potential for adverse impacts does exist.

Disturbance, displacement, or loss of fish and wildlife may occur as a consequence of habitat loss. The intensity and duration of these effects depend on the alternative selected. Most unavoidable effects are expected to be short-term (less than 2 years). In all cases, the effects would be managed to comply with established legal limits. To minimize these effects, monitoring procedures and mitigation measures have been designed for those areas that may be affected.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road.

Irreversible or irretrievable effects, where applicable, were described in the environmental consequences by resource.

Cumulative Effects

Cumulative effects are addressed in the environmental consequences discussion by resource.

Other Disclosures

NEPA at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders."

The laws and regulations listed in Chapter 1, Laws and Regulations, would be adhered to. Disclosures are addressed in the environmental consequences discussion by resource. The following is a discussion of issues relating to the Beschta Report (1995).

Issues Relating to the Beschta Report (1995)

The interdisciplinary team (ID Team) considered resource concerns raised by the Beschta Report (1995). The ID Team considered concerns in the context of the post-fire conditions of the

Flagtail Fire Recovery Project area, and the goals and objectives of the Forest Plan, while consulting the scientific literature on post-fire logging. Scientific literature and monitoring reports are cited throughout the DEIS and FEIS, including McIver and Starr (2000). McIver and Starr reviewed and discussed the existing body of scientific literature on logging following wildfire and interpreted 21 post-fire logging studies. McIver and Starr also include an annotated bibliography providing discussion of references, commentaries, and scientific papers pertaining to post-fire logging studies by a wide range of scientific and advocacy sources including the Beschta Report; Everett (1995) (regarding review of the Beschta Report); Saab and Dudley (1997) (regarding responses by cavity-nesting birds to high intensity wildfire and post-fire salvage logging); Sallabanks (1998) (regarding response of breeding bird communities to wildfire in the Oregon Blue Mountains); Sexton (1994) (regarding ecological effects of post-fire salvage logging on vegetation diversity, biomass and growth); and 124 other sources.

The scientists who authored the Beschta Report provided their opinions on issues of salvage logging in the form of general principles and recommendations. They presented their suggested policy principles and land management recommendations as generally applicable to Federal lands throughout the western United States, or at least the Interior Columbia and Upper Missouri Basins. They were not focused on the specific ecological, social, and economic characteristics of the post-fire conditions of the Flagtail Fire Recovery area or the Malheur National Forest.

Beschta Report authors asked land managers to consider all post-fire hazards and management alternatives, but mainly recommended passive management. The report is centered on the "common thread" that natural patterns and processes provide the best pathway to recovery. Alternatives 1 and 4 come closest to meeting the Beschta Report recommendations to allow natural processes to provide the pathway to recovery. Alternatives 2, 3, and 5 allow salvage harvest in the Flagtail Fire area. The effects of all alternatives are described in Chapter 3.

The Beschta Report concerns and their applicability to the Flagtail Fire Recovery Project are addressed below, with quotes from the Beschta Report presented in bold italicized font to distinguish them from responses. Further documentation of the site-specific consideration of resource topics raised in the Beschta Report is contained in Chapter 3. Additionally, the IDT and the Responsible Official considered an alternative based on Beschta. See Chapter 2, Alternatives Considered but Eliminated from Detailed Study, for further discussion of that alternative .

Findings and Recommendations

Ongoing human activity and the residual effect of past activity continue to threaten watershed ecosystem integrity. The region's ecosystems, not just forests, are under severe strain.

> Ongoing human activity and the residual effect of past activity do continue to threaten watershed ecosystem integrity and will likely continue to do so in the future. As revealed during the Interior Columbia Basin Ecosystem Management Project, many of these activities that pose the greatest threats to watershed integrity occur on private lands and are the result of permanent settlement, construction of cities, towns, industrial areas, and various agricultural practices beyond the authorities of the Forest Service.
>
> The Forest Service implements an ecosystem approach through multiple scales of assessment, especially Forest Plans. The Malheur Forest Plan (1990) was amended by the "Regional Forester's Eastside Forest Plans Amendment #2" (1995) and INFISH

(1995) to meet ecological objectives. Ecosystem Analysis at the Watershed Scale for the Upper Silvies Watershed was completed in 2001. The Upper Silvies WA, and updates contained in Affected Environment parts of Chapter 3 of the DEIS and FEIS, describe current and historical landscape conditions and the residual effect of past activity on both forest and stream ecosystems on the National Forest. The proposed project contains actions aimed at recovery of certain ecosystem process and it contains design criteria and mitigations aimed at minimizing further disruption of ecosystem processes. Examples of actions aimed at recovery include fuels control by logging and include road decommissioning, and fuels reduction by logging. Chapter 3 discloses short-term impacts and risks associated with some activities in order to realize long-term improvements. Projects planned under other decisions (Chapter 1, Actions Outside of this EIS to Address Recovery Needs and Additional Fire Recovery Projects Ongoing or Completed) also would help decrease adverse effects of past activities and the Flagtail Fire.

Fires are an inherent part of the disturbance and recovery patterns to which native species have adapted.

Fire has long been a part of the Flagtail area's disturbance and recovery pattern. Prior to 1900, lightning caused fire and Native American burning had a significant influence on plant community structure and species compositions, and fire regimes. Native Americans set fires at regular intervals within the Upper Silvies Watershed and there is evidence this has taken place for at least the last 2,000 years although it may have been practiced long before this. This use continued until permanent settlement by non-native people occurred (around 1900). Lightning causes 87% of the fire starts in the watershed; the rest are human caused (Upper Silvies WA 2001). However since 1900, fire exclusion, selective logging of high value trees, and livestock began dramatic changes, especially in Hot Dry and Warm Dry forests. Grasses were grazed by livestock, reducing fine fuels and making fire suppression more effective. Selective logging removed many of the larger, fire-resistant ponderosa pine. The result is that stands are much denser than historically and an understory of shade tolerant species such as Douglas-fir and grand fir has developed in many areas. These species are not well adapted to the type of fire they may experience today, especially where frequent, low-severity fire has been replaced by infrequent, high-severity fire. The smaller trees serve as ladder fuels that provide a pathway for ground fires to travel into the tree canopy. Once in the canopy, the trees crowns are close enough together for the crown fire to travel long distances causing widespread mortality, as occurred in Flagtail Fire. In these ecosystems, wildfire no longer operates within historical ranges of variability (Agee 1994), and their effects may be foreign to ecosystem function (Everett 1995).

Past management practices-including fire suppression-have resulted in raised fuel loadings in the area beyond what is expected in a natural system (minimal human effect). The result of the Flagtail Fire is the removal of much of the fuels less than 3 inches in diameter; however the larger diameter fuels are well in excess of what occurred in this area prior to 1900. If these large fuels are not effectively reduced, the severity of future wildfires will not be part of the disturbance and recovery patterns to which native species have adapted. Species present in this area were adapted to primarily low intensity, frequent fire as part of the disturbance regime.

Chapter 3 discloses the effects of a future wildfire would be severe if the heavy fuels are not treated. Part of the Desired Condition (Chapter 1) is to allow "… for maintenance of reduced fuel levels through future low intensity prescribed or natural fires." If fuels are not effectively reduced, the return to these natural disturbance and recovery patterns probably would be delayed many decades.

This issue is also discussed in the responses immediately below.

There is no ecological need for immediate intervention on the post-fire landscape.

The Forest Service recognizes that ecosystem management includes biological, physical, and human needs (40 CFR 1508.14). While there is no immediate ecological need to salvage harvest fire-killed trees, there is a valid objective to capture economic value of the fire-killed and damaged trees expected to die. Due to decay and checking of wood, there is an immediate need to harvest to recover the economic value from fire-killed trees. Also, future wildfire suppression costs would increase without immediate logging.

Additionally, there are opportunities to fulfill other ecological needs through this project while following ecosystem managment direction. Two long-term ecological needs, re-establishing upland vegetation and reducing future fuel loading, would be delayed for decades without immediate intervention. Planting would accelerate reforestation. Timber harvest with subsequent fuels treatment would reduce the potential for high severity fires in the future as the standing dead trees fall on the ground. This reduced potential would protect forest growth and allow natural and prescribed fire to be used to maintain stands and fuels in more natural and resilient conditions.

Another ecological purpose and need for the project, reducing the effects of roads on wildlife and water quality, could also be fulfilled. This project would reduce sedimentation in streams from existing roads and from interactions between roads and post-fire runoff. In addition there are needs to treat sediment sources and streams to rehabilitate past disturbance. These needs are addressed in this FEIS as well as projects covered under other decisions (see Chapter 1, Actions Outside of this EIS to Address Recovery Needs and Additional Fire Recovery Projects Ongoing or Completed).

While there is no immediate ecological need for treatment in this fire situation, there is an immediate human need for treatment (due to the loss of economic value of fire-killed trees over time). The Flagtail Fire Recovery alternatives have been carefully thought out, and contain design features and mitigation measures to protect resources such as soil quality and actions to improve resource conditions, such as watershed conditions.

Existing condition should not be used as "baseline" or "desired" conditions upon which to base management objectives.

In discussing this comment, it is important to note that Beschta authors define baseline as desired conditions. While baseline can be defined differently, we fully agree with the Beschta recommendation that the existing condition should not be used as a desired condition. For this EIS, existing conditions included the effects of past activities (such as past timber harvest) as well as the effects of the Flagtail Fire. Existing, post-fire, conditions were not used as desired conditions (or baseline conditions as defined in Beschta), but were used to compare current conditions to desired conditions (see Chapter 1).

As an example, the existing open road density in the Jack subwatershed is 4.84 miles/mile^2. The desired condition (taken from the Malheur Forest Plan, as amended) is 3.2 miles/ mile^2 (not the existing condition of 4.84 miles/ mile^2). All action alternatives move the open road density toward the desired condition by reducing open road density to 3.87 miles/mile^2 (see the wildlife section of Chapter 3).

Desired Conditions in this EIS are based on the Forest Plan as amended and recommendations from the Upper Silvies WA (USDA Forest Service 2001). Desired Conditions describe what environmental, social, or commodity goods and services are wanted from a particular land management area. Proposed activities were designed to move resource conditions closer to the desired conditions and address the management direction provided by the Malheur Forest Plan as amended. Changes to management objectives (in terms of Forest Plan Standards) are made at the Forest Planning level rather than the project level. Any request to change those standards would be considered during Forest Planning rather than project planning.

Fire suppression throughout forest ecosystems should not automatically be a management goal of the highest priority. The overall management goal must be to preserve (and reestablish) the fire and other disturbance regimes that maintain ecological systems and processes, while protecting human life and property.

One of the goals for the Malheur National Forest is to initiate initial suppression 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 considerations. An additional goal is to identify, develop, and maintain fuel profiles that contribute to the most cost efficient fire protection program consistent with management direction (Chapter IV-4). General fire suppression recommendations are not within the decision space for Flagtail Fire Recovery FEIS.

Purposes and Needs in Chapter 1 include reducing future fuel loading and re-establishing upland vegetation. Part of the Desired Condition is to allow "… for maintenance of reduced fuel levels through future low intensity prescribed or natural fires." When the Desired Conditions are achieved and maintained, fire suppression needed to protect life, property, and resources would be reduced.

Recommended Post-Fire Principles

Allow natural recovery and recognize the temporal scales involved with ecosystem evolution. Human intervention should not be permitted unless and until it is determined that natural recovery processes are not occurring. Preserve capabilities of species to naturally regenerate. Do not take actions which impede natural recovery of disturbed systems. Active reseeding and replanting should be conducted only under limited conditions; such practices should be employed only where there are several years of evidence that natural regeneration **is not** ***occurring.***

Flagtail Fire severity was outside the historical range of variability, because fuel loads and connectivity were higher than under natural conditions, resulting in higher tree mortality and higher future fuel loads than under natural conditions. Congress has long emphasized restocking of unstocked National Forest forestland. Regional Forester direction is that deforested lands capable of growing trees should be reforested as quickly as practicable, with salvaged areas to be reforested within 5 years (Nov. 19, 2002, Regional Forester Letter). Relying on only natural recovery processes would delay reforestation 2 to 5 decades, as described in Chapter 3, and would not meet the reforestation objectives.

Local experience on the Blue Mtn. and Prairie City Ranger Districts indicates that delaying reforestation activities will make the regeneration of early seral conifer species such as ponderosa pine increasingly difficult because of vegetative competition from sod forming grasses and snowbrush ceanothus that is low immediately after a fire and increases over the next 3-5 years (Chapter 3). Additionally, animal damage to seedlings from pocket gophers and big game is currently low, but is expected to increase over the next several years. Experience on the Reed Fire (planted the next spring), and the Summit Fire (planted within 3 years of the fire) is that vegetation competition and animal damage can be avoided if an area is planted soon after a fire. If natural reforestation failed, it would likely require expensive, labor-intensive site preparation and the use of chemicals (herbicides and rodenticides) and to establish conifer seedlings because of the potential vegetative competition and animal damage. By planting as soon as possible, there is no anticipated need for control of competing vegetation or animal damage control. This avoids use of chemicals to achieve reforestation goals.

Tree species to be used in conifer planting are all native species collected from locally adapted seed sources and are chosen to mimic the species that are best adapted to each bio-physical environment. Wider spacing than normal is prescribed to decrease competition thus reducing the need for intermediate thinning treatments and increasing individual tree growth. Another benefit to wider spacing is the opportunity for locally seeded ground, shrub, and tree vegetation to become established. This allows natural recovery processes to still take place.

Salvage logging is not expected to have an effect on the developmental pathway of the vegetation (Chapter 3). Reduction in shade on seedlings from salvage operations will not affect seedling survival in the plant associations present in the Flagtail Fire Recovery planning area. Successful regeneration of previous clearcuts in the immediate vicinity of the fire attests to this fact.

A non-native, but also non-persistent, grass seed mix would be used to establish ground cover in certain specific situations. Non-native seed would be used because there is no local seed available for this area. Seed will be sown to prevent erosion on soil exposed during road work, on landings, and on certain skid trails. Seeding will also reduce the risk that noxious weeds could colonize disturbed sites. Areas that are seeded with this mix will be monitored to verify that seeded grasses do not persist.

To allow natural recovery of vegetation and riparian areas, under all alternatives livestock grazing would be delayed for two or more years depending on fire severity and whether monitoring shows that the range resource is ready after two growing seasons or not. This will comply with the Forest's post burn grazing guidelines (Appendix H). Grazing may be delayed for a longer period if necessary to meet other resource objectives.

Noxious weed prevention strategies are included in the alternatives (Chapter 2).

Protect soils. No management activity should be undertaken which does not protect soil integrity.

This is Forest Service policy. Forest Service Manual 2500, Region 6 Supplement to Chapter 2520, Watershed Protection and Management (2500.98-1) provides policy to meet direction in the "National Forest Management Act" of 1976 (NFMA) and other legal mandates, to manage lands without permanent impairment of land productivity and to maintain or improve soil and water quality. Forest Plan Standards meet NFMA and other legal and regulatory requirements to protect soil integrity.

Site-specific soil assessments and analysis were completed for Flagtail Fire Recovery Project. Information regarding soil conditions and effects of the alternatives are described in Chapter 3.

The Flagtail Fire Recovery alternatives contain design and mitigation measures to protect soil integrity. The timber harvest activities will not permanently impair the productivity of the land or irreversibly damage soil or other watershed conditions.

Recommendations on Post-Fire Practices

Salvage logging should be prohibited in sensitive areas including: severely burned areas, erosive sites, fragile soils, roadless areas, riparian areas, steep slopes or any site where accelerated erosion is possible. Because of soil compaction and erosion concerns, conventional types of ground-based yarding systems should be generally prohibited.

As explained in the response immediately above, federal laws, regulations, and the Forest Plan provide authoritative direction to ensure that management activities on these sites do not result in unacceptable impacts to soil and water resources.

Harvest and yarding of trees could lead to increased erosion, soil compaction, and loss of down wood and soil fauna. However, the extent to which these effects occur depends upon a variety of factors such as specific site conditions, the methods used, the timing of these activities, and their duration.

As evidence in Chapter 3 indicates, all alternatives meet Forest Plan Standards for detrimental soil impacts, including compaction. Under harvest alternatives (2, 3, & 5) erosion and sediment delivery to streams likely would be negligible. Under Alternatives 1 and 4, there would be no risk of erosion or sediment production from harvest. The alternatives are designed to avoid or mitigate potential impacts of salvage harvest on severely burned areas and erosive sites (including steep slopes), so that impacts are small and acceptable (Chapters 2 and 3). For instance, skyline or helicopter yarding systems will be utilized on steeper slopes. No harvest is planned for fragile and highly erosive sites.

No roadless areas exist within the project area; see discussion of unroaded areas in Chapter 3, Other Disclosures for further discussion. Timber harvest activities will not occur in default RHCAs.

On portions of the post-fire landscape determined to be suitable for salvage logging, limitations aimed at maintaining species and natural recovery processes should apply. Salvage logging must: leave at least 50 percent of standing dead trees in each diameter class,

leave all trees greater than 20 inches DBH or older than 150 years, generally leave all live trees.

Regional Forester's Eastside Forest Plans Amendment #2 (1995) directs that snags shall be maintained at 100 percent potential population levels of primary cavity excavators. Malheur National Forest determined prescriptive levels based on this direction as well as post-fire snag use levels and snag inventory data summarized in the DecAID analysis tool (Mellen 2003). Prescriptions have been fine-tuned to address physical and biological conditions in the Flagtail project area. In the FEIS, a new alternative (Alternative 5) was developed to further analyze the effects of various snag and down log levels on dependent species. A range of snag prescriptions have been analyzed in Chapter 3 of the DEIS and FEIS.

The wildlife habitat value of snags and down woody debris, and the effects of alternatives on snag habitat and down-wood-dependant species are addressed in Chapter 3. All trees that have a reasonable chance of surviving will be retained within the salvage harvest areas (except trees in areas such as landings, trees that pose a hazard to logging operations, or trees that must be felled for road work).

Leaving all snags over 20 inches DBH would result in a loss of economic viability for salvage operations, loss of the commercial forest product value and associated benefits to the local economy.

Currently, potential fire intensity and severity are low. With snags left at levels recommended by the Beschta Report, fuel loading will increase over the next 10 to 20 years as the snags decay and fall down. These levels would result in future fuel loadings that are less than Alternative 1 and 4 in the DEIS but more than the other alternatives. Accumulations of large woody fuel can burn or smolder for long periods of time effecting soils, soil organisms, and plant propagules present in the soil. A volatile fuelbed would be created as trees and brush grow through the fallen snags. These levels of snags or down logs are likely not characteristic of what existed historically in this area of high frequency, low severity fire regime The desired condition would not be achieved using this recommendation.

Because of the wide range of chronic ecological effects associated with road building, the building of new roads in the burned landscape should be prohibited.

Road construction would be kept to a minimum. Roads would not be built within RHCAs.

Under Alternative 2, 3.9 miles of temporary would be constructed, under Alternative 3, 2.9 miles of temporary road would be constructed, and under Alternative 4, 3.3 miles of temporary road would be constructed. While some local impacts to soils would occur, these roads would be rehabilitated and decommissioned at completion of harvest activities.

About 0.3 miles of permanent road would be constructed, and 0.3 miles of road in RHCAs will be reconstructed (including a culvert replacement where fill is failing) under Alternatives 2 & 3 to allow decommissioning of 1 mile of existing road in an RHCA, while maintaining needed access to parts of Snow Creek subwatershed. Over the long term, stream ecosystems would benefit from the RHCA road decommissioning. Effects are described in Chapter 3.

Structural (check dams, etc.) post-fire restoration is generally to be discouraged. Sediment management should focus on reducing or eliminating anthropogenic sources prior to their initiation (that is, improve stream crossings to prevent culvert failure), and protecting and maintaining natural sediment control mechanisms in burned landscapes, particularly the natural recruitment of large woody debris on hillslopes and in streams.

No check dams are proposed for streams. Some unattached coarse woody debris would be added to streams and hillslopes under other decisions (see descriptions in Chapter 1, Actions Outside of this EIS to Address Recovery Needs and Additional Fire Recovery Projects Ongoing or Completed and Appendix J).

Numerous roads within the analysis area have been identified as having minimal cross drainage with sediment routed to the streams in numerous locations. Maintenance, restoration, and/or decommissioning of roads that are contributing to erosion and sediment concerns are identified in the action alternatives. No harvest activities will occur within RHCAs, and any hazard trees felled within RHCAs would remain there. In all action alternatives, unharvested RHCAs (INFISH buffers) and buffered ephemeral draws provide for natural sediment control.

The ground cover and sediment control provided by natural recruitment of large woody debris on hillslopes is minor, compared with re-growth of ground plants and shedding of needles and small woody debris by burned trees. Natural recruitment of large woody debris to channels and draws is anticipated as the fire affected trees die and fall into the active stream channels. “Actions Outside of this EIS to Address Recovery Needs” and “Additional Fire Recovery Projects Ongoing or Completed” described in Chapter 1 and Appendix J would accelerate recruitment.

Post-fire management will generally require reassessment of existing management— for example the condition of the transportation system (determine the need for undertaking road maintenance, improvement, or obliteration).

As part of the analysis for this project, a Roads Analysis was completed and is documented in the project file. The ID Team focused on identifying roads or portions thereof, within the existing road system, where resource damage is occurring or is likely to occur based upon the post-fire conditions in the planning area. Roads were recommended for maintenance/restoration and decommissioning. The results of the assessment of the transportation system condition led to the proposed actions related to the road system (Chapter 2).

Continued research efforts are needed to help address ecological and operation issues.

The Flagtail Fire is not currently the focus of research, and a decision to conduct research is outside the scope of the Flagtail Fire Recovery DEIS and FEIS. Considerable research has begun regarding fire ecology, fire effects, fire risks, fire recovery, and restoration as part of the Joint Fire Science Program and the “National Fire Plan.” Additionally, the Forest is using the monitoring and administrative study data gathered for the Summit Fire Recovery Project as it considers and addresses ecological and operational concerns.

Additional information must be provided to the public regarding natural fires and post-burn landscapes to provide balance to the "Smokey Bear" perspective of fires and forests.

The DEIS and FEIS contain information regarding natural fires, fuels, vegetation, wildlife, and streams in this landscape.

Fire suppression activities should be conducted only when absolutely necessary and with utmost care for the long-term integrity of the ecosystem and the protection of natural recovery processes.

This recommendation is beyond the scope of this analysis. National fire management policies direct suppression activities. Current policy is to suppress fires that threaten natural resources and human life and property; these types of fires have become more common because current forest conditions differ greatly from historical conditions, resulting in increased fire sizes and severity. Fire suppression activities are implemented with consideration for ecosystem protection, among other factors. For instance, operating procedures are in place to protect smaller bodies of water from excessive removal of water and riparian areas from damage to suppression activities (Evers 2003).

Unroaded

Introduction

Agency direction is to consider unroaded areas greater than 1,000 acres if they are contiguous to an inventoried roadless area. No inventoried roadless areas are located in or adjacent to the Flagtail Fire Recovery Project area. However, comment letters from several groups asked that the IDT consider 2 areas within the planning area identified by ONRC as roadless. In the following description, Area 1 is approximately 1,600 acres and is located in the northeast portion of the planning area. Area 2 is approximately 1,800 acres and is located in the southwest portion and includes land outside the planning area boundary (see map at the end of Letter #11, Chapter 4).

Regulatory Framework

National Forest System Land Resource Management Planning; Final Rule (November 2000)

Malheur Forest Plan

Analysis Methods

The IDT evaluated both areas for consistency with the nine roadless characteristics defined in 36 CFR 294.11.

Results

Characteristic 1 – High quality or undisturbed soil, water, and air.

Area 1 - As described in the Watershed Existing Condition, most of the draws draining this area are disturbed from past skidding and/or roading. Some are gullied. The active flow paths in these draws have probably caused erosion as they extended headward. Even under pre-fire conditions these draws were sources of sediment and concentrated flows that either reached the Silvies River or were deposited on floodplains along Jack Creek or the Silvies River. They are temporarily vulnerable to the re-initiation of erosion until ground cover accumulates. The nonforested portion of this area has lost up to several inches of topsoil, including much of the soil crust, from historic management activities. One site (3-5 acres) of active erosion was identified during field surveys for this project. Although Activities Proposed Outside this EIS are expected to initiate rehabilitation of these legacy conditions, recovery of the active erosion site is expected to take decades. Recovery of draws has begun with the on-going placement of coarse woody material but is not expected to be complete until additional fire killed trees fall over the next 15-30 years. Under the current conditions watershed function is not typical of pristine, wilderness-like conditions associated with unroaded areas.

Area 2 **-** This area also includes draws that have been disturbed by historical and more recent logging and, possibly, by historical grazing with effects on watershed function that are similar to those described for Unroaded Area 1. Although some gullies contain deep deposits of litter (several inches), other draws have little ground cover, and, prior to the fire transported sediment and concentrated flows to the Silvies River, Snow Creek or their floodplains. While Activities Proposed Outside this EIS are expected to initiate rehabilitation of some of these legacy conditions, draws with only small portions inside the fire boundary and that generally burned with low severity were not included in the Categorical Exclusion for placement of coarse woody material. These draws and others that are entirely outside the fire boundary would not be rehabilitated until adjacent living trees die and fall naturally over the next century (or following wildfire). Under the current conditions watershed function is not typical of pristine, wilderness-like conditions associated with unroaded areas.

Characteristic 2 – Sources of public drinking water.
There are no sources of drinking water located in either Area 1 or Area 2.

Characteristic 3 – Diversity of plant and animal communities.
In Area 1, the stands south and east of the Bald Hills (located in sections 17, 19, 20, and 24) are now primarily second growth ponderosa pine stands. The situation is the same north of the Bald Hills near the National Forest boundary (located in section 7 and the north portion of section 18). Mortality varied with a mosaic pattern in most of the stands, except for in section 24 where it was very high. In the portion immediately north of the Bald Hills (central and southern portions of section 18) the stands are a mix of ponderosa pine and Douglas-fir; primarily medium sized, with scattered larger trees. Mortality was very high in this area. In Area 2, the northern portion (in sections 22 and 23) is primarily ponderosa pine and Douglas-fir, mostly medium sized with scattered larger trees. Mortality was moderate to very high. In the central portion of this area (sections 26, 27, and 35) the stands were more of a mix of species, with ponderosa pine, Douglas-fir, grand fir, western larch, and lodgepole pine. Fire intensity was low to moderate, but because of the species, mortality was generally moderate to high. These forest types are typical in this watershed. Non-forested areas are generally small except for the Bald Hills area which is about 250 acres of open habitat. The unforested Bald Hills is a distinctive feature in Area 1, but is not unique to the south half of the Blue Mountain Ranger District.

Both unroaded areas have been partially inventoried within the past 15 years for plant species listed on the Regional Foresters' Sensitive Plant List. Surveys were completed within proposed project areas where activities could affect habitat. Within that time only two sightings have been documented within the Snow Creek and Jack Creek drainages, both adjacent to riparian habitat. Plant habitat within the two unroaded areas is similar to habitat in the roaded areas and surveys have not yet found unique habitats or rare plant species within these unroaded portions of the Flagtail Fire.

Prior to the Flagtail Fire, Area 1 was about 40% old forest multiple strata (OFMS); the remaining 60% was primarily stem exclusion (SE) due to past management activities. Area 1 included most of Dedicated Old Growth (DOG) Area 221 and Replacement Old Growth (ROG) Area 221. Area 1 included a portion of a northern goshawk post-fledging (PFA) area, although identified nest sites were located outside the unroaded area. The DOG/ROG burned with severe to moderate severity, converting structural stage to stand initiation (SI) or understory reinitiation (UR). Outside the DOG/ROG, portions of Area 1 burned with somewhat less severity; post-fire, stands classify as stem exclusion (SE) as well as understory reinitiation (UR) and stand initiation (SI). Because of the fire, the area now provides habitat for early-sere species rather than late-sere dependent species.

Prior to the Fire, Area 2 was primarily classified as young forest multiple strata (YFMS) with scattered stands of old forest multiple strata (OFMS). Stands likely had higher total tree densities than they did historically due to fire suppression; therefore, stands were more structurally complex and had higher canopy cover than they did historically, providing better habitat for canopy dependent species. Area 2 included a portion of DOG 220. To date, no active northern goshawk territories have been identified in the area despite the presence of suitable habitat. About 40% of Area 2 burned in the Flagtail Fire, including DOG 220. The fire converted stands primarily to understory reinitiation (UR) and stand initiation (SI) structural stages, converting habitats suitable late-sere dependent species to early-sere dependent species. Outside the fire area, stands remain primarily YFMS.

Adjacent forested areas provide a similar mosaic of habitats and therefore support a similar array of wildlife species as described in Chapter 3, Terrestrial Wildlife. The size of these unroaded areas is relatively small as compared to larger contiguous habitats located in the Strawberry Mountain Wilderness and Aldrich Roadless Area to the north and the Shaketable Roadless Area to the west.

Characteristic 4 – Habitat for threatened, endangered, proposed, candidate, and sensitive species (TES) and for those species dependent on large, undisturbed areas of land.
Habitat for TES terrestrial animals was very limited in the project area, even prior to the Flagtail Fire, due to past management activities in forestlands and limited non-forested habitats (see Wildlife Biological Evaluation in Appendix D). Area 1 is entirely within the project area; therefore, disclosures for TES species are as described in the Wildlife Biological Evaluation. Area 2 extends beyond the project area boundary; however, descriptions of TES habitats in these areas would be essentially the same as described for the project area.

The unroaded areas, as mapped, do not reflect the influence of the perimeter roads; if road influences are considered, the size of the undisturbed areas of land is reduced. Additionally, Areas 1 and 2 have one or more unclassified roads that are currently accessible to the public. For example, Chapter 3, Terrestrial Wildlife, Big Game Habitat, describes the effects of open roads on elk use; roads that averaged as little as one vehicle per 12-hour period were affecting habitat selection out to 1,000 meters or more (Rowland et al. 2001 and Wisdom et al. 1998). Under the existing condition, all of Areas 1 and 2 are within 1,000 meters of an open road, reducing their effectiveness as elk habitat. Disturbance effects vary by wildlife species, and road influences may or may not extend to the same distance as suggested for elk. About 95% of Areas 1 and 2 is within 500 meters of an open road; again suggesting a high influence of roads on habitats.

In the short-term, the Flagtail Fire, particularly where it burned with moderate to severe intensity, has further reduced the likelihood of wildlife species dependent on large, contiguous blocks of forest from using these areas. Species such as wolverine might use these areas for dispersal or foraging; however, given the size of these areas, the influence of roads, and the severity of the burn, it is unlikely that use levels would vary substantially from adjacent areas.

There are no fish-bearing streams in either Area 1 or Area 2. Watershed conditions in Area 1 or Area 2, located higher in the landscape, are disturbed much like the remainder of the Flagtail Project Area and are described above in this section under "Characteristic 1 – High quality or undisturbed soil, water, and air."

There are no threatened or endangered plant species and no habitat for threatened or endangered plant species on the Malheur National Forest (which includes the unroaded areas identified). Surveys have not yet found sensitive plant species within these unroaded portions of the Flagtail Fire (see Characteristic 3).

Characteristic 5 – Primitive, semi-primitive non-motorized, and semi-primitive motorized classes of dispersed recreation.
Area 1 and Area 2 are managed as roaded modified and roaded natural.

Characteristic 6 – Reference landscape.
The forest types in Area 1 and Area 2 have been sufficiently altered that they no longer provide a reference landscape. The most noticeable impacts are from timber harvest, unimproved roads, and livestock grazing.

Characteristic 7 – Natural appearing landscapes with high scenic quality.
Area 1 – Much of the original large timber in this area has been harvested; starting as railroad logging in the 1930's as part of the Bear Valley timber sale and continuing to the present, converting to truck hauled operations in the 50's and 60's.

All of the stands south and east of the Bald Hills (located in sections 17, 19, 20, and 24) have had most if not all of the large trees removed with ground based yarding and are now primarily second growth ponderosa pine stands. The situation is the same north of the Bald Hills near the National Forest boundary (located in section 7 and the north portion of section 18). Mortality was varied with a mosaic pattern in most of the stands, except for in section 24 where it was very high. Roads are located approximately ¼ mile apart and skid trails accessed the interiors of the stands.

The portion immediately north of the Bald Hills (central and southern portions of section 18) was also harvested in the past, but only some of the larger trees were removed. The stands are a mix of ponderosa pine and Douglas-fir; primarily medium sized, with scattered larger trees. Mortality was very high in this area.

Area 2 – Harvesting in this area was not as intensive as in Area 1, but was widespread over most of the area.

The northern portion (in sections 22 and 23) is primarily ponderosa pine and Douglas-fir, mostly medium sized with scattered larger trees. Most was lightly to moderately harvested in the past with ground skidding equipment. There are roads around this portion and skid roads throughout. Mortality was moderate to very high.

In the central portion of this area (sections 26, 27, and 35) the stands were more of a mix of species, with ponderosa pine, Douglas-fir, grand fir, western larch, and lodgepole pine. Most of the area was lightly harvested removing large ponderosa pine with ground skidding equipment. A road up Snow Ck. accessed the area with skid trails running down through the stands. Fire intensity was low to moderate, but because of the species mortality was generally moderate to high.

The balance of this area is outside of the Flagtail Fire boundary. The stands there were also harvested in the past, those on the west facing slope along the boundary had most of the larger trees removed while the ones to the south contained light to moderate stocking of larger.

Visual Corridor **-** Area 2 has about 200 acres within the visual corridor. This portion has most of the trees appearing green, although some are expected to turn brown based on the amount of fire damage that has been observed. There is one classified road through the middle of this portion, some unclassified roads, many skid trails and stumps resulting from past harvesting. This area does not have the pristine, wilderness-like appearance associated with unroaded areas due to the effects of past management activities.

Outside the Visual Corridor **-** Both ONRC identified unroaded areas have been altered by recent and older harvests that removed many of the large diameter trees. Most of the large diameter trees that remained after past harvesting were killed by the fire, especially in the Designated Old Growth Area in Area 1, where there was a higher amount of large diameter trees. The amount of classified and unclassified roads, skid trails and stumps within the ONRC identified unroaded areas combined with the increased visibility of the landscape through the loss of live trees gives the viewer the same effects to landscape aesthetics as adjacent burned areas not identified by ONRC as unroaded areas. These areas do not have the pristine, wilderness-like appearance associated with unroaded areas.

Characteristic 8 – Traditional cultural properties and sacred sites.
There are no traditional cultural properties or sacred sites in Area 1 or 2.

Characteristic 9 – Other locally identified unique characteristics.
Area 2 has no identified unique characteristics. The unforested Bald Hills is a distinctive feature in Area 1, but is not unique to the south half of the Blue Mountain Ranger District.

Based on these 9 characteristics, neither Area 1 nor Area 2 is considered to have value for consideration as roadless areas. This document will continue to analyze these areas as their existing land classification.